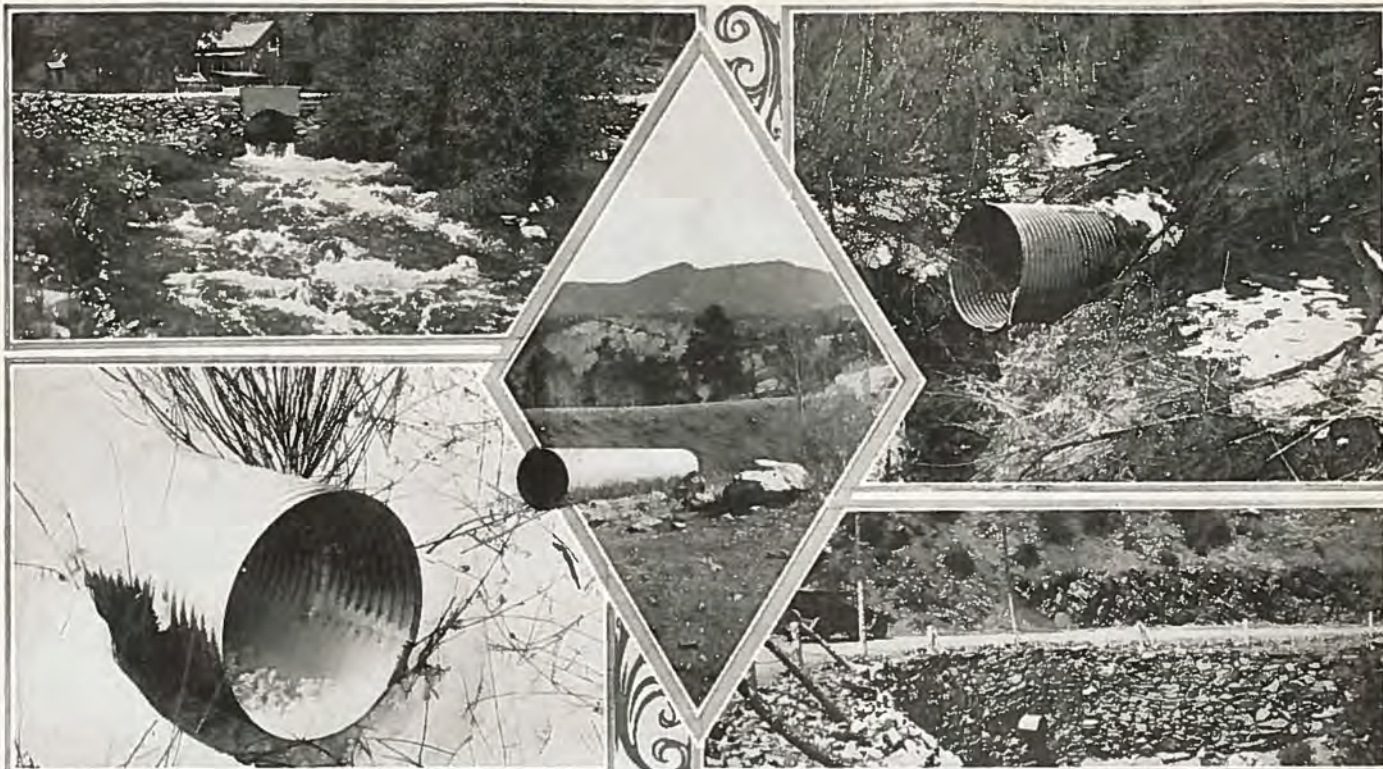




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A magazine devoted to Good Roads



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Official Publication of the
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 Denver, Colorado

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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 408 Chamber of Commerce Building, Denver, Colorado.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.
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OUR COVER PICTURE



A winter scene in Bear Creek canon, a part of Denver's Mountain Park system, is printed on the front cover of this month's COLORADO HIGHWAYS. Thru a highly developed system of maintenance by forces of the City of Denver this thoro fare is kept open thruout the winter months. With its covering of snow, this canon presents one of the most picturesque travel attractions in this part of the state.

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If the motor vehicle is to continue giving the economic service of which it is capable, we must have more Concrete highways and widen those near large centers of population.

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Good Roads Demand Reflected in Vote

Popularity of Better Highways Proposals Disclosed by People's Ballots
in Progressive States

POPULAR demand for good roads and willingness of the people to pay reasonably to get better highways without costly delays are reflected in the results of the recent election in middle west states.

Minnesota adopted Amendment No. 1 to put gasoline tax money into roads by nearly 500,000 "yes" against less than 200,000 "no" votes. On nearly 830,000 ballots cast, the proposal received 87,000 votes in excess of the number necessary to pass it, a far greater margin than any other amendment. Whether the result may be counted a good roads victory, however, will depend on highway income legislation at the session beginning in January.

More definite good roads victories are reported in other states.

Missouri voters by a big majority approved higher auto taxes, also a gasoline tax and bonds of \$15,000,000 a year to pull that state out of the mud.

Illinois voters authorized a new \$100,000,000 bond issue to carry on good roads work, notably paving which is being built at the rate of 1,000 miles per year.

Wisconsin farm bureau members have headed a legislative program with a gas tax proposal—motor vehicle taxes there are about double those in Minnesota and about three times as high as Colorado charges.

Texas citizens authorized the state to collect a gasoline tax and speed up the construction of improved roads, for which it is now a leader in mileage.

Iowa taxpayers, patterning after the Minnesota plan, will urge the legislature to impose a gasoline tax and to issue \$85,000,000 of bonds for 3,000 miles each of highway paving and graveling.

Other states are advancing good roads programs. The single exception is Kentucky, in which a bond proposal was voted down.

There will come before the general assembly which convenes in January several proposals for the financing of the road program in Colorado after 1926.

These proposals probably will include an increase in the gasoline tax; higher motor vehicle fees; restoration of the half-mill levy for road construction, and a new bond issue.

Each of these proposals has been suggested either separately or collectively by good roads organizations. Neither of them has been specifically endorsed by the State Highway Engineer.

While he feels that the people of Colorado demand a continuance of the present road program, he is satisfied to accept the judgment of the legislators of how much money shall be spent after 1926, and how it shall be raised.

The present program of the Highway Department runs about \$5,000,000 per year. Of this sum nearly \$1,000,000 goes for road maintenance work.

Several of the good roads organizations have advocated the passage of a measure to finance construction and maintenance work for the next fifteen years. At the present rate of improvement it is claimed that it will take this long to complete the state highway system.

By means of such a measure it is claimed that the present outstanding highway bonds can be retired and the road program placed upon a "pay as you go" basis. At the same time over \$200,000 in interest charges can be saved the taxpayers.

The demand for heavy license fees on trucks and passenger busses is present everywhere in the state. There is little doubt that the present fees on these two classes of vehicles will be materially increased. The fees now charged are very low.

County road officials recently passed a resolution in favor of a 4-cent gasoline tax. In advocating the measure, one of the delegates said the average sum paid the state now in gasoline tax by one of the passenger busses on a 75-mile trip was 18 cents.

The majority of these busses carry twelve passengers. A charge of \$4 is made for each passenger making the 75-mile trip. Some of the busses travel on regular schedules and come in direct competition with railroads for passengers.

At the same time the legislators probably will be asked to consider several measures designed to regulate traffic over the highways, with the object of reducing the terrible death toll from accidents.

Highway Engineer Reports on Road Work Done in 1924

AS briefly as possible I wish to submit a short statement setting forth the activities of the Highway Department during the year 1924, and in some ways compare the results attained with those of the year preceding.

The Department has disbursed during the 1924 fiscal year, for Administration, Construction and Maintenance, an amount of \$5,721,530, divided as follows:

For Federal Aid construction projects	\$3,552,000.00
For State construction projects	972,000.00
For Maintenance	821,000.00
For Property & Equipment..	98,000.00
For Office Administration...	62,000.00
For Engineering Administration	88,000.00
For Road Signs and Traffic Census	22,000.00
For County Bond Projects...	103,000.00

From these figures you will note that 80% of our funds have gone into Construction, 14.35% into Maintenance, 1.7% into Property and Equipment, and 2.63% into Administration.

During 1924 there was expended for Construction \$4,500,000, which was approximately \$300,000 more than was expended in 1923 for Construction. Due to favorable weather conditions throughout the entire construction season, and the bunching of funds into larger projects than had been the policy of the Department heretofore, the results attained by our construction forces were more satisfactory this year than in any prior year under the present administration. Notwithstanding that the increase in the work performed over that of the previous year was very material, the engineering expense in connection with this work was approximately \$100,000 less than for the year 1923. We have referred to the administrative expense of the Department as being 2.63% of our total expenditures; this shows a reduction over the administration expense in 1923 (which was 3.18%) of 0.55%. From the above figures you will note that a marked improvement has been made in the general overhead and engineering expenses during the present year, and we trust that if the funds available for construction can be concentrated even more in the future than they have in the past on worthwhile projects, that a further reduction in engineering and administration may be accomplished.

The construction work performed during the year comprised 202 different construction projects, as compared with 396 in 1923, and the mileage and types of completed projects are as follows:

23 projects covering a hard-surfaced type of improved road, totaling	64 miles
55 gravel-surfacing projects, totaling	269 miles
69 grading projects, totaling...	122 miles

In addition there was some 36 different bridges. This would give us a grand total of completed road construction during the year of 455 miles.

In addition to the above road mileage constructed during the year, the Bureau of Public Roads and the Forest Service, with Forest funds, have independently, or with State participation of funds, constructed 50 miles of road, as Colonel Peck has already advised you.

In relation to the maintenance work accomplished during the year 1924 on state highways, a total of 8,958 miles has been maintained, with a greater or less degree of perfection. The mileage under the patrol system of maintenance, however, was 5,216; and even under the dry weather conditions prevailing during 1924, the results of the patrol system in those counties where this work was faithfully performed have been reflected in much praise to those respective counties, and, regardless of the weather conditions, we believe that results have been attained by the patrol system that have substantiated our belief of two years ago that, whether wet or dry, our roads could be made adequate to withstand the traffic under this system of maintenance.

The average cost for the maintenance of the state highways for the year 1924 has been \$166.00 per mile, which is approximately \$50.00 or \$75.00 less per mile

than adequate maintenance should cost—this figure being based on the average cost of roads in other states under similar traffic.

In the matter of Federal Aid construction in our state, it might be well at this time to call attention that under the Federal Act of 1921 the state receiving Federal Aid obligates itself to the following effect: that on roads receiving Federal Aid, it will maintain same to the satisfaction of the inspectors of the Bureau of Public Roads, and that in case this is not done, the state agrees that the Bureau of Public Roads may then, with its own organization, maintain said roads to its standard of maintenance and charge the state for all expenses incident to such maintenance—the state further agreeing that, pending the satisfactory maintenance by it of the Federal Aid stretches of road, the Bureau of Public Roads shall divert the Federal moneys that such state under normal conditions would be allotted to other states. So that in the first instance the Highway Department of the State of Colorado obligates itself to maintain, to the satisfaction of the Bureau of Public Roads, the Federal Aid projects that have been constructed in this state;



Views of State Road No. 10, showing newly improved stretch on west slope of LaVeta Pass, near the town of Fort Garland, in Costilla county.

and this is the reason that County Commissioners recently have received a communication from the Highway Department requesting them in turn, who desire Federal money for the improvement of a road within their county, shall obligate themselves to maintain such Federal Aid project to the degree required by the Government. This does not in any way relieve this department of co-operation in such maintenance as to funds furnished, except that the amount of such funds may vary as the Legislature dictates the expenditures of the Highway Department. I wanted to bring this matter up before you, as there perhaps was some misunderstanding as to a circular sent out to the counties recently, at the suggestion of the Highway Advisory Board, concerning the obligations which the counties must assume as to the maintenance of Federal Aid projects. One of the points referred to in this circular is the acquisition, by the counties, of rights-of-way for Federal Aid projects. The Government does not participate in the cost of rights-of-way, and it is therefore asked that the county receiving a Federal Aid project will assume the cost of the necessary rights-of-way on a location that will be mutually agreeable to the Bureau of Public Roads, the county in question, and the State Highway Department.

There is one other matter that I think it pertinent at this time to call to your attention; and that is, that there has been some talk relative to the State Highway Department taking over the maintenance of the state highways of Colorado. A conference was held with the Commissioners of one of the Highway Districts on this matter, at which no satisfactory arrangement could be agreed upon. In behalf of the Highway Department, and as its administrative officer, I wish to place myself on record at this meeting to the effect that, as I previously expressed to you some three years ago, when you held your annual meeting at the Albany Hotel, I do not believe this is the opportune time for such action to be taken. I believe that the majority of the counties, under the present system of maintenance, co-operating with the State Highway Department, are attaining excellent results—while there are others that do not seem to get into line in a way that demands encouragement or help from the State. As to the latter class of counties, we can

only hope that, with patience and further co-operation, the time may soon be reached when they will line up, by comparison, with the first class of counties. The State at this time is not provided with funds to adequately equip the enormous maintenance organization that would be required to function efficiently under a state maintenance program. I am not in favor of it now; but ask you gentlemen, as a body, to help us get the results that, without undue expenditure, have already been attained by certain counties operating under intelligent maintenance organizations—namely, the performance of the work required to the satisfaction of the Department, the county, and the taxpayers as a whole.

The traffic census has been continued throughout the year on the more important roads, and additional valuable data has been secured as to the number of vehicles per day over our highways, which will be a guide to determine the type of construction necessary to adequately withstand such traffic. It is to be hoped that we may continue this over a term of years, thus permitting us to assemble data that will be, in my belief, a great benefit to the department.

A larger number of the counties have installed traffic policemen on their main highways, in order to curb the violations of the State traffic laws, and to add to the safety of our travelers, as well as to protect our roads from violations of the speed and loading limits. As expressed to you last year, the department would again be glad to share with a county in the cost of such traffic patrols as may be justified.

The work of marking our roads with uniform direction, distance and caution signs has been continued throughout the year, the signs being furnished by the Rocky Mountain Motorists Association, and being installed by the maintenance forces of the Highway Department and counties. Three thousand eight hundred and forty-eight requisitions have been furnished the Rocky Mountain Motorists, and 3,095 signs have been received and installed by the department to date.

The department has continued to operate on a strictly cash basis. Our budget for the year 1925 will contemplate an expenditure of \$4,550,000, the funds for which will be derived: \$1,500,000 from the 1925 Bond Sale; \$1,350,000 from Federal Aid to be earned; \$750,000 from the half-

mill levy; \$800,000 from the State's share of the present 2c gas tax; \$50,000 from the Internal Improvement Fund, and a \$100,000 carry-over of Highway funds.

It is to be noted that the increase in the number of motor vehicles in 1924 over 1923, in the State of Colorado, was approximately 15,000 cars, or 8 per cent. Estimating the average value of a car at \$800.00, the people of the State have an investment in motor vehicles of \$162,000,000. When there is added to this the cost of accessories, etc., the investment approximates \$200,000,000. We believe, as expressed to you last year, that this investment should be protected, and that the cost of operation and maintenance of such equipment should be reduced. This cost can be reduced by providing suitable roads and maintaining them after they are constructed.

I should like to extend an invitation to those of you who are interested, to visit our offices in the State Office Building, and there we will show you in detail the costs of any project that has been completed, such costs being divided into engineering, administration, etc. If you have in mind certain projects, in connection with which there seems to be a questionable overhead expense, you can be shown to the last dollar where every cent of the money that went into the project was placed; so I will appreciate it, gentlemen, if any of you who may wish to do so will visit our Accounting Division and satisfy yourselves as to the way in which our accounts are kept.

To those of your Association who will presently retire from their positions as county commissioners, I wish to express, in behalf of the department, our sincere thanks for the encouragement and co-operation that you have extended to the department during your term of office; and it is with regret that we note the many changes that will take place. On the other hand, to those new members who soon will assume office as commissioners of your respective counties, we assure you, on behalf of this department, that we will do our utmost to cement the harmonious relations that must exist between the County Commissioners and the Highway Department if effective road improvement and maintenance are to continue; and we therefore cordially invite you to meet with us in our offices that we may discuss your problems and ours.

County Officials Advocate Higher Gasoline Tax for State Roads

AN intensive study of the problems of finance facing the State Highway Department formed the principal activity of the seventeenth annual convention of the Colorado State Association of County Commissioners when they met in the House of Representative chambers in the State Capitol a month ago. From this study came forth three definite recommendations for financing the Highway Department for the years which will follow the exhaustion of the present \$6,000,000 bond issue that will be used up entirely by the close of 1926.

Briefly, these recommendations are as follows:

Restoration of the one-half mill levy in the general property tax for highway purposes.

Increase of the State gasoline tax from the present tax of 2 cents a gallon to 4 cents a gallon; the present plan of dividing the proceeds of the tax equally between the State Highway Department and the counties to obtain with the new increased tax, the counties to use their half of the tax solely on highways.

Increase in the automobile license fees; the increase to be not less than 25 per cent of the present fees on all classes of motor vehicles.

These three recommendations, if plans

outlined by the county commissioners are carried out, will be placed squarely before the legislature at its present session.

The convention favored, almost to a man, the increase in the gasoline tax as one of the most equitable programs of taxing for highway purposes, on the ground that such a tax places the greatest burden of highway upkeep on those who use the highways most.

The convention was unanimous in favor of the increase in automobile license fees.

Several commissioners put up a strong fight in the convention against adoption of the resolution recommending restoration of the one-half mill levy. For a time

in the convention the recommendation was apparently lost, but when a roll call was finally demanded and the resolution came to a vote, this recommendation passed by a tally of more than two to one. Though the fight on the part of a number of commissioners against the plan had been bitter, the consensus of opinion was that all the commissioners would stand back of the recommendation as voted by a large majority.

Although highway matters occupied the attention of the convention during most of its session, the commissioners found time to dispose of a number of important resolutions submitted to them by their committee on resolutions. They also found time to visit a number of the points of particular interest in the development of Denver, and were extensively entertained during the three days of their convention.

The first in the list of resolutions passed by the convention was one of appreciation for the co-operation received from the State Highway Department during the year 1924, and of appreciation for the efforts of the department to reduce engineering expenses throughout the State. A resolution expressing deep thanks to J. W. Shy, president of the commissioners' association, and to T. W. Monell, secretary-treasurer, was next adopted.

Passage by the legislature of the Co-Operative Fidelity Bond bill, which has been advocated by the commissioners for many years, was once more urged in a strong resolution that condemned the attitude of the established surety companies in charging what the resolution declared to be grossly excessive premiums on bonds for county officials.

Imposition of a license or permit fee on the operators of motor trucks and busses who carry on commercial transportation on State highways was recommended, in conformity with the plan now in effect in several other states. In this resolution it was declared openly that the "operation of such trucks and busses is more destructive to our highways than any other agency."

A constitutional amendment which

would compel voters to declare their party affiliations at the time of registration for primary election will be framed by the legislative committee of the commissioners and presented to the legisla-



James E. Beckley, of Delta, newly-elected president of County Commissioners' Association

ture as the result of another resolution passed at the convention.

Aid for the farmers whose crops suffer from the ravages of jack rabbits was sought in a recommendation to the legislature for a bill authorizing the counties, at their option, to offer and pay counties for the destruction of the rabbits.

The question of holding tax sales on the second Monday of November, as at present, was brought up and the convention finally resolved that the Colorado

law should be amended to permit the holding of such tax sales on or before the third Monday in December.

The many financial and other difficulties involved in carrying out the present law that requires each county of the State to maintain its own poor farm were discussed at length by the convention and a resolution was passed asking the legislature to amend the law so as to permit two or more counties, at their option, to unite in the building, operation, and maintenance of a poor farm. This, it was believed by the commissioners, would prove a great saving of expense to small counties where the population of one county does not justify the maintenance of a poor farm.

Courtney Riley Cooper, a newspaper man and author, was especially thanked and commended in a resolution for the good he has done the State by writing and having published in national magazines articles which advertise Colorado and bring to the attention of the nation the beauties and resources of this State.

It was the sense of the convention that the term of office of county commissioners should be six years instead of four, with one commissioner going out of office every two years, and a resolution favoring a constitutional amendment to that effect. Under the amendment, if passed, the commissioners declared, there would always be two commissioners in a county who would have had experience in the office.

James E. Beckley of Delta was elected president of the association of commissioners to succeed Mr. Shy when the convention came to a close on December 17. Other officers for the ensuing year included Daniel Straight of Greeley, first vice president; J. C. Vaughn of Rocky Ford, second vice president; John W. Green of Silver Plume, third vice president, and T. W. Monell of Montrose, secretary-treasurer. Mr. Monell was re-elected to that position for his fifteenth successive term as secretary-treasurer.

A number of addresses on highway subjects and other matters important to the commissioners were delivered by prominent men during the convention. Mayor Benjamin F. Stapleton of Denver first wel-



Members of the County Commissioners' Association of Colorado in Session at Seventeenth Street

comed the members to the city, a response being made by Commissioner G. W. Huntley of Flagler. Col. Allen S. Peck, United States forester, addressed the commissioners, as did Maj. L. D. Blauvelt, chief highway engineer; William Weiser, chairman of the highway advisory board, and Robert H. Higgins, superintendent of maintenance for the State Highway Department.

Considerable discussion was had at the convention relative to improvement of maintenance of State highways, and particular stress was laid on the address by Major Blauvelt, who showed by figures that the amount of money spent per mile on maintenance in the State is not more than half what should be spent annually to keep the highways in proper condition at all times and in all seasons. No specific recommendations were made by the convention on this subject, however.

The operation of the motor vehicle license system and recommendations for changes in the system were explained by Secretary of State Carl S. Milliken. His recommendations were largely followed in the resolutions adopted by the convention. Grant Halderman, president of the Public Utilities Commission of Colorado, and William I. Rellly, chairman of the State Industrial Commission, were also on the program for short talks.

The Hardesty Manufacturing Company entertained the commissioners at a banquet in the Albany Hotel in Denver the evening of December 15, and this proved to be one of the most enjoyable events on the entire program of entertainment.

After adjournment of the convention at noon on December 17th, the commissioners were taken in automobiles to the new Colorado General Hospital in Denver and were entertained at luncheon there by Dr. Charles N. Meader, dean of the medical school, and George A. Collins, superintendent of the hospital. The commissioners made an inspection trip through the hospital and medical school.

Following the entertainment at the State hospital, the Denver Tourist Bureau took over the remainder of the afternoon and conducted the commissioners on a tour of inspection through Overland Park,

the huge Denver automobile camp ground. Harry Burhans, secretary of the bureau, displayed to the commissioners the thirty-odd county exhibits which were placed in Exposition Hall at the park throughout the tourist season of last year, and urged on the commissioners that all counties be represented in the displays in 1925. At its closing session the convention had authorized the appointment of a committee to co-operate with the Denver Tourist Bureau in the plan of county exhibits at the camp ground.

The following resolutions pertaining to road matters were passed by the commissioners:

BE IT RESOLVED, That we express our appreciation for the support and co-operation received from the State Highway Department, and

BE IT FURTHER RESOLVED, That we commend the State Highway Department on its efforts to reduce the engineering expenses throughout the State during the past year, and

BE IT FURTHER RESOLVED, That we would appreciate a continued effort to further reduce not only the engineering expenses, but all overhead expenses of this department, and

BE IT RESOLVED, That we express our willingness to co-operate with them in every way to this end.

WHEREAS, Large sums of money are being expended in the construction and maintenance of our State roads and highways, and

WHEREAS, Auto transportation of freight and passenger transportation by busses is rapidly increasing, and

WHEREAS, The operation of such trucks and busses is more destructive to our highways than any other agency, and

WHEREAS, A large number of companies have been formed for the purposes of transporting freight and passengers over our highways, without having to pay any tax or license for such privilege, and

WHEREAS, Our permanent carriers are paying a heavy tax while

being subjected to such ruinous competition, and that there is a great danger that many railroads which are now serving sparsely settled communities of this State may ultimately have to cease operation to the great injury of such communities, unless such competitors are placed upon a more equal basis with them, and

WHEREAS, This committee is of the opinion that such equalizing must be brought about either through taxation or through a higher license fee, and to the further end that such companies may in some small degree compensate the counties for the destruction or injury to their highways,

NOW, THEREFORE, BE IT RESOLVED by this association, that a bill be framed by the legislative committee as uniform as possible with the laws on this subject, which have already been passed by our sister states, and which will provide for an adequate license or permit fee, and at the same time subject such carriers of freight and passengers to such reasonable regulations as will protect the public dealing with them, as well as the highways over which they travel.

WHEREAS, There is a great danger that the construction and improvement of highways in the State of Colorado will largely cease unless some additional source of revenue is provided by the incoming legislature for highway purposes, and

WHEREAS, Unless such revenue is forthcoming the State of Colorado will be unable to meet the National Federal Aid appropriation, and that such funds will find their way into other states which can meet them;

NOW, THEREFORE, BE IT RESOLVED, That this association go on record as favoring the restoration of the half mill levy; a 2c increase on gasoline tax, and an automobile license fee increase of not less than 25 per cent, and

BE IT FURTHER RESOLVED, That we use our influence with our legislators to that end.



Annual Convention, held in State Capitol Building at Denver on December 15, 16 and 17.

Governor Signs Road Budget

THE annual budget of the State Highway Department, calling for the expenditure of \$4,550,000 on state roads in 1925, was signed by Governor William E. Sweet on December 27.

As approved by the governor, \$2,850,000, more than half the entire budget, is to be expended on Federal Aid Projects. Other appropriations include:

State projects	\$300,000
Maintenance	800,000
Property and equipment.....	50,000
Administration	175,000
Surveys	25,000
Contingent fund	150,000

Following is a list of the Federal Aid Projects comprising the \$2,850,000 item:

District 2

Between Gunnison and Montrose, two projects, \$140,000.

Bridge over Grand River at Palisade, \$65,000.

Bridge over White River near Meeker, \$40,000.

Grading west of Minturn, \$65,000.

Grading and surfacing north of Rifle, \$60,000.

Bridge at Montrose, \$20,000.

District 3

Asphalt paving north of Trinidad, \$140,000.

Grading west of Durango, \$40,000.

Bridge at Alamosa, \$15,000.

Grading west of Walsenburg, \$40,000.

Grading west of LaVeta Pass, \$30,000.

Bridge over West Fork near Pagosa Springs, \$25,000.

Grading south of Durango, \$25,000.

Grading between Hochne and La Junta, \$30,000.

Grading from Monte Vista east, \$25,000.

Grading from Mancos west, \$30,000.

Grading from Antonito north, \$30,000.

District 4

Concrete paving from Vineland east, \$68,500.

Grading from Huerfano River bridge west, \$60,000.

Grading from Portland toward Florence, \$81,500.

Bridge five miles west of Pueblo, \$25,000.

Concrete paving east from Las Animas, \$40,000.

Concrete paving between Rocky Ford and Swink, \$115,000.

Bridge twenty miles south of Pueblo, \$15,000.

District 5

Concrete paving from a point two and one-half miles north of Castle Rock toward Larkspur, \$310,000.

Paving from Husted north, \$190,000.

Paving from Colorado Springs south, \$50,000.

Grading from Hugo east, \$25,000.

Grading Turkey Creek Canon road from the Park County line toward Ballays, \$70,000.

District 6

Grading Steamboat Springs west, \$50,000.

Grading in Byers Canon, \$110,000.

Grading Turkey Creek road from Shafers Crossing to Park County line, \$45,000.

Concrete paving from Lafayette north, \$100,000.

Bridge at Craig, \$15,000.

Concrete paving from Berthoud south toward Longmont, \$215,000.

District 7

Grading from Nunn north toward Wyoming line, \$125,000.

Graveling from Fort Morgan west, \$125,000.

Graveling from Greeley east, \$70,000.

Graveling from Brush toward Beta bridge, \$20,000.

Concrete paving from Merino west to bridge at Beta, \$105,000.

Among the purely state projects, there are a half dozen which are of importance to Denver, as they constitute links in some of the most attractive drives around the city. For a road from Echo Lake down Chicago Creek toward Idaho Springs



Finished Grade in Conejos Canon, State Road No. 10, to Cumbres Pass

there is appropriated \$1,975, which sum will be duplicated by the Forest Service. Completion of that road will give motorists another excellent scenic drive.

The sum of \$5,000 is appropriated to continue the work on the Harding Memorial highway up Mt. Evans. That, together with a surplus from 1924, it is said, will be sufficient to keep the work going in 1925.

An appropriation of \$19,666 is made for the Mount Holy Cross trail, or Loveland Pass highway.

\$15,000 to Improve Guy Hill Road

For improving the Guy Hill road up Golden Gate Canon from Golden to Black Hawk and Central City, \$15,000 is to be spent.

An appropriation of \$10,000 is made for the improvement of the Cole Creek road west of Arvada.

A road is to be built from Rollinsville to the east portal of the Moffat tunnel at a cost of \$5,000.

The sum of \$40,000 is appropriated to complete the Deer Creek road.

Other important state projects include the following:

Widening of the Wolf Creek Pass road, \$14,000.

Widening of the Cochetopa Pass road, \$18,000.

Surfacing of Serro Summit in Montrose County, \$5,000.

Grand Mesa road, Delta County, \$6,000.

Canon City-Colorado Springs road, \$3,000.

Repairing the Busk-Ivanhoe tunnel, \$9,000.

Improving the South St. Vrain Canon road, \$3,000.

A bridge at Lyons on North St. Vrain Canon road, \$4,500.

Completion of the Cameron Pass road, \$3,000.

According to department estimates, a one-half mill tax levy will produce \$750,000 in 1925 and half of the two-cents-a-gallon gasoline tax will provide \$800,000. These items, together with the \$50,000 credited for internal improvement, the Federal Aid and the proceeds from bonds sales, are expected to supply the funds for the expenditures proposed.

The appropriations for new projects are divided among the highway districts as follows:

No. 2—\$457,736; No. 3—\$492,420; No. 4—\$70,944; No. 5—\$729,190; No. 6—\$688,841; No. 7—\$510,869.

Denver, which constitutes district No. 1, receives none of the state highway funds.

Two of the important projects outlined for 1925 will leave only twenty-one miles unpaved of the seventy-five-mile highway between Denver and Colorado Springs. Paving south of Denver is to be extended to one mile south of Castle Rock, while the concrete on the Colorado Springs end of the road is to be advanced to Monument—twenty miles north of the Springs.

The sum of \$15,000 has been set aside to open the Busk-Ivanhoe tunnel on the highway which is being constructed on the old roadbed of the Colorado Midland Railroad. The right-of-way was given to the state by A. E. Carlton and associates of Colorado Springs. Opening of this road will complete an important link in a new transcontinental route to the west coast.

BORROWED EPITAPHS

Tom Jones has gone to heavenly heights;

He tried to drive without his lights.

Jack Hayes this busy life forsakes;

He never would re-line his brakes.

Here's all that's left of Amos Bossing;

He tried to beat it to the crossing.

No more from Brown are earthly smiles;

He took the curve at forty miles.

Ted Small has gone to his abode;

He kept the middle of the road.

Here lies our friend, poor Tony Dix;

For booze and gasoline won't mix.

Jim Henry's friends are all bereft;

He made a short turn to the left.

Ben Gray is free from earthly pains;

A rainy day—he had no chains.

Poor Bill's beneath the sod, alas!

He speeded up and tried to pass.

Now Tom has joined the heavenly band;

He tried to drive it with one hand.

Millions of Savings in Highways

A NOTABLE contribution to road-making literature, with especial reference to cutting the cost of highway construction, is offered in a copyrighted interview by Thomas H. MacDonald, chief of the Bureau of Public Roads of the United States Department of Agriculture, appearing in the forthcoming number of the Highway Magazine. The title of this interview is "Research in Material and Design Cuts Cost of Highway Construction," and it offers pertinent suggestions, both for betterment of roads and lessened costs.

"Stabilization of subgrades in highway construction has long been the goal of engineers," said Mr. MacDonald in his statement. "Recent research work in this field has resulted in the discovery of methods of preparing subgrades for road construction which in the next few years will save millions of dollars.

"Formerly, when bad subgrade materials were encountered, it was the custom for the average constructor to obtain his materials with which to build up the base for his road from some distant point, thereby increasing the cost of the road to an appreciable degree.

"This factor has been eliminated to a great extent by tests made recently in government research laboratories. Exhaustive tests have shown that an engineer on the ground can build up his own subgrade, regardless of conditions, for the most part from materials on hand.

"Subgrades, as we all know, vary from solid rock to exceedingly plastic clay with all combinations of materials between these two extremes. The finely divided clays will absorb considerable water by capillarity and become incapable of supporting heavy loads. Moreover, they swell and shrink with changes in moisture content, producing heaving and cracking of road surfaces.

"The idea of stabilized subgrades is recognized and carried out in a practical way in present methods of 'stage' construction, in which a surfacing of sand clay or pit run gravel is used originally and until traffic warrants a better surfacing. In exceedingly bad soils, such as adobe in California, a layer of granular material is of value under any type of surfacing.

"Another very important factor in highway construction that has been given a great deal of attention by government experts is that of road drainage.

"Some soils, it has been shown, are incapable of supporting loads in the presence of moisture, therefore investigation of the best methods of drainage have been considered most important. One outstanding fact has been developed as a result of such investigations, namely, that no system of drainage can remove the moisture held in the soil by capillarity, and that in some types of soils even capillary moisture makes the soil very soft and plastic. Drainage systems, however, are most effective in removing free water from the soils and for cutting off sources of free water so that they will not reach the subgrade of the road.

"As above stated, in the past many roads have been constructed with materials hauled from great distances, the theory being that local and more available

materials were not suitable to the work at hand.

"The cost of importing such materials can be eliminated from highway construction for the most part, as research has shown that many local materials may be successfully used in present day road building. A research recently completed at Arlington on a large number of aggregates developed the fact that softer aggregates, heretofore believed to be without value in construction, can be safely used. It was shown, for instance, that aggregates having a French coefficient of wear above six are perfectly suitable for present day concrete roads, and that many gravels previously thought unsuitable may be used.

"Similarly, local investigations have shown the way to use the soft limestone and marl such as occur in Florida and North Carolina. Such materials make excellent bases under more durable road surfacings. Tests have also shown that Florida limestone rock can be used advantageously on penetration macadam construction within a radius of economic haul.

"The use of local materials for non-rigid bases has been largely developed in the Pacific States and other localities. In certain locations such as Massachusetts, North Carolina and Florida, the most common local material for road building is fine, clean sand. In such localities a sand-asphalt surfacing which is satisfactory for local traffic contains 93 per cent of sand, the local material avail-

able, requiring the importing of only 7 per cent, the asphalt in the mixture.

"Ideas on reinforcement have changed rapidly and are still changing and furnish a fruitful field for further research. Some states use no reinforcement, and others use steel up to the amount of 100 pounds or more per 100 square feet, costing as much as \$10,000 per mile.

"Research is needed to show the proper amount of steel to use in concrete roads for the greatest economy. Thus far such work has conclusively shown the efficiency of longitudinal steel placed at the edge of the pavement for strengthening the edge and serving in carrying loads across the joints.

"Recent tests have developed a way to improve poor subgrade materials. As has been shown, admixtures of granular materials such as sand, cinders or stone screenings materially cut down the capillary moisture content, greatly decrease the shrinkage and swelling and materially increase the bearing value of the subgrade under the worst conditions.

"Where it has been impractical to employ the materials as mentioned, it has been found that the same results may be obtained with mixtures of hydrated lime and Portland cement in amounts to only five per cent of the weight of the soil. In this connection it has been shown that the five per cent mixture of Portland cement to a depth of one foot seems to have increased the supporting strength of concrete pavements by almost fifty per cent."



Federal Aid Project under Construction in Saguache County, Showing Heavy Fills and Method of Dirt Handling with Loader

DEPARTMENT ACTIVITIES

DALE HINMAN LOW BIDDER ON 16-MILE STATE ROAD PROJECT

Dale Hinman, Denver contractor, was the successful bidder on the largest grading and gravel surfacing project so far let by the Colorado Highway Department. The project is located between Rifle and Grand Valley in Garfield county. It is known as Federal Aid Project No. 261-A. Hinman's bid was \$132,556. The project is sixteen miles in length. Six bids were received, and there was less than \$700 between the three lowest bidders. Winterburn & Lumsden of Grand Junction were second low, with a bid of \$133,072, and Shields & Kyle of Pagosa Springs, third, with \$133,243. Other bidders were: Orman Construction Company of Pueblo, H. C. Lallier of Hudson, Colorado, and E. H. Honnen of Colorado Springs. Mr. Hinman announced he would start work on the project within thirty days. It is to be completed by December 1, 1925. There is 169,240 yards of gravel surfacing in the job.

NEW LAFAYETTE PAVED ROAD NOW OPEN TO MOTOR TRAFFIC

On December 12 the new paved road south of Lafayette was opened to traffic, following the completion of beautiful new concrete bridge over Coal Creek. This bridge structure, considered one of the finest in the State, was constructed under the supervision of Resident Engineer B. T. Miller.

In commenting upon the opening of the new stretch of pavement, the Lafayette Leader had the following to say:

"It does indeed seem great to think that one may now hop into his gas wagon, take the paved road at Lafayette and sail over pavement all the way into the city of drug store holdups and high taxes."

KANSAS STATE OFFICIAL TELLS OF BIG 1925 PAVING PROGRAM

Tourists will roll into Colorado from Kansas over a paved highway stretching from one side of the latter state to the other by the end of 1926, said Frank J. Ryan, Kansas secretary of state, during a recent visit in Denver.

Mr. Ryan said that plans had been completed for the paving of the western end of the road during the next two years. Half of the cross-state pavement in Kansas already has been constructed.

"You can put my home state down, therefore, as one of the biggest Colorado boosters in the country," said the Topeka official. "One of the biggest problems faced by Kansas today is that of providing good roads and paved main highways without unduly raising state taxes."

While in Denver the visiting official was a guest of Secretary of State Carl Milliken and paid a visit to Major L. D. Blauvelt, State highway engineer.

STATE ROAD OFFICIALS TO TAKE STEPS AGAINST BILLBOARDS

During the coming year an intensive campaign against the posting of advertising signs along State Highways will be conducted by maintenance men under the

direction of Superintendent of Maintenance R. H. Higgins.

Notices have been sent out to all maintenance crews to give particular attention to this work. Posting of advertising signs along State highways is unlawful in Colorado. The same restriction applies to the lands of the national forests.

In its crusade against signs the State Highway Department will have the cooperation of forest rangers.

The billboard problem along State roads is one of the most difficult confronting State officials. In the state of Massachusetts, it has been solved, in a measure, by the imposition of a tax on all signs erected either on public or private property.

MAJOR BLAUVELT HONORED BY NATIONAL HIGHWAY OFFICIALS

"So the folks back home may know"—Maj. L. D. Blauvelt, Colorado state highway engineer, was elected secretary of the American Association of State Highway Officials, recently held in San Francisco.

Major Blauvelt is the first Western man made an active officer of the association, the membership of which is made up of highway officials from every state in the Union. For the past two years he has been a member of the executive committee.

It was through his activity that the last convention of the association was held in the West, the first time that the highway officials were prevailed upon to hold their annual meeting in this section of the country.

Oliver T. Reedy, senior assistant engineer of the Colorado department, was one of the principal speakers at the Frisco meeting. He discussed the use of convict labor in road work.

STRAIGHT ROAD ACCIDENTS

Straight roads with their fascination for the driver, who "likes to step on the gas," are responsible for more automobile accidents than curves, hills or even railroad

crossings. This deduction is based on automobile accidents tabulated in the state of Wisconsin in 1922-23, where straight road accidents outnumbered all others more than two to one.

Curves, hills and railroad crossings seem to bring out any caution that a driver has. A man who would not think of skidding around a sharp turn will drive his car faster than fifty miles per hour on the straight-away. In the city, the white-gloved hand of the traffic officer prevents such recklessness.

Out of 2,981 road accidents in Wisconsin in 1922-23 2,044 occurred on straight roads and only 937 in all other places, including curves, cross-roads, hills, corners and railroad crossings. Reckless driving is given as the cause for 1,628 accidents. Improper or no lights, broken mechanism, intoxicated drivers, weather conditions, narrow bridges and culverts and cars on the wrong side of the road are among the other causes listed.

It is interesting to note that in the 2,981 accidents there were 10,258 people involved—The Golden Circle

GRADE CROSSING STOP LAW IN NORTH CAROLINA

The North Carolina stop law, which has been in force for something over a year and which has had considerable criticism, has decreased the number of grade crossing accidents very materially, according to the July-August North Carolina Highway Bulletin. During 1922 and to July 1, 1923, there were 268 accidents at grade crossings, while in 1923-24 there were 235, a decrease of 33. During the former period 145 persons were injured and 44 killed, while during the latter period there were only 113 injured and 22 killed. An attempt to have the law repealed or amended was made at the recent special session of the Legislature, but neither was successful and the law remains in force as before.—South Carolina Highway Bulletin.



John F. Greene, Resident Engineer, poses "on the trail" of a new Highway above Indian Creek, in Costilla County

NATIONAL ASSOCIATION OF HIGHWAY OFFICIALS ADOPTS FURTHER FEDERAL AID, COLTON BILL AND NATIONAL PARKS ROADS APPROPRIATIONS

During the convention of the American Association of State Highway Officials, held at San Francisco, November 17-20, several resolutions were adopted relating to Federal aid matters. The Association went on record favoring a continuance of Federal aid under the pending Dowell Bill, which provides \$75,000,000 for 1925 and a like amount for 1926, and also gave its endorsement to the Colton Bill, which is also now pending in Congress, and which provides for 100 per cent Federal aid in the western public land states under certain conditions, as well as removing the limitation per mile of cost which has served to handicap the construction of Federal aid roads in the thickly populated eastern sections. In addition the Association discussed at length the proposition of improving the highways adjacent to and within the various National Parks, and went on record urging Congress to immediately appropriate two and one-half millions for each of the years 1925-1926 and 1927 to carry out the construction program as outlined by the National Park Service under the Act passed at the last session of Congress.

It was the opinion of the representatives of the states present at the convention, that the present system of Federal aid highway construction is working out to the satisfaction of all states and that the same method should be continued in the future, rather than to attempt any change to a National highway commission plan, such as has been advocated during the past. It is doubtful, therefore, whether the National highway commission plan will be again brought up during a session of Congress for some time to come, as the public seems generally well pleased with the present Federal aid plan, under which the actual work is carried on directly by the states.

The resolutions adopted by the Association relating to these various subjects were as follows:

Resolution on Federal Aid

WHEREAS, We note with much satisfaction that the Federal Administration and the Congress have unqualifiedly given approval of the general policy of Federal Aid in highway construction, and that the political parties have also gone on record for a continuation of this policy.

THEREFORE, BE IT RESOLVED, That the American Association of State Highway Officials in 10th Annual Convention assembled urge the Congress to speedily pass the authorization bill, which has already passed the House of Congress, known as H. R. 4971, in order that proposed Federal Aid projects for the coming construction year may be expedited.

Resolution on Colton Bill

WHEREAS, there is now pending in Congress a bill known as the Colton Bill, being H. B. No. 6133, and

WHEREAS, this bill is of great benefit to all the States of this country in that it permits the Federal Government to participate in the entire cost of the construction of highways which must be built to a better



Yes, it's a road—in the making. A Federal Aid crushed rock surfacing project near Monte Vista, recently completed

standard than was at first contemplated when Federal Aid was initiated for highway construction in the respective states, and

WHEREAS, the passage of this bill will be of great benefit to many of the Western states in permitting them to construct trans-continental highways through vast stretches of desert and sparsely settled sections of the public domain.

NOW, THEREFORE, be it resolved that it is the desire of this association in convention assembled that the Colton Bill, H. B. No. 6133, be enacted into a law of the land.

Resolution on National Parks Roads Appropriations

WHEREAS, the recent development of the State and Forest Highways as stimulated and perfected by Federal appropriations, most wisely made by a far seeing Congress; and

WHEREAS, There have not been made any substantial Federal appropriations for the improvement of the existing or the construction of additional roads in our National Parks, and,

WHEREAS, The few existing roads in our National Parks are entirely inadequate and unsafe to meet the needs of the constantly increasing National Park travel; and,

WHEREAS, the National Parks stimulate inter-state and inter-National travel, and serve as an extremely necessary part in the recre-

ational, educational and economical life of our people, and tend to make them more patriotic citizens; and

WHEREAS, Congress has finally recognized the wisdom and necessity of developing and making usable to the citizens of this nation and of the world, our most wonderful National Parks, containing as they do the greatest, most beautiful and most wonderful natural features of the world, and Congress has signified their desire that such road improvement should be immediately undertaken in passing by unanimous vote by both the House of Representatives and the Senate the Bill H. R. No. 3682, 68th Congress, 1st Session, which authorizes the appropriation of \$2,500,000.00 for each of the fiscal years of 1925-1926 and 1927, notwithstanding which appropriation to put such work into effect has not yet been made.

NOW, THEREFORE, BE IT RESOLVED, by the American Association of State Highway Officials here assembled at San Francisco, at their tenth annual meeting, that Congress should immediately make the appropriations authorized by the said bill H. R. No. 3682 in order that the roads of the National Parks shall be extended and improved as provided for therein, and as necessary to bring them up to the standards of the approach roads, leading to the Parks, which roads are being—or have been

(Continued on page 14)

Road News, Views and Gossip

ELIMINATE IRRESPONSIBLE CONTRACTORS

Everybody seems to agree that the irresponsible contractor is a nuisance and should be eliminated—except perhaps the irresponsible contractor himself. He would probably eliminate himself through the bankruptcy courts if he were not of that class of which one is born every minute.

Responsible contractors detest him because his outstanding characteristic is bidding for work at less than the cost of doing it honestly and well. Engineers despise him because his low bids require them to either give him the contract and suffer delays, law suits and constant bickering, or give it to a higher and responsible bidder and be accused of graft by the taxpayers. The surety companies are beginning to realize that they cannot continue to pass on to the shoulders of the other contractors (and by them to the tax payers) the financial losses caused by their underwriting any contractor regardless of his responsibility.—Public Works.

ROAD TOLLS

Road taxes of a century ago were probably five times higher than now and roads were not so good. This statement is based on an article in New Hampshire Highways on early-day turnpikes built in that state more than a hundred years ago and as late as 1883 by private companies who took tolls from every user according to his vehicle and load.

"Pay-as-you-use" highways—the old toll roads—were popular and for many years carried the bulk of vehicle traffic in the eastern states. The turnpike, as distinguished from other roads of the same period, were those at which gates were placed at intervals to bar the progress of the traveler until a toll was paid which gave him the privilege of using the road. Only after \$600 or more had been spent on the road could any tolls be taken at the gates, and then the users paid the following rates among others:

Every ten sheep or hogs.....	1c a mile
Every ten cattle.....	2c a mile
Every horse and rider or led horse.....	1c a mile
Every sulky, chair or chaise with one horse and two wheels.....	1½c a mile
Every chariot, coach, stage, wagon or phaeton, with two horses, four wheels.....	3c a mile

For every carriage of pleasure the like sum according to the number of wheels and horses on same.

Applying the lowest toll rate of 1 cent a mile to one of our heavily traveled routes, averaging 1,000 vehicles a day, it would mean \$10 a mile daily or \$2,500 for 250 days a year and on 150 miles the total would be \$325,000 annually. The cost of 150 miles gravel road would be \$167,550 a year and of pavement \$247,650 annually—including interest on the in-

vestment, depreciation and upkeep. So the "luxury" of a pavement would net the owners \$77,350 a year on such a road, besides affording the users a saving of nearly \$500,000 a year in running expense due to the better roads, plus the gain in comfort and convenience.

The reader may find it interesting to figure on his own estimates the tolls he would have had to pay under the old plan and his profits from the better road of today.

ASPHALT PAVEMENT OF A NEW TYPE GETS CHICAGO TRYOUT

Kentucky rock asphalt is now being tried out in Chicago, a mile stretch on Washington boulevard, between Ashland and Western avenues, having been laid with it. This asphalt is laid just as it comes from the mines except that it is crushed. It is laid cold and is said to have many advantages, one meritorious feature is that it is not necessary to heat the rock asphalt in order for it to bond.

While this material is not new in road building and has been used by the bureau of streets for repair work, its extensive use is new to Chicago. The highway department of DuPage county has laid it in places for several years with such satisfactory results that rock asphalt will be used there in the future even in the building of state aid roads.

When first spread, rock asphalt has the appearance of ordinary black dirt. It is simply spread over the foundation and then pressed down by a steam roller, after which it is ready for light traffic. Heavy trucks are kept off the pavement for several weeks after laying. Pavement made with rock asphalt becomes harder with use and it is claimed that it will not rut or "bleed" in hot weather.

DAY LABOR—CONTRACT

The day labor system does not save money to the taxpayer. It has been proven (and quite recently too) that responsible bidders in almost every case, submit bids far below those figures which represent the actual cost to the taxpayer of projects constantly undertaken as a "saving proposition." The contractor, in competition with others all endeavoring to outbid him, cannot impose upon the public to the extent that the public is led to believe it is imposed upon, by those who are interested in keeping their political prestige and a public office.

The contractors' figures represent the total cost to the taxpayer, and his "hand is on the table," as it were, before the game begins. The figures right then show what the job is going to cost. On the other hand, the taxpayer never does know what a day labor project is going to cost him because the costs are seldom, if ever, properly accounted so as to show the true state of affairs; at any rate they are never kept in the way that the contractor has to keep them in order to forestall disaster. The contractor must furnish a

surety bond within the sum of his bid and the job must be completed before he gets his money, but under the day labor system, the job may be protracted over an indefinite period and never completed, although the cost to the taxpayer goes on just the same.

The contractor cannot borrow labor and equipment from another job without accounting for it, as it is bound to show up a loss somewhere if he does. The contractor has no political friend to help him if he makes a mistake in his department and his only support, the bank, fails out from under him if he exceeds his cost and credit.

The contractor hires only good men and insists that they do a good day's work. He has no political obligations and cannot afford to retain "friends" or idlers. His foremen are retained solely on account of their efficiency and their ability to "produce the goods." When they cease to do this they are laid off.

In fact the whole working mechanism of the contractors' organization is an example of efficiency. It has got to be or he would "go broke."

Public work let out to contract is the best economical assurance that the taxpayer has.—Utah Constructor.

ROAD CONSTRUCTION IN THE HAWAIIAN ISLANDS

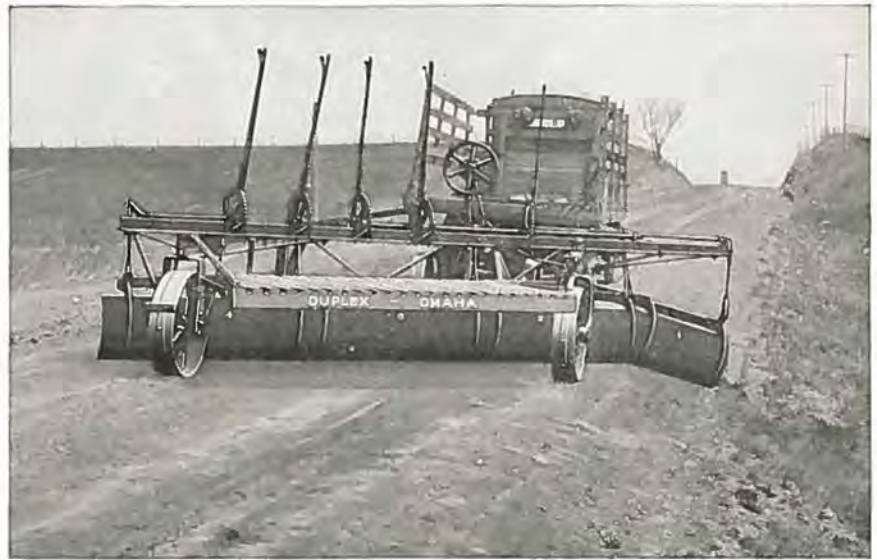
Several large paving projects estimated to cost well over a million dollars are planned for early construction on the Islands of Oahu and Hawaii by the Superintendent of Public Works, Lyman Bigelow, following the recent extension of Federal Aid funds to the Hawaiian Islands. The projects to be constructed call for about twenty-eight miles of concrete and asphalt concrete highway. Plans for placing the projects under contract are now being prepared, and, it is believed, that because of the size of the projects, the call for bids will bring out a number of bidders among Pacific Coast contractors.

J. S. Bright, construction engineer of the Bureau of Public Roads, has just returned to San Francisco following a two months' trip to the islands for the purpose of studying the highway system, methods of construction and to take up matters regarding the Federal Aid projects with officials of the island government.

Approximately 751.6 miles of highway has been improved on the various islands, according to Mr. Bright. Of this amount 18.4 miles is concrete, 302.6 miles asphalt macadam and oil macadam, 58.2 miles water bound, 283.4 sub-base only, 44 miles coral, and the remainder is sand clay and gravel.

The Federal Aid projects to be built are eight miles of highway from Hilo to Kilauea on the Island of Hawaii and a section of concrete highway from Waiahole to Kahuku on the Island of Oahu. The Federal Aid allotment for the two projects is \$315,000.

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Highway Officials Adopt Federal Aid

(Continued from Page 11)

—improved by the States, Counties and National Forest Service; and that such other appropriations as may be necessary to further improve or extend the roads and to properly develop and improve other phases of our National Park development should be made by Congress.

BE IT FURTHER RESOLVED, That a copy of these resolutions shall be furnished the President of the United States, the Secretary of the Interior, the Director of the U. S. Budget, the Chairman of the Senate Appropriation Committee, the Chairman of the House of Representatives Appropriation Committee, the Chairman of the Interior Department Committee on Appropriations, and to the representative of the press.

Uniform Highway Marking

One of the important subjects discussed at the recent convention of the American Highway Officials Association was that of a uniform system of highway signing throughout the United States. It seemed to be the consensus of opinion that some uniform plan should be worked out under which standard signs would be used for all purposes, such as railroad crossings, curves, slow, danger, etc. In addition the plan discussed provides that all routes shall be given an identification number which shall be retained for the full length of the route across the country, such route number to appear at frequent intervals along the route. With such a uniform marking system and with proper guide maps giving the route numbers, a tourist may follow a given route by number to his destination, and at no time be in doubt as to the proper route to follow. Furthermore, the plan proposed would serve to eliminate much of the friction resulting from the indiscriminate naming and signing of routes by highway and trail associations. The final action of the Association was to place the matter of working out a uniform marking plan in the hands of the Bureau of Public Roads, and the following resolution was adopted:

WHEREAS, This Association has adopted the report of the Sub-committee on Traffic Control and Safety, recommending the immediate selection of transcontinental and interstate routes from the Federal Aid Road System, said roads to be continuously designated by means of standard highway marking signs and protected by standard traffic warning signs; and

WHEREAS, This system of highways when established and marked will satisfy the demand for marked routes on the part of transcontinental and interstate traffic, thus meeting the need which has been met in the past in a measure by the marked trails established by the reputable trails associations; and

WHEREAS, Many individuals have sought to capitalize the popular demand for interstate or cross-country routes by organizing trails, collecting large sums of money from our citizens and giving practically no

service in return, with resulting discredit to the reputable trails associations which have heretofore rendered distinct public service by stimulating highway improvement, maintenance and marking;

NOW, THEREFORE, BE IT RESOLVED, That this Association hereby recommends to the several states that the reputable trails associations now existing be permitted to continue their markings during their period of usefulness, pending the establishing of the proposed marking system, unless such action shall conflict with the marking systems and policies now in force in the several states; and

BE IT FURTHER RESOLVED, That no trail association be permitted to establish further routes on State or Federal Aid Routes.

THIRTEEN DANGERS HIGHWAY ENGINEERS SHOULD REMOVE

Engineers of the Bureau of Public Roads of the United States Department of Agriculture, who have made a close study of the causes of highway accidents in order that Federal-aid roads may be built as safely as possible, have listed the following causes of accidents:

Blind curves and road intersections; sharp curves on embankments; unprotected embankments; narrow bridges; sharp convex vertical curves; slippery road surfaces; steep grades; narrow road surfaces; low or rough shoulders; steep crowns; sharp curves at bridge and underpass approaches; grade crossings; unsuperelevated curves.

This list takes into account only the dangers which the highway engineer should eliminate by removing the cause if possible, and if this can not be done, by erecting proper warning signs. A complete solution of the problem can be effected only by building safe roads and educating drivers to use them in a safe way.—Roads and Streets.

HOW ABOUT IT, GIRLS?

"For heaven's sake, what do you want?" protested the stern father as little Willie's persistent tugs drew his attention from the stock reports.

"Please, pa," demanded the urchin, "what is the most warlike nation in the world?"

Pa thought for a moment and then replied: "Vacci—nation. It's nearly always in arms." —Los Angeles Times.

TELEPHONE TALKWAYS

The Talkways

of the telephone are found in open wire and aerial cables, on pole lines and in cable conduits under the streets. Thousands of miles lie out of sight, sharing the sub-surface of city streets with gas and water mains and the electric wiring which supplies light and power.

Factories are working day and night to provide the sheathed cable and copper wire which when finished becomes a part of the telephone system.

Materials are high now but the job can't wait. Every new demand must be foreseen and promptly met by the installation of adequate equipment.

Bell System

One Polic,
One System
Universal Service



and all Directed
toward
Better Service

The Mountain States Telephone and
Telegraph Company

WE BELIEVE IN DENVER!

for
30
Years



Buckeyes of today have thirty years of continuous excavator construction experience behind them. Time and experience are essential for the development of any equipment to its highest degree.

Probably no one appreciates just how important this is as the men who use trench excavators.

The experienced excavator contractor acknowledges the superiority of the exclusive features of Buckeye design.

When machine-cut trench was in its "teething" stage Buckeye began to acquire an enviable reputation for honest labor and honest products that men could put faith in.

Today, that reputation has grown to full manhood. It's our most highly prized asset and we're *proud* of it.

So are Buckeye owners. *Ask* the next one you meet.

The Buckeye Traction Ditcher Company

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers
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There's a Buckeye Sales and Service Office Near You

We Recommend
FWD Trucks
For All Trucking Purposes

Whether it be a short, fast haul or a long, heavy haul F-W-D will do the work better, quicker and cheaper than any other form of transportation. *Let us prove it.*

We have two of these trucks in stock ready for immediate shipment.

Liberty Trucks & Parts Co.

1532 Sixteenth Street Denver, Colorado

Our stock of parts for Government released trucks, especially NASH, HEAVY AVIATION and LIBERTY, is the largest in the West.

Engineers and Contractors

Start the New Year RIGHT

With the following resolution :

" I will have all my concrete aggregates 'PIERCE TESTED' during 1925."

The Pierce Testing Laboratories, Inc.

730-34 Nineteenth St., Denver

Our Letter Box

Colorado State Highway Department,
Denver, Colo.

Gentlemen:

Having traveled mostly over the nine northwestern counties in this state for a number of years, and in the last four years having seen mountain trails broadened into splendid highways, I have often thought that it was my duty to express to you my ever-enlarging sense of deep gratitude and appreciation.

I have indeed been deeply impressed by the wonderful change and splendid condition of the highways over which I have driven in this state as compared with several other states.

One naturally must expect to drive over some poor stretches of road, but these are getting fewer every year, and many that I recall four years ago have been miraculously changed into an almost perfect roadbed in a remarkably short time.

I have heard many comments upon the excellent condition of the highways in the section mentioned. I am especially grateful for the efficient department of maintenance that you have for our benefit.

It is an undisputed fact that the better the roads the less gasoline it requires, and the same is true with tires, repairs and upkeep of a car. I for one would welcome a higher gasoline tax to equalize this difference. In my judgment it is far better to pay more toward better

roads and use less gasoline and fewer tires and repairs and use this saving towards benefits for our own state in which we all can share equally.

Respectfully yours,
T. P. KUHRE,
Grand Junction, Colo.

GASOLINE TAX AND REGISTRATION FEE QUARTER OF A CENT A MILE

Motorists of the country pay in the form of gasoline and registration fees an average of only a quarter of a cent a mile according to the Bureau of Public Roads of the United States Department of Agriculture.

That is what the fees paid in a year amount to when divided by 6,000 which is believed to be the average motorist's annual mileage. The average license fee per mile travelled is one-fifth of a cent and the gasoline taxes paid make up the difference of one-twenty-fifth of a cent.

The motorist or truck operator is assured of a good return from the taxes he pays since the receipts are very largely devoted to road construction and maintenance. In 1923, 81 per cent of the motor vehicle license revenues and 58 per cent of the gasoline taxes were turned over to the State Highway departments for expenditure under their supervision and a considerable portion of the remainder was expended by the counties for road purposes.

Consideration of the gasoline tax is of special interest to the motor vehicle operator. Thirty-five states now have this form of tax, the rates ranging from one to three cents with exception of one state which has a four-cent tax. A one-cent

gasoline tax increases the cost of operating the average vehicle by less than a tenth of a cent per mile. On a trip from Washington to Philadelphia the tax would amount to 10 cents. The trip over the Lincoln Highway from New York to San Francisco would be taxed \$2.50. It is interesting to compare these rates with the toll charges which motorists formerly had to pay on toll roads. On six different turnpikes in Virginia and Maryland tolls amounting to \$5.05 were charged for a total of 187 miles which is equivalent to 2.7 cents a mile. If a State attempted to charge this same rate for the use of the public highways by automobiles it would have to establish a gasoline tax of 36 cents per gallon.

AUTO DRIVERS SHOULD BE EXAMINED, SAYS EDITOR

There should be a law licensing drivers of automobiles. At present any car owner can run a car, no attention is paid his physical or mental condition, and then only when an accident happens. How many near-sighted people are running cars? How many people have a real knowledge of traffic rules and know how to stop their car quickly? How many car owners carry liability insurance? How many know that it is against the law to let a child under 16 run a car? How many examine their cars and see if their brakes are working properly?—Brainerd (Minn.) Dispatch.

ALL ARRANGED

She—Oh, I wish the Lord had made me a man!

He (bashfully)—He did. I'm the man.

ENGRAVING SERVICE



Printing
Plates of Quality

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Color Plates

Seeleman-Ehret

Photo Engravers
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GOOD ROADS ARE NO ROADS BURIED UNDER SNOW

Manarch Twin Rotary Snow Plow Can Keep Your Roads Open

Has 80 H. P. motor within itself. The only effective way to handle heavy snow propositions. Self starter and depth control handled from tractor operator's seat. Separate clutches on each rotor permits operation of both rotors, or one at a time as your work requires. Extra heavy cutting blades. Has worked successfully in 10 feet depth of combined snow and ice.

Ask for detail of complete unit (which can be turned around on the road), consisting of Monarch "60" Tractor and Monarch Twin Rotary Snow Plow, with its own 80 H. P. motor, or for detail of plow alone with attachments to fit your Holt (10 ton) or Best ("60").

Proper guarantees given of efficiency and dependability.

W. W. GRISWOLD, Distributor, 1817 15th St., Denver, Colorado
Also Agent for the old time "BAKER" LINE of SNOW PLOWS for trucks or small tractors. Ask for information.

COLORADO STATE HIGHWAY DEPARTMENT

COMBINED FINANCIAL STATEMENT FOR THE FISCAL YEAR ENDING NOVEMBER 30, 1924

Balances, December 1, 1923		
Highway Fund	\$1,142,405.80	
Federal Aid Bond Fund	998,031.24	
County Bond Fund	123,687.14	
Total Balances		\$2,264,124.18
RECEIPTS:		
One-half mill levy	\$ 860,972.65	
Gasoline Tax	844,247.99	
Internal Improvement	72,300.00	
Federal Aid	1,562,226.12	
County Aid	76,046.38	
Excess War Supplies	69,388.55	
Sale, 1924 Bonds	1,500,000.00	
Total Receipts		\$4,985,181.69
Total, Balances and Receipts		\$7,249,305.87
DISBURSEMENTS:		
Federal Aid Projects	\$3,467,942.95	
State Projects	1,014,422.32	
Maintenance	804,727.01	
Property and Equipment	94,793.83	
Administration, General Office	63,194.75	
Administration, Engineering	90,285.93	
Road Signs and Traffic Census	22,041.18	
Refund to Yuma County	128.50	
County Bond Projects	107,030.71	
Total Disbursements		\$5,664,567.18
Balances, November 30, 1924		
Highway Fund	\$1,067,800.68	
Federal Aid Bond Fund	500,281.58	
County Bond Fund	16,656.43	
Total Balances		\$1,584,738.69
Total Disbursements and Balances		\$7,249,305.87

ENGINEER'S SUPPLIES

Tapes, Slide Rules, Transits, Levels, Planimeters,
Federal Aid Sheets, Rods, T-Squares,
Drawing Supplies.

Western Agents K. & E. Company

*Write for General Catalog H36
Highway Engineer's Catalog 3660*

THE KENDRICK-BELLAMY COMPANY
801 16th Street at Stout
DENVER

Road Builders and Engineers use the pages of COLORADO HIGHWAYS each month as a guide in placing orders for supplies.

Your sales message will reach these active buyers thru this medium.

Rates upon application

ANNOUNCEMENT

We have been appointed sole distributors for

"RUSCO"

Brake Lining—
(Grips strongest—wears longest)

Clutch Facings—
Ford Removable Bands.
Woven Endless Fan Belts.
Big Car Type Emergency Brakes.

Manufactured by the

Russell Mfg. Co., Middletown, Conn.

Liberty Trucks & Parts Co.
1532 Sixteenth Street Denver, Colorado

The Bulletin Board

ROAD SHOW ATTRACTS MANY BUILDERS FROM COLORADO

The annual national road show held in Chicago January 5 to 19 found only a handful of Colorado men in attendance. Not more than a dozen contractors and machinery dealers went to the show this year. For some reason the folks out here didn't seem to get up much enthusiasm about the "big scream." This was in contrast to a year ago, when two special Pullmans carried the Colorado delegation to the Windy City.

However, the attendance at the Chicago Road Show this year broke all records, according to reports from the committee in charge. The number of exhibits was the largest so far. Road builders from all over the world were in attendance.

Among the Denverites who took in the show were: Ray Corson and Jim Griffin, representing H. P. Wilson & Co.; Elton Fair, representing Adams leaning wheel graders in Colorado; Paul Fitzgerald, the Denver P. & H. representative; Harry Payne Wilson, Best tractor distributor; Charles Hine and George Meffley, representing H. W. Moore & Co.; Ed Honen, Colorado Springs contractor, and Barney Miller, Osgood sales representative.

Messrs. Corson and Griffith attended the annual sales conference of the Koehring Company at Milwaukee and the Barber-Greene conference in Chicago. Messrs. Hine and Meffley were called in to the annual sales meeting of the Marion Steam Shovel Co. at Marion, Ohio. Besides they visited other factories represented by the Moore concern in this territory.

P. & H. FEATURE NEW CLUTCH CONTROL DEVICE ON DRAGLINE

The Pawling & Harnischfeger Company of Milwaukee, Wis., have recently developed and made practical application of a new clutch control device, operated by the power of the engine and adapted for use on the P. & H. excavators. This new device, although simple in construction and action, will undoubtedly be a big factor in the ever-rapid development of the gasoline and electric powered excavators.

The perfection of this new device has enabled the operator of the P. & H. machines to control movements of the machines with approximately one-tenth of the physical effort which was previously required on such similar machines.

This device, as shown in the accompanying picture, is simply a small auxiliary brake with attachments which causes the power of the motor to operate the main drum clutches. When the spur gear is rotating, the drum clutch, clutch operating arm and drum all rotate with it. The auxiliary clutch band is stationary, the dead end being fastened to the machine frame and the other end to the operating lever. When the operator pulls the lever towards him, the auxiliary clutch band is tightened about its drum, retarding the rotation until the clutch

operating arm has been rotated sufficiently to cause the main clutch to grip the drum. The average pull required to operate this control device is about 4½ pounds. There are only a very few moving parts and the whole operation is very simple. There is very easy accessibility for lubrication and adjustment.

HEIL ISSUES NEW BOOKLET ON TRUCK BODY EQUIPMENT

A new body and hoist catalog, No. 140, has been issued by the Heil Company of Milwaukee, Wis. It is one of the most complete booklets issued on the subject of dumping equipment for motor trucks.

Every body is sizably illustrated and information concerning it tabulated for easy reference. Six pages in this twenty-eight-page catalog are devoted to Heil hoists: hydro-mechanical, hi-lift, vertical hand hoist and underneath hand hoist.

H. P. Wilson & Co. of Denver are distributors for Heil products in the Rocky Mountain territory. They will be pleased to furnish any users of trucks copies of the new Heil catalog.

STEINBARGER SALES MANAGER VISITS EASTERN FACTORIES

H. H. Huddle, sales manager of H. N. Steinbarger & Co., returned January 1 from a three weeks' trip to eastern factories represented by his firm in the Rocky Mountain territory. He found that plans are being made by the manufacturers for one of the biggest years on record in 1925.

Among the factories visited by Mr. Huddle included the Bucyrus Company at Milwaukee, where he attended a jubilee sales conference; the Russell Manufacturing Company at Minneapolis, the Chain Belt Company in Milwaukee, the Evinrude Company at Milwaukee, and the Sauerman Bros. plant in Chicago.

While in Chicago he made arrangements to represent the well-known Stevens-Adamson line of gravel screens and

washing equipment in this territory. This is an old established line and the Steinbarger company are pleased to make the new connection.

DENVER FIRM TAKES AGENCY FOR BEACH GRADER LINE

Messrs. Fink & Scharber, 1617 Wazee street, Denver, have taken the agency for the well-known line of Beach roller bearing graders. They also will represent the Beach Manufacturing Company in this territory on tamper rollers, drags, plows, fresnoes, bottomless buckets and screening plants. For the past year this firm has handled only the Duplex maintainer.

THE TEN COMMANDMENTS OF THE ROAD

By L. A. Boulay, Director

Department of Highways and Public Works of Ohio

1. Stop, look and listen at all railroad crossings.
2. Remember that gasoline and whiskey don't mix.
3. Don't attempt to pass traffic on hills or curves.
4. When parking get as far off the road as possible.
5. If you want to drive with one arm, join the circus.
6. Be sure you apply your brakes before you get to the curve.
7. Don't misjudge the speed of the oncoming car when passing the car ahead of you. Play safe.
8. Cut down your speed on wet pavements. The only fellow who knows how a car will skid is long since dead.
9. Drive with courtesy and with respect for the rights of others.
10. In case of doubt, go slow.

Question—Were you ever pinched for going too fast?

Answer—No, but I've been slapped.

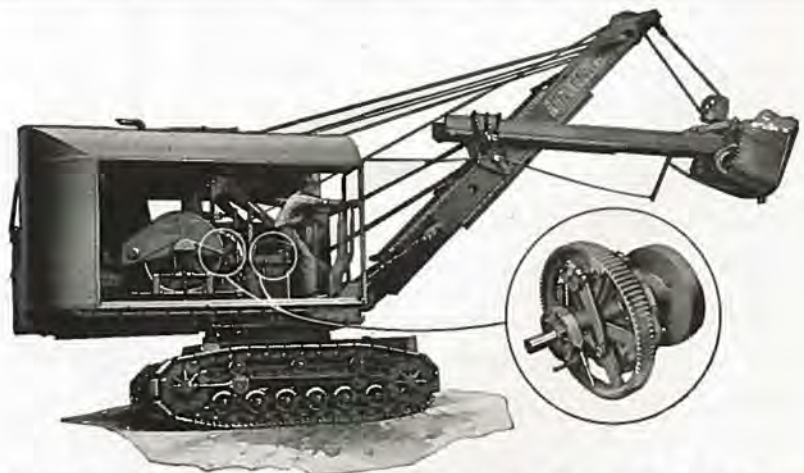


Illustration showing new clutch control device installed on P. & H. Draglines to Increase Speed of Operation

*You Won't Growl
at Our Service*



Copyright, 1924, Elmer E. Sommers

It's a Fact—

Cheap oils fill the space in your crank case but they
DO NOT LUBRICATE!

They may "look" like good lubricants, but they do not hold up under heat and strenuous conditions—at the time when lubrication is most needed. Buy oils you can depend on.

S O M M E R S

Truck, Tractor and Automobile Oils

Our guarantee goes with every drop. They may cost a little more per gallon but the saving in repairs and in the life of your motor more than offset this cost.

Sommers Oil Co.

Denver, Colorado

BIDS OPENED

Proj. No.	Length	Type	Location	Low Bidder	Bid Price
261-A	16.045 mi.	Gravel Surfaced	Rifle-Grand Valley	Hinman Bros., Denver	\$132,556.90

PROJECTS BEING ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location
243-B	2.973 mi.	Gravel Surfaced and Bridge	Piedra-Pagosa Springs
265-A	3.141 mi.	Gravel Surfaced	West of Bayfield

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
272-A	325' & 30' spans	Bridges and Approaches	Apishapa River East of Fowler
288-A	19.099 mi.	Sand-Clay Surfacing	Merino-Brush

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R Div. 3	0.55 mi.	R. R. Grade Separation	North of Trinidad
254-B	.8 mi.	Graded	Hot Sulphur Springs-Parshall
271-B	3. mi.	Grav. Surf. & Conc. Pav.	Portland-Florence
276	.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
286-A	.2 mi.	R. R. Grade Separation	Between Nunn and Dover
286-B	17. mi.	Grading	North of Nunn
287-A	18. mi.	Grading	Orchard-Wiggins
288-B	3. mi.	Conc. Pav. & Grav. Surf.	Merino, southwesterly

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	asphalt paving	Stamey-Mackey Const. Co.	\$72,956	1	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	189,038.45	83	116-C
135	Denver-Morrison	5.3 mi.	Conc. Pavement	Colo. Bridge & Constr. Co.	178,158	87	135
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267	42	210-B
213-A	Hesperus-Mancos	3.538 mi.	gravel surf.	Hooker & Hanson	40,422	6	213-A
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	100	213-B
222-C	Broomfield-Lafayette	2.82 mi.	Conc. Pavement	R. M. Larsen	134,933	95	222-C
226-D	Through Platteville	1.155 mi.	Conc. Paving	Chris O'Neill	38,226	0	226-D
230-A	Wohurst, south	0.852 mi.	Conc. Pavmt.	M. J. Kenney Const. Co.	82,710	96	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surf.	O. L. Hackett	66,178	85	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surf.	Dale Hinman	81,255	70	242-A
248-A	Buena Vista-Salida	12. mi.	Grading & Surf.	Western Const. Corp.	93,533	39	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surf.	Northwestern Cons. Co.	126,374	51	253-A
253-B	Brookston-Milner	3.064 mi.	gravel surf.	Hinman Bros.	66,583	4	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408	61	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surf.	R. P. Morrison	34,900	51	258-A
262-A	West of Walsenburg	2.186 mi.	Gravel Surf.	Central Const. Co.	19,367	77	262-A
262-B	Rio Grande Del Norte	490 ft.	Bridge	Levy Const. Co.	82,123	0	262-B
262-C	LaVeta Pass, west	2.897 mi.	crushed rock surf.	C. M. Emerson & Sons	23,218	20	262-C
267-A	Model-Trinidad	2.954 mi.	Gravel Surf.	Pople Bros. Const Co.	25,583	27	267-A
269-A	Cortez-Dolores	2.172 mi.	Gravel Surf.	Engler & Teyssier	21,215	100	269-A
270-A	East of Monte Vista	3.429 mi.	Gravel Surf.	Stamey-Mackey Const. Co.	17,667	100	270-A
271-A	Florence-Pueblo	3.286 mi.	Gravel Surf.	Driscoll Trucking Co.	56,479	0	271-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surf.	Shields & Kyle	103,768	40	272-B
277-A	Colorado Springs, south	2.840 mi.	Conc. Paving	Stamey-Mackey Const. Co.	229,921	2	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand Clay Surf.	Holly, Burshears & Dobbins	16,016	36	278-A
279-A	Denver-Morrison	1.439 mi.	Concrete Paving	A. J. Collins *	42,155	100	279-A
279-B	Morrison-Balleys	5.295 mi.	Grading	Harry H. Brown	85,980	0	279-B
281-A	Lafayette, South	1.249 mi.	Paving	Sims & Boston	55,373	83	281-A
281-B	South of Longmont	3.068 mi.	Paving	J. Finger & Son	102,502.40	43	281-B

BONDING THE IRRESPONSIBLES

Probably the worst evil in the public works contracting field today is the fact that bonds can be obtained from reliable insurance companies by practically anyone who is low bidder. On the face of it, the prices bid and their relation to the engineer's estimate seem to be given little consideration. Nor does a lack of experience in doing the work involved appear to count much. Insufficient capital likewise is not a bar. The main qualification for obtaining a bond is apparently to be the low bidder.

This sums up the case against the bonding companies, as it is generally stated by everyone concerned except the representatives of those companies. There certainly is much need of greater care on the part of the bonding companies in selling bonds to contractors with whom

they have had no experience or who have previously failed.

It is all very easy to put the blame on the bonding companies. The fact is, however, that very few public officials ever refuse to award a contract to a low bidder, if he can get a bond. There are exceptions, but the courage they display is all the more noteworthy on account of its rare appearance. In other words, the public official decides that the bonding company will make good, if the lowest bidder fails. And in a sadly increasing number of cases the bonding company does have to make good.

Without having heard the bonding companies' side of the story, it goes without saying that some of them must be well fed up on this class of business. It is a question, however, whether they single-handed can work out a policy that will

help much. Certainly it would be better for all concerned if public officials, contractors, organizations and the bonding companies would join hands to meet the situation.

A few feeble efforts have been made to get all who are affected to co-operate on a solution of the problem, but chiefly there has been only talk. And most of this has come from the public officials and the contractors. It is time for public officials to realize that the bonding companies need their help in reducing the number of contracts awarded to irresponsible bidders.—Successful Methods.

PUT SALT ON THEIR TAILS

Coca—Have you read "To a Field Mouse?"

Cola—No, how do you get 'em to listen?—Purple Cow.

County Commissioners and Contractors



When you are ready to buy your
Keystone Culverts



Our Mr. J. P. Sanderson will be glad to call on you

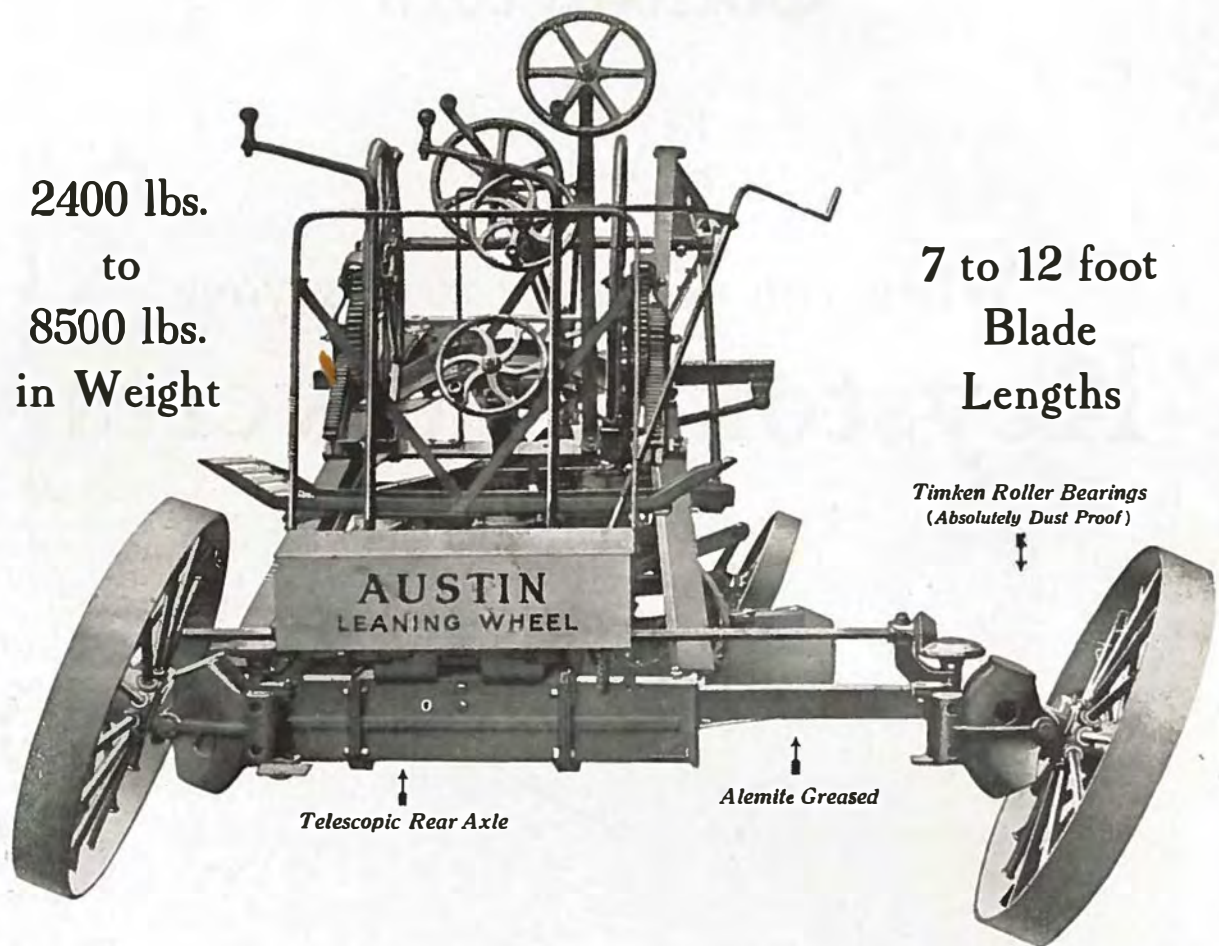
**The Colorado Culvert and
Flume Co. - - - PUEBLO**

AUSTIN GRADERS

On Leaning Wheels

2400 lbs.
to
8500 lbs.
in Weight

7 to 12 foot
Blade
Lengths



Correct Design Best of Materials Quality Workmanship
Featuring
The Telescopic Rear Axle Timken Bearings
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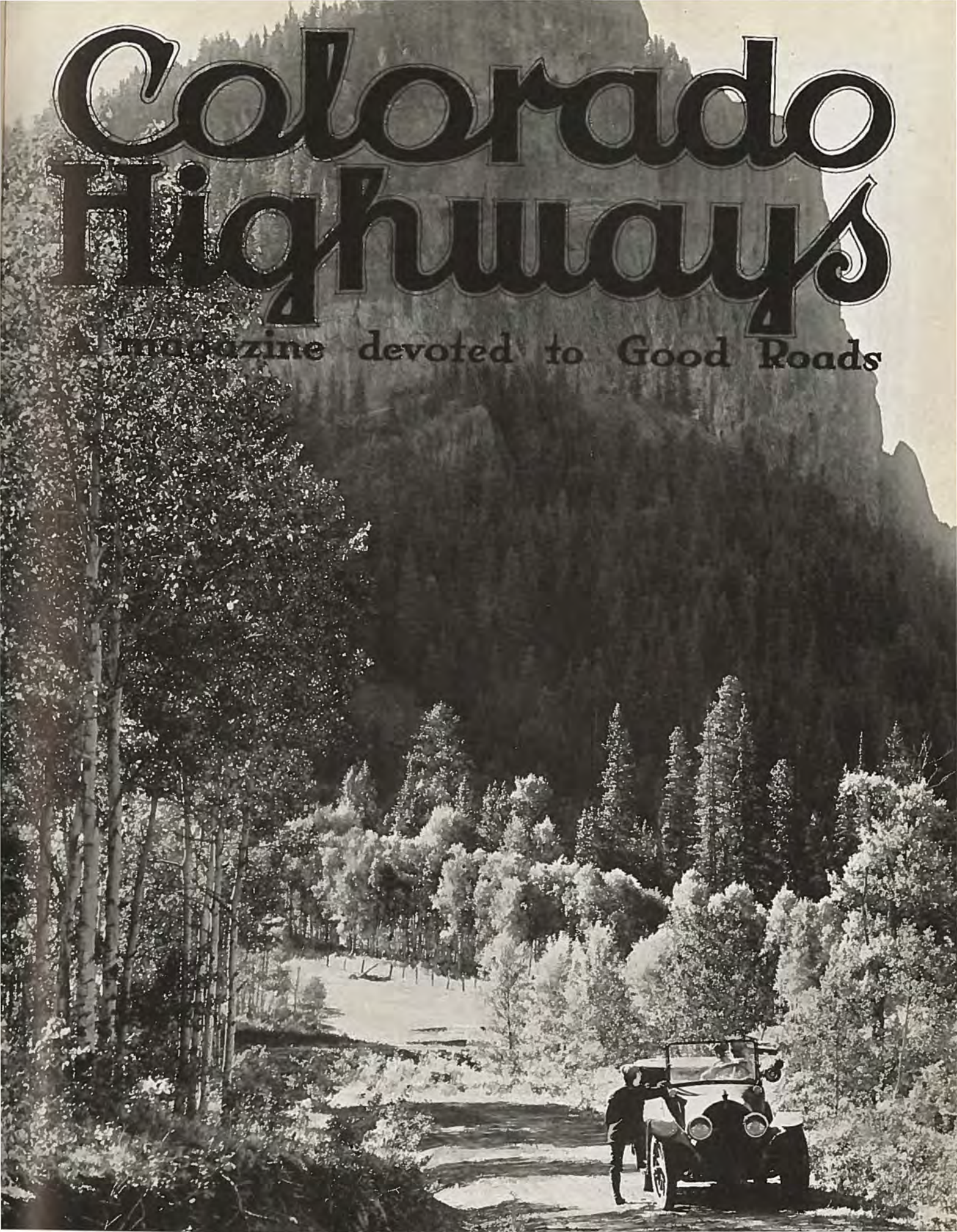
DENVER

CONSTRUCTION EQUIPMENT

"See These Graders at Our Showroom"

Colorado Highways

A magazine devoted to Good Roads



The High Cost of Postponing Permanent Highway Building

*Permanent
roads are a
good investment
—not an expense*

Poor motor roads stifle industry and agriculture, waste huge sums annually in high maintenance costs, and greatly increase gasoline, tire and repair bills.

There is not a state, not a county, not a community, that isn't paying a heavy price for having too few *permanent* roads.

There are still many sections of the country—even whole states—that are trying to operate twentieth century traffic over nineteenth century roads.

This is costing millions of dollars every year, and will keep on costing millions until we have well developed permanent highway systems everywhere.

Even what we often call the more progressive communities are far behind the demands of modern highway traffic with its 16,000,000 motor vehicles.

From the Atlantic to the Pacific, and from Canada to Mexico, we need more Concrete roads—the roads for twentieth century traffic.

Your highway officials want to be of the greatest possible service to you. Get behind them with ways and means that will provide more Concrete roads and streets. Such an investment will pay you big dividends year after year.

Portland Cement Association

Ideal Building
DENVER

*A National Organization
to Improve and Extend the Uses of Concrete*

Offices in 29 Cities



Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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 State Highway Engineer.
OLIVER T. REEDY,
 Senior Assistant Engineer.

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 Edwin Mitchell.....Auditor
 Roy F. Smith.....Chief Clerk

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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 408 Chamber of Commerce Building, Denver, Colorado.
 M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.
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OUR COVER PICTURE

As a frontispiece for COLORADO HIGHWAYS this month we show a view taken last summer near the foot of the west slope of the far-famed Wolf Creek pass (elevation 10,850 feet). During the past two summers the State Highway Department has expended a large sum of money improving and widening this important artery of travel. In the opinion of many motorists, Wolf Creek is one of the most beautiful and spectacular in the state. It is on the direct route to the Mesa Verde National Park and in the summer months is traveled by thousands of tourists from all parts of the world.
 —Photo by courtesy the Denver Tourist Bureau.



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Some State Road Cost Facts

OF late there has been a lot of criticism about the high cost of engineering in the State Highway Department.

Now, there is an old saying that, "where there's a lot of smoke, there must be some fire." In these modern times this isn't necessarily true, for the manufacture of smoke screens by the enemy, in order to cover up their own movements, is one of the most highly developed strategies of warfare.

Of course, there's always two sides to every question. Likewise there is a saying that, "the truth will out."

In this connection, the following facts and figures, gathered from the records of the Highway Department, are of interest to every tax payer and user of Colorado roads.

The question has been asked: "What per cent of the Highway funds go into the roads, and what part into the overhead expenses of the Highway Department, including all engineering costs?"

To answer this question the distribution of Highway funds for the year 1924 is given as follows:

Administration	2.70%
Road machinery and equipment.....	1.68%
Maintenance	14.21%

Construction—

Federal Aid Projects	56.69%
State Projects	17.59%
County Bond Projects.....	1.88%
Engineering	5.25%
Total Construction	81.41%

Total	100.00%
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From this it will be noted that the administration cost, plus the engineering cost, was 7.95%, as against 12%, which is allowed by law. It will also be noted that over 90 cents of every dollar expended by the Highway Department in 1924 went into construction and maintenance of the roads.

It is further noted from the distribution that there is an engineering item of 5.25% tabulated under construction. This is for FIELD engineering only right on the work, and this item could hardly be regarded as overhead. The field engineer is the man who protects the interests of the people on the job. He is there to see that the people get what they pay for in the way of roads. Private corporations look upon his employment as the best investment they can make.

The position is taken by Highway Departments in other states or other industrial organizations, that the

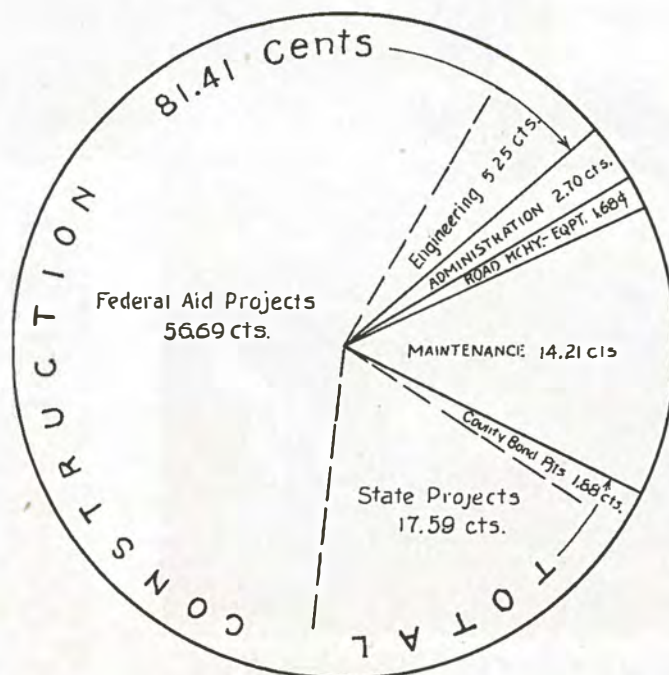
employee who measures in and drives the stakes, indicating the proper location of the construction work, is just as much a legitimate charge against the construction as the man who afterwards uses a pick to excavate at that point.

In the 2.70% for administration is included 1.59% for office engineering, which the Highway Department does not regard as an engineering item chargeable against construction. This item includes preliminary surveys and the drafting of plans for projects not yet placed under actual construction.

Subtracting this percentage from the item tabulated against administration leaves 1.11% as strictly administrative cost.

Recently the Highway Department made an attempt to compare its own administrative and engineering costs with those of other states whose conditions are somewhat similar as to the amount expended and as to the size and distribution of the construction work—by distribution is meant the situation as to whether the projects are close together in a well settled state, or whether they are widely distributed over more or less thinly settled states, thus requiring a comparatively larger engineering force for the same number of projects.

Under usual conditions, a \$100,000 project will cost no more for engineering than a \$35,000 project. If three projects of the smaller size happen to be so close together that one engineering party can handle them all, the engineering cost will still be higher on account of the unavoidable greater transportation, but the percentage for each one will be greatly reduced.



From data furnished by a few of the states, the following tabulation, based on total expenditures, will serve for a comparison with Colorado:

	Field Engineering	Administration Including Office Engineering	Total, both Administration and Engineering
Idaho	6.00%	3.90%	9.90%
Nevada	6.15%	3.00	9.15
Utah	6.70%	3.27	9.97
Wash.	5.60%	3.00	8.60
Wyoming	5.57%	4.00	9.57
Average	6.00%	3.43%	9.44%
COLO.	5.25%	2.70%	7.95%

The above graph shows how the State Highway Dollar was expended in Colorado during the year 1924.

(Continued on Page 20)

The Colorado Sun Circle

By C. L. CHATFIELD

Irrigation Engineer

Member Colorado Society of Engineers

SPRING hats and styles are on exposition during the winter months; at least three months ahead of the time that they are to be pressed into service. This occasions many a guffaw from mere man, on the theory that the ladies are "jumping the gun." They may be, but anticipation or the practice of getting in early and avoiding the rush is sound when you stop to consider.

The time to get into business at least expense is when business is low, with purchase prices corresponding, and the time to buy stocks or bonds is when the market is depressed. In so many words, the psychological moment for entrance into any field is at a time ahead of that when the fruits of one's labors or investments are to be harvested. Therefore the ladies' reasoning is based on firm foundation.

We are aware, from outside evidence, that spring is next in order, in season. That means inception of 1925 road-building campaign, also anticipatory preparation for the handling of the season's tourist business and absorption of the millions that they bring with them.

Last year it was estimated that roundly \$50,000,000 was spent here by summer visitors. If that be true, what about the millions that were carried on through to other states on the east and west main-stem highways. Again, what of the tourists who come but move on or return home sooner than they would if a trip were laid out that would hold interest and occupy them longer.

The majority of tourists are nomadic; they travel in automobiles and prefer to keep on the move with variation in scenic diet. The West is large, and unless interest is maintained within the state of Colorado, they move on.

Although our plains area is attractive, it is secondary, while our mountains are of primary importance from the tourist viewpoint, but inasmuch as the distance

east and west or north and south through them is comparatively short, the logical solution of the problem is a circle trip belting the entire region—not a short circle trip or series of such, which consume little time, but one of such proportions, with side trips sufficient, to cover an entire season or more.

The Colorado Sun Circle, as proposed, would do the trick. With variation and magnificence of scenery; innumerable places of quaint interest pregnant with tales of pioneer past and lore of Redman and the hills, it is astonishing, even to Coloradoans, who are best situated but unfortunately not inclined to see Colorado first.

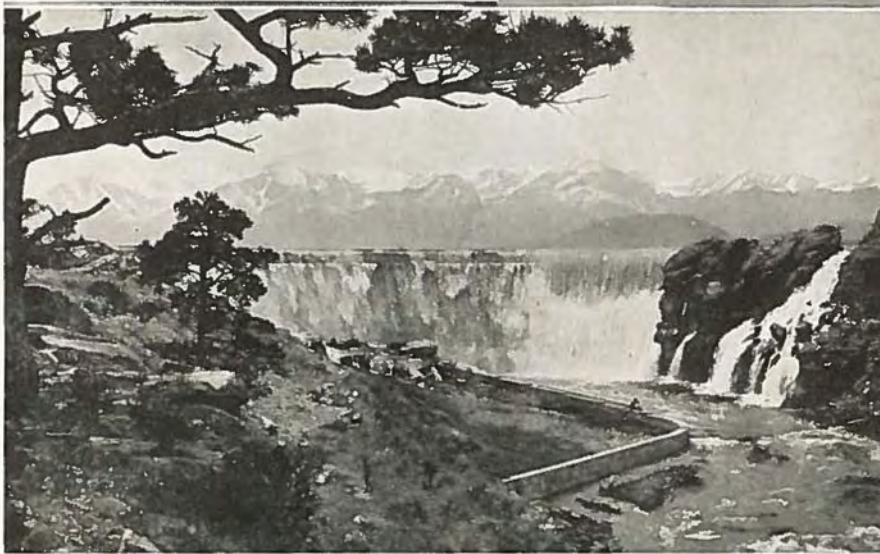
The Park-to-Park Highway, the child of the brain of John M. Steele, secretary of the Real Estate Exchange, is highly successful, and, if so, why not the Colorado Sun Circle, even though conceived by a lowly civil engineer.

The idea has received the endorsement

of every person and organization to whom or which explained. The Rocky Mountain Motorist, Incorporated, by its secretary, agreed to edit the map as sponsored by the Colorado Society of Engineers, and it may be that dilatory tactics on the part of the latter organization is responsible for lack of success to date.

The idea cannot be entirely bad or inquiry would have resulted in criticism rather than praise. That it is good in practice has been demonstrated by the operation of smaller circles in this state and on larger ones in California.

Why, if California had the wealth conducive to tourist attraction that Colorado has, would a wheel be left unturned to capitalize it in all phases? Emphatically no! As recently remarked in one of our newspapers, with reference to a drab announcement of the acquisition of a tract of land on Mount Evans by the City of Denver, if a California city had received title to such a tract it would have been headlined and a blazoned description given of the two lake jewels, backed by beetling crags and cliffs and fed by glacial snowbanks; the Alpan

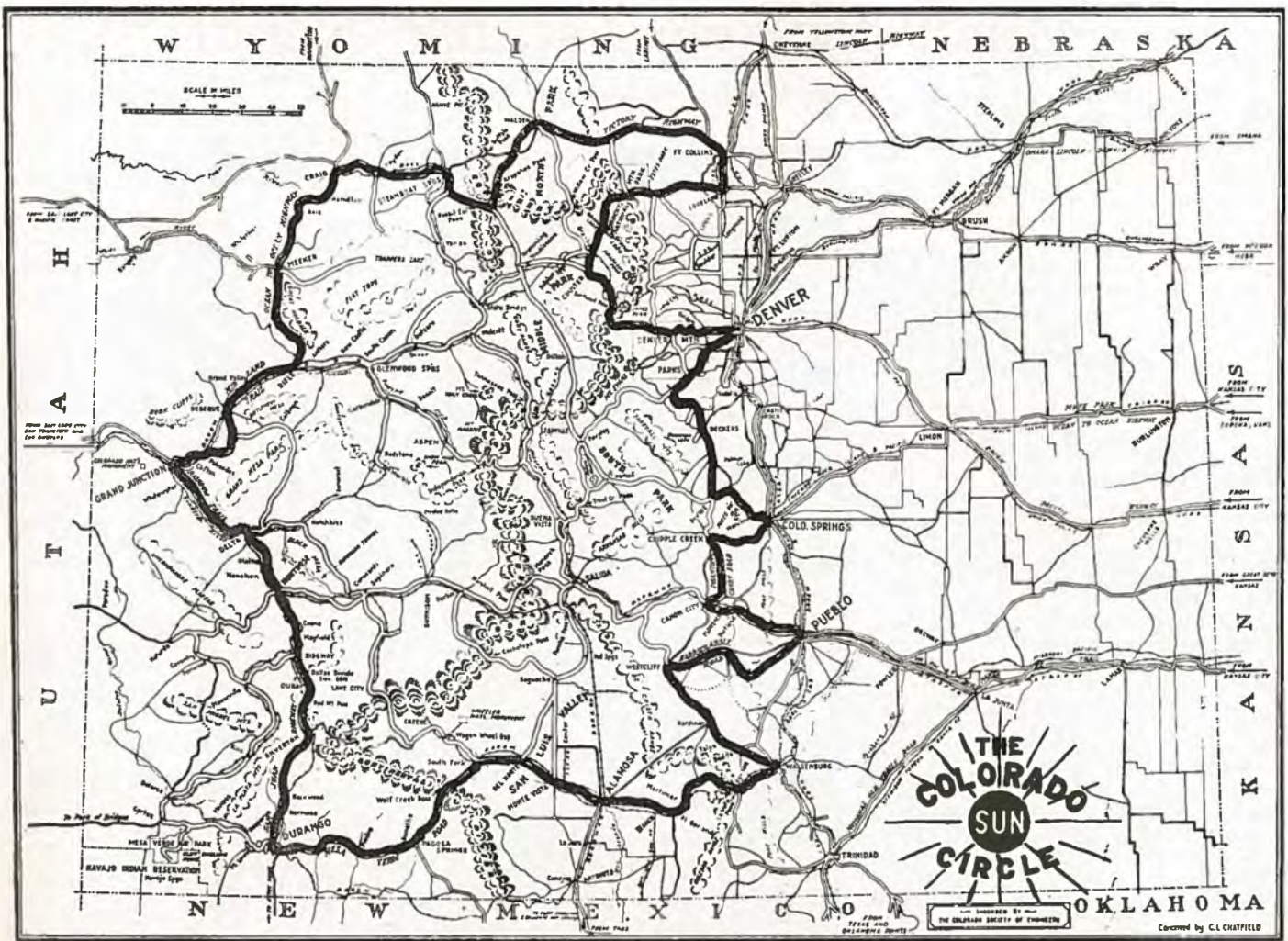


Above—View of sand dunes in San Isabel National Park. Below—DeWeese Dam on Grape Creek, with Sangre De Cristo Range in distance.—Photos by U. S. Forest Service

mosses and flowers; the incomparable outlook to the plains and the tortuous windings of the excellent auto highway, whereby the tourist is but gradually introduced to such sublime heights lest he become overcome by their grandeur.

Colorado is becoming more and more a tourist state; in fact, the increase in tourist travel is at a greater rate than most of our citizens realize. Many business men feel the effects of this increase as reflected in their earnings, but have not divined the source.

The Rocky Mountains in Colorado are a natural retarding factor to travel westward, and the north-and-south highway east of the mountains will be, and is even at the present time, although not functioning to capacity as yet, an artificial retarding factor. To my mind, it would be possible to create another artificial barrier in the form of a north-and-south highway within the mountains directly



Map showing Colorado Sun Circle, approximately 1,600 miles, proposed by the Colorado Society of Engineers as an attraction to summer tourists.

connecting the various parks and points of interest that are really, when it comes down to fundamentals, the points that are most attractive to tourists and are the things that are responsible for the tourists coming to our state.

If it were not for the mountains in Colorado, there would be no excuse for tourist travel unless they were passing through. The greater ease that is afforded in reaching all parts of them, the greater the appeal. At present, with a few exceptions, in order to travel by auto from one part of the mountains to another, at least on the eastern slope, it is necessary to return to the plains and again re-enter the mountains. Therefore, an intra-mountain auto road north and south, eliminating this necessity, would be of inestimable value, and, further, would provide a scenic line that would be unsurpassed by anything of like character in any state in the Union.

Elaborating again on this north-and-south highway, a belt line may be established traversing the mountains in more or less the form of a rough circle by using as a portion the north-and-south highway on the eastern side of the main range. Although the belt line may be entered along any one of the main east-and-west highways from Pueblo, Colorado Springs, Denver, Lafayette, Longmont,

Loveland or Fort Collins, in order to have a beginning and ending, for the purposes of this article, Denver will be used.

The route would be as follows, entering the mountains from Denver to Bergen Park through the Denver Mountain Parks:

Bergen Park up Clear Creek to Idaho Springs;

Idaho Springs over Berthoud Pass through Granby to Grand Lake;

Grand Lake up North Fork over Milner Pass down Fall River through Rocky Mountain National Park to Estes Park;

Estes Park down Big Thompson River through Box Canon to Fort Collins;

Fort Collins up Cache la Poudre River over Cameron Pass across headwaters of Aramie River to Walden;

Walden to Steamboat Springs via Rabbit Ear Pass;

Steamboat Springs down the Yampa River to Craig;

Craig south to Meeker on the White River (Trapper's and Marvine Lakes lie at the head of this stream);

Meeker to Glenwood Springs on the Grand River;

Glenwood Springs down the Grand River to Grand Junction, up the Gunnison to Ouray through Delta and Montrose;

Ouray to Silverton across the San Juan Mountains via Red Mountain;

Silverton, down the Animas River to

Durango (from Durango tourists would go west to Mancos into the Mesa Verde National Park and then return to Durango);

Durango to Pagosa Springs on the Los Finos River, Pagosa Springs over Wolf Creek Pass to Del Norte on the Rio Grande River;

Del Norte to Monte Vista;

Monte Vista to Alamosa;

Alamosa over La Veta Pass to Walsenburg;

Walsenburg over Music Pass to Silver Cliff;

Silver Cliff to Pueblo via Goodpasture; Pueblo to Florence and Canon City;

Canon City via Phantom Canon to Victor and Cripple Creek;

Thence to Colorado Springs;

Thence over Ute Pass to Divide;

Thence via Horse Creek to Decker's Springs;

Thence via Sedalia to Denver.

Variations of this route, of which there are several, may be made and still accomplish the same result.

There are roads of a kind at the present time, some parts really excellent, along the greater portion of this route, and therefore the foundation has been laid for as comprehensive a system, giving access to all parts of the mountainous Colorado, as is conceivable. Every main

(Continued on page 20)

Motor Vehicle License Report

A TOTAL of 197,361 passenger motor vehicles were licensed by the State of Colorado during the year 1924, an increase of 16 per cent over the preceding year, when there were 175,669 cars of this type licensed, according to a statement issued by Secretary of State Carl Milliken.

The total amount collected in 1924 from motor license fees was \$1,258,204.80. The increase in the amount collected was \$131,986.25, being 12 per cent more than the sum paid the state by car users the previous year. The secretary's report shows a total of 15,886 trucks registered last year, compared with 13,287 in 1923.

The number of license plates issued for trucks only in 1924 was more than were issued for both passenger cars and trucks in 1913, when the state assumed control of licensing. In that year the state issued plates for 13,135 passenger cars and trucks. Until 1920 the state made no distinction between trucks and passenger cars.

Of the total number of passenger cars licensed, 57,709 were registered from Denver county. There were 4,267 license plates for trucks taken out in Denver county. This was nearly one-third of the total number issued for the entire state. The total amount of fees paid in to the state from Denver was \$397,736.10.

Weld county was second in amount of motor vehicle fees collected, reporting \$76,883.35. El Paso county was third with \$73,381.39, and Pueblo county fourth, with \$65,050.02.

The secretary's report also shows 2,226 motorcycles registered in the state. There was also issued 7,559 drivers' licenses. The number of dealers' licenses issued totalled 2,591, and the number of re-issues, 22,523. The latter plates were issued to owners who had lost one or both of their original plates.

The figures given out by the Secretary of State indicates that Colorado now has one automobile for every five persons in the state.

The registration report covering the 63 counties in the state for the year of 1924 follows:

Counties	Owners	Trucks	Fees Collected
Adams	4,105	568	\$ 27,362.56
Alamosa	1,280	75	7,573.72
Arapahoe	4,291	368	26,173.53
Archuleta	304	20	1,557.19
Baca	1,418	242	8,918.26
Bent	1,610	73	8,710.78
Boulder	8,332	501	51,398.72
Chaffee	1,265	63	7,632.65
Cheyenne	903	99	5,603.87
Clear Creek	345	27	2,186.35
Conejos	825	52	4,668.85
Costilla	410	27	2,234.88
Crowley	1,168	109	6,995.77
Custer	391	48	2,397.04
Delta	2,458	305	15,961.50
Denver	57,709	4,267	397,736.10
Dolores	70	4	294.01
Douglas	937	69	5,737.35
Eagle	424	43	2,274.75
Elbert	1,444	77	8,206.20



Scene on summit of Milner Pass, showing Poudre Lakes and the Cathedral Spires at right, features of the popular Fall River trip.

El Paso	10,950	650	73,381.39
Fremont	4,272	306	25,901.94
Garfield	1,318	99	7,868.90
Gilpin	136	6	731.23
Grand	450	33	2,233.04
Gunnison	828	28	4,355.17
Hinsdale	49	8	378.98
Huerfano	2,825	128	16,290.28
Jackson	339	24	1,827.01
Jefferson	4,699	449	29,674.23
Kiowa	871	92	5,150.60
Kit Carson	2,169	314	14,714.58
Lake	498	6	2,758.39
La Plata	1,432	71	8,174.14
Larimer	8,211	495	50,291.69
Las Animas	5,746	358	35,094.93
Lincoln	1,654	207	10,394.17
Logan	3,900	347	23,138.96
Mesa	4,589	397	27,911.58
Mineral	101	14	544.16
Moffat	684	44	3,639.74
Montezuma	677	65	4,131.23
Montrose	1,808	188	11,397.39
Morgan	3,983	257	22,975.40
Otero	4,829	307	28,385.15
Ouray	279	9	1,565.83
Park	445	41	2,674.82
Phillips	1,821	279	12,441.87
Pitkin	183	0	813.25
Prowers	2,649	223	16,186.17
Pueblo	10,508	705	65,050.02
Rio Blanco	356	17	1,769.17
Rio Grande	1,611	240	11,308.04
Routt	1,238	34	6,122.86
Saguache	922	127	5,898.02
San Juan	84	10	522.27
San Miguel	356	25	2,120.77
Sedgwick	1,032	128	6,620.64
Summit	222	5	1,018.97
Teller	872	54	4,912.30
Washington	2,083	463	15,163.22
Weld	12,926	979	76,883.35
Yuma	3,067	617	22,164.87

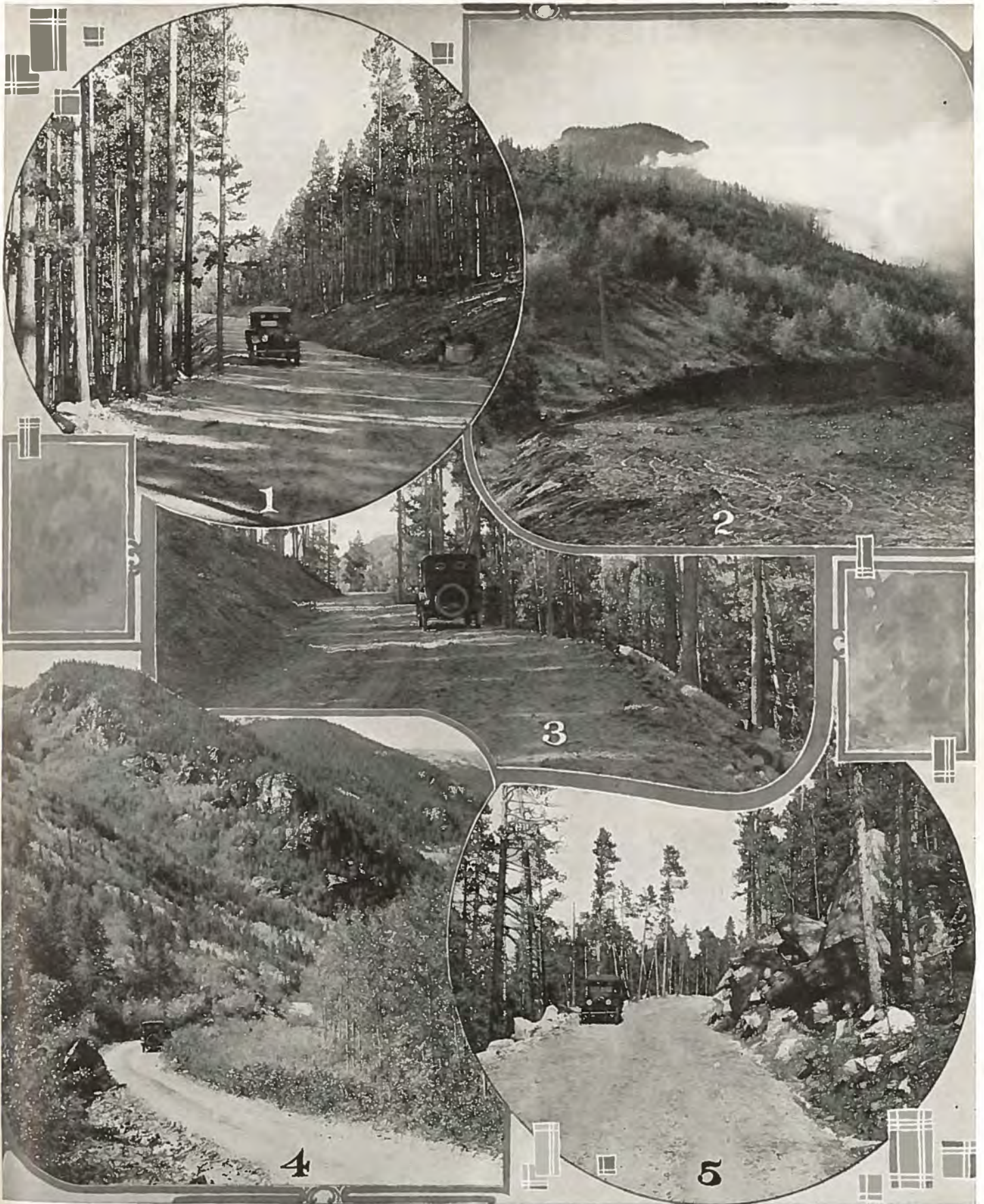
Total 197,361 15,886 \$1,258,204.80

Registration and Receipts by Years Since State Assumed Control of Licensing

Year	Passenger		Total Receipts
	Cars	Trucks	
1913	13,135	*	\$60,833.00
1914	17,756	*	80,047.00
1915	27,568	*	120,800.84
1916	43,296	*	197,794.75
1917	66,850	*	297,292.21
1918	83,244	*	372,490.25
1919	104,865	*	491,713.36
1920	119,964	7,585	815,100.00
1921	136,336	9,403	906,059.27
1922	151,499	10,829	991,677.22
1923	175,669	13,287	1,126,218.55
1924	197,361	15,886	1,258,204.80

Total \$6,718,231.35

*Trucks included with passenger cars for these years.



Scenes along the Warren G. Harding Highway, leading to the summit of Mount Evans (elevation 14,260 feet). (1) A fine stretch of roadway near Echo Lake. (2) Looking up the slope of Squaw Mountain. (3) A side hill cut thru the Lodge Pole pines. (4) Old road over Soda Pass, leading to Idaho Springs, used by early settlers, but now closed to motor traffic. (5) Romantic, rocky and 10,000 feet above sea level.—Photos by Denver Tourist Bureau.

The Twentieth Century Highway

By EDWARD N. HINES

Chairman, Board of County Road Commissioners, Wayne County, Michigan

Progress in concrete highway building can well be epitomized in the following outline of what Wayne County has done, and its probable future development seen in what we are now planning to do. Although I understand that today there are some 31,000 miles of concrete in service in the United States, Wayne County, which took its place fifteen years ago as the pioneer of concrete road construction, is still a pioneer.

Back in 1906, the Board of County Road Commissioners in Wayne County was created for the purpose of improving the county's important highways. At that time there was not a single mile of improved road nor an adequately paved village street in the entire county. The automobile was looked upon largely as a toy or a luxury, and motor trucks were hardly known.

This newly created Wayne County road commission, of which I was a member, made a survey of the county and laid out a systematic, continuing plan of road improvement covering a period of years towards which to work as funds became available.

This survey contemplated the improvement of approximately 350 miles of the 1,370 miles of public road outside of the cities and villages. It has been rigidly adhered to and the entire 350 miles originally planned has been constructed, plus 40 miles additional to meet conditions that have arisen since.

While no changes have been found desirable in the routes selected for improvement, there have been important changes in the character of roads built. Types of construction that were deemed standard in 1906 soon proved too expensive to maintain and were otherwise inadequate, so that following satisfactory experiments with concrete, in 1909 we adopted the concrete road as our standard type and have built practically nothing else during the past fifteen years.

During the past nine years the owner-

ship and use of motor cars of all kinds in Wayne County has increased nearly fourteen times as fast as the population. Every day more and more people are using the motor car. Noting this development several years ago and being confronted with increasing maintenance charges on the shoulders of our concrete roads, we increased our minimum width of metal to twenty feet, making thirty feet over all. We also started in to widen the twenty feet or more all concrete that, because of the demand for mileage, had previously been constructed of a lesser width than eighteen feet.

We also increased the capacity of our bridges to a 30-ton live load and their clear roadway width to a minimum of twenty-seven feet, building largely a T-beam and slab type with a precast concrete ornamental handrail. This type of bridge lends itself to future widening without any great loss of the initial investment.

Realizing that rights of way are fundamental, our commission for several years past has been groping around in an effort to correct and relieve traffic congestion. One hundred foot rights of way have been acquired on some of our radial roads out of Detroit, such as Woodward, Michigan and Grand River roads. Many double concrete highways have been constructed, ranging from forty feet in a single roadway to seventy feet between curbs with provision for interurban tracks in the center.

But no sooner has an improvement of this character taken place than the road immediately becomes congested with traffic. We have come to realize that half measures are useless and are now striking out boldly with a new plan in co-operation with the Detroit Rapid Tran-

sit Commission and the road commissions of Oakland and Macomb counties. All the history of the past shows that our failures have been due to underestimating the future rather than in overshooting the mark.

In conjunction with the Detroit Rapid Transit Commission, all of the territory in Wayne, Oakland and Macomb counties that lies within a 15-mile radius from the Detroit city hall is now being mapped with respect to the widths of rights of way of all mile, half-mile, radial and other important roads. Every half-mile road is being planned for a minimum eighty-six feet width, every mile road a full 120 feet, except that every third mile road is having eighty-four feet added for future rapid transit needs, making a total of 204 feet for these super-highways. Radial main arteries, which are of greater importance than meridian roads, since they have no main parallel highways, are being planned for a right of way of 204 feet.

The Detroit Rapid Transit Commission arrive at the 204-foot figure for their super-highway by taking a width of 120 feet for an arterial city street, and adding eighty-four feet to it for surface rapid transit. Where interference with the foundations of adjoining buildings is to be avoided and main sewers provided for, 120 feet is the desirable width for a four-track underground rapid transit line. A 120-foot street with a four-track rapid transit beneath may be looked upon as a double-deck or two-level thoroughfare.

If, at the edge of the built-up area of the city, the four tracks are brought out from underground and laid upon the surface with grade separations every half mile, and if the former 120-foot street is divided into two 60-foot sections which are placed on each side of the surface rapid transit facilities, then we will have a single level thoroughfare, with the same four rapid transit tracks and the

(Continued on page 18)



Showing modern methods employed in the construction of Colorado concrete highways—giant roller preparing subgrade in advance of mixer crew.

One Per Cent Good Roads

THE United States has 342,000 miles of "good" roads, according to the Federal Bureau of Public Roads, probably more than all the rest of the world put together.

We have heard a lot about the good roads in Italy and one or two other places in the world, and we've heard more about the famous good roads built by the Romans something like two thousand years ago.

But probably all together they wouldn't make a very extravagant showing alongside the 40,000 miles of good roads constructed in the United States last year.

The good roads in the United States—and this does not include city streets—are equal to something like 114 roads 3,000 miles long, clear across the continent at its widest point.

They would cover the country with a net-work of good roads every forty miles north and south, and east and west.

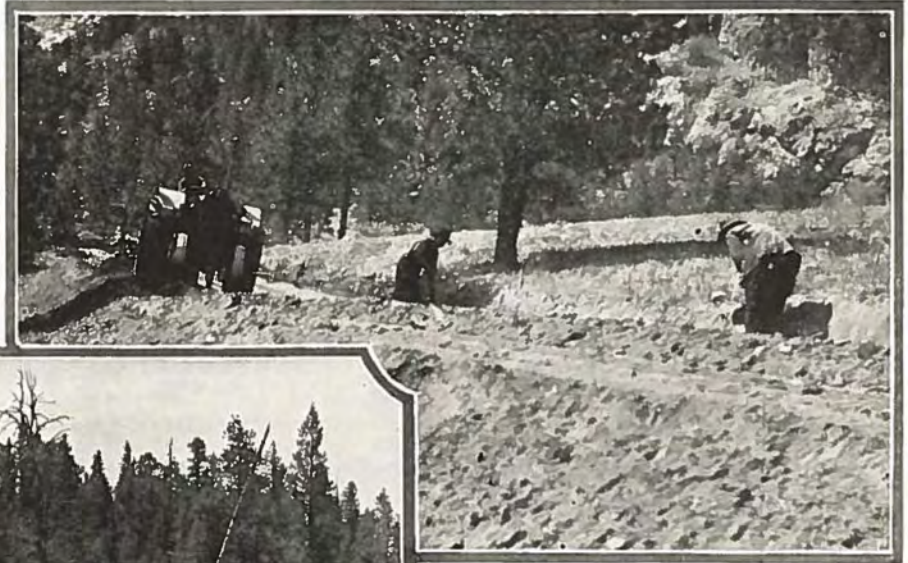
But before we allow ourselves much of the feeling of satisfaction which some of these figures would seem to warrant, it would be well to remember that all our

Of the total, 175,000 miles are ordinary gravel, 100,000 macadam, and only 27,000 miles are concrete. There are 30,000 miles of the various kinds of asphalt road, and 10,000 miles of other kinds of pavement.

Although it is going to be manifestly unnecessary to improve all these highways with concrete or asphalt, we can see that we have a long way to go before we will have done even moderately well in equipping the country with the sort

The growth of "the good roads movement" in the United States and Canada since its organized inception in 1880, and with the great stimulus it received in the periods immediately following the advent of the automobile and the appearance of the motor truck, has been so rapid, so extensive and so effective that highway construction today constitutes one of the greatest, if not the greatest, problem in American economic life.

There are now 1,702 organized agencies



Forest roads in Colorado—(above) Grading on Bennett Creek road in Colorado National Forest. (Below) A section of the Rabbit Ear Pass road. Photos by U. S. Forest Service.

good roads put together are but a mighty small part of the total.

Probably most people will be surprised to know how small a percentage of the total of our roads have been made into "good" roads, in view of the surprisingly large mileage of construction that has been completed in the last two decades, since the automobile has come into general use.

The Federal Bureau of Public Roads gives the number of rural highways in the United States as 2,819,386.

Our 342,000 miles of good roads is therefore only a little more than one per cent—less than one and one-quarter per cent of the total.

And these good roads include all sorts—gravel, macadam, asphalt, concrete, brick and stone block, and all other kinds.

of roads that modern conditions of travel demand.

All over the United States we have been doing big things in road building.

Especially has this been true with the 40,000 miles of good roads built last year, and the even greater mileage constructed and being constructed during the present year.

People may travel from one end of the nation to the other with speed and comfort hardly to be imagined a generation ago.

But the time has not come yet, and will not come for a good while yet, to let up on this job of road building, with some 2,477,386 odd miles of rural highways yet in the plain dirt stage, and much of them impassable for considerable portions of every year.

actively and directly pleading the cause of good roads. The agitation, to date, has brought about the construction of 310,000 miles of surfaced highways—raising the highway mileage of the United States to 2,478,552, and that of Canada to 255,000.

The automobile industry, fourth largest in the country, with 368 manufacturing plants, capitalized at \$1,274,378,642, employing 325,000 workmen, having an annual output of 2,205,197 passenger cars and trucks valued at \$3,594,814,620, and supplemented as it is by 1,910 firms producing auto parts valued at \$300,000,000 a year, together with 1,000 firms manufacturing annually 35,000,000 tires valued at \$1,000,000,000, is absolutely dependent upon highway improvement for its stability and upon increased road mileage for greater expansion. In addition, 33,000 distributors of automobiles are involved, as well as 45,800 dealers in automobile accessories and 45,000 dealers in tires. So great, too, has the road-building industry become, in consequence of the demand for improved roads, that 7,500 contracting firms are now engaged in actual construction work. The roads are now traversed by 9,211,295 licensed cars and trucks, of which 3,000,000 are used on the farms.

Prior to 1880, when Amos G. Batchelder, late chairman of the executive board of the American Automobile Association at Washington, with H. S. Earle of Detroit and other pioneer advocates, organ-

(Continued on page 18)

Youth Wins Firestone Essay Prize

JOHAN LISKA, high school youth of Wisconsin Rapids, Wisconsin, is announced as winner of the H. S. Firestone Fours Years' University Scholarship for 1924, his essay having been chosen as the best of those submitted in the fifth good roads essay contest.

Liska's essay represented Wisconsin in the national competition, in which one essay was entered from each state and territory. It had previously been selected as the best of those from his state by a committee named by the Extension Division of the University of Wisconsin. More than 200,000 high school students throughout the United States and territorial possessions sought the honor which fell to him. The contest was conducted by the Highway Education Board, of which Dr. J. J. Tigert, United States Commissioner of Education, is chairman.

National judges who reviewed the state essays were James J. Davis, Secretary of Labor; Dr. W. O. Thompson, president of the Ohio State University, and Merle Crowell, editor of the American Magazine. Liska is the fifth high school student to win this honor in as many years. Honorable mention was given to the essays by Richard Arimizu, Hilo, Hawaii; H. Harold Kelley, 707 West Euclid avenue, Pittsburg, Kansas, and Viola Greene, Willimantic, Connecticut, R. F. D. No. 1.

The prize winning essay follows:

THE RELATION OF IMPROVED HIGHWAYS TO RURAL HOME LIFE

By John Liska

Isolation is the primary cause of the ignorance so evident in rural communities. Poor roads, more than anything else, have forced the farm home into a demoralizing isolation. The improvement of highways, making the consolidated school and social center possible, is injecting new life into homes formerly hopelessly isolated. Home life is broadened and enriched. Boys are willing to stay "down on the farm." Girls cease to envy their city cousins and to leave home for "the bright lights."

Just a few minutes of travel on a particular road leading out of the city of Wisconsin Rapids will convince the most doubtful skeptic of the value of good roads and their influence upon home life. About two miles from the city this

road branches. One branch, is called "the left road"; the other "the right road." The left road is almost always in a deplorable condition; the right road is hard surfaced. The homes on the left road are delapidated, the front yards scarcely recognizable among the tangle of broken machinery, old wire, and various other objects placed "out of the way." The land has been cropped till it is impossible for even quack grass to flourish. The stock, descendants of some of Granddad's scrubs, is now so degenerated that scarcely any characteristics of a high-producing, profitable animal are evident.

Can you expect the boy or girl to remain "down on the farm" under these conditions? Not one boy or girl living on this road has any education above the eighth grade, and very many have not even completed the eighth grade. These young people, many of them lying about their ages, have had to seek a "job" at the store, mill or factory, instead of completing their education. Can home life be pleasant and happy where these conditions exist?

The road to the right leads through land slightly more fertile, but more fertile only as a result of better farm management. No farm home on this road, for a distance of twenty miles, is without at least one modern convenience. Several farms are equipped with every modern convenience, both in and out of the home.

The aesthetic influence a good road exerts is very evident. Often it stimulates latent self-respect into practical expression. These people are continually adding some improvement in an honest attempt to beautify their home surroundings. Through diversification and rotation of crops they have succeeded in bringing their land to a high degree of fertility, resulting in a more stable income each year. They are sending their children to high schools, agricultural schools and universities. A better education is teaching these children to realize the value of a true home.

Before the right road was improved, conditions were alike on both branches. The improved highway alone made diversified farming profitable, made a better education possible and better homes a reality.

On the left road the average farmer has, in a large measure, lost his self-

respect and has allowed his home to fall below the standard and has failed to keep in stride with the times. He is considered inferior to city people. Farmers, such as those on the right road, are again placing the farm home upon the pinnacle where it should rest, "The True Home of Man."

How necessary to that home is a good road! What a relief it must have been to those simple folk in Whittier's "Snow-bound" to have the road opened and the floundering carrier bring the village paper to the door!

The left road may be compared to the snow-bound road, impeding progress, forcing isolation. The right road may be compared to the opened road, offering new opportunities, new possibilities and new happiness.

The right road is, in the true sense of the word, the "right road." We must build more of them. Until this is accomplished, home life in isolated sections will, in the future, simply exist; but when all roads are right roads, these same communities, those same homes, will live.

Contract Let for New Road in Pike National Forest

A contract has been let to W. E. Shoecraft and E. P. Arthur, contractors of Colorado Springs, for the construction of a new road, extending from a point near Monument to Woodland Park in Pike National Forest. Their bid for the work was \$8,040.

Other bidders included Dooling Bros., \$15,672; Manitou Transfer Co., \$9,844; George E. Churchill, \$8,300; N. J. Jacobson and T. J. Ehrhardt, \$9,430, and B. L. and J. L. Morrison, \$10,800.

The new road forms a short circle trip from Colorado Springs into the Pike National Forest, and also connects with the Woodland Park-Deckers road.

With the completion of the construction work maintenance begins, and upon the efficiency of the system of maintenance of the roads of the state depends in a very large measure the success or failure of a state's road program.—Ex.

The annual highway expenditures are approximately \$1,000,000,000.



A typical ranch scene in Colorado, located in the San Luis Valley, one of the richest agricultural sections of the state.

America Registers 17,000,000 Autos

MOTOR vehicle registrations in the United States for the year 1924, not including the final ten days of December when they were comparatively negligible, reached the aggregate of 17,700,179, a gain of 16.28 per cent over the total of 15,222,658 recorded in 1923.

This total, compiled by *Motor* from official figures obtained in every state, means that there is one passenger car or truck for every 6.42 persons, basing the calculation on an estimated present population of 114,000,000.

The number of passenger cars increased from 13,455,073 at the end of 1923 to 15,520,663, a gain of 2,065,590, or 15.35 per cent.

The number of commercial vehicles increased from 1,767,585 at the end of 1923 to 2,179,516, a gain of 23.3 per cent, indicating the rapidity with which the use of trucks and busses is being expanded.

The amount of money invested in these vehicles is conservatively estimated at \$10,620,107,400.

With a total production for the year of about 3,580,000, of which about 300,000 were exported, it would appear that something like 800,000 of the cars and trucks made were used to replace vehicles which were scrapped.

New York still leads in registrations with 1,412,050, of which 1,136,300 are pas-

senger cars, but California is a close second with 1,321,480 and is less than 10,000 behind on passenger cars with 1,126,956. Ohio with 1,237,000, Pennsylvania with 1,221,893, and Illinois with 1,123,000 are the only states in the one million class.

The second five, in order, are: Michigan, 877,453; Texas, 823,074; Massachusetts, 672,315; Indiana, 649,797; Iowa, 614,500. Other states in the 500,000 class are: Missouri, 545,000; Wisconsin, 526,400; Minnesota, 503,115, and New Jersey, 499,000.

When it comes to percentage of gains the South steps to the front, showing the results of two prosperous years. The leader is Florida with a percentage increase of 34.9, jumping from 160,000 to 215,872, but Georgia is running close with a gain of 34.5 per cent, rising from 173,794 to 233,818. New Mexico is third with 32.2. Louisiana with 29.4 and Mississippi with 29.3 are virtually tied for fourth place.

Other states which gained 20 per cent or more, in alphabetical order, were: Alabama, 24.3; Arkansas, 25.8; California, 21.9; Michigan, 20; New Hampshire, 20.9; North Carolina, 21.6; South Carolina, 27.6, and Utah, 20. Connecticut gained 19.9.

Further analysis shows that the grain states of the Middle West and other agri-

cultural areas made poor showings, offering additional evidence that motor vehicles sales depended largely on the general course of business. States which gained less than 10 per cent, in alphabetical order, were: Iowa, 6.6; Kansas, 9.4; Montana, 7.9; Nebraska, 8; North Dakota, 7.1; Oklahoma, 5.8; South Dakota, 8.1, and Wyoming, 9.9.

The largest numerical gain was 221,197 in California, with New York second with 197,408. Ohio came third with 168,300, Pennsylvania fourth with 157,269, and Texas fifth with 134,175.

The only states which failed to gain 10,000 or more were Arizona, Delaware, Idaho, Maryland, Montana, Nevada, Rhode Island, Utah, Vermont and Wyoming, and of these Arizona and Rhode Island fell short by only a few hundred.

The figures in every case were obtained from the office of the Secretary of State or the Motor Vehicle Division.

Half loads may be ordered on all trucks in Michigan when wet weather naturally softens the roads to such an extent that full loads will seriously injure them. At important points state police will be stationed on guard and will maintain telephone service so that shippers and freight handlers may inquire as to the condition of the roads.



Scene on the southern slope of Red Mountain Pass, a link of the Picturesque Durango-Silverton-Ouray "Million Dollar Highway."

Why

Stockland Graders

It Cuts

Look at the curved blade on a Stockland Quicklift grader. It CUTS instead of scraping. If you've ever used a shovel, no one can tell you that a cutting blade doesn't move more earth with less power than the old style scraping blade.



It Rolls

An even quantity of earth slips up along the curved Stockland moldboard, forms into a smooth roll and delivers uniformly at the end of the blade. Think of the lessened drawbar pull over the old "bust-it loose-and-push-it" type.



It Grips

Because the curved blade and moldboard slip under the earth and ROLL it forward, the pressure on the Stockland blade is DOWNWARD. The wheels stay on the ground, they grip. No wheel will hold if the grader "rides the blade." A non-swerving grader is not a matter of wheel design, but of grader design. Stockland proves it.



Move More Earth

TODAY, buyers of road graders can get something more than a scraping blade hung on four wheels. They can get a correctly designed earth moving machine that will operate to full capacity in any soil—deliver a full load of stiff clay as steadily as light loam—and this without the gouging, skidding, blade-riding performance so often a part of grading.

Every feature of Stockland design is based on the fundamental job a grader must do. The blade design, the centrally located blade suspension, the frame, steering device and controls—even relatively unimportant parts such as the wheels—will all impress you as a sound job of engineering.

Note the three features shown at the left. Users tell us Stockland capacity means fewer rounds—Stockland's constant road grip makes "smoothing up" unnecessary. Highway officials in semi-arid territory state the correct design of the cutting blade is an important factor in their earth road programs.

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BEFORE YOU BUY ANOTHER GRADER

know why Stockland design is correct. There's nothing mysterious about it—you'll appreciate the advantages at once because they are *real* advantages. Don't let wrinkles in grader design mislead you. Send for STOCKLAND GOOD ROADS MANUAL, an interesting treatise on earth road construction and the story of a grader built to do its job. Address Stockland Road Mach'y Co., Minneapolis.



Use the **Stockland** ^{LIFT}
QUICK ^{LIFT} Graders

10 seconds blade up — 10 seconds blade down
— Grades 7 miles instead of 6

With State Road Builders

Bad Weather Halts Work on Grand Valley-Rifle Job

Adverse weather conditions have made it impossible for Hinman Bros. to start work on their 16 mile grading and gravel surfacing contract between Rifle and Grand Valley. A big outfit will be placed on the work just as soon as the weather will permit, according to Dale Hinman.

This is the largest contract of its kind let to date by the State Highway Department. Hinman Bros. were the successful bidders over six other large contracting outfits. Their bid was \$130,000.

The work is located on one of the main routes from Denver to the Western Slope, and will eliminate one of the worst stretches of roadway between the Capitol City and Grand Junction.

Plans are now being made by the Highway Department to improve the bad stretch or road west of Minturn, which in past years has been a source of great inconvenience to motorists traveling between Leadville and Glenwood Springs. A contract for the improvement of the Minturn stretch will be let some time early in the spring.

The department also has plans under way for the further improvement of the road between Red Cliff and Leadville. These two improvements connect with the new road over Battle Mountain, completed two years ago.

State Is Asked to Help Mountain Road in Towns

A movement is now under way in the towns of Craig, Steamboat Springs and Hayden for the improvement of the Victory Highway through their respective corporate limits. These improvements will be carried out in co-operation with the State Highway Department, under the law which permits the State to improve streets in towns under 2,500 population located on State highways.

The Victory Highway is the only trans-continental road traversing the State of Colorado, running from New York to San Francisco. It crosses the Continental Divide on Berthoud Pass.

The work proposed under the plan outlined by the citizens of these three named towns will be carried out by road maintenance crews. As it is now these crews work up to the limits of the towns and stop. The new scheme would permit them to carry their work on through the streets of the towns.

As a general thing the worst stretches of any trunk route road are to be found in the towns which they serve.

New Cheyenne Mt. Roadway to be Opened on June First

Present indications are that the new road which Spencer Penrose is constructing to the top of Cheyenne Moun-

tain, west of Colorado Springs, will be opened on June 1.

Construction of this roadway has presented many difficulties to the engineers in charge. The work is being carried out by a large crew of men on force-account with dynamite and a steam shovel. J. J. Coogan is superintendent in charge of this project.

Cheyenne Mountain is the peak that it is believed Lieut. Zebulon Pike ascended, wearing cotton overalls and Indian moccasins in the coldest of winter weather, depending upon what game he could shoot for himself and companions. The new road, therefore, will be one of the most romantic trips in the West. The ride over it will be parallel to the course of the great explorer, but with decidedly more comfort.

From the top of Cheyenne Mountain, Pike surveyed the white-capped summit of Pikes Peak, and wrote in his diary that that peak would never be climbed by man. He missed his guess, as others have done. But it was a long time before his prediction proved false.

The construction of the Cheyenne Mountain highway is being carried out by private enterprise, and when completed will be operated as a toll road. Two other toll roads are being operated out of Colorado Springs at the present time with marked success. They are the Pikes Peak Auto highway and the Corley scenic highway over the roadbed of the junked Cripple Creek Short Line running from the Springs to Cripple Creek, one of the most famous mining towns in the world.

\$25,000 to be Spent on Big Thompson Canon Road

Washouts on the Big Thompson Canon road to Estes Park will be a thing of the past when work of raising the roadbed now under way is completed. Two crews of men are now at work on the job, which will be completed before the rush of summer traffic to the park starts.

The work is being carried out under the direction of Division Engineer A. B. Collins. Cost of the improvement is being borne by Larimer County and the State Highway Department on an equal basis. The sum of \$25,000 has been appropriated for the project.

Two crews of twenty-five men each are employed on the work. One crew is located at the upper end of the canon, while the other is located at the lower end. They are blasting out the sides of the canon and raising the road in places where it is low enough for the high water of the spring freshets to flood the roadway.

In years gone by the Big Thompson road has been blocked at various times by flood waters, and it is with the object of making the road free from flood danger in the future that the present work is being done.

Plans for Byers Canon Road Await Approval of Bureau

Plans for a one-mile extension of the new road project in Byers Canon, west of Hot Sulphur Springs, located on the Victory highway, have been completed by the State Highway Department and referred to the U. S. Bureau of Public Roads for approval.

It is expected that the project will be ready for advertising the latter part of February, in order that work on the project may be started early in the spring. Last summer there was constructed one mile of the road through the canon, extending from the city limits of Hot Sulphur Springs. This work was carried out by the Pioneer Construction Company with Joe Gordon as superintendent.

The new project will bring the new roadway within about two miles of Parshall, and will complete the heaviest part of the work. Practically the entire distance must be blasted from solid granite walls along the river. Some of these walls reach sixty feet in height. The engineers estimate that 65,000 yards of solid rock must be excavated with high explosives.

The survey for the new roadway through the canon was made several years ago by R. E. Cowden, locating engineer, of the State Highway Department.

Construction of the new road through Byers Canon will eliminate one of the worst stretches of roadway between Denver and Craig. Years ago when the Moffat road was constructed the county gave up its road line in the canon to the railroad, and the present road over the hill from Hot Sulphur Springs to Parshall was constructed. During the wet weather the hill road is next to impassable and is difficult for most automobiles to negotiate in dry weather.

Plans Under Way by State to Improve Santa Fe Trail

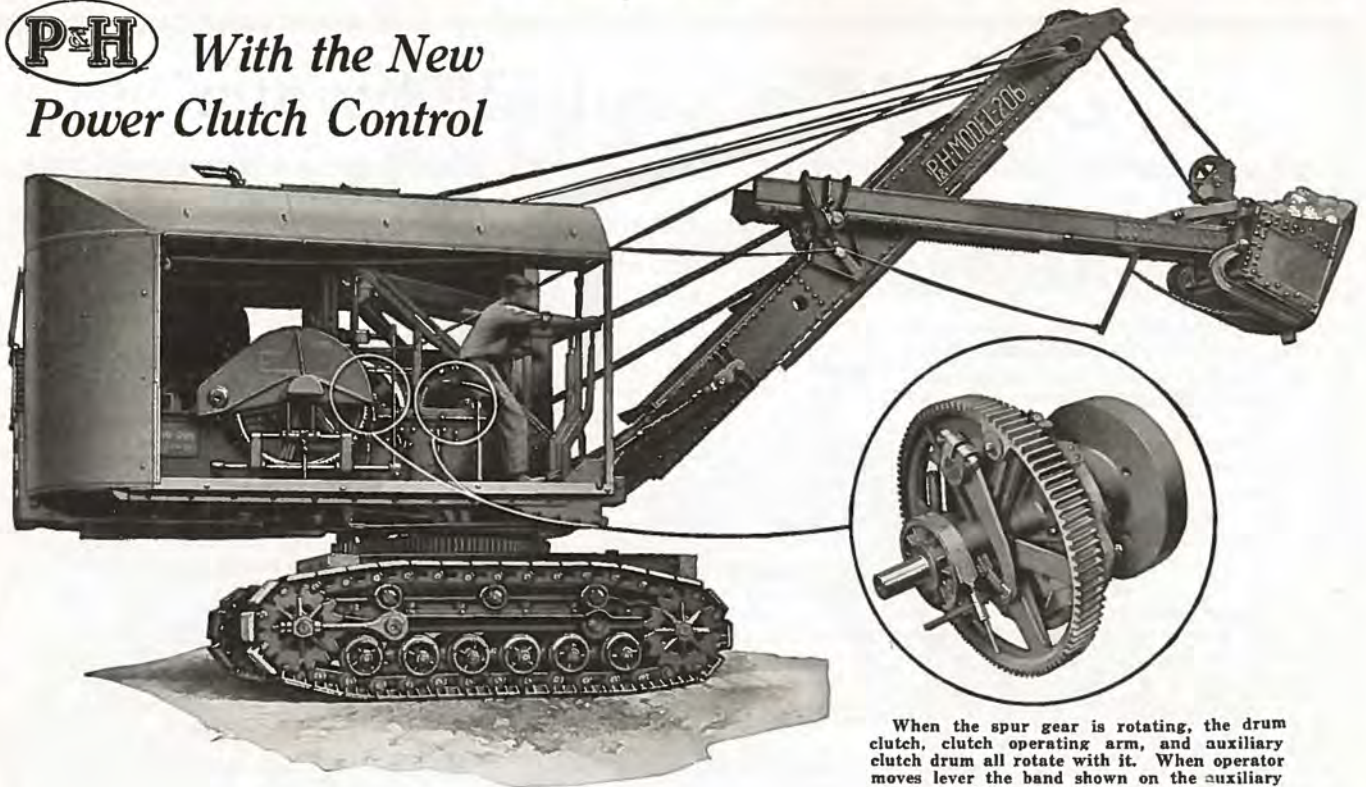
Plans are now under way by the State Highway Department for the improvement of the Santa Fe Trail in Pueblo County to the Otero County line with gravel surfacing. The work contemplated will be carried out with the object of future paving operations.

It is said that the route of the road will be changed in a few minor places, thus shortening the distance about three-fourths of a mile, and thereby reducing construction and maintenance costs.

A child upon being asked by its teacher to tell her the most dangerous part of an automobile, answered, "the driver."—Ex.

Gravel haulers' ball at Ericksburg this week, says an exchange. Wonder if Jiggs will be there?—Ex.

P & H With the New
Power Clutch Control



When the spur gear is rotating, the drum clutch, clutch operating arm, and auxiliary clutch drum all rotate with it. When operator moves lever the band shown on the auxiliary drum at left is tightened, retarding it. The operating arm then causes the main clutch to grip the drum.

Easier Handling - No Fatigue - Greater Yardage

Another simple but very important development—the P & H Power Clutch Control for P & H Excavators. It eliminates the hard work of operating the various clutches by sheer physical effort.

The operator just moves the lever selected toward him and the engine power does the rest. The average pull, as far as the operator is concerned, is only 4½ lbs. The Control is almost push button easy.

Faster handling of the machine is possible—and greater yardage can be excavated during the entire day.

This new feature together with the powerful P & H crowding motion that is exerted throughout the dipper movement (from directly in front and under the operator up through the

top of a bank), and the proven dependability of P & H construction and design, give the user still greater value.

If you want to make your excavating work pay bigger profits—and speed it up—get in your order for a P & H now and specify shipping date.

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Along National Highways

Asphalt Paving Industry Has Biggest Year in Its History

The phenomenal growth of the asphalt paving industry during the period 1918 to 1924, inclusive, was emphasized at the annual meeting of The Asphalt Association held in Chicago, January 8th, by the report of the secretary showing that while in 1918 a total of 52,600,000 square yards of asphalt pavement was laid in the United States, the comparative figures for 1924 were 118,800,000 square yards, or an increase of 125 per cent.

The outlook for paving in 1925 was shown to be most encouraging, as evidenced by seventy-three telegraphic reports from state and city engineers comparing the yardage laid in 1924 with the anticipated yardage laid in 1925. Many states and cities reported an anticipated increase of more than 100 per cent in paving activity, while the general average indicated at least a 20 per cent gain over the past year.

The research department of The Asphalt Association reported striking progress in its laboratory investigations looking to an increase in the stability of asphalt paving mixtures and into the use of a much wider range of asphalt sands as well as in the development of an efficient method of testing both the stability of paving mixtures and the relative value of various combinations of sands and fillers.

Mr. C. G. Sheffield, manager of the Fuel Oil and Asphalt department of the Standard Oil Company of New Jersey, was elected president of the Association; Mr. Leroy M. Law, chief chemist of the New Orleans Refining Company, was elected vice-president and Mr. J. R. Draney, formerly of the U. S. Asphalt Refining Company and now at the head of his own organization, was elected chairman of the board of directors, and Herbert Spencer and J. E. Pennybacker were re-elected treasurer and secretary respectively.

Eighteen new members were added to the Association rolls during the year, including the Mexican Petroleum Corporation, one of the largest producers in the asphalt industry, and the Asphalt Roads Association in England, which latter organization comprises some fifteen or twenty of the most representative companies identified with paving in England and France.

Mr. J. H. Cranford, president of the Cranford Paving Company of Washington, D. C., and retired president of the American Road Builders' Association; Mr. R. B. Tyler, president, R. B. Tyler Company, Louisville, Ky.; Mr. V. P. Strange, president, Strange-McGuire Company, Salt Lake City, Utah, and Mr. Fisher Jones of the Mexican Petroleum Company, were new directors elected for the current year in addition to the directors who continued in office.

Iowa's Champion Draft Team Pulls 19 Tons on Paved Road

Iowa's champion draft team, Pat and Barney, owned by the Blue Line Storage Company of Des Moines, can start and pull a load of 38,960 pounds, approximately 19½ tons, on pavement, but can handle only 18,980 pounds, 6¼ tons, on a dirt road. Incidentally, it might be mentioned that on steel rails like the railway locomotive uses, this same team theoretically could start and pull a load of 116,880 pounds, approximately 58¼ tons.

These pulling contests for horses, while planned chiefly to test the strength of draft horses, are incidentally closely corroborating the results of traction tests on motor vehicles being conducted by the Engineering Experiment Station of Iowa State College and the State Highway Commission.

The motor vehicle tests show an average from thousands of runs of 14 ton-miles per gallon of gasoline on dirt road and 31 ton-miles per gallon of gasoline on pavement. This is a trifle more than twice as much transportation for a given amount of energy expended on pavement as on dirt. The draft horse tests show an average of nearly three times as much transportation on pavement as on dirt.

Pat and Barney were the winners of the 1924 Iowa State Fair contest. This was held to determine the champion draft horse team of the state. These horses were able to exert a tractive pull of 3,000 pounds for a distance of 27.5 feet. Exerting a tractive pull, it must be remembered, of 3,000 pounds, is very different from pulling a load of 3,000 pounds. An equivalent and example of a tractive pull of 3,000 pounds would be the lifting of a dead weight of 3,000 pounds straight up off the ground or out of a hole in the ground. To pull a load of 3,000 pounds on a pavement requires only a small fraction of a tractive pull of 3,000 pounds.

Incidentally these pulling contests and the scientific apparatus designed for making these tests of horse strength are producing scientific as well as practical reasons which anybody can see and appreciate for the improvement of Iowa highways. The question of transportation is one of the largest factors entering into Iowa field or factory productions. The motor vehicle tests show that, for instance, a gallon of gasoline will provide power for hauling one ton 14 miles on dirt, 21 miles on gravel and 31 miles on pavement, or will haul 14 tons on dirt, 21 tons on gravel and 31 tons on pavement. These horse tests are corroborating this, as stated above, by showing that this draft team weighing about 3,000 pounds combined, can haul 6¼ tons on dirt and 19¼ tons on pavement. This saving in transportation by actual figures shows that the cost of the higher type of road can be paid in a

maximum of approximately 15 years.

The results of these tests are leading road builders and scientific experts to declare that we are paying for better roads whether we have them or not.

Woman Takes Active Part in Promoting National Roads

Wherever women have taken an active part in public affairs, they have invariably entered into their tasks with an energy and zeal that brings credit upon themselves and their work. There is a striking instance of this fact in the person of Mrs. Anna Norris Kendall, a noble old lady of seventy-nine years, who is road commissioner of Washington County, Alabama. She has come to be called the "Grandmother of Good Roads" because she has devoted her whole life to that worthy cause. As related in the American Magazine, she has made good roads her life hobby, and realized the need of them ever since she was a tiny tot on her father's farm in Illinois, and got stuck in the mud while crossing the prairie trail which led from the house to the barn.

When she went to Alabama ten years ago, she saw at once that the lack of good roads was holding the community back from prosperity. She immediately directed her efforts to selling the idea of good roads to the people with such success that they elected her road commissioner. Mrs. Kendall not only appreciates what good roads mean to a community, but she knows how to build them. She thoroughly understands about sub-surface ditches to take care of the seepage and ground water. She knows, too, the importance of cross drains and the proper methods of installing culverts.

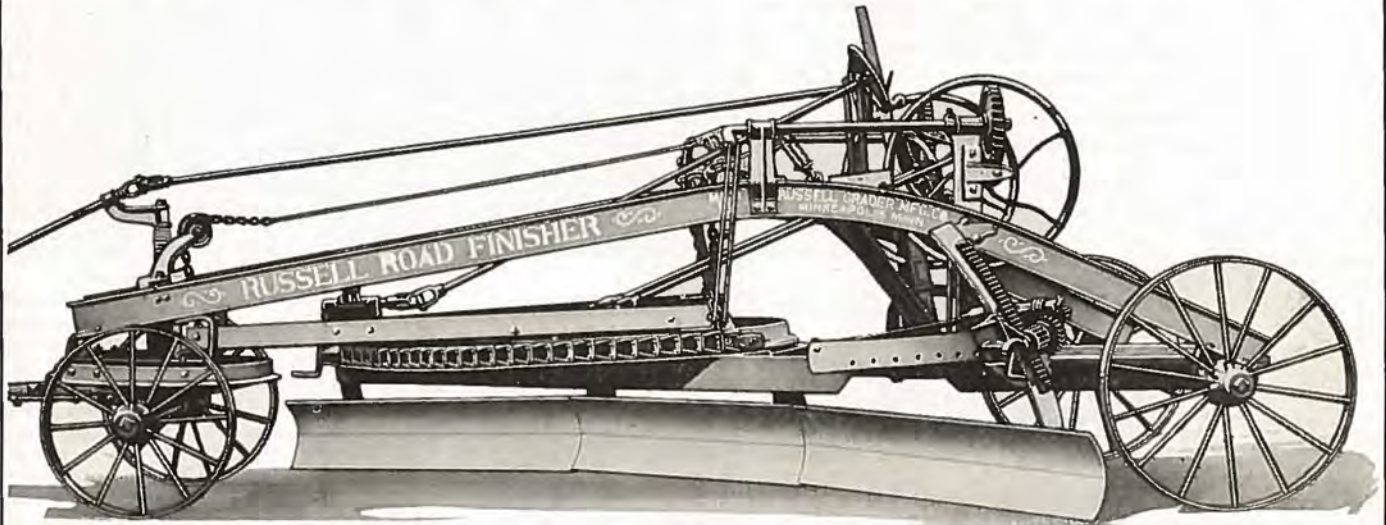
"Be sure to dig those side ditches deep enough," she tells the workmen. "Unless they parallel the road and are deep enough to hold the water which runs off in heavy rains, we shall be forever mired in the springtime."

Residents of Washington County, who had become resigned to being mired in the sticky Alabama soil, love to watch her standing bareheaded by the side of the road, directing the driver and his team of mules, with the confidence and skill of a veteran highway engineer.

Today, Mrs. Kendall's favorite project is the Mississippi Valley Highway, already under construction, and she is the honorary member of the commission. She is enthusiastic about the idea of one continuous highway from Duluth to the Gulf of Mexico, a main artery through the fertile valley that feeds three fourths of the population of the United States.

And so this "Grandmother of Good Roads" is working away quite as zealously and efficiently as though her life were only beginning, cognizant that good roads are the arteries of the country, and that no region not fed by them can thrive.—Road Economics.

Russell Reversible Maintainer



Light Draft with Sturdy Construction

15 Foot 3 Section Blade, Weight 3,600 Pounds

Blades Reverse for right or left hand operation. All blades are attached to circle which is raised and lowered by large hand wheels and self locking worm gears. Adjustments are quick and accurate. Compensating Springs take the weight of the blade and circle.



The outer blades are raised and lowered by a combination worm gear with rack and pinion. These blades can be moved forward at the outer edges, making blade scoop shaped. The illustration shows the wide range of adjustments made possible by this construction.

Easy to operate all hand wheels within reach of operator standing in one position on platform

Ask for Bulletin No. 25C

THE HERBERT N. STEINBARGER CO.

Machinery Equipment Supplies

1640 WAZEE STREET

DENVER, COLORADO



The Twentieth Century Highway

(Continued from page 8)

same 120 feet for vehicles, pedestrians, tree planting, etc.

Col. Sidney D. Waldon, chairman of the Detroit Rapid Transit Commission, gives the main objects in obtaining the wider rights of way, substantially as follows:

To permit a variety of treatment in pavements, tracks, tree planting, etc., depending upon the requirements of the territory traversed.

To give increased capacity, with increased speed and safety to motor vehicle transportation, regardless of any other use to which it may be put. This means individual and collective rapid transit on rubber tires, until such time as the density of population demands rail transportation.

By proper spacing of vehicle roadways, while retaining the center free, to provide for future train-operated rapid transit on the surface at half the cost of an underground system. By reason of the lower cost, rapid transit can be provided at a much earlier date, or for the same money over a much larger area.

When surface rapid transit is provided with grade separations at the station points at half mile intervals, the express-motor vehicle roadway can also be carried over the same intersecting streets, and provide a new facility not now available to the motor vehicle owner anywhere in the world.

The wide right of way, regardless of the particular form of development that may be used, will have surface capacity sufficient to take care of the circulation and transportation of the occupants of the tallest structures. Being wide, the super-highway will not only invite major improvements of this character, but it will give them the maximum of light and air, and a splendid setting.

Regardless of whether the super-highway is developed wholly for vehicular traffic, or vehicular traffic and street cars, or for vehicular traffic and rapid transit, it will permit of the planting of trees and shrubbery in places along its route where they will not be disturbed by the successive steps in its development.

Much emphasis has been placed on the element of safety and relief of traffic congestion in planning for wider rights of way. We believe that one element has been overlooked, that is the time factor through greater allowable speeds, which will restore to the automobile that large element of usefulness that has been taken away from it through narrow roads and streets.

The thing that is vital and fundamental is to obtain the rights of way now, as the land naturally will never be cheaper than it is today. The construction of the highways themselves will be a gradual process.

For the successful working out of the foregoing plan there are still some vital, necessary steps to be taken by the communities interested. Chief of these will be a special act of the state legislature creating a transportation district with the administrative authority to plan for financing the acquisition of the necessary rights of way.

Wayne County, however, has not waited for such legislation but has pro-

ceeded under existing laws as rapidly and as steadily as those limitations permitted.

During the fiscal year just closed, over \$800,000 was expended in acquiring additional rights of way, and in 1925 we expect to invest upwards of a million dollars for similar purposes.

We have also established as a policy an ultimate, minimum width of forty feet of concrete on all of the main highways in Wayne County and all roads are now being graded to a width of forty feet so that when it becomes necessary to widen we will have a firm subgrade on which to work. Two crews, during the working season, are being kept busy continuously widening all concrete roads of a lesser width than eighteen feet.

In highway planning, failure to look ahead not only handicaps the development of the community, but invariably proves most costly in the end. Our experience shows the necessity for the immediate widening of roads near large centers of population, and of now laying definite plans and securing rights of way for much greater widths in the future.

One Per Cent Good Roads

(Continued from page 9)

ized the League of American Wheelmen, and began a systematic campaign, a good roads enthusiast was looked upon with undisguised curiosity or amusement as something of a "nut"—a loquacious, but no doubt well-meaning person, who might be seen, but not heard. Usually he was promptly "sat down upon" by the lugubrious taxpayer.

Opposition gradually melted away, however, as the campaign became more fully organized and extended. Since 1880 more than \$3,000,000,000 has been spent for highway improvement in the United States and Canada. More than \$1,300,000,000 is now available, and \$1,500,000,000 additional will be necessary to carry out projects under contemplation. And yet, with all this, only a beginning has been made. Billions more must be expended before the country has anything like a highway system adequate to the traffic needs.—Kentucky Road Builder.

ASPHALT USED TO REPAIR CONCRETE ROADS

Highway engineers in various parts of the country are finding it advisable in a greater degree to repair concrete roads with asphaltic materials. This is true particularly in Maryland, New York, California, New Jersey, Wisconsin, Illinois, Missouri, North Carolina, Oklahoma, Michigan, Ohio, Kansas, Iowa, Colorado, Texas and Canada.

Concrete roads are prone to develop longitudinal and transverse cracks. Everywhere these cracks are being filled with asphalt. Maryland has been resurfacing some of its concrete roads laid in 1913 and 1914 by means of asphalt. Among these is a two-mile stretch of the Baltimore-Washington Boulevard near the Baltimore city limits that was built in 1913 of Portland cement concrete and resurfaced with asphalt in 1919. The road from Baltimore to Camp Meade, built in 1914 of compressed concrete, was resurfaced with asphalt also in 1919. In Baltimore city it has been found necessary to give some concrete a flush coat of bituminous material covered with gravel.

In New York a number of concrete roads have been resurfaced with asphalt. All told, up to 1921, eighty miles of concrete roads laid in this state from 1912 to 1914 had been so resurfaced. Among these were the Cicero-Brewerton road in Onondaga county, four miles long, and the Moravin Lake Road in southern Cayuga county. Eight miles of concrete road in Suffolk county have been resurfaced with asphalt. Port Chester, N. Y., applies asphalt and grits to old concrete pavements. In Waverly, N. Y., it is the practice to cover concrete with bituminous macadam and gravel.

California has resurfaced a large mileage of its concrete roads with asphalt. From the beginning it has been the plan of the state highway commission ultimately to cover all its concrete roads with bituminous materials. In New Jersey, at Camden, it is the practice of the engineers to lay a complete asphalt top with binder on concrete pavements. Roselle Park, N. J., repairs the cracks in concrete with bituminous materials covered with sand.



A unique "Two Mixer" set up, used by a contractor in conjunction with a fleet of small speedy trucks in laying one of Colorado's concrete pavements in record time.



ADAMS

Adjustable Leaning Wheel

Graders "The Original"

Backed by 40 years
of proved performance

*Why experiment with
Imitations*

Thos. J. Fair

Distributor

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\$10,000 Saved On One Building

We have just completed a series of investigations and tests on concrete aggregates for one of the leading architects in Denver, which will result in a saving of from 58c to 87c per cubic yard of concrete, or a total of over \$10,000 on this particular piece of construction work.

We can effect a similar saving for you. Copies of this data will be shown on request.

The Pierce Testing Laboratories, Inc.

730-34 Nineteenth St., Denver

The Most Economical All-Purpose TRUCKS

F W D

ECONOMY OF INVESTMENT—The special ability of the F. W. D. to make quick time through traffic, to surmount difficulties that "stall" ordinary trucks, reduces delivery and hauling costs.

ECONOMY OF OPERATION—Because the power is distributed equally to all four wheels, each one is asked to do one-quarter of the work; this means a saving on fuel and tires.

ECONOMY OF UPKEEP—Then, too, there is less strain on any one part or set of parts—which means longer truck life—less repair and replacement—a considerable annual item in ordinary truck upkeep.

ECONOMY OF TIRES—Because of the equal load distribution in F. W. D., the same size tires are used on all four wheels. This reduces tire replacement costs by one-third. The manufacturer's guarantee is the same on F. W. D. equipment as on heavy dual equipment used on rear driven trucks.

Let us prove to you that F. W. D. Trucks will answer your trucking needs

Liberty Trucks & Parts Co.
1532 Sixteenth Street Denver, Colorado

The Colorado Sun Circle

(Continued from page 5)

mountain pass is crossed by a U. S. Forest Service road, the excellence of which needs no testimony; thus are the difficult stretches provided for already. This Belt Line Highway is crossed and crisscrossed by network of main arteries as well as secondary roads. One extremely important factor is that the belt line, as it now operates and will in the future, is an economic necessity from all standpoints other than tourist travel.

Playing up the name, THE BELT LINE HIGHWAY — COLORADO'S SCENIC AUTO ROAD, or THE COLORADO SUN CIRCLE, with a comprehensive coordination of the existing roads, the construction of missing links and adequate marking, would have advertising value that cannot be equalled. Grades would have to be reduced and the road bettered for quite a portion of its entire length, but one can readily realize the value of such a road in conjunction with the plains road and those that now lead from the mountains to the plains. A network for auto highways will be afforded to the tourist that will be sufficient to occupy his entire attention and eliminate the desire to go westward.

The entire "Sun Circle" or "Belt Line" must be adequately posted, marked, logged and mapped. The sign may be either round or oval and belted with yellow. "Colorado Sun Circle" might be the better name, as it would convey at once a picture of a crown of continuous sunshine capping the Rockies. Remember, Colorado boasts of its sunshine.

An entire season could easily be spent on main and side trips and yet only a fair start made toward getting into the "meat" of the wonders of the country, which are not surpassed by anything in the new or old countries.

But, in order to hold the average tourist, you must keep him occupied, tell and show him where to go. He must be informed fully and in advance of what he is to see and how to go about it. Otherwise, being in a strange country, he becomes more or less bewildered, and finally, since no one shows an interest in him, moves on or returns home. COLORADO MUST ENTERTAIN AND BE MORE CORDIAL ABOUT IT.

Are we to be put to shame for our lack of appreciation of things aesthetic as well as not being able to successfully refute the charge of obtuse business acumen? It would be well for once if our heads were in the clouds with eyes upraised, rather than our feet on the ground with eyes downcast.

Why not a Colorado Sun Circle—an auto highway that is one continuous round of pleasure, with the name symbolic of the crown of glorious sunshine that caps our Rockies? Why advertise California by saying, "'Tis so in California, why not in Colorado?" Revamp this phrase to read, "'Tis so done in Colorado," and then, as before said, crawl out from behind the Great Bear.

It is not intended to infer that everything that we are doing is wrong and a total loss. To the contrary, the Rocky Mountain Motorist, Incorporated, and the Tourist Bureau among others are furnishing maps and literature that are of inestimable value, but it is not corre-

lated in such form as to make reference to many maps and pamphlets unnecessary for a nomadic season's outing.

The former organization has been successfully breaking down the belief that community interest is paramount to general and are now securing unified statewide effort in such matters. The foundation has been laid and there isn't a doubt but that every community in Colorado would get behind a move to organize our tourist resources, not only because it will mean more business but at a less overhead. At present there is a great deal of duplication and overlapping which is expensive.

This thing cannot be done alone but must be the result of unified effort on the part of all public-spirited organizations and citizens. A map as a basis has already been prepared, but this should be accompanied by a book epitomizing our big show. It is a big one—it is stupendous.

He—I simply can't live without you.

She—Well, you'll have to, for I couldn't live with you.

Some State Road Cost Facts

(Continued from Page 3)

The application of Federal Aid funds is restricted to construction work on roads of the Federal Highway system which has been approved by the Secretary of Agriculture. The federal funds are met with state funds on the following basis: Federal funds, 56.12%; state funds, 43.88%.

The government also requires that the details of design and the location of the road shall be approved by the Secretary of Agriculture; and that the state shall maintain the roads upon which federal money has been applied in a manner satisfactory to the Secretary of Agriculture.

The Colorado Highway system embraces about 9,000 miles, of which 3,360 miles belong to the Federal Highway System.

The distribution of Federal Aid projects is determined by the State Highway Advisory Board, approved by the Governor of the state and by the U. S. Bureau of Public Roads.

WHERE THE TALKWAYS MEET

Many thousands of dollars worth of switchboards and other central office equipment have been added to the telephone plant in this state every month for the past five years.

That's just the INSIDE installation. It doesn't include pole lines, cables and all the buildings that are being erected and added to from month to month. Just the exchange equipment.

On a railway journey from Denver to Grand Junction, you see the locomotive, the tracks and yards, the cars and stations and bridges. But to talk from Denver to Grand Junction you see only the telephone instrument before you. Great exchange buildings house millions of dollars worth of switchboards, intermediate and terminal frames, batteries and power plants—the intricate and highly sensitive mechanisms which make Long Distance communication a valuable service for every citizen.

Bell System

One Policy
One System
Universal Service



and all Directed
toward
Better Service

The Mountain States Telephone and
Telegraph Company

WE BELIEVE IN DENVER

BUILDERS OF TRENCH EXCAVATORS FOR **30** YEARS

Buckeye Positive Digging with Safety

Gears and chains transmit power on Buckeyes. No slippage—an automatic safety device protects against overloads. All power is profitably used.

Another positive feature that appeals to all contractors is the Quick-Shift Conveyor, originally developed and perfected on Buckeyes. This conveyor is driven from both ends. It has an exceptionally wide belt which is kept centered by a patented construction. No material too wet, too slippery or too difficult to handle with a Buckeye Conveyor.

Buckeye ingenuity, plus thirty years' experience, provides the safety feature that insures continuous, profitable performance.

Ask any owner.

GET THE FACTS

"We've owned seven Buckeyes," say Herr Bros., Piper City, Ill., "and have always had more work from these machines than they were guaranteed to do."

See why it is that Buckeye owners are so enthusiastic about their machines. Get the facts on the practical operating conveniences and big range of cutting widths offered only by Buckeyes.

If you're near an owner, ask him. Or, send for descriptive booklets.

THE BUCKEYE TRACTION DITCHER COMPANY

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

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When writing advertisers, please mention Colorado Highways.

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Western Agents K. & E. Company

Write for General Catalog H36
Highway Engineer's Catalog 3660

THE KENDRICK-BELLAMY COMPANY

801 16th Street at Stout
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Duplex

The World's Greatest Road Maintainer
Standardize and Save

Beach Graders

A Better Grader Cannot be Built
Roller Bearing Wheels

FINK & SCHARBER

1617 Wazee St.

Denver

The Bulletin Board

Liberty Parts Manager Visits Big Truck Plants

Richard Carlson, manager of the Liberty Parts and Trucks Company, Denver, recently visited the manufacturing plants of the Indiana Truck Corporation, located at Marion, Indiana, and the Four-Wheel Drive Truck Company at Clintonville, Wisconsin.

In these two plants he was given the privilege of seeing the Indiana, Liberty and F. W. D. trucks in course of manufacture. At the Chicago Road Show he saw the new Indiana 1½-ton truck on display. This truck is designed especially for contracting work. It is claimed the truck will do fifty miles per hour loaded. It is sold fully equipped.

"While I have spent many years in the repair and handling of trucks, to see the modern methods employed in the manufacture of motor trucks in the Indiana and F. W. D. plants was most interesting to say the least," said Mr. Carlson.

Austin-Western Equip All Graders with Leaning Wheels

Word has been received by H. P. Wilson & Co. that in the future all models of the Austin-Western graders, from the smallest one-horse maintainer to the large size scarifier-graders, will be equipped with leaning wheels, according to Ray Corson, sales manager.

Until now only the seven-foot Standard model came equipped with leaning wheels. In a few weeks the newly equipped machines will be exhibited in the specially constructed display room of the firm, located on Blake street, Denver.

New Gas Shovel Purchased by Mesa County on Big Project

A new gasoline shovel has been purchased by Mesa county through the agency of Paul Fitzgerald of Denver. The new shovel will be used first in the construction of a modern 24-foot roadway to the top of the Orchard Mesa, near Palisades, according to Commissioner Gus Johnson.

Delivery of the machine will be made within two weeks and work on the new highway will be started immediately, said Mr. Johnson. This road will provide access to a newly developed irrigated section, which has been without means of decent travel.

"We believe that the new machine will pay for itself on this one project," said Mr. Johnson. "There is no need talking, you must have modern machinery to build modern roads.

"Later, when the Orchard road is completed, which we think will be by the end of next summer, the machine will be moved to another section of the county and used in constructing more sorely needed roadways."

This is the second piece of equipment of the kind purchased by Mesa county. Several years ago the county bought a dragline for use in taking some of their roads out of creek beds. With the two machines working, Mr. Johnson said that Mesa county would carry out an ambitious road-building program during the coming summer.

Both of the machines purchased are P. & H.'s, the sales being made through Fitzgerald, who is the Colorado sales representative of the Harnishfeger Corporation. The new machine is one of the latest developments of the corporation, being a gas-driven one-yard shovel.

Over 10,000 acres of land are included in the Orchard Mesa tract, which has been developed by a government irrigation project. The road which Mesa county will construct is not a state highway. At present there is a narrow, crooked road leading to the mesa.

H. P. Wilson Company Takes Cummer Asphalt Plant Agency

In the future all products manufactured by the F. D. Cummer Son Company of Cleveland, Ohio, including asphalt plants, both yard and car types, will be sold in this territory by H. P. Wilson & Co., 1500 Seventeenth street, Denver. Several of these plants are now being used by Colorado contractors.

The Wilson firm also announces that they have received a complete stock of Page dragline buckets and repairs for distribution in this territory. They have also become distributors for the Page "walking" type dragline, equipped with Diesel engine equipment. These are manufactured by the Page Engineering Company, Chicago.

Montezuma County Buys New Holt for Heavy Road Work

A 10-ton Holt tractor for use with a heavy scarifier-grader has been purchased by Montezuma County, through the Clinton-Held Company, Denver, distributors for Holt Caterpillar tractors in the Rocky Mountain territory.

This machine will be used in heavy construction work on Montezuma County roads, according to Chairman H. L. Crawford. This is one of the largest counties in the State in point of area, and has 142 miles of State highways.

It is located in the extreme southwest corner of the State. Cortez is the county seat. With the full support of its citizens, the county will carry out a large road-building program during the coming summer, according to Chairman Crawford. The county obtained such splendid results from the use of a tractor apportioned to it by the State last summer, that the commissioners were prompted to purchase a new one with which to expand the county's road-building activities.

Rosing Appointed Head of Armco Advertising Staff

Anton S. Rosing, heretofore assistant manager, Advertising and Publications Bureau of the Portland Cement Association, Chicago, has been appointed publicity manager of the Armco Culvert and Flume Manufacturers' Association, Middletown, Ohio, in charge of advertising, publications and other publicity work.

Mr. Rosing is a civil engineer, graduate of the University of Michigan and a member of the Western Society of Engineers. Previous to joining the staff of Portland Cement Association he was engaged in active construction work, principally railroad construction, and for two years was assistant professor of civil engineering at Michigan Agricultural College, Lansing, Michigan.

Steinbarger Appointed Agent for Clyde Hoist Equipment

Announcement is made that Herbert N. Steinbarger Company, Denver, henceforth will represent the Clyde Iron Works in the distribution of the well-known Clyde hoists in the Rocky Mountain territory.

The Steinbarger Company has just issued a new catalogue of all the lines represented by them in the Colorado territory. This book is now being distributed among state and county road builders, as well as to contractors. It is one of the most complete catalogs published by a Denver distributor. Its pages are filled with valuable information on construction equipment.

New bulletins on Sauerman Cableways and Russell graders and maintainers have been received from the factories by this concern and are ready for distribution. A number of important improvements have been made by the manufacturers of this equipment which should interest prospective buyers.

Hardesty Takes Agency for New Hi-Way Guard Fence

Announcement is made by the R. Hardesty Manufacturing Company that in the future all products manufactured by the Page Iron Works of Chicago will be distributed in the Rocky Mountain territory through the Hardesty concern.

The Page Iron Works are manufacturers of the Page Hi-Way guard fence, which has gained great popularity with motorists and road officials in a large number of eastern states. The fence consists of a patented woven wire mesh, which is anchored to posts in such a manner that it can readily be replaced in short links, should it become broken which is seldom the case, according to the manufacturers.

The mesh is manufactured from non-rusting wire. It is easily installed and the upkeep is practically nil.

*You Won't Growl
at Our Service*



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What's the Use?

Why Experiment on Your
Car or Tractor?

OUR OILS ARE SECOND TO NONE. THEY LUBRICATE PERFECTLY AND ARE GUARANTEED TO THE LAST DROP.

S O M M E R S

Truck and Tractor Oils
Quaker State Motor Oil
Majestic Motor Oil
Gear Compounds
Cup Greases

Perfect lubrication means lower upkeep, more satisfactory service, and longer life for the motor. Don't neglect it. Order today. Shipments in iron drums.

Sommers Oil Co.

Denver, Colorado

BIDS OPENED

Proj. No.	Length	Type	Location	Low Bidder	Bid Price
243-B	2.973 mi.	Gravel Surfacing	Piedra-Pagosa Springs	Engler & Teyssier, Durango	\$44,025 20
265-A	3.143 mi.	Gravel Surfacing	Durango-Bayfield	Blackwell & Butler, Grand Junction	31,286.00

PROJECTS BEING ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Bids Opened Feb. 17, 1925
272-A	0.417 mi.	325' and 30' bridges	Apishapa River, east of Fowler	

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
288-A	19.099 mi.	Sand-Clay Surfacing	Merino-Brush

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R Div. 3	0.55 mi.	R. R. Grade Separation	North of Trinidad
246-C	1.5 mi.	Concrete Paving	Vineland, east
254-B	0.8 mi.	Grading	Hot Sulphur Springs-Parshall
270-B	2.5 mi.	Gravel Surfacing	Monte Vista, east
271-B	1 mi.	Gravel Surf. and Conc. Pav.	Portland-Florence
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
283-B	4 mi.	Concrete Paving	Berthoud, south
286-A	0.2 mi.	R. R. Grade Separation	Between Nunn and Dover
286-B	17 mi.	Grading	North of Nunn
287-A	18 mi.	Grading	Orchard-Wiggins
288-B	3 mi.	Conc. Pav. and Grav. Surf.	Merino, westerly

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	1	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	139,038.45	84	116-C
135	Denver-Morrison	5.3 mi.	Concrete Pavement	Colorado Bridge & Const. Co.	178,158.00	87	135
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	58	210-B
213-A	Hesperus-Mancos	3.533 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	6	213-A
213-B	Durango-Hesperus	5.26 mi.	Gravel Surfacing	J. Edd, Hansen	72,960.00	100	213-B
222-C	Broomfield-Lafayette	2.82 mi.	Concrete Pavement	R. M. Larsen	134,933.00	100	222-C
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	0	226-D
230-A	Wohurst, south	0.852 mi.	Concrete Pavement	M. J. Kenney Const. Co.	82,710.00	97	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surfacing	O. L. Hackett	66,178.00	85	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	70	242-A
248-A	Buena Vista-Salida	12 mi.	Grading and Surf.	Western Const. Corp.	93,533.00	41	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	59	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	19	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408.00	70	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	66	258-A
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	0	261-A
262-A	West of Walsenburg	2.186 mi.	Gravel Surfacing	Central Const. Co.	19,367.00	77	262-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	1	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	20	262-C
267-A	Model-Trinidad	2,954 mi.	Gravel Surfacing	Pople Bros. Const. Co.	25,583.00	27	267-A
271-A	Florence-Pueblo	3,286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	11	271-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	40	272-B
277-A	Colorado Springs, south	2,840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	8	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand-Clay Surf.	Holly, Burshears & Dobbins	16,016.00	43	278-A
279-B	Morrison-Baileys	5,295 mi.	Grading	Harry H. Brown	85,980.00	1	279-B
281-A	Lafayette, South	1,249 mi.	Paving	Sims & Boston	55,373.00	84	281-A
281-B	South of Longmont	3,068 mi.	Paving	J. F'inger & Son	102,502.40	47	281-B

"Look Under Your Roads"
Slogan Gains Popularity

The slogan writers hit upon a happy phrase when they brought forth "Look under your Roads." In that one statement is epitomized the essence of the road builder's art.

Modern social and commercial conditions demand dependable and economical highway transportation. Safe, rapid communication over our highways every day in the year, regardless of weather or season, is of paramount importance. This requirement can be met only by the highest type of pavement surface and it is in the production of this surface that road building has reached its present point of success. This success is remarkable enough from the standpoint of mass production, but even more so from that of economy of transportation and comfort to the highway traveler. For it is only within quite recent times that thought has been expended on producing definite tractive and riding qualities.

The surface, however, important as it is, is only one item in highway construction, as road builders are now realizing. They long ago learned, but sometimes forget, that the basic road improvement, the most important detail of road construction, is drainage. Lacking this, the best pavement in the world may fail. Properly drained, even the poorest road will be vastly improved.

The slogan "Look under your Roads" was selected by the Armco Culvert & Flume Manufacturers Association about a year and a half ago to call public attention to the high importance of adequate drainage facilities. The slogan has since been taken up by other organizations having the same aim, namely, better highways. Research organizations, also, spurred on by the necessity of safeguarding the vast investment of public funds in our highways, are now lending themselves to a more careful study of subsoil and drainage conditions. This anxiety for more attention to fundamentals in highway design and construction is bound to result in lasting

benefit to the highway user.

If you want to know which of your highway expenditures have been well planned, or why some roads are giving unsatisfactory service or no service at all, look under your roads. The answer to your query may be elsewhere, but the chances are you will find it in your drainage structures. You will find your investigation enlightening, too, even if you are not a road builder.

"Look under your Roads."

GOOD ROADS THROWN IN

Occasionally we hear someone groaning and making dismal sounds over the fact that much money is spent in road building. But to our notion good roads are an investment. They pay big dividends. The building of roads gives employment to many thousands of hands who in turn spend it with the storekeeper, and thus it keeps rolling on, doing a little here and a little there, swelling the grand total to a mighty big figure—and we get the good roads besides.

Of course—

Keystone Culverts

and

Flumes



But we also specialize—

Electro-Galvanizing Bars, Rods, Bolts, Angles, etc.



PIPE BANDS
Galvanized, bent and
asphalt dipped for 4
miles of wood-stave
pipe.

**THE COLORADO CULVERT
AND FLUME CO.**

Pueblo

KOEHRING



There Always Have Been Cheaper Mixers than the Koehring

BUT it's the last thousand dollars *put into* a mixer that makes the great big difference in service-life and on-the-job reliability. Koehring paver leadership is the best proof of the extra value that has always been built into the Koehring—and always will be! Koehring experience and stubbornness for quality—Koehring heavy duty construction—are more than worth their cost on the job, season after season. We know that the money you pay for the heavier duty construction that goes into the Koehring is the most profitable mixer investment you can make!

H. P. WILSON & CO.

Distributors

Construction Equipment

1500 17th STREET

DENVER

Display Rooms—1936-38 Market Street

Construction Mixers—10, 14, 21, 28 cu. ft. Mixed Concrete. Steam, gasoline or electric power. Mounted on trucks or skids. Rubber tired wheels optional.

Dandy Capacities—7 cu. ft. Mixed Concrete. Gasoline power. Power charging-skip or low charging platform with hopper, light duty hoist, automatic water measuring tank. Standard or flanged rim steel wheels or disc wheels, rubber tired. Mixes mortar as well as concrete.

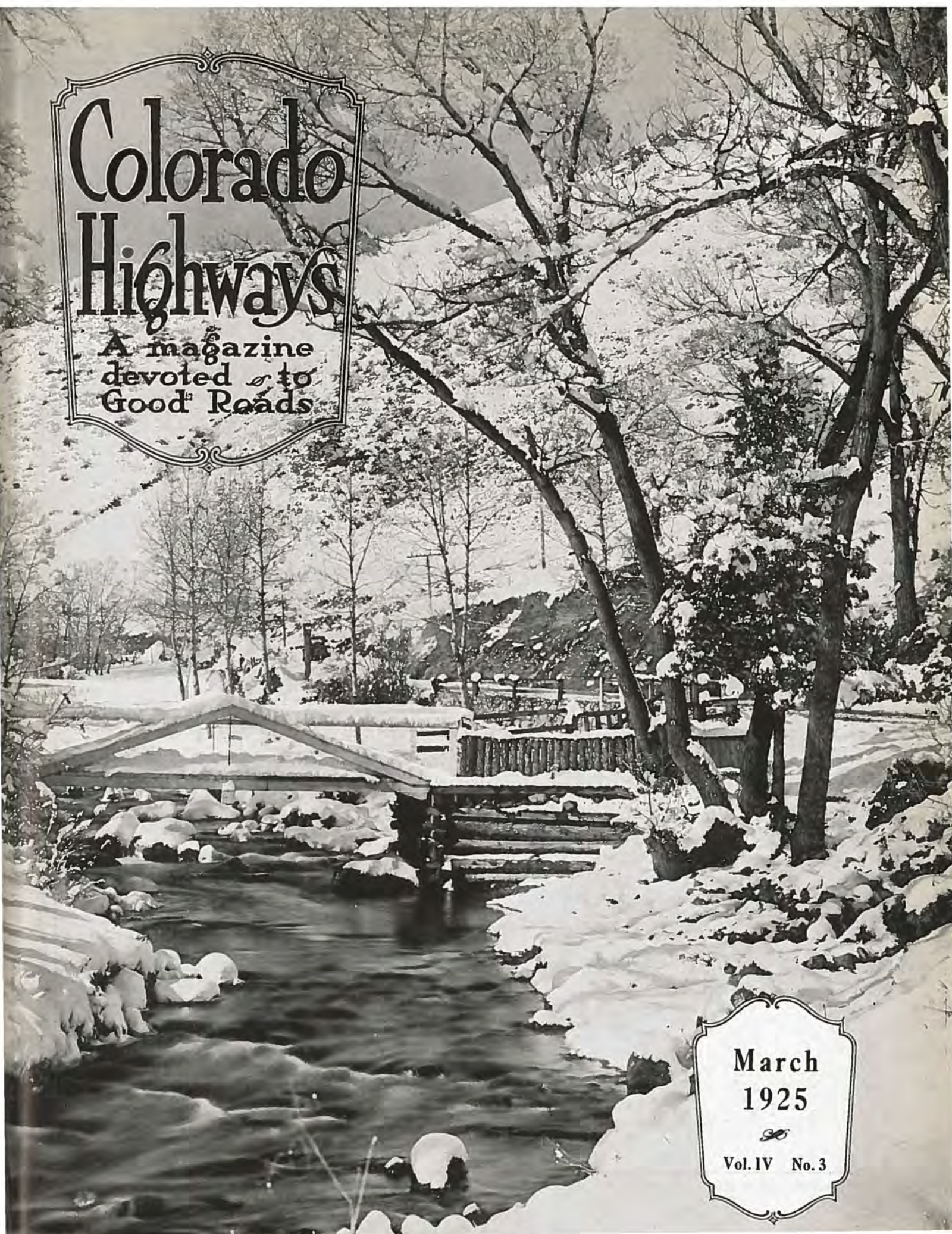
Paver Capacities—7, 13, 21, 34 cu. ft. of Mixed Concrete. Steam, gasoline or electric power. Full length multiplanes, steel rim or rubber tired wheels.

Boom-and-bucket or spout distribution. Single or double adjustable derrick on 21E. Auxiliary water tank optional on 21E and 32E. Batch meter.

*Write for
Paver Bulletin*



42620-1



Colorado Highways

A magazine
devoted to
Good Roads

March
1925

90
Vol. IV No. 3

Why Keep On Paying This Tax?

Everybody expects to pay some taxes, but why impose unnecessary taxes on yourself?

Do you realize that every time you drive your car on an unpaved highway you are actually taxing yourself one to four cents a mile?

This is the cost of increased repair, tire and gasoline bills.

Highway research has definitely established these facts.

Each year you tax yourself in this way a good many dollars.

Instead of spending this money for increased transportation costs, why not invest it in Concrete Highways and pay yourself some dividends?

Concrete Roads and Streets pay for themselves in the saving they effect on the cost of motoring.

Their maintenance cost is so low that this saving alone returns good dividends on the investment, year after year.

You are imposing an unnecessary tax on yourself from which you get no return, by failing to work for more Concrete Highways.

Not in a long time have general conditions been so favorable for carrying on such public works as permanent highway building.

Your highway authorities are ready to carry on their share of this great public work. But they must have your support.

Tell them you are ready to invest in more Concrete Highways, now.

Portland Cement Association

Ideal Building
DENVER

*A National Organization
to Improve and Extend the Uses of Concrete*

Offices in 29 Cities



Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
 Denver, Colorado

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 State Highway Engineer.
OLIVER T. REEDY,
 Senior Assistant Engineer.

DIVISION HEADS.

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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

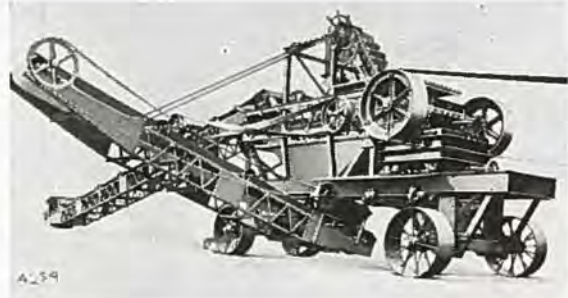
M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.
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OUR COVER PICTURE

On the cover of this month's COLORADO HIGHWAYS is a winter scene in Bear Creek canon, showing the rustic bridge leading to the entrance of the Denver Motor Club's country home. This road forms a circle trip thru Denver's famous mountain park system, and also carries considerable thru traffic. It is maintained by the park forces of the City of Denver, in co-operation with the State Highway Department. During the summer months the roadway in Bear Creek canon is one of the most heavily traveled in the state, being a favorite drive with tourists. Photo by courtesy of Denver Tourist Bureau.

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BEST TRACTORS



Current Opinion

HIGHWAY LEGISLATION

Politicians again this winter are looking wistfully at the long rosters of positions in state highway departments and planning "readjustments" of laws which will make these positions more available to faithful workers in the political vineyards.

In several states in which large funds for road improvement have become recently available, road department reorganization acts are being urged by legislators. In some instances the changes proposed are good—are backed in principle by the best highway thought of state and national authorities on public roads administration. By and large this commendation is not possible.

The "reforms" proposed reflect no thought except that begotten by the desire to give the politically faithful ones clear access to the five hundred or a thousand jobs which active highway departments have to offer. There is no contention here that political appointees are invariably venal. This is not the case. There are many elected and appointed highway commissioners whose concern for the technical tasks of highway construction and operation is much greater than their interest in political currents. But highway administration is the task not only of the specialists but of the specialized organization. It is a labor of years to build up such an organization.

Men must be trained and the trained men must be kept until they are skilled in team work.

No big business can be otherwise well managed and road construction and operation today is truly big business. Contractors and engineers organizations in every state this winter have the vital duty of watching highway legislation and arousing the business public to the vicious significance of certain trends of legislation.—Engineering News-Record.

GUARDING THE HIGHWAYS

The people of Colorado should be constantly on their guard against all those who thru selfish interest or for any other reason attempt to interfere with the program that is giving to Colorado a system of highways that is of the highest public benefit. Under the present state law, with the co-operation of the federal government and the whole-hearted assistance of the Forestry bureau, the main avenues of approach to Colorado are being put into good condition, the scenic wonderlands of the interior are accessible to the tourist, and at the same time the people of all parts of the state are provided with convenient ways of rapid transportation for their products as well as for themselves.

Under the present system of highway building and maintenance certain definite aims are reached. The work is done according to a definite program for the whole state extending thru a period of years. The distribution of the building fund is not influenced by par-

tisan politics nor subject to local favoritism. The work is being planned and carefully inspected by engineering experts of the highest standing and of thorough honesty. The abominable log-rolling system, the common curse of all public improvement programs, is excluded from Colorado highway building.

Some of the criticism directed against the Colorado highway board and its engineers is sincere and has no other purpose than the public welfare. There are other critics that are neither sincere nor devoted to the public interests. There are politicians who will never rest until they get their fingers in the richest pot of state affairs. There are contractors who have no regard for the principle of an honest job for reasonable pay. There are selfish local interests that demand consideration ahead of the general good of the state as a whole. There are engineers that knock every job that is not their own.

No one would pretend that Colorado's highway program and system is without a flaw. Honest criticism and helpful suggestions are always in order. But honest critics should be extremely careful that they have a full knowledge of all the facts lest with the best of intentions they play into the hands of those whose motives and purposes are not for the public interest.—Pueblo Chieftain.

GOOD ROADS AS GAS SAVERS

Research conducted at Iowa State college, in co-operation with the United States Bureau of Public Roads, indicates that where a gallon of gasoline is consumed in driving an automobile on a poor road, only seven-tenths of a gallon will be required on a well surfaced road. In other words, making allowance for the fact that the figures are not presumed to be more than very broadly accurate, every dollar of expenditure for gasoline on a bad road can be reduced to 70 cents on a good road.

During July, a month when automobile traffic was at its height, there was used in driving motor vehicles in the United States approximately 675,000,000 gallons of gas. There was registered in the United States at that time some 15,500,000 cars, so that the average daily consumption of gasoline by automobiles was about 1.4 gallons. Assuming arbitrarily that the average motor vehicle gets 14 miles to a gallon of gas, which may be pretty high, the total daily mileage made by them in July was 300,000,000, or half as much mileage in one day as all the passenger trains in the country travel in a whole year.

These figures are a little big for easy comprehension but they have the authority of the Bureau of Roads back of them and they do serve to emphasize once more in a concrete way the tremendous direct money saving value of good roads to every user of a motor vehicle. Millions of dollars have already been saved in gasoline alone by the roads now constructed, while the savings in wear and tear, which cannot be guessed at, must represent many millions more.—Duluth Record.

Snow Problem on Public Highways

SNOW blockades every winter cause untold losses to business throughout the northern states. Railroad engineers have long battled with the problem of keeping the right-of-way open so traffic could move on schedule, no matter how severe the blizzard might be.

Tremendous efforts have also been made by municipal authorities to combat snow drifts and blockades in city streets. But in the past these efforts have been frequently limited to the use of man power, shovelers and trucks. These have invariably proved to be slow, inadequate and costly.

In recent years state and county road officials have recognized the value of keeping roads open to traffic in winter and have tackled the snow removal problem with a marked degree of success. With the increased truck and passenger-car traffic over the nation's highways, snow blockades cause a serious loss to trade.

And unless adequate provisions are made for breaking out roads and removing the snow, the entire business life of the community is at stake. Business of every kind is brought to a standstill. Freight and express shipments cannot get to the railroads; mail, express and freight deliveries to manufacturing concerns, business houses and individuals are delayed or completely shut off; coal, food and other supplies cannot be transported.

This danger and this possibility of immeasurable loss exist in all sections of the northern states, not only where frequent and very heavy snowfalls are encountered, but also in those sections where snowfalls are infrequent.

In most cities of Colorado provision of

one kind or another has been made by the municipal authorities for the removal of snow from the streets. In Denver a snow-removal program has been adopted. With the tremendous increase in motor traffic throughout the state, officials in a large number of counties have adopted snow-removal programs. However, to date the programs have been more or less of an experiment. In almost every case the counties have had the cooperation of the state highway authorities in the work.

During the present winter snow removal has been carried on on a larger scale than ever before. In some of the counties elaborate equipment designed for snow removal on the highways has been put in use. The efforts put forth by these counties is said to have more than justified the expenditures. Marked success has been attained by several of the counties in the eastern part of the state with snow-removal units of various design.

As yet no uniform method of removal has been adopted in this state. The units now in use range from horse-drawn, homemade V-plows, to elaborate patented plows, attached to trucks and tractors. In one instance a 14-horse outfit was reported as doing splendid work in removing snow from an important rural route. This was an exceptional case, but serves as an example of the importance which the farmers of that district attach to the keeping of their roads open in all seasons of the year.

In most of the counties the snow-removal work is a part of the general road maintenance work, which is carried on in conjunction with the state highway department.

The public has come to realize what snow blockades are costing in loss of business as well as inconvenience, and it has been found in Colorado that a definite demand exists and is constantly increasing for proper snow-fighting and snow-removal equipment. The duty of breaking out roads, clearing snow and maintaining unobstructed traffic rests directly with the highway officials as an important part of the road and street maintenance program.

In recognition of this duty, the State Highway Department last year tried out a rotary snow plow in the removal of snow from Berthoud Pass. This plow was constructed from scrap parts and surplus war materials in the shops of the department in Denver. The experiment proved successful, the plow burrowing a passage through eight to twelve feet of snow and opening Berthoud Pass fifteen days earlier in the season than usual.

The state highway department also recognizes the fact that the great sums expended on the construction of hard surface roads, and in the improvement of highways of all kinds, entitle the public to the continuous use of these highways at all times. A heavy snowfall, particularly when accompanied by deep drifts, makes such use impossible. An adequate snow-fighting organization must be provided to carry on this important work. Only the most modern and efficient snow-fighting equipment is practical.

Various state highway departments, charged with the responsibility of maintaining state roads, have inaugurated definite policies and provided equipment for the specific purpose of keeping state roads free from snow blockades and open



Showing methods of snow removal employed by several of the counties on state highways in Colorado this winter.

for traffic throughout the winter. While in some phases of this work trucks fitted with plows have done excellent work in light snowfalls, whenever the snowfalls become heavy or the conditions in any way extreme, heavier power is essential and tractors have been very generally depended upon for such work.

In some of the states the responsibility for maintenance, including snow removal, is placed upon county and town officials. This is true in Colorado. In most of the states comprehensive plans for snow removal have been carried out by adjoining counties and towns realizing the responsibility for keeping open definite sections of main routes. This plan must be followed, otherwise the benefits of snow removal are only local and no through traffic on main highways becomes possible, due to interlying sections being snow-bound.

In reporting on the snow removal program in District No. 7 of Colorado, State Superintendent John Stamm writes as follows:

"There is no uniform system of snow removal in this district, but each county takes all of the equipment they have at hand, starts with each snowfall, and removes it as soon as possible. In this work some of the counties use tractors pulling V-shaped drags, graders or maintainers. Some use trucks and some use teams, but every commissioner in this district recognizes the advantage of removing the snow at the earliest possible moment.

"By immediate snow removal the counties save money later on in the spring by keeping the roads free from ruts, and also keep their roads in good shape during the winter months as well. Logan, Sedgwick, Phillips, Yuma and Washington counties had from twelve inches to three feet of snow this winter, and their state roads are in mid summer condition, just because they removed the snow. The roads in Weld, Morgan and Larimer counties are in first class condition, but they did not have the snow that the rest of the district had; but they removed what snow they did get, and obtained splendid results as a result.

"The counties spent quite a sum of money and hard work removing snow, but each will save more than the cost this spring, when they get their roads in shape for the summer travel."

Effective work was done with a snow plow on the Pikes Peak Highway in Kit Carson county. In this section there has been an unusual amount of snow this winter. This road was first opened with a grader, according to Douglas Stewart, superintendent of maintenance. When the plow which was purchased by the Kit Carson county commissioners was put to work the road was filled two to four feet deep with solidly-packed snow and ice.

This condition made it necessary to use two 10-ton tractors, plowing out the snow 16 feet wide on the first trip and widening it on the return trip. The cost of this operation was \$50 per day and the crew opened an average of ten miles per day.

The cost could be materially reduced in new snow, which would require only one trip over the road, and the use of only one tractor, according to Stewart. As a result of snow removal in this dis-



(Upper) Showing how Yuma county utilized a truck with V-plow to clear snow from road. (Lower) Two 10-ton tractors bucking snow in Kit Carson county.

trict the condition of the roads is now better than ever before at this time of the year, he says.

During the past year a survey of snow removal methods employed by the states east of the Mississippi River was made by James B. McCord, of the U. S. Bureau of Public Roads. Some very valuable data was collected. His report in part follows:

"Winter transportation of freight and passengers over the public highways in the United States is steadily increasing. The demand for one hundred per cent use of the roads in the area of heavy snowfall is making itself felt with an insistence which is growing almost in unison with the increase in the manufacture and use of motor vehicles and the construction of modern types of highways. Forty-eight thousand motor vehicles were registered in the continental United States in 1906; 1,700,000 in 1914; and there are now registered over fifteen million motor vehicles—one to every seven persons in the country. The mileage of surfaced roads has increased from 150,000 miles in 1906 to approximately 430,000 miles at the present time, with a very extensive program for further improvement. Approximately 62 per cent of the motor vehicles are registered in the snow area of over 20 inches average annual snowfall, and 53 per cent of the improved roads lie within those sections where the snowfall frequently becomes deep enough to interfere with motor traffic.

"Modern production and commerce, generally speaking, become restive under interference with their activities by seasonal climatic changes and particularly

when interruptions are due to such a phase of climatic change as the precipitation of snow. While the seasonal influence on the actual growth of products of the soil must, perforce, be accepted, yet foodstuffs and other articles grown in the warm seasons continue to move in their various channels and through many processes toward the ultimate consumers throughout the entire year. The movement of rural products such as milk, butter, eggs, poultry, etc., depends to an increasing degree on the highways in winter as well as in summer. For example—a Baltimore milk production survey shows 36 per cent of the city's supply now being brought into the city by motor truck. In 1919 only 18 per cent reached the city in this way. The number of bus and trucking lines throughout the country is also increasing and their patrons insist upon the maintenance of regular winter schedules. There are 450 bus lines in Ohio, 283 in Pennsylvania, and large numbers in other States where snow is a problem. These bus lines operate even in sparsely populated sections such as the mining regions of northern Michigan and Minnesota, as well as in various parts of the northwest.

"Railroads cannot supply economic transportation for short haul traffic such as is generally performed by motor vehicles over the highways. For example, as a result of traffic investigations in Connecticut, it is estimated that 1,019,688 tons of commodities were transported over the State system in the three months' period beginning with September, 1922. More than a third of this tonnage moved only from one to nine miles,

and nearly another third moved from ten to twenty-nine miles. It is apparent from these figures that in industrial sections there is a large volume of short haul traffic which does not compete with the railroads, and which cannot be carried by the railroads when the highways become snowbound.

"Consideration must be also given to those who use passenger cars for their own comfort, convenience and pleasure. Proper highway financing requires owners of passenger cars, as well as owners of motor trucks and busses, to pay sufficient money in license fees to entitle them to demand full use of the highways during twelve months of the year.

"At the same time it must be recognized that the snow problem varies in different States and in different sections of each State. While the Bureau of Public Roads is interested in all measures that will insure to the public the continuous use throughout the year of the roads constructed with Federal Aid, wherever there is a need for such service, yet the dissimilar conditions in different sections with regard to the need for removing snow for automobile traffic is realized. For example, there are Federal Aid roads in Maine, New Hampshire, Vermont, northern New York, northern Michigan, northern Wisconsin and northern Minnesota, where not only is there no great amount of winter automobile traffic, but, as a matter of fact, the inhabitants would seriously object to having the snow removed from the roads because they use these roads during the winter mainly for logging and sleigh traffic.

"The problem of keeping rural highways free from obstruction by snow is relatively a new one. In hardly any State was work of this nature performed to any great extent prior to the winter 1920-21, although in some States, notably in Pennsylvania, certain main highways were cleared during the war to facilitate the movement of war munitions. At the present time, however, with very few exceptions, the State Highway Departments, particularly in the East, are keenly interested in keeping their main highways cleared of snow for motor vehicle traffic and the States are extending and must continue to extend their snow programs to meet the growing demand.

"The bureau's investigation has developed the fact that east of the Mississippi River there were over 13,000 miles of the main trunk lines on the snow removal programs during the winter of 1922-23, and the programs have been enlarged for this winter to cover over 16,000 miles; an increase of 23 per cent. The road mileage on the States' snow program east of the Mississippi River for the present winter (including Federal Aid roads) amounts to 32.2 per cent of the mileage of State highways surfaced with gravel and higher types of pavement. The cost of the work per mile cleared during 1922-23 varied from \$5 to \$320 per mile, depending on the locality, amount of snow encountered and the methods used in performing the work.

Control of the Work. State vs. County and Town

"It is found that on main trunk lines snow can be removed more efficiently under State supervision, and the States which are assuming control of this work



Looking "over the top" of a snow bank in front of the plow in Kit Carson County. (Insert) A modern paved road after snow had been removed.

are increasing in number. It will be observed on the chart covering snow work among the Eastern States of the 20 States within the area of heavy snowfall east of the Mississippi River, the following 11 States perform the work with State forces under the control of the State highway organizations: Rhode Island, Connecticut, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, West Virginia, Illinois, and Indiana. A short highway in the State of Minnesota is also cleared by State forces. In the following eight States the work is done by towns, cities, counties, and in some cases by private bus lines and trucking companies: Maine, New Hampshire, Vermont, Massachusetts, New York, Kentucky, Michigan, and Wisconsin. The greater part of the work in Minnesota is also performed by the counties. Where the snow removal is left to counties, towns, villages or private interests, the work is performed in a more or less haphazard fashion. These agencies confine their snow program to meeting the local needs, and as a rule no effort is made to remove snow throughout the entire length of main highways, even within the limits of their jurisdiction, to say nothing of failure to co-operate with adjoining counties or neighboring States in order to connect the work on inter-county or interstate routes. The Bureau of Public Roads urges the advantages of State control of snow removal.

Arguments Against Snow Removal

"Two arguments have been advanced against removing snow from highways:

"(a) That the cost of the work is excessive compared to the resulting benefits;

"(b) That one of the principal causes contributing to the recent excessive heaving of roads, particularly in the eastern states, during the past winter was the un-

usual extent to which the roads have been kept clear of snow; as the snow in former years served to protect the road and its subgrade from the low temperature.

"With respect to the cost of snow removal, this question suggests two phases; (1) Whether the cost of snow removal is warranted by the demands for use of a given highway and the monetary loss which would result were the traffic over that road interrupted due to failure to remove the snow; (2) Whether the damage caused by rutting of the road surface, which generally results from allowing snow to remain on the highway, is not greater than the cost of removing the snow at an expenditure of from \$50 to \$200 per mile. The first phase depends upon many variable factors, and the policy to be pursued in each particular case must of necessity be governed by due consideration of all of the factors involved. With respect to the second phase, it should be possible to solve this problem by careful study of the cost of repairs which may be attributed directly to failure to remove snow from the roads—principally the repair of rutted surfaces of different types of pavement.

"With regard to the effect of snow removal upon the subgrade and to the suggestion that snow removal is responsible for excessive heaving of the surfaces in the spring, this question was put to each of the States east of the Mississippi River. Four States—Maine, Connecticut, New York, and Michigan—replied in the affirmative. Five States—Rhode Island, New Jersey, Maryland, Delaware, and Virginia—replied in the negative. The other States gave no information. Massachusetts is doubtful about it. Judging from this difference of opinion it would seem as though the subject of the effect of snow removal on damages to paved roads

might be worth investigation. Perhaps some interesting data might be obtained by allowing the snow to remain on short sections of road on the snow program; such sections to have practically the same subgrade conditions as the cleared portions, with the same surfacing and subject to the same traffic.

"Methods of dealing with the snow problem on public highways may be divided into three main headings: (1) Preventive measures against drifting; (2) compaction by rolling; (3) snow removal.

"Snow drifts are formed on the lee side of obstructions. Therefore, such obstructions as hedges, bushes, small trees, board fences, etc., along the windward side of the right of way, if too close to the roadway, will cause the snow to drift across the travelled way. Such nearby obstructions should be removed. Trees with high trunks do not cause drifting, nor do young trees planted for purposes of beautification, since they have small spread and are widely spaced. Low bushy trees should be trimmed if it is not desired to remove them. Wire fences should be constructed in the place of board fences. Where cuts are likely to cause drifts, snow fences should be erected from 50 to 60 feet from the right of way to the windward of the road.

"Compaction by rolling is done generally for the benefit of horse-drawn traffic—for logging sleds and for sleighs. It has not been found satisfactory for automobile traffic.

Snow Removal

"Snow removal generally is accomplished by the use of some form of plow, sometimes supplemented by hand shoveling. The secret of success in snow removal lies in four factors: (1) A definite snow removal program; (2) an efficient, live organization with assignment of every man connected with the work to a specific task; (3) sufficient suitable snow-removal equipment kept in warm storage during idleness to prevent difficulty in starting, and availability of spare parts for prompt, emergency repairs; and (4) fighting the storm by commencing the work as soon as the storm begins and continuing the removal throughout the storm and until the entire snow program is completed. The following is a general description of a State organization for snow removal which is typical of organizations and methods employed on snow removal among those States which have comprehensive programs and efficient organizations.

"The State in mind has a snow program for the present winter of 2,200 miles. During the winter of 1922-23 the program included 1,850 miles. The average annual snowfall, taken in different sections of the State over a period of years, ranged from 24.7 inches to 92.2 inches. The average annual snowfall in different sections of the State for the winter of 1922-23 was 48 inches. The range for the winter 1922-23 was from 24.4 inches to 84.5 inches. The total cost of the work to the State for 1922-23 was \$91,498, or an average of \$49 per mile for the season. The work is under the direct supervision of the maintenance engineer at headquarters and is performed by the State maintenance forces. The State is divided into four divisions and 15 districts, under the supervision of four division engineers and 15 district engineers.

Under the district engineers are 52 superintendents, 700 foremen, 6,300 laborers, 130 truck drivers and 40 tractor operators. It is said that the superintendents are the key men in the snow removal program in this State. The mileage of highways on the snow program is divided in such a way that there is one foreman responsible for each 10 miles of highway. For relief of men in storms of long duration, an additional maintenance force is available for replacement. For the winter of 1922-23 the equipment consisted of 114 trucks equipped with blade plows, 15 ten-ton tractor plows, 300 road machines and drags. Each truck was loaded with about two tons of ballast. The tractor plows were equipped with V-shaped plows approximately 5 feet high and 10 feet long on each wing. There are garages and repair shops in each of the 52 districts which contain sufficient spare parts for prompt repairs in case of breakdowns. The snow removal equipment is kept stored in warm buildings to avoid delay in starting because of low temperature. An arrangement is in effect with the U. S. Weather Bureau under which the maintenance engineer or his assistant is notified by telephone of approaching storms, and one of them is always available for telephone calls. The entire organization is instructed to keep in readiness for emergency snow calls throughout the winter. As soon as headquarters is convinced that the snowfall is to be serious, the division engineers are notified by telephone to order the district engineers to have the organization called, the equipment prepared, and to commence the work when the snow reaches a depth of three inches. They are instructed to continue the work, night and day, until the roads on the snow program are cleared. The average width of paved roadway is 18 feet; the snow is cleared to both sides of the road to an average width of 26 feet. In this State the rates of pay are as follows:

Division engineers	-----\$6,000	per annum
District engineers	-----3,600 to \$4,200	per annum
Superintendents	-----2,100 to 2,700	per annum
Foremen and subforemen	-----40 to 55c	per hr.—10-hr. day
Laborers	-----30 to 45c	per hr.—10-hr. day
Truck drivers	-----40 to 50c	per hr.—10-hr. day
Tractor operators	-----40 to 50c	per hr.—10-hr. day

The morale of the whole organization is said to be very high and the interest of the personnel in snow removal work very keen; and it is not unusual for the men to work continuously for forty hours in order to complete their particular job.

Equipment

"The equipment used for snow removal ranges from scoop shovels for hand work, through various types of plows, to such complicated machinery as rotary plows, rotary brooms and steam shovels; the latter being sometimes employed in the mountain passes in the West, where snow falls from 25 to 30 feet during the season.

"In States that have definite, well-organized snow removal programs, two types of equipment are preferred:

"1. Adjustable, straight, steel blades attached to the front of motor trucks or tractors. The blades have a curved surface and vary in dimensions from 15 to 30 inches high and approximately 12 feet long. The blade is set at an angle with the line of travel. If trucks are used they are generally weighted down to their capacity with stone or other ballast.

"2. V-shaped plows for attachment to the front of trucks or tractors. This type of plow varies from 2 to 5 feet high with 10-foot wings. The sides of the plow are generally concave to give the snow a rolling motion. Sometimes wing blades are attached for the purpose of extending the snow furrow farther from the paved roadway.

"Horse, truck and tractor-drawn machines and graders are used to some extent as supplementary equipment.

"Rotary plows constructed on the same principle as railroad plows, and rotary brooms, have not yet been used to any great extent among the Eastern States. For very deep snow, it is believed that such equipment would fill a great need, provided they are of proper design and construction. Some of the rotary plows are of such design as to permit the throwing of the snow 30 or 40 feet from the center of the road. Various schemes of snow melting have been attempted but they have not been successful.



Snow piled up four feet on each side of one of Kit Carson county's roads after snow removal crew had finished its work.

Stonewall-San Luis Road Survey

FOR a number of years business interests of the lower San Luis Valley have been urging the construction of a new roadway from Stonewall, located in Las Animas county, to San Luis, the county seat of Costilla county.

The distance between these two points is only about forty miles, but—some forty, stretching over a rugged, broken, snow-capped mountain range, reaching an elevation of 12,000 feet—a “no man’s land” of towering peaks and dense, virgin forests. Along the proposed route are found numerous beautiful lakes and sparkling mountain streams, heavily stocked with trout, all made inaccessible through lack of road facilities.

Upon the urgent solicitation of citizens and business men of the southern part of the state, and more particularly of the Trinidad and San Luis Valley sections, the State Highway Department last fall sent a surveying party into the field to find a suitable route for the construction of a roadway over the range.

At the same time the surveying party

was instructed to make an estimate of the cost of construction. R. E. Cowden, chief locating engineer of the highway department, was put in charge of the party. They were in the field several weeks, undergoing severe hardships in running the lines, utilizing meager field equipment and working in mean weather a greater part of the time in high altitudes.

A report filed with the department by the head of the party following the completion of the survey places a conservative estimate on the cost of the construction at approximately \$500,000. At the present time no such sum of money is available to the department for the building of the proposed project. As the road is not located on the Federal Aid highway system, the project necessarily could only be constructed from state funds.

This is one of the few proposed roads in the state not advocated as a tourist attraction. The Stonewall-San Luis road is advanced as a purely business proposition—a dollars and cents idea calculated to save the sheep and cattle inter-

ests of the southeastern part of the San Luis Valley many thousands of dollars each season in reduced shipping charges.

During the summer months many thousands of head of sheep are fattened along the Culebra range. In the fall these sheep are shipped from Fort Garland. This necessitates a long drive from the range. It also necessitates a much longer railroad haul to the Kansas City market, to which nearly all of the sheep of that section are shipped.

With the construction of the road over San Francisco Pass, the sheepmen would be enabled to make their shipments from Tercio, over a branch road of the Santa Fe railroad, thus giving them a direct route through Trinidad to market. It is claimed that shipments can be made out of Tercio at a saving of \$27.50 per car in freight charges.

Private interests own several thousands of acres of land on the eastern slope of the range. They refuse to give the sheepmen permission to move their flocks over their lands. Construction of the roadway would give sheep-growers



(1) Dotted line on map shows proposed new road over San Francisco pass. (2) Setting up transit under difficulties. (3) Showing peaks of Culebra range. (4) The most popular man in camp. (5) Engineering party above Purgatoire creek. (6) Mission in San Pablo built in 1854. (7) Moving camp from San Francisco creek.

the necessary outlet from the forest ranges.

The survey shows that about twenty miles of the proposed road over the top of the range would be on a six per cent grade. At San Luis the route would connect with the new road over Cumbres Pass, which leads to the Mesa Verde National park from Pagosa Springs. The road would cross the Culebra range at an elevation of 11,910 feet on what is known as San Francisco Pass. For twenty-four miles it would pass through a country heavily timbered with aspen and spruce, much of which on the eastern slope is in a virgin state. There is no road over the pass at present, and there are very few trails, especially on the eastern side of the range.

The country abounds in wild game. A flock of nearly 300 wild turkeys were seen by the members of the engineering party one morning. Deer also are plentiful in the region. All game is protected by line riders and game wardens.

From the top of San Francisco Pass the surveyors obtained a marvelous view of the famous Barlett ranch, with its beautiful "castle ranch house," consisting of several structures constructed in the style of an ancient castle. It is located in New Mexico. The property, consisting of 280,000 acres of ranch lands, is controlled by the heirs of the late James Bartlett, noted Chicago grain speculator.

By reason of its necessarily steep grades the road, if constructed, would never become very popular with tourists, but from a business standpoint it would prove a great success, according to the claims of the big stockgrowing interests of the San Luis Valley.

Members of the engineering party included: R. E. Cowden, Paul Smith, A. P. Hilman, F. McDowell, Ira Thorley, Jr., Robert Beeler, Arthur Hull and Harry Hill.

Scholarship to be Awarded For Best Essay on Highways

An offer of four years at college with all expenses paid is contained in an announcement made by the Highway Education Board of its sixth annual good roads essay contest, in which all high school students are eligible to participate.

In line with administration policies tending toward economy, students are being requested to write essays on the subject, "Economies Resulting from Highway Improvement," having in the two preceding years written papers on subjects dealing with highways and religion and highways and home life.

The principal prize is a four years' university scholarship, offered by H. S. Firestone, of Akron, Ohio, a member of the Highway Education Board, of which the U. S. Commissioner of Education, Dr. J. J. Tigert, is chairman. This scholarship, which in the past five years has been won by three young women and two young men, provides that the successful contestant may attend any college or university in the United States, with tuition, room, board, books and special fees paid by the donor. It is said to be the largest single educational award offered in this country, and its estimated value to



Two different types of concrete bridges constructed on State Road No. 1, near Lafayette, forming links in pavement running north from Denver.

the winning student is approximately \$1,000 annually, or at least \$4,000 for the four years.

Many state awards are offered by the co operating organizations, including tuition scholarships, cash prizes, loving cups and medals.

By educational authorities this annual competition among high school students, started in 1920, is declared to have been the first essay contest to assume national proportions. It annually attracts approximately a quarter of a million contestants, the number who submit essays depending upon the nature of the subject. Entire high schools often participate as part of their school duties. Essays are received from every state in the Union, while many of the best come from outlying territories and possessions, such as Alaska, Hawaii, the Philippines, Porto Rico and the Canal Zone.

The award in 1924 went to John Liska, a Wisconsin high school student, whose subject was "The Relation of Improved Highways to Home Life." The first winner, Miss Katharine Butterfield, of Weiser, Idaho, was graduated last year from Northwestern University, near Chicago. Other successful students were Miss Garland Johnson, Bridgeport, West Virginia, 1921; Karl G. Pearson, District of Columbia and Lindsborg, Kansas, 1922; and Miss Dorothy Roberts, Harlan, Kentucky, 1923. With the exception of Liska, all of these students are in college, and

he will enter when he has completed his high school course.

Rules of the contest do not limit participation to high school seniors, but provide that any student attending high school may submit an essay. No other conditions, except those governing the preparation of the paper itself, are provided. Essays must not exceed 700 words in length and must be handed school principals or teachers not later than May 1, 1925. Selection of the best essay is by a process of elimination.

Complete information will be forwarded each person who inquires of the Highway Education Board, Willard Building, Washington, D. C.

The best essays of previous years have been collected in pamphlet form and are available for distribution. These booklets may be found in most libraries, or had upon request to the Board.

"The Peck Highway" has been suggested by John Otto, of Grand Junction, as a name for the new Grand Mesa road. He suggests this name in honor of Ray Peck, forest supervisor, and Col. A. S. Peck, district supervisor.

Mr. Otto also claims that it would be a descriptive name for the new road, standing for "pecks of scenery, pecks of fish, pecks of fresh air, and pecks of coolness in hot weather."

The Grand Mesa is one of the most picturesque forest playgrounds in Colorado. It is made accessible by the new roadway.

U. S. Bureau of Roads Report

THE annual report for the year ending June 30th, 1924, of the Bureau of Public Roads, which has just been made public, reviewing the activities of the Bureau for that year, shows that its investigations are beginning to bear fruit in more or less final determinations and conclusions. Of course, it is realized that none of the conclusions are final in all their details, since this can hardly be said of any decisions concerning the application of involved physical laws to engineering materials and structures. The report also sums up the work done on Federal-aid roads during the latest fiscal year and up to the end thereof.

The most important step taken is that given as "the final designation and approval of the Federal-aid highway system

in all the states of the Union." The system as so selected can be carried out in a period of not more than ten years and "will result in a connected system of arterial highways that will permit unobstructed highway transportation between all cities of 5,000 population or larger."

The total mileage of existing roads as certified by the states amounted to 2,866,061 miles. The law provides that 7% of this may be included in the Federal-aid highway system. This 7% amounts to 200,624 miles, and up to the end of the latest fiscal year 171,687 miles had been accepted by the Bureau. A considerable part of this is already improved and this reduces the magnitude of the task. In three states, Delaware, Maryland and Rhode Island, the original system has already been completed or provided for and additions to the system in excess of

7% have been approved by the secretary. Anticipating the completion of the system in other states, most of which have a much larger mileage than the three just named, a detailed examination of all roads in the systems of these states is now under way, those of Connecticut and Pennsylvania being completed and New Jersey nearly so.

That part of the system located in the eleven Pacific and mountain states is now more than 50% completed. In this section attention has been given especially to the acceleration of the improvement of through roads to the Coast, although the national need for these roads does not in all cases coincide with the local highway needs. Except in the sparsely settled western States, however, national and local needs are practically identical.

Last year 8,620 miles of completed

FEDERAL-AID ROADS

Mileage of Federal-Aid roads completed during the fiscal year 1924, by types of construction and by States.

States	Graded and Drained	Sand-Clay	Gravel	Water-bound Macadam	Bituminous Macadam	Bituminous Concrete	Portland Cement Concrete	Brick	Bridges	Total
Alabama	78.1	149.8	.....	17.4	31.2	4.8	.....	0.2	281.6
Arizona	16.0	37.8	.....	.....	4.0	17.8	.....	0.4	161.1
Arkansas	81.1	4.5	8.3	10.6	15.9	.....	0.3	120.7
California	71.0	86.6	7.3	14.8	5.1	51.4	.....	.....	236.1
Colorado	12.5	63.5	.....	.....	1.0	42.4	.....	0.5	119.9
Connecticut	17.3	.....	.....	17.3
Delaware	26.6	.....	.....	26.6
Florida	20.6	8.6	21.1	3.8	0.1	54.1
Georgia	152.7	100.3	4.5	20.8	9.1	25.5	.....	0.6	313.4
Idaho	2.3	78.9	.....	.....	6.8	12.8	.....	0.1	100.7
Illinois	0.2	.....	.....	.....	.....	168.2	.....	0.9	169.4
Indiana	0.5	12.4	.....	.....	.....	70.4	.....	0.3	83.6
Iowa	269.0	108.2	.....	.....	.....	121.1	.....	.....	498.3
Kansas	37.5	16.8	20.1	.....	8.7	95.7	18.1	.....	197.0
Kentucky	89.0	.....	2.9	.....	41.1	.....	16.8	.....	149.8
Louisiana	49.3	.....	.....	1.9	.....	.....	.....	51.2
Maine	48.0	.....	12.1	.....	16.8	.....	.....	77.0
Maryland	1.0	5.0	.....	.....	6.5	48.2	.....	.....	60.6
Massachusetts	42.1	.....	22.2	.....	0.3	64.5
Michigan	40.7	8.9	.....	9.3	92.5	.....	.....	151.5
Minnesota	81.2	291.2	.....	.....	.....	6.9	.....	0.2	379.6
Mississippi	14.4	93.5	11.1	.....	3.4	19.0	2.8	.....	144.3
Missouri	104.5	236.6	28.7	18.0	.....	25.6	.....	0.8	357.0
Montana	25.6	33.5	.....	.....	.....	4.8	.....	0.1	63.9
Nebraska	144.2	100.9	57.1	.....	6.7	24.4	4.4	.....	337.8
Nevada	13.5	24.7	3.5	15.6	.....	1.2	.....	0.1	51.7
New Hampshire	8.3	5.2	14.5	3.7	1.9	.....	0.8	34.5
New Jersey	37.8	.....	.....	37.8
New Mexico	42.6	129.0	.....	.....	0.7	6.8	.....	.....	179.0
New York	119.2	.....	169.6	0.7	1.4	291.0
North Carolina	3.1	4.5	.....	14.3	5.0	24.4	.....	0.1	110.2
North Dakota	497.9	1.5	167.8	.....	10.4	1.1	.....	0.3	668.2
Ohio	13.5	.....	.....	5.6	33.7	26.6	119.4	.....	267.7
Oklahoma	0.9	0.3	82.6	6.3	.....	18.2	.....	0.7	123.8
Oregon	110.7	.....	.....	12.3	9.0	.....	0.4	132.4
Pennsylvania	0.3	14.5	158.1	1.1	.....	174.0
Rhode Island	1.8	3.9	4.8	.....	.....	10.5
South Carolina	292.6	21.5	.....	.....	2.8	3.7	.....	0.2	320.6
South Dakota	42.2	.....	374.2	.....	.....	0.8	.....	0.2	417.4
Tennessee	3.3	.....	.....	19.3	62.5	.....	.....	.....	85.2
Texas	32.2	.....	429.9	34.5	61.6	40.9	21.9	19.2	641.2
Utah	39.1	.....	89.3	.....	.....	11.0	.....	0.5	139.9
Vermont	15.6	.....	5.4	.....	.....	.....	0.2	21.3
Virginia	12.0	48.6	.....	17.1	28.6	.....	57.2	.....	163.9
Washington	1.6	42.9	.....	.....	.....	4.6	.....	0.4	49.4
West Virginia	10.2	.....	7.1	.....	24.3	.....	10.2	.....	52.0
Wisconsin	24.2	18.9	175.4	.....	.....	47.4	.....	.....	265.8
Wyoming	14.3	121.0	30.9	.....	.....	.....	.....	0.2	165.9
Total	1,604.8	888.2	3,353.8	106.7	566.6	252.1	1,667.9	169.4	10.8	8,620.3

¹ Negative figures caused by revision of records when final vouchers were paid on projects the type of which was changed after ratification of project agreement.

roads were added to the system, bringing the total of Federal-aid roads to 35,157 miles. The total cost of the Federal-aid roads completed last year was \$144,707,337, of which \$66,789,427 was paid by the Federal Government.

As in previous years, the mileage of gravel roads completed exceeded the mileage of any other type of construction, as is shown by the accompanying table. The mileage of Federal-aid roads completed up to June 30th, 1924, is as follows: Graded and drained, 7,015; sand-clay, 3,727; gravel, 13,811; waterbound macadam, 903; bituminous macadam, 1,652; bituminous concrete, 1,029; Portland cement concrete, 6,428; brick, 537; bridges, 53.8—a total of 35,157.

Experience has demonstrated the wisdom of the policy of approving low type surfacing materials with a view to improving the character of the surface as the traffic may demand in the future. This is especially true of gravel. It is found that "the tractive resistance of well maintained gravel surfaces is only slightly greater than that of the highest types of paved roads. The cost of vehicular operation over such roads is therefore not greatly in excess of the minimum attainable by paving. The original cost is much lower, and so long as the traffic does not exceed in volume or weight the limits within which these lower types are economically maintainable, the experiments indicate that the investment in them is a good one. Other experiments show that the low-type surfaces make the best possible bases for pavements when the traffic reaches proportions which justify paving."

Federal aid has been used to great advantage in the bridging of major streams on main roads. In many cases where these streams form the boundaries between states or other political divisions, Federal aid and the co-ordinating influences of the Federal government have been the means of securing practical action where agreement to such action had not formerly seemed possible.

Grade crossing elimination has been greatly aided by Federal aid and advice and 26% of the grade crossings existing in Federal-aid projects have been eliminated. Sixty-five per cent of the elimination was due to relocation of the roads and the remainder to overhead structures or underpasses. Many of the 74% not eliminated are across branch line railroads or industrial roads carrying few trains, and the 26% elimination, there-

fore, represents that of a much larger percentage of the hazard.

Forest highways have been selected for Federal aid in Alaska and all except three of the western states in which there are national forests—California, Oregon and New Mexico—and negotiations are still under way with these states. The forest highway system will probably approximate 775 miles of Class 1 roads, between 6,000 and 7,000 miles of Class 2 roads, and between 4,000 and 5,000 miles of Class 3 roads. Up to the close of the fiscal year, 1,823 miles of these roads had been completed at a cost of \$18,228,305.

Traffic on many of these roads has reached the point where it is necessary to widen some and to surface others; although the natural soil in many cases is of such nature that it will carry the traffic without additional surfacing.

It is the aim of the Bureau where possible to keep the standard of the forest highways equal to that of the adjacent state and Federal-aid highways. Due to sliding banks and other happenings, the most critical time for the maintenance of these roads is the first two years after construction, and the Bureau maintains all forest highways during this time, after which the local co-operator assumes the responsibility and expense.

Surplus War Materials

During the fiscal year the Bureau distributed war materials to the value of \$12,271,533. The largest item in value was that of explosives worth \$3,412,820, or 28% of the total value of the war material distributed, an increase from slightly less than 3% of the value distributed prior to last year. A considerable part of this, however, was for farmers rather than highway work.

The next largest item was 860 motor vehicles valued at \$1,693,847 and 125 tractors valued at \$530,209. Spare parts for automobiles and tractors were valued at \$2,222,924. Up to last year the item of motor vehicles constituted over 40% in value of the total distribution but last year dropped to 14%. Shop machinery was furnished to the value of \$1,007,186 and road machinery valued at \$86,049.

To date the value of the surplus war material distributed has been \$241,067,371. It is estimated that if this material had been sold, it would have brought somewhere between twenty and thirty million dollars, and this disposition of it has, therefore, saved the general taxpayers over \$210,000,000.

Highway Research

The Bureau regards highway research as no less important than construction work and, in fact, as necessary to insure the successful administration of the construction work. Most of the results of such research up to date have been made public and given to the readers of Public Work, in conformity with the most commendable policy of the Bureau to publish results as promptly as practicable.

"Facts are now being brought to light which, considered in relation to each other, indicate the general outlines of a scientific method which will practically eliminate guesswork, waste and uneconomical practices. * * * Methods have been devised by which it can be determined with scientific accuracy whether or not the improvement of a road is desirable and the form which the proposed improvement should take. The studies of subgrade soils are showing what practical steps may be taken to secure a satisfactory foundation for the roads and what provision must be made in the design of the surface to overcome the handicap of unstable subgrades. It is now possible to design with practical certainty types of road surface which will satisfactorily serve traffic of several classes of density and weight and to adapt the type of surface to the traffic with considerable precision. Methods of maintenance are gradually crystallizing which insure the conservation of the investments made; and principles of finance have been evolved, based upon the economic and physical investigations, which seem to assure wise expenditure of the public money and a fair distribution of the expenses to the several classes benefited."

Among the physical researches and tests are those concerning impact on concrete road slabs, stress measurements on such slabs, measurement of impact by motor vehicles and the proper design of skew arches. Impact tests had been made a few years ago, but a new series is under way employing a new method using an accelerometer, which is found both simple and reliable. It is believed that the experiments on skew arches will lead to a change in the present method of skew arch design.

A series of tests of paving brick was made in co-operation with the American Society for Testing Materials with the idea of determining the effect of varia-



Old bridge located eleven miles north of Dillon replaced by modern bridge, (right) constructed with Federal Aid funds.

tion in the size of the brick upon the rattler loss. Other tests made include compression tests for Portland cement, the relation between quality of cement and quality of concrete in which it is used, the relation between quality of sand and the crushing strength of concrete in which it is used, the quality of rock desirable for concrete aggregate, the developing of a universal standard screen scale for testing sieves, determination of the effect of moisture in causing the bulking of sands, etc.

Investigations have been made with a view to evolving tests of bituminous paving mixtures, particularly in regard to their behavior under traffic. Plans have been completed for a new series of tests comprising twenty-eight sections of sand mixtures in which the grading of sand, percentage of filler dust, and percentage, consistency and character of asphalt are varied, together with five sections of stone and sand mixtures. The essential purpose of this test is to furnish a means of correlating service behavior with laboratory tests of mixtures.

In co-operation with the technical committees on road materials of the Federal Specifications Board, new specifications for oil, asphalt, and tar products have been compiled. Co-operative experimental tests have been carried on with various state highway testing laboratories in connection with the work of the sub-committee on bituminous and chemical testing problems of the American Association of State Highway Officials.

One of the most important lines of investigation which has been developed recently is that dealing with subgrade materials, in conformity with the increasing realization that the character of the subgrade upon which a road is constructed plays a most important part in its durability and the amount of load it will

carry. The investigation points directly to possible ways in which plastic, volume-changing subgrade materials may be improved by the use of admixtures of more stable granular materials. Field studies have been made in Iowa and Minnesota during the spring thaw, and practical field tests have been made on the value of processes suggested.

A very important feature in research work is the cooperative work carried on by a number of agencies, including Purdue University, the universities of Texas, Maryland and Kansas, Iowa State College, Kansas State Agricultural College, Iowa State University and the Pennsylvania Highway Department.

During the fiscal year the Bureau made laboratory examination of 1,769 samples of various road materials, most of them for use in connection with federal aid projects.

Highway Transportation Surveys

Highway transportation surveys have been undertaken in Connecticut, California, Pennsylvania, Maine and Cook County, Ill.

The principal purposes of the data obtained in the several traffic surveys are as follows:

(1) Highway Administration and Engineering Data.

(a) To determine daily, seasonal, and yearly traffic flow and distribution on state highway systems.

(b) To estimate future traffic on state highway systems.

(c) To determine the relation of traffic density to the factors responsible for the growth of traffic, such as motor-vehicle registration, production, and population.

(d) To classify highways as industrial, high, medium, or low-type traffic routes based on (1) passenger-car and motor-

truck density; and (2) motor-truck capacities, gross loads, and wheel loads.

(e) To determine the density of motor-truck traffic and the gross tonnage per mile of highway.

(f) To determine the maximum loading and frequency of critical loads on the highways as an index of pavement width and design requirements, and to establish highway traffic width and design factors for highways contiguous to large centers of population.

(g) To determine the relation between highway width, traffic density, and speed.

(h) To measure the effect of congestion at intersections and "bottle necks" upon the rate of traffic flow.

(i) To estimate the extent to which the improvement of old or the opening of new traffic routes is economically justified.

(j) To correlate traffic loads and density of traffic on the highways with highway construction and maintenance costs.

(k) To determine the type and volume of traffic on the highway as an index to the allocation of highway construction and maintenance funds.

(l) To determine the distribution of motor-truck loads and the amount and frequency of motor-truck overloading.

(m) To compare the cost of various types of highway improvements such as relocations, grade reductions, eliminations of grade crossings (both rail and highway), and elimination of traffic "bottle necks" with the estimated saving in transportation costs resulting from such improvements.

(n) To compare the earning value of the state highway system (based on passenger-miles and freight ton-miles) with the present worth of the highway system using replacement value minus depreciation.

(Continued on Page 18)



Fine stretch of gravel surfaced highway located west of Kremmling, Grand county, constructed with Federal Aid funds.

Lost Time Big

By G. R. WAMSLEY, C. E.

THE enormous mileage of good roads, with which this country has been blessed during the past several years, would seem to indicate that the time has been well employed, and that the pace set could hardly be surpassed. Yet, on the other side of the picture, are the steadily mounting costs which suggest that means may and should be found to expedite construction so as to relieve the taxpayer's burden without depriving him of any of the benefits accruing to him from the continued improvement of the highways he uses.

Often Unseen But Serious

Road building is no longer the slow and laborious process that it used to be, thanks to the increasing efficiency of machinery and methods. The transformation that may be made in a district by a few years spent in the improvement of its highways is little short of marvelous. But if we stop to analyze the progress made on one particular project, we are apt to find evidences of waste that might be almost entirely eliminated by proper planning and management. Usually the factor that enters most seriously into the cost of a road-building program is loss of time. This is such a subtle waste that its importance is often overlooked. In fact, it is the despair of those striving for greater economy in road-building that the time element is given too little consideration.

To a district sadly in need of serviceable highways, the hardship caused by undue delays becomes a serious matter. Not only are the people in the community deprived of the use of their old routes indefinitely by being compelled to follow long and inconvenient detours for what seems an interminable period, but they are expected to pay the additional amount necessary to carry the interest charges on the bond issue. This is no small sum, where an expensive type of road has been authorized. In the case of super-roads, several years may elapse before a community may be able to complete its program, meanwhile the majority of the people are denied the savings and privileges that a comprehensive system of serviceable and quickly built roads would bring in far less time.

Nature of Traffic Should Control

Where the amount and nature of the traffic do not demand the best class of highways, it is a mistake to build a type of road far in advance of requirements, merely to satisfy a possible and problematical increase of traffic some time in the future. To do so would be not only a waste of money, but a waste of time as well. The building season for any type of road is limited, especially in the northern states. For concrete roads the season is surprisingly short.

In this connection, the facts presented by Chief Inspector H. K. Davis, Ames, Iowa, in the "Engineering News-Record" furnish interesting information on the subject. The climate in Iowa permits a construction season of approximately 220 days long, from the time the first outfit starts pouring concrete in the spring to the time when the closing-down date occurs in the fall. Counts were made

on the construction delays that interfered with the work over a period of three years, 1921 to 1923 inclusive. The average for the three years is shown in the following table:

Cause of Delay.	Per Cent of Time on Job
Sundays and holidays.....	13.34
Snow, rain, mud and frost.....	13.23
Breakdowns of equipment.....	0.77
Shortage of materials.....	4.32
Moving equipment	2.77
All other causes.....	2.05
Total	36.48

One-Third Time Lost

This percentage represents the whole days that were lost, and shows that over one-third of the time spent on the job was dissipated. Yet, this does not tell the complete story, for there were some minor delays, amounting to fractions of a day or a few hours, which are not included in the count stated in the foregoing.

With the length of the construction season only 220 days at the most, and one-third of that unutilized, there remains but a brief period out of the year actually available for the building of the concrete type of road. The Iowa State Highway Commission estimates, as a result of its own experience, that about three months of steady pouring time would have laid all the concrete paving placed in the state during the year.

Confirming Evidence

Records, which have been obtained from other parts of the country, confirm these conclusions and emphasize the existence of a startling condition, for which only a partial remedy seems possible. The ordinary paving crew can lay only about five or six miles of concrete per season under the most favorable circumstances. A job started very late in the season, therefore, would have to be carried over into the next year with little real accomplishment to show for the expense involved. Beginning again in the spring means the re-assembling of the equipment and materials with a consequent increase in cost for the whole job.

The Use of Local Materials

Avoidance of such extravagances in road building can be secured only by the most diligent attention to the details of planning and execution of the work, together with the selection of the more easily constructed types of roads wherever feasible. Serviceability for the greatest number of road users, rather than exceptionally fine highways for a few people along main routes, should govern the decisions of those responsible for the type of construction adopted for any given community. Preference should be given to the kind of roads that can be built from materials available in the immediate locality. At any rate, local materials should be utilized as much as possible, instead of following so-called standard specifications which call for certain kinds of materials that oftentimes must be shipped from great distances.

Engineers should be permitted and en-

couraged to exercise their authority in so planning the work, in assembling the equipment and materials, and in determining the type of construction, that time may be conserved to the utmost, and so that the roads built for any community will serve the largest number of people at the least cost. Serviceability and cost per capita are the two factors that really measure the economy of a given system of roads.—Road Economics.

Engineer Tells How to Drain Road by Use of Modern Crown

A road should have just enough crown to provide lateral drainage for the surface of the roadway. It would seem that any crown over and above that amount is objectionable. Some reasons why a road should be built with modern crown are set out as follows:

1. To facilitate ease of driving;
2. To prevent the rapid run off of surface water and consequent shoulder wash;
3. To retain rainfall on the surface long enough to permit penetration for compaction purposes;
4. To reduce as much as possible the erosive action of high winds;
5. To aid in maintenance.

Most of us have observed from experience that a road of high crown is difficult to drive. The tendency is for the car to approach the shoulder lines where the section is more flat or for some other reason the driving is easier. The result is obvious. The shoulders become worn down still farther, the center remaining about the same, and the result is that an already excessive crown becomes the more exaggerated.

When a road is built with an excessive crown the transverse slope is so great that much damage is done to shoulder slopes by the quick discharge of water from the surface. There is but one way to correct this condition, and that is to flatten the crown so that the velocity of run off is reduced.

Furthermore, by permitting the water to run from the road surface to the side ditches, we are losing the very ingredient that makes for the life of the road. The types that we build are mainly water-bound and it behooves us to conserve the moisture so necessary for compaction. An earth road that will puddle after rainfall, or a gravel road with that quality and quantity of binding material that it will rut slightly after rainfall, are easiest of maintenance. And it is found that such roads withstand drought conditions for much longer periods.

This further fact has been observed, that a road with a "peaky" crown is subject to a more destructive action from high winds. Such a road will generally be found swept as clean as a floor, whereas a road of flat section will retain a light mulch of loose material which is available for maintenance.

Finally, there is the problem of maintenance. Ask the patrolman which of the two types is easiest of maintenance. Then to satisfy yourself drive over a few miles of each and see for yourself which you find in the better condition.

With State Road Builders

Engineers Rush Plans on Score of 1925 Projects

The state highway department has under contract nearly \$2,000,000 worth of road work. Most of this work was contracted last summer and fall, cold weather causing a shut-down on all but a few projects.

In the number of projects carried over from last year, six have been completed during the winter. There are now twenty-six projects under contract, on which the contractors hope to get an early start this spring, and which they are hopeful will be completed by the middle of the summer.

Plans on a dozen more projects contained in the 1925 budget are now being rushed to completion. These will be contracted at an early date and the work started as soon as favorable weather will permit.

"We are going at this work with a bang this year," said Maj. L. D. Blauvelt, state highway engineer, "and we shall expect every contractor to do his utmost to clean up on his particular project before snow flies in the fall.

"Every effort will be made to make 1925 a banner year in point of number of new roadways constructed. Co-operation of all concerned will make this possible."

It is expected that about fifty miles of paved roads will be completed during the year, together with a large mileage of new graded and gravel surfaced highways.

The highway budget of the department for 1925 calls for about \$4,500,000 new construction. This includes several much needed bridge structures in various parts of the state.

Under a joint agreement between the state and the U. S. Forestry Service, the sum of \$90,000 has been appropriated for the construction of about three miles of new roadway from Echo Lake in the direction of Idaho Springs, on what is known as the Chicago creek road.

This roadway was surveyed by the U. S. Forestry Service engineers last fall. As funds become available the road will be extended to Idaho Springs.

During the coming summer an extension on the Mt. Evans road will be made above Summit Lake, at an altitude of over 12,000 feet. Improvements are to be made on the camp grounds at Echo Lake by the City of Denver.

U. S. to Spend Half Million on Rocky Mt. Park Highways

The Department of Interior has decided to allot \$445,000 for road work in the Rocky Mountain National Park in the next three years, according to announcement in Washington, D. C., Tuesday.

Of that sum, \$240,500 is to become immediately available for the fiscal year beginning July 1 and improvement work can be begun as soon as weather condi-

tions permit. Of the \$140,500, the sum of \$50,000 is to be used in widening and rebuilding the Fall River road; \$25,000 is to be spent in reconstructing the High-drive road; \$10,000 in rebuilding the Glacier Basin road, and \$22,000 is to be put on the road between Glacier Basin and Bear Lake. There is an allowance of \$23,000 for concrete bridges in the park.

Besides the \$140,500 appropriation immediately available, the department has decided to allow \$8,000 for surveys in the park.

The moneys allotted for road work in the Rocky Mountain park are to be taken from a blanket appropriation of 7½ million dollars which has been made by congress for road work in all the national parks in the next three years.

Weld County Plans Big Road Program for Next Summer

In keeping with the policy of former years, Weld county will carry out an ambitious road building and maintenance schedule during 1925, according to Commissioner Dan Straight.

To enable the county to carry out this program as economically as possible, especially in the gravel surfacing work, the commissioners have purchased two modern conveyor systems, which will be installed in gravel pits for the loading of gravel material.

These conveyors are of the portable type, and can be moved from one pit to another with little effort. Weld county has some of the finest gravel roads in the state. Most of them have been constructed by farmers on a yard-haul basis. This has been found to be a most efficient method of handling gravel.

Weld county has the patrol system of maintenance on both state and county roads, which has proved most satisfactory, her roads being well kept at all seasons of the year.

County Forces Make Fine Showing on Canon Highway

Seven miles of the roadway thru Salt canon, on the Canon City-Colorado Springs highway, has been improved by Fremont county road forces under the direction of Floyd Coleman, road supervisor.

The road has been straightened, widened and brought up to grade. It is now in first class condition. Work of gravel surfacing the roadway is now in progress. By the time the summer travel starts it is expected that the roadway will be in tip-top shape.

The work now being done will eliminate the worst stretch in the roadway between Canon City and Colorado Springs. In wet weather it was very slippery and in places dangerous to travel. Motorists are congratulating the Fremont county commissioners upon the very excellent piece of work being done.

Road Men of Larimer County Meet in Annual Conference

The annual conference of the county commissioners with the road overseers and patrolmen of Larimer county was held in the court house at Fort Collins, on February 23. Chairman Harris Akin presided at the meeting, which lasted one day.

In the forenoon County Engineer James G. Edwards addressed the road men regarding their work, emphasizing the need for economy and efficiency at all times, these features to be guarded in the employment of help and in the purchase of materials. Many valuable suggestions were given by him on maintenance and reconstruction problems.

An open forum was held in the afternoon, the various road men discussing problems incident to their work, with a result that a number of splendid ideas were brought to light.

A like conference was held by the commissioners and road men of Otero county in La Junta on February 19, following an inspection tour of the roads in the county made by the commissioners the week previous.

Road work entails one of the big expenses of the county, and the Otero commissioners have evolved a system whereby they hope to get this work done at less cost than in former years.

Big Underpass Project at Wolhurst Open to Traffic

Building of the underpass crossing at Wolhurst on the Denver-Colorado Springs highway was completed by the M. J. Kenney Const. Co. the past month.

This underpass eliminates two very dangerous railroad crossings below Wolhurst, which in years gone by have been the scene of several fatal accidents. The subway goes under the tracks of the Santa Fe and D. & R. G. W. railroads.

The cost of the two subways, together with nearly a mile of concrete paving, was \$82,710. A portion of this sum was paid by the railroad companies and the balance by the state and federal governments. Work on the project was started last summer.

The Wolhurst underpass is the first of a series which will be constructed between Denver and Colorado Springs. Another underpass is now in course of completion at Breed. As the concrete pavement is extended both north and south, other crossings which are now a menace to life and limb will be eliminated.

A traffic census taken by the Highway Department last summer shows this to be the most heavily traveled road in the state, the truck traffic of today alone being more than the entire traffic of five years ago.

Along National Highways

Road Programs Considered in Eleven Western States

Financing of highway construction and maintenance is one of the big problems confronting the legislatures in western states. In practically all of the states, with the exception of Washington and Arizona, various bills have been introduced providing means for raising funds.

Increased motor vehicle fees, especially increases in the gasoline tax, is the favorite proposed method for raising funds. A number of other measures have been proposed in some of the states for raising funds.

In California a bill has been introduced to increase the registration fee on motor vehicles from \$3 to \$5. A \$25,000,000 bond issue for the construction of bridges has also been proposed.

In New Mexico, the present auto license law may be amended whereby all the revenue derived from this source be used directly by the Highway Department instead of two-thirds of it as at present, in addition to an increase of 2c in the gas tax.

A total of about \$8,500,000 will be expended this year by the state of Washington on construction and maintenance. In Utah the total revenue is about \$2,000,000 annually. Wyoming has about \$2,500,000 yearly for construction.

The total estimated cost of the completion of the California highway system is \$215,000,000.

Big Mileage of Roads Built in U. S. in National Forests

More than 1,800 miles of roads and nearly 5,000 miles of trails were constructed within or adjacent to the 147 national forests during the fiscal year ending June 30, 1924, according to the annual report made by Chief of the Forest Service to the Secretary of Agriculture. In addition, maintenance work was performed on 7,423 miles of roads and 32,105 miles of trails. Including the construction work completed within the last year, the total mileage of national forest roads constructed by June 30 of this year stood at 8,707 and the total mileage of trails at 15,855. The sum of \$9,351,132 was expended on the road and trail work of the Forest Service during the last fiscal year, the report says. This sum was augmented by funds from co-operative agencies, such as states, counties and local organizations. Thirty-one states and Alaska share in the pro rata distribution of funds made each year by the Forest Service to those states and territories containing national forest lands.

"Perfect Road" Built Thru Historic Frontier Country

The children of the American forest, who, in the days when they flourished, were wont to track the pathless woods

with unerringly correct homing instinct, again bid fair to lead the nation in similar manner but more modern fashion.

One of the few "perfect roads" now being built is that under construction between Pocatello and Fort Hall, Idaho. It is upon the Fort Hall Indian reservation, the home of the historic Bannock and Shoshone Indians, and the historic country that was the setting of Emerson Hough's "Covered Wagon" story.

The roadway is a Federal Aid project and one of the very few "100% Federal Aid projects" being built.

It embodies the latest methods of concrete construction, and while it is progressing somewhat slowly, owing to the care with which it is being built, it is expected to be a model of its type and to serve as an example for other highways throughout the country.

When completed during the coming spring, this roadway is expected to be the scene of heavy travel, not only because of the historic country it traverses, but also because of the scenic beauty along its route. It will offer tourists a close association with the Indian in modern environment and is being built largely for the benefit of the Indians in and about the Fort Hall country.

Raise in Gas Tax Asked in Seven Western States

All of the eleven western states now have a gasoline tax. The amount of the tax runs from 1 cent to 3 cents. In seven of these states it has been proposed to increase the amount of the tax.

The following table shows the amount of the present tax, the proposed increase and the proposed total:

State	Present Tax	Proposed Increase	Proposed Total
Arizona	3c	None	3c
California	2c	1c	3c
Colorado	2c	2c	4c
Idaho	2c	None	2c
Montana	1c	None	1c
Nevada	1c	2c	3c
New Mexico	1c	2c	3c
Oregon	3c	1c or 3c	4c or 6c
Utah	2½c	1c	3½c
Washington	2c	None	2c
Wyoming	1c	2c	3c

California Builds Unique Highway Across Sand Dunes

The highway commission of California is engaged in the construction of an experimental road across the sand dunes in Imperial county, which have for years been the bugaboo of motorists traveling to and from the Pacific coast over the southern route. The sands of this desert are as treacherous as those of the Sahara.

The place where the shifting sands are crossed by the highway is 6½ miles wide. In 1916 a plank road, built of pine, was

constructed. This is now being replaced by an entirely new roadway constructed of redwood timbers. A total of 2,000 feet of experimental road is being built.

Half of the test road is 18 feet wide and the rest is 10 feet wide. The new roadway is described as consisting of 6x8-in. plank, laid on the 8-in. side and separated by spacers 4 x 6 x 24 in. so placed as to form a track and continuous path for vehicles. The planks are held together by bolts to hold the planks firmly together and permit sufficient elasticity to not unduly strain the structure by possible expansion and contraction during periods of extreme heat in the desert.

The present road is 8 feet wide. It consists of planks bolted and spiked to stringers and held in place by three bands of strap iron.

East of the sand hills the California Highway Commission is completing a graded and rock-surfaced highway to the Arizona line at the Colorado River, opposite Yuma, Ariz. This road will eliminate one of the worst detours in the state.

The problem of the desert is to prevent the roadway from being buried by the shifting dunes during wind storms.

Cross-Country Bus Service Started By New York Firm

Transcontinental bus service now enters upon the scene. A company has been launched in New York to operate a fleet of passenger busses over the Lincoln Highway between the eastern metropolis and the Pacific coast.

It is planned to establish regular service, the fares to be \$410 per passenger, including accommodations enroute. Recently the first trip over the route was made with three busses. The tour was organized by the Motorway Tours Co., Inc., with general offices at 65 Wall St. This concern has long operated interurban busses in many sections of the East.

The schedule calls for the arrival in Los Angeles in 30 days. The busses are painted in the Lincoln Highway colors: red, white and blue. In this manner a start has been made to make the Lincoln Way an artery for the transcontinental travel of the car owner, and likewise for those who only wish to make temporary use of it. This is probably the forerunner of other lines from the East to the Pacific coast.

Three Million Was Spent by Utah in 1924 on State Roads

More than \$3,000,000 was spent by the Utah State Highway Commission in 1924 in construction and maintenance of state highways. The figure, shown in the report of the state auditor, shows the state reached its greatest highway construction period last year and represents an increase in expenditures over 1923 of approximately \$900,000.

HIGHWAY BRIEFS

California's 2-cent gas tax has produced \$13,068,168.15 during the first year of its operation. Of this sum, \$842,022.64 has been refunded to purchasers of gas not used in automobiles. The gasoline tax money in California is apportioned 50 per cent to the State Highway Commission and 50 per cent to the counties for road building purposes.

Illinois, and her road builders, during one week completed a total of 60.79 miles of concrete road. One contracting company alone with one mixer laid 2,671 feet of standard 18-foot roadway in one day. This same company, in one week, completed 14,405 feet of the same type of pavement. These are reported to be world records for this type of construction. To accomplish the state's record of 60.79 miles of new road in one week there were 116 paving mixers in operation with more than 3,000 teams and 11,000 men employed. The year's record last season was 1,085 miles and will be surpassed this year.

T. H. MacDonald, Chief of the Bureau of Public Roads, in a recent address, said: "The state of New York has been severely criticized by a great many people because several years ago it issued \$100,000,000 in bonds, yet I am convinced that the highways purchased with this borrowed money are now worth twice this \$100,000,000 in actual value. I think

that is a very conservative statement and, in addition, the people of the state have had the service of the roads all these years."

Of all inventions, with the expectations of the alphabet and the printing press, those which abridge distances have done the most for mankind.—Macaulay.

The total annual taxation in the United States is \$9,000,000,000, of which \$654,000,000, or about 7 cents out of every tax dollar, is expended for highways. Only 2 cents out of every dollar of federal money goes for roads.

Indiana has a program of road improvement for 1925 which calls for the hard surfacing of 218.1 miles of highway.

Tennessee will have available \$11,256,360 for its 1925 road work. The state proposes to pave 962 miles.

The Stockyards bridge over the Arkansas river, which has been completed only a few months, in Pueblo county, has been seriously damaged by heavy and overloaded trucks passing over it. Certain trucking companies are responsible for trucks with eight-ton loads going over it, investigations of the county commissioners disclosed. Stringers and supports were broken and damaged to the approximate extent of \$1,000. What step will be taken, if any, against the responsible persons have not been announced.

Good roads, canals and navigable rivers by diminishing the expense of carriage, put the remote parts of a country nearly on a level with those in the neighborhood of a town; they are, upon that account, the greatest of all improvements.—Adam Smith.

The word "highway" comes from the old Roman roads in which the surface was elevated as much as four feet above the surface to permit good drainage. The Appian Way was the first of these and the beginning of a system of 48,500 miles built under state supervision. It was made of blocks of lava resting on a masonry foundation and was begun 311 B. C.

In the last 13 years investments in automobiles have increased about 2700 per cent and highway expenditures have in the same time increased almost 600 per cent.

"One encounters many odd contrasts to American costs as one travels through the Continent," related a lady who recently returned from European travel. "But I can't help recalling especially an afternoon in Marseilles when I paid forty cents for a Saturday Evening Post and four cents for a bottle of excellent wine."—Columbus Dispatch.

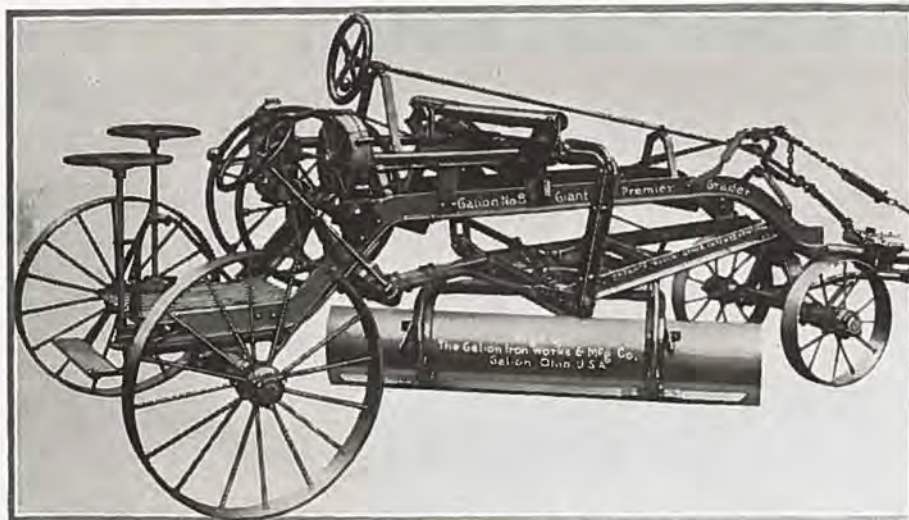
In a Western city, there is a sign reading as follows:

4,076 died from effects of gas—
39 inhaled it.
37 put a lighted match to it.
4,000 stepped on it.

H. W. MOORE EQUIPMENT CO.

18th and Wazee Streets

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The New Galion Grader with Hyatt Roller Bearings, E-Z lift, improved type steering gear and offset hitch, heavier frame construction, enclosed steel cut gears and Alemite lubrication throughout, makes the greatest advance in grader construction in ten years. Descriptive matter on request.

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High speed and dependable Rex Pavers give greatest yardage at the least cost. Speed in charging, speedy thorough mixing, speed in discharge.



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Rex 14E Paver which broke paving record on Fort Morgan-Brush highway project.

The Paver illustrated broke all Colorado records by laying 3 miles of paving in 21 days. The average for the entire job was 540 lineal feet of 18-foot pavement in a 10-hour day. High run of 660 lineal feet. This means a batch of concrete every 72.7 seconds. Each batch was required to remain in the drum a full 60 seconds to comply with state regulations.

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U. S. Bureau of Roads Report

(Continued from Page 12)

tion as the basis of computing present worth.

(2) Highway Economic Data.

(a) To obtain highway transportation information concerning the volume of tonnage shipped by motor truck, marketing methods, and the relation of highway transportation to other types of transportation.

(b) To determine the mileage zones of motor-truck haulage and the relation of the type of commodity hauled to such zones.

(c) To estimate the net tonnage of freight transported by regular and irregular trucking operators.

(d) To determine the situs of ownership of passenger cars and motor trucks operating over the highway systems.

(e) To estimate the value of motor-truck net tonnage hauled over the highway systems.

(f) To determine the type of origin and destination as well as the origin and destination of net tonnage of commodities transported by motor truck over the highway systems.

(g) To obtain information concerning the relation of motor-truck transportation to other methods of transportation, particularly as to competition, rates, operating schedules, and delivery time in the short, middle-distance, and long-haul mileage zones.

(h) To obtain data concerning haulage practices of motor-truck operators, the volume of tonnage transported by motor truck between various cities and areas,

and additional data of value to governmental agencies charged with the regulation and control of highway transportation.

(i) To estimate passenger-car business and non-business usage of highways.

(j) To determine the proportion of farm traffic on the highways.

A survey of highway-truck transportation and marketing in the Chicago Metropolitan area has developed several important facts. One of the most striking is the almost complete absence of cost records maintained by motor truck companies. The field work of a study of the influence of highway improvement on rural land values in sixteen counties in Iowa has been completed, the conclusions from which, supported by other investigations, will determine the limits of increase in rural land values resulting from the several types of highway improvements and assist in determining the amount which rural land can economically contribute to highway improvements on the basis of increased values per acre resulting from the highway improvement.

Publicity

The Bureau, through its monthly publication, Public Roads, keeps the public informed promptly concerning all work in hand and preliminary and tentative conclusions therefrom. Another medium of information and publicity is that of motion pictures. During the past year such pictures have been made of the highway experiments at the Arlington Experiment Farm, tests of guardrails by the Pennsylvania State Highway Depart-

ment, and a two-reel picture of the highway inspection tour of the Pan-American Commission in June of last year. The Bureau also co-operates with the office of Exhibits in the preparation of models and exhibit booths for exhibition at state fairs and in the demonstration of department exhibits at such fairs, and has also prepared special displays for automobile shows and highway conventions.

Highway Department Makes Inventory of War Supplies

A complete inventory of all surplus war materials assigned to the State Highway Department by the government for road-building purposes has just been finished by Frank H. Owens, superintendent of shops.

The inventory covers 163 typewritten sheets, and covers everything from rubber boots to parts for heavy trucks. These materials are now available to the counties for road purposes at a fraction of their original cost. They may be obtained through the Purchase and Traffic Division of the Highway Department.

Included in the stock are parts for the following trucks: Atterbury, Pierce-Arrow, Selden, Packard, Kelly-Springfield, Gram-Bernstein, Nash, Jeffery Quad, Republic, Liberty, White and G. M. C.

The stock also includes parts for Holt tractors, motorcycle parts and Pittsburg motor accessories. There is also a considerable stock of bearings on hand.

Inquiries addressed to the Purchase and Traffic Division of the Highway Department will receive prompt attention.



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Literature on Request

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from a
Road Superintendent's Note Book

July 1907—Three 18 in. ARMCO Culverts installed under Bishop-Big Pine Road.

April 1909—Two 48 in. ARMCO Culverts installed under Bishop-Big Pine Road.

August 1922—ARMCO Culverts under Bishop-Big Pine road examined and found in perfect condition. I estimate these culverts will still be in good condition 20 years from now.

From an actual communication from a Road Superintendent—(Name on Request)

THERE'S just one way to be sure of culvert economy—KEEP A RECORD OF INSTALLATIONS—of costs, of repairs, of replacements.

Men who keep such records are finding that:

No culverts of any material prove so dependable—give such certainty of service as ARMCO Culverts.

No culvert material can honestly claim greater "permanence" than ARMCO Culverts.

No culverts seem less affected by time and service than ARMCO Culverts.



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ARMCO CULVERTS

PERSONAL MENTION

County Engineer W. H. Fleming of Montrose has just completed plans for a new bridge to span the Uncompahgre River at the foot of Main Street in Montrose. In making tests to reach a solid foundation, Mr. Fleming was surprised to find bedrock only five feet under the surface of the river. Plans of the bridge have been sent to the Bureau of Roads for approval.

P. T. Clemens, resident engineer stationed at Brush for the past year, is now engaged in supervising the construction of some small bridges south of Atwood.

S. L. DeWeese, of Rocky Ford, has been appointed general overseer of the highways in Otero county. The following district overseers also were appointed by the county commissioners: W. C. Conrad, Fowler; Thomas A. Davis, Manzanola; R. A. Lusk, Swink; Frank Hansen, East Holbrook; H. C. Dice, West Holbrook; Ora Swisher, Fairmont; and Dan W. Jones, Rocky Ford. This is the first year Otero county has had a general road superintendent.

Opening snow-covered highways is one of the specialties of Commissioner C. J. Buchanan of Kit Carson county. With two 10-ton tractors snow was removed from the highways in the eastern part of the county the latter part of January, and

late news bulletins say these roads are now in mid-summer condition as a result.

Commissioners of Phillips county announce the appointment of the following road overseers to serve during 1925: Dist. No. 1—Road boss, A. T. Lock; truck, Otis Cauble; maintainer, Wilbur Lyons. Dist. No. 2—Road boss, John Garrett; truck, Henry Meiers; maintainer, Lee Hair. Dist. No. 3—Road boss, R. Layman; truck, N. G. Patterson; maintainer, C. A. Mitchell. Engineer, William Rambo; head graderman, A. H. O'Donnell; assistant, Jack Kidwell.

A. G. Hamel, forest supervisor of the San Isabel, is preparing a series of maps showing the roads and trails through the forest. They will be published in the near future.

J. J. Vandemoer, district engineer of the highway department, has completed arrangements for the expenditure of \$10,000 on the Blue Mesa highway in Gunnison county. The highway department's steam shovel, under the direction of George Toupain, assistant superintendent of maintenance, will be used on the work.

John Stamm, maintenance superintendent of Division No. 7, made a complete survey of road conditions in northeastern Colorado last month. He reported most of the roads in his district in mid-summer condition.

A. B. Collins, district engineer, Greeley, is completing plans for the construction

of the overhead crossing at Nunn. This crossing will be of steel and concrete and the estimated cost is \$40,000.

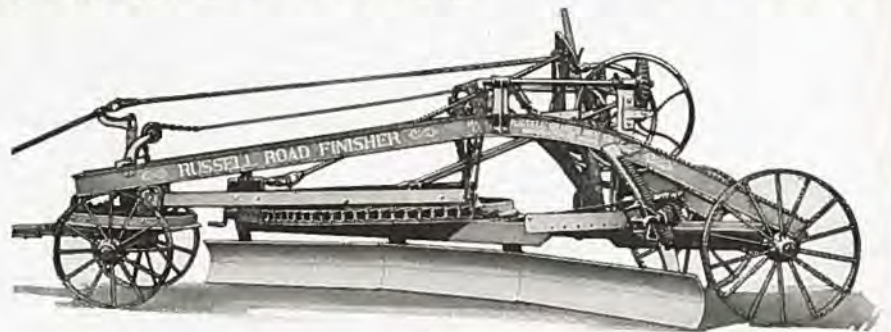
Overseers for the seventeen road districts of Jefferson county have been appointed by the county commissioners. Those named are: J. B. Phillips, Jack Boyle, Arthur Tripp, J. L. Trezise, J. C. Williams, Chas. Rouse, W. B. Patrick, Robert Smith, Alvin Theobald, Ray Berrian, Tony Granzella, J. B. Ellen, W. H. Knapp, Chas. Wheeler, Parley Roach, D. V. Manning, and Frank West.

H. A. Gottgetreu has been appointed road supervisor of El Paso county.

Chairman W. E. Tyner, of La Plata county, has announced the appointment of the following road overseers for 1925: State highway districts—Tony Sorenson, George Olbert and William Springer, with Hans Sorenson, John Frink and Jule A. Daniles as truck drivers; county road districts—A. N. Ginrich, Frank Conway, Seymour Ellis, L. E. Campbell, Albert N. Salabar and G. L. Holgate. Lewis Swartout and Norman Ellis are truck drivers appointed in these districts. Sol Thayer and C. C. Campbell will have charge of the tractor outfits and Tom McCartney will operate the Fordson equipment.

Fred Cummings, formerly overseer in El Paso county, has been appointed road superintendent in Elbert county, according to Chairman Al Carnahan. Cummings also will have charge of the county bridges.

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MAINTAIN YOUR ROADS AT LOW COST

Study the diagram of the blades. The Russell is different. It will crown a road, taking dirt from both sides and spread it evenly in the center. Blades reverse for right or left hand operation. The center blade can be set direct across the road and the outer edges of the two end blades moved forward, making a scoop shaped blade. The end blades can also be raised or lowered at the outer edge. 15-foot 3-sectional blade, weight 3,600 lbs. Get full details of the Russell Reversible Maintainer.

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TRACTOR

Throughout the country, progressive counties, townships and State Highway Departments are organizing "Caterpillar" patrol systems for maintaining definite units of dirt and gravel roads; to keep all roads good—not just main highways.

Wide awake officials are realizing that the 2-Ton "Caterpillar" is the ideal maintenance machine. It has ample power to pull all kinds of maintainers now used on the highways. It will handle a 7-ft. grader or two dump wagons. The 2-Ton maintenance outfit means small investment, low fuel cost and the high character of workmanship and materials reduces cost of upkeep to a minimum. It is designed especially for tractive power and will develop 15 H. P. on drawbar.

New 5-ton for Medium Power Demands.

The Great 10-ton is Supreme for Heavy Duty.

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CONTRACTORS' GOSSIP

Lee Williams, contractor of Pueblo, has been awarded a contract for the construction of a steel and concrete bridge over the Apishapa River, east of Fowler on the Santa Fe Trail. It is a Federal-aid project, replacing an old bridge destroyed by floods last year.

Elackwell & Butler, contractors of Grand Junction, are working on a three-mile gravel surfacing project for the state highway department, located between Durango and Bayfield.

Spotts & Malcom were successful bidders for a portion of the new water works system to be installed at Loveland. Mackey Brothers, of Sterling, also were awarded a portion of the same work. The total cost is to be about \$185,000.

A. E. Moody, former Wyoming contractor, has established an office in Denver. He recently purchased a new ditching machine to be used on local contracts.

Engler & Tessier, of Durango, are now working on a three-mile grading and gravel surfacing Federal aid project between Piedra and Pagosa Springs.

The Strange-McGuire Paving Co. brought suit against the Highway Department last month to compel the latter to issue a contract to them for the laying

of seven miles of asphalt paving on the Colorado Springs highway. At the time of going to press Judge Butler of the Denver district court still had the case under advisement.

The Levy Const. Co. of Denver have started construction of a new steel bridge across the Rio Grande River near Alamosa. This bridge is to cost about \$80,000.

Stamey-Mackey Const. Co., of Hutchinson, Kans., are using a steam shovel in moving dirt on a three-mile concrete paving project south of Colorado Springs. They expect to complete the job by fall.

The Weiland Engineering Co. are preparing plans for the paving of ten city blocks in Florence this summer.

The Salle Const. Co. were successful bidders on a \$20,000 bridge project in Pueblo last month. The bridge will span Dry Creek.

A new contracting firm under the name of the San Luis Valley Const. Co. has entered the Colorado field. Members of the firm are: W. C. Christensen, president; T. A. Crowther, vice-president; W. O. Crowther, secretary-treasurer; and R. J. Bailey and Jesse C. Hutchins. They have offices at Antonito. Members of the firm worked on the Conejos and La Manga Pass projects last summer.

A large steam shovel has been purchased by the City of Denver, through

City Engineer A. K. Vickery, for use in the widening of the Platte River.

William Lewis, of the Greeley highway office, is in charge of a force of field engineers completing surveys for the new road between Brush and Merino. The new route will eliminate the present "stair steps" road between these two points. The road is located in Morgan, Washington and Logan counties.

\$20,000,000 YEARLY ASKED FOR STATE ROAD WORK

A definite income of twenty million dollars a year is recommended in the fourth biennial report of the California Highway Commission, which has been filed with the governor. The report shows that on June 30, 1922, shortly after the new commission took over its duties, there was a balance available for new highway work of \$21,631,621. On June 30, 1924, all of this had been expended or obligated except \$6,035,316.

The principal policies of the present commission, which it says it believes is a reflection of the co-ordinated desires of the people, are as follows:

First—The completion of the main trunk line highways, including certain of the most important interstate connections.

Second—The maintenance in high class condition with annual revenues of the improvements already installed.

Third—The reconstruction as fast as available funds will permit on existing constructions dictated by the condition of pavement and the requirements of traffic.

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Welcome Contractors

"This is a Fine Laboratory, and I am glad to have seen it,"

is the manner in which one of the prominent Road Contractors recently expressed himself on the occasion of his first visit to the Pierce Testing Laboratories.

Many contractors do not have a very clear idea of the functions of a Concrete Material Testing Laboratory and we wish to take this opportunity to invite all the contractors to visit us so that we may take them through and explain the apparatus and testing methods which go to insure the permanence of concrete structures erected with tested materials.

The Pierce Testing Laboratories, Inc.

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There is

Buckeye NO "Weakest Link"

THIS applies not only to the digging chains—but equally well to all other details of Buckeye construction.

Take the steel used in these chains—in each link and each pin there is *more* than "just enough" steel, with the result that the chain will successfully withstand abuse incident to the wear and tear of the roughest digging.

This same rugged construction and performance ability is built right into Buckeyes throughout.

Gears are cut from steel blanks. Shafts are chrome and chrome nickel—high carbon. Roller chains are the best made.

And power? Nobody ever heard of a Buckeye quitting. They just keep right on digging—day in, day out, in all kinds of weather and in all kinds of soil.

Ask any owner. Or, send for the Buckeye booklets.

First Choice in the West

Mr R. A. Watson, of Los Angeles, says that his Buckeye is the best ditcher he has ever used.

"Practically no time lost due to break-downs," is one reason he gives. The unusually strong construction of the bucket chains is another.

Buckeyes are first choice of an unusually large number of men whose ability to weigh values was acquired by practical experience.

This is true not only in the West, but in other parts of the country.

**THE BUCKEYE TRACTION
DITCHER COMPANY**

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

FINDLAY, OHIO

There's a Buckeye Sales and Service Office Near You

Overhauling Season Announcement

Please remember that we carry a complete line of parts for

LIBERTY

HEAVY AVIATION

NASH QUAD

F. W. D. and

WOODS HYDRAULIC HOIST

We also have in stock Eisemann & Bosch Magnetos; Stromberg & Zenith Carburetors; Borg, Beck & Brown Lipe Clutch; parts for the Buda H. U. & Continental Motors; the Rusco Clutch & Brake Linings; and other parts and accessories too numerous to mention.

The Liberty Trucks and Parts Co.

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Minneapolis Steel & Machinery Co.

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When writing advertisers, please mention Colorado Highways.

Northwest Appoints Wilson Distributor for Colorado

B. W. Mackie, field service engineer of the Northwest Engineering Co., spent the week of February 23 in Denver. He announced that in the future Northwest shovels and draglines would be represented in this territory by the Wilson Machinery Co. The Northwest company specializes in the manufacture of a ¾ and 1-yard gasoline dragline and shovel.

The same week, I. E. Jones, general sales manager, and "Dad" Ralston, sales manager east of the Rockies, for the Best Tractor Co. of San Leandro, Calif., were visitors of the Wilson Machinery Co. These gents are the "two big guns" of the Best sales organization. They reported favorable market conditions all over the country. Mr. Ralston makes his headquarters at St. Louis. A total of 1150 Best tractors were sold through the St. Louis office last year. They went into all eastern states.

The St. Louis office was opened by Mr. Ralston four years ago. At that time H. W. Moore & Co. of Denver were the only Best distributors east of the range. Since that time agencies have been established in every eastern state.

Announcement is made by the Byers Machine Co., of Ravenna, Ohio, that the Wilson Machinery Co. of Denver will represent them in the sales of Byers "Bear Cat" Cranes in the intermountain territory in the future. The Byers Crane is described as a "one-man machine that can be operated with a clamshell, ditcher, backfiller, shovel, or dragline, as well as skimmer."

Sommers Gives Advice to Los Angeles Park Officials

E. E. Sommers, president of the Sommers Oil Co., Denver, returned home on February 28 from a month's vacation trip in California. He was accompanied by B. F. Bennet, sales manager of the Sommers firm, and Lee Carberry, city sales representative. While on the coast Mr. Sommers was the guest of city officials of Los Angeles on a trip to their mountain parks. He is a member of the Denver mountain parks board and a former member of the State Highway Advisory board. The coast officials sought his advice in laying out their park system.

Steinbarger Agent for Puffer-Hubbard Wheelbarrows

H. N. Steinbarger Co. announce their appointment as distributors of Puffer-Hubbard wheelbarrows in the Colorado territory. These wheelbarrows are designed especially for concrete handling, being unusually sturdy and are equipped with the "easy grip" handles.

A new catalog of the Russell Mfg. Co.'s complete line also is now being distributed by the Steinbarger firm. This catalog consists of 72 pages, beautifully illustrated, and containing much valuable information on road building equipment, from graders to crushing and screening plants.

H. W. Moore Announces Plans of Newly Organized Concern

H. W. Moore Equipment Co. is the successor to H. W. Moore & Co. The new company inherits the lines carried by the former company, including Galion Graders and the Gravel Screening Plants, Jaeger Concrete Mixers, Lakewood equipment, Marion Steam Shovels, in fact practically all of the old lines. The only exception is the Clyde Iron Works products.

H. W. Moore will be president and general manager of the new company and the directors will be, in addition to himself, C. R. Hine, C. H. Mellish, T. C. Sanderson, G. L. Meffley, J. C. Moore and F. L. Woodward.

The new company has secured a block on Sixth Avenue between Acoma and Bannock streets, where it will erect its own building and have in addition demonstration grounds where the prospective purchaser can see in active operation

such equipment as he contemplates buying. This is a radical move on the part of the new company, but follows the policies now being generally adopted in the East. Such a move ten or fifteen years ago would have been a perilous one, but in the day of the automobile it makes very little difference whether the location be downtown or out in the country.

The new company is acting as the selling agents for the liquidation of the stock of merchandise of the old company, and is offering some remarkable bargains in equipment that are worth looking into.

Pending the erection of the new building, H. W. Moore Equipment Company is continuing business at the old location, Eighteenth and Wazee streets.

Still On the Hoof

Farmer—"I don't suppose you run across a brindle cow with a white face as you come along the road?"

Motorist—"Not quite, brother, but I judge she's suffering some now from nervous shock."—Columbus Motorist.

Preserve the Home Contact

DON'T LOSE TOUCH with your boy or girl at college. Letters are slow, formal things. Only your own voice—*yourself*—preserves the home contact fully and wholly. Many parents arrange to call their sons or daughters at regular weekly intervals, fixing an hour which in truth is the "home hour" for the youngsters—the time when they may be in intimate touch with the folks at home and all the influences of the home life.

Year after year much of the telephone property of this company has worn out or has been outgrown, and has been replaced at much higher prices for material and labor. However, it is essential that we have modern equipment to provide satisfactory service, even though it greatly increases the company's average investment per telephone.

When the student accomplishes some achievement of moment in his college life or is accorded some special recognition, his first thought is to tell Dad and Mother about it. Encourage him to use Long Distance. Nothing will tie him closer to home and home folks than voice-to-voice contact over the telephone.

Station-to-Station calls are quicker and cost less.

Bell System

One Policy
One System
Universal Service



and all Directed
toward
Better Service

The Mountain States Telephone & Telegraph Co

What Are Your Profits Going to Be This Year?

Many contractors could have increased their profits on last year's jobs—many will resolve to replace inefficient equipment during 1925—reduce expensive delays—many will forget this, however,



P & H Excavator with Crane Boom and Grab Bucket.

and go through another year with lower profits than they really should have.

Some, however, will benefit—they will realize that new P & H Corduroy Excavators, Shovels, Draglines, Cranes, Back-fillers, Trenchers, will save them money, speed up the work, lower maintenance costs.

GET READY NOW

How do you classify yourself—will you make an extra effort to revamp your equipment and put yourself in a position to become more permanently established in your business through more certain profits on every job?

P & H Excavators will help you more than ever because competition makes close figuring necessary. And whether close figures are required or not—P & H equipment, economical dependable day in and day out—puts dollars in your pocket.

P & H has had the advantage of a greater number of years of actual experience with gasoline excavators



Replacing the crane boom with shovel boom is a matter of only a few hours. The powerful crowding motion is an exclusive P & H development.

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P & H Dragline has many features which give it remarkable digging capacity, long life and low maintenance.

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Nothing Just As Good

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Adjustable *Leaning Wheel*

Graders

"The Original"

A Proved Success Since 1885

HE LEANS TOWARD THE LOAD



Cheapest in the long run—Always beware of the higher cost of the cheaper price.

Your Grader should lean against the load—not away from it.

SO DOES THE ADAMS
ADJUSTABLE LEANING WHEEL GRADER

By the way—Adams has built *Leaning Wheel Graders* exclusively for 40 years. By every test they are the best.

Why experiment with imitations?

Buy an Adams Grader and do more work per dollar of operating cost—the true measure of economy.

Thos. J. Fair

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1611 Wazee St.

Denver

The Bulletin Board

Conveyor Used in Handling Plaster on New High School

A most unusual application of conveyor equipment in building construction which has created considerable interest among contractors is being used by Henry & Seeley, plastering contractors, on the Mitchell Junior high school in Denver. So far as is known it is the first time that a Barber-Greene conveyor has been used in the handling of mixed plaster material.

The installation consists of a 60 ft. B-G conveyor, equipped with electric power. Operation of the conveyor and mortar mixer is handled by one man. The mortar is discharged from the mixer direct to the belt of the conveyor, which extends to the first, second or third floors, emptying into a specially-constructed, open-bottom hopper. This hopper is large enough to handle one batch of mortar.

A small mine car operated over a track is used in moving the mortar from the hopper to the various rooms being plastered. One man operates the car and looks after the hopper. Thus the entire operation of mixing the mortar and moving it to the plasterers is handled by only two men.

This installation eliminates the services of about nine hod-carriers and saves the contractors approximately \$60 per day in labor charges.

P. J. Sullivan is the general contractor on the Mitchell school. The conveyor equipment was purchased through H. P. Wilson & Co., intermountain distributors of Barber-Greene equipment.

Commissioner Dan Straight announced the purchase of two of these conveyors for use in handling sand and gravel on Weld county highways this summer.

Increased Sales on Fordson Graders Reported by Moore

Sales of two carloads of Hadfield-Penfield road graders were reported by H. W. Moore & Co. during the past month. This is the largest number of these machines sold in this territory during a single month. Recently the Hadfield-Penfield manufacturers brought out a new model rigid rail track, which is said to give the Fordson "super power" for every pulling purpose. One of the new models is now in the Denver stock of the Moore concern.

The machines sold during the past month went to cities and counties. They will be used in the maintenance of streets and county roads. A feature of the machine is that it can be operated by one man. The new model has flat links of hardened steel with facilities for attaching lugs when needed.

Adams Issues New Booklet On Leaning Wheel Graders

A new booklet describing various methods of dirt handling and maintenance with graders has been issued by the J. D. Adams Co., manufacturers of Adams Leaning Wheel Graders. These booklets are now being distributed to county road officials, street commissioners and contractors in Colorado, Wyoming and New Mexico by Thomas J. Fair, Denver distributor. The booklet also describes in full detail the new model Adams leaning wheel grader, equipped with a "quick lift" attachment. This grader is constructed of pressed-steel throughout, thus reducing the cost of repairs. More than twenty new Adams graders have been placed in service on Colorado roads this year, says Mr. Fair.

New Galvanizing Plant Is Installed by Pueblo Firm

A new addition has been added to the plant of the Colorado Culvert & Flume Co. of Pueblo, according to L. R. Shallenberger, president. In this addition has been installed complete machinery for the electro-galvanizing of bars, rods, bolts, angles, etc. Machinery also has been installed for the manufacture of bands for wood stave pipe. These bands are galvanized, bent and asphalt-dipped.

With the construction of the new addition the Pueblo concern is now in a position to supply this class of material in any quantities. For several years the Colorado Culvert & Flume Co. has confined its efforts to the manufacture of Keystone corrugated culverts and irrigation flumes.

Sanderson Surprises Friends By Marriage to Pueblo Girl

J. P. Sanderson, that energetic young man who sells Keystone culverts for the Colorado Culvert & Flume Co. of Pueblo, has dun went and dun it. Yes, sir, J. P. is now a benedict. The bride was Miss Jane Parks of Pueblo. The date of their marriage was Friday, February 13th. Speaking of courage, well, let your conscience be your guide. Some folks would say they had more than their share. The honeymoon trip consisted of a tour of the Southwest. The newlyweds are "at home" in Pueblo.

Clinton-Held Firm Reports Sale of Five Big Tractors

Sales of five Holt "caterpillar" tractors were made the past month by the Clinton-Held Company. Purchasers of these power units included La Plata, Arapahoe and Park counties. Two 5-ton tractors were purchased by Milton N. Thompson, prominent rancher of Limon. He will use them in planting 1,000 acres of corn. The machines will be operated on day and night shifts, complete lighting equipment being furnished with the tractors for this purpose.

Four Stockland "quick-lift" graders were purchased by Mesa county for maintenance purposes. A Stockland grader also was bought by Park county for use with their new tractor. This outfit will be used in maintaining the Baileys-Fairplay road, which is regarded as one of the finest pieces of roadway in the state.



Showing unique conveyor installation for handling mixed mortar on Denver high school building, a modern labor saving device operated by only two men.

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Perfect lubrication means lower upkeep, more satisfactory service, and longer life for the motor. Don't neglect it. Order today! All shipments made in iron drums.

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Denver, Colorado

BIDS OPENED

Proj. No.	Length	Type	Location	Successful Bidder	Bid Price
272-A	0.417 mi.	325' & 30' Bridges and Approaches	Between Fowler and Manzanola	Lee F. Williams	\$56,434.60

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
288-A	19.099 mi.	Sand-Clay Surfacing	Between Merino and Brush

PLANS COMPLETED AWAITING APPROVAL

246-C	1.951 mi.	Concrete Paving	Vineland, east
254-B	1.087 mi.	Grading	Hot Sulphur Springs-Parshall
270-B	2.830 mi.	Gravel Surfacing	Monte Vista, east
286-A	0.549 mi.	R. R. Grade Separation	Between Nunn and Dover
288-B	2.519 mi.	Conc. Pav. and Grav. Surf.	Merino, westerly

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	1	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	139,038.45	84	116-C
135	Denver-Morrison	5.3 mi.	Concrete Pavement	Colorado Bridge & Const. Co.	178,158.00	98	135
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	66	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	6	213-A
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	1	226-D
230-A	Wolhurst, south	0.852 mi.	Concrete Pavement	M. J. Kenney Const. Co.	82,710.00	97	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surfacing	O. L. Hackett	66,178.00	85	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	70	242-A
248-A	Buena Vista-Salida	12 mi.	Grading and Surfac.	Western Const. Corp.	93,533.00	41	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	59	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	29	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408.00	70	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	66	258-A
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	0	261-A
262-A	West of Walsenburg	2.186 mi.	Gravel Surfacing	Central Const. Co.	19,367.00	100	262-A
262-B	Rio Grande Del Norte	490-ft.	Bridge	Levy Const. Co.	82,123.00	1	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	20	262-C
267-A	Model-Trinidad	2.954 mi.	Gravel Surfacing	Prople Bros. Const. Co.	25,583.00	27	267-A
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	11	271-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	41	272-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	223,921.00	8	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand-Clay Surfac.	Holly, Burshears & Dobbins	16,016.00	43	278-A
279-B	Morrison-Baileys	5.295 mi.	Grading	Harry H. Brown	85,980.00	8	279-B
281-A	Lafayette, South	1.249 mi.	Paving	Sims & Boston	55,373.00	84	281-A
281-B	South of Longmont	3.068 mi.	Paving	J. Finger & Son	102,502.40	47	281-B

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BYERS



They did this grading with a Bear Cat

THE Fuller Construction Co. of Dallas, Texas, report a very successful experience with their new Bear Cat Skimmer on a particularly tough job of street grading.

The photograph above shows the character of the excavation and the shallow depth of the cut. In spite of this hard digging, the Bear Cat loaded 54 wagons holding 1½ yards each, in 2 hours' time. That means a rate of 400 yards per ten-hour day, an exceptional yardage for digging of this difficult character.

Compact, powerfully built, with a 40 h. p. Hercules gasoline motor, this Skim-

mer has a 12 foot crowd and develops 5 tons pressure at the bucket lip. A good high swing permits dumping from sub-grade into trucks on a higher level. No fireman, no ground man—the Bear Cat is operated by one man. The average daily operating cost, including depreciation, is \$15.23.

The full caterpillar mounting gives 100 per cent traction and saves hours of time in quick and positive moving up on the job. Seven interchangeable attachments make the Bear Cat available for material handling, ditching, excavating, etc.

Write or wire for details.

THE BYERS MACHINE COMPANY, RAVENNA, OHIO, Represented by

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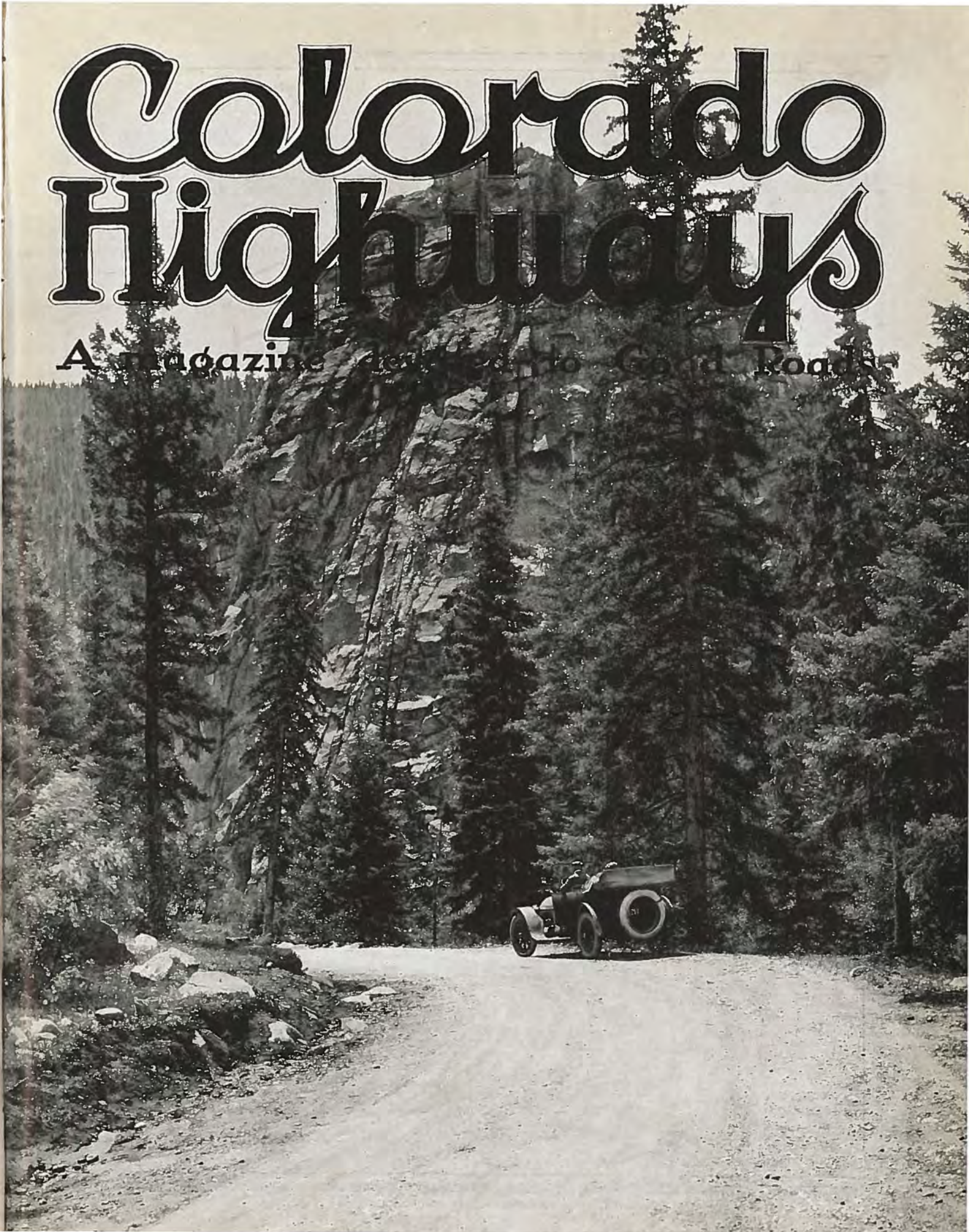
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roads are a
good investment
—not an expense*

Now Is the Ideal Time to Build More Paved Highways

There is not a single community in the United States that does not need a greater mileage of permanently paved roads.

More than 17,000,000 motor vehicles are now using our highways for business and pleasure. They are packing the paved roads in already congested areas, as well as over-running regions until recently considered remote. And they are pounding to pieces all but permanent roads.

Even though a number of states have made good progress in building Concrete Roads, their present permanently improved mileage is entirely inadequate, as every motorist knows.

Meantime, while the building of permanent highways lags, the production of motor vehicles is at the rate of 4,000,000 a year!

Sooner or later this gap must be closed. Why wait?

Not in a long time have general conditions been so favorable for carrying on such public works as permanent highway building, thus assuring tax payers more for their money.

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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
215 Chamber of Commerce Building, Denver, Colo.
Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.
10 CENTS A COPY. \$1.00 A YEAR.

OUR COVER PICTURE



This month's issue of COLORADO HIGHWAYS carries on its front cover a scene in the middle Boulder canon, between Boulder and Nederland, showing one of the massive cliffs which are to be seen along this popular tourist route. A considerable sum is being expended by Boulder county for improvements on this roadway this spring. The road was constructed a number of years ago by convicts from the state penitentiary.

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Tilter Concrete Mixer**

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SOME unequalled features of the Rex Tilter—Furnished with hard rubber tires and roller bearings, or plain steel wheels with spring hung axle—better cushioning effect than pneumatic or cushion tires—means longer life and no punctures or other tire trouble.

So well balanced you can push it by hand anywhere on the job. Weight 1,250 lbs. Capacity 5½ cu. ft. dry. Charges or discharges either side. Positive locking device—holds drum in any desired position—not necessary to return drum to charging side when only part of batch has been dumped. Removable bushings in both drum bearing and drive shaft bearing.

Ball thrust bearing for drum—less friction—less power required. Large handwheel and geared reduction instead of direct connected dumping bar—no back breaking effort necessary to tilt drum.

All sizes, both Tilter and Standard non-tilting Rex, in Denver stock.

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And now still better BEST TRACTORS

Some of the improvements to be found in the new Best Models.

Recoil springs which allow front idler to move back if any obstruction gets between track and sprocket. This replaces tightener pins formerly used.

Track roller bearings protected from dirt by an improved new seal which will greatly increase life of these bearings.

Three speeds forward on Best Thirty with a maximum speed of 3 $\frac{5}{8}$ miles per hour.

Increased bearing surfaces and improved lubrication systems in Best Sixty motor

New manifold on Best Sixty which provides automatic heat regulation for air entering carburetor.

Improved spring suspension on Best Thirty, which allows for full oscillation.

Best Tractors have improvements which give added strength, increased power, and which further reduce the already low cost of operation.

Not that there are new models to announce—there are not—just some well proved refinements which make these tractors even better than before—a continuation of a fifteen year old policy of keeping Best Tractors as good as engineering skill and practical road building experience can make them.

Best owners—ever enthusiastic over the performance of these tractors, will experience even greater satisfaction when they know the added strength, greater pulling power and increased economies of the Best Tractors.

If you are interested in road building, it will pay you to see a Best Sixty or Thirty constructing and maintaining highways in your own state.

May we have the opportunity of showing you some of these Best tractors in operation?

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BEST TRACTORS



Current Opinion

Adequate transportation facilities are the basis of trade.

The cost of adequately improving the highway to meet traffic conditions is less than the cost of attempting to operate vehicles over the unimproved highway.

The cost of a needed improvement has to be paid by the public, whether the improvement be made or not, and the cost of going without the improvement is greater than the cost of making it.

Various ways are used to finance highway improvements—bond issues, gasoline tax, automobile license fees or a combination of these. A bond issue is merely a convenient device for extending the period of payment over a series of years. It amounts simply to borrowing the community's credit and provision for retiring the debt by diverting such revenues as automobile license fees, gasoline taxes or what not to the retirement of the bonds.

Whatever plan of financing is adopted, proceeds should be so invested that the cost of upkeep of the highway as improved is the lowest possible.

A distinction should be made between taxes levied to pay the cost of needed community improvements and taxes levied purely for the support of government. The first if properly carried out constitute an investment that will pay good returns. The second must be regarded as a necessary expense.

Taxes levied for useful, substantial public improvements therefore are an investment.

As regards highway improvement, there is sufficient technical experience and skill now available so that any community may undertake an improvement program with confidence that the expenditure involved will prove a good investment.

There is still a very large part of the public which does not understand that the best type of paved road soon pays for itself. It is no doubt true that in some sections of the country the motor vehicle owner feels his car ownership results in subjecting him to too many varieties of taxation.

However, American enterprise has provided our citizens with about 17,000,000 motor vehicles. In 1924, 3,680,000 motor vehicles were produced.

If we can accept the optimism of the automotive industry as expressed recently at several of the large motor shows, it seems likely that production in 1925 will considerably exceed 4,000,000. The public is going to buy this output. The economy, safety and comfort which the motor vehicle is capable of rendering to its owner is entirely dependent upon the condition of the highways.

Bulletin No. 69 of the Iowa Engineering Experiment Station, Ames, Iowa, contains research studies conducted by T. R. Agg. These studies are only one group of several made during recent years, each of which has confirmed preceding studies along similar lines.

Professor Agg shows that a 3-ton, solid tired truck at an average speed of 10 miles an hour will have a differential of 6 cents a mile in operating cost in favor of the concrete road as against an ordinary gravel road. In the case of an ordinary touring car, the differential is 2 cents a mile.

Various states are now building a system of concrete roads. They are doing this on the deferred payment plan by means of the device known as a bond issue. This bond issue they are paying for, principal and interest, with the proceeds of motor vehicle license fees. In other words, the state's credit is borrowed over a period of years and the amount of that credit is wiped out by the revenues from motor vehicle licenses.

In Illinois the owner of a 3-ton truck pays an annual license fee of \$22.50. This is his total annual contribution to the community enterprise of buying a paved road system. The paved roads reduce his operating cost by around 6 cents per mile, so when he has driven 375 miles on the paved roads, these roads have earned for him the license fee of \$22.50 in the savings produced through operation over pavement by comparison with dirt or gravel.

The owner of a 30-horsepower touring car pays a license fee of \$12 as his total annual contribution to paved road construction. The paved roads reduce the operating cost of the touring car by about 2 cents a mile. Therefore the owner has had his license fee returned to him in the form of savings in car operation when he has driven 600 miles.

Pueblo Completes Bridge Program

By RALPH C. TAYLOR

BRIDGES that will stand the test. When the Pueblo flood of June 3, 1921, struck Pueblo county, few bridges stood the test. Most of them were swept from their moorings and hurled into almost bottomless beds of sand.

All of the more important bridges in Pueblo county which were lost in one night have now been replaced after almost four years and the expenditure of more than half a million dollars of Federal, state and county funds.

The replacement, according to highway and bridge engineers, has been of a substantial nature to resist floods as great or mightier than the Pueblo flood.

Not alone did the Arkansas River sweep a clean channel, but Salt Creek, St. Charles, Fountain and other swollen and enraged streams claimed a toll of bridges. The bridge links in the chain of highways were broken, dividing the county into communities without highway access.

When morning dawned on the flooded area it also dawned on the county commissioners that they faced the greatest problem in the history of modern highways. They realized the gigantic works of man were but puny straws to a storm-maddened nature. They realized that Pueblo had been excommunicated from an anxious and sympathetic world. While the loss of life was heavy and the property damage enormous, the paramount consideration was to provide access for

the waiting world to send in aid and relieve the distress.

Due to the heavy loss of bridges it was impossible to rebuild the structures in one year without a bonded indebtedness. To obtain the best bridges at the least cost, the reconstruction program was arranged to cover a period of years. This program, which began immediately after the flood with the state highway department converting \$160,000 worth of Federal-aid paving into bridges, has now been practically completed.

Bridges to weather the wrath of floods, substantial structures which cannot be undermined and which afford an abundance of clearance, has been the aim of county and state officials in the rebuilding program. To accomplish this, longer bridges with as few spans as possible have been erected. Suspension bridges were considered, but none have been built, largely because contractors could not be found who would bid on that type of work.

Beauty has not been overlooked in building service into the bridges. The concrete and steel bridges of graceful design now stand as monuments to modern engineering.

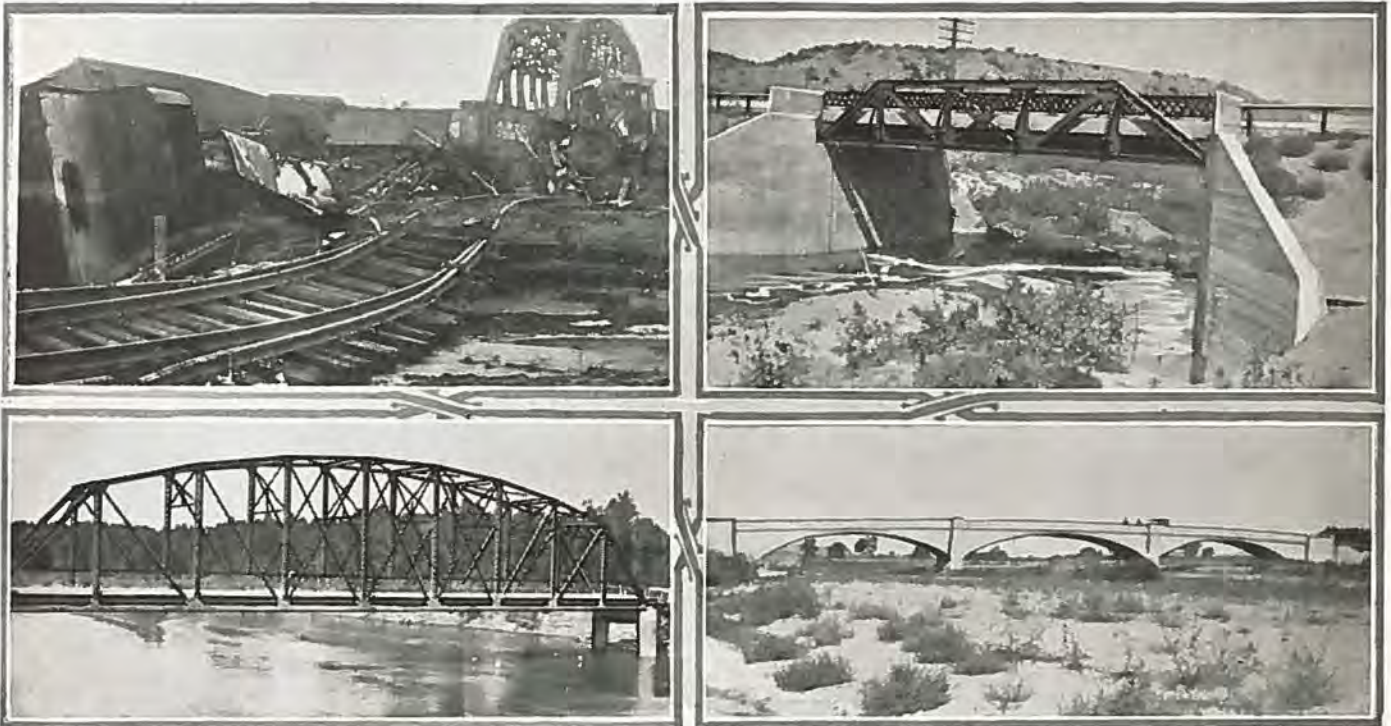
To add further protection to the bridges the channels have been straightened so that the water will flow in a straight course for several hundred feet above the bridge. To maintain straight channels

and prevent undermining of abutments, flood fences have been installed. These fences consist of steel rails driven to bed rock at intervals of ten feet, connected above the surface with heavy fencing and with rubbish, boulder and earth fills as added reinforcements.

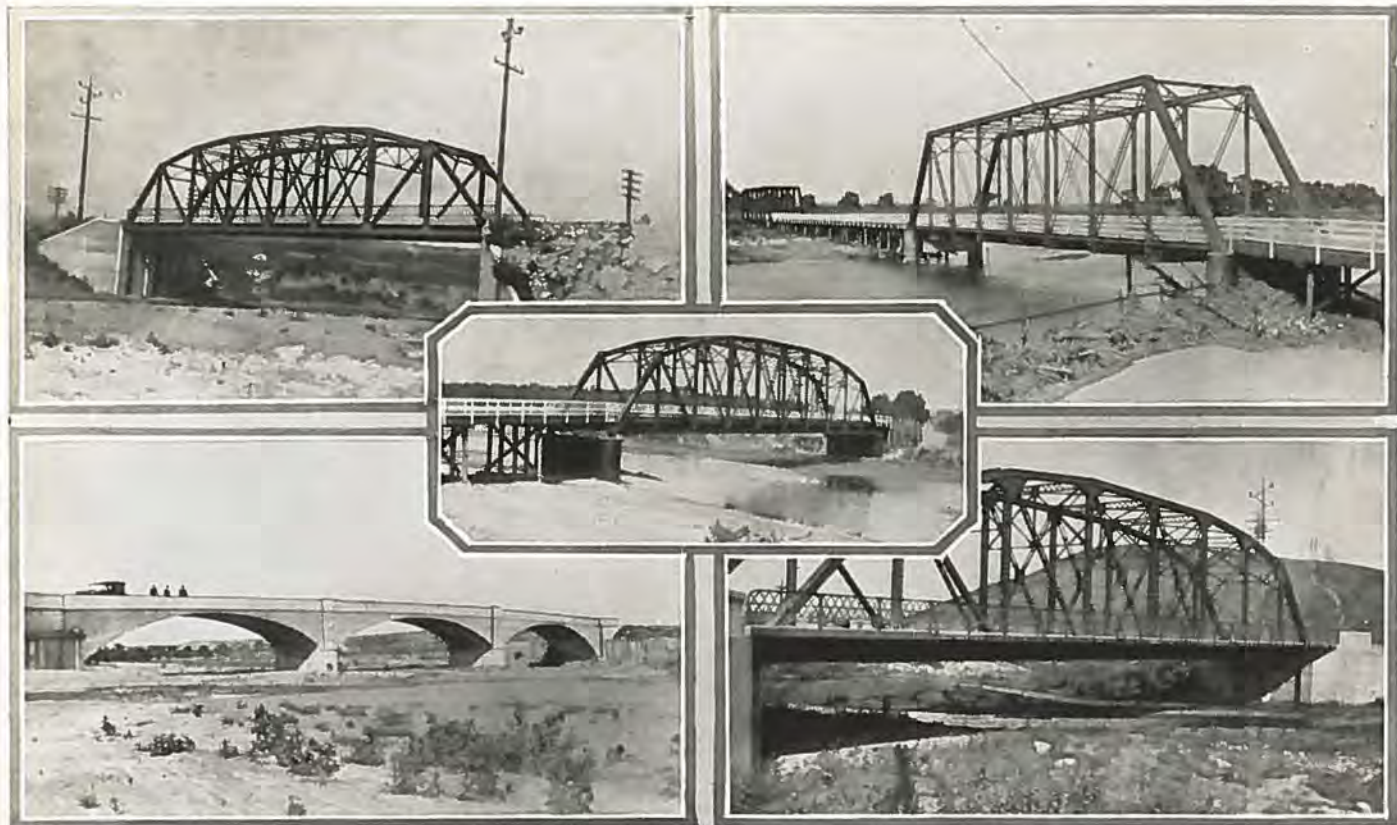
The flood of the Arkansas River left in its wide path many new channels. Some of the bridges which escaped being wrecked were left to span a bed of sand with the stream flowing a quarter of a mile away. This condition existed at the Stockyards crossing of the Arkansas River east of Pueblo. The original span of 160 feet was useless where it stood. Attempts to move the river back under the bridge failed. To move the span was likewise believed to be useless because another high flow of water might change the channel back to its old location. The solution was to build another 160-foot span over the actual stream and to connect the intervening space with piling. When the financial condition of the county permits the piling will be replaced by permanent steel construction. The new steel span was constructed of salvage from the Santa Fe avenue bridge which was swept downstream.

Similar conditions at the Boone bridge caused the installation of wooden piling at one end of the steel structure.

For several days following the flood the only means of crossing streams was by the old-fashioned "ford" method. Temporary wooden bridges were soon built,



Upper left—Engines and cars piled against railroad bridge, after the Santa Fe avenue bridge, a county structure, had been washed down stream during the 1920 flood disaster in Pueblo. Upper right—Six-mile creek concrete and steel bridge on Santa Fe Trail, a Federal Aid project built by McCormick & Brockaway and Arthur & Allen. Lower left—Nyberg bridge over Arkansas river, 12 miles east of Pueblo, a county project. Lower right—Three-span concrete bridge seven miles southeast of Pueblo, over the St. Charles river, a county project, built by the Pueblo Bridge & Const. Co. Photos by Ralph C. Taylor.



Upper left—Large single span steel bridge over St. Charles river, a Federal Aid project, constructed by Rogers & Pickard. Upper right—Stockyards bridge over Arkansas river at east edge of Pueblo. This county bridge is more than 800 ft. in length and is one of the longest highway structures in southern Colorado. Center—Steel span bridge with temporary piling approaches over Arkansas river at Boone, a county bridge built by the Pueblo Bridge & Const. Co. Lower left—Concrete bridge over St. Charles river, eight miles east of Pueblo, constructed by the Salle Const. Co. for Pueblo county. Lower right—Steel span bridge over Salt Creek on Santa Fe Trail, two miles east of Pueblo, a Federal Aid project, constructed by Robbins Const. Co. Photos by Ralph C. Taylor.

sometimes involving novel schemes. The Salt Creek temporary structure on the Santa Fe Trail was made of heavy timbers and a flooring of three-inch iron pipes laid close together. The St. Charles temporary bridge on the Walsenburg highway was made of materials borrowed from Huerfano county. The material and timbers were used for two years before a new concrete bridge was built and the borrowed bridge dismantled and returned. The permanent bridge is so constructed that high water can flow over it without harming or destroying it.

Channels of 100 to 300 feet in width could not be profitably spanned with temporary bridges. Instead the roads were inclined into the channels where small wooden bridges of 50-foot length were built over the actual flow of water. These bridges were built on the river bed and anchored to one of the banks by heavy cables. High water pushed the bridges downstream, but they were saved when the cables swung them to one side and held them until the water subsided. A team of horses dragged the bridges back across the streams when they returned to a normal flow.

Pueblo county is said to be the county with all new bridges, with the future program dedicated to highways.

The more important projects of the bridge reconstruction program include the following:

- Arkansas River—
 - Stockyards, steel and pile county bridge.
 - Nyberg, steel county bridge.
 - Boone, steel and pile county bridge.
 - Nepesta, wood county bridge.
- St. Charles River—
 - Santa Fe Trail, steel Federal-aid bridge.
 - South Vineland road, concrete county bridge.
 - Wilson road, concrete county bridge.
 - Walsenburg road, concrete and steel Federal-aid bridge.
- Salt Creek—
 - Santa Fe Trail, steel Federal-aid bridge.
- Six Mile Creek—
 - Santa Fe Trail, concrete and steel Federal-aid bridge.
- North Creek—
 - Beulah, steel county bridge.
- Rock Creek—
 - Beulah road, concrete county bridge.
- Fountain River—
 - Pinon, county wood bridge.
- Huerfano River—
 - Undercliff, wood county bridge.
- Kansas-Colorado Boulevard—
 - Numerous wood bridges over arroyos, state and county bridges.
- Siloam Road—
 - Several wood bridges over dry creeks, state and county bridges.
 - The 1925 bridge projects will be at

Muddy Creek on the Walsenburg highway and Dry Creek on the Canon City road, both Federal-aid projects, which will replace present bridges. Both will be of steel.

State and county officials who were actively concerned in the Pueblo county bridge reconstruction program include: L. D. Blauvelt, state highway engineer; James D. Bell, division engineer of the state highway department; G. L. L. Gann, state highway advisory board member; Charles Reese and his successor, Charles B. Clark, as county engineers; Charles Stepp, county road superintendent; W. L. Rees, O. G. Smith, J. P. Harbour and his successor, Hurb H. Wilson, as county commissioners.

Judge Charles C. Butler in the Denver district court on April 7 ruled that State Highway Engineer Blauvelt was within his rights in rejecting the bid of the Strange-McGuire Paving Co. of Salt Lake City, Utah, for the construction of seven miles of asphalt pavement between Wolhurst and Sedalia, on the Colorado Springs-Denver highway. Notice of an appeal to the Supreme court was given by the contractors. This project has been tied up in the courts since last October. It involves the use of Colorado materials on state road construction.

A Colorado Wonder Road

THERE is perhaps no other highway in the Rocky Mountain region that will have a greater pull upon the tourist who loves the grandeur of the scenery in the heart of the Rockies than the one which is being built through Montrose, Ouray, Silverton and Durango to the Mesa Verde National Park. Especially will this be true when the facts concerning this opportunity for a most thrilling and awe-inspiring trip are more generally known.

It would be useless in a short story to try to bring out all the intensely interesting points encountered on this highway, but a short discussion as to its development and something of what strangers think of the scenic attractions therealong, as measured with other mountain highways, may be of interest at this time.

Only twelve short years ago the greater part of this highway was but a narrow trail constructed primarily for horse-drawn vehicles and only wide enough for the most part to accommodate one vehicle. Clinging as it seemed to be on the face of very precipitous granite walls, it permitted of many thrilling views to the bottom of the canon, in some places a few hundred feet below, while in others a thousand feet would not even closely approximate the height. Today the views

are as entrancingly beautiful as before, with the added feeling of perfect safety because of the regular and easy grades, the wide roadway and the protection afforded in the huge masonry walls which line the outer edge of the roadway wherever it has been necessary to make fills of considerable height.

Until about twelve years ago no motorist had ever attempted to negotiate this road; then one day Mr. F. J. Hartman, who sold Ford automobiles at Montrose, Colorado, decided to make the trip by Ford. The story of the first trip, as it was related in a Montrose paper, now follows:

"For the first time an automobile traveled by its own power from the town of Ouray up to the great heights, along the narrow defiles and dizzy, rock-cleft roads that characterize the Ouray-Red Mountain highway, conceded to be one of the most marvelous, awe-inspiring and precipitous mountain highways in the world.

That trip from Ouray to Red Mountain certainly made history in automobiling and added a striking and wonderful proof to the fact that the triumph of automobiles over every kind of travel and all manner of roads is a thing of the very near future.

It was a trip that few believed could

ever be accomplished, this auto trip from Ouray up to the highest incorporated town in the world, and along the steep, but smooth, roadway, cut out of the solid rock, just wide enough for a team or auto to move along and with the mountain rising to sheer heights on one side and the other side of the road bordering great canon depths.

Dr. L. G. Crosby received a summons to Ironton yesterday for professional services. In a half jocular vein he suggested to Mr. E. A. Phinney, of the Ouray Electric Light & Power Co., that he believed he would make the trip in their machine, a handsome Ford car, recently purchased by the two gentlemen.

Mr. F. J. Hartman, Jr., Western Colorado representative of the Ford Motor Co., was up from his home at Montrose, and after some good-natured "daring" the gentlemen decided to undertake to make the pioneer auto trip over the famous road, up to the great heights, and not only to Ironton, but to Red Mountain.

Walter Walker, editor of the Plaindealer, was asked to be the fourth member of the party.

About four o'clock the return trip was begun and at six o'clock the party was back in Ouray after one of the most ex-

(Continued on Page 20)



Upper left—A scene in the town of Red Mountain, showing first automobile to make the trip from Ouray to Red Mountain. Picture taken in 1911. Upper right—On the road to Red Mountain in 1911—Walter Walker, John Davey, Joe Hartman and E. A. Phinney. Lower left—Photo taken at the Genessee mine—left to right, E. A. Phinney, Harry Hope, John Davey, Ellen Davey, Mabel Davey, Joe Hartman and Walter Walker. Lower right—Another view in Red Mountain—left to right, Walter Walker, John Davey, Asa Horn, Frank Tessadri, J. Cassagrandri, Joe Bonatti, George Mount, Joe Hartman and E. A. Phinney.

The Smoky Hill Route

By EDWIN HUNT HOOVER

NEWS ITEM:

Cherry Creek, K. T.—Mr. Williams of the Express informs us that he picked up a man in the last stage of exhaustion who had subsisted on the bodies of his brothers. The three brothers set out from Illinois for the Gold Region. They took the Smoky Hill Route and found the distance much greater than represented. They ate up their provisions and when near death one of them, sinking more rapidly than the others, requested the survivors to live on his flesh and try to get through. He died and then commenced the horrible feast. They ate the body and again braved starvation. Another died and the survivor lived upon his remains, but the same fate had almost reached him when he was found by an Indian, carried to his lodge and fed. The next day the Express (Jones and Russell's Leavenworth and Pikes Peak Express) came along and brought him part way through, but was obliged to leave him because of his feebleness and delirium. He will be brought in tomorrow.

provisional name of "Jefferson"; and Denver was variously known as "Cherry Creek" or "Auraria," depending on an informant's location in one or the other of the "gold diggings." William N. Byers, editor, proprietor, owner, advertising manager and collector of the paper, was firing his first gun in the campaign for honest road information. At that date the most pretentious vehicle to trek the plains between America and the Gold Diggings of the mountain domain was a Concord coach, which fancy but durable conveyance made its initial appearance in "Cherry Creek" barely in time for Mr. Byers to rush the epochal story (along with that of the cannibalistic emigrant) into print; for its arrival—unheralded, of course—was coincidental with the date of publication.

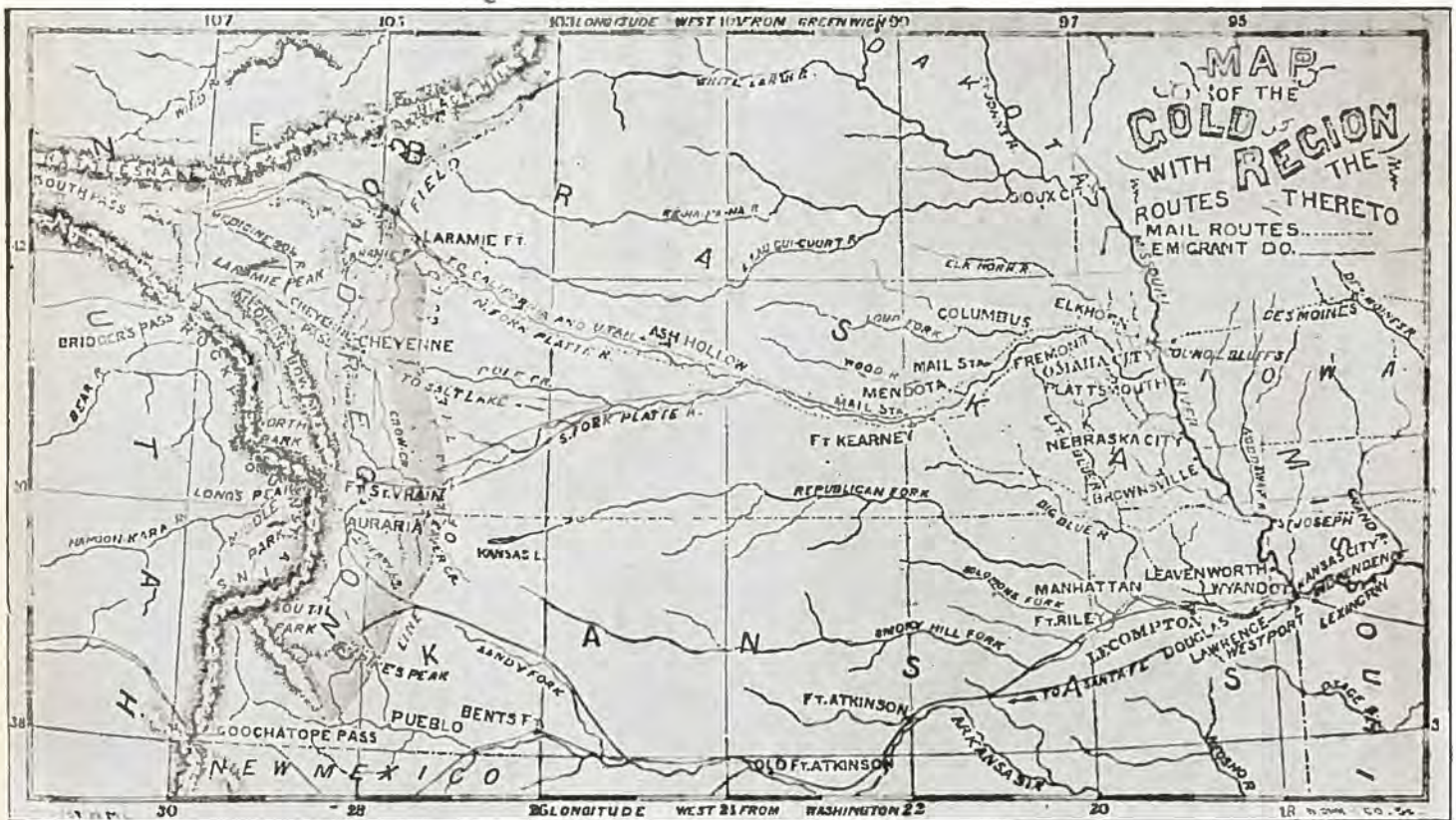
Subsequent issues of the Rocky Mountain News carry numerous philippics against the "Smoky Hill Route" and accuse "certain unscrupulous interests" of "nothing less than manslaughter" when they recommend emigrants from the eastern states, enroute for the Gold Diggings, to this fateful trail. Grim tales told by hollow-eyed pilgrims who survived the waterless, woodless, foodless Smoky Hill Route were faithfully chronicled by Mr. Byers, who termed it the Smoky Hill Route. He interlarded these news stories with editorial fulminations

at steamship agents who circulated maps—purporting to be safe guides across the Smoky Hill to the Promised Land—which directed gold seekers into a Sahara-like waste that meant death or terrible suffering for a vast majority.

Automobilists in this generation follow the Smoky Hill Route over the Union Pacific Highway where bridges and culverts span sandy expanses of the Smoky Hill River. Road maps indicate stopping places for the night; garages are recommended; hotels specified. Matters of wood and water are quite incidental because they are free and frequent. Gasoline and oil are more important. If an axle breaks or the public camp grounds are not equipped with shower baths—these are items for lurid vocabulary and vital concern. Yet if the motorist will look to the east or west he may see a dim path of a forgotten era where an emigrant staggered up a sandy gulch, sixty-five or seventy years ago, looking for life-giving water, and laid down to die scarce a mile from the point where the absent showers are causing discomfort or the broken axle necessitates sending for a tow car.

Passengers on the Kansas branch of the Union Pacific railroad look on pastoral scenes that were once the lurking place of stark, grim tragedies of the old Smoky Hill Route. At Cheyenne Wells, Aroyo, Hugo, Limon, some Old Timer in '59 would have given an arm or a leg for a drink of water, no matter how alkaline

This excerpt is the earliest Road Bulletin in the Rocky Mountain Region. It appeared in the May 7, 1859, issue of the Rocky Mountain News. Colorado was then Kansas Territory (K. T.) with the



The map from which this reproduction was made was published in the first issue of the Rocky Mountain News in 1859 and so far as is known it is the first road map ever printed in the state. Note the outline of the Range as travelers in those days thought it was.

—and gave his life because water there was none.

Names such as "Big Grove," "Prairie Camp," "Big Ravine," "Express Camp," were given to water holes in 1860, when Green Russell surveyed the Smoky Hill Route after the city of Leavenworth, Kansas, had been aroused to the necessity for reliable trail information by William Byers' campaign in the Rocky Mountain News. It was up to the city of Leavenworth to prove to emigrants that their city was the gateway to the gold regions by a route that cut 200 miles from the more leisurely Platte River road, which was used by the Express company. This survey provided a definite routing whereby argonauts might know the distances to wood and water; also the total mileage from Leavenworth to Denver—610 miles—which forewarned travelers of the amount of provisions they would have to carry, for no trading post, store, or even house existed along the Smoky River, the Saline, Mud Creek, Solomon's Fork, Big Sandy, Bijou Creek and other points along the route.

The chaotic conditions that obtained along the then famous but now almost forgotten Smoky Hill Route at the time Mr. Byers began his crusade for authentic trail information are best exemplified by

the stories that ran in the Rocky Mountain News of 1859 and 1860:

* * * Nine men—mere skeletons—reached Ft. St. Vrain. They had had no bread for more than ten days, part of which time they had lived on the flesh of a dead ox, partially devoured by coyotes; four days they subsisted on roots. They travelled more than a hundred miles without water * * * These men tell the story that they were induced to take the Smoky Hill Route by representatives of certain parties in eastern Kansas who employ runners on steamboats to mislead emigrants by their representations and by distributing circulars and cards purporting to be guides over the route. They are thus induced to start out with a short supply of provisions and learn when too late that all the statements are false—that there is no road at all and but little wood. Emigrants are wandering over the plains in all directions, discouraged and bewildered. Some are striking for the Platte or the Arkansas, and others are still searching for what does not exist—the Smoky Hill Road.

* * * One man tells us he knows of seventeen men who have thus per-

ished or disappeared; another says the remains of one hundred may be seen along the track * * * The protruding eyes, the sunken cheeks, the trembling knees and cracked voices of those we have seen do not lie.

Two footmen who have arrived via the Smoky Hill Route report ten or fifteen bodies unburied and many new graves. These men lived nine days on prickly pears and one hawk.

Another expedition reported is that of G. A. Fox and N. O. Ames from Ohio, who state that there was a good road from Leavenworth to Salina, after which there was no road at all. This party traveled twelve days without seeing wood and 150 miles without water except melting snow, which fortunately fell twice, otherwise they must have perished. They picked up three men who had lain down to die from hunger and thirst, having eaten nothing for four days, and brought them into Auraria.

Mr. Byers kept up his fight in exposing the ghastly conditions, overlooking no opportunity to hurl a bomb at those responsible, and saw to it that his newspaper was circulated in Leavenworth—until the Leavenworth "Times" took up the gauntlet, replying that, via the Smoky Hill Route it was only 325 miles from



Original counties and Highways of Colorado—map published in 1866—note the various stage routes traversing the state, including the famous Smoky Hill route.

Leavenworth to Salt Lake. To this Mr. Byers replied that the most charitable interpretation he could make of this gigantic perversion of facts was that a misprint had been made. He declared that the distance to Denver—for the settlements of Auraria, Cherry Creek and Highlands combined under that name—was in excess of 800 miles, according to the best information available.

This situation resulted in the survey by Green Russell, who reported in part:

"We followed the military road to Salina. Then west 73 miles to the west side of the big bend of the Smoky Hill, which stream it follows 110 miles. The track is along the bench or second bottom land from half a mile to two miles from the stream. Abundance of water at short intervals, wood and inexhaustible supply of buffalo grass. At this distance a chalk formation is reached and through it for 100 miles the road continuing along the bench land before mentioned. Three hundred and fifty miles from Leavenworth the route joins the old Pony Express road, following it 15 miles to the junction of the north and south forks of the Smoky Hill where the old road diverges to the northward and keeps along the north fork. The new road bears S.W. by W. along South Fork to Big Grove, 422 miles from Leavenworth. Three miles east of the Big Grove the last spring of running water on the Smoky Hill is found. A barrel was set in the well and no difficulty need be apprehended for water.

"The trail continues up the dry bed of the stream due west and at 17½ miles the party dug the Cheyenne Wells and found abundance of water at 7-foot depth. They walled the wells with rocks. At this point the road leaves the Smoky Hill and bears 55 degrees west across the divide across Sandy Creek." (About the location of the present Kit Carson.) "This is the longest drive without water on the whole route, being 22 miles.

"The Express Company last year" (the paper is dated May 9, 1860) "mistook this stream" (a branch of the Arkansas) "for a branch of the Smoky Hill. The new road follows the old one up the Sandy 55 miles to the Express road, which reaches Denver in about 70 miles."

The final points mentioned in the report are "Big Ravine," "Express Camp," "Big Pool," "Bijou Creek," "Dry Ravine," "Denver." These mark progress up the Big Sandy, onto the plains and into Denver. The Union Pacific with only slight deviations follows this trail through Byers, on Bijou Creek, Bennett, Watkins. The actual path crossed the present site of the Grant Smelter and came to its terminal at the foot of Fifteenth Street where it crosses the Platte River—for there was the business center of Denver at that time.

The chances are that if none but seasoned frontiersmen had attempted the Smoky Hill Route there might have been fewer casualties, save those incidental to Indian massacres; for it is delicately



A stretch of the Smoky Hill route in Colorado as it looks today.

hinted in the Green Russell report that if emigrants had had the intelligence to dig for water in the dry river beds, they might have found the precious fluid within a few feet of the surface. But the heavy percentage of travel was by "tenderfeet" who had little or no knowledge of pioneering. If water was not visible there was no water so far as they were concerned. They had no conception of distance and became panic-stricken, "wandering discouraged and bewildered" when their food supplies, purchased optimistically with an idea that they could cover forty or fifty miles in a day, gave out.

To those who traveled great distances without seeing wood Mr. Russell admits that there is one stretch of 90 miles where such a condition existed—"but there is a bountiful supply of buffalo chips," he declared. "Between waters" for a frontiersman of Mr. Russell's stamp meant the distances between available supplies of that commodity. If water was in the ground it was available, and the Russell crew knew where to find it. On the other hand, inexperienced emigrants from the east saw nothing but death from thirst at various stages of the journey where the surveyors afterward set barrels in the ground so that "there need be no apprehension for water."

It was for this inexperienced type of adventurer that Mr. Byers waged his campaign. His vision did not extend to the automobile traffic of half a century later, but he knew that road conditions—then as now—vitaly affect the building up of a new territory.

Thus his sense of news value was guided by the economics of frontier life: two gentlemen who fought out their differences on the streets of Denver were entitled to two paragraphs in his Rocky Mountain News; one man who staggered into town with an account of hardships on the Smoky Hill Route got two columns.

And the chances are that hundreds of men and women who today motor or

travel by train over the old Smoky Hill Route, via the Union Pacific Highway or railroad, owe their very existence to the efforts of William N. Byers in making the short cut from Leavenworth to Denver safe for emigrants—for there is no way to calculate how many of the last generation might have perished if his "good roads" campaign had not borne fruit. The chances are, also, that not one in a thousand of the present-day travelers over that notorious route knows anything of its dramatic history.

Good Roads Delegation Is Named by Governor Morley

Governor Morley has announced the appointment of thirty-two delegates to represent Colorado at the thirteenth annual convention of the United States Good Roads association, which will be held in Houston, Texas, April 20 to April 25. The appointment of delegates was made at the request of Gov. E. Lee Trinkle of Virginia, who is president of the association. Twenty-six of the delegates are Denver men, while the remaining six are from towns in various parts of the state.

Those named as delegates by the governor follow:

Ed Scholtz, Ralph W. Smith, Carl P. Schwab, Frank L. Bishop, Dr. J. N. Vroom, E. R. Cumbe, John B. Dodge, L. B. Utter, Roe Emery, W. C. Shepherd, William C. Shanklin, Carl S. Milliken, Charles McAlister Willcox, F. L. McFarland, Ralph Dergance, Rex B. Yeager, C. F. Oehlmann, H. A. Hicks, Col. John Galen Locke, W. D. Nash, John Norton, G. E. Turner, F. P. Bertschey, R. E. Wilson, James C. Burger and E. E. Sommers, all of Denver; and William T. Lambert, Jr., speaker of the house of representatives, Sedalia; Lieut. Gov. Sterling B. Lacy, Grand Junction; State Representative Charles A. Austin, Crook; H. S. Bushnell, Georgetown; Ralph Wienbroer, Trinidad; and the Rev. Fred Arnold, Canon City.

Seeing Colorado By Motor



COLORADO is called the Motorist's Paradise. Here where the mountains meet the plains, good roads, many miles concrete, carry the tourist to the gateways of a wonderland. From the main north and south highway roads penetrate the foothills and the mountains to regions of rugged grandeur.

Pike's Peak is within striking distance of Colorado Springs at the south end of our tour, and part of the trip is made on concrete via Manitou. This lone peak is a sentinel visible for miles in every direction. "Pike's Peak or Bust" is still a well-known slogan and is now used by the enterprising motorist who crosses the great plains from the east following the trails of the adventurous pioneers of 75 years ago.

Going north from Colorado Springs toward Denver part of the travel is on concrete. At the Garden of the Gods curious rock shapes greet the tourist, great mushrooms and other fascinating and strange figures carved from the red rock by wind-blown sands.

Just south of Littleton we come to concrete again, and from there into Denver there is pavement, and the clean, thin air of the "Mile High City" is a delight.

From Denver the tourist makes sallies in several directions. To the northeast through Brighton to Greeley there is an unbroken boulevard of concrete 44 miles long. North and westerly much of the way to Boulder is paved and the balance

is a well maintained stone or gravel road. Boulder is a favorite point of entry to the mountains. Up Boulder canyon, or the two St. Vrain canyons the way is steep alongside rushing streams of cold mountain water. Estes Park may be reached through Lyons. The Rocky Mountain National Park proves a mountain wonderland to delight the eye, and the pinnacle of Long's Peak with its sheer precipices of bare rock, seems the grand-daddy of all mountains.

And then if one has the time and the inclination there's the trip over the Fall River highway, stretching from Estes Park across Milner Pass and down to Grand Lake. At Granby this road connects with the Victory highway. From this point the motorist may return to Denver, or he may take the trail that leads to the Western Slope.

If returning to Denver the motorist again crosses the Continental Divide on Berthoud Pass, with a perfect mountain boulevard to drive over. Likewise the western route will take him over splendid highways. At Craig he will find the oil fields. The circle route thence leads to Meeker, one of the pioneer towns of Colorado and at one time an Indian trading post.

At Rifle this road connects with the Ocean-to-Ocean highway, and from there the route extends to Grand Junction, the metropolis of the Western Slope. Delta and Montrose are the next two stops, and

then to Ouray, the northern terminus of the world-famous Ouray-Silverton-Durango "million dollar" highway. Climbing out of Ouray the trail leads over Red Mountain, through the deserted towns of Iron-ton, Red Mountain and Chattanooga, down to Silverton, in the heart of the San Juan mountains.

From this picturesque mining camp the motorist again climbs, going over Lime Creek and Cascade Creek passes, down to Durango, with a side trip to the Mesa Verde national park. Back again the trail leads through Pagosa Springs, over the beautiful Wolf Creek Pass to Monte Vista, Alamosa, and thence across La Veta Pass to Walsenburg. Turning north from this point the traveler soon reaches Pueblo and Colorado Springs, the starting point, all of the time traveling over highways reaching altitudes of 11,000 and 12,000 feet, the equal of any in the entire country.

Vacation being over, the motorist carries back with him memories of clear, green forests, high peaks and deep canyons, rivers and waterfalls, all made accessible by the improved roads which have been built.

Too many drivers, seeking to arrive on the opposite side of the railroad right-of-way, get only as far as up to and including.



Street scenes in the cities of Manitou and Fort Collins—one of the mecca of tourists and the other a flourishing oil center.

U. S. Apportions Forest Funds

APPORTIONMENT of funds amounting to \$2,500,000 appropriated by Congress for the construction of improved roads and trails in the various national parks and national monuments was announced at the Interior Department today.

The Interior Department appropriation act for the fiscal year 1926, which has just been signed by the President, contains an appropriation of \$1,500,000 to be expended for the building of these much-needed roads and trails in the national parks and monuments under the jurisdiction of the National Park Service. An initial appropriation of \$1,000,000 for this road and trail work was made available in the deficiency act, which was signed by the President December 5, 1924, making in all \$2,500,000 available.

These appropriations were made under authority of the National Park Highways Act of April 9, 1924, which authorized the appropriation of \$7,500,000 for the carrying out of a three-year road and trail construction program.

Of the \$2,500,000 fund appropriated, the sum of \$453,000 has been allotted to Glacier National Park, Montana, of which \$410,000 is to be spent on the Transmountain road. This road is being built across the Continental Divide, and when completed will be the first means of access through the park from the east side to the west by motor or other vehicular conveyance.

In the Yosemite National Park, California, \$404,000, the next largest allotment, will be expended. Approximately half of these funds will be used in paving the El Portal road from the park boundary to Yosemite Village connecting with the all-year highway which the state is building to El Portal and which is expected to double the automobile travel into Yosemite. The remainder will be devoted to the reconstruction of the Wawona, Big Oak Flat, and Mariposa Grove roads.

The sum of \$235,500 has been allotted to Mount Ranier National Park, Washington, of which \$75,000 has already been allotted to replacing several old, dangerous wooden bridges with modern concrete structures on the Nisqually road from Longmire to Paradise Valley, one of the most important park roads.

Crater Lake National Park, Oregon, is to have \$183,000 of these appropriations, to be expended on the entrance roads from the directions of Medford and Fort Klamath.

In Sequoia National Park, California, \$179,000 will be expended on the reconstruction, construction and surfacing of The General's Highway from the Middle Fork entrance through to the magnificent grove of giant sequoia trees known as "Giant Forest."

The sum of \$166,000 has been allotted for road work in the Grand Canyon National Park, Arizona. This is to be expended on the road to the Maine entrance and connecting branches, the reconstruction of the Grand Canyon-Desert View road to provide an all-year highway, and on trail work.

The \$140,500 allotted to Rocky Mountain National Park, Colorado, will be divided between six different projects, all of them important. The famous Fall River road, the highest road in the National park system, reaching an altitude of 11,797 feet on the top of Rocky Mountain, and the High Drive from Fall River to Moraine Park, getting the larger share of these funds.

The largest of the parks, Yellowstone, in Wyoming, Montana and Idaho, is only allotted \$130,000 owing to the fact that its 356 miles of roads were well built by the army engineers in the days when the War Department assisted in supervision of the park. The entire allotment is to be expended on reconstruction and surfacing of existing roads.

The sum of \$110,000 is available for road work in the Hawaii National Park. The provisions of the Federal aid act have been extended to Hawaii for the first time and the park road work will be done in connection with the Federal aid work and will be handled by the Bureau of Public Roads.

In Mount McKinley National Park, Alaska, \$80,000 has been allotted for road work, which is to be handled by the Alaska Road Commission.

Lassen National Park in California has been allotted \$110,000 for road work.

Hot Springs National Park in Arkansas has been allotted \$53,000 for road work.

Lafayette National Park in Maine has been allotted \$50,000 for road work.

Mesa Verde National Park in Colorado has been allotted \$44,000 for road work.

Platt National Park in Oklahoma has been allotted \$42,000 for road work.

Wind Cave National Park in South Dakota has been allotted \$20,000 for road work.

Pinnacles National Monument in California has been allotted \$3,000 for road work.

A fund of \$97,000 has been reserved for

further road work in the national monuments and for surveys, plans, etc.

In addition to the \$2,500,000 actually appropriated, the 1926 Interior Department appropriation act authorizes the Secretary of the Interior to approve projects, incur obligations, and enter into contracts for additional road work in the national parks and monuments not exceeding a total of \$1,000,000.

Salida Citizens Complete "Tenderfoot Spiral Drive"

What is perhaps the most picturesque scenic road in the whole United States was finished recently when the last bit of earth was lifted by the big steam shovel on the "Tenderfoot Spiral Drive," a road that winds in corkscrew fashion three complete times around Tenderfoot mountain, near Salida, Colo., finally gaining the summit. It affords an excellent panorama of Salida, nestling at its foot, the fertile valley of the upper Arkansas, the majestic Sangre de Cristo range of the Rocky Mountains, the well-known collegiate group and the Shavano group, the home of the now famous "Angel of Shavano."

In honor of the event a dedication of the new road was held last week. Several hundred persons made their way to the summit, many in cars and some climbing the steep trail beginning at the Salida depot. Pathe News was on the job and caught the string of cars on two laps of the road, the big steam shovel disposing of the last few tons of earth, and the crowd at the summit.

This hair-raising road is just a little over two miles long, and yet mounts the more than 500 feet from base to summit over easy and safe grades. It is a thirty-year dream of Salida residents, and represents the combined efforts of three civic organizations and the hearty co-operation of the citizenry.



A stretch of gravel surfaced roadway over "Nine Mile Hill" north of Meeker, in Rio Blanco county.

American Forest Week

Forests are the source of traffic. They build roads—economically—and guarantee use for them. An unproductive, especially a burned forest, neither builds nor uses roads—nor anything else. In view of the general public indifference to forests in this country, President Coolidge says, in proclaiming American Forest Week for April 27-May 3, that there is danger in our neglect and urges upon the public that our forests be put to work and kept at work.

Now there are many ways in which a forest may work—as many ways as there are uses for the forests, from supplying a week-end camping place to providing the necessary supplies of lumber, paper and other commodities for a nation. Until recently we have supplied our forest needs out of a surplus in the United States. Such a situation required no thought for production or renewal. We were working on velvet. But the nap is worn off our velvet and now we are faced with the necessity of production as well as utilization.

Timber must be produced in the form of a crop. We must be content with yield and leave the stand to produce future yields. The only difference between the forests and other agricultural crops is the time factor, and with a forest to start with where there is a representative succession of age classes, this factor is of no importance, for there is a yield every year, and yet the forest remains always.

While it is yielding crops which require roads over which they may be hauled, it is protecting the headwaters of streams which supply cities with drinking water, irrigate fields and turn the wheels of industry; it is attracting summer visitors which require roads over which to drive to their favorite haunts. Several millions of dollars are spent every year in the West to give greater access to the uses of the forests of our mountains. We are not all foresters when it comes to establishing policies, computing growth and fixing yield, but in connection with one very important phase of forestry every man who goes into the forests is a forester, and that phase is fire.

Although American Forest Week invites our attention to many sides of forestry, this is the one for us to concentrate on. Until not only fire suppression but fire PREVENTION is established on an efficient basis very little else can be accomplished. A share of this is our job. Of 207 fires in Colorado last year, 9 resulted from brush burning. More fires were caused by smokers than any other cause—66. Forty-seven more resulted from camping. Of course we do not do all the brush burning, smoking and camping in the State of Colorado, but we, collectively, as road builders and road users, come in contact with most of the rest of those who do and thereby have an opportunity to accomplish something.

American Forest Week begins April 27,

but as far as fire protection is concerned, it does not end until next winter's snows have closed the fire season.

Contractor Rushes Work on New Concrete Road Bridge

Despite adverse weather conditions, work is advancing rapidly on the new stretch of paving which is being constructed on the road to Pueblo. Seventy-five men and thirty teams are continually at work on the grading and some new phase of the project is undertaken every fortnight. Actual paving will be started about May 1.

A large crew of men is now grading the road and others are sinking the first of two or three concrete tubes which will serve as bases for the center pier of a 300-foot bridge across Fountain creek. The west abutment of this bridge was completed two weeks ago and the east abutment is now being constructed. The tubes will be sunk to a depth of about 25 feet.

Pilings will be driven for the falsework on this bridge in about 30 days. It will be nearly two months before the center pier is completed.

The approaches to the Kettle creek bridge on the Denver road were begun yesterday, but work had to be abandoned almost immediately, owing to snow.—Colorado Springs Gazette.



A night view of the beautiful 1100-ft. concrete bridge over the Platte River at Fort Morgan.

With State Road Builders

Pueblo Editor Urges Use of Convicts on Road Work

The use of convicts in building state highways was urged by Frank S. Hoag, of Pueblo, member of the board of corrections, in an address before the Arkansas Valley Association of County Commissioners March 14 at the quarterly meeting of the organization.

Hoag declared that Warden Thomas J. Tynan and the board of corrections, governing body of the penitentiary, are anxious that the various counties find use for the convicts on the big road jobs, especially in the mountains. The saving to the counties will be 20 to 40 per cent, it was pointed out. The state provides the convicts, their clothing and everything but road equipment and daily maintenance.

Only about a third of the more than 900 convicts are at present being worked on jobs outside the prison walls. The officials are anxious to get employment for the remainder who can be worked away from the penitentiary with safety. The trouble at the institution is caused by the inmates who do not have anything to occupy their minds or bodies, according to Hoag.

George L. L. Gann, prominent Pueblo business man, was the unanimous choice of the association for the appointment to succeed himself as member of the state highway advisory board from Division No. 4. A copy of the resolution endorsing Gann, which was proposed by W. L. Rees, of Pueblo, was sent Governor Clarence J. Morley, who will make the appointment.

A tour of inspection over the flood protection work was made by the county officials, who were entertained at a banquet in the evening provided by machinery salesmen. The next meeting will be held in Pueblo in June and will be two days, one day for business and one day for pleasure.

Speakers at the March meeting included: J. W. Beckley, of Delta, president of the Colorado Association of County Commissioners; J. Arthur Phelps, of Pueblo, attorney of the state association and district attorney of the Arkansas Valley; Robert H. Higgins, of the state highway department; H. W. Moore, of the H. W. Moore and Company, Denver; T. Lee Witcher, county attorney of Fremont county; and J. C. Vaughn, of Rocky Ford, who presided in the absence of Ray McGrath.

Those present at the sessions were: J. C. Lent and W. L. Rockhill, Baca county commissioners; Dan Carl and John C. Pepper, commissioners, and Miss Della C. McGillivray, county clerk of Bent county; F. A. Bromley, county clerk of Chaffee county; S. S. Spillars and W. F. Tarbox, Crowley county commissioners; Clarence Pond, Custer county commissioner; C. A. Somerville and Frank Steinmier, county commissioners, and R. M. Booth, county clerk, Fremont county; J. O. Walker,

John Lamberson and P. O. Meyer, Kiowa county commissioners; J. J. Abercrombie and W. H. Green, commissioners, and J. B. Romero, county clerk, Las Animas county; J. P. Vaughn, J. G. Washburn and D. P. McClaren, commissioners, Carlos M. Wilson, clerk, and C. C. Hurnsburg, attorney, Otero county; J. G. Schlager, commissioner, Miss Vera Rosebrough, clerk, O. H. Rodenbaugh and Al Hoyt, road overseers, Prowers county; W. L. Rees, O. G. Smith, Hurb H. Wilson, commissioners, William Barber, clerk, and Charles Stepp, road superintendent, Pueblo county. Huerfano county was not represented.

Machinery salesmen and state highway officials included: J. O. Clayton, Pueblo; George L. Meffley, Pueblo; H. S. Riley, Colorado Springs; Frank B. Egan, Denver; J. P. Sanderson, Pueblo; L. R. Shallenberger, Pueblo; E. E. McKelvy, Pueblo; R. C. Peppers, Hudson; H. W. Moore, Denver; R. H. Higgins, Denver; G. L. L. Gann, Pueblo; Lewis Swink, Rocky Ford; J. D. Bell, Pueblo.

County Officials Appoint New Highway Supervisors

County commissioners A. H. Poppen, G. W. Dunckley and R. I. Gwillim have announced the appointment of the following maintenance men for the year 1925:

The Victory highway from Gibraltar Rock near Mt. Harris, west to the Moffat county line, will be under the direction of J. W. Cawfield, of Hayden, former county commissioner. Frank B. Leslie will have charge of the road from Oak Creek to the Gore range.

Overseers for the local road districts so far appointed are as follows: William T. Mosher, Deep Creek; William Green, Williams Forks; Mark Harrison, Twenty-

mile Park; Walter Hartman, Snake River; Gordon Adair, South Hayden; Charles L. Arnold, Yampa; Louis Summer, Sidney; O. S. Perry, Toponas; B. F. Williams, Steamboat Springs; Elmer Yoast, Elkhead; John R. Lockhart, Oak Creek; D. L. Harmon, Elk River; W. H. Widger, Dunckley; Ralph Whiteman, Mt. Harris. Four appointments are still to be made, for the Rabbit Ear highway, Yellow Jacket pass, the state road between Steamboat Springs and Oak Creek and from Steamboat Springs to Mt. Harris.

24 Road Overseers Named For Lincoln County Roads

Twenty-four road overseers have been named for the various districts in Lincoln county by the county commissioners at Hugo. The newly-appointed list follows:

O. J. Crawford, Shaw, No. 1; Jim Ready, Genoa, 2; not filled, 3; T. S. Taylor, Limon, 4; E. L. Elam, Genoa, 5; H. G. Heimbauch, Bovina, 6; not filled, 7; R. E. Robinson, Hugo, 8; T. C. Schnebly, Boyero, 9; Tim Hammond, Hugo, 10; Roy Aubert, Hugo, 11; J. T. McClure, Kendrick, 12; E. J. Elliott, Boyero, 13; Ben M. Chaboude, Amy, 14; S. M. Stevens, Rush, 15; Gus Grube, Hugo, 16; C. C. Logan, Rush, 17; Ralph Wood, Carr Crossing, 18; P. L. Coakley, Rush, 19; William Bombeck, Haswell, 20; C. M. Igou, Hugo, 21; Carl Kravig, Karval, 23; Ralph Barr, Arriba, 24.

Dooling Brothers, Denver contractors, were low bidders for a mile of heavy grading between Golden and Central City, on what is known as the Guy Hill road, or Golden Gate canon highway, in Jefferson county. Most of the work consists of widening the roadway, involving the moving of solid rock.



A fine stretch of gravel surfaced road near Hayden on the Victory Highway, constructed with Federal Aid funds.



Keystone Culverts were first installed in Colorado in 1911.

These same culverts are still in service today, and if their present excellent condition is any criterion, they will be in service for a good many years to come.

If the only true test of value is service. If Keystone have proven themselves to last as long as any other culvert you want to compare them with. What stronger evidence could a culvert purchaser desire?



THE COLORADO CULVERT PUEBLO



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Keystone Culverts meet the requirements of Government, State, City and County Officials throughout the United States. Keystone price is always uniformly lower than the price of most other culverts.

No culvert of any type in general use is giving more dependable, satisfactory service in Colorado than Keystone. Be sure and get a price from us on Keystone Culverts before you place your next order.

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Work on Big Thompson Road Finished by State Forces

Work of reconstructing the roadway through the Big Thompson, leading to Estes Park and the Rocky Mountain national park, for a distance of seven miles, to eliminate the danger of flood washouts has been practically completed, according to A. B. Collins, division engineer.

The roadway has been raised several feet at a score of places between the Handy Dam and the Forks hotel. Retaining walls of heavy rock were constructed at a number of points where floods have blocked the road in previous years.

Crushed rock and clay were used in resurfacing the roadbed over the seven miles. The road also was widened in a number of places. To do this it was necessary to blast away several high rock points. Trucks were used in hauling the surfacing materials. Two crews of twenty men each were employed on the work for two months.

E. M. Collins supervised the work of resurfacing the roadbed.

Latest reports state that the road is now in fine condition, and by the time that the peak of the tourist travel arrives in the middle of summer should be in the pink of shape. During the summer months the road through the Big Thompson canon is one of the most heavily traveled in the state. It is one of the widely-known scenic highways in America.

State to Let Contract for New Merino-Brush Highway

On April 16 the State Highway Department will receive bids for the construction of nineteen miles of grading and sand-clay surfacing between Merino and Brush.

This road will be constructed over an entirely new line running through parts of Logan, Washington and Morgan counties. Besides eliminating the well-known "stair-steps" stretch of roadway between Merino and Brush, with its score of tortuous twists and right-angle turns, the new road line will reduce the distance between these two points by several miles.

By constructing the road over a new survey line the present road will be used as a "detour." Every effort will be made by the highway engineers to have the new road open for traffic by early fall. A light coating of sand and gravel will be used for surfacing, preparatory to paving of the road next summer.

This is a Federal-aid project and one half of the cost of construction will be paid for by the U. S. government. Starting of work on the project was delayed for several months through difficulty experienced by the State Highway Department in obtaining a satisfactory right-of-way. It is the largest grading project ever contracted by the state.

Winterburn & Lumsden, well-known highway and drainage contractors of Grand Junction, have been awarded a contract for the construction of a large irrigation project in Mesa county.

"Known All Over the World"

All communications should be addressed
to "The Director and Secretary"



THE SCIENCE MUSEUM,

SOUTH KENSINGTON,

LONDON, S.W. 7

11th March, 1925.

Please quote at the head of your
reply Ref. No. 25/350 Sc.M.

Sir,

I am directed by the Board of Education to inquire if you would be willing to favour Them by presenting to the Science Library of this Museum "Colorado Highways" and other publications of your Department.

The addition of these publications is very desirable and would be much appreciated by readers.

I am to enclose, for your information, a copy of a leaflet describing the Library.

I am, Sir,

Your obedient Servant

Director.

The Director,
Highways Department,
Denver,
COLORADO,
U.S.A.

The above is a reproduction of a letter received by Maj. L. D. Blauvelt, State Highway engineer. It is self-explanatory, and needless to say the Science Museum of London has been placed upon the mailing list to receive a copy of "Colorado Highways" each month.

Better Roads in Colorado Reduces Gas Consumption

Because Colorado's roads are so much better than those in any other state in the Union, and because Coloradoans generally are using better motor cars than the average resident of the United States, average consumption of gasoline by Colorado-owned automobiles is 35.5 gallons less per car annually than the average for the entire United States, according to figures announced by James Duse, state oil inspector, from data compiled by William J. Beggs, statistician in the oil inspection department.

Colorado's average yearly gasoline consumption per car over the 11-year period from 1914 is 414.5 gallons. The average for the entire United States for the same period was 450 gallons.

In 1914, the first year for which figures are available, there were 21,439 automobiles in Colorado. These motor cars burned that year 10,372,238 gallons of gasoline, an average of 483.3 gallons per year.

In 1924 there were 215,473 machines in the state, and their total gas consumption was 91,312,882 gallons, or 423.8 gallons for each machine in the state for the year.

The decreased average consumption in 1924 indicates that better types of motors are being used now than in 1914, and also that roads are in better condition than in years past, according to Duse.

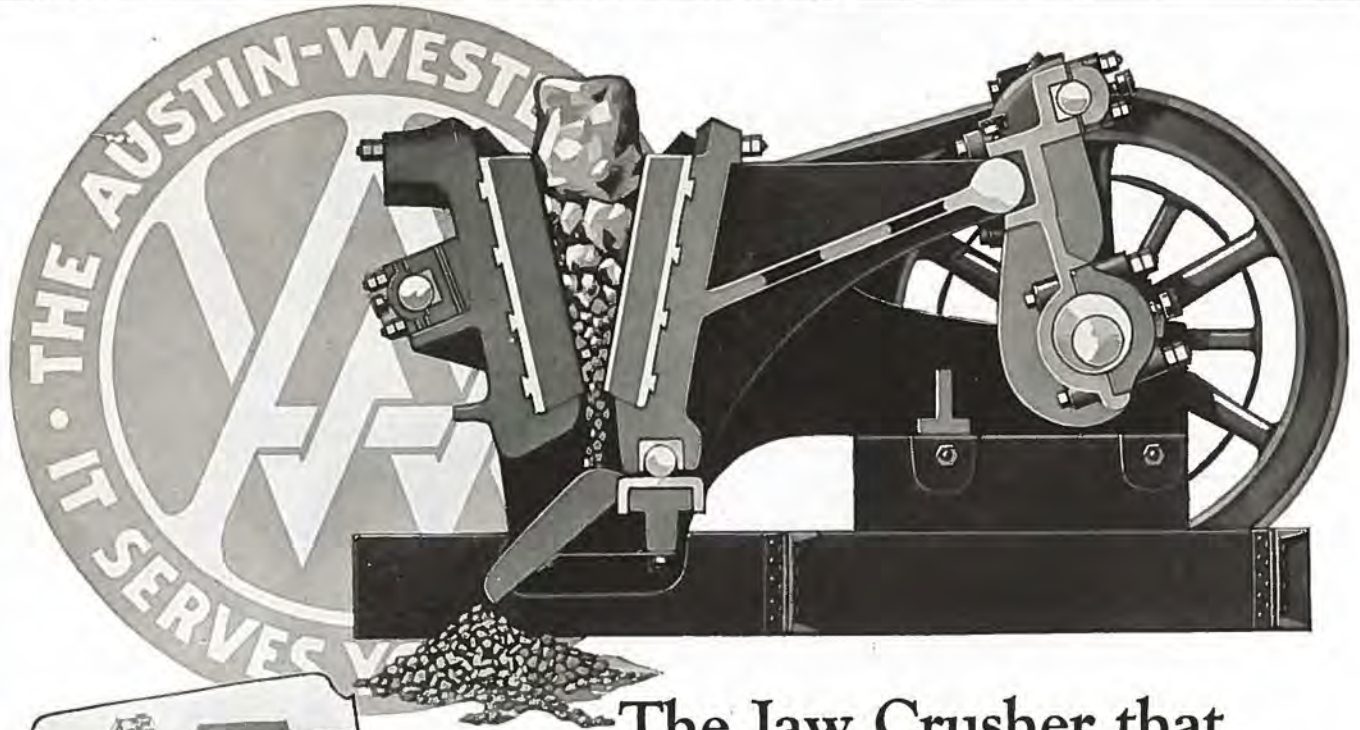
Charles Cornwall Appointed Huerfano County Road Boss

"If I am given the proper support and co-operation, I know that I can give Huerfano county good roads."

That statement was issued today by Charles Cornwall, former sheriff of Huerfano county, and recently named county road supervisor by the board of county commissioners.

"I have observed that our road equipment has not received the best of care and it will take time to get everything in order. If the most efficient work is to be done, it is highly essential that our equipment be in first class order.

"I want to make it plain that my workmen must be conscientious in their work. They are expected to do a full day's work. They must begin work on time and keep steadily at it until quitting time. We will not tolerate the loafer, and if some of my workmen think that they have a 'political job' they have another think coming."



The Jaw Crusher that is Different

And what this Difference means to You

THE important thing is not so much the fact that the Western-Aurora Crusher has broken away from, and left behind, the old Blake Type Jaw Crushers with their springs and toggles as it is the fact that the unique Western-Aurora design means much to you in the way of service and satisfaction.

Space won't permit anything like a complete description of the now famous Western-Aurora two-blow stroke, but the coupon will bring you a catalog that tells all about it. What counts is that as a result of this continuous two-blow stroke and freedom from springs and toggles a Western-Aurora Crusher in your plant means:

- Greater output,
- Fewer delays,
- Less power required for operation, and
- Longer life for the crusher itself.

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The Jaw Crusher that is Different.

When choosing a crushing plant, your first thought is naturally of the crusher itself—but elevator, screen and bin are of almost equal importance. This fact is always in the minds of Western engineers, and as a result you will find each unit in the Western-Aurora Crushing and Screening Plant on a par with the crusher, and ready to give you the same standard of service.



You will find many worth while ideas and much valuable information in this catalog. Better clip the coupon now, while you think of it.



I would like the catalog.

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THE AUSTIN-WESTERN ROAD MACHINERY CO. CHICAGO

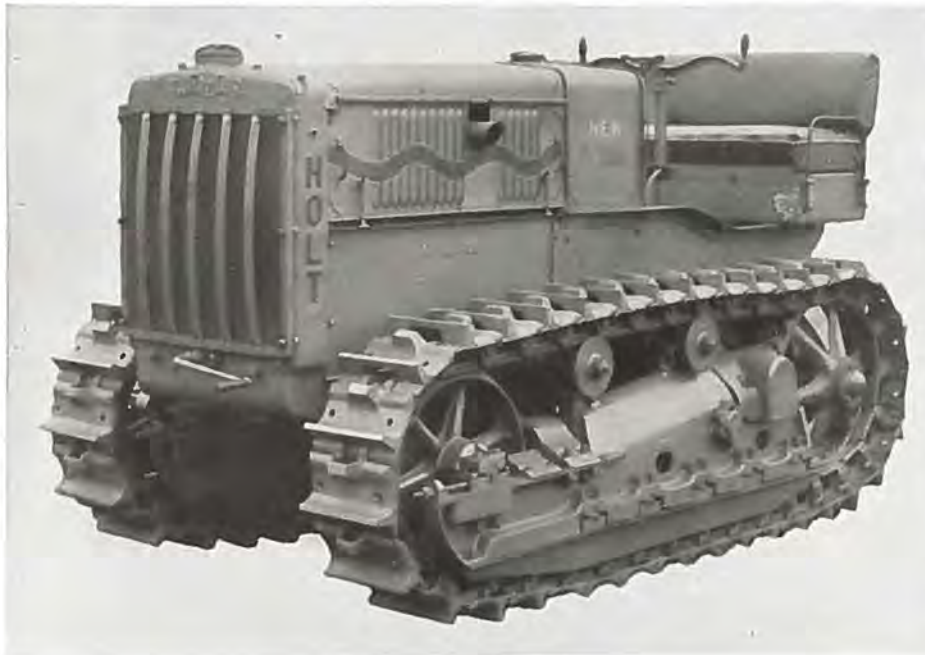
Distribution of Automobile License Fees, 1924

Reprinted from "American Highways"

State	Total Gross Receipts	Cost of Collection and Other Expenses	Net Receipts for Highways	To State Highway Department					Unexpended Balance	Average Revenue Per Motor Vehicle
				Administration	Construction	Maintenance	To Counties	To Cities		
Alabama	\$ 1,853,289	\$ 35,150	\$ 1,612,218	\$ 207,395	\$ 1,152,118	\$ 252,704	\$ 205,921		\$11.72	
Arizona	339,721					339,721			5.87	
Arkansas	2,333,033	68,400	2,264,633	181,600	500,000	583,033	1,000,000		16.31	
California	7,011,112	851,794	6,159,317	467,083	2,612,575		3,079,658		5.27	
Colorado	1,249,480	105,343	1,144,136	572,068			572,068		5.85	
Connecticut	5,058,908		5,058,908		3,213,065	3,284,981			23.45	
Delaware	604,354		604,354	25,816	449,354			129,184	17.20	
Florida	2,500,000	150,000	2,350,000	112,579	164,421		573,000		11.94	
Georgia	2,532,147	82,788	2,449,358	278,838	1,586,862	583,657			12.16	
Idaho	1,287,338		1,287,338	32,184		289,662	965,540		18.57	
Illinois	11,513,957		11,513,957		11,513,957				10.16	
Indiana	4,126,058	219,200	3,906,858	3,906,858					6.17	
Iowa	8,995,118	455,065	8,540,065	574,212	1,434,390	2,722,076		2,512,575	14.64	
Kansas	3,412,355	205,445	3,206,910				3,206,910		8.30	
Kentucky	3,281,535	69,535	3,212,000	3,212,000					14.15	
Louisiana	2,844,979	99,265	2,745,714	2,745,714					15.97	
Maine	1,934,360	216,477	1,717,883	88,661	436,350	1,192,869			14.99	
Maryland	2,135,311	240,429	1,894,882	66,500		1,119,466	708,976		10.91	
Massachusetts	8,122,166	842,805	7,279,360	70,916	2,850,238	4,319,931		38,275	12.08	
Michigan	11,261,282		11,261,282	821,440	1,199,651	2,718,014	5,623,232	1,100,408	12.85	
Minnesota	8,559,130		8,559,630	144,964	1,978,849	3,135,816	3,300,000		16.84	
Mississippi	1,160,730	34,821	1,125,908		489,777		636,132		8.62	
Missouri	4,525,914	258,831	4,267,082	749,012	2,585,000	933,070			8.30	
Montana	776,320	32,010	744,309				744,309		9.62	
Nebraska	3,594,437	125,805	3,468,632		963,031	1,255,435	1,250,165		11.64	
Nevada	181,969	9,970	171,999		171,999				9.92	
New Hampshire	1,522,186	110,392	1,411,794	90,000	375,000	946,794			20.67	
New Jersey	8,854,808	517,620	8,337,188	207,126	2,780,306	1,724,754	3,625,000		17.12	
New Mexico	392,929	19,646	373,282	26,316	173,483	173,483			9.41	
New York	24,089,241								17.04	
North Carolina	7,150,061	743,860	6,406,200	234,471	1,891,692	3,276,138		1,003,898	23.38	
North Dakota	816,871	43,075	773,796	106,925	398,435		268,435		6.98	
Ohio	11,721,041	276,804				5,695,635	5,748,602		9.34	
Oklahoma	3,692,898	369,289	3,323,609				2,784,155	539,453	10.93	
Oregon	4,766,070	223,611	4,542,358	3,406,768			1,135,589		24.74	
Pennsylvania	20,051,021	1,502,751	18,548,270	1,720,872		16,827,397			16.32	
Rhode Island	1,618,773	79,432	1,539,341	137,000	540,000	719,000		143,000	16.96	
South Carolina	1,151,983	205,001	946,982	160,369		48,884	737,729		7.05	
South Dakota	2,142,446	64,273	2,078,172		1,499,712		578,460		15.05	
Tennessee	2,597,567	55,330	2,542,237	298,821	972,297	1,271,118			12.69	
Texas	10,474,558	429,964	10,044,594		7,158,997		2,885,597		12.99	
Utah	487,110		487,110		445,959			41,151	7.13	
Vermont	1,323,376	85,295	1,238,081	75,000	353,081	660,000		150,000	21.63	
Virginia	3,715,049	193,035	3,522,014			3,522,014			14.14	
Washington	4,475,197	159,772	4,315,425	57,253	4,258,172				14.62	
West Virginia	2,874,587	159,466	2,715,121	275,678	1,223,443	776,000		440,023	14.53	
Wisconsin	6,712,637	250,845	6,461,792	168,000	1,508,389	3,062,319	1,615,448	107,636	12.45	
Wyoming	448,664				448,664				10.28	
Hawaii	568,515	12,472	556,042				541,299		14,743	
Total	\$222,842,641	\$9,605,066	\$176,710,191	\$21,222,439	\$58,819,267	\$61,433,911	\$41,077,249	\$2,606,473	\$4,322,849	\$13.29

a=Used for administration, construction or maintenance.
 b=Construction and maintenance.
 c=Retirement of bonds and pay interest.
 d=To ferries.
 e=Construction aid to counties.
 f=To retire county bonds assumed by State.
 g=Must be used for maintenance of State system.
 h=Fiscal year.

i=\$890,000 paid on sinking fund.
 j=Including road Districts.
 k=Auto license and gas tax are combined in one fund.
 l=Includes balance of last year.
 m=All goes to State General Fund.
 n=\$160,000 for bridge purchase.
 o=\$50,746 to road equipment.

HOLT**CATERPILLAR**
Reg.U.S. Pat.Off.**Tractor**

You Must
See the
New 5-ton
Caterpillar
Loaded to
Realize its
Enormous
Power

The New 5-Ton will pull 25 per cent more than any tractor of the same size motor, which means a big saving in fuel and oil. It will pull a 10-ft. blade grader. Let us show you the New 5-Ton Caterpillar in operation.

The 2-Ton Caterpillar will solve your maintenance problem and save money. The powerful 10-Ton for heavy construction is recognized by the big road builders as the most dependable and economical tractive power.

Stockland Quick-Lift Graders

There must be reasons for grader designs.

We suggest that, before you purchase your next grader, you consider the matter of design very carefully. Send for the complete story of a Road Grader built to do its work—it's all in the Stockland GOOD ROADS MANUAL—plus a lot of information about road grading—No obligation—get your copy by return mail.

See the New Ransome Concrete Mixer

before you buy. A fast, sturdy, efficient machine at a low price. You will appreciate a better mixer—Why not look it over?

RANSOME TILTING TRAILER MIXERS
RANSOME STANDARD BUILDING MIXERS
RANSOME PAVERS
RANSOME CONCRETE CHUTES AND TOWERS

Clinton & Held Co.

1501-1511 Wazee Street

DISTRIBUTORS

Denver, Colorado

A Colorado Wonder Road

(Continued from Page 6)

hilarating, thrilling, unusual and stirring automobile trips that could be taken or imagined, and the Ford machine had made what could be truly termed a world record, having conquered one of the earth's most noted mountain drives.

The machine that made the trip is a 1911 Model T Ford, five passenger, 20 H. P., 1500 pounds weight, and was sold to Messrs. Crosby and Phinney some weeks ago by Mr. Hartman.

Enroute to Red Mountain and on the return many magnificent photographic views were taken, including several with the machine standing in snowbanks at altitudes of 10,500 and 11,000 feet.

It was a trip that every gentleman who took it will always remember as one of the most unusual and thrilling experiences of his life.—Reprinted from "Ap-pian Way."

Since the gentlemen made their famous trip in the jointly-owned flivver, marvelous improvements have been made on the roadway between Ouray and Silver-ton. Today the traveler finds a broad, smooth roadway to drive over.

Thousands of dollars of state and Federal money have been expended in making this one of the most picturesque mountain boulevards in America.

The towns of Ironton and Red Mountain, which the Montrose party found thriving mining camps, are now no more—"ghost towns," with empty buildings and fast passing from the picture.

State to Pave Highway to Fort Logan Military Post

At last the State of Colorado is about to carry out its pledge to the U. S. government in constructing a paved road from Petersburg to Fort Logan, local military post.

On April 3 the State Highway Department opened bids for two miles of pavement located between these two points. Bids were asked for on two types of pavement—straight concrete and asphalt with a concrete base. Thirteen contractors submitted bids for the work, only two of whom submitted bids for the asphalt surfacing.

R. L. Hanes, Denver, submitted the lowest bid for the concrete, while the Allied Contractors, Inc., also of Denver, were low bidders on the asphalt pavement. The bid of Hanes was \$37,000, which was approximately \$10,000 less than the Allied concern agreed to construct the asphalt pavement for.

Last year this road was graded and gravel surfaced. The highway department also constructed a new steel and concrete bridge over the Platte River, located a half mile west of Peterburg.

A short time after the inauguration of Gov. Clarence J. Morley he ordered the highway engineer to advertise for bids for a paved roadway. Plans for this paving were prepared last year, but the then governor, William E. Sweet, declined to approve the paving project, and ordered that the road should be gravel surfaced instead.

Several years ago the government threatened to abandon the military establishment at Fort Logan unless the roadway to the post was paved to a connection with the Denver-Littleton paved highway. After several conferences with state and Denver officials it was pledged that the state would construct the pavement.

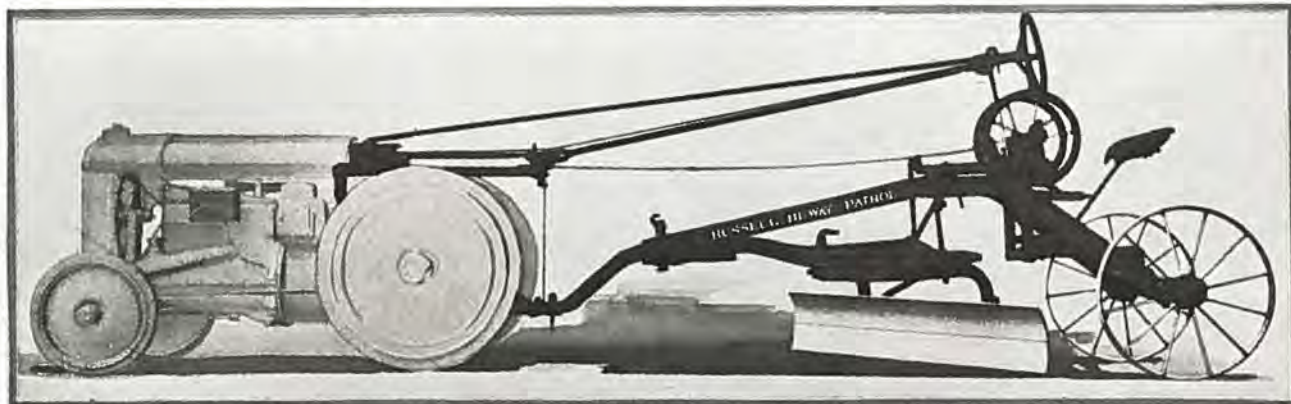
Yellowstone Park to Open Summer Season on June 18

The formal opening of Yellowstone National Park this year will take place on June 18 at West Yellowstone, Montana, the western entrance to the park, according to an announcement from the Department of the Interior.

Appropriate ceremonies have been planned for the opening events, and local color will be given by the presence of a number of cowboys and pack animals. The governors of Montana, Idaho, Wyoming and Utah have signified their intention to be present, and will make a tour of the park afterwards. In addition to Mrs. Ross, governor of Wyoming, the women of the country will be represented by Mrs. John D. Sherman, president of the General Federation of Women's Clubs.

Although the hotels and permanent camps will not be open until June 18, as soon as the roads are free from snow, which sometimes occurs several weeks earlier, the park will be open to motorists carrying their own camping equipment, and food supplies may be purchased at the park stores.

RUSSELL FORDSON PATROL



A ONE MAN UNIT

TRACTOR CAN BE INSTANTLY DETACHED—RELEASING IT FOR OTHER WORK

All controls same as on tractor itself. Operator can start, stop, turn, speed up or slow down, handle clutch and shift gears without leaving grader. Steering device is put on without drilling any holes in tractor.

Grader can be used as a standard Horse Patrol by addition of regular front trucks and horse pole. Can be detached from Fordson in fifteen minutes, releasing tractor for any other duty.

Steering device can be used with other equipment.

Grader is standard RUSSELL HI-WAY PATROL—a 6 or 8 foot blade—weight 1200 lbs. Has worm gear lift with absolutely no loss motion in connections. Full reversible blade. Adjustable lifting arms. Comfortable spring seat.

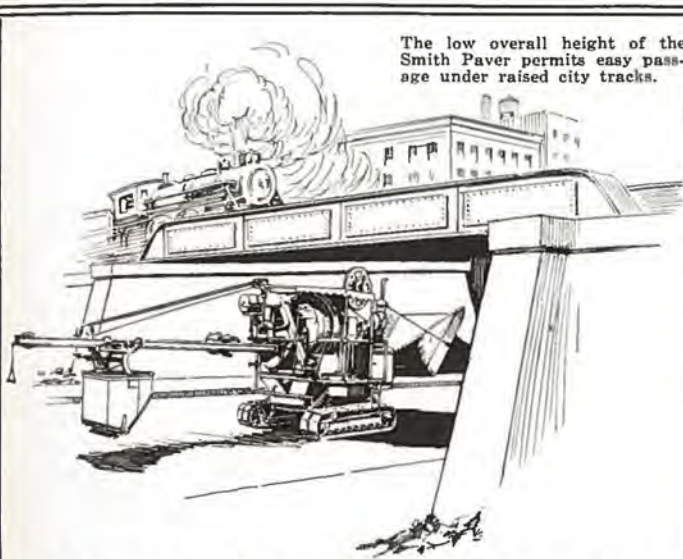
Six wheel construction with draw bar extension permits short turns.

Fits any FORDSON Tractor. Use one that you have or buy from your own Local Dealer.

THE HERBERT N. STEINBARGER CO.

1640 WAZEE ST. CONSTRUCTION EQUIPMENT DENVER, COLO.

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Lowest Overall Height and What It Means to You

RUGGED, squatty, hugging the ground—the Smith Paver with lower overall height and low center of gravity has set a new standard in paver design.



There is no superstructure to dismantle when shipping a Smith Paver. It clears all railroad trestles.

This low overall height means not only the physical advantages—as indicated in the sketches—but it indicates Smith concrete mixer engineering ability—forethought—care in design.

It means a lower center of gravity.

It means less vibration—no light superstructure.
It means compactness, strength, long life.

It means clearance of bridges, trestles and all ordinary overhead obstructions, without dismantling.

And all of these are reasons why Smith Pavers require less maintenance work—cause fewer delays—and pave faster—with *more* profits to the user.



The Smith can operate in the closest quarters—its compact construction and low overall height permitting work in alleys even when there are overhead obstructions.

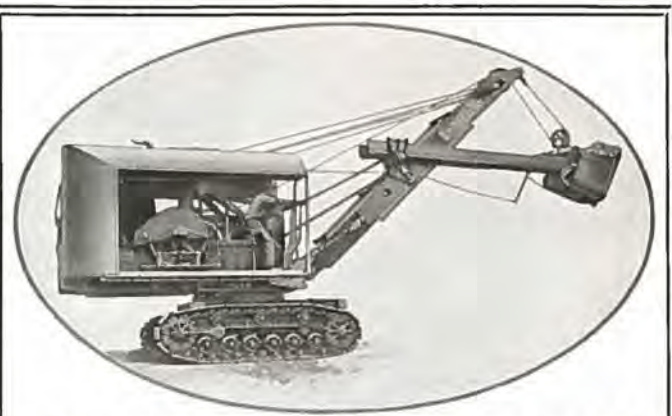
The T. L. SMITH COMPANY

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DENVER



SMITH PAVERS



Greater Digging Range With No Useless Weight

The P & H Shovel has long digging reach. It can force the dipper to maximum height and **HOLD IT IN THAT POSITION** with a comparatively **SHORT BOOM**.

This is due to the powerful positive crowding motion which is effective at **ANY POSITION OF THE DIPPER**.

The short boom means the *elimination of useless weight* not only in the boom itself but in the counterweight necessary to balance a heavy boom.

The weight of the P & H is concentrated in the **VITAL MACHINERY AND WEARING PARTS** which have approximately the same weight as any other shovel of similar capacity and in addition have **GREATER STRENGTH** because of the larger percentage of alloy and heat-treated steels.

Quality of material and proper proportioning of all parts are the distinguishing features of the P & H Shovel.

New Power Clutch Control Increases Output

The latest in Excavator control—the operator of a P & H simply moves the levers with a slight pull and engine power does the rest—less fatigue, greater speed of handling and larger output.

HARNISCHFEGER CORPORATION

Successor to

PAWLING & HARNISCHFEGER CO.

Excavating Machinery Division
Established in 1884

3857 National Ave., Milwaukee, Wis.

Sales Representative:

Paul Fitzgerald
INDUSTRIAL & CONSTRUCTION

EQUIPMENT

U.S. NATIONAL BANK BLDG.
DENVER, COLO.

P & H GASOLINE SHOVEL

Gov. Morley to Select New Member for Advisory Board

At the time of going to press with this issue of Colorado Highways, Governor Clarence J. Morley had not announced the appointment of a new member to the state highway advisory board to fill the vacancy on the board caused by the death of John A. Donovan, Longmont, representing the sixth district.

Mr. Donovan died in Dener at St. Joseph's hospital on February 10. He had served on the board since 1923, having been appointed to the office by Governor William E. Sweet. He was identified with the good roads movement in Colorado for many years, and his services on the advisory board were marked by an unselfish interest, insisting at all times upon an impartial distribution of the highway funds.

Mr. Donovan was born in Cincinnati on April 12, 1857, and moved to Longmont in 1885, where he joined his two brothers, Timothy and D. C. Donovan, in establishing the first lumber business in that city. They conducted this business until last year, when they sold it out to J. F. Schwartz.

Active in business and political circles in Longmont, Mr. Donovan held several political as well as high fraternal offices. He was elected to the city council in 1898 and served until 1900, when he was elected mayor. In 1902 he was the Democratic candidate against S. C. Morgan for mayor. This election resulted in a tie. The two candidates agreed to decide the contest by the toss of a coin. Mr. Donovan was the winner on the toss, but he insisted that Morgan serve.

For years he was a familiar figure at state and national Democratic conventions. He was the delegate from Longmont to the international conventions of the Rotary club held in Edinburgh, Scotland, and Toronto, Canada. During the war he was appointed by Governor Julius Gunter to serve on the exemption board.

He was a prominent member of the Longmont lodge of Elks, and also was a past grand knight of the Knights of Columbus. Two brothers and a number of nephews and nieces survive.

Letter Way and a Better Way

THE LETTER WAY was a good way when it was the only way. But the art of letter writing has been lost in the rush of modern business life.

The telephone way—a better way, a more personal way—has taken its place.

More and more, Long Distance is doing the work of the postman and the social and business letters of other decades are being replaced by the social and business telephone calls of today.

The modern business man calls up his family when he is out of town, makes hotel reservations in the next city, insures appointments with his customers and keeps in touch with his business at home—all by Long Distance.

It is the better way—the best way—to meet the needs of communication in business.

One of the advantages of Long Distance service is the station-to-station call. It means calling a number or an address without specifying a particular person. It saves time and money.

To meet the constant demand for more telephones, new plants must be built—at costs much greater than the average of our present plant. To do this we must obtain capital which must be paid adequate returns. Telephone rates are based entirely on the needs of conducting the telephone business—wages for labor, wages for capital, running expenses, depreciation and just enough surplus to protect the service and the investment.

[Station - to - Station Calls]
are Quicker and Cost Less

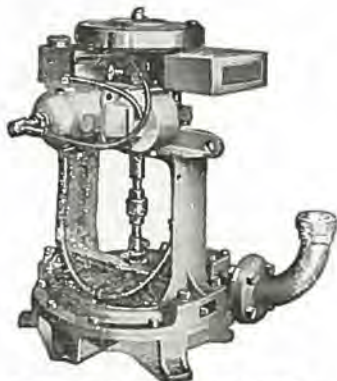
Bell System

One Policy
One System
Universal Service



and all Directed
toward
Better Service

The Mountain States Telephone & Telegraph Co.



Evinrude No. 1 Weight 115 lbs.
Capacity 5,000 gals. per hr., 20
ft. head.

Price \$160.00 Denver

Evinrude Pumps

CENTRIFUGAL PUMP— Handles gritty and dirty water. High capacity, light weight. Easy to move around. One man can handle it. Unwater your bridge jobs; supply your concrete mixer. Any man on the job can operate it. Runs 4 hours continuously on gallon of gasoline. One gal. of good lubricating oil lasts 7 days.

HIGH PRESSURE PUMP— Net weight 102½ lbs. 4-5 horsepower. Twin cylinder power plant, direct connected to pump, speed 400 min.; 2,000 max. r. p. m. Will deliver 1,500 gal. per hour through 1⅓ miles of 1½-inch pipe, or raise water a total head of 277 ft. Will throw a stream 100 ft. through a ¾-inch nozzle.

CARRIED IN STOCK BY

THE HERBERT N. STEINBARGER CO.

Construction Equipment

1644 Wazee Street

Denver, Colo.

**COLORADO STATE HIGHWAY DEPARTMENT
COMBINED FINANCIAL STATEMENT FOR THE FIRST THREE MONTHS OF THE FISCAL YEAR 1925**

Balances, December 1, 1924		
Highway Fund	\$1,067,800.68	
County Bond Fund	16,656.43	
Federal Aid Bond Fund	500,281.58	
Total Balances		\$1,584,738.69
RECEIPTS:		
Half Mill Levy	\$ 82,166.61	
Gasoline Tax	201,229.45	
Internal Improvement	26,700.00	
Federal Aid	216,963.09	
County Aid	15,954.91	
Excess War Supplies	11,930.04	
Total Receipts		\$ 554,917.10
Total Balances and Receipts		\$2,139,655.79
DISBURSEMENTS:		
Federal Aid Projects	\$ 283,348.20	
State Projects	50,708.15	
Maintenance	67,844.34	
Property and Equipment	13,524.16	
Surveys	1,230.56	
Administration, General Office	15,725.62	
Administration, Engineering	17,749.50	
Road Signs and Traffic Census	3,122.84	
County Bond Projects	537.76	
Total Disbursements		\$ 453,791.13
Balances, February 28, 1925		
Highway Fund	\$1,238,276.57	
Federal Aid Bond Fund	431,469.42	
County Bond Fund	16,118.67	
Total Balances		\$1,685,864.66
Total Disbursements and Balances		\$2,139,655.79



IROQUOIS

ASPHALT PAVING MACHINERY

We are Western Distributors for the complete Iroquois Line of Paving Equipment:

- Asphalt Portable Mixing Plants
- Semi-Portable Plants
- Tandem Rollers
Steam Rollers
- Asphalt Mixers
Melting Kettles
- Fire Wagons
Surface Heaters
- Asphalt Paving Tools of Every Kind

Literature on Request

HENDRIE & BOLTHOFF
Mfg. and Supply Company
Denver - Colorado

Thos. J. Fair, Pioneer Road Man, Dies from Operation

In the passing of Thomas J. Fair in Denver on March 18, Colorado lost one of its pioneer good roads boosters. His death was a shock to hundreds of friends and co-workers in the cause of better highways in this state and in Wyoming and New Mexico.

Mr. Fair was born in New Haven, Mo., in 1859, where he grew to manhood and engaged in contract hauling business for several years. He came to Colorado in 1897, establishing a residence in Colorado Springs, where he became prominent in Republican politics. He joined the police department of that city a year later, serving as Captain of Police from 1898 to 1905, when he was appointed street commissioner. He held this position for four years.

During the time he was street commissioner he purchased the first Adams Leaning Wheel grader to be shipped to Colorado. At the expiration of his term as street commissioner he joined the sales force of J. D. Adams & Co. of Indianapolis, and later became distributor for the products of this concern in Colorado and Wyoming.

In 1919 he moved to Denver, where he resided up to the time of his death. He was one of the pioneer road machinery men of this territory, and during the sixteen years he was engaged in the business he sold hundreds of Adams graders to counties and state forces.

He was a prominent member of the Colorado Springs lodge of Elks; also a member of the Modern Woodmen and Yeomen. Funeral services were con-



THOMAS J. FAIR

ducted by the Elks lodge of Denver. Burial was in Fairmount cemetery. He is survived by his wife, Mrs. Mary F. Fair, and one son, Elton T. Fair, both of Denver.

The sale of Adams graders in this territory in the future will be carried on by Elton T. Fair, with offices and warehouse located at 1611 Wazee street, Denver.

Forest Service Buys Small Pumps for Fire Prevention

A number of Evinrude portable high pressure pumps have recently been purchased by the U. S. Forest Service from the H. N. Steinbarger Co. These pumps will be used for fire-fighting purposes in the forest preserves.

This is a light weight, self-contained pumping unit, that supplies large quantities of water with sufficient pressure to carry it long distances. The manufacturers claim that it will throw a stream 100 feet through a $\frac{3}{4}$ -inca nozzle at 120 lbs. pressure.

E. H. Frazier, salesman of the Steinbarger Co., with headquarters at Pueblo, was confined to his bed for two weeks in March suffering from influenza.

The new Rex tilting type concrete mixer is finding great favor with contractors. Several improvements have been made on this machine this year.

Roy Atchison, formerly with H. W. Moore & Co., is now traveling northeastern Colorado for the Steinbarger firm.

A supply of descriptive folders on the new Russell junior crushing and screening plant are now being sent out to contractors and county commissioners.

H. G. Sanford, formerly in charge of the contractors' equipment department of the Stearns-Roger Mfg. Co., is now representing the Butler Manufacturing Co. in the Denver territory. This concern manufactures steel buildings, gasoline and water tanks, and various steel products used in the building industry.

\$60 a Day

Over his former methods is being saved by one Denver Contractor, through the use of a piece of equipment that we sold him for handling dirt for

\$1100 *Ask Us About It*

H. W. MOORE EQUIPMENT COMPANY

DENVER, COLORADO



Buckeye Positive Digging with Safety

Gears and chains transmit power on Buckeyes. No slippage—an automatic safety device protects against overloads. All power is profitably used.

Another positive feature that appeals to all contractors is the Quick-Shift Conveyor, originally developed and perfected on Buckeyes. This conveyor is driven from both ends. It has an exceptionally wide belt which is kept centered by a patented construction. No material too wet, too slippery or too difficult to handle with a Buckeye Conveyor.

Buckeye ingenuity, plus thirty years' experience, provides the safety feature that insures continuous, profitable performance.

Ask any owner.

GET THE FACTS

"We've owned seven Buckeyes," say Herr Bros., Piper City, Ill., "and have always had more work from these machines than they were guaranteed to do."

See why it is that Buckeye owners are so enthusiastic about their machines. Get the facts on the practical operating conveniences and big range of cutting widths offered only by Buckeyes.

If you're near an owner, ask him. Or, send for descriptive booklets.

THE BUCKEYE TRACTION DITCHER COMPANY

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

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There's a Buckeye Sales and Service Office Near You

Ask the Opinion of Him who has had Experience with Our Service —

We have a completely equipped laboratory for the testing of building materials of all kinds.

Trained experts who have been engaged for years in laboratory research, in field experiments, and in the analysis of concrete aggregates and other structural materials are at your service.

Get in touch with us on your next contract—we may be able to save you money on your concrete mix—as we have for others.

The Pierce Testing Laboratories, Inc.

730 Nineteenth St.

Denver, Colo.

LEE LINE STEEL DUMP BODIES



THE WINTER-WEISS CO.

541-549 BROADWAY, DENVER, COLO.
Phone South 5580

Let us arrange to have your hauling done by individual truck owners—one truck or a fleet

Commercial Bodies Busses Trailers Transmissions

The Bulletin Board

H. P. Wilson & Co. Changes Name and Staff Reorganized

The firm of H. P. Wilson & Co. was reorganized during the past month, and henceforth will conduct its business under the firm name of the Western Equipment Company, with general offices and warehouse located at 1936-38 Market street, Denver.

New officers of the firm are: M. A. Wogan, president; Ray Corson, vice-president and general manager; E. L. Pound, secretary; and Carl Braun, treasurer.

With the reorganization of the firm, a new policy has been adopted, the sales force now being employed on a contract and bonus system. Six salesmen are employed—two ex-contractors, two expert machinery men and two technical practical engineers. The field salesmen are James S. Griffin, Casper; E. E. McKelvey, Pueblo; and R. E. Schmuck Western Slope and eastern Colorado.

In the new location the firm has a sample of each machine set-up. The mechanical and warehouse force has been reorganized and a delivery service has been inaugurated.

Mr. Braun is in charge of the service and order department, and Harry Stillings is employed on office sales work.

The firm occupies a new building, constructed especially to meet its requirements, consisting of two floors and a full basement, and covering over 10,000 sq. ft. of floor space.

The Western Equipment company are distributors in the intermountain territory of concrete, building and earth-handling equipment. These include a score of well-known lines, as follows:

The Koehring company, draglines and concrete mixers; Austin-Western Road Machinery company, complete line; Austin Manufacturing Co., Western Wheeled Scraper Co., Barber-Greene, conveyors and ditchers; Buckeye Traction Ditcher Co., ditchers and back-fillers; Wonder concrete mixers; C. H. & S. Mfg. Co., The Hell company, truck bodies; The Metaform Co., Schramm compressors; Page Engineering Co., G. H. Williams, clamshell buckets; F. C. Cummer, asphalt plants; Cleveland wheelbarrows; Kilbourn-Jacobs concrete carts; Butler hoppers; Sackett tower chutes; and Tiger bunks.

Conveyor Replaces Twenty Hod-Carriers on New School

In the March issue of Colorado Highways there appeared an article with illustration detailing the installation of a belt conveyor for handling of mixed plaster mortar on the Mitchell Junior high school in Denver. At that time the conveyor was handling the mortar to the first floor. In the illustration above this same conveyor is shown extended to the third floor working on a 44-degree incline. With



Belt conveyor handling plaster mortar to third story of Mitchell Junior high school in Denver.

this arrangement the plaster contractors, Henry & Feeley, have been enabled to dispense with the services of 22 hod carriers. The conveyor used is a Barber-Greene, 60 feet in length and equipped with an 18-inch belt. It was sold through the Western Equipment Co., local distributors. P. J. Sullivan is the general contractor on the building. Local building contractors have watched with a great deal of interest this conveyor installation.

P & H Used on Approaches for New Delaware River Bridge

The erection of the Delaware River suspension bridge at Philadelphia involves the largest feats of engineering that have ever been attempted in suspension bridge construction. This bridge when completed will have a total length of a mile and a half, each span being 1,750 feet long, with a width of 54 feet. The suspension cables used will be 30 inches in diameter. The total cost of this bridge is expected to approximate \$25,000,000, of which amount about \$8,000,000 is to be spent on the bridge approaches alone.

The excavation for these approaches has been undertaken by Mr. Edward C. Gahagen, of Philadelphia, and a considerable amount of the dirt on the Philadelphia side has already been removed.

To obtain straight approaches to this bridge it was necessary to remove a wide swath of buildings in the very heart of the city, rip out the old foundations and excavate for grade and solid footing. In doing this, digging of the toughest kind was encountered. Old foundations, concrete floors of cellars, heavy brick and plaster walls had to be broken up and shoveled out. This material was further entangled by pipe work from the old gas and water mains and other general debris. The soil itself is a heavy loam, streaked with clay and with rocks scattered through it.

In choosing the equipment for this job Mr. Gahagen originally thought that at least two power shovels would be required, but in actual operation found that one P & H Model 206 $\frac{3}{4}$ -yard shovel handled the whole job very nicely. During the first month of operation this machine moved about 12,000 cubic yards of this material. The daily output has averaged about 450 yards, with a record for one day of 534 truck loads of $2\frac{1}{2}$ yards each in ten hours.



P & H $\frac{3}{4}$ -yd. shovel excavating for Philadelphia approaches of the Delaware river suspension bridge.

Overhauling Season Announcement

Please remember that we carry a complete line of parts for

LIBERTY

HEAVY AVIATION

NASH QUAD

F. W. D. and

WOODS HYDRAULIC HOIST

We also have in stock Eisemann & Bosch Magnets; Stromberg & Zenith Carburetors; Borg, Beck & Brown Lipe Clutch; parts for the Buda H. U. & Continental Motors; the Rusco Clutch & Brake Linings; and other parts and accessories too numerous to mention.

The Liberty Trucks and Parts Co.

DENVER, COLORADO

Colorado Distributors for F. W. D



Bridges and Structural Steel

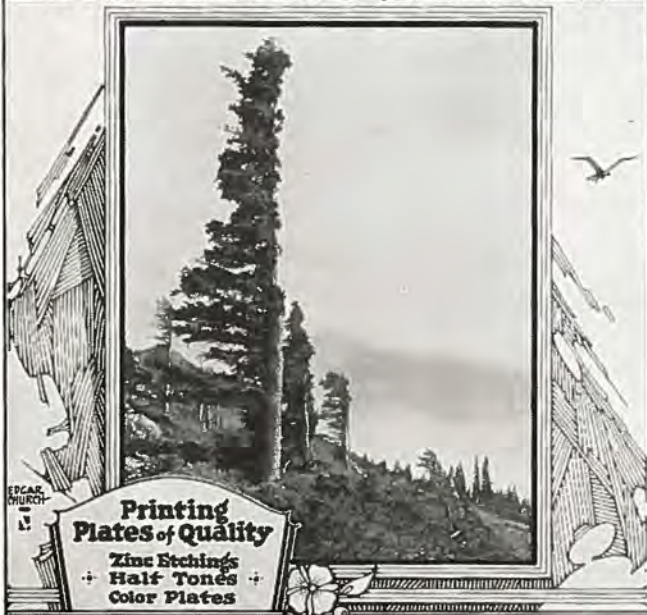
For every purpose

Plans and specifications gladly sent upon application

Minneapolis Steel & Machinery Co.

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Printing
Plates of Quality
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A TRACTOR DOES NOT EAT When Not Working

Your expense is entirely eliminated until you get busy again. Why use 12 or 15 horses and 3 or 4 men for a job which one moderate priced Tread Type tractor and one man can handle? We guarantee our "30" Monarch (\$2375 Denver) to pull more than 3 four-horse teams, and our "20" Monarch (\$1150 Denver) the equal of more than 2 four-horse teams. In other words from 7 to 10 foot graders.



The more mud, sand or snow, the bigger advantage we have over horses or high wheel tractors.

The Monarch has had a successful career of about 10 years in oil fields, road work and farming. Very useful, between times, as a power unit.

W. W. GRISWOLD, Distributor
1817-15th St., Denver, Colo.

"At a Special Bargain Price for a Quick Turn-over"

Three (3) Ten-Ton HOLT "CATERPILLAR" Tractors, of the latest model—never used—fully equipped with Full Cabs, Frost Pans, Pintle Front and Rear, Electric Lighting Systems. It will pay you to investigate. For full particulars, see

"Jim" Davis

1710 Market Street Denver, Colorado

BIDS OPENED

Proj. No.	Length	Type	Location	Successful Bidder	Bid Price
558	0.476 mi.	Graded	Between Golden and Rollinsville	Cooling Bros., Denver	\$13,637.80
246-C	1.951 mi.	Paving	Vineland	Strange-McGuire Pav. Co.	57,108.95
270-B	2.833 mi.	Grav. Surf.	Monte Vista-Alamosa	San Luis Valley Const. Co.	15,471.50
904-B (Pav.)	1.908 mi.	Paving	Petersburg-Ft. Logan	R. L. Hanes	37,984.95

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
169-R	0.501 mi.	Bridge & Paved Approaches	Between Las Animas and Lamar
254-B	1.087 mi.	Grading	Hot Sulphur Springs-Parshall
266-B	3.181 mi.	Gravel Surfacing	South of Durango
286-A	0.549 mi.	R. R. Grade Separation	Between Nunn and Dover
288-A	19.099 mi.	Sand-Clay Surfacing	Between Merino and Brush
288-B	2.519 mi.	Concrete Pav. & Grav. Surf.	Merino, westerly
290-A	1.020 mi.	Concrete Paving	Las Animas-Lamar

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R Div. 3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
246-D	6 mi.	Gravel Surfacing	Avondale, east
247-B	2.329 mi.	Concrete Paving	Rocky Ford-Swink
262-E	3 mi.	Gravel Surfacing	West of Walsenburg
262-F	3 mi.	Gravel Surfacing	West of La Veta Pass
267-B	3 mi.	Gravel Surfacing	East of Hoehne
271-B	1 mi.	Grav. Surf. & Concrete Pav.	Portland-Florence
275-B	6.5 mi.	Pav. & R. R. Grade Crossing	Sedalia-Castle Rock
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
283-B	4 mi.	Concrete Paving	Berthoud, south
286-B	17 mi.	Grading	North of Nunn
287-A	18 mi.	Grading	Orchard-Wiggins
293-A	105 ft.	Steel Truss Bridge	Montrose over Uncompahgre River
568	61 ft.	Timber Trestle Bridge	East of Aurora over Canal
569	437 ft.	Timber Trestle Bridge	West of Byers over Bijou Creek

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	12	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	139,038.45	84	116-C
135	Denver-Morrison	5.3 mi.	Concrete Pavement	Colorado Bridge & Const. Co.	178,158.00	98	135
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	71	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	6	213-A
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	1	226-D
230-A	Wohurst, south	0.852 mi.	Concrete Pavement	M. J. Kenney Const. Co.	82,710.00	97	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surfacing	O. L. Hackett	66,178.00	85	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	78	242-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	1	243-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surfac.	Western Const. Corp.	93,533.00	44	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	63	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	34	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408.00	70	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	66	258-A
261-A	Riffe-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	1	261-A
262-A	West of Walsenburg	2.186 mi.	Gravel Surfacing	Central Const. Co.			
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	8	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	20	262-C
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	1	265-A
267-A	Model-Trinidad	2.954 mi.	Gravel Surfacing	Pople Bros. Const. Co.	25,583.00	37	267-A
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	40	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	2	272-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	61	272-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	28	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand-Clay Surfac.	Holly, Burshears & Dobbins	16,016.00	64	278-A
279-B	Morrison-Baileys	5.295 mi.	Grading	Harry H. Brown	85,980.00	8	279-B
281-A	Lafayette, South	1.249 mi.	Paving	Sims & Boston	55,373.00	85	281-A
281-B	South of Longmont	3.068 mi.	Paving	J. Finger & Son	102,502.40	51	281-B

Moore Breaks Ground for
New Office and Warehouse

On April 1, ground was broken for the new office building and warehouse to be occupied by H. W. Moore Equipment company, at West Sixth Ave. and Acoma street, Denver. Charles S. Lambie & Co. are the contractors. An effort will be made to complete the building, ready for occupancy, on May 1. The building, warehouse and storage yard will cover an entire block—34 lots. The present quarters of the concern at 18th and Wazee streets will be vacated.

On March 25 the Moore company staged a Fordson demonstration at Limon, Colo., which was witnessed by commissioners from five surrounding counties and the city officials of Limon. Featured in the demonstration was the new Hadfield-Penfield crawler type Fordson grader. Four of these graders equipped with rubber tires were recently purchased by the city of Denver. They are equipped with 8-foot blades.

Byers Bear Cat At Work on
Loveland's New Water Job

A Byers Bear Cat trench pull shovel is being used by Spotts & Malcom on their water contract at Loveland, consisting of four miles of 20-inch trench. This machine was sold through the Wilson Machinery Co., recently appointed distributors for the Byers products in the intermountain territory.

Harry P. Wilson also announces that three eastern Colorado counties, Washington, Yuma and Kiowa, are now using Stroud elevating graders in their road work. They are being used to raise the grade of the roads above the prairies. It is calculated that by raising the grade of the roadway, the wind will blow them free from snow in the winter months.

On May 1 the Pikes Peak Highway Co. will start clearing snow from the world-famous scenic thoroughfare with their Best Special La Plant-Choate snow plow, according to plans announced from Colorado Springs.

Flat-Bottom Ditcher Placed
on Market by Clinton-Held

The Clinton-Held Co. have branched out in the manufacturing business. Arrangements have been completed whereby the concern will fabricate, through the General Iron Works, of Denver, the Clinton flat bottom ditcher.

Distributors in seven western states have recently been appointed for the sale of these ditchers, which are used in road building and irrigation projects.

The Clinton-Held Co. recently became sole distributors in this territory for the Ransome mixers, manufactured by the Ransome Concrete Machinery Co., of Dunellen, N. J. L. L. Clinton, president, announces that E. C. Mallory, well-known contractors' equipment salesman, has joined the sales force of the concern.

Arvid Olson, building contractor, is constructing a four-story apartment building at Nineteenth and Sherman, Denver. The building is his own property.

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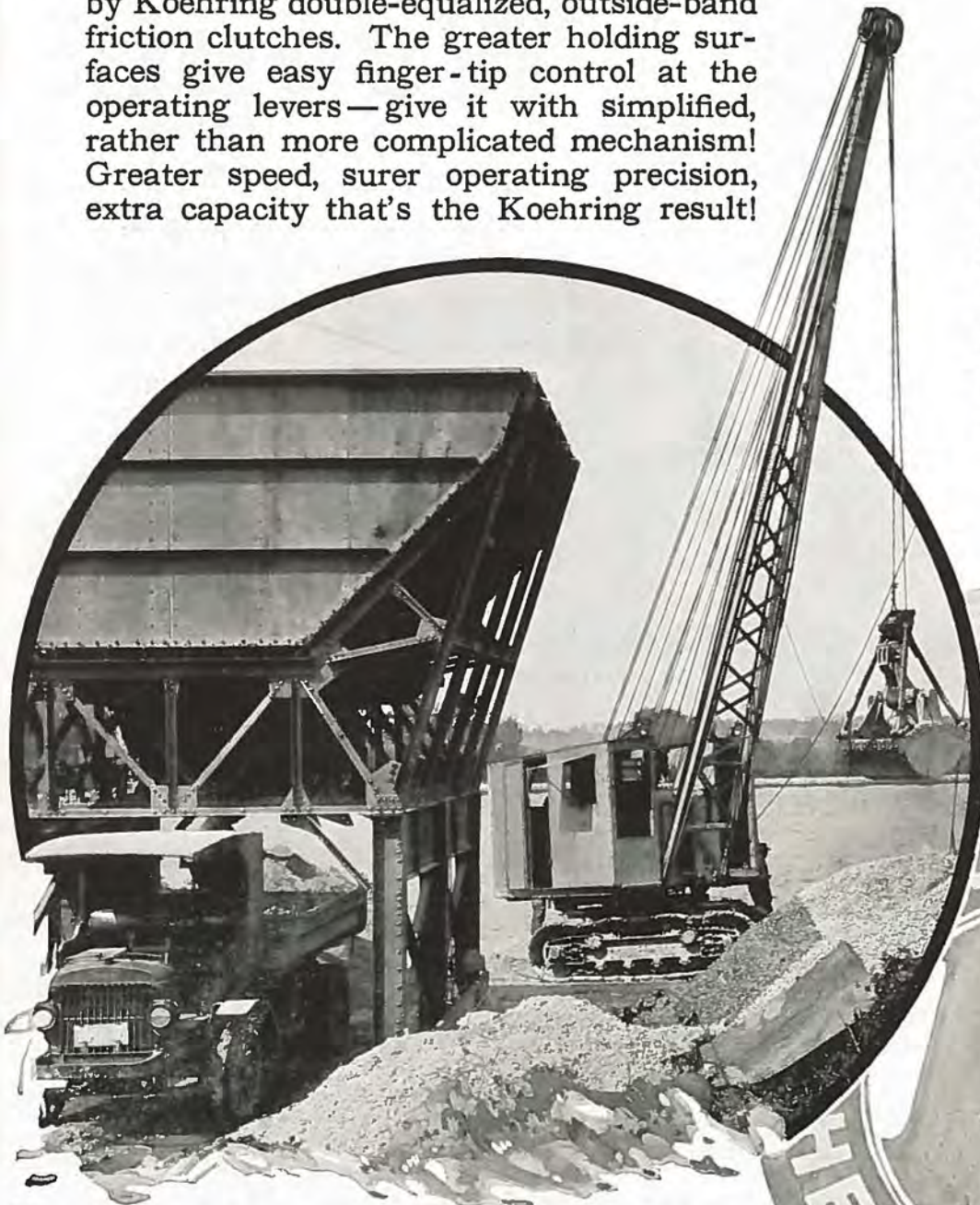
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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

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OUR COVER PICTURE

On the cover of this month's COLORADO HIGHWAYS appears a view on the Harding highway, which forms a part of Denver's far-famed Mountain park system. The picture was taken near Echo Lake, at an altitude of over 10,000 feet. Plans of the state and government include several important improvements on this road during the summer. Eventually it is planned to extend the Harding highway to the summit of Mount Evans.

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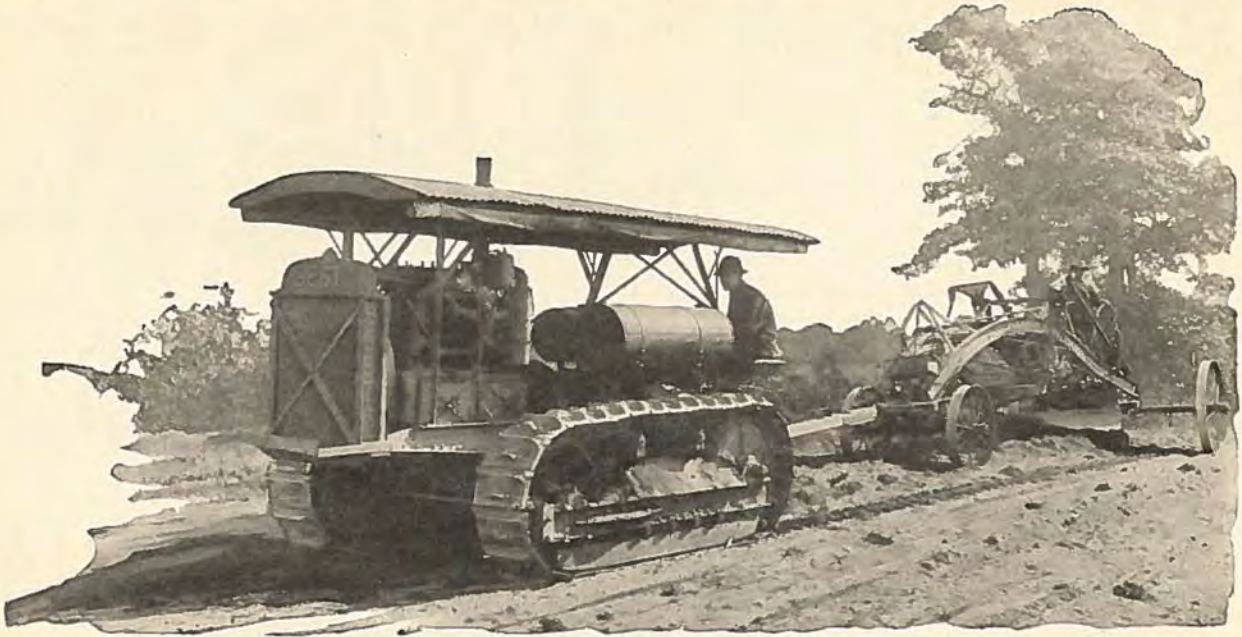
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Current Opinion

The average man has only a vague notion of engineering, as related to road construction.

He appraises the highway engineer in terms of sextant and compass, as a mere designer and builder, whose chief duties consist in taking measurements, figuring estimates and seeing a job through to completion according to certain prescribed rules, says Road Economics. The handling of such details, however, constitutes but a minor part of the engineer's tasks.

Only those who possess an intimate knowledge of that loyal and efficient organization of technical men back of the good roads movement, have a true conception of what engineering means in highway work. The public should show a better appreciation of the economic value of having technically trained minds in charge of the nation's highway program.

It would not be exaggeration to say that much of the great progress in road building, as well as the growth and betterment of highway service, is largely creditable to the engineering profession.

The planning, the execution and the supervision of a specific road job do of course represent the routine work of the engineer. But his biggest contribution to highway improvement is in shaping the broad policies that promote economy in construction and efficiency in road service.

It requires the engineering type of mind to make intelligent traffic studies, correctly interpret the results and apply the derived data in practice. Only specially qualified men can carry on the intensive research work and experimental tests, which have brought about such notable advances in construction methods and maintenance practices.

No better instance of the value of engineering service to the public can be cited than the operation of the U. S. Department of Commerce under the guidance of a man who is an acknowledged leader in his profession.

His ability in coping with the nation's commercial problems, and his successful efforts in extending the service of the governmental bureaus to a larger number of industries than ever before, have

been the subject of the most favorable comment by the public and the press.

From a common sense standpoint, the tremendously important work of highway construction and maintenance should be placed under the most competent management.

The debt, which the public owes to its engineers for past performances, can be repaid by conferring greater authority upon them, by giving them more complete control in highway administration and by putting their compensation on a proportionate and dignified ratio to their responsibility.—*Highway Topics.*

Paved Roads Save Money

Tests conducted by a number of state highway commissions of the nation show that for fuel alone, the driver of a Ford car who travels 6,000 miles a year can save slightly better than \$18 a year if all driving is on paved roads rather than gravel roads. To operate the same car 6,000 miles on earth roads cost \$47 more in gasoline at 20 cents per gallon, than on paved highways.

So when an occasional protest is registered against paving state roads, highway officials suggest the car owner get busy for a few minutes with pencil and paper and determine to his own satisfaction if there is not a huge saving to be had between the two types of roads.—*Highway Topics.*

Chalking Up Real Gain

Figure out how much tax you have paid on your auto in every way in the last seven years. Then consider whether you would take that amount in cash and have all the good roads dug up and the old muddy ones stuck back in their place! If you would really make the trade, then you are privileged to try to keep down auto taxes. And if you would, you are only one out of a thousand, so you are not entitled to force your plan onto a progressive American majority.—*Carlton Vidette.*

U. S. Opens New Scenic Wonderland

FOR the past five years the Bureau of Public Roads has been building a Forest Road from Aspen, Colorado, in a southeasterly direction toward Independence Pass, which has given its name to the project. In 1924 the Weller Grade Section of this project was completed. This is the third section which the Government has constructed and is 1.744 miles in length, extending from a point 6.12 miles from the city limits of Aspen to a point which is 7.86 miles distant.

This project is a part of Route No. 38 of the Colorado Forest Highway System between Aspen and the town of Twin Lakes. The entire route is approximately 38 miles in length and about equally divided between Lake County on the east side of Independence Pass and Pitkin County on the west side. That part in Pitkin County is, with the exception of 1.5 miles adjacent to Aspen, in the Holy Cross National Forest. The portion in Lake County is wholly within the Leadville National Forest. This route is a part of State Highway No. 82, which is 86 miles in length and extends from Twin Lakes Junction to the city of Glenwood Springs, both of which points are on the primary portion of the Colorado Federal-aid Road System.

The entire road between Twin Lakes Junction and Glenwood Springs via Independence Pass is locally known as the Independence Pass Highway and is of importance not only because it provides a road that is 25 miles shorter than the corresponding distance between its termini via the Federal-aid Route, but it opens up an area which has potential scenic and recreational attractions the equal of any other in Colorado.

In addition to the above features, this road probably will have a direct beneficial effect upon the mining industry in the vicinity of Aspen. Ever since the first discovery of silver at Aspen in 1879

By **FRED C. HILL,**
Chief of Road Survey Party, U. S. Bureau
of Public Roads.

its mining industry has been associated with that of Leadville. The distance between these places via Independence Pass is 59 miles as compared to 139 miles via Tennessee Pass and Glenwood Springs. Although the summer of 1924 was the first season that automobiles have been able to go over Independence Pass, the mining men of both towns found it to be a great convenience. Another effect of the road that is anticipated and predicated by the Aspen mining men is the revival of the old mining camps up Lincoln Gulch and at the old town of Independence. Lincoln Gulch joins the Roaring Fork Canon at a point 9.5 miles from Aspen. Up the gulch at distances which vary from 8 to 12 miles there has been considerable mining activity for many years, but the long haul to Aspen over very bad roads has prevented the development of the district. With the completion of the section of the project now under construction there will be an excellent road to the mouth of Lincoln Gulch. This will materially help in overcoming the transportation handicap under which this district has labored in the past. The Independence mining district is located on the Roaring Fork River, about 16 miles from Aspen. At one time the district had 2,000 inhabitants and as its rich gold ore was free-milling, the problem of transportation was not of great importance. Unfortunately, the rich ore was found only in pockets near the surface and when these were worked out, leaving nothing but low grade ore, the cost of hauling over the old stage road was prohibitive and the camp was abandoned. The completion of the auto highway to Independence should influence the resumption of work on the extensive bodies of low grade ore found in this locality.

The benefits which the National Forest will receive from the Independence Pass project will be largely, for the present at least, to facilitate the administrative work of the Forest officers. Practically the entire area traversed by the road has been either burned out or cut over so that the only merchantable timber is in small isolated and almost inaccessible places. If the mining industry in this locality is revived the Government will receive some revenue from timber sales on these areas. In Lincoln Gulch there are some good stands of merchantable timber which will be logged within a short time now that the hauling problem for this vicinity has been improved by the road already built.

On account of the high altitude of the project, ranging from 7,900 feet at Aspen to 12,184 feet on Independence Pass, and then dropping to 9,200 feet at Twin Lakes, the length of the season that the road will be free of snow is very limited. On the Twin Lakes side the road should, on an average, be open for travel from May 15 to November 15 for a distance of 10 miles. From this point over the pass and down the Aspen side to Lincoln Gulch the season will not ordinarily begin until July 1 and usually will not last later than October 25. From Lincoln Gulch to Aspen the road will be passable from May 15 to December 1.

The story of the Independence Pass road dates back to 1879, when the construction of a toll road from Leadville to Aspen was commenced immediately after the discovery of silver at the latter place. This toll road was completed in 1882 and is said to have been a financial success for the men who built it. Within a few years Pitkin County purchased that part of the road within its boundaries. But about the same time both the Denver and Rio Grande and the Colorado Midland railroads built into Aspen so that the necessity of the stage road as the main commercial artery connecting Aspen to



Before and After on the Independence Pass Road—"The Hair Pin" on old road—A large car could not make this turn without backing up several times. (Right) Same spot after completion of new road. Photos by U. S. Bureau of Roads.

the outside world no longer existed and the road was of importance only in connecting the mining districts at Independence and up Lincoln Gulch to Aspen. But little maintenance or repair work was done on the road and as the activities of the two mining districts which it served were gradually diminished, the road was used less and less until it was practically abandoned and almost impassable by 1911. In that year citizens of Aspen, realizing the importance of, and desiring to have their town on a main line of automobile travel, subscribed funds toward paying for the survey of an auto highway from Aspen via Independence Pass to Twin Lakes Junction. This survey was made in that year by the Colorado State Highway Department, which had just been organized, and it is interesting to note that it was the first location survey made by that department.

The following year the Forest Service expended about \$3,300 from 10 per cent funds for the construction of a short stretch of road about 3.5 miles from Aspen. It was built on the line of the state's survey and was the first construction on the Independence Pass Highway as well as the first contact of the Government with this project.

During the following four years construction work on the road in Pitkin County was carried on with funds furnished by the state, by the county, and from subscriptions made by the citizens of Aspen. In 1916 the Forest Service made surveys on the Lake County end of the road with Ten Per Cent Funds. A center line was run for the first two miles out of the town of Twin Lakes and a 5-mile location survey was made from Bromley—a change station on the old stage road 12 miles from Twin Lakes—toward the top of the pass. In the same year A. E. Palen, U. S. Highway Engineer, detailed to the Rocky Mountain District of the Forest Service from the office of Public Roads and Rural Engineering, made a comprehensive and complete report on the Independence Pass route between Twin Lakes and Aspen. This investigation and the above-mentioned surveys really mark the inception of the Independence Pass road as a Forest Road project. At this time it was planned to make this a major project, but the results of the investigation and surveys indicated that the cost of the improvement would be excessive as compared to the probable value of the road and construction was postponed for an indefinite period.

During the years 1917 and 1918 the state and Pitkin County continued working on the Aspen end of the road. On the Twin Lakes side the first construction work started in 1916 and was continued by the state until 1923, when the road was completed on that side, and in addition about 4.7 miles was constructed on the Pitkin County side of the pass. The road built by the state has a 14-foot overall width and grades and curves suitable for automobile traffic.

Unfortunately, the construction in Pitkin County was characterized by harmful local influences, partly of a political nature and partly of a too eager desire of the Aspen citizens to secure an early completion of the road without regard for sound engineering and economical



The old and new road on Weller Cliff. Picture on left was taken in 1916. The view on the right was taken in August, 1924, just after the masonry walls were finished. Photos by U. S. Bureau of Roads.

principles. The latter influence undoubtedly was due to the failure to fully understand the real magnitude of the work, so that both the time and monetary elements were greatly underestimated. The result was a sacrifice of the standards which were originally proposed, so that instead of a 16-foot overall width, most of the road was built to width of only eight feet, very sharp and dangerous curves were introduced, grades as high as 12% and 14% were used in place of the original maximum of 6%, and all structures were built with little or no regard for permanence. But in spite of these compromises, at the end of the 1918 season and after seven years' work, only a little more than eleven miles of the road had been built in Pitkin County, no automobile had gone over the pass, and more money had been spent than originally had been estimated for all of the construction on the Aspen side. Naturally this lack of progress was discouraging to those promoting the road and especially so as the depression in the mining industry following the World War, together with the abandonment of the Colorado Midland Railroad, had so affected the prosperity of the Aspen district that neither public nor private funds were available for further financing the road. So at this time it appeared that a new policy would have to be adopted if it was ever to be completed. The promoters concluded that the solution of the difficulty rested on securing the aid of the Federal Government from funds available for Forest Road construction. Consequently a vigorous campaign was waged for favorable action on an application which Pitkin County had filed with the

Forest Service under date of September 28, 1916. This resulted in the allotment of \$32,000 in the 1920 working plan for survey and construction work on the Independence Pass road. A survey was made that year and construction extending from the city limits of Aspen for a distance of 3.52 miles to the foot of Curtis Hill was started. It was called the Curtis Hill Section and construction was completed in 1921 with the final report made by John D. Slye, Chief of Party, under date of February 6, 1922. In 1922 another allotment was made for an extension of the 1920 survey and the construction of another section contiguous to the Curtis Hill Section. The survey was made the same year and construction of another unit called the Curtis Hill-Weller Grade Section, covering the remainder of the 1920 survey and the lower mile of the new location, was started soon after the completion of the survey. The survey and the construction work which was completed in 1923 is covered in a final report made by the writer under date of April 2, 1924. The construction of the part of the 1922 location survey extending beyond the end of the Curtis Hill-Weller Grade Section was provided for in the 1922 program by an estimated amount of \$69,000. This is the Weller Grade Section, the construction phase of which is covered by this report. In the design and estimate for the Weller Grade Section, which was worked up during the winter of 1922-23, the maximum grade was held to 6.6%. The roadway width was based on the new 1923 12-foot standard, but as practically all of the roadway was in the solid, the overall width was 17 feet on side-hill sections. The section

as surveyed and designed was 1.742 miles long, of earth graded type, with corrugated metal pipe culverts and cement rubble masonry headwalls, rustic log guard rails, and cement rubble masonry retaining and guard walls. The engineer's estimate was \$62,557.13 for construction items only. This high cost was due to very heavy rock work on the upper half mile and the necessity of masonry retaining and guard walls on the Weller Cliff.

On August 7, 1923, the contract for this work was awarded to the firm of Tagert, MacDonald and McSkimming, of Aspen, Colo., on their bid of \$56,000.

As soon as the contractors were informed that the District Engineer had recommended that the contract be awarded to them, they started to make arrangements to secure a steam shovel and drilling apparatus. A $\frac{3}{4}$ -yard heavy duty Osgood shovel with extra long boom and dipper handle was ordered by telegraph and also a single cylinder air compressor and drilling apparatus. The shovel was shipped from Ohio by fast freight, arrived in Aspen August 14, and on the morning of August 18 started to work on the lower end of the project. Two horse-drawn tank wagons were used to supply the shovel with water, which was secured from several small streams encountered along the road.

Almost as soon as the shovel started it was evident that the digging was going to be much harder than had been anticipated. This was due to the large proportion of granite fragments encountered. These were of various sizes, but many averaged from three to five cubic yards and were firmly embedded in a soil of disintegrated granite with enough clay so that it was firmly compacted, especially in the old road. Getting out the rock, particularly those near the grade line, was not only slow work, but the cause of an excessive amount of wear and tear on the shovel.

From the beginning the contractors thought that the job could be completed in one season and when they saw that the shovel was not making the expected progress they secured another shovel crew so that two shifts a day could be worked. The double shift started on September 27 and continued until October 19. At this time the shovel was at Station 397, above the Weller Cliff, where a stretch of 700 feet of rock had been taken out by hand. Up to this point the character of the material handled by the shovel was entirely as previously described and no solid rock formation had been encountered. From Station 397 to Station 401 the excavation was all in solid rock with a total volume of 5,800 cubic yards, of which 3,600 cubic yards were between Stations 397 and 398, where the road cut through a rock hump with a maximum center line cut of 44 feet. To shoot this hump, three small tunnels were driven into it, the longest of which was 43 feet.

The building of the Weller Grade Section of the Independence Pass road was in reality the key that finally opened the road to traffic, as the old road, particularly on the Weller Cliff, was so dangerous that neither the state nor county felt justified in putting the road above it in repair until this portion was made safe.



(Upper) From the point at left center of picture, there are magnificent views looking up and down the Roaring Fork canon. The point is surfaced so that motorists can leave the roadway to secure this view. Lower left—Same point as upper picture before construction. Lower right—Steam shovel with some big boulders. Photos by U. S. Bureau of Roads.

With the completion of this section, repairs were made on the old road and last season, 13 years after the inception of the road as an automobile highway, the long-delayed auto traffic was an actuality instead of the dream of a few public spirited citizens of Aspen. The road was open from July 1 to September 15, when it was necessary to close it on account of the heavy rock work on the Grottos Section, and although no traffic count was made, the writer estimates that an average of 35 cars per day went over the road on week days. On Sundays and holidays the average was increased to 85. Of the week-day traffic, it is estimated that 40% was of a local nature, 30% was tourist travel, and the remaining 30% was composed of travelers who were using the road for business purposes. This latter class was composed largely of commercial men who used the road solely because it permitted them to better route their trips. As near as could be determined, the increase in the Sunday traffic was largely of a local character.

In view of the fact that the opening of the road was not advertised, the amount of traffic for the first season was very gratifying to those who have worked for its completion as being an indication of the popularity which it undoubtedly will have in the future and thus vindicate the large expenditures which have been made in the past and also those which are now being made in the construction of the Grottos Section as well as those contemplated in this year's program for the construction of a 3-mile stretch beyond the work now under contract. Incidentally, it is of interest to note that in anticipation of the completion of the

road so that it can be widely advertised, a movement has already been started to stage a celebration on top of Independence Pass in 1926 which not only will signalize the formal opening of the highway, but also will celebrate the fiftieth birthday of the State of Colorado and the one hundred and fiftieth anniversary of the Independence of the United States.

Considering the results of recent investigations as to the causes of automobile accidents and more particularly to those which can be attributed to improper design or faulty road conditions, the Weller Grade Section, in fact all of the Government construction on this route, can be classified as being reasonably safe in that the width of clearing and the degree of curvature provide ample sight distance; the roadway is sufficiently wide to allow automobiles to pass without undue crowding; no bridges or culverts have been so constructed or located as to cause a "bottle-neck" effect; the route is being provided with proper signs by the efforts of both the State Highway Department and the Forest Service; on account of the road surface being composed of disintegrated granite it will never be skiddy and in addition, can be kept smooth and free from holes, depressions and ruts with a minimum amount of maintenance.

As to the type and construction standards of the Government work to meet the future demands which can reasonably be anticipated it seems that, giving due regard to the length of the season the route can be used, its close proximity to other roads serving the same general territory and same class of travel, but with lighter grades and less rise and fall, all traffic requirements should be taken care of for the next ten years.

Gypsum-Dotsero Road Wins Praise

By WORTH C. KNOWLES

TRaversing one of the most scenic sections of the Pike's Peak Ocean-to-Ocean Highway and eliminating a stretch of road once considered the roughest adobe trail between Leadville and Grand Junction, Colo., the new Gypsum-Dotsero road is due for completion not long after May 1, 1925.

The work, which comprised broadening and gravel surfacing, was commenced in October, 1923, and covered a distance of 5.185 miles. The contract was let to O. L. Hackett for \$66,178.

Grading was started at the Dotsero bridge across the Colorado River, and extended to a point about 1.5 miles from Gypsum. Leaving Dotsero the road ascends a slight grade, follows along the foot of low hills and through the center of a lava bed. Over the first two miles several moderate grades were encountered and the original road was followed in the reconstruction project.

Beyond that point the original road, which was a rocky, winding and uneven trail through the sagebrush, was abandoned and the new highway directed to the right on a gradual and more direct route to Gypsum. No sharp inclines appear in the new road and the dangers which heretofore lurked in the old trail from sudden washes, cave-ins and rock slides as well as trespassing vegetation are no longer apparent.

An eighteen-foot highway with four-foot shoulders is provided and the thorough grading and gravel surfacing has made the road one of the best on the Western Slope and without doubt the finest section of unpaved road between Leadville and Grand Junction.

At different points natural washes across the roadway were taken care of by the erection of paved fords, insuring the road's safety against heavy rains and making it possible to remove debris from

the highway without injury to its structure. Due to insufficient funds it was necessary to leave a gap of crooked adobe highway unimproved between the town limits of Gypsum and the new road. When dry the road is dusty and generally ill-appearing. However, that this strip will be completed within the next two years there is little doubt.

Approximately 10,000 cubic yards of gravel were used in the surfacing of the highway, according to Division Engineer H. L. Jenness of Glenwood Springs, who, with Field Engineer W. A. Whitney, supervised the building of the highway.

At one point a small lake was encountered and extensive filling for a distance of about thirty yards was essential before a good base could be obtained. Here a guard rail was erected, the only place on the entire stretch where such precaution was made necessary by natural hazards. During April the road was rolled, side-drainage put in proper condition, and any sign of ruts removed.

The remainder of the road from Dotsero to the Eagle county line is fairly well graded, chiefly of adobe, and is kept in good condition as it approaches the Garfield county boundary and follows the scenic windings of the Colorado River through Glenwood Canon.

One of the principal scenic attractions of the new road is a view of the Continental Divide and the snow-capped range from a high point on the new road near its end a short distance northwest of Gypsum. The "backbone of the continent" is seen best from this place, fifty miles or more away, and the scene is made more alluring by the glimpse of Gypsum in the valley foreground.

Connecting immediately with the new highway is the road through one of the

most picturesque canons on the Western Slope—Glenwood Gorge—a fifteen-mile gash through the mountains, through which flows the Colorado. A highway kept smooth and well graded by Garfield County makes the way doubly inviting to tourists.

Rocky buttresses tower high in the sunlit spaces of the canon, and at Shoshone a footpath leads the traveler to Hanging Lake, a delightful body of water situated on a ledge overhanging the canon and Hanging Lake Trail. Public camp grounds, a road patrol house and a stream of excellent drinking water invite the tourist to linger long.

Beyond Shoshone and its power plant lie Grizzly and No Name Creeks, both trout streams of some repute and unusually attractive in their rocky confines. Then there is Tumble Creek and its municipal picnic grounds not far from Glenwood Springs.

At Glenwood Springs the motorist finds hot mineral waters, the largest open-air, hot water swimming pool in the world, and scenic attractions unrivaled in western Colorado; and to reach these and other points of interest in western Colorado travelers now include in their course the new Gypsum-Dotsero road, on the Pike's Peak Ocean-to-Ocean route.

A group of Chama, New Mexico, road boosters, under the leadership of H. L. Hall, turned snow-shovelers the last week in April, and cleared the western slope of Cumbres Pass of snow. Residents of the San Luis valley are now doing the same thing on the eastern slope. It is announced that the government will do considerable new work on the Cumbres been let for the construction of a new Pass road this summer. A contract has section to join the work done in Conejos canon last summer.



New and Old Road Between Dotsero and Gypsum—(Left) A section of the new Gypsum-Dotsero highway, showing fine gravel surfacing. (Right) Part of the abandoned trail through sagebrush, once the roughest road between Leadville and Grand Junction. Photos by Worth C. Knowles.

From Four Miles An Hour To Forty

SOMEONE has said "The characteristics of raw materials is first of all that they are bulky; and secondly, that they must be transported somewhere else in order to be useful." And it was raw materials that these United States of ours began to produce in variety and quantity to amaze the world. Corn and grain lavishly rewarded the settler on virgin prairie sod; the useful and rare metals rewarded the prospector; great forests but awaited the woodman's axe and transportation to be put to many uses.

When men heard of fertile areas that were being developed they came from afar and themselves sought a farm, and the community grew in numbers; roadways stretched out; land that had been sold by the acre for agricultural purposes was sold by the foot for factories or home sites, and the road that had been built to carry away the raw products of the farm now brought in the raw products of other like communities for fabrication or consumption.

For decade after decade our country grew in population and resources. Roads were built—but, strangely enough, they were quite generally the roads of a hundred years back.

"With the decline of the toll road, following the advent of railway transportation in 1830, public roads entered their dark age, which endured almost sixty years in America. Then came the renaissance. It is this period, since about 1890, which embraces the vital activities of road development in the fifty years since 1874.

"Never, of course, was there cessation of highway development. Provisions were regularly made for laying out and caring for roads and road taxes were lev-

ied during all the period of highway destitute from 1830 to 1890. Control of roads was strictly local—township and county supervision—and the manner in which they were built and kept up depended on the intelligence and energy of this supervision, and was hampered further by the prevailing custom of paying road taxes in labor. Near towns and on a few routes connecting the larger towns improvements might be high metal bridges, gravel surfacing, Telford and Macadam construction—but such instances were uncommon. The prevailing road was a dirt road, seldom truly constructed, only occasionally repaired, often good with favoring soil and drainage and weather, never good all the year and frequently impassable in fall and winter and spring.

"In such way highway development continued until 1890."*

Then suddenly came the realization that a cheap road was a costly road; that speed was often economy and not luxury; that comfort was worth having. To the humble bicycle has been credited the birth of country-wide interest in better roads. The League of American Wheelmen, organized in 1887, became almost immediately an organization to promote road improvement. A wave of enthusiasm was started. On March 3, 1893, was created by Federal legislation the office of Public Roads Inquiry, with an appropriation of \$10,000.00. New Jersey passed a state aid law in 1891. In 1893 Massachusetts enacted a similar law and created a commission for its administration.

Other forces came to bear. The intro-

* Engineering News Record, April 17, 1924. C. S. Hill.

duction of rural mail delivery sharply accentuated the curse of the bad road. Then came the automobile and the truck. By 1904, when there were 58,000 automobiles in use in this country, it is reliably estimated that the total expenditure for rural roads was not quite \$60,000,000.00. Today, with 16,000,000 automobiles in use, over \$1,000,000,000.00 a year is spent for road purposes. Today, throughout the length and breadth of the country there are few who will not affirm the theory that more roads and better roads are desirable.

"Good roads, like good streets, make habitation along them most desirable; they enhance farm values, facilitate transportation and add wealth to the producers and consumers of the country; they economize time and save wear and tear; they bring the countryside into beneficial touch with the city; they aid social, religious, educational and industrial progress; they make better homes and tend to keep the people on the farm; they promote social and industrial intercourse, and prevent intellectual stagnation in our rural population."

There are many who hold a better road to be luxury; there are many who hold that comfort has no economic value. There are districts where the old and faulty scheme of paying road taxes in labor still prevails; there are districts where the farmers, speaking figuratively, are content to remain in the rut—who look on impassable winter roads as though they were as unavoidable as the winter storms. There are districts that shake their heads over mounting taxes and look on road costs as an expense, rather than an investment, and there are many who do not know that modern trac-



(Left) Showing grade crossing on D. & R. G. W. railroad on new section of roadway near summit of Cumbres Pass, completed by government. (Right) Starting the descent from LaManga Pass into Conejos canon, on the new Cumbres pass road. Photos by U. S. Bureau of Roads.

tor-drawn implements have cut the cost of road building and road maintenance.

Who pays for the roads? Under the administrations of our Federal and state governments the purchasers and operators of motor vehicles are shouldering the burden of road construction and maintenance. In the year ending July 1, 1924, a total of nearly \$200,000,000.00 was collected from the owners and operators of these vehicles for licenses and permits, of which amount 80 per cent was made available for highway expenditure. Add to this the sum of over \$32,000,000.00 collected from gasoline taxes during the same twelve months, of which over 62 per cent was made available for expenditure by or under the supervision of the respective state highway departments. A recent report from the Federal government stated that it had paid out over \$264,000,000.00 on account of Federal-aid highways, but this is not a tax on the man who doesn't own an automobile, because the government has collected \$590,000,000.00 in taxes on automobiles, tires and accessories. "It is not necessary to fight sensible appropriation for making roads, for the driver pays his own way."

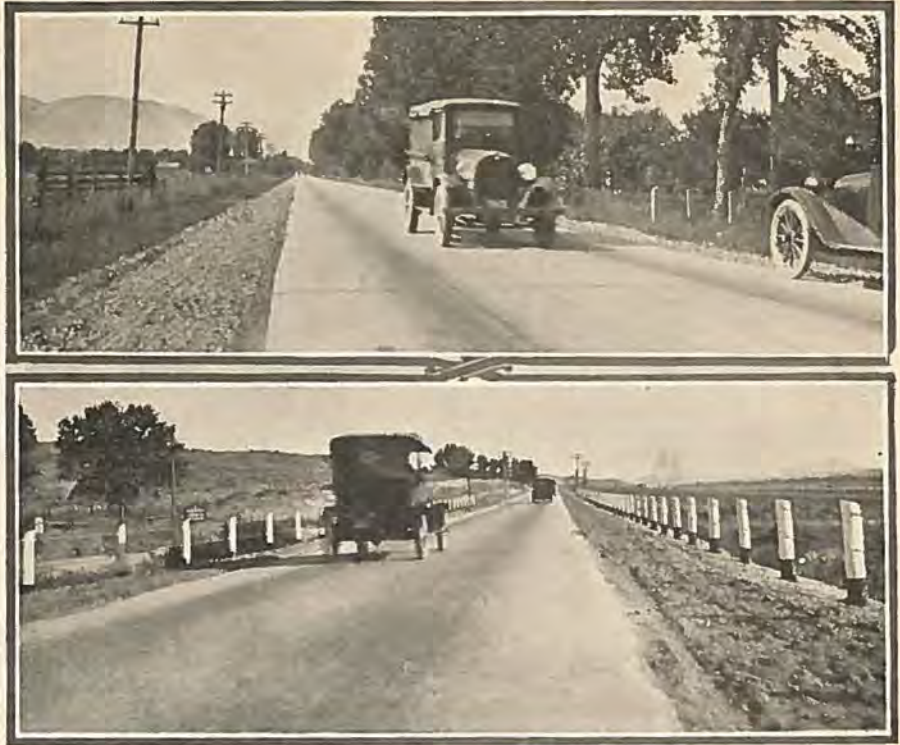
And so, if roads are an expense, the man who chooses not to use them may largely escape the cost of building and maintaining them. But a good road is a good investment. Let us prove this definite declaration:

First, a good road saves money for the man who uses it—it makes money for the man who lives near it. Now, a road may be improved in three ways—by the betterment of the surface, by the reduction of the grade and by the shortening of the length. Now, a better surface permits a greater load for equal power or a faster haul, or both. Reduced grades make for one or both. And shortened roads decrease the time of hauling—they bring the raw materials nearer the markets? So do the other improvements—for a decrease in time of hauling equals a decrease in the length of the road!

But let us refer to actual instances of the savings made by improved roads as recorded in the Department of Agriculture's Bulletin No. 505, "Benefits of Improved Roads":

"A farmer in Sullivan County, Tenn., in 1908, had to haul barbed wire from Bristol to Kingsport, a distance of twenty-three miles. He found that with a two-horse team his maximum load was 500 pounds and that three days were necessary to make one round trip. To haul one ton, therefore, required twelve days and, at \$3.00 a day for the man and team, the cost was \$36.00. This was before Sullivan County issued bonds for road improvement. Under the bond issue the road from Bristol to Kingsport was improved, so that the same team can now readily draw a ton to the load and make one round trip in two days at a cost of \$6.00. The ton mile cost under the old conditions was \$1.50 and this cost was reduced to 26 cents by the improved road.

"Another instance, at Crosby, Texas, is significant. There a shell road was built for one mile out of town. A farmer four miles out came to town with a team of two mules and loaded on his wagon at the railroad station two tons of wire fencing. At the end of the improved shell road, on his return, the farmer was com-



(Upper) A fine piece of concrete pavement east of Boulder. (Lower) Showing a stretch of newly completed concrete pavement on Denver-Colorado Springs highway. Photos by Staff Photographer.

elled to throw off 3,000 pounds of wire. He then hitched two additional mules to haul 1,000 pounds on the remaining three miles of unimproved road. This man then had to make three more trips for the remaining 3,000 pounds of wire, and it required his time for the four miles from 10 o'clock one morning until 11 o'clock the next morning to finish the hauling. If the improved road had extended four miles to the farm, the original team of two mules could have hauled the two tons of wire in two and one half hours.

"The distance between Dandridge and Jefferson City, in Jefferson County, Tenn., is ten miles. Before the county issued bonds this road was so bad that twenty bushels of wheat made a good load for a two-horse team at almost any time of the year, and a day was required to make the round trip. Dandridge is the county seat and Jefferson City is the nearest railroad station. A few years ago the county issued bonds and improved this road by relocating and surfacing it with macadam. At the present time fifty bushels of wheat can be hauled over it with a two-horse team and a round trip made in less than a day. It formerly cost 15 cents a bushel to deliver wheat at the depot, or 50 cents per ton-mile, while on the new road it costs 4 cents per bushel, or about 13 cents per ton-mile—about one quarter of the former hauling cost. These figures are based on a charge of \$3.00 a day for man and team."

A careful appraisal of the existing conditions in any one rural locality will show the reduction in hauling costs that result from improved roads. Immediately it is possible to approximate the cost for road work that the community may properly expend. As Bulletin No. 505 explains:

"If the construction of narrow single-

track roads with improved surface will reduce the hauling cost 5 cents a ton-mile and the average yield of wheat is thirty bushels to the acre, there results for an average haul of five miles an economic advantage of 22.5 cents per acre, or \$36.00 per quarter section. This is 4 per cent on \$900.00. It appears immediately that such a community will be safe in borrowing money to the extent of \$2,000 per square mile of wheat area to effect such an improvement in the roads as will reduce the hauling charges 5 cents per ton-mile on the wheat crop alone."

The problem of today is not a problem of production, but of distribution. And our highways are far from operating at their highest efficiency.

But good roads do something more for a community than save time for those who use them. Road betterments increase land values. Good roads advance farm values because they bring the market and the farm closer together and make the business of farming more profitable on an acreage served by good roads. Many instances are available to show how rural property increases in price as the roads that serve it are made better.

"In Lee County, Va., a farmer owned 100 acres between Ben Hur and Jonesville which he offered to sell for \$1,800.00. In 1908 this road was improved, and although the farmer fought the improvement, he has since refused \$3,000.00 for his farm. Along this same road a tract of 188 acres was supposed to have been sold for \$6,000.00. The purchaser refused the contract, however, and the owner threatened to sue him. After the road improvement, and without any improvements upon the land, the same farm was sold to the original purchaser for \$9,000.00.

"In Jackson County, Alabama, the peo-

ple voted a bond issue of \$250,000.00 for road improvement and improved 24 per cent of the roads. The census of 1900 gives the value of all farm lands in Jackson County as \$4.90 per acre. The selling value at that time was from \$6.00 to \$15.00 per acre. The census of 1910 places the value of all farm lands in Jackson County at \$9.79 per acre, and the selling price is now from \$15.00 to \$25.00 per acre.

"The price of farm land, like that of any other commodity, is ruled by the relation between supply and demand. When the price of farm lands advances it measures a readjustment between the supply and the demand. This readjustment, as has been seen, is sharp and immediate in many cases. One distinct item of increase is becoming more evident from year to year; that is, immigration into the rural districts where road conditions are favorable. In this respect the presence of good roads has its greatest influence upon the owners of automobiles. There are repeated instances of this kind in New England and those states which have been active in improving their roads by state aid."*

The study of \$3,000 farms in Iowa shows that the condition of highways in their neighborhood was the fourth factor in determining their value—the other factors being fertility, buildings, and general condition of equipment. Spotsylvania County, Va., improved forty-one miles of road, and land which formerly sold at an average of \$25.74 an acre within three years changed hands at \$44.74 per acre. In Franklin County, New York, where 124 miles of road were built, farm lands immediately showed an increase of 27.8 per cent in value.

A newspaper article by B. C. Forbes touches on the benefit of improved roads in North Carolina from a different angle:

"Automobile users in North Carolina are saving \$7,500,000 a year in gasoline alone through the substitution of good roads for poor roads. How much more is saved through the reduction in wear and tear, in accidents, time, etc., cannot be computed.

"Read these figures furnished by Cox for this column: In the fiscal year, July, 1920, to July, 1921, in our state 142,000 automobiles consumed 73,997,000 gallons of gas, or 520 gallons per car.

"From July, 1922, to July, 1923, there were 247,612 cars and they used 112,365,000 gallons of gas, or 454 gallons per car.

"The difference in saving the latter year was consequently sixty-six gallons each. At 25 cents a gallon this would make \$16.50 per car; 247,612 cars last year at \$16.50 per car per year would be a total saving in gasoline alone of \$4,085,598 provided the people did not travel any more mileage on good roads than they had the year before on poorer roads.

"We confidently estimate that this fiscal year, July, 1924, to July, 1925, there will be 300,000 automobiles in the state and that, since the roads are mostly completed, the saving will be much greater.

"Personally, I am satisfied that the saving in gas to each individual car this year will average \$25.00 per car. Three hundred thousand cars would make a saving to our people of \$7,500,000.

* Farmers' Bulletin No. 505. Benefits of Improved Roads.

"A saving of \$25.00 on each of America's 16,000,000 motor vehicles would mean \$400,000,000 a year."

It is difficult to figure out to a fraction of a per cent the economic benefits of the improved highway system—too many other conflicting factors have their influence. For example, let us consider the development of California within the ten years from 1910 to 1920. During approximately that period, from 1909 to 1919, \$73,000,000 of road bonds were issued. During that period the population increased 44 per cent. During that period the value of farm products increased 350 per cent. During that period the population on the highways, exclusive of the two largest cities, increased 63 per cent. The California State Highway Department figures that on the basis of 5 cents a mile saved by those who use the paved highways, California's paved roads yield a total annual operating income of \$25,000,000.

There are, of course, many reasons for improved roads—reasons that may not all

the people who live within the territory that it serves, and attracts new people to make use of its economies and conveniences.

An improved road does not necessarily mean a paved road. A well-built sand-clay, or gravel or macadam road closely approximates the qualities of a concrete or asphalt road, although upkeep costs may be greater. Month by month and year by year road building activities are increasing—and largely because of the fact that the income from motor registrations and gasoline taxes comes close to financing this program of road activity. It is estimated that at present there are over three million miles of roads in the United States, of which 450,000 miles are surfaced, and that each year the amount of surfaced roads is being increased by at least 10 per cent.

To the development of modern road building implements must be given full credit. The scarifier or road plow will tear loose impacted or stubborn materials so that they may later be moved by scraper or elevating grader. And the tractor has been developed to furnish reliable motive power even in narrow quarters and where the footing is uncertain. It is no longer as costly to build roads and to maintain them as when only horse and man power were available.

No matter what sort of road or finished highway it is to be, the tractor-drawn implements swiftly and economically do the heavy preparatory work, clearing and leveling the subgrade. The tractor hauls away waste material, and transports rock and sand and cement in long wagon trains. The tractor is the great economic force that has brought improved roads within the reach of outlying communities, desert settlements, mountain outposts and detached rural districts.

And the tractor maintains the roads that it has built. Hitched to a plow, it frees them of snow; it levels their surface in the spring by pulling the grader; it brings new materials for resurfacing.

For these thousands and thousands of years man has been content to plod along at the snail's pace of four miles an hour; but now, thanks to a new understanding of the value of improved road development of the automotive vehicle, mankind has increased his speed one thousand per cent and now thinks nothing of traveling at forty miles per hour—and all within the space of twenty-five or thirty years! Never were good roads so needed as today; never before have there been available such highly developed automobiles and trucks to make use of these good roads; never before has the economic urge of the curtailing of distributing costs made it imperative to shorten the path between production and consumption.

Hence, the great demand for the road-building tractor! And let us remember that the subject of good roads may no longer be classified as an issue—national or local. There may be differences as to types of pavement, as to methods of administration and to raising the necessary funds, but we can agree with President Coolidge, in his last message to Congress, when he said, "No expenditure of public money contributes so much to the national welfare as for building good roads."—Compiled by the C. L. Best Tractor Co.



This view shows splendid condition of state highway in Glenwood canon located near Glenwood Springs.

be translated into terms of dollars and cents. The good highway makes accessible the rural school. It insures against interruption of food supply. It smooths and speeds the business of living. For the family it is an open-air theater and an open-air school, and as we have seen the improved highway saves money for the people who use it, makes money for

Uniform Road Marker System Planned

THE first meeting of the Joint Board appointed by the Secretary of Agriculture for the purpose of planning a uniform marking system for interstate highways, was held in Washington, D. C., on April 20, 1925.

Attending this meeting were: Thomas McDonald, chief of the Bureau of Public Roads and representatives of the following states: Messrs. Green of New York, Sloan of New Jersey, Hotchkiss of Wisconsin, French of New Mexico, Brown of North Dakota, Williams of Massachusetts, Shirley of Virginia, Avery of Oklahoma, Peterson of Utah, Babcock of Minnesota, Moorefield of South Carolina, Piepmeyer of Missouri, Sheets of Illinois, Dietzer of Mississippi, Boulay of Ohio and Rogers of Michigan.

The conference lasted two full days and resolutions were finally adopted covering the following points:

1. That a uniform system of through road marking be adopted, based on numbering.

2. That resolution No. 5 regarding trail marking as adopted by the American Association of State Highway Officials at its last annual meeting in San Francisco, be adopted as the policy of this Board. Resolution No. 5 is as follows:

WHEREAS, This Association has adopted the report of the Subcommittee on Traffic Control and Safety, recommending the immediate selection of trans-continental and interstate routes from the Federal Aid road system, said roads to be continuously designated by means of standard highway marking signs and protected by standard traffic warning signs; and

WHEREAS, This system of highways when established and marked will satisfy the demand for marked routes on the part of trans-continental and interstate traffic, thus meeting the need which has been met in the past in a measure by the marked trails established by the reputable trails associations; and

WHEREAS, Many individuals have sought to capitalize the popular demand for interstate or cross-country routes by organizing trails, collecting large sums of money from our citizens and giving practically no service in return, with resulting discredit to the reputable trails associations which have heretofore rendered distinct public service by stimulating highway improvement, maintenance, and marketing; now, therefore be it

RESOLVED, That this Association hereby recommends to the several states that the reputable trails associations now existing be permitted to continue their markings during their period of usefulness, pending the establishing of the proposed marking system, unless such action shall conflict with the marking systems and policies now in force in the several states; and, be it further

RESOLVED, That no trail association be permitted to establish further routes on State or Federal Aid routes; and be it further

RESOLVED, That we hereby warn the citizens of this nation to investigate carefully the responsibility of trails organizers and demand convincing evidence insuring proper expenditure of funds be-



Type of marker suggested for use on Interstate roads.

fore contributing to or otherwise supporting such agencies.

3. That each state in the Union be requested to submit for the consideration of this Board a design for a marker of national significance to be acted upon by the Board at a later date.

4. That each state where authority does not exist, ask its legislative body to grant authority to the State Highway Department to provide a uniform system of marking and signing for the roads now under state jurisdiction.

5. That the Chairman of this Joint Board be asked to group the several states in such manner as will best promote the study of the roads to be selected and marked under the supervision of this Board; that group meetings be held at which representatives from each of the states involved and from the Bureau of Public Roads be present, at which meeting or subsequent meeting a study of the proposed routes to be selected and marked in each state be made; that joint meetings of related groups be held when necessary; that these groups report their recommendations to this Board for review, adjustment and ultimate adoption.

6. That it be the sense of this Board that in laying out the highways to recommend for adoption as part of the proposed uniformly marked system of interstate highways, each state be requested to bear in mind the following purposes:

- a. The connection of important centers with those reasonably direct lines which will be improved at the earliest possible date.
- b. The dispersion of traffic over a sufficient number of alternate routes to promote safety and ease of maintenance.
- c. The selection of approximately 1 per cent or less of the total highway mileage of the state as of greatest importance; of a second 1 per cent approximately as of secondary importance; and a third 1 per cent approximately as of tertiary importance; and that these suggested percentages be increased in sparsely settled states.

7. That it is the sense of this Board to adopt as a preliminary and tentative standard for the interstate highways to be selected, the following color scheme: For all route markers and directional signs black lettering on white background; for all warning or caution signs black lettering on lemon yellow background and that this tentative recommendation be submitted to each of the states for their comments and recommendations before being finally adopted by this Joint Board.

8. Since there has previously been adopted a resolution, except as to the use of lemon yellow as a color, it is the sense of this Board that the recommendations of the Subcommittee on Traffic Control and Safety as adopted by the American Association of State Highway Officials at its last meeting, be adopted as the preliminary standards for traffic warning signs to be used by this body. These resolutions provided shapes for non-luminous signs as follows:

1. Railroad warning sign.—Round.
2. Danger or Stop sign.—Octagonal.
3. Caution or Slow sign.—Diamond shaped.
4. Look or Attention sign.—Square.
5. Road markers.—Some characteristic or conventional shape different from the above.
6. Directional and Information sign.—Rectangular.

In line with the recommendations of the National Joint Board, a group meeting of state highway officials of five western states will be held in San Francisco on May 15. States to be represented at this meeting are: California, Oregon, Utah, New Mexico and Colorado.

Maj. L. D. Blauvelt, state highway engineer of Colorado, is secretary of the American Association of State Highway Officials.

Other group meetings will be held in various parts of the country, and it is hoped by early fall that a comprehensive plan of interstate highway marking will be finally decided upon.

This marking will be carried on under the direct supervision of the various states.

The National Joint Board on Interstate Highways is composed of representatives of the Department of Agriculture, the U. S. Bureau of Public Roads and State Highway officials.

"The Harnischfeger Corporation, formerly the Pawling & Harnischfeger Company of Milwaukee, Wis., have recently issued a 64-page book entitled, "Forty Years of Progress." In this book is a history of the growth and development of this organization since its founding forty years ago along with photographs and descriptions of the entire plant and personnel as it is today. Pictures and short descriptions of each of the various products in the electric crane, hoist, machine tool and gasoline excavator lines are also given. In all, this book gives a complete but concise description of the large P & H organization. Copies of this book will be sent on request."

Road Building By Tractor

COLORADO enjoys the distinction of having the best highway system in the West. This honor has come to the Centennial state within the last four years. We state this, not as a boast, but as a matter of fact.

Where formerly the motorist found it difficult to travel through the plains country and in the mountains, he now finds broad, smooth, concrete and gravel surfaced roadways to ride over. Trips that once required a whole day to make in a car, now may be made in three or four hours.

Tractors have played a most important part in the bringing about of this wonderful improved condition of our highway system. Following the close of the World War, the government distributed to the various states, through the Department of Agriculture, several hundred tractors of the crawler type for use in constructing and maintaining state roads.

Nearly a hundred of these tractors, some of which had seen service on the battlefields of France, were apportioned to the counties of Colorado, through the State Highway Department. With the distribution of these tractors, the road building program of this state gained marked impetus. Most of the tractors were of the heavy duty type, and it was necessary for a great many of the counties to purchase heavier auxiliary road building equipment for use with them.

During the four years that these tractors have been in use by the counties, hundreds of miles of old roads have been widened and reconstructed, and in addition a large mileage of entirely new roads have been built to grade and later gravel surfaced. At the same time animal power for road building and road maintenance in this state has almost been entirely eliminated in some sections.

State and county officials have found that the tractor is a great time saver, not to mention the fact that it can be ope-

rated continuously without a rest, with less help and over ground conditions impossible to navigate with animal power. The power of the tractor is being applied to a variety of uses by the counties—from cleaning snow from the mountain passes and pulling heavy scarifier graders with the heavy duty machines, to the handling of maintenance equipment with the lighter models.

Finding great economy in the use of these war tractors in their road work, a large number of the counties have made additional purchases of tractors from the different factories, until now there are over 150 tractors of various sizes being used in Colorado. While the bigger part of the work to which these tractors have been put has been located on "county roads", a large share has been done on "state highways," the cost of which has been paid for on a "joint account" between the state and the counties.

One county reported that it has built to grade over sixty miles of new roadway last year with its tractor-grader outfit. A few weeks ago Arapahoe county, under the supervision of Thomas Shearer, county road superintendent, graded fifteen blocks of new streets south of Englewood, with a heavy tractor and grader. Other counties report similar achievements.

The number of tractors now being operated by the counties run from one to seven. A majority of these machines are being used in the reconstruction of old roads. Increase of traffic has made it necessary for these roads to be widened and brought up to modern grade. Tractors have been found to be the most economical power for this work. A report from the Weld county commissioners shows seven modern tractor outfits now in use in that county.

Road and street contractors of Colorado also are finding wide use for the tractor. Several of them own complete-

ly motorized outfits for this work. Some of these men have witnessed the evolution of the dirt moving game from the old pick and shovel and wheelbarrow days. They say that the modern tractor has revolutionized the dirt moving business. In the old days twenty-four head of good horses or mules were required to pull an elevating grader in stiff clay. A sixty horsepower tractor now does the same work with greater dirt moving capacity.

It has been found that where motorized outfits are on the job, that road projects are invariably completed on time. With the modern tractor in the road contractor's outfit, the stable camp is eliminated; the number of men and the labor turnover are reduced. The motorized method reduces the whole operation to a mechanical basis. Likewise the outfit can be quickly moved from one location to another.

The tractor was originally designed for agricultural work, with ability to travel over all sorts of soil. The ancestor of the modern gas tractor was a fanning mill for cleaning wheat on the farm, first built in 1871. Today the tractor is used by farmers, road builders, railroads, industrial concerns and on public work of all kinds. It played an important part in the World War, making it possible to move artillery and wagon trains over "impassable" ground.

Maj. L. D. Blauvelt, state highway engineer, has always been a strong advocate of the use of modern earth moving equipment in road construction, and he says that use of the war tractors helped in a large measure to advance Colorado to the front rank in improved highways.

The annual highway expenditures are approximately \$1,000,000,000.



(Left) A tractor-blade outfit owned by Arapahoe county. Road Supervisor Thos. Shearer standing beside tractor. (Right) A tractor elevating-grader outfit being operated by a Colorado contractor.

State Asks Approval on Big Grading Job North of Nunn

During the month of April plans were submitted to the U. S. Bureau of Public Roads for approval for the construction of an overhead highway crossing of the Union Pacific tracks to be located between Nunn and Dover.

Bids for the construction of this project will be asked for in the very near future. With the construction of this structure, the only remaining railroad crossing between Greeley and Cheyenne, Wyo., will be eliminated.

Through a change in the alignment of the highway between these two points last year six railroad crossings were eliminated. From Greeley to Eaton an entirely new roadway was graded and gravel surfaced. At first there was considerable opposition to the change in the roadway, but it is said that the users of this road now are highly pleased with the change.

Plans also are being drafted by the department engineers for the grading of seventeen miles north of Nunn on this same highway. It is expected that construction on this project will be started and completed this summer.

Engineers also are working on plans for fourteen other projects located in various parts of the state. One of these projects embraces the grading of eighteen miles of highway between Orchard and Wiggins. The department is also preparing plans for six miles of pavement between Sedalia and Castle Rock.

Plans have been completed for the construction of one mile of heavy rock work in Byers canon, between Hot Sulphur Springs and Parshall. This is an extension of the work done in Byers canon last year.

Shortly the department will ask for bids on two and one-half miles of pavement between Rocky Ford and Swink, which, when constructed, will complete the paving between these two points.

Four contract awards were made by the State Highway department during April as follows:

Three miles of gravel surfacing south of Durango, awarded to B. R. & L. J., Morrison, Colorado Springs, on bid of \$17,171.

Nineteen miles of grading and sand clay surfacing, between Merino and Brush, to Scott & Curlee, Sterling, on bid of \$102,627.

Two and a half miles of concrete paving and gravel surfacing west of Merino, awarded to Engineers Construction Corp., Greeley, on bid of \$70,381.

One and one-half miles of concrete paving, including bridge and paved approaches between Las Animas and Lamar, awarded to Salle Construction Co., Pueblo, on bid of \$34,561.

The sum of \$2,200 has been subscribed by the citizens of Paonia for the gravel surfacing of the road on the south side of the river between Paonia and Hotchkiss. The project was sponsored by the Lions and Rotary clubs of Paonia. Work will start immediately. When completed the road between the two towns will be entirely gravel surfaced.



A splendid stretch of state road located on the Victory highway near Steamboat Springs.....Photo by H. L. Jenness.

Governor Appoints Two New Members on Advisory Board

Governor Clarence J. Morley appointed two new members on the State Highway Advisory Board during April.

They are as follows: Judge Milton R. Welch of Delta, to represent the Second District, and W. G. Duvall, of Golden, as representative of the Sixth District.

Judge Welch, who is a prominent lawyer of the western slope and former member of the district bench, succeeds William Weiser of Grand Junction. Mr. Duvall, who is a prominent lumber dealer and business man of Golden, takes the place of the late John J. Donovan of Longmont.

Governor Morley also re-appointed Messrs. Geo. L. L. Gann and Frank H. Blair as members of the Advisory Board. Mr. Gann has been a member of the board since it was organized under the present highway act in 1920. He represents the Pueblo district. Mr. Blair lives in Sterling and is the board member from the Seventh District.

The board will hold its annual spring meeting the latter part of May, the date for which had not been set at the time of going to press with this issue of Colorado Highways.

At this meeting a chairman and vice chairman will be elected. Mr. Weiser was chairman of the board for the last two years.

State Completes New Link on Denver-Morrison Road

Another link of concrete pavement was added to the Colorado highway system last month when a five mile stretch new roadway was completed by the Colorado Bridge & Construction Co. on the Denver-Morrison highway.

Work on this piece of pavement was started early last year. It started one mile east of Morrison and extended to a connection with the old pavement which was constructed several years ago.

Last summer there was completed of

mile of pavement west from the city limits of Denver. This road now is entirely paved from Denver to the city limits of Morrison, and within a few hundred yards of the Bear Creek entrance to the Denver Mountain park system.

With the completion of the Morrison road, the highways leading to both entrances to Denver's famous mountain park system are now paved with concrete. The pavement on the south Golden road, leading to the Lookout Mountain entrance, was constructed several years ago.

11 Contractors Are Given Jobs by State Road Dept.

The following contractors started road building projects under contract with the State Highway Department during the month of April:

San Luis Valley Constr. Co., Sanford, Colorado.

Stamey-Mackey Const. Co., Trinidad, Colorado.

Honaker & Hanson, Cortez, Colorado.

Chris. O'Neill, Platteville, Colorado.

Engler & Teyssier, Durango, Colorado.

Hinman Brothers, 3358 Race St., Denver, Colorado.

Levy Const. Company, 630 Symes Bldg., Denver, Colorado.

Blackwell & Butler, Grand Junction, Colorado.

Pople Bros. Constr. Co., Trinidad, Colorado.

Lee F. Williams, Thatcher Bldg., Pueblo, Colorado.

Dooling Brothers, 305 Bank Block, Denver, Colorado.

Plans have been completed by the Rocky Mountain Motorists, Inc., to install 3,500 new signs on Colorado roads in the immediate future. A total of 4,380 signs already have been installed under the direction of the State Highway department. As fast as possible every road in the state will be logged and adequately marked. Future plans call for the marking of the roads to the Missouri River, with the idea of directing tourists to Colorado.

TABULATION OF BIDS ON STATE HIGHWAY PROJECTS

F. A. PROJECT NO. 246-C, PUEBLO COUNTY, LOCATED EAST OF VINELAND

No.	ITEM	Unit	Quantity	Estimate		Lee F. Williams		Salle Const. Co.		LaNeir, Selander & White		F. C. Dreher Contr. Co.		Strange-McGuire Paving Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	300	\$.40	\$ 120.00	\$.45	\$ 135.00	\$ 1.00	\$ 300.00	\$.50	\$ 150.00	\$.50	\$ 150.00	\$.50	\$ 150.00
2	Borrow Fill	Cu. Yd.	8,900	.40	3,560.00	.45	4,005.00	.40	3,560.00	.50	4,450.00	.50	4,450.00	.36	3,204.00
3	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	Sand Cushion	Cu. Yd.	1,820	2.00	2,640.00	2.00	2,640.00	1.70	2,244.00	1.25	1,650.00	1.50	1,980.00	1.50	1,980.00
5	Gravel Shoulder	Cu. Yd.	880	1.50	1,320.00	2.00	1,760.00	1.40	1,232.00	1.50	1,320.00	2.00	1,320.00	2.00	1,760.00
6	Concrete Pavement	Sq. Yd.	20,610	2.40	49,464.00	2.25	46,372.50	2.18	44,929.80	2.15	44,311.50	2.51	45,548.10	2.14	44,105.40
7	Def. Metal Joint	Lin. Ft.	10,310	.20	2,062.00	.25	2,577.50	.22	2,268.20	.16	1,649.60	.12	1,237.20	.18	1,855.80
8	Cl. A Concrete	Cu. Yd.	36	22.00	792.00	30.00	1,080.00	22.00	792.00	18.00	648.00	20.00	720.00	22.00	792.00
9	Cl. B Concrete	Cu. Yd.	43	21.00	903.00	30.00	1,290.00	21.00	903.00	17.00	731.00	20.00	860.00	22.00	946.00
10	Reinforcing	Lb.	3,600	.07	252.00	.07	252.00	.075	270.00	.06	216.00	.05	180.00	.065	234.00
11	18" C. M. P. Culvert	Lin. Ft.	840	2.00	1,680.00	2.25	1,890.00	1.85	1,554.00	1.80	1,512.00	1.35	1,134.00	1.85	1,554.00
12	18" C. M. P. Siphon	Lin. Ft.	115	1.50	172.50	2.00	230.00	2.10	241.50	2.00	230.00	1.00	115.00	1.25	149.75
13	24" C. M. P. Siphon	Lin. Ft.	38	2.00	76.00	2.00	76.00	2.80	106.40	2.25	85.50	1.25	47.50	1.50	57.00
14	Timber Headers	M. B. Ft.	3.5	60.00	210.00	80.00	280.00	55.00	192.50	60.00	210.00	60.00	210.00	70.00	245.00
15	Remove & Replace Cul.	Lump Sum			10.00		400.00		35.00		25.00		10.00		15.00
16	18" Trash Guard	Each	6	8.00	48.00	10.00	60.00	12.50	75.00	8.00	48.00	7.50	45.00	7.50	45.00
17	24" Trash Guard	Each	2	10.00	20.00	10.00	20.00	15.00	30.00	10.00	20.00	12.00	24.00	10.00	20.00
Totals					\$63,331.50		\$63,070.00		\$58,785.40		\$57,258.60		\$58,032.80		\$57,108.95

No.	J. L. Busselle & Co.		A. F. Hewitt		J. Fred Roberts & Sons Const. Co.		W. A. Colt & Son		P. C. Croll		Engr. Const. Corp.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.35	\$ 105.00	\$.40	\$ 120.00	\$.40	\$ 120.00	\$.50	\$ 150.00	\$.80	\$ 240.00	\$.60	\$ 180.00
2	.35	3,115.00	.40	3,560.00	.40	3,560.00	.50	4,450.00	1.00	8,900.00	.65	5,785.00
3	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	1.50	1,980.00	1.70	2,244.00	1.70	2,244.00	2.00	2,640.00	1.50	1,980.00	2.00	2,640.00
5	1.50	1,320.00	1.70	1,496.00	1.85	1,628.00	1.50	1,320.00	2.80	2,464.00	2.50	2,200.00
6	2.24	46,166.40	2.37	45,845.70	2.30	47,403.00	2.20	45,842.00	2.75	56,677.50	2.46	50,700.50
7	.20	2,062.00	.19	1,958.90	.17	1,752.70	.20	2,062.00	.25	2,577.50	.17	1,752.70
8	20.00	720.00	20.00	720.00	20.00	720.00	22.00	792.00	28.00	1,008.00	22.00	792.00
9	20.00	860.00	20.00	860.00	16.00	688.00	22.00	946.00	25.00	1,075.00	22.00	946.00
10	.07	252.00	.0675	243.00	.07	252.00	.07	252.00	.06	216.00	.065	234.00
11	1.75	1,470.00	1.95	1,638.00	1.88	1,579.20	2.00	1,680.00	2.00	1,680.00	1.98	1,621.20
12	1.25	143.75	1.48	170.20	1.40	161.00	1.50	172.50	2.00	230.00	1.54	177.10
13	1.50	57.00	2.20	83.60	1.85	70.30	2.00	76.00	3.00	114.00	1.68	63.84
14	65.00	227.50	70.00	245.00	65.00	227.50	60.00	210.00	60.00	210.00	60.00	210.00
15		15.00		15.00		10.00		20.00		50.00		30.00
16	7.00	42.00	7.50	45.00	8.00	48.00	8.00	48.00	25.00	150.00	10.00	60.00
17	9.00	18.00	9.50	19.00	10.00	20.00	10.00	20.00	30.00	60.00	18.00	26.00
Totals		\$58,555.65		\$62,265.40		\$6,485.70		\$60,182.50		\$77,634.00		\$67,420.44

F. A. PROJECT NO. 288-B, LOGAN COUNTY, LOCATED SOUTHWEST OF MERINO

No.	ITEM	Unit	Quantity	Estimate		F. C. Dreber Con. Co.		W. J. Cameron		Scott & Curlee		Carl C. Madsen Const. Co.		A. F. Hewitt 361 Lafayette	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	300	\$.30	\$ 90.00	\$.50	\$ 150.00	\$.30	\$ 90.00	\$.45	\$ 135.00	\$.45	\$ 135.00	\$.48	\$ 129.00
2	Borrow Fill	Cu. Yd.	22,000	.35	7,700.00	.47	10,340.00	.32	7,040.00	.45	9,900.00	.35	7,700.00	.43	9,460.00
3	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	Sand Cushion	Cu. Yd.	1,640	2.00	3,080.00	1.62	2,494.80	1.50	2,310.00	1.50	2,310.00	1.20	1,848.00	1.55	2,387.00
5	Concrete Cl. A	Cu. Yd.	644	24.00	13,056.00	25.00	13,600.00	19.00	10,836.00	19.00	10,836.00	17.40	9,465.50	19.80	10,771.20
6	Concrete Cl. B	Cu. Yd.	20	23.00	460.00	25.00	500.00	20.00	400.00	21.00	420.00	18.00	360.00	25.00	500.00
7	Wire Mesh Reinforce't	Lb.	32,030	.07	2,242.10	.0725	2,322.18	.07	2,242.10	.08	2,562.40	.065	2,081.95	.068	2,178.04
8	15" C. M. P. Culvert	Lin. Ft.	380	1.75	665.00	1.85	613.00	1.70	646.00	1.50	570.00	1.30	494.00	1.75	665.00
9	30" C. M. P. Culvert	Lin. Ft.	82	3.50	112.00	3.00	96.00	3.40	108.80	3.50	112.00	3.10	99.20	3.70	118.40
10	Untreated Timber	M. B. Ft.	62.9	75.00	4,717.50	73.80	4,642.02	72.50	4,569.25	60.00	3,774.00	55.00	3,469.50	72.50	4,569.25
11	Treated Timber	M. B. Ft.	289.1	115.00	33,246.50	112.00	32,379.20	104.00	30,066.40	82.50	23,850.75	86.00	24,862.60	95.17	27,513.65
12	Treated Timber Piling	Lin. Ft.	7,812	1.15	8,983.80	1.15	8,983.80	1.15	8,983.80	.90	7,030.80	.98	7,655.76	.95	7,421.40
13	Cable Guard Fence	Lin. Ft.	670	.65	435.50	.75	502.50	.65	435.50	.60	402.00	.70	469.00	.65	435.50
14	Remove 4 Bridges	Lump Sum			1,500.00		1,000.00		1,200.00		1,200.00		600.00		1,000.00
15	Gravel Shoulder	Cu. Yd.	220	2.00	440.00	1.85	407.00	2.50	550.00	1.80	396.00	.80	176.00	1.45	319.00
16	Concrete Pavement	Sq. Yd.	5,100	2.60	13,260.00	2.62	13,362.00	2.51	12,801.00	2.76	14,076.00	2.50	12,750.00	2.49	12,699.00
17	Deform. Met. Joint	Lin. Ft.	2,550	.20	510.00	.18	459.00	.17	433.50	.20	510.00	.20	510.00	.19	484.50
18	Timber Headers	M. B. Ft.	4.1	60.00	246.00	60.00	246.00	60.00	246.00	65.00	266.50	40.00	164.00	68.00	287.80
Totals					\$90,746.40		\$91,999.50		\$82,451.35		\$77,853.45		\$72,832.61		\$80,881.74

No.	La Nier, Selander & White		K. V. Johnson 1744 Glenarm		Engr. Const. Corp.		A. R. Mackey		Fulton & Fulton		Levy Const. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.40	\$ 120.00	\$.35	\$ 105.00	\$.35	\$ 105.00	\$.24	\$ 72.00	\$.26	\$ 78.00	\$.35	\$ 105.00
2	.48	10,560.00	.40	8,800.00	.35	7,700.00	.46	10,120.00	.26	5,720.00	.35	7,700.00
3	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	1.10	1,694.00	1.85	2,849.00	.85	1,309.00	.81	1,247.40	1.75	2,695.00	1.75	2,695.00
5	17.50	9,520.00	24.80	13,451.20	16.95	9,220.80	17.50	9,520.00	20.00	10,880.00	17.75	9,656.00
6	17.50	350.00	23.00	463.00	19.00	380.00	18.50	370.00	20.00	400.00	35.00	700.00
7	.08	2,562.40	.08	2,562.40	.07	2,242.10	.0625	2,001.88	.07	2,242.10	.076	2,434.28
8	1.50	570.00	1.55	589.00	1.50	570.00	1.54	585.20	1.50	570.00	1.75	665.00
9	4.50	144.00	3.45	110.40	2.45	78.40	3.60	115.20	3.25	104.00	3.25	104.00
10	57.50	3,616.75	74.00	4,664.60	42.80	2,682.12	55.25	3,475.22	60.00	3,774.00	75.00	4,717.50
11	86.00	24,862.60	112.00	32,379.20	82.30	23,792.98	98.00	26,886.30	90.00	26,019.00	99.00	28,620.90
12	.67	5,234.04	1.12	8,749.44	.89	6,962.68	.93	7,265.16	.92	7,187.04	.99	7,733.88
13	.60	402.00	.60	402.00	.65	435.50	.48	321.60	.65	435.50	.65	435.50
14	-----	1,000.00	-----	1,450.00	-----	1,000.00	-----	1,765.00	-----	1,000.00	-----	1,200.00
15	1.25	275.00	1.90	418.00	1.40	308.00	1.22	268.40	1.50	380.00	1.75	385.00
16	2.50	12,750.00	2.54	12,954.00	2.55	13,005.00	2.28	11,628.00	2.30	11,730.00	2.60	13,260.00
17	.18	459.00	.20	510.00	.15	382.50	.18	459.00	.16	408.00	.16	408.00
18	60.00	246.00	56.00	229.60	50.00	205.00	58.00	237.80	60.00	246.00	60.00	246.00
Totals		\$74,367.79		\$90,715.84		\$70,381.03		\$76,340.16		\$73,820.64		\$81,068.06

F. A. PROJECT NOS. 290-A AND 169-R NO. 1, BENT COUNTY, LOCATED NORTHEAST OF LAS ANIMAS

No.	ITEM	Unit	Quantity	Estimate		F. C. Dreher Con. Co.		W. A. Colt & Co.		Pueblo Br. & Con. Co.		Stamey-Mackey Co.		Salle Const. Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	700	\$.45	\$ 315.00	\$.50	\$ 350.00	\$.35	\$ 245.00	\$.55	\$ 385.00	\$.30	\$ 210.00	\$.47	\$ 329.00
2	Borrow Fill	Cu. Yd.	13,000	.40	5,200.00	.50	6,500.00	.35	4,550.00	.40	5,200.00	.30	3,900.00	.37	4,810.00
3	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	Sand Cushion	Cu. Yd.	2,000	1.50	3,000.00	1.25	2,500.00	1.50	3,000.00	1.25	2,500.00	1.25	2,500.00	1.47	2,940.00
5	Gravel Shoulder	Cu. Yd.	460	1.50	690.00	1.25	575.00	1.50	690.00	2.25	1,085.00	1.50	690.00	1.57	722.20
6	Concrete Pavement	Sq. Yd.	10,800	2.35	25,380.00	2.21	23,868.00	2.20	23,760.00	2.27	24,516.00	2.20	23,760.00	2.07	22,356.00
7	Defmd. Met. Joint	Lin. Ft.	5,400	.20	1,080.00	.18	972.00	.25	1,350.00	.17	918.00	.18	972.00	.17	918.00
8	Concrete Cl. A	Cu. Yd.	59	21.00	1,239.00	23.00	1,357.00	22.00	1,298.00	24.00	1,416.00	20.00	1,180.00	20.00	1,180.00
9	Concrete Cl. B	Cu. Yd.	8	20.00	160.00	25.00	200.00	22.00	176.00	20.00	160.00	20.00	160.00	18.00	144.00
10	Reinforcing	Lb.	4,675	.07	327.25	.05	233.75	.07	327.25	.07	327.25	.055	257.12	.07	327.25
11	15" C. M. P. Culvert	Lin. Ft.	120	1.75	210.00	1.40	168.00	2.00	240.00	1.90	228.00	1.50	180.00	1.60	192.00
12	24" C. M. P. Culvert	Lin. Ft.	30	2.50	75.00	2.80	84.00	3.00	90.00	2.90	87.00	2.50	75.00	2.10	68.00
13	24" C. M. P. Siphon	Lin. Ft.	118	2.00	236.00	1.90	224.20	2.00	236.00	2.00	236.00	1.75	206.50	2.10	247.80
14	18" Vit. Tile Pipe	Lin. Ft.	180	1.50	270.00	1.65	297.00	2.00	360.00	2.85	513.00	2.25	405.00	1.50	270.00
15	Timber Headers	M. B. Ft.	0.8	60.00	48.00	57.00	45.60	60.00	48.00	70.00	56.00	65.00	52.00	55.00	44.00
16	Siphon Trash Guard	Each	2	7.00	14.00	12.00	24.00	10.00	20.00	15.00	30.00	10.00	20.00	8.00	16.00
Totals					\$38,246.25		\$37,400.55		\$36,392.25		\$37,609.25		\$34,569.62		\$34,561.25

F. A. PROJECT NO. 270-B, RIO GRANDE AND ALAMOSA COUNTIES, LOCATED BETWEEN MONTE VISTA AND ALAMOSA

No.	ITEM	Unit	Quantity	Estimate		Engler & Teyssier		San Luis Valley Const. Co.		J. J. Navins		E. M. Harris & Sons		Central Const. Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	200	\$.40	\$ 80.00	\$.27	\$ 54.00	\$.30	\$ 60.00	\$.45	\$ 90.00	\$.35	\$ 70.00	\$.40	\$ 80.00
2	Borrow Fill	Cu. Yd.	17,100	.40	6,840.00	.27	4,617.00	.30	5,130.00	.39	6,669.00	.37	6,327.00	.40	6,840.00
3	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	Gravel Surface	Sq. Yd.	26,600	.50	13,300	.40	10,640.00	.35	9,310.00	.47	12,502.00	.44	11,704.00	.39	10,374.00
5	Concrete Cl. B	Cu. Yd.	16	21.00	336.00	20.00	320.00	17.00	272.00	22.00	352.00	20.00	320.00	20.00	320.00
6	15" C. M. P. Culv.	Lin. Ft.	310	2.00	620.00	1.90	589.00	2.25	697.50	2.00	620.00	1.75	542.50	2.00	620.00
Totals					\$21,178.00		\$16,222.00		\$15,471.50		\$20,285.00		\$18,965.50		\$18,236.00

No.	Stamey-Mackey		B. L. & J. L. Morrison	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.35	\$ 70.00	\$.35	\$ 70.00
2	.35	5,985.00	.35	5,985.00
3	.02	2.00	.02	2.00
4	.35	10,108.00	.35	9,576.00
5	20.00	320.00	20.00	320.00
6	1.75	542.50	1.90	589.00
Totals		\$17,027.50		\$16,542.00

STATE PROJECT NO. 558, JEFFERSON COUNTY, LOCATED GUY HILL ROAD NORTHWEST OF GOLDEN

No.	ITEM	Unit	Quantity	Estimate		Hamilton & Glendon Co.		Pioneer Engr. & Const. Corp.		A. F. Hewitt		W. J. Cameron		E. H. Honnen	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	3,900	\$.45	\$ 1,755.00	\$.50	\$ 1,950.00	\$.92	\$ 3,588.00	\$.40	\$ 1,560.00	\$.94	\$ 3,666.00	\$.28	\$ 1,092.00
2	Exc. Rock	Cu. Yd.	12,100	1.10	13,310.00	1.50	18,150.00	.52	11,322.00	1.10	13,310.00	.94	11,374.00	.96	11,616.00
3	Cement Rub. Masonry	Cu. Yd.	18	12.00	216.00	16.00	288.00	15.00	270.00	14.50	261.00	12.00	216.00	11.00	198.00
4	Selected Surfacing	Sq. Yd.	2,590	.20	518.00	.22	570.60	.20	518.00	.14	362.60	.30	777.00	.15	388.50
5	18" C. M. P. Culvert	Lin. Ft.	316	2.25	711.00	1.75	553.00	2.50	790.00	2.25	711.00	2.20	696.20	1.90	600.40
Totals					\$16,474.00		\$21,447.80		\$16,253.00		\$16,161.10		\$16,692.20		\$13,861.90

No.	ITEM	Unit	Quantity	H. C. Lallier Con. & Engrs. Co.		Salle Const. Co.		Doelling Bros.		Thomas Mishov Contract. Co.		Jacobson & Ehrhart		A. S. Tebbe and W. K. Everingham	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.45	\$ 1,755.00	\$.40	\$ 1,560.00	\$.45	\$ 1,755.00	\$.50	\$ 1,950.00	\$.40	\$ 1,560.00	\$.35	\$ 1,260.00	\$.35	\$ 1,260.00	
2	1.15	13,915.00	.90	10,890.00	.90	10,890.00	.95	11,495.00	1.05	12,705.00	1.15	13,915.00	1.15	13,915.00	
3	12.50	225.00	11.00	121.00	11.00	121.00	12.00	144.00	12.00	144.00	14.00	196.00	14.00	196.00	
4	.35	906.50	.20	77.00	.10	35.00	.15	52.50	.18	63.00	.25	87.50	.25	87.50	
5	2.25	711.00	2.10	450.60	1.80	396.00	2.25	506.25	2.00	450.00	2.15	472.50	2.15	472.50	
Totals					\$17,475.00		\$18,860.90		\$13,637.30		\$14,724.50		\$15,549.20		\$16,316.90

No.	Putname & Anderson		K. V. Johnson	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.32	\$ 1,248.00	\$.50	\$ 1,950.00
2	.98	11,858.00	1.10	13,310.00
3	8.00	240.00	12.50	362.50
4	.14	362.60	.25	647.50
5	1.60	506.60	2.55	806.80
Totals				\$14,094.20

STATE PROJECT NO. 904-B, ARAPAHOE COUNTY, LOCATED BETWEEN PETERSBURG AND FORT LOGAN

No.	ITEM	Unit	Quantity	Estimate		Allied Contractors, Inc.		J. Everitt Young Const. Service Co.		Monaghan-Cunningham Const. Co.		F. C. Dreher Contr. Co.		Carl C. Madsen Const. Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	800	\$.50	\$ 400.00	\$.50	\$ 400.00	\$ 1.00	\$ 800.00	\$.50	\$ 400.00	\$.55	\$ 440.00	\$.40	\$ 320.00
2	Borrow Fill	Cu. Yd.	700	.50	350.00	.50	350.00	.75	525.00	.50	350.00	.55	385.00	.40	280.00
3	Prep. Sub Grade	Sq. Yd.	19,550	.03	586.50	.03	586.50	.05	977.50	.03	586.50	.07	1,368.50	.03	586.50
4	Gravel Shoulder	Sq. Yd.	840	1.50	1,260.00	1.50	1,260.00	1.50	1,260.00	1.42	1,192.80	1.42	1,192.80	.93	783.60
5	Concrete Pavement	Sq. Yd.	19,550	2.30	44,965.00	2.30	44,965.00	2.275	44,476.25	2.28	44,574.00	2.28	44,574.00	1.93	37,731.50
6	Timber Headers	M. B. Ft.	3.2	65.00	208.00	65.00	208.00	70.00	224.00	64.25	205.60	55.00	176.00	60.00	192.00
Totals					\$47,769.50		\$ 2,894.50		\$ 3,786.50		\$47,273.95		\$48,186.30		\$39,698.00

Alternate bids for Bituminous Pavement

No.	ITEM	Unit	Quantity	Estimate		Allied Contractors, Inc.		J. Everitt Young Const. Service Co.		Monaghan-Cunningham Const. Co.		F. C. Dreher Contr. Co.		Carl C. Madsen Const. Co.		
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
7	Concrete Base	Sq. Yd.	19,550	\$ 1.40	\$27,370.00	\$ 1.25	\$24,437.50	\$ 1.03	\$20,136.50							
8	Concrete Header	Lin. Ft.	19,550	.08	1,564.00	.07	1,368.50	.05	977.50							
Sub Total					\$28,934.00		\$25,806.00		\$21,114.00							
9a	Coarse Agg. Spec. B.	Sq. Yd.	18,465	1.25	23,081.25	1.03	19,018.95	1.39	25,666.35							
Sub Total					\$54,819.75		\$47,629.45		\$50,566.85							
Totals					\$83,783.75		\$75,632.40		\$71,680.80							

No.	ITEM	Unit	Quantity	Estimate		Western Paving Const. Co.		Engr. Const. Corp.		R. L. Hanes		Andrew J. Collins		J. Fred Roberts & Sons Const. Co.			
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount		
1	\$.38	\$ 304.00	\$.50	\$ 400.00	\$.45	\$ 360.00	\$.35	\$ 280.00	\$.60	\$ 480.00	\$.30	\$ 240.00	\$ 1.00	\$ 800.00	\$.75	\$ 600.00	
2	.38	266.00	.50	350.00	.50	350.00	.50	350.00	.65	455.00	.25	175.00	.50	350.00	1.00	700.00	
3	.0275	537.63	.03	586.50	.05	977.50	.07	1,368.50	.05	391.25	.085	684.25	.04	291.75	.05	391.75	
4	1.00	840.00	1.25	1,050.00	2.00	1,680.00	2.00	1,680.00	2.00	1,680.00	1.18	949.20	1.50	1,260.00	1.50	1,260.00	
5	2.05	40,077.50	2.19	42,814.50	2.19	42,814.50	2.29	44,769.50	2.32	45,356.00	1.83	35,776.50	2.17	42,423.50	2.30	44,965.00	
6	60.00	192.00	65.00	208.00	70.00	224.00	70.00	224.00	55.00	176.00	60.00	192.00	60.00	192.00	65.00	208.00	
Totals					\$42,217.13		\$45,619.00		\$48,672.00		\$49,124.50		\$37,984.95		\$45,807.50		\$48,730.50

HOLT **CATERPILLAR** Tractor

Reg.U.S. Pat.Off.



CATERPILLARS AND MANEY SELF-LOADING SCRAPERS

move the dirt from where it is to where you want it in the shortest time, at least cost per cubic yard. The fast jobs are always the most profitable. Contractors with Caterpillars have a big advantage in figuring jobs. They can make defi-

nite calculations for figuring jobs on schedule, which is the basis for actual cost of operations. They eliminate the loss of feeding a "flock of mules" between jobs. Ask for catalog on Caterpillar Tractors and Maney Scrapers.



The Clinton Curb and Gutter Ditcher

makes a ditch 8 to 18 inches deep and 30 inches wide. Will cut ditch with square shoulder for curb. Saves 75 per cent of time and labor.

See it in operation on Denver streets.

A Better Mixer A Better Paver—

Manufactured by the Ransome Concrete Machinery Co., the oldest and largest concern building concrete construction equipment. Ransome mixers and pavers are sold extensively in the East, and when known, will be bought extensively in the West.

All sizes, tilting and non-tilting mixers, carts and chutes.

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DISTRIBUTORS

Denver, Colorado

Gov. Morley Vetoes Bill to Regulate Motor Bus Lines

Efforts of the State Association of County Commissioners to bring about the enactment of a law which would compel automobile transportation lines to pay, in part, for the damage done to state and county roads by their heavy freight and passenger cars, failed when Gov. Clarence J. Morley on May 9th disapproved Senate Bill No. 355.

This measure, introduced by Senator Elmer Abbey of Weld county, at the instance of the Commissioners' association, was designed to regulate the operation of trucks and passenger busses, and provided that these lines in return for the use of the highways, should pay into the state treasury a sum equal to 2 per cent of their gross earnings. The state public utilities commission was to exercise general supervision over the lines and see to it that the license fee was paid promptly.

In vetoing the measure, Gov. Morley declared that the bill had many fine features, especially the one providing for the payment of a part of the gross earnings, because the latter provided much needed funds for highway construction and maintenance, but he could not see his way clear to approve it, because he believed the measure to be discriminatory and designed to give a few bus companies all the best of it. He called special attention to that clause of the bill providing for compulsory liability insurance, saying that this clause was clearly un-

constitutional, in that it compelled one class of common carriers to take out insurance, while another class was permitted to operate without insurance.

As passed by the general assembly the bill provided for the division of the money paid in as license fees on the following basis: Fifty per cent to the state highway department, forty per cent to the counties traversed by the lines on a mileage basis and the remaining 10 per cent to the city and county of Denver.

Following the action of the governor in vetoing the measure, the county commissioners, through Dan Straight of Weld county, vice president of the state association, announced that another bill providing for the taxing and regulation of auto transportation lines would be introduced in the next general assembly.

A bill passed the assembly and approved by Gov. Morley is designed to clarify the state traffic code. The old law contained a provision "plotted" curve, in connection with the speed regulations. The new law changes the statute so as to eliminate this word, and puts the particular section in such language as to be understood by everybody.

Efforts by members of the general assembly to amend the traffic code so as to eliminate the speed limit on state highways of 35 miles per hour failed when the house "killed" a measure to this effect, passed by the senate.

Several measures which had for their subject a raise in the state gasoline tax to 4 cents, or a re-arrangement of the distribution of the proceeds of this tax, failed of passage. As a matter of fact

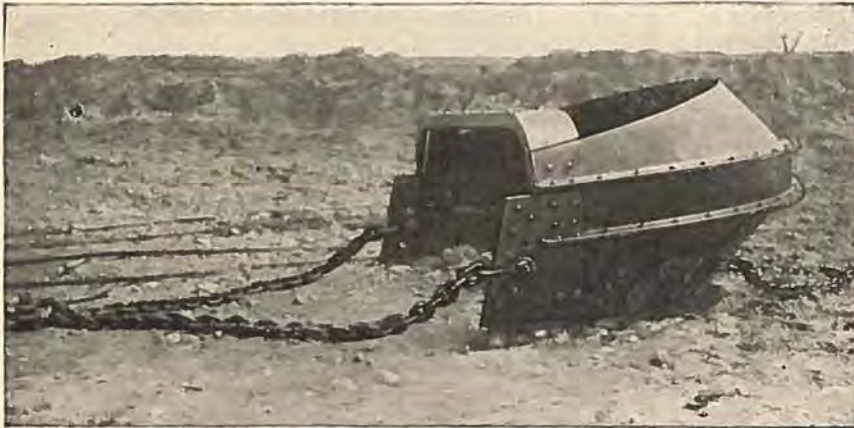
none of these measures ever were reported out of committees. The same fate befell several bills which had for their object a complete reorganization of the state highway department.

The only action taken by either house of the general assembly with reference to the state highway department was the adoption of a resolution by the house of representatives which provides for the appointment of a special committee by the governor for the purpose of making an investigation of the department. This committee is to consist of an engineer, experienced in highway construction, an auditor and an investigator. No money was appropriated to defray the salaries and expenses of the committee.

Passes Open Month Earlier Than in Previous Seasons

Reports received by the State Highway department from the several district maintenance superintendents indicate that all mountain pass roads will be open to traffic a month earlier this year than ever before. This is due to the small amount of snow in the high altitudes during the past winter.

The mountain roads have suffered less from the elements this spring than in years and already are in splendid condition for travel. As a general rule the mountain passes are blockaded with snow until the middle of June but the first part of May found cars going over all of the passes but one or two this year.



A TWO-YARD CRESCENT READY TO DIG

A half yard portable scraper unit with Sauerman special hoist operating on road contract in Southern Colorado.



Sauerman Crescent Power Scraper Bucket A Powerful Digger

The mold board action of the cutting edge makes the Crescent Scraper a powerful digger. Will excavate hard packed gravel and large boulders. Requires less power than other types.

Complete Plants

Portable plants with hoist mounted on steel trucks made in 1/4, 1/2 and 3/4-yd. sizes. Stationary plants from 1/3-yd. to 8-yd. sizes. All units especially manufactured for scraper service. Sauerman Bros. also manufacture V-shaped and square type power scrapers.

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The Herbert N. Steinbarger Co.

CONSTRUCTION EQUIPMENT

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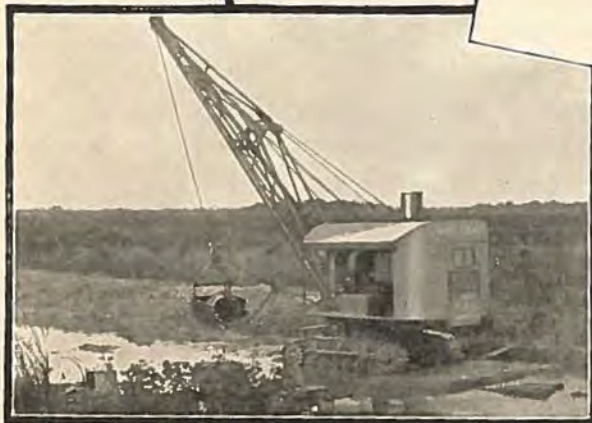
Denver, Colorado

Performance—The Reason for Buying The Second P & H

In The Shop for First Time in Four Years' Continuous Operation—

Read This—

The P & H Dragline Satisfied Them—Now purchased a P & H Shovel with Power Clutch Control which makes handling easier and increases daily production.



P & H Gasoline Dragline—Made in 1/4 yd. to 1 1/4 yd. capacities. P & H ratings are conservative—with generous factors of safety.

ELLA M. GALLUPE, COUNTY CLERK
D. L. VARNELL, CLERK TO THE BOARD
H. BERTHOLD, ROAD SUPERVISOR

THE BOARD OF COUNTY COMMISSIONERS
MESA COUNTY
 GRAND JUNCTION, COLORADO
 February Third, 1925.

Harnischfeger Corporation,
 Milwaukee, Wis.
 H. Harnischfeger, President.

Dear Sir,

In reply to your letter of January 28th, I am very pleased to advise you that our reason for making a purchase of a P. & H. 206 shovel to supplement our 3/4 yard P. & H. Dragline purchased in the spring of 1921 was entirely founded performance.

We have just put the dragline in the shop for its first overhaul since its purchase. It has been in construction operation more 8 hour days during the four years of its life than there are working days in those four years and except for cable, brake and clutch linings and here and there a rivet or bolt it has had but one replacement; A swing shaft that broke thru crystallization. We figure at this time that the reboring of the engine, replacement of all bearings thru the machine above the turn-table and a general tightening up of the frame will give us as good a dragline as we had originally. Our present estimate of the cost of this overhaul including parts and labor is \$1,200.00.

The U.S. Reclamation Service and a General Contracting Company are both operating on drainage construction in this County using a number of different makes of gas draglines and shovels both outfits using your equipment in part. We have had constant access to their cost and yardage sheets and from their experience as well as from our own we have reached our conclusions as to the relative value of P. & H. equipment.

No machine in the valley and there has been 14 or more during the past 4 years has made as good a record as ours. We take some of the credit naturally but our record is the evidence of our appreciation of a good tool.

Wishing you every good thing for the Harnischfeger Corporation that you have enjoyed under the old name and a progress in business equal to the progress our new machine shows in design and improvement over our old one, we are,

Very truly yours,

Mesa County Board of Commissioners
 by *J.H. Buntz*
 Road Supervisor.

HARNISCHFEGER CORPORATION
 Successor to
PAWLING & HARNISCHFEGER CO.

Excavating Machinery Division
 Established in 1884
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HIGHWAY BRIEFS

County commissioners of the Fifth district held their regular spring meeting in Colorado Springs on April 18th. President Richard Quinn of Divide presided over the meeting. Counties represented included Chaffee, Douglas, Elbert, El Paso, Lincoln, Kit Carson, Park and Teller. Commissioners from Fremont and Pueblo counties of the Fourth district also were in attendance. Commissioner Dan Straight of Weld county reported on the activities of the State Association committee during the session of the General Assembly. This committee worked for the passage of the highway bus and county bonding bills. The bus bill was vetoed by Gov. Morley on the grounds that it discriminated against the smaller truck and bus companies. Several of the commissioners expressed a regret at the meeting that the 4-cent gasoline tax bill failed of passage.

Judge V. Johnson of Cheyenne Wells presided at a very enjoyable banquet given the commissioners at the Elks Club. The fall meeting of the Fifth District Association will be held at Burlington at a date to be announced later.

A road camp has been established at Cerro for the improvement of the road over Cerro Summit. This work will be carried on with the aid of a steam shovel under the supervision of George Toupain, assistant superintendent of maintenance

of the State Highway Department. After the work on Cerro is finished it is planned to move the big machine on to the Blue Mesa road. The stretch of roadway over Cerro and the Blue is the worst on the Rainbow route in Colorado.

Work has been resumed on the Byers canon road project by the Pioneer Construction Co. under the direction of R. J. Gordon. It is expected that this job will be ready for final inspection by the middle of May. The sum of \$70,000 has been appropriated by the State Highway department for the extension of this road through the canon. Work on another mile of the road will probably be started within a few weeks.

Road Supervisor Tom Shearer of Arapahoe county announces that another link of new roadway will be constructed on the Denver-Kansas City Airline this summer. A new 10-ton tractor and scarifier grader outfit will be used on the work. About fifteen miles of the road was completed last year. A crew of men are now busy gravel surfacing this road between Joes and Idalia in Yuma county.

Maintenance headquarters for Division No. 6 have been transferred from Glenwood Springs to Steamboat Springs. Charles E. Baker is in charge of the state maintenance in this division. The office will be located in the courthouse under an arrangement made with the county commissioners. The division com-

prises the counties of Grand, Jackson, Moffat, Rio Blanco, Routt and Summit. Until this year Garfield county was a part of this division, but was withdrawn. Steamboat Springs was chosen as a more central location for the headquarters for the territory now included.

R. C. Cronin, well-known Boulder county road builder, has been placed in charge of the construction of a new highway to the summit of Flagstaff mountain, near Boulder. A crew of twenty men are working on the job. The highway will have a minimum width of 20 ft. and a maximum grade of 6 per cent. This road occupies the same position to Boulder as the Lookout Mountain highway does to Denver.

A federal program of road building in the national forests of Colorado with a total expenditure of more than \$850,000 during 1925 and 1926 has been approved by Secretary of Agriculture William M. Jardine, according to announcement made by Julius M. Johnson, district engineer of the Bureau of Public Roads in Denver.

J. Finger & Son expect to complete their concrete paving job located between Longmont and Lafayette by July 1. The last week in April it was necessary to close down the work on account of the water shortage. When this project is finished there will remain only a short unpaved stretch between these two points.

Announcement—

H. W. MOORE EQUIPMENT COMPANY are now in their new home at Sixth and Acoma Streets, Denver, Colorado. In addition to their warehouse and show rooms, they have a block of ground where they can demonstrate any piece of equipment the trade will be interested in. Visitors to the city are requested to call South 9000 and avail themselves of our transportation facilities. All Broadway Cars pass within one block of our place. Special direct Western Union service connection in our office.

H. W. MOORE EQUIPMENT COMPANY

Sixth and Acoma Streets

Denver, Colorado

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Road Building and Maintaining Equipment

Have you checked up on culvert performance?

Many engineers have changed their ideas about culverts after an actual investigation of installations, covering preferably hundreds of examples of all types.

The true, unbiased story is "under the roads" and invariably has revealed two specific things:

first: More culverts fail from breakage than from any other cause.

second: Culverts of pure iron show an almost negligible percentage of failures, as compared with culverts of rigid material.



Ingot Iron

There is only one pure iron-ARMCO Ingot Iron

Every Armco Culvert carries a guarantee of satisfactory service to our customers. Start sending your orders now to a house where for 36 years every customer has been given a square deal.

THE R. HARDESTY MANUFACTURING CO.

Established in 1888

Denver, Colorado

Missoula, Montana

ARMCO CULVERTS **FOR ECONOMY**

"Look under your roads"

When writing advertisers, please mention Colorado Highways.

Legislation Affecting U. S. Roads Before 68th Congress

The last Congress had before it several matters of legislation affecting highways. As usual, more bills were introduced than became laws. The following were of most general interest.

Bills Which Became Laws

Dowell Bill (H. R. 4971), authorizing appropriations under the Federal Highway Act \$75,000,000 for the fiscal year 1926, \$75,000,000 for fiscal year 1927; and for forest roads and trails \$7,500,000 for the fiscal year 1926 and \$7,500,000 for the fiscal year 1927. This bill also makes organic law that all authorizations for roads shall hereafter be apportioned to the states by the Secretary of Agriculture on January 1 of each year. Non-taxable Indian lands are hereafter to be considered as "unappropriated public lands" in the operation of the Federal Highway Act.

Temple Bill (H. R. 4522), to complete topographic survey of the United States.

Reece-Capper Bill (H. R. 7269) directs the Secretary of War to transfer to the Secretary of Agriculture 100 5-ton tractors and 1,000 trucks for use on roads.

Pan-American Congress of Highways (S. J. Res. 190) authorizes the President of the United States to appoint a commission of five to attend the Pan-American Congress of Highways at Buenos Aires October 3, 1925. This congress is the result of the visitation made in June of last year to this country of representa-

tives of all the Pan-American countries who visited many of our highways under the escort of the state highway departments.

Bills Which Did Not Become Laws

Colton Bill (H. R. 6133). This bill provided that in the case of any state containing unappropriated public lands exceeding 5 percentum of the total area of all lands in the state in which the population does not exceed ten per square mile of area, Federal aid up to 100 per cent may be used on the primary system.

Also in the case of any project involving construction in mountainous, swampy, or flood lands on which the average cost per mile for the grading and drainage structures other than bridges of more than twenty feet clear span will exceed \$10,000 per mile; and also in the case of any project which, by reason of density of population or character and volume of traffic, the state highway department and the Secretary of Agriculture may determine should be improved with a surface of greater width than twenty feet, the Secretary of Agriculture may pay more than \$15,000 per mile. In no event shall the payments of Federal funds on any project under this proviso exceed 50 percentum of the cost of the project, except as such payments are authorized to be increased in the public-land states.

That in apportioning appropriations for forest roads no state entitled to share in such appropriations shall receive less than \$20,000 of each year's allotments. This bill will be reintroduced in the next Congress.

Naming Oregon Trail (S. 2053). Passed Senate, died in Committee on Roads of the House after extensive hearings.

Reorganization Bill (H. R. 9629). This bill provided for the transfer of the Bureau of Public Roads to the Department of the Interior and the creation of a new Department of Transportation in the Department of Commerce. This bill did not get to the floor of either House of Congress. It will be reintroduced in the next Congress.

Denison Bill (H. R. 10468). This bill proposed granting privilege of erecting toll bridges under certain restrictions. No action was taken in either House of Congress. Will be reintroduced in the next Congress.

El Paso County to Improve Old Squirrel Creek Route

The southeastern portion of El Paso county is to have a number of new road and bridge improvements in the next few months. A road crew has been started out by W. H. Bartell, commissioner in charge of roads, in the Squirrel creek neighborhood, where three 40-foot bridges are to be built this spring.

The grading crew will begin work near Squirrel creek, where five miles of county road will be graded. Another five miles will be graded near Williams creek. The Chico basin country also will have a number of road improvements this year.



IROQUOIS ASPHALT PAVING MACHINERY

We are Western Distributors for the complete Iroquois Line of Paving Equipment:

Asphalt Portable Mixing Plants
Semi-Portable Plants

Tandem Rollers Steam Rollers
Asphalt Mixers Melting Kettles
Fire Wagons Surface Heaters

Asphalt Paving Tools of Every Kind

Literature on Request

HENDRIE & BOLTHOFF
Mfg. and Supply Company
Denver—Colorado



Smith 21-E on Construction Work

What a Difference "Leaning Wheels" Make

Here's an Adams Leaning Wheel Grader with Back-Sloper, finishing a flat-bottom, back-sloped ditch.

Now, suppose this were a "straight-axle" grader, with wheels running at right angles to the axle. The downhill lean of the grader, plus the heavy side load on the blade, naturally would cause the wheels to run in a bad pitch that would waste much power and mean excessive wear on wheel boxes and spindles. Also, the machine would crowd against the bank, waste still more power and do less accurate work.

In contrast to this, the "Leaning Wheels" of Adams Graders balance the weight of the machine against the side load on the blade. The result is, the wheels in their leaned position turn freely on the spindles instead of in a pinch and the grader travels straight ahead doing clean, accurate work, with no waste of power or time.

That's why Adams Graders do better work on all grading jobs and so much more of it per day or per dollar than is possible with "straight-axle" graders.

By the Way! Adams has built Leaning Wheel Graders exclusively for 40 years. Recent imitations lack the **PROVED PERFORMANCE** which is your assurance of satisfaction in Adams Graders.

Elton T. Fair Company

Distributors, Colorado and Wyoming

1611 Wazee Street

Denver, Colorado

**ADAMS
ADJUSTABLE
LEANING WHEEL
GRADERS**

"The Original - A Proved Success Since 1885"

Fame of Smith Performance Sold This Paver

Ever since the first Smith Paver was built, constant thought has been given to not only making it better but to making it the *best* on the market. And that we have succeeded we are confident, for we are continually making sales on the strength of Smith performance—on the records made by Smiths on job after job.

It is no dream that the Smith Paver performs month in and month out with un-failing endurance. It is no dream that it offers the last word in fast, accurate mixing and speedy discharge; it is no dream that it is the most economical paver to operate—that its maintenance costs are practically nothing. These are facts—facts proven every day in competition in all parts of the country.

You, too, will be convinced of the superior merits of the Smith if you investigate this machine and its records. Do not buy until you have seen a Smith.

Paver Catalog 409-E sent on request

The T. L. SMITH COMPANY

1052 32nd Street, Milwaukee, Wisconsin

Distributors

Burnite Machinery Co.

DENVER



SMITH PAVERS

Colorado Teacher's Safety Lesson Wins \$500 in Cash

Mrs. Myrtle A. Roe, a teacher of Sterling, Colorado, has submitted the best lesson plan for teaching street and highway safety in the schools in a contest conducted by the Highway Education Board.

She received a check for \$500 from the National Automobile Chamber of Commerce and a trip to Washington. More than 75,000 elementary school teachers from every state in the Union sought the prize which she won.

In a companion contest conducted among elementary school pupils of the nation, in which it is estimated by Board officials that more than 400,000 essays were submitted, Francis B. French, a pupil in St. Mary's School, Elizabeth, New Jersey, has been declared the winner. His award is a trip to Washington and a gold watch, having previously received as winner of New Jersey honors a gold medal and a check for fifteen dollars.

Both the successful teacher and the pupil winning national honors made the trip to Washington during the Easter vacation, week of April 13 to 18, as the guests of the Board and the automobile organization.

Mrs. Calvin Coolidge consented to serve as honorary chairman of the national essay committee, the active members of which were the late Senator Medill McCormick, Mrs. Thomas G. Winter, former president of the General Federation of Women's Clubs, and Dr. Jesse H. Newlon, president of the National Education Association and Denver, Colorado, Superintendent of Schools.

The national committee that reviewed the state lessons and awarded the national honors to Mrs. Roe consisted of Mrs. S. M. N. Marrs, vice president of the National Congress of Parents and Teachers, Austin, Texas, Dr. W. F. Bond, State Superintendent of Education for Mississippi, and Dr. Charles B. Glenn, City Superintendent of Schools of Birmingham, Alabama.

Both committees were named by the U. S. Commissioner of Education, Dr. J. J. Tigert, who also is Chairman of the Highway Education Board.

The prizes awarded Mrs. Roe and the New Jersey lad represent a part of an appropriation of \$6,500 offered by the National Automobile Chamber of Commerce to stimulate the study of street and highway safety among elementary school pupils of the nation. Of this amount more than \$5,000 were expended as state prizes.

Other valuable national awards were given, however, in both the lesson competition and the essay contest. Second national honors, a check for \$300 for the second best lesson, go to Miss Edith B. Whitney, Virginia, Minnesota, elementary schools, while third honors, a check for \$200, are awarded by the committee to Miss Hazel I. Leland, Burlington, Vermont. These lessons will be prepared by the highway board and submitted to the schools as suggestive texts for the instruction of school children in the principles of highway safety.

Other pupils also were signally honored by the essay committee. Two girls are



Daddy!

What a joy comes to the wife and the kiddies when "Daddy" remembers them with a Long Distance call!

His actual presence comes over the wire with his familiar voice, his inquiries about their health and the little happenings of the household.

Every Bell telephone is a Long Distance station, inviting the traveler to communicate with those who are dearest to him, those who miss him most.

Days are shorter to the home folks when they know they will hear from "Daddy." His calls are major events in the life of the family.

And Station-to-Station rates make telephoning inexpensive.

Bell System

One Policy
One System
Universal Service

and all Directed toward Better Service

The Mountain States Telephone & Telegraph Co.

to be the recipients of gold watches, which will be presented to them through their city superintendents of schools. They are Miss Marion MacArthur, Central School, Cheboygan, Michigan, who wins second national honors, and Miss Lucia Pegues, Mt. Pleasant Academy, Mt. Pleasant, South Carolina.

Denver Furnishes Asphalt for Boulder County Bridge

An unusual paving project was carried out in Boulder county on Sunday, April 26, when the 120 ft. steel bridge over Boulder creek, two and one-half miles north of Erie, was covered with asphalt.

This asphalt was furnished from the paving plant of the City and County of Denver. A total of 34 tons of sheet asphalt was required on the job. It was mixed in the Denver plant and hauled hot in six trucks owned by Paul V. Jenness, of the Colorado Haulage Co.

The trucks loaded with asphalt left

the Denver plant early on Sunday morning, and at the end of the thirty-three mile trip to the bridge site, it was found that the asphalt had only a heat loss of between 5 and 10 per cent. A specially designed canvas covering was used.

The asphalt was laid over a wooden flooring consisting of two by fours laid on edge. John McClure of the Denver paving department was in charge of laying the asphalt. An 800 lbs. hand roller was employed in rolling the asphalt.

The bridge on which the asphalt was laid was constructed by the Boulder county commissioners. It forms an important link on the main north and south county highway, which forms the eastern boundary of Boulder county. Commissioner S. D. Buster supervised the project.

This is the first time that asphalt has been hauled as long a distance as this in this territory and laid without additional heating. The asphalt was purchased from the Denver plant thru an arrangement made by the Boulder commissioners with the Denver officials.



Buckeye Positive Digging with Safety

Gears and chains transmit power on Buckeyes. No slippage—an automatic safety device protects against overloads. All power is profitably used.

Another positive feature that appeals to all contractors is the Quick-Shift Conveyor, originally developed and perfected on Buckeyes. This conveyor is driven from both ends. It has an exceptionally wide belt which is kept centered by a patented construction. No material too wet, too slippery or too difficult to handle with a Buckeye Conveyor.

Buckeye ingenuity, plus thirty years' experience, provides the safety feature that insures continuous, profitable performance.

Ask any owner.

GET THE FACTS

"We've owned seven Buckeyes," say Herr Bros., Piper City, Ill., "and have always had more work from these machines than they were guaranteed to do."

See why it is that Buckeye owners are so enthusiastic about their machines. Get the facts on the practical operating conveniences and big range of cutting widths offered only by Buckeyes.

If you're near an owner, ask him. Or, send for descriptive booklets.

THE BUCKEYE TRACTION DITCHER COMPANY

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers.

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For every purpose

Plans and specifications gladly sent upon application

Minneapolis Steel & Machinery Co.

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If It's a Truck Part We Have It —

Largest Stock of Parts in the West

LIBERTY HEAVY AVIATION NASH QUAD
F.W.D. TRUCKS and
WOODS HYDRAULIC HOISTS AND BODIES

We also have in stock Eisemann or Bosch Magnetos; Stromberg or Zenith Carburetors; Borg & Beck, or Brown Lipe Clutch; parts for the Buda, H. U. or Continental Motors; Rusco clutch and brake linings, and other parts and accessories too numerous to mention.

We ship the day order is received.

The Liberty Trucks and Parts Co.

FWD Distributors for Colorado

1532 Sixteenth St.—Sugar Bldg.

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The Bulletin Board

Park Service Buys Shovel for Fall River Road Work

Snow on the world famous Fall river highway in the Rocky Mountain national park between Estes Park and Grand Lake will be cleared this year with a Bucyrus 20-B oil burning shovel. Sale of this shovel to the National Park service was made by the Herbert N. Steinbarger Co. the latter part of April.

In previous years a large force of men with hand shovels and teams were used in this work. The new power shovel also will be used later in the summer in widening out the roadway. In several places the road is very narrow. For the snow removal work the shovel is equipped with a specially designed dipper. One of the snow cuts is about 2,000 feet long, with the snow from 10 to 20 feet deep.

Sale of a car load of Russell graders to the U. S. Forest Service is reported by the Steinbarger firm. These graders will be used in road maintenance work and new construction. A recent survey shows fifteen Russell maintainers in operation in Wyoming and New Mexico.

G. R. Moore, district engineer of Sauerman Bros., was a Denver visitor during April. A. B. Eaton has installed a Sauerman power scraper plant on Clear Creek. The Western Sand & Gravel Co. have moved their Sauerman power scraper plant from Casper, Wyo., to a location on Clear Creek. G. F. Bell is general manager of this plant.

H. H. Huddle, sales manager of the Steinbarger firm, turned forest fire fighter one day last month, when he aided forest rangers to extinguish a blaze in the Deer Creek region near Baileys. An Evinrude high pressure pump was used on the job.

New FWD Truck Bought by County to Maintain Roads

Delivery of six new FWD motor trucks has been made by the Liberty Truck & Parts Co. to the Midwest Refining Co. These trucks, which are powered on all four wheels, will be used in the Wyoming oil fields. A few months ago the Midwest firm purchased eight of these trucks. At present they have 36 of them in operation in Wyoming, according to Richard Carlson, sales manager of the Liberty concern.

The purchase of an FWD has been made by Washington county, Colorado, to be used exclusively in maintenance work.

Manager Carlson announces that the Liberty firm has been appointed distributors for Zenith carburetors in this territory. They also distribute Eiseman magnetos and Rusco brake lining products.

Northwest Sales Manager Visits Denver Distributor

C. R. Dodge, general sales manager of the Northwest Engineering Co., of Chicago, visited the offices of the Wilson Machinery Co., Denver, the latter part of April. He reported a large increase in the sale of Northwest machines throughout the country. Mr. Dodge was particularly pleased with the prospects for increased business in the western territory.

The Wilson Machinery Company were recently appointed distributors for the Northwest products in the Colorado territory.

Mrs. Elsa Parsons, secretary of the Wilson firm, was confined to her home for two weeks in April, suffering from influenza. However, she is now back on the job.

Harry P. Wilson made a trip to the East on business the third week in April.

The sale of Best tractors in this territory this year have far surpassed all expectations, he said, a large number of both the "forty" and "sixty" sizes having been purchased by counties, contractors and industrial concerns.

Austin-Western Builds New Fordson Power Road Grader

A new motor grader has been placed on the market by the Austin-Western Road Machinery Co, according to the Western Equipment Co., Colorado distributors of the Austin-Western line of construction equipment. This new grader is powered with a Fordson tractor. It is equipped with an 8-ft. blade.

Scott & Curlee, Sterling contractors, have purchased a 1925 model standard

Western elevating grader for use on their 19-mile grading job for the State Highway department, located between Merino and Brush.

An Austin New Era elevating grader will be used by H. C. Lallier, Hudson contractor, on the grading and surfacing job which he has contracted from the City of Denver. He also purchased a car load of 1½-yd. Western dump wagons for this job.

Sales of both of these pieces of equipment was made by the Western Equipment Co.

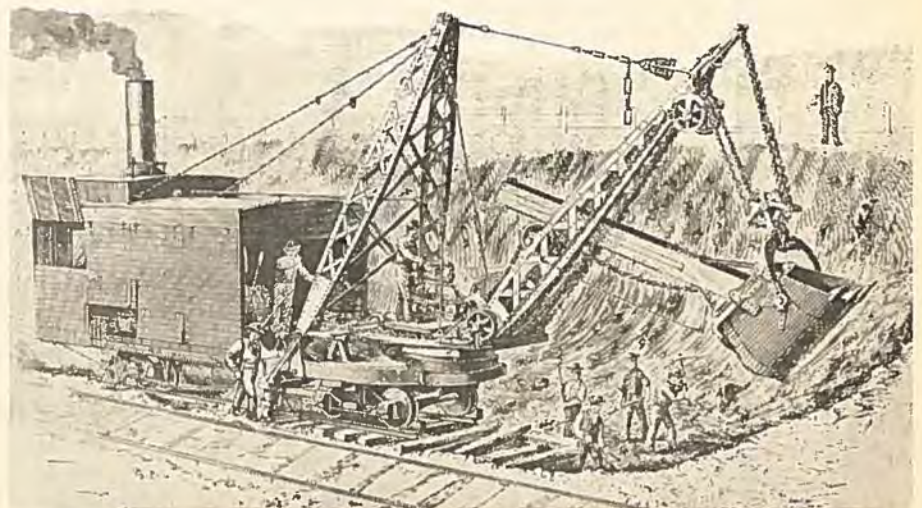
Mr. Wogan also reported the sale of a Koehring No. 2 crane to D. T. Allen of Casper, Wyo.; a Koehring 13-E paver to A. O. Peabody of Gallup, New Mex., and a Koehring Dandie 107-S mixer to Arvid Olson, Denver contractor.

C. W. Brantingham, western sales representative of the Cleveland Wheelbarrow Co., was a Denver visitor the latter part of April.

Fair Reports Delivery on Two Car Loads of Graders

Delivery was recently made of two car loads of Adams leaning wheel graders to the Wyoming State Highway department by the Elton T. Fair company. The order for these machines which will be used principally in maintenance work on state highways in the sister state on the north, was placed several weeks ago.

Mr. Fair announces that arrangements have been made for increasing the stock of parts for Adams graders in the concern's Denver warehouse. A plan also has been worked out whereby they can give more prompt service on all sizes of graders manufactured by the J. D. Adams Company.



An embryonic ancestor of the modern steam shovel—one of the first Osgood shovels put in operation on levee work.

Steel Dump Bodies

Automatic
or
Under Body
Hoists



Lowest Cost Hauling!

The Winter - Weiss Company

541-549 Broadway—Denver

Call South 5580 for men with their own
trucks to do your hauling

Commercial Bodies, Buses, Trailers,
Universal Six-Speed Transmissions



"THE BODY MAN"

It Is Said—

"The proof of the pudding is in the eating." By this token we believe that constant growth is proof of reliable service.

Scores of contractors and builders are daily saving money and finding keen satisfaction in having their concrete aggregates

"Pierce Tested"

Protect yourself against faulty materials. Consult with us on your next job.

We have every facility for rendering a **SERVICE** which is accurate, adequate and will result in a saving of time and money.

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A TRACTOR DOES NOT EAT When Not Working

Your expense is entirely eliminated until you get busy again. Why use 12 or 15 horses and 3 or 4 men for a job which one moderate priced Tread Type tractor and one man can handle?

We guarantee our "30" Monarch (\$2375 Denver) to pull more than 3 four-horse teams, and our "20" Monarch (\$1150 Denver) the equal of more than 2 four-horse teams. In other words from 7 to 10 foot graders.



The more mud, sand or snow, the bigger advantage we have over horses or high wheel tractors.

The Monarch has had a successful career of about 10 years in oil fields, road work and farming. Very useful, between times, as a power unit.

W. W. GRISWOLD, Distributor

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for supplies

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through this medium

Rates Upon Application

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Length	Type	Location	Bids Opened
568	61 ft.	Timber trestle bridge & approaches	7 mi. east of Denver	May 14, 1925
569	438 ft.	Timber trestle bridge & approaches	Bijou Creek, west of Byers	May 14, 1925

BIDS OPENED

Proj. No.	Length	Type	Location	Low Bidder	Bid Price
266-B	3.181 mi.	Gravel Surfacing	South of Durango	B. R. and J. L. Morrison, Colo. Spgs.	\$ 17,271.80
288-A	19 mi.	Sand-Clay Surfacing	Between Merino and Brush	Scott and Curlee, Sterling	102,627.35
288-B	2.519 mi.	Conc. Pav. & Gravel Surfacing	Merino, westerly	Engineers Const. Corp., Greeley	70,381.03
290-A & 169-R	1.521 mi.	Concrete Paving	Las Animas-Lamar	Salle Const. Co., Pueblo	34,561.25

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
254-B	1.087 mi.	Grading	Hot Sulphur Springs-Parshall
286-A	0.549 mi.	R. R. Grade Separation	Between Nunn and Dover
247-B	2.329 mi.	Concrete Paving	Rocky Ford-Swink

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R Div. 3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
246-D	6 mi.	Gravel Surfacing	Avondale, east
262-E	3 mi.	Gravel Surfacing	West of Walsenburg
262-F	3 mi.	Gravel Surfacing	West of La Veta Pass
267-B	3 mi.	Gravel Surfacing	East of Hoehne
271-B	1 mi.	Grav. Surf. & Concrete Pav.	Portland-Florence
275-B	6.5 mi.	Pav. & R. R. Grade Crossing	Sedalia-Castle Rock
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
279-C	6 mi.	Grading	Shaffer's Crossing
283-B	4 mi.	Concrete Paving	Berthoud, south
286-B	17 mi.	Grading	North of Nunn
287-A	18 mi.	Grading	Orchard-Wiggins
293-A	105 ft.	Steel Truss Bridge	Montrose over Uncompahgre River
297-A	2 mi.	Grading	East of Palsade

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	12	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	139,038.45	88	116-C
135	Denver-Morrison	5.3 mi.	Concrete Pavement	Colorado Bridge & Const. Co.	178,158.00	100	135
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	79	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	6	213-A
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	10	226-D
230-A	Wohurst, south	0.852 mi.	Concrete Pavement	M. J. Kenney Const. Co.	82,710.00	97	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surfacing	O. L. Hackett	66,178.00	85	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	91	242-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	1	243-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surfac.	Western Const. Corp.	93,533.00	53	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	63	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	37	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408.00	70	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	69	258-A
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	5	261-A
262-A	West of Walsenburg	2.186 mi.	Gravel Surfacing	Central Const. Co.			
262-B	Rio Grande Del Norte	490-ft.	Bridge	Levy Const. Co.	82,123.00	22	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	25	262-C
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	1	265-A
267-A	Model-Trinidad	2.954 mi.	Gravel Surfacing	Pope Bros. Const. Co.	25,683.00	37	267-A
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	40	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	17	272-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	72	272-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	28	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand-Clay Surfac.	Holly, Burshears & Dobbins	16,016.00	78	278-A
279-B	Morrison-Baileys	5.295 mi.	Grading	Harry H. Brown	85,980.00	18	279-B
281-A	Lafayette, South	1.249 mi.	Paving	Sims & Boston	55,373.00	85	281-A
281-B	South of Longmont	3.068 mi.	Paving	J. Flinger & Son	102,502.40	59	281-B

Smith Issues New Booklet On Small Tilting Mixers

One of the latest publications of The T. L. Smith Company, Milwaukee, Wis., is a small two-color broadside covering the new line of small tilting mixers developed this year. Four models are shown, the 2½-S (Smith Mascot) with a capacity of 25 to 45 cu. yds. per day; the 3½-S Half Bag Tilter, with a daily output of 35 to 50 cu. yds.; the 5-S One Bag Tilter, with 50 to 80 cu. yds. daily capacity; and the 7-S One-Bag Tilter, with a daily capacity of 75 to 120 cu. yds. The Mixers are fully illustrated and complete specifications are given. A copy will gladly be sent upon request.

Contractor Saves \$10,000 on Change in Concrete Mixture

Just a little thing like a "concrete mix" resulted in the saving of \$10,000 in the construction cost of a large hotel building,

now under way in Denver, according to the estimate of the architect. This is one of the "wrinkles" in the modern construction game.

The architect had figured on using a certain mixture of sand and gravel in his concrete. This was submitted to George Pierce, of the Pierce Testing Laboratories, Denver, to determine whether it would test the required strength.

After some investigation Pierce found that by changing the proportions of sand and gravel that the same result could be obtained. He submitted his findings to the architect, with a result that his mix was accepted. The difference in the cost of materials required in the original mix and the mix which was accepted resulted in the big saving of money on the building.

The Pierce Laboratories are the official testers of all materials, including cement, sand and gravel which go into the concrete pavements, and all culverts which are installed on Colorado state roads.

Modern constructors and public officials

are finding it safer to have all materials tested before they go into the job, than to wait until after the job is finished. And they sometimes find that a big saving in money can be effected by so doing.

Moore Equipment Co. Moves Into Own Modern Building

H. W. Moore Equipment company have moved into their new home at Sixth Avenue and Acoma Street, Denver. They are occupying a new building constructed for their particular use. The building occupies a plot of ground 100 by 125 feet. In addition the firm has fenced off a storage yard of 32 lots, where machines will be demonstrated in actual operation.

Harold W. Moore, president, reports the sale of ten Hadfield-Penfield one-man graders to the New Mexico Highway department. Sales of other construction have been larger this spring than for the past two years, he said.

*You Won't Growl
at Our Service*



"Cinders"

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**OIL IS OIL,
but consider
this point,**

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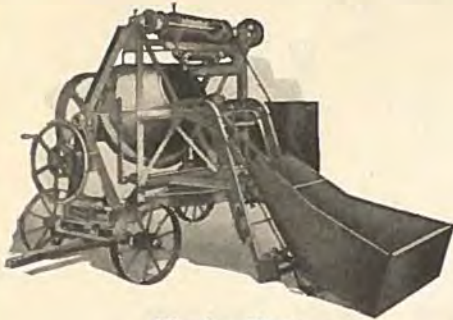
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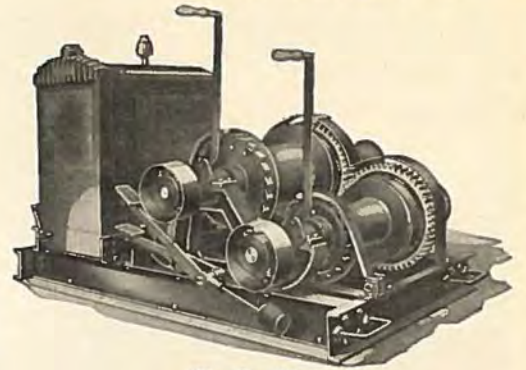
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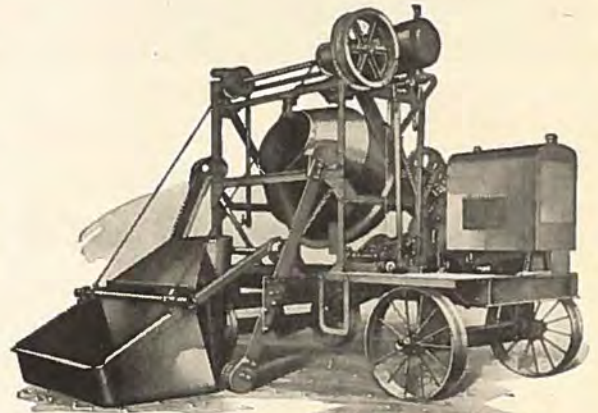
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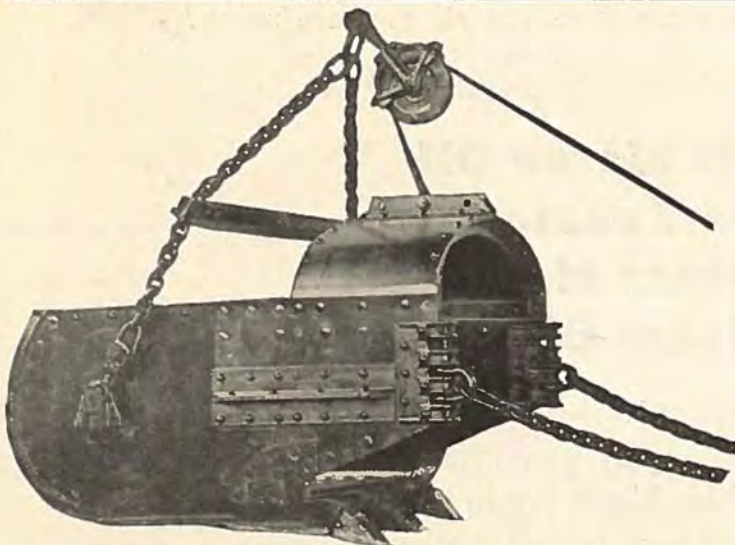
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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

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OUR COVER PICTURE

On the front cover of this issue of Colorado Highways we print a view of the Canon of the Colorado River, located near Grand Junction. During the past few years great improvements have been made in the surface of this highway by State and County forces. Other improvements have been planned for this year. It is on the main trunk line from the State Capital to the Metropolis of the Western Slope.

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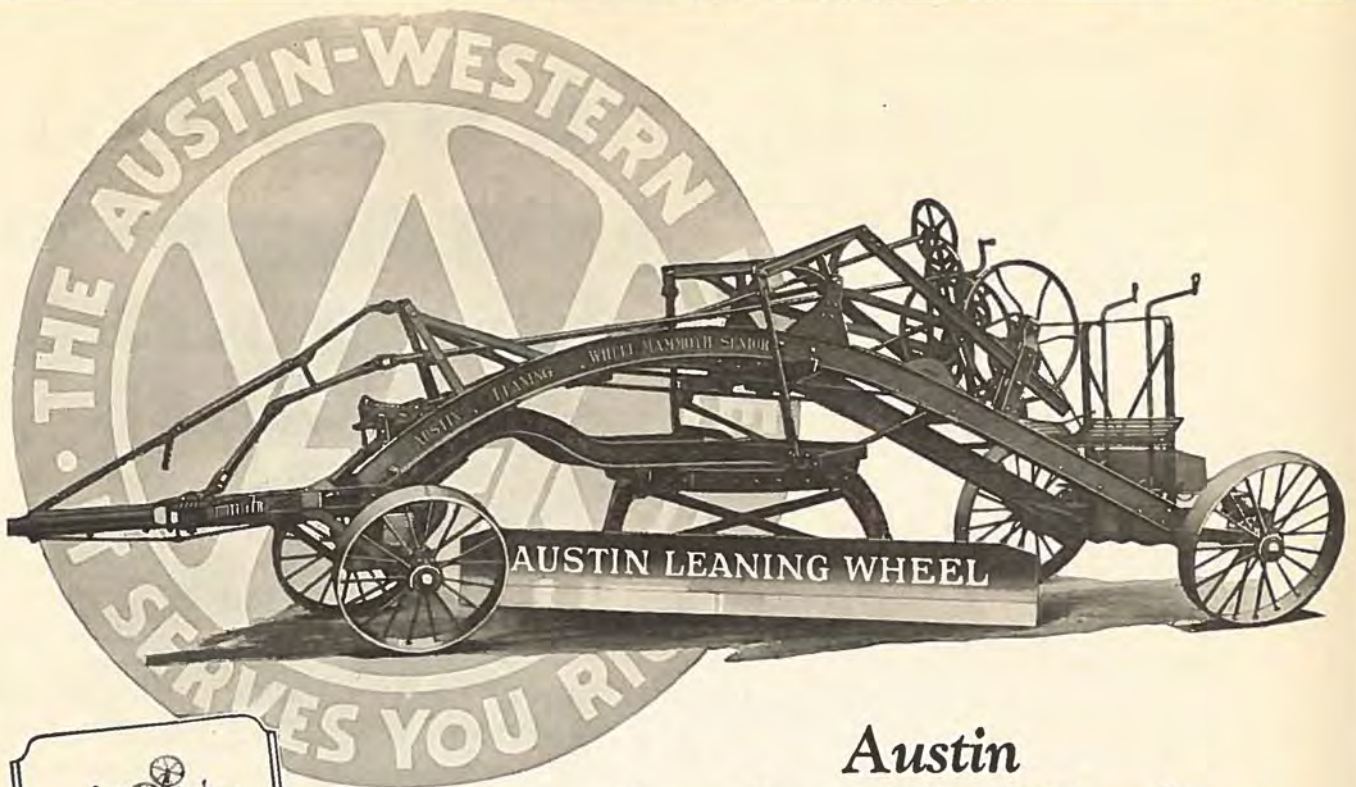
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Current Highway Comment

Favorable weather conditions have permitted the State Highway Department to get its 1925 construction and maintenance program well under way.

Since the first of January twelve Federal Aid projects have been contracted. The contract price for this work totals \$714,556.38. To date the department also has expended nearly \$2,000,000 since the beginning of the present biennium period.

During the month of June the department expended on road contracts and other improvements to the highway system approximately \$650,000. With continued favorable weather conditions this pace will be maintained until the end of the construction season.

The mileage of new roads to be completed this year probably will not be so great as in previous years, due to the fact that a late start was made in contracting for the work on some of the projects. There also will be less construction on strictly State roads—that is, roads not included in the Federal Aid system—because of the fact that less construction money is available for this work. In some few of the counties local officials are accepting the apparently small State contribution and are levying and assessing the balance in order that their full programs may be carried out.

Close observation and knowledge of the desires of the people and the needs of the State would convince one that a greater highway building program should be provided. Contrasting present traffic needs with those of the past it would seem that larger appropriations should be made today than were set aside a few years ago.

Colorado is getting more today for its "road dollar" than at any other time in the last ten years. In checking up contract prices paid on contracts awarded during the past three months, a review of contract prices paid on work awarded during the past three months shows a reduction in some instances of as much as 100 per cent over prices paid for similar work two and three years ago.

The prices bid by contractors this year are well below preliminary estimates made by engineers, and indicate that road improvements this year will cost only about eighty cents on the dollar. As an illustration, a contractor was awarded a project on his bid of 87½ cents for rock excavation of the same class for which he was paid 98 cents last year.

Funds are available for the financing of the

State Highway Department until the end of 1926. As yet no plans have been formulated for carrying on the activities of the department or for the acceptance of Federal Aid funds which have been allotted to the State after that time.

CONTINUOUS HIGHWAY IMPROVEMENTS

Tourists who travel Colorado highways this summer will find great improvements over preceding years, with abundant proof that great sums of money are being wisely and effectively spent and an impressive demonstration of the value of a systematic policy of continuous highway development and maintenance. In the region east of the mountains, Colorado already has the beginning of a system of paved roads that will shortly include a north and south highway through the State, together with important branches east and west, connecting the principal cities of this district. Even more extensive is the rapidly extending mileage of surfaced roads, which are much less costly to construct and to maintain, and which are nearly as satisfactory for common uses as are the paved roads.

In the mountain regions of Colorado highway progress is even more impressive than on the plains. Engineers and road builders have accomplished triumphs that are a splendid demonstration of their ability, as well as a manifestation of the farseeing wisdom of the State's highway policy. Necessarily any road system must be built in sections, and for a time these sections must be separated by gaps of inferior roads. Thus there must be for many years impressive contrasts between the old and the new, but as a rule each successive project of construction removes the worst part of the old road, and each new section is valuable not only for itself but also for the additional value it brings to every other part of the entire system.

It would be a great misfortune for the State if the program of continuous and consistent highway improvement should be interrupted or changed in any important particular. Such a change would leave the State with local improvements, the disconnected fragments of a great system. The failure to complete the system as originally planned would very greatly impair the value of the parts already finished.—*Pueblo Chieftain.*

Thirty Road Jobs Under Contract

COLORADO had thirty Federal Aid projects under construction during the month of June, which, when completed, will cost approximately two million dollars.

During the past month four projects were accepted as completed. The work being done on the various projects under way now is progressing at the rate of approximately \$650,000 per month. Involved in the four projects completed in June was about \$200,000.

At the same time contractors started construction on six new projects, one of them for nineteen miles of grading located between Merino and Beta, north of Brush. This piece of work is being done over an entirely new survey, and when completed will eliminate twenty right-angle turns between Brush and Sterling. As funds become available, it is planned to lay pavement over this route, which will give a continuous ribbon of concrete between Fort Morgan and Sterling. This is one of the heaviest traveled highways in Northeastern Colorado.

Since the first of January, sixteen contracts, at a total cost of \$956,734, have been awarded by the State Highway Department. Work on all of these projects has been started. Favorable weather conditions have made it possible for the contractors to make rapid progress on all uncompleted projects.

Officials of the department expect the end of the construction season will find only a few scattered projects to be carried over into 1926. Highway Engineer Blauvelt has issued instructions to all divisions that every effort should be made to rush the work to completion.

As rapidly as possible, bids will be

asked for on all projects contained in the 1925 budget, which totals about \$4,500,000. Prices received on work already let to contractors are far below the preliminary estimates by engineers. Indications are that all work this year will cost about 80 cents on the dollar. To date the number of contracts let will absorb about one-fourth of the 1925 funds, so that there will be considerable work of importance in subsequent lettings. These include three strips of concrete pavement on the Denver-Colorado Springs highway.

At the end of the present construction season Colorado should have about 250 miles of paved highways. In this connection it might be stated that Colorado stands far down the list of states in the matter of paved highways. Even Iowa, celebrated for her mud and dust, has 536 miles of pavement.

One of the big projects which the department contracted during the month of June was nineteen miles of grading located between Nunn and the Wyoming State line. Following completion of the grading, this road will be gravel surfaced through a co-operation agreement with Weld County, whereby the State and County will share the cost of graveling on a fifty-fifty basis. It is estimated that the graveling work will cost \$25,000.

The road north of Nunn will follow a new survey line and will eliminate all railroad crossings. The State already has a fine road between Greeley and Nunn.

Another important project which the State has under contract and on which rapid progress is being made is sixteen miles of gravel surfacing located between Rifle and Grand Valley, which is a link in the main route between Grand Junction and Denver. The State also has under

construction a 490-foot steel bridge over the Del Norte River, near Alamosa.

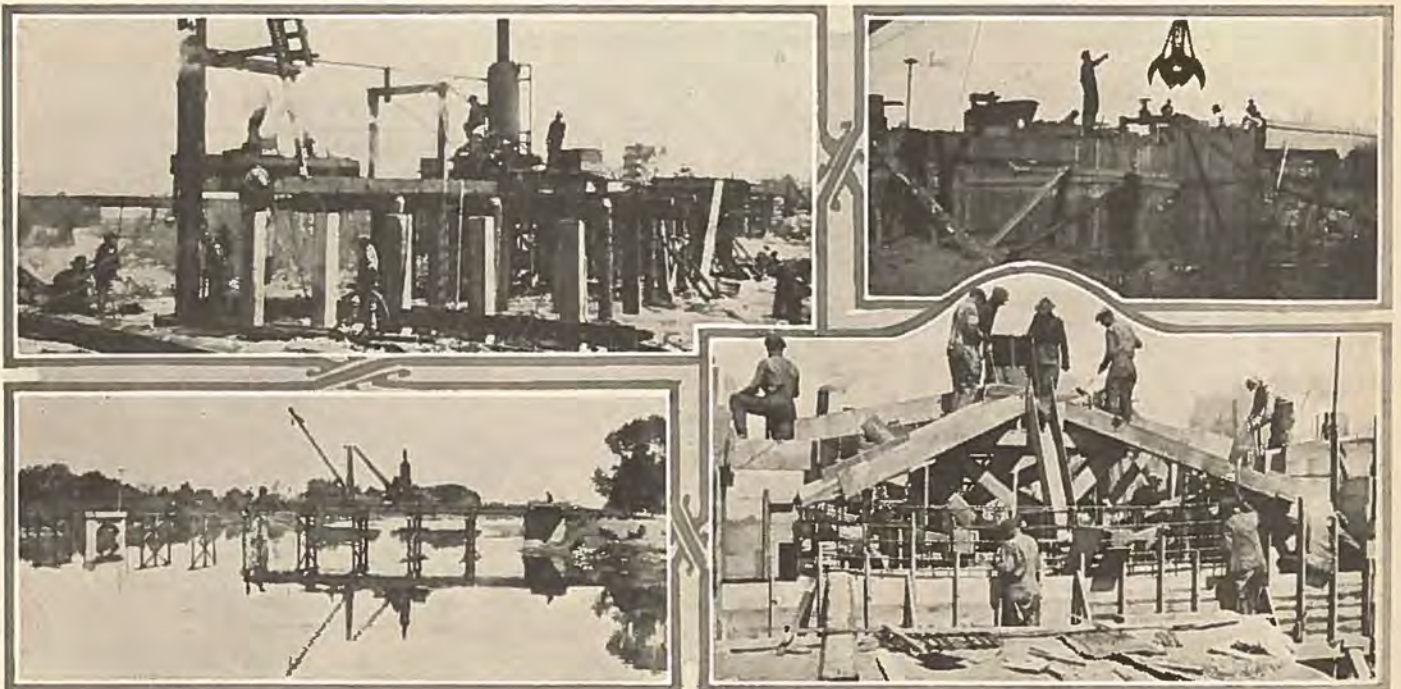
A study of the 1925 program of the highway department indicates that Maj. L. D. Blauvelt is intent upon making important connections and strengthening weak links in the more heavily traveled routes. It is shown that the comparatively short sections of new paving, grading and graveling are in nearly all instances designed with the systematic improvement of the entire system.

During the past five years marvelous improvements have been made on the State system as a whole, and there is every indication that the State road officials have made the most of its resources with energy and judgment.

In reviewing the progress made on our great national road system, Earl C. Reeves wrote recently in Collier's, as follows:

"Rome sat upon her seven hills and ruled the world over her highways. In the wilds of Macedonia their ruins may be found. In England I have driven over them, resurfaced with modern materials. A marvelous system for that age, but they took centuries of building. Uncle Sam is building eleven Appian Ways of solid concrete this year.

"In the comparatively recent days when the whip was the only accelerator most of us knew, a 'best road' cost the country around \$1,500 to \$2,000 a mile to build. A mile of the 1924 de luxe highway costs \$45,000. The statistician says commercial trucks average 47-mile trips, while the farmer now drives eighteen miles to market his produce, instead of five or six. In the United States there are now more than 1,600,000 trucks, and a full three-quarters of them started hammering our



Views showing construction work on new 490-ft. steel and concrete highway bridge across the Rio Grande Del Norte river on State Road No. 10, located near Alamosa.

roads to pieces in the last six years. We are spending four and a half billions on operation of motor vehicles—cars and trucks—this year. Four years of civil war during the '60s cost us just that.

"Here we have one of the greatest material changes taking place within a period of twenty years in all the history of the world."

The following is a list of the sixteen road projects awarded on contracts up to June 15:

F. A. P. 243-B, 2,973 miles of gravel surfacing, located east of Piedra in Archuleta County; Engler & Teyssier, contractors; cost, \$44,025.20.

F. A. P. 246-C, 1,951 miles of concrete paving, located east of Vineland, in Pueblo County; Strange-McGuire Paving Company, contractors; cost, \$57,108.95.

F. A. P. 261-A, 16 miles of gravel surfacing, located between Rifle and Grand Valley, in Garfield County; Hinman Bros., contractors; cost, \$132,556.

F. A. P. 262-B, 490-foot steel bridge over Del Norte River, in Alamosa County; Levy Construction Co., contractors; cost, \$74,657.

F. A. P. 265-A, 3,143 miles of gravel surfacing, located between Durango and Bayfield; Blackwell & Butter, contractors; cost, \$31,286.

F. A. P. 266-B, 3,181 miles of gravel surfacing, located between Durango and Bonad, in La Plata County; B. L. & J. L. Morrison, contractors; cost, \$17,271.

F. A. P. 270-B, 2,833 miles of gravel surfacing, located between Monte Vista and Alamosa, in Rio Grande County; San Luis Valley Construction Co., contractors; cost, \$15,471.

F. A. P. 272-A, two bridges, 355 feet, located between Fowler and Manzanola, in Otero County; Lee F. Williams, contractor; cost, \$56,444.

F. A. P. 279-B, 5,295 miles of mountain grading, located between Conifer and Balleys, in Jefferson County; Harry H. Brown, contractor; cost, \$78,164.

F. A. P. 288-A, 18,725 miles of grading, located between Brush and Beta, in Morgan County; Scott & Curlee, contractors; cost, \$102,627.

F. A. P. 288-B, 2,519 miles of concrete paving, south of Merino, in Logan County; Engineers Construction Corporation, contractors; cost, \$70,381.

F. A. P. 290-A, 1,287 miles concrete paving and grading, east of Las Animas, in Bent County; Salle Construction Co., contractors; cost, \$34,561.

F. A. P. 247-B, 2,329 miles of concrete paving, located between Rocky Ford and Swink; LaNier, Selander & White, contractors; cost, \$71,001.

F. A. P. 254-B, 1,087 miles of grading in Byers Canon, between Hot Sulphur Springs and Parshall, in Grand County; Pioneer Construction Corporation, contractors; cost, \$61,071.

F. A. P. 267-B, 2,216 miles of gravel surfacing, located between Trinidad and La Junta, in Las Animas County; Central Construction Company, contractors; cost, \$22,857.

F. A. P. 286-B, 19,263 miles of grading, located between Nunn and Wyoming State line, in Weld County; James Collier, contractor; cost, \$87,249.



Showing splendid condition of roadway in Big Thompson canon, after completion of project by State highway forces in co-operation with Larimer county.

State's New Traffic Code Changes Limit of Loads

Colorado has a new traffic and weight law. It was passed by the last general assembly and the Attorney General of the State recently gave an opinion to the effect that the matter of the enforcement of this act was a duty which should be performed by the sheriffs in the various counties.

This law has teeth in it and it should be enforced to the letter. It provides for a maximum loading limit on trucks. This section of the law is of the utmost importance. Modern roads are constructed to carry a certain load. The roadbed is like the foundation of a building. There is a limit to the load it will sustain. When overburdened the surface gives way. Then the road goes to pieces. Maintenance costs increase as a result. This costs the road users and the taxpayers money.

There is no doubt that many trucks are now traveling over Colorado roads carrying with load far beyond the legal limit. This should be stopped. A few arrests and stiff fines probably would put a stop to the practice. In some of the other states traffic officers have authority to compel drivers of overloaded trucks to unload right on the spot they are caught all excess weight being carried. The truck owners are fined besides.

Overloaded trucks are costing the people of Colorado thousands of dollars yearly. It is unfair to other vehicle owners and the taxpayers to permit the drivers of these trucks to go unpunished. In some of the other states officers have been employed to enforce their traffic laws. They are supplied with portable weighing machines with which they can ascertain the load of a truck in an instant.

The new law allows a speed limit of thirty-five miles per hour on State roads. A more vigorous enforcement of this statute would probably reduce the number of accidents on our highways. The limit on mountain roads is twenty miles per hour. The speed of trucks weighing more

than 10,000 pounds, including their load, is limited to twenty miles per hour.

A copy of the new law, which is an amendment to the highway act of 1921, follows:

"Be It Enacted by the General Assembly of the State of Colorado:

"Section 1. That Section 2 of Chapter 141, Session Laws of 1921, being Section 1269 of the Compiled Laws of 1921, be and the same is hereby amended to read as follows:

"Section 2. No vehicle shall be propelled along or upon any public highway at a speed exceeding thirty-five (35) miles per hour; said maximum speed shall be reduced to twenty (20) miles per hour on all mountain roads; to twelve (12) miles per hour where vision is obscured beyond a point two hundred feet from vehicle, and to twenty (20) miles per hour in the case of vehicles weighing more than 10,000 pounds, including their load, unless said vehicle be equipped with pneumatic or cushion tires; and in case of any vehicle traveling up or down any mountain highway having a grade of ten per cent or more, said maximum speed shall be reduced to fifteen (15) miles per hour.

"Section 2. No vehicle the weight of which, together with any load thereon, exceeds fourteen (14) tons on four wheels, nor any vehicle the weight of which, together with any load thereon, or the weight of which on any one axle thereon exceeds seven hundred (700) pounds per lineal inch of channel base width of the tire sustaining the weight, shall be propelled on any public highway except by written permission of the Board of County Commissioners of the County as to County Highways or the State Highway Department as to State Highways.

"Section 3. The General Assembly hereby finds, determines and declares that this Act is necessary for the immediate preservation of the public peace, health and safety.

"Section 4. In the opinion of the General Assembly an emergency exists: therefore this Act shall take effect and be in force from and after its passage."

Cumbres Pass Open To Traffic

The year of 1925 finds another Colorado mountain pass open for travel in the completion of three sections of the Cumbres Pass Forest highway, thereby bringing to a reality the aspirations and expectations of many western highway enthusiasts who have eagerly advocated its construction as a necessary factor in the industrial development of southwestern Colorado.

To the inhabitants of the San Luis and San Juan valleys especially is the opening of Cumbres Pass particularly valuable, as has already been evidenced by the increased commercial interchange of natural and manufactured products. Its completion is also of marked significance as a Forest utility road both for its commercial and administrative advantages, and, too, from a recreational viewpoint since it traverses and makes accessible a heretofore isolated area which is singularly attractive either from its scenic characteristics or for its abundance of fishing streams.

The opening of the Cumbres Pass highway also provides an alternative route from the eastern slope of the mountain range to the Mesa Verde national park, and reports indicate a large number of tourists taking advantage of the route to and from the famous cliff dwelling ruins.

Cumbres Pass is located in southwestern Colorado in Conejos county on a spur range extending in a southeasterly direction from the Continental Divide and is crossed, in addition to the highway, by the D. & R. G. W. narrow gauge railroad from Alamosa in the San Luis valley to Durango in the San Juan valley. This territory was in the early days served by a toll road, which, like many other mountain toll roads, was narrow, steep and at times barely passable for team travel. It

BY C. F. CAPES
Associate Highway Engineer
U. S. Bureau of Public Roads

was later turned over to the county, after which time it rapidly deteriorated and eventually became entirely impassable except for saddle-horse travel.

Investigation of a proposed new route over Cumbres Pass was made as early as 1916 by U. S. Highway Engineer A. E. Palen, but the project did not become active until September, 1920, when a co-operative agreement was made between the State Highway Department and the Secretary of Agriculture for the survey, plans and estimate of approximately 15 miles of road extending from a point on the Conejos river about 25 miles west of Antonito over La Manga and Cumbres Passes to the Colorado New Mexico State line near Cresco, Colorado.

Accordingly the survey was immediately started by Chief of Party Louis A. Hamilton and completed in the spring of 1921, staking a center line with a maximum 6 per cent. grade and general minimum radius of curvature not less than 100 feet. In order to facilitate construction work, this survey divided the job into six sections.

In June, 1922, a relocation of the Cumbres Section was made from the Los Pinos Section House to the State line. The plans called for an earth graded roadway 14 feet in width. The contract for the 8.5 miles was awarded to Ed. O'Neil of Meeker, Colo., on his bid of \$86,514. His outfit consisted of a steam shovel, 18 teams, eight wagons, eight wheelers, one grader, etc. All work was completed and the Cumbres Section accepted from the contractor August 8, 1924, and the road opened to the use of the public.

On the La Manga Pass project, which includes all of section three and a part of section two of the entire survey, provided for a 12-foot roadway with a 17-foot overall width on side-hill sections which corresponds closely to the 14-foot 1922 standard used on the Cumbres section.

This job was advertised May 27 and bids opened June 12, 1923, the contract being awarded to Harvey & Peabody of Santa Fe, New Mexico, on their low bid of \$44,377.95, the State of Colorado sharing in the cost of the job to the extent of \$19,700. Work was started about the first of July, with a crew of 50 teams and 90 men. The steam shovel and air compressor after being released by the contractor on the Cumbres section, were transferred to this project. The steam shovel moved about 10,000 yards of material by the close of the season. The average cost per yard of material excavated was 34 cents.

The 1923 season's work and progress were quite satisfactory, but adverse weather conditions made it impossible to complete more than 75 per cent. of the job that season. Operations were resumed early in 1924 and the work finished and accepted by the Bureau, with concurrence of the State Highway Department and the Forest Service August 19. In finishing up, a considerable portion of the five miles was surfaced with selected material, which additional work increased the total contract amount by approximately ten per cent.

Upon the completion of the La Manga Section, the entire Cumbres Pass was officially opened for travel, temporary connections at each end having been finished by the respective State Highway Departments. That portion in New Mexico extends from the State Line to Chama, a



Left—A section of the Conejos canon project, which forms a part of the Cumbres Pass highway. Right—A steam shovel in pay dirt on La Manga Pass section. Photos by courtesy U. S. Bureau of Public Roads.

distance of 8.5 miles where it joins with routes either south to Santa Fe or west to Durango and southwestern Colorado. It is at present only a single track road containing sharp curves in many places and excessive grades. Additional improvements are being made each year especially on the lower end in relocating to avoid railroad grade crossings.

The work done by the Colorado State Highway department in conjunction with Conejos county forces, is a 5-mile section beginning on the Conejos river and climbing La Manga mountain, connecting with the Harvey & Peabody contract. The state project maintains a 6 per cent. maximum grade and affords a reasonably smooth traveling surface. Its average width is about 12 feet.

Work on the Conejos Canyon section of the road was started on July 24, 1924, by the San Luis Valley Construction Company of Manassa, Colo., a co-partnership composed of seven San Luis valley ranchers, most of whom have had previous experience in dirt moving and some of whom had recently completed station contracts on other sections of the Cumbres Pass road. Their bid for the work was \$46,500, the state of Colorado sharing \$11,500 of the total cost, the balance being paid from U. S. Forest Highway funds.

The upper end of this project connects with the State highway project. As is implied by its name, it runs through the Conejos River canyon, extending five miles down the river following generally along the old road. The old road mentioned is a portion of the original Antonito-Platoro road which in the early days served in the mining development of the upper Conejos canyon region, and connected, close to the old mining town of Platoro, with a toll road crossing the divide into Alamosa Creek. The 5-mile canyon section is of primary importance as a link in the Federal Aid Highway system over Cumbres Pass. It will be of greatest service to the public during the season from May first to December first, but will probably be of some use to local residents the year round.

The location for this project was made by Chief of Party George F. Hellesoe. The same design was followed as was used on the previous sections, namely, a 12-foot roadway width with standard grade and alignment.

The Conejos River Valley, although termed a canyon, is in most places broad enough to allow considerable freedom in locating a highway and the fall of the country is so slight that no grade problems were encountered except that considerable adverse curve was used by the employment of which a higher standard of alignment could be obtained. Most of the land in the valley is privately owned, but its value or improvements did not interfere greatly with the location.

The job was entirely completed and accepted on November 22, 1924, within 92 official weather working days, or 75 of the 120 days allowed. The contractor's outfit consisted of 30 equipped teams, divided into three gangs and distributed among as many camps along the five miles of work. Each of the seven partners on the contract had a few teams and some light grading equipment which they pooled.

The first item of work undertaken, the clearing of the right-of-way, was super-



Upper—A wide, smooth curve approaching guard railed fill, on Cumbres Pass. Lower—View on west side of the Cumbres Pass, looking toward New Mexico after new road was completed. Photos by courtesy U. S. Bureau of Public Roads.

vised by one of the members of the firm, as was many of the other items of construction, and although possibly not always skilled or professional in his particular line, each foreman being personally interested in the proper execution of the whole job, procured a higher degree of efficiency from his crew than probably would have been obtained otherwise. The clearing work was promptly followed by the grading with plow and fresno.

The culvert material for the job was received and installed early in the game, practically all culverts being placed ahead of grading work. All drainage structures were 18 inches to 30 inches C. M. P. protected at each end by cement rubble masonry head walls. The culverts were placed at numerous intervals owing to many washes occurring along the base of the canyon walls and their installation in many cases involved considerable excavation to provide an ample opening or catch-basin at the inlet end. Several of these catch-basins were paved with stone paving laid in cement.

The guard rail advertised for this work was rustic, but in view of the scarcity of suitable timber for this type, an extra work order was executed between the contractor and the District Engineer whereby wooden guard rail should be substituted. Two thousand lin. feet of this item was installed, the timber, which was red spruce posts and yellow pine railing, being sawed, treated and given a prime coat, then set in place and given two final coats of paint. It presents a much better appearance when completed than some of the rustic guard rail instituted on the Cumbres Section and will probably give just as long a period of service.

One particularly commendable feature of the execution of this job by the contractor was the manner in which traffic was cared for during the new construction. This problem was of no little sig-

nificance, since more than half of the new location was along the old road and in many places it was impossible to construct detours for any reasonable cost. The traffic was therefore compelled to use the new grading, oftentimes delaying the teams and hindering the workmen and also coming close to nearby blasting. However, warning and cautionary signs and barricades were kept well posted along the work and no accidents were reported either from blasting or poor road conditions. A total of one and one-quarter miles of detour road was built under extra work order, some of which will be useful in the future as developing nearby camp sites. The season being dry, was, of course, a great aid in keeping the road in travelable condition but necessitated an extra amount of temporary finishing by the contractor.

Surfacing with selected material was contemplated in the engineer's estimate of certain stretches of the job aggregating about two miles. To accomplish this and expedite its completion, two crews of eight teams and dump-board wagons each were outfitted and the material placed at the rate of about 160 yards a day. Gravel was available from the river at reasonable intervals, in no case exceeding three-quarters of a mile haul and as the work progressed so satisfactorily and was of reasonable cost, it was decided to place a 4-inch coat over the entire five miles. This was completed about November 15, just before bad weather set in.

The engineering of this job was handled in conjunction with that of the other Cumbres Pass Projects by a resident engineer assisted during the early season by a junior civil engineer. As the other jobs became completed, the engineering force was reduced to a resident only, who was located at the contractor's camp on the Conejos Section and supervised all ac-

(Continued on Page 24)

Highway Board Reorganized

THE semi-annual meeting of the State Highway Advisory Board, as required by the provisions of the State highway law, was held in Denver on May 18 to 21. All seven members of the board, including two new appointees of Gov. Clarence J. Morley, were present.

Reorganization of the board and the appointment of a committee for the purpose of working out a plan whereby the cost of maintaining State highways can be reduced were the most important matters disposed of at the meeting.

William G. Duvall of Golden, Milton R. Welch of Delta, George L. L. Gann of Pueblo and Frank H. Blair of Sterling, upon the convening of the meeting, presented their credentials. Messrs. Gann and Blair were reappointed to the board by Governor Morley. Mr. Duvall had been named to fill the vacancy created in the sixth district by the death of John A. Donovan, and Mr. Welch was appointed from the sixth district to succeed William Weiser of Grand Junction, whose term had expired.

Mr. Weiser having been chairman, it became necessary to elect a new chairman. The board members chose Mr. Duvall, one of the new men, the members being unanimously of the opinion that the deliberations of the body should be presided over by a man appointed by the governor and in sympathy with his administration.

Mr. Blair was the choice of the members for vice chairman. Both he and Mr. Duvall will serve until next May. While new as a member of the advisory board,

Mr. Duvall is an "old man" in the good roads movement and is thoroughly familiar with the road problems of Colorado.

The question of maintenance was brought up by Governor Morley himself. The governor attended the morning session of the second day. He called the board's attention to the necessity of utmost economy and expressed the belief and hope that some system could be devised whereby savings could be obtained without lowering efficiency in the maintenance work.

During this session the question of the State taking over the maintenance of all State highways embraced within the so-called 7 per cent system of Federal Aid road projects was discussed, but no definite action was taken. Robert H. Higgins, state superintendent of maintenance, and June V. Johnson, district engineer of the United States Bureau of Public Roads, addressed the board and gave their views of the matter.

Discussion of the matter was closed for the time being by the appointment of a committee of three members, namely, Messrs. Duvall, Seerie and Lansing. This committee will consider the governor's suggestion and formulate a plan in line with it.

Routine matters, such as acting upon petitions for route changes and declaration of new State highways, occupied the attention of the board during the remainder of the meeting. The board approved a new route for the State highway located between Fort Morgan and Greeley, via Kersey.

By the change in route of this road, a total of twenty-one right angle turns will be eliminated with the construction of the new road. Under the plans for the improvement of this road by the department, it is estimated that approximately \$100,000 will be expended in its future improvement.

Highway Bridge Engineer Joins New Jersey Force

Robert S. DuBois, connected with the State Highway Department for the past four years as bridge engineer, resigned his position on June 15. He has accepted a like position with the State Highway Commission of New Jersey, with central headquarters located at Trenton.

Mr. DuBois joined the forces of the Colorado department in June, 1919, as a structural draftsman. In October of the same year he was transferred to field duty as resident engineer, which position he held until 1921.

He was graduated from Yale University in 1916 as a civil engineer, and accepted a position with the New York, New Haven & Hartford railroad. In 1917 he resigned that position and enlisted in the engineering corps of the United States Army. Early in 1919 he joined the engineering force of the Denver & Rio Grande railroad.

During the past four years he has had charge of the designing of more than fifty major bridge structures constructed by the State Highway Department.



Members of the State Highway Advisory Board—Back row, left to right—George L. L. Gann, Pueblo; William G. Duvall, Golden; Peter Seerie, Denver. Front row, left to right—Chas. B. Lansing, Colorado Springs; B. B. Allen, Silverton; Milton R. Welch, Delta; Frank H. Blair, Sterling, and Maj. L. D. Blauvelt, State Highway Engineer.

The Engineer's Estimate

By ROY J. RANDALL

THE keen competition in all lines of manufacturing has made it necessary for a very exact system of cost accounting to be followed through every factory operation. Simply knowing the total cost of production of the finished article is not sufficient for the head of a successful concern—he must know the cost of each separate operation, and these must be shown in such a manner that he may be able to make deductions as to the reasons for them and the possibilities for reducing them. They must be sufficiently accurate for him to estimate the cost of future operations.

Highway Contracting may be compared to manufacturing of a very complex nature. The average Highway Contract consists of many operations of very different kinds, each of which in turn varies from similar operations on another job in a different locality. The Highway Contractor must make an accurate estimate of the cost of each of the various materials delivered for use on the job. He must know the probability of being able to supply the proper amount of labor to do the work. He must be able to estimate the skill of the workers on the job in order to determine the length of time to be allotted for each operation.

Also the cost of operating all of the various machines used on the work, the camp costs, in fact all of the various direct costs of doing the work must be known before the contractor will be able to prepare his bid. The fixed overhead expenses will, of course, be known, and probably will be the easiest of all of the costs to predetermine. These include the premiums on bond and on compensation insurance and all the other premiums and fees that necessarily must go with the job.

The contractor, in preparing his estimate of cost of doing work, must refer to cost sheets which have been kept by him on previous contracts. He will examine the proposed work and note all conditions peculiar to this work. He must make such modifications as may be necessary due to these conditions to the unit costs experienced on previous work.

All of the above assumptions are based on the expectation that the contractor has kept accurate cost accounts on all of his previous work and will use them intelligently in preparing his bid. He will never allow the presence of competitive bidders on the morning of the opening of bids to sway his judgment and cause him to make a last-minute modification of his bid. His prices are based on the operating costs of equipment with which he has had experience while operating on similar work, and he will not lower these prices with the ex-

pectancy of using a new and untried piece of equipment with the hope of lowering costs.

The engineer makes an estimate of cost for practically all public work. In the case of city work where an improvement district is to be organized, the Engineer's Estimate is very important for the reason that it is the basis of the organization of the District and the total cost of doing the work cannot exceed the Engineer's Estimate.

In the case of Federal Aid Projects with the State Highway Department, an estimate is prepared at the time the plans are submitted to the Bureau of Public Roads. This estimate is used to insure

fifty-seven bids were received on the forty-five projects, or an average of 5.7 bidders on each project, as compared with fifty-four bidders during 1923.

The total estimated cost for the contracts awarded, as shown by the engineer's estimates, was \$2,876,564.30, as compared with \$2,316,853.52 during 1923. The total of the low bids was \$2,660,966.11, or 92.5% of the Engineer's Estimates, as compared with 91.18% during 1923. The total of the average of all bids received was \$2,864,047.76, or 99.56% of the Engineer's Estimates, as compared with 101.03% during 1923. During 1924 six contracts were awarded to the low bidders where the low bid was in excess of the Engineer's Estimate.

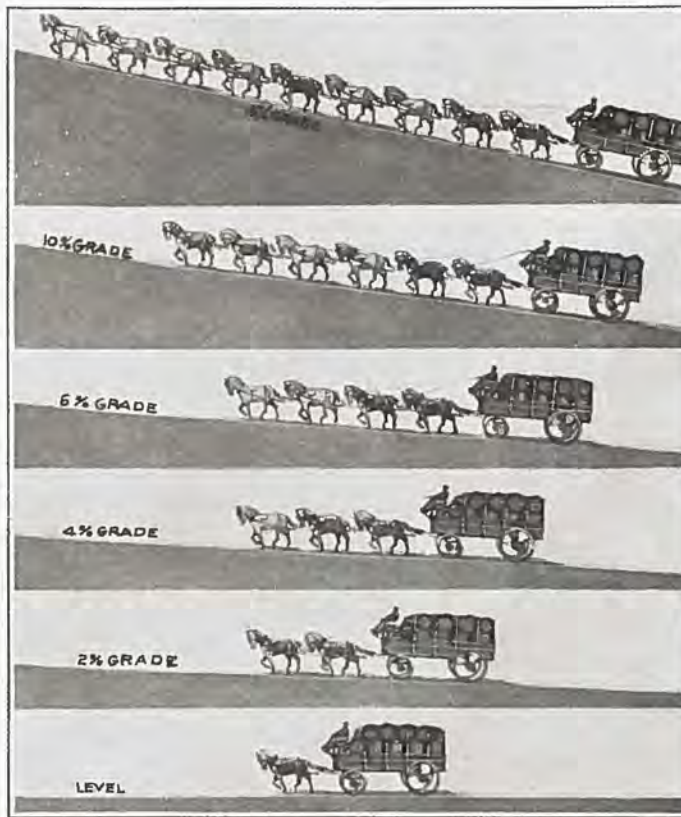
After contracts are awarded on Federal Aid Projects an estimate is prepared using the contract prices for each of the several items of work, and this estimate is used as the basis for the Project Agreement with the Bureau of Public Roads.

The engineer usually finds that one of the most important sources of data to be used in preparing estimates are not available for him. He does not have access to full and complete cost accounts kept on similar work and under like conditions. He must depend on reports from the field parties showing forces and equipment employed and other conditions which affect the cost of doing the work. He, of course, has no knowledge of who the successful bidder will be and consequently cannot predict the type of equipment that will be used in doing the work, and, what is perhaps more important, he cannot predict the financial advantages that will result from good management should the work be awarded to a first-class contractor. For these reasons it is not to be wondered at occasionally if the Engineer's Estimate is too low or too high.

Let us suppose that all bids received on a project are being submitted by intelligent contractors, who have an accurate knowledge of the cost

of doing the different kinds of work, the only difference being in the intensity of their desire for the proposed work. Perhaps some of them have completed previous contracts and are very anxious to acquire new contracts, while others have some work ahead. This condition will cause a variation in the amount of the estimated contractor's profit. Occasionally a contractor will take a small job at cost in order to hold his organization together temporarily.

With the above assumptions the average of all bids received on a project, especially when several proposals are had, should represent a fair figure for doing (Continued on Page 20)



Graphic demonstration of power cost on heavy grades. Same proportions as those here indicated for horse-drawn vehicles apply to motor trucks.

as near as may be possible that the funds apportioned in the Budget and available for use are adequate to construct the project. An engineer's estimate is prepared in like manner for State Projects, and for the same reason.

However, the Department is not limited by the Engineer's Estimate in the award of contracts. During the year 1924 bids were received and opened twenty-three times on forty-five Federal Aid and State Projects, and contracts were awarded on forty-three of these; all bids were rejected on two. Separate contracts were awarded for bridge and road work on one project; however, this had been advertised in this way. Two hundred

Snow Removal On Milner Pass

ON THE fifteenth day of June, at 9 a. m., the far-famed Fall River highway, extending from Estes Park to Grand Lake, crossing Milner Pass at an altitude of 11,797 feet, was opened to traffic. Every year the snow drifts into this road, and in former years required many weeks of hard labor to open the pass.

The contract between the Rocky Mountain National Park and the Rocky Mountain Parks Transportation Company calls for the opening of the pass to traffic on June 15. Heretofore from 75 to 200 men have been used to open the pass by hand shoveling, and it has required from four to six weeks to accomplish the work.

This year a 20-B Bucyrus steam shovel was used in the work, thus eliminating the snow-shoveling gang. The snow was 20 feet deep at the deepest point. The main drift was approximately 1,500 feet long. The road through the drift in former years was cut wide enough to permit the passage of one car. This year it was made a little wider on account of clearance for the steam shovel.

For several years Roger W. Toll, superintendent of the Rocky Mountain National Park, has made a careful study as to the proper equipment to be used for this work. Various schemes were tried, but in every case they proved unsatisfactory. If the schemes seemed workable, it was found that the price would very closely approach the cost of a steam shovel, because the shovel could later be used for general road construction work in the park.

By H. H. HODDLE

One of the schemes tried this year was the laying of dynamite along the main drift. It was hoped by this means that the snow could be blasted from the roadway. This proved to be unsuccessful, as practically all of the snow fell back into place again, so that the shovel had to move all of the snow unassisted by the dynamite.

Last fall the dynamite was placed along the roadway and left there to be touched off in the spring. Markers were placed along the roadside. These indicated the depth of the snow at the various points.

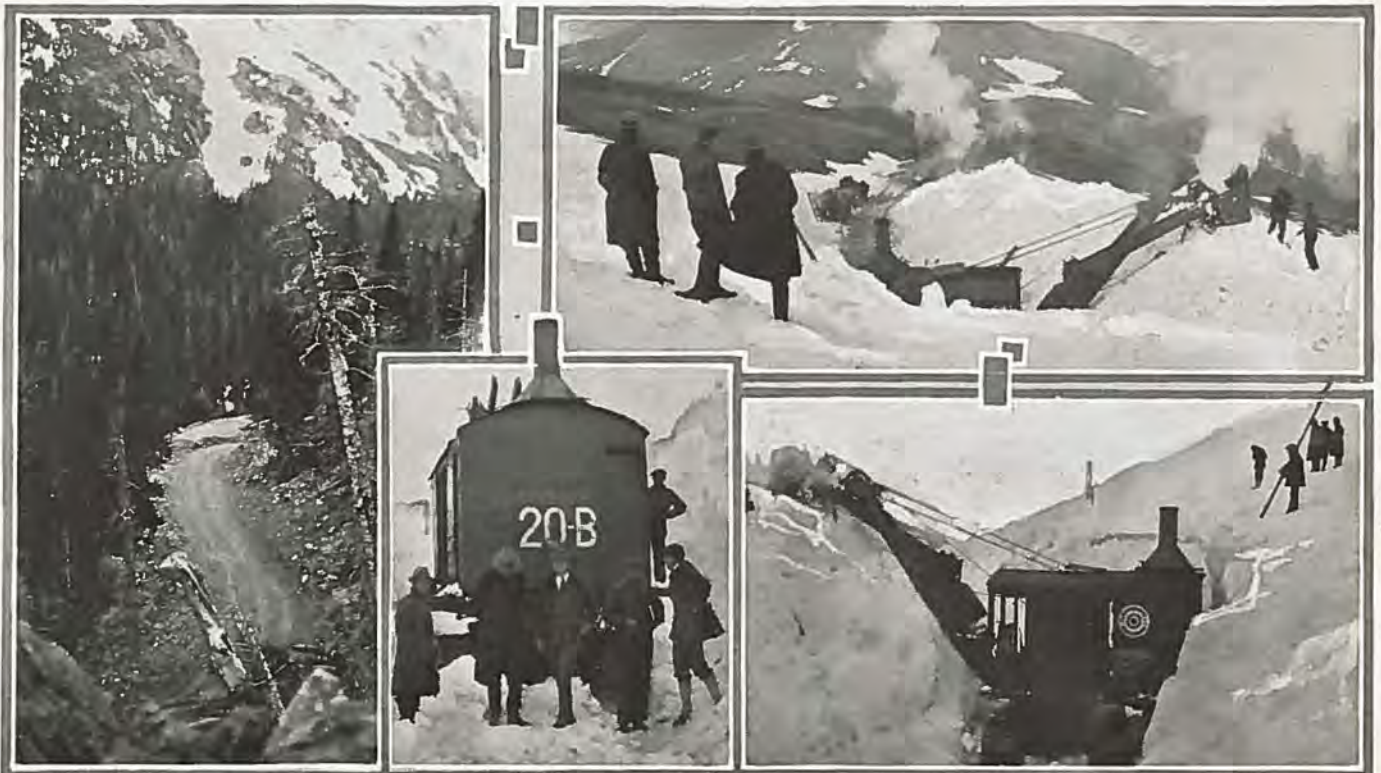
After a full investigation of various methods, the National Park Service finally purchased an oil-burning steam shovel. This is a standard shovel, equipped with a $\frac{3}{4}$ -yard rock dipper for use in the heavy work on roads in the park to follow later. At the same time an order was placed with an outside firm for the fabrication of a special snow dipper. This was not delivered until after the snow job was finished. The shovel headed its way through the snowdrifts with the standard size dipper. This delayed the work, as much faster progress could have been made with the larger special snow dipper.

The first traffic moved over the famous mountain highway the morning of June 15 on schedule time. Eastern tourists found keen delight in driving through the huge snow banks on either side of the roadway.

The shovel was shipped to Lyons, Colo., which is twenty-three miles from the town of Estes Park. From the village to the place where the shovel began operations is eighteen miles, making a total of forty-one miles that the shovel had to be transported before it got into the work. The erecting engineer on the shovel, E. H. Welker, decided the best method of moving the shovel on the job would be to knock it down and have it transported on trucks to a point near the work. The contract for the haulage of the shovel was given to the Rocky Mountain Transportation Company. In this work, Mr. Welker was assisted by Jack Taylor, shovel engineer, who took charge of the shovel for the park service, and by Gene Lawson, fireman.

The dismantling of the shovel took a little over two days. It was erected within two miles of the top of the pass. This erection was done without crane facilities. It took twenty-two hours to erect the shovel. The shovel was knocked down so that the heaviest load was seven tons, this being the swinging frame and the main engine. This could have been further reduced, but it was found to be unnecessary. A fleet of five-ton trucks handled the hauling.

In charge of the shovel during the snow removal was Jack Taylor, engineer, and Gene Lawson, fireman. Roger W. Toll was general superintendent and G. W. Camp, foreman. R. V. McQueary, a local contractor, had a crew of men and teams cleaning up and doing maintenance work on the road after the snow was taken off.



Showing steamshovel clearing snow from the summit of Milner Pass, located between Estes Park and Grand Lake. Shovel is working in snow 20 feet deep. The Pass was opened to travel on June 15. Traces of this huge snow drift remain nearly all summer.

Federal Aid Catechism

1. What Is Federal Aid?

Federal Aid consists of an appropriation by Congress to be apportioned among the various States to aid highway construction on a system previously approved by the Secretary of Agriculture.

2. From What Source Is This Money Derived?

From taxes paid to the Government through the collection of taxes from manufacturers of automobiles, auto accessories, etc., and from other Internal Revenue.

3. How Much Federal Aid Is Appropriated?

Dependent entirely upon Congress. The last appropriation involved \$75,000,000 each year for the fiscal years 1926 and 1927.

4. How Much Federal Aid Does Colorado Receive?

Approximately \$1,373,237.00.

5. How Much Federal Aid Does Wyoming Receive?

Approximately \$934,947.00.

6. How Much Federal Aid Does New Mexico Receive?

Approximately \$1,185,166.00.

7. How Are Federal Aid Appropriations Handled?

By the United States Department of Agriculture, through the Bureau of Public Roads and in co-operation with the State Highway Departments.

8. What Is the Bureau of Public Roads?

It is an organization of skilled and experienced highway engineers, who are charged with the administration of Federal Aid and location and construction of Forest Highways. The headquarters of the Chief of Bureau is in Washington, D. C., with a Regional Office at San Francisco, Cal., and twelve District Offices, each in charge of a District Engineer. District No. 3, with headquarters at Denver, Colo., administers all Federal Aid and Forest Highway activities in Colorado and Wyoming.

9. How Does the Bureau of Public Roads Handle This Work?

The Bureau deals only with the State as a unit and the counties are able to participate in this fund only by co-operation with their State Highway Departments. The allotments to the State are based upon area, population and mileage of roads within the State.

10. What Is the Percentage of Federal Participation in Colorado, Wyoming and New Mexico?

In Colorado the Federal Government pays 56.06%; in Wyoming, 64.2%, and in New Mexico, 61.51%.

11. Can Federal Aid Be Obtained on All Roads?

No. Only such projects which are on the Federal Aid Highway System.

12. What Is the Federal Aid Highway System?

It is a connected system of arterial highways that will provide continuous highway transportation between important cities and will give access to main highways within or connecting States. The Federal Highway Act of November, 1921, provided for the establishment of such a system, the mileage of which was based on the mileage of all existing roads of record in the States. Each State certified to this mileage and 7 per cent of the total within the State was designated as the Federal Aid System.

13. What Is the Length of the Federal Aid System in Colorado?

Total mileage is 3,332 miles.

14. What Is the Length of the Federal Aid System in Wyoming?

Total mileage is 3,042 miles.

15. What Is the Length of the Federal Aid System in New Mexico?

Total length is 3,332 miles.

16. Can This Mileage Be Extended?

Only upon completion of the Federal Aid System, approved.

17. Does the Bureau of Public Roads Have Any Connection With the So-Called National Highway Organizations?

Absolutely none. These organizations are financed entirely by popular subscriptions and sale of memberships. Some of the larger ones maintain valuable statistical divisions, legal and publicity divisions, and it is through these divisions that the public is informed of progress being made in highway improvements. These organizations usually select a certain route throughout the United States and advertise it widely, give it a name and call upon the public for its support. The Government does not enter into agreements with these organizations, nor does it recognize any tour so fostered. However, the organizations usually select a route upon which Federal Aid has been expended.

18. Does Federal Aid Apply to Maintenance?

No. These funds apply to construction only.

19. What Types of Pavement Can Be Built by Federal Aid?

There is no restriction in the selection of type. They may be either graded and drained, or may be of any type involving surfacing, either gravel, asphaltic or cement concrete. The type of improvement depends entirely upon the amount of traffic and class of material.

20. What Is the Usual Routine Procedure in Handling Federal Aid?

The route is approved by the Secretary of Agriculture as being a part of the Federal Highway System. Actual location is then made by the State, subject to approval of Federal Engineers. Plans and estimates are next prepared by the State Highway Department, who enters into an agreement with the Secretary of

Agriculture for the proposed improvement. The improvement is advertised for bids and award is made to the lowest bidder, or bid may be rejected in case the amount is in excess of the estimate prepared by the State or for other reasons specifically named. The construction is under direct supervision of the State Highway Department, subject to inspections and recommendations of the Federal Engineers. Upon completion of the improvement a final inspection is made, and if all work has been done in accordance with the plans and specifications, the acceptance is recommended, the contractor released by the State, and the State assumes maintenance of the project.

21. Is the Maintenance of the Federal Aid Projects by the States After Completion a Requirement of the Law?

Yes. All project agreements specifically provide that the State will maintain the projects upon completion. Failure to maintain them automatically results in the Secretary of Agriculture refusing to approve any additional projects for construction.

22. Is the Condition of Maintenance Receiving the Attention of the Bureau of Public Roads?

Yes. Constant physical examination is made of all completed projects, and unsatisfactory conditions are brought to the attention of the State Highway Department and repairs must be made within a reasonable time.

23. Does the Bureau Maintain a Laboratory for the Purpose of Testing Materials Entering into Road Construction of Highways and Bridges?

Yes. A Testing Laboratory is located in Washington, where all materials used in highway construction may be tested to establish the fact that they comply with specifications. This service is free to the States desiring to have materials tested. In addition, most of the States have installed testing laboratories.

24. Are There Other Federal Funds Available for Road Construction?

Yes. Direct appropriations by Congress for specific road projects resulting in benefits to the public, also appropriations for roads and trails within the National Forests, Indian Reservations, National Parks, etc.

25. Are There Funds Expended for Construction on the Federal Highway System?

Not necessarily. The Federal Highway Act of 1921 also provided for a Forest Highway System. This latter system is selected, subject to the approval of the Secretary of Agriculture, by conferences between representatives of the United States Bureau of Public Roads, State Highway Departments and Forest Service. It involves the improvements which extend the Federal Highway System wholly or partly within or adjacent to the National Forests, and other roads of primary importance to counties or communities.

26. How Are Funds Handled?

By direct expenditures through the Bureau of Public Roads, in which the Government pays up to 100% of the cost on construction, or in a reduced percentage, depending upon the amount of co-operation received from the State, County or local subdivision.

27. Who Has Charge of Such Forest Highway Construction?

The Bureau of Public Roads makes location surveys, designs and estimates. Also directs the construction of all Forest Highways and major development roads where the cost of construction amounts to more than \$5,000.00 per mile. The Forest Service has charge of the survey and construction when the cost is \$5,000 or less per mile. These improvements are minor forest roads and trails, not requiring skilled engineering direction.

28. How Much Money Is Provided for All Forest Roads?

This depends entirely upon Congress. The appropriation for the fiscal years 1926 and 1927 will amount to \$7,500,000.00 each year. Of the yearly appropriation, \$4,500,000.00 will be expended by the Bureau of Public Roads in construction of major highway and development roads within the National Forests, etc., and \$3,000,000.00 will be handled by the Forest Service on minor roads and trails.



Upper—Showing smooth condition of road between Longmont and Lyons, on State road No. 66. Lower—Stretch of new completed concrete pavement south of Longmont; constructed with Federal Aid funds.

29. Have Any Important Forest Highways Been Constructed by the Bureau of Public Roads in Colorado?

Yes. The following projects have been constructed by the Bureau, or are under construction at the present time:

NAME	MILES	LOCATION	COST
Monarch Pass	27.47	On main road between Salida and Montrose; crosses the Continental Divide at Monarch Pass in Cochetopa National Forest.....	\$ 207,450
Independence Pass	12.66	From Aspen south and east toward Twin Lakes, in Holy Cross National Forest.....	231,911
Cumbres Pass	24.03	Between Megotie and Colorado State Line, near Cresco, in Rio Grande National Forest.....	240,588
Sedalia-Decker Springs	14.82	Between Sedalia and Deckers, in Pike National Forest, on Jarre Canyon Route.....	76,055
Sugar Creek-West Creek	9.14	Between Deckers and West Creek, on Jarre Canyon Route, in Pike National Forest.....	104,066
Hardscrabble	17.3	Between Greenwood and Querida, in San Isabel National Forest.....	110,346
Nederland-Ward	10.5	Between Nederland and Ward, in the Pike and Colorado National Forests.....	51,997
Berthoud Pass	29.93	Between Empire and Fraser, in the Pike and Arapahoe National Forests.....	417,834
Red Mountain	6.55	Between Ouray and Silverton, in the Uncompahgre National Forest.....	225,325
Arapahoe Glacier	4.63	In Colorado National Forest, near Glacier Lake.....	51,246
Durango-Silverton	50.47	Between Durango and Silverton, in the San Juan National Forest.....	675,114
Cameron Pass	6.45	Between Fort Collins and Walden, in the Arapahoe and Colorado National Forests.....	129,152
Fremont Pass	11.4	Between Dillon and Leadville, in the Leadville National Forest.....	134,877
Tennessee Pass	8.34	Between Leadville and Inturn, in the Holy Cross National Forest.....	109,100
Mount Evans	3.79	Between Echo Lake and Idaho Springs, in the Pike National Forest.....	69,486
Mount Evans	9.36	Squaw Pass to Echo Lake, in the Pike National Forest.....	125,677
Total,	246.84		\$2,960,225

30. Have Any Important Forest Highways Been Constructed by the Bureau of Public Roads in Wyoming?

Yes. The following projects have been constructed by the Bureau, or are under construction at the present time:

NAME	MILES	LOCATION	COST
Encampment-Slater	7.32	Between Encampment and Slater, in the Hayden National Forest.....	\$ 58,054
Centennial-Brooklyn Lake	9.8	From Centennial to Brooklyn Lake, in the Medicine Bow National Forest.....	85,230
Wind River	34.05	Between Dubois and Moran, in the Washakie and Teton National Forests.....	243,373
Dayton-Steamboat Rock	7.51	Between Dayton and Kane, in the Bighorn National Forest.....	131,690
Cody-Yellowstone	4.17	Between Cody and Yellowstone National Park, in the Shoshone National Forest.....	70,694
Wyoclo	9.21	Between Laramie and Walden, in the Medicine Bow National Forest.....	56,700
Buffalo-Tensleep	62.05	Buffalo to Tensleep, in the Bighorn National Forest.....	553,549
Aladdin-Hulett	3.75	Between Aladdin and Hulett, in the Black Hills National Forest.....	44,958
Total,	137.86		\$1,244,248

31. Have Any Important Forest Highways Been Constructed by the Bureau of Public Roads in New Mexico?

Yes. The following projects have been constructed, or are under construction at the present time:

NAME	MILES	LOCATION	COST
Canyoncito-Pecos	11.50	Between Canyoncito and Pecos, in the Santa Fe National Forest, on the Santa Fe-Las Vegas Highway.....	\$ 218,000
Highrolls-Weed	27.77	Between Highrolls and Weed, in the Lincoln National Forest, serving Cloudcroft, the famous summer resort.....	145,548
Hondo-Mescalero	26.46	In the Lincoln National Forest, on the main highway between Alamogordo and Roswell.....	162,096
Capitan-Nogal Hill	6.72	On the Carrizozo-Roswell Highway, in the Lincoln National Forest.....	20,926
San Ildefonso-Frijoles	4.17	North of Santa Fe, in the Santa Fe National Forest.....	82,638
Cimarron-Taos Surfacing	18.00	Extends East from Taos, in Taos National Forest, on the main road between Cimarron and Taos.....	60,000
Glenwood-Reserve	11.09	In the Gila and Datil National Forests, on the Silver City-Reserve Highway.....	263,395
Navajo Canyon	10.13	In the Carson National Forest, north of Santa Fe and near Canjilon.....	63,710
Glorieta-Panchuela	17.80	In the Santa Fe National Forest, Santa Fe County.....	135,223
Tijeras Canyon	4.57	In the Manzano National Forest, Bernalillo County.....	24,386
Alma-Dry Creek	5.80	In the Gila National Forest, Catron and Grant Counties, north of Silver City.....	118,945
Alpine-Reserve	15.20	In the Datil National Forest, Catron County.....	82,217
Total,	169.21		\$1,377,084

In Appreciation

The stretch of roadway located between Lyons and Longmont is a fine example of what may be accomplished with a gravel surfaced highway. It is almost as smooth as pavement and gives every evidence of having received careful and intelligent maintenance.

Late last fall a light coating of gravel was spread over this ten-mile stretch. Winter travel was allowed to pack the gravel into the sub-soil. With the first break of the cold period a maintenance crew was put to work, with a result that motorists now find it truly a joy ride.

The commissioners of Boulder County may justly feel proud of this accomplishment.

The horde of summer visitors also find a keen delight in driving over the road located in the Big Thompson Canon, which forms one of the main entrances to the Rocky Mountain National Park area.

Many improvements were made on this highway by the State and Larimer County early in the spring. The condition of the surface at the present time gives evidence that this work was given most skillful attention. A vote of thanks to the Larimer County Commissioners!

Colorado has sixty-two kinds of maintenance—good, bad and indifferent. Luckily, most of it is good. But the bad spots merely emphasize the need for a more uniform system of road care.

Twenty-eight states in the country, through legislative action, have invested their highway departments with the duty of constructing and maintaining State roads. County lines, so far as roads are concerned, have been obliterated in these states.

Colorado has a new maximum weight law for trucks operating over State highways. One overloaded truck can do more damage to a dirt road in wet weather than a maintenance crew can repair in a week. Enforcement of the new law is a job for the police officials in the various counties.

Farmers were not the only ones who benefited from the recent rains. Motorists find the roads in splendid condition as a result of this moisture.

The average patrolman can keep a road smooth with the proper amount of moisture. To keep it free from ruts in dry weather is a test of real efficiency. And, it might be added, that this very thing is being done on some sections of the State highway system.

During the dry weather the patrol crews in these sections move the loose sand to each side of the road. In due season they move it back again.



One of Colorado's fine mountain roadways, constructed under State supervision.

In time of peace, prepare for war—the road officials of Washington and Yuma Counties now are engaged in preparations for a battle with the elements next winter. Several stretches of roadway in these counties are being thrown up three and four feet above the ground level. In this manner it is thought that the winter winds will keep the surface of the roads free from snow.

Traffic in these modern days must be served the year round.

Motto: "Build and maintain roads for fivers and the Pierce-Arrows will take care of themselves."

There are four motor vehicles for every mile of road in Colorado. The average travel for each of these vehicles is 4,000 miles per year. It takes roads with a real foundation to carry such traffic.

Construction of modern highways is an engineer's job. They cost money in salaries, it's true. But any motorist who drives over the finished product of one of these gents will admit the engineer is worth all he is paid—and sometimes more.

NOTICE TO ADVERTISERS

In order to rearrange our publication schedule, we are combining the June and July numbers of Colorado Highways in this issue. By so doing our publication date hereafter will be the first of the month instead of the fifteenth. All copy intended for future numbers should reach our offices not later than the twentieth of the month preceding publication. Address, Colorado Highways Publishing Co., 215 Chamber of Commerce Building, Denver, Colo.

Day Labor Gets Set-Back in Ruling on Indian Service Job

Two recent Federal Government actions tend to show that day labor practices in some branches of the national government are being forced to recognize the economical advantages of the contract system, according to "The Scraper," published by the Kentucky Association of Highway Contractors.

A distinct victory for those who stand as advocates of the straight contract method of handling public construction work is found in a recent action taken by the Committee on Public Buildings and Grounds of the House of Representatives.

This action consisted of adopting an amendment to Senate Bill 3173, which provides for construction of a memorial bridge across the Potomac River, at Washington.

As passed by the Senate, the measure stipulated that construction of the bridge be handled "by contract or otherwise." This, of course, left the door wide open for a typical day labor situation to enter.

The amendment adopted by the committee provides that strict accounting be made of the job in the event that it be handled under the force account system. This sets a mark of recognition in high places of the fact that day labor methods invite a laxity not found in contract operations.

The text of the amendment follows: "Provided, That by contract or otherwise this work or any part thereof shall not be undertaken until complete designs, working drawings and specifications are made and competitive bids are taken, and if it be determined to do said work or any part thereof under any other method than by regular contract method, the said commission shall cause to be kept an itemized account of all moneys expended, including, among other items, all labor, materials, rental, repairs, transportation, of labor, equipment and materials, engineering costs, depreciation of government-owned equipment and cost of repairs to same."

TABULATION OF BIDS ON STATE HIGHWAY PROJECTS

F. A. PROJECT NO. 286-B, LOCATED BETWEEN NUNN AND COLORADO-WYOMING STATE LINE, WELD COUNTY. TYPE OF PROJECT, GRADING.
LENGTH, 19.265 MILES.

No.	ITEM	Unit	Quantity	Estimate		San Luis Valley Const. Co.		Olson Const. Co.		Wickham Bros. & Schwiager		James Collier		W. A. Colt & Son	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	9,800	\$.25	\$ 2,450.00	\$.19	\$ 1,862.00	\$.25	\$ 2,450.00	\$.35	\$ 3,430.00	\$.25	\$ 2,450.00	\$.24	\$ 2,352.00
2	Borrow Fill	Cu. Yd.	234,000	.30	70,200.00	.19	44,460.00	.23	53,820.00	.225	52,650.00	.21	49,140.00	.24	56,160.00
3	Dry Exc. Structure	Cu. Yd.	340	.30	102.00	.50	170.00	.60	204.00	1.00	340.00	.60	204.00	.50	170.00
4	Wet Exc. Structure	Cu. Yd.	35	1.00	35.00	2.00	70.00	2.00	70.00	3.50	122.50	3.00	105.00	2.00	70.00
5	Overhaul	St. Yd.	63,000	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00
6	Concrete Cl. A	Cu. Yd.	801	23.00	18,423.00	21.00	16,821.00	23.00	18,423.00	25.00	20,025.00	18.00	14,418.00	22.00	17,622.00
7	Concrete Cl. B	Cu. Yd.	170	22.00	3,740.00	20.00	3,400.00	23.00	3,910.00	25.00	4,250.00	20.00	3,400.00	21.00	3,570.00
8	Reinforcing	Lb.	73,990	.07	5,179.30	.06	4,439.40	.065	4,809.35	.06	4,439.40	.05	3,699.50	.07	5,179.30
9	15" C. M. P. Culvert	Lin. Ft.	652	1.75	1,141.00	1.25	815.00	1.60	1,043.20	1.65	1,075.80	1.50	978.00	1.50	978.00
10	18" C. M. P. Culvert	Lin. Ft.	438	2.00	876.00	1.40	613.20	1.90	832.20	1.90	832.20	1.75	766.50	1.75	766.50
11	24" C. M. P. Culvert	Lin. Ft.	386	2.50	965.00	2.12	818.32	2.50	965.00	2.75	1,061.50	2.25	868.50	2.25	868.50
12	36" C. M. P. Culvert	Lin. Ft.	426	3.75	1,597.50	3.10	1,320.60	3.75	1,597.50	3.75	1,597.50	3.25	1,384.50	4.00	1,704.00
13	Concrete Piling	Lin. Ft.	1870	3.50	6,545.00	5.00	9,350.00	4.50	8,415.00	4.00	7,480.00	3.50	6,545.00	3.50	6,545.00
14	Cable Gd. Fence	Lin. Ft.	1820	.65	1,183.00	.75	1,365.00	.60	1,092.00	1.10	2,002.00	.60	1,092.00	.60	1,092.00
15	Timber Header	M. B. Ft.	1.6	60.00	96.00	115.00	184.00	85.00	136.00	100.00	160.00	100.00	160.00	60.00	96.00
16	Timber Piling	Lin. Ft.	720	1.00	720.00	1.30	936.00	.80	576.00	1.30	936.00	.90	648.00	1.10	792.00
17	Remove Conc. Ford	Lump Sum			100.00		75.00		100.00		60.00		50.00		100.00
18	Remove One Culvert	Lump Sum			10.00		25.00		25.00		10.00		10.00		10.00
19	Remove and Replace 1 Culvert	Lump Sum			10.00		40.00		25.00		15.00		70.00		20.00
Totals					\$714,632.80		\$88,024.52		\$99,753.25		\$101,746.90		\$87,249.00		\$99,355.30

No.	A. R. Mackey		Stevens Bros.		K. W. Reynolds		H. C. Lallier		J. Fred Roberts & Sons Const. Co.		Hamilton & Gleason Co.		Monaghan-Cunningham Const. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.22	\$ 2,156.00	\$.30	\$ 2,940.00	\$.27	\$ 2,646.00	\$.20	\$ 1,960.00	\$.25	\$ 2,450.00	\$.28	\$ 2,744.00	\$.23	\$ 2,254.00
2	.185	43,290.00	.24	56,160.00	.27	63,180.00	.19	44,460.00	.25	58,500.00	.24	56,160.00	.23	53,820.00
3	.30	102.00	1.00	340.00	.40	136.00	.30	102.00	1.00	340.00	.95	323.00	1.00	340.00
4	1.00	35.00	5.00	175.00	.50	17.50	1.00	35.00	10.00	350.00	9.00	315.00	1.00	350.00
5	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00	.02	1,260.00
6	23.75	19,023.75	20.00	16,020.00	25.00	20,025.00	23.00	18,423.00	22.50	18,022.50	20.90	16,740.90	19.00	15,219.00
7	23.75	4,037.50	20.00	3,400.00	24.00	4,080.00	23.00	3,910.00	22.50	3,825.00	20.90	3,553.00	18.00	3,060.00
8	.058	4,291.42	.05	3,699.50	.0675	4,994.33	.07	5,179.30	.06	4,439.40	.06	4,439.40	.05	3,699.50
9	1.45	945.40	1.00	652.00	1.60	1,043.20	1.70	1,108.40	1.60	1,043.20	1.75	1,141.00	1.25	815.00
10	1.70	744.60	1.20	525.60	1.90	832.20	2.00	876.00	1.85	810.30	2.00	876.00	1.50	657.00
11	3.00	1,158.00	2.00	772.00	2.60	1,003.60	2.50	965.00	2.65	1,022.90	2.50	965.00	2.30	887.80
12	3.90	1,661.40	2.75	1,171.50	3.75	1,597.50	3.70	1,576.20	4.00	1,704.00	3.75	1,597.50	3.35	1,427.10
13	3.70	6,919.00	2.70	5,049.00	3.50	6,545.00	3.60	6,732.00	4.50	8,415.00	3.75	7,012.50	5.00	9,350.00
14	.65	1,183.00	.50	910.00	.65	1,183.00	.60	1,092.00	.60	1,092.00	.62	1,128.40	.60	1,092.00
15	60.00	96.00	100.00	160.00	65.00	104.00	60.00	96.00	70.00	112.00	75.00	120.00	60.00	96.00
16	.85	612.00	.90	648.00	.95	684.00	1.10	792.00	1.00	720.00	.75	540.00	1.00	720.00
17		85.00		200.00		100.00		100.00		75.00		100.00		50.00
18		5.00		50.00		65.00		20.00		15.00		10.00		10.00
19		10.00		50.00		125.00		20.00		35.00		10.00		25.00
Totals		\$87,615.07		\$94,182.60		\$109,621.33		\$88,706.90		\$104,231.30		\$99,035.70		\$95,087.40

F. A. PROJECT NO. 267-B, LOCATED BETWEEN TRINIDAD AND LA JUNTA, LAS ANIMAS COUNTY. TYPE OF PROJECT, GRAVEL SURFACE.
LENGTH, 2.216 MILES.

No.	ITEM	Unit	Quantity	Estimate		L. N. Swope & Son		Pople Bros. Con. Co.		Battista Enrietti		Central Const. Co.		W. A. Colt & Son	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	1,400	\$.40	\$ 560.00	\$.37	\$ 518.00	\$.40	\$ 560.00	\$.30	\$ 420.00	\$.30	\$ 420.00	\$.35	\$ 490.00
2	Borrow Fill	Cu. Yd.	13,400	.40	5,360.00	.37	4,958.00	.40	5,360.00	.30	4,020.00	.30	4,020.00	.35	4,690.00
3	Dry Exc. Struct.	Cu. Yd.	120	.50	60.00	.60	72.00	.40	48.00	.50	60.00	.50	60.00	.50	60.00
4	Wet Exc. Struct.	Cu. Yd.	80	1.50	120.00	1.00	80.00	1.00	80.00	1.00	80.00	2.00	160.00	2.00	160.00
5	Overhaul Grade	St. Yd.	7,700	.02	154.00	.02	154.00	.02	154.00	.02	154.00	.02	154.00	.02	154.00
6	Gravel Surface	Cu. Yd.	4,480	1.55	6,944.00	1.60	7,168.00	1.60	7,168.00	1.50	6,720.00	1.35	6,048.00	1.60	7,168.00
7	Overhaul Surface	Yd. Mi.	24,200	.25	6,050.00	.25	6,050.00	.25	6,050.00	.25	6,050.00	.25	6,050.00	.25	6,050.00
8	Concrete Cl. A	Cu. Yd.	165	24.00	3,960.00	23.00	3,795.00	21.00	3,465.00	22.00	3,630.00	20.00	3,300.00	22.00	3,630.00
9	Concrete Cl. B	Cu. Yd.	8	23.00	184.00	22.00	176.00	20.00	160.00	21.00	168.00	20.00	160.00	21.00	168.00
10	Reinforcing	Lb.	13,500	.07	945.00	.07	945.00	.065	877.50	.07	945.00	.07	945.00	.07	945.00
11	Structural Steel	Lb.	9,000	.07	630.00	.055	495.00	.10	900.00	.07	630.00	.08	720.00	.08	720.00
12	18" C. M. P. Culvert	Lin. Ft.	120	2.10	252.00	2.00	240.00	2.00	240.00	2.00	240.00	2.00	240.00	2.00	240.00
13	48" Trash Guard	Each	2	12.00	24.00	40.00	80.00	20.00	40.00	5.00	10.00	15.00	30.00	12.00	24.00
14	Timber Piling	Lin. Ft.	512	1.00	512.00	.95	486.40	1.00	512.00	.75	384.00	.90	460.80	1.10	563.20
15	Remove Part of Bridge	Lump Sum			100.00		75.00		100.00		120.00		90.00		100.00
Totals					\$25,855.00		\$25,292.40		\$25,714.50		\$23,631.00		\$22,857.80		\$25,162.20

F. A. PROJECT NO. 254-B, LOCATED BETWEEN BYERS CANON, HOT SULPHUR SPRINGS AND PARSHALL, GRAND COUNTY. TYPE OF PROJECT, GRADING. LENGTH, 1.087 MILES.

No.	ITEM	Unit	Quantity	Estimate		Salle Const. Co.		Hamilton & Gleason Co.		E. H. Honnen		H. C. Lallier C. & E. Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	9.5	\$80.00	\$ 760.00	\$75.00	\$ 712.50	\$75.00	\$ 712.50	\$100.00	\$ 950.00	\$80.00	\$ 760.00
2	Exc. Common	Cu. Yd.	3,000	.50	1,500.00	.50	1,500.00	1.05	3,150.00	.40	1,200.00	.50	1,500.00
3	Exc. Rock	Cu. Yd.	65,000	1.30	84,500.00	1.07	69,550.00	1.05	68,250.00	1.10	71,500.00	1.30	84,500.00
4	Surfacing	Cu. Yd.	1,800	1.00	1,800.00	1.50	2,700.00	.60	1,080.00	.75	1,350.00	.95	1,710.00
5	18" C. M. P. Culvert	Lin. Ft.	334	2.50	835.00	2.25	751.50	2.25	751.50	2.20	734.80	2.40	801.60
6	Cem. Rub. Masonry	Cu. Yd.	824	11.00	9,064.00	9.50	7,828.00	9.00	7,416.00	8.25	6,798.00	10.00	8,240.00
7	Dry Rub. Masonry	Cu. Yd.	105	5.00	525.00	3.00	315.00	3.00	315.00	3.00	315.00	6.00	630.00
Totals					\$98,984.00		\$83,357.00		\$81,675.00		\$82,847.80		\$98,141.60

No.	K. V. Johnson		Pioneer Const. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$100.00	\$ 950.00	\$50.00	\$ 475.00
2	.40	1,200.00	.50	1,500.00
3	1.09	708.50	.875	56,875.00
4	1.00	1,800.00	.50	900.00
5	2.00	668.00	2.25	751.50
6	9.50	7,828.00	.50	412.00
7	2.00	210.00	1.50	157.50
Totals		\$83,506.00		\$61,071.00

F. A. PROJECT NO. 247-B, OTERO COUNTY, LOCATED BETWEEN ROCKY FORD AND SWINK. TYPE OF PROJECT, 2.329 MILES OF CONCRETE PAVEMENT.

No.	ITEM	Unit	Quantity	Estimate		Salle Const. Co.		W. A. Colt & Son		Strange-Maguire		J. Finger & Son		LaNier & Selander	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	800	\$.50	\$ 400.00	\$.35	\$ 280.00	\$.40	\$ 320.00	\$.30	\$ 240.00	\$.50	\$ 400.00	\$.40	\$ 320.00
2	Borrow Fill	Cu. Yd.	12,400	.50	6,200.00	.35	4,340.00	.30	3,720.00	.30	3,720.00	.50	6,200.00	.37	4,588.00
3	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
4	Sand Cushion	Cu. Yd.	3,000	2.00	6,000.00	1.37	4,110.00	1.50	4,500.00	1.20	3,600.00	1.75	5,250.00	1.00	3,000.00
5	Gravel Shoulder	Cu. Yd.	1,040	2.00	2,080.00	1.47	1,528.80	1.50	1,560.00	2.00	2,080.00	2.00	2,080.00	1.25	1,300.00
6	Concrete Pavement	Sq. Yd.	24,650	2.35	57,927.50	2.47	60,885.50	2.30	56,695.00	2.37	58,420.50	2.39	58,913.50	2.22	54,723.00
7	Def. Metal Joint	Lin. Ft.	12,300	.20	2,460.00	.17	2,091.00	.20	2,460.00	.15	1,845.00	.20	2,460.00	.17	2,091.00
8	Concrete Cl. A	Cu. Yd.	118	21.00	2,478.00	23.00	2,714.00	20.00	2,360.00	20.00	2,360.00	20.00	2,360.00	17.00	2,006.00
9	Concrete Cl. B	Cu. Yd.	28	20.00	560.00	23.00	644.00	20.00	560.00	20.00	560.00	20.00	560.00	17.00	476.00
10	Reinforcing Steel	Lb.	12,000	.07	840.00	.07	840.00	.07	840.00	.06	720.00	.07	840.00	.06	720.00
11	18" C. M. P. Culvert	Lin. Ft.	568	1.75	994.00	1.60	908.80	1.50	852.00	1.40	795.20	1.75	994.00	1.35	766.80
12	18" C. M. P. Culvert	Lin. Ft.	100	2.00	200.00	1.85	185.00	1.75	175.00	1.85	185.00	2.00	200.00	1.55	155.00
13	18" C. M. P. Siphon	Lin. Ft.	233	1.50	349.50	1.60	372.80	1.25	291.25	.97	226.01	1.25	291.25	1.05	244.65
14	18" C. M. P. Siphon	Lin. Ft.	133	1.75	232.75	1.85	246.05	1.50	199.50	1.20	159.60	1.50	199.50	1.25	166.25
15	24" C. M. P. Siphon	Lin. Ft.	68	2.25	153.00	2.25	153.00	2.00	136.00	1.60	102.00	1.75	119.00	1.75	119.00
16	15" Trash Guard	Each	6	6.50	39.00	7.00	42.00	7.00	42.00	7.00	42.00	7.50	45.00	7.50	45.00
17	18" Trash Guard	Each	4	7.50	30.00	8.00	32.00	8.00	32.00	8.50	34.00	9.00	36.00	8.75	35.00
18	24" Trash Guard	Each	2	9.50	19.00	9.00	18.00	11.00	22.00	11.00	22.00	12.00	24.00	12.00	24.00
19	3'x3' Trash Guard	Each	2	10.00	20.00	12.00	24.00	15.00	30.00	16.00	32.00	15.00	30.00	18.00	36.00
20	Timber Headers	M. B. Ft.	2.8	60.00	168.00	60.00	168.00	60.00	168.00	70.00	196.00	70.00	196.00	55.00	154.00
21	Remove 3 Culverts	Lump Sum			60.00		36.00		60.00		30.00		50.00		30.00
Totals					\$81,212.75		\$79,620.95		\$75,024.75		\$75,371.31		\$81,250.25		\$71,001.70

No.	F. C. Dreher Con. Co.		Lee F. Williams		Stamey-Mackey Co.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.60	\$ 480.00	\$.45	\$ 360.00	\$.40	\$ 320.00
2	.40	4,960.00	.45	5,580.00	.35	4,340.00
3	.02	2.00	.02	2.00	.02	2.00
4	1.50	4,500.00	1.50	4,500.00	1.00	3,000.00
5	1.50	1,560.00	2.00	2,080.00	1.50	1,560.00
6	2.28	56,202.00	2.10	51,765.00	2.20	54,230.00
7	.15	1,845.00	.16	1,968.00	.17	2,091.00
8	25.00	2,950.00	22.00	2,596.00	20.00	2,360.00
9	27.00	756.00	22.00	616.00	19.00	532.00
10	.07	840.00	.06	720.00	.06	720.00
11	1.00	568.00	2.00	1,136.00	1.35	766.80
12	1.25	125.00	2.30	230.00	1.60	160.00
13	1.00	233.00	1.75	407.75	1.25	291.25
14	1.25	166.25	2.00	266.00	1.50	199.50
15	2.00	136.00	2.50	170.00	2.25	163.00
16	7.50	45.00	8.00	48.00	8.00	48.00
17	8.50	34.00	9.00	36.00	8.65	34.60
18	10.00	20.00	10.00	20.00	11.00	22.00
19	15.00	30.00	15.00	30.00	25.00	50.00
20	60.00	168.00	80.00	224.00	60.00	168.00
21		60.00		60.00		75.00
Totals		\$75,680.25		\$72,814.75		\$71,123.15

June and July, 1925

COLORADO HIGHWAYS

F. A. PROJECT NO. 288-A, LOCATED BETWEEN BRUSH AND A POINT SOUTH OF BETA, LOGAN, WASHINGTON, MORGAN COUNTIES.
TYPE OF PROJECT, GRADING AND DRAINAGE. LENGTH, 18.725 MILES.

Table with 16 columns: No., ITEM, Unit, Quantity, Unit Pr., Estimate Amount, A. R. Mackey Unit Pr. Amount, Scott & Curlee Unit Pr. Amount, Hall-Hardman Const. Co. Unit Pr. Amount, LaNier, Selander & White Unit Pr. Amount, Monaghan-Cunningham Const. Co. Unit Pr. Amount. Rows include items like Exc. Common, Borrow Fill, Overhaul, Prep. Sub Grade, Concrete Cl. A, Concrete Cl. B, Reinforcing Steel, Structural Steel, C. M. P. Culvert, C. M. P. Siphon, Trash Guard, Coal Hole Ring and Cover, Cable Guard Fence, Untreated Timber Piling, Lowering Bridge, Barb Wire Fence, and Remove and Replace Fence. Totals: \$124,055.70, \$102,843.85, \$102,627.35, \$119,076.76, \$103,346.45, \$113,753.37.

Table with 16 columns: No., K. V. Johnson Unit Pr. Amount, Carl C. Madsen Const. Co. Unit Pr. Amount, James Collier Unit Pr. Amount, Central Const. Co. Unit Pr. Amount, J. Fred Roberts & Sons Const. Co. Unit Pr. Amount, J. L. Busselle & Co. Unit Pr. Amount, Karl W. Reynolds Unit Pr. Amount. Rows include items like Exc. Common, Borrow Fill, Overhaul, Prep. Sub Grade, Concrete Cl. A, Concrete Cl. B, Reinforcing Steel, Structural Steel, C. M. P. Culvert, C. M. P. Siphon, Trash Guard, Coal Hole Ring and Cover, Cable Guard Fence, Untreated Timber Piling, Lowering Bridge, Barb Wire Fence, and Remove and Replace Fence. Totals: \$117,117.12, \$109,680.62, \$105,901.95, \$108,103.75, \$127,650.30, \$147,581.25, \$118,187.65.

COLORADO HIGHWAYS

June and July, 1925

STATE PROJECT NO. 569, LOCATED WEST OF BYERS OVER BIJOU CREEK, ARAPAHOE COUNTY. TYPE OF PROJECT, 438-FOOT TIMBER TRESTLE AND APPROACHES.

No.	ITEM	Unit	Quantity	Estimate		W. O. Morrison		Frank Ford		C. A. Sweitzer		A. R. Mackey	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	50	\$.25	\$ 12.50	\$.80	\$ 40.00	\$ 1.10	\$ 55.00	\$.40	\$ 20.00	\$.22	\$ 11.00
2	Borrow Fill	Cu. Yd.	4,000	.25	1,000.00	.38	1,520.00	.30	1,200.00	.40	1,600.00	.22	880.00
3	Treated Timber	M. B. Ft.	48.6	120.00	5,832.00	105.00	5,108.00	91.45	4,444.47	83.00	4,033.80	92.20	4,480.92
4	Untreated Timber	M. B. Ft.	49.4	75.00	3,705.00	84.00	4,149.60	76.90	3,798.86	53.00	2,618.20	58.00	2,865.20
5	Treated Timber Piling	Lin. Ft.	4,186	1.20	5,023.20	1.32	5,525.52	1.39	5,818.54	1.21	5,065.06	1.17	4,897.62
Totals					\$15,572.70		\$16,838.12		\$15,316.87		\$13,337.06		\$13,134.74

No.	Knollman & Crandell		Levy Const. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.40	\$ 20.00	\$.28	\$ 14.00
2	.60	2,400.00	.28	1,120.00
3	100.00	4,860.00	95.00	4,617.00
4	70.00	3,458.00	84.00	4,149.60
5	1.25	5,232.50	1.50	6,279.00
Totals		\$15,970.50		\$16,179.60

F. A. PROJECT NO. 266-B, LA PLATA COUNTY, LOCATED BETWEEN DURANGO AND BONDAD

No.	ITEM	Unit	Quantity	Estimate		Engler & Teyssier		Wood, Morgan & Burnett		Blackwell & Butler		Shields & Kyle		Central Const. Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	8	\$40.00	\$ 320.00	\$30.00	\$ 240.00	\$50.00	\$ 400.00	\$25.00	\$ 200.00	\$75.00	\$ 600.00	\$50.00	\$ 400.00
2	Exc. Common	Cu. Yd.	7,300	.35	2,555.00	.27	1,971.00	.2975	2,171.75	.34	2,482.00	.35	2,555.00	.39	2,847.00
3	Exc. Rock	Cu. Yd.	100	1.00	100.00	.27	27.00	1.65	165.00	.34	34.00	1.00	100.00	1.30	130.00
4	Borrow Fill	Cu. Yd.	6,600	.35	2,310.00	.27	1,782.00	.2975	1,963.50	.34	2,244.00	.35	2,310.00	.29	1,914.00
5	Overhaul	St. Yd.	100	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00	.02	2.00
6	Gravel Surface	Sq. Yd.	29,370	.45	13,441.50	.38	11,350.60	.40	11,948.00	.42	12,545.40	.40	11,948.00	.39	11,649.30
7	Concrete Cl. B.	Cu. Yd.	44	25.00	1,100.00	25.00	1,100.00	22.00	968.00	30.00	1,320.00	30.00	1,320.00	22.00	968.00
8	15" C. M. P. Culvert	Lin. Ft.	266	2.25	598.50	2.25	598.50	2.25	598.50	2.00	532.00	2.50	665.00	1.90	505.40
9	24" C. M. P. Culvert	Lin. Ft.	168	3.50	588.00	3.50	588.00	3.50	588.00	3.00	504.00	4.00	672.00	2.90	487.20
Totals					\$21,015.00		\$17,659.10		\$18,804.75		\$19,863.40		\$20,172.00		\$18,902.90

No.	Stamey-Mackey Const. Co.		B. L. & J. L. Morrison	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$40.00	\$ 320.00	\$80.00	\$ 640.00
2	.40	2,920.00	.32	2,336.00
3	1.00	100.00	1.50	150.00
4	.35	2,310.00	.32	2,112.00
5	.02	2.00	.02	2.00
6	.40	11,948.00	.34	10,155.80
7	22.00	968.00	21.00	924.00
8	2.00	532.00	2.00	532.00
9	3.10	520.80	2.50	420.00
Totals		\$19,620.80		\$17,271.80

STATE PROJECT NO. 568, LOCATED SEVEN MILES EAST OF DENVER ON ROAD NO. 8, ADAMS AND ARAPAHOE COUNTIES. TYPE OF PROJECT, 61-FOOT TIMBER TRESTLE AND APPROACHES.

No.	ITEM	Unit	Quantity	Estimate		W. O. Morrison		Knollman & Crandell		A. R. Mackey		C. A. Sweitzer	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	100	\$.25	\$ 25.00	\$.70	\$ 70.00	\$.40	\$ 40.00	\$.30	\$ 30.00	\$.50	\$ 50.00
2	Borrow Fill	Cu. Yd.	2100	.25	525.00	.38	798.00	.40	840.00	.30	630.00	.50	1,050.00
3	Treated Timber	M. B. Ft.	7.0	120.00	840.00	110.00	770.00	110.00	770.00	120.00	840.00	90.00	630.00
4	Untreated Timber	M. B. Ft.	7.3	75.00	547.50	85.00	620.50	70.00	511.00	100.00	730.00	60.00	438.00
5	Treated Timber Piling	Lin. Ft.	780	1.10	858.00	1.40	1,092.00	1.15	897.00	1.50	1,170.00	1.25	975.00
6	Remove Old Bridge	Lump Sum			100.00		180.00		300.00		150.00		200.00
Totals					\$2,895.50		\$3,530.50		\$3,358.00		\$3,550.00		\$3,343.00

No.	Frank Ford		Levy Const. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount
1	\$ 1.10	\$ 110.00	\$.28	\$ 28.00
2	.35	735.00	.28	588.00
3	110.00	770.00	95.00	665.00
4	86.40	630.72	85.00	620.50
5	1.45	1,131.00	.95	741.00
6		100.00		50.00
Totals		\$3,476.72		\$2,692.50

Signs of the Times Miscellaneous News Items of Significance to Highway Builders

County Road Men Discuss Problem of Highway Finance

By RALPH C. TAYLOR

Maj. L. D. Blauvelt, State highway engineer, was one of the principal speakers at the meeting of the Arkansas Valley Association of County Commissioners, who met in Pueblo June 26 and 27, with approximately 100 county officials in attendance.

Under the Federal Aid act of 1921, Colorado receives approximately \$1,400,000 annually. Colorado has to put up 44 per cent and the Government's 56 per cent is represented by the \$1,400,000, making the total almost \$3,000,000 a year. In the past three years the State has met Federal Aid appropriations by proceeds from the \$6,000,000 bond issue, \$1,000,000 of which have now been refunded through the State auto license fees. The balance of the bond issue will finance Colorado's road program through 1926.

The serious problem is providing funds to meet the Federal appropriations after January 1, 1927, Blauvelt pointed out. If the appropriation is not met, the money diverts to other states. Blauvelt did not attempt to state what should be done to solve the problem.

Although no action was taken by the association, the general opinion was that the gasoline tax should be increased to raise the necessary funds. Speakers pointed out that this means of financing the road department would place the burden of the tax on the persons who use the highways most and consequently receive the greatest benefits.

Robert H. Higgins, superintendent of the State Highway Maintenance Department, told the county officials that the model roads for maintenance are the Pueblo-Beulah road and a Weld County road. "If all highways were kept in such splendid shape, the maintenance problem would be solved. It would cut down auto repair bills three times and lengthen the life of motor vehicles. It may cost a little more, but it is worth while," Higgins said.

O. G. Smith, highway commissioner in Pueblo County, was called upon by Chairman Ray McGrath of Prowers County to explain the good condition of the Beulah highway. "It is cheaper to keep a good road good than to let it get bad and then make it good," Smith stated. "Long, straight, smooth, wide roads are what satisfies the autoists. On the twenty-eight miles of Beulah road we keep one man who operates a one-man maintainer, which costs the county \$8 a day. A load of shale occasionally helps take care of the bad places as they appear."

Dan Straight, Weld County commissioner and president of the Colorado Association of County Commissioners, stated that Weld County has one-sixth of the road mileage of Colorado. Approximately half of the 10,000 miles of highway in that county are improved. "We use the same methods in road maintenance as Pueblo County," the speaker said. "We have found that for road building the lighter truck equipment is cheaper and faster."

Alva B. Adams, former United States senator from Colorado, was the principal speaker at the banquet given by the machinery salesmen in honor of the county officials. He said, in part:

"The federal government should get into partnership with the West a little more in highway building. It donates millions of dollars to make harbors. When we ask them for road money they say, 'We'll put up one dollar if you will match it.' What difference does it make if the money is spent on roads or harbors? If the United States is prepared to spend money to see that commerce goes out on the high seas, why not be prepared to spend money in the same manner to take commerce to the harbors?"

"An improved highway into a farming section of land means more income to the federal government because good roads increase the value of lands and

"Congress recognizes the right to spend money in the East, but it does not favor such expenditures in the West. In the Senate, where there is equal representation from each State, it is possible for the western senators to prevent legislation detrimental to the West.

"Roads are what make cities. They are the channels through which prosperity comes."

Adams, one time county attorney of Pueblo County, told the commissioners that they were the most influential public officials to the ordinary persons. "The president of the nation affects us less than the county commissioners. The president cannot levy a tax; he cannot spend money without an appropriation from Congress. The commissioners can levy a tax and spend the people's money without advice from anyone."

Other prominent speakers included: R. L. Shaw, Denver, in charge of the motor vehicle license department under Secretary of State Carl S. Milliken; G. L. L. Gann, Pueblo, advisory member of the State Highway Board; R. N. Booth, Canon City, and J. C. Vaughn, Rocky Ford.

It was voted to hold the next meeting in Pueblo in September, during the Colorado State Fair.

Gann-Sedalia Concrete Road Is Approved by Gov. Morley

On June 27, Gov. Clarence J. Morley approved the contract for the construction of seven miles of concrete pavement on the Colorado Springs-Denver trunk route, located between Gann and Sedalia. Work on the construction of the new link of pavement has been started by the Strange-Maguire Paving Company of Salt Lake City, Utah, the low bidders on the project. Their bid price for the work was \$314,174. The road will be located

east of the railroad tracks, thus eliminating two dangerous railroad crossings.

This project was first advertised for bids about a year ago, when the department asked for alternate bids on asphalt and concrete surfacing. At that time the Strange-Maguire concern was the low bidder on the asphalt type of pavement. The question of whether the department could let the contract for asphalt pavement was brought up and the matter referred to the State's attorney-general. He ruled that asphalt could not be used because it was not a "home product."

The matter then was taken into the courts and recently the supreme court decided that Maj. L. D. Blauvelt, State highway engineer, was within his rights in rejecting the bid of the Strange-Maguire firm. In reaching its decision the higher court did not consider the question of the "Colorado Made Goods" act, but decided the case upon the question of whether there was a contract between the department and the contractors.

At the second letting, which was on the basis of concrete pavement only, the Salt Lake concern was again low. Their bid was approximately \$15,000 lower on the concrete type of pavement than they had previously agreed to construct the asphalt type pavement for.

Plans have been completed for a second link of pavement in this road extending from the end of the Strange-Maguire contract through the town of Castle Rock, and at the time of this writing bids are being advertised for. The length of this project is five miles, which includes an underpass crossing of the railroad tracks a short distance north of Castle Rock.

1925 to Set New Record for General Construction Work

All existing records for volume of construction work under way in the United States during a single month were shattered in May, according to statistics compiled by the Associated General Contractors of America. The May volume was 26 per cent greater than that of April, reflecting the great volume of contracts awarded during the two preceding months. The amount of construction activity in the first five months of this year is being taken as an indication that 1925 will set a new twelve-month record.

The cost of construction in the principal centers of the United States remained stationary during May, being exactly double that of 1913. The fact that costs have not increased as a result of the heavy volume of contracts awarded in March is being viewed as a marked assurance of the present stability of the construction industry.

The volume of building contracts during April was the greatest for any month in any year on record, exceeding the previous high mark set in the preceding month by 11 per cent.

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The Engineer's Estimate

(Continued from Page 9)

the work. As a matter of fact, the unreasonably large profit that is contained in the proposal of the high bidder is usually more than offset by the low bidder's figure having a possibility of a loss contained in it. If these statements are true, then the Engineer's Estimates for the past two years have presented very fair figures for contractors to "shoot at."

The engineer in charge of construction finds that his troubles begin when a contract is awarded at prices which are certain to cause the contractor to lose money on the job.

The first signs of the rocky coast ahead are observed when the contractor wishes to use some inferior materials or methods in the construction. The engineer is made to feel that by insisting that the specifications be followed, he is "taking the bread from the baby's mouth." Later other indications of difficulties appear. The progress is not what it should be. Inquiries are made as to the reasons why certain of the contractor's bills are not being paid. The fact that the contractor takes questions of procedure over the heads of Resident and Division Engineers into the Headquarters Office generally is an indication that he is not having success with the work at his contract prices and is looking for a way out. Thus he struggles through the fog of his own making—he asks for extension of time for completion of the work—he makes

claims for errors in the resident engineer's measurements—he claims extras which he thinks should be paid for.

Finally the time arrives when the project is nearing completion. By this time the Auditor of the Department has a sheaf of claims which have been filed against the contractor and wants to know from the Engineering Division when the advertisement for final payment will be run and when the final estimate will be in.

Then the completion date is received and after many conferences the project is closed up. The whole history of the project shows that it is unsatisfactory to the engineers and most certainly to the contractor. In the very great majority of cases the reason for all the friction is given in the contract prices.

Now, getting back to the Engineer's Estimate—this may be too low because the unit prices are too low, but there are other ways in which the Engineer's Estimate may be too low. Because of lack of data it is often found that Engineers have not included among the items detailed for the work many things which should have been included. For the reason that sufficient care was not used in making the preliminary surveys the quantities may be in error or the classification may be wrong.

These errors may be serious because when the job is finally closed up and the correct quantities used instead of the original quantities in the preliminary estimate, the contractor who had been

awarded the work may not have been the low bidder at all.

The preliminary estimate should show, as closely as can reasonably be expected, all of the work contemplated in the construction of the project. There should be no alterations made in the plans after bids have been received, and the ideal condition would be to have no bills for extra work except such as were known when the contract was let, such as bills for wetting and rolling, etc.

Some contracts have been completed in the State Highway Department which fulfill the above conditions; many have minor differences in quantities and few extra bills. The contracts which have large alterations in quantities, we are happy to say, are now becoming more scarce.

Contractors and engineers alike go on from one project to another. They lay out plans for future projects, each wishing for the other to improve. Perhaps the day will come when Engineers will cease to make mistakes, when contractors will leave an honest profit in their bid prices, when they will agree on classification and yardage and when there will be no overruns. I doubt it.

Cole Brothers, contractors on the Del Norte irrigation project, purchased two Best "Sixty" tractors and four La Plant-Choate dump wagon outfits for use on their job through the Wilson Machinery Company, Denver.



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This P & H Gasoline Shovel belonging to the California Highway Commission has encountered many rocky stretches in highway construction through the mountains.

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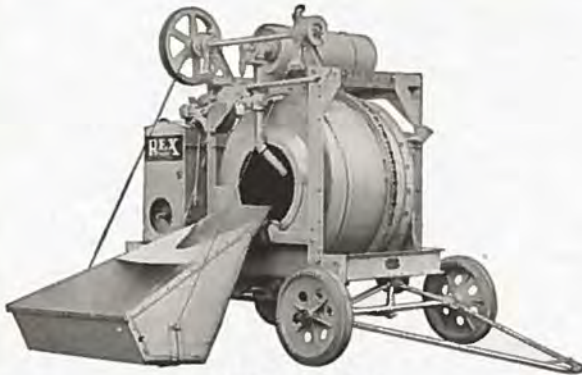
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Rex Model 237-S

Note the stream lined skip with the large charging opening. 237-S Mixer is equipped with 8 horse-power 2-cylinder LeRoi engine. To get full particulars ask for Bulletin 37-S. Rex Mixers made in sizes from 3½-foot to 28-foot.

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Rex Pavers are admitted by all to be the leading high speed pavers. Rex Mixers are built on the same plan. Speed getting materials in and out of the drum, coupled with a fast thorough mix, means more and better concrete per day.

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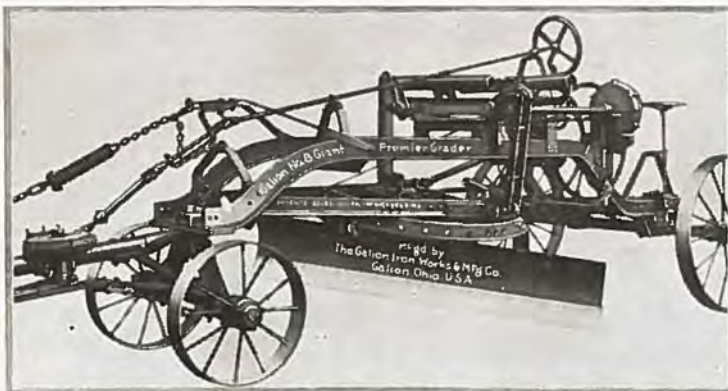
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Literature on Request

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STATE HIGHWAY DEPARTMENT
COMBINED FINANCIAL STATEMENT FOR THE FIRST SIX MONTHS OF THE YEAR 1925

Balances, December 1, 1924		
Highway Fund	\$1,067,800.68	
Federal Aid Bond Fund.....	500,281.58	
County Bond Fund.....	16,656.43	
Total Balances.....		\$1,584,738.69
RECEIPTS:		
Half Mill Levy.....	\$ 424,027.91	
Gasoline Tax.....	383,229.45	
Internal Improvement.....	48,300.00	
Federal Aid.....	356,018.34	
County Aid.....	46, 60.45	
Excess War Supplies.....	27,526.17	
Total Receipts.....		\$1,285,162.32
Total Balances and Receipts.....		\$2,869,901.01
DISBURSEMENTS:		
Federal Aid Projects.....	\$ 844,130.76	
State Projects.....	140,870.73	
Maintenance	243,017.67	
Property and Equipment.....	32,843.47	
Surveys	2,583.91	
Administration, General Office.....	31,238.26	
Administration, Engineering.....	33,765.22	
Road Signs and Traffic Census.....	7,096.00	
County Bond Projects.....	5,434.73	
Total Disbursements.....		\$1,340,980.75
Balances, May 31, 1925		
Highway Fund.....	\$1,513,853.23	
Federal Aid Bond Fund.....	3,845.33	
County Bond Fund.....	1,221.70	
Total Balances.....		\$1,528,920.26
Total Disbursements and Balances.....		\$2,869,901.01



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GALION engineers have just produced, in this new No. 8 Engine Grader, an easily handled, well balanced power grader that is built stronger than any similar type road machine ever built either by ourselves or others. Its superior strength lies largely in the exceptional size of the main frame

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12 ft. Adams Grader at work cutting a high back-slope by riding up on the banks. No grader without "Leaning Wheels" could do this work.

Only a Leaning Wheel Grader Can Do This Job

This striking picture was not "posed," but shows an Adams Grader at work, widening a road by riding up on the side banks and cutting them back—a job no straight-axle grader could even attempt.

Shaping high back slopes and cutting down steep banks is common, everyday work for Adams Graders, because the Leaning Wheels enable the operator to hold the grader right where he wants it to work. This photo shows on how steep a bank it is possible for an Adams Leaning Wheel grader to work.

"Leaning Wheels" increase the working range of a grader tremendously—enable it to work successfully in places that are inaccessible for straight-axle graders.

Let Adams Graders cut the cost of all your grading jobs. They'll do your surface grading far better and cheaper, and make big savings on all kinds of bank and ditch work. Get a copy of our new catalog—60 pages of photos, facts and figures for roadbuilders.

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For years Smiths have been making records of speed, accuracy and endurance, and time and again they have proven by their economy of operation and length of service that they are quality pavers without equal.

Their low overall height, simple one-man control, speedy power discharge, full-length traction—all are features that mean efficiency in paver operation.

The low over all height of the Smith Paver permits easy passage under city raised tracks.



There is no superstructure to dismantle when shipping a Smith Paver. It clears all railroad trestles.

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DENVER



SMITH PAVERS

Cumbres Pass Open To Traffic

(Continued from Page 7)

tivities from there with the aid of a Government owned automobile. During most of the season it was necessary to use one day a week, sometimes two, in the supervision of construction and maintenance on the Cumbres and La Manga Sections, the balance of the time being taken up with staking new work, measuring completed work and general supervision on the Canyon Section which progressed at such a rate as to require almost constant attention.

The job was entirely completed and accepted November 22 within 92 official weather working days, or 75 per cent of the 120 days allowed. This unusual saving in time may be attributed to many causes, some of which were doubtless controlled or affected by the peculiar physical features of this particular job and the character of the organization which constructed it and can therefore hardly be used as a criterion. Some of the principal reasons for effecting a prompt completion were probably: favorable weather conditions throughout the season; efficient and intensive supervision on the part of the contractor and his co-operation at all times with the engineer. This being the initial highway job for this organization, one might have some misgivings as to their ability to produce a satisfactory job, but the Canyon Section undoubtedly compares very favorably with the balance of the work on Cumbres Pass.

In surveying the present status of the entire Cumbres Pass Project and its development during the past three years, it is interesting to note the comparative costs, methods and progress of the three sections, each started in as many consecutive years and all completed in 1924. It is also of interest to view the job as a whole or collectively. Out of a total length of 29 miles within the Forest, the Bureau has built to date 19 miles of 12-foot standard width Forest Roadway, at a total cost of \$196,441.73, which expenditure is divided as follows:

Contract payments	\$169,072.26	86 %
Equipment charges	3,477.79	1.9 %
Explosives	7,116.00	3.6 %
*Construction engineering	11,600.00	5.9 %
Other contingencies	5,175.68	2.6 %

The State and County have built an intermediate five miles of a 9-foot roadway at a cost, as near as can be ascertained, of \$36,000. Our original revised estimate made in March, 1922, based on standards prescribed for Federal Aid Highway System highways, was \$105,000 for this identical five miles of work. A tentative estimate recently compiled amounts to \$55,000 for improvements of this work to a standard design, which would make its total cost \$91,000. The difference in unit prices of today and three years ago is probably accountable in part for the apparent discrepancy in the estimates. This makes a total of \$232,000 expended to date on the 24 miles of new road, leaving only five miles of new construction to be done and possible improvement of the five-mile County Section to complete a highway of standard design entirely through the Rio

Grande National Forest from the State Line to within 13 miles of Antonito. This 13 miles is covered at present by an old road following the old meandering route established in the early days, making innumerable twists and turns through various Mexican settlements and barnyards. For this reason, portions of this road, more particularly the upper half, should be relocated and improved to be made comparable to the new work now completed. At the railroad town of Antonito, a connection is made with a well improved State Highway north through the San Luis Valley and south over a partially improved road to Santa Fe, New Mexico.

Federal Aid Funds for the Various States Are Shown

Federal aid funds for the fiscal year 1926 which have been authorized by House Resolution 4971 will amount to \$73,125,000, according to official reports.

States which will benefit include all of those in the Union, as well as the territory of Hawaii. The states and the amounts apportioned to them for their highway work are as follows:

States.	Amount
Alabama	\$ 1,541,870
Arizona	1,056,171
Arkansas	1,264,164
California	2,472,636
Colorado	1,373,237
Connecticut	474,801
Delaware	365,625
Florida	892,878
Georgia	1,983,089
Idaho	936,927
Illinois	3,191,479
Indiana	1,938,693
Iowa	2,070,396
Kansas	2,074,360
Kentucky	1,411,607
Louisiana	997,262
Maine	685,140
Maryland	635,783
Massachusetts	1,090,118
Michigan	2,225,227
Minnesota	2,124,151
Mississippi	1,291,960
Missouri	2,417,727
Montana	1,548,473
Nebraska	1,581,969
Nevada	948,076
New Hampshire	365,625
New Jersey	935,082
New Mexico	1,185,166
New York	3,657,096
North Carolina	1,699,168
North Dakota	1,180,699
Ohio	2,789,588
Oklahoma	1,755,105
Oregon	1,179,668
Pennsylvania	3,360,123
Rhode Island	365,625
South Carolina	1,052,549
South Dakota	1,215,020
Tennessee	1,622,985
Texas	4,415,715
Utah	846,467
Vermont	365,625
Virginia	1,449,713
Washington	1,118,987
West Virginia	797,295
Wisconsin	1,873,308
Wyoming	934,947
Hawaii	365,625
Total	\$73,125,000

*Total probable to complete.

Materials Contained in Mile of Modern Concrete Paving

While the cost of concrete roadways varies with the locality and the pavement design, an average of \$30,000 a mile is often given for an 18-foot pavement 7 inches thick. Several thousand dollars' fluctuation either way in the price would not be unreasonable, depending upon the locality in which paving is done.

For this sum the community gets nearly two and one-fourth acres of pavements containing 2,000 cubic yards of mixed concrete. This calls for 3,400 barrels of Portland cement or seventeen carloads. It calls also for 1,100 cubic yards of sand, equalling thirty-two carloads. It calls likewise for 1,600 cubic yards of crushed stone, which is forty-six carloads. Into this mixture will have to be poured 300,000 gallons of water, which is thirty-eight tank carloads. The total weight of this concrete would then approximate 4,000 tons.

Before the cement could be delivered 400 pounds of dynamite would be required to blast the rock which went into it. The fuel necessary to burn the rock would total 340 tons of coal, or its equivalent in oil or gas. While cement requirements are commonly measured by the barrel, it is usually delivered in sacks holding a cubic foot each. And 13,600 such sacks would be required for the cement in the mile of road. Thirteen bales of cotton would be needed for these. Into the cement would go nineteen tons of gypsum, which is necessary to regulate its time of setting.

Except for the great improvements in methods of building concrete roads developed during the last fifteen years, converting this great mass of materials into pavements at the rate needed would be impossible. Where once a two-mile road job was considered big, contracts are now largely let in ten and twenty-mile stretches. During 1924 Illinois alone completed more than 1,200 miles of concrete highways.

Receipts from motor vehicle fees and gasoline tax in California in 1924 totalled \$8,812,723. This entire sum was used for maintenance and reconstruction purposes. Total receipts of the California department were \$17,719,653.

Federal revenue derived from taxation of motor vehicles and accessories since 1917 has been more than twice as great as the amount expended by the Federal Government for road construction, according to a report of the Secretary of Agriculture. This is likewise true to a marked degree in some states.

The Highway Commission of California has let a contract totalling \$298,610 for the construction of the first unit on the Bay Shore highway south of San Francisco. The road is across the salt marshes adjacent to the west shore of San Francisco bay. The initial grade is being built sixty feet wide on a 100-ft. right-of-way. Culverts and other necessary work probably will bring the cost of the contract to nearly \$400,000. The road is thrown up 6½ feet above the unreclaimed marsh land. An industrial railroad is being used to haul the dirt on the fill.



Two Widths at One Cut

Two sizes of trench in one operation—ready for two sizes of pipe to be laid immediately.

Excavating costs were reduced by half.

Great range of cutting widths, a wonderful advantage, is only one of the many superior working features of Buckeye Trench Excavators.

There is no "weak link" in Buckeye construction. From power plant to digging chains Buckeyes are designed and built to give steady, profitable service in all kinds of digging.

The heavy-duty engine develops plenty of power—it always has some in reserve.

The power is profitably used—gears and chains transmit it. No loss due to slippage. Automatic safety device protects against overloads.

Then there's the Quick-Shift Conveyor—the greatest individual improvement on modern trenching machines. It was originally developed and perfected on Buckeyes.

Driven from both ends, this Conveyor has an exceptionally wide belt, which is kept centered by a patented construction. No material too wet, too slippery or too difficult to handle with this Buckeye invention.

Thirty years' successful experience guarantees Buckeye performance.

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Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers

There's a Buckeye Sales and Service Office Near You.

We have just secured 14 LIBERTY TRUCKS

from U. S. Government Warehouse

They arrived in Denver Tuesday, and that day 7 trucks were taken by Counties and driven away.

As good as any ever received by State Highway Department and selling at $\frac{1}{3}$ original cost.

Don't forget that we have the only stock of Parts in the West for Nash, Liberty or Heavy Aviation.

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you will receive a test sheet showing results of a 28-day test, usually before the cement arrives on the work.

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The Bulletin Board

Clinton-Held to Represent New Caterpillar Tractor

Products of the Caterpillar Tractor Company, recently organized in California, in the future will be distributed in Colorado and Wyoming by the Clinton-Held Company, Denver, says an official statement from the company. The Caterpillar Company will manufacture all the products formerly made by the Holt Tractor Company and the C. L. Best Tractor Company. They will market five sizes of tractors—namely, a 2-ton, "thirty," 5-ton, the "sixty" and 10-ton. All will be put out under the trade name of "Caterpillar."

The new Caterpillar Company was organized under the laws of the State of California, with an authorized capital stock of \$12,500,000. The general offices of the concern are located in San Leandro, Cal. Eastern offices will be located in Peoria, Ill.

The trade names of "Best" and "Holt" have been eliminated. In the future all products of the two concerns in the merger will be known as "Caterpillars." The sales of Best tractors in this territory were formerly made by the Wilson Machinery Company, of which Harry Powell Wilson is the head. The Clinton-Held Company, until the merger, were distributors of the Holt products.

It was announced that the various size tractors of the two old concerns will continue to be manufactured by the new concern. Sales and service will be handled by the one local concern.

Officers of the Caterpillar Tractor Company are: C. L. Best, chairman of the board; R. C. Force, president; Murray M. Baker, vice president; P. E. Holt, vice president; B. C. Heacock, vice president and secretary; O. L. Starr, general factory manager.

The combined sales of the two constituent companies for the year 1924 were approximately \$17,500,000. "Caterpillar" and "Track Layer" tractors have become standard equipment in many important industrial activities, particularly in the field of road building and maintenance, contracting, grading, logging, snow removal and agriculture.

Austin-Western Distributes New Catalogue on Full Line

The Austin-Western Road Machinery Company, 400 North Dearborn street, Chicago, Ill., have recently issued their new 1925 general catalogue, giving information and showing illustrations of the complete Austin-Western line of machinery.

In order to make it easy to find information on new machines, or striking improvements in old ones, an index to the new and improved machines is given on page 3 of the catalogue. Among the important changes in the Austin-Western line made during the last year are the

addition of Leaning Wheel Graders, Austin Motor Graders, Austin Portable Conveyors and Austin 4-cylinder Motor Rollers. Improvements were made on the Austin Super Crushers, Back Slopers, Patrol Graders and other equipment.

The new catalogue is now available for distribution and will be sent to anyone interested by writing to the Austin-Western Company or to the Western Equipment Company, Denver, who handle sales and service on the Austin-Western line in this territory.

Wilson Dam is Pictured in T. L. Smith Mixer Catalogue

The T. L. Smith Co. of Milwaukee has just issued its 1925 mixer and paver catalogue. The most outstanding of these views is one of the great Wilson dam, just completed at Muscle Shoals, Ala. This is the largest dam in the world and the second largest masonry structure ever built, being outdone only by the great pyramid of Cheops. It required 1,400,000 cubic yards of concrete, and the United States Government used eight of the world's largest mixers—Smith 56-S and 112-S—to do the job. It was accomplished in twenty-eight months. The General Motors building in Detroit—the world's largest office building—and the world's longest bridge, in Hennepin County, Minnesota, are also shown, as well as the beautifully arched 2-mile railroad bridge of the Florida East Coast line that runs down to Key West. These jobs were all done with Smith mixers. The views are in color and suitable for mounting.

Four new tilting mixers, recently added to the Smith line, are included in this catalog, among them the Smith "Mascot," the smallest tilting mixer in the world. Standing by the side of the great Smith 112-S tilter—the largest mixer in the world—this little mixer certainly looks the Mascot. Its easy portability and small size will make it invaluable to contractors who would hesitate to tie up a larger mixer on their small jobs, and for the small contractor who wants a high-

grade mixer at a low cost. The mixing and tilting action is identical with that of the larger machines, and the "Mascot" delivers 25 to 40 cubic yards per day. The three other tilting mixers which have been added to the line are the 3½-S, 5-S and 7-S sizes, all easily portable and delivering 3½, 5 and 7 cubic yards of concrete, respectively, per batch. The new catalog contains 64 pages and is beautifully illustrated throughout.

Notes

Tom B. Burnite has sold the Colorado Fuel and Iron Company an Orton & Steinbrenner 50-ton locomotive crane with a 90-foot boom, steam power, for use in the construction of the \$3,000,000 building program of the concern in Pueblo. The crane has a 50-ton capacity at a 20-foot radius. Mr. Burnite also sold the C. F. & I. a 65-horsepower Mead-Morrison double-drum electric hoist.

He reports that a Smith mixer is being used in the construction of the new Presbyterian Hospital, on which Alex Simpson, Jr., is the contractor.

A large sale of Ford dump bodies for use on street and road contracts is reported by the Winter-Weiss Company. Several large contractors have standardized on bodies sold by this concern for their dirt-moving outfits. The Winter-Weiss Company are sales distributors of the well-known Lee line of automatic and under-body hoist bodies.

Sales of two P. & H. shovels are reported by Paul Fitzgerald, Colorado and Wyoming sales representative. One of these was purchased by the American Beet Sugar Company for use on a new project located in California. The other shovel, equipped with gasoline engine, was shipped to Cole Brothers, who are the contractors on the big irrigation project being constructed by the Del Norte Irrigation Company, located near Creede, Colo.



Type of Fordson sweeper designed by F. J. Altwater, Highway Commissioner, being used by the City of Denver.

Steel Dump Bodies

Automatic
or
Under Body
Hoists



Lowest Cost Hauling!

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Call South 5580 for men with their own
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BIDS OPENED

Proj. No.	Length	Type	Location	Low Bidder	Bid Price
568	61 ft.	Timber trestle bridge & app.	7 mi. east of Denver	Levy Const. Co., Denver	\$ 2,692.50
569	438 ft.	Timber trestle bridge & app.	Bijou Cr. west of Byers	A. R. Mackey, Sterling	13,134.24
247-B	2,329 mi.	Paving	Rocky Ford-Swink	LaNier & Selander, Ft. Morgan	71,001.70

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
246-D	5.397 mi.	Gravel Surfacing	Avondale, east
262-E	3.527 mi.	Gravel Surfacing	Walsenburg, west
283-B	4.209 mi.	Concrete Paving.	Berthoud-Longmont
286-A	0.549 mi.	R. R. Grade Separation	Between Nunn and Dover

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R Div. 3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
258-C	6 mi.	Gravel Surfacing	West of Gunnison
262-F	3 mi.	Gravel Surfacing	West of La Veta Pass
271-B	1.5 mi.	Gravel Surf. & Concr. Pav.	Portland-Florence
271-D	100 ft.	Concrete Bridge	West of Pueblo
275-B	5.554 mi.	Pav. & R. R. Grade Crossing	Sedalia-Castle Rock
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
279-C	6 mi.	Grading	Shaffer's Crossing
287-A	18 mi.	Grading	Orchard-Wiggins
293-A	105 ft.	Steel Truss Bridge	Montrose over Uncompahgre River
294-A	2.5 mi.	Gravel Surfacing	Mancos, west
295-A	2.5 mi.	Gravel Surfacing	North of La Jara
296-A	110 ft.	Concrete Bridge	South of Pueblo
297-A	2 mi.	Grading	East of Fallsade

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	38	2-R Div. 2
116-C	North of Breed	3.163 mi.	Paving and Bridge	LaNier, Selander & White	139,038.45	100	116-C
169-R	Las Animas-Lamar	1.521 mi.	Concrete Pav.	Salle Const. Co.	34,561.00	4	169-R
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	87	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	18	213-A
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	38	226-D
230-A	Wohurst, south	0.852 mi.	Concrete Pavement	M. J. Kenney Const. Co.	82,710.00	100	230-A
240	Gypsum-Dotsero	5.185 mi.	Gravel Surfacing	O. L. Hackett	66,178.00	100	240
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	95	242-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	17	243-B
246-C	Vineland, east	1.951 mi.	Concrete Pav.	Strange-Maguire Pav. Co.	57,108.00	1	246-C
248-A	Buena Vista-Salida	12 mi.	Grading and Surf.	Western Const. Corp.	93,533.00	67	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	70	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	43	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Engr. Co.	72,408.00	70	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	75	258-A
261-A	Rife-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	15	261-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	32	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	43	262-C
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	18	265-A
266-B	Durango, south	3.181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	1	266-B
267-A	Model-Trinidad	2.954 mi.	Gravel Surfacing	Pople Bros. Const. Co.	25,583.00	69	267-A
270-B	Monte Vista-Alamosa	2.833 mi.	Gravel Surf.	San Luis Valley Const. Co.	15,471.00	15	270-B
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	71	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	33	272-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	72	272-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	35	277-A
278-A	Cheyenne Wells, west	8.4 mi.	Sand-Clay Surf.	Holly, Burshears & Dobbins	16,016.00	100	278-A
279-B	Morrison-Baileys	5.295 mi.	Grading	Harry H. Brown	85,980.00	34	279-B
281-A	Lafayette, South	1.249 mi.	Paving	Sims & Boston	55,373.00	100	281-A
281-B	South of Longmont	3.068 mi.	Paving	J. Finger & Son	102,502.40	69	281-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	1	288-A
288-B	Merino, west	2.519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	1	288-B

H. W. Moore Equipment Company have a caravan out on the Western Slope demonstrating in the various counties the work that can be accomplished by use of the new Galion motorized grader. This grader is equipped with a 7-foot blade. It was designed from suggestions furnished by H. W. Moore for the economical maintenance of mountain highways. The demonstrators will be out for another four weeks.

Ray Corson, formerly sales manager of the Western Equipment Company, has entered business under the firm name of Ray Corson Company. He has opened offices at 1732 Wazee street. He will handle the Barber-Greene, Heil, Metaform and C. H. & E. lines.

A new type of self-dumper has been placed on the market by the Wood Hydraulic Hoist Company, Detroit, according to Richard Carlson, manager of the

Liberty Trucks and Parts Company, Denver, local distributors of the Wood products. The new gravity dumper is suited for all short wheelbase truck chassis which are now on the market for the use of road contractors.

The City of Greeley is operating at a great saving in cost of a new sand filter reclaimer purchased from the Hendrie & Bolthoff Company, Denver. The plant is driven by a Fordson tractor. It has a capacity of 100 yards per day. It is estimated that the city will be able to save the cost of the plant in one season.

A number of sales of Adams graders to contractors in Colorado and Wyoming during the month are reported by Elton T. Fair Company.

A new crowding device has recently been added to the Byers Bear Cat shovel,

according to Harry P. Wilson, local sales distributor. It is said to be quite different from that usually found in gasoline shovels.

W. L. Robinson, of Mt. Vernon, Ohio, has been re-elected president of the Pikes Peak Ocean-to-Ocean highway. E. E. Jackson, of Colorado Springs, was re-elected secretary. It is announced that the Utah legislature has appropriated \$1,136,000 for the construction of a link in this highway between the Colorado line and Price, Utah.

L. D. Blauvelt, state highway engineer; June Johnson, Federal highway engineer; and James D. Bell, divisional engineer, with headquarters in Pueblo, made an inspection tour of the roads in District No. 4 the middle of last month. The roads in this district were reported as being in excellent condition.

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after FOURTEEN YEARS
PROVEN SERVICE still the most
economical—is it any wonder road men
prefer KEYSTONE culverts?*



You can't help admitting the buyer of Fourteen Years ago knew his checkers. You have to admit few people knew then just how long culverts would last. He bought Keystone because his judgment dictated, and because he was told they would last.

Today how his face would brighten, how satisfied he would be if he could get up and tell present-day buyers which culverts to buy. He would have the distinct advantage of being able to show you the culverts he purchased still in use and that's evidence. The kind that justifies your following his example.



**THE COLORADO CULVERT
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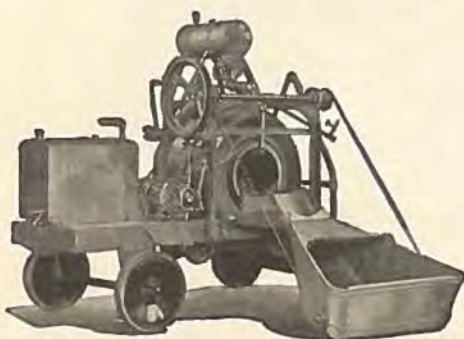
Dandie Light Mixer

7 cu. ft. mixed Concrete. Two or four cylinder gasoline engine. Power charging skip, or low charging hopper and platform. Rubber tired steel disc wheels or steel rimmed wheels.



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VALUE
—Such as Never Before
Seen in the Light Mixer Field!



STILL within the price range for light mixers, this 7 ft. Dandie Model offers extraordinary values!

A heavy duty, four cylinder, radiator cooled gasoline engine, completely enclosed in a steel housing.

Completely enclosed transmission always running in an oil bath, and mounted on shaft revolving in roller bearings. Steel disc wheels with rubber tires or regular steel rimmed wheels. Beveled edge, chilled drum rollers, pinned to shaft which turns in big bearings! Koehring double gear drum drive!

In every bearing—every detail—you'll find the reliable Koehring construction the surest insurance of reliability and long, trouble-free service life!

Light Weight—just the balanced light weight to be hauled on its rubber tires behind your car or truck and to lose no time between job and job.

This Dandie Model has been tested and tried by *overwork* and abuse—and it's more than worthy of the Koehring name.

For high speed operation—solid, substantial construction and light weight portability—this Dandie has established new values and standards in the light mixer class.

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Take our word for it, you will be putting yourself in the way of extra profits and extra value if you learn all about the details of this Dandie Model before you decide on a 7 ft. light mixer. No obligations. Send back the coupon today!

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Without obligation to me of any kind, send me free information about the Koehring Dandie Light Mixer.

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This Is the Road That Gets the Traffic—

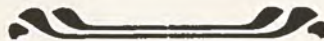
No matter how many roads there are leading in or out of your town, the ones best paved get the traffic.

This is especially true if these roads are of Concrete. For every motorist appreciates the many advantages of driving over its true, rigid, unyielding surface.

No wonder Concrete Highways are crowded for mile after mile. More than 17,000,000 motor vehicles are using them today. And new cars are being produced at the rate of 4,000,000 a year.

Here is a situation of vital concern to you. Everywhere we need more or wider Concrete Roads, or both, to take care of the ever-increasing traffic. And now is the time to plan for their construction.

Your highway officials want to be of the greatest possible service to you. Get behind them with ways and means that will provide more Concrete Roads and Streets. Such an investment will pay you big dividends year after year.



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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

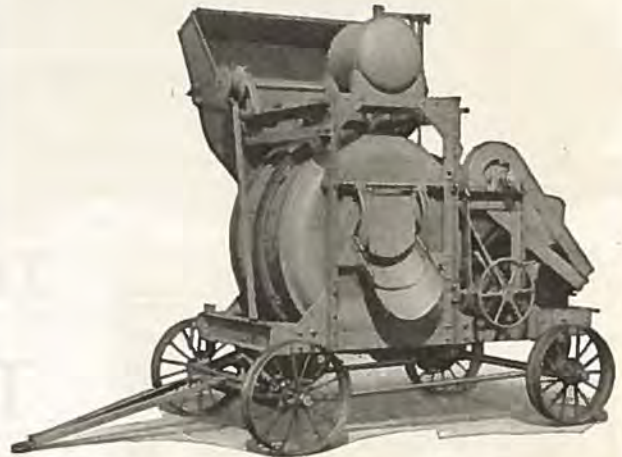
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OUR COVER PICTURE

On the cover of this month's issue of COLORADO HIGHWAYS we have a picture just a little different. Heretofore our subjects have been mostly roads, but in this instance we have a view of a ranch located near the foot of the far-famed Rabbit Ear Pass in Routt county. We hope our readers will like it. We might add that the picture does not do the subject full justice, but it's good to look upon anyway.

REX MIXERS



The New 14-S High Speed Two to Three Bag Mixer. Built up to the standard of speed and dependability established by the Rex Record Breaking Pavers.

Rex Mixers made in the following sizes: 3½-S Foot Tilter, 5-Foot, 7-Foot, 14-Foot, 21-Foot, 28-Foot. All ratings wet mix.

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The Austin Motor Grader WITH LEANING FRONT WHEELS

THE patrol system of road maintenance is generally admitted to be the best possible method of keeping earth, gravel and similar roads in good condition at all times. A road that is systematically maintained will always be a joy to those who travel over it, and will never get into such shape that it will need expensive grading.

Motorized patrol graders are becoming increasingly popular in all parts of the country, and of these motor-propelled machines the Austin Motor Grader is without doubt one of the most, if not the most, efficient.

The Natural Grader built in the Natural Way

The operator of the Austin Motor Grader has directly under his hand all Motor and Grader Controls, and stands at the rear of the machine where every practical reason for motor and grader operating demands that he should stand. [Contrast this with other types of Motor Graders on which the operator is stationed in front of the tractor, which is not only a hot place, and a dangerous one, but also an unnatural place because the Motor Controls have to be extended out to the front where they do not belong, and the operator stands directly above the blade where no practical grader operator would ever choose to stand, and where, in the forty years road graders have been made, no operator was ever before asked to stand.]

EQUIPMENT

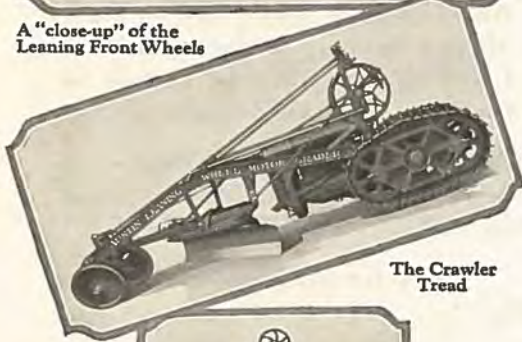
The exclusive leaning front wheels, illustrated at the left, are probably the most popular feature of the Austin Motor Grader, and are alone enough to account for its remarkable efficiency. The front ends of ordinary road graders are kept from slipping sideways by the teams or tractors used to pull them. The front end of a motor grader is not hitched to anything, and, therefore, has a tendency to slip sideways, which tendency can best be overcome by the use of leaning front wheels.

These leaning wheels in combination with the crawler tread, also illustrated at the left, enable the Austin Motor Grader to work on shoulders and in ditches where a straight-wheel motor grader with ordinary rear wheels would be useless. The crawler tread is also to be preferred for use in soft or sandy soils.

Two types of scarifier attachments are provided; the center type, which is fastened to the blade circle, and the rear type, illustrated at the left, which is intended for more difficult work.



A "close-up" of the Leaning Front Wheels



The Crawler Tread



The Rear Scarifier is sturdy and strong

Our Special Motor Grader Bulletin discusses the subjects of road maintenance in general, and motor grading in particular, in detail. The coupon makes it easy to ask for your copy.



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THE AUSTIN-WESTERN ROAD MACHINERY CO. CHICAGO



Current Highway Comment

COLORADO'S FEDERAL-AID HIGHWAYS

BEGINNING with the fiscal year 1917 and ending with the fiscal year of 1926, congress has appropriated for federal-aid road construction a total of \$615,000,000. Colorado's share of this amount, had the money been apportioned in the ratio of taxes paid, would have been \$3,345,600. As a matter of fact, Colorado received apportionments amounting to \$10,933,118. The state has received more than three times as much as if the division were made in proportion to federal taxes paid.

This information is contained in a letter written by J. W. Johnson, district engineer of the federal bureau of roads, to A. B. Collins, district engineer of the Colorado State Highway department, and published in the Greeley Tribune.

"The western states are undoubtedly at this time receiving assistance from older and richer states in the construction of the federal-aid system," writes Mr. Johnson. Now, whether such a division of federal funds is right, is a question to be debated. But as a matter of business common sense, it would be very foolish for Colorado to pass up this federal money for road building. We question the expediency of federal aid as a general principle, believing that it tends to build up a bureau-crat government at Washington and to destroy local self-government, the value of which Mr. Coolidge and Mr. Borah have recently very forcefully declared.

But we have the system of federal-aid in road building, nevertheless. This year Colorado received from the United States government \$1,361,482.06. Had the state not availed itself of this money on a 60-40 basis, the money would have gone to other states.

The recent session of the legislature, which over-

appropriated the expected revenue of two years by approximately a million dollars, however, failed to provide any means for Colorado to meet the federal-aid appropriations after 1926. In 1927, unless some provision is made for more revenues before the budget is made up at the end of 1926, the federal government will offer Colorado something like one and a half million dollars to be spent on highway construction and Colorado will calmly ignore the offer.—*Sterling Advocate*.

BUILDING HIGHWAYS

THE building of good roads and surfaced highways is one of the very best investments Colorado is making. Already the nation is beating a path to Colorado's summer playgrounds. In winter the sunny radiance of southern California may appeal, the balmy breeze of Florida may woo its thousands and every southern clime may offer man security from snow and chilling blast, but when the summer sun beats down and the heat becomes oppressive and innervating, it is then that the people east, south and west begin to long for the invigorating ozone, the bracing air, the cooling shades and limpid waters in the roof garden of the continent in Colorado's wonderful mountains. Good roads are making these places of rest and recreation accessible with ease and safety. It is only recently that the interior mountains and the remoter mountain parks have thus been open to the touring public. People are just learning that the real beauty spots and places of scenic grandeur are far back of the front range. The result is that travelers are pouring over our mountain passes in increasing numbers every year, and more and yet more of the world is passing our door.—*Mancos Times*.

Highways Aid Colorado Industry

By Clarence J. Morley
Governor of Colorado

GOOD roads, the best obtainable, when all contingencies of potential traffic, natural topography and finance are given due consideration, are one of our country's, and indeed of every state's, foremost duties to our citizens. Not only does the state owe to its citizens the best roads it can build, but it likewise owes these good roads to those of every other state.

Colorado is in a peculiar situation in regard to its highway system, one scarcely approached by any other state in the union. The continental divide traversing the state from north to south has naturally developed over the period of years covering Colorado's growth as one of the leading states, a condition of traffic concentration east of the front range of the Rockies, and it is here, north and south, through the cities east of the Divide, that the greatest traffic is expected to be found during many years to come on Colorado highways. West of the Divide great development is bound to occur, and proportioned to its growth, time will meet its needs in road building.

Colorado requires and must complete as soon as practicable, a great north and south highway, connecting with paved road the border cities of Cheyenne, Wyoming, and Raton, New Mexico. This, I am sure, will be the great artery of motor traffic in the state. We are well on our way toward realization of such a highway, with pavement already extending from Denver to Greeley, with half the road between Denver and Colorado Springs in concrete, a considerable strip completed north of Trinidad, and more under construction, and still lesser parts of the north and south highway finished or under way.

But this north and south artery will not suffice—we must build hard surfaced feeders into this road in aid of the business of smaller towns and of the farming and stockraising industries not on the

big highway. There should be one from Sterling, a connection between Greeley and Fort Collins; one from Pueblo, serving the world-famous Rocky Ford melon district—and as traffic develops, the need for more will doubtless be filled. The connection between the capitol city and the towns west and northwest are already completed or approaching completion; to Golden, to the great mountain recreational district west of Golden, and to the north.

As an integral part of this network, comprising the north and south highway and its feeders, there should be well graded gravel surfaced roads, feeding into the main arteries from every point. We need broad, surfaced roads through the mountains and the long straight stretches through the plains country that, with the population and traffic not justifying pavement, should be made as direct as possible—well graded, and with the best graveled surfaces.

Hard-surfaced roads constructed of cement or asphalt are justified only when traffic will show that the maintenance costs on graveled roads, when capitalized, will warrant the construction of such permanent hard-surfaced roads. Colorado, while extensive in area, is a comparatively small state in population, and consequently we have a comparatively small appropriation for our highways. With this we are proceeding as best we may to do our part in the establishment of the great international system.

Federal aid is available for much of this work, but of course a great cost will be entailed to the state, a cost, however, that in the future will return to the state many-fold. Good roads are a wonderful investment, with a big return, perhaps the largest return of any investment a state can make. Nearly \$300,-

000,000 was given to the various states by the government in its plan of Federal aid for highway construction up to April, 1924.

I feel that it is Colorado's duty to utilize the Federal aid offered by the government for the construction of roads that carry interstate traffic. People should realize what Federal aid means to every state, accepting its benefits. This money comes from Federal taxes. A recent compilation tells us that nearly \$600,000,000 has been collected in taxes on motor vehicles by the government since 1917. The smaller and wealthier eastern states such as New Jersey, Delaware, Massachusetts, and New York, though New York is not so small as some others, each pay a larger amount to the support of Federal aid than do Colorado, Nebraska, Arkansas, or many others of the central and western states, and our state of Colorado receives more contribution from the Federal aid than most of these eastern states. The money is divided according to population and mileage, and when Colorado's mileage of interstate roads is considered, it gives to us a full share of Federal aid money.

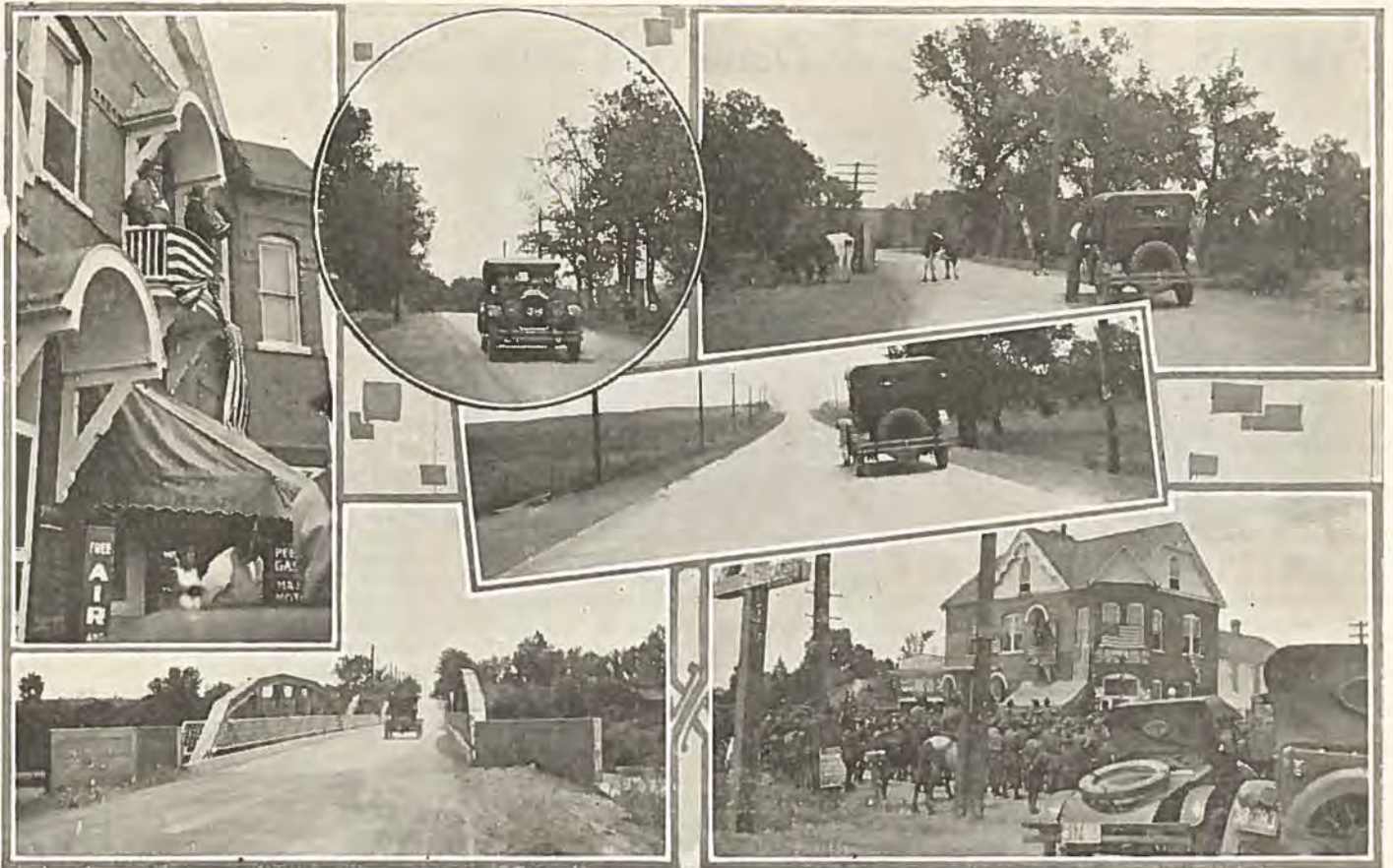
And thus, while Colorado benefits greatly from the use of Federal aid money, it is the duty of the state to use it. It is our duty to Wyoming, Nebraska, Kansas, New Mexico, Utah, and every other state whence come visitors over the highways. It is our duty to the people of the East who motor across country to see to it that the Federal aid money and state funds are wisely spent in permanently improving these interstate roads.

This program means that Colorado must advance as much for the construction of Federal aid roads as does the government for use in Colorado, and we must later take upon ourselves the maintenance of these roads under the Federal aid agreement. Therefore, a great finan-

(Continued on page 18)



BEFORE AND AFTER IN BYERS CANON—View on left shows ground before excavation work was started, and on right is view of the completed road. When finished the new road will eliminate the worst stretch of highway between Denver and Steamboat Springs.



NEW FORT LOGAN CONCRETE ROAD OPEN—Views showing crowd that attended dedicatory exercises and glimpses of the highway. Upper left shows Gov. Clarence J. Morley delivering principal address.

Governor Dedicates Ft. Logan Road

CULMINATING efforts of many prominent highway officials who for years have been urging completion of the project, the Petersburg-Fort Logan concrete highway was formally opened late in July with ceremonies at Petersburg. Governor Clarence J. Morley delivered the principal address at the ceremonies, which were attended by virtually all the citizens of Petersburg, several hundred from Denver, and a delegation of officers and soldiers from the United States army post at Fort Logan.

Governor Morley was introduced by E. E. Sommers, president of the Sommers Oil company, and a former member of the state highway advisory board. The governor delivered his address from a balcony of one of Petersburg's principal buildings, and paid high praise to those who waged a three-year fight for the paving of the highway. He particularly referred to the efforts made by Mr. Sommers, who was one of the leaders in the battle that early this year resulted in letting a contract for the project. The governor also paid high tribute to the late Lieut. Col. W. S. Mapes, for a number of years commanding officer at Fort Logan. One of Colonel Mapes' pet projects for the fort was the completion of such a highway as was opened and dedicated by the ceremonies on July 17, and just a day before the formal opening of the road he was killed

in an automobile accident in Denver. Governor Morley declared that Colonel Mapes had given invaluable aid in making preliminary arrangements for the road and in helping win the fight that won for the pavement.

"Long ago the state gave assurance to the Federal government that this road would be paved, and this was done at a time when abandonment of the fort by the war department was threatened," Governor Morley said in his dedicatory address. "Credit for construction of the highway should go to those who waged the successful fight to keep the government from abandoning Fort Logan. The state had given its assurances of paving the road, and that contract was sacred. The war department continued to do its part, and the honor of Colorado and this community was at stake. The road had to be finished according to the promise. This is now done and those who made the promise for the state are vindicated."

Lieut. Col. James A. Higgins, commanding officer at Fort Logan, headed the delegation of officers and men from the army post who attended the ceremonies of dedication. The first battalion of the Thirty-Eighth Infantry and the band of the Twelfth Artillery took part in the program, and during the address by Governor Morley and the brief introductory talk by Mr. Sommers they stood at attention behind Colonel Higgins.

Following the program at Petersburg, the Governor and his party in an automobile, followed by the troops in march, went over the new highway to Fort Logan to complete the formal opening.

Approval of the paving of the Petersburg-Fort Logan highway was one of the first acts of Governor Morley's administration, and its early completion by the state highway department was urged by him in his inaugural address.

"MODERN TRAIL BLAZERS"

Modern highways, in the last analysis, are the "trail-blazers" of civilization. Along them rise the cities, the farms, the churches and "the little red schoolhouse." Over them in these days the automobiles of the farmer, the business man and the professional man travel. The tremendous impetus given to road building by the demands of modern transportation has not only been felt in every state in the Union, but the Federal government, aside from its millions of money in Federal aid to the various states, has gone on record again and again in its encouragement of and support to this most vital need. Population follows the improved highway. Increased valuation of real estate and a rapid multiplication of personal property values along paved highways is as inevitable as day and night.

Autos Brought Road Crisis, Says Coolidge

RECENTLY, in addressing several hundred gentlemen connected with the automobile industry, President Coolidge said, in part:

I shall not deliver a speech to you, and therefore have not equipped myself with the statistics of traffic accidents, which are thoroughly familiar to you. Neither do I intend to repeat the familiar formulas of advice to both drivers and pedestrians, to exercise care at all times. I do wish, however, to say a word on a different aspect of the traffic problem.

The coming of millions of motor cars brought a highway crisis. It took one form in the cities, and another form in the country. The motor-car invasion found the open country with plenty of room for the new vehicles, but without fit roads. On the other hand, it found that the cities and towns had been laid out and built at a time when it was impossible to anticipate the traffic congestion that the motor cars precipitated. The open country has dealt with its part of this problem by providing good roads on an amazing scale, and at a tremendous cost. The cities were not able to adjust themselves so quickly, and so they confronted a situation which plainly implied the necessity for completely overhauling and reshaping their highway and traffic systems.

It is perfectly plain that if, when our cities and towns were first laid out, the motor-car revolution could have been anticipated, both ground plans and struc-

tures would have been arranged on widely different lines. The relations between business, and residence, and industrial districts would have been vastly different. Convenient and adequate parking spaces would have been provided, quite as a matter of course. One cannot help wondering how a model city, adapted to the conditions they all now confront, would have been organized if from its beginnings these conditions could have been foreseen.

But that speculation has little more than an academic value to us. Our city and town authorities are called to deal with the practical question of adjusting themselves to conditions that could not have possibly been anticipated. Billions of dollars in property value, not to mention the whole mode of living for many millions of people, are involved.

It seems fairly certain that if, a half century ago, men could have foreseen this transportation revolution, they would have agreed that it meant an end to the congestion of population in the limited areas of cities. It would have been assumed that when once the business man and the working man found themselves able to live many miles away from their employment, there would immediately begin a sweeping redistribution of population, spreading it over wider areas and organizing it in quite different communities. Yet experience has been quite the contrary. Instead of using the new transit facilities to end overcrowding, people

have seemed determined to crowd themselves more than ever. The apartment house, the skyscraping commercial building, and the elevator have tended to increase congestion. Electric railways, subways, and motor cars have tended to diffusion of the people. It must be said that thus far the victories have been all on the side of the skyscrapers, the elevators, and an ever-increasing congestion of population.

Some recent studies by engineers and sociologists have led to doubts whether the superior efficiency of the very great cities as business, industrial and cultural centers, can be taken altogether for granted. They have advantages, but they also have disadvantages; and the disadvantages seem to be multiplying faster.

I do not presume to judge between those investigators who conclude that the cities must inevitably go on with their rapid rate of growth, and those others who tell us that transportation and industrial program must be made to counteract this tendency, and bring diffusion of the population masses. But it must be apparent that whichever view is correct, many and difficult and costly readjustments must be made. There is need for concerted, fundamental and courageous consideration of all the questions involved. They reach a hundred times deeper than the mere superficial problem of getting streams of motor cars moved through city streets. They have to do with the elementals of social organization. They



VIEW OF DURANGO-SILVERTON-OURAY "MILLION DOLLAR HIGHWAY"—Tourists from all over the world are finding this road a source of wonder and keen delight. It taps one of the greatest scenic areas on the North American continent.

concern vital phases of community welfare and progress. The physical configuration of our cities, the direction of the mighty currents of the nation's commerce, the continent-wide distribution of population and industry—these are all included among the problems with which you gentlemen are dealing. I cannot too earnestly urge you to take the broadest and most inclusive view of them. You will be in no danger of over-emphasizing them. You will help most if you will visualize them to yourselves, and help the rest of us to visualize them, in their actual character and full proportions.

Good Roads Great Stimulant to Industry, Says Rotarian

Following immediately in the wake of good roads and paved streets has come the invention of nearly all our labor²-and time-saving machines and implements, whether on the farm, ranch, in the factory or home. Good roads and improved streets have been the greatest stimulant to industry.

Antedating even Julius Caesar, some of the world's greatest patriots have concerned themselves with the building of good roads and permanent highways, both rural and urban. They have been our chief civilizing influences.

The country or state having the best highways and streets will be found to excel in wealth, civic pride, patriotism, education and general welfare. Prejudice, intolerance, ignorance and moss-backism cannot thrive in a country dedicated to building beautiful roads and streets. The most illiterate sections of America prove this statement to be true.

Any tax-paying citizen or voter should consider it a patriotic duty and a contribution to his fellow-man to vote for bond issues designed to promote and foster better roads and more beautiful streets. Such expenditures were never known to work hardships on any people or class of citizens.

As an example of the philosophy of "The greatest good to the greatest number," no better can be found than the principle of extending our highways and improving our streets.

Good roads to the country are what good streets are to the city.

No other economic factor can add as much to land values—a fact land owners and farmers have been too slow to realize. Good roads have built most of our schoolhouses, established social levels and brought about a community of interests unknown before the day of road improvement and modern vehicular transportation.—The Rotarian.

Nearly Half Million Miles of Excellent Roads in U. S.

Although the exact state of road improvement in the United States is not known, it is estimated by the department of agriculture that the total mileage of surfaced roads at the end of 1924 was between 450,000 and 475,000 miles. Indica-



COLORADO'S FIRST STRIP OF ASPHALT HIGHWAY—This piece of asphalt pavement is located in front of the Fitzsimons Hospital east of the town of Aurora in Adams county.

tions are that approximately 40,000 miles of surfaced roads of various types have been built during each year since 1921. A considerable part of the work, moreover, has consisted of resurfacing. It therefore cannot be assumed that the net mileage of surfaced roads has been increased during the last three years by the total amount of new construction.

The last complete survey of the road improvement situation was made in 1921, when the total surfaced mileage was reckoned at 387,760 miles. New construction and resurfacing since 1921 have proceeded at a rate which is believed to justify the estimate that the net gain since then is well above 60,000 miles.

In announcing these facts, the department draws attention to certain wrong ideas that are current about road improvements. Improved roads, it says, are not luxuries. For the movement of every vehicle over a road there is a certain cost, which is less if the road be improved than if it be left in a state of nature. Logically, therefore, the only limit that should be placed on expenditure for road improvement is the amount that can be saved in vehicular operating costs. This amount, of course, depends upon the number of vehicles using the road. It is pointed out that the country loses more, in increased cost of operating vehicles, by not improving roads than it costs to improve them.

Another common error, says the department, is that all roads should be hardsurfaced. Hard surfacing with concrete, brick, asphalt, stone or wood blocks is an expensive process. When its cost is greater than the saving accruing from the improvement, hard-surfacing is not advisable. It is possible to make great improvements in roads without hard surfacing them and these improvements are quite effective in reducing the cost of travel.

When vehicles using a road are comparatively few, an unsurfaced but graded and drained road can be made and maintained in satisfactory condition by dragging at very low cost.—New Orleans Item-Tribune.

HIGHWAY EQUIPMENT

FOR COUNTIES

It has been only a very few years since a split log drag was considered the only equipment, other than wheelbarrow, pick and shovel, that was needed for maintaining country roads in all but three or four of the eastern states. The tabulated data on road maintenance in this issue shows how far the counties have progressed beyond that standard. One Alabama county reports that its maintenance gangs are equipped with plow, wheelers, graders, tractor, scarifier, finisher and drags, as well as shovels and other small tools. The three maintenance gangs in an Iowa county use a crushing and screening plant, four trucks, two blade graders, six wheel scrapers and two plows; while the patrolmen are supplied with patrol grader, drag, sllp, scythe, mower, shovel, etc. About ninety per cent of all the patrolmen and gangs have graders, while more than half the gangs have tractors or trucks or both. A reference to the table will show the use by a number of counties of scarifiers, rollers, gravel crushers, screens and loaders, concrete mixers, tar kettles, heaters and other appliances.

For each section of the country, according to its climate, topography, soil, available surfacing materials and traffic, there are appliances particularly suitable to its needs, and maintenance officials, in order to select these wisely, should familiarize themselves with what the various manufacturers have to offer.

INTERSTATE TRAFFIC

The Supreme Court of the United States has decided that:

"No state, either by statutes or by regulation through a public service commission, can interfere with interstate traffic on the highways, and in no way can the state invade the Federal control over interstate commerce."

Elton T. Fair, Adams grader distributor, spent two weeks traveling the Wyoming territory last month.

Road Across Salt Desert Completed

THE successful conclusion of the cooperative efforts of three states and the Federal government was the subject of felicitous ceremony at Salduro, Saturday, June 13, when the new Wendover highway was officially opened to traffic. Initiating the construction of some noteworthy project by official hands heaving a shovelful of earth is a common enough procedure. The unique distinction accorded the completion of this direct route to the coast was the clearing of the final salt barrier from beneath the Victory arch by shovelers George H. Dern, governor of Utah; J. G. Scrugham, governor of Nevada; and W. M. Jardine, secretary of the United States department of agriculture. Brief addresses were made by these officials before they cleared the way for traffic between Utah and Nevada. Other speakers on the program were Thomas H. McDonald, chief of the federal bureau of public roads; Charles R. Mabey, former governor of Utah; Senator Tasker L. Oddie, of Nevada; Harvey M. Toy, chairman of the California highway department; and Preston G. Peterson, chairman of the Utah state road commission. Some 400 other celebrants invaded the desert, the majority by special train over the Western Pacific, although a number of motorists took advantage of the occasion to drive the 123 miles from Salt Lake and enjoy the novelty of crossing the mud flats of the Great Salt Lake desert on a modern gravel surfaced highway. The fastest running time by auto was made by Al Jenkins, professional driver, who covered the distance in two hours and forty minutes, and beat the special train by eight minutes.

From Salduro it is ten miles to Wendover on the Utah-Nevada line and the western edge of the desert. From Wendover the recently completed highway extends 41.9 miles east paralleling the 40-mile tangent of the Western Pacific and crossing in that distance what is probably the most inhospitable waste that the vicissitudes of Mother Earth have produced. The subsidence of the ancient Lake Bonneville, of which Great Salt Lake is the shrunken remnant left, in western Utah an alluvial deposit hundreds of feet in depth which receives the drainage of the surrounding area. These mud flats are never dry to more than four or five inches from the surface. During the dry season this treacherous footing is covered to the horizon with a yellowish-white incrustation. There being no outlet, the flat is highly saline in character. Near the western side are the salt beds, six miles wide, running from a depth of a few inches at the edges to four feet thick at Salduro, which is located near the center of the salt field. The salt extends for thirty miles north and south. From October to May the mud flats and the salt are covered with water varying in depth from one to eighteen inches. Due to its salt content it does not freeze, and is blown about constantly by the high winds prevailing in the region.

To bridge this gap in the New York-San Francisco highway with an enduring and safe automobile road was entirely too great an undertaking for Utah, with her resources already strained in the building

of roads more immediately essential for local needs. The story of the building of the road will be briefly told, but the thing of paramount importance is that it is now completed and open to traffic. As such it stands and will always remain, a monument to the soundness and the justice of the policy of granting Federal funds to aid the states in the construction of roads. The project has cost \$390,000, of which the government's share is \$284,000. Citizens of California, through the Utah-Nevada-California Highway Association, contributed \$50,000, Nevada agreeing that funds available from this source for the construction of the primary road across the two states be used first in Utah for the building of the Wendover cut-off. The Utah legislature appropriated \$25,000, the balance of the total cost, some \$21,000, being made up from state funds remaining from projects completed under the old bond issues.

Other Sources of Assistance

Notwithstanding the efforts of state and bureau officials and the tri-state highway organization, the road would still be unfinished but for the friendly services tendered by the Western Pacific in the reduced rates for gravel from its Dyke pit in Nevada, fourteen miles west of Wendover. In addition the presence of the railroad was of incalculable importance in the conveying of men and supplies along the forty miles of construction. Great praise is due the contractors who built the road, who matched their financial resources, energy and ability against unfavorable conditions and won out. As frequently happens in contracts on public works, the contractors' profits are not commensurate with the labor and risk involved. That it took "a long pull, and strong pull and a pull altogether" in getting this contract under way may be evidenced in the matter of surety bond ordinarily required on state road construction. Due to the hazardous nature of the Wendover job and the unusual features

connected with its construction the bonding costs were excessive. At a conference of state and bureau officials it was decided to eliminate the surety bond on this contract and substitute a retent of 20% of the value of the periodic estimates instead of the usual 10%.

Construction Features

For twelve years successive state administrations have made attempts to bridge the Wendover flats, and some grading and gravel surfacing has been extended into the flat both from the east and west limits. It had been demonstrated that a drag-line and bucket could handle the mud. No attempt had ever been made, however, to build on the salt beds, but that problem has now been solved by the engineers and successfully accomplished by the contractors. The Western Pacific hauled its embankment material to the salt field, a method far too expensive for highway construction. The plan adopted, suggested by the dyking operations of the salt and potash works at Salduro, was to cut through the salt and build the embankment from the underlying clay. A contract for the construction of the subgrade across the six miles of salt section was awarded in September, 1923, to N. E. Lamus, superintendent of equipment at Salduro. "Salt is salt," of course, but it is also a safe foundation for a highway if properly protected from the melting action of fresh water. The location of the road, north of the railroad tracks, afforded sufficient protection from the waves and the scouring action of fresh water from a southerly direction. Protection was necessary on the north where the waves could lash the embankment from an unobstructed sweep of many miles.

The first operation was to cut a trench through the salt under the north slope of the proposed section. The salt was deposited on the north of the trench and the clay, which was excavated by the trencher to a depth of 12 feet, carried by a con-



VIEW OF GRAVEL ROAD NEAR GYPSUM—This is a gravel surfacing project just completed by the State Highway Department under a Federal Aid agreement.

veyor attachment along the line of the embankment. In the completed road this trench "keys" the embankment to the clay underlying the salt, being back-filled, first with salt and then with clay from parallel trenches, the material in the embankment connecting with the clay underneath and effectively preventing the ingress of fresh water. Over several miles both on the salt and the mud flats a 6 to 1 slope, heavily graveled, was constructed on the north to counteract the effect of wave action, on the south a 3 to 1 slope was found sufficient.

Due to the fineness and slow-drying qualities of the mud, the wind was found to be a much better drying agent than the sun, and road graders attached to tractors were moved back and forth for the purpose of aerating the mass. Account was kept of the mileage traveled on one two-mile section, and it was found that in working down and drying this stretch a small tractor traveled 210 miles and a larger one 156 miles.

Gravel for the project was placed in windrows along the tracks and conveyed either by trucks or by horses and wheel scrapers to the roadway. Culverts, to permit the passage of the wind-driven waters under the roadway, were constructed entirely of wood, as the salt and other chemicals quickly attack any form of metal. Treated timber fastened with hardwood pins was used throughout the project.

History of the Route

Many of the earliest explorers and pathfinders followed the Wendover route, finding it the shortest and also the one with the easiest grades from the Salt Lake Valley to the Pacific Coast. Among those who followed this route were John C. Fremont, Kit Carson and Jim Bridger. During the California gold rush of '49 the treacherous nature of the mud flats caused the abandonment of the route for the less direct and more tortuous trails to the north around the lake or to the south around the southern extremity of the desert. The earliest official explorations of the region state that tons of equipment, including tools, clothing, food and supplies of all kinds, lay dumped upon the flat where teamsters had been forced to lighten loads, while here and there sunken wagons and the bleached bones of oxen showed where the owners had abandoned everything in a flight for their lives from this scene of desolation.

The building of the Western Pacific in 1909 led to the consideration of the route for a modern highway and about the time that through routes for automobile traffic became a pressing problem. Tetzloff, a famous automobile racer, drove through Utah and in investigating routes west from Salt Lake City drove at the rate of 105 miles an hour on the salt beds without treating a tire, and declared that except for the rather too ardent desert sun, he had found the most ideal race course that lay out of doors. Further investigation of the route followed and a few sentences from the biennial report of the Utah State Road Commission for the period of 1913-14 give the chief reasons that have later led two Democratic and two Republican state administrations, the Bureau of Public Roads and the United States Army to approve the Wendover Cutoff. "During the biennium the



CONCRETE ROAD NEAR GRAND JUNCTION—Several hundred cars daily use this modern pavement at a big saving in operation costs.

Commission has given consideration to the question of an interstate road extending in a westerly direction from Salt Lake City through Tooele County in Nevada. A number of routes for this road have been investigated, but the one most favored roughly parallels the Western Pacific Railroad from Timpie to Wendover.

"In addition to this being the shortest course from Salt Lake City to the Nevada line, or even to Irapah, of those given serious consideration, the fact that it is close to a railroad argues for its low cost of construction, and for the safety of the traffic which it will accommodate after it is constructed. On the other proposed routes, grades of considerable consequence are encountered, but on the Wendover route the grade is practically level, and the alignment straight for the greater part of the distance."

The practicability of the route is thus emphasized for the reason that an unfortunate controversy has existed between the State of Utah on one hand and a trail organization on the other as to the choice of routes, a dispute that has had nation-wide publicity and which was carried before Secretary of Agriculture Wallace for final adjudication as to the location of the primary Federal route. In addition to its other unusual features, the Wendover road, out of the 170,000 miles of highway in the Federal system, is the only one on which the Secretary of Agriculture held a hearing before making his decision.

Following the investigation of routes by the Utah Commission in 1913-14, the Wendover route was made a state road in 1915, and considerable pioneer construction was undertaken in 1915 and 1916, financed largely by private contributions.

The Psychology of Construction

About every other phase of the business world having been discussed by the Press, we would like now to take a shot at what

it is pleased to call "The Psychology of Construction."

And by no means is it the least of the benefits that accrue to a city, town or state from such activities.

The activities of construction are worthy of all that can be said of them. The sight of large numbers of men and the various types of machinery at work on any type of construction—be it street work, highway work, or the construction of buildings and the betterment of railroads—all goes to make the combination that gives the country where such operations are going on an atmosphere of business that must naturally get to be contagious.

When a community or state has little or no construction work going on—that is the time to get BUSY and START SOMETHING. That isn't all egotism on the part of the contractors either. It's good sound sense, and good sensible psychology too.

We, as individuals, as communities, as states, get to be no bigger than our mental calibre. We simply can't do anything larger than we think. Then it MUST be obvious that the necessary thing to do is to keep people THINKING BIG. Thinking progressively, planning goals yet to be reached—anything else means stagnation; and that's one of the things that construction will accomplish. The hurry and bustle of construction is simply bound to get into one's system. It stirs dormant ambition. It makes one feel that the community in which he lives is again on the map; and that new possibilities are coming within his grasp.

That's the Psychology of Construction, which is the second largest business in the country—and it's important and far-reaching. It involves not only the making of a town, building or what not, but it involves the making of a nation. When construction halts, within a very short period of time all other businesses are bound to be affected. So it is written somewhere—"Go thou and do likewise."—W. R. Richards, Exec. Secy., Rocky Mountain Branch, Associated General Contractors of America.

Elevating Graders On Highway Work

AS a part of the study being made by the Bureau of Public Roads on the various details of road construction, J. L. Harrison, highway engineer of the bureau, publishes in the bureau's monthly organ, "Public Roads," the result of his study of the use of elevating graders and wagons on more than twenty separate outfits during the 1924 working season.

The graders used were drawn, some by sixteen horses, others by twenty horses, and others by caterpillar tractors. The wagons were apparently all horse-drawn. No mention is made of trains of wagons drawn by tractors, although this has been practiced to a certain extent in the east. The detailed discussion by Mr. Harrison occupies about ten pages and it is possible to give here only a summary of his observations and conclusions.

The elevating grader is a digging and loading mechanism and the wagon a hauling mechanism. Mr. Harrison believes that the wagons should be considered as supplements to the loading mechanism, a sufficient number being employed to keep the grader busy; rather than that the grader should be considered as a device for loading wagons, the latter being the principal feature of the outfit.

Concerning the economy of the grader, he states that an ordinary slip scraper can move about one-fifth of a cubic yard per load, a Fresno about one-third of a cubic yard, and a No. 2 Wheeler about two-fifths of a cubic yard. Two horses and a man are required for either slip or Wheeler, and three horses and a man with a Fresno. As compared with this, a standard 1½-yard bottom dump wagon with one man and two horses will carry from 1.2 to 1.4 cubic yards, and a 2-yard wagon with three horses will carry two cubic yards. The function of the grader is to fill these wagons as quickly as possible so as to keep them in continuous operation with as little time as possible spent in anything other than hauling.

The peculiar field of the elevating grader is handling clay and loam in level or rather heavily rolling country. It is not well adapted to work where slopes are steep and changes in slope abrupt, and it cannot be used to advantage for widening old roads in deep cuts. Neither are those available well adapted to handling sand or working over wet ground. It does not operate satisfactorily where rocks and boulders abound, nor on cut-over lands unless all the larger roots have been removed.

In laying out a procedure for using a grader and wagon combination, the engineer's problem is divided into three parts: 1. The production that this grader can secure; 2. The distance the earth must be hauled; 3. The wagon supply which must be provided in order to move this production over this distance.

Grader Production

The elevating grader is always worked in a loop, usually making a cut down one side of the area, turning at the end and cutting up the other side and then turning back again. No material is ever taken out on the turns, and occasionally the lay

of the work permits cutting on only one side of the loop.

While excavating, the grader moves forward, digging out material and depositing it in a wagon which moves alongside; then stops while the loaded wagon moves forward and an empty wagon takes its place. The rate at which the grader moves forward while cutting is regulated by that of the wagon which it fills, and the rate at which the material is removed depends upon the cross-section of the cut thrown on to the elevator by the plow or disk. Under favorable conditions this may equal 1 square foot, but with unskillful handling or unfavorable conditions may fall to less than half of this.

Where horse-drawn wagons are used, the maximum rate practicable appears to be about 4 feet per second. The discharge from the belt is first placed on the forward end of the box and moved toward the tailboard as the box is filled. This requires that the excavator move at a slightly lower speed than the wagon, and this theoretically is about one quarter of a foot per second, making the speed of the grader about 3¾ feet per second. If the grader could continue excavating at this rate without stop and always cutting a 1 square foot cross-section, the output of the machine would be about 500 cubic yards an hour, which may be considered the maximum theoretical capacity. Seventy cubic yards is frequently the average, and few attain a daily average of 100 cubic yards. The difference between the 100 and 500 is caused by losses of one sort or another, and the aim of the contractor should be to reduce these losses to a minimum.

The losses must fall under one of three headings: 1. Failure to maintain the full cross-section while cutting; 2. Failure to maintain full speed while moving; 3. Time losses during the working period.

Full cross-section of bite cannot be maintained in highway excavation. There are a number of reasons for this. If the soil is heavy and comes off the disk in strips or ribbons, a high rate of cutting

may be possible; but if it tends to clog the belt, or if the bull wheel which drives the belt slips—a very common condition—the cross-section must be reduced to that which the belt can elevate. Moreover, in many soils, particularly moist clay, the belt fouls badly and as a result tends to slip whenever the load is heavy.

A second cause of reduced cross-section is that the ground is seldom level, while the floor of the cut must end in a level cross-section. This is ordinarily secured by digging a full bite on the high side only and removing a less amount on each trip on the lower side. This might be obviated by taking a wider bite on the lower side than on the upper, but elevating graders are not ordinarily so designed that the width of bite can be changed readily. However, if, instead of following the usual custom, the plow be set for a bite wider than normal, the tractor can be driven a little further from the bank on the high side, thus reducing the width of the bite on this side, and a wide bite may be taken on the low side by driving closer to the bank. This can be done with tractors, but is very difficult to accomplish with horses.

There is still the fact that the layers will taper longitudinally, generally running out to nothing at each end. This cannot be avoided, but the most skillful operators endeavor to make the bite as uniform and large as possible.

Mr. Harrison states that elevating graders were originally designed for horses, and full advantage of caterpillar traction will not be secured until they are redesigned in some particulars. The weak points are the absolute dependence of the elevating mechanism on the bull wheel, and the tendency of the belt to foul and consequently to slip. The output, therefore, is dependent upon the traction which the bull wheel has on the particular soil over which it is working. The full advantage of the tractor as a prime mover will not be available until the design of the grader is so modified that the power of the tractor can be effec-



MODERN MAINTENANCE OUTFIT—This type of outfit has been adopted by one of the counties in eastern Colorado as standard equipment.

tively utilized in forcing the grader to pick up and elevate a full load without regard to soil conditions.

The studies made by the bureau's engineers show that under average working conditions a 1½ cubic yard bottom-dump wagon is loaded in about 75 feet, indicating that the amount delivered by the excavator is a little less than 0.5 cubic foot per foot of run. This one feature, therefore, reduces the 500 cubic yards per hour theoretical capacity to approximate 250 cubic yards. This loss cannot be regained by efficiency in any other part of the work.

Loading should begin as soon as the belt is clear of the driver, and the wagon should gain enough to bring the belt at the back of the wagon by the time the load is finished, so that the time lost in bringing the following wagon under the belt may be a minimum. The wagon box is ordinarily a little more than 6 feet long and, with the wagon traveling about 4 feet per second, the wagon must move 4 feet further than the grader during the loading period, giving the grader a rate of travel of about 3¾ feet per second. The contractor who operates his elevating grader at a lower speed than this owes a second loss in yardage to this fact. It was found on the jobs inspected that caterpillar tractors hauling graders ordinarily travel about 3 feet per second, thus showing a direct loss of 20% or more in the output.

Loss of Time

The third item of loss is due to loss of time, some of which is unavoidable. The time consumed in making a turn may be taken as about 45 seconds. If the cuts are short, this may amount to 60% of the total time, while if the cuts can be lengthened to a thousand feet, it may be reduced to 6 or 7%. Moreover, in some cases the length of excavation is longer on one side (the uphill side generally) than on the other, and consequently the grader has not only to turn in a half circle, but to travel a certain distance before cutting on the short side begins. With good superintendence it seems reasonable to consider the turning time, including the unproductive run, as 45 seconds, and this can frequently be bettered. The turning time for caterpillar tractors is about the same as for horses, although this is con-

Effect of Length of Cut on Output and on Relation Between Turning Time and Working Time. Average Management With 1½ Cubic Yard Wagons

(Loading distance, 75 feet; loading time, 23 seconds; exchange time, 18 seconds; time losses, 10 per cent.)

N. B.—A loading loop consists of a run down the cut, a turn, a run up the cut, and a second turn. In developing this table, a half loop—one run and one turn—has been used. By this device the "length of cut" may be compared directly with plans for construction work. The output in loads per hour and the percentage of working time and time used in turning are the same as they would be if the whole loop were used.

Number of loads	Length of cut		Wagon loading time		Wagon exchange time		Grader turning time		Time losses due to breakdowns, rests, etc., 10 per cent	Total time	Loads per hour	Percentage of total time used in turning grader	Percentages of time grader is at work
	Feet	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.	Sec.					
1	75	23	.	.	18	45	7	75	48	60.0	30.6		
2	150	46	18	45	11	120	60	37.5	38.3				
3	225	69	36	45	15	165	65	27.3	41.8				
4	300	92	54	45	19	210	69	21.4	43.8				
5	375	115	72	45	23	255	71	17.6	45.0				
6	450	138	90	45	27	300	72	15.0	46.0				
7	525	161	108	45	31	345	73	13.0	46.7				
8	600	184	126	45	36	391	74	11.5	47.1				
9	675	207	144	45	40	436	74	10.3	47.5				
10	750	230	162	45	44	481	75	9.3	47.8				
15	1,125	345	252	45	64	736	76	6.4	48.9				
20	1,500	460	342	45	85	932	77	4.8	49.4				

trary to the general impression. This is due to the fact that the radius of the turn is largely governed by the grader and ground conditions rather than by the flexibility of the prime mover. It is so easy to shift a tractor into high gear that it is surprising to find that no effort is made to do so in making the turns on the majority of jobs. Where the cut is long, a few seconds saved in turning is not so important, but where the cut is short and the turning time is 50 to 75% of the total time, a few seconds saved at each turn totals very high in a day's work.

In calculating the cost of a job using elevating graders, the contractor should pay especial attention to the lengths of cuts and the relative amount of side borrow. With an elevating grader this has entirely different bearing from the problem where Fresnos and wheelers are used.

Another loss of time comes in loading

the wagons. This depends chiefly upon the cross-section of bite and speed of grader, but also upon the excavated material that is lost along the edge of the belt and by spilling from the wagon. From such observations as have been made, it appears that this loss may amount to from 5 to 10% of the material taken out by the disk, particularly in light loam and sandy soils.

Another important factor in time losses is the period used in exchanging wagons. This averages about 18 seconds, but was found to vary in different jobs from 9 seconds to 52 seconds. This is the most conspicuous and perhaps most avoidable loss which the contractor encounters in elevating grader work. If the replacement wagon follows the loading wagon with the noses of the horses against the tailboard of the wagon ahead, the exchange would be theoretically possible in about 4 seconds, the distance from the tailboard of the forward wagon to the back of the replacement driver's seat being about 14 feet and the belt about 3 feet wide.

The most common cause of failure to exchange wagons in five or six seconds is inadequacy of the wagon supply. Many contractors seem to consider that the elevating grader is a piece of equipment for loading a train of wagons, rather than that the grader is the primary tool and the wagon supply should be selected to handle all the material that it can be made to produce.

On the jobs studied it was the rule rather than the exception to find replacement teams walking from 20 to 100 feet behind the wagons they are to replace. Ten seconds exchange time is lost if this distance is 40 feet. Another point is that the load should be finished with the belt over the rear end of the wagon. If it is finished with the belt just back of the driver, two additional seconds are required in making the exchange. Another important point is that the loaded wagon should not turn out at right angles, but should drive ahead at an angle so as not to interfere with the replacement wagon instantly taking the loading position; the loaded wagon then standing until the replacement wagon passes.

Reducing the average exchange period (Continued on page 24)

Effect of Various Losses on Elevating Grader Output

	Grader speed 3¾ feet per second			Grader speed 3 feet per second		
	Bite	Bite	Bite	Bite	Bite	Bite
	40 per cent	50 per cent	60 per cent*	40 per cent	50 per cent†	60 per cent
Theoretical maximum production of grader at plow, cubic yards per 10-hour day. Rate at which material is delivered by grader while it is loading wagons, cubic yards per 10-hour day.....	5,000	5,000	5,000	4,000	4,000	4,000
For 1½ cubic yard wagons:						
Portion of grader time spent in loading wagons (based on average length of cut of 450 feet)..... per cent	....	....	....	50	45	42
Portion of grader time that can, under good management, be spent in loading wagons (450-foot cut)..... per cent	62	60	58	800	900	1,010
Resulting average production per 10-hour day as now obtained... cubic yds.	....	....	....	....	....	....
Average production per 10-hour day reasonably possible with good management..... cubic yds.	1,240	1,500	1,740	....	....	....
For 2 cubic yard wagons:						
Portion of grader time spent in loading wagons (based on average length of cut of 450 feet)..... per cent	....	....	....	57	53	50
Portion of grader time that can, under good management, be spent in loading wagons (450-foot cut)..... per cent	64	63	62	910	1,060	1,200
Resulting average, production per 10-hour day..... cubic yds.	1,280	1,575	1,860	....	....	....

* Contractors should endeavor to work in this field.
† Contractors now customarily work in this general field.

With State Road Builders

U. S. Troops Blazed First Wagon Trail to Grand Mesa

What was the first wagon road to Grand Mesa was cut through by government troops in 1880. We learn this from the biography of William Ziler, who recently died at his home near Montrose, and the following was printed in the Montrose Daily Press:

After reciting the many places Zilmer had been, then follows:

"He then came over to the Uncompahgre with the government troops. Joined them as second wagon master and came over from Saguache, landed at Fort Crawford, April 14, 1880. Made two trips to Alamosa that summer for supplies. First load of supplies was brought here and forded the Uncompahgre River between the Jay and Lew Ross places to the camp the soldiers had there. Second load brought in from Alamosa was taken to Grand Mesa, where the cavalry had moved to get feed for horses and mules. Had to camp near Cedaredge for a week or more so the infantry could cut a trail out to the lakes to take up the wagons. Had a hard time getting the wagons up the trail, but finally did it, and some were turned over. There were two trains of wagons that made these trips, 24 wagons in each train.

"The camp was moved back to Fort Crawford on September 22, 1880, for the winter."—Hotchkiss Times.

Grand Mesa Highway Open To Heavy Summer Traffic

Colorado motorists will find many new points of interest to visit when the Grand Mesa highway, under construction this summer by the United States Forest service, is opened early in August. The two crews, one working from Alexander lakes and the other working on top of the mesa, will have met at the top of the south rim of Grand Mesa to finish the highway.

Almost as soon as the new road is opened, Indian Point, east of Whitewater, will be accessible to motorists, and near the points are Battlement lakes, a new haven for fishermen. Near Ward lake are several as fine camping sites and positions for summer homes as can be found in the state, and a new road around the north end of this lake was finished late in June by the crew building the Grand Mesa highway from Alexander lakes. As soon as the area has been surveyed, the forest service plans to open up building sites for lease.

If it is possible to do so this season, the Chamber of Commerce of Grand Junction plans to open up a road from the Grand Mesa highway to Earth's End, which would make accessible another great scenic point just to the west of the main highway on top of the mesa. About seven miles of easy construction would be entailed in opening up such a road, and

then cars could reach Earth's End, a point on the west rim of Grand Mesa, towering a mile above Grand Junction and Palisade.



Division Engineer H. L. Jenness and Field Engineer W. A. Whitney on an inspection tour.

Automobilists Delay Work By County on Canon Road

The exceptionally heavy traffic from Denver and all points on the eastern slope to Estes Park this summer has been felt especially on the South St. Vrain road from Lyons to Estes Park, and as a result the county commissioners of Boulder county have announced their decision to postpone the improvement work planned on this road until fall. The work will be started as soon as automobile traffic on the road has decreased to a point where workmen and their outfits can operate unhampered by the constant stream of automobiles, County Commissioner E. B. Hill announced two weeks ago.

Later on it is hoped that the United States Forestry service will finance the building of five miles of road into Allen's Park, in line with plans that have been under consideration by the forest service for some time, and which the service is understood to be looking on with favor, Mr. Hill declares.

Some disappointment has been felt in Longmont, Lyons and the other major towns affected by the South St. Vrain road over the decision of the commissioners to postpone starting the work, but this was due chiefly to the fact that property holders along the road had hoped the work would be done this spring, when, instead, the commissioners bent their efforts on completion of the Flagstaff road just west of Boulder. This road has now been completed and is carrying heavy traffic.

Ouray Road Men Are Praised for Good Job of Surfacing

Ouray county commissioners were praised highly and thanked for their cooperation with the state and Federal government in the work on the D. S. O. Million Dollar highway by Supervisor McQuery of the state highway department on his last trip over the new highway. Early in July the highway was reported finished in the Ridgway section, with the sole exception of three miles extending from the switchbacks above Ouray, Colo., to Ironton, which is in the Federal bureau of public roads section of the highway.

This small section is being resurfaced. Although such arrangements are unusual, the resurfacing work is being done on the Federal part of the road by state highway forces under the direction of Edward Creel. Usually the Federal government has its own men do such work, but in view of the excellent work done by the state on its own section, the government officials decided that it would be better and cheaper to have the state do the work on the three-mile stretch.

All rocks have been taken off the wide parking spaces on the road, and rock sluffings have been cleaned off for the entire length of the division, clear to the San Juan county line. Supervisor McQuery has installed a number of convenient devices appreciated by motorists in the form of piped water at Bear Creek falls and other places.

STATEMENT SHOWING RECEIPTS AND DISBURSEMENTS OF COLORADO MOTOR VEHICLE LICENSE FEES BY THE STATE AUDITOR 1920 TO 1924, INCLUSIVE

Year	Gross Receipts	Administration Expense, 5%	Cost of Tags	Total Deductions	Amount Distributed by State Auditor
1920	\$ 819,877.88	\$ 40,750.00	\$ 26,862.43	\$ 67,612.43	\$ 752,265.45
1921	906,059.27	45,000.00	40,537.01	85,537.01	820,522.26
1922	987,597.98	49,500.00	44,994.51	94,494.51	893,103.47
1923	1,142,814.43	57,161.91	38,485.72	95,647.63	1,047,166.80
1924	1,258,244.79	61,149.37	50,343.99	111,493.36	1,146,751.43
Totals	\$5,114,594.35	\$253,561.28	\$201,223.66	\$454,784.94	\$4,659,809.41
Per cent	100	4.96	3.93	8.89	91.11

In Appreciation

On July 17 two miles of concrete pavement located between Fort Logan and Petersburg, where it connects with the main North-South paved highway, was opened to traffic. Elaborate dedicatory ceremonies marked the opening of the road.

Gov. Clarence J. Morley delivered the principal address. He declared that the road was made possible by the unflinching determination of E. E. Sommers, former member of the State Highway Advisory Board, to fulfill a pledge made by the State of Colorado to the Federal Government a few years ago.

The pledge was made when the War Department avowed it would withdraw troops from the army post at Fort Logan unless adequate highway facilities were provided by the state.

The completed road is as fine as can be found anywhere. And it forms an important link in the state's system of paved highways.



CAR OWNERS SAVE MONEY ON PAVEMENT—View showing a stretch of concrete road located south of Loveland in Larimer county on State Road No. 1.

Colorado's First Equipment Salesman Was Bold Pioneer

By RALPH C. TAYLOR

The life of an equipment salesman was a hard one a hundred years ago, when Jacob Fowler blazed the way as the pioneer equipment man in the Arkansas Valley. The Indians fought the early equipment men off and today the paleface public officials have taken up the Indians' task of keeping them at bay.

Fowler, with his band of thirteen men and many pack horses laden with curious instruments, started up the Arkansas Valley in 1821. They had departed from the country of the white man and had invaded the redskins' hunting grounds, infested with buffalo, deer and wild turkeys.

It is to be presumed that the present town of Fowler took its name from this early traveler. At least, it is recorded that he called a halt of his band at the mouth of the Apishapa, which empties into the Arkansas River less than two miles west of the present town of Fowler.

The unlucky thirteenth member of the band was slain at the Apishapa camp during the progress of a hunt for game. A grizzly bear, which had wandered from its native haunts, sprang on the hunter and tore him to bits.

Further up the valley Fowler and his men were surrounded by a large band of Comanches. They made it known that they believed that the "White Father" had sent the equipment for them. They demanded that Fowler turn over all his "curios" to them. The intervention of a group of Kiowas in favor of the white men appeared to quiet the trouble temporarily. The Kiowas were steadfast in their friendliness toward Fowler, but they were outnumbered by the Comanches.

The Comanches sent a messenger to Fowler warning him that unless he released the laden pack horses to them before the next sun that they would attack his party. At the expiration of the given time the Comanches prepared for war, but were prevented making the attack by the timely arrival of a large group of Arapahoes, who joined the Kiowas and announced they would defend their

"white friends." Seeing themselves outnumbered, the Comanches withdrew from the region.

Camp for the winter was established where Nepesta later was built. It was a cold winter, one of the few during which the Arkansas River was frozen across. Indians, ten thousand of them, gathered in and camped near Fowler's party. They did not molest the pioneers or their property. As an expression of their friendship, they gave the white men dog meat. The chieftains even went so far as to offer the white men squaws. Although a surplus of squaws existed, members of Fowler's party declined the generous offer.

In the spring of 1822 Fowler and his followers went up the Arkansas River to the mouth of the Fountain River, named by Fowler as Warm Spring Creek. They gave it that name because the water would not freeze readily, attributing the fact to the warmth of the water instead of its composition.

On this site, which later became Fort Pueblo and then the present city of Pueblo, Fowler's men built the first house in the Arkansas Valley, with the exception of a winter stockade 50 miles west, near where Canon City now stands.

The Crow Indians visited the storehouse of Fowler that spring and during friendly visits absconded with much of his wares by concealing articles under their blankets.

After trapping beaver and hunting bear, deer and buffalo where Pueblo now stands the party went over into the San Luis Valley.

The trails of a century ago, blazed under such discouraging circumstances, have today become the transcontinental highways of the Nation.

DO YOU KNOW?

That at the end of every 2,500 miles of service a tire should be deflated, soapstone and grit removed and the inside of casing washed with gasoline?

That after drying, the inside should be dusted with talc, the tire mounted, and the tube charged with fresh air—and then you're ready again for a spin over the hills and far away.—Illinois Motorist.

Sign on Independence Pass Highway—
"Detour. Drive careful while we build you a better road."

It is estimated that better roads in Colorado are reducing car running costs from one to five cents a mile.

Let us be fair about this road program. Travelers from some sections are finding that some other localities are still waiting for greatly needed road improvements.

Colorado has good roads. A noted operatic singer recently said so. He declared that he could tell when he reached the Colorado state line in the dark by the splendid road that he encountered. Yes, we admit that we have good roads. But there's still room for improvement.

A ten-cent tax on a gallon of gasoline is only half a cent a mile. The cost of driving cars is now admitted to be several cents a mile lower on improved roads. According to that, a 10-cent tax is a sound proposition. But it is one that the people must get accustomed to thinking of. At first glance it seems too high. At any rate we are not advocating a 10-cent gasoline tax.

A careful study of the road situation convinces most car owners that highway improvements in Colorado are in reality costing them nothing. These good roads take only a part of the money that otherwise would go for more gasoline and tires and greater car depreciation.

The census taken by the State Highway Department shows that travel on the main North-South highway running through Denver has trebled during the past five years. Paving in this case is by far the cheapest kind of road. But a lot of people thus far have failed to see it in that light.

TABULATION OF BIDS ON STATE HIGHWAY PROJECTS

F. A. PROJECT NO. 275-B, DOUGLAS COUNTY, LOCATED BETWEEN SEDALIA AND CASTLE ROCK. TYPE OF PROJECT, CONCRETE PAVEMENT;
LENGTH 5.334 MILES.

No.	ITEM	Unit	Quantity	Engineer's Estimate		Allied Contrs. Inc., of Colo.		J. C. Brodie		J. L. Busselle & Co.		J. Finger & Son		Strange-Maguire Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Excav. Common	Cu. Yd.	28,600	\$.35	\$ 10,010.00	\$.28	\$ 8,008.00	\$.32	\$ 9,152.00	\$.30	\$ 8,580.00	\$.30	\$ 8,580.00	\$.35	\$ 10,010.00
2	Excav. Rock	Cu. Yd.	1,100	1.20	1,320.00	.85	935.00	1.00	1,100.00	1.25	1,375.00	1.00	1,100.00	1.00	1,100.00
3	Excav. Borrow	Cu. Yd.	18,250	.35	6,387.50	.28	5,110.00	.30	5,475.00	.30	5,475.00	.30	5,475.00	.35	6,387.50
4	Overhaul	St. Yd.	107,000	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00
5	Struct. Exc. Com. Dry	Cu. Yd.	1,700	.50	850.00	.50	850.00	.60	1,020.00	.50	850.00	.50	850.00	.60	1,020.00
6	Struct. Exc. Com. Wet	Cu. Yd.	100	3.00	300.00	3.00	300.00	3.00	300.00	5.00	500.00	2.00	200.00	4.00	400.00
7	Sand Cushion	Cu. Yd.	3,564	1.40	4,989.60	1.00	3,564.00	1.00	3,564.00	1.25	4,455.00	1.00	3,564.00	1.35	4,811.40
8	Sand Subgrade	Cu. Yd.	2,200	1.60	3,520.00	1.20	2,640.00	1.25	2,750.00	1.25	2,750.00	1.00	2,200.00	1.35	2,970.00
9	Gravel Shoulder	Cu. Yd.	2,246	1.75	3,930.50	1.25	2,807.50	1.60	3,593.60	1.50	3,369.00	1.75	3,930.50	1.50	3,369.00
10	Concrete Pavement	Sq. Yd.	55,458	2.35	130,326.30	2.25	124,780.50	2.25	125,335.08	2.22	123,116.76	2.18	120,898.44	2.19	121,453.02
11	Def. Metal Joint	Lin Ft.	27,784	.20	5,556.80	.18	3,605.42	.14	3,882.76	.14	3,882.76	.15	4,160.10	.14	3,882.76
12	Concrete Cl. A	Cu. Yd.	1,271	22.00	27,962.00	18.50	23,513.50	21.00	26,691.00	18.00	22,878.00	20.00	25,420.00	20.00	25,420.00
13	Concrete Cl. B	Cu. Yd.	9	21.00	189.00	18.50	166.50	21.00	189.00	20.00	180.00	20.00	180.00	20.00	180.00
14	Reinforcing	Lb.	120,100	.07	8,407.00	.055	6,605.50	.055	6,605.50	.055	6,605.50	.055	6,605.50	.055	6,605.50
15	15' C. M. P. Culvert	Lin. Ft.	220	1.70	374.00	1.70	374.00	1.50	330.00	1.50	330.00	1.25	275.00	1.50	330.00
16	18' C. M. P. Siphon	Lin. Ft.	185	1.70	314.50	1.70	314.50	1.70	314.50	1.25	231.25	1.25	213.75	1.30	230.25
17	Timber Header	M. B. Ft.	1.6	65.00	104.00	65.00	104.00	65.00	104.00	70.00	112.00	60.00	96.00	80.00	128.00
18	Remove 19 Structures	Lump Sum			300.00		300.00		250.00		300.00		110.00		300.00
19	30' Concrete Piling	Lin. Ft.	3,480	4.00	13,920.00	3.25	11,310.00	4.50	15,660.00	4.00	13,920.00	5.00	17,400.00	3.00	10,440.00
20	Cable Guard Fence	Lin. Ft.	1,180	.65	767.00	.65	767.00	.60	708.00	.60	678.00	.65	767.00	.60	678.00
21	Remove Bridge 668+38	Lump Sum			200.00		200.00		150.00		250.00		100.00		200.00
22	Remove Bridge 699+10	Lump Sum			200.00		200.00		150.00		300.00		200.00		200.00
23	Remove Bridge 946+85	Lump Sum			1,000.00		800.00		900.00		1,200.00		500.00		1,100.00
24	1 1/2" Elec. Conduit	Lin. Ft.	350	.30	105.00	.30	105.00	.30	105.00	.20	70.00	.15	52.50	.40	140.00
25	Elec. Outlet Boxes	Each	4	.75	3.00	.75	3.00	1.00	4.00	1.00	4.00	1.00	4.00	2.00	8.00
26	Rip Rap	Sq. Yd.	350	1.00	350.00	1.00	350.00	1.75	612.50	1.50	525.00	2.00	700.00	2.00	700.00
27	Detour Bridge	Lump Sum			1,000.00		779.99		800.00		1,200.00		1,000.00		1,325.00
Total					\$224,398.70		\$200,515.91		\$211,770.94		\$205,214.77		\$206,644.29		\$205,273.68

No.	H. C. Lallier C. & E. Co.		Platt Rogers, Inc.		J. Fred Roberts & Sons Const. Co.		LaNier, Selander & White		Pople Bros. Con. Co.		Frank Anderson		Sallee Const. Co.		F. C. Dreher Con. Co.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.35	\$ 10,010.00	\$.39	\$ 11,154.00	\$.30	\$ 8,580.00	\$.34	\$ 9,724.00	\$.40	\$ 11,440.00	\$.32	\$ 9,152.00	\$.34	\$ 9,724.00	\$.40	\$ 11,440.00
2	1.25	1,375.00	1.50	1,650.00	.30	380.00	.34	374.00	.75	825.00	.80	880.00	.90	990.00	1.25	1,375.00
3	.35	6,387.50	.35	6,387.50	.30	5,475.00	.34	6,205.00	.40	7,300.00	.32	5,840.00	.34	6,205.00	.40	7,300.00
4	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00	.02	2,140.00
5	.50	850.00	1.00	1,700.00	.50	850.00	.60	1,020.00	.75	1,275.00	.80	1,360.00	.50	850.00	.65	1,065.00
6	2.00	200.00	3.00	300.00	2.00	200.00	3.00	300.00	3.00	300.00	3.00	300.00	4.00	400.00	5.00	500.00
7	1.40	4,989.60	1.35	4,811.40	1.00	3,564.00	1.00	3,564.00	1.25	4,455.00	1.30	4,633.20	1.30	4,633.20	1.20	4,276.80
8	1.40	3,080.00	1.60	3,520.00	1.25	2,750.00	1.25	2,750.00	1.50	3,800.00	1.30	2,860.00	1.50	3,300.00	1.38	3,036.00
9	1.50	3,869.00	1.50	3,869.00	1.35	3,032.10	1.50	3,869.00	1.75	3,890.00	2.00	4,492.00	1.60	3,593.60	1.46	3,279.16
10	2.25	124,780.50	2.30	127,553.40	2.17	120,343.86	2.20	122,007.60	2.26	125,335.08	2.27	125,889.66	2.12	117,570.96	2.30	127,553.40
11	.16	4,437.44	.16	4,437.44	.135	3,744.09	.14	3,882.76	.15	4,160.10	.14	3,882.76	.17	4,714.78	.11	3,050.74
12	20.00	25,420.00	20.00	25,420.00	19.00	24,149.00	19.20	24,408.20	20.00	25,420.00	20.00	25,420.00	22.00	27,962.00	21.00	26,691.00
13	20.00	180.00	20.00	180.00	20.00	180.00	19.20	172.80	22.00	198.00	20.00	180.00	20.00	180.00	25.00	225.00
14	.06	7,206.00	.05	6,005.00	.055	6,005.50	.05	6,005.50	.055	6,605.50	.05	6,005.00	.06	7,206.00	.055	6,605.50
15	1.65	368.00	1.75	385.00	1.25	275.00	1.40	308.00	1.25	275.00	1.50	330.00	1.30	286.00	1.10	242.00
16	1.65	222.75	1.75	236.25	1.25	168.75	1.50	202.50	1.40	189.00	2.00	270.00	1.30	175.50	1.00	185.00
17	65.00	104.00	70.00	112.00	90.00	144.00	65.00	104.00	65.00	104.00	60.00	96.00	60.00	96.00	58.00	92.50
18		300.00		300.00		250.00		100.00		350.00		285.00		300.00		270.00
19	5.00	17,400.00	4.00	13,920.00	3.50	12,180.00	3.50	12,180.00	4.00	18,920.00	4.40	15,812.00	5.00	17,400.00	5.00	17,400.00
20	.70	791.00	.80	904.00	.50	565.00	.65	784.50	.65	784.50	.60	678.00	.60	678.00	.58	655.40
21		200.00		200.00		200.00		200.00		300.00		72.00		200.00		250.00
22		200.00		200.00		200.00		200.00		300.00		72.00		300.00		400.00
23		1,200.00		200.00		1,000.00		1,500.00		1,000.00		310.00		1,400.00		1,500.00
24	.50	175.00	.30	87.50	.25	87.50	.30	105.00	.50	175.00	.20	70.00	.60	210.00	.50	175.00
25	.80	3.20	1.00	4.00	2.00	8.00	.75	3.00	4.00	16.00	5.00	20.00	2.50	10.00	7.00	28.00
26	1.50	525.00	1.50	525.00	1.00	350.00	2.00	700.00	2.50	875.00	1.60	560.00	2.00	700.00	1.20	420.00
27		1,000.00		2,500.00		1,400.00		1,000.00		1,650.00		1,645.00		1,200.00		1,200.00
Total																
		\$216,908.99	\$218,218.99		\$198,771.80		\$208,354.36		\$216,722.68		\$212,754.62		\$212,425.04		\$221,345.80	

F. A. PROJECT NO. 283-B, LARIMER COUNTY, LOCATED WEST AND SOUTH FROM BERTHOUD. TYPE OF PROJECT, CONCRETE PAVEMENT;
LENGTH 4.209 MILES

August, 1925

COLORADO HIGHWAYS

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No.	ITEM	Unit	Engineer's Estimate		J. Finger & Son		J. L. Busselle & Co.		H. C. Lallier Engr. & Const. Co.		Salle Const. Co.		J. Fred Roberts & Sons Con. Co.		
			Quantity	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount	Unit Pr. Amount			
1	Excav. Common	Cu. Yd.	17,800	\$.40	\$ 7,120.00	\$.35	\$ 8,010.00	\$.35	\$ 6,230.00	\$.40	\$ 7,120.00	\$.34	\$ 6,052.00	\$.33	\$ 5,874.00
2	Excav. Borrow	Cu. Yd.	18,900	.40	5,660.00	.40	5,660.00	.35	4,865.00	.40	5,660.00	.34	4,726.00	.33	4,587.00
3	Overhaul Exc. Bor.	St. Yd.	140,800	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00
4	Str. Exc. Com. Dry	Cu. Yd.	1,490	.50	745.00	.50	745.00	.70	1,043.00	.60	894.00	.50	745.00	.60	894.00
5	Str. Exc. Com. Wet	Cu. Yd.	300	3.00	900.00	1.00	300.00	4.00	1,200.00	2.50	750.00	4.00	1,200.00	3.00	900.00
6	Sand Cushion	Cu. Yd.	8,500	1.50	12,750.00	1.00	8,500.00	1.35	11,475.00	1.50	12,750.00	1.20	10,200.00	1.50	12,750.00
7	Gravel Shoulder	Cu. Yd.	1,885	1.50	2,827.50	1.75	3,298.75	1.50	2,827.50	1.40	2,639.00	1.50	2,827.50	1.75	3,298.75
8	Concrete Pavement	Sq. Yd.	44,187	2.60	114,886.20	2.28	100,746.36	2.37	104,723.19	2.50	110,467.50	2.17	95,885.79	2.35	103,839.45
9	Def. Metal Joint	Lin. Ft.	21,945	.20	4,389.00	.16	3,511.20	.14	3,072.80	.16	3,511.20	.16	3,511.20	.14	3,072.30
10	Concrete Cl. A.	Cu. Yd.	672	22.00	14,784.00	20.00	13,440.00	18.00	12,096.00	22.00	14,784.00	25.00	16,800.00	23.00	15,456.00
11	Concrete Cl. B.	Cu. Yd.	42	20.00	840.00	20.00	840.00	19.00	798.00	22.00	924.00	25.00	1,050.00	20.00	840.00
12	Reinforcing	Lb.	77,300	.065	5,024.50	.055	4,251.50	.06	4,638.00	.06	4,638.00	.06	4,638.00	.055	4,251.50
13	Structural Steel	Lb.	60,800	.07	4,256.00	.08	4,864.00	.08	4,864.00	.08	4,864.00	.07	4,256.00	.08	4,864.00
14	15" C. M. P. Culvert	Lin. Ft.	1,044	1.70	1,774.80	1.30	1,357.20	1.40	1,461.60	1.80	1,879.20	1.50	1,666.00	1.30	1,857.20
15	18" C. M. P. Culvert	Lin. Ft.	20	2.00	40.00	1.60	32.00	1.60	32.00	2.00	40.00	1.80	36.00	1.50	30.00
16	18" C. M. P. 20 Gage	Lin. Ft.	564	1.25	692.50	1.30	720.20	1.15	637.10	1.30	720.20	1.50	831.00	1.30	720.20
17	24" C. M. P. 20 Gage	Lin. Ft.	231	1.50	346.50	1.75	404.25	1.40	323.40	1.60	369.60	2.10	485.10	1.80	415.80
18	8" Vit. Clay Pipe	Lin. Ft.	40	.50	20.00	.50	20.00	.40	16.00	.80	32.00	2.00	80.00	.50	20.00
19	10" Vit. Clay Pipe	Lin. Ft.	20	.60	12.00	.60	12.00	.55	11.00	1.00	20.00	2.00	40.00	.60	12.00
20	18" Vit. Clay Pipe	Lin. Ft.	2,200	1.30	2,860.00	1.30	2,860.00	1.25	2,750.00	1.50	3,300.00	2.10	4,620.00	1.25	2,760.00
21	Cem. Rub. Masonry	Sq. Yd.	6,050	2.00	12,100.00	2.00	12,100.00	1.50	9,075.00	2.00	12,100.00	1.60	9,650.00	2.00	12,100.00
22	Coal Hole Covers	Each	8	12.00	96.00	10.00	80.00	12.00	96.00	10.00	80.00	11.00	88.00	10.00	80.00
23	Place Steel Hdgate	Each	9	3.00	27.00	10.00	90.00	3.00	27.00	3.50	31.50	5.00	45.00	3.00	27.50
24	Move Wire Fence	Lin. Ft.	5,610	.05	280.50	.15	841.50	.05	280.50	.05	280.50	.02	112.20	.04	224.40
25	Remove 20 Struct's	Lump Sum			200.00		200.00		200.00		300.00		250.00		400.00
26	Cable Gd. Fence	Lin. Ft.	2,910	.60	1,746.00	.65	1,891.50	.55	1,600.50	.65	1,891.50	.70	2,037.00	.60	1,746.00
27	Timber Headers	M. B. Ft.	8.8	65.00	572.00	60.00	528.00	70.00	616.00	65.00	572.00	60.00	528.00	70.00	616.00
28	22' Conc. Piles	Lin. Ft.	220	3.50	770.00	5.00	1,100.00	4.25	935.00	5.00	1,100.00	5.00	1,100.00	4.25	935.00
29	32' Conc. Piles	Lin. Ft.	320	3.75	1,200.00	5.00	1,600.00	4.25	1,360.00	6.00	1,920.00	6.00	1,920.00	4.25	1,360.00
30	Untr. Timber	Lin. Ft.	1,728	1.00	1,728.00	1.00	1,728.00	.80	1,382.40	1.10	1,900.80	.80	1,382.40	.90	1,555.20
31	Remove Stone Sdwalk	Lin. Ft.	366	.08	29.28	.10	36.60	.05	18.30	.07	25.62	.25	91.50	.10	36.60
32	Remove Conc. Sdwalk	Lin. Ft.	60	.20	12.00	.10	6.00	.10	6.00	.18	10.80	.25	15.00	.20	12.00
33	Relay Stone	Lin. Ft.	258	.20	51.60	.20	51.60	.15	38.70	.18	46.44	.40	103.20	.20	51.60
34	Relay Conc.	Lin. Ft.	42	.30	12.60	1.00	42.00	.50	21.00	.20	8.40	.70	29.40	.50	21.00
35	Remove Br. at 1116	Lump Sum			200.00		150.00		250.00		200.00		350.00		150.00
36	Remove Br. at 1176	Lump Sum			200.00		150.00		100.00		200.00		150.00		150.00
Totals					\$201,858.98		\$182,873.66		\$181,875.49		\$198,736.26		\$180,237.29		\$188,203.00

No.	ITEM	Pople Bros. Con. Co.		F. C. Dreher Con. Co.		Carl C. Madsen Const. Co.		Spotts & Malcom		R. L. Hanes & Co.		Engrs. Con. Corp.		Levy Const. Co.	
		Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1		\$.32	\$ 5,696.00	\$.40	\$ 7,120.00	\$.30	\$ 5,340.00	\$.38	\$ 6,764.00	\$.35	\$ 6,230.00	\$.40	\$ 7,120.00	\$.40	\$ 7,120.00
2		.35	4,865.00	.40	5,660.00	.30	4,170.00	.38	5,282.00	.35	4,865.00	.40	5,660.00	.40	5,660.00
3		.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00	.02	2,806.00
4		.75	1,117.50	.75	1,117.50	.65	968.50	.475	707.75	.60	745.00	1.00	1,490.00	.75	1,117.50
5		3.00	900.00	5.00	1,500.00	8.00	2,400.00	2.85	855.00	5.00	1,500.00	3.00	900.00	4.00	1,200.00
6		1.75	14,875.00	1.20	10,200.00	1.00	8,500.00	1.43	12,155.00	1.20	10,200.00	1.20	10,200.00	1.50	12,750.00
7		2.25	4,241.25	1.25	2,356.25	1.00	1,855.00	2.43	4,680.50	1.25	2,356.25	1.50	2,827.50	1.50	2,827.50
8		2.42	106,982.54	2.30	101,680.10	2.14	94,560.18	2.47	109,141.89	2.30	101,680.10	2.35	103,839.45	2.38	105,165.06
9		.16	3,511.00	.10	2,194.50	.15	3,291.75	.19	4,169.55	.18	3,950.10	.165	3,620.93	.18	3,950.10
10		22.00	14,784.00	20.00	13,440.00	18.00	12,096.00	20.90	14,044.80	19.00	12,768.00	19.75	13,272.00	23.00	15,456.00
11		22.00	924.00	17.50	785.00	18.00	756.00	19.00	798.00	18.00	756.00	19.00	798.00	30.00	1,260.00
12		.06	4,638.00	.05	3,865.00	.05	3,865.00	.06	4,638.00	.065	5,024.50	.055	4,251.50	.0615	4,753.95
13		.085	5,168.00	.07	4,256.00	.07	4,256.00	.067	4,073.60	.075	4,560.00	.075	4,560.00	.071	4,316.80
14		1.45	1,513.80	.90	939.60	1.20	1,252.80	1.56	1,628.64	1.40	1,461.60	1.50	1,566.00	1.70	1,774.80
15		2.00	40.00	1.25	25.00	1.40	28.00	1.90	38.00	2.00	40.00	1.65	33.00	2.00	40.00
16		1.75	969.50	.90	498.60	1.30	720.20	1.23	681.42	1.25	692.50	1.55	868.70	1.25	692.50
17		2.50	677.50	1.25	288.75	1.60	369.60	1.42	328.02	1.50	346.50	1.76	406.56	1.50	346.50
18		.40	16.00	.50	20.00	.50	20.00	.47	18.80	.75	30.00	.68	27.20	.50	20.00
19		.55	11.00	.60	12.00	.70	14.00	.57	11.40	1.00	20.00	.78	15.60	.60	12.00
20		1.28	2,816.00	1.00	2,200.00	1.30	2,860.00	1.22	2,684.00	1.30	2,860.00	1.70	3,740.00	1.30	2,860.00
21		2.70	16,335.00	1.70	10,285.00	1.85	11,192.50	1.90	11,495.00	1.50	9,075.00	3.00	18,150.00	2.25	13,612.50
22		8.50	68.00	6.50	52.00	15.00	120.00	11.00	88.00	12.00	96.00	10.00	80.00	12.00	96.00
23		10.00	90.00	3.00	27.00	3.00	27.00	2.85	25.65	3.00	27.00	25.00	225.00	3.00	27.00
24		.10	561.00	.05	280.50	.045	252.45	.02	112.20	.03	168.30	.025	140.25	.05	280.50
25			500.00		200.00		200.00		300.00		400.00		500.00		500.00
26		.65	1,891.50	.58	1,687.80	.60	1,746.00	.56	1,629.60	.60	1,746.00	.75	2,182.50	.65	1,891.50
27		65.00	572.00	50.00	440.00	60.00	528.00	55.00	484.00	65.00	572.00	60.00	528.00	60.00	528.00
28		3.50	770.00	4.00	880.00	5.00	1,100.00	6.00	1,320.00	5.00	1,100.00	4.50	990.00	5.50	1,210.00
29		3.50	1,120.00	4.00	1,280.00	5.00	1,600.00	6.25	2,000.00	6.00	1,920.00	5.00	1,600.00	5.50	1,760.00
30		1.10	1,900.80	.90	1,555.20	.90	1,555.20	.75	1,296.00	.80	1,382.40	.95	1,641.60	.95	1,641.60
31		.10	36.60	.05	18.30	.06	21.96	.06	21.96	.10	36.60	.30	109.80	.10	36.60
32		.12	7.20	.20	12.00	.10	6.00	.07	4.20	.10	6.00	.80	18.00	.20	12.00
33		.20	51.60	.07	18.06	.30	77.40	.20	51.60	.20	51.60	.80	77.40	.10	25.80
34		1.00	42.00	.80	33.60	.60	25.20	.60	25.20	1.00	42.00	.88	36.96	.40	16.80
35			250.00		250.00		200.00		190.00		100.00		250.00		150.00
36			150.00		100.00		25.00		190.00		300.00		100.00		150.00
Totals					\$200,747.99		\$177,783.76		\$168,835.74		\$194,529.83		\$194,421.95		\$195,967.01

F. A. PROJECT NO. 262-F, COSTILLA COUNTY, LOCATED BETWEEN LA VETA PASS AND RUSSELL. TYPE OF PROJECT, CRUSHED ROCK SURFACE; LENGTH 2.007 MILES

No.	ITEM	Unit	Quantity	Engineer's Estimate		K. V. Johnson		Central Const. Co.		C. M. Emerson & Sons		Shields & Kyle		W. A. Colt & Son	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	2	\$50.00	\$ 100.00	\$50.00	\$ 100.00	\$50.00	\$ 100.00	\$35.00	\$ 70.00	\$75.00	\$ 150.00	\$50.00	\$ 100.00
2	Excav. Common	Cu. Yd.	10,400	.35	3,640.00	.40	4,160.00	.32	3,328.00	.34	3,536.00	.35	3,640.00	.35	3,640.00
3	Excav. Rock	Cu. Yd.	3,600	1.25	4,500.00	1.25	4,500.00	1.00	3,600.00	1.15	4,140.00	1.25	4,500.00	1.25	4,500.00
4	Excav. Borrow	Cu. Yd.	3,200	.35	1,120.00	.40	1,280.00	.32	1,024.00	.34	1,088.00	.35	1,120.00	.30	960.00
5	Overhaul, Exc. and Bor.	St. Yd.	5,000	.02	100.00	.02	100.00	.02	100.00	.02	100.00	.02	100.00	.02	100.00
6	Struct. Exc. Com. Dry	Cu. Yd.	1,500	.50	750.00	1.00	1,500.00	.40	600.00	.50	750.00	.50	750.00	.60	900.00
7	Struct. Exc. Com. Wet	Cu. Yd.	200	3.00	600.00	2.00	400.00	1.00	200.00	1.25	250.00	1.00	200.00	2.00	400.00
8	Struct. Exc. Rock Dry	Cu. Yd.	100	4.00	400.00	2.00	200.00	1.50	150.00	2.25	225.00	1.50	150.00	2.00	200.00
9	Struct. Exc. Rock Wet	Cu. Yd.	50	8.00	400.00	5.00	250.00	2.00	100.00	5.00	250.00	3.00	150.00	3.00	150.00
10	Crushed Rock Surface	Cu. Yd.	3,620	1.75	6,335.00	1.60	5,792.00	1.50	5,430.00	1.75	6,335.00	1.85	6,697.00	1.75	6,335.00
11	Overhaul Rock Surface	Yd. Mi.	100	.25	25.00	.50	50.00	.25	25.00	.35	35.00	.25	25.00	.25	25.00
12	Concrete Cl. A	Cu. Yd.	62	22.00	1,364.00	22.00	1,364.00	21.00	1,302.00	22.00	1,364.00	20.00	1,240.00	22.00	1,364.00
13	Concrete Cl. B	Cu. Yd.	38	21.00	798.00	21.00	798.00	20.00	760.00	21.00	798.00	20.00	760.00	21.00	798.00
14	Reinforcing	Lb.	5,400	.08	432.00	.07	378.00	.07	378.00	.07	378.00	.09	486.00	.07	378.00
15	Cem. Rub. Masonry	Cu. Yd.	215	12.00	2,580.00	12.00	2,580.00	9.00	1,935.00	11.50	2,472.50	12.50	2,687.50	12.00	2,580.00
16	15" C. M. P. Culvert	Lin. F.	100	2.00	200.00	2.00	200.00	1.70	170.00	1.85	185.00	1.50	150.00	2.00	200.00
17	18" C. M. P. Culvert	Lin. Ft.	324	2.25	729.00	2.20	712.80	2.00	648.00	2.00	648.00	2.00	648.00	2.25	729.00
18	24" C. M. P. Culvert	Lin. Ft.	72	3.00	216.00	3.00	216.00	2.80	201.60	3.00	216.00	3.00	216.00	2.50	180.00
19	36" C. M. P. Culvert	Lin. Ft.	44	4.50	198.00	4.00	176.00	4.50	198.00	4.00	176.00	5.00	220.00	5.00	220.00
20	Rip Rap	Sq. Yd.	206	1.00	206.00	2.00	412.00	.75	154.50	2.00	412.00	1.00	206.00	1.00	206.00
21	Stone Underdrain	Lin. Ft.	140	.50	70.00	1.00	140.00	.40	56.00	.50	70.00	.40	56.00	.50	70.00
22	Remove 9 Structures	Lump Sum			200.00		300.00		150.00		200.00		150.00		200.00
23	Move Fence	Lin. Ft.	8,480	.03	254.40	.04	339.20	.02	169.60	.025	212.00	.02	169.60	.03	254.40
24	Point Up Abutments	Lump Sum			75.00		100.00		50.00		30.00		10.00		75.00
25	Untr. Timber Piling	Lin. Ft.	1,728	1.30	2,246.40	1.00	1,728.00	1.00	1,728.00	1.00	1,728.00	.75	1,296.00	1.30	2,246.40
Total					\$ 26,863.80		\$ 26,426.00		\$ 22,017.70		\$ 24,993.50		\$ 25,102.10		\$ 26,000.80

F. A. PROJECT NO. 295-A, CONEJOS COUNTY, LOCATED BETWEEN ALAMOSA AND LA JARA. TYPE OF PROJECT, GRAVEL SURFACE; LENGTH 4.456 MILES.

No.	ITEM	Unit	Quantity	Engineer's Estimate		P. A. Mortensen		Jensen, Holman & Haynie		Central Const. Co.		Shields & Kyle		Engler & Teyssier		W. A. Colt & Son	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Excav. Common	Cu. Yd.	1,400	\$.40	\$ 560.00	\$.38	\$ 532.00	\$.35	\$ 490.00	\$.29	\$ 406.00	\$.35	\$ 490.00	\$.22	\$ 308.00	\$.30	\$ 420.00
2	Excav. Borrow	Cu. Yd.	19,500	.40	7,800.00	.38	7,410.00	.32	6,240.00	.29	5,655.00	.30	5,850.00	.22	4,290.00	.30	5,850.00
3	Struct. Exc. Com. Dry	Cu. Yd.	130	.50	65.00	.60	78.00	.80	104.00	.40	52.00	.75	97.50	.60	78.00	.60	78.00
4	Struct. Exc. Com. Wet	Cu. Yd.	10	1.00	10.00	.75	7.50	5.00	50.00	2.00	20.00	3.00	30.00	2.25	22.50	2.00	20.00
5	Overhaul, Exc. & Bor.	St. Yd.	19,000	.02	380.00	.02	380.00	.02	380.00	.02	380.00	.02	380.00	.02	380.00	.02	380.00
6	Gravel Surface	Cu. Yd.	7,990	1.75	13,982.50	1.27	10,147.30	1.75	13,982.50	1.45	11,585.50	1.80	14,382.00	1.85	14,781.50	1.75	13,982.50
7	Overhaul Surface	Yd. Mi.	1,000	.25	250.00	.25	250.00	.25	250.00	.25	250.00	.25	250.00	.25	250.00	.25	250.00
8	Concrete Cl. B	Cu. Yd.	27	22.00	594.00	22.00	594.00	16.00	432.00	20.00	540.00	25.00	675.00	18.00	486.00	20.00	540.00
9	15" C. M. P. Culvert	Lin. F.	130	1.80	234.00	1.20	156.00	1.75	227.50	1.75	227.50	2.00	260.00	1.50	195.00	2.00	260.00
10	18" C. M. P. Culvert	Lin. Ft.	30	2.00	60.00	1.65	49.50	2.00	60.00	2.10	63.00	2.50	75.00	1.75	52.50	2.50	75.00
11	24" C. M. P. Culvert	Lin. Ft.	62	3.00	186.00	2.10	130.20	3.00	186.00	3.00	186.00	3.00	186.00	2.50	150.00	3.00	186.00
12	30" C. M. P. Culvert	Lin. Ft.	64	4.00	256.00	2.40	153.60	3.75	240.00	4.00	256.00	4.00	256.00	3.10	198.40	3.50	224.00
13	36" C. M. P. Culvert	Lin. Ft.	38	5.00	190.00	2.60	98.80	4.25	161.50	5.00	190.00	5.00	190.00	4.00	160.00	5.00	190.00
14	Remove 5 Structures	Lump Sum			50.00		60.00		30.00		50.00		50.00		25.00		50.00
Total					\$24,617.50		\$20,046.90		\$22,833.50		\$19,861.00		\$23,171.50		\$21,373.90		\$22,505.50

F. A. PROJECT NO. 293-A, MONTROSE COUNTY, LOCATED WEST OF MONTROSE. TYPE OF PROJECT, UNCOMPAHGRE RIVER BRIDGE; LENGTH, 114 FEET.

No.	ITEM	Unit	Quantity	Engineer's Estimate		K. V. Johnson		Levy Const. Co.		Monarch Engr. Co.		W. O. Morrison		C. A. Switzer		Wear Bros.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Excav. Common	Cu. Yd.	100	\$.35	\$ 35.00	\$.35	\$ 35.00	\$.35	\$ 35.00	\$.30	\$ 30.00	\$.40	\$ 40.00	\$.50	\$ 50.00	\$.35	\$ 35.00
2	Excav. Borrow	Cu. Yd.	2,400	.35	840.00	.35	840.00	.35	840.00	.32	768.00	.45	1,080.00	.50	1,200.00	.40	960.00
3	Overhaul	St. Yd.	5,500	.02	110.00	.02	110.00	.02	110.00	.02	110.00	.02	110.00	.02	110.00	.02	110.00
4	Gravel Surface	Cu. Yd.	225	1.50	337.50	1.25	281.25	1.50	337.50	3.25	731.25	2.50	562.50	3.50	787.50	1.75	393.75
5	Concrete Cl. A	Cu. Yd.	292	23.00	6,716.00	21.00	6,132.00	23.00	6,716.00	24.90	7,270.00	22.50	6,570.00	20.00	5,840.00	18.00	5,256.00
6	Concrete Cl. B	Cu. Yd.	2	22.00	44.00	20.00	40.00	23.00	46.00	29.00	58.00	22.00	44.00	19.00	38.00	18.00	36.00
7	Reinforcing	Lb.	35,800	.07	2,506.00	.06	2,148.00	.064	2,291.20	.06	2,148.00	.069	2,112.20	.06	2,148.00	.06	2,148.00
8	Structural Steel	Lb.	84,000	.085	7,140.00	.08	6,720.00	.074	6,216.00	.083	6,972.00	.0798	6,703.20	.0815	6,846.00	.085	7,140.00
9	15" C. M. P. Culvert	Lin. Ft.	40	2.00	80.00	2.00	80.00	2.00	80.00	2.00	80.00	2.00	80.00	2.50	100.00	2.00	80.00
10	Cable Guard Fence	Lin. Ft.	430	.75	322.50	.75	322.50	.65	279.50	.55	236.50	.68	292.40	.80	344.00	.60	258.00
11	Struct. Exc. Com. Dry	Cu. Yd.	200	.50	100.00	1.00	200.00	1.00	200.00	.50	100.00	1.50	300.00	1.00	200.00	1.00	200.00
12	Struct. Exc. Com. Wet	Cu. Yd.	220	3.00	660.00	3.00	660.00	3.00	660.00	6.50	1,430.00	6.00	1,320.00	5.00	1,100.00	2.00	440.00
13	Struct. Exc. Rock Wet	Cu. Yd.	120	6.00	720.00	5.00	600.00	6.00	720.00	10.00	1,200.00	9.00	1,080.00	5.00	600.00	4.00	480.00
14	Detour Bridge	Lump Sum			800.00		700.00		790.00		450.00		1,010.00		800.00		400.00
Total					\$20,411.00		\$18,868.65		\$19,321.20		\$21,584.55		\$21,304.80		\$20,163.50		\$17,936.75

F. A. PROJECT NO. 275-A, DOUGLAS COUNTY, LOCATED BETWEEN GANN AND CASTLE ROCK. TYPE OF PROJECT, CONCRETE PAVEMENT;
LENGTH, 7.008 MILES.

August, 1925

COLORADO HIGHWAYS

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No.	ITEM	Unit	Quantity	Engineer's Estimate		Allied Contractors, Inc. of Colo.		E. H. Honnen		J. Everett Young Const. Service		A. O. Peabody & W. E. Clark Con. Co.		Pople Bros. Con. Co.		J. L. Busselle & Co.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	7.5	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$40.00	\$ 300.00	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$50.00	\$ 375.00
2	Excav. Common	Cu. Yd.	91,700	.35	32,095.00	.40	36,680.00	.465	42,640.50	.38	34,846.00	.33	30,261.00	.32	29,344.00	.37	33,929.00
3	Excav. Rock	Cu. Yd.	30,700	1.20	36,840.00	.40	12,280.00	.465	14,275.50	.84	25,788.00	.75	23,025.00	.75	23,025.00	.75	23,025.00
4	Borrow Fill	Cu. Yd.	49,400	.40	19,760.00	.40	19,760.00	.35	17,290.00	.38	18,772.00	.37	18,278.00	.32	15,808.00	.34	16,796.00
5	Overhaul	Sta. Yd.	42,500	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00
6	Gravel Shoulders	Cu. Yd.	3,100	1.75	5,425.00	1.75	5,425.00	1.60	4,960.00	1.50	4,080.00	1.50	4,650.00	2.10	6,510.00	1.60	4,960.00
7	Sand Cushion	Cu. Yd.	4,700	1.50	7,050.00	1.50	7,050.00	1.00	4,700.00	1.30	6,110.00	1.35	6,345.00	.85	3,995.00	1.25	5,875.00
8	Concrete Pavement	Sq. Yd.	73,470	2.35	172,654.50	2.30	168,981.00	2.30	168,981.00	2.23	163,838.10	2.32	170,460.40	2.20	161,634.00	2.28	167,511.60
9	Def. Metal Joint	Lin. Ft.	36,665	.22	8,066.30	.16	5,866.40	.14	5,133.10	.20	7,333.00	.18	6,599.70	.17	6,233.05	.18	6,599.70
10	Concrete Cl. A	Cu. Yd.	2,327	22.00	51,194.00	19.00	44,213.00	21.00	48,867.00	18.50	43,049.50	19.75	45,958.25	20.50	47,703.50	19.00	44,213.00
11	Concrete Cl. B	Cu. Yd.	21	20.00	420.00	19.00	399.00	25.00	625.00	20.00	420.00	19.75	414.75	19.00	399.00	19.00	399.00
12	Reinforcing	Lb.	197,300	.07	13,811.00	.06	11,838.00	.055	10,851.50	.0525	10,358.25	.06	11,838.00	.055	10,851.50	.0575	11,344.75
13	15" C. M. P. Culvert	Lin. Ft.	440	1.75	770.00	1.75	770.00	1.30	572.00	1.50	660.00	1.70	748.00	1.50	660.00	1.60	704.00
14	Timber Header	M. B. Ft.	2.6	70.00	182.00	70.00	182.00	65.00	169.00	70.00	182.00	75.00	195.00	60.00	156.00	70.00	182.00
15	Rip Rap	Sq. Yd.	250	2.00	500.00	2.00	500.00	2.50	625.00	1.60	400.00	2.00	500.00	2.00	500.00	2.00	500.00
16	Remove 4 Culverts	Lump Sum			50.00		50.00		50.00		40.00		40.00		65.00		65.00
17	Remove 2 Bridges	Lump Sum			350.00		375.00		400.00		200.00		300.00		250.00		400.00
18	Concrete Piling	Lin. Ft.	3,000	4.00	12,000.00	4.00	12,000.00	5.00	15,000.00	4.75	14,250.00	3.75	11,250.00	4.00	12,000.00	4.00	12,000.00
Total					\$362,392.80		\$327,594.40		\$336,189.60		\$331,501.85		\$332,078.10		\$320,359.05		\$329,714.05

F. A. PROJECT NO. 262-E, HUERFANO COUNTY, LOCATED WEST OF WALSENBURG ON ROAD NO. 10. TYPE OF PROJECT, GRAVEL SURFACE;
LENGTH 3.527 MILES.

No.	ITEM	Unit	Quantity	Engineer's Estimate		McNaghan-Cunningham Con. Co.		Pople Bros. Con. Co.		W. O. Morrison		John A. Duncan		Central Const. Co.		W. A. Colt & Son	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Excav. Common	Cu. Yd.	3,800	\$.45	\$ 1,710.00	\$.34	\$ 1,292.00	\$.30	\$ 1,140.00	\$.35	\$ 1,330.00	\$.35	\$ 1,330.00	\$.33	\$ 1,254.00	\$.30	\$ 1,140.00
2	Excav. Rock	Cu. Yd.	100	1.25	125.00	1.50	150.00	1.00	100.00	1.30	130.00	1.25	125.00	1.25	125.00	1.50	150.00
3	Dry Exc. Structure	Cu. Yd.	300	.50	150.00	.50	150.00	.75	225.00	.90	270.00	1.00	300.00	.40	120.00	.60	150.00
4	Borrow Fill	Cu. Yd.	27,100	.45	12,195.00	.34	9,214.00	.30	8,130.00	.30	8,130.00	.32	8,672.00	.33	8,943.00	.30	8,130.00
5	Overhaul Exc. Bor.	St. Yd.	1,700	.02	34.00	.02	34.00	.02	34.00	.02	34.00	.02	34.00	.02	34.00	.02	34.00
6	Gravel Surface	Cu. Yd.	7,140	2.00	14,280.00	1.75	12,495.00	1.30	9,282.00	2.08	14,851.20	1.85	13,209.00	1.90	13,566.00	2.25	16,065.00
7	Overhaul Surface	Yd. Mi.	4,000	.25	1,000.00	.25	1,000.00	.25	1,000.00	.25	1,000.00	.25	1,000.00	.25	1,000.00	.25	1,000.00
8	Concrete Cl. A	Cu. Yd.	70	24.00	1,680.00	18.00	1,260.00	21.00	1,470.00	19.50	1,365.00	26.00	1,820.00	21.00	1,470.00	20.00	1,400.00
9	Concrete Cl. B	Cu. Yd.	38	23.00	874.00	18.00	684.00	22.00	836.00	23.00	874.00	20.00	760.00	20.00	760.00	20.00	760.00
10	Reinforcing	Lb.	6,700	.07	469.00	.06	402.00	.065	435.50	.07	474.00	.08	536.00	.07	469.00	.07	469.00
11	15" C. M. P. Culvert	Lin. Ft.	100	2.00	200.00	1.54	154.00	1.35	135.00	1.60	160.00	1.76	176.00	1.80	180.00	1.75	175.00
12	18" C. M. P. Culvert	Lin. Ft.	384	2.25	864.00	1.73	664.32	1.69	644.40	1.95	748.80	1.97	756.48	2.30	883.20	2.00	768.00
13	24" C. M. P. Culvert	Lin. Ft.	68	3.00	204.00	2.47	167.96	2.35	159.80	3.00	204.00	2.70	183.60	3.20	217.60	2.50	170.00
14	18" C. M. P. Siphon	Lin. Ft.	69	2.00	138.00	1.66	114.54	1.59	108.50	1.85	127.65	1.85	127.65	2.00	138.00	2.00	138.00
15	18" Trash Racks	Each	2	8.00	16.00	10.00	20.00	12.00	24.00	10.00	20.00	5.00	10.00	10.00	20.00	10.00	20.00
16	Remove 2 Culverts	Lump Sum			20.00		10.00		20.00		20.00		10.00		20.00		20.00
17	Remove 4'x6' Conc. Culv.	Lump Sum			50.00		50.00		100.00		65.00		50.00		100.00		60.00
18	Cl. A Concrete Ford	Cu. Yd.	65	22.00	1,430.00	18.00	1,170.00	18.00	1,170.00	14.00	910.00	16.00	1,040.00	18.00	1,170.00	20.00	1,300.00
Total					\$35,439.00		\$29,031.82		\$24,979.20		\$30,708.65		\$30,139.73		\$30,469.80		\$31,979.00

No.	J. Fred Roberts & Sons Const. Co.		H. C. Lallier & Co.		C. & E. Engr. Const. Corp.		Platt Rogers, Inc.		Strange-Maguire Paving Co.		Carl C. Madsen Const. Co.		Lee F. Williams									
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount								
1	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$50.00	\$ 375.00	\$30.00	\$ 225.00	\$50.00	\$ 375.00	\$10.00	\$ 75.00								
2	.40	36,680.00	.30	27,510.00	.43	39,431.00	.32	29,344.00	.31	28,427.00	.36	33,012.00	.35	32,095.00								
3	1.00	30,700.00	.85	26,095.00	.43	13,201.00	1.10	33,770.00	.95	29,165.00	.75	23,025.00	.35	10,745.00								
4	.40	19,760.00	.33	16,302.00	.43	21,242.00	.35	17,290.00	.35	17,290.00	.33	16,302.00	.35	17,290.00								
5	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00	.02	850.00								
6	1.75	5,425.00	1.50	4,650.00	1.40	4,340.00	2.10	6,510.00	1.50	4,650.00	1.50	4,650.00	1.40	4,340.00								
7	1.50	7,050.00	1.00	4,700.00	1.40	6,580.00	1.50	7,050.00	1.35	6,345.00	1.35	6,345.00	1.20	5,640.00								
8	2.30	168,981.00	2.25	165,307.50	2.25	165,307.50	2.33	171,185.10	2.25	165,307.50	2.12	155,756.40	2.29	168,246.30								
9	.15	5,499.75	.13	4,766.45	.20	7,333.00	.15	5,499.75	.16	5,866.40	.14	5,133.10	.13	4,766.45								
10	18.00	41,886.00	19.50	45,376.50	20.00	46,540.00	21.30	49,565.10	19.50	45,376.50	20.00	46,540.00	21.00	48,867.00								
11	18.00	378.00	20.00	420.00	20.00	420.00	22.00	462.00	19.50	409.50	21.00	441.00	20.00	420.00								
12	.05	9,865.00	.055	10,851.50	.06	11,838.00	.05	9,865.00	.05	9,865.00	.55	10,851.50	.055	10,851.50								
13	1.50	660.00	1.50	660.00	1.75	770.00	1.45	638.00	1.45	638.00	1.50	660.00	1.50	660.00								
14	60.00	156.00	70.00	182.00	70.00	182.00	60.00	156.00	65.00	169.00	80.00	208.00	60.00	156.00								
15	3.00	750.00	2.00	500.00	2.00	500.00	2.00	500.00	1.50	375.00	2.50	625.00	1.50	375.00								
16		50.00		50.00		50.00		50.00		50.00		50.00		100.00								
17		500.00		200.00		350.00		200.00		50.00		350.00		400.00								
18	5.00	15,000.00	3.50	10,500.00	5.00	15,000.00	4.00	12,000.00	3.50	10,500.00	3.00	9,000.00	4.75	14,250.00								
Total															\$344,575.75	\$319,305.95	\$334,309.50	\$345,319.95	\$325,558.90	\$314,174.00	\$320,127.25	\$343,949.70

Highways Aid Colorado Industry

(Continued from page 4)

cial problem faces Colorado, as I believe it faces every other state in regard to its highway system. We must meet the problem, not only because of the obligation, but because we do not wish Colorado to be backward in the matter of good roads.

The financial problem is practically solved under our budget, for this year and next, but after that the problem faces our next legislature, which should be given the co-operation of all other state officials toward its solution.

I trust a program for adequately financing the state highway department, sufficient to care for its needs for years to come, can be devised without the issuance of more bonds. Bonds are appropriate in emergency, but when planning a financial program for a decade or two, the issuance of bonds should be avoided. I believe other financial methods can be arranged to give the highway department funds adequate for both new construction and maintenance of finished roads.

In the maintenance of state highways I believe in a system whereby the responsibility is fixed. When responsibility for any kind of work is permanently fixed, an executive can immediately put his finger on the spot where trouble oc-

curs. Maintenance of modern roads, both hard surfaced and gravel surfaced, with the complexities of modern traffic conditions, has become an engineering problem, and the state should have an engineer to handle this problem of maintenance.

Upkeep of roads should be sectionalized and each section should be assigned to one man who is responsible for its proper maintenance—this man to be responsible to the head of the maintenance department. Thus whenever any section of road is not properly maintained, the engineer at the head of the maintenance can without difficulty place the responsibility and know who has fallen down on his job.

The highway problem is second only to that of the continuing problem of education. It calls, too, for reconstruction of statutes of the various states to make for uniformity. An interstate motor traveler should not be subjected to one rule of supervision in one state and another in another state, affecting the same conditions. Because of conflicting motor vehicle laws, not only between states, but between cities in the same state, it is quite impossible for a motorist to drive from one coast of America to the other without being arrested from two to six times, unless he has the eloquence of a Demosthenes to melt the heart of the traffic squad or the justice of the peace.

Increased Maintenance Vital Necessity on Modern Roads

Better highways for everybody is an infinitely more sensible program than the finest road that can be constructed for a few favored individuals.

It is of little value to have a reinforced concrete, asphalt, or hard-surfaced road of any standard material, between two isolated points, if there is nothing but unimproved mud roads leading to the paved road.

It is not practical, from a financial standpoint, to build concrete, asphalt or otherwise paved highways on every parish and state road at once. It is practical to put parish and state roads in passable condition and keep them that way, while higher types of highways are being built.

Maintenance of existing roads so they can be used every day in the year is the biggest job. The human element is the biggest factor in its accomplishment, for unless men of today are able to visualize the needs of tomorrow, very little will be done.

Materials that inevitably are pulverized by the tremendous traffic that passes over the highways cannot endure. Every passing car stirs up dust-clouds, which blow away, thus ultimately shortening the "life" of the road. Build permanent roads.

The New 204



1/2 Yd.

HARNISCHFEGER CORPORATION,
3857 National Ave., Milwaukee, Wisconsin.

Please send a copy of Bulletin 82-X, which tells all about the new, light and speedy P & H Gasoline Excavator—Model 204.

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A new model—a 1/2-yard excavator—of standard P & H construction especially suitable for use where space is limited, as in alleys, basements and similar locations.

The tail swing is shorter by two feet than the 206 Model—fast on its corduroy traction—low bearing pressure—swing speed of 5.4 R.P.M.—complete metal cab—power clutch control—accessible—and convertible into dragline, clam-shell crane, magnet crane, pile-driver, skimmer scoop.

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Announcing the Consolidation of
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and
THE HOLT MANUFACTURING COMPANY

Under the Name of

Caterpillar Tractor Co.

And the Selection of Our Organization as Exclusive Distributors for Colorado and Wyoming.

We can now offer five models of Caterpillar tractors—the former Holt line, consisting of two-ton, five-ton, ten-ton; and the former Best line, consisting of the Best thirty and the Best sixty. With this greater line, better service is assured. An adequate stock of tractors and parts will be on hand at all times.

We have been selling and servicing tractors for ten years and we appreciate the importance of fast service of parts, of having field service men experienced in all models immediately available for customers.

Clinton & Held Co.

1501 to 1511 Wazee Street
 Denver, Colo.

World Motorist Groups the Most Distinctive Highways

The American motorist will find in his touring trips that the United States has some of the most distinctive as well as the most unique highways in existence. Mr. Lee of the Asphalt Association, whose hobby is collecting old notes on roads, vouches for the fact that the United States possesses the longest paved motor road in the world, the Pacific Highway, running from Vancouver, B. C., along the Pacific Coast to the Mexican border, a distance of 1,476 miles.

In this country also is to be found the highest motor road in the world—that on Pike's Peak, in Colorado, 14,109 feet above the level of the sea. Nevada Avenue, Colorado Springs, Colorado, 6,343 feet above sea level, is the highest paved street in the world, and Market Street, Philadelphia, is the widest.

The shortest and narrowest paved motor road in existence is likewise in America. It traverses Smith's Island, one of the little islands in the lower Chesapeake Bay near Christfield, Maryland. This road is less than a mile long and is just wide enough to permit the passage of one motor car at a time. At intervals there are sidings, or "passing tracks," where the cars pass each other.

In this country is to be found not only the most unique paved street in the world, but three of the world's most beautiful and famous paved mountain roads—the Columbia River Highway, in Oregon; the Storm King Highway, which overlooks the Hudson River; and "America's Valley

of the Rhine," from the Peekskill Mountains in New York, and the Lackawanna Trail, which runs from Delaware Water Gap through the Pocono Mountains in Pennsylvania. The unique street referred to is Lombard Street, San Francisco, a twisting thoroughfare which climbs a steep hillside at 30 per cent grade in much the same manner as a grapevine claims a pole.

The shortest street in the world, for instance, is to be found, not in the United States, but in France. It is the Rue Ble, in Paris. The narrowest street in the world is the Via Sol, in Havana, Cuba, a thoroughfare only forty-seven inches in width. The most unique paved motor road in the world is that of the Via Nizza, a roadway constructed upon the roof of the Fiat Motor Works at Lingotta, Italy.

To Nankin, China, goes the rather doubtful credit of having the dirtiest street in the world—the Tchantsi. The Via Castile, in Seville, Spain, has long had the distinction of being the cleanest street in the world. Fifth Avenue, New York City, harbors more wealth than any other thoroughfare, although Grosvenor Street, London, is the most aristocratic.

To Pearl Street, New York City is granted the palm as the noisiest street in existence, while it is a matter of dispute as to whether Michigan Avenue, Chicago; Columbus Circle, New York City; or New York Avenue at Fourteenth Street, in Washington, D. C., is the most dangerous street to cross.

The most dangerous road in existence is the Corniche road, which winds its way above the Mediterranean from Laturbia to Nice, in France, along one edge of

which for many miles there is a sheer drop of 1,000 feet. Broad Street, Philadelphia, fourteen miles long, is the longest straight street in the world, and Broadway, New York, fifteen and one-half miles in length, is the longest.—Roads and Road Construction, London.

AUTO CASUALTIES

(From the San Francisco Examiner)—An average of 52 deaths daily and 5,650 injuries daily! Such was the record of automobile casualties in the United States for 1924.

The figures are a warning. We have all been warned before, and will have to be warned again; but here are some of the lessons which the above figures ought to teach:

Drive decently. Drive only when perfectly sober. Don't "cut in."

Walk warily. Cross only at crossings. "Watch your step."

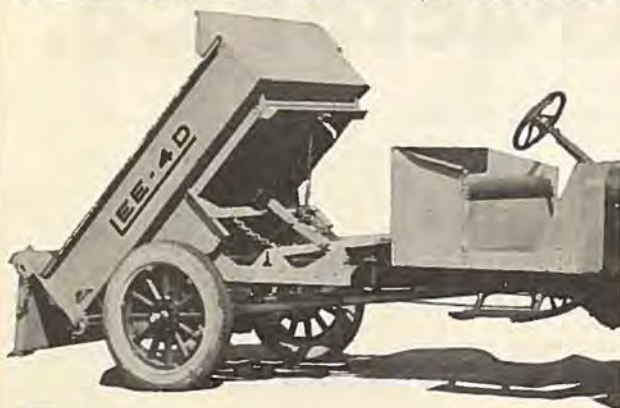
Enforce the laws rigidly. Keep personal influence and the "squaring" of cases out of police headquarters and the courts. Sentence heavily and uniformly.

Don't begrudge the money paid in taxes for large and competent squads of motor policemen or traffic policemen.

BUILD ROADS—straighten out curves, eliminate grade crossings, pave and widen highways, regrade bad grades—**BUILD ROADS.**

An unsolved mystery—Why some counties continue to use wornout equipment at a sacrifice of efficiency and reduced maintenance costs.

LEE LINE STEEL DUMP BODIES



PRICES REDUCED \$25.00 to \$50.00

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Commercial Bodies, Busses, Trailers, Transmissions



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BOSS HANDY MIXER

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FACTORY
—COMPLETE—
STEEL WHEELS
PNEUMATIC TIRES \$30 EXTRA

POWER LOADER FILTERS
1/4-1/2 BAG SIZES

Used By 10,000 Users

BIGGEST MIXER BUY EVER OFFERED

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WRITE OR WIRE FOR NEW PRICES—CATALOGS—TODAY

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- 105 - 145
- 215 - 225
- GAS
- STEAM
- ELECTRIC
- ALLEY STREET PAVES

HOISTS

- SINGLE AND DOUBLE DRUM REVERSING
- \$135 UP
- FORDSON WINCHES



Efficient and Economical Highway Maintenance

The Fageol highway maintenance truck is designed to efficiently take care of practically all forms of maintenance likely to occur in road work, such as repairing breaks and cracks in concrete, spraying hot tar on patches in asphalt roads, shouldering up road edges by means of scraper, stenciling road signs, repairing fences, etc.

Because of the complete equipment of this unit, the small crew of men required to operate it, and because of its ability to cover a large amount of territory, maintenance costs can be reduced thousands of dollars annually.

A number of these trucks are being successfully used by maintenance divisions of State Highway Departments and Electric Railways in keeping highways and streets in first class condition.

Built by

The Fageol Motors Company

OAKLAND, CALIFORNIA

Table Showing Gas Tax Rate Levied in Forty-four States

Forty-four states out of forty-eight, up to May 18, 1925, had recognized the fact that the tax on gasoline was one of the fairest and most equitable taxes that could be imposed. They, by their actions, have said that those who use the highways should pay for building and maintaining them. There is no escape from this logic. The tendency is to raise the tax in some states from one to four cents. During the past few years many legislatures have raised the tax, and it is reasonable to assume that during the next two or three years the tax will be raised in many of those states which now have a two-cent rate. For the information of all interested in building highways, we give in detail the tax in each state, as follows:

4c	THREE	Arkansas Nevada North Carolina
3 1/2c	ONE	Utah
3c	SIXTEEN	Arizona Florida Georgia Idaho Indiana Kentucky Maine Mississippi New Mexico Oklahoma Oregon South Carolina South Dakota Tennessee Virginia West Virginia

2 1/2c	ONE	Wyoming
2c	NINETEEN	Alabama California Colorado Delaware Iowa Kansas Louisiana Maryland Michigan Minnesota Missouri Montana Nebraska New Hampshire Ohio Pennsylvania Vermont Washington Wisconsin
1c	FOUR	Connecticut Rhode Island Texas North Dakota

U. S. Forest Service Spends Huge Sum on Pass Highways

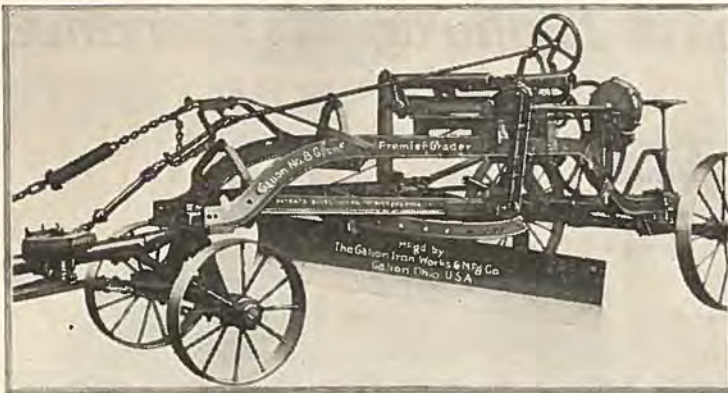
More than \$165,000 worth of road contract work will be completed on the Tennessee, Independence, and Fremont pass highways before fall by the Federal government, and Leadville will be the center of operations and supply depot for all three projects. The most recent contract awarded by the Bureau of Public Roads at Denver was for \$65,000 worth of improvement and extension work on the Tennessee Pass highway, under stipulation that it must be completed before December 15. Work began on this project June 25, and with weather as favorable as has been encountered at the start, should be finished well before the time limit.

Table Showing U. S. Highway Mileage

Total mileage roads in all states.....	2,820,165
Total mileage Federal Aid System.....	197,412
Mileage Federal Aid System improved—graded, drained, sand-clay up.....	101,642
Mileage Federal Aid System improved by Federal Aid.....	48,566
Mileage Federal Aid System improved without Federal Aid.....	53,076
Mileage Federal Aid System paved with or without Federal Aid.....	21,595
Concrete	16,780
Brick	1,775
Bituminous Concrete	3,040

Above, generally typical of pavement not on Federal Aid System.

Mileage Federal Aid System improved, with Federal Aid January 1, 1925....	55,612
Mileage Federal Aid System paved, with Federal Aid.....	13,177
Percentage paved (concrete, brick, bituminous concrete).....	23.7%
Percentage concrete of paved.....	83.5%



New GALION "E-Z Lift" GIANT No. 8 ENGINE GRADER

Built Stronger — Easy to Steer — Perfect Balance

GALION engineers have just produced, in this new No. 8 Engine Grader, an easily handled, well balanced power grader that is built stronger than any similar type road machine ever built either by ourselves or others. Its superior strength lies largely in the exceptional size of the main frame

which is made from special T bars with a 4" x 1" stem. This member has never before been used on a road grader. Despite added strength in the frame, however, this large capacity grader is light of draft and requires little power to pull it. All excess weight has been eliminated by using steel and machined parts in place of the customary gray iron castings.

An Engine Grader with big capacity for Road Work built with the Strongest and Most Rigid Frame ever put on a Road Grader

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H. W. MOORE EQUIPMENT COMPANY

Sixth and Acoma Streets

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Contractor's Equipment, Fordson Power Machinery, Road Building and Maintaining Equipment

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We are distributors for this exceptionally fine product, and can supply you promptly in any quantity.

The life of your car depends on lubrication.

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OUR MOTOR OILS ARE GUARANTEED

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Denver, Colorado

Elevating Graders On Highway Work

(Continued from page 11)

is by no means a simple matter. The loading loop varies in length from one so short that only one load can be taken on each side to a loop 1,000 feet or more in length. The wagon loop also varies in length in the same way. As an illustration, take a loading loop 500 feet in length from which the hauling is in one direction to a point 500 feet below the lower end of the loading loop. (On the jobs studied the average length of cut was almost exactly 450 feet, but averaged as low as 250 feet on two jobs and as high as 600 feet on five.) Under this condition the wagon haul will vary from 500 to 1,000 feet, averaging something over 750 feet. The supply will, therefore, be excessive at some points and deficient at others. In order to obviate this, the contractor should require an empty wagon to trot to position when necessary to place it in position behind the loading wagon when the haul is long. The return pace of the horses can be much reduced when the haul shortens, and with the rest thus obtained by the horses, the occasional trotting will not be injurious to them.

Miscellaneous Delays

Other delays may be classified principally under three headings—breakdowns, cleanouts and rests.

Breakdowns occur rather frequently on elevating grader work. The chain drives give the most trouble, the belt gives more or less, and other parts break occasion-

ally. Lack of proper maintenance is the outstanding cause of this trouble. The contractor should buy a new set of chains for the belt drive every spring and should keep on hand spare parts for those parts of the machine which are most apt to break. Where the grader has been used so long that trouble with the elevating mechanism is more or less caronic, it should be discarded and a new one obtained. It is poor economy to continue an old machine in service if this can be done only by accepting a reduction in output. At current prices a substantially built machine can be had for the money secured from the movement of 8,000 to 10,000 cubic yards of material. The loss of as little as 50 or 60 yards a day during the construction season will cover the entire cost of a new machine, and this is a small amount when considered in the light of the heavy reduction in rate of output which attends any reduction in the bite.

Cleaning out around the lower roller stops the outfit many times a day, especially in moist clay soils. Occasionally this must be performed once for every ten or fifteen wagon loads and requires from one to three or four minutes each time. With the present design of grader, this loss of time does not appear to be avoidable.

Another delay where horses are used is that caused by resting the horses, especially in hot weather. The time losses on horsedrawn jobs sometimes exceed 20% in hot weather. It is here that the caterpillar tractor shows its great advantage.

The total of time losses due to breakdowns, cleanouts and resting stops may

generally be set at about 5% on caterpillar jobs and from 10 to 20% on horse-drawn jobs, the latter in heavy ground and hot weather.

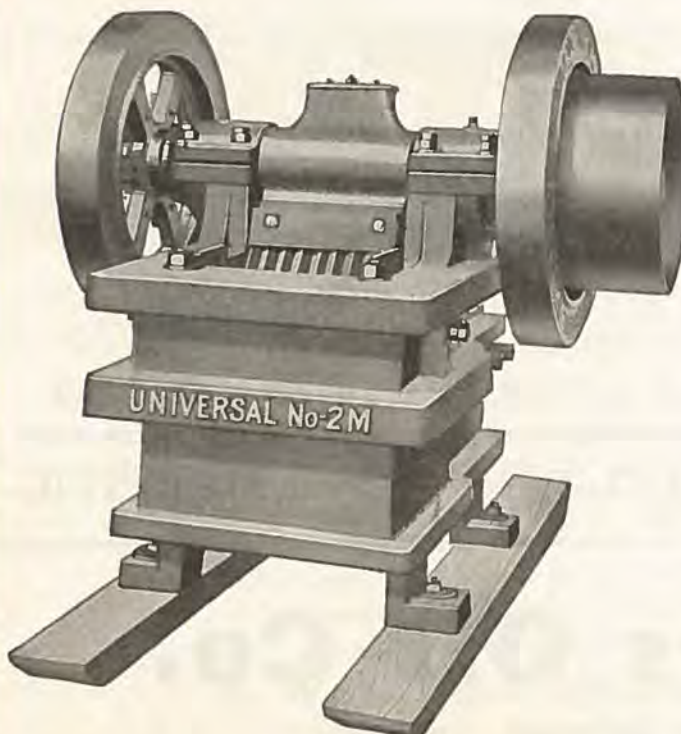
There are other time losses found on some work. For instance, the time occupied in driving from stable to the point of excavation for the day in question and driving back again at night; stops for watering the horses, etc.

Summing up, Mr. Harrison has found that comparatively few contractors operating elevating graders succeed in averaging much over sixty loads an hour and many do not reach this output. But there is no apparent reason why an efficient contractor should not produce 120 loads an hour. The principal requirements for this are an adequate wagon supply and really competent superintendence.

The contractor figuring on a job should never assume that the conditions will be average conditions. "Many contractors are in financial difficulties today for no other reason than that, in bidding on work of this kind, they have failed to note that projects differ a great deal in this vital element—the average length of cut—and have assumed that the rate of production to which they were accustomed could be maintained, only to find that it could not. It is always necessary to scrutinize this detail with care, but it is doubly necessary in crossing state boundary lines."

WHATMOREDOYAWANT?

Weather: perfect; crops: bully; roads: great; people: Okay.—Ex.



Universal Crushers

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A wide range of sizes and types for Contractors, Quarries, Stone and Gravel Plants.

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Universal Crushers and repair parts carried in Denver stock.

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No Stops for Repairs



though some of the material was so hard it couldn't be dug with a pick

"This machine has been in sand, clay, cemented gravel, iron ore and hard pan. Some of the material was so hard it could not be dug with a pick.

"This machine has never been stopped for repairs and has no parts replaced except minor wearing parts. The machine is still in excellent condition, and at present is cutting in stiff clay, 16 feet deep.

"Where surplus excavation must be removed from the street the High Quick Shift Conveyor permits loading wagons on one side while the spoil bank is on the other side. This saves loading cost."

The foregoing is part of a letter from Smith Bros., Dallas, Texas, written one and one-half years after buying their C-15 Buckeye.

Why is it that so many Buckeye owners send us such favorable reports? Simply because we build Buckeyes as tho we were going to use them ourselves—extra strong, plenty of power and easy to operate.

That's the big reason, in a few words.

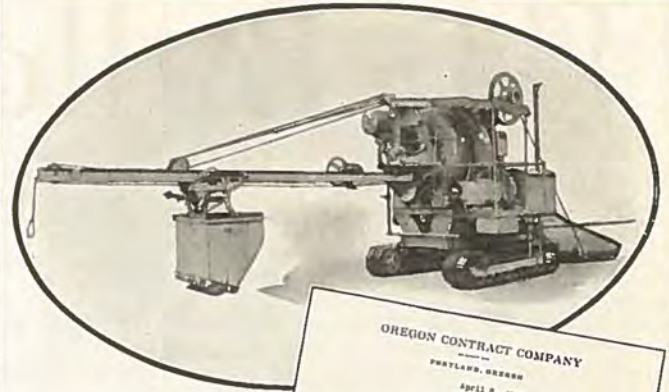
Ask any owner.

The Buckeye Traction Ditcher Company FINDLAY, OHIO

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers

THERE'S A BUCKEYE SALES AND SERVICE OFFICE NEAR YOU

BUILDERS OF TRENCH EXCAVATORS FOR **30** YEARS



"At the Head of the Class Every Way You Look At It!"



Telegrams and letters such as these tell the story of Smith Paver durability—speedy maximum production—low cost of operation—and the practically negligible maintenance cost. Records of years of service prove that, regardless of the initial cost, the Smith is the most economical to operate in the long run and, as the telegram states, is "at the head of the class every way you look at it."

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DENVER



SMITH PAVERS

The Bulletin Board

Wilson to Handle Sales for Western Equipment Co.

Another change has been made in the field of road machinery and equipment dealers in Denver. Announcement is made that the Wilson Machinery Company, headed by Harry P. Wilson, has taken over the sales organization of the Western Equipment Co., located at 1936-38 Market street. The offices of the Wilson concern, formerly at 1626 Sixteenth Street, will be closed, and the firm will make its future home at the Market street address.

The transfer of the accounts held by the Western Equipment Co. was made to Wilson on August 1. Under the new arrangement the Wilson concern will have complete charge of the sales of all equipment formerly sold by the Western Equipment Co.

A list of the manufacturers to be represented in the Rocky Mountain territory by Wilson is as follows:

Austin Western Road Machinery Co., road machinery; Western Wheeled Scraper Co., fresnos and plows; Byers Machine Company, small crawler and truck cranes; The Koehring Company, concrete mixers and heavy duty shovels and cranes; The Heil Company, truck bodies and hydraulic hoists; The C. H. & E. Mfg. Co., pumps, hoists and saw rigs; Construction Machinery Co., Wonder tilting type concrete mixers; Barber-Greene Co., conveyors and loaders; Metal Forms Corporation, road and building forms; the Cleveland Wheelbarrow Co., concrete carts and wheelbarrows.

It is announced that Harry P. Wilson will be in complete charge of the sales organization. The present force of salesmen of the two organizations as well as the office force, with a few exceptions, will be retained, it was said.

Clinton-Held Co. Agents for Spears-Wells Line

Sales of all equipment manufactured by the Spears-Wells Machinery Company, Oakland, Calif., will be made through the Clinton and Held Co., 1501 Wazee street, Denver, in the Rocky Mountain territory in the future, according to announcement made by L. L. Clinton, president of the latter concern.

Lines manufactured by the Spears-Wells concern include loaders, road and street scarifiers, road drags, portable compressors and asphalt heaters.

On July 25 the Clinton-Held concern took over the stock of parts for Best Tractors formerly handled by the Wilson Machinery Co. At the same time a \$25,000 stock of parts for Holt tractors was received from the Caterpillar Tractor Co., which now operates the plants of both the Holt and Best concerns, under a recent consolidation agreement.

The products of the Caterpillar concern, which includes all size tractors formerly

produced by Holt and Best, will be distributed in Colorado and Wyoming by the Clinton-Held company. Five models of tractors for every class of tractor work are included in the line.

Ill Health Forces Corson to Retire from Business

During the week of July 20 the newly-organized concern of Ray Corson Company, with offices at 1732 Wazee street, passed out of existence. The sudden closing up of the affairs of the firm, when it was just getting under way with a large line of construction equipment accounts, was due to a breakdown in the health of Mr. Corson, who was ordered by his physician to take a year's leave from business worries.

Practically all of the accounts held by Mr. Corson, including the Barber-Greene, C. H. & E. and Heil lines, were taken over by the Wilson Machinery Co. Mr. Corson is well known in the construction equipment field in Denver. He was formerly sales manager of the Western Equipment Co.

P & H Adds New Machine to Big Family of Excavators

The P & H family of excavators has recently been enlarged by the development of a new ½-yard full revolving gasoline or electric machine, mounted on Corduroy traction and is known as Model 204, according to Paul Fitzgerald, Rocky Mountain sales representative.

This machine, which is designed and built by the Harnischfeger Corp., Milwaukee, resembles other P & H models in that it involves the same general principles of construction and operation. This

machine handles a ½-yard dragline or clamshell bucket on a 30-ft. boom and has a rated lifting capacity of 13,000 lbs. at 10 ft. radius, which is 75% of its tipping capacity. It meets a distinct need for a light weight, sturdy, fast, powerful and durable machine, possessing great mobility and ease of control.

Pigg & Son Break Another Record on Alley Paving

Another concrete paving record went by the boards on July 22, when W. F. Pigg & Son, Denver contractors, completed 84 blocks of alley paving in the city of Denver. Seven paving districts were paved by this concern, starting on May 27.

In executing the contracts on these seven paving districts Pigg cut his cost 5 per cent from his last year's low run, while at the same time he increased his output of concrete about 75 per cent. His high run was 1,510 square yards of concrete laid in eight hours, with 250 cubic yards of mixed concrete. His average on the seven districts was slightly less than 1,400 yards per day. Last year he averaged only 750 yards per day.

Two Ford trucks were used in handling the mixed concrete from a Rex 14-E paver located in the street and fed by hand from stock piles. On many days the paver ran over 1,500 yards in 8 hours.

The paver was the same used by the Pigg firm in breaking the state highway paving records on the Fort Morgan and Merino concrete pavement projects. Foreman Butch Steen was in charge of the work.

Charles Pigg stated that the paver is now being used on a \$145,000 curb and gutter contract which Pigg & Son are doing in University Park subdivision for the city of Denver.



MIXER CREW BREAKS RECORD—Showing Rex paver owned by W. F. Pigg & Son, contractors, in action on alley paving job in Denver.

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NASH F W D LIBERTY

HEAVY AVIATION

GENUINE FACTORY PARTS



**LIBERTY
TRUCKS & PARTS COMPANY**

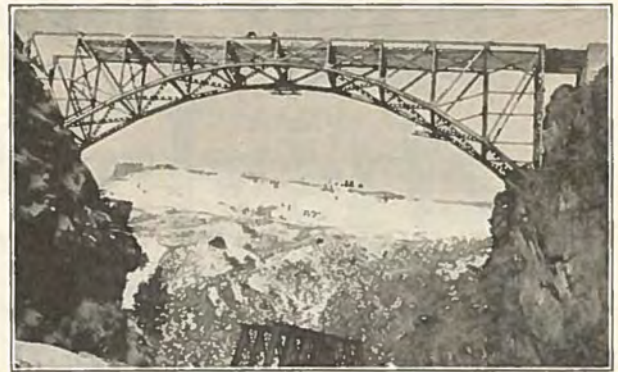
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1532 16th Street, Denver

Exclusive Distributors: Woods Hydraulic Hoists
and Bodies—F W D Trucks



Send your order today—We will ship today



**Bridges and Structural
Steel**

For every purpose

Plans and specifications gladly
sent upon application

Minneapolis Steel & Machinery Co.

**Denver Office, 15th & Wazee
Denver, Colorado**

*County Commissioners
Let us help you Solve
Your Dirt Road Problems----*

The surfacing materials used on the Overland Park track during the recent automobile races held in Denver were prepared and applied as per our direction.

We were asked to produce a mixture of sand and adobe soil that would eliminate, as far as possible, a slippery or "skiddy" surface. After a series of experiments a mixture of these two soils was produced which not only retarded skidding, but compacted in such a manner as not to "dig out" or become rutty and chunky with traffic.

So perfect was the mixture adapted to fast automobile traffic that the racers were driving over the track at a rate of 75 miles per hour, less than one hour after a heavy downpour of rain which fell on the afternoon of July 18.

The world famous drivers declared they had never driven over a faster track or a better surface.

We can solve like dirt road problems for you. Give us a trial.

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BIDS OPENED

Proj.	Length	Type	Location	Low Bidder	Bid Price
254-B	1.087 mi.	Grading	Hot Sulphur Springs-Parshall	Pioneer Construction Co., Denver	\$ 61,071.00
262-E	3.527 mi.	Gravel Surfacing	West of Walsenburg	Pople Bros. Const. Co., Trinidad	24,979.20
262-F	2.007 mi.	Crushed Rock Surface	La Veta Pass-Russell	Central Construction Co., La Veta	22,017.70
275-A	7.008 mi.	Concrete Paving	Gann-Castle Rock	Strange-Maguire Pav. Co., Salt L. C.	314,174.00
275-B	5.334 mi.	Concrete Paving	Sedalla-Castle Rock	J. Fred Roberts & Sons C. Co., Denver	198,771.80
283-B	4.209 mi.	Concrete Paving	Berthoud, south	C. C. Madsen Const. Co., Denver	168,835.74
286-B	19.265 mi.	Grading	Nunn-Wyoming State Line	Jas. Collier, Denver	87,249.00
293-A	114 ft. bridge	Bridge	West of Montrose	Wear Bros., Delta	17,936.75
294-A	2.898 mi.	Gravel Surfacing	Mancos-Cortez	Engler & Teyssler, Durango	23,273.75
295-A	4.456 mi.	Gravel Surfacing	Alamosa-La Jara	Central Const. Co., La Veta	19,861.00
886	1.3 mi.	Grading	Summit Lake-Mt. Evans	Dooling Bros., Denver	26,818.60
267-B	will not be awarded.				

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Length	Type	Location
246-D	5.397 mi.	Gravel Surfacing	Avondale-Fowler
258-C	5.587 mi.	Grading and Gravel Surfacing	West of Gunnison
282-B	2.932 mi.	Gravel Surfacing	Rifle-Craig
286-A	0.549 mi.	R. R. Grade Separation	½ mile north of Nunn
296-A	113 ft. bridge	Concrete Girder Bridge and Approaches	Over Muddy Creek 19 miles south of Pueblo
297-A	2.848 mi.	Grading	Fallsides-DeBeque

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R-3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
271-B	1.5 mi.	Gravel Surf. and Concrete Paving	Portland-Florence
271-D	100 ft.	Concrete Bridge	West of Pueblo
275-C	5 mi.	Concrete Pavement	Husted-Monument
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
278-B	5 mi.	Sand-Clay Surfacing	Hugo, east
279-C	6 mi.	Grading	Shaffer's Crossing
287-A	18 mi.	Grading	Orchard-Wiggins
298-A	2 mi.	Graded	North of Pagosa Springs
540	0.1 mi.	Bridge	West of Bethune

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	58	2-R Div. 2
169-R	Las Animas-Lamar	1.521 mi.	Concrete Pav.	Salle Const. Co.	34,561.00	15	169-R
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	92	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	40	213-A
226-D	Through Platteville	1.155 mi.	Concrete Pavement	Chris. O'Neill	38,226.00	100	226-D
242-A	Grand Junction-Fruita	7.703 mi.	Gravel Surfacing	Dale Hinman	81,255.00	100	242-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssler	44,025.00	60	243-B
246-C	Vineland, east	1.951 mi.	Concrete Pav.	Strange-Maguire Pav. Co.	57,108.00	20	246-C
247-B	Rocky Ford-Swink	2.329 mi.	Concrete Paving	LaNier, Selander & White	71,001.00	2	247-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surf.	Western Const. Corp.	93,533.00	85	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	80	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	60	253-B
254-A	Byers Canon	1.057 mi.	Grading	Pioneer Const. & Eng. Co.	72,408.00	100	254-A
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	85	258-A
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	30	261-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	75	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,213.00	75	262-C
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	50	265-A
266-B	Durango, south	3.181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	10	266-B
267-A	Model-Trinidad	2.954 mi.	Gravel Surfacing	Pople Bros. Const. Co.	25,583.00	100	267-A
270-B	Monte Vista-Alamosa	2.833 mi.	Gravel Surf.	San Luis Valley Const. Co.	15,471.00	80	270-B
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	75	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	55	272-A
272-B	Pueblo-Fowler	13 mi.	Gravel Surfacing	Shields & Kyle	103,768.00	100	272-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	70	277-A
279-B	Morrison-Balleys	5.295 mi.	Grading	Harry H. Brown	85,980.00	60	279-B
281-B	South of Longmont	3.068 mi.	Paving	J. Pinger & Son	102,502.40	85	281-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	10	288-A
288-B	Merino, west	2.519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	50	288-B

Equipment Notes

Operation of the new maintenance outfit designed by the Fagoel Motor Co. of Oakland, Calif., by the State Highway Department has proven a decided success. This machine is designed for the quick repair of concrete roads and the painting of bridges. It is equipped with concrete mixers, compressor for breaking up concrete, and a set of paint sprayers. In charge of the unit is James Edwards, former supervisor of roads in Larimer county.

A brisk sale of concrete mixers, in both large and small sizes, is reported by the Hendrie & Bolthoff Mfg. and Supply Co. This concern handles sales of the Boss mixer, manufactured by the American Concrete Machinery Co. Since the passage of the new truck weight law by the Colorado legislature, the H. & B. concern also is finding a large sale for Black &

Decker truck weighing devices. Agents employed by the various counties have been equipped with these portable scales for the purpose of stopping overloaded trucks on state and county roads.

A record for the sale of trucks in this territory was reported by Richard Carlson, general manager of the Liberty Trucks & Parts Co., during the month of July. Sixteen Liberty and Heavy Aviation trucks were sold to counties in two weeks' time. Mr. Carlson's concern makes a specialty of giving fast service on parts for these two trucks, as well as other Government released trucks. He reports receipt of a fresh stock of Rusco brake lining.

Harry P. Wilson, head of the Wilson Machinery Co., announces that the sale of Buckeye Traction Ditchers would be handled in this territory in the future under the reorganized sales agreement

made with the Western Equipment Co. This ditcher has found great popularity in the Wyoming oil fields, on construction of pipe lines, where heavy duty digging is required.

Smith mixers are finding a ready sale in the Denver territory, especially in the construction field, according to Tom Burnite, sales representative, who reports several sales during the month of July. A recent bulletin issued by the Smith manufacturers shows their mixers in use on a score of the largest projects in the country.

John Fink recently purchased the interest of Harry Scharber in the firm of Fink & Scharber, Rocky Mountain sales agents for the Duplex maintainer and road drags. It was announced that the business would be continued under the firm name of Fink & Scharber for the time being.

You Drive Over *Facts* about Culverts



UNDER the roads, perhaps right in your territory, are the very facts you would like to have about culverts.

It's a simple matter to stop and look—determine for yourself what service the various types of culvert structures are giving—find out which type is proving most economical and dependable.

A large proportion of the most enthusiastic users of ARMCO Culverts are men who secured their facts from the highways.



Every Armco Culvert carries a guarantee of satisfactory service to our customers. Start sending your orders now to a house where for 36 years every customer has been given a square deal.

The R. Hardesty Manufacturing Co.

Established 1888

Denver, Colo.

Missoula, Mont.

ARMCO CULVERTS

Look Under Your Roads

Announcement

The WILSON MACHINERY COMPANY, under the management of Harry P. Wilson, August 1, 1925, will take over from the Western Equipment Company, their warehouse and office, 1936-1938 MARKET STREET, together with their stock of machinery, and conduct all future selling of the products of the following well known manufacturers:

Austin-Western R. Machy. Co.
(Road Machinery)

Western Wheeled Scraper Co.
(Fresnos and Plows)

Byers Machine Co.
(Small Crawler and Truck Cranes)

Heil Company
(Truck Bodies and Hydraulic Hoists)

Cleveland Wheelbarrow Co.
(Wheelbarrows and Concrete Carts)

Koehring Company
(Pavers, Mixers, Cranes)

C. H. & E. Mfg. Co.
(Pumps, Hoists, Saw Rigs)

Construction Machy. Co.
(Concrete Mixers)

Barber-Greene Company
(Loaders and Conveyors)

Metal Forms Corporation
(Road and Building Forms)

BUTLER Steel Bins and Measuring Hoppers

The Wilson Machinery Company

HARRY P. WILSON, President

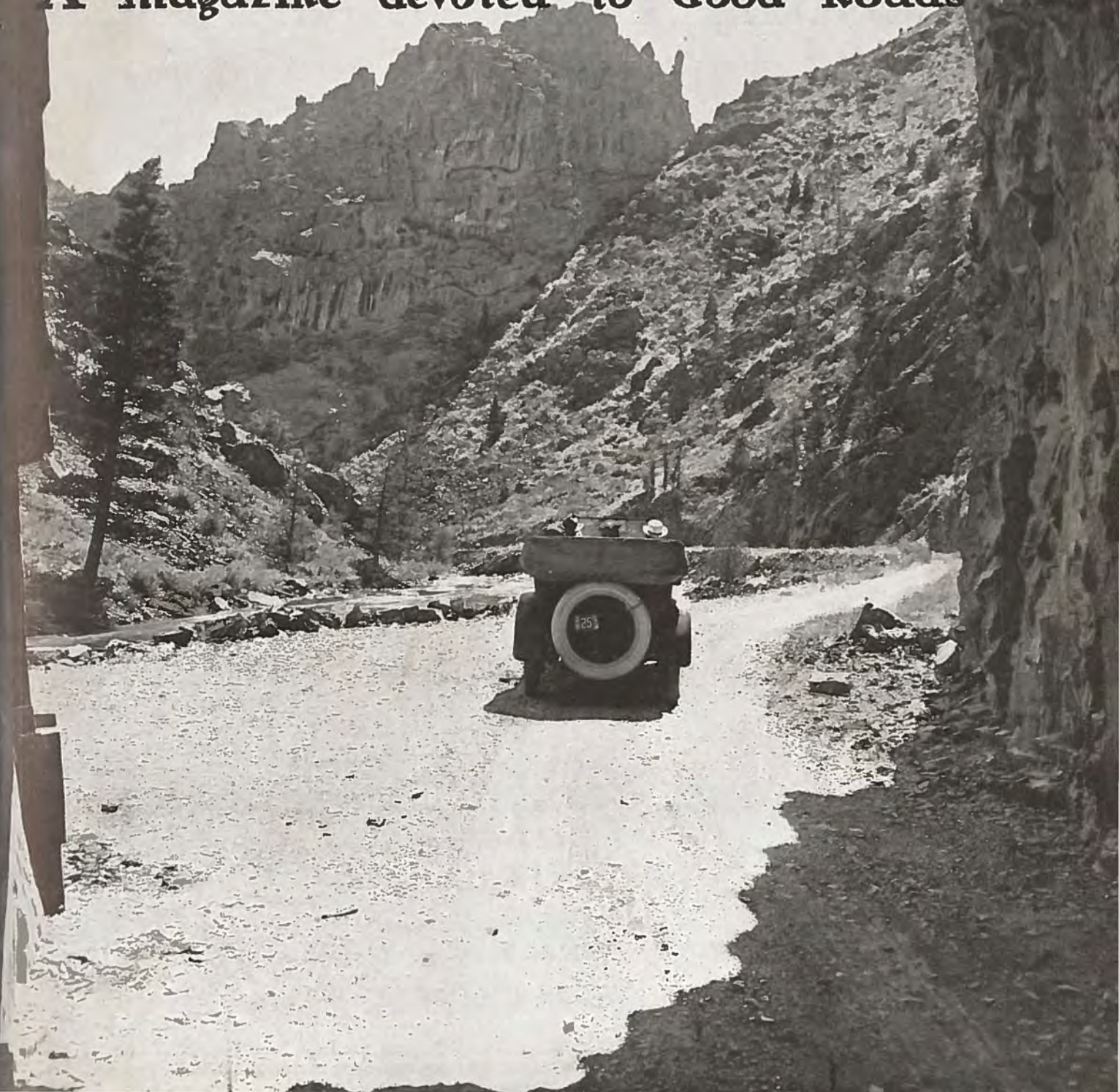
1936-1938 Market Street

Champa 438-439

DENVER

Colorado Highways

A magazine devoted to Good Roads



*Permanent
roads are a
good investment
—not an expense*

How Much Are Traffic Jams Costing You?

Think of the strain on your nerves, and the bodily fatigue as you battle your way through the traffic jam—one of America's 17,000,000 motorists!

Think of the danger of accident—no matter how careful a driver you are.

If you would avoid the traffic jam, you must drive around it—usually on unpaved roads and bumpy streets.

And driving on unpaved highways, instead of on Concrete, takes money right out of your pocket. It greatly increases your tire bills, your gasoline bills and your repair bills.

Nor is that all. You have to pay your share of the cost of untangling traffic jams—with expensive traffic signals and additional police.

“How can these costs be reduced?” you ask.

There is one sure economic way.

Tell your highway authorities you want more roads, and wider ones, paved with Concrete—that you want city streets like country boulevards. Tell them you want plans made now for continuing highway programs, and are ready to back them.



Portland Cement Association

Ideal Building

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*A National Organization
to Improve and Extend the Uses of Concrete*

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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

10 CENTS A COPY. \$1.00 A YEAR.

OUR COVER PICTURE

Poudre from the tunnel—that's the picture on the cover of this month's issue of COLORADO HIGHWAYS. The drive through the Cache La Poudre canon from Fort Collins to the foot of Cameron Pass is one of the most beautiful in the state. A broad, smooth-surfaced highway with easy grades, this drive is truly one of the most beautiful to be found anywhere. With the opening of the highway across Cameron Pass, this highway will become one of the most important, both from a tourist and commercial standpoint, in northern Colorado.

Sauerman
Crescent
Power Drag Scrapers



The mold board action of the cutting edge makes the Crescent Scraper a powerful digger. Will excavate hard packed gravel and large boulders. Requires less power than other types.

Portable plants with hoist mounted on steel trucks made in 1/4, 1/2 and 3/4-yd. sizes. Stationary plants from 1/3-yd. to 8-yd. sizes. All units especially manufactured for scraper service.

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THE HERBERT N. STEINBARGER CO.
Construction Equipment

1642 Wazee Street

Denver, Colorado

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at Our Service*



"Cinders"

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Let "The Other Fellow" Do the Experimenting.

Buy our guaranteed brands of oils and greases. Avoid delay and expense of repairs
by

CORRECT LUBRICATION

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MOTOR OILS

GEAR COMPOUND

TRUCK AND TRACTOR OILS

CUP GREASES

You haven't used the best, if you haven't used our oils. Guaranteed to the last drop.
Shipped in drums to insure cleanliness and avoid waste through leakage.

Sommers Oil Company

DENVER, COLORADO



Current Highway Comment

FEDERAL AID, ANOTHER SIDE

SENATOR HARRELD of Oklahoma told the Albert Pike Highway convention that he expects to continue to urge federal aid for highway construction tho the President is opposed to the principle and a strong campaign is being organized to defeat it in Congress. Mr. Coolidge, we believe, made an exception of highway appropriations when he declared against the so-called 50-50 plan of government financing. He was concerned with the continued usurpation by the federal government of state functions and saw in federal aid not only a false economic policy but broad extension of such encroachment. Declaring against the plan, he made possible exception of what he termed post roads appropriations on the basis that transport is properly a federal problem.

The real fight originates in eastern states, particularly New York and Pennsylvania, which pay a very large percentage of federal taxes and receive back in highway appropriations only a relatively small amount. Federal aid is protested as an injustice, and in considerable measure the complaint is justified. It is wrong to require states in strong financial position to help other states perhaps less able financially in essentially state projects. Highways, however, as the President points, may well be excepted for reasons that are apparent.

When it comes to such states as Colorado another consideration needs to be taken into account and that is public land holdings. One-fifth of this state's area is held by the federal government in forest reserves alone. In addition there are national parks and monuments and other public lands. The state's capacity to finance itself is reduced to the extent that its taxable area is limited and inasmuch as the profits of public lands go to the nation it is proper that the federal government should in some measure make recompense. That is more certainly a matter of justice than the contention advanced by eastern states opposed to financing highway construction other than their immediate own.—*Colorado Springs Gazette.*

COMPLETION of the Denver-Greeley highway was celebrated last week. This was an important event in more ways than one. It means that motorists can now travel between those two points at any time of the year and in any kind of weather with no uncertainty as to the possibility of getting thru. Colorado has been slow in getting her thru highways in good shape, but is gradually accomplishing this. The states of Utah, Idaho, Washington, Oregon, California, Arizona and New Mexico have not neglected these thru highways, realizing their value in getting tourists. While some of those states have no other roads to speak of, not being required to keep up so many miles of highways as Colorado, on the other hand they have not the sources of revenue with which to build and maintain them that we have in this state. Good thru highways in every direction across the state will be a big asset and the sooner they are completed the sooner can the benefits be harvested. The more tourist travel thru this state the better prices will products of truck gardens and farms bring to the producer.—*Windsor Poudre Valley.*

SCIENTIFIC HIGHWAY CONSTRUCTION

THERE is a growing tendency to pay more attention to scientific highway construction. The initial surveying work to secure the best location for a road must be backed up by sound engineering principles applied to the construction of the hard surface itself.

With states, cities and counties spending hundreds of millions of dollars on permanent paving, the taxpayers are learning that they cannot afford cheap and imperfect construction by incompetent and inexperienced contractors.

All over the country, state highways, market roads and city streets that were not built by competent engineers, are breaking up under heavy traffic and in a few years have to be rebuilt.

Permanent highways can only be built with a proper equipment and after the subgrade has been allowed time enough to settle. The contractor should have a good, long record of experience and a reputation at stake. The type of pavement laid should have a time tested service record at a low maintenance cost.—*Fort Collins Courier.*

Cache La Poudre Canon Drive

Completion of Highway Across Cameron Pass Reduces Distance Into North Park Country 100 Miles

SEVENTY-FIVE miles into the heart of the Rockies on high gear! That's the Cache la Poudre Canon highway.

At the start of next summer this par excellent road will be completed over Cameron Pass, reaching an altitude of 10,285 feet, down to Walden, the center of the North Park country, far-famed as a sportsman's paradise.

The completion of this road will mark the realization of a life-long ambition of H. A. (Ted) Edmonds, prominent Fort Collins business man, who died early in 1925. For more than twenty years Mr. Edmonds labored with dauntless perseverance on the building of this highway, which in future years is bound to become one of the most important commercial and scenic roads in the state.

The eastern terminus of the road is Fort Collins, a most attractive, up-to-date city, located in a rich farming community, and now the center of the northern Colorado oil boom. Opening of the pass route will make accessible a virgin terri-

tory rich in agricultural and mineral wealth and abounding in game and fish.

Heretofore the North Park region could only be reached by a long and circuitous route via Wyoming. The new road will reduce the distance from Fort Collins to Jackson county points nearly 100 miles. The Cameron Pass route makes accessible some of the most magnificent scenery in the Rocky Mountains.

Construction of the road through Poudre Canon was started about ten years ago. At that time a gang of convicts from the state penitentiary under the direction of Warden Thomas J. Tynan were encamped near the mouth of the canon, about fifteen miles west of Fort Collins. The convicts worked their way up the canon gradually, blasting and grading out the roadway as they went.

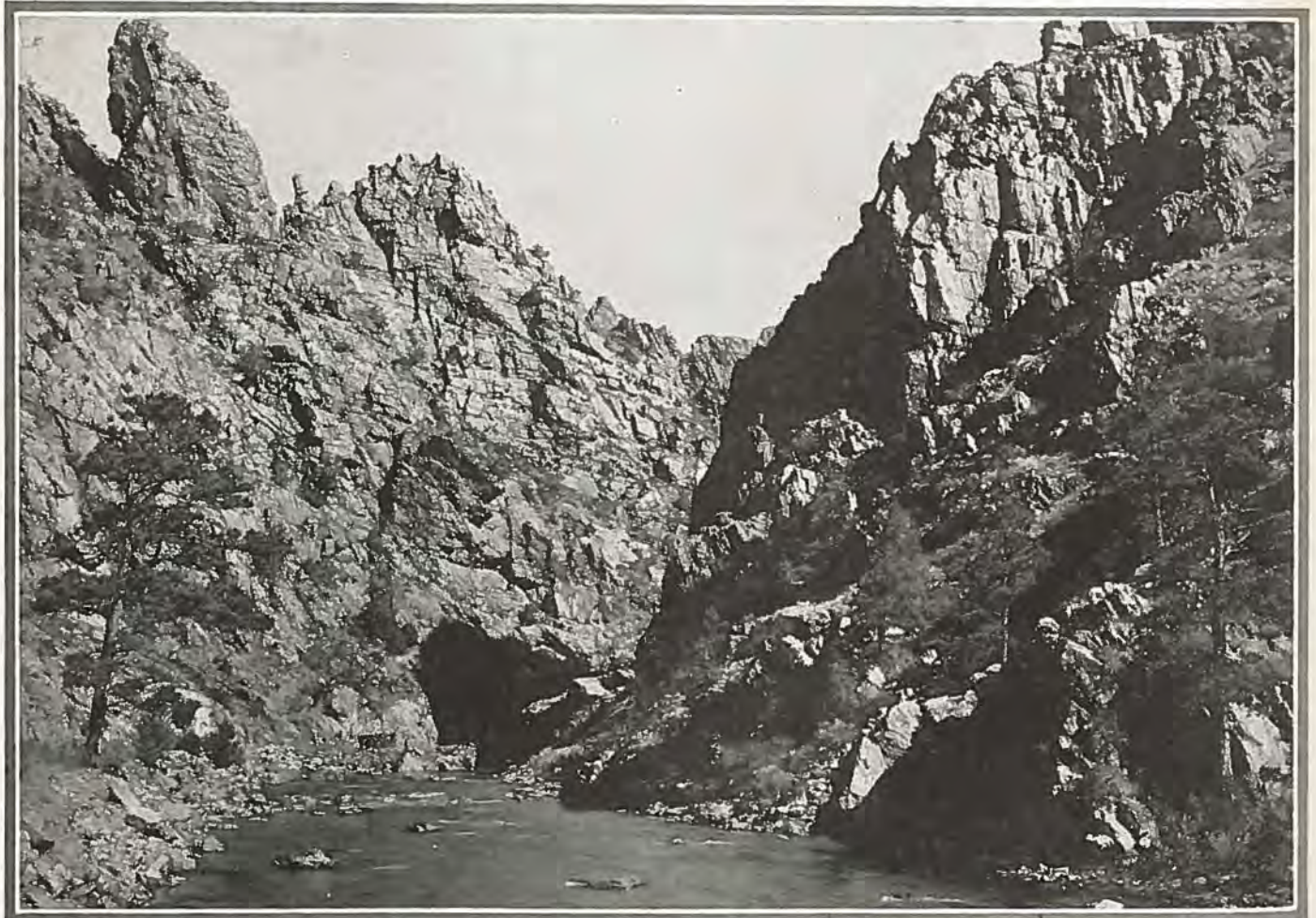
About twenty miles west of Fort Collins is located the "Little Narrows," at which point the canon is only about thirty feet wide. Here the road plunges straight through the heart of a granite

cliff, a distance of nearly a hundred feet.

A little further on, the road enters the "Big Narrows," where it was necessary in several places to suspend the workmen from the top of the cliffs by means of ropes in order to drill dynamite holes for blasting away a footing for the roadway. For several miles the canon is very rough and rocky, the walls high and forbidding. The water dashes through a rocky canon heavily sprinkled with boulders.

With the exception of four miles located on the eastern slope of Cameron Pass, the road is now complete. A crew of 110 men is employed by Larimer county on this uncompleted section. On the summit of the pass a contracting firm recently completed five miles of new roadway under a contract for the U. S. Bureau of Public Roads.

The road for the entire distance is 18 to 30 feet in width. Except on the pass proper the grade is not over four per cent. To Chamber Lake, seventy-five



CACHE LA POUDE HIGHWAY—Showing rugged country thru which Colorado has constructed one of the finest mountain boulevards in the world. It connects with Cameron Pass, which will be open to travel in 1925, eliminating present route via Wyoming into North Park.

miles west of Fort Collins and located at the foot of the pass, the road has been under patrol maintenance for two years. The surface of this part of the road is unsurpassed anywhere in the state.

On the western slope of the pass, from Walden to the summit, there has been constructed during the past three years a splendid highway. This work has been under state and government supervision. Construction of the road has been on a co-operative basis, the state, government and Larimer county contributing the necessary funds each year.

When completed it is estimated that the total cost of construction will approximate three-quarters of a million dollars. Accurate data on the cost is not available because of the varied sources from which the funds were derived and the large number of projects carried out on the road.

Almost the entire stretch of roadway is located in National Forests. To Cameron Pass from Fort Collins it is in Colorado National Forest and from Cameron Pass to North Park is in Arapahoe National Forest. For this reason the state was able to obtain substantial assistance from the government in constructing the road.

In the two "Narrows" extremely heavy rock excavation was encountered. Some of the side-hill cuts run as high as a hundred feet. Hundreds of tons of TNT were used. Convicts were used on all of this work. George Asher was in charge of the construction over the convicts for eight years.

"Build a wide, safe road," were the instructions given to Asher by Warden Tynan when he started the work. And Asher carried out the orders to the letter. It is one of the widest and safest canon roads in the state. The same type of road was constructed over Cameron Pass by the government and county forces. State forces on the west slope also constructed a ten-mile stretch of splendid roadway, which compares favorably with the rest of the route.

Surfaced for the entire distance with gravel and disintegrated granite, the road may be traveled in rainy weather in comfort and safety.

Until the construction of the road through the "Narrows" a few years ago, fishermen traveled to the resorts on the upper Poudre via Pingree Hill, through Livermore and the Forks. This was a tortuous route and was driven only by a few of the most daring motorists.

About 35 miles from Fort Collins, the U. S. Forest Service has constructed a road to Bennett Creek, and a side trip over this, taking the motorist to the top of the canon, gives a rare view of the river and the canon. The Fort Collins Municipal camp ground is located twenty-five miles up the canon at a point called Young's gulch.

Several miles above Rustic, on the main stream is a profile easily discerned by all. It resembles a man's face as though carved out of the wall of the canon and is known as "The Old Man of the Mountains."

The scenic beauty of the canon is appealing for its full length. In places it widens out, giving a wide view, but in others it narrows up, the walls becoming high and precipitous.

From the top of Cameron Pass a rare



SCENES IN POUDBRE CANON—Middle view shows the far-famed Poudre tunnel located at the "Little Narrows." The canon at this point is only thirty feet wide. The tunnel bore is thru solid granite.

view of the North Park country is obtained. From Walden the motorist may continue over Rabbit Ear Pass to Steamboat Springs and on to Salt Lake City, or turn over Willow Creek Pass into Middle Park and on to Denver via Berthoud Pass, or back over Milner Pass on the Fall River road to Estes Park.

The business interests of Fort Collins and Walden plan a big celebration upon the occasion of the opening of the road over the pass. State Senator Nate Warren of Fort Collins is head of the committee in charge of the arrangements.

Colorado Highways Equal to ANY, Says Pueblo Merchant

Colorado's highways are equalled by

few and surpassed by none, according to a statement made by B. F. Scribner of Pueblo, following a 7,000-mile tour of eastern states. His trip took him to Eastport, Maine, and return.

"It is possible to travel from St. Louis to the eastern seaboard on paved roads," he said, "but the only state that has as complete a system of good roads as Colorado is Illinois.

"Some states do not have speed laws but will arrest a man for reckless driving. Whether or not he is driving recklessly is determined by the arresting officer. In other states passengers of a speeding car are held equally responsible with the driver."

Busk-Ivanhoe Tunnel Dedicated

Old Midland Roadbed Designated as "Carleton Highway" by State Board as Memorial to Colorado Springs Capitalist

WITH the opening of the Busk-Ivanhoe tunnel and approaches to automobile traffic another "short-cut" to the western slope is made available.

The distance between Leadville and Glenwood Springs over the Carleton Highway, via the Busk-Ivanhoe tunnel, is 12 miles shorter than over the Tennessee Pass route. It is 81 miles between the two points via the Carleton route, and 93 miles by way of Tennessee Pass.

In making the tunnel available for auto traffic there is also being developed one of the largest irrigation projects launched in Colorado during the last ten years. This phase of the tunnel project is being carried out by A. E. Carleton and associates of Colorado Springs. Water sufficient to irrigate 20,000 acres of land in the Arkansas valley will be diverted through the tunnel from Ivanhoe lake, located at the west portal.

Water from the lake will be carried through the tunnel in a three-foot flume, with a maximum pressure of twenty pounds. Ivanhoe Lake has been raised ten feet by a dam. Raising of the lake has submerged the highway leading from the west portal. A stretch of new roadway a mile in length is being constructed under the supervision of the Carleton interests, who have taken over the work of

rehabilitating the tunnel in connection with the irrigation project. A steam shovel is being used on this work.

While automobiles can now get through the tunnel, there is considerable work to be done on the approaches, and the route will not be in the best of condition until next summer, and the State Highway Department is not advising motorists to take the Carleton route at present.

The tunnel, which is two miles long, including the approaches, has a grade of 1.44 percent. The tunnel averages from 13 feet 8 inches to 19 feet in width, and in addition to the flume there will be drainage ditches at the sides which will carry off the seepage which is continually present. There is a snowshed extending 600 feet on the western end of the tunnel and under ordinary weather conditions the tunnel route can be kept open for six months of the year, starting June 1. The tunnel is reached by a thirty-minute drive out of Leadville over the old Midland right-of-way, which together with the bore, bridges, etc., was presented to the state by the Midland stockholders. The Lake county commissioners have put the highway leading to the tunnel into shape and the western end is also to be cared for by the time the irrigation project has been completed.

One-way traffic rules will probably be

required for the tunnel and some arrangement will be made by the highway department to handle this feature. This can be handled without difficulty. There is no danger of any bad air in the tunnel, as there is a breeze through it at all times.

In case it should be necessary, ventilation chimneys can be installed, according to Maj. L. D. Blauvelt, state highway engineer.

Ivanhoe Lake at the western end of the tunnel, which collects snow run-off and surplus waters not now used, will be diverted through the tunnel to Turquoise Lake at the eastern end, closer to Leadville, there stored and sent down the Arkansas River as needed. Ivanhoe Lake is an eighty-acre lake with splendid streams feeding it and the importance of the water supply is considered of much greater value to the farmers of eastern Colorado than even the desirable tourist and motoring features of the roadway through the tunnel.

A portion of this water was made available this year through the tunnel and sold to the Bessemer ditch, which is an irrigation source for farmers near Pueblo. In view of the water shortage situation on the eastern slope, the development of this new water supply is considered of prime importance for future growth of the farming industry of the Arkansas valley. Un-



VIEW OF EAST PORTAL OF THE BUSK-IVANHOE TUNNEL—This old railroad tunnel, two miles in length, is now being rehabilitated by the State Highway Department for automobile use. The roadbed was presented to the state by A. E. Carleton, Colorado Springs millionaire.

doubtedly a part of this water will be utilized for the rich sugar beet lands near Swink.

In the snowshed above the tunnel are 25,000 acres. An acre of snow will irrigate an acre of land. There is reservoir space on the western slope sufficient to hold all the water for the time when needed. Plans of the Carleton interests include the raising of Turquoise Lake fifty feet. Just above this lake there is another reservoir site three miles long by a mile wide, that probably can be built up to fifty feet.

With the completion of the new dam, Ivanhoe Lake will be a mile long, half a mile in width and thirty feet deep above the tunnel level. From the west end of the lake there is being excavated a three-foot ditch around the side of the mountain to Lyle Creek connecting with Lyle Lake, a body of water as large as the original Ivanhoe Lake. This will be used as a feeder for the lower lake.

It is estimated that the flume through the tunnel will carry 80 second feet of water. The cost of installing the pipe is estimated at \$15,000. The state highway department has expended \$28,000 in rehabilitating the tunnel for a highway and making the connecting links. It will cut two or three hours off of the trip through the state from east to west, because of the easy grades.

The tunnel has a fall of about 10 feet to the mile, descending to the east. It is timbered for about half the distance with 12 x 12 timber, a five-segment arch which is very pointed. The timbers are set from two to three feet apart, most of them in perfect condition. However, considerable timbering was necessary on the west portal.

The grades on the right-of-way average 2½ percent with a maximum of 4 per cent in several short stretches. The average width of the road is sixteen feet. It will be necessary to construct a detour 3,000 feet in length around a short tunnel below Hellgate, which it is estimated will be much cheaper than retimbering the tunnel.

The tunnel connects with Basalt on the western slope of Mount Massive. It will also connect with the Frying Pan country, famous fishing grounds, to Thomasville and other resorts. From Thomasville down to Carbondale the old Midland roadbed is utilized, a perfect mountain highway.

While there are other feats of diversion of waters from one slope to another in the state, the Carleton enterprise is the newest and most important in the last ten years, irrigation engineers state. The entire Midland roadbed, bridges and tunnels was presented to the state highway department when the Midland railroad was junked six or seven years ago.

Board Designates National Roads for Uniform Markers

Fifty thousand miles of roads, forming a network of highways from the Canadian border to the Gulf coast and from the Atlantic to the Pacific, were selected as "United States highways" on August 5 by the joint board of highways meeting at Washington, D. C. Every federal aid highway in the United States is included in the system, which will connect every



CLOSE-UP OF BUSK-IVANHOE TUNNEL—Showing snow shed at east portal, with roadway in splendid condition. A breeze blows thru the tunnel constantly, eliminating possibility of bad air. It is one of the longest highway tunnels in the world.

state capitol and most points of national and sectional interest.

Plans have been formulated for the marking of these highways in such a way that motorists will find little difficulty in following routes from one end of the country to the other. These markers will carry the number of the highway and also the letters "U. S." In addition various danger signs will be posted along the routes.

Under the plan of the board a motorist at any point in the United States can be constantly informed of his location by the markers which will be posted at frequent intervals.

The sub-committee which will complete the work on the system is composed of E. W. James of the bureau of public roads, chairman; F. T. Sheets of Springfield, Ill.; B. H. Piepmeier, Jefferson City, Mo.; R. A. Cline, Salem, Ore.; Charles H. Moorfield, Columbia, S. C.; and Cyrus S. Avery, Oklahoma City, Okla.

Road designations in the Rocky Mountain states include the following:

Colorado—One road from Mack to Grand Junction, Glenwood Springs, Edwards, Leadville, Buena Vista, Colorado Springs, Limon, Burlington, thence into Kansas; another from Grand Junction to Montrose, Salida, Canon City, Pueblo, La Junta and Lamar, thence into Kansas; another from Trinidad to La Junta; another from the northwest border to Maybell, Craig, Hot Sulphur Springs, Denver, Bennett and Limon; another from Cheyenne, Wyo., to Greeley, Brighton and Denver; another from Virginia on the northern border to Fort Collins and Denver; another from Denver south to Colorado Springs, Pueblo and Trinidad; another from Greeley to Fort Morgan, Sterling and Julesburg.

New Mexico—One road from Lordsburg to Aleman and another from Lordsburg to Las Cruces; another from Manuel to Gallup, Bluewater and Clement; another from Springerville, Ariz., thru the Datil National forest in New Mexico to Socorro; another from El Paso, Texas, to Las Cruces, N. M., Aleman, Socorro to near La Joya, Clemente, Albuquerque, Santa

Fe, Chapelle, Las Vegas, thence north to Raton; another from near La Joya to Willard, Fort Sumner and Clovis, with a branch from Albuquerque to Willard; another from Las Vegas to Santa Rosa to Tucumcari, thence into Texas; another from Raton to Des Moines and Clayton; another from El Paso, Texas, to Alamo-gordo thru Mescalero and the Apache Indian reservation to Roswell, Elida and Clovis.

Arizona—From Yuma to Gila Bend, Phoenix, Superior, Globe and Solomonsville to Duncan, from Phoenix, Tucson to Nogales; from Tucson, Tombstone to Douglas; from Douglas toward Lordsburg in New Mexico; from Phoenix and Prescott to Ash Fork; from Java, Calif., to Ash Fork, Flagstaff and Holbrook to Gallup, N. M.; from Holbrook to St. Johns, N. M.; from Flagstaff north to the Grand canon, Kimball and toward Colorado.

Wyoming—From Yellowstone National park to Washakie, Baseline, Hudson, Lander, Rawlins and Laramie to Cheyenne; another from Laramie to the Colorado line; from Rawlins, near Red Desert, either near or thru Green River to Kemmerer, toward Montpelier, Idaho; from Kemmerer to Evanston to Utah line; from Yellowstone National park to Cody, to Greybull; from Frannie to Greybull, Basin, Worland, Thermopolis, Casper, Douglas, Cottonwood, Wheatland and Little Bear to Cheyenne; from Cottonwood to Guernsey, Fort Laramie, Torrington, to Nebraska line; from Worland to Buffalo, Sheridan and Ohlman to Montana line; from a point northwest of the Buffalo-Sheridan road eastward near old Fort Kearney, and thence north of Arvada to Gillette, Moorcroft and Sundance to South Dakota line; from Douglas to Lusk, Newcastle toward Rapid City, S. D.; from Lusk toward Harrison, S. D.

Careless driving is more often the cause of accidents than speed. One driver may be more reckless while driving at 10 miles per hour than another who hits 'er up at a rate of thirty-five. Good brakes are essential to safety.

Ideal Roads of Yesterday and Today

Famous Appian Way Was Ideal in Its Day, But in This Day "The Show Road of the World" Far Surpasses It

IF THE highway engineers of today took Emperor Appius Claudius as their patron saint and followed his ideas about the building of roads, they would soon find themselves enmeshed in the coils of prohibitive costs. But then Mr. Claudius did not have to make any reports to the taxpayers and he used the point of the sword rather than the ballot box to vindicate his good judgment.

Via Appia, the Appian Way, was constructed as a military road from Rome to Papua, a distance of possibly 142 miles, by Emperor Appius Claudius about 312 B. C., and was later extended to Brundisium, a total of about 360 miles, and completed by Julius Caesar. It was known as the "Queen of Roads" and was adorned with statuary and pagan temples. It was built by slave labor, cost not being an item of particular concern, and is said to have been in excellent condition 800 years after its completion. To build a road in the present era exactly like the Appian Way would cost in the neighborhood of \$250,000 a mile. Its inadequate width of 18 feet seems ridiculous as compared with the requirements of modern transport arteries.

When the Lincoln Highway Association conceived the idea of building an Ideal Highway, one which would stand as a model of modern concrete road construction, it realized that the rapidly changing conditions in this country did not permit of the building of a road which would be truly Ideal for more than twenty years. That length of time was settled upon arbitrarily because that is about as far as it seems practical to look

into the future of motor transportation.

The Ideal Section is supreme among highways today, and it marks a courageous effort to find out what a road should be today to accommodate our travel over the highways. These are some of the significant features of the section, "The Show Road of the World"—built of gravel concrete.

The right-of-way is 100 feet wide, and options are held for 25 feet more;

The paving is 40 feet wide with no center obstruction;

The paving material is concrete, 10 inches thick, reinforced with steel;

The coarse aggregate used was washed and graded gravel produced by a commercial plant;

There are no ditches, and the road is drained with tile;

The roadsides have been landscaped and beautified;

There is a pathway for pedestrians;

The highway is lighted for night travel;

The Section contains one bridge and one culvert;

The paving cost \$64,000 a mile;

The entire project cost \$193,650;

The length of the section is slightly more than a mile and a third;

The Lincoln Highway Association paid \$130,000 of the cost.

In a road which was inspired by a desire to find the ideal, washed and graded gravel was selected from all the other coarse aggregates as being the "ideal" coarse aggregate.

It is safe to say that Appius Claudius, when he built the Appian Way some twenty centuries ago, had no thought

that it would be held as the model for two thousand years. His reasons for the great undertaking were those of military necessity and had nothing to do with posterity. He recognized the need of good roads, but only from one standpoint—that of transporting warriors and engines of battle.

After remaining for twenty centuries as the example and inspiration for all road builders, the Appian Way is today in the discard. It has remained for the twentieth century to antiquate it with a perfectly smooth gravel concrete highway, to place it on the same plane with other engineering work in those ancient days when Julius Caesar was looked upon as a boy with a great future and the Roman Empire was in the heyday of its glory.

Built of heavy cobblestones, whose rough surfacing is the enemy of fast transportation, we see at once that the motor car proved the undoing of that other Ideal Section of Highway, the Appian Way. Slow-moving road vehicles of other days found no fault with its ancient cobbles. And so, with the modern demand for a smooth, hard surface, we are forced to abandon the ideals of Appius Claudius and to turn to the Ideal Section of the Lincoln Highway for our text-book on highway construction.

The modern Show Road of the World, built of gravel concrete, will live for many years; its specifications and its unique and practical features of construction will be copied not only by the highway engineers of this country, but in foreign countries also.—National Gravel Bulletin.



NEW CONCRETE MAINTENANCE MACHINE OPERATED BY STATE—This outfit is moved from one section of the state to another, making repairs on concrete pavements and bridges. It is equipped with concrete mixers, paint brushes and jack-hammers.

"Gas" Tax Diverted

The gasoline tax yielded \$80,000,000 last year, but only 60 per cent of this sum was applied to road work under supervision of the state highway departments. Of the \$9,100,000 gasoline tax in Pennsylvania, \$6,800,000 went into the "general fund." Such instances are all too common. All money that comes from taxes on motor vehicles and the gasoline consumed by them should obviously be used to build and maintain roads and streets. "Obviously," we say, yet in not half of the 35 states that taxed gasoline in 1924 was the entire tax turned over to the state highway departments.

All men interested in highway improvement, and especially the automobile associations, should begin vigorous effort to stop the flow of gasoline taxes into "general funds" or other channels that divert the money from the highways.

We quote the following from an editorial article in the Macon (Ga.) News:

"The American Automobile Association speaks out boldly in condemnation of the growing practice on the part of the states of diverting the gasoline tax money to purposes other than that of building and maintaining highways.

"It also calls attention to the tendency to increase the amount of this tax by one cent a gallon, whenever a little more money is needed, until now the rate is five cents in South Carolina and four cents in Arkansas, Nevada and North Carolina.

"As to the matter of diversion, we are told that seven states—including Georgia—have directed a total of \$11,000,000 into other channels.

"The inquiry into the diversion of the tax into wrong channels was made by A. M. Loomis of the Washington office of the National Grange who is also a member of the advisory board of the D. C. Division of the A. A. A.

"Admitting the equitable character of the tax which has now been adopted by forty-three states and the District of Columbia, Mr. Loomis, who is a nationally known expert on taxation, foresees the destruction of the gas tax structure unless two tendencies are forthwith discontinued. These tendencies are:

"First, misappropriation of the tax to other than road purposes.

"Second, the disposition to pyramid the tax by adding a cent or two at a time, revealing a well developed case of 'Gimmies' in the legislatures.

"I wonder if in tapping the golden flow of cash for the purchase of power, we have not opened the door to a new kind of 'gold digger,'" Mr. Loomis warned.

"In Pennsylvania a total of \$6,800,000 of the \$9,089,541 raised from the tax went into the 'general fund' of the state.

"A part of it went back to the counties where it was raised, but nothing so far as the records show went to the fund administered by the state highway department.

"In Maryland \$476,000 failed to reach the state highway department; in Texas where roads and how to build them is the outstanding problem, \$970,000 of the \$3,892,769 raised by the tax was put into the free school fund.

"North Dakota put every cent realized



DENVER OILS BEAR CREEK CANON—As an experiment to eliminate the dust nuisance in Bear Creek canon, a part of the Denver Mountain Parks system, the City and County of Denver has oiled one and one-half miles of the roadway west of Starbuck. The work was supervised by F. J. Altwater, city highway commissioner. Mr. Altwater is the gentleman in the center picture wearing a straw hat. Standing at his right is W. T. Murnan, his chief assistant.

from the gas levy into the general fund.

"South Carolina turned into the general fund \$729,000 or one-third of the entire tax.

"Montana went South Carolina one better and put 40 per cent of the tax into the general fund of the state.

"Georgia put one-third or a little over a million into the general fund while New Mexico, though she put almost all the gas tax into new roads, kept a little balance for the development of fish.

"What we want to do here in Georgia is to use this fund, without any future diversion, for the floating of a bond issue and then get to work in real earnest."

Stamey-Mackey Construction Co., who have four miles of heavy grading on Independence Pass, are ahead of schedule on the work. This is one of the heaviest construction jobs in the state at present. It is being done for the U. S. Bureau of Public Roads. The Stamey-Mackey concern have three other contracts with the government, one each on Tennessee Pass, Fremont Pass and at Echo Lake, all now under construction.

The Pioneer Const. Co. have started on their second contract in Byers Canon, located near Hot Sulphur Springs. Joe Gordon is in charge of the work.

Federal Aid Law Under Fire

Large Eastern States Launch Attack on Principal of Act — Western Road Men Start Counter Offensive

FEDERAL Aid for highways is under fire. Much of the opposition comes from eastern states. Some eastern Senators want Federal Aid discontinued. Even President Coolidge is only lukewarm on the subject and in his Memorial Day address said Federal Aid for highways had led to some extravagance. But the opposition does not all come from the East; there is some of it here in Indiana. One Indianapolis newspaper has been running editorials advocating doing away with federal aid for highways.

A very good general statement on the subject is the following, just issued by the American Automobile Association:

"The question of Federal Aid for highways, the necessity or lack of necessity for it has caused considerable discussion among Federal aid State Officials during the past year. It is believed that in the minds of various Eastern Statesmen there is a belief that the Federal Aid program, as carried out under the direction of the United States Bureau of Public Roads, should be abolished.

"The first definite attack upon the Federal Aid system was made by Governor Ritchie of Maryland at the recent Conference of Governors held at Poland Springs, Maine. Governor Ritchie's contention was that in view of the fact that the amount paid by the States to the Federal Government is based on income, those States paying heavy income taxes receive back a smaller percentage in Federal Aid than do the States whose income taxes are smaller. This he claimed placed the larger States at a distinct disadvantage. To prove his contention Governor Ritchie presented figures to show that Nevada receives in Federal Aid 216 per cent of the funds paid by the State into the Federal Treasury while New York State gets back less than 1 per cent of the taxes it pays. He also showed that three other States, New Mexico, North Dakota and South Dakota, receive more than they pay.

"That this form of argument is one-sided and basically unsound is readily appreciated. It is true that Nevada gets back more in Federal Aid than it pays in income taxes but it is also true that approximately 90 per cent of Nevada is Government owned land and that the benefit from the highways in that state is enjoyed mostly by tourists from all over the country, a great majority of them coming from the East. This latter fact is also true of New Mexico, South Dakota and North Dakota. It is not the policy of the Bureau of Public Roads to approve any road construction that would only benefit one particular community but rather to approve and encourage the construction of highways which will, through their connections, make available to the national public the means of intercourse both social and commercial between all the states of the United States. This is essentially a Federal function and should as such be left undisturbed.

"In this day of development of automotive transportation with its accompanying commercial possibilities the ben-

efited within the boundaries of any one state. A policy that would result in building a wall around any one state or group of states should be discouraged for, as Governor Whitfield of Mississippi said, state lines have long been obliterated in industrial matters and the development and maintenance of highways with their consequent promotion of commerce are the concern of the nation.

"Why the idea should prevail that percentage of distribution of Federal Aid should be based upon the amount of income tax paid into the General Fund of the Federal Government is a matter for wonderment. In citing the cases New Mexico and Nevada apparently consideration was not given to the fact that much of the income derived from the natural resources of those two states is received by eastern capitalists and reflected in the income tax returns of their place of residence.

"It seems selfish that because of the fact that some of the Eastern States have nearly completed their construction program they should be in favor of discontinuing Federal Aid. The Federal Good Roads Bill authorizing appropriations for 1926-27 met with the opposition of five Senators when it came up for vote in the upper Chamber. Two of these Senators were from Pennsylvania. Senator Reed of that state offered an amendment to reduce the authorization considerably. He said, 'The sooner the Federal Government gets out of the business of state subsidies the better for all concerned.' A statement such as this can only lead to the belief that very little thought had been given to the subject before an opinion had been expressed. Pennsylvania occupies a most favorable position to benefit by a broad national good roads program. That state produces ten per cent of all the crushed stone used for paving roads, eleven per

cent of all paving sand, and twenty-two per cent of the cement. Through its extensive petroleum refining industries it produces nine per cent of the gasoline. Pennsylvania also produces thirty-nine per cent of all the steel produced in the United States, one-tenth of which is used in the construction of motor vehicles.

"Other examples could be drawn to emphasize the fact that the development of good roads through Federal Aid does not benefit any one State but rather reacts to the benefits of all the states concerned. There is, however, better grounds for argument. No reasonable-minded person can deny the part the railroads have played in the growth of our country, nor fail to recognize the fact that in the United States railroad transportation has reached its highest development. This development has been due in no small part to the co-operation and aid extended by the Federal Government. When it is realized that the United States Government gave to the railroads of the country 158,293,736 acres of land from the public domain as an encouragement to transportation development the present amount of Federal Aid for the construction of highways is little enough to expect as encouragement for the development of our newest infant in the transportation field.

"This Association has repeatedly taken the stand in favor of the Federal Aid program, the latest expression of sentiment being advanced at the Annual Meeting held in Atlantic City, June 29th-30th, when it was unanimously voted through resolution that the Federal Aid policy should be continued.

"It will be an action to be deplored if the Federal Aid program is discontinued before highways in the undeveloped sections of the country, notably in the south and west, can be constructed under this plan."—Indiana Highways and Motors.



SNOW SCENE TAKEN ON MAY 15—This shows how the Silverton-Eureka road looked on this date. A measuring stick showed 10 feet of snow on each side of the

With State Road Builders

Colorado's State Highway System Totals 9,928 Miles

Statistics compiled by the state board of immigration show at least \$75,000,000 was expended in highway construction throughout Colorado during the fifteen-year period from 1910 to 1924 inclusive.

This huge amount of money was spent in the construction of new roads, maintaining highways already built, and in administration and engineering expenses, according to Tolbert R. Ingram, deputy immigration commissioner, who gathered the data.

At the beginning of 1925 Colorado had 68,135 miles of state and county roads, records of the federal bureau of roads disclose. This does not include streets and roads in incorporated towns and cities.

Of the total mileage, 9,928 miles comprise what is known as state highways, and 29,207 miles the county highways.

During 1924 the total cost of highway construction and maintenance in the state was about \$11,538,804. Deputy Commissioner Ingram states. Of this amount the counties expended \$5,432,820; the state highway department, including Federal aid, received \$5,664,567; and the forest service \$441,417.

Platteville Dedicates New Paved Road With Festival

On August 14 the citizens of Platteville celebrated the opening of the last mile of concrete laid between Denver and Greeley, completing the ribbon of pavement between these two points.

The paving of this road was started in 1915, with short strips added each year until the entire stretch was completed. Since the road was paved traffic has increased nearly 500 percent, according to figures compiled by the State Highway Department.

Gov. Clarence J. Morley, Mayor L. S. Birkle of Platteville and Dan Straight, Weld county commissioner, were among the speakers. The Greeley band furnished music for the occasion.

Big Outfit Moves Dirt on Road Work North of Nunn

An outfit of 75 teams is being employed by Lane brothers, sub-contractors for James Collier of Denver, on the nineteen-mile grading project located between Nunn and the Wyoming state line.

In this stretch of roadway all but two miles is on a new survey line. Where the old road is used it is to be brought up to grade and widened. The new road will be several miles shorter than the old route, and will greatly reduce snow hazards during the winter months.

At present the work consists only of grading, but plans of the State Highway Department call for gravel surfacing in

the near future. When this is done it will give a good all-year road from Denver to Cheyenne.

On completion of the present project all crossings of the main-line railroads will be eliminated.

Springs Contractor Is Low Bidder on Two Road Jobs

Ed. Honnen, Colorado Springs contractor, was the successful bidder on two out of three projects contracted by the State Highway department on August 13.

Bidding \$40,188 in competition with two other bidders, Mr. Honnen went under the state engineer's estimate of \$49,493.50 by \$9,305.50 for the construction of a 113-foot concrete girder bridge with graded approaches over Muddy creek, nineteen miles south of Pueblo on state highway No. 1, in Pueblo county.

In a grading and gravel surfacing project, 5½ miles long, west of Gunnison, Colo., on state highway No. 6, in Gunnison county, Mr. Honnen bid \$60,100.80. The engineer's estimate for this project was \$65,095.50.

C. A. Switzer of Denver was the lowest of three bidders on the grading project, 2.8 miles long, extending easterly toward DeBeque, Colo., from a point approximately 2 miles east of Palisades, in Mesa county. His bid was \$17,810, while the estimate of the engineer was \$17,826.

Capitol City Takes Lead in Marking National Highways

"It's easier to get lost in a city than on the deserts of Utah and Nevada on the Victory highway," Ben Blow, manager of the Victory Highway association, who has driven from coast to coast along the route of the memorial transcontinental motor highway many times, insists. Blow has never been lost in the desert, altho he cruised it before the Victory highway was laid out. But he has had a good deal of trouble in large cities, following the route thru dense business districts where in the nature of things, highway markers have been impossible.

Blow believes that a solution of this difficulty has been found, and several cities along the line of the Victory highway are trying the new system out.

It is the marking of the highway on the curbs of paved streets. Curb markings do not interfere with traffic or vision, yet they are easily seen by the motorist.

Denver was the first city on the line of the Victory highway to see the possibilities of the plan. Denver has marked the Victory highway from its eastern to its western limits, by stenciling the curbs of the streets. The markings extend thru the civic centers of the city, where no other type or markers or signs has ever been permitted.

New Highway on Grand Mesa Open to Motor Car Travel

Grand Mesa Skyway is open to the world. This word comes from the Grand Junction Sentinel. The road was officially opened to traffic on August 26, when a score of cars made the trip to the top of the world's largest flat top mountain, motoring to Alexander Lakes.

They found the road in splendid condition. Plans are now afoot for several of the towns surrounding the Grand Mesa to hold a rousing barbecue-Rodeo celebration in the near future.

The Grand Mesa is one of the most important scenic attractions on the western slope.

U. S. Bureau Lets Contract For Work on Tennessee Pass

A contract for the improvement of approximately seven miles of the Tennessee Pass highway between Mitchell and Pando has been let to the Stamey-Mackey Construction Co. of Colorado Springs, by the U. S. Bureau of Public Roads.

Completion of this stretch of road will provide a practically new highway eighteen feet in width from the top of Tennessee Pass to Red Cliff. The Wells Construction company is working on the lower end of the stretch, while the San Luis Valley company has a contract on the upper end.

The Stamey-Mackey project will cost approximately \$65,000, including several small bridges and other drainage structures. H. Z. Mitchell is foreman on the job. With favorable weather conditions the contractors expect to complete the entire work by the end of the fall. One hundred and fifty working days are estimated as the time in which the work can be finished.

Most of the work consists of heavy grading. Work has already been started. A steam shovel will be used as a part of the equipment.

Bus Runs 10 Months on West Slope Without Using Chains

That the roads are a good deal better between Montrose and Grand Junction than they used to be is demonstrated by the fact that the passenger bus operating between these two towns has required the use of chains only once in ten months' time. The bus makes daily trips, according to the Montrose Press.

This is a splendid record, to be able to run these big busses almost a year, two trips each way a day, without chains. It shows conclusively the roads have been wonderfully improved. They are being graded in such a way that the water runs off and leaves them dry except when extra heavy rains fall.

F. A. PROJECT NO. 297-A, MESA COUNTY, LOCATED BETWEEN PALISADES AND DE BEQUE

Item No.	ITEM	Unit	Quantity	Engineer's Estimate State Highway Dept. Denver, Colo.		Brown & Smith Conifer, Colo.		E. H. Honnen P. O. Box 391 Colorado Spgs., Colo.		K. V. Johnson 1744 Glenarm Denver, Colo.		Blackwell & Butler Grand Jct., Colo.		Winterburn & Lumsden Grand Jct., Colo.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	1.5	\$100.00	\$ 150.00	\$ 50.00	\$ 75.00	\$ 80.00	\$120.00	\$ 30.00	\$ 45.00	\$ 30.00	\$ 45.00	\$ 65.00	\$ 97.50
2	Excav. Common	Cu. Yd.	24,500	.35	8,575.00	.45	11,025.00	.49	12,005.00	.52	12,740.00	.68	16,660.00	.31	7,595.00
3	Excav. Rock	Cu. Yd.	15,700	1.10	17,270.00	1.05	16,485.00	.49	7,693.00	.85	13,345.00	.68	10,676.00	1.09	17,113.00
4	Excav. Com. Borrow	Cu. Yd.	7,800	.35	2,730.00	.45	3,510.00	.49	3,822.00	.45	3,510.00	.68	5,304.00	.31	2,418.00
5	Excav. Rock Borrow	Cu. Yd.	2,200	1.10	2,420.00	1.05	2,310.00	.49	1,078.00	.85	1,870.00	.68	1,496.00	1.25	2,750.00
6	Str. Exc. Dry Com.	Cu. Yd.	300	.50	150.00	.75	225.00	1.50	450.00	1.00	300.00	1.00	300.00	1.00	300.00
7	Str. Exc. Wet Com.	Cu. Yd.	10	1.00	10.00	1.50	15.00	1.50	15.00	1.00	10.00	1.00	10.00	3.00	30.00
8	Str. Exc. Dry Rock	Cu. Yd.	300	2.00	600.00	1.50	450.00	1.50	450.00	3.00	900.00	1.00	300.00	2.25	675.00
9	Str. Exc. Wet Rock	Cu. Yd.	260	4.00	1,040.00	2.50	650.00	1.50	390.00	5.00	1,300.00	1.00	260.00	5.50	1,430.00
10	Overhaul Exc. and Bor.	St. Yd.	29,000	.02	580.00	.02	580.00	.02	580.00	.02	580.00	.02	580.00	.02	580.00
11	Select Surf. Material	Cu. Yd.	1,100	1.00	1,100.00	1.25	1,375.00	.60	660.00	.75	825.00	.55	605.00	2.40	2,640.00
12	Concrete Cl. A	Cu. Yd.	399	22.00	8,778.00	23.00	9,177.00	18.00	7,182.00	18.00	7,182.00	22.00	8,778.00	22.00	8,778.00
13	Concrete Cl. B	Cu. Yd.	38	21.00	798.00	24.00	912.00	21.00	798.00	18.00	684.00	22.00	836.00	22.00	836.00
14	Reinforcing	Lb.	36,500	.075	2,737.50	.065	2,372.50	.07	2,555.00	.07	2,555.00	.08	2,920.00	.0798	2,912.70
15	15" C. M. P. Culvert	Lin. Ft.	350	2.00	700.00	2.00	700.00	2.00	700.00	1.80	630.00	1.50	525.00	1.72	602.00
16	18" C. M. P. Culvert	Lin. Ft.	164	2.25	369.00	2.45	401.80	2.50	410.00	2.00	328.00	2.00	328.00	1.94	318.16
17	24" C. M. P. Culvert	Lin. Ft.	148	3.00	444.00	3.55	525.40	3.00	444.00	3.00	444.00	2.50	370.00	2.92	432.16
18	16" Cast Iron Pipe	Lin. Ft.	53	7.00	371.00	11.00	583.00	3.00	159.00	12.00	636.00	3.50	185.50	7.60	402.80
19	18" Cast Iron Pipe	Lin. Ft.	32	7.50	240.00	12.75	408.00	4.00	128.00	10.00	320.00	4.50	144.00	7.75	248.00
20	Coal Hole Ring and Cover	Lump Sum			11.00	(No Bid)			15.00		12.00		12.00		1,500.00
21	Cable Guard Fence	Lin. Ft.	120	1.00	120.00	.90	108.00	.70	84.00	.70	84.00	1.00	120.00	.90	108.00
22	Rip Rap	Cu. Yd.	300	1.00	300.00	3.50	1,050.00	1.50	450.00	3.00	900.00	3.00	900.00	5.85	1,755.00
Total					\$49,493.50		\$52,937.70		\$40,188.00		\$49,200.00		\$51,354.50		\$53,521.32

F. A. PROJECT NO. 258-C, GUNNISON COUNTY, LOCATED WEST OF GUNNISON

Item No.	ITEM	Unit	Quantity	Engineer's Estimate State Highway Dept. Denver, Colo.		Shields & Kyle Pueblo, Colo.		A. R. Mackey Sterling, Colo.		K. V. Johnson 1744 Glenarm Denver, Colo.		E. H. Honnen P. O. Box 391 Colorado Spgs., Colo.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	9.1	\$ 25.00	\$227.50	\$ 80.00	\$728.00	\$ 40.00	\$364.00	\$ 40.00	\$364.00	\$ 80.00	\$728.00
2	Excav. Common	Cu. Yd.	39,600	.35	13,860.00	.30	11,880.00	.34	13,464.00	.60	23,760.00	.32	12,672.00
3	Excav. Rock	Cu. Yd.	15,400	1.30	20,020.00	1.20	18,480.00	1.29	19,866.00	1.00	15,400.00	1.20	18,480.00
4	Excav. Borrow	Cu. Yd.	1,700	.35	595.00	.30	510.00	.34	578.00	.50	850.00	.30	510.00
5	Overhaul Exc. & Bor.	St. Yd.	53,000	.02	1,060.00	.02	1,060.00	.02	1,060.00	.02	1,060.00	.02	1,060.00
6	Str. Exc. Dry Com.	Cu. Yd.	200	.60	120.00	1.00	200.00	.45	90.00	1.00	200.00	.75	150.00
7	Str. Exc. Wet Com.	Cu. Yd.	300	1.50	450.00	3.00	900.00	1.00	300.00	2.00	600.00	2.00	600.00
8	Str. Exc. Dry Rock	Cu. Yd.	100	4.00	400.00	2.00	200.00	.30	30.00	3.00	300.00	2.00	200.00
9	Str. Exc. Wet Rock	Cu. Yd.	50	5.00	250.00	4.00	200.00	.30	15.00	5.00	250.00	2.50	125.00
10	Gravel Surface	Cu. Yd.	5,000	1.75	8,750.00	2.00	10,000.00	1.90	9,500.00	1.60	8,000.00	1.50	7,500.00
11	Overhaul Surface	Yd. Mi.	4,000	.30	1,200.00	.25	1,000.00	.25	1,000.00	.30	1,200.00	.30	1,200.00
12	Concrete Cl. A.	Cu. Yd.	222	23.00	5,106.00	*22.00	4,884.00	25.50	5,661.00	22.00	4,884.00	20.00	4,440.00
13	Concrete Cl. B.	Cu. Yd.	250	22.00	5,500.00	18.00	4,500.00	23.50	5,875.00	22.00	5,500.00	20.00	5,000.00
14	Reinforcing	Lb.	19,900	.08	1,592.00	.075	1,492.50	.0525	1,044.75	.07	1,393.00	.07	1,393.00
15	15" C. M. P. Culvert	Lin. Ft.	1,102	2.00	2,204.00	1.40	1,542.80	1.75	1,928.50	1.75	1,928.50	1.75	1,928.50
16	18" C. M. P. Culvert	Lin. Ft.	308	2.25	693.00	1.65	508.20	2.20	677.60	2.00	616.00	2.10	646.80
17	24" C. M. P. Culvert	Lin. Ft.	92	3.00	276.00	2.50	230.00	2.90	266.80	2.50	230.00	3.00	276.00
18	Timber Snow Fence	Panel	90	9.00	810.00	11.00	990.00	9.00	810.00	11.00	990.00	9.00	810.00
19	Cable Guard Fence	Lin. Ft.	1,000	.70	700.00	1.25	1,250.00	.65	650.00	.75	750.00	.70	700.00
20	Move Wire Fence	Lin. Ft.	11,000	.03	330.00	.04	440.00	.015	165.00	.03	330.00	.03	330.00
21	Remove 9 Structures	Lump Sum			100.00		63.00		100.00		360.00		150.00
22	Dry Rub. Masonry	Cu. Yd.	17	6.00	102.00	3.50	59.50	3.00	51.00	6.00	102.00	4.50	76.50
23	Rip Rap	Cu. Yd.	750	1.00	750.00	3.50	2,625.00	.75	562.50	3.00	2,250.00	1.50	1,125.00
Total					\$65,095.50		\$63,743.00		\$64,509.15		\$71,317.50		\$60,100.80

F. A. PROJECT NO. 296-A, PUEBLO COUNTY, LOCATED 19 MILES SOUTH OF PUEBLO ON ROAD NO. 1, OVER MUDDY CREEK

Item No.	ITEM	Unit	Quantity	Engineer's Estimate State Highway Dept. Denver, Colo.		Thos. Mishou Con. Co. 1712 E. 5th St. Pueblo, Colo.		Platt Rogers, Inc. Thatcher Bldg. Pueblo, Colo.		Salle Const. Co. 6 Amhurst Bldg. Pueblo, Colo.		Lee F. Williams 347 Thatcher Bldg. Pueblo, Colo.		P. C. Croll 614 Jackson St. Pueblo, Colo.	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Exc. Common	Cu. Yd.	100	\$.30	\$ 30.00	\$.325	\$ 32.50	\$.35	\$ 35.00	\$.50	\$ 50.00	\$.40	\$ 40.00	\$.80	\$ 80.00
2	Borrow Exc.	Cu. Yd.	10,600	.30	3,180.00	.325	3,445.00	.35	3,710.00	.33	3,498.00	.38	4,028.00	.50	5,300.00
3	Overhaul	St. Yd.	5,000	.02	100.00	.02	100.00	.02	100.00	.02	100.00	.02	100.00	.02	100.00
4	Str. Exc. Dry Com.	Cu. Yd.	150	.50	75.00	.55	82.50	1.00	150.00	1.00	150.00	1.00	150.00	.80	120.00
5	Str. Exc. Wet Com.	Cu. Yd.	400	1.50	600.00	2.75	1,100.00	2.50	1,000.00	4.00	1,600.00	4.00	1,600.00	3.00	1,200.00
6	Concrete Cl. A	Cu. Yd.	315	21.00	6,615.00	25.50	8,032.50	24.50	7,717.50	29.00	9,135.00	34.00	10,710.00	24.00	7,560.00
7	Reinforcing	Lb.	52,600	.07	3,682.00	.065	3,419.00	.065	3,419.00	.075	3,945.00	.065	3,419.00	.07	3,682.00
8	Untr. Timber Piling	Lin. Ft.	2,160	1.00	2,160.00	.80	1,728.00	1.10	2,376.00	.90	1,944.00	1.00	2,160.00	.70	1,512.00
9	Cable Guard Fence	Lin. Ft.	200	.60	120.00	.65	130.00	.80	160.00	.60	120.00	1.00	200.00	1.00	200.00
10	Timber Headers	M.B. Ft.	0.4	60.00	24.00	55.00	22.00	65.00	26.00	80.00	32.00	80.00	32.00	80.00	32.00
11	Bronze Name Plates	Each	2	45.00	90.00	50.00	100.00	15.00	30.00	25.00	50.00	50.00	100.00	25.00	50.00
12	Remove Old Bridge	Lump Sum			200.00		100.00		250.00		75.00		100.00		150.00
13	Crush. Rock Surface	Cu. Yd.	460	2.00	920.00	2.50	1,150.00	1.45	667.00	1.30	598.00	6.00	2,760.00	3.00	1,380.00
14	Overhaul Surface	Yd. Mi.	100	.30	30.00	.25	25.00	.25	25.00	.25	25.00	.30	30.00	.25	25.00
Total					\$17,826.00		\$19,466.50		\$19,665.50		\$21,322.00		\$25,429.00		\$21,391.00

No.	C. A. Switzer 4312 Zenobia St. Denver, Colo.		Knollman & Grandall 701 S. Broadway Denver, Colo.		Pueblo Bridge & Con. Co. Pueblo, Colo.		Chas. J. A. Lindstrom 1111 Lincoln Pl. Boulder, Colo.	
	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	\$.30	\$ 30.00	\$.35	\$ 35.00	\$.50	\$ 50.00	\$.35	\$ 35.00
2	.30	3,180.00	.25	2,650.00	.45	4,770.00	.35	3,710.00
3	.02	100.00	.02	100.00	.02	100.00	.02	100.00
4	.50	75.00	5.00	750.00	1.25	187.50	.50	75.00
5	3.00	1,200.00	5.00	2,000.00	5.00	2,000.00	3.00	1,200.00
6	22.00	6,930.00	31.00	9,765.00	32.00	10,080.00	24.00	7,560.00
7	.05	2,630.00	.07	3,682.00	.065	3,419.00	.06	3,156.00
8	1.00	2,160.00	1.10	2,376.00	1.25	2,700.00	.85	1,836.00
9	.60	120.00	.80	160.00	.80	160.00	.60	120.00
10	50.00	20.00	80.00	32.00	100.00	40.00	70.00	28.00
11	45.00	90.00	25.00	50.00	40.00	80.00	12.50	25.00
12		100.00		200.00		100.00		150.00
13	2.50	1,150.00	5.00	2,300.00	3.75	1,725.00	1.75	805.00
14	.25	25.00	.30	30.00	.50	50.00	1.06	106.00
Total		\$17,810.00		\$24,130.00		\$25,461.50		\$18,906.00

F. A. PROJECT NO. 294-A, MONTEZUMA COUNTY, LOCATED BETWEEN MANCOS AND CORTEZ. TYPE OF PROJECT, GRAVEL SURFACE; LENGTH 2.898 MILES.

No.	ITEM	Unit	Quantity	Engineer's Estimate		Wood & Morgan Burnett Co.		Engler & Teyssier		B. L. & J. L. Morrison	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Clear and Grub	Acre	2	\$50.00	\$ 100.00	\$30.00	\$ 60.00	\$70.00	\$ 140.00	\$50.00	\$ 100.00
2	Excav. Common	Cu. Yd.	8,000	.40	3,200.00	.32	2,560.00	.28	2,240.00	.33	2,666.67
3	Excav. Rock	Cu. Yd.	500	1.25	625.00	.50	250.00	.75	375.00	1.25	625.00
4	Excav Borrow	Cu. Yd.	13,500	.40	5,400.00	.32	4,320.00	.28	3,780.00	.33	4,500.00
5	Overhaul. Exc. and Bor.	St. Yd.	6,000	.02	120.00	.02	120.00	.02	120.00	.02	120.00
6	Struct. Exc. Com. Dry	Cu. Yd.	250	.50	125.00	1.00	250.00	.75	187.50	1.00	250.00
7	Struct. Exc. Com. Wet	Cu. Yd.	10	2.00	20.00	1.00	10.00	2.25	22.50	3.00	30.00
8	Struct. Exc. Rock Dry	Cu. Yd.	10	4.00	40.00	1.00	10.00	2.50	25.00	1.50	15.00
9	Struct. Exc. Rock Wet	Cu. Yd.	10	6.00	60.00	1.00	10.00	3.00	30.00	4.00	40.00
10	Gravel Surface	Cu. Yd.	5,220	1.75	9,135.00	2.25	11,745.00	2.15	11,223.00	2.10	10,962.00
11	Overhaul	Yd. Mi.	2,000	.25	500.00	.30	600.00	.25	500.00	.30	600.00
12	Concrete Cl. A	Cu. Yd.	54	23.00	1,242.00	23.00	1,242.00	21.00	1,134.00	20.00	1,080.00
13	Concrete Cl. B	Cu. Yd.	57	22.00	1,254.00	23.00	1,311.00	20.00	1,140.00	23.00	1,311.00
14	Reinforcing	Lb.	4,500	.09	405.00	.08	360.00	.09	405.00	.10	450.00
15	15" C. M. P. Culvert	Lin. Ft.	618	2.20	1,359.60	1.75	1,081.50	1.75	1,081.50	2.00	1,236.00
16	18" C. M. P. Culvert	Lin. Ft.	30	2.75	82.50	1.98	59.40	2.00	60.00	2.50	75.00
17	24" C. M. P. Culvert	Lin. Ft.	192	3.50	672.00	2.73	524.16	2.75	528.00	3.00	576.00
18	Moving Fence	Lin. Ft.	8,100	.03	243.00	.03	243.00	.0225	182.25	.03	243.00
19	Remove 17 Structures	Lump Sum			100.00		68.00		86.00		102.00
20	Remove Crib in Ditch	Lump Sum			20.00		10.00		15.00		10.00
Total					\$24,703.10		\$24,834.06		\$23,273.75		\$24,991.67

STATE PROJECT NO. 886, CLEAR CREEK COUNTY, LOCATED BETWEEN SUMMIT LAKE NEAR MT. EVANS. TYPE OF PROJECT, GRADED ROAD; LENGTH 1.8 MILES.

No.	ITEM	Unit	Quantity	Engineer's Estimate		Deoling Bros.		Pioneer Const. & Engr. Corp.		A. Dukelow		C. A. Switzer		Anderson & McVeigh		K. V. Johnson	
				Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount	Unit Pr.	Amount
1	Excav. Com.	Cu. Yd.	1,800	\$.70	\$ 1,260.00	\$.70	\$ 1,260.00	\$ 1.00	\$ 1,800.00	\$ 1.50	\$ 2,700.00	\$.60	\$ 1,080.00	\$.70	\$ 1,260.00	\$ 1.30	\$ 2,340.00
2	Excav. Rock	Cu. Yd.	13,100	1.50	19,650.00	1.50	19,650.00	1.60	20,960.00	1.65	21,615.00	1.60	20,960.00	1.45	18,995.00	1.50	19,650.00
3	Borrow Fill	Cu. Yd.	4,200	1.20	5,040.00	1.05	4,410.00	1.40	5,880.00	1.50	6,300.00	1.50	6,300.00	1.20	5,040.00	1.30	5,460.00
4	Dry Com. Exc. Struct.	Cu. Yd.	20	1.00	20.00	1.00	20.00	1.00	20.00	2.00	40.00	.60	12.00	.90	18.00	1.00	20.00
5	Dry Rock Exc. Struct.	Cu. Yd.	60	3.00	180.00	3.00	180.00	4.00	240.00	3.00	180.00	1.60	96.00	2.75	165.00	1.00	60.00
6	15" C. M. P. Culv.	Lin. Ft.	276	2.60	717.60	2.10	579.60	3.00	828.00	2.50	690.00	1.75	483.00	2.55	703.80	2.15	593.40
7	18" C. M. P. Culv.	Lin. Ft.	26	3.00	78.00	2.50	65.00	3.50	91.00	2.50	65.00	2.00	52.00	2.75	71.50	2.80	72.80
8	24" C. M. P. Culv.	Lin. Ft.	66	3.50	231.00	3.00	198.00	4.00	264.00	3.00	198.00	2.75	181.50	3.40	224.40	4.00	264.00
9	30" C. M. P. Culv.	Lin. Ft.	34	4.50	153.00	4.00	136.00	5.00	170.00	5.00	170.00	3.40	115.60	4.25	144.50	5.00	170.00
10	Dry Rub. Masonry	Cu. Yd.	80	5.00	400.00	4.00	320.00	5.00	400.00	12.00	960.00	7.00	560.00	4.00	320.00	2.50	200.00
Total					\$27,729.60		\$26,818.60		\$30,653.00		\$32,918.00		\$29,840.10		\$26,942.20		\$28,830.20

One a Minute

American manufacturers are justly proud of their production records. Our vast home markets provide an outlet that permits most lines of industry to take full advantage of quantity production. Records of a thousand a day or a million a day, depending on whether it is automobiles or chewing gum, are commonplace. But the record on which we can always count is that there is a fool born every minute. Certainly in no line of industry does this hold so true as in road contracting.

When we first began to build improved highways on a vast scale in this country ten to fifteen years ago, there was much to learn about costs. The specifications for road surfacing then began to change so fast that it was hard for a contractor to accumulate any cost experience he could use later. Tightening up on inspection also had its effect. Rapidly changing prices of materials and labor brought further uncertainties. For the last two or three years, however, conditions that affect road building have been fairly stable in this country. In fact, in some states they have been probably more favorable than in many other lines of industry.

In spite of this stabilizing of conditions, we continue to see some of the wildest bidding imaginable by road contractors. High and low bidders will vary frequently as much as 50 per cent on big jobs. The extremes are usually about as bad one way as the other. But it is the wild low bid which messes up everybody concerned.

State highway officials have no choice. If the low bidder can qualify, he gets the job. The state official feels he is out from under because he can fall back on the bonding company. And it would astound the public to know the percentage of road jobs that are finished by the bonding companies in some states. Accurate figures are not available, but in one state it appears that nearly half the road contracts let in the last four years

have been finished by the bonding company.

Highway officials may contend that the public does not lose when the contractor on a road job goes broke, providing his bond is good. No expert in economics is necessary to prove the fallacy of this contention. The delay in reorganizing the job means weeks or months of a partially blocked road. This is only one factor in the situation.

There seems to be no way in which to reduce the production of fool bidders. The only hope might be to surround him in such manner as to keep him from butting out his brains. Society is progressing in the protection of unfortunates generally. Our highway organization system, however, allows the wild low bidder to run amuck while he ruins himself and damages a lot of other folks.

Truly, there is one a minute produced. But is it the irresponsible low bidder or the public official that deserves the title? —Successful Methods.

Pouring of concrete on the new five-mile stretch of pavement south of Colorado Springs on the Pueblo road has been completed, according to a report made to the state highway department by Division Engineer Montgomery.

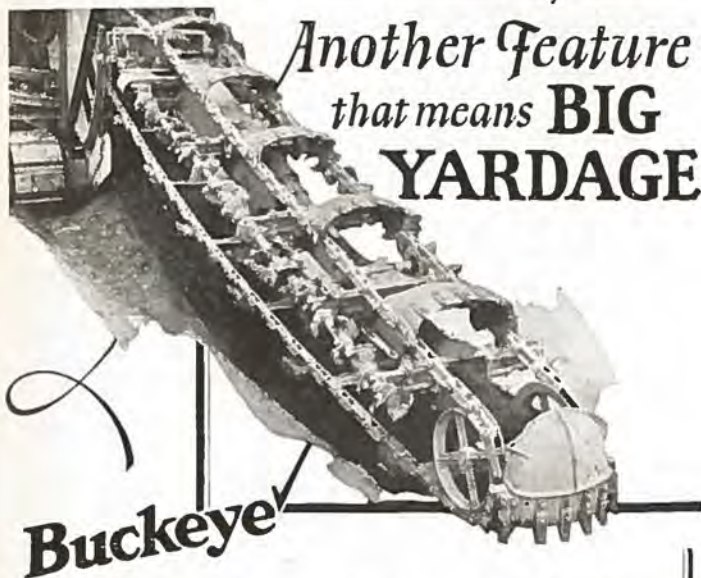
It is expected the road will be ready for traffic about the last of September. There remains considerable work for the contractors in completing the shoulders and drainage structures.

Repairs on the piece of concrete pavement washed out near Husted in the floods of last month have been finished and the roadway opened to traffic. During the repairs a detour road parallel to the highway was used, causing little inconvenience to motorists.

Fifty men are employed by Dooling Bros. in the construction of 1¼ miles of grading on the Mount Evans highway. The work is located at an altitude of 13,000 feet. Heavy snow and rain storms have added to the difficulties of the work.



VIEW OF THE NEEDLES MOUNTAINS—Showing Molas Lake located above Silverton, on the highway leading to Durango—10,500 feet elevation.



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Federal Road Construction

There has been much criticism of the Federal government's method of building roads, because the plan adhered to of the abandoning of natural road beds in the interest of eliminating curves and securing the straightest and shortest road between two given points. Many people, among them engineers of prominence, hold the view that it is an economic waste to spend money on a natural road bed, but that all available funds should be spent in places where the road is soft and needs maintaining to stand up under travel. The claim that by pursuing such a road building policy states would have good roads much sooner than by the present policy; that the extra mileage would mean nothing as compared with the money wasted on roads that are already good.

These people forget that the federal government is looking far into the future and is spending its money with a view to serving coming generations. They are permanent roads that will likely carry travel for hundreds of years to come, and in time, no doubt, these gravel roads will be changed to concrete in order that they might accommodate the greatly increased travel. And more roads will be built, and they too must be constructed in a way to meet the demands of travel.

Considering the fact that the government is building for the future is it not good business for all unnecessary mileage to be eliminated and the road made as straight as possible? This unnecessary mileage would have to be maintained and would only add extra hours of

travel that are a complete waste. Think not only of the upkeep of the additional mileage, but also of the great waste that would result in loss of time, wear and tear on tires and cars and cost of gasoline and oil. The original cost might be considerably more and the completion of a road might be delayed under the Federal government's method, but after the roads are once built there are not many people who would be willing to change back to the method of the government's critics. The soundness of the government's idea is obvious after the road is built and needs no defenders. Let the good work keep up and it will be only a year or two before every state in the Union will have at least one good road across it, with others under way. Road development in this country is a revelation. A few years ago no one would have dreamed that travel across the continent by auto could be made with so much comfort and rapidity.—Ely (Nevada) Times.

The All-Western Road Show

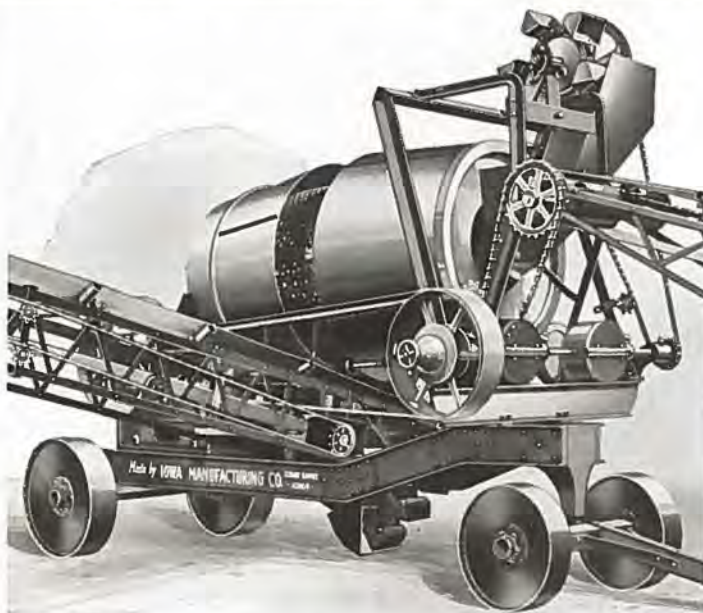
Unprecedented interest is aroused throughout the West in the All-Western road show to be held in San Francisco, November 9-14, under the auspices of the Western Construction Equipment Distributors. Preparations are being made for ten thousand visitors and large delegations of contractors, supervisors, county commissioners, and engineers are coming from every point in the western third of the country to view the first large show of road-building, excavating, and quarry equipment ever held in the West.

A separate day during Show week is set apart for each group of visitors to the Show. Tuesday is Engineers' Day, Wednesday, Supervisors' Day; Thursday, Contractors' Day, and Friday, Dealers' Day. Conventions on the Show grounds will be held on each of these dates and in addition to viewing the greatest machinery exposition ever held in the West, and second in size only to the annual Chicago Show, visitors will have a chance to meet their kind, exchange ideas and profit by a mutual discussion of their problems.

The Executive Committee, consisting of Edward R. Bacon of Edward R. Bacon Company, Charles A. Spears of the Spears-Wells Machinery Company, and P. H. Curtis, of the Western Highways Builder, announce that they have received orders for exhibition space from most of the leading manufacturers of the East, and ground plans provide for nearly 100,000 square feet of space for exhibits.

C. A. Switzer, of Denver, was the low bidder for the construction of a 113-ft. concrete bridge and approaches, located 19 miles south of Pueblo on State Road No. 1 over Muddy Creek in Pueblo county. His bid was \$17,810. Eight other contractors submitted bids for the work.

Heavy rains during the early part of August interfered with the work being done by J. Fred Roberts and Platt Rogers, Inc., on the paving projects located north and south of Sedalia on State Road No. 1. Twelve miles of concrete pavement is being constructed by these two contracting outfits.



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A FINANCIAL SUCCESS

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Denver, Colorado

Road Ruts

In Appreciation

Several years ago A. E. Carleton, a Colorado Springs capitalist, made a present of the old right-of-way of the Colorado Midland railroad between Leadville and Glenwood Springs to the State of Colorado.

A part of this right-of-way includes the Busk-Ivanhoe tunnel. This bore through the Continental Divide is two miles long. Extensive repairs have been made on the bore by the State Highway Department. The roadbed has been conditioned for auto travel.

Water from Ivanhoe Lake, located a few hundred feet from the west portal, is being diverted through the tunnel to the eastern slope for irrigation of lands in the Arkansas Valley.

This new road provides a "short-cut" between Leadville and Glenwood Springs. The route abounds in scenic grandeur.

The State Highway Advisory Board has dedicated the route "The Carleton Highway," as a memorial to the donor. We applaud the action of the board.

Why are the streets in so-called "tourist centers" always so rough? Is it because the traffic is so heavy, or lack of civic pride? We suspect the latter.

In a certain county adjacent to Denver there is a road constructed by the State Highway Department that is going to pieces for lack of maintenance. The state spent several thousand dollars in building this road. This sum will be wasted unless steps are taken to save the surfacing, which is rapidly disintegrating.

In this same county the state of Colorado has expended more than a million dollars for roads. These roads have added several millions of dollars to property values in the county. In return for the expenditure of this money the state has received very little co-operation in maintenance work. We wonder how much longer the state is going to pour money into road building in counties under such conditions.

At last steps have been taken to abate the dust nuisance in Bear Creek canon on the Denver Mountain Parks Highway system. A mile of the road has been oiled as an experiment. If it proves a success other portions of the road probably will be treated with oil.

The road from Fort Collins to Chambers Lake along the Cache la Poudre River is a fine example of results to be obtained from constant patrol maintenance. This is indeed a pleasure drive.

Some engineers seem to have the notion that all contractors are cheats. In view of the large number of contractors

TAXES

Make a Difference, Too

The Telephone Company's tax bill in Colorado, if applied solely to that purpose, would almost run the state administration without help from other sources.

This year we will pay, in all forms of taxation, a bill of \$710,604. Of course, this includes state, school, federal and municipal assessments. But just to illustrate its importance as a contribution to the business of running the state it would pay—

The salaries of the governor and his office force for 40 years.

Or the whole expense of the supreme court for 20 years.

These comparisons are not made as a protest against the tax burden borne by this company. We cheerfully bear our share of the cost of government. But they do illustrate one of the ordinary expenses of operating the telephone industry—expenses which only can be met from revenues received from the users of service.

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One System
Universal Service



and all Directed
toward
Better Service

The Mountain States Telephone and
Telegraph Co.

who have gone broke on jobs during the past two years, we wonder if the engineers are right.

Highway affairs in this country are being conducted on a very high plane. More than a billion dollars yearly is being spent on construction and maintenance. Never before has so great a public endeavor been carried out so completely free from suspicion.

Rapid strides have been made in methods of construction and maintenance. Our engineers are more than keeping pace with the tremendous growth in highway traffic. But there remain many problems to be solved.

Efficient administration of the Federal Aid act has had much to do with the high standard of roads found in most states today. Yet we find a concerted effort on the part of certain interests to discredit the principle of Federal Aid to the states for highway construction. Several of the large eastern states which have nearly completed their highway systems are leading the attack. It's the old story of selfish interest.

Mt. Herman Forest Highway Opened to Traffic Aug. 23

A new "circle road" from Colorado Springs was opened to traffic on August 23 when the Mount Herman highway connecting Monument with Woodland Park, built by the U. S. Forestry service, was dedicated. The highway is eighteen miles in length. While it is a fine scenic road, it was built primarily for forestry operations.

The road has 200 turn-outs in the eighteen miles and is perfectly safe for motor travel. It cost \$40,000. The Forest Service will use the road in tree planting operations near Mount Herman, where five million young trees are to be planted to replace those destroyed in the fire of 1850.

The territory thru which the road goes is filled with huge boulders, many of them balanced rocks.

Last year over 5,000 touring cars passed this point. We have not yet heard the record for 1924, although one is being kept by the road workers.—Montrose Press.

The Bulletin Board

West Slope Irrigation Firm Buys Koehring Gas Shovel

Carl C. Madsen Construction Co., Denver, who have a contract for the construction of four miles of paving south of Berthoud, have purchased a 107-S Koehring Dandie mixer from the Wilson Machinery Co.

Sale of a Koehring No. 1 Gasoline shovel was made to the Cimarron and Uncompahgre Valley Canal & Irrigation Co. of Montrose. The transaction was handled by E. E. McKelvy, western slope representative of the Wilson concern.

Announcement is made that the Wilson firm are now sole representatives in this territory for the Zenith line of shovels, which is a high grade hand shovel for sand and gravel work. A large stock is carried in Denver, according to Harry P. Wilson, president.

A Byers "Bear Cat" gasoline machine, which can be equipped with skimmer, ditcher or clam shell attachments, has been received in Denver, and is now on the floor for inspection.

The best booster is a satisfied customer with a piece of machinery that actually does the work expected. After having used two No. 9, C. H. & E. Triplex pumps on the Broadmoor-Cheyenne mountain highway, the Wilson concern received an order for another of these pumps to be operated on the Pikes Peak auto highway. This pump will be used for supplying water to various tanks at different elevations of the highway for supplying tourist cars.

New Jaeger Tilting Mixer Favored by Bridge Builders

The new 5-L Jaeger Mixers with the open type Accurate Measure "tip-over" water tank, are finding wide popularity with bridge contractors in the Rocky Mountain territory this season, according to H. W. Moore Equipment Co., Denver, distributors. This machine is a full one-sack capacity machine when mixing proportions of 1, 3 and 5. Recent purchasers of this equipment include Chris O'Neill, Platteville, for use on a highway bridge at Wheatland, Wyo., and C. A. Switzer, for use on a Colorado highway bridge near Pueblo.

An interesting report is made to the Moore concern by James Anderies, a plaster contractor, on one of the 3½ Jaeger mixers of the Trailer type equipped with special Plaster paddles. Mr. Anderies is working twelve plasterers with the product of this one machine.

Thirty-eight Ersted Hyster Hoist attachments for Fordson tractors have been sold by the Moore concern this season. While not recommended for a 3,000 pound hammer, due to the fact that this is getting pretty close to the maximum horsepower developed by the Fordson, still many contractors are said to be

using these hoists with good results on highway work in Wyoming, where the specifications call for the use of a 3,000 pound hammer.

Allied Contractors, Inc., of Omaha, recently made purchase of their third installation of Cedar Rapids Crushing Equipment, the last machine being a No. 924 Cedar Rapids Crusher for use at their quarry at Golden.

New Model Backfiller Now Marketed by P & H Concern

A new, one-man, high quality backfiller has been designed and recently placed on the market by the Harnischfeger Corporation, formerly the Pawling & Harnischfeger Co., Milwaukee, Wisconsin.

This backfiller is a development of forty years of experience in the manufacture of material handling machinery of all kinds combined with eleven years of experience in the design of backfillers. This machine embodies many excellent features. For instance, an all-steel construction of heavy duty parts is used.

The machine is easily controlled by one operator, since all the levers are closely grouped at the center of the machine and have a straight pull. The boom is adjustable in steps of eighteen inches between twenty-one feet and thirty feet, and the change may be made in a very few minutes in the field. The boom has a half circle swing, making possible a great amount of work from one location. The boom swing and hoist mechanisms are power driven through worm gearing and controlled by a friction clutch. The scraper is self-filling, of heavy material and fitted with renewable steel teeth. The scraper has a working speed of 130 feet per minute and a return speed of 275 feet per minute.

This backfiller may be mounted on a standard flat car or heavy truck without dismantling. It may be loaded or unloaded under its own power. The total weight with boom and scraper is 13,000 pounds. It will be known commercially as the P&H Model, 25 Backfiller.

Clinton Flat Bottom ditchers are now being manufactured and distributed in California, according to L. L. Clinton, president of the Clinton-Held Company. This machine recently came into great popularity among curb and gutter contractors. On the coast they are being used extensively for digging irrigation ditches in the orchards.

A Best "Sixty" Tractor was delivered to Adams county early in August to the county commissioners of Adams county, which is now engaged in carrying out an ambitious county road construction program.

The Carleton interests recently purchased a 20-B Bucyrus steam shovel for use on their big irrigation project at the Busk-Ivanhoe tunnel near Leadville. This is one of the largest water projects launched in Colorado in several years. Sale of the shovel was made thru Herbert N. Steinbarger Co., Denver.

Motion pictures of a 20-B Bucyrus shovel clearing snow from Milner Pass on the Fall River road, above Estes Park, were recently shown on Curtis street in Denver. The pictures were shown in the east before being sent west.

Mrs. Elsie E. Parsons, formerly secretary of the Wilson Machinery Co., is now engaged as a public secretary with offices at 720 Majestic building.



NEW P & H BACKFILLER—The Harnischfeger Corporation recently placed upon the market an improved backfiller designed for operation by one man.

WILLIAM N. BOWMAN COMPANY

Architects and Engineers

613-619 Insurance Building Denver, Colorado
Telephone Main 976

June Nineteenth, 1925.

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We consider the service of Pierce Testing Laboratories, Inc., Denver, Colo., of great value in many ways in relation to our work.

For economical construction on large buildings where high compressive stresses are used, we find that laboratory tests give us accurate data and full assurance that the structure will have a definite factor of safety.

In no other way can we know what the factor of safety is. The best of building superintendents find it hard to be everywhere at once and many of them have not had the necessary training to appreciate the importance of scientific proportioning, proper mixing, amount of water, etc.

Their service has also been of much assistance to us in cost calculation, steel reinforcement, testing and foundation tests on bad soils.

Their service has been prompt, reliable, and charges moderate and merits the highest endorsement we could give it.

Yours truly,

WILLIAM N. BOWMAN COMPANY.
(Signed) Wm. N. Bowman.

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BIDS OPENED

Proj.	Length	Type	Location	Low Bidder	Bid Price
258-C	5.587 mi.	Gravel Surface	West of Gunnison	Ed. H. Honnen, Colorado Springs	\$ 60,100.80
296-A	113 ft. Bridge	Concrete Bridge	South of Pueblo, Muddy Creek	C. A. Switzer, Denver	17,810.00
297-A	2.848 mi.	Grading	Palisades-DeBeque	Ed. H. Honnen, Colorado Springs	40,188.00

PROJECTS BEING ADVERTISED FOR BIDS

Proj.	Length	Type	Location	Bids Opened
246-D	5.418 mi.	Gravel surfacing	Avondale to Huerfano River	Sept. 2
282-B	2.932 mi.	Gravel surfacing	West from Meeker	Sept. 2

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj.	Length	Type	Location
271-B	0.778 mi.	Concrete Bridge and Paving	West of Portland
271-D	0.137 mi.	Concrete Bridge and Approaches	West of Pueblo
286-A	0.549 mi.	R. R. Grade Separation	1/2 mi. north of Nunn
287-R	18 mi.	Grading	Fort Morgan-Wiggins

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R-3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
2-R-4	6.5 mi.	Concrete Pavement	North of Trinidad
275-C	5 mi.	Concrete Pavement	Husted-Monument
275-D	0.8 mi.	R. R. Crossing and Approaches	North of Castle Rock
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
278-B	5 mi.	Sand-Clay Surfacing	Hugo, east
279-C	6 mi.	Grading	Shaffer's Crossing
282-C	6 mi.	Concrete Pavement	Lafayette, north
298-A	2 mi.	Graded	North of Pagosa Springs

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	84	2-R Div. 2
169-R	Las Animas-Lamar	1.521 mi.	Concrete Pav.	Salle Const. Co.	34,561.00	53	290-A
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	92	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	58	213-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	76	243-B
246-C	Vineland, east	1.951 mi.	Concrete Pav.	Strange-Maguire Pav. Co.	57,108.00	56	246-C
247-B	Rocky Ford-Swink	2.329 mi.	Concrete Paving	LaNier, Selander & White	71,001.00	8	247-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surfac.	Western Const. Corp.	93,533.00	95	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	86	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	64	253-B
254-B	Hot Sulphur Springs-Parshall	1.087 mi.	Grading	Pioneer Const. Co.	61,071.00	8	254-B
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	95	258-A
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	46	261-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,128.00	81	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	95	262-C
262-E	West of Walsenburg	3.527 mi.	Gravel Surfacing	Poppe Bros.	24,979.00	0	262-E
262-F	LaVeta Pass-Russell	2 mi.	Crushed Rock Surf.	Central Const. Co.	22,017.00	0	262-F
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	71	265-A
266-B	Durango, south	3.181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	36	266-B
270-B	Monte Vista-Alamosa	2.833 mi.	Gravel Surf.	San Luis Valley Const. Co.	15,471.00	95	270-B
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	84	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	71	272-A
275-A	Gann-Sedalla	7 mi.	Concrete Paving	Strange-Maguire Pav. Co.	314,174.00	2	275-A
275-B	Sedalla-Castle Rock	5.334 mi.	Concrete Paving	J. Fred Roberts & Sons	198,771.00	1	275-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	80	277-A
279-B	Morrison-Baileys	5.295 mi.	Grading	Harry H. Brown	85,980.00	76	279-B
281-B	South of Longmont	3.068 mi.	Paving	J. Finger & Son	102,502.40	100	281-B
283-B	Berthoud, south	4.2 mi.	Concrete Paving	C. C. Madsen Const. Co.	168,835.00	0	283-B
286-B	Nunn, north	19 mi.	Grading	James Collier	87,249.00	0	286-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	27	288-A
288-B	Merino, west	2.519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	66	288-B
293-A	West of Montrose	114 ft. steel bridge		Wear Bros.	17,936.00	0	293-A
294-A	Mancos-Cortez	2.9 mi.	Gravel Surfacing	Engler & Teyssier	23,273.00	0	294-A
295-A	Alamosa-La Jara	4.456 mi.	Gravel Surfacing	Central Const. Co.	19,861.00	16	295-A

Highway Notes

Charles G. Sheely, well-known Colorado contractor, is now connected with the Denver Bridge Company, with offices at 721 Central Savings Bank building, Denver. The concern makes a specialty of steel bridges suitable for county roads. R. S. Dahlberg is chief engineer in charge of field operations. Steel is being erected on an 80-foot steel span bridge over the Bear river near Evanston, Wyo. The firm also is building a 300-foot pile bridge for Adams county over Bijou creek near Hoyt.

Charles Hine recently resigned as sales manager of the H. W. Moore Equipment Co. He has been succeeded by Lou St. James. Mr. Hine is now connected with a firm of equipment dealers in San Francisco.

Elton T. Fair, Colorado and Wyoming distributor of Adams graders, sold a 12-

foot scarifier grader with extensions to the commissioners of Adams county during the month of August. Mr. Fair also sold a 10-foot grader to Clayton Ryan, Denver road contractor, for use on a 3.5 mile project near Allen's Park.

One of the latest pieces of equipment evolved by F. J. Alwater, Denver highway commissioner, using a Fordson tractor, is a "horse" for pulling street sprinklers. The operator is provided with a steering wheel which extends to the driver's seat on top of the water tank.

LaNier-Selander & White, a Greeley contracting firm, are pouring concrete on two and one-half miles of pavement between Swink and Rocky Ford. They are making an effort to complete the job before winter comes.

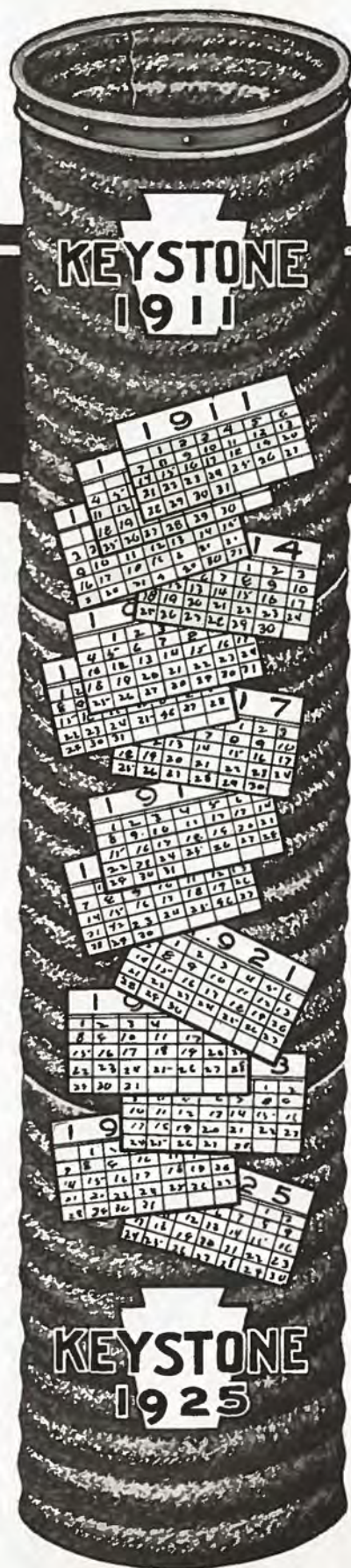
Winterburn & Lumsden have completed 7 1/2 miles of grading and surfacing on

a Federal Aid contract located between Grand Valley and DeBeque. This concern operated a dragline night and day on this contract thruout last winter. Completion of this work eliminates one of the worst stretches of roadway between Grand Junction and Glenwood Springs.

J. Finger & Son are finishing up the shoulders on three miles of paving located south of Longmont. This pavement has been open to traffic several weeks.

Shields & Kyle finished thirteen miles of gravel surfacing located between Pueblo and Fowler last month. As funds become available this stretch of roadway will be paved.

The Dan Reed Const. Co. are making the dirt "fly" on a \$75,000 sewer contract at Greeley. This work is being done preparatory to an extensive paving program.



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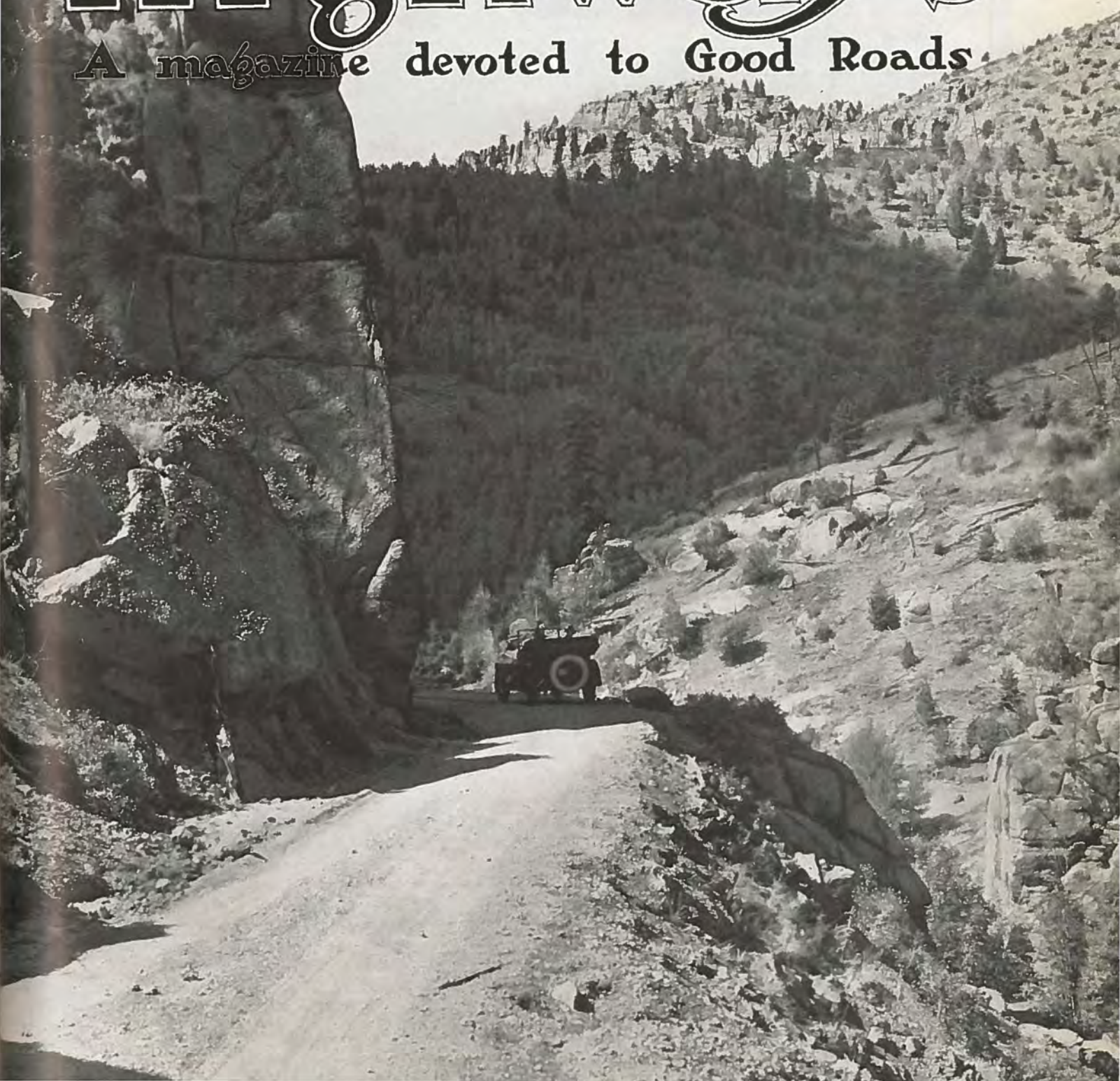


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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

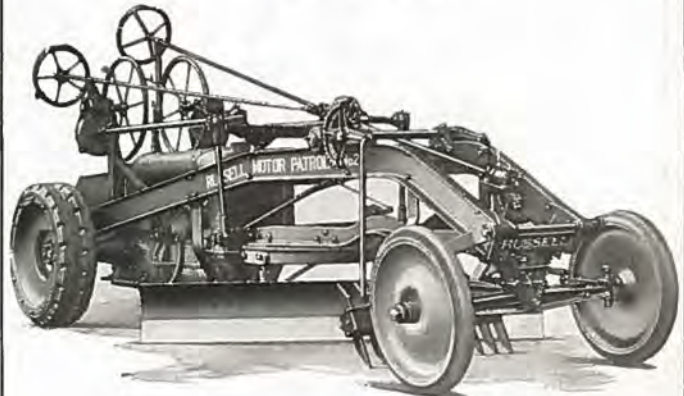
Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

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OUR COVER PICTURE

A particularly rugged scene with high-crested crags located in Phantom Canon, which forms a link in the popular circle trip between Cripple Creek and Canon City in Teller and Fremont counties, is printed on the cover of Colorado Highways this month. During the past summer thousands of tourists from all corners of the globe enjoyed the myriad beauties of this twenty-mile canon road. It is a State Highway constructed on the roadbed of an old railroad abandoned a few years ago.

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Federal Aid for Highways

AN EDITORIAL

THERE is genuine cause for alarm in the effort now being made by Eastern States to force or persuade the government to discontinue federal aid for highways. Such a backward step in the program of road building and otherwise developing the country's resources would not only be damaging to the States which are relying on such aid but would be a shortsighted and unprofitable move from the standpoint of the national government.

For generations it has been the policy of the United States government to encourage and aid the development of resources, to promote progress and to increase the wealth of the nation. That it has been a profitable policy in every way an economist can testify. Aside from the general value of the progress attained taxable wealth has been created which has returned directly to the government far more than was ever invested by the government. Long ago the government aided in establishing post roads. Railroads were aided and in more recent years, with the advent of the motoring era, the construction of highways has been fostered through federal aid equitably apportioned in accordance with needs and with the road building programs of the various States.

Discontinuance of federal aid would be exceedingly unprofitable for those very eastern States which are agitating the matter because they profit very definitely from any national development that brings an excess of taxable wealth. So far as the western States are concerned the question is of more immediate concern because their road building programs are menaced. It is incumbent, therefore, upon the western States, in every way possi-

ble to offer united and aggressive defense of federal aid for highways and to make such a showing that the next Congress will see the dangerous and unwise character of the agitation to discontinue national highway aid.

The States of the West need only to be awakened to the gravity of the situation. They have a strong case to present and it should be a winning case. Virtually all of the national forests and national parks of the government have been taken by the government from the western States. A large percentage of the area of these States is now in federal reserves and in those areas the grazing lands, timber, water and power and minerals are unavailable for the use of these States. As the national parks and forest reserves form recreation grounds for the people of the East as well as for the West, and as these vast areas are inaccessible without adequate highways, the western States are fully justified in their demand for federal aid in building such roads.

The United States realized a revenue of \$986,646 from the national forests of California last year, only one-fourth of which is returned to the State for schools and roads.

Again there is an overwhelming weight of argument in favor of a continuance of federal aid in the situation of the eleven western States with respect to roadbuilding programs. It is virtually impossible for most of these States to maintain an adequate road building program and of meeting the constantly increasing demands of motor travel without the help of the federal government.—
Touring Topics.

Who Pays Uncle Sam's Bills

Individuals and Corporations, Not States, Furnish the Cash—Collection Centers Not Indicative as to Location of Taxable Property

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WHEN the Federal Government wants funds to meet her obligations she calls upon her citizens, irrespective of residence, to pay according to their means.

States, as such, have no obligations and tabulation of receipts for the Federal Treasury, by States, is misleading, unfair and in many cases far from the truth as to who meets the assessments.

A National Viewpoint Desirable

Probably the ideal way of considering the real business affairs of the Nation as transacted by present day methods would be to discard all State lines and consider New York, Boston, Philadelphia, Baltimore, New Orleans, St. Louis, Chicago, San Francisco, etc., as clearing house centers. But we have been in the habit of telling what this State does and what that State has accomplished, so long, that certain results are tabulated as by States, when in reality some States would actually starve, if it were not for their neighbors. They have plenty of gold in the till but no hills on which to graze cattle. Some of the richest States in the Union do not annually produce one-half of one percent of the basic wealth so necessary to our very National existence.

Some people can be born in one State, educated in another, and attain business success in another—always at home, and proudly American. Others are like one of the early fathers, who, going twelve miles west of Boston, celebrated the event by erecting a stake on which he had inscribed—"Thus far shall civilization go and no farther."

Claim An Unequal Burden to States

In recent months a concerted effort has been made to try to prove that Federal co-operation with the States in certain endeavors is vicious, leads to extravagance and compels certain States to contribute to the Federal treasury amounts beyond a just requirement. It is not the purpose of this article to discuss the merits or demerits of Federal financial co-operation with the States in certain endeavors. But it is our purpose to attempt to show that, while there are States given credit for very large payments into the Federal treasury, and the bookkeeping total seem to give them grounds for such assumptions, in reality it is property often thousands of miles away from the bookkeeper's desk which furnishes the taxable wealth from which the seeming excess of contributions are made.

In entering the protest against Federal co-operation with the States in various enterprises tables have been widely published to prove that a few States really furnish more than 75 percent of the entire amounts collected by the Federal Government for these purposes, and that they receive in return but a very small

portion of what they pay into the treasury. At the same time other States are given sums far in advance of what they pay.

Since the larger part of these Federal contributions of late years has been for highways, these highway appropriations have been singled out as especially unfair.

Group Study By States

In reality no State pays more into the Federal treasury than is indicated by its wealth and population.

The total receipts of the Federal treasury, in a major part, come from internal revenue and customs duties. These two items last year constituted 83.27 percent of the entire receipts. Since we have no way of prorating the tariff returns to the several States, this leaves us to consider internal revenue as the source from which the States pay funds direct to meet the bills of the Federal Government. Last year internal revenue represented almost 70 percent of the total Federal receipts.

It is impossible to make a study of this situation except by certain comparative methods. To make tabulations showing the entire 48 States is unnecessary and to do so simply overburdens the line of investigation and makes it more difficult for one to follow the relationship of the several States. We have therefore taken fifteen States from which to make certain deductions—the first fifteen States leading in various things around which center the basis for collecting funds for Federal appropriations. The items used for comparison are basic wealth, national wealth, population and internal revenue.

The first fifteen States in basic wealth are given because, while they may not pay into the Federal treasury as much as some States which are called "industrial" and are, therefore, capable of producing larger incomes, basic wealth is of vital importance to the entire nation and States providing such wealth need the fullest development. By basic products is meant the value of one year's production of wealth from minerals, forests, animals and agriculture (see full table of basic wealth on other pages of this issue). Basic wealth gets the least return for its products. Many crops are perishable and must take the market price offered.

Naturally, we think that States having the greatest amount of total wealth should pay the largest sums to run the government and population in relation to total wealth is an element for consideration.

There are twenty-two States in these four groups and it should be noted that the following States are always a part of the four groups given: California, Illi-

nois, Indiana, Michigan, Missouri, New York, Ohio, Pennsylvania, Texas and Wisconsin.

Two States are in all groups but one: Massachusetts and New Jersey, each not in the basic wealth group.

Four States are in two groups: Iowa, Kansas and Minnesota in both basic and total wealth and North Carolina in population and revenue paid.

Six States are in one group only: Connecticut, and Virginia in revenue payments; Georgia and Kentucky in population; and Oklahoma and West Virginia in basic wealth.

A More Intimate Inspection

Now let us study more closely these various elements as expressed in percentages of the total for the United States.

Notice first, that in every column in each table, the total percentage shows that the fifteen States considered, furnish over 50 percent of the entire percentages of the United States, with the exception of one—the group which pays 88.5 percent of the total internal revenue furnishes 47.09 percent of the total basic wealth. The general average of all the elements considered is 65.9 percent of the percentage for the entire nation.

The fifteen States leading in basic wealth have 61.6 percent of the total national wealth. They pay 72.24 percent of the internal revenue, have 64.3 percent of the total national wealth and 58.7 percent of the population.

The fifteen States leading in total wealth have 69.6 percent of the total national wealth, pay 81.13 percent of the internal revenue, have 62.2 percent of the population and furnish 55.62 percent of the basic wealth.

The fifteen States leading in population have 63.4 percent of the total national population. They pay 86.66 percent of the internal revenue, have 65.2 percent of the total wealth and furnish 51.02 percent of the basic wealth.

The fifteen States leading in payments of internal revenue pay 88.5 percent of the total national internal revenue. They have 66.0 percent of the total wealth, 61.8 percent of the population, and supply 47.09 percent of the basic wealth.

In furnishing basic wealth, outside of the basic wealth group, the other groups are in the following order: total wealth 55.62 percent; population 51.02 percent; payments in internal revenue 47.09 percent.

The groups of States having the largest amount of total wealth, outside of the total wealth group, are in the following order: payments in revenue 66.0 percent; population 65.2 percent, and basic wealth 64.3 percent.

The groups of States having the largest population, outside of the population

TABLE NO. 1

First Fifteen Ranking States in Percentage of Total Basic Wealth of the Nation Compared to their Percentage of the Nation's Total Wealth, their Percentage of Total Payments through Internal Revenue and Population.

State	Percentage of total basic wealth	Percentage of total national wealth	Percentage of total internal revenue paid	Percentage of total population
Pennsylvania	7.6	9.2	9.7	8.4
Texas	7.5	3.1	1.3	4.3
Illinois	5.2	7.1	7.7	6.0
California	4.8	4.8	4.6	3.6
Iowa	4.8	3.3	0.06	2.2
Ohio	4.1	5.8	5.5	5.3
Oklahoma	3.6	1.2	0.04	1.9
Missouri	3.5	3.1	2.4	3.2
Minnesota	3.2	2.7	1.1	2.2
New York	3.2	11.7	28.8	10.2
Kansas	3.0	2.0	0.07	1.7
Indiana	3.0	2.8	1.6	2.7
Wisconsin	2.9	2.5	1.4	2.4
Michigan	2.7	3.6	7.9	3.3
West Virginia	2.5	1.4	0.07	1.3
Total	61.6	64.3	72.24	58.7

TABLE NO. 2

First Fifteen Ranking States in Percentage of Total National Wealth in Comparison with their Percentage of Total Payments Made by the States through Internal Revenues, Population and Percentage of Basic Wealth.

State	Percentage of total national wealth	Percentage of total internal revenue paid	Percentage of total population	Percentage of total basic wealth
New York	11.7	28.8	10.2	3.2
Pennsylvania	9.2	9.7	8.4	7.6
Illinois	7.1	7.7	6.0	5.2
Ohio	5.8	5.5	5.3	4.1
California	4.8	4.6	3.6	4.8
Massachusetts	4.1	5.0	3.5	0.05
New Jersey	3.7	4.0	3.2	0.07
Michigan	3.6	7.9	3.3	2.7
Iowa	3.3	0.06	2.2	4.8
Missouri	3.1	2.4	3.2	3.5
Texas	3.1	1.3	4.3	7.5
Indiana	2.8	1.6	2.7	3.0
Minnesota	2.7	1.1	2.2	3.2
Wisconsin	2.5	1.4	2.4	2.9
Kansas	2.0	0.07	1.7	3.0
Total	69.6	81.13	62.2	55.62

TABLE NO. 3

First Fifteen Ranking States in Percentage of Total National Population Compared to their Percentages of the Total National Wealth, Credits in Payments of Internal Revenue and Total Basic Wealth.

State	Percentage of total population	Percentage of national wealth	Percentage of internal revenue paid	Percentage of basic wealth
New York	10.2	11.7	28.8	3.2
Pennsylvania	8.4	9.2	9.7	7.6
Illinois	6.0	7.1	7.7	5.2
Ohio	5.3	5.8	5.5	4.1
Texas	4.3	3.1	1.3	7.5
California	3.6	4.8	4.6	4.8
Massachusetts	3.5	4.1	5.0	0.05
Michigan	3.3	3.6	7.9	2.7
New Jersey	3.2	3.7	4.0	0.07
Missouri	3.2	3.1	2.4	3.5
Georgia	2.8	1.2	0.06	1.6
Indiana	2.7	2.8	1.6	3.0
Wisconsin	2.4	2.5	1.4	2.9
North Carolina	2.3	1.4	5.7	2.4
Kentucky	2.2	1.1	1.0	2.4
Total	63.4	65.2	86.66	51.02

TABLE NO. 4

First Fifteen Ranking States Credited with Largest Payments of Internal Revenue, 1924, Compared to their Percentage of the Total National Wealth, Population and the Total Basic Wealth of the Nation.

State	Percentage of total revenue paid	Percentage of total national wealth	Percentage of total population	Percentage of total basic wealth
New York	28.8	11.7	10.2	3.2
Pennsylvania	9.7	9.2	8.4	7.6
Michigan	7.9	3.6	3.3	2.7
Illinois	7.7	7.1	6.0	5.2
North Carolina	5.7	1.4	2.3	2.4
Ohio	5.5	5.8	5.3	4.1
Massachusetts	5.0	4.1	3.5	0.05
California	4.6	4.8	3.6	4.8
New Jersey	4.0	3.7	3.2	0.07
Missouri	2.4	3.1	3.2	3.5
Virginia	1.6	1.5	2.1	0.04
Indiana	1.6	2.8	2.7	3.0
Wisconsin	1.4	2.5	2.4	2.9
Connecticut	1.3	1.6	1.3	0.03
Texas	1.3	3.1	4.3	7.5
Total	88.5	66.0	61.8	47.09

group, are in the following order: total wealth 62.2 percent; payments in revenue 61.8 percent and basic wealth 58.7 percent.

The groups of States making the largest payments in internal revenue, outside of the internal revenue group, are in the following order: population 86.66 percent, total wealth 81.13 percent, and basic wealth 72.24 percent.

The groups ranked according to the highest percentages of the total for the United States are:

Payments in internal revenue. 88.5 percent
 Total wealth 69.6 percent
 Population 63.4 percent
 Basic wealth 61.6 percent

You will notice that the total percentage for the group making payments of internal revenue is higher than any other group, although the population and total wealth groups are very close seconds in their payments of revenue, being 86.66 and 81.13 respectively.

Deductions Drawn

Closer observation of these groups by comparison shows that:

1. In total payments into the Federal treasury, the group having the largest population coincides very closely to the fifteen highest in actual payments, being 86.66 percent over against 88.5 percent.

2. The group having the greatest total wealth follows closely with a percentage of revenue payments of 81.13 percent.

3. This shows that the fifteen States in population and the fifteen States in total wealth follow very closely the fifteen States in revenue payments.

4. In these comparisons one naturally supposes that population and total wealth would go hand in hand with revenue payments and they do very closely as far as total percentages are concerned, but the list of States changes and consideration of population and total wealth bring six other States into the reckoning.

5. If the Federal Government used the method of raising funds by a general levy

on all property these groups of States would not shift so much.

6. Connecticut and Virginia, representing .07 percent of the entire basic wealth of the nation, when we come to make up the population group, give way to Georgia and Kentucky, which furnish 4.0 percent of all the basic wealth. Also Connecticut, North Carolina and Virginia, representing 2.47 percent of the entire basic wealth of the nation, when we come to make up the total wealth group, give way to Iowa, Kansas and Minnesota which furnish 11 percent of all the basic wealth.

In the case of Michigan, it is immediately and satisfactorily explained, when it is understood that 43 percent of the total tax paid by Michigan in excise on automobiles and 73 percent of all the automobile excise tax of the United States is collected in Michigan. When it is known that there is an average of \$31 per car collected it can be understood how this large fund is really spread out over the country, for the purchaser of the car pays the bill.

Here is a list of the cars, by States, which paid this excise tax last year.

Alabama	31,213
Arizona	9,744
Arkansas	44,327
California	158,275
Colorado	24,034
Connecticut	46,243
Delaware	6,586
Florida	36,584
Georgia	27,453
Idaho	10,269
Illinois	166,543
Indiana	85,397
Iowa	76,936
Kansas	55,411
Kentucky	38,743
Louisiana	24,495
Maine	19,273
Maryland	44,473
Massachusetts	94,622
Michigan	161,561
Minnesota	63,772
Mississippi	42,271
Missouri	98,099
Montana	9,414
Nebraska	31,874
Nevada	1,091
New Hampshire	11,236
New Jersey	84,922
New Mexico	6,385
New York	221,091
North Carolina	30,651
North Dakota	13,285
Ohio	141,454
Oklahoma	73,045
Oregon	27,596
Pennsylvania	200,027
Rhode Island	16,717
South Carolina	33,806
South Dakota	14,794
Tennessee	44,710
Texas	178,531
Utah	11,495
Vermont	10,955
Virginia	48,325
Washington	35,193
West Virginia	30,929
Wisconsin	84,860
Wyoming	6,699

Of the Michigan income tax the Fords alone paid \$21,260,000. It should be stated however that the people of Michigan have not made any claim that they are paying more than their due share of the internal revenue.

As to North Carolina, a similar explanation can be made. North Carolina's seeming excess is even more startling, for 86 percent of the total internal revenue

paid by North Carolina is on tobacco in its manufactured form, and the purchaser, wherever he may live, pays for the revenue stamp. North Carolina likewise is not making any complaint.

Before we take up the case of New York, it should be noted, in passing, that all of the other States in this group are not paying much more if as much as their total wealth and population would seem to demand.

State	Revenue	Wealth	Population
Pennsylvania	9.7	9.2	8.4
Illinois	7.7	7.1	6.0
Ohio	5.5	5.8	5.3
Massachusetts	5.0	4.1	3.5
California	4.6	4.8	3.6
New Jersey	4.0	3.7	3.2
Missouri	2.4	3.1	3.2
Virginia	1.6	1.5	2.1
Indiana	1.6	2.8	2.7
Wisconsin	1.4	2.5	2.4
Connecticut	1.3	1.6	1.3
Texas	1.3	3.1	4.3

While Massachusetts and New Jersey show a slight increase of payments in excess of wealth, the results obtained from a study of New York are the same for these States except in a much less degree. Massachusetts, New Jersey, Virginia and Connecticut together barely furnish an average of one-half of one percent of the basic wealth of the nation from each State. Virginia would not be in this group at all if it were not for the tobacco revenue tax, which is 56 percent of the total internal revenue paid through that State. And Virginia, likewise, is not complaining.

Is New York Imposed Upon?

By public address and newspaper articles, broadcast throughout the country, statements have repeatedly been made that New York pays over 25 per cent of every bill that Uncle Sam must meet.

Let us see. The keeper of accounts credits New York with having paid 28.8 percent of the total internal revenue collected. Normally, wealth and population considered, New York should pay 10.9 percent. If all the facts could be secured, it could easily be shown that that is really all she is doing now. Publicity of income taxes paid and much painstaking study of tabulations, some of which seem to be made more for bewilderment than elucidation, enables one to at least scratch the surface and present to the

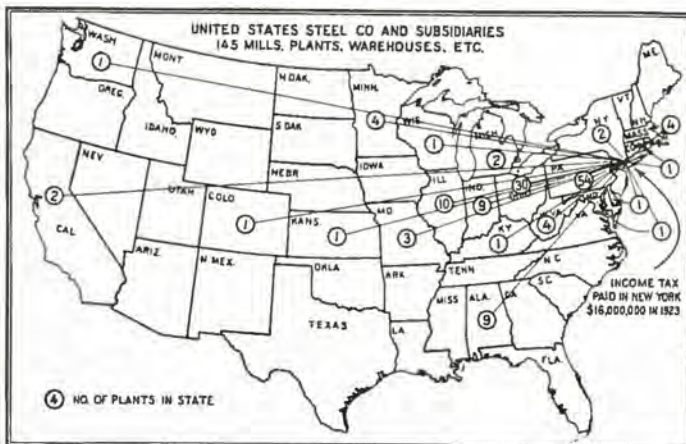
public a fair and well substantiated statement as to the real situation.

The total internal revenue credited to New York, in round numbers, is \$690,400,000. Of this amount \$506,593,000 or over 73 percent comes from corporation and individual incomes. And 40.9 percent of the 73 percent is from corporations. Speaking of personal income tax paid in New York, who is it that does not understand that the \$7,500,000 personal income tax paid last year by Mr. Rockefeller represented earnings collected from many States. Always remember that corporations pay an income tax only when a profit exists. Such is not the case in personal obligations above certain exemptions. With corporations it is "NO PROFITS, NO INCOME TAX." In 1922 (last Federal Report) the corporations in New York paid 25.59 percent of all the corporation tax of the United States and still were able to declare cash dividends to their stockholders of over \$975,724,000 and also stock dividends of over \$1,229,572,000. No one begrudges their prosperity. The total number of corporations in the United States paying an income tax that year were 212,535. Of this number 35,504 paid an income tax in New York—almost three times as many as Pennsylvania and yet New York has only 11.7 percent of the total national wealth while Pennsylvania has 9.2 percent of the total national wealth.

Again, according to the latest Federal report (1922) the total corporation tax paid in the United States that year was \$783,776,268, which was 47.6 percent of the entire income tax. Manufacturing paid \$389,776,280, or 40.9 percent of all corporation tax or 23.7 percent of all income tax of the nation.

New York paid 22.8 percent of all corporation tax paid by "manufacturing" while Pennsylvania paid but 11 percent. The same year manufacturing plants and equipment were valued in New York State at \$2,133,897,000 while the same kind of property was valued by the Federal report at \$2,193,873,000 for Pennsylvania. Since New York paid more than twice as much as Pennsylvania on a less valuation there is no other conclusion to be drawn but that there are manufacturing corporations paying income tax in New York which have no property whatsoever in that State.

In 1921 (last Federal Report) manufacturing plants in New York State showed



a production of \$6,973,506,000 and those in Pennsylvania a total output of \$5,059,009,000. At the same time the corporations under the head of manufacturing in New York State paid a federal tax of \$89,131,469, while those of Pennsylvania \$42,992,173. This shows that the industries in Pennsylvania produced 72 percent as much as New York while the Federal tax paid was but 48 percent as large as that of New York. No one would accuse Uncle Sam of letting Pennsylvania pay a less proportionate share than New York, hence the only conclusions to be drawn is again to assert that manufacturing corporations pay taxes in New York which have their property in other States.

Then again, railroads and equipment in New York State have a value of \$1,479,682,000 and street railways, shipping, water works, etc., are valued at \$2,594,070,000, making a total for transportation and other utilities of \$4,073,752,000. Pennsylvania for the same items has a value on railroads and equipment of \$1,902,737,000 (exceeding that of New York) and \$1,268,165,000 on street railways, shipping, etc., making a total of \$3,170,902,000. These properties in New York paid an income tax of \$40,459,465 while Pennsylvania paid but \$9,920,949. At the valuation rate Pennsylvania should have paid around thirty million. Some one might suggest that many Pennsylvania corporations failed to show a net income, hence their income tax was below normal. The facts are, however, that a larger percentage of corporations in New York failed to show a net income than in Pennsylvania. There is, therefore, but one answer to this situation—namely, that there are transportation corporations paying an income tax in New York which have no property there. (See illustration Southern Pacific and Union Pacific Railroads.)

On page 30 of "Statistics of Income" of the Treasury Department (1922) in connection with table showing the net income and taxes paid on personal and corporation income, by States, the Treasury Department gives this word of explanation:

"The amounts do not represent, however, what may be called the geographical distribution of income. The figures are compiled from the returns filed in each State. An individual files his income tax return in the collection district in which his legal residence or principal place of business is located, and a corporation files its income tax return in the collection district in which its principal place of business or the principal office or agency is located. Consequently, income reported by an individual or corporation in one State may have been derived from sources in other States. From the foregoing it will be clear that there is no way of ascertaining from the income tax returns the amount of income earned in the respective States or the amount of tax paid on that basis."

Who Owns the New York Corporations and Where Is Their Property?

It is naturally an impossible task to find the ownership of the corporations listed to pay income tax in New York; for while there were, according to the last Federal report, 35,504 corporations which



NATIONAL BANK DEPOSITS NEW YORK CITY
(STATEMENT U S TREASURY DEPARTMENT MAY 15, 1925)

paid an income tax, there were also 29,358 which, through making certain deductions, were relieved from paying an income tax. Therefore, to list this number of corporations—64,862—as to who controls them, where their property really exists and who enables them to make a profit so they can pay an income tax, shall not be attempted.

Surely a reasonable number of illustrations will serve to prove the statement that residents of New York are not the sole owners of many of the corporations paying an income tax in that State and in many cases, little or none of the property creating the profits is in that State.

United States Steel Corporation

The United States Steel Corporation, in 1923, paid an income tax of \$16,000,000 in New York. They have 145 plants and warehouses, only two of which are located in New York State. They have 153,350 stockholders who really paid this income tax. These stockholders hold residence as follows:

Alabama	1,678
Arizona	52
Arkansas	38
California	2,004
Colorado	424
Connecticut	5,800
Delaware	507
District of Columbia.....	1,313
Florida	364
Georgia	344
Idaho	27
Illinois	10,048
Indiana	2,406
Iowa	341
Kansas	137
Kentucky	1,205
Louisiana	325
Maine	1,234
Maryland	1,493
Massachusetts	11,100
Michigan	3,279
Minnesota	4,412
Mississippi	122
Missouri	1,347
Montana	83
Nebraska	168
Nevada	20
New Hampshire	1,835
New Jersey	6,495
New Mexico	35
New York	32,322
North Carolina	348
North Dakota	22

Ohio	9,574
Oklahoma	84
Oregon	173
Pennsylvania	41,917
Rhode Island	1,385
South Carolina	103
South Dakota	37
Tennessee	457
Texas	215
Utah	76
Vermont	986
Virginia	780
Washington	239
West Virginia	2,057
Wisconsin	1,112
Wyoming	20
Alaska	8
Canal Zone	18
Hawaii	21
Philippine Islands	9
Porto Rico	25
Foreign	2,716

Total153,350

Attention is called to the fact that there are more stockholders of this company living in Pennsylvania than in New York.

Railroads

Probably the most flagrant examples of the railroad situation are the Union Pacific and Southern Pacific. The Union Pacific in 1923 paid an income tax in New York of \$4,500,000 and yet this road does not operate east of Omaha and Kansas City—half the length of the continent from New York State.

The Southern Pacific paid a tax of \$5,000,000 and this road does not run any nearer New York than New Orleans.

No attempt will be made to give the list of stockholders of these two railroads but it is common knowledge that they live in many States.

The Banks

It is well known that New York is our financial center and we must have financial centers.

On May 15, 1925, the statement of the United States Treasury Department showed that while the deposits in the New York City National banks totaled \$2,218,027,000, a study of this statement shows that 38 percent of those deposits were from banks and trust companies outside of New York State.

Just a Few More Examples

There are over 64,800 corporations making reports to the Federal Government through New York State. Here are 24 examples, in addition to the ones above mentioned—hardly a drop in the bucket—with whose names you are more or less familiar. The mention of them immediately makes you realize how they permeate so many activities of the business life of the nation. They do not know State lines. Transportation has enabled them to carry their products to the remotest hamlet. Only 24—and yet their paid up capital stock is \$2,380,242,000 and their net income last year—after paying their income tax—was \$376,955,787 or 15.8 percent. This statement of capital stock and net profit is merely shown to indicate what enormous proof would pile up if a larger list of the 64,850 other corporations in New York were tabulated. Here is the list. Unless otherwise stated the net income given is for the year 1924. Remember that the Federal corporation

tax has been paid before net income is tabulated.

American Railway Express; net income \$2,950,000; operates in every State.

American Beet Sugar Company; net income \$1,515,972.

American Can Company; net income \$15,423,202.

American Locomotive Company; stockholders in many States total 11,754; plants in New York, Virginia, New Jersey, Pennsylvania and Canada; net income \$12,462,563.

American Radiator Company; net income \$9,908,217.

American Smelting and Refining Company; stockholders in every state total 12,807; plants in Colorado, Utah, Washington, California, Montana, Texas, Arizona, Maryland, Illinois, Nebraska, Oklahoma, New Jersey, also Mexico and South America; net income \$22,471,506.

American Sugar Refining Company; stockholders in every State total 25,747; group of Northeastern States have more stockholders than group in which New York is classed; plants are located at Boston, Brooklyn, Philadelphia, Baltimore and Chalmette, Louisiana; also owns stock in Beet Sugar plants in California, Michigan, Iowa and Ohio; net income \$8,557,724.

American Telephone and Telegraph Company; stockholders in every State in the Union total 358,273; companies extending through the entire United States; net income \$144,954,889.

American Tobacco Company; net income \$17,952,545.

Anaconda Copper Mining Company; plants in Montana and Wyoming; net income \$18,589,971.

Buckeye Pipeline Company; pipelines in Ohio; net income \$1,041,571.

Indiana Pipeline Company; pipelines in Indiana; net income \$965,945.

National Biscuit Company; net income \$12,092,828.

National Lead Company; plants, 49 in various States; net income \$5,296,413.

Nevada Consolidated Copper Company; mines and plants all in Nevada; stockholders in several States; net income \$2,620,797.

Pan American Petroleum and Transport Company; no property in New York; net income \$13,011,215.

Postum Cereal Company; plants at Battle Creek, Mich., and Windsor, Canada; stockholders in every State total 1,500; net income \$2,881,466.

Sinclair Consolidated Oil Corporation; stockholders over 41,000 living in every State, have refineries, terminals, bulk stations or service stations in nearly every State east of the Rocky Mountains; pipeline companies, Texas, Kansas, Oklahoma, Missouri and Illinois; net income \$29,737,887.

Tobacco Products Corporation; controls United Cigar Stores Company and factories in Virginia; net income \$4,529,556.

Union Tank Car Company; net income \$1,101,717.

Utah Copper Company; 867,613 acres in Utah; owns Nevada Consolidated; majority of stockholders live in New York; net income \$12,140,261.

Utah Securities Corporation; Electric power, light and gas business in Utah, Idaho and Colorado; net income \$135,606.

Woolworth Company; stockholders in every State; stores 1,356; net income \$20,698,180.

Western Union Telegraph Company; stockholders in every State 26,138; maintain over 25,000 offices throughout the country; has over 1,500,000 miles of wire; net income \$15,915,756.

The Other Side of the Picture

Before concluding it is well that we take a glance at the other side of the picture. Parties who have been protesting that their State is being assessed by the Federal Government to give funds to some far distant State seems to forget that it is the natural resources of that far distant State which enables her citizens to sit in their smug complacency. Mines of Nevada, Utah, Montana and Colorado are emptied of their wealth, never to be reimbursed, and the profits go to residents of other States.

Insurance—fire, life and casualty, are much needed parts of our business life—yet New York, Hartford and Baltimore are foolish to lay claim to the prosperity of these institutions.

Boston is the center of our wool market and yet the Boston "Common" cannot take the place of New Mexico, Arizona and Utah as a sheep pasture.

Knowing that all manufacturing in Montana last year paid out over \$21,000,000 in wages and salaries alone it is astounding to note that manufacturing of metals and metal products for the entire State paid an income of but \$17.

Business Centers Not State Owned

Centralization of business in certain centers is a natural growth and economically sound. Surplus funds gravitate to certain cities; industries develop where power is cheapest or raw material nearest at hand. Water transportation cannot be developed around a desert town. Fertility of the soil is not the gauge of land values. The Federal Constitution, at the beginning, refused to curb domestic business relations and would not allow States to set up toll gates at State lines.

States do not own the corporations or the individuals in their business relations. There is not a single large city in the entire country which secures its prosperity exclusively from the citizens who live in the same State in which that city is located. The poorest State helps to enrich the richest State.

That is a false theory which makes the claim that States contribute to the Federal Treasury. Federal funds should go for Federal needs, collected from all who have and expended so that all may have again.

On September 23rd and 24th the commissioners of the 4th district known as the Arkansas Valley County Commissioners' Association, met in Pueblo for two days' session. They were entertained on Wednesday at the Bulah Country Club by Mr. Fred and Mr. Joe Bullen of Pueblo. On Thursday they were the guests of the State Fair Association and the Pueblo County Commissioners at the State Fair. Thursday evening they were the guests of the Equipment Men at a dinner at the Naile Hotel. Commissioners from other districts who attended the two-day meeting were Mr. and Mrs. Dan Straight, Weld County, Mr. and Mrs. Jim Beckley of Delta, who is President of the State Association of County Commissioners, and Mr. O. B. Scooley of Brush.

It was particularly noted at the banquet at the Naile Hotel on Thursday evening that our good friend, Mr. Jim Beckley, is still on the job advertising Delta county, the tables being decorated by peaches, apples and grapes, a gift from the exhibition of Delta County Fair.

Mystery: Why some townspeople will permit their streets to become full of chuck holes, when they have all of the equipment to make necessary repairs. In one town we recently saw a grader standing not more than fifty feet from a mud-hole on the main street. And, this town has spent considerable money advertising to attract tourists.



NEW FEDERAL AID ROAD NEAR DURANGO—View shows completed project east of Durango, eliminating two river crossings and several bad grades.

Across the Continental Divide Three Times in One Day

By State Senator William R. Eaton

DID you ever leave Denver about four o'clock in the afternoon, go up Turkey Creek Canon, pass George Turner's playhouse city, turn out for the new work at Conifer, run up and down over the ten and twelve per cent grades for a few miles, and then travel over a boulevard highway for seven or eight miles, and stop at Mrs. Davis' hotel at Shawnee, and get on the outside of one of her T-bone steaks? You ought to do it some time when the moon rises not later than eight o'clock, for then you can leave the hotel, feeling at peace with all the world, loaf over the road to Kenosha Summit, and as you reach the sign showing that it is 20 miles to Fairplay, you come out upon the South Park by moonlight. It is a view that cannot be surpassed, and I have not the words to describe it. Do it some time. When you get to the hotel at Fairplay, and have a good night's rest, you are ready to cross the Continental Divide three or four times the next day—if you desire.

We wanted to cross it three times. At any rate, we went to Breckenridge, which is only 25 miles over Hoosier Pass. The old road has all disappeared except a thousand feet on the west side of the pass, and the new work at that point looks as if it would be completed in a few days. The sign at the top of the pass states that the elevation is 11,314 feet. It is a wonderful ride. The garage boy said you needed an hour and a half to make the trip. He was right. You can hardly believe that the crossing could be made in that time. But it can be. We rode both ways, and from both sides, enjoyed one of the most spectacular views that is to be found in the Rocky Mountains.

After returning to Fairplay, we passed by the Antero Reservoir, now dryer than usual, continued on to the Salt Works and hardly knew that the next rise led to what used to be the "terrible" Trout Creek Pass. Its elevation is not stated, but the old station of Newitt which is just below the top of the pass on the Buena Vista Side used to have a sign on it stating that the elevation was 9,840 feet.

The run down the curves to Buena Vista is interesting, the road is wide and smooth, and it does not take long to cover the 16 miles to the town where you expect information as to Independence, Carleton and Tennessee Passes. Always, you are told Tennessee Pass is good traveling. I do not know whether you are always told some fairy story about the other two passes, but our experience this summer on three occasions is that in Buena Vista they did not furnish any reliable information about the other two passes. However, after lunch, we followed up the Arkansas to and through the canon below Granite, and when we reached the road to Twin Lakes, Independence Pass

and Aspen, we turned off the Leadville road, and after making a turn or two, there came into view one of the most wonderful autumn views that any one will see this year. The reds, golds, and yellows of the aspens, the browns, purples and greens of the firs and spruces, made a picture that looked more like a Persian carpet than anything I can now think of. I do not know what makes this the most wonderful of similar views in this state; whether it is the elevation, or if there is more expanse of mountain, or whether you can ride and see the view for more miles or more hours. It does not disappear until long after you pass Twin Lake Falls, but when it does, you then realize that you have actually entered upon Independence Pass Road.

As we traveled over this road, we encountered the clouds, which enveloped us and finally precipitated some rain ahead and on one side of us. Have you ever had the experience in our mountains of having the rain on one side and none on the other? Not alone did we ride for some distance in this phenomenon, but finally the rain seemed to cease ahead, the cloud opened, we found we were driving the last stretch before we start up the shelf part of the Pass road, there was the rainbow in front, and the end of it was in the shaft house of the mine whose buildings were directly ahead, but miles away, and near the top of a peak. This road has a good, solid foundation, and practically no surfacing, but its builders have left a road which can be traveled in stormy weather with all the safety of a pavement. On reaching the top of Independence Pass, we found that we were

well above timber line, and as far as our experience goes, this is the only pass that actually goes above timber line. The sign board states the elevation is 12,095 feet. One look around, and there are several peaks of over 14,000 feet elevation, which look close enough to be climbed within fifteen minutes. It is too bad that no one has put up markers to show the names of them. And then there are a couple of lakes right on the pass. Where does the water come from? Why does it not run down the steep sides? Snow has been within walking distance all summer, but this can hardly explain why some highway official of the United States Forest Survey, or of the State of Colorado, has had about sixty feet of the road gravelled, and has left the balance of the road on the top wet, muddy and deeply rutted, without either graveling or drainage.

Right on the top is the first place we found where you can easily break a spring, but the new road on the Western side takes you down, down, down, past more of those highest peaks of the Continental Range, until you reach that portion of the road where the new work is being done. Where the steam shovel was working, a detour road had been prepared, so that we had only to do a little driving similar to that which we all had to do before the mountains were boulevarded; then, we slowly passed over and admired the balance of this year's work, and, reaching the fully completed work, slipped down the balance of the twenty-one miles from the top to Aspen, taking two hours to go down; a few days before, we had gone up to the top from Aspen in an hour and a half; this gives a good



ROCKY FLATS ELIMINATED—Picture shows fine stretch of roadway south of Fairplay, formerly a bugaboo to motorists; work done by Park county outfit.



One of the beautiful lakes on Midland Trail near Busk-Ivanhoe Tunnel.

idea of the road to one familiar with mountain pass driving.

You see, we drove over the Continental Divide three times that day, and traveled only 161 miles to do it. The next morning, we left Aspen at ten o'clock, reached Basalt a little before eleven, and turned onto the new Carleton Highway constructed on the old Colorado Midland grade. The road bed is wonderful; it does not give the impression of being new work, perhaps it is not. It is wide enough for cars to pass with plenty of safety room. After passing the Seven Castles and conjuring up some tales of the ogres to fit their sublime appearance, we continued up the Frying Pan, recognizing different vistas from time to time, and finally realized that the pictures must have been used by the old Midland road, and that was why we seemed to be merely viewing old scenes from a new road.

When I tell you that it took us exactly two hours to ride from Basalt to the Portal of the old Ivanhoe Busk tunnel, which, we were told, must now be called the Carleton Tunnel, and that the distance is 46 miles, and that we had to spend practically half an hour in waiting for our turn to be dragged across the mud by the teams provided by the road builders, you must also understand that we did not hurry one foot of the way. The grade and turns are the easiest of any pass or road in the Rocky Mountains. We drove every inch in high gear, but that does not mean that we were forcing the car at all; there is not a place in the road from Basalt to the top that is any harder driving than driving up the hill to the State House from Broadway.

Why will road builders make a mud hole on the top? Is it the same reason that accounts for the lack of drainage and sample of surfacing on the top of Independence Pass? I have listened to so many road builders and engineers state that the principal element in road building is a solid foundation, that I believe it. But whoever is doing the work at the portal of Carleton Tunnel on the western slide has piled up a mud hole almost a thousand feet long, and about three feet "high"; I do not say deep; a car can not go down into it more than 14 to 18 inches; and when it goes down as far as it can sink, there is no "bottom"; when you look at it from the side, you can see there is still another foot to sink through the new material. Maybe someone knows where bed rock is, and is trying to hide it. One of the officials of the Highway Department, in stating that his department was not doing the work, suggested that possibly this mud had been piled up so that it could be drained, and if and when drained, it would make a good road. To a layman who can see nothing but rocks and timber lying around, the slope of the hill and a little lake just below the road, it appears that some of the locally available foundation material would make a road, even without surfacing. One of our passengers tritely stated the situation by asking this question, "Is it not queer that on Independence Pass you ride over the granite clear to the top, and there you are dumped in the mud, but the road builders give you a 60-foot carpet of surfacing just to show you that it is all intentional, while on the Carleton Pass they give you a delightfully surfaced highway to the top, and then just

dump you in the mud, and leave you until the road builder gets ready to drag you out with his teams or tell you to go back and go another way?" This has been the experience of more than one motorist recently.

The tunnel drive is a very interesting experience. With a guard at either end of the tunnel, and trusting to luck that their watches are set together, an attempt is being made to regulate the traffic. For twenty minutes after the half hour, cars may enter from the Western Portal; the last car is presumed to make the entire trip through the tunnel in not more than ten minutes; at the eastern portal, cars enter for twenty minutes after the hour. Our experience was that we were being experimented with. We reached the western portal with a minute or two to spare, that is, it was about twelve minutes before the hour. The guard insisted that it was "after ten minutes to" the hour. So we waited until half past the next hour, and promptly on that minute, we were commanded to move forward and start through the tunnel. Upon entering the portal, moving lights were seen, so we backed out, and were gruffly ordered to "re-enter, stop interfering with the traffic, and anyway, the lights which we saw were lights of the workmen in the tunnel." So we re-entered, and proceeded about 200 yards, when the lights came near enough to distinguish that they were in fact upon an automobile. To back out that two hundred yards was a nice little driving stunt, and those who read this and enter the western portal of that tunnel will appreciate it; for on the left side, the side wall timbers do not stand straight, but

lean in toward the top; on the right side is the ditch for drainage in which a conduit is being built, and that is the only place where the tunnel is not straight; that is the place where the curve was put. However, after we backed out, and let the advancing automobile pass, we re-entered the tunnel, and had the novel experience of driving about two miles through the tunnel from one side of the Continental Divide to the other. The road bed was solid, but rough; no attempt seems to have been made to deflect the water from the top, but the work at the side indicates that drainage will be made of the road. Upon coming into daylight on the eastern side, we continued over an almost perfect road bed down past Turquoise Lake to Malta, and back to the point where we turned off at Twin Lakes the preceding day, and once more wondered at the wonderful coloring of the autumn foliage.

Of course, one does not venture suggestions to the "Pats" and "Mikes" who guard our destinies and our tunnels; but the arrangement at the portals of the Carleton Tunnel may well merit some consideration by some persons in authority, who ought to go up there, incog, and see how the general public gets along. While we were waiting, a clock was brought up and laid against a pole; also, a sign, which gave instructions as to how often and when a trip should be made through the tunnel. The comment of a deputy sheriff who read the sign that "half these driving fools will start into the tunnel a few minutes after the time just out of cussedness" ought also to be considered by those who make the final rules. It was also suggested that if a toll of 25 cents per car were charged, that would pay for the employment of

two men and the maintenance of a telephone so that the way could actually be kept clear.

As soon as we passed Twin Lakes and the entrance to the Independence Pass road, on our way from Turquoise Lake to Buena Vista, we retraced possibly twenty-five miles that we had covered the preceding day and decided to spend the rest of the afternoon at Buena Vista, and cross Monarch Pass in the morning.

Leaving at ten a. m., we drove just 57 miles to the top of Monarch Pass, where a sign informs you the elevation is 11,650 feet. The wonders of the autumn foliage came into view at the turn off to Poncha Pass and continued until after the town of Monarch was passed. Here the reds and purple colors were more vivid than on the mountains surrounding Twin Lakes, but the expanse did not appear to be quite so great. Just as we reached the top of the pass, some clouds which had been hovering over Shavano Peak seemed to literally attempt to chase us out of the little cut through which you pass from Atlantic to the Pacific slope; the wind current was very violent, and the clouds enveloped us and passed on us through a chimney. We drove down the Western side about a quarter of a mile, and as we passed entirely out of the cloud we stopped, looked back, and there we could see the cloud blowing and billowing through the cut at a high speed, and then rising and forming a rain cloud right in front of us. The grandeur and wonder of these actions of the clouds among the tall peaks never fails to be interesting. The road up and down both sides of Monarch Pass is in excellent condition, and from the foot of the pass to our turnoff at Doyle, we had good roads.

The Doyle cutoff to Ohio City seems to have had some work done upon it and is in good shape, but the 12 per cent grade has not yet been eliminated. Our destination was the Carter Mine above Ohio City, which is just 222 miles from Denver by way of South Park. When we rolled up to the portal of the Carter Tunnel, we had crossed the Continental Divide five times and traveled 457 miles. At the mine portal, we left the automobile, and "embarked" upon a mine "passenger" car, and were hauled into the tunnel for a distance of almost two miles behind an automobile locomotive, which traveled at the tremendous speed of four miles per hour. There we got off at the underground station, entered the "lift" or "cage" or "elevator" and were hoisted over a quarter mile up the inside of the mountain; then we climbed up some two hundred feet further to the opening of the shaft on the mountain. Of course, we came back the same way. We attempted to compare the sensation of driving through the Carleton Tunnel with the ride through the Carter Tunnel, but finally decided that it could not be done.

I started to write a story of our crossing the Continental Divide three times in one day, but extended it to state that we crossed the "Backbone of the Continent" six times in six days. So I will only add that we left the mine at 7:30 in the morning, and drove back over Monarch Pass, delighted our vision with the autumnal pictures on the mountains through the pass, re-crossed Trout Creek Pass and Kenosha Summit, which seemed very tame indeed after the marvelous rugged scenery of the high range, finished the 222 miles, and rolled into Denver just in time for a six o'clock dinner.



VIEW OF COMPLETED ROAD IN BYERS CANON—One mile of this beautiful roadway has been completed under a Federal Aid agreement. New road eliminates bad grades over Parshall hill, west of Hot Sulphur Springs on Victory highway.

Good Roads Increase Farm Values

By R. S. Tiernan,
State Highway Commissioner, Kansas

THE dividends which are returned from capital invested in permanent roads are often more difficult to accurately figure than dividends returned from other forms of invested capital. A person can invest in a tractor. He knows its cost; he can ascertain the cost of maintenance. He can easily compute in dollars and cents the work which the tractor does, and can readily discover whether or not he receives dividends on the capital invested in it. On the other hand, a person makes an investment in a permanent road. Although he knows exactly what the original cost of the road is, the expense of maintenance, the depreciation, and the actual returns in dollars and cents are often more difficult to determine.

A Big Profit

There are several direct benefits which usually come from the building of good roads and directly cause the capital invested to return large dividends. These benefits are the immediate increase in land values, the possibility of marketing when prices are highest, the making of new available, the increase in the amount of load hauled. Actual cases illustrating these benefits are interesting.

Farm Value Increase

During the past ten years, communities in the vicinity of Fort Scott, Kansas,

have invested a considerable amount of capital in highways. The farm land upon these improved highways has increased from \$5 to \$25 an acre immediately upon the completion of the road. A fair average increase would be \$10 an acre. Even if the permanent road cost the landowner an amount equal to \$2 per acre on his land, there would still be a profit of \$8 an acre immediately upon the construction of the highway.

The serviceable road invariably permits the farmer to market his crops when the prices are the highest. This fact is illustrated by the following cases. During the winter, a certain farmer in this community stated that had he been able to haul his oats to market during the time the roads were impassable he could have obtained 15 cents more a bushel than he received when it was feasible for him to sell his crop. His oat crop made 40 bushels to the acre, so that by not having the use of a permanent highway to market he lost \$6 an acre from the sale of his crop for one year. He could still have paid \$2 an acre into the road building fund and realize a profit of \$4 an acre on every acre planted in oats, as a result of the advantage which a perma-

nently good road would have afforded him.

More Definite Figures

In another instance, a farmer living at a distance of 20 miles desired to sell his milk to a condensery. He accordingly arranged to have the milk delivered upon a truck. A few days after the delivery was started the roads became impassable for the truck, and he was compelled to discontinue the sale of the milk upon the condensery market. On account of the lack of good surfaced road he lost the benefit of a milk market which would have returned him 5 cents more a gallon net for his milk than he otherwise received. On an average production of 20 gallons of milk daily throughout the year, his annual loss in milk sales alone would be \$365.

The increased amount of load possible when a good road is available is one of the greatest factors in making good roads a profitable investment. A few years ago, a permanent highway was built past an 800-acre farm, which is situated a few miles from town. With the same motive power and with less expense of maintenance, the farmer operating this farm increased his annual haul 1,000 tons. Figuring the cost of hauling at 50 cents per ton, on this one item alone, the value of the permanent highway to the owner was annually \$500.



ON THE ROAD TO DURANGO—from Silverton, showing beautiful mountain range near Electra lake, below Cascade creek divide. Road in perfect condition.

Board Adopts Uniform Signs for Use on National Roads

THE Joint Board, composed of State highway officials and officers of the Bureau of Public Roads, appointed by the Secretary of Agriculture to select a series of interstate roads to receive national numbers and to devise uniform directional and warning signs to be used on all classes of roads in every State, has about completed its work.

The standard route marker will be a typical United States shield painted white on which will appear in black the name of appropriate State, the initials U. S., and the route number. Steps have already been taken to see that this marker is not used except on the system of highways designated by the Joint Board. All directional signs will be in black and white of standardized sizes and in style indicated on printed chart herewith.

In the selection of colors and shapes the board has been guided by the principal that all signs indicating the necessity for any degree of caution will be yellow background with black lettering. The degree of caution required will be indicated by the shape of the signs as well as by the words and symbols on them. Thus a round sign will always indicate a railroad crossing; an octagonal sign will indicate positive danger and will call for a complete stop; a diamond-shaped sign will be equivalent to a command to proceed with caution; and a square yellow sign will call attention to the need for a lesser degree of caution.

A circular sign 24 inches in diameter with a yellow background and bearing the familiar railroad crossing in black with the letters RR, also in black, in the upper quadrants has been adopted for use at railroad grade crossings in all States in which existing laws permit the use of such a sign; and the board recommends that the use of the sign be authorized by suitable legislation in all States.

The standard stop sign adopted is a regular octagon with the word "Stop" in black letters on a yellow background.

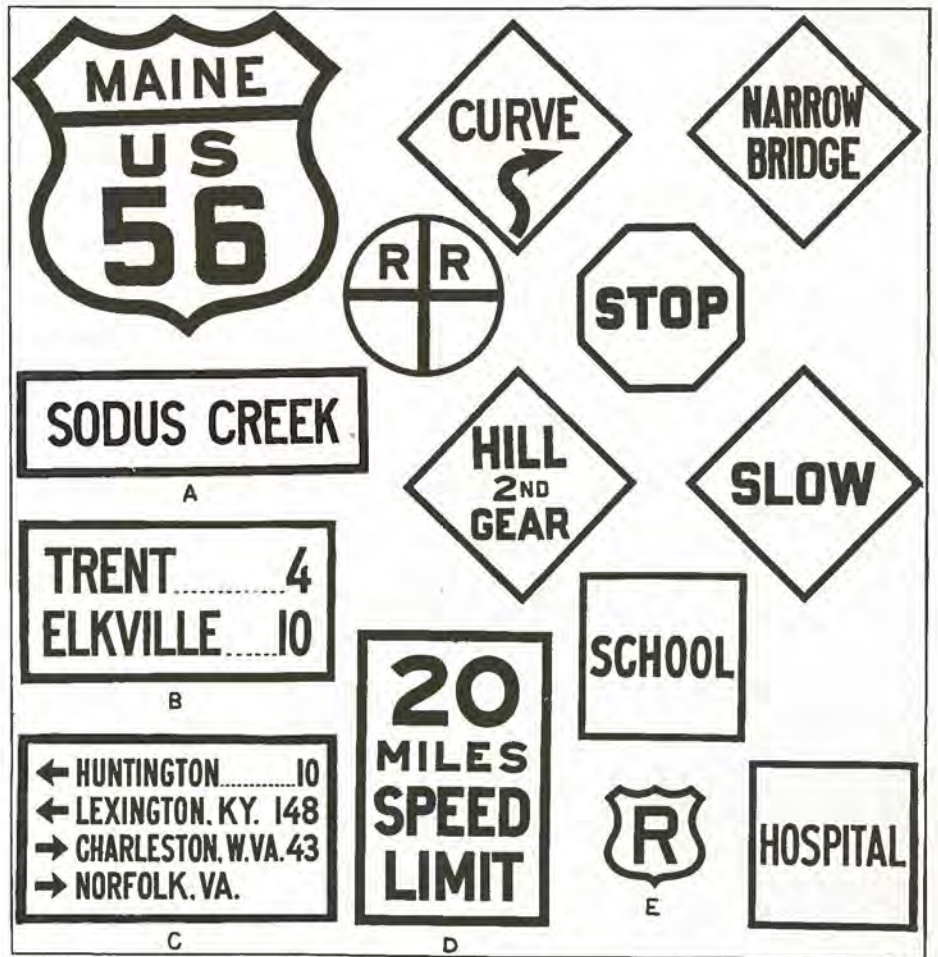
The caution signs are diamond shaped with a yellow background on which are superimposed the warning words and symbols giving notice of curves, hills, loose gravel, etc., ahead. In addition to these cautionary signs provision has been made for the use of "look" or "attention" signs to be used sparingly on approaching schools and other points at which caution may be necessary. These signs will be square with a yellow background and black letters.

Brass Tack Figures

In the enormous amount of general statistics and arguments urging the value of good roads for this, that or the other reason, it is certainly refreshing to find an occasional clear statement such as the following, which gets right down to brass tacks.

This is an extract from a published letter written by Mr. R. E. Johnson of Gaffney, S. C., to a member of the South Carolina General Assembly.

"I have often said that I would gladly pay \$100 per year road tax if the State



and County would spend the money on permanent roads.

"As my farm and your farm are on the same road, I want to give you some figures on the cost of hauling over this road in 1913 and in 1924. In 1913 it took my teams one-half day to get to Gaffney, ten miles, over a road hub deep in mud. We put five sacks or 1,000 pounds on the wagon with two 1,100-pound mules, got an early start after dinner, with two tired mules for the return trip home and could go about a quarter of a mile and have to stop and wind the mules; had to keep this up all the way and they reached the farm at night with the mules and driver completely worn out—at a cost of \$4.00 per 1,000 pounds, not figuring the cost or damage done the mules and wagon; 80 cents per ton mile.

"Last week my wagons came to town in two hours in a trot, put on 20 sacks or 4,000 pounds to the wagon with 900-pound mules and all were back home by dinner time and hadn't even raised the sweat on the mules. At \$4.00 per day it cost me \$1.00 per ton to haul my guano this year against \$8.00 per ton in 1913. Why couldn't I afford to pay \$100.00 per year road tax?

"I have spent three hours in the rainy season in 1913 on this road in my auto running in low gear and pushing out of the mud holes, damaging my car \$25.00 per trip, when now it takes me from 20 to 30 minutes, rain or shine, to make the trip and my car lasts four times as long and looks new five times as long as it would back in 1913."

Why Worry, Indeed?

Why worry about road taxes when you spent last year these enormous amounts without any complaint:

Estimated expenditures for non essentials, 1924, from statement of U. S. Treasury Department:

Tobacco	\$1,847,000,000
Beverages (non-alcoholic) ..	820,000,000
Theaters, movies, etc.	934,000,000
Candy	689,000,000
Jewelry	453,000,000
Firearms	67,000,000
Musical instruments	440,000,000
Sporting goods	431,000,000
Perfumes and cosmetics	261,000,000
Chewing gum	87,000,000
Toilet soaps (1/2 since some are essentials)	76,000,000
Furs (1/2 since some are essentials)	176,000,000
Radio (a)	150,000,000
American tourists abroad (b)	650,000,000
American tourists at home (c)	1,000,000,000
Total	\$8,031,000,000

(a) Radio Corporation; (b) Department of Commerce; (c) American Out Door Life Exposition.

Just six months' allowance of the above fund would improve the entire Federal Aid Highway System of the United States and thus enable you to drive from the county seat of any county in any state, to the county seat of any county in any other state in the Union, and keep on a paved road.

Road Ruts

Ten deadly railroad crossings have been eliminated on the road between Denver and the Wyoming state line, State Route No. 1, which runs thru Brighton, Fort Lupton, and Greeley.

Recently the State Highway Department let a contract for the elimination of the last "death trap" on this road located near Nunn.

The elimination of grade crossings has been an important phase of the work of the State Highway Department in recent years. By means of route changes and the construction of underpasses more than thirty dangerous crossings have been wiped off the map.

This work has been accomplished by intelligent engineering. The cost? Well, it was worth any price. But we can say no money was wasted.

There are so many reasons why the government should continue giving aid to the various states for road building, that some of the arguments of the opposition appear ridiculous.

The people of Colorado are sold on the idea of Federal Aid—and we don't mean maybe. Tell your congressman about it.

Some fellows seem to delight in the pastime of trying to beat a train to the crossing. Friends of such fellows ought to take their cars away from them until they get back to normal. It doesn't pay, because death is so permanent.

"Give us gravel" is the battle cry of citizens in a certain western slope county. After traveling over some of their roads, we'd say their demand was more than justified. We suggest a portable crusher and a couple of teams to the commissioners. A few miles of gravel each season would soon make everybody happy.

Colorado has the best highway system in the west. Yet our program is just now getting under way. There is a lot of work to be done before we can say it is perfect.

Let's finish the North-South pavement without delay. It is the backbone of the state's road system. Statistics show that this road carries about 60 percent of all motor traffic in the state.

We have found a man who can truly be classed as "one in a million." He is a county commissioner who lives beside a rough piece of road.

Overheard recently in the lobby of a hotel in northwestern Colorado:

First Commercial Ambassador: "How are the roads up this way?"

Second C. A.: "Well, they're so darn good, they are monotonous."

"It's Great Road to Denver" Says Editor of Wray Rattler

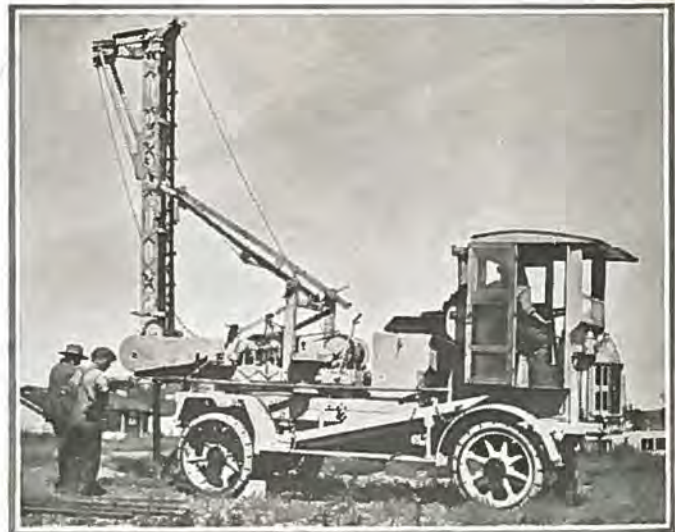
It's a great road, nearly 200 miles long, that connects Wray with the capital of the state. The time was, you know, some five years to the windward, when a car could scarcely negotiate the trip, because of deep sand, high centers, etc. The writer traveled over the 200-mile stretch between Wray and Denver one day recently, and the only difficulty that beset us was to keep within the speed limit. The road is paved or surfaced with gravel all the way. More than that, it is faultlessly maintained most of the way. There is a 10-mile stretch of paving between Brush and Fort Morgan and a 22-mile stretch between Fort Lupton and Denver. When we traveled over the road the other day we found that Weld county was doing a better job of maintaining its portion of the road than any other county. That 29 mile stretch, although not all in Weld county, is a marvel. Washington county is also giving much attention to maintenance and is excelled only by Weld county. The road from Wray to the county line on the west could stand a lot more dragging; in fact, it must have more, if it is to keep pace with Weld and Washington counties. Good roads are not confined to the eastern sections of the state. We traveled over many miles of roadway, and everywhere in Colorado we found superb roads. No wonder people all over the United States are talking of Colorado roads.—Wray Rattler.

F.W.D. TRUCKS

Will Solve
Your
Problems

The Public Service Co. of Colorado recently purchased the Earth Boring and Pole Setting machine mounted upon the famous F.W.D. Truck, as shown in the picture above.

This sturdy power-unit shows the same economy in digging holes and setting poles that it does in Road Maintenance, Snow Removal, Road Graveling, Ditch Cleaning, etc.



Let us prove to you by a demonstration that the F.W.D. is the best truck for your requirements.

LIBERTY TRUCKS & PARTS CO.

F. W. D. Distributors

1532 Sixteenth St.
Sugar Building

Denver, Colo.



23,828 Feet of Trench in 16 Days

If labor were cheap, digging trench with Buckeyes would be even cheaper, says Hugh McLean of the Oakwood Construction Co., Detroit.

They own two Buckeyes. On one job these two machines cut trench 12 to 24 in. wide, average 11 ft. deep, to the tune of 16,085 ft. in 11 days.

And then, on a different job, they finished 7,744 ft. of 12 to 24 in. trench, average 12 ft. deep, in five days.

Average per Buckeye, per day, 744 ft. And both jobs were back-filled with one Buckeye Back-Filler a few days after the trench was opened.

Easy Handling—High Quick Shift Conveyor

General construction, the high Quick Shift Conveyor and the Alligator Traction, alone, would make the most critical man buy a Buckeye, says Mr. McLean. The conveyor not only handles *all* kinds of materials without spilling or slipping, but it is high enough so that dirt can be loaded direct into wagons and trucks when necessary.

Good men, good organization and good machines make high daily averages, year in and year out.

We can supply the good machines for trench excavation and back-filling.

Ask any Buckeye owner—or send for the Buckeye booklets.

The Buckeye Traction Ditcher Company

FINDLAY, OHIO

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers

There's a Buckeye Sales and Service Office Near You



Tremendous Force Under Positive Control

From the start of the dipper travel—right up through the top of the bank, the P & H shovel crowding motion is applied. The full power of the motor and flywheel inertia is back of the manganese steel teeth of the dipper.

This tremendous force is positive, and under the immediate control of the operator regardless of the position of the dipper. Dumping into cars can be quickly and accurately done.

Ready When the Starting Whistle Toots

A turn of the crank and the day's work is begun—no fuel or water trouble, no preliminary firing up. When not in actual use no fuel is consumed. Electric motor-equipped, the same advantages hold true.

And—the proven design of P & H equipment, the larger use of double-strength alloy steels—the cut gears, precise workmanship—gives you a machine that years have proven to be the most economical. As one quarryman wrote: "Thanks for giving us a machine that we can depend on to be ready every day when the whistle blows."

Bulletin 82-X mailed on request.

HARNISCHFEGER CORPORATION

Successor to

Pawling & Harnischfeger Co.

Established 1884

3857 National Avenue, Milwaukee, Wis.

Western Warehouses: San Francisco, Los Angeles, Seattle
Rep.: Paul Fitzgerald, First Natl. Bank Bldg., Denver

P-H GASOLINE SHOVEL

See our Exhibit—All Western Road Show—November 9 to 14, San Francisco

BUILDERS OF TRENCH EXCAVATORS FOR 40 YEARS

Combined Financial Statement, December 1, 1924, to August 1, 1925

COLORADO STATE HIGHWAY DEPARTMENT

BALANCES, DECEMBER 1, 1924

Highway Fund	\$1,067,800.68	
Federal Aid Bond Fund.....	500,281.58	
County Bond Fund	16,656.43	
Total Balances		\$1,584,738.69

RECEIPTS

Half Mill Levy	\$ 588,819.11	
Gasoline Tax	673,492.14	
Internal Improvement	58,700.00	
Federal Aid	1,124,532.38	
County Aid	61,905.93	
Excess War Supplies	44,912.50	
Sale, 1925 Bonds.....	500,000.00	
Total Receipts		\$3,052,362.06
Total Balances and Receipts.....		\$4,637,100.75

DISBURSEMENTS

Federal Aid Projects.....	\$1,730,941.66	Percent
State Projects	366,172.26	61.43
Maintenance	531,976.92	13.00
Property and Equipment	58,473.37	18.88
Surveys	7,657.70	2.08
Administration, General Office	49,336.36	0.27
Administration, Engineering	49,910.07	1.75
Road Signs and Traffic Census.....	12,951.85	1.77
County Bond Projects	10,135.72	0.46
Total Disbursements		100.00
Total Disbursements		\$2,817,555.91

BALANCES, AUGUST 31, 1925

Highway Fund	\$1,524,863.87	
Federal Aid Bond Fund	288,160.26	
County Bond Fund	6,520.71	
Total Balances		\$1,819,544.84
Total Disbursements and Balances		\$4,637,100.75

No machinery dealer is worthy the name unless he is in position to immediately render both the expected and unexpected in

Service

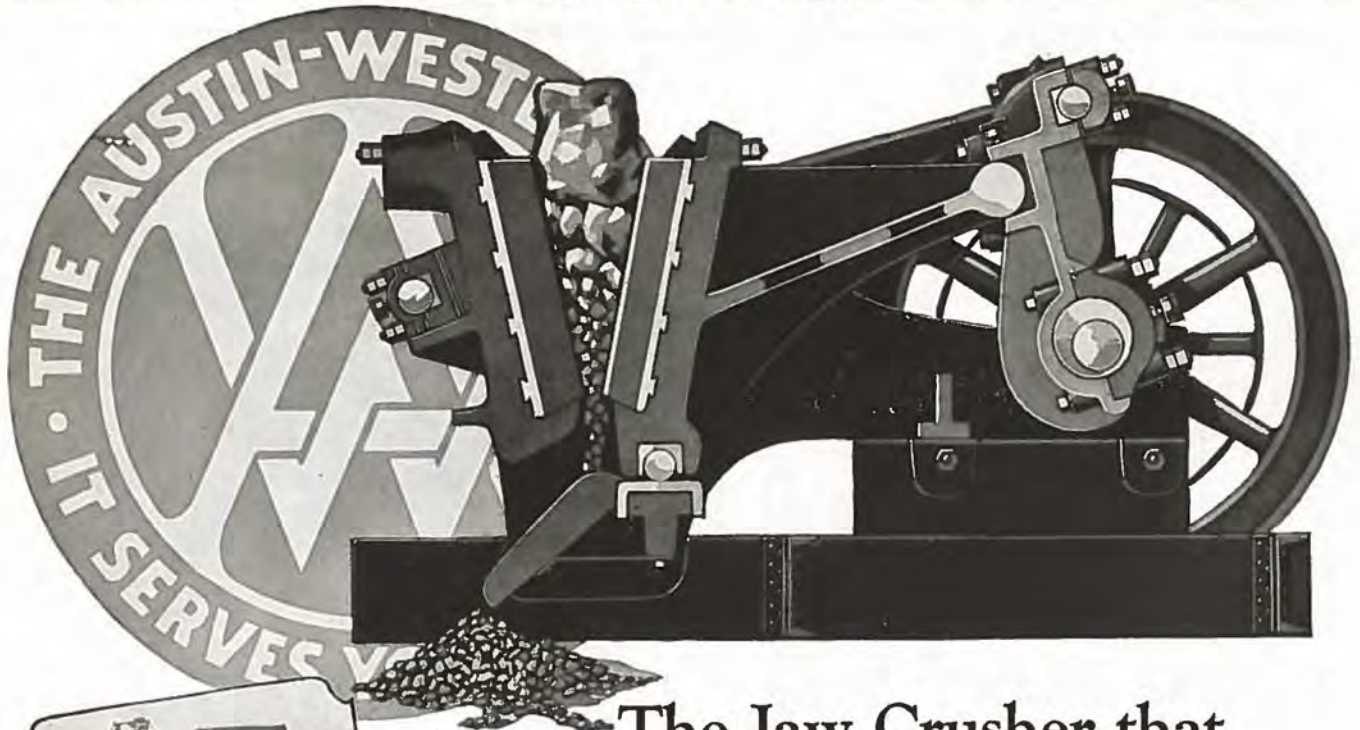
Wizard All Steel Road Plows	Jaeger Concrete Mixers
Moore Special Fresnos	Concrete Culvert Forms
Galion E-Z Lift Graders	Heltzel Road Rails
Fordson One Man Maintainers	Barnes Pump Outfits
Galion Portable Screen Plants	Footo Paving Mixers
Cedar Rapids Crushers	Lakewood Finishers
Etnure Road Oilers	Whitcomb Locomotives
Chausse Tar and Asphalt Heaters	Portable Asphalt Plants
Universal Truck Cranes	Marion Steam Shovels
All Industrial and Agricultural Equipment for use with Fordson	

H. W. MOORE EQUIPMENT COMPANY

Sixth and Acoma Streets

Denver, Colorado

Contractors' Equipment, Fordson Power Machinery, Road Building and Maintaining Equipment



The Jaw Crusher that is Different

And what this Difference means to You

THE important thing is not so much the fact that the Western-Aurora Crusher has broken away from, and left behind, the old Blake Type Jaw Crushers with their springs and toggles as it is the fact that the unique Western-Aurora design means much to you in the way of service and satisfaction.

Space won't permit anything like a complete description of the now famous Western-Aurora two-blow stroke, but the coupon will bring you a catalog that tells all about it. What counts is that as a result of this continuous two-blow stroke and freedom from springs and toggles a Western-Aurora Crusher in your plant means:

- Greater output,
- Fewer delays,
- Less power required for operation, and
- Longer life for the crusher itself.

The catalog explains why you are sure to enjoy these advantages from

The Jaw Crusher that is Different.

When choosing a crushing plant, your first thought is naturally of the crusher itself—but elevator, screen and bin are of almost equal importance. This fact is always in the minds of Western engineers, and as a result you will find each unit in the Western-Aurora Crushing and Screening Plant on a par with the crusher, and ready to give you the same standard of service.



You will find many worth while ideas and much valuable information in this catalog. Better clip the coupon now, while you think of it.



I would like the catalog.

WILSON MACHINERY COMPANY

DISTRIBUTORS

1936-1938 MARKET STREET

DENVER, COLORADO

The Bulletin Board

All Western Show Promises Varied Program of Exhibits

Every visitor at the All-Western Road Show to be held in San Francisco November 9th to 14th, will find a convention particularly interesting to him. There will be prominent speakers and discussions covering every department of road-building in the following schedule of conventions:

Monday, November 9—Annual convention of the Western Association of State Highway Officials.

Tuesday, November 10—Morning session—Western Construction Equipment Distributors Convention.

Afternoon session—Good Roads Convention.

Wednesday, November 11—Convention of Western Supervisors and Road Commissioners.

Thursday, November 12—Convention of Western Contractors.

Friday, November 13—Morning session—Business meeting of Western Construction Equipment Distributors.

Afternoon session—Annual convention Pacific Coast Sand and Gravel Association.

Program Committees of each of these organizations have prepared programs which will be announced later.

There are no evening sessions scheduled except the general banquet which will take place on Friday evening, November 13. Ladies are invited on this occasion and short speeches and entertainment will accompany the dinner, after which the banquet hall will be cleared for dancing.

The exhibits of road-building machinery will be housed in five enormous tents and will occupy more than 125,000 square feet of solid exhibits. Outside of the tents about 15 acres of ground will be given over to working exhibits of excavating machinery, graders, sand and gravel equipment, together with special unique displays set up by Eastern manufacturers.

Visitors will therefore be able to examine, under the most favorable conditions, the latest models of machinery with which they are familiar in their every day work. Many advanced models which otherwise would be introduced to the trade for the first time at the annual show in Chicago in January, will be shipped to San Francisco for the examination of Western roadbuilders.

The hotel committee is receiving hundreds of applications from all parts of the country for reservations during show week. Many groups are coming to the show in special cars and the hotel committee is endeavoring to establish them as far as possible according to states.

Among the interesting exhibits will be that of the Bureau of Public Roads. It will take the form of a number of panels

each devoted to one particular phase of highway engineering. Miniature trains and automobiles will run through this exhibit to bring home to visitors the relationship of transportation and highway building. Working models illustrating the results of research the Bureau has made in connection with Western road-building problems will be demonstrated and this exhibit alone is worth the attendance of every Western roadbuilder.

Chicago Road Show Officials To Invite Foreign Delegates

The Central and South American countries will receive invitations to send delegates to the Annual Convention and Road Show of the American Road Builders' Association, which will be held in Chicago, January 11-15, inclusive, 1926. This invitation will be personally presented to the Central and South American countries by Mr. Frank Page, who is the past president of the American Road Builders, and a delegate on the part of the United States to the Pan-American Congress of Highways which is soon to be held in Buenos Aires.

Mr. Page is chairman of the North Carolina State Highway Commission, as well as vice president of the American Association of State Highway Officials. He is a brother of the late Walter Hines Page, Ambassador to England, during the world war.

Mr. Page will visit practically every country of Central and South America, and personally present to these countries an invitation to send delegates to the Road Builders' Convention.

Wilson Concern Reports Big Increase in Equipment Sales

H. C. Lallier, well-known Hudson road contractor, is engaged on a sub-contract grading job for the J. Fred Roberts Const. Co. north of Castle Rock. This is a five-mile concrete paving project contracted by the Colorado State Highway department. Mr. Lallier is using a new 107 S Koehring Dandie Mixer, recently purchased from the Wilson Machinery Co., for pouring of headwalls on drainage structures.

The Producers & Refiners Corp. are engaged in constructing a pipe line near Hanna, Wyo., on which they are using a Model 44-B Barber-Greene Standard Ditcher.

Ed. Honnen, Colorado Springs contractor, is using a new model Sullivan Air Compressor on his five and one-half mile gravel job west of Gunnison. His bid for the work was \$60,100. Purchase of the compressor was made thru the Wilson Machinery Co., who recently became distributors for this unit in the Colorado territory.

The Bijou Irrigation Company of Fort Morgan report favorably upon the work being done with a new Byers "Bear-Cat" gasoline trench machine recently purchased by them.

Extra heavy sales on Zenith hand shovels is reported by this concern. Exclusive sales rights on this well-known line in the Rocky Mountain territory was taken over by Wilson in September.

Mr. M. A. Wogan of the Wilson firm attended the "letting" by the New Mexico State Highway Department on September 25, when fifteen road contracts were awarded. Colorado contractors were low bidders on several of the projects.



GRAVEL SCREENING PLANT—Working on Hesperus Federal Aid project under construction by Ed. Hansen, contractor.

WILLIAM N. BOWMAN COMPANY

Architects and Engineers

613-619 Insurance Building Denver, Colorado
Telephone Main 976

June Nineteenth, 1925.

To Whom It May Concern:

We consider the service of Pierce Testing Laboratories, Inc., Denver, Colo., of great value in many ways in relation to our work.

For economical construction on large buildings where high compressive stresses are used, we find that laboratory tests give us accurate data and full assurance that the structure will have a definite factor of safety.

In no other way can we know what the factor of safety is. The best of building superintendents find it hard to be everywhere at once and many of them have not had the necessary training to appreciate the importance of scientific proportioning, proper mixing, amount of water, etc.

Their service has also been of much assistance to us in cost calculation, steel reinforcement, testing and foundation tests on bad soils.

Their service has been prompt, reliable, and charges moderate and merits the highest endorsement we could give it.

Yours truly,

WILLIAM N. BOWMAN COMPANY.
(Signed) Wm. N. Bowman.

WNB'F

**LEE LINE
STEEL DUMP BODIES**

PRICE
\$129 F. O. B.
Factory



"THE BODY MAN"

**The
Winter-Weiss
Company**

541-549 Broadway, Denver, Colo.
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Commercial Bodies, Busses, Trailers,
Transmissions

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Printing
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+ Half Tones +
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**Bridges and Structural
Steel**

For every purpose

Plans and specifications gladly
sent upon application

Minneapolis Steel & Machinery Co.

Denver Office, 15th & Wazee
Denver, Colorado

BIDS OPENED

Proj.	Length	Type	Location	Low Bidder	Bid Price
246-D	5.418 mi.	Gravel Surfacing	Avondale to Huerfano River	Shields & Kyle, Pueblo	\$43,897.30
282-B	2.932 mi.	Gravel Surfacing	West from Meeker	Winterburn & Lumsden, Grd. Junct.	31,466.26
286-A	0.549 mi.	R. R. Grade Separation	Nunn-Doyer	Brown & Smith, Conifer	35,162.50
560	0.757 mi.	Grading	East of Deer Park	Jacobson & Ehrhart, Denver	6,120.00

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj.	Length	Type	Location
271-B	0.778 mi.	Concrete Bridge and Paving	West of Portland
271-D	0.137 mi.	Concrete Bridge and Approaches	West of Pueblo
282-C	4.052 mi.	Gravel Surfacing	Rifle-Meeker
287-A	20.620 mi.	Grading	Fort Morgan-Greeley

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R-3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
2-R-4	6.5 mi.	Concrete Pavement	North of Trinidad
213-D	3.5 mi.	Gravel Surfacing	West of Hesperus
275-C	5 mi.	Concrete Pavement	Husted-Monument
275-D	0.8 mi.	R. R. Crossing and Approaches	North of Castle Rock
276	0.2 mi.	Overhead R. R. Crossing	North of Colorado Springs
278-B	5 mi.	Sand-Clay Surfacing	Hugo, east
279-C	6 mi.	Grading	Shaffer's Crossing
287-B	7 mi.	Graded	Greeley, East
298-A	2 mi.	Graded	North of Pagosa Springs
550	2.245 mi.	Graded	Loveland Pass

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
2-R Div. 2	North of Trinidad	1.922 mi.	Asphalt Paving	Stamey-Mackey Const. Co.	\$ 72,956.00	100	2-R Div. 2
290-A	Las Animas-Lamar	1.521 mi.	Concrete Pav.	Salle Const. Co.	34,561.00	100	290-A
210-B	Grand Valley-Debeque	7.507 mi.	Grading	Winterburn & Lumsden	94,267.00	100	210-B
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	40,422.00	72	213-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	88	243-B
246-C	Vineland, east	1.951 mi.	Concrete Pav.	Strange-Maguire Pav. Co.	57,108.00	100	246-C
247-B	Rocky Ford-Swink	2.329 mi.	Concrete Paving	LaNier, Selander & White	71,001.00	32	247-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surf.	Western Const. Corp.	93,533.00	96	248-A
253-A	Steamboat Springs, west	6.50 mi.	Gravel Surfacing	Northwestern Const. Co.	126,374.00	100	253-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,533.00	70	253-B
254-B	Hot Sulphur Springs-Parshall	1,087 mi.	Grading	Pioneer Const. Co.	61,071.00	22	254-B
258-A	Gunnison-Sapinero	3.239 mi.	Gravel Surfacing	R. P. Morrison	34,900.00	100	258-A
258-C	West of Gunnison	5.587 mi.	Gravel Surfacing	Ed. H. Honnen	60,100.00	1	258-C
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	57	261-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	89	262-B
262-C	La Veta Pass, west	2.897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	95	262-C
262-E	West of Walsenburg	3.527 mi.	Gravel Surfacing	Popple Bros.	24,979.00	0	262-E
262-F	LaVeta Pass-Russell	2 mi.	Crushed Rock Surf.	Central Const. Co.	22,017.00	10	262-F
265-A	Durango-Bayfield	3.143 mi.	Gravel Surfacing	Blackwell & Butler	31,286.00	100	265-A
266-B	Durango, south	3.181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	51	266-B
270-B	Monte Vista-Alamosa	2.833 mi.	Gravel Surf.	San Luis Valley Const. Co.	15,471.00	100	270-B
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	84	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	76	272-A
275-A	Gann-Sedalia	7 mi.	Concrete Paving	Strange-Maguire Pav. Co.	314,174.00	3	275-A
275-B	Sedalia-Castle Rock	5.334 mi.	Concrete Paving	J. Fred Roberts & Sons	198,771.00	3	275-B
277-A	Colorado Springs, south	2.840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	85	277-A
279-B	Morrison-Balleys	5.295 mi.	Grading	Harry H. Brown	85,980.00	85	279-B
283-B	Berthoud, south	4.2 mi.	Concrete Paving	C. C. Madsen Const. Co.	168,835.00	5	283-B
286-B	Nunn, north	19 mi.	Grading	James Collier	87,249.00	16	286-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	40	288-A
288-B	Merino, west	2.519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	30	288-B
293-A	West of Montrose	114 ft.	steel bridge	Wear Bros.	17,936.00	21	293-A
294-A	Mancos-Cortez	2.9 mi.	Gravel Surfacing	Engler & Teyssier	23,273.00	1	294-A
295-A	Alamosa-La Jara	4.456 mi.	Gravel Surfacing	Central Const. Co.	19,861.00	24	295-A
296-A	South of Pueblo	113 ft.	Concrete Bridge	C. A. Switzer	17,810.00	1	296-A
297-A	Pallsades-DeBeque	2.848 mi.	Grading	Ed. H. Honnen	40,188.00	26	297-A

Park County Officials Buy

Pair of Fordson Maintainers

Park County Commissioners have just purchased two Hadfield-Penfield One-Man Maintainers mounted on Fordson Tractors with Hadfield-Penfield Crawler Tracks for maintenance, light grading and winter snow removal. This purchase will not only save county taxpayers money but will insure them the use of their highways under all weather conditions this winter.

Ralph Donaghy, who sub-contracted two bridges under J. Fred Roberts and Sons Construction Company on the Castle Rock Paving job, has bought a new 5-L One Sack Capacity Jaeger Mixer for this work.

The Johnson county commissioners at Buffalo, Wyoming, have placed their order for one of the New Model Galion Giant Premier E-Z. Lift Graders. This machine is equipped with steel cut gears which run in a bath of oil. All New Style Galion Graders are regularly equipped with Hyatt Roller Bearing

Wheels running on high carbon steel axles.

Shields and Kyle made their 2nd Galion Grader purchase within the year. They were so well pleased with he No. 10 Grader used on the Deckers job that when recently awarded additional contract they immediately placed their order for one of the Galion No. 8 E-Z. Lift machines. This is another model 1926 Galion which has all of the latest improvements.

The Commonwealth Irrigation Company of Alamosa, Colorado, are now the proud owners of a Bay City Model No. 4 Combination Shovel and Drag Line, purchased this month for cleaning and enlarging their canals and laterals. This is the 2nd Bay City One-Man Excavator in use in this territory, the other being owned by the New Cache La Poudre Irrigation Company, of Greeley, Colorado.

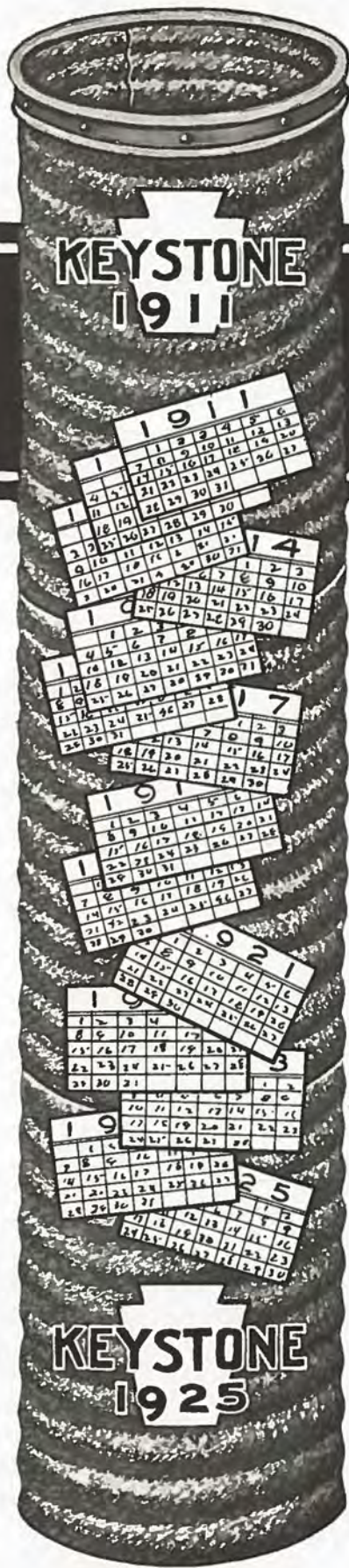
Guard Rail Holds Big Truck on Road After Wheel Breaks

Interesting data on the protection provided by wire link fence used for high-

way guard purposes is supplied by J. D. Pridden, district highway engineer for the North Carolina Highway Commission, in a report on a recent accident to a heavily laden truck on state route No. 10 between Salisbury and Statesville, N. C.

The truck, loaded with timber, was traveling at a rapid rate of speed down a grade when a piece of lumber slipped off and caught in the front wheel, breaking the wheel and steering gear and causing the truck to go out of control and dash ditch bound.

Previous to the accident, fortunately, the highway commission had installed several hundred feet of Page Hi-Way Guard on both sides of the road as a protection to the deep ditch on either side. The careening truck struck the Hi-Way Guard causing it to stretch considerably before the force of the impact could be absorbed and the truck stopped. Neither the driver nor his helper were injured. The only damage to the truck was that caused by the piece of lumber. After the accident the distorted length of guard was removed and a new length spliced in.



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THE COLORADO CULVERT AND FLUME COMPANY

THINK

What you would pay for Culverts
today if it wasn't for

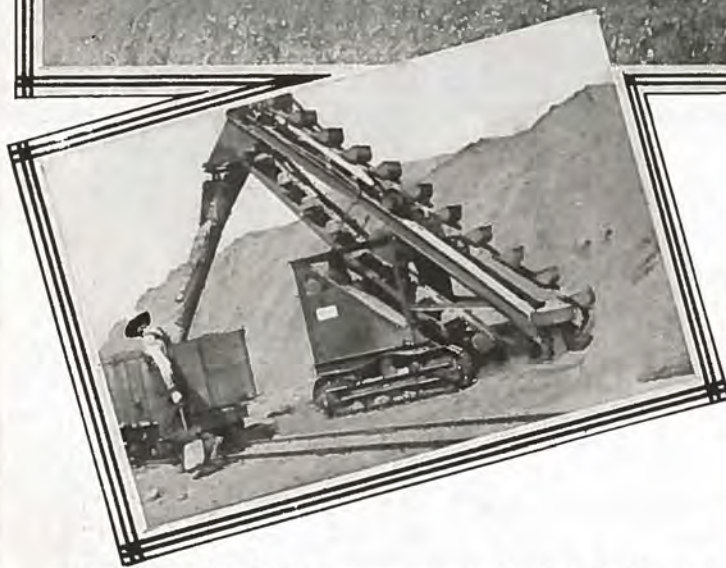
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FOURTEEN YEARS ago KEYSTONE Culverts were first installed in Colorado. Then, and ever since, the price has been uniformly more economical, quality considered, than the price of any other culvert you could purchase.

Multiply that difference in cost, per carload, at prevailing bank interest—compounded—and you will see that you could replace every KEYSTONE Culvert you bought at the end of ten years and still be money ahead. But—KEYSTONE Culverts do not need to be replaced. They have stood the test of time, impact, thawing and freezing—in fact, every condition that good culverts are supposed to stand. They have proven conclusively that you would be money out of pocket if you had paid more for this same life.

No matter in what County you are located, don't buy a culvert until you first get our prices on KEYSTONE Copper-Bearing Galvanized Culverts

The Colorado Culvert & Flume Co.
PUEBLO



More Miles of Surfaced Roads for Less Money with Barber-Greene Loaders

Use of Barber-Greene conveyors or bucket loaders in surfacing highways, eliminates the grief and high cost of hand labor.

An increasing number of county commissioners are using Barber-Greene labor saving equipment on difficult surfacing jobs and find that they can improve more miles of roadway for less money, thus enabling them to reduce county road appropriations.

Barber-Greene equipment is designed for loading bulk materials at low cost. Sand, gravel, coal, dirt

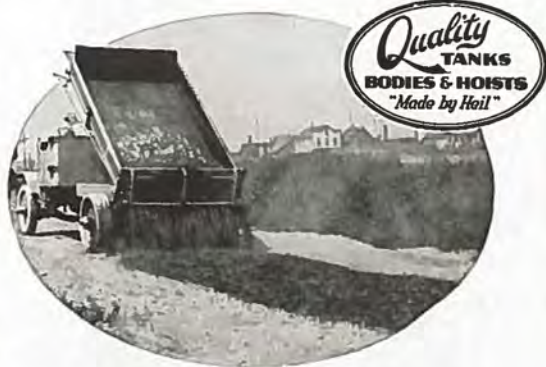
or snow can be loaded economically into trucks, wheelbarrows, horse carts or other conveying equipment. The Model 42 Barber-Greene has practically become the standard for material loading on road jobs.

A Barber-Greene material handling engineer is always available to present the best methods and plans of using B-G material handling equipment. Ask for his services or additional data on the machines. No obligation.

Heil Hydraulic Bodies and Hoists

Lead in the Good Roads program. All Heil bodies are tapered three inches wider at rear than front so that the stickiest load will slide out easily. Concrete, wet clay, gravel and mud are dumped "clean" with Heil units. Heil hoists are the most powerful manufactured. They are simple, compact; allow no side-sway; are direct-acting, no cables, piping, rollers, arms, gears, etc. Simple to operate—easy to maintain. Ask the Colorado state highway department.

Gravel spreading device furnished when specified. Heil Bodies and Hoists mount on any make or model motor truck.



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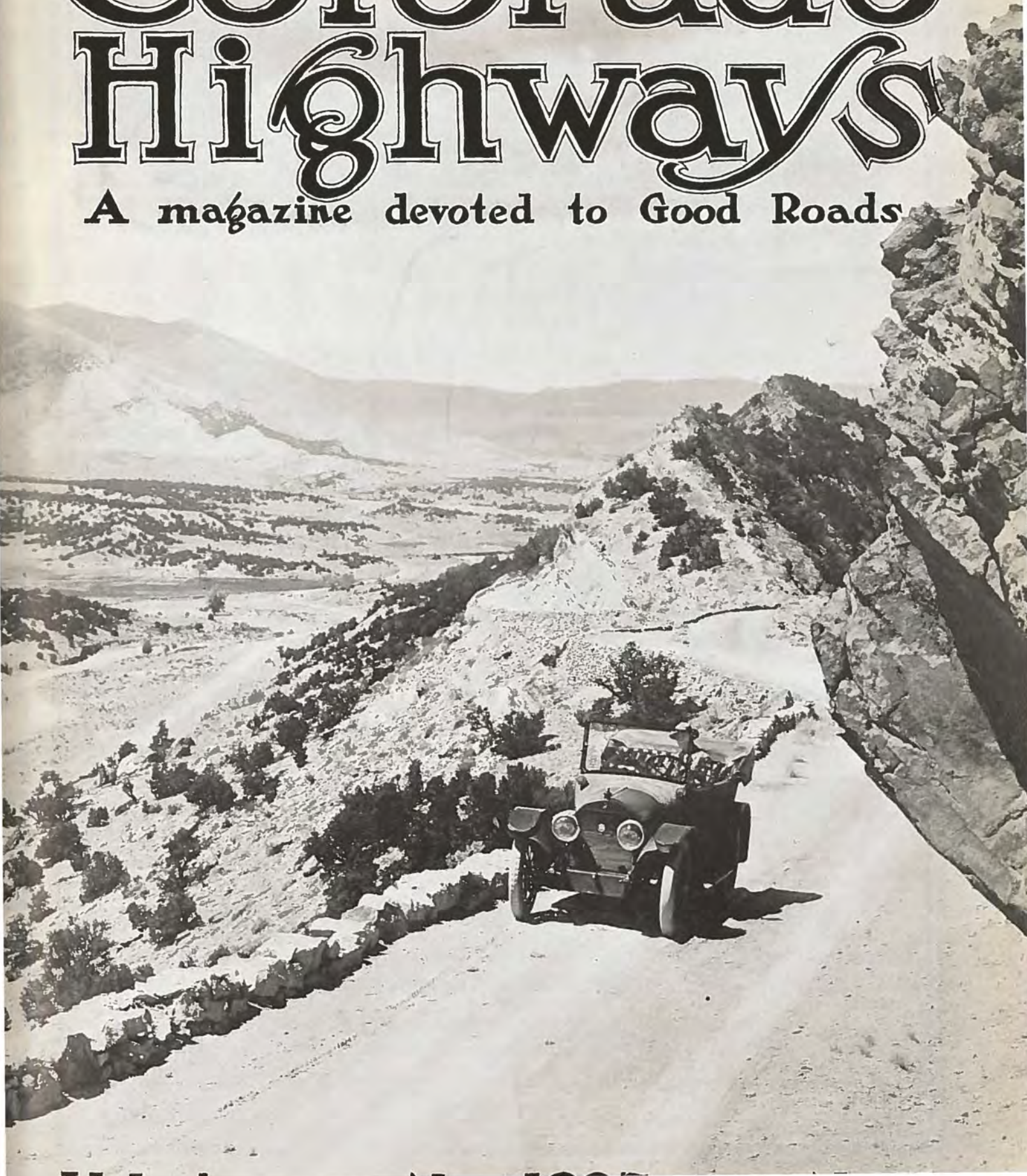
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DENVER, COLORADO

Colorado Highways

A magazine devoted to Good Roads



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roads are a
good investment
—not an expense*

An Extra Gasoline Tax of from 10 to 20 Cents Per Gallon

Your gasoline bills run into real money.

But have you ever stopped to figure how much of this is in the form of an incredibly high gasoline tax?

Let's see what happens when you leave the Concrete Highway and take to a gravel or a dirt road.

Conclusive tests have proved that a gallon of gasoline will carry you only two-thirds as far on a gravel road as on a Concrete Road. On a dirt road a gallon of gasoline will carry you only half as far as on Concrete.

With gasoline at twenty cents a gallon, you would thus pay a gasoline tax of 10 cents per gallon on the gravel road and 20 cents a gallon on the dirt road.

These are figures you can't get away from. You can prove them yourself.

And remember that every time you travel on either a dirt or a gravel road you also increase wear and tear on tires and run up your repair bills.

Why continue to pay these high taxes and get nothing in return but the discomfort and inconvenience of unpaved roads and streets?

Let your local officials know you want an adequate system of Concrete Roads and Streets. They are just as willing to build them as you are anxious to get them.

But they must have your support.



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Published Monthly by the

COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

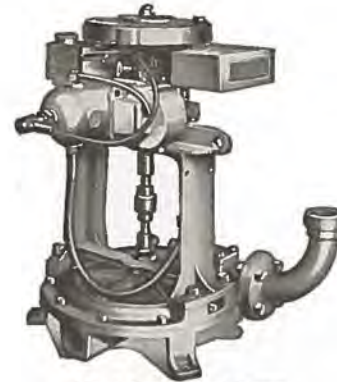
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OUR COVER PICTURE

A picturesque stretch of roadway on the Skyline Drive near Canon City is shown on the cover of the November issue of COLORADO HIGHWAYS. The construction of this notable highway opens up to the motorist a mountain view of rare beauty. Unusual skill, experience, time and money were required for its building. It is one of the most widely advertised scenic roads in Colorado.

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PUMPS



No. 1 Centrifugal Pump

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The No. 1 Centrifugal Pump weighs 115 lbs., is easily handled. Capacity, 5,000 gallons per hour at 20-foot head. Handles dirty and gritty water. Used very extensively instead of a diaphragm pump.

HIGH PRESSURE PUMP

Twin cylinder 4-5 horsepower engine direct connected to Viking pump. Will deliver 1,500 gallons per hour through 1 1/2 miles of 1 1/2-inch pipe. Total net weight, 105 lbs. Ideal for fire fighting and supplying water for steam shovels because of great portability.



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Editorial

FEDERAL AID FOR ROADS

INCREASING the appropriation for federal aid in highway construction is likely to be one of the most bitterly fought over issues in the next Congress. Opposition to our national policy in several instances serving as political capital, is rapidly arousing public interest.

Nor are champions for the defense lacking. Alvin MaCauley, president of the Packard Motor Car Company, writing in the National Republic for September on "The Government's New Big Business," cites proof that savings in the operating costs of motor vehicles will more than offset the billion dollar expenditure necessary to complete the 200,000-mile federal-aid system within ten years. Delay in pushing road construction at maximum speed means an increasing waste as the number of motor vehicles grows. Of the 21,264,742 cars in the world registered on January 1, 1925, 17,591,981 are in the United States. It is small wonder that a road-building program of unprecedented magnitude has been forced upon us. Despite present operating costs due to inadequate roads, motor transportation is lowering the cost of living, increasing our national health through outdoor life, and knitting the nation into a homogeneous whole through the breaking down of sectionalism.

The road-building accomplished under federal supervision cannot be too highly praised. The obligations of the government in the building of inter-state roads cannot be disregarded. The desirability of continuing the present program cannot be overstressed, nor the urgent necessity for appropriating \$100,000,000 annually to push it with at a speed limited only by men, materials and climate. Whether or not we have roads adequate for our transportation needs we must pay for them, declare our highway engineers, and we pay more if we do not have them than if we do. Probably as thorough and comprehensive a digest of the subject as has yet been made appeared in the Outdoors Pictorial for September. As the facts are brought before the public in articles such as those men-

tioned, the completion of our great highway system will be assured, for Congress, though frequently criticised, does represent the best thought of the American people.—*Wadena News*.

GASOLINE TAX PROVES POPULAR

THE gasoline tax is the most painless, profitable and equitable tax ever levied. It is painless because it is collected in small, hardly noticeable installments. It is profitable because the overhead expense is very low.

The State Treasurer of New Jersey collected over \$350,000 at an estimated cost of \$80. The experiences of other States are similar. It is equitable because the taxpayer pays in accordance with his use of the highways, not, however, to the extent to which he is benefited, as the average saving which an improved road (made possible by revenues derived from the gasoline tax) effects for a motor vehicle has been given by the United States Bureau of Public Roads as three and six-tenths cents per mile.

The gasoline tax being a special tax will only remain an equitable tax as long as the money raised is devoted to road construction and maintenance. If it is diverted to any other purpose, no matter how worthy, it immediately becomes an unjust and indefensible tax which will speedily prove unpopular, and the diversion, if continued, will result in its repeal.

The governing Boards of Western States Counties can well afford to take an active interest in all legislation affecting the disposition of funds raised by the gasoline tax. Many of the Counties benefit directly, as in some States the revenue is disbursed 50 per cent to the State and 50 per cent to the Counties. All Counties benefit indirectly on account of reduced State taxation. The gasoline tax must be continued and its continuance is threatened by Legislatures enacting legislation which will result in the money so raised being diverted from its legitimate use: the construction and maintenance of highways.—*American County*.

West Urged to Unite in Defense of Federal Aid Highways

Whole Nation Benefited by Better Roads—Auto Club Executive Points Out High Lights of Issue and Advises States to Organize

WITH nearly eighteen million motor vehicles daily traversing the roads of the United States, it is obvious that highway development is worthy of most serious consideration. In fact, our highways today might be called our paramount consideration in view of the fact that the automobile practically has provided every family in the country with a private transportation line, operative at will and ready at a moment's notice to run down to the corner grocery or across the continent.

The problem of constructing adequate highways is peculiarly acute in the Western states where distances are great and population comparatively small. Good roads cost money and the only way that funds may be raised for this purpose is from the population of the country as a whole in the city, county or state where the roads are being built.

Crowding the West

Curiously enough, while the Western states are the least equipped to launch into an extensive good roads program, their roads serve a wider range of the country's population than do the roads of the East. This is because the large majority of the Nation's playgrounds are west of the Mississippi River.

Each year brings a large increase in the number of Eastern motorists trekking across the continent to view the splendors of the Grand Canyon, the geysers of Yellowstone and the giant trees in the national parks of California. These scenic wonderlands belong to the nation at large. The citizen of Maine or Florida has as much interest in Yosemite, Mount Lassen, Sequoia Giant Forest or Yellowstone Park as does the Westerner.

With not only their own population to serve, but having to act as host to mil-

By **CARL E. McSTAY**
Field Secretary Automobile Club of
Southern California

lions of visitors from all parts of the country, the Western states find the problem of good highways serious, indeed. They have limited funds for building, but must build the high type and expensive roads because the development of the automobile as a utility has brought hard service and many demands upon the

Road builders and vehicle manufacturers must co-operate in order that the roads shall be built to carry the vehicles and that the vehicles shall not overburden the road. Road building authorities of the Nation, the States, the Counties and the Municipalities must co-operate that the roads which know no political borders shall be properly co-ordinated.

—W. M. JARDINE,

highways. Also the most mountainous stretches of country are in the far West, which makes road building doubly difficult.

Paid In Land

There is little cause for wonder, then, that the Western States are apprehensive of the suggestions that have come from the East that Federal aid in highway construction be discontinued. This beneficent legislation has been attacked as being paternal, as it is the Western states that are in great need of such aid and are making the most of the opportunity.

It is doubtful if those who oppose Government aid in highway construction re-

alize to what extent the people at large are indebted to the West for the Federal lands, national forests and national parks. In considering Government aid, it should be remembered that in its conservation program, the nation has withdrawn from the Western states from 45 to 90 per cent of their respective total area. Obviously these vast tracts are unproductive of revenue so far as the states are concerned. Millions of acres of these great public holdings are valuable as grazing lands, rich in timber, have hydro-electric development possibilities, capable of earning millions of dollars annually and unfathomable mineral resources. All this wealth accrues to the people at large and not to the Western states from which the territory has been taken.

It seems but reasonable, then, that the Government should aid these eleven states in their notable ambition to construct highways that will serve the national parks, transcontinental travel of all kinds, military purposes, post roads and facilitate the handling of products of the soil and the mines.

While the building of interstate and transcontinental highways directly benefits the states which such roads traverse, they are in many instances of even greater benefit to the country at large, connecting as they do the resources of the country as a whole. Therefore, the problem is in no sense local, of municipality, county or state, but on the contrary is national in its aspect.

When the great transcontinental railways were first projected, the co-operation of the national government was forthcoming. Otherwise, for many years at least they would not have been built.

The harbors of our country have been



NEW ROAD TO WESTERN SLOPE COMPLETED—Two views of new Federal Aid highway located between Grand Valley and DeBeque, recently open to traffic by the State Highway Department. This roadway taps the rich oil shale fields of Western Colorado. Photos by Div. Engineer H. L. Jenness.

developed through federal aid and the wealth thus created has repaid many fold the investment and this notwithstanding the fact that the majority of our nation's population do not live adjacent thereto.

By no other means than federal aid can the building of direct connections between the various states be attained, for it is impossible for the State of California to directly contribute toward the building of a connecting route across an adjoining state, however important that connection may be to the welfare of the State of California. However, the State of California and all other states in the Union can, through the federal government, render the aid necessary to build the type and kind of a road that traffic demands.

The argument that federal highway aid is paternalistic and has a tendency to develop weakness is unworthy of the maker. If it be true, then there should be no state highway system and the road problems of each community should be solved by the community itself without regard to their neighbors. Instead of the most direct and practical routes being available for those whom pleasure or business cause to journey from one portion of the state to another, the traveler would find himself winding and twisting about on local roads built to serve the needs of the local population alone, without thought to direct and proper connection with other communities within the state.

The same problem is involved in the construction of interstate and trans-continental roads and the plain duty of our federal government is not only to participate in the cost of building such roads, but to co-operate with the various states in the planning of the type of construction and the location of such roads in order that the best interest of the people as a whole may thereby be served.

The big men of our nation agree that the theater of action in the days to come is on the Pacific Coast and the territory adjacent thereto. That territory is not confined to the states immediately bordering on the Pacific Ocean. Otherwise they might as well be islands separated from their neighbors by a vast expanse of water. Colorado, Utah, Arizona, New Mexico, Wyoming, Montana and Idaho will benefit and their development is essential to that of Oregon, Washington and California, and our government will benefit by that development in accordance with its participation therein.

It is, therefore, essential that the people of these Western states realize the importance of banding themselves together in a determined effort to obtain consideration on the part of the other states of the Union which, with themselves, comprise our nation, to the end that federal aid in highway building be not only continued, but augmented and developed as need demands.

This is not asking charity nor seeking favors, for the West has and continues to contribute its full share toward the prosperity of our nation as a whole and that contribution will be enlarged just to the extent that the development of its resources can be attained.

On every hand in every section of our country it has been demonstrated that the building of good roads brings about a more rapid and more thorough development.



VIEW OF WOLHURST-SEDALIA CONCRETE PAVEMENT—This is considered one of the finest pieces of paved roadway in the state from the standpoint of smoothness. Photo by Staff Photographer.

“Bind the Republic with a Perfect System of Roads”

Let it not be said that internal improvements may be wholly left to the enterprise of the states and of individuals. I know that much may be justly expected to be done by them; but in a country so new and so extensive as ours there is room enough for all the general and state governments and individuals to exert their resources. Many of the improvements contemplated are on too great a scale for the resources of the states or of individuals, and many of such a nature that the rival jealousy of the state, if left alone, might prevent. They require the resources and the general superintendence of the government to effect and complete them.

But here are higher and more powerful considerations why Congress should take charge of this subject. If we were only to consider the pecuniary advantages of a good system of roads and canals, it might indeed admit of some doubt whether they ought not to be left wholly to individual exertions; but when we come to consider how intimately the strength and political prosperity of the Republic are connected with this subject, we find the most urgent reasons why we should apply our resources to them. Good roads and canals, judiciously laid out, are the proper remedy. Let us, then, bind the Republic together with a perfect system of roads and canals.

The fund proposed to be set apart in this bill is about \$650,000 a year, which is doubtless too small to effect such great objects of itself, but it will be a good beginning. Every portion of the community—the farmer, the mechanic, and the merchant—will feel its good effects; and, what is of greatest importance, the strength of the community will be greatly augmented and its political prosperity rendered more secure.—From an address

by John C. Calhoun before the House of Representatives, 1817.

* * *

A great deal is being said these days about Federal aid for highways. The charge has been made that it is in violation of the principle of states' rights; that under that doctrine the states should assume the entire obligation for the building of the highways of the nation. The above quotation from an address by the greatest of all advocates of the rights of the states proves he held a different view.

The need for “binding the Republic together with a perfect system of roads” is as urgent now as it was a hundred years ago. In fact, in this age of motor transportation, it is more urgent. Federal aid will make it possible.—California Highways.

Blauvelt Offers Counties Help of State on Plans

Maj. L. D. Blauvelt, state highway engineer, in a statement issued to county commissioners calls attention to the fact that the state highway law provides that the highway department, at the request of local bodies, may make plans and specifications for county road work, and may act as consulting engineer to assist in planning and supervising local projects.

He assured the commissioners that the state highway department desires to co-operate with the counties whenever, in their opinion, it may be of service to the people. Numerous co-operative projects on the state highway system were cited as evidence of the cordial relations and mutual confidence existing between the department and the county boards.

WHATSTHEHURRY?

Throttle 'er down a little! What's the hurry? You are endangering your life as well as others who travel along the public highways!—Albert Lea Tribune.

Only One Jump Ahead of Saturation

Bus Transportation Emerges from Its Swaddling Clothes
as New Highways Through the Land Are Opened

By J. W. Wilder

THE phenomenal rise of the motor bus as an important factor in our transportation system has been the cause of widespread comment; but past developments are as nothing compared to the growth which its sponsors confidently predict. If estimates recently made may be relied upon, 272,000 busses will be operating in 1930, an increase of almost 500 per cent over the 60,000 now running.

Bus transportation would seem to be out of its swaddling clothes. Its early enthusiasts drew intimate comparisons between the bus and the railroads. They said, "Here are two primary agencies of transportation. Their growth and their problems are similar. Their development will logically follow identical lines. They both aim for the same ideal—the carrying of the nation's populace."

But though many of their assertions have proved true, time has shown that there are radical and basic differences, which will drive these two arms of transportation farther and farther apart.

The greatest difference lies in the question of operating room. Railroads operate over roadways owned by themselves for their exclusive use. Their routes once

established are inflexible. Changes are expensive. All improvements are paid for by the railroad which reaps sole benefit for moneys expended on betterments.

Pay Proportionate Share

Motor busses, on the other hand, operate over highways owned by the public and share these roadways with 17,000,000 other units of transportation. Bus companies pay only a proportionate share of the cost of their construction and maintenance. And because these roadways are owned by the public, bus companies can improve their service only by seeking out the improvements the public installs.

It is becoming more and more apparent that the similarity between railroads and motor busses ceases with the fact that both haul passengers. The railroad, because it is inflexible, must develop the territory it crosses if it is to succeed. The motor bus, because it is highly flexible, does not directly do this, but seeks out population centers which the public's roads tap.

Bus transportation and success, then, must logically follow the development

and improvement of our highways. And because these highways are today only one jump ahead of saturation, it follows that the problem of suitable operating room for the predicted growth of bus traffic will be a serious one.

This saturation of roadways applies equally well to the city and rural bus lines. It might seem reasonable to assume that the city bus has much the easier problem of the two, for most city streets are now paved and there are many routes through town which can be chosen. And in addition to this, population is concentrated and waiting for the bus.

Many Kinds of Paving

But population, in the calculations of bus companies, is assuming secondary importance because the greater the concentration of population the more competitive the field of transportation and the greater the investment required. It is true that though most city streets are paved, bus operators are finding that there are many kinds of pavements, not all of which are suited to their needs.

Alvan Macauley, president of the Packard Automobile Company, has defined



MANCOS HILL ON HIGH—There was a time when motorists dreaded this stretch of roadway, but now, as the picture indicates, it is in all respects a mountain boulevard. Ninety per cent of the traffic entering the Mesa Verde National Park travels over this highway. Photo by Staff Photographer.

the problem of the city street as follows: "Many of the streets in use today are built on the 1862 model. They were adequate for the horse-drawn traffic of a past generation, but are not suited for the concentrated motor traffic of today. These streets are being torn to pieces by the ceaseless, heavy flow of motor vehicles."

Patrons of the city bus do not want to ride over bumpy, rutted streets. Property owners do not desire to have their streets waved and rutted by busses, even though those pavements are out of date. And so the city bus operator is finding himself more and more enmeshed in the problem of finding pavement types which will carry his growing traffic without being ground to pieces, and thus bring condemnation on his head for hastening the destruction of public thoroughfares.

City officials and engineers have been interested in this problem for years. Their search for pavements suitable to today's traffic has been unrelenting. A typical situation is that of Chicago, where bus transportation has enjoyed phenomenal extension and where motor vehicle concentration grows more complex daily. John J. Sloan, president of the Board of Local Improvements, as spokesman for the board, gave out this newspaper statement recently: "The increasing popularity of the concrete pavement is due in great part to the automobile. Aside from being approximately ten per cent cheaper to build, it gives longer wear, is not affected by oil drippings from cars, is not damaged by intense cold or heat, and because it is a rigid type of pavement, does not develop ruts and waves under the constant pounding imposed by heavily loaded trucks and busses."

Problem Solved by Many

The problem of today's street has been solved in the manner mentioned by Mr. Sloan in hundreds of cities. In search for a pavement type which would last indefinitely, cost little to maintain and render service in keeping with the demands of motor vehicles, cities have paved with concrete.

City-to-city bus lines have not had out-of-date pavements to contend with. The general improvement of rural highways really began with the coming of the motor vehicle and the two can be said to have developed together. Early in the development of city-to-city bus lines, it was realized that existing systems of road maintenance and policies would have to be revised if motor vehicles were to render the maximum service of which they were capable.

The result of this belief was the passage of the Federal Aid Act, an act which unified state highway departments and started the nation upon the way toward widespread improvement of highways. Helter-skelter laws and policies were discarded and road improvement became a business. How stimulating was the act in its effect toward more and better roads is readily seen in the figures for road construction and maintenance for 1924 compared with 1914, two years before the act was passed. The total cash expenditure for roads in 1914 was \$239,663,785. In 1924, ten years later, the expenditure was just short of \$1,000,000,000. And this growth was all due to the motor vehicle.



HOOSIER PASS NOW A PLEASURE—The above view shows a stretch of the improved roadway recently constructed by the State Highway Department with State funds. Photo by H. L. Jenness.

Best Highway System Seen

Because of this increasing investment in better roads, America is laying the foundation for what will some day be the most extensive and best highway system in the world. Already 470,000 miles of highway have been improved in some manner. This includes all types of improvement from grading up to high class pavement. But each improvement, no matter how limited, has beckoned to new fields for bus transportation. Included in this half million miles of improved highway are some 34,000 miles of concrete—and the yearly construction mileage of this type of road is steadily increasing, but is still behind the motor vehicle's needs.

Concrete is today the approved type of pavement for rural roads. It is accepted as standard by most of the states. Under increasing weight and volume of traffic, it has proved its worth.

Satisfying as is this growth of permanent roads, many persons believe that America has not yet hit her stride in building permanent roads. William Randolph Hearst, in a front page editorial on July 4, 1925, said in part, "When the federal government entered into partnership with the states in a plan of road building, it was mainly for the purpose of securing several great transcontinental highways. The object was a most commendable one. Many years have elapsed since the program was first announced and yet those very necessary highways have not been built. Sections of them have, but this is not enough. The federal government should revise its program and adopt a more liberal attitude, an attitude which will immediately construct several such highways. The government was liberal enough with the first transcontinental railroads and should be equally liberal with highway construction."

Many will agree with him. But an extended policy will serve to increase the disadvantages of the present building plan as well as the advantages. Under

an extended policy, as such a policy is now laid down, there will be many more miles of roads built to be torn to pieces, roads which private cars and busses cannot use because they are not built substantially enough to withstand present traffic requirements. On the other hand, states which are building for the future, as Illinois, Pennsylvania, California and others are, will benefit by an extended program.

Greater Interest Needed

The need is for more active sustained interest in permanent road construction. The only source of such interest is the public, those who use the roads for pleasure, those who use the roads for business, and those who know that permanent roads increase property values and make the standard of living better all along the line.

Any bus operator, whether an individual or a corporation, has learned by costly experience that the condition of highways figures prominently in operating costs and consequently profits. Gasoline, tire wear and general vehicle maintenance are lowest when busses are operated continuously over concrete pavement. It is also necessary that bus operation shall be maintained without limitation for twelve months in the year rather than throughout those periods or months only "when the roads are good."

To realize these ends, rigid, non-yielding highway pavement, whether the location be town or country, is necessary.

It goes without saying that present bus fares, whatever they may be in any locality, have been fixed or adjusted with due regard to operating costs and unless bus operators can earn a fair profit on their investment, they cannot operate. It is likewise logical to believe that as their operating costs can be reduced, they will make every endeavor to retain public good will by lowering fares where justified.

Opportunity for Manufacturers

Bus manufacturers and bus operators

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Impressions of English Highway Practice

DURING the spring of 1924 I was detailed to study the rural roads of England. With this not unpleasant assignment I was employed during the months of April, May and June, and although England did not live up to her reputation for fine spring weather—it rained nearly every day—it was possible to get about without particular difficulty even in the remote country districts. One could forgive the rain for the astonishing beauty of the roadside which it produced.

In addition to meeting the English officials, the trip included a journey in a Chandler (American-made) automobile from London to Edinburgh, and a little farther north in Scotland, going up through the counties on the east side of the little island and returning to London by way of the westside counties, a drive of more than 1,500 miles.

The main north and south roads were rather generally followed, but the large centers of population and the manufacturing cities were avoided for two reasons. I wanted particularly to see the rural roads; and the heavy traffic congesting the narrow, crooked streets of the cities, built when riding in a saddle was more popular than any other sort of transportation, was not tempting to an amateur driver whose forbears for some generations had been taught to drive on the right-hand side of the street.

They say that even Henry Ford had to yield to British conservatism and put the steering wheel on the right hand side before the English would buy his cars. The Chandler car, originally made with the steering wheel on the left side, had been remodeled so that the wheel, clutch pedal, and brake were moved to the right side. The gear shift, however, was left in the center and had to be worked with the left hand. One soon learned to make the car go, but the idiosyncrasies of the car, together with passing other cars on the wrong side of the road, made such a thing as intuitive driving out of the question. It was not difficult, however, to go as fast as the law permits, for in England as in Massachusetts the legal limit of speed is 20 miles an hour. The law is obeyed equally well in both places, I should say.

The journey, as it was planned, gave an opportunity to inspect a considerable mileage of the two main north and south trunk lines throughout the length of England.

There are many similarities and some differences between the English country roads and the rural roads of the United States. They are perhaps more crooked even than the roads of our older states, and the reason for the poor alignment is apparently the same in both countries. In neither country was there any thought of motor traffic or any other sort of fast traffic when the roads were surfaced. Mostly the roads were improved by putting down hard surfaces within the limits of the then existing rights of way. We seem to be making faster progress

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in this country in correcting that fault, perhaps not because we are more progressive, as we like to think, but because the urge is greater. The motors have come upon us at a faster rate and in greater numbers, relatively, than in England.

Great Britain still has from 20 to 25 per cent of its highway freight moved by horses, while I suppose that in the United States not more than 10 per cent of the traffic is horse-drawn, and in some of the states the horses are no longer counted in the traffic census.

But when it comes to the matter of the riding quality of the roads we have very much to learn from England. I saw no road on my long auto journey so rough as are most of our rural roads, but it should also be said that I saw hardly any so smooth as the best of the roads in the United States built by the state highway departments with the Federal-aid stimulant.

The English and American Road Problems Compared

Our road problem is so much bigger than Great Britain's that the reason for the better average improvement of the English road is apparent. In all England, Wales, and Scotland, there are but 177,000 miles of road, cities and boroughs included, as against our estimated mileage of 2,941,000, outside of cities and towns. England, Wales and Scotland have an average of about 242 persons to the mile of road, while in this country there are not more than 35 people to the mile. In Massachusetts, one of our states

of dense population, there are about 175 people to the mile.

The English roadside almost invariably is a thing of beauty, and an American has to go to Scotland before he feels at home. For some reason, sparse population and lack of money, perhaps, the Scotch roadsides are nearly or quite as barren and unkempt as most of ours are. The English roads generally have a wide grass border, and there are trees and shrubs everywhere. Sometimes the line of sight is restricted by the roadside growths, but it is plain to understand why even then the shrubs are spared.

The drainage water from the roads disappears quickly from the carriageway and flows off in unseen ditches near the right-of-way lines. The turf at the pavement edge is carefully trimmed and kept so just as in a park. Laborers trimming the edge with spades with a tightly stretched cord for a guide were seen, working as painstakingly as if they were trimming a garden border.

The traffic control at bad road intersections in the country as handled by the agents of the automobile clubs, in co-operation with the police authorities, is wonderfully well done and worthy of much more attention than can be given to it here. In the matter of road signs, however, I was disappointed. I think that on the whole we mark our roads, at least so far as direction signs are concerned, better than it is done in England.

Nearly all of the roads inspected were of some bituminous type, tarmac, tar macadam, asphalt, tar-painted, etc. In my 1,500 mile journey not more than a mile or two of the road in the open country was recognizable as being of the cement-concrete type, and some of that had



UNIQUE WARNING SIGN—The above sign is posted on the main traveled highway between Olathe and Delta. It reads "Drive Slow—You May Meet a Fool." This sign was erected when the road at this point was narrow and steep, but it is broad enough for three cars and the grades and curves have been eliminated.
Photo by Staff Photographers.

been covered with tar or asphalt. I do not imply that no cement-concrete surfaces have been laid on the rural roads, but seemingly most of the work of that type must be in the cities and towns. The English road officials, from Sir Henry Mayberry, chief of the road department of the Ministry of Transport, down to the surveyors of the smaller counties, seem to be almost a unit in believing that they can not afford to scrap the great mileage of bituminized roads which they have constructed even if it can be proved that the concrete type is more desirable from the viewpoint of maintenance costs, which they seem to disbelieve. They seem to be thoroughly wedded to the bituminous types of construction.

The reason for their preference is clear when one sees the carefully planned grades, long established, with sodded shoulders, drainage ditches and entering driveways, and when one realizes the great expense which they have incurred in putting in the heavy road foundations. Notwithstanding the large costs of maintaining the bituminous road surfaces, the Englishman is slow to adopt a road type with which he is not familiar, and he is entirely willing that his American cousin shall make what he calls the experiments. He wants proof of the reputed low cost of maintenance of concrete roads, and in his doubting conservatism he will not admit that the relatively few years of life of the American concrete roads have given them any "history" worth talking about.

The Cost of Maintaining English Bituminous Roads

How large the upkeep charges are for the bituminous roads is shown in some figures published by the ministry showing the annual cost of upkeep on four class 1 roads leading out of London into the Provinces. The total length of the four roads is 321 miles and the report says:

The annual cost of upkeep taken over the whole length of each road ranges from 707 pounds per mile in one case to 980 pounds in another (\$3,360 to \$4,701 per mile.)

Assuming the average width of the carriageway of these roads to be 30 feet, and assuming that \$4,000 per mile fairly represents the average annual cost of upkeep, we see that these four roads cost not less than 22½ cents per square yard for maintenance. This annual outlay would appear to be sufficient to renew completely the wearing surface as often as once in five years. The figures, the report says, do not include any capital outlay for the roads in the past.

I have been unable to find a statement showing the mileage or square yardage of concrete roads in Great Britain. The handbook of the British Portland Cement Association states that 281 concrete roads had been built up to June, 1923. Of these, nearly 79 per cent were built after the year 1920. Many of the roads were very short, some less than one-half mile in length, and evidently the total yardage was not sufficiently impressive to be set forth in the handbook.

On the other hand, much of the new arterial road work in the vicinity of London is of the cement-concrete type, some of it 50 feet in width with the slab 8 inches thick, and the work very well ex-



ON THE ROAD TO MOUNT EVANS—A view of the Harding Memorial Highway with Mount Evans in the background, taken at an altitude of 12,500 feet. During the past summer this road was extended to a point near the summit of the famous peak. Photo by Staff Photographer.

ecuted, some American equipment being employed.

There are so many types of bituminous road in use or offered for use in England that the patentees have had to tax their ingenuity to find names for them all, but from my observation I believe that the great bulk of the pavements are either some sort of penetration macadam, tar-mac, or merely surface-painted.

I was much interested in looking for wavy conditions or corrugations in the surface of the bituminous roads. The county surveyors will tell one that they have waves in their pavements, and they seem to know what one is talking about when one speaks of corrugations, but their waves are not like our waves, for I found very little, practically no, evidence of the corrugations which are so prevalent in our bituminous pavements.

Their methods of spreading the bituminous material are much like ours except that they work more slowly than we do, perhaps more carefully and skillfully, but I am forced to the conclusion that the apparent superiority of the British bituminous roads is due very largely to their thick, heavy foundations and in some measure to the use of curbs to confine the pavements at the sides.

Almost without exception the English road is built with what they call "hard core" as a foundation. Hard core may consist of almost any hard material laid as a foundation for the full width of the carriageway. The stones are large, sometimes as large as 8 inches in longest dimension and often as large as the thickness of the layer will permit. The hard core layer is usually from 8 to 12 inches in thickness. Strong hard slag seems to be a popular material, but when that is too costly and brickbats or stones from walls or buildings are available they are put into the road. The point is, of course, to secure a hard unyielding base which will not hold capillary water. The county surveyors are beginning to wonder if these hard core foundations, strong as from our viewpoint they seem to be, are going to be heavy enough for the future

motor traffic. When we consider how few of our rural roads have any foundation at all under the 5 or 6 inches of bituminized stones, do we need to look much further for the cause of the corrugations? Or to explain the apparent superiority of the British roads? The English seem also to be completely convinced of the need of substantial curbs to prevent the lateral movement of the pavement. All of the new work with which the Ministry of Transport has to do is provided with curbs, and the county surveyors generally are installing curbs in connections with their widening work and extensive repairs.

Bases 12 Inches Thick

Illustrating the extreme care in the matter of road foundations which some of the county surveyors are taking, C. F. Gettings, of Worcester County, told me when I was looking over some of his work with him that because of the bad subsoil with which he has to deal, he first lays a stratum of "blinder," or cinders, 3 inches thick over the subgrade followed by a layer of slag 6 inches thick, then 3 inches of tar-mac, and finally a dusting on the top of pulverized slag. Thus he has 12 inches of material in place before he lays the wearing course, which he prefers shall be tar-mac. Tar-mac is crushed slag, heated and mixed with a refined tar at the works where the slag is produced and shipped cold to the highway job.

When conditions permit him to do so, Mr. Gettings employs what we in this country have come to call the stage-construction method. First, after rolling as much as is effective the 6-inch layer of slag, he turns on the traffic to further consolidate it. He does the same with the 3-inch slag layer, sometimes giving it a light tar treatment and allowing the traffic to pass over it for a considerable period, but not after it shows any sign of distress. In this manner he makes sure, before the wearing course is laid, that he has a firm, hard base for it, and that there will probably be no further

settlement of his foundation after the pavement is completed.

Some of the best bituminous pavements that I have seen anywhere were built under Mr. Gettings' direction. The traffic over the main Worcester County roads is called heavy. The country is in the Midlands, one of the regions of great manufacturing activity. The traffic census taken by the ministry in August, 1923, indicates that the roads are in the group of 1,000 to 1,500 tons per 16-hour day. We would not consider that to be a very heavy traffic, but Mr. Gettings thinks a carriageway 22 feet wide and of the thickness before stated is needed for the main roads of the country where the subsoil is bad.

The Cost of English Labor

In the United States such substantial work would cost much more than the public is accustomed to pay for the rural highways. The English feel the high cost of their road work, too. Common labor in 1924 was receiving the equivalent of 25 cents per hour, a price which the English employer thought was outrageous, yet we at that time were paying more than double the English hourly wage. Living standards and cost of living are different, but I do not believe the disparity is so great as I had been led to believe.

In July, 1924, Portland cement cost in London about \$2.22 per barrel, American basis, and other materials of construction seemed to be not greatly lower in price than in the United States.

The arterial roads near London are of great interest. They are being built in part to supply the general need for more roads, in part to by-pass through traffic so that it will not have to go through the narrow, already congested streets of the metropolis, and in part to provide work for the unemployed.

In England in 1924, there were more than 1,000,000 persons "on the dole," or supported to a greater or less extent by the government. Any public work which could be found for these unemployed was welcomed, and for several years the construction of the arterial roads in the Greater London area and the by-pass roads around the cities and towns in the Provinces has provided work for many men. In 1922-23 there was set aside more than \$31,000,000 for the road-fund unemployment program.

In the Greater London area alone, 165 miles of the arterial roads, including the widening and straightening of some roads, are either under construction or planned for, the total estimated cost of the work being in the vicinity of \$60,000,000.

All of this work is being done on a large scale. Rights of way 100 to 120 feet in width are being secured and with much delay and difficulty. When houses are in the way and must be demolished, the public authorities must provide other houses elsewhere to shelter the tenants, so great is the housing shortage.

The carriageways of the most important arterial roads are to be 50 feet wide and curbed. Sidewalks and planting strips are provided for, and iron fences are installed along the right-of-way lines. On the Great West Road all pipes, sewers, water and gas, and all electric wires are to be placed in conduits under the sidewalks and planting strips. One section of this road under traffic in 1924 was said



WINTER SCENE NEAR RIFLE—Showing stretch of Federal Aid gravel highway between Rifle and Meeker covered with a blanket of snow. Trucking operations are maintained on this road throughout the year.

to have cost at the rate of 180,000 pounds (\$864,000) per mile.

In the arterial road and by-pass work very low grades are insisted upon, the alignment is as nearly perfect as can be obtained, and no effort seems to be spared in securing the best results in all branches of the work. The pavements, or many of them, are of the cement-concrete-base type laid in most instances with the expectancy of covering them later on with asphalt, but in some cases the concrete is being allowed to take the traffic for the present. The concrete slab, 8 inches thick and reinforced, is said to be costing about 10s. per square yard (\$2.40 approximately.)

English Road Administration

The Ministry of Transport took the place of the road board in 1919, and under Parliament it is the highest road authority of Great Britain. Its organization is somewhat like that of the Bureau of Public Roads. The road department of the ministry is in charge of a chief, Sir Henry Mayberry, with Col. C. H. Bressey under him in the capacity of chief engineer who, in turn, has a corps of divisional engineers located at various places throughout the country in direct charge of the operations.

The revenue which the department has for road purposes, derived almost wholly from the registration fees paid on account of the motor vehicles, amounted in 1924 to about 15,000,000 pounds (\$72,000,000.) This is about the same sum that Congress has been appropriating recently for our Federal-aid work, but here the likeness ends. Colonel Bressey told me that the annual revenue which the department received represented, fairly closely, one-third of the total sum spent annually by Great Britain for all highway purposes. Such a sum, approximately \$216,000,000, would not go very far toward paying the annual highway bill of the United States, which in 1922 was estimated to amount to more than \$1,000,000,000.

The ministry has divided the roads into two categories, known as class 1 and class 2, and the present policy is to allot to the counties not more than 50 per cent of the cost of improvements on class 1

roads, and not more than 25 per cent to such work on the class 2 roads. Roads less important than class 2 roads are merely local in character, and they receive no money from the ministry.

In England, Wales and Scotland, the total mileage of class 1 roads is about 23,000 miles, and the class 2 roads aggregate about 14,000 miles. The total mileage of all roads, including the merely local ones, is given as 177,321 miles, so, roughly speaking, the ministry is concerned with about 21 per cent of the total mileage of the country.

Gasoline Tax Abandoned in 1921

Prior to January 1, 1921, at which time the present road fund was established, there had been in effect a tax on gasoline or "motor spirit," speaking in the language of the country, by means of which most of the grants made by the ministry were financed. After the year 1915 this tax was at the rate of 6d., about 12 cents per gallon. Beginning with January 1, 1921, the tax was abolished, and in place of the gasoline tax as a revenue producer a tax of 1 pound (about \$4.80) per horsepower of the motor vehicles was substituted. This tax is still in effect, and the owner of a Ford car, for example, pays into the public treasury annually very nearly \$100 for the privilege of driving on the British roads. The high registration fee has fostered the manufacture and use of low-powered cars, and special attention has been given to small-cylindered motors and high piston speeds.

The ministry does not favor a proposed plan to return to a gasoline tax, which the motor interests are pressing for, chiefly, I believe, because the officials dislike to abandon a source of assured income for a plan which they think to be less sure. They say they need at least 15,000,000 pounds per annum for the roads; that the present taxing plan will surely produce that revenue; and that their experience with the collection of the gasoline tax prior to 1921 has not left happy memories. The old relatively high gasoline tax was doubtless evaded in many instances. Sir Henry Mayberry says that while the motors were increasing in numbers from year to year in an astonishing fashion the receipts from the

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State Vehicle Tax Totals Over Million and Quarter

A total of \$1,391,650 has been collected by the state of Colorado in motor vehicle license fees from January 1 to September 30, inclusive, according to a report issued by Secretary of State Carl S. Milliken.

The report shows a registration of 211,160 passenger cars and 17,195 trucks. Of the sum collected, Denver car and truck owners paid \$443,629.99. Under the state law Denver county does not receive one penny from motor vehicle fees and gasoline taxes paid into the state treasury, the money being divided on a fifty-fifty basis by the state highway department and the other sixty-two counties in the state.

Of the 211,160 passenger cars in the state, only 163,000 appear on the personal property tax rolls of the counties, according to the Colorado tax commission. The average value of these cars, according to tax assessors figures, is \$129.

The cost of collecting the motor vehicle fees is 8.89 per cent, which includes the cost of plates, printing and administration. The cost of administration last year was 4.96 per cent.

The report of collections by counties follows:

Counties	Owners	Trucks	Fee Collected
Adams	4,892	666	\$ 30,722.64
Alamosa	1,335	86	8,149.25
Arapahoe	4,806	379	30,257.23
Archuleta	325	27	1,696.41
Baca	1,308	230	8,810.18
Bent	1,651	97	9,680.97
Boulder	8,584	579	55,798.53
Chaffee	1,330	79	8,236.32
Cheyenne	929	108	5,929.68
Clear Creek	427	31	2,757.31
Conejos	959	80	5,684.96
Costilla	445	24	2,611.69
Crowley	1,215	107	7,550.03
Custer	401	51	2,558.31
Delta	2,650	352	17,771.51
Dolores	91	2	420.90
Douglas	972	77	6,116.40
Eagle	529	52	2,983.43
Elbert	1,453	93	8,712.32
El Paso	11,519	653	79,775.29
Fremont	4,417	335	27,962.27
Garfield	1,414	124	8,378.30
Gilpin	180	6	943.52
Grand	531	44	2,867.77
Gunnison	875	31	4,700.60
Hinsdale	60	5	346.78
Huerfano	2,855	159	17,216.00
Jackson	353	29	2,025.07
Jefferson	5,032	474	32,761.23
Kiowa	943	94	5,818.75
Kit Carson	2,285	367	16,108.23
Lake	583	8	3,285.75
La Plata	1,593	84	9,343.92
Larimer	9,092	593	58,317.12
Las Animas	5,481	348	34,898.32
Lincoln	1,723	203	11,039.96
Logan	4,141	393	26,690.96
Mesa	4,814	406	30,570.45
Mineral	116	18	740.74
Moffat	808	58	4,994.94
Montezuma	972	82	5,931.01
Montrose	1,892	203	12,063.60
Morgan	4,145	313	25,619.31
Otero	5,041	304	30,506.93
Ouray	277	8	1,516.00
Park	472	42	3,028.98
Phillips	1,855	298	12,716.10
Prowers	2,793	214	17,230.22
Pueblo	11,208	770	72,115.66
Rio Blanco	414	25	2,266.60
Rio Grande	1,709	250	11,967.98
Routt	1,481	60	7,457.45
Saguache	883	104	5,800.58
San Juan	102	8	602.34
San Miguel	441	32	2,688.14
Sedgwick	1,131	132	7,287.64
Summit	441	2	1,166.48
Teller	901	60	5,381.41
Washington	2,181	469	16,277.82
Weld	13,378	1,103	84,931.95
Yuma	3,340	643	24,542.25
Total Counties	148,424	12,675	\$ 948,020.76
Denver County	62,736	4,520	443,629.99
Total State	211,160	17,195	\$1,391,650.75

Good Roads Week, during which it is hoped the attention of the American people may be focused upon the necessity for a continuation of highway construction, will be celebrated January 11th to 16th. The same dates have been selected for the annual convention and road show of the American Road Builders' Association, which convenes in Chicago, Monday, January 11th.



GLENWOOD CANON HIGHWAY — One of the most picturesque roadways in Colorado, following for several miles the Colorado River. Photo by H. L. Jenness.

Wolf Creek Death Trap Is Eradicated by State Force

Eradication of the most dangerous death trap on the automobile highways of the state was reported by the state highway department Friday, as completion of the widening of the road over Wolf Creek pass and around Fourth of July cliff was announced.

The road over Wolf Creek pass, the highest automobile pass in the state, has been a narrow and tortuous path, especially on its western side. The road leads around Fourth of July cliff with a straight drop of 2,000 feet from the mountain ledge, to the bottom of the canon.

Wolf Creek pass road is the direct route to Durango and the Mesa Verde National park and is used by thousands of tourists yearly.

The new road, four and one-half miles of which were completed this year, is at no place less than eighteen feet wide, and is twenty-four feet wide in places.

Contractors Rush Work on Castle Rock-Denver Road

The work of pouring concrete on the State Highway between Sedalia and Castle Rock is progressing in a very satisfactory manner. The Strange-McGuire Company has just completed one mile of pavement and is finishing about five hundred feet each day.

The Roberts Company has commenced laying concrete on its project, commencing where the new road leaves the old on the Vosler place and is working north to connect with the Strange-McGuire project as soon as possible. When this is done traffic will then be routed over the pavement instead of detouring as at present.

Grading work has been completed on the street in Castle Rock and it is expected that the pouring of concrete on this section will be commenced soon.

"I Am Good Roads"

I am good roads.

I return to the public moneys spent for my construction and maintenance a hundred fold.

I add to the safety, comfort and pleasure of the traveling public. My smooth surface makes me a friend to the beasts of burden, lightening their loads.

I reduce the cost of upkeep of horse-drawn vehicles as well as the automobile.

I add miles upon miles of service to automobile tires.

I reduce the cost of lubrication and power, giving more miles per gallon to motor-driven vehicles, paying for my maintenance alone in the saving of fuel.

I annihilate distance, giving more miles per hour of travel.

I take you away from man-made world along highways and byways where one can breathe the fragrance of the meadows.

I take you from the sweltering lowlands to the hills.

I lead you through canons kissed by the sparkling streams of the mountains.

I take you to the crest of the world, opening to your wondering eyes all the most beautiful panoramas of nature.

I make it possible to bring to your homes needed aid in cases of emergency.

I educate old age as well as the youth of the land, making it possible for all to "See America" as I turn page after page of nature pictures painted by the Divine hand, teaching them the beauties of their own country.

I am the arteries of the nation in time of need, making it possible to assemble and assemble quickly, its protective resources.

I am for the whole people. The highways are for the rich and poor alike.

I am of service to the City, the County, the State and the Nation.

I give so much and ask for so little. Protect me, I am Good Roads.

Sincerely yours, J. C. GLASSFORD,
Grand Junction, Colo.

Note—The above was written by Mr. Glassford after he had made a trip on the Western Slope on roads that formerly were impassable to automobile traffic; now you can hit 'em on high, he says.

The Importance of Good Management

Men who are capable of directing and handling the expenditures made on our highways, running approximately into one billion dollars a year, should be of a type that will demand serious consideration before they are replaced with inexperienced executives. To handle this large expenditure in the very best way, so as to bring results, there must be an inducement held out to men who are able and who have the honesty, integrity and ability, to see that the work is done properly and that this large annual expenditure is made in a way that it will bring to the people of the State and Nation proper returns. It is self evident that their term of office must be more permanent and they must be given some assurance that, when they have spent a number of years in this work, their services will not be dispensed with, requiring them in many instances to enter some other line of endeavor, and to give up practically a life's work, for which they are eminently qualified and trained to carry on successfully. Not until the public has been educated to the point where they will appreciate the services of their highway officials and realize when they have a good man, capable, in every way of carrying on the work successfully, that it will mean a great loss to dispense with his services, and train a new one, will the continuity of services of such men be prolonged in keeping with similar large undertakings.

Coloradoans Praise Home Roads After Summer Trips

Thousands of Coloradoans are returning daily from their summer trips. The chief topic of conversation and the point which gets more comment than any other with reference to their trips was the quality of the roads in the various states and communities visited.

First, last and all time, when the summer vacation trip is being discussed, the talk is of roads.

In comparing Colorado roads with those of other states, our own highway system is most generally conceded to be far ahead of the others. But they say our job of road building is far from being complete. We must keep up the good work in order to maintain Colorado's fine reputation.

"We need more concrete and more gravel roads and more maintenance," is the way one vacationist put it. He had just returned from a motor trip to Buffalo, N. Y.

New Type of Road Saves Concrete

Twenty-four states have adopted as standard the design of cement roads worked out by the Highway Research Board. This design is only one of the many improvements in road-building made possible by the research of this organization.

This new type of cement road is very

thin at the center but thick at the edges. Although this new design quite reverses the former design, whereby the road was thicker at the center, it not only makes a much stronger road but saves about 390 cubic yards of concrete per mile. At \$10.00 per cubic yard for concrete this saving amounts to \$3,900 per mile, or, if we assume that the twenty-four states will build 2,400 miles of concrete road this year the saving will be \$9,360,000.

Canadian Road Boosters Ask for Fund of Twenty Million

The Canadian Good Roads association is marshalling its forces to press its application to the Dominion Government for a renewal of the Federal grant of \$20,000,000 to assist the various provincial governments in carrying out their programs of construction of main roads designed to be linked up inter-provincially and finally nationally.

Remains of the first recorded roads are still in existence. They were built by the Assyrian Empire about 1900 B. C., and like the spokes in a wheel, radiated from Babylon to the corners of the empire.

The word "highway" comes from the old Roman roads in which the surface was elevated as much as four feet above the surface to permit good drainage. The Appian Way was the first of these and the beginning of a system of 48,500 miles built under state supervision. It was made of blocks of lava resting on a masonry foundation and was begun 311 B. C.

No machinery dealer is worthy the name unless he is in position to immediately render both the expected and unexpected in

Service

Wizard All Steel Road Plows
Moore Special Fresnos
Galion E-Z Lift Graders
Fordson One Man Maintainers
Galion Portable Screen Plants
Cedar Rapids Crushers
Etnure Road Oilers
Chausse Tar and Asphalt Heaters
Universal Truck Cranes

Jaeger Concrete Mixers
Concrete Culvert Forms
Heltzel Road Rails
Barnes Pump Outfits
Foote Paving Mixers
Lakewood Finishers
Whitcomb Locomotives
Portable Asphalt Plants
Marion Steam Shovels

All Industrial and Agricultural Equipment for use with Fordson

H. W. MOORE EQUIPMENT COMPANY

Sixth and Acoma Streets

Denver, Colorado

Contractors' Equipment, Fordson Power Machinery, Road Building and Maintaining Equipment



White Peril

No longer need a winter blizzard paralyze transportation and business; no longer should there be impending perils from fire departments being snowed in; from doctors and ambulances being unable to travel or from interruptions of food and fuel deliveries.

For "Caterpillar" Tractors using effective snow removal equipment have proved that they are the means of maintaining "open roads" through the worst of winter's storms.

Let us send you the names of prosperous communities throughout the snow belt that are using "Caterpillar" Tractors to "baffle the blizzard."

Catalogs will be gladly mailed on request.

SNOWPLOWS FOR ALL CATERPILLARS
IN DENVER STOCK

Clinton & Held Co.

1501 to 1511 Wazee Street
Denver, Colo.

Reduced Prices on
"Caterpillar"
Tractors

F O B. Peoria, Ill.

10-Ton	\$5950
5-Ton	3650
2-Ton	1950

F O B. San Leandro,
California

Sixty	\$5500
Thirty	3400

"Here and There"

Thousands of dollars worth of road machinery is destroyed each year by wintering outdoors along the roadside. A large number of counties have no winter sheds for their road equipment. As a result road drags, maintainers, blade graders, plows, scrapers and every kind of road machinery must stand out along the roadside and take the winter snow, rain and snow.

The county with its storage shed also has a chance to have the workmen, who are kept on the payroll during the winter months, go over the machinery making repairs, replacements and painting, in preparation for the following season's work.

A coat of paint or two certainly makes a difference in the appearance of things. A newly painted grader tends to give the operator more pride in his work. And, then there's a big saving on the machinery. This is not a paint ad.

With the coming of November and the alternate freezing and thawing, the time approaches for the preparation of all dirt roads for winter. Road surfaces should be kept as free as possible from all ruts and holes in which water can stand. When the days of alternate freezing and thawing arrive more time and money should be spent on dragging and light blade grader work than at almost any other time. Every possible effort should be made to keep the road surface in such condition that the water will run off in-

stead of penetrate into the roadbed. Every precaution should be taken to have the road bed freeze up smooth, if possible. If this is done the traveling public will have a chance for a good road all winter long on which to travel. A dirt road frozen smooth provides as good a traffic surface as the best possible pavement. Money spent in caring for the road surfacing during the freeze-up weather will save a fairly large amount of money as well as provide decent traffic surfaces for the traveling public during the trying period of the spring break up.

Wide shoulders, well kept up and maintained, are an important safeguard on the paved road. The wide shoulder gives an opportunity for a car in an emergency to run off or partially off the pavement to avoid danger of collision or in other necessity. Another important point is that it affords an opportunity to avoid parking with the car entirely on the highway in the case of tire or engine trouble or other necessity for stopping. On a heavily traveled, eighteen-foot, paved roadway there is no room for the parking of a car on or even partially on the pavement. The stopping or parking of a car on a paved road at all heavily traveled invariably tends to slow up traffic and can add a potential danger, especially in head-on collisions of cars in turning out to pass around the car which has stopped.

Sixty-five per cent of the traffic on the Connecticut highways is primarily for pleasure and but thirty-five per cent primarily for business. These percentages

are arrived at as a result of a joint traffic census conducted by the State Highway Department and the Bureau of Public Roads. This percentage would indicate the justice of placing the majority of the road building and maintenance tax on the vehicles themselves rather than on the property.

Road funds should be expended where they will do the most people the most good. Traffic census reports indicate that the primary road system of Iowa as a whole is carrying approximately 85% of the traffic on the highways of the state. Every mile of the primary road system, if this thought were strictly followed out, should receive an approximate expenditure of six times the amount expended on the lesser important feeder roads.

"The convenience and comfort of a good road," says the Elmore Eye, Michigan, newspaper, "is a magnet that draws trade and business and that spreads prosperity into surrounding territory."

In the clean up on advertising signs on the state highways the state has torn down 5,000 signs from 1,100 miles of highway. The State Highway Department reports that the state system is now practically free from advertising signs.

Grade separation, it is estimated by one railroad authority, will require an expenditure ultimately of a sum greater than the present entire capitalization of the railroad.

EW D TRUCKS

FOR
ADAPTABILITY

Solve your highway maintenance and trucking problem the most economical way.

Enjoy the utmost in dependability, economy, satisfaction and service.

Cheapest by far in the long run.

DISTRIBUTORS:

Liberty Trucks and Parts Company

Sugar Building

Sixteenth and Wazee Sts.

Denver, Colo.

Why Take Chances With Your Concrete?

Hundreds of contractors, builders and municipalities in the Rocky Mountain territory are taking advantage of our service and are having their building materials

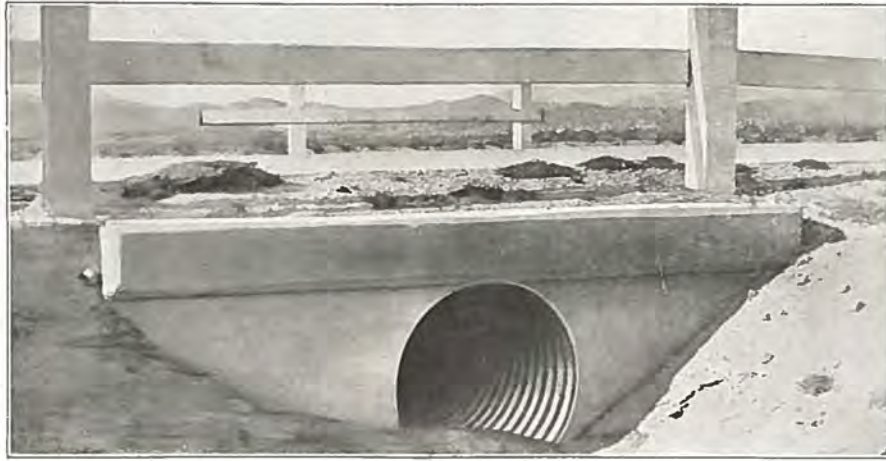
"Pierce Tested"

thus benefiting by a saving in production costs. Can you afford to be without this protection?

Pierce Testing Laboratories

730 NINETEENTH ST.

DENVER, COLO.



Roads of today are not the makeshift trails of former times—they are engineering triumphs, giving maximum comfort, convenience and long service.

This excellence is arrived at, to a large degree, through careful selection of materials used. Not the least important of these is that which goes into the drainage structures. The use of

ARMCO CULVERTS

for this purpose insures the greatest economy. Made of the purest commercial iron on the market, they have the greatest possible resistance to rust, with consequent long life and a minimum of repairs and replacements.



The R. Hardesty Mfg. Co.

1888—1925

DENVER, COLORADO

MISSOULA, MONTANA

Only One Jump Ahead of Saturation

(Continued from Page 7)

should identify themselves with all movements that are directed toward educating the public to an understanding that we must have increased highway mileage capable of withstanding present-day traffic and accommodating it from the standpoints of comfort and safety. They must be expected to pay their just share of whatever cost such extensions require. If they do not do these things, they can expect antagonistic legislation against them from time to time and will find that mainly because of their laxity in helping to direct and shape favorable public opinion, more difficulty will be encountered in repealing or revising such legislation, much of which is admittedly bound to be unjust, than they would have found had they been identified with all movements toward the desired end in the beginning, thus shaping regulatory measures along sound, conservative lines.

Down in Texas a bus line has just been started which has its terminus in Los Angeles, 1,700 miles of bus line. The fare is \$40.50. Out of Chicago runs a bus tour which goes up into Canada, down to Washington and back to Chicago—3,250 miles of tour by bus. There are many other long lines. Some states are literally covered by a network of bus lines. The movement is growing; it is certain to continue growing provided the roads increase the length of that jump ahead of saturation, and build for the great extension of private automobile and bus ownership so confidently predicted.

Impressions of English Highway Practice

(Continued from Page 10)

tax remained nearly constant. Much of the gasoline and the kerosene imported into England nominally for heating and manufacturing purposes doubtless found its way into the tanks of the motor cars.

To conclude this somewhat sketchy and superficial summary of some rather large subjects, I believe that in speed of road construction, in the matter of road equipment of all kinds, as concerns motor-vehicle regulation, highway financing, and research and experimental work generally, we do not have much to learn from Great Britain.

In matters of road location we can see there in aggravated form the same sort of mistakes which have been made in this country, particularly in the older states, where we have put down expensive pavements on faulty locations with unnecessarily tortuous alignment, a timid following of the line of least resistance, using rights of way good enough, perhaps, when horses did the work, but sadly inadequate for our present-day motorized traffic.

It is doubtful if we can hope to equal the bituminous roads of England until we pay more attention to the foundations. We should either follow somewhat after the English methods or develop some substitute, possibly less costly, which will be as effective.

An Argument for Federal Aid

In view of the question raised in some quarters as to the wisdom of the Federal-aid policy of the Government, here are a few figures that will enable the situation to be viewed from a new angle.

Since 1918 motorists as a class have paid the Federal Government in the form of excise taxes on automobiles and parts the sum total of \$779,385,339. Since the beginning of the Federal aid the Government has actually expended \$276,305,407 as its share for the construction of Federal-aid highway projects, according to figures compiled by the American Automobile Association.

This means that the Government has expended less than 36 per cent of the amount of motor vehicle revenue paid by the motorists as a class into the coffers of the Treasury Department. At this rate the Government still owes the motorist some \$503,079,932. With this balance sheet there can be little doubt that they will line up 17,000,000 strong for continuation of the Federal aid policy.

They have already footed the bill.—
Los Angeles Examiner.

"It is not the original cost of the gravel road but the upkeep that takes the money." In the opinion of E. H. Puffer, Road Commissioner of Calhoun county, Michigan, it takes about \$150 per mile to keep a mile of pavement in repair. Gravel road records show that it takes from \$800 to \$1,000 to keep it in repair.


LEE LINE

STEEL DUMP BODIES

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\$129


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541-549 Broadway, Denver, Colo.
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Commercial Bodies, Busses, Trailers,
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Printing
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Zinc Etchings
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No Stops for Repairs

though some of the material was so hard it couldn't be dug with a pick



See our exhibit at the All Western Road Show, San Francisco, November 9 to 14. Location is Tent 4, Lot 412.

"This machine has been in sand, clay, cemented gravel, iron ore and hard pan. Some of the material was so hard it could not be dug with a pick.

"This machine has never been stopped for repairs and has no parts replaced except minor wearing parts. The machine is still in excellent condition, and at present is cutting in stiff clay, 16 feet deep.

"Where surplus excavation must be removed from the street the High Quick Shift Conveyor permits loading wagons on one side while the spoil bank is on the other side. This saves loading cost."

The foregoing is part of a letter from Smith Bros., Dallas, Texas, written one and one-half years after buying their C-15 Buckeye.

Why is it that so many Buckeye owners send us such favorable reports? Simply because we build Buckeyes as tho we were going to use them ourselves—extra strong, plenty of power and easy to operate.

That's the big reason, in a few words.

Ask any owner.

The Buckeye Traction Ditcher Company

FINDLAY, OHIO

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers

There's a Buckeye Sales and Service Office Near You

BUILDERS OF TRENCH EXCAVATORS FOR  YEARS



Building the sub-grade with an Adams Grader. "Leaning Wheels" enable the grader to cut cleanly and accurately, without skidding.

Make Your Grading Pay a Profit

This job of widening a road by cutting back the banks is just one way in which hundreds of Road Builders are using Adams Graders to cut their grading costs—making savings that soon pay for the graders and show nice profits, besides. The Adjustable Leaning Wheels enable Adams Graders to climb up on side banks and cut them down much more quickly and cheaply than plows, scrapers or shovels, in many cases. This is particularly true on cuts involving a short haul, as on the job illustrated above.

In building flat-bottom or "V" shaped ditches, and finishing berms, Adams Graders with Back Slopers do the work quicker and more accurately, at a fraction of the cost of hand methods. Our catalog suggests many ways in which Adams Graders will save you money on all kinds of grading. Send for a copy—NOW!

By the Way! Adams has built "Leaning Wheel" Graders exclusively for 40 years. Recent imitations lack the PROVED PERFORMANCE which is your assurance of satisfaction in Adams Graders.

ELTON T. FAIR COMPANY

Distributors, Colorado and Wyoming

1611 Wazee Street

Denver, Colorado

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

"The Original—A Proved Success Since 1885"

The Bulletin Board

Road Men to Hold Annual Convention in Chicago

The annual convention and road show of the American Road Builders' Association will be held January 11 to 15, 1926, in Chicago. The road show, which has been steadily increasing in size for the last few years, will once more be held in the Coliseum and adjoining buildings. The place in which the sessions of the convention will be held will be announced later.

Before deciding to go back to Chicago, the executive committee of the American Road Builders' Association canvassed the country thoroughly, as it was felt that a gathering so important to the nation-wide highway industry should always be held in the same section of the country. It was found, however, that at the present time Chicago is the only city which can meet the specifications of the American Road Builders' Association in regard to hotel accommodations and exhibition space for heavy machinery. At the show held last January, more than three hundred carloads of machinery were displayed and the registration list showed that more than 16,000 persons interested in the various phases of highway construction and maintenance were in attendance.

W. H. Connell, engineering executive and deputy secretary of the Pennsylvania Department of Highways, the new president of the association, has announced that the convention will be carried on in two divisions, one covering the engineering side of road building, and the other the construction side. These two divisions of the convention will be in session simultaneously in adjacent rooms. By handling the program in this manner, those interested in engineering can devote their entire time to engineering subjects, while those whose main interest is in construction may keep their attention fixed on that phase of the work.

An effort will be made this year to increase the attendance from foreign countries by issuing official invitations requesting other nations to send delegates and special arrangements will be made for their entertainment. Invitations also will be extended to the Pan-American Highway Commission and to the delegates who attend the Pan-American Road Congress in Buenos Aires this fall.

In addition to the convention and road show, the usual entertainment program will be provided.

Business Satisfactory, Says Sales Report of Moore Firm

Business in general has been very satisfactory. Sales of Jaeger Mixers are continually increasing; old time contractors continue giving us repeat orders, the

latest of these being a One-Sack 5-L Jaeger to the Alec Simpson Jr. Company and a 1/2-Sack machine to the F. H. Cowell Company, says H. W. Moore, of the Moore Equipment Co.

We recently shipped one of the Galion-Fordson One-Man Maintainers to Cheyenne, Wyoming, for the purpose of demonstrating to the Wyoming State Highway Department. The demonstration was held on the city streets of Cheyenne, the machine being equipped with a 12-in. mouldboard and blade for maintenance work. Before the demonstration was completed the city dads placed their order for this machine.

As a result of the interest shown, a Caravan consisting of a Fordson Tractor equipped with Hadfield-Penfield Rigid Rail Crawler Tracks and a Galion-Standard Premier E-Z Lift Grader is now making a tour of northeastern Colorado for the purpose of showing city and county officials what can be accomplished with this combination.

Demonstrations are held in each town and city on the route. The Caravan has already done its stuff at Louisville, Lafayette, and Longmont, and will continue the circle by demonstrating at Fort Collins, Windsor, Greeley, Platteville, Fort Lupton, and Brighton before returning to Denver.

J. Everett Young Const. Co. of Denver are constructing a 205-ft. steel bridge over the Platte River on West Third avenue for the City of Denver. Steel for this bridge is being fabricated by the Minneapolis Steel & Machinery Co. The latter concern also is furnishing steel for F. A. project No. 176-A, consisting of four 95-ft. spans at Lovell, Wyo. McGuire & Blakesly, of Great Falls, Mont., are contractors on the project.

Sixty Firms Engage Exhibit Space at Western Road Show

The following is a list of exhibitors who have taken space at the San Francisco Road Show. This does not include the exhibitors of motor trucks, which occupy a separate department of 25,000 square feet.

Chain Belt Co., Norris K. Davis, Construction Machinery Co., Novo Engine Co., Universal Crane Co., McMyler-Interstate Co., Byers Machine Co., Northwest Engineering Co., Ransome Concrete Machinery Co., Harnischfeger & Co., Koehring Co., Jaeger Machine Co., T. L. Smith Co., California Corrugated Culvert Co., Spears Wells Machinery Co., Burch Plow Works, Insley Manufacturing Co., Heltzel Steel Form & Iron Co., A. W. French & Co., J. D. Adams & Co., Foote Co., Good Roads Machinery Co., A. L. Young Machinery Co., Cresson-Morris Co., Watson Truck Corporation, Ingersoll-Rand Co., G. H. Williams & Co., C. D. Edwards & Co., Chicago Pneumatic Tool Co., Killefer Mfg Co., Galion Iron Works & Manufacturing Co., Austin Western Road Machinery Co., Portland Cement Association, Conneaut Shovel Co., George H. Haiss Co., Kwik Mix Co., Smith Engineering Co., Rix Compressed Air & Drill Co., Climax Engineering Co., Lakewood Engineering Co., Brown Hoisting Machine Co., Blaw Knox Co., Buffalo Springfield Roller Co., Stockland Road Machinery Co., Russell Grader Manufacturing Co., Koppel Sales Co., Thew Shovel Co., Barber Green Co., Sauerman Bros., Owens Bucket Co., Speeder Manufacturing Co., Fate Root Heath Co., Erie Steam Shovel Co., Clyde Iron Works, Lufkin Rule, Caterpillar Tractor Co., Gerlinger Steel Casting Co., Austin Machinery Co., Flory Co., Butler Bin Co., Erie Steel Construction Co., Bureau of Public Roads.



ONE-MAN MAINTAINER IN GRAND COUNTY—Type of maintenance machine operated on Victory Highway near Granby and Grand Lake.

*You Won't Growl
at Our Service*



"Cinders"

Copyright, 1924, Elmer E. Sommers

We Have It—

A ZERO OIL DERIVED EXCLUSIVELY
from PENNSYLVANIA CRUDE!

Quaker State

Cold Test Motor Oil

Made from the highest grade crude oil in the world—refined with the same great care that is used in making the Medium and Heavy grades. We claim it to be the best winter oil on the market today.

*We Are Western Distributors for This
Famous Oil*

Sommers Oil Company

DENVER, COLORADO

BIDS OPENED					
Proj.	Length	Type	Location	Low Bidder	Bid Price
271-D	0.137 mi.	Bridge and Approaches	5 mi. W. of Pueblo	C. A. Switzer, Box 18, Pueblo	\$11,869.25
237-A	20.62 mi.	Grading	W. of Ft. Morgan	H. C. Lallier Con. & Engr. Co., Hudson	101,817.70
536	38 ft.	Timber Trestle Bridge	2 mi. N. of Parker	A. K. Mackey, Sterling	1,580.10
550	2.245 mi.	Mtn. Grading	W. of Silver Plume	W. A. Colt & Son, Las Animas	15,542.25

PROJECT ADVERTISED FOR BIDS

282-C	4.052 mi.	Gravel Surfacing	North of Rifle	Bids opened Nov. 6, 1925
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PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj.	Length	Type	Location
271-B	0.778 mi.	Concrete Bridge and Paving	W. of Portland
271-D	0.137 mi.	Concrete Bridge and Approaches	W. of Pueblo
275-D	0.379 mi.	R.R. Crossing Underpass and App'ch's	N. of Castle Rock at D. & R. G. R. R.
276	0.133 mi.	Concrete Bridge and Paved App'ch's	N. of Colo. Spgs. over C. R. I. R. R.
279-C	5.772 mi.	Graded	Turkey Creek

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2-R-3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
2-R-4	6.5 mi.	Concrete Pavement	North of Trinidad
213-D	3.5 mi.	Gravel Surfacing	West of Hesperus
258-B	3.5 mi.	Graded and Bridges	Gunnison, West
526	0.25 mi.	Grading	Meredith Canal Crossing near Ordway (completed)
546	.....	Bridges	Divide, West
282-A	0.8 mi.	Bridge and Approaches	Craig, South (completed)
275-C	5 mi.	Concrete Pavement	Husted-Monument
278-B	5 mi.	Sand-Clay Surfacing	Hugo, East (completed)
287-B	7 mi.	Graded	Greeley, East
298-A	2 mi.	Graded	North of Pagosa Springs

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per Cent Complete	Proj. No.
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	\$ 40,422.00	88	213-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	95	243-B
247-B	Rocky Ford-Swink	2.329 mi.	Concrete Paving	LaNier, Selander & White	71,001.00	70	247-B
248-A	Buena Vista-Salida	12 mi.	Grading and Surf.	Western Const. Corp.	93,533.00	100	248-A
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	80	253-B
254-B	Hot Sulphur Springs-Parshall	1,087 mi.	Grading	Pioneer Const. Co.	61,071.00	45	254-B
258-C	West of Gunnison	5.587 mi.	Gravel Surfacing	Ed. H. Honnen	60,100.00	20	258-C
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	70	261-A
262-B	Rio Grande Del Norte	400-ft. Bridge		Livy Const. Co.	82,123.00	90	262-B
262-C	La Veta Pass, west	2,897 mi.	Crushed Rock Surf.	C. M. Emerson & Sons	23,218.00	100	262-C
262-E	West of Walsenburg	3,527 mi.	Gravel Surfacing	People Bros.	24,979.00	30	262-E
262-F	LaVeta Pass-Russell	2 mi.	Crushed Rock Surf.	Central Const. Co.	22,017.00	30	262-F
266-B	Durango, south	3,181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	70	266-B
271-A	Florence-Pueblo	3,286 mi.	Gravel Surfacing	Driscoll Trucking Co.	56,479.00	98	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	I. E. Williams	56,434.00	80	272-A
275-A	Gann-Sedalia	7 mi.	Concrete Paving	Strange-Maguire Pav. Co.	314,174.00	25	275-A
275-B	Sedalia-Castle Rock	5,334 mi.	Concrete Paving	J. Fred Roberts & Sons	198,771.00	30	275-B
277-A	Colorado Springs, south	2,840 mi.	Concrete Paving	Stamey-Mackey Const. Co.	229,921.00	100	277-A
279-B	Morrison-Baileys	5,295 mi.	Grading	Harry H. Brown	85,980.00	95	279-B
283-B	Berthoud, south	4.2 mi.	Concrete Paving	C. C. Madsen Const. Co.	168,835.00	10	283-B
286-B	Nunn, north	19 mi.	Grading	James Collier	87,249.00	50	286-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	70	288-A
288-B	Merino, west	2,519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	82	288-B
293-A	West of Montrose	114 ft. steel bridge		Wear Bros.	17,936.00	21	293-A
294-A	Mancos-Cortez	2.9 mi.	Gravel Surfacing	Engler & Teyssier	23,273.00	15	294-A
295-A	Alamosa-La Jara	4,456 mi.	Gravel Surfacing	Central Const. Co.	19,861.00	75	295-A
296-A	South of Pueblo	113 ft. Concrete Bridge		C. A. Switzer	17,810.00	25	296-A
297-A	Pallsades-DeBeque	2,848 mi.	Grading	Ed. H. Honnen	40,188.00	30	297-A

Adams Sales Manager Visits Denver, En Route to Coast

J. H. Turnbull, district sales manager of the J. D. Adams Company, Indianapolis, was a Denver visitor on October 29. He was on his way to the Road Show at San Francisco.

He stated that the company was making a drive on the sale of equipment for snow removal, which includes their No. 8 and No. 12 graders. These are equipped with extensions which give up to 18 ft. blade surface.

Elton T. Fair, local distributor of the Adams line in Colorado and Wyoming, reported that the commissioners of Las Animas have purchased three new Adams graders during the past month. This county has standardized on Adams graders. One of these graders will be operated with a new Best Sixty tractor recently purchased through the Clinton and Held company, Caterpillar tractor distributors for this territory.

Herbert N. Steinbarger, head of the local contractors' equipment concern bearing his name, will be one of the Den-

ver visitors of the Western Road Show, to be held in San Francisco on November 9 to 14. While on the coast he will visit friends at Los Angeles.

KOEHRING PRODUCES NEW PAYER DESIGNED FOR SPEED

A new paver has been produced by the Koehring company which is described as a notable advance in paver design. The new paver is of the 13-E size.

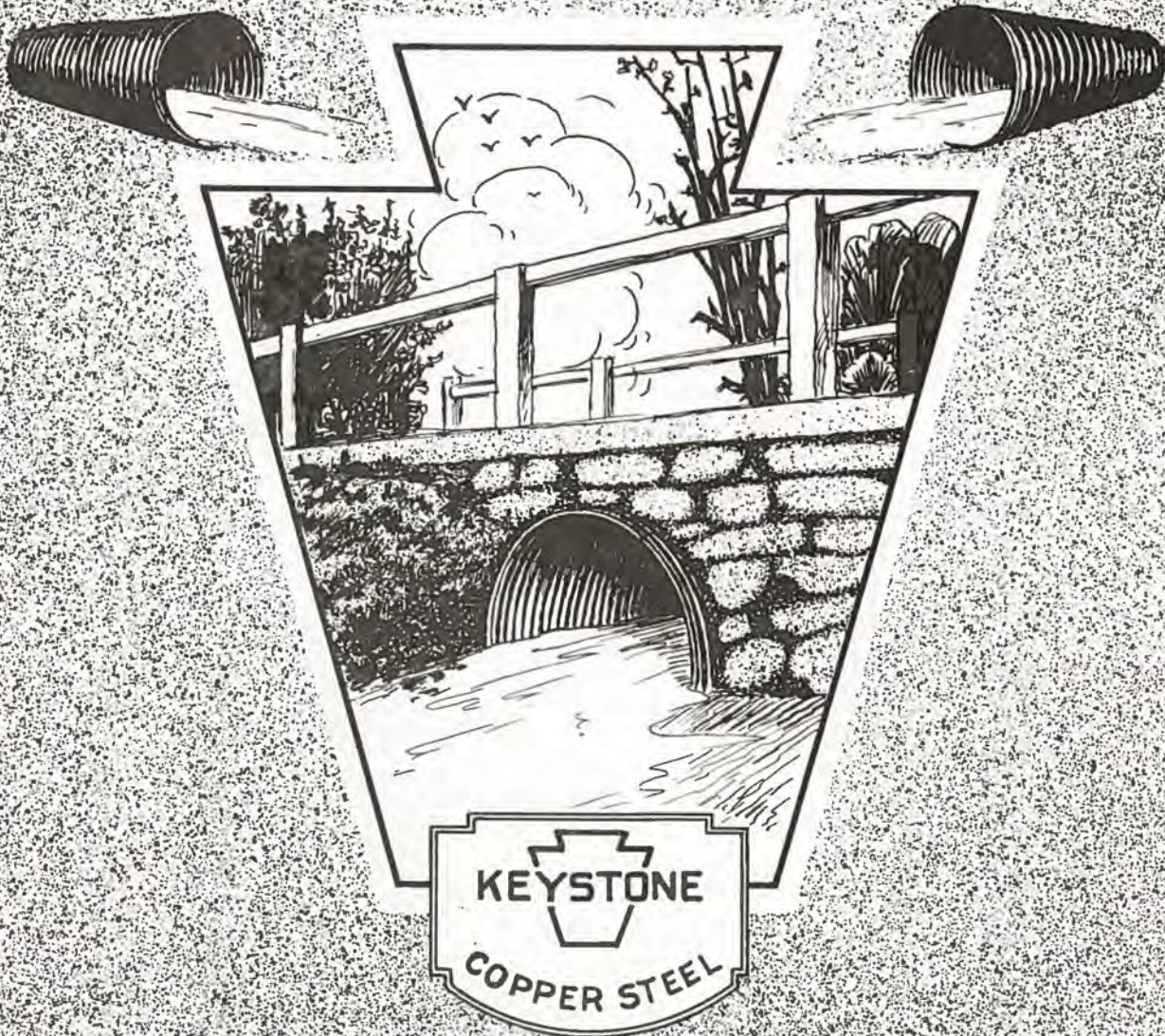
According to H. P. Wilson & Co., Rocky Mountain distributors of the Koehring products, speed is intensified in this model. All operations of charging and discharging are fast—from the raising of the charging skip with double cables, and automatic opening of the water valve, to the quick drum discharge and speedy placing of the concrete by the boom and bucket. The 13-E Koehring has a traction speed forward of practically two miles an hour.

It is also claimed that this Koehring achievement eliminates the frequent attention to bearings, thru elimination of frame strains. The gears run in a continuous oil bath.

HEIL BUILDS HOISTS ON TRAILER BODIES

Enactment of laws limiting highway loads have given contractors the problem of obtaining proper load distribution to permit capacity hauling without violation of the statutes. To meet this situation The Heil Company, of Milwaukee, Wis., is installing dump bodies and Hydro hoists on Warner Semi-trailers for use with different truck tractors. The trailer has a fifth wheel attachment through which power is transmitted from the motor to the hoist for dumping the load. The drive is mechanical throughout, no piping being required, as the pump is an integral part of the hoist. This equipment is claimed to be especially suitable for handling coal, building supplies, and similar bulk material in cities and towns where pay loads are an economic problem.

Nature works fast when it comes to roads. Ever notice how quickly a road-way passes out of the picture after it has been abandoned? Just one of the many reasons why constant maintenance is necessary.



KEYSTONE

Makes Road Men Sit Up and Take Notice

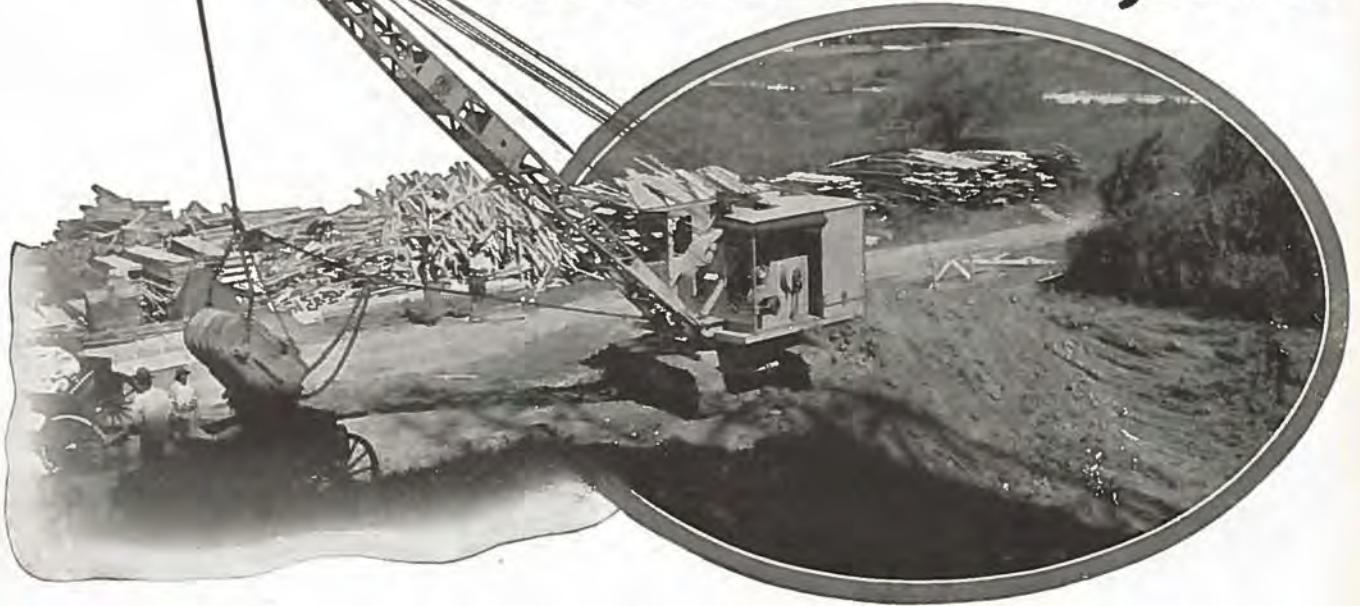
Engineers — Government, State, City and County — favor Keystone Culverts. This action on their part is confirmed by over *Fourteen Years Proven Service* in Colorado, where culverts are subjected to severe and unusual use.

This durability, combined with lower initial and installation cost, means a definite economy and a continuous source of satisfaction to these men who are installing Keystone Culverts every day.

The Colorado Culvert & Flume Co.
PUEBLO

KOEHRING

Gasoline Dragline



Precision in Operation!

ANOTHER factor of Koehring extra capacity is *precision of operation*, secured by finger-tip ease of control, smooth operation, and easy, sensitive responsiveness to the control levers.

Oversize Clutches, of far greater friction area than has ever before been considered necessary, make levers easy to shift, doing away with need for mechanical aid, and retaining the "feel" of the work essential to operator's confidence, and accuracy.

Special design for internal combustion engine means full, smooth utilization of power, smooth speed of operation, and a quick sensitiveness to control levers all of which result in accurate casting of the bucket, in

more bucket trips, and more yardage handled per day—with no penalty of extra strain or wear.

And, in addition, Koehring Heavy Duty construction is the greatest factor of long, trouble-free service life that can be built into a Dragline.

Dragline Capacities

No. 1— $\frac{3}{4}$ cu. yd. dragline bucket on 40 ft. boom or $\frac{1}{2}$ cu. yd. on 45 ft. boom. 4 cylinder, 5' x 6" gasoline engine, 1000 R. P. M.

No. 2—1 cu. yd. dragline bucket on 40 ft. boom; $\frac{3}{4}$ cu. yd. on 45 ft. boom; $\frac{1}{2}$ cu. yd. on 50 ft. boom. 4 cylinder, 5 $\frac{1}{2}$ " x 7" gasoline engine, 1000 R. P. M.



Write for Dragline Bulletin No. DL 42

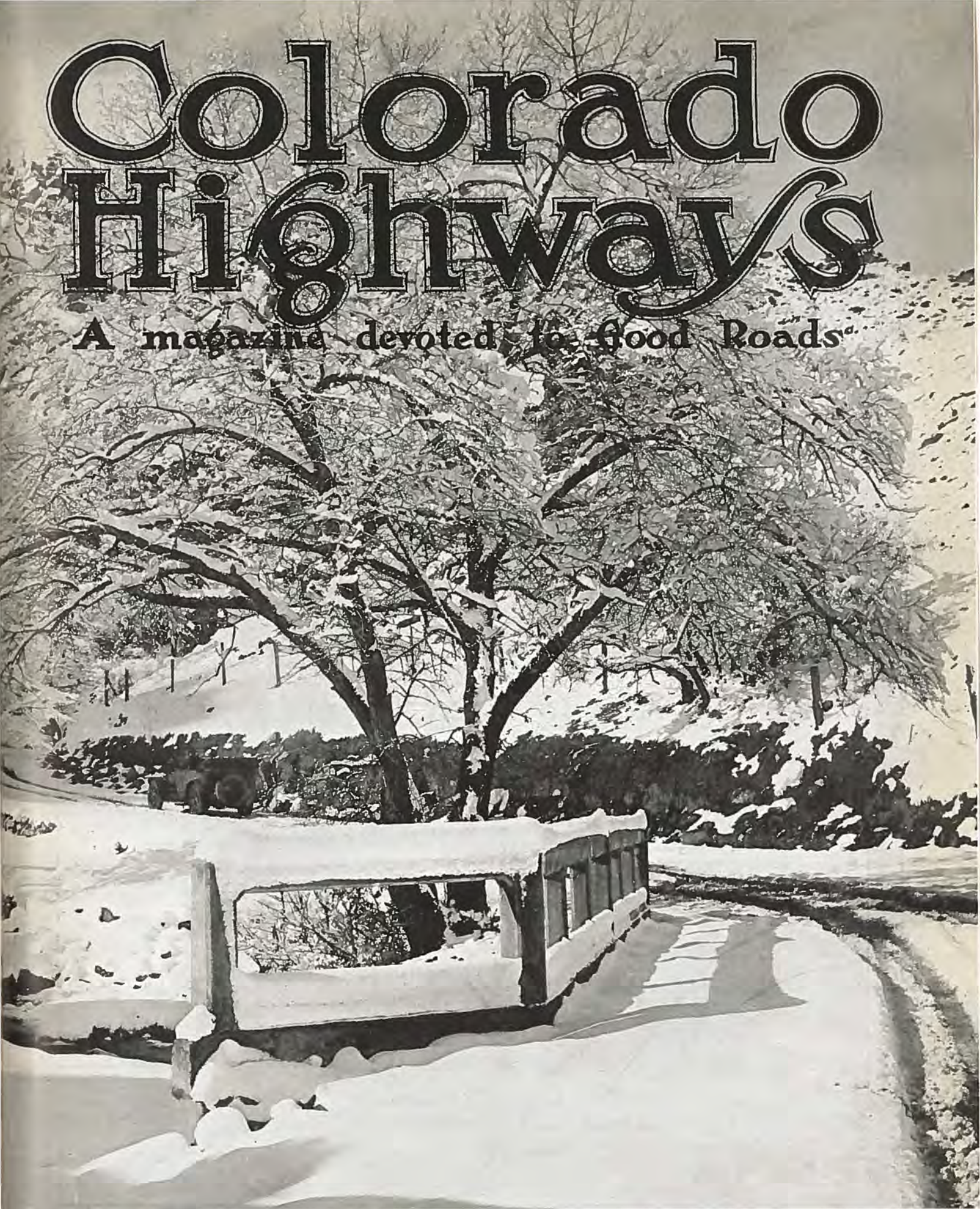
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Colorado Highways

A magazine devoted to Good Roads



*Permanent
roads are a
good investment
—not an expense*

70 Times as Many Cars to the Mile

Good progress has been made the past two or three years in permanently paving our highways.

Yet when we realize that there are more than 18,000,000 motor vehicles now registered in the country, and that production is at the rate of 4,000,000 a year, our improved road mileage becomes almost insignificant.

While the mileage of our improved highways has been multiplying only three times, the number of motor vehicles has multiplied over two hundred.

Instead of closing up this gap, we are letting it grow wider.

Highway authorities recognize in this startling situation one of the most pressing problems of the times.

They also know that not in a long time have general conditions been so favorable for carrying on such public works as permanent highway building.

Your own highway authorities are ready to carry on their share of this great public work. But they must have your support.

Tell them you are ready to invest in more Concrete highways, now.



Portland Cement Association

Ideal Building

DENVER, COLORADO

*A National Organization
to Improve and Extend the Uses of Concrete*

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Official Publication of the
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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
 215 Chamber of Commerce Building, Denver, Colo.
 Phone Main 4962.

M. W. BENNETT, Editor.

Articles on the subject of road building and highway development in the West are solicited. Manuscripts should be addressed to the Editor, with return postage. Photographs should accompany articles whenever possible. Manuscripts not found available will be returned promptly.

10 CENTS A COPY. \$1.00 A YEAR.

OUR COVER PICTURE

A picturesque winter scene in the Denver Mountain Parks is shown on the cover of this month's Colorado Highways. The picture was taken near the country home of the Motor Club of Colorado, located in Bear Creek Canon. This highway is maintained by the State Highway Department in co-operation with the City of Denver. A motorized year-round patrol is employed. It probably carries more traffic daily than any other mountain road in the state.



Digs, Elevates, Conveys, Dumps in one continuous forward movement and returns to digging point under the control of one man.

Sauerman Slackline Cableway

A profitable method of excavating from a wet pit. Eliminates entirely the use of bucket elevators.

Complete units furnished by Sauerman Brothers includes Bucket Blocks, Cables, Mast and Special Two-Speed Hoist.

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CATERPILLAR
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They Shall Pass!

The days of experiment and trial are past. Modern plows, pulled by "Caterpillars," are keeping open the winter roads. "Caterpillars" work uninterruptedly through the thick of the fight; improved plows resist the shock of impacted drifts.

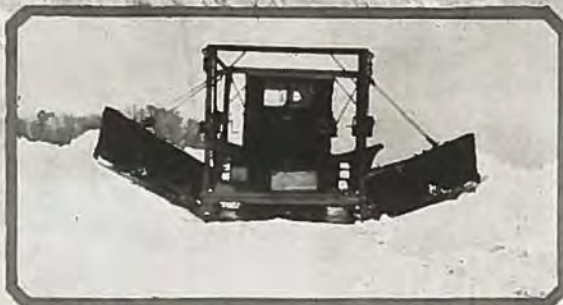
Newly published literature tells the story of accomplishment—ask for "The Snow Removal Book." It belongs in the library of every engineer and road official of the snow belt.

Clinton & Held Co.

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DENVER, COLORADO

Snow Plows for all Caterpillars, and
BIG RED SNOW FENCE in Denver Stock





How Build the Highways?

(An Editorial)

THE 1926 budget of the state highway department is now being drawn. The department faces no small problem in the knowledge that after 1926 nothing is certain. Unless some plan to finance the work is evolved, the department had just as well be abolished, inasmuch as it would have no funds to meet federal-aid appropriations and about all its revenues would be necessary to pay interest and sinking fund requirements on existing bond issues.

There are several suggested plans for financing the state highway program. One is for a bond issue of \$50,000,000. That would mean that the state would be burdened with taxation for fifteen or twenty years and that by the time the bonds had been paid off, the highways would be pretty well worn. However, it would remove the highway affairs pretty largely from the control or interference of the legislatures and that is something that is worth considering. A comprehensive plan would be worked out and carried to completion without interruptions every two years with the change of governors or the biennial farce conducted by the legislatures.

But the general tendency over the country is to accumulate huge debts. It is very easy to vote bonds, but it is hard to pay them. They always mean heavy taxes and taxes that can not be eliminated in a pinch. In "lean" years heavy taxes mean that people lose their farms and their homes. The individual knows that he can overreach his credit or that he can easily incur too much "overhead." Under a burden of debt, expenses cannot

be cut. The man who pays as he goes can reduce expenses when need be by postponing for a time or sacrificing some of the things he would like to have.

In the construction of highways Colorado has made excellent progress, largely on the "pay-as-you-go" plan. Since 1910 the state highway department has expended \$30,931,512 on its highways. Of this amount only \$7,634,318 has come from bonds. The balance was from state taxes and federal funds. Colorado is known throughout the country for its excellent highways. We do not need to fear that we are falling behind the other states. But we should make sure that this progress is not abruptly broken off.

One suggested plan for financing the state's highway program is to increase the gasoline tax to three cents and to give to the state highway department all of the revenues from that source, as well as all the revenues from motor license fees, which would be somewhat increased. It is claimed that this plan would raise more than eighteen million dollars in the first three years. From that amount, it is argued, the existing bonds could be retired and thereafter the state would have from seven to ten million dollars a year for roadbuilding. The plan, of course, would entail some additional taxation, but there can be no plan of building highways that does not mean taxes. The money put into good roads means that much less spent on upkeep of cars, and to pay as we go means the elimination of interest and the possibility of reducing expenses if the time comes that it is felt necessary to retrench.—*Sterling Advocate*.

Harding Memorial Highway

State Completes Another Link in Spectacular Motor Road to Summit of Mount Evans to Attract Tourists

ANOTHER link in Colorado's great memorial to the late President Harding, the Mount Evans highway, was constructed during the past season by the state highway department, taking the terminus to within few hundred feet of the saddle between Mount Evans and Mount Epaulet.

The Harding Memorial highway, as this road has been christened, will be one of the wonders of the modern world when completed. Climbing to the summit of Mount Evans, 14,259 feet above sea level, this highway will be the highest on the North American continent, higher even than the famous Pike's Peak road.

As an example of marvelous engineering skill, this highway is unexcelled by any road construction project. But its chief claim to fame lies in the stupendous scenic wonders it will throw open for the eyes of the public. From the top of Mount Evans, or even from the end of the present road, 1,000 feet below the summit, hundreds upon hundreds of square miles of mountains, valleys, plains and timber lands are spread out below. Travelers who have been over the finished part of the highway are unanimous in declaring it the finest scenic route they have ever seen. The grandeur of the vistas unfolded as the motorist climbs this memorial highway beggar description, capped by the climax of the whole eastern range of the Rockies spread out on a long line below as he reaches the summit.

During the summer just past more than one mile of this road was constructed, beginning at Summit Lake and extending nearly to the saddle at the foot of Mount Evans. This section of the highway necessitated some of the heaviest construction work of the whole project. Under the direction of Michael Dooling, Denver contractor, the side of high cliffs were shot away at spots and thousands of boulders, many of them weighing tons, were moved in order that the route surveyed by the engineers might be followed. Drexel J. Lacey was the resident engineer on the project.

This work was finished just before the first heavy snow in September and the department closed that section until after the snow has disappeared next June in order to allow the new road to settle and pack. At one point the contractor encountered a natural bog, 13,000 feet above sea level, caused by water seeping from the mountain. Virtually all of the road above Echo Lake is above the timber line and allows an unobstructed view in all directions to the motorist.

On account of the short working season at that altitude, the heavy construction costs and the limited amount of money available, it will be several years before the road to the summit is completed. Maj. L. D. Blauvelt, state highway engineer, expects to build another section of the highway next year and the 1926

budget of the department will probably contain an item for this purpose.

Two courses are open to the department on this project. The road from the saddle to the summit, about three miles of the heaviest possible construction, may be completed next, or it may build down and across from the saddle to connect with the Denver-Morrison-Conifer-Schafer's Crossing-Baileys road.

In the latter event, motorists could easily climb to the summit from the saddle by a trail and a fine circle trip out of Denver would be provided for visitors to the city.

This connection would require the construction of about twenty miles of road, some of it ordinary construction and other portions costing from \$50,000 to \$75,000 a mile to complete. Several tunnels would be needed to keep the road at a grade low enough for good motoring.

From the Denver-Baileys road a fair road now follows Deer Creek up toward Mount Evans, branching off three miles above Baileys. This could easily be regraded and widened and the department plans to use it on the connecting link. If the next step is not the completion of the road to the summit, work in 1926 will probably start at the Baileys end, as engineers report it cheaper and easier to build a mountain road ascending rather than descending. Should construction start at the present terminus at the saddle under Mount Evans, all materials and supplies would have to be trucked from Denver, through Bergen Park, past Echo Lake and over the saddle. The final decision of the department probably will be announced the first of the year.

In the scenic development of the West, it is hard to understand why Mount Evans is not better known. It is the tenth

highest peak in Colorado, only thirty-three miles from Denver on an air line, and is higher than either Long's or Pike's peaks. Of course the latter two are more closely associated with the romance of early day Colorado, Pike's Peak as the goal for the Cripple Creek gold seekers and Long's Peak as the home of the Earl of Dunraven and other members of the British aristocracy in the olden days. Mount Evans, while not difficult to climb, has been more inaccessible than the other two famous peaks of the front range.

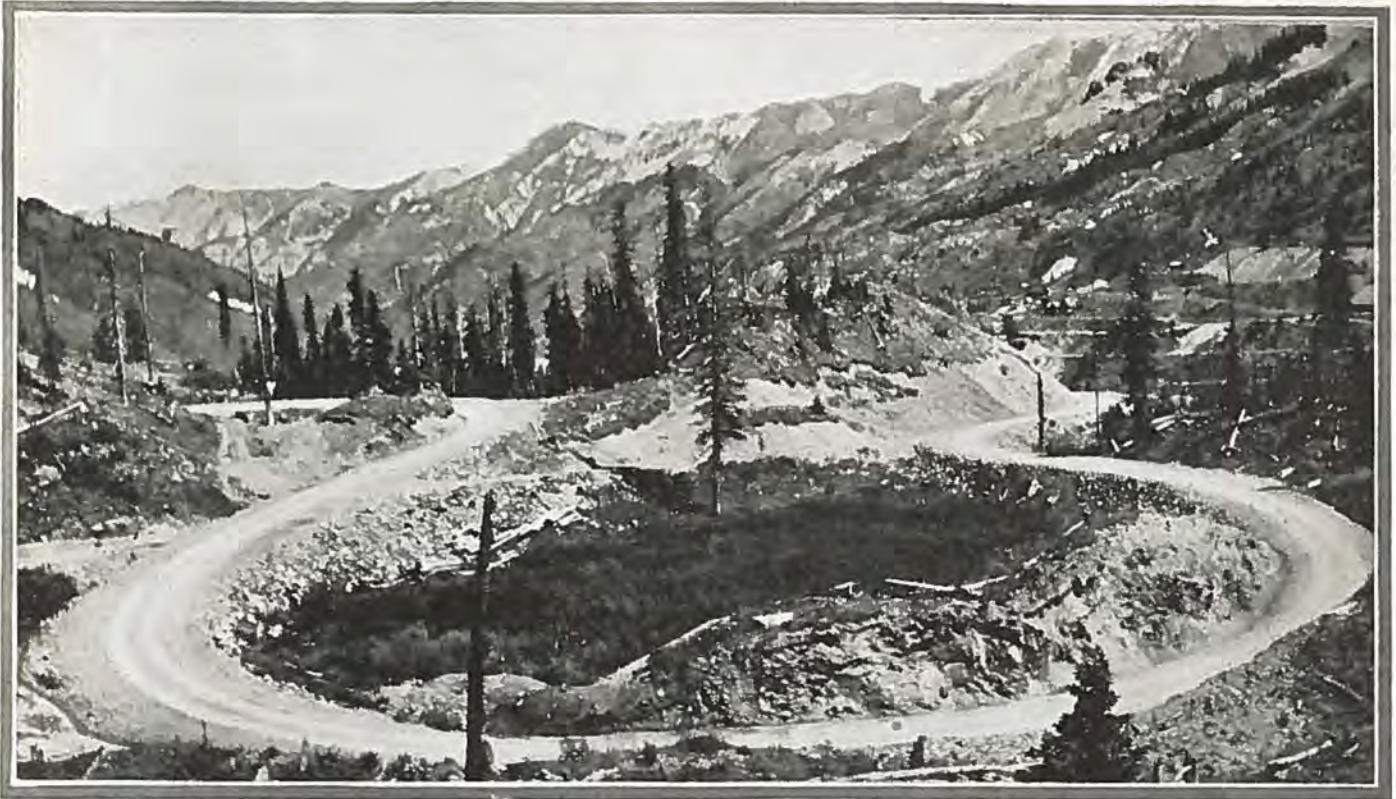
However, Denver citizens within the past few years have come to appreciate the recreational and scenic possibilities of Mount Evans and the great peaks surrounding it. The forestry service has helped to popularize this area in the Pike National forest by the construction of trails and shelter houses, making it a model reservation area. The proposal also has been made that Congress create a Denver National park of this region.

A forestry engineer made the first survey for an automobile road up to the summit and the daring project attracted immediate attention several years ago. Appreciating this opportunity, the city of Denver immediately started construction of the road from Bergen Park, the nearest point in the city's mountain park system to Mount Evans, to the edge of the national forest at Squaw Pass. By the present route, following the government survey, Mount Evans is sixty-six miles from Denver.

When completed this great memorial highway will be one of the state's greatest attractions to offer the thousands of annual visitors and will prove a valuable addition to Colorado's already famous scenic and recreational advantages.



MODERN GRAVEL PLANT—Showing how screen gravel is handled in modern conveying and loading outfit on Federal Aid Job.—Photo by James D. Bell.



View of spectacular switchback on the Ouray-Silverton Million Dollar highway near Ironton, a Federal Aid Project.

Federal Aid Must Continue

Official of Motor Clubs Take Up Fight—Federal Aid Means Continuity in Highway Construction

INTERSTATE highway transportation is more important today than ever before in our history. The ease with which transcontinental highways are making it possible for the people of every part of the Nation to intermingling is emphasized by the recent Washington-San Francisco tour of the president and general manager of the American Automobile Association. By simply equipping their car with a pullman bed which enabled them to drive twenty-two of each twenty-four hours, the A. A. officials were able to cross the continent in less than five days.

Everywhere encouraging progress is being made in the construction of a system of main arterial highways which will eventually connect the Atlantic and the Pacific, the North and the South with a system of highly improved motorways.

Interstate highway progress to date has largely been the result of a policy of the Federal Government inaugurated in 1916 when it undertook to aid the States in the building of the arterial highways of the Nation. Approximately 170,000 miles of roads have been designated in the Federal-aid highway system and since 1921 construction has progressed smoothly at an average rate of over ten thousand miles per year.

Yet the primary Federal-aid system is by no means completed. Even at the

present rate of progress it will take another ten years to fill all the gaps in the more important interstate highways. This is particularly true in the West, where the problem of financing highway construction across great areas of sparsely populated territory has been a slow and difficult process which in some instances would have been impossible without Federal aid.

Due to what is perhaps, more than anything else, a misconception of the real purpose of Federal aid, political sentiment against its continuance has developed in certain eastern States where it is complained that these States pay more in Federal taxes than they receive back in Federal appropriations.

This attitude is a matter of grave concern to those eleven western States in which is situated the greater part of the public domain. In these States the Government owns millions upon millions of acres of mineral lands, national forests, Indian lands and national parks which are not taxable and from which the States derive no revenue. Yet these States, already struggling under the burden of providing adequate highway transportation for their purely local needs, are expected to construct splendid highways across these areas of untaxable public domain for the accommodation and pleasure of eastern tourists who are coming westward in ever-increasing numbers.

This public domain, which in several western States is greater in area than all New England, is as much the property of the citizens of Pennsylvania, or of any other eastern State, as it is the property of the citizens of the State in which it is located. Those eastern States in turn must realize that Federal assistance in the construction of highways is an income to which the western States are entitled.

We have gone too far with this plan of national highways to lay down the pick and shovel now. The immediate problem of the West is to make the entire Nation realize this fact.

As the champion of good-roads development in the West, the California State Automobile Association will devote every legitimate effort to securing the continuation of Federal appropriations for assistance in highway building, without which interstate highway construction cannot continue in most western States.

In making adequate presentation of the highway financing needs of the West to Congress, this organization will have the fullest co-operation and assistance of the American Automobile Association, the nationwide organization of motorists with which it is affiliated, and the backing of approximately one million organized motorists represented by that organization. —Motor Land.



View of the Victory Highway in Colorado—newly completed Federal Aid project west of Steamboat Springs.

The Victory Highway

Like the Roads of Ancient Rome It Will be an Enduring Monument to American Heroes of World War

ONE of the great newspapers of this country recently made editorial comment upon the Victory Highway as follows:

"When the Victory Highway is completed it will constitute the greatest monument in all history. From the pyramids to the peace palace at The Hague, there is nothing that compares with the gigantic enterprise of proclaiming our part in the World War by means of a paved roadway crossing the continent and linking the two oceans with a concrete chain 3,300 miles long. The most colossal of the triumphal arches, ancient or modern, becomes a minor circumstance when contrasted with the Victory Highway. And like the roads of ancient Rome, it will be an enduring monument as long as the Victory Highway remains the great republic of the west."

In carrying out the memorial aspect of the Victory Highway, life size bronze eagle groups are planned, to mark each

By **BEN BLOW**
Vice-President and Manager, The Victory
Highway Association

county line, similar to that erected in Kansas on the Shawnee-Douglas county line, which was dedicated on Armistice Day of 1923, comprehending bronze tablets set into the base, which will carry the names of those men and women from the particular county who gave their lives to their country in the World War, the Shawnee county marker carrying the names of 96 men and one woman who "gave the last full measure of devotion."

In its practical aspect, the Victory Highway supplies a new and intelligently laid out route based upon provisions of the Federal Aid road law which requires the development of primary or interstate highways of adjacent states.

Starting at New York City, the point of departure being Battery Park, crossing is made by ferry to St. George, Staten

Island, whence a new line, following largely the famous old Cranbury Turnpike to Camden, New Jersey, gives entry to Philadelphia over what will be, when completed in 1926, the greatest suspension bridge in the world.

From Philadelphia through Wilmington and Baltimore, through the Cumberland country of Maryland following mainly the old National road, the Victory Highway line is of tremendous historical interest as well as of unusual scenic worth and trends to the northwest from the western part of Maryland through a corner of Pennsylvania and on into Ohio and Indiana, the gateway being Wheeling, West Virginia.

Through this section great manufacturing industries are to be seen and the old days of the National road which reach back to stage coach times are evidenced by quaint towns and old time monuments.

The line through Ohio, Indiana and Illi-

nois is straight and well paved in practical entirety, a surfaced way between New York and a point in Missouri, 40 miles to the west of St. Louis, marking the fourth birthday of The Victory Highway Association.

Construction work in Missouri, for years the barrier between the east and the west, is proceeding rapidly and along new lines under the direction of Theodore Gary, chairman of the Highway Commission which is building an air line between St. Louis and Kansas City, 41 miles shorter than the shortest existing road and 23 miles shorter than the shortest rail line between the two great Missouri cities.

At St. Louis, the climb toward the crest of the Rockies begins and through Kansas, where nearly a hundred miles of concrete reaches west from the Missouri line, the old cattle country days form part of the history reaching back into those times when the western highlands of Kansas teemed with uncounted thousands of buffalo and swarmed with red skins against whose resistance the westward building of the Union Pacific railway progressed with difficulty.

Across Colorado, the Victory Highway essays the Continental Divide over Berthoud and Rabbit Ear passes on a government built road which supplies a wide and safe line of easy grade through the most inspiring scenery to be found on any of the cross country highways topping a region between Denver and Salt Lake where coal veins thirty feet in thickness are to be found and where the Uintah basin in Utah supplies one of the greatest undeveloped empires to be found in the United States.

West of Salt Lake is the desert with all its mystery of mirage and history of the days of overland ox team travel, directly to the west of Salt Lake City being a salt, alkali, mud flat, where for six miles a grade has just been finished across a solid bed of rock salt which reaches 8 miles north and south and supplies, during the few summer months when it is free of water, the fastest natural automobile speedway in the world, where automobile tires, whirling at the rate of more than a hundred miles an hour, do not even get warm, owing to the cooling properties of the salt.

West from the Utah line across Nevada is the way of glorious sunsets, where mirages form a part of every day's trip, the Victory Highway line following the Humboldt river in practical entirety across the Sage Brush State and entering California by the canyon of the Truckee River, giving scenic entry into the rugged Sierras which crossed, give place to orange groves and olives and all the amazing agriculture of Central California.

Sacramento, the Capitol of California, is the first city of importance reached and from here the way into San Francisco is down a concrete highway which tops the Sacramento river levee, passes through a small area where the bulk of the world's asparagus is grown and, passing through Contra Costa County, comes into sight of the end of the way through a highway tunnel from the west portal of which the whole panorama of San Francisco Bay is to be seen with the Golden Gate opened wide as if to greet the traveler, while on one side the hills of San Francisco topped by lofty buildings which climb tier on tier, looks like some fabled palace swung in the clouds.

In its entire stretch across the country, the Victory Highway is historical and scenic and in the west it supplies a passage to the Pacific which takes in the minimum of desert and can be essayed even in the mid of summer with no fear whatever of overpowering blaze of sun or summer heat.

It is the shortest line across, the most scenic and supplies today the maximum of pavement. It has been selected as the only New York-San Francisco line which will be developed in its entirety by Federal Aid and passing through the heart of America in the grainfields of Kansas it ties the east and west together into that unity of interest which is only to be achieved when barriers of nature are conquered by the engineers' transit and travel may flow back and forth over good roads.

It is a big undertaking that the Victory Highway Association is engaged in, the development of a great memorial highway. It embodies tremendous responsibility. But to my mind it is thoroughly worth while, even more than worth while; for as the Victory Highway idea develops and unfolds, it seems to me as if its accomplishment was a National obligation. I believe that we who today live under the Stars and Stripes, our Flag, owe to those who died in defense of that Flag, a duty. We must prove our remembrance in the present and send on this message in bronze to all the coming years:

"The United States of America Does Not Forget."

Highway Officials Honor Maj. Blauvelt at Detroit

A treasure better than gold was bestowed upon L. D. Blauvelt, state highway engineer, during the last convention of the American Association of State Highway Officials, held in Detroit, November 18 to 21, inclusive. At the close of the sessions Mr. Blauvelt was elected to the position of vice-president of the organization for the year 1926.

During the past year Maj. Blauvelt has served the association as secretary. For two years he was a member of the executive committee. The members of the

association are the heads of the various highway departments in the United States. Attending the convention this year in company with Maj. Blauvelt from the Colorado department was Oliver T. Reedy, senior assistant engineer.

Forty-six of the 48 states were represented at the four-day meeting. The two absent members were detained at home on account of special sessions of legislatures in their states. A total of 270 delegates registered at the meeting. J. W. Johnson, district engineer of the U. S. Bureau of Public Roads, Denver, also was a delegate from Denver.

Frank Page, highway engineer of North Carolina, was elected president to succeed Frank F. Rogers, state highway commissioner of Michigan. Gov. A. J. Groesbeck of Michigan addressed the delegates, and told of the work that the state of Michigan is doing in the construction of super highways to handle the tremendous travel radiating from the city of Detroit.

The entertainment features included an inspection trip through the Ford Motor company's plant.

The delegates attending this convention have under their control the expenditure of over one billion dollars per year for road construction and maintenance.

North Carolina Highway System Includes 6444 Miles

Figures recently compiled show that on July 1 the North Carolina State Highway system included 6,444 miles of good roads. Of this mileage in excess of 2,000 miles has been paved or is being paved by the highway commission, exclusive of paving done by counties and turned over to the state. Route 10, one of the most important routes in the state, has approximately 500 miles of paving completed or under construction in its total length of 579 miles.

According to figures from the construction department of the state highway commission, 84.23 miles of paving was laid during August. This was divided as follows: Concrete, 38.22 miles; asphaltic concrete, 17.26; sand asphalt, 8.63 miles, and concrete base, 20.12 miles.



WILLOW CREEK PASS HIGHWAY—Looks like motorists won't have much to complain of from this stretch of roadway.—Photo by H. L. Jenness.

How Research Board Aids State

Experts Are Engaged in Extensive Program of Research Into Problems Affecting Road Building

By PROF. S. S. STEINBERG
University of Maryland

MOTHER Shipton's prophecy made 30 years ago that "carriages without horses shall go" has been abundantly realized to the people of the United States. We now have 18,000,000 motor vehicles on our highways. And yet we appear to be far from any saturation point. Indications are that motor transportation is going to develop beyond anything we can now visualize, and in so doing it will continue to make changes in our daily life and in our business, in our cities and in our towns. Upon the motor highways of the future will depend how rapid, and in how satisfactory a manner, this development will take place.

This year, as last year, another billion dollars will be expended in highway work, thus indicating that the people of the country expect the highways to keep pace with the increase in number of motor vehicles. Whereas, a few years ago a road contract 2 miles long was considered a large undertaking, now contracts are let in 10 and 20 mile stretches. In one day recently Pennsylvania let road contracts totaling \$12,000,000. The previous record was that of Illinois with a letting of \$9,000,000 in one day. As a result of this stupendous program, it has been truly said that the construction of highways will be the most active American industry during the current year.

Fortunately, highway engineers realize the necessity of having this great development of our highway system proceed on sound principles of engineering and of economics. This is evident from the fact that the federal government, the state highway departments and many universities are engaged on an extensive program of research into the problems affecting highway finance, construction and maintenance. A recent census showed that there are almost 50 highway research projects under way throughout the country. It is the function of the Highway Research Board of the National Research Council to co-ordinate these researches, spread as they are over such a wide territory; to prevent duplication of effort, by putting the workers in touch with one another; and finally, to make known to each state the findings which may be immediately applied in practice; thus resulting, not only in the better construction and maintenance of highways, but also in a great saving in the taxpayer's dollar.

The Highway Research Board thus occupies a unique position as a service organization to highway engineers and to the public, and it enjoys the complete confidence of all agencies throughout the country engaged or interested in highway development. As indicative of the personnel of the board and the interests represented, we might cite that Dean A. N. Johnson of the University of Maryland is chairman; W. H. Connell of the Pennsylvania State Highway Department is vice-chairman, and C. M. Upham, state highway engineer of North Carolina, is

director. The Executive Committee also includes Prof. T. R. Agg of Iowa State College; A. J. Brosseau, president of Mack Trucks, Inc.; Dr. H. C. Dickinson of the United States Bureau of Standards; T. H. MacDonald, chief of the U. S. Bureau of Public Roads, and W. Spraragen of the National Research Council.

When research of a general character needs to be undertaken, which a single organization would not be justified in conducting, the Highway Research Board has been assigning an expert to carry on such investigation. The results are then



ASPHALT PAVEMENT NORTH OF TRINIDAD—Six miles of this pavement was completed in 1925, constructed according to U. S. standards.—Photo by James D. Bell.

made available to all interested agencies. As an example, there is now nearing completion a nation-wide survey on the economic value of using steel reinforcement in concrete roads. In some states it is the practice to incorporate in the concrete steel rods or mesh, using half a pound or more to every square foot of surface. In other states no reinforcement is used. As this item alone may amount to many thousands of dollars per mile of road, it is necessary for the highway engineer to know whether the use of reinforcement is justified, and if so, the proper amount needed for the greatest economy.

Another investigation, just commenced under the auspices of the Highway Research Board, is on the development of earth roads. Although we may now travel with speed and comfort from one end of the country to the other, we must not forget that 85 per cent of all our rural highways are still in a state of nature, and many of them impassable for several months of each year. It may help us to realize what a great economic loss this means when we consider that one-third of all the automobiles in use are owned by farmers most of whom are compelled to use these earth roads. This problem is an especially significant one in the western states where there is a great mileage of highways to improve and maintain and the funds are so limited that any extensive program of surfacing with the more costly types of pavements is out of the question.

Many attempts have been made to solve this problem. For instance, in North Carolina, where they have a "sea of sand" stretching for hundreds of miles along the coast, the state highway commission has developed, as a result of research, a sand-asphalt surface made up of a mixture of 93 per cent local sand and 7 per cent of asphalt. This renders very satisfactory service to that locality. In South Carolina, Illinois and California, tars and oils are being used, either by mixing with the earth or as surface applications. In the southern states either the top soil of the fields, or a mixture of sand and clay is used. In Iowa, Missouri and South Dakota, experiments are being conducted in which the natural soil is mixed with hydrated lime, or in some cases with Portland cement, in an attempt to stabilize the natural soil.

Realizing that this is one of the most important problems confronting highway engineers, the Highway Research Board is attempting to co-ordinate completed and current research on this subject with the hope of developing a low-cost road surface that will be suitable for light traffic.

Another investigation about to commence under the auspices of this board is that on culvert pipe. In highway construction many types of pipes are used for culverts, including cast iron, concrete, corrugated metal and vitrified clay. The object of this investigation will be to set up a basis of comparison of the different kinds of pipe in order that highway engineers may be properly guided in the design of these drainage structures.

The annual mileage of roads under construction and maintenance is so great that any little economy that research may effect means, in the aggregate, an enormous saving. As a result of research into the mixing of concrete, it was discovered that ordinarily this material is mixed far too wet. It was shown that by the use of but 1 pint more water than necessary for each bag of cement, the strength of the resulting concrete was reduced to the

same extent as if 2 or 3 lbs. of cement were omitted.

Elasticity of Concrete

To most people concrete would not suggest itself when thinking of an elastic material. Yet to a certain degree, concrete is not unlike rubber in compressing under an applied force and in its ability to spring back to its original dimensions upon release of the load. In the study of concrete, it is necessary to know accurately the elastic curve to which this material responds. For this purpose cylinders are used. These are made in the laboratory or are bored from the concrete roads in service. It is very evident that the changes in height of the specimen due to supplied loads are very small. To detect and to measure these deformations, as they are called, very sensitive instruments have been devised. One of the simplest and most practical methods in use consists of two small mirrors properly mounted on the concrete cylinder and so arranged as to rotate when pressure is applied to the specimen, and to reflect graduated scales which are sighted at through a telescope. This set-up is so sensitive that changes in height amounting to two and one-half millionths of an inch per inch height of specimen can be observed. When we realize that this measurement is less than one-thousandth of the thickness of a sheet of ordinary newspaper, we begin to appreciate how small a quantity we are discussing. This device has been very successfully used by Dean A. N. Johnson in his research work at the University of Maryland.

The laboratory and field methods developed by research are used in maintaining a rigid control over all materials that enter into the building of a highway. Before the use of any material is permitted in the work, a sample must pass an appropriate test and meet a fixed standard. Research has made possible the use of many local materials, such as gravel and stone, formerly neglected or thought unfit for road purposes. Due to the vigilance of the highway engineer over the quality of materials as well as the methods of construction, the public is assured that there is an adequate return for every dollar spent on highway work. As we review the accomplishments of highway research during the past few years, we have reason to feel gratified at the splendid progress made. Although we cannot foretell, with certainty, the highway engineering problems of the future, we may rest assured that so long as highway engineers continue to be guided by the spirit of scientific research our future highway development will remain in safe hands.

DUMB-BELLS

If wives only knew what stenographers think of their husbands, they would cease to worry.—Kingston Standard.

BRIGHT AND SNAPPY

Insurance Salesman (over phone): "Is this Mr. Jones? How would you like to have your wife and child receive fifty dollars a week after your death? Now our—"

Jones: "Why, very much indeed, thank you. I wish 'em luck. By the way, do you supply the wife and child?"—American Legion Weekly.



NEW BRIDGE NEAR SALIDA—This modern steel and concrete structure was completed with Federal Aid early in 1925. It forms a part of a fifteen-mile stretch of gravel surfaced highway.—Photo by Staff Photographer.

Advisory Board Approves "Pay As We Go" Plan for Financing State Highway Dept. After 1926

In unanimously approving the proposed "pay-as-we-go" plan for financing state highway activities, the State Highway Advisory Board at its annual October meeting in Denver took an important step that may have a material bearing on Colorado's good road program.

Briefly, this plan calls for abolition of the property tax on automobiles; repeal of the ½-mill levy for road purposes; increase of the motor vehicle license fees by from 60 to 70 per cent; increase of the state gas tax from 2 to 3 cents a gallon; and repeal of the statutes giving the counties one half of all gas tax and license fee receipts for maintenance work, the highway department to have administration of all this revenue.

In 1926 all the six million dollar highway bond issue authorized in 1922 will be exhausted and some new way of providing revenue for the department must be devised or virtually all construction work must stop in 1927. The state also would lose the 1½ million dollars of federal aid construction money offered each year.

The Motor Club of Colorado is backing this proposed financing plan and is now preparing petitions for circulation to initiate the measures necessary to place the plan in operation, giving the people of the state an opportunity to vote directly on the proposals at the 1926 election. The club also expects to launch a statewide campaign to gain support for the plan.

Proponents of the plan point out that it would place the burden of highway construction and maintenance on the motorist, but not to an unbearable extent. Under the "pay-as-we-go" plan, sufficient funds would be available to carry on construction work on even a larger scale than at present and at the same time retire outstanding highway bonds and keep maintenance work up.

The advisory board, with all members present, was in session nearly a week considering the 1926 budget. Governor

Morley met with the board and Major Blauvelt, engineer, at all sessions in order that they could have a better understanding of the needs and wishes of the several members when he makes up the final budget. Delegations were received and heard from nearly every county of the state on projects desired in the various sections. Nothing definite was decided and the board will reconvene in Denver December 8, when the tentative budget will be prepared and submitted to the governor for final action.

W. G. Duvall, Golden, chairman of the board, announced that the members were unanimous in their desire to complete paving of the main north and south highway, from Colorado Springs through Denver to Fort Collins, as soon as possible, and that as much of the federal aid money as can be spared will be put on this project next year. The Denver member of the board, Peter Seerie, has nearly one-fourth of the available funds for disposition and will divide Denver's share among each of the other districts.

Cuba to Improve Highways Following Mexican Policy

First steps in what will be a nationwide improvement of its highways, were taken by the Cuban government in the middle of last September when a contract was signed in Havana with Byrne Brothers of Chicago, whereby the latter will make an airplane survey of a proposed central highway through the republic. This will also include other important roads.

This is the second contract recently entered into by Byrne Brothers with Latin American countries, an agreement entered into with the Mexican government a few weeks ago being scheduled to begin this month. This will consist of a highway between Mexico City and Laredo.

What Missouri Is Doing With Road Fund

Favorable Vote on Highway Measure Results in Construction of Several Thousand Miles of Good Roads at Low Cost

LAST November the people of Missouri voted favorably on a proposition which provides for a fifty per cent increase in motor registration fees and a tax of two cents per gallon on all gasoline used in motor vehicles. This action made it possible for the Legislature to appropriate \$50,000,000 for the next two years' state road construction program. As a result the State Highway Department in April had under contract approximately \$16,000,000 worth of new road work for the 1925 construction program. Additional contracts for three or four million dollars worth of work have been let each month since then.

Bonds to the extent of \$25,000,000 had been sold by the latter part of April, \$30,000,000 of the bonds will be sold during the next two years, and the balance of \$5,000,000 will be sold in 1927. The State will get during the next two years, approximately \$5,000,000 of federal aid, and an additional income from Proposition No. 5 of \$10,000,000, which will not be needed for administration, retirement of bonds, interest or maintenance.

A total revenue of \$4,000,000, or approximately \$225 per mile per year on the average, is provided for maintenance. This will enable the Department to maintain all of the state roads that are now built and also the unfinished roads until they are hard-surfaced.

The building of a state system of 7,640 miles of road is a gigantic undertaking, and although the Federal Government will allow aid on 7,700 miles in Missouri, it would not be wise to add any roads to the system at this time. By the latter part of April the Department had finished approximately 1,800 miles of hard-surfaced roads. In addition to this it had under contract for construction approximately 400 miles of hard-

By B. H. PIEPMEIER, Chief Engineer,
Missouri State Highway Commission.

surfacing. Approximately 1,300 miles either had been graded or was under contract for grading.

The Department is maintaining the policy of building roads simultaneously in the various counties throughout the state. It, however, is giving special attention to the finishing of the gaps in the more important roads. By the end of 1926, therefore, many of the important roads will be practically finished, or in such condition that they may be traveled any day in the year. By completing a few of the main roads, a large percentage of the traffic will be taken care of until such time as it is possible for the State to build the balance of the system.

The Department is now able to build much larger sections of work and is getting much better prices. It is conservative to say that we are now letting contracts twenty per cent cheaper than we did when we were compelled to let small sections of work. All of the work is being extensively advertised and is interesting road builders from coast to coast. At one letting we had bidders from New York, Ohio, Minnesota, North Dakota, Iowa, Oklahoma, Arkansas and many other states. Over 530 bids were presented on the work advertised. Three years ago some of our concrete roads cost approximately \$30,000 per mile; we are now building some at \$23,000 per mile.

We have lowered the cost of road building in some sections of the state by buying road materials in wholesale quantities and by opening new quarry sites, which are decreasing the cost of production and reducing freight rates. However, the State is buying and producing material only in those parts of the state

where contractors would have to gamble on prices and quantities. In the Springfield territory the State has secured crushed stone at Phenix, Missouri, for 96 cents per ton, in Kansas City territory at \$1.10 per ton, and in northwestern Missouri, at Gallatin and Smithville, for \$1.25 per ton.

At Gallatin and Smithville it was necessary for the State to invest \$250,000 in the plant and equipment to get any company interested in producing enough stone for the state program. The investment is protected by title to the land, to all machinery, and by a surety bond of \$125,000, guaranteeing that the company will buy the plant at the end of five years at the price of \$250,000. In addition the State is protected by another surety bond of \$100,000, guaranteeing that the company will produce stone and sell it to the State at \$1.25 per ton.

The \$250,000 investment is reduced each year by the stone company paying the State 20 cents for each ton of material sold to the State or in the commercial market. This investment is a good one and will save the State a large amount of money. Stone in northwestern Missouri is very scarce. If this investment had not been made, the State would in a very short period of time have spent twice the \$250,000 in additional freight and price of stone. The commercial price of stone in Kansas City and northwestern Missouri is now \$1.65 to \$1.85 per ton f. o. b. plants.

The State has invested in a large gravel deposit at La Grange and this material has already resulted in a great saving to the State in its road building program.

The State's contract for cement last year proved to be a good one. It not only helped to reduce the commercial price of cement 20 cents per barrel, but the State was actually refunded \$31,162.24 as its share of the profit on the cement ordered and used by the State. This year the State made several contracts for large quantities of material that will result in a saving of approximately one-half million dollars.

We are testing all road materials at the plants before shipping to the work. This procedure insures high quality and prevents delays. Every car of cement, steel, gravel, stone, or sand is tested by trained men before it enters our state roads. We are trying to build quality into every mile of state highways.

We are now building at the rate of 1,000 miles per year, which is one of the largest state road building programs in the United States.

Changes in the Old Home Town

"No Hitching Here," the sign once read, (Yes, backward we are harking)—

But since the old town forged ahead

The legend reads "No Parking."

Detroit Motor News.



MAINTENANCE MAN LENDS A HELPING HAND—Showing how the road man in Mesa County stops his work to give an Oregon visitor aid in fixing a "flat one." The lady is asking the photographer, "What's the big idea."—Photo by Staff Photographer.

Something Should Be Done About Heavy Trucks on the Highway

MR. HAROLD KESSINGER of the Mid-West Review brings up the question of "What are we going to do with the road-destroying, life-endangering over-weight motor truck?"

Here is a serious menace to our highways, and on our highways. This is a big problem for every state to solve. Can commercial vehicles be segregated and taxed adequately to maintain truck-trunk highways?

It is apparent that no private company could build highways, and operate trucks in competition with the railroads, even if the hard roads built by the truck company were free from taxation, and even if the truck corporation were given a monopoly by the state commerce commission.

At the coming session of the Illinois Legislature few measures will be more important than the legislation regulating the taxing trucks and truck companies.

Last year Illinois built more hard roads than had ever been built before, in the same length of time, by any state in the Union, or any country in the world. The Hundred Million Dollar Bond Issue has been voted for by the people, and during the next four years Illinois will possibly build more roads than many other states combined. Shall Illinois build roads to be destroyed? Shall the over-weight truck be allowed on the highways at all? Or shall special truck roads be built in the state's larger industrial centers? Shall any trucks, especially those of commercial truck lines, be allowed to wear out the roads without the paying of some extra fee in the way of licenses or franchise charges? Shall Illinois waste the hundred million, or conserve it?

Shall the roads be built to last a reasonable period of years, or to be worn out in a few years by truck lines, which hurt the railroads, which do not pay their way, which wear out the roads paid for largely by small cars, and which the trucks,



VIEW OF NEW HIGHWAY EAST OF CANON CITY—This beautiful new road was constructed by the State with Federal Aid funds. Note the smooth surface of the gravel and substantial guardrail.

as road hogs, make it ALWAYS unpleasant, and many times UNSAFE for other people upon our highways?

We are very much interested to know just what our members think of the truck situation, and welcome any suggestions for the solution of this modern problem.

Drivers' licenses have been responsible for the reduction of fatal accidents in New York City. Three years ago there were more fatalities in motor vehicle accidents inside the city than in the state. Statistics show that with the adoption of the system of requiring every person to pass a test and be the holder of a personal license before being permitted to drive a car on the city streets, the situation is entirely reversed. The total of fatalities has increased, inside the city but 20 per cent over three years ago while in the country the increase has been 60 per cent. In rural districts and small towns anyone is permitted to drive a car. New York people must pass an examination to prove their ability to drive. Accident prevention on the high-

ways, declares a student of accident statistics, is chiefly the elimination of the careless and unfit and not something to be prevented by some mysterious government agency or road building safeguard.

"Known All Over the World"

Yes, just like "Piggly-Wiggly"—we're known all over the world. As the letter reprinted below shows. And real money for a bona fide subscription from the land of Lenin and Trotsky. We don't know how many millions of shin plasters—but anyhow, we got two-fifty in real dough—the Uncle Sam kind.

These Bolsheviks are showing signs of real intelligence. They know what they want and where to come for it. But they are not the only people in foreign lands who receive regularly copies of Colorado Highways. Yes, we're spreading the fame of Colorado and her mountain boulevards the world over.

Mr. Ornatsky's letter reads as follows:
Colorado Highways Publishing Co.,
215 Chamber of Commerce Bldg.,
Denver, Colorado.

Gentlemen:

According to the indication of Mr. MacDonald, chief of Bureau of Public Roads, I beg you to accept me as annual subscriber of "Colorado Highways" from beginning of the year 1925.

At the same time I beg you to send me a single number of this from November, 1923, Vol. 2, No. 11, and one from September, 1922, Vol. 1, No. 6.

As payment for publications requested, I send you immediately \$2.50 and in case of this amount being too large for payment, I beg you to send me for rest of amount some bulletins on your choice, dealing with highway construction and maintenance.

Yours truly,

ENG. N. ORNATSKY,
Chief of Laboratory and Experiment
Road Work of Moscow District.

Address: Eng. N. Ornatsky,
Grete Gruzinskaja St.
Moscow, Russia.



WHAT FEDERAL AID IS DOING FOR THE ARKANSAS VALLEY—A newly completed stretch of roadway east of Avondale.—Photo by James D. Bell.

Railroads Find Selling of Scenery Pays Big Dividends

THREE live railroads, with a system extending from Chicago to the Pacific Coast, decided the way to get business was to go after it.

The business they wanted was summer travel to the Northwest. Their principal means of soliciting this business was to tell the public what they had to offer along their lines, in scenery, climate and opportunity. They have been at it for three years, now—the Burlington, Great Northern and Northern Pacific—and have checked their results by means of a very definite process of learning the number of visitors to each of the five National Parks on their main line—Yellowstone, Glacier, Mt. Rainier, Crater Lake and Rocky Mountain.

In two years the visitors to Crater Lake and Mt. Rainier increased approximately 100 per cent; Yellowstone and Glacier, 50 per cent. And this in spite of the fact that 1924 was an off year for travel.

It is interesting to note that their greatest number of inquiries came from the industrial centers near the large metropolitan districts. For instance, Jersey City showed 291 per cent above the average for the whole country; Paterson 240 per cent, Yonkers 151 per cent, Trenton 187 per cent. Even in New England, New Bedford showed 221 per cent and Lowell 113 per cent.

Apparently the East is becoming interested in the West, and the Far West, at that.

Travel experts have always said that the American school teachers, on account of their long summer holiday and their appreciation of the educational value of travel, were the one great tourist source for the western mountain country. This railroad group's study shows that the first place in reality belongs to an altogether different class—the business executive group, including department heads, officials of business firms, and major salesmen. Twenty-five per cent of all of the eastern visitors to these National Parks come from that classification. The teacher group is second; clerical workers third; professional men—doctors, lawyers and dentists—fourth. And then come housewives—mother off for recuperation. Following, in order, come skilled workers—mechanics, engineers, foremen—and then students, farmers and "retired."

Most of the visitors said that scenery had been the strongest factor in governing their choice of a place for a holiday. Horseback riding is another strong factor, and the "dude ranch" was also attractive.

Of those who visited the parks, 79 per cent traveled by rail, 18 per cent reported the automobile as their means of transportation, and 3 per cent used both.

The ranking of the several travel groups provides an informative index to the migratory instincts of representative Americans, but the experience of the railroads suggests that the most impressive scenery will lack for beholders until it is advertised. A good many Americans believe in seeing America first, and will put their belief into practice when the facilities for so doing are made sufficiently available to them—

a requirement which the railroads seem to have met.

Aside from the findings, the report is of interest in showing how properly conducted business these days, after establishing a definite method of meeting a problem, gives it time for development and then makes a cold-blooded study of the results to find whether the plan is right or wrong.—Forbes Magazine.

Road Building Figures

The Federal Government, in co-operation with the States, has become the world's largest road contractor. For the year ending June 30 last, federal built roads amounted to 14,032 miles at a total cost of \$295,608,485, of which the Federal Government bore \$135,408,047, and the States the balance. Of this, 9,445 miles were constructed and accepted at a cost of \$190,485,399, the Government bearing \$87,801,946 of this cost. A total of 4,587 miles was built, but had not been accepted at the close of the fiscal year. Of this cost the Government's share was \$47,606,101 out of a total cost of \$105,125,086.

Taking the States' share of the cost for the year, if spread on an average among the forty-eight States, it would mean that each of the States spent out of its funds, or bonded funds, \$3,337,508 in the year. Fourteen western States shared in the program, however, and if these had shared alike in cost and mileage, it would mean an expenditure of \$3,503,706 in each State, a gigantic undertaking at any angle considered.

Middle western and western States were included in the program, with Texas taking the lead in mileage and cost. The Department of Agriculture, releasing the figures, does not segregate the mileage as to paved and other types of improvement. Iowa was the farthest east State in the western program. Utah had a liberal share in the year's activity.

The distribution of mileage and costs by States, as mentioned in the report issued recently, includes the following, with the total cost mentioned first, Federal Aid second, and then mileage.

Arizona	\$1,241,768	\$728,436	86
California	9,347,100	5,072,101	361
Colorado	3,768,633	2,037,915	148
Idaho	1,212,978	722,936	93
Iowa	4,076,507	1,870,461	314
Nebraska	1,430,037	674,831	130
Nevada	1,457,220	1,234,674	131
New Mexico	3,411,712	2,155,220	367
Oregon	2,305,315	1,323,270	139
South Dakota	3,416,836	1,745,242	458
Texas	11,778,972	4,867,315	784
Utah	2,954,735	1,923,030	204
Washington	1,967,888	826,316	69
Wyoming	2,682,193	1,660,997	294

There is a decided undercurrent of sentiment against continuance of Government Aid in road building. In some quarters this sentiment is outspoken and among those who have taken this stand is President Coolidge. He spoke in his inaugural address of the tendency of States to compete for government money without consideration of the financial ability of the States to stand the expense, and also from the angle of the Federal Government being a party to this attitude, as well as on the side of economy. At the last appropriation there was a decided op-

position to continuing the system, while from many eastern States there is a set movement to oppose further appropriations. This move is predicated on the assertion that the eastern States built their highways out of their own pockets and now do not think they should be paying a share of the cost in western States. This division may be expected to be more marked in the future and it will not be surprising if in the future the only part the Federal Government takes in highway construction will be on two or three transcontinental roads already surveyed and planned for.

Without doubt the system has been of incalculable value to some of the western States, when it is considered that fourteen States obtained nearly \$27,000,000 in federal money for road construction in one year.

Federal Aid does two things to speed up highway improvement. It enables the different States to double the mileage and gives the States the impetus to build their roads. In many instances States would be slow to expend large sums of money or bond themselves to raise the funds if their dollars were not to be matched by the Government.—Salt Lake Tribune.

How to Take a Vacation Trip at Home

Go over next door. Sit there wishing you were at home. Remarkably like being on vacation.

Rub poison ivy on hands and think you have been to the country.

Hire some reliable robber to chase you home every night. Results same as if you visited Chicago.

Examine ruts in roads around your home through magnifying glass. Look exactly like Grand Canyon.

Poke eyes full of cinders and sleep on pantry shelf. Wonderful substitute for an upper berth.

Fill your grip with lead and run for the car every morning. Same thing as touring Europe.

Fill bathtub with water and broken glass. Ah, just like the old swimming hole!

Let faucet run in kitchen sink. Sounds as if you were summering at Niagara.—Tom Sims, in Life.

Cycles to Work After Parking Car

We have reached the point where the canny motorist carries a bicycle along so he can ride to work after he finds a place to park.—Detroit Motor News.

Hordes of autos now remind us
We should build our roads to stay,
And departing leave behind us
Kinds that won't be washed away.

When our children pay the mortgage
Father made to haul the loads,
They'll not have to ask the question—
"Here's the bonds, but where's the roads?"



Tremendous Force Under Positive Control

From the start of the dipper travel—right up through the top of the bank, the P & H shovel crowding motion is applied. The full power of the motor and flywheel inertia is back of the manganese steel teeth of the dipper.

This tremendous force is positive, and under the immediate control of the operator regardless of the position of the dipper. Dumping into cars can be quickly and accurately done.

Ready When the Starting Whistle Toots

A turn of the crank and the day's work is begun—no fuel or water trouble, no preliminary firing up. When not in actual use no fuel is consumed. Electric motor-equipped, the same advantages hold true.

And—the proven design of P & H equipment, the larger use of double-strength alloy steels—the cut gears, precise workmanship—gives you a machine that years have proven to be the most economical. As one quarryman wrote: "Thanks for giving us a machine that we can depend on to be ready every day when the whistle blows."

Bulletin 82-X mailed on request.

HARNISCHFEGER CORPORATION

Successor to

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P & H GASOLINE SHOVEL

In Its Third Year



and the chain has never been replaced

"The Buckeye boom can stand lots of hard usage," say Kraay & Livers, Harvey, Ill. "The chain is strong—never replaced it. Dirt doesn't bother the Alligator tread. The Buckeye apron wheel is very good."

Kraay & Livers know their C-15 Buckeye. This is its third year. Their average operating cost, including engineer, oil, gas and repairs, is \$20.50—and they average over 600 ft. in 8 hours on trench 22 in. wide and 10 ft. deep, in the hardest kind of digging.

The Newest Buckeye Chain Is Even Stronger

Manganese steel links, with manganese steel T-head pins, each using a manganese reversible bushing for taking up wear—that's the Buckeye chain construction. All parts "oversize" for extra strength and service.

Buckets are heavy electric—cast carbon steel in one piece. The box girder type boom is built up of heavy angle and plate construction. That's Buckeye all the way through—built to "take it" in the hardest digging.

No wonder Buckeyes give such good service. Ask any owner.

The Buckeye Traction Ditcher Company

FINDLAY, OHIO

Manufacturers of Trench Excavators (both Wheel and Chain-and-Bucket Types), Pipe-Line Trench Excavators, Tile and Open Ditchers, Back-Fillers, Pipe Screwing Machines, Curb Diggers and Clay Diggers

There's a Buckeye Sales and Service Office Near You

BUILDERS OF TRENCH EXCAVATORS FOR **30** YEARS

Million Wise and Billion Foolish

One automobile club advertises that its legislative lobby prevented the passage of a gasoline tax law, and that motorists were thereby saved many million dollars annually. They don't tell us, however, how many million dollars of increased operating expenses will result because of failure to improve the roads. Nor do they mention the value of time lost in traveling over poor roads or on congested highways.

It seemed to the editor as he read the advertisement published by this automobile club that it was an excellent illustration of the old saw, "penny wise and pound foolish." But considering the magnitude of the blunder, the saw should be changed to read "million wise and billion foolish."

Motor cars and motor-car mileage have been increasing for more than a decade at a far more rapid rate than expenditures for highway improvement. We have unquestionable evidence, therefore, that there is a greater demand for improved highways than there is a supply of them. Nearly every motorist will concede this. But the managers of a few motor clubs seem to think that it will increase their popularity—and possibly their salaries—if they can point with pride to defeat of legislative bills that are aimed to make motorists pay directly for a considerable part of highway construction and maintenance. Such managers are a real menace to the continued development of our roads. They are working directly contrary to the best interests of the motorists whom they are hired to serve.

Motor Industry Is Proving Great Aid to Railroads

In a recent statement by Secretary William M. Jardine of the Department of Agriculture, he points out that there is no basis for the belief that the motor vehicle is to become a serious competitor for the railroads.

Statistics compiled show that the motor industry is itself a large contributor to the railroads in amounts so great, in fact, that earnings of passenger carrying automobiles in competition with rail passenger lines are over-shadowed by the earnings which the railroads receive from the motor industry.

In a report submitted to the International Chamber of Commerce at Brussels this week the American committee on highway transport states:

"It is as a feeder, a supplement to the main lines of railway transportation that the motor truck and passenger vehicle exercise their greatest usefulness. It is probable that in spite of the fear of the railways that competition with motor transportation would reduce their traffic and earnings, the loss of certain local traffic has been more than offset by the new traffic created through motor feeders reaching into territory hitherto unavailable to the railway, in some cases not previously under cultivation because lacking in transportation facilities. And certainly the railroads have derived much new traffic from the direct movement of automobile parts, finished automobiles, petroleum and road materials."

A former treasury official recently reported that in one year the railroads obtained from the handling of motor ve-

hicles and parts, together with road materials, a total of 400 million dollars in revenue, while taxes for highway building and maintenance paid by the railroads in the same time amounted to 35 million dollars.

Interstate Commerce Commission figures show that the total tonnage of automobiles, motor trucks, refined petroleum and its products, that portion of the cement, clay, gravel, sand and stone and the asphalt used in road construction, gave the railroads a freight tonnage of 154,000,000 tons or 6.6 per cent of the total rail tonnage for 1923, producing a revenue of \$400,000,000 or 8.6 per cent of the total estimated freight revenues.

Highway location is not a function of the state legislature in the opinion of Gov. Smith of New York state. In giving his approval to a legislative bill increasing the state road system by some 2,400 miles he stated that the system was apparently as perfect as could be secured by the existing method. He added: "Laying out highway routes I do not believe to be a legislative function. It is an engineering problem and while it remains a legislative one we will never be able to resist the tendency to lay out new routes as a result of log rolling projects in the legislature not strictly destined to improve the state highway system but rather to promote the interest of some localities."

The Reason

The reason some men have such a profound longing for the Open Road is that they know they can make 65 miles an hour on it.—Motor News.

The New Idea Havelock Surface Maintainer

Three floatings in one operation.

We will ship this Surfacer to any County in the State on approval.

Western Distributor



This machine is absolutely guaranteed to eliminate the corrugation on the gravel road.

The only machine built that will do it.

ROY C. PEPPERS ENGINEERING SALES CO., Hudson, Colorado

When Winter Comes

The removal of snow on heavily traveled highways is of paramount importance in the interests of economical maintenance operations, as well as in the interests of traffic movement during the Winter months.

Snow removal on graveled surfaced highways and dirt roads is advocated by Highway Engineers in the interests of maintenance:

First: By moving the snow from the road surface to the side ditches, there is a much more rapid drying out of the road surface.

Second: Distributes traffic over the full width of the road surface instead of confining same to one or two deep ruts in the direction of travel.

Third: By distributing traffic over the full width of road and considering the rapid drying of surface, under these conditions, a great amount of rutting and wearing to road surface is eliminated with consequent less maintenance.

Fourth: Spring maintenance is materially lowered as the result of these winter snow operations.

Whether your Highways be Hard Surfaced, Gravel Surfaced or Dirt, ADAMS GRADERS will handle this class of work with more efficiency and less cost than ordinary graders. Because, Adams Graders have ADJUSTABLE LEANING WHEELS and do not side-slip and skew. They are SUREFOOTED and STAY PUT.

We recommend Adams Leaning Wheel Graders Nos. 7, 8, 10 or 12, equipped with moldboard extensions or special length moldboards, behind teams, trucks or tractors for this class of work.

ELTON T. FAIR COMPANY

Distributors, Colorado and Wyoming

1611 Wazee Street

Denver, Colorado

ADAMS ADJUSTABLE LEANING WHEEL GRADERS

"The Original - A Proved Success Since 1885"

FWD The Tractor Truck

Amly suited and powered for every need of maintenance work—

DRAGGING
SPREADING
BLADING

DITCHING
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SNOW REMOVAL

in addition to usual trucking duties

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The Highway Engineer

The transportation of men and women, their belongings and the product of their labor, is a common, economic necessity. Transportation is as old as man, and the development of ways and means of getting about are milestones in the march of progress. The Bible tells of the "highways and byways." Since that far-distant day, roads have been bettered and means of transportation improved from the primitive to the modern present-day methods.

By providing better means of transportation by means of better roads the highway engineer is advancing civilization, is rendering a distant service to mankind.

The railroad engineer followed the pioneers westward, and the transportation lines provided quick and easy transportation of passengers and freight from coast to coast, across great distances, through unproductive territory. From these lines branches were built through the more fertile and productive sections.

But now the highway engineer is building a network of roads to connect the important towns, to reach points not reached by the railroads to meet the demand for a kind and class of transportation not furnished by the railroads.

He is a man of broad vision, of foresight, convinced of the vital necessity that the highways meet the demands for economic transportation, a man with the ability to plan, finance and construct to meet the needs. For, while the routine of the highway engineer is largely construction work, it is not merely running lines

in the field, surveying with transit and chain; it is the selection of the proper route, the improvement of the route with adequate drainage facilities and a surface of proper type, built to the proper width, on the easiest grade and in the best place, for the least money. These are points which require study and investigation, judgment and experience.

They require as well an intimate contact with and a knowledge of many items; a technical knowledge of the legality of contracts and specifications; of bidders and their methods; a human understanding of contractors, their policies and qualifications; a sound judgment of working conditions and prices as affected thereby; the details of all classes of work from the simplest to the most involved, from placing a small pipe culvert to the building of an arched bridge.

In addition to construction ability he must possess the ability to weigh the evidence, to judge and decide which is the best improvement and which expenditure of money will give the greatest service. For highways are the products of his brain and his efforts; a labor rendered freely, gladly and conscientiously, in which the thought of personal gain or recompense gives way to the satisfaction of a good job well done.—Louisiana Highways.

Federal Aid Is Fair to All States

In a recent attack on Federal Aid for highways Governor Ritchie of Maryland contended that those States paying heavy

income taxes receive back a smaller percentage in Federal Aid than do States whose income taxes are smaller. That is quite true, but it is based upon a sound American principle that has made a strong union of the States possible, that has been the foundation of our wonderful system of public schools and has, in fact, contributed to the general development and progress of the entire country. Ever since the union of the thirteen original colonies the strong States have been aiding the weak and the strong counties have been helping those not so fortunate. The strong States have profited by this principle because the building up of the weaker States has made the big States stronger. It may be true that the weaker States appear to get more than their share in the distribution of Federal Aid for highways, but all States will benefit by the building up of a great national highway system, and those benefits will accrue more quickly through Federal Aid than if they await the individual resources of the separate States. Governor Ritchie's contention is no argument against Federal Aid; rather to any thinking person it is the best excuse and reason for it.—Southwest Builder and Contractor.

Out West

This is a big country, and the West is a business beyond all eastern imagination. You leave San Diego, in Southern California, and, in about the time it takes to go across five states from New York to Washington, you arrive in Los Angeles, still in Southern California.

City and County of Denver

BOARD OF WATER COMMISSIONERS
1509 Cleveland Place

To Whom It May Concern:

The Pierce Testing Laboratories have tested practically all of the materials used in the seven-million dollar extension of our water system. Their work has been along the line of testing all cement, concrete aggregates, concrete field specimens, re-inforcing steel and cast iron pipe.

They have an exceptionally thorough knowledge of cement, concrete aggregates and the design of concrete mixes, and consequently have been able to save us a great deal of money in their scientifically balanced concrete mixtures which covered a wide range of concrete aggregates.

These Laboratories have, therefore, the faculty of relieving the engineer of a great deal of detail and annoyance regarding the use of concrete aggregates and their proper mixture, which is of great value and is appreciated by every engineer.

Yours very truly,

DENVER MUNICIPAL WATER WORKS,
(Signed) Burton Lowther, Chief Engineer.

Pierce Testing Laboratories

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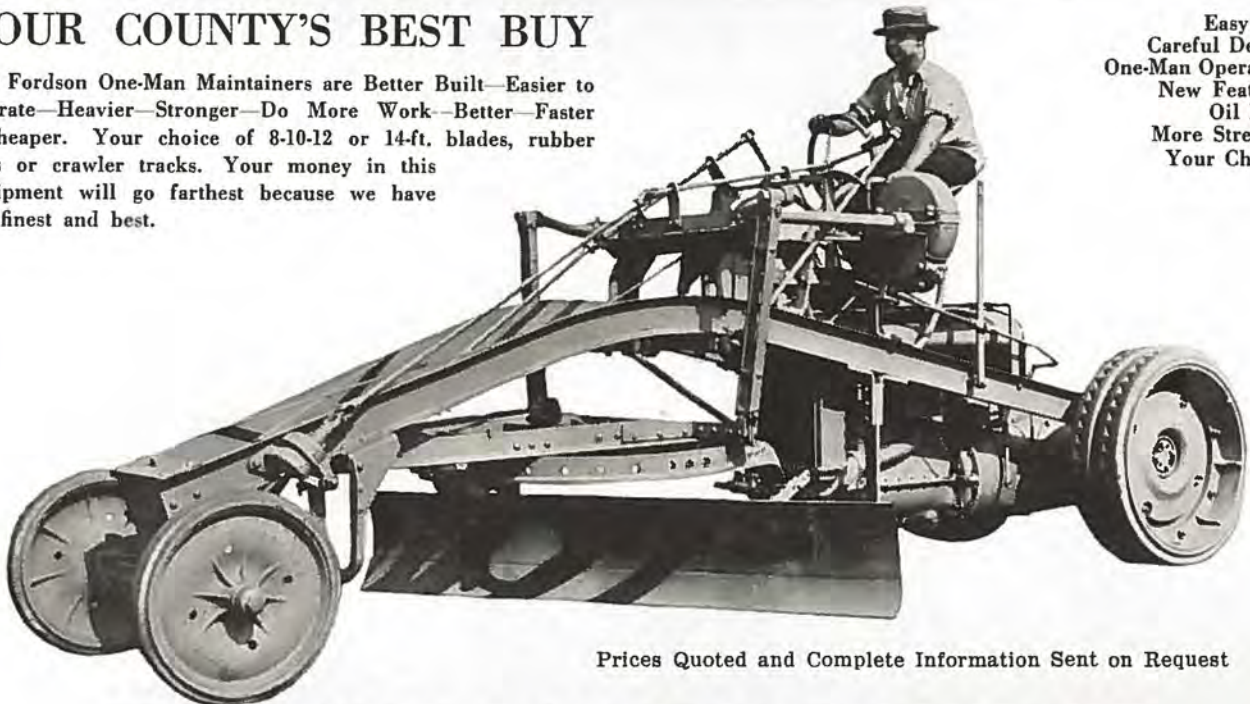
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Our Fordson One-Man Maintainers are Better Built—Easier to Operate—Heavier—Stronger—Do More Work—Better—Faster—Cheaper. Your choice of 8-10-12 or 14-ft. blades, rubber tires or crawler tracks. Your money in this equipment will go farthest because we have the finest and best.

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H. W. MOORE EQUIPMENT COMPANY

SIXTH AND ACOMA STREET

DENVER, COLORADO

Contractors' Equipment—Fordson Power Machinery—Road Building Equipment

Live Data for Construction Men and Engineers

THE ANNUAL ROAD REVIEW AND CONVENTION NUMBER OF COLORADO HIGHWAYS will be issued for the annual convention of county commissioners and supervisors to be held in Denver January 18th and 19th.

This issue will contain data and statistics on all projects completed during the past year, and a complete chart on incompleting projects. *It will be the biggest issue of the year.*

Reservations for extra copies and space should be in this office not later than December 20th.

COLORADO HIGHWAYS

215 CHAMBER OF COMMERCE BLDG.

DENVER, COLORADO

The Bulletin Board

Head of Koehring Company Visits Denver Distributor

Among the western road show visitors who stopped over in Denver on their return to the east was W. J. Koehring, vice-president and production manager of the Koehring Company.

"The western road show has demonstrated one fact to us manufacturers," said Mr. Koehring. "There is a larger field for construction equipment out in this western territory than we formerly thought was possible.

"It would not surprise me to see three great road shows held in this country in the future. The big one of course will be in Chicago, with another on the coast and a third held somewhere in the south, possibly at New Orleans.

"There was more actual buying at the San Francisco show than at any previous show of its size. It was a new thing, but it certainly went over big from every standpoint. We were a little bit disappointed at the small attendance from this section of the west. But possibly that was due to the fact that the folks over here are in the habit of looking forward to the Chicago show, at which the Rocky Mountain territory has always been well represented."

Mr. Koehring stated that his company is just closing the largest year of its history. For the past several months this concern has been turning out six giant Koehring cranes per week. Four of these six have been going to Florida for use in reclaiming waste lands. A freight embargo to this section has limited the number of machines that it was possible to ship.

While in Denver Mr. Koehring was the guest of Harry P. Wilson, president of the Wilson Machinery Company, Rocky Mountain distributors of Koehring products.

Other representatives of eastern manufacturers of road equipment who visited the Wilson company during the past month include: Messrs. O. H. Kiest, of the A. W. French Co., manufacturers of the Ord concrete finisher; L. A. Kliebenstein, sales manager of the Wonder Mixer Company; Mr. Moore, sales agent of the Le Roi Engine Co., and Mr. Morgan, of the Butler Bin Co., of Milwaukee.

Caterpillar Dealer Returns From Big Pacific Coast Show

L. L. Clinton, president of the Clinton & Held Company, was a visitor at the Western Road Show held in San Francisco November 9 to 15. While on the coast he visited the factory of the Caterpillar Tractor Co., discussing with officials so the latter concern plans for the sale of Caterpillar tractors in this territory during the coming year. The Clinton & Held Company have the exclusive sales rights on the Caterpillar tractor in Colorado and Wyoming.

"It was one of the finest exhibits of road and construction equipment I ever saw," said Mr. Clinton. "However, it was a strictly Pacific coast show. I met very few people from the eastern slope there.

"I was surprised at the large number of county officials at the show. They seem to be taking a keen interest in what the manufacturers have to offer in the way of modern road building equipment. 'How can I save money on my road program,' was the slogan of nearly every one I met. They are looking to the equipment manufacturers to show them a way to cut their construction and maintenance costs. And from what I heard a few of them say, the manufacturers have just what they are looking for.

"I believe the western show will be bigger next year than this. Everybody was most enthusiastic over the prospects for a big season the coming year. A larger number of sales were made at this show than was expected."

While on the coast Mr. Clinton also made arrangements for the distribution of a new Clinton flat-bottom ditcher which will go into production in Denver during the coming year.

Moore Salesmen Have Busy Time With County Road Men

During the meeting of the State Highway advisory board every equipment dealer in Denver was kept busy visiting with county commissioners and road officials. At the headquarters of the H. W. Moore Equipment company it was hard to tell whether they were running a moving picture show, a sales organization, or an F. A. project.

A movie outfit was recently purchased by this concern. All of their equipment was up in fine display shape; the Cedar Rapids one-piece was making gravel; a Fordson maintainer was doing its stuff in another corner, and still in another section of the lot the two-man grader outfits were kept busy on demonstrations, while the picture show with music was going on in the office.

Among the representatives of the eastern factory connections who stopped in Denver for a visit while en route to the recent Road Show on the Coast were: John H. Jay, general manager of the Iowa Manufacturing Company; John Heltzel, of the Heltzel Steel Form and Iron Company; W. McK White, president of the Chaussee Oil Burner Company; F. A. Peck, vice-president of the Universal Crane Company; and John Boyd, vice-president of the Galion Grader Company.

C. G. Lund has succeeded George Mefley as sales representative of H. W. Moore Equipment Company in the Pueblo territory. Mr. Mefley has been transferred to the Denver office of the concern and will have charge of sales on equipment suitable for county purposes. Louis St. James is in charge of sales of contractors equipment in the Denver office. Tom Sanderson retains his position as sales manager of Fordson equipment.

Extensive

Motorist: It's preposterous. I'm an expert driver. What I know about driving would fill a book.

Policeman: And what you don't know would fill a hospital. Give me your name and address.—Weekly Telegraph.



PUEBLO CONTRACTORS BUY KOEHRING CRANE—The firm of Arthur & Allen, dirt contractors, of Pueblo, are the latest purchasers of a Koehring crane in this territory. It was sold thru the Wilson Machinery Company.

Next Road Show and Convention to Be International in Scope

Prior to the last 5 years American highway engineers were more or less in the habit of going to Europe to observe the latest developments in highway construction. Today the reverse is true. So rapid and so extensive has been the development of road building in America that European highway engineers are now coming to this country for the purpose of studying the materials, methods and machinery employed in building roads.

According to Charles M. Upham, state highway engineer of North Carolina; former secretary, American Association of State Highway Officials; director, Highway Research Board, National Research Council, and convention and exposition manager, American Road Builders' Association, the annual Good Roads Convention and Exposition to be held at the Chicago Coliseum, Jan. 11 to 15, next, inclusive, will be an international instead of a national affair. It is under the auspices of the American Road Builders' Association that this big dual event is held each year.

Mr. Upham said:

"At the last convention representatives from 20 foreign countries were present. For the next event invitations will be sent not only to those countries represented last year, but to all the others, inviting them to send delegates, and arrangements will be worked out for their special entertainment. Invitations will be sent also to the members of the Pan-American Highway Commission and to all those who attend its international convention in Buenos Aires this fall.

"We plan to make the next good roads convention and exposition in Chicago the greatest of its kind ever held in the world. At this early date many applications for exhibition space at the exposition have been received. Many new developments in road-building materials, methods, and machinery have been brought out since the last exposition and all of these will be on display. At the last exposition more than 300 carloads of machinery were on exhibition at the Coliseum and in adjacent buildings and 20,000 persons from the United States, Canada, Mexico and other foreign countries were in attendance. We expect from 25,000 to 30,000 visitors at the next event."

W. H. Connell, chief engineering executive, Pennsylvania State Highway Department, who is president of the American Road Builders' Association this year, is making arrangements for the next convention conference to meet in two divisions, one section presenting papers and discussing the engineering phases of road building and the other dealing with construction problems. The two sections will meet simultaneously in adjoining convention halls. By arranging the program in this way those interested only in engineering problems can devote all their time to those sessions while contractors and highway officials interested only in construction subjects can hear those discussions without being compelled to sit through long sessions in which they are not particularly interested.

The annual good roads conventions and expositions of the American Road Builders' Association have established them-

IT ISN'T A HOME WITHOUT A TELEPHONE



HERE is a young man. He has a new suit, a dollar and a nickel.

With the dollar he will buy two tickets for the movies. The nickel will be spent for a telephone call.

He is a nice, young chap.

But the girl without a telephone will stay at home.



You Can Have One for a Few Cents a Day

selves as the two greatest events each year in connection with the development of America's colossal good roads program, for which more than one and one quarter billion dollars are being expended annually. The association was organized more than 20 years ago and is greatly responsible for the establishment of Federal Aid in road building and the legislation which created the various state highway departments.

Campaign Launched to Compel Snow Removal

For the first time in the history of the United States a definite campaign has been launched by the American Automobile Association to make the removal of snow from the primary highways mandatory on all states coming within the snow belt as designated by the Bureau of Public Roads of the Department of Agriculture.

The campaign initiated by the A. A. A. and launched through its affiliated clubs throughout the country is the result of a

study of the extent to which lack of a regular snow removal program handicaps transportation along the main arteries and causes heavy and unnecessary expenditures on the maintenance of highways.

A call has been sent out from national headquarters of the A. A. A. to all its affiliated clubs to see to it that laws are introduced for passage by the forthcoming legislatures to make snow removal mandatory on the state organization. The program does not contemplate that all roads should be kept open but only the primary systems along which winter touring and winter transportation is on the increase.—Engineer and Contractor.

Wisconsin is collecting five million dollars in gasoline taxes this year. A 2-cent levy was imposed last May. In addition Wisconsin collects eight million dollars annually from motor vehicle license fees. This money is used to construct and maintain Wisconsin's state highway system. Colorado's gas tax totals about \$1,800,000 annually.

BIDS OPENED					
Proj.	Length	Type	Location	Low Bidder	Bid Price
282-C	4.052 mi.	Gravel Surfacing	North of Rifle	Hinman Bros. Const. Co., Denver	\$50,200.64

PROJECT ADVERTISED FOR BIDS				
Proj. No.	Length	Type	Location	Bids Opened
275-D	0.879 mi.	Underpass & Approaches at R. R. Crossing	North of Castle Rock	Dec. *, 1925

* This date will be given later.

PLANS SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj.	Length	Type	Location
213-D	3.877 mi.	Gravel Surfacing	West of Durango
243-B	0.778 mi.	Concrete Bridge & Paving	West of Portland
276	0.133 mi.	Concrete Bridge & Paved Approaches	North of Colo. Springs over C.R.I. R.R.
278-B	6.856 mi.	Grading	East of Hugo
279-C	5.772 mi.	Mountain Grading	Turkey Creek
282-A	0.852 mi.	Steel Bridge & Approaches	South of Craig

PLANS BEING DRAFTED

Proj. No.	Length	Type	Location
2R-3	0.55 mi.	R. R. Grade Crossing	North of Trinidad
2R-4	6.5 mi.	Concrete Paving	North of Trinidad
258-B	3.5 mi.	Grading and Bridges	West of Gunnison
271-A	3. mi.	Gravel Surfacing	Between Portland and Beaver
275-C	5. mi.	Concrete Paving	Husted-Monument
281-D	6. mi.	Concrete Paving	Between Lafayette and Longmont
287-B	7. mi.	Grading	East of Greeley
298-A	2. mi.	Grading	North of Pagosa Springs

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1925

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Fer Cent Complete	Proj. No.
213-A	Hesperus-Mancos	3.538 mi.	Gravel Surfacing	Hooker & Hanson	\$ 40,422.00	90	213-A
243-B	Piedra-Pagosa Springs	2.973 mi.	Gravel Surfacing	Engler & Teyssier	44,025.00	100	243-B
247-B	Rocky Ford-Swink	2.329 mi.	Concrete Paving	LaNier, Selander & White	71,001.00	70	247-B
253-B	Brookston-Milner	3.064 mi.	Gravel Surfacing	Hinman Bros.	66,583.00	80	253-B
254-B	Hot Sulphur Springs-Parshall	1.087 mi.	Grading	Pioneer Const. Co.	61,071.00	45	254-B
258-C	West of Gunnison	5.587 mi.	Gravel Surfacing	Ed. H. Honnen	60,100.00	35	258-C
261-A	Rifle-Grand Valley	16 mi.	Gravel Surfacing	Hinman Bros.	132,556.00	80	261-A
262-B	Rio Grande Del Norte	490-ft. Bridge		Levy Const. Co.	82,123.00	100	262-B
262-E	West of Walsenburg	3.527 mi.	Gravel Surfacing	Pople Bros.	24,979.00	45	262-E
262-F	LaVeta Pass-Russell	2 mi.	Crushed Rock Surf.	Central Const. Co.	22,017.00	35	262-F
266-B	Durango, south	3.181 mi.	Gravel Surf.	B. R. & J. L. Morrison	17,271.00	85	266-B
271-A	Florence-Pueblo	3.286 mi.	Gravel Surfacing	Driscoll Trucking Co	56,479.00	100	271-A
272-A	Apishapa River, east of Fowler	0.417 mi.	Bridges and Approaches	Lee F. Williams	56,434.00	80	272-A
275-A	Gann-Sedalia	7 mi.	Concrete Paving	Strange-Maguire Pav. Co.	314,174.00	40	275-A
275-B	Sedalia-Castle Rock	5.334 mi.	Concrete Paving	J. Fred Roberts & Sons	198,771.00	50	275-B
279-B	Morrison-Balleys	5.295 mi.	Grading	Harry H. Brown	85,980.00	95	279-B
283-B	Berthoud, south	4.2 mi.	Concrete Paving	C. C. Madsen Const. Co.	168,835.00	20	283-B
286-B	Nunn, north	19 mi.	Grading	James Collier	87,249.00	60	286-B
288-A	Merino-Brush	19 mi.	Grading and Surf.	Scott & Curlee	102,627.00	70	288-A
288-B	Merino, west	2.519 mi.	Concrete Pav.	Engineers Const. Corp.	70,381.00	100	288-B
293-A	West of Montrose	114 ft. steel bridge		Wear Bros.	17,936.00	65	293-A
294-A	Mancos-Cortez	2.9 mi.	Gravel Surfacing	Engler & Teyssier	23,273.00	25	294-A
295-A	Alamosa-La Jara	4.456 mi.	Gravel Surfacing	Central Const. Co.	19,861.00	100	295-A
296-A	South of Pueblo	113 ft. Concrete Bridge		C. A. Switzer	17,810.00	60	296-A
297-A	Palisades-DeBeque	2.848 mi.	Grading	Ed. H. Honnen	40,188.00	55	297-A

Pipe Investigation

Announcement is made by Chas. M. Upham, Director of the Highway Research Board of the National Research Council, of the commencement of a new investigation by that Board on Culvert Pipe; and that R. W. Crum, Engineer of Materials and Tests, Iowa State Highway Commission, has been designated Chairman of that investigation. The objects of this study are: to correlate the various tests and experiments on pipe loads and stresses; to set up a standard of comparison of the life of different kinds and classes of culvert pipe; and to determine the most probable conditions of service for which standards should be designed.

Mr. Crum's experience in research work well qualifies him to head this important investigation. After graduation from the Iowa States College in 1907, he was for a time on the Engineer Corps of the Pennsylvania Lines, following which he returned to his alma mater as Associate Professor of Civil Engineering. He remained in this position for twelve years, during which time he was engaged on research work for the Iowa Engineering Experiment Station. Since 1919 he has been Engineer of Materials and Tests with the Iowa State Highway Commission where he has conducted many highway research studies. Mr. Crum is the author of a

number of important research papers. He is a member of the American Society of Civil Engineers, the American Society for Testing Materials and the American Concrete Institute, and is active on several research committees of those organizations.

Auto Fees Shared with Cities

The participation of cities in the apportionment of state revenues for highway purposes obtained from motor vehicle fees and a tax on gasoline, and the elimination of a direct state tax for highways are features of the recently enacted state highway law of Wisconsin. The apportionment of maintenance funds under this statute covers highways under the jurisdiction of every unit of government in the state.

According to the National Municipal Revue, on the state system this allotment is based on road classification and traffic. Thus primary federal aid highways receive \$500 per mile, secondary federal aid highways \$400 per mile, and the remainder of the state system receives \$300 per mile. An allotment of \$25 per mile is made for the care of town roads and village streets not included in the state system, and for city streets similarly classified the apportion-

ment is on the following basis: \$50 per mile to cities not over 10,000 in population; to cities with a population over 10,000 up to and including 39,000, \$100 per mile; to cities with population from 39,000 to 150,000 \$150 per mile, and above 150,000 in population the allotment is \$200 per mile. In addition those cities which include within their limits sections of state highways receive the same allotment as those provided for the state highways outside of the city limits. A further allotment of \$200 per mile is made to counties having county truck highway systems. The balance remaining in the state highway fund is used for administration and construction purposes.—Roads and Streets.

Pecan trees along the highways is a suggestion made by Pulaski County, Arkansas Circuit Judge Richard M. Mann, who says: "I do not know of any improvement that could be added to the highways of the state which would be of greater value than the lining of the Arkansas highways with pecan trees. These would be useful from a standpoint of providing a supply of nuts, also for the shade which they would give and the beauty which they would add to the highways."

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