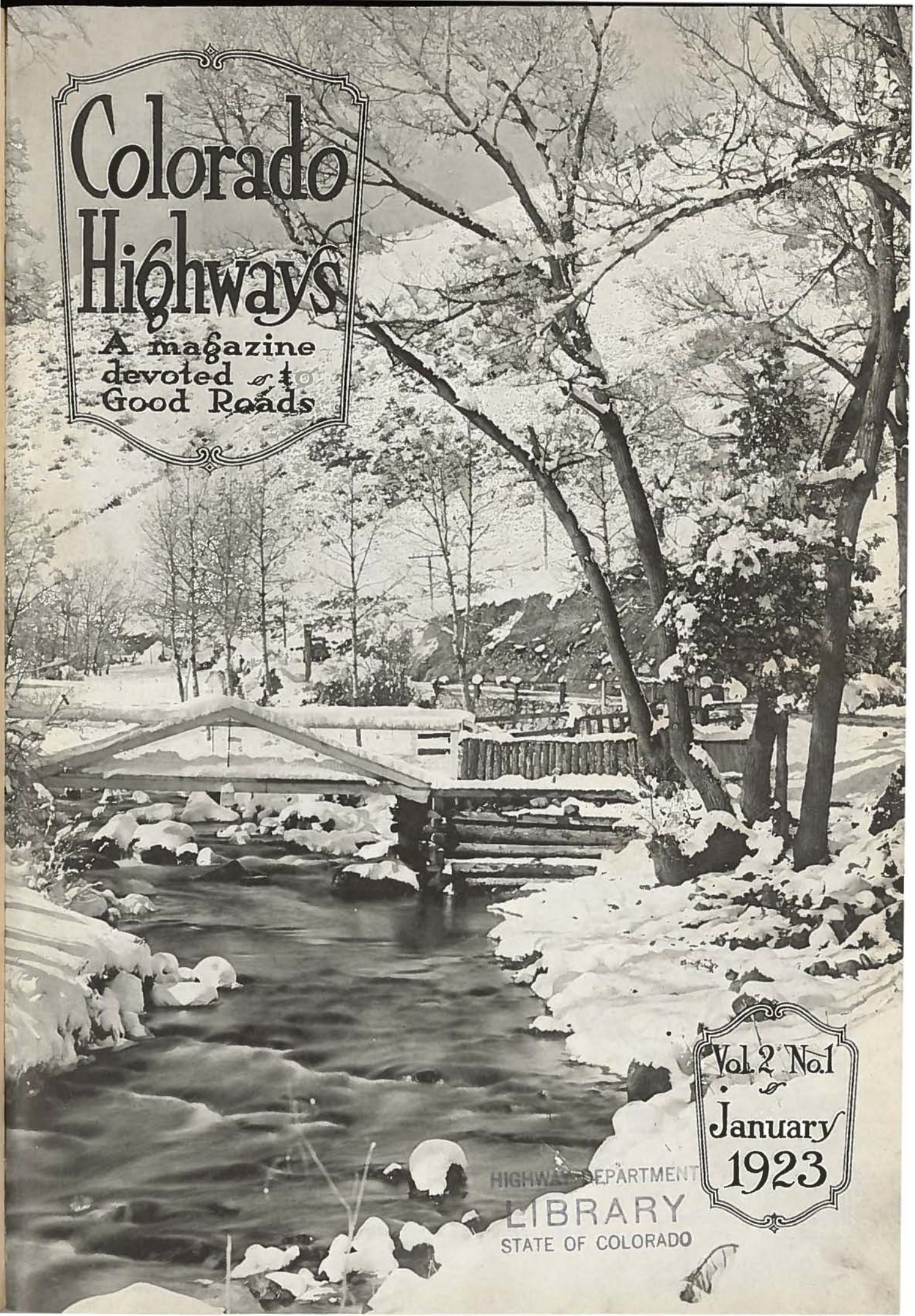
Colorado Highways

A magazine devoted to Good Roads



Vol. 2 No. 1
January
1923

TWO MACHINES TO SOLVE YOUR ROAD PROBLEMS

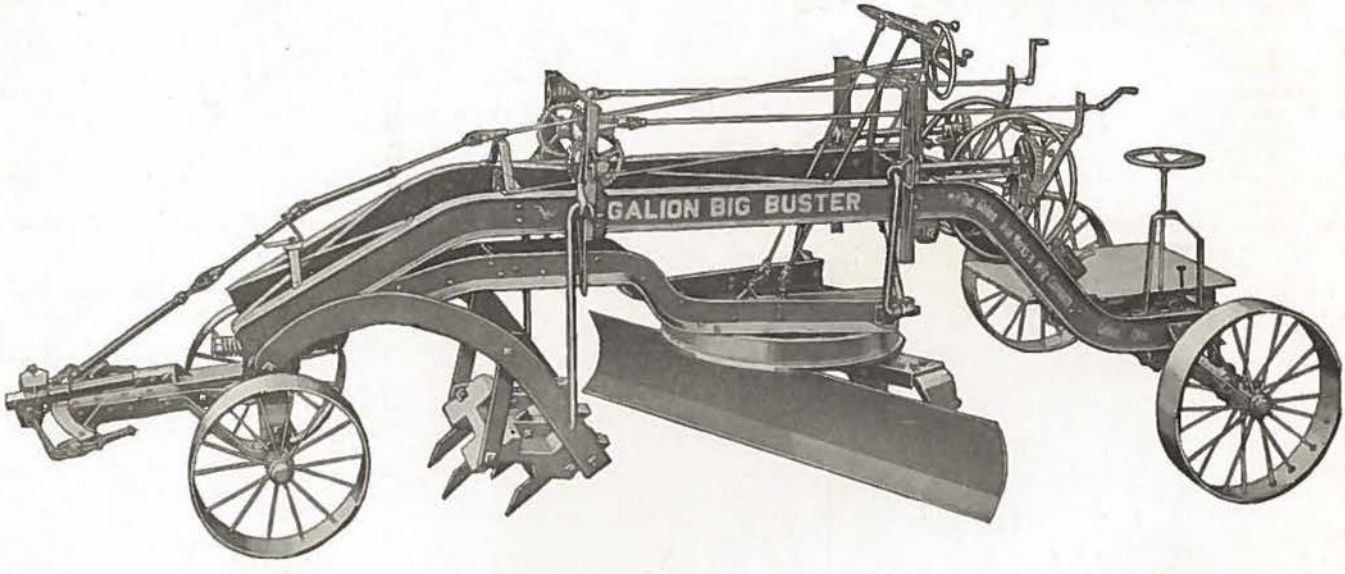
DUPLEX MAINTAINER

For Better Roads

Unequalled For Highway Maintenance

GALION BIG BUSTER

Combination Scarifier and Grader. For Heavy Duty Road Construction



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Colorado Highways
"BETTER ROADS"
VOLUME II. JANUARY, 1923. NUMBER 1.

How the Highway Dollar is Expended

Statistics Compiled by State Experts Show that 95.19% of Highway Fund was Actually Spent on Roads During 1922

EIGHTY-FOUR and one-half cents of every dollar expended by the State Highway Department during the year 1922 went into actual construction of roads.

At the same time ten and one-half cents of every dollar expended went into maintenance.

The construction costs was divided as follows:

Federal Aid, $2,762,815,55; State Projects, $1,284,181.10; and County Bond Projects, $1,657,350.04.

For engineering there was deducted from every dollar five and one-tenth cents, for administration two and one-half cents, and for road machinery and equipment two and 32/100 cents.

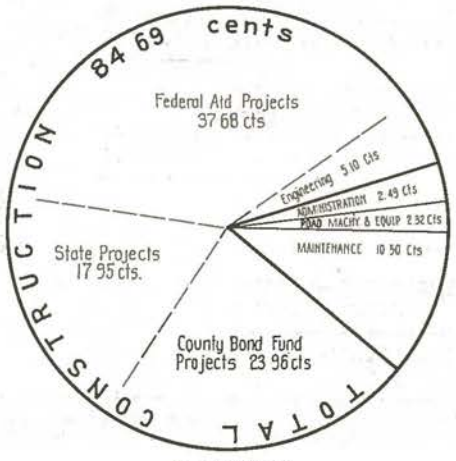
The highway law allows the department four per cent for administration. The total spent for administration during 1922 was $167,780.53, which was divided as follows: General office, $65,412.88; engineering administration, $75,318.22, and preliminary investigations, $27,049.43.

The analysis of the 1922 highway dollar shows that thirty-seven and 68/100 cents was expended on Federal Aid Projects; seventeen and 95/100 cents on State Projects, and twenty-three and 96/100 cents went for county bond and fund projects, and that the engineering and inspection on these projects cost five and 1/10 cents, making a total of eighty-four and 69/100 cents of every dollar expended by the Highway Department during the last year that went into actual construction of roads.

It is doubtful if the Highway Department of any other state in the Union can boast of such a fine showing. The administration in some states alone runs as high as six per cent. And while the Colorado law allows the department four per cent of the total amount appropriated for road purposes, for administration, under the present regime, the amount has been held to a fraction less than two and one-half cents.

This has been made possible by the strictest economy practiced in all of the divisions and by the introduction of efficient methods in handling the activities of the department.

Of the $6,735,882.75 expended by the Highway Department in 1922, $5,704,-346.69 was paid out for actual construction. There was $707,570.32 spent for maintenance, making a total of $6,411,-917.01, or 95.19% of the whole, actually spent on the roads.



SUMMARY

ADMINISTRATION		2 49%
ROAD MACHY & EQUIP		2 32
MAINTENANCE		10 50
CONSTRUCTION		
Federal Aid Projects	37 68 %	
State Projects	17 95	
County Bond Fund Projects	23 96	
Engineering	5 10	84 69
TOTAL		100 00 %

From the expenditure for maintenance the greatest showing was made. Over 7,000 miles of roads were kept in repair and maintained. In maintaining the roads as they have been during the past year, and none will deny that the roads throughout the state are today in better condition than ever before, it has been the policy of the department that it is a wanton waste of the taxpayers' money to build new roads and not properly take care of them.

OUR COVER PICTURE

We make our bow to 1923 with a snow scene taken near the home of the Denver Motor Club located in Bear Creek Canon.

Br-r-r-, but don't it look chilly? The picture was snapped just after a big storm, that threatened for a while to tie up traffic. But that didn't happen. Note the auto in the distance. Bear Creek canon is one of the most beautiful winter drives in Colorado, and growing more popular each year.

Therefore the department has paid particular attention to maintenance, not even considering this work second in importance to new construction.

During the year the department purchased $156,185.21 of new road machinery and equipment. Most of these materials were purchased from the U. S. war department under the terms of the Kahn-Wadsworth bill. The prices paid for the materials was only a fraction of the actual manufacturing cost, plus the freight.

These materials, which included a large number of trucks and tractors, were cleared to the counties through the department, thus effecting a great saving to the taxpayers of the state.

In 1922 there was completed by the Highway Department 285 miles of Federal Aid roads of all classes, including forty miles of concrete paving.

There was improved about 1,100 miles of roads. This included state projects and county bond projects.

The maintenance work was handled on a "fifty-fifty" basis with the counties. The work was done by the county commissioners under the supervision of the State Highway Department.

Work of the engineering division was greatly increased the past year by the necessary surveys, plans and specifications required for the improvements laid out under the counties' half of the $5,-000,000 bond issue authorized in 1919.

In many cases the surveys covered stretches of road well beyond the immediate projects. The data, however, were necessary to the proper design of the work, and is available for extension.

Surveys, plans and specifications were made for the following general division of the work:

Federal Aid Projects; state projects; state bond issue projects by the counties; road plans and specifications for county projects; investigations of sources of supply of road materials and tests in conjunction with the Colorado Agricultural College at Ft. Collins; and bridge plans for the bridges involved in the various projects.

Under the provisions of the Federal Aid act it is necessary for the State Highway Department to prepare all plans and specifications for projects. The plans and specifications must be paid for by the state.

The following is a complete statement of disbursements made by the Highway Department during the past year:

STATE HIGHWAY DEPARTMENT

Disbursements and Percentages for Fiscal Year 1922

	Disbursements	Totals	Per cent of the Total Disbursements	Total Per cent
Administration:				
General Office	$65.412.88		00.971	
Engineering Administration	75,318.22		01.118	
Preliminary Investigations	27,049.43		00.402	
Total Administration		$167,780.53		02.491
Road Machinery and Equipment		$156,185.21		02.319
Maintenance		707,570.32		10.504
Construction:				
Federal Aid Projects:				
Engineering	$224,895.02		03.339	
Construction	2,537,920.53		37.677	
Total F. A. Projects		$2,762.815.55		41.016
State Projects:				
Engineering	$75,347.03		01.118	
Construction	1,208,834.07		17.947	
Total State Projects		$1,284,181.10		19.065
County Bond Projects:				
Engineering	$43,456.40		00.645	
Construction	1,613,893.64		23.960	
Total County Bond Projects		$1,657,350.04		24.605
Grand Total Disbursements		$6,735,882.75		100.000

NOTE:

Total Construction .....$5,704,346.69—84.686%
Total Maintenance ..... 707,570.32—10.504%

Total actually spent on the road....$6,411,917.01—95.19%

Scene on the southern slope of Red Mountain Pass, showing type of roads being constructed by the State in co-operation with the U. S. Forest Service.

Over Nine Million for Colorado Roads

Total of $4,500,000 Carried Over from 1922 in State and Federal Aid Projects—Budget Makes $1,600,000 Available for Maintenance

FUNDS made available for construction and maintenance of roads in Colorado during 1923 equal the sum of $9,236,350. The annual budget covering this amount for road purposes was approved by Governor O. H. Shoup on December 15.

Of the total amount included in the budget, $4,500,000 is carried over from the budget of 1922. This sum is represented by uncompleted contracts and work planned last year but not yet placed under contract.

The sum to be spent in 1923 on Federal Aid Projects this year will be $5,272,700. One-half of this sum comes from the government. There is made available for State Aid Projects a total of $1,494,896.

A close analysis of the budget shows that the sum apportioned to State Aid Projects represents within a few dollars the total receipts of the Highway Department from the one mill levy tax.

The number of Federal Aid Projects carried over from 1922 is thirty-three, seventeen of which remain to be contracted. In addition to these the department carries over 48 state projects. An appropriation of $328,400 is made for the latter projects.

The greater portion of the money made available for state projects will be expended in counties not included on the Federal Aid "interstate system" of roads in Colorado. It is from the construction of state projects, which otherwise would be impossible, that these counties derive an indirect benefit from the $6,000,000 bond issue authorized by the voters at the last November election.

In making up the budget the Highway Engineer and the members of the State Highway Advisory Board gave particular attention to maintenance. The sum of $825,000 is made available for this purpose. A like sum is guaranteed by the counties, making a total of $1,650,000 to be expended for maintenance purposes in 1923. Plans of the department call for the maintenance of 8,325 miles of roads throughout the state. Of this mileage, 5,292 miles will be under patrol system.

During the past year there has been an insistent demand all over the state for the installation of guide signs along the highways. In order to provide adequate marking of the main state roads, the Advisory Board recommended an appropriation of $70,000 to be used in providing markers and taking a traffic census.

Statistics gathered from the taking of the traffic census will be used in determining the type of roads to be constructed in Colorado during the next few years.

In the column below listed as "receipts" will be found an item of $425,000 from motor vehicle fees. In four years this sum will be wiped out, unless the legislature provides for an increase in motor truck and passenger-carrying car license fees.

At the end of four years this entire amount will be deducted from the Highway Fund in order to pay the interest and retire the $6,000,000 good roads bond issue authorized in November.

Analysis of the budget reveals that the one mill tax now levied against property is the foundation of the present highway finances. The total amount derived from this source is $1,500,000. One-half of the levy is authorized by constitutional amendment and the other half by legislative enactment.

A "recap" of the 1923 budget follows:

RECAPITULATION

Receipts

Bond Fund balance 12-1-22	$1,800,000	
Highway Fund balance 12-1-22	400,000	
Due from U. S.	300,000	
Due from Counties and miscellaneous	125,000	
One Mill levy	1,500,000	
Motor Vehicle License	425,000	
Gasoline Tax	275,000	
Internal Improvement	50,000	
Sales to Counties	200,000	
Miscellaneous Receipts	25,000	
Bond Sale 1923	1,500,000	
U. S. Federal Aid	2,636,350	
		$9,236,350

Disbursements

Federal Aid Projects	$5,272,700	
State Projects	1,494,896	
County Bond Fund Projects	1,000,000	
Maintenance	825,000	
Road Signs and Traffic Census	70,000	
Property and Equipment	150,000	
Administration	281,454	
Contingent	142,300	
		$9,236,350

Good Roads Have One Drawback

It's nice to live in the country—nice for your city relatives when the auto season gets in full swing. It's pretty hard for a country cousin to get out of reach for the auto.

A typical concrete-laying scene in Colorado, showing roller and concrete mixer in operation.

Colorado Highways
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Address all communications to State Highway Department, attention M. W. Bennett, Editor.

Owing to the necessarily limited edition of this publication, it will be impossible to distribute it free to any persons or institutions other than the state and county officials actually engaged in the planning or construction of highways, instructors in highway engineering, newspapers and periodicals, and civic associations. Others desiring to obtain Colorado Highways can do so by sending 10 cents for each number desired. Associations desiring to distribute the magazine can obtain it at cost in lots of from 500 copies up.

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EDITORIAL COMMENT

What's ahead!

Colorado's road plans for 1923!

On another page of this issue will be found an outline of the budget for the coming year.

It shows a total of $9,236,350 to be expended on construction and maintenance of state highways.

The new year promises to be an exceptional one in the way of improvements. With the first break of winter the road work will start. Thirty odd projects will be carried over from 1922. This work totals $4,500,000.

Plans already are completed for the most comprehensive road building program ever launched in this state. The work contemplated reaches into every county. It is expected that approximately 600 miles of roads of all classes will be improved.

About 7,000 miles of state roads will be placed under patrol maintenance. This means that these roads are to be kept up in the same manner as the railroads maintain their rights-of-way.

The sum apportioned to this important phase of the highway work equals $1,650,000. This is the largest amount ever made available for maintenance.

Distribution of the State Highway funds this year has met with approval in nearly every county in the state.

Each county has received its just share of these moneys. A glance at the budget shows that a more equal distribution could hardly have been made.

In those counties where there are no Federal Aid roads, provision has been made to build State Aid projects. By this method all sections receive equal benefit from the passage of the recent $6,000,000 Highway Bond issue.

With the state funds distributed as they are, marked progress should be made in the improvement of the state's main highways.

These highways served about 85 per cent of the traffic. Much praise has been expressed by citizens and road officials throughout the state on the manner in which funds were distributed for this work.

It has been ruled by the attorney-general that eight tons may be hauled over the state highways, exclusive of the weight of the truck. This is the limit of the load set up by an act of the legislature.

Investigation by the State Highway Department shows that the eight-ton limit is too high. Trucks loaded to the limit are found to do great damage to the roads.

In most other states the loads are limited to five tons. An effort probably will be made to secure the passage of a bill reducing the loads to five tons in Colorado.

Overloaded trucks cause a great waste of the taxpayers' money, because there has not yet been found a road that will withstand such traffic.

Recently the State Highway Commission of Maryland discovered that it cost the taxpayers of that state $150,000 to repair a road that had been practically destroyed by overloaded war trucks.

The same thing is happening right now on some of Colorado's roads.

One way of eliminating over-loaded trucks is to make the offender unload his excess weight right on the roadside. A few arrests would also have a good effect.

Road Building and Maintenance

BY F. L. BARTLETT,
Chairman of Road Committee,
Denver Civic Association.

A WELL kept highway through any county is a permanent advertisement of thrift, education, good business and prosperity.

We always start road building by grading the natural soil, adding when needed proper and adequate bridges and drainage. This is our base or starting point. Further treatment depends on the character and extent of travel over the road. Its permanancy in protracted seasons of both wet and dry weather.

In Colorado more than any other state we have an unusual and complex variation of soils, due to the fact that our soils come from the decay and abrasion of the rocks which compose our mountain ranges. This errosion is constant but slow. Could one return to this earth a million years from now no doubt a wonderful change would be seen.

The foothills wash extends many miles east on this side of the ranges, well into Kansas and Nebraska and in many other directions. If the wash comes from shales and slates we have the so-called "adobe" soil; if from granite and quartz, we have a harder and more compact soil; if from sandstone, we have sandy soil and so on. Therefore a road built anywhere in Colorado is bound to show a great variation. In some places the soil forms a natural cement and a good hard wearing surface. One that we cannot improve by adding anything to it. In other places we have clay or adobe which does not cement and softens when wet. In other places we have deep sand which remains loose.

After a road is graded and has been in use long enough to show the effects of travel, the careful road supervisor or engineer will go over it in both wet and dry spells to study its condition. He will find part of the road has cemented or "set" with a good, hard surface and therefore needs little attention; other sections may be slippery and soft in wet weather. He will use gravel, sand or fine crushed rock on this, adding just enough to harden the road bed, and right here is where good judgment is needed and it is a case where it is better to use too little rather than too much — **just enough is right.** It may mean 1 inch or 4 inches. If the supervisor understands his business he will harrow in the sand or gravel and give it a chance to set.

On sandy stretches he will reverse the order and add loam, clay, or adobe and harrow that in, remembering that the best setting or cementing mixture is 15 parts of clay or adobe and 85 parts of sand or fine gravel.

If he is keen on road maintenance and sand or gravel is scarce, he will hunt up some part of the road where the material is self-cementing and will use this to cover either sandy or bad adobe stretches. In this case, however, he will simply spread this material over the surface 4 or 5 inches thick to form a new road bed.

In the writer's opinion more attention should be given to our natural soils which are self-cementing. These are in most cases mixtures of sand and decomposed lime shales or of sharp fractured gravel mixed with more or less lime. Such material under the action of travel (which is pressure) and water form a natural cement which makes an excellent road bed.

These natural road building materials can be found in almost every county in the state and should be examined and tested with a view to using them as much as possible in road building. In building a road from our natural soils, great care should be taken to keep grass, weeds and roots out of the road bed. These decay and hold moisture and will sooner or later cause depressions in the road bed. The crucial time after a road is built or an old one rebuilt is the first six months. Fills will settle, soft places show up and ruts form which must be worked out gradually, otherwise the road will never be satisfactory.

There has been a good deal of road money thrown away in Colorado in gravelling roads—for two reasons. First: By not properly preparing the road, grading and smoothing it up, filling up depressions and conducting a careful survey to ascertain just how much sand or gravel can be used to advantage—some parts need more, some less—depending on the nature of the soil. Second: By using **too much** sand or gravel. Often six or eight inches is used where the road will only assimilate two inches.

If the gravel is self-cementing too much will do no harm since it will set in time. Usually, however, such is not the case and any excess will always remain loose. Gravel composed of angular or sharp fragments will nearly always cement, while if composed of water-worn rounded particles it will only cement when mixed with other materials.

To most people "gravel is gravel" but the intelligent road engineer knows that there are as many kinds of gravel as there are rocks in our mountains and he makes a careful study of it before using on the road. After a gravelled or sandy road has been in use six months or so, no matter how carefully done, it will be found that some places need a little more and that other places have too much, the aim being to secure a hard surface, otherwise we shall have the well known "washboard" surface, the bugbear of all motorists.

The automobile is driven by the friction of the rear wheels against the road surface, the area of contact is very small, if the road bed is hard there is no slip, if it is covered with loose sand or gravel, there is a certain amount of slips which forms ridges and pockets.

(*Cont'd on Pg. 16.*)

A snow scene on Mt. Lookout near Bergen Park, in Jefferson County.

Huge Sum for Road Maintenance

More Than One and One-half Million Dollars Made Available to Keep State Roads Smooth During 1923

A TOTAL of $1,622,070 has been made available for maintenance of state roads during 1923. This is the largest sum ever appropriated for maintenance work in Colorado.

It was the unanimous decision of the highway advisory board and the highway engineer, after reading the report of Robt. H. Higgins, superintendent of maintenance, that the patrol system of maintenance should be continued.

By this method the state expects to maintain not less than 5,292 miles of the 8,325 miles of state highways. This is an increase of 1,068 miles that will be under patrol the coming year.

The cost of this maintenance will be borne jointly by the state and the counties, one-half being paid from the state highway department fund. This amounts to $811,035. Figured on a basis of 8,325 miles of road to be maintained this means that $195 will be available for each mile of road. In 1921 the cost was $25 per mile. Last year it figured about $135 per mile.

It is calculated that the sum made available for maintainenance in 1923 will be sufficient to keep the state highways in passable condition the year round. As a result of the work done by patrol crews the year just passed, Colorado's roads have been in better condition, as a whole, than in any previous year. It was this showing that prompted nearly all of the sixty-two counties to increase their appropriations for maintenance which the state was more than pleased to match on the fifty-fifty basis.

As heretofore the maintenance work will be directed by the county commissioners, under the supervision of State Supt. Higgins and his seven division superintendents.

In 1922 the highway department allotted $600,000 to maintenance, which was matched by the counties. Later this sum was increased by $100,000 which was taken from the reserve fund, when it was found that the original sum would not be sufficient to carry on the work. The additional $100,000 was met by counties affected by a like amount, making the total expenditures for maintenance $1,400,000 last year.

The appropriation of $811,035 was made by the highway department after receipt of reports from the sixty-two counties had been received. In making such a large appropriation for this work, the members of the Advisory Board and Major L. D. Blauvelt, state highway engineer, gave expression to their sentiment that it was equally as important to maintain roads as it is to build them.

"It's no use to spend money for highway construction if one is not prepared to keep them in shape once they are built", said Major Blauvelt.

The appropriation for maintenance in 1923 is larger by $222,070 than it was in 1922.

Robert H. Higgins will start immediately to confer with the various county commissioners. As soon as the boards sign contracts binding themselves to meet the state appropriations the money for the work will become available.

In some of the counties maintenance work will be carried right thru the winter months, while others that have exhausted their maintenance funds will put their crews on the roads just as soon as the frost is out of the ground in the spring.

The total state and county appropriations for maintenance in 1923 for each county follows:

Adams	$52,000
Alamosa	20,000
Arapahoe	45,000
Archuleta	14,000
Baca	18,000
Bent	12,000
Boulder	60,000
Chaffee	25,000
Cheyenne	24,000
Clear Creek	16,000
Conejos	12,950
Costilla	10,000
Crowley	24,000
Custer	7,000
Delta	27,200
Denver	40,000
Dolores	8,000
Douglas	25,000
Eagle	30,000
Elbert	20,250
El Paso	53,220
Fremont	35,000
Garfield	20,000
Gilpin	8,000
Grand	36,000
Gunnison	38,400
Hinsdale	4,000
Huerfano	30,000
Jackson	12,000
Jefferson	24,000
Kiowa	8,000
Kit Carson	25,000
Lake	15,000
La Plata	20,000
Larimer	50,000
Las Animas	40,000
Lincoln	27,350
Logan	33,400
Mesa	50,600
Mineral	5,000
Moffat	26,000
Montezuma	16,000
Montrose	31,200
Morgan	33,000
Otero	30,000
Ouray	13,600
Park	26,000
Phillips	14,000
Pitkin	15,000
Prowers	30,000
Pueblo	50,000
Rio Blanco	15,000
Rio Grande	20,000
Routt	30,000
Saguache	20,000
San Juan	10,000
San Miguel	30,400
Sedgwick	10,000
Summit	16,000
Teller	30,000
Washington	30,500
Weld	60,000
Yuma	40,000

1922 BREAKS ALL RECORDS FOR ROAD-BUILDING, SAYS REPORT

Washington, December 30—All records for road construction in the United States were broken during the fiscal year 1922, according to the annual report of the Bureau of Public Roads, United States Department of Agriculture. During that period 10,000 miles of Federal-aid roads and more than an equal mileage of highways without Federal assistance were constructed.

From the viewpoint of Federal-aid progress the year divides itself into two periods, one before the other after the passage of the Federal highway act. The first period was a season of great construction activity during which the greater part of the work of completing the 10,000 miles was done. It was also one of almost complete stagnation with respect to the initiation of projects.

When the year opened there was an unobligated balance of $18,793,544 of the Federal-aid appropriations and the projects initiated since the beginning of the work aggregated 35,402 miles. By the end of October 1921 the unobligated balance had been reduced to $11,714,328, the lowest it had been since 1918. Only two states at that time had a balance of more than $1,000,000 to draw upon for new projects, and a number were so reduced that their balance was not sufficient to pay for another mile of road.

Just before the passage of the Federal highway act the mileage submitted by the states had not grown during the fiscal year but had actually diminished as a result of the withdrawal and substitution of projects. The total mileage proposed was only 35,379 miles as compared with the 35,402 miles of four months before. Immediately upon the approvel of the act the initiation of projects took on new life and in the months of March and June reached the unprecedented total of 1,250 miles a month. At the close of the year the submitted mileage is 39,940 miles, 4,538 miles greater than at the close of the preceding fiscal year.

At the close of the preceding year projects completed aggregated 7,469 miles and there were 17,978 miles under construction, which were estimated as 50 per cent complete. In one year the completed mileage has grown to 17,716 miles, an increase of more than 10,000 miles, and there still remains under construction 14,513 miles which are estimated as 56 per cent complete. The Federal aid earned by the states on completed and uncompleted projects amounts to $194,560,135, of which $166,911,552 have actually been paid.

The total length of projects in all stages, including those which have been completed and those which are in the stages preliminary to construction, is 39,940 miles.

The roads brought to completion during the year average over 200 miles for each state. The greatest increase in completed mileage is in Texas, which has added during the year 933 miles to its completed highways. Arkansas, Georgia, Iowa, Minnesota, and North Carolina, each with an increase of more than 500 miles, and Montana and Wisconsin, with more than 400 miles, made notable advances toward the goal of a completed highway system.

The largest payment of Federal aid during the year also went to Texas, which received from the Government $5,915,046 and earned nearly $2,500,000 more. Other large payments were made to Illinois, Iowa, Ohio, and Pennsylvania, each of which received from $4,000,000 to $5,000,000 or more during the year.

Official Count on Bond Vote

Amendment Authorizing $6,000,000 for Good Roads Passes by Overwhelming Majority—All Highway Districts Favored Issue

THE official count of the vote on the highway bond issue filed with Secretary of State Milliken shows a majority of 64,736 in favor of the good roads measure. The total vote for the amendment in the sixty-three counties was 131,272, with 66,536 votes against it.

In Denver the bond amendment carried by a majority of 30,948, with 40,452 for and 9,504 against it, which shows that 80.9 per cent of all the people in Denver who voted on the amendment cast their ballots for it.

Likewise the other six highway districts showed substantial majorities for the bonds. Only eighteen of the sixty-three counties registered small majorities against the amendment. The amendment which authorizes a $6,000,000 bond issue for better roads, carried by one of the biggest majorities ever registered in Colorado for an amendment.

It was one of only two amendments that carried at the November election.

The proceeds from $1,500,000 of the bonds will probably become available in July. Provision has been made in the 1923 highway budget for the use of the funds in meeting a like sum offered to Colorado by the government in Federal Aid.

By the terms of the amendment the issuance of the bonds is limited to $1,500,000 per year for years. The bonds bear 5 per cent. Interest and retirement of the bonds will be paid from the highway department's one-half of the annual receipt from motor vehicle license fees.

By this arrangement there will be no increase in taxes. Under the amortization plan worked out by the state officials the entire bond issue will be retired in nineteen years.

It is the plan of the highway department to use the entire $6,000,000 in matching Federal Aid funds already apportioned to Colorado, which will give the state $12,000,000 for new construction of roads during the next four years. In addition the department will have available during this period about $8,000,000 to be used for maintenance and the construction of State Aid projects in counties not on the Federal Aid 7 per cent system.

Under a recent act of congress the expenditures of Federal Aid funds is limited to a system of roads in each state constituting seven per cent of the total public road mileage. In Colorado the seven per cent system consists of the main traveled highways with a total mileage of 3,360 miles.

In laying out Colorado's system it was found that these 3,360 miles serve 80 per cent of the traffic and 65 per cent of the population lives adjacent to the system.

The following table shows the vote on the bond amendment by districts with the percentage of votes cast in each district in favor of the issue:

Bond Issue Vote by Districts, Together With the Percentage of Vote Cast In Each District In Favor of Issue

District	For	Against	Majority	Pct.
No. 1	40,452	9,504	30,948	80.9
No. 2	12,249	8,311	3,938	59.5
No. 3	11,446	8,555	2,891	57.2
No. 4	19,279	12,115	7,164	61.4
No. 5	14,087	7,286	6,801	65.9
No. 6	16,675	7,805	8,870	68.1
No. 7	17,084	12,960	4,124	56.8
Total	131,272	66,536	64,736	66.3

Vote on Highway Bond issue amendment by counties was as follows:

	For	Against
Adams	1840	1466
Alamosa	1112	473
Arapahoe	2632	809
Archuleta	321	290
Baca	637	821
Bent	905	964
Boulder	5592	2692
Chaffee	1064	854
Cheyenne	299	484
Clear Creek	639	179
Conejos	348	855
Costilla	404	171
Crowley	885	482
Custer	263	336
Delta	1807	1493
Denver	40452	9504
Dolores	152	160
Douglas	674	528
Eagle	737	311
Elbert	566	782
El Paso	7796	2349
Fremont	2164	1767
Garfield	1534	938
Gilpin	264	117
Grand	731	131
Gunnison	888	658
Hinsdale	149	62
Huerfano	1819	760
Jackson	211	199
Jefferson	3223	1090
Kiowa	463	588
Kit Carson	746	1216
Lake	1254	430
La Plata	1314	1148
Larimer	3344	2509
Las Animas	3810	1497
Lincoln	795	977
Logan	2181	1223
Mesa	3638	1647
Mineral	131	75
Moffat	1037	367
Montezuma	744	653
Montrose	1245	1762
Morgan	1710	1019
Otero	3000	1777
Ouray	562	295
Park	446	187
Phillips	582	714
Pitkin	506	224
Prowers	1101	1397
Pueblo	8797	3129
Rio Blanco	426	319
Rio Grande	573	1507
Routt	1634	521
Saguache	438	767
San Juan	131	137
San Miguel	574	483
Sedgwick	485	510
Summit	332	181
Teller	1511	333
Washington	1004	1140
Weld	5088	4739
Yuma	1562	1340
Total	131272	66536

Good Reason For It!

We heard the other day of a contractor who stopped in the office of a State Highway Department and remarked to the Chief Engineer that he did not seem to be quite as tall as the contractor had pictured him. "No," replied the engineer, "I have been recently married and have settled down quite a good deal."—The Juanita Company News.

"Slowly and sadly we laid him down
And we spoke not a word of sorrow."
He told us before he'd surely have
His brake bands fixed—tomorrow.
—Bay City Motor News.

A herd of sheep fattening for the market along the road side in the San Luis Valley

ACTIVITIES OF STATE AND

"Humps" To Save Surface Of Fall River Road

THE little "humps" which caused late tourists over the Fall River Road quite a bit of discomfort, were put there for a purpose. And that purpose was not to inconvenience the motorist.

Melting snow has caused considerable damage to the road each spring, so Roger W. Toll, superintendent of the Rocky Mountain Park, got the bright idea that this damage might be reduced to a minimum if the snow water could be run off the road at short intervals.

So the "humps" were thrown up. These trenches will prevent the water from running down the road and ruining the road surface, which otherwise would be washed off.

It has been rumored that the Park Service plans to charge a toll fee to motorists using the Fall River Road. Supt. Toll a few days ago denied that any such charge was contemplated by them for the present. Over $200,000 has been expended by the State of Colorado on this road. It is estimated that another $100,000 will have to be spent to make it a satisfactory road.

About $20,000 was spent on the road by the State this past season. This was used in widening and improving the surface. In places the road is very narrow. At other places the grade exceeds six per cent.

In regard to the toll system, it is pointed out that the Fall River Road was constructed by the State with the understanding that it would eventually be turned over to the government for maintenance. As yet the road has not been officially transferred to the government. In view of this fact it is doubtful whether the government could consistently install the toll system.

The Rocky Mountain Park is one of the few operated by the Park Service that does not charge toll fees to autoists in proportion to the mileage in the parks. Entrance fees are now charged at Yellowstone, Glacier, Yosemite and Sequoia.

"My personal feeling is that no automobile license fee should be charged," said Mr. Toll, "in Rocky Mountain at present or in the future, unless it is clearly to the benefit of the Park to do so, and unless it is desired by the majority of those interested in the welfare of the Park. I feel confident that this is also the policy of the National Park Service."

State to Provide Sign Posts For Main Highways

TOURISTS who come to Colorado in the future will know where they are going. In the 1923 budget of the Highway Department the sum of $70,000 has been set aside for the purpose of erecting markers on the main state highways and taking a traffic census next summer.

An arrangement has been made with the Mountain State Automobile Association, a Colorado organization, whereby the latter furnishes the markers free of charge. They will be installed by the maintenance division of the Highway Department. The roads will be marked by numbers. In order to carry out this system it will be necessary to re-number the state highways.

The editor will be glad to have brief items for this column from county officials, road superintendents, maintenance overseers, and others interested in road building. Copy should reach us by the 20th of the month preceding publication.

Under this scheme each road leading from adjoining states carrying heavy tourist traffic will be marked first. The moment the tourist crosses the state line he will know instantly that he is in Colorado.

Figures compiled from the taking of the traffic census will be of incalculable value to the road engineers in the construction of roads. By this information it will be possible for the Highway Department to determine exactly the class of road to construct to carry the traffic.

In commenting upon the announcement made by the Highway Department in regard to the markers, the Montrose Press writes as follows:

"The Daily Press feels that this is almost as important as the actual construction, particularly in this state, the haven of thousands of tourists each year who of course do not know anything about the roads nor the location of cities throughout the state.

"After we have invited and persuaded thousands of tourists to come to this state, it remains for us to make touring as easy and convenient as possible. A marker at a fork in the road may not occasion comment, but the lack of it certainly will, and comment of a very adverse nature should, perchance, the visitor take the wrong road only to discover the mistake many miles further on. Colorado highways ought to be so marked that anyone can go anywhere without a moment's hesitation. That is what makes touring a pleasure, and pleasant touring conditions will help make Colorado."

Elk River Road Out of Steamboat Completed

A SPLENDID new road has just been completed by the Highway Department out of Steamboat Springs. It runs from the Soda Spring in Steamboat to the Mad Creek bridge on Elk River.

While only 6½ miles in length, the road is most important from the standpoint of the ranchers served by it. The road was constructed with Federal Aid funds.

The Northwestern Construction Company had the contract, which was awarded a little over a year ago. Formerly the road was known as the Steamboat-Clark post road. The amount of the final estimate was $68,778.17.

Engineer H. L. Jenness gave his final O. K. on the project early in December, at which time he stated that it was a splendid piece of construction, considering the difficulties which the contractors encountered.

By action of the county commissioners $30,000 will be available for new construction on state highways in Routt county in 1923. This sum will be spent on the road from Rabbit Ear Pass through Steamboat, Mt. Harris and Hayden. Half of the money is subscribed by the county and the balance by the state.

The road to be improved is a part of the Victory Highway.

Dirt Movers Eliminate Disappointment Hill

NO longer is it necessary for motorists to hire a team of horses to get their cars over Disappointment Hill on the Norwood-Dolores Highway.

Recently dirt movers finished work on this extremely difficult piece of road under the supervision of Forest Ranger Harry Kaufman. Construction work on the road has been closed down until next spring.

It is now possible for cars to travel between Norwood and Dolores without having to be pulled over the hill. The road crosses the Montezuma National Forest, and opens up an extended area of public lands, rich in scenic beauty and recreational possibilities.

Colorado Doubles Mileage In Seven Years

COLORADO has more than doubled her improved road mileage during the past seven years, so says the Bureau of Public Roads. In a statement issued recently the Bureau gives the following statistics:

"It is found by this Bureau, which has made an extensive investigation as to the highway mileage and revenue of the state, that in 1914 there were 13,298 miles of improved road, and a total of 39,780; while in 1921 the improved mileage had increased to 29,540 miles, and a total of 48,143.

"The improved roads at the present time are classified as follows: Graded and drained, 24,941 miles; sand, clay and gravel, 4,397 miles; macadam, 131 miles, and other types of surfacing, seventy-one miles.

"While most of the improved roads in Colorado are what is known as the 'low type', the fact that more than 60 per cent of the total mileage has been improved constitutes a record that will be envied by many."

For each square mile of area, the statement says, the road revenue amounts to $85.56, and there is one-half mile of road. The total road revenue amounts to $9.35 per capita, $182.07 per mile of road, and totals $8,765,443.

COUNTY ROAD BUILDERS

Winter Road Over Poncha Pass Planned

THE improvement of twelve miles of road over Poncha Pass is contemplated by the State Highway Department, according to a statement made by Major L. D. Blauvelt, State Highway Engineer. The work will consist of grading and drainage of the road between Poncha Springs and Adler.

It is expected that the effect of this work will be to make it possible to keep the road open all winter, thereby giving a year-round road to the western slope.

This route would take the traveler over Poncha Pass from Salida, through Mineral Hot Springs to Saguache, over Cochetopa Pass and Blue Mesa to Gunnison.

Just when the work will commence has not been definitely determined. Major Blauvelt, Col. Pat Hamrock, Warden Tom Tynan, H. A. Edmunds, chairman of the State Highway Advisory Board, in company with Dr. F. M. Cochems recently drove over Poncha Pass for the purpose of inspecting the road and to get an idea of the amount of work that must be done.

This road forms a link in State Highway No. 36, which connects with the famous Gunbarrel road between Saguache and Monte Vista, which has been greatly improved during the past few years, and is now considered one of the finest of the State's boulevard roads.

Plan To Keep Pass Open Is Abandoned

THE plan to keep Tennessee Pass open for winter travel has been abandoned. It has been found an impossible task, and it is practically a settled fact that the road wil be blocked with snow for the rest of the year.

Road officials had felt that there was a possibility of keeping the road open the year round when the new work on Battle Mountain was completed. Last reports received by the Highway Department stated that there was three feet of snow on the pass. It was also reported that the snow on Battle Mountain had about filled the cuts.

It had been planned to use a 10-ton Holt tractor with a special plow to remove the snow from the road, but it was found that it would not be feasible to operate the outfit over the pass.

Following the first snow a truck was two days in getting from Red Cliff to Leadville. A part of the trip was made with the aid of a team of four horses. In describing the difficulties of the trip the Leadvile-Herald Democrat says: "The journey was frought with danger and each member of the truck crew made the prediction that if efforts to keep the pass open are continued somebody will get frozen."

It was said that Tennessee Pass could never be cleared sufficiently to permit anything approaching traffic between Red Cliff and Leadville during the winter months.

Good Progress Made On Debeque Road

WORK on the road between Grand Valley and Debeque will be continued all winter, according to H. L. Jenness, division engineer of the State Highway Department.

The project consisting of five miles of grading and crushed rock surfacing to cost approximately $65,000. Contractor Frank L. Hoffman has about twenty teams and a modern rock crusher outfit on the job.

At present the work is about 20 per cent completed. It was started on November 1. When completed it will eliminate a bad stretch of the road leading to Grand Junction. Plans are being made to extend the work from Una to DeBeque later on.

It is expected that the present work will be completed early next spring. The old road was particularly difficult of passage in wet weather on account of the adobe soil.

Survey Started For New Road at Gypsum

SURVEY of a new road between Dotsero and Gypsum has been started by highway forces under W. A. Whitney, resident engineer.

The proposed project will be six miles in length and will eliminate the worst stretch of road between Tennessee Pass and Grand Junction. During the summer months this piece of road which is a link in the Pike's Peak Ocean-to-Ocean Highway is particularly hard on travel.

At times the old road is practically impassable due to the heavy gypsum dust which covers the surface. In places the dust sometimes is a foot deep and the road becomes very rough. This one stretch has cost motorists several hundred dollars in broken springs during the past few years.

The survey will start at the end of the improved road through Glenwood Canon and extend to the bridge over the Colorado River at Dotsero. The improvement planned consists of gravel surfacing, which will be taken from the river bed.

The old road crosses a lava bed at one point and the gypsum soil under traffic grinds up like flour, making it exceedingly difficult for motor travel. Work on the project will be started as soon as possible. It is proposed as a Federal Aid project in which the government will share a part of the cost.

Billboards Ordered From State Highways

AN order has been issued by Robert H. Higgins, superintendent of maintenance, calling for the removal of billboard signs from state highways within thirty days.

Division superintendents have been given instructions to have all signs, which have not been taken down by owners by the end of that time, removed by force. This order applies to all signs placed upon the state right-of-way.

This means the doom of all the unsightly bilboards which have become an eyesore along our main highways. It was pointed out by Supt. Higgins that the state has nothing to do with the signs now located on private property, but it is hoped that the removal of the boards from the main highways will have a tendency to check the placement of boards on private property.

An appeal has been made to property owners to refuse permission for the posting of the boards on private land.

The action on the part of the Highway Department officials follows a campaign being waged throughout the state against the billboard nuisance. It is claimed that the boards have a tendency to marr the beauty of our landscapes.

Funds Made Available For Holy Cross Trail

THE sum of $20,000 has been made available in the 1923 State Highway budget for construction on the Loveland Pass road. Surveys for the work has already been completed.

This is the first time the state has appropriated funds for this road, which ultimately will extend from Silver Plume to Dillon, and from there to Red Cliff and a point near the Mount of the Holy Cross.

To the engineering forces of the Highway Department it is known as "State Road No. 105", but the general public now know it as the "Holy Cross Trail". It is regarded as one of the most important roads in the state.

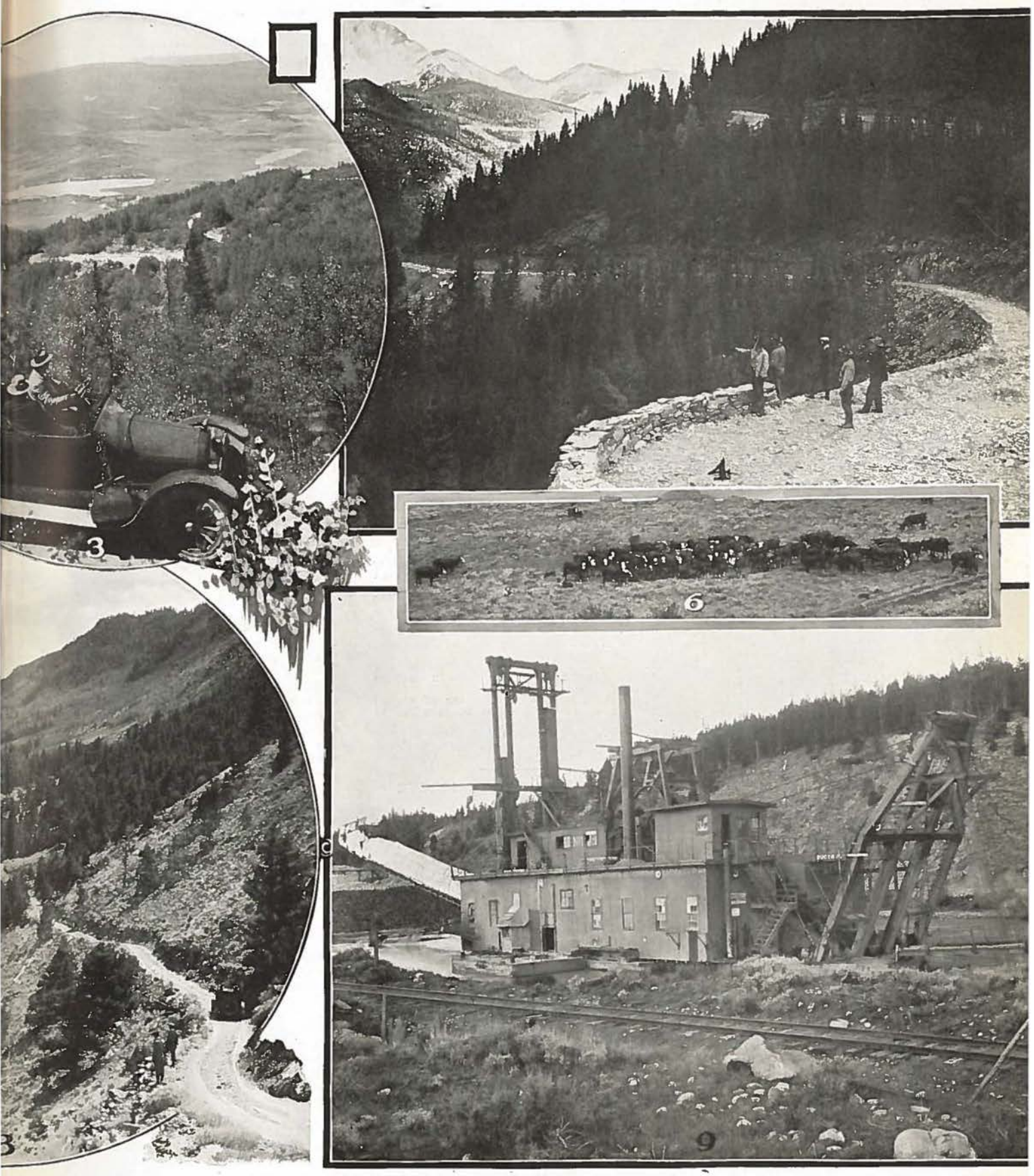
Besides being an unexcelled scenic route, its commercial value will be second to no other road in the state. It has been said that the Holy Cross Trail bears the same relation to Denver from a highway standpoint, as the Moffat Tunnel will in providing railroad facilities to the western slope.

By the route over Loveland Pass Glenwood Springs and Grand Junction are brought about 90 miles closer to Denver. The proposed road will follow the old trail followed by the stage coaches during the early mining days. Drivers of these coaches prided themselves on making the trip from Idaho Springs and Georgetown to Dillon on time every day in the year.

It is said that the grade over Loveland Pass is one of the easiest in the state. In making the survey the highway engineers consulted several of the old stage drivers with a result that the new road will follow the sunny side of the pass all the way over.

Construction work will probably be started early in the spring.

Rugged mountains cutting into the skies o'ershadow fertile valleys ribboned by crystal streams thruout Northwestern Colorado. These guard the pass thru Grand County. 3. Crest of Hoosier Pass, Summit County. 4. A section of the Fall River road, above Grand Lake. 8. The Trough, Grand County. 9. Dredging scow in operation in Summit County, where millions of dollars have been taken out.— Pho



re scenes that catch the gaze of the most blase traveler. 1. One of the rich wheat fields in Routt County. 2. The famous Rabbit Ears whi 5. Tonopas (finger) Rock, Routt County. 6. Cattle grazing in Eagle County. 7. A bend in the road on Floyd Hill, Clear Creek Count os by Bruce Wiswall.

Automobile Registration for Year of 1922

During the period of Jan. 1 to Nov. 30, 1922, there was a total of 149,913 passenger automobiles registered in Colorado, according to a report given out by Secretary of State, Carl Milliken.

There was also 10,672 trucks registered in the state, and 2,739 motorcycles. Receipts from the registration of these vehicles equalled $987,308.98, which is transferred to the road fund of the state. One half of the fees is apportioned among the counties in which it was collected and the other half goes to the State Highway department.

The report is as follows:

Counties	Owners	Trucks	Amount
Adams	2998	376	$20,296.84
Alamosa	1002	60	6,151.42
Arapahoe	2957	208	18,186.71
Archuleta	238	13	1,261.60
Baca	1101	205	5,949.80
Bent	1536	48	8,666.01
Boulder	6225	309	39,718.09
Chaffee	886	36	5,487.60
Cheyenne	771	64	4,698.48
Clear Creek	240	23	1,638.51
Conejos	666	30	3,872.35
Costilla	377	20	2,180.45
Crowley	995	63	5,944.79
Custer	207	30	1,335.29
Delta	1789	180	11,637.41
Denver	42764	2865	309,847.81
Dolores	37	5	178.25
Douglas	813	42	4,948.08
Eagle	305	29	1,827.41
Elbert	1182	52	6,834.50
El Paso	8454	478	59,918.25
Fremont	2919	224	18,062.28
Garfield	1109	55	6,661.46
Gilpin	84	5	447.63
Grand	292	9	1,425.09
Gunnison	588	9	2,832.14
Hinsdale	42	2	215.45
Huerfano	2042	100	12,164.93
Jackson	233	8	1,117.04
Jefferson	3228	290	20,537.55
Kiowa	793	53	4,543.80
Kit Carson	1841	239	12,550.34
Lake	361	2	2,157.82
La Plata	1088	44	6,222.26
Larimer	6106	299	38,928.05
Las Animas	4234	300	27,520.60
Lincoln	1482	173	9,488.28
Logan	3225	234	20,835.60
Mesa	3177	201	19,254.84
Mineral	76	10	437.56
Moffat	561	22	2,909.48
Montezuma	566	40	5,539.10
Morgan	3066	133	18,046.56
Montrose	1605	129	10,171.51
Otero	3979	190	23,424.72
Ouray	214	6	1,223.57
Park	318	16	1,835.87
Phillips	1509	174	10,050.12
Pitkin	152	4	754.94
Prowers	2255	135	13,670.40
Pueblo	7115	488	45,764.56
Rio Blanco	315	10	1,626.56
Rio Grande	1402	201	10,471.20
Routt	900	11	4,317.84
Saguache	707	54	4,374.76
San Juan	51	0	266.49
San Miguel	281	25	1,887.35
Sedgwick	900	118	5,962.83
Summit	126	1	598.54
Teller	637	43	4,090.03
Washington	1920	403	13,961.03
Weld	10321	626	64,344.28
Yuma	2550	450	18,044.87
Total	149913	10672	$987,308.98

It's a Real Rara Avis, All Right!

A prospective buyer walked into the garage and said to the proprietor: "I would like to see a first-class second-hand car."

The proprietor looked at him, and smiled as he replied: "So would I, brother."—Jack-O-Lantern.

LIST OF COMPLETED PROJECTS OMITTED IN REPORT

By an oversight there was omitted from the list of "completed projects" printed in last month's issue of Colorado Highways the following eighteen projects. These projects were completed in 1922, in addition to those reported in December.

They are as follows:

F. A. P. No. 80—Six and one-half miles of graded road in Routt County north of Steamboat Springs.

F. A. P. No. 81-B—One and three-quarter miles of graded road through Vernon Canon in Jefferson County.

F. A. P. No. 87—One and one-third miles of concrete paving east of Boulder in Boulder County.

F. A. P. No. 94—Three and a quarter miles of sand clay surfacing in Fremont County from El Paso County line southwest on Florence road.

F. A. P. No. 96—One and a third miles of concrete paving in Otero County between La Junta and Swink.

F. A. P. No. 97—Six and three-quarter miles of gravel surfacing in Prowers County east of Lamar to Carlton.

F. A. P. No. 100—Three miles of gravel surfacing in Rio Grande County north of Del Norte.

F. A. P. No. 101—Four miles of gravel surfacing in La Plata County northeast of Bayfield.

F. A. P. No. 103—Five and three-quarter miles of graded road in San Miguel County east and northwest of Norwood.

F. A. P. No. 104—One quarter mile of gravel surfacing and bridge north of Montrose in Montrose County.

F. A. P. No. 106—One and a third miles of gravel surfacing in Routt County south of Steamboat Springs.

F. A. P. No. 107—Three miles of gravel surfacing in Moffat County between Craig and Maybell.

F. A. P. No. 111—Nine and three-quarter miles of sand clay surfacing east of Limon in Lincoln County.

F. A. P. No. 120—One and a quarter miles of concrete paving from Berkeley to West Arvada in Jefferson County.

F. A. P. No. 122—Eight and one-half miles of gravel surfacing west of Julesburg in Sedgwick County.

F. A. P. No. 124—Concrete bridge over Alamosa River north of La Jara in Conejos County.

F. A. P. No. 126—Three miles of gravel surfacing south of Dolores in Montezuma County.

F. A. P. No. 127—Two and three-quarter miles of sand clay surfacing south of Limon in Lincoln County.

NEW BULLETIN ON CONCRETE ROADS

"Portland Cement Concrete Roads," a new publication prepared by the Bureau of Public Roads, has been issued as bulletin 1077 of the United States Department of Agriculture.

The bulletin is the work of James T. Voshell and R. E. Toms, engineers of the bureau, who have been in charge of a large amount of Federal-aid road construction and who have had an opportunity of inspecting concrete road construction under a wide variety of conditions.

The Subjects discussed are materials used, proportioning, design, construction, organization and equipment, capital required, cost, maintenance, and resurfacing.

Particular attention is given to width of pavement on tangents and curves, transition curves, and super-elevation. Practical field methods are described and tables and charts given of value to field engineers.

Contractors will be interested in the pages describing operations with varions kinds of equipment accompanied by diagrams illustrating organization and plant layout.

PRESS COMMENT

"The Colorado highway budget is an impartial, non-partisan, non-sectional distribution of road money, to be spent in a business-like way for the benefit of the people of this state. That is what it should be."—Pueblo Chieftain.

Nothing in the way of a news report has brought more comfort recently to the residents of this community than the statement that the State Highway Commission and the board of county commissioners of Eagle county have positively agreed to build a decent road from Gypsum to Dotsero, for with scarcely an exception that up-and-down twisted, corkscrew trail that now passes for a road is just about the rottenest in the whole country. It is understood that the new line will be closer to the mountains, in a better formation, and much straighter and on a better grade than the present makeshift. This is certainly most welcome news to everyone who drives a car, and a cause for holiday rejoicing.—Glenwood Springs Post.

A WORD OF PRAISE.

December 18, 1922

Colorado State Highway Commission,
Denver, Colorado.

Gentlemen:—

I have just been perusing the December issue of the "Colorado Highways," including the illustrated article on the Battle Mountain Highway.

I am going to reproduce your descriptive article of the construction of this wonderful highway, and wonder if you would loan me the cuts of the highway used in this article. We will be very careful in the use of them and will return them promptly when thru.

Being thoroughly acquainted with the obstacles encountered in this work, I think it is one of the most wonderful pieces of highway construction I have ever witnessed, and I am surprised that the work was completed at so comparatively small a sum. When the work was started I never thought that it would come under half a million dollars. I congratulate the Highway Department on the success of this project.

Very respectfully,
ADRIAN REYNOLDS, JR.

On the Sabbath so drive your car that when the roll is called on Monday morning you can say, "Glory be, I'm still here."—Akron Motorist.

Sponsored by the Tennessee Good Roads Association, a movement is under way for the authorization of a $75,000,000 bond issue to complete the state highways system of Tennessee.

The American Automobile Association says that tourist travel is heaviest over the central routes across the country, namely the Lincoln Highway, the National Old Trails Road, and the Yellowstone Trail. In winter the heaviest travel is over the Atlantic Highway south of Florida.

Revised List of County Commissioners and Clerks of Colorado

The following is a list of the commissioners who will serve during the next two years in Colorado's sixty-three counties:

Adams County—H. G. Tiffany, Harry C. Flanders, H. G. Nunemaker.
Alamosa County—S. P. Long, John Fultz Hooper, Herman Emperius.
Arapahoe County—E. F. Burden, P. Y. Ancell, Ramhan A. Miller.
Archuleta County—C. O. Dunagan, Thos. S. Reavis, G. T. Howe.
Baca County—G. M. Graft, Albert Peterson, Jno. M. Johnston.
Bent County—J. L. Thompson, Dan Carl, John C. Peper.
Boulder County—E. B. Hill, S. D. Buster, Guy Miller.
Chaffee County—J. H. Habenicht, Mell DeWitt, G. F. Snell.
Cheyenne County—Anton I. Johnson, J. W. Shy, W. C. Schultz.
Clear Creek County—Louis V. Crist, John W. Green, George W. Curnow.
Conejos County—Frank A. Espinoza, C. P. Jensen, Asisclo Gonzales.
Costilla County—S. N. Smith, Wm. H. Meyer, A. Lopez.
Crowley County—W. F. Tarbox, J. E. Downey, S. S. Spillars.
Custer County—Wm. Kettle, Clarence Pond, E. W. Vickerman.
Delta County—J. E. Beckley, W. T. McMurray, W. G. Balch.
Denver County—M. J. McCarthy, W. B. Lowry, M. D. Burnett.
Dolores County—George E. Moore, Edward Baer, George W. Snyder.
Douglas County—C. H. Lowell, Andy Seaburg, J. T. Berry.
Eagle County—C. L. Hartman, G. D. Roberts, J. H. Keyer.
Elbert County—E. T. Evans, Jack Wood, W. J. Park.
El Paso County—J. B. Fowler, W. H. Bartell, H. A. Scholton.
Fremont County—Frank Steinmier, Charles A. Somerville, Sanford G. Kelso.
Garfield County—Z. B. Kiggins, B. P. Coulter, John L. Heuschkel.
Gilpin County—Richard I. Hughes, Thomas P. Atkinson, John L. Robins.
Grand County—Simon Olson, Thos. J. Mitchell, Fount McQueary.
Gunnison County—Ted Knowles, Geo. Sullivan, W. U. Mergelmen.
Hinsdale County—W. E. Christie, D. C. Baker, John H. Hammond.
Huerfano County—G. A. Goemmer, T. A. Martinez, George S. Neibuhr.
Jackson County—Harry Green, Owen S. Case, C. B. Harmon.
Jefferson County—O. N. Evans, E. L. West, Fred Blackmy.
Kiowa County—Wirt Bailey, John Rebel, J. O. Walker.
Kit Carson County—G. W. Huntley, I. D. Messenger, C. J. Buchanan.
Lake County—Daniel Colahan, Morgan Walsh, George Bennett.
La Plata County—Ole M. Lee, J. A. Minner, Wm. E. Tyner.
Larimer County—Harris Akin, J. W. McMullen, F. E. Baxter.
Las Animas County—Joseph Ray, Hal Barnes, I. F. Easley.
Lincoln County—R. R. Lucore, J. D. Peyton, August Grube.
Logan County—C. M. Morris, S. A. Richerson, J. P. Dillon.
Mesa County—Gus J. Johnson, Chas. S. Jones, Chas. A. Wallace.
Mineral County—N. G. Corson, L. G. Carpenter, Jas. H. Soward.
Moffat County—Earl A. Salisbury, Frank C. Barnes Jr., Henry Phibbs.
Montezuma County—H. L. Crawford, F. C. Hallar, E. S. Porter.
Montrose County—H. P. Steel, F. J. Hartman, John Howell.
Morgan County—Jas. Hurley, O. B. Schooley, M. S. Richeson.
Otero County—George Bar, J. E. Stubbs, J. C. Vaughn.
Ouray County—Geo. B. Croft, W. H. Brown, C. H. Rowley.
Park County—J. F. Rhodes, G. S. Singleton, J. T. Witcher.
Phillips County—Ralph L. Anderson, Clithro Barkey, Roy E. Owens.
Pitkin County—J. R. Williams, Chas. O'Kane, C. M. Reed.
Prowers County—A. P. Knuckey, Ray McGrath, Henry Marser.
Pueblo County—W. L. Rees, O. G. Smith, Hurb H. Wilson.
Rio Blanco County—Dennis Murray, Fred A. Nichols, Frank M. Green.
Rio Grande County—O. A. Lindstrom, R. S. Williams, T. J. Hawkins.
Routt County—A. H. Poppen, A. H. Chivington, Alva Jones.
Saguache County—D. S. Jones, Geo. Woodard, Ed Clark.
San Juan County—Edw. Meyer, J. Ernest Shaw, H. Clay Johnston.
San Miguel County—Albert J. Reed, T. B. McMahon, A. T. Woods.
Sedgwick County—Gustav Sprick, Geo. R. Sellers, John C. Wagner.
Summit County—Andrew Lindstrom, Henry A. Recen, William H. Briggle.
Teller County—Matt Edwards, R. Quinn, J. B. Wild.
Washington County—R. M. Buckmaster, J. B. White, Terrence McAloon.
Weld County—Chas. A. Hewitt, Dan C. Straight, Forrest L. Prowars.
Yuma County—Alex Shaw, Harry F. Strangways, H. H. Brand.

List of County Clerks.

Fred O. Pearce, Brighton, Adams County; Robt. Ginn, Alamosa, Alamosa County; Thomas H. Noonan, Littleton, Arapahoe County; Philip R. Johnson, Pagosa Springs, Archuleta County; Victor G. Baker, Springfield, Baca County; Maey S. Bell, Las Animas, Bent County; J. Etta Coons, Boulder, Boulder County; F. A. Bromley, Buena Vista, Chaffee County; E. H. Akerly, Cheyenne Wells, Cheyenne County; Kenneth O. Moscript, Georgetown, Clear Creek County; Severiano Ortis, Conejos, Conejos County; Daniel Sanchez, San Luis, Costilla County; B. D. Bradley, Ordway, Crowley County; Ralph Callaghan, Silver Cliff, Custer County; Paul K. Osborne, Delta, Delta County; Charles Moewes, Denver, Denver County; Lyda K. Drommond, Rico, Dolores County; Harry Jones, Castle Rock, Douglas County; Nettie M. Cave, Eagle, Eagle County; F. D. Hart, Kiowa, Elbert County; O. W. Ward, Colorado Springs, El Paso County; Blake Rogers, Canon City, Fremont County; Walter J. Frost, Glenwood Springs, Garfield County; Clifford I. Parsons, Central City, Gilpin County; Hugh J. Harrison, Hot Sulphur Springs, Grand County; C. C. McWilliams, Gunnison, Gunnison County; Frank B. Hough, Lake City, Hinsdale County; Frank Tafoya, Walsenburg, Huerfano County; C. E. Mitchell, Walden, Jackson County; Claude B. White, Golden, Jefferson County; Ithal Jenkins, Eads, Kiowa County; Bessie Guthrie, Burlington, Kit Carson County; John Gregory, Leadville, Lake County; Clara C. Goeglein, Durango, La Plata County; Matthew Auld, Fort Collins, Larimer, County; Juan B. Robero, Trindad, Las Animas County; Claude Wilson, Hugo, Lincoln County; Mrs. Edyth C. Wheeler, Sterling, Logan County; Ella M. Gallupe, Grand Junction, Mesa County; H. D. Barnhart, Creede, Mineral County; David E. Houston, Craig, Moffat County; Samuel M. Burke, Cortez, Montezuma County; T. W. Monell, Montrose, Montrose County; A. H. Asmus, Fort Morgan, Morgan County; C. M. Wilson, La Junta, Otero County; Harold F. Kiesel, Ouray, Ouray County; Harry L. Moyer, Fairplay, Park County; Rex C. Evans, Holyoke, Phillips County; Jennie E. Sanders, Aspen, Pitkin County; Jno. W. Prowers, Lamar, Prowers County; William Barber, Pueblo, Pueblo County; Claude J. Wilson, Meeker, Rio Blanco County; H. G. Trapp, Del Norte, Rio Grande County; John D. Crawford, Steamboat Springs, Routt County; Martin K. Slane, Saguache, Saguache County; C. E. Dresback, Silverton, San Juan County; Chas. Hooks, Telluride, San Miguel County; Nellie E. Nichols, Julesburg, Sedgwick County; Geo. F. Forman, Breckenridge, Summit County; John F. White, Cripple Creek, Teller County; John H. Duncan, Akron, Washington County; Claude E. Newton, Greeley, Weld County; John Adcock, Wray, Yuma County.

New Bridge at Almont Now Open to Traffic

A NEW highway bridge over the East River near Almont has been opened to traffic. The structure is 80 feet long and is supported on 24-inch steel piling which was driven 17 feet into the river bottom.

The new structure was built for permanence and cost about $10,000. It replaces an old structure which was destroyed by flood waters. There is a 20-foot roadway on the new bridge.

Completion of the bridge was delayed on account of the piling striking huge boulders in river bed. The abutments are made of concrete and it is not expected that floods will affect the new structure.

The Monarch Engineer Company of Denver had the contract. Charles Whalen and Pat Cleary were foremen in charge of construction. Bernard L. Flanagan was inspector for the State Highway Department and H. T. Reno, engineer on the project.

HOW COLORADO VEHICLE FEES COMPARE WITH OTHER STATES.

	Ford	Buick	Dodge	Essex	Chevrolet	Hudson	Franklin	Marmon	Chandler	Stude.	Maxwell	Olds.
Colorado	**$ 5.00**	**$ 5.75**	**$ 5.00**	**$ 5.00**	**$ 5.00**	**$ 7.50**	**$ 9.75**	**$15.75**	**$ 8.25**	**$ 8.75**	**$ 5.00**	**$ 6.75**
Montana	7.50	15.00	15.00	7.50	7.50	15.00	15.00	15.00	15.00	15.00	7.50	7.50
Kansas	8.00	12.75	10.50	11.00	8.00	14.00	10.00	16.50	12.59	17.75	8.50	12.50
Washington	10.60	19.00	16.00	16.60	16.00	22.00	16.00	23.20	18.40	19.60	13.60	17.80
Nebraska	11.60	18.75	16.75	16.50	16.25	20.00	15.90	21.30	17.50	18.00	14.25	18.35
South Dakota	13.60	17.00	17.00	17.00	13.00	20.00	17.00	20.00	17.00	20.00	17.00	17.00
Arkansas	10.00	14.50	12.50	11.25	11.50	16.25	12.75	17.50	14.50	16.00	10.75	11.75
Maine	10.00	16.50	12.50	11.25	11.75	16.25	12.75	17.50	14.50	16.00	19.75	11.75
Nevada	7.70	12.25	11.00	11.25	11.28	13.65	10.70	14.50	11.90	12.25	9.45	12.42
South Carolina	6.00	10.00	8.00	8.00	10.00	12.00	8.00	14.00	10.00	12.00	8.00	10.00
Florida	8.00	14.75	12.50	13.00	12.52	16.00	12.50	18.50	14.50	15.50	10.50	13.50
Rhode Island	10.00	10.00	12.50	11.25	8.00	16.25	12.75	17.50	12.50	16.00	10.75	11.75
West Virginia	13 50	19.40	16.80	15.30	15.90	21.00	16.90	23.10	18.90	20.70	14.75	16.65
Oregon	15.00	40.00	28.00	34.00	34.00	40.00	28.00	47.00	34.00	40.00	22.00	34.00
Minnesota	12.00	35.90	19.60	27.50	19.50	37.90	53.00	79.70	37.80	32.70	17.70	26.90
California	14.20	16.20	15.00	12.60	13.80	17.00	15.40	18.60	16.60	18.60	13.80	12.60
Idaho	15.00	20.00	20.00	20.00	20.00	30.00	20.00	30.00	20.00	30.00	20.00	20.00
Kentucky	13.80	16.80	15.00	11.40	13.20	18.00	15.60	20.40	17.40	20.40	13.20	11.40

Road Building and Maintenance

(*Continued from Page 5*)

The railroad engineer puts sand on his rails to obtain friction, he has a steel hard surface to work upon and enormous weight. The automobile is light, the tires are soft, sand or gravel with rounded particles rolls, it don't crush and give friction. If the sand is deep enough the wheels spin or move forward by jerks.

In other words, it is a simple mechanical problem—the rubber tires must have a more or less solid surface to work upon else there is an almost imperceptible slip which forms the "washboard" condition.

This is one of the present-day problems of road building and the only remedy is to use materials which will "set" or form a reasonably hard surface.

This season (1922) has been excessively dry, all of our gravel roads and many of our dirt roads have loosened up. Going over them with light drags has done little good. Constantly blading the loose material from the sides into the center has made them worse.

Too much crown, especially of loose sand or gravel, makes the roads dangerous to drive over and puts a constant strain on the driver. In a few cases the patrols have exercised their good judgment and bladed the loose material off to the sides of the road until they got down to a good, hard surface. This is the right and only thing to do, if later on the road bed softens up under wet conditions the material can be put back in sufficient quantity to again harden up the surface.

It is not the intention of the writer to assume unusual knowledge of road building or to dictate how roads shall be built, but rather to present some ideas which have worked out well in other states. Road building has become one of the great institutions of the United States, it offers an opportunity to our younger engineers which many will accept with gratitude and much enthusiasm. We cannot spend all our road money on concrete roads, for a long time ahead we must depend on our dirt and gravel roads mainly. Therefore the following conditions should be considered as carefully as one would consider building a railroad or a dam. Study the climatic conditions, the rainfall and the watershed. Study the soil, its action under wet and dry conditions, have tests made both physical and chemical. Study mixtures of the materials along the line of the road with a view to securing your material along the right-of-way. Study the character of travel which the road must carry.

After the road is built, study its action under traffic and correct faults as soon as possible.

Forty million dollars is being spent on good roads in Canada this year. Highways construction has been carried on a larger scale this year than ever before and the appropriations for work are the highest on record, according to A. W. Campbell, commissioner of highways.

FOREST SERVICE STOCKS STREAMS

No greater stimulus for recreation can be found than a stream or lake well stocked with game fish; but through increased use many streams once plentifully stocked are becoming depleted, says Colonel William B. Greeley in the annual Forest Service report. To meet rapidly increasing use and maintain fish production, carefully prepared plans for securing, transporting, and planting fry or ringerlings must be executed. In Colorado the Forest Service received 4,173,000 trout fry from State hatcheries and 776,000 trout fry from Federal hatcheries, which were successfully planted in streams and lakes within the National Forests.—U. S. Forest Service.

Original Photos Used In Avery Catalogue

A NEW catalogue in which original photographs are used for illustration purposes has just been issued by the Avery Company. L. L. Clinton, local distributor for the Avery line, also has received a large supply of booklets giving a description of the improved Avery one-man, power-lift "road razer". This machine is designed to take the place of the old-style horse drawn road drag generally used. Over twenty of these machines are now in use on Colorado roads.

The catalogues illustrating the complete Avery line, which includes threshing machinery and farm implements of all kinds, is said to have cost $12 each. They are being distributed to the sales force only.

COMBINED STATEMENT—HIGHWAY FUND AND BOND FUND
Fiscal Year Ending November 30, 1922

RECEIPTS

U. S. Government			$1,267,028.14
One Mill Levy			1,520,414.83
Motor Vehicle License			458,443.93
Internal Improvement			125,000.00
Gasoline Tax			317,736.11
Counties and Miscellaneous			772,960.19
Cancelled Vouchers			1.40
		$4,461,584.60	
1921 Bond Fund, Balance 12-1-21		$1,720,384.06	
1922 Bond Fund (Sale 6-1-22)		3,000,000.00	
Premium, 1922 Bonds		151,257.00	
		$4,871,641.06	
Total receipts			$9,333,225.66

DISBURSEMENTS

Overdrafts, 12-1-21			$438,209.57
Administration:			
Administration	$ 65,412.88		
Administration Roads	102,367.65		
		$167,780.53	
Construction:			
Federal Aid Projects	$2,762,815.55		
State Projects	1,284,181.10		
County Bond Projects	1,657,350.04		
		$5,704,346.69	
Maintenance		707,570.32	
Property and Equipment		156,185.21	
Total Disbursements			$6,735,882.75

BALANCES

Highway Fund:			
State Treasurer		$ 439,975.53	
Bond Fund:			
Federal Aid	$ 751,695.61		
Counties	816,305.20		
Premium	151,257.00		
		$1,719,157.81	
Total Balances			$2,159,133.34
			$9,333,225.66

TRAFFIC TESTS BEGIN AT ARLINGTON

Traffic has been started on the circular track of the Bureau of Public Roads of the United States Department of Agriculture, at the Arlington Experiment Station, in the experiment to determine the cause of waving in bituminous surfaces. The track is composed of 27 sections of asphaltic concrete of different mixtures.

Before starting the traffic, profile measurements of the surface were taken with the autographic profile device especially devised for the purpose. Measurements were taken at frequent intervals and will be repeated from time to time as the tests progress in order to determine the rate of formation of inequalities in the surface.

It is also planned to study the flow of the bituminous concrete under traffic. This will be done by noting the movement of brass plugs placed in the surface both in the upper and lower portions.

At present traffic is being confined to a path 2½ feet wider than the distance between outside edge of tires in order to obtain an accelerated test. This will also leave a space on the track for investigation under summer temperatures.

The wear test on the circular track consisting of 61 sections of concrete and located at the outside edge of the bituminous track has also been commenced. In this test concrete made of a great many different materials and mixes is being subjected to a traffic of two solid rubber-tired wheels loaded with 600 pounds per inch of width of tire or approximately that of a 5-ton truck and traveling at a speed of 20 miles per hour. The device used will be guided by wheels traveling on rails and is electrically driven, the power being transmitted to one of the wheels used to represent the traffic which will make this wheel act as the drive wheel of a truck.

On both the bituminous and the concrete wear test, traffic will run continually during working hours, but from the nature of the tests thousands of trips and a considerable period of time will be necessary before much data is secured.

BIDS RECEIVED DURING DECEMBER, 1922

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE	LOW BIDDER	BID PRICE
F.A.P. 218B	Hasty-Lamar	Bent	3.489 mi.	Gravel surface	M. J. Kenney	$36,372.90
S.P. 694	Lake George-Howbert	Park	11.787 mi.	Mountain grade	Levy Construction Co.	39,494.55
Cheyenne County Bond Project	State Highway 32 & 9s	Cheyenne		Timber bridges	A. R. Mackey	16,991.89
El Paso County Bond Project	Sand Creek	El Paso	400 ft. span	I-Beam bridge	J. R. Donaghy	23,746.80

PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE BUREAU OF PUBLIC ROADS AWAITING APPROVAL

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE
F.A.P. 157B	Buena Vista, Northwest	Chaffee	6.526 mi.	Grading
F.A.P. 168B	Northwest of Lamar	Prowers	3.286 mi.	Gravel surface
F.A.P. 211	Meeker-Craig	Rio Blanco	1.679 mi.	Gravel surface
F.A.P. 231	Over Six-Mile Creek, East of Avondale	Pueblo	0.454 mi.	Gravel surface and bridge

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE
F.A.P. 81A	Denver-Idaho Springs	Jefferson	3.5 mi.	Grading
F.A.P. 125	Sapinero, West	Gunnison	2.819 mi.	Grading and steel arch bridge
F.A.P. 159A	Ramah-Mattison	Elbert	6.288 mi.	Sand-clay surfacing
F.A.P. 222C	Denver-Lafayette	Boulder	1.5 mi.	Concrete Paving and railroad grade separation
F.A.P. 223	Kremmling-Murphy Pass	Grand	4.9 mi.	Gravel surfacing
F.A.P. 224	Morrison-Baileys	Park	5.621 mi.	Mountain grading
F.A.P. 229	Pueblo-Florence	Fremont	1.756 mi.	Gravel surfacing

H. P. WILSON, President

To all our friends

we extend

best wishes for a

Happy and Prosperous

New Year

THE business outlook in the West for 1923 gives promise of great prosperity. Never before has the future of the contractor on the dawn of a new year been so encouraging.

Millions of dollars will be expended in Colorado during the forthcoming months on roads, structures and tunnel work.

For the success of such enterprises good tools are most essential.

We enjoy a reputation for supplying only the best. Scores of satisfied customers attest this fact.

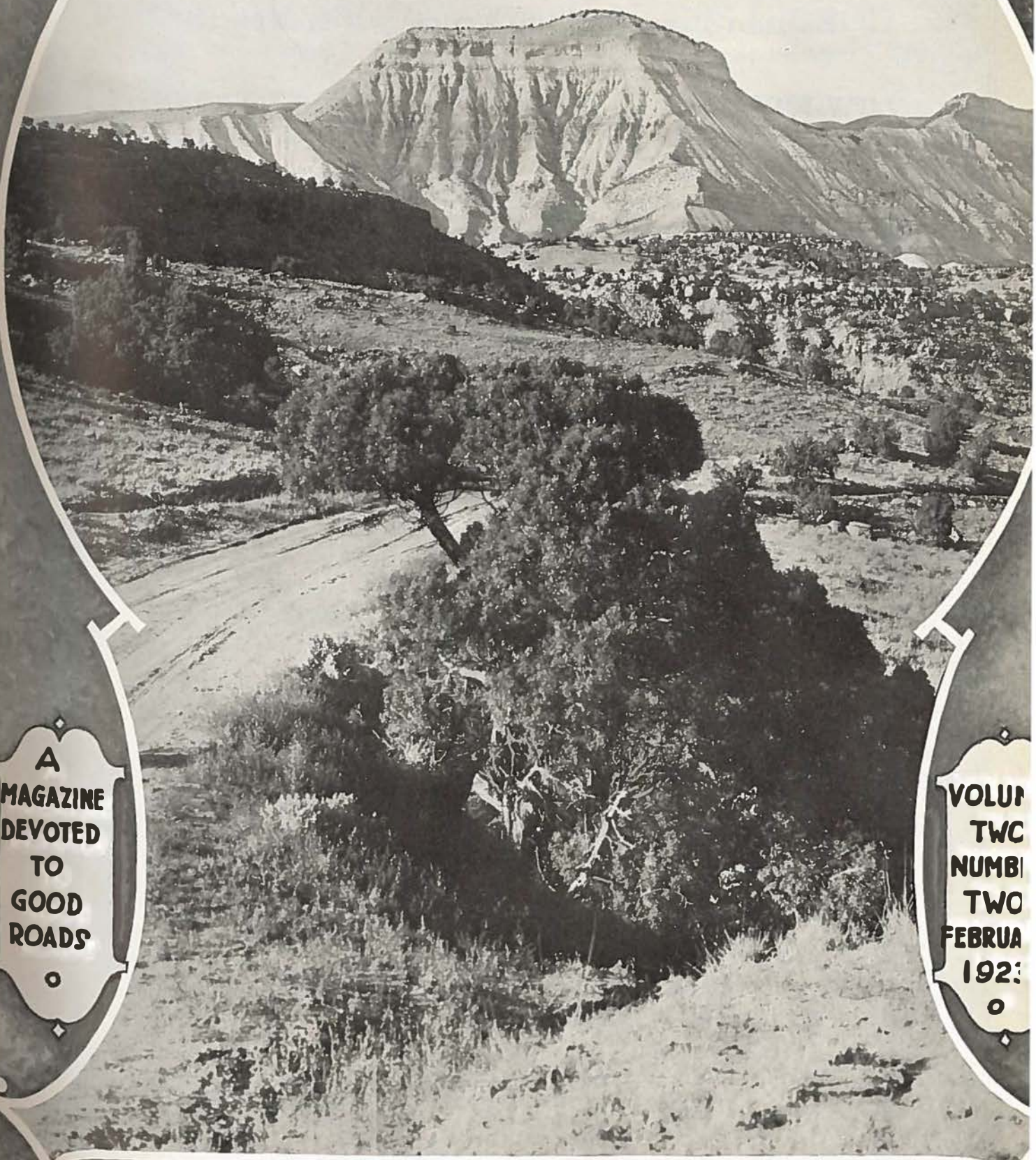
To maintain this reputation is our purpose in life.

H. P. Wilson & Company

DENVER

THE BRADFORD-ROBINSON PTG. CO., DENVER

COLORADO HIGHWAYS



A MAGAZINE DEVOTED TO GOOD ROADS

VOLUME TWO NUMBER TWO FEBRUARY 1923

Colorado Highways
"BETTER ROADS"
VOLUME II. FEBRUARY, 1923. NUMBER 2.

Work all Winter on Dolores Canon

New Highway will Form Link in Important Commercial and Scenic Route Between Yellowstone and Mesa Verde Parks

THE radium-bearing ore bodies of western Colorado are world famous. Tons of literature have been printed about them.

But through lack of adequate highway facilities few people of the country have had opportunity to visit the district. The country is so rugged that the ores bearing the precious metal have been brought out on pack mules.

Ever since the discovery of carnotite in the Paradox Valley there has been an insistent demand for a modern highway into the district. But somehow or other funds have never been made available for the purpose.

About two years ago the members of the Grand Junction Chamber of Commerce started a fund to be used in building a road through the Dolores Canon. It was calculated that the construction of this piece of highway would ultimately lead to a modern road into the heart of the Paradox Valley.

It was proposed to construct eleven miles of road through the Dolores Canon. Work was started in 1921. About nine miles of the road has been completed. Last year the State Highway Department took up the work with the State funds.

As now planned the road will eventually connect Grand Junction with Durango, by way of Whitewater, Gateway, Uranium, Naturita, Dry Creek Basin, Egnar, Dove Creek, Ackermen, Dolores, Cortez and Mancos.

When completed the road will form the main connecting link between Yellowstone and the Mesa Verde National Parks. By the end of this year it is expected that the road between these two parks will be ready for travel. Plans have been made by the Forest Service for the construction of a link of the road near Vernal, Utah.

The Dolores canon work is located on State Road 31-S. At present there is a small force of men with a portable compressor and jack hammers working to complete the road through the canon, which will be 12 feet wide. They will be employed all winter.

The Dolores Canon is one of the most picturesque in Colorado. It is very narrow, running through the Red Dolores sandstone, which forms very striking walls, in several places 800 feet in sheer height. Added interest is given the road by the fact that the area east of the canon forms the famous radium district.

Showing type of country tapped by Dolores Canon road—extremely rugged and beautiful, but difficult to build a road through.

In this region is concentrated the greatest body of radium ore in the world.

This route will be open practically throughout the year, as it crosses no pass higher than 7,500 feet, and will be particularly valuable from a commercial standpoint in years to come.

Work now in progress is under the supervision of John J. Vandemoer, division engineer. Plans have been made to give adequate maintenance to the road as soon as completed, thereby assuring a smooth, easy graded road for the heavy traffic that is bound to follow. George Toupain is in charge of the maintenance in this district, which is rapidly becoming one of the most important in the state from the standpoint of roads.

WORK ON WOLF CREEK PASS TO START AGAIN IN MAY

The sum of $13,000 has been made available in the 1923 budget for the completion of the excavation work started on Wolf Creek Pass last spring.

Eleven miles of the work was done by State Highway forces last year. It is expected that nine miles on the west side of the pass will be widened to 20 feet during the coming summer.

The work is under the supervision of Robt. H. Higgins, state superintendent of maintenance.

When this work is completed it will subdue the last big obstacle which traffic going to the Mesa Verde National Park and the Western Slope has had to contend with during past years.

OUR COVER PICTURE

A scene on the canon of the Grand River near Grand Junction is printed on the cover of the February issue of Colorado Highways.

Even the most superficial description of this picturesque canon may not be put in words. The traveler is numbed by the spectacle. At first he cannot comprehend it. Dawning appreciation comes and then growing wonder. The highly mineralized soil in the canon gives some marvelous color effects not found elsewhere in Colorado.

After a trip through this canon one is convinced that the chap who coined the phrase "See America First" had Colorado in mind.

Assembly Considers Many Road Bills

Activities of the State Highway Department During Next Few Years Depends upon Action Taken by Legislators

THE Twenty-fourth General Assembly of Colorado, now convened in regular session, has before it a large number of bills affecting the State Highway Department. Some of these measures affect the department directly, while others are of great interest to the department, because the State Highways and their uses are dealt with by these measures. All of the measures are of the utmost importance, because whatever action is taken upon them by the members of the assembly, in a large measure, depends the scope of the department's activities during the next few years.

Among the measures not directly affecting the department is a group of several bills designed to bring about state supervision of automobile truck and passenger lines operating between fixed points, and on a regular schedule. The authors of these bills all seek to place these automobile lines under the supervision of some authority, though they differ as to the authority. Most of them seek to have automobile lines declared a public utility and placed under the state Public Utilities Commission, while one bill provides that the commissioners of a county shall have power to grant franchises.

Of interest to highway users and to the people in general is the fact that all of these bills provide for fees for automobiles used in regular passenger and freight service many times higher than the fees charged at present for this class of automobiles, the theory of the authors being that the heavy machines used by auto stage lines are not now paying license fees commensurate with the damage done by them.

Another group of bills deals with the lighting equipment of automobiles on state highways. There are two bills—one in the House and one in the Senate, which provide for the submission of all lighting equipment to the Secretary of State for inspection and forbids the use of any headlights or tail lights which have not been approved. In the same category belongs a bill which provides that every automobile must be equipped with a device which will indicate, under proper manipulation, whether the driver intends to stop or turn to the right or to the left. These bills are designed to do away with glaring headlights and make night driving safe.

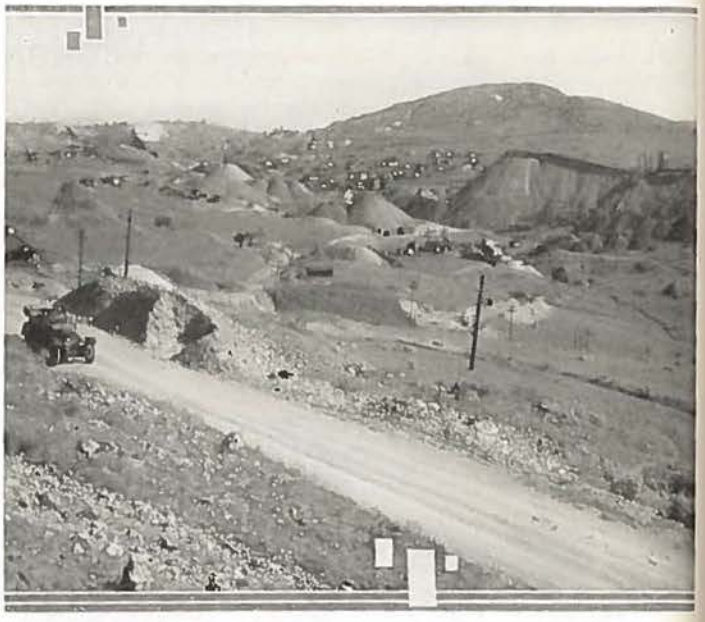
There are two bills which affect the Highway Department insofar as both seek to insure the payment of the automobile property tax in which the department participates to the extent of one mill. The bills seek to accomplish the same end by different means. One of them declares all unpaid general taxes on an automobile a lien against the machines in question, while the other provides that every county assessor shall furnish the county clerk and recorder of his county with a list of the automobile owners, together with the amount of tax due on each man's automobile.

In the House there was introduced a bill which has for its object the employment by the various counties of a licensed engineer with at least three years' experience for the supervision of road construction and maintenance.

Following is a list of the bills introduced which affect the Highway Department directly, together with a brief resumé of the matters which their authors seek to accomplish:

House of Representatives.

House Bill 18, by Representative Lambert, provides for the repeal of the one-half mill highway levy ordered by the General Assembly in 1919;



Human ant hills, left by the seekers of gold at Victor in Teller County. Note the high type of road construction. Surfaced with disintegrated granite, one of Colorado's super road materials.

House Bill 121, by Representatives Bond and Hotchkiss, is the enabling act required to make the money realized from the sale of the $6,000,000 bond issue, voted by the people last November, available for the State Highway Department in four yearly installments of $1,500,000 each;

House Bill 229, by Representative Wilkin, amends the state gasoline tax law by raising the tax from one to two cents per gallon;

House Bill 343, by Representative Axel P. Johnson, rearranges the seven highway advisory board districts by adding the county of Adams, Arapahoe, Douglas, Jefferson, and Clear Creek to Denver and provides that these counties with Denver shall constitute the First District;

House Bill 355, by Representative Cranston, amends the state gasoline tax law by

House Bill 371, by Representative Nelson, amends Section 5 of the State Highway law by adding the words "and graded" to the section so that hereafter it would be unlawful to drive vehicles, the wheels of which are equipped with lugs and spikes, on graded as well as paved highways;

House Bill 402, by Representative Rees, amends the State Highway law with respect to the allocation of the State Highway fund, by providing that the allocation shall be made on a combined state highway and county road mileage in each county, with the proviso that no county shall be given a greater percentage of the money available to be spent each year than its proportion of the sum total according to its mileage of state and county highways;

House Bill 423, by Representative Wilkin, amends the state gasoline tax law by adding to the bill a section providing for penalties for all dealers in gasoline and kerosene who fail to pay the tax into the state treasury;

House Bill 451, by Representative Wilkin, title only, intended for a bill which will abolish the State Highway Department as at present organized and restore the old Highway Commission, in existence prior to May, 1921.

Senate Bills.

Senate Bill 4, by Senator Young, provides for a change in the highway advisory board districts by adding the counties of Adams, Arapahoe, Douglas, Jefferson, and Clear Creek to the City and County of Denver, and providing that they, with Denver, shall constitute the first district;

Senate Bill 56, by Senator Colgate, repeals the one-half mill levy for state highway purposes voted by the General Assembly in 1919, thereby cutting the state road tax and the amount available for construction and maintenance from this source in half;

Senate Bill 71, by Senator Dickenson, is virtually the same bill as Senate Bill 56;

Senate Bill 97, by Senators Young and Callen, sets aside $450,000 of the State Highway fund for the construction of a state cement, brick and crushed rock

(Continued on page 16)

Straight Roads for Future Traffic

Right-angle Turns Must be Eliminated if Colorado is to Have Modern Highway System--- Millions Spent Yearly on Zig Zag Roads

BY J. H. FREEMAN, C. E.

THE old Roman roads were built on the shortest and best routes from start to destination, and they were built right. They have been in constant use more than two thousand years. Who can estimate the savings their directness has made!

In this country the right of eminent domain allows ditches, railroads and public highways to be constructed on the most feasible route, regardless of intervening private property, recognizing the principle that the good of the many is superior to the interests of the few.

Ditches, must of necessity, follow grade lines regardless of the damage done to the property of other individuals, the damage being paid by the ditch owner.

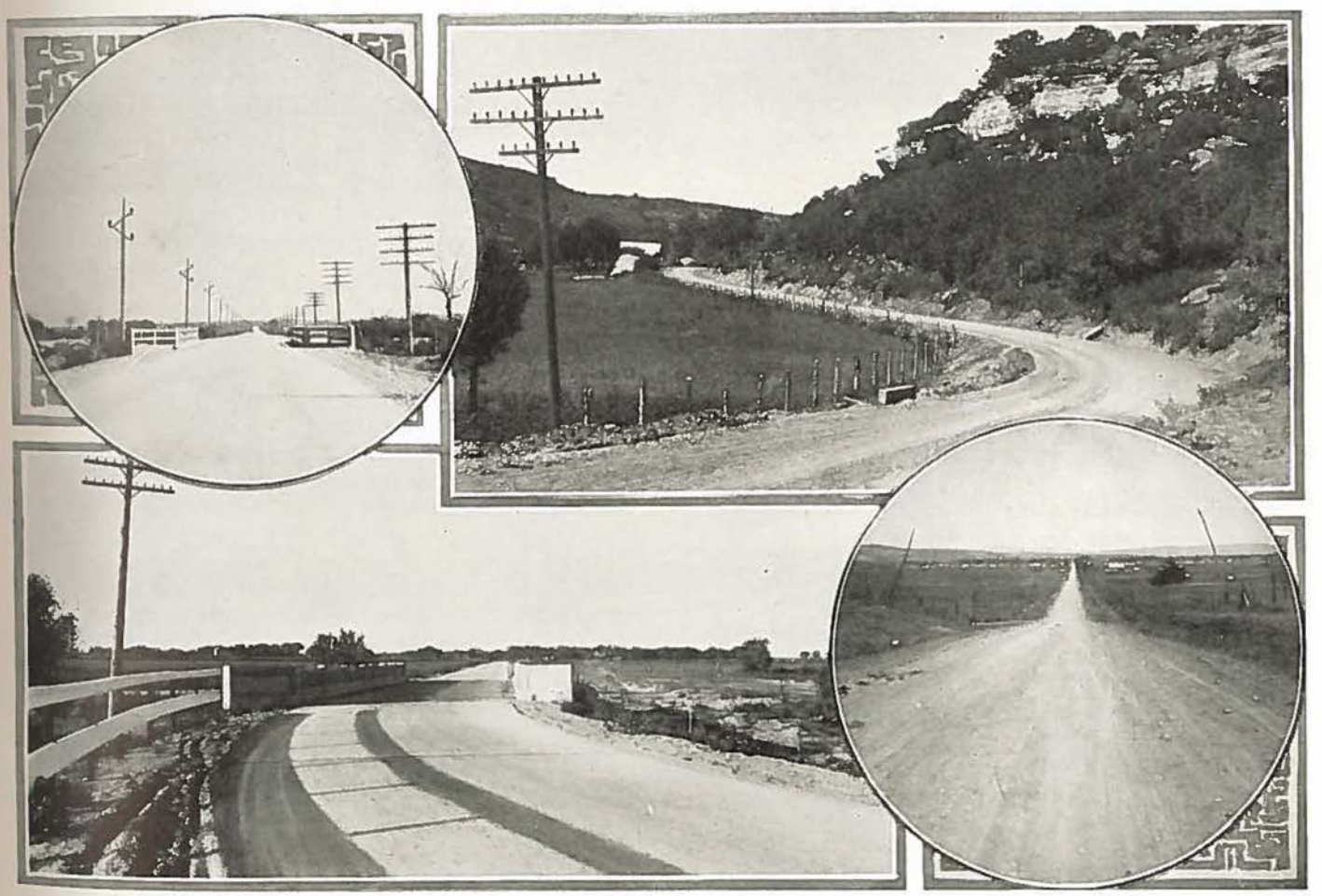
Railroads are built on the best route possible, regardless of who it hurts. They are of public importance, and private interests must give way for the public good. When a railroad is to be built, a locating engineer is sent out with instructions to forget that there are farms, houses or other property in the way, but to lay out the best route possible between control points. The public demands the best service possible and this can only be had by building on the best line.

Ditches and railroads belong to individuals and corporations, but our public roads belong to all the people, and are of vastly more importance. Our Ocean to Ocean, border to border, and interstate highways especially are of the greatest importance to all the people as arteries of travel and commerce. They are of utmost importance as channels for the transportation of necessities when railroads are tied up by strikes. A network of good roads throughout the country would make us almost independent of the railroads with their high tariffs and frequent interruptions. And who can estimate their value to the life of our nation in time of war. France was saved by her good roads.

Roads to be good, must be on the best route possible and the best route is the shortest route, other things being equal. They should be laid out by the best locating engineers instead of by county commissioners, whose only object seems to be to put them where they will cost least. It is a strange fact that most of our roads in the farming country have never been laid out at all, though vast amounts have been spent on them.

In the early history of the West, most of the country was public domain and travel followed the easiest routes. As the country settled up, each settler fenced up his homestead and threw the travel outside, over the hill above the calf-lot, or down through the bogg below the pigpen, regardless of its adaptability for road purposes. Other settlers did the same, and thus it came about that the travel was thrown on the lines between

(Continued on page 14)



A few views showing how State Highway Engineers have taken "kinks" out of Colorado roads:
(1) Easy Curve, standard guard rail, bridge and straightaway on concrete road near La Salle.
(2) Finished Federal Aid Project between Dolores and Cortez, in Montezuma County; a fine example of alignment. Note broad, easy curves.
(3) Straight as a "string" is this splendid piece of road west of Craig, in Moffat County.
(4) Federal Aid concrete road between Swink and La Junta, one of the finest examples of hard surface constructon in the State.

Colorado Highways

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EDITORIAL COMMENT

The dawn of a new road-building season is just around the corner.

In another two months road work in Colorado will be on in full swing in a score or more of counties. Others will fall into line as soon as weather permits.

Even now work is being done in some of the southern Colorado counties, where it is possible to work all winter.

"Get an early start, boys," is the word sent to all of the Highway Department division heads. As a result the enginers and draftsmen have been going at top speed, getting plans ready for the spring work.

Major Blauvelt has emphasized the fact to his subordinates that the construction season in Colorado is limited to a few summer months. Therefore it is essential that road work in this state be started with the first break in spring. Otherwise it becomes necessary to carry over a good many projects into the following year.

This he is endeavoring to avoid wherever possible. Projects carried over are costly to the traveling public through inconvenience of detours.

The contractors also have caught the spirit of the new order of things about the Highway Department.

They have not been idle this winter. The forced layoff has been employed by them to get their outfits in tip-top shape for the big road campaign that is coming.

With a budget of $9,236,350 the Highway Department will let a lot of contracts next spring. This means much work for the road builder. And we find that they are wide-awake to the situation.

This is also true of the county commissioners all over the state. They have learned by long experience that it does not pay to wait too long to get their work under way.

During the past few weeks quite a number of the commissioners have been in Denver for conferences with Highway Officials relative to the work planned in their respective districts.

At the same time they have placed orders for road machinery to be used in road improvements and maintenance. These materials have been purchased through the Highway Department and from dealers.

One dealer reported that he had received more orders during the past three weeks than for months previous. A pretty fair indication that prosperity once more is smiling upon a class of business men who were pretty hard hit a year or so ago.

The orders which have been placed with the dealers show that road builders in this state realize that good machinery pays in the long run.

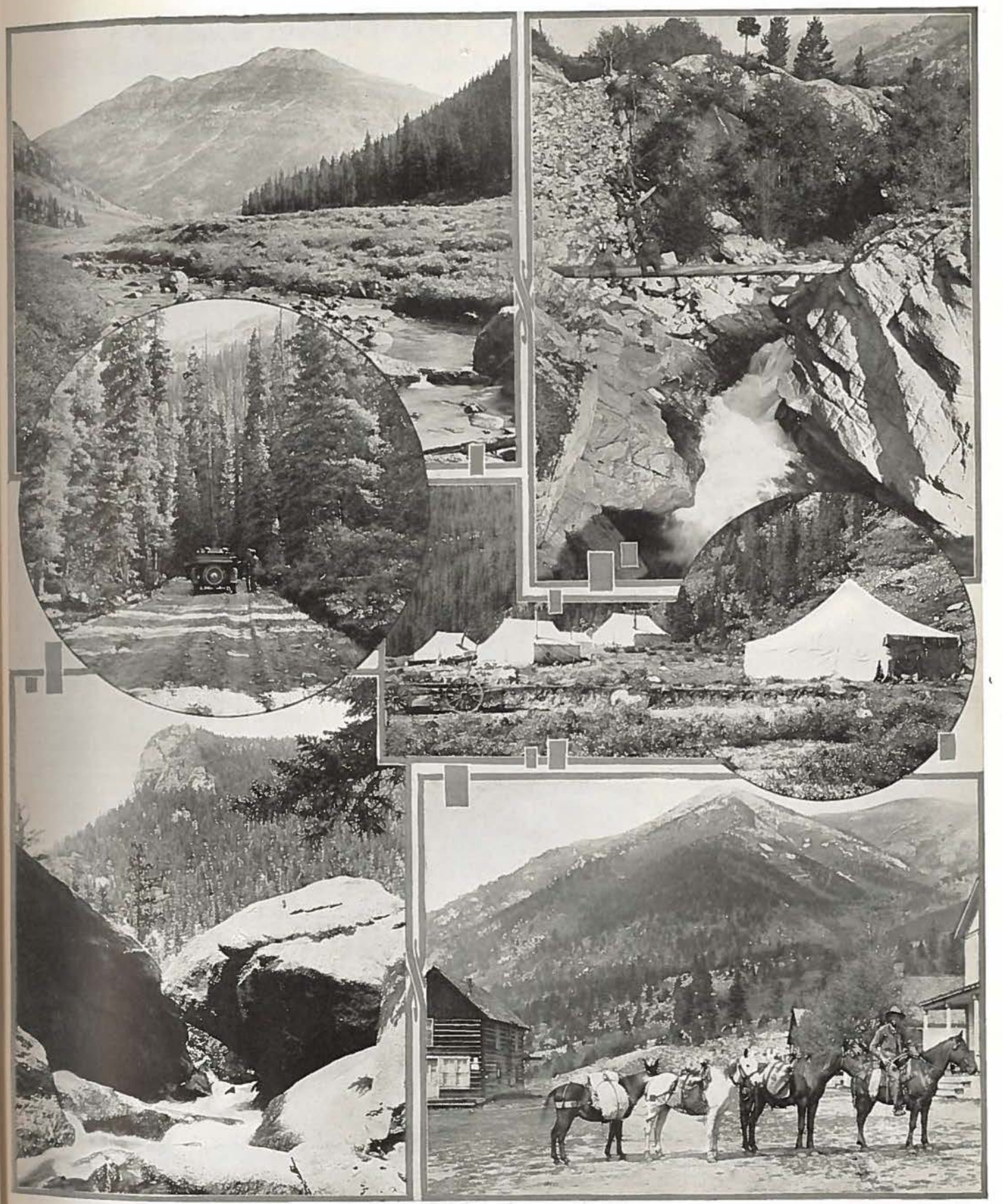
In nearly every instance the contractors and county men have purchased larger and more substantial equipment. Experience has taught the Colorado road builder that cheap, light equipment does not stand the gaff.

Several of the counties have recently purchased big, heavy scarifier-graders for use in maintenance work. With these machines they hope to accomplish more work at less expense than with the lighter machines.

It is pointed out that with the larger machine, especially the combination equipment, the road man has a tool with which he can do a variety of operations. If a piece of road needs to be scarified he has the tool to do it with. And if it needs to be graded or bladed, the one machine will answer for that, too.

So it appears that at last the road builders of the state are exercising a little common sense, and are profiting by experience.

We predict that the coming year will find a concerted effort everywhere to give the taxpayers the utmost value for every dollar made available for road purposes.



Scene in the Rugged Rockies which dominate the Twin Lakes Country, and along the Independence Pass Highway. Lackawanna Gulch, with Mt. Champion in the distance. Courting calamity on log over roaring Lake Creek. Center left, lodgepole pines on Independence Pass road; at right, road camp. Below, Sheepshead Rock, on Lake Creek; outfit bound for a sheep camp.

Engineers Confer on Road Plans

Exchange of Ideas Expected to Bring Closer Co-operation Between Field and Office Forces, Resulting in Lower Costs

TO bring about closer co-operation between the engineers in the field —the men who supervise actual construction—and the administration department—composed of the men who plan the work and prepare the plans—a three-day conference of engineers of the State Highway Department and representatives of the United States Bureau of Public Roads, was held in Denver on January 18, 19, and 20. For three days the men charged with the task of providing the people of Colorado with roads, exchanged ideas, with the result that it can safely be said that a better understanding was effected not only between the field and the administrative forces, but also between the Highway Department and the Bureau of Public Roads.

"I am sure that the coming year will see the beneficial results of this conference," was Highway Engineer Blauvelt's comment following the meeting. "I am sure that as the direct results of the exchange of ideas and suggestions, a considerable saving will be effected during the coming year. I will be very much mistaken if the engineering and office overhead expense of the Highway Department—low as it was for 1922—will not be materially reduced."

The conference was presided over by Major Blauvelt. Others in attendance were from the State Highway Department: Senior Engineer Oliver T. Reedy, Assistant Highway Engineer James E. Maloney; Traveling Division Engineer Elzie E. Montgomery; Locating Engineers George F. Davis and Edward Cowden; Office Engineer Roy Randall, Assistant Bridge Engineer N. W. Morgan, and the following Division Engineers: J. J. Vandermoer, Grand Junction; J. R. Cheney, Durango; James D. Bell, Pueblo; Ernest Montgomery, Colorado Springs; H. L. Jenness, Glenwood Springs; A. B. Collins, Greeley, and John P. Donovan, of Denver. Edwin Mitchell, head of the Accounting Division, and Harry Roe, head of the Purchasing and Traffic Division, and several assistant maintenance superintendents attended the sessions also.

The United States Bureau of Public Roads was represented by J. W. Johnson, District Engineer, and A. V. Williamson, Assistant District Engineer.

A large number of subjects were discussed. Of great importance was a discussion centering around the manner in which the state must proceed to obtain the approval of the Federal Bureau of Public Roads of changes in construction plans, once plans for a certain piece of road have been approved and construction has commenced. The Federal Government's representatives gave some valuable instructions regarding the method of procedure which, if followed, will not only avoid delays in construction work, but will assure, in addition, the government's participation in the changed projects.

A change of plans is often found advisable and necessary. The engineer in charge of actual construction quite often finds that a change in plans is desirable, but unless he knows how to proceed a good deal of delay and, often a good deal of additional expense, is incurred if the department does not proceed properly to obtain the government's consent.

Porthos Gate—on the upper Arkansas Valley in Fremont County, close to the rock tunnel, on the Canon City-Salida Highway. Road was constructed under severe hardships.

Steps were taken to bring about the closest possible co-operation between the locating and the division engineers. It was agreed that, if the two classes of engineers are in close touch with each other from the very inception of a highway project until actual construction work is started, the Highway Department will best be able to attain its object: to get the best roads in the easiest and most economical way.

Edwin Mitchell and Harry Roe, heads of the Accounting and Purchasing, and Traffic Divisions, respectively, discussed the relation of the engineer in the field with their respective divisions. Both demonstrated that through the co-operation of their respective departments and of the field men the cost of administration and of transportation can be reduced materially, without decreasing the department's efficiency.

BANKING HIGHWAYS AT CURVES.

According to a recent announcement from the offices of the Permanent International Association of Road Congresses in Paris the British Ministry of Transport has directed its divisional road engineers to see that local officials in constructing highways in England, allow for super-elevation of roadways on corner curves wherever desirable. The action was taken following investigation and recommendations by the British Roads Improvement Association which pointed out the benefits to be gained through banking at sharp curves in the way of safety to traffic. In the event of two vehicles meeting at a curve, it was declared, they could be maneuvered on a banked curve with more certainty and less risk of skidding. It was also declared that there would be much less wear upon the pavement. French road engineers long ago adopted the banked curve and in some parts of the United States they are now in use.

THE MEN WHO MAKE THE ROADS.

O, Brothers, when you motor out
  In double fours of flivvers,
To lamp the landscape round about
  And agitate your livers,
The while your gas-consumer flies,
  O'er beaten trails and byways;
Oh, breathe a prayer and bless the guys
  That built the bloomin' highways.

Be mindful of their lowly lot,
  They rarely ride as you do.
You drive nice cars, but they do not,
  At least a very few do.
And life would be a dreary hike
  Along the rugged by-ways,
If it were not for fellows like,
  The ginks that give us highways.

—C. Wiles Hallock.

Buttes Bridge Open to Traffic

Structure Forms Important Link on Main North and South Highway Route—Old Bridge Was Destroyed by Flood in 1921

BY R. S. DU BOIS,
Bridge Engineer, Colorado Highway Department.

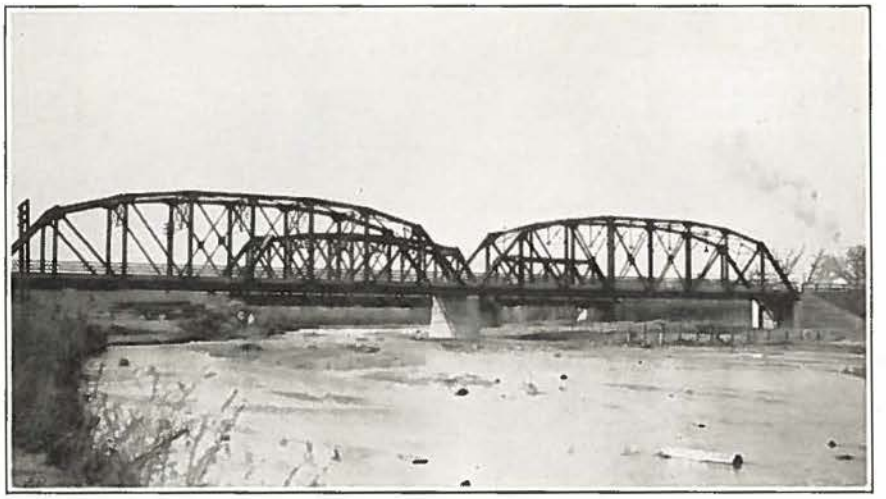
THE Buttes bridge over the Fountain River on the main road from Colorado Springs to Pueblo, has been finished and opened for traffic. It consists of two 150-ft. steel truss spans on concrete abutments. It supersedes a concrete arch bridge which was washed out during the floods of June, 1921, through undermining of the foundations.

Immediately after the flood, Major Blauvelt, the State Highway Engineer, personally supervised the construction of a temporary timber trestle across this river, because of the great importance of this bridge to the traffic of the State in general, and particularly to the relief of flood-stricken Pueblo.

The Fountain River is peculiarly treacherous on account of the sudden high floods to which it is subject, combined with the fact that the sand in the river bed is unusually fine, so that there is more scour of the stream bottom during high water than occurs in most streams.

In making the design for the new structure, the first aim was to raise the bridge span proper above the reach of high water. The railroad bridge just up stream has proven satisfactory, in this regard, so the new highway span has been put at the same elevation as the railroad bridge. We made our span a little longer than that of the railroad bridge. At this time the railroad is preparing to add an additional span to the south end of their bridge, which will bring south end of their new bridge about even with ours.

To secure protection against the underscouring of the pier and abutments, the concrete of the substructure goes down about sixteen feet below the lowest point of the stream bed, and below it, and well anchored in it, are timber piles whose tips are seated in the bed rock about twelve feet further down. We believe that this will be sufficient, since the railroad bridge has had no trouble from its pier and abutment whose piling went down to bed rock. We think that this much work is desirable, since one railroad abutment has given much trouble through settlement, both during and since the 1921 flood, and in this abutment records indicate that the piling do not go down to bed rock.

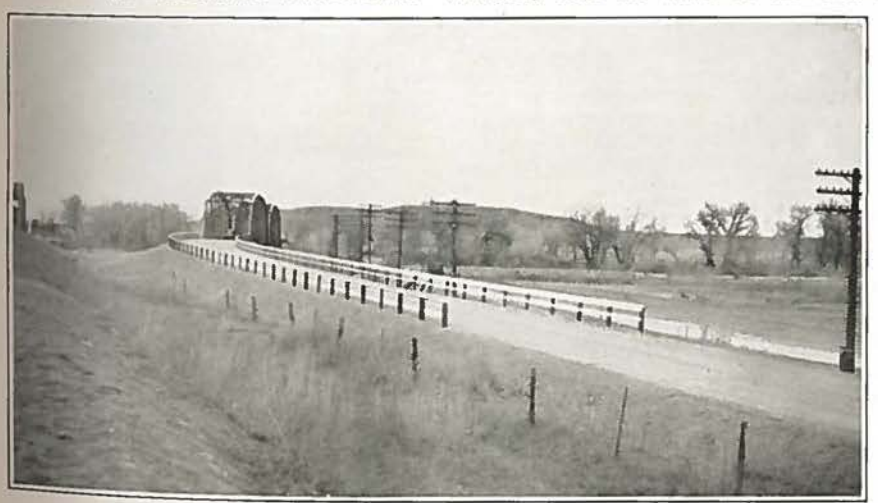


Side view of Buttes bridge, looking south.

The contract for our new bridge was let to the Pueblo Bridge and Construction Co. The steel work was fabricated by the Hansell Elcock Co., of Chicago. Work was begun Jan. 13, 1922, and reported completed Jan. 15, 1923. The bridge was built as Federal Aid Project No. 161. Final inspection by the government representative was satisfactory. The State Highway Department inspector was Mr. Thornburg, under Mr. Littlefield as Resident Engineer and Mr. Ernest Montgomery as Division Engineer.

The foundation work was very troublesome, on account of the conditions encountered. The sand is so fine, and water-laden, that it was only with great difficulty that the water in the excavations could be kept low enough to permit work to proceed. In excavating for the pier, a portion of the old concrete arch bridge was found buried in the sand. It did not interfere in any great measure with the excavation proper, but did make a great deal of trouble through the fact that it diverted a heavy sub-surface flow against the cofferdam, and made much more pumping necessary. There was some trouble from floods, which took out part of the temporary bridge, which had to be repaired.

The new bridge is on a slightly different site. This shift gave the new bridge a slightly better alignment across the stream, avoided the probability of very considerable trouble from the old foundations, and permitted a new alignment on the approaches with considerable reduction in curvature. The approaches have rather high fills, so guard fences were constructed on each side of the road, to clearly define the safe roadway. The picture shows one of the new abutments before the approach was filled in, and several views of the bridge and approaches, and the guard fence on the approaches. The railroad bridge is shown in the background of one of the pictures.



Showing guard rail and approach from the south.

FOREST SERVICE STUDIES ROAD NEEDS

A comprehensive study is now being made of the road needs of the National Forests, according to a statement in the annual report of the Forest Service, United States Department of Agriculture, issued to day. The figures available indicate that to complete the necessary system of forest development roads and trails 13,560 miles of roads and 37,114 miles of trails must be constructed, at an estimated expenditure of $64,693,000. For the system of forest highways of primary importance to the states, counties and communities, the rough survey indicates that $107,658,000 must be expended for the construction or improvement.

Mississippi's Highway Patrol System

BY J. M. McBEATH,
Chairman of the Mississippi State Highway Commission.

PRESIDENT HARDING, in his first message to Congress, said, "I know of nothing more shocking than the millions of public funds wasted in improving highways; wasted because there is no policy of maintenance. The neglect is not universal, but it is very near it. There is nothing that Congress can do more effectively to end this shocking waste, than condition all Federal Aid on provisions for maintenance."

As a result of this, Congress, in passing additional appropriation for Federal Aid, safeguarded it with a drastic maintenance feature, which requires that all roads heretofore built, or to be built with Federal Aid, must be maintained by the State Highway Department. If, after inspection the Federal Bureau finds that any Federal Aid roads are not being properly maintained, the Federal Government may give notice to the State Highway Department, and if the roads are not put under adequate maintenance within ninety days, the Secretary of Agriculture may have the work done and take the cost out of the State's allotment.

When it is necessary for the Secretary of Agriculture to maintain roads in this manner, no more Federal Aid will be extended to the State, until the cost has been refunded to the Federal Bureau.

When the President caused the provision to be inserted in the law, he probably "builded better than he knew," for he could not have foreseen the wonderful effect on the roads of the United States by the maintenance requirement.

Until the convening of the last session of the Legislature, Mississippi had no provision for state maintenance, and in fact, the highway department was confronted with the constitutional provision, which places: "All roads, ferries and bridges under the exclusive jurisdiction of the Board of Supervisors." The Legislature, however, submitted to the people of the state, to be voted on at the November election, an amendment to that section of the Constitution, which will make it read as follows:

> "All roads, ferries and bridges shall be placed under the jurisdiction of the Boards of Supervisors, provided that certain roads shall be designated as State Highways, which highways shall be under the control of the State Highway Department for supervision and maintenance."

Where Funds Come From.

Realizing that something must be done at once towards maintaining the Federal Aid roads already built, the Legislature turned over to the State Highway Department, for that purpose, fifty per cent of the automobile tax, and forty per cent of the one cent gasoline tax. But, on account of the constiutional provision giving the Boards of Supervisors full control over the roads, the Highway Department had to get authority from the Boards of Supervisors in the different counties before it could take over the roads. In most counties this was readily granted, and the Highway Department now has under maintenance approximately eight hundred miles of road.

After a committee of the Commission had visited several states, a system of maintenance, patterned after that of Wisconsin, was pronounced the most modern and adopted. This system, known as the Highway Patrol System, provides that a man with a team and wagon, light grader and other road working machinery be placed in charge of ten miles of road to devote his entire time to keeping the road in perfect condition. This patrolman must report every day to the District Engineer, just the kind of work he is doing and where. This enables the District Engineer to keep a check upon the patrolmen and also on the condition of the road. While the Department has found it difficult to select dependable men in every instance, yet the system is working adequately, as the local people who pay the taxes are delighted and feel that the roads will not be worn out before the maturity of the bonds. As one farmer said, "It is the first time in the history of the state, that the taxpayers are really seeing their money come back to them."

Importance of Systematic Inspection.

Our patrolmen are being made to realize that one of the most important factors in maintenance is a definite and systematic method of inspection, by which slight defects are being discovered promptly as they develop and the necessary means taken to correct them.

Of course, the most important part of maintenance is the keeping of the roads in good condition, in order to take care of the traffic.

We realize that a proper maintenance policy is nothing more or less than a common-sense following of the old proverb, "A stitch in time saves nine."

The Federal Highway Act, which was passed in 1917, and amended in 1919 and 1921, provides for a State Highway System to consist of 7 per cent of the total mileage. This will give Mississippi a state highway system of some 5,000 miles, which will connect every county seat in the state, and it is proposed by the amendment to put this system under the jurisdiction of the State Highway Department.

If the constitutional amendment carries at the November election, the State Highway Department will take over for maintenance, as soon as possible, not only all Federal Aid roads, but all the roads known as the State Highway System.

PLAN NETWORK OF ROADS THRU GRAND MESA PARK

A dreamland for novelists, where a world of new material would unfold in the imagination as mile upon mile of unexcelled scenery lured the motorist or equestrian onward, is provided in the late appropriation of the Forest Department for a number of roads and trails. Every one of the innumerable lakes will be accessible in the near future within a short jaunt on horseback, or a brief spin in the car. Whereas the one-day picnicker formerly went across the river, to the City Park, or the canyons nearby, he may soon travel to the top of Grand Mesa, fish and row in the cool blue waters and feel that he has had a day of blessedness without staying away from home longer than from daybreak to dark.

The highway from Mesa to Mesa Lakes will soon be completed, and next in order comes the continuation of this short-cut route, over the rimrock to Alexander lakes. The appropriation has been made and work will follow right after the completion to Mesa Lakes.

Trails Open Granby Lakes.

Not only the motorist is to be benefited by the progressive activity of the Forest Department. The forest rangers of Battlement Forest, meeting with Supervisor Ray Peck, have laid out plans for an appropriation to cover the construction of the Whitewater Trail, the Indian Point Trail, and the Granby Trail, which combined will furnish a short trip over Whitewater to Granby Lakes and thence over to Alexander.

Few people in this vicinity have ever heard of the Granby Lakes, yet they are among the most beautiful on the Mesa, well stocked with trout and in as lovely a setting as any. The primary object in building these trails is to furnish a safe and short route for cattlemen to drive their herds to and from the range, but in providing or this accommodation the route is laid out exactly as it would be for a purely scenic ride.

Over these trails the lover of horseback riding may reach Alexander Lakes almost as soon as the motorist who leaves Whitewater at the same time over the Delta and Cedaredge road, and might be enjoying the fishing in Granby Lakes before the autoist had finished the trip. The Granby group is accessible to the equestrian and pedestrian only, hence furnishes a temptation not offered the motor campers.

Many Highways Included.

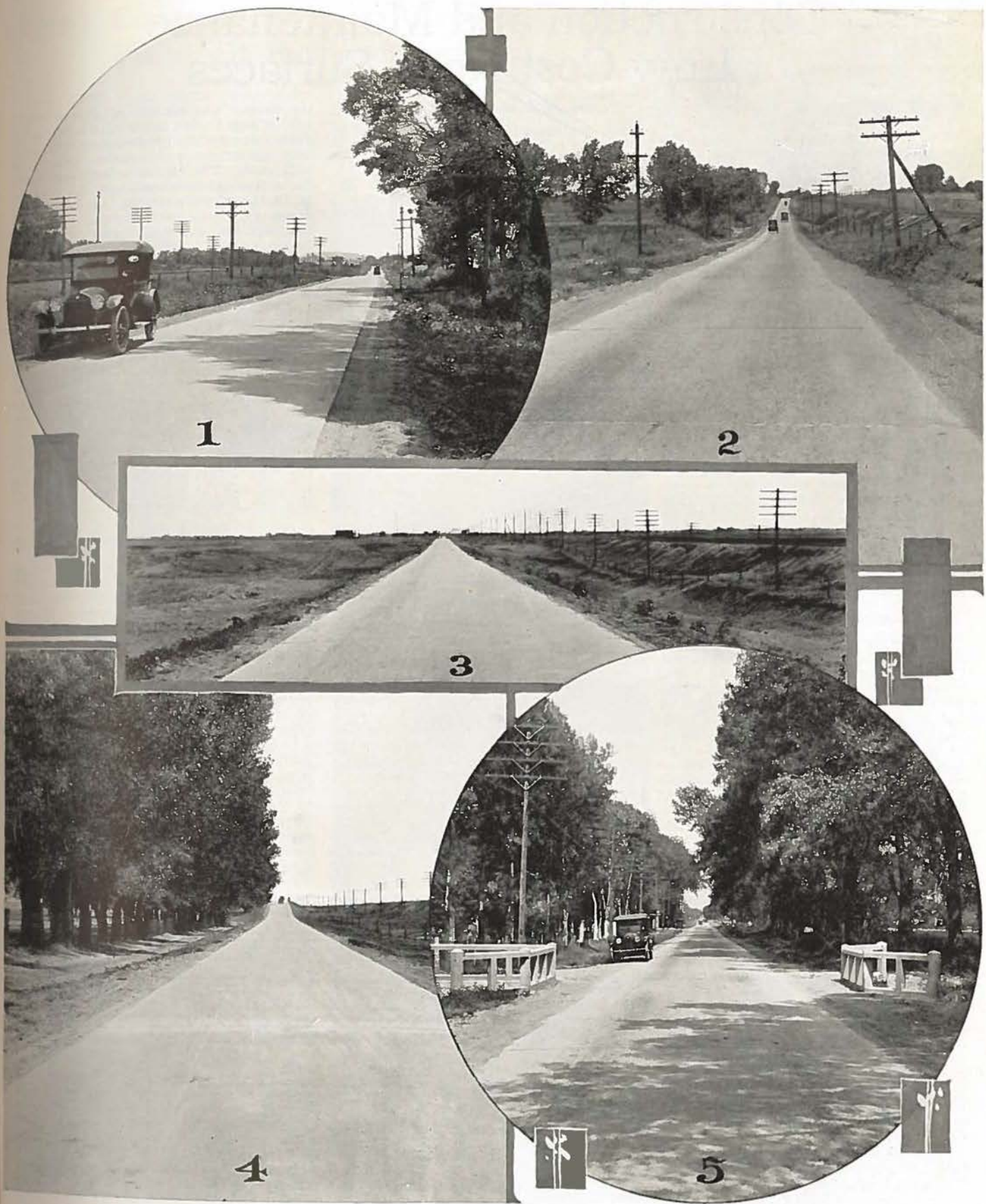
After present road plans are completed, much of which will be finished this year, Collbran will be connected with Newcastle by a short-cut via Buzzard Creek. Divide and Buzzard Creeks will be connected, furnishing an outlet to Plateau Valley and Grand Junction for the Divide Creek arm belt, the road from Colbran to Delta will be reconstructed to conform with government specifications as to width and grade, and the Johnson Springs, Hightower, and Muddy Ranger Stations will be connected.

Some of these new roads are forest development projects, built for the use of the department in facilitating transportation for government employes, while others are forest highways, built for tourist trade as well as forest use. The latter are built jointly by the forest department, state and county, while the former are built by the department alone.

MAY NEED 'EM

Brown—"What is the first thing to do when you are learning to run an auto?"

Black—"Say your prayers."—Portland, Me., Express.



Types of high-grade concrete road construction in Colorado, showing results accomplished by the State Highway Department during the past few years—1. Road to Littleton. 2. Another view of the Littleton paved road, showing how grades were subduced. 3. Looking north on the concrete paving near Brighton. 4. Another view of the same road. Note the splendid alignment. 5. A shady stretch on the concrete road of the Golden road, which connects Denver and the Mountain Parks.

Construction and Maintenance of Low Cost Road Surfaces

BY WILLIAM N. BOSLER,
Asst. Engineer, Kentucky Department of State Highways.

WHEN starting upon a survey, the field engineers should be governed only by two points, the beginning and end of project. Local influences and wishes should not be allowed to dictate the road to pass everybody's front door. As a matter of fact we have today too much evidence of this past interference in the location of our highway systems throughout that country. The engineer on location must be somewhat of a futurist, that is, he must visualize future traffic and urban development of the community due to the new highway. He must study the topography and establish the most direct, practical, serviceable and economical route within the recognized limits of alignment, curvature and gradient; he must be thoroughly conversant with the geological formations in order to properly lay the grade line and typical cross sections; he must carefully note the watershed areas and subsoil conditions to correctly recommend the proper size drainage structures and foundation sections for the road surface; he must make a complete material survey to determine the quantity and quality of local deposits of road building materials. In a few words the field engineer not only locates but must plan for construction and prepare for future maintenance.

Stabilizing Sub-Grade.

It is my personal opinion that the competent locating engineer must necessarily know construction as well as maintenance of highways. In fact, location work offers the greatest opportunity to display real engineering ability in highway work, as there is a greater chance to save money by proper location than any other phase of road work. Personally I have never seen a correctly located road that cost too much. It is better business policy to first locate properly and construct as a grade and drain improvement to be followed later by surfacing than to attempt to spread surfacing by sacrificing location because, in the final analysis, the location is one of the few permanent features of the road. In this connection I desire to state that only permanent drainage structures should be constructed regardless of the type of road surface.

Now let us assume that we have built a properly located and drained graded earth road. From a purely construction viewpoint it is far better to allow the road to be seasoned at least one year by traffic and to permit slides to become stable before placing the surfacing. An earth road properly maintained is not a bad riding surface and by this method of procedure you have the additional advantage of time in detecting subgrade failures before placing an expensive surface. An earth road can be kept in good riding condition if the following rules are kept in mind: First, drag after every rain but never when the mud is in such condition as to stick to the drag and spread unevenly; second, drag early and often. If the drag cuts too much, shorten the hitch; third, do not increase the crown by throwing too much material to the center. To prevent this, set the drag straight and throw the material to the sides.

Selecting Surface Material.

In selecting the surfacing material, the engineer is again governed by finances. The traffic census, future development and local road building materials should be given due consideration in the design and selection of the road surfacing. I am a firm believer in the merits of all road-paving materials on the market today when used within the proper limits of traffic and precept of design. However, I do not believe there is any highway authority, regardless of his experience, that can conclusively prove that any known type is permanent and should be universally used on our main trunk highway system. If investigations are carried far enough existing failures will be found in all types of pavement and this is not necessarily due to the material itself but can be caused by faulty design, excessive traffic or poor construction. Again because a certain type of surfacing is successful in Maine or Texas does not warrant that it would prove the same in Kentucky. Difference in topography and climatic conditions also enter into the selection of road surfacing material.

Naturally the taxpayer will demand the best returns in service for money expended by the public official on roads as he does in his private investments. It therefore becomes incumbent upon us to thoroughly investigate and utilize to the utmost local road building materials for our road surfaces. As a matter of fact a road built of native materials, if properly maintained, is a better road for every purpose than one which is constructed of much better material at a greater cost but which is not properly cared for. In the use of local material by increasing the thickness of the surfacing section we can secure a more economical improvement than by importing materials from other states. The first or original cost will be less and during construction additional material can be stored on the site of work at a reasonable charge to care for future maintenance. In certain sections of the state we have an abundance of creek, bank and river gravel, limestone, sandstone and slag of good quality. In Western Kentucky owing to the availability of material we have constructed a large mileage of bank gravel and clay gravel roads and should continue to do so, for although not a permanent type, it proves, with proper maintenance, to be very serviceable and a good return for the money invested. The real secret of success with any gravel road is the ability to keep just enough moisture in the road; too much water is no worse than too little. The surface of gravel roads can be kept in first class condition under reasonable traffic by dragging. This is very important and requires excellent judgment. The maintenance man must know from experience when the surface is in the right condition to drag, how much crown is best for the surfacing material and above all must be willing to get results at one operation. Incompetent men on gravel maintenance means wasted money and no results. More depends upon the execution of the work and experience of the man in charge than upon the methods used. A roadway should be kept uniform in cross section from ditch to ditch not only to prevent water damage but also to distribute the travel so as to eliminate ruts. Concentrated travel on one section of surface will soon wear out a gravel road. If experiments now being conducted by this Department, namely, surface treating gravel roads, prove successful, we are of the opinion that maintenance cost can be reduced and the life and serviceability of this type greatly increased.

Reconstruction.

The next subject for consideration is reconstruction. Ordinarily speaking the general alignment of the existing road surface must be followed because of permanent land improvements, however, changes in curvature, gradient and small revisions in alignment, installation of new drainage structures and additional right of way will be found necessary to improve the safety of traffic. As regards design the depth of existing surface material is generally considered as having a value of 50 per cent. Additional new surfacing must be added to bring the compacted thickness to the requirements. Scarification and reshaping are necessary to produce the required cross section, then the usual method of constructing the type in question, all of which is to be followed by a bituminous carpet treatment. A great many miles of waterbound limestone macadam roads in this state that are considered by laymen to be practically worthless, could have been saved in the past by the proper maintenance methods, but unfortunately at that time such matters came within the jurisdiction of the county and was neglected to such an extent that what could then have been resurfaced, now has to be reconstructed and cost nearly as much as original work.

A few words to the county officials regarding this matter may not be amiss. Consider your highways in the same attitude as a railroad company views its property. As soon as it is constructed, start maintaining and keep maintaining as long as the road is to be used as such. If you would only spend one-half in maintenance of what you will lose by not maintaining, your roads would all be good and at the end of ten years' time you will have something to show for your money besides an experience and depleted highways.

Road Congress Attracts Record Crowd From all Parts of America

Over 15,000 road builders, contractors and machinery representatives from all parts of the United States attended the 20th Annual Convention of the American Road Builders' Association and the 14th National Good Roads Show held in Chicago, January 15th to 19th inclusive.

It was the largest convention of its kind ever held in this country, both in point of numbers and enthusiasm displayed.

The Congress was in session four days at the Congress Hotel, with the exception of Wednesday afternoon, when the delegates attended the Good Roads Show at the Coliseum building.

The State Highway Department of Colorado was represented at the convention by Robert H. Higgins, superintendent of maintenance. There were also several contractors and machinery representatives from Denver in attendance.

At the Road Show there was on display every known kind of drag, grader, steam shovel, tractor and truck, besides all kinds of tampers and finishing machines for concrete roads, together with a large variety of paving machines. In addition there was a large number of different styles and makes of culverts.

Several of the states had exhibits, including New Jersey, Illinois, and Iowa.

On Wednesday afternoon Col. H. L. Bowlby, in charge of the distribution of surplus war materials to the various state highway departments, had a meeting with the maintenance engineers of the various states represented at the convention. Representatives of thirty-nine states attended this conference.

The purpose of the conference with Col. Bowlby was to ascertain if any of the states had a surplus of materials which they had found it impossible to make use of, and to devise a scheme whereby the materials could be exchanged with other states, thereby putting the material, which is now lying idle, into service.

In order to facilitate the exchange of the materials a committee was appointed to compile a list of equipment which has not needed in the various states that could be exchanged.

Mr. Thomas H. McDonald, chief of the Bureau of Public Roads, was unable to attend the convention, but sent a paper which was read by one of his representatives.

Papers on maintenance were read by delegates from the Highway Departments of Wisconsin, Illinois, Michigan, North Carolina and several other states, detailed contents of which will be mailed to the delegates with the regular report of the convention.

The attendance at the convention was so large and the number of papers read, it was impossible to permit extended discussion of any subject submitted to the Congress.

"I found that the Colorado Highway Department, organized in 1910, was among the pioneer departments of the country," said Mr. Higgins. "A great many of the eastern and southern states did not form their departments until Congress began voting Federal Aid for roads.

"As a result I found that the progress made on roads by these states does not compare favorably with Colorado. The general improvement of their roads does not match up with our state.

The Royal Gorge—Colorado's most famous chasm, reached by a modern highway, 2,600 feet above the D. & R. G. W. Railroad tracks and the Arkansas River.

"While a large number of them have more miles of hard-surfaced or cement and brick roads, still taking the entire system of their state mileage as a whole. I would say we are up among the leading states for good roads. These conclusions are reached both from observations enroute to and from the convention, as well as from statements made by delegates during the sessions."

The next Congress will be held in Chicago, the date of which is being left to the decision of the executive committee.

WORTHAM RESIGNS AS WELD COUNTY ROAD SUPERVISOR.

"John Wortham has done gone and quit us"—

For four years he was Weld County's road superintendent. A corking record he has made on the job, too. It is doubtful if any other "road boss" in the State ever received more compliments on his work.

Wortham has entered the Engineers' Construction Corporation of Greeley. He will act as one of the consulting engineers for that organization in the near future.

In paying a compliment to Wortham upon his retirement from the county service, the Greeley News says:

"Wortham's work with the county brought laudations from the biggest road men in the United States. He made friends during his incumbency in the county office which will make him an extremely valuable man to the Engineer's Construction Corporation."

What more could one say. It certainly expresses the sentiments of every official of the State Highway Department, who wish him continued success in his new field of endeavor.

BIG ROAD PROGRAM ANNOUNCED BY MESA COUNTY OFFICIALS

Mesa County will adopt the patrol system of maintenance of roads during the coming season, according to Chairman Gus J. Johnson, who was a visitor at the State Highway Department offices in Denver last month.

"Our plans include a big maintenance program and we expect to keep our roads in a condition comparable with any in the state," said Mr. Jonnson. "We are dividing our mileage into districts with a patrol in each district. The patrols will be held strictly to account for the condition of the roads in their respective districts.

"By this method we hope to make our link of the Pike's Peak Ocean-to-Ocean Highway the best in the chain through Colorado, and make it a real pleasure for the tourists to drive over it through our county.

"At the same time we are going to exert every effort to give every section of the county the best roads possible and make the year 1923 a banner one from the standpoint of good roads."

Mr. Johnson also said that it will be the endeavor of the Mesa County Commissioners to see that all roads of the county receive their just share of consideration. The patrol crews will be required to look after the upkeep of the roads as well as the bridges and culverts.

The commissioners expect to carry out their program by efficient management and not by an increase in taxes.

Commissioners Plan Early Start on 1923 Road Work

A early start on all road work this spring.

This seems to be the plan of county commissioners as expressed by them during visits at the Highway Department in Denver during the past month.

"Down our way we have planned to get to work just as soon as the frost is out of the ground," was the way one commissioner expressed it.

"There's a lot of work to be done all over the state, and we all feel that the quicker we get at the job the better it will be for everybody concerned. The traveling public demands better roads and it's up to us folks to give them what they want in the least possible time."

The commissioners came to Denver to see the Highway officials for the purpose of getting their plans in ship-shape before the construction season starts. Some of them came for advice, others to purchase road materials and others to get some wrinkles straightened out.

All left the impression that they were going in for greater construction of county roads and for maintenance on a more elaborate scale than ever before. A good many of the counties profiting by the splendid results obtained last year, are adopting the patrol system of maintenance.

"It has been clearly shown that there is no need to build roads if you are not going to maintain them," declared G. W. Huntley, chairman of the Kit Carson county board. "We have found in our county that it pays to keep the maintainers on the road all the time.

"Keep the traffic moving over all parts of the road and you prevent ruts. That's the reason we have made adequate provision for maintenance this year."

Everybody was enthusiastic over the prospects for the coming year. All felt that Colorado will soon rank among the leading states of the Union for better roads. The passing of the $6,000,000 bond issue at the November election was hailed as a big step forward in the progress of the state as a whole.

"It's going to be a great year as far as roads are concerned," said Dan Straight, commissioner of Weld County. "And we are all ready for the start. Of course, we are doing some work in different parts of the county all the time, but in just a few weeks from now you will see our forces in full swing. So watch Weld County's smoke this year. We are going to show 'em how it's done."

Mr. Straight was accompanied by Commissioner F. L. Powars, of Fort Lupton, who was equally as enthusiastic over the prospects for the coming season.

Other commissioners from over the state who were in Denver during the month transacting business with the Highway Department were:

R. M. Buckmaster, of Washington County; George B. Croft, and C. H. Rowley, of Ouray; Z. B. Kiggins and R. B. Coulter, of Garfield County; Joe Ray and Hal Barnes, of Las Animas; H. G. Tiffany, of Adams County; J. E. Downey, of Crowley; J. A. Minner, Wm. E. Tyner and John A. Bell, of La Plata; H. L. Crawford, of Montezuma; E. B. Hill, S. D. Buster and Guy Miller, of Boulder; O. N. Evans, E. L. West and Fred Blackmer, of Jefferson; George Woodard, D. S. Jones and E. F. Clark, Saguache; Thomas S. Reavis and G. T. Howe, of Archuleta; Gus J. Johnson and Charles A. Wallace, of Mesa County.

Maintenance Crews Keep Rifle-Meeker Road Open Thru Winter

Scene on Rifle-Meeker Highway—Showing Result of Maintenance Work.

"The mail every day in the year on time."

This is the motto of the highway officials of Garfield and Rio Blanco counties. This means winter and summer.

Years ago the drivers of stage coaches took a great pride in their ability to make their trips on schedule at all seasons of the year. This is equally true of the road men in northwestern Colorado today.

On the highway between Rifle and Meeker several crews of maintenance men are being employed now keeping the snow cleared. This is the first winter that an effort has been made to keep this road open to travel. So far the experiment has proved highly successful.

As a result, the citizens of that district, the mail carriers and the postmasters have only words of praise for the highway officials. Never before has it been possible for the mail carriers to make their trips on schedule at this time of the year.

Blades and graders with two-horse teams are being used to keep the road surface shaved clean of snow. To say that this is quite a job, puts it mildly. The heaviest traffic in northwestern Colorado passes over this particular stretch of road. Big, heavy trucks are constantly moving between the two towns hauling supplies.

D. Kirk Shaw, road superintendent of Rio Blanco county, and Commissioner Z. D. Kiggins of Garfield county are in charge of the work.

"It's a great piece of work these gentlemen are doing and they deserve a lot of credit for their efforts," said Charles Baker, assistant superintendent of maintenance of the State Highway Department.

SUGGESTED PLAN WHEREBY TWO CROSSINGS CAN BE AVOIDED

Plans are now under way whereby two dangerous railroad crossings on the North and South Highway a short distance south of Colorado Springs will probably be eliminated the coming summer.

Negotiations have been started by the State Highway Department with officials of the Denver & Rio Grande Railroad for the purpose of reaching an agreement in the matter.

The crossings are located at Kelker and about a mile south of Colorado Springs. Both crossings are located on right-angle turns and have been the scene of several bad accidents.

If the plan suggested by the Highway Department meets with the approval of the D. & R. G. officials, and it is said that they are as anxious to eliminate the grade crossings as the Highway Department, the tracks of the railroad will be moved over about one hundred feet to make room for the highway, which will use the present roadbed of the railroad.

Engineers have estimated that this will be the cheapest way in which the crossings can be eliminated. By this method the highway will be kept on the right side of the tracks, and will continue straight south from the city limits.

DETROIT TIME

The Boss—"What time was it those two Fords rattled up the alley last night?"

Porter Pat Murphy—"Tin after tin, sior."—Bay City News.

An Interesting Proof of

ARMCO IRON CULVERTS

Enduring Staunchness

This unusual installation furnishes a remarkable demonstration of the staunchness and rigidity of culverts of rust-resisting **ARMCO IRON.** This culvert not only sustains the weight of this projecting end, but also bore the weight of this enormous icicle, until its lower end reached the ground. No culvert of any other construction could withstand such a service test.

ARMCO IRON Culverts ***stand up*** under the severest condition.

The R. Hardesty Mfg. Co.

DENVER, COLO.

WOODS CROSS, UTAH MISSOULA, MONT.

POCATELLO, IDAHO

Straight Roads for The Future

(Concluded from page 3)

the farms instead of being laid out by an engineer where it should go. These are the horrible roadways on which much money is being spent in a vain attempt to make a good road without interfering with anybodies' calf-lot or pig-pen.

We can never hope to have a system of good roads as long as we persist in spending money on these lanes between farms with their frequent right-angle turns.

The distance around a square farm or field, is one-third longer than the distaince diagonally across it, and strangely, most of our valleys, and consequently our roads run diagonal to the farm lines. Our roads, however, to make this diagonal course are found zigzaging around and between the farms with sharp right-angle turns at every quarter or half mile. The result is that the road is one-third longer than it should be, which means that there is one-third more road to build and maintain, one-third more fence to build and one-third more land taken from the production of crops.

It adds one-third to the distance, and cost of travel and transportation, and one-half to the time enroute on account of reducing the speed to make the sharp curve without accident.

Think what it would mean to cut the time of a trip from Boston to San Francisco one-half, and the distance to be traveled and cost of gas one-third. This would be the ratio of improvement in all the many places where the road now goes around the farms, if it were cut diagonally across.

Then, too, there is the element of danger in the square turns, to be considered. One case, and it is similar to hundreds of others all over the country, is the "Twin Death Curves" near Salida. Here the road makes two right-angle turns about three hundred feet apart, on an otherwise straight stretch of road, to avoid crossing a small cow-pasture, worth less than a cheap "Tin Lizzy". The long, straight, level approaches seem to tempt a dangerous speed and wrecks are alarmingly frequent. The loss in smashed cars in one year is more than the value of several such tracts, and the cost of a new road across. There have been broken bones, bruises, doctor bills and hospital expenses several times, and the narrow escapes are a warning that lives are likely to be lost.

It is not the exercise of good judgment to allow these death-traps to remain on our public highways, nor is there any economy in it. The loss of life cannot be estimated in dollars and cents, but the other items show largely on the wrong side.

If sixty autos lose one minute each by slowing down for a curve, the aggregate is one hour lost on that curve. On a busy road ten times that number will sustain the loss in a day, which in other words means the loss of one day, or three hundred and sixty-five days in a year for each such curve. Time is money. Add this to the cost of wrecks, loss of use of surplus land occupied, and longer roads to build and maintain, and multiply the sum total by the time—if you can—which this road will be in use, and you will see the loss being sustained on account of the farm line, right-angle turn roads.

It is a needless loss, and no one gains anything to offset it. The farmer actually would be the gainer by cutting the roads straight through, as he would save on land and fence. The inconvenience of the cut up farm would be but temporary. Jones would swap the corner of his farm on the other side of the road for Smith's corner on this side, and both would gain by making the road their line. The public would gain safety by reason of less stock having to cross the road daily.

Let us fix firmly in our minds that the public highway is of vastly more importance to all the people as individuals, and to our nation, than ditches, railroads, or any other property, except the farm, and that if they are laid out in the right place and properly built they will remain for untold time, possibly for ages. If located right, they will be of service and pleasure to untold millions, but if not located on the best possible routes they will prove to be of needless expense and continual aggravation to generations to come. Each year increases the difficulty of changing to a better location, as well as additional loss of money spent on the old road.

Recently a Federal Aid road was built down a dangerous hill where it should have been run on a level, because the county commissioners would not allow the State Highway Engineer to abandon the old road which they had spent so much money on. Many accidents have already resulted.

Now that provision has been made to spend millions on our public highways, it would seem an opportune time to begin right, to correct the blunders of the past, to stop spending money on roadways which must soon be abandoned, to lay

out all roads on the best possible line and lay deep a foundation on which the road for the future can be confidently built.

The December Colorado Highways says: "Where we had ten to fifteen vehicles per day twenty years ago, passing over a given highway, today we find anywhere from five hundred to one thousand motor vehicles traveling over the same road, and where the speed was eight to ten miles per hour in former years, now the speed of the vehicle is from twenty-five to thirty-five miles per hour."

Let us anticipate the future by this glance at the history of the past. We are now bonding the future to build roads, and in all justice we should build to accommodate the needs of that future. The all-important question is, what will those needs be.

Let the above-cited increase continue another twenty years,—and we have no reason to doubt that it will—and our roads must then accommodate 25,000 to 50,000 motor vehicles per day, traveling at a speed of from eighty to one hundred miles per hour. We must also anticipate some likely improvements in methods of transportation. Probably instead of narrow wheeled trucks there will be caterpillars for heavy loads, which will improve instead of destroying the road. Also we can confidently expect the advent of the train of trailers that will carry great amounts of freight with but little wear on the roads.

Will our farm line roads with right-angle turns accommodate that traffic? If not, let's cut them out now and begin to build for the future.

The crooked road is one of the most expensive, most dangerous and most aggravating that we have to deal with, and its existence is very often inexcusable. Cut it out. Let's go straight.

Our legislature should provide means for securing rights of way without overburdening the counties with immediate expense.

Quarter of Million Dollars Spent on Boulder County Roads

More than a quarter-million of dollars was spent by the county, the State Highway Commission and the Federal Government on construction and maintenance of roads in Boulder County during 1922.

Chief among the projects of construction was that of the South St. Vrain. Over six miles of road was double-tracked by an efficient crew under the direction of R. C. Cronin. The total expenditure on this highway was brought close to the $90,000 mark.

From Lyons to Riverside Ranch, a distance of 12 miles, motorists can now glide over a boulevard smoother than the average city street and wide enough at all points to permit passage of cars without danger of accident.

The cost of the work on the St. Vrain during the year was approximately $40,000. Practically all of this was received from the state.

Already $14,000 has been appropriated for the same project during the coming year.

Approximately $50,000 was expended during the year on maintenance of State Highways within the county. This work is carried on by six crews, stationed at advantageous points for the work. The Lincoln Highway throughout the county, Arapahoe Road from Ten Mile Corner into Boulder, the Boulder Canon road from Boulder to the Gilpin County line at Rollinsville, the Longmont-Lyons road and the North and South St. Vrain Highways are included in the main arteries of highway thus patrolled by the maintenance forces. For this work the county appropriated $23,000 which was matched by the state. This sum proved insufficient and between $3,000 and $5,000 additional was secured.

For regular road work within the county $171,000 was included in the amount raised from taxes during the year. Out of this sum went the county's share of maintenance of state highways and its pro rata of Federal Aid and state projects. The remainder was used for regular maintenance of roads not included in the state highway system.

Sixteen thousand dollars was spent on Federal Aid projects in the county during the year. This went principally for construction of new concrete bridges. Chief among these were two just below Lyons and one across Left Hand Creek on the Boulder-Niwot road.

During the summer the county completed construction of the new Nederland-Ward Highway under the terms of a contract entered into with the United States Forestry Service several years ago. The Nederland end of the road had been left for county construction. This was done by county forces under the direction of Commissioner Guy Miller. The entire length of the highway also was given surface attention and was one of the most popular tourist drives of the year.

The preliminary survey of the proposed road to Arapahoe Glacier was completed during the year. Forty-five thousand dollars is available for this road and actual construction.

Assembly Considers Road Bills

(Concluded from page 2)

factory, to be operated by the convicts in the state penitentiary;

Senate Bill 298, by Senator Toll (by request), provides for an increase of the state tax on gasoline, kerosene and other oil products from one cent to two and one-half cents per gallon;

Senate Bill 239, by Senators Warren and Morrison, empowers the State Highway Department to withhold funds earned by contractors to secure the payment of claims held by employes and merchants against contractors;

Senate Bill 240, by Senator Warren, provides penalties for the injuring and destruction of signs and notices;

Senate Bill 328, by Senator Tobin, clarifies and makes more explicit the gasoline tax law, in order to insure the prompt collection of the tax;

Senate Bill 440, by Senator McFadzean, takes away the gasoline tax from the counties and State Highway Department and makes its proceeds part of the general fund of the state government.

MOTORIZING THE LANGUAGE

A little girl from the city had been visiting in the country, and was being questioned as to what kind of time she had. Finally someone said, "I bet you don't even know how to milk a cow."

"Bet I do," she said.

She was pressed for particulars and explained: "You take the cow into the barn and give her some breakfast food and water and then you drain her crankcase."—Prairie Farmer.

New Motor Law Abolishes Free Automobile License Plates

The first bill to be enacted into law by the twenty-fourth general assembly was a measure affecting the State Highway Department and every county in the state. It was House Bill No. 2, striking from the Colorado motor vehicle law that section which provides for free license tags. It passed both Senate and House without a dissenting vote.

This is a measure which had the unqualified indorsement of the State Highway Department. Reports from the Secretary of State's office indicate that the department and the counties were losing a considerable sum every year through the issuance of what was known as X licenses to individuals not entitled to them.

During 1922 a total of 2,050 free licenses were issued. In round figures this meant a loss of $12,000 to the good roads cause. Hereafter the state, the counties, municipalities and others, heretofore exempted from the payment of automobile license fees, will pay just like every other automobile owner. The counties, of course, will get back one-half of the money which they spend for licenses and the State Highway Department will spend the other half on highways.

TABLE SHOWING MILEAGE OF STATE ROUTES IN COUNTIES

Of the 48,000 miles of public roads in Colorado, a total of 8,779.93 miles are designated as "State Highways".

Included in the State Highway System is the "Federal Aid Highway System", which totals 3,336 miles of main routes, forming a part of the government's interstate highway system.

Money received by the State from the Government can be expended only on the Federal Aid system, which in Colorado serves about 85 per cent of the motor vehicle traffic in the State.

A tabulation of State road mileage in the counties follows:

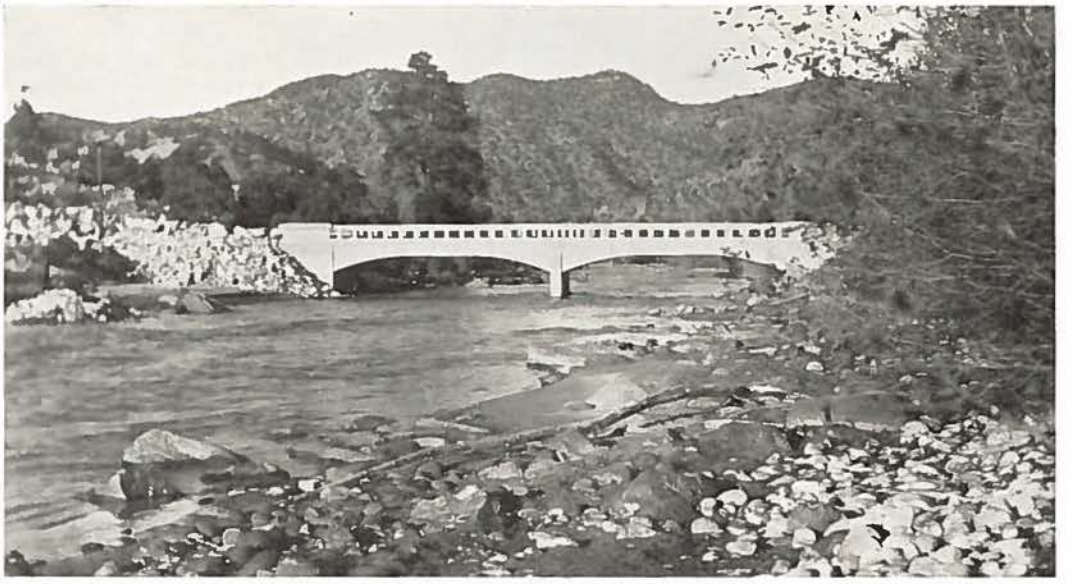
County	Mileage
Adams	108.25
Alamosa	64.50
Arapahoe	91.50
Archuleta	102.00
Baca	229.75
Bent	85.26
Boulder	108.75
Chaffee	99.50
Cheyenne	128.00
Clear Creek	76.50
Conejos	92.25
Costilla	103.25
Crowley	74.50
Custer	103.50
Delta	132.50
Dolores	85.00
Douglas	140.80
Eagle	134.30
Elbert	100.70
El Paso	268.08
Fremont	152.00
Garfield	127.00
Gilpin	33.25
Grand	196.75
Gunnison	225.50
Hinsdale	60.00
Huerfano	126.00
Jackson	134.00
Jefferson	207.95
Kiowa	135.50
Kit Carson	173.37
Lake	74.50
La Plata	104.75
Larimer	230.50
Las Animas	233.00
Lincoln	329.00
Logan	154.00
Mesa	217.75
Mineral	68.00
Moffat	180.50
Montezuma	99.25
Montrose	256.25
Morgan	130.00
Otero	85.63
Ouray	58.75
Park	197.50
Phillips	77.00
Pitkin	79.00
Prowers	189.50
Pueblo	212.25
Rio Blanco	163.00
Rio Grande	94.00
Routt	169.00
Saguache	207.50
San Juan	48.00
San Miguel	129.50
Sedgwick	65.50
Summit	103.50
Teller	112.00
Washington	256.50
Weld	319.00
Yuma	225.00
TOTAL MILEAGE IN STATE	8,779.93

SHATTERED ROMANCE.

"There's no romance in an automobile courtship."

"How's that?"

"Just as I started to propose last night we had a blowout."—Judge.



Concrete Bridges Lead on Heavy Traffic Roads

Showing 80-ft. slab and girder type concrete bridge across Arkansas River in Brown's Canon near Salida, in Chaffee County, opened to traffic in 1908. Cost, $4,200. Pueblo Bridge Co., contractors.

The permanent Bridge is the only economical type --- any other is an extravagance. The concrete bridge being the most durable, is the best investment.

Any day, any season, is just the same to a concrete bridge.

"CONCRETE FOR BEAUTY AND PERMANENCE"

PRESS COMMENT

NEW ROADS WILL BRING TOURISTS

Colorado is to invest an enormous sum of money in good roads in the new year. Paonia will feel the result directly, and quickly. Paonia will profit still more in 1923 from the tide of tourist traffic now turned in our direction by the completion of new through highways. The tourist camp ground in Paonia's new city park is no small inducement to travelers by motor.

Closely allied with the forecast of more good roads is the promised development of the Beezley ranch by the new Snowshoe Cabins Company into a pretentious summer resort and headquarters for vacationists and sportsmen. Work on this project is already under way and the opening of spring will be the signal for construction and improvement in all departments to be prosecuted with vigor. The coming year will bring hundreds of new visitors to this deservedly popular vacation spot.—Paonia (Colo.) Paonian.

ROADS BIG ASSET

That Colorado's good roads are a distinct asset to the state is evidenced by the fact that the cash receipts from the tourists this year were five times the gold output, and twice the total value of the state's wheat crop. Colorado's annual investment in roads is about $3,500,000, and from the figures given above, it would seem to be about the best investment the state makes. More than 200,000 people from forty-five states visited Colorado during the past twelve months, and it is estimated that they spent and left in the state $40,000,000. This amount was well distributed over the state. In addition to the tourist revenue, the people of Colorado benefit directly from better roads to a degree that is past all computation.—Brush Tribune.

WILL HAVE WORLD'S BEST HIGHWAYS

According to the present program, 120,000 miles of improved Federal Aid highways will be constructed in the United States within the next twenty years, at a cost of about $3,000,000,000. It is estimated that an equal, or greater, mileage of state or local roads will be constructed within the same period. When the work now in progress, or in contemplation, is completed the highway system of the United States will excell in mileage and quality any system of highways in the world.—Canon City Record.

GREAT ROAD IMPROVEMENT

Motorists can now travel between points out of Grand Junction on wonderful roads and they are getting better every month. For instance, it is now safe to travel as far south as Montrose, nearly seventy miles, in two hours and ten or fifteen minutes, whereas it used to take three hours. Graveling the roads, straightening our sharp curves, widening the grades and road maintenance that is constantly under way is producing wonderful results. It will not be more than three years at the longest before we can travel to Denver by motor during the summer months between suns. Mind the prediction.—Grand Junction News.

DUST DANGEROUS TO TRAFFIC AND COSTLY TO THE TAXPAYERS.

In the past ten years there has been a very marked change in the engineering practice regarding road types.

Now the West has confronting them the dust from dirt and gravel roads. On the heaviest traveled roads you will find a forceful example of the need of a suitable dust layer, not only for the comfort of the motorists but as a prevention of accidents.

In the summer months when riding through the mountains and main highways throughout the country, you will find one continuous dust cloud and motorists complain of narrow escapes from serious accidents. This dust is costing thousands of dollars to the taxpayers, not only in health and accidents, but to crops and to the road itself, as this dust is worn out binding material which helped to hold the road together. Without this binding material your road soon forms pockets and the surface starts to unravel and rut under the rapidly moving automobiles, together with the suction of the tires.

In the East and central West practically all the leading cities, towns and counties are treating this type of road with a refined asphaltic road oil which, when applied properly, will not only eliminate the dust but will also reduce the cost of maintenance, a matter of considerable importance to both the road commissioners and taxpayers.

COMPANY FORMED TO MARKET OPEN-TOP ROAD CULVERT

A new company has been formed by Richard W. McQueary, well-known Colorado contractor, for the purpose of placing on the market a patented open-top culvert.

Members of the firm are: Mr. McQueary, president; W. H. Wood, vice-president; Gus Loehring, secretary-treasurer, and J. L. Norton, general sales manager.

Offices of the firm are located in room 717 Mining Exchange Building, Denver. A sales organization to handle the business in Colorado and Wyoming has been perfected. Later it is planned to establish agencies throughout the country.

It is claimed that the McQueary patent is the only "open-top" culvert on the market, and is especially adapted to hill roads. The culvert will be manufactured in Denver.

For two years the culverts have been under test on the world-famous Fall River road, where it is claimed they have saved many hundreds of dollars in preventing wash from the spring thaws. The open-tops catch the water in the middle of the road and throw it off down the side of mountain before it has had chance to wash into gullies.

More than a dozen counties in Colorado have adopted the culvert as standard for mountain roads.

An order has been placed by the City and County of Denver for the installation of a large number of the McQueary culverts on the Lookout Mountain road in the Denver Mountain Parks.

GRANNIS TO REPRESENT FIVE LINES IN DENVER

L. R. Grannis, formerly of Denver, representative for Landes & Company, has entered business for himself, with offices in the Chamber of Commerce Building, Denver. In the future, Mr. Grannis will represent five standard lines in the Rocky Mountain territory. They are: Williamsport Wire Rope, Blaw-Knox Company, Maxon concrete road finishing machines, Insley concrete distributing machines, and Koppel industrial cars and track.

Also he has been appointed special representative in the contracting, drainage and irrigation field for Link Belt gasoline-driven drawler crane, dragline and excavators. Mr. Grannis has been connected with road machinery manufacturers for fifteen years, and he enters the local field with a wide experience in handling contractors' supplies.

LANDES TO REPRESENT ONLY P. & H. IN FUTURE

In the future only one machinery line will be represented by Landes & Company in the Denver territory, according to announcement made by W. H. Fitzgerald, local manager. This line will be the well-known Pawling & Harnisphager excavator machines, dragline, trenching machines, electric traveling cranes and machine tools.

The "P. & H." line is one of the oldest in the country, and during recent years has had quite a "run" in the western states.

DENVER MACHINERY DEALERS VISIT EASTERN FACTORIES

"They haven't got a thing on us in the east; our roads in Colorado are just as good as theirs, and a whole lot better in some places."

Thus spoke J. P. Juett, of the H. P. Wilson Company, upon his return from a 21-day trip to eastern factories. Five others of the firm were members of the "expedition", which included a visit to the Chicago Road Show.

In the party were H. P. Wilson, president; R. E. Corson, J. S. Griffin, J. F. Pollock and D. E. Gunther. Mr. Wilson left the party in Chicago and went on to New York to visit relatives, where he remained until February 1.

Ten factories were visited by the party while on the trip, all of which are represented by the Wilson firm in the Rocky Mountain territory: They included: Wonder Mixer factory at Waterloo; Koehring, C. H. & E., Meta Forms Co., Heil Construction Co., Milwaukee Locomotive Works, and Ideal Engine Works, at Milwaukee; Western Wheeled Scraper Co. at Aurora; the Austin Mfg. Co. at Harvey, and Holt Mfg. Co. at Peoria.

Mr. Juett declared that everywhere they went comment was passed upon the wonderful strides the West is making in the matter of roads. Heads of the big manufacturing concerns seemed particularly interested in the work that is being done in Colorado, and predicted that great prosperity would result from the State's progressive road policy.

A Modern Filling Station in all that the Word Implies

Your every motor car need satisfied on the instant. Everything from that good SOMMERS Peerless Gasoline and Majestic Motor Oil to a wash or polish—Majestic medium motor oil is just the thing for this season of the year—not affected by sudden changes in temperatures.

Don't pay unnecessary repair bills. Use 600-Z Transmission Lubricant—it won't channel.

Our battery department is equipped to give you quick service at all times.

We also sell tires that give the utmost mileage at minimum cost. A complete line of accessories carried.

Don't take chances with your radiator in winter—alcohol is the best and safest "anti-freeze". Let our service boys test the mixture and play safe.

SOMMERS OIL COMPANY, DENVER

GENERAL OFFICES, 15TH STREET AND CLEVELAND PLACE.

PHONES, CHAMPA 2623-4

SOMMERS OIL *and* GASOLINE

ASPHALT PLANT INSTALLED BY MILLER, DOUGLAS & HAINES

An elaborate asphalt mixing plant has been added to the equipment of Miller, Douglas & Haines, contractors. The plant was purchased from H. W. Moore & Co., and has been installed on the site of the old Grant smelter near the Denver stockyards. Recently this concern completed paving of ten blocks on Santa Fe Drive on a contract from the City of Denver. Hauling of the asphalt from the plant to the project was done by Paul V. Jenness with a fleet of heavy trucks. The paving on Santa Fe Drive has a slag base which was obtained from the old dump at the Grant smelter. A contract also is held by Miller, Douglas & Haines for the paving of South Broadway, and arrangements have been made whereby they will lay the National "black top" on a mile of paving east of Aurora early in the spring. This is the first "black top" laid on a state highway in Colorado, and is to be put down as an experiment.

MONARCH TRACTOR COMPLETES 1,500-MILE TEST CRAWL

On December 11 a stock Monarch Industrial Tractor completed a 1,500-mile overland trip from Watertown, Wis., to New Orleans, La. This is said to be the longest overland trip ever attempted by a crawler type tractor. The tractor left Watertown on October 8 and arrived at its destination one day ahead of schedule.

The trip was made as an experiment, and during the long trip encountered every kind of soil from concrete and gravel to black gumbo and buckshot mud. Following its triumphal entry into New Orleans, where the Mayor and prominent members of the Chamber of Commerce greeted "Blondie" Sorenson, the driver, the tractor was loaded into a freight car and shipped to Chicago, where it was one of the big features of the Good Roads Show, January 15th to 19th.

Senator DuPont has spent more than $3,000,000 on the boulevard he gave the state of Delaware. The boulevard is over 100 miles in length. Most of it is completed and already in use.

1,104 MILES OF FOREST ROADS COMPLETED

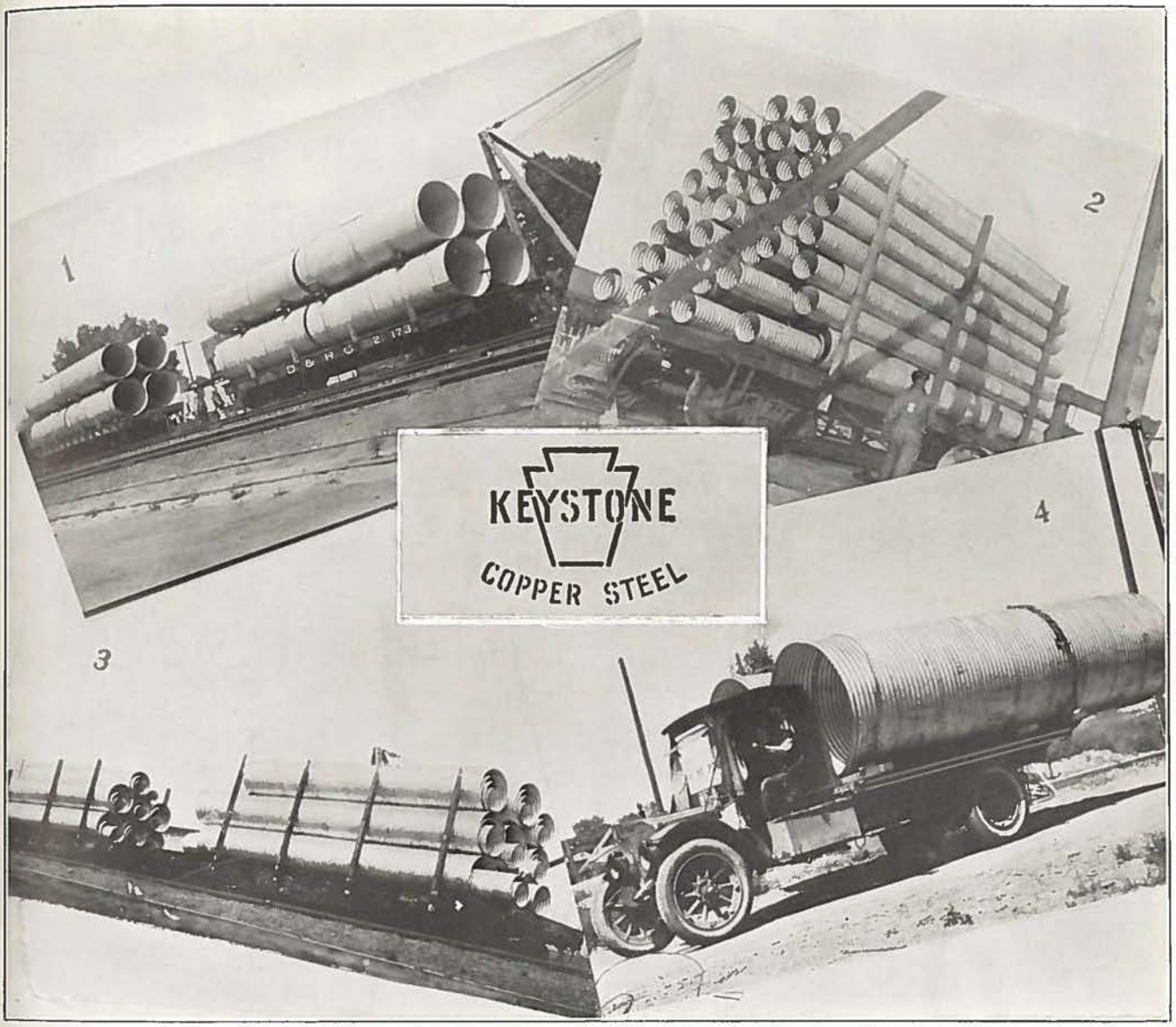
During the calendar year, 1921, 1,104 miles of road and 2,959 miles of trail were constructed or improved within and adjacent to the National Forests, according to a statement in the annual report of the Forest Service today issued. Three thousand and seven miles of road and 4,294 miles of trail were maintained.—

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS AWAITING APPROVAL

NO.	LOCATION	COUNTY	LENGTH	TYPE
81A	Mt. Vernon Canon	Jefferson	3.504 mi.	Crushed Rock Surfacing
125	Sapinero, West	Gunnison	2.708 mi.	Gravel Surfacing and Bridge
157B	Between Buena Vista and Leadville	Chaffee	6.526 mi.	Grading
168C	Between Lamar and Hasting	Prowers	3.574 mi.	Gravel Surfacing
207	Over Blue River, 13 miles north of Dillon	Summit	100 ft. span	Steel Truss Bridge and Approaches
211	Between Meeker and Craig	Rio Blanco	1.853 mi.	Gravel Surfacing
223A	Between Kremmling and Steamboat Springs	Grand	2.881 mi.	Gravel Surfacing
231	West of Avondale, Over Six Mile Creek	Pueblo	0.454 mi.	Gravel Surfacing and Bridge

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

NO.	LOCATION	COUNTY	LENGTH	TYPE
F.A.P. 120	Over Clear Creek Southeast of Arvada	Jefferson	Two 100 ft. spans	Steel Truss Bridge
F.A.P. 159A	Between Ramah and Mattison	Elbert	6.288 mi.	Sand-Clay Surfacing
F.A.P. 214	Durango, South	La Plata	3.0 mi.	Gravel Surfacing
F.A.P. 222C	Between Denver and Lafayette	Boulder	1.5 mi.	Conc. Pav. & R. R. Grade Separation
F.A.P. 224	Between Morrison and Baileys	Park	5.621 mi.	Mountain Grading
F.A.P. 229	Between Pueblo and Florence	Fremont	0.879 mi.	Gravel Surfacing
F.A.P. 241	Over Gunnison River, ½ mi. north of Delta	Delta	Four 150 ft. spans	Steel Truss Bridge and Approaches
S.P. 791	Between Denver and Morrison	Arapahoe	1.886 mi.	Concrete Paving



1. Hiawatha, Utah (2 cars)
2. Sheridan, Wyo.
3. Socorro, New Mex. (2 cars)
4. Truck haul, Crowley County, Colo.

THE DEMAND FOR

KEYSTONE CULVERTS 2 OUNCE COATED

in 1922

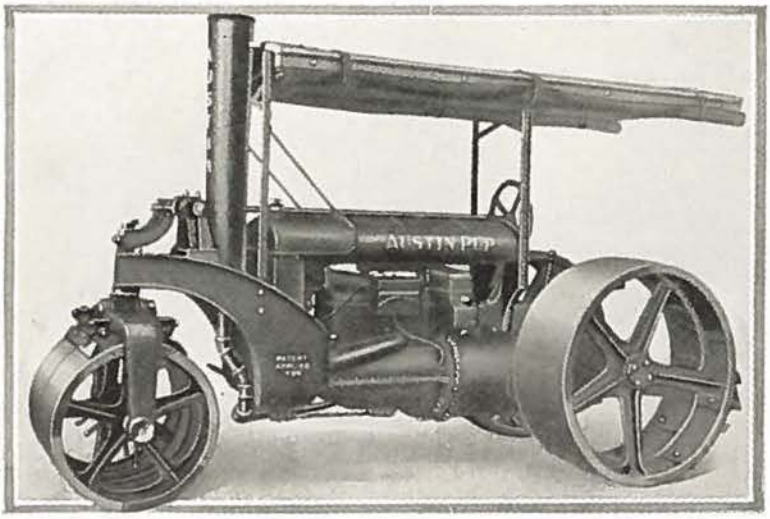
EXCEEDED THE SUPPLY

THE COLORADO CULVERT & FLUME CO.

PUEBLO

We sell **KEYSTONE** only—because it is best!

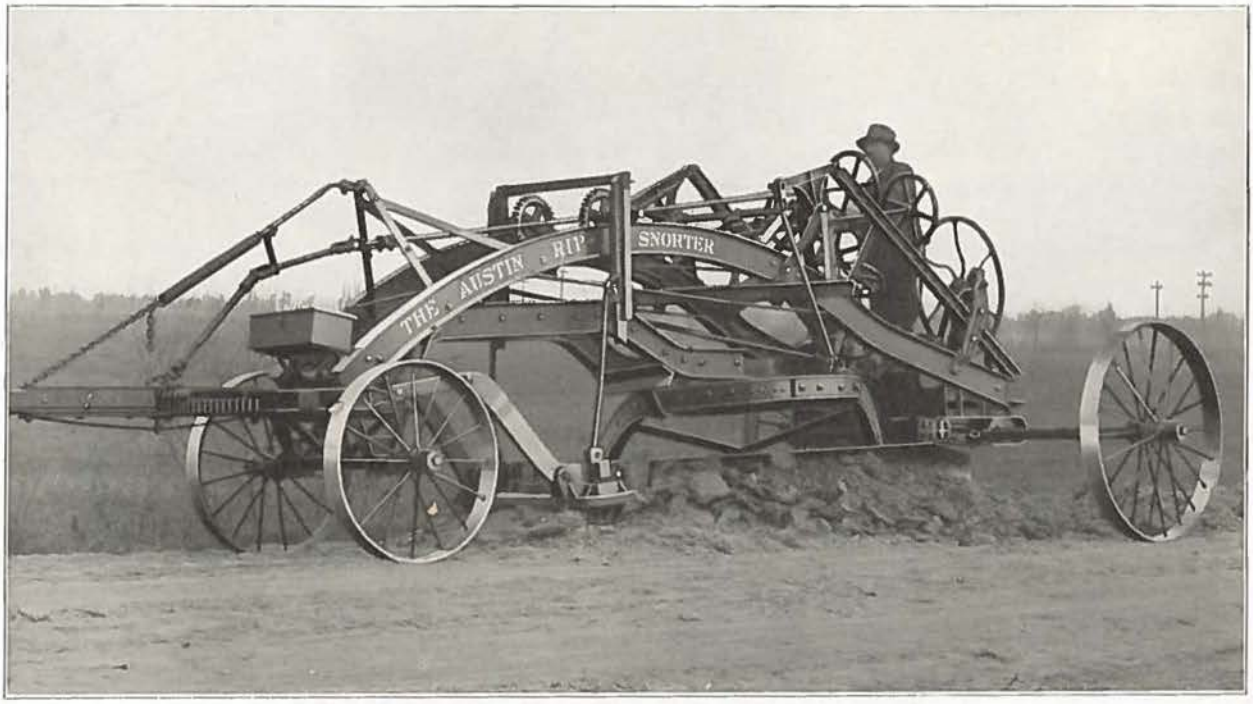
AUSTIN'S LATEST ADDITIONS



RIP SNORTER "JUNIOR" *AND* "AUSTIN PUP"

3 or 4 ton—3 wheel
Gasoline Roller.
Real Machines at
Reasonable Prices.

Every Austin-Western User Wears a Smile!



Austin Rip Snorter Now Furnished Both in "Junior" (5000 lbs.) and "Senior" (8500 lbs.)

Announcing three new lines---Heil Truck Bodies and Hoists---Butler Steel Binns and Proportioning Hoppers ---WEHR TRACTOR GRADER.

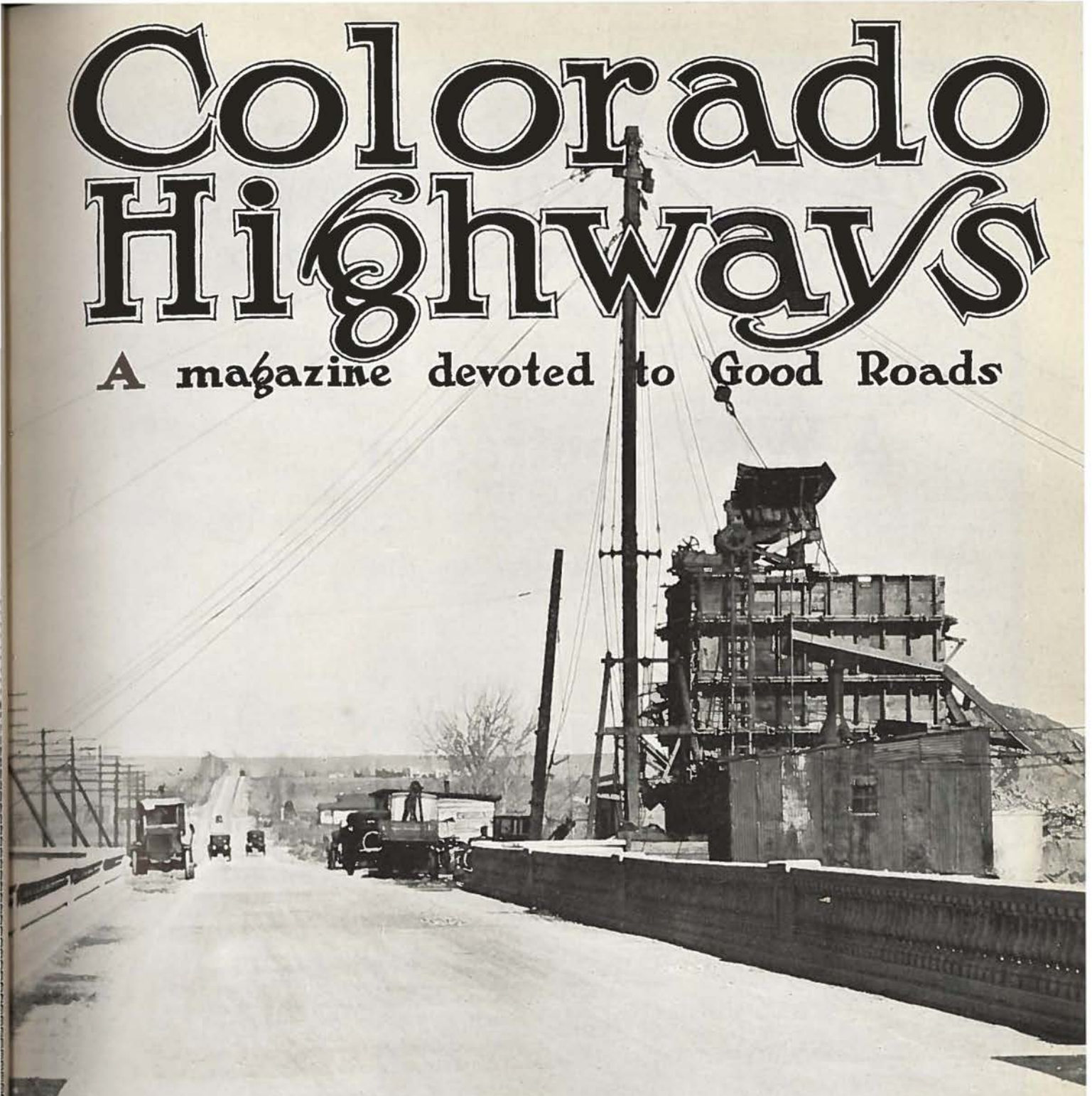
We are Specialists in our Line. When you need Contractors Equipment, Earth Handling Machinery or Concrete Construction Equipment consult us.

H. P. WILSON & COMPANY, DENVER, COLORADO

THE BRADFORD-ROBINSON PTG. CO., DENVER

Colorado Highways

A magazine devoted to Good Roads



Vol. 2. March 1923 No. 3

Colorado Highways
"BETTER ROADS"
VOLUME II. MARCH, 1923. NUMBER 3.

Colorado Adopts Standard Road Signs

Rocky Mountain Motorists, Inc., to Furnish Signs Free of Cost--Scenic and Historic Attractions of State to be Exploited

BY the end of the summer the principal Highways of the State will be sign-posted and tourists will not have to stop and ask the way at every turn in the road.

The Rocky Mountain Motorists, Inc., have arranged as one of their major activities, the sign-posting of all the roads in the state and within the next sixty days the markers will begin to go up at various points throughout the state.

The Rocky Mountain Motorists, Inc., is a non-profit association of business and professional men, motorists, and institutions of the Mountain States interested in the proper development and exploitation of the scenic and historic attractions, the climatic advantages and the recreational opportunities of the Rocky Mountain region.

In our State and throughout the Rocky Mountain region we have in our scenic wonders and climatic advantages assets which we have not developed and advertised in proportion to their magnitude.

The organization of the Rocky Mountain Motorists, Inc., which includes as its directors some of the leading men of the State, proposes to develop and exploit these advantages in a broad gauged systematic plan.

The sign-posting of the roads will be on a comprehensive scale and will eventually cover every State Highway and county road in the State of Colorado, and later will reach out into the surrounding territory on all the well-traveled main highways.

Under the arrangements made by the Highway Department under Major L. D. Blauvelt, The Rocky Mountain Motorists, Inc., will supply the road markers and the posts. The Highway Department will then place and erect them in concrete bases.

The road-markers will be of the highest grade vitrolite enamel on steel. The posts will be 2½" boiler pipe.

The published Purposes and Aims of the Rocky Mountain Motorists, Inc., are given below:

"To unite in one body all the motorists, business men, auto clubs and other institutions in our territory, in a great non-sectional movement, to bring to the attention of the public the scenic, climatic and recreational advantages of the Rocky Mountain region.

"To improve all conditions which will tend both directly and indirectly to benefit the resident motorists in this territory; to place before the visiting tourist a program of entertainment and a means of enjoyment which will make his stay here more pleasant and tend to induce him to prolong his visit.

Sample of marker adopted by State Highway Department for Colorado roads.

"To provide the tourist with a complete system of strip-maps covering the entire region which in connection with the numbering and marking of the highways will assist the motorist in reaching his destination.

"To properly and adequately mark all the roads of this region with official markers which will be of practical use to tourists.

"To assist the Highway Commission and the Good Roads Association, in its Good Roads Program.

"To encourage auto touring and properly and impartially direct tourists to all points of interest in the Rocky Mountain region.

"To prepare and distribute appropriate literature regarding the scenic, climatic and tourist attractions of this territory and in all other ways to consistently and forcefully advertise the attractions of this region.

"To encourage and support members of the automobile industry and those catering to the tourists, who, by proper service, advance the interests of the community. To discourage those unethical practices which tend to bring disrepute to the industry and the community.

"To initiate or to assist in the furtherance of all worthy undertakings which will enable us to more worthily and properly play the host to the tourists of America."

* * *

This is a big movement of business men for the benefit of all in this region

(*Continued on Page 12*)

OUR COVER PICTURE

The cover picture of the March issue of Colorado Highways shows a stretch of improved concrete road on Federal Boulevard north of Denver.

This piece of road forms a link in the main North and South Highway in Colorado, which it is expected will eventually be paved from the Wyoming line on the north to the New Mexico state line on the south.

There remains only a few miles of the road to be paved between Denver and Fort Collins. Projects planned for the coming summer will take the paving into Lafayette from Denver.

The Corrugated Metal Culvert

BY G. M. MONAHAN

IN European cities about three hundred years ago, persons who claimed to be better than the rest insisted on the right to walk close to the walls of buildings in passing along the streets. That was a queer thing for them to do, as seen through the spectacles of the present age, but it was a wholly natural thing in view of the fact that the center of the street was then lower than the sides and served as a drain or open sewer.

This central drain was called the "kennel", so that when the arrogant swashbuckler ordered the humble citizen to get himself away into his kennel he did not mean to consign him to the doghouse, but to the squalor of the middle of the road.

In France this central drain was called "coulouere", which meant a channel, gutter, or gallery, and which has come to mean in later times in the English speech of the roadbuilders—the culvert—"an arched or flat-covered drain of brickwork or masonry or corrugated iron pipe, carried under a road, railroad, etc., for the passage of water." Without the word, the roadbuilders would not know how to describe their work and without the culvert it would not be possible to build good roads.

The amount of money invested in improved roads in the United States has reached an enormous sum and but a small percentage of the total mileage has been improved. The investment can only be conjectured but it will run well into the billions.

A considerable part of this cost is invested in waterway structures, bridges and culverts which are a part of the foundation of the general highway structure.

The tendency in modern road building is toward permanence. This should begin in the foundation, that is, in proper location, drainage and subgrade. These are the only truly permanent features and may properly include culverts. No matter what the wearing surface of the road is to be, these fundamental principles must be observed and incorporated into the construction.

If there is not sufficient money on hand to build a first-class paved highway complete, whatever is available should be put into the construction of a well drained and graded sub-grade properly located. Build the foundation first. It will be economy in the end.

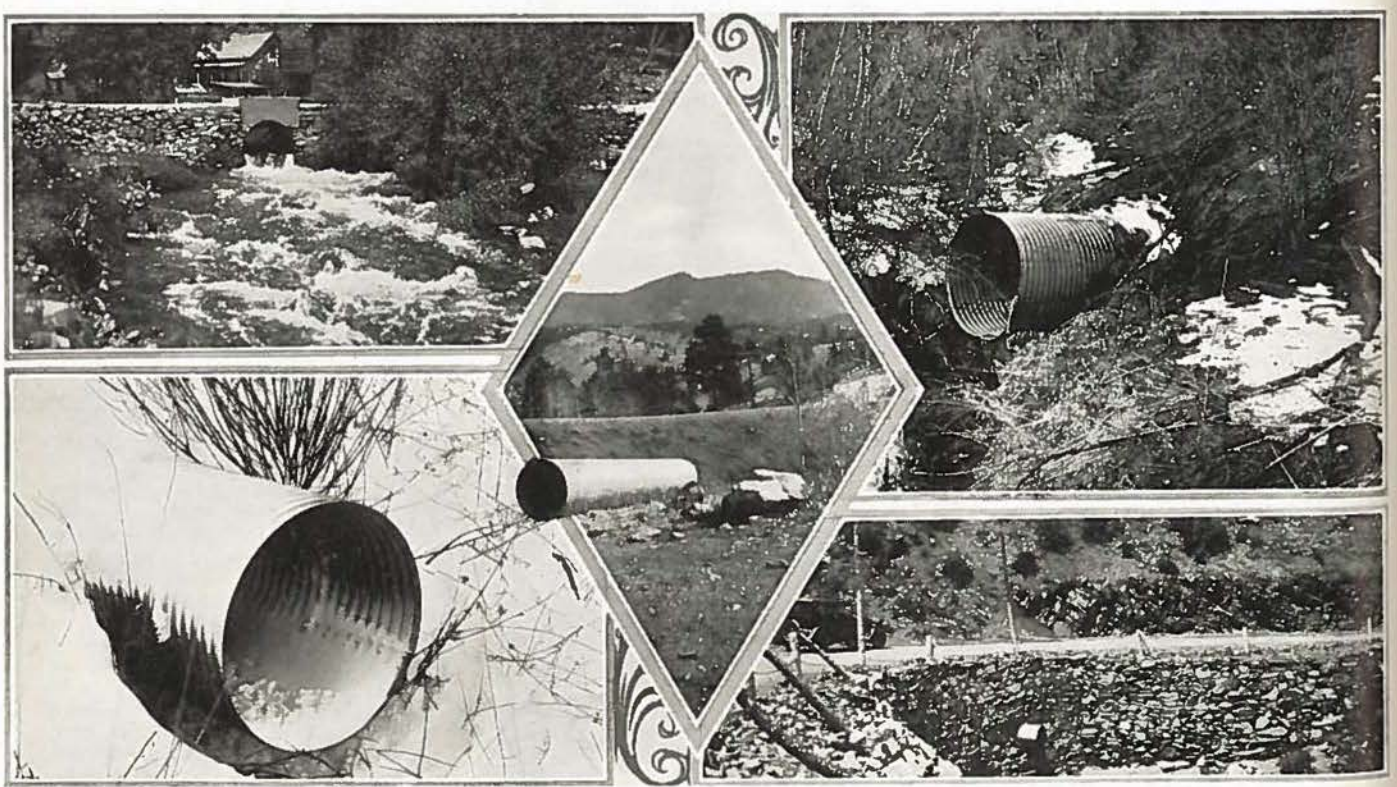
The culvert being a part of the drainage system is a very vital feature of road construction. A culvert to be highly efficient and economical should have the following qualifications: Strength, Durability, Ease of Maintenance, Reasonable Cost.

Builders of roads including both railroads and highways, have searched for many years for the ideal culvert and have experimented with all of the known types in an endeavor to find one which combined all of the above qualities. Various kinds possessed one or more of these, but were sadly deficient in the others. For a long time wood and stone were about the only materials used. Then came vitrified clay and cast iron followed by concrete and finally corrugated metal pipe,—"wrinkled tin", it was called by some.

In the test of universal service all of these candidates failed to pass the requirements. Wood as a culvert material could score but one point, namely, low first cost (but extravagant maintenance). Stone came the nearest to fulfilling all of the conditions imposed except that it was not universally distributed and its transportation and installation brought up the cost excessively for many localities. Cast iron could qualify on everything except cost, and its use therefore had to be very limited. Finally, concrete seemed to have suggested the successful solution of the culvert problem. Theoretically it was debatable but the Scotch verdict of "not proven" could be claimed on points argued by both sides. Time alone could decide the controversy.

Up to the present time concrete construction has had a wonderful development and its success is attested by the tremendous volume of this class of construction in use today throughout the entire world. The notable failures do not argue against concrete as a general con-

(Continued on Page 17)



Typical corrugated culvert installations on Colorado highways and railroads. Upper left—60 inch culvert on Idaho Springs road. Upper right—48 inch culvert under main line railroad. Lower left—another railroad installation. Lower right—On Mt. Lookout, in Jefferson county. Center—Taken on highway near Shawnee, Park county.

Beet Farmers Save on Haulage Costs

Hauls Two Loads of Beets to Concrete Road From Field, Then Pulls Both to Sugar Factory With One Team.

WHAT is the heaviest farm traffic load in Colorado?

Ask any farmer this question and he will very quickly answer—"Beets."

And its a fact. Beets are the heaviest farm load hauled on the roads of this state. In the northeastern part of the state in the fall of the year after the beet hauling season is over you will find the worst roads imaginable.

The surface of the roads over which the best wagons travel to the various factories are literally ground into dust. Large, deep ruts are found for miles along these roads. Talk about your test roads to determine the type of roads to build in the future. Nowhere could there be found a better test for a given type of road than one of these beet routes.

But we started out to tell the story of a beet hauler. A few months ago a prominent highway official started out on a tour of the northern Colorado road districts.

He was traveling along giving the roads the "once over," when he came upon a beet farmer. The farmer was perched upon the seat of a wagon loaded to the guard rails with beets. Attached to the wagon was a trailer likewise piled high with beets.

Pulling the wagon and trailer were a pair of fine bays. A likely looking outfit to say the least. They were moving along with seemingly no effort at all. The highway official became interested. He stopped and hailed the beet hauler.

"That's a fine team you have there, neighbor. How many tons of beets have you got on those two wagons?" asked the official.

"Oh, about ten tons," replied the farmer. "I guess I could have piled on a few more, but I did not want to load my team down too heavy."

"Well, I didn't think it possible to pull such a big load over these roads. Its certainly wonderful how things have changed in the farming communities," continued the official.

"I can't say it was always like this," replied the farmer. "Years ago we didn't have roads as good as this to haul our beets over and of course we couldn't haul as big loads. But now we have gravel surfaced roads and concrete roads.

"I have about a mile to haul over the dirt road before I strike the concrete road leading to the Brighton sugar factory. As a general thing I drive the big wagon over to the concrete road and then unhitch my team and go back to my place and get the trailer. You see I can haul the big wagon and the trailer over the concrete easier than I can the one wagon alone over the dirt road. That's just the difference. And most of all it is not half as hard on the teams. These hard surfaced roads are the only thing that will stand up under the beet hauling traffic."

A little investigation on the part of the highway showed that other beet growers of the district were doing the same thing. They are taking advantage of the paved road by hauling bigger loads.

When the highway official got back to his office he did some calculating, and tabulated some results of efficiency tests. He was satisfied that surfacing saves fuel. He knew this because when leaving a dirt road and going onto a gravel surfaced highway, he had always unconsciously loosened up on the throttle of his machine. The car went faster and less gasoline was consumed. This was also true when leaving gravel for concrete.

He had found that there was less fuel used and the car showed less wear and tear, with a decided increase of comfort in riding.

With this in mind, he looked up the results of some tractive tests that were made. The figures indicate that the average ton-mines per gallon of fuel is as follows:

On earth road.....14 ton miles
On gravel road.....21 ton miles
On concrete road...31 ton miles

After noting the above results it was easy to figure out how the beet farmer was able to haul bigger loads over the improved roads. It took less strength on the part of the teams to pull the loads over the hard surfaced roads. And they traveled along at an easier pace and with less effort than was required to pull the wagons over the ordinary dirt roads.

It was also figured at 24 cents per gallon, fuel çosts per ton-mile on these averages are as follows:

On earth road.....1.71 cents
On gravel road.....1.15 cents
On concrete road..... .77 cents

By these figures it can easily be seen that the hard surfaced roads in a few years pay for themselves in reduced haulage costs, to say nothing of the value of the roads to the lands adjacent. In some districts where concrete roads have been laid the increase in the value of the lands alone has been enough to more than pay the cost of the paving.

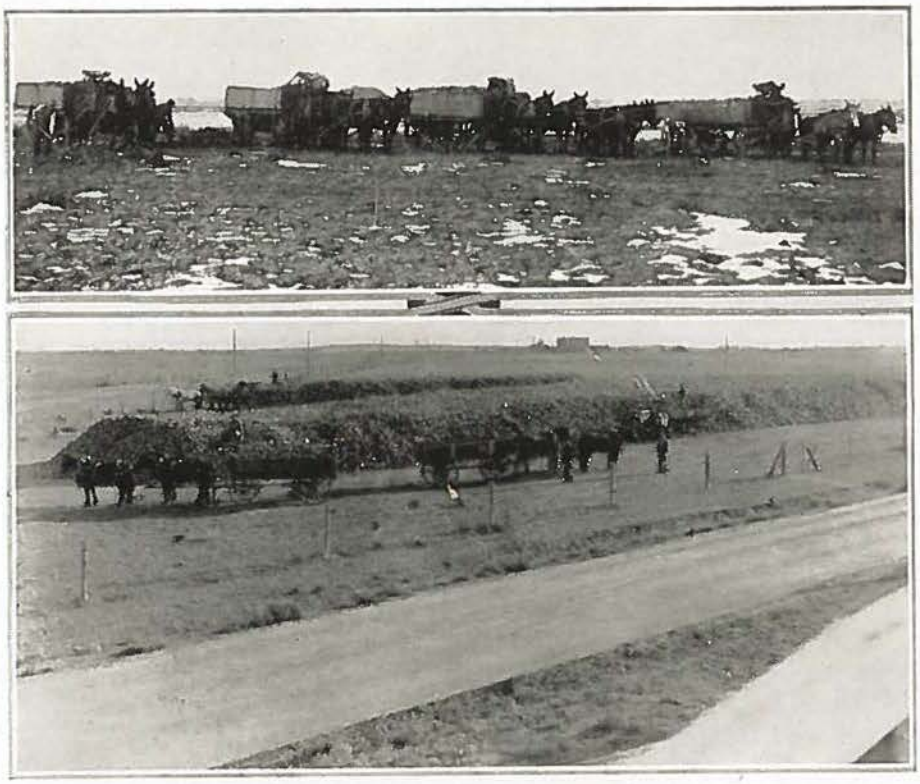
Average weights for each general type of vehicle have been found as follows:

Horse drawn passengers, 671 pounds. Horse drawn freight, 1,998 pounds. Passenger automobiles, 2,691 pounds. Motor driven freight, 2,720 pounds.

These weights applied to various types of vehicles using a given road gives the daily average tonnage. Apply to this tonnage the cost of gasoline consumed per ton-mile and you can determine whether or not it is economical to pave any particular road.

For instance a traffic census showed that 904 vehicles passed over a piece of road near Greeley which has since been paved. The daily average tonnage was 1,232 tons. The test data showed a cost per ton mile of fuel, on gravel, 1.15 cents and .77 of a cent for fuel on concrete road.

(*Cont. on Page 12*)



Top—Loading beets in the field, using four-mule teams for haul to concrete road. Bottom—Huge beet dump in field near Brighton, showing method of piling beets for hauling to sugar factory.

Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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COLORADO HIGHWAYS PUBLISHING COMPANY,
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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.**

EDITORIAL COMMENT

$20,000,000 for road improvements in Colorado.

That is a lot of money—especially when it is your money.

It belongs to the taxpayers of this state.

And of course you will be interested in how it is being spent. You will certainly want to know whether you are getting your money's worth. To be sure you have a right to know.

It is the important job of Colorado Highways to keep you informed on the progress of the work. As the work goes forward you will be kept posted through the columns of this publication. There will be no attempt to color the facts—just plain truths will be given.

And right here we want to emphasize that the Highway Department has nothing to conceal. It is pledged to give all parties concerned a square deal. Any citizen can come in, or write or wire, at any time on any subject he may choose and be assured that his inquiry will be promptly answered.

Officials of the Highway Department are paid to serve the public—and that's what they are endeavoring to the best of their ability to do.

Of course, not all of that $20,000,000 which has been made available for roads in Colorado during the next five years will come out of the pockets of the taxpayers. A little over $6,000,000 comes from the Federal Government.

In each issue of Colorado Highways there will be details of every contract that is let. Also you will find reports on how the work is being done. Complete data on detours to be used while the main roads are under construction will be available.

You will want to know about these things. So it would be well for you to be sure that you receive your copy of Colorado Highways each month.

Assurance is given by the State Highway Department that all detours will be kept in as good shape as is possible in order to facilitate travel while the main roads are being built. Detours if neglected cost the traveling public a lot of money. Officials of the Highway Department are keenly alive to this fact.

Promptly each month the Department will inform you through the columns of this publication as each new section of road is open to traffic.

Colorado is known all over the world for its good roads—the best in the West. We must retain this enviable position.

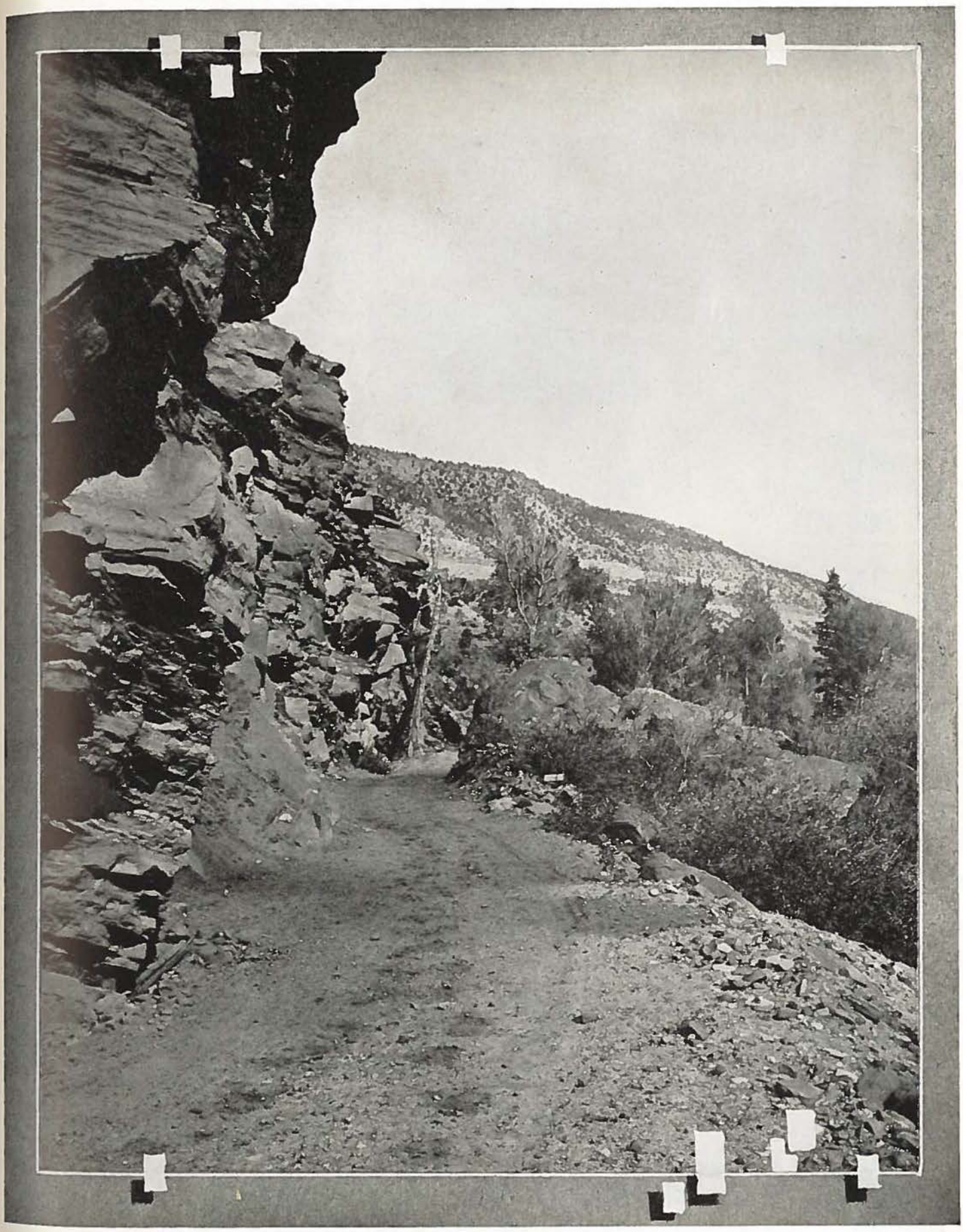
The fame of Colorado's roads has spread far and wide. Thousands of tourists with ready money to spend are attracted here each summer by reason of our splendid road system, which taps the greatest playground area on the face of the earth.

The backing and intelligent co-operation of the road-using public is the thing most desired by any Highway Department.

At the last general election the people of this State by an overwhelming majority endorsed the road program laid down by the Highway Department for the next five years. It was a vote of confidence in the integrity and honesty and efficiency of those in charge of the Department.

The work of supporting the Highway Department in its efforts to give this state the best roads it is possible to build for the least amount of money is up to the individual, not alone for his own selfish interests, but also because he is a good citizen.

So let us all work together to keep Colorado first in the matter of roads.



The famous Stone Wall of southern Colorado, showing difficult road construction—a highway blasted from solid rock.

Crowley County Builds New Shops

Officials Make Splendid Record in Road Work—Highway Surfaced With Gravel From New Irrigation Ditch at Low Cost

Top circle—Grading state highway with dirt excavated from Ordway drainage ditch; when completed will be 30 ft. wide and will cost state and county about 2¼ cents per yard. Top left—Portion of Kansas-Colorado boulevard between Sugar City and Ordway recently completed with gravel surfacing. Bottom circle—Front of Crowley county highway shops in Ordway. Bottom right—Machinery shed ready for roof and siding.

IF you want to see some good roads and some good road outfits, stop in Ordway first time you are down that way.

Here you will find one of the most progressive counties in the state from the standpoint of good roads. Folks down that way have been "sold" on the value of better roads for a long time, and they have a way of going after things that brings results all along down the line.

They handle road work in a business-like way. During 1922, Crowley county graded 68 miles of state highways and surfaced 23 miles with sand, gravel and shale.

Last year the county constructed four large bridges, and now have three under way, which are nearly completed. These structures were paid for from the county's allotment of bond funds.

The county also has just completed a garage and storage shed for their road equipment at a cost of $2,600. This means that the road outfits will be stored and repaired in a central shop, owned and operated by the county. In constructing these shops they are following the lead of several other large counties in the state.

Records kept by those counties operating their own garages, where county trucks and road machines can be repaired by employes of the county, show that a vast saving can be effected for the taxpayers.

The Crowley county garage is located on a corner lot measuring 130 ft. by 135 ft. The main shop is 28 by 50 ft. clear space. There is an enclosed shed back of the shop measuring 30 ft. x 32 ft. and a machinery shed 24 x 124 ft.

The shed has a 9 ft. clearance in front and 7 ft. in rear. The roof and siding is made of 26 gauge galvanized steel. The lots are enclosed with a 5 ft. solid board fence. A cement floor 5 inches thick is laid in the main shop.

In the shop is one double pit, large enough for two tractors to be worked on at one time. There is storage space for sixteen trucks, engines and graders. The buildings and sheds were built in about three weeks by regularly employed road men. The cost of the building was approximately $2,000, and the lots cost $600.

On the main state highways, Nos. 20s, 33 and 83, running through the county, there was expended the past year $19,000 for maintenance in co-operation with the state highway department. In addition to this sum, the county spent $13,000 on road improvements. For cement and steel drains on state highways the county expended about $3,500.

During the year the county purchased, according to J. E. Downey, chairman of the board, new equipment amounting to $8,000, which includes one Holt Caterpillar engine, four Liberty trucks, one stationary engine, two Big Buster graders, and several drags, plows, slips, Fresnoes, Maintainers, a gas wagon and tanks. A large part of this equipment was purchased through the Highway Department at considerable saving.

One of the big projects which the county now has under way in the surfacing of two and one half miles of main highway near Ordway. The surfacing is taken from the Ordway Drainage Ditch, which is being excavated along the side of the road.

The ditch is 21 ft. wide and 12 ft. deep. The grade on the road will be 2½ ft. high and 30 ft. wide. When completed the new surfacing will cost about 2¼ cents per yard.

The commissioners of Crowley county are: J. E. Downey, chairman; Fred Tarbox and S. S. Spillars.

Tourist Traffic as a Factor in Highway Development

By A. R. Hirst, State Highway Engineer of Wisconsin, at American Road Congress.

Quite commonly the term "tourist" has been accepted to mean one who is traveling for pleasure at some distance from his home environment. In many states the term "tourist" means a person from without the state. There is no justification for these distinctions. If we accept the Webster definition the tourist traffic on our highways is all traffic using the highways as a part of a sightseeing or pleasure trip. Therefore, in the consideration of tourist traffic we must include not only the traffic traveling in cars coming from without the state, but the traffic of the people of the state itself.

Of course, the volume of this traffic varies with the seasons, especially in the northern states. The tourist traffic in states, such as Wisconsin, is practically confined to late May, June, July, August, and early September. Doubtless in the states south of us the seasons are longer, especially in those states making a feature of winter resort business, but the effect of the children going to school is such that the bulk of the tourist traffic in practically every state undoubtedly falls in the non-school months.

We doubt very much whether tourist traffic has had or will have any large effect upon the type of highways or the location of highways of any state. There are, of course, exceptional instances where highways are built exclusively to make accessible to tourists certain areas or certain specific features of scenic or historic interest, and in those specific cases the volume and character of the tourist traffic will indicate the necessity for and will dictate both the location and character of the road.

In the vast majority of cases, however, in every American state, regardless of the amount of tourist traffic using the area, it is our opinion that the location of the highway and its type will be dictated almost entirely by the business uses which the road must be built to serve.

In very few cases will a superiority of alignment of grade or surface be indicated and forced by the amount of tourist traffic over a principal state highway. In some cases on roads heavily traveled by tourist traffic the amount of this traffic will dictate a wider type of surface than would have to be built to serve the business traffic, but it is our opinion that these cases are very limited. The thing that is going to dictate the location and type of the great majority of our highways is the demands and uses of motor trucks, motor busses, and of the local tributary heavy business.

There are some roads in areas, which are not business areas, and where roads are built and maintained largely to serve tourist traffic, the location of which will be dictated solely by the requirements of tourist traffic.

In such areas of scenic or resort value the location and alignment of roads will and should be dictated not by the theoretical requirements of shortness of distance and ease of grades which should prevail in the construction of main roads built for business service, but the locations will and should be largely predicated on making the roads as pleasant to travel as is possible by taking advantage of every chance for a scenic view and of artistic effects in general.

The surfaces of such roads need not be of the kind dictated by heavy business traffic in the congested areas. As long as vision is preserved, both vertical and horizontal, a large amount or easy curvature can and should be used, and distance, within reasonable limits, is quite immaterial if the bulk of the traffic is tourist traffic.

Summing up, it is our opinion that tourist traffic has had and will have very little influence upon the construction policies of states, in so far as determining widths, characters or locations. It will have an influence on the development of certain roads which will be developed largely in accordance with the tourist demands and the type of country traversed.

Forcing Higher Type Construction.

As to the interest of tourist traffic on the maintenance programs of states, the tourist traffic will influence these programs in so far as it is a percentage of

(*Continued on Page 12*)

Mt. Princeton, Chaffee county, as seen from the crest of Chalk Canon. This is a bulwark of the Collegiate Range, ranked as one of the most beautiful mountain groups in Colorado.

Standard Bridge Designs Furnished County Highway Officials Without Cost

BY R. S. DUBOIS,
Bridge Engineer, Colorado Highway Department

THE bridge department of the State Highway Department makes designs and prepares plans for highway structures. When work is to be done in co-operation with the Federal Government, all the plans for structures are made in the bridge department, as are also most of the plans for purely state work. To an increasinng degree, work is being done for the counties in their local work.

In general, the supervision of surveying and construction of the highway structures is handled by the Division Engineers of the Engineering Division, though more attention to actual construction supervision is planned by the bridge department.

One clause of the Highway Act of 1921 says that the State Highway Engineer shall "Furnish plans for all bridge construction of twenty feet or more span on county highways; and also plans for county highway construction, when requested." He is therefore given jurisdiction over all bridges on public roads, whereas he is to serve only in a consulting capacity on county road construction.

Many of the bridges throughout the state were built before the days of automobiles. The heavy loads now using our roads in many cases, load these structures more heavily than they were designed for. This causes a considerable wear in the connections of the bridge. Periodic inspection and repairs as needed, will go far in prolonging the life of the structures, and postpone considerably the date at which they will have to be replaced.

The bridge department wishes to cooperate with the counties in their bridge construction. It offers to the counties its services in all phases of bridge design, repair and strengthening. It will prepare plans for a structure, or will examine a proposed plan, report upon the adequacy of the design shown, and note any changes in design when modification is considered preferable, or will inspect existing bridges and report upon repairs or alterations considered advisable, or estimate quantities of material involved, and prepare estimates of the cost of construction.

This service is a technical line by men specializing on it, is available to the County Commissioners upon request. It is desired to call their attention to the fact that such service is available.

Contractor Hopes to Break Record on Brighton Concrete Road

At present there is scattered along the Greeley road between a point just south of Fort Lupton and Platteville about 10,000 cubic yards of gravel. This material will be used in the concrete paving that will be done between these two points next summer.

About seven and one-half miles of this road is to be paved. When finished it will leave but one unpaved link between Denver and Greeley. The work of paving the Fort Lupton-Platteville stretch will be done by White & Johnson, Denver contractors.

The contract for the work was let last fall and the contractors have been busy all winter hauling gravel to be used on the job. They expect to start pouring concrete the latter part of April, and by that time they expect to have all the gravel, 15,000 cubic yards, that will be used on the job, ready for mixing.

Gravel is one of the most important items of material that goes into a concrete project. Shortage of gravel has delayed more concrete projects than any other cause. That's the reason that White & Johnson have kept their teams busy during the winter months getting out gravel. They are anxious to make a record on this project which will stand for a long time for Colorado contractors to aim at.

A central mixing plant, which will be moved two or three times, will be used on the job. As planned, the maximum haul will not be over a mile and a quarter. The bins will be of 120 ton capacity.

All new equipment will be used. A new Rex 28-S central mixer and a Maxon finishing machine were recently purchased for this work. The complete plant will be of sufficient capacity to lay a mile of concrete a week, but the contractors are only counting on laying two and one-half miles per month.

This means that the entire project should be completed and ready for traffic by the end of July.

One mile of the project, of which the seven and one-half miles is a part, was laid last fall north of Brighton. Work was shut down then on account of the beet hauling season. When completed this will constitute the longest single stretch of concrete in the state, running from Denver to above Fort Lupton, a distance of about 35 miles.

Traffic over this road is the heaviest in the state. During the summer months it is heavily traveled by tourists, being a part of the Lincoln Highway leading into Denver from Julesburg.

Convicts Build Splendid Drive Near Canon City

Travel between Canon City and Salida on the Rainbow Route will be greatly facilitated next summer by work now being done by convicts under the direction of Warden Tom Tynan on what is known as the Devil's Gap cut-off. There is about five miles of the work and in many respects will make when completed one of the most attractive pieces of roadway in Fremont county.

The cut-off begins near Three Mile spring and follows the right-of-way of an old electric line to Eight Mile park. The plans of the road, prepared by engineers of the state highway department, call for several bridges of steel and concrete construction.

A new survey was made along a hillside high above the present road through the creek bottom. Steep grades of the old road, a source of hardship to motorists, are eliminated. By putting the new road on the hillside, a vista of scenic beauty is opened to the traveler.

Expense of the construction is shared jointly by the state and Fremont county. An appropriation of $23,000 has been made for the work. It is expected that the new road will be ready for travel early in the spring.

It is estimated that automobile owners traveling over the new route will save enough gasoline to propel their cars a distance of ten miles on level ground.

White River Forest Highway Opens National Playground

Gradually there is an expansion of Colorado's road system into the remotest sections of the state.

Each year we find more recreational areas made accessible to tourists. Hardly a month passes but what there is a new road completed, connecting up with the great intrastate system planned by state, county and government road engineers.

Just now there comes a report to Colorado Highways of a new piece of work in the White River National Forest, near Trappers Lake.

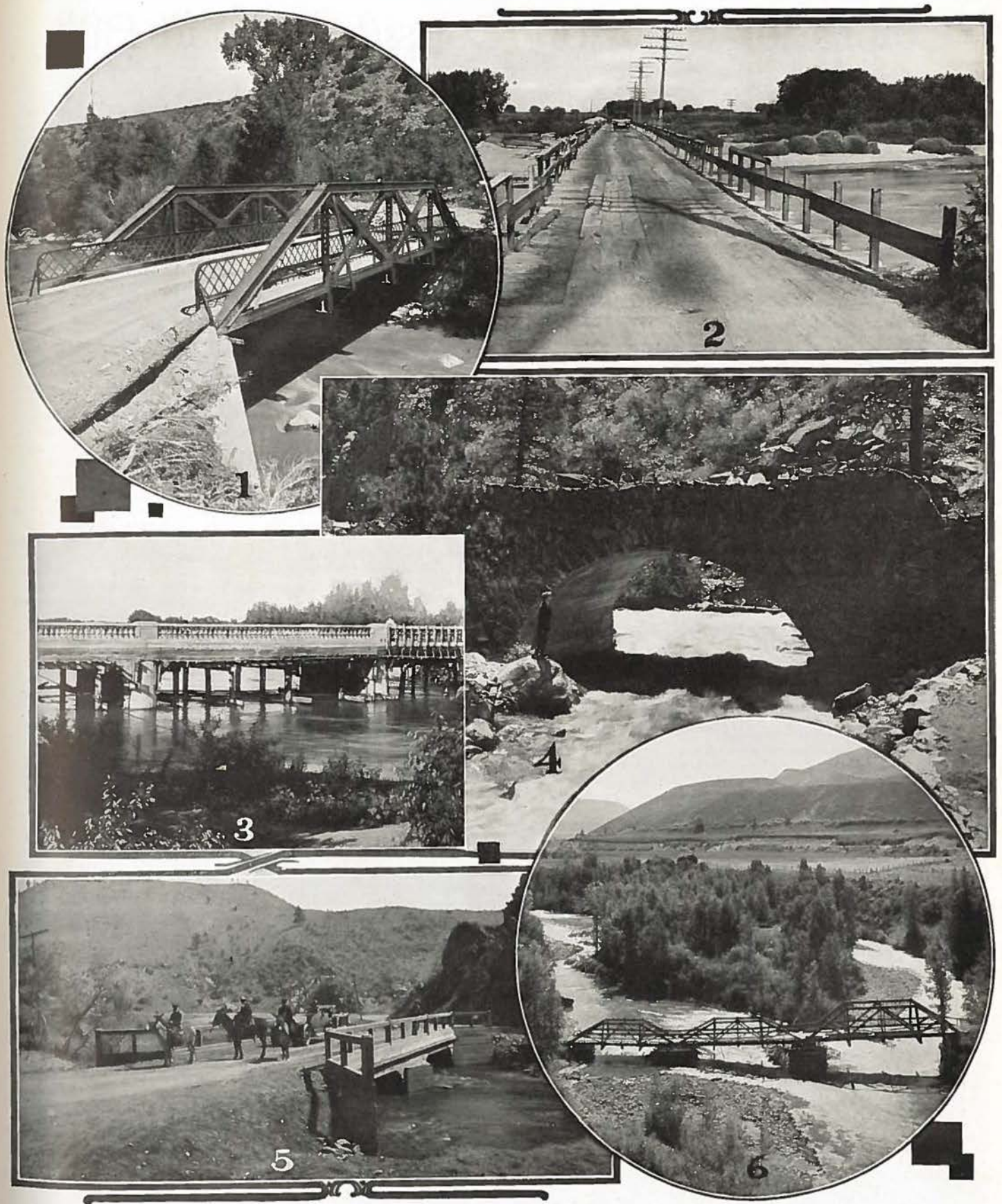
With the completion of this road there will be a saving of about seventy miles between Meeker and Denver over any other route. It is just another example of how road engineers, each year, are bringing the eastern and western sections of the state closer together by direct roads.

The work done last summer was by the forest service between Trappers Lake and Meeker and forms a part of the proposed Yampa-Trappers Lake-Meeker highway. Supervision of the work was under Ranger Elmer E. Stephenson. The new auto road taps a virgin recreational center and forms a scenic wonder route, it is said.

The commissioners of Rio Blanco county recently expressed their satisfaction with the work in a resolution which was forwarded to the headquarters of the U. S. Forest service.

Additional appropriations probably will be made to complete the work next summer.

Twice the mileage of two teams of horses is covered, on the average, each day, by the farm truck, according to figures gathered by the Research Department of a leading Truck Sales Department. Cost figures covering a period of one year gives the ton-mile cost with the two teams as $1.20 while the motor truck cost was reported to be 30 cents per ton-mile. Cost figures for the two teams were placed at $4,410 and for the trucks $2,967.



Bridges are the sign posts along the modern highway—(1) A substantial steel bridge across Roaring Fork river, Pitkin county. (2) Oldstyle wooden bridge across South Platte, near Kersey, which has been replaced with a modern concrete structure. (3) Concrete slab bridge which replaced No. 2. (4) An example of picturesque bridge construction suited to surrounding, located in Middle Boulder Canon. (5) A modern slab concrete bridge in Jefferson county. (6) Another picturesque bridge in Fremont county.

Colorado Assembly Considers Road Bills

Of unusual interest to men actively engaged in road construction is a bill which has passed the senate and, say its authors, will undoubtedly pass the house of representatives and meet with the approval of Governor Sweet. This bill, Senate bill Number 239, introduced by Senators Nate C. Warren, of Larimer, and Senator J. L. Morrison, of Montezuma county,—briefly, permits the state highway department, any board of county commissioners and, in fact, any municipality, school district or other political subdivision, to withhold from moneys due a contractor for public work sufficient money to pay claims for labor, supplies and the like by employes and creditors of contractors filed with the party which has let the contract.

In the past there has not been a law on the statute books which permitted the withholding of money. As a result there have been quite a few cases of laborers, merchants and others losing money rightfully due them.

For the benefit of readers of Colorado Highways the essential sections of the bill are herewith reprinted:

"Any person, co-partnership, association of persons, company or corporation that has furnished labor, materials, team hire, sustenance, provisions, provender or other supplies used or consumed by such contractor, or his or its sub-contractor, in or about the performance of the work contracted to be done, and whose claim therefor has not been paid by the contractor or sub-contractor, may at any time up to and including the time of final settlement for the work contracted to be done, which final settlement shall be duly advertised at least ten days prior thereto by publication of notice thereof at least twice in a public newspaper or newspapers of general circulation published in the county or counties wherein the work was contracted for and wherein such work was performed, file with the board, officer, person or other contracting body by whom the contract was awarded, a verified statement of the amount due and unpaid on account of such claim. And upon the filing of any such claim or claims, such board, officer, person, or other body awarding the contract shall withhold from all payments to said contractor, sufficient funds to insure the payment of said claims, until the same have been paid or such claims as filed shall have been withdrawn in writing by the person or persons filing same or their duly authorized agents or assigns. At any time within ninety days following the date fixed for final settlement as published in the manner hereinbefore provided, any person or persons, co-partnership, association of persons, company or corporation, or his, their or its assigns whose claims have not been paid by any such contractor or sub-contractor, may commence an action to recover the same individually or collectively, against the surety or sureties on the bond, specified and required in Section Two hereof."

A bill designed to increase the state highway fund and the road funds of the several counties has met with the approval of the senate and is now being considered by the house of representatives. It is a measure by Senator David Elliot, of El Paso county.

It provides that the owner of an automobile must, before his annual automobile license is issued to him, make an affidavit that he had paid on his automobile the property tax which was due and payable during the preceding calendar year.

Senator Elliot made the statement on the floor of the senate that he had been informed by the proper authorities that something like 40,000 were licensed last year, the owners of which had not paid the property tax on these machines. Elliot estimates that the state and counties lose the property tax on at least $7,000,000 worth of automobiles each and every year.

The state highway department and county road funds will benefit by many thousands of dollars if the proposed law brings about the collection of the tax on these machines.

WISCONSIN TO PUT ONE CENT ROAD TAX ON GASOLINE—EIGHTEEN STATES NOW HAVE SUCH A TAX

Wisconsin will collect 1c road revenue from every gallon of gasoline used in motor vehicles on the highways. Road officials interested in the matter of raising money for roads by tax on the gasoline consumed by motor vehicles will be interested in the following Wisconsin figures. During the fiscal year there was tested in the state 2,518,459 barrels of gasoline. This is approximately one barrel for every man, woman and child in the state, the population being 2,631,839. There are fifty gallons of gasoline in a barrel, making a total of 125,922,950 gallons used in the state. Using 4,000 miles as the average for the miles for all cars per year, and 12 miles per gallon as the average miles secured, Wisconsin's 325,000 licensed cars would probably use 108,330,000, which at the rate of 1c per gallon would net the state $1,083,333.

Of the eleven states whose legislatures convened last year, four enacted a gasoline tax. They are Maryland, Louisiana, South Carolina and Mississippi. Bills for a gasoline tax are still pending in Massachusetts and Rhode Island. In all of these cases, as has hitherto been the custom, the gasoline tax has been enacted in addition to the customary motor vehicle registry and general license fees. The gasoline tax in these four states is 1c a gallon.

These recent additions give a total of 18 states in the Union which collect fees on gasoline purchased within their borders. The 14 which previously had the law are Arizona, Arkansas, Colorado, Connecticut, Florida, Georgia, Kentucky, Montana, New Mexico, North Carolina, Oregon, Pennsylvania, South Dakota and Washington. The rate in every case is 1c a gallon, except in Oregon, where the fee is 2c. A gasoline fee bill was introduced into the recent New York legislature, but in view of the fact that registry fees were materially increased on both passenger cars and trucks no serious effort was made to pass it.

The general assembly of Colorado is now considering a bill which will increase the gasoline tax in this state from one cent per gallon to two cents. The receipts from the tax will be applied to the road fund for maintenance and new construction.

FEDERAL AID FOR ROAD BUILDING NOT A NEW IDEA

Federal aid for road building is not a new idea in the United States. Vol. III of the American Annual Register, 1827-1829, shows that a total of $4,177,549.06 was apportioned from the time of the adoption of the constitution to that date to assist individual states in works of public improvement, a large portion of which was for road building. The largest single item was for construction and maintenance on the famous old Cumberland road, a total of $1,622,245.75. Over $166,000 was set aside for the survey of roads and canals. The following is partial list of the appropriations made:

Road from Cumberland to the Ohio	$1,662,245.75
Continuation of the Cumberland road	453,547.36
Repairs to the Cumberland road	55,510.00
Road from Nashville to Natchez	3,000.00
Road from Wheeling to the Mississippi river	10,000.00
Road from Missouri to New Mexico	30,000.00
Road from Mississippi to the state of Ohio	5,639.35
Road from Georgia to New Orleans	5,500.00
Roads in Tennessee, Louisiana and Georgia	15,000.00
Road from Nashville to New Orleans	7,920.00
Surveys of roads and canals	166,681.49
Surveys, maps, and charts of the Ohio and Mississippi rivers	4,168.24
Military roads	10,218.43
Survey of the water courses of the Mississippi river	11,122.04
Road through the Creek Nation	3,621.01
Opening the old Natchez road	5,000.00
Breakwater at the mouth of Delaware Bay	5,000.00
Total	$4,179,549.06

Massachusetts will hereafter put a tax on the highway sign even though erected on private property. The contention is that the value of the sign is derived from the public highway, not from private property on which it is located and that the first obligation is to the public who owns the highway and gives the sign an advertising value. Permission from the land owner is a secondary matter. It would be well for other legislatures to extend the Massachusetts idea and give the highway authorities some control over all signs erected on private property that in any way derive their value from their location as regards a public highway. This is the only way that the highway officials can keep any control over the sign and billboard nuisance along the public highways.

County Officials Endorse State Road Program at District Meet at Pueblo

Ten of the eleven counties embraced in the County Commissioners' Association of the fourth highway district were represented at the association's regular meeting in Pueblo on Saturday, February 10. The counties represented were: Baca, Bent, Crowley, Custer, Fremont, Huerfano, Kiowa, Otero, Prowers and Pueblo. Las Animas was the only county whose commissioners did not attend.

The meeting was presided over by James E. Downey, of Ordway, president of the association. B. D. Bradley, also of Ordway, acted as secretary.

By unanimous vote the commissioners adopted a resolution indorsing the road-building program as mapped out by the state highway department for the next four years and protesting against the proposed repeal of one half of the one mill levy for road purposes, proposed by members of the general assembly.

Copies of the resolution were ordered sent to the senators and representatives of the counties represented in the association.

Adoption of the resolution was preceded by an interesting discussion. The feature of this discussion was an address by Mr. George L. L. Gann, of Pueblo, the district's representative on the state highway advisory board. Mr. Gann discussed in detail the highway department's program and pointed out the effect which the repeal of half of the mill levy would have on it. He earnestly urged the retention of the levy.

Robert H. Higgins, superintendent of maintenance, attended the meeting as the highway department's official representative. He spoke on cooperation of county officials with the state highway department in carrying out the road construction program. He sought to impress the commissioners with the idea that the state would never get anywhere if "men continued to fight the other fellow."

Washington County Farmers Effects Savings on Highways

Two or three years ago the farmers of Washington county were up in arms at the expenditures which were being made on roads. A good many of them felt that they were not getting their money's worth.

They were dissatisfied with the way the funds were being handled and they did not hesitate to let it be known. But just then there was a change made in the methods of expending the money. The farmers saw results were being obtained and they fell into line.

From then on they were a unit behind those who were in charge of the roads in that county. After a season of reasonably good roads these same farmers joined forces with the highway officials and at six different places in the county they are hauling gratuitously, surfacing material for the roads.

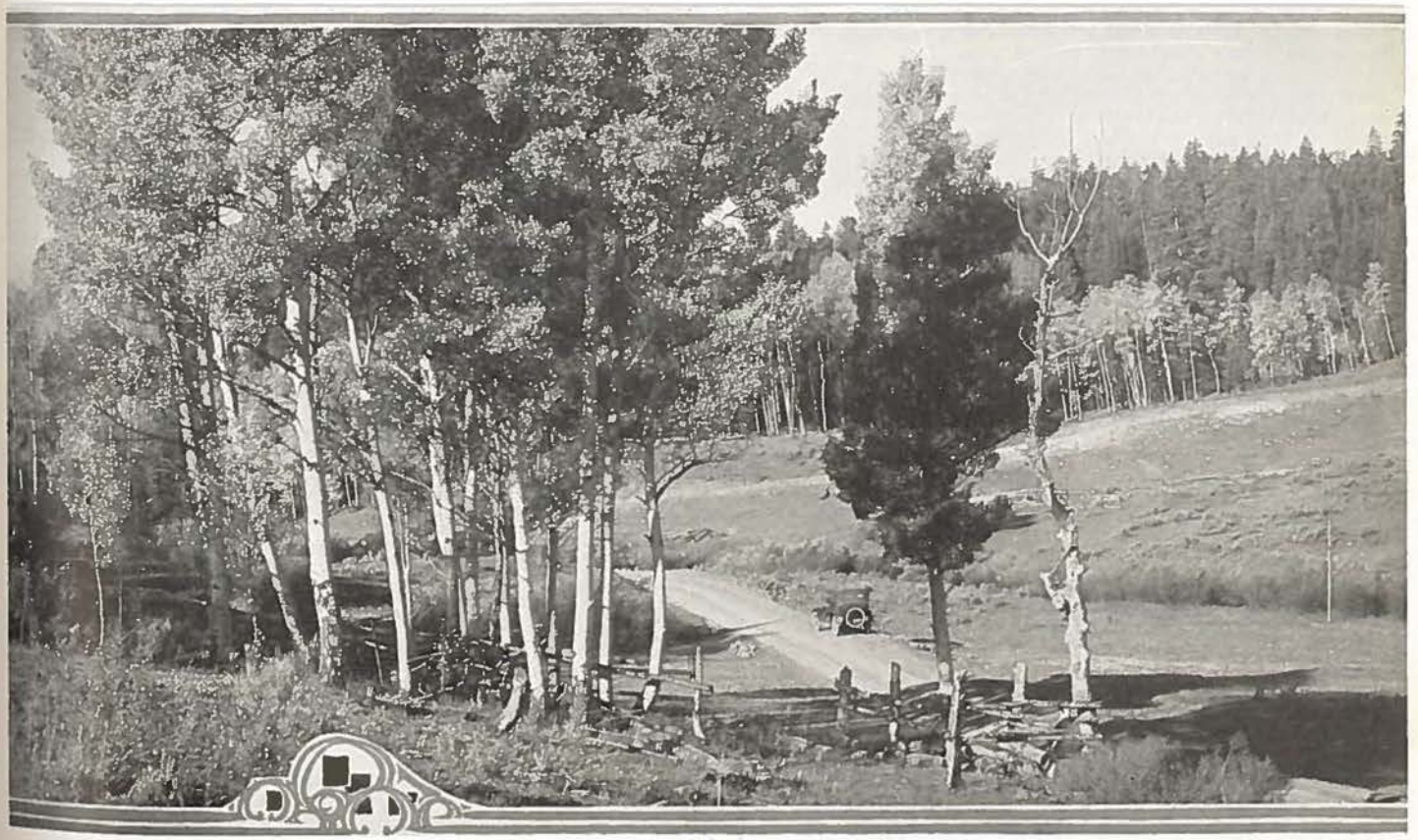
A report reaching the State Highway Department shows that some thirty odd miles of new roads connecting with the main state highways are being constructed in this manner.

The arrangement with the county is that the county road department furnish means for loading and the farmers haul and spread the surfacing free of cost, in some instances hauling surfacing six miles. By furnishing this labor free the farmers cut their road tax bill down to a minimum. The work is being done at a season of the year when teams of most of the farmers are idle and they are being used in building gravel roads over which the crops of next fall will be hauled. Besides saving on their tax bills the farmers will reduce hauling costs on all products marketed from the district.

The same condition prevails along Road No. 5-s south from Yuma, which was improved last year. The farmers in this district are getting together and improving connecting roads to this highway without cost to the county.

At present, Washington county boasts of some of the best surfaced roads in the state. The work that the farmers are doing in extending the "feeders" is indicative of the educational value of a comparatively few miles of well surfaced and maintained highways which the county had to start with a few years ago.

And in developing the roads in their county by co-operating with the officials in this manner the farmers figure that they are saving money, and saving money means making money—in two ways. They cut down their tax bills and reduce their haulage costs.



Scene near Kremmling, Colorado, on Victory Highway.

Tourist Traffic as a Factor in Highway Development

(*Continued from Page 7*)

the total maximum traffic on any road. It will, in many cases, force the construction of roads of a higher type than the local needs would demand because of its severe demands on low type roads at certain seasons. It is possible, for instance, to maintain gravel roads under certain weather conditions up to a certain total traffic per day without surface treatments and with general satisfaction to the traffic. But if this traffic is vastly increased during certain periods it is necessary from the standpoint of road surface and of public safety (on account of dust) to either build a higher type road or to surface treat the inferior type. It is probably not often that a surface treated gravel road is the truly economical type, and therefore where surface treatments are impelled by tourist traffic the construction of more permanent types of surfacing may be impelled.

Naturally the increased traffic, due to tourist business, produces increased maintenance costs in some cases. However, these increased maintenance costs due to tourist traffic on certain specific stretches are a very small portion of the total maintenance program of any state which is maintaining a statewide road system, and can probably be practically disregarded in a study of the economics of real all year around service to traffic.

Summing up the maintenance situation, it is our opinion that the light tourist traffic has very small influence on the cost or the policies adopted for maintenance by the average state. It involves certain extra costs, especially in specific instances on inferior road surfaces. On the higher types of road, it means practically no difference in the maintenance cost, and probably no difference in the maintenance cost on most of the lower types of road such as earth. It is only in the case of some of the intermediate type of structures that it increases the cost of maintenance by throwing the balance on the side of more expensive types of maintenance.

Cost of Detours.

One of the largest items of cost in the construction or maintenance of roads is the cost of detours, and if our people can be brought to realize that included in the cost of construction there must be included the cost of making detours, we would advance much more rapidly in the public demands for this service.

5. The State Highway Department should maintain, not only at their central office, but at all division offices, traffic information bureaus.

6. In addition there should be available for use by commercial organizations, banks and business houses, well thought out maps of various scales, furnished to these houses at cost, so that there may be the most widespread publicity of the touring routes and their condition in a given state.

The curse of the country has been poor and prejudiced map service. It is our contention that, within reasonable limits, a state cannot make a mistake in furnishing the maximum kind and number of highway maps needed for all types of highway map service.

An Essential Service.

All the above includes traffic service, unknown ten years ago, but it is a traffic despatching service which is absolutely essential in the proper conduct of the highway traffic of any state. The time has gone by when the states can afford to have a myriad of motorists seeking blindly to find their way. It is expensive, it is unnecessary, and it produces a loss of time, money, and morals not compatible with modern progress.

The traffic must be directed, not only for its own advantage in saving in time and money, but for the advantage of the state and county highway departments in keeping traffic off of roads where it would be inconvenienced and also inconvenience construction and maintenance operations.

Kind of Service People Appreciate.

We know from personal experience that, while, undoubtedly, our construction and maintenance work is welcomed, and probably most of our citizens and many of our visitors, appreciate the importance of it and the meaning of it to them as travelers, it is the traffic service which we have furnished—the numbering of our highways, the key maps, the traffic service maps—which has brought ten commendatory comments to one commendatory comment brought out by our construction and maintenance operations combined. The people appreciate this kind of service, they know that it means dollars to them, and more than dollars, it means comfort, convenience, safety and speed in their travels. The American public is going to insist upon more and more of it, and it behooves all who are connected with highway development, whatever the unit of government they serve, to recognize this demand and to meet it.

Colorado Adopts Standard Road Signs

(*Continued from Page 1*)

and all business firms should, and we believe will, be interested.

The Rocky Mountain Motorists, Inc., hopes to have all of its plans in operation by the time the tourists begin to arrive.

The movement has the endorsement of the leading and outstanding men of the state and is receiving the active support of the business men in all sections.

Three methods will be used in the unfolding of the plans of the organization:

1st. Everything will be done to interest the resident motorists and tourists in their own state; to make touring safer and happier; and to encourage auto travel by the residents of the state.

2nd. A comprehensive plan of publicity is being prepared to present to the touring public of the United States the scenic wonders, climatic advantages and tourist attractions of the entire region, to the end that we may bring into this territory a greater number and a larger proportion of the better class of tourists.

3rd. An extensive program of entertainment will be presented to the tourists who do come, which will tend to keep them in this territory longer. This will increase the spending power of the visiting public.

It is said that the tourist spends on an average of $5.00 a day. Last year we had approximately one million tourists in the state. If we increase the average length of stay only one day we are increasing the cash income of the state $5,000,000.

The possibilities are that through the efforts of the Rocky Mountain Motorists, Inc., the income derived from tourists may be increased by 25 to 30 million dollars.

This is bound to have a very beneficial effect on general business conditions in the state.

It is hoped that every business man, every business firm, every institution and large corporation will cooperate in this movement to the extent of their ability to support it.

Beet Farmers Save on Haulage Costs

(*Continued from Page 3*)

There was a possible saving of .38 of a cent per ton mile in fuel consumed. This saving applied to 1,232 tons of average daily traffic gave an average daily saving of $4.78 per mile of road. This daily saving would amount to $1,746 a mile a year.

It is computed that the saving in the cost of maintenance on the concrete road over the gravel road would pay the interest on the money invested in the concrete road, so that the saving on fuel costs would be net, and in about fifteen years would pay for the road.

Is it any wonder that the beet farmers of northern Colorado are demanding more concrete roads over which to haul their beets to the factories each year?

And in this connection it seems only reasonably fair that the road users should pay for the cost of construction and maintenance of thoroughfares without special assessments on adjacent property.

If the public surfaces a road and saves the owner of the rolling stock a large percentage of the cost of operating his car, the owner should be required to pay back a fair share of the savings. This should not be called a tax, it is rather a charge for service rendered.

At least this is the way a lot of folks are looking at this road problem of ours these days. And we don't know if they are not right about it.

"A dirt road is no better than the field in pulling beets out to the factory," said a beet farmer.

"About five tons is all that we can get out of the field with a four-horse team on one of these big wagons, but after we get it to the concrete it becomes a question of how many beets we can pile on.

"On the concrete road it is dead easy to haul two big wagon loads at one time. Of course, when we get to the beet dump we have to unhook the second wagon and pull them up one at a time.

"This concrete is a great thing and I hope to see the day that every road in the beet growing districts will be paved, because in a few years they will pay for themselves in the reduction of the costs of hauling."

The importance of good roads has long been appreciated by the Great Western Sugar Company. In the past few years this concern has spent approximately $75,000 per year in the construction of roads leading to their sugar factories.

This money was spent in co-operation with the various counties.

Rotory Snow Plow Proves Success In Trial on Road Near Palmer Lake

The time is not far distant when automobile travel across the Continental Divide every month in the year will become a reality. Working upon a design prepared by Major L. D. Blauvelt, state highway engineer, mechanics in the state highway department's repair shops in Denver have constructed a rotary snow plow which, in the opinion of highway officials, will solve the problem of traveling through the mountains during the winter months.

The first working model of the plow was tested out by highway department employes on February 26 and 27 on the highway between Greenland and Palmer Lake, in Douglas county. The test was a thorough one and demonstrated that the plow is capable of doing the work for which it was designed: clear the roads of snow drifts from four to six feet deep.

The plow, generally speaking, is a small edition of the typical rotary snow plow used by the railroads to clear their tracks of snow. Power to rotate the fan is furnished by a powerful Continental motor while the power required to push the plow through the snow drifts is furnished by a ten-ton Holt caterpillar tractor. The plow was built from material taken from scrapped trucks and other war material furnished the state by the United States government. Every bit of work was done by the highway department's own mechanics.

The rotating fan is about ten feet in diameter and revolves with terrific speed. When in motion the plow ate its way through drifts five feet deep as if there had not been any obstruction whatever. Snow was hurled over the telephone and telegraph wires strung along the road.

The test showed the plow fully capable of doing the work for which it was built. Some defects were uncovered by the test but these are of a minor character and can easily be remedied. Further tests will be made during the remainder of the winter and if they, too, prove satisfactory, the highway department will probably build several plows to be stationed in various sections of the state during the winters to come.

Road to Leadville Opened for First Time in Winter

For the first time since automobiles made their appearance in Colorado and came into general use, the main east and west road across the State has been open as far west as Leadville in the dead of winter. Early in February the commissioners of Lake county put a snow plow on the highway between Leadville and Buena Vista and succeeded in moving the snow sufficiently to permit automobiles to run. A number of machines took advantage of the road and made the run between the two cities. The commissioners of Lake county deserve high commendation for their enterprise.

Piers on Fort Morgan Bridge Over Platte Are Laid

The foundations for the concrete bridge over the Platte river at Fort Morgan have been laid, and work on the first of eleven spans has been started, according to officials of the Colorado Bridge and Construction Co., contractors.

The bridge is of the Marsh type, designed for beauty and to give a maximum of durability. It will be 1,112 feet in length when completed. There are eleven 90-ft. spans, ten 7-ft. piers and two 26-ft. abutments.

It is probable that the bridge will be electrically illuminated later. Work on the foundation was started last fall, and the contractors expect to complete the project by the middle of the summer.

When completed the bridge will cost approximately $80,000, which will be paid out by the state and federal governments. It will be the longest bridge in northeastern Colorado and will form a link in the Lincoln highway.

Arthur Hewett is in charge of the construction work.

STATE HIGHWAY DEPARTMENT
STATE OF COLORADO

COMBINED STATEMENT OF THE HIGHWAY FUND AND BOND FUND
FOR THE QUARTER ENDING FEBRUARY 28, 1923

BALANCES, 12-1-22			
Highway Fund	$439,975.53		
Federal Aid Bond Fund	902,852.61		
County Bond Fund	816,305.20		
TOTAL		$2,159,133.34	
RECEIPTS			
One Mill Levy	$181,418.36		
Motor Vehicle License Fees	249,052.37		
Gasoline Tax	63,885.97		
Internal Improvement	18,900.00		
U. S. Government	320,847.80		
Counties, Federal Aid Projects	35,361.80		
Counties, Merchandise	31,461.88		
Counties, Transfer from Bond Fund	7,954.61		
Bulletin Subscriptions and Advertising	1,319 20		
Refunds and Junk Sales	2,205.46		
TOTAL		$ 912,407.45	
TOTAL BALANCES AND RECEIPTS			$3,071,540.79
DISBURSEMENTS			
Federal Aid Project Preliminary	$ 21,501.96		
Federal Aid Project Construction	323,957.63	$ 345,459.59	
State Projects		115,856.28	
Maintenance		58,738 80	
Property and Equipment		25,715.52	
Administration, General Office	16,329.78		
Administration, Engineering	27,075.75	43,405.53	
County Bond Projects		238,519.30	
TOTAL			$ 827,695.02
BALANCES			
Highway Fund		$ 900,656.61	
Federal Aid Bond Fund		765,403.26	
County Bond Fund		577,785.90	
TOTAL			$2,243,845.77
TOTAL DISBURSEMENTS AND BALANCES			$3,071,540.79

RELATIONSHIP OF CONTRACTORS TO THE BONDING COMPANIES

The matter of road contract bonds in their relation to highway work has been the subject of considerable discussion among highway officials and contractors in Colorado during the past year.

There has been a general feeling among a majority of road builders that the bonding companies are largely responsible for the "fly-by-night" contractors who have been awarded jobs from time to time. During the past year these irresponsibles nearly broke the market, resulting in a good many of the old-line contractors refusing the bid on projects.

While the officials of the Colorado Highway Department have done everything possible to prevent irresponsible bidders from getting work, they have been practically helpless in the matter, when a contractor came up with good corporate surety bonds. In such a case there was nothing for the department to do but award the work to the lowest bidder.

As a result it has been necessary for the bonding companies to take over the work of a number of contracts where the bids were too low. It is contended that this has had a tendency to raise the rates on bonds, thereby working a hardship on all concerned.

It is contended that if the bonding companies had been more strict in their issuance of bonds, a number of these irresponsibles would have been ruled out.

An official of one of the bonding companies was asked what he considered the requirements should be for a contractor to obtain a contract bond. He replied as follows:

"The requirements to obtain a road contract bond are simple and only become complex or mystifying when the applicant forgets the credit relationship that exists between the applicant and the surety. As it is, only four things are needed:

"First, the surety wants some General Information, it wants to know whether the applicant is a corporation, a co-partnership or an individual; if a co-partnership, who are the individuals; and it desires to know the reputation of the applicant among those who have had business relations with him. The surety wants to know the previous experiences as a contractor in the class of work similar to that being considered, how long in the business, the kind of plant possessed, the size of the organization, and any other information that will show the applicant is able to properly estimate the cost of, and successfully complete the proposed work.

"Second, the surety must know the Financial Responsibility of the applicant; and it is always desirable to inform the surety of the amount of banking credit the applicant enjoys, and the basis on which it is extended. It is to the contractor's advantage to give his surety detailed information when making a financial statement, because the sureties, like banks and other organizations dealing with credits, do not allow any items that are not explained. For instance, an item like "Liberty Bonds and other securities, $30,000," might be stricken out unless a list of the securities is attached because there are so many oil stocks and other "phoney" securities that have no quick realizable value, and what contractors need in their business are securities that are readily accepted by a bank as collateral for a loan.

"When reporting accounts receivable, it is well to explain that all the items are due and earned from work performed and that no anticipated profits are included because the latter are never allowed. Also to indicate the market value and incumbrance if any of each parcel of real estate rather than lumping all real estate together in one item or to only give the equity claimed, as there are certain homestead exemptions that must always be considered.

"Plant is something that every contractor needs in his business but which wears out or deteriorates rapidly and plant has only a small scrap or salvage value if it happens the contractor is unfortunate and must liquidate at the end of a losing contract.

"Third, the surety wants to know about the Other Work on Hand and this is best reported by giving the contract price, kind of work, location, and approximate percentage completed of each contract, also whether or not they are proceeding on a profitable basis.

"Fourth, the surety wants to know something about the Proposed Work, the kind of work, the location, amount of the contract, the bid price, and the other bids, if the bids have been opened. It is desirable to submit a copy of the contract documents and engineers can assist in this matter if they will give the contractor an additional copy for the use of the surety. Sometimes we get them and sometimes we don't, and it is only fair to the surety to tell it what the obligations are before it assumes the suretyship."

The Corrugated Metal Culvert

(*Continued from Page 2*)

struction material. Nothing great was ever accomplished without experimental failures in the beginning. They do indicate, however, its adaptability and its limitations. Undoubtedly we have yet to learn much about concrete. As a material for the construction of culverts, experience seems to warrant the conclusion that it is adaptable conditionally:

Where not subjected to the fatal effect of contraction and expansion caused by freezing.

Where not subjected to the deteriorating effects of alkali.

Where properly reinforced for strength.

Where the accessibility of the necessary ingredients renders its cost economical.

Whether or not it is economical under favorable conditions depends upon the availability of some other material having the same qualifications at less cost.

Today the ideal culvert (after having passed through the light gauge and low grade material stage) is the pure iron corrugated culverts.

It was known that pure iron would resist corrosion. As a result of investigations and reports made by the Office of Public Roads, United States Department of Agriculture, a number of manufacturers changed their metallurgical processes so as to produce a very pure iron from open hearth furnaces. It is now possible to obtain an extremely pure iron for the manufacture of road culverts. This pure material is giving satisfaction to the manufacturers as well as to the road builders.

Thus was the corrugated metal culvert rescued from the list of undesirables, rehabilitated and given its place among first-class structures. But the standard corrugated culvert of today is far different from that of even a few years ago.

It is true that there are still to be found upon the market culverts manufactured from inferior grades of metal. The best grades are obtainable however, and great caution therefore should be used by public officials in purchasing them. The difficulty is to know when you are getting the right quality and for this reason the purchaser should be protected by reasonable specifications.

Specifications, alone, however, will not protect the purchaser. A substantial guarantee that the metal will meet the requirements of the specifications should be obtained from the manufacturer. Then, if proof positive is desired, an analysis of samples taken from the shipment should be made under the terms of the guarantee, and if necessary a bond required indemnifying the purchaser against any failures in compliance with the specifications in force.

So-called guarantees other than this are of little value for obvious reasons, chief of which, is the fact that should the manufacturers go out of business or be financially irresponsible, the purchaser's protection would cease. The safest guarantee is to know you are buying the right metal at the outset, Manufacturers, for the most part, can be relied upon to furnish material in culverts exactly as represented, having realized long ago that it is folly to do otherwise

There are good reasons for using corrugated metal culverts. Their general use throughout the country and their adoption by many of the State Highway Departments, railroads and irrigation companies is proof that they have passed the experimental stage. The specific reasons for their use are: They are strong and durable, easily handled and quickly installed, thereby reducing to a minimum the interference with traffic. They are not subject to injury by freezing or water contained therein, or by the action of alkaline soils. They effectively resist corrosion. They readily adapt themselves to unequal settlement in new embankments, and are easy to maintain. Finally, compared to other forms of culvert structures having the same qualifications, they are undoubtedly cheaper.

Another recommending feature of the corrugated metal culvert is that it is not destroyed by being washed out by sudden floods. There is nothing to break about a corrugated metal culvert. Full length culverts have been found far from the original site, after a flood, apparently intact and uninjured, and ready to be reinstalled and give the service originally intended.

The highest efficiency of any culvert is not realized unless it is properly installed. Corrugated iron pipe is more nearly "fool proof" than any other type in this respect but it cannot be expected to operate at its highest efficiency where carelessly thrown in a ditch without regard to grade or proper support and covered loosely with any kind of material. It should be laid true to grade on an even bed and the back filling should be thoroughly tamped or puddled around it. There should be at least twelve inches of fill over smaller sizes, 18 inches in diameter or less and at least eighteen inches to twenty-four inches of fill over those of larger diameter.

Good culverts make good roads. Good roads make for better markets. The producer can haul his products at any and all times cheaper on good roads than he can on bad roads. It is apparent that good roads are a great factor to all lines of business.

The best antidote for bad roads consists of three things: DRAINAGE—MORE DRAINAGE — STILL MORE DRAINAGE.

EXTRA MILE OF ROAD WITH 500 VEHICLES PER DAY COSTS USERS $18,500 PER YEAR

Every extra mile of highway on a road carrying an average of 500 vehicles per day, estimating at 10 cents per mile, costs the traffic using it, $18,500 per year. This is not paid out in a lump sum by the county or any other organization and it is practically impossible to effectually point out to the individual traveling the road just what part of it he is paying. Nevertheless it is a bill that must be paid by the public, either in the form of road taxes or paid individually by the motor car owner.

Two extra miles of such a road entail an additional cost of $37,000. A three-months' use of a detour road involving three extra miles' travel costs the users, on the same basis, $13,500. Highway engineers, with figures like these before them, are today learning the lessons railroad engineers learned years ago. Railroad engineers find it economical to spend millions of dollars cutting out every extra mile of distance. To gain a mile of distance they make huge cuts and fills, build bridges and tunnel through mountains. They did not do this in the first days of railroad building. They came to it only as accurate cost accounting methods showed clearly the extra cost of every extra mile in transporting their freight and passengers. Highway officials, with traffic census figures and transportation cost data piling up before them are now learning the same lesson. The average user of the highway seldom thinks of the extra cost the individual mile of travel causes him because in the individual case it seems too infinitesimal to even consider. Multiply the individual case by 500 or 1,000 per day, total the figures over a week, a month, or a year and the results assume astonishing proportions.

An extra mile of road with 500 vehicles per day, costs $18,500 per year extra, representing a 5 per cent interest on $365,000. The use of the three-mile detour for three months looms up the total of $13,500 expense to those forced to travel the longer distance simply during the construction of a main section of road.

A study of figures like these make it plain to the layman that it is sometimes economical to buy expensive roadway rather than to continue to use even good highways already constructed but needlessly long in route. It will explain why it is sometimes economical to buy new right-of-way and build a new road rather than to detour traffic while the old is being rebuilt. Figures like these will explain many things that may, to the layman, seem much like needless expenditure but which when considered in the light of the traffic census and transportation cost data make the action highly economical.

MISFIT HIGHWAYS.

America, so far as its highways are concerned, is like a boy who has outgrown his clothes. It isn't his fault. It will do no good to scold him. The remedy is to get him a new and larger suit and to make allowance for his continued growth.

Rapid increase in the volume, weight and speed of motor traffic is causing all the highway trouble according to officials of the Iowa State Highway Commission who have completed exhaustive tests to discover the best method of handling the road problem.

They discovered among other things the following pertinent facts:

Highways which used to have 20 to 30 vehicles a day now carry 500 to 1,000 in the same time.

Where the speed formerly was 4 to 8 miles an hour it is now 25 to 35 miles.

Where the loads used to be two tons at the most, now many a touring car with its passengers weighs that much, and loaded trucks reach ten and more.

In ten years the registration of automobiles in one state increased from 10,422 to 481,535. Road revenues ten years ago averaged $552 per vehicle. Now they average $50 per vehicle.

In eleven years traffic increased eleven times as fast as revenue for highway use. In eleven years residents of the state bought 718,000 new cars at an average cost of $800, a total of $575,000,000.

Revenues for highway construction where these cars run have totaled less than one third the cost of the machines.

Highway traffic has outgrown the road. No wonder the farmers of many states are demanding roads which will be as good as city streets.

BUT THEY CARRY MORTGAGES.

"Even the poor no longer carry bundles."

"Of course not! They take them right in their autos."—Judge.

PRESS COMMENT

GOOD ROADS MAKE VALUABLE FARMS.

We can't refrain from commending as strongly as we know how the community loyalty and public spirit that prompts our people to give their time and labor to the gravel surfacing of the road leading south from Mancos. It is a splendid piece of public enterprise of the kind that reflects great credit on any people.

This is one way of getting good roads without paying for them in cash more than we can afford, and it is one way our people can put in some of their leisure time in winter so that it will be worth real money to them. Improved roads are worth all they cost to the property-owners. If the people south of town should keep up the work from year to year they have so well begun until the main road is well surfaced to Webber Hall or beyond, it would add a thousand dollars to the value of every average farm in that community, and every such farm would be worth that much more to the owner either as a holding proposition or a selling proposition. It would be worth this much more by reason of the fact that the farmer could haul a full load to town or come to town in his car with ease and comfort under any weather conditions.

What is true in the Webber community is true in a measure with other local communities. While it may not be practical to surface long roads out to less wealthy communities, it is practical to surface those parts of the road that are persistently bad, for no road is any better than the worst mudhole. We hope to see our people go on investing some of their spare time in good roads from year to year.—*Mancos Tribune.*

TAXATION PROBLEMS.

Every day and every way the problems of taxation are growing more complicated. Now it is the railroad companies who declare that they are paying more than their fair share of the costs of state government and who want a part of their tax burden transferred to other shoulders, that is, to the owners of trucks that use the public highways.

In some cases there is a measure of justice in the railroad complaints. A man or a company engaged in trucking between Pueblo and Colorado Springs, Canon City or Rocky Ford, is a competitor of the railroads. The railroads have a very large investment and a complex organization. They serve a necessary public need apart from the local freight business. They pay large amounts in taxation, and they are strictly regulated by state and federal laws. They do not use the highways directly, but are compelled to construct and to maintain roads of their own; yet they are taxed for the highways, and the truck drivers use the highways to compete with the railroads.

But that is not the whole of the story. Take the case of the truckman who operates between Pueblo and Beulah and Rye, or between Colorado Springs and Florissant or Hartzel, or between Rifle and Meeker. In this case the truckman is not a competitor of the railroad for he serves a community to which the railroad does not extend, and there are many such communities in this state. Moreover, in such cases the truckman brings business to the railroad, just as much as does the branch railroad or the transfer man in the city, and in a measure this is true of all the truckmen. They are competitors and they are also feeders of railroad business. In many cases it is much better for the railroads to have the trucks bringing products from isolated communities and distributing their supplies, than to build branch lines to every remote mountain valley or isolated plains district.

It is easy enough to say that the truck owners and the railroad companies ought both to bear their fair share of the costs of state government, but it is much more difficult to say what that fair share actually is.—*Pueblo Chieftain.*

EQUIPMENT NOTES

Former Senator Thomas J. Ehrhart has joined the firm of H. W. Moore and Company, and will have charge of the maintenance equipment sales department, specializing on the Duplex Maintainer, for which the Moore firm is distributor in the Rocky Mountain region. Senator Ehrhart enjoys a wide popularity among road builders in Colorado, having been State Highway Commissioner for a period of ten years, and as such, of course, has played a prominent part in the development of roads in this state.

The R. Hardesty Manufacturing Company has a new plant for the making of Armco Corrugated Culverts in Denver. The plant is located at Thirty-first and Blake streets, and covers two blocks of ground. Offices of the concern will be maintained in the present location at 1833 Market street until sometime in the summer, when they will be removed to a new building adjoining the main plant. Ample storage and shipping facilities are provided in the new location. The Hardesty concern distributes Armco Culverts in the states of Colorado, Montana, Idaho, Utah, Wyoming and New Mexico.

J. P. Juett has taken his son's place as representative for H. P. Wilson & Co., on the western slope of Colorado, with headquarters in Grand Junction. Mr. Juett felt it his duty to continue the work started by his boy, Paul, in this territory. The son died the middle of December. At the time of his death young Juett enjoyed a wide acquaintance among contractors and county commissioners in the western part of the state and was making rapid strides in the selling end of the machinery trade in that section.

Thomas B. Burnite, representing Smith Pavers in Colorado, also has returned to his desk from a trip to the road show. He is optimistic over the prospects in the contracting field the coming season. He is also enthusiastic over the new 3-S tilting concrete mixer that Smith is putting out. It is designed to mix concrete, plaster and mortar.

A new bulletin has just been issued by the Pawling and Harnischfeger Company containing a complete set of operating views and complete data on their latest model 206 Excavator Crane. These are now being distributed in Colorado through Paul Fitzgerald, Denver representative of Landes & Company. One of the features of the P. & H. Crane is that it can be converted into a full revolving shovel.

New model Best Tractors are being featured by H. W. Moore and Company. These machines are now equipped with top controls and improved final drive. They also may be had in any one of three tops, enclosed cab, canopy or folding.

Fresnos and Lee automatic dump bodies manufactured by Moore in Denver also are now being featured by the sales force. The automatic dump body is said to be a big time saver and is very simple and effective in operation. They are especially adapted to all kinds of hauling on road jobs.

R. H. Atchison, sales representative of the Moore firm, has returned from a trip to the Marion Company plant at Marion, O. He accompanied G. B. Van Wagenen, sales manager, to the Chicago road show, making the side trip to Marion after the show was over.

Two Koehring dragline machines have been purchased by the U. S. Reclamation Service for use on projects at Riverton, Wyo., and in Yellowstone Park near Savage, Mont. These machines were purchased through H. P. Wilson & Co., distributors for the Rocky Mountain territory.

The recent purchase of heavy road building machinery by the Producers & Refiners Corporation indicates the value placed upon good roads by large business industries. This machinery, which consisted of two 10-ton Holt caterpillar tractors; two 5-ton locomotive type snow plows; one Austin Rip Snorter grader, and eight Miami 5-ton slowspeed trailers, will be used by the oil concern in building roads in the oil fields of Wyoming. At certain seasons of the year it is impossible to get supplies into the oil fields over roads maintained by the state, so the drilling companies have taken it upon themselves to build their own roads. They have found that it is cheaper in the long run, because with improved roads they are enabled to reach their properties without delay, and delays in the oil game are oftentimes very costly.

SMOOTH RIDING SURFACE PROTECTS ROAD FROM TRAFFIC

Impact tests, made on various experimental roads, show that even the slightest unevenness in the pavement surface leads to surprising results when motor vehicles pass over the pavement at the customary speed. Experimenters have been surprised at the force of the impact caused by the slightest unevenness or waviness. Tests show conclusively that to protect pavements from a rain of terrific blows, they must be built with a perfectly smooth riding surface. Contractors and inspectors have been inclined in the past to pay too little attention to the smooth riding qualities of their finished product.

Footpaths alongside the regular county roads are being considered by New Jersey officials as a means of adding to the safety on the highways. It is proposed to amend the highway law giving the State Highway Department power to place footpaths wherever it deems advisable. It is believed that with a separate path, pedestrians will keep off the regular highway and that hundreds of accidents will be prevented.

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS AWAITING APPROVAL

PROJ. No.	LOCATION	COUNTY	LENGTH	TYPE
81A	Mt. Vernon Canon	Jefferson	3.504 mi.	Crushed rock surfacing
125	Sapinero, West	Gunnison	2.708 mi.	Gravel surfacing and bridge
157B	Between Buena Vista and Leadville	Chaffee	6.526 mi.	Grading
207	Over Blue River, 13 mi. North of Dillon	Summit	100 ft. span	Steel truss bridge and approaches
211	Between Meeker and Craig	Rio Blanco	1.853 mi.	Gravel surfacing
223A	Between Kremmling and Steamboat Spgs.	Grand	2.881 mi.	Gravel surfacing
229	Between Pueblo and Florence	Fremont	0.879 mi.	Gravel surfacing
256A	Between Atwood and Merino	Logan	2.5 mi.	Concrete paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

PROJ.	LOCATION	COUNTY	LENGTH	TYPE
FAP 120	Over Clear Creek, NE of Arvada	Jefferson	2 spans @ 100 ft.	Steel truss bridge
FAP 135	Between Denver and Morrison	Jefferson	5.067 mi.	Concrete paving
FAP 159A	Between Ramah and Matheson	Elbert	6.288 mi.	Sand-clay surfacing
FAP 214	Durango, South	La Plata	3. mi.	Gravel surfacing
FAP 222C	Between Denver and Lafayette	Boulder	1.5 mi.	Concrete bridge & R. R. grade separation
FAP 224	Between Morrison and Baileys	Park	5.621 mi.	Mountain grading
FAP 226B	Platteville, North and South	Weld	4.023 mi.	Concrete paving
FAP 230A	Between Littleton and Sedalia	Douglas	0.852 mi.	Concrete paving
FAP 241	Over Gunnison River, ⅛ mi. North of Delta	Delta	4 spans @ 150 ft.	Steel truss bridge and approaches
FAP 247	Between Rocky Ford and Swink	Otero	1.149 mi.	Concrete paving
FAP 252	Loveland, South	Larimer	3.5 mi.	Concrete paving
FAP 255	Between Ft. Morgan and Brush	Morgan	2.8 mi.	Concrete paving
SP 705	Between Norwood and Naturita	Montrose	1.5 mi.	Grading
SP 800	Over Platte River, South of Julesburg	Sedgwick	84 spans @ 19 ft.	Timber trestle bridge and approaches
Melvin Bridge	over Cherry Creek, Southeast of Denver	Arapahoe	29 spans @ 19 ft.	Timber trestle bridge and approaches
Box Elder Creek Bridge	Box Elder Creek, ⅛ mile East of Watkins	Adams and Arapahoe	16 spans @ 29 ft.	Timber trestle bridge and approaches

HOLT TRACTORS

CATERPILLAR

Reg. U.S. Pat. Off.

2, 5 AND 10 TONS—SIZES

Build Roads CHEAPLY by

THE HOLT WAY

A Tractor of all Purposes

Stationary Drive, Pumping, Hoisting, Hauling, Removing Snow and many other applications

THIS UNIT IS THE IDEAL COMBINATION

No blade machine too big for them to successfully handle

Another Application---Holt and a Wagon Train

For Land Leveling the HOLT is There

WE WILL BE PLEASED TO GIVE FULL DETAILS OF THESE MACHINES OR FIGURE YOUR REQUIREMENTS

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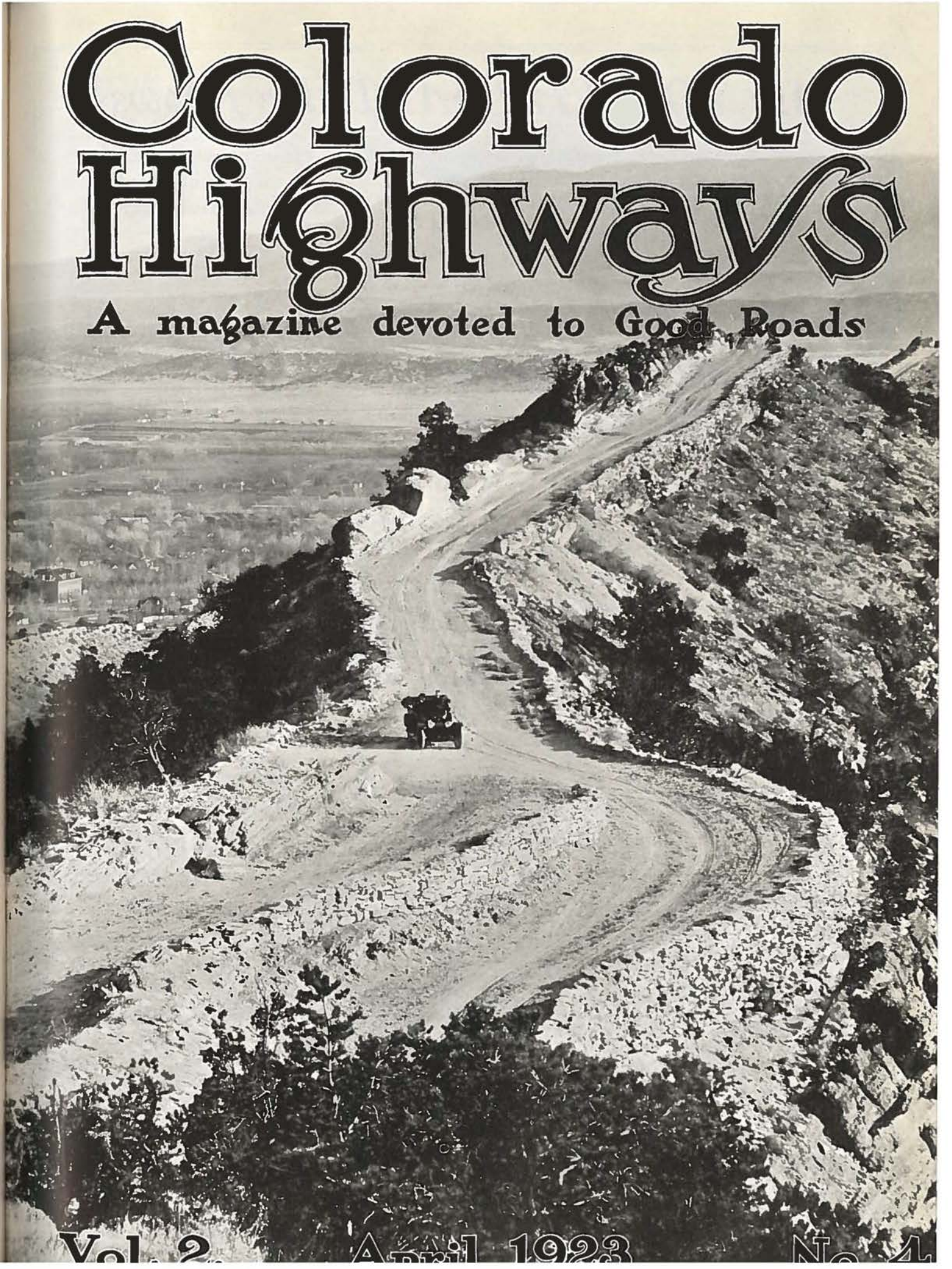
THE BRADFORD-ROBINSON PTG. CO., DENVER

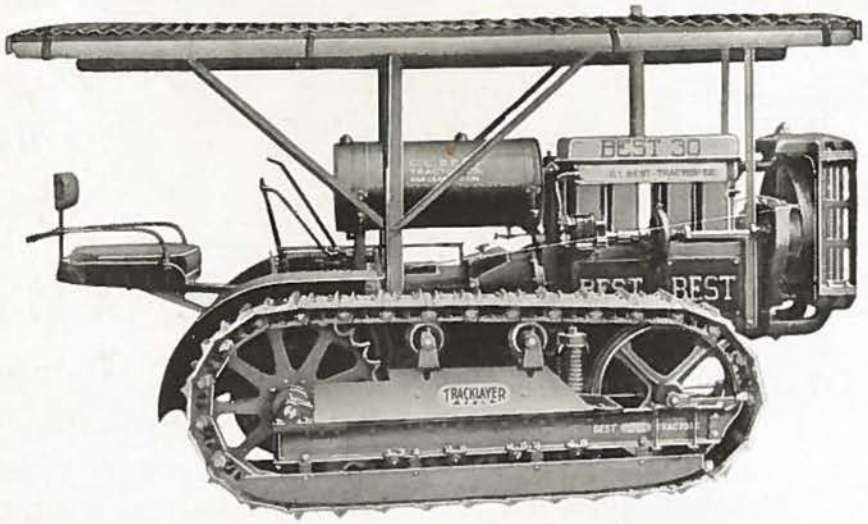
Colorado Highways

A magazine devoted to Good Roads



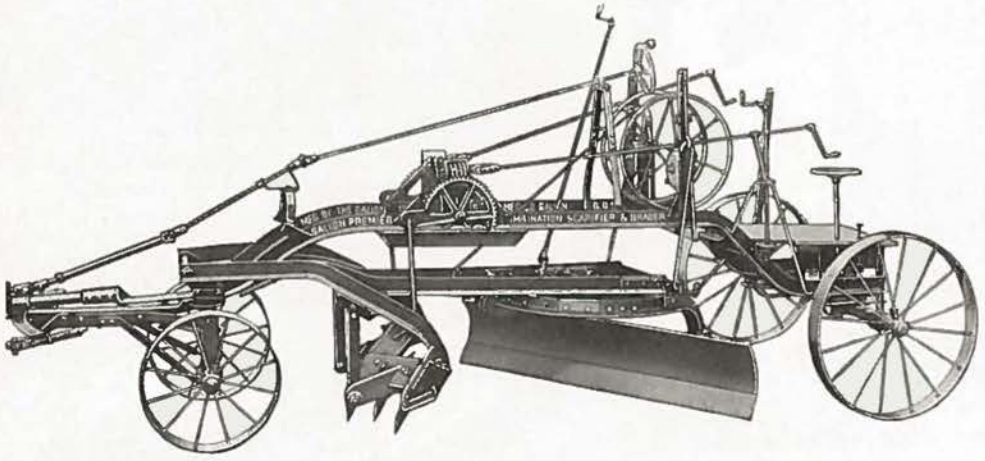
Vol. 2 April 1923 No. 4

Ask TOM EHRHART, He Knows!



He is suggesting the following combination for dirt and gravel road maintenance:

BEST 30 HP TRACTOR for Power



GALION No. 8 Combination GRADER and SCARIFIER for the Repair Work

DUPLEX MAINTAINER for keeping right the roads that the above equipment has made right

H.W. MOORE & Co

1761 WAZEE ST., DENVER

Our Service Department is unequalled in the West

Colorado Highways
"BETTER ROADS"

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10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

The view on the cover page of the April issue of Colorado Highways shows the Skyline Drive at Canon City.

This marvelous piece of road engineering traverses the crest of a rocky ridge of the mountain overlooking the city, for a distance of three miles. This magnificent boulevard is thirty feet wide and 800 feet high, and is unlike anything of a like character in the world.

The view obtained from this drive is beyond description. To the west lies a deep, narrow valley filled with garden tracts, the Greenhorn range of mountains and the world-famous Royal Gorge; Pike's Peak to the north; the snow-capped Sangre de Cristo range to the south; and to the east, Canon City, with its hundreds of green fields and orchard tracts.

Colorado Highways
"BETTER ROADS"
VOLUME II. APRIL, 1923. NUMBER 4.

Five Counties Reduce Road Costs

Old Time Road Boss Passes From Picture Under New System

(BY DAN J. McQUAID)

ROADS may be just designated routes to travel on, but let me say right here that they're building them differently in Northeastern Colorado, and the methods used are so successful that they have virtually cut the former costs in half.

Besides, the new type of roads are standing up in excellent shape, even under the severest use they receive during the crop-hauling season, when large trucks are seen everywhere hauling heavy loads of grain at high speed.

The taxpayers of Washington, Yuma, Phillips, Sedgwick, and Logan Counties are really getting their money's worth nowadays when it comes to road building. They are well pleased with the methods used by the Colorado State Highway Department and the results obtained from the spending of their proportionate share of the State bond money and also the road fund. New low cost records have been made in all of the above-named counties, due to the splendid co-operation with the county commissioners have given the Highway Department officials.

The old-time district or township road boss with his friends and favorites has been eliminated on all State roads in District No. 7. His place has been filled by a competent assistant engineer from the State Highway Department engineering division. This method cuts the former cost of such service in about half to begin with. Besides the slogan of "hit the ball or hit the trail" has been adopted, and the basis for all pay for hauling has been changed to a "piece work" system. In the old days drivers and teams were paid so much a day for their services regardless of the kind of a team they had or how much they hauled.

Gravel surfacing on this road by Colorado farmers

Under the new system the teamster is paid for the number of cubic yards of material he delivers on the project, and they can haul just as much dirt as they desire in a day, and are paid in proportion to the amount they haul. By this method the teamster with a light wagon hauling one cubic yard to a load only gets half as much as the man with a big, strong team hauling two cubic yards to a load.

Formerly it was customary to do as little as they could for this money; under the new system the harder they work the more they make and each team owner really takes a contract for hauling so much clay or gravel to each load for a certain sum, depending on how far they have to haul it.

Clay and gravel are the principal materials being used. Through the sandy sections of each county the loose sand is first removed down to a moist or hard bottom and to the width it is decided to build the road. Upon this road bed sev-

(Continued on Page 16)

Farmer team unloading gravel on Northern Colorado road.

120 Miles Without Rail Crossing

Many Improvements Planned On Pike's Peak Route To Coast

A STRETCH of 120 miles along the Pike's Peak Ocean-to-Ocean Highway, transcontinental route, without a single crossing of a railroad, will soon be completed in western Colorado and eastern Utah, when a new subway is placed under the D. & R. G. W. Railroad tracks at Clifton, Colo., and a short cut is made south of the tracks at Palisade, the only crossings of that road at this time between De Beque, Colo., and Cisco, Utah.

Thirty miles of this distance is now paved with concrete and gravel, and a special surfacing through the famous Plateau Canyon is as smooth as pavement most of the year, making one of the most comfortable as well as scenic roads in the west. The last 45 miles into Cisco, Utah, has in past years been only a moderate dirt road, but with the expenditure of several thousand dollars on bridges and grading this year should equal any dirt road in the state.

Before the tourist season starts the six per cent Forest Highway to Mesa Lakes, a beautiful group only 15 miles from the Transcontinental Highway, lying on top of Grand Mesa, will be completed, and also a new hotel, store, boat house, and camp improvements, will be in by that time, assuring tourists of a fishing and camp grounds of natural beauty excelled by none in Colorado.

State highway activities are unusually pronounced for this time of the year and promise more in results during 1923 than has ever before been accomplished in the western part of the state. Before the summer is over it is hoped that the new Douglas Creek Pass road from Grand Junction to Vernal, Utah, through the Rangley oil fields will be completed, affording a new route to Salt Lake City that avoids both the desert west of Grand Junction and the long desert encountered between Meeker and Rangley on the northern route, at the same time opening up a new resource of dazzling virgin scenery. This road was started by the Grand Junction Chamber of Commerce, and since has been designated a State Highway.

In a visit to this city recently Major L. D. Blauvelt, State Highway Engineer, expressed his entire satisfaction over the manner in which all Western Slope highways were being improved. There is not a bad mile of road on the detour to Ouray, often styled the American Alps; the Rainbow Route has been reduced to a grade at all places which makes it a joy to motorists, and the bad hills have been reduced to six per cent on the road from Grand Junction to the Mesa Verde National Park.

KEEN BIDDING BY CONTRACTORS FOR STATE HIGHWAY PROJECTS

If numbers of bidders and keen rivalry are any indication, the State of Colorado will get its roads built at the lowest possible figure this year. More than one hundred contractors crowded into the hearing room of the Colorado Tax Commission one day early in March when bids for three road projects were opened by State Highway Engineer Blauvelt. Numerous bids were received on each of the three projects, indicating that the contractors of the State are anxious to do work for the State. To be successful, a contractor must cut down his bid to the lowest possible figure consistent with good business.

FREE AUTOMOBILE TAGS ABOLISHED BY LAW ENACTED BY LEGISLATURE

Free automobile license tags—the brown tags with the letter X—are disappearing fast from the streets and roads of the State. As soon as the bill providing for their abolishment became effective through the signature of Governor Sweet, Secretary of State Milliken notified all holders of such licenses to take out regular 1923 plates and pay for them. Mr. Milliken's orders were obeyed promptly. Not a case was reported where payment of the license fee was refused, state, county and municipal authorities realizing that the money will be returned to the county or state road funds.

The only kicks registered came from the owners of automobiles who saw a petty graft taken away from them.

Modern road-making—showing the effect of the explosion of a ton of T. N. T. used by the El Paso County road crew, under Supt. H. A. Cudger, in blasting out a narrow portion of the North and South Highway near Pike View, four miles north of Colorado Springs. Photo by courtesy Pike's Peak News Bureau.

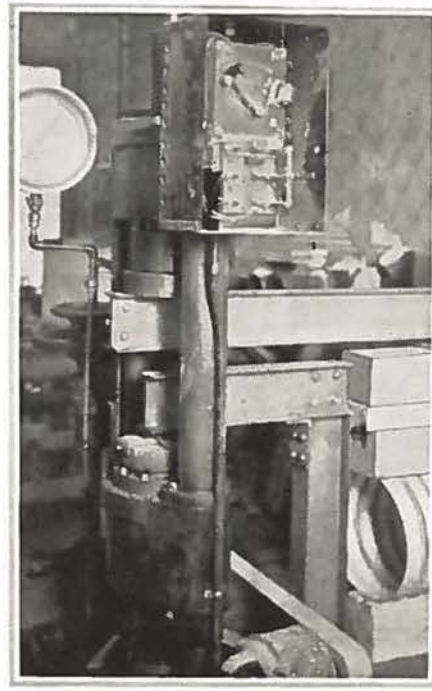
Material Tests Protect Public

Showing How Science Enters Construction of Modern Highways

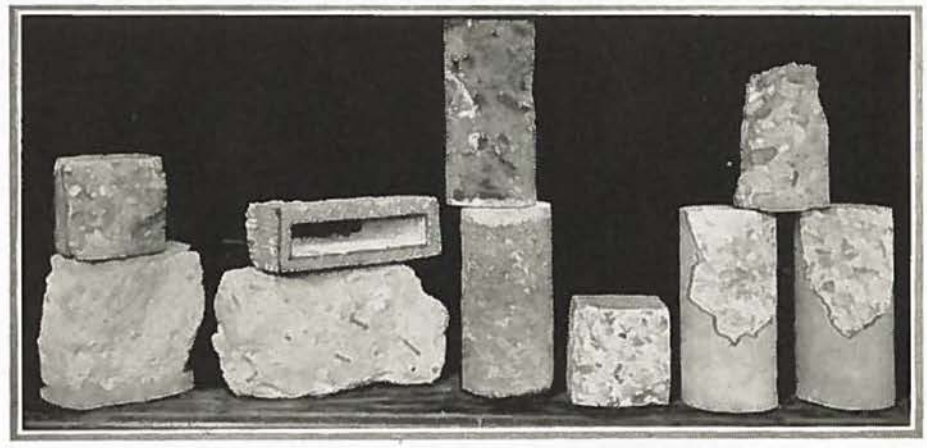
By GEORGE PIERCE, Mgr., Pierce Testing Laboratories

THE testing of structural materials is not new by any means, but since the building of Federal and State Highways has reached the present state of development these materials are being tested more than ever before. Such technical bodies as United States Bureau of Standards, The American Society for Testing Materials, The American Concrete Institute, The American Society of Civil Engineers, and the Portland Cement Association have spent years in getting together standard specifications and methods for the testing of structural materials. Further, since the United States Government has taken a very active part in the building of roads throughout the country, the United States Bureau of Public Roads has worked up standard specifications and methods for testing road materials, and all states which are receiving Federal aid in their highway construction have adopted these specifications and methods.

There are two kinds of materials entering into the construction of highway structures; those produced by nature such as sand and gravel, and those manufactured, such as cement, steel, and galvanized corrugated iron for culverts. The materials found in nature vary in quality as we find some sands and gravels which are perfect and cannot be improved on as road materials, while there are other sands and gravels which may be absolutely unfit for use and still others, which, while in their native state are not perfect, can by proper handling and manipulation be made to fill the necessary requirements. The same is also true of those materials which are manufactured, as there are different qualities in all manufactured materials, so we find cement varying in quality, also steel and culvert material which may or may not come up to the high standard required for highway construction. Consequently, all such materials which are used in highway work have to be tested, and if they do not meet the standard requirements they are rejected and other materials must be substituted. The old idea that sand is just sand, and gravel is just gravel no matter where found, no longer prevails. As an illustration, in the State of Colorado there are localities where the average sand will pass standard requirements, and there are others where it is very difficult to find sand in its natural state which will develop sufficient strength when mixed into concrete to make structures which will be permanent. The same is true of gravel, because in some localities the pebbles are composed of fragments of hard rock which have become worn due to the action of water, while in others the gravel is from disintegrated granite or from sandstone, and is consequently soft or friable. In other places it is impossible to find any coarse gravel and it becomes necessary to crush either granite, or hard limestone to make a coarse aggregate. One of the peculiarities of the sand and gravel deposits in the State of Colorado, is that where good sand is found it is often difficult to locate good gravel. The main sources of supply of sand and gravel are in beds of rivers and creeks or on the slopes of the valleys throughout the state. Those portions which lie nearest the mountain ranges generally supply the better kinds of sand and gravel, and especially the latter, as gravel being heavier than sand, it is the first to be deposited by the rivers while the sand is carried for hundreds of miles down stream. Hence in the eastern part of Colorado, as the valleys of the Platte and Arkansas, good sand is obtainable; but coarse gravel is almost unknown. On the other hand in western Colorado in the valleys of the Grand and its tributaries, good gravel is obtainable, but the sand is generally mixed with oil shale or dirt and consequently is of an inferior quality. The problem of the Engineering Division of the State Highway Department is to find suitable materials or else treat them by special methods of screening, washing, and crushing to bring them up to standard. It therefore becomes necessary to test all materials in a properly equipped laboratory where the samples are sent well in advance of the time when actual construction work is to be started. It is of the utmost importance that representative samples of the sand and gravel or crushed rock be taken. Picked samples, which would pass all the required tests, and be so reported, would prove misleading, if the general run of the pit proved inferior and later had to be rejected by the engineers. This not only proves costly to the contractors but causes delay to the construction work. Frequently, excellent sources of supply of gravel are passed up due to the hasty taking of samples at the top or edge of the pits, where the overburden has not been sufficiently removed and the samples contained more dirt than the general run of the pit. It is practically necessary that all sand and gravel be screened and reproportioned in the proper amounts to make the different classes of concrete which are used in the highway work. This does away with the old practice of using pitrun gravel and cement to make concrete. The standard mixes which are generally used in highway work are the paving mix for concrete roads, and Class A and Class B concrete. The last two mixes are used in concrete structures such as bridges, culverts, headwalls, spillways, etc. The paving mix consists of one part cement, two parts of fine aggregate (sand) and three parts of coarse aggregate (gravel or crushed rock), all of which are gaged with the proper amount of clean water so as to form a stiff working mixture. Class A concrete consists of one part cement, two parts of fine aggregate and four parts of coarse aggregate which is gaged with just enough water to make the resulting concrete flow



Compression Machine for Testing Sewer Pipe.



Specimens of Poor and Good Concrete.

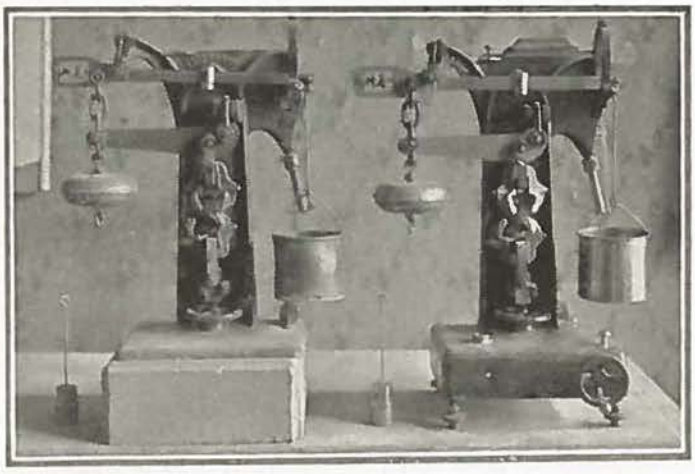
easily into place. As this class of concrete is used in reinforced work it is absolutely necessary that the mix be workable so that it can be placed easily in the forms, thus avoiding the honeycombed condition which is so often seen in concrete structures. Care, however, should be exercised that too much water is not used, as there is nothing which effects the strength of concrete quicker than the use of an excess amount of water. The consistencies of all concrete mixes, when made in the laboratory, are controlled by use of the Flowability Table. This device was designed and brought to its present state of efficiency by the U. S. Bureau of Standards and corresponds to some extent in regulating the water content of concrete mixtures, to the well known Slump Test of Prof. Duff Abrams of the Lewis Research Institute. Class B concrete consists of one part of sand, two and one-half parts of fine aggregate and five parts of coarse aggregate gaged with sufficient water to make a stiff quaking mixture, which should be of about the same consistency as the paving mixture, due to the fact that this class of concrete is generally massive and can be more easily placed than Class A concrete. It is very seldom that pitrun or bankrun gravel is found in the proper proportions of sand and gravel, and it therefore becomes necessary to screen the sand through a quarter inch screen which is the screen which classifies sand from gravel. Unless the concrete structures are very massive, it is necessary to either reject or crush all gravel which will not pass a two and one-half inch ring, and in some classes of concrete such as in thin slabs, beams and girders of bridges, it is necessary to reject or crush all material which will not pass a one-inch ring.

The tests which sand and gravel are subjected to in a laboratory are the mechanical analysis which indicates whether they are properly graded, tensile strengths of the sand when made into mortar, and compression strengths of the concrete which is made from the mixture of cement, sand, gravel and water. All sands are compared with a treated sand known as Standard Testing Sand which is put out by the Ottawa Silica Co., or Ottawa, Illinois, and which is used by all testing laboratories throughout the United States and Canada as a standard. In order to pass the highway requirements all sands must show a tensile strength at least equal to that of the standard testing sand when mixed in the proportions of one part of cement to three parts of sand and made into briquettes and broken at seven and twenty-eight days. The requirements for compression strength vary with the different classes of concrete, the paving mix or (1-2-3) having a minimum of 2000 lbs. per square inch at the 14 day period, and 2800 lbs. per square inch at the 28 day period when made into 6x12 cylinders. The Class A concrete or the 1-2-4 mix has a minimum of 1500 lbs. per square inch, at the 14 day period, and 2000 lbs. per square inch at the 28 day period. The Class B concrete has a minimum of 1300 lbs. per square inch at 14 days and 1800 at 28 days. All sands are tested for the percentage of elutriation contained in it, which means the amount of fine particle of foreign matter which adheres to the coarser grains of sand and prevents the proper adhesion of cement to the grains of sand. It has been found through experience that 3 per cent of elutriation is the maximum amount allowable and all sands which contain an excess of this must be thoroughly washed to remove it. A great many engineers and contractors hesitate going to the expense of putting in the proper equipment for the screening and washing of their sand and gravel, but there are several cases on record whereby thousands of dollars have been saved in the cost of construction just through the building of suitable screening plants. As an illustration $5000.00 was saved on one mile of concrete paving near Denver through the contractor's foresight in having early tests made of a deposit of sand and gravel prior to making his bid. This material was so dirty that all other contractors passed it up as worthless and figured on getting their materials with an additional haul of several miles. The laboratory tests showed that after washing these materials thoroughly, they passed all requirements and as a consequence the contractor's bid was $5000.00 less than the next lowest bidder, while the second bid was under the engineer's estimate. Another instance is where over $20,000 was saved in the Colorado State Highway Department through a series of laboratory investigations the results of which indicated that a certain sand could be used satisfactorily for concrete work, although it had been condemned for years as being unfit. On the other hand, serious concrete failures have occurred through the use of materials without first having them tested and thousands of dollars lost thereby. Recent instances have occurred wherein hundreds of yards of concrete had to be taken out and replaced through the use of faulty gravel. The accompanying illustration shows specimens of two different types of concrete, that which is excellent having been tested to over 7200 lbs. per square inch in compression as against that which was taken out having proved to be a complete failure and when tested gave a strength of only 190 lbs. per square inch. The former concrete being so hard and dense that it is practically impossible to make an indentation in it with a nail, while the other is so soft that nails could be driven into it easier than it is possible to drive them into oak lumber.

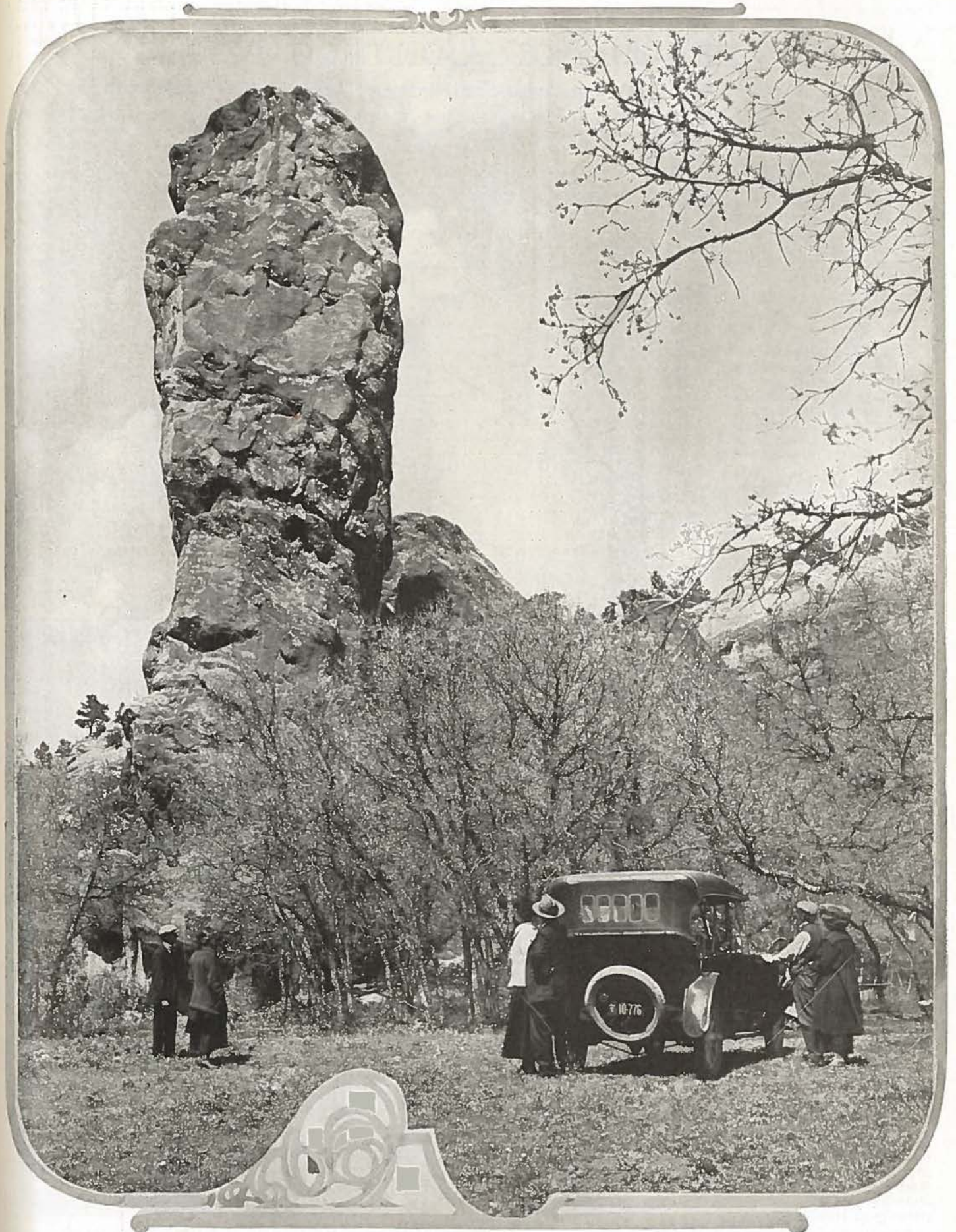
All cement which is used in state highway work is thoroughly tested according to U. S. Government standard specifications and methods. Practically all the cement used is sampled at the cement mills by personal representatives of the laboratory who are known as cement shippers. Two methods are used in sampling cement. When bin storage is available samples are taken every hour, or more frequently if necessary, as the cement flows into the bin. About ten pounds of cement are taken for each sample representing approximately 100 bbls. of manufactured cement. During the season of heavy shipments, it occasionally becomes necessary to resort to car sampling which is handled by having the shipper take a composite sample from 20 sacks picked at random in the car. All samples are shipped by express to the laboratory in Denver where they are tested immediately. The following routine tests are made on all samples of

(Continued on page 18)

Compression Concrete Testing Machine.



Tensile Machines for Testing Strength of Cement and Mortar.



Nature's Sentinel Obelisk in Roxborough Park, twenty miles southwest of Denver.

$13,500,000 For Colorado Roads

Largest Sum Ever Set Aside For Highway Work In This State

PLANS of the State of Colorado, of the counties of the state and of the United States government call for the expenditure of more than $13,500,000 for roads and bridges in Colorado during the year 1923. This is by far the largest sum ever set aside for the cause of good roads in Colorado. Its expenditure will go far to increase the state's fame for fine roads and will greatly contribute to the betterment of transportation facilities within the state.

The following table shows the agencies which will spend the money and the amount appropriated by each:

State highway department	$ 6,600,000.00
Counties (Counties raised by county road tax)	3,212,519.31
Counties (One half of one cent gasoline tax)	275,000.00
Counties (One half of automobile license fees)	425,000.00
United States government (Federal Aid)	2,636,350.00
Forest Service (forest highway fund)	427,000.00
Total	$13,575,869.31

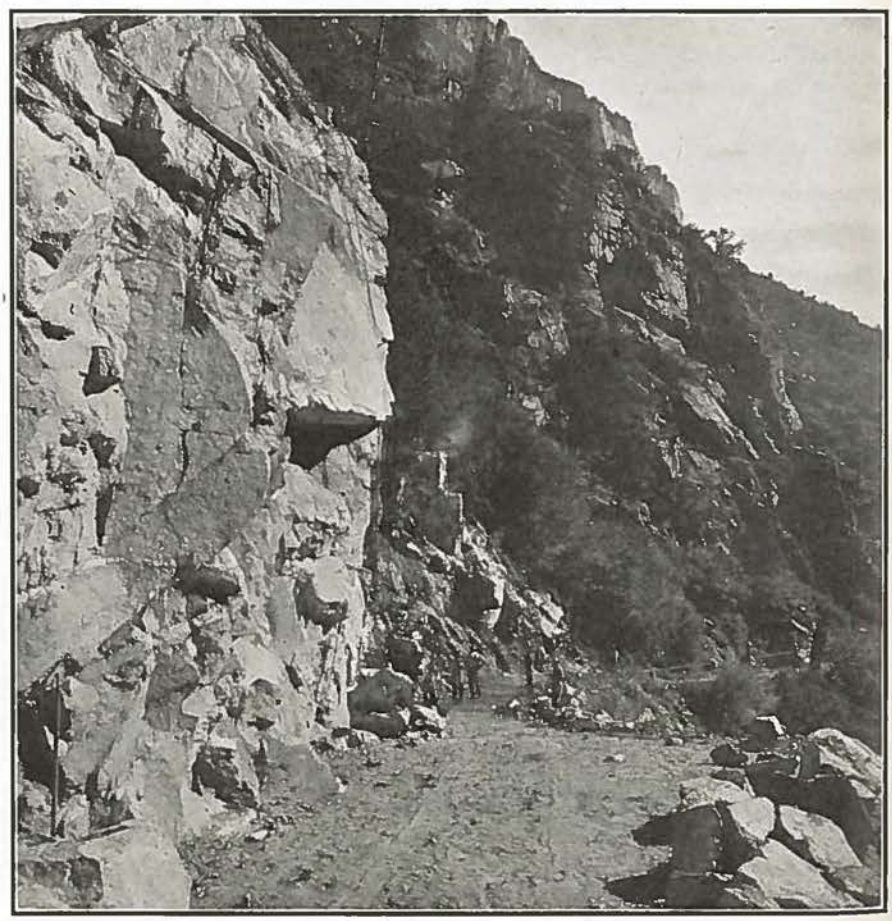
Included in the sum credited to the state highway department is the balance of the counties' half of the $5,000,000 bond issue, voted in November 1920 and $1,500,000 of the bonds authorized last fall, as well as $1,500,000 to be collected from the one-mill state road tax. The balance is made up by balances, state gasoline tax, motor vehicle license fees, etc. The amount to be spent by the United States government will be expended jointly by the state and the United States Bureau of public roads on what is known as federal aid projects. The forest highway fund money will be used for roads which are constructed in the United States forest reserves.

Nothing illustrates better the willingness of the people to tax themselves in order that all the roads in the state may be improved and put in first-class shape than the fact that the counties of the state have decided to raise not less than $3,212,519.31 for roads and bridges. This sum is twice as much as the amount which the counties pay into the state highway fund through the one-mill state road tax and is paid in addition to the latter. All counties levy this special county road tax, with the exception of Denver. Denver does not levy it because it has no highways or county roads within its confines, though the people of the capital city are taxed a little over $400,000 for their mountain parks. A goodly portion of this sum is used for the construction and upkeep of roads.

With the exception of slightly over $800,000 the entire amount raised by the counties in addition to their contribution to the state highway fund is used for the betterment of county roads. The $800,000 mentioned is used by the counties to meet a like amount appropriated by the state highway department for the maintainence of state highways.

Following are the amounts which each county is raising through county tax levies for roads and bridges. The figures were furnished by the treasurers of the various counties and are official:

Adams	$ 97,468.05
Alamosa	16,352.53
Arapahoe	46,624.62
Archuleta	14,462.03
Baca	32,019.27
Bent	28,747.43
Boulder	163,219.45
Chaffee	16,053.95
Cheyenne	25,602.05
Clear Creek	22,115.32
Conejos	21,670.74
Costilla	20,289.20
Crowley	23,313.74
Custer	10,864.51
Delta	60,721.37
Dolores	9,811.07
Douglas	28,794.15
Eagle	60,510.53
Elbert	85,794.30
El Paso	174,631.20
Fremont	62,161.19
Garfield	100,302.61
Gilpin	9,892.75
Grand	20,779.90
Gunnison	33,313.05
Hinsdale	4,687.45
Huerfano	43,382.94
Jackson	10,676.75
Jefferson	65,919.43
Kiowa	18,096.87
Kit Carson	$ 74,990.37
Lake	8,241.51
La Plata	60,262.42
Larimer	141,139.85
Las Animas	132,516.77
Lincoln	59,806.05
Logan	101,250.38
Mesa	110,059.24
Mineral	5,100.84
Moffat	27,040.28
Montezuma	40,383.43
Montrose	50,361.87
Morgan	60,097.74
Otero	96,278.95
Ouray	18,079.96
Park	35,699.38
Phillips	17,501.29
Pitkin	8,872.88
Prowers	62,743.98
Pueblo	126,425.14
Rio Blanco	19,835.90
Rio Grande	34,697.73
Routt	35,394.82
Saguache	34,500.47
San Juan	5,132.55
San Miguel	32,351.66
Sedgwick	34,005.71
Summit	16,012.53
Teller	29,335.16
Washington	43,660.23
Weld	297,381.02
Yuma	65,080.75
Total	$3,212,519.31



Heavy type of rock work encountered on mountain roads in Colorado—Scene in Glenwood Canon

Some Interesting Auto Figures

Statistics Show Colorado Has One Motor Vehicle For Every Six Inhabitants

WITH 151,499 passenger automobiles, 10,829 trucks and 2,770 motorcycles in operation in Colorado in 1922, this State stood seventh in the list of states, so far as the number of motor vehicles per number of inhabitants is concerned. Statistics collected by the motor vehicle department of Secretary of State Milliken show that there was one motor vehicle for every 6.01 inhabitants in Colorado.

This figure is considerably higher than the average for the entire United States. Reports from every state in the Union to Mr. Milliken show that there were in operation in 1922 the enormous number of 9,978,211 passenger automobiles, 1,409,439 trucks, and 193,495 motorcycles. With the population as shown by the 1920 census these figures show that there is one automobile for every 8.84 inhabitants of the United States.

So far as actual numbers are concerned, New York leads California by something like 140,000, but the average in the Empire state is only one machine for every 10.68 inhabitants. Ohio and Pennsylvania have licensed almost as many machines as California, but the average in these states is much lower than in California because their population is much greater.

The southern states show the lowest average of any group of states. Alabama, with only one machine for every 26.68 people, is at the very bottom of the list. The fact that these states have a very large Negro population who are unable to afford automobiles is probably responsible for the low average.

Some interesting statistics have been gathered by Mr. Milliken regarding the number of the various classes of motor vehicles licensed in the other states and the amounts collected in license fees for these vehicles. A comparison of the collections of the various states proves the oft-repeated statement that license fees in Colorado are among the very lowest in the entire country.

New York, in 1922, collected in license fees the sum of $12,575,380 on 1,027,468 automobiles and trucks. Colorado's collection from 165,098 vehicles was $991,677. On the basis of New York fees Colorado would have collected nearly $2,000,000.

The following tables show the states and the district of Columbia in the order of motor vehicles owned in them per population, together with the number of people per vehicle, and the 1922 registration of motor vehicles and collections of fees for the same year:

PERSONS PER MOTOR VEHICLE

December 31, 1922.

California	4.29
Iowa	4.90
Nebraska	4.97
District of Columbia	5.12
South Dakota	5.19
Kansas	5.47
Colorado	6.01
Oregon	6.05
Nevada	6.12
Indiana	6.36
Washington	6.39
Minnesota	6.48
North Dakota	6.35
Michigan	6.71
Wyoming	6.75
Wisconsin	6.98
Ohio	7.00
Vermont	8.03
Maine	8.37
Oklahoma	8.52
Idaho	8.53
Illinois	8.53
Missouri	8.74
Florida	8.83
Massachusetts	8.84
Maryland	9.00
Texas	9.24
New Hampshire	9.25
Delaware	9.30
Rhode Island	9.33
Connecticut	9.38
Montana	9.47
Utah	9.54
Arizona	9.67
New Jersey	9.71
New York	10.68
Pennsylvania	10.83
West Virginia	13.53
Virginia	14.03
New Mexico	14.48
North Carolina	14.52
Kentucky	15.89
Tennessee	17.51
Lousiana	17.95
South Carolina	18.00
Arkansas	20.80
Georgia	20.80
Mississippi	23.25
Alabama	26.68
TOTAL U. S.	8.84

REGISTRATION OF MOTOR VEHICLES

States	Total Registration of Cars and Trucks	Passenger Cars	Trucks	Motor Cycles	Total Fees
Alabama	90,052	80,183	9,869	638	$ 1,201,566
Arizona	38,034	.....	.....	425	216,958
Arkansas	86,425	78,425	8,000	237	998,531
California	861,805	822,394	39,411	16,300	8,384,606
Colorado	162,328	151,499	10,829	2,770	991,677
Connecticut	154,675	128,629	26,046	4,386	3,567,744
Delaware	24,560	.....	.....	427	426,377
District of Columbia	85,425	76,593	8,832	2,494	367,773
Florida	115,891	96,842	19,049	1,456	1,538,342
Georgia	145,584	128,654	16,930	1,000	1,831,541
Idaho	53,874	49,393	4,481	703	819,291
Illinois	786,190	686,466	99,724	8,156	7,882,482
Indiana	469,939	413,410	56,529	6,598	3,000,000
Iowa	500,148	468,736	31,412	3,569	7,923,388
Kansas	327,194	303,725	23,469	2,315	165,738
Kentucky	154,021	136,627	17,394	1,042	2,138,908
Louisiana	102,284	87,003	15,281	509	1,756,226
Maine	92,539	78,697	13,842	1,321	1,500,000
Maryland	165,624	153,748	11,876	7,579	2,824,843
Massachusetts	449,838	378,839	70,999	11,675	5,685,527
Michigan	578,980	518,558	60,422	5,163	7,807,145
Minnesota	380,557	341,322	39,235	3,240	6,488,593
Mississippi	77,001	70,430	6,571	109	3,016,000
Missouri	392,969	353,375	39,594	2,792	3,512,183
Montana	62,649	55,681	6,968	397	620,873
Nebraska	256,654	233,658	22,996	1,856	3,031,699
Nevada	12,647	10,000	2,647	112	120,937
New Hampshire	48,293	42,157	6,136	1,880	1,246,229
New Jersey	341,626	257,880	83,746	9,284	6,475,000
New Mexico	25,473	.....	.....	163	350,000
New York	1,002,293	781,070	221,223	25,175	12,766,364
North Carolina	182,550	163,600	18,950	1,190	2,826,075
North Dakota	99,052	96,080	2,972	766	699,000
Ohio	859,504	740,430	119,074	21,246	7,888,108
Oklahoma	249,659	.....	.....	952	2,729,169
Oregon	134,229	118,731	15,498	3,206	3,340,516
Pennsylvania	829,737	691,237	138,500	20,159	12,575,380
Rhode Island	66,466	53,455	13,011	1,459	1,139,742
South Carolina	95,978	88,400	7,578	605	741,714
South Dakota	125,238	116,141	9,097	660	807,960
Tennessee	135,716	119,319	16,397	861	1,589,824
Texas	526,238	.....	.....	3,410	4,261,488
Utah	49,156	41,935	7,221	725	749,272
Vermont	43,881	41,241	2,640	856	781,982
Virginia	169,000	146,000	23,000	2,200	2,900,000
Washington	220,957	189,016	31,941	3,846	3,291,671
West Virginia	112,763	.....	.....	1,361	1,936,079
Wisconsin	388,044	361,222	26,822	5,918	4,153,375
Wyoming	30,637	27,410	3,227	304	316,849
TOTAL	12,364,377	9,978,211	1,409,439	193,495	$151,384,745

Business vs. Politics

(An Editorial)

Often it is said that business and politics do not mix.

Far be it from us to debate the question. That's been threshed out countless times before.

But as regards highway affairs the answer is pretty well defined. Business wins with hands down, at least as far as Colorado is concerned.

Two years ago the General Assembly enacted the present highway law, but not until after a healthy legislative battle. Proponents of the measure promised a business administration in highway affairs.

And business, strictly business, it has been ever since. It can be truthfully said that more has been accomplished in road building during these two years than ever before in the history of the department. The pledge made two years ago has been adhered to to the letter.

In fact, the Highway Department has been almost totally divorced from politics. And thereby hangs a political tale.

At the beginning of the last campaign, leaders of the two big parties were approached by friends of the department and asked to include in their platforms a plank endorsing the $6,000,000 highway bond issue.

Their answer was "no"—a big, flatfooted NO.

"The Highway Department is out of politics, and let's keep it out," they said. "It's getting along all right now, so why not let well enough alone. We are for good roads, and that's the only plank that should go in the platform."

And so, "We are for good roads" was the sum and substance of the stand taken by both parties as regards roads in the last campaign in Colorado.

But this was not so in five other western states. Candidates for the gubernatorial chair in these states selected the administration of highway affairs by their predecessors for an "issue". As a result the personnel of the highway departments in all five of these states has been changed.

In each case the cry of the candidate was for a "business administration" of road matters. Some of the criticism heaped upon the old regime might not have been justified. But the selection of the highway target was a good one for the candidates, for it swept them into office.

So from this it might be said that "Colorado was two years ahead of the procession, as usual", because this State had divorced its Highway Department from politics two years previous, much to the satisfaction of all concerned.

For years it was a favorite indoor pastime of Colorado politicians to take a slap at the Highway Department. And for a good many years it proved effective political thunder. But times have changed and so has the administration of the Highway Department, and one doesn't hear so much knocking, but a great deal more of boosting all over the State nowadays.

If Colorado is to have 2,000,000 population in 1930, that's the way it should be. Because good roads will do more to help increase our population to this figure than anything else. The modern highway is an economic necessity and the greatest community developer known. Schools, churches and good roads go hand in hand. Attendance at schools and churches in communities with good roads is much greater than in districts with poor roads.

There is a demand all over the country that the highway department be divorced from politics, because it has been found that politics has been one of the most menacing influences directed against progressive, efficient highway development.

In this respect Colorado is fortunate in having its highway engineer and his subordinate placed under civil service regulations, making their removal subject to the review of this commission. Experience has shown efficient and economical work can be accomplished under this plan, not alone in Colorado, but in other states having the civil service code.

Every sixth person in Colorado owns an automobile.

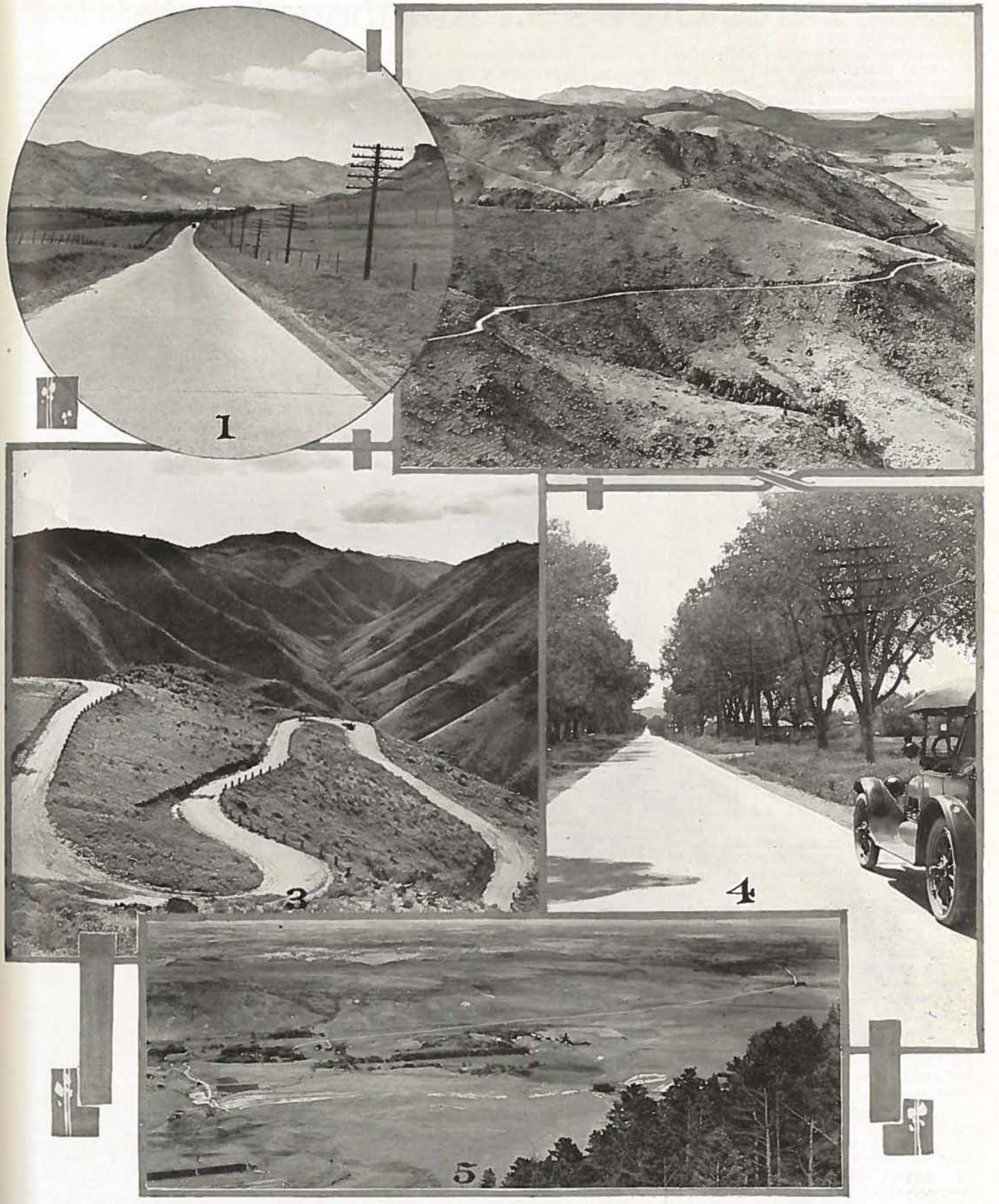
Colorado has a road program covering a four-year period. This program was approved by a 65,000 majority at the November election.

On two occasions Colorado citizens have given their approval to the good roads movement by overwhelming majorities.

Colorado's road tax bill in 1923 will be $13,500,000, over half of which was voted by the people.

Tourists spent $45,000,000 in Colorado in 1922. Over 60 per cent of these visitors came here in automobiles. By making further improvements on our road system it is estimated that they can be prevailed upon to stay from two to four days longer, thus increasing the above amount by $25,000,000 each year.

Colorado is the only state in the Union that doubles its population each year. Yes, the other half are tourists.



Scenes along route to Denver Mountain Parks—(1) Concrete paving between Denver and Golden. (2) A fine stretch of gravel surfacing on Lookout Mountain. (3) Lariat Loop on Lookout Mountain. (4) A shady stretch. (5) The concrete road as viewed from the top of Lookout Mountain with Denver visible sixteen miles away.

Three Crews on Rainbow Route

What may be termed the last remaining "bad" stretch of the Rainbow Route —one of the State's principal east and west highways—will have been put into first-class shape by the end of the present year, Highway Department officials declare, provided the United States Bureau of Public Roads gives its approval to a project covering the improvement of the first few miles west of Sapinero, in Gunnison County.

If approval of this project is given in time to undertake construction this summer, not less than three separate and distinct outfits will be at work during the summer getting the "bad" stretch into as good shape as the balance of the Rainbow Route.

This stretch is that portion of the route across the Blue Mesa in Gunnison and Montrose Counties, between Cimarron and Sapinero.

A large gang of convicts constitutes the first of the three outfits. These convicts have been at work all winter improving the highway west of Cimarron toward Cerro Summit. They worked last summer getting the road from the western approach to Cerro, across the summit and for several miles east of the latter, into shape. They are now working from the point where they left off last fall. When they finish this part of the work they will undertake to rebuild and put into shape the road east from Cimarron to the Montrose-Gunnison county line.

The second crew will be established near what is known as the Half-Way House at the junction of the Big and Little Blue Rivers. Its members will work under the direction of Robert H. Higgins, superintendent of maintenance, and George Toupain, his district assistant. The Highway Department has purchased a steam shovel which will be put at the disposal of this outfit. Elimination of grades and widening of the road will occupy the attention of these men. The work is extremely heavy, but when completed will make this portion of the Rainbow Route as safe and easy to negotiate as any. Toupain was in Denver during the latter part of March and made arrangements for the shipping of the big shovel.

The third section of work is that covered by the plans now under consideration by the United States Bureau of Public Roads. It covers a three-mile stretch immediately west of Sapinero. An appropriation of $90,000 has been made in the 1923 budget of the Highway Department for this project. It includes construction of a bridge across the Lake fork of the Gunnison, at an elevation of 131 feet above the river bed, one of the highest, if not the highest bridge in the State.

Surveys heretofore submitted for this bridge and the approaches were rejected by the Bureau of Roads for various reasons, but Highway officials believe that the present plans will meet with the Bureau's approval. If the plans are satisfactory the bridge will be approached at a maximum grade of six per cent, and numerous bad hills, some with a twenty per cent grade, will be eliminated.

FUNDS AVAILABLE FOR BIGGEST STATE ROAD PROGRAM ON RECORD

The Highway Department will start the 1923 construction season with more money to its credit in the state treasury than any year since the Department was created. The fiscal year 1922 saw the Department with a balance of $1,342,828.14, and this has been added to materially by the payment of the State road tax of one mill. Edwin Mitchell, head of the auditing division of the Department, announces that sufficient money is now at the disposal of the Department to insure an uninterrupted building season. The Department will be able to meet all demands upon it, no matter how rapidly construction progresses. No longer will contractors be compelled to wait for their money, as was the case before the Department was reorganized following the adoption of the present highway law.

The excellent financial condition of the Department is, in no slight measure, due to the hearty cooperation of the commissioners of many counties which had contracted to bear the expense of a large number of Federal Aid projects several years ago. The county commissioners have paid, or are paying, their counties' obligations and, by doing so, have materially assisted in placing the Department on a sound financial basis.

TEN YEARS AGO—AND TODAY

A picture taken on the Rainbow Route near Montrose, ten years ago.

Type of Federal Aid road near Montrose, today.

Commissioners Discuss Unit Cost of Road Maintenance

Maintenance cost accounting was one of the chief topics discussed by members of the Association of County Commissioners of the Fifth Highway District at the Association's meeting in Cheyenne Wells on March 17th. The Highway Department was represented at the meeting by Robert H. Higgins, superintendent of maintenance, and Ben Briggs, assistant superintendent for the district.

Both Higgins and Briggs pointed out the importance of proper accounting on maintenance work and of keeping records regarding various expenditures entering into the task of keeping the highways in proper shape. Obtaining unit costs, they made it clear, will help in guiding the Highway Department and the counties in making maintenance appropriations and keeping a check on expenditures.

Despite the fact that the weather was extremely bad, the meeting was well attended. Of the nine counties embraced in the district, only three were not represented. The counties in the district are: Chaffee, Lake, Teller, El Paso, Douglas, Elbert, Lincoln, Cheyenne, and Kit Carson. Those not represented were Lake, Chaffee, and Douglas.

George W. Huntley, president of the association, presided over the deliberations.

In the evening a banquet was served at the Cheyenne County high school, under the direction of Miss Lucille Kenyon, domestic science teacher, assisted by the high school girls, wearing green caps and aprons. This being St. Patrick's Day, the decorations and the several courses of the banquet were carried out in a green and white color scheme. The Royal Novelty Orchestra furnished music and songs for the evening, which was greatly appreciated by all. Speeches followed the banquet, Judge V. H. Johnson extending a welcome to the assemblage and introduced Richard Quinn of Cripple Creek as toastmaster. John Crook, whose speeches were last week broadcasted by radio from Denver, was the first speaker, followed by H. W. Moore, president of the Moore Hardware and Mfg. Co., of Denver; W. E. Graves, principal of C. C. H. S.; H. Riley, of the Out West Printing Co., of Colorado Springs. At the last district meeting Anton Johnson and J. W. Shy of Cheyenne County had promised to write an essay to be read at this meeting. This essay, entitled "The Frog," was read by Mr. Shy, to the great enjoyment of those present. Next was J. H. Curtis, one of Cheyenne Wells' leading young business men; C. T. Link, of the state tax commission, was the next speaker. Mr. Crook was called on to give his famous address, "The Call of the Mountains." This was the most interesting effort of the evening and as given by Mr. Crook in his pleasing and forceful manner, one can hear the "call." This gentleman was followed by Senator Ehrhart of Denver. Mrs. Schultz, wife of Commissioner W. C. Schultz, was then called on, and responded with a few words, after which the meeting was turned over to G. W. Huntley, president of the district association.

The next meeting will be held at Cripple Creek some time in June. There were about 100 present at this meeting.

Much credit is due the business men of Cheyenne Wells, who united with the county commissioners and spared no effort to make this meeting a success.

WORK ON FORT LUPTON PAVING TO START WITH FIRST WARM WEATHER

Preparations are going forward at a rapid rate for the extention of the paving on the Lincoln Highway north from its present extremity two miles south of Fort Lupton through that town and north to Greeley. Contractors Johnson and White of Denver are already on the job and are constructing a huge cement warehouse south of Fort Lupton and are installing a large central concrete mixing plant. Workmen have been active during the good weather all season hauling sand and gravel to sites near the highway in preparation for the spring and summer work and as soon as warm weather can be assured, actual work of laying the concrete will commence.

The present contract of Johnson and White calls for seven and one-half miles, which will bring the paving to a point three miles north of Fort Lupton from where it will be extendel through Platteville and thence along the newly-constructed roadbed parallel to the Union Pacific tracks, passing through La Salle and Gilcrest. This will eliminate the winding and dangerous bottom road that has been such a sore spot to motorists. The new survey will strike the present Greeley paving just north of La Salle.

It is expected that all the paving will be completed this season. The newly constructed roadbed from Platteville north to Gilcrest and La Salle will be a great improvement to the Weld County roads and will invite more general travel of that strip of highway.

Due to the fact that the detours through this section of the county will be very good, citizens are looking for increased travel even while this strip of paving is being laid. The river road north of Platteville will offer exceptional detour comforts and the detours south of this point will be comparatively short and furnish a hard roadbed. The long detour west of Fort Lupton and across the river will be eliminated by a short easterly road.

CONVICTS MAKE GOOD PROGRESS ON CACHE LA POUDRE HIGHWAY

Convicts from the state penitentiary, under the direction of George Ashler, have been and still are engaged in widening the Cache La Poudre road near the east end of the canon, a few miles west of Fort Collins. The men were brought down from the present western terminus of the road when cold weather and snow made work there impossible. They have worked near the mouth of the canon all winter. When they finish their present job the road will be of standard width through its entire length.

If present plans are carried out the convicts will be returned to their old camp near Chamber's Lake in the spring and again put to work extending the Cache La Poudre road to the foot of Cameron Pass, there to meet the road which is being built by the forest service over the pass. Once the convicts and the forest service people finish their jobs it will be possible for the residents of North Park to drive to Fort Collins, Denver and other Colorado cities without being compelled first to make a detour to Laramie, Wyoming.

PLANS FOR PAVING ON MORRISON ROAD COMPLETED BY ENGINEERS

Plans and specifications are being prepared for another stretch of concrete pavement on the Denver-Leadville road, via Morrison, Bailey's, Jefferson, Kenosha Pass and Fairplay. The part of the road to be paved is in Jefferson County and will connect the present stretch of concrete out of Denver with the mile of pavement being constructed out of Morrison toward Denver.

The road, when the work is completed, will follow the present road only in spots. Most of the present road will be abandoned for what the engineers consider a better route. The road, when completed, will not pass through the high cuts, a few miles northeast of Morrison, but will run to the east and south of it.

The survey of the new route has met with the approval of the United States Bureau of Public Roads.

TWO CARS CAN NOW PASS ON ROAD THROUGH JARRE CANON

Contractor Richard McQueary, of Grand Lake, and a force of men are completing a much-needed piece of road improvement upon which they have been engaged the greater part of the winter. The work consists of widening what is known as the Jarre Canon road between Sedalia and Decker's, in Douglas County, a road serving as an outlet for the people living in the Platte Canon country and also a link in the Denver-Cripple Creek road, by way of Divide. For several miles the road has been widened until now two machines can pass anywhere in the Canon.

The project embraced some extremely heavy rock work. In several places cliffs forty feet high had to be shot away. The men were seldom, if ever, interrupted by snow storms or severe weather.

ROCK SHAPES AND FACES

Erosion has sculptured a profile of Lincoln, the immortal, out of the Colorado Rockies at Evergreen; Jumbo Elephant, at Palmer Lake, along the Denver & Rio Grande Western Railroad; Whistling Swan, in Platte Canyon; Mother Grundy, in Clear Creek Canyon, along the Colorado & Southern Railway; Human Skull, on the Skyline Drive, at Canon City; Sphinx Head, near Corona, along the Moffat Railroad; Wise Owls, in Estes Park, and Lingering Lion, in the Garden of the Gods at Colorado Springs.

Legislators Divided on Bills Affecting Activities of State Highway Department

Highway legislation occupied a good deal of the attention of the members of the general assembly early in April. Two bills, both of which will have an important bearing upon the finances of the state highway department during the next two years, were up for consideration but at the time of going to press no definite decision had been reached on either measure.

The bills referred to are the bill repealing one-half of the one mill levy for state road purposes and the bill dealing with the State gasoline tax.

Early in March the house passed the gasoline tax bill with a tax of 2 cents per gallon and an equal division of the proceeds between the state highway department and the counties provided for.

The senate adopted and sent to the house a bill repealing one-half of the state road mill levy. This bill was approved by the house on second reading but then "put on ice" to await action of the senate on the gasoline tax bill. House members expressed the opinion that the house should not pass the mill levy repeal bill until the senate had acted upon the gasoline tax bill. These members felt that repeal of the mill levy, without a substantial increase in the gasoline tax, would cripple the highway department and curtail the activities of the department in carrying out the program laid out for the next four years.

Early in the month the senate went on record as being opposed to any increase in the gasoline tax. It amended the house bill by again fixing the tax at one cent per gallon, as at present.

Thus matters stood at press time. Representatives who believe that reduction of the revenues of the highway department by $750,000 a year is a mistake, have announced that they will make one more effort to induce the senate to change its position. They are planning to make the gasoline tax bill the subject of a conference between house and senate committees and work out something which will meet the approval of both bodies.

Action upon the mill levy repeal bill will depend upon the outcome of the efforts of the conference committee.

Billboards On Curves Are Forbidden by New State Law

In the future it will be unlawful to erect a billboard or advertising sign on any public highway within 300 feet of a crossing or upon a curve in such a manner as to obstruct the full view of the curve. The general assembly has enacted into law a bill by Representatives Lake, of Denver, and Niven, of Boulder, forbidding the erection of billboards and advertising signs. Violations are punishable with a fine of not less than $25 and not more than $100 or a jail sentence ranging from ten to thirty days, or by both fine and imprisionment.

The bill, which had the backing of almost every motoring organization, will eliminate a great source of danger on Colorado's highways, besides, it will prevent the marring of the landscape through ugly signs.

Gov. Sweet Names New Member to Highway Advisory Board

Mr. John A. Donovan, of Longmont, will become a member of the state highway advisory board in May. He was appointed by Governor William E. Sweet as the member from the sixth district, represented at present by Mr. H. A. Edmonds, of Fort Collins. Mr. Edmonds' term will expire in May and Mr. Donovan was appointed to take his place.

Mr. Donovan has been a resident of Longmont for a number of years. He is engaged in the wholesale lumber business and is rated among Boulder county's most substantial citizens. Always a friend of the good roads movement, he is sure to take an active interest in the affairs of the state highway department.

Mr. Donovan's appointment will necessitate a reorganization of the advisory board. Mr. Edmonds is chairman of the board and the election of a new chairman will become necessary. Mr. George L. L. Gann, of Pueblo, is the present vice chairman.

WORK ON WOLF CREEK PASS ROAD TO START EARLY PART OF JUNE

The coming summer will see the completion of the work on the State Highway over Wolf Creek Pass, one of the State's most important east and west roads and the chief highway leading into the San Juan country and to the Mesa Verde National Park. When heavy snow storms stopped the work last fall, the steam shovel used to widen the old road and to cut down heavy grades, together with supplies, was cached near the top of the pass. As soon as the weather permits, a crew of men will be sent to the pass and the work resumed where it was left off last fall. Sufficient money has been set aside to complete the road on the west side of the Divide.

With the work completed the road over Wolf Creek Pass, one of the most attractive, scenically, will be as safe and easy to negotiate as any mountain road in the State.

PAVING ON BROOMFIELD ROAD TO START WITH WARM WEATHER

With the arrival of warm weather the laying of concrete on the North and South Highway, from Broomfield north, will begin. Grading will have been completed within a few weeks. Due to the fact that the engineers' plans call for cutting down the grade of the highway from the Interurban crossing, north of Broomfield, to the top of Goodhue Hill, those in charge of construction work have been compelled to close the road for traffic of every sort.

An excellent detour has been provided. Until the project has been finished and, perhaps, until the next stretch, from the top of Goodhue Hill to Lafayette has been completed, all traffic will be routed over the road which branches off the North and South Highway just south of the Interurban crossing north of Broomfield. This is the road to Boulder via Marshall. It is followed for a short distance and then the automobilist turns upon a country road which leads him into Lafayette.

The detour has been newly graveled and road signs have been provided, so that he cannot go astray.

ENGINEERS RUSH PLANS FOR SCORES OF NEW HIGHWAY PROJECTS

Never before in the history of the Highway Department have the men of the Department's engineering division been so busy as during the present winter. Determined to "clean up" the 1923 budget for road construction, Highway Engineer Blauvelt, early in the fall, gave instructions to use the off season for the preparation of plans and specifications for as many budget projects as possible. The engineering division "went to it" with a vengeance and as a result numerous projects are ready for advertising. Construction work will be begun on a scale unprecedented in Colorado as soon as the weather permits.

EX-SERVICE MAN APPOINTED HEAD OF TRAFFIC DIVISION

Thomas Elkins has been named head of the traffic and purchasing division of the Highway Department. He took over the duties of the office on March 15. He was named from the eligible list created by the State Civil Service Commission through a competitive examination last fall. He is an ex-service man, having been mustered out of the service with the rank of major, and has had considerable experience in the line of work which he will direct.

Elkins takes the place of Harry Roe who had been in charge of the division since the Department's reorganization by Highway Engineer Blauvelt. Mr. Roe severed his connection with the Department to accept a lucrative position with one of the largest oil companies in the west.

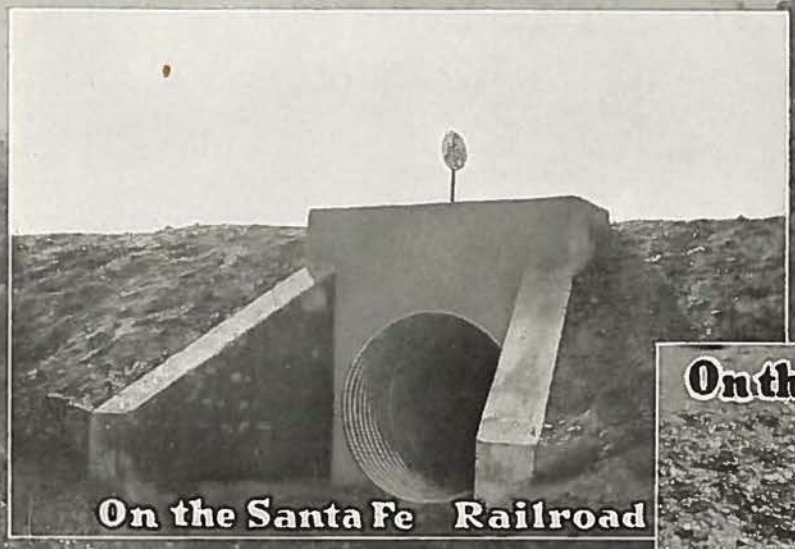
ENGINEERS DRAW PLANS FOR TWO RAIL CROSSINGS AT WOLHURST

Negotiations have about been completed between the Highway Department and the engineers of the Denver & Rio Grande Western and Santa Fe Railroads by which these railroads will participate in the cost of construction of an undercrossing just south of Wolhurst in Douglas County, on the North and South Highway. Engineers are now at work on the plans for the crossing which will eliminate one of the most dangerous railroad grade crossings on one of the most heavily traveled stretches of road in the entire State.

Unless there is an unforeseen hitch, the undercrossing and several miles of paved highway between Wolhurst and Sedalia will be constructed during the next seven months.

Don't be afraid to dim your lights Suppose the other fellow doesn't. If you can't see him, it won't hurt for him to see you. It is better for one man to see where he is going than for both to be blinded.

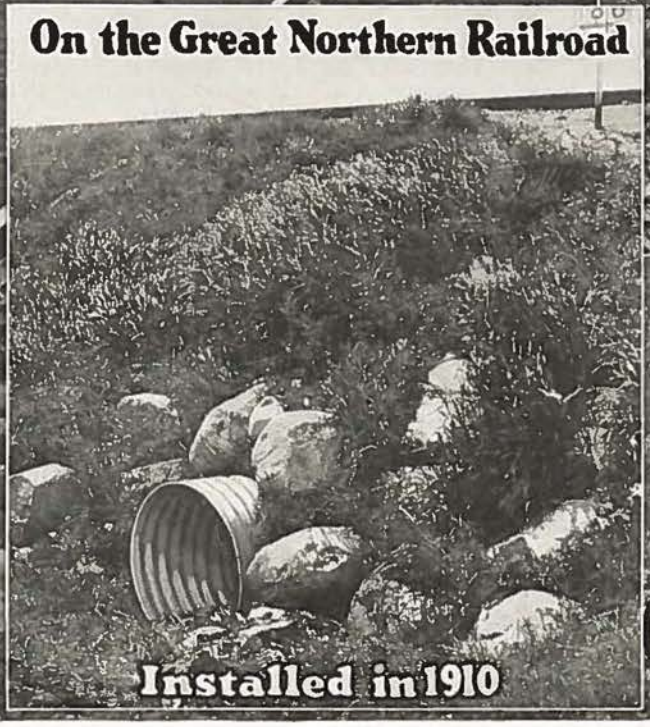
for Permanent Installations



On the Santa Fe Railroad

On the Western Pacific Railroad

Under 56 Foot Fill



On the Great Northern Railroad

Installed in 1910

ARMCO CULVERTS

ARMCO Ingot Iron

The R. Hardesty Mfg. Co.

DENVER, COLO.

Woods Cross, Utah Missoula, Mont. Pocatello, Idaho

Highway Extension Program To Benefit Colorado Farmers

(By Verner Z. Reed, Jr.)

Colorado is just now awakening to the great importance of highway construction and improvement as an invaluable asset in the development of the State's vast resources. I do not mean to say that the State of Colorado, in past administrative policies, has ignored or overlooked the improvement of our public thoroughfares, but I believe that the people of Colorado, the great body of permanent residents, whe derive their support here and pay their quota of taxes, are just awakening to the realization of what Good Roads have done, can do and will do to insure the future happiness and prosperity of all of our people.

For this reason I am heartily in sympathy with the $6,000,000 bond issue recently authorized for the extension of our excellent system of good roads. I can conceive of no class of our people who will be more widely benefited than the farmers, among whom there is bound to be promoted a spirit of friendly cooperation, in the marketing of their products than has been shown in the past. As an accessory of civilization it is needless for me to call attention to the part which the automobile and the auto truck have played in promoting the great development of this and every other state; but, while we all rejoice that the farmers—the real producers——will be the primary beneficiaries in the coming program of highway extension and betterment, there are thousands of us who will participate in the gladsome welcome which we will extend to thousands and thousands of tourists lured here not only by our wonderful climate and matchless scenery, but by the splendid state highways which link our national parks and monuments.

We should all work together for better roads in every direction.

There is a decided spirit of cooperation nowadays in almost every line of endeavor. Good roads, we all know, will promote this spirit among the farmers of Colorado; and, I might add, among all of our producers. As an asset toward the greater industrial development of our state I can conceive of no greater boon than a net work of modernized highways.

In my judgment a dollar invested in highway extension and betterment means a return of at least $50; and we should construct our roads with this idea in view. It is to be hoped that Colorado will not lag behind her sister states in highway construction.

Let us go forward with the slogan that Colorado shall have the best system of public thoroughfares in America. And under this slogan we will be sure to win.

Five Counties Reduce Road Costs.

(Continued from page 3)

eral inches of hard clay are hauled and leveled off, and after this has been packed another layer of several inches is placed over it and then the wearing surface is completed by placing a light coat of gravel over all the clay. This is worked constantly with drags, floats, or blade machines until it finally packs in a hard even surface. There are miles and miles of such roads in Northeastern Colorado that have been built the past year that are as fine and easy to travel as the best macadam city streets.

The old method of high crowns and sloping sides has been done away with as this caused every vehicle to drive in the center of the road or on top of the crown and wear two wheel tracks down the center of each road. The water lodged in this rut and would cause it to wear deeper after every rain. The method used in Northeastern Colorado might be called the "flat top method" as these new roads only have a slight crown with good deep gutters on each side to carry away all surplus water. With the flat top crown the tendency for all travelers is to use the whole surface of the road. The writer has just returned from a trip over several hundred miles of roads in Northeastern Colorado and was very favorably impressed at the ease with which one can drive on these flat top roads. The hands can rest on the steering wheel instead of grasping and turning it continually and no ruts or tracks were noticeable; or in other words, the whole surface of the road for its full width is being used instead of a trail, as you might call it, in the center.

The gravel surface roads are being built similar to the concrete roadways and are standing the test remarkably well, as heavy trucks are hauling tons of grain at high speed over these new roads without making any impression on them whatsoever, because each truck don't drive in the same track day after day, but weave back and forth on their side of the road and wear it all alike. There is no side-sliding action because all four wheels are practically level at all times, which means that tires will last much longer and the wear and tear on trucks and cars from side thrust is practically eliminated, giving additional saving of thousands of dollars each year to auto and truck owners along these roads in upkeep and repairs on their machines.

The work has been done under the supervision of the Engineering Department of District No. 7, of the Colorado State Highway Commissioner, Mr. Frank H. Blair of Sterling, Colorado, being the advisory member from this district, while Mr. A. B. Collins, with headquarters at Greeley, is the engineer in charge. The work has been under the direct supervision of Mr. William A. Lewis, resident engineer of the subdivision of District No. 7, comprising the five counties in Northeastern Colorado. Mr. Lewis has his headquarters at Sterling, and each of the projects in his division is under the direction of an assistant engineer, so that with this organization and the large amount of work being performed, the overhead expense is reduced to a minimum. Mr. Lewis is a very practical engineer and believes that it is useless to spend money building roads unless it is done so it will remain finished, and has shown his ability and good judgment in the construction of Northeastern Colorado State roads in the past two years. After the roads are completed they are turned over to the county and each county receives a yearly allowance for maintenance and upkeep. This phase of the State work is in charge of Mr. John Stamm. His work in the maintenance of these roads is deserving of a great amount of credit.

The improvement of the Golden Rod Hi-way from the State line west through Yuma, Colorado, and on to Fort Morgan and Denver, will be a big asset to Denver, as it will bring many more tourists through Denver in the future. About $84,000.00 is being spent on the Golden Rod Hi-way in Eastern Colorado and the new construction work makes it a boulevard with easy grades, and the tourists who travel it have praised it in every town they go through.

WESTERN SLOPE ASKS FOR FUNDS TO BUILD ROAD OVER GRAND MESA

Grand Junction, Colo., March 30.—At a meeting between State Highway Department, Forest Department, and the Bureau of Public Roads officials soon to be held in Denver to decide upon apportionment of the $3,500,000 recently made available for highways, part of which will be spent on forest connection links in this State, a claim will be put in for several thousand dollars to improve the road from Delta to Alexander Lakes on top of Grand Mesa.

For several years a good road has been contemplated between these two places, and now with the completion of a splendid highway up from the other side of the mesa it is very desirous that the present road from Delta be widened and the grade improved.

A. S. Peck, district forester, has shown a great interest in this project, and it is considered probable that he will request a good appropriation for it. Completion of a standard auto highway from the Delta side will make a circle trip from Grand Junction over the Mesa via Delta equal to any in the Rocky Mountain region for beauty and recreational possibilities. The high point on the road will be about 11,000 feet, and it will be 115 miles long.

UNIQUE PARK SYSTEM

Denver has a system of nineteen mountain park areas agregating 5,018 acres, in the Colorado Rockies, through consent of the State Legislature. These areas, connected by 100 miles of scenic drives, begin fifteen miles west of the city limits. In 1922 they were visited by 750,000 autoists.

FIRST LOG HOUSE

The first known log house built by white men within Colorado's bounds was erected in 1816, for a troop of Spanish cavalry patroling the Arkansas, near the site of Pueblo.

Material Tests Protect Public

(Continued from page 6)

cement and are either accepted or rejected depending upon whether or not they pass the tests. These tests consist of tensile strengths, setting time, soundness and fineness. The tensile strength is made of a mortar consisting of one part of cement to three parts of standard testing sand by weight, with a minimum strength of 200 pounds per square inch at 7 days and 300 pounds at 28 days. The setting time is obtained by making small pats of pure or neat cement mixed with the proper amount of water to produce what is known as normal consistency; the setting time being obtained by use of the Gilmore needles, the lighter one weighing one-fourth pound and the end of the needle measuring one-twelfth of an inch diameter; the heavier one weighing one pound and measuring one-twenty-fourth of an inch diameter. The initial set of cement is said to have taken place when the pat will hold the lighter needle placed thereon without an appreciable indentation, and the final set is obtained when the pat will hold the heavier needle without an appreciable indentation. The initial set of cement is that period when the cement ceases to be plastic, and the final set of cement when it becomes hard and crystalline.

The soundness test is obtained by taking the same pat which was used to determine the setting time, and after it has been kept in the moist air closet for 24 hours it is placed in a closed vessel and kept in an atmosphere of steam for five hours. Should the cement be improperly proportioned as to the raw materials used in its manufacture or insufficiently ground on the raw side, or improperly burned in the kilns, these defects will be brought out by the soundness test, as the pat will either warp, crack, check, or disintegrate completely when exposed to the live steam, as sound cement should produce a pat which will remain firm and true to shape under this test.

Standard specifications require that cement must be ground fine enough in its finished state to allow at least 78% of it to pass a 200 mesh sieve which contains 40,000 holes to the square inch. This test is very important, as it is only that portion of the cement which is very fine that is active in its cementing qualities, as the coarser particles in cement are practically as inert as sand.

The corrugated iron culverts are also subject to test and inspection, the tests made consist of a determination of the gage of the metal and the amount of spelter coating on the metal. The proper gage is necessary to develop the full strength for which the culvert is designed; the proper spelter coating determines the length of life of the culvert, as when the coating is gone the iron begins to rust and the culvert is soon worthless. All culvert materials which are used in state highway work are required to have what is known as a two ounce coating of spelter, which means that there should be one ounce of coating for each square foot of exposed surface, or two ounces for each square foot of metal. The samples of the culvert material are taken by the laboratory inspectors at the plants of fabrication; one sample being taken from each 50 sheets of metal used. These test pieces are sent to the laboratory and the spelter stripped from them by use of chemicals and the amount of spelter on the sheets determined. If it is found that two ounces or more are on the sheets the inspectors are so notified and the culvert manufacturers are allowed to fabricate the pipe. After the pipes are all fabricated they are again subject to inspection as to condition of the material, riveting, true shape as to size and diameter and proper lengths, and if found to be in accordance with specifications, each pipe is stamped by the inspector as having passed requirements.

The need for testing materials lies not alone in insuring permanence of construction but also that records may be kept showing the class of materials used in any work and by observation their action noted during the passing years. These records are also valuable as showing available sources of materials for future construction.

SINGING AND SEEING "AMERICA"

Tourist travel is a recognized industry in Colorado, where in 1922, visitors spent $42,000,000, according to a canvass made by the Denver Tourist Bureau. It's the only known business wherein the purchaser literally uses the scenic goods, then puts it back, satisfied, on the high shelf of the Rockies.

The road-builder has a mortgage in the respect and honor of posterity.

IN OUR LETTER BOX

March 19, 1923.

M. W. Bennett, Editor,
Colorado Highway Publishing Co.,
Denver, Colorado.

Dear Sir:

I noticed in your March issue of "Colorado Highways", a fine view of Crowley County's shops, shed, etc. It is a fine view of this new equipment and the graded roads.

I wonder if you could see fit to let us have the cut or a mat of same for publication in The New Era, with proper credit to you and your excellent magazine. I am not trying to flatter you when I say excellent, and I look forward to receiving this magazine as much as I do my own trade journals.

Thanking you kindly for this favor and assuring you we will greatly appreciate it, as will also the county commissioners.

Yours very truly,
THE ORDWAY NEW ERA,
L. I. Giffin.

THE VICTORY HIGHWAY ASSOCIATION

Topeka, Kansas,
March 19, 1923.

Mr. M. W. Bennett,
Editor, Colorado Highways,
1824 Stout Street,
Denver, Colorado.

Dear Mr. Bennett:

I want to thank you very much for the picture of the Victory Highway near Kremmling, which appears in the March number of your magazine, also to compliment you generally on the get-up of that magazine.

If other highway commissions practiced the same policy of keeping in contact with the public through an official publication, it would save them a great deal of grief, and I congratulate both you and the Colorado Highway Commission on the Colorado Highways.

Very truly yours,
BEN BLOW, Manager.

ALL YEAR ROAD FROM SALT LAKE TO DENVER ASSURED BY OFFICIALS

Grand Junction, Colo., March 29.—The dream of an all-year road from Salt Lake to Denver via Grand Junction is at last to be realized, according to promise coming from Price,, Utah, and Eagle, Colorado. The Chamber of Commerce at each place has, after one winter of experimenting, found it possible and practical to keep the Pike's Peak Ocean-to-Ocean Highway open through the winter time, according to their reports, and in the future will have sufficient machinery for this purpose on the job.

Tennessee Pass was kept open last fall for more than a month longer than could have been done without the special machinery, but the heavy storms at last conquered the efforts of the people. They say, however, that the only reason they had to give up was because of insufficient machinery for the distance they had to make, and this fault will be remedied before another winter.

At Price the job is not so difficult, as there were only a very few days this past winter that the road could not safely be traveled, and it is now being driven as an outlet to Los Angeles regularly from western Colorado and Utah points.

Better be a minute late at the crossing than ten years or more ahead of time at the Pearly Gates.—Exchange.

EQUIPMENT NOTES

AVERY MACHINERY CO. TAKES OVER STOCKLAND AGENCY

Stockland graders have a new home in Denver.

The agency for this well-known line of dirt movers has been taken over by the Avery Machinery Company, distributors. A full stock of the graders will be carried in Denver, according to Mr. L. L. Clinton, president.

A feature of the Stockland Grader is its "quicklift" attachment which permits the lifting of the blade assembly instantly in one movement—saving well over an hour in the average day's work, the manufacturers claim.

The Stockland is made in seven models, as follows: The Pony, for light maintenance work; the Junior, for medium and light maintenance; Master, for general maintenance and light construction; Standard for heavy maintenance and medium construction; Special, for general construction; Giant Junior for general heavy construction, and the Giant for heavy-duty construction.

All of the models are equipped with the "quick-lift" built-in features. They also are equipped with a specially designed curved blade, which cuts in at an angle, like the blade of an ordinary jackplane, instead of scraping.

"For a long time we had considered taking on a grader to handle in connection with Avery tractors and road maintainers," said Mr. Clinton, "but we could never get one that we thought would 'fit in' until the Stockland agency was offered to us.

"We believe this grader has more good points than any other road machine on the market, and that's the reason we have put in a big stock of them for instant delivery."

H. N. STEINBARGER & CO. TO REPRESENT CHAIN BELT

A shift has been made in the Denver agency of the Chain Belt Company of Milwaukee, manufacturers of Rex Mixers and Pavers.

This agency is now in the hands of the H. N. Steinbarger Company, who have been given distributing rights in Colorado, Wyoming and New Mexico.

Rex mixers are made in five sizes, while the pavers come in three sizes. Formerly Rex mixers were handled in this territory by Landes & Co.

Word has been received by Mr. Herbert N. Steinbarger that the Chain Belt Company will shortly announce a new line on the 4-s and 7-s sizes. The New Rex 28-s also is a new departure in concrete mixers for construction work or central mixing plants. One of the big features of this machine is the fact that the operating levers are controlled from the operator's platform.

MOORE DISPLAYS NEW MODELS BIG BUSTER AND DUPLEX MACHINES

The new model Galion combination grader and scarifier is now being shown by H. W. Moore & Co. A feature of the new model is a seven-tooth "A" shaped scarifier. Also weight has been added to various parts, until the Big Buster now weighs about 10,000 pounds. One of the machines is now on display in Denver.

Announcement is made that the Duplex Maintainer is now made in three models instead of one, as formerly. With the three models every type of maintenance can be handled. The models are: Master, with four blades; Junior, with three blades; and Baby, with two blades. The Junior and Baby models are new. A full range of work can be handled, including tractor, truck and horse-power.

Catalogues on all three models are now being sent out on request by the Moore Company.

Former Senator T. J. Ehrhart is now making a 10,000-mile trip over Colorado calling on county commissioners and contractors, featuring the Big Buster and Duplex machines in sales talks.

RED SNOW IN SUMMER

Billions of organisms—half plant and half animal—are borne on Chinook winds from the Arctics and, covering the surface of large snow banks in Rocky Mountain National Park, in Colorado, transform them, to the wonder of tourists, into red snow in summer.

FAIRY TALE WAY TO CHINA

In a volcanic crater in the Sangre de Cristo Mountains in San Isabel National Forest, west of Pueblo, Colorado, is an apparently bottomless pit, with black marble sides, in which depth soundings of 1,500 feet have failed to touch bottom.

BIDS RECEIVED DURING MARCH

PROJ. No.	LOCATION	COUNTY	LENGTH	TYPE	LOW BIDDER	BID PRICE
F.A.P. 81A	Mt. Vernon Canon	Jefferson	3.504 mi.	Crushed rock surface	H. C. Lalier	$33,877.70
F.A.P. 211	Meeker-Craig	Rio Blanco	1.853 mi.	Gravel surface	Hinman Bros.	31,314.03
F.A.P. 223A	Kremmling-Steamboat Springs	Grand	2.881 mi.	Gravel surface	Henry Shore	27,667.40
S.P. 705	Norwood-Naturita	Montrose	2.776 mi.	Grading	Geo. F. Wear & Co.	10,089.00
Box Elder Creek Bridge east of Watkins		Adams & Arapahoe	16 spans at 29 ft.	Timber bridge	A. R. Mackey	14,781.51
Melvin Bridge over Cherry Creek near Denver		Arapahoe	29 spans at 19 ft.	Timber bridge	Colo. Bridge & Constr. Co.	12,088.34

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

NO.	LOCATION	COUNTY	LENGTH	TYPE
125	Sapinero, West	Gunnison	2.708 mi.	Gravel surfacing and bridge
157B	Between Buena Vista and Leadville	Chaffee	6.526 mi.	Grading
207	Over Blue River, 13 mi. North of Dillon	Summit	100 ft. span	Steel truss bridge and approaches
229	Between Pueblo and Florence	Fremont	0.879 mi.	Gravel surfacing
255A	Between Ft. Morgan and Brush	Morgan	2.702 mi.	Concrete paving
256A	Between Atwood and Merino	Logan	2.5 mi.	Concrete paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

PROJ. No.	LOCATION	COUNTY	LENGTH	TYPE
F.A.P. 120	(Rev.) Over Clear Crk. N.E. of Arvada	Jefferson	2 spans at 100 ft.	Steel truss bridge
F.A.P. 135	Between Denver and Morrison	Jefferson	5.067 mi.	Concrete paving
F.A.P. 159A	Between Ramah and Matheson	Elbert	6.288 mi.	Sand-clay surfacing
F.A.P. 208C	Clifton-Palisades	Mesa	5. mi.	Gravel surfacing
F.A.P. 214	Durango, South	La Plata	3. mi.	Gravel surfacing
F.A.P. 222C	Between Denver and Lafayette	Boulder	1.5 mi.	Concr. bridge & R. R. grade separation
F.A.P. 224	Between Morrison and Baileys	Park	5.621 mi.	Mountain grading
F.A.P. 226B	Platteville, North and South	Weld	4.023 mi.	Concrete paving
F.A.P. 230A	Between Littleton and Sedalia	Douglas	0.852 mi.	Concrete paving
F.A.P. 241	Over Gunnison River, ½ mi. North Delta	Delta	4 spans at 150 ft.	Steel truss bridge and approaches
F.A.P. 245	Las Animas, West	Bent	6. mi.	Gravel surfacing
F.A.P. 247	Between Rocky Ford and Swink	Otero	1.149 mi.	Concrete paving
F.A.P. 252	Loveland, South	Larimer	3.5 mi.	Concrete paving

EQUIPMENT NOTES

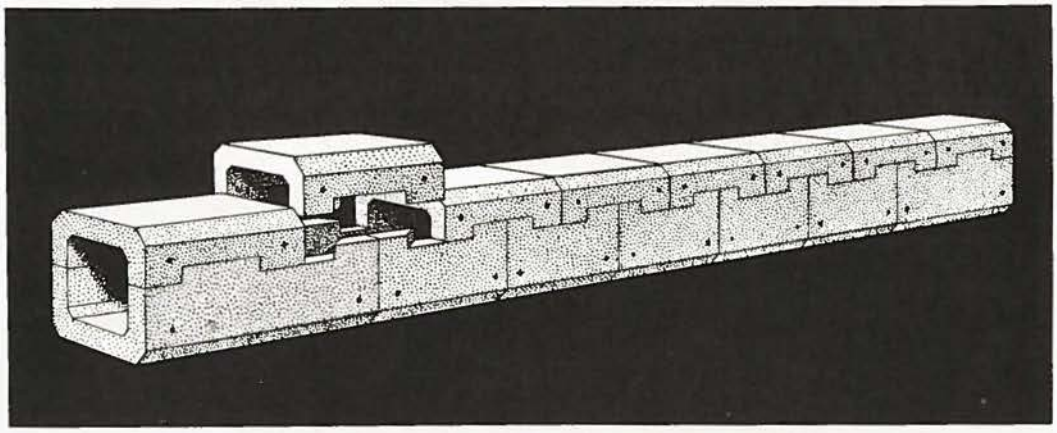
Another Link Belt Dragline Excavator shipped to Sayler Construction Co., Lamar.

The C. F. & I. Co. came in for thirty Blaw-Knox Steel Buildings. They're Ideal for storage and they are cheap.

WENDELKEN

Interlocking Concrete Culverts

HEAVILY REINFORCED



NOTE REMOVABLE TOP UNITS AND MORTISED CONSTRUCTION

Make them yourself or we will make them for you

Can be used FLUSH
with Street or Road SURFACE

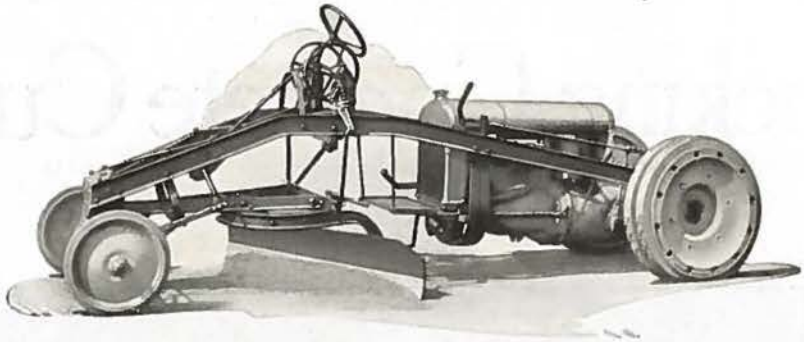
THE COLORADO CULVERT & FLUME CO. PUEBLO

WEHR GRADER

A New Fordson Unit, Simple, Yet Effective

SPEEDS
3—Forward
1—Reverse

Weight
With Rubber
Tire Wheels
7,100 lbs.

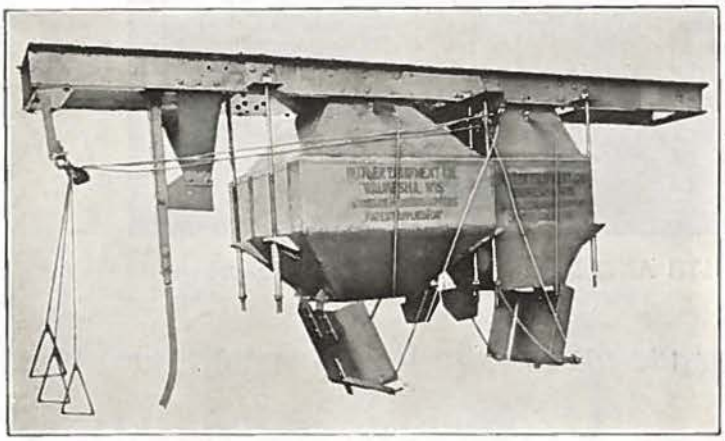


Blades and
Mouldboards
Furnished
6-8-10-Ft. Lengths
According to
Conditions

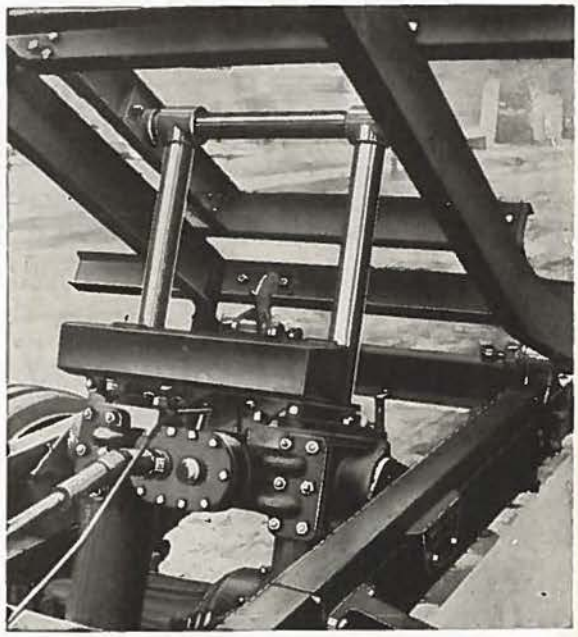
**ONE MAN
OPERATED**

FOR MAINTAINANCE WORK, IT'S A DANDY

Did you see our demonstration? If not we will demonstrate for you.



A pull on the levers—that's all required.
Butler Proportioning Hoppers.
Measure Your Batches Quickly and Correctly.



The most efficient Hydraulic Hoist for Truck Bodies made—The Heil

Steel Truck Bodies, all types, for all materials.
All Trucks, including Fords.

Where others have failed you, try the right principaled hoist

We can furnish hand hoists also

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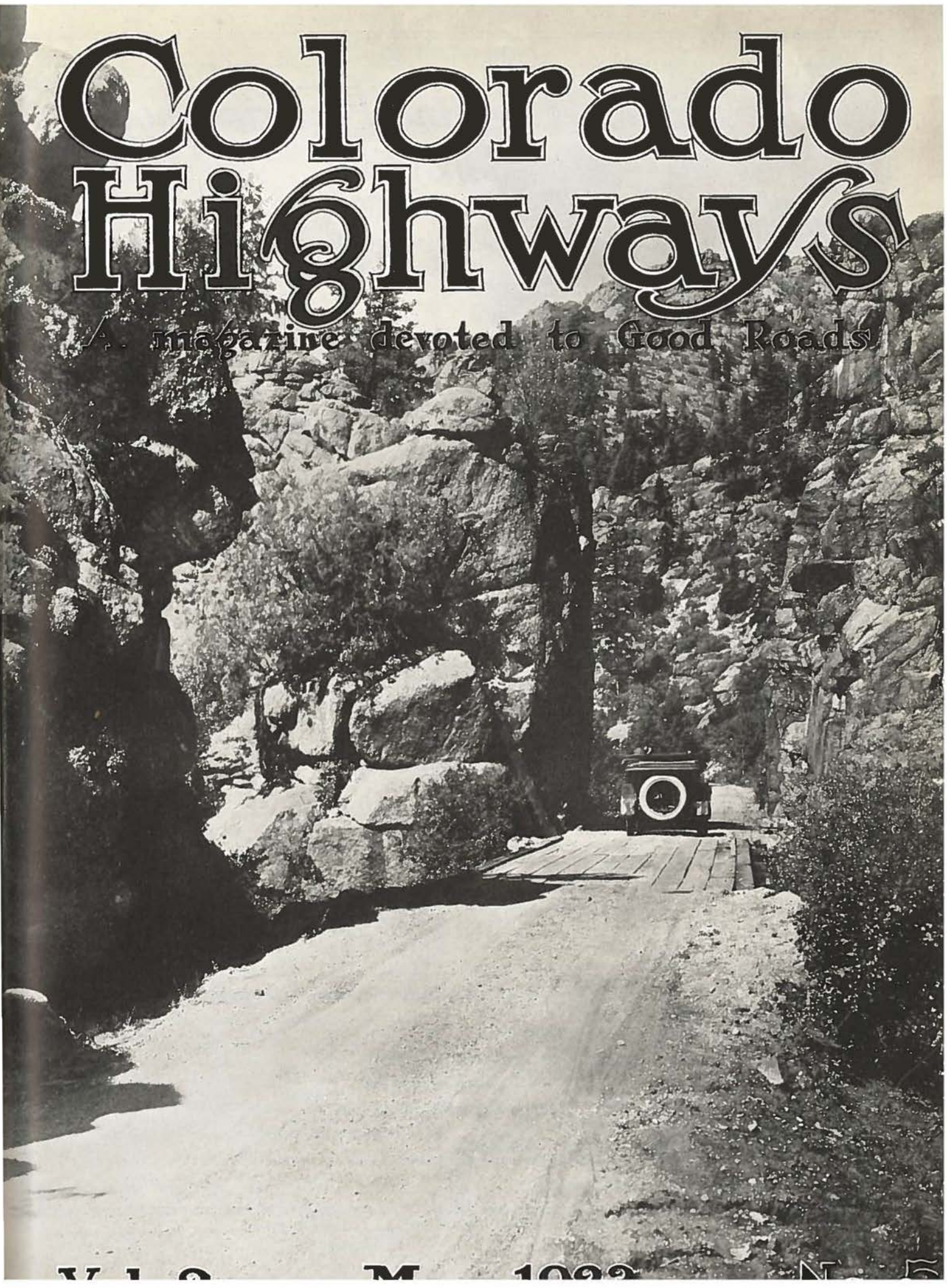
THE BRADFORD-ROBINSON PTG. CO., DENVER

Colorado Highways

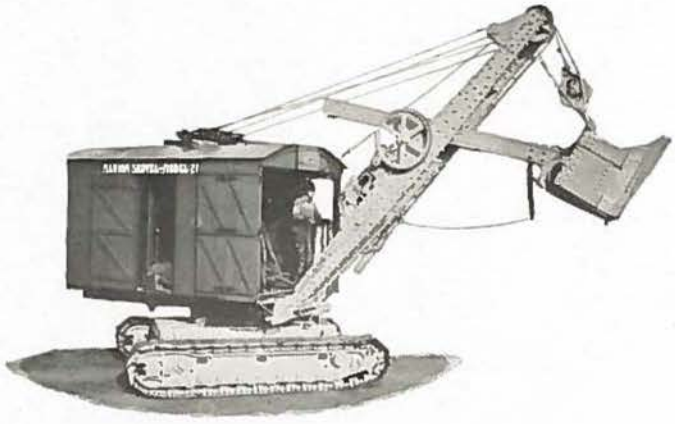
A magazine devoted to Good Roads



Vol. 2 May 1923 No. 5

The Marion Gasoline-Electric Shovel or Dragline

Has all the advantages of the straight gasoline motor operated machine without sacrificing the simplicity of standard practice.



Gasoline Engine direct connected to Generator

Separate Hoisting, Rotating and Crowding Motors

High Speed at light loads with
Slow Speed and High Torque
or Pull under heavy loads.

An impossibility with friction-operated machines or machines with a single power unit

THINK THIS OVER AND ASK US FOR FURTHER INFORMATION

H.W. MOORE & Co.

1761 WAZEE ST., DENVER

Our Service Department is unequalled in the West

Colorado Highways

"BETTER ROADS"

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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R. S. Du Bois .....Bridge Engineer
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Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
1824 Stout Street, 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.

10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

The scene on the cover page of Colorado Highways this month shows a particularly attractive stretch of the Phantom Canon road between Florence and Cripple Creek.

This road is constructed on an old railroad bed, over which millions of dollars' worth of precious metals was hauled during the Victor and Cripple Creek boom days. The route follows one of the most beautiful canons in Colorado and each summer is traveled by thousands of tourists.

The Phantom Canon road forms a link in a popular circle automobile trip from Colorado Springs via Divide, Cripple Creek, Victor, Canon City and Florence, and return.

Colorado Highways
"BETTER ROADS"
VOLUME II. MAY, 1923. NUMBER 5.

Colorado's 1923 Highway Program

A Total of $7,767,596 Available For Construction of New Roads

UNLESS unforeseen conditions develop, such as unfavorable weather conditions, lack of laborers or inability to obtain necessary materials, more roads will be constructed in Colorado in 1923 than during any year since the State, through the Highway Department, undertook to develop and construct a system of highways.

The Highway Department's budget for 1923 sets aside $7,767,596 for construction, and it will be the Department's aim to make every effort to "clean up" the budget.

Last year, shown by the records to have been the busiest in the Department's history, witnessed the improvement of approximately 1,160 miles of State Highways at an expenditure of $6,735,882.75. These figures, by comparison, will give an idea of the activities planned by the Department for the construction season just now getting under way.

When the Department was reorganized in May, 1921, those placed in charge of the Department's affairs mapped out a system of inter-state highways and connecting inter-county roads with a view of concentrating the State's efforts on the improvement of the roads embraced in this system. The system, embracing, roughly speaking, 3,300 miles, was designed to serve the greatest number of people. It was submitted to the United States Bureau of Public Roads as the Federal Highway System in Colorado, and upon it is being expended the so-called Federal Aid money made available for Colorado by acts of Congress.

These interstate highways crossing the State east and west from the Kansas to the Utah line, and north and south from the Wyoming border to New Mexico, may be likened to the main lines of a giant railroad system, but as a railroad is dependent for its business upon what is known as "feeder" roads, so the Highway Department's plans provide for "feeders" to the main arteries of travel.

The entire system is so designed that every county seat and every principal city or town in the State is located on either a main interstate highway or a road connecting with a main interstate highway.

No matter where he lives, a resident of Colorado will be able, when the entire system is completed, to travel on an improved road to any part of the State.

The construction of these "feeder" roads, which in some instances are as important as the interstate highways, is being carried on with State money alone. No Federal Aid money is available for them under the rules laid down by the government.

For 1923 the budget sets aside $2,494,896.00 for the improvement of the "feeders", while of the money received from sale of bonds, the sum of $2,336,350 has been set aside for interstate or Federal system highways. For the latter the United States Government furnishes an additional $2,936,350.

In mapping out the entire system and making appropriations for the various roads the thought uppermost in the minds of the members of the highway advisory board and the state highway engineer was to build roads which would last; roads which would enable the farmers to get their products to market; and roads which would make it possible for the city merchant to get into easy touch with the man in the country. In other words, commercial roads above everything else has been the watchword of the department heads.

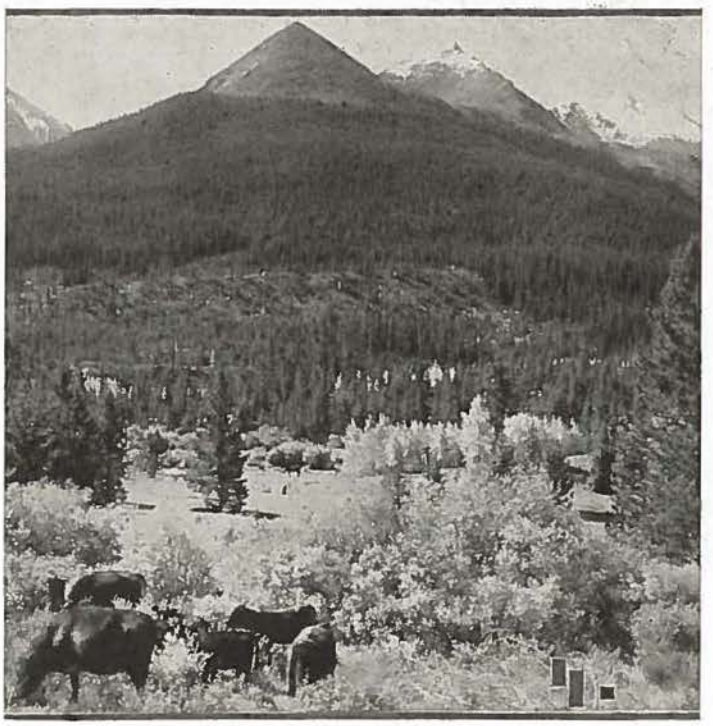
No one realizes the value of the State's scenic attractions more than the officials of the Highway Department. They are fully aware of the fact that tourists visiting the "Nation's Playground", as Colorado is aptly called, spend many millions of dollars in the State annually, but at the same time they full well realize that the needs of the people of the State must be the first consideration.

A careful study of the road system as laid out by the department and of the appropriations made will reveal that, with perhaps a single exception, not one of the many roads provided for can be classed as a purely "scenic" road. This lone exception is the highway now being constructed from Echo Lake to the summit of Mount Evans, for which in the 1923 budget, the sum of $50,000 has been set aside.

It might be mentioned that this road is being built to complete a circle trip through one of the most attractive regions from a scenic standpoint, in the State, which heretofore has been practically inaccessible. It is being built at the urgent request of the people of Denver.

The City and County of Denver contributes, roughly speaking, one-fourth of the money at the disposal of the Highway Department. Inasmuch as there is not one foot of state highways in Denver County, every dollar of Denver money is expended in some other county. For this reason the highway engineer and the members of the highway advisory board granted the request of the people of Denver for the construction of the Mt. Evans road.

This road will open up a veritable wonderland and will add materially to Colorado's



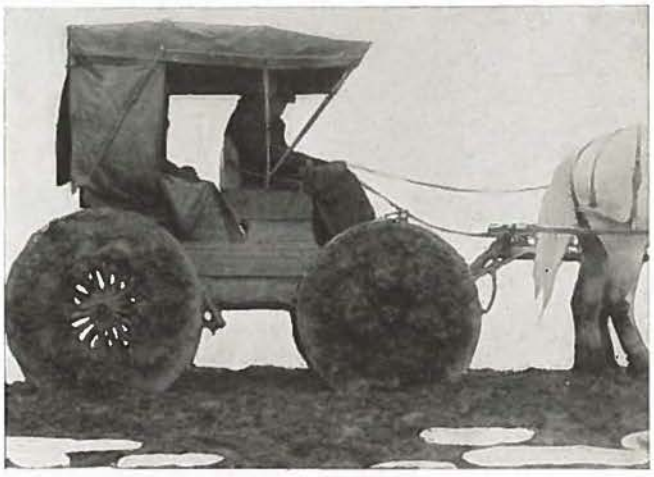
Three Sisters Peaks, Lake County on the Independence Pass Road.

(Continued on page 18)

History of State Highway Department

Has Expended $19,813,207.05 During Thirteen Years of Existence

THE people of Colorado have spent $19,813,498.80 for the construction and maintenance of state highways through its Highway Department during the thirteen years that the State's road-building activities have been conducted through a department of the State government. Altogether $21,972,632.14 has been entrusted to the Highway Department in the thirteen years which ended November 30, 1922—the end of the last fiscal year—but on that day there remained an unexpended balance of $2,159,133.34 in the State Treasury to the credit of the department.



A Rural Traveler Fifteen Years Ago.

Starting with an annual expenditure of only $40,352.54 in 1910, the activities of the department have grown from year to year until in 1922 they had reached a total of $6,735,882.75. These figures, better than anything else—unless it is the excellent condition in which the traveler finds the State Highways in all sections of Colorado—show that the people of the State are fully aware of the importance of good roads and have been willing to dig deep down in their pockets to get good roads.

When it is considered that the taxable property of the State is only about $1,500,000,000, that the State is sparsely settled and that more than one-third of the land in the State is owned, not by private individuals, but by the United States Government, the showing revealed by the books of the State Highway Department regarding highway expenditures is a most creditable one.

The figures regarding Highway Department receipts and disbursements were prepared by Mr. Edwin Mitchell, Auditor of the Department. They are authentic, having been taken from the Department's books and checks by the State's official examiners. The tables presented herewith are the first authentic information ever given to the people of the State.

The first State Highway Department was created by act of the General Assembly in 1909, but, due to the lack of funds, John F. Shafroth, then Governor, did not appoint the commission until 1910. The first Highway Commission consisted of C. P. Allen, Denver; W. M. Wiley, Holly; Thomas H. Tully, Durango, and James E. Maloney, still connected with the present Highway Department as the assistant highway engineer, as engineer.

This first department was operating in a manner quite different from the Highway Department of today. Its construction work was done solely through the various counties. It merely laid out and superintended the work. It did not let contracts as the department of today does, nor did it engage in any maintenance activities.

In 1909 the good roads movement which has given Colorado one of the finest highway systems in the entire country, was in its infancy. The fact

Scene on Kenosha Pass Road, One of Colorado's Present Day Mountain Boulevards.

that the Assembly appropriated only $40,352.54 for the biennial period for road-building is indicative of the fact that in those days highway construction was not considered of great importance. The fact that this appropriation, insignificant as it was, was placed in the fifth class—the last class to be paid—further proves that the new department was not considered very important by the State's lawmakers.

The next general assembly did not consider roadbuilding any more important than its predecessor. It also placed the appropriation for the next biennial period in the fifth class, with the result that during that period—1911-1912—only $36,767.16 was expended for roadbuilding purposes. The State's revenues for that period were not large enough to pay all appropriations. The result was that fifth class appropriations were only paid in part and the young highway department received only $36,-767.16.

Not until 1913, when the General Assembly enacted a new highway law and made other sources of revenue available for the department, did roadbuilding in Colorado get under way on a fairly large scale. In that year the General Assembly adopted a state motor vehicle license and ordered one-half of the proceeds from the sale of license plates turned over to the department, together with the earnings of what is known as the Internal Improvement Fund. The new law for the first time, placed at the disposition of the department sufficient money to undertake projects on a worth-while scale. At the same time the State was divided into five highway districts, with a representative from each one on a State Highway Commission. Thomas J. Ehrhart was named Highway Commissioner and made the executive head of the department.

While the revenue from the motor vehicle department and the Internal Improvement Fund gave the department several times the amount of money which it had had when it depended upon legislative appropriation, the department was not able to operate on the scale made necessary by the rapid growth of the number of automobiles until 1916. During that year the department received the proceeds of a levy of one-half mill on all taxable property in the State, in addition to the money it derived from the automobile licenses and the Internal Improvement Fund.

The legislation which placed the department on its present-day scale was enacted by the Twenty-second General Assembly in 1919, when the department was given an additional tax of one-half mill. This tax became effective in 1920. Together with the increase in taxable property, it practically doubled the money available for roadbuilding and maintenance.

During the same year the State began for the first time to really feel the benefits of what is known as Federal Aid legislation by Congress. True, during the preceding two years the State had received something like $38,000 out of the Federal Treasury for road construction, but, in 1920 this Federal Aid amounted to the respectable sum of $810,051.87.

A study of the table of expenditures by years accompanying this article will reveal that during the last two years the State expended more for roadbuilding and maintenance than during the combined preceding eleven years. This enormous increase—in 1922 the expenditures were practically 170 times as large as in 1910—is due to the fact that the people of Colorado, now fully aware of the importance and need of first-class highways, voted a bond issue of $5,000,000 for highway purposes, and the General Assembly voted a one-cent gasoline tax, the proceeds of which were ordered into the highway fund. Approval of this bond issue enabled the department to take advantage of much more Federal Aid appropriations than before, and to greatly increase its activities.

The Modern Colorado Concrete Road.

A Thing Of The Past In Colorado.

The year 1923 will see even greater expenditures than were recorded in 1922. The department's budget exceeds $9,000,000, thanks to another bond issue of $1,500,000 a year for four years, and if the weather conditions are half way favorable, this sum will be expended in construction work and maintenance.

One feature of the combined statement of the department's expenditures during the thirteen years of its existence is the fact that of the total amount expended, only $580,929.68 was spent for salaries. This is only three per cent of the total. It proves that the money went where the people wanted it to go: on the State's highways.

The following tables show the department's receipts from its five principal sources of revenue. Aside from the information which they contain, so far as the Highway Department is concerned, they reflect the growth of the state during the past twelve years.

The tables follow:

Revenue from State Gasoline Tax.

1919	$ 250,000.00
1920	230,000.00
1921	320,660.00
1922	317,736.11
Total	$1,118,396.11

(Continued on page 18)

Half Million Dollars for Forest Roads

Federal and State Officials Adopt Tentative Plan for Improvement of Highway System in Colorado National Forests

BY A. W. STONE

WITH the projected improvement, construction and survey of one hundred and twenty miles of roads within the boundaries of Colorado's national forests this year, involving the expenditure of approximately $527,000 by the government, almost two and three-quarters millions of dollars will have been spent by Uncle Sam since 1918, on Colorado National Forest roads alone—to say nothing of $240,000 between that year and 1912, at the rate of $40,000 a year.

By virtue of an agreement reached recently at a conference between L. D. Blauvelt, state highway engineer; J. W. Johnson, district engineer for the federal bureau of public roads, and Allen S. Peck, district forester, a tentative plan for the construction and improvement of almost 2,000 miles of roads, all within the Colorado national forests and all of primary importance, was adopted.

This plan contemplates a forest road-system covering this amount of mileage when all construction and improvement shall have been completed, it was explained. It includes 210 miles of roads already made, and the 120 miles to be taken care of this year.

The allotment of appropriations for various road projects for this year was also agreed upon at the conference, and District Engineer Johnson will make the formal recommendation to the department of agriculture, to have the program adopted.

The program does not contemplate the construction of elaborate road surfaces. In most instances the highways will be of the variety known as "dirt" construction, with gravel surfacing. Most of them will be graded out of the sides of mountain slopes, valleys and hills. But they will be of a class of improvement

A grader in action on road in Colorado National Forest

Type of road constructed by the U. S. Forestry Service

to render them negotiable to ordinary automobile and vehicle travel, and will make the forests more accessible to the general public than they have ever been before.

To date, the exact extent of road construction within the Colorado national forests has been 209.9 miles, at a total cost of $2,100,000. The appropriations for this year will bring the total up to $2,561,000, exclusive of the $240,000 spent prior to 1918.

Following are the stretches of road to be constructed, with their locations:

Red Mountain—Four and seven-tenths miles, beginning at the south end of the present forest highway, now under construction, extending southward to the north end of Federal Aid Project No. 174. In the Uncompahgre national forest. Cost, $104,000.

Cameron Pass—Six and a half miles, beginning at a point one mile east of the pass and extending to a point five and a half miles west, connecting with the present road on the west side. This will complete the road between Fort Collins and Walden, passing through the Colorado and Arapahoe national forests. Cost, $68,000.

Berthoud Pass—Six miles, from Twin Bridges, at the west end of the present day-labor project, to Fraser. This was surveyed three years ago by the federal bureau of public roads. It is in the Arapahoe forest, and will cost $66,000. Its completion will mean that of the entire Berthoud Pass project, from Empire to Fraser.

Independence Pass—Five and two-tenths miles, in the Holy Cross national forest, from the terminus at the east end of the Independence Pass project to a point one and seven-tenths miles east of the present project. Cost, $69,000.

Cumbres Pass—Five and a half miles, from the Los Pinos section house to a point one and seven-tenths miles north of La Manga pass, in the Rio Grande forest. Cost, $46,000.

Fremont Pass—Survey of road from the top of Fremont Pass, on the county line between Summit and Lake counties, north to Dillon, a distance of twenty-four miles. Also construction of section between Kokomo and Wheeler, seven miles in length. In the Leadville forest. Cost for survey and construction, $50,000.

Delta-Collbran—Fifteen miles, survey and construction, from Cedaredge, in Delta county, north to the Grande Mesa, in the Battlement forest. Cost, $30.000.

Tennessee Pass—Survey only, of stretch between Redcliffe and Leadville, twenty-five miles, for road 18 feet wide, beside ditch and shoulder.

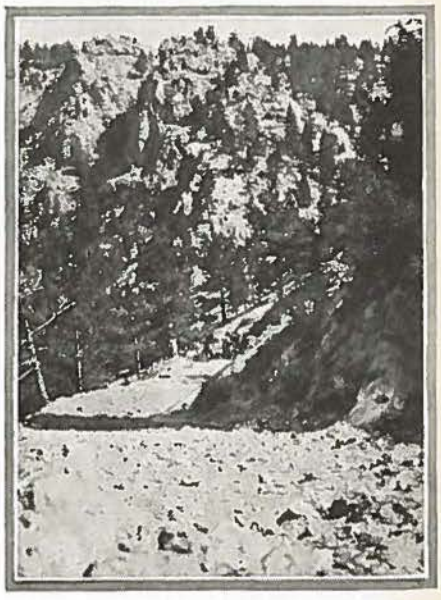
Sugar Creek-West Creek—Survey only, eighteen miles, from Sugar Creek (at the west end of the constructed Sedalia-Decker Springs project), through Deckers to West Creek, in the Pike forest. Cost, $6,000.

Buffalo-Deckers—Survey from Buffalo Station, on the Colorado and Southern railroad, southeast to Deckers, a distance of 18 miles, joining at Deckers with the Sugar Creek survey. In the Pike forest. Cost, $6,000.

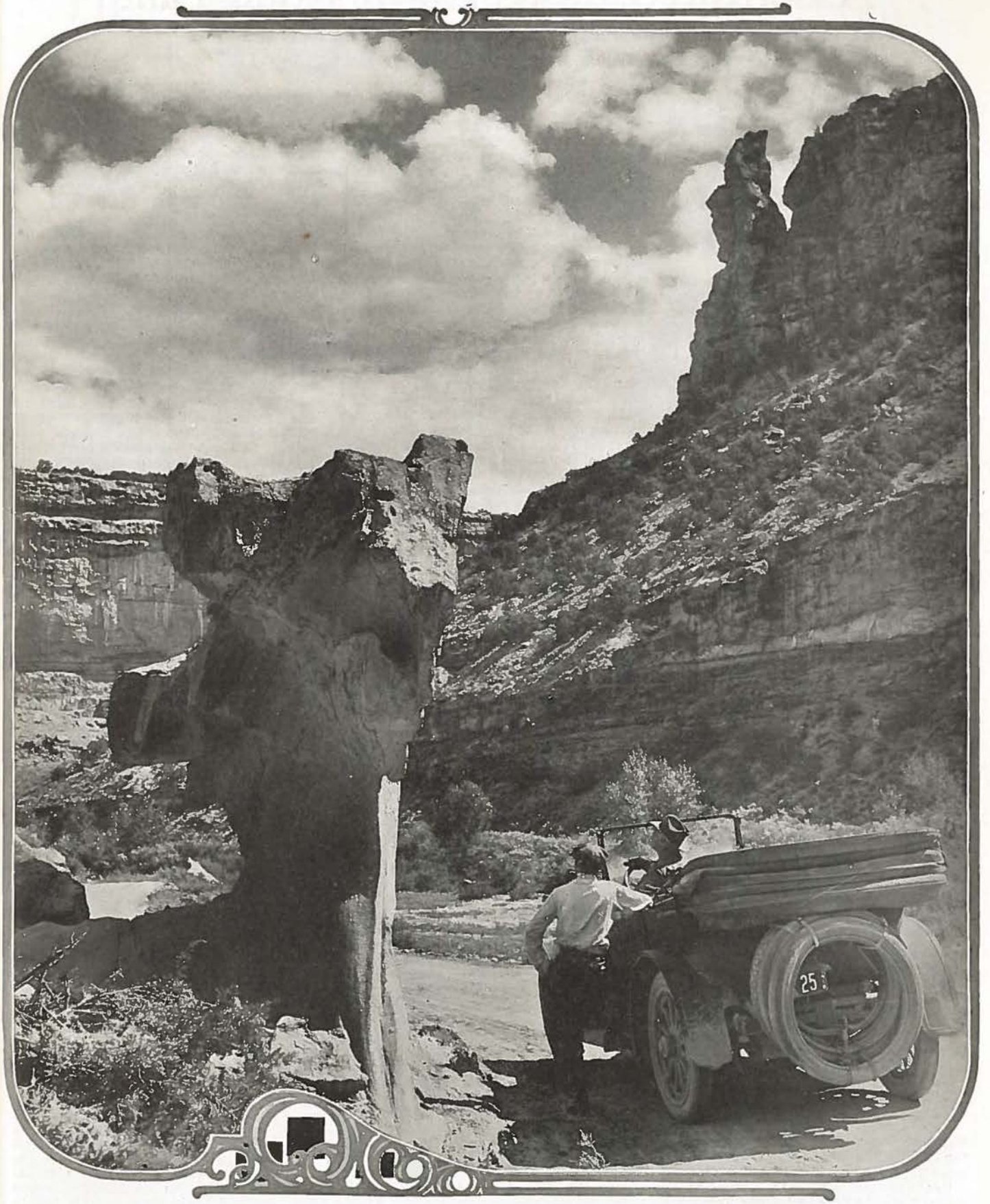
Ward-Raymond—Survey, of twelve miles, from West Park, through Peaceful Valley to Raymond. In the Colorado forest. Cost, $3,000.

Curicanti Creek-Crystal Creek—Ten miles for survey only, between Curicanti and Crystal Creek, along the Gunnison

(Continued on page 18)



Heavy rock work on Bennett Creek Road



The Devil's Wing in the canon of the Colorado River above Grand Junction.

Assembly Passes Eight Road Bills

Repeal of One-half Mill Levy and Increase in Gasoline Tax Most Important of Measures Enacted on Closing Day

EIGHT bills affecting the State Highway Department, some of them directly and others indirectly, were passed by the Twenty-fourth General Assembly and became laws when Governor William E. Sweet gave them his official approval.

A number of bills, notably those dealing with the regulation of automobile passenger bus and truck lines, either died in committee or were defeated on the floor.

Of greatest importance among the bills which were passed are two dealing with the Department's finances. These two measures, one repealing the one-half mill levy and the other raising the gasoline tax to two cents per gallon, were largely responsible for the thirty-seven-hour closing day of the session, the Senate and House being unable for that length of time to reconcile their views on the two bills.

As the bills were finally passed the one-half mill levy for road purposes, authorized by the Legislature several years ago, was abolished, while the other raises the gasoline tax from one cent to two cents a gallon, and as the saying is, "puts teeth" into the gasoline tax law which will insure prompt collection of the tax.

Adoption of these two bills and their approval by Gov. Sweet means, roughly speaking, a reduction of the annual income of the Highway Department by about $450,000. The repeal of the half mill levy will take from the Highway Department, $750,000. The increase of one cent on the gasoline tax will add to the Department's receipts approximately $300,000, the difference being $450,000 of a net loss to the Department.

Under the provisions of the gasoline tax law about $300,000 additional will be distributed each year among the counties for road purposes prorated on a basis of state highway mileage within each county. The law provides for a fifty-fifty split of the proceeds of the gas tax between the Highway Department and the counties. Instead of $300,000 as heretofore, about $600,000 will be distributed annually to the counties.

The gasoline tax bill was signed by Gov. Sweet on April 30 and will become effective on July 30. The repeal of the half-mill levy will first be put into effect next October when the State Board of Equalization fixes the tax rate for 1923.

Other laws passed by the General Assembly which affect the Highway Department follow:

Repealing the free automobile license tags—so-called X licenses—to public officials and charitable institutions.

Requiring the applicant for an automobile license plate to produce a receipt for the property tax on the automobile or truck for the preceding calendar year.

Enabling the Governor, Secretary of State, State Auditor and State Treasurer to issue the $6,000,000 of highway bonds voted by the people of the State by a 65,000 majority at the last general election.

A law giving the Highway Department, any board of county commissioners, municipality, etc., the right to withhold from the amounts due contractors on account of public works, a sum sufficient to pay any claims for labor, supplies, etc., filed against a contractor.

A law forbidding the erection of sign boards at sharp curves or within 300 feet of an intersection of highways.

A law making the destruction of road signs, erected by the Federal Government, the State, a county or municipality, a misdemeanor, punishable with a fine or jail sentence, or both.

Enforcement of the law repealing the free automobile tags will increase the motor license receipts several thousand dollars annually. The law which will require the owner of an automobile to present a receipt for the property tax on the machine for the preceding year also is expected to produce an additional revenue of several thousands of dollars annually. It is said to have been impossible heretofore to enforce the collection of property tax on all automobiles by the State and counties in cases where the owners of machines did not own real estate.

The adoption of the enabling act for the $6,000,000 good roads bond issue is a necessary formality which must be complied with before the bonds can be offered for sale. In the passage of this measure the Legislature specified that all the receipts from motor vehicle licenses going into the highway fund shall be used each year in the retirement and payment of interest on the bonds.

The Highway Department's share of the annual automobile license fees is about $500,000. As originally drawn the enabling act provided that only that portion required annually to meet the interest and retire $50,000 of the bonds for the first four years should be deducted, but this was amended by the General Assembly whereby all of the license fees will be used each year for paying interest and retirement of bonds. The bonds will be issued at the rate of $1,500,000 per year until the entire $6,000,000 in bonds have been sold.

The proceeds from the sale of these bonds will be used to meet a like sum apportioned to Colorado by the Government in Federal Aid for the construction of an interstate highway system.

Nearly 3,360 miles of this system is located in Colorado, and consists of the main trunk line roads in this State.

Enforcement of the law forbidding the erection of sign boards at sharp curves and at intersections of roads, is expected to eliminate many accidents due to obscuring of the view of the automobilist, and will to some extent, prevent the marring of the landscape.

The law against the destruction of road signs also is important in view of the fact that the Colorado Highway Department is planning to erect signs giving directions and distances along every state highway.

Aside from the truck and passenger bus line bills which failed of passage, the most important Highway Department bills which were passed, were bills rearranging the boundaries of the highway advisory board districts and providing for the distribution of all state highway funds among the sixty-three counties of the State on a mileage basis.

It is now estimated that the total receipts of the Highway Department in 1924, with the repeal of the one-half mill levy and after setting aside the motor vehicle collections for the payment of interest and retirement of the bonds, will total about $4,400,000. This includes the $300,000 additional which the Department will receive from the increased gasoline tax and $1,500,000 from the bond issue to meet Federal Aid of $1,500,000.

As now planned by Highway officials this sum will be divided about as follows: $3,000,000 for Federal Aid projects, one-half to be paid by the Government; $825,000 for maintenance; $175,000 administration; $100,000, property and equipment; $100,000, contingent fund, and $200,000 for State Projects.

During the present year the State will expend $1,109,996 on State Projects. These projects are constructed by funds of the State, mostly in counties having no Federal Aid roads, thus giving an equal distribution of the road funds of the State to all counties.

With the curtailment of the Department's funds next year it may be necessary for some of the counties to cooperate with the State on a fifty-fifty basis in order to obtain sufficient funds to construct roads in counties not included on the Federal Aid System.

LANSING REAPPOINTED MEMBER OF STATE HIGHWAY ADVISORY BOARD

Gov. William E. Sweet announced the re-appointment of Charles B. Lansing of Colorado Springs as a member of the state highway advisory board for a term of three years. Mr. Lansing has been a member of the board since it was organized two years ago, following the enactment of the present highway law.

He represents the Fifth Highway District and is one of the most enthusiastic boosters for good roads in the State. On May 7, John P. Donovan of Longmont took his place on the advisory board, succeeding E. A. Edmonds of Fort Collins, who was chairman of the board for two years.

UPSETTING EDEN'S FRUIT BASKET

The antiquity of man has never been traced to pre-glacial days, but a freak rock image containing hieroglyphics unearthed near Grand Lake, Colorado, has started scientists to wondering if Adam and Eve got their start in this hemisphere and then journeyed across Bering Strait.

Tips On Keeping Good Roads Smooth

Practical Road Builder Gives Some Advice On Proper Maintenance Methods

BY HENRY J. BARKER

PRACTICALLY every road official faces the problem of mudlocked roads during the spring season of the year—just at the time when the roads are used most by farmers and business enterprises.

The first big question is how to build roads good and still build them at a reasonable cost. The next question is how to keep them good after they are once built, at a minimum expense. With the funds available it is a real problem to decide how to best invest them to get the best results.

Some road officials put the majority of their available funds into hard roads, leaving the by-roads to take care of themselves. This works an extreme hardship on the farmers who depend largely on the "farm-to-market" roads. Other officials spend practically all of their funds building or grading,—leaving little or none for maintenance. This results in a good road until the first rain and then it becomes a bad road until graded again.

Other officials devote their road building efforts to certain small periods in the year—leaving the road to take care of itself during the rest of the time.

All of the above methods have good points but they are greatly overshadowed by their bad features.

The proper method—the method used by many road officials and praised by taxpayers and travelers everywhere it is in use—is to build roads good by proper grading and drainage and then keep them good and smooth by a system of continuous maintenance.

In order to do proper grading the road official must first purchase a tractor with plenty of power to handle the work intended. It is always best to have surplus power for extremely difficult road work that the tractor may be called upon to do. In selecting a tractor it is essential to buy a standard make. A tractor that has proven to be a good hard working substantial engine in the hands of other officials and a tractor that will be economical in first cost—economical in fuel, oil and water consumption and the economical in upkeep costs is the kind of a tractor to buy.

The next thing to do is to pick a standard make of a grader of a size that will best go with the tractor. Most road officials buy the 10-foot or 12-foot size for their large road engines.

Now after the equipment is ready, the next thing to do is to select a good tractor operator to run the tractor and a good grader man to operate the grader. Remember the machines will do the work for which they are recommended but the tractor operator and grader man must furnish the brains.

Before starting to grade the roads—all tall grass, weeds, bushes and other obstructions within the roadway should be mowed down or taken up.

A good grader operator can run a fairly straight ditch without a staked line but it is nearly always advisable to make an accurate survey of the road and stake off the center line of the ditch by placing sticks every 300 feet. Nearly all grader operators and road officials are familiar with the various cuts to bring the road up to the required smoothness, therefore we will not go into detail on this subject.

By building roads good and keeping them smooth at all times a net work of year round farm-to-market roads results that will be praised by taxpayers and conscientious road officials will be able to build and maintain them for what it would cost to build a mile or two of hard roads.

Eat, drink, and be merry, for tomorrow we take a joy-ride.

A maintenance outfit in action on one of Colorado's main roads.

Automobiles vs. Roads

(An Editorial)

Automotive industry enjoys unparalleled prosperity.

This is the word that comes direct from Detroit, the world's automobile manufacturing center. A dispatch says that the first quarter of this year was the largest in the history of the industry in point of production, sales and deliveries.

And there is every prospect that the second quarter will outrun the first by a comfortable margin.

Every plant is running full force. This means steady employment for thousands of workers, and in turn prosperity for a large portion of the population of the country, because increased production of cars at Detroit means a corresponding increase of sales and prosperity straight down the line throughout the country.

The automotive industry is a barometer. It is a big factor in the prosperity of the country, just like steel, railroads and building. It promotes good roads and quickens commerce.

Every new automobile owner is a potential good roads booster. He wants smooth highways over which to drive the new flivver. And in order to get this smooth highway, he is willing to go almost any route. This is one of the reasons why the people of Colorado and a dozen other states last fall voted overwhelmingly for good roads bonds.

We are told that the United States at the present time is enjoying a business boom. But at the same time the powers that be are using every precaution to prevent inflation. The banks have sufficient funds to meet all legitimate needs, but they are not encouraging speculation.

In a few weeks road work in Colorado will be in full swing. The State Highway Department has a score or more of projects, running into thousands of dollars, ready for letting on contracts.

The Department's budget this year calls for about forty projects, including grading, gravel surfacing and concrete paving, to be started this year. At present there is every indication that two-thirds of these projects will be completed before the end of the present construction period. Every possible means will be taken to facilitate this work and get it finished as quickly as possible.

About $3,000,000 will be expended in Colorado this year on new Federal Aid projects. The cost of these projects will be borne jointly by the State and Government. In addition there is about $3,500.00 worth of work that is being carried over from last year, and there will be approximately $1,800,000 paid out for maintenance.

The sum made available for maintenance is the largest on record. This work has already been started in a majority of the counties. All maintenance work is done on a "fifty-fifty" basis by the counties and the State. County men do the work under the supervision of State Highway officials. Splendid results were obtained last year under this arrangement.

Besides sharing the cost of maintenance on State Highways, the counties will expend in the coming year about $3,000,000 for the improvement of county roads and bridges.

Altogether Colorado's road bill this twelve months will total approximately $13,500,000, which is the largest sum ever made available for road construction and maintenance in this State. But there is no gainsaying that it is money well spent. Colorado's tourist business alone is enough to justify this expenditure, to say nothing of the immeasurable benefits which the citizens of the State will derive from the improvements that will be made in the highway system.

We have the Rocky Mountains here and we want people to come and see them, and we want them to spend some money here—and they do each year. Last year the tourists spent the huge sum of $45,000,000 in this State. This means a great thing to Colorado. But in order to get people to come here and see what we have, we must provide the facilities for them to see the things that we have here for them to enjoy.

Again we repeat that the building and maintenance of the system of highways that we have already in this State has been one of the greatest assets that the State of Colorado has.

And the expenditures that have been made for roads has added greatly to the prosperity of every man, woman and child in the State, and under the present efficient management in charge of the Highway Department the taxpayers will get a dollar's worth of road work done for every dollar that is paid out of the state treasury.

Another phase of road work which is being given close attention at this time is the matter of posting markers along the roads.

It is hoped that by the time the tourists arrive in June that most of our main highways will be posted so that the visitors can find their way to the principal points of interest.

An arrangement has been made by the Highway Department whereby these signs will be furnished the state without cost. The only expense to which the state will be put is that of erecting the signs. This work will be done by the maintenance crews.

Adequate markers along our main routes have been needed for a long time. In time it is planned to mark every road in the state. This includes the county roads.

The Incomparable ruggedness of the natural bowl that encloses Ouray, Colo., is shown in the above photograph. In the foreground appears a switch-back on the famous Durango-Silverton-Ouray "Million Dollar Highway."

D. S. O. Road To Be Opened in July

MOTOR traffic over the wonderful Durango - Silverton - Ouray highway will open about July 15, according to road officials.

This "million dollar highway" is one of the outstanding achievements of the Colorado Highway Department, the Federal Bureau of Roads and the U. S. Forestry Service, all three government agencies having expended thousands of dollars on improvements to road.

Recent conferences at Denver of officials of both the highway department and the government with leading citizens from southwestern Colorado, resulted in the concerted action necessary to allow use of the D. S. O. highway during the 1923 season.

During the summer months thousands of tourists from all parts of the country travel over this most spectacular scenic route. For several years work of building the road has been under way, and it has been closed to traffic at frequent intervals during the past few summers.

At present the state highway department has three construction projects under way on the road between Ouray and Silverton. There is another project above Durango which is being prosecuted with state funds. To date more than $500,000 has been spent on improvements. It is expected an equal amount will be required to fully complete the road.

The D. S. O. highway is described as the "Scenic route to the Mesa Verde," and is one of the really wonderful roads of Colorado. Also it is sometimes called the "Switzerland of America." The completion of the section between Ouray and Silverton, which has been somewhat delayed by extremely heavy rock work, necessary to reduce the grade and widen the road, will permit travel to cross the range with as little inconvenience as is encountered on any of the other Colorado mountain roads.

Reports from San Juan county indicate a revival of mining in that section, and the early completion of D. S. O. highway, over which a considerable part of the ore from the mines of the district is moved, has changed a situation of uncertainty into one of definite purpose.

The section traversed by the D. S. O. is as rich in romance as it is in scenic beauty. Difficult to reach from the outside world because of the lack of road facilities, this region has not progressed as much as some of the other parts of the state. But with the prospect of a highway second to none in the Rocky mountain territory to attract outsiders, it is confidently expected that the San Juan country will show a large increase in population during the next few years.

With the completion of the D. S. O. road, Colorado adds another link in its vast system of commercial and scenic highways, which are the means of attracting thousands of visitors to this state each summer.

The D. S. O. also forms an important link in a North and South highway on the western slope, which will eventually connect Yellowstone and Mesa Verde National Parks, two of the most popular playgrounds in America.

Ride not with the flivverboob lest he should lead thee to a policeman, and the policeman deliver thee to the judge, and the judge take away thy substance.

600,000 Visit Colorado Annually

THERE were several million travelers in Colorado in 1922. Of this number about 600,000 remained in the state an average of seven days. From these will come settlers. In fact, some are here already.

"Hardly a day passes but what our mail inquiries contain questions as to living conditions in Colorado," says Harry N. Burhans, secretary of the Denver Tourist Bureau. "It may be the cool nights in summer, the moderate winter weather, the jobbing center, the nearby mountain resorts, the shopping facilities.

"There are several instances that come to mind wherein the bracing air was the deciding factor in favor of Denver out of five or six cities considered. One man is working today for a mercantile establishment, having brought his family because his wife, a former school teacher in Boston, concluded that the school facilities here were better than any other place in the West. Illustrations are without number, many families comprising those now residing in Denver being wealthy. They made their money in other states, but like to enjoy the remaining days in sunshine-filled Colorado."

Many Are the Lures.

There are many other lures besides the snow-crowned Rockies that bring prospective residents to Colorado. Colorado today thrills the educator, student, historian and adventurer, even in its commercial pursuits. Pitchblende ore is put through a process that gives the world radium at a cost of about $40,000 a gram. Coronado's dream is meeting with unexpected and unbelievable proportions. Clanging street cars pass the capitol, where, in the rooms of the Colorado state museum, repose skeletons of Indian cliff dwellers and their crude weapons of warfare that they might have used in attacking Coronado's marching conquistadores. Who knows? Jean Allard Jeancon, curator of archaeology, says the museum, assisted by Denver university, may yet help to solve the antiquity of man.

Denver Shows the Way.

Recreational possibilities, too, are different in Colorado. Take Denver. It led other cities of transcontinental America not only in the establishment of the first municipal automobile camp, but in the development of a system of mountain parks outside the city limits. It required a special act of legislature to enable Denver to connect nineteen park areas in the Colorado Rockies with a system of automobile roads, many of which were once moccasin-winged trails. The newest side trip from Denver is the one-day return trip to Echo lake, cupped in the heights of the continental divide. It is fifty-two miles from the city. Denver is a mile above sea level. With a few hours the traveler is whisked from temperate to near-Arctic climes, Echo Lake having an altitude of 10,660 feet.

Research is bringing many men and women high in the educational field to Colorado, for short and long periods. It has brought a few persons of rank in this line.

Geologic upheavals changed the contour of the Rockies and erosion wore away the peaks. Glaciers were still active in cutting down the giant sentinels as recently as a few thousand years ago, according to no less an authority than Prof. T. M. Van Tuyl of the Colorado School of Mines. It is on the return trip from Echo Lake that alternate dark and light colored banding in the rocks is seen near Morrison. These strata are believed by him to date back to the Archean periods, close to the creation of the world.

Rich in Wonders.

Within a stone's throw, almost from there is Dinosaur Park, where the thigh bone of an atlantosaurus, the largest land animal known to the scientific world, has been unearthed. Here, too, have been excavated fossil specimens that inhabited the shores of what was an island possibly 5,000,000 years ago. At the time, in the Cretaceous period, scientists say the Gulf of Mexico and the Arctic Ocean were connected by a sea that extended across North America. And here thunder lizards tipping the scale at twenty tons splashed in the swamps as the primal ocean water receded. After a long time the continent was uplifted and restored to something like its former outline.

In the Colorado museum of natural history in Denver are several skeletons of these prehistoric mammals. Through the ingenuous strides of J. D. Figgins, the director, formerly connected with the American museum in New York City, they are covered with imitation hides and set in imaginary surroundings as they might have appeared ages ago.

Beauty Near Denver.

Glaciers of precolumbia times in the nearby Boulder district, petrified trees, arrow-marked cabins of gold prospectors, shopping districts, the little white cottage in the shadow of the Rockies where George M. Pullman conceived the idea of his Pullman berth in sleeping cars, red snow in the heights, velvety green residence lawns due to the presence of mineral salts in the soil, all go to make a lost yesterday meet today. And in these things many people of wealth, having retired from business activities, take an unusual interest.

The movement for better homes, too, is expanding in proportion to the development of recreational possibilities. The system of Colorado mountain parks, for example, is causing cabins, hotels and resort buildings to spring up in increasing numbers. And in this mountain setting is one fine residence after another; forest-toned houses that are equal in many respects to the country estates of citizens of other cities, in places where the owners have no mountain settings in which to build their charming "nature homes."

And this is not confined only to Colorado people. In the region of Evergreen, for instance, twenty-five states are represented in the cabins and mountain houses built by those who come to Colorado each year to enjoy their vacation season.

LIVING GLACIERS

In the Boulder glacial district, which may be visited in a one-day trip out of Denver, is Arapahoe Glacier, the largest in the Colorado Rockies, nearly a mile square and which moves 27 feet a year.

A "pack train" on the road to Ouray in the dead of winter. PHOTO COURTESY OF COOPER & COOPER, DENVER

Officials Engage In Heated Debate Over Merits of Concrete

Concrete roads and bridges were attacked by John A. Crook, Denver bridge builder, in a talk before the Arkansas Valley County Commissioners' Association, held at the Pueblo county court house, Saturday, April 14. He stated that in his judgment the only place where concrete should be used is in foundation work or where weight bears down with a column of force. Reinforced concrete such as floors of bridges and other similar work, is dead weight, he asserted.

Concrete bridges cost more and will not last as long as steel structures, Crook stated He said that his firm built a concrete bridge over a certain river at a cost about five times that of a bridge of the same length erected over the same river, by the same firm.

Crook was answered by O. G. Smith, county commissioner of Pueblo county in charge of roads and bridges. He pointed to the steel bridge 150 feet long across the St. Charles river on the Santa Fe trail, just completed and compared it to a concrete bridge now under construction over the same river on the Wilson road. The concrete bridge contract is less than one half that of the steel bridge, but it has a 300 foot length of 3 spans.

G. L. L. Gann, vice chairman of the state highway department, and member of the advisory board from the fourth district, talked on road conditions and materials for surfacing.

R. H. Higgins, superintendent of maintenance of the state highway department, impressed upon the minds of the commissioners, the need of proper qualification of work done, in the making of reports.

W. L. Rees, chairman of the Pueblo board of county commissioners, was called upon for a talk on county finances. which led to a discussion entered into by George Barr of Otero county and Joseph Ray of Las Animas county.

Budget systems in county offices, recording and handling of the county poor and other interesting subjects were discussed. J. E. Ray of Las Animas county, vice president, presided in the absence of President J. E. Downey. William Barber, Pueblo county clerk, acted as secretary in place of B. D. Bradley, who was unable to attend.

At noon the commissioners were the guests of half a dozen machinery-implement men at a dinner at the Congress Hotel where several interesting remarks were made. The Arkansas Valley County Commissioners' Association includes 13 counties in the southeastern part of the state along the Arkansas river.

LARGE SUM AVAILABLE FOR ROAD ON "ROOF OF GARDEN OF THE WORLD."

Grand Junction, Colo., May 10.—Tourists the world over will be enabled to travel the largest flat top mountain on the globe on as fine a mountain highway as ever was made from dirt, when the $75,000 now virtually assured for the circle trip of 130 miles over Grand Mesa. "Roof Garden of the World," has been expended by the forest service. Nearly 500 lakes, 200 of which are large, inviting spruce surrounded waters with thousands of trout beckoning fishermen and campers, are opened up to motorists by this route, none of them more than three or four miles from the main highway, and fully 50 of them lying just below the roadbed.

The appropriation of $30,000 for a good road between Mesa lakes and Alexander lakes, two groups comprising dozens of magnificent natural lakes, has been followed by word that $45,000 will in all probability be secured to meet this road with a similar six per cent grade reaching the Alexander group from Delta, on the other side of the mesa. This will make the entire length of the road, excepting five miles on the Mesa side, either forest highway or along the transcontinental routes; the five miles lying out of these classes is to be repaired to conform with forest specifications within the next few weeks.

Grand Mesa is a connecting link in the large V formed by the meeting of the Rainbow route and the Pike's Peak Ocean to Ocean highway in Grand Junction. The lakes region, with hotels, camp grounds, store facilities, etc., may be reached within 15 miles of the Pike's Peak road in Pleateau Canon or within 20 miles of the Rainbow route at Delta. There is at this time a reasonably good dirt road over this route, but with the additional expenditure of $75,000 it will rival any Rocky mountain highway ever built.

MAJOR BLAUVELT HONORED BY NATIONAL HIGHWAY OFFICIALS

Highway Engineer L. D. Blauvelt was signally honored last month when he was appointed far-western member of the executive committee of the National Association of Highway Officials.

Announcement of his appointment came in a telegram from W. C. Markham, executive secretary of the association, with headquarters at Washington, D. C.

Major Blauvelt takes the place of E. P. Olson, former highway engineer of Idaho. Mr. Olson recently severed his connection with the Idaho State Highway Department, and by doing so automatically vacated his place on the executive committee.

The membership of the National Association of Highway Officials is composed of virtually every head of the highway departments of the various states, together with men active in highway construction work by the United States government.

FIRST 1923 HIGHWAY PROJECT COMPLETED THROUGH JARR CANON

The first contract to be completed under the 1923 budget of the state highway department was that calling for the widening of the Jarr Canon road, one of the most heavily stretches of highway in the vicinity of Denver.

Contractor Richard McQueary finished the job early in April. He started on the work shortly after the budget had been completed last December and kept working throughout the winter months.

He is now enaged under the direct supervision of the highway department in grading, draining and surfacing the state highway from the Denver city limits south to Fort Logan, which is a continuation of Sheridan boulevard.

DENVER MAINTAINS 989 MILES OF STREETS WITH FULL ROAD OUTFIT

A total of 989 miles of streets are maintained by the highway department of the City of Denver. Besides the city has about 100 miles of roads in her mountain parks to maintain in condition, in addition to about 40 miles of roads through her city parks.

Equipment used on this work includes eight tractors, sixty-two trucks and twenty-two graders of varied sizes. The city also operates a large asphalt plant and sufficient equipment for the construction of new asphalt streets and the repairing of those already laid.

The early part of April the Denver asphalt forces started the annual spring repair work. At the same time constructors began work on extension of the paving on South Broadway to the city limits. This work will consist of laying two inches of asphalt on a slag base.

SMALL LOADS IN SPRING SAVE ROADS, IS REPORT

Washington, May 10.—Highway conservation should be considered with highway promotional efforts throughout the country, particularly at this time of the year, is a statement given out by the good roads board of the National Motorists' Association to automobile clubs throughout the country.

Hundreds of thousands of dollars are annually lost in practically all sections of the country, due to lack of regulatory measures in the spring of the year when the frost is coming out of the ground, during which period also there is a greater percentage of rain. Some states have taken the precaution of mandatory laws requiring lesser loads on trucks on the improved roads of the state or intercounty highway system. This has proved a considerable saving in the expenditure of maintenance monies. As pointed out by the National Motorists' Association officials an overloaded truck in the spring of the year can cause a hundred-fold more damage to a highway than the passenger or pleasure motor vehicle.

"It is about time that the money spenders of state legislatures thought more about conservation of highways already built than of adding additional tax burdens in the form of special taxes against the use and ownership of the passenger vehicles or the family flivver," states Fred H. Caley, secretary of the National Motorists' Association at Washington. "We are not in any sense opposed to the proper operation of the motor truck or bus line, but we do believe that officials having jurisdiction over highways that cost thousands of dollars should carefully watch the roadbed at this time of the year and curtail the loads allowed on those highways when evidence is shown that the road is being destroyed or seriously damaged by heavy unit vehicles."

The vituperating outpourings of the press against the careless motorist should result in something more than "Safety Campaigns". They should initiate a real movement which would sweep the country.

LIST OF WAR MATERIALS NOW AVAILABLE FOR DISTRIBUTION ON ROAD PROJECTS

Announcement is made through the Purchase and Traffic Division of the highway department that the following surplus war materials are available for transfer to counties and municipalities in the State of Colorado for use in construction and maintenance of public roads.

It is suggested this list be used in making requisitions for any of the materials required.

As new material is received supplements to this list will be issued by T. R. Elkins, head of the Purchase and Traffic Division.

The list should be cut out and pasted on a piece of heavy card board for ready reference.

Description	Price Each
Adze	$ .75
Anvils, 34-lb.	1.50
Anvils, 250-lb.	12.50
Asphalt, barrels	cwt. 2.00
Axe heads	.50
Axe handles	.15
Axes, w/handles (used)	.50
Axe, fire	.60
Axes, Hunters	.45
Axes, w/handles 5-lb.	1.88
Bars, wrecking, 24-in.	.50
Bars, wrecking, 36-in.	.75
Bars, pinch, 60-in.	1.00
Bars, digging, 8 ft.	1.50
Blox, Double Tack, 3-in.	1.50
Blox, Double Steel, 8-in.	3.50
Blox, Single Snatch, 4-in.	1.50
Blox, Single Snatch, 6-in.	1.75
Blox, Single Snatch, 10-in.	3.50
Blox, Single Snatch, 14-in.	7.50
Braces, Ratchet, 8-in.	1.00
Brooms, Stable	1.00
Canvas water buckets	.25
Carts, water, 150-gallon tank, (2 in stock) each	75.00
Chain, skid, ⅜ x 20-¾ in.	.21
Chain, spoke clamps	.17
Chain, eyes Disc wheels	.14
Caps, Blasting	per 100 1.00
Cutters, cold	.25
Chisel, sq. point	.20
Cable, steel, ¾ in.	ft. .08
Carbide, ½-lb. cans	.05
Cots, folding, canvas	1.75
Cots, steel, folding	2.25
Covers, Mattress, 3′ x 6′ x 6″	1.50
Drills, Rock, 30-in.	1.00
Drills, Rock, 44-in.	1.50
Engines, Gasoline, 12 H. P.	250.00
Engines, Gasoline, 7 H. P.	150.00
Exploders, hand fuse	18.00
Files, assorted	.35
Forges, portable, small	12.00
Forges, portable, large	20.00
Globes, lantern, red and clear	.08
Grease, axle, per can	.75
Grease, axle, per case	3.60
Grindstones, ball bearing	1.00
Hatchets, claw	.35
Hammers, rivet, ¾-lb.	.35
Hammers, sledge, 12-lb. no handle	.96
Hammers, spike	.75
Hammers, cross pein, 3½-lb.	.45
Hammers, cross pein, 4-lb.	.45
Hammers, cross pein, light	.35
Hammers, stone	.35
Hammers, ball pein, 2½-lb.	.45
Handles, hatchet	.10
Handles, machine hammer, 10-in.	.10
Handles, machine hammer, 14-in.	.10
Handles, machine hammer, 16-in.	.10
Handles, machine hammer, 18-in.	.10
Hammers, farriers	.25
Hammers, sledge, per lb.	.08
Handles, pick	$ .15
Handles, D handle shovel	.15
Handles, long, shovel	.15
Hardies, B. S.	.20
Harness, wheel	set 15.00
Harness, cart	15.00
Hasps and staples, 4-in.	.05
Hinges, 4-in. strap, pair	.05
Hinges, 6-in. strap, pair	.10
Hinges, 5-in. T., pair	.10
Hose, Disch. 2-in., 25-ft. lengths, ft.	.15
Horse Rasps, each	.25
I Beams, 10″ x 20′	13.50
I-Beams, 3¼″ x 6″ x 15′	lb. .02¼
Knives, drawing	.75
Lanterns, folding	.50
Mattox, trench	.25
Mattox, pick	.45
Nails, 10d to 60d	keg 3.75
Nippers, farriers	.30
Oil, leather	gal. .50
Oil, Neatsfoot (100-pt. case)	pt. .10
Oil, Spica	pt. .05
Pails, galvanized iron	.25
Pails, canvas, water	1.00
Peavies	1.25
Pipe, iron 1¼ in.	.07
Pipe, iron, 2½ in.	.18
Pliers, wire cutting	.50
Points, pick	.45
Pump with engine, 3 H. P., Alamo	150.00
Pumps, Blackmere, hand	6.00
Pumps, Gould Rotary	10.00
Pumps, hand Piston	4.50
Pump, Hill's Centrifugal	850.00
Posts, fence, angle iron	.25
Ranges, field, 4-hole	10.00
Ranges, field, 2-hole	7.00
Rope, ½ in.	lb. .08
Rope, ⅝ in.	.08
Rope, ¾ in.	.08
Rope, Manila 1″	.08
Rope, 1-⅜″	.08
Saddle bags, leather, 2 pocket, (2)	1.50
Saws, hand, 26-in. cross cut, 7 pt.	.50
Saws, hand, 26-in. cross cut, 8 pt.	.50
Saws, 6 ft. cross cut	1.50
Scales, platform, weight 115 lbs. capacity 300 lbs.	20.00
Shovels, S.H. rd. point	.45
Shovels, L.H. rd. point	.45
Skid chains, Nash trucks	each .21
Skid chains, Liberty trucks	1.50
Skid chains, Heavy Aviation	1.25
Spades, S. H.	.45
Spikes, wire, 7-in., kegs	3.50
Spikes, wire, 8-in., kegs	3.50
Spikes wire, 9-in., kegs	3.50
Spring Auto repair kits	1.25
Staples, assorted	3.50
Stoves, Sibley	1.50
Steel Rd. Chrome 1-⅛ in.	lb. 03½
Tarpaulins, 5 x 6	2.00
Tarpaulins, 17 x 30	20.00
Tents, pyramid, 120 lb. with covers	12.00
Tents, 14′ x 16′—5″	30.00
Tents, 16′ x 16′ x 36″	12.00
Tents, 16′ x 20′—5′ ...with poles	37.50
Tents, 6½′ x 6½′—24″, without poles	3.00
Tires, solid, press-on 36″ x 6″	20.00
Tires, solid, press-on 36″ x 4″	16.00
Tires, solid, 38 x 5	28.00
Tires, solid, 40 x 10	55.00
Tires, motorcycle 28 x 3	3.50
Tires, Q. D. 34 x 3½	8.00
Tires, Q. D. 34 x 4	8.00
Tires, Q. D. 34 x 6	11.25
Tires, Q. D. 36 x 5	12.50
Tires, Q. D. 36 x 7	16.00
Tires, Q. D. 37 x 2½	9.00
Tires, Q. D. 37 x 6	14.00
Tires, Q. D. 39 x 5	15.00
Tools, cement finishers	2.00
Tongs, B. S. bolt, 22-in.	.35
Tongs, B. S. assorted	$ .35
Tongs, B. S. clincher	.30
Tongs, B. S. clincher, 14-in.	.30
Tongs, B. S. clincher, 16-in.	.35
Trailers, four wheel, solid rubber tires, three ton without bodies	125.00
Trailers, four wheel, solid rubber tires, three ton with cargo bodies	150.00
Trailers, four wheel solid rubber tires, three ton with water tank	165.00
Trailers, four wheel, solid rubber tires, five ton without bodies	175.00
Trowels, plasterers	.50
Trowels, bricklayers	.90
Tubes, inner, motorcycle, 28 x 3	.75
Vises, bench 4-in.	4.50
Vises, bench 4¼-in.	4.50
Vises, B. S., small A	4 50
Vises, B. S., 5-in.	5.50
Vises, pipe and bench	7.50
Wheelbarrows, (used)	4.00
Wheelbarrows, (new)	10.00
Wheels, front, escort wagon	1.50
Wheels, rear, escort wagon	1.50
Wrench, monkey, 10″	.30

STATE OBTAINS FIFTY-YEAR LEASE ON LASALLE CUT-OFF HIGHWAY

The LaSalle cut-off on the Denver-Greeley highway is now an assured fact, following the consummation of a fifty-year lease between the State of Colorado and the Union Pacific Railroad. The lease was signed in Omaha by President Gray on May 1.

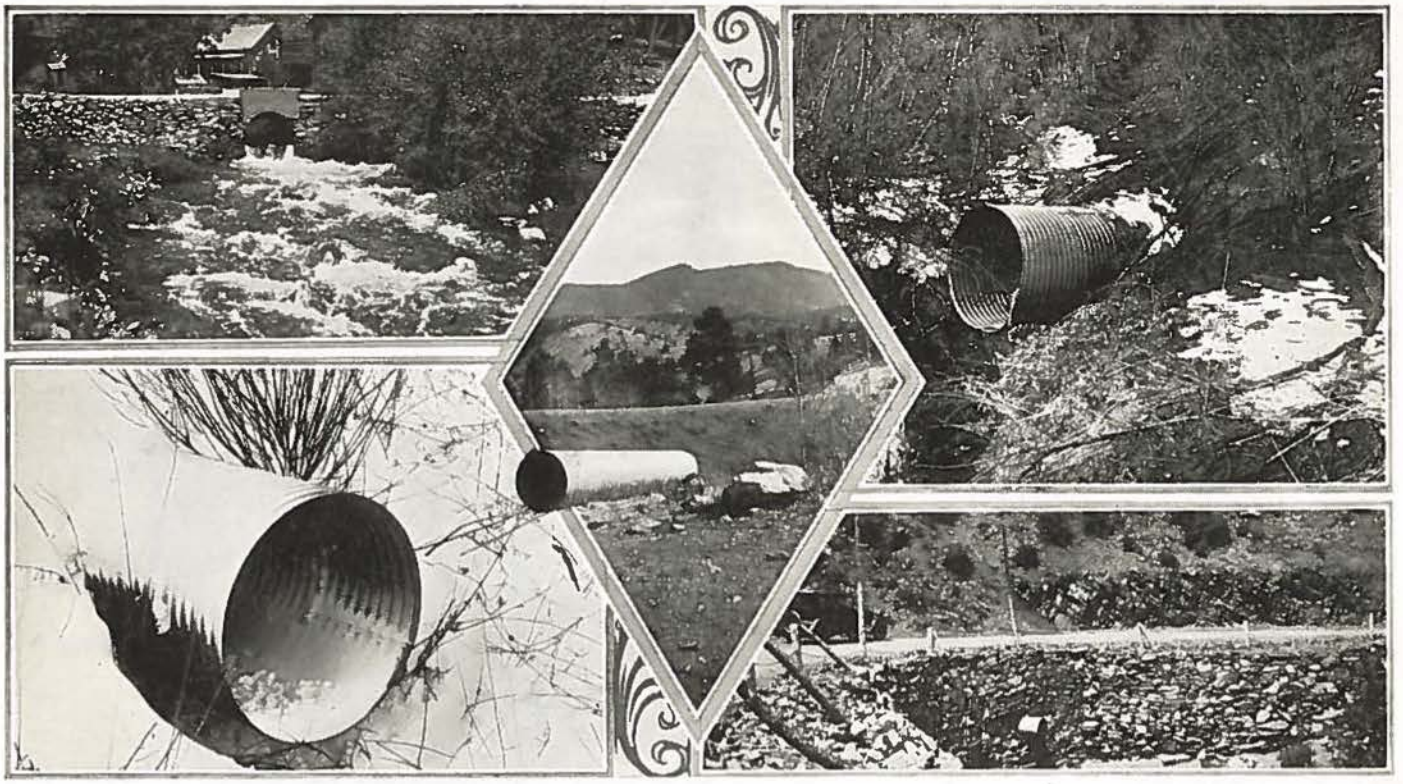
Signing of the lease followed a conference between Highway Engineer L. D. Blauvelt, Attorney-General Russell Fleming, the members of the Weld county board of commissioners, and the U. P. railroad officials. All were highly pleased with the outcome of the conference.

The state officials not only obtained a lease for a highway right-of-way from Mr. Gray on terms acceptable to the State but the Union Pacific president went even further and agreed to the insertion of terms which the two officials had not even hoped for.

From LaSalle the highway will follow the railroad line to a point just south of Greeley, where it will connect with the concrete already completed. The construction of the so-called LaSalle "cut-off" has been the dream of Weld county officials for a number of years. Grading of the new road is now under way and in another year is expected to be paved with concrete, thus completing a continuous ribbon of concrete pavement from Denver to Greeley, a distance of 54 miles.

"President Gray more than met us half way," said Major Blauvelt. "He granted us a lease of a strip of ground over the railroad's property from LaSalle northward to near Dover, a distance of some forty-three miles, for a period of fifty years. He then consented to the insertion of a provision to the effect that, in case the Union Pacific should ever determine to change its roadbed in such a manner as to affect the highway, the railroad company will move the highway and reconstruct it at its own expense.

"Mr. Gray deserves the thanks of the people of Colorado. His attitude will enable the state highway department to straighten out the road north and south from Greeley and, most important, will make possible the elimination of six dangerous grade crossings."



Typical ARMCO Ingot Iron Corrugated Culvert Installations in Colorado.

ARMCO INGOT IRON

is in a class by itself—distinctly different from all other ferrous metals both chemically and physically. The finished metal contains less than 1/6 of 1% impurities including in the aggregate sulphur, manganese, copper, silicon, oxygen, nitrogen and hydrogen.

It is the indispensable quality of **PURITY** of metal that makes **ARMCO** Ingot Iron culverts unique among all constructions in rust-resistance.

It is a poor economy which purchases, for such basic use, any but the very best obtainable stock; or which secures it anywhere but from a company possessing the material, equipment, resources, experience and organization to furnish it in the proper manner and at the proper time.

ARMCO Ingot Iron is your assurance of **QUALITY.**

THE HARDESTY ORGANIZATION your assurance of **SERVICE.**

No order is too small to merit our prompt and courteous attention. None too large for our equipment.

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DENVER, COLORADO

WOODS CROSS, UTAH. MISSOULA, MONT. POCATELLO, IDAHO.

TRADE MARK ARMCO REG. U.S. PAT. OFF.

PROJECTS ADVERTISED FOR BIDS

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE	LOW BIDDER	PRICE
F.A.P. 125	Sapinero, toward Montrose	Gunnison	2.708 mi.	Gravel surfacing and bridge	Dale Hinman	$81,699.62
F.A.P. 157B	Between Buena Vista and Leadville	Chaffee	3.924 mi.	Grading	J. V. Stryker	59,741.00
F.A.P. 256A	Between Atwood and Merino	Logan	2.5 mi.	Paving	LaNier, Selander & White	72,638.00
S.P. 772	Blackhawk	Gilpin	568 feet	Masonry flume	Northwestern Const. Co.	21,226.80
S.P. 775	Over Br. Cr., bet. Troutdale & Bendemeer	Jefferson	24 ft. span	I-beam bridge and approaches		
S.P. 782	East of Craig	Moffat	2.179 mi.	Gravel surfacing	Stroehl Mach. & Sup. Co.	12,042.00
S.P. 789	Over Rattlesnake Creek, east of Byers	Arapahoe	204 ft. span	Timber trestle bridge & approaches		
Phipps Bridge	over Bear Cr. bet. Troutdale & Bendemeer	Jefferson	20 ft. span	I-beam bridge and approaches		

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE
207	Over Blue River, appx. 13 mi. north of Dillon	Summit	100 ft. span	Low truss bridge and approaches
214	Durango, south	La Plata	2.082 mi.	Gravel surfacing
226B	Platteville, north and south	Weld	2.868 mi.	Paving
229	Bear Creek, between Pueblo and Florence	Fremont	0.879 mi.	Gravel surfacing and bridge
255A	East of Ft. Morgan	Morgan	2.702 mi.	Paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

PROJ. NO.	LOCATION	COUNTY	LENGTH	TYPE
F.A.P. 2 (Reop.)	Trinidad, north	Huerfano	3.5 mi.	Concrete paving
F.A.P. 71C	Between Durango and Hesperus	La Plata	3. mi	Gravel surfacing
F.A.P. 116B	Breed, north and south	El Paso	0.91 mi.	Concrete paving
F.A.P. 116C	North of Breed	El Paso	3.22 mi.	Concrete paving
F.A.P. 120 (Rev)	Over Clear Cr. S.E. of Arvada	Jefferson	2 spans @ 100 ft.	Steel truss bridge
F.A.P. 135	Between Denver and Morrison	Jefferson	5.067 mi.	Concrete paving
F.A.P. 159A	Between Ramah and Matheson	Elbert	6.288 mi.	Sand-clay surfacing
F.A.P. 208C	Clifton-Palisades	Mesa	5. mi.	Gravel surfacing
F.A.P. 222C	Between Denver and Lafayette	Boulder	1.5 mi.	Concrete bridge and R. R. grade separation
F.A.P. 224	Between Morrison and Baileys	Park	5.621 mi.	Mountain grading
F.A.P. 230A	Wolhurst, toward Sedalia	Douglas	0.852 mi.	Paving
F.A.P. 230B	Between Wolhurst and Gann	Douglas	5. mi.	Paving
F.A.P. 241	Over Gunnison River, ½ mi. north Delta	Delta	4 spans @ 150 ft.	Steel truss bridge and approaches
F.A.P. 245	Las Animas, west	Bent	6. mi.	Gravel surfacing
F.A.P. 246	East of Pueblo	Pueblo	2.537 mi.	Paving
F.A.P. 247	Between Rocky Ford and Swink	Otero	1.149 mi.	Concrete paving
F.A.P. 252	Loveland, south	Larimer	3.5 mi.	Concrete paving

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
7-C	Norwood-Naturita	10.6 mi.	Mountain Grading	Girardet-Hotchkiss Eng. Co.	$ 68,684	65	7-C
29	Morrison-Turkey Creek	1.9 mi.	Mountain Grading	Wm. Flick	70,839	98	29
30	Morrison Paving	.94 mi.	Concrete Paving	Peterson, Shirley & Gunther	41,677	75	30
71-B	Durango-Hesperus	3.6 mi.	Gravel Surfacing	Peterson, Shirley & Gunther	61,556	--	71-B
102	Ouray-Red Mountain	1.06 mi.	Mountain Grading	Johnson & Johnson	58,972	40	102
116-A	Colorado Springs Paving	4.18 mi.	Concrete Paving	Standard Engr. & Constr. Co.	238,944	14	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Eng. Co.	53,709	9	119-B
129	Federal Boulevard	4.42 mi.	Paving	Peterson, Shirley & Gunther	164,331	98	129
133	Federal Boulevard	4.22 mi.	Paving	W. J. Cameron & Co.	146,399	98	133
136	Turkey Creek Road	5.52 mi.	Mountain Grading	Peterson, Shirley & Gunther	54,479	100	136
139	Ft. Collins-Loveland	4.02 mi.	Concrete Paving	Mutual Constr. Co.	139,263	98	139
163	St. Charles Bridge	0.5 mi.	Steel Bridge	Rogers & Pickard	85,636	82	163
165	Canon City east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	63	165
166	La Junta-Swink	2.01 mi.	Concrete Paving	Carl C. Madsen	66,949	81	166
168-A	Granada-Lamar	5.67 mi.	Gravel Surf.	Standard Engr. Co.	52,421	100	168-A
168-BC	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	5	168-B
171	Delta, north	6.67 mi.	Gravel Surf.	Reeves & Cook	66,268	100	171
173	St. Charles Bridge	0.25 mi.	Concrete Bridge	J. Ralph Donaghy	23,691	100	173
174	Red Mountain	3.03 mi.	Mountain Grading	Pickering Bros.	82,071	57	174
189	Hayden, east	5.41 mi.	Gravel Surf.	H. C. Lallier Constr. & Engr. Co.	41,941	72	189
190	Summit County Bridge and Road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	5	190
208-A	Grand Junction-Palisades	3.14 mi.	Gravel Surf.	F. L. Hoffman	33,644	100	208-A
209	Grand Junction-Fruita	4.20 mi.	Gravel Surf.	Hinman Bros.	60,955	81	209
219-A	Grand Valley-De Beque	5.30 mi.	Gravel Surf.	F. L. Hoffman	57,429	16	210-A
213-B	Durango-Hesperus	5.26 mi.	Gravel Surf.	J. Ed. Hansen	72,960	5	213-B
215	Pagosa Springs Bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	17	215
216-A	Holly, east	5.38 mi.	Gravel Surf.	W. A. Colt & Son	57,867	84	216-A
217	Pueblo, east	2.94 mi.	Paving	Ed. Lindsay	72,164	45	217
218-A	Hasty-Lamar	8.34 mi.	Gravel Surf.	Monaghan & Cunningham	52,247	91	218-A
218-B	Hasty-Lamar	3.49 mi.	Gravel Surf.	M. J. Kinney	40,000	28	218-B
221	Loveland, north	4.05 mi.	Concrete Paving	Fred C. Dreher Constr. Co.	142,125	43	221
222-B	Broomfield cut-off	1.52 mi.	Concrete Paving	Miller, Douglas & Hanes	68,302	33	222-B
225	Fitzsimons Hospital Road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	--	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Concrete Paving	White & Johnson	241,133	33	226-A
226-C	Platteville-La Salle	10.73 mi.	Grading	C. R. Conover & Bro.	36,296	41	226-C
228	Atwood-Sterling	4.41 mi.	Concrete Paving	La Nier, Selander & White	148,484	56	228
231	Six-Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockway	25,165	3	231
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	--	81-A
211	Meeker, north	1.85 mi.	Gravel Surf.	Hinman Bros.	34,445	--	211
223-A	Kremmling-Rabbit Ear	2.88 mi.	Gravel Surf.	Henry Shore	30,565	--	223-A
142-R	Sterling, south	0.40 mi.	Concrete Paving	White & Johnson	15,000	--	142-R
222-A	East of Broomfield	2.74 mi.	Concrete Paving	Miller, Douglas & Hanes	97,168	100	

CONCRETE HIGHWAY BRIDGES

At the left is shown a concrete bridge and retaining wall built above Bear Creek Falls on the world-famous Million-Dollar D. S. O. Highway between Ouray and Silverton.

It is a fact that concrete bridges, like concrete roads, are for the traffic of today and tomorrow. They grow stronger as they grow older.

Almost without exception lower in first cost than those built of other materials, concrete bridges are free from deterioration. They will not rust, rot nor burn.

They need no painting, no replacement of parts,—and are free from maintenance expenses that soon make other types of bridges more expensive in the end, regardless of original cost.

No road is better than its weakest bridge.
Concrete bridges are dustless, non-slippery and are equally serviceable in all seasons.

"CONCRETE FOR BEAUTY AND PERMANENCE"

History of State Highway Department

(Continued from page 5)

Revenue from Mill Levy.

1916	$ 570,735.46
1917	592,615.63
1918	631,069.56
1919	705,237.50
1920	1,416,793.18
1921	1,479,774.42
1922	1,520,414.83
Total	$6,916,640.58

Revenue from Motor Vehicle Tax.

1913	$ 31,420.25
1914	45,270.58
1915	52,298.17
1916	90,565.43
1917	134,983.92
1918	176,955.13
1919	143,447.98
1920	439,402.78
1921	400,000.00
1922	458,443.93
Total	$1,972,788.17

Revenue from United States Government.

1918	$ 17,052.54
1919	21,231.98
1920	810,051.87
1921	1,191,584.11
1922	1,267,028.14
Total	$3,309,448.64

Revenue from Internal Improvement Fund.

1913	$ 490,000.00
1914	210,000.00
1915	144,000.00
1916	54,000.00
1917	.....
1918	300,000.00
1919	240,000.00
1920	351,500.00
1921	115,500.00
1922	125,000.00
Total	$2,030,000.00

RECEIPTS

Legislative Appropriations	$ 77,119.70	
Internal Improvement Fund	2,030,000.00	
State road fund	21,456.56	
One-half and one mill levies	6,916,640.58	
Motor Vehicle licenses	1,972,788.17	
United States Government	3,309,448.64	
Gasoline tax	1,118,396.11	
Counties' contributions to meet Fed. Aid	1,204,674.36	
Bond Issue 1921 & 1922	5,151,257.00	
Miscellaneous	169,950.27	
Cancelled Vouchers	900.75	
Total		$21,972,632.14

DISBURSEMENTS

Counties (Construction and Maintenance)	$4,464,243.71	
Salaries and expenses	581,210.03	
Fed. Aid Projects	8,668,406.35	
Special State Projects	2,285,322.15	
Forestry Projects	392,074.50	
Emergency Projects	44,162.91	
Maintenance	892,427.14	
Property & Equipment	508,096.21	
Excess War Supplies	163,802.91	
Freight on T. N. T.	69,866.33	
Truck Dump Bodies	60,191.76	
Counties from Bond Fund	1,683,694.80	
		$19,813,498.80
Balance Highway Fund		439,975.53
Balance State Bond Fund		902,852.
Balance Counties Bond Fund		816,305.20
		$21,972,632.14

Scene on Fall River Road near Grand Lake, showing water being drained from surface of road by means of open top culverts.

HIGHWAY DEPARTMENT EXPENDITURES FROM THE DEPARTMENT'S INCEPTION TO DATE

1910	$ 40,352.54
1911	.....
1912	36,767.16
1913	461,165.85
1914	301,274.38
1915	212,597.14
1916	623,133.27
1917	720,993.83
1918	1,174,974.03
1919	1,555,559.25
1920	3,896,945.39
1921	4,053,853.21
1922	6,735,882.75
Total	$19,813,498.80

Colorado's 1923 Highway Program

(Continued from page 3)

reputation as a state of unparalleled scenery.

Many roads now under construction and about to be constructed are unequaled from a scenic point of view. This is practically true of every road which traverses the mountains. But in this respect the State is very fortunate that such is the case, for it makes possible to build roads, which while primarily commercial roads, are also attractive to the tourists. It might be said without fear of contradiction that every road west of the eastern foothills of the Rockies is a scenic road and a commercial road as well.

There are a number of scenic roads being constructed in the State and whose construction will continue in the future, but which are not being built by the State. They are being constructed as development roads by the United States Forestry Service. The latter is building them to open up the great Forest Reserves in the mountains and make them accessible to the people. These activities are being carried on independently of the State Highway Department, though the heads of the Forestry Service are cooperating with the State, and before a forest development project is placed upon the program, the forestry officials generally consult with the State Highway Department, in order that a maximum amount of good may be obtained from the forest roads and that the latter, as far as possible, fit in with the State's system of highways.

Types of roads to be constructed during the year comprise hard surface, gravel, dirt, etc. In selecting the type of road to be built, the Department is governed by local soil and traffic conditions.

It would be considered foolish to build concrete roads in the mountains, where the travel is light and where there is a good rock foundation for roads. On the other hand concrete roads are specified near the large centers of population, where the traffic is of such proportion that gravel or dirt roads do not stand up under the traffic.

In selecting roads for improvement and in selecting surfacing material, the watchword of the Highway Department, say officials, will be during 1923 what it has been the past two years:

"The greatest good for the greatest number."

Half Million Dollars for Forest Roads

(Continued from page 6)

river, in the Gunnison forest. Cost, $3,500.

All the construction and surveying will be performed by the United States bureau of public roads. Work will begin as soon as the recommendations of District Engineer Johnson have been formally accepted, and the weather permits of outdoor labor in the mountains.

The widths of the roads will vary from twelve to eighteen feet, exclusive of ditch and shoulder. The latter is virtually a three-foot addition to all widths, since it will be solid enough to permit of use for passing or turning around.

The appropriations are a little less than those of a year ago, owing to the fact that last year's appropriations covered, in some instances, two year allotments. They come from the $3,500,000 appropriated by Congress for the road aid of forest states, of which Colorado is one of the most important.

Six Projects Totaling Sixty Miles Completed in Seventh District

Six gravel surfacing projects embracing more than sixty miles of roads have been completed in Logan, Washington, and Morgan counties located in northeastern Colorado during the last month, according to A. B. Collins, division engineer.

The work of spreading this gravel was all done by farmers owning teams, and they were paid for their labor on a yard-mile basis. Approximately $75,000 was paid out on the projects. Several other like projects are now under construction.

Mr. Collins stated that every one of the state projects authorized in District No. 7, which is under his supervision, have been put under construction. In nearly every case the work is being done by farmer labor.

It is expected that by the end of the summer more than 200 miles of roads in this section of the state will be improved by gravel surfacing. In each case the roads are covered with a clay base before the gravel is spread.

Nineteen miles of new road in Washington county on the Kansas Airline west of Cope has been completed. Gravel surfacing also has been finished on Road No. 23 south to Kelly; No. 19 south of Brush; No. 9 north to Peetz, and No. 28-s from Akron north to Atwood in Logan county.

With the work just completed on the last named road there is a ribbon of thirty-eight miles of highly improved gravel surfacing, making one of the finest roads in eastern Colorado.

Engineer Collins also announced the completion of three miles of extremely heavy grading and surfacing east of Wray on the Golden Rod Highway. This piece of work eliminates two railroad crossings. On the project were several heavy fills and deep cuts. All of the fills are 30 ft. wide and the cuts are sufficient to permit two cars to pass with ease at any point. The two railroad crossings were eliminated by a change in the line of the road. These crossings have been the scene of a number of bad accidents. About thirty farm teams were employed on the work, which cost about 19 cents per yard, including overhead items such as administration, engineering, etc.

With the completion of this project one of the very worst links in the Golden Road Highway in Colorado was subdued. During the summer months this road is traveled by thousands of tourists coming into the State from Kansas points.

Records kept by the highway engineers in District No. 7, which is represented on the Highway Advisory Board by Frank H. Blair, of Sterling, show that more than 400 farmers with teams have been given employment on the roads this spring.

A good road, like virtue, is its own reward.

NATURE GUIDE TO EXPLAIN MANY BEAUTIES OF ROCKY MOUNTAIN PARK

Visitors to the Rocky Mountain National Park, Colorado, this summer will find available during July and August, free nature guide service, which has become so popular a feature in other National Parks, according to a statement issued today by the Department of the Interior, announcing the appointment of J. M. Johnson, of Ridgewood, New Jersey, as park ranger in charge of this work. Ranger Johnson, a lecturer on natural history subjects for the Board of Education of New York City and the National Association of Audubon Societies, is intimately acquainted with the Rocky Mountain region, having spent five summers traveling and camping through the mountains from Colorado to Wyoming.

Plans for the work contemplate the giving on successive evenings an illustrated talk at different hotels in the park and in the near-by village of Estes Park. The evening talk is to be followed, the next morning, by a short, leisurely field trip starting from a point within a convenient distance from the hotel. On these field walks the flowers, trees, birds, and animals will be identified and the geoglogical features of the park will be explained by the nature guide. It will be the aim of the nature guide work to encourage conservation of the columbine, the State flower of Colorado, assist in forest-fire protection work, and to help visitors to better understand and enjoy what they see.

Some men don't want roads because land will increase in value.

EQUIPMENT NOTES

A feature is being made by the sales force of H. W. Moore & Co., of a "three-piece combination" for maintenance work. The combination consists of a Best tractor, Big Buster scarifier-grader and Duplex maintainer, which sells for about the same price of a large truck equipped with dump body. The tractor has enough power to pull three 2-yard dump wagons on hauling jobs.

A new model 14-ft. Jaeger mixer is announced by the Moore company. This machine is twice the size of the largest mixer heretofore built by Jaeger.

During the first seventy-six working days this year the Pawling & Harnischfager company manufactured and sold seventy dragline excavators, says Paul Fitzgerald, Denver manager of Landes & Company, distributors. This is a record for the P. and H. concern. A large number of the new machines were placed on jobs in western states. Fitzgerald says that reports reaching him indicate that the west is on the eve of a great revival of irrigation works.

The P. & H. Company has just issued a booklet entitled "What the Users Say," containing letters and telegrams from owners of their machines. It is one of the most interesting pieces of advertising literature brought out recently.

Mr. L. R. Shallenberger, general manager of the Colorado Culvert & Flume Company, was a Denver visitor on April 19 in connection with the hearing before the Interstate Commerce Commission on the proposed merger of the D. & R. G. W. and Santa Fe railroads. He announced that his firm had been granted rights to manufacture the Wendelken concrete culverts in southern Colorado. This culvert is designed to meet the requirements of certain kinds of street and road construction. Mr. Shallenberger said that they would manufacture the Wendelken culverts in addition to copper-steel corrugated culverts. He said that the company's plant in Pueblo was running at full capacity and predicted that the present summer would see a record number of road projects under way throughout the Rocky Mountain region.

Announcement was made on May 6 by the Avery Machinery Company that they will in the future be the distributor in Colorado, Wyoming and New Mexico for the complete line of the Austin Machinery Corporation. The Austin line is to be handled in addition to the Avery road machinery and Stockland graders.

The Austin Machinery Corporation manufactures a wide variety of construction and dirt moving machinery, including a concrete mixer and drag line excavator. Arrangements whereby the Avery concern will represent the Austin line in the Rocky Mountain region were made by E. A. Abbott, manager of sales and promotion.

J. B. Bartholomew, president of the Avery Company of Peoria, Ill., was a visitor in Denver on May 3. He came to Colorado from a visit to Dallas, Texas, on an annual inspection trip. He was accompanied by Mrs. Bartholomew.

"Everything in the farm and road machinery line is looking up and I believe we are headed for an era of great prosperity," was the optimistic message which Mr. Bartholomew brought with him from the east.

"Conditions have greatly improved in our business during the past six months and the future looks fine for a big increase in machinery sales. Some of the factories back east are now working overtime."

L. R. Grannis has been appointed distributor by the Philip Carey Company for Elastite Expansion Joints in the Colorado territory. Mr. Grannis announces that a complete stock is now carried in Denver. These joints are used extensively on concrete paving in the Rocky Mountain region.

An order for five more 10-ton Holt tractors and approximately twenty slow speed trailers has been placed through H. P. Wilson & Company by the Producers & Refiners Corporation. This equipment will be used by the oil concern for constructing roads in the oil fields of Wyoming. Five Holt tractors were shipped to the P. & R. concern last month.

The Reclamation Service was the purchaser of two 60-h. p. electric triple drum hoists. Three 14-S Koehring H. D. Mixers were purchased by the contractor on the D. & R. G. shops. The Baldy Mountain Placer Company also placed an order for a Koehring gasoline shovel to be shipped to New Mexico, while four elevating wagon grader outfits were purchased by contractors for use on railroad work in Wyoming.

STATE FORCE STARTS WORK ON HIGHWAY NORTH OF WALSENBURG

Work has been started on surfacing of about fifteen miles of the North and South Highway between Walsenburg and Pueblo county line. This improvement is being done by state forces under the direction of Robert H. Higgins, superintendent of maintenance.

The sum of $25,000 has been set aside in the state highway budget for the work. Six large trucks are employed on the project, which is expected to be completed about the middle of June.

Limestone material taken from a large pit located a short distance from the road is being used for surfacing. With the completion of this project, there will be a continuous stretch of limestone surfaced roadway from Pueblo to the top of Raton Pass on the New Mexico state line.

Except for this one piece of road now under construction, the road from Pueblo to Raton Pass is considered the finest automobile road in southern Colorado. It is the smoothest and is the equal of any city street. It carries all of the traffic from the southern part of the state and is the main route from Colorado to Texas and the Gulf coast, forming an important link in what is known as the Colorado-to-Gulf highway which runs from Denver to Galveston, Texas.

Work of improving the road from Raton Pass to Walsenburg through Trinidad has been going on for several years with federal aid funds. It is the longest piece of limestone surfacing in the state, and probably in the west for that matter, covering a distance of about 120 miles.

Highway officials have found that limestone, which abounds in Colorado, makes one of the finest materials available for road surfacing. It forms a perfect binder and after being used for a short time hardens on the surface of the road, making it smooth for automobiles.

It is said that the commissioners of Pueblo county contemplate surfacing the road north of Pueblo to the El Paso county line with limestone as soon as funds become available. The road south of Pueblo to the Huerfano county line was surfaced with this material a few years ago. The road west of Pueblo to Florence also is nearly all surfaced with limestone.

Both roads are very popular with motorists because of the splendid riding qualities of the surface of the two routes.

MANCOS CLUB TO LAUNCH BIG CAMPAIGN TO BOOST REGION

Mancos, Colo.—The Mancos Mesa Verde Club is planning an extensive advertising campaign on the Mesa Verde National Park and the San Juan Basin. Heretofore the traveling conditions in this part of the state have not been as fully advertised as they should have been. This advertising will partly come out in the form of pamphlets containing pictures, a complete road map of this section and a description of the country and its possibilities. They will be distributed in Denver, Pueblo, Colorado Springs and many of the larger cities throughout the United States. A large per cent of the population of the country do not even know who the Cliff Dwellers were. An interesting example of refreshing ignorance on this subject happened when a man from this section was in Seattle recently. He entered a large store and asked a bright looking girl behind the counter to fix him up a five-pound box of candy, and to pack it securely, as it was going down among the cliff dwellings.

She smiled at him and asked, "Are you a cliff dweller?"

REPAIR CREW STARTS WORK ON STRETCH OF VICTORY HIGHWAY

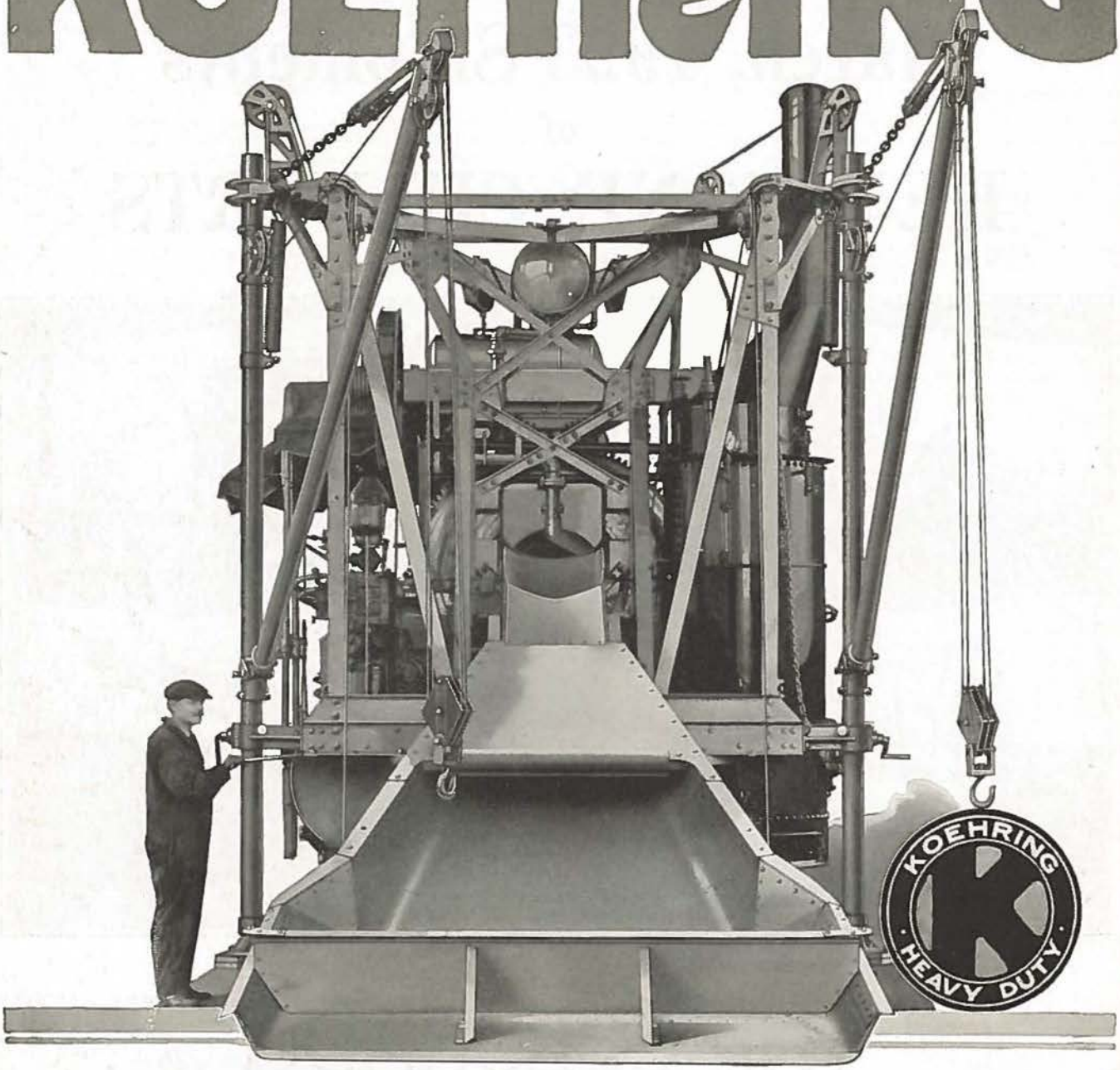
A crew of twenty men has been engaged to make repairs on the Vernon Canon road in Jefferson county, forming an important link in the Victory highway. This road has been washed very badly by two cloudbursts.

The work being done by the road crew under Foreman Roy Mooney, consists of building retaining walls along the road three miles above Morrison. It was announced by Charles Brock, division superintendent of maintenance, that the road will be placed under intensive maintenance, which insures that stretch of interesting roadway will be kept in finest possible condition for travelers this summer.

Traffic between Denver and Idaho Springs and western slope points use this stretch of highway, which makes a short cut around Lookout Mountain.

Ninety-three thousand children were killed in the streets or on highways last year. That statement should be placed in a conspicuous place in every school house and every home throughout the land. The Romans taught their children from the cradle that their enemies must be destroyed. Their teaching was successful. Why not teach ours the rudiments of safety?

KOEHRING



Loading End Strains

THINK of strains that the loaded fast-moving skip puts on the mixer frame! How they must tug and twist at the frame! Hundreds of times every working day. Thousands of times every season!

Now look at the Koehring frame construction—how the frame is braced, and re-inforced against strains and stresses from every direction. This is one reason why Koehring driving parts do not get out of alignment and set up unusual wear, breakages and delays. Get this Koehring "Heavy Duty" construction fixed in your mind, and recall it when you think about mixers.

H. P. WILSON & COMPANY

Distributors of Construction Machinery to meet every requirement.

DENVER, COLORADO.

Koehring Capacities

Pavers: 7, 10, 14, 21, 32 cu. ft. capacities mixed concrete, steam and gasoline. Write for catalog P.

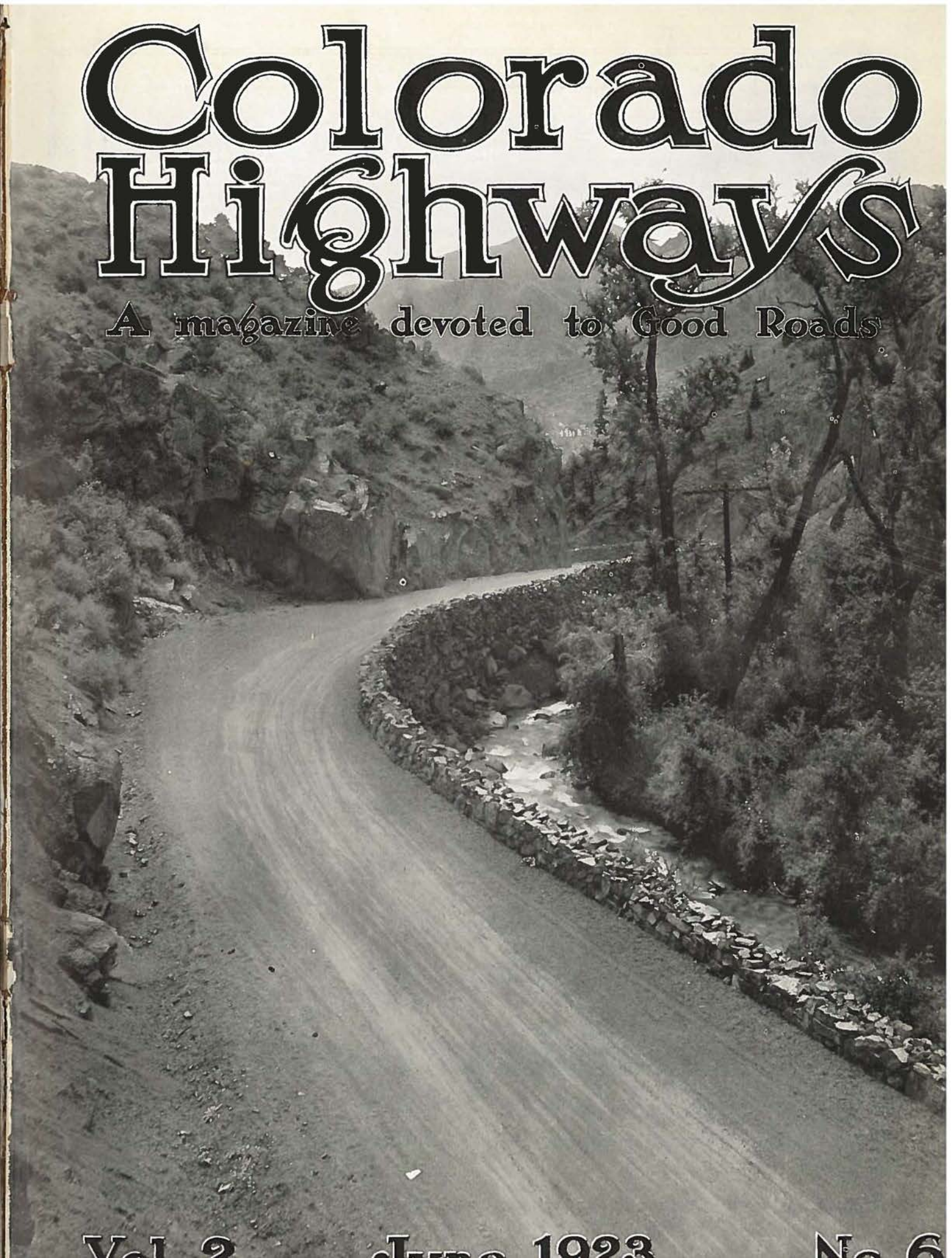
Construction Mixers: 10, 14, 21, 28 cu. ft. mixed concrete, steam and gasoline. Write for catalog C.

Dandie: A light staunch mixer for footings, culverts, foundations, etc. 4 and 7 cu. ft. mixed concrete, steam and gasoline. Power charging skip, low charging platform, batch hopper, light duty hoist. Write for Catalog D. Rubber tires optional.

THE BRADFORD-ROBINSON PTG. CO., DENVER

Colorado Highways

A magazine devoted to Good Roads



Vol. 3 June 1923 No. 6

We are pleased to announce the addition to the Jaeger line a 14 cu. ft. Mixer, with a capacity of 28 cu. ft. dry aggregate. This model embodies the same excellent design which has made the smaller Jaeger Mixers standard equipment in this territory.

Call on Us for Further Particulars

H.W. MOORE & Co

Denver Salt Lake

Our Line of Construction Machinery is the Most Complete in the West

Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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L. D. BLAUVELT,
State Highway Engineer.
OLIVER T. REEDY,
Senior Assistant Engineer.

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10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

As a frontispiece this month Colorado Highways prints a picture showing a stretch of the world-famous transcontinental Ocean-to-Ocean Highway. This particular piece of roadway is located in Ute Pass under the towering cliffs of Pike's Peak.

Over this route the Ute Indians were wont to make their pilgrimages into the South Park Country and the hunting grounds thereabout long before the advent of the white man.

It was near the spot where this picture was taken that Gen. Pike started his unsuccessful ascent of the peak which now bears his name. Today the highway over Ute Pass stands as a monument to the genius of modern roadbuilders, and is recognized as one of the finest examples of mountain road construction in the United States.—*Photo by Denver Tourist Bureau.*

Colorado Highways
"BETTER ROADS"
VOLUME II. JUNE, 1923. NUMBER 6.

How El Paso County Maintains Roads

Spends $300,000 Annually on Highway Improvements --Four Road Crews are Employed.

BY JACK F. LAWSON

WITH an investment of one quarter of a million dollars in equipment and an annual budget of almost $300,000, El Paso County is the banner district in Colorado for highway construction and maintenance. Its thousands of miles of hard surfaced roads testify to the value and results obtained from the big capital investment which El Paso County has put into its highways. Incidentally it has 2,864 miles of roads to keep in repair or more mileage than the state of Rhode Island can boast of.

El Paso County's highways are subjected to extremely hard wear and tear. Thousands of motor cars are constantly grinding on the surface of its many miles of roads. The total is augmented in the summer season by other thousands of high-powered cars from nearby states whose owners come here for the season and who while here make constant use of the splendid roadways which help to make the Pike's Peak region famous the world over as the "motorist's paradise."

El Paso County, since H. A. Gudger was placed at the helm by the present board of county commissioners, has brought its roads up to a standard that will be hard to exceed. Road construction has been done more economically than ever before in the history of the Pike's Peak region and upkeep has been reduced to a science that will bear investigation and imitation.

The county has been divided into districts with a camp or station in each. The necessary equipment for maintenance of the mileage within each district is stationed at each road camp. Men are assigned to the various camps and they are constantly on the job. Storms and high water have ceased to worry the ranchers living in the eastern portion of El Paso County since the adoption of modern methods of road upkeep. Once word is received of trouble the crew for that district is promptly on the job and the damage repaired.

Showing how El Paso county is economically building roads with a ten-ton Holt tractor furnished by the U. S. Government from surplus war stocks, supplemented with a modern large type Stockland grader. With this combination outfit one mile of modern roadway can be constructed in a day.

Upper left—Front view of El Paso county garage and repair shops. Upper right—Loading station operated on county road project. Lower left—A corner in the garage. Lower right—A section of the modern machine shop.

Camps now are established at Husted, Fountain, on the Falcon road and at Rock Creek on the Canon City Highway where 28 teams and men with motor equipment are located.

The men at the various camps work on a regular schedule arranged by H. A. Gudger, supervisor of roads, for El Paso County. The main highways are dragged every other day, unless there is an unforeseen interruption, while the secondary roads are worked at least once a week. Constant maintenance is the secret of keeping the roads in excellent condition, according to Mr. Gudger.

But it requires equipment and men to do the work. And El Paso County has machinery and equipment that is thoroughly up to date. It has an average of 60 men on the county payroll, while 17 motor trucks of between two to three and one-half tons capacity are included in the road equipment.

The county owns and keeps in service four complete sets of graders and tractors which are on the job at least 300 days of the year. It owns and operates three gravel pits equipped with the latest devices in loading traps. A truck can be loaded at any one of the gravel pits in four to six minutes.

Equipment necessarily must be kept in condition to stand up to the constant usuage it is put to in El Paso County and a large garage and well equipped machine shop is maintained at Colorado Springs, the county seat. The garage, which is 50 by 150 feet, accommodates all the motor equipment and has all the necessary machinery to make its own repairs to broken parts. A skilled machinist is in charge.

In addition to the regulation upkeep work, the county is constantly adding to its mileage of new roads. The program for the present year includes a new road 40 miles long extending from Rush, about 40 miles east of Colorado Springs to the south line of the county. This new project, 17 miles of which remains to be completed during the summer, will prove of great benefit to the fast growing community in the eastern part of El Paso County, placing it in closer communion with Pueblo and Crowley counties.

During the past three years millions of dollars worth of surplus war materials have been allotted to Colorado by the Department of Agriculture to be used for road building purposes. This material has been apportioned out to the various counties through the state highway department.

Splendid results have been obtained from the use of this material, which has included hundreds of motor trucks and thirty-two Holt caterpiller type tractors. One of the pictures accompanying this article shows how El Paso County is making use of one of the tractors allotted to them.

Other counties are doing equally as good work. In El Paso County the road officials have supplemented the materials furnished by the government by other labor-saving devices purchased in the open market. The accumulation of this material has made it necessary to construct a modern machine shop and garage to make repairs and house the equipment.

Machine shops and garages are also maintained by Crowley, Weld, Mesa, and Boulder counties. The officials of these counties have found this the most economical method of handling their equipment.

Gradually the counties are learning that good equipment speeds up the work, cuts labor costs and increases the amount of work done. Likewise this is true with the state, which recently purchased two caterpillar type steam shovels for moving dirt on mountain passes. One of these machines is now being used on Wolf Creek Pass, widening the road on the western slope of the pass, while the other is working near Sapinero.

"We have found that these machines are great time savers and do the work more economical than by the old methods," said Major Blauvelt in a recent interview.

"It is my honest opinion that the counties would save thousands of dollars by supplementing the equipment which they have received from the government with modern blade and drag machines and steam shovels. With the steam shovels and elevator graders dirt can be moved more cheaply and a big saving can be made on nearly every kind of road construction."

The steam shovels generally are used to replace the old-style and costly loading pits where there is any great amount of surfacing to be done. Great use has been made throughout the state of the surplus materials which the government has provided, and the results obtained have been little less than marvelous.

Trails and Tourist Camps

(BY WARREN E. BOYER)

TRAILS they were called in pioneer days. The name still sticks, but the mud doesn't. Graveled highways and hard-surfaced stretches have taken the place of the beaten brushwood and rut-marked roads. And it's over these highways that the endless lines of auto tourists are pouring into the Sky-Land State. From all directions they're coming, and as Fred Gilman Jopp, travel authority and writer said recently when in Denver, "coming fast once they hit the Colorado line."

He floundered and splashed around with his gas buggy, he said, almost continuously from the time he left Chicago until he reached the Colorado line. Then, with teeth set and who knows, maybe with the exhaust wide open, he snapped his pencil-pushing fingers at Missouri and Kansas and galloped for 205 miles into Denver in a day's time. He praised the Colorado highway department for what he considers an aggressive program to help link the two coasts with dependable highways.

And so the mushroom tent cities spring up again, making old Omar, the tent-maker blush, if his wandering spirit is hanging o'er Overland Park in Denver, or any of the other 212 automobile camps in the state. In these 213 tent camps last year 514,412 persons stayed from one night to a month or more. Many of them are back again, or are coming. Their summer residence here may give the census taker a few extra grey hairs, but that's all. He brings money to the state that would not be brought otherwise, and oftentimes he becomes a permanent resident of some community.

Boulder is helping to put its municipal camp on the travel map through fifty panoramas now being placed in cities of the East by officials of the Chamber of Commerce. The picture will be labeled "Entrance to Boulder Canyon, Where Mountains and Plains Meet".

Holyoke has put its camp grounds in condition for what looks like the biggest tourist season in its history. Longmont has erected a community shelter house and installed pay gas-plates for cooking. Sunset Park is a well equipped auto camp park and gives a view of the Rocky Mountains.

Red Canons Park out of Canon City is a scenic spot. There is no state highway to this region; however, good highways extend to Canon City. So the enterprising business men and civic leaders took off their coats one day not long ago and repaired the road to the scenic park. Some day a series of state highways will link up a number of state parks such as this wonderful area, in the region of the Arkansas river. And the region of the Arkansas is rich in history of the Spanish explorers and the days of pioneers.

Colorado Springs, Pueblo, Fort Collins, Grand Junction, Trinidad, Walsenburg, Loveland, Meeker—the list is endless. And the 213 communities which last year catered to the automobile traveler were the gainers, financially, in return for a nominal outlay in advertising the community's welcome to travelers, and for the small overhead expense of the camp upkeep. Tourist bureaus, including the Denver bureau, which carries literature of every section of Colorado and distributes free a list of prospective travelers to chambers of commerce, helped materially in directing road travelers. The visitor remained longed than he anticipated through the combination of good roads and courteous treatment.

For days before the Overland Municipal Camp opened in Denver dozens of campers sought to gain admittance. And when the gates were thrown open May 15 there was a long line of automobiles from a dozen states. Others are coming in daily.

Trails will ever be a part of the language of the westener. The gypsy motorist unfolds his tent, as the Indian did decades ago, and sits by a campfire of windproof fuel and equipment. The romance of the West still lives, for, even in the mushroom cities of canvas there is the possibility that years before the Redman camped on that very spot. Who knows? Trails have a romantic appeal to the traveler. The name still sticks, but the mud doesn't. Permanent highways are replacing them.

In Mesa Verde National Park, Colorado, the visitor this summer may behold for the first time the skeletal remains of one of the prehistoric inhabitants of this region as he was laid out in his grave centuries ago, according to a statement issued by the Department of the Interior.

These human skeletons were uncovered in an aboriginal cemetery near the southwest corner of Pipe Shrine House last summer. All the skeletons that were found were well preserved, considering their antiquity, and had been buried in an extended position on a hard clay bed. They lay on their backs at full length with legs crossed and heads oriented to the east, generally accompanied by mortuary vessels of burnt clay and other objects. These vessels once contained food and water, the spirit of which was thought would be suitable food for the spirit of the defunct.

Every bone of one skeleton was left where it was found and was not raised from the position in which it was interred over 500 years ago. Walls of a stone vault were constructed around it, reaching to the surface of the ground, and to a wooden frame, firmly set in cement, was nailed a wire netting, above which was constructed a waterproof wooden roof hung on hinges. By raising this roof the visitor may now behold the skeleton remains of a man about forty-five years old, 5 feet 6 inches tall.

So far as known this is the first time care has been taken to preserve a skeleton of a Pueblo in its aboriginal burial place so that it may be seen by visitors. It shows the environment of the defunct and satisfactorily answers the question whether the Cliff Dwellers were pygmies.

Fall River road in the Rocky Mountain National Park, constructed by the Colorado State Highway Department.

—Photo by courtesy Denver Tourist Bureau.

MAJOR BLAUVELT ATTENDS MEETING OF NATIONAL HIGHWAY OFFICIALS

State Highway Engineer L. D. Blauvelt left for Washington on June 1 to attend a meeting of the executive committee of the American Association of Highway Officials. The meeting was called for the purpose of fixing the time and place for the next annual meeting of the association and dispose of some other important business. Major Blauvelt is the far-western representative on the committee.

How State Projects Can Be Financed

Suggested that Counties not on Federal Aid System Use Increased Gasoline Tax to meet State Funds on Fifty-fifty Basis.

THE state highway department's program for the improvement of state highways which are not a part of the system of interstate roads for which federal aid is available is sure to be greatly curtailed next year and in the years to come unless the counties of the state having state highways not included in the system of federal aid roads are willing to cooperate with the highway department in the form of a willingness to share in the expense of the improvements. Fortunately the counties will be in a position to assume this financial burden without any additional taxes or any drain upon the county road fund.

As the readers of Colorado Highways know, the twenty-fourth general assembly saw fit to reduce the present income of the Highway Department by approximately $750,000 annually by repealing one-half of the one mill levy for state road purposes. They also know that the assembly followed this action up by increasing the gasoline tax from one cent to two cents.

In round figures the one cent gasoline tax produced about $600,000 annually. This sum was divided equally between the state highway department and the counties, the latter's share being distributed on a basis of state road mileage. The highway department received approximately $300,000 and the counties the same amount.

By doubling the gasoline tax rate and leaving the basis of distribution undisturbed the highway department and the counties each will now receive about $600,000 per annum from the gasoline tax. It will be seen that the highway department was given $300,000 for the $750,000 taken from it, a net loss in revenue of $450,000, while the counties were given $600,000, in place of $300,000, which they had heretofore received.

What moneys the state highway department receives from the remaining state road tax of ½ mill, from the proceeds of the bond issue voted last November, from the internal improvement fund and from other sources of revenue will be required to meet federal aid appropriations by Congress, defray engineering and office expense and continue in operation the system of maintenance inaugurated by State Highway Engineer Blauvelt. Little money will be available for state highways other than those included in the federal aid system of interstate highways.

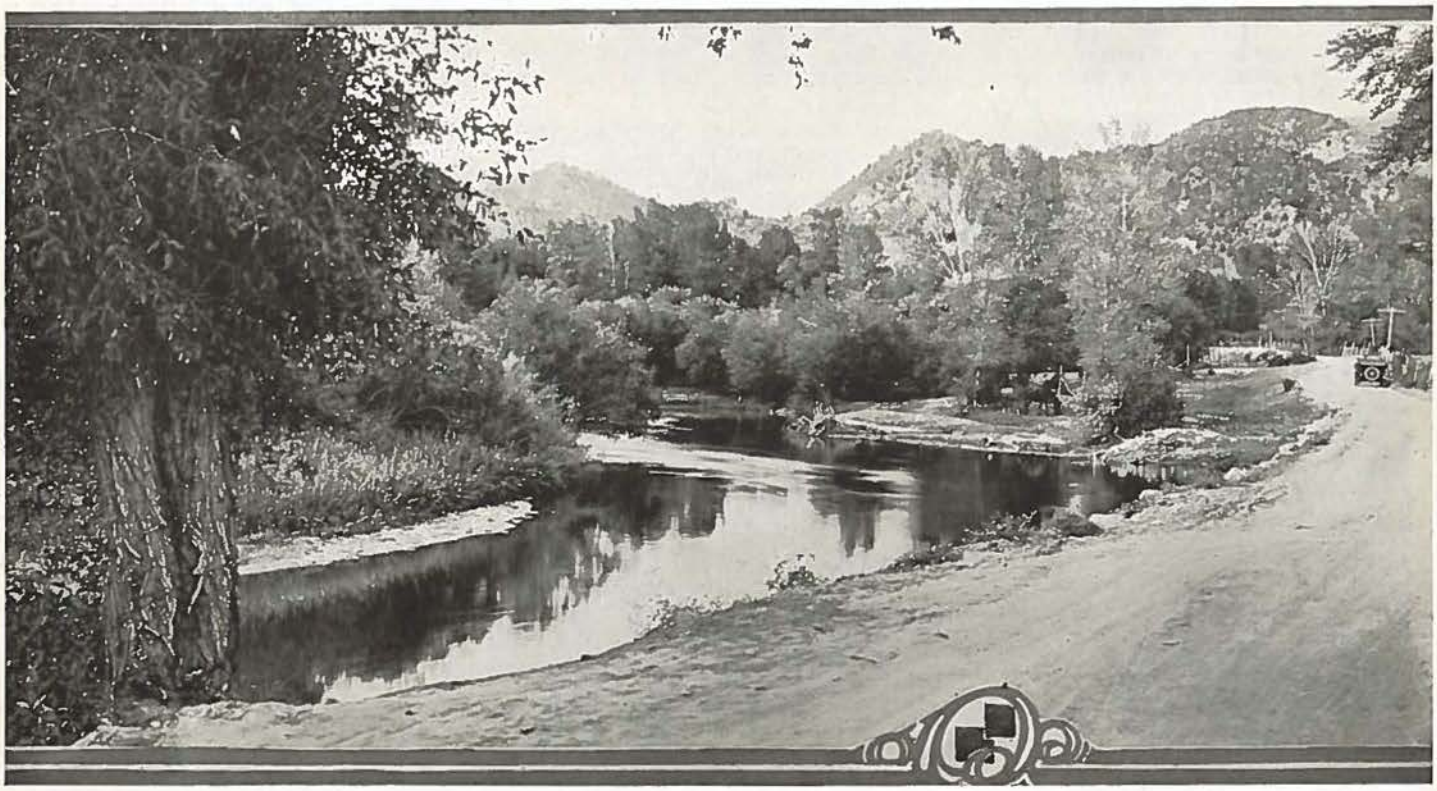
The highway department recognizes the fact that the state roads not included in the interstate system are as important, if not more so in some instances, as the federal aid roads. It is anxious to improve them as fast as the federal aid roads but, unless the counties come to its assistance, it is helples and can only do a limited amount of work.

All the counties need to do to assure continuance of the work on purely state roads for which federal aid is not available is to set aside that portion of their gasoline tax receipts which was voted them by the general assembly. By turning over the additional $300,000 given them they reduce the cut in the highway department's income to about $150,000 and by doing so they will enable the department to continue work on almost the same scale as this year and last.

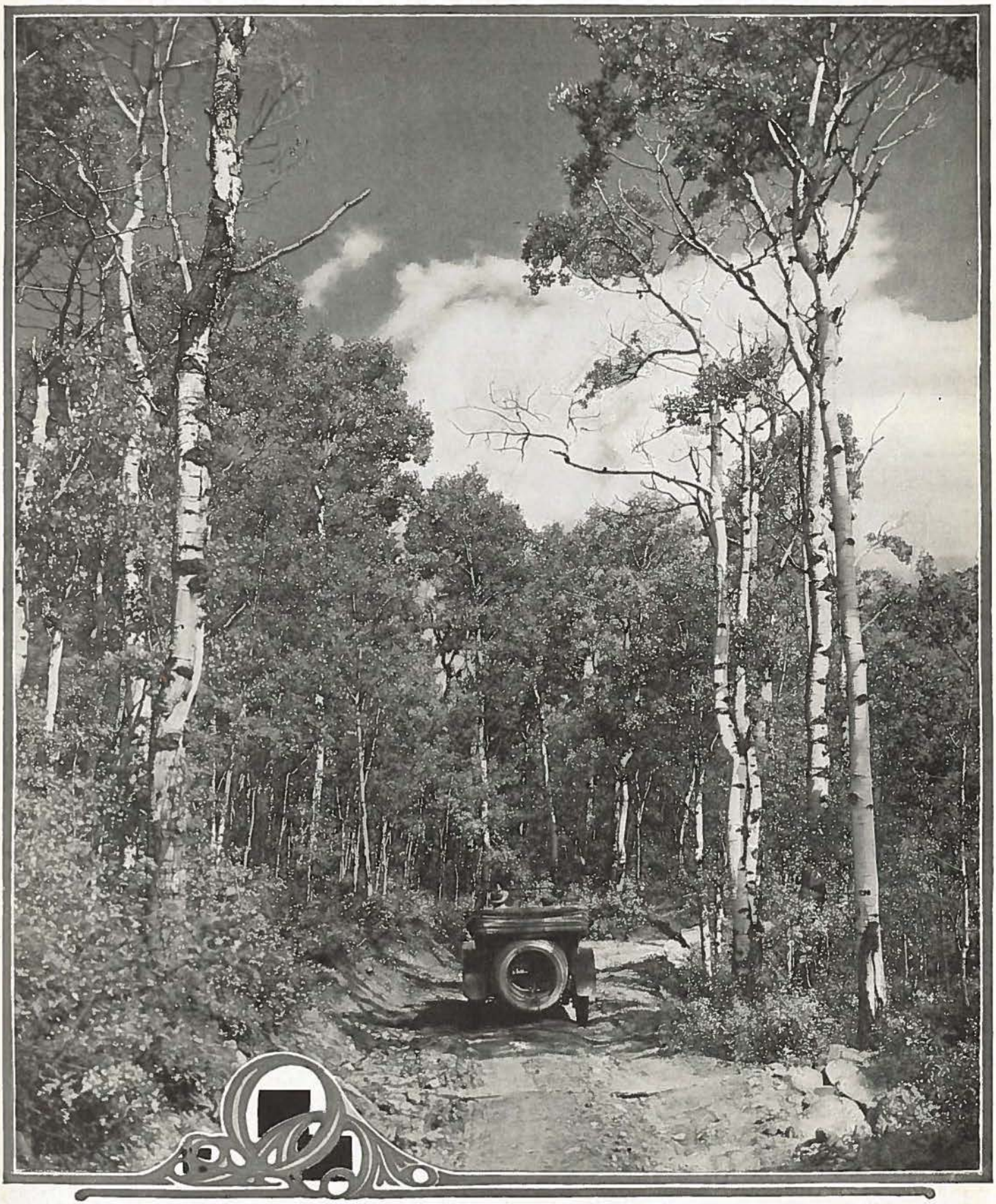
This magazine suggests that the county commissioners enter into agreements with the highway department regarding the improvement of such stretches of state highways in their respective limits as they wish to see put into first-class shape, the counties pledging their share of the additional gasoline tax to defray half of the cost and the highway department the other half.

In other words Colorado Highways suggests the same plan for purely state highway projects for the highway department and the counties as now obtains between the department and the United States government with regard to federal aid roads.

In round figures Colorado has 8,500 miles of state highways. Of this total about 3,500 miles are so-called federal aid roads. The balance of 5,000 miles are state highways for which federal aid is not available. They can not be improved to any appreciable extent unless the counties adopt some plan such as has been suggested.



Beautiful White River, Rio Blanco County, three miles south of Rifle from good shale road



Lanes of quaken aspen line the road everywhere f rom Delta to Collbran in Delta and Mesa counties

Modern Highway Drainage

Effectiveness of Corrugated Metal Culverts, Their Convenience and Stability.

BY G. M. MONAHAN.

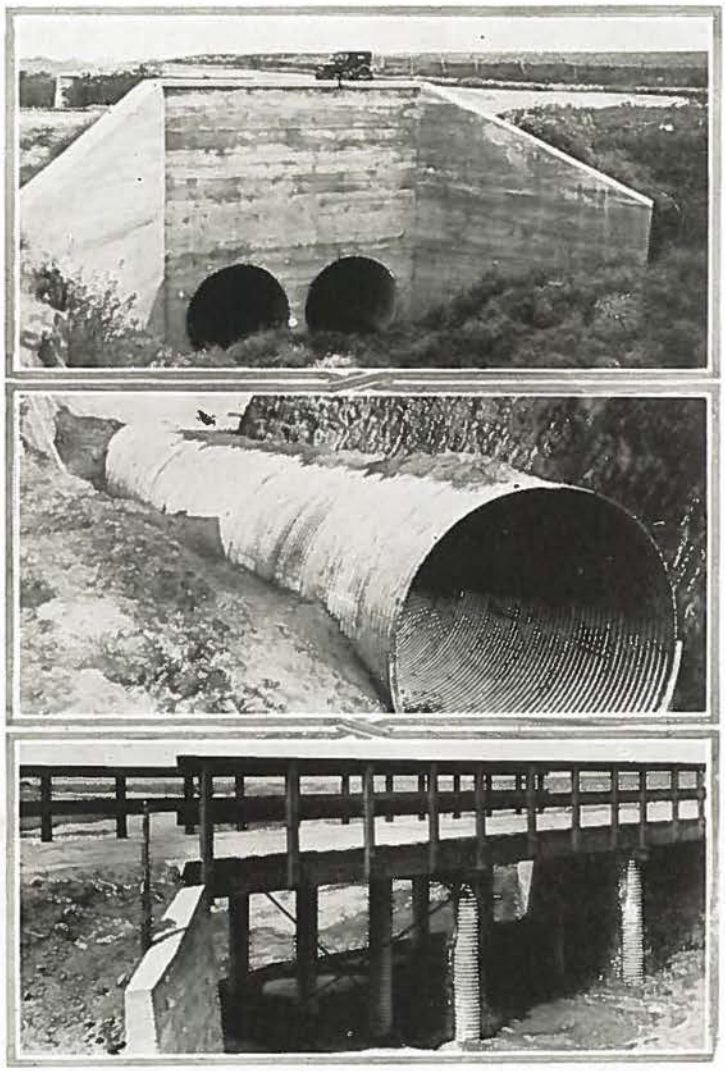
DRAINAGE is the principal feature which distinguishes a highway of any sort from a mere trail through the woods and fields. The very word "highway" implies construction of a road on a visible grade in order that the water may be drained away and provide the means of traffic under all weather conditions.

Road building accomplishes its purposes largely through the proper grading to provide practical ways and means for the disposal of moisture which is death to any road other than hard surfaced.

The side drains of dirt roads are usually sufficiently formed by the plow and the grader, with a small amount of labor with hand tools to take care of the ordinary fall of moisture, other than seepage. The principal thing to be borne in mind is the necessity of providing frequent outlets, and not allowing the water to flow for long distances by the side of the road. The increasing volume which is the result of a lack of sufficient number of outlets wil sometimes seriously wear the sides of the ditches, and endanger the road bed itself.

The drainage which must be carried across the line of the roadway is a much more serious problem.

Structures of sufficient size and strength must, of course, be provided for the larger stream, and these should be constructed of material insuring permanency and satisfaction; for the demands of the present day are such that highways must be built with the thought of strength and permanency uppermost.



Top picture shows deep installation with substantial headwalls. Middle picture shows culvert in ditch ready for dirt covering. Bottom shows corrugated culverts used in bridge construction.

Corrugated metal is a practical material for drainage structures as large as seven feet and for all structures save where a bridge alone will answer the purpose. It is immensely strong, and has an elasticity and toughness which recommends it for rough-and-ready situations like those of the graded road. As a result of its corrugated form it has just enough of "give" to enable it to dispense with perfectly solid foundations and to withstand settling and shifting action of the earth, as well as freezing and thawing and other conditions which are so fatal to rigid forms of construction.

In the mad haste to construct roads to care for the ever increasing traffic, often times the essential point of properly installing corrugated metal culverts is overlooked, and the one really permanent and necessary feature of the road work will of necessity fail to function properly.

The corrugated metal culvert comes nearer being the "fool-proof" structure than any other type for an ordinary handy man or laborer can lay a corrugated metal culvert without any special training or mechanical ability.

To properly install a corrugated metal culvert it is first necessary to have the ditch dug, or low spot in the road ready to receive it. The bottom of the ditch should be leveled as much as possible, giving sufficient slope so the water would flow through it sufficiently easy to carry any debris that might be moving through the culvert. It is not necessary to block off the entire highway to install a corrugated metal culvert as it can be installed in two sections, thereby leaving one side of the road open for traffic at all times.

Sufficient earth covering should be placed over the culvert to protect it against contact with horses' shoes or iron tires. A covering of one-half an inch for each inch of diameter of culvert will, in most cases, give the metal ample protection, although the greater amount of surface over the culvert will naturally give the greater protection to the culvert itself. The culvert should be laid in the ditch in such a way that the riveted seams run parallel with the sides of the ditch; not with the top and bottom of the ditch. The inlet end of a culvert is the end on which the lap of the metal on the circumferential seam shows on the inside so that the water is passed through the culvert and over the joint and not up against the lap. Placing the culvert in this way allows it to exert its greatest strength as well as to avoid to a great extent leakage in the longitudinal seams.

After the culvert has been properly installed care should be taken in making the back fill to see that the earth is well tamped along the sides of the culvert to insure against future settling, thereby producing the hated "thank you mam" so often found in earth roads.

In many cases, particularly in sections of the country where the road is built with a very flat surface, and it is not possible to place enough earth over a corrugated metal culvert to give it the proper protection from external forces a wooden culvert or box type concrete culvert that could be laid flush with the road surface is recommended; for while the corrugated metal culvert provides the ideal drainage in practically all cases, it is not claimed to be a "cure all" and there are some instances where its installation would not give the service desired.

The filling should be thoroughly tamped, up to nearly the top of the pipe, and large stones should not form a portion of the fill. In places where much water is to be cared for, and particularly if the slope is rather high, it is well to provide the culvert with wing walls of some sort to prevent damage to the fill at both the inlet and outlet end. These bulkheads may be made of stone, of concrete, or corrugated metal! but one of wood is far preferable to none, as its presence may, in time of freshet, save the whole roadway at that point from destruction.

Common labor and common sense assisted by pick and shovel are all that are necessary for the successful installation of a corrugated metal culvert, and where

(Continued on page 16)

Plans For Colorado Traffic Census

Highway Department to put check on all Vehicles Traveling over Main Routes.

PLANS are rapidly being formulated by state highway officials for the taking of the traffic census authorized in the 1923 budget of the highway department.

In the budget members of the Advisory board made available the sum of $7,000 to be used in erecting road signs along the main routes of the state and for taking a traffic census.

It is estimated that about $15,000 will be required to obtain the traffic information. Stations with census enumerators will be established in about twenty-five cities of the state. The enumerators will count all of the vehicles which pass over the roads entering these centers.

At the same time they will classify trucks according to their size. This information will be used in ascertaining the amount of tonnage which the various main highways of the state carries over a given period.

At present it is planned to start the census about the middle of June and probably will be continued at intervals through July, August and September. It is expected that it will require about 50 men to carry on the work.

It has been five years since the highway department took its last census of traffic on the state roads. Types of roads constructed since that time have been built upon the facts and figures gained from that census.

The taking of a traffic census is the only system which the highway department has of giving a real scientific analysis of the kind of roads that should be constructed to take care of the traffic of not only today but of tomorrow. The more detailed information which the engineers can get along these lines the better they are able to determine what kind of roads are best suited to carry the traffic.

The road engineer is faced not alone with constructing a road that will handle the traffic which a given route is already carrying, but he must build his road good enough to take care of the increased traffic which might be expected from the improvements made.

It has been noticed that wherever a concrete road is constructed various industries spring up along these routes, because business men recognize the advantage of having their plants located on roads over which their finished products can be hauled at a minimum cost.

So these things must be taken into consideration when the engineer goes out to build a new road. And unless he has facts to go upon he is unable to determine the cheapest and best road to built. It often happens that a concrete road with its low upkeep cost is the cheapest to build in the long run. Its initial cost is much greater than gravel surfacing, but its after-cost is shown to be much lower.

Then again a traffic census might show that a gravel surfaced road is sufficiently adequate to handle the traffic of today and for a long time in the future.

Th plan of the highway officials is to establish stations on each of the main routes entering concentrated traffic centers of the state, taking count of the vehicles and making weight tabulations of the trucks going in all directions. All of these statistics will be sent to the highway department at short intervals and to be compiled by experts, and made available to the road engineers later in their work of selecting materials for the various highways of the state.

"In some cases the department has been working in the dark in the selection of surfacing materials," said Highway Engineer L. D. Blauvelt.

'We consider the taking of the traffic census one of the biggest features of the work of the department this year. We shall exert every effort to obtain every bit of information possible during the time the census is being taken.

"In those sections of the state where beet hauling is done in the fall we will be active, because we are particularly anxious to construct roads in the beet growing sections that will carry not only the heavy traffic of today but the greater traffic of tomorrow.

"Progressive road builders of today are selecting the types of surfacing and building the kind of roads which will bear the brunt of today's traffic and will emerge as nearly undamaged, ready to carry the increased traffic of the future. They also provide for the "reserve" needed under the strain of traffic which is sure to come.

"That's why the cost of some of our main roads may seem high to some people."

Major Blauvelt said that it had been the policy of the highway department not to sacrifice quality in an effort to serve the present, the department taking the position that this policy will result in a conservation of highway funds and in enduring satisfaction to everybody concerned.

The traffic census will better enable the department to make savings in surfacing materials and reduce road costs.

State To Contract For Nearly $500.000 of Road Projects

Approximately $500,000 worth of road work will be contracted by the State Highway Department within the next three weeks. Plans are completed for the letting of six projects in different parts of the state.

Three of the projects call for concrete paving, two are gravel surfacing contracts and the other involves the construction of a steel and concrete bridge over Beaver Creek near Florence on the Pueblo road.

All six of the projects are to be paid for jointly by the State and Federal governments.

The most important of the contracts calls for the paving of five miles between Morrison and Denver in Jefferson county. This paving will fill the gap between the present paving extending from Denver and the mile of paving recently completed east of Morrison. The latter paving was the costliest piece of concrete work in the state, due to heavy rock work encountered in moving the railroad over ten feet into the side of the mountain at Morrison.

In the new paving will be 5.370 miles of 6 and 7 inch concrete to conform to the new specifications recently adopted by the highway department. The road will be standard 18 feet in width, six inches in thickness in the center and seven inches on the sides.

Plans are now under way by officials of the Denver Motor Club to plant trees along the new right-of-way of the concrete road, which will eliminate the grades and curves of the present road.

A contract will be awarded for the construction of 2.702 miles of concrete pavement between Fort Morgan and Brush. When this project is completed there will be only three miles of paving to be laid between these two points.

At the same time the department will let a contract for 286.8 miles of concrete between Fort Lupton and Plattesville. The present paving project under way south of Fort Lupton will be extended through that town in a few weeks.

Two miles of gravel surfacing will be contracted for south of Durango, and 4.748 miles of gravel surfacing will be let between Grand Junction and Palisades. The latter project will complete the gravel surfacing into Palisades from Grand Junction.

On the Durango project one of the highest fills in the state will be made. The plans call for a 50 foot fill at one point. This road leads out onto the Florida Mesa, which in recent years has been developed into one of the finest irrigated farm sections in southwestern Colorado.

Until about ten years ago the Florida Mesa was a favorite stamping ground of coyotes and was covered with tall sage brush. Today the traveler sees on all sides hip-roofed barns and fine farm residences.

PLANS DRAWN FOR PAVING SOUTH OF WOLHURST ON DENVER-SPRINGS ROAD

Plans are being completed by the engineers of the highway department for concrete pavement on the Denver Colorado Springs road from a point a short distance south of the Wolhurst crossing to the bridge over a sand draw near Gann, the railroad station for the town of Louviers. This improvement will be pushed while work is progressing on the mile-stretch from the end of the completed road which includes the crossings under the Santa Fe and Denver, Rio Grande tracks.

Both railroads have submitted plans for the undercrossings. They will be submitted to the United States bureau of roads in the near future. Highway engineer Blauvelt hopes to be able to start work on the under crossings before the summer is far advanced. Work on the road south of the crossings will be pushed, no matter what the status of the undercrossings.

"Call of the Open Road"

Winter's long spell is broken.

Again we welcome the sight of tractors and road machines.

As we drive along we see them in action mending the winter-rutted surface of the roads.

It's a great sight—men at work with modern, labor-saving devices—construction costs cut to a minimum—more and better work with more miles of good, hard-surfaced roads for less money.

The maintenance crews were started this year at the earliest possible moment. They have taken advantage of the moisture which still remains in the subgrade to get the best possible results.

From every corner of the state reports about the good roads have been coming in to the Highway Department. It has been a case of foresight, instead of hindsight with the men who build and maintain Colorado's splendid highway system.

And from these various districts we learn that we may expect this season the best roads we have ever had, provided no unforseen or otherwise unfavorable circumstances develop.

By the end of the season more than sixty projects in which the federal government will pay half of the cost will be under construction.

It is expected that more than 1,000 miles of roads in Colorado will be improved this year. This includes about sixty miles of new paving.

There is no easy road to success. And likewise there is no cheap route to securing well maintained roads. It costs real, hard money.

But Colorado's road bill is a mere pittance compared with what some of the other states are spending each year for road improvements.

And yet Colorado ranks among the largest states in the Union in point of improved highways. It is because Colorado is blessed with an abundance of unexcelled road material. Her soil lends itself to better roads.

While new construction is one of the big things in Colorado, our highway officials are not neglecting maintenance. Last year's experience has convinced every road man in the state that every dollar put into maintenance pays a big dividend.

In fact every dollar spent in this direction finds its way back into the pockets of the taxpayers in savings in operating and upkeep costs, in the cheaper and quicker transportation of commodities.

There is also the greater comfort and pleasure derived from the use of the road itself.

Increasing traffic demands roads—yes, and traffic will be served.

That's about the size of it in these western states. More and more each year we find the tourists—nomads or fliverites, whichever you choose to call them, coming our way.

These fliverites bring dollars with them from other states. They come to see our scenic wonders. Already the vanguard of the nomads are with us. Camp grounds all over the state are being opened to receive the visitors.

Thousands of tons of literature have been sent out of the state to persons in the east, telling about the wonders of Colorado. Plans have been made by railroad officials to handle the largest passenger traffic on record to Colorado.

The tourists who come to Colorado by rail will be forced to travel to the various recreational areas by auto—increasing the traffic over our roads into the mountainous country.

Strange as it may seem there is only one strictly scenic state highway in Colorado and this is not yet completed. All others have been constructed for commercial purposes. However, we have many highways that serve both purposes.

While all of the roads in Colorado which traverse the Rockies connecting the eastern and western parts of the state might be termed scenic roads, yet each has great commercial value and serve an ever increasing motor transport.

Now and then we hear someone complain about the high cost of engineers employed on our roads. A word or two of explanation might not be amiss.

In the first place, to have good roads—and good roads means modern roads—roads that will sustain modern traffic—it requires the services of good engineers. The old system of building a road by the winding route was scrapped long ago.

Today roads are built as straight as possible and over the shortest route possible between two given points. Modern traffic demands that they be built on easy grades. To get easy grades and good alignment necessitates the employment of engineers.

Engineers are the best protection the taxpayer has in getting his money's worth in roads. Thousands of dollars are saved the traveling public in reduced fuel costs on the roads now being constructed in this State.

Not every road that is surveyed is actually built. Sometimes it is necessary to make two or three surveys to find the cheapest and best route. Surveys are necessary to estimate costs. A prominent railroad chief engineer in his instructions to field men says that a survey intelligently made, but not used, is just as valuable to his road as one that is used.

The engineer is the agent of the people. He is on the job every minute from the time a project is started until it is finished, and sees to it that the people get their money's worth.

Road Plans Changed By Tests

Experiments at Bates Station Result in Changes of Highway Designs in Many States

A FEW years back road builders hailed the pneumatic tire on automobiles with great joy. At last we were to have a vehicle that would not destroy our roads. No more deep ruts to retard traffic. It was thought that the highway problem had been solved.

But it was only an illusion. Soon the highway engineer found out that his pet macadam roads were going to pieces—vanishing into thin air, as it were. They simply would not "stay put" and were blowing away. It was discovered that the automobile tire formed a sort of a vacuum on the surface of the road and in little or no time the road was full of chuck holes the like of which the road builder had not seen in the old days. These ruts were of a different kind from those made by the old steel rimmed wagon wheels, but they were there just the same and are still there for that matter on the majority of our roads today.

These new fangled ruts make riding pretty upleasant, to say the least, to the motorist, and there is an insistent demand for their elimination, not alone for the discomfort which they give to the auto owner, but because of the increased cost of operating a motor vehicle over them.

So today we find highway engineers all over the country busy trying to find the "ideal highway." Material experts are engaged in research work. Tests are being made almost daily in different parts of the country. And the end is not in sight.

The fast moving automobile and truck has revolutionized road making in this country, as it has in most of the European countries. Roads that have withstood the usage of centuries have failed miserably under modern traffic conditions. Some of the famous old highways built hundreds of years ago have had to be rebuilt.

Vast and costly experiments have been made in the various states during the past few years. Probably the most notable of these was that made at the Bates experimental station, conducted by the Illinois Division of Highways. Other extensive tests have been made at the Arlington station near Washington by the U. S. Bureau of Public Roads, and at the Pittsburgh testing grounds in California, conducted under the joint supervision of the California Highway Department and the Bureau of Public Roads.

View of Bates Experiment Road

While a wealth of very valuable information has been gathered from these tests, many engineers still claim that the ideal highway yet remains to be constructed.

Three years ago the State of Illinois approved a $60,000,000 bond issue to construct 5,000 miles of highways. The Bates test was conceived by the Division of Highways to furnish reliable information to be used in the construction of these roads. It was an experiment of unprecedented magnitude. To date the experiment has cost several hundred thousands of dollars. But the information thus far gained from these tests, it is said, has saved many times as much money to the state. Other states have likewise benefited from these experiments.

The Bates test road consisted of sixty-three sections of pavements each 18 feet wide and from 100 to 250 feet in length. These were laid end to end, making a continuous straight pavement two miles long. Twenty-two of these sections were of brick, seventeen of asphalt and twenty-four concrete. In each type of pavement the sections varied from those so thin they were sure to break under the lighter test loads to sections which were considered strong enough to support successfully the heaviest loads permitted by the state traffic laws.

The materials of each pavement conformed to the very high standards required by state specifications. "Learn the Facts" was the spirit of the whole test. And it might be added that some very startling facts were learned, but even with all these facts at hand, the highway engineers of the country are in the dark about some things relative to highway construction, and it will probably be several years before all the facts are learned.

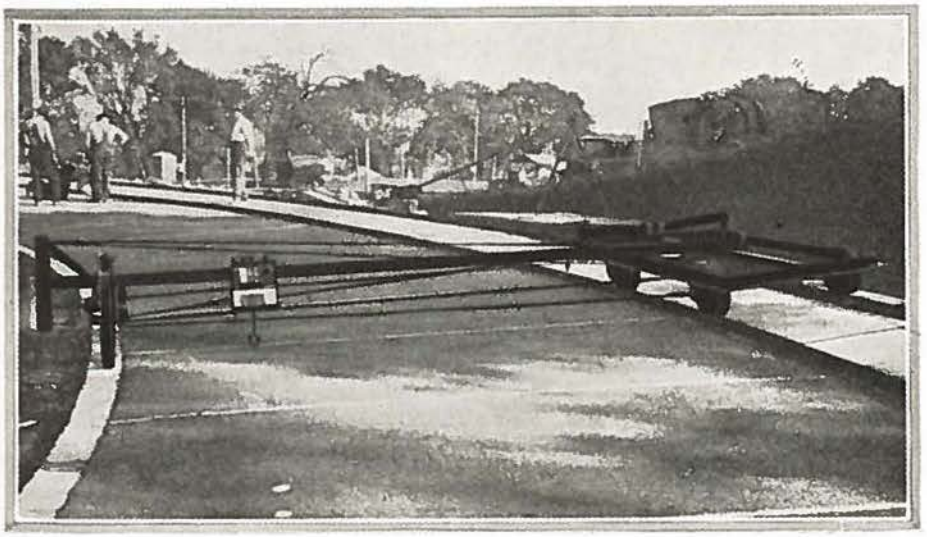
In California they constructed a circular road and run trucks over the various types of pavement. At Arlington the tests have been confined to impact tests, and there also were learned some interesting things about pavements. In a large measure the tests made at Arlington confirm some of the results obtained at the Bates station under actual traffic conditions.

On the pavement at the Bates station were placed a fleet of army trucks. These trucks made a total of 23,000 round trips with loads varied by six increments, the last of which was completed a few weeks ago. The trucks were started out with the bare chassis. The loads were increased by 2,000 pound increments until a gross load of 10 tons was reached.

The records of the test show that the greatest traffic imposed upon any section was 377,460 tons, of which 52.6 per cent. is the state's legal load limit of four tons per rear wheel. A summary of the test traffic is given in the accompanying table.

The tests were conducted night and day, because it was discovered by the experts that the pavement acted differently at night than in daytime. The conclusions developed from these tests are being watched with the keenest interest by the highway officials in other states.

As a result of the tests at the Bates station the Illinois highway department has already changed its design for concrete pavements and for concrete bases under asphalt pavements to a cross section with thickened edges. Besides the thickened edges the new design has a center joint for both concrete pavements and the concrete bases for asphalt top. A center joint and uniform base thickness is specified for brick pavement. Some states have a large mileage of brick pavements on their state highways and the new design for this kind of paving adopted by the Illinois highway depart-



Apparatus used in testing road materials by U. S. Bureau of Public Roads

ment following the Bates tests is being watched with keenest interest.

While a thorough study of the traffic runs has not been made, Clifford Older, Chief Highway Engineer of Illinois, thinks the following comparison in the different types of pavement included in the Bates tests is justifiable by the results.

Bituminous Filled Brick on Macadam Base.

"A difference in the thickness of the base, thickness of the brick or type of brick apparently had no effect upon the load supporting capacity of these sections. All five sections failed at approximately the same time and to the same extent."

Asphaltic Concrete On Macadam Base.

"No consistent ratio of strength to thickness of base appears. Apparently traffic supporting capacity increases with an increase in thickness of asphaltic top. The evidence supporting this point is not conclusive, however."

Ashaltic Concrete On Concrete Base.

"The assumption made at the beginning of construction, that an asphaltic concrete wearing surface on a concrete base would have a traffic supporting capacity equal to that of a concrete pavement having a thickness equal to that of the base plus one inch seems to have been a fair guess. It is further evident that increased base thickness is accompanied by increased strength."

Bituminous Filled Brick On Concrete Base

"The original assumption that a bituminous filled brick wearing surface on a concrete base has a strength equal to that of a concrete slab having a thickness equivalent to that of the base plus one-half the thickness of the brick surface was apparently incorrect. In practically every instance the concrete pavement sections proved of greater strength than their supposed equivalent in bituminous filled brick."

Monolithic Brick.

"The original assumption that the brick surface in this type of pavement acts as a unit with the concrete of the base, thus forming a truly monolithic slab having the same carrying capacity as an equal thickness of concrete, was disproved early in the traffic tests. It was clearly evident that the strength of a so-called monolithic section was less than that of a concrete section of the same thickness."

"In comparing an added inch of brick with an added inch of concrete base, the total thickness remaining the same, it was noticed that the thicker base section has the advantage."

Concrete

"Soon after starting traffic it developed that the sections containing special cements or other chemicals showed less strength than plain concrete sections of the same thickness."

"Sections containing certain special features of design consisting of transverse and longitudinal joints with marginal steel, showed greater strength than plain concrete sections of the same thicknesses."

SUMMARY OF TRAFFIC

Increment	Load in Pounds on Each Rear Wheel	Load in Pounds on Each Front Wheel	Gross Load	Net Carried or Live Load in Pounds	Number of Round Trips	
					Day	Night
First	2,500	2,250	9,500	....	1,000	....
Second	3,500	2,150	11,300	....	2,167	1,033
Third	4,500	2,000	13,000	1,700	2,000	1,000
Fourth	5,500	1,900	14,800	3,500	2,000	1,000
Fifth	6,500	1,800	16,600	5,300	2,000	1,000
Sixth	8,000	1,930	19,860	8,560	5,000	5,000

SMALL TOWNS AND THROUGH ROADS

Generally when a new road project is under discussion every little town along the route will contend that location should pass through it. In states where traffic is much greater than in Kentucky, the small town people are beginning to realize how objectionable the great volume of traffic is on their main street. At first they were amused by counting the number of automobiles that passed daily or in observing the great variety of color schemes used by the different states on their license tags. After several years' experience in maintaining their streets, the cost has been counted and they found that repairs and maintenance was an appreciable item in the expenditure of their budget.

Not only is the cost altogether objectionable, but interruption to business and the increased danger to pedestrians have brought about a reversal of desire. Now through highways are being routed outside the town limit. Both the state of Illinois and that of Missouri have adopted the policy of avoiding small towns, even though it becomes necessary in some cases to construct a new piece of road around the town. The necessity for this policy has even been felt in states as far west as Nebraska.

While the State Highway Commission of Kentucky has given no expression of its opinion in the matter it is certainly worth the while of the inhabitants of small towns to thoroughly consider the matter of designating a through road down their main street.—Kentucky Road Builder.

"Here, waitress; this doughnut has a tack in it." "Well, I declare. I'll bet the ambitious little thing thinks it is a flivver tire."—Youngstown Telegram.

When the pedestrian learns to carry a few spareribs, the same as a motorist carries a few spare tires, everything will be lovely, and we'll be all set.—Bay City Motor News.

D. L. D. Delegates Aak For Gravel Surfacing on Roads

In spite of the impassable roads in Nebraska and railroal traffic halted on account of flood conditions, the D. L. D. convention held in McCook, Nebr., on May 23, was well attended and was generally conceded to be quite a success.

A. C. Collins, division engineer of the Colorado Highway Department, was one of the speakers.

The business men of McCook manifested keen interest in the meeting and took part in the various discussions. An address of welcome by the Mayor of McCook, addresses by Roy Cochran, state engineer of Nebraska, and A. B. Collins of Colorado, and reading of the secretary's report took up the greater part of the morning session.

Election of officers and a round-table discussion of ways and means for a more satisfactory method of financing the activities of the organization were features of the afternoon session. A banquet was served in the evening.

The following officers, who have conducted the affairs of the association so successfully for the past two years, were re-elected.

C. H. Roper, Lincoln, president; E. H. Spaulding, Grinnell, Iowa, vice-president, and O. M. Parke, Lincoln secretary-treasurer.

A resolution was adopted by the convention "recommending that the State Highway Department be urged to do all in its power to gravel the D. L. D. highway, believing that gravel roads will save the taxpayers of Nebraska thousands of dollars and add to the pleasure and comfort of the residents of this great state."

The convention also went on record as favoring a gasoline tax on motor-driven vehicles. The delegates took the stand that those who operate motor cars and trucks should be required to pay this tax for the purpose of building and maintaining the highways.

The Colorado delegates on their return home were greatly impressed with the fact that auto traffic in Nebraska to the state line, where earth graded roads prevail, was at a standstill, while under the same rain conditions in eastern Colorado automobiles without number could be seen from the train skimming along over the gravel surfaced roads.

WIFE OF COUNTY COMMISSIONER KILLED WHEN TRAIN HITS AUTO

Friends of Mr. Mell DeWitt, one of the commissioners of Chaffe county were shocked to learn of the death of his wife in an automobile accident one mile north of Buena Vista on May 29. The machine in which they were riding was struck by a Denver & Rio Grande train at a road crossing, the machine being badly demolished, and the couple caught on the cowcatcher of the engine and carried a distance of 200 feet. Mrs. DeWitt died on the way to a hospital.

The couple were on their way to a cattle ranch four miles east of Buena Vista when the accident occurred. Although badly cut and bruised, Mr. DeWitt was not internally injured, and will recover. Mrs. DeWitt was 50 years old and one of the pioneers of Chaffee county.

Western Slope Man is Elected Chairman of Highway Advisory Board

William Weiser, of Grand Junction, representative of the second highway district, was elected chairman of the State Highway Advisory Board, at the board's semi-annual meeting held in Denver at the highway department's office on May 15, 16, 17, and 18. Charles B. Lansing, of Colorado Springs who was reappointed as the member of the board from the Fifth district by Governor William E. Sweet for a term of three years, was elected vice-chairman. Weiser takes the place of Mr. H. A. Edmonds, of Fort Collins, whose term expired, while Mr. Lansing succeeds George L. L. Gann, of Pueblo.

Mr. Weiser was placed in nomination by Mr. E. E. Sommers, representing the First highway district. The nomination was seconded by Mr. Lansing. Mr. Lansing was placed in nomination by Mr. J. A. Clay, of the Third district. His nomination was seconded by Mr. Gann, the retiring vice-chairman. Both nominees were electel by unanimous vote. Both have been members of the board since the reorganization of the highway department was effected under the highway law enacted by the twenty-third general assembly in 1921. They are deeply interested in good roads. Their services in the past are a guarantee that they will look after the affairs of the department at all times.

John A. Donavan, of Longmont, appointed a member of the board in place of Mr. H. A. Edmonds, was present at the meeting. It was the first meeting which he attended.

The greater part of the meeting was devoted to the disposition of routine business. Aside from the election of officers the most important business to come before the board was a report of State High way Engineer Blauvelt submitting to the board a plan for the renumbering of all state highways. The plan was approved by unanimous vote. It will be made public as soon as some minor details are worked out.

Altogether there will be 169 numbered highways. The first forty-nine numbers are reserved for interstate highways which are being improved with federal aid money. The balance is for highways which are being improved with state and county funds.

In connection with the renumbering of the state highways representatives of Colorado Motorists, Inc., who are furnishing the signs for the marking of state highways, appeared before the board and reported that a large number of signs have been ordered. Colorado Motorists will place 1,500 signs at the disposal of the board this year. Each sign will bear the road number adopted for the road on which it is placed under the numbering plan adopted by the advisory board.

In this connection mention might be made of the fact that the state highway department engineering forces are working on a new state highway map. This map will show all of the state highways, together with the numbers adopted for each road.

Members of the advisory board devoted most of their time at the meeting to the presentation of reasons why certain roads in the state should be declared state highways. Some twenty petitions to have roads declared state highways were presented but only two were granted. The balance were either turned down or action upon them was postponed until engineers can make a report on the feasibility and cost.

In turning down or postponing action upon nearly all of the petitions the members of the board were actuated by the thought that the board should not go ahead and add to the state's road system when there are no funds available to improve these roads. Not until money is at hand to improve the roads, will they be added to the state's highway system.

The two roads declared state highways follow:

From Littleton to Deer Creek Park, from Deer Creek Park to Phillipsburg and from Phillipsburg to a junction with the Turkey Creek Canon road at a point near Conifer;

From a point on the Jarre Canon road about six miles north of Decker's, through Night Hawk, South Platte, Dawson, Buffalo, Pine Grove and Camp Gulch to a connection with the Denver, Morrison, Bailey's, Fairplay, Leadville highway.

Before adjourning the advisory board granted State Highway Engineer Blauvelt authority to enlarge the highway department shops in Denver. They gave him permission to expend up to $20,000 for the enlargement. The shops at present are totally inadequate to meet the demands made upon them and an addition to the buildings and additional machinery is necessary if they are to continue to do good work.

General Assembly Puts "Teeth" in Gasoline Law

With the growing importance that the state gasoline tax will assume in the financing of building and maintenance operations of the state highway department during the years to come, the law under which this tax is levied is becoming of greater importance also. The law was amended by the twenty-fourth general assembly by the addition of what in legislative language is known as the "insertion of teeth". A careful study of the law as it now stands reveals it to be one of the most stringent tax laws now on the statute books. It is doubtful if any other state levying a gasoline tax law has so severe a measure as Colorado.

Colorado was among the first states in the Union to resort to the levying of a tax on oil products to obtain means with which to construct and maintain highways. The initial gasoline tax law, enacted in 1919, like most laws on an entirely new subject, developed some defects in its application. It was to remedy these defects that the law was amended by the twenty-fourth general assembly.

In particular was the law found defective in that it did not provide penalties for those oil dealers which did not pay tax. The state oil inspector did not have any means to enforce the law and collect the money due the state and counties. As a result many thousands of dolars due in tax remained uncollected. Suits brought by the oil inspector resulted in the collection of only a small amount.

It is with respect to penalties for nonpayment of tax that the law has been made the most stringent of its kind in the country. Even though the law will not become effective until the latter part of July a large number of oil dealers behind in the payment of the tax have already begun to pay up. There is no doubt that, once the oil inspector's office begins to operate under the amended law that the state and counties will get all the money due them.

In view of the importance of the law to both state and counties Colorado Highways herewith reproduces the penalty section of the law.

The section follows:

"It shall be unlawful for any person, firm, co-partnership, association, or corporation to sell or offer for sale gasoline or other products subject to said tax, while in default or delinquent in the payment of the whole or any part of such tax, and in the event of the failure or refusal to pay such tax and the whole thereof, after demand made therefor by the State Inspector of Oils, such delinquent tax, with interest thereon at the rate of two per centum (2%) per month from and after such demand, together with a penalty of ten per centum (10%) of the amount of such delinquent tax, may be recovered by, and in the name of the State of Colorado, and the Attorney General of the State of Colorado is hereby authorized and directed to institute suit therefor in any court of competent jurisdiction. In the event such a suit is instituted, upon application made by the Attorney General, the Court may issue a writ of injunction, without requiring any bond, enjoining, and restraining the defendant from selling or offering to sell any product subject to said tax until anv judgment recovered in said suit has been paid, and the Court shall, upon application therefor, by the Attorney General, appoint a receiver of the property and business of the delinquent defendant, for the purpose of impounding the same as security for any judgment recovered, and said tax shall constitute a first and prior lien against said property. The State Oil Inspector and his assistants and deputies shall have the right during business hours to inspect the books and records of any dealer in the products subject to said tax, for the purpose of ascertaining the amount of tax due and payable, and whether the same has been paid, and any such dealer who refuses or declines to permit such inspection of his books and records, or who sells or offers for sale any gasolise or other products subject to said tax, while delinquent in the payment of the whole or any part of such tax, shall be deemed guilty of a misdemeanor, and, upon conviction in any court of competent jurisdiction, shall be subject to fine in a sum not to exceed one thousand dollars, or to imprisonment in the county jail for a term not exceeding six months, or to both such fine and imprisonment. The remedies herein provided for the enforcement and collection of said tax shall be cumulative".

Pueblo County Returns Bridge Borrowed From Sister County After Flood Disaster

BY RALPH C. TAYLOR

Pueblo, Colo., June 1.—To prevent accidents on highways, near and on bridges, Pueblo county commissioners may adopt a plan suggested by O. O'Donnell. O'Donnell suggests the right-of-way to all bridges be given to west bound automobiles. He bases his suggestion on the fact that the sun sinking in the west blinds motorists driving toward it and sometimes they drive on a bridge without seeing another car driving on the bridge from the opposite direction.

The erection of appropriate signs several hundred feet west of each bridge on an east and west road would warn the east-bound drivers. To avoid confusion and simplify the matter, the rule would hold good the full 24 hours of the day. The early morning sun is not as blinding, rises faster and there is less traffic on the road at that hour, thus the plan would not conflict with the morning sun.

Colorado highways were highly praised by Capt. Bernard S. MacMahan upon his arrival at Pueblo in charge and at the head of the Transcontinental Shrine Caravan, motoring from Los Angeles to Washington, D. C., to the Shrine conclave.

"The roads in Colorado are in better shape than any we have traveled since leaving California. They were well maintained and made driving a pleasure," said the veteran and noted caravan pilot.

The Shriners seemed particularly pleased with the state highway from Trinidad to Pueblo which is one continuous ribbon of lime rock, and one of the finest roads in the state.

The main purpose of the Shrine Transcontinental Caravan each year is to stimulate interest in the nation's highways and to create a national reputation for the route it takes, sufficient to get others to follow later.

A "Better Acquaintance" meeting was held May 17 between the Pueblo city highway employes and the city officials E. E. Colby, superintendent of the city highways, stated that the splendid progress made during the past year was principally due to the cooperation of every man in the department.

The meeting was in the form of a banquet-smoker, held in the city shops. Endless special features entertained the men. Fred E. Olin, commissioner of streets was a principal speaker. The heads of the various city departments attended.

Unusual progress is being made by the Pueblo Bridge and Construction company on a three span concrete bridge being erected over the St. Charles river on the Wilson road, 6 miles southeast of Pueblo. The bridge replaces on swept out by the flood of June 3, 1921. The concrete is being poured at the rate of one span a week.

Approximately $2,000,000 worth of work on roads and bridges in the southeastern part of Colorado on state highways out of the office of James D. Bell, division engineer of the fourth district, is either under way, just completed or is to start this year.

Work completed this year totals $684,460; work to be done this year, but not yet started, includes $485,400, and work started and now under way but not completed, $830,317. Concrete paving, gravel surfacing, grading and the construction of bridges is included in the work, as well as changes in roads.

With the completion of the concrete bridge over the St. Charles river at Fisher, 12 miles south of Pueblo on the Walsenburg road, Pueblo county was able to return a borrowed bridge to Huerfano county.

The flood of June 3, 1921 swept the steel structure down the river, cutting off all approach to Pueblo from the south. Huerfano county wanted to get to Pueblo to see what the flood had done and to administer flood relief, but they found the gap in the road. Knowing that Pueblo county had no means of fixing it then, they went to Walsenburg, where they loaded a bridge on trucks and hauled it to the St. Charles where it was assembled. It was utilized for almost 2 years until the new state highway structure was completed.

To cope with the treacherous Arkansas, the Pueblo county commissioners decided to build one of the longest bridges in the state to cross the river near the Pueblo stockyards. The bridge will be over 800 feet in length.

A 160 foot steel span afforded ample space for the river until the flood of June 1921. The bridge was not washed away, but the river changed its course and established its channel several hundred feet south of the bridge. Realizing that it would be impossible without great expense to endeavor to harness the river and make it flow under the old bridge again, the commissioners at first decided to move the bridge to the new channel. They revised their plans to extend the bridge to take in the old and new channels.

The Santa Fe avenue bridge over the Arkansas, which was swept down the river, was salvaged, torn apart and from it a 160 foot steel span was made over the new channel at the Stockyards. There were several hundred feet of river bed between the two spans and not having sufficient funds to continue the steel bridge, the county decided upon a pile bridge to connect the two until the funds permit a steel replacement. The bridge will be open for travel about June 15.

SPEED FIEND AND OVERLOADED TRUCK TO BE BANISHED FROM BRIGHTON ROAD

The state highway department and the commissioners of Adams county have entered into an agreement by which both will share in the employment of two traffic officers on the road between Denver and Brighton. These officers will enforce the 35 miles-an-hour speed limit for autos fixed by the state traffic code and see to it that the maximum load for trucks provided for in the code is not exceeded. The Denver-Brighton road is the most heavily traveled stretch of highway in the state. Speeding motorists, it is reported, are endangering life and property by their excessive speed and too heavily loaded trucks will result in the breaking-down of the concrete pavement.

Steam Shovel Makes Dirt Fly on Road Over Famous Red Mountain Above Ouray

Durango, June 2.—Motor traffic over the mountain state highways in southwestern Colorado will be opened about June 15, in the opinion of J. A. Clay, member of the highway advisory board. The entire district is now making ready for the reception of the largest number of tourists in its history.

With the contractor speeding up construction work, the highway between Silverton and Ouray will be opened early in July. It has been thought in the past that due to the difficult construction of the new road between Red Mountain and Ouray it would not be possible to open the highway for traffic this year. However, the contractor has secured a steam shovel to move the dirt and rock, and with the employment of every available man the road work will have progressed so far by the middle of July that motor vehicles can get by. The opening of this stretch will provide a mountain circle trip for the tourist not excelled in the country.

The Durango-Silverton highway is expected to be open for traffic by June 15. Two huge snowdrifts near Silverton will have to be dug through and small washouts repaired before cars can get through.

Wolf Creek Pass will be opened at least a week or ten days earlier this year and it will be about June 15. Residents of Pagosa Springs have ordered a quantity of T. N. T. to be used in blowing out the snowdrifts and about June 1 parties of workmen will work their way toward the top of the pass.

The highway west from Durango over Mancos hill, which has been closed all winter is now open for traffic, although somewhat rough.

It is expected that the new highway over the Continental Divide at Cumbres pass will be completed late this fall and may be open for traffic this year. This road will absorb most of the traffic when in operation due to the fact that it can be kept open at least a month later in the fall and can be opened fully a month earlier in the spring.

The new state highway from Cortez westward to the Utah State line will be completed this summer. That section between Ackmen and Lewis completed last year is reported to be a boulevard.

BOY, PAGE THE CENSUS TAKER

Colorado is perhaps the only state that temporarily doubles its population of 1,000,000 through sightseers. In 1922, for example, the 213 auto camps reported a registration of 514,412 campers, and the railroads handled fully as many vacationists having Colorado destination points.

HIS GOOD TURN

May—"Is Stockton a careful driver?"

Ray—"Very. He even watches the corners when he has the right of way."

—Topics of the Day Films.

Modern Highway Drainage

(Continued from page 8)

these are employed a permanent and satisfactory installation will result, eliminating all necessity of closing the road to traffic for more than a couple of hours during the actual installation.

We should profit by the mistakes of the past in building today for the future. Those structures which have stood the test for years; which have proved that certain materials combined by engineering skill are better than others for certain purposes, should be taken as examples by those who build similar works.

Those who are engaged in financing or directing the construction of public or private enterprise should study with the utmost care the various materials, the service that has been rendered, and the results obtained in their combinations before deciding upon what they shall employ.

A failure to determine upon the best materials to be used, means a neglect to serve the best interests of those directly concerned and of the people as a whole.

We cannot, of course, foresee the conditions of the future, but we can, and must, see to it that when we build we harness the best skill and materials we have and that the completed structures will, to the best of our knowledge, serve for generations to come and be monuments to our ability.

The difference between an elephant and the new sport models is that the elephant carries his trunk in front.—American Motorist.

Push Your Community to the Front

Concrete arch bridge in Yellowstone Park, constructed under supervision of U. S. engineers, showing simple but pleasing decorative treatment.

Get Bridges that Pay for themselves—like concrete roads.

Concrete bridges are moderate in first cost, low in maintenance cost and stand for ages.

Concrete bridges will not rust, rot, burn nor deteriorate in any other way. They need no periodical painting, nor replacement of worn out parts.

Concrete bridges are dustless, nonslippery and non-absorbent. They add to the attractiveness of a community and make it a better place in which to live and work.

Concrete bridges are a good investment, from every standpoint. You will find them in every progressive community.

"CONCRETE FOR BEAUTY AND PERMANENCE"

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Percent Complete	Proj. No.
7-C	Norwood-Naturita	10.6 mi.	Mtn. Grading	Girardet-Hotchkiss Eng. Co.	$ 68,684	72	7-C
29	Morrison-Turkey Creek	1.9 mi.	Mtn. Grading	Wm. Flick	70,839	98	29
30	Morrison Paving	.94 mi.	Conc. Paving	Peterson, Shirley & Gunther	41,677	87	30
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	61,556	...	71-B
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	40	102
116-A	Colorado Spgs. Paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238.944	33	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hothckiss Engr. Co.	53,709	12	119-B
129	Federal Blvd.	4.42 mi.	Paving	Peterson, Shirley & Gunther	164,331	98	129
133	Federal Blvd.	4.22 mi.	Paving	W. J. Cameron & Co.	146,399	98	133
139	Ft. Collins-Loveland	4.02 mi.	Conc. Paving	Mutual Constr. Co.	139,263	98	139
163	St. Charles Bridge	0.5 mi.	Steel Bridge	Rogers & Pikard	85,636	93	163
165	Canon City east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	73	165
166	La Junta-Swink	2.01 mi.	Conc. Paving	Carl C. Madsen	66,949	84	166
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	14	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	60	174
189	Hayden east	5.41 mi.	Grav. Surf.	H. C. Lallier Constr. & Engr. Co.	41,941	75	189
190	Summit County Br. & Road	1.45 mi.	Grad. & Br.	Colo. Bridge & Constr. Co.	40,154	28	190
209	Grand Junction-Fruita	4.20 mi.	Grav. Surf.	Hinman Bros.	60,955	100	209
210-A	Grand Valley-De Beuqe	5.30 mi.	Grav. Surf.	F. L. Hoffman	57,429	27	210-A
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf	J. Edd. Hansen	72,960	9	213-B
215	Pagosa Springs Bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	20	215
216-A	Holly east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	84	216-A
217	Pueblo east	2.94 mi.	Paving	Ed. Lindsay	72,164	58	217
218-A	Hasty-Lamar	8.34 mi.	Grav. Surf.	Monaghan & Cunningham	52,247	95	218-A
218-B	Hasty-Lamar	3.49 mi.	Grav. Surf.	M. J. Kinney	40,009	54	218-B
221	Loveland north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	50	221
222-B	Broomfield cut-off	1.52 mi.	Conc. Paving	Miller, Douglas & Hanes	68,302	42	222-B
225	Fitzsimmons Hosp. Road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	...	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	43	226-A
226-C	Platteville-La Salle	10 73 mi.	Grading	C. R. Conover & Bro.	36,296	50	226-C
228	Atwood-Sterling	4.41 mi.	Conc. Paving	La Nier, Selander & White	148,484	60	228
231	Six Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockway	25,165	15	231
81-A	Rifle Range-Vernon Canon	3.50 mi.	crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	...	81-A
211	Meeker north	1.85 mi.	Grav. Surf.	Hinman Bros.	34,445	...	211
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	...	223-A
142-R	Sterling south	0.40 mi.	Conc. Paving	White & Johnson	15,000	85	142-R

CONTRACTS AWARDED DURING MAY

Proj. No.	Location	County	Length	Type	Low Bidder
F.A.P. 125	Sapinero-Montrose	Gunnison	224 ft.	Steel arch bridge	Winterbourne & Lumsden
F.A.P. 125	Sapinero-Montrose	Gunnison	2.708 mi.	Gravel surfacing	Dale Hinman
F.A.P. 157-B	Buena Vista-Leadville	Chaffee	3.924 mi.	Grading	J. V. Stryker Constr. Co.
F.A.P. 256-A	Atwood-Merino	Logan	2.5 mi.	Concrete paving	La Mier Delander & White
S.P.. 792	Blackhawk	Gilpin	568 ft.	Masonry flume	Stroehle Mach. & Sup. Co.
S.P. 782	East of Craig	Moffat	2.179 mi.	Gravel surfacing	Northwestern Constr. Co.
S.P. 775	Betw. Troutdale & Bendemeer	Jefferson	24 ft. span	I-beam bridge	Colo. Br. & Constr. Co.
S.P. 789	East of Byers over Rattlesnake Cr.	Arapahoe	204 ft.	Timber trestle bridge	Levy Constr. Co.
Phipps Bridge	Betw. Troutdale & Bendemeer	Jefferson	20 ft. span	-beam bridge	Colo. Br. & Constr. Co.
F.A.P. 207	Over Blue River, north of Dillon	Summit	100 ft. span	Low truss bridge	Rogers & Pickard

PROJECTS BEING ADVERTISED FOR BIDS

Proj. No.	Location	County	Length	Type	Bids Opened
F.A.P. 120	Over Clear Cr., N.W. of Denver	Jefferson	150 ft. span	Steel truss bridge	June 19, 1923
F.A.P. 135	Morrison-Denver	Jefferson	5.065 mi.	Paving	June 19, 1923
F.A.P. 208-C	Clifton-Palisades	Mesa	4.748 mi.	Gravel surfacing	June 19, 1923
S.P. 714	Rifle, north	Garfield	2.144 mi.	Grading & gravel surfacing	June 19, 1923
F.A.P. 214	Durango, south and east	La Plata	2.082 mi.	Gravel surfacing	June 20, 1923
F.A.P. 226-B	Platteville, north and south	Weld	2.868 mi.	Paving	June 20, 1923
F.A.P. 229	Between Pueblo and Florence	Fremont	0.587 mi.	Gravel surf. and bridge	June 20, 1923
F.A.P. 255-A	East of Ft. Morgan	Morgan	2.702 mi.	Concrete paving	June 20, 1923

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Location	County	Length	Type
226-C	North of Platteville	Weld	4.404 mi.	Concrete paving
246-A	East of Pueblo	Pueblo	2.537 mi.	Concrete paving
247-A	Rocky Ford-Swink	Otero	1.329 mi	Paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	County	Length	Type
F.A.P. 2 (Reop.)	Trinidad, north	Huerfano	3.5 mi.	Concrete paving
F.A.P. 71-C	Between Durango and Hesperus	La Plata	3. mi.	Gravel surfacing
F.A.P. 116-B	Breed, north and south	El Paso	0.91 mi.	Concrete paving
F.A.P. 116-C	North of Breed	El Paso	3.22 mi.	Concrete paving
F.A.P. 159-A	Betw. Ramah and Matheson	Elbert	6.288 mi.	Sand-clay surfacing
F.A.P. 222-C	Betw. Denver and Lafayette	Boulder	1.5 mi.	Concrete bridge and R. R. grade separation
FA.P. 224	Betw. Morrison and Baileys	Park	5.621 mi.	Mountain grading
F.A.P. 230-A	Wolhurst, toward Sedalia	Douglas	0.852 mi.	2 R.R. undercrossing, 3 bridges and paving
F.A.P. 230-B	Between Wolhurst and Gann	Douglas	5. mi.	Paving
F.A.P. 240-B	Gipsum-Dotsero	Eagle	5.561 mi.	Gravel surfacing
F.A.P. 241	Ovr. Gunnison Rvr. north of Delta	Delta	4 spans @ 150 ft.	Steel truss bridge and approaches
F.A.P. 245	Las Animas, west	Bent	6. mi.	Gravel surfacing
F.A.P. 252	Loveland, south	Larimer	3.5 mi.	Concrete paving
F.A.P. 749	West of Canon City	Fremont	2.419 mi.	Grading
F.A.P. 752	Colorado Springs, south	El Paso	1.651 mi.	Grading

STATE HIGHWAY DEPARTMENT
STATE OF COLORADO
SEMI-ANNUAL STATEMENT OF THE HIGHWAY AND BOND FUNDS
FOR THE PERIOD ENDING MAY 31st, 1923

BALANCES DECEMBER 1, 1922.			
Highway Fund	$ 439,975.53		
Federal Aid Bond Fund	902,852.61		
County Bond Fund	816,305.20		
Total		$2,159,133.34	
RECEIPTS			
One Mill Levy	$ 843,139.98		
Motor Vehicle License Fees	406,052.37		
Gasoline Tax	140,885.97		
Internal Improvement	40,200.00		
U. S Government	665,072.97		
Counties, Federal Aid Projects	71,271.72		
Counties, Merchandise	66,000.99		
Counties, Transfer from Bond Fund	7,954.61		
Bulletin Subscriptions and Advertising	1,856.71		
Refunds and Junk Sales	4,836.24		
Total		2,247,271.56	
Total Balances and Receipts			$4,406,404.90
DISBURSEMENTS			
Federal Aid Projects, Preliminary	$ 45,244.38		
Federal Aid Projects, Construction	783,140.09	$ 828,384.47	
State Projects		330,573.80	
Maintenance		207,377.59	
Property and Equipment		46,805.54	
Administration, General Office	31,555.09		
Administration, Engineering	54,210.26	86,367.57	
Road Signs and Traffic Census		394.94	
County Bond Projects		357,717.05	
Total			$1,857,621.05
BALANCES			
Highway Fund		$1,621,289.83	
Federal Aid Bond Fund		468,905.87	
County Bond Fund		458,588.15	
Total			$2,548,783.85
Total Disbursements and Balances			$4,406,404.90

EQUIPMENT NOTES

General offices of the Hardesty Manufacturing Company are now located in a new building connected with the main plant at Thirty-first and Blake Streets in Denver. The offices were removed from the old location at 1833 Market Street on May 15.

The new plant of the Hardesty concern covers several acres of ground space and is one of the largest of its kind in the country. Likewise it is one of the most complete from every standpoint for the manufacture of culverts and irrigation supplies. Branches are maintained at Woods Cross, Utah, and Missoula, Mont.

Mr. R. Hardesty is president of the concern.

J. S. Schwartz of Colorado Springs is one of the progressive contractors of the West who believes in taking advantage of modern labor-saving devices in executing his contracts. Upon being awarded a contract for $74,000 worth of sewer work by the municipality of Colorado Springs recently, he immediately took a train for Denver.

"I want another one of those P. & H. ladder type trench diggers as quickly as you can get it here," he announced to Paul Fitzgerald, local manager for Landes and Company.

The order was placed as though it might have been a bag of peanuts.

It is the second P. & H. trench machine Mr. Schwartz has purchased in two years. He is rated as one of the largest sewer contractors in the West and has a reputation for getting his jobs done on time. The present job will be laid in 24 inch vitrified and 45 inch concrete pipe.

C. T. McGrew, general sales manager of the Stockland Machinery Company of Minneapolis, was a visitor in Denver on May 31. While here he conferred with L. L. Clinton, head of the Avery Machinery Company, local distributors for the Stockland line of graders and maintenance equipment. He was also a guest of A. J. Held on a motor tour of Denver's mountain parks. Before returning to the factory Mr. McGrew will make a tour of the entire west.

A bulletin of real, live interest has just come off the press, showing the comprehensive line of excavators manufactured by the Pawling & Harnischfeger Company of Milwaukee. The number of the bulletin is 58X and entitled "Follow the Corduroy Trail". It is one of the most interesting bulletins that has come to the desk of the editor of Colorado Highways. If you are a contractor, road official, irrigation engineer, or a shovel runner, ask them to send you a copy. It contains 36 beautifully illustrated pages showing P. & H. excavating equipment operating under almost every condition imaginable.

An interesting exhibit of Wehr graders as combined with Fordson tractors will be one of the features of the big road building equipment display which H. P. Wilson and Company will have at the Colorado Pageant of Progress to be held in Denver the week of July 2.

In addition the Wilson firm will have a large selection of Heil bodies for use on the Ford chassis, as well as several other lines of new equipment all designed to cut labor costs and increase efficiency.

Harry P. Wilson, president of the firm, announces that they have taken the agency for the Waukesha motor in the inter-mountain territory. These motors are now used by a number of large manufacturers as power plants for their various construction machinery. The motors range in size from 20 to 50 horse power.

The largest volume of business in the history of the concern was also reported by Mr. Wilson during the past month. The demand for road graders has been so heavy that they have been unable to keep them in stock. The third car load of Wonder mixers has just reached their Denver warehouse.

F. D. Zimmerman, publicity manager of the Continental Oil Company of Denver, was a delegate to the convention of the Associated Advertising Clubs of the World held in Atlantic City on June 4 to 7. He plans to travel via boat to Jacksonville, Fla., where he will visit friends. Later he will attend the Optimists convention to be held in Chattanooga, Tenn., on June 14, 15 and 16. From there he will go to Indianapolis, his old home, to spend a few days. He is accompanied by his wife on the trip, which will take him away from Denver for three weeks.

Showing flexibility of Bear tractors as used in side-ditch of road

Bear Tractor Used in Trials on Denver Streets and Parks

It's a Bear!

Sounds like the title of a song. But it is not so poetic as that. Just a new road tractor that has made its appearance on Colorado roads.

An interesting demonstration of the machine was staged in Denver during the past fifteen days, arranged through the contractors equipment department of the Stearns-Roger Mfg. Co. with the Bear Tractors Company of New York.

Maintenance work in several of the citys' parkways, as well as on some new street construction was arranged to show the Bear in action. A large number of local contractors and highway officials attended the demonstration.

While the Bear Tractor is a result of several years development it was only placed on the market definitely this year. Low maintenance cost, high mechanical efficiency and unequalled pulling power for its size, weight and engine capacity are some of the claims which the Bear Tractors Company make for this machine with a remarkable flexibility as will be noted in the above picture.

The machine is 118 inches overall, its width 60 inches and its height 64 inches. It will turn around within a 12-foot circle and has a clearance of 11 inches. The weight is 5500 pounds. One of the features of the machine is that ball bearings are used throughout. All bearings run in oil reservoirs, thus requiring attention only about once a month.

PREHISTORIC ROAD BUILDING

How One Style Started

It was back in the prehistoric age. Two heavy-set men came down the road talking loudly. Said one: "He can't do it for the money. His actual costs will be more than that. I have all the figures right here in the cart." He stopped and a cart came up, drawn by a mastodon. He climbed up and commenced unloading flat stones, which he spread out side by side. Chiseled on them were hieroglyphics. Turning to his companion, he continued, pointing at the stones. "There are the actual cost figures, and, besides, he is going to use a dinosaur and you know they ain't worth a darn except in wet weather."

The Engineer

As the town contractors stood airing their grievances, they noted coming down the road a queer human. Somewhere, somehow, he had gotten hold of two pieces of mica held together with a bone, and which sat on his nose in such a position that he could look through them. The skins he wore were all dyed yellow, and he had made himself some queer foot gear that came to his knees and were laced with deer thongs. Coming close to the contractors, he sat up something like a three-legged stool, on top of which was perched a long narrow open gourd. Reaching in his pocket, he took out a stone with a leather string tied to it, which he fastened beneath the legs. Then from another gourd he filled the gourd on top, which he carefully leveled after switching the three legs so that the swinging stone set over a place scratched on the road. After he was all set, a man driving two mastodons and a tandem hit one of the legs with a wheel. Did he cuss No, he was an engineer.

The Cement Salesman

Presently another specimen of the genus humanus strolled into the group. He was wonderfully and fearfully arrayed in a suit of black beaver with a vest of otter skin dyed purple and further set off by a marten's skin beautifully red, for a necktie. By his side his wooing hatchet with seventeen notches cut into the flinty stone. One could tell at a glance he was a cement salesman.

It Was a Her

Enter another personage on the scene. It was a her. She had a dress that was almost a bear skin. She had a bracelet of boar tusks, highly polished to which was suspended a sun dial. She had a bag made of cat skins, and would from time to time reach in it, and, extracting a piece of talc, would rub her nose with it, looking into a small bucket of water which she carried at all times for her mirror. She was perpetually chewing on some beeswax. She was a stenographer.

She created a sensation. The material man slipped behind her and brought down his wooing club with full force but never even batted an eye. A contractor lifted one of the stone tabulations, and, climbing a tall tree, dropped it full upon her head. It merely disarranged the hair, making it fall over one ear. She looked in the bucket of water and then pulled the hair down over the other ear. (That's how the style started.)

A High-Brow Falls

Not for nothing had the engineer burned the midnight oil. Truly, he was a "high brow." He walked in front of her, casting rather a contemptuous glance upon her, and yet tempered with superior indifference.

Scarcely had he passed her than quick as a flash she picked up the wooing club dropped by the material man, and, in a moment more, the engineer sank to sweet unconsciousness in the stenographer's arms.—Trap Rock Chats.

GOVERNOR MOVES TO HAVE STATE CARS REPAIRED IN HIGHWAY SHOPS

Governor Sweet and Highway Engineer Blauvelt are working out a plan by which repairs on all State-owned automobiles in or near Denver will be made in the Denver shops of the Highway Department. The plan was suggested by the Governor in the interest of economy, the State paying annually thousands of dollars for new automobile parts and repairs. The Highway shops are equipped with up-to-date machinery and fully capable of making any kind of repair upon an automobile.

The Highway Department's mechanics will, if the plans of Governor Sweet are carried out, pass upon the condition of every State car in case a department seeks to purchase a new car in place of an old one. Not unless the mechanics pronounce a car beyond repair and advise that it be discarded, will the purchase of a new car be authorized.

High Lift for Excavation Work

Steam Hoe for Trench Work

ERIE

Steam Shovels
Drag Lines
Steam Hoes
Railroad Ditchers

Types A - B

ROUND WHEELS - RAILROAD WHEELS OR CATERPILLAR TRACTION

Railroad Ditchers for Railroad Construction

A General Purpose Machine

YOU SEE ERIES OPERATING EVERYWHERE

Ask the Operators Why?

Standard Shovels Mounted on Erie Lubricated Caterpillars

SOME LOCAL USERS

Colorado Highway, 2; Boulder County, Colo., 1; Washington County, Colo., 1; Wm. Flick, Denver, 1; Frank Vance, Denver, 1; Ed. Honan, Colorado Springs, 2; Corley Coal Co., Colo. Springs, 1; Pople Bros., Trinidad, 1; Midwest Refining Co., Wyoming, 2; Sprague & Niceley, Wyo., 6; Mills Const. Co., Wyo., 3; Christensen Const. Co., Wyo., 1.

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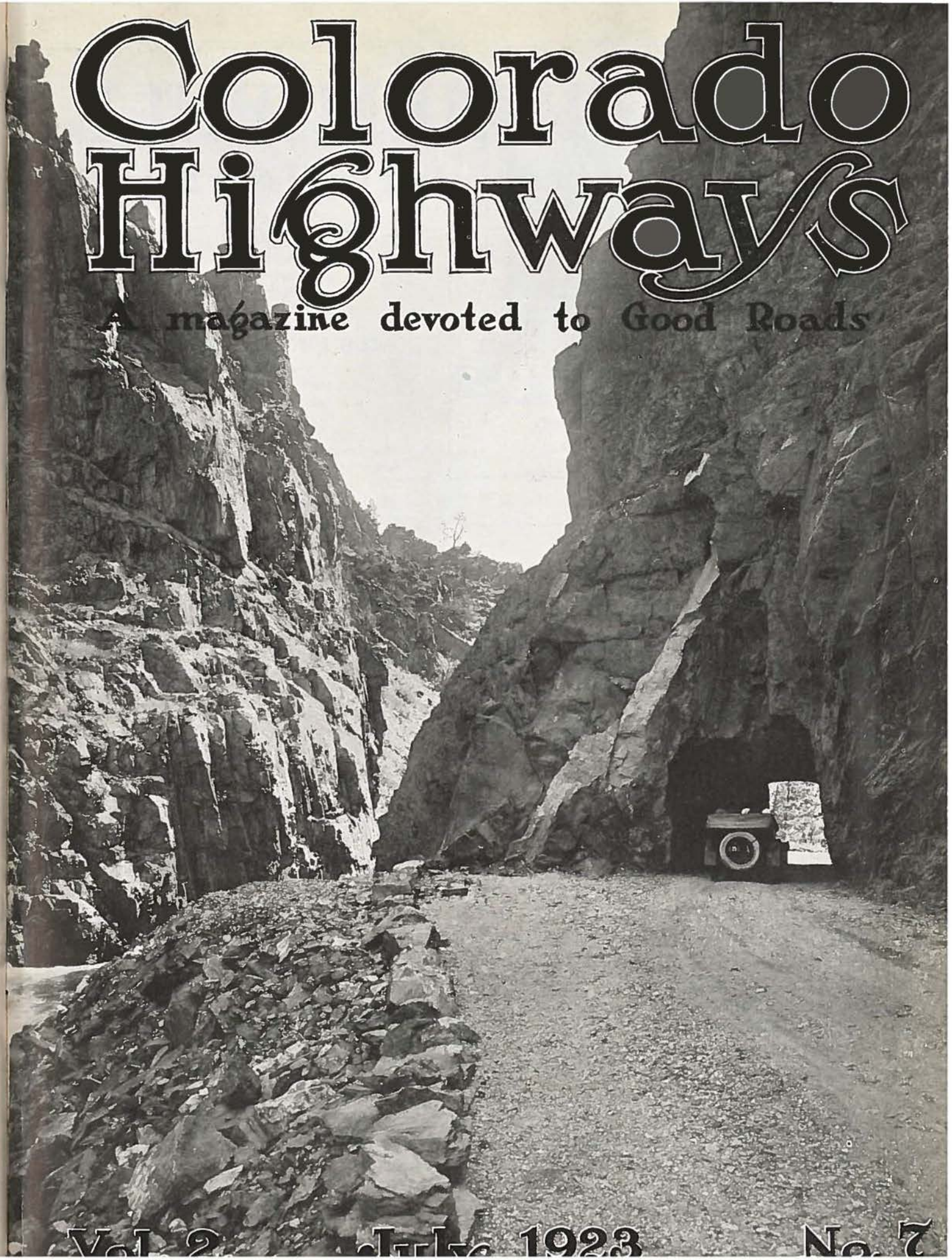
ERIE, PA.

ERIE Revolving Shovels

THE BRADFORD-ROBINSON PTG. CO., DENVER

Colorado Highways

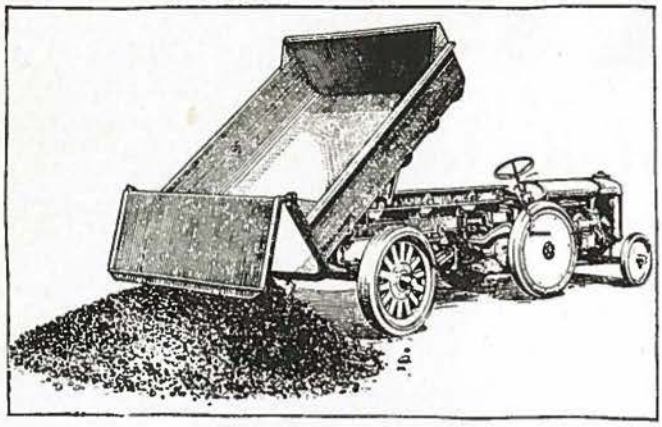
A magazine devoted to Good Roads



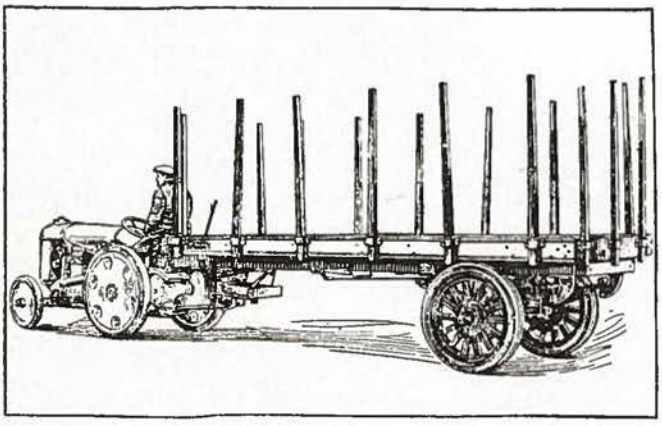
Vol. 2 July 1923 No. 7

THE TRAILMOBILE

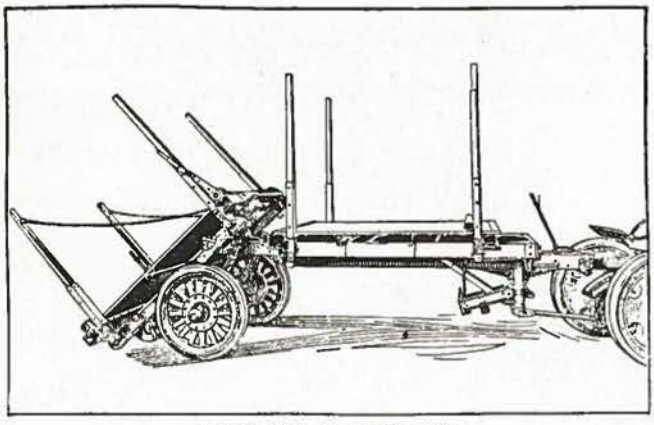
Fordson Tractor Combination for Heavy Hauling



Model "Z-5-D" Trailmobile



Model "Z-5" Trailmobile



Model "Z-5-J" Trailmobile

2½, 5 and 6-ton bodies, low platform stake bodies, standard platform stake bodies, hand hoist and dump bodies, stakes, bolsters and rollers for lumber, roll-off end dump bodies, very low, springless platform bodies.

—*LOW FIRST COST*

Less than one-half the cost of a standard five-ton truck ($1,800 to $2,600 buys entire outfit, including tractor).

—*LOW UPKEEP*

Half the depreciation and interest charge of a truck. Overhauling or renewal of parts at a fraction of the cost on a truck.

The Trailmobile makes correct use of the great power of the Fordson Tractor. There is no alteration in the standard Fordson, or in the method of taking the draft. The entire outfit is compact, and can be easily turned and backed by one man

The draft is in a horizontal line from the regular drawbar cap. There is no weight on the drawbar cap because, while 30 per cent of the load rests on the Fordson, it is distributed by a special bridge directly to the rear Fordson hubs. This improves the traction, but puts no weight on the worm-gear housing.

The Trailmobile can quickly be coupled and uncoupled. In uncoupling, the hinged prop near the front of the Trailmobile is dropped, and the drawbar removed from its coupler; when the driver pulls forward, the Trailmobile nose slides down the inclined portion of the bridge, leaving the Trailmobile resting on its prop.

Road speeds up to 18 miles per hour.

A good hand brake on the Trailmobile, operated from the driver's seat, is part of the regular equipment.

H.W. MOORE & Co

Exclusive Trailmobile Distributors for the Entire Rocky Mountain Region

Construction Machinery of Every Description

Largest Stock in the West

1761 Wazee St.
Denver

141-143 Pierpont Ave.
Salt Lake City

Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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L. D. BLAUVELT,
State Highway Engineer.
OLIVER T. REEDY,
Senior Assistant Engineer.

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10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

A view of the world-famous Cache La Poudre highway is carried on the cover page of this month's issue of Colorado Highways. This is one of the most wonderful drives in the west, passing through a marvelously beautiful canon, with its rushing mountain stream, wild flowers and spectacular cliffs. In the picture is shown a tunnel blasted from solid granite, a monument to the skill of modern road engineers. Officials of the State Highway Department expect to complete the Cache La Poudre road over Cameron Pass this year, giving a short route to one of the west's greatest trout fishing grounds. For over six years workmen have been engaged in constructing the Poudre highway, using hundreds of tons of high explosives.

View of paved road construction in Ogden Canyon, Weber County, Utah. This is a Federal Aid Project. The pavement was laid over old macadam road, reinforced with crushed rock, where necessary, with 1½ inches of mixed black base and 1½ inches of surfacing. This road constructed under traffic, detours being impossible on account of box canyon as shown in this picture. View taken in May, 1921, while road was under construction, showing passing traffic, crew laying base in distance and surface in the foreground.

Colorado Highways
"BETTER ROADS"
VOLUME II. JULY, 1923. NUMBER 7.

Highway Bonds Bring Premium

Sale of Road Securities Assures Completion of 1923 Construction Program

Completion of the 1923 construction program of the state highway department was assured when Harry E Mulnix, state treasurer, on June 22, sold to the International Trust Company, of Denver, the first installment of the $6,000,000 bond issue, authorized by vote of the people at the last general election. The highway department will receive $1,508,150 from the sale of the bonds for acceptance of a like amount of Federal Aid money. Of this amount $1,500,000 is principal and $8,150 represents a premium which the bank paid.

The price realized for the bonds is considered very good in view of the fact that the twenty-fourth general assembly inserted in the enabling act a provision compelling the state treasurer to insert into the bonds a provision making them callable one year from the date of issuance. This action of the assembly made the bonds less attractive to investors. Had the assembly voted for the issuance of an out-and-out serial bond, the premium realized by the state would have been much larger, in the opinion of financiers and investors.

As the bonds now stand the state treasurer is required not only to redeem a certain fixed amount each year, but he must utilize every dollar available at the end of the year to retire additional bonds. As is well known, the interest on the bonds and the amortization charges are to be paid from the highway department's one-half of the state motor vehicle license. Members of the assembly figured that, with the steady increase in automobiles and the increase in license fees, more money would be realized from fees than was necessary to pay interest and amortization charges. In order to utilize this probable excess for the retirement of the bonds they inserted the provision into the bonds that the bonds should be callable.

State Treasurer Mulnix sold the bonds at private sale. Bids for the securities were opened on June 14, but not one of the bids was considered acceptable. Mr. Mulnix, for this reason, rejected them. Altogether there were seven bids, from Denver, New York and Chicago banks and bond houses. The best bid was that of a group of Denver investment bankers: $7,725 above par, but attached to this bid was a condition that the money realized from the sale of the bonds should be kept on deposit in certain Denver banks.

Feeling that he could not keep the money on deposit because it was to be used for the payment of road construction and also because there are certain laws governing the deposition of state funds, Mr Mulnix flatly declared that he could not agree to such a condition. The next highest bid offered a premium of $3,630, without any strings attached to it. This Mr. Mulnix considered too low in view of the intrinsic value of the bonds. He expressed the belief that he would obtain a better price. The actual sale of the bonds at a figure more than $4,500 higher than this bid bears out the correctness of the treasurer's judgment.

Printing and signing of the bonds will require several weeks but in the meanwhile the highway department will go ahead and let contracts for the full amount of the bond issue as fast as the plans worked out by its engineering division are approved by the United States bureau of roads. Before the end of July, the department heads say, the state will witness the greatest road building activity in its history.

TRAFFIC ENUMERATORS START COUNT OF VEHICLES ON COLORADO ROADS

The first traffic census taken in Colorado during the last five years was started by the State Highway Department on the Denver-Fort Collins-Cheyenne road on July 1. A crew of twenty enumerators is employed in the work, with J. E. Furlong, as the chief census director.

Information gathered by the enumerators will be used by the state road engineers as a basis for determining the type highways that will be constructed in Colorado in the future. It is expected that the work will require about two and one-half months to complete. After the field work has been finished Mr. Furlong will compile the data obtained by the enumerators in a form that will be easily accessible to the road engineers in their daily work.

The enumerators were stationed along the Denver-Fort Collins road for four days. Traffic is being counted at different intervals during the day and night. The stations are so located that the traffic over the "feeders" roads may be counted at the same time as the count over the main highways.

At most of the stations to count covers a period of eight hours each day, but at two or three junction points a 24-hour check is being made.

Every vehicle using the highway as an artery of travel is counted and classed. Weights and the various types of trucks also are being counted. In this way the engineers will learn the amount of tonnage the various highways are carrying at all hours of the day and night.

The census will show the number and class of Colorado motor vehicles traveling over the roads, including light and heavy weight cars, passenger busses, motorcycles, trucks, loaded and empty, under three tons and over three tons; all classes of foreign motor vehicles; tractors and other engines, horse drawn vehicles, live stock, such as horses and cattle, being driven over the highways.

Likewise the field reports will show the direction in which the traffic is traveling, what the weather was and the condition of the road on the particular day on which the census was taken.

Traffic was counted on the Denver-Greeley-Cheyenne road for four days, July 5 to 9, and then the enumerators were switched to the Sterling-Julesburg main route.

During the next few weeks every main highway and mountain pass in the state will be covered by the enumerators. Mountain passes on which the traffic will be counted include: Wolf Creek, La Veta, Cochetopa, Monarch, Tennessee, Berthoud and Rabbit Ears. Later in the year it is planned to take a census of winter travel over the main highways, in order to get a comparison of summer and winter traffic.

Within a few weeks the floor of the Fourth street bridge over the Fountain river in Pueblo will be waxed and a mammoth dance will be given for the general public by the East Pueblo Improvement association. New abutments and one new steel span have been installed in the bridge which was damaged by high waters 2 years ago. The occasion will be to celebrate the laying of concrete paving on both ends of the bridge.

Roads of the San Isabel Forest

(By A. G. HAMEL)

ROADS are a vital asset to any region, in fact they are the arteries of a community; without roads a community does not prosper. The question of roads always has been an important one, more especially since the advent of the automobile.

The San Isabel Recreational Plan of Development is coordinated with the road system, in fact the road system is a part of it. The success of the Plan depends to a great extent upon how well the road system is developed. The traffic unit is the circulatory system and without it the plan cannot function.

The San Isabel National Forest is well located with reference to the great trunk line traffic of the nation; first there are four great railroads coming to the edge, or surrounding the Forest, and from the railroad points, automobile roads penetrate the three divisions of the Forest.

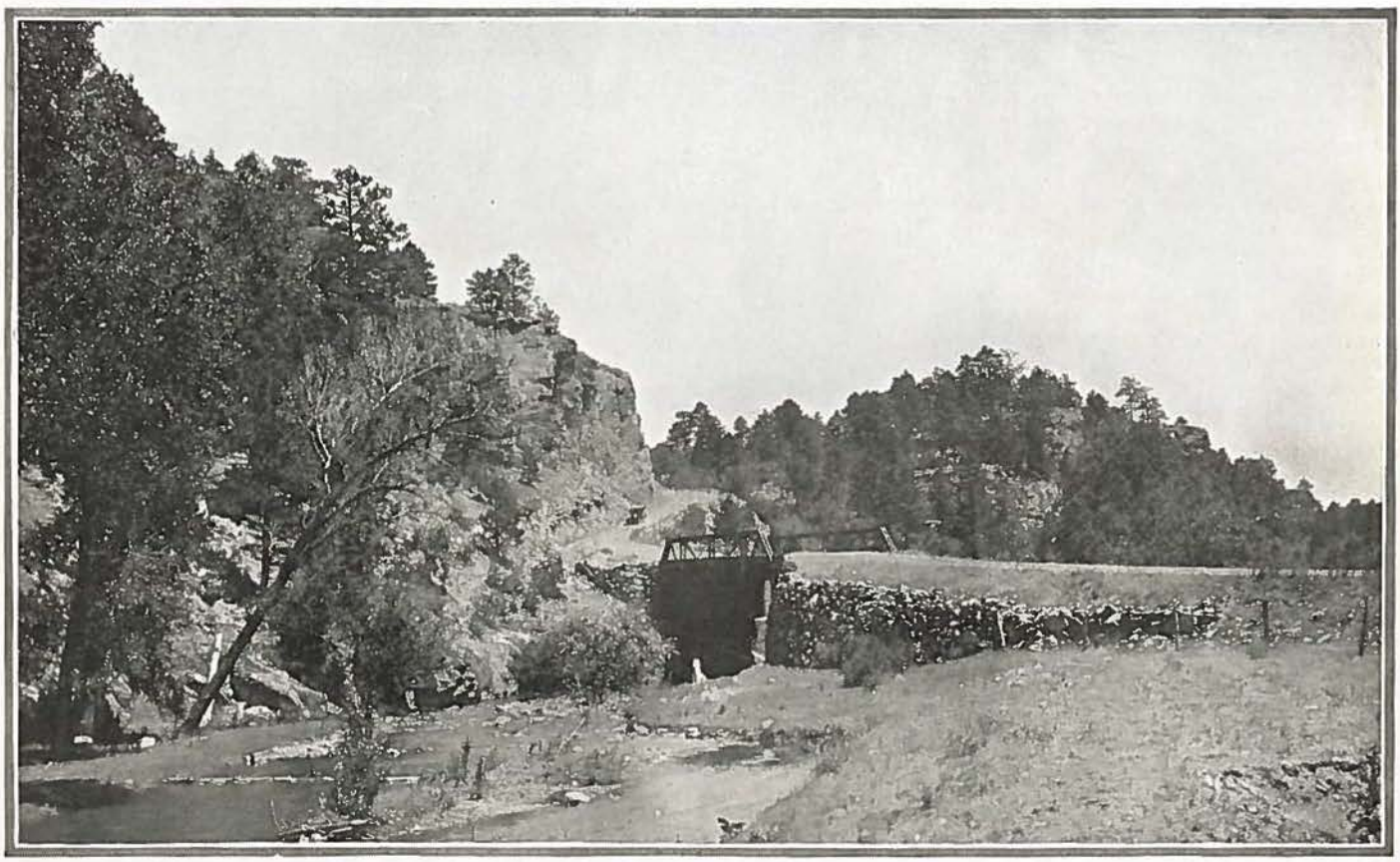
There are approximately seven hundred miles of roads that serve the Forest, a considerable portion of which is included in a comprehensive road plan for the administration, protection and development of the Forest.

The main lines of automobile roads are not lacking to bring the motorist to the edge of the Forest. To the eastern gateway leads the National Old Trails Road, the Santa Fe Trail, and Colorado-Kansas Boulevard. The National Old Trails road comes to the southern gateway of the Forest, where it connects with the "Colorado to Gulf Highway" running parallel to the Forest and skirting the eastern slopes. The Spanish Old Trail passes through the town of Walsenburg to La Veta and thence over La Veta Pass to Alamosa, thence through southwestern part of Colorado. The northern portion of the Forest is bordered by the Rainbow Route.

View of road near Beulah in Greenhorn Mountains.

One of the essential factors which makes the San Isabel region of great value is the relatively small amount of development work necessary in order to open up the entire region. The low land that lies between the different divisions has admitted of roads being built that in a measure form the back bone of the entire system. For instance, there is a mainline road running along the eastern side of the Forest which will function until some other line closer to the Greenhorn range is open. A mainline already exists along the northern side, and a road forming the very backbone of the scheme is in good usable condition in the Wet Mountain and upper Huerfano Valleys.

In numerous places there are other roads that need but little repair or improvement to bring them to the desired standard for this big plan. There are other possible roads that have difficult sections through canons or over divides that need improvement. The Hardscrabble project through North Hardscrabble Canon, and the Cuchara-Stonewall respectively are two projects that are nearing completion.



A section of the Hardscrabble road, showing type of bridge construction found in San Isabel National Forest.

A glimpse of the Sangre de Cristo Range with its lofty peaks.

It is now possible to enter the Wet Mountain Valley either from the south and swing back out by the "across the range route," or come through from the Rainbow Route and pass out of the Valley, either across the range of the Greenhorns, or swing south through the Spanish Peaks region.

A comprehensive plan of road development was prepared for the entire region in cooperation with Pueblo, Fremont, Custer, Huerfano, and Las Animas counties, and all work being done is so directed that the accomplishments are in harmony with it. The rapid strides being made in the completion of the entire plan is due to the fact that the Government, State and Counties are working hand in hand.

Much was done the past year toward the accomplishment of the plan and work is now under full swing again this season. With the "All for one and one for all" spirit which permeates this section of the State, what was once our dreams are rapidly becoming realities.

The San Isabel is now offering recreational possibilities today over good roads that less than a year ago were inaccessible to automobile travel.

The San Isabel National Forest includes three separate units, the Sangre de Cristo Range, the Greenhorn Mountains and the Spanish Peaks, which almost encircle the Wet Mountain Valley and Huerfano Park. The entire forest, with the exception of the western slope of the Sangre de Cristo, which drains into the Rio Grande del Norte, is within the watershed of the Arkansas river and its southwestern tributaries.

The majestic grandeur and pure beauty of the mile upon mile of rugged, snow capped peaks of the Sangre de Cristo is unequalled by any other mountain range in Colorado. To the east lie the rich, rolling meadows of the Wet Mountain Valley, with the pine and spruce covered slopes of the Greenhorn mountains in the dreamy distance; to the west is the flat expanse of the San Luis valley, with its innumerable lakes and checkerboard farms, while way to the south, silhouetted against the horizon, the symmetrical mass of the Spanish Peaks rises sharply above the golden mists of the valley.

Camping out is one of the most enjoyable ways to spend a vacation on the San Isabel. There are so many delightful places in the mountains, that one has no trouble in choosing a location. All the important streams of the various divisions of the forest offer suitable sites for summer camps, with a plentiful supply of pure mountain water, fuel wood, and forage for livestock close at hand. One may reach the higher and more secluded parts of the mountains either by wagon or with pack outfits.

Food supplies and other camp necessities are readily obtained at nearby towns and ranches.

The many streams and lakes of the San Isabel are well stocked with trout, and excellent fishing may be found in any part of the forest. Among the most noted fishing grounds within easy reach of Westcliffe are North and Middle Taylor, Sand, Colony, Grape, Macey, Swift, Texas, and Brush creeks, Hermit lake, and Lake of the Clouds. There are many other fine trout streams and lakes along the western slope of the Sangre de Cristo, and in the Greenhorn mountains and Spanish Peaks country.

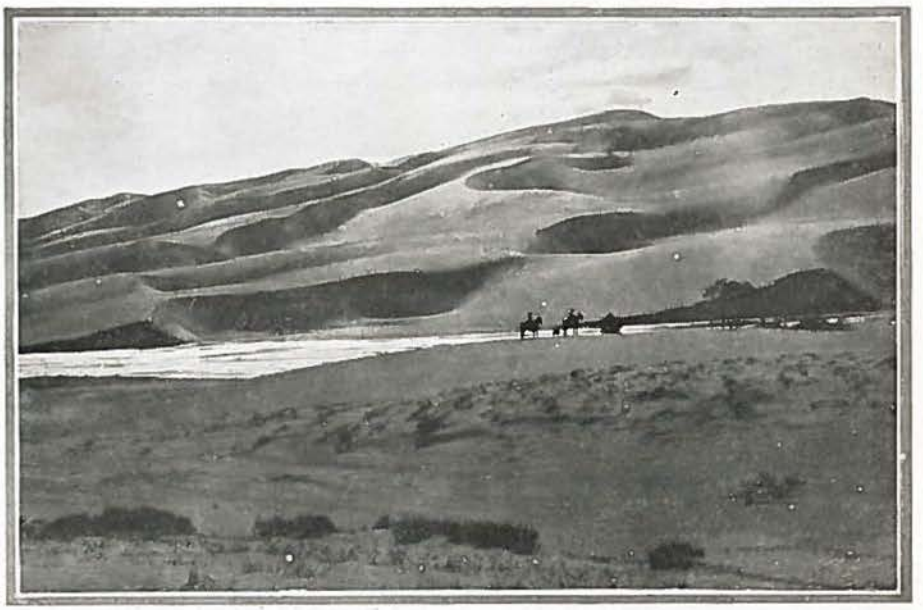
The Greenhorn mountains may be entered from Pueblo on the east over excellent automobile highways to Rye and Beulah (25 and 35 miles, respectively), and From Florence and Canon City on the north by way of the Hardscrabble and Oak Creek auto roads. One of the finest automobile roads in the state, a part of the "Rainbow route", which follows along the Arkansas river, skirts the northern boundary from Canon City to Salida, with a branch road, running southward from Cotopaxi to Westcliffe

The Spanish Peaks country can be reached by automobile via the Spanish Trail from Walsenburg to Alamosa. The southern part of this division also is accessible from Trinidad.

To the mountain climber the San Isabel Forest offers unexcelled opportunities. The Sangre de Cristo range rises 6,000 feet above the valley to an elevation of 14,000 feet, forms a narrow ridge or sierra, scored by deep ravines, walled in by steep cliffs several thousand feet in height. Its skyline formed by a series of pyramidal peaks, between which are some of jagged form with sharp columns projecting upward, is one of the most striking to be found in any range.

Among the interesting peaks to be climbed are Sierra Blanca (14,390 feet), the third highest peak in Colorado; Crestone Peak (14,233 feet), Horns Peak (13,447 feet), Mount Humboldt (14,041 feet), Old Baldy (14,176 feet), and Rito Alto (12,989 feet).

The Spanish Peaks, east (12,708 feet), and west (13,623 feet), and Greenhorn Mountain (12,230 feet), are also of interest because of the wonderful panoramic view obtained from their summits.



The San Isabel Sand Dunes, one of the world's wonders.
—Photos by courtesy U. S. Forest Service.

Colorado Pass Roads Opened Early

State, Government and County Officials Co-operate in Clearing Snow from Mountain Highways

TRAFFIC got an early start over the mountain passes in Colorado this year. By the middle of June nearly every pass road in the state was being travelled by the largest number of motorists on record. It seemed that the tourists were standing-by waiting for the passes to be cleared of their snow blankets.

Tennessee pass was the first to be opened, thanks to the efforts of the county commissioners of Lake county. A heavy truck with a snow plow attachment was used most successively in clearing this important link of state highway. It was entirely free of snow by the first of May and since has been travelled by hundreds of motorists routed over the transcontinental road through Leadville.

In order to facilitate traffic over Battle Mountain the officials of Eagle county put into service a steam shovel clearing away a number of rather bad slides. It is said that an earnest effort will be made next year to keep Tennessee Pass open throughout the winter.

On June 10 three other important pass roads were opened. They were: Hoosier pass, (10,313 feet elevation;) Willow Creek, (9,683 feet,) and Wolf Creek, with an altitude of 10,850 feet. Berthoud Pass, (11,306 feet elevation) was opened to traffic on June 12, while the first cars passed over Rabbit Ears, (9,680 ft.) on June 18.

A steam shovel owned by the State Highway Department started work on the western slope of Wolf Creek pass early in June and will be kept busy for the rest of the summer. An appropriation of $25,000 has been made for widening this road to the foot of the pass on the western slope. Last summer the shovel was moved up to eastern slope to the top of the pass, where it remained buried in the deep snow all winter.

The route over Wolf Creek carries a majority of the summer travel to the Mesa Verde National Park, and for a good many years was considered not at all safe for the heavy traffic which passed over it each season.

This season there will be expended on mountain pass roads in Colorado the sum of $468,000. About $50,000 of this sum will come out of the State Highway Fund, the balance being appropriated by the government through the Forest Highway Fund.

This is the largest sum ever expended by the government in this state on mountain pass roads. The projects on which the money will be expended are as follows:

Cumbres Pass, $66,000; Red Mountain above Ouray, $104,000; Cameron Pass, $68,000; Independence Pass, $69,000; Fremont Pass, $75,000; Berthoud Pass, $66,000 and Loveland Pass, $20,000.

With the completion of the work on Cumbres Pass, which will take the road into Chama, N. M., a new route to the Mesa Verde park will be available to tourists. The sum to be expended on Red Mountain this summer is expected to finish the work on this magnificent highway. To date nearly $1,000,000 has been spent on the construction of the road between Ouray, Silverton and Durango.

Along the D. S. O. road is found the most beautiful mountain scenery in the west. Originally constructed as a toll road between Ouray and Silverton, over which millions of dollars worth of precious metals were transported, the new road presents one of the finest examples of modern road building to be found anywhere in the world.

The new work being done on Cameron pass, connecting with the excellent highway through Poudre Canon above Fort Collins, will open a new route over the Continental divide, making it possible to reach the finest fishing and game country in Colorado without the necessity of leaving the state. Heretofore, tourists have been compelled to drive into Wyoming and back into Colorado via Tie Siding in order to reach their destination.

Construction of a link in the new Holy Cross Trail will be started at an early date. This road will cross Loveland Pass and later will be extended to Red Cliff, reducing the distance between Denver and Glenwood Springs about 90 miles. In the early days this route was used by stage coaches which operated every day in the year from Idaho Springs. The survey of the new motor highway follows for the most part the old road, and it is hoped that it will be possible to keep the new road open each year longer than any of the other roads crossing the Continental divide.

Loveland Pass reaches an elevation of 11,876 feet, and it is said to be one of the easiest passes in the state from the standpoint of grades. The new road will be much longer than the old stage road, because of the necessity of making grade for auto traffic.

Traffic was started over Berthoud Pass about a week earlier this year than usual, due to the work of the maintenance crews of Grand county under the direction of Frank McQueary, road supervisor. Reports show that all traffic records have been broken on this pass this season, due to the heavy tourist travel over the Fall River road.

Snow from the Fall river road was cleared by crews of men employed by the Park Service under the direction of Roger W. Toll, superintendent of the Rocky Mountain National Park. It required about six weeks to complete the job.

About six miles of new road will be constructed by the Forest Highway Service on Cameron Pass this summer. This work is located on the eastern side of the pass and will connect with the State project at Chambers Lake. The road through Poudre Canon was constructed by convict labor, who have been located on the project about seven years. The road in the canon was blasted from solid granite, the convicts making use of rope ladders at some places to drill holes for blasting. George Asher, has charge of the convict work.

About seven miles remains to be constructed on the Cumbres Pass road which is located in Conejos county. This new road is said to open up a veritable fisherman's paradise.

Snow slides have interfered with the work on Red Mountain during the early spring, but reports indicate that the contractors will have the road ready for traffic about the middle of July. Improvements also are being made in the road between Durango and Silverton.

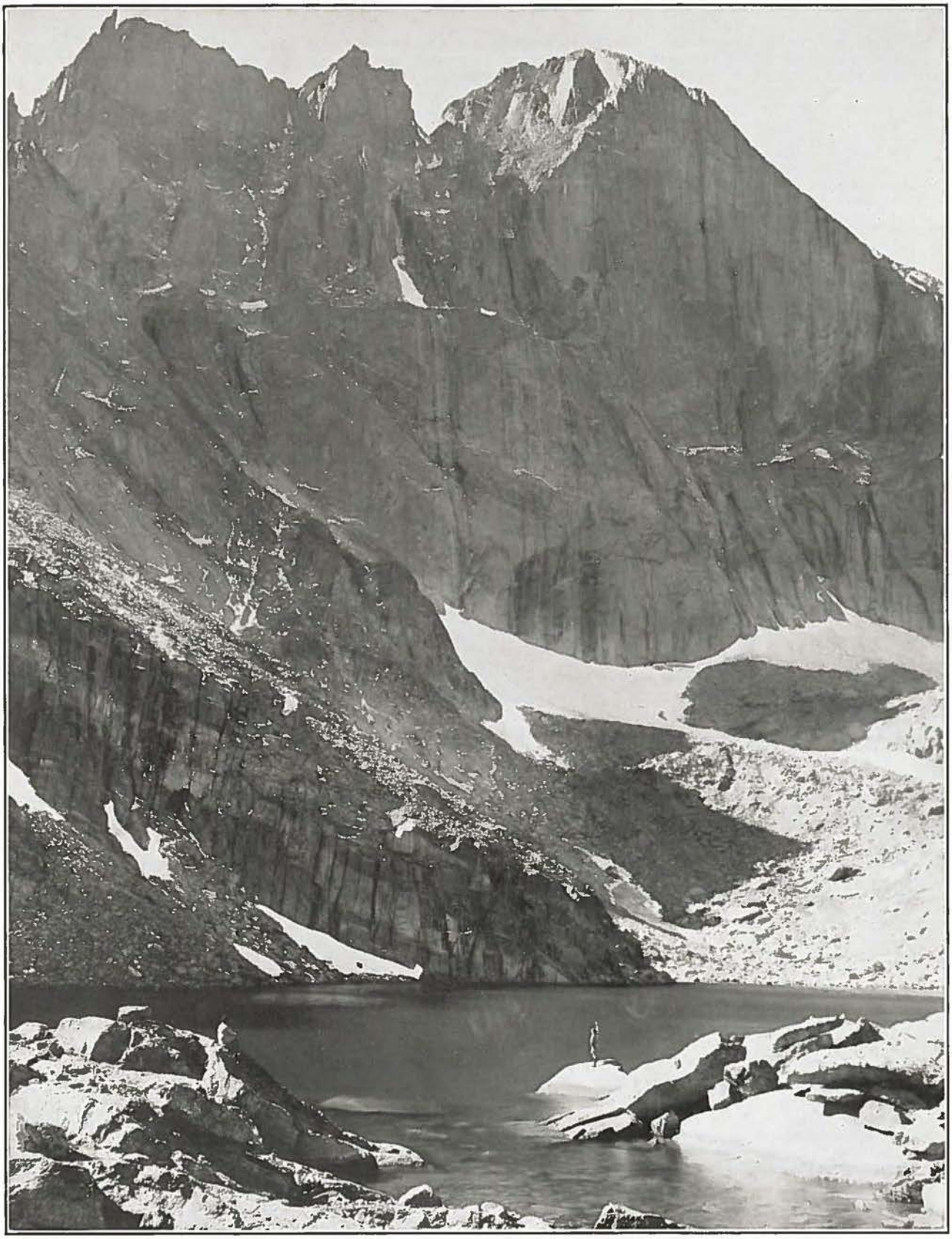
The wonderful mountain roads of the San Isabel National Forest, reached by hard surfaced highways from Pueblo, are being traveled by a record breaking number of tourists this year. Many do not make the drives with their own cars but prefer the large sight-seeing busses of the San Isabel Tours company just installed this season. The well constructed roads lead through some of the most magnificent scenery of the North American continent. This statement has been made by hotel men, tourist bureau routers and other world travelers who have visited the San Isabel.

Colorado has eighteen passes over the Continental Divide with an average altitude of 10 619 feet. Fifteen of these passes have modern improved highways crossing them. No other state has as many mountain pass roads reaching such elevations.

By the end of the present construction season it is expected that roads will be opened on two more passes, while work will be started in a few weeks on a third. The work of building roadways over the passes in Colorado is being done with the co-operation of the federal government through the Forest Service and the Bureau of Public Roads.

The eighteen passes and their respective elevations are as follows:

Berthoud	11,306 feet
Cochetopa	10,032 "
Fremont	11,320 "
Hoosier	10,313 "
Independence	12,095 "
La Veta	9 378 "
Monarch	11,650 "
Poncha	8,945 "
Red Mountain	11,018 "
Tennessee	10 276 "
Willow Creek	9,683 "
Wolf Creek	10 850 "
Cumbres	10 003 "
Cameron	10,295 "
Rabbit Ears	9,680 "
Fall River	11,797 "
Loveland	11,876 "



Majestic Longs Peak (elevation 14,255 feet) and Chasm Lake, 2,300 feet below the summit, in Rocky Mountain National Park, Colorado

—Courtesy Denver Tourist Bureau.

Officials Discuss Road Costs

How to eliminate "jiggle us" or the "wash boards" from state highways was one of the principal topics of discussion at the annual meeting of the Fifth Highway County Commissioners Association held in Cripple Creek on June 16th.

The matter, which has come to be looked upon as one of the most important phases of maintenance work with which the state and counties now have to contend, was taken up under the question of "What is best for dragging roads?" Various phases of maintenance were discaused at length by the members and road experts in attendance, including the representatives of several large road machinery manufacturers.

Participating in the discussion were Robert H. Higgins, head of the maintenance division of the State Highway Department; Thomas J. Ehrhart, former state highway commissioner, now representing H. W. Moore & Co., of Denver; Richard Quinn, county Commissioner of Teller county, and J. W. Shy of Cheyenne County.

It was the general opinion of the maintenance men that all of the equipment now used was good for the particular purpose for which it was manufactured, but there is no one piece of machinery that will serve all maintenance purposes. Some of the commissioners voiced the opinion that the trucks now being used in maintenance work were being operated at speeds too fast to give best results.

Others stated that it was their opinion that better results could be obtained from the use of small tractors, and it was thought that the "washboards" were caused by the trucks being operated at speeds averaging ten miles an hour. Upkeep costs on the trucks, which the drivers were compelled to operate in low gear, also were said to be too high. It was stated that "trucks were made to haul loads and not pull them."

Mr. Shy brought out some very interesting points in regard to expenditure of money for road maintenance.

Mr. Quinn was elected president of the association for the ensuing year. Mr. Shy was elected vice-president and John H. White, county clerk of Teller county, was named secretary-treasurer, succeeding E. H. Akerly of Cheyenne Wells.

The commissioners of Teller county presented to Ma or L. D. Blauvelt, State Highway Engineer, a gold key made from metal mined in the Cripple Creek district.

An invitation extended by J. H. Habenicht, of Chaffee county, to hold the next meeting of the association at Buena Vista was accepted by the association. It will be held some time in August, the exact date to be announced later.

President Quinn appointed the following as a standing committee on by-laws: H. A. Sholten, J. D. Peyton and C. J. Buchanan.

The association also adopted the following resolution of sympathy to be extended to Mell De Witt of Chaffee county:

"Whereas, since our last meeting the wife of our friend and colleague Mell De Witt of Chaffee County, has departed this life.

"Now, therefore, be it resolved, that we of Fifth Highway District Commissioners' Association of Colorado, do hereby extend our bereaved associate our sympathy.

"Be it further resolved, that a copy of this resolution be spread upon our minutes and forwarded to our bereaved brother."

A banquet was served by the Ladies Aid of the Union church in the Elks home to the delegates in the evening.

The following commissioners and guests attended the meeting:

Cheyenne county—Anton I. Johnson, J. W. Shy, W. C. Schultz, V. H. Johnson, E. H. Akerly; Douglas county—C. H. Lowell, J. T. Berry, B. M. Stewart; Elbert county—W. J. Parks; El Paso county—H. A. Scholten, W. H. Bartell, R. F. Sonnekson; Kit Carson county—G. W. Huntley, retiring president; C. J. Buchanan, W. D. Jones; Lincoln county—R. R. Lucore, J. D. Peyton, Claud Wilson; Park county—John T. Witcher; Teller county—Matt Edwards, Richard Quinn, J. B. Wild, John H. White; Chaffee county—J. H. Habenicht, R. H. Higgins, B. A. Briggs, and M. B. Kinnikin of the State Highway Department; Mrs. J. H. Habenicht, Buena Vista; Mrs. A. I. Johnson, Wild Horse; Miss Ethel Shy, Cheyenne Wells; Mrs. W. C. Schultz, Cheyenne Wells; Mrs. V. H. Johnson and daughter, of Cheyenne Wells; Mrs. M. B. Kinnikin, Lake George; Mr. and Mrs. Quinlan, of Denver; Thomas J. Ehrhart, representing H. W. Moore & Co.; John Pollock, of H. P. Wilson & Co., Denver; R. C. Peppers, Hudson; H. S. Riley, Out West Printing Co., Colorado Springs; M. A. Birckett, of the R. Hardesty Mfg. Co., Denver; John A. Crook, Denver Steel & Iron Co.; A. R. Mackey, bridge contractor, Sterling; A. R. Held, of Avery Machinery Co., Denver, and H. G. Hayward, banker, of Hugo, Colo.

GANN URGES COMMISSIONERS TO KEEP HISTORIC SANTA FE TRAIL SMOOTH

The necessity of towns along the Santa Fe trail keeping that highway in good condition, was explained by G. L. L. Gann, member of the advisory board of the State Highway Department, at the regular meeting of the Arkansas Valley Association of County Commissioners held at the Pueblo county court house June 16. Gann urged the various county commissioners of counties through which the Santa Fe trail traverses to give the road special attention because of its national importance and because that it is one of the few national roads kept open the entire year from Atlantic to Pacific oceans.

The Santa Fe trail as a transcontinental highway is known as the National Old Trails Road which starts at Washington, D. C., the nation's capital and traverses thirteen states and ninety counties on its almost direct route of 3,030 miles to Los Angeles. It is a highway which penetrates the world's grandest scenic attractions, according to world tourists. It is a historic road, the stretch from Washington to Baltimore, known as "Braddock's Road," being the first highway constructed by the national government. The road is linked with the prairie schooner trains of the pioneers who blazed the way, of Indian wars, gold rushes and countless incidents of historic record. It is a well-marked highway with an appropriate marking, that of red, white and blue.

Following a discussion by the commissioners, a committee composed of W. L. Rees, Pueblo county, chairman; J. L. Thompson, Bent county and George Barr, Otero county, was named to confer with Major L. D. Blauvelt, state highway engineer, relative to contractors doing state highway work who fail to complete projects as specified by contract. The committee will recommend that there be a time limit made on all projects and that when the contractors fail to complete the work by that time, they shall be fined or otherwise penalized. It was said that in many instances state highways, which are the arteries of travel, have been closed for periods of as much as a year.

Joseph Ray of Las Animas county, who presided in the absence of J. E. Downey of Crowley county, informed the commissioners that speed maniacs who destroy highways and endanger lives of other automobilists are being arrested and prosecuted in his county. The week preceding the meeting nineteen speeders were arrested while making more than 35 miles an hour and all of them were fined $10 each. To the fine $9.50 was added in each case for court costs and sheriff fees. Ray recommended that the signs to be placed on the state highways over the state include the speed limit on them to warn resident motorists as well as tourists.

An unique feature of the meeting was the dinner served at the bridge camp of the Pueblo Bridge and Construction company located 8 miles southeast of Pueblo where a 3 span concrete bridge is being completed on the St. Charles river. The excellent dinner was served at the invitation of Fred Bullen, president of the company.

It was voted at the afternoon session to hold the August meeting in Trinidad. Heretofore practically all of the meetings have been held in Pueblo.

The 2.8 miles of concrete paving on the Santa Fe Trail east of Pueblo is complete and joins with 3 miles already laid from Pueblo to Blende. When the 2.537 miles of paving now submitted to the U. S. Bureau of Public Roads is completed, Pueblo county will have a continuous ribbon of concrete paving from Pueblo to Vineland, a distance of 10 miles. That stretch of road has more traffic than any other highway in Southern Colorado. It is the principal highway from the Arkansas Valley to Pueblo, all roads being tributary to it.

Fall River Road May Get U. S. Aid

The coming session of congress will, unless all signs fail, provide funds for widening Fall River road in the Rocky Mountain National Park, but under what conditions now are unknown. Members of the senate and house appropriations committees went over the road in the closing days of June and each of them was emphatic in declaring that the road should be widened.

Senator Robinson, of Arkansas, proposed to members of the two committees in informal discussions of the road that congress appropriate $280,000 for the widening of the road, but this would be in the nature of a loan. His proposal was that an annual permit be issued to each automobile using the road at a charge of one dollar. This permit would allow the holder to use the road as many times as he pleased and to have as many passengers in his car as he pleased. The dollar was proposed for a sinking fund that eventually would pay off the loan.

Arguments against this proposed one dollar annual permit for use of the road were many and varied. One was that while the government had spent vast sums on roads in the Yellowstone and Glacier parks, it had spent none in Rocky Mountain, and the belief was expressed that now was the time for the government to do something for Colorado.

The argument for the charge that $7.50 was charged at Yellowstone and $5 at Glacier for each automobile was answered by the statement that this charge was merely for entering the parks over government roads, whereas Fall River was a state highway, constructed by the state and was used by residents of the state in pursuit of their regular business.

Senators and representatives on the appropriation committees asserted that with the Harding economy program in force that it was extremely difficult to extract money from congress for any purpose; that the demand for appropriations ran into many millions above the supply of money. Senator Robinson in urging the $280,000 loan with a dollar permit string to it, said:

"I want to see the Fall River road widened. I have proposed the loan with the charge for going over it to prove to senators and representatives alike that the government is merely loaning the money, and that eventually it will be returned. I see in this an opportunity to get the money at once so that work of widening the road can begin early next Spring and be pushed through to early completion.

"The Fall river road opens some of the grandest scenery on the American continent. I had no idea of the beauty of Rocky Mountain National Park and the grandeur of the scenery until I went over the Fall River road.

"I feel that it is imperative that the road should be widened six feet, making it a twenty-foot road. About the need of this widening there can be no question. The one question is: how can congress appropriate the money for the work? I believe my plan is one that can be carried through."

Senator Francis E. Warren, of Wyoming, agreed with Senator Robinson that the road should be widened, and expressed confidence that the Robinson plan could be put through congress without difficulty, making the money immediately available.

"Personally, I feel that the Fall River road should be a duplicate of the Lookout Mountain road in the Denver Mountain Parks," said Congressman Winslow, of Massachusetts. "If that can be done then there is, with other road improvements being carried on by the Colorado State Highway Department, a boulevard from Denver to Estes Park village. I consider that Rocky Mountain National Park is entitled to this highway; it is our national park nearest to nation; its accessability is one of its strong points, and the fact that its summer attendance exceeds that in any other national playground is proof conclusive that it should be a wide road and one that is open the year around."

The road was opened the third week in June through the efforts of the Rocky Mountain Parks Transportation Company, Roe Emery, president of the company, being determined that the members of the appropriation committees should see it. To open it several hundred feet were dug out of snow fifteen feet in depth; a dozen places the road was cleared through six and seven feet of snow. When the committee went over it in the last week in June there were only a few places where it was muddy.

The narrowness of the road was remarked by members of the committee. At Grand Lake, after dinner, Congressman Edward T. Taylor, of Colorado, in whose district the road lies, arose and made a plea to his brother members of the committees for an appropriation for widening the road. Mr. Taylor explained the difficulty of getting through the Rocky Mountain National Park bill, succeeding only after a promise that the state would build the road now known as Fall River.

"We have kept the faith in every particular," said Mr. Taylor. "We did not construct an ordinary road; we surveyed it and built it along the side of canons, wrapped it around mountains and you saw it today—a wonder work for the state to do. Now we ask that the government come forward and do something for us.

"I have voted for appropriations for improvements in Yellowstone, Glacier and other national parks; I have aided in the passage of these bills, now I ask that you come to my aid and see that we have the money for making this great road one that can be used by even the most timid driver. We have kept the faith, now I ask you to keep the faith with us."

Congressman Quinn, of Mississippi, one of the representatives who stood by Mr. Taylor throughout the battle for the Rocky Mountain National Park, asserted that he was for any movement in congress that would give Fall River safety. The same statement came from Congressman Hull, of Iowa; Congressman Abernathy of North Carolina and others who composed the committees.

The unanimity of the members in the belief that Fall River road should be six feet wider was taken as conclusive evidence that the coming session of congress, assembling in December, will appropriate the money for the highway. While the $280,000 loan and dollar permit proposition was received with favor, yet there was also an expression that if the money could be appropriated direct and without a permit it should be done.

The fact that Fall River is a state highway proved one of the problems of the senators and representatives. The question was whether congress could make a direct appropriation, but the opinion prevailed that this could be done as the road is within the confines of a national park.

One of the points about the road impressed on the congressional committees was that the grade of the road was now established; that all that was necessary was to take off six feet more to make it a two-way road, and that this could be easily done. Those familiar with road construction asserted that $280,000 would not only widen the road, but would provide walls and chains at dangerous places, similar to those in use on the Denver Mountain Parks highways.

Several members of the committees asked about keeping the road open, and Roe Emery explained that fences could be constructed on the pass that would answer the purpose. He called attention to these fences used by railroads and expressed the belief that by this method the snow could be controlled. Several of the members suggested sheds. However, this phase was not considered, members of the committees holding that the contractor for widening the road could solve the snow problem.

WORK STARTED ON HOLY CROSS TRAIL ACROSS LOVELAND PASS

Construction work on the first stretch of the Loveland Pass road from the town of Graymont, just west of Silver Plume to Dillon, will be under way by the time this issue of Colorado Highways reaches its readers. District Engineer John P. Donovan and Richard W. McQueary, Grand Lake contractor, went to Graymont on July 6, and selected a site for the road camp.

Roy Mooney, who has just finished extensive repairs on the Mt. Vernon Canon section of the Denver-Idaho Springs road, will be in charge of the construction outfit. The state highway department will do the work on its own account, having entered into a contract with Mr. McQueary for the use of his teams and men.

Anxious to get the road through as far as Dillon at the earliest possible date, the highway department will construct a twelve-foot road for the present. Only $20,000 was appropriated for the highway in the 1923 budget. If a road of the usual standard width were built, this amount would pay for not more than two miles of road. By building the 12-foot road the department hopes to complete about six miles of the road.

The surveys will be made with the idea in view of locating the road in such a manner that in years to come it will be possible to widen the road at the least expense.

Good Roads Are Worth Their Cost

The highway is not simply a road. It is not simply a surface.

It is the assurance of the civilizing influence of better communication between sections.

It is a silent, but persistent factor for the reduction of living costs.

It is an humble, but powerful foe of ignorance for the reason that it makes easily accessible our splendid system of public schools to the people in rural districts.

It is the safeguard of our food supply. It is a guarantee to the public against the prostrating influence of industrial upheaval and interruption to distribution therefrom.

It is the popular open-air theater of enjoyment of the family.

It is the text book of nature to our people.

It is the connecting link between the home and the factory.

It is the call to open air; the great physician who makes no charge for his services.

The people who are opposed to good roads oppose them for the same reason that some people oppose our great public school system; they are not informed.

A little more than twenty-five years ago there were four automobiles in the United States, one of these in a circus. Today automobile registrations have passed the eleven million, five hundred thousand mark and it is estimated that one million, eight hundred thousand new vehicles will be purchased in the United States during 1923.

The invention and general accepted use of the automobile has forced upon us a "good roads movement" unparalleled in all the history of all the world, and the public is just beginning to realize that the highways are public properties, the building of which is only the beginning, for the problems of maintenance, financing, traffic rules and regulations, policing, control of speed and character of traffic are just as essential to the good service of the highways, as the problems of construction are to the engineers who have been called upon to build them. Education of the public on these problems must necessarily come from highway officials and road builders of the State and Nation.

There are more than two million miles of roads in the United States that are just dirt roads —not even a gravel or sand-clay surface. Some of these are on trans-continental routes, many are on interstate routes, but most are little-traveled country roads. Although the mileage of improved roads is but a fraction of that of dirt ones, the ton-mile and even vehicle-mile traffic is undoubtedly much greater and the improved roads do and should have more public funds spent on them than the dirt roads.

But this does not mean that the dirt roads should be neglected and the taxpayers who must use them receive no consideration. If the improved roads average 500 vehicles per day over each mile and average $3,000 a year for maintenance and depreciation, while dirt roads average 5 vehicles a day, equal consideration would call for $30 per mile per year for maintenance—not much, but $30 more than the greater part of them receive.

Gasoline Tax Totals $282,251.38

The sum of $141,125.69 will be distributed among the counties of the state as their share of the proceeds of the state gasoline tax during the first six months of the current year. Total collections were $282,251.38. This sum is divided equally between the state highway department and the counties, the counties' share being divided on the basis of state highway mileage.

Formerly the distribution was made only once a year, but among the amendments made to the gasoline tax law by the twenty-fourth general assembly was one which makes semi-annual distributions mandatory.

Every county in the state will participate in the division of the money except Denver because the capital city has no state highways within her boundaries.

Gasoline tax collections during the last half of the year will show a large increase. The new law raising the tax from one cent to two cents became effective this month. Collections, in the opinion of James Duce, State Oil Inspector, should at least double. The increase in the tax will have no influence whatever on the cost of collection because all expenses of the oil inspection department are paid out of the one-tenth cent fee charged for oil inspection.

The severe penalties provided in the new gasoline tax law will result in much prompter payment of the tax. Already oil dealers who were behind in their payment have paid some of the over-due taxes and have arranged for the payment of the balance with Mr. Duce.

NEW DENVER-COLORADO SPRINGS ROAD NOW OPEN TO TRAFFIC

A new connecting link for motorists between Denver and Colorado Springs has just been completed by the State Highway Department in co-operation with El Paso county.

The new road extends northeast from Colorado Springs, slightly to the east of the main highway, passing through the most favored spots in the Black Forest of Colorado, and finally runs into the Cherry Creek road at Franktown, where it connects with the Denver road.

It is a 60-foot well-graded roadway for most of its length. The route affords a splendid view of Pike's Peak, "Sentinel of the Rockies", for a distance of about forty miles. It passes through one of the most thickly wooded sections in Colorado.

Construction of the road was financed with state and county funds.

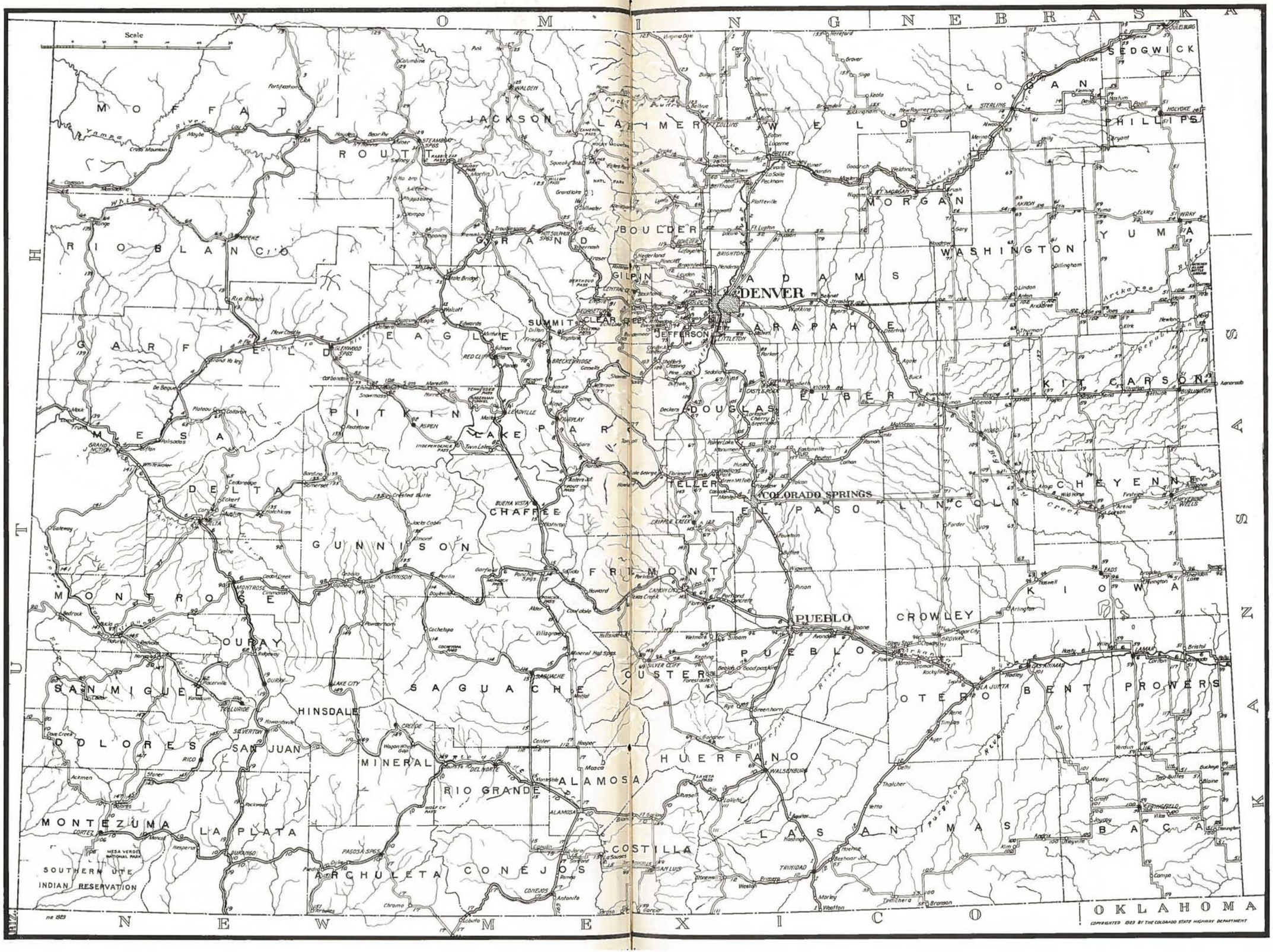
The roadway runs through Parker, Franktown, Irving and Cherry. Reports received by the Highway Department show that traffic over the new highway, since the improvements were made, has increased about 50 per cent, and it is being used by motorists who desire to avoid the heavy traffic on the main Denver-Colorado Springs road.

ALTVATER ASSUMES CHARGE OF DENVER STREET MAINTENANCE

Fritz Altvater, for the past four years superintendent of the highway department's shops in Denver, resigned on July 7, to take the position of state highway commissioner of the City and County of Denver. The appointment was tendered Mr. Altvater by Mayor Stapleton soon after the latter's election. As highway commissioner Mr. Altvater will have complete charge of the city's streets.

Mr. Altvater's resignation from the state highway department is universally regretted. A good executive, he combined with his ability rare tact and judgment as will those who had business at the shops know. He was generally considered one of the most competent employes of the department.

View of new road constructed through the Black Forest northeast of Colorado Springs, forming a new connecting link with Denver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PHILLIPS
RIO BLANCO
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CLEAR CREEK
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DELTA
GUNNISON
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TELLER
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MONTROSE
FREMONT
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KIOWA
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SAN MIGUEL
HINSDALE
DOLORES
SAN JUAN
MINERAL
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RIO GRANDE
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CONEJOS
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"Road Maintenance Work"

A Knotty Problem.

Much has been written and suggested as to the most efficient and economical means of maintaining roads. No doubt every one of these utterances and writings were correct, but if applied as a general principal, would be more or less erroneous considering it from a strictly efficient point of view.

First of all the application of the proper machinery is necessary in maintenance work, as well as the proper type of pumping equipment would be in a water handling problem. That is to say, in Colorado especially, we have different grades of soil and various conditions to encounter, perhaps more so than in any other state. For instance take time to consider the fact that part of Colorado is sandy and the soil loose, and in other sections of this state we have the dobie to contend with, which is very hard when dry and when wet will displace and large grooves can be cut in the road way by a light vehicle, an automobile or a truck. In addition to this we have the mountainous sections where in some places the road is exceedingly hard and there can on account of this, be no fixed rule as to stating just what type of tools can best be adapted to road maintenance work.

A drag works well in some places, a planer in others, a light grader in many places and a regular maintainer, of which there are several on the market, does very well in some localities, yet there are many places where neither of these can be used to advantage and where heavy grading units are necessary, this is an engineering problem to be worked out in the particular locality considering the conditions of the road and the kind of material it is built of, as to the most efficient unit to use for the particular requirements.

If the proper tool is selected, the next important thing is the selection of the proper power, just as though after selecting the proper pump for handling certain conditions, in a pumping plant, the power is the second important consideration. The same is true of the motive power required for the operation of the maintenance tool.

Trucks have been used to a good advantage, but considering the first cost of this type of equipment versus the fact that they must necessarily run in low gear and at a slow speed, the cost of the upkeep of the truck is very high, therefore, it is not practical or economical to operate trucks for this service. Horses, if there is plenty of available stock, can be used to a good advantage, but there are so many ways where teams can be used in a more economical manner, and frequently the distance to traverse in a day's time for maintenance work is so excessive, particularly in the hot weather, that the teams are practically eliminated from consideration.

We now have left the only motive power practical and that is the tractor. Considering the first cost, the cost of operation and upkeep and the fact that the unit is at all times ready to give its maximum service, the tractor is considered to be the unequaled, endorsed motive power for this type of work. There are several sizes and types of tractors and the selection of the size and the type is entirely to be considered and recommended as to the type of maintenance tool used.

In conclusion we can only sum up on a fixed definite policy and that is that maintenance work as a whole is to be classed with other engineering problems, simply a case of application.

WHAT AN EASTERN TOURIST THINKS OF COLORADO ROADS

When a thing goes wrong the whole wide world is pretty apt to hear about it. But it seldom happens that a person will take the time and effort to let another know that his work is well done.

Albert W. Seaman of Brooklyn, N. Y., is an exception to the rule. He is a motorist; not the ordinary kind, we admit. He likes the open road and he sees things as he goes along

Mr. Seaman was chief counsel for the Brooklyn Motor Club for a number of years and has been identified with several national motor associations.

Four times he has crossed the continent in his automobile, each time driving through Colorado. In May of this year he made a trip through Colorado over the Santa Fe Trail. What he has to say about the roads in this and other western states is quite interesting, and for this reason we herewith reproduce a letter received by Highway Engineer Blauvelt from him the latter part of June.

The letter follows:

June 29, 1923.

State Highway Department,

Denver, Colorado.

L. D. Blauvelt.

Dear Sir:

I was impressed with the immense amount of work that has been done in Colorado. I went through Colorado in 1914-19-21 and 1923. We did not confine ourselves to the main trails, but we went where fancy dictated, and it was the exception to find the road bad, in fact, I cannot recall any that could be called really bad on this trip, yet we left La Junta immediately after a heavy storm which was characterized as a cloudburst. In a few places the road was heavy and at times slick, the ruts were not deep, in this respect a very great improvement in two years. Another thing was noticeable, the roads were shaped so that they dried off quickly. If one waits a few hours only, there is no difficulty in going over them except that they are of course heavy at first and then naturally rough until dragged, which I found was done almost as soon as the storm ceased.

We are slow drivers, yet we made from 150 to 180 miles a day and usually stopped with the sun from one-half to an hour high. I have traveled the Santa Fe, the Golden Belt, Ocean-to-Ocean, D. L. D. Overland, Midland, and Arrowhead and the Lincoln Highway, and I think that unless one happens to hit a very severe storm there is nothing to worry about this side of the Utah or Nevada line. If you hit Kansas or Missouri in a heavy rain there is nothing to do but to stop and wait. This would save a lot of work on the roads if it were done wherever there are dirt roads.

The people in the east think they have done much towards good roads. They have. But when one considers how sparsely the country is peopled, it is a marvel the amount of work that has been done in the west.

Yours very truly,

(Signed) A. W. SEAMAN.

COLORADO HIGHWAY OFFICIALS ATTEND MEET IN SALT LAKE CITY

Colorado was represented by five officials of the state highway department at the semi-annual meeting of the Western Association of State Highway Officials held in Salt Lake City on July 10th and 11th.

Those attending the meeting from this state were: Major L. D. Blauvelt, state highway engineer; John A. Donovan, J. A. Clay, William Weiser, members of the highway advisory board, and Edwin Mitchell, auditor of the highway department.

The party left Denver on July 6th, and motored to Salt Lake, via Vernal, Utah. En route the party inspected the state roads in northwestern Colorado, including the highways in Routt and Moffat counties, on which considerable work has been done this season.

Major Blauvelt is secretary of the association. He announced before his departure that six states will be represented at the meeting.

Subjects that will be discussed include Federal and Forest Aid for western states. It is said that some of the western states desire a modification of the government road specifications, in order that greater road mileage may be obtained from the money spent. The highway officials also will discuss the subject of a uniform accounting system.

Officials of the Bureau of Public Roads are expected to attend the meetings.

Upon their return to Colorado the local officials will make an inspection of the roads on the western slope.

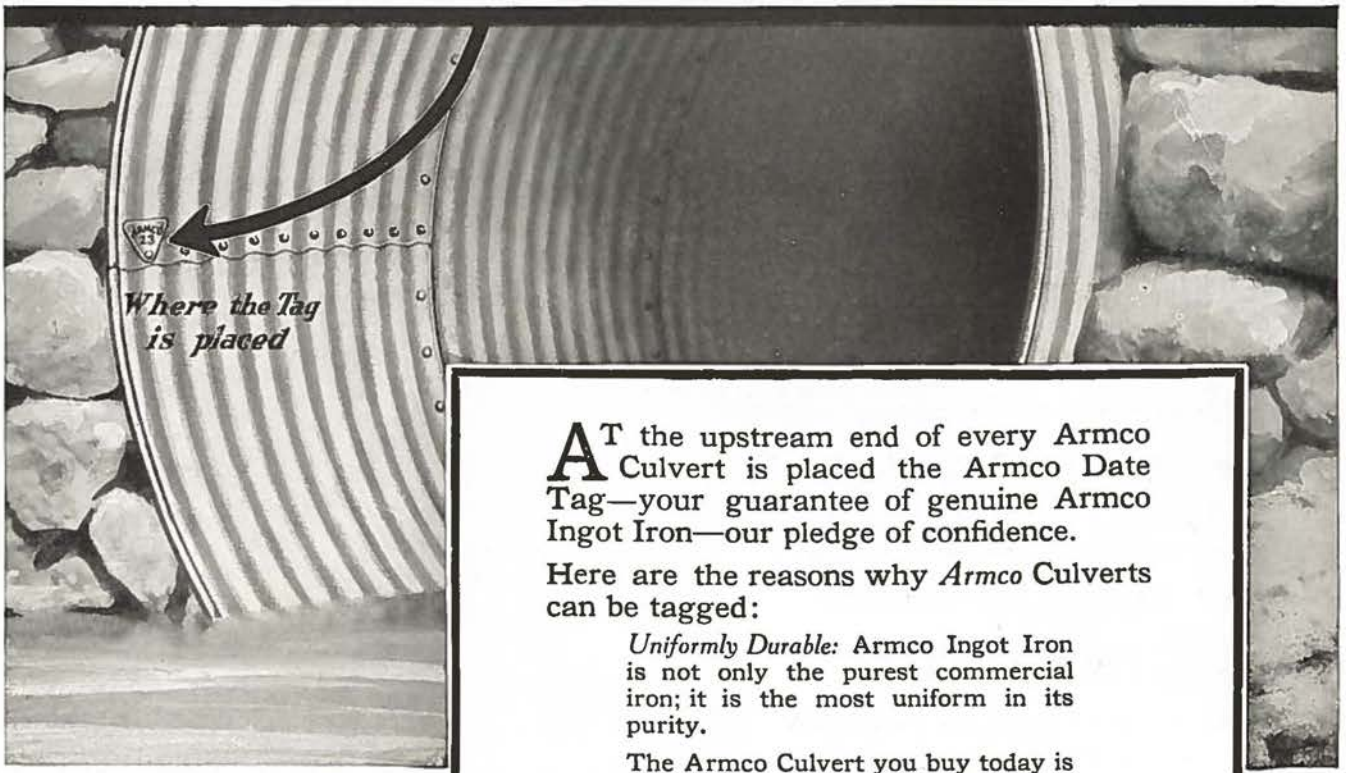
STANLEY HILL ON SOUTH ST. VRAIN BEING REDUCED TO EVEN GRADE

The end of the present construction season will see the elimination of the steep grade on Stanley hill on the South St. Vrain road from Lyons into Estes Park. A large force of men is now engaged in constructing what amounts to a new road up the hill at a grade which will permit every motor vehicle to negotiate the climb from the St. Vrain river without any difficulty. Residents and visitors will appreciate the new road, the stiff climb up the hill being the only drawback on this wonderful highway.

The new road is being built by Boulder county under the direction of the state highway department. Its completion will greatly relieve the other roads leading to Estes Park from the East.

There's nothing will cure a reckless driver like thirty days' observation of the sun through a barred window.

Why ARMCO CULVERTS Can be Dated



AT the upstream end of every Armco Culvert is placed the Armco Date Tag—your guarantee of genuine Armco Ingot Iron—our pledge of confidence.

Here are the reasons why *Armco* Culverts can be tagged:

Uniformly Durable: Armco Ingot Iron is not only the purest commercial iron; it is the most uniform in its purity.

The Armco Culvert you buy today is of exactly the same material used in the thousands of Armco Veterans that have made this culvert the standard for durability and economy.

Tested Everywhere: Installed in every State, in Canada and many foreign countries, Armco Culverts have been tested for longer periods and under more widely varying conditions of service than any other metal culvert.

Insist on the Armco Tag

TRADE MARK
ARMCO
REG. U.S. PAT. OFF.
Ingot Iron

THE R. HARDESTY MFG. CO.

DENVER, COLO.

Woods Cross, Utah, Missoula, Montana
Pocatello, Idaho

ELEVEN WESTERN STATES COLLECT GAS TAX FOR ROAD PURPOSES

Eleven western states now collect a tax on gasoline for road purposes. Six of the states have adopted a two-cent tax, while three have a one-cent tax, one a three-cent tax and the other collects 2½ cents tax on each gallon of gasoline sold in the state.

In a majority of cases this tax, which amounts to $18,230,000 annually in the eleven states, goes into the State Highway funds to be used in the construction and maintenance of roads. In the states of Colorado, California and Nevada, the tax is split evenly between the states and counties.

The gasoline tax is being used in a good many of the western states to solve their difficult problem of road financing, and several of them have passed stringent laws providing for its collection.

Besides its adoption in the western states it is being used by a large number of eastern and middle-western states for obtaining revenue for road building purposes.

Texas recently adopted the 1-cent gas tax and at the same time raised its motor license fees 100 per cent. It is estimated that $10,500,000 additional will be realized by the increased taxes. Oklahoma adopted a one-cent tax and expects to realize $900,000 annually, while Indiana expects to collect $3,000,000 from its 2-cent tax.

The governors of Michigan and Iowa vetoed the 2-cent gasoline tax measures recently passed by the legislatures in these states.

The yearly gasoline revenues in the eleven western states follow:

State:	Rate	Amt. per year
California	2c	$11,000,000
Colorado	2c	1,200,000
Arizona	1c	180,000
Idaho	2c	320,000
Washington	2c	2,000,000
Utah	2½c	610,000
Nevada	2c	120,000
Montana	2c	600,000
Oregon	3c	1,900,000
New Mexico	1c	150,000
Wyoming	1c	150,000
	Total,	$18,230,000

COST OF PAVING COMPILED ON VARIOUS TYPES OF MATERIAL

Average costs per square yard of various types of paving for county roads have been compiled by the Bureau of Public Roads. The figures cover 68,000,000 square yards of paving constructed with federal aid in all parts of the United States during the period 1916-1921. The costs per square yard are as follows: Sandy-clay, 18 cents; gravel, 46 cents; plain and surface-treated macadam, 95 cents; bituminous macadam, $2.10; bituminous concrete, $2.50; plain cement concrete, $2.57; reinforced cement concrete, $2.74; and brick, $4.10.

These figures cover only the cost of the paving; they do not include the cost of grading, and officials point out that it must not be assumed that roads of the several types can be constructed in any locality at these figures. For example, the cost of bituminous concrete varied from $1.70 in the New England states to $3.13 in the group of states including Kentucky, Tennessee, Mississippi, and Alabama. In one group of states the cost of brick dropped to $2.40. Costs of constructing these types in the various groups of states have been compiled and can be obtained from the bureau.

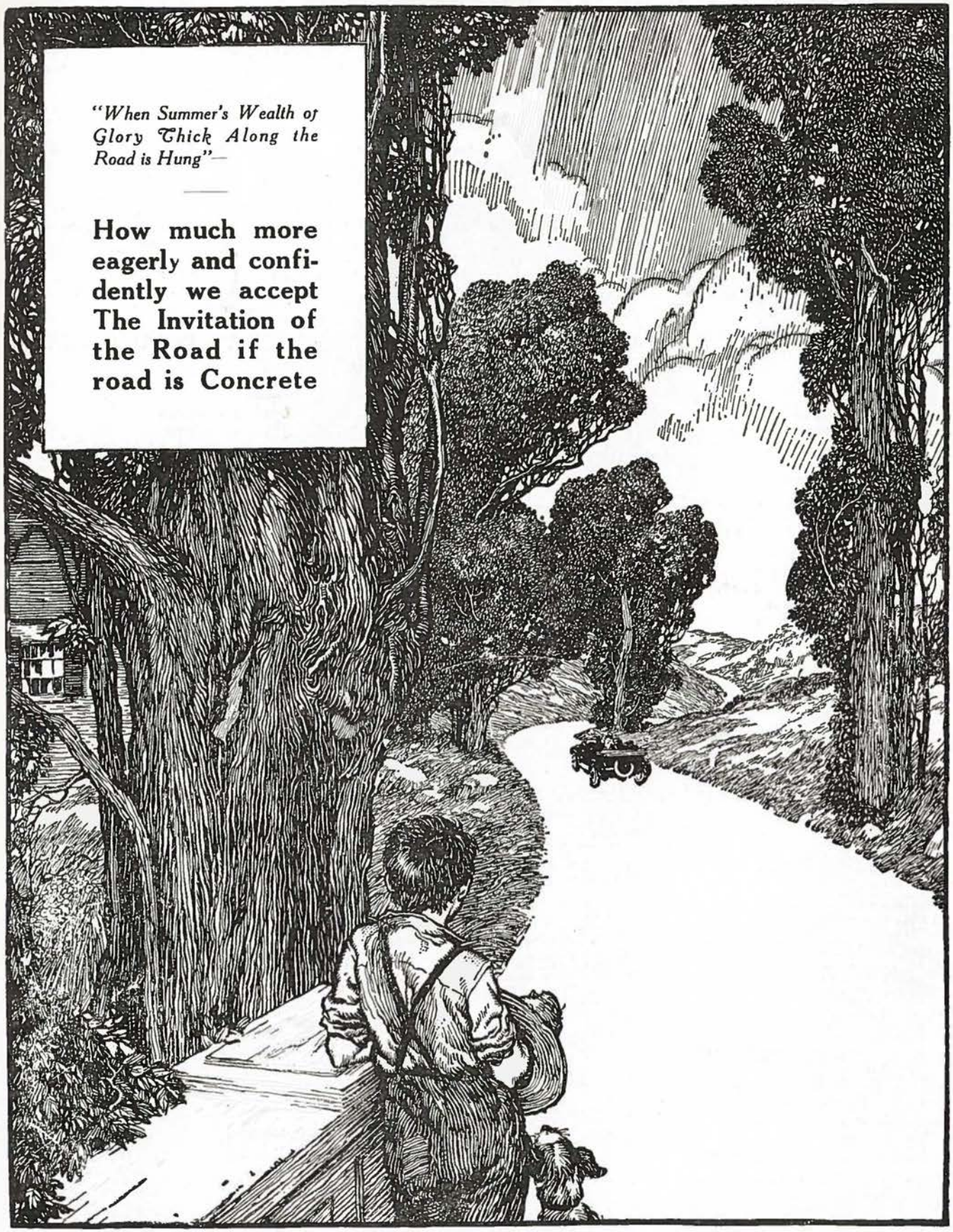
WYOMING MAKES GREAT STRIDES IN CONSTRUCTING ROAD SYSTEM

The state of Wyoming now has a total of 5,867 miles of improved roads, according to a recent survey made by the Bureau of Public Roads. Seven years ago the state had 1,724 miles of its road system improved.

Today there is 39,373 miles of unimproved roads in Wyoming, of which 6,715 miles are graded and drained, 413 miles surfaced with gravel, stone and shale and 27 miles hard surfaced.

Figures collected by the government show that the last seven years have been a period of great road development in the state. From 1914 to 1921 the total road mileage has increased from 14,797 miles to 46,526 miles. This is in strong contrast to the majority of states which have made great progress in road improvement, but without any appreciable change in total mileage.

Federal Aid has played a considerable part in the development in Wyoming, as it has in other states, evidenced by the fact that it has 474 miles of Federal aid roads completed and 421 miles either under construction or approved for construction and nearly $800,000 available for new projects.


"When Summer's Wealth of Glory Thick Along the Road is Hung"—
How much more eagerly and confidently we accept The Invitation of the Road if the road is Concrete

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	County	Length	Type	Bids Opened
F.A.P. 246-A	East of Pueblo	Pueblo	2.537 mi.	Concrete paving	July 9, 1923
S.P. 786	Echo Lake-Mt. Evans	Clear Creek	4.58 mi.	Grading	July 9, 1923

BIDS RECEIVED DURING JUNE

Proj. No.	Location	County	Length	Type	Low Bidder	Bid Price
F.A.P. 207	North of Dillon	Summit	100 ft. span	Low truss bridge	Rogers & Pickard	$20,491.50
F.A.P. 120	Over Clear Creek near Arvada	Jefferson	150 ft. span	Steel truss bridge	Colo. Br. & Const. Co.	30,054.70
F.A.P. 135	Denver-Morrison	Jefferson	5.065 mi.	Concrete paving	Colo. Br. & Const. Co.	161,962.10
F.A.P. 208-C	Clifton-Palisades	Mesa	4.748 mi.	Gravel surfacing	Dale Hinman	39,018,50
S.P. 714	Rifle, North	Garfield	2,144 mi.	Gravel surfacing	Northwestern Const. Co.	11,586.80
F.A.P. 214	Durango	La Plata	2.082 mi.	Gravel surfacing	Dale Hinman	48,555.50
F.A.P. 226-B	Platteville	Weld	2.868 mi.	Concrete Paving	White & Johnson	81,748.90
F.A.P. 229	Pueblo-Florence	Fremont	0.587 mi.	Gravel surfacing	H. M. Fox	34,646.50
F.A.P. 255-A	Ft. Morgan-Brush	Morgan	2.702 mi.	Concrete paving	Colo. Br. & Const. Co.	77,967.05

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Location	County	Length	Type
71-C	Durango-Hesperus	La Plata	2.911 mi.	Gravel surfacing
226-C	(Div. 1) North of Platteville	Weld	4.404 mi.	Concrete paving
241	Delta-Grand Junction	Delta	0.377 mi.	Gravel surfacing & bridge
245-A	Las Animas	Bent	4.545 mi.	Gravel surfacing
247-A	East of Rocky Ford	Otero	1.329 mi.	Concrete paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	County	Length	Type
F.A.P. 2	(Reop.) Trinidad, North	Huerfano	3.5 mi.	Concrete paving
F.A.P. 116-B	Breed, North and South	El Paso	0.91 mi.	Concrete paving
F.A.P. 116-C	North of Breed	El Paso	3.22 mi.	Concrete paving
F.A.P. 159-A	Ramah-Matheson	Elbert	6.288 mi.	Sand-clay surfacing
F.A.P. 222-C	Denver-Lafayette	Boulder	1.5 mi.	Concrete bridge & R. R. grade separation
F.A.P. 224	Morrison-Baileys	Park	5.621 mi.	Mountain grading
F.A.P. 230-A	Wolhurst-toward Sedalia	Douglas	0.852 mi.	Paving
F.A.P. 230-B	Wolhurst-Gann	Douglas	5. mi.	Paving
F.A.P. 246	East of Pueblo	Pueblo	2.537 mi.	Paving
FA.P. 252	Loveland, South	Larimer	3.5 mi.	Concrete paving
S.P. 749	West of Canon City	Fremont	3. mi.	Grading
S.P. 75	Lake George-Florissant	Teller	5. mi.	Grading

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
7-C	Norwood-Naturita	10.6 mi.	Mtn. grading	Girardet-Hotchkiss Eng. Co.	$ 68,684	72	7-C
29	Morrison-Turkey Creek	1.9 mi.	Mtn. grading	Wm. Flick	70,839	98	29
30	Morrison paving	.94 mi.	Conc. Paving	Peterson, Shirley & Gunther	41,677	98	30
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	61,556	0	71-B
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	30	102
116-A	Colorado Springs paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238,944	36	116-A
119-B	Chochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	21	119-B
129	Federal Boulevard	4.42 mi.	Paving	Peterson, Shirley & Gunther	164,331	98	129
133	Federal Boulevard	4.22 mi.	Paving	W. J. Cameron & Co.	146,399	98	133
139	Ft. Collins-Loveland	4.02 mi.	Conc. Paving	Mutual Constr. Co.	139,263	98	139
163	St. Charles Bridge	0.5 mi.	Steel bridge	Rogers & Pickard	85,636	83	163
165	Canon City, east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	73	165
166	La Junta-Swink	2.01 mi.	Conc. Paving	Carl C. Madsen	66,949	84	166
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	14	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	57	174
189	Hayden, east	5.41 mi.	Grav. Surf.	H. C. Lallier Constr. & Engr. Co.	41,941	98	189
190	Summit County bridge and road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	28	190
208-A	Grand Junction-Palisades	3.14 mi.	Grav. Surf.	F. L. Hoffman	33,644		208-A
210-A	Grand Valley-DeBeque	5.30 mi.	Grav. Surf	F. L. Hoffman	57,429	36	210-A
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	18	213-B
215	Pagosa Springs bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	60	215
216-A	Holly, east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	84	216-A
217	Pueblo, east	2.94 mi.	Paving	Ed. Lindsay	72,164	79	217
218-A	Hasty-Lamar	8.34 mi.	Grav. Surf.	Monaghan & Cunningham	52,247	95	218-A
218-B	Hasty-Lamar	3.49 mi.	Grav. Surf.	M. J. Kinney	40,009	54	218-B
221	Loveland, north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	57	221
222-B	Broomfield cut-off	1.52 mi.	Conc. Paving	Miller, Douglas & Hanes	68,302	58	222-B
225	Fitzsimons Hospital road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	23	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	53	226-A
226-C	Platteville-La Salle	10.73 mi.	Grading	C. R. Conover & Bro.	36,296	88	226-C
228	Atwood-Sterling	4.41 mi.	Conc. Paving	La Nier, Selander & White	148,484	61	228
231	Six Mile Creek bridge	0.45 mi.	Steel Bridge	McCormick & Brockway	25,165	29	231
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	17	81-A
211	Meeker, north	1.85 mi.	Grav. Surf.	Hinman Bros.	34,445	0	211
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	0	223-A
142-R	Sterling, south	0.40 mi.	Conc. Paving	White & Johnson	15,000	100	142-R

U. S. Bureau Makes Scientific Study of Traffic Problems to Reduce Road Costs

What the United States government is doing thru the Bureau of Public Roads to solve the many new problems caused by the increased use of highways by rapidly moving vehicles was explained by Henry C. Wallace, Secretary of Agriculture, before the American Automobile Association at New York City on May 22.

He declared that the development and use of automobiles had changed many notions about road building, and that the government had been compelled to adopt scientific methods in the administration of the Federal Road Act. The vast sums of money being spent by the government and the states make it necessary, he said, that officials attack the road problem vigorously in order to avoid enormous waste.

"Successful and economical road building more and more is becoming dependent upon careful scientific research," said Secretary Wallace.

"Roads must be adapted to the density and character of the traffic. In rural sections where the roads are used mainly for moving farm products to market and for tourist travel, the building of a road that will stand up is a very different matter than in regions where there is a heavy traffic of freight-carrying trucks. Conditions of soil and climate, of rainfall, drainage, temperature, all must be studied. The sort of road-making material available and its suitability to the character of the road needed must be ascertained. How best to use this material is a matter of scientific determination. The funds available for road improvement without imposing unduly heavy tax burdens must be considered. Surfacing material must be determined with relation to the traffic.

"The Department of Agriculture is making careful study of all such matters, as well as a number of others concerning which information is needed if we would build our roads wisely. We are conducting inquiries into the traffic carrying capacity of the sand-clay and top soil roads in the Southern States. Field parties are studying gravel roads in the Northern States and trying to ascertain why in some sections gravel waves form more rapidly than in others and what can be done to prevent them. We are developing and standardizing tests for sub-grade materials and their treatment. We are inquiring into methods of drainage and developing most interesting information. Our engineers are investigating the matter of paving designs and are conducting careful impact tests to secure information on the load-carrying capacity of road slabs in different designs and the behavior of surfacing materials under varying conditions of traffic.

"The character and density of road traffic has been changing so rapidly that no one can speak with full authority as to the best methods and type of road construction. The whole question is one for persistent and continued scientific study, and it is the expectation of the department to exend this study just as rapidly as its funds permit and the results seem to justify."

NEVADA LAUNCHES TWO-YEAR ROAD PROGRAM TO COST $6,500.000.

A two-year road building program has been launched by the Nevada highway department, which will cost approximately six and three quarter million dollars.

This two-year program will involve the improvement of about 575 miles of highway, and together with the 400 miles constructed up to 1923 will give a completed mileage at the end of 1924 of approximately 975 miles.

Fourteen contracts were carried over from last year by the Nevada department. Work was resumed upon these the middle of June, a majority of them being located in the northern part of the state, where weather conditions would not permit work being started at an earlier date.

Secretary of Agriculture Wallace recently approved two road projects in the national forests in Nevada. The cost is estimated at $58,657. To date a total of $251,000 has been appropriated for the two roads on the Austin East Highway and the Currant Creek project. The Austin road work is a section in one of the main east and west highways thru the state; while the Currant Creek project forms a link in the National Trail and is important as a connecting road between different parts of the Nevada National Forest.

TRAFFIC CENTER LINES ON ROADS INCREASE SAFETY OF MOTORISTS

BY FRANK T. SHEETS.

The use of traffic center lines on highways is becoming more and more popular in the United States. In the case of a road having a paved width sufficient to accommodate two lines of traffic, the safety of the highway users may be increased from twenty-five to fifty per cent by the addition of a traffic center line. This conclusion has been reached after observations of traffic on two track roads where a center line has been introduced. Further it is based upon unsolicited testimony from the traveling public immediately after such a line was introduced.

In the United States, practically all motor vehicles have what is popularly termed a left hand drive, and at the same time vehicles keep to the right hand side of the road. When a traffic center line is used, the drivers no longer pass each other with a more or less uncertain clearance between the vehicles, but approach each other with confidence, using the center line as a positive visible gauge on the driver's side, and knowing that the clearance thus afforded will insure absolute safety in passing without any danger of running off the unseen outside edge of the pavement.

On curves, the traffic center line is of even greater advantage than on tangents, and even if not used on the latter it should be painted on all curves having a radius less than one thousand feet. This center line should extend not less than four hundred feet beyond the ends of the curve.

In the case of the so-called rigid types of pavement, such as cement, concrete, brick, bituminous concrete or sheet asphalt on a concrete base, which are the predominating types in this country, the traffic center line will materially increase the life of the pavement by tending to keep traffic from the extreme edges of the pavement, where the outside edges and unprotected corners at joints or transverse cracks are the most vulnerable places in the pavement structure.

GOVERNMENT URGED TO CONSTRUCT AND MAINTAIN ROADS THROUGH PUBLIC LANDS

At the annual meeting of the American Automobile Association held in New York City on May 22nd, Mr. C. C. Cottrell of the Good Roads Bureau of the California State Automobile Association proposed a resolution setting forth the obligations of the Federal Government to both build and maintain highways across unappropriated public lands and reserves. The resolution, which was adopted by unanimous vote, was as follows:

"RESOLVED, It is the opinion of the American Automobile Association, assembled in annual convention in New York City on May 22, 1923, that the obligation of both building and maintaining highways across unappropriated public lands and Federal Reserves should be a function of the Federal Government rather than of the States in which such lands or reserves are situated."

The state of Colorado would benefit immensely by the carrying-out of the spirit of this resolution by the government because more than one-fourth of the area of the state is government land.

THE CENTER POLE OF POWER

With machinery constructed for carryin' heavy loads, it springs the proposition of securin' better roads. Where once we followed byways as we driv' the frisky shote, or poked along the highway that would stall a mountain goat—we now encounter road-hogs in their mighty souper-eight, or run acrost the flivver with its precious human freight.

In these strenuous days of "git-there" we have got to have the track, when half the people's going out, and half's a-comin' back—when Granny and the children gets the taste fer higher speed, I reckon that a better road's the everlastin' need. So the Legislatur socks a bigger license on yer boat—while the tight-wad uses language that I wouldn't keer to quote.

Then resurrect your shovel an' yer scraper and yer hoe, and don't be pessimistic when you're partin' with your dough. Remember, we are living through a mighty restless hour, when rapid transportation is the center pole of power! There's no excuse for terrapins, or lazy-minded toads, when Progress blows her whistle, in the call for better roads.—N. C. Highway Bulletin.

What has become of the old-fashioned man who made his daughter dismiss callers at 10 o'clock? His son is now wondering if HIS daughter will be in from the automobile ride by two in the morning.

SPECIAL BODY STARTS SURVEY OF CALIFORNIA HIGHWAY NEEDS

A committee of nine prominent citizens has been appointed by the governor of California to study the highway needs of that state, following the passage of a bill by the last legislature providing for a survey of the highway system.

This committee is authorized to study the highway needs and road financing problems of the state. The members of the committee, who serve without pay, also are authorized to propose a complete system of state roads, study types of construction and materials to be used, to recommend the inclusion of additional mileage, the exclusion of certain legislative roads now included in the system, and the time to be occupied in the completion of the system.

The committee is required to submit to the legislature two years hence some plan for financing the enterprise. State Highway Engineer R. M. Morton estimates that it will require $200,000,000 to complete the 6,500 miles of highway now included in the system.

Napoleon had his Waterloo; Cornwallis his Yorktown; the Kaiser his Hindenberg line; and the motorist who consistently tries to beat trains to crossings will also lose, sooner or later.

How surplus war materials may be used in the construction of fire fighting apparatus is found in the new chemical "wagon" added to the equipment of the Littleton volunteer fire department.

The tanks, which are of 45-gallon capacity and the truck were secured through the state highway department. Under the direction of Chief Will Scott the two tanks were attached to the truck. In trials the truck developed a speed of 35 miles per hour and the chemical tanks proved of sufficient capacity to handle small fires.

This is the second piece of apparatus the Littleton volunteers have constructed from surplus war materials.

EQUIPMENT NOTES

One of the most interesting exhibits of road machinery and earth moving equipment staged in the west was staged by Colorado dealers in connection with the Pageant of Progress held in Denver on July 2-15.

Most of the equipment exhibited was adapted to Fordson tractors, using the latter as motive power. These units included road maintainers, trailers, etc. The largest of the exhibits were those of H. P. Wilson & Co. and H. W. Moore & Co. with a dozen or more pieces of equipment shown.

The Wilson exhibit included the Wehr grader with a Fordson tractor attachment, a Wonder mixer, equipped with rubber tires and wire wheels, a complete set of Heil truck bodies, including oil tanks, gravel body with underneath hand hoist and rocker type dump body.

A miniature crushing and screening plant also was exhibited, as was a miniature truck equipped with a Heil hydraulic hoist dump body.

Harry Corson, sales manager, was in charge of the Wilson display.

Unusual use was made of a Best tractor in the placement of the Moore exhibit. It was found that a rock crusher weighing about 5,000 pounds was unloaded about 100 yards from the grounds. The problem of moving the crusher was solved by placing it on skids and attaching it to the tractor, which weighed less than the load, and pulling it into place.

Besides the Best tractor and rock crusher the Moore exhibit, which was supervised by G. B. Van Wagenen, treasurer of the concern, included the entire line of Trailmobiles, all attached to either Ford trucks or tractors.

Evidence of the keen interest being taken by the general public in all matters relating to road building was found in the large number of persons who visited the exhibits of the two concerns.

A new catalog of the 1923 Koehring line has just come off the press. This catalog includes complete specifications on the world's largest paver, built exclusively by the Koehring Manufacturing Co. It is known as the "32-E" and has a capacity of 32 cubic feet of mixed concrete per batch. At least a dozen of these large machines are now in use on eastern highways.

L. R. Shallenberger, general manager of the Colorado Culvert & Flume Co., Pueblo, was one of the out-of-town visitors to the Pageant of Progress held in Denver, July 2 to 15. Interest of Mr. Shallenberger in the Pageant centered on the road machinery exhibits. For a number of years he has made a close study of road construction and he displayed keen interest in the score or more of labor-saving devices displayed in the industrial section.

The Colorado Culvert & Flume Co. are distributors for Keystone culverts, which are being used extensively in the intermountain territory on state and country roads. These culverts are manufactured from copper-steel, the latter content to give them strength and the copper to prevent corrosion.

A new one-yard capacity shovel, operated either by gas or electricity, has been placed on the market by the Pawling & Harnischfeger Company of Milwaukee. Designed similar to the P. & H. ½ and ¾ yard machines, now widely in use, the new shovel is operated by one man, no fireman being required.

The practical elimination of fuel and water hauling expense is one of the features of the gasoline or electric drive machine. The one yard machine also has the crowding motion, a standard P. & H. design, enabling the operator to bite into the heaviest digging, regardless of the position of the dipper. It is also mounted on the well-known P. & H. Corduroy Tractor.

These machines are coming into common use in road work for dirt loading, contractors finding them more economical in loading operations. In some states the highway departments and counties have supplemented the equipment which they have received from the war department with machines of this type.

The new one-yard machine of the P. & H. company can also be used, by a simple change of booms, with a dragline, clamshell, piledriver, crane hook, etc.

Those who are opposed to good roads might adopt the Chinese method of engineering. If the roads are in bad shape, improve the vehicle to stand the knock In other words, put the cart before the horse.—Exchange.

H. W. Moore and company have recently taken on the distribution in the intermountain state of a line which will be of great interest to the ever-increasing number of people who are using the Fordson tractor as a power unit. This line, which is manufactured by the Trailmobile Co., of Cincinnati, is a two-wheeled trailer so designed as to do away with the difficulties heretofore encountered in employing the Fordson as a highway transportation unit.

The tongue of the trailer rests on a steel bridge placed over the rear axle of the tractor in such a way that the weight of the load is taken off the housing and distributed directly to the tractor drive wheel bearings. Thirty percent of the load is said to be carried by the trailer, which is rated at five-ton capacity. There is said to be no strain on the tractor mechanism. All types of bodies, including power dump units, are supplied, and a hauling unit of five tons capacity with a speed of seven to ten miles an hour is thus supplied at a very low first cost.

If you want to know more about modern road building there's a booklet just published by the J. D. Adams Company, represented by Thomas J. Fair, in Denver, which contains something of interest. Besides giving some valuable tips on building highways with Adams adjustable leaning wheel graders, the booklet contains the 1923 catalog of the full Adams line of road building equipment.

The Stearns-Rogers Mfg. Company announce that they are now exclusive agents for the Novo Engine Company in the Colorado district. They have received a large stock of engines and other equipment. A number of sales are reported to local contractors. The Stearns-Roger concern also are now sales agents in Colorado for the Northwest dragline excavator.

Two of the Northwest machines were recently put in operation on irrigation projects in the Arkansas valley. One was purchased by the Sayler Construction Company of Lamar and is working on the Holly Drainage ditch and the other was bought by the Numa Drainage District at Ordway.

Importance of the tourist traffic to Colorado has attracted the attention of the R. Hardesty Mfg. Co., who recently placed upon the market a patented tent stove pipe ring and ventilator. It does away with mutilating the tent and can be installed in one minute.

Speaking of good luck charms, Tom Burnite takes all prizes. Some people run to horse shoes, tiny Buddahs and rabbit's feet, but not Tom. He carries around a human skull in a brief case to bring him good fortune on his business deals.

Recently he caused a near-riot in Albuquerque, N. M., by producing "Old King Tut", as he fondly calls his good luck piece, while on a deal with city officials.

Yes, he sold the Elgin motor-driven street sweeper. It was the first piece of equipment he had ever sold in New Mexico. He is sure that "King Tut" turned the deal.

G. L. L. Gann, member of the State Highway Advisory board and Mrs. Gann were painfully but not seriously injured a few weeks ago when the automobile in which they were riding overturned just inside the north city-limits of Pueblo.

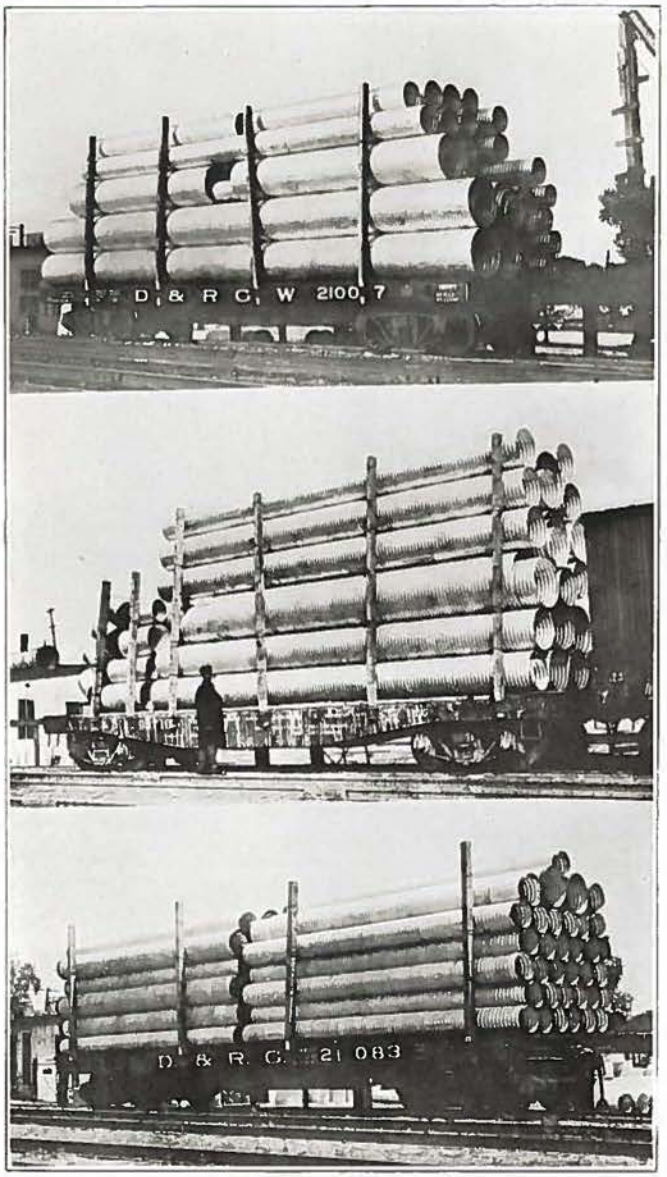
THE ROAD OF GRATITUDE

The address made by Robert Louis Stevenson to the Samoan Chiefs on the opening of the Road of Gratitude:

"I wish every Chief in these islands would turn to and work, and build roads, and sow fields, and plant food trees, and educate his children, improve his talents —not for love of Tusitala, but for love of his brothers, and his children, and the whole body of generations yet unborn. Chiefs! On this road that you have made many feet shall follow. . . . Our road is not built to last a thousand years, yet in a sense it is. When a road is once built, it is a strange thing how it collects traffic; how, every year as it goes on, more and more people are found to walk thereon, and others are raised up to repair and perpetuate it and keep it alive; so that perhaps even this road of ours may, from reparation to reparation, continue to exist and be useful hundreds and hundreds of years after we are mingled in the dust. And it is my hope that our far-away descendants may remember and bless those who labored for them today." —Highway Bulletin.

One careless motorist and one thoughtlessly flung match can, in a few minutes, ruin acres of forest that it has taken nature years to build up.

A FEW MORE—



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Steel for Strength
to Resist Crushing

Coating 2 oz. Zinc

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to Resist Corrossion

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Perfect Culvert

The Colorado Culvert and Flume Co.
PUEBLO

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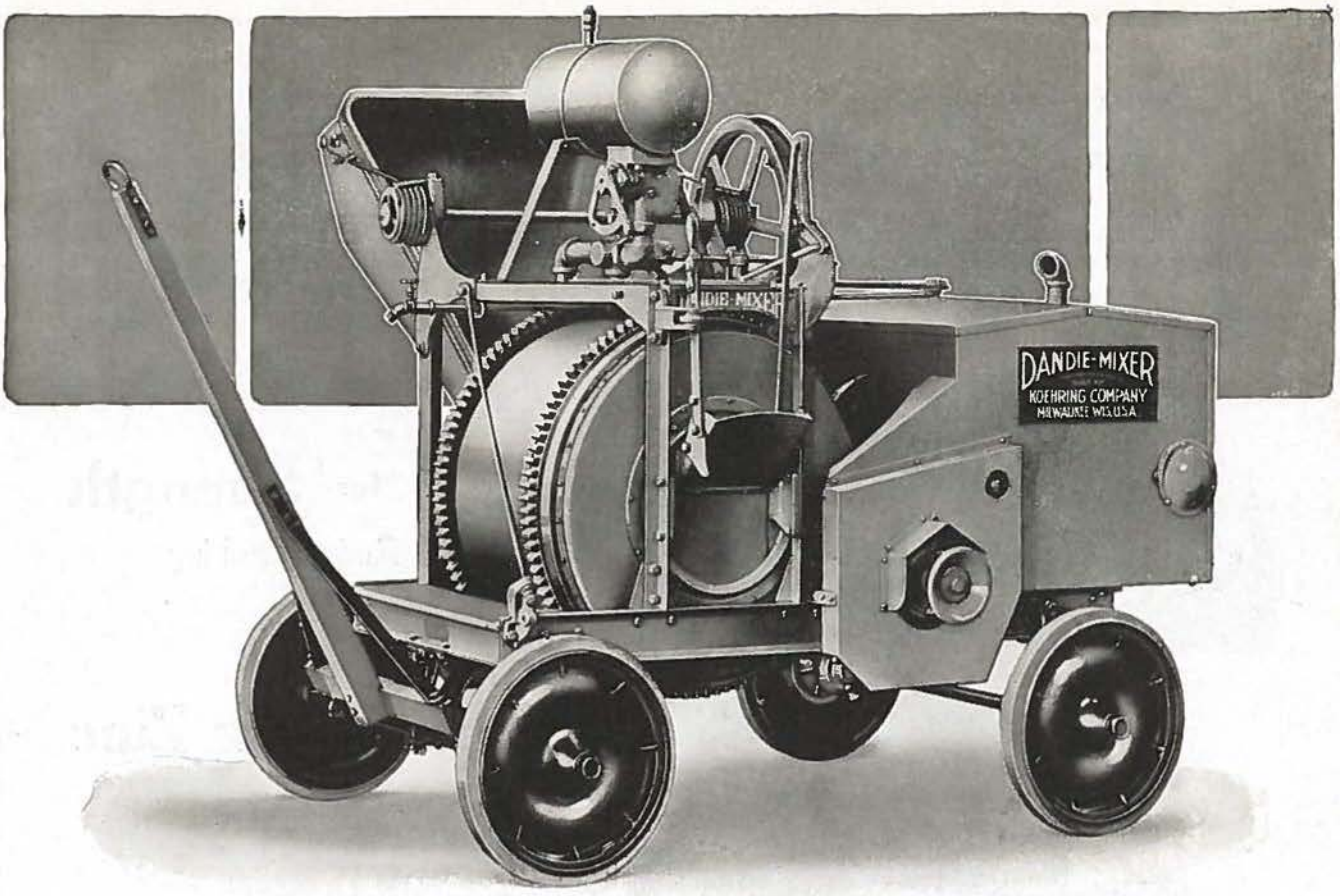

Here's your easiest profit

SAVE time moving from job to job, and use the time for putting concrete in the forms. That's turning overhead into profits.

Hitch the rubber tired Dandie behind your truck and speed from job to job. That means more jobs done per season, and a bigger working field. Where could you find an easier, surer profit?

Neither can you find a surer profit than by investing in the light mixer of utmost reliability —of greatest minute by minute capacity and longest service life.

The Koehring Dandie light mixer is the remarkable value in the light mixer field — built light, but with best Koehring construction — yet selling within the price range for light mixers.

Learn to judge mixer construction—send today for Koehring Dandie Catalog No.

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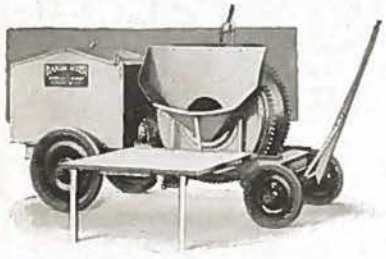
4 and 7 cubic feet mixed concrete. Steam and Gasoline. Power charging skip or low charging platform — automatic water-measuring tank. Discharge control from both sides. May be equipped with light duty hoist. Mixes mortar as well as uniform concrete.



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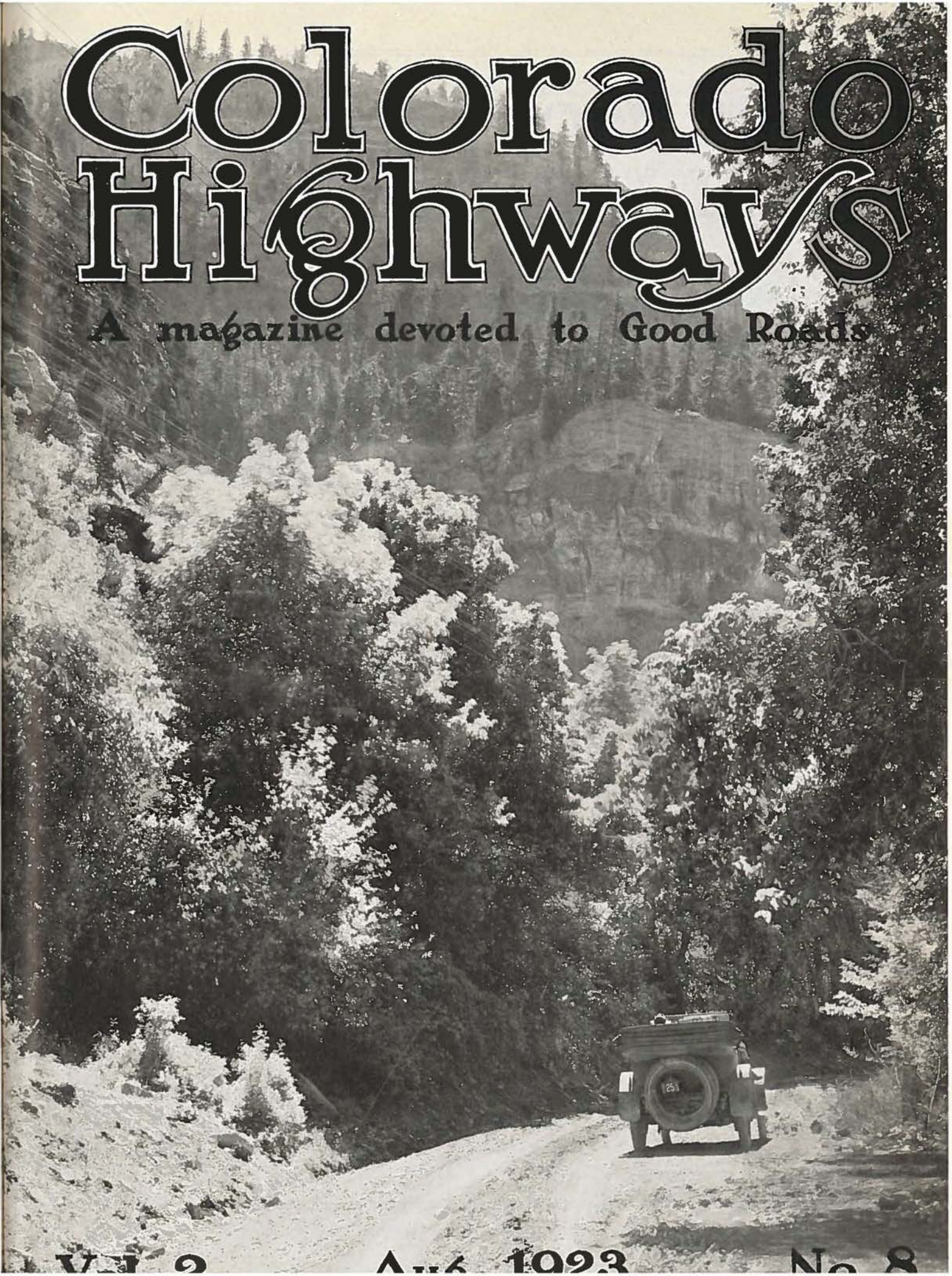
Colorado Highways

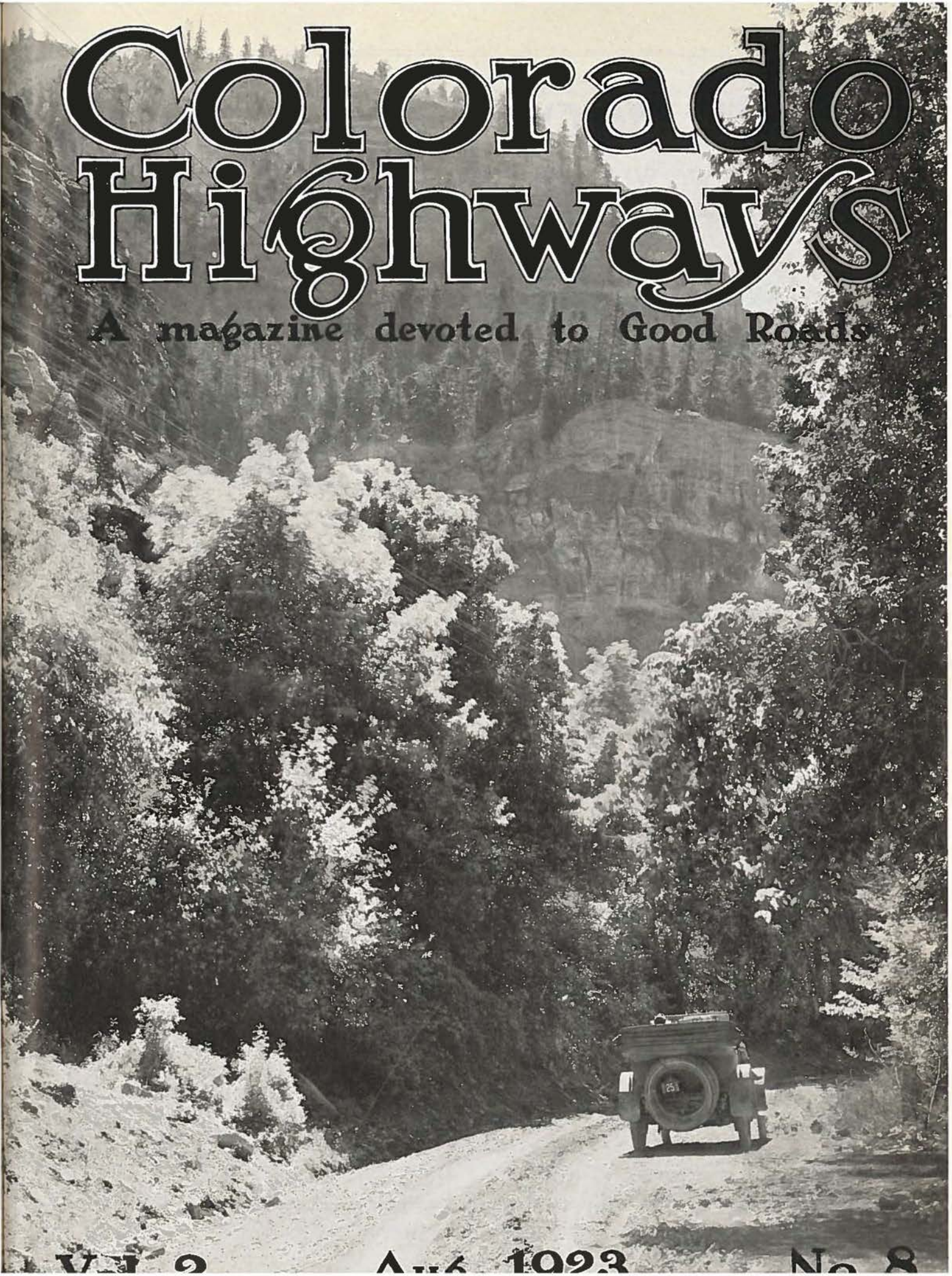
A magazine devoted to Good Roads



Vol. 2 Aug. 1923 No. 8

Colorado Highways

A magazine devoted to Good Roads

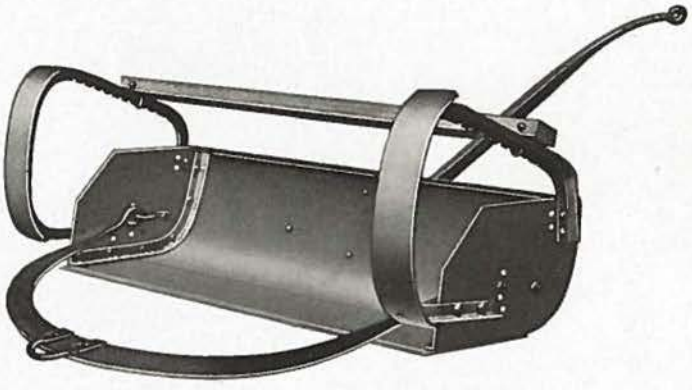


Vol. 2 Aug. 1923 No. 8

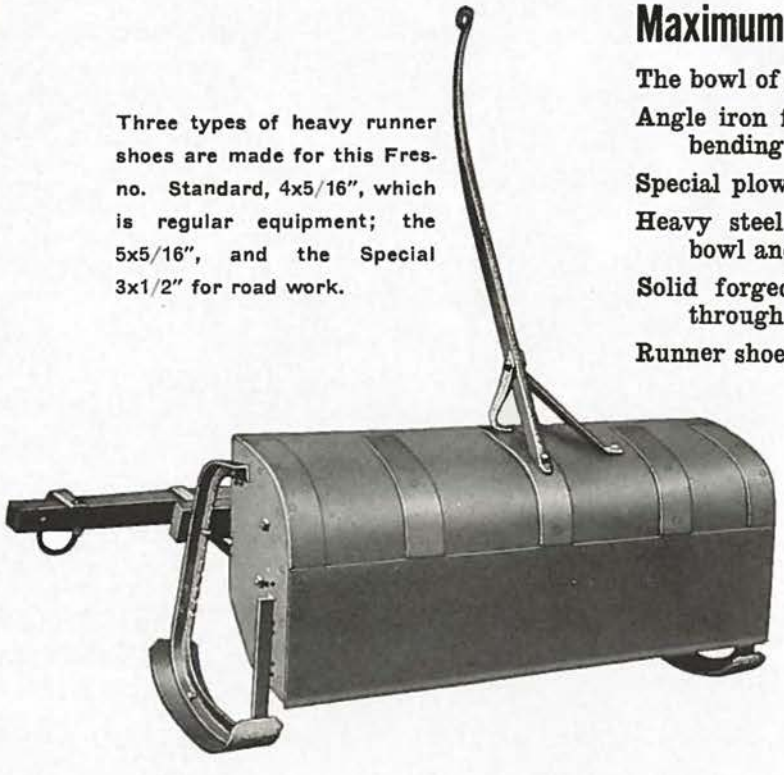
H. W. MOORE Special Fresno

DESIGNED BY WESTERN FOLK TO MEET WESTERN NEEDS

In road building or maintenance; in railroad grading, fill-ins, or land leveling, the "Moore Special" gives equally satisfactory service. It is built especially to meet Western conditions. Can be adjusted to dump the load in one spot or spread it in layers of varying thickness.



3-ft. and 3½-ft. Fresnos equipped with Steel pulling Bail in place of drawbars and evener at no extra cost.



Three types of heavy runner shoes are made for this Fresno. Standard, 4x5/16", which is regular equipment; the 5x5/16", and the Special 3x1/2" for road work.

Maximum Service Under All Conditions

The bowl of extra heavy plate steel—

Angle iron flange stiffener to prevent twisting and bending under heavy load—

Special plow steel blades of extra thickness—

Heavy steel wearplates covering entire height of bowl and reinforcing bowl ends—

Solid forged steel Johnson bar attached to bowl through the center wearplate—and

Runner shoes that are **INTERCHANGEABLE**

All combine to insure LONG LIFE and HARD SERVICE.

That's why we are proud to stand back of the "MOORE SPECIAL."

Denver, Colorado

H.W. MOORE & Co.

CONSTRUCTION MACHINERY

Salt Lake, Utah

Colorado Highways

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

"On the road to Ouray". And, some road it might be said, traversing one of the most wonderful scenic areas in the entire west. Our cover picture this month shows a bit of mountain grandeur just north of Ouray, the northern terminous of the world-famous Durango-Silverton-Ouray Million Dollar Highway. This remarkable stretch of mountain roadway, reaching an elevation of over 11,000 feet, was recently opened to motor travel.

Colorado Highways
"BETTER ROADS"
VOLUME II. AUGUST, 1923. NUMBER 8.

Fifty-three Projects Contracted

FIFTY-THREE road projects involving an expenditure of $3,633,217.30 and on which the federal government shares half of the cost, are now under construction in Colorado.

Fifteen of the projects are concrete paving, six are concrete and steel bridges and the balance include rock and gravel surfacing and mountain grading. Reports from field engineers show that the projects average about fifty per cent complete.

Five projects were completed by the highway department during the month of July. These included two miles of mountain grading on the Turkey Creek road above Morrison; one mile of paving east of Morrison; two miles of concrete paving between La Junta and Swink; eight and one-half miles of gravel surfacing between Hasty and Lamar, and eleven miles of grading between Platteville and La Salle.

The contractors on these projects were: William Flick, Peterson, Shirley & Gunther, Carl C. Madsen, Monaghan & Cunningham and C. R. Conover & Bro.

A contract has been let by the Highway Department to the Engineers Construction Corp., of Greeley for the construction of 4.404 miles of concrete paving between Platteville and La Salle. When this paving is completed there will remain only six miles of roadway to be paved between Denver and Greeley, giving a ribbon of concrete fifty miles long.

The bid price for the Platteville-La Salle paving was $120,113.32. Two thousand lineal feet of this highway will be constructed in a manner similar to the standard section in use by the State of Illinois Highway Department. The paved section of the road is eighteen feet in width with a thickness of seven inches at the center line. This thickness is reduced to six and one-third inches at a point six feet from the center line on each side and from this point to the edge of the pavement, a distance of three feet on each side, this thickness is gradually increased from six and one-third inches to nine inches at the edge.

Plans also provide for the use of a center line longitudinal joint to be constructed of a bituminous filler or metal joint. This joint will be doweled with 4 ft. C ½ inch bars spaced five feet on centers and extending across center of joint. The spacing of the transverse joints has been increased to sixty feet and a filler one-half inch in thickness will be used.

It will be the first piece of paving of this type constructed in Colorado. This type of paving was adopted by the Illinois Highway Department following extensive experiments conducted at the Bates station.

The first mile of asphalt paving contracted by the Colorado Highway Department is now being laid east of Aurora on the U. P. Highway, adjacent to the Fitzsimons Hospital. The asphalt top is two inches in thickness and is being laid on a six inch concrete base.

Mixing of the asphalt top is by a patented process held by the National Paving Corp. Miller, Douglas & Haines hold the contract for the work. Their bid was $36,618. Connecting with two miles of concrete paving east of the city limits of Denver and through the town of Aurora, the new paving forms a link on one of the heaviest traveled roads radiating from the capital city of the state, and will afford a splendid test of bituminous paving for state highways in Colorado.

Another important paving contract let by the Highway Department during July was for five miles of concrete pavement in Jefferson county, forming the connecting link between the city limits of Denver and the town of Morrison.

This contract was awarded to the Colorado Bridge and Construction Co. on their bid of $161,962.10. Work on the contract has been started and it is expected that about half of the paving will be laid by the time winter sets in. A splendid detour has been provided for traffic over the Ft. Logan-Morrison road, this road having been graveled recently to facilitate the heavy travel from the Denver Mountain Parks.

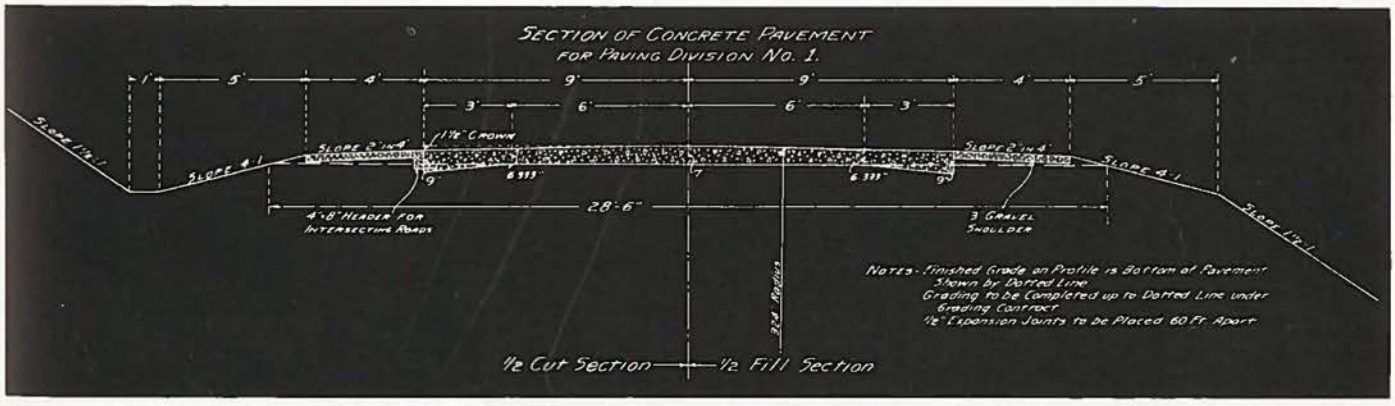
The Colorado Bridge and Const. Co. also have started work on three miles of paving between Fort Morgan and Brush, which, when completed, will connect these two points with a concrete road, with the exception of a short stretch.

Reports from field engineers indicate that White & Johnson, contractors, on eight miles of paving through the town of Fort Lupton on the Denver-Greeley highway, are making splendid progress on their contract. At present they are laying about 25 stones per day, and at the rate work is now going, the contractors should have the work completed within sixty days.

On September 1, the Colo. Bridge & Const. Co. expect to have completed the 1,100-ft. concrete Marsh type bridge over the Platte river at Fort Morgan. This is one of the longest concrete bridges in the west and the first of this type constructed in this state.

Dale Hinman, contractor, has moved his two dirt moving outfits into Mesa and

(Continued on page 19)



Showing cross section of new type of concrete paving to be laid on Colorado highways. This type of paving is designed to withstand the heavy loads of modern truck traffic.

Fort Morgan Bridge Opened

BY LELAND F. JAMES
Former Engineer Corps of the Navy.

THE new concrete arch bridge, now nearing completion across the South Platte river near Fort Morgan, marks one of the high achievements of a successful road-building year, and in view of the purposes to be served it should be a source of much gratification to everyone interested in the continued development of a Greater Colorado.

Designated as State Project No. 682, this bridge is one of the largest undertakings of the 1922 program as laid out by the State Highway Department, and it has the added distinction of being the longest bridge of the well known "Rainbow Arch" design in the world.

The work on this major project was begun in July, 1922, by the Colorado Bridge and Construction Company of Denver, and has been carried on under the supervision of the State Highway Department through its Bridge Department and Division Engineer A. B. Collins acting in co-operation with the Board of County Commissioners of Morgan County, at an estimated cost of $80,000.00, which is being paid for out of funds made available through the City of Fort Morgan and Morgan County bond issues, to which is added an allotment by the State to the project.

When within the next few weeks, the bridge is opened to traffic, there will forever be removed the old-time barrier interposed by the Platte river to establishing an efficient system of road transportation connections in the vicinity, through the lack of which a considerable area of otherwise naturally favored land lying north of the river was, at critical times, in such large measure isolated by high flood-waters that the full development of the community resources was seriously retarded.

Close-up showing detail of arch reinforcing end connections.

This view shows the clear waterway underneath the arch span.

The importance of the project lies not only in unifying the local interests, whereby the value of the natural resources are greatly increased, but also in serving as the master link in an important north-and-south state highway, through which there is a direct cross connection between two of the most important highway entering the State of Colorado, viz.: the O-L-D, which is the direct route from Sterling via Fort Morgan to Denver; and the East and West route from Sterling via New Raymer to Fort Collins; thus contributing to the further efficiency of the system of inter-connecting highways with adjoining states. Moreover, the residents of the sections thus joined are placed in easier touch with more remote parts of the country, this being an essential to the public interest, as well as to the building up of the community.

Briefly described, the bridge consists of eleven concrete arch spans, the floor resting on concrete beams suspended from the arches. Each arch rib is reinforced with four steel angles laced both ways. The hangers each have two steel angles and the floor beams two angles with added steel rod reinforcing. The arch ribs set on concrete piers supported by timber pile foundations.

The arch sections are of uniform design throughout, except that a small increase in the height of the piers from each end toward the center gives the structure as a whole a camber of one foot, which adds to the artistic effect. Each arch has a rise of eighteen feet and spans a length of ninety feet, so that the bridge has a total length of 1090 feet between the springings of the end arches.

The foundation piles, sixty in number for each of the ten channel piers were

Fort Morgan bridge during recent flood in Platte river showing 5-foot clearance above water.

End view showing abutment

first driven to safe refusal, found at a depth of about twenty-five feet and were then sawed off flush with a plane parallel to and five feet below the lowest recorded low-water level. Open spaces around the pile heads were then excavated to a further depth of one foot, and after fitting the wooden forms and reinforcing rods in position, a class B concrete mixture was poured until the piers were built up to a designed size. For the abutments, which are of U-type, reinforced and further strengthened with concrete cross beams, sixty-five piles were driven with an off-shore batter of 1:4 for the purpose of balancing the stresses tending in this direction. The arch reinforcing of 3"x3"x5/16" angles, with their hangers and angle cross beams, were then bolted in place and the first superstructure pourings were made. These included the three floor beams nearest each pier, the haunches of the arches to which two of these beams were rigidly secured to take the weight of the maximum load on the deck structure; and reinforced concrete pilasters based on the ends of the pier and rising to a height of three feet above the surface of the roadway, cross connected by the third beam. Final pourings included the remaining part of the arch spans and hangers, together with the deck floor and beam supports. Class A, 1:2:4 concrete mixture was used for the entire superstructure; Class B, 1:2½:5 for the substructure of the spans. The 8-½" slab floor with 9" curb provides a twenty-foot clear roadway, and is paved with a 2" thickness of 1:2:3 concrete laid monolithic with the floor. Each deck section is given a slight crown and camber. Ornamental guard rails are added to complete the structure.

Reinforced concrete noses on the upstream ends of the foundation piers serve as efficient ice breakers; and as a safety precaution for night travel, electric lights will illuminate the roadway, one light on top of each pilaster between the arch sections.

There are a few special features of design which are worthy of mention. In the first place, the bridge is a radical departure from the usual arch type in that it carries a suspended roadway. This feature, of course, necessitates the ribbed arch, since with the solid barrel arch it is not possible to run the roadway below the top line of the arches. Second: a specially patented device is employed to secure the independent expansion and contraction of the several elements in each arch span by fitting sliding steel plates flush with the under surface of the deck to slide on reverse steel plates made flush with the upper surface of the near end concrete supporting beams. To insure freedom of movement, each floor section is separated from the arch members and from the adjoining floor sections by a liberal clearance which is filled flush with expansion joint felt. Third: There is a suggestion that the structure as a whole combines the advantages of both the concrete arch and steel suspension types. Fourth: It is claimed that the design and detailing is such that one span could be entirely removed or carried away without impairing the integrity of the remaining sections, although this is hardly a question for serious consideration, since the bridge is primarily designed to stand as an everlasting structure against all probable forces of destruction, including strong wind pressure, high flood water, and heavy truck traffic up to twenty tons loading, with an added impact allowance.

With the exception of cement, and steel reinforcing angles and rods, which had to be shipped in, all heavy materials required in the construction were readily accessible to the site. Fine aggregate was selected from the river bed, and coarse aggregate was trucked in from a crushing plant located three miles north of the river. All materials were tested to the standard of the State Highway Department specifications.

Credit is due those men on the ground in charge of the work, for their foresight in taking advantage of such opportunities as were afforded for providing against delays due to adverse conditions. A case in point is that of availing themselves of low water to build all the footings and to set the arches at each end, thereby enabling them to continue the construction of the intermediate spans without delay, except that which could not under any circumstances have been avoided during the high flood waters prevailing over a period of many weeks this spring. Equipment used comprised a 7-H Yeager mixer, a 40-foot Insley mast hoist, and a small pile driver.

There is enough of architectural beauty in evidence to indicate that the aesthetic feature has been given no small amount of consideration in the design. Viewed from any angle the bridge presents a pleasing and attractive appearance; or, in the words of Mr. Arthur E. Hewitt, Superintending Constructor for the Colorado Bridge and Construction Company, "We couldn't put any other type at this point that would look more like an honest to goodness bridge".

General view of partially completed bridge

Half Billion For Good Roads

ABOUT half a billion dollars represents the combined total of federal and state appropriations for road construction during the present year. Prospects are that there will be a little more road construction this year than last, although last year was regarded as highly satisfactory.

Reports received by the Bureau of Public Roads of the Department of Agriculture do not indicate that there has been any marked curtailment of road construction activities in line with President Harding's advice to relieve present conditions affecting materials and labor by postponing public works so far as possible until a period when business slackens up. Any curtailment along this line would be a matter for action by the states. The federal government having made available appropriations for the use of the states under the federal aid system leaves it to the judgment of the states as to when to proceed with the work.

Wages being paid in road construction are generally slightly higher than a year ago, with the exception of the Pacific Coast where the same rate prevails. The greatest increase in wages has taken place in New England where the present level is approximately thirty per cent higher than a year ago.

Various factors lead officials of the Bureau of Public Roads to regard the general outlook as considerably better than one year ago when the railroad and coal strike loomed as disturbing elements. The designation of the system of federal aid highways in most of the others. With a definite program for accomplishment laid out road work can proceed much more smoothly.

What States Are Doing

Returns for thirty-three scattered states show that in these states there will be available $507,014,205 for road work as compared with $456,513,339 spent in the same states last year, the figures including both federal and state appropriations. On federal aid work there was under construction on April 31, 14,000 miles of road estimated to cost $261,000,000 as compared with approximately the same mileage estimated to cost $233,000,000 twelve months previous. In addition to this funds have been allotted to specific federal aid projects which will involve a total of something like $130,000,000 and many of which will soon be under construction. On the above date there was still available to be allotted to specific projects $90,000,000 which if matched by the states in the same proportion as in the past will involve a total of something like $210,000,000.

From latest reports it appears that thirty states now tax gasoline as compared with four states at the beginning of 1921. Most of the revenue derived goes for road purposes and bureau officials regard this as a step in the right direction. With road users paying a more equitable share of the cost, highway finance is placed upon a firmer foundation.

Figures compiled by the Bureau of Public Roads indicate that out of 25,000 miles of federal aid roads which have been completed 18.3 per cent are of the cement-concrete type. Gravel roads comprise 39.1 per cent of the total while graded and drained roads represent 20.6 per cent. Other types of roads include sand-clay, 10.8 per cent, bituminous macadam, 4 per cent, bituminous concrete, 3.1 per cent, waterbound macadam, 2.7 per cent, and brick, 1.4 per cent.

Inasmuch as the federal aid roads include roads built in all sections of the country and figures are regarded as fairly representative of the character of the main highways. Complete figures covering all roads constructed and now in use probably will show a somewhat higher percentage of the lower types of road since the more important roads have been selected for improvement with federal aid.

Scientific Road Building

Secretary of Agriculture Wallace regards the administration of the federal road act as one of the important phases of the work of his department. In a recent discussion of the road construction problem Secretary Wallace emphasized the fact that successful and economical road building is becoming more and more dependent upon careful scientific research.

"Naturally those who are concerned in the development and use of automobiles will be most keenly interested in that part of the work of the Department of Agriculture which has to do with roads," said Secretary Wallace. "Our relation to road building lies in the two fields of scientific research and the administration of the federal road act. The increasing use of rapidly moving motor vehicles brings many new problems of road construction. The vast sums of money which are being spent make it necessary that we attack these problems vigorously if we would avoid enormous waste. Successful and economical road building more and more is becoming dependent upon careful scientific research.

"Roads must be adapted to the density and character of the traffic. In rural sections where the roads are used mainly for moving farm products to market and for tourist travel, the building of a road that will stand up is a very different matter than in regions where there is a heavy traffic of freight-carrying trucks. Conditions of soil and climate, of rainfall, drainage, temperature, all must be studied. The sort of road-making material available and its suitability to the character of the road needed must be ascertained. How best to use this material is a matter for scientific determination. The funds available for road improvement without imposing unduly heavy tax burdens must be considered. Surfacing material must be determined with relation to the traffic.

"The department of Agriculture is making careful study of all such matters, as well as a number of others concerning which information is needed if we would build our roads wisely. We are conducting inquiries into the traffic-carrying capacity of the sand-clay and top soil roads in the Southern states. Field parties are studying gravel roads in the Northern states and trying to ascertain why in some sections waves form more rapidly than in others and what can be done to prevent them. We are developing and standardizing tests for sub-grade materials and their treatment. We are inquiring into methods of drainage and developing most interesting information. Our engineers are investigating the matter of pavement designs and are conducting careful impact tests to secure information on the load-carrying capacity of road slabs of different designs and the behavior of surfacing materials under varying conditions of traffic.

"The character and density of road traffic has been changing so rapidly that no one can speak with full authority as to the best methods and types of road construction. The whole question is one for persistent and continued scientific study, and it is the expectation of the department to extend this study just as rapidly as its funds permit and the results seem to justify.

"The designation and approval of the federal aid highway system under the act of 1921 is progressing rapidly. By the end of the summer approximately 179,000 miles will have been designated as a part of this system. Up to May 5 all but three states had submitted tentative systems for approval. The systems of thirty-three states had been formally approved, including a total of 105,406 miles.

"Considering the approved systems in the thirty-three states we find that of the 1,015 cities of 5,000 or more population in these states 959 of them lie directly on the approved system, and there is not one but will be connected with the system by an improved state or county road. When the system is completed, therefore, one will be able to travel from any town of 5,000 population or greater to any other town of the same population without leaving an improved road.

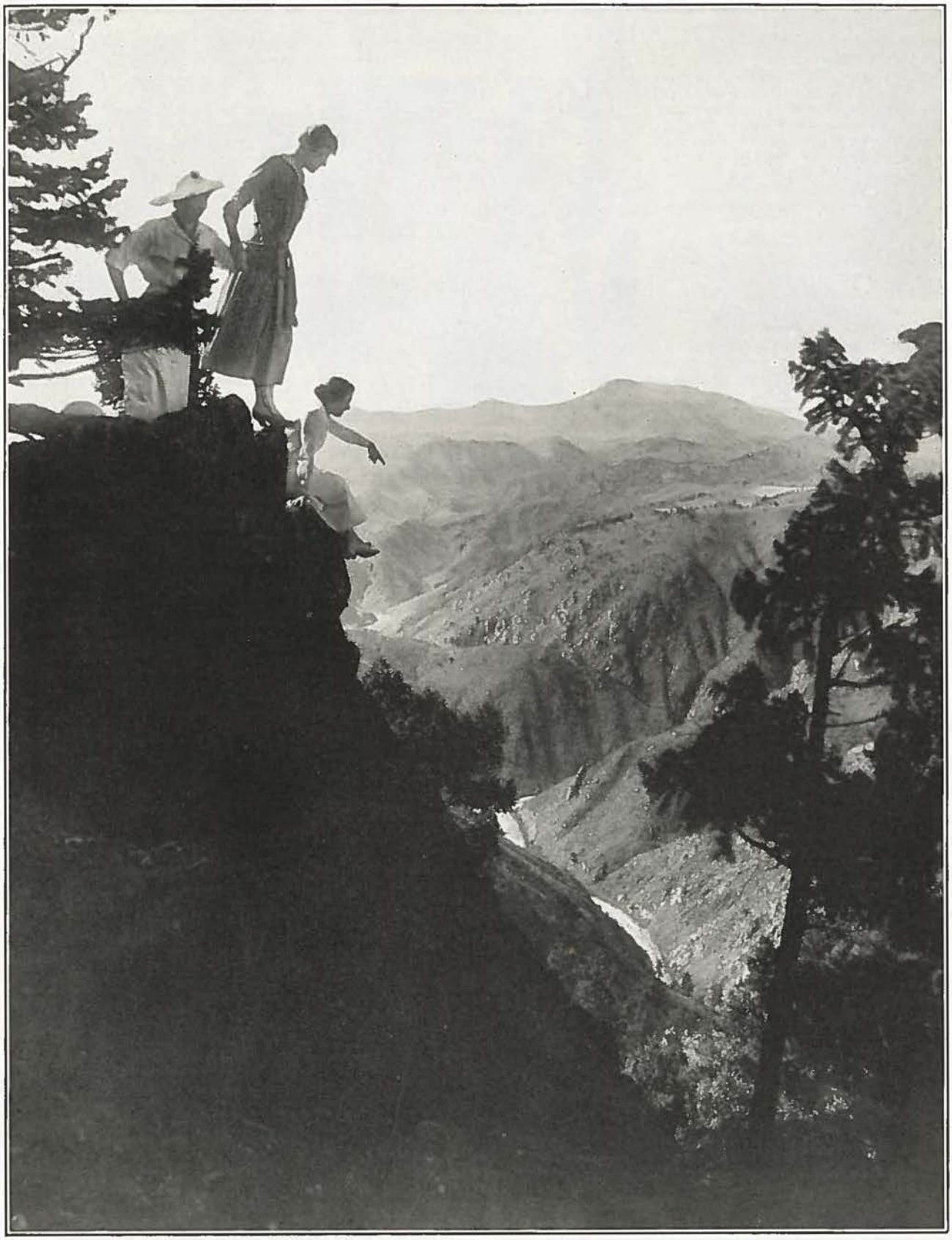
"The detailed study of the availability of the improved roads to the total population has not been completed, but if we take typical states in the East, Middle West and West, we find that the roads on the federal aid system will give a maximum of service. In Maryland not more than two and one-half per cent of the population lives further than ten miles from a federal aid road; in Indiana less than one per cent; in Arizona, where the total population is but 334,000, perhaps one-third will live outside of the ten mile zone.

"A federal aid road will cross the western mountains at practically every one of the important passes. The Rockies will be crossed at Berthoud, Lookout, Gibsono Targhee, Pleasant Valley and Reynolds passes in Montana and Idaho; La Veta, Wolf Creek and Red Mountain passes in Colorado, and Raton pass on the Colorado-New Mexico line. The Cascade range will be crossed at Stephens and Snoqualmie passes in Washington, and Grant Pass in Oregon; and the Sierra Nevadas will be crossed at Truckee and Walker passes in California.

Routes to Give Service

"In designating the routes to be included in the federal aid system the chief aim of the states and the federal agency has been to select routes which will give the

(Continued on page 22)



Looking from Colorow Point, in Denver's Mountain Parks, where renegade Utes leaped to their death to expiate unforgivable crimes, into Clear Creek Canyon, 2,000 feet below, where gold was first discovered in marketable quantities in Colorado in 1859. —Courtesy Denver Tourist Bureau.

Pueblo County Highways

BY RALPH C. TAYLOR

ROADS of service and safety are the aim of Pueblo county's quartet of highway builders, whose aim is rapidly becoming a realization. A definite road building program is carried out under the supervision of Charles Stepp, superintendent of roads, who receives the united support and co-operation of O. G. Smith, commissioner of roads and bridges, W. L. Rees, chairman of the board of county commissioners and Hurb H. Wilson, third board member.

Pueblo county has one of the smoothest running highway departments in the entire state, which is forging to the front with excellent highways, accomplished through a definite program and the fullest co-operation of officials and employes.

Time and labor-saving equipment is maintained along with the latest in road machinery. Many new and unique means of building and maintaining highways have been devised and the officials are quick to grasp successful methods developed in other counties.

No road, no matter how finely finished, is worthy of travel by the public unless it embodies all of the known improvements tending toward the greatest safety to the autoist, according to Supervisor Charles Stepp, who says, "With the safety of the public always in mind, we are working toward the elimination of lurking dangers. If drivers will exercise good judgment, caution and alertness, there need be no accidents. We have widened all highways from six to ten feet. This gives all roads a uniform width of 30 to 35 feet, insuring ample passing room for three cars.

Charles Stepp, superintendent of highways in Pueblo County, with coat removed, ready to tackle some of the highway problems.

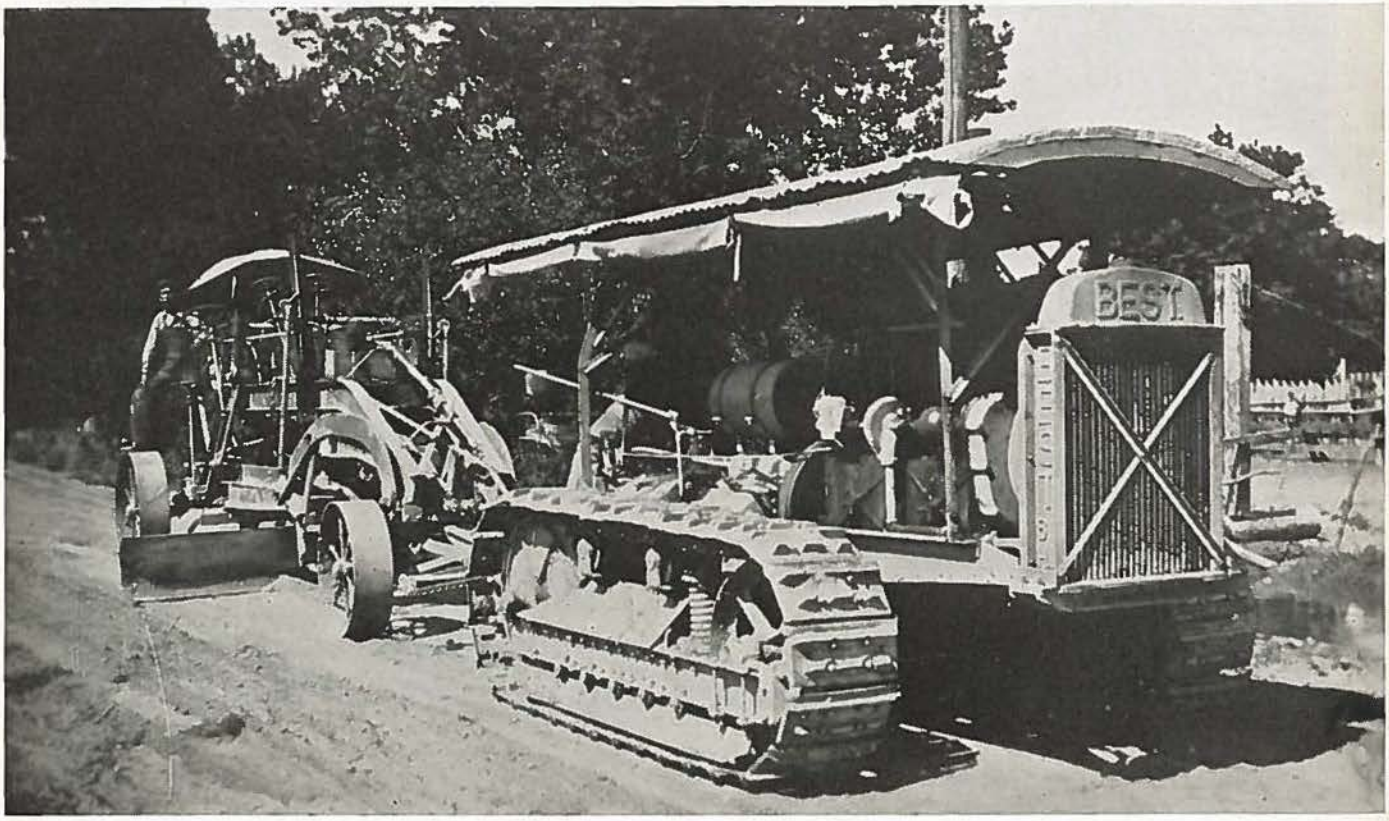
Plenty of roadway is needed by the best of drivers.

"Another thing which is the source of much favorable comment is our plan for widening all sharp turns in the roads. In this connection we have always caused to be removed from curves, obstructive sign-boards which conceal cars meeting at such points.

"At the present we are carrying out another safety measure, that of widening culverts on the main arteries of traffic. The 18-foot culverts are being replaced by 32-foot culverts which maintain the average road width and which do not necessitate inconvenient stops by passing cars."

The best type of road is that surfaced with limestone shale, and with proper maintenance it outwears other surfacings and gives better service, according to Stepp. The county has a road-shaling crew at work all the time and it will continue to operate until the funds run out. A great amount of shale placed on any road at one time does not make as good a road as a covering laid every year or two. The shaling crew consists of 26 men and from 12 to 13 large dump trucks.

Commenting on the cost and source of shale, Chairman Rees, long experienced in county road building, says, "Pueblo county has been fortunate in securing shale for road work. Shale is expensive, but to date the county has never had to pay for any shale. Shale deposits are so uncertain because they are ever changing with the sudden walls of water coursing the usually dry streams. To obtain the shale from a mountain deposit would be exceedingly costly because it would have to be crushed to the suitable size and as limestone shale is the harder and rock-like form of shale, it would be difficult crushing. In the past Nature has caused shale slides and has crushed the shale for us and then the material has been swept down ordinarily dry streams



Large type Best tractor and grader working a Pueblo county road. This equipment turns out a mile of graded road each day.

Pueblo county commissioners not only stand together, but work together. Left to right: O. G. Smith, W. L. Rees, and Hurb H. Wilson.

by high water, where it was easily accessible. This year we will buy our first shale when we start surfacing the Pueblo-Colorado Springs highway. We will acquire a shale mountain near the highway. We have now approximately 100 miles of shaled highways in the county."

County, state and federal road builders who have passed over Pueblo county's shaled roads as automobile tourists have complimented the builders. One nationally known automobile association head said after entering Pueblo over the Colorado-to-Gulf highway from the south, that he had derived more pleasure and comfort over that shaled highway than the concrete coast roads of California.

Commissioner of Roads Smith, states that the maintenance of all highways regularly is absolutely essential for good roads. To quote Smith: "We have regular road patrols or maintenance crews on the six state highways leading out of Pueblo. The Santa Fe Trail east toward La Junta; Kansas-Colorado Boulevard east to Ordway; Colorado-to-Gulf highway south to Rye and Walsenburg, and the same road north toward Colorado Springs; the Rainbow Route toward Canon City and the State Highway to Siloam to the west, all are worked by maintenance crews continually, a maintainer being at the disposal of each crew.

"The continual maintenance of roads in dry weather as well as wet keeps small holes rutting into large rough spots. Dry maintenance keeps the holes filled with gravel which soon works into hard surfaces by rains and travel. The county roads are worked after each rain. All roads are kept open at all times except in cases of flood and high water which is beyond our control, but repairs are made promptly."

Pueblo county officials favor the road with a six-inch crown which they contend promotes safety, more comfortable driving and has the same drainage as the higher crowned roads which have practically all been eliminated in the county. The building of first class earth roads is accomplished with tractor and grader equipment at the rate of one mile a day.

Maintenance of roads is by various methods, the most unique of which is a steel drag pulled by a Fordson tractor. The front blade is directly in front of the back wheels while the back blade follows the rear wheels. The Fordson, as a one-man maintainer, has proven successful as well as three other one-man maintainers of the Avery "road razor" type. They are best adapted to hard surfaced roads as they can be easily adjusted to cut the surfacing down to the depth of the small holes. The "earth shavings" are thrown to the side of the road and later worked back into a smooth road. Where the road is too hard for road razors the county uses two scarifiers or "road harrows", which tear up and pulverize the top surface. The scarifiers are immediately followed by grading equipment.

Pueblo county's 2,000 miles of county roads and 200 additional miles of hard surfaced state highways are maintained with the following men and equipment: A steady force of 86 men; 19 large dump trucks, 4 tractors, 9 graders, 3 one-man Avery maintainers, 1 Fordson maintainer, 2 scarifiers and 1 loader, with a total investment of $35,000. Much of the equipment is surplus material of the War Department. Barns and garages for the equipment are in East Pueblo. The annual budget for the county is $200,000.

Commenting on the annual Pueblo county highway employes' and officials' picnic held at Rye July 28, Commissioner Wilson said, "The day of 'all work and no play' has passed. Pushing men from day to day and trying to get the utmost work from them is a failure, but much more success can be derived by co-operating with them and interesting them. The energy of men must be conserved to obtain the best results. Showing the men that we are interested in their social welfare as well as their working day, is promoting the fine spirit among the men which is in turn accomplishing such finished work."

The delay of contractors in completing state highway projects will be eliminated, according to assurances given W. L. Rees, chairman of the Pueblo county board, by L. D. Blauvelt, state highway engineer. The Arkansas Valley Association of County Commissioners appointed a committee, naming Rees chairman, to interview Blauvelt in this regard. Blauvelt promised to attend the next meeting of the association and explain his plans.

New road signs are being placed throughout the San Isabel National Forest. The signs are painted on metal and bear the U. S. Forest Service shield with other instructions and directions to the tourists. The handsome signs are being sent out of the office of A. G. Hamel, forest supervisor at Pueblo.

What is declared to be Pueblos county's most beautiful concrete bridge has been opened at the Nicholson crossing on the St. Charles river, 7 miles southeast of Pueblo. The bridge is of three spans with a total length of 272 feet and was built by the Pueblo Bridge and Construction Company for the low figure of $35,000. In the structure 5,580 sacks of cement were poured and 28,560 pounds of reinforcement rods were used.

The excellent shale highway on the Pueblo-Rye-Walsenburg road at Fisher Crossing. This road is recognized as one of the best in the entire state.

Building Permanent Roads

Quality is the reward of eternal vigilance.

This is an old and true saying in the business world. It is equally true in the building of roads.

To obtain good roads the utmost care must be exercised by those in charge of construction. Every detail of the work must pass the closest inspection. State and government experts are constantly on the job.

Second to agriculture, construction is the nation's greatest business. Of this second greatest business in the country, road-building is the most important factor. In charge of this giant industry are some of the best engineering brains in the world. Thousands of highly trained specialists are employed.

Today the world's record road program is being carried out. Thousands of miles of roadways are being constructed. At the present time over 500 miles of highways are completed weekly in the United States. Millions of dollars are being poured out to smooth the way for the nation's ever-increasing traffic.

In every week of the current year this country will build more miles of roads than was included in the great Roman highway system in Great Britain, which earned for Caesar and his contemporaries twenty centuries of unending praise and admiration.

And, the roads which are being built today are subjected to traffic such as the world has never seen before. Fast moving vehicles require roadways of highest quality construction, in order to withstand the gruelling punishment of the impact resulting from high speeds. Nothing else will stand the strain.

The demand for roads that will serve this heavy traffic has brought into the highway construction field the trained scientist, the chemist and the engineer. It is these men who are producing the finest highways in the world.

At every stage in the construction of the modern road, from the time the project is started with a survey, until it is opened to traffic, trained men are in charge. If the project happens to be "hard" surfaced, every feature of the construction, from the testing of the cement, sand and gravel, to keeping a watchful eye on the concrete mixture, is carried on under the supervision of trained experts.

Then after the concrete has been poured and cured, it is finally inspected by a government expert. The work must pass the rigid specifications of the U. S. Government before Uncle Sam will pay his half share of the cost. Uncle Sam is a strong believer in getting a full dollar's worth of good roads for every good roads dollar, and if there is the slightest doubt about the work, he will refuse to reimburse the state.

The general public demands quality roads. And such roads can only be obtained through the use of modern machinery and the finest materials, under the supervision of trained road men. This accounts for the fact that we sometimes see two or three engineers employed on a project, the total cost of which might run as high as two hundred thousand dollars. It is a part of the eternal vigilance exercised by the state and federal highway departments.

These engineers are employed to protect the interests of the taxpayers. And, it can be said without fear of contradiction that the taxpaying public is getting more for its good roads dollar in Colorado than ever before. We believe this true of most every other state in the union.

The public insists that road funds be spent where they will do the most people the most good. Also there is an insistent demand that the roads be constructed in such a manner that they will serve the traffic of today and of the future. This demand has resulted in the Federal Bureau of Public Roads adopting the seven per cent system of interstate highways. With this definite program for accomplishment laid out road work can proceed much more smoothly.

More than half a billion dollars are being spent for good roads in the United States this year, according to government reports. It is indicated that there will be a little more road construction this year than last. Reports show that the work is progressing more rapidly than in previous years.

The road program in Colorado is now well under way, with more than a score of main projects under construction in various parts of the state. It is estimated that about 1,000 miles of new roads of various types will be improved in this state this season.

This including grading, draining, gravel and rock surfacing and concrete paving. Besides there will be more than a score of new bridges constructed.

Truly, modern highway traffic must be served.

More U. S. Funds For Colorado

Expenditures totaling $325,824 of forest road funds for the construction of roads within or adjacent to the National Forests of Colorado have been approved by the Secretary of Agriculture, Wallace. All but $55,700 of this amount has been allotted from the Forest Highway fund.

One of the projects calls for the extension of the Berthoud Pass road from the end of the highway completed last year to Fraser, a distance of six miles. The sum of $66,000 has been appropriated for this work, making the total for the entire Berthoud Pass project amount to $192,134. This road is very important to the Pike and Arapaho National Forests.

The sum of $104,000 was approved for that section of the Red Mountain project running north from Ironton, a distance of nearly five miles. This highway serves the Uncompahgre National Forest.

For extending the Cameron Pass road, in the Arapaho National Forest, so that one terminus will be 5½ miles west of the Pass and the other terminus one mile east of the Pass, an additional allotment of $68,000 was approved, thus making the total authorization for this project $118,000.

The Independence Pass project is to be extended to a point a little more than four miles east of Curtis Hill, and an additional appropriation of $6,634 of Forest Highway funds has been approved for the work. In addition, $35,000 from the Section 8 road fund and $20,700 from the Forest Road construction fund will also be allotted to this project, and the State of Colorado will allot $6,666 under a cooperative agreement. This road is of great importance to the public and to the Holy Cross National Forest.

For making location surveys of proposed projects the sum of $25,500 was approved. These surveys will cover about 83 miles of highway.

NEW ROAD MARKERS READY FOR POSTING ON MAIN HIGHWAYS

"On to Colorado, the playground of the nation."

This is the thought to be conveyed to tourists on roads as far east as the Mississippi river through the medium of guide posts.

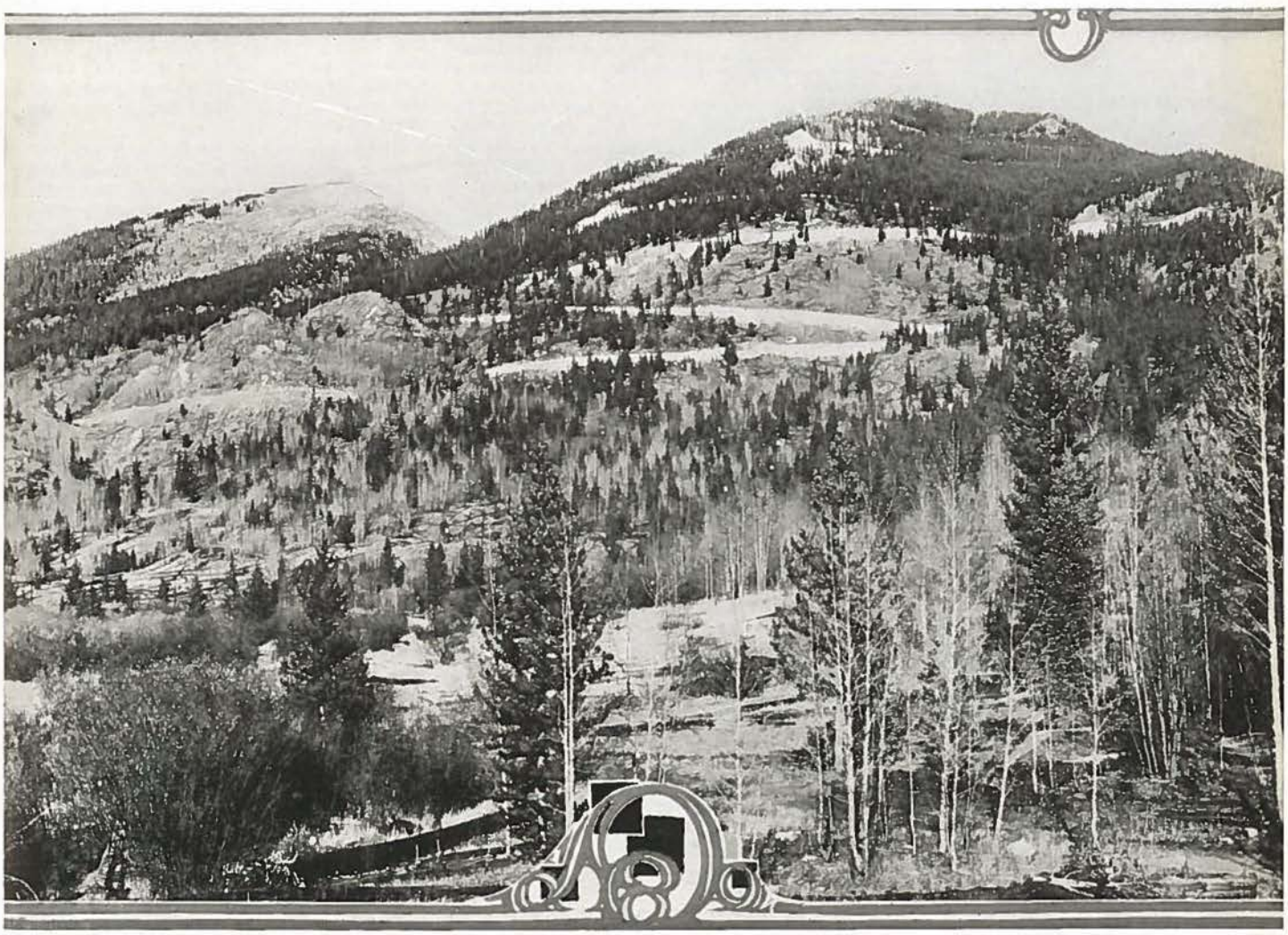
These markers are now being erected by the Rocky Mountain Motorists, Inc. The first shipment of the signs has arrived in Denver. Posting of the signs is in the hands of the State Highway Department.

It is expected that 360 miles of state highways will be covered by the markers this year. In all, 1750 of the signs have been ordered. They will bear the new numbers of the state highways. At first only the main highways will be posted. These roads include those of the Federal Aid 7 per cent system.

The signs will be erected on steel posts and imbedded in concrete. A ten year guarantee has been given by the manufacturer on the lettering and coloring.

There are four varieties of the signs. The full size signs will show four or six towns and mileage, the half size showing one or two towns; rectangular in two sizes showing speed limit and the danger sign.

Plans of the Rocky Mountain Motorists, include posting of the markers as far north as Montana, south as far as El Paso and east as far as the Mississippi river.



A notable switchback leading to the top of the Divide on the Fall River Pass Highway, connecting Grand Lake with the Rocky Mountain National Park—traveled by thousands of tourists each summer.

Asphalt Men to Meet in Denver

Practical paving problems, including the salvaging of old pavements, will be discussed by leading highway engineers of the United States at the two-day convention of the Asphalt Association to be held at Denver in the Brown Palace Hotel on August 21st and 22nd.

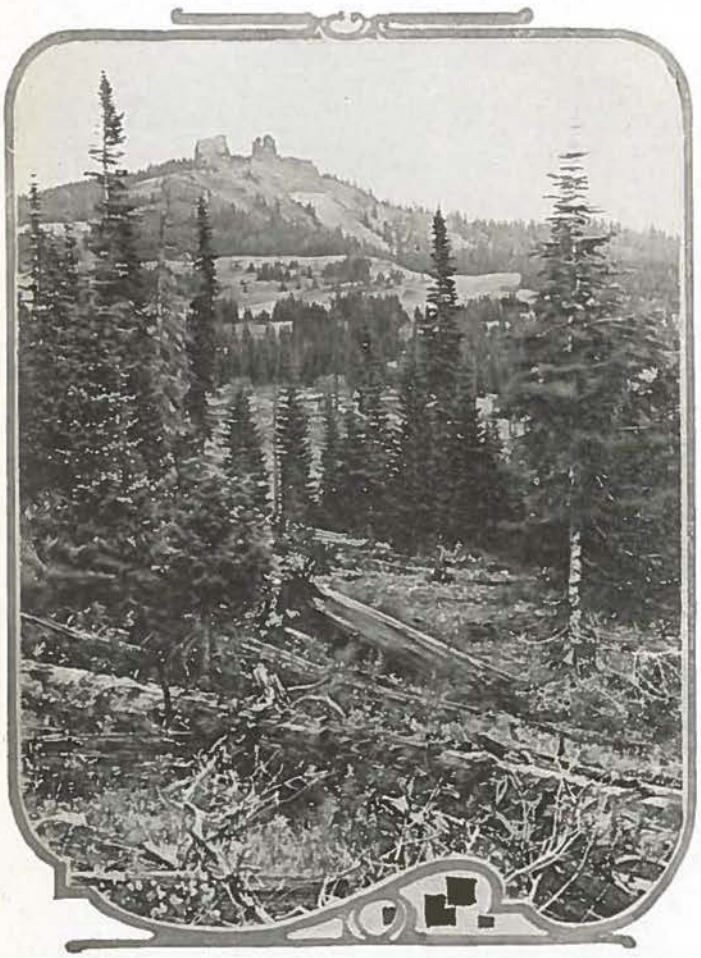
Among the distinguished engineers and officials listed to address the convention are: Capt. L.. R. Tillotsen, state highway engineer of Kansas; John B. Hittell, chief paving engineer of Chicago; John A. Griffin, city engineer of Los Angeles; Fred G. Simmons, state highway engineer of Oklahoma; L. D. Blauvelt, state highway engineer of Colorado; A. K. Vickery, city engineer of Denver; Chris P. Jensen, county surveyor of Fresno County, California, and Charles Schultz city engineer of Tulsa.

Hon. William E. Sweet, governor of Colorado; Hon. B. F. Stapleton, mayor of Denver, and E. H. Ammons, president of the Denver Civic and Commercial Association, will deliver addresses of welcome to the delegates from all over the United States.

The two-day conference will be devoted to an earnest consideration of practical paving problems, among them such questions as specifications and design for all types of base, including gravel, macadam, asphaltic concrete and Portland cement concrete; the various types of asphalt wearing surfaces; the quality and characteristics of sand, stone and gravel for asphaltic paving; methods of paving between and adjacent to car tracks; asphalt for bridge floors; tests and specifications for asphalt.

Indications point to a large attendance and plans are being made for an elaborate entertainment for the delegates, including a dinner on the evening of August 21st and an automobile trip on the afternoon of August 22nd.

This is the first time the Asphalt Association has held its annual convention in Denver, and in view of the fact that all railroads now have summer rates in effect to Colorado, the attendance is expected to be the largest on record.



Showing the famous Rabbit Ear Rocks, from which the pass is named in Jackson county.

Heavy Boulders and Water Makes Slow Work on Loveland Pass

Ten teams and forty men are making dirt fly on the first link of the Holy Cross Trail road, which eventually will connect Denver with Dilllon and Red Cliff, via Loveland Pass. This outfit is employed on a force account under the supervision of Richard McQueary, the contractor who built the world-famous Fall River road.

"I think we will be able to open up six miles of the new road before snow flies," declared McQueary. "I don't believe I have ever encountered anything in the way of boulder or rock work quite so difficult to handle as that found above Graymont.

"We are building a 14-ft. roadway sloped to the inside, and when finished the road will be wide enough for two cars to pass at any point. Our camp is now located three miles above Graymont.

"By the way, I have never seen any section of the state quite so beautiful from a scenic standpoint, as Loveland Pass. Old timers up there tell me that it will be possible to keep the road open about a month longer than Berthoud Pass. It should be open to travel about two weeks earlier in the spring and about two weeks later in the fall.

"As the road is now staked out I think it also will be a much easier pass than Berthoud. At present we are up about 10,000 feet. But it is certainly rough going in getting out the granite boulders. We have to shoot everything and we have experienced a great deal of trouble in draining off the water. I have had to keep eight or ten men busy cutting drainage ditches."

A survey party under Division Engineer John P. Donovan are now working from the top of Loveland Pass, which is 11,786 feet elevation, down to the present work. Old time residents of the district have been consulted with regard to snow banks. An effort will be made to survey the road in such a way as to miss the heavy snow drifts.

Eventually the Holy Cross Trail will form a gateway to the world-famous Mt. of the Holy Cross, located near Red Cliff. Also the road when completed will reduce the distance between Denver and Glenwood Springs by ninety miles.

STORY OF CEMENT MAKING TOLD BY MOTION PICTURES

Much of the unusual equipment involved in making cement is interestingly illustrated in a two-reel moving picture called "The Story of the Manufacture of Portland Cement," just released for general showing.

Starting with views of one of the large plants in which cement is made, the film pictures in a nontechnical way shows the essential steps in transforming thousands of tons of raw materials into Portland cement. Scenes taken at a number of plants are included.

From the moment that a great blast breaks loose a cliff of limestone in the quarry, to the time when the finished cement goes into storage in big cement bins, the process of manufacture is almost entirely mechanical—otherwise present day outputs would be impossible.

In addition to straight photography, animated drawings have been inserted to make clear what occurs inside the grinding mills, what goes on within the white-hot interior of the huge kilns, and how the cement sacks, suspended upside down, are filled after they have been tied.

This film can now be secured without charge by interested organizations through any office of the Portland Cement Association or from the association headquarters at 111 West Washington street, Chicago.

County Officers Call Conference

Road officials of eleven counties in the Arkansas Valley will meet in conference at the court house in Trinidad on Saturday, August 18, according to a notice sent out by D. B. Bradley, secretary of the Arkansas Valley Association of County Commissioners.

The cause of delay in the completion of state highway contracts will be one of the principal topics of discussion. A special committee appointed at the last meeting of the association for the purpose of investigating this matter will make a report of their findings at this time.

This committee is composed of W. L. Rees of Pueblo county, George Barr of Otero county, and J. L. Thompson of Bent county.

Officials of the State Highway Department who will attend the meeting include: L. D. Blauvelt, state highway engineer; James E. Maloney, assistant highway engineer, and Robt. H. Higgins, superintendent of maintenance.

Program of the meeting follows:

1. Roll Call.
2. Water Commissioners; Their Duties and Pay.
   J. G. Stubbs, Otero County.
   S. G. Kelso, Fremont County.
3. Enforcement of Motor Vehicle Laws by County Officers.
   Hal Barnes, Las Animas County.
4. Cause of Delay in Completion of State Highway Contracts.
   W. L. Rees, Pueblo County.
   George Barr, Otero County.
   J. L. Thompson, Bent County.
5. Road Building and Maintenance.
   The Officials of the State Highway Department.
6. Announcements.
7. Adjournment.

THE $1,000,000 CONGRESSIONAL APPROPRIATION

The executive committee of the National Park-to-Park Highway Association, composed of Rex B. Yeager, chairman; F. J. Chamberlin, F. R. Dildine, G. V. Hodgin and Gus Holms, at a recent meeting held in the Association's headquarters, decided on launching a movement, through its memberships, protesting against repetition of the $1,000,000 Congressional appropriation for the shipping board using this huge sum to advertise foreign countries.

An investigation by the Association failed to find where a single cent of this sum was spent in the interest of the scenic west and while the shipping board's expenditure helped some of the publications through its advertising campaign and created some business for the railroads, it did not in any way help the western portion of the United States of America

The great publicity campaign has resulted in drawing the American public's attention from its own recreative attractions to a much greater extent than is generally believed.

If the eleven western states could have $1,000,000 a year to advertise themselves it would not only sell the scenic west to the American people, but would attract many foreigners to America, while as it is, all is going out and nothing coming back. The National Park-to-Park Highway Association believes this unjust and contributes to the slow return of prosperity.

It does not take much thinking to realize what great sums of American money have been spent in foreign travel and while a percentage has gone to keep our own ships moving, the advertising campaign has fattened the purse of many foreign-owned ships, and but few dollars have been brought to America, especially the western part.

The National Park-to-Park Highway Association leads in the move to awake the great picturesque west in looking out for itself through its thousands of members and the many local co-operative National Park-to-Park Highway Clubs. What the Association could do for the west with $1,000,000 a year publicity fund is easily answered.

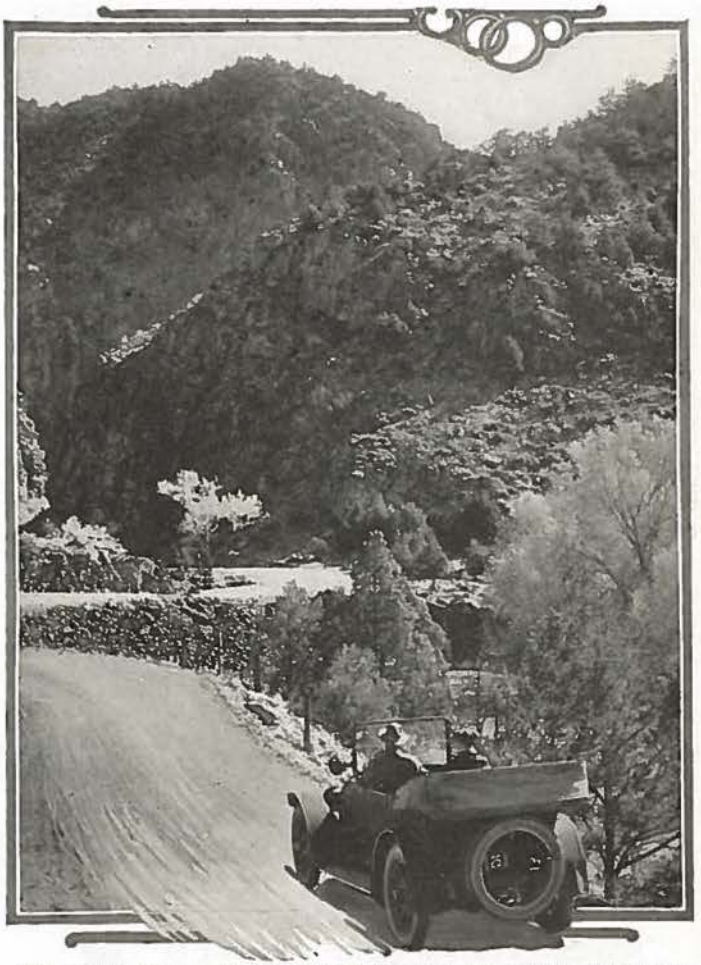
IDEAL SECTION OF LINCOLN HIGHWAY.

Construction work on the far-famed stretch of model highway known as the Ideal-Section of the Lincoln Highway in Lake county, Indiana, is now under way after nearly two years of preliminary research.

In addition to $33,000 per mile provided by the State of Indiana, Lake county authorities have assured $25,000 from the county funds toward paying for the construction of the section. Extra expense beyond the sum supplied by the state and county, which is equivalent to what the construction of the usual state specifications would cost, will be met by the Lincoln Highway Association thru a special fund provided by the United States Rubber Company.

It is expected that the paving work will be completed by the end of October, many details including the lighting installation and the beautification of the right-of-way remaining for accomplishment until next spring

While it is not expected that many states can undertake in the near future highway improvements embodying all of the principal elements of the Ideal-Section design, it is felt by the Lincoln Highway Association and the officials of the United States Rubber Company that the design will be suggestive and will tend to bring to the attention of the American public the vital necessity of the adequacy in present day specifications if the vast sums which are now going into highway construction are to properly serve the America of to-day and tomorrow.



When the river and the range meet on the upper Arkansas in Canon City in Fremont county—one of the state's main east and west roadways and the gateway to one of Colorado's most famous scenic areas.

FUNDS AVAILABLE FOR WORK ON PROJECT THRU SOUTH ST. VRAIN

Boulder County will continue with the improvement of the South St. Vrain Canon road into the Estes Park region, during the coming summer. The money set aside for this much-needed improvement will enable the county to widen and straighten this road for a distance of several miles east and south of Allen's Park. The principal work to be done this summer will consist of the elimination of the steep grade in the present road at the point where the road leaves the St. Vrain River.

The South St. Vrain Canon road is considered by many the most attractive entrance into the Rocky Mountain National Park. It has grown steadily in popularity until the old, narrow road proved inadequate to the traffic demands and made widening and elimination of grades imperative.

GOOD ROAD SOON REPAYS ITS COST, SURVEY SHOWS

A good road is such a paying investment that it is the poorest kind of business judgment to do without it, according to the U. S. Bureau of Public Roads. The bureau produces figures based upon a survey of traffic in Connecticut to prove its contention. An actual count of the traffic on the Boston Post Road showed that the average weight of vehicles and commodities passing over the road in nine hours each day was 1,140 tons. Adding one-third as a conservative estimate for the full day increases the weight to 1,520 gross tons daily.

Experiments made at the Iowa Experiment Station show that with gasoline at 24 cents a gallon the cost of moving this tonnage over a dirt road would have been $26.44 a mile, assuming the impossible, that such traffic could be carried over a dirt road. The cost of fuel for moving the same tonnage over a paved road would be $11.70, a difference of $14.74 a day. On the basis of 300 days a year the actual saving in fuel alone for moving this tonnage would be $4,422. If the paved highway costs $40,000 a mile, the average interest at 5 per cent would be $2,000 a year, which, deducted from the saving on fuel, would leave a balance which would retire the cost of the road in less than 12 years.

This calculation does not take into account other savings in the cost of operating commercial vehicles or value of the heavy movement of passenger vehicles.

Speed cops from other counties find no exceptions in Pueblo which was demonstrated a few weeks ago when a special speed cop from Las Animas county was arrested by a city speed officer in Pueblo. The visiting officer defied arrest although he admitted speeding at 35 miles an hour where the limit was 20 miles. He was fined $1 per mile for the excess speed as is the custom in police court and was detained until his $15 fine was paid. When he returned to Trinidad the county officials showed their disapproval by recalling his commission.

Kansas motor car drivers must hereafter drive on their own side of the road or be held responsible for every accident on the highways in which they are in any way involved. This is the statement authorized by N. W. Watson, State Highway Engineer. Concrete road designs call for a longitudinal joint down the center of the road. This joint is to be bound together with reinforcing steel and is to provide a half-inch opening at the top to fill with some type of black filler. This will form a distinct center line down the road. Anyone traveling on the wrong side of the line is to be held responsible and cannot escape blame for any accident in which he is concerned.

States Allowed to Sell Worn Out Road Machinery

The department of justice has rendered an opinion that is of particular interest to Colorado relative to the right of states to dispose of surplus war material turned over by the government to aid the state in road-building work. The text of this opinion has just been made public at Washington.

It was delivered to the secretary of agriculture, who has charge of federal aid road building activities, and it bears date of June 23 this year.

In a number of states sensational charges have been made in regard to the disposition of surplus war materials, especially in Ohio, Kentucky and Arkansas.

In Arkansas and Kentucky, it was alleged, serviceable war materials were sold as junk at prices that were ridiculously low. The department of agriculture, in retaliation, issued an order that no more war materials should go to Arkansas and on its suggestion proceedings in court were threatened against the buyers of the property on the ground that they had no title. Under this threat the purchasers made haste to return the property they thought they had acquired. After Arkansas had purged itself in the opinion of the department of agriculture it was restored to the favored list.

At the present time war supplies are being withheld from Kentucky as the result of an expose which showed that material was sold by state authorities at prices which were only a small fraction of current market quotations for similar goods. The flurry in Columbus over alleged irregularities in the disposal of war materials in that state followed a report of investigators and was made public soon after the present state administration came into power.

Property Held to Be Beyond Federal Control.

The opinion of the department of justice, signed by W. D. Riter, acting attorney general, runs counter to the idea of the bureau of public roads of the department of agriculture that those who are responsible for disposal of this government property at ridiculously low sums should be held to accountability for offenses against the federal government. In effect, the department says that the property, having been turned over to the states, is beyond federal control and that such part of it as becomes unserviceable may be sold by the agents of the state but that the states are "under obligation" to use the proceeds derived from such sales for the benefit of the road-building program.

After reviewing the acts of congress authorizing the transfer of war materials to the states the opinion of the department of justice says:

"Both the wording of the acts and their purpose indicate that title to the material transferred passes to the states. The sole condition attached to the transfer is that the material be used on roads constructed with federal aid. The states, therefore, receive the material subject to the obligation to use it on roads constructed with federal aid, but when the material becomes unserviceable for such use the duty to keep the property ends, since to retain it further would not serve the purpose of the acts of congress.

Unserviceable Property Can Be Sold By States.

"The states may make appropriate disposition of such unserviceable property, but they are under obligation to use the proceeds derived form its sale in the purchase of equipment to be used on roads built with federal aid, or, possibly, in the construction or maintenance of such roads."

The department of justice calls special attention to section 5 of the act of March 15, 1920, which provides:

"That the title to said vehicles and equipment shall be and remain vested in the state for use in the improvement of the public highways, and no such vehicles and equipment in serviceable condition shall be sold or the title to the same transferred to any individual, company or corporation."

The opinion further says:

"The prohibition in section 5 against sales by the states of equipment 'in serviceable condition' implies a right on the part of the states to dispose of equipment which is not in serviceable condition."

The acting attorney general also says:

"It is my opinion that the states may sell or exchange material transferred to them by the federal government which at the time of sale is unserviceable for road improvement."

The highway department of Colorado will soon receive a copy of the opinion of the department of justice.

The Parker Community Club is marking Cherry Creek Drive from Denver south with attractive steel road signs indicating the route from Denver along Cherry Creek through Parker and into the Happy Canon country and Daniels Park, and south to Franktown and Castlewood Dam, to Cherry, Elizabeth, Elbert, Kiowa and to Monument and Colorado Springs through the Black Forest. The Cherry Creek Drive south from Denver is graveled all the way and is in ideal condition for travel. The community club is also considering a camping ground for tourists on Cherry Creek about a mile from Parker.

The Pitt River Bridge, near Baird, Cal., built in 1916. One arch, 242 feet clear span, 38 feet clear rise, carried on three ribbed arches, 4 feet wide and 3 feet deep at crown and 11 feet 3 inches deep at the springing line. Carries a 21 foot roadway. Cost $38,237.

Concrete bridges, like concrete roads, are for the traffic of today and tomorrow.

Safe, durable, they will not rust, rot nor burn.

Almost without exception concrete bridges are lower in first cost.

Concrete bridges are practically free from maintenance expense.

"CONCRETE FOR BEAUTY AND PERMANENCE"

BIDS RECEIVED DURING JULY

Proj. No.	Location	County	Length	Type	Low Bidder	
F.A.P. 246-A	East of Pueblo	Pueblo	2.537 mi.	Concrete Paving	R. A. White	$78,431.10
S.P. 756	Echo Lake-Mt. Evans	Clear Creek	4.58 mi.	Mtn. Grading	Ed. H. Honnen	57,682.00

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	County	Length	Type	Bids Opened
F.A.P. 71-C	Hesperus-Durango	La Plata	2.911 mi.	Gravel Surfacing	August 7, 1923
F.A.P. 226-C	(Pav. Div. No. 1) Platteville-La Salle	Weld	4.404 mi.	Concrete Paving	August 2, 1923
S.P. 708-9	Ridgway-Placerville	Ouray-San Miguel	2.614 mi.	Grading	August 2, 1923
S.P. 713	Basalt-Snowmass	Pitkin	3.343 mi.	Grading	August 7, 1923

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Location	County	Length	Type
2 (Reop.)	Trinidad, north	Las Animas	3. mi.	Concrete Paving
240	Gypsum-Dotsero	Eagle	5.372 mi.	Gravel Surfacing
241	Delta-Grand Junction	Delta	0.377 mi.	Gravel Surfacing and Bridge
245-A	Las Animas-Hadley	Bent	4.545 mi.	Grading and Gravel Surfacing
247-A	Rocky Ford-Swink	Otero	1.329 mi.	Paving
252	Loveland-Berthoud	Larimer	2.463 mi.	Paving

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	County	Length	Type
F.A.P. 116-B	Breed, North and South	El Paso	0.91 mi.	Concrete Paving and R. R. Grade Separation
F.A.P. 116-C	North of Breed	El Paso	3.22 mi.	Concrete Paving
F.A.P. 222-C	Denver-Lafayette	Boulder	1.5 mi.	Concrete Bridge and R. R. Grade Separation
F.A.P. 224	Morrison-Baileys	Park	5.621 mi.	Mountain Grading
F.A.P. 226-D	Platteville	Weld	1. mi.	Concrete Paving
F.A.P. 230-A	Wolhurst toward Sedalia	Douglas	0.852 mi.	Paving and R. R. Grade Separation
F.A.P. 230-B	Wolhurst, Gann	Douglas	5. mi.	Paving
F.A.P. 242	Grand Junction-Fruita	Mesa	3.5 mi.	Gravel Surfacing

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
7-C	Norwood-Naturita	10.6 mi.	Mtn. Grading	Girardet-Hotchkiss Eng. Co.	$ 68,684	75	7-C
29	Morrison-Turkey Creek	1.9 mi.	Mtn. Grading	Wm. Flick	70,839	100	29
30	Morrison paving	.94 mi.	Conc. Paving	Peterson, Shirley & Gunther	41,677	100	30
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	61,556	8	71-B
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	38	102
116-A	Colorado Springs paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238,944	42	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	30	119-B
129	Federal Boulevard	4.42 mi.	Paving	Peterson, Shirley & Gunther	164,331	98	129
133	Federal Boulevard	4.22 mi.	Paving	W. J. Cameron & Co.	146,399	98	133
139	Ft. Collins-Loveland	4.02 mi.	Conc. Paving	Mutual Constr. Co.	139,263	98	139
163	St. Charles Bridge	0.5 mi.	Steel Bridge	Rogers & Pickard	85,636	84	163
165	Canon City, east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	80	165
166	La Junta-Swink	2.01 mi.	Conc. Paving	Carl C. Madsen	66,949	100	166
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	21	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	77	174
189	Hayden, east	5.41 mi.	Grav. Surf.	H. C. Lallier Constr. & Engr. Co.	41,941	98	189
190	Summit County Bridge and road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	30	190
208-A	Grand Junction-Palisades	3.14 mi.	Grav. Surf.	F. L. Hoffman	33,644		208-A
210-A	Grand Valley-DeBeque	5.30 mi.	Grav. Surf.	F. L. Hoffman	57,429	44	210-A
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	26	213-B
215	Pagosa Springs Bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	70	215
216-A	Holly, east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	88	216-A
217	Pueblo, east	2.94 mi.	Paving	Ed. Lindsay	72,164	80	217
218-A	Hasty-Lamar	8.34 mi.	Grav. Surf.	Monaghan & Cunningham	52,247	100	218-A
218-B	Hasty-Lamar	3.49 mi.	Grav. Surf.	M. J. Kinney	40,009	86	218-B
221	Loveland, north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	60	221
222-B	Broomfield cut-off	1.52 mi.	Conc. Paving	Miller, Douglas & Hanes	68,302	80	222-B
225	Fitzsimons Hospital road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	40	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	70	226-A
226-C	Platteville-La Salle	10.73 mi.	Grading	C. R. Conover & Bro.	36,296	100	226-C
228	Atwood-Sterling	4.41 mi.	Conc. Paving	La Nier, Selander & White	148,484	80	228
231	Six Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockway	25,165	32	231
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	32	81-A
211	Meeker, north	1.85 mi.	Grav. Surf.	Hinman Bros.	34,445	20	211
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	12	223-A
246-R	East of Pueblo	2.537 mi.	Conc. Paving	R. A. White	78.431	0	246-A

Fifty-three Projects Contracted

(Continued from page 3)

La Plata counties, where he has contracts for five miles of gravel surfacing in Mesa county between Clifton and Palisades and two miles of gravel surfacing east of Durango in La Plata county. Both contracts are Federal Aid projects and total $87,574.00.

Plans on six proposed highway projects have been submitted to the Federal Bureau of Public Roads for approval by the State Highway Department during the past month. These include three miles of paving north of Trinidad; five and one-half miles of gravel surfacing in Eagle county between Gypsum and Dotsero; four and one-half miles of grading and gravel surfacing between Las Animas and Hadley in Bent County; one and one-third miles of paving between Rocky Ford and Swink, and two and one-half miles of concrete paving between Loveland and Berthoud in Larimer county, and a bridge in Delta county.

Engineers of the department are now drafting plans for ten miles of paving on the Colorado Springs-Denver road. Four miles of the paving will be laid north and south of Breed, and six miles south of Wolhurst connecting with the present paving at that point. Included in the project south of Wolhurst is an underpass crossing under the Santa Fe and D. & R. G. W. railroad tracks. The project at Breed also includes an underpass railroad crossing. These two underpasses will eliminate two of the most dangerous railroad crossings between Denver and Colorado Springs.

State Highway Engineer Blauvelt is now conducting negotiations whereby the railroad companies will pay a large share of the cost of these two crossings.

Rains during the past sixty days have seriously interferred with highway construction and maintenance work throughout the state, and as a result the state and the counties have been put to considerable extra expense in keeping the main roadways open to traffic. In several places the rain has been so heavy and frequent that it has been almost impossible to do any kind of work and important paving projects have been held at a standstill.

This has been especially true of the paving project north of Loveland, where the contractor, Fred C. Dreher, has had only about fifteen working days since he started paving early in the spring. However, with fair weather he expects to complete his work by the end of the season.

The heavy rains have caused extra hardships on the maintenance crews throughout the state. There have been cases where the roads have been put into splendid condition one day and cloudbursts washing them out the next.

CALCUTTA INDIA, BUILDS AMERICAN TYPE OF STREETS

That cities in India are adopting American types of street pavements is indicated in word received from that country. Asphaltic concrete pavements, now in such wide use on the Pacific coast with pronounced success and low cost for maintenance, are an American development, having been originated in this country and having been brought to a high state of perfection by American highway engineers. India has a very enervating climate and asphaltic concrete, according to James R. Coats, city engineer of Calcutta, is proving as successful there as in the United States. "Here in Calcutta," writes Mr. Coats, "we have laid 1,300,000 square yards of asphaltic concrete per annum during each of the last five or six years."

"It is the duty of every citizen to try and save the life of another if it is in his power to do so," commented W. L. Rees, chairman of the Pueblo board of county commissioners, following the death of Art Robinson, prominent cattle man who was killed when his car plunged into a ravine made in a highway by high waters. Residents near by had seen the impending danger but had failed to notify the authorities, causing Rees to issue the foregoing statement.

Half Billion For Good Roads

(Continued from page 6)

maximum of local service and at the same time connect with one another to form a great national highway system. The states were first asked to certify the total mileage of road in existence at the time the act was passed. Seven per cent of this was the maximum allowable mileage that could be included in the system. The total was 194,262 miles. The states were then asked to prepare maps of state systems proposed by them, locating the roads by controlling points. These state systems were carefully reviewed and studied by the department and some changes were suggested as being desirable from the national point of view. Conferences were held between representatives of the department and of states and groups of states, and out of these conferences came agreement as to the systems finally decided upon.

"Federal aid for road building was inaugurated by the federal aid road act, approved July 11, 1916.

"Since the above date $540,000,000 have been appropriated or authorized for the fiscal years 1917 to 1925, inclusive. Of the above amount $75,000,000 is authorized for the fiscal year 1925 and will not be available for expenditure until July 1, 1924. Sixty-five million dollars is authorized for the fiscal year beginning July 1 of this year, leaving $400,000,000 authorized or appropriated for expenditure up to the current fiscal year.

"Of the $400,000,000 authorized or appropriated up to the current fiscal year $226,274,214 had been paid to the states for work completed up to March 31, of which $160,938,223 was paid on projects completed and accepted, and $65,335,991 had been paid in progress payments for work completed on projects which were still under construction on March 31.

"On March 31, 21,638 miles had been completed at a total cost of $378,087,845, and the federal share of the cost amounting to $160,938,223 had been paid to the states.

"On the same date 3,413 miles additional had been completed but they had not been inspected for final acceptance. The total cost of these roads was approximately $51,500,000.

"On the same date there were 14,010 miles under construction and these roads were reported at the time as fifty-six per cent complete in the aggregate.

"The total mileage completed or under construction on March 31 was 39,062 miles.

"While the improvement of the federal aid system may proceed more slowly than some would like, and more slowly than it would under more favorable economic conditions, nevertheless almost before we realize it we shall find that we have a federal road system which will not only serve local needs, but which will make it possible for the tourist to drive from one end of the country to the other and from one part of any state to another, in the assurance of finding good roads the entire distance."

Archer R. Knuckey, chairman of the board of county commissioners of Prowers county, president of the Arkansas Valley County Commissioners' Association and prominent Holly, Colorado, business man, was instantly killed July 5 when the car in which he was sitting was struck by an eastbound Santa Fe passenger train near Boone, 20 miles east of Pueblo. Knuckey and W. C. Simpson, also of Holly, were going on a fishing trip when attempting to make the grade crossing, the car plunged through a cattle guard and was stranded on the railroad tracks. Simpson hastened up the track with a lantern and attempted to flag the onrushing train. Knuckey, believing the train was stopping, re-entered the car and endeavored to back it from the tracks. His body was carried several hundred feet on the front of the engine. The investigating coroner's jury returned a verdict of death by accident.

The abandoned Colorado & Southern railroad bed north of Pueblo and east of the Fountain river may be taken over by the county for an automobile highway. The present road in that section is damaged by water after heavy rains and is impassable at times. The railroad grade being much higher and stronger, would make an excellent road, the county commissioners believe.

Speeding on highways in Pueblo county is an expensive business. A special deputy sheriff, whose identity is being kept secret, has been appointed to arrest all persons driving in excess of 35 miles an hour. The officer will also enforce other state highway regulations to motor vehicle traffic.

EQUIPMENT NOTES

A novel and practical attachment has been brought by the J. D. Adams Company for use on graders employed on maintenance work. By use of this attachment an ordinary 12-ft. Adams Adjustible Leaning Wheel Grader can be converted into an eighteen maintenance machine at a nominal cost.

Several of these attachments have been purchased by county road superintendents during the last few months, and so far they have been working out very satisfactorily, according to Elton T. Fair, sales manager with Thomas J. Fair, the Adams distributor in Colorado and Wyoming.

Mr. Fair returned last week from a 10 days sales trip in Wyoming. He placed another 12-ft. Adams Road King in Natrona county, making three of these machines now owned by this county. John Reil is the road superintendent of Natrona County, Wyo., which is carrying out an extensive maintenance program this year.

J. E. Urbine, who operates a commercial sand and gravel plant in Green River, Wyo., has purchased his second Sauerman cableway excavator outfit. The purchase was made from the Herbert N. Steinbarger Company of Denver. This plant is of the one- and one-half yard, two speed, steam-hoist type. About 2,000 yards of sand and gravel per day is the capacity of the new outfit.

Mr. Steinbarger also reported the delivery of a 150-ton Bucyrus wrecking crane and a Bucyrus locomotive type pile driver to the Denver and Rio Grande Western Railroad the past month.

Word was received that Hamilton & Gleason Const. Co. have moved one of their four Bucyrus shovels from California to a new Union Pacific railroad job at Park City, Utah. They are now working on an 800,000 yard job for the Santa Fe Railroad near Ludlow, Calif.

Four extra large Koehring concerte mixing plants were disposed of in one day by H. P. Wilson & Co. to Colorado and New Mexico contractors in July. One of these machines will be used in mixing concrete for the State Highway bridge which will be constructed across the D. & R. G. tracks near Sapinero. Winterburn & Lumsden are the contractors. This will be the highest bridge in Colorado when completed. It will be of steel and concrete construction.

Two snow plows and a 10-ton Holt caterpillar tractor were purchased by the Bair Oil Company of Rawlins, Wyo., last month from the Wilson concern. This equipment will be used in keeping the roads open to the oil company's wells during the coming winter.

This is the second Wyoming oil concern to purchase like equipment for maintaining the roads leading to their properties. The Producers & Refiners Corporation recently purchased five tractors and a large number of trailers to be used on road construction and maintenance.

Harry P. Wilson, president of the Wilson concern, announced the arrival of the new model two and ten-ton Holt tractor. Both machines are now on display in Denver. An enclosed engine, gear driven fan and pump are among features of the new machines.

Ray Corson, sales manager of the Wilson firm, has just returned from a two-weeks vacation trip with his family to California and the Grand Canyon. While in California he was the guest of state highway officials on an inspection tour of their paved and dirt roads. He was much impressed with the methods of construction and maintenance employed by the California road men.

Tom Reavis, chairman of the board of county commissioners of Archuleta county, was in Denver in July and completed arrangements for the purchase of a Wehr grader from the Wilson firm. This grader is propelled by a Fordson tractor. Eleven of these machines are now in use on Colorado roads, being used in maintenance work.

"The Look Around" is out again. Publication of this most interesting house organ of H. W. Moore & Co. was resumed this month. For something like a year "Look Around" has remained in a state of coma, and road men of the intermountain territory are glad that it has come to life again.

Harold W. Moore, president of the Moore firm, is the editor. Tom Flynn is listed as the assistant editor, "practical thinker" and "his driver". The publication office is 1761 Wazee street, Denver,

to which all communications should be addressed.

"It is with a feeling of profound satisfaction that we resume publishing the 'Look Around'," says the editor. "We admit frankly that this Western Empire with its undeveloped resources, its fighting men, its far-seeing leaders has gripped our imagination from the day thirty years ago when we first set foot within its bounds.

"We hope that we will be able to make some contribution to its marvelous development.

"We do not claim, however, that our desire to again publish the 'Look Around' is governed entirely by altruistic motives; nor are we foolish enough to believe that printers' ink and protestations are a satisfactory substitute for good service and dependable merchandise."

That future issues of "Look Around" will be as interesting as the August number, for truly it is a bang-up set-up, is the wish of Colorado Highways.

A device that will eliminate the chatter bumps from roads is the claim made for the Michigan maintainer, which is now handled in the intermountain territory by H. W. Moore and Co. of Denver and Salt Lake City. The device is designed for attachment to any make of truck. Attachment is made possible by two hanger arms bolted to the frame of the truck near the center. Five double-coil springs made of oil-tempered steel provide ample tension to hold the blade in its proper working position.

It is claimed that one motor truck equipped with this device will plane the road, obliterating chatter bumps, gathering loose gravel from the shoulder and spreading it over the road in one continuous operation. Also the machine can be used for finishing sub-grades and for leveling gravel on new roads, according to the claims of the manufacturer.

Several of the machines have been purchased by Colorado counties for use on maintenance patrols.

Paul V. Jenness, the Colorado distributor for F.W.D. trucks and parts, and also managing director of the Colorado Haulage Co., was a visitor in Denver last week. Mr. Jenness makes his headquarters in Colorado Springs. At present the Colorado Haulage Co. has the contract for the hauling of all materials on the paving project on South Broadway in Denver. This is one of the largest paving projects let on contract by the City of Denver, consisting of over four miles of asphaltic concrete pavement. The Standard Engineering Co. are the contractors. Contract for the hauling of all aggregates for the paving of several blocks in Golden, Colo., also is held by the Colorado Haulage Co. The Golden paving will consist of asphalt with a slag base.

H. W. Moore & Company have just received a shipment of three-up hitches, recently perfected by the Watson Products Corporation, Canastota, New York, for use with Watson Dump Wagons.

This hitch has proven most successful in grading work, and where rough going is encountered.

The U. S. Indian Service has recently purchased a Northwest dragline excavator for use on a project at Isletta, N. M., the sale being made through the Stearns-Roger Mfg. Co. of Denver. Three of these machines are being used on big projects in Wyoming, one by Tim Lawlor on the North and South railroad; one by the Burlington at Guernsey and one by the J. G. White Construction Co. at Rawlins.

A combination scarifier, road roller and tractor is the latest power unit brought out by the Avery Company. It is designed for the heaviest road work. The scarifier attachment can be raised or lowered at the will of the operator and the machine used as a roller. Tests show that the machine will make over one mile of old road per day, according to L. L. Clinton, president of the Avery Machinery Co. of Denver.

Austin Pup! That's the name given a new 3-ton, 3-wheeled power roller put on the market by the Austin Mfg. Co. It is designed to meet specifications for concrete roads in several states.

The new machine is a combination of the Fordson tractor and the Austin Gas Roller. It is used in preparing subgrades and is the first three-wheeled power roller weighing less than seven tons put out for road work.

A special circular illustrating the construction and operation of the Austin Pup in detail is being distributed by H. P. Wilson and Company of Denver

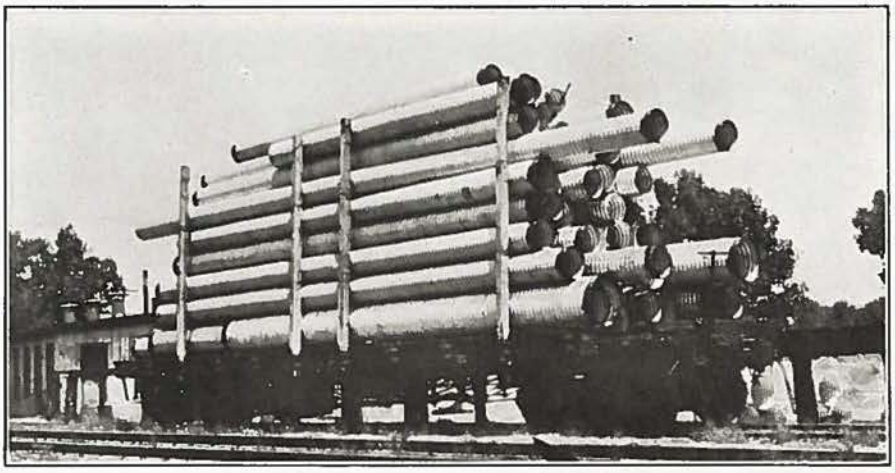
The United States Forest Service uses

Keystone Culverts

KEYSTONE COPPER STEEL

□ □ □

Carload shipped to U. S. Forest Service Project in June 1923



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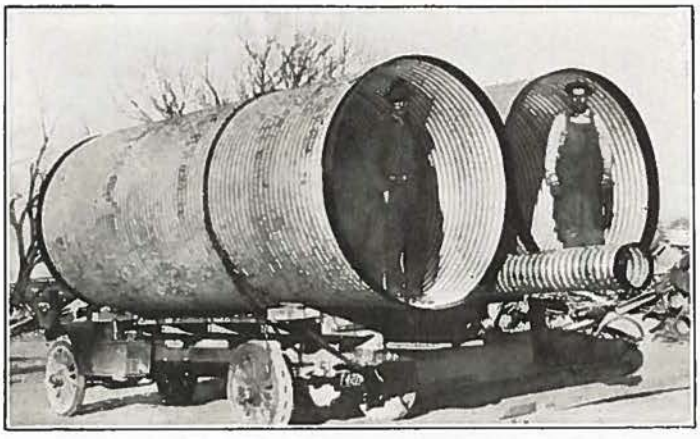

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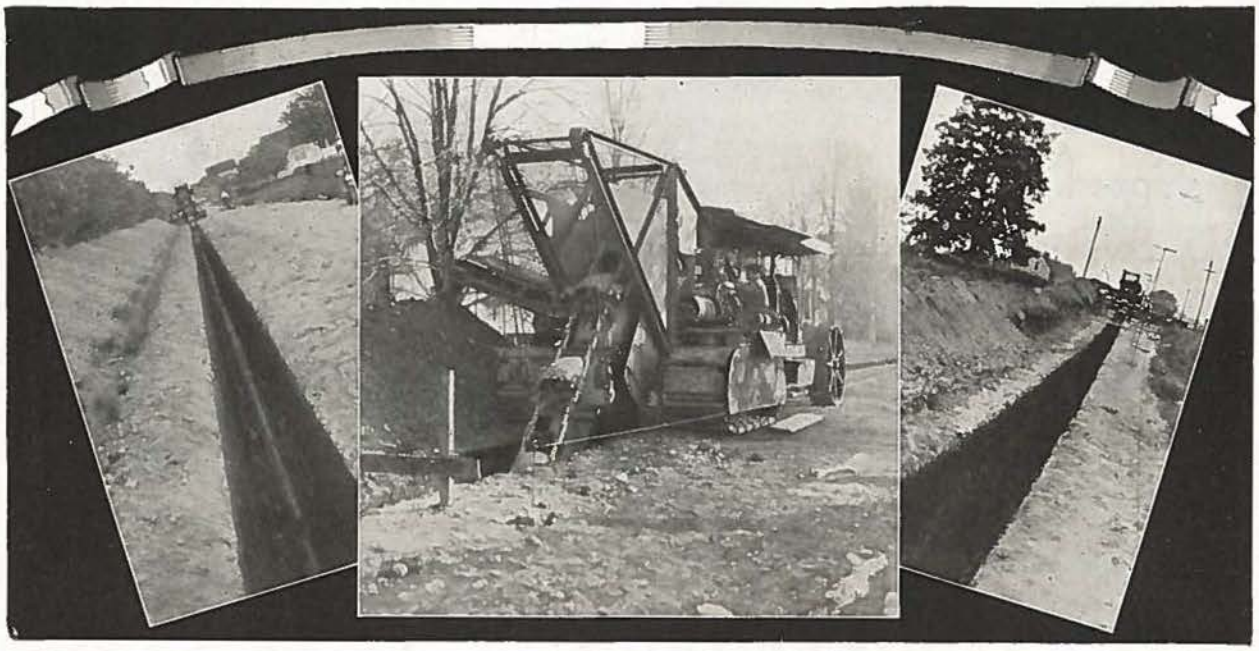

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BUCKEYE EXCLUSIVE
New Rotary Auxiliary Cutter to Make Wider Trenches.

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Instantly shifted to left or right discharging dirt to either side of the trench.

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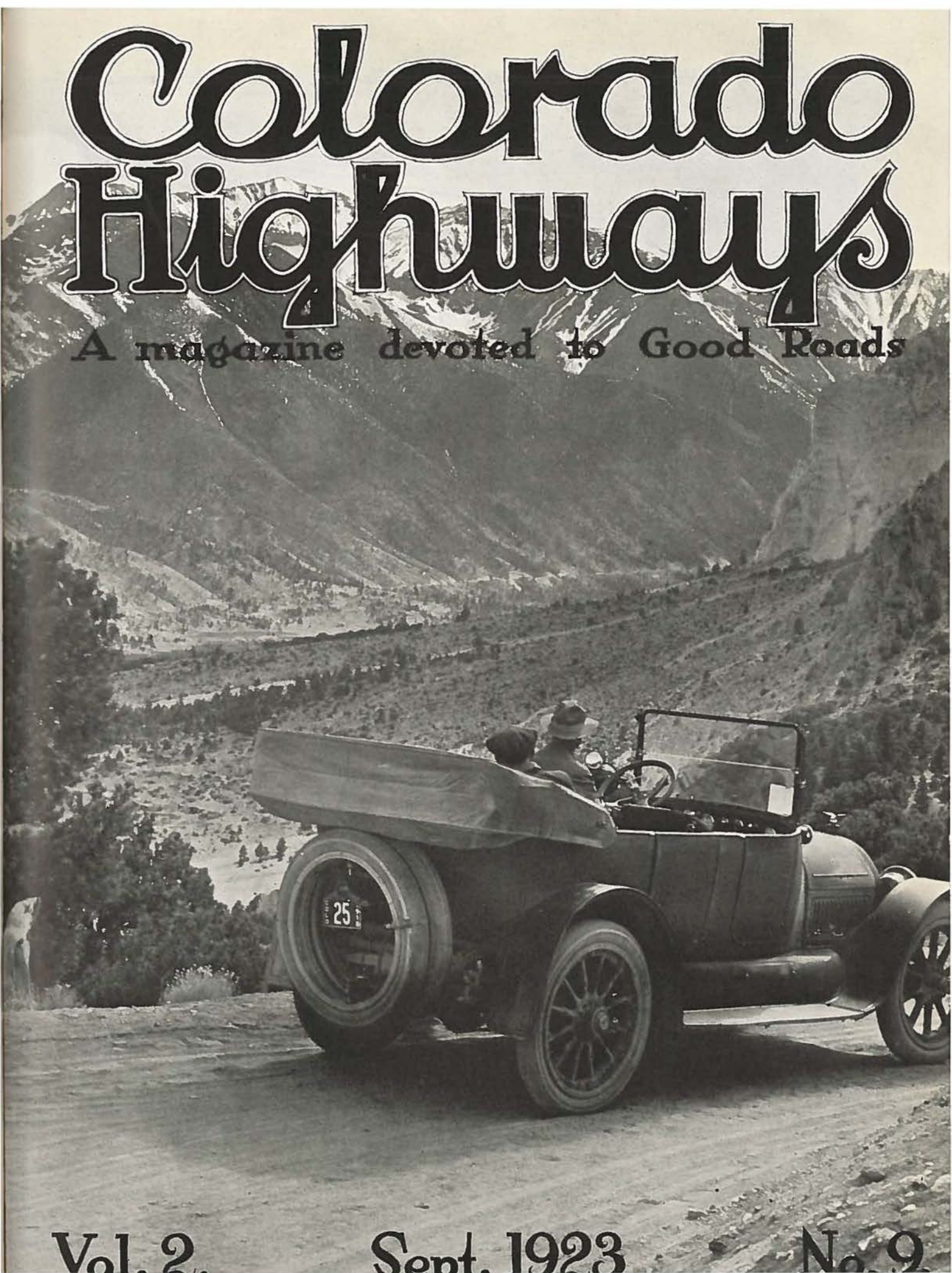
Colorado Highways

A magazine devoted to Good Roads



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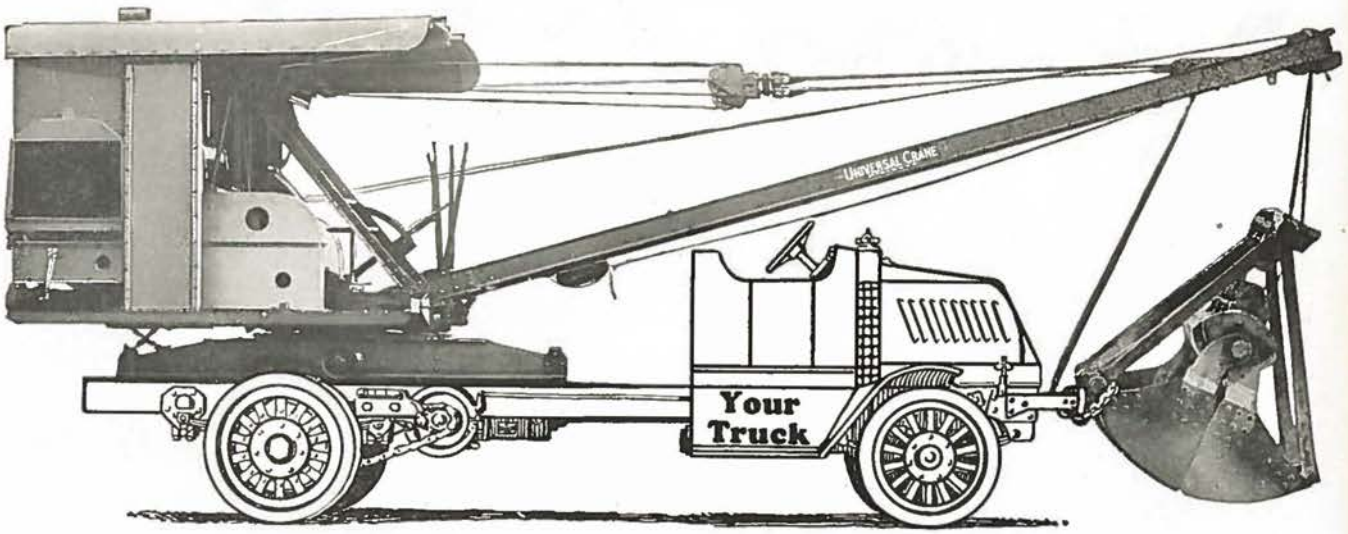

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Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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OLIVER T. REEDY,
Senior Assistant Engineer.

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10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

From the heights above Chalk Creek Canon is shown Mount Antero in Chaffee County on the cover picture of this month's issue of Colorado Highways. Mt. Antero rises to a height of 14,245 feet and is one of the highest peaks in the State. It may best be seen from the highway between St. Elmo and Buena Vista. With Mt. Shavano, the "college group", consisting of Mt. Princeton, Mt. Yale and Mt. Harvard, and Mt. Antero, Chaffee County boasts of five of the very highest mountains in the west. They form a range unsurpassed in grandeur and scenic beauty.

Colorado Highways
"BETTER ROADS"
VOLUME II. SEPTEMBER, 1923. NUMBER 9.

Storms Cause Heavy Road Damage

Damage running well into the hundreds of thousands of dollars was done to highways of the State by the unprecedented rains during July and August. Not a section of the State escaped entirely the destructive rains which fell almost continuously from early in July until late in August, though the western slope, according to reports received at the office of the state highway department, did not suffer quite as heavily as that portion of the state lying east of the Rocky Mountains.

Records of the weather bureau for Colorado show that not in fifty years has so much rain fallen as in 1923. Streams which in normal years carry only a small amount of water or, during the summer months, are dry, were running bank full during July and August and repeatedly broke over the banks. Dry washes, time and again, were turned into raging torrents. Culverts designed to carry a flow of water which represents the average of fifty years proved inadequate.

That the state's highways should suffer under these abnormal conditions is natural. In many places where streams left their banks, washouts occurred. In others the enormous volumes of water rushing from the hillsides overflowed the ditches along the roads and tore deep gullies in the road bed. Elsewhere the flood waters carried away bridges. Hardly a day passed that some damage was not reported from some section of the state.

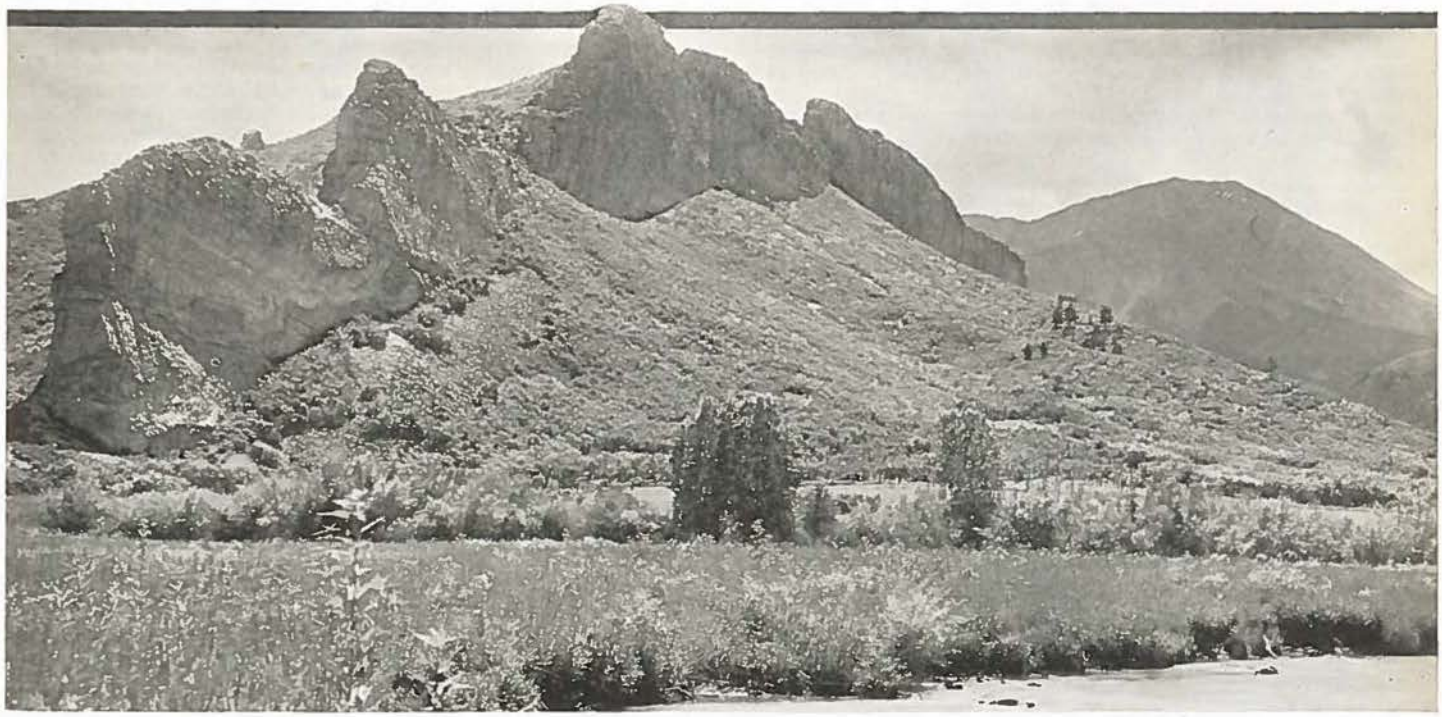
The flood conditions demonstrated the efficiency of the present state highway department organization in general and of the maintenance division in particular. The maintenance division met the severe test to which it was put in a manner of which the state can be proud. No matter what the damage done to a state highway the men of the division, assisted everywhere by the county commissioners and the county highway forces, succeeded in opening every principal artery of travel.

Washouts were repaired without loss of time, even though the repairs may have been only temporary. Timber bridges were thrown across streams and gulches in many places where the permanent structures had been swept away by flood waters. At no time was traffic over any main highway interrupted for any considerable length of time. The work of the maintenance forces not only won the praise of the people of the state but also of the thousands of tourists who were visiting Colorado at the time that the floods were at their worst.

An interesting feature of the flood was the fact that not a single one of the bridges constructed in recent years by the state highway department was lost. All of them withstood the terrific strain to which they were subjected. What bridges were lost were structures put up years ago or small timber bridges.

Exactly what damage was done by the flood waters will not be known for some time. Some highway officials estimate that the loss to state highways and county roads will reach, if not exceed, the $1,000,000 mark. The damage was especially great in northern and eastern Colorado. Estimates from Weld and Larimer counties place the damage in these two counties at not less than $75,000 each.

Highway department officials are confident that, unless tthe heavy rains should continue, the maintenance division, with the aid of the county organizations, will have repaired the greater part of the damage done by water by the end of September and that the roads will be in as good shape for the hauling of crops as they were before the unprecedented series of cloudbursts and rain storms began.



Section of Stonewall and Western Spanish Peaks, south of La Veta, showing Cuchara Creek, near Cuchara Pass.

Asphalt Men Discuss Road Problems

Various Phases of Pavement and Highway Construction Considered by Experts at Two-Day Conference in Denver

PROBLEMS confronting the asphalt industry of the United States were discussed at a two-day regional conference of the Asphalt Association held in Denver on August 20 and 21.

Engineers from nearly every section of the country, from New York to the Pacific Coast, some of them occupying high positions in the technical world, read papers relating to various phases of asphaltic concrete paving.

These papers ranged from asphalt as a paving material to essential test data. Discussions that followed the reading of these papers brought out a large number of helpful suggestions from some of the engineers, gained from actual experience in city paving and highway construction.

More than 200 delegates attended the conference, a majority of them from the western states, and it was the paving problems as they found them in this territory that occupied the attention of the conference most of the time.

Among the speakers were: J. R. Draney, president of the Asphalt Association; Fred G. Simons, state highway engineer of Oklahoma; John B. Hittell, chief engineer, board of local improvements, Chicago; Charles Shultz, city engineer, Tulsa, Okla.; C. P. Jensen, county surveyor, Fresno, Calif.; John A. Griffin, city engineer, Los Angeles; A. K. Vickery, city engineer, Denver; Roy M. Green, president, Western Laboratories; G. W. Craig, district engineer, Asphalt Assn., Chicago; and Dr. S. H. Diggs, chief research chemist, Midwest Refining Co., Casper, Wyo.

It was the second conference of its kind held in this country, the first having been held last year in Atlanta, Ga. President Draney explained, that while the association was national in scope, the design of the annual conferences is largely sectional. In this way the national body may take up the problems of the respective areas and relieve the members from long travel.

In opening the sessions President Draney spoke as follows:

"The highway departments stand among the foremost in importance in every state of the Union. During the past decade great strides have been made in road construction and we find that great engineering skill has been devoted to that end.

"This conference has been called for the purpose of discussing various problems that confront the engineers in their work of laying pavements on city streets and the country roads. It is the sincere hope of all concerned that great good may be accomplished along these lines at this conference."

In further explanation of the object of the conference, J. E. Pennybacker, secretary of the association, said:

"To treat with road problems as they affect asphalt is the principal reason for this meeting. Improvement of methods and the solution of problems that have not been dealt with exhaustively is our aim."

Development of methods whereby local materials may be used in the mixture of hard surfacing for roads in isolated sections was advocated by Engineer Simmons of Oklahoma. He was the first speaker on the program. Mr. Simmons pointed out that in this manner large sums of money could be saved the taxpayers in reduced transportation costs on materials that now must necessarily be shipped from distant points.

He declared that the use of local materials, especially in most of the western states where long hauls are frequent, would go far toward satisfying the urgent demand for better roads in the farming districts. He was of the opinion, based upon his experience in constructing highways in Oklahoma, that some sort of asphaltic mixture with a local aggregate, would provide a smooth surface and act as a protection to roads carrying only light traffic. Feeder roads to the main highways, he said, could be surfaced in such a manner at a minimum of expense, which would answer the purposes of light traffic until such time as the number of vehicles increased to justify the higher types of surfacing.

Methods employed in the laying of asphalt pavements in Chicago and the results obtained, were explained by Engineer Hittell in his illustrated talk. Also interesting to engineers from other sections of the country was the address of Engineer Jensen on the methods used in Fresno county, Calif., which enjoys the distinction of being one of the largest users of asphalt on roads in the country. His talk which was illustrated with stereopticon slides related to "asphaltic concrete base". Mr. Jensen advocated the use of asphalt "clear through."

Highway Engineer Borden of Nevada was of the opinion that the ideal road is one that gives the least wear on cars and tires. The latter expense he said was by far the largest item of cost in transportation.

It was suggested in the open forum that the national organization appoint a committee to devise improvements and economies for roads in remote rural sections, thereby giving aid to the development of the necessary feeders to the main-traveled highways.

In the absence of R. G. Smith of California, who was scheduled to talk on the subject of asphalt construction on alkali soils, Engineer G. W. Craig and Dr. S. H. Diggs, detailed some of their experiences in the handling of this problem. It was explained that the damage from alkali to cement structures was caused by the soda of the percolating salts replacing the lime of the cement. A coating of asphalt, it was said, provided the most effective remedy against this evil.

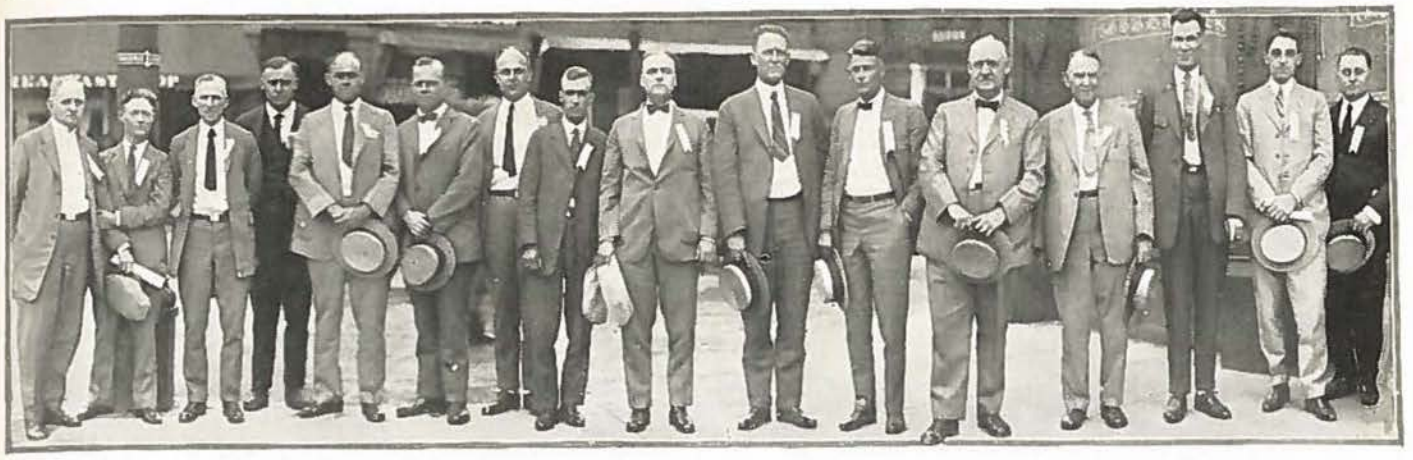
Hale Smith, secretary to Gov. William E. Sweet, welcomed the delegates to Colorado. The governor had been expected to address the conference, but was unable to attend because of official business that could not be laid aside.

The importance which Gov. Sweet attaches to good roads, said Mr. Smith, was evidenced in the fact that the governor spends from 15 to 20 per cent of his official time in conferences with highway executives of this state.

Likewise he pointed to the governor's long record as an ardent advocate of better roads, and said that it was with much regret that the state's chief executive found it impossible to speak before the conference.

It was charged by Roy M. Green of the Western Laboratories that the action of city councils in insisting upon dictating the types of pavements that shall be laid has cost the taxpayers of a large number of cities throughout the country huge sums of money. Selection of types of

Delegates who attended Asphalt Conference at Denver in August.



Another Group of Delegates to National Asphalt Conference.

pavements, he declared, should be left to the best judgment of the experienced engineer.

One method of determining how much money should be expended on a given road is by computing the amount of gasoline tax that is produced by the vehicles passing over the road, said Secretary Pennybacker. In this way the road could be capitalized at so much per mile, thus giving a basis of determining the amount it would be justifiable to spend on it. Of course, there are exceptions to this rule, he said, such as historic roads maintained for sentimental reasons and other highways which must be improved as a part of a system of connecting roads.

A fashion show and tea was the main entertainment feature provided for the ladies, while an automobile trip over the Denver city streets and through the mountain parks, with a dinner at Hosa Lodge on top of Lookout Mountain was enjoyed by the delegates attending the conference.

ASSOCIATED CONTRACTORS START TRI-STATE BRANCH IN DENVER

During the past month a unit of the Associated General Contractors of America was established in Denver. This unit comprises the states of Colorado, New Mexico and Wyoming. It will be known as the Rocky Mountain branch.

Alex Simpson, Jr., a prominent Denver contractor, is president, while Maj. W. R. Richards, is executive secretary. General offices are located in the Architects and Builders' Exchange Building, at 1735 Stout Street, Denver.

Other executives of the new branch are: Maurice Levy, vice-president; Fred C. Dreher, secretary and treasurer, and the following directors: F. J. Kirchhof, J. Fred Roberts, J. Everett Young, C. S. Lambie, Peter Seerie, all of Denver, and Fred Bullen, of Pueblo.

To obtain the highest standards of materials, equipment and ethics and to promote a better feeling between contractors, is the purpose of the organization. Fourteen standing committees are maintained by the national body, covering contracts, material, labor, publicity, methods, membership, executive, legislation, transportation, ethics, insurance, codes, finance and construction development.

The national body was organized in 1918 with fourteen members. Today it has 2,000 members representing 365 cities in forty-five states. Major Richards who will direct the activities of the Rocky Mountain branch, was formerly connected with the J. G. White Engineering Company of New York. During the war he was in charge of construction in several of the large aviation fields.

President Simpson is a director in the national organization and Mr. Kirchhof is a member of one of the national committees.

Establishment of a trade school in Denver is proposed. Several of these schools are now operating in other parts of the country. All have the co-operation of the trades unions. Weekly luncheons in Denver is to be one of the social features of the new branch.

SNOW AND RAIN DELAYS WORK ON ROAD TO TOP OF MT. EVANS

First snow of the season fell on Mount Evans on August 20, according to a report brought to the State Highway Department by John P. Donovan, engineer in charge of construction in Division No. 1.

Capt. Donovan and a party of engineers were caught in a severe snow storm on Mount Warren on this date. About three inches of snow was reported near Summit Lake, where a crew of workmen employed by Contractor Ed. Honnen, of Colorado Springs, is now engaged in excavation work.

This was the earliest date on which snow has been reported on Mt. Evans in several years. Work on the new four-mile stretch of roadway to the summit of Mt. Evans has been seriously delayed all summer by heavy rain falls. Reports of the engineers indicate that the work to Summit Lake, where the present project will end, will not be entirely completed this year.

However, every effort is being made by the contractor to get as much of the road completed as possible. In pursuance of this effort, five crews of workmen are employed at different points on the four-mile stretch.

Plans also are being made to place maintenance crews on the Mt. Evans drive early next spring in order to put the highway in the best possible condition for the heavy summer traffic. Each year finds a large increase of traffic over this wonderful scenic road, more than 500 cars being reported as having traveled the highway in one day this year.

CONTRACTORS ON BRIGHTON PROJECT MAKE RECORD FOR CONCRETE PAVING

In keeping a weather eye on the several concrete paving projects now in course of construction in different parts of the states, highway engineers find that some contractors seem to have an uncanny way of getting their jobs executed on record time.

Such a contracting firm is White and Johnson, who for more than a year have been laying cement pavement on the Denver-Greeley highway, south and north of Brighton.

At the present time this firm is completing a concrete project south of Ione. Within three weeks they expect to move their central mixing plant onto a project which begins at the town of Ione and extends four miles north to the paving at Platteville.

The grading and drainage structures, including corrugated culverts, on the Ione project have been completed. One carload of reinforcing steel and two carloads of culverts, the latter of the copper-steel type, will be used in the project.

Efforts are being made by the contractors to complete their work before the beet-hauling season starts at Ione. As the line of the new road north of Ione will not interfere with traffic moving over the old road, an excellent detour will be provided.

LINDSEY USES THIRTY-FIVE TEAMS ON SANTA FE PAVING

Ed. Lindsey is engaged with thirty-five teams in making the sub-grade for two miles of paving east of Pueblo on a contract for concrete paving made by R. A. White, contractor, with the State Highway Department.

Mr. White expects to start pouring concrete on the project in a couple of weeks. With the completion of this project there will be eight miles of pavement extending east on the Santa Fe Trail from Pueblo, reaching a point near Vineland in the Arkansas Valley.

In a few years it is expected that the entire distance from Pueblo to La Junta will be paved with hard surfacing, at least this improvement forms a part of the general program of the State Highway Department.

Gasoline Tax To Be Distributed

The constitutionality of the statute authorizing the collection of two cents a gallon on gasoline used for propelling motor vehicles was upheld by District Judge C. J. Morley in the Denver district court last month. Judge Morley upheld a demurrer filed by Attorney General Russell W. Fleming to a suit brought by the Navy Gas & Supply Company against James Duce, state oil inspector, to enjoin the latter from collecting the tax. He followed this action by ordering the suit dismissed.

In his decision Judge Morley expressed the opinion that the third section of the statute, which provides for the division of the gasoline tax on an equal basis between the State Highway Department and the counties on a highway mileage basis, was unconstitutional, but, reports to the contrary in the daily press notwithstanding, Judge Morley did not hold this particular section to be invalid. The statement regarding section three, Colorado Highways has ascertained from the court records, was simply the unofficial expression of Judge Morley's private opinion.

Reports that were circulated throughout the state following the announcement of Judge Morley's opinion, that there would be no division of the gasoline tax collected and that the entire proceeds of the tax would be turned into the state highway department and expended by the latter are without any foundation whatever.

All counties having state highways within their boundaries—that is every county in the state except Denver—will receive one-half of the gasoline tax when the next distribution is made, unless some one should, in the meanwhile, go into court and enjoin the state auditor and state treasurer from making the distribution and there is little likelihood that this will be done. No state official is going to question the right of the general assembly to order the distribution of the tax.

Judge Morley based his opinion that the third section is invalid chiefly upon the fact that on its face the section is in violation of that provision of the state constitution which forbids the general assembly to levy taxes for the benefit of any county. Many lawyers believe that the supreme court will not sustain the judge's opinion should the provision be attacked in some other suit. These lawyers contend that the gasoline tax is simply an excise tax and not a general tax.

From all appearances the opponents of the two-cent gasoline tax will make no further effort to evade the payment of the tax. They appear satisfied that the law is constitutional and that they cannot escape payment of the tax. This became apparent when a few days after Judge Morley had announced his decision the very company which had brought the suit paid to the state oil inspector the money it owed on several shipments of gasoline.

It is gratifying to note that the biggest oil companies paid the tax without any hesitation whatever when the two-cent tax law became effective on August 1. As a matter of fact two of the biggest companies were represented at the hearing before Judge Morley by an attorney who appeared as a friend of the court and supported the contentions of the attorney general.

Collection of the two-cent tax is proving much easier than the collection of the one-cent tax proved during the past four years. This is chiefly due to the fact that the new law contains a provision authorizing the appointment of a receiver for any oil dealer who is delinquent in the payment of the tax. Appointment of a receiver is something that no dealer appears to relish.

In conjunction with the oil inspector, Attorney General Fleming is doing everything in his power to collect the gasoline tax due under the old law. Suits asking for judgments aggregating more than $100,000 have been filed in various district courts of the state against delinquent dealers. Unfortunately the stringent provisions of the present law do not apply to taxes due before August 1, and their collection, for that reason, is much more difficult.

Colorado Highways wishes to assure all county commissioners and others having to do with the making of budgets for road building and maintenance purposes when they meet this fall to allocate funds, they may safely count on receiving their share of the gasoline tax money. Roughly speaking they may figure on receiving double the amount which they received when the tax was limited to one cent. If anything, there will be a slight increase in the amount turned over to the county because of the increase in the gasoline consumption and because of the prompter collection of the entire tax.

STEEP GRADE OVER STANLEY HILL IN BOULDER COUNTY ELIMINATED

At last one of the worst grades on the South St. Vrain Canon has been subdued. Work on Stanley Hill, located south of Allen's Park has been completed. For several months a large road crew has been employed on the project, which was considered one of the most important undertaken by Boulder County in several years.

Plans are said to be under way for the extension of the road into Allen's Park next summer. From this point the road leads into Estes Park and forms one of the most picturesque routes to the Rocky Mountain National Park.

At the foot of Stanley Hill is one of the finest pieces of dry rock masonry to be found in the state. It makes a solid rock wall nearly fifty feet high. This wall was constructed in four weeks with six men on the job. The new road over Stanley Hill connects with the old road in the gnarled forest. It skirts the outside of the hill and when entirely finished will give a wonderful view up Peaceful Valley to the Arapahoe Peaks and Mt. Audubon.

The old road now goes through the trees, cutting off this fine view of the range. Double tracked for the entire distance, the new roadway is only six per cent in grade, making it easy for the smallest cars to negotiate.

In passing it might be added that Boulder County now can boast of the best roads in northern Colorado, due to a very ambitious road maintenance program carried on during the entire summer. This program will be continued through the winter months, Boulder County road officials say.

NEW PAVING PROJECT PLANNED NORTH OF BROOMFIELD CUT-OFF

An additional mile and a half of concrete pavement on the North and South highway was completed in August and opened to traffic. This stretch extends north from Broomfield toward Lafayette. It extends to the top of what is known as Goodhue hill. In part the highway has been relocated. By running the new road parallel and east of the Denver and Interurban tracks from a point where the highway enters Broomfield two dangerous railroad grade crossings have been eliminated.

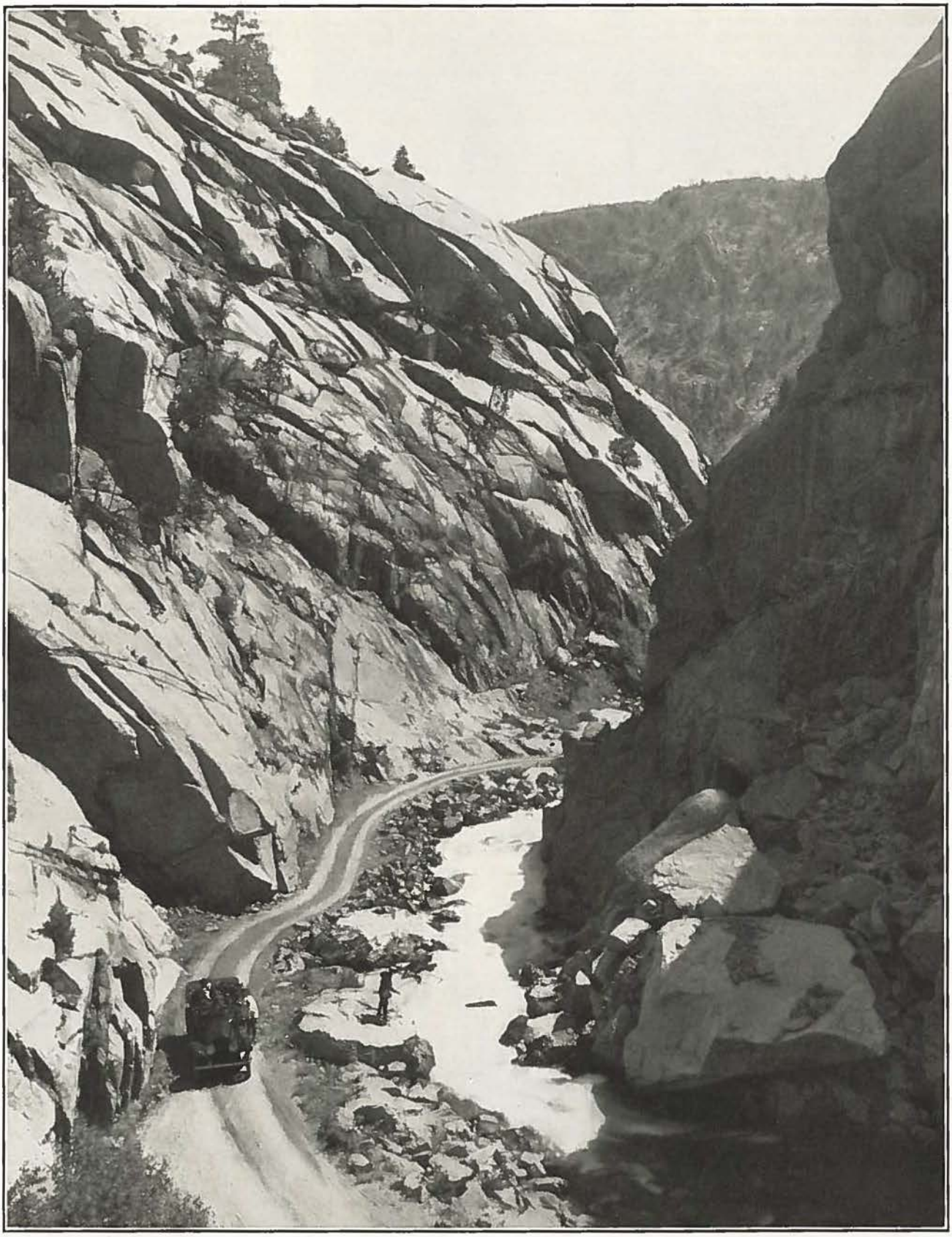
Plans completed by the highway department call for the elimination of Goodhue hill. The road, instead of winding on the side of the hill, will be run straight across the hill. The plans call for a big fill on the northern slope of the hill. The filling will be done during the fall and winter and during that time traffic will be permitted to pass over the highway because the traffic will not interfere with the work.

When the fill has been completed and work is started on the road from the foot of the hill toward Lafayette the highway will be closed and the present detour put to use again.

PUEBLO COUNTY INSTALLS SWINGING BRIDGES FOR SCHOOL CHILDREN

Pueblo county may install swinging foot bridges for school children where the flood of June, 1921 swept away bridges and compel the children to walk great distances to cross streams. The structures would be unique, serviceable and low in cost. One end of the bridge would be pivoted to a concrete abutment. The other end would rest on a suitable support at normal times and would be fastened to a cable which would extend above the bridge to a tree or other anchor on the opposite side. When flood waters began to pile debris against the bridge the force exerted would swing the bridge to one side in the same manner as a gate.

The idea was the outcome of a novel idea used in saving temporary bridges in time of high water. Since the flood of 1921 small wooden structures have served as crossings on many roads over creeks. They do not reach from bank to bank but span the actual stream. They are not held in place by piling but rest on the river bed. A heavy cable extends to an anchor in the bank and when high water comes down the channel the cable holds the bridge while the water pushes it to the bank out of danger. A team of horses then pulls the structure back when the water recedes.



South St. Vrain Canon above Lyons, showing new improved highway forming one of the three entrances to Estes Park.
Photo by Denver Tourist Bureau

Beauties of the Western Slope

BY CHAS. RUMP,
Grand Junction Chamber of Commerce

TO have really seen Colorado constitutes a chapter in one's life which tells of an experience never to be forgotten, but the person who has never been OVER THE RANGE has not seen Colorado. Year after year tourists from all parts of the world come to Colorado literally by the hundreds of thousands but many go away from this Wonderland of America without having enjoyed the best that this great state has to offer—the beauties and splendors of the Western Slope of the Continental Divide.

Every lover of high mountains has known of Pike's Peak from his infancy, yet there are 26 other mountains in Colorado that are higher and 16 of which lie in the region described in a booklet recently issued by The Grand Junction Chamber of Commerce. The very apex of the Rockies, Mount Albert, 14,420 feet, with its twin, Mt. Massive, 14,404 feet, stand snow-crowned sentinels over the majestic Continental Range. Of the 59 named highest peaks of the United States, exclusive of Alaska, that exceed 14,000 feet in elevation, Colorado has 46, most of which are located on the Western Slope. The Eagle River Canon with its town on the mountain top; the castellated and rainbow-hued Glenwood Canon of the Colorado with its marvelous hanging lake; Glenwood Springs with its health-giving mineral hot waters and wonderful open air pool; the great oil shale mountains; Grand Mesa with its hundreds of lakes in the clouds; the Colorado National Monument with its sandstone monoliths defying imagination—all of these and scores of others, with a list that is endless, await the recreationalist on his trip beyond the pass.

There is no interest of humankind that is not found flourishing here—education, agriculture, commerce, mining, recreation and beauty.

See Colorado first, and to do so required a discovery of the vastness and greatness and the joy of living in the great western section of the State of Colorado.

Many thousands of tourists and home-seekers that come to Colorado annually do not realize that this vast empire exists, and do not realize that the highways leading over the Continental Divide are as safe as the boulevards in their own home towns.

Independence Monument.

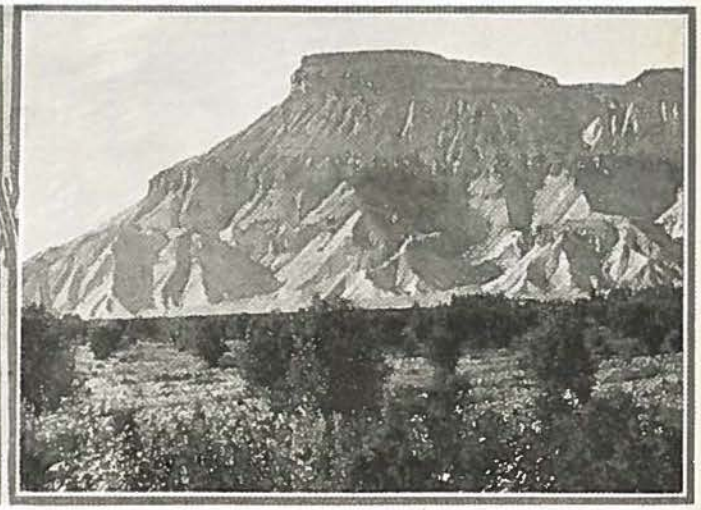
Leaving Colorado Springs you pass through the wonderful Ute Canon, across the South Park over the Mosquito Range, then by way of Buena Vista and Leadville you cross over Tennessee Pass at an elevation of more than 10,000 feet. The next point of interest is Battle Mountain and the state highway at this point has been made one of the safest spots on the entire road. Leaving Battle Mountain you travel down the Eagle River Valley to where the river joins the great Colorado. You then follow the Colorado River down through some of the most wonderful scenery to be offered anywhere in the state. No trip would be complete without stopping at this point, for a plunge in the wonderful Glenwood pool. Following down the Colorado you pass through, near De Beque, some of the largest oil shale deposits in the United States, and suddenly, coming out of this rugged country, you enter the great valley of the Colorado and the surprise and joy that overcomes you with the view easily repays you for the entire trip.

Spread out in the panorama before you are more than 9,000 acres of orchard and more than 100,000 acres of irrigated land. This valley has an elevation of about 4,500 feet and is completely surrounded by mountains and mesas, many very rugged.

A short run of 12 miles brings you to Grand Junction, the metropolis of the Western Slope of Colorado. This city is located in the very center of the "Garden of the Rockies" and on every hand new and interesting adventure awaits you.

Grand Mesa is only three hours drive from the city and this mountain is the largest flat-topped mountain in the world. It has an elevation of more than 10,000 feet, comprising more than 750,000 acres, with more than 200 lakes stocked with trout—more lakes and reservoirs, in fact, than in all other National Forests combined. Every kind of recreation can be found on this mountain. There are several rustic hotels and numerous cabins located among these lakes; or if the traveler desires, he may pitch his camp in any spot that he may wish. The lakes on Grand Mesa have always been noted for their excellent trout fishing—few places in Colorado today can boast of such fishing as is found here.

Trout Lake on Grand Mesa



Mt. Garfield Overlooking Peach Orchard

Another point of interest that everyone should see is the Colorado National Monument. The entrance to this monument is only one-half hour's drive from Grand Junction. Most gorgeous of all National Monuments, comprising about 14,000 acres. As becomes its name, the predominant color is red—not one rigid color, but an ever-changing, inimitable blending of flaming scarlets and crimsons and russets and maroons and those thousands of other tints and tones which can be found nowhere but in Nature's pallet. Deep purples and ruddy carmines melt into shining copper and dull bronze as the shadows of the canon or the shafts of Aurora gain the mastery.

It is not, however, the brilliancy of coloring alone that makes the Monument a delight to travelers. The rocks found there are of such grotesque magnificence, they present such a variety of picturesque forms, they offer such an abundance of cliffs and buttes and towering monoliths, of stately columns and spires and giant figures, sometimes appearing almost as if made in human likeness, that the eye, still confused by Nature's warmth of coloring, can scarcely mirror the prodigality of her sculpture. To one following the "Trail of the Serpent" there appear bold monoliths whose walls of sheer precipitancy offer no means of ascent. Independence Rock, one of the huge monoliths, a giant among giants, towers 800 feet from the bottom of the canon.

If you return to the Eastern Slope, you make your return trip by the way of the Rainbow Route, passing through the towns of Delta, Olathe, and Montrose. At Montrose your trip would not be complete without taking a day's side trip to Ouray, where you will find the wonderful San Juan range, known as the Switzerland of America. Returning to Montrose you go up the Gunnison River, where you can stop off at hundreds of places to enjoy trout fishing. Leaving the town of Gunnison you start the return climb over the Continental Range by the way of Monarch Pass. This pass rises to an elevation of over 11,000 feet and its roadbed is like a boulevard the entire distance. At the summit of Monarch Pass a stop should be made to take in a panorama view of Western Colorado and the memory of this sight will remain with you forever. Descending from Monarch Pass you pass through Salida down the Arkansas River through Canon City and then back to your destination. Upon your return you will have completed the most wonderful scenic trip that is possible anywhere in Colorado. You will have found that good hotel accommodations were awaiting you at every stop, or if you have camped along the highway that every campsite has been one long to be remembered.

Rings of stone arranged by Arapahoes to hold down their tepees in the Cache la Poudre Canyon out of Fort Collins, are viewed with interest by Colorado tourists who visit Rocky Mountain National Park.

Here's to the memory of Adam Ring,
Of Road Hogs Adam was the king,
Until one day he met a truck;
Now Adam lies beneath the muck.

Osgood Steam Shovel Moving Rock on Project 157-B Between Buena Vista and Granite

Counties Save $20,000 Yearly on Insurance Thru Ruling by Attorney-General Fleming

Some $20,000 will be saved the individual counties of the state through an opinion of Attorney General Russell W. Fleming, rendered at the request of the state highway department. The money represents the aggregate of premiums paid into the state compensation insurance fund to insure life and limb of the workmen employed by counties to do state highway work. The saving to each county varies according to the amount of work done by a county for the highway department.

In practically every county of the state —Denver is the only exception because it has no state highways—the state highway department utilizes the county road forces to construct and maintain state highways. In many counties the local organization is taken over by the state highway department to carry out what is known as state projects. In every county the state and the county administration jointly bears the maintenance expense, though men employed by the counties do the actual work.

In both construction and in maintenance the state highway department is the employer. The counties simply furnish the men and the machinery, though in maintenance work the counties and the state must be considered as joint employers because both share equally in the pay.

Under the workmen's compensation act every employer is required to insure his employes. The cost of insuring their road employes to the counties is $2.01 for every $100 of payroll. With more than $1,000,000 being expended on state projects the cost of this insurance to the counties exceeds $20,000 a year.

Realizing that an injustice was being done the counties, the highway department heads asked the attorney general for an opinion, advancing the belief that the burden of paying the premiums should fall on the state and not on the counties. The officials submitted that the state was the real employer and that the counties, in constructon work at least, are simply acting as the department's agents.

After a thorough examination of the law the attorney general has held that the contention of the highway department is correct and that the counties should be relieved from all premium payments, except one-half of the premium due on the payroll of the men engaged in maintenance work because in that class of work the county is also an employer.

Arrangements are now being perfected with the management of the state compensation insurance fund by which the latter will include the premiums required to insure men doing road work for the state in the appropriation bill which is submitted every two years to the General Assembly, the latter appropriating the money necessary to insure all state employes for the current biennial period.

As soon as the details have been worked out the boards of county commissioners of every county will be notified and requested to keep separate payrolls for construction and maintenance work, in order that the amounts due the insurance fund from the state and from the counties may be readily ascertained.

Relieving the individual counties of the premium payments is but one instance of the good feeling that prevails between the counties and the highway department. The highway department's action cannot help but increase this feeling, especially because the action was purely voluntary on the part of the department heads.

Of the 181,799,997 acres included within the boundaries of the National Forests, 20 per cent is accurately mapped, and 56 per cent has been covered by rough reconnaissance, says the annual report of the Forest Service today made public. On about 24 per cent no mapping work has been done.—U. S. Forest Service.

The motorists' nth commandment: "Always keep one eye on the traffic cop."

Gravel Highway Maintenance

BY F. D. COPPOCK,

President, Greenville Gravel Co., Greenville, Ohio.

Editor's Note.—The following article, which recently appeared in the Highway Engineer and Contractor, was written by a man who sells sand and gravel, and is most interesting because of the fact that he went out of his way, spending several hundred dollars in going out of his way to see that his material was used in manner to give the best results.

One of the strong points of Mr. Coppock's argument, is that he does not advocate the use of gravel, except on secondary roads, leaving the main highways for concrete, asphalt and brick. His investigations show that gravel roads may be maintained at a cost of $400 to $800 per mile, depending upon the traffic involved. We are reprinting his argument because we feel that it is worth any man's time to read, whether he is a road official, or just interested in good roads.

The last decade marks an epoch in our national progress. It has been difficult to keep pace with its succession of rapid changes. Wireless, aeroplanes and radio are mystic in their character and revolutionary in their application and yet no one single innovation has so completely revolutionized our mode of living as has the motor-driven vehicle.

The motor vehicle has brought with it serious problems. The tremendous increase in traffic on our highways makes it imperative that consideration be given to our new methods and new economies in order to meet this new emergency. Coupled with the increased tourist traffic is the problem of motorized central schools, motorized mail delivery, motorized bus-lines, motorized parcel post delivery, and motorized trucking,—the latter grown to such an extent as to bankrupt steam and electric lines—changes that have come so swiftly that we have been unable to put our highways in condition fast enough to care for the increased burdens. There is no reason, however, why we cannot readily adjust ourselves to the new condition, and instead of our roads getting worse each season they may, by proper maintenance, be made day by day in every way better and better.

We have, by reason of the nature of our business, made an exhaustive and careful study of the subject of road maintenance under these new conditions. We operate a number of large gravel washing, screening and crushing plants in four different states and are vitally interested in the continued and proper use of gravel as a road material. Our interest, therefore, would seem as an obviously selfish interest, depending as it does upon the successful use of properly prepared gravel for road construction and maintenance, and yet this article is prompted by a sincere desire to help solve in a practical way a vexing problem irrespective of personal interest.

Much criticism has appeared in magazines in recent months complaining about the deplorable condition of our highways, but little has been said in a constructive way. Our object is to point out clearly practical and economical methods of constructing and maintaining gravel roads.

In order to demonstrate to county officials the results and economies to be attained from intensive and full-time patrol, we took over, with the consent of the commissioners of Darke County, Ohio, about seven miles of one of the principal highways of the county and have for the past year maintained the same under what we consider a proper and practical patrol method. Our experience during the past year in maintaining this road, together with our careful observation of maintenance on gravel roads in Indiana and Michigan has placed us in a position to advance suggestions and offer some figures on the costs of such maintenance. We find that we have attained results at the end of the first year which we had not hoped to reach before the end of two or three years. In fact, during the thawing season this spring this road for its full width was in condition to carry the automobile and truck travel without hindrance to the traffic or damage to the road.

The common fault with the old method of road repair is that after the materials have been placed on the road they are left as deposited for the traffic to pack and as traffic follows only the packed wheel tracks, this creates ruts which in wet weather will hold water until it soaks away. This water softens the material on the road and also the sub-grade so that traffic mashes the gravel down, mixing it with the dirt below, causing chuck holes and ruining the road. It is necessary to prevent ruts or depressions which hold water, and this can only be done by dragging often, and by the proper use and kind of surface materials.

Most of the old gravel roads have been built from gravel found in local deposits and while they do not as a rule need rebuilding, they do need a different kind of maintenance. Most of these roads have sufficient material on them so that if the proper drainage was provided and proper forming of the road's surface had, very little repair material would be needed to keep them in good condition. The success of gravel road maintenance depends more on the proper drainage and dragging than on the amount of material used.

The common practice of applying gravel in road repair is to dump a full load of gravel in a place, and often one load against another for a considerable distance. This practice is not only wasteful, but considering the present automobile traffic, dangerous as well. It is absurd to place thick layers of gravel on the road and expect it to be packed uniformly by the traffic.

The first step—and one of the most important things necessary to the proper maintenance of gravel roads—is drainage. Today the side ditches of our older gravel roads are filled with material washed into them from the fields and from the road's surface, until in most instances there is no ditch or drainage. These ditches should be cleaned out and opened up until there is no point in them less than 18 inches below the surface of the road. These side ditches should always have outlets to waterways leading from the right-of-way of the road. There should be no pockets or low places in the side ditches which will hold water.

Quite a few of the gravel roads have a sod berm along the edge of the road which is from two to three inches higher than the road's surface. This has been caused by the use of the road scraper. These shoulders or sod berms are very detrimental and should be done away with as they prevent the prompt flow of water from the road surface.

Because of the lack of side ditch drainage it has become common practice to ridge the gravel in the center of the road or maintain a very high crown. This was found necessary in order to drain off the water and form a firm, dry portion on which to drive. This high crown is detrimental as it causes all of the travel to drive in the center of the road, confining the wear to two narrow wheel tracks. The travel should be general over all parts of the road.

After proper drainage has been provided, the surface of the road should be lightly scarified or harrowed and dragged, so as to produce a uniform and smooth surface. This can be done without hindrance to the traffic. The crown or high center of the road can be loosened a little at a time by means of harrowing and this loose material moved with a drag to the side of the road and used to fill the low part of the road between the sod berm or edge of the road and the center.

The harrowing and dragging should be continued until the center of the road is not more than three or four inches higher than its edges. After this has been done and proper drainage provided, the road is then ready for surface treatment.

Next in importance to drainage and the proper preparation of the road bed is the character of the material which is placed on the road. Present day traffic requires a different material than formerly. Experience has already taught engineers and those boards and officers having charge of road maintenance that the old methods are inadequate and impractical. The past two years have clearly demonstrated the imperative need of not only adequate drainage and good road beds, but of high class material in order to avoid the almost impassable road conditions that we have had during the thawing season of the past few years.

The average bank run or pit-run gravel, as found in local deposits and commonly used, has been proven unfit for use in road maintenance. These deposits do not run uniform in coarseness or quality. Very often they contain too much sand,

always too much loam, and at times too many boulders, which render the material unfit.

Sand and loam create dust, prevent drainage and retain moisture. In thawing seasons dirty gravel becomes very soft because of the moisture it retains. The old idea, that repair gravel should be mixed with loam in order to make it pack quickly, is an erroneous one. Repair gravel should have no loam whatever in it. Clean gravel will pack without hindrance to traffic if properly applied and maintained.

Boulders or large stones are very objectionable as they are inclined to work to the surface, causing an expense to remove and also creating bumps which in turn cause chucks.

In road construction the gravel used should be clean and uniform in its mixture of various sizes from sand to pebbles not larger than 1½ inches. At least 25% but not to exceed 35% of fine sand 1/10 inch down should be mixed with the gravel for road construction. A proper sand mixture prevents the subsoil from coming up through the gravel, which is apt to happen under heavy traffic, at the same time an excess of sand is undesirable. Where a partial rebuilding is needed or where the road is so nearly worn out that a light surface treatment is not sufficient, a clean gravel should be used, ranging in size from sand to 1½ inches.

For maintaining the average gravel road the material should be that of a very fine, clean gravel without sand. A washed and screened pebble ranging in size from 1/10 to ¼ inch has proven satisfactory, preferably a pebble from 1/10 to ½ inch. Never use larger than ¾-inch pebbles. This should be applied in very thin layers as required. Each application should be a little more than enough to absorb all the worn-out particles of mud and soil on the surface of the road. There should at all times be a loose, thin coating of this material on the road surface. The dragging of the road will move this loose material back and forth, filling in the low places as they occur and keeping the road smooth at all times.

The reason why a fine gravel is better than coarser material for a road dressing or surface use is that if larger particles are used the process of dragging will pull the larger stones loose from the surface, making it rough and impossible to keep smooth.

An application of one inch of fine gravel twice during a season will keep a much used gravel road in excellent condition. This would require 400 cubic yards of material per mile. The average gravel road could be well maintained with one application per season or 200 cubic yards of material per mile.

The average cost of paved roads, concrete for example, is about $25,000 per mile, the interest on which at 6% would amount to $1,500 per mile per year. Until the travel becomes heavy, a much used road can be maintained by the proper use of gravel and patroling at a less cost than the interest on the permanent type.

Roads so maintained will give good service during all seasons of the year and at a very low cost. Compared with the so-called permanent type, a properly maintained gravel road is as smooth to ride over and as enjoyable, and until the travel becomes moderately heavy, it may be kept in every way as serviceable.

Jefferson County Maintenance Crew Working on State Highway Through Turkey Creek Canon.

As to the cost of proper maintenance. The side ditches of the average gravel road can be cleaned out so as to provide good drainage at a cost of approximately $250 per mile, the other costs very materially depending on the amount of traffic. If the traffic is heavy, the material and labor costs would amount to from $600 to $800 per mile per year. If the traffic is medium this cost would be about $400 per year. The by-roads or gravel roads which are used very little could be maintained in good condition at a cost of $100 or less per year.

In order to properly maintain gravel roads there should be constant employment. A certain number of miles should be placed in charge of one man. This man to be employed by the year. He should be provided with a light truck to be used for the distribution of materials, for the hauling of refuse and as a power unit for the scarifying, harrowing and dragging of the road's surface. The general impression is that dragging should be done when the road is soft or after a rain or thaw. It is as important to drag the road in dry weather as in wet. In fact, a road under ordinary traffic should be dragged at least once if not twice a week, during the entire year. Under extremely heavy traffic it should be dragged each day.

Roads which have been built of crushed stone can be likewise maintained. However, the material used in the maintenance work on such roads should be that of fine screened gravel, because of its low cost in production, its better wearing qualities due to its round rather than angular surfaces, and, too, because sufficient of the material remains loose and can be dragged back and forth maintaining a smooth surface.

In localities where gravel deposits are found in abundance, and in territories where gravel can be shipped on reasonably low freight rates, gravel roads should prove practical. As stated previously, the material as found in local deposits is unfit without plant treatment. Screening plants, however, cannot be provided for the sole purpose of producing road repair materials as the wasting of the by-products such as sand and oversized boulders, in such an operation would result in too high a cost. Gravel washing and screening plants producing materials for general uses, such as railway ballast, concrete, etc., are able to produce the ideal repair gravel at the lowest possible cost.

A summary of the most important features in connection with proper road maintenance and the items that should be particularly exacted under governing specifications is as follows:

1. Good drainage.
2. Proper shaping of the road surface with not to exceed a 4-inch crown.
3. Application of clean, small pebbles in thin layers.
4. Dragging often, depending on the amount of use.
5. Prompt attention to development of defects.

Neglecting to provide for or perform any of the above mentioned important features in connection with gravel road maintenance will result in failure.

This article is intended for the purpose of conveying a practical plan for gravel road maintenance and of imparting an idea of costs and results. It is not for the purpose of opposing the construction of the various types. Permanent road construction is necessary considering the present road traffic. Our object should not be to discourage the building of permanent highways, but should be to encourage economy, and prove that there is a place for gravel in proper maintenance and construction of highways. Proper specifications should be exacted and proper maintenance methods employed in a practical and economical way to the end that we may quickly have placed our highways in condition to carry the increased burdens of present-day and future motor traffic.

Three Highway Projects Complete

Three highway road construction projects were reported by the state highway department as completed during the past month.

All were federal aid projects in which the government, through the Bureau of Public Roads, shared fifty percent of the cost.

The projects are as follows:

No. 7-c, ten and one-half miles of mountain grading between Norwood and Naturita in Montrose county;

No. 189, five and one-half miles of gravel surfacing between Hayden and Mt. Harris in Routt county.

No. 222-b, one and one-half miles of concrete paving north of Broomfield in Adams, Boulder and Jefferson counties.

The total cost of the three road improvements was $173,199.

The project in Montrose county cost $68,684, and was done by Girardet-Hotchkiss Engineering and Construction Co. The contract was let July 24, 1922. This road serves as an outlet to the rich Uranium deposits of the Paradox valley, giving an improved road to Placerville, the nearest railroad point to the Paradox mines. In the Paradox valley is located the largest body of radium-bearing ores in the world.

In the project was 11,500 cubic yards of common excavation; 6,200 cubic yards of rock excavation, 76,600 yards of barrow fill and 2,100 feet of corrugated metal culverts.

The stretch of road between Hayden and Mt. Harris before it was improved was practically impassable when wet. The old road was an unimproved dirt road of clay formation. Also there were many sharp curves and steep grades, making travel over it dangerous. The estimated cost of the improvement was $65,000, but the H. C. Lallier Construction and Engineering Company bid in the work at $41,942.

The improved stretch is located on the Victory Highway, and forms a link in the highway between Steamboat Springs and Craig, one of the main transcontinental routes through Colorado. During the summer months it is heavily traveled by tourists.

There was used in surfacing of the road 10,960 cubic yards of gravel from pits located one and one-half miles from the project. Also the contract called for 22,700 cubic yards of common excavation, with ten acres of grubbing and clearing. There was 19,800 yards of barrow fill.

The Broomfield project consisted of an extension of the concrete paving north from Denver over Federal boulevard, ending at a point north of the Zang ranch on Goodhue hill. Plans of the state highway department call for a further extension of this paving over the Burlington Railroad tracks to a point one mile south of Lafayette next spring.

Work on the Broomfield paving was done by Miller, Douglas & Hanes, who also had the contract on the paving between Denver and Broomfield. The Broomfield contract was awarded last October on a bid of $62,573.

There was laid on the project 16,044 square yards of 18 ft. 7 inch concrete. The contract included 15,600 yards of common excavation, 15,000 yards of overhaul, 1,500 yards of rock excavation, and 700 ft. of tile underdrain. Also there is about 100 yards of guard rail on the project.

It was thrown open to travel early last month. Inspectors pronounced the completed project one of the best in the state from the standpoint of grade, alignment and finish.

The Broomfield paving forms a link in one of the heaviest traveled highways in Colorado. During the past five years traffic on this road has trebled, according to statistics recently compiled by highway census enumerators.

During the past month the department reported final acceptance by the government of the paving on Federal boulevard to Broomfield, a distance of twelve miles. This paving was opened to traffic early in the spring of this year, but the contractors completed the shoulders and drainage structures only a few weeks ago.

On Sept. 1 the Colorado Bridge & Construction Company started pouring concrete on the paving project between Fort Morgan and Brush. This project consists of two and seven-tenths miles of standard concrete pavement. The contractors expect to complete this work before the season ends.

Work also has been started by Dale Hinman and Winterburn & Lumsden on eleven miles of gravel surfacing and steel bridge between Sapinero and Cimarron. Hinman has the surfacing work, while Winterburn & Lumsden are constructing the bridge structure, which, when completed will be the highest highway bridge in Colorado. This stretch of road is located on the Rainbow Route, and the improvements contracted will eliminate one of the worst pieces of road on the route between Colorado Springs and Grand Junction.

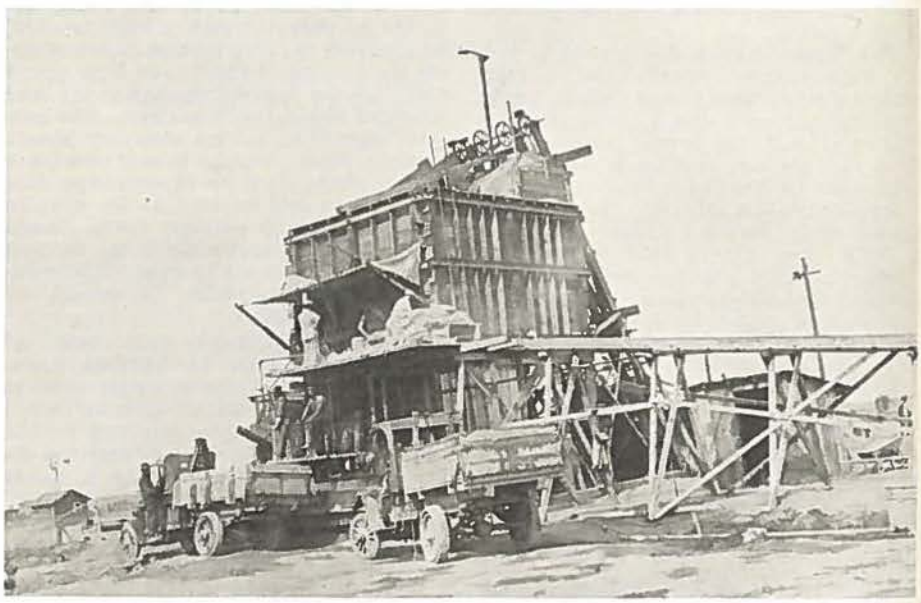
The Engineers Construction Corporation of Greeley started work on four miles of concrete pavement north of Platteville over a part of the LaSalle "cut-off" last month.

When the present contracts let by the highway department have been completed there will remain only about six miles to be paved between Denver and Greeley, a distance of about fifty-one miles over the new road alignment.

Reports from field engineers indicate that the paving north of Loveland, which Fred Dreher has under contract, will be completed before winter sets in. The work on this project has been delayed nearly all summer on account of heavy rains. At present this project is 70 percent complete. Rapid progress is now being made on the project.

The paving north of Colorado Springs is now 50 percent complete. Officials of the Standard Engineering & Construction Company expect to move off the project before snow flies. This project consists of 4.18 miles of standard 18 ft. pavement.

Pueblo has adopted a plan of flood protection, known as the "Bluff Channel Plan." The actual work will start at once and it is estimated that it will require two years to complete the project which will cost approximately $4,000,000. The cost will be levied against property owners in the Flood Conservancy District, according to the benefit derived and the assessments will spread over a 30-year period. The river will be changed from its present channel through the center of the city to the Mesa Bluffs, occupying the greater portion of the Union Depot yards. Passenger tracks will remain as they are but freight tracks will be moved to Peppersauce bottoms. The plan is for Arkansas River protection only, the Fountain River being already cared for.



Showing central mixing plant in operation on Denver-Greeley concrete road above Ft. Lupton—White & Johnson, Contractors.

Willows at foot of Willow Creek Pass, 90 miles west of Denver, wearing their best summer clothes

ENGINEER BLAUVELT MAKES TWO APPOINTMENTS IN HIGHWAY SHOPS

Announcement was made by Highway Engineer Blauvelt on September 1, of the appointment of W. T. Murnan as general foreman of the highway department's shops in Denver.

At the same time Maj. Blauvelt announced the appointment of Frank H. Owens as master mechanic of the shops in charge of all repairs.

This change in the personnel of the highway shops was brought about following the resignation of F. J. Altvater as superintendent of the shops. Mr. Altvater left the employ of the state to accept the position of highway commissioner in the city of Denver.

As general foreman of the shops, Mr. Murnan will have direct charge of the office surplus war materials, records of the shops, requisitions, shop orders and store room. The duties of Mr. Owens include general supervision of automobile, truck, road equipment and general repairs, as well as mechanical research.

Reports of the two shop heads will be made to the general offices of the Highway Department through the Purchase and Traffic Division of which T. R. Elkins is the head.

Since January 1 of this year more than $500,000 worth of surplus war materials have been handled by the shops. These materials have been distributed to the various counties of the state for use in road construction and maintenance.

Plans are now being made by the department for the enlargement of the shops. Other improvements include the installation of a heating plant and various labor-saving devices.

ENGINEERS START SURVEY ON MT. EVANS DRIVE FROM SUMMIT LAKE

On Sept. 7 a party of highway engineers established a camp near Summit Lake in the Mt. Evans region.

Headed by Elsa Montgomery, special engineer, these men will find a line for the new road that is planned to come off the top of Mount Evans into the Deer Creek valley.

They will be employed on the survey about six weeks. If possible the road from the western slope of Mt. Evans will form a connection with the Turkey Creek highway at a point near Baileys, forming a circle trip through the Denver Mountain Parks from Bergen Park, via Echo Lake, and Mt. Evans.

When completed this highway will be the highest automobile road in the world, reaching an altitude of 14,260 on the summit of Mt. Evans. It will be about 75 miles in length, passing through one of the most picturesque sections of the west, abounding in scenic beauty unsurpassed anywhere.

At present there is a splendid road up the Deer Creek valley to a point about ten miles below Mt. Evans. An effort will be made to utilize this road, which was constructed several years ago by Park county.

Members of the highway surveying party include:

Elsa Montgomery, Drexel Lacey, John Campion, W. K. Morrison and Homer Winter.

The hardest problem the engineers have to solve is to find a line with not over 6 per cent grade that will allow them to construct down to the Deer Creek road. The latter road now ends at an altitude of about 9,500 feet and the altitude at the terminus of the road at Summit is 13,000 feet. On an air line it is about ten miles from the connection on Deer Creek to the top of Mt. Evans.

1924 GOOD ROADS SHOW TO BE HELD IN CHICAGO JAN. 13 TO 19.

Chicago has been selected as the place for the next National Good Roads Show to be held January 13 to 19, 1924. At the same time the annual meeting of the American Road Builders' Association will be held.

This was decided at a meeting of the board of directors held in New York on May 15. It was reported that receipts from the sale of exhibition space at the last show netted $62,824.77 and the disbursements $56,332.81, leaving a gross profit of $6,491.96.

Frank Page, chairman, State Highway Commission, Raleigh, N. C., was elected president.

EASY WINNERS

Records for 1922 show that railway trains won every grade crossing race they were entered in whenever they got anything like a fair chance.—Lexington Herald.

Work Started on Two Miles of Paving East of Pueblo on Santa Fe Highway

BY RALPH C. TAYLOR,
Staff Correspondent.

Pueblo, Sept. 10.—Work has started on 2.5 miles of concrete paving east of Pueblo on the Santa Fe Trail. R. A. White, Denver contractor, expects to get the $80,000 project completed this fall. The pavement will connect with 6 miles already laid.

Members of the Arkansas Valley Association of County Commissioners will meet in Pueblo during the Colorado State Fair, according to the officers. The exact date has not been fixed, but a State Fair booster meeting is to be made of it. Fair dates are September 24 to 29.

After a summer of continued deluges and floods, Pueblo county commissioners have found their emergency road funds all used and are having difficulty deriving money from other funds to repair roads and bridges washed out by high waters. They report damages only outrivaling the 1921 season when the great Pueblo flood occurred.

Two miles of new gravel road have been opened to traffic north of Piñon on the Pueblo-Colorado Springs highway. The new road eliminates several bad curves and represents some remarkable road building. Excellent draining facilities are afforded by the numerous culverts and concrete aprons.

Fifty thousand new maps of the Old Trail route have been published in Pueblo following a meeting of the directors of the Southern Colorado Old Trails Association. The maps will be distributed throughout the east by a representative of the Organization. All Chambers of Commerce and information bureaus will be provided with the maps which will be a convenience to the tourist.

Damages amounting to over $20,000 were done late in August to the South Side streets in Pueblo as a result of an overflow of the C. F. & I. Company's reservoirs.

In accordance with the good-will program of the Pueblo city highway department, the annual employes' picnic was held August 3 at the city's mountain park at Beulah. Superintendent of Highways E. E. Colby and the city commissioners attended. The day was declared a holiday; transportation provided the men, and a day of entertainment, including a picnic dinner.

Flooding of county roads by farmers who do not care for their waste water properly, has been stopped in Pueblo County. After several roads were made impassable, the county commissioners exercised the state law in regard to the violation.

One span of the Arkansas River bridge three miles below Fowler was taken out August 20 when the Apishapa dam broke, flooding an area of seven miles and doing $500,000 damage. The bridge, which is near the junction of the Apishapa and Arkansas rivers, was overflowed 15 feet above the floor of the bridge.

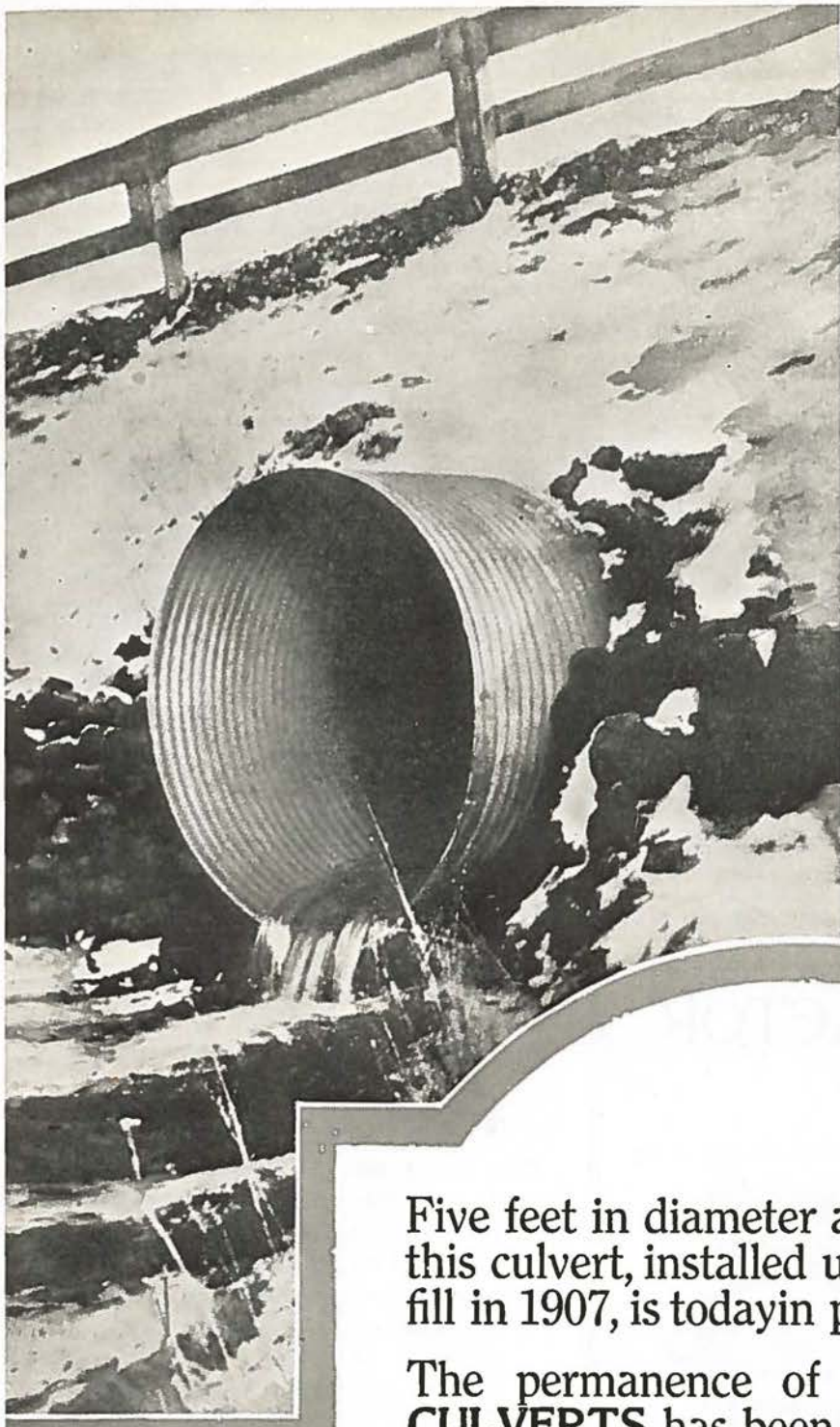
COUNTY ENGINEER'S FIELD.

James W. Brooks, director of the American Highway Educational Bureau, says:

"As an important factor in public service, the day of the county engineer has arrived, and in order that he may accomplish the greatest good for his people, he should be given unstinted support, both morally and financially, in the work entrusted to his hands.

"It is not enough to improve the main road. The by-road also must be brought up to a higher standard of efficiency. To the county engineer falls this great privilege and opportunity. His field of effort is in many respects ideal. He is with home folks on home roads, and his recompense and public approbation will be in direct proportion to the success which he achieves in reducing community loss through the reconstruction of time-wasting and farm-restricting roads."

Always remember that a pedestrian would rather hear your automobile horn than to listen to Gabriel's trumpet.



a dozen years have made no impression on this ARMCO IRON CULVERT

Five feet in diameter and 60 feet long, this culvert, installed under this 12 foot fill in 1907, is todayin perfect condition.

The permanence of **ARMCO IRON CULVERTS** has been proved by installations like this, made ten years ago or earlier, in all parts of the country.

THE R. HARDESTY MFG. CO.
DENVER, COLO.

Wood Cross, Utah **Missoula, Mont.**
Pocatello, Idaho

AMERICAN ARMCO INGOT IRON
LOOK FOR THE TRIANGLE TRADE MARK

The Armco trade mark is a guarantee of quality—their record of service—Your assurance of permanence.

EQUIPMENT NOTES

Koehring Mixers are having quite a run with contractors in this territory. Wilson and Company have sold more of these units than they could obtain from the factory within the past month. On every important building operation, where quality concrete counts, Koehring equipment is found functioning successfully. A few of the construction jobs on which Koehring equipment is being used follow. Colorado State Hospital by Alex. Simpson Jr. Company; Denver & Rio Grande shops in Denver, Salida and Grand Junction; Sixteenth Street viaduct, Denver; New Burlington shops, Denver; paving between Denver and Colorado Springs, paving in city of Colorado Springs, Broadway extension, Denver; highway project at Grand Junction, dam construction by U. S. Reclamation Service at Pagosa Springs, and paving in Santa Fe, N. M.

Harry P. Wilson, president of H. P. Wilson & Co., left Denver the latter part of August for a combination business and pleasure trip to the East. He will spend his vacation with his relatives and family in Wisconsin.

The McMyler Interstate Company are announcing in this territory, through their local distributors, H. W. Moore & Company, their new No. 4 locomotive crane. This crane, which is of 20 ton capacity, is a refinement of the well-known model which is already favorably known in this territory, and which has made an enviable record among the users of this class of equipment.

Plans have been perfected by the Link Belt Company for placing a gasoline driven shovel on the market, according to word received by L. R. Grannis, intermountain distributor. It is said that the new shovel, which will be an addition to the various types of draglines manufactured by Link Belt, will embrace several new departures in shovel construction. An illustrated booklet describing in detail the new shovel, will be ready for distribution in a few weeks, said Mr. Grannis.

Largest manufacturers of irrigation supplies in the world. Few people in Colorado know that this title belongs to the Hardesty Mfg. Co. of Denver. When the name Hardesty is mentioned road builders usually connect it with Armco corrugated culverts. But this is only one of many products manufactured by the Hardesty firm. A competent staff of engineers is employed by Hardesty as salesmen for irrigation supplies. Besides the firm maintains an engineering department to solve the irrigators problems. Products of the firm are shipped to all parts of the world and it is truly one of Colorado's greatest manufacturing plants.

A half-bag mixer and a one-bag machine have been brought out by the Chain belt company, according to announcement made by Herbert N. Steinbarger, intermountain distributor. In bringing out these two new models the Chain Belt concern is said to have designed a mixer that embraces the speed and low mixing cost of the Rex Paver.

Something new, every day and in every way, in the road building and maintenance game. Now comes the Stockland grader people with a rubber-tired grader. Forty-eight of these graders were furnished the state of Washington recently. Of course, there is a reason for the rubber tires. In Washington a long ways must be traveled until one reaches a dirt road—they have endless miles of paving up that way. Well, they hitch the graders behind trucks and move them over concrete roads to the maintenance jobs. The rubber tires serve to eliminate the shocks attendent to steel wheels, thus saving wear and tear on the graders. L. L. Clinton, president of the Avery Machinery Company, intermountain distributors of the Stockland line, hopes to see a fleet of these rubber equipped graders moving over Colorado's concrete roads one of these days.

An interesting demonstration of the use of the Bear Tractor for road maintenance was made by the Stearns-Roger Mfg. Company in Arapahoe county this past month. Attached to a Havelock Maintainer, the Bear Tractor proved its efficiency as a power unit. This tractor recently was introduced in Colorado by the Stearns-Roger firm. One of its principal features is the increased power delivered to the draw-bar. In several of the eastern states it is in wide use for road maintenance and construction work.

BIDS RECEIVED DURING AUGUST

Proj. No.	Location	County	Length	Type	Low Bidder	
F.A.P. 226-C	(Pav. Div. No. 1) Platteville-La Salle	Weld	4.404 mi.	Conc. Paving	Engr. Constr. Corp.	$109,194.84
F.A.P. 247-A	Rocky Ford-Swink	Otero	1.329 mi.	Paving	J. Finger & Son	41,369.40
S.P. 708-9	Ridgeway-Placerville	Ouray & San Miguel	2.614 mi.	Grading	B. Walters	14,426.30

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	County	Length	Type	Bids Opened
F.A.P. 2-R	Trinidad, north	Las Animas	3. mi.	Paving	Sept. 13, 1923
F.A.P. 224	Morrison-Baileys	Jefferson	5.127 mi.	Grading	Sept. 13, 1923
F.A.P. 240	Gypsum-Dotsero	Eagle	5.185 mi.	Gravel Surfacing	Sept. 13, 1923
F.A.P. 241	Gunnison River, north of Delta	Delta	600 ft.	Steel Bridge	Sept. 13, 1923
F.A.P. 245-A	Las Animas-Hadley	Bent	4.545 mi.	Gravel Surfacing	Sept. 13, 1923
F.A.P. 252	Loveland-Berthoud	Larimer	2.463 mi.	Paving	Sept. 13, 1923
S.P. 806	Ramah-Simla	Elbert	2.955 mi.	Sand-Clay Surfacing	Sept. 13, 1923

FEDERAL AID PROJECTS FOR WHICH PLANS HAVE BEEN SUBMITTED TO THE U. S. BUREAU OF PUBLIC ROADS FOR APPROVAL

Proj. No.	Location	County	Length	Type
222-C	Denver-Lafayette	Boulder	2.825 mi.	Concrete Paving and R. R. Grade Separation
230-A	Wolhurst—toward Sedalia	Douglas	0.852 mi.	Paving and R. R. Grade Separation

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	County	Length	Type
F.A.P. 116-B	Breed, North and South	El Paso	0.91 mi.	Concrete Paving & R. R. Grade Separation
F.A.P. 116-C	North of Breed	El Paso	3.22 mi.	Concrete Paving
F.A.P. 226-D	Platteville	Weld	1. mi.	Concrete Paving
F.A.P. 230-B	Wolhurst-Gann	Douglas	5. mi.	Concrete Paving
F.A.P. 242	Grand Junction-Fruita	Mesa	3.5 mi.	Gravel Surfacing
F.A.P. 251	Boulder-Lafayette	Boulder	1.014 mi.	Concrete Paving

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
7-C	Norwood-Naturita	10.6 mi.	Mtn. Grading	Girardet-Hotchkiss Eng. Co.	$ 68,684	100	7-C
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	61,556	22	71-B
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	58	81-A
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	40	102
116-A	Colorado Springs paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238,944	50	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	40	119-B
125	Sapinero-Cimarron	11.3 mi.	Grav. Surf.	Dale Hinman	36,797	6	125
125	Sapinero-Cimarron		Steel Bridge	Winterburn & Lumsden	53,072	6	125
129	Federal Boulevard	4.42 mi.	Paving	Peterson, Shirley & Gunther	164,331	98	129
133	Federal Boulevard	4 22 mi.	Paving	W. J. Cameron & Co.	146,399	98	133
135	Denver-Morrison	5.3 mi.	Conc. Pavement	Colo. Bridge & Constr. Co.	178,158	2	135
163	St. Charles Bridge	0 5 mi.	Steel Bridge	Rogers & Pickard	85,636	89	163
165	Canon City, east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	84	165
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	44	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	92	174
189	Hayden, east	5.41 mi.	Grav. Surf.	H. C. Lallier Constr. & Engr. Co.	41,941	100	189
190	Summit County Bridge and Road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	32	190
210-A	Grand Valley-DeBeque	5.30 mi.	Grav. Surf.	F. L. Hoffman	57,429	59	210-A
211	Meeker, north	1.85 mi.	Grav. Surf.	Hinman Bros	34,445	40	211
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	34	213-B
215	Pagosa Springs Bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	73	215
216-A	Holly, east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	99	216-A
217	Pueblo, east	2.94 mi.	Paving	Ed. Lindsay	72,164	81	217
218-B	Hasty-Lamar	3.49 mi.	Grav. Surf.	M. J. Kinney	40,009	86	218-B
221	Loveland, north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	70	221
222-B	Broomfield cut-off	1.52 mi	Conc. Paving	Miller, Douglas & Hanes	68,302	90	222-B
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	26	223-A
225	Fitzsimons Hospital road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	50	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	70	226-A
226-B	Brighton-Greeley	2.86 mi.	Conc. Paving	White & Johnson	89,923	3	226-B
226-C	Platteville-Greeley	4.4 mi.	Conc. Paving	Engr. Constr. Corp.	120,114	2	226-C
228	Atwood-Sterling	4.41 mi.	Conc. Paving	La Nier, Selander & White	148,484	93	228
231	Six Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockaway	25,165	40	231
246-R	East of Pueblo	2.537 mi.	Conc. Paving	R. A. White	78,431	0	246-A
255-A	Ft. Morgan-Brush	2.70 mi.	Conc. Paving	Colo. Bridge & Constr. Co.	85,763	2	255-A
256-A	Sterling-Brush	2.50 mi.	Conc. Paving	La Nier, Selander & White	79,902	8	256-A

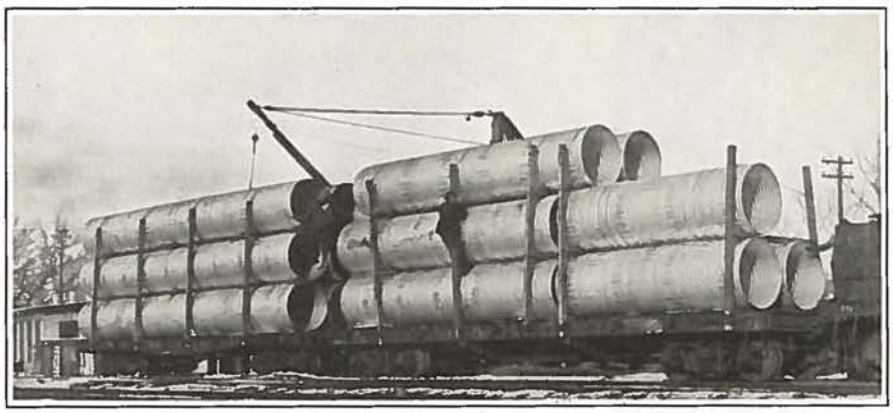
Wide Radius of Service—

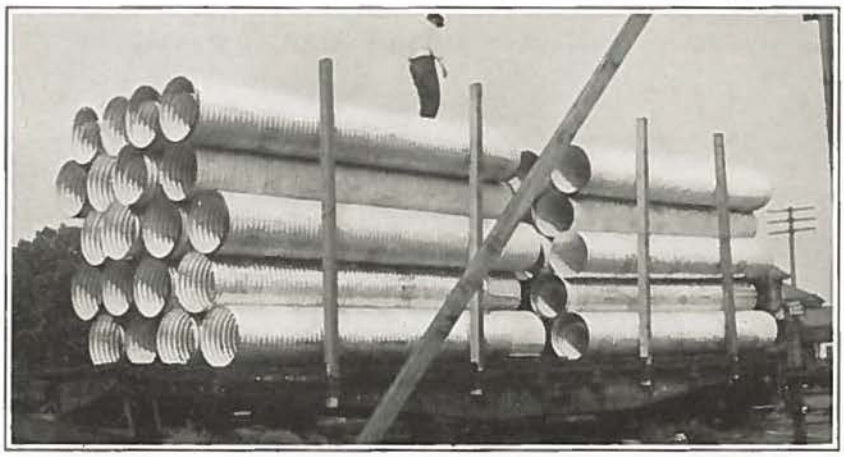
FROM OUR PUEBLO PLANT, WE SHIP

KEYSTONE CULVERTS

from the Missouri River to the Pacific Coast

This shipment went to Kansas, within 40 miles of Kansas City, Mo.





This carload went to Oregon, within 120 miles of the Pacific Ocean

The Colorado & Flume KEYSTONE C&F COPPER-STEEL *Culvert Company*

PUEBLO

KOEHRING

Bearings are Wearing In When Common Bearings are Wearing Out

DRUM roller bearings are to a mixer what the foundation is to a skyscraper. Untrue bearings mean breakages in every part of the mixer due to distorting frame strains, and metal crystalization — the direct result of faulty, inadequate drum roller bearings.

Do drum rollers turn on fixed axles or are they fixed to axles that turn in bearings? That's a big difference.

The latter which is the Koehring Heavy Duty Construction is the freight car truck type, suitable for heaviest service. So long as any of the bearings are left, there is full lubrication, and a full even face of the bearings to carry the load. There is no beveling of the bearings at the outside edges leaving a narrow ridge on which the drum rollers and the drum can wobble and "weave."

If you know the facts about drum roller construction you will know that Koehring freight truck construction has the most enduring trouble-proofing drum roller bearings ever put on a concrete mixer.

Koehring Capacities

Pavers, 7, 10, 14, 21, 32, cu. feet mixed concrete.

Heavy Duty Construction Mixers, 10,14,21 28 cu. feet mixed concrete.

Dandie Light Mixers, 4 and 7 cu. feet mixed concrete. May be equipped with low charging platform, power charging skip, automatic water measuring tank and light duty hoist.

KOEHRING COMPANY
MILWAUKEE, WIS.

MANUFACTURERS OF CONCRETE MIXERS, CRANES, DRAGLINES, SHOVELS

H. P. Wilson & Co.

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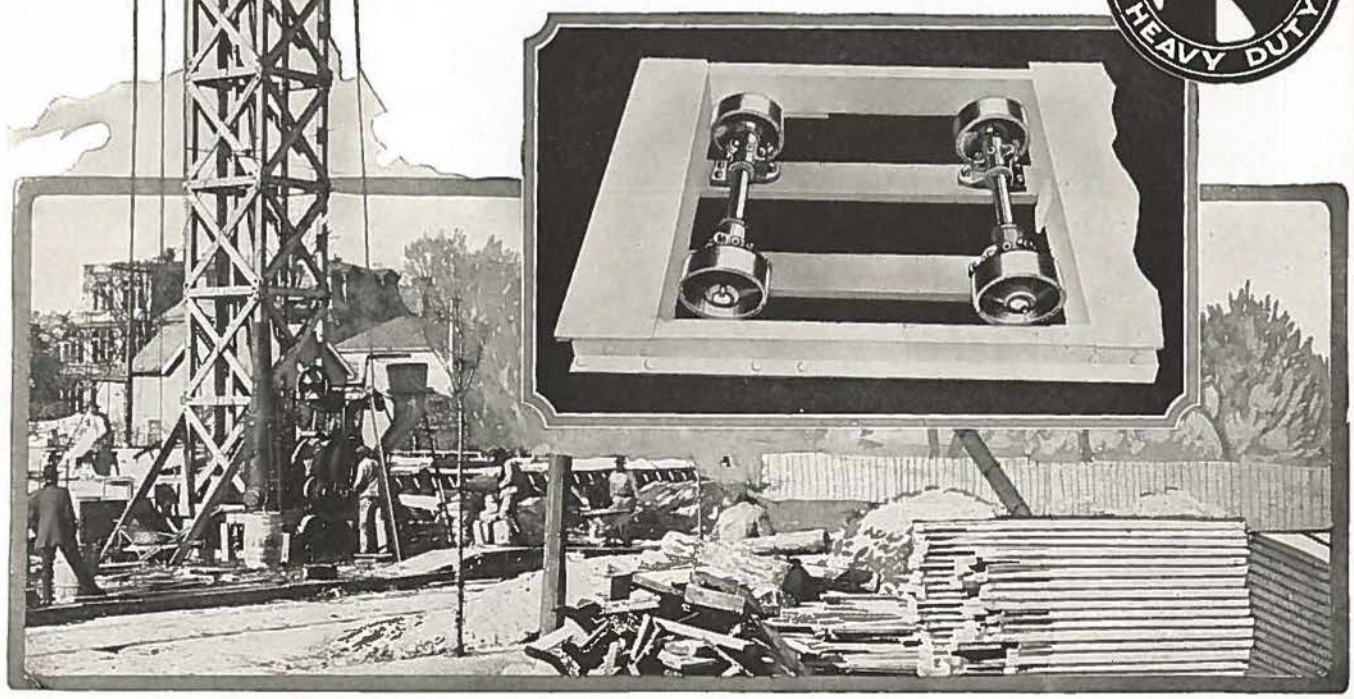
17th and Blake Sts. Denver, Colo.

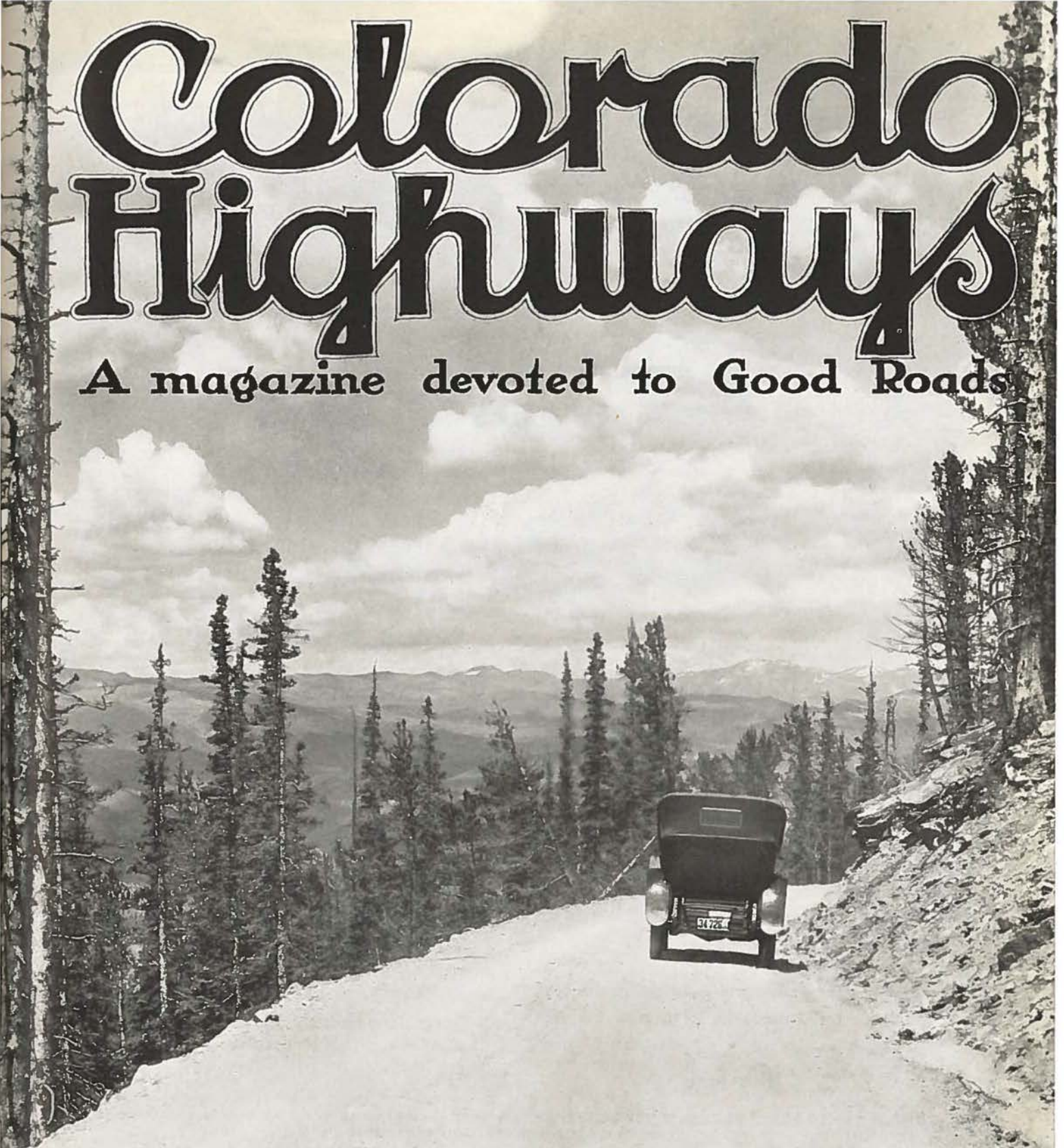
KOEHRING K HEAVY DUTY



THE BRADFORD-ROBINSON PTG. CO., DENVER

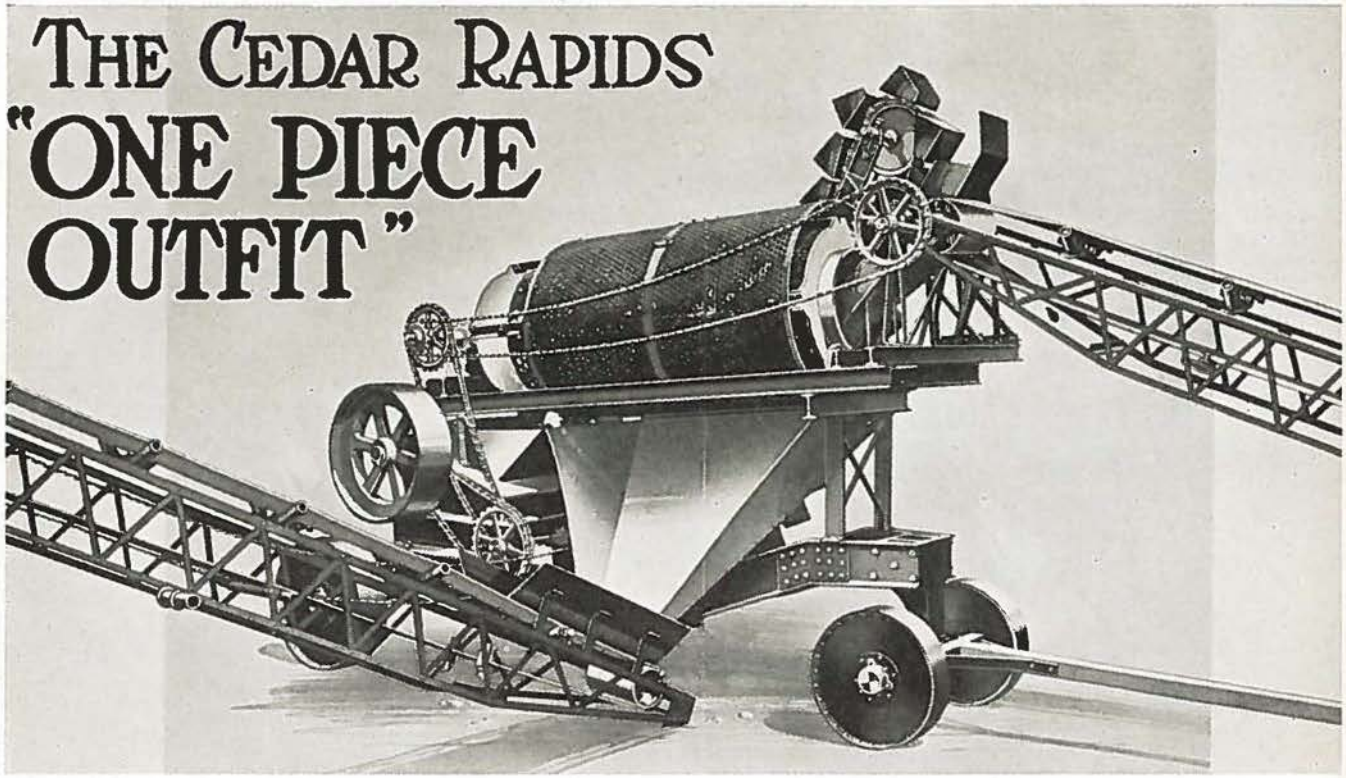
Colorado Highways

A magazine devoted to Good Roads



Vol. 2. Oct. 1923 No. 10.

THE CEDAR RAPIDS "ONE PIECE OUTFIT"



Conveys Material from Quarry Ledge or Gravel Pit; Crushes; Screens; and Delivers Finished Product direct to Storage or Loading Bins

The urgent need of hard roads, and more hard roads, becomes more apparent every day. High cost is the one deterrent factor; and the biggest single item of highway building is the transportation of materials.

With stone and gravel constituting the bulk of the material used, the solution of the high cost problem lies in the use of stone or gravel to be found locally.

The CEDAR RAPIDS "One Piece Outfit" makes possible the economical building and maintenance of roads where the cost was formerly prohibitive. Strictly portable, it may be operated on small jobs over a wide territory, filling a long felt need of state, county and township highway departments as well as road contractors.

This outfit is built entirely of steel, with wide tread, disc type wheels fitted with roller bearings.

CEDAR RAPIDS FORCE FEED JAW TYPE CRUSHERS are built along standard lines, yet embody improvements which are the last word in crusher construction.

A size and model suited to every crusher need—simplicity of construction, interchangeability of parts, strength and durability.

H.W. MOORE & Co.

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Colorado Highways

"BETTER ROADS"

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

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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 view along the Mt. Evans Drive, near the far-famed Echo Lake, is shown on the front cover of this month's Colorado Highways. From the summit of Mt. Evans are seen a score of peaks, exceeding 13,000 feet in altitude. Five crews of men have been employed all summer extending the highway from Echo Lake to Summit Lake, where a "turn-around" will be constructed for the convenience of autoists. The road to Summit Lake will be completed early next spring. Photo courtesy Denver Tourist Bureau.

Colorado Highways
"BETTER ROADS"
VOLUME II. OCTOBER, 1923. NUMBER 10.

Ten Projects To Be Contracted

All Road Work Provided For in 1923 Budget To Be Put Under Contract By November 30, Say Officials

UNLESS there is some unforeseen delay within the next two months every Federal Aid project provided for in the 1923 budget of the State Highway Department will be under contract on November 30, the day when the Department's fiscal year ends. At this time all but ten projects contained in the budget have been worked up by the Department's engineers and placed under contract and a majority of the ten still remaining are advanced to such a degree that the letting of contracts for them is only a matter of weeks.

Obtaining project agreements, making surveys, working out detailed plans, obtaining the approval of the Bureau of Roads, and advertising are the steps which the Highway Department must take before a contract for any project can be let. That the entire budget should be placed under contract speaks well for the Highway Department and its engineering forces.

The ten projects are scattered over the State and involve appropriations totaling $975,200. All Federal Aid projects laid out in the budget called for the expenditure of $5,272,700, so that more than 80 per cent of the budget is now under contract.

Following are the ten projects not yet under contract:

F. A. P. 242—Graveling and surfacing from Grand Junction west toward Fruita; appropriation, $49,900;

F. A. P. 243—Construction of a new bridge at Piedra, between Pagosa Springs and Durango; appropriation, $78,300;

F. A. P. 248—Grading, surfacing and drainage between Salida and Buena Vista; appropriation, $120,000;

F. A. P. 116 B and C—Concrete paving north from Breed and undercrossing at Breed on North and South Highway; appropriation, $278,000;

F. A. P. 230 A and B—Concrete paving south from Wolhurst and two undercrossings south of Wolhurst on North and South Highway; appropriation, $334,000;

F. A. P. 251—One mile of concrete paving from Boulder Junction, north of Lafayette, toward Boulder; appropriation, $40,000;

F. A. P. 254—Grading and draining road in Byers Canon; appropriation, $75,000;

F. A. P. 257—Construction of new bridge over the Moffat Road tracks on highway between Denver and Brighton; appropriation, $20,000.

Colorado's share of $452,000,000 appropriated by Congress for highway construction purposes—Federal Aid—during the fiscal years 1917-1924 is $8,198,398.94. Of this sum the State has been paid in cash up to August 1, 1923, the sum of $4,063,845.30. In addition the State had earned $323,601.42, but this money had not been paid over at the time of the compilation because approval to the State's claim had not been given at the time.

Federal Aid projects under contract in Colorado, on August 1, had a value of $700,082.37, so that on the same day the balance available to the State from the Federal Treasury for highway purposes was $3,110,869.85.

Twin Lakes, on the Spectacular Independence Pass Highway.

Switchback on Monarch Pass, showing smooth roadway and easy grade.

Editor Discovers Colorado Roads

Hard-boiled Newspaper Writer Travels "Worst Routes" To Learn Truth About Highways —Finds Nearly All Boulevards

(BY S. K. COCKEMS.)

TO know Colorado's highways one must travel them. To know how good they are, to appreciate the enormous amount of labor and energy spent, one must spend a week or more in constant travel over the State. Then one will cease to knock Colorado roads and become a booster for them. Many are the typical motorists who bring forth their shiny gas wagons on a Sunday morn, and, for the first time in a week, get a few miles off the pavements. They may be unfortunate enough to strike a few miles of roadway that is not in good condition. They are the ones who raise the cry: "Colorado highways are rotten; the State must do something if she wants to retain the tourist patronage!"

I have asked a number of Denver motorists about road conditions and have received a wide variety of answers. In many cases my informants did not know how to get to Baileys; never heard of the road to Fairplay; knew there was a Berthoud Pass, but did not know just how to get there; had heard of a mountain route to Salida, but thought the roads were in terrible shape.

It is the motorist who lacks information that spreads the propaganda of poor highways and thereby hurts the State and himself. To convince himself that the roads are not as bad as he thinks they are, let him take a tour of the State such as I have just completed.

Several weeks ago, during the time that rain was falling every day somewhere in Colorado, I prepared to make a trip to Mesa Verde National Park, and from there to Steamboat Springs, Grand Lake, and Estes Park. In view of the rainy weather and pessimistic reports regarding the highways, I made a number of inquiries regarding the best route to take to Mesa Verde. All reports were of a despondent nature. When I suggested that I wanted to go to Salida by way of Fairplay, through South Park, I was told that it was doubtful whether I could make it; that that was a mountain route and very likely would be almost impassable for automobiles. I was so filled up with pessimistic reports that then and there I determined to take the routes that were knocked the most.

At two o'clock on a Saturday afternoon we left Denver, intending to reach Fairplay in time for a late dinner. Those who knew of our intentions told us we would be extremely lucky if we reached Fairplay before midnight.

I was not driving a Rolls-Royce, nor was I driving a flivver. So, with just an ordinary machine we set out. In spite of being held up by bridge construction on the way to Fort Logan, and by the washout on the Turkey Creek road and a huge boulder that had fallen on the highway between Morrison and Evergreen, we reached Fairplay at ten minutes to six that afternoon. The road for the greater part of the distance was a boulevard, considering that it was a mountain highway. At Conifer we were informed that the road near Shafer's Crossing was in fearful shape, full of boulders, etc. Never having been over this particular course before, we were in Baileys, without becoming aware of the fact that we had passed Shafer's Crossing and the boulder-strewn road. Such is the credence one may take of unofficial reports upon road conditions. One of the finest stretches of road in the State, easily accessible for Denver motorists, is the road to Fairplay. From Baileys on it is in truth a boulevard, supplemented with the finest of Colorado scenery.

It rained in torrents during the evening at Fairplay and the pessimists there suggested that the road to Salida would be too "slick" for safe travel the next day. We got to Del Norte in time for a very early dinner that night, spending more than two hours visiting relatives in Salida. The road was wet, but it was not "slick", and I doubt if it ever would get too slick for safe travel.

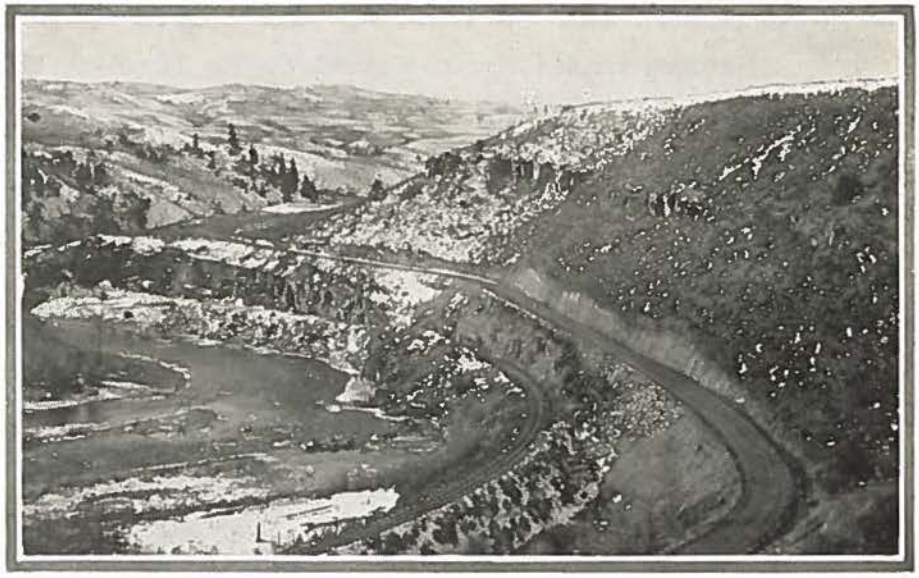
At Salida we heard that the road over Poncha Pass was rather rough. It wasn't. There were spots, of course, where one had to travel slowly and it was at these spots that road crews were at work, whipping the highway into shape

after the heavy rains. Over the pass and on to Saguache the road warranted any speed allowed by law without harm to car or riders. Then came a stretch, a veritable race course—the Gunbarrel Road, leading from Saguache straight south. I won't say that we broke the state highway speed laws, but it was a temptation to do so. A broad highway, perfectly surfaced, making for easier riding than a concrete roadbed, stretched away before us. As I said, we got to Del Norte for a very early dinner. It rained again that night and I thought that I might have to fall back on chains to make Wolf Creek Pass. Some cheerful road experts in Denver had told me before I left that I should take two sets of chains along on my trip; that I surely would wear out one pair before I got half way around. Not too early in the morning we started out for Wolf Creek Pass. The eastern side climb was in good shape. The western slope side was under construction in spots, but nowhere did the road call for chains or curses. The pull from Del Norte to Pagosa Springs was made in plenty of time to allow an inspection of the huge hot springs and a good lunch.

Durango was our objective for the night. We got there at 4:30 in the afternoon, using chains for a half mile stretch that had been drenched a few hours before in a young cloudburst. We met a road crew on their way to put the road in shape. This bad stretch was not rough, but was "slick" and all one needed to ride comfortably and securely were chains. There was nothing the matter with the road from Durango to Mancos, and then on to Mesa Verde National Park.

Beginning our journey northward from the Park we again inquired about the highway leading from Cortez through Dolores to Norwood and thence on to Ouray.

"Don't try that route. The road from Dolores to Norwood has just been opened and all this rain must have put it in fearful condition."



A section of the world-famous Battle Mountain Road near Redcliff, recently completed

That was the cheerful advice we received from those "who knew". We told a garageman at Cortez that we wanted to reach Ouray that night. He laughed at us. It was then 11 o'clock in the morning.

"You'll be mighty lucky if you don't camp somewhere between here and Norwood."

The sixty-five-mile ride through the thinly settled country from Dolores to Norwood over the new road was delightful. This road still is narrow and unsurfaced. There were places where chains had to be put on; not because of mud holes, but because of the grades, where one wanted to be sure of traction. Norwood was reached at 4 o'clock and Ridgeway just at sunset. Several of the daily customary showers greeted us on the way. We reached Ouray early in the evening.

In that part of the country we found that they had pride in their good highways. When we asked about the road to Montrose we were told the truth. The road was in excellent condition, the trip being made in less than an hour.

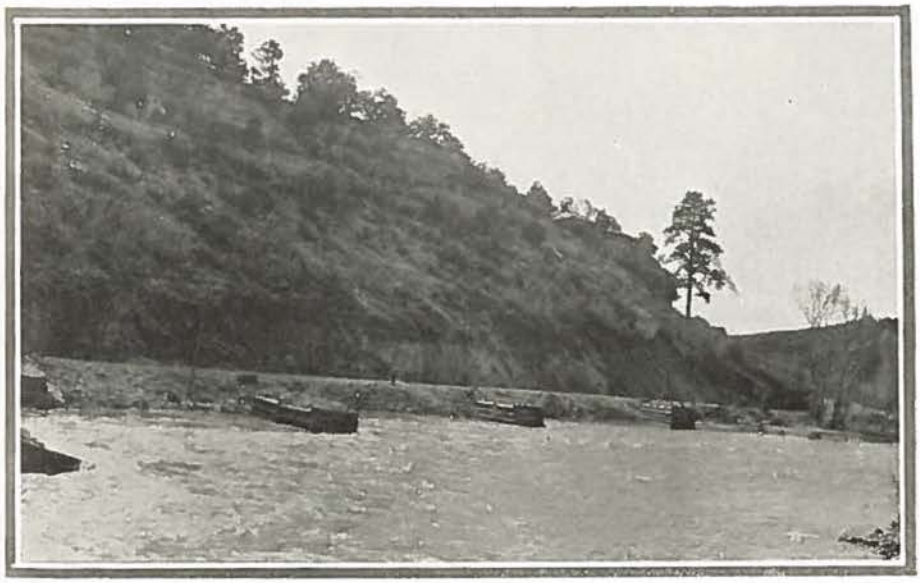
Gunnison was our stopping point for the night. One could drive over this highway in perfect confidence that he would reach his objective without worry or haste or fear of bad roads.

At Gunnison we heard further pessimistic reports and decided, with the prospect of going over Monarch Pass, that we would not try to travel any further than Leadville that day. The road over Monarch Pass was wonderful; almost unbelievable to find such a highway leading over the Continental Divide. We stopped at Buena Vista for lunch and reached Leadville too early in the afternoon to plan to spend the night there. Over Tennessee Pass we went and down into Redcliffe; then to Wolcott, where an effort was made to discourage our further journeying that day. It was dark when we left Wolcott with a sinister warning that the road to State Bridge would be our waterloo and that from State Bridge to Steamboat Springs the road was a mire. We will admit that the fourteen-mile journey to State Bridge left something to be desired, but it wasn't impassable and it wasn't difficult driving. This section had been drenched daily for weeks by heavy rains. What more could one desire but a road that one could travel on in safety.

At State Bridge a lonely and sleepy individual told us fearful tales of bridges out and creeks running wild over highways. We started out. We found bridges out, but the road was safe, as at each danger point sufficient warning had been placed. The first twenty miles necessitated a few trips over temporary ways into the sage brush. Then again we came to the unbroken highway, wide and smooth and dry, that carried us swiftly and safely into Steamboat Springs.

Pessimism regarding the roads seemed to pursue us. As we were about to leave Steamboat Springs we were told that the

(Continued on page 24)



Dolores River Road south of Dolores, in Montezuma County.

Citizens Raise Loan for Highway

Famous Busk-Ivanhoe Tunnel To Be Used As Part of All-Year Road to Western Slope Via Basalt

REALIZING the importance of an all-year highway across the Continental Divide—a highway which will permit automobile traffic between points on the Western Slope and the plains country east of the Rockies, public-spirited and enterprising citizens of Colorado Springs have undertaken to raise the sum of $30,000 for the purpose of making the far-famed Busk-Ivanhoe railroad tunnel and part of the old Colorado Midland Railroad right-of-way available for automobile and other vehicular traffic at once. They expect to loan this money to the State Highway Department until such a time that the Department has sufficient funds on hand to repay the money.

Rather than wait until State funds are available, the people of Colorado Springs and other communities interested are digging into their pockets to speed up the work and are putting up the money to finance the work. They want this new highway and want it badly and they are willing to advance the money to get it. They have the hearty support and cooperation of William Weiser, of Grand Junction, chairman of the State Highway Advisory Board, and of Charles B. Lansing, of Colorado Springs, board member from the Fifth District.

A year or so ago Spencer Penrose, A. E. Carlton and others associated with them in the ownership of the old Colorado Midland Railroad, presented the State with the greater part of the right-of-way of the road and followed this present later with another, consisting of the Busk-Ivanhoe Tunnel and some fine steel bridges and trestles, making only the one reservation, that they be permitted to bring water through the tunnel for irrigation purposes.

The Busk-Ivanhoe Tunnel was constructed to make the Colorado Midland Railroad independent of the storms which usually rage during the winter months in the vicinity of Hagerman Pass, where the Midland Railroad crossed the Continental Divide. It is one of the longest railroad tunnels in the United States. Its construction cost more than $2,000,000. Sixteen feet wide and twenty-four feet high, it is nearly 2½ miles long. Its heighth and width make it peculiarly adapted for automobile traffic.

Residents of Colorado Springs and of Chaffee, Lake and Garfield Counties were not slow in seeing the advantages of the utilization of the tunnel and that stretch of the old right-of-way from Arkansas Junction, south of Leadville, toward Basalt. Not only would use of the tunnel make automobilists independent of wind and weather, but the changing of the old railroad bed to a modern highway, they realized, would cut many miles off the distance between all points east of Arkansas Junction and Glenwood Springs and all points west, besides opening for automobile traffic one of the scenically most attractive sections of the Rockies.

An investigation by competent engineers and other experts disclosed that comparatively little work was required to open up this new highway. Removal of the railroad ties and the placing of flooring on the railroad bridges and in the tunnel was practically all that was required to permit automobiles and other vehicles to pass over the new highway.

Highway Department Officials approved the plans but when those behind the project asked the State for money to do the necessary work, it was found that all funds available for 1923 had been appropriated and that the heavy damage done to the roads of the State during the summer by heavy rains had even consumed the contingent fund. It was then that the citizens of Colorado Springs determined to raise the money themselves and turn it over to the State Highway Department.

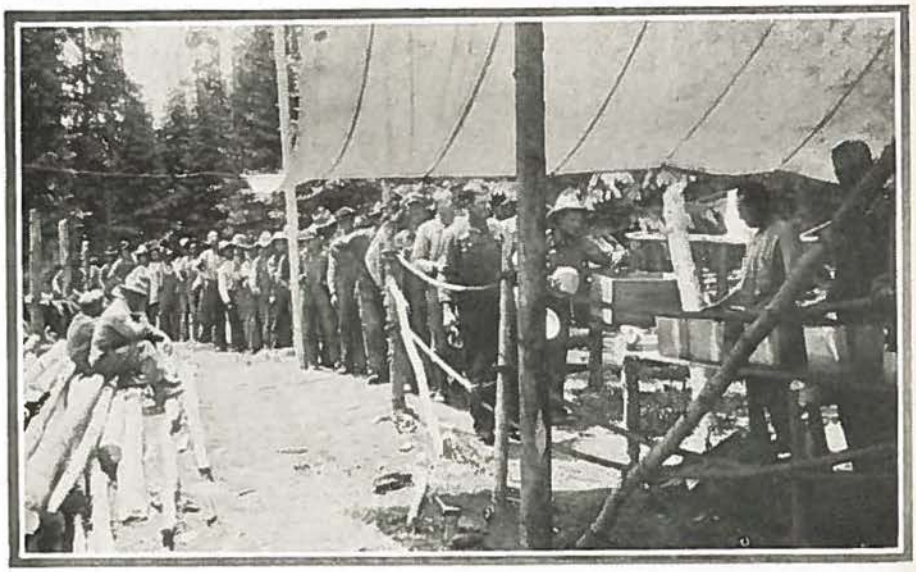
Messrs. Weiser and Lansing, the advisory board members, in whose districts the proposed road is located, were appealed to. When the plan was put up to them, they gave their hearty assent. Not only that, but they agreed to provide for the repayment of the $30,000 by the State Highway Department, by appropriating $15,000 in 1924 and an equal amount in 1925, each of their districts putting up $7,500 a year.

The first $15,000 has already been subscribed by the citizens of Colorado Springs. The Chamber of Commerce of that city led off with a subscription of $2,500. There is no doubt that the balance of $15,000 will be subscribed in the near future, and that the work of flooring the tunnel and bridges and of removing the ties will be undertaken at once. Russell K. Dougherty, Colorado Springs road enthusiast, is in charge of the subscription.

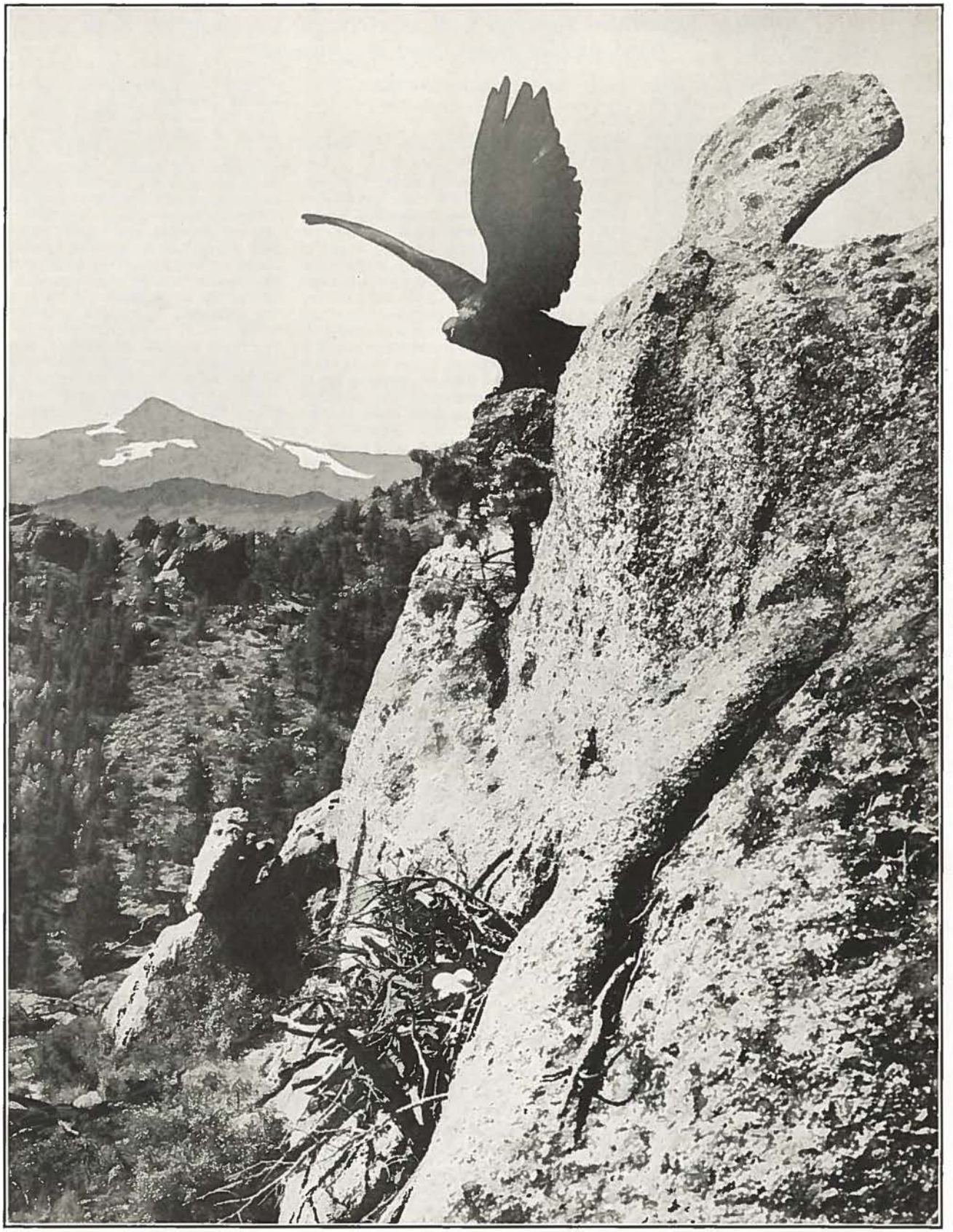
The new highway, starting at Arkansas Junction and running almost due west to Basalt, will offer a fine alternative route to Glenwood Springs or vice versa. It will lessen the distance between Glenwood Springs and Leadville materially and permit the automobilist to reach his objective without being compelled to negotiate the stiff grades of Tennessee Pass and Battle Mountain.

Attorney General Russell W. Fleming, assisted by George H. Shaw and Paul W. Lee, of Fort Collins, special attorneys, are preparing an appeal from the decision of United States Judge J. Foster Symes dismissing the State's suit to break the monopoly enjoyed by the Rocky Mountain Parks Transportation Company on the highways within the boundaries of the Rocky Mountain National Park. The State of Colorado constructed a goodly portion of the highways within the Park and, through its legal representatives, contends that these highways should be open to all the people.

"Our highway system has been laid down on lines which we recognize as presenting a parallel to our political institution. * * * Our highways are built by and under the States, with such Federal participation as is calculated to assure continuity and articulation * * * The importance of a perfected highway system as a measure of national defense has been profoundly impressed upon us and must not be overlooked. * * * * As we shall extend and improve our highways and more and more adapt them to the methods of transport, which this age has so marvelously developed for us, we shall strengthen year by year the ties of mutual interest and interdependence which united all our sections."—President Harding's last pronouncement on the necessity and value of improved highways.



A typical "Chow Party" in road camp near Silverton.



A bit of the Rocky Mountain National Park, where thousands find recreation each summer, reached by three main highways. Long's Peak, with its elevation of 14,260 feet, is seen in the distance.

Surfacing Alamosa County Highways

Use of Modern Equipment Reduces Cost of Handling Disintegrated Rock On Bond Project Near City of Alamosa

BY JOHN F. GREENE
Resident Engineer

THE old saying that, "By their deeds ye shall know them," may be changed in some respects, and be said of the San Luis Valley counties that "By their highways you will know them". These highways vary from the long tangent type of the prairie, with easy grades, to the short, sharp twists of the mountains, where you usually travel—with a flivver—in low gear.

As a rule the San Luis Valley counties, including Mineral County, because of its direct connection to the valley, are well supplied with natural road building materials. This is not so of the county of Alamosa, whose highways are of the prairie type, so, when the idea of grading and surfacing that section of State Highway No. 38, which extends west from the town of Alamosa, was considered, the question of surfacing materials became the most important.

At Wagon Wheel Gap in Mineral County, a pit of surfacing material, composed of disintegrated rock was found, which was so located, that it could be loaded into railroad cars by using a gravity chute seventy-five feet long. Mineral County had used this material for surfacing with very satisfactory results.

Special freight rates were requested by Alamosa County for this surfacing material, and the following rate was finally made by the Denver & Rio Grande Western Railroad: Any place up to twenty-five miles, 60 cents a ton; twenty-five to fifty miles, 80 cents a ton; fifty to seventy-five miles, $1.00 per ton.

At the west end of the Alamosa freight yards a spur track 200 feet long was constructed, making it possible to unload material within 100 feet of the highway upon which it was to be used. The spur track was raised three feet in order to facilitate the unloading of cars.

The entire work of grading and surfacing was performed by machinery. First, two 10-ton Holt Caterpillar Tractors, each pulling two road blades, realigned and widened to the road to twenty-four feet, leaving the last furrow on the shoulder as a means of holding the surfacing in place.

A loader was used at the spur track to load trucks and trailers, handling as much as two hundred and fifty yards a day, the trucks hauling three yards each and the tractor hauling twenty-one yards in seven 3-yard trailers. The average haul on the first four miles west of Alamosa was two miles.

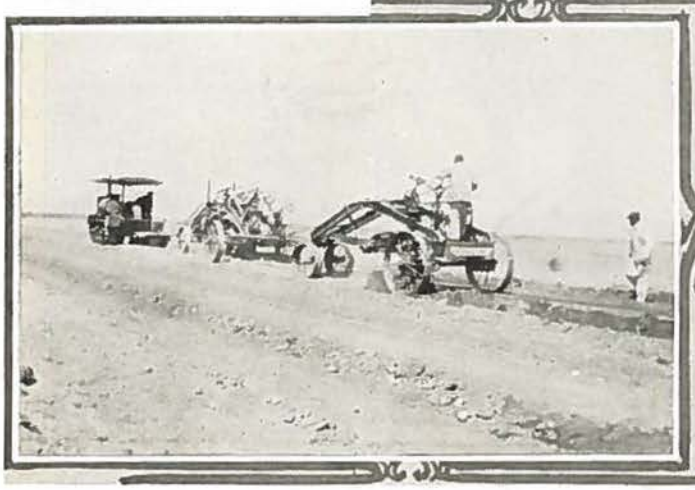
One tractor with blade and scarifier kept the sub-grade shaped and the surfacing spread. A centrifugal pump was installed to wet the surfacing before it was rolled; but due to rains at opportune times this pump was only in use two days throughout the job.

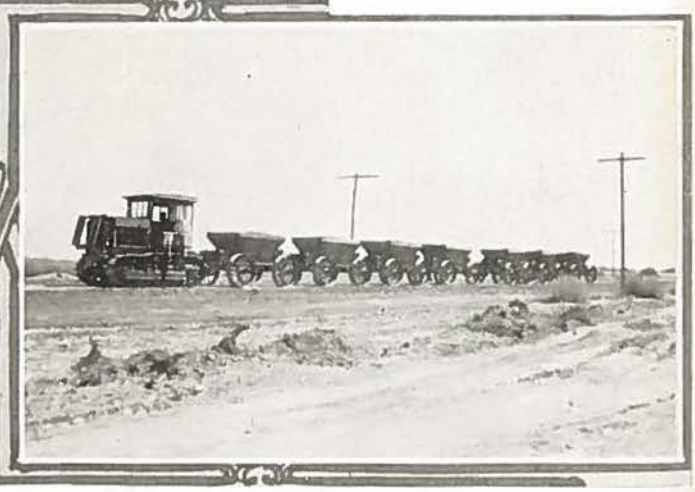
After the surfacing material had been spread to the required thickness, which was fur to six inches, according to the material making up the sub-grade, the scarifier was then used and set so as to cut about two inches into the sub-grade, thus giving the surfacing a good chance for a strong bond with the sub-grade, which in many places had become hard due to the trucks and tractor hauling over it. After scarifying and blading, the highway was opened to traffic. The day the first four miles was opened, it rained, giving the surfacing a good soaking. On the following morning a tractor, pulling a road drag, and a six-foot roller weighing three hundred pounds per lineal inch, was worked over the entire four miles of new road, with the result that the new surfacing was packed so it was able to stand the traffic without showing signs of raveling.

After the first four miles were finished, the loading machine was moved to a spur track called Wills, six miles west of Alamosa. The highway parallels the railroad the entire distance between Alamosa and Monte Vista, so that it was possible, in each case, to unload the surfacing material just off the highway right-of-way.

The good features about this surfacing is that, after dragging, there is a small amount of loose material on the road that will stay in the depressions and not blow off, that, after it is packed, it will absorb very little water, and that it is hard enough to withstand abrasion from traffic.

This work was carried on with State and Bond Funds by county forces. Mr. C. M. Terrill, the Alamosa County road supervisor, was in charge of construction forces.





Upper center—Modern loading machine in operation. Left—Tractor doing double duty by pulling two graders. Right—Slow-speed trailers used in hauling rock surfacing.

$40,000,000 From Tourist Crop

Some interesting figures as to the value of the National Parks in developing tourist travel to the various states in which they are located has been made public by the Department of the Interior. The figures based on careful studies carried on by National Park officials during the year are said to be conservative.

It is estimated that about $2,000,000 was expended in Yellowstone National Park by Park visitors during the current year and that $4,000,000 was expended by these tourists in the immediate adjacent states and within a reasonable distance of the Park. Every community on each side of the Park has been doing everything in its power to increase its tourist business with the result that automobile camp grounds with modern facilities are available to the motorist in almost every town on the approach roads to the Park. There is considerable rivalry among the states and towns for tourist business. Wyoming came to a realization of the value of this business the first of the three adjoining states, and today it is heading the others but is followed closely by Montana and Idaho.

Glacier National Park, Montana, is credited with having brought $1,250,000 of travel money into the state by tourists, nearly $700,000 having been expended in the Park.

One million and a half dollars is estimated as having been spent in the State of Washington as a result of travel to Mount Rainier National Park, the great playground of the Pacific Northwest. A new $3,000,000 hotel in Seattle and a new $1,000,000 hotel in Tacoma are being constructed primarily for caring for tourist traffic.

The total gross revenue estimated to have accrued to communities adjacent to Crater Lake National Park, Oregon, this season is placed at $320,000. An astute business man of Oregon recently stated that Crater Lake National Park represents an asset of $7,000,000 to the state, paying a four per cent annual dividend on that sum.

Yosemite National Park, California, is estimated to have brought $5,000,000 within the state, which was expended within a radius of 200 miles of the Park, in addition to approximately $2,500,000 expended in the Park. Yosemite's greatest value to the state from an economic standpoint lies in the fact that its timbered watersheds provide extensive capacity for water storage, outside the limits of the Park, upon which both for power and irrigation California is more dependent for progress than on any other one thing. With the mountains being denuded rapidly of forests all around the Park its tremendous importance in this respect will become greater and greater as time goes on.

The Sequoia and General Grant National Parks, California, which afford places to which the residents of the San Joaquin Valley may resort to escape the extreme heat of the summer, responsible for the wonderful fruit production of Southern California, are credited with having saved to the local communities some $800,000 which otherwise would have been spent in travel to other parts of California, the United States and abroad. It is also estimated about $200,000 is spent by visitors from outside the State to the Big Tree Parks.

The number of visitors to Rocky Mountain National Park, Colorado, from outside of the State is estimated at 65,000 people, their average stay in the State at ten days and their daily expenditure at $8 per day. This gives a total of $5,200,000 spent by visitors to Rocky Mountain, to which may be added approximately $2,500,000 spent by residents of the State in travel to and recreation in the Park.

Mesa Verde National Park in Southwestern Colorado is responsible for a considerable amount of travel money coming into the State. It is estimated by civic organizations in Denver that rail and auto travelers left over $40,000,000 in Colorado during the past season.

The upbuilding and prosperity of two modern thriving cities is directly responsible to National Parks. They are Hot Springs, which adjoins Hot Springs National Park, Arkansas, and Sulphur, which adjoins Platt National Park, Oklahoma.

The value of Grand Canyon National Park to the State of Arizona in bringing travel money to the State is estimated at nearly $2,000,000 annually and this amount is increasing steadily.

The really great value of tourist travel to the entire West lies not in the money that visitors expend for daily living and amusement, but in the information that is gained by them regarding the agricultural, commercial, mining, and industrial opportunities of the West, and in this manner the National Parks, in attracting tremendous travel to the West, are playing a highly important part in the economic development of the Nation.

The State of Texas has received $15,878,890.89 from the Federal Government to date for Federal Aid roads.

ROUTE OF PROPOSED PAVING NORTH OF LAFAYETTE CHANGED BY ENGINEERS.

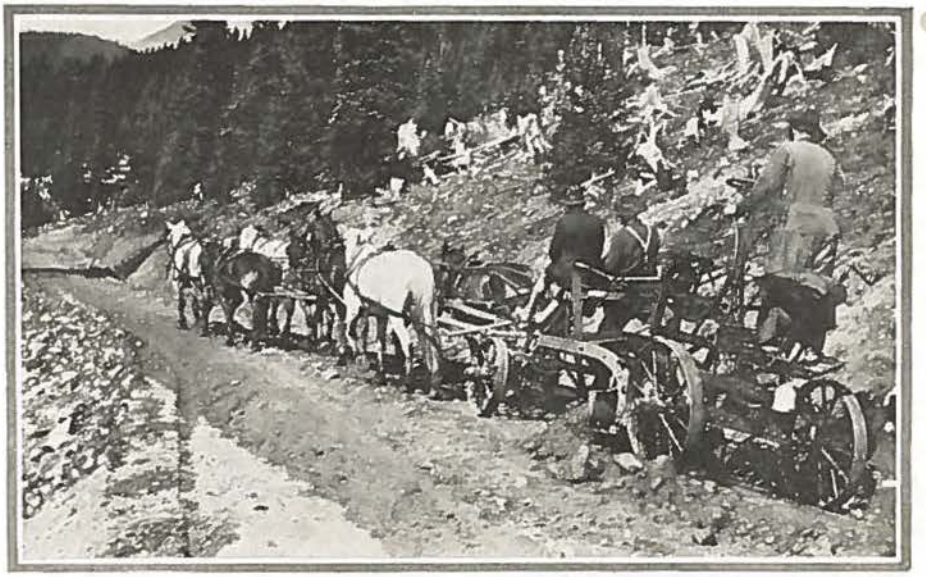
An important change in the alignment of the North and South Highway, between Lafayette and Longmont, has been decided upon by the heads of the State Highway Department. This change involves the abandonment of several miles of the present highway and the construction of a new road. The change has been decided upon in the interest of safety and economy.

Instead of turning north from Lafayette, circling a small irrigation reservoir and making two right-angle turns before taking a straight shoot for Longmont, the new plan calls for the extension of the present highway, as it passes through Lafayette in an east and west direction, to a point about half a mile west of Lafayette. It will then turn due north toward Longmont, joining the old road at a point about six miles south of that city.

The turn around the irrigation reservoir about two miles north of Lafayette on the present highway has been considered a danger spot for years. So many accidents have occurred there—some of them fatal—that the spot has become known as "death curve".

In anticipation of the change a project calling for the construction of concrete pavement between Lafayette and Boulder will begin at the point where the proposed new main highway will intersect the east and west road into Boulder. This intersection is about half a mile west from the present junction of the North and South Highway, made familiar to all automobilists by a large arrow suspended over the main highway. This project will extend from the proposed intersection toward Boulder for about a mile.

New York collects $12,736,364 in automobile and truck license fees.



Adams grader used to shape mountain roadway in Gunnison County.

Wolf Creek Nears Completion

Two miles of heavy rock work remains to be completed on the Wolf Creek Pass road project now under construction by the maintenance division of the State Highway Department. Some of this work runs 15 to 18 feet high on the inside.

The present work on Wolf Creek Pass is a continuation of the excavating started on the eastern slope last year. When completed it will give a 20-foot roadway across the pass for 25 miles. Besides the rock work, there will be about two miles of dirt excavation at the bottom of the Pass on the western slope, according to a report received by Robt. H. Higgins, Supt. of Maintenance, on September 15th.

Since May 15th, when the work on the Pass was resumed, the steam shovel under J. D. Taylor, foreman, has moved 53,420 yards of dirt and 11,645 yards of rock. Several hundred pounds of high explosives have been used in blasting the rock.

Completion of the work is expected by the end of the present construction season. Wolf Creek is one of the most important of roads across the Continental Divide in Colorado. It is open to traffic about five months in the year. The old road was narrow, steep and with numerous sharp curves. As now improved it is broad, smooth and easy of grade.

An appropriation of $25,000 was provided in the 1923 highway budget for the improvements made this year. This sum will be ample to complete the work, says Supt. Higgins. The steam shovel used on the project is the property of the State Highway Department.

Heavy rains delayed the work nearly all summer, Foreman Taylor reporting 45 days of straight rain. A six-inch snow storm fell on the Pass on September 16.

LOAD TEAM CAN PULL DEPENDS UPON TYPE OF HIGHWAY SURFACING USED.

The world never has known what a horse could do until pulling contests were conducted here for the first time in the history of the world, says a dispatch from the Iowa State Fair.

Prof. E. V. Collins of the Iowa College of Agriculture and Experiment Station at Ames, used his new invention, a dynamometer, in the tests which horsemen said would lead to the selection of sires on performance and revolutionize the draft horse and mule industry. Some of the results were these:

The size of load a team can pull depends on the road—the same team drawing three tons on a concrete pavement easier than one ton on a firm dirt road.

Teams developing 2,300 pounds tractive or drawing pull started and pulled a 24-ton load over a level pavement and 66 tons after they were once started.

Tested teams showed all the way from 8.6 to 21.2 horse power and exerted from 2,000 to 2,300 pounds tractive pull.

Heavier teams surpassed the lighter ones, starting loads with less exhaustion and taking them easier and more quickly to destinations.

The feature demonstration was made with 6,240 pounds of grain in sacks on a new farm wagon. To move this load of 7,720 pounds gross weight required tractive pulls of 125 pounds on a concrete pavement, 200 pounds on brick pavement, 300 pounds on asphalt and 520 pounds on a good dirt road. Corroborating other tests, the result showed that a 3-ton load is more easily handled by a team on a concrete road than 1-ton on a dirt road. It was taken as evidence that permanent highways are bigger time and money savers for farmers than previously estimated.

With the Collins dynamometer, predetermined loads can be imposed on horses for any required distance or time, and pair after pair can be tested with absolute assurance that the load is the same. This has never before been possible, although much desired, for constructive breeders have realized that selection on the basis of performance is the only sure and certain method of improving the draft qualities of horses and mules.

HIGHWAY POLICING EXPERIMENT IN PENNSYLVANIA OF INTEREST TO ROAD OFFICIALS.

Policing of state highways, as undertaken in Pennsylvania, is of interest in Colorado.

The new Pennsylvania law directs employment by the highway department of traffic officers and they will pay special attention to the evils of overloading trucks, of speeding of vehicles and especially of trucks, and of misuse of headlights. Here is what the highway department secretary says:

"Our traffic force will drive from the roads that five per cent of vehicle operators who through carelessness, ignorance or intent, endanger the lives and property of pedestrians and the ninety-five per cent of drivers who obey the laws and the rules of the road. We intend to make Pennsylvania highways an unhealthy place for intoxicated drivers. So-called speed demons will be curbed. The traffic force will be looking out for those drivers who roar through the state, utterly regardless of the rights of the other fellow."

Highway officials explained that a small portable weighing device will establish cases of overloading, and offenders when fined in court and ordered to deposit and return for the excess load will not be apt to repeat. They hold speed regulations on heavy truck as important for the protection of the roads as on faster vehicles for the protection of life and other property.

DENVER CONTRACTOR TO CONSTRUCT THREE STEEL BRIDGES IN WYOMING.

A contract for the construction of three steel bridges has been awarded by the county officials of Carbon County, Wyoming, to Daniel B. Miller, a Denver contractor. One of the bridges is to be 10 feet long over the Medicine Bow River at Elk Mountain; another 80 feet long, over Pass Creek, near Wolcott; while the plans for the third call for a 36-foot girder bridge over Mill Creek near Elk Mountain. Construction of the bridges will start immediately. For several weeks Mr. Miller has been employed on the construction of a state highway bridge near Dillon, on a contract by the Colorado Bridge & Construction Co., with the Colorado Highway Department.

HIGHWAY EMPLOYE DIES SUDDENLY WHILE MEMBER OF SURVEY PARTY ON MT. EVANS.

John Campion, for four years an inspector in the employ of the State Highway Department, died last month in camp on the slope of Mount Evans with a surveying party. Death came suddenly and was due to an attack of acute indigestion. The funeral was held in Denver, where Mr. Campion had lived for years. Prior to entering the service of the Highway Department he had been in the employ of the City of Denver under the administration of the late Robert W. Speer.

COUNTY OFFICIALS VISIT STATE FAIR AND ROAD EXHIBIT.

More than sixty members of the Arkansas Valley County Commissioners' Association met in special session at the Pueblo county court house September 25. The meeting was adjourned a few minutes after 10 a. m. and the entire delegation proceeded to the Colorado State Fair Grounds to spend the day at the 1923 Fair. In the large party were several members of the State Highway Board. Most members had their entire families with them.

Considerable interest was shown by the commissioners in the colorful and illuminated educational display of the U. S. Department of Agriculture, which featured good roads and their relation to the farmer.

The United States Forest Service has completed preliminary surveys for a 15-mile mountain road from Beulah to Rye, Pueblo's two summer resorts. The road will run through some of the greatest scenic points of the newly famed San Isabel National Forest. A trail has long been established along the proposed route and the automobile road has been encouraged by Puebloans as well as tourists.

The road will make a most wonderful circle drive from Pueblo, connecting what Pueblo considers her own two beauty spots in the Greenhorn range. J. L. Brownlee, assistant district engineer of the Forest Service, and A. G. Hamel, supervisor of the San Isabel National Forest, made the preliminary surveys.

Concrete Paving Costs Reduced in Colorado

A COMPILATION of unit prices show that Colorado's concrete pavements cost, with only two exceptions, less than in thirty-seven other states.

The average price per square yard of concrete paving in these 37 states is $2.43, while the average cost in Colorado is $2.22. The only other states having a lower price than Colorado are Indiana and New Mexico, with $2.19.

The standard price in New Mexico was for 7-inch pavement, while Colorado's standard is 7½-inch center and 6-inch sides. It is an undisputed fact that bidding among contractors for road jobs in Colorado has been keener than in almost any other state, and contracts have been taken by road builders in this State for less than is being paid for the same class of work in most other states.

So low have been the bids received on a number of projects that officials of the Highway Department have delayed awarding contracts until the bidders could satisfy the Department that they were fully capable of carrying out the terms of the contract.

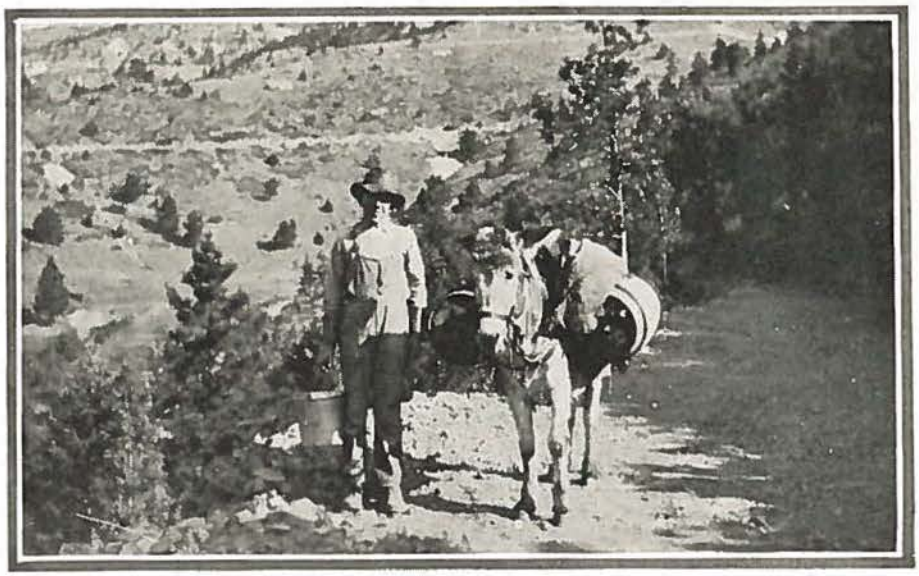
An abundance of material adjacent to road projects has been one of the factors in reducing the costs of construction in this State. Contractors also have been free from a labor shortage such as has handicapped road builders in other states. With a plentiful supply of labor the contractors have been enabled to complete a majority of the projects let by the Department on schedule time.

The table shows the unit prices at which contracts have been awarded in 37 states on concrete payements:

COST OF CONCRETE ROAD PAVEMENTS IN VARIOUS STATES DURING 1922

STATE	Yardage Upon Which Average Price Based	Number of Contracts	High Price	Low Price	Aver. Price Per Sq. Yd.	Total Yardage Roads Awarded
Arizona	1,777,408	4	$2.33	$1.98½	$2.30	1,824,168
California	1,611,135	42	(1.49	1.17	1.36 (c)	2,611,984
	.....	..	(3.78	1.93½	2.25	.....
Colorado	438,051	18	2.44	2.07	2.22	453,811
Connecticut	388,461	23	1.98	1.09	1.42 (c)	528,158
Delaware	588,739	25	3.17	2.30	2.66	678,345
Dist. of Colum.	5,000	1	....	....	3.50	5,430
Florida	135,700	1	....	....	2.70	712,799
Ill. State	4,138,092	69	....	....	23,000 per mi. (c)	6,589,643
Misc.	1,328,274	59	2.98	1.64	2.26	.....
Indiana	1,902,968	63	3.08	1.52	2.19	3,134,292
Iowa	1,395,269	14	3.28	2.18½	2.51	1,536,063
Kansas	1,377,774	29	2.70	2.27	2.55	1,952,283
Kentucky	138,337	3	2.96	2.55	2.72	142,037
Maine	154,582	5	1.92	1.42	1.62 (c)	187,568
Maryland	1,350,155	89	3.70	1.60	2.41	1,366,998
Massachusetts	204,980	5	2.89	2.24	2.57	339,835
Michigan	2,030,525	42	2.25	1.00	1.54 (c)	3,564,228
Minnesota	705,751	15	3.32	1.87	2.24	962,128
Mississippi	36,872	1	....	....	2.74	226,577
Missouri	1,329,635	37	3.25	2.00	2.70½	1,781,426
Nebraska	193,606	21	3.80	2.52	2.62	202,004
New Hamp.	30,348	3	2.48	2.15	2.40	47,820
New Jersey	1,133,579	48	3.80	2.31	2.67	1,374,668
New Mex.	172,998	3	1.96	1.76"-188-2.19 7"		172,998
New York	(3,624,515	118	1.65	.92	1.20 (e)	.....
	(271,191	25	5.00	2.25	2.78	4,844,252
North Dak.	12,000	1	....	....	3.39	12,000
Ohio	825,342	32	....	....	3.28 (dx)	2,920,203
Oklahoma	764,191	20	2.83	2.29	2.50	791,049
Oregon	553,089	22	2.80	1.72	2.32	582,901
Pennsylvania	1,645,273	51	....	....	4.25 (dx)	.....
	1,418,228	39	3.60	2.15	2.74	4,904,103
South Car.	270,260	6	2.87	2.34	2.60	281,201
Tennessee	99,969	1	....	....	2.34	236,440
Texas	580,745	15	3.25	2.35	2.64	649,871
Utah	410,688	6	3.01	2.60	2.88	547,085
Virginia	645,353	22	2.89	1.89	2.30	829,090
Washington	1,009,515	29	2.85	1.70	2.24	1,003,957
West Va.	737,804	30	3.10	2.20	2.36	1,118,054
Wisconsin	3,853,617	87	2.30	.73	1.26 (c)	4,382,824

(c) Exclusive of cement.
(e) Exclusive of cement and steel reinforcing.
(dx) Bids made in lump sum—road complete.
Average cost in the above named States for 1922.....$2.43 per yard
(Much of this yardage was 6" pavement and practically nothing over 7½ " center and 6" sides.)



Nipper Proves Hero on Difficult Road Project in Clouds Above Virginia Canon

"Where in the deuce is that nipper?" inquired the foreman of the road crew.

"Wonder what could be keeping him. I'm nearly faint from thirst. And those drills are on the ragged edge. We'll soon have to close down if that boy don't hurry along."

Two miles down the canon the "nipper" was plodding along with his precious cargo of water and sharpened drills, loaded "aboard" a "mountain canary."

Meantime a score of tired, sweating workmen were cussing their luck—"forty miles from water and forty feet to hell." The road job hung on a precipice 500 feet above the bottom of the canon.

Finally the "nipper" with his cargo arrived. He was greeted with mixed emotions by the disgruntled workers. A "nipper" is the most cussed and discussed individual in a road gang.

In this case the "nipper" was engaged in hauling water from Idaho Springs to State Road Project No. 776, located two miles up Virginia Canon on the route to Central City. Two miles of new road was under construction, making a six per cent grade and eliminating the old 15 per cent grade, which has been the jinx of flivverites for years.

The new work connects with the road constructed over the mountain between Idaho Springs and Central City last year. The distance between these two points is now eleven miles. By the old road it was six miles. The new road was extended in order to reduce the steep grade.

The hero of this particular difficult road project was the 14-year-old "nipper".

"He was worth his weight in gold," said Capt. John P. Donovan, division engineer. "It would have been impossible to construct the job without his services.

"Only those who have been engaged in building roads in out-of-the-way places can appreciate the work of a "nipper" and his trusty burro. They bring gladness to the hearts of the workers on each trip—cool, fresh water and sharp tools for drilling the holes in the rock that must be blasted away to make roadbed."

Acting as foreman for the State on the project was George K. Kimball, and W. E. Griffith was resident engineer in charge.

Plans for the project were made up from nine survey lines.

Loveland Pavement Completed

A solid ribbon of pavement from Fort Collins to Loveland, a distance of approximately twelve miles, became an accomplished fact on September 17.

On this date this important link in the North and South Highway was opened to traffic. Since early spring about half of the road has been closed on account of construction. During this time traffic was diverted over a detour located to the west of the main road.

Traffic is now moving over concrete from the city limits of Loveland north to Ft. Collins.

The new work consists of four miles of standard 18-foot concrete pavement, which was constructed by the Fred C. Dreher Construction Co. This project was delayed for the greater part of the summer on account of heavy rains. During July and August the contractor was able to get in only about fifteen working days.

The contractor is now engaged in building up the shoulders to the concrete, preparatory to final acceptance by the State Highway Department. The total cost of the improvement, one-half of which is Federal Aid, is $137,326.42.

Records of the Highway Department show that traffic over the old road, which was half graveled and costly to maintain, carried traffic amounting to 200 automobiles and forty trucks per day. The road serves a well settled and highly cultivated section.

Work of improving the detour which will be used around the concrete paving project south of Loveland, extending from the end of the present paving, a distance of two and one-half miles, has been started under the supervision of Div. Engr. A. B. Collins. The new project will be constructed by the Dreher Construction Co. It will extend to a point near Campion. Gravel will be spread over the detour road.

Construction of the new paving will be started early next spring. The paving should be completed by the middle of the summer. During the coming year it is expected that another link of paving on this road will be laid extending the concrete south of Loveland into Berthoud.

The State has either completed or under construction a total of 110 miles of concrete paving at the present time.

"Federal Aid Project No. 81-A open to traffic."

This report was received in the offices of the State Highway Department on September 16th.

This project includes the improvement of the road which connects the concrete pavement at the Rifle Range on the Golden road with the mouth of Vernon Canon. The new road reduces the distance between Denver and Idaho Springs about four miles and eliminates the necessity of through traffic having to go over Lookout Mountain.

The improvement includes three and one-half miles of grading and rock surfacing, at a total cost of $37,265.47, one-half of which is paid for by the Federal Government.

At the mouth of Vernon Canon, above Morrison at the summit of the Hogback road, the new road connects with an improved road through the canon which forms a junction with the Mountain Parks boulevard near the Ralston Ranch. The old road leading from the Rifle Range was narrow, with heavy grades and very slippery in bad weather. Grades on the improved stretch are reduced to 6 per cent and is from 18 to 20 feet wide.

The contract was let to H. C. Lallier Const. & Engr. Co., of Hudson, Colo., on April 28, 1923. It included 37,300 square yards of rock surfacing, 22,900 yards of common excavation, 26,100 station yards of overhaul and 6,100 yards of barrow fill.

While the project is not entirely complete, the contractor now being engaged in cleaning up a few ravelled ends, Div. Engr. John P. Donovan reports that the project should be ready for final acceptance within fifteen days.

State Forest Funds are Distributed To Counties For Upkeep of Roads

PRACTICALLY every county west of the foothills of the Rockies in Colorado was the recipient of a warrant from the State Auditor's office in payment of its share in the earnings of the seventeen National Forests of Colorado during the latter part of September. Under the law governing the administration of the National Forests one-fourth of the earnings of the Forests goes to the counties in which the Forests are located. The money is distributed on the basis of forest acreage. The greater the acreage of a county in a forest, the greater the amount the county receives.

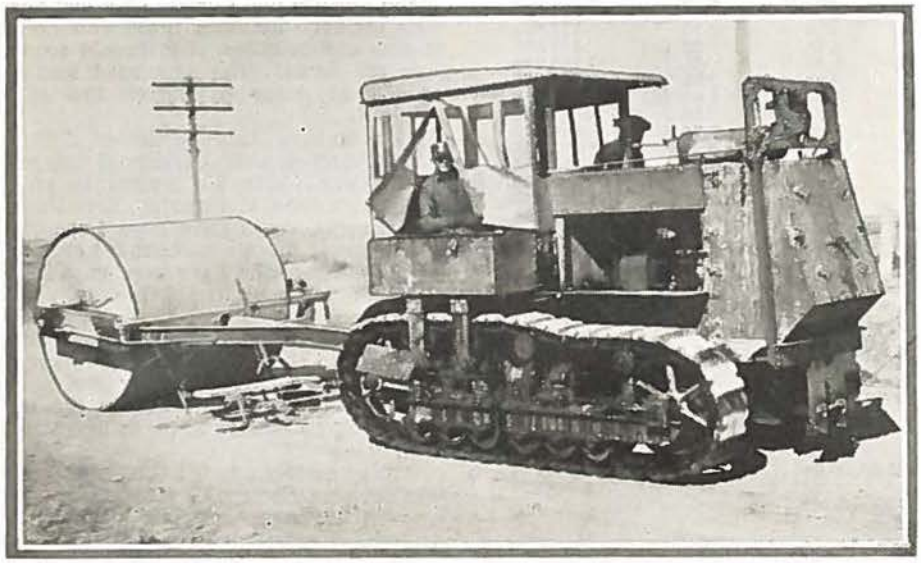
The forest law further provides that the money received from forest earnings must be spent either on roads or on schools in the proportion of 95 per cent on one and five on the other. It is left to the county commissioners to decide whether 95 per cent shall be spent on roads and 5 per cent on schools, or vice versa.

Following are the amounts of the warrants sent by State Auditor Stong to the counties who participated in the distribution:

Alamosa	$ 189.80	Lake	$ 984.80
Archuleta	3213.76	La Plata	3125.76
Boulder	1362.81	Larimer	6792.44
Chaffee	2767.96	Las Animas	165.40
Clear Creek	740.90	Mesa	7257.03
Custer	970.70	Mineral	5671.94
Conejos	3304.72	Moffat	394.47
Delta	2608.14	Montezuma	2935.90
Dolores	4079.40	Montrose	2882.36
Douglas	596.60	Ouray	1268.33
Eagle	4372.82	Park	3017.02
El Paso	445.25	Pitkin	3560.58
Fremont	399.89	Pueblo	214.04
Garfield	5295.20	Rio Blanco	3389.82
Gilpin	431.07	Rio Grande	2823.72
Grand	3440.29	Routt	5251.19
Gunnison	9568.56	Saguache	6993.43
Hinsdale	4996.47	San Juan	1828.99
Huerfano	712.68	San Miguel	2173.70
Jackson	3397.50	Summit	1771.87
Jefferson	422.18	Teller	451.45

In view of the fact that the county road funds were greatly depleted through the expense of making repairs of damage done by excessive rains last summer, it is to be hoped that the counties will utilize the money for road purposes.

The gross receipts from automobile and truck license fees in the United States totals $152,367,023, of which amount $34,058,664 is expended on Federal Aid 7% construction.



Maintenance outfit rolling the wrinkles out of Prowers County roads.

What It Costs to Collect Auto Fees

THE following table, showing automobile license fee collections in the 48 states and the cost of collection and other expenses, was prepared by the American Association of State Highway Officials. In some states the expenses of collection are defrayed by legislative appropriations and are not taken out of the gross collections, as in Colorado. In two cases no information was obtainable regarding the manner in which collection expenses are defrayed.

State	Total gross receipts	Cost of collection and other exp'nse
Alabama	$1,262,800	$25,256
Arizona	216,598	*.....
Arkansas	1,030,196	29,874
California	8,384.606	814,496
Colorado	991,677	94,494
Connecticut	3,567,744	*.....
Delaware	426,377	*.....
Florida	1,538,342	50,592
Georgia	1,830,047	68,907
Idaho	812,943	Not given
Illinois	7,861,211	*.....
Indiana	2,999,588	176,470
Iowa	7,923,388	277,318
Kansas	3,100,000	85,071
Kentucky	2,140,444	62,868
Louisiana	1,756,226	65,087
Maine	1,417,507	162,100
Maryland	2,841,648	347,872
Masachusetts	5,685,527	648,725
Michigan	8,385,022	839,148
Minnesota	6,543,685	404,087
Minnesota	6,543,685	*404,087
Missouri	3,497,957	200,000
Montana	619,899	36,499
Nebraska	3,081,699	120,691
Nevada	120,937	6,475
New Hampshire	1,246,098	90,496
New Jersey	6,251,418	89,132
New Mexico	243,813	7,024
New York	12,736,364	Not given
North Carolina	2,715,331	553,197
North Dakota	698,931	50,000
Ohio	7,888,992	264,424
Oklahoma	2,729,169	272,916
Oregon	3,340,519	154,306
Pennsylvania	12,575,380	583,950
Rhode Island	1,139,742	83,271
South Carolina	734,856	32,178
South Dakota	743,232	74,323
Tennessee	1,592,230	70,467
Texas	4,261,488	85,230
Utah	729,455	54,661
Vermont	781,982	73,096
Virginia	2,491,809	102,828
Washington	3,291,671	109,684
West Virginia	1,936,079	92,000
Wisconsin	4,085,845	178,706
Wyoming	316,849	*.....
Total	152,367,023	.....

* Indicates that collection expense is handled by special appropriation.

WORK OF MARKING COLORADO ROADS NOW UNDER WAY BY MAINTENANCE CREWS.

To date 1500 markers have been delivered to the State Highway Department by the Rocky Mountain Motorists, Inc., to be erected on the main roads of the State. Erection of the road signs is being done by maintenance crews employed by the State. The signs are furnished to the State free of cost.

Work of erecting the signs will continue through the winter months, according to Highway Engineer Blauvelt. He expects that the work will be completed by the middle of next summer. When the Colorado Highway marking system is completed it will be possible to travel to any section of the State by following the various road numbers.

The new system of marking includes renumbering of the state highways. Markers now being posted are on the main routes through the State and to the various state and national playgrounds. In adequately marking Colorado roads, the State Highway Department is following the lead of other progressive commonwealths.

How Colorado Ranks Among States in Road Building Under Federal Aid Highway Act

Here are some facts regarding Colorado and Colorado highway activities which, Colorado Highways believes, are of general interest to the people of the State and which, it believes, are not generally known. They are gathered by the American Association of State Highway officials, composed of the heads of the highway departments of the several states and of the United States Bureau of Public Roads. They are authentic in every way. They go to show that Colorado, though ranking far below some states, so far as population and assessed valuation of property is concerned, ranks high when it comes to highway activities.

Colorado ranks:

In ratio of population, 33; with 939,629 inhabitants;

According to taxable valuation, 27; with $1,578,256,499;

In ratio of total road mileage, 27; with 48,000 miles;

In ratio of population per mile of seven per cent system, 35; with 280 inhabitants;

According to taxable valuation per mile of seven per cent system, 25; with $469,719;

In ratio of total Federal Aid from 1917 to 1924, 24; with $8,198,398;

In ratio of total Federal Aid per mile of seven per cent system, 24; with $2,400;

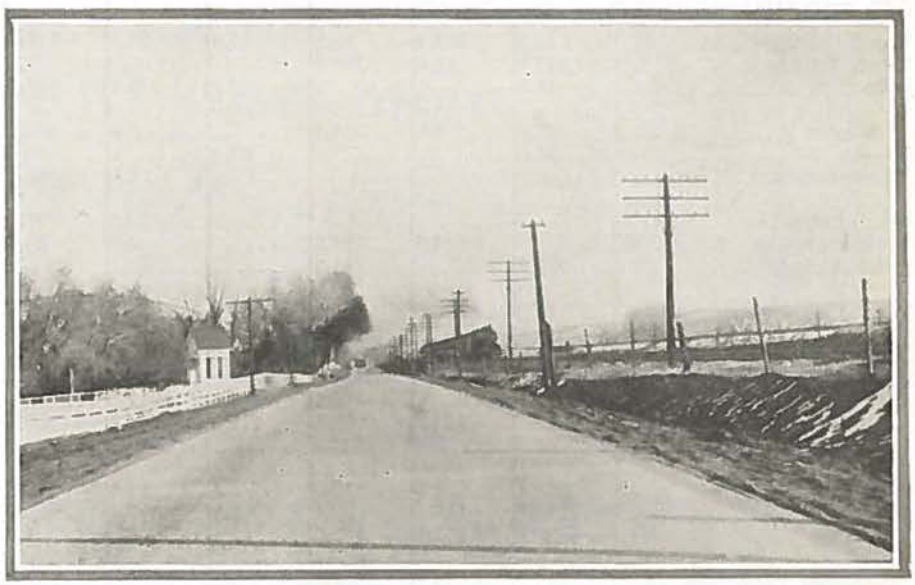
According to number of automobiles and trucks, 21; with 162,328;

According to automobiles and trucks per mile of seven per cent system, 23; with 48;

According to gross automobile license fees, 36; with $991,677;

According to average revenue per automobile and truck, 45; with $6.10.

The State's ranking so far as average revenue per automobile and truck is concerned, proved again the oft-repeated statement that Colorado charges practically the lowest fees of any state in the Union. Only three states—Indidana, South Dakota, and Arizona—charge lower fees and of these, Indiana has doubled its fees since the compilation was made. In South Dakota the average revenue is $5.90 and in Arizona $5.59.



Concrete paving at Wolhurst on Denver-Colorado Springs highway.

Mileage by Types of Federal Aid Projects Under Construction and Federal Aid Cost Per Mile

July 1, 1923

(Includes projects entirely completed and those under construction)
(Compiled by the American Association of State Highway Officials)

States	Graded and drained miles	Sand-Clay miles	Gravel miles	Water-bound macadam miles	Bitumi-nous macadam miles	Bitumi-nous concrete miles	Concrete miles	Brick miles	Bridges miles	Totals	
										Miles	Federal Aid Cost per mile
Alabama	3.2	374.4	425.5	11.6	117.6	43.5	9.6	.....	3.8	989.1	$6,687
Arizona	163.0	18.1	304.7	14.2	.....	5.0	88.3	.....	0.8	594.0	7,821
Arkansas	.....	.....	720.0	50.6	112.4	206.9	45.7	.....	1.0	1,136.6	5,015
California	147.8	100.7	206.8	.....	79.9	21.4	289.1	.....	1.0	846.7	11,516
Colorado	171.1	130.0	177.3	.....	.....	1.0	110.6	.....	2.4	592.5	8,565
Connecticut	.....	.....	.....	.....	27.2	.....	58.4	.....	.....	85.6	17,619
Delaware	.....	.....	.....	.....	.....	.....	62.1	6.2	.....	68.3	13,968
Florida	31.0	34.3	.....	.....	81.1	.....	37.3	40.4	2.5	226.5	15,098
Georgia	78.3	1,100.2	219.8	37.3	55.5	2.5	103.2	0.4	18.6	1,615.6	6,227
Idaho	147.5	18.6	332.6	4.3	.....	26.2	21.2	.....	0.9	551.3	7,726
Illinois	145.1	.....	0.4	.....	3.3	8.1	746.5	17.3	0.9	921.6	15,140
Indiana	6.1	.....	13.8	.....	28.6	12.0	369.3	.....	0.1	429.8	16,921
Iowa	1,242.8	.....	425.5	.....	.....	.....	381.3	22.0	.....	2,071.5	5,401
Kansas	171.8	36.7	153.1	4.5	58.5	.....	395.3	103.6	.....	923.5	11,350
Kentucky	312.9	.....	41.8	59.8	114.1	.....	50.0	3.9	0.2	582.8	10,868
Louisiana	7.4	.....	832.6	3.2	9.5	5.7	2.0	.....	0.1	860.4	5,827
Maine	.....	.....	91.8	.....	103.8	.....	39.4	.....	0.2	235.1	14,689
Maryland	3.8	.....	31.6	0.1	31.2	12.4	181.3	.....	.....	260.4	13,298
Massachusetts	.....	.....	.....	3.3	138.6	31.7	79.5	.....	0.3	253.5	17,629
Michigan	.....	.....	298.1	18.1	.....	76.2	341.7	0.4	.....	734.4	12,618
Minnesota	414.1	.....	1,870.6	.....	.....	22.1	224.9	.....	0.3	2,532.0	4,395
Mississippi	160.5	30.9	575.1	11.3	.....	1.9	79.4	9.2	.....	868.2	6,574
Missouri	253.7	.....	634.6	45.1	63.6	15.9	223.3	5.6	4.9	1,246.7	8,571
Montana	190.6	.....	593.7	16.0	6.9	0.9	28.5	.....	1.5	838.1	5,452
Nebraska	1,623.2	133.7	190.3	.....	.....	.....	27.0	7.5	0.2	1,981.9	2,923
Nevada	70.9	7.0	317.3	19.1	.....	1.6	38.3	.....	0.4	454.5	8,498
New Hampshire	.....	.....	86.2	20.0	34.0	27.1	1.9	.....	0.2	169.4	8,763
New Jersey	.....	.....	3.4	.....	.....	5.0	140.0	.....	.....	148.4	18,214
New Mexico	241.2	5.1	868.0	.....	.....	.....	43.2	.....	0.8	1,158.3	3,833
New York	.....	.....	.....	.....	328.6	.....	558.3	.....	0.7	887.6	15,608
North Carolina	63.2	601.1	85.8	17.9	38.0	137.7	127.0	.....	1.4	1,072.1	7,470
North Dakota	1,277.9	19.4	339.4	.....	.....	1.1	1.9	.....	1.4	1,641.2	2,794
Ohio	18.8	.....	.....	83.3	234.3	65.3	289.8	318.7	0.1	1,010.3	12,838
Oklahoma	27.4	2.0	394.2	.....	0.6	43.1	141.0	1.2	6.3	615.9	11,171
Oregon	96.6	.....	469.4	25.6	.....	40.6	88.5	.....	0.5	721.2	9,108
Pennsylvania	.....	.....	.....	.....	7.5	100.3	714.8	23.7	.....	846.3	19,338
Rhode Island	.....	.....	.....	.....	10.4	37.0	7.2	.....	.....	54.6	17,507
South Carolina	.....	949.2	122.6	.....	3.0	30.3	55.9	0.2	6.9	1,168.0	4,446
South Dakota	376.9	.....	861.5	.....	.....	.....	.....	.....	0.6	1,239.1	4,322
Tennessee	10.0	.....	180.0	122.1	296.2	9.6	32.4	.....	1.2	579.5	14,546
Texas	211.1	58.1	2,469.8	663.0	188.4	8.9	216.9	20.3	5.1	3,841.5	5,109
Utah	137.2	.....	164.0	9.3	.....	7.8	70.5	.....	0.9	389.6	8,823
Vermont	.....	.....	63.1	7.4	17.9	.....	3.5	.....	0.3	92.1	13,067
Virginia	27.3	163.7	71.1	117.0	164.3	3.3	181.0	.....	0.8	728.3	10,055
Washington	47.0	.....	246.8	.....	.....	.....	181.8	.....	1.3	477.0	11,935
West Virginia	153.4	1.7	18.2	8.4	86.4	16.6	89.5	11.4	0.2	385.7	10,572
Wisconsin	233.6	187.4	632.4	2.7	9.6	.....	290.4	.....	0.1	1,356.3	5,480
Wyoming	420.1	252.1	132.5	.....	.....	1.2	17.0	.....	2.3	825.3	5,267
Totals	8,686.7	4,224.3	15,593.2	1,375.0	2,450.8	1,029.7	7,285.6	591.9	71.1	41,308.3	7,736
Percentage	21.0	10.2	37.8	3.3	5.9	2.5	17.7	1.4	0.2	100	

Harold W. Moore, president of H. W. Moore & Co., returned to Denver on October 4, following a two weeks' visit in New York and other eastern cities. On the return trip to Denver he visited several factories represented by his firm in this territory. Inquiries brought out the fact that business is "looking up." The head of one large manufacturing plant described the situation as follows; he said: "The fever has left the patient. In the future when business is off it won't be bad and when it is good, it won't be booming. Or, in other words, business has returned to its normal trend."

A Koehring high-speed mixer was used on the paving project on the state highway north of Colorado Springs, extending a distance of 4½ miles to Breed, on which work was stopped September 20 until next spring, when the concrete on the fills will be poured. This was done in order to allow the fills to settle during the coming winter months. Experts who have gone over the work completed say it is one of the best jobs in the State. The Standard Engineering Co. have the contract.

Harry P. Wilson, head of the Denver machinery firm of H. P. Wilson & Co., returned home September 18 from a vacation trip to the east. He was a visitor of the Colorado State Fair, held in Pueblo, September 24 to 29. While there he attended the meetings of the Arkansas Valley County Commissioners' Association.

Elton Fair, sales manager for Thomas J. Fair, Colorado distributor for J. D. Adams graders, made a pleasure trip to Yellowstone Park last month. He found that Adams graders are used for maintenance on most of the roads in the Park and that these machines enjoy a wide popularity among the men engaged in road work in the national recreational area.

L. R. Granis spent the week of September 24 in Steamboat Springs, supervising the erection of several Blaw-Knox portable steel buildings purchased by the Victor-American Coal Co. The structures are for use of mine employes at Mt. Harris. Grannis was accompanied by his wife to Steamboat. They made the trip in an automobile and encountered a heavy snow storm on Berthoud Pass.

BIDS RECEIVED DURING SEPTEMBER

Proj. No.	Location	Length	Type	Low Bidder	
F.A.P. 2-R	Trinidad, North	3.	mi. Paving	Stamey Mackey Const. Co.	$108,849.90
F.A.P. 222-C	Denver-Lafayette	2.825	mi. Paving	R. M. Larson	122,666.80
F.A.P. 224	Morrison-Baileys	5.127	mi. Grading	M. J. Kenney Const. Co.	54,347.00
F.A.P. 240	Gypsum-Dotsero	5.185	mi. Gravel Surfacing	O. L. Hackett	66,178.30
F.A.P. 241	Gunnison River, North of Delta	600	ft. Steel Bridge	Winterburn & Lumsden	99,309.76
F.A.P. 245-A	Las Animas-Hadley	4.545	mi. Gravel Surfacing	W. A. Colt & Son	42,786.00
F.A.P. 252	Loveland-Berthoud	2.463	mi. Paving	F. C. Dreher Const. Co.	84,676.60
S.P. 806	Ramah-Simla	2.955	mi. Sand-Clay Surfacing	R. P. Morrison	17,097.30

PROJECTS ADVERTISED FOR BIDS

Proj. No.	Location	Length	Type	Bids Opened
F.A.P. 230-A	Wolhurst, Toward Sedalia	0.852	mi. Paving & R. R. Grade Separation	October 16, 1923
F.A.P. 230-B	Wolhurst-Gann	3.995	mi. Paving	October 16, 1923
F.A.P. 251	Boulder-Lafayette	1.014	mi. Paving	October 16, 1923

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

Proj. No.	Location	Length	Type
257	Between Denver and Brighton	0.282	mi. Concrete Viaduct

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	Length	Type
F.A.P. 116-B	Breed, North and South	0.91	mi. Paving & R. R. Grade Separation
F.A.P. 116-C	North of Breed	3.22	mi. Paving
F.A.P. 226-D	Platteville	1.	mi. Paving
F.A.P. 242	Grand Junction-Fruita	3.5	mi. Gravel Surfacing
F.A.P. 243	Bayfield and Pagosa Springs	2.5	mi. Gravel Surfacing

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
71-B	Durango-Hesperus	3.6	mi. Gravel Surf.	Peterson, Shirley & Gunther	$ 61,556	32	71-B
81-A	Rifle Range-Vernon Canon	3.50	mi. Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	70	81-A
102	Ouray-Red Mountain	1.06	mi. Mtn. Grading	Johnson & Johnson	58,972	42	102
116-A	Colorado Springs paving	4.18	mi. Conc. Paving	Standard Engr. & Constr. Co.	238,944	64	116-A
119-B	Cochetopa Pass	7.5	mi. Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	45	119-B
125	Sapinero-Cimarron	11.3	mi. Grav. Surf.	Dale Hinman	36,797	17	125
125	Sapinero-Cimarron		Steel Bridge	Winterburn & Lumsden	53,072	3	125
129	Federal Boulevard	4.42	mi. Paving	Peterson, Shirley & Gunther	164,331	100	129
133	Federal Boulevard	4.22	mi. Paving	W. J. Cameron & Co.	146,399	100	133
135	Denver-Morrison	5.3	mi. Conc. Pavement	Colo. Bridge & Constr. Co.	178,158	9	135
163	St. Charles Bridge	0.5	mi. Steel Bridge	Rogers & Pickard	85,636	89	163
165	Canon City, east	9.33	mi. Grav. Surf.	G. A. Allen	94,769	88	165
168-B	Lamar-Hasty	6.86	mi. Gravel Surf.	Standard Engr. Co.	60,194	44	168-B
174	Red Mountain	3.03	mi. Mtn. Grading	Pickering Bros.	82,071	64	174
190	Summit County Bridge and Road	1.45	mi. Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	38	190
207	Dillon-Kremmling	100	ft. Truss Bridge	Rogers & Pickard	28,831	2	207
208-C	Grand Junction-Palisade	4.75	mi. Gravel Surf.	Northwestern Const. Co.	46,627.35	5	208-C
210-A	Grand Valley-DeBeque	5.30	mi. Grav. Surf.	F. L. Hoffman	57,429	59	210-A
211	Meeker, north	1.85	mi. Grav. Surf.	Hinman Bros	34,445	65	211
213-B	Durango-Hesperus	5.26	mi. Grav. Surf.	J. Edd. Hansen	72,960	42	213-B
214	Durango-Bayfield	3	mi. Gravel Surf	Dale Hinman	53,411.05	7	214
215	Pagosa Springs Bridge	0.17	mi. Steel Bridge	Plains Constr. Co.	33,286	81	215
216-A	Holly, east	5.38	mi. Grav. Surf.	W. A. Colt & Son	57,867	99	216-A
217	Pueblo, east	2.94	mi. Paving	Ed. Lindsay	72,164	81	217
218-B	Hasty-Lamar	3.49	mi. Grav. Surf.	M. J. Kinney	40,009	100	218-B
221	Loveland, north	4.05	mi. Conc. Paving	Fred C. Dreher Constr. Co.	142,125	78	221
222-B	Broomfield cut-off	1.52	mi Conc. Paving	Miller, Douglas & Hanes	68,302	99	222-B
223-A	Kremmling-Rabbit Ear	2.88	mi. Grav. Surf.	Henry Shore	30,565	29	223-A
225	Fitzsimons Hospital road	1.00	mi. Bit. Paving	Miller, Douglas & Hanes	36,618	50	225
226-A	Brighton-Ft. Lupton	8.23	mi. Conc. Paving	White & Johnson	241,133	78	226-A
226-B	Brighton-Greeley	2.86	mi. Conc. Paving	White & Johnson	89,923	30	226-B
226-C	Platteville-Greeley	4.4	mi. Conc. Paving	Engr. Constr. Corp.	120,114	2	226-C
228	Atwood-Sterling	4.41	mi. Conc. Paving	La Nier, Selander & White	148,484	100	228
229	Pueblo-Florence	1	mi. Grav. Surf. & Bridge	H. M. Fox	34,646.50	2	229
231	Six Mile Creek Bridge	0.45	mi. Steel Bridge	McCormick & Brockaway	25,165	42	231
246-R	East of Pueblo	2.537	mi. Conc. Paving	R. A. White	78,431	2	246-A
255-A	Ft. Morgan-Brush	2.70	mi. Conc. Paving	Colo. Bridge & Constr. Co.	85,763	6	255-A
256-A	Sterling-Brush	2.50	mi. Conc. Paving	La Nier, Selander & White	79,902	34	256-A

STATE HIGHWAY DEPARTMENT
STATE OF COLORADO
STATEMENT OF THE HIGHWAY AND BOND FUNDS FOR THE THIRD QUARTER ENDING AUGUST 31, 1923.

BALANCES DECEMBER 1, 1922

Highway Fund	$ 439,975.53		
Federal Aid Bond Fund	902,852.61		
County Bond Fund	816,305.20		
Total		$2,159,133.34	
RECEIPTS			
One Mill Levy	$1,134,666.25		
Motor Vehicle License Fees	461,052.37		
Gasoline Tax	233,011.66		
Internal Improvement	65,200.00		
U. S. Government	855,264.35		
Counties, Federal Aid Projects	85,298.71		
Counties, Merchandise	91,487.75		
Counties, Transfer from Bond Fund	7,954.61		
Bulletin Subscriptions and Advertising	1,856.71		
Refunds and Junk Sales	5,971.03		
Authorized Bond Issue	1,500,000.00		
Total		$4,441,763.44	
Total Balances and Receipts			$6,600,896.78
DISBURSEMENTS			
Federal Aid Project Preliminary	$ 58,597.08		
Federal Project Construction	1,431,445.04	$1,490,042.12	
State Projects		797,411.51	
Maintenance		502,635.92	
Property and Equipment		80,149.98	
Administration, General Office	47,080.19		
Administration, Engineering	82,654.98	129,735.17	
Road Signs and Traffic Census		5,436.80	
County Bond Projects		532,788.00	
Total			$3,538,199.50
BALANCES			
Highway Fund		$1,335,487.32	
Federal Aid Bond Fund		1,500,000.00	
County Bond Fund		227,209.96	
Total			$3,062,697.28
Total Disbursements and Balances			$6,600,896.78

EQUIPMENT NOTES

Announcement of a new type ditcher and trenching machine is made this month by the Keystone Driller Company. A booklet containing a complete description of the new machine will be ready for distributed by the Stearns-Roger Mfg. Co. of Denver, intermountain distributors for the Keystone line, within a couple of weeks.

The machine has a new crawler attachment, using the well-known Buckeye crawler. By this construction the designers of the unit have been able to do away with the side jacks. It has a larger boiler and weighs 15 tons, whereas the older type machine weighed only 14 tons.

Construction of the unit is such that it can be used with a skimmer scoop, several sizes of ditcher scoops, as well as with a clamshell bucket.

While the unit is entirely new in this territory, it is said to have met every requirement most satisfactorily on several jobs on which it has been used in three or four eastern states, and as now constructed, carries the full guarantee of the Keystone concern.

It is both surprising and educational to take a trip through the new plant of The R. Hardesty Manufacturing Company and observe the number of different standard products manufactured.

Their Can Department is especially interesting. Here you see common tin pass through machinery at a rapid rate of speed, to emerge at the opposite end a nice looking finished coffee can.

Perhaps the most interesting line of cans to watch, however, are the five-gallon gasoline, oil and honey cans. The Hardesty Company ship on the average of from three to ten car loads of five-gallon cans a week throughout this western territory.

A new addition to this modern factory is a Lithographing Department. In this department some very beautiful examples of lithographic work is produced. The same wonderful color combinations found so prolific in the advertising pages of current magazines are reproduced on tin in this plant.

Almost every style and type of can used in the commercial world, from the plain sifter top pepper can to the large five-gallon square cans, are manufactured by the Hardesty Company. The addition of this Lithographing Department makes the Hardesty Can Factory one of the most modern and up-to-date in this section of the country.

A new road building unit which screens, crushes and loads materials in one operation, has been brought out by the Russell Grader Mfg. Co. Bulletins describing the new unit are now being distributed by Herbert N. Steinbarger & Co. For years road builders have recognized the value of using a certain portion of crushed material in road surfacing as compared with loose pit run gravel. The only drawback has been the expense of producing such material. It is claimed that the Russell plant brings down the cost and provides increased capacity. The unit is combined in a compact portable form, and can be moved quickly from place to place. All over-size material from the pit run is crushed, thereby adding to the aggregate the sharp, irregular material necessary for a firm, well-bound road surface.

The operation of the plant is said to be quite simple. The pit run material is brought to feeder conveyor with dragline buck scrapers or drag scrapers and the material is conveyed to a shaking grizzly or screen which passes all smaller material directly into hopper below. The oversize passes over the perforated screen into crusher. The delivery conveyor consists of a 24-inch belt.

John Pollock, who formerly had charge of the parts department of H. P. Wilson & Co., is now connected with the Liberty Trucks and Parts Co. as general sales representative. He is now on a tour of the State calling upon county commissioners and road supervisors. The Liberty Trucks and Parts Co., of which Fritz J. Altvater, former superintendent of the State Highway Shops, is the head, deals exclusively in parts for army trucks which have been distributed by the War Department to the counties for road work. The concern is also general distributors for Liberty trucks in the intermountain territory, with offices at 1530 Fifteenth Street, Denver.

Colorado has 130 miles of Federal Aid sand-clay roads—California has 100 miles.

Editor Discovers Colorado Roads

(Continued from page 5)

road over Rabbit Ears Pass was almost blocked to traffic. We left at noon with the announced intention of arriving at Grand Lake in time for dinner. We were informed that it would be a hard task to make Kremmling. The road on the western side of the pass was in excellent condition. On the eastern side, however, we found that the heavy rains had created havoc with the surface of the adobe highway. The road was very rough in spots and we began to wonder why some work hadn't been done on it, when, lo, we found ourselves on a broad stretch of roadway, surfaced smoother than the average asphalt pavement. Several cars going west passed us at terrific paces showing that the road must extend for some distance. Crews were at work on this road and the reason for work on the old stretch was explained. The new road was taking the place of the old one, though not following the winding trail the old one does. That highway, when finished, I believe will be one of the most delightful in that part of the State. For miles this pavement stretched away toward Kremmling. From Kremmling to Grand Lake the roads were very good. There was no need to watch for chuck holes, no need to keep a lookout for bridges gone. Grand Lake was reached by 6 o'clock.

From Grand Lake we drove into Estes Park over the Fall River Road. (Note: The editor may delete this reference to the Fall River Road.) The road was wonderful to the top of Fall River Pass, but from the top of the pass into Estes Park it was mighty rough going. It was not dangerous, but it was fearfully rough and one had to keep close watch on his car as it bounded from one boulder to another.

This bad stretch was soon forgotten after we got out of Estes Park on our way to Idaho Springs by way of Allen's Park and Nederland. This mountain route from Estes Park to Denver may well be called "The Driveway in the Clouds." Here is a road that keeps one at a high elevation for a great distance. It rained hard on this part of the trip but the road was hard and smooth and at no place did it show signs of "slickness". When we left Estes it was a bright summer day. After passing through several very heavy showers we again came out into the land of sunshine and for a few miles ran over a carpet of snow about one-half inch thick. Through this snow was blooming a wide variety of mountain flowers, from the blue bell to the Indian paint brush. It was a scene one could not forget.

This road from Estes Park to Idaho Springs and thence on to Denver makes a most delightful drive. One can depend on this road because it is smooth and hard surfaced. Some say that it has too many grades to make the driving of it a pleasure. What is a mountain trip without grades? What is more exhilarating than to hum up one grade, and then, around a curve, and down another? Brakes? I believe that an experienced mountain road driver uses his brakes far less than the average city driver does while rambling around the streets.

Colorado should be proud of her mountain roads and anticipate with pride what they will be like in another few years if the present work on them is continued.

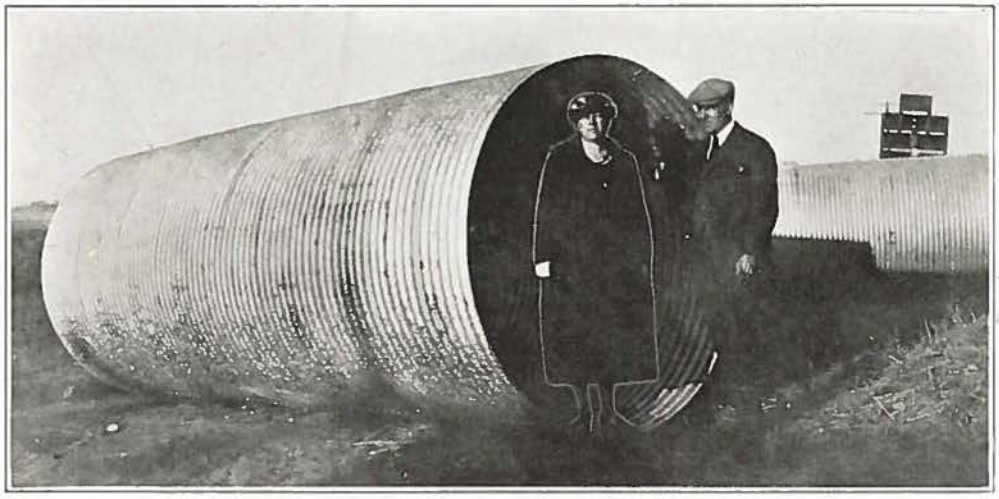
The purpose of this little exposition is to warn the knocker not to knock until he really has had some experience with the highways of this State.

The Pawling & Harnischfeger Co., of Milwaukee, has issued Bulletin 407, on the care and operation of electric traveling cranes and hoists. Copies of this bulletin are now available for distribution through Paul J. Fitzgerald, Denver branch manager of Landes & Company, distributors for the P. & H. concern in Colorado and Utah. The new bulletin tells about the purchasing of cranes, how to order repair parts, inspection of cranes, directions for starting, care of bearings, gears and cables, load brakes, overheating wet armature motors for alternating current, manual controllers, magnetic switch controllers, contractors, wiring, etc.

Reports from H. P. Wilson & Co. show the sale of more than a score of Koehring mixers in the Denver territory during the past month. These mixers are finding great favor among high-grade contractors bent upon fast mixing and economical operation of their concete plants.

KEYSTONE PRODUCTS

KEYSTONE COPPER STEEL



Culvert
6 ft. diam.

Well-Casing
11 in. diam.
by
34 feet

Flume
No.
108
5 ft., 9 in.
diameter

The Colorado Culvert and Flume Company

PUEBLO

KOEHRING
Dragline

All Koehring Built!

KOEHRING draglines are all Koehring-built from the ground to the boom peak — from the foundry through the machine shops to the loading of the flatcars in the erecting shops.

This alone makes possible strict adherence to Koehring Heavy Duty standards in every detail — and when you know the detail of Koehring construction, you will recognize All-Koehring-built as an unusual value in excavating machinery — as an important, additional factor of greater capacity performance, lowest maintenance and longest trouble-free service life.

Dragline Capacities

No. 1. ¾ cu. yd. at 30 ft. radius.

No. 2. 1 cu. yd. at 40 ft. radius.

No. 3. 1½ cu. yd. at 40 ft. radius. May be adapted for crane-excavator and shovel.

Write for catalog.

KOEHRING COMPANY

Manufacturers of Concrete Mixers, Draglines, Crane Excavators, and Shovels

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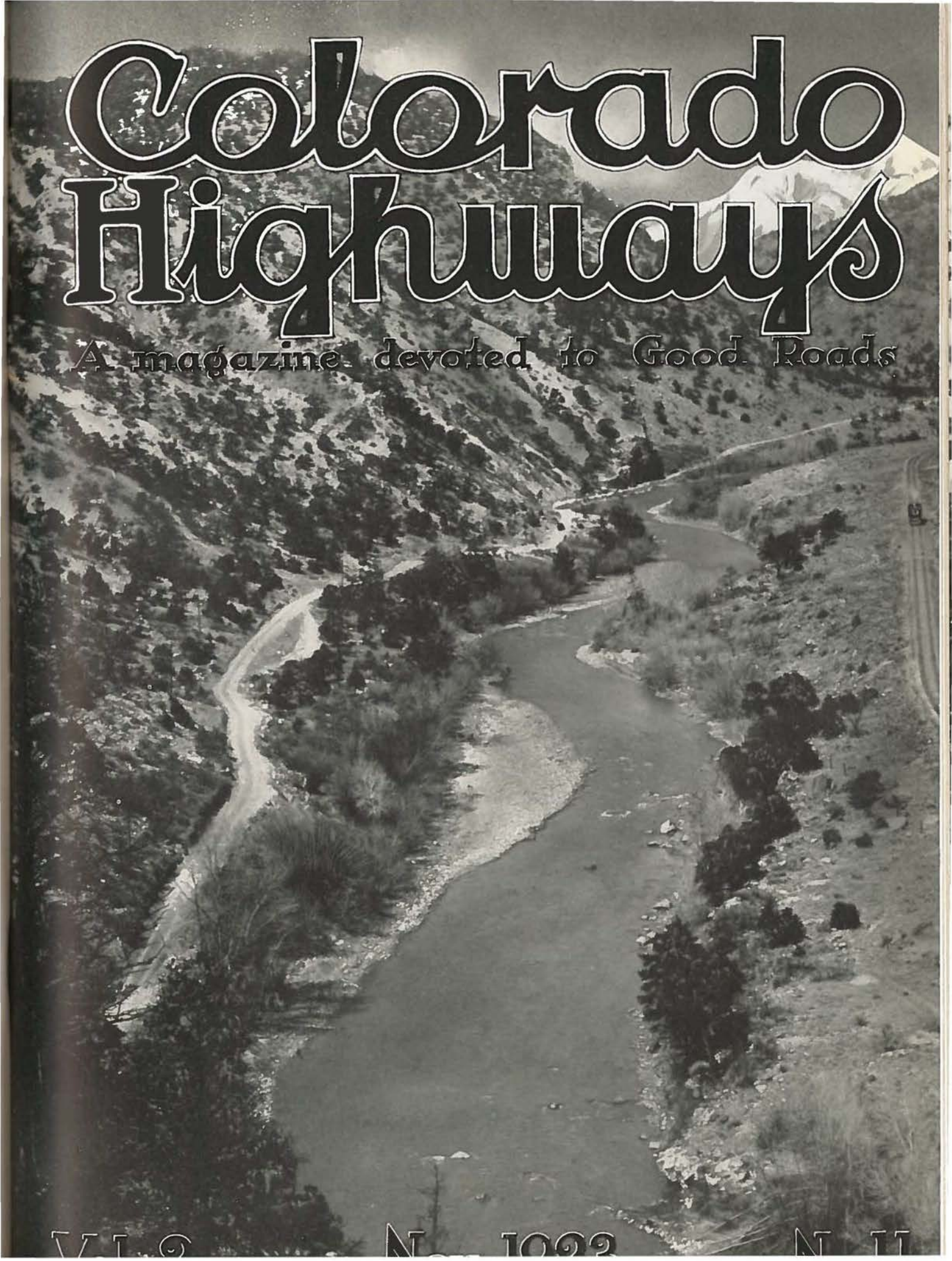
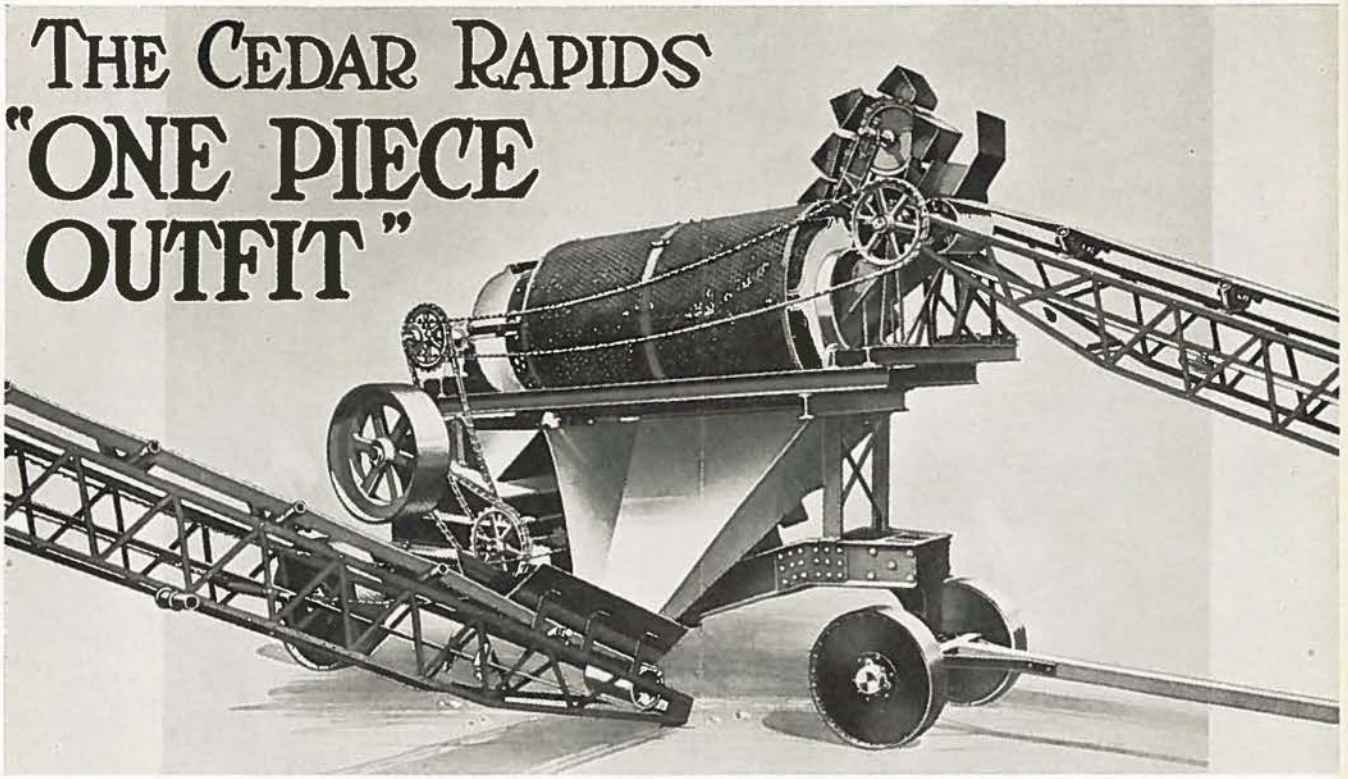
THE BRADFORD-ROBINSON PTG. CO., DENVER


Colorado
Highways
A magazine devoted to Good Roads

THE CEDAR RAPIDS "ONE PIECE OUTFIT"



Conveys Material from Quarry Ledge or Gravel Pit; Crushes; Screens; and Delivers Finished Product direct to Storage or Loading Bins

The urgent need of hard roads, and more hard roads, becomes more apparent every day. High cost is the one deterrent factor; and the biggest single item of highway building is the transportation of materials.

With stone and gravel constituting the bulk of the material used, the solution of the high cost problem lies in the use of stone or gravel to be found locally.

The CEDAR RAPIDS "One Piece Outfit" makes possible the economical building and maintenance of roads where the cost was formerly prohibitive. Strictly portable, it may be operated on small jobs over a wide territory, filling a long felt need of state, county and township highway departments as well as road contractors.

This outfit is built entirely of steel, with wide tread, disc type wheels fitted with roller bearings.

CEDAR RAPIDS FORCE FEED JAW TYPE CRUSHERS are built along standard lines, yet embody improvements which are the last word in crusher construction.

A size and model suited to every crusher need—simplicity of construction, interchangeability of parts, strength and durability.

H.W. MOORE & Co

DENVER, COLO. WESTERN DISTRIBUTORS **SALT LAKE, UTAH**

Colorado Highways

Official Publication of the
COLORADO STATE HIGHWAY DEPARTMENT
Denver, Colorado

Published Monthly by the
COLORADO HIGHWAYS PUBLISHING COMPANY,
1824 Stout Street, 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.

10 CENTS A COPY. **$1.00 A YEAR.**

OUR COVER PICTURE

An airplane view of the Arkansas River and the famous Rainbow Route, near Salida, is printed on the cover of Colorado Highways this month. This is one of the most picturesque sections of Colorado and during the summer is traveled by thousands of motor and rail tourists from all parts of the country. In the early days this route was used by goldseekers and was the main artery of travel to Leadville when that camp was at the height of its prosperity. Today it forms an important link in a great transcontinental motorway.

Colorado Highways
"BETTER ROADS"
VOLUME II. NOVEMBER, 1923. NUMBER 11.

State Highway Bond Expenditures

How State's Share of $5,000,000 Bond Issue Was Expended on Federal Aid Projects

WHEN the people of Colorado voted for the $5,000,000 bond issue for highway construction in November, 1920, they decreed that one-half of this sum should be expended by the state highway department and the other half by the counties under the highway department's direction. The sum of $2,500,000 was set aside for the counties, and an equal amount was placed in the state highway fund. Added to the highway department's portion was $151,257,—the amount realized by the state as a premium on the entire issue, and later $56,307.24, which was adanced by several counties out of their share of the proceeds of the bonds to assist in the completion of certain highway projects.

Altogether the state highway department received $2,707,564.24 of bond money. Colorado highways is enabled to publish herewith the department's account how this sum was expended. The appended report was prepared by Edwin Mitchell, the department's chief auditor, and Roy Randall, the office engineer. It accounts for every penny of the state's portion of the bond fund. The last disbursements from the fund were made during the month of September.

In presenting the report Colorado Highways desires to call attention to the fact that the amount of money found opposite a project is not the amount which the project cost, nor that the amount of money found in the tabulation built the mileage specified. The report simply sets forth just how much of the state's portion of the bond fund was contributed toward the completion of each of the projects found in the list. As a matter of fact, probably double the amount of money was used to complete all of the projects listed.

Colorado Highways wishes to call attention to one fact in connection with this bond issue; the state highway department did not charge the counties one penny for handling their portion of the issue, notwithstanding the fact that the highway law expressly authorizes the department to make a charge of four percent for administration and specifically includes the proceeds of all bond issues as monies against which such a charge may be made.

In lieu of making a charge of four percent the department took charge of the premium obtained thru the sale of the bonds and then turned this money back to the counties by putting it on the various projects, thus giving the people of the state a maximum of construction for their money.

The following table contains the designation of each highway project on which highway department bond money was expended, its location, length and the amount of money expended:

F.A.P.	County	Location	Type	Length Miles	Amount
2-R	Las Animas	North of Trinidad	Concrete Paving	2.998	$ 13,964.74
7-C	Montrose	Between Naturita and Norwood	Grading	10.500	41,318.83
7-B	Montrose	Thru Naturita E. & W.	Grading	4.044	32,991.31

(Continued on next page)

Completed State Highway through Poudre Canon ready for traffic

F.A.P.	County	Location	Type	Length Miles	Amount
18-R					12,280.39
28	Summit	North of Dillon	Grading	2.093	10,769.14
29	Jefferson	Turkey Creek	Grading	1.946	10,417.70
30	Jefferson	Denver-Morrison	Concrete Paving	0.944	31,668.37
32	Adams	Denver-Brighton	Concrete Paving	5.737	8,392.40
38	Morgan	East of Ft. Morgan	Concrete Paving	2.727	10,006.38
51	Cheyenne	Cheyenne Wells N.	Sand Clay Surfacing	8.788	8,062.40
52	Teller	Cripple Creek S. E.	Grading	4.884	3,447.01
54	Chaffee	Buena Vista-Divide	Grading	5.074	20,734.48
55	El Paso	Peyton East	Sand Clay Surfacing	5.360	6,762.69
58	Prowers	Granada North & W.	Gravel Surfacing	3.129	4,567.63
59	Bent	Las Animas-Hasty	Gravel Surfacing	9.921	35,170.04
65	Ouray	Ouray-Silverton	Grading	1.155	19,473.56
68	Rio Grande	Monte Vista North	Gravel Surfacing	11.358	15,692.92
71-A	La Plata	Durango West	Gravel Surfacing	4.962	37,473.46
71-B	La Plata	West of Durango	Gravel Surfacing	3.609	13,756.60
74	Moffat	Craig West	Gravel Surfacing	6.493	8,155.66
75	Grand	Kremmling North	Grading	6.846	7,434.08
78	Eagle	N. W. of Redcliff	Grading	2.759	5,843.77
80	Routt	Steamboat Springs N.	Grading	6.647	32,819.17
81-A	Jefferson	Rifle Range-Vernon Canon	Grading	3.505	19,698.97
81-B	Jefferson	Vernon Canon	Grading	1.714	15,970.51
87	Boulder	East of Boulder	Concrete Paving	1.334	9,208.36
88	Boulder	South of Longmont	Concrete Paving	1.117	7,766.34
89	Adams	Henderson-Brighton	Concrete Paving	4.413	950.74
92	Pueblo	Huerfano River, East Pueblo of	Concrete Bridge	0.091	347.80
94	Fremont	Fremont-El Paso county line-Florence	Sand-Clay Surfacing	3.296	20,758.75
96	Otero	La Junta-Swink	Concrete Paving	1.377	20,067.64
97	Prowers	Lamar-Carlton	Gravel Surfacing	6.669	24,956.76
100	Rio Grande	Del Norte North	Gravel Surfacing	3.087	8,113.38
101	La Plata	Bayfield N. E.	Gravel Surfacing	4.091	18,895.47
102	Ouray	Ouray-Silverton	Grading	1.051	14,731.50
103	San Miguel	Norwood E. & N. W.	Grading	5.681	10,632.69
104	Montrose	North of Montrose	Gravel Surfacing and Bridge	0.208	4,979.55
106	Routt	Steamboat South	Gravel Surfacing	1.357	7,871.15
107	Moffat	Craig-Maybell	Gravel Surfacing	3.970	15,467.97
111	Lincoln	Limon East	Sand Clay Surfacing	9.875	31,623.36
113	Chaffee	Salida S. E.	Grading	4.500	4,903.85
116-A	El Paso	Colorado Springs N.	Concrete Paving	4.185	74,642.98
119-A	Saguache	Saguache-Cochetopa Pass	Sand-Clay Surfacing	7.482	6,114.41
119-B	Saguache	Saguache-Cochetopa Pass	Crushed Rock Surfacing	7.474	13,090.88
120	Jefferson	Berkely-Arvada	Concrete Paving	1.273	6,581.60
122	Sedgwick	Julesburg West	Gravel Surfacing	8.401	13,823.05
124	Conejos	North of La Jara	Concrete Bridge	0.170	3,290.04
125	Gunnison	Sapinero West	Grading	3.062	5,272.21
126	Montezuma	Dolores South	Gravel Surfacing	3.141	11,613.62
127	Lincoln	Limon South	Sand-Clay Surfacing	2.727	7,452.87
129	Adams	Denver-Broomfield	Concrete Paving	4.424	80,910.84
130	Arapahoe and Douglas	Littleton-Wolhurst	Concrete Pavement	1.004	25,803.98
131	Adams and Arapahoe	Aurora	Concrete Paving	0.833	29,504.59
133	Adams	Denver-Broomfield	Concrete Paving	4.223	66,435.56
135	Jefferson	Denver-Morrison	Concrete Paving	5.370	4,273.60
136	Jefferson	Turkey Creek N. E. Conifer	Grading	5.522	17,075.42
137	Jefferson	Arvada-Denver	Concrete Paving	0.596	7,440.83
139	Larimer	Loveland-Ft. Collins	Concrete Paving	4.024	72,282.22
142	Logan	Sterling South	Concrete Paving	2.500	76,685.65
146	Weld	Greeley-La Salle	Concrete Paving	2.079	58,127.84
148	Weld	Brighton-Lupton Fort	Concrete Paving	4.897	74,899.95
157-B	Chaffee	Riverside North	Grading	6.526	10,731.09
161	El Paso	At Buttes	Bridge	0.275	56,834.22
162	El Paso	Colorado Springs-Manitou	Concrete Paving	1.363	50,338.10
163	Pueblo	St. Charles River E. Pueblo	Bridge	0.502	37,610.73
165	Fremont	Canon City-Florence	Gravel Surfacing	9.325	60,521.36
166	Otero	La Junta-Swink	Concrete Paving	2.012	55,302.88
168-A	Prowers	Granada-Carlton	Gravel Surfacing	5.655	47,465.58
168-B	Prowers	Lamar North	Gravel Surfacing	3.286	17,774.61
169	Bent	East of Las Animas	Bridge	0.511	46,030.92
171	Delta	Delta N. W.	Gravel Surfacing	6.673	45,193.47
172	Gunnison	Sapinero E.	Gravel Surfacing	3.189	18,250.10
173	Pueblo	St. Charles River	Bridge	0.255	7,491.08
174	Ouray	Silverton-Ouray	Grading	3.035	47,736.23
178	Rio Grande	At Monte Vista	Bridge	0.029	6,715.77
180	Costilla	Fort Garland South	Grading and Bridge	2.135	4,499.44
182	Eagle	Red Cliff North	Grading	3.305	37,449.50
183	Mesa	Grand Junction-Palisades	Concrete Paving	1.363	39,831.97
184	Mesa	Grand Junction-Fruita	Concrete Paving	0.806	12,149.70
187	Rio Blanco	Meeker South	Shale Surfacing	2.698	5,480.15
188	Moffat	Craig East	Gravel Surfacing	3.158	14,837.95
189	Routt	Hayden East	Gravel Surfacing	5.414	39,656.65
190	Summit	North of Dillon	Grading	1.453	11,756.79
208-A	Mesa	Grand Junction-Palisades	Gravel Surfacing	3.144	26,690.16
209	Mesa	Grand Junction-Fruita	Gravel Surfacing	4.202	47,538.27
210-A	Garfield	Grand Valley-DeBeque	Gravel Surfacing	5.302	26,101.25
211	Rio Blanco	Meeker-Craig	Gravel Surfacing	1.679	12,751.26
213-B	Montezuma	Durango-Cortez	Gravel Surfacing	5.276	14,171.77
215	Archuleta	At Pagosa Springs	Bridge	0.170	19,990.66
216-A	Prowers	N. Granada East	Gravel Surfacing		51,014.41
217	Pueblo	East of Pueblo	Concrete Paving	2.938	27,818.63
218-A	Bent	East of Hasty	Gravel Surfacing	8.341	41,699.97
218-B	Bent	Hasty-Prowers county line	Gravel Surfacing	3.489	25,933.56
221	Larimer	Fort Collins-Loveland	Concrete Paving	4.049	50,326.93
222-A	Adams, Boulder and Jefferson	Denver-Broomfield	Concrete Paving	2.736	72,837.26
222-B	Boulder	Broomfield North	Concrete Paving	1.519	38,880.98
223	Grand	North of Kremmling	Gravel Surfacing	2.881	7,319.37
225	Arapahoe	East of Aurora	Concrete Paving	1.003	16,568.92
226-A	Weld	Fort Lupton North & South	Concrete Paving	8.228	117,667.82
226-B	Weld	Platteville North & South	Concrete Paving	2.868	2,359.60
226-C	Weld	Platteville-La Salle	Concrete Paving	10.725	27,769.94
228-A	Logan	Southwest of Sterling	Concrete Paving	4.405	105,367.80
229	Fremont	At Beaver Creek	Bridge	0.879	752.25
231	Pueblo	At Six-Mile Creek	Bridge	0.454	9,537.08
255	Morgan	Fort Morgan and Brush	Concrete Paving	2.702	212.50
256	Logan	Merino-Atwood	Concrete Paving	2.500	6,222.00
TOTAL					$2,707,564.24

Colorado Forest Road System

U. S Forces Start Work on 200 Miles of Highways Thru National Forests as Key Routes

(BY GERALD F. DOYLE)

WORK on 200 miles of highways through the national forests in Colorado was commenced in the past season, the total cost of which is estimated to be in the neighborhood of $530,000, according to J. W. Johnson, district engineer in charge of the Denver office of the United States Bureau of Roads.

These roads are in many cases portions of key routes through Colorado. The system of which they form a part is intended to be of service both to residents and tourists, affording easier connection between important points for the former, and facilitating travel to spots of scenic interest for the latter, as well as providing good routes for transstate travel.

The roads to be constructed are part of the state highway system, as well as serving the national forests.

In addition to these roads, a large program of smaller trails, to be completed by the United States forest service, was also entered on.

The work undertaken was decided upon at a conference, early last season, between the heads of the Federal Bureau of Roads, the State Highway Department and the United States Forest Service. The entire funds to be used on the work will virtually all come from federal sources. However, consultation is taken with the state officials, for the purpose of deciding on the practicability of certain projects in their relation to the program of the state.

In a wider field, the roads to be constructed are part of a contemplated 2000-mile highway system in several states, to cost approximately $14,000,000, of which Colorado's share will be $3,500,000.

Among the projects upon which a start was made last season were:

The completion of a road between Empire and Frazer on the Berthoud Pass highway, through the Arapahoe National forest, calling for an expenditure of $66,000; six miles of this road were completed this year, making a total of thirty-one miles on this stretch, and is considered one of the most important projects undertaken by the bureau.

Work was commenced, and is practically completed on an addition of over four miles to the Red Mountain highway, in the Uncompahgre National forest. Cost of this project was in the neighborhood of $104,000, this high figure being due to the extremely difficult nature of the ground to be worked, it being mostly mountain side and cliff.

Improvements to the Cameron Pass road, on the highway between Walden and Fort Collins was also undertaken, with an addition of six and one-half miles, were begun. This road lies in the Colorado National forest, and goes up Poudre Canon to the pass. When completed it will have cost $137,000, of which sum $71,000 was brought forward from 1922. This also was a difficult piece of construction due to the unfavorable surface conditions.

The road between Aspen and Twin Lakes, in course of construction for the last ten years, had an addition constructed this year of one and seven-tenths miles thru very heavy cliff. The work this year cost $69,000, and is a portion of a new route thru Holy Cross forest, part of the highway from Glenwood Springs to Denver which cuts thirty miles off the present trip. At Twin Lakes, the federal road will join a state highway project.

Extension of the present road thru Cumbres Pass, in the Rio Grande National forest, to the extent of five and one half miles was also commenced. This road will help in opening up the San Juan country.

Surveys in preparation for 1924 construction work were commenced and completed in several instances.

The opening of the lakes region of the Grand Mesa was provided for in the survey of fifteen miles north from Cedar Ridge in the Battlement National forest.

On Fremont pass in the Leaville National forest, twenty-four miles were

(Continued on page 18)

Modern dirt-moving equipment used by U. S. Bureau of Roads

Three Paving Projects Started

Contracts Awarded for Six Miles of Concrete Pavement on North and South Highway to Be Completed in 1924

TWENTY-ONE bids were received on three road projects advertised for letting on October 16th. Awards were made on all three of the projects. Total cost of the work contracted will be $272,619.53 when completed.

All of the projects are to be constructed with Federal Aid Funds. The specifications call for nearly six miles of standard 18-ft. concrete pavement, five miles in two projects to be laid on the North and South highway between Wolhurst and Gann, and one mile on the road between Lafayette and Boulder.

The following awards were made on the bids opened on October 16th:

F. A. P. No. 230-A, Douglas county, consisting of two 45-ft. underpass railroad crossings at Wolhurst, with 0.852 miles of concrete pavement, contract awarded to M. J. Kinney Construction Co., Denver, the bid price being $82,710.25, which includes 10 per cent for engineering and contingencies.

F. A. P. No. 230-B, Douglas county, connecting with Project No. 230-A, the work consisting of 3.95 miles of 18-ft. standard concrete paving, between Wolhurst and Gann; contract awarded to Brodie & Anderson, Denver, on their bid of $153,971.51.

F. A. P. No. 251, Boulder county, located half-mile west of present North and South highway, extending westerly one and one-tenth mile toward Boulder; contract awarded to J. Fred Roberts & Sons Construction Co., Denver, on bid price of $35,937.77.

Work on these three projects was started fifteen days after the contracts were awarded. The contractors in each case agree to finish them in less than twelve months.

Project No. 230-A will connect with the present concrete pavement ending at Wolhurst. Two railroad crossings which are of constant danger to the large volume of traffic using this highway will be eliminated by the construction of two 45-ft. underpasses. These passes will be constructed under the Denver & Rio Grande Western and Santa Fe railroad tracks.

The specifications also call for the construction of a 32-ft. bridge over Babcock gulch and a 40-ft. concrete bridge over the Highline ditch.

On Project No. 230-B there will be a 100-ft. bridge constructed over the wash north of Gann, thus eliminating one of the worst stretches of roadway on the Colorado Springs-Denver highway. The present road covered by these projects is very rough, difficult and costly to maintain.

The new work in Boulder county will Thickness of the concrete to be laid on improve the main inter-county road between Denver and the city of Boulder. all three projects will be 7½ inches in the center and 6 inches on the sides. It will be 18 feet in width.

In constructing the new pavement south of Wolhurst the line of the old road will be followed the greater part of the distance, except where the new highway runs under the railroad tracks and connects with the line of the old road on top of the hill about a quarter of a mile east of present Highline ditch crossing.

Traffic will use the old road during the construction of Project No. 230-A, and will be diverted over a detour alongside the work on Project No. 230-B.

Plans have been submitted to the Bureau of Public Roads for a three mile extension of the paving at Breed. This project calls for the construction of an underpass railroad crossing at Breed with two concrete bridges, one 200 ft. long over Pine Creek and the other 150 ft. in length over Kettle Creek.

When this project is completed, which will probably be the middle of next summer, there will be a stretch of a little over eight miles of concrete highway extending north from Colorado Springs.

Statistics gathered by census enumerators this past summer show that this road carries the heaviest amount of passenger car traffic in the state, especially during the summer months when the tourist season is at its height. Because of the heavy travel and the peculiar soil conditions the Colorado Springs-Denver highway is likewise one of the most difficult in the state to keep in smooth condition.

STATES APPROPRIATE LARGE SUMS FOR HIGHWAY WORK

Last year 82,000,000 square yards of asphalt highways were constructed in this country, according to reports received by the Asphalt Association of New York.

These reports also show that bond issues for highway construction authorized from Aug. 1, 1922 to Aug. 1, 1923, amounted to $617,029,537, exclusive of Federal Aid. This included bonds issued by states, counties, townships and road districts.

"For some time," said J. E. Pennybacker, secretary of the Asphalt Association, "among good roads advocates the opinion has prevailed seemingly that the public demand for improved roads is not now as great as in previous years. That the exact reverse is the case is shown by the investigations we have made.

"Not only is the demand for good roads increasing practically everywhere, but there is a much greater demand for the finest types of hard surfaced highways."

Bond issues authorized during the year in the various states, exclusive of Federal Aid, were as follows:

Alabama, $6,605,000; Arizona, $2,610,000; Arkansas, $6,416,000; California, $33,150,314; Colorado $6,000,000; Connecticut, $125,000; Delaware, $10,240,000; Florida, $35,493,000; Georgia, $1,005,000; Idaho, $425,000; Illinois, $123,638,000; Indiana, $5,877,996; Iowa, $17,435,000; Kansas, $1,582,062; Kentucky, $5,987,000; Louisiana, $9,813,100; Maine, $916,000; Maryland, $4,658,000; Massachusetts, $628,000; Michigan, $9,564,250; Minnesota, $19,311,679; Mississippi, $5,325,000; Missouri, $15,634,999; Nebraska, $1,020,000; New Jersey, $24,300,000; North Carolina, $25,540,000; New York, $5,990,000; Ohio, $8,719,000; Oklahoma, $4,915,000; Oregon, $8,868,000; Pennsylvania, $159,398,000; Rhode Island, $805,000; South Carolina, $5,611,000; Tennessee, $984,000; Texas, $18,406,500; Virginia, $4,096,493; Washington, $819,000; West Virginia, $16,197,665, and Wisconsin $7,464,000.

COUNTY ROAD OFFICIALS TO HOLD DISTRICT MEET AT CASTLE ROCK

"Improvement in road machinery," "The Moffat Tunnel," and the "Development of Corrugated Metal Pipe," are subjects to be discussed at the district meeting of the Fifth Highway County Commissioners Association to be held in Castle Rock on Saturday, November 17, according to announcements sent out by John H. White, secretary.

The speakers include Tom J. Ehrhart, John A. Crook and T. J. Patterson. Members of the association will be taken on a trip through the DuPont powder plant at Louviers. A banquet will be given at the Hotel Clark at 6:30 p. m.

One of the questions to be discussed by the commissioners is: "The proportion of total county road and bridge levy allotted by various counties to meet State Maintenance on a fifty-fifty basis."

Commissioner J. T. Berry and Road Supervisor Doug. N. Stewart, of Castle Rock, are in charge of the arrangements. Because of the importance of the meeting the largest gathering of commissioners since the association was organized is expected to attend.

Latest information on road conditions in the eastern states is being broadcasted over wireless from Washington every Wednesday night by the American Automobile Association in co-operation with the Radio Corporation.

While special attention is given to road and touring conditions based on accurate data provided by the National Touring Bureau, accident prevention, handling traffic, road building and maintenance and other subjects of interest to the motorist will be discussed by recognized national authorities.

The information will be broadcasted thru WRC, the Radio Corporation's newest and most modern station, which has a radius of about 500 miles at present. This station is known as "The Voice of the Capital."

California has 147.8 miles of Federal Aid graded and drained roads. Colorado has 171.1 miles.

(Top) At the summit of Millner Pass (altitude 10,759 feet) on the world-famous Fall River Highway, the highest "circle trip" highway in the world, where water starts from a small lake on its way to the Pacific and Atlantic Oceans.

(Bottom) In the region of the Mt. of the Holy Cross, which in a few years will be made accessible to automobile tourists as the Fall River section, through the construction of a modern highway across Loveland Pass (altitude 11,876 feet), from Silver Plume to Dillon. Four miles of this road were constructed by State Highway forces the past summer. Plans are now under way for further construction in 1924.

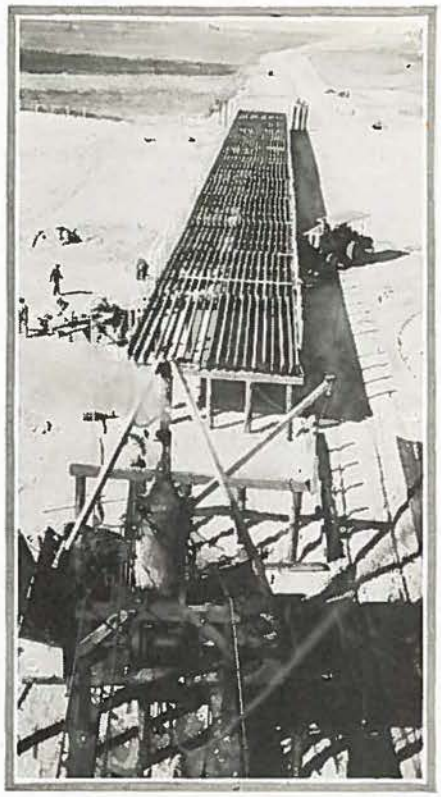
New Bridge Spans Box Elder Creek

Traffic Now Moves Over 464-Foot Structure East of Watkins Without Fear of Delay from Flood Waters

IN some respects the construction of the creosoted wooden pile bridge across Box Elder creek, near Watkins, on the Denver, Kansas City Air Line, was the most unusual encountered in this section of the state.

The bridge is 464 feet in length, and consists of sixteen 29 ft. spans, and forms a most important improvement on one of the most heavily traveled roads east of Denver. It replaces an old concrete ford across what is ordinarily a dry creek with a loose and deep sand bottom. During torrential rains over its catchment area this stream becomes a roaring flood, sometimes blocking traffic for days at a time, and it was for the purpose of permitting the passage of vehicles at all times that the new structure was constructed.

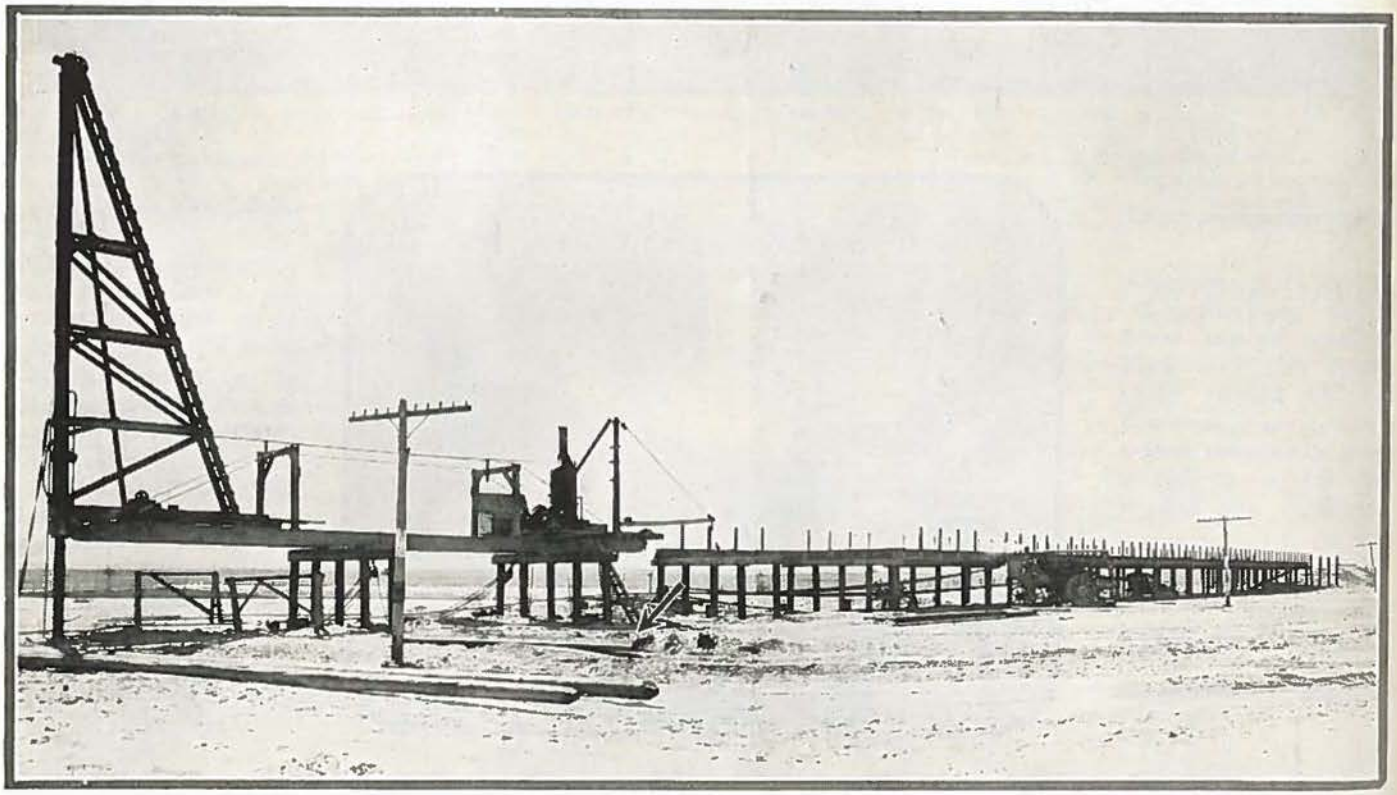
On account of these sudden floods, and the treacherous nature of the bed of the stream, the engineers of the State Highway Department specified the same penetration for the piling as that used in the Union Pacific R. R. bridge about 100 yards below this Highway bridge on the same stream. The length specified for the piling was 48 ft. with a penetration of 40 ft. These are the longest piles used to date in any Highway bridge in this state. All were of Oregon Fir and creosoted. The piles were longer than the leads of the pile driver. A pump and jet were installed, and the piles were jetted and steam hammer driven at the same time. The driving outfit consisted of a No. 2 Vulcan steam hammer, weighing 6600 pounds, and a 25 horse power Clyde hoist, engine and boiler mounted on a traveler 66 ft. long, which permitted an over-hang sufficient to drive piling from bent to bent on the 29 ft. spans. The gunwales of this traveler were of 16x18" timbers, Oregon fir, sticks that are of unusual size in this vicinity. Water for the jet was secured from a sump dug in the channel of the creek, and delivered to a 2½ inch jet nozzle by a two stage centrifugal pump, belt driven by a Case steam traction engine. With this outfit no trouble was experienced in driving the piles, capping and laying stringers on two complete bents a day. Once started, the work of driving piling went forward steadily and without a hitch,—a really good performance, especially when it is considered that there is approximately ¾ of a mile of piling underground in this structure.



Picture taken from top of pile driver, looking west

When the contract was awarded to A. R. Mackey, of Sterling, some of his contractor friends expressed doubt as to his ability to come out on the right side of the ledger. "The job simply can't be done for that price,—he bid the work too cheap and he won't be able to come out on it," said one of the unsuccessful bidders. But later events proved that Contractor Mackey knew what it was all about. He had a neat little trick up his sleeve, and he put it to work, turning

(Continued on page 18)



Showing derrick equipment used to drive piles and lay stringers on Box Elder Bridge Project

State Aid Road Funds Limited

Counties May Be Requested to Share Cost of Projects on Highways Not Included in Federal Aid System

MEMBERS of the advisory board of the State Highway Department will be confronted with a most serious problem when they meet this month for discussion of the 1924 highway budget.

Repeal by the Twenty-fourth General Assembly of one-half of the one mill State Road Tax, together with the fact that all revenue derived from the sale of automobile license tags must be used for the payment of interest and retirement of the $6,000,000 highway bond issue authorized last November, which obligation was assumed by the Highway Department from its revenue accruing from one-half of the automobile tax, in order that the taxpayers of the State might be relieved from increased taxation, has placed the board in a position where its members will be compelled to reduce appropriations for State Projects, as distinguished from Federal Aid Projects, to just about one-third of the appropriation for 1923.

Improvements of the State Highway system will be confined principally to what is known as the Seven Per Cent System of interstate roads, unless ways and means are found by which funds, in addition to those now in sight, are made available. To arrange for additional funds for the financing of improvements on roads other than those for which Federal Aid is available, is a problem for the board to solve.

In order that the public may readily understand the situation created through the action of the General Assembly, Colorado Highways herewith publishes some data regarding probable income and expense of the department during the coming year. The figures, of course, are not exact, but they are close enough to give everyone interested in continued road improvement, an idea of the situation.

Following is the estimated income of the department for 1924 from all sources:

Sale of highway bonds	$1,500,000
One-half mill State Road Tax	750,000
State Gasoline Tax	550,000
Internal Improvement Fund	50,000
Sale of War Material	50,000
Federal Aid, U. S. Government	1,500,000
Total	$4,400,000

The entire proceeds from the sale of highway bonds will be, as a matter of fact and law, devoted to the acceptance of Federal Aid. Deducting the bond money and the Federal Aid, a total of $3,000,000, from the funds available, leaves $1,400,000.

To maintain the state highways with patrol crews, etc., will require an outlay on the part of the highway department of at least $800,000. Deducting this sum from the balance, leaves $600,000. Administration expenses will amount to approximately $175,000 and at least $100,000 must be set aside for contingent expenses to meet unforeseen conditions, such as were created last summer by unprecedented heavy rains. Another $100,000 is required for the purchase of equipment, operation of the highway shops, payment of freight charges, and repairs of surplus war materials allotted to the State.

The last mentioned three items reduce the highway fund to about $225,000 and this is the amount available for so-called State Projects. Readers of Colorado Highways can readily see that the number of state projects will necessarily be small and that many roads which should be improved during the coming year will remain untouched, or what work will be done will only approximate that which should be accomplished.

This condition is not the fault of the Highway Department. It was created by the members of the General Assembly. The latter acted, despite the fact that representatives of the State Highway Department who were called upon by legislators to furnish the Assembly with information, laid all facts before the Assembly and at that time predicted the curtailment of the State Project improvement program.

Officials of the highway department see only one solution of the problem, and most likely the members of the highway advisory board will put the matter squarely up to the various boards of county commissioners before they submit the 1924 budget to Governor William E. Sweet for approval.

These officials suggest that a fairly good-sized State Project program can be carried out, provided the counties will meet an appropriation by the highway department with an equal sum out of county funds, just like the State and U. S. Government jointly bear the expense of Federal Aid Projects.

During the last two years a large amount of necessary betterments and improvements of state highways has been accomplished by means of the expenditure within the counties of $2,500,000 of so-called County Bond Funds, which was one-half of the 1919 $5,000,000 bond issue, the other half being allocated to Federal Aid Projects.

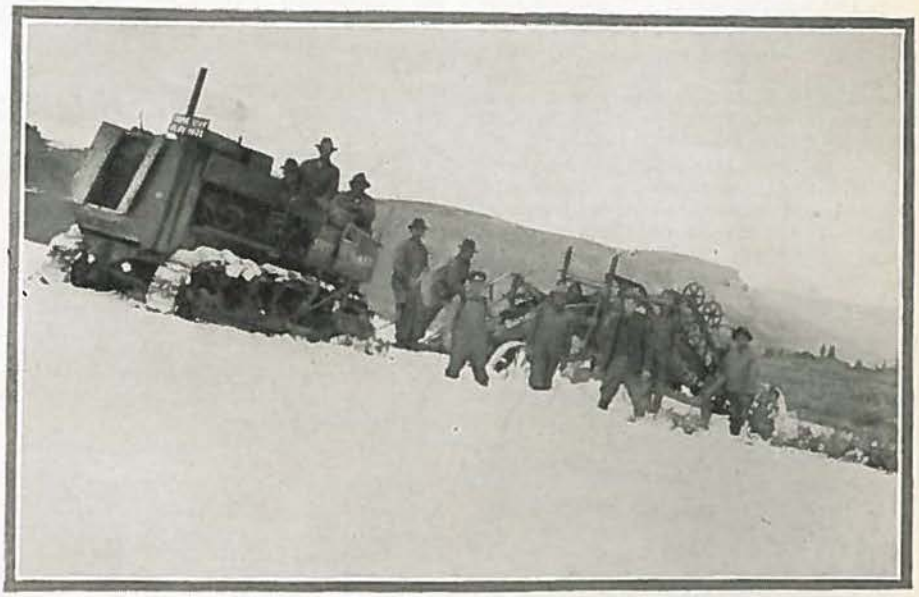
This county bond fund is now exhausted, which will further reduce the considerable activity within the counties during the year 1924.

In the final analysis of the case, the highway department, through the repeal of the ½ mill levy, amounting to $750,000, and its obligating itself to pay interest and repay the bond issue from its half of the automobile license receipts, finds itself $1,250,000 short for the financing of State projects.

This in part has been replaced by its proportion of the one-cent increased gasoline tax, which, based on 1922 figures, will amount to approximately $350,000. So, deducting this increase from the total as above set forth, $1,250,000, leaves a net loss of $900,000, which in past budgets has been allotted to State Projects.

This is especially unfortunate, as according to the new U. S. law of 1921, only those counties that are located on Federal Aid roads can participate in Federal Aid, and the desire of the department has been that counties not participating in Federal Aid would be assisted by a substantial appropriation for State Projects.

An inspection trip over the roads around Walden was made by John A. Donovan, member of the state highway advisory board, last month. He was accompanied by Edwin Mitchell, state highway auditor, and Robt. H. Higgins, maintenance superintendent. They drove from Walden to Hot Sulphur Springs over Willow Creek pass in a blinding snow storm. Neither of them thought so much of the trip.



Road forces breaking the Blue Mesa in Gunnison County

Construction Report Division No. 2

Made by Maj. J. J. Vandemoer, Division Engineer, at the Sixth Session of County Commissioners at Delta, October 22

IN order not to overlook anything I am going to take up each county in its alphabetical order, and this brings us to Delta county to start with.

The most important project under construction in this county at this time is the 600-foot Delta bridge across the Gunnison river which was let on Sept. 20, to Winterburn & Lumsden of Grand Junction for $99,300, which includes the bridge structure alone. This amount was $8,850 below the engineer's estimate, and the bids ranged as high as $156,200. We hope to complete the entire project, including the necessary grading and graveling, for $114,000.

Probably the project which is dearest to the hearts of all the citizens of Delta county is what is known as the Grand mesa project, which involves the construction of a first-class road from Cedaredge to the top of Grand mesa.

The bureau of public roads engineers have completed their location surveys of this project, and, as I understand it, have agreed to adopt the general route of the present state highway, which I think meets with almost unanimous approval of the citizens of Delta county and the representatives of the state highway department.

There is a total of $45,000 appropriated for this road and it is our hope and expectation that construction work will begin this coming season.

And this spirit of helping the other counties is certainly to be commended because we all belong to Colorado and it is this spirit of co-operation which is gradually breaking down the mountain barriers between the east and the west, and the north and the south side of the range, which of course must be done if we are to have the unity which we must have to make this state of ours what she should be.

Right in keeping with this policy the state has just completed what is known as the Fruita-Rangely road, which breaks down the Book Cliff barrier to the north and places Rangely oil fields within 96 miles of Grand Junction, and opens up a road to the Uintah basin. About 60 miles of road were made passable and 25 good sized bridges were built out of a state appropriation of $60,000.

The opening of this road will help to develop the west end of Garfield county and Rio Blanco county, which up to this time, have not had adequate road facilities.

The surveys on the Black mesa road project are progressing in good shape and it is expected to have all the necessary information gathered together before the winter weather drives the survey parties out of the field.

This hill is the gateway to the entire west end of San Miguel county and Montrose county and for that reason any money spent for improvement here will benefit the entire community including the west end of Montrose county.

San Miguel county is maintaining her federal aid project from the top of Norwood hill west in good shape as she always has, and we appreciate this co-operation.

The state project just below Sam's sawmill is completed and will be a great help to winter travel when the weather is bad, as it lies on the sunny side of the canyon.

The state project on Dallas divide in this county is rapidly nearing completion and this also will make it easier to get over the divide during the winter months which not only benefits San Miguel county, but Montrose county as well.

Ouray County

Coming to Ouray county by far the most important work which is going on in this county is the construction of the Ouray-Silverton highway which is being built from Bear Creek falls above Ouray to the top of the pass at Red mountain.

By next fall we hope to have the entire work completed, which will probably be one of the most difficult and expensive highways in the United States.

The state and the county are also improving the Ouray side of Dallas divide.

This county has just completed 10 months' operation of the county drag line in the construction of roads thru waterlogged land and I know you will all be interested to know that during this period of time 83,000 cubic yards of material were moved at a cost per mile of $932, which makes the unit cost per cubic yard the extremely low figure of about 10 cents. These costs include supervision, all labor, repairs, gas and oil, use of trucks, and the placing of culverts and driveways on 14 miles of road and the depreciation of the drag line at $15 per day.

The operation of the drag line not only constructs a well drained roadway but also serves to drain the land through which the road is built.

Montrose County

This county has also made rapid strides in gravel surfacing from the Delta-Montrose county line clear thru to the Ouray-Montrose county line a distance of about 35 miles.

The grading work over Cerro summit and east of Cimarron is completed at this time and the next step I hope will be gravel surfacing and drainage.

The 20 miles of F. A. P. highway in the west end of Montrose county which were completed early in the summer are holding up well, in spite of the heavy rains which have been frequent during the season.

San Miguel County

Taking up San Miguel county we are pleased to state that the steam shovel is now at work in the San Miguel canyon, and we hope before the winter is over that the Norwood hill will be widened to a 20-foot roadway with a two-foot ditch. There is appropriated for this project $16,000 of bond funds. It is also planned to put the proper drainage in and gravel surfacing job between Clifton

And in no matter what direction you travel in Gunnison county you find the kind of co-operation between the county commissioners and the representatives of the state highway department which makes for the efficient and economical expenditure of public funds, and I think Mr. Toupain will join with me in extending our thanks for the splendid help given us both in our operations.

Mesa County

The only federal aid work going on in Mesa county at this time is a grading and gravel surfacing job between Clifton one mile post east of Palisade, at a cost of about $60,000. This project is 5.7 miles in length and is being constructed by Hinman Brothers. This work is under way at this time and should be completed sometime in the spring.

Mesa county forces are widening the Plateau canyon road, by the use of bond funds. Very satisfactory results are being obtained and it is hoped that some of these fine days we will be able to start a steam shovel up the canyon and not let it stop until it has dug its way clear thru.

This highway is one of the most important on the western slope and is a gateway into the Grand valley from the north and east, and any improvement on this stretch of road benefits a large scope of territory.

The commissioners of Mesa county have done everything in their power to further the construction activities of this department, and I want to express my appreciation at this time.

Continuing along this route after leaving the above federal aid project we come to our good friend Toupain's steam shovel job on the Piney where 21,000 cubic yards of material have been moved at a total cost of $4,000, or at the unit cost of about 19 cents per cubic yard.

We then come to the steam shovel improvement each way from the half way house where 19,000 cubic yards of material were moved at a total cost of $9,000, or at a unit cost of 47 cents per cubic yard.

This unit cost is remarkably low when we consider that 50 per cent of this material was solid granite and required heavy drilling and shooting.

Going east from the town of Gunnison, the road is being surfaced by county trucks thru what is known as Cemetery lane, and speaking of Cemetery lane, I am at a loss to know why Gunnison needs a cemetery, because I have never seen any "dead ones" in that county yet.

Going east from Cemetery lane the Parlin hill improvement has been completed by county forces, which gives us a good 6 per cent grade and also straightens out the alignment of the road in good shape.

Continuing east from here we come to the grading and drainage and surfacing

improvement at the Saguache-Gunnison county line, which is just about completed at this time.

Going north from Gunnison we find the Slate creek bridge under construction just south of Crested Butte.

A large share of Delta county's bond funds have gone into the gravel surfacing of her main highways radiating out of the city of Delta, and a very fine showing has been made for the money expended. You can travel on gravel surfaced roads from Delta toward Grand Junction, a distance of about seven miles, and from Delta south to the Montrose-Delta county line, which is another six miles. You can also travel from Delta to Cedaredge, a distance of 16 miles, on a very fine gravel road, and also from Delta to a few miles above Austin, a distance of about nine miles, thus making about 38 to 40 miles of gravel surfaced roadway in this county, which includes a very fine stretch just outside Hotchkiss.

If we can just keep this good work up for a few more years the entire north fork valley will have gravel surfaced roads. We, of the highway department, appreciate the splendid co-operation which the commissioners of Delta county have given us in all of the work in this county, both from a construction standpoint and from a maintenance standpoint.

Gunnison County

The most important federal aid project in Gunnison county is being constructed by Winterburn & Lumsden from Sapinero west, a distance of about three miles.

This project includes the construction of the steel arch bridge across the lake fork of the Gunnison at a cost of $53,000 and the grading and graveling of about three miles of mountain road at a cost of $37,000.

The completion of this project will eliminate probably the most dangerous stretch of road from Denver to Montrose over the Rainbow route, and will benefit not only the citizens of Gunnison county but everyone who has occasion to travel the Rainbow route and especially Montrose county.

WHY HE CALLED IT "PORTLAND" CEMENT

Portland cement was first used in the United States about fifty years ago. The average annual production for the ten years following was only 36,000 sacks. Last year the company used over 470,000,000 sacks of Portland cement. Capacity to manufacture was nearly 600,000,000.

Portland cement was discovered by Joseph Aspdin, an English mason. When a mixture of this dull gray powder with water had hardened it was the color of a popular building stone quarried on the Isle of Portland, off the coast of England. So Aspdin called his discovery "Portland" cement.

This cement is now manufactured in 27 states by 120 plants. There is at least one of these plants within shipping distance of any community in this country.

State Road Crew With Steam Shovel Constructs Boulevard Over "Blue Mesa"

Less than a year ago the motorist contemplating a trip over the "Blue Mesa" highway between Montrose and Sapinero, Colorado, would have been well justified in having his brakes gone over carefully and all other essentials incident for a rough trip given close attention.

Moreover, he would have done well to increase his life insurance, with an even chance that his loved ones would remember him longer.

The Blue Mesa divides the Uncompahgre River valley from the Gunnison River, and there is a difference of approximately 3,000 feet between the mean and extreme altitudes. Before the improvements of the last year were made, it would require a stretch of the imagination to call the road over the Mesa a "highway". Perhaps it could have been better described as a "mountain trail".

For years this trail served the cattleman and miner, both of whom used packhorses in those good old days gone by. But as civilization advanced westward and the automobile claimed deserved recognition, a highway was demanded.

As a result, should one desire to make an auto trip over this "trail" today, there would be no particular necessity for knowing that the car was in other than ordinary good mechanical condition and the increase of life insurance would resolve itself into just a good business proposition under any circumstances, but with the chances that the lucky company who wrote the policy would at the end of the trip be 100% winner in the transaction.

Possibly some person will ask how this "mountain trail" was converted into a beautiful scenic highway in so short a space of time, especially if the inquirer was familiar with the topography of the country and the materials that were required to be removed in the process.

There was required to be handled approximately 10,000 cu. yds. of solid rock. The amount of dirt yardage moved was negligible. The rock consisted of red granite, some quartzite and some limestone. Most of it was drilled hard and shot up into blocks ranging from one-quarter yard to two-yard pieces.

It was decided by the State Highway Department, owing to the nature and location of the work, that it would be best to do it by State forces, rather than to ask for competitive bids. Therefore, the department purchased an Erie steam shovel and went after it.

Incidentally, the steam shovel was about all the equipment used on the project, except a portable compressor and a road machine, the latter used for finishing and surfacing the road-bed.

George F. Toupain, assistant superintendent of maintenance, was placed in charge of the work, with Alvin Herbold operating the steam shovel. As a shovel runner the latter proved that he belongs to the A-1 class, as he managed to keep the road open intermittently during the construction, results in such remarks by passerbys, as: "That fellow on the steam shovel over on the Blue Mesa certainly understands his business."

The accompanying picture of the shovel in operation gives some conception of the class of material that was handled.

In opening the road over the Blue Mesa to traffic, the highway department adds another link in the main road that leads to the western slope.

In describing the route, Supt. Toupain writes as follows:

"This strikes me as one of Colorado's most beautiful scenic highways which will be well worth coming many miles to see along about the middle of June, when you may still pick snow-balls on the north side, while you may pick our State flower, the Columbine, on the south side."

How To Maintain Dirt Roads

IN the columns of Colorado Highways there have appeared from time to time numerous articles on various methods of maintaining gravel, dirt, sand-clay and hard-surfaced roads. These articles have been printed for the information of those whose business it is to keep our highway system safe and smooth for traveling.

Officials of the state highway department are of the opinion that too much cannot be printed about the importance of maintenance, because only thru constant study and the application of modern methods can our highways be kept in first-class condition to meet the ever-increasing use to which they are subjected.

The fact that modern road building and maintenance is in the experimental stage is fully appreciated by those in charge of this work in Colorado. To seek more light on these subjects and to profit by the mistakes and successes of our own state and others, is the constant aim of these officials.

For these reasons we herewith reprint an article written by K. C. Wright, resident engineer, and which appeared in a recent issue of Utah Highways, as follows:

The writer is cognizant of the fact that the methods set forth herein are radical departures from those now in vogue in the various counties. However, he is in strict accord with the following statement taken from a recent bulletin by Prof. William Peterson of the U. A. C. bearing on this subject:

"In general, maintenance is reduced as the quality and completeness of the work is emphasized in construction."

"Maintenance is the most important item of work to be considered in road management. It is always admitted that anything constructed for practical utilization depends upon the amount of effective maintenance it receives. Therefore roads which are most widely used and exposed in all their parts to the worst of elements relatively should receive the highest degree of attention, and moreover the higher type of construction and the more it costs the more marked attention will it require."

Besides eliminating the difficulties and discomforts of travel, careful maintenance is the only way the road can be made to last long enough for the public to realize anything like a fair return on the money invested in the original construction of the road.

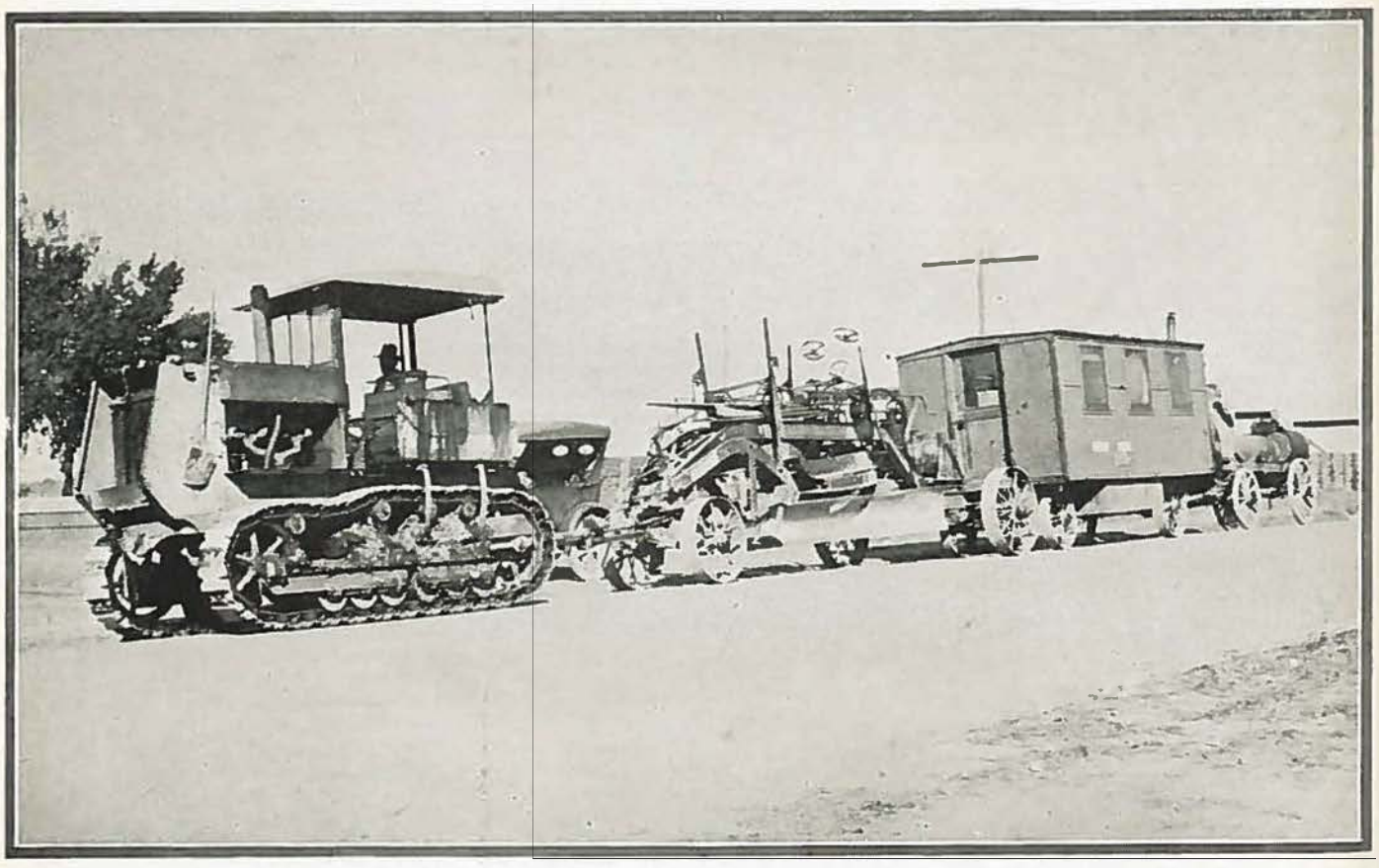
Quoting Prof. Peterson again:

"Money spent in roads, if not protected, depreciates faster than in any other legitimate expenditure that can be made. An earth road may be built at a cost of $3,000 to $50,000 per mile and if given no attention the investment will be entirely obliterated within five years.

"The question, when should maintenance on a newly constructed road begin, has been asked by several, the answer is definite and undebatable. Maintenance should begin a few days before the road is completed and very special attention should be given the road as soon as it is thrown open to complete use."

The following ten suggestions are given. If these suggestions are followed the result will soon manifest itself in better roads:

1. Inspect the road for its entire length during a rainy day and locate all holes, which will be easily noted as they will be filled with water.
2. Use the road drag immediately after a rain.
3. Fill all holes and depressions that cannot be evened up with the drag with good material and then go over the section again with a drag.
4. Never put on the road any sod, sand or any material from the side ditches. Obtain fresh material of the same character as the balance of the road.
5. When the road surface is very rough, run a spiked-tooth harrow over it while the road is still wet and this will very materially increase the efficiency of the drag.
6. In dragging the road, drag from the edges of the surfaced portion of the road toward the center. Be careful never to drag any material from the unsurfaced portion of the road onto the surfaced part.
7. Be sure after dragging the road that no ridge has been left between any



One of Arapahoe County's modern maintenance outfits

portion of the road and the ditch. At times a one-horse cultivator can be used to advantage in removing the ridge that may have formed between the wheel rut and the ditch. The drag should be used immediately afterwards to bring the surface of the road back into shape.

8. Remove all glass, tin cans, nails, and rubbish of whatever character that may be found on the surface of the roadway.

9. See that all culverts are clear, with outlets, and inlets in good order, and that the water can run freely in the ditches.

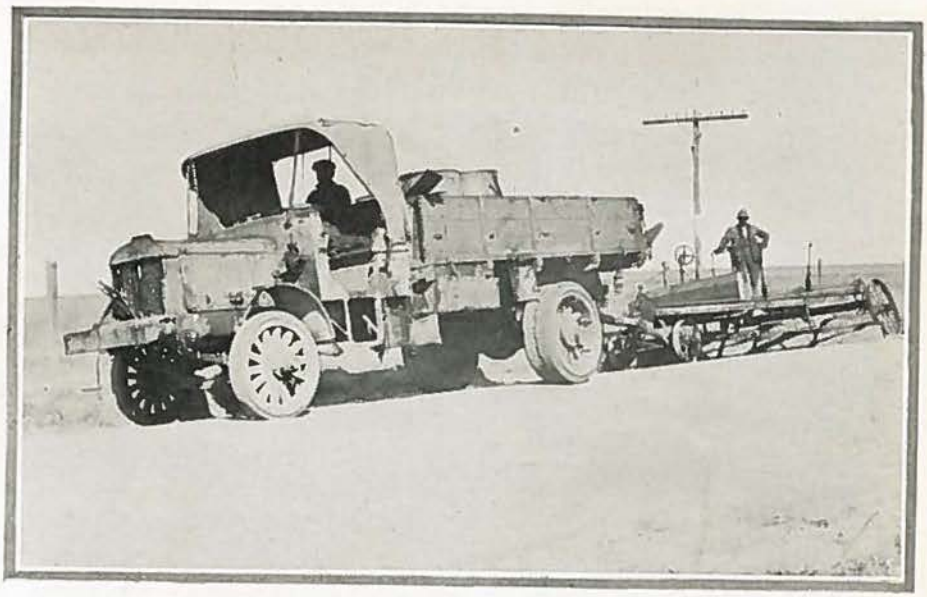
10. The old surface of the road must be cleaned and roughened before new material is added.

Too often the suggestions 3 and 4 above are not given proper attention. It is not possible to keep a road in good state of repairs by dragging only. Material wears out and must be replaced. Ordinarily from 200 to 300 cubic yards of gravel per mile per year should be added to the surface to keep it in a good state of preservation.

The patrol system of maintenance is the most effective system yet devised for maintaining roads, but as this system has not been adopted universally, the discussion of this subject will be limited to the system now employed, that of periodic repairs.

All common types of road, i. e., earth, sand-clay and gravel roads are most effectively maintained by the same methods, dragging. It matters not whether this operation is done with a small drag or a grader, the underlying principles are the same. The following, taken from bulletin 31 by the U. S. bureau of public roads, is so complete and well stated that it is reproduced here:

"The principle factor in successfully operating a properly constructed road drag, provided that the condition of the road is favorable, is skill on the part of the operator. Under ordinary circumstances the position of the hitching link on the draw chain should be such that the runners will make an angle of from 60 degrees to 75 degrees with the center line of the road, or, in other words, by lifting or otherwise manipulating the drag. The length of hitch is another very important consideration in operating the road drag. It is impracticable to prescribe even an approximate rule for fixing the length of hitch, because it is materially affected by the height of the team and the arrangement of the harness, as well as by the condition of the road surface. Experience will soon teach the operator, however, when to shorten the hitch in order to lessen the amount of cutting done by the front runner and when to lengthen it in order to produce the opposite effect. When the road surface is sufficiently hard or the amount of material which it is desired to have the drag move is sufficient to warrant the operator standing upon the drag while it is in operation he can greatly facilitate its work by shifting his weight at proper times. For example, it is desired to have the drag discharge more rapidly, the operator should move toward the discharge end of the runners. This will decrease the ditch end of the runners to swing forward and thus increase the skew angle of the drag. The operator may, of course, produce the opposite effect by moving his weight in the opposite direction. In the same way, he can partially control the amount of cutting which the drag does by shifting his weight backward or forward, as the case may be.



Adams County "Maintainer" on U. P. Highway

When to Use the Drag

"It is fully as important that a road be dragged at the right time as it is that the dragging be properly done. The rule frequently cited, that all roads should be dragged immediately after every rain, is in many cases entirely impracticable and is also very misleading because of the conditions which it fails to contemplate. It is true that there are many road surfaces composed of earth or earthy material which do not become very muddy under traffic, even during long rainy seasons, and since such surfaces usually tend to harden very rapidly as soon as the weather clears up, it may be desirable to drag roads of this kind immediately after a rain. Such roads, however, would not ordinarily need to be dragged after every rain, because of the strong tendency that they naturally possess of holding their shape. On the other hand, many varieties of clay and soil tend to become very muddy under only light traffic after very moderate rains, and it is evident that roads constructed of such materials could not always be successfully dragged immediately after a rain. Sometimes, in fact, it may be necessary to wait until several consecutive clear days have elapsed after a long rainy spell before the road is sufficiently dried out to keep ruts from forming almost as rapidly as they can be filled by dragging. In many cases of this kind, however, it is possible greatly to improve the power of the road to resist the destructive action of traffic during rainy seasons by repeatedly dragging it at the proper time. Well constructed sand-clay and topsoil roads should not often become muddy after they are once well compacted. They may become seriously rutted, however, under heavy traffic, during rainy weather, and are almost sure to need dragging several times each year. Such roads should ordinarily be dragged as soon after a rain as practicable, as otherwise the surface soon becomes dry and hard, so that it is necessary to do considerably more dragging in order to fill the ruts. Furthermore, the material which the drag moves will not compact readily unless it contains a considerable amount of moisture. In general, it may be said that the best time to drag any type of road is when the material composing the surface contains sufficient moisture to compact readily after it has been moved by the drag and is not sufficiently wet for the traffic following the drag to produce mud."

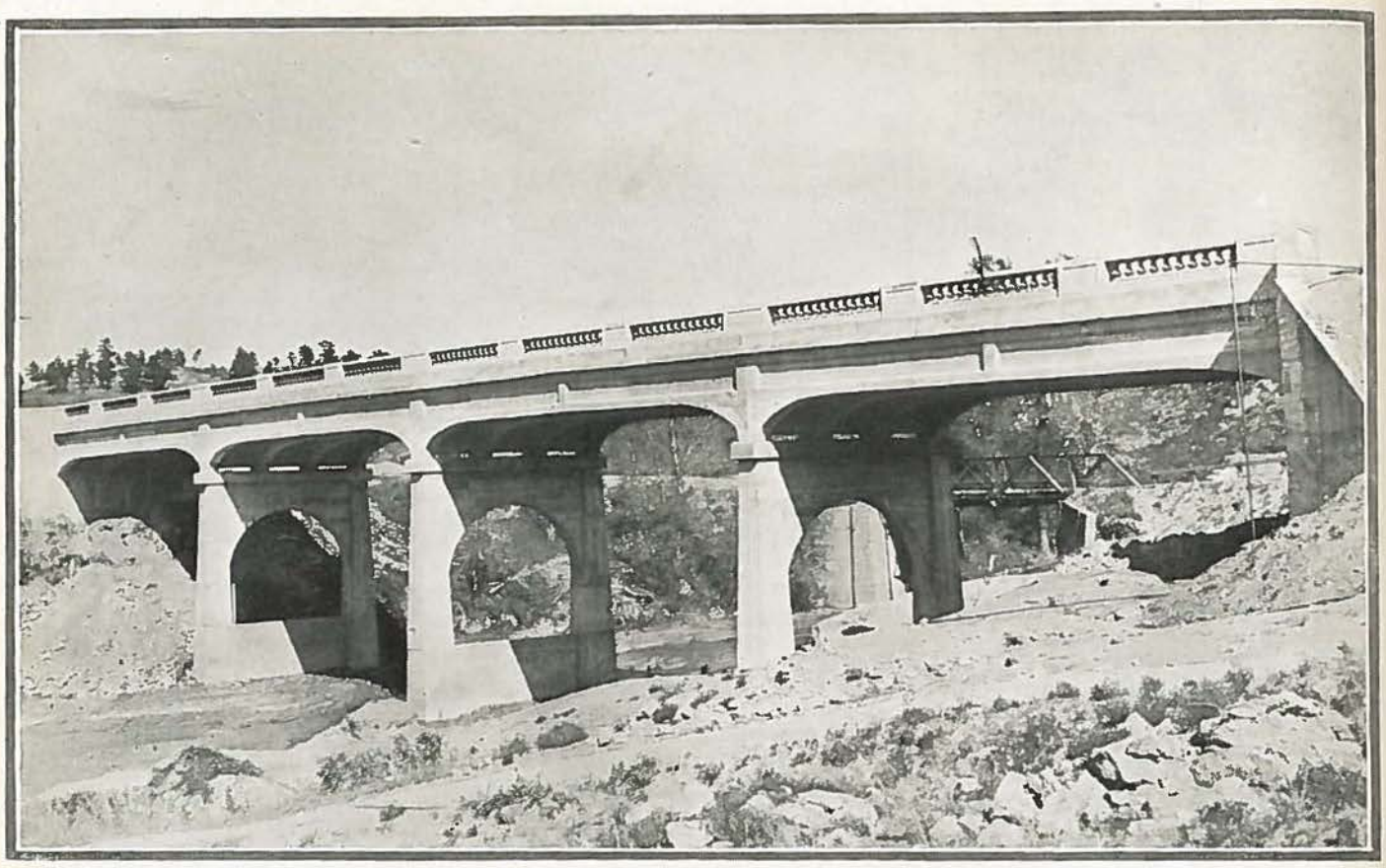
COLORADO BOOSTERS LAUNCH PLAN TO ADVERTISE BEAUTIES OF ENTIRE STATE

Movement for the establishment of a state-wide tourist and publicity bureau was recently launched by a group of prominent business men representing different parts of the state. Sentiment in favor of such an organization has been strongly expressed by leading citizens for several years, and indications point to a realization of the scheme.

A good many of these citizens feel that Colorado has been somewhat backward in the matter of attracting tourists to the state, and they are anxious to see sectional differences put aside, whereby the whole state may profit by the tourist trade that now goes elsewhere.

Proponents of the plan to establish a state-wide bureau, patterned after the example of California and other communities, claim that Colorado's scenery excels that to be found anywhere in the western country and rivals in some respects that of the Swiss Alps, while for climate and tourist accommodations it is without a peer.

In spite of these facts trainload after trainload of pleasure seekers are allowed to pass thru the state en-route to other sections of the west, when these sightseers might just as well be induced to make Colorado their destination.



Imposing concrete bridge over Cottonwood Creek, which replaces old structure, seen in background

Colorado Springs-Breed Paving

Four Miles of Hard Surfaced Highway to Be Opened to Traffic Early in Spring

BY V. H. LITTLEFIELD,
Resident Engineer.

Before the final location of Federal Aid Project No. 116-A was approved, there had been three other locations made; one on the east side of the Santa Fe Railway, and the other two between the present highway and the Santa Fe Railway, but about one-half mile further west than the final location. Three bridges were necessary on these two locations, where as on the present location only one bridge is required, that being at Cottonwood Creek. The new highway connects with Nevada Avenue at the city limits of Colorado Springs. Nevada Avenue is also the street that the highways from Pueblo and Canon City enter Colorado Springs from the south.

With the completion of this project one can ride on paving from a point four miles north of Colorado Springs all the way to Manitou, which includes two Federal Aid Projects between Colorado Springs and Manitou, or to the Broadmoor Hotel, which includes a Federal Aid Project.

The State did not start paving at the city limits of Colorado Springs on this project, but 700 feet ahead, due to the fact that a new bridge will soon be required to replace the present wooden bridge over the Rock Island tracks just north of the city limits. This 700-ft. gap will allow plenty of room for an easy grade to meet any elevation that may be established for the new bridge.

The alignment of this project is ideal, very few curves and these are light. The grades are not heavy, the maximum being only 4.5% and that on only two short stretches.

Actual work of excavating and building the fills was started in December, 1922, the construction of the drainage structures also starting at this time. The grading was finished in September, 1923.

The quantities involved in the grading are 107,000 cubic yards of excavation and 19,000 cubic yards of borrow fill. All cuts were made with an elevating grader and the dirt handled either ahead or back to make the fills. All fills were constructed by spreading the dirt in six-inch layers and rolling with a 6700-lb. car wheel roller. This method of compacting the material proved very satisfactory and there should not be but a very slight shrinkage, if any, by next spring, at which time the fills are to be paved. All fills after being paved will be guarded with a heavy timber guard rail. These fills were left unpaved this year in order to give them the winter to settle in. The distance not paved this year amounts to 4,300 lineal feet, while the distance paved amounts to 17,786 lineal feet. The last 9,000 feet of paving required a 2-inch sand cushion on account of the adobe sub-grade encountered.

Paving was started June 21st, and after many delays in getting a good mixer on the job and contending with a rainy season, the last stone was placed October 6, 1923. Average number of stones per day was eleven and the greatest number of stones in one day was sixteen, stones being of 30 ft. lengths.

The imposing structure over Cottonwood Creek is a reinforced concrete bridge and a great deal of credit is due Mr. E. E. Thornburg, inspector, and Harvey Phelps, foreman for the contractor, for the first class work and splendid results obtained throughout the entire construction of the bridge. This bridge is 212 ft. in length, or four 53-ft. spans. The three piers and both abutments are resting on solid foundations. The quantities involved are:

883 cu. yds. Class "A" concrete.
119,500 lbs. of reinforcing steel.
3,300 lbs. of structural steel.
300 spindles, pre-cast.

Work started on the bridge in April, 1923, and finished in September, 1923.

All rock used in the concrete for the bridge, drainage structures and paving was secured from the famous Vindicator Mine at Victor. The sand was secured locally along the job. The shouldering material was secured from a gravel pit near the Pike View Mine and some from a pit near the job.

(Continued on page 16)

ARMCO
Ingot Iron

Now, after fifteen years of general use—

it is time to make some general observations.

Men who have inspected culverts—men who have actually climbed out of their cars hundreds of times and delved into the condition of highway substructures—make the following report:

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.

Perhaps the culverts in your district will bear out the truth of these observations. When making your inspection be sure the corrugated culverts on which you pass judgment are genuine Armco Culverts—not culverts "just as good" as Armco.

This Little Dot

↓

If this triangle were a sheet of ARMCO Ingot Iron, this little dot would represent all impurities. If it were the least bit larger by the addition of any other material, the iron could not bear the ARMCO Trademark. There is less than 1 part impurities to every 625 parts of pure ferrite—less than 1 *ounce* to every 39 *pounds* of pure iron.

Begin today saving money by sending all your orders to HARDESTY—where your patronage is always appreciated, where for over thirty-five years every customer has always been given a square deal.

The R. Hardesty Mfg. Co.

DENVER, COLO.
WOOD CROSS, UTAH MISSOULA, MONT.
POCATELLO, IDAHO

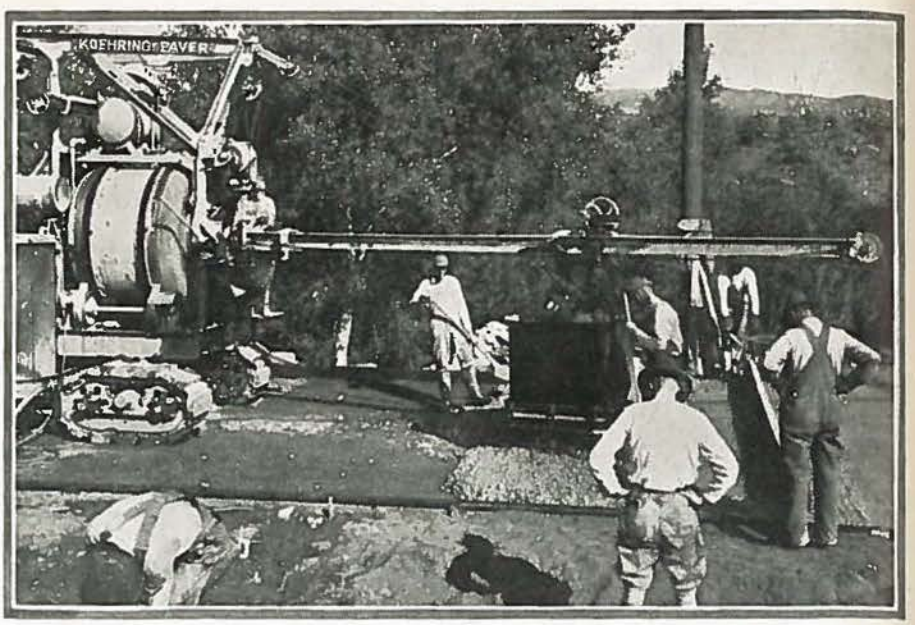
ARMCO CULVERTS

Colorado Springs-Breed Paving

(Continued from page 14)

The paving was operated by having stock piles of crushed rock and sand every half mile and loading this material of the proper proportions into Ford trucks with dump bodies holding one 4-sack batch, or 20 cu. ft. These trucks carried the dry mix to the Koehring Paver on the grade and after dumping the load, the required number of sacks of cement was added to the mix. The batch was then fed to the mixer and after a minute and one-half was discharged to the required place on the road.

Mr. James Lockwood, inspector on the paving, deserves credit for his careful watching of the sub-grade, all material and the general workmanship of the paving. The finisher for the contractor deserves credit for the splendid manner in which the joints were finished, producing a smooth riding surface.



Pouring concrete on pavement between Colorado Springs and Breed

TRUCK DRIVER FREEZES FEET ON LOVELAND PASS ROAD

Al Christopherson, a truck driver for the State Highway Department, had both feet frozen while engaged in removing the state construction outfit from the Loveland pass project on Oct. 23.

He was placed under a physician's care at Silver Plume for several days, and later was removed to a Denver hospital. Christopherson and several workmen engaged in removing the equipment from Loveland pass were caught in a snow storm which raged for two days, leaving a three-foot blanket of snow in the region.

Finding themselves unable to proceed from Silver Plume the two trucks loaded with camp outfits and two graders were stored in a warehouse there for the winter. The wind blew forty miles an hour on the pass during the storm.

B. T. Miller, resident engineer, on the project, was compelled to remain in Silver Plume for several days on account of the roads being blocked with snow.

Miller's report to the Highway Department shows that three and one-half miles of the Loveland pass road were constructed. The work started at the Boy's Scout's camp.

Surveys have been commenced for a four mile extension of the road to be constructed next summer. Altogether about sixteen miles of the Loveland pass project remains to be constructed. When completed it will give a short route to Dillon and the Western slope. Ultimately the highway will be extended to the Mount of the Holy Cross.

New Bridge Spans Box Elder Creek

(Continued from page 8)

what to all appearances was a "bad contract" into a nice little profit.

The trick which he uncovered was an addition to the pile driving outfit designed by his foreman, Jess Cooper, and which he installed on the job. This consisted of a derrick constructed on the rear end of the traveler and used in placing the stringers. The use of this derrick eliminated the work of placing these stringers by hand, thus increasing the efficiency of the outfit,—speeding up the work, and reducing the cost of placing the stringers.

Results obtained from the use of this unique rigging were most satisfactory, the stringers being placed economically and eliminating much hard labor. The advantage of this method of erecting stringers can be better appreciated when it is considered that each stringer weighed 540 lbs. and had to be raised a minimum distance of eight feet.

During a flood shortly before the construction was started, an automobile ran off the old concrete ford in the night, and washed down in the sand leaving only the steering wheel exposed, which is shown in one of the photographs. The machine was later salvaged by the aid of the derrick.

The cost of the bridge was met by equal appropriations of the 1921 bond issue funds of Adams County and Arapahoe County. It was built throughout according to the standard specifications of the Colorado State Highway Department for creosoted wooden structures. The job was under general supervision of Maj. John P. Donovan, Division Engineer of Division No. 1, and under the immediate supervision of W. R. Douglas, Resident Engineer, and B. D. Rosenzweig, Inspector.

Colorado Forest Road System

(Continued from page 5)

surveyed at a cost of $75,000. This proposed route between Kokomo and Wheeler will present several very difficult jobs.

On the important transcontinental highway over Tennessee pass, in Leadville National forest, twenty-five miles between Leadville and Red Cliff were surveyed.

Twelve miles of the route between Boulder and Estes Park, via Nettleton and Peaceful Valley, in the Colorado National forest, were also surveyed. This is a portion of what is known as the Ward-Raymond route.

Eighteen miles of the old Six-Mile road, between Buffalo and Deckers Springs were also gone over by the federal engineers in prepartion for construction in 1924.

Working in cooperation with the state highway department, the federal bureau surveyed ten miles of the old Rainbow route on the western slope in the Curicante Creek-Crystal Creek section of the Black Mesa along the Black Canon in the Gunnison National forest.

"MAINTENANCE"

(By A. B. Collins, Resident Engineer)

Maintenance of improved roads is often neglected.

As a result costly improvements have gone to ruin.

Insufficient funds for Maintenance is often to blame.

No financial oversight can be more disastrous than failure to provide for our improved highways.

The character and volume of traffic determine the type of road to build, provided adequate Maintenance is assured.

Economy, therefore, can be had only when proper Maintenance is guaranteed.

No part of highway work requires more skillful supervision than Maintenance.

A slip-shod method of Maintenance will ruin the best of roads.

Nowhere is there a greater field for application of sound business principles than in public highway Maintenance.

Constant attention to detail, combined with close study, produces efficiency.

Efficient Maintenance, the secret of public highway success.

A total of $91,653,149.69 was expended by the Federal Government on Rural Post roads in 1922.

"PERSONAL MENTION"

Ernest Montgomery, who holds the position of Division Engineer, with headquarters in Colorado Springs, was in Denver on Oct. 20, to make a report on his inspection of the Busk-Ivanhoe tunnel. It has been proposed to convert this tunnel into an all-year highway. He has suggested that mine experts be called in to investigate the danger from carbon monoxide thru automobiles traveling in the tunnel. The tunnel is two and one-half miles long.

Joe Ray, one of the Las Animas county commissioners, was a visitor at the highway office in Denver last month. He came in to talk over contemplated road improvements near Trinidad.

Capt. John P. Donovan, spent two days in Clear Creek county last month, going over several proposed road projects for next year. He reported the road thru Virginia canon in splendid condition.

Members of the survey party on Mount Evans are receiving visitors at the "saw mill camp" near the Royal Ranch in Deer Creek canon each Sunday. They expect to be on the job for another three or four weeks. Snow and cold weather has no terrors for these engineers. For a month past they have "battled" the worst weather in years on Mt. Evans. To find a 6 per cent grade from Summit Lake to Deer Creek canon is the object of their labors.

So the people may know, it is announced that Roy Randall, office engineer of the Highway Department, is not the "Roy A. Randell" reported by the Denver police as missing from home last month. Our Roy was the object of much good-natured banter by his friends during the month.

A. B. Collins who looks after the interests of the Highway Department in the Seventh district, made a flying visit to Denver last month. While in the city he handed in his road report for the year. His plans for the coming season are also nearly completed. He has outlined an ambitious program for 1924.

Engineer John J. Vandemoer made a trip over the Fruita-Rangeley project last month. He will tell of his findings in a future issue of Colorado Highways.

Roy A. Smith, chief clerk of the Highway Department, has returned from a two-weeks vacation trip to Yellowstone Park. He said the "old bus" never missed firing once,—not even when he encountered a "flock" of hungry bears. Mrs. Smith, and their son Donald, accompanied him on the trip.

John Stamm, maintenance chief in the Seventh District, was in Denver the latter part of October, to submit his plans for the coming season. He reported the roads in his district as being in first-class condition. That was before it snowed on October 24.

H. L. Jenness is the last of the division engineers of the State Highway Department to "jump off the dock into the turbulent sea of matrimony." He was married to Miss Laura W. Hammond of Glenwood Springs early last month. Their honeymoon included a three week's trip thru the east, with visits to New York, Philadelphia, Washington and Chicago. Mr. Jenness is now back on the job at his headquarters in Glenwood Springs making plans for the next construction season in District No. 6.

William Lewis, formerly acting as resident engineer in Division No. 7, was transferred to special duty on several projects located in the southern part of the state last month.

"It beats the band how those Californians claim everything under the sun," mused Engineer John P. Donovan recently.

"While on a visit in Los Angeles last summer my wife entered one of our youngsters in a baby show, and our baby proved to be one of seventeen that registered 100 per cent.

"That afternoon the papers came out with a picture of our baby, saying he was a California product. Can you beat it?

"But sometimes I wish Colorado had more of that Pacific coast spirit."

EQUIPMENT NOTES

Manufacturing has a human "kick" in it that will surprise you if you haven't noticed it, especially after a trip through the new plant of The R. Hardesty Mfg. Co.

Here the workman who has finished some intricate piece of work for the company, feels every bit as fine a thrill when the last rivet is seated as any golfer gets when he hears the little thump that comes at the end of a perfect putt.

Several hundred of these above-the-average employees work in the plant, yes, and eat. On the second floor of the Main Office at 31st and Blake Streets, the company maintains a restaurant where lunch is served each working day. No wonder this company has grown, that their products are known all over the world; there is a certain something which it is difficult to explain behind the scene, felt only after one makes a trip through their splendid new plant.

Factory representatives swarmed about the general offices of H. P. Wilson and Company, Denver, during the past month. Among the visitors were E. J. Ehret, western sales manager of the Wyoming Shovel Works, who spent three weeks in Denver and adjacent territory in the interest of Red Edge shovels and picks; M. J. Sparks, representative of the Erie Steam Shovel Co.; and J. L. Beck, of the firm of Babb & Beck, Chicago, western representatives of the Western Wheeled Scraper Co.

Among other Eastern factory representatives who have recently visited H. W. Moore & Company, are Douglass Corner, of the Conveying Weigher Company, St. Louis, manufacturers of the Conweigh tunnel loader or mucking machine; W. C. Whitcomb, of the Geo. D. Whitcomb Company, Rochelle, Illinois, manufacturers of gasoline and electric locomotives; and Justin Griess, of the McMyler Interstate Company, Cleveland, who sold to the D. & R. G. Railroad a complete car dumping plant for use in transferring coal from narrow to standard guage cars at their junction points.

A stock of parts for the famous Bear Tractor, which has made such a remarkable showing on highway construction throughout the country during the past year, has been received by the Stearns-Roger Mfg. Co., Denver, intermountain distributors. Several of these machines are now in operation in this territory. A large run on these power units is expected during the coming year, according to Joe Sanford, of the Stearns-Roger concern.

Chas. A. Bishop, district sales manager of the Bear Tractors, with headquarters in Kansas City, was in Denver during the first part of November, making plans for giving service on the Bears in this section.

"How many Adams graders have you sold in Colorado?" a friend recently inquired of Thomas J. Fair, Denver distributor.

"Ask me something easy," replied Mr. Fair. "But I will say this, all we have sold are still on the job. One in particular I recall at Colorado Springs has been functioning for fifteen years."

The county of Las Animas is the latest purchaser of a Road King No. 10. Mr. Fair said that a new pamphlet on how to move dirt with Adams Leaning Wheel Grades is on the press and will be ready for distribution in a few weeks. This booklet will show the entire Adams line

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W. R. Little, of the Lee Trailer & Body Company, Chicago, on his recent visit to Denver and other Western points, expressed his pleasure with the exceptional progress being made by their Denver representatives, H. W. Moore & Company, in the distribution of Lee bodies in the Inter-Mountain territory. It is, he says, indicative of what can be done with a commodity so well adapted to public needs, plus concentrated effort. Western folk are quick to realize the many advantages of a small truck with trailer or dump body equipment, over the heavier type. The Lee line is already meeting with splendid success all along the Pacific Coast, but Mr. Little feels that in a very short time Denver will be their best territory.

Automobile tourists driving through Boulder Canyon are impressed with "Chief Niwot," a huge rock image of a famous Indian whose camp was located for years in the Colorado Rockies.

Harry P. Wilson reported the following sales by his concern during the month: One new Ladder type Buckeye trenching machine, to the Orman Construction Co., Pueblo; one Caterpillar conveyer type gas-driven Barber-Greene coal loader, to retail department Colorado Fuel & Iron Co.; several Koehring non-tilting concrete mixers; three C. H. & E. hoists, and a No. 16 saw rig and several large orders of Wyoming Red Edge shovels.

Instruction on the operation, inspection, lubrication, etc., of the A. F. W. D. truck are given in a booklet being distributed by the F. W. D. Auto Company. Every operator of a F. W. D. truck will find much valuable information in this booklet. The Four Wheel Drive Company also outlines specifications and equipment of the new F. W. D. Machine Shop Truck in a bulletin recently issued. This machine comprises a compact, practical and complete repair shop mounted on a 3-ton F. W. D. chassis, Paul V. Jenness, 13 E. Bijou St., Colorado Springs, is Colorado distributor for F. W. D. trucks and parts.

The Osgood Company, Marion, Ohio, manufacturers of steam shovels, have added another unit to their line of revolving steam shovels in the new 1-¼-yd. heavy duty, which is now ready for the market. Barney L. Miller, Bank building Denver, is the Osgood representative in the Mountain states.

Sites for five additional gravel pits have been acquired by the J. W. Brannan Sand & Gravel Co. of Denver. Work of opening the pits has been started. The building boom in Denver has resulted in a wide expanse in the business of this concern.

Sales of Iowa Rock Crushers in this territory would indicate that this crusher, which has only been on the market a short time, bids fair to take its place among the leaders, according to H. W. Moore & Company. The crusher itself is a jaw crusher of standard design, with added features making for long life and freedom from breakdowns; and will successfully crush down to ½ inch, a feature not ordinarily attained in crushers of the jaw type.

A new ¾-yard gasoline or electric rope-thrust revolving shovel, has just been announced by the Bucyrus Company, bulletins on the machine are now being distributed by Herbert N. Steinbarger, Denver, who represents the Bucyrus Company in the Mountain states. The main feature of this machine is the ingenious rope-thrust arrangement. By this arrangement the whole power of the main engine is behind the drive of the shovel. It is mounted on caterpillars.

A new bulletin on the uses of explosives has just been issued by the Department of the Interior, thru the Bureau of Mines. The bulletin is No. 219, and is written by C. A. Taylor and W. H. Rinkenbach, assistant explosive chemists. Road builders handling explosives will find this bulletin of much interest.

There is apparently an increasing realization among contractors and other users of hand shovels, that the use of high grade implements of this type will increase the efficiency of their operators.

In line with this movement, H. W. Moore & Company report that their sales of Conneaut shovels have considerably increased of late, and that the number of industrial concerns and large contractors who are standardizing on the Conneaut line is being rapidly added to.

H. P. Wilson and Company have recently added to their Ford truck and Fordson Tractor accessories the Baker Double Drum Winch for use in connection with the Fordson Tractor. These units are manufactured in Omaha, together with the Baker Un-loader which is used for many purposes, such as loading wagons and back filling ditches. One of these units is now working successfully on Everett J. Young's new paving job in Denver.

Motorists traveling between Meeker and Craig are now praising the work of the Highway Department in completing the new project on "Nine Mile Hill." About two and half miles of gravel surfacing on this road was completed last month.

Ninety cents of every Federal Aid dollar went to roads in 1922.

BIDS RECEIVED DURING OCTOBER

Proj. No.	Location	Length	Type	Awarded to	Bid Price
F.A.P. 230-A	Wolhurst, toward Sedalia	0.852 mi.	Paving and R. R. Grade Separation	M. J. Kenney Constr. Co.	$75,191.14
F.A.P. 230-B	Between Wolhurst and Sedalia	3.995 mi.	Paving	Brodie & Anderson	139,974.10
F.A.P. 251	Between Boulder and Lafayette	1.014 mi.	Paving	J. Fred Roberts & Sons	32,670.70

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

Proj. No.	Location	Length	Type
F.A.P. 116-B	Breed-Colorado Springs	0.892 mi.	Paving and R. R. Grade Separation
F.A.P. 257	Between Denver and Brighton	0.282 mi.	Concrete Viaduct

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	Length	Type
F.A.P. 116-C	North of Breed	3.22 mi.	Paving
F.A.P. 226-D	Platteville	1. mi.	Paving
F.A.P. 242	Grand Junction-Fruita	3.5 mi.	Gravel Surfacing
F.A.P. 243	Bayfield-Pagosa Springs	2.5 mi.	Gravel Surfacing
F.A.P. 248-A	Buena Vista-Salida	9.3 mi.	Grading and Gravel Surfacing
F.A.P. 253-A	Steamboat Springs-Hayden	6.5 mi.	Gravel Surfacing
S.P. 811	Over Rio Grande-Del Norte River, East of La Jara	200 ft. span	Steel Truss Bridge

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	$ 61,556	46	71-B
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	87	81-A
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	45	102
116-A	Colorado Springs paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238,944	95	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	60	119-B
125	Sapinero-Cimarron	11.3 mi.	Grav. Surf.	Dale Hinman	36,797	29	125
125	Sapinero-Cimarron		Steel Bridge	Winterburn & Lumsden	53,072	12	125
135	Denver-Morrison	5.3 mi.	Conc. Pavement	Colo. Bridge & Constr. Co.	178,158	14	135
157-B	Buena Vista-Leadville	4.20 mi.	Grading	J. V. Stryker Const. Co.	65,715	40	157-B
163	St. Charles Bridge	0.5 mi.	Steel Bridge	Rogers & Pickard	85,636	89	163
165	Canon City, east	9.33 mi.	Grav. Surf.	G. A. Allen	94,769	100	165
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	52	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	67	174
190	Summit County Bridge and Road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	44	190
207	Dillon-Kremmling	100 ft.	Truss Bridge	Rogers & Pickard	28,831	9	207
208-C	Grand Junction-Palisade	4.75 mi.	Gravel Surf.	Northwestern Const. Co.	46,627.35	23	208-C
210-A	Grand Valley-DeBeque	5.30 mi.	Grav. Surf.	F. L. Hoffman	57,429	72	210-A
211	Meeker, north	1.85 mi.	Grav. Surf.	Hinman Bros	34,445	83	211
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	46	213-B
214	Durango-Bayfield	3 mi.	Gravel Surf	Dale Hinman	53,411.05	23	214
215	Pagosa Springs Bridge	0.17 mi.	Steel Bridge	Plains Constr. Co.	33,286	100	215
216-A	Holly, east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	99	216-A
217	Pueblo, east	2.94 mi.	Paving	Ed. Lindsay	72,164	100	217
221	Loveland, north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	82	221
222-B	Broomfield cut-off	1.52 mi	Conc. Paving	Miller, Douglas & Hanes	68,302	100	222-B
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	36	223-A
225	Fitzsimons Hospital road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	50	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	82	226-A
226-B	Brighton-Greeley	2.86 mi.	Conc. Paving	White & Johnson	89,923	33	226-B
226-C	Platteville-Greeley	4.4 mi.	Conc. Paving	Engr. Constr. Corp.	120,114	8	226-C
229	Pueblo-Florence	1 mi.	Grav. Surf. & Bridge	H. M. Fox	34,646.50	14	229
231	Six Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockaway	25,165	55	231
240	Gypsum-Dotsero	5.185 mi.	Gravel Surf.	O. L. Hackett	66,178	5	240
241	Gunnison River, North of Delta	600 ft.	Steel Bridge	Winterburn & Lumsden	99,309	5	241
245-A	Las Animas-Hadley	4.54 mi.	Gravel Surf.	W. A. Colt & Son	42,786	7	245-A
246-R	East of Pueblo	2.537 mi.	Conc. Paving	R. A. White	78,431	4	246-A
255-A	Ft. Morgan-Brush	2.70 mi.	Conc. Paving	Colo. Bridge & Constr. Co.	85,763	21	255-A
256-A	Sterling-Brush	2.50 mi.	Conc. Paving	La Nier, Selander & White	79,902	100	256-A

HIGHWAY MARKERS PRAISED BY COLORADO AUTO DRIVERS

Words of sincere appreciation are heard of the activities of the State Highway Department in placing markers on the roads of Colorado. These markers are being posted in conjunction with the Rocky Mountain Motorists, Inc., an organization engaged in a campaign to boost this state to the rest of the world.

The work of posting the markers is being done by the maintenance crews employed in the various counties. At the present rate over 2,000 of the markers will be posted along the main routes in the state by the time the vanguard of the 1924 tourist crop arrives.

Already the familiar orange and black signs are becoming familiar to the automobile drivers. The information given on these sign boards has been carefully compiled and the distances are correct, having been measured by the district engineers of the highway department. Each sign is specially made for the particular spot where it is posted, nothing having been left to guess work.

The traveling public has found that these signs give intelligible information, rendering travel easy over the roads that have been posted, and the stranger, and any number of home-folk for that matter, is not obliged to stop at every sign post, get out his map and start figuring out a complicated puzzle.

It is the plan of the highway department to adequately mark every main route in the state in accordance with the new numbering system recently adopted by the highway advisory board. Officials of the Rocky Mountain Motorists, Inc., also plan to post sign boards on the transcontinental roads from the Missouri river to Colorado.

The U. S. Bureau of Public Roads

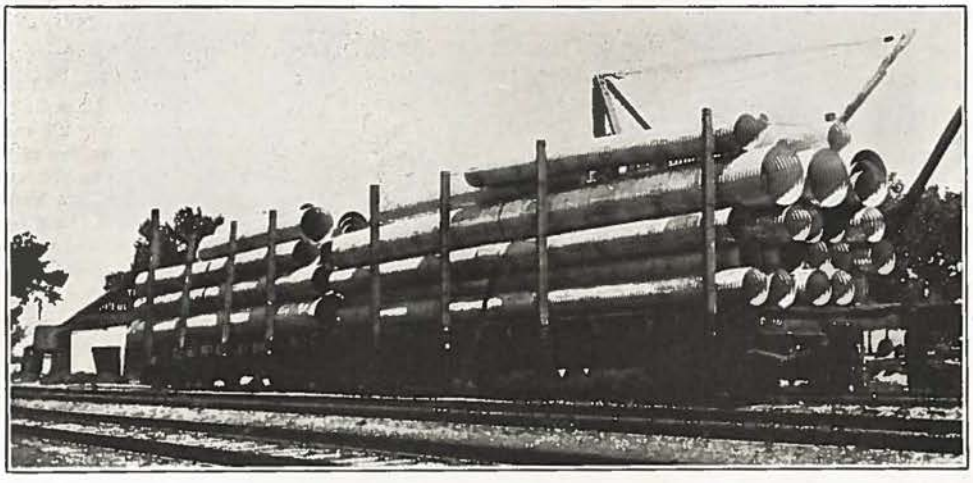
USES

KEYSTONE KEYSTONE COPPER STEEL CULVERTS

ON THE

Cameron Pass National Forest Road

Over the Continental Divide between Jackson and Larimer Counties, Colorado



Double Carload Shipped This Summer

The Colorado Culvert and Flume Company

PUEBLO

KOEHRING
CRANE EXCAVATOR

Capacity!

CAPACITY, the profit factor is measured, not alone by bucket dimensions, by line-speed and power, but is greatly increased or decreased by flexibility of operation, speed and ease of control, and ability to stand up to unsparing high speed operation without breakdown delays, or fast depreciation.

Boom with load. The Koehring alone is designed to combine the functions of elevating, or lowering boom, and of swinging boom simultaneously. No excessive wear. This new flexibility means excess capacity. *Single lever* steering turns crane to right or left, propels it forward or backward. Easy to control as a motor truck. Koehring heavy duty construction, the assurance of trouble-free, long service life — another big factor of extra capacity.

KOEHRING · K · HEAVY DUTY

REG. U. S. PAT. OFF.

No. 1 Capacity: 7 tons at 12 ft. radius. Will handle bucket up to and including one cubic yard capacity, the radius of operation depending upon the size of the bucket. Standard boom 35 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 5″ x 6″ gasoline engine.

No. 2 Capacity: 12 tons at 12 ft. radius. Will handle bucket up to and including 1½ cubic yards capacity, the radius of operation depending upon the size of the bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 7½″ x 9″ gasoline engine.

No. 3 Capacity: 20 tons at 12 ft. radius. Will handle bucket up to and including 2 cubic yards capacity, the radius of operation depending upon the size of bucket. Standard boom 40 ft. long, but special lengths of boom can be furnished where necessary. Four cylinder 8½″ x 10″ gasoline engine.

KOEHRING COMPANY

Manufacturers of Cranes, Draglines, Shovels, Concrete Mixers

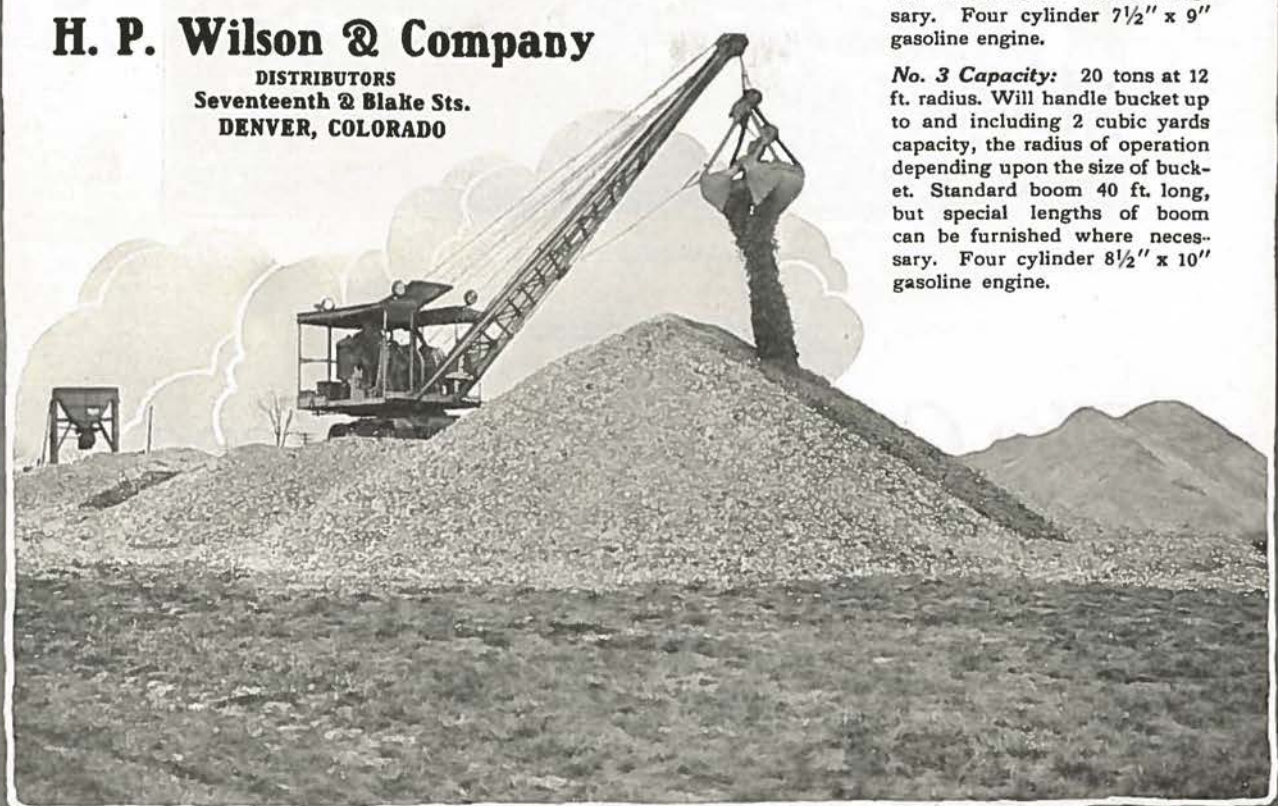
MILWAUKEE, WISCONSIN

H. P. Wilson & Company

DISTRIBUTORS

Seventeenth & Blake Sts.

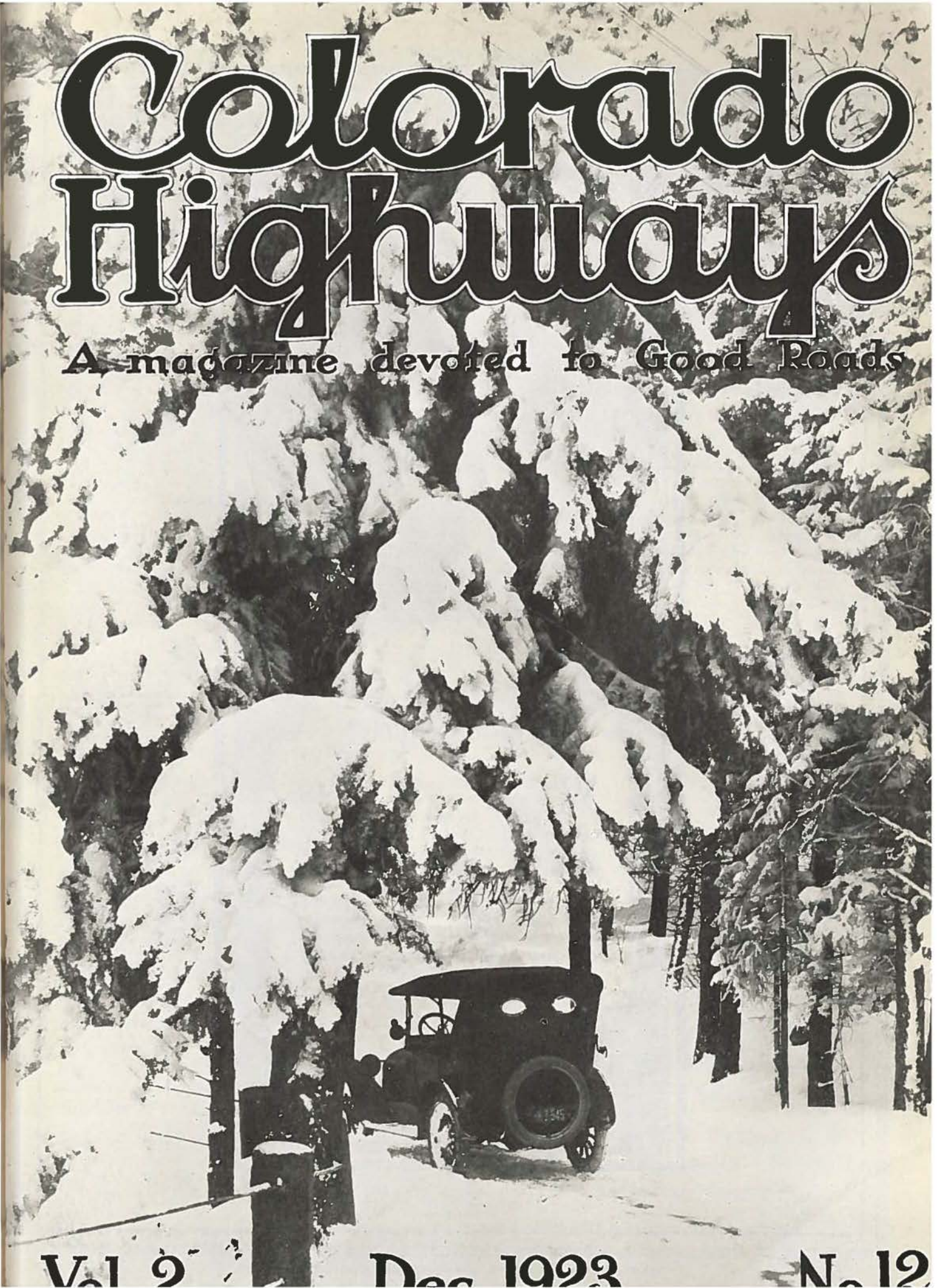
DENVER, COLORADO



THE BRADFORD-ROBINSON PTG. CO., DENVER

Colorado Highways

A magazine devoted to Good Roads



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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

The world-famous Lookout Mountain Highway, a part of the Denver Mountain Parks road system, as it looks after a heavy snow fall, is pictured on the cover of the December issue of Colorado Highways. Only sixteen miles from Denver, the Lookout Mountain road forms the gateway to the grandest scenic area in the world. The picture was taken just below Cody Lodge and Buffalo Bill's grave, located on the summit of Lookout. Photo by courtesy of Denver Tourist Bureau.

Colorado Highways
"BETTER ROADS"
VOLUME II. DECEMBER, 1923. NUMBER 12.

Colorado Completes Record Mileage

Total of 643 Miles of Main Highway System Improved in 1923, with State and Federal Aid Funds — Expenditures Reach $4,600,000.

A TOTAL of 643 miles added to Colorado's highway system—that's the record of the State Highway Department during 1923, according to a report issued by Maj. L. D. Blauvelt, state highway engineer.

This is a record for road improvement in Colorado. In addition to the new road construction, there were seventy-two bridge structures of various types completed.

Expenditures of the department during 1923 reached a total of $4 600,000. It is estimated that over 1,000 men were given steady employment throughout the year, through the activities of the department.

Of the total mileage completed, 191 miles were constructed in co-operation with the U. S. Bureau of Public Roads, the government contributing one-half of the cost. This mileage is divided as follows:

Concrete paving, 51 miles; gravel surfaced, 85 miles; graded and drained, 55 miles. There was constructed thirty-one bridge and major drainage structures completed with Federal Aid funds.

A total of 452/4 miles of State Projects were completed during the year as follows: Gravel surfaced, 253/6 miles; graded and drained, 198 miles, and 41 bridge structures of various types. The latter work was done entirely with state funds. In addition to the new construction the department through its maintenance division in co-operation with the counties maintained a total of 8,200 miles of state highways.

With the work completed during the past year, the state of Colorado now has a total of 167.3 miles of concrete paving, and 3,181.5 miles of surfaced state highways, with 5,274.6 miles of graded roads. The total road mileage of the state is 45,450 miles. The state highway system totals about 9,000 miles. Improvements made with Federal Aid Funds were on what is known as the 7% system, which comprises about 3,300 miles of the total state road mileage.

During the past three years the state has improved a total or 671.7 miles of roads in co-operation with the Federal Bureau of Roads. This included 330 miles of gravel, crushed rock and sand-clay surfacing.

On its own account with state funds the Highway Department has improved 828.9 miles of state roads.

In the matter of improving the roads of the state, it has been the policy of the Highway Department, according to Highway Engineer Blauvelt, to make such improvements as to insure the maximum accommodation of local and national highway service needs. With this in mind the state system to be included in the national 7% system was selected in such a manner as to co-ordinate with the Federal Aid systems of adjoining states making the necessary connections at state lines. In this way the Colorado road system has been made to fit in with the national highway system as projected by the government.

When completed the national system will total 180,000 miles, the largest national network of roads in the world.

In Colorado this system will connect every important town and city in the state. At present the State Highway Department is concentrating its efforts on the main system. Already it is possible to travel to nearly every point in the state on improved roads, a large percentage of them constructed with state funds.

Rapid strides have been made by Colorado in the past three years in the matter of hard surfaced roads, meaning concrete and bituminous paving. With its 35 miles of paving between Denver and Greeley, Colorado has the eighth longest unbroken stretch of concrete pavement in America. It is now possible to ride to Greeley, (with the exception of one short stretch of gravel surfaced roadway) on concrete. During the past year 10 miles of this pavement was completed.

An equal mileage of pavement was completed on the Denver-Ft. Collins highway. Plans now being formulated by the Highway Department call for the construction of six miles of pavement, closing the gap between Denver and

(Cont. on page 16)

Roosting on the corner of "eternity", chewing away a new 25-foot roadway at the foot of Berthoud Pass, one of Colorado's famous mountain boulevards. State Highway forces are now engaged in constructing an extension of this road between Empire and Lawson. Photo by U. S. Bureau of Public Roads.

Road Building in Larimer County

Officials Work in Perfect Harmony and Maintain Adequate Traffic Facilities for All Communities by Patrol System.

BY JAMES G. EDWARDS,
Road Supervisor, Larimer County.

LARIMER County is one of the northern-most counties of the state of Colorado, the north line being the dividing line between Wyoming and Colorado.

The elevation of the county varies from 5,000 feet to 14,000 feet above sea level, three-fourths of the county being mountainous, as beautiful as there is under the sun, and the remaining one-fourth being fine farm land. In Larimer county one finds a veritable spot of plenty, an ideal place to live and work, the lowlands to furnish bumper crops, and the mountains to supply us with health and energy.

Thousands of visitors find enjoyment in the picturesque mountains in the western part of this county, comprising the grandest scenery in the world, with its pine-covered gorges, wild, rugged scenery, and resistless mountain streams rushing madly down wild chasms.

With its valuation of $52,000,000, Larimer county is one of the richest counties in the state. Her farms are fertile and productive, her mountains are well stocked with timber, and her cattle ranches rank with the largest in the west. Her towns and cities are prosperous and delightful to live in.

To develop all these resources to the fullest extent, it has been necessary to build roads that her citizens and visitors might travel over with the least possible inconvenience, and that the crops and products might be moved to market. The county officials have endeavored to build roads second to none and so far have achieved no small degree of success.

There are over 1,600 miles of roads in this county, 242 miles of which are classified as State Roads. The state roads have been well selected, forming the primary arteries of travel through the county. They afford all the communities good, well-kept highways to the different towns and railroad centers. All but 40 miles of the state roads are now entirely of gravel or concrete surface. It is hoped to complete the State Road system in the county by the end of the next construction season.

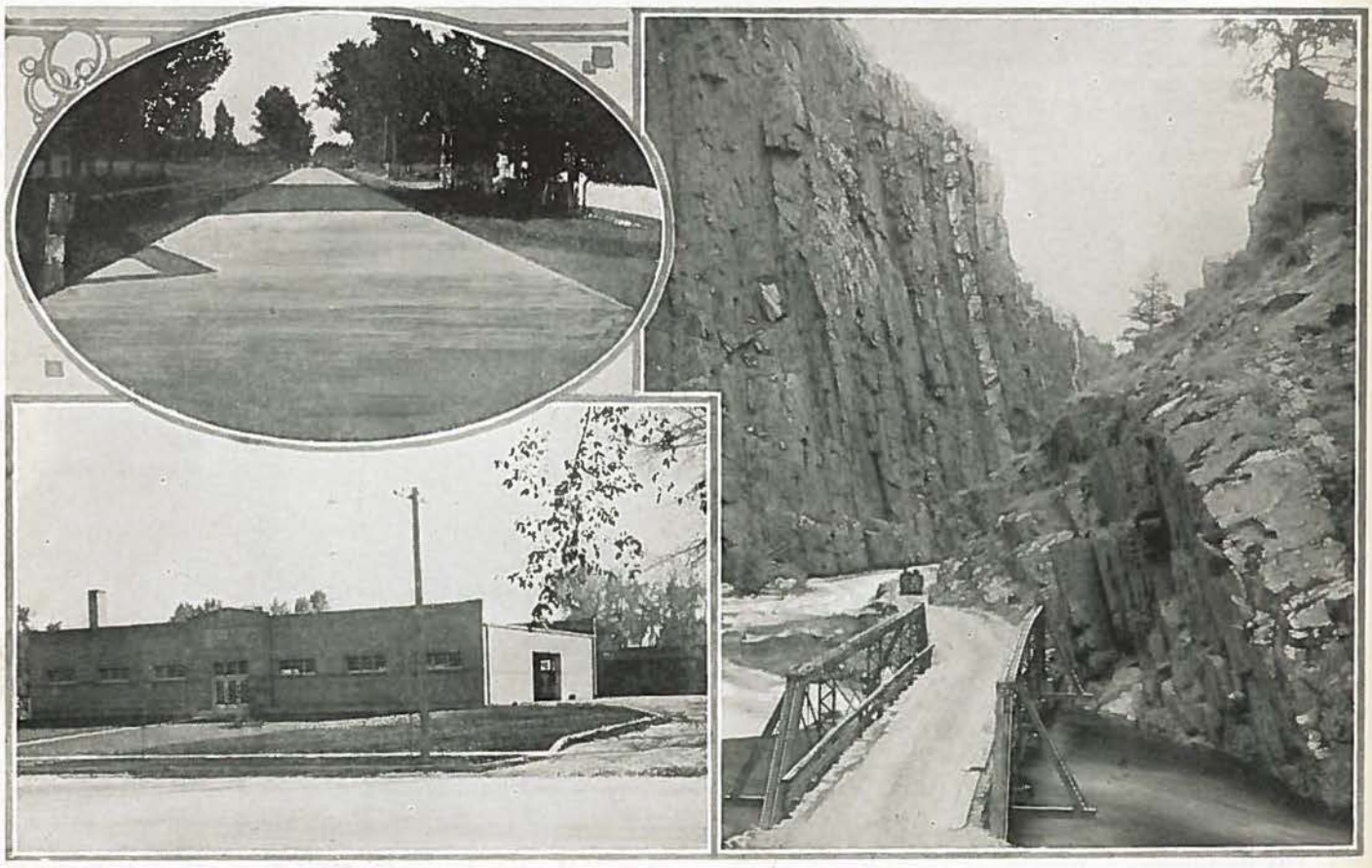
At present there are twelve miles of continuous concrete connecting the two largest towns in the county, Fort Collins, the county seat, and Loveland, the gateway to the Rocky Mountain National Park. Plans for 1924 contemplate the construction of an extension of four miles of concrete south of Loveland toward Denver. This concrete is all on State Highway No. 1, which is the main north and south road through the state.

The Rocky Mountain National Park and Estes Park are both located within the boundaries of Larimer county, and for this reason the tourist traffic is enormous.

During the year 1923 something over $240,000 was spent on the roads in this county. This does not include that expended by the State and Federal Governments on Federal Aid Projects. The maintenance fund for State Highways alone was $50,000, and it can be said here that the county commissioners of Larimer county feel that the maintenance fund for state roads is one of the finest features ever adopted. The very splendid condition of the roads here bespeak the wisdom and foresight of public officials responsible for this provision in the state highway law for the upkeep of our highways.

For years the state and counties spent thousands of dollars for construction and appropriated small sums for maintenance, with the consequent deterioration of our main roads.

Larimer county has one of the finest



Larimer County road views—Upper left, a stretch of new concrete pavement north of Loveland. Lower left, Larimer County highway shops, where all road equipment is repaired. Right—Showing the "Pillar of Hercules", one of the interesting points on the Big Thompson Canon drive.

garages in the state, in which all repairs and mechanical work is done by county mechanics. The road equipment consists of twenty-two trucks and cars, four caterpillar tractors, one rock crusher, one screening plant, one pile driver, one air compressor, one steam shovel complete with dragline, thirty-five graders and five maintainers, besides smaller tools and implements common to road building.

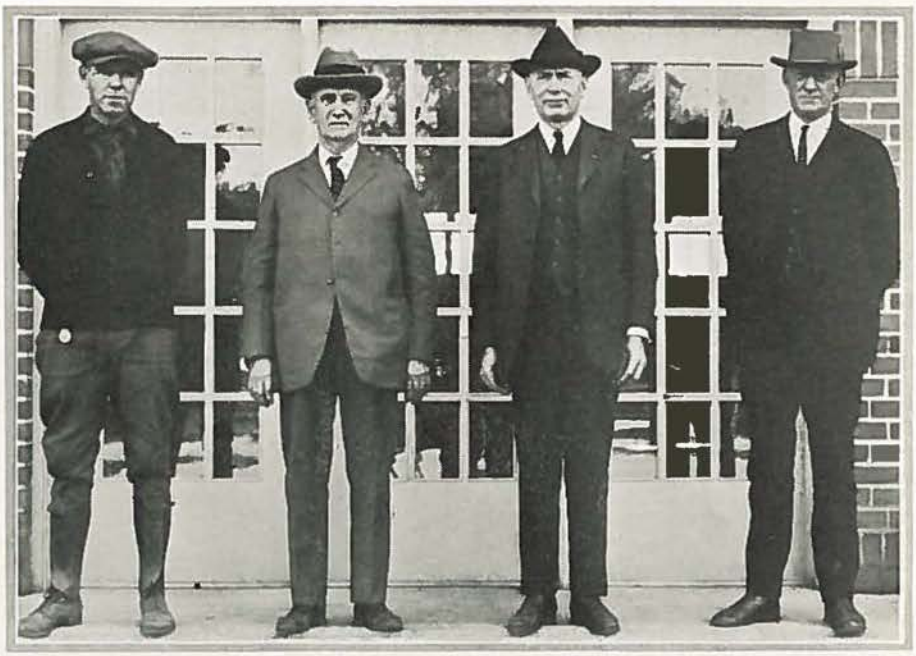
In the construction of our mountain roads, two carloads of blasting powder have been used annually. The Big Thompson canon road to Estes Park and the Poudre Canon road leading to North Park and Salt Lake City, are both eighteen-foot boulevards, blasted from solid rock nearly their entire length, reaching from the valley on the east to the top of the Continental Divide, which is the west boundary of the county.

Each road follows along a gurgling, rushing mountain stream, up canons with grim walls hanging overhead in fantastic shapes and bold profiles, to where the streams come to life at the foot of perpetual snow banks. These two roads are kept in better condition than most city streets by patrols, consisting of two men and a team with a small patrol grader and a drag. Each patrol covers from 15 to 25 miles and are employed the year round. On the state roads in the valley, the patrols consist of two men and a truck each, and cover on an average of 25 miles.

During the month of June this year disastrous floods occurred over the entire county, carrying away seventy bridges and washing out many miles of roads. Some of the roads in the mountains were entirely obliterated and in the valley miles of gravel surfacing was destroyed. This happened at the beginning of the tourist season, but in no case was traffic held up more than 48 hours, and at the present time nearly all the bridges have been replaced. The surfacing has been restored so that little evidence remains of the damage that was done by the floods.

The two principal streams in the county, the Cache Le Poudre and the Big Thompson river, left their channels in different places, sometimes leaving bridges high and dry, at the same time cutting new channels and destroying the highways. In a majority of instances it was found advisable to try and restore the streams to their original locations. For this purpose a new steam shovel was purchased and now is busily engaged digging out the original river beds and building leves and dikes.

It is the endeavor of the county officials to see that every part of the county has good roads commensurate with their needs. To this end the county is divided into twelve districts, exclusive of the state roads, and each district is under a road overseer. The districts in the farming communities are large and each overseer has a permanent force of men at all times. The mountain districts are small as far as road mileage is concerned and sometimes have only one or two isolated roads to maintain, and the road overseer puts in only part time, and work generally stops during the winter months, due to heavy snow falls. The county engineer is the general road overseer and is in charge of all work.



Larimer County Commissioners. Left to right, James G. Edwards, engineer; F. E. Baxter, Harris Akin, chairman, and J. W. McMullen.

All of the road men are called in for general discussion of road problems once a year, and much good is derived from these meetings, as a spirit of co-operation and a uniform method of work is established. Political appointments of road men is taboo and the men are chosen for their ability and industry.

The officials in charge of the Larimer county work are Harris Akin, J. W. McMullin and F. E. Baxter, comprising the board of county commissioners, three of the most ardent good roads boosters in Colorado. Perfect harmony exists between the members of the board and between the commissioners and the State Highway Department. The condition of the highways in Larimer county is proof of the statement.

HIGHWAY ENGINEER MEMBER OF BODY TO PROBE ROAD SCHEMES

State Highway Engineer L. D. Blauvelt has been named a member of a special committee of the Denver Civic and Commercial Association, created for the purpose of protecting the people of the state against promoters of irresponsible highway organizations.

During the past few years people in various communities have been defrauded out of thousands of dollars by promoters of highway organizations. These promoters have presented to their prospective victims that the town or city would benefit greatly in a commercial and financial way through the construction of a transcontinental highway, which highway of course would pass through the community.

As a rule nothing was heard about the highway after the victims had written their checks and the promoters had departed.

Hereafter the committee named by the Civic and Commercial Association will carefully investigate all proposed highway schemes, and make public whatever facts its members are able to ascertain. The committee feels sure that its efforts will save the good roads enthusiasts of the state thousands of dollars annually, and at the same time aid those identified with bona fide highway associations.

Maj, Blauvelt declared that the Highway Department is pushing forward the work of posting signs on the state roads, which will enable motorists to reach any point in the state without delay. In the past the matter of posting signs on the roads has been one of the most "selling" points of the fake promoters.

U. S. COMPLETES 8820 MILES OF FEDERAL AID ROADS IN 1923.

Federal Aid roads totalling 8,820 miles were completed during the fiscal year ending June 30, 1923, bringing the total of Federal Aid roads completed to 26,536 miles. The mileage completed during the year is classified as follows:

	Miles
Graded and drained	1860.1
Sand-clay	749.5
Gravel	3815.4
Waterbound macadam	335.6
Bituminous macadam	452.9
Bituminous concrete	76.8
Concrete	1440.3
Brick	78.8
Bridges	10.8
	8820.2

The projects under construction at the close of the year amounted to 14,772 miles and were estimated as 55 per cent complete. In addition to the 26,536 miles completed and the 14,772 miles under construction there were at the close of the year a number of projects approved but not yet placed under construction, the aggregate length of which was 6,917 miles.

Half Million for State Projects

Highway Advisory Board Sets $4,725,000 as Amount to be Expended for Improvements on Colorado Roads in 1924.

INABILITY of the members of the highway advisory board and State Highway Engineer Blauvelt to comply with most of the requests of county commissioners and others interested in highway construction for money for so-called state projects was the outstanding feature of the annual budget meeting of the board last month. By reducing the appropriations for administration, engineering, maintenance and other activities, the board members were able to set aside $500,000 for state projects. When it is realized that projects requested by county commissioners totaled more than $2,000,000, it will not occasion surprise that disappointment prevails throughout the state.

When the members of the advisory board got together on November 15, they agreed that, no matter what happened, the budget would not be permitted under any circumstances to exceed the department's estimated revenue. To make appropriations for projects when the money to pay for them is not in sight, a practice followed sometimes in the past, was condemned as bad business by all members of the board. The members rigidly adhered to their agreement, even though they fully realized that the wholesale turning-down of projects would cause bitter disappointment.

Colorado Highways desires to take advantage of this occasion to again call attention to the fact that the inability of the heads of the highway department to make the customary appropriations for state projects is solely due to the action of the twenty-fourth general assembly in repealing one-half of the one mill levy for state highways. This repeal, together with the fact that under the terms of the bond issue voted by the people last November all revenue from automobile licenses must be devoted to the payment of interest and ammortization charges on these bonds, deprived the department of something like $500,000, which would have been available for state projects.

Heads of the department and the members of the advisory board must bow to the general assembly. Good roads enthusiasts who foresaw what results the repeal of the one-half mill levy would have upon the department's activities, sought to convince the members of the legislature that the repeal was unwise and that the small counties away from the main interstate highways would suffer most from the resultant lack of funds, but their efforts were to no avail. The repeal bill was passed and the curtailment of road-building activities to $500,000 is the result.

The advisory board's meeting lasted from November 15 to November 21, It was, generally speaking, preliminary in character. The budget will not be formally approved and submitted to Governor Sweet for his signature until some time in December. At present Major Blauvelt and his assistants in the various subdivisions of the highway department are engaged in working out the detailed budget, with the recommendations made by the advisory board as the basis.

The greater part of the six days that the board was in session was devoted to hearing requests of various boards of county commissioners and groups of road enthusiasts for appropriations for state projects. Every day, for eight hours, the board members listened to the spokesmen of the applicants. In some casas the applicants were informed that there was not a chance of an appropriation, while in others, considered favorably, they were informed that only a portion of the money asked for would be available. Despite the fact that the repeal of the half-mill levy was given considerable publicity at the time that the general assembly took action, most of the delegations who called on the board were greatly surprised when the lack of funds was explained to them. In some cases requests for appropriations in a single county were larger than the amount available for the entire highway

Members of the State Highway Advisory Board. Back row—Left to right, John A. Donovan, Longmont; Maj. L. D. Blauvelt, state highway engineer; J. A. Clay, Durango, and Geo. L. L. Gann, Pueblo. Front row, Chas. B. Lansing, vice-chairman, Colorado Springs; Willliam Weiser, chairman, Grand Junction; E. E. Sommers, Denver, and Frank H. Blair, Sterling.

district of which the county was a part.

Under the budget outlined, after all delegations had been heard, about $4,725,000 will be expended for new work next year. Roughly speaking, the department will set aside about the same amount of money as in 1923 for maintenance, the counties meeting the state appropriation on a fifty-fifty basis. County officers will be interested to learn that the maintenance program for 1924 will be changed in that the joint maintenance fund during the coming year will not be available for the payment of the expense of supervision. Heretofore the supervisors have been paid out of this fund. In 1924 and thereafter the supervisor, both county and state, will be paid out of separate funds.

Federal aid projects will be constructed to the full extent of the amount of money made available for Colorado by Congress. Just where the Federal Aid projects will be placed has not been fully determined. Members of the board and Major Blauvelt are still engaged in working out the details, and decline to commit themselves further than to say that, generally speaking, the 1924 projects will be continuations of the work undertaken in the past. A systematic effort will be made to improve the main interstate highways as quickly as possible and concentrate work upon them. Altogether about $3,000,000 will be available for Federal Aid projects during the year.

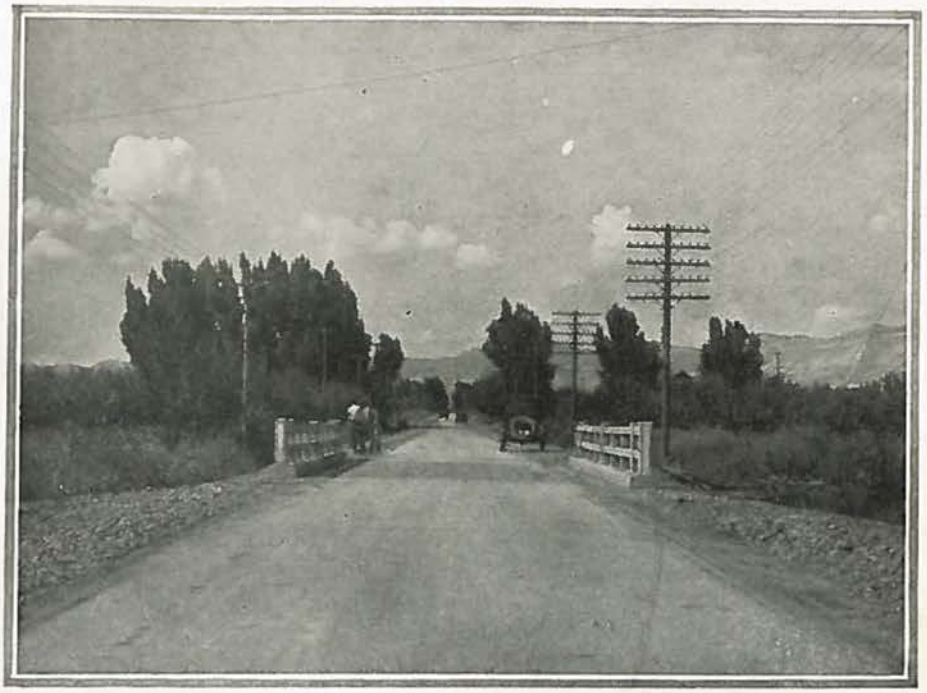
For state projects, as has already been outlined, about $500,000 will be made available. Administration, purchase of equipment, transportation of war supplies, etc., will consume the balance of the amount available to the department during the year. A small contingent fund, to meet unforeseen conditions, such as washouts, will also be provided.

The $4,725,000 provided for in the budget is not by any means the only money to be spent by the department during 1924. There is a considerable number of unfinished and even uncontracted for projects which will be carried over into the new year from the 1923 budget. The exact amount of money called for by these projects has not been ascertained at this time—reports from many of them being still outstanding; but Edwin Mitchell, auditor of the department, estimates the amount in excess of $3,000,000. These projects must be considered as separate and distinct from those which will be provided for in the 1924 budget.

The following table, prepared by the advisory board, gives the estimated revenue of the department for 1924 and the manner in which it will be expended, according to a decision of the advisory board:

ESTIMATED RECEIPTS

Highway fund balance, 12-1-23.		$ 300,000
One-half mill levy..	$ 750,000	
Two-cent gasoline tax	575,000	
Internal improvement	50,000	
Sales to counties and miscellaneous	50,000	
		$1,425,000
1924 bond sale.....	$1,500,000	
Federal Aid	1,500,000	
		$3,000,000
		$4,725,000



A stretch of concrete pavement in Mesa County, near Grand Junction, constructed with Federal Aid Funds. Photo by U. S. Bureau of Public Roads.

ESTIMATED EXPENDITURES

Federal Aid projects.	$3,000,000	
State projects	500,000	
Maintenance	811,000	
Property and equipment	75,000	
Contingent Fund ...	150,000	
Administration	189,000	
		$4,725,000

The November meeting of the board was attended by all seven members. It was the most harmonious meeting ever held by the board. All members displayed a disposition to forego selfish, local interests and approach the matter of making appropriations in a spirit of broad-mindedness which has only the interest of the state as a whole in view. Members representing the rich districts, it was announced after the meeting, had cheerfully helped out the districts not blessed with a large population and a large property valuation by giving part of the funds at their disposal for the construction of some much-needed stretch of road.

STATE HIGHWAY ENGINEER ATTENDS NATIONAL MEET IN NEW ORLEANS

Maj. L. D. Blauvelt, state highway engineer, and Oliver T. Reedy, senior assistant engineer, and William Weiser, chairman of the State Highway Advisory Board, early this month attended the annual meeting of the American Association of State Highway Officials, held in New Orleans, La.

They took an active part in the deliberations of this body, composed of the country's leading highway builders. Maj. Blauvelt enjoys the distinction of being a member of the association's executive committee.

COLORADO COLLECTS LICENSE FEES ON 173,033 AUTOMOBILES IN 1923

Records of the motor vehicle department of the Secretary of State's office show that on December 1 there had been licensed in Colorado 173,033 passenger automobiles, 12,959 trucks and 2,400 motorcycles.

Owners of these vehicles paid into the state treasury the sum of $1,119,989.36. Denver county alone paid $362,033.72, having 51,645 passenger cars, 3,785 trucks, and 1,021 motorcycles.

The five leading counties so far as passenger automobiles are concerned, after Denver, are: Weld, 10.988; El Paso, 9,812; Pueblo, 8,775; Boulder, 7,250; Larimer, 6,728. San Juan county, with 58 passenger automobiles, has the smallest registration of any county in the state. Hinsdale and Dolores counties, with 61 and 63 respectively, have the next lowest.

Next to Denver, with 3,785 trucks, Weld county has registered the largest number of trucks, 713; then follow, El Paso, 583; Pueblo, 573; Adams, 472, and Yuma with 469. Pitkin county registered only one truck.

Of the $1,119,989.36 paid by the owners of these motor vehicles, one-half is turned into the state highway fund, while the other one-half is distributed among the counties. The state's one-half is being used under the provisions of the bond issue law approved by the people last November, to pay the interest on the $6,000,000 highway bonds and to retire them when they mature.

Motorist (arrested for speeding)—"Good morning, Judge, how are you this morning?"

Judge—"Fine! $25.00."—Fairfield Motorist.

Taxes and Their Relation to Roads

BY CHARLES B. LANSING,
Vice-Chairman State Highway Advisory Board.

AS an American citizen, it is your duty to know what your government is doing. You should know its fundamentals and how it is run.

For, remember it is YOUR government. You have a right to know what is going on, and in order to vote intelligently on the various issues and to keep the government on as an efficient basis as possible, every citizen should keep himself informed as to the operation of the government, both city, county, state, and Federal.

Taxes are probably the most widely discussed phase of our government at the present time. Everyone seems to want more and more of the things that taxes pay for, such as good schools, good roads, pensions, etc. At the same time there is a great outcry about the vast sums that are paid in taxation. It is true that the greater amount of taxes paid today have been voted by the people themselves.

Under our system of government it is within the power of the people to decide what schools, roads, pensions, etc., they want, and it is for them to say the amount of taxes they wish to pay.

These decisions are either made directly by YOU, Mr. Taxpayer, on the ballot, or indirectly through YOUR choice of candidates to administer YOUR government.

In order to be guided as to how YOU will decide to run your government in the future, let's see what you have decided in the past.

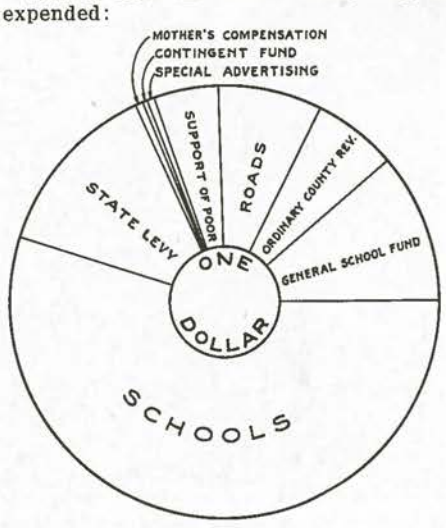
First, where is your revenue coming from now, and how have you decided to raise your money for the operation of your government? In order to make the question as simple as possible, let us leave out the city taxes and take the case of the man who lives in the country.

There are two places where he is required to pay his taxes. First, to the County Treasurer, and, secondly, direct to the Federal Government. He also pays special taxes, such as the automobile license tax, direct to the county treasurer, and the gasoline tax indirectly when he buys gasoline.

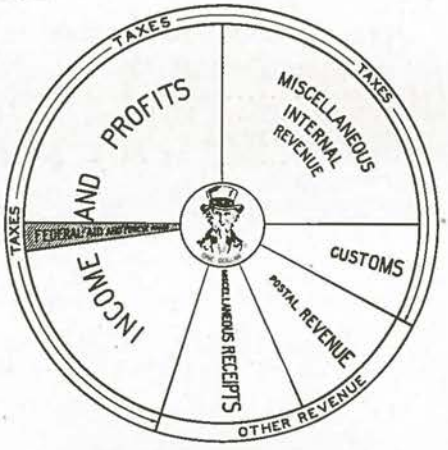
Below are printed four graphs, showing where the county dollar comes from and how it is generally expended, and Federal revenue and expenditures:

Here is the average county revenue dollar:

This is how the usual county levy is expended:

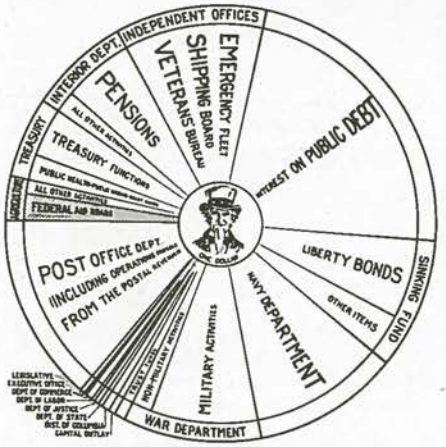


Here is where the Federal dollar comes from:



THE FEDERAL REVENUE DOLLAR
SHOWING THE SOURCES OF FEDERAL REVENUE AND THE AMOUNT REQUIRED FOR ROADS
FISCAL YEAR 1922
AS REPORTED BY THE BUDGET BUREAU

And here is how the Federal dollar is spent:



THE FEDERAL EXPENDITURE DOLLAR
SHOWING THE DIVISION OF THE FEDERAL EXPENDITURE FOR THE FISCAL YEAR 1922
AS REPORTED BY THE BUDGET BUREAU

It will be noted that of the whole dollar spent by the Federal Government, only two cents is spent for roads. Also consider for one moment that ninety-two cents of the whole Federal dollar is spent for war and its accessories. **That is something to think about.**

An analysis of these dollars bring out the fact that the direct taxation on automobiles pays for about one-half of the expenditures on roads in this country. The Federal Government collects $115,000,000 on auto excise taxes and spends only $92,000,000 on roads.

The states and counties collect $220,000,000 from registration, gasoline, and personal property taxes on automobiles, and spend $600,000,000 on roads. All of the motor taxes ($335,000,000) are about one-half of the total ($692,000,000) road expenditures.

The state of Colorado has issued $6,000,000 of bonds for road purposes, of which both the interest and principal of the bonds will be paid out of automobile license fees. Many other states have done likewise, so that of the total, local, state, and national taxes of $9,000,000,000, **the tax levies for highway purposes were but 5.3 per cent.**

That certainly won't prove that the increase of taxes has been due to large highway appropriations.

When one considers the great benefits to the people from highway improvements, these expenditures have been the best investment made by the American people. By providing modern, rapid transportation, land values have been greatly increased, and the social benefits derived from use of these modern roadways has been manifold.

Modern roads have brought the markets closer to the farmer and have made our citizens more efficient by widening their range of activity, besides bringing the people of urban communities and the cities closer together.

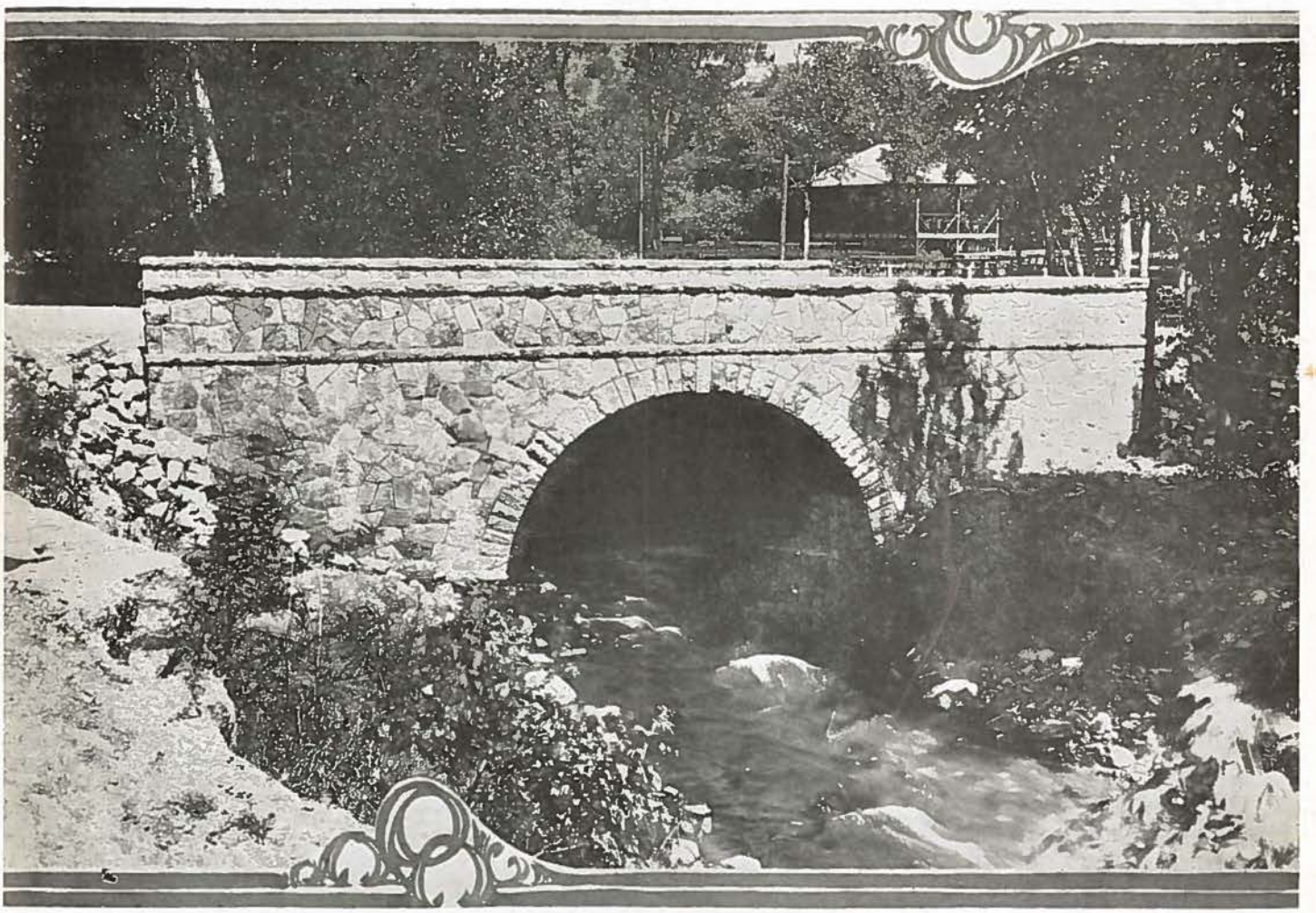
When these facts are considered, it is to be seen that modern highways are not to be thought of as things that cost money, but as things that greatly improve living conditions and give out money to everyone.

For example, how much would a doctor be worth to society today, if he was limited in his activities by the horse and buggy and the poor roads of the past? Or how about the truck traffic which is moving thousands of tons of commerce over our modern highways? And how much less time would the rancher have for work on the farm if he took his milk to market by horse over the poor roads of yesterday?

The improved highway is coming more and more. We cannot do without it. And being **your** highway, it is up to YOU to vote for it, to impress upon your elected officials the importance of same, and support the better roads program by increasing your appropriations for highway purposes, knowing the returns and wealth it is bringing you.

In all the leading states of the union large amounts are being spent on highway betterments. These states are issu-

(Continued on page 21)



Stone bridge on highway across Fountain Creek, near Manitou, showing artistic use of local materials

Highway Smileage

"Speaking of bathing in famous springs," said the tramp to the tourist, "I bathed in the spring of '86."—American Boy.

There's nothing will cure a reckless driver like thirty days' observation of the sun through a barred window.—Georgia Highways.

Garage Mechanic: Yer car needs gas, mister.

The Owner: That car had five gallons of gas the day before yesterday and that's every dam' drop it's going to get till tomorrow!—Life.

It was evening. A stranger approached the motorist.

"Sir," said he, "your beacon has ceased its function."

"Sir?"

"Your illuminator, I say, is shrouded in unmitigated oblivion."

"Really, I don't understand you."

Just then a boy shouted: "Hi, mister, your lamp's gorn out."—Boston Post.

A highway builder's word should be as good as his bond.

Count that day lost
Whose slow descendin' sun
Sees motor trucks sold at cost,
And biznis dun fer fun.

—Walt Mason.

The difference between Satan and the road department is that the former makes his detours more enticing.—Knoxville Sentinel.

A highway financing bill introduced in the Arkansas Legislature provides for a tax of 4 cents a gallon on gasoline, a tax on automobiles of 12 cents per horse power and 55 cents per 100 pounds gross weight, a tax on trucks ranging from $25 to $500, and on motorcycles, $10 flat. The minimum tax for automobiles would be $15.—Good Roads.

The lesson gained from past road building experience is that immediate maintenance lessens the final cost of a road or bridge.

You will never interfere with a pedestrian who is beating it away from a speeding auto for the curb. He is making a non-stop flight.

Dyer—I understand your wife suffers from car sickness.

Ryer—Yes, it makes her sick to think we can't afford as good a car as our neighbors.—Ex.

He: I am going to buy a roadster.

She: Why don't you buy a touring car? I think it is nice to take your friends out.

He: Gosh, if I were going to take my friends, I would have to buy one of those Coney Island buses.—Chevrolet Review.

The license on a Ford for one year in England is $100.

Mother and son were at the circus.

"Mother, ain't that elephant big as hell?" asked the young son.

"Why, son, haven't I told you time and again not to say 'aint'?"—Boll Weevil.

A woman came into the Bank of North Lake one day recently and made a deposit of several items. After ascertaining the amount, Burton M. Smith, president of the bank, asked, "Did you foot it up?" "No, I rode over," said she.—Milwaukee Banker and Manufacturer.

Fruita-Rangely Road Project

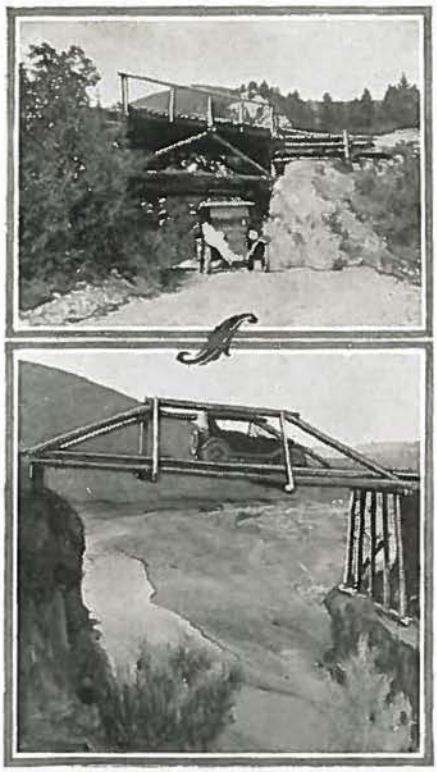
BY JOHN J. VANDEMOER

THIS project had its inception in the minds of the Board of Directors of the Grand Junction Chamber of Commerce early in 1921, in order to develop the territory lying north of the city and establish a line of communication with the west end of Garfield and Rio Blanco counties, which would then connect Grand Junction with the State Road up and down the White River country, which includes the producing Raven oil fields, just four miles west of Rangely and where there is located a refinery which produces all of the gas and oil for not only the White River country, but for a large share of the Uintah Basin. And, speaking of the Uintah Basin, which lies in western Utah, this is by far the largest undeveloped territory in this section of the United States that I know anything about, where water supply is unlimited and the soil is fertile. All that is needed is increased transportation facilities and more settlers, and, as transportation facilities improve, the development of the agricultural possibilities will increase. This year, even under the adverse farming conditions, 7,000,000 pounds of alfalfa seed were raised in the Uintah Basin. This seed must all be hauled to the nearest railroad point, and it is hoped that Colorado will receive a portion of this hauling business, as her roads become more improved.

Grand Junction is growing constantly and the reason why she is growing is because her citizens have the vision of a larger Grand Junction, and they are all pulling together to make this vision come true. Instead of waiting for help from the outside, they are helping themselves, and digging down in their own pockets to accomplish their objectives, which up to this time have been the construction of roads not only to the north of her, but to the south as well. This has all been accomplished under the able direction of William Weiser, chairman of our State Highway Advisory Board, and his faithful and loyal Board of Directors of the Grand Junction Chamber of Commerce, of which he is the president. And, in order that you might have some idea of what has been accomplished from a financial standpoint, the Grand Junction Chamber of Commerce has raised a total of $31,278.61 for the construction of roads, outside of her own home county of Mesa, in order to bring business to Grand Junction, and it will bring business to Grand Junction. Small beginnings often bring large results in the end, and according to the old adage that the "Lord helps those who help themselves," the Lord did help, in the form of the State Highway Department, for when Major Blauvelt saw that Grand Junction had actually raised $31,278.61 for road construction purposes in 1921, he couldn't resist allotting another $30,000.00 to go with it, in 1922, which was afterwards increased to $35,723.96, and in 1923 another appropriation of $30,000.00 was made. This appropriation was made in order to keep the good work on Douglas Pass going, which lies 56 miles north of Grand Junction or 41 miles north of Fruita, and is at an altitude of 8,200 feet.

This work had been started in the summer of 1921 and consisted of the construction of about one mile of rather heavy mountain, side hill grading, which included considerable rock work on the south side of the pass, and about one-half mile of ordinary mountain side hill grading work on the north side of the pass.

The construction of this mile and a



Top—Loop bridge of unique construction on south side of pass. Bottom—Bull draw bridge, 42-ft. span, across Douglas Creek.

South side of Douglas Pass, showing switch-backs, on new highway being constructed by State Highway Department into the Uintah Basin, one of the largest undeveloped sections of the United States.

half of road cost the Chamber of Commerce, according to their books, $13,649.80, together with an equipment and culvert cost of $1,744, making a total cost of $15,393.80.

In 1922 the State Highway Department took up the construction of this road project, which covers a total distance of 96 miles, from Grand Junction to Rangely. The distance around by Rifle and Meeker is 182 miles. The new road then saves 86 miles in distance between Grand Junction and Rangely and makes the run from Grand Junction to Vernal 152 miles, and from Grand Junction to Roosevelt 182 miles; in other words, it is as far from Grand Junction to Vernal now as it used to be from Grand Junction to Rangely around by way of Rifle.

At the time this work was taken over by the State, a fair, unimproved country road existed from Fruita up East Salt Wash to the foot of Douglas Pass, a distance of 36 miles. To date only enough work has been done on this portion of the road to keep it in passable shape. This stretch, however, is practically all blade work, and can be put in shape under maintenance.

From the foot of the pass to the connection with the Chamber of Commerce work involves about 38 miles of heavy mountain side hill excavation work, consisting of considerable rock work.

This 3.8 miles of grading work outside of bridges was accomplished by State forces at a total cost of $22,741.42, or at a cost of $5,721.43 per mile, and the pioneer construction over the top of the pass was completed on July 4, 1923. This 4.8 miles from the foot of the pass to the top, including bridges, engineering and grading, cost $39,924.32, which is an average cost of $8,317.57 per mile. This stretch of road is laid out on a maximum 7% grade, and rises about 1,500 feet in 4.8 miles, or an average 6% rate of grade. There are numerous switchbacks and about a mile from the top the road loops under itself, passing under what is called the loop bridge (a photograph of which I am enclosing). This 4.8 miles have proven to be by far the greatest problem on the project, owing to the unstable nature of the mountain side traversed, and will have to be widened to 16 feet width as travel increases.

From the top of the pass it is 40 miles to Rangely, and we encountered no very heavy work on this side. At present we are using about two to three miles of temporary road with some steep grades getting down off the pass on the north side, but the permanent line is on easy grades and alignment and will be built next season.

From the foot of the pass on the north side of the road follows down what is known as the west side of Douglas Creek on easy grades, and the main construction problem has been that of providing adequate bridges across the deep washes which come in to Douglas Creek from both sides.

Ten miles from the top of the divide it was found necessary to cross over to the east side of Douglas Creek in order to avoid heavy construction and expensive bridge work.

Fifteen miles from the top of the divide it was again found necessary to cross over on to the west side of Douglas Creek in order to avoid heavy grading costs.

Twenty-four miles from the top of the divide it was again found necessary to cross on the east side of Douglas Creek at what is known as Bull Draw, in order to avoid heavy grading and bridging costs.

Twenty-nine miles from the top of the divide it was again found necessary to cross to the west side of Douglas Creek in order to avoid heavy grading and bridge costs, and for the next eleven miles the road follows down on the west side of the creek into Rangely.

As can be seen from the accompanying sketch map, the great problem on the north side of the divide is the construction of adequate bridges which will withstand the tremendous floods which this country is subject to, owing to the fact that it lies in a cloudburst area and the nature of the soil is such that the water all finds its way into Douglas Creek, which at its point of discharge into the White River flows as much as 15,000 second feet at high water stage.

Twenty-two bridges, averaging about 30 feet long and 30 feet high, have been constructed on this project up to date over the most important drainages at a total cost of $11,707.27, or at a cost of $532.14 per bridge. Fortunately, the bridge material could be obtained off the public domain in the vicinity of Douglas Pass, which reduced the cost of the lumber to about $40 per thousand, which cost was about equally divided between logging, milling, and hauling to the bridge sites. Red spruce was used for the sub-structures and aspen was used for the flooring.

The bridges were built 16 feet wide and are very substantial in character, and I anticipate no very great trouble in maintaining them for some time to come.

The cost of grading from the top of the pass to Rangely amounted to $24,978.66, or at the rate of $624.46 per mile.

The large majority of money up to date has been spent from the foot of the pass on the south side, a distance of about five miles, to the top of the pass, which is all quite heavy mountain construction, and from the top of the pass north to Rangely, a distance of about 40 miles, which is not difficult construction from a grading point of view.

This makes a total of 45 miles, upon which a total of $81,117.76 has been spent up to date, or at the rate of $1,802.62 per mile of road constructed, including 22 bridges.

There is, of course, a vast amount of improvement necessary on this road, owing to the fact that only a pioneer road has been constructed to date, but it is open to travel, and after a few more years' work has been done upon it, a very good road will result at a very reasonable cost per mile.

LONGEST CONCRETE HIGHWAYS

What state has the longest stretch of continuous concrete highway?

Statistics from the different states in the union places Wisconsin in the lead with ninety-three miles, followed by Minnesota, Iowa and California in the order named.

Colorado is tenth on the list, with a thirty-five-mile stretch extending from the city limits of Denver toward Greeley on the Lincoln Highway.

This hard surfaced roadway passes through the towns of Brighton, Ft. Lupton, and Platteville. The concrete street pavements in these towns maintain the unbroken chain to a point nineteen miles south of Greeley. Here the chain is broken with a sixteen-mile stretch of unpaved road which connects with the three miles of concrete highway extending south from the city limits of the latter city.

The first pavement upon this highway was constructed during 1918 for a distance of two miles. The ever-increasing amount of heavy traffic upon this road is largely responsible for the rapid strides made during succeeding years in providing a permanent link in a north-and-south state thoroughfare.

On a continuation of this highway south of Denver to Colorado Springs, twelve miles of concrete pavement have been installed, eight miles extending to a point south of Littleton, while the remaining four miles commences at the city limits of Colorado Springs and runs north to Breed. Contracts have been awarded for a five-mile extension of the former pavement.

There are at present one hundred and fifty-one miles of concrete-paved highways in the state of Colorado.

Listed below are thirteen of the longest continuous routes of concrete-paved highways in the United States:

State	Road	Length
Wisconsin,	Troy Center through Milwaukee Co. to Fond du Lac.	93 miles
Minnesota,	Anoka to Belle Prairie	83 miles
Iowa,	Charles City to Algona	78 miles
California,	Yuba City to Chico	60 miles
Delaware,	Lewes to Dover	60 miles
California,	Chico to Red Bluff	60 miles
Minnesota,	Duluth to Eveleth	56 miles
Minnesota,	Westmoreland to Indio	54 miles
Florida,	Jacksonville to Lake City	43 miles
Colorado,	Denver to Greeley	35 miles
Arizona,	Phoenix to Buckeye	33 miles
California,	Edom to Banning	30 miles
Maine,	Portland to Lewiston	23 miles

REGULATING THE PEDESTRIAN

Every city, township, county, and state in the United States has a wealth of laws for the regulation of the motorist, while only a few scattered cities have any laws which tend in the least to regulate the pedestrian.

There is something fundamentally wrong with laws which deal with only one side of a question and make no pretense of recognizing the existence of the other side. This is especially true in view of the fact that statistics show an unbelievably large percentage of accidents in which pedestrians are struck by automobiles to be due to the carelessness of the pedestrian.

During the past ten years there have been placed on the statute books so many laws in regard to the automobile that the motorist is pretty well regulated. The time has come to regulate the pedestrian and the minimum of accidents will never be reached until motorists and pedestrian are equally regulated.

Colorado Traffic Shows Big Increase

Preliminary Report of Census Takers Submitted to Highway Officials Shows Gain of 500 Per Cent in Five Years.

BY JOHN E. FURLONG,
Chief of Traffic Census, State Highway Department.

IN the 1923 budget of the State Highway Department there was made available a sum of money for the purpose of taking a traffic census along with the posting of signs on the main highway routes through the state. The traffic census was deemed necessary to obtain data on the number, types and weights of vehicles using our highways.

This information will be used in determining the type of roads that will be constructed in the state in the future. Figures so far compiled show increases of as high as 500 per cent in the traffic on certain roads over the traffic count of 1918.

It was decided that during the summer months recorders should be stationed along the main routes at certain points and the vehicles counted. The men employed in the work for the most part were college students seeking work during the summer months. Twenty enumerators were used, being shifted from station to station.

The work was started July 1 and continued until the middle of September, when all but four were dismissed. Since the first of October two men have been employed in the office in totaling and making tables of the results obtained.

Plans included the taking of a partial count of three or four days in each month on the different stations east of the main divide. No attempt was made to take a complete count for a full month at any of these stations. With this in view, the force was organized to start from Denver as a center, and take the count on the road north to Ft. Collins and Greeley, swinging around to Julesburg from Greeley, then from Denver to Limon and Burlington, and from Limon to Colorado Springs, then swinging south from Denver to Colorado Springs; then from Colorado Springs to Pueblo and to the State line, taking in also the Santa Fe Trail from Pueblo east to the State line.

At the same time, with the co-operation of the Division Engineers in the different divisions, counts were taken in the San Luis Valley and in the Valley of the Colorado, down as far as Rifle. A few observations were taken at Craig and Steamboat Springs on the north highway, also at Rabbit Ear Pass.

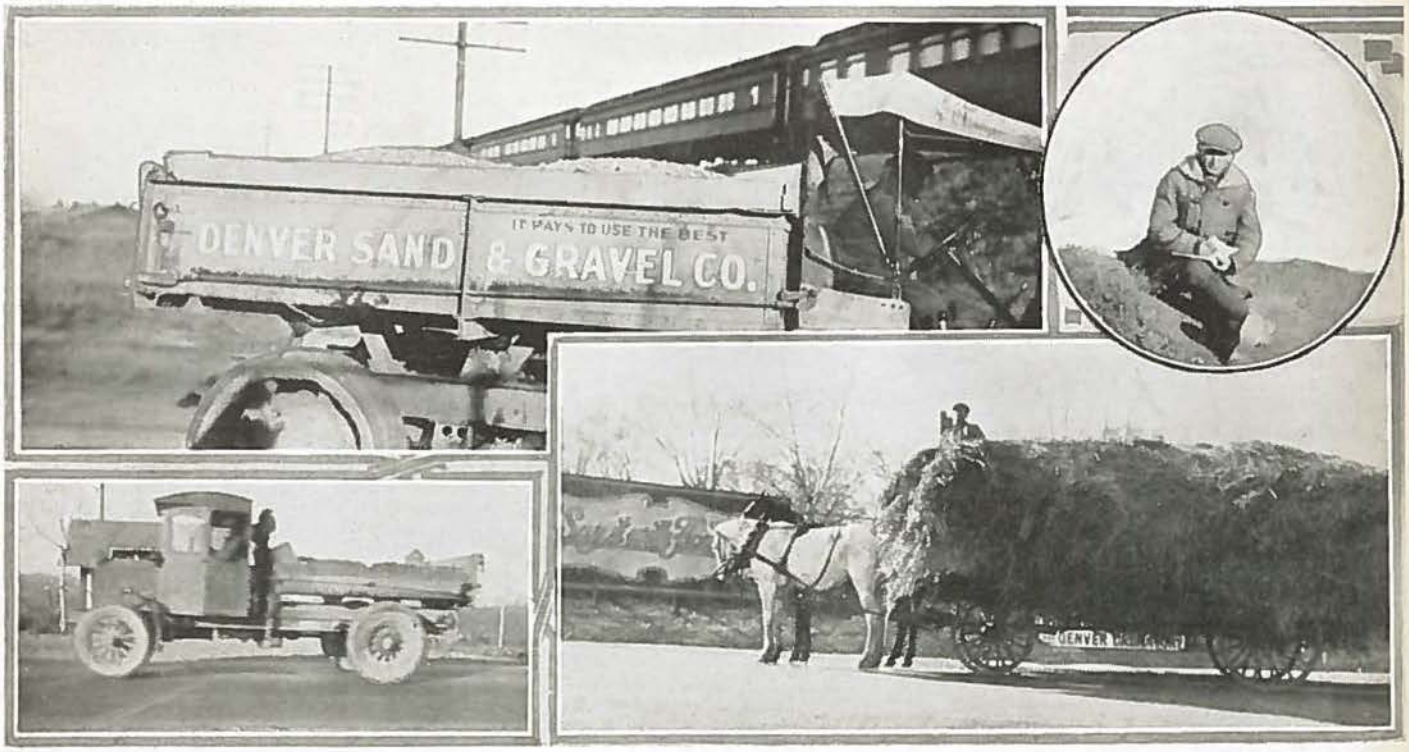
About three days were spent at each station. At some of the principal stations, such as Greeley, Loveland, Ft. Collins, Denver, Colorado Springs, etc., twenty-four-hour counts were taken, but at the other stations, eight-hour counts were taken, from eight o'clock in the morning until four o'clock in the afternoon. The twenty-four-hour counts give a proper percentage from which the eight-hour counts can be prorated so as to get the full day's traffic at any station. The count was taken in such a manner as to separate the Colorado cars from the out-of-state cars; also separate the trucks, motorcycles, horse-drawn vehicles, and other classifications of traffic. These separate classifications are now being totaled.

Camp equipment, including cooking utensils, etc., were issued to the enumerators, but due to the excessive rains, these were often abandoned for the nearest boxcar, jail or barn, preferable in the order named. The men were stationed on the main highway entering the various towns to record the traffic entering and leaving terminals, also at the junction of the main highways or important county roads; the latter being considered as feeders and their traffic recorded.

On the twenty-four-hour shifts a continuous census was taken, whereas the eight-hour shift was varied one hour each day, in order to cover a range of eight to ten hours of observation per station.

In this manner two complete trips of ten moves each, covering the state east of and including the main passes, such as La Veta, Wolf Creek, Poncha, Monarch, Tennessee, Berthoud and Rabbit Ear, were made. Each move covered from fifteen to eighteen stations. It was desired to cover that portion of the state west of the above-named passes, but the data required in the allotted time made that impossible. The western slope country will in all probability be covered during the coming year.

In order to cover the highways required, the stations were located from twenty to 250 miles apart. The enumerators were moved from one station to an-



Showing types of heavy traffic snapped on some of Colorado's main highways. Traffic enumerator (in circle) taking count of cars

other without losing more than one day in the moving. This was accomplished through the co operation of the Division and Resident Engineers in the various districts providing their motor equipment.

Taking of a traffic census is a man's size job. The enumerators worked in all kinds of weather, sometimes with little or no shelter. However, the many amusing incidents which the men observed recompensed them for most of the grief. During the rainy season the conditions in some of the camps often made one think of that remark made by some young martyr during the late world war, "Kindly keep your feet out of the water we have to sleep in."

There is reason to believe that the local moonshine merchants in some parts of the state must have received more or less thrill when questioned by the enumerators as to what they were hauling. In one instance a wagon was noticed to carry the same load going and coming several times. The enumerator being of an inquisitive nature finally stopped the vehicle. With exaggerated gestures, the driver explained, "We ain't got nuthing but furniture on this wagon."

But the vehement gestures were his downfall; also some pre-Volstead liquid, which upon contact with the pavement became null and void.

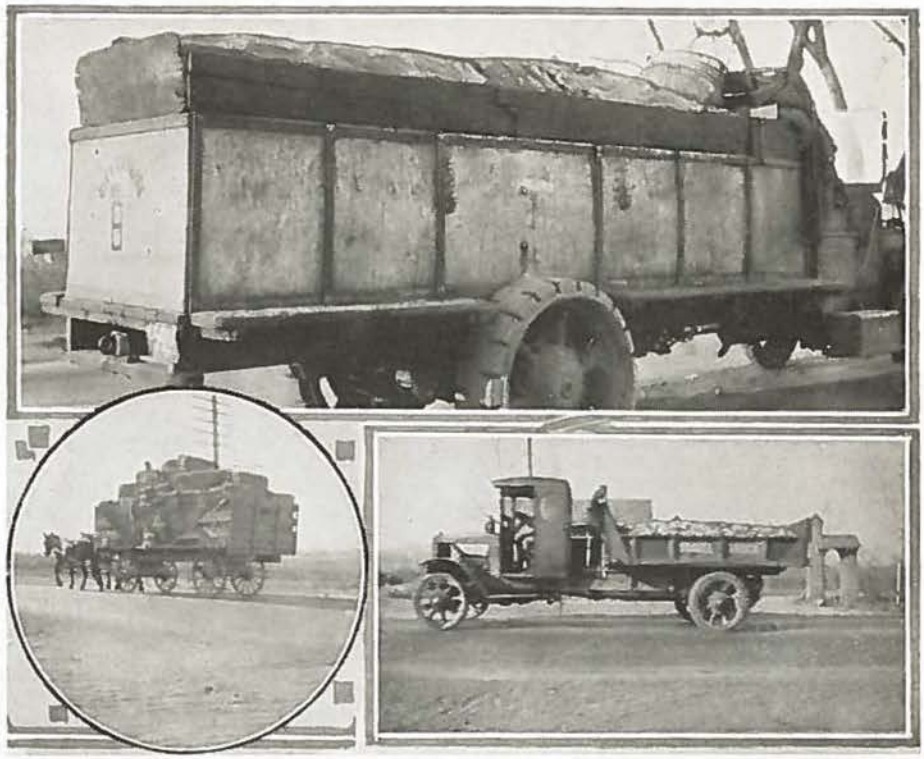
Another incident profited one of the recorders a $5 bill. A large touring car whizzed by at a terrific rate. The recorder made a mark on his tally sheet. A few minutes later the big car pulled up and stopped in front of the station.

The man in the rear seat beckoned for the recorder and said: "Just forget it, young man," and pressed the note into his hand. The motorist did not wait for the recorder to explain. A check-up on the license number showed that the car was the property of one of Colorado's most prominent citizens.

Several times the recorders were threatened with bodily harm by irate motorists who thought they were being checked as speeders. Some of the young men adopted unique methods of earning their board while on the job. One of the boys milked cows for farmers in the morning and evening for his meals, thus saving the cost of his rations.

The count is being continued so as to get a typical count of the traffic during the winter months. This probably will be continued until the department gets the average count for each month in the year so as to establish a yearly curve of the fluctuation of traffic. At one or two stations it is probable that a daily count will be made for a full month so as to get the monthly fluctuation of traffic in the same way that the twenty-four-hour count gives the daily fluctuation of traffic.

The count shows that the traffic coming from the north, east and south, and centering at Denver, develops the largest traffic. The Brighton-Denver, Brooiafield-Denver and Littleton-Denver roads are the most heavily traveled, the counts reaching an average of 3,700 vehicles per day of twenty-four hours during the month of August. The eight-hour proportion of the twenty-four hours ranges from 44% to 57%, an average of practically



Upper picture—What a 10-ton load looks like. Lower left—"All the baled hay they could stack on." Lower right—"Just an ordinary load; six tons of gravel."

50% of the twenty-four-hour traffic, which is during the eight hours from 8 a. m. to 4 p. m. The truck traffic varies from 4% to about 16% of the total. The count also shows that the foreign car traffic during August is heavier than that of July and the foreign car traffic near the state lines running from 50% to 60% of the total traffic.

Below is printed tables showing the average traffic for July and August on Roads Nos. 1 and 2, the most heavily traveled roads in the state:

Colorado Highway Traffic Census for 1923.

State Highway No. 1.

Denver South to New Mexico State Line via Castle Rock.

Stations where records were taken	Average total number of vehicles per day of 24 hours			
	Date July	No.	Date Aug.	No.
Petersburg, south end	18-19-20	3320	27-28-29	3541
Littleton, 1 mile north	"	3163	"	3764
Littleton, south limits	"	2135	"	2505
Castle Rock, north limits	"	1193	"	1526
Palmer Lake, north end	"	1341	"	1453
Palmer Lake, south end	"	1220	"	1429
Pikeview, 1 mile north	"	1149	"	1569
Colorado Springs, 1 mile north	"	1716	"	1516
Colorado Springs, 1-4 mile south	"	1244	"	1294
Fountain	"	898	"	956
Buttes	"	821	"	906
	July		Sept.	
Pueblo, 2 miles north	26-27-28	1089	6-7-8	1143
Pueblo, south limits	"	629	"	673
Greenhorn, Junction Road 1 and 165	"	535	"	519
Walsenburg, north end	"	673	"	496
Walsenburg, south end	"	1358	"	1077
Trinidad, north end	"	1601	"	1403
Trinidad, south end	"	1222	"	748
Morley, south end	"	557	"	657

Colorado Highway Traffic Census for 1923.

State Highway No. 1.

Wyoming State Line to Denver via Ft. Collins.

Stations where records were taken	Average total number of vehicles per day of 24 hours			
	Date July	No.	Date Aug.	No.
Bulger	1-2-3-4	235	11-12-13	288 (1 day)
Wellington	"	536	"	870
Ft. Collins, northeast	"	1223	"	822
Ft. Collins, south end	"	1943	"	1735
6 miles south of Ft. Collins	"	1062	"	1032
Loveland, south end	"	1821	"	2239
Campion Jct.	"	1280	"	1747
Berthoud, north end	"	1167	"	1482
Berthoud, west end	"	1288	"	1938
Longmont, north end	"	1988	"	2527
Longmont, south end	"	2965	"	3007
5 miles south of Longmont	"	1631	"	1791
Lafayette, south end	"	1532	"	1833
Broomfield	"	3074	"	2142
Denver, north limits	"	3359	"	3712

Colorado Highway Traffic Census for 1923.

State Highway No. 2.

Nebraska State Line to Greeley.

Stations where records were taken	Average total number of vehicles per day of 24 hours			
	Date July	No.	Date Aug.	No.
Julesburg, east end	10-11-12	167	19-20-21	237
Julesburg, west end	"	258	"	385
Crook	"	271	"	384 (1 day)
Illiff, 3 miles south	"	414	"	406
Sterling, north end	"	598	"	665
Sterling, 1 mile southwest	"	1004	"	1207
Merino, at depot	"	532	"	677
Brush, north end	"	855	"	1070
Brush, west end	"	733	"	809
Ft. Morgan, east end	"	798	"	980
Ft. Morgan, northwest end	"	474	"	726
Weldona	"	617	"	559
Kersey, west end	"	356	"	634
Kersey, south end	"	478	"	526
Greeley, 1 mile east	6-7-8	674	15-16-17	873

ROAD NEWS, VIEWS AND GOSSIP

Night life in a surveyor's camp is not what it used to be—a "thousand miles from nowhere," and with nothing but the howl of a coyote or a mountain lion to keep one company.

No, it's not what it was in years gone by, especially since the radio has come into popularity. For instance, the engineers engaged in surveying the Mt. Evans road have a complete radio set in their camp.

From the air at night they receive all the latest news, football reports and concerts flashed from stations located in cities from Chicago to the Pacific Coast.

"As I write this, we are listening to the concert of the Marine band at Chicago," wrote Vernon Duke, a member of the party, to one of the boys in the office. "We have our aerial strung outside and the set installed here in the tent with a loud speaker attachment. Believe me, boy, it's great dope. I don't know how we could get along without it now."

The engineer's party is encamped about fifteen miles from the nearest ranch house on the western slope of Mt. Evans. Drexel Lacey, in charge of the outfit, sent word to the Highway Department that the survey should be completed the first part of December. Inclement weather has delayed the work considerably.

Capt. John P. Donovan, division engineer of Dist. No. 1, was born and drug up in Massachusetts, the land of politics, pie and Saturday night baths. On the 18th of November he violated the custom of nearly 40 years and bathed, not realizing that it was Sunday. The shock put him in bed for two days, but he is now convalescent.

Commissioner E. B. Hill, chairman of the Boulder County Board, was a conspicuous figure about the offices of the State Highway Department during the early part of last month. Mr. Hill is very much interested in a new road through South Boulder Canon to the east portal of the Moffat Tunnel. It might be added that he was not alone in his enthusiasm about the proposed highway, several prominent Denver citizens giving their strong moral support to the proposal. The new highway would afford a picturesque gateway to the tunnel which thousands of tourists will want to see when completed.

"I think we did a good job," remarked Chairman William Weiser, of Grand Junction, following the close of the annual meeting of the Highway Advisory Board, held in the offices of the Department the week of November 15. "It was also the most harmonious meeting I ever attended," he continued. "Everybody was in the best of spirits and I am sure that the state will see a lot of good road work accomplished during the coming year if the budget is carried out as tentatively agreed upon."

Elza Montgomery, special engineer, in charge of construction at Wolhurst, reports that work of removing the dirt from under the two railroad tracks at that point will be started early in December. Grading for the work south of the tracks was started November 15. The underpass at Wolhurst will eliminate one of the most dangerous grade crossings in the state. A traffic count shows an average of 2,000 cars per day crossing the tracks below Wolhurst.

Plans are well under way for the annual convention of the county commissioners, to be held in Denver during the Stock Show in January, according to President J. W. Shy, of Cheyenne Wells. The program which will be carried out is now being prepared by Secretary T. W. Monnell of Montrose. If possible, a copy of the program will be carried in the January issue of Colorado Highways. Many problems vital to the good roads movement in this state will be discussed by the commissioners.

With six new graders equipped with ten-foot blades, Las Animas county will launch a vigorous maintenance program early next spring, according to Commissioner Joe Ray, of Trinidad, who was a visitor in the Highway Department last month. Mr. Ray is a strong advocate of maintenance as a cure for road evils. In this he enjoys the co-operation of the other two Las Animas commissioners.

Thomas R. Elkins, head of the traffic division of the Highway Department, is busy these days with repairs being made in the buildings and housing the garage and machine shops on East Colfax Avenue. The shops are being enlarged in order that major repairs can be made on all automobiles owned by the state of Colorado. Additions to the shops will cost about $25,000. Repairs can be made on all kinds of machines from flivvers to heavy duty tractors.

Edwin Mitchell, auditor of the Highway Department, in a statement issued a few days ago, praises the officials of the counties for the splendid manner in which they have co-operated with the department during the past year in the matter of handling accounts with the state.

Mitchell also stated that the records of the department are now complete for eleven months of the fiscal year, which closed on November 30th. All accounts for 1923 will be closed by December 15th.

Thomas L. Darby, in the early days of Colorado a prominent mining and railroad engineer, and who has been employed by the Highway Department for a number of years, is seriously ill in Mercy Hospital. Mr. Darby is 73 years old and came to Colorado during the early gold rush to Leadville. He is a native of Kentucky.

A check-up of the funds apportioned to the counties from the first $5,000,000 good roads bond issue shows that only a small balance remains in the state treasury to the credit of the various counties, according to Edwin Mitchell, highway auditor. In last month's issue of Colorado Highways a statement of the disbursements by the Highway Department from its one-half of the bonds was printed.

Contractor Richard McQueary is now engaged constructing four miles of highway on "state force account," between Lawson and Empire. This new work will connect with the highway recently completed by the Forestry Department from Berthoud Pass into the town of Empire. In constructing the new road between Lawson and Empire, two railroad crossings and two bridges across Clear Creek will be eliminated, the line of the new road following the north side of the creek. Considerable heavy rock work is to be done in the first mile north of Lawson. The new work is expected to be completed by early spring. In the meantime traffic will follow the old road. An agreement has been made by the Highway Department whereby part of the right-of-way of the Colorado & Southern railroad is used. It is agreed that the department must pay for any damage done to the railroad tracks in constructing the new road.

Maj. John J. Vandemoer, division engineer of District No. 2, reports that work on F. A. P. No. 174, which is located between Ouray and Silverton, is nearly completed. Work on this project has been in progress for about two years, being under a contract with Pickering Bros., contractors, Salt Lake City. Being located in a high altitude, it was only possible to work about four months out of the year, and in view of this fact, it is considered that the three miles of heavy rock work was done in fairly fast time.

The project starts at the top of the divide between Ouray and Silverton and extends toward Ouray, being known as the "Red Mountain job." It was considered one of the most difficult pieces of road construction in Colorado. The contract price on the three miles was $101,000.

In anticipation of the 1924 budget, engineers of the Highway Department have started surveys on extension of the state highway system in order that work may be started immediately after the budget is approved, according to James E. Maloney, assistant state highway engineer. He stated that plans are now being worked up on a number of projects proposed in the tentative budget. If approved, actual construction on these projects will be started early in the spring.

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DENVER, COLO. MISSOULA, MONT.

ARMCO CULVERTS

Colorado Completes Record Mileage

(Continued from page 3)

Greeley. Extensions to the Denver-Ft. Collins road also are being considered.

About six miles of paving on the Denver-Colorado Springs road were completed in 1923. Construction of five more miles is now under way. A six mile extension is planned for 1924, south of Wolhurst. A mile of bituminous concrete pavement was laid east of Aurora.

East of Pueblo the pavement to Vineland was completed, together with several expensive bridge structures. On the Santa Fe Trail east of Pueblo the Highway Department also completed several short stretches of concrete between La Junta and Rocky Ford. It has placed under contract three miles of asphalt paving north of Trinidad. Work on this pavement is now in progress.

Between Fort Morgan and Brush three miles of pavement was completed. South of Sterling a two-mile extension of the paving was completed.

During the year the department also practically completed the construction of a new road over Wolf Creek Pass with state forces. A four-mile extension of the world-famous Mt. Evans highway was completed, this road now extending from Denver to a point within one mile of Summit Lake. Surveys covering an extension of this highway to Deer Creek Canon are now completed. Construction of the road will be resumed in the spring.

Three miles of the projected highway over Loveland Pass to the Mt. of Holy Cross was completed. A new route from Idaho Springs to Central City was opened to traffic. A six-mile extension in the Poudre Canon route was opened. Nine miles of gravel surfacing between Lamar and Hasty was laid, as was six miles of gravel surfacing east of Holly on the Santa Fe Trail.

Between Canon City and Florence nine miles of gravel surfacing was finished, as was six miles of surfacing between Hayden and Mt. Harris on the Victory Highway in Routt county. About twenty miles of a new road between Fruita and Rangely was projected by the Highway Department.

Work on seven miles of the famous Ouray-Silverton highway was practically completed. Construction on this highway was limited to about four months, due to the high altitude. Four miles of new road was completed on the Cumbres Pass highway, which when entirely completed will give a new route to the Mesa Verde National Park.

Notable progress also was made on the new road project between Sapinero and Cimarron, located on the route from Gunnison to Montrose and western slope points. Five miles of gravel was laid between Grand Valley and Debeque in Mesa county, as was seven miles of grading and surfacing on Cochetopa Pass. About six miles of new road also was opened near Calhan, between Colorado Springs and Limon.

The benefits of this great cost of time, money and labor already are apparent. To the farmers of this state this great net work of roads means much. Gradually they are working into a direct and economic connection between farmers in remote sections of the state and the railroad shipping points.

The extremely unfavorable weather conditions prevailing during the entire year hampered the contractors and held back the construction work. Floods during the summar also caused considerable damage to nearly every main road east of the Continental Divide. This caused the department to draw heavily on its contingent fund for emergency repairs.

During the past year considerable additional equipment was purchased by the counties and the maintenance forces were more experienced. This year maintenance on the whole has been far more satisfactory than last. And today the condition of the state highway system is better than ever before, as testified to by the traveling public.

Likewise the traffic on our roads has been the largest in the history of the state, with a great improvement over previous years in the upkeep and condition of the roads. The work of keeping the roads smooth is performed by patrol crews, each caring for ten to twenty miles. Most of the dragging and grading is done with heavy trucks supplied to the counties through the Highway Department from surplus war stocks distributed by the government.

HIGHWAY ADVISORY BOARD DESIGNATES HARDING MEMORIAL ROAD.

At the recent meeting of the State Highway Advisory Board a resolution was passed designating the highway from Bergen Park, in Jefferson county, to Deer Creek, in Park county, as the Warren Harding Highway.

This action of the board was in recognition of the late president's interest in the construction and development of the highways of the nation. When completed, the Harding Highway will be the highest in the world, circling a section where nature seemingly has reveled in the delight of her own picturesqueness.

All but sixteen miles of this wonderful highway has been completed. Provision has been made for the construction of four additional miles during the summer of 1924. By the time this issue comes off the press a party of highway engineers will have completed the survey of the entire route into Deer Creek Canon.

The resolution passed by the Highway Advisory Board follows:

"Whereas, The Highway Advisory Board has heretofore devised a numbering system whereby the state highways of Colorado are known and designated, and

"Whereas, This Board has been requested to designate that combination of roads leading from Bergen Park to Echo Lake and from thence over Mount Evans and projected to connection with the Conifer-Baileys road, by an appropriate name, as well as by numbers,

"Therefore, Be It Resolved, That in view of the well known interest of our late President Harding in the construction and development of the highways of the nation, and especially in view of the enthusiasm with which he expressed his approval and warm sympathy in this project for the highway over Mount Evans, and indicated his vision of the future benefit and pleasure to be enjoyed by the people of this whole country, through the construction of this highway in the midst of the Nation's playground: —we hereby designate the hereinbefore described highway from Bergen Park via Echo Lake, Summit Lake, Mount Evans, and Deer Creek, to connect with the Conifer-Baileys road, as the Warren Harding Highway."

TWENTY-FIRST ANNUAL MEETING OF PORTLAND CEMENT ASSOCIATION

The twenty-first annual meeting of the Portland Cement Association was held at The Biltmore, New York, November 19 to 21, inclusive. As usual, the first day's session was devoted to meetings of standing committees covering such subjects as Accident Prevention and Insurance, Advertising and Publicity, Conservation, Technical Problems, etc., resulting in the preparation of annual reports which were presented at the business session on Wednesday, November 21.

On Tuesday, also following several years' custom, the general session was devoted to a discussion of problems concerning mill practice or things related thereto. At this session, papers were presented by Paul C. Van Zandt, chief engineer, Asano Portland Cement Co., 1918-1923, on "The Manufacture of Portland Cement in Japan," and by T. H. Cosford, assistant to general manager, Marquette Cement Manufacturing Co., on "Modern Cement Storages and Improvements in Methods of Loading and Packing, and Bag Handling."

The annual election of officers was held on Wednesday, November 21, with the following results:

F. W. Kelley, Albany, N. Y., was elected president; Blaine S. Smith, Chicago, first vice-president; L. R. Burch, New York City, second vice-president, all of these constituting re-elected officers.

Colorado Highway Traffic Census for 1923.
State Highway No. 3 and No. 2.
Wyoming State Line to Denver via Greeley.

Stations where records were taken	Average total number of vehicles per day of 24 hours			
	Date July	No.	Date Aug.	No.
Nunn, Rd. No. 3	6-7-8	545	15-16-17	645
Ault, 1 mile east, Rd. No. 3	"	673	"	624
Ault, 1 mile west, Rd. No. 3	"	534	"	669
Eaton, north end, Rd. No. 3	"	715	"	866
Eaton, south end, Rd. No. 3	"	1342	"	1398
Greeley, north end, Rd. No. 3	"	1778	"	1554
Greeley, south end, Rd. No. 2	"	1948	"	1588
5 miles south of Greeley, Rd. No. 2	"	1072	"	1059
Platteville, north end, Rd. No. 2	"	1354	"	1003
Platteville, south end Rd. No. 2	"	1277	"	----
Ft. Lupton, north end, Rd. No. 2	"	1204	"	1204
Ft. Lupton, south end, Rd. No. 2	"	1908	"	1887
Brighton, north end Rd. No. 2	"	2773	"	2940
Brighton, south end, Rd. No. 2	"	2058	"	2303
Sand Creek Jct., Rd. No. 2	"	3487 (4 days)	"	2771

Why Road Rollers?

BY RAY CORSON.

THIS question has been asked, debated, discussed, on numerous occasions and little has been done in the Western territory in regard to the adoption of a rolled road.

It is entirely practical and economical, besides efficient to roll every piece of road after being built, for it compacts the roadbed so that the life of the road is longer and maintenance a great deal less. This is particularly true on a road subject to a great deal of moisture and where the components of the road composition is of such a nature that water easily softens the mass. A rolled road eliminates the destructive element. Water, to a great extent, thereby reducing the cost of maintenance.

For resurafcing roads, a good crushed rock or crushed gravel, crushed to certain size and laid in courses with a good clay binding, is perhaps one of the most satisfactory gravel coated constructions there is. But how much better would this same road be if a twelve or fifteen-ton roller were passed over this construction so that the entire mass would be compressed to a hard consistency? It would, no doubt, make the life of this road considerably longer, increase the pleasure of driving over same, lessen the wear and tear of vehicles, and reduce accidents.

The cost of a road roller is very small when compared to the long service it will give, the small upkeep bill and low operating cost. Take for granted a road roller costs approximately $6,000. This roller's life is good for at least ten years. The depreciation of the machine would not exceed over $600 per year. The upkeep cost approximately $500 per year. The interest on the investment at 8 per cent, $480 per year and the cost of operation including engineer, fuel, etc., not exceeding $10 per day. Taking this versus the number of miles of highways that a machine of this type could successfully care for, the cost per mile would be extremely low for this additional compression service. This roller could be used better than 200 days a year and in addition to the fact of its rolling operations, in case of emergency, could be used as a tractor, stationary power plant, or many other applications.

No doubt contractors, several who have expressed their opinions, would be very glad to own a road roller, as they would obtain a great deal of satisfaction for putting down a job that they were sure would last. Reputation is a great thing, and every contractor likes to have a good reputation, particularly on the work that the general public are observing every day and what is more noticeable than poorly constructed roads, which may not be due to the laxity or inefficiency of the contractor himself, but to the fact that he was not allowed to finish his work.

Speaking on the subject of concrete paving, particularly where fills and cuts are made, it is a foregone conclusion that much maintenance cost and the unsightly cracking that we often see on our concrete road structures would be eliminated if the subgrade were rolled under suitable compression and packed to a consistency where water would not easily penetrate and soften the mass.

Take our adobe roads where gravel surfacing is applied on same, if a roller were used on such construction the gravel would be firmly embedded in the adobe soil and certainly would be a road that would be much less easily penetrated by traffic.

Time in packing a road, rolling versus traffic packing, is another item to consider as a road roller can make a much better and harder road in one-third the time and prevent a lot of wear and tear on both motor and other vehicles, besides cutting the excessive cost of reblading road while ordinary traffic is passing over the same.

Of course it is useless to run a road roller over roads that have been packed by elements over a long period of time unless a new coat or surface is applied, then it can be accomplished only when the whole mass is moist.

There is much argument as to the reason why "Road Rollers" and the writer predicts that before the expiration of the next ten years, where roads are built, road rollers will be used more extensively. We must wake up to the fact that it is entirely practical and good common-sense, besides saving a lot of wasted money and making the highways more safe and pleasant for vehicular and motor travel.

Highway Bridge Plans

An important phase of the work of the Colorado Highway Department is the replacement of old drainage structures with modern concrete and steel bridges and culverts, as well as to maintain existing structures until they also can be replaced with bridges adequate for the traffic of today.

Until the last few years comparatively little was done in the way of modern bridge construction. At the present time the highway department has a bridge-designing division with a staff of competent engineers employed. Through this division the department furnishes standard designs free of cost to the counties.

Likewise the head of the bridge department acts in the capacity of consulting engineer on plans submitted by the various counties from time to time. This service is furnished without cost to the counties. During the course of the year scores of bridge plans are sent in by county road officials for approval.

As a result there may be found on Colorado's roads today many fine and substantial bridge structures, some of them constructed with reinforced concrete and others fabricated from steel. But all are designed to carry the present-day heavy traffic as well as take care of any overload which might be placed upon them.

The bridge engineers now employed by the State have an eye not alone for durability, but also beauty, as may be found in the finished products of their ingenuity in different parts of the State. A fine example of modern design and construction is the new concrete bridge over Cottonwood Creek, located four miles north of Colorado Springs on the North-South Highway.

This structure was built as a part of the concrete paving project extending from Colorado Springs to Breed, forming a link on one of the most important routes in the State.

The bridge has 20 ft. clearance on the roadway between curbs and 21 ft. between faces of the hand rails. The piers are open, with the load borne on columns, above high-water mark.

It is the general policy of the state bridge department to send the man who designs the bridges into the field during construction on some of the larger structures. By so doing the man most familiar with the plan is enabled to see that all details are carried out correctly.

By this procedure Highway Engineer Blauvelt feels that the engineers may become equally as proficient in both field and office. The designer of the structure has the satisfaction of seeing the "child of his brain" take actual form and reach completion, thus giving him a greater interest in the work that he is doing.

The Bridge Department is kept in close touch with all drainage structures at all times, from the time of the preliminary inspection through the preparation of plans and the construction to final acceptance of the project.

CONTRACTORS START WORK ON NEW PROJECT SOUTH OF WOLHURST STATION

Brodie & Anderson, Denver contractors who were awarded the contract to construct five miles of pavement from Wolhurst, south towards Gann, on the main North and South Highway, have started actual construction work. A large force of men is now engaged in altering the course of the high-line canal south of the Wolhurst railroad crossing, a change made necessary through the abandonment of the present railroad crossing and a realignment of the highway.

An excellent detour has been provided traffic between Wolhurst and Sedalia. This detour has been placed in excellent condition by grading and surfacing. It will easily take care of the heavy traffic next spring and summer without inconvenience to motorists.

In this connection, Colorado Highways suggests that automobilists traveling between Denver and Colorado Springs have at their disposal an alternate route which is fully as good as the North and South Highway, and from a scenic viewpoint even more attractive than the main route. Reference is had to what is known as the Cherry Creek road, extending from Denver through Parker, Franktown, Cherry, and Springer, to the northeastern city limits of Colorado Springs.

Pueblo Road Notes

BY RALPH C. TAYLOR
Special Correspondent

Important issues to be taken up and presented at the state meeting of the county commissioners' association will be discussed December 15 in Pueblo by members of the Arkansas Valley Association of County Commissioners. Commissioners from eleven Arkansas Valley counties will attend. Early indications are that most of the members will attend the state meeting in Denver in January.

Two new steel bridges to cost at least $100,000 will be built in the spring by Pueblo county. The bridges will be 200-foot spans and will replace temporary bridges which have been used since the old structures were washed away June 3, 1921, at the time of the Pueblo flood.

One of the bridges will be erected across the Arkansas River at Boone, and the other will span the St. Charles River at the South Vineland road, 7 miles east of Pueblo.

The Pueblo county commissioners have appropriated $280,000 to be used for bridges and highways during 1924. This is $80,000 more than in 1923, but the county commissioners assert that much of this additional amount is necessary to take care of 1923 road warrants. The commissioners have appropriated $24,000 to match the $24,000 of the State Highway Department, to be used for maintenance of state highways in Pueblo county.

State Highway No. 1, which runs from the New Mexico to Wyoming state lines through Colorado, is completely shaled through Pueblo county and is surfaced with shale through most of Huerfano and Las Animas counties. This shale highway is gaining much fame for its excellent condition. Pueblo county, co-operating with the State Highway Department, has just completed taking sharp turns out of the road in Pueblo county, and the last 12 miles north of Pueblo to El Paso county line has been shaled.

Taxes and Their Relation to Roads

(Continued from page 8)

ing bonds in order to charge to each year its fair share of the improvement cost. This is taken by good roads advocates as an indication that many of the present generation want to enjoy some of the good roads benefit, rather than leaving it entirely to future years.

Excepting agriculture, construction is this country's greatest business. Government statistics show that road building is the most important part of construction. Compared with this year's road building, the great Roman highways and the great Chinese Wall, representing so much labor and time, are almost nothing.

Great improvemeents have been made this year on the highway system in Colorado. In every section work is being speeded up and the construction is moving more rapidly than in previous years. We find that the local roads in the various counties are being constructed more permanently. As these improvements are completed, taxes will be reduced, as the remaining expense will be only that of surfacing and maintenance.

It can also be truthfully said that Colorado's roads never were better. But there still remains a large amount of work to be done before the system can be put "over the top".

Everywhere in the state we find land coming back into its own—coming back strong on a lot of communities. One of the most important factors in determining land values is community development. This means good roads, good schools, churches, progressive towns, good railroad service, good markets, are things that are considered in placing a value on farm lands.

Reports of the immigration agent show a large influx of people from other states locating on farms in this state. Our good roads are said to be one of the principal attractions.

The fame of Colorado's roads has spread to all parts of the United States and Canada. Travelers sing the praises of our highways. The tourists tell the folks back home about our wonderful roads.

The reputation has been gained during the last two years. A wonderful record —one that every Colorado citizen should be proud of.

EQUIPMENT NOTES

All aboard for the Road Show! Chicago, January 14-19. Five big days. Colorado will be well represented. Indications are that the largest delegation of Colorado road officials, contractors and equipment dealers will take in the exhibition.

Likewise reports emanating from the show committee in the Windy City indicate that the show will be the "biggest and best yet".

The Colorado contingent will leave Denver on "specially conducted cars" on Saturday, January 12, at 9 p. m., over the Burlington. Tom Burnite has been delegated to look after arrangements. He has reserved twelve rooms at the Morrison Hotel, $6 per room or two fellows in a room at $3 per person. Those who desire to obtain one of these rooms should communicate with Mr. Burnite at once.

Among those who have indicated that they will make the trip are: A. K. Vickery, A. K.Vickery Jr., Maurice Levy, Dick Levy, Fred Schmidt, Bob Weiger, Tom Burnite, J. Everett Young, Bill Roark, C. S. Lambie, Alex Simpson, Francis Kirchoff, Charles Pigg, Larry Grannis, Paul Fitzgerald, Gerald Stack, Chas. Draney, Col. W. R. Richards (asphalt carpenter), M. J. Kenney, Charles Sheeley, Thomas R. Elkins, Harold W. Moore, Cliff Jennings, Fred Dreher, Harry P. Wilson, Ray Corson, Harry J. Manning, M. W. Bennett, Frank O. Ray, city engineer of Colorado Springs, and Leonard K. Cahoon, of Salt Lake City.

Harry P. Wilson, president, and Ray Carson, sales manager, of the H. P. Wilson Company, will leave Denver on January 1 for a ten days' trip to factories represented by the Wilson firm in this territory. They will visit the Road Show in Chicago before returning home.

D. D. Guilfoil, general sales manager for Sauerman Bros., of Chicago, manufacturers of cableway excavators, was a Denver visitor on December 5 and 6, as the guest of Herbert N. Steinbarger, intermountain agent for the Sauerman products. Mr. Guilfoil was very much pleased with the sales of Sauerman outfits in this territory during 1923 and looks for a material increase in business during the forthcoming year.

A new booklet describing the complete line manufactured by the Pawling & Harnischfeger Co., is being distributed by Paul Fitzgerald, Denver manager, Landes & Co., western distributors of the P. & H. equipment. The booklet is beautifully illustrated, showing P. & H. machines in actual operation in various parts of the country. It also contains some very valuable hints on the care and operat'on of draglines, excavators, etc., which owners and operators should find very interesting.

L. R. Shallenberger, president of the Colorado Culvert & Flume Co., of Pueblo, was stricken with influenza while on a visit to Denver on November 20, and was confined to his bed at the Shirley-Savoy Hotel for a week.

A new three-valve has been invented by the Koehring Company and has been installed as a part of the regular equipment of Koehring mixers and pavers, according to word just received by H. P. Wilson & Co., western distributors, with headquarters in Denver. This valve is one of the most important improvements made on concrete mixer outts in recent years. The valve is simple in operation and is practically "foolproof."

Equipment to be used in the improvement of the Fruita-Rangely road extension will include an Adams leaning wheel scarifier-grader. An order for this machine was placed by the Highway Department with Thomas J. Fair, Colorado distributor, two weeks ago. Shipment of the grader will be made direct from the Adams factory in Indianapolis, thus saving a neat sum in freight charges. While the county boards of Colorado have been large purchasers of Adams graders during the past year, this is the first one bought by the state.

Teacher: "If a farmer sold 1,470 bushels of wheat at $1.17 a bushel, what could he get?"

Boy: "An automobile."—American Boy.

The LaPlant-Choate Manufacturing Company, Cedar Rapids, Iowa, have just put on the market two types of snow plow for use with the C. L. BEST Tractor. The straight blade type comes in 6½-, 10- and 12-foot sizes, while the larger plow, a V-type, comes with 12-foot extension side wings. The V-plow is the type which has been selected by one of the leading highway departments of the Northwest as the most practical under all conditions of operation. The LaPlant-Choate announces that they will be in position to make shipments by November 1st. Distribution in the Inter-Mountain territory will be made through H. W. Moore & Company, Denver.

Another piece of heavy equipment which has recently been added to the H.W. Moore & Company line is the Butler Vacuum Street Sweeper. This sweeper won highest award and a special medal of honor after being operated 27,000 miles at the Panama-Pacific Exposition, and is already in use by many of our larger cities from coast to coast. It picks up the dust and other litter instead of brushing it aside for hauling away later, providing a dustless, sanitary and disease preventing means of sweeping; yet the cost of operation is surprisingly low.

R. F. Carlson, sales manager of the Liberty Trucks & Parts Co., of Denver, has just returned from an extensive trip into Wyoming, Utah and the western slope. He reports a very successful trip and a number of large sales of truck parts. The Liberty concern keeps a large stock of parts for all kinds of trucks in Denver ready for shipment, on a moment's notice. A specialty is made of parts for trucks and tractors issued by the government to the states for use on roads.

J. P. Sanderson, traveling representative of the Colorado Culvert & Flume Co., was a visitor in Denver during the recent meeting of the State Highway Advisory Board. He reported unusually large sales of culverts and irrigation supplies for this season of the year. Several of the counties, he said, are placing orders now for culverts to be installed early in the spring.

A new half-bag concrete mixer is announced by the T. L. Smith Company of Milwaukee. The new model is of the tilter type. It is equipped with pressed steel wheels fitted with clincher rims for Ford 30x3½ pneumatic tires. The capacity of the mixer is 4 cubic feet which is a full half-batch (1-3-6 mix) with materials containing the usual 40% voids. This type of mixer, the makers claim, is especially adapted to side-walks, curbing, retaining walls and culverts.

According to observations made during their campaign to introduce a number of Fordson specialties which they have recently taken on, H. W. Moore & Company report that the Ford Motor Company's efforts to increase the sales of Fordson tractors for industrial purposes in the Intermountain territory are beginning to show surprising results. These results, they feel, are in great measure due to the energy and unceasing efforts of Mr. John McLin, of the local Ford Branch, who is awakening a widespread interest among the Ford dealers in the possibilities of increasing their sales field among contractors and others having heavy hauling problems.

Complete data on the new Snow Loader is contained in a bulletin just issued by the Barber-Greene Company. It is called "Mechanical Snow Handling" and gives some good pointers on snow removal. H. P. Wilson & Co. Denver, are intermountain distributors for the Barber-Greene products.

Weather permitting, Contractor Charles Sheeley, who operates under the firm name of the Colorado Bridge & Construction Co., expects to complete pouring of concrete on two miles of pavement between Fort Morgan and Brush in about two weeks. This concern also recently completed the construction of a 500 bridge over Cherry Creek at Melvin in Arapahoe county.

Traffic is now moving over the first mile of asphalt paving constructed on a state highway in Colorado. This paving is located east of Aurora in Adams county. Construction of three miles of asphalt paving has been started by the Stamey-Mackey Const. Co. north of Trinidad, located on State Highway No. 1. This paving connects with the paving in the city of Trinidad.

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

Proj. No.	Location	Length	Type
F.A.P. 116-B	Breed-Colorado Springs	0.892 mi.	Paving and R. R. Grade Separation
F.A.P. 243	Piedra, between Bayfield and Pagosa Springs	1.61 mi.	Gravel Surfacing
F.A.P. 253-A	West of Steamboat Springs	6.506 mi.	Gravel Surfacing
F.A.P. 257	Between Denver and Brighton	0.282 mi.	Concrete Viaduct

PROJECTS FOR WHICH PLANS ARE BEING DRAFTED

Proj. No.	Location	Length	Type
F.A.P. 17-R	Husted	2.36 mi.	Paving
F.A.P. 116-C	North of Breed	3.22 mi.	Paving
F.A.P. 242	Grand Junction-Fruita	3.5 mi.	Gravel Surfacing
F.A.P. 248-A	Buena Vista-Salida	9.3 mi.	Grading and Gravel Surfacing
F.A.P. 254-A	Hot Sulphur Springs West Byers Canon	1.5 mi.	Grading
S.P. 811	Over Rio Grande-Del Norte River, East of La Jara	200 ft. span	Steel Truss Bridge

STATUS OF FEDERAL AID PROJECTS UNDER CONTRACT, 1923

Proj. No.	Location	Length	Type	Contractor	Approx. Cost	Per cent Complete	Proj. No.
71-B	Durango-Hesperus	3.6 mi.	Gravel Surf.	Peterson, Shirley & Gunther	$ 61,556	57	71-B
81-A	Rifle Range-Vernon Canon	3.50 mi.	Crushed Rock	H. C. Lallier Constr. & Engr. Co.	37,264	87	81-A
102	Ouray-Red Mountain	1.06 mi.	Mtn. Grading	Johnson & Johnson	58,972	47	102
116-A	Colorado Springs paving	4.18 mi.	Conc. Paving	Standard Engr. & Constr. Co.	238,944	98	116-A
119-B	Cochetopa Pass	7.5 mi.	Grad. & Surf.	Girardet-Hotchkiss Engr. Co.	53,709	70	119-B
125	Sapinero-Cimarron	11.3 mi.	Grav. Surf.	Dale Hinman	36,797	37	125
125	Sapinero-Cimarron		Steel Bridge	Winterburn & Lumsden	53,072	12	125
135	Denver-Morrison	5.3 mi.	Conc. Pavement	Colo. Bridge & Constr. Co.	178,158	18	135
157-B	Buena Vista-Leadville	4.20 mi.	Grading	J. V. Stryker Const. Co.	65,715	52	157-B
163	St. Charles Bridge	0.5 mi.	Steel Bridge	Rogers & Pickard	85,636	100	163
168-B	Lamar-Hasty	6.86 mi.	Gravel Surf.	Standard Engr. Co.	60,194	64	168-B
174	Red Mountain	3.03 mi.	Mtn. Grading	Pickering Bros.	82,071	67	174
190	Summit County Bridge and Road	1.45 mi.	Grad. & Bridge	Colo. Bridge & Constr. Co.	40,154	61	190
207	Dillon-Kremmling	100 ft.	Truss Bridge	Rogers & Pickard	28,831	9	207
208-C	Grand Junction-Palisade	4.75 mi.	Gravel Surf.	Northwestern Const. Co.	46,627.35	23	208-C
210-A	Grand Valley-DeBeque	5.30 mi.	Grav. Surf.	F. L. Hoffman	57,429	72	210-A
211	Meeker, north	1.85 mi.	Grav. Surf.	Hinman Bros	34,445	100	211
213-B	Durango-Hesperus	5.26 mi.	Grav. Surf.	J. Edd. Hansen	72,960	50	213-B
214	Durango-Bayfield	3 mi.	Gravel Surf.	Dale Hinman	53,411.05	32	214
216-A	Holly, east	5.38 mi.	Grav. Surf.	W. A. Colt & Son	57,867	100	216-A
221	Loveland, north	4.05 mi.	Conc. Paving	Fred C. Dreher Constr. Co.	142,125	83	221
223-A	Kremmling-Rabbit Ear	2.88 mi.	Grav. Surf.	Henry Shore	30,565	42	223-A
225	Fitzsimons Hospital road	1.00 mi.	Bit. Paving	Miller, Douglas & Hanes	36,618	63	225
226-A	Brighton-Ft. Lupton	8.23 mi.	Conc. Paving	White & Johnson	241,133	83	226-A
226-B	Brighton-Greeley	2.86 mi.	Conc. Paving	White & Johnson	89,923	44	226-B
226-C	Platteville-Greeley	4.4 mi.	Conc. Paving	Engr. Constr. Corp.	120,114	19	226-C
229	Pueblo-Florence	1 mi.	Grav. Surf. & Bridge	H. M. Fox	34,646.50	43	229
231	Six Mile Creek Bridge	0.45 mi.	Steel Bridge	McCormick & Brockaway	25,165	70	231
240	Gypsum-Dotsero	5.185 mi.	Gravel Surf.	O. L. Hackett	66,178	5	240
241	Gunnison River, North of Delta	600 ft.	Steel Bridge	Winterburn & Lumsden	99,309	10	241
245-A	Las Animas-Hadley	4.54 mi.	Gravel Surf.	W. A. Colt & Son	42,786	11	245-A
246-R	East of Pueblo	2.537 mi.	Conc. Paving	R. A. White	78,431	4	246-A
255-A	Ft. Morgan-Brush	2.70 mi.	Conc. Paving	Colo. Bridge & Constr. Co.	85,763	47	255-A

MISSOURI ADOPTS UNIQUE METHOD TO KEEP PUBLIC INFORMED.

The state of Missouri has evolved a unique method of keeping the public informed about its road building and maintenance operations. It consists of the erection by the Missouri Highway Department of 150 large signboards.

These are known as Project Information Signs because they set forth certain essential features and basis facts concerning each project. The boards are 10 ft. high and 24 ft. long.

In addition to stressing the fact that "road building is a process"—a succession of related steps requiring time to accomplish them—the sign serves to acquaint the people with the following additional facts:

The law under which the project is financed; the width of roadway; the length of project; its terminations; date of awarding contract; name of contractor; cost of completed project; date of the approval of specifications; name of the Chief Engineer; name of Division Engineer, name of Project Engineer; method of maintenance and cost of maintenance per mile.

The sign emphasizes the fact that it takes time to build a road, that when once built it must be maintained systematically for an indefinite period of years. It has been found that the fact that a contractor's name goes down in history along with that of the project engineer, serve to make these two persons, who are more directly connected with the construction work than any other, take greater pains to secure an enduring job.

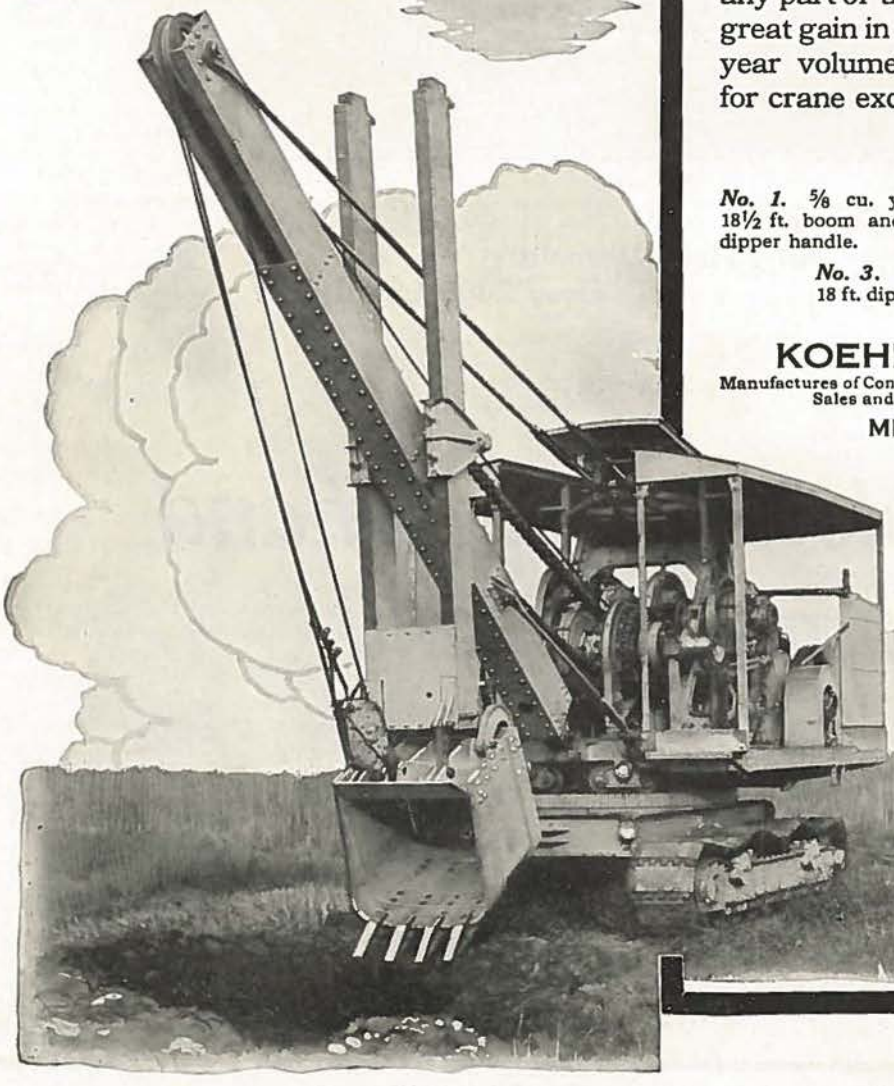
So favorable has been the impression made by the billboards that communities have complained because they were not favored with such a sign along the state road in their vicinity, writes B. H. Piepmeier, chief engineer of the Missouri Highway Department.

IDAHO SPRINGS TO IMPROVE LINK ON VIRGINIA CANON ROAD

The City of Idaho Springs has plans under way for the improvement of the street which connects with the Virginia Canon Highway to Central City, which is now being completed by State Highway forces, according to Capt. John P. Donovan, division engineer. This is one of the most picturesque highways in the state, and brings Central City within one hour's drive of Idaho Springs. State Senator William Renshaw recently headed a delegation of Idaho Springs business men which urged the Highway Department to start construction of the connecting link up Chicago Creek to the Harding Highway at Echo Lake. Volunteers from Idaho Springs did considerable work on the road last summer.

Only two cents of the Federal Revenue dollar went for Federal Aid roads in 1922.

KOEHRING SHOVEL



Capacity — plus

GREATER mobility, and the Koehring Heavy Duty construction that does away with capacity-cutting breakdowns and delays beyond question give Koehring Shovels the greatest *actual* capacity.

Ability to "keep on the job" at the top capacity operation without punishment to any part of the Koehring Shovel means a great gain in month-by-month, year-by-year volume handled. Easily changed for crane excavator and dragline work.

Capacities

No. 1. 5/8 cu. yd. with 18½ ft. boom and 14 ft. dipper handle.

No. 2. 1 cu. yd. with 20 ft. boom and 16 ft. dipper handle.

No. 3. 1½ cu. yd., 24 ft. boom, with 18 ft. dipper handle. Write for catalog.

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