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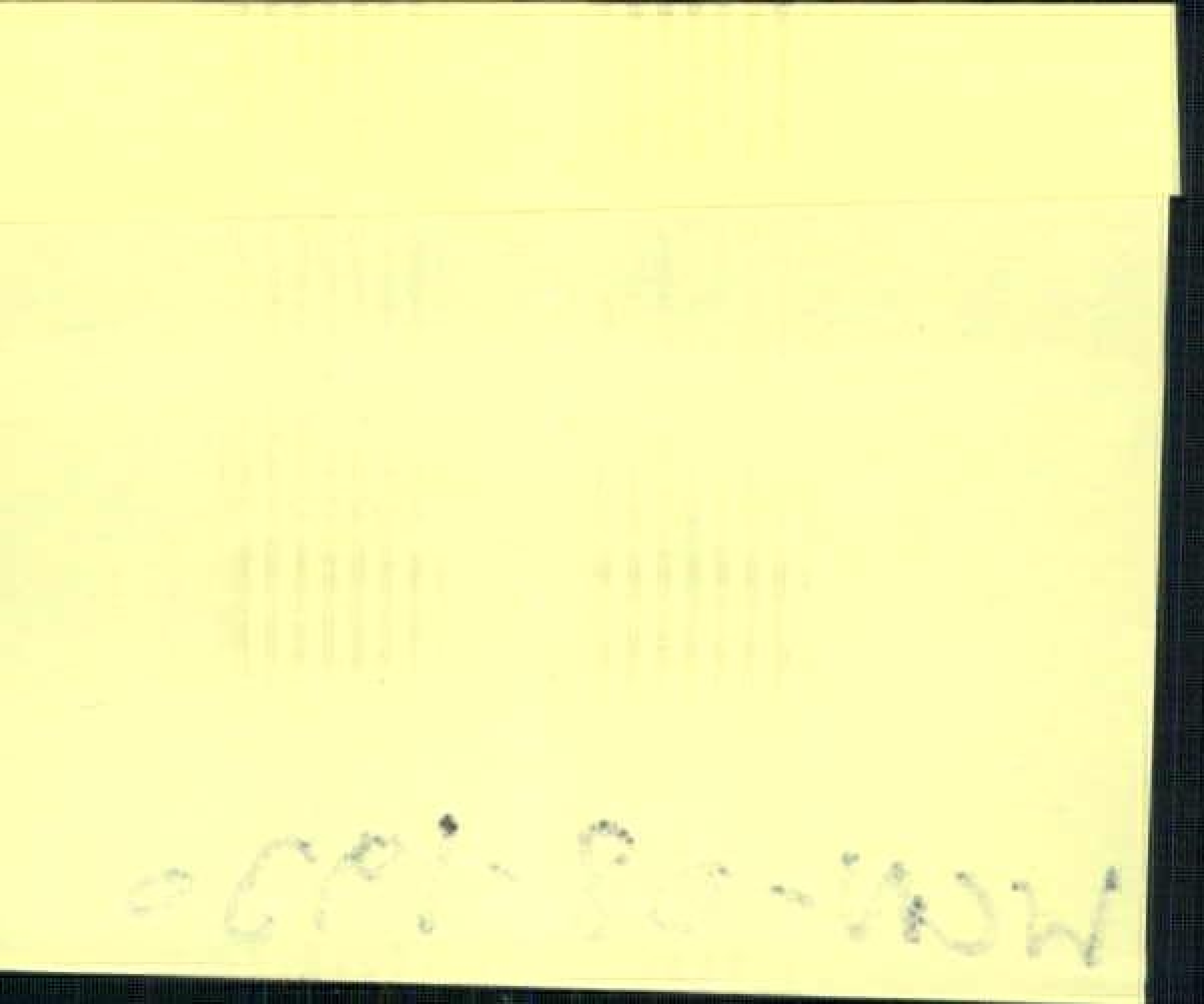


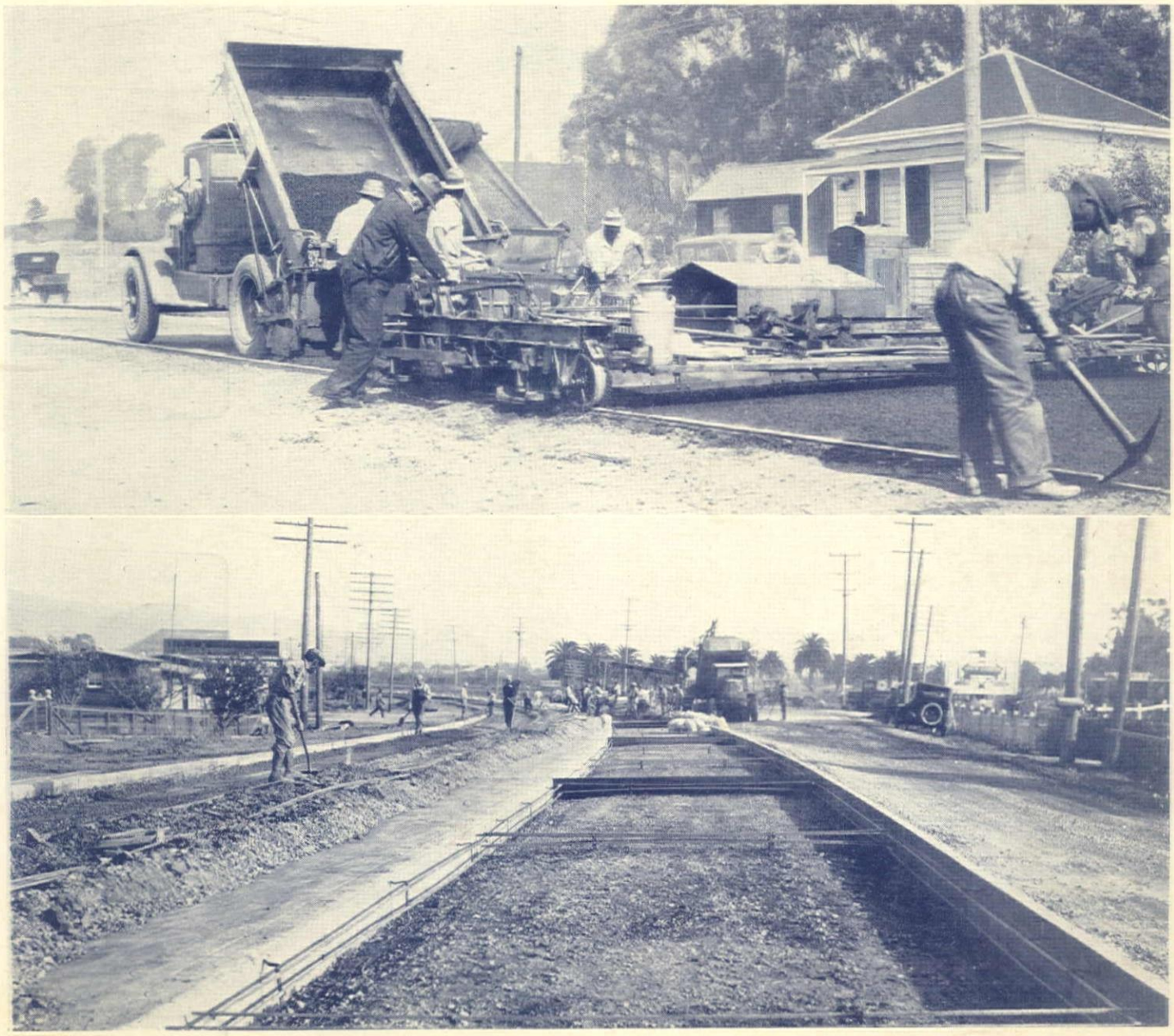
WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

PUBLISHED SEMI-MONTHLY
VOLUME V NUMBER 15

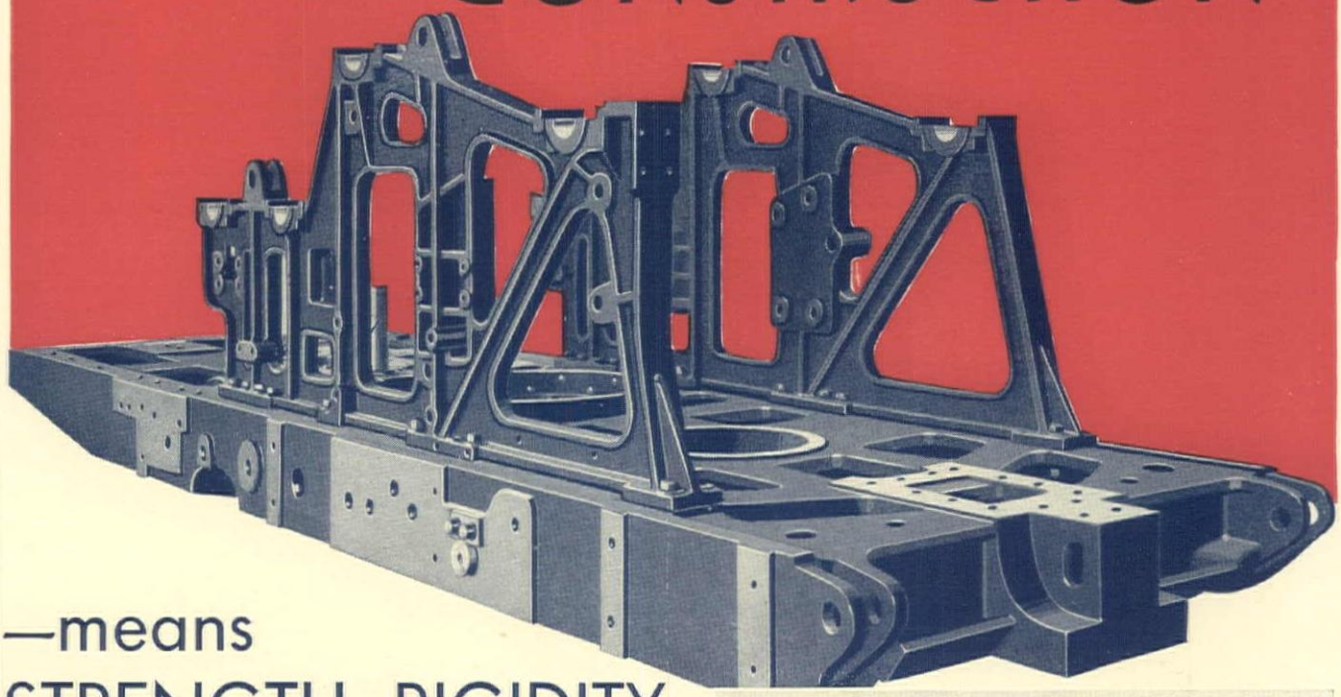
SAN FRANCISCO, AUGUST 10, 1930

25 CENTS A COPY
$3.00 PER YEAR



PLACING ASPHALTIC CONCRETE AND PORTLAND CEMENT CONCRETE ON 8.7-MILE SECTION OF CALIFORNIA STATE HIGHWAY BETWEEN HAYWARD AND NILES, HANRAHAN CO., CONTRACTOR

UNIT CAST STEEL CONSTRUCTION



—means STRENGTH, RIGIDITY and PERMANENCE of ALIGNMENT

The greatest single factor of support for P & H power is unit cast steel construction. All the main frames of P & H Excavators, including the revolving frame, car body, side stands and side frames of the crawlers, are heavy single-piece steel castings. The engine is mounted directly upon the revolving frame, instead of on structural sills attached to the frame. Shafts and gears are kept in perfect alignment at all times. There is less wear, and maintenance costs are reduced to the minimum.

Shafts are of chrome-manganese steel, extra large and heavy, and those for heavy duty are forged and heat-treated. Gears are extra wide faced, hobbed from steel blanks. All of this sturdy construction explains why P & H Excavators are able to stand up year after year under the tremendous power of their large motors.

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32 Beale St., San Francisco 2025 Santa Fe Ave., Los Angeles
ROBERT M. TAYLOR, Pacific Coast Manager
Service Stations, Complete Repair Part Stocks and Excavators at San Francisco, Los Angeles and Seattle

P&H

EXCAVATORS

1/2 to 4 cu. yds. (A-561)

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DEVOTED TO CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

VOLUME V AUGUST 10, 1930 NUMBER 15

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SUBSCRIPTION RATES

THE annual subscription rate is $3 in the United States and foreign countries where extra postage is not required. To Canada $4 and to foreign countries where extra postage is necessary the annual rate is $5. Single copies 25 cents.

Published semi-monthly by
WESTERN CONSTRUCTION NEWS, INC.
Eastern Representatives:

Main Office:
114 SANSOME STREET
SAN FRANCISCO, CALIF.

F. R. JONES, 201 N. Wells Street
Chicago, Ill.
H. B. KNOX, JR., 101 Park Ave.
New York, N. Y.

Branch Office:
422 WESTERN PACIFIC BDG.
LOS ANGELES, CALIF.

S. H. WADE, *President and General Manager*
S. J. SANDERS, *Vice-President* PHILIP SCHUYLER, *Managing Editor*
Entered as second-class matter at the postoffice at San Francisco, California, under the Act of March 3, 1879

This Letter is Used as an Advertisement by Permission of the Writer

MEM. AM. SOC. M. E.

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MECHANICAL ENGINEERING
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OIL STORAGE PLANTS
OIL PIPE LINES
POWER PLANTS

SAN FRANCISCO, CALIF. July 22nd, 1930.

Mr. Howard Tallerday, Vice Pres.,
Western Pipe & Steel Company,
San Francisco.

Dear Mr. Tallerday:

It gives me very great pleasure indeed to express to you not only my own appreciation but that of The Pacific Molasses Company, Ltd., for the splendid manner in which your company handled the 108 foot diameter tank, which work your field crew completed today.

This tank was completed in the unprecedented time of twelve days - a record of which you can justly feel proud. Despite the high speed in erecting this tank, the quality of workmanship was all that could be desired, and the tank is quite satisfactory in every respect.

Please express to the various members of your organization the writer's appreciation, also that of The Pacific Molasses Company, Ltd. for the splendid manner in which you met the emergency which demanded that this tank be made ready in such a short space of time.

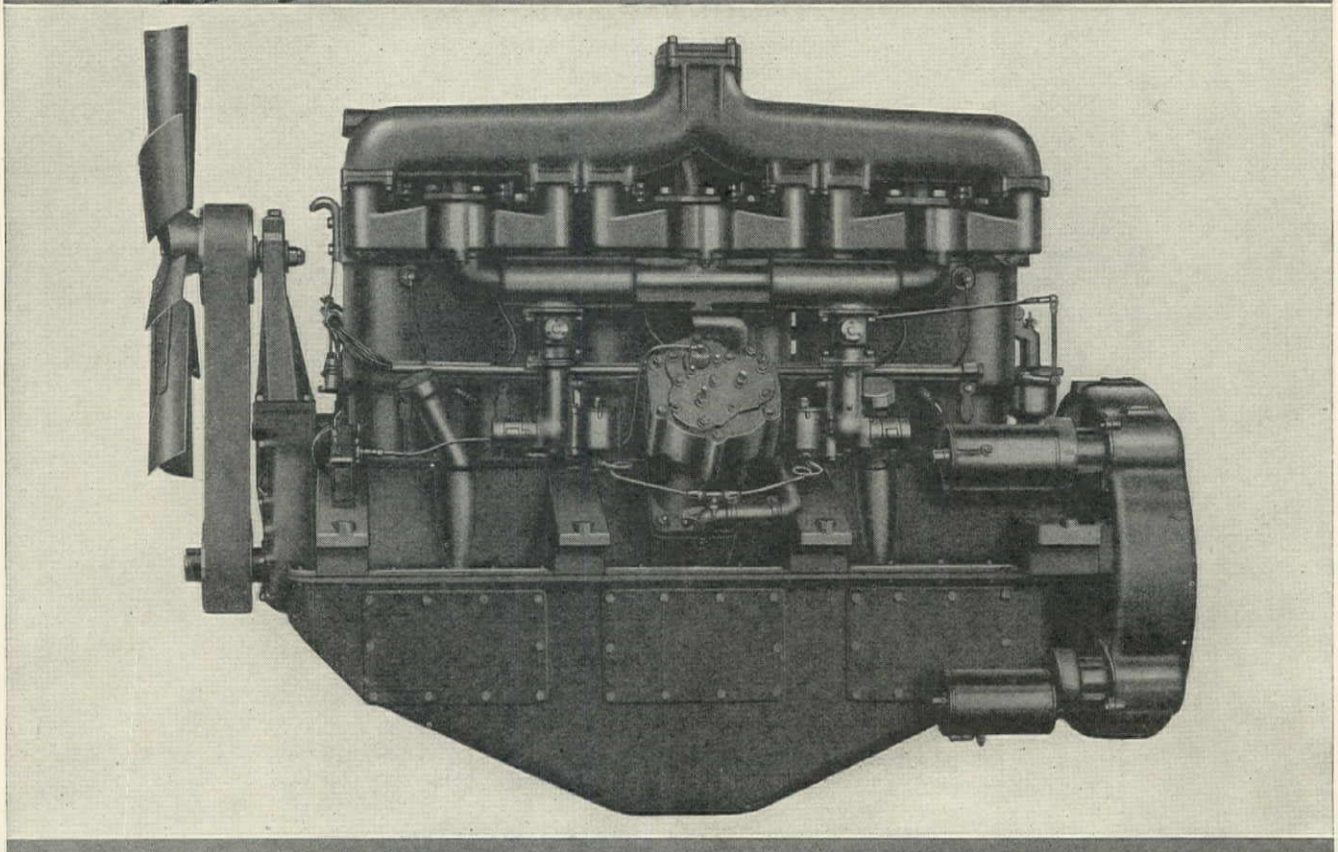
Yours very truly,

D. Dorward

D. DORWARD,
Consulting Engineer for
THE PACIFIC MOLASSES CO., LTD.

DD/G.
c-PM

Western Pipe & Steel Co. of California takes great pride in reproducing the above letter from Mr. Dorward. Attention is especially directed to his statement that in spite of the speed with which this emergency work was performed, the quality of workmanship was not sacrificed.



Bigger than the Job!

The equipment you manufacture may never need all the power generated in a Le Roi Engine. Yet it is well to give your customers this reserve strength, this extra protection against delays and profit-loss . . . Le Roi Engines furnish the maximum rated horsepower under full load . . . They perform at top speed with the lowest operating costs . . . Day after day they can be kept at the most punishing work, with complete assurance that they will perform dependably, economically, efficiently . . . Le Roi Engines will increase the working capacity of your products . . . They are a valuable selling asset to any portable power machinery . . . Investigate the many reasons for their world-wide reputation — Le Roi for Dependable Power.

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LE ROI ENGINES

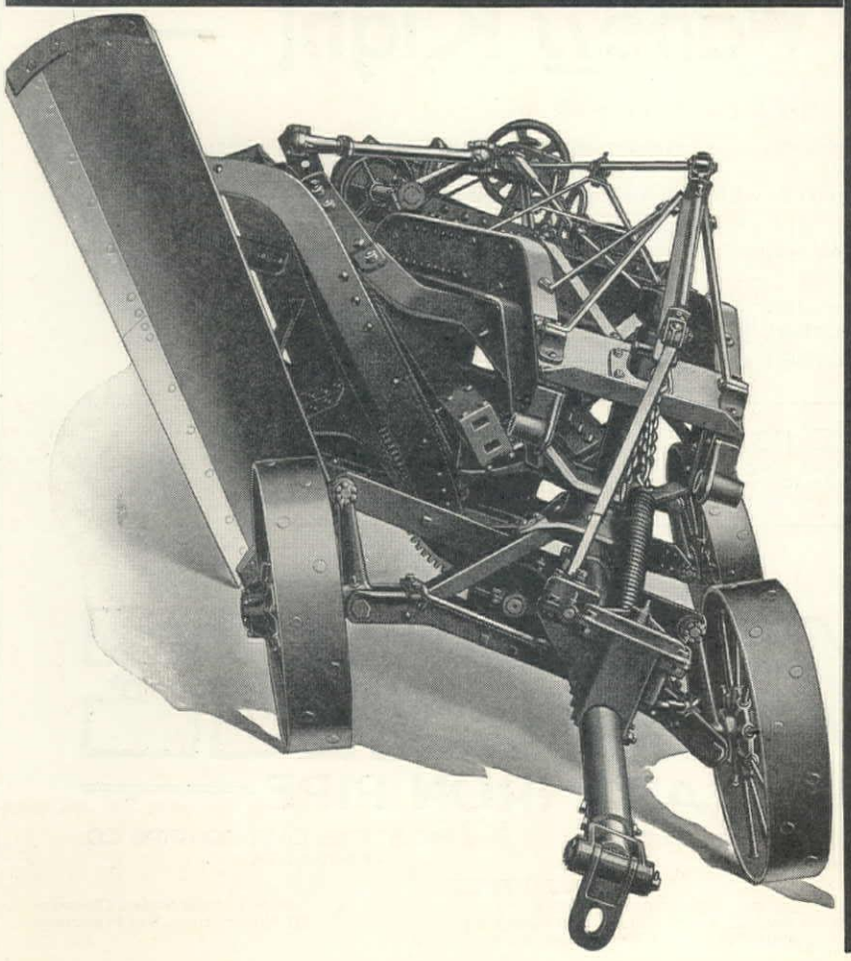
FOR DEPENDABLE POWER

When writing to LE ROI CO., *please mention Western Construction News*

Announcing the

"CATERPILLAR" SIXTY *Leaning Wheel* GRADER

Meeting Needs of Modern Roads



Wider grow the roads, deeper the ditches, better sloped the banks — Wider reaches the "Caterpillar" blade, deeper does it cut in the ditches, higher does it reach into the bank—

With these advantages comes the "Caterpillar" Sixty Leaning Wheel Grader.

Leaning Wheels.
3-Point Control to hold correct blade pitch advantage.
Ball and Roller Bearings on entire lift mechanism.
Bank Cutting Blade which cuts a 60 degree slope with a high reach of six feet six inches.
Compensating Spring Lift so mounted as to equalize tension on both ends of blade and exert uniform lifting force at any elevation of blade.
All Housed Gears Machine Cut.
Extensible Lift Links for greater reach.
Centralized Adjustment Controls.
60½-Inch One-Piece Structural Steel Circle.
Bronze Lift Gears, adjustable to six points of wear, running against machine-cut steel worm mounted on roller bearings.
One-Piece Carbon Steel Blade Beams riveted half way 'round the circle.
Four Vise-Like Screw Clamps that hold circle in their grip.
Nine-Inch Ship Channel Frame, weighing 28.6 pounds to the foot, reinforced.
42-Inch Lateral Side Shift.
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Tapered Roller Bearings in all wheels.
Tapered Cork Seals and Metal Guards to exclude dust from wheels.
Steel Wheels with Cast-In-Hub Spokes countersunk through tire.
Draft Direct to Blade . . . no draft applied to blade through frame.

Price
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Caterpillar Tractor Co.

PEORIA, ILL. *and* SAN LEANDRO, CALIF., U.S.A.
Track-type Tractors : Combines : Road Machinery
(There is a "Caterpillar" Dealer Near You)

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TRACTOR

"What if McWane *is* Right —

about cast iron pipe being a better bet in those small lines, too?

"McWane puts up a pretty good case for using cast iron 2-inch pipe everywhere we can—"

"It has over-capacity as compared with the perishable pipe—that's true."

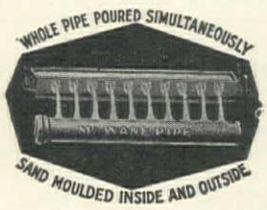
"Yes, and the same installation and pumping costs are spread over a far longer life. . . . besides, after two years the McWane-Pacific cast iron pipe *will* flow more water, thus holding down future pumping costs."

"Then there's the lower depreciation rate on cast iron pipe; it will maintain the real and the book valuations of the plant better."

"All right; we better buy McWANE-PACIFIC sand-cast pipe in the 1¼ to 12-inch sizes then!"

The above thoughts can well pass through any executive's or official's mind who is conscientiously trying to spend other people's money to the best advantage.
Full details of this modern-weight, modern-strength, sand-cast pipe—with or without famous Precalked Joints—gladly sent on request.
At least *find out* why McWane-Pacific pipe costs less per year.

WRITE FOR ILLUSTRATED LITERATURE



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CAST IRON PIPE

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PACIFIC STATES CAST IRON PIPE CO.
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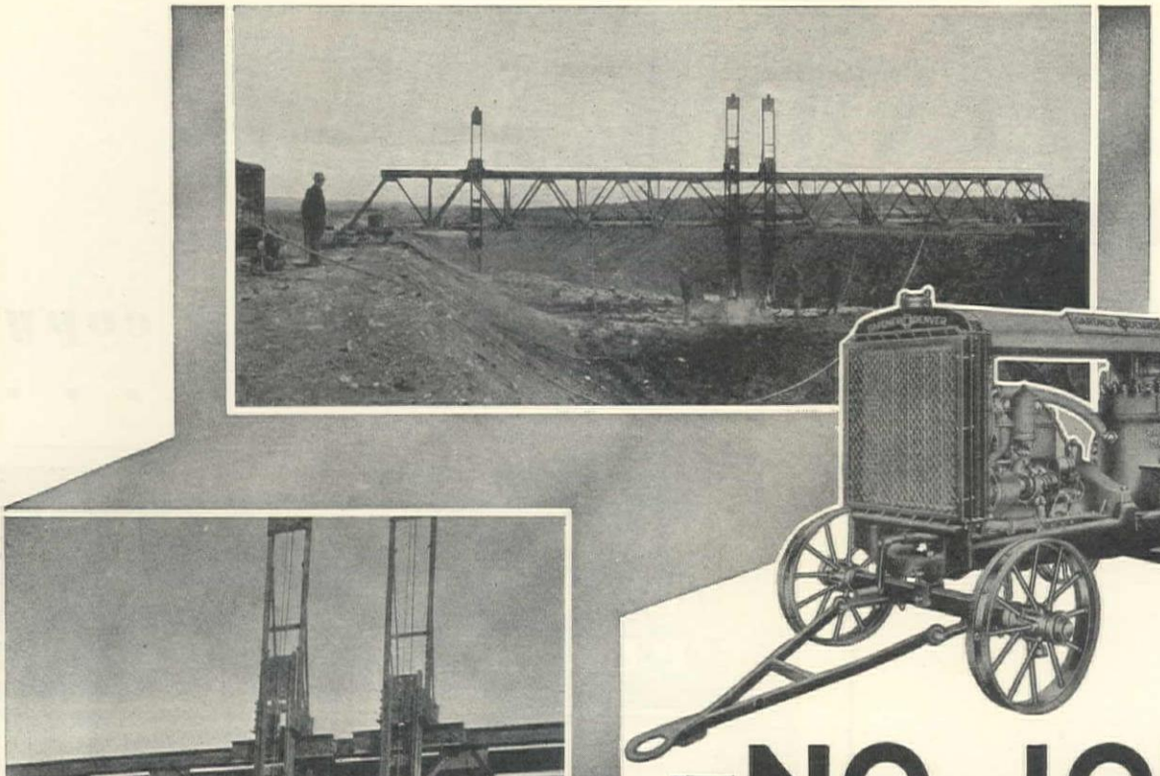

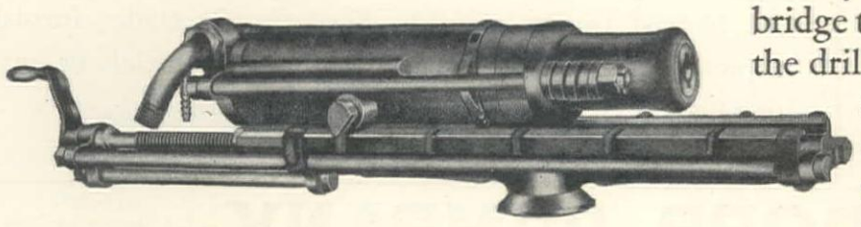

—NO JOB— TOO BIG

for Gardner-Denver equipment. Digging a canal through country that necessitates 26 miles of hard rock work, requires Air Compressors, Rock Drills and other equipment that will stay on the job. In order to obtain a maximum amount of work from the drilling equipment Mittry Brothers developed a novel portable drill bridge which with G-D Portable Compressors allowed three G-D Model 17 Drills to be used at the same time. The mobility and ease of handling of this bridge together with the fast cutting of the drills, is accomplishing an amount of work that will complete this project in record time. Let us tell you more about our construction equipment.

GARDNER-DENVER COMPANY

QUINCY, ILL. DENVER, COLO.

SALES OFFICES THROUGHOUT THE WORLD

GARDNER-DENVER

When writing to Gardner-Denver Company, *please mention Western Construction News*

The last dipperful

FINISHED AHEAD OF TIME AS USUAL — WITH A GAS + AIR

Time is the all-important factor on most digging jobs. Increased yardage adds dollars to the contractor's profits. He must dig big yardage every hour weather will permit.

Toughest digging doesn't put you behind schedule if a Bucyrus-Erie Gas + Air is on the job. The Gas + Air with the equivalent of a steam crowd and a steam swing maintains fast output in hardest materials. Compressed air gives a powerful cushioned crowd without robbing power from the hoist at the critical moment. It gives a fast, smooth swing, impossible with a clutch machine. And as the dipper goes up through the bank, the full power of the gas engine is available for the hoist alone.

The result — speed and steadiness of output impossible with the ordinary clutch-type machine.

Introduced only five years ago, the Gas + Air has scored a brilliant success because it finishes the hardest jobs on time. There is a Diesel + Air, too. Like the Gas + Air it is built only by Bucyrus-Erie. Investigate these machines — they will help you compete for jobs and make you bigger profits. Write today for complete specifications.

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A-123—8-10-30—WCN

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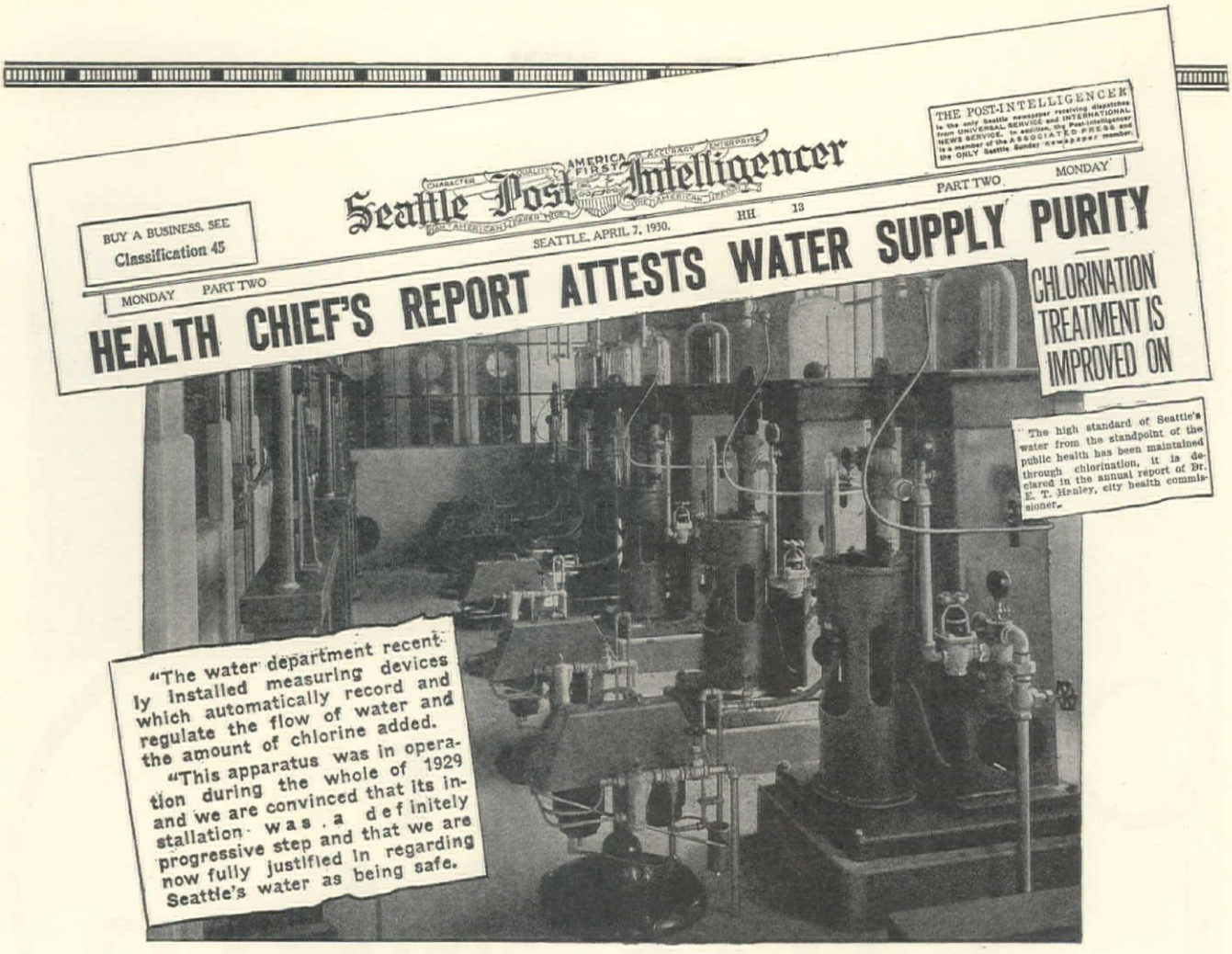


Automatic Chlorination — Solves Seattle's Problem

"The Only Safe Water is a Sterilized Water"

ACCURATE proportioning of chlorine dosage to a widely varying flow was Seattle's problem. Dependable automatic control apparatus a necessity. « « That the six W & T Automatic Vacuum Chlorinators installed on Young's Lake Supply adequately fill this need is evidenced by Dr. Hanley's report. « « Technical publication 106 (yours for the asking) describes this apparatus in detail.

WALLACE & TIERNAN COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

NEWARK • NEW JERSEY

Baltimore, Boston, Buffalo, Charleston, Charlotte, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Knoxville, Lexington, Lincoln, Los Angeles, Minneapolis, New York, Ogden, Oklahoma City, Philadelphia, Pittsburgh, Roanoke, San Francisco, Seattle, Spokane, St. Louis, Syracuse. Wallace & Tiernan, Ltd., Toronto, Winnipeg, Canada. Wallace & Tiernan, Ltd., London, England

SA-23

Cut Out This Man

YOU no longer need a "wagon skinner." Put his wages in your pocket. Western Crawler dump wagons no longer have to be "wound up." We have perfected a practical, automatic, entirely mechanical device for closing the doors after dumping. It is simplicity itself and acts instantly. The entire mechanism is mounted on the wagon and requires no special attachment on the tractor. A single trip-lever controls both dumping and closing. Your tractor driver can work that lever from his seat by means of a rope, or your dump boss can work it direct from the ground.

Order your new wagons equipped with this labor-saving device—or mount it on your Western Crawler wagons already in the field. Its use will release your "wagon skinners" for other work.

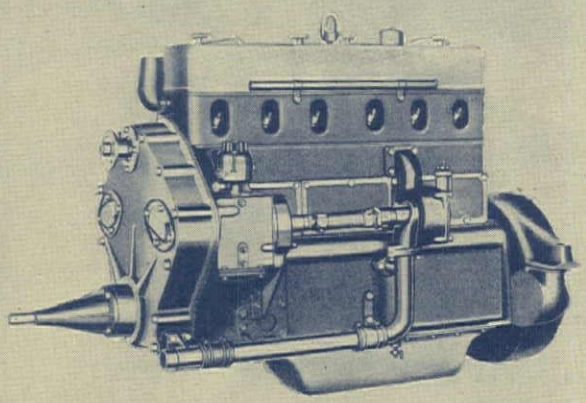
This whole welcome story is contained in Bulletin No. 30-JWC just off the press. Where shall we send your copy?

WESTERN WHEELED SCRAPER COMPANY

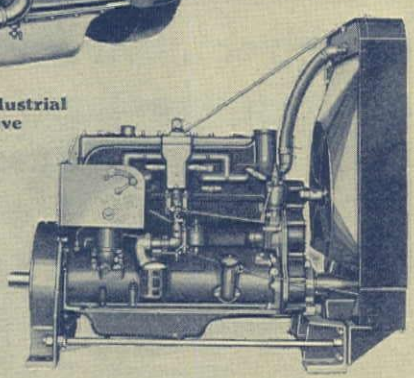
AURORA, ILLINOIS, U. S. A.

WESTERN

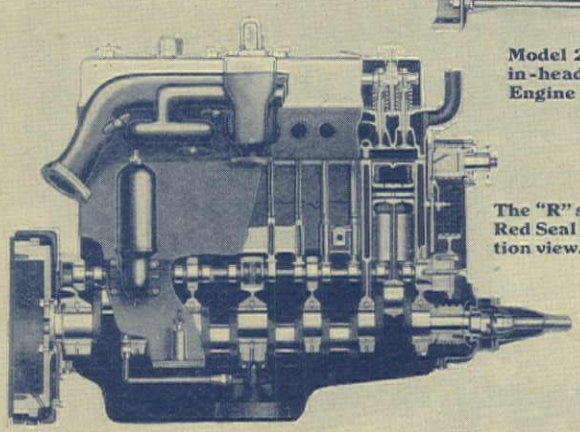
SPECIFY CONTINENTAL



Model 29R—6-Cylinder Industrial Engine with automotive type housing.



Model 29R—6-Cylinder valve-in-head Red Seal Industrial Engine with foot-type housing and radiator.



The "R" series Continental Red Seal Engine. Cross section view. Right hand side.

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Mendenhall Auto Parts Co.

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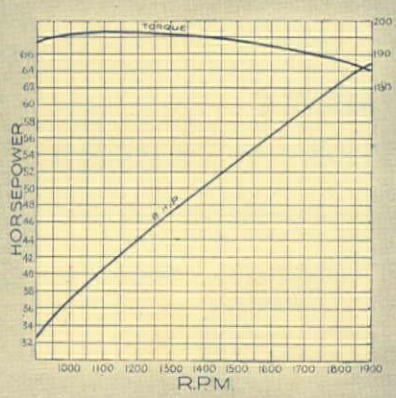
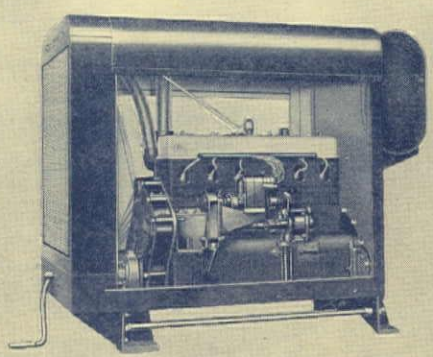
Colyear Motor Sales



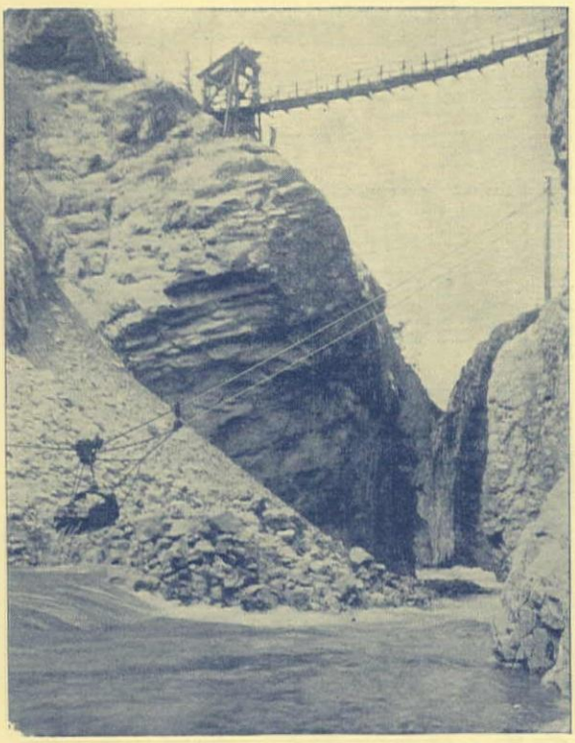


Model P57A—Red Seal Industrial Power Unit with 29R Industrial Engine.

CONTINENTAL MOTORS CORPORATION
INDUSTRIAL EQUIPMENT DIVISION
Office and Factory: Muskegon, Michigan

The Largest Exclusive Gasoline Motor Manufacturer in the World

Continental Engines



Helping To Build Diablo Dam

IN constructing the great Diablo Dam, part of a 240,000-hp. hydroelectric development for the city of Seattle, the contractor (Winston Bros. Co.) found early use for a 1½-cu.yd. Sauerman slackline cableway in stripping the loose material from the rocky canyon, clearing the site for the dam foundations. (See illustration above.)

This was followed by the installation of a 2½-cu.yd. Sauerman cableway at Reflector Bar, half a mile downstream, to dig aggregates for the concrete work. This second cableway, shown in view below, working on an average haul of 600 to 800 ft., brings in 75 cu.yd. of sand and gravel hourly. It lifts the materials from 72 ft. below water to a hopper at the top of the washing and screening plant 100 ft. above the water line.

Contractors Increase Their Profits by Using Sauerman Slackline Cableways

LARGE earth-moving jobs—canal excavation, construction of earth embankments and dams, excavation of gravel from rivers, etc. — no longer require a large equipment investment. Instead of using separate machines for excavating, conveying and elevating, the progressive contractor installs a Sauerman Slackline Cableway Excavator which handles the material in one continuous operation from the excavation to the place of disposal.

One of these cableways not only handles as much yardage per day as the expensive combinations of excavators and conveyors which were formerly used for long range earth-moving, but it also offers the advantage of lower operating cost and easier maintenance.

These powerful, economical long range machines are adaptable to almost any excavating project where the materials have to be moved distances of from 200 to 1500 feet. They are furnished with gasoline, electric, steam or diesel-electric power units. Handling capacities range from 10 to 300 tons per hour.

Write for 50-page illustrated catalog

SAUERMAN BROS., Inc., CHICAGO, ILL.

Pacific Coast Distributors:

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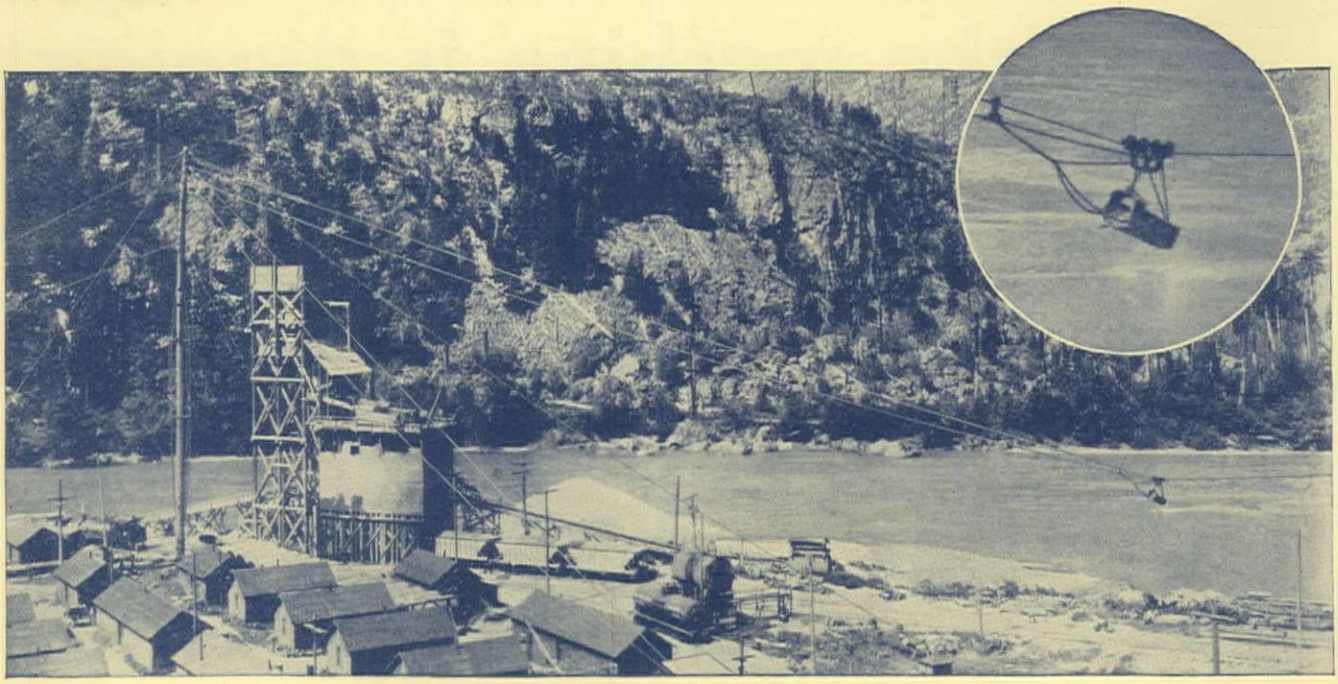

..WRITE..
for Bulletin No. P-26 and complete data

THE LATEST DEVELOPMENT by TELSMITH

TIMKEN BEARING EQUIPPED

The ONLY PORTABLE CRUSHING *and* SCREENING PLANT *with a* GYRATORY CRUSHER

Greater capacity, *not on paper but on the job* . . . finer crushing . . . more rugged construction . . . all are combined in *the new Telsmith*— the *only* portable crushing-screening-loading plant *equipped with a gyratory crusher.* It turns out two accurately sized products to conform exactly with state or county specifications for gravel or hard surface roads. The crusher is in closed circuit with the screen . . . *no oversize.*

The most outstandingly flexible portable outfit on the market . . . *Telsmith* may be equipped with a 6-A or 8-A Telsmith Primary Breaker, to deliver sand and minus 1½ in. rock . . . or with a No. 32 Telsmith Reduction Crusher, for sand and ¾ in. rock.

For quarry operations, adding either a 10-A Telsmith Primary Breaker or a Telsmith Jaw Crusher, at foot of feed conveyor, converts it into a two-crusher plant with a large capacity of ¾ in. or 1-in. product.

The capacity of *Telsmith* is truly remarkable. In clean sand and gravel . . . 30-40 tons per hr. making two products, sand separate from gravel . . . and 40-60 tons per hr. making one product, mixed sand and gravel. In crushed stone, 20-25 tons per hr.

All Steel*... with the utmost rigidity of construction... *Timken* Tapered Roller *Bearings* throughout... all conveyors equipped with 3-pulley troughing idlers with anti-friction bearings... the *Telsmith* Portable is backed by *Telsmith's Guarantee.

SMITH ENGINEERING WORKS, 1826 Holton Street, Milwaukee, Wis.

JENISON MACHINERY COMPANY
58 Fremont Street
San Francisco, California

GARLINGHOUSE BROS.,
2044 Santa Fe Avenue
Los Angeles, California

STANDARD PLANT HAS 6 UNITS

I
Steel Receiving Hopper with Reciprocating Plate Feeder.

II
Steel Frame Feed Conveyor with 2-wheel truck.

III
Complete crushing and screening plant, mounted on heavy trucks with..... (a) double-deck vibrating screen (b) gyratory crusher (c) elevator to return crushed product to screen (d) jib crane (e) steel operator's platform.

IV
Steel Conveyor for fine finished product.*

V
Steel Conveyor for coarse finished product.*

VI
2-compartment, all-steel storage bin for loading trucks.*

*Not shown in illustration.

TELSMITH

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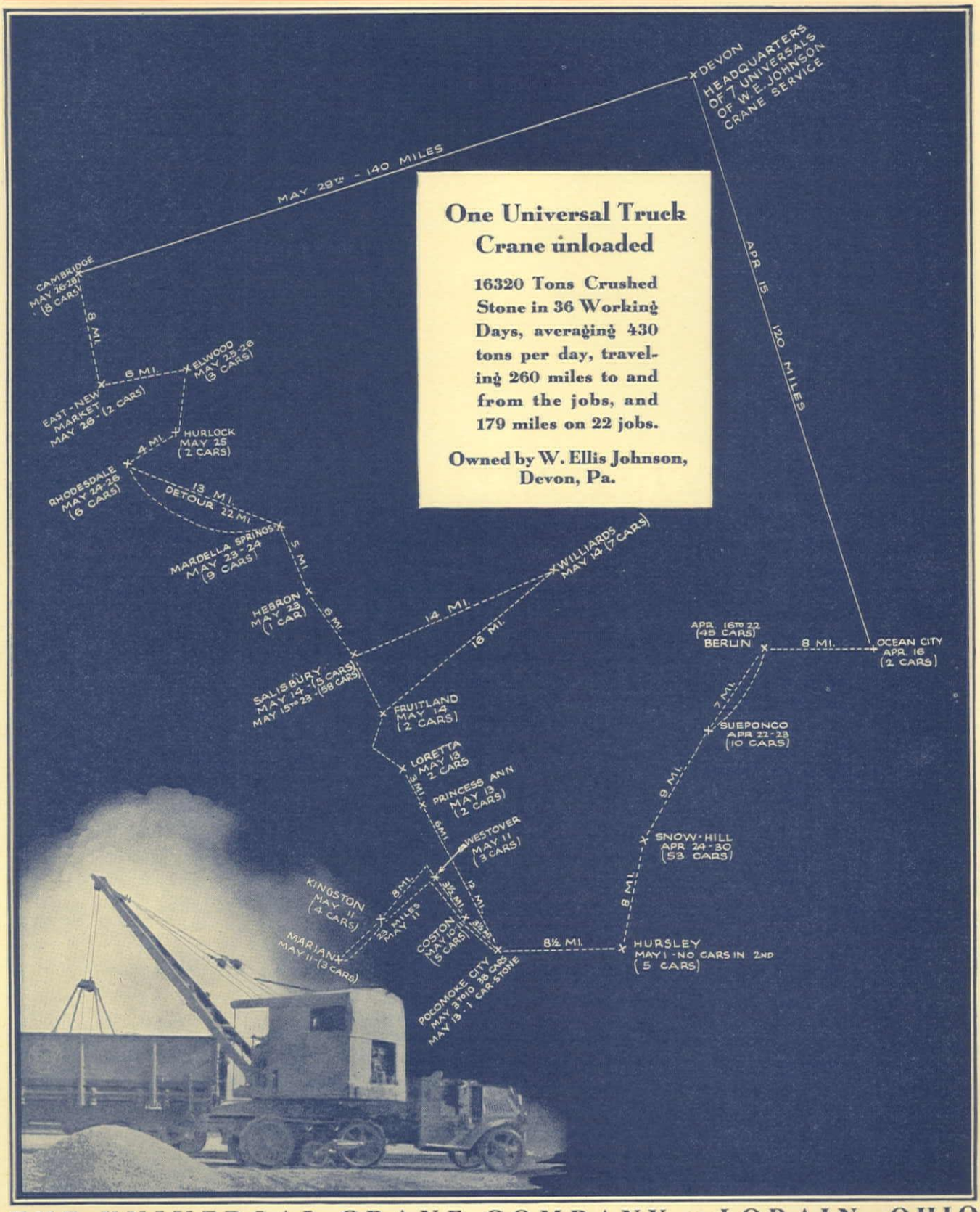

One Universal Truck Crane unloaded

16320 Tons Crushed Stone in 36 Working Days, averaging 430 tons per day, traveling 260 miles to and from the jobs, and 179 miles on 22 jobs.

Owned by W. Ellis Johnson, Devon, Pa.

THE UNIVERSAL CRANE COMPANY • LORAIN, OHIO

UNIVERSAL

Truck Crane and Universal "35" Representatives: The Universal Crane Co., Los Angeles, Calif.; The Universal Crane Co., San Francisco, Calif.; The Feenaughty Machinery Co., Portland, Seattle, Spokane.

Universal "35" Representatives only: The Smith Booth Usher Co., Los Angeles, Calif.; The Jenison Machinery Co., San Francisco, Calif.

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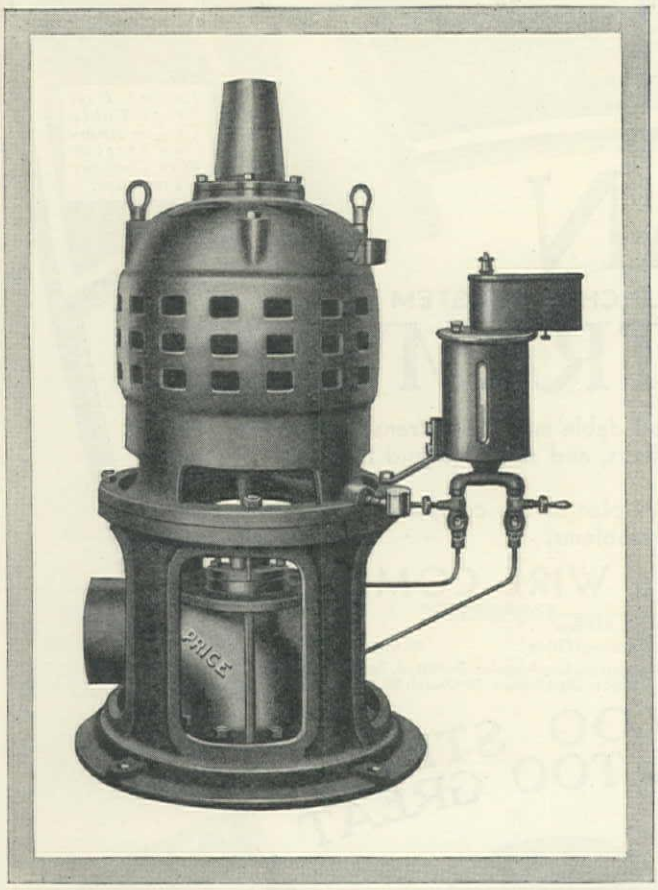
Before you buy a turbine pump

. . . . *think of these things*



Fairbanks-Morse Price Turbine Pump. Illustration shows the solenoid-operated lubricator which can be furnished as extra equipment.

Who makes the pump? Is the guaranty reliable? What are the service facilities? Are they permanent? How is the pump built? . . . Think of *these* things before you buy a turbine pump. Be *sure* of them if you would protect your investment.

See how Fairbanks-Morse Price Turbine Pumps measure up to every requirement. The entire unit—pump *and* motor—is built by Fairbanks-Morse—a pioneer in the industry. *Both* pump and motor are covered by the single guaranty of an organization known for fair dealing. Quick service is assured regardless of the number of years that your pump may serve—complete Fairbanks-Morse service departments are maintained in principal cities.

Fairbanks-Morse Price Turbine Pumps are built as a unit. Turbine heads are designed especially to fit Fairbanks-Morse Ball Bearing Motors. The complete motor can be removed readily. Replacements can be made easily as all parts of motors and pumps are standardized.

The complete story, Bulletin No. 5500, explains why experienced buyers regard a Fairbanks-Morse Price Turbine Pump as a *protected* investment in long time water service. May we send it?

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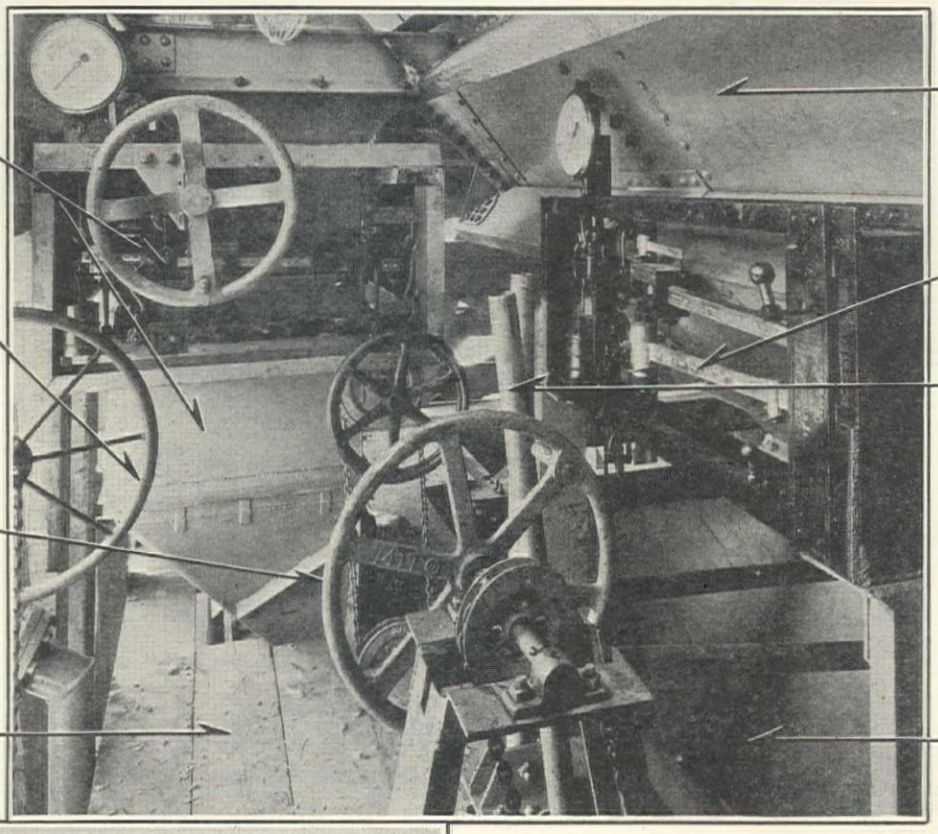
The convenient arrangement of the proportioning plant controls is a feature of the Northern States Contracting Company's central mixing plant at the Twin City Lock and Dam---on the Mississippi at Minneapolis.



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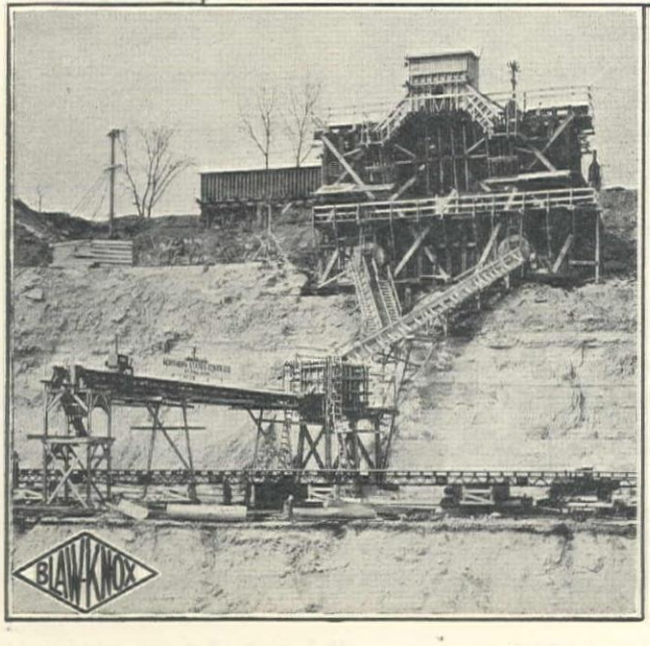
Weigh Hopper for aggregates. Top of hopper is just below bin gates, saving headroom. The Weigh Hopper replaces the usual mixer receiving hopper.



The twin Central Mixing Plant for the Northern States Contracting Company is an excellent illustration of the engineering ability which combines Blaw-Knox Equipment into an efficient concreting unit.

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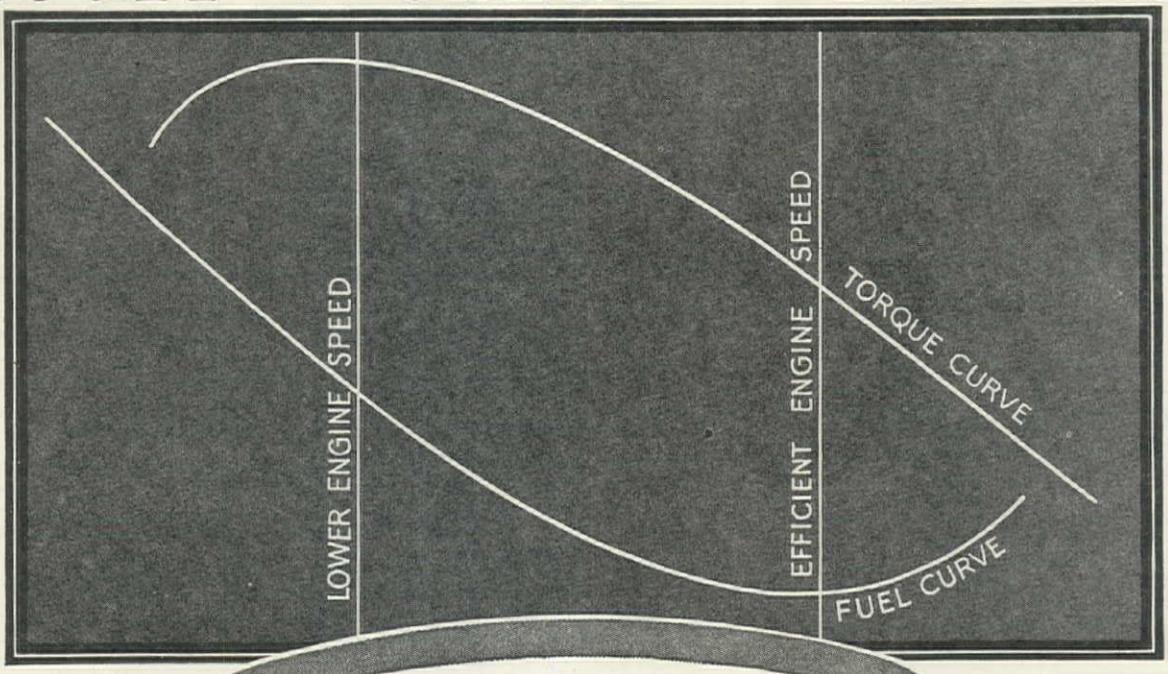

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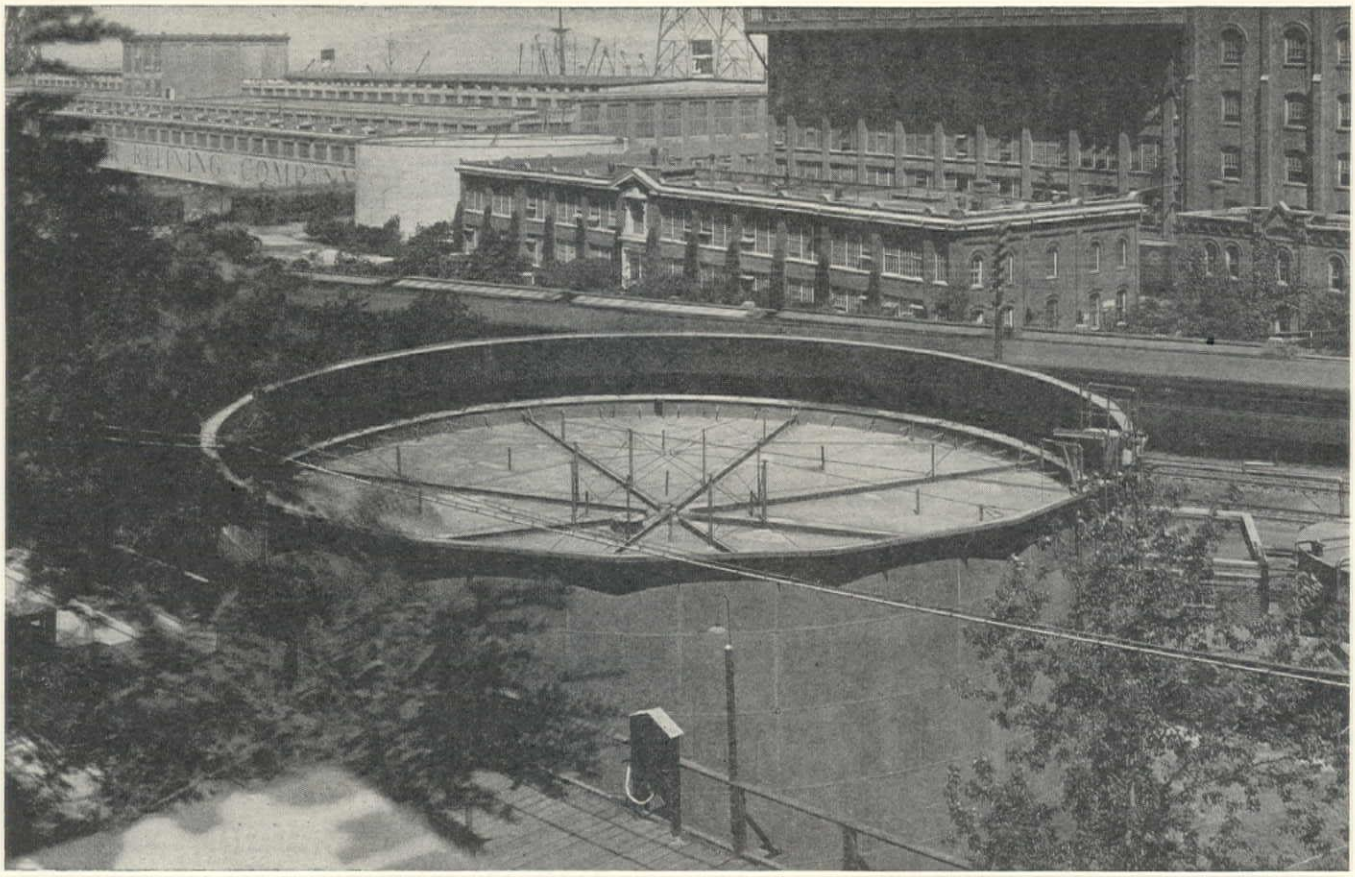

25,000- barrel fuel oil tank equipped with a Wiggins Floating Roof at the plant of the California and Hawaiian Sugar Refining Corporation at Crockett, Calif.

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THE Wiggins Floating Roof is a device which rides on the surface of the oil in a tank. There is no air space between the deck and the liquid. The space between the edge of the deck and the tank shell is closed with an effective seal which forms a long sliding contact with the tank shell.

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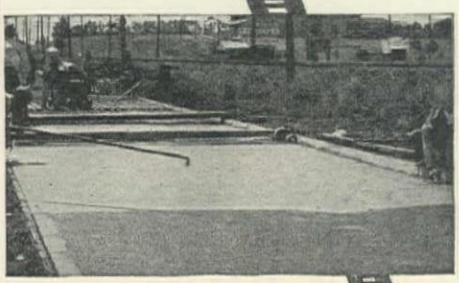

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Perfect wearing surface

"What *is* this 'Hunt Process' and what does it do for me?"

A straight-from-the-shoulder question and here's the answer in plain words:

The "Hunt Process" is a curing method which consists of spraying freshly-poured concrete with a processed asphalt compound, preventing evaporation of the mixing water and effecting an ideal cure.

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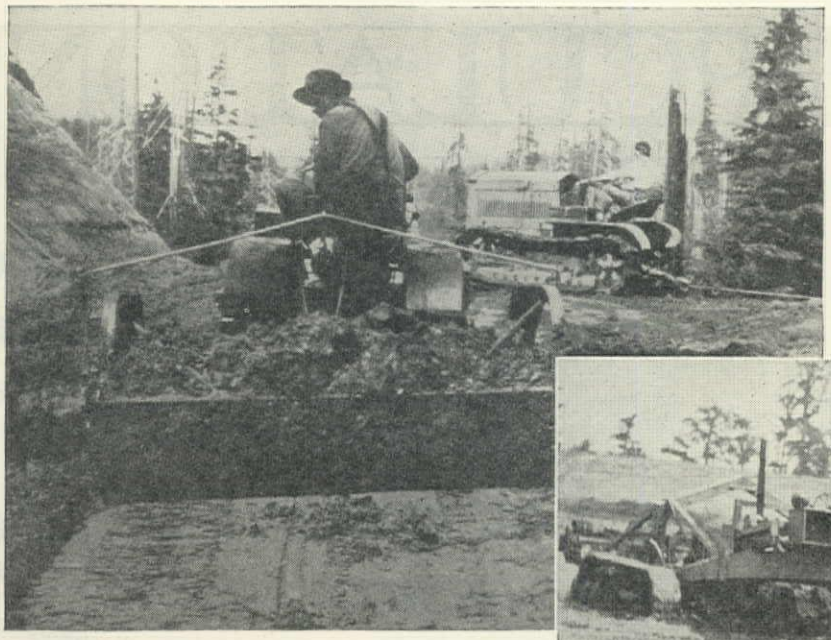

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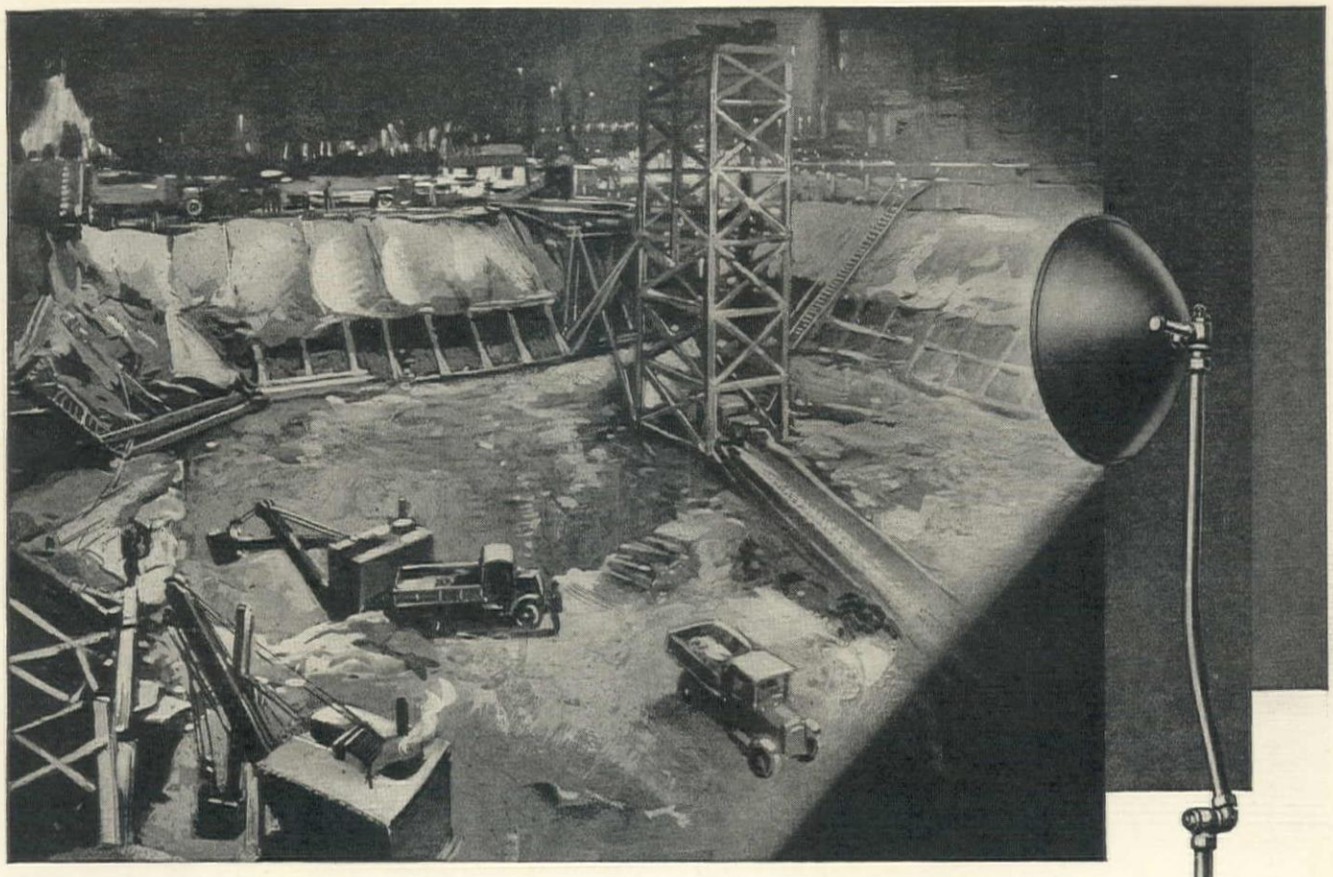

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...without delaying traffic

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SPEED combined with power and stamina is lowering both hauling and maintenance costs for the hundreds of operators using *Sterling Chain Drives* ...*the only motor trucks offering these features*:

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Driver Dan Says:
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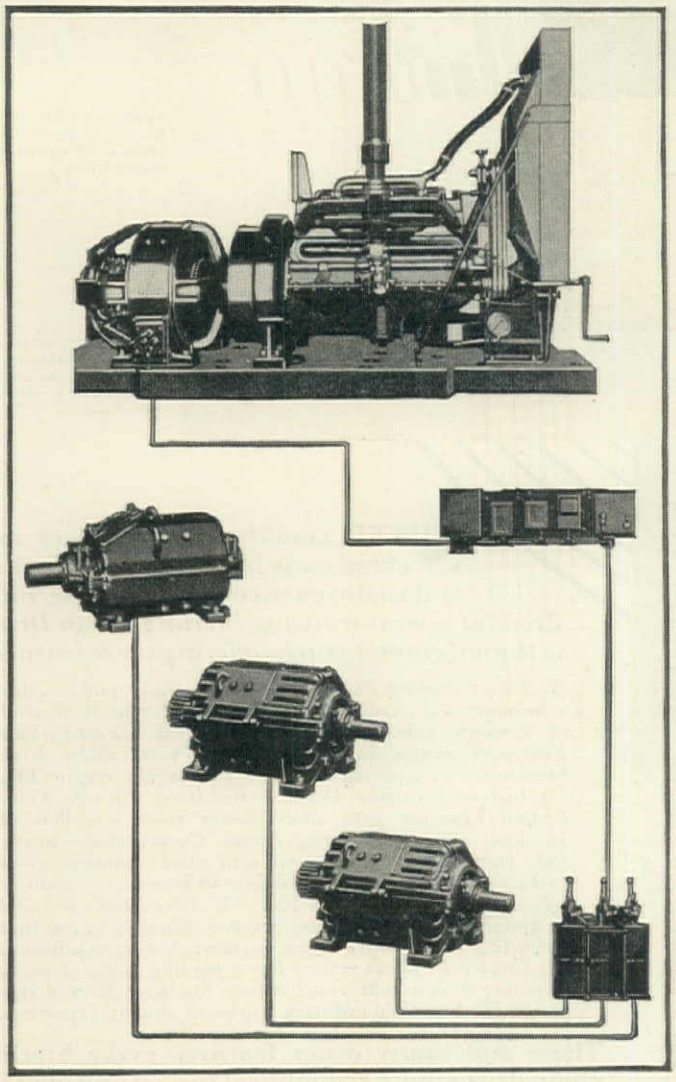
CUSHIONING

The DIGGING SHOCKS



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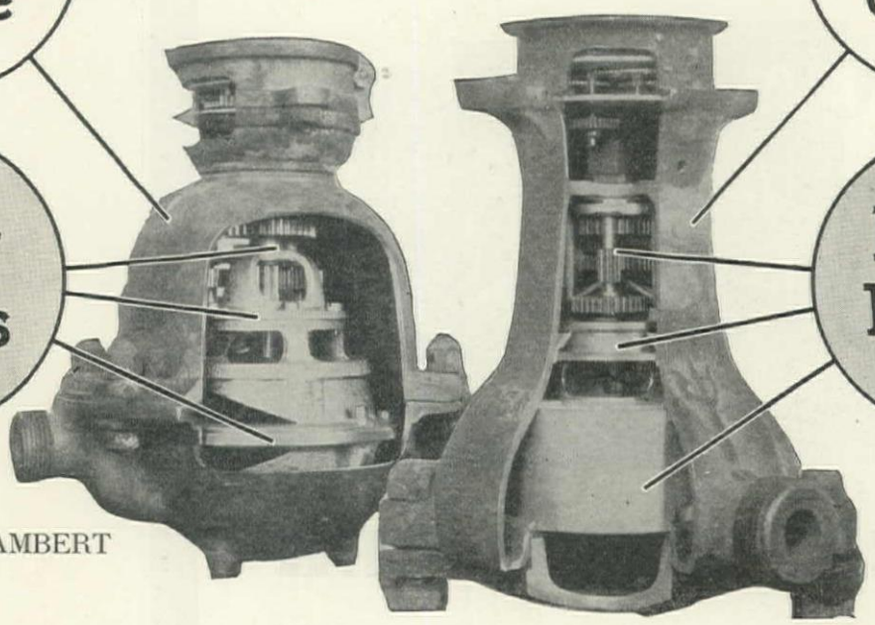

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VOLUME V | AUGUST 10, 1930 | NUMBER 15

After a long lapse, railroad construction in the Far West is to be revived. Stationmen are again 'on the job' to subcontract large projects in Arizona, California, Colorado, Nevada, New Mexico, Oklahoma, Oregon and Texas

Stationmen Again

Construction of 200 miles of new line by the Great Northern and Western Pacific between Klamath Falls, Oregon, and Keddie, California, will start this month; the Santa Fe has announced that construction will start immediately on three lines in the Southwest, a total of 380 miles, and is now building about 125 miles of line in Texas and Oklahoma and 23 miles in Arizona; the Oregon Electric is constructing 27 miles of its Linn county extension. Contemplated work includes 30 miles of Union Pacific extension to reach the site of Boulder dam; a new and safer route for the Southern Pacific through San Jose, California, etc. In the near future, after the Interstate Commerce Commission approves the purchase of the Denver & Salt Lake by the D. & R. G. W., construction of the 42-mile Dotsero cutoff in Colorado may be looked for.

Qualified general and subcontractors are finding in this program, the aggregate cost of which approximates $50,000,000, an opportunity to again use their railroading experience. The large volume of this work will benefit the construction industry and will also considerably relieve unemployment.

The joint federal-state San Francisco Bay Bridge Commission has agreed upon the Rincon hill-Goat island-Key System fill route for the proposed publicly owned toll bridge between San Francisco and Oakland, the preliminary estimated cost of which is $72,000,000 for a double-deck cantilever carrying interurban trains as well as pleasure cars and trucks. Final agreement between the communities and other affected interests on such features of design as approaches and termini is now being sought.

S. F. Bay Bridges

Meanwhile, the final report of the chief engineer of the Golden Gate Bridge & Highway District for a suspension bridge linking Fort point in San Francisco with Lime point to the north in Marin county, is expected about August 13. This proposed publicly owned highway toll bridge, the estimated cost of which exceeds $30,000,000, would require about the same construction period as the transbay bridge—four to five years.

Final plans for the $12,000,000 Richmond-San Rafael private highway toll bridge are now being drawn.

These three bridges are urgently needed to better the transportation situation of the San Francisco metropolitan area. The first two are tremendous from the standpoints of engineering design, construction, and finance—their building is being demanded.

To those who reflect on the number of financial casualties in engineering construction, the interview of Rhodes E. Rule with an experienced highway contractor, published elsewhere in this issue, will be enlightening. To place construction on a stable footing, this contractor calls for complete plans and specifications, coupled with full and impartial enforcement of the provisions. Incidentally, the special provisions require careful treatment by the engineer in responsible charge and who has best knowledge of the conditions—they are not the proper function of a subordinate nor can they safely be copied from requirements in other localities.

Engineering Specifications

This angle for improving relations between the engineer and contractor goes back to the fundamental principle whereby the engineer must stand in the contractor's shoes if he is to see whether the works might be honestly built from the designs and specifications.

Two examples of recent water main cleaning jobs in Northern California are described in this issue. The larger project was a 25,000-ft. cast-iron irrigation supply line, laid in 1892, and the other a 1450-ft. wood-stave line for industrial use, laid in 1924. In both cases the problem of diminishing supply and pressure was effectively and quickly remedied and at costs far below those of line replacement. This type of maintenance deserves more consideration from the water works men of the Far West.

Water Main Cleaning

About 3500 delegates attended the Second World Power Conference which convened in Berlin June 15. Besides an invaluable exchange of ideas relative to greater development of the power industry, numerous social occasions afforded professional contact among the engineers of many nations. This, like the recent World Engineering Congress at Tokio, reminds us that 'under the skin of nationality, all engineers are brothers'.

World Power Conference

Hayward-Niles Highway, California

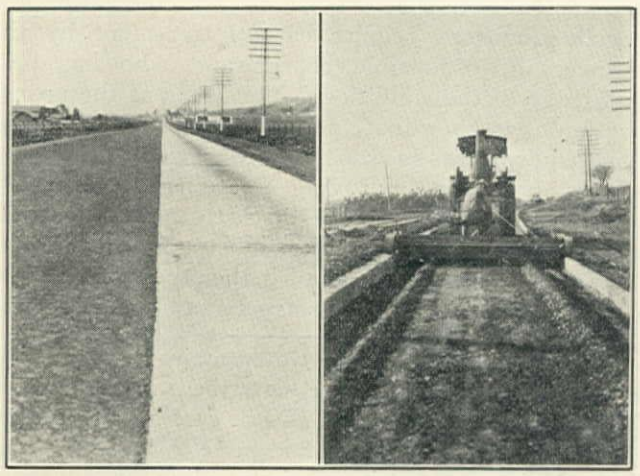
Management, Production, and Methods on 8.7 Miles of Combined Portland Cement Concrete and Asphaltic Concrete Paving, Laid by Hanrahan Co. of San Francisco

By H. K. CHURCH

Junior Highway Engineer, Division of Management, U. S. Bureau of Public Roads, Washington, D. C.

Foreword — The Division of Management covered the entire paving project of the Hanrahan Co. between Niles and Hayward, California, for the purpose of analyzing costs and methods and of being of service to the contractor. E. V. Aldrich observed the portland cement concrete paving and I observed the asphaltic cement concrete paving. This article is a resume of the two reports, with appropriate comments.

Management—From the standpoint of the Division, management is judged by two standards: 1 — The tendency of the contractor to eliminate his avoidable delays, after 'spotting' them, with no outside pressure by ourselves; and 2—the willingness of the contractor to eliminate the avoidable delays which we bring to his attention, or his ability to prove that they are unavoidable. The tendency of the contractor's superintendent, George Faw, was toward high management in both of these respects. The entire project was featured by excessive major time losses due to rain, and good management was responsible for the quick recovery from the effect of these pronounced major delays. A glance at the tabulation for major and minor delays (Table I) shows that 30.5% of total available time for portland cement concrete paving was lost because of rain and wet subgrade. The corresponding figure for asphaltic concrete paving was 49.4. The tabulation of minor delays during continuous hours of operation (Table II) shows that the efficiencies of the mixer and the pugmill were 89.25 and 85.60%, respectively, during the available hours for 100% operation—the record is good.



(Left) Combined Section of Asphaltic Concrete and Portland Cement Concrete Pavement on Hayward-Niles Highway. (Right) Carr 10-ft. Subgrader Pulled by 12-ton Buffalo-Springfield Roller

TABLE I

Major and Minor Delays During the Available Hours of the Project

(Note: Minor delays are those of less than 15 minutes duration, and major delays are those of more than 15 minutes duration.)

Item	P. C. Concrete Hours	P. C. Concrete %	A. C. Concrete Hours	A. C. Concrete %
Total available working time	688.00	100.0	696.00	100.0
Unavoidable delays				
Major				
Rain	66.00	9.6	200.00	28.8
Wet Subgrade	144.00	20.9	144.00	20.6
Moving	7.74	1.0	16.33	2.3
Mixer trouble (mechanical)	14.08	2.0	7.33	1.1
Moving pipe-line	24.00	3.5	.....	.....
Lack of materials	0.50	0.1	.....	.....
Material handling	.....	.....	4.75	0.7
Batcher trouble	.....	.....	6.25	0.9
Miscellaneous	19.50	2.9	.....	.....
Total	275.82	40.0	378.66	54.4
Minor (pro-rated)				
Mixer trouble (mechanical)	1.50	0.2	1.34	0.2
Aggregate heating	.....	.....	5.23	0.8
Batcher trouble (mechanical)	.....	.....	0.29	0.0
Miscellaneous	4.70	0.7	3.04	0.4
Total	6.20	0.9	9.90	1.4
Total unavoidable delays	282.02	40.9	388.56	55.8
Avoidable delays				
Major				
Truck operation	1.50	0.2	0.25	0.0
Lack of prepared grade	23.00	3.3	.....	.....
Water supply	11.91	1.7	.....	.....
Roller operation	.....	.....	0.50	0.1
Street delays (city)	.....	.....	11.83	1.7
Total	36.41	5.2	12.58	1.8
Minor (pro-rated)				
Truck supply	16.90	2.4	8.78	1.2
Truck operation	5.30	0.8	.....	.....
Turning of trucks	3.10	0.4	.....	.....
Water supply	2.60	0.2	.....	.....
Moving water hose	4.00	0.6	.....	.....
Operator	0.90	0.1	12.00	1.7
Street delays (city)	.....	.....	13.14	1.9
Total	32.80	4.5	33.92	4.8
Total avoidable delays	69.21	9.7	46.50	6.6
Total delays	351.23	50.6	435.06	62.4
Total actual time working at 100% efficiency	326.77	49.4	260.94	37.6

(Note: The term pro-rated is explained thus: The total available working time minus the total major delays will give the hours of continuous operation. However, due to minor delays the machinery was not operating at 100% efficiency during this continuous operating time. Stop watch study records for the hours of continuous operation give certain reliable percentages of time lost in minor delays. These percentages multiplied by the hours of continuous operation give the hours of minor delays (pro-rated). The following tabulation shows the nature and extent of the minor delays, as disclosed by the stop watch studies.)

The engineering management of a project is judged by only one standard—the ability of the engineers to get a good job without unreasonable limitation of the contractor's production. The resident engineer, William Rice, and his assistants, Fred Montell and Ross Westbrook, achieved this. During the last week of the asphalt paving, Earl Withycombe, construction engineer, made an effort to increase the efficiency of the pugmill by double charging the aggregates. His chief consideration was not to increase the batch cycle time and decrease the production thereby. Such an attitude is commendable and should be recommended to the entire personnel of any highway organization.

Production—The graph of the summary of major and minor delays gives a pictorial story of the production secured and the distribution of time losses. As in any type of highway construction, there is a key piece of equipment to which all other pieces are subordinated and correlated. In the case of portland cement concrete it is the mixer—on this contract a Multifoote 27-E paver. For asphaltic concrete it is the pugmill, in this case a Geiger 2500-lb. unit. Since these two pieces of equipment make and limit the production, it is proper that all delays be based on their operation and performance. Our method is to divide delays into two parts—major, of more than 15 minutes duration, and minor, of less than 15 minutes duration. The former are easily obtainable. The latter we determine by stop watch analysis of the actual operation of the piece of equipment during two of the eight hours of daily operation. By assuming that the time resulting from the subtraction of major delays from hours of the day is distributed as our stop watch studies disclose, we are enabled to ascertain the nature and the extent of those delays, in seconds, which are not easily detected by casual observation. Thus, the data which are plotted to produce the graphs shown. In order to magnify the effects of the minor losses, which are not emphasized by the summary of major and minor losses, an additional graph is made, which shows the distribution of an hour of working time. The importance of the minor delays, not easily detected by the superintendent, and their effect in terms of dollars and cents are emphasized.

TABLE II

Minor Delays During the Continuous Hours of Operation

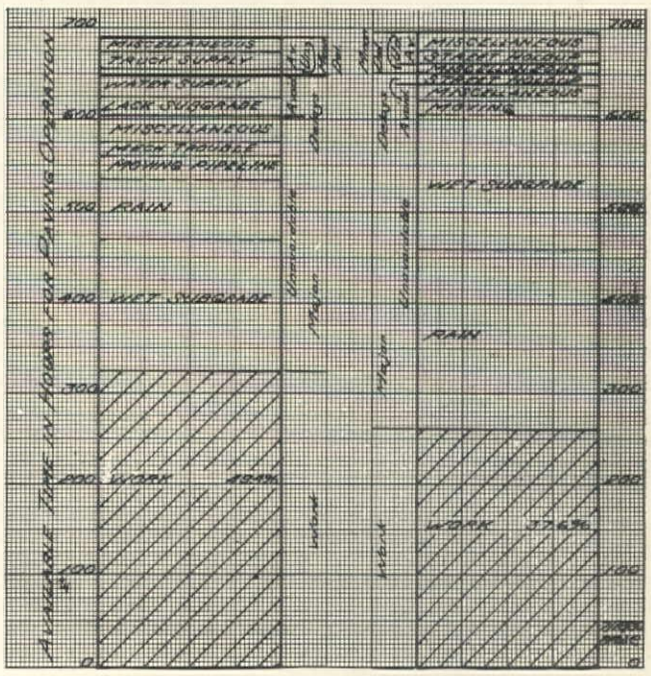
(Total Available Working Time Minus All Major Delays)

Item	P. C. Concrete %	A. C. Concrete %
Available working time	100.00	100.00
Actual working time	89.25	85.60
Unavoidable delays		
Mechanical trouble, mixer	0.42	0.44
Aggregate heating, damp	.....	1.70
Miscellaneous	.....	1.00
	0.42	3.14
Avoidable delays		
Miscellaneous	1.30	.....
Moving water hose	1.09	.....
Water Supply	0.72	.....
Operator	0.25	3.95
Turning of trucks	0.86	.....
Batcher truck operation	1.46	.....
Batcher truck supply	4.63	2.90
Street delays (city)	.....	3.41
	10.43	11.26
Total delays	10.75	14.40

Portland Cement Concrete Paving—Stop watch studies disclosed a batch cycle of 72.6 seconds (charging time 11.2, mixing time 59.6, and discharge time 1.8). Such a cycle gives a possible production of 49.6 batches per hour, whereas 44.2 were obtained throughout the course of the job, during the net hours of operation. The graph shows a proper distribution of these delays which were responsible for the loss of 5.4 batches per hour. Attention is called to the avoidable losses, some of which are summarized below, with reasons for their possible avoidance:

Water Supply	An insurance against water supply delay with present-day production is a 3-in. line, instead of the 2½-in. used.
Operator	This is not precisely avoidable. A mixer operator is human, but his delays should not exceed 0.50%.
Turning	Probably conditions at the mixer could have been changed to eliminate this delay due to truck turning.
Batcher Truck Operation	Alert truck drivers.
Batcher Truck Supply	Always avoidable when there is one contractor involved. In this case, a problem of the bunching of a mixed fleet of trucks. The hauling subcontractor was especially anxious to keep the mixer in continual operation. Nevertheless, he could not afford an excess of trucks, which a single contractor ought to have.

The monetary effect of these losses is considerable. The graph indicates that, in terms of operating expense, the loss is $4.85 per hour. If the loss is con-



HAYWARD-NILES PAVING

Summary of Major and Minor Delays

Item	P. C. Concrete	A. Concrete
Batches Mixed	15,004	13,091
Batches Mixed, with Elimination of Major and Minor Avoidable Time Losses	18,000	16,330
Loss, in Batches	2,996	2,429
Loss In Per Cent	16.7	14.9
Loss (Evaluated at $47 per hour)	$3,200	$48/hour $1,822

sidered from the standpoint of the batches which might have been turned out during the 6 minutes, 5 batches per hour were lost. If a reasonable profit of $1.50 per batch is allowed, the loss becomes $9.00 per hour.

The major time losses were largely unavoidable, and were due to inclement weather. Two major losses which might have been available for correction were lack of prepared subgrade and poor water supply. The former should never hold up the mixer, especially in California where wooden forms are used, enabling the crews to stay far ahead of the mixer. These two delays occurred when full operating expenses held.

Asphaltic Concrete Paving — Stop watch studies disclosed a batch cycle of 62.0 seconds (charging time 9.0, mixing time 45.0, and discharging time 8.0). The possible production equalled 58 batches an hour, or 73 tons of mix, whereas 49.6 batches were obtained—a loss of 8.4 batches per net hour of operation. The avoidable losses shown on the graph for an hour of working time are:

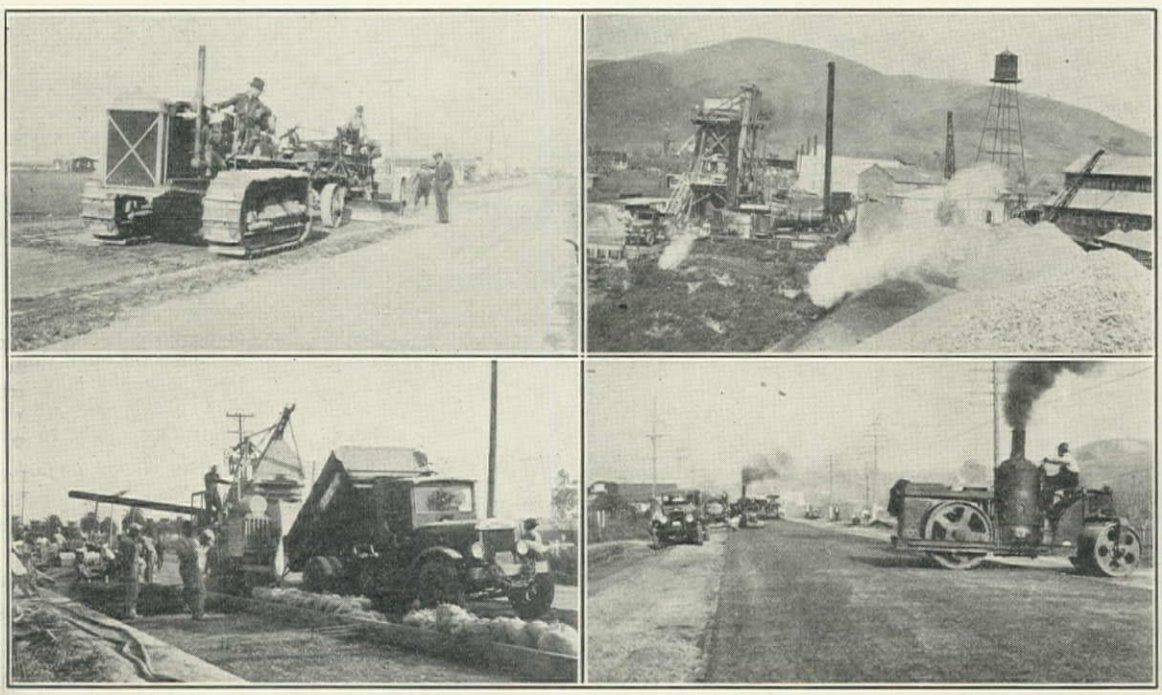
Street delays	Paving through Niles was difficult and, although the delay is classified as avoidable, it is doubtful that the best of management could have eliminated the time loss.
Overmixing	A batchmeter is needed greatly for a pugmill.
Time interval between end of discharge and beginning of charge	A direct mechanical connection between close of discharge gate and open of charging gate to pugmill would have saved $352.
Batcher truck supply	Comment has been given under P. C. C. Paving, and it holds for A. C. Paving.

Due to what we consider avoidable minor delays, 6.6 batches were lost per hour. As in the case of portland cement concrete, the major time losses were largely unavoidable. Of the avoidable major losses, only one was significant and that was caused by difficulties of handling materials in the town of Niles; it was not characteristic of the entire job and is considered here merely because it would have been avoidable by perfect management.

Our analysis of the evaluated avoidable time losses is given in the graphic summary of major and minor delays. Basing them again on our analysis of total labor and equipment costs for the two jobs, they are 13.5 and 7.7%, respectively.

In conclusion, under production the following tabulation is given:

	P.C.C.	A.C.C.
Percent of total available working time that mixer operated at 100% efficiency	49.4	37.6
Percent of total available working time that mixer operated, apparently, at 100% efficiency (the above plus % of minor delays)	54.8	43.8



(UPPER LEFT) CATERPILLAR '60' AND RUSSELL 'SUPER MOGUL' GRADER ON HAYWARD-NILES HIGHWAY. (UPPER RIGHT) ASPHALT PLANT, SHOWING 2500-LB. GEIGER PUGMILL AND P&H NO. 206 WITH 1-YD. OWENS CLAMSHELL ON STOCKPILE. (LOWER LEFT) AUTOCAR 5-TON BATCH TRUCK LOADING MULTIFOOTE 27-E PAVER. (LOWER RIGHT) BUFFALO-SPRINGFIELD 8-TON TANDEM ROLLERS WORKING PAVEMENT NEAR NILES

Methods—There were a few features of the job, which tended to directly or indirectly lower the production of the key pieces of equipment.

The most outstanding was the use of the 27-E paver to pour a 1-ft. strip of portland cement concrete the length of the job. This strip was intended to strengthen and true up the edges of the existing slab, which was to be double-decked and widened. Twice a week usually, the large paver backed up and poured this strip with a full complement of men. Our average hourly production of 44.2 batches is based on production for full width of pavement, because we want no abnormal conditions. The direct effect of this placement of the 1-ft. strip was to lower the overall production of the job from 44.2 batches to 39.9 batches per hour. The loss is 4.3 batches per hour, or 0.086 hour per net hour of operation. Since the net hours of operation for the job totalled about 376, the loss becomes 32.3 hours. Evaluated, this loss is $1520.

If the contractor allowed for this loss in his bid, the state is paying for poor design. If the contractor did not allow for the item, he loses. A small mixer should have been used, and the mix changed proportionately to fit the mixer.

The next outstanding feature was the lack of a suitable timing device for the asphalt pugmill.

The third feature was the awkward situation at the portland cement concrete batching plant, located at a commercial aggregate plant in Niles. Because of switching of cars in the yard, difficulties in turning and hauling through Niles, and lack of crane facilities, this feature tended to lessen the efficiency of the hauling units of the H. V. Tucker Co.

Conclusion—The portland cement concrete paving was done with high efficiency during the low percentage of actual continuous working time. If decent weather conditions had been obtained, the outfit would no doubt have shown a higher efficiency during the continuous working time. The same comment holds for the asphaltic concrete. No startling daily tonnage records were obtained because the maximum capacity of the plant, under mixing time specifications, was 585 tons.

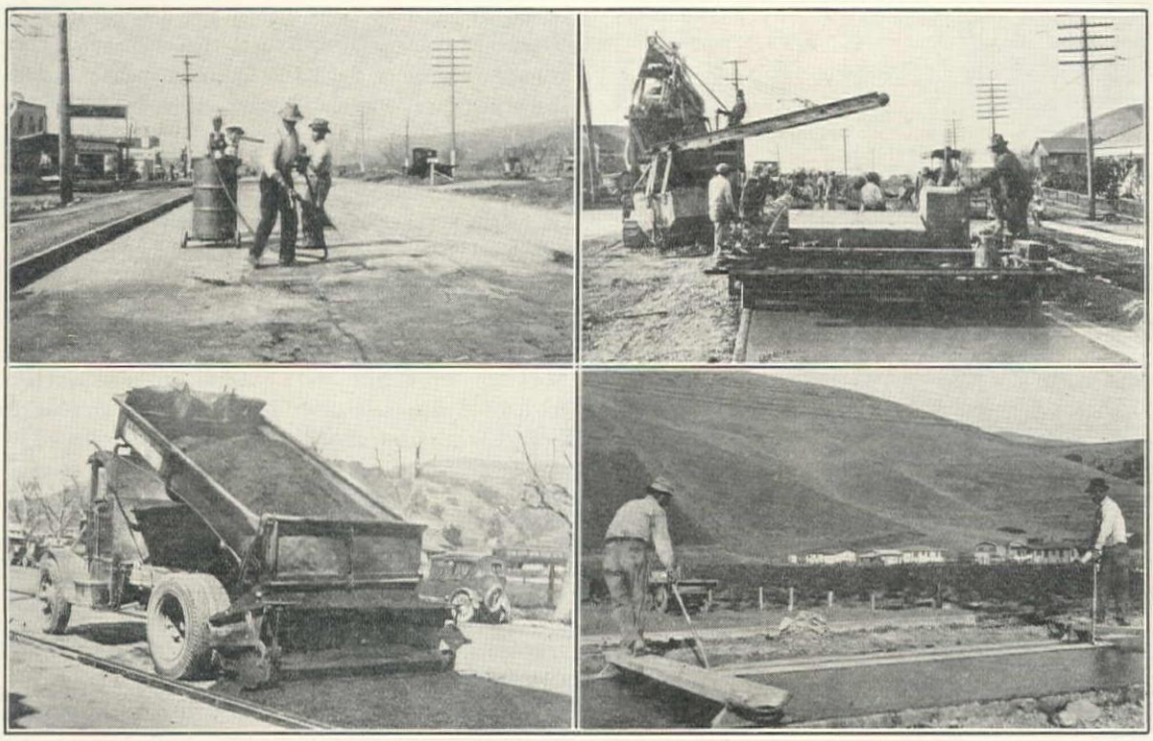
The following tabulation is of interest:

	P. C. C.	A. C. C.
Capacity of the key equipment	397 cu.yd.	585 tons
Best daily production secured	368 cu.yd.	559 tons
Efficiency during best daily production	92.7%	95.6%
Average daily production secured on those days when a start was made on mixing	290 cu.yd.	418 tons
Efficiency during the starting days	74.0%	71.4%

Remarks—It is hoped that the analysis has clearly demonstrated the importance of minor delays and avoidable major and minor delays.

In the case of portland cement concrete paving, it may be assumed that materials costs are a constant and that labor and equipment costs are constant per day of full operation. It is therefore evident that production will affect the unit cost of labor and equipment. Actually, the unit cost of these two items is inversely proportional to the production. It has been shown that avoidable delays made up 9.7% and 6.6% of the total available working time for the portland cement concrete and the asphaltic concrete paving respectively, and this was true of a well-managed job. Such losses make up a large part of the time available in all construction jobs. They should be eliminated, even if it becomes necessary for the superintendent to carry a stop watch.

In the case of asphaltic concrete paving, the problem is a little different. Here the characteristics of the mixing machine, the pugmill, are highly variable, in respect to both size and cycle time per batch. The capacity of a paver is fairly well defined by state specifications, and 400 cu.yd. of material per 8-hour day can be had with the standard paver. Although the law of inverse proportion holds for the relationship between total equipment and labor unit cost and daily production, there is also the problem of deciding just what capacity per day is the maximum attainable before the law of diminishing returns swings into effect. But, regardless of capacities, production and quality are the goals.

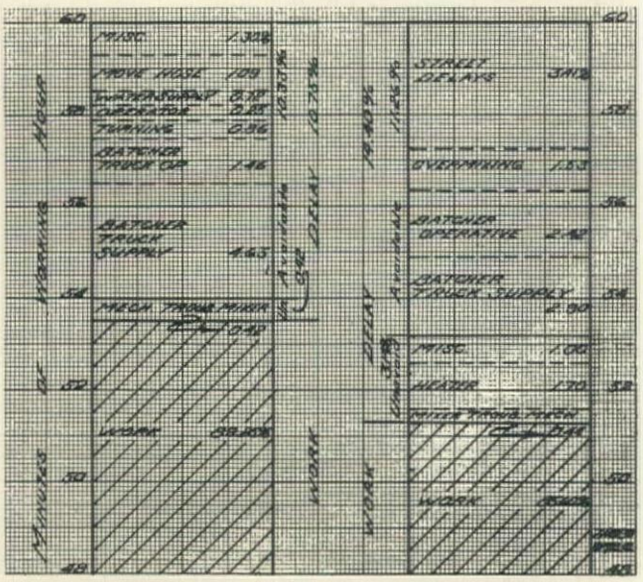


HAYWARD-NILES PAVING. (UPPER LEFT) APPLYING BITUMULS TO OLD PORTLAND CEMENT CONCRETE PAVEMENT PRIOR TO LAYING ASPHALTIC CONCRETE TOP. (UPPER RIGHT) MULTIFOOTE 27-E PAVER AND 10-FT. ORD FINISHER ON NEW PORTLAND CEMENT CONCRETE. (LOWER LEFT) MACK TRUCK LOADING 20-FT. GALION SPREADER BOX. (LOWER RIGHT) LONGITUDINAL FLOATING ON NEW PORTLAND CEMENT CONCRETE

Editor's Notes—The Hanrahan Co. bid for paving this 8.7-mile section between Hayward and Niles, Alameda county, was $325,305, others being $360,380, $361,503, $399,485, and $399,917; with the average bid $369,300. The contract was awarded August 29, 1929, and practically completed on April 15, 1930. Major items in the work included: 20,600 cu.yd. of roadway excavation at $0.30; 195,600 sta.yd. of overhaul at $0.01; 25,650 cu.yd. of imported borrow at $0.28; 3650 cu.yd.

of structure excavation at $1.40; 74,000 sq.yd. of subgrade for paving at $0.09; 9500 tons of crusher-run base at $1.40; 16,800 cu.yd. of 'A' concrete paving at $8.50; 21,000 tons of asphalt concrete paving at $4.40; 76,000 sq.yd. of asphalt paint binder at $0.02; 415,000 lb. of reinforcing steel at $0.04. The unit bid summary was published in the July 25th, 1929, issue, p. 40.

A short progress article appeared in the March 25th, 1930, issue, p. 168. Grading was begun August 15, 1929, using one Adams no. 10 leaning wheel grader and Caterpillar '60', one Russell 'Super Mogul' grader and Caterpillar '60', one Ateco hydraulic dirtmover and Caterpillar '30', two steam shovels on imported borrow (one Thew and one Osgood), one Barber-Greene trencher, one Barber-Greene model 407 loader, and one 10-ft. Carr subgrader hauled by a 12-ton roller. Air tools were operated from a Rix '6' compressor. Fourteen 5-ton trucks—Sterlings, Macks and Autocars—were used for hauling. Portland cement concrete paving began October 10, using the following equipment: two Multifoote 27-E pavers, Johnson batching hoppers and scales, one 10-ft. Ord finisher. Equipment on asphaltic concrete paving (work started Decem-



HAYWARD-NILES PAVING
Distribution of One Hour of Working Time

Item Cycle Data	P. C. Concrete (Mixer)	A. Concrete (Pugmill)
Charge	11.2 sec.	9.0 sec.
Mix	59.6 sec.	45.0 sec.
Discharge	1.8 sec.	16/2 8.0 sec.
Total Cycle	72.6 sec.	62.0 sec.
Possible Batches	49.6 per hour	58.0 per hour
Batches Obtained	44.2 per hour	49.6 per hour
Batches Obtainable (Avoidable Delays Eliminated)	49.4 per hour	56.2 per hour
Lost Batches	5.2 per hour	6.6 per hour
Loss (Evaluated at $47 per hour)	$4.85	$48/hour $5.50

ber 4) included one 2500-lb. Geiger asphalt plant, one P&H model 206 clamshell crane with 1-yd. Owens bucket, two 20-ft. Galion spreader boxes, one 20-ft. Ord tamper, four Buffalo-Springfield rollers (two 12-ton and two 8-ton). There was also one 5-ton Blaw-Knox truck turntable and one 20-ton Fairbanks-Morse truck scales on the work.

At grade and line changes the road was rebuilt with portland cement concrete, 30 ft. wide and 10-8-10-in. thick, using transverse expansion joints at 60-ft. intervals, with two intermediate dummy joints. At points where the old 18-ft. cement concrete pavement was left in, the new grade and width was obtained by surfacing with asphaltic concrete, first applying a paint coat of Bitumuls 'H' with a hand outfit. The top deck over old pavement had a minimum thickness of 3 in. and laid in 20-ft. strips.

Armco culverts, furnished by the California Corrugated Culvert Co., were used on the work. Pine headers were specified. Asphalt was supplied by the Standard Oil Co., the Calaveras Cement Co. furnishing 105,000 sacks of cement for the concrete. The Soule Steel Co. furnished all reinforcing steel and expansion joints. Kaweah limestone dust, Antioch sand, and Pacific Coast aggregates were used. E. J. Immel, of Berkeley, did the structures and H. V. Tucker Co., San Francisco, subcontracted the rough grading and all hauling.

W. F. Hanrahan is president, T. A. Hanrahan vice-president and general superintendent, M. S. Hanrahan secretary, H. A. Daae engineer, and S. P. Doyle office manager for the Hanrahan Co. of San Francisco. This contract was in district IV of the California Division of Highways, of which J. H. Skeggs is district engineer and E. G. Poss assistant district engineer. William Rice was the resident engineer on this contract. C. F. Rogers, assistant highway engineer, U. S. Bureau of Public Roads, with present headquarters at district 2, San Francisco, is in direct charge of studies made by the Division of Management.

WYOMING TO VOTE ON HIGHWAY BONDS

At the November 4 election in Wyoming, a $2,800,000 highway bond issue will be voted upon. This bond issue, if carried, will make possible the financing of the State Highway Department for a 3-year period and be equivalent to re-issue of the 1919 bonds whose retirement was accomplished through motor vehicle license fees on July 1, 1930, nine years in advance of the due date. The primary object of the bond issue is to immediately obtain funds to match Federal aid which will be available for the next three years.

SANTA FE RAILROAD EXTENSIONS

The Santa Fe Railway Co. will start construction immediately on 380 miles of new lines, to cost about $15,000,000, in Colorado, Oklahoma, Texas, and New Mexico. One line will extend from Amarillo, Texas, to Las Animas, Colorado (220 miles); a second from Felt, Oklahoma, to Colmor, New Mexico (110 miles); and a third from Spearman, Texas, to Dumas, Texas (50 miles). Additional details will be published shortly.

WESTERN PACIFIC CONTRACT AWARDED

The Western Pacific Railroad Co. awarded a contract July 29 to the W. A. Bechtel Co. and the Utah Construction Co. on a joint bid for 112 miles of main line railroad between Keddie, California, on the Feather river canyon route, and Bieber, California, where a connection will be made with the 88-mile Great Northern extension south from Klamath Falls. Construction is to begin at once and will be rushed to completion. The estimated cost of the project, $9,824,669, includes $4,500,000 for labor, $4,800,000 for materials, and the balance for rights-of-way and engineering. A pre-bid article, including estimated quantities, was published in the July 10th issue, p. 337.

J. W. Williams is chief engineer and T. L. Phillips is principal assistant engineer for the Western Pacific Railroad Co. at San Francisco. R. A. Hollenbeck, construction engineer, with headquarters at Greenville, California, is in direct charge of construction between Keddie and Bieber. Two locating parties are now in the field, one under Hollenbeck and the other under H. V. Johnston, locating engineer. These parties will handle construction during the early stages, but there will be seven residencies on the work beginning about September 15. H. M. Smitten is bridge engineer and R. I. Glouster is office engineer for the Western Pacific at San Francisco.

Fourth Street Viaduct, Los Angeles

By CHAD F. CALHOUN
General Manager, Fisher, Ross, MacDonald & Kahn, Inc., Los Angeles

Fifty railroad tracks, three streets, and a 250-ft. river channel will be spanned by the Fourth st. viaduct now being constructed for the city of Los Angeles by Fisher, Ross, MacDonald & Kahn, Inc. As the fifth and largest of six bridge crossings of the Los Angeles river and adjacent trackage, this project is part of a program begun in 1923. The estimated cost of the unit, including the wrecking of two existing bridges, a west approach, damages, rights-of-way, and the viaduct proper, is $2,800,000.

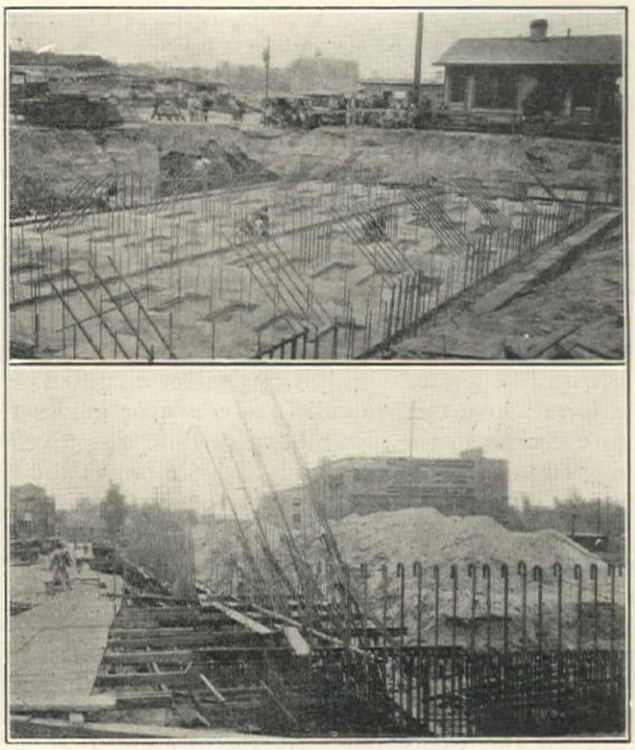
Bids for the viaduct were received April 2, 1930, the lowest of five bids submitted being $1,246,635. The contract was signed May 14 and work began immediately. Concreting started June 7 and by June 19, one-fourth of the 50,000 cu.yd. total excavation had been completed and 2100 cu.yd. of concrete placed.

On July 1, the east approach walls, abutments 1 and 2 for the arch spanning Mission road, abutment 3 (east river abutment for the 254-ft. arch), and the Fourth place approach walls were under construction. It is estimated that the contract will be completed during August, 1930.

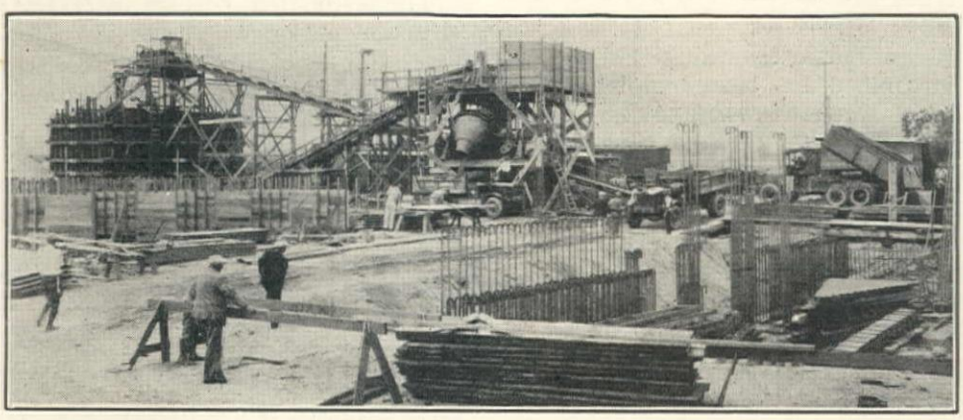
Included in the Fisher, Ross, MacDonald & Kahn contract are: Arch centers—$40,000; reinforcing steel —$250,000; concrete—44,200 cu.yd. class 'F' at $16.25 and 1000 cu.yd. class 'D' at $5.00; reinforced concrete piles (cast in place)—$25,000; grading—$40,000; gutter —7750 sq.ft. at $0.30; sidewalk—34,700 sq.ft. at $0.20; sewer and storm drain—$25,000; paving (in place)— $30,000; ornamental handrail and pylons—$36,000; transformer—$1200; and lighting standards.

Design—The viaduct has an overall length of 2600 ft., consisting of approaches, ten abutments, and eighteen piers, and extends from Mateo st. on the west to Mission road on the east. There are seven arch spans of 64½ to 117½ ft., and one 254-ft. arch across the river channel. The remaining eighteen spans are of girder and slab design. The overall width of the bridge is 71 ft., with a 56-ft. roadway.

Approach grades are on fills between cantilever type reinforced concrete retaining walls. Street crossings, of which there are three, are made by barrel-type, unsymmetrical, rigid frames, each having a curved top member. The 254-ft. arch span across the Los Angeles river is of the open spandrel type, with four ribs. Highway and sidewalk loads are carried on the outside ribs and highway plus railroad loads on the inside ribs. To avoid secondary stresses due to rib shorten-



Fourth St. Viaduct for City of Los Angeles, June 13, Fisher, Ross, MacDonald & Kahn, Contractors. (Upper) Footing of Abutment No. 2. (Lower) Footing of Retaining Wall for East Approach



Fourth St. Viaduct, June 18. Smith 2-yd. Mixer Loading Brockway-Indiana Truck

ing, shrinkage of concrete, and abutment settlements, and to reduce deflection in the structure, temporary hinges are used for the arch ribs. These hinges are of concrete, spirally reinforced, centered on the axis at the springing and crown lines. Using a 1: 2: 3 concrete with five separate gradings of aggregate (fine sand to 1½-in. rock) and with thorough compaction, the hinges are expected to develop an ultimate strength of more than 5000 lb. per sq.in.

Construction—Concrete is being mixed in a central plant at 4th and Mission st., the east end of the work. Cement is delivered sacked direct by rail and is placed on an 18-in. belt conveyor running through the cement storage house and to the mixer platform. Sand and rock are delivered by truck and trailer and dumped into a pit which feeds a 24-in. belt conveyor running from the pit to the top of the bunkers. A revolving spout operated by a cable from the receiving pit delivers the aggregate to the proper one of five bins. The bottoms of the bunkers rest on the ground and above a 12-ft. pit. All aggregates are weighed in one 2-yd. Madsen batch box, weights being read to 5 lb. on a single 24-in. dial. The batch hopper discharges direct to a 30-in. conveyor which delivers to a 2-yd. electrically operated Smith tilting mixer mounted on a platform above the ground. The conveyor moves the entire charge to the mixer hopper while the mixer is being emptied. Concrete is mixed 1½ minutes and the batch is dumped direct into trucks equipped with regulation bodies. When used for hauling concrete, the regular tail gate on these trucks is removed and a special 15-in. hand-operated converging tail gate is bolted in. With this arrangement, the concrete flows readily when the body is raised for dumping, and there is little segregation. When not used for concreting, the special gate is removed and the trucks work on the excavation. At the present time, the trucks discharge concrete by short chutes direct to the footings. Concrete in the walls, piers, and deck will be placed from 1-yd. bottom-dump buckets, elevated by crane, the trucks discharging direct into the dump buckets.

The Stephens-Adamson Co. furnished all of the conveyors used in the construction plant.

Excavation of the east main river abutment, extending 22 ft. below streambed, has been completed without sheeting, although water was encountered in small amounts 3 ft. from sub-grade. Cast-in-place concrete piles under this and the other river abutment are being driven by the Raymond Concrete Pile Co. Two Bucyrus-Erie 1¼-yd. gas+air shovels, used alternately as draglines or clamshells, are handling the excavation. These rigs with 50-ft. booms will later be used to hoist the concrete in 1-yd. dump buckets.

Personnel—This viaduct was designed by Merrill Butler, engineer of bridges and structures, with H. H. Winter as principal assistant. H. P. Cortelyou is superintendent of general construction and L. E. Meidroth is resident engineer for the city; J. J. Jessup is city engineer, R. W. Stewart is deputy city engineer, and D. M. True is office engineer. Robert Youmans is superintendent for the contractors.

RANDOLPH FIELD IMPROVEMENTS, TEXAS

The constructing quartermaster, Randolph field, Texas, awarded contracts on June 27 to the Southern Steel Co., San Antonio, for 3600 lin.ft. of non-climbing fence around the airdromes and to Kirkwood, Wharton & Lee, San Antonio, for 35,000 lin.ft. of 8 to 30-in. drainage pipe. Arthur W. Parker, captain, Q.M.C., is constructing quartermaster for Randolph field.

SAN FRANCISCO BAY BRIDGE

On July 22, the joint Federal-State San Francisco Bay Bridge Commission, of which Mark L. Requa is chairman, selected a route for the proposed transbay bridge. This route is from Rincon hill at the foot of Harrison st., San Francisco, to Goat island, thence to the Key System fill, and along this fill to Yerba Buena ave., in Emeryville, the Eastbay terminus being at San Pablo ave., Oakland.

A geologic study showed that the San Francisco peninsula and Goat island were once connected by a low mountain range passing through Rincon hill. The remnants of this range provide good foundation at reasonable depths. A deep channel exists east of Goat island, but the piers there can be placed on piling. The remaining sites for the bridge have been discarded as unfeasible.

The San Francisco bay bridge would have a length of 7600 ft. from the foot of Harrison st. to Goat island, using four central spans of 1600 ft. and two 600-ft. approach spans. Between the San Francisco short line and the Key System fill, the distance is 21,000 ft., the stretch from Goat island to the fill including a 750-ft. span and then steel trestle to grade. The project would require a tunnel through the top of Goat island. The tentative designs call for a two-decker cantilever about 60 ft. wide and 221 ft. clear height above mean low tide. There would be four passenger auto lanes and two truck lanes on the upper deck and four interurban street car lanes or two street car and two truck lanes on the lower deck. Multiple approaches are being considered for both ends of the structure.

The estimated cost is $72,000,000 and the construction period will be between four and five years. Operating as a public toll bridge serving 50,000 interurban passengers and 12,000 automobiles per day, the bridge bonds would at present ferry rates be retired in 20 years.

Besides its chairman, the personal representative of President Hoover, the bridge commission is composed of W. H. Stanley and L. E. Gregory, rear admirals, U. S. N.; G. B. Pillsbury, brigadier general, and E. L. Daley, colonel, U. S. A.; Arthur H. Breed, state senator; C. H. Purcell, state highway engineer; C. D. Marx, professor emeritus at Stanford University; and George T. Cameron, publisher. Surveys and borings were made by the California State Highway Commission, C. E. Andrew, bridge engineer, assisted by army and navy engineers and representatives of the two ferry systems affected. The design and construction of this project would be handled by the State, approval by the War Department being the next step after public hearings which are now in progress.

Stanford Cleans 12-in. Cast-Iron Water Main

University Employs the 'National Method' to Recondition Nearly Five Miles of Irrigation Supply Line Between Searsville Lake and the Quad

Water main cleaning is an effective remedy for a diminishing supply. It will often save the cost of a new line, eliminate expensive temporary expedients which have been added to the system as the carrying capacity of the mains decreased, and both improve the potability of the water and bring back much-needed pressure. Little of this type of maintenance has been done by western waterworks men and few of them willingly admit that their system needs it. They are careful of the visible portion of the water system — certainly the invisible portion deserves as much attention.

Stanford University and the National Water Main Cleaning Co. used the 'National Method' to restore an important irrigation supply line to its full usefulness, with surprising results and at comparatively small expense. There was no inconvenience from the line being out of use, as the cleaning period was short and an alternate irrigation supply was available from the

Fig. 1. Tubercules on Section of 12-in. Cast-Iron Irrigation Supply Line for Stanford University. Pipe in Service 38 Years Before Cleaning

recently enlarged Felt Lake reservoir. The pipe-line was opened in but few places and for only short sections. To the uninitiated, the work was not only interesting but bordered on the spectacular.

The Stanford project involved a 12-in. cast-iron irrigation supply line from Searsville lake to the University 'Quad', a distance of 25,000 ft. This pipe was asphalt dipped and laid with lead joints in 1892; it had never before been cleaned. The installed capacity of the line was 3.5 c.f.s. and on June 19, 1930, shortly before cleaning, it was only 2.01 c.f.s. By the Hazen-Williams formula, $v = 1.318\, C_1\, r^{0.63}\, s^{0.54}$, '$C'_1$ was found to have a value of 65 on June 19 and of 124 on July 12, following the cleaning. (King* recommends that a value of $C_1 = 100$ be used for estimating discharges of pipe-lines where the carrying capacity after a series of years is the controlling factor.) Cleaning increased the effective diameter of the pipe from 9.3 to 12 in. With the pipe flowing 2.72 c.f.s., the head loss after cleaning was 4 ft. per 1000 ft.

Cast-iron water mains require cleaning at varying intervals because of tuberculation of the metal and formation of deposits in the pipe. If their diameter will not admit a man, these mains can be effectively cleaned by sending or pulling a machine through them, the cleaning device being inserted either through a special connection or by removing a short section of pipe to set the machine and then returning it to the line. The machine generally used is known as a pontoon type, and is carried through the line by pressure, whether by gravity or pumping. Normal water work-

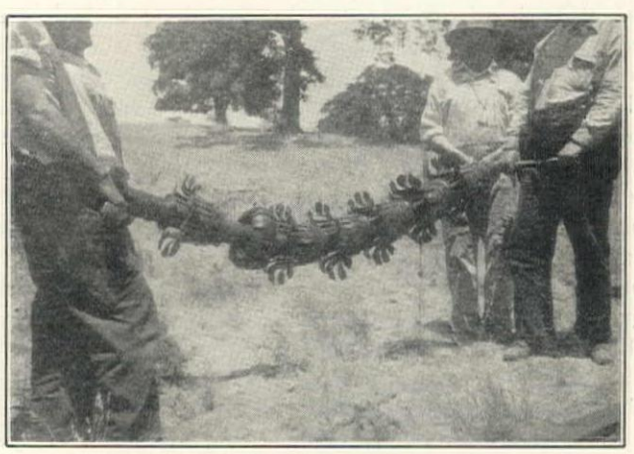


Fig. 2. Pontoon (or Mushroom) Type Cleaner Used by National Water Main Cleaning Co. on Recent Stanford University Contract

ing pressure is usually sufficient to produce the cleaning action. Of course, if ample pressures are not available, the same results are obtained by pulling the machine through the line with a cable and winch. The cleaner is so designed that it passes readily through gate valves and other fittings, or bends not exceeding 45 deg. The water main cleaner takes off and breaks up all clogging matter, flushing it out ahead through an open hydrant or blowoff. The operation does not destroy the asphaltic lining of the pipe and where the 'National Method' is used it is guaranteed to restore the line to 95% of the carrying capacity of new pipe.

Irrigation demands for the Stanford campus exceeded the normal capacity of the line and, together with natural clogging, required installation of a 6-in. Byron Jackson booster pump about two years ago. Since its cleaning, the pipe has delivered more water

*"Handbook of Hydraulics', 2nd Edition, H. W. King, McGraw-Hill Book Co., Inc.

without the booster pump than it did when that expedient was used on the dirty main.

Cleaning of the Stanford irrigation line was begun June 30 and completed July 12, 1930, the 25,000 lin.ft. of pipe being covered in six 'shots' of varying length, depending on the judgment of the field superintendent. For the second 'shot', typical of the work, a 12-ft. section in the pipe-line immediately below the booster pump was removed by cutting off the bell and the pipe then rolled out on the ground so that the cleaner could be inserted. To make the setting, it was necessary to use chain falls after the pull of a light truck proved insufficient. The cleaning machine was flexible and had a total length of 6½ ft., with six cutting heads and two sealing pistons, and somewhat resembled a centipede (see Fig. 2). The cutting heads were equipped with spring steel blades, those on the two front heads having sharp triangular teeth. A perforated nose permitted the passage of flushing water and collected material.

After returning this length of pipe to the line and applying a connecting sleeve, a point for removal of the machine was selected and opened. A gravity flow was then turned into the line and men were stationed at blowoffs and exposed pipe crossings to note progress of the cleaner. With the full pressure due to gravity (30 lb.) the machine was unable to make satisfactory headway against the flat slope and clogged condition of the pipe. However, when the booster pump was started and the pressure raised to 80 lb., the machine went rapidly into action. As its rate of travel did not exceed that of a man walking moderately, the machine could be traced either by a characteristic noise or by vibration of the ground where the pipe was buried at considerable depths. In the latter case, a slender stick was effective in catching the vibrations. It was a simple matter as the cleaning progressed to determine the exact location of sections of the line which had been 'missing' since the time of the 1906 earthquake and fire, when the complete record of the system was destroyed.

A short section between the storage dam and booster pump was satisfactorily cleaned with a 3-head machine at 24-lb. pressure.

A varied assortment of vegetable growths, mud, and scale was removed by the machine and flushed through the lower opening to a nearby creekbed, leaving the interior of the pipe in fine condition. Tubercules such as those shown in Fig. 1 were cut off clean and the line, freed of 'corruption', now has many more useful years after 38 of continuous service.

J. W. McDonnell is engineer for Stanford University and R. H. Button is superintendent of buildings and grounds. Cleaning of this line was in charge of R. S. Olding, field superintendent for the National Water Main Cleaning Co. The Water Works Supply Co., San Francisco and Los Angeles, represents the National Water Main Cleaning Co. of New York City on the Pacific coast.

On July 27, an 18-in. wood-stave line for The Paraffine Companies, Inc., at Emeryville, California, was successfully cleaned by the 'National Method' without damage to the pipe. This 1450-ft. salt water line, laid in 1924 between the plant and San Francisco bay, had incrustations from 2 to 2½ in. thick. Cleaning restored its carrying capacity to that of new pipe.

RAILWAY BUILDING LOANS

By provisions of S.B. 4311, introduced at the 71st Congress, 2nd session, on April 28, and referred to the Committee on Interstate Commerce, it is planned to extend Federal credit, based upon Government ownership or control of one-half of the 1,200,000 sq.mi. in the eleven far western states, for the purpose of constructing railroads in these states.

TARIFF INCREASES ON CONSTRUCTION MATERIALS

The effect of major tariff increases on construction materials is shown in the following table:

Commodity	New Tariff	Old Tariff
Brick	$1.25 per M	None
Cement	$0.06 per cwt.	None
Pig iron	$1.125 per ton	$0.75 per ton
Soft lumber	$1.00 per M f.b.m.	None

PROPOSED NATIONAL MONUMENT AT BOULDER DAM

Consideration is being given to the creation of a national monument which will include the lake, 115 miles long, surface area 150,000 acres, behind Boulder dam. On April 25, about 4212 sq.mi. of public domain in the region was withdrawn from settlement pending examination of the land.

WYOMING HIGHWAY BIDS RECEIVED

On June 13, the Wyoming Highway Commission opened bids for its third 1930 letting, as follows:

Project	Length	Type of Work	Low Bid
Gillette-Moncroft Road	11.0 miles	Surfacing	Watt Bros. Const. Co. ($22,630)
Lander-Rawlins Road	11.5 miles	Surfacing	Tyler & Baker Const. Co. ($30,863)
Jackson-Moran-Cheney-Wilson Roads	17.4 miles	Surfacing	Three Bros. ($31,640)
Cokeville-Star Valley Road	2.9 miles	Grading	Thos. E. Madden ($17,000+)
		Raise grade	Blanchard Bros.
Medicine Bow-East	3.0 miles	Surfacing	($10,965)
Walcott-Parco-Hanna Roads	25.5 miles	and surface	Jones Co. & T. O. Lever ($52,357)

NEW MEXICO HIGHWAY DEPARTMENT PUBLICATIONS

The New Mexico Highway Department has issued a bulletin containing detailed information on oil-processed roads within the state. New Mexico began oil-processing three years ago and had 300 miles of this type of road on January 1, 1930, with plans to oil about 250 miles additional during 1930. W. C. Davidson, state highway engineer, and E. B. Bail, construction engineer, collaborated on this non-technical bulletin.

The Department now has ready for distribution its 1930 tourist road map of New Mexico, 17 by 21 in., with road types shown in colors.

Sepulveda Boulevard Tunnel, Los Angeles

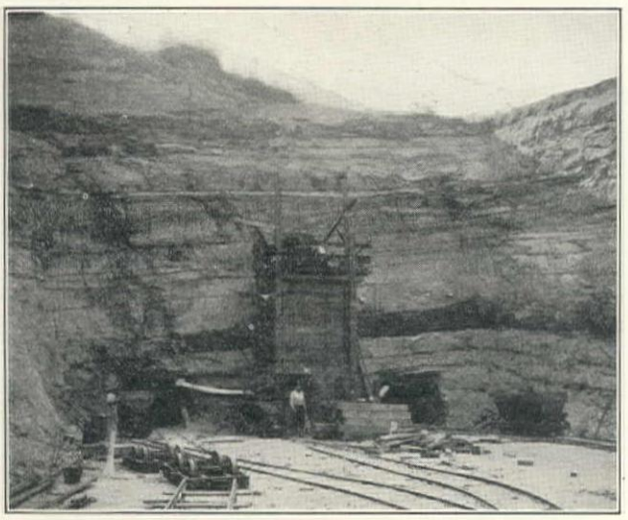
Construction Methods on 655 Lin. Ft. of Vehicular Tunnel Under Mulholland Highway and 7.65 Miles of Boulevard Grading

By J. L. DONOVAN
J. G. Donovan & Son, Glendale, California

Editor's Note—J. L. Donovan was born in Los Angeles. He spent 2 years at Occidental College and then 5 years intermittently as timekeeper and foreman on private excavation and on grading subcontracts with his father, J. G. Donovan. For the last 7 years he has been junior partner with J. G. Donovan & Son, grading contractors. This firm built the first section of the high-gear road to Big Bear Valley (1928) and began the Sepulveda blvd. project in September, 1929.

The grading and improvement of Sepulveda blvd. between Wilshire and Ventura blvd. in the city of Los Angeles represents an important feature in development of the highway system which will link San Fernando valley with the San Joaquin hinterland and with the Pacific ocean. Sepulveda blvd. will provide a through artery from Santa Monica, Wilshire, Beverly Hills, and Hollywood to the Los Angeles metropolitan airport, reducing the distance between that airport and Wilshire blvd. 6½ miles and that to San Pedro by 13 miles.

A nearly completed section, for which we have the contract,* includes 7.65 miles of grading and 655 lin.ft. of tunnel under Mulholland highway, the width of

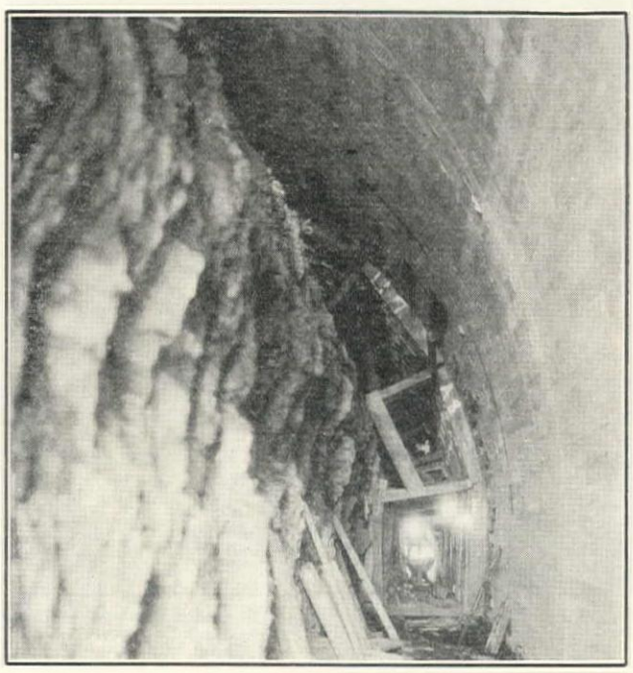


Sepulveda Tunnel from North Portal, Showing Side Drifts and Muck Bunker in Front of Top Drift

roadway being 62 ft., maximum centerline grade 4.5%, minimum radius of curvature 187 ft., and summit elevation 1193.6 ft. The width of tunnel is 42 ft. between side-walls, of which 36½ ft. is roadway, 4 ft. is sidewalk, and 1½ ft. is a wheelguard. The height of tunnel from roadway to arch crown is 26½ ft. and the roadway at the center of the tunnel is 140 ft. below Mulholland highway.

Plans and specifications for the tunnel were prepared under the direction of Merrill Butler, engineer of bridges, and the grading plans were drawn by J. T. Thomas, division engineer at Sawtelle, who is preparing plans for the paving. Our work is a cash job, the contract being signed August 30, 1929, with 400 days contract time (estimated completion date September 1, 1930).

The estimated excavation, including grading, ditches, channel changes, and tunnel, with a 15,000-yd. allowance for slides, is 568,284 cu.yd., or a daily average of 1420.7 cu.yd. Included in the tunnel work is



Side Drift and Concrete Lining for Sepulveda Tunnel, Wall Forms Braced from Central Core

599 lin.ft. of cross-section No. 1, 16 lin.ft. of cross-section No. 2, and 40 lin.ft. of portal structure.

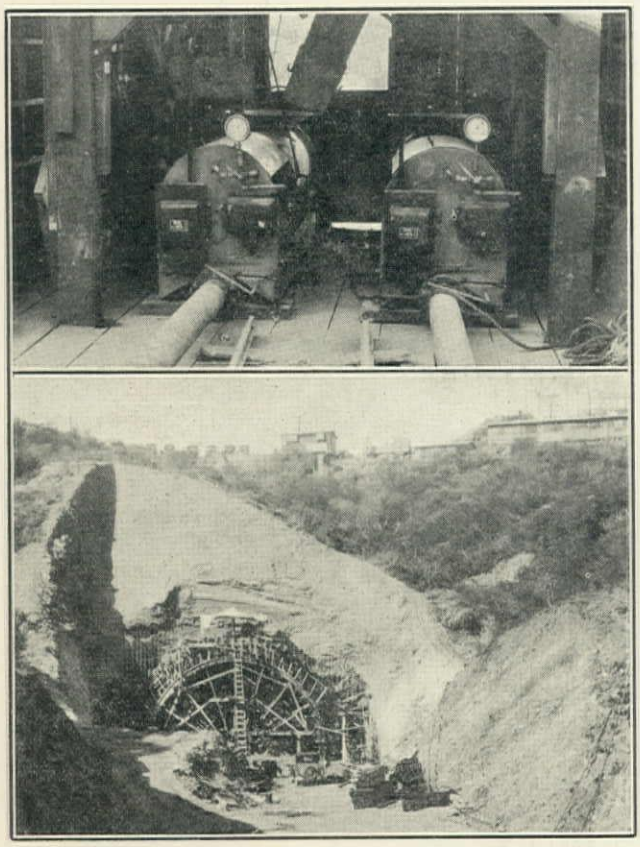
Many interesting problems have been encountered in the grading, tunnel driving and enlargement, temporary timber lining, wall forms, concrete lining, and core excavation on this contract. The construction methods are described hereafter.

Driving Tunnel—Tunneling was begun from the north portal on October 16, 1929, three drifts being driven through to the south end. These drifts were 9 ft. 4 in. wide by 8 ft. high outside of timbers. The top drift was driven 1 ft. below the extrados line at the crown of the arch, and the side drifts at the top of the footing grade 1 ft. in from the outside line of the wall. All drifts were timbered with douglas fir sets on 4-ft. centers, the sets consisting of 8 by 8-in. posts and caps. The side walls of these drifts stood without

*See unit bid summary in the March 10th, 1929, issue, p. 40; progress article in the November 25th, 1929, issue, p. 628; and a description of the engineering features in the December 25th, 1929, issue, p. 667.

lagging, but 2 by 12-in. lagging was required for the crown. (The south half of the tunnel is in shale and the north half in sandstone.)

Hand excavation, the miners working under forced ventilation and using 6 Ingersoll-Rand jackhamers and 12 Ingersoll-Rand clay diggers, was made at an average rate of 15 ft. per 24 hours (3 shifts). Material excavated from the top drift was deposited in a 50-yd. bunker at the north portal and from there discharged by gravity to 16-ft. Koppel-type side-dump cars. These cars were hauled in 3 to 4-car trains by a 4½-ton Whitcomb gasoline locomotive on a 24-in. narrow gauge and 4½% grade. The two side drifts, which went in at the top of footings, carried 24-in. gauge



(Upper) Two 14-ft. Ransome Pneumatic Concrete Guns Above North Portal Muck Bunker, 6-in. Delivery Lines Leading to Top Drift. (Lower) South Portal Form Work, Camp in Background

tracks and material from their excavation was loaded direct into the 16-ft. cars.

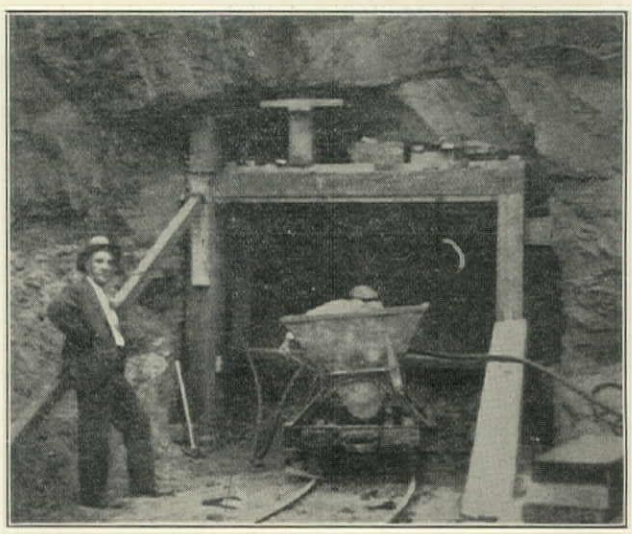
Placing Footings—After the drifts were completed on December 5 and 6, 1929, excavation was made for the footings to carry the tunnel lining. As this excavation progressed, a central mixing plant was installed, as described hereafter. As the footing excavations were made, the side walls were drilled back 1 ft. to neat walls, the outside posts of each square set being removed for this purpose. An 8 by 8-in. plate was put in about 18 in. from the end of the cap timbers and was supported by a 3-in. standard iron pipe resting on a steel plate in the bottom of the footing excavation. After the concrete footings were in place, the pipes were cut off flush with the top of the footings.

Enlargement for Lining—When the footings were in place, that portion of the tunnel following the periphery of the side walls was excavated, leaving a central core. This method allows us to brace the forms from the core, saving a great deal of heavy timbering. Also, it permits the excavation and removal of most of the tunnel material by gasoline shovel and dump trucks after the lining has been placed. Thus, the cost of the work is greatly reduced below that for straight tunnel excavation. The enlargement section was trapped down into the lower drifts by the stoping method and material was removed with the mine cars. The rate of enlargement averaged 8 ft. per day, this work being completed the last of May.

Enlargement timbering on 4-ft. centers is used all the way around the extrados line and is removed before concreting.

As enlargement is carried forward, the temporary timber lining is placed. This consists of segments cut from 8 by 12-in. by 8-ft. douglas fir, supported by 8 by 8-in. posts. The temporary lining is not continuous but consists of rings placed on 5-ft. centers (3 by 12-in. lagging is used behind the arch rings where the ground formation makes this necessary); it extends beyond the spring line and rests on the concrete footings. Enlargement and temporary timbering are kept 100 ft. ahead of the wall forms.

Wall Forms—After enlargement has been made and the temporary timber lining placed, wooden forms for the wall lining are constructed. The arch rings are made of segments cut from 6 by 12-in. timbers to the radius of the intrados line and are spaced on 2 to 3 ft. centers, depending on the load. Each ring is composed



Starting East Drift from North Portal, Sepulveda Tunnel, J. G. Donovan Standing Near 16-ft. Koppel Type Muck Car. Two Douglas Fir Sets in Place

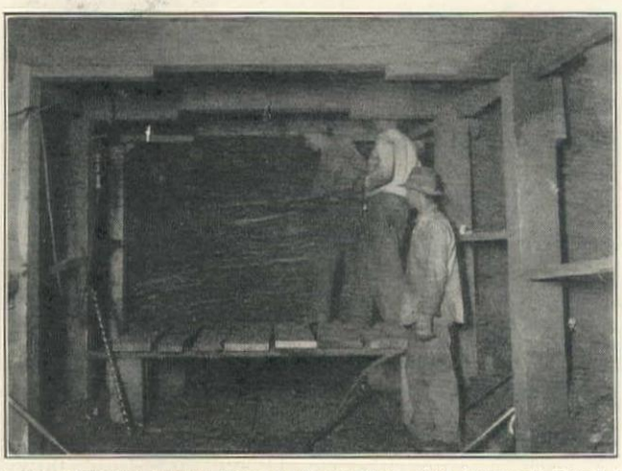
of 8 curved segments and 2 straight pieces. The weight of supported material can be developed by flatness of arch—possible in this case as the tunnel excavation is not in running ground. The segments rest at their joints on a beveled cap cut from a 6 by 8-in. timber, and are supported by 6 by 6-in. posts which in turn rest upon carefully prepared wooden foot blocks on the core. The arch rings are covered with sized 2 by 6-in. lagging, the edges being beveled to give a tight joint on the outer face. The side of the lagging against which concrete is to be placed is left rough so that the

concrete surface will be satisfactory for plastering. Forms are built in 25-ft. sections, there being enough for three runs, or a total length of 75 ft.

Removing Temporary Lining—The form arch rings are placed between the arch rings of the temporary timber lining and, as the lagging is brought up from the bottom, the temporary lining is removed. During this process, the load is transferred to the form by means of 2-in. pipe sprags filled with concrete. The sprags rest on 5 by 5-in. concrete blocks on the surface of the form and on 6 by 6-in. steel plates against the earth.

Concreting Plant—Cement shed storage is provided at the level of Mulholland highway with space for 2000 sacks, or about a one-day run. Sacked cement is delivered by truck from a mill at Riverside and from the unloading platform is carried by gravity in a covered chute to the cement room at the rear of the mixer.

The aggregate bunkers have a total capacity of 400 tons in four sizes—1½-in., ¾-in., pea gravel, and sand. All aggregates are produced in the San Fernando valley and delivered by 20-ton trains (truck and trailer) and end-dumped onto a platform above the bunkers. The bins are kept well filled so as to provide over one



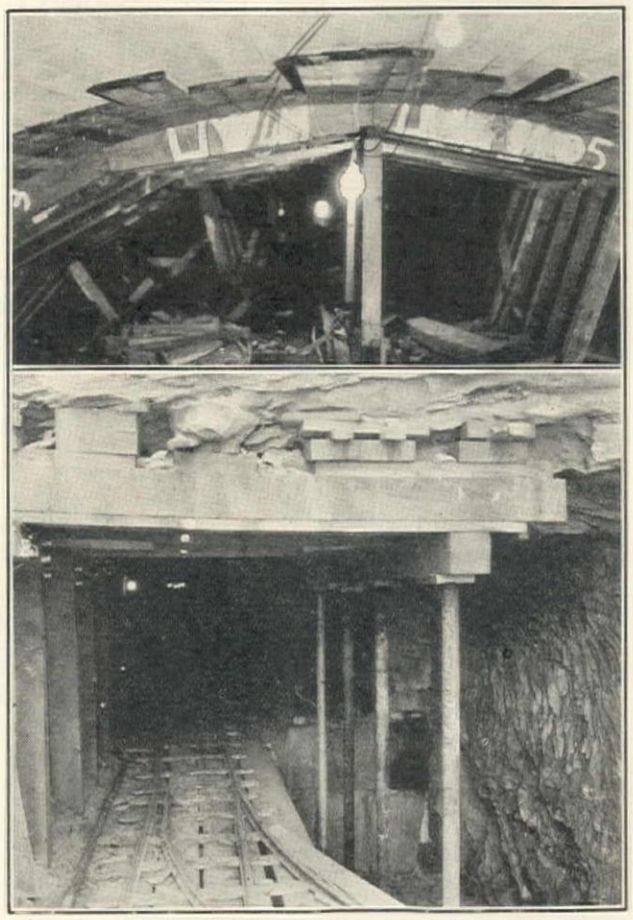
Miners Working Under Forced Ventilation with Ingersoll-Rand Air Tools in Top Drift of Sepulveda Tunnel 432 ft. from North Portal

day's run. Aggregates are batched by two Rucker weighing hoppers—one for two sizes of rock and the other for one size of rock and the sand. Cement is placed in a dump box and measured by volume, the water being controlled by a measuring tank on the mixer. A 1: 2: 3 blended mix is produced, using a 7-sack, 1½-minute batch in a 28-S Koehring mixer.

Concrete is chuted in an 8-in. casing, 300 ft. long and on a 30 deg. angle, to a 2-yd. metal-lined hopper which in turn discharges into two 14-ft. measuring hoppers, each suspended above a 14-ft. Ransome pneumatic concrete gun. These guns discharge at 60 to 35-second intervals, depending on the distance to the point of lining.

Delivery of Concrete from Guns—The concrete guns are set on top of the north portal muck bunker and concrete is transported through the top drift in two lines of 6-in. standard flanged wrought-iron pipe, one line on each side. The delivery pipes make two sharp bends as they pass over the top of the forms and down each side to within 8 ft. of the bottom of the wall. Much difficulty is experienced from wearing at the bends, and for the shorter bends special Duraloid castings have been substituted for the wrought-iron. These special castings we find will outlast the ordinary wrought-iron bends five times. By threading the pipe so that each length extends beyond the flange, it is possible to chip and smooth out the joint so as to materially reduce the wear. The chief wear on the delivery lines occurs at bends and on the discharge ends of the pipes.

For air supply to the concrete placing guns, the initial installation included one 1200-c.f.m. Chicago-Pneumatic stationary compressor powered by a 250-hp. Fairbanks-Morse electric motor; one 300-c.f.m. Ingersoll-Rand stationary compressor powered by a



(Upper) Timbering and Forms in Top Drift Near South Portal. (Lower) Pipe Sprags Carrying Load on Side Drift

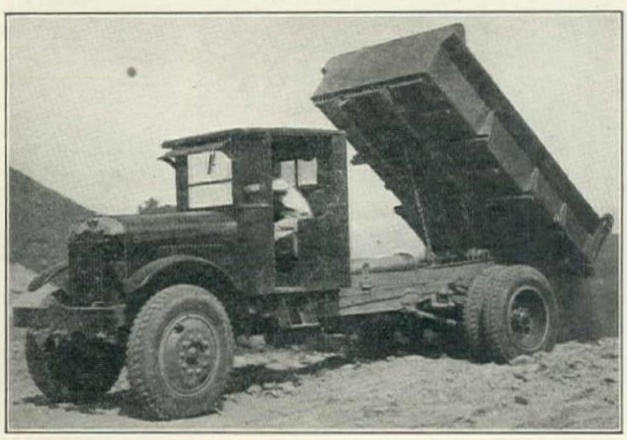
50-hp. General Electric motor (both units being placed in a compressor house on the summit near Mulholland highway); one 310-c.f.m. Ingersoll-Rand type 20 portable and one 220-c.f.m. Chicago-Pneumatic portable compressor on the grade near the north portal. Near the portable compressors, 1500 cu.ft. of compressed air storage is provided in two tanks. The above air supply proved inadequate, and one 310-c.f.m. Ingersoll-Rand type 20, one 310-c.f.m. Sullivan, and two 310-c.f.m. Chicago-Pneumatic portable compressors were added, giving a final rated capacity of 3270 c.f.m. and an actual volume of delivered free air of 2350 c.f.m. The supply line between the stationary compressors and guns was at first 3 in. and, with 115 lb. pressure at the compressors, there was only 90 lb.

at the guns. This 25-lb. loss was cut to 2 lb. by laying a 6-in. supply line to the guns in lieu of the 3-in. line. For shooting concrete near the south portal (between 600 and 700 ft.) it was necessary to use 105 lb. of air at the guns, this pressure decreasing as the lining approaches the north portal and thereby lessening excessive wear on the pipes and bends and preventing

Bucyrus-Erie 1¼-yd. Gas+Air Shovel Loading 8-yd. Republic-Linn Truck Tractor on Sepulveda Blvd.

undue strain on the forms. We might have been able to shoot a lesser amount of concrete with less air if so much (200 cu.yd.) had not been required by specifications for deposition in each pour. Under existing conditions, we must have sufficient compressor capacity to build up back air between shots.

If the 2-gun system and 2 delivery lines were not used, it would be impossible to get continuity of pour. Under the method used, concrete is brought evenly up each side of the wall and there is no need for changing



Republic 4-yd. Dump Truck Grading on Sepulveda Blvd.

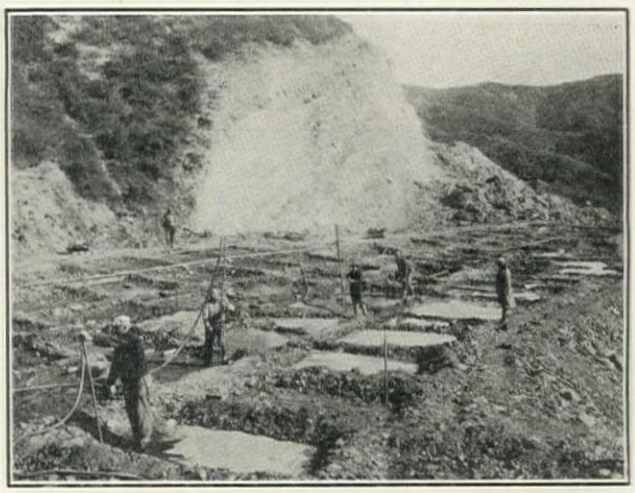
the discharge end of the line from one side to the other.

Placing Concrete in Forms—It has been the general practice on tunnels to place discharge pipes through a bulkhead and then shoot concrete until the section is filled. On Sepulveda tunnel, where the reinforcing steel is within 2½ in. of the form on the intrados line and a copper seal joint has to be placed at the end of each section, this practice could not be followed. The delivery lines on our project have to be carried clear over the arch and down the sides so that shooting is always done directly into previously deposited concrete. Furthermore, we are required to 'boot' all concrete as placed, in accordance with Los Angeles specifications.

As the pour comes up the sides of the wall, sections of the discharge pipes are removed. This is a difficult and rather slow operation, as the working space—varying from 40 to 20 in.—is filled with sprags and reinforcing steel. With the plant capacity used, 240 cu.yd. of concrete could be placed in an 8-hour day if it was possible to dispose of it. But, due to time lost in removing pipe sections as the forms are filled, the final bulkheading, and form closure, a 200-yd. pour requires 30 to 12 hours. This yardage includes overbreak and represents a 25-ft. length of tunnel lining. Forms are left on four days, lining being done as a consecutive operation with three sets of forms.

The volume of concrete required in the tunnel and portals and wing walls is 8523 cu.yd. and the reinforcing steel totals 192,000 lb.

Core Excavation—Excavation of the central core



Jetting Sidehill Fill on Sepulveda Blvd. with 1-in. Pipes

follows completion of the side walls. This work is done with a Bucyrus-Erie 1¼-yd. gas+air power shovel working two shifts, and four 4-yd. La France-Republic dump trucks. The average core excavation is 400 cu.yd. per 8-hour day.

Tiling, Plastering, and Paving Tunnel—The final operations on the tunnel—placing white glazed tile to 7 ft. above curb grade, plastering the remainder of the lining, and asphaltic concrete paving—were sublet.

Grading Sepulveda Blvd.—The boulevard grading contract includes 501,000 cu.yd. of comparatively free digging in sandstone and shale. Five power shovels have been used on this work—two 1¼-yd. Bucyrus-Erie gas+air, two ¾-yd. Bucyrus-Erie type B steamers, and one 1¼-yd. Northwest model 5. Four 8-yd. Republic-Linn truck tractors, four 4-yd. Republic dump trucks, and a maximum of five hired dump trucks were used to haul from the shovels. Powder on both the boulevard grading and tunnel work is 20% Trojan '40' and Trojan granular. The maximum cut is 60 ft. and fill 80 ft. Culverts are of monolithic or reinforced concrete pipe, furnished by the United Concrete Pipe Co., of Los Angeles.

All fills are compacted by spreading with Cater-

pillar '60' and '30' tractors and 12 or 8-ft. Russell blades and Master bulldozers, and rolling either with 12-ton gas rollers or, where this is impractical on account of sidehill fills, by jetting with 1-in. pipes. In the latter case, fill slopes are jetted from bottom to top and, after drying out, the top of the roadway is diked in squares and further settlement secured with jets up to 60 ft. long. From a main on Mulholland highway, 7000 ft. of 6-in. pipe was laid to the tunnel site and a 400-g.p.m. supply boosted against 300 ft. total head to a 60,000-gal. steel tank on the summit. The discharge from this tank is by gravity both ways from the summit.

Personnel—J. J. Jessup is city engineer, H. P. Cortelyou engineer of general construction, Merrill Butler bridge engineer, J. T. Thomas division engineer at Sawtelle, and D. M. True office engineer for the city of Los Angeles. L. E. Meidroth was the resident engineer on our contract. T. M. McDaniel is general superintendent and H. B. Howard general foreman for J. G. Donovan & Son. McDaniel is responsible for the methods used and planned the plant and equipment set-up. He also has direct charge of the work during its progress. The grading and tunnel crew totals 250, of which 100 are unmarried men quartered in a camp on the summit beside Mulholland highway.

Belton-Glacier Park Station Highway, Montana

Gap in Section Between Nimrod and Rising Wolf to Be Closed in 1930, Completing Another Transcontinental Route

The Bureau of Public Roads is now completing the Nimrod-Summit-Rising Wolf section of a road along the southern boundary of Glacier National Park between Glacier Park Station and Belton, Montana. This construction will close a gap in a transcontinental route, U. S. Highway No. 2 (Route 77, Montana state highway system) and besides opening the southern part of Glacier National Park to automobile travel, will give the state its shortest east-west highway. Completion of this road and of the Transmountain

Section of Belton-Glacier Park Station Highway Above Great Northern Railway

highway over Logan pass in Glacier National Park (see August 10th, 1929, issue) will close a loop which touches Lake McDonald, Logan pass, and St. Mary's lake—a region of great scenic value.

From Belton to Glacier Park Station on this highway is 56 miles, the Continental Divide being crossed between Nimrod and Summit. The road follows the Flathead river and Bear creek, for part of its length paralleling the Great Northern tracks. Construction has extended over a 12-year period and has cost $1,275,000, most of which was paid from Federal funds.

Much of the construction between Belton and Glacier Park Station was heavy and the working season was short. Clearing was done in the fall or early spring so that debris could be removed and burned before the June-September fire season. Equipment and supplies were transported from the railway over 'tote' roads until the pioneer grades could be established. The road was built to the minimum width for two-way travel and is as yet unsurfaced. All bridges are of permanent type and grade separations have been planned in anticipation of future heavy traffic; one concrete underpass has been constructed near Pinnacle. There was heavy rock work for 21 miles east from Belton, on which blasting was hindered by proximity to the railroad. At one point east of Pinnacle where the location was 'tight' because of two retaining walls constructed by the railroad company at different levels and close to the river, a timber trestle 418 ft. long was required. To secure a footing in rock which slaked and crumbled when exposed to air, the bottoms of the posts for this trestle had to be sealed in with concrete. The trestle deck is of 2 by 6-in. laminated wood strips, covered with a bituminous mat wearing surface.

NOTICE TO HIGHWAY CONTRACTORS

Effective on and after August 1, the Colorado State Highway Department will require that all persons, firms or corporations submitting bids on highway work for the Department shall have been qualified as bidders by submitting financial, experience and equipment statements on forms provided by the Department. Proposal blanks will not be issued to bidders not having such statements submitted and approved by the Department at least 7 days prior to the letting.

The death toll of automobiles on highways in the United States during 1929 was 31,500, a gain of 12% over 1928. In this period, population increased 1% and automobile registration 8%. Automobiles account for 32% of the accidental deaths in this country, including mine disasters, fires, and other catastrophes.

They Will Get Hurt

The 'Human Equation' Causes Death and Accidents on Construction Projects

By ROBERT ROBERTSON, *Los Angeles, California*

"That rock must have had his number on it", murmured an old 'stiff' as one of the construction gang crumpled into a heap after being struck a glancing blow from a blasted rock. "It was old Jim's time, that's all", reported the pal of an experienced construction 'stiff' after seeing his friend fall from a scaffolding 400 ft. into the river. Men in the construction game learn that precautionary measures are fine for about 5% of the accidents—and perhaps for more of the smaller cuts and bruises—but for the great majority of deaths noted they believe that a man's time has come. Ask any of them, and the same impression of fatalistic belief is voiced.

M. H. (Harvey) Slocum and His Dog 'Chief'

One of the best known and best liked construction superintendents in the west is M. H. (Harvey) Slocum, who holds this to be true, and cites striking examples to prove his conclusions. After the Exchequer dam, which proved to be a hazardous undertaking with but few serious accidents resulting, Slocum reassembled his men for other large projects, one of the last of these being the San Gabriel dam. He brought to this project many years of construction experience and a constantly growing conclusion as to why men are killed while working on hazardous jobs. Slocum can recall incidents where seasoned engineers and superintendents who constantly cautioned their men to take safety measures, were killed for no other reason than the evident fact that they walked under a cliff or passed beneath a scaffolding when these apparently solid structures toppled over. Or, he can remember when a group of men has escaped injury except for one of them who is instantly injured or is killed outright. The only consistent thing noted about the pranks of Fate is that generally the best men 'get theirs' and the less valuable men escape. This fact substantiates the belief that 'accidents will happen'. Sheer luck and complete ignorance of impending danger often seem to combine to save a man's life. Again, a 'stiff' may jump into a dangerous place to forestall some calamity that was utterly invisible to the uninitiated—sometimes he does not live to explain why he took that chance.

Slocum attributes much of his success to the 'stiff' on the job. He has said that if he has made any kind of a success of a big job, it is because the 'stiff' had the right attitude toward him, his foremen, and the job as a whole. The typical 'stiff' is a quaint type of man that one seldom hears of—he is a hard worker, hard drinker, honest and loyal, and exceedingly independent. He will walk off a job if things do not suit him, or will work a 24-hour shift if he thinks the 'old man' believes in him. He is almost childish in his pleasures, and extremely sensitive of his reputation among those whom he considers real 'stiffs'. A nod of recognition from the boss will keep him working like a Trojan for weeks, and instill a high standard of loyalty and hard work among the whole crew around him. When he says "I'll put out for the old man today", he becomes a human dynamo in action; but if he decides that the cook is a 'stomach robber' and the foreman does not know 'dirt', a great construction project lags in all of its departments.

WYOMING HIGHWAY BRIDGES OPENED

The Wind River Bridge, 3½ miles west of Shoshoni on the Shoshoni-Riverton road, was opened to traffic May 30. The contract for this $74,000 structure was awarded in July, 1929, to J. F. Turpen and completed in June, 1930. The bridge is 465 ft. long, consisting of four 50-ft. concrete approach spans and one 250-ft. steel truss span across the river.

On June 12, the Kemmerer overhead, which crosses the O.S.L. tracks and Ham's Fork river at Oakley east of Diamondville, was opened. Sharrock & Pursel were the contractors on this project, the total cost of which was $55,000. The overhead is 270 ft. long, 55 ft. above streambed, and 26 ft. above the railroad. It consists of three 80-ft. deck plate girder and one 20-ft. I-beam spans.

At the July 8, 1930, letting of the Wyoming Highway Department three bridge contracts were let, total awards $86,636.

Z. E. Sevison is state highway engineer of Wyoming, C. C. Warrington is office engineer, and W. H. Fisher is engineer of bridges.

Service of natural gas has increased until it now covers 90% of all gas used by the 2,000,000 consumers of this type of fuel in California.

Contractor's Views on Specification Writing

(As Outlined to Me by an Experienced Highway Contractor)

By RHODES E. RULE*
Civil Engineer, San Diego, California

I doubt if specification writing is keeping pace with other rapid advances in the art of highway engineering. From my observation, there are too many engineers who are giving scant or ill-advised attention to their specifications.

The multiplying volume of automobile traffic and the ever-increasing speed of vehicular travel has made necessary radical changes in the principles of design of highways—changes leading to safety and economy. Our engineers have not been lacking in this respect. The average motorist, traveling at 40 miles an hour over broad, smooth highways, gives credit to the designing and construction engineers and the contractors for a well-planned and well built job.

Cost of Work—But scant attention is given to the cost of the work or to the difficulties which have been encountered in construction. And, when I speak of cost, I do not mean just the dollars-and-cents cost of the contract. Any piece of work inefficiently done, regardless of whether it is building a highway or plowing a field, is costly to the economic structure of the state and is ultimately reflected in that intangible thing called 'prosperity.' If, because of some condition, the financial casualties among contractors are numerous, these will be reflected in the prosperity of the community and the nation as a whole.

Relation of Engineer and Contractor—I do not think that our highway engineers are devoting sufficient thought to the relations between themselves, acting as agents of the people, and the contractors on whom devolve the responsibility of constructing highways. Any improvement in these relations which will lead to greater efficiency will be reflected in ultimate cost.

Complete Plans and Specifications—The contractor, when he undertakes to do a certain piece of work for a stipulated price, is risking not only his personal fortune but his reputation as a constructor. He has examined the plans and specifications and gone over the ground and has come to the conclusion that, for the stipulated price, he can carry out the undertaking at a fair profit to himself. If the plans and specifications are definite and certain, stating exactly what will be required of the contractor to complete the work, all bidders are placed on a common plane and the low bidder will be one who, because of greater efficiency of his organization or willingness to accept a smaller margin of profit, is capable of doing the work for the lowest price. If, however, it is necessary for a bidder to read between the lines of the specifications or to be familiar with the whims and peculiarities of the engineer, an efficient contractor, who under proper conditions would be low, may be out of the running.

In fairness to the public footing the bills, to the contractor who spends his money bidding on the job and who risks his fortune and reputation if he is the successful bidder, and to himself who is responsible to the people to get the best job for the least number of dollars, the engineer should spare no pains in the preparation of specifications that state exactly what must be done; no more and no less.

Enforcing Provisions—The tendency in many cases seems to be toward over-rigidness. If this is done with the idea that by asking a lot you can get a little, it is a confession of weakness on the part of the engineer. He is admitting that he is incapable of holding the contractor to the terms of the contract and, in order to get the class of work that is desired, he specifies a higher grade of work or a more elaborate process of performance. As an example, I recently bid on a job of heavy grading, involving a large amount of steep sidehill work in a rough, rocky, and mountainous territory. The specifications, apparently copied from a standard set, called for making all embankment in layers not to exceed 12 in. thick, each layer to be wet and rolled. Under the conditions, these specifications seemed to be in error, but an interview with the engineer elicited the bare information that the specifications will be adhered to. Feeling that this was not strictly true, but nevertheless uncertain regarding what would be required, an abnormally large allowance was made for contingencies and the resulting bid was far from low. A visit to the job during the progress of the work disclosed that I was right in my assumption. The engineer, although an honest citizen and a capable locator and designer, was not giving a square deal to the public or the contractors who bid on the job.

Omissions—Equally harmful is the error of omission. Of necessity, the plans and specifications cannot cover all of the minute details that arise in the progress of the work but they should cover clearly and completely every item involving an appreciable sum of money. If the specifications are indefinite, the tendency is for the gambling, irresponsible type of contractor to take a chance on the omission and submit a low bid. The conservative, dependable contractor will either submit a high bid or will refuse to bid at all. Clearly, if the bidder must resort to his imagination in attempting to arrive at what manner and location of detours will be required, what methods of construction will be permitted, and many other matters often slighted in the specifications, he cannot be blamed for an occasional bid that seems to be erratic.

Special Provisions and Interpretation—Standard specifications, carefully and logically written, are excellent tools and tend to increase the quality of the resulting work, but the highway engineer should be-

*Associate Member, American Society of Civil Engineers.

ware of placing dependence on them beyond their limitations. Every job has its peculiar characteristics, and special provisions should be written to cover these individual conditions. These should be given careful study by the engineer who is directly responsible for the work and should not be delegated to a subordinate, as is so often the case. Full explanations should be given in treating of the intent of the specifications.

Many sets of standard specifications that I have worked under have provisions that must be waived in a good many jobs. Provisions such as these should be eliminated from the standard specifications and written into the special provisions when required. Many other provisions are not strictly adhered to under construction conditions. These should be revised to specify exactly what is to be required.

Advice to the Engineer—I think that the best test that an engineer can put to his specifications is to review them from the contractor's viewpoint. My advice to you engineers who write the specifications is:

(1) Put yourself in the contractor's shoes. Ask yourself if you could build the works, as called for on the plans, with certainty and exactness.

(2) Take your specifications and check them over with the last jobs that were done under them. If any of the requirements were not adhered to, eliminate them or give definite instructions to your inspectors that they must be enforced. Give the contractors the benefit of the same information.

Status of Engineering Construction—The construction industry is one of the most necessary that we have in modern civilization. The greatest part of major construction is performed by contractors. Yet it has never reached a stable footing; new names and new faces are seen every year—old ones are soon forgotten. The effect of the casualties on the general economic welfare of the country is not insignificant. Anything that can be done to minimize the risk and uncertainty of the industry will surely be reflected in general prosperity and will result in awards going to a higher grade of contractors, which in turn will give the public better and more permanent structures.

Water Control Station for Transit-Mixed Concrete

By HEINRICH HOMBERGER
San Francisco, California

For the past few years it has been the practice to deliver concrete for structures within a city in a ready-mixed condition, rather than to install a mixer at the site and deliver aggregates and cement by truck. Under this present practice, it is desirable to ship the concrete mixture in a fairly dry condition and to add the final water at the point of use. This necessitates a water-control tank and gaging apparatus, by means of which the required additional water can be delivered to each mixer truck after it arrives at the site where the concrete is to be placed. An operator is required to fill the measuring tank, as the required amount of water must be changed from time to time, depending on whether a dry concrete is demanded—as for foundation work—or a wet concrete.

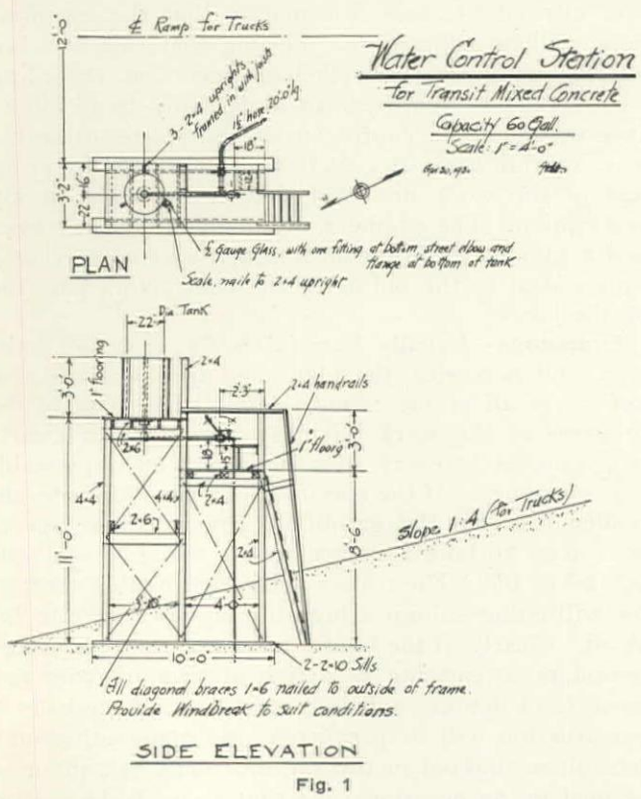


Fig. 1

The plan and side elevation of a typical water-control station is shown in Fig. 1. Sizes of timber for the structure are indicated, and a specification of the hardware required to make up the ½-in. supply and the 1½-in. discharge line is as follows:

PIPE FITTINGS

Supply Line	Discharge Line
½-in. pipe	2-in. tank flange
½-in. ell	2-in. long nipple (2)
½-in. nipple (2)	2-in. ell
½-in. valve	2-in. pipe
½ by 2-in. bushing	2-in. tee
	2-in. quick-opening gate
	2 by 1½-in. bushing
	1½-in. nipple
	1½-in. hose clamp fitting
	1½-in. hose, 20 ft. long

It is desirable to place the structure so that the operator in looking at the scale behind the gage glass, will not have to face the sun at any time (the plan, Fig. 1, contains an arrow which indicates the north point). Beside the station proper, the trucks will have to back up a ramp with a slope of about 1:4, so that the dry mixture in the drums can be brought to the forward ends of the trucks, thus leaving ample space in the rear to hold the desired amount of water. The ramp should be provided with a tamped surface of crushed rock, at least 8 in. deep, to protect it against the trucks.

ITEMS OF INTEREST

SACRAMENTO WATER BONDS FAIL

Rejection of a $450,000 bond issue to provide funds to repair the Sacramento, California, filtration plant has been recommended in the State Supreme Court as a result of a recount suit filed by the Sacramento Chamber of Commerce. The bonds failed to gain the necessary two-thirds majority by 14 votes.

SAN GABRIEL RIVER OUTLET CHANNEL

E. C. Eaton, chief engineer for the Los Angeles County Flood Control District, has begun hydrographic surveys in Alamitos bay as the first step toward a new $661,000 outlet channel for the lower San Gabriel river. This 400-ft. channel will carry the river sediment into the Pacific ocean instead of allowing it to deposit in and to shoal the bay. Construction will probably start in the spring of 1931 following condemnation of a 36-acre right-of-way. Alamitos bay will be used for the staging of aquatic events during the 1932 Olympic games.

BRIDGE RIVER TUNNEL HOLED THROUGH

The Pacific Engineers, Ltd., of Vancouver, B. C., holed through the Bridge river tunnel on July 8 after 2½ years of construction. This tunnel is 16 ft. diam. and over 2½ miles long and cost $1,750,000; it is part of the Bridge river hydroelectric development of the B. C. Electric Railway Co.

The purpose of the tunnel is to divert water from Bridge river, a tributary of the Fraser, into Seton lake at 1200 ft. lower elevation. The tunnel will serve a powerhouse on the lake shore and will provide enough water to generate 216,000 hp. Ultimately, a second and parallel tunnel will be driven and the capacity of the plant raised to over 500,000 hp. The first unit of the Bridge river power plant will have a capacity of 54,000 hp. and will cost $14,000,000. Delivery of power from this unit is expected by the end of 1932.

E. E. Carpenter is chief engineer for the B. C. Electric Railway Co., Ltd., of Vancouver.

SALYER CONSOLIDATED MINES CO. PROJECT ON TRINITY RIVER, CALIFORNIA

R. L. Oakley, engineering contractor of Palo Alto, California, is engaged on a $180,000 development for the Salyer Consolidated Mines Co. of Los Angeles. This project is located in heavy country on the south fork of the Trinity river 60 miles northeast of Eureka. It involves several miles of open ditch work, roads, two suspension bridges, 7000 lin.ft. of 42-in. and 850 lin.ft. of 54-in. electric-welded steel pipe, a small intake reservoir and standpipe from which four pipe connections radiate to 7-in. hydraulic giants.

Oakley is using the following equipment on this contract: Two small Universal power shovels, one ½-yd. Northwest shovel, one Caterpillar '30' with bulldozer, one Cletrac '20' with Atlas scraper, two 110-c.f.m. Ingersoll-Rand air compressors, and a small fleet of new Ford trucks. The subcontract for furnishing the steel pipe has been awarded to the Western Pipe & Steel Co. of San Francisco.

LOLO PASS ROUTE TO BE PHOTOGRAPHED

Aerial photographic surveys will be used to provide topographic maps of three strips from which locations and profiles can be projected and preliminary cost estimates made for the Lewis & Clark highway between the Montana state line and Lewiston, Idaho. From Lolo pass (about 5000 ft.) in the Bitterroot range, the present designated route is down the Lochsa river to the middle fork of Clearwater river and down the fork to a connection with existing roads. The entire route lies through a heavily forested mountain country accessible only by pack trains. On a 50-mile gap where canyon construction will be heaviest, there is no survey and no recent reconnaissance for 32 miles. About 25 years ago, the Union Pacific spent $300,000 on a survey along this route between Missoula and Lewiston, the estimated construction cost reaching $200,000 per mile.

The survey and final routing will be made by the state of Idaho in cooperation with the U. S. Bureau of Public Roads and will be done in one season, whereas ground methods would consume several seasons. J. D. Wood is commissioner of public works for Idaho and B. J. Finch is district engineer for district 12 of the Bureau of Public Roads.

BROWNSVILLE NAVIGATION DISTRICT

The Brownsville (Texas) Navigation District is proposing to construct the following improvements: a channel 300 ft. wide and 25 ft. deep through Brazos Santiago pass; a channel 100 ft. wide and 25 ft. deep in the pass and through a bay on the west side of Long island; two channels 100 ft. wide on the bottom and 24 ft. deep from Long island to Point Isabel and Brownsville; also turning basins and equipment for the port. Building of the jetties, deepening of Brazos Santiago pass, channel dredging at Brownsville, and construction of the turning basin at the head of the channel will be done by the U. S. Engineers, Milo P. Fox, major, Corps of Engineers, district engineer at Galveston, being in charge of this work.

Preliminary plans have not yet been made, nor will they be ready for the examination of prospective bidders before the middle of October. As the engineers will not be prepared to receive proposals for 30 to 45 days thereafter, bids will not be invited until December or January. For the remainder of the project it is expected that about two years will elapse before the Navigation District will ask for bids on the terminal facilities needed to meet government requirements.

John Gregg is chairman of the Brownsville Navigation District and Robert J. Cummins, consulting engineer, Houston, is engineer for the project.

City Planners Meet in Denver

National Conference on City Planning Holds Twenty-Second Annual Meeting

By DONALD M. BAKER*

President, City Planning Commission; Consulting Engineer, Los Angeles, California

With an attendance of between 400 and 500, comprising professional city planners, members of planning commissions, and public officials from all over the United States, the National Conference on City Planning held its 22nd annual meeting in Denver on June 23 to 26, 1930.

A full program of papers and discussions, commencing with a round table discussion on zoning at breakfast every morning and ending with an evening session, occupied the first three days, and the next day was given over to a trip through the mountains inspecting the municipally owned park system of the city of Denver.

Subdivision regulations in unincorporated areas, traffic, and civic centers occupied the program during the first day; financing the public improvements, administration of zoning, and mountain recreational areas the second day; with the third day given over to airports, and educational work and publicity on city planning.

No revolutionary ideas in planning theory or practice were advanced in papers and discussions, they being primarily personal experiences and thoughts. Emphasis was laid by Jacob L. Crane, planning consultant of Chicago, upon the necessity for regulation or control of subdivisions in unincorporated areas outside of municipal boundaries. As the tendency of American cities is to grow in area by annexation, there must be some coordination between street and highway structure within the present city limits and outside area which may become a part of the city through annexation. A system of rating subdivisions filed in Santa Barbara county whereby the County Planning Commission submits a report to the Board of Supervisors upon merit and quality of subdivisions, as well as on other features, was described by L. Deming Tilton, director of planning, Santa Barbara county.

In a discussion on downtown traffic and parking, Miller McClintock, director of the Erskine Bureau for Street Traffic Research at Harvard University, Cambridge, Massachusetts, emphasized the necessity for providing space to care for automobile parking facilities in the central area at the same time that attention was being given to opening and widening arteries to provide for easier approach into this area. "It is useless to provide additional means of approach to the metropolitan area," said McClintock, "unless at the same time means are provided for taking care of the additional automobiles which are encouraged to come into the central area by these means, as parking space is the controlling factor". McClintock also emphasized the fact that decentralization which results from congestion was an indication of an unhealthy condition.

The discussion on financing of public improvements, while bringing out no particularly new ideas, did develop the fact that this is a matter which is being given attention and thought all over the country. City planners are beginning to realize that in addition to making a plan, they must suggest ways and means of putting it into effect and of financing it after it has been made effective.

Discussions on zoning brought out the fact that Tom Thumb golf courses are very popular throughout the United States and are giving planning commissions much cause for thought. It also brought out the ever-present discussion of the necessity for keeping zoning out of local politics, which matter seems to crop up whenever zoning administration is being discussed.

Results of research by the School of City Planning of Harvard University were discussed by John Nolen, city planner of Cambridge, Massachusetts, and this was followed by a paper from Clarence M. Young, assistant secretary of commerce for aeronautics. These papers emphasized the fact that an airport is an integral part of the city plan, that the location of the same should be approached from the city planning standpoint in order that it may fit in with transportation and traffic facilities, zoning, etc. They also emphasized that accessibility of an airport should be measured in units of time and not miles, and that some form of rapid rail transportation is advisable in order to bring passengers from the port into the central district.

Denver has an excellent system of mountain parks† located within easy reach of its inhabitants and comprising in excess of 10,000 acres, which are being progressively developed. Its civic center program also excited admiration from visiting planners.

Concurrent with the meeting of the conference, an excellent exhibit of planning activities from all parts of the country was on display in the municipal auditorium, and this attracted not alone those in attendance at the conference, but many of the citizens of Denver.

On the Sunday afternoon preceding the conference, the American City Planning Institute held a meeting at which technical papers were discussed. Much interest was shown in invitations for future meetings of the conference, the greatest rivalry being exhibited between Los Angeles and Washington in bidding for the 1932 meeting. Houston, Rochester, and Minneapolis gave invitations for the 1931 session. The time and location of the 1931 session will be determined by the Board of Governors.

Harland Bartholmew, city planning consultant of St. Louis, Missouri, was elected president of the conference, succeeding Edward M. Bassett, attorney-at-law of New York, who has served in this office for the past three years. F. Shurtleff, New York City, was reelected secretary.

*Member, American Society of Civil Engineers.

†Editor's Note—See 'Road Construction in Denver Parks', November 25th, 1929, issue, p. 617.

PERSONAL MENTION

Homer O. Blair, consulting engineer of Tacoma, Washington, has moved his office from the Pacific Savings bdg. to the Puget Sound Bank bdg. (Tacoma).

W. A. Bechtel Co., engineering contractors of San Francisco, announce the removal of their offices from 206 Sansome st. to 155 Sansome st. This firm, as joint bidder with the Utah Construction Co., was awarded a contract July 29 for the 112-mile Western Pacific railroad extension from Keddie to Bieber, California.

Henry H. Blood, chairman of the Utah State Road Commission, was re-elected president of the Western Association of State Highway Officials at a meeting in Salt Lake City early last month. Z. E. Sevison, state highway engineer of Wyoming, was re-elected vice-president and J. D. Wood, commissioner of public works, State of Idaho, was re-elected secretary at this meeting.

O. L. (Dad) Waller, vice-president of Washington State College since 1909, and head of the civil engineering department, has resigned. Waller has been at W.S.C. for 37 years and has acted as consultant on a number of important Federal irrigation projects, being advisor to the late George W. Goethals on the Columbia basin survey, etc. He will retain his office in the Mechanics Arts bdg. at Washington State College, Pullman.

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ARMCO CULVERT BRIDGES

BOOK REVIEWS

SPECIAL ASSESSMENTS IN CALIFORNIA

By JAMES I. TUCKER, B.S. LL.B.

Published by author at 203 Wilson bdg., Los Angeles—342 pages—5¼ x 7½—Flexible—$3.50

This volume is a non-technical discussion of special assessments in California, a subject of prime importance at the present time. The author presents it in a rational manner that should have considerable public appeal, basing the work soundly on fundamentals. Too often defects and mistakes in operation and enforcement are attributed to defects in the laws themselves. Fallacies in this regard are cleverly exposed by the author in his text. There are chapters on the rights of the taxpayer, and fundamental theories on the ownership of property and the interrelation between public and private rights. The history and development of special assessment laws are sketched from medieval times to the present in a most understandable manner. The procedural features of the various improvement acts are thoroughly discussed from the inception and jurisdictional features of procedure to the issuance of street improvement bonds. There are general chapters on improvement programs and road department work and contracts. Possibly the most interesting chapter in the book deals with assessment burdens and remedies and contains a clear review of the situation as it now exists in Southern California. In the back of the book is a synopsis of the California improvement acts, which is followed by a comprehensive general index. The volume is in textbook form and following each chapter is a list of study questions.

The author is assistant to the director, School of Citizenship and Public Administration, University of Southern California, and conducts a course in special assessments. The book deals particularly with conditions as they exist in Southern California, but is well worth reading by anyone having an interest in the subject. The volume is not to be taken as a legal treatise or relied upon as such. It is written in a sensible and understandable manner and should be of great interest, particularly to laymen who have contact with special assessment matters.

H. A. POSTLETHWAITE,
Attorney-at-Law, San Francisco.

WATER SUPPLY ENGINEERING

By HAROLD E. BABBITT and JAMES J. DOLAND

McGraw-Hill Book Co., Inc.—740 pages—6 x 9—Boards—$6.00

A thorough and up-to-date treatment of all theoretical and practical essentials of water supply engineering is presented by the authors in this single-volume text. Of unusual value to the engineer and others interested in the promotion, design, construction, or operation of water supply systems, the book gives the practicing engineer a convenient grouping of fundamentals besides filling a classroom need.

Outstanding subjects in the 28 chapters are: Finances, hydraulics, location and construction of wells, dams, reservoirs, aqueducts, power and pumping machinery and equipment, pipes and fittings, distribution systems, water purification, the application of electricity to waterworks practice. 'Water Supply Engineering' is profusely illustrated with photographs, drawings, graphs, and charts, and contains a large amount of new and dependable technical data; an exhaustive index is provided.

DESIGN OF MASONRY STRUCTURES AND FOUNDATIONS

By CLEMENT C. WILLIAMS, C.E.

McGraw-Hill Book Co., Inc.—603 pages—6 x 9—$5.00

The second (1930) edition of this text considers the design of masonry structures and foundations from three important aspects—stability, economy, and architectural appearance. New material includes the treatment of development in plain concrete, arch dams, and foundations; a typical revision from the first or 1922 edition is in the chapter on retaining walls where the classic treatment of Coulomb is replaced by a simpler and more practical analysis.

The chapter headings include: general principles; masonry laid in mortar; plain concrete; reinforced concrete; masonry arches; dams and sea walls; retaining walls and quay walls; bridge abutments and piers; concrete viaducts and trestles; culverts and underground conduits; bins and chimneys; forms and construction; foundations on dry ground; open foundations under water; foundations under water (pneumatic process); specifications.

WIND STRESSES IN BUILDINGS

By ROBINS FLEMING

John Wiley & Sons, Inc.—193 pages—6 x 9—Boards—$3.50

The author, a structural engineer with the American Bridge Co., sums in this 1930 book his 17 years of writings on the subject of wind stresses, enlarged by considerable new material, and adds a chapter on earthquakes and earthquake resistance. As a study of the wind itself is necessary to an understanding of wind action, the first chapter is devoted to this phase, followed by a classification of the winds and then a discussion of hurricanes and tornadoes. Wind pressure and wind velocity are considered in chapter 4. The following five chapters are on wind stresses in steel mill buildings and in many-storied buildings, the design of details in tall buildings, and the 53-story Lincoln bdg. in New York City.

WATER SUPPLY AND UTILIZATION

By DONALD M. BAKER and HAROLD CONKLING

John Wiley & Sons, Inc.—485 pages—5⅞ x 9—Boards—$6.00

Another text and reference book by western engineers for the west—a realm in itself. In this 1930 book, Baker and Conkling give a complete outline of hydrology from the viewpoint of the arid west, together with a valuable outline of water law and administration as developed in that region. Their book is filled with examples of and references to the latest research and investigation; it demonstrates a wealth of practical experience.

Western background is needed to write of the problems of a region where circumstances force on almost every citizen an intelligent consideration of the weather—where 'a rain is front-page news'. Baker has a background of 11 years in hydraulic engineering in the Southwest and California, plus 5 years of consulting experience in water development. Conkling spent 11 years investigating stream development for the Bureau of Reclamation, then 6 years as hydraulic engineer for the California Division of Water Rights, followed by 2 years as chief of the Division and administrator of the California water law; he is now deputy state engineer of California.

Not only students, but engineers, bankers, and public officials need to understand the principles and practice of water supply and its utilization. They will find in this excellent work a useful introduction, followed by chapters on climatology, precipitation, disposition of precipitation, evaporation, transpiration, stream flow and runoff, water rights in surface streams (with statutory provisions for each state in the arid region), determination of available water supply, groundwater hydrology, groundwater in alluvial deposits, water rights in underground water, purposes for which water is utilized, conflict and correlation between uses of water, administration of streams, valuation of water rights, and quality of water. Besides their logical sequence, the chapters are carefully subdivided into sections for convenient reference and include up-to-date bibliographies. A comprehensive index is provided to make the volume convenient for reference. There are 85 pertinent tables and 155 figures in the text.

STRESSES IN CONCRETE BRIDGE SLABS

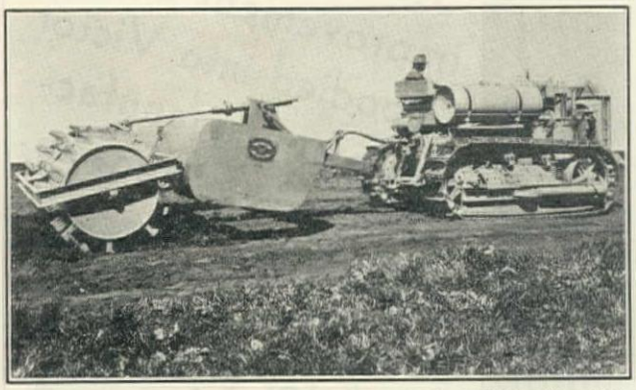
The March, 1930, issue (Vol. 79, No. 1) of 'Public Roads', the official organ of the U. S. Bureau of Public Roads, contains a 23-page, highly technical discussion of the 'Computation of Stresses in Bridge Slabs Due to Wheel Loads', by H. M. Westergaard, professor of theoretical and applied mechanics, University of Illinois.

New Equipment and Trade Notes

ATECO TAMPING ROLLER

The American Tractor Equipment Co., Oakland and Peoria, is now producing a tamping roller, model TR-8, for sale through Caterpillar dealers. This unit is designed to meet the requirement for thoroughly compacting earth on embankments, roadways, and dams after it has been spread in 8-in. layers; it complies with state highway department and Bureau of Reclamation specifications.

This tamping roller consists of two hollow, water-tight cylinders, each 52 in. overall diam. and 48 in. wide, to which



Ateco Tamping Roller and Dirtmover Behind Caterpillar '60'

are welded 112 ball foot castings. For normal work, the weight of the roller (5485 lb.) provides ample pressure on the tamping feet—665 lb. per ft. However, the cylinders may be filled with water to increase the weight to 8800 lb., or 1080 lb. per it. A removable cross-beam and slip tongue are furnished with the unit. Under normal conditions, a Caterpillar '60' will pull two or three Ateco tamping rollers.

The roller may be used in conjunction with an Ateco dirtmover by substituting the roller for the wheel assembly of the dirtmover, a simple and rapid change. Using this 7900-lb. combination, the material is tamped as it is spread.

INTERNATIONAL ANNOUNCES TWO HEAVY-DUTY TRUCKS

The International Harvester Co. of America, Chicago, recently added the model W-1 (2½-ton) and the model W-3 (3½-ton) to its line of heavy-duty motor trucks. Both trucks

International Model W-3 Heavy-Duty Truck

are of the double reduction drive type and each is available in five wheelbases, the W-1 from 130 to 200-in. and the W-3 from 144 to 235-in. Attractiveness in design, finish, and appearance have been sought in the development of these trucks to meet the increasing demand for style in such equipment.

The engines are 4-cylinder, valve-in-head types with overhead camshaft and valve mechanism, and are composed of five independently maintained sub-assemblies to simplify servicing; all parts are easily accessible for a quick check-over. The W-1 cylinders are 4¼-in. bore and 5½-in. stroke and those of the W-3 are 4¾-in. bore and 5½-in. stroke. Rated horsepowers are 28.9 and 36.1, with brake horsepowers at 1800 r.p.m. governed speeds of 53.5 and 60. The models are furnished with strong, pressed-steel channel frames, internal expanding 4-wheel brakes, shatter-proof glass at the rear of the cab, and other conveniences. They have five forward and two reverse speeds.

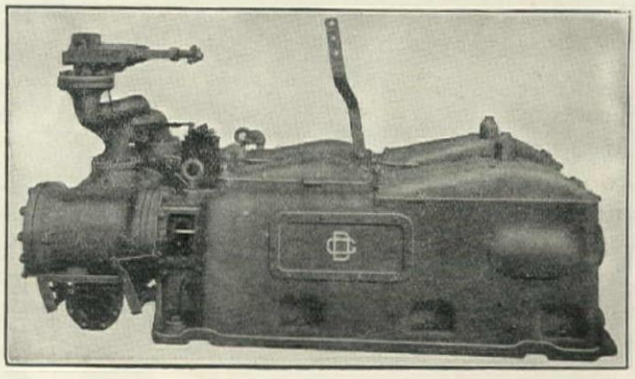
ST. LOUIS POWER SHOVEL CO.

D. C. Corner, president, and M. Corner, secretary, of the St. Louis Power Shovel Co., have completed a three-months inspection of tunnel construction, beginning with the Hetch Hetchy project for the water supply of San Francisco.

The St. Louis Power Shovel Co. manufactures the Conway shovel for work in small headings. Type '50' Conway shovels were recently selected by J. F. Shea Co., Portland; T. E. Connelly, San Francisco; and S. S. Mogoffin & Co., North Vancouver, for their tunnel contracts on the Owyhee irrigation project in Oregon and Idaho.

GARDNER-DENVER DRILLING ENGINE

The Gardner-Denver Co. has developed at its Quincy, Illinois, plant a 12 by 12-in. twin roller bearing rotary drilling engine, model DEB, designed to operate with 350-lb. steam pressure and weighing 14,000 lb. A semi-steel dirtproof case



Gardner-Denver Twin Drilling Engine

encloses all moving parts, access to the interior being provided through dust-proof covers on top and hand holes inside. The base is cast integral with this case and rigidity is added to the mountings by toepads at the crank ends.

The crankshaft is 6½-in. diam., of special alloy steel forging ground to size, and is mounted in heavy-duty roller bearings supported by pedestals cast in the base. Shaft expansion is provided in the bearing mounting design by allowing one end of the shaft to be stationary and the other to float. To eliminate the possibility of the engine stopping on dead center, the cranks are set on quarters. Moving parts are counterbalanced and lubricated by a splash system. The reciprocating parts are made light so as to reduce inertia of the system to a point allowing rapid acceleration from rest or when the direction of drive is reversed.

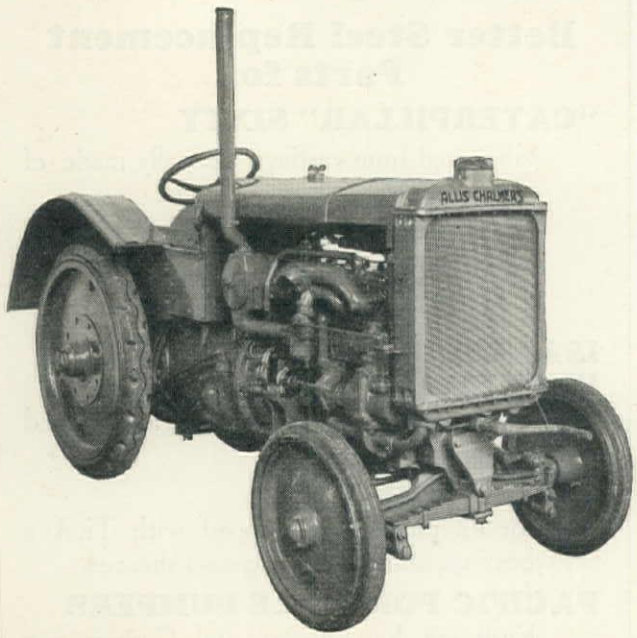
The Chain Belt Co., Milwaukee, manufacturer of 'Rex' construction equipment, announces the appointment of The Equipment Corp. of Arizona at Phoenix and the Concrete Products Co., Oakland, California, as distributors.

UNIVERSAL CRANE FOR STEEL WORK

The Universal Crane Co., Lorain, Ohio, has developed a special traveling carriage with which its cranes can be used for steel erection or demolition on buildings beyond reach of the 56-ft. boom, truck-mounted unit. The carriage is of structural steel, mounted on wheels which can be run on rails laid upon the structural beams of the building. The carriage is telescopic to fit rail gauges of 15 to 20 ft., and the crane can work straight through one bay, setting side bays as it progresses. To move another bay, jack screws in the traveling carriage can be used to place the crane on transverse wheels at right angles to those on which it ordinarily rests. The unit is propelled along the rails through crane winches in the subframe. A 6-part boom hoist line is used and the cable drums have 500 ft. or more capacity. The unit is interchangeable for work on buildings or, with truck mounting, along the ground.

ALLIS-CHALMERS NARROW TREAD TRACTOR

The Allis-Chalmers Manufacturing Co. has announced a model U industrial tractor with an outside width of only 47 in.



Allis-Chalmers Narrow Tread Industrial Tractor

The rear tires are 40 by 5-in. and the front tires 24 by 3½-in., permitting short and quick turning for close-range work. The transmission provides four speeds forward and one reverse, the fourth gear giving a maximum speed of 20 m.p.h. This tractor can be furnished with spring-mounted front axles.

BLAW-KNOX CO. ANNOUNCEMENT

Blaw-Knox Co., Pittsburgh, Penn., announces the addition to its sales staff of John E. Chiquoine, a graduate of the University of Pennsylvania. Chiquoine was successively with the American Chemical Machinery Co., of which he was chief engineer, and the industrial engineering division of E. I. Du Pont de Nemours & Co.

HERCULES MOTORS CORP. ANNOUNCEMENTS

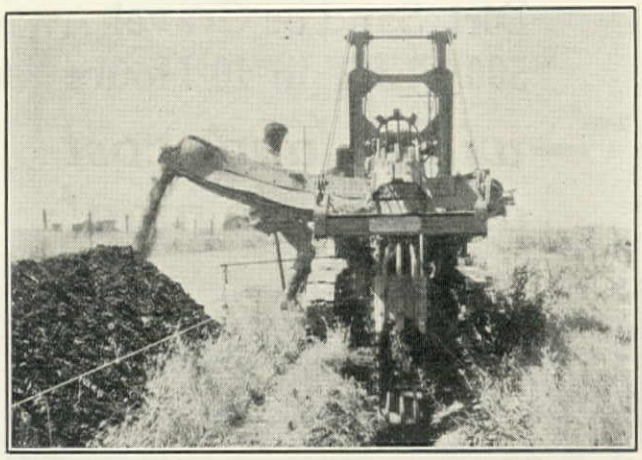
The Hercules Motors Corp., Canton, Ohio, announces the appointment of Walter T. Radtke as Pacific Coast sales representative, with headquarters at room 601, Russ bdg., San Francisco. Radtke was formerly Hercules representative in the mid-continent states.

Hercules also announces the appointment of the following new Western distributors of its engines, power units, and parts: the F. C. Richmond Co., Salt Lake City, as exclusive distributor for the Mountain States; and the Alamo Iron Works, San Antonio, for the Winter Garden section of Texas.

Hercules products are also distributed in the west by the Smith-Booth-Usher Co., Los Angeles; the Edward R. Bacon Co., San Francisco; and the Norvell-Wilder Co., Houston.

P. G. & E. USES CLEVELAND 'BABY DIGGER'

The Pacific Gas & Electric Co. is using a Cleveland 'baby digger' for excavating about 4 ft. per minute on a pipe-line

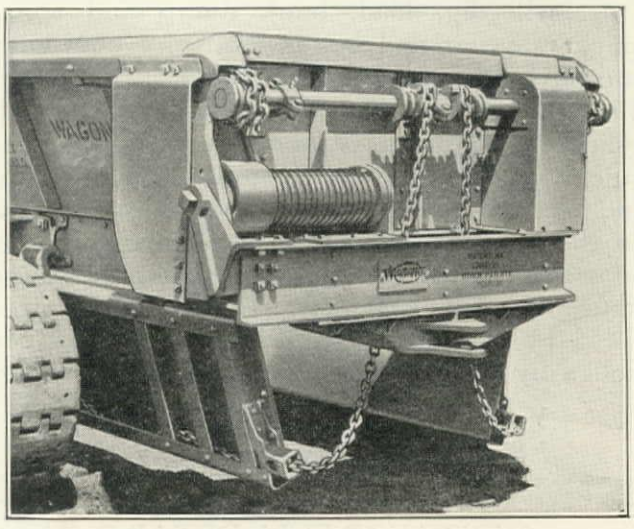


Cleveland Baby Digger on P.G.& E. Pipe-line Near Tracy, California

job near Tracy, California. The utility company has purchased nine of these units in the past two years from the Edward R. Bacon Co. of San Francisco, distributors for the Cleveland Trencher Co. in Northern and Central California and Western Nevada.

DOOR CONTROL FOR WESTERN WAGONS

The Western Wheeled Scraper Co., Aurora, Illinois, has developed a simple and easily operated door control for Western crawler wagons. This control is designed to replace the complicated mechanism in power devices for winding up



Door Control for Western Crawler Wagon

doors of large dump wagons. It consists of a large spring with sufficient initial energy to tightly close the doors under all conditions; a completely enclosed toggle and ratchet arrangement to hold the doors closed against the load or open against the spring pressure; and a pawl and ratchet so constructed that a single pull on a rope running to the tractor or on the lever attached to the rope will trip the load, a second pull on the same rope or lever closing the doors when the wagon has moved forward free of the dumped load. This mechanism eliminates the man formerly needed to trip and wind up the doors and increases production because of its greater speed.

. . . "Most Complete Road Oil Spreader I Have Ever Seen"

WE SOLD a Union Tank Road Oiler to one of the Coast counties ★ The Superintendent in charge after using it wrote us that it was the most complete road oil spreader he had ever seen ★

He also wrote:

"It has not given one minute's trouble of any kind" ★

"The pump works perfectly and has not leaked one drop of oil" ★

"The release valve enables us to heat all sprays evenly and gives us fast, even spraying action" ★

"We are perfectly satisfied and if we were purchasing another road oiler would send the order to you" ★

We build road oilers of any capacity—and adapted for use on any truck chassis ★ We build the tanks rugged—with seams riveted at close pitch and covered with the finest grade of insulating material ★

We equip each oiler with a rotary pump—a powerful, slow speed pump capable of building up fifty percent more pressure than needed ★

We also build road oilers for spreading emulsified asphalt products—and portable road oilers which may be used on flat racks or dump trucks ★

If you want a *real* road oiler—one built to give long, trouble-free service—write for our bulletin which shows in detail the Union Tank Road Oiler ★

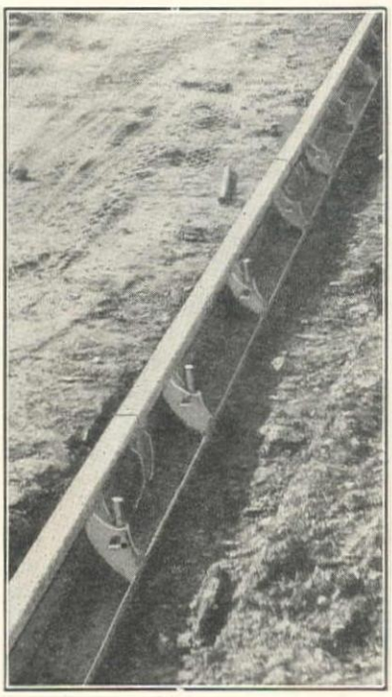
UNION
TANK & PIPE CO

Mechanical Engineers, Manufacturers of Steel Plate and Sheet Metal Products.

2801 SANTA FE AVENUE
Los Angeles, California

The HELTZEL *Superior Lock* ROAD FORM

Is a Truly Heavy-Duty Form



That is what you want—a form that will give you the greatest service with the lowest upkeep and handling costs. Then, try a set of Heltzel's—the form with the brace-acting stake pocket.

The stake pockets on the Heltzel Superior Lock Road Form act as braces between the tread and base of the rail and give unusual strength and rigidity to the rail.

Get the complete details today from any of the dealers listed below.

HELTZEL

Steel Bins, portable and stationary; Steel Forms for Road, Curb and Gutter, or Sidewalk Construction; Miscellaneous Equipment of all Types for the Contractor doing Concrete Work.

Ask your nearest dealer!

KRATZ & MCCLELLAND, INC.
522 Bryant Street, San Francisco, Calif.

CROOK COMPANY, 1220 So. Grand Avenue, Los Angeles, Calif.

THE C. H. JONES COMPANY
134-140 Pierpont Avenue, Salt Lake City, Utah

ROCKY MOUNTAIN EQUIPMENT COMPANY
1117 Wazee Street, Denver, Colo.

NEW MEXICO ROAD MACHINERY COMPANY
Albuquerque, New Mexico

UNIT BID SUMMARY

Note: These unit bids are extracts from our Daily Construction News Service

STREET AND ROAD WORK

SAN FRANCISCO, CALIF.—GOVT—GRADING—MARIPOSA COUNTY

Bids received as follows by the Bureau of Public Roads, 461 Market St., San Francisco:

(A) MARIPOSA COUNTY—Award of contract recommended to Geo. Pollock Co., Forum Bdg., Sacramento, $205,875 for 7.08 miles grading Mariposa Grove Section, Wawona Route, Sierra National Forest, Yosemite National Park Project 2-B2. Bids received from:

(1) Geo. Pollock Co., Sacramento $205,875
(2) Lewis Construction Co., L. A. 208,167
(3) Granfield, Farrar & Carlin, S. F. 254,268
(4) T. E. Connolly, San Francisco 261,984
(5) Fredrickson & Watson Const. Co., Oakland, and Fredrickson Bros., Stockton 262,083
(6) Dan G. Munro, Los Angeles 277,336
(7) J. G. Donovan & Sons, L. A. $280,300
(8) M. S. Ross, Los Angeles 303,320
(9) S. H. Palmer Co., S. F. 304,439
(10) D. McDonald, Sacramento 320,047
(11) C. R. Johnson, Portland .....
(12) Engineer's estimate 271,369

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
55 acres clearing	$100	$200	$300	$300	$200	$225	$500	$500	$440	$500	$450	$300
320,000 cu.yd. road. excav.	.55	.52	.68	.70	.70	.74	.69	.78	.78	.80	.74	.70
1,345 cu.yd. struct. excav.	1.90	1.50	1.25	1.50	1.50	2.00	2.00	1.00	2.00	3.00	2.00	2.00
94,764 sta.yd. overhaul	.01	.02	.03	.03	.02	.04	.02	.015	.035	.05	.04	.05
7.08 mi. finishing	$250	$500	$300	$250	$300	$300	$750	$500	$350	$300	$400	$400
121 cu.yd. cem. rubble mason.	18.00	10.00	15.00	15.00	13.00	18.00	18.00	18.00	18.00	20.00	14.00	16.00
152 ft. 10-in. corr. pipe	1.20	2.50	1.00	1.00	1.50	1.50	1.45	1.16	1.90	2.50	1.40	1.40
2,296 ft. 18-in. corr. pipe	1.75	3.00	1.25	1.50	2.25	2.10	2.25	1.76	2.50	3.00	1.85	2.00
2,124 ft. 24-in. corr. pipe, 14 ga.	2.75	3.50	1.75	2.00	3.00	3.00	3.15	2.70	3.10	4.00	2.75	3.00
450 ft. 24-in. corr. pipe, 12 ga.	3.75	3.70	2.40	2.65	4.00	3.60	4.15	3.54	4.00	3.50	3.60	4.10
80 ft. 30-in. corr. pipe, 14 ga.	3.75	4.00	2.25	3.00	4.00	3.50	3.90	3.37	3.75	5.00	3.40	4.00
810 ft. 30-in. corr. pipe, 12 ga.	4.75	4.50	2.80	3.50	5.00	4.25	5.15	4.43	4.75	4.50	4.28	5.00
38 ft. 36-in. corr. pipe	6.00	5.00	3.25	4.00	6.00	4.50	5.90	5.46	7.50	6.00	5.50	6.20
195 cu.yd. hand-laid riprap	2.00	5.00	4.00	2.00	4.50	4.00	3.50	8.00	3.75	5.00	3.00	3.00
Maintenance of detours	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250
0.5 mi. move fences	$300	$300	$400	$300	$250	$300	$400	$350	50.00	$500	$100	$250

(B) MARIPOSA COUNTY—Award recommended to Geo. Pollock Co., Forum Bdg., Sacramento, $65,937 for 2.6 miles grading Sect. B, Fish Camp-Fourmile, Route 47, Oakhurst National Highway, Sierra National Forest, MARIPOSA COUNTY. Bids on:

(1) 17 acres clearing
(2) 85,420 cu.yd. roadway excavation
(3) 405 cu.yd. structure excavation
(4) 12,705 sta.yd. overhaul
(5) 2,648 mi. finish earth graded roads
(6) 34 cu.yd. cem. rubble masonry
(7) 794 ft. 18-in. corr. pipe
(8) 200 ft. 24-in. corr. pipe
(9) 426 ft. 36-in. corr. pipe
(10) Maintain road and sect. accept. for traffic
(11) 74 right-of-way monuments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Totals
Geo. Pollock Co.	$110	.64	2.00	.01	$300	20.00	1.75	3.75	7.00	$1,500	4.50	$ 65 937
Lewis Const. Co., L. A.	200	.69	1.50	.05	500	15.00	3.00	3.70	5.00	1,500	4.00	72,524
T. E. Connolly, S. F.	225	.77	2.00	.02	250	15.00	1.50	2.50	4.00	1,500	4.00	77,093
Dan G. Munro, L. A.	225	.77	2.00	.05	300	18.00	2.10	3.00	4.00	1,500	3.50	78,246
Yglesais Bros., Calexico	250	.78	2.00	.05	300	15.00	1.75	2.00	4.00	1,500	3.00	78,917
S. H. Palmer Co., S. F.	385	.75	1.60	.03	330	17.50	2.50	3.10	7.00	1,500	4.00	80,606
L. W. Hesse, Merced	450	.95	2.00	.05	400	16.00	2.00	2.50	6.00	1,500	3.50	98,385
J. G. Donovan & Sons, L. A.	500	1.00	2.50	.04	750	18.00	2.25	3.15	5.90	1,500	4.00	104,914
D. McDonald, Sacramento	500	1.45	3.00	.05	350	20.00	3.00	4.00	6.00	1,500	5.00	143,574
C. R. Johnson, Portland	450	.72	1.50	.05	400	15.00	1.85	2.75	5.50	1,500	5.00	
Engineer's estimate	200	.70	2.00	.05	300	16.00	2.00	3.00	6.20	1,500	3.50	72,625

SACRAMENTO, CALIF.—STATE—GRADING AND BITUMINIZED MACADAM—MARIN COUNTY

Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, $54,415, low bid to California Division of Highways, Sacramento, for 1.3 miles grading and surfacing with bituminous macadam in MARIN COUNTY from Belvedere Crossing to Tiburon, MARIN COUNTY. Bids from:

(1) Granfield, Farrar & Carlin, S. F. $54.415
(2) Sib'ey Grading & Teaming Co., S. F. 57.914
(3) E. C. Coates, Sacramento 58,735
(4) Frederickson & Watson, Oakland, and Frederickson Bros., Stockton 59,075
(5) H. W. Rohl, San Francisco $65.487
(6) Arliss-Knapp Co., Oakland 70.799
(7) J. P. Holland, San Francisco 80.486
(8) C. Emil Force, Piedmont 88,245

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
82.000 cu.yd. roadway excav.	.30	.31	.32	.33	.37	.40	.55	.57
1,016.000 sta.yd. overhaul	.005	.0066	.005	.005	.005	.01	.005	.01
1100 cu.yd. struct. excavat.	1.00	1.00	1.00	1.00	1.50	1.25	1.00	1.00
75 cu.yd. 'A' concrete (struct.)	20.00	20.00	25.00	18.00	25.00	25.00	23.00	25.00
6600 lb. reinf. steel (struct.)	.05	.05	.05	.05	.05	.05	.04	.06
5600 tons crusher run base	1.80	1.80	2.00	1.94	2.25	2.00	2.16	2.25
1800 tons broken stone (surf.)	2.10	2.40	2.60	3.00	2.90	2.50	3.74	3.00
100 tons asphalt road oil	20.50	25.00	20.00	25.00	24.00	20.00	26.00	24.00
596 ft. 18-in. corr. pipe	.50	.50	.60	.50	.65	1.00	.60	.75
100 ft. 30-in. corr. pipe	.75	1.00	1.00	.60	.85	1.50	.75	.75
3000 ft. 8-in. perf. metal underdr.	1.35	1.40	1.50	1.30	1.30	1.50	1.25	1.75
184 tmber guide posts	4.00	2.00	2.00	2.00	3.40	2.00	3.00	3.00
1 mile new property fence	400.00	500.00	500.00	360.00	500.00	500.00	650.00	500.00
20 monuments	3.00	4.00	3.00	3.00	4.00	5.00	3.00	3.00
69 stat. finish roadway	4.00	5.00	5.00	5.00	6.00	5.00	5.00	10.00

Work in World Zeppelin Service Finished on Schedule

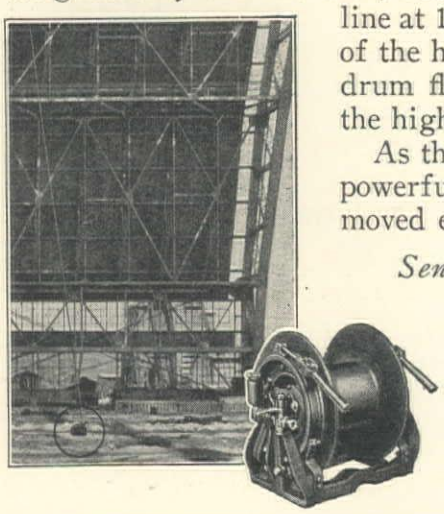
Sullivan Hoists Erect Largest Airship Dock

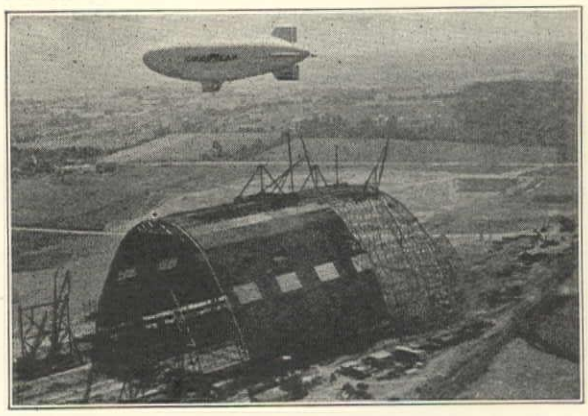
THREE miles southeast of Akron, Ohio, Sullivan Air Hoists helped erect the largest airship dock in the world. The floor is large enough for ten football fields. Yet it is dwarfed by the roof, which could shelter several Graf Zeppelins.

It was in hoisting material for constructing the roof that Sullivan hoists lent speed.

Twelve Turbinair hoists were put on the job. They weighed only 345 lbs. each, but lifted a ton on single line at 110 feet a minute. Some of the hoists used had oversize drum flanges, to take care of the high lifts.

As the work progressed, the powerful little machines were moved easily to new positions.



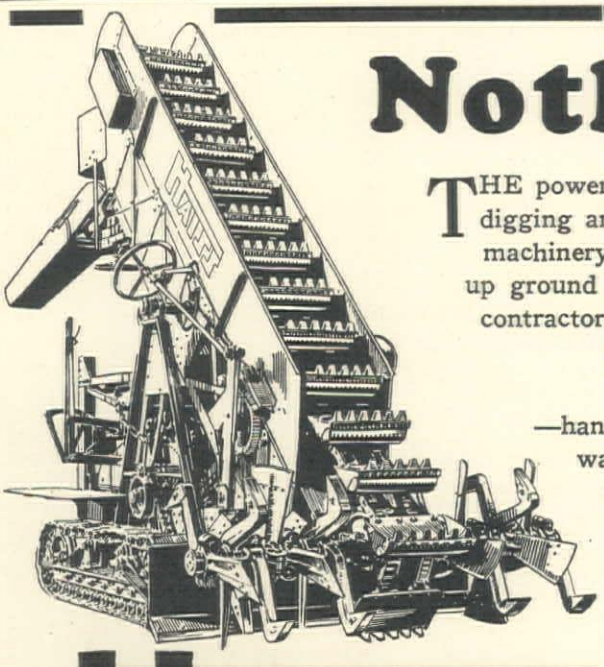


There are 20 different models in the Sullivan Hoist line. One, two, and three-drum hoists, from 3 to 75 H. P., are available, for lifting material, setting steel and stone, operating derricks, pulling cars, handling scrapers, for scores of other tasks.

Send for Hoist Catalogs and the picture book, "Speed Up with Air"

SULLIVAN AIR POWER EQUIPMENT

SULLIVAN MACHINERY COMPANY
580 Market St., San Francisco 30 Church St., New York
STANDARD EQUIPMENT & SUPPLY COMPANY
700 California Life Bld., Sacramento, Calif.
LOS ANGELES EL PASO SALT LAKE SPOKANE VANCOUVER SEATTLE



Nothing Like It—

THE powerful nibbling action of the Haiss pick-and-paddle digging and feeding device is like nothing else in excavating machinery. It has a lifting and loosening action which breaks up ground without plowing. One Haiss Excavator owned by a contractor in Cincinnati loaded

630 cu. yds. of spoil from street grading in 8-hour working day

—handling a cut of 18 inches to 2 feet depth. Its season's work was 30,000 cu.yds. The continuous digging of an 8 ft. wide cut tears out yardage in shallow grading—faster than any of the older types of equipment on skimming passes.

Write for Performance Book 530 and see the working pictures and data.

GEORGE HAISS MANUFACTURING CO., Inc.
Canal Place and East 144th Street, New York, N. Y.

Represented by:

A. L. Young Machinery Co.	San Francisco
Brown-Bevis Company	Los Angeles
Clyde Equipment Co.	Seattle
Clyde Equipment Co.	Portland
Steel Products Corporation	El Paso
Burnite Machinery Co.	Denver
Stannard Arnold Machinery Co.	Salt Lake City
Hall, Perry Machinery Co.	Butte

HAISS EXCAVATOR

SACRAMENTO, CALIF.—STATE—MENDOCINO COUNTY—GRADING, SURFACING AND TIMBER BRIDGES

E. C. Coats, Miranda, Humboldt County, who bid $85,289, low bid to California Division of Highways, Sacramento, for 2 miles grading and surfacing with untreated gravel or stone and timber bridges from McDonald to Wendling, MENDOCINO COUNTY. Bids from:

(1) E. C. Coats, Miranda ..... $ 85,289
(2) Kennedy-Bayles Construction Co. 97,573
(3) W. C. Colley, Berkeley 105,351
(4) Ariss-Knapp Co., Oakland $114,970
(5) J. P. Holland, Inc., S. F. 120,505
(6) Fredrickson & Watson and Fredrickson Bros. 123,982

		(1)	(2)	(3)	(4)	(5)	(6)
13	sta. clearing and grubbing	20.00	25.00	$100	50.00	$350	50.00
75,550	cu.yd. roadw. exca	.335	.50	.52	.51	.675	.70
200,000	sta.yd. overhaul	.01	.01	.015	.02	.01	.02
3,340	cu.yd. struct. exc.	1.00	2.00	1.60	1.50	.75	2.50
5,000	yd. gravel or stone surfacing	2.10	2.50	3.00	3.00	2.08	3.00
900	yd. 'A' concr. (struct.)	25.00	20.00	22.00	30.00	25.00	21.00
50	yd. 'A' concr. (tremie)	25.00	16.00	20.00	30.00	30.00	22.00
75	yd. 'B' concrete	23.00	20.00	20.00	28.00	25.00	22.00
104,600	lb. reinf. steel	.06	.0475	.05	.06	.06	.05
26,000	lb. struc. metal	.08	.10	.12	.13	.15	.16
110	ft. 15-in. corr. pipe	.70	.50	.50	1.00	.75	.80
996	ft. 18-in. corr. pipe	.80	.75	.75	1.00	1.00	.90
162	ft. 30-in. corr. pipe	1.20	1.00	1.25	1.50	1.50	1.25
800	ft. 8-in. perf. underdr.	1.80	1.60	2.25	1.50	1.50	1.90
58	M redwood (dense)	90.00	$100	95.00	$110	$145	$115
15	M redwood (select)	85.00	90.00	88.00	$105	$120	$105
0.6	mi. property fence	$500	$500	$475	$406	$600	$600
60	timber guide posts	2.00	1.75	2.00	2.50	3.00	2.00
106	sta. fin. roadway	5.00	5.00	6.00	5.00	6.00	5.00
32	monuments	3.00	3.00	3.00	3.00	3.00	3.00

SACRAMENTO, CALIF.—STATE—SAN BERNARDINO COUNTY—GRADING AND OIL-TREATED SURFACING

H. W. Rohl, 4351 Alhambra Ave., Los Angeles, who bid $187,325, low bid to California Division of Highways for 9.5 miles grading and surfacing with oil-treated crushed gravel or stone from 1½ miles southwest of Dunn to Cronise Valley, SAN BERNARDINO COUNTY. Bids received from:

(1) H. W. Rohl, Los Angeles $187,325
(2) Southwest Paving Co., Los Angeles 188,937
(3) Chas. Heuser, Glendale 210,337
(4) New Mexico Const. Co., Albuquerque, N. M. $210,877
(5) Skeels & Graham, Tucson, Ariz. 213,981
(6) Healy-Tibbitts Const. Co., S. F. 276,203

		(1)	(2)	(3)	(4)	(5)	(6)
89,000	cu.yd. road embankment	.30	.30	.30	.30	.35	.93
132,000	sta.yd. overhaul	.01	.02	.02	.015	.02	.01
81,000	yd. ditch and channel excav.	.14	.16	.18	.16	.18	.15
2,860	yd. structure excavation	1.00	.90	1.00	1.00	1.00	1.00
51,000	yd. pit-run gravel	.60	.65	.60	.60	.80	.79
2,700	M gallons watering	3.50	2.60	4.00	2.70	4.00	2.00
25,500	tons oil-treated gravel or stone surface	1.80	1.80	2.50	2.85	2.10	2.26
700	yd. screenings	3.00	2.00	2.00	3.00	2.60	3.00
700	bbl. fuel oil	2.25	2.67	2.00	2.80	2.90	3.00
90	ft. 18-in. corr. pipe	.75	.60	.30	.80	.50	1.00
598	ft. 24-in. corr. pipe	1.00	.70	.80	.80	.60	1.50
13,915	ft. treated piles	1.00	.90	.95	.80	.90	1.50
533	drive piles	12.00	15.00	15.00	16.00	18.00	20.00
94	M douglas fir timber	75.00	76.00	78.00	65.00	70.00	90.00
115	M redwood (dense)	$100	97.00	98.00	90.00	90.00	$110
130	M redwood (select)	$100	96.00	96.00	90.00	90.00	$100
502	sta. finish roadway	5.00	5.00	5.00	6.00	4.00	5.00
148	monuments	3.00	3.00	2.00	2.50	4.00	3.00

SACRAMENTO, CALIF.—STATE—RIVERSIDE COUNTY—GRADING AND OIL-TREATED SURFACING

Bert Noble, 841 W. Beech St., San Diego, $256,609 low bid to California Division of Highways for 16.2 miles grading and oil-treated surfacing from Desert Center to Hopkins Wells, RIVERSIDE COUNTY. Bids received from:

(1) Bert Noble, San Diego $256,609
(2) Jahn & Bressi, Los Angeles 256,815
(3) Yglesais Bros., San Diego 263,636
(4) Lang Transportation Co., L. A. 264,674
(5) H. W. Rohl, Los Angeles 265,284
(6) Hodgman & MacVicar, Pasadena $294,300
(7) Southwest Paving Co., L. A. 297,823
(8) Skeels & Graham, Tucson, Ariz. 301,503
(9) New Mexico Const. Co. 317,016
(10) Healy, Tibbitts Const. Co., S. F. 366,961

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
104,500	cu.yd. roadw. emb.	.35	.30	.30	.33	.30	.44	.38	.40	.31	.97
118,100	sta.yd. overhaul	.01	.01	.01	.01	.01	.01	.015	.02	.015	.01
218,400	yd. ditch and ch. exc.	.15	.14	.15	.15	.14	.18	.18	.15	.16	.15
15,100	yd. pit-run gravel	.50	.45	.60	.75	.50	.75	.65	.65	.60	.92
4,500	cu.yd. struct. excav.	1.00	.75	.75	.75	1.00	1.25	1.00	1.00	1.00	1.00
45,000	tons oil-treated gravel or stone surface	1.85	2.08	2.10	2.00	2.00	2.15	2.28	2.55	2.85	2.65
1,200	yd. gravel or stone (scr.)	2.00	3.00	2.50	2.25	3.00	2.25	2.50	2.50	3.00	2.37
1,170	bbl. fuel oil	3.00	2.50	3.00	2.35	2.25	2.75	3.00	3.25	3.00	2.50
240	ft. 24-in. corr. pipe	.60	.50	.75	.65	1.00	.60	.70	1.00	1.00	1.00
1,678	ft. 36-in. corr. pipe	.70	.75	1.00	1.00	1.25	.95	1.00	1.00	3.00	1.25
4,800	M gal. water	3.50	3.50	3.00	4.00	4.00	4.00	3.81	3.50	5.00	2.00
17,400	ft. treated piles	.85	.85	.90	.85	1.00	.90	.95	.90	.90	1.00
680	drive piles	16.00	14.00	16.00	13.50	12.00	15.00	15.25	17.50	16.00	20.00
130	M douglas fir timb.	70.00	65.00	70.00	70.00	75.00	69.00	78.00	70.00	65.00	88.00
169	M redwood (dense)	90.00	90.00	95.00	90.00	$100	90.00	99.00	90.00	90.00	90.00
149	M redwood (select)	90.00	95.00	90.00	90.00	$100	93.00	97.00	90.00	90.00	90.00
855	sta. finish roadw.	3.00	2.50	3.00	3.00	5.00	3.00	5.00	4.00	6.00	5.00
324	monuments	2.50	3.00	3.00	2.50	3.00	2.50	3.00	4.00	3.00	3.00

HELENA, MONTANA—STATE—GRADING AND SURFACING

Bids received as follows by Montana State Highway Commission:

(A) CASCADE AND JUDITH BASIN COUNTIES—Contract awarded to Smith & Thornquist, Great Falls, Mont., $46,388 for 11 miles gravel surfacing Armington-Lewistown Highway, Section D. Bids received on:

(1) 11,364 cu.yd. crushed gravel surf., top course
(2) 13,637 cu.yd. crushed gravel surf., base course
(3) 1,500 cu.yd. binder
(4) 18,750 lin.ft. wire cable guard rail
(5) 2,016 lin.ft. timber guard rail
(6) 1,200 cu.yd. stockpiled gravel

	(1)	(2)	(3)	(4)	(5)	(6)	TOTALS
Smith & Thornquist, Great Falls, Mont.	1.45	1.35	.25	.45	.50	1.15	$46,388
J. M. Carter, Billings, Montana	1.75	1.60	.25	.50	.60	1.00	54,065
Stevens Bros., St. Paul, Minn.	1.92	1.72	.15	.375	.75	1.92	56,646
Thos. Staunton, Great Falls, Mont.	2.20	2.00	.10	.65	.65	2.20	68,762
Morris Const. Co., Great Falls, Mont.	2.50	2.50	1.00	.75	.75	2.50	83,077
Engineer's estimate	1.75	1.65	.40	.65	.65	1.65	58,965

(B) POWELL COUNTY—Contract awarded to L. T. Lawler, Lewisohn Bdg., Butte, Montana, $76,845 for 8.7 miles grading and surfacing Deer Lodge-Butte Highway, Section A. Bids received on:

(1) 156,205 cu.yd. roadway excavation
(2) 26,088 cu.yd. gravel sub-base
(3) 713 cu.yd. structure excavation
(4) 528 lin.ft. 15-in. corr. pipe
(5) 1,450 lin.ft. 18-in. corr. pipe
(6) 137 cu.yd. Class 'A' concrete
(7) 920 cu.yd. hand-laid riprap
(8) Clearing and grubbing
(9) 12,342 cu.yd. top course crushed gravel surf.
(10) 5,086 cu.yd. base course crushed gravel

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
L. T. Lawler, Butte, Mont.	.20	.20	1.00	1.40	1.70	30.00	3.00	$2,000	1.20	1.20	$76,845
Max J. Kuney Co., Spokane	.21	.21	1.50	1.50	2.00	30.00	2.00	2,000	1.30	1.30	80,734
Clifton, Applegate & Toole, Spokane, Wash.	.225	.50	1.00	1.20	1.45	24.00	2.00	350	1.40	1.40	87,486
C. & F. Teaming & Trucking Co., Butte, Montana	.27	.50	1.00	1.40	1.56	25.00	2.25	300	1.30	1.30	92,715
Thos. Staunton, Great Falls	.24	.80	1.00	1.20	1.35	26.00	3.50	100	1.30	1.25	96,542
Engineer's estimate	.22	.75	1.00	1.20	1.35	25.00	4.00	350	1.35	1.25	93,423

(C) BEAVERHEAD COUNTY—Contract awarded to L. T. Lawler, Butte, Montana, $127,591 for 15.93 miles grading Dillon-Idaho State Line Highway, Section B. Bids received on:

(1) 269,706 cu.yd. roadway excavation and borrow
(2) 1,246 cu.yd. structure excavation
(3) 100,010 sta.yd. overhaul
(4) 948 lin.ft. 15-in. corr. pipe
(5) 1,050 lin.ft. 18-in. corr. pipe
(6) 1,528 lin.ft. 24-in. corr. pipe
(7) 656 lin.ft. 36-in. corr. pipe
(8) 361 cu.yd. 'A' concrete
(9) 32,988 lb. reinf. steel
(10) 18,850 cu.yd. gravel sub-base material

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
L. T. Lawler, Butte, Mont.	.36	.90	.02	1.35	1.45	2.10	4.10	23.00	.065	.33	$127,591
Tucker Bros. & Scott	.36	1.10	.03	1.20	1.45	2.65	5.25	23.00	.08	.50	135,081
C. & F. Team. & Trucking Co.	.37	1.00	.03	1.40	1.56	2.12	3.82	26.00	.08	.48	135,642
Clifton, Applegate & Toole	.37	1.00	.03	1.30	1.60	2.30	4.75	26.00	.07	.45	137,287
Engineer's estimate	.33	1.00	.04	1.40	1.65	2.40	4.50	25.00	.08	.55	128,777

(D) GARFIELD AND ROSEBUD COUNTIES—Contract awarded to Stevens Bros., St. Paul, Minn., who bid $95,402 for 35 miles grading Jordan-Miles City Highway, Sections D and E. Bids received on:

(1) 470,082 cu.yd. road. exc. and bor.
(2) 86 cu.yd. structure excav.
(3) 14,980 sta.yd. overhaul
(4) 818 ft. 15-in. corr. pipe
(5) 2,558 ft. 18-in. corr. pipe
(6) 1,284 ft. 24-in. corr. pipe
(7) 372 ft. 30-in. corr. pipe
(8) 272 ft. 36-in. corr. pipe
(9) 311 cu.yd. hand-laid riprap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Stevens Bros., St. Paul, Minn.	.18	.50	.04	1.25	1.50	2.00	2.50	4.00	2.25	$ 95,402
Stanley Bros. and J. E. Hilton & Sons, Miles City, Mont.	.20	1.50	.04	1.15	1.33	2.20	2.70	4.20	2.50	104,837
Engineer's estimate	.22	1.00	.04	1.35	1.50	2.25	2.75	4.25	4.00	115,356

(E) PHILLIPS COUNTY—Contract awarded to Stevens Bros., St. Paul, Minn., $51,574 for 13 miles grading Malta-Vandalia Highway, Section A. Bids received on:

(1) 193,169 cu.yd. road exc. and bor.
(2) 229 cu.yd. structure excav.
(3) 1,888 lin.ft. 18-in. rein. conc. pipe
(4) 828 lin.ft. 24-in. reinf. conc. pipe
(5) 204 lin.ft. 30-in. reinf. conc. pipe
(6) 340 lin.ft. 36-in. reinf. conc. pipe
(7) 69 cu.yd. 'A' concrete
(8) 7,212 cu.yd. sub-base material
(9) 118 cu.yd. hand-laid riprap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Stevens Bros., St. Paul, Minn.	.17	.50	2.50	3.50	5.00	7.00	22.00	.75	2.25	$51,574
L. T. Lawler, Butte, Montana	.18	.90	2.58	3.60	5.60	8.25	28.00	.75	4.00	55,204
Tomlinson, Arkwright Const. Co., Great Falls, Mont.	.188	.60	2.45	3.45	4.85	6.60	27.50	.80	2.50	55,653
Stanley Bros., St. Cloud, Minn.	.21	1.00	2.28	3.16	4.82	6.61	25.00	.70	3.00	58,568
Winston Bros. & Montgomery, Chinook, Mont.	.20	1.00	2.70	3.50	5.50	7.00	23.00	1.10	5.00	60,974
Thos. Staunton, Great Falls	.22	.60	2.45	3.15	4.50	5.60	26.00	1.10	3.50	63,351
Engineer's estimate	.22	1.00	2.60	3.60	5.15	6.50	26.00	.60	5.00	61,108

DENVER, COLORADO—GRADING—GOVT.—WYOMING

Morrison-Knudsen Co., Boise Idaho, who bid $448,118 low bid to the U. S. Bureau of Public Roads for 15 miles grading the Grand Loop Project, Canyon Junction-Tower Junction Section, in the Yellowstone National Park, Wyoming. Bids received from:

(1) Morrison-Knudsen Co., Boise, Ida. $448,118
(2) L. T. Lawler, Butte, Mont. 449,323
(3) V. P. Strange, Salt Lake City $479,276
(4) Engineer's estimate 442,189

	(1)	(2)	(3)	(4)
44 acres clearing	500.00	250.00	300.00	300.00
31 acres grubbing	200.00	350.00	300.00	250.00
347,000 cu.yd. excav. Type "A"	.79	.82	.91	.82
16,000 cu.yd. excav. Type "B"	1.40	1.35	1.30	1.10
3,750 cu.yd. excav. structure	2.00	2.50	1.75	1.50
9,000 cu.yd. select surf. mater.	.50	.60	.60	.60
136,200 sta.yd. overhaul	.03	.03	.03	.03
15,028 miles finishing	300.00	300.00	250.00	350.00
13,500 cu.yd.mi. overhaul and select material	.40	.45	.50	.25
645 cu.yd. "A" concrete	37.50	35.00	33.00	35.00
80,630 lb. reinforcing steel	.07	.08	.09	.08
935 cu.yd. cement rub. mas.	20.00	17.00	18.00	20.00
7,374 lin.ft. 24-in. corr. culvert	3.00	3.00	2.80	3.00
794 lin.ft. 30-in. corr. culvert	4.00	3.75	3.75	4.25
96 lin.ft. 36-in. corr. culvert	5.50	6.00	5.00	5.75
30 cu.yd. hand laid riprap	4.00	2.50	3.00	2.00
1,970 cu.yd. hand laid rock embankment	3.00	2.00	2.00	1.50
2,270 lin.ft. blind underdrain	1.00	.80	1.50	1.50
8,040 lin.ft. rustic guardrail	.90	.80	1.00	1.00
Lump sum, maint. of detours	$5000	$5000	$5000	$5000
6 miles plowing old road	150.00	200.00	100.00	150.00
Furnish water pumping plant	150.00	350.00	300.00	200.00
60 days operat. pump. plant	7.50	8.00	5.00	7.00
Remove old drain structure	$1000	$2000	$2500	100.00

OGDEN, UTAH—GOVT.—GRADING AND SURFACING, IDAHO

Bids received as follows by Bureau of Public Roads, Ogden, Utah:

(A) Award of contract recommended to Jas. Tobin & Sons, Spokane, Wash., $55,696 for 5.56 miles grading Clark Fork Road, Pend Oreille National Forest, BONNER COUNTY, Idaho. Bids received on:

(1) 28 acres grubbing
(2) 118,000 cu.yd. roadw. excav.
(3) 1,000 cu.yd. borrow excav.
(4) 137,000 sta.yd. overhaul
(5) 5.56 miles finish earth gr. road
(6) 12,000 yd.mi. cushion haul
(7) 30 cu.yd. cement rub. masonry
(8) 900 ft. 18-in. corr. pipe
(9) 36 ft. 24-in. corr. pipe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Jas. Tobin & Sons, Spokane, Wash.	80.00	.36	.30	.03	$200	.20	12.00	1.70	2.60	$55,696
L. T. Lawler, Butte, Montana	95.00	.36	.36	.03	110	.22	10.00	1.65	2.40	55,990
Jas. Crick, Spokane, Wash.	80.00	.36	.37	.03	100	.20	15.00	2.00	3.00	56,066
Triangle Const. Co., Spokane	$100	.39	.50	.03	300	.20	15.00	1.80	2.70	60,845
Morrison-Knudsen Co., Boise, Ida.	$110	.46	.30	.015	150	.20	10.00	1.60	2.50	65,957
W. L. Geist, St. Maries, Ida.	$150	.43	.60	.025	200	.23	12.00	1.60	2.80	66,122
Bauers & Bauers, Dayton, Wn.	$150	.43	.40	.04	180	.21	12.00	1.70	3.13	67,726
Sam Orino, Spokane, Wn.	$200	.45	.45	.02	150	.20	9.00	1.90	2.75	68,418
Siems-Spokane Co., Spokane	80.00	.48	.43	.015	200	.20	12.00	2.00	3.00	68,500
Engineer's estimate	$200	.46	.40	.04	300	.25	14.00	2.25	3.25	74,329

(B) Award of contract recommended to Triangle Construction Co., Spokane, Wash., $48,272 for 3.7 miles grading North and South Highway, St. Joe National Forest, LATAH COUNTY, Idaho. Bids on:

(1) 23 acres grubbing
(2) 66,500 cu.yd. roadway exc.
(3) 53,600 sta.yd. overhaul
(4) 3.78 mi. finish earth gr. road
(5) 31 cu.yd. 'B' concrete (culv.)
(6) 45 cu.yd. cement rubble masonry
(7) 1,400 ft. 18-in. corr. pipe
(8) 40 ft. 36-in. corr. pipe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Triangle Const. Co., Spokane, Wn.	$250	.45	.04	$300	30.00	15.00	1.80	6.25	$48,272
Jas. Crick, Spokane, Wash.	400	.50	.03	300	40.00	15.00	2.00	8.00	55,057
Bauers & Bauers, Dayton, Wash.	200	.58	.05	200	30.00	12.00	1.75	6.50	56,212
T. Marrazzo, Spokane, Wash.	400	.60	.035	400	28.00	15.00	2.10	6.50	62,742
Siems-Spokane Co., Spokane, Wash.	395	.665	.02	250	30.00	12.00	2.00	8.20	64,644
W. L. Geist, St. Maries, Idaho	325	.75	.04	400	30.00	15.00	1.80	6.00	72,392
Engineer's estimate	400	.55	.05	350	42.00	13.00	2.25	6.00	60,640

(C) Award of contract recommended to Jas. Tobin & Sons, Spokane, Wash., $68,139 for 5.7 miles grading Enaville-Murray Linfor Road, Coeur d'Alene National Forest, SHOSHONE COUNTY, Idaho. Bids on:

(1) 10 acres grubbing
(2) 69,600 cu.yd. roadway excavation
(3) 3,400 cu.yd. borrow excav.
(4) 9,200 cu.yd. embankment meas. borrow
(5) 64,000 sta.yd. overhaul
(6) 5.7 miles finish earth graded roads
(7) 90 cu.yd. cement rubble masonry (culv. headwalls)
(8) 670 lin.ft. 18-in. corr. pipe
(9) 80 lin.ft. 24-in. corr. pipe
(10) 372 lin.ft. 36-in. corr. pipe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Jas. Tobin & Sons, Spokane, Wash.	$100	.76	.30	.40	.03	$200	10.00	1.70	2.60	5.00	$68,139
Sam Orino, Spokane, Wash.	75.00	.75	.45	.50	.04	150	9.00	1.90	2.75	4.00	68,726
Bauers & Bauers, Dayton, Wash.	$200	.78	.40	.30	.04	200	12.00	1.75	2.75	5.25	72,222
Siems-Spokane Co., Spokane	90.00	.97	.70	.52	.03	250	12.00	1.90	3.00	6.00	86,875
Engineer's estimate	$125	.90	.55	.65	.05	250	14.00	2.25	3.25	5.50	83,827

(D) Award of contract recommended to Jolin & McAllister, Spokane, Wash., $46,869 for 12 miles surfacing with crushed rock North and South Highway, St. Joe National Forest, BENEWAH AND LATAH COUNTIES, Idaho. Bids on:

(1) 2,000 cu.yd. borrow exc. should.
(2) 2,000 cu.yd. sub-base
(3) 6.53 mi. fine grading
(4) 6,900 cu.yd. crushed rock, bottom
(5) 12,800 cu.yd. crushed rock, top
(6) Provide and maintain water plant
(7) 900 M gallons watering
(8) 1,300 cu.yd. supp. cr. rock
(9) 60,300 yd.mi. haul surf.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Joslin & McAllister, Spokane, Wash.	.55	1.52	75.00	1.52	1.52	$200	1.00	1.27	.15	$46,869
Triangle Const. Co., Spokane, Wash.	.50	1.35	$200	1.35	1.45	200	2.50	1.35	.17	48,087
Carl Nyberg, Spokane, Wash.	.45	1.30	$300	1.40	1.50	300	3.00	1.30	.15	48,504
Engineer's estimate	.50	1.50	$250	1.50	1.60	500	2.50	1.55	.20	53,837

SACRAMENTO, CALIF.—STATE—GRADING AND CONCRETE PAVING—SAN LUIS OBISPO COUNTY

Cornwall Const. Co., 219 E. Mason St., Santa Barbara, $130,828, low bid to California Division of Highways for 3 miles grading and concrete paving from San Luis Obispo to foot of Cuesta Grade, SAN LUIS OBISPO COUNTY. Bids from:

(1) Cornwall Const. Co. $130,828
(2) Watson & Sutton, San Diego 134,973
(3) McCray Co., Los Angeles 135,710
(4) J. F. Knapp, Oakland 140,660
(5) W. A. Dontanville, Salinas 142,556
(6) T. M. Morgan Paving Co. $145,004
(7) M. J. Bevanda, Stockton 149,829
(8) Ariss-Knapp Co., Oakland 154,675
(9) I. L. Ryder, San Jose 174,293

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
75,700 cu.yd. roadway excav.	.40	.445	.50	.45	.42	.55	.50	.50	.55
850,000 sta.yd. overhaul	.01	.0075	.01	.01	.01	.01	.009	.02	.015
1,600 cu.yd. structure excav.	1.00	1.00	1.00	1.00	1.25	1.00	.75	1.00	2.00
35,000 sq.yd. subgrade (pave)	.09	.10	.10	.09	.09	.08	.084	.10	.09
7,200 cu.yd. concrete paving	9.15	9.54	8.75	10.00	10.60	9.50	10.80	9.95	12.20
260 cu.yd. concrete (struc.) "A"	20.00	20.00	20.00	20.00	22.00	20.00	18.00	20.00	25.00
13 cu.yd. concrete (struct.) "C"	19.00	18.00	18.00	18.00	19.00	20.00	15.00	18.50	20.00
189,000 lb. reinf. steel	.04	.047	.045	.045	.04	.05	.048	.047	.05
406 ft. 18-in. corr. pipe	.50	.50	.60	.50	.50	.50	.60	1.00	.75
230 ft. 24-in. corr. pipe	.75	.75	.75	.60	.50	.50	.80	1.25	.90
106 ft. 30-in. corr pipe	1.00	.75	1.00	.70	.75	.50	1.20	1.50	1.00
46 ft. corr. pipe (clean and relay)	2.00	1.00	1.00	1.00	1.00	.50	.90	1.50	1.00
700 cu.yd. remove concrete	1.50	1.20	1.50	2.00	1.25	2.00	2.40	2.00	3.00
46 remove trees (12-in. or more)	10.00	15.00	6.00	5.00	10.00	3.00	10.00	10.00	20.00
60 cu.yd. cushion course	1.25	2.50	2.50	2.00	3.50	2.50	1.80	3.47	3.00
400 tons crusher run base	2.25	2.50	2.50	3.00	3.00	2.00	3.30	3.33	2.50
2.5 mi. new property fence	$500	$450	$500	$500	$250	$400	$500	$500	$400
290 ft. timber guard rail	1.25	1.00	1.25	1.00	1.00	1.00	1.00	1.00	1.00
700 bbl. fuel oil (shoulders)	4.00	2.00	2.50	2.20	2.50	2.25	2.40	2.65	3.00
157 stat. finish roadway	5.00	4.50	5.00	5.00	8.00	8.00	6.00	5.00	7.00
52 monuments	3.00	2.00	2.50	2.50	3.00	3.00	3.00	5.00	3.00

SACRAMENTO, CALIF.—STATE—PLACER COUNTY—CONCRETE PAVING AND GRADING

N. M. Ball, 1889 Yosemite Road, Berkeley and Porterville, who bid $62,253, low bid to California Division of Highways for 1.7 miles grading and concrete paving through Lincoln, PLACER COUNTY. Bids from:

(1) N. M. Ball, Berkeley $62,253
(2) Hanrahan Company, San Francisco 64,807
(3) C. W. Wood, Stockton 66,073
(4) Mathews Construction Co. 65,160
(5) Fredrickson & Watson, Oakland, and Fredrickson Bros., Stockton $66,702
(6) Clark & Henery Construction Co. 76,832

	(1)	(2)	(3)	(4)	(5)	(6)
9,500 cu.yd. roadway excavation	.30	.30	.25	.30	.25	.35
10,500 sta.yd. overhaul	.02	.02	.02	.01	.02	.02
15,200 cu.yd. impt. borrow	.37	.40	.35	.30	.30	.45
800 cu.yd. import. material	1.00	1.00	.60	1.00	.90	1.00
750 cu.yd. struct. excavation	1.00	1.50	1.00	1.00	1.25	1.00
20,000 sq.yd. subgrade	.09	.09	.07	.09	.09	.08
4,150 cu.yd. concrete paving	9.00	9.25	10.00	9.25	10.50	11.50
195 cu.yd. concrete (Str-"A")	20.00	20.00	19.00	23.00	20.00	20.00
9 cu.yd. concrete (Str-"E")	70.00	60.00	70.00	70.00	60.00	60.00
122,500 lb. reinf. steel	.045	.05	.05	.05	.045	.06
2,000 yd. macadam and oil surfacing	.75	.75	1.00	1.40	.65	1.00
390 ft. 12-in. corr. pipe	.50	.50	.50	.60	.50	.50
710 ft. 18-in. corr. pipe	.50	.50	.50	.70	.50	.75
10 ft. 8-in. vitr. pipe	.50	.50	1.00	1.00	.50	.75
235 ft. timb. headers	.30	.60	.50	.50	.20	.50
1 mi. move and reset fence	100.00	200.00	300.00	350.00	200.00	250.00
1,500 ft. remove fence	.05	.03	.05	.10	.05	.05
670 ft. remove guard rail	.10	.14	.10	.07	.05	.10
89 sta. finish roadway	5.00	5.00	5.00	5.00	4.00	6.00
14 ft. 12-in. vitr. pipe	1.00	.75	1.00	1.25	.50	1.00

PORTLAND, ORE.—GOVT.—EMULSIFIED ASPHALT PAVING—WASHINGTON

Award of contract recommended to Stilwell Bros., Inc., 3220 9th St. South, Seattle, Wash., who bid $125,310 to the Bureau of Public Roads, Portland, Ore., for 11.77 miles asphalt macadam paving the West Entrance-Paradise Inn Section of the Mt. Rainier National Park, WASHINGTON. Bids received on:

(1) 2,000 cu.yd. coarse aggregate (park surface)
(2) 1,300 tons emulsified asphalt
(3) 1,000 cu.yd. coarse aggregate (base course)
(4) 153,000 sq.yd. asphaltic macadam (top course)
(5) 1,000 cu.yd. rock chips (second seal coat)
(6) 2,000 cu.yd. rejections (stockpiles)
(7) 1,000 mi.yd. haul (rejections)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTALS
Stillwell Bros., Inc., Seattle	2.54	32.00	4.50	.46	3.00	.25	.25	$125,310
J. L. Smith Const. Co., Seattle	3.00	28.00	5.50	.50	4.25	.25	.25	129,400
Newport & Pyle, Portland, Ore.	2.25	32.00	2.75	.53	5.10	.25	.25	135,790
Meyers Contr. Co., Portland	4.00	35.00	6.00	.48	5.00	.25	.25	138,690

OGDEN, UTAH—GRADING—CACHE COUNTY, UTAH—GOVT.

Award of contract recommended to Olof Nelson, Logan, Utah, who bid $96,824 for 4.6 miles grading Logan-Garden City Road, Cache National Forest, CACHE COUNTY, Utah, for Bureau of Public Roads. Bids received from:

(1) Olof Nelson, Logan, Utah $96,824
(2) W. H. Puckett Co., Boise, Ida. 97,918
(3) Utah Construction Co., Ogden $115,786
(4) Engineer's estimate 103,109

	(1)	(2)	(3)	(4)
91,000 cu.yd. roadway excav.	.52	.58	.65	.60
1,250 cu.yd. structure excavation	3.00	2.50	8.00	3.50
80,000 sta.yd. overhaul	.03	.04	.04	.05
4.66 mi. finish earth gr. road	$300	$300	$200	$200
560 cu.yd. 'A' concrete	28.00	28.00	30.00	26.00
32 cu.yd. 'B' concrete	28.00	28.00	25.00	25.00
143 cu.yd. 'D' concrete	30.00	29.00	35.00	28.00
85,300 lb. reinforcing steel	.08	.06	.08	.065
275 lb. bronze bearing plates	.30	.40	.10	.40
712 lin.ft. 18-in. corr. pipe	2.00	2.00	2.00	2.00
120 lin.ft. 24-in. corr. pipe	3.00	3.25	2.70	3.00
1,100 cu.yd. hand-laid riprap	4.00	1.50	3.00	4.00
Move and rebuild flume	$8000	$8000	$8000	$8000

BRIDGES AND CULVERTS

HELENA, MONTANA—STATE—CONCRETE AND STEEL

Contract awarded to McGuire & Blakeslee, Great Falls, Montana, who bid $112,993 for constructing 546-ft. bridge on the Wolf Creek-Cascade Highway, Section C. CASCADE COUNTY, Montana, work for Montana Highway Comm. Bids on:

(1) 1,014 cu.yd. 'A' concrete
(2) 287 cu.yd. 'D' concrete
(3) 89,600 lb. reinf. steel
(4) 680,900 lb. structural steel
(5) 10,300 lb. cast steel
(6) 1,080 cu.yd. structure excavation

	(1)	(2)	(3)	(4)	(5)	(6)	TOTALS
McGuire & Blakeslee, Great Falls, Mont.	28.00	29.50	.07	.0795	.19	12.55	$112.993
W. P. Roscoe Co., Billings, Montana	25.75	27.40	.069	.076	.17	19.25	114,754
Portland Bridge Co., Portland, Ore.	29.00	29.00	.06	.085	.20	11.00	115,185
Stevens Bros., St. Paul, Minn.	27.50	31.00	.067	.081	.19	14.00	115,202
Engineer's estimate	30.00	28.00	.07	.08	.15	12.00	113,881

OLYMPIA, WASH.—STEEL SUPERSTRUCTURE—STATE—LAKE UNION BRIDGE

Contract awarded to U. S. Steel Products Co., Seattle, Wash., who bid $1,247,888 for constructing steel superstructure for the Lake Union Bridge at Aurora St. in the City of Seattle, work for the Washington State Highway Comm. Bids on:

(1) 7,000,000 lb. struct. steel (carbon)
(2) 8,100,000 lb. struct. steel (silicon)
(3) 370,000 lb. steel castings
(4) 60,000 lb. steel forgings
(5) 80,000 lb. iron castings
(6) 1,100,000 lb. reinf. steel
(7) 3,400 cu.yd. Class 'A' concrete
(8) 4,000 ft. railing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
U. S. Steel Products Co.	.061	.075	.12	.1275	.08	.055	21.00	10.00	$1.247.888
Pacific Bridge Co.	.072	.081	.12	.15	.08	.04	20.00	10.00	1,387,774
Wallace Bridge Co.	.078	.089	.104	.144	.102	.0427	17.15	9.50	1,482,313
General Constr. Co.	.081	.091	.11	.14	.08	.065	18.00	11.00	1.554,388
Hans Pederson	.085	.10	.13	.17	.07	.065	22.50	8.00	1,672,130

CONSTRUCTION NEWS SUMMARY

NOTE: For additional information regarding projects in this summary refer to Daily Construction News Service, date appearing at end of each item.

TABULATION OF AWARDS

Awards for the month of July, 1930, for Engineering Construction projects in the Far Western States total $37,024,000, as follows:

Paving	$ 7,600,000
Grading	9,000,000
Bridges	4,425,000
Sewer construction	1,950,000
Water supply systems	1,175,000
Irrigation and reclamation	500,000
Power development	1,000,000
River and harbor work	700,000
Lighting systems	700,000
Railroad construction	9,974,000
	$37,024,000

LARGE WESTERN PROJECTS

(See Construction News, this issue, for details.)

WORK CONTEMPLATED

Paving, water and sewer mains and lighting system on Tweedy Blvd. for City of Southgate, Calif.; $500,000.

Sewer mains and disposal plant for City of Phoenix, Ariz.; $817,000.

Highway improvements for State of Wyoming; $2,800,000.

Addition to Lake Union Steam Power Plant for City of Seattle, Wash., including equipment to cost $600,000.

BIDS BEING RECEIVED

Dam for the City of Denver, Colo.; concrete construction; bids to August 12.

BIDS RECEIVED

Grading, Grand Loop Project, Yellowstone National Park, Wyoming, for Bureau of Public Roads, Denver, Colo.; Morrison-Knudsen Co., Boise, Ida., $448,118, low.

CONTRACTS AWARDED

Railroad, 111 miles from Keddie, Plumas County, to Bieber, Lassen County, Calif., for Western Pacific Railroad Co., to W. A. Bechtel Co. & Utah Construction Co., San Francisco, $9,824,669.

Ford Motor Co., assembly plant at Richmond, Calif., to Clinton Construction Co., San Francisco, $3,500,000.

Addition to Ford Co. assembly plant at Long Beach, Calif., to Clinton Construction Co., Los Angeles, $350,000.

STREET and ROAD WORK

WORK CONTEMPLATED

ALTURAS, CALIF.—Plans by City Engr. S. A. Mushen, protests Aug. 4, for improving Main St., involving 29,000 sq.yd. asphalt concrete paving, 5300 ft. 4-in. and 6-in. cast iron mains, hydrants, rock sub-base, etc. City will pay $25,000 of cost, balance 1911-15 Acts. 8-2

HAYWARD, CALIF.—Plans by City Engr., J. B. Holly, for improving Smalley Ave., Laurel Ave., etc., involving 165,450 sq.ft. 6-in. Emulsified asphalt macadam paving and grading, vitr. sewers, corr. iron and concrete culvert. Bids after Aug. 6. 7-22

LOS ANGELES, CALIF.—Plans by County Surveyor, protests Aug. 11 for improving streets in Tract 5766, near Wilmington, work involving: 7000 cu.yd. grading; 6500 lin.ft. curb & gutter; 28,000 sq.ft. cement sidewalk; 96,000 sq.ft. 4-in. Bitumels paving; 118,000 sq.ft. 4-in. disintegrated rock sub-base. 7-19

MONTEREY, CALIF.—Plans by Architects, Swartz & Ryland, Spazier Bdg., Monterey, for constructing girls' athletic field, 8 tennis courts, and corr. culverts for Monterey Union High School Dist. Bids after Aug. 5. $18,000. 7-26

OAKLAND, CALIF.—Plans by City Engr. for improving Broadway Terrace and Hermosa Ave. involving 3907 cu.yd. excavation, reinf. conc. pipe conduit, vitr. sewers, etc. Bids after Aug. 28. 7-26

OAKLAND, CALIF.—Plans by City Engr. for (1) Improving 88th Ave. near Olive St., involving 3120 cu.yd. excavation, 33,133 sq.ft. penetration macadam paving, corr. iron and reinf. conc. culverts, vitr. sewers, and reinf. conc. pipe conduits; and (2) Improving Marguerite Drive, involving 7789 sq.ft. penetration macadam paving, vitr. pipe conduit, etc. Bids after Aug. 7. 7-26

OROVILLE, CALIF.—Plans made, protests Aug. 6 by County for improvement of Road Dist. No. 1 (Berry Creek Causeway Maintenance District). Work involves: Causeway upon earth rolled fill, work involving: 8400 cu.yd. embankment; clearing and grubbing and moving present timber bridge; stripping the site of the fill to bedrock; cut-off trench; 18-in. reinf. conc. conduit with timber control gate stand and placing control gate; three tube reinf. conc. syphon drainage culvert; highway approach; reconstructing Swayne Logging RR. (narrow gauge); taking up and relaying 1400 ft. of main line track and 900 ft. of siding track; move and reset water tank and camp buildings, tent floor and grading new camp sites; regrading road connecting with Lakeside Way. 1921 Act. 7-25

REDWOOD CITY, CALIF.—Plans by City Engr., protests Aug. 11 for improving Hawes St., Nevada St., Opal St., Ruby and other streets, paving with 5-in. concrete, paving with 3½-in. asphalt base with 1½-in. asphalt surface, concrete box culverts, earth channel, etc. $40,000. 1911-15 Acts. 8-1

SAN DIEGO, CALIF.—Plans by City Engr. for improving West Point Loma Blvd. involving 168,565 sq.ft. 6-in. asphalt paving, 3066 ft. 6-in. and 45 ft. 10-in. cast iron pipe, etc. Bids soon. 7-25

SOUTHGATE, CALIF.—Plans by Engr., E. M. Lynch, Central Bdg., L. A., for improving Tweedy Blvd. from Alameda St. to Atlantic Ave. for City, paving, grading, curbs, water mains, cement sewers, lighting system, $500,000. 7-19

DENVER, COLO.—Plans by City Engr. for: (1) Paving alleys in Dist. 197, $24,000; and (2) Paving alleys in Dist. 198, $26,000.

DENVER, COLO.—Plans by A. K. Vickery, City Engr., for improvement streets in District No. 8, $100,500.

CHEYENNE, WYO.—Bond election will be held Nov. 4 by the State of Wyoming to vote $2,800,000 for state highway improvements. Z. E. Sevison is State Highway Engineer.

BIDS BEING RECEIVED

JUNEAU, ALASKA—Bids to 9 a.m., Sept. 3, by Bureau of Public Roads, Juneau, Alaska, for 2.4 miles of Salmon River Highway, involving 4700 cu.yd. of common and 21,900 cu.yd. rock excavation, 2900 cu.yd. gravel top course. 8-4

GRAND CANYON, ARIZ.—Bids to 10 a.m., Aug. 12, by Park Supt., Grand Canyon, Ariz., for 17 miles subgrade reinforcing selected gravel material Sect. D, Route 2, Grand Canyon-Old Trails National Highway, COCONINO COUNTY, involving 28,400 cu.yd. reinf. material, 122,000 yd.mi. hauling material. 7-28

FRESNO, CALIF.—Bids to 10:30 a.m., Aug. 14, by City Clerk for improving Glenn Ave., curbs, sidewalks and approaches. 8-2

GLENDALE, CALIF.—Bids to 10 a.m., Aug. 21, by City for improving Broadway, Concord St., etc., involving grading, 26,180 sq.ft. 3-in. asphalt base with Warrenite Bit. surface, 83,630 sq.ft. 2-in. Warrenite Bit. surface, water system, lighting system, etc. 8-4

GLENDALE, CALIF.—Bids to 10:00 a.m., Aug. 14, by City for improving Broadway, between Pacific Ave. and the east line of lot 1, Moorpark Tract, and portions of Concord St., Kenilworth Ave., Columbus Ave., etc., involving 5-in. macad. pavement; curbs; gutters; cement walk; 2-in. Warren. pavement on 3-in. asphalt concrete base; 6-in. Class 250 cast iron water pipe; water services, etc. 8-2

LAGUNA BEACH, CALIF.—Bids to 7:30 p.m., Aug. 13, by City for improving High Drive and other streets in Laguna Cliffs, involving 45,000 cu.yd. grading, 1,060,000 sq.ft. oil and rock surfacing, 1430 ft. 4-in. cast iron water pipe, vitr. sewers, etc. 8-2

LONG BEACH, CALIF.—Bids to 2:00 p.m., Aug. 22, by City for: (1) Improvement of alley east of Sherman Place between 15th and 17th St., 15th St., between Sherman and Stenton, work involving: 9771 sq.ft. 6-in. cement concrete pavement. (2) Improvement of Del Rey Court between Broadway and 4th St., and other streets, work involving: 17,926 sq.ft. 7-in. cement concrete pavement. (3) Improvement of alley north of 17th St., between Alamitos Ave. and Gundry Ave., work involving: 5343 sq.ft. cement conc. pavement. (4) Improvement of Magnolia Ave., between 10th and Anaheim St., work involving: 3257 sq.ft. 6-in. cement concrete gutter; 5619 sq.ft. 8-in. cement concrete gutter; 56,761 sq.ft. 6-in. asphaltic concrete pavement. 8-1

LOS ANGELES, CALIF.—Bids to 2:00 p.m., Aug. 18, by County for: (1) Improving Main St. south of Artesia, from Orangethorpe Ave. to Central Road, involving: 32,549 cu.yd. excavation; 434,952 sq.ft. 9x7-in. concrete pavement; 43,332 sq.ft. 7½-in. concrete pavement; 178,780 sq.ft. 4-in. disint. rock and oil surface; 494,411 sq.ft. 5-in. disint. rock culverts. ALTERNATE ON PAVING—478,284 sq.ft. 6-in. asphalt base; 479,544 sq.ft. 1½-in. asphalt wear. surface. (2) Improving 1¼ miles of Richfield Ave. and Ocean Ave. near Hynes, involving: 13,543 cu.yd. excavation; 229,561 sq.ft. 9x7-in. concrete pavement; 245,628 sq.ft. 5-in. disintegrated rock and old macadam base; 29,534 sq.ft. 4-in. disintegrated should. with oil and rock surface. ALTERNATE ON PAVING—229,561 sq.ft. 6-in. asphalt concrete base; 229,561 sq.ft. 1½-in. asphalt concrete surface. 8-2

MILL VALLEY, CALIF.—Bids to 8 p.m., Aug. 18, by Mill Valley school district for paving playground at Old Mill School. 7-26

NAPA, CALIF.—Bids to 10 a.m., Aug. 12, by County for 9 miles of Berryessa Valley Road, involving 23,000 cu.yd. grading, 9000 cu.yd. crushed rock surface. 7-22

OROVILLE, CALIF.—Bids to 1:30 p.m., Aug. 18, by County for 4 miles of Fell Road. 8-2

REDDING, CALIF.—Bids to Aug. 15, by Joint Highway Dist. 11, for 3 miles grading Weed-Klamath Falls Road, involving 51,444 cu.yd. excavation, corr. pipe, etc., $65,000. C. F. Mau, Redding, is engineer. 8-4

SAN LUIS OBISPO, CALIF.—Bids to 2 p.m., Aug. 15, by the Division of Highways, District Engineer, District 5, Bank of Italy Bldg., San Luis Obispo, Calif., for oiling 4 miles in SANTA BARBARA COUNTY, between El Capitan Creek and one mile south of Tajiguas Creek, borders to be constructed of crusher run base. 8-4

SAN FRANCISCO, CALIF.—Bids to 2:00 p.m., Aug. 21, by Bureau of Public Roads, 461 Market St., S. F., for 4.5 miles Sect. 1B, Generals Highway, Sequoia National Park, TULARE COUNTY, involving 43,400 cu.yd. excavation, 5400 cu.yd. placing reinf. material, etc. 8-1

SAN FRANCISCO, CALIF.—Bids to 2 p.m., Aug. 14, by U. S. Bureau of Public Roads, 807 Sheldon Bdg., S. F., for oiling 12 miles of Quincy-Beckwith Nat. Highway, Plumas National Forest, involving 12 miles mixing oil treated surfacing, and 181,500 gallons asphaltic oil. 7-29

SAN RAFAEL, CALIF.—Bids to 11 a.m., Aug. 12, by County for 3.6 miles grading Lucas Valley Road, involving 18,000 cu.yd. excavation, etc. 7-26

SO. SAN FRANCISCO, CALIF.—Bids to 7:30 p.m., Aug. 18, by City for improving Linden Ave. involving 210,000 sq.ft. asphalt paving vitr. and concrete sewers, 44 electroliers, reinf. concrete bridges. 7-28

DENVER, COLO.—Bids to 2 p.m., Aug. 15, by U. S. Bureau of Public Roads for 6 miles Willow Creek Pass Highway, Arapahoe National Forest, GRAND COUNTY, Colorado, involving 40 acres clearing, 19 acres grubbing, 71,000 cu.yd. roadway excavation, corr. pipe, etc.

HOLLY, COLO.—Bids to 8 p.m., Aug. 18, by City, for curbs and sidewalks in Dist. 1, $16,000.

BOISE, IDAHO—Bids to 2 p.m., Aug. 6, by State Comm. of Public Works for (1) 2.6 miles Palouse Highway, between Coeur d'Alene and Ford, KOOTENAI COUNTY, involving 8000 cu.yd. rock and 28,000 cu.yd. common excavation, 170 cu.yd. concrete, corr. pipe, etc.; (2) 10 miles Raft River Highway from Burley to Declo, CASSIA COUNTY, involving 130,000 cu.yd. roadway excavation, 18,000 cu.yd. gravel surfacing, 890 cu.yd. concrete, 106,000 lb. reinf. steel, corr. pipe, etc.; and (3) 24 miles of Old Oregon Trail from Bonanza Ranch to Snake River, POWER and CASSIA COUNTIES, involving 19,000 cu.yd. solid rock, 15,000 cu.yd. loose rock, and 197,000 cu.yd. common excavation, 3000 cu.yd. concrete, corr. pipe, etc.

PORTLAND, ORE.—Bids to 10:00 a.m., Aug. 13, by U. S. Bureau of Public Roads for 3.7 miles Baker River Highway, No. 25B, Mt. Baker National Forest, WHATCOM COUNTY, Washington, involving 54,000 cu.yd. roadway excavation, 21 acres clearing, 15 acres grubbing, etc.

PORTLAND, ORE.—Bids to 10 a.m., Aug. 15, by Bureau of Public Roads for: (1) Improving San Creek-Park Boundary Road, Crater National Forest, KLAMATH COUNTY, 4 miles, involving 67,000 gallons asphaltic oil and 4 miles oil mixing; and (2) 1.8 miles National Park Road, Crater Lake National Park, KLAMATH COUNTY, involving 29,800 gallons asphaltic oil and 1.8 miles oil mixing. 8-4

SALT LAKE CITY, UTAH—Bids to 2 p.m., Aug. 15, by State, for 6.9 miles from Cisco to Colorado Line, GRAND COUNTY, involving 91,000 cu.yd. excavation, 14,500 cu.yd. gravel surfacing, 120.7 M. F.B.M. lumber for bridges, 32 tons of structural steel. 8-4

EVERETT, WASH.—Bids to Aug. 18, by County, for grading 1 mile of roadway, Main St. extension from Edmonds east, $10,000.

OLYMPIA, WASH.—Bids to 10 a.m., Aug. 19, by State Director of Highways for: CLALLAM COUNTY—Surfacing 4.5 miles of State Road No. 9 from Lairds Corner to Port Angeles, involving: 12,500 cu.yd. crushed gravel surfacing, 820 cu.yd. excavation; WHITMAN COUNTY—Grading and draining 0.3 miles of Spring Flat Creek Bridge and approaches between Parvin Road and Colfax, involving: 6580 cu.yd. excavation, one 20-ft. concrete bridge, 45 lin.ft. pipe culverts, etc. 7-25

SOUTH BEND, WASH.—Bids to Aug. 18, by County for surfacing Lateral Highway No. 7 from Wilson Creek Bridge, involving 1242 cu.yd. surfacing.

CHEYENNE, WYO.—Bids to 10:30 a.m., Aug. 5, by State Highway Comm. for: (1) 0.854 miles surfacing with bit. macadam streets in Gillette, involving 22,490 gallons bit. binder, 1377 tons broken stone; (2) 1.2 miles concrete paving streets in Cody, involving 27,051 sq.yd. concrete paving, vitr. sewers, curb, etc.; (3) 7.2 miles Orin-Lusk Road, CONVERSE COUNTY, involving 91,500 cu.yd. earth, 4860 cu.yd. loose rock and 1500 cu.yd. solid rock excavation, etc.; (4) 5.7 miles Sundance-Carlile Road, CROOK COUNTY, involving 58,800 cu.yd. earth, 13,500 cu.yd. loose rock excavation, 32,000 cu.yd. solid rock excavation, etc.; (5) 9.5 miles grading and timber bridges on Gillette-Moorcroft Road, CAMPBELL COUNTY, involving 108,400 cu.yd. earth excavation, etc., and (6) 8 miles surfacing Casper-Shoshone Road, FREMONT COUNTY, involving 13,000 tons selected material surfacing.

BIDS RECEIVED

PHOENIX, ARIZ.—J. C. Steele, Phoenix, Ariz., who bid $75,703 to the City for improving Jefferson St. from 9th and 16th Sts., and portions of 16th St., Washington St. and other streets. Work involves: conc. pave., grading, sidewalks, curb and gutter. 8-4

GILROY, CALIF.—Hanrahan Co., Standard Oil Bdg., S. F., $54,911 low bid to City for asphalt paving Hanna St., First St., etc. for City. Bids rejected and territory will be increased. 7-26

LOS ANGELES, CALIF.—Griffith Co., Los Angeles Railway Bdg., L. A., $373,925 low for improving Olive St., etc., in Olive St. and 23rd St. Improvement District, asphalt paving, water system, storm drain, lighting system, for City. 8-1

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) PLACER COUNTY—N. M. Ball, 1889 Yosemite Road, Berkeley, $62,253 low for 1.7 mi. grading and concrete paving through Lincoln; (2) MENDOCINO COUNTY—E. C. Coats, Miranda, $85,289 low for 2 miles grading and surfacing and timber bridges from McDonald to Wendling; (3) RIVERSIDE COUNTY—Bert Noble, 841 W. Beech St., San Diego, $256,609 for 16.2 miles grading and oil treated surfacing from Desert Center to 9½ miles west of Hopkins Wells; and (4) SAN BERNARDINO COUNTY—H. W. Rohl, 4351 Alhambra Ave., Los Angeles, $187,325 low for 9.5 miles grading and surfacing with oil treated gravel or stone from southwest of Dunn to Cronise Valley. (See Unit Bid Summary.) 7-30

SACRAMENTO, CALIF.—Chas. N. Chittenden, 2046 First St., Napa, $51,532 low for 1.4 miles grading and surfacing near Alturas, MODOC COUNTY, for California Division of Highways. Bid rejected, work to be done by day labor. 7-28

SAN BERNARDINO, CALIF.—Gilmore Oil Co., Ltd., Los Angeles, who bid $4050, low bid to District Engineer, California Division of Highways, 247 Third St., San Bernardino, for 23.8 miles of heavy fuel oil to be applied as a dust layer in SAN BERNARDINO COUNTY from Sawmill to Bear Lake. 8-1

SAN BERNARDINO, CALIF.—Gilmore Oil Co., Los Angeles, $1622, low bid to Dist. Engr., California Division of Highways, San Bernardino, for 34.3 miles fuel oil to be applied to shoulders in SAN BERNARDINO COUNTY from San Bernardino to Victorville. 7-30

SAN DIEGO, CALIF.—Watson & Sutton, P. O. Box 396, San Diego, $9286 low for improving Palm St., grading, concrete paving, etc., for City. 8-2

SAN DIEGO, CALIF.—V. R. Dennis Const. Co., P. O. Box 183, Stat. A, San Diego, $9635 low bid to County for 2.8 miles bitumuls surfacing near Descanso. 7-29

SAN FRANCISCO, CALIF.—Low bids as follows, by City: (1) C. B. Eaton, 715 Ocean Ave., S. F., $20,663, low for improving Ulloa St. from 35th to 38th Ave., etc., grading, vitr. sewers, 6-in. concrete base, 2-in. asphalt surf.; and (2) C. B. Eaton, 715 Ocean Ave., S. F., $46,338, low for improving Castro St. and Glen Park Terrace, grading, paving with 6-in. concrete base, 1½-in. asphalt surface, vitr. sewers, etc. 7-31

DENVER, COLO.—Cook & Bansom, Ottawa, Kansas, $69,712 low for grading 7.5 miles Holman-Rio Pueblo Project, TAOS COUNTY, New Mexico, for Bureau of Public Roads. (See Unit Bid Summary.)

DENVER, COLO.—Morrison-Knudsen Co., Boise, Ida., $448,118 low for 15 miles grading Grand Loop Project, Canyon Junction-Tower Junction Sect., Yellowstone National Park, WYOMING, for Bureau of Public Roads. (See Unit Bid Summary.) 7-28

DENVER, COLO.—Low bids as follows, by State: (1) J. B. Bertrand, Inc., Denver, $51,600, low for 1.2 miles asphalt paving on W. Alameda Ave., from Denver to Morrison, DENVER AND ARAPAHOE COUNTIES; (2) J. Finger & Son, Denver, Colo., $51,990, low for 2.7 miles grading and gravel or rock surfacing south of Buena Vista, CHAFFEE COUNTY; and (3) Mt. States Construction Co., Pueblo, Colo., $40,000, low for 2.7 miles surfacing and bridge at Las Animas, BENT COUNTY.

BUTTE, MONT.—L. T. Lawler, Butte, Mont., $88,406 for improvement of Upper Nine Mile Road and Basin Creek Road for County.

PORTLAND, ORE.—Morrison-Knudsen Co., Boise, Idaho, $43,047, low bid to U. S. Bureau of Public Roads, New Postoffice Bdg., Portland, Ore., for grading 5 miles of the Canyon City-Burns Highway located in the Malheur National Forest, HARNEY COUNTY, Oregon. 8-1

PORTLAND, ORE.—J. A. Lyons, Portland, $12,385 low for concrete paving E. 82nd St. for City.

PORTLAND, ORE.—Stilwell Bros., Inc., 3220 9th St., South, Seattle, Wash., $125,310 low to Bureau of Public Roads, Portland, Ore., for 11.77 miles asphalt macadam paving the West Entrance-Paradise Inn Section of the Mt. Rainier National Park, Washington. (See Unit Bid Summary). 7-25

PORTLAND, ORE.—Low bids as follows by State Highway Commission: MALHEUR COUNTY—Newport Const. Co., Exchange Bdg., Portland, $106,795 low for 10 miles regrading and resurfacing Dead Ox Flat and Weiser Spur Section of Old Oregon Trail. POLK COUNTY—Earl L. McNutt, Eugene, Ore., $20,030 low for 2.8 miles roadbed widening Clow Corner-Monmouth Section of West Side Pacific Highway. LINN COUNTY—Earl L. McNutt, Eugene, Ore., who bid $28,545 low for 2.37 miles roadbed widening of Tangent-Shedd Section of the Pacific Highway. 7-28

SALT LAKE CITY, UTAH—Gibbons & Reed, Continental Bank Bdg., Salt Lake City, $95,000 low for paving streets in Dist. 229 for City.

SALT LAKE CITY, UTAH—Low bids as follows by State: (1) E. C. Lee & Son, Price, Utah, $21,315, low for 10 miles gravel surfacing Price-Emery County Line and Castle Gate Road, CARBON COUNTY; (2) Wheelwright Const. Co., Ogden, Utah, $23,036, low for 14 miles gravel surfacing Richfield-Elsinore, Richfield-North Project, SAN PETE and SEVIER COUNTIES; (3) Ora Bundy, Ogden, Utah, $16,368, low for concrete paving Viaduct on 24th St., City of Ogden, WEBER COUNTY.

SALT LAKE CITY, UTAH—Gibbons & Reed, Salt Lake City, Utah, $7803 low bid to Utah State Road Commission for concrete paving at Magna City, SALT LAKE COUNTY.

SALT LAKE CITY, UTAH—Christensen & Gardner, Vermont Bdg., Salt Lake, $32,172 for 1 mile concrete paving near Tooele, TOOELE COUNTY, for State.

HOQUIAM, WASH.—F. E. Wilder, Olympic, Wash., $23,145 low for concrete paving M St., for City.

PROSSER, WASH.—Fred G. Redmon, Yakima, $15,900 low for grading Lateral Highway No. 2 near Kennewick for County.

SEATTLE, WASH.—Low bids as follows by City: (1) Queen City Const. Co., Seattle, $19,155 low for grading 42nd Ave. west; and (2) Fiorito Bros., Seattle, $13,580 low for paving Ninth Ave. northwest.

CONTRACTS AWARDED

PHOENIX, ARIZ.—Awards as follows by City: (1) To O. U. Miracle Const. Co., 4751 Monroe St., San Diego, $13,108 for concrete paving McKinley St. from 14th to 16th Sts.; and (2) To Pacific Construction Co., Phoenix, Ariz., $9569 for concrete paving Third St. from Hadley to Grant St.

PHOENIX, ARIZ.—To Hodgman & MacVicar, 714 Plymouth Road, Pasadena, who bid $34,562 to Arizona State Highway Commission for improving 4 miles of Fredonia-State Line Highway from Fredonia North. 7-28

VANCOUVER, B. C.—To G. W. Ledingham, 348 E. 8th Ave., Vancouver, B. C., $235,435, for paving streets for City.

BISHOP, CALIF.—To L. C. Pulley, 1960 Alamitos St., Long Beach, who bid $4981 for 8.8 miles oiling as dust layer from Mono Lake to foot of Conway Grade, MONO COUNTY, work for the California Division of Highways. 7-25

GILROY, CALIF.—To Hanrahan Co., Standard Oil Bdg., San Francisco, $54,985 for improvement of Hanna St., First St., etc., work for City of Gilroy, Santa Clara County. Work consists of grading, paving with asphalt, sewers, etc. 7-22

LOS ANGELES, CALIF.—Awards as follows by Board of Public Works: (1) To Geo. H. Oswald, 366 E. 58th St., L. A., $120,350 for improving Virgil Ave. from Sunset Blvd. to Geneva St., grading, asphalt paving, lighting system, etc.; (2) To Geo. H. Oswald, 366 E. 58th St., Los Angeles, who bid $149,370 for improving streets in 117th St. and Denver Ave. Improvement District, grading, paving with concrete, constructing curbs, vitrified sewers, concrete gutters, water systems, etc. 7-21

MARTINEZ, CALIF.—Awards as follows by County: (1) To U. S. Lee, 888 Rodney Drive, San Leandro, $26,355 for 7 miles Emulsified asphalt paving of Long Tree, Fairview & Brentwood Roads; (2) To Geo. G. Wood, General Delivery, Gilroy, $4214 for grading 1.44 miles of Buchanan Road and $4152 for grading 2.7 miles of Road D14 near Pittsburg. 7-21

MARTINEZ, CALIF.—Awards as follows by County for asphaltic macadam: (1) To Pereira & Reed, 545 Roosevelt Ave., Tracy, $6091 for Road C-31 and C-32 near Concord; and (2) To Leo G. Lynch, Danville, $6753 for Division 40, Crow Canyon Road. 8-4

MARYSVILLE, CALIF.—To Hemstreet & Bell, Marysville, who bid $13,000 for furnishing and spreading crushed rock on 6.1 miles of the Willow Glen Road, work for Yuba County. 7-22

MARYSVILLE, CALIF.—To Central California Roads Co., 2779 Poplar St., Oakland, for improvement of F, B, and 12th Sts. for City, involving 19,521 sq.ft. 2½-in. asphalt base with 1½-in. asphalt surface. 7-29

OAKLAND, CALIF.—To Lee J. Immel, 1031 Evelyn Ave., Berkeley, who bid $32,548 for grading and macadamizing of roadways at the Ninth Ave. pier, work for the Oakland Port Commission. 7-22

PACIFIC GROVE, CALIF.—To Clark & Henery Const. Co., Chancery Bdg., S. F., $6101 for asphalt paving Laurel Ave. for City. 7-21

PALO ALTO, CALIF.—To W. A. Dontanville, Salinas, who bid $53,646 for improvement of California Ave. for City of Palo Alto, consisting of 6-in. concrete base with 2-in. asphalt surface; 20 electroliers, etc. 7-30

SACRAMENTO, CALIF.—To A. Mitchell, 128 J. St., Sacramento, who bid $3050 to District Engineer, Dist. 10, California Division of Highways, for fencing in SOLANO COUNTY from Creston to Vacaville. 7-31

SACRAMENTO, CALIF.—To Clark & Henery Const. Co., Chancery Bdg., San Francisco, who bid $57,147 for 1.4 miles asphalt paving from Forest Lake to North boundary, SAN JOAQUIN COUNTY, work for the California Division of Highways. 7-22

SACRAMENTO, CALIF.—To A. Teichert & Sons, 1846 37th St., Sacramento, who bid $141,335 for 13.9 miles grading and surfacing with oil treated crushed gravel or stone from 1½ miles east of Cottonwood Creek to Democrat Springs, KERN COUNTY, work for the California Division of Highways. (See Unit Bid Summary, July 25.) 7-22

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways. YOLO COUNTY—Contract awarded to Jones & King, Atherton and Jackson Sts., Hayward, who bid $129,575 for 5.8 miles asphalt paving from Bretona to Dunnigan. SACRAMENTO COUNTY—Contract awarded to Fredrickson & Watson, 354 Hobart St., Oakland, and Fredrickson Bros., First National Bank Bdg., Stockton, who bid $89,029 for 2.6 miles concrete paving and grading from south of Arno to Cosumnes River. DEL NORTE COUNTY—Contract awarded to Hemstreet & Bell, Marysville, who bid $88,405 for 12.7 miles bituminized macadam surfacing from southerly boundary to Wilson Creek. RIVERSIDE COUNTY—To Steele Finley, 204 E. 4th St., Santa Ana, who bid $34,402 for 6.2 miles widening from north boundary to 1 mile west of Beaumont. LOS ANGELES COUNTY—Contract awarded to Southwest Paving Co., Washington Bdg., Los Angeles, who bid $134,330 for bituminized macadam surfacing from 1.3 miles to 13.9 miles north of Castaic School. (See Unit Bid Summary, July 25 issue.) 7-21

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: MARIN COUNTY—Contract awarded to Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, who bid $54,415 for 1.3 miles grading and surfacing with bituminous macadam from Belvedere Crossing to Tiburon. SAN LUIS OBISPO COUNTY—Contract awarded to Cornwall Construction Co., 219 E. Mason St., Santa Barbara, who bid $130,929 for 3 miles grading and concrete paving from San Luis Obispo to foot of Cuesta Grade. (See Unit Bid Summary.) 7-31

SAN BRUNO, CALIF.—To Hanrahan Co., Standard Oil Bldg., S. F., $43,009 for improving streets in 5th Addition for City, grading, paving with waterbound macadam base with 3-in. asphalt surface, concrete sewers. 7-31

SAN FRANCISCO, CALIF.—To Finnell Co., Inc., 1630 39th St., Sacramento, $112,573 for 5.14 miles grading & surf. Sections D & C, Route 23, Placerville-Lake Tahoe National Forest, ELDORADO NATIONAL FOREST, Eldorado County, work for Bureau of Public Roads. 7-21

SAN FRANCISCO, CALIF.—To Isbell Const. Co., Carson City, Nev., $58,271 for 2.58 miles grading Section C, Rt. 3, Glenbrook Nat. Forest Highway, Tahoe National Forest, DOUGLAS COUNTY, Nev., work for Bureau of Public Roads. 7-21

SAN FRANCISCO, CALIF.—Award recommended to Pearson & Dickinson, 1451 Cypress Ave., Riverside, $33,032 for 15.5 miles oil processing Idyllwild National Forest Highway, San Bernardino National Forest, RIVERSIDE COUNTY, for California Division of Highways. 7-22

SAN FRANCISCO, CALIF.—Award recommended to E. B. Bishop, Chester, $27,094 for 8.5 miles surfacing Yuba Pass National Highway, Tahoe National Forest, SIERRA COUNTY, for Bureau of Public Roads. 7-29

SAN FRANCISCO, CALIF.—Awards of contract recommended as follows: (1) To Geo. Pollock Co., Forum Bdg., Sacramento, $205,875 for 7 miles grading Mariposa Grove Sect., Wawona Route, Sierra National Forest, Yosemite National Park Project, 2-B2, MARIPOSA COUNTY; and (2) To Geo. Pollock Co., Forum Bdg., Sacramento, $65,937 for 2.6 miles grading Sect. B, Fish Camp-Four-Mile, Route 47, Oakhurst National Highway, Sierra National Forest, MARIPOSA COUNTY. Above work is for Bureau of Public Roads. (See Unit Bid Summary).

SAN MATEO, CALIF.—Awards as follows by City: (1) To Hanrahan Co., Standard Oil Bdg., S. F., $37,625 for improving 23rd Ave., 24th Ave., Flores St., grading, asphalt paving, concrete pipe, concrete culvert and street lighting system; and (2) To N. Sisevich, 1616 B St., San Mateo, $2257 for improving San Mateo Drive, concrete wall, asphalt paving, etc. 7-22

SAN RAFAEL, CALIF.—To S. M. McGraw, Box 387, San Rafael, $32,510 for concrete paving, vitr. sewers, corr. culverts, etc., in Palm St. Improvement Dist. for City. 7-30

SANTA CRUZ, CALIF.—To Granite Const. Co., Watsonville, $8913 for 2.6 miles asphalt macadam paving on the Brown Valley-Mt. Madonna and Calabasas Road, work for County. 7-25

STOCKTON, CALIF.—To Geo. French, Jr., P. O. Box 675, Stockton, $33,658 for grading and surfacing 4 miles of Bacon Island Road 624 for County. 7-22

DENVER, COLO.—Awards as follows by Bureau of Public Roads: (1) To Morrison-Knudsen Co., Boise, Ida., $135,410 for grading and surfacing Sect. 1B2 & 1B3, Grand Loop Road, Yellowstone National Park, Wyoming; (2) To Pioneer Const. & Engr. Corp., Denver, Colo., $114,965 for grading 11 miles of North and South Highway, Mesa Verde National Park, Colorado; and (3) To Morrison-Knudsen Co., Boise, Ida., $67,715 for 1.6 miles grading and surfacing Grand Canyon Rim National Highway, Yellowstone National Park, Wyoming.

DURANGO, COLO.—To Kimball Const. Co., Colorado Springs, $24,350 for constructing sidewalks in Dist. 4 for City.

LAMAR, COLO.—To New Mexico Const. Co., Denver, Colo., $117,000 for paving in Dist. 3 for City with Warrenite Bit. paving.

LAMAR, COLO.—To New Mexico Const. Co., P. O. Box 1707, Denver, Colo., $138,551 for Warrenite Bit. paving Dist. 3 for City.

GREAT FALLS, MONT.—To Birch & Sons, Great Falls, Mont., $11,415 for grading Rainbow Road for County.

HELENA, MONTANA—Awards as follows by State Highway Comm.: (1) To L. T. Lawler, Butte, Mont., $76,845 for 8 miles graveling Deer Lodge-Butte Road, POWELL COUNTY; (2) To Stevens Bros., St. Paul, Minn., $95,402 for 35 miles grading Jordan-Miles City Road; (3) To Sutherland & Burns, Missoula, Mont., $41,476 for 11 miles grading Hamilton-Florence-City Road; (4) To Stevens Bros., St. Paul, Minn., $51,475 for 13 miles grading Malta-Vandalia Road; (5) To L. T. Lawler, Butte, Mont., $127,591 for 15 miles grading Dillon-Idaho State Road; (6) To E. N. Brown, Bozeman, Mont., $40,894 for 15 miles graveling Georgetown-Lake Road; and (7) to Smith & Thornquiste, Great Falls, Mont., $46,388 for 11 miles grading Arlington-Lewiston Road.

SANTA FE, N. M.—Awards as follows by New Mexico State Highway Commission: (1) To E. J. Maloney, Gallup, N. M., $38,269 for 21 miles surfacing in McKINLEY COUNTY from Gallup to Guam; (2) To Rawls & Wright, El Paso, Tex., $14,200 for placing selected material from Santa Rosa to Pastura, GUADALUPE COUNTY; (3) To Skousen Bros., Santa Fe, N. M., $67,770 for grading 7 miles from Watrous to Wagon Mound in MORA COUNTY; (4) To Lee Moor Contracting Co., El Paso, Tex., $128,380 for constructing two steel girder bridges, concrete paving, etc., on 2 miles from Carlsbad to Carlsbad Caverns, EDDY COUNTY; (5) To Lee Moor Contracting Co., El Paso, Tex., $14,000 for surfacing in SOCORRO COUNTY; (6) To Rawls & Wright, El Paso, Tex., $25,500 for surfacing near Santa Rosa, GUADALUPE COUNTY; and (7) To Skousen Bros., Santa Fe., N. M.. $24,997 for grading, etc., in COLFAX COUNTY.

BURNS, ORE.—To C. E. Silbaugh, $15,736 for constructing sidewalks on various streets for City.

KLAMATH FALLS, ORE.—To Northwest Roads Co., Portland, Ore., who bid $37,803 as follows for the improvement of Manzanita, Fremont and Le Roy streets, District 84, for the city, grading, Warrenite Bit. paving, storm sewers, etc. 7-31

LAKEVIEW, ORE.—To Dunn & Baker, Klamath Falls, Ore., $32,934 for paving with bituminous surface various streets for City of Lakeview, Oregon.

PORTLAND, ORE.—Awards as follows by State Highway Comm.: (1) BENTON and LINCOLN COUNTIES—To Frank M. Bullis, Corvallis, Ore., $16,466 for 5 miles surfacing near Summit; (2) To C. E. Silbaugh, Burns, Ore., $47,610 for 10 miles grading Silver Creek-Sage Hen Hill Sect. Central Ore. Highway. 7-28

OGDEN, UTAH—Award of contract recommended to Olof Nelson, Logan, Utah, $96,824 for 4.6 miles grading Logan-Garden City Road, Cache National Forest, CACHE COUNTY, Utah, for Bureau of Public Roads. (See Unit Bid Summary.) 7-19

OGDEN, UTAH—Award of contract recommended to J. W. Whiting, Springville, Utah, $34,772 for 4.7 miles grading and surfacing Alpine-Scenic Road, Wasatch National Forest, UTAH COUNTY, Utah, for Bureau of Public Roads.

OGDEN, UTAH—Awards recommended as follows by Bureau of Public Roads: (1) Award of contract recommended to Jas. Tobin & Son, Spokane, Wash., $56,119 for 5.56 miles grading of Clark Fork Road, Pend Oreille National Forest, BONNER COUNTY, Idaho; (2) Award of contract recommended to Jas. Tobin & Son, Spokane, Washington, who bid $68,139 for 5.7 miles grading Enaville-Murray Linford Road, Coeur d'Alene National Forest, SHOSHONE COUNTY, Idaho; (3) Award of contract recommended to Triangle Construction Co., Spokane, Wash., $48,272 for 3.7 miles grading North and South Highway, St. Joe National Forest, LATAH COUNTY, Idaho; (4) Award of contract recommended to Joslin & McAllister, Spokane, Wash., $46,869 for 12 miles surfacing with crushed rock North and South Highway, St. Joe National Forest, BENEWAH and LATAH COUNTIES, Idaho. (See Unit Bid Summary.) 7-21

OLYMPIA, WASH.—Awards as follows by State Highway Comm.: (1) To Union Bridge Co., Portland, Ore., $18,807 for 3.6 miles surfacing from Wing Creek to Prindle, SKAMANIA COUNTY; and (2) To Chapman & Chapman, Seattle, $6334 for resurfacing from Summit to Skykomish, KING and CHELAN COUNTIES.

OLYMPIA, WASH.—To C. O. Davis, Mt. Vernon, Wash., $7470 for grading 1 mile of Drayton Harbor Road for County.

SEATTLE, WASH.—Awards as follows by City: (1) To Queen City Const. Co., $20,940 for grading 42nd Ave. west; and (2) To Fiorito Bros., Seattle, $14,914 for concrete paving 9th Ave. Northwest.

SEATTLE, WASH.—Contract awards as follows by City: (1) To L. Coluccio, Seattle, $28,337 for paving Madison St. and E. Madison St.; (2) To N. Fiorito, Seattle, $22,341 for concrete paving 8th Ave. northwest; (3) To N. Fiorito, Seattle, $75,218 for concrete paving 8th Ave. northwest; and (4) To Fiorito Bros., Seattle, $13,450 for concrete paving West Viewmont Way.

VANCOUVER, WASH.—To Angelo & Martell, Cape Horn, Wash., $7425 for grading Lateral Highway No. 7 for County.

BRIDGES and CULVERTS

WORK CONTEMPLATED

UKIAH, CALIF.—Plans by E. H. Smith, County Surveyor, for constructing bridge over Eel River at Ferry site near lower dam above Potter Valley. 7-21

BIDS BEING RECEIVED

CHICO, CALIF.—Bids to 8:30 p.m., Aug. 19, by City for widening Main St. Bridge over Little Chico Creek, $5000. 7-25

EUREKA, CALIF.—Bids to 2 p.m., Aug. 12, by County for: (1) Wooden bridge over Moseley Slough in Road District 3; (2) Wooden bridge over the north fork of the Mad River at Riverside. 7-26

NAPA, CALIF.—Bids to 10 a.m., Aug. 12, by County for arch culvert extension on road near Myrtledale Springs involving 142 cu.yd. concrete and 10,200 lb. reinf. steel. 7-22

REDWOOD CITY, CALIF.—Bids to 9 a.m., Aug. 11, by City for 6 reinf. concrete bridges involving 550 cu.yd. concrete, 59,000 lb. reinf. steel, etc., $15,000. 7-24

SAN LUIS OBISPO, CALIF.—Bids to Aug. 11 by City for reinf. conc. French St. Bridge, Santa Rosa St. Bridge and Chorra St. Bridge, $20,000. 7-23

SALT LAKE CITY, UTAH—Bids to 2 p.m., Aug. 15, by State Road Commission for bridge over Davis-Weber Canal, DAVIS COUNTY, involving: 52 cu.yd. concrete, 37,330 lb. structural steel, 7608 lb. reinf. steel, 19 M ft. B.M. lumber, 184 sq.yd. bitum. wearing surface. 8-4

BIDS RECEIVED

PHOENIX, ARIZ.—L. C. Lashmet, Phoenix, Ariz., who bid $6700, submitted the low bid to the Arizona Highway Comm., for constructing reinforced concrete bridge on the Tucson-Nogales Highway, near the U. S. Veterans Hospital. 8-2

RIVERSIDE, CALIF.—Following 2 lowest bids on bridge over San Jacinto River for County: STEEL BRIDGE—M. H. Slocum, 2064 Dudley, Pasadena, $20,540; Robt. Dawson, $20,880. WOODEN BRIDGE—Robt. Dawson, 4333 Maryland St., San Diego (low), $11,045; W. M. Ledbetter Co., Los Angeles, $11,850. 7-30

SACRAMENTO, CALIF.—F. G. Faucett, 5th and D Sts., Galt, low bid to County, for a 304-ft. wooden trestle to be known as the Hagle Bridge and to be constructed over Laguna Creek, 1½ miles from Harold Station. Bridge is to have a redwood floor, and the balance of the construction is to be untreated Douglas fir. 8-1

SACRAMENTO, CALIF.—Silveria & Robbins, Ventura, $20,132 for reinforced concrete bridge over Nojoqui Creek, near Zaca, SANTA BARBARA COUNTY, for California Division of Highways. 7-31

PORTLAND, ORE.—Teller Construction Co., Portland, Ore., $46,966, low bid to Bureau of Public Roads for five bridges and one box culvert on the Salmon River Highway, Siuslaw National Forest, LINCOLN COUNTY. 8-4

PORTLAND, ORE.—Hargreaves & Lindsay, Eugene, Ore., $12,175 low for reinf. conc. bridge over Myrtle Creek at Myrtle Creek, DOUGLAS COUNTY for State.

EVERETT, WASH.—Solie & Co., $5180 low for repair bridge over Pilgrim Creek on Mukilteo Highway for City.

CONTRACTS AWARDED

BEVERLY HILLS, CALIF.—Contract awarded to Carpenter Bros., Inc., Midway Bdg., 9533 Brighton Way, Beverly Hills, Calif., who bid $11,595 for constructing a pedestrian tunnel at Hammel Drive and Wilshire Blvd., work for City. 8-1

LOS ANGELES, CALIF.—To Robt. E. McKee, Central Bdg., Los Angeles, who bid $181,885 for constructing Sixth St. undercrossing, reinforced concrete construction, work for the City. 7-23

OAKLAND, CALIF.—To Robt. B. McNair, 3745 Rhoda Ave., Oakland, for 270 ft. 27-in. and 445 ft. 33-in. reinf. conc. culvert between Penniman Ave. and Suter St. for City. 7-23

SACRAMENTO, CALIF.—To Ralph Hunter, 3408 Brockway, Sacramento, who bid $25,106 for reinf. conc. bridge over south fork of American River near Riverton, ELDORADO COUNTY, for California Division of Highways. 7-22

SACRAMENTO, CALIF.—To Whipple Engineering Co., 183 North Madison St., Monrovia, who bid $83,000 for steel and reinforced concrete bridge over the Trinity River near Douglas City, TRINITY COUNTY, work for the California Division of Highways, Public Works Bdg. 7-21

HELENA, MONT.—Awards as follows by State: (1) To Stevens Bros., St. Paul, Minn., $51,457 for concrete & 4 timber bridges over Milk River near Malta; and (2) To McGuire & Blakeslee, $112,993 for steel and concrete bridge over Missoula River on Wolf Creek-Cascade Road. (See Unit Bid Summary.)

PORTLAND, ORE.—To Kuckenberg & Wittman, Portland, Ore., $15,240 for reinf. concrete bridge over Rock Creek near Mitchell, WHEELER COUNTY for State.

CHEHALIS, WASH.—T. J. Wagner, Elma, Wash., 4368 for constructing pile trestles on Bunker Creek near Chehalis for County.

EVERETT, WASH.—To Geo. Clark, $5259 for constructing repairs to Pidgeon Creek Bridge No. 2 for City.

OLYMPIA, WASH.—To Goetz & Brennan, Seattle, $32,672 for 190-ft. timber trestle over Nason Creek on Stevens Pass Highway, CHELAN COUNTY, for State.

SEWER CONSTRUCTION

WORK CONTEMPLATED

PHOENIX, ARIZ.—C. C. Kennedy, Call Bdg., San Francisco, and Holmquist & Maddock, Phoenix, Ariz., have been appointed Engineers by the City of Phoenix, Arizona, to prepare plans & specifications for constructing sewer mains and a sewage disposal plant. Bonds in amount of $817,000 have been voted. 7-19

ELSINORE, CALIF.—Bonds voted $22,500 by City for sewer system extensions. 8-1

FLORENCE, CALIF.—Plans by Engr., D. C. Scott, Ellis Bdg., Phoenix, Ariz., for sewer mains for City, involving 38,000 ft. 6-in. to 15-in. sewer pipe, 74 manholes, 20,000 cu.yd. excavation & backfill. 7-21

MADERA, CALIF.—Plans by A. M. Jensen, 68 Post St., S. F., Consulting Engr. for sewer extensions for City, $20,000. 8-1

NEWPORT BEACH, CALIF.—Plans by Currie Engr. Co., Anderson Bdg., San Bernardino, for sewage disposal plant for City, $165,000. 7-28

OAKLAND, CALIF.—Plans by City Engr. for 265 ft. 8-in. vitrified sewer on 6th St. from Castro to Grove. Bids after Aug. 7. 7-23

SANTA CRUZ, CALIF.—Plans by R. Fowler, City Engr., for vitrified sewer in Plateau Ave. for City. 8-1

SOLEDAD, CALIF.—Plans by Engr., C. C. Kennedy, Call Bdg., San Francisco, for sewer mains and sewage treatment plant, plain sedimentation and separate sludge digestion, $30,000. Bids will be called for this fall. 7-21

BENNETT, COLO.—Plans by Engr., B. Lowther, Colorado Bdg., Denver, Colo., for disposal plant for City, $20,000.

BUTTE, MONT.—Plans by City Engineer protests Aug. 6 for sewers in Dist. 379, to cost $27,000.

GREAT FALLS, MONT.—Plans by City Engineer protests Aug. 4 for sewer on 1st Ave., to cost $15,000.

PORT ANGELES, WASH.—Plans by City Engr. for constructing sewer system in east dist. of city to cost $90,000. Bids soon, on either vitrified or concrete pipe.

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Bids to 10 a.m., August 13, by Board of Public Works, City Hall, Los Angeles, for the construction of sections of the North Outfall Sewer system, as follows: (1) Construction of Section 34-C, work involving: 8006 lin.ft. 54-in. pre-cast reinf. conc. or semi-elliptical sewer; 2558 lin.ft. 48-in. pre-cast reinf. conc. or semi-elliptical sewer; 2870 lin.ft. 42-in. pre-cast reinf. conc. or semi-elliptical sewer. (2) Construction of Section 34-D, work involving: 2710 lin.ft. 54-in. pre-cast reinf. conc. or semi-elliptical sewer; 7808 lin.ft. 48-in. pre-cast reinf. conc. or semi-elliptical sewer; 2330 lin.ft. 42-in. pre-cast reinf. conc. or semi-elliptical sewer. 7-28

ROSWELL, NEW MEXICO—Bids to 3 p.m., Aug. 14, by City for furnishing 1700 ft. 18-in., 14,970 ft. 21-in., 5695 ft. 10-in., and 38,070 ft. 8-in. vitrified pipe, also fittings.

PORT ANGELES, WASH.—Bids to Aug. 20, by City for vitrified or concrete sewers in eastern section of City, to cost $90,000.

BIDS RECEIVED

SAN FRANCISCO, CALIF.—E. J. Treacy, Call Bldg., S. F., $5125, low for vitr. sewers on Pennsylvania Ave. near 23rd St., for City. 7-31

CONTRACTS AWARDED

CARPINTERIA, CALIF.—Awards as follows by the Carpinteria Sanitary District: (1) To Fairbanks-Morse & Co., Los Angeles, $4460, only bid for furnishing and installing pumping plant equipment in pumping plant No. 1. (2) To Harmon Co., 405 No. Vega St., Alhambra, who bid $12,000, submitted low bid for the construction of a reinforced concrete pump house. 8-2

LOS ANGELES, CALIF.—To Chas. H. Johnston, 947 N. Orange Drive, L. A., $334,920 for constructing reinf. concrete Jefferson St. Storm Drain system, Sect. 3, for City. 7-23

OFFICIAL BIDS

NOTICE TO CONTRACTORS

Bridges, Grading, Surfacing and Paving

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, California, until 2 o'clock p.m. on August 13, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Humboldt County, an overhead crossing over the tracks of the Northwestern Pacific Railroad about 2½ miles north of Beatrice (I-Hum-1-G), consisting of two 61 ft. 7-in. through plate girder spans, one 40-ft. steel beam span and approximately 450 feet of timber trestle approach.

Placer County, through Newcastle (III-Pla-17-B), consisting of five hundred thirty-one (531) lineal feet of tunnel and about one (1.0) mile of roadway to be graded and surfaced with crusher run base and oil treated crushed gravel or stone surfacing.

Santa Barbara and San Luis Obispo Counties, between the second crossing of the Cuyama River and the Easterly Boundary of San Luis Obispo County (V-S.B-SLO-57-B, C & D), about thirty-seven and nine-tenths (37.9) miles in length, to be graded and surfaced with oil treated crushed gravel or stone.

San Diego County, between La Posta and Tecate Divide (VII-S.D-12-F), about eight and four-tenths (8.4) miles in length, heavy fuel oil to be furnished and applied to the roadbed.

Los Angeles County, a reinforced concrete girder bridge across San Gabriel River near Seal Beach (VII-L.A-60-F), consisting of seven 57-foot spans on concrete piers with pile foundations.

Orange County, from Seal Beach to Sunset Beach (VII-Ora-60-A), about three and three-tenths (3.3) miles in length, to be graded and paved with Portland cement concrete.

Los Angeles and Orange Counties, between Anaheim Street and Seal Beach (VII-L.A-Ora-60-F & A), about three and one-tenth (3.1) miles in length, to be graded and paved with Portland cement concrete and bituminous macadam.

Proposal forms will be issued to only those Contractors who have furnished verified statement of experience and financial condition in accordance with the provisions of Chapter 644, Statutes of 1929, and whose statements so furnished are satisfactory to the Department of Public Works. Bids will not be accepted from a Contractor to whom a proposal form has not been issued by the Department of Public Works.

Plans may be seen, and forms of proposal, bonds, contract and specifications may be obtained at the said office, and they may be seen at the offices of the District Engineers at Los Angeles and San Francisco, and at the office of the District Engineer of the district in which the work is situated. The District Engineers' offices are located at Eureka, Redding, Sacramento, San Francisco, San Luis Obispo, Fresno, Los Angeles, San Bernardino and Bishop.

A representative from the district office will be available to accompany prospective bidders for an inspection of the work herein contemplated, and Contractors are urged to investigate the location, character and quantity of work to be done, with a representative of the Division of Highways. It is requested that arrangements for joint field inspection be made as far in advance as possible. Detailed information concerning the proposed work may be obtained from the district office.

No bid will be received unless it is made on a blank form furnished by the State Highway Engineer. The special attention of prospective bidders is called to the "Proposal Requirements and Conditions" annexed to the blank form of proposal, for full directions as to bidding, etc.

The Department of Public Works reserves the right to reject any or all bids or to accept the bid deemed for the best interests of the State.

DEPARTMENT OF PUBLIC WORKS, DIVISION OF HIGHWAYS
C. H. PURCELL, State Highway Engineer

Dated July 16, 1930.

RICHMOND, CALIF.—To Jasper-Stacy Co., 216 Pine St., San Francisco, who bid $139,946 for centrifugally cast reinforced concrete and vitrified pipe sewers, Douglas Fir piling, etc., on Dock Ave., Hall Ave., 14th and 10th Sts., etc., work for the City. (See Unit Bid Summary, July 25 issue.) 7-22

STOCKTON, CALIF.—To E. A. Burns, 1215 North Baker St., Stockton, $1368, to the City for vitrified pipe sewer on portions of Burkett Villas. 7-29

SEATTLE, WASH.—To Queen City Construction Co., Seattle, Wash., $174,225 for constructing sewers in University Way for City.

SEATTLE, WASH.—To Thos. Scalzo, Seattle, Wash., $13,832 for sewer in Willow St. for City.

LIGHTING SYSTEMS

WORK CONTEMPLATED

OAKLAND, CALIF.—Plans by City Engr., protests Aug. 7, for 21 single-light electroliers, etc., on 38th Ave. from Allendale Ave. to Liese Ave. 7-19

RICHMOND, CALIF.—Plans by City Engr., E. A. Hoffman, protests Aug. 4, for 48 lighting standards, conduit system, etc., on Tenth St. from Ripley Ave. to Cutting Blvd. 7-19

BIDS BEING RECEIVED

PALO ALTO, CALIF.—Bids to 10 a.m., August 28, by Supervising Superintendent of Construction, U. S. Veterans' Hospital, Palo Alto, Calif., for revisions and additions to the ground lighting system, involving cast iron lighting standards; lighting units for standards in place; installation of C. C. including control switch and stepdown lighting transformers, parkway cable, including foundations, trenching backfill, etc. 8-4

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

SANTA ANA, CALIF.—Plans by County Surveyor W. K. Hillyard, for water system improvements to serve Westminster Dist. Bonds voted $32,000. 8-1

GREAT FALLS, MONT.—Plans being made by Consulting Engineers, Blake & Veatch, Kansas City, Mo., for 4,000,000-gallon reservoir, enlargement of filtration plant and 16-in. water main and distributing main extensions. Bonds voted $690,000 by City.

HELENA, MONT.—Bonds voted by City in amount of $200,000 for constructing water system improvements.

GRANTS PASS, ORE.—Bonds voted by City, $400,000 for water system improvements as follows, and purchase of present system. Work will include the construction of a $50,000 filter plant; pumping plant; enlargement of reservoir; and installation of distribution system. Baar & Cunningham, Spalding Bldg., Portland, Ore., are the Consulting Engineers. 8-4

MALIN, ORE.—Bonds have been voted by the City of Malin, Oregon, in amount of $35,000, for the construction of water system improvements. 8-1

BIDS BEING RECEIVED

CHINO, CALIF.—Bids to 7 30 p.m., Aug. 19, by City for one deep well turbine pump 700 g.p.m. in Well No. 1. 7-21

FRESNO, CALIF.—Bids to 2 p.m., Aug. 15, by County for 38,000 ft. 4-in. to 8-in. cast iron water mains, valves, hydrants, etc., in distributing system for Fresno County Water Works Dist. No. 1, $55,000. A. Segel, Griffith-McKenzie Bdg., Fresno, is Engr. 7-26

LIVINGSTON, CALIF.—Bids to 8 p.m., Aug. 11, by City for 700 ft. Class 150 cast iron pipe, 6-in., also hydrants, gate valves, etc. 7-24

REDWOOD CITY, CALIF.—Bids to 10 a.m., Aug. 18, by County for stripping base of Emerald Lake Dam, new fill, 30-in. concrete pipe spillway, paving with rock macadam, 1911 Act. 8-4

SAN FRANCISCO, CALIF.—Bids to 2 30 p.m., Aug. 13, by Board of Public Works for drilling wells near Pleasanton, $8000. 7-25

SANTA MONICA, CALIF.—Bids to 10 a.m., Aug. 12, by City Clerk, for 7200 ft. 30-in. 'C' cast iron pipe. 8-4

DENVER, COLO.—Bids to 2 p.m., August 12, by Board of Water Commissioners, City and County of Denver, 1509 Cleveland Place, Denver, Colorado, for concrete dam, together with outlets, outlet structures, etc. Work involves: 50,000 cu.yd. concrete; 22,000 cu.yd. excavation. 7-29

BIDS RECEIVED

LOS ANGELES, CALIF.—Fairbanks-Morse & Co., Los Angeles and San Francisco, low bid to the Los Angeles Harbor Department for furnishing and installing pumping equipment, motors, etc., for the Fish Harbor Salt Water Supply Line. 8-1

GREAT FALLS, MONT.—Fagenstrom Bros. Const. Co., Great Falls, Mont., $37,807 low bid for installation of water mains in business district for City.

PORT ORCHARD, WASH.—Low bids as follows by City for 125,000-gallon tank: STEEL—Chicago Bridge & Iron Works, Smith Tower, Seattle, $6350, low; and WOOD—Buffelin Wood Pipe Co., Tacoma, $3400, low. 8-1

CONTRACTS AWARDED

PHOENIX, ARIZ.—To N. B. McGinnis Const. Co., Phoenix, Ariz., $12,932 for constructing flood prevention structures at Verde River intake for City.

OCEANSIDE, CALIF.—To U. S. Pipe & Foundry Co., Los Angeles, 593¢ per ft. for 1100 ft. 6-in. cast iron pipe for City. 7-26

SACRAMENTO, CALIF.—To Geo. French, Jr., Box 675, Stockton, $14,300 for reinf. concrete dam at Preston School of Industry, near Ione, for State Architect's Office. 7-24

COLORADO SPRINGS, COLO.—To E. H. Honnen, Colorado Springs, $31,500 for constructing spillway and ditches for Reservoir 4 for City.

MEEKER, COLO.—To J. F. Spotts Const. Co., Loveland, Colo., for constructing pipe system, etc., for City to cost $88,000.

GREAT FALLS, MONT.—Awards as follows by City: (1) To Fegenstom Bros. Const. Co., $37,807, for installing water mains in business district; (2) To Minneapolis-Moline Power Implement Co., $5327 for one 25,000-gal. steel tank; and (3) To Crane Co., $2181 for pumping plant equipment.

PROVO, UTAH—To Cox & Christensen, Provo, Utah, $6990 for constructing reinf. concrete underground reservoir for City.

IRRIGATION and RECLAMATION

BIDS BEING RECEIVED

PALMDALE, CALIF.—Bids to 5 p.m., August 22, by the Palmdale Irrigation District, for furnishing and installing one complete 1350 G.P.M. turbine pump, complete with motor; one 900 G.P.M. horizontal booster pump complete with motor. 7-28

TURLOCK, CALIF.—Bids to 2 p.m., Sept. 2, by Anna Sorenson, Secretary Turlock Irrigation District, Turlock, for the concrete lining of various canals of the District. Work involves: 958,000 sq.ft. 2-in. concrete lining. Work is divided into twelve schedules and separate bids may be submitted on each schedule or project may be bid on as a whole. 7-23

DENVER, COLO.—Bids to Aug. 14, by the Bureau of Reclamation, Denver, Colorado, for 1 two-column motor-operated hydraulic compression machine, 2,000,000-lb. capacity. 7-28

YAKIMA, WASH.—Bids to 3:30 p.m., August 18, by L. M. Holt, Supervising Engineer, U. S. Indian Service, Box 156, Yakima, Washington, for pumping plants as follows: One 25 cu.ft. per second pump and one 50 cu.ft. per second pump. Pumps are to be direct connected to 2300-volt, three-phase, 60-cycle automatically controlled vertical induction motors. Lift of pumps is to be 27-ft. Water is to be delivered through 90 lin.ft. of concrete pipe, 30-in. and 42-in. diameter, respectively. 7-28

BIDS RECEIVED

LIVE OAK, CALIF.—Freeman & Murch, Willows, Calif., who bid 12c per cu.yd., submitted the low bid to Reclamation District No. 777, for 4 miles of canal. Work involves: 30,000 cu.yd. of excavation. 7-28

CONTRACTS AWARDED

DENVER, COLO.—To Newport News Shipbuilding and Drydock Co., Newport News, Va., $53,750 for furnishing one 6000 h.p. turbine, one pressure regulator and butterfly valve for Bureau of Reclamation, for 3rd Unit of Shoshone Power Plant, Idaho.

POWER DEVELOPMENT

WORK CONTEMPLATED

SODA SPRINGS, IDAHO—Bond election Aug. 19 by City to $30,000 for constructing hydro-electric plant.

SEATTLE, WASH.—Plans by City Engineer, O. A. Piper, City-County Bdg., Seattle, Washington, and bids will be called for soon by the Board of Public Works, City-County Bdg., Seattle, for addition to Lake Union Steam Power Plant, including boilers, pre-heaters and burners. Estimated cost, $600,000. 7-29

BIDS BEING RECEIVED

OAKLAND, CALIF.—Bids to 8 p.m., Aug. 13, by East Bay Municipal Utility Dist., 512 16th St., Oakland, for furnishing spare parts for equipment of Pardee Power Plant. 7-25

BIDS RECEIVED

DENVER, COLO.—General Electric Co., $47,130, low bid to Bureau of Reclamation for one 5000-k.v.a. generator, four 1667 k.v.a. transformers, and switchboard, for third Unit of Shoshone Power Plant, Idaho. Bids rejected, plans to be revised and project readvertised. 7-23

CONTRACTS AWARDED

PASADENA, CALIF.—Awards as follows by the City of Pasadena, for equipment for Municipal Light and Power Department: (1) To Consolidated Steel Corp., 1200 N. Main St., L. A., who bid $123,151 for two 15,000 sq.ft. boilers, including boilers proper, steel supporting members, superheater, water columns, valves. (2) To Sutor Co., 2008 E. Slauson Ave., Los Angeles, who bid $29,460 for two suitable air preheaters, including enclosing casing. (3) To Foster-Wheeler Co., Los Angeles, who bid $29,475 for two sets of tubes, headers, connections, recirculators, etc., for side, rear, and front furnace walls. Bids for two automatic desuperheaters were rejected. Low bid from C. C. Moore Co., Los Angeles, $4185. 7-31

SURETY BOND AND CASUALTY INSURANCE DIRECTORY

RAILROAD CONSTRUCTION

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To W. A. Bechtel Co., 155 Sansome St., San Francisco, and Utah Construction Co., Phelan Bdg., San Francisco, for 111 miles of railroad from Keddie, Plumas County, to Bieber, Lassen County, the Western Pacific R. R. Co. portion of joint line from Keddie to Klamath Falls, Ore. Construction will start at once, to cost $9,824,669, of which $4,500,000 will be for labor, $4,800,000 for material, and balance for right-of-way and engineering. Work involves: 1500 acres clearing; 1,264,354 cu.yd. solid rock excavation; 788,148 cu.yd. loose rock excavation; 779,903 cu.yd. common excavation; 256,626 cu.yd. loose rock borrow; 560,291 cu.yd. common borrow; 3,655,771 sta.yd. overhaul; 6500 ft. tunnels, 17x22 ft.; 5100 tons struct. steel (viad. & bridges); 275,000 ft. B.M. Douglas fir; 3300 ft. piling; 1733 cu.yd. conc. (foot); 416,971 Douglas fir cross ties; 17,845 tons 85-lb. rail; 354,000 cu.yd. crushed rock or gravel; also steel and wooden tanks, sidings, line protection. J. W. Williams is Chief Engr., T. L. Phillips, Principal Asst. Engineer, R. A. Hollenbeck is Construction Engineer and H. M. Smitten Bridge Engr. for Western Pacific Railroad Co. 7-29

ROWENA, ORE.—To J. F. Shea Co., Henry Bdg., Portland, Ore., for constructing tunnel for the Oregon-Washington Railroad & Navigation Co., located two miles from Rowena. 7-30

RIVER and HARBOR WORK

WORK CONTEMPLATED

REDONDO BEACH, CALIF.—Bond election July 29, by City to vote $30,000 for creosoted pile wharf extension. D. L. Bundy is City Engr.

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Bids to 3 p.m., Aug. 26, by U. S. Engineers Office, 751 South Figueroa St., Los Angeles, for repairing revetment at Reservation Point in Los Angeles Harbor, California. 7-26

SACRAMENTO, CALIF.—Bids to 3 p.m., Aug. 28, by U. S. Engineer's Office, California Fruit Bdg., Sacramento, for 779,000 cu.yd. dredging in New York Slough. 7-29

SAN DIEGO, CALIF.—Bids to 11 00 a.m., September 3, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for extension of a reinforced concrete pier at the Naval Operating Base (air station), San Diego, Calif. 7-30

SANTA BARBARA, CALIF.—Bids to 12 m., Aug. 31, by City Clerk for a supporting and protecting wall or revetment (being a portion of East Cabrillo Blvd.) The wall is to be of riprap construction with sheet piling, 3000 ft long. 8-4

SEATTLE, WASH.—Bids to 3 p.m., Aug. 28, by U. S. Engineer's Office, Burke Bldg., Seattle, for 26,000 cu.yd. dredging in Bellingham Harbor.

BIDS RECEIVED

SAN FRANCISCO, CALIF.—American Dredging Co., 255 California St., San Francisco, bid .2321 yd. low bid to U. S. Engr. Office San Francisco, for 1,107,000 cu.yd. dredging in Oakland Harbor. Other Bids: United Dredging Co., .2788; San Francisco Bridge Co., .30; Hydraulic Dr. Co., .33. Engr. estimate, .1929. 7-24

SEATTLE, WASH.—General Const. Co., Colman Bdg., Seattle, $17,600 low bid to U. S. Bureau of Lighthouses for constructing wharf at Salmon Bay lighthouse depot, Seattle.

CONTRACTS AWARDED

SANTA MONICA, CALIF.—To Merritt-Chapman-Scott Corporation, P.O. Box 698, San Pedro, at $40,000, for the construction of a 700-ft. wooden and concrete pier for J. L. Lasky, 609 Palisades Beach Road, Santa Monica. 8-4

MACHINERY and SUPPLIES

WORK CONTEMPLATED

HEMET, CALIF.—Bonds voted by the City of Hemet, Riverside County, as follows: (1) $6000 for the purchase of tractor, grader, truck and street sweeper for the Street Department. (2) $12,000 for purchase of new fire truck, enlargement of fire house, etc. 7-30

BIDS BEING RECEIVED

PHOENIX, ARIZ.—Bids to Aug. 15, by Superintendent, Phoenix Indian Sanatorium, Phoenix, Arizona, for one concrete mixer. 8-4

PALMDALE, CALIF.—Bids to 5 p.m., August 22, by the Palmdale Irrigation Dist. for furnishing 3000 ft. more or less of 14-gauge, 12-in. welded Toncan iron pipe, complete with valves, etc. 7-28

SAN DIEGO, CALIF.—Bids to 11 a.m., August 27, by Bureau of Yards and Docks, Navy Department, Washington, D. C., for one 55,000-bbl. steel tank and piping at the Naval Operating Base (Fuel Depot), San Diego.

CONTRACTS AWARDED

SACRAMENTO, CALIF.—Awards as follows by U. S. Engineer's Office, California Fruit Bdg., Sacramento, Calif.: (1) To Stockton Iron Works, Stockton, Calif., who bid $1015 for one clamshell bucket; (2) To Yuba Mfg. Co., 351 California St., S. F., $600 for one dragline bucket. 7-28

BUILDING CONSTRUCTION

BIDS BEING RECEIVED

BERKELEY, CALIF.—Bids up to 8 p.m., Aug. 18, by Board of Education, Durant & Milvia Sts., Berkeley, for brick and hollow tile gymnasium building for the Board of Education at the Burbank Jr. High School, Addison and Curtis Sts., $50,000. Hardman & Russ, Berkeley Bank Bdg., Berkeley, are Architects. 7-23

SAN JOSE, CALIF.—Bids to 2 p.m., Aug. 19, by State Architect's Office, Public Wks. Bdg., Sacramento, for reinforced concrete gymnasium with brick veneer base at the State Teachers' College, San Jose, $130,000. 7-23

FORT LEWIS, WASH.—Bids to 11 a.m., Aug. 21, by Constructing Quartermaster, Fort Lewis, Washington, for the construction of five field officers' quarters, 13 company officers' quarters, and 22 non-commissioned office quarters. 7-26

CONTRACTS AWARDED

DELANO, CALIF.—To Roy A. Stearns, Delano, Calif., who bid $7820 for frame and brick grammar school addition to the Delano Grammar School. 7-25

DOS PALOS, CALIF.—To C. D. Jones, Box 410, Dos Palos, Merced County, who bid $9900 for frame and stucco classroom building for the Dos Palos Grammar School District. 7-25

EUREKA, CALIF.—Awards as follows by County for concrete, stone and terra cotta Club House on H and 10th Sts.: GENERAL CONTRACT—To Mercer-Fraser Co., Eureka, Calif, $77,875; ELECTRIC—To Eureka Electric Co., Eureka, Calif., $1747; PLUMBING—To Moore & Cook Co., Eureka, Calif., $3177; STEAM HEATING—To Frank E. Cook & Sons, Eureka, Calif., $5432. 7-29

EXETER, CALIF.—Awards as follows for brick grammar school for Kaweah Grammar School Dist.: GENERAL CONTRACT—Awarded to W. T. Harris, 577 McKinley Ave., Fresno, $14,469. HEATING—To Barrett-Hicks Co., Fresno, $1262. 7-22

LIVERMORE, CALIF.—To Schuler & McDonald, 1723 Webster St., Oakland, who bid $37,669 for reinforced concrete storage plant and rock crusher for the Kaiser Paving Co., Latham Square Bdg., Oakland, to be constructed at Livermore, Alameda County. L. H. Nishkian, 525 Market St., San Francisco, is the Engineer. 7-22

LONG BEACH, CALIF.—To Clinton Construction Co., 1103 Spring-Arcade Bldg., Los Angeles, for erection of an addition to the Ford automobile factory at Long Beach harbor. The addition will be one story, 480x86 ft., and will consist of a pressed steel unit. Construction will be cast reinforced concrete and composite piling, brick walls, and steel roof trusses; $350,000. 8-2

LUCERNE, CALIF.—To A. O. Lightford, Lucerne, $26,559 for reinforced concrete grammar school building for the Lucerne School Dist. N. R. Coulter, S. F., is Architect. 7-19

MARTINEZ, CALIF.—Awards as follows by Alhambra Union High School District for reinf. concrete and stucco high school addition: GENERAL CONTRACT to Wallace Snelgrove, 24th and Esmond Ave., Richmond, $18,417; HEATING to Thomas J. Kennedy, 1002 Arlington Way, Martinez, $1530; ELECTRIC WIRING to Stinchfield & Glass, Martinez, $1432. 7-31

PACIFIC GROVE, CALIF.—To J. J. Grodem, 1028 San Antonio Ave., Alameda, $80,000 for reinf. concrete, brick veneer and frame auditorium and classroom building for the Pacific Grove High School District. 7-26

RICHMOND, CALIF.—To Clinton Construction Co., 923 Folsom St., San Francisco, in connection with $3,500,000 Ford Motor Co. assembly plant at Richmond. Buildings are to be Class 'A', reinforced concrete and brick. General contract awarded to Clinton Const. Co. includes concrete piling, fenders, fender piling and trestle, painting, land piling, mason work, conc. work, cut stone and granite, redwood block floor, rolling steel curtains, counterbalanced freight elevator doors, folding doors and operators, vertical sliding doors, hollow metal work, metal toiler partitions, stack lining, ornam. and misc. iron, fender work, steel sand and operators, glass and glazing, carpenter work, metal furring lathing and plastering, roofing and sheet metal work, rubber tile floors, tile work, terrassino work and linoleum, and construction of dock. Other contracts awarded as follows: HEATING, VENTILATING AND PLUMBING awarded to F. W. Snook Co., 596 Clay St., San Francisco; STRUCTURAL STEEL awarded to Herrick Iron Works, Oakland; ELECTRICAL WORK, Alta Electric Co., 938 Howard St., San Francisco. 7-25

SANTA CRUZ, CALIF.—To Wilson & McGranahan, 75 Ocean View, Santa Cruz, $49,475 for reinf. concrete & stucco Gault School. 7-24

SANTA CRUZ, CALIF—Awards as follows by Board of Education, for reinf. concrete Mission Hill Junior High School: GENERAL CONTRACT to Wilson & McGranahan, 75 Ocean View, Santa Cruz, $91,874; ARCHITECTURAL IRON to Pacific Iron Works, 1155 67th St., Oakland, $2945; PLUMBING to Byrne Bros., 46 Pacific Ave., Santa Cruz, $11,998; HEATING to O'Mara & Stewart, 218 Clara St., San Francisco, $15,874; ELECTRIC to Irvin M. Smith, 337 Soquel, Santa Cruz, $5428; ROOFING to W. J. Porter, 1473 W. San Carlos, San Jose, $4575; SHEET METAL WORK to Superior Metal Products Co., 4400 Market, Oakland, $3556; TILE AND TRAVERTITE to Art Tile & Mantel Co., 221 Oak St., S. F., $4255; PAINTING to J. F. Ecker. 20 N. Joaquin St., Stockton, $4900; GLASS AND GLAZING to Santa Cruz Glass Co., Santa Cruz, $1130. 8-2

TURLOCK, CALIF.—To Neil & Wirtner, 300 Almond Ave., Turlock, $11,248 for gymnasium for Turlock Union High School Dist. 7-24

YOUNTVILLE, CALIF.—To Gaubert Bros., 4735 Brookdale, Oakland, Calif., $20,840 for reinforced concrete and stucco school building for the Yountville Grammar School District. 8-2

OPPORTUNITY PAGE

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THE BUYERS' GUIDE

Refer to advertisements for addresses of companies listed. Advertisers index on page 76

Acetylene, Dissolved
Prest-O-Lite Co., Inc., The

Acetylene Generating Apparatus
Oxweld Acetylene Co.

Air Compressors
Bacon Co., Edward R.
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Atlas Imperial Diesel Engine Co.

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Seaside Oil Co.
Shell Oil Co.
Standard Oil Co.
Union Oil Co.

Asphalt, Emulsified
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Shell Oil Co.

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Standard Boiler & Steel Works
Union Tank & Pipe Co.

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Warren Bros. Roads Co.

Back Fillers
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Cleveland Tractor Co., The
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Orton Crane & Shovel Co.
Spears-Wells Machy. Co., Inc.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
West Coast Tractor Co.
W-K-M Company, Inc.
Worden Co., W. H.

Beams, Channels, and Angles
Pacific Coast Steel Corp.

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Harron, Rickard & McCone Co.
Heltzel Steel Form & Iron Co., The
Jenison Machinery Co.
Link-Belt Co.

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Solano Iron Works

Blasting Supplies
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Hercules Powder Co.

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Harron, Rickard & McCone Co.
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Commerce Casualty Co.
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Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
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Indemnity Insurance Co. of North America
Maryland Casualty Co.

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New Amsterdam Casualty Co.
Rolph, James Jr., Landis & Ellis

Brick, Common
Gladding Bros. Mfg. Co.

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Greenberg's Sons, M.
Western Iron Works, S. F.

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Lakewood Engr. Co.
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Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Owen Bucket Co.

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Garfield & Co.
Haiss Mfg. Co., Geo.
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Williams Co., G. H.
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Union Carbide Sales Co., The

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Jenison Machinery Co.
Lakewood Engr. Co.

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Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.

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Link-Belt Co.
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Wallace & Tiernan Co.

Clay Products
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Pacific Clay Products Co.

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Concrete Curing
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McEverlast, Inc.

Concrete Forms
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American Concrete Pipe Co.

Concrete Roads
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Thew Shovel Co., The
Universal Crane Co., The
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Cranes, Tractor
West Coast Tractor Co.

Cranes, Traveling
Harnischfeger Sales Corp.
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Thew Shovel Co., The

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Smith Engineering Works
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Orton Crane & Shovel Co.
Thew Shovel Co., The

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Garfield & Co.
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Marion Steam Shovel Co.
National Equipment Corp.
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Speeder Machinery Corp.
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OPPORTUNITY PAGE

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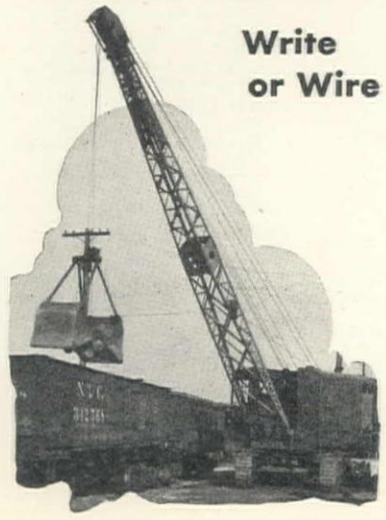

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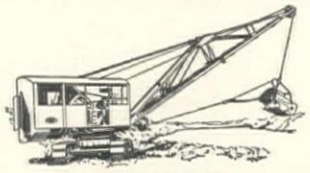

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Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
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Wailes Dove-Hermiston Corp.

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Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

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Paraffine Companies, Inc., The
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Columbia Wood & Metal Preservative Co.

Pipe, Pressure Line
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Lock Joint Pipe Co.
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Pipe, Riveted Steel
Lacy Mfg. Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
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Pipe, Sewer
Gladding, McBean & Co.
Pacific Clay Products

Pipe, Standard
Claussen & Co., C. G.
Pacific Pipe Co.

Pipe, Vitrified
Gladding, McBean & Co.
Gladding Bros. Mfg. Co.
Pacific Clay Products

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Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Steel Tank & Pipe Co.
Union Tank & Pipe Co.
Western Pipe & Steel Co.

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Jenison Machinery Co.
Spears-Wells Machy. Co.

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Leitch & Co.
Schramm, Inc.

Powder
Giant Powder Co., Cons., The
Hercules Powder Co.

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Hercules Motors Corp.
International Harvester Co.
Jenison Machinery Co.
Novo Engine Co.

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Paraffine Companies, Inc., The

Pumps, Centrifugal
Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Ingersoll-Rand Co.
Jaeger Machine Works, The
Pelton Water Wheel Co., The
Rix Company, Inc., The
Washington Iron Works
Woodin & Little

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OPPORTUNITY PAGE

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Oiling

San Francisco, Calif., July 28, 1930

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 14th day of August, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for furnishing and applying oil, and processing the oil treated existing crushed rock surfaced road, Sections A and B of Route 23, Quincy-Beckwith National Forest Highway, Plumas National Forest, Plumas County, California.

The length of the project is 12.046 miles and the principal items of work are approximately as follows:

Mixing oil treated crushed rock surfacing, 12.046 miles.

Asphaltic oil furnished and applied, 181,500 gals.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form of Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

Where copies of plans and specifications are requested, a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Check should be certified and made payable to the Federal Reserve Bank of San Francisco.

Guarantee will be required with each bid as follows: In the amount of five (5) per cent of the bid.

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within sixty (60) calendar days from that date exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the contracting officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:

Bid for Road Construction. To be opened 2:00 p.m., August 14, 1930. Project 23-A2, B2 —Oiling Spring Garden-Feather River Inn.
807 Sheldon Building, San Francisco, Calif.

C. H. SWEETSER, District Engineer,
Bureau of Public Roads.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Subgrade Reinforcing

Grand Canyon, Arizona, July 26, 1930

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 10:00 o'clock a.m. on the 12th day of August, 1930, and then publicly opened for furnishing all labor and materials and performing all work for subgrade reinforcing with selected gravel material Section D of Route No. 2, Grand Canyon-Old Trails National Forest Highway, in Tusayan National Forest, Coconino County, Arizona.

The length of the project to be improved is 17.57 miles and the principal items of work are approximately as follows:

Subgrade reinforcement material, 28,400 cu.yd.

Hauling and placing subgrade reinforcement material, 122,000 cu.yd.miles.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form of Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

Plans and specifications for the work are available at the office of the Bureau of Public Roads, 508 Ellis Building, Phoenix, Arizona, for distribution to prospective bidders.

Where copies of plans and specifications are requested, a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Checks should be certified and made payable to the Federal Reserve Bank of San Francisco.

Guarantee will be required with each bid as follows: In the amount of five (5) per cent of the bid.

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within one hundred (100) calendar days from that date exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the contracting officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:

Bid for Road Construction. To be opened 10:00 a.m., Aug. 12, 1930.
Red Lake Section D, Grand Canyon-Old Trails National Forest Highway Route No. 2.
Office of the Park Superintendent, Grand Canyon, Arizona.

C. H. SWEETSER,
District Engineer, Bureau of Public Roads.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

Grading and Surfacing

Standard Government Form of Invitation for Bids

San Francisco, California, July 31, 1930.

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 21st day of August, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading portions of section 1-B, Generals Highway, Hospital Rock to Giant Forest, Sequoia National Park, California. The length of the project to be graded is 4.514 miles and the principal items of work are approximately as follows:

Clearing, 8.76 acres.

Unclassified excavation, 43,400 cu.yd.

Unclassified excavation for structures, 500 cu.yd.

Unclassified excavation for borrow, 5500 cu.yd.

Overhaul, 30,861 sta.yd.

Crushing and placing subgrade reinforcement material, 5400 cu.yd.

Supplemental subgrade reinforcement material, 300 cu.yd.

Hauling subgrade reinforcement material, 14,000 cu.yd.mi.

Cement rubble masonry, 82 cu.yd.

Corrugated metal pipe in place, 1248 lin.ft.

Hand laid rock embankment, 320 cu.yd.

Hauling and placing government furnished C.M. pipe, 84 lin.ft.

Hauling borrow, 6000 cu.yd.mi.

Stone guard rail, 1500 lin.ft.

Proposals will be received from capable and responsible contractors who must submit with their request for Standard Government Form of Bid an attested statement, on forms to be supplied by the District Engineer, of their financial resources and construction experience. Standard Government Form of Bid will be supplied only to contractors showing sufficient experience and financial resources to properly construct the work contemplated.

Where copies of plans and specifications are requested, a deposit of $10 will be required to insure their return. If these are not returned within 15 days after opening of bids the deposit will be forfeited to the Government. Checks should be certified and made payable to the Federal Reserve Bank of San Francisco.

Guarantee will be required with each bid as follows: In the amount of five (5) per cent of the bid.

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within two hundred forty-five (245) calendar days from that date subject to such extensions as may be provided for under the Special Provisions.

Liquidated damages for delay will be the amount stated in the Special Provisions for each calendar day of delay until the work is completed and accepted.

Partial payments will be made as the work progresses for work and material delivered if such work and material meet the approval of the Contracting Officer.

Article on patents will be made a part of the contract.

Bids must be submitted upon the Standard Government Form of Bid and the successful bidder will be required to execute the Standard Government Form of Contract for Construction.

The right is reserved, as the interest of the Government may require, to reject any and all bids, to waive any informality in bids received, and to accept or reject any items of any bid, unless such bid is qualified by specific limitation.

Envelopes containing bids must be sealed, marked, and addressed as follows:

Bid for Road Construction. To be opened 2:00 p.m., August 21, 1930.
Section 1-B, Generals Highway, Sequoia National Park, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER, District Engineer,
Bureau of Public Roads.

NOTICE TO CONTRACTORS

Spare Parts for Power Plant

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 8:00 p.m., August 13, 1930, and will at that hour be opened for furnishing spare parts for the equipment of the Pardee Power Plant.

Specifications may be obtained upon application to the office of the District.

JOHN H. KIMBALL, Secretary.
Oakland, California, July 24, 1930.

Sealed proposals will be received until 11:00 a.m., September 3, 1930, and then publicly opened, for the construction of six (6) Company Officers' Quarters at Fort Douglas, Utah. Plans and specifications may be obtained upon deposit of $15.00 for their safe return. Checks must be made payable to The Treasurer of The United States.

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Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Jenison Machinery Co.
Pelton Water Wheel Co., The
Pomona Pump Co.
Woodin & Little

Pumps, Dredging and Sand
Jenison Machinery Co.

Pumps, Hydraulic
Jenison Machinery Co.

Pumps, Power
Gardner-Denver Co.
Jaeger Machine Works, The

Pumps, Road
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Novo Engine Co.
Woodin & Little

Pumps, Sewage
Dorr Co., The
Fairbanks, Morse & Co.
Industrial & Municipal Supply Co.

Pumps, Sewage Ejector
Industrial & Municipal Supply Co.

Pumps, Sludge
Dorr Co., The

Pumps, Water Works
Fairbanks, Morse & Co.
Industrial & Municipal Supply Co.
Jenison Machinery Co.
Pelton Water Wheel Co., The
Pomona Pump Co.
Washington Iron Works

Rails
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Claussen & Co., C. G.

Reinforcing Bars
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Soulé Steel Co.

Reinforcing Wire Fabric
Soulé Steel Co.

Reservoirs, Steel
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Riveting Machines
Ingersoll-Rand Co.
Rix Company, Inc., The

Road Finishers
Bacon Co., Edward R.
Blaw-Knox Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Road Forms
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Harron, Rickard & McCone Co.
Heltzel Steel Form & Iron Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Road Graders and Scrapers
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Caterpillar Tractor Co.
Jenison Machinery Co.
Shaw Excavator & Tools Co.
Spears-Wells Machinery Co.
Taylor & George
West Coast Tractor Co.
Worden Co., W. H.
Young Machinery Co., A. L.

Road Oil
Gilmore Oil Co.
Seaside Oil Co.
Shell Oil Co.
Standard Oil Co.
Union Oil Co.

Road Oil, Emulsified
American Bitumuls Co.
Shell Co.

Road Rollers
Austin Western Road Machy. Co., The
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Hackley Equipment Co., P. B.
Huber Manufacturing Co.
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Spears-Wells Machinery Co.
Taylor & George

Roofing
Paraffine Companies, Inc., The

Rules, Steel, Wood and Aluminum
Lufkin Rule Co., The

Saws, Portable
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Jenison Machinery Co.
Young Machinery Co., A. L.

Scarifiers
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Jenison Machinery Co.
Le Tourneau Mfg. Co.
Spears-Wells Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.

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Solano Iron Works
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Link-Belt Co.
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Young Machinery Co., A. L.

Screens, Sewage
Dorr Co., The
Link-Belt Co.

Screens, Vibrating
Harron, Rickard & McCone Co.
Link-Belt Co.
Smith Engineering Works

Second-Hand Equipment
Atkinson Construction Co.
Contractors Mchy. Exchange
Excavating Equipment Dealers, Inc.
Harron, Rickard & McCone Co.
Tieslau Bros.

Sewage Disposal Apparatus
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Industrial & Municipal Supply Co.
Link-Belt Co.
Wallace & Tiernan
Water Works Supply Co.

Sewer Joint Compound
Ric-Wil Co., The

Sharpeners, Rock Drill Steel
Gardner-Denver Co.
Ingersoll-Rand Co.

Sheet Piling
Pacific Coast Steel Corp.

Shovels—Diesel Engines
Atlas Imperial Diesel Engine Co.

Shovels, Electric, Gasoline, Steam
American Hoist & Derrick Co.
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St. Louis Power Shovel Co.
Thew Shovel Co., The
Young Machy. Co., A. L.

Shovels, Hand
Harron, Rickard & McCone Co.
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Worden Co., W. H.

Sluice Gates
California Corrugated Culvert Co.
Water Works Supply Co.

Spreaders, Gravel, Rock and Asphalt
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Standpipes
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Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Steel, Drill
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The

Steel Plate Construction
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Steel, Structural
Pacific Coast Steel Corp.
Western Iron Works
Western Pipe & Steel Co.

Street Sweepers, Sprinklers, Flushers
Austin Western Road Machy. Co., The
Jenison Machinery Co.

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Truscon Steel Co.

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Truscon Steel Co.

Subgraders
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Lakewood Engineering Co.

Swimming Pool Equipment
California Filter Co., Inc.

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Ingersoll-Rand Co.
Lacy Manufacturing Co.
Rix Company, Inc., The
Western Pipe & Steel Co.

Tanks, Corrugated
California Corrugated Culvert Co.
Western Pipe & Steel Co.

Tanks, Elevated Steel
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Tanks, Oil Storage
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Steel Tank & Pipe Co.
Western Pipe & Steel Co.

Tapes, Measuring, Steel and Fabric
Lufkin Rule Co., The

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Hunt Co., R. W.

Tie Plates
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Water Works Supply Co.

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Thew Shovel Co., The

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Universal Crane Co., The

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La France Republic Corp.
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Tunnel Shovels
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Marion Steam Shovel Co.
St. Louis Power Shovel Co.

Turbines, Hydraulic
Pelton Water Wheel Co., The
Water Works Supply Co.

Turntables
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Harron, Rickard & McCone Co.
Jenison Machinery Co.

Unloaders, Car and Wagon
Bacon Co., Edward R.
Jenison Machinery Co.
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Valves
California Corrugated Culvert Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
Pacific Pipe Co.
Water Works Supply Co.

Valves, Gate
California Corrugated Culvert Co.
Claussen & Co., C. G.
Pelton Water Wheel Co., The
Water Works Supply Co.

Valves, Hose Gate
Greenberg's Sons, M.

Valves, Hydraulic
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Pelton Water Wheel Co., The
Water Works Supply Co.

Washers, Sand and Gravel
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Jenison Machinery Co.
Smith Engineering Works

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California Filter Co., Inc.
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Water Supply Installations
California Filter Co., Inc.
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Wallace & Tiernan
Water Works Supply Co.

Water Transportation
American-Hawaiian Steamship Co.

Water Wheels
Pelton Water Wheel Co., The
Water Works Supply Co.

Water-Works Supplies
American Cast Iron Pipe Co.
California Filter Co., Inc.
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Water Works Supply Co.

Welding Apparatus (see Torches)
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Welding Equipment
Taylor & George
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