WESTERN CONSTRUCTION NEWS

ENGINEERING CONSTRUCTION IN THE FAR WEST

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VOLUME V NUMBER 21

SAN FRANCISCO, NOVEMBER 10, 1930

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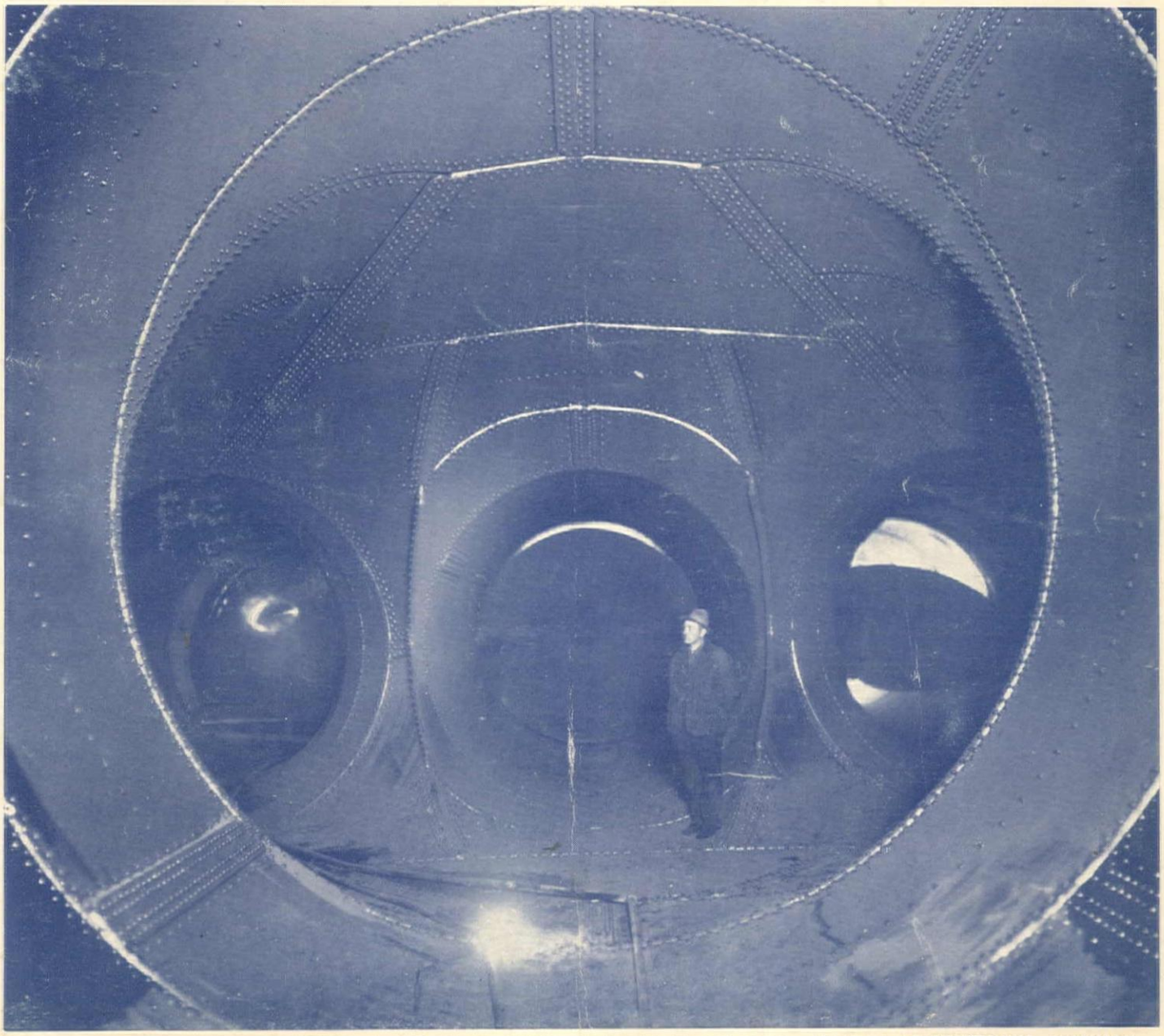


THREE-BRANCH STEEL MANIFOLD—INLET, 17 FT. DIAM., OUTLETS, 10½ FT. DIAM.—AT HEAD OF PENSTOCKS, CUSHMAN HYDROELECTRIC PLANT NO. 2, FOR TACOMA, WASHINGTON. BUTTERFLY VALVES IN TWO RIGHT-HAND OUTLETS, TEMPORARY BLANK FLANGE IN LEFT-HAND OUTLET

The HEAVIEST SHOVELS BUILT

MANY of the P & H Models are heavier than any other machine of similar rating. For instance Model 300-B, 5/8-yd. machine, weighs 48,000 lbs.; the model 600-A, 1-yd. machine, weighs 81,000 lbs.

P & H machines are heavy because all main frames, including carbody, revolving frame and corduroy frames, are heavy single-piece steel castings. This unit cast steel construction gives strength and rigidity that cannot be obtained with structural frames or combination cast and structural frames.

The carbody and tractions are much heavier than those employed on other machines. This heavy construction provides a solid foundation that permits the machine to travel through the deepest mud—or over rocks without danger of springing.

Unit cast construction preserves perfect alignment and cuts maintenance costs.

Structural Features that Mean Great Strength

Steel construction. All frames are single-piece castings. Engine is mounted directly upon revolving frame. Shafting of chrome-manganese steel, forged, heat treated and machined. Gears and pinions cut from heat-treated steel forgings. Drum clutches operated by power. Combined swing gear and roller path extra heavy steel casting. Heavy axles carry entire weight—no weight on drive shafts. P & H patented chain crowd—the most positive crowding motion known. Large size motors.

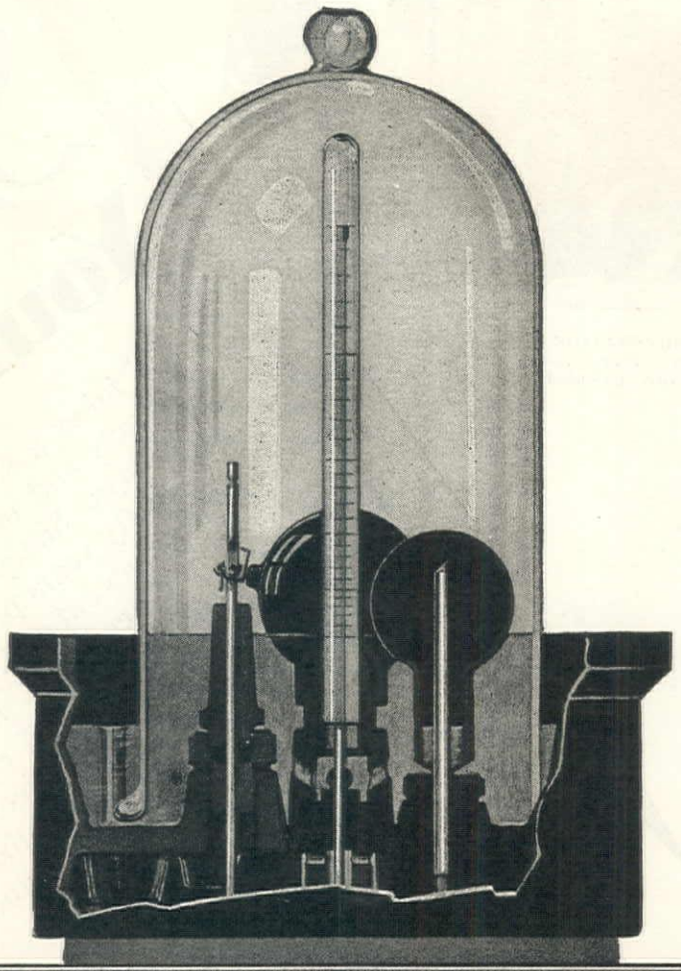
HARNISCHFEGER SALES CORPORATION
Established 1884
4490 W. National Ave., Milwaukee, Wis.
32 Beale St., San Francisco 2025 Santa Fe Ave., Los Angeles

ROBERT M. TAYLOR, Pacific Coast Manager
Service Stations, Complete Repair Part Stocks and Excavators
at San Francisco, Los Angeles and Seattle

A-559

P&H Gasoline · Diesel · Electric EXCAVATORS

NO VACUUM CHLORINATOR HAS EVER WORN OUT



WHETHER used for drinking water sterilization, swimming pool disinfection or the general practice of Chlorination in sanitary and industrial fields the

VACUUM CONTROL CHLORINATOR

has established a record for trouble-free service and low maintenance costs unequalled in the history of chlorination.

Housed under the glass bell jar—free from diaphragms . . . springs . . . and delicate control parts—the complete control unit is always in sight.

A control unit so readily accessible for cleaning and adjusting—so simplified in construction and operation that—of the more than THREE THOUSAND W&T VACUUM CHLORINATORS installed since the first of the type was put into service over eight years ago—*not a single machine has ever worn out.*

VACUUM CONTROL is an exclusive W&T feature.

Ask for technical publication No. 38.

WALLACE & TIERNAN CO. INC.

"A Chlorinator for every purpose"

NEWARK, N. J.

BRANCHES IN ALL PRINCIPAL CITIES

A PRODUCT OF

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SA 25

THE ONLY SAFE WATER IS A STERILIZED WATER

ENSCO CONCRETE CUTTING CORPORATION, Los Angeles Contractors, demolishing buildings . . and costs, with a RIX "6" No. 4, equipped with RIX patented *Super-Charger.*

Sharpen Your Pencil

IT takes a sharp pencil to land contracts and make a job show profit nowadays. Sharpen your pencils with RIX. Fifty years prove this sturdy pioneer rig does cut cost. Now as never before, you need RIX 26% *extra* efficiency *pendability* . . RIX "*Express*" service. A size for every purpose, and a hundred jobs on which it will save you time and money. . . RIX

Write for Bulletin 3-O.

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LOS ANGELES - - - - - - - - 684 Santa Fe Avenue
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Rix Co. are also agents for COCHISE Drills, and exclusive distributors for THOR Pneumatic Tools in Seattle territory.

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PORTABLE AIR COMPRESSORS

The Compressor with the Super-Charger

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DEVOTED TO ENGINEERING CONSTRUCTION IN THE FAR WEST

VOLUME V NOVEMBER 10, 1930 NUMBER 21

CONTENTS

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NIGHT AND DAY

THE STURDY ATLAS DIESEL KEEPS RIGHT ON GOING . . . . . .

Bucyrus-Erie excavator, powered with an Atlas Diesel.

turning out 10%-15% more yardage saving 75%-85% on fuel costs . . .

NO CHOKING and stalling in tough digging, here. Night and day... from shift to shift... the sturdy, rugged Atlas Diesel plugs right on. "Boy, this engine is built!"

That's one of the reasons why hundreds of dirt-movers, all over the world, are making profits that would be impossible with any other type of engine,

Imagine a 1-yard shovel averaging fuel costs of $1.05 per 8-hour shift! But you expect unusual performance, with an Atlas Diesel.

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It turns out 10%-15% more yardage, too . . . because it has the unique lugging power (torque) of the steam engine. With its common-rail fuel system, an Atlas Diesel maintains a steady flow of power over the entire range of speeds.

Assurance that an Atlas will give you the same phenomenal savings and yardages that hundreds of other dirt-movers have been getting with excavators powered with Atlas Diesels . . . is given by our rigid factory inspection.

Specify an Atlas Diesel for your next excavator. And mail the coupon for complete facts.

ATLAS IMPERIAL full diesels

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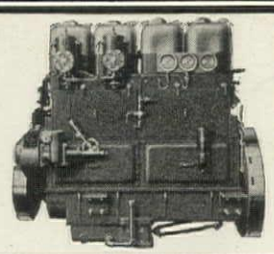
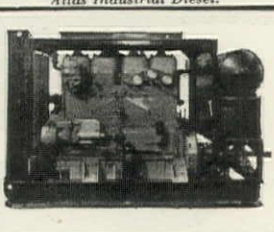
Bucyrus-Erie Excavators . . . P & H (Harnischfeger) Excavators . . . Link-Belt Excavators . . . Thew-Lorain Excavators . . . Moore Speedcranes . . . Plymouth Locomotives . . . Lidgerwood Logging Equipment.



For shovels and draglines Atlas Industrial Diesel.



For rock crushers, compressors, etc. Atlas Portable Diesels.

Atlas Imperial Diesel Engine Co.,
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Please mail free book.

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Name _____

Address _____

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Where traction *means* yardage

THE scraper fills quickly in soft soil—there is need for the full power of the dependable engine in the "Caterpillar" Tractor. The long, wide tracks of the "Caterpillar" ripple over the surface of the soft soil with no wasteful slip. Tractor and scraper go into the corners, climb the steep grades, ride the soft places—handling yardage for the earth-mover and contractor with a saving of men, money and minutes.

• • •

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TEN	$1100	TWENTY	$1900
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(There's a "Caterpillar" Dealer Near You)

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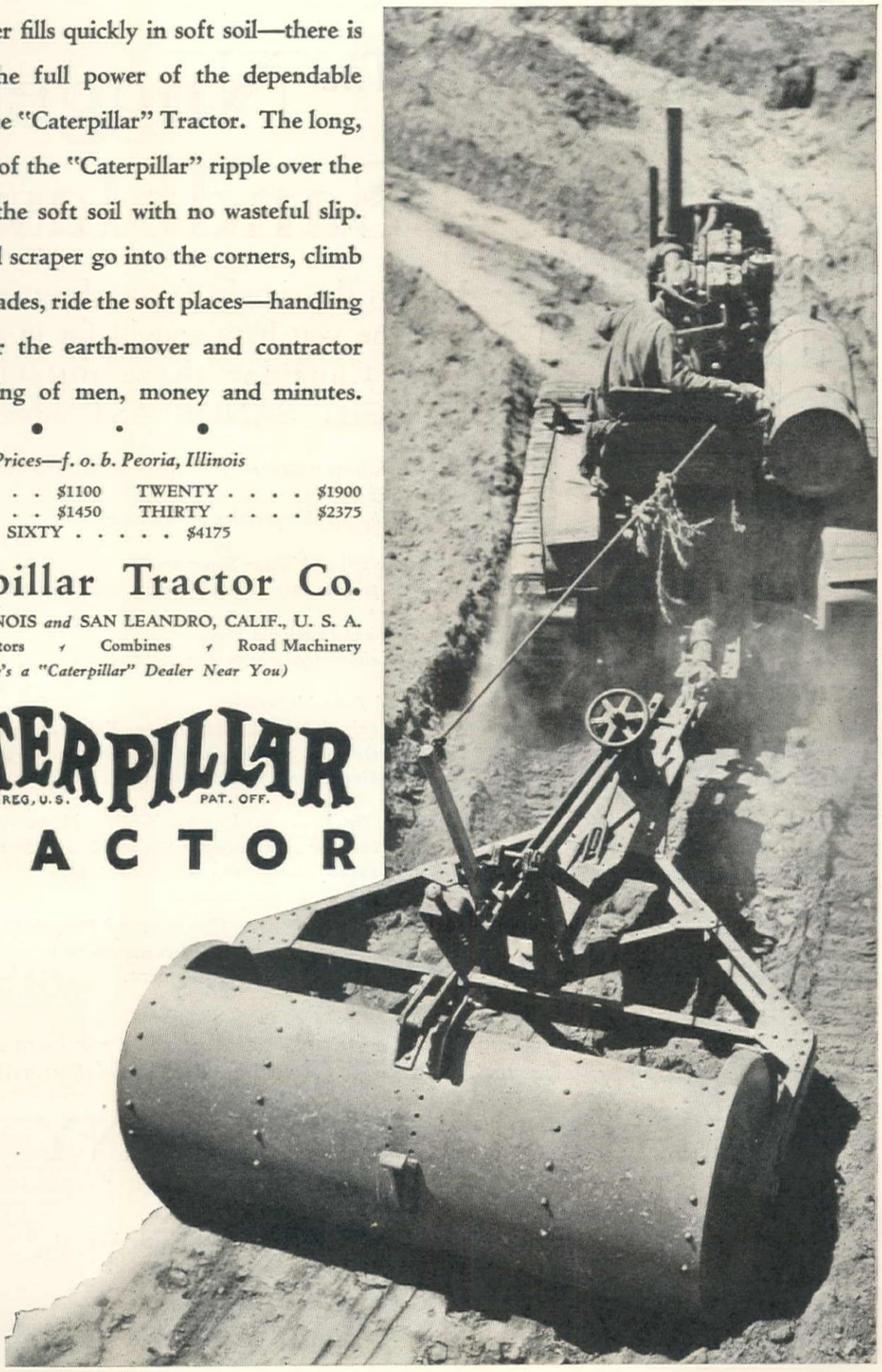

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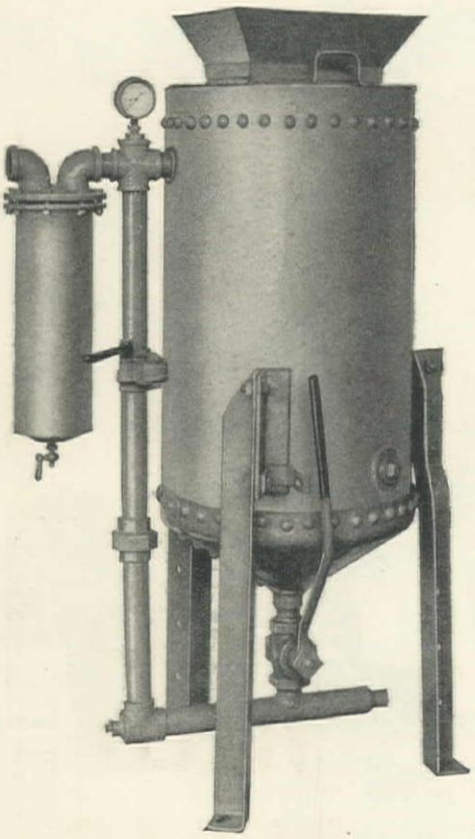
A Big Step Forward in Sandblast Engineering



The NUGGET SANDBLAST manufactured in three sizes, one of which will exactly fit your needs.

The Nugget Sandblast

Here is the simple, fast-working sandblast machine you have sought for in vain till now. Consider these outstanding NUGGET SANDBLAST advantages:

1—Perfect, Instant Control and Operation of Sand Mixture at any Pressure—
by simple operation of two levers.

2—Positive Oil and Water Separator—
permits only clean, dry air to enter sand chamber.

3—Convenient Handhold Plate—
allows ready inspection of pressure tank, if desired.

4—Hinged Top with Screen—
only clean sand passes screen. Refuse and other unusable material quickly cast aside by merely swinging back hinged top. No time lost as with loose screen.

5—Nozzle Tips Guaranteed for 300 Working Hours—
compare with ordinary tips which must be replaced frequently, with consequent loss of time.

NOTE: These Guaranteed Nozzle Tips supplied complete with connections to fit any type of sandblast equipment.

You'll get a new idea of how sand blast costs can be slashed when you learn ALL the performance facts about the NUGGET . For further information write to

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Manufacturers

San Francisco: 1222 Mission St. *Los Angeles:* 249 South Ave. 51

Distributors

GARDNER-DENVER COMPANY AIR COMPRESSORS

Pavement Breakers, Jackhammers, Sheeting Drivers, Clay Spades

KOEHRING Shovel

All the Power Where You Want It— in the Crowd or in the Hoist

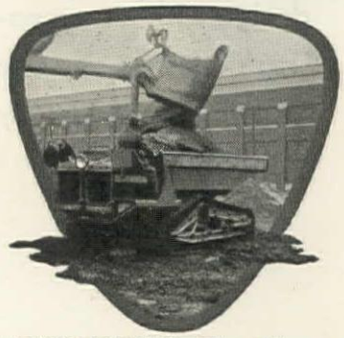
THE Koehring dipper never dodges its job. *You* put it where *you* want it! That's Koehring independent crowd and hoist, and it's a money-maker on every kind of shovel job!

Raise or lower boom from the cab without need for adjusting crowding cables! Ready instantly for high bank work, deep, close-in digging or thin stripping! No interfering bail in handling rock or timbers.

Short boom, with long sticks, and dipper that crowds above and beyond end of boom! — needs less headroom, but has long reach! Know the Koehring!

N. E. C. PRODUCTS — KOEHRING — Pavers, Mixers; Power Shovels, Pull Shovels, Cranes, Draglines; Dumptors. INSLEY — Excavators; Concrete Placing Equipment, Cars, Buckets, Derricks. T. L. SMITH — Tilting and Non-tilting Mixers, Pavers, Weigh-Mix. PARSONS — Trench Excavators, Backfillers. C. H. & E. — Portable Saw Rigs, Pumps, Hoists, Material Elevators. KWIK-MIX — Mixers: Concrete, Plaster and Mortar.

KOEHRING DUMPTOR



A THREE-IN-ONE truck, tractor and bulldozer, 5 cu. yd. struck measure capacity! Low enough for mechanical loading!

No turning after dumping! Load ahead of driver; he sees where to dump. Backs out!

Two motors, one for each multi-plane. Simple throttle steering, 1, 2, 3¾, 5 miles per hour.

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Milwaukee, Wisconsin

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Harron, Rickard & McCone Co.....1600 Bryant St., San Francisco, Calif.
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Wilson Machinery Co.....1936 Market Street, Denver, Colorado
Lund & Company.....49 N. Second, West, Salt Lake City, Utah
Northwest Equipment Co., Inc.....Great Northern Tracks, Great Falls, Montana
L. A. Snow Company, 1032 Sixth Ave., S., Seattle, Wash., Portland; Spokane

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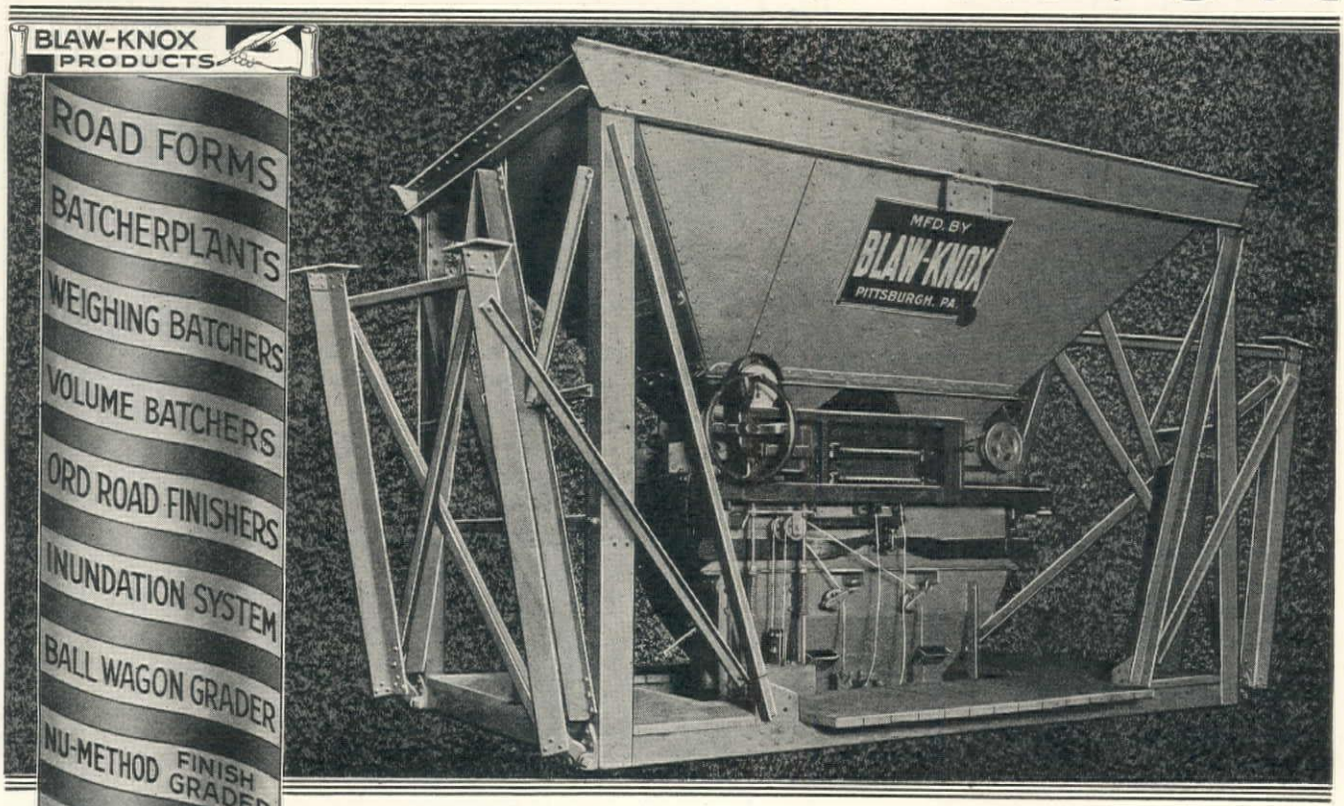
Your portable, self-cleaning BATCHERPLANT is ready for you at BLAW-KNOX



Blaw-Knox anticipates your needs--there's a BATCHERPLANT *immediately available* to suit your job.

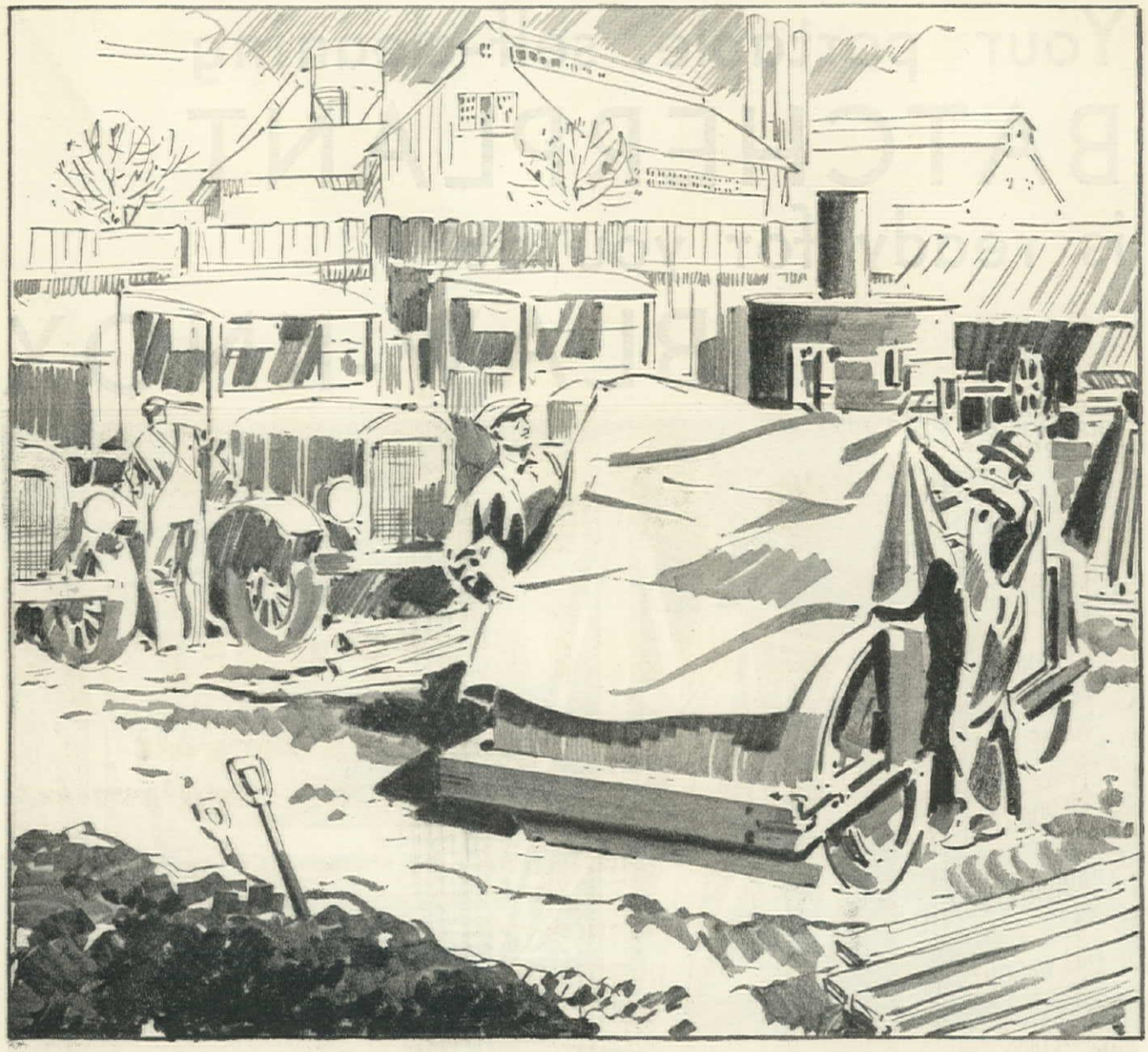
Any size; any capacity; with one, two, three or more compartments-The measuring equipment--Weighing Batchers, Volume Batchers, or the Inundation System--is shipped attached and ready for immediate use.

It pays to deal with Blaw-Knox---you get a time-proven quality product.

BLAW-KNOX COMPANY
2089 Farmers Bank Building
PITTSBURGH, PA.

Garlinghouse Bros., 16th St. and Santa Fe Ave., Los Angeles; Harron, Rickard & McCone, 1600 Bryant St., San Francisco. Calif.; J. L. Latture, 312 E. Madison St., Portland, Ore.; L. A. Snow Co., 1032 Sixth Ave. S., Seattle, Wash.

—Write
—Wire
—or Phone
for it.



The road-building season *isn't* over!

WITH Shell Colas you can go right on building—at any temperature above freezing and on any day it isn't raining *hard*. This finer cold asphalt emulsion *stays* stable and liquid. It "breaks" and binds damp aggregates *better* than when they're dry.

SHELL COLAS REG. TRADE MARK

Colas doesn't delay traffic: It is ready to use as soon as applied. Use it for patching, too. A quick but permanent repair of concrete, asphaltic or other hard surfaced roads.

Shell engineers are at your service at any time.

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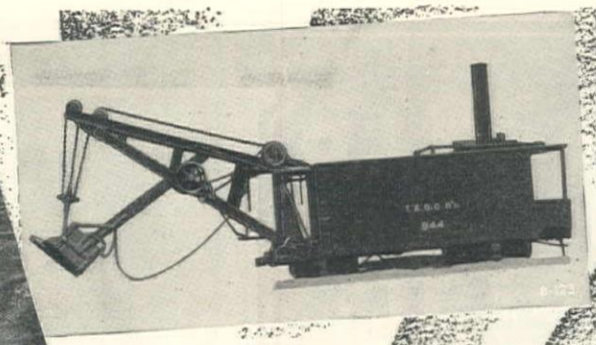
1880—One small factory; the first Bucyrus shovel.



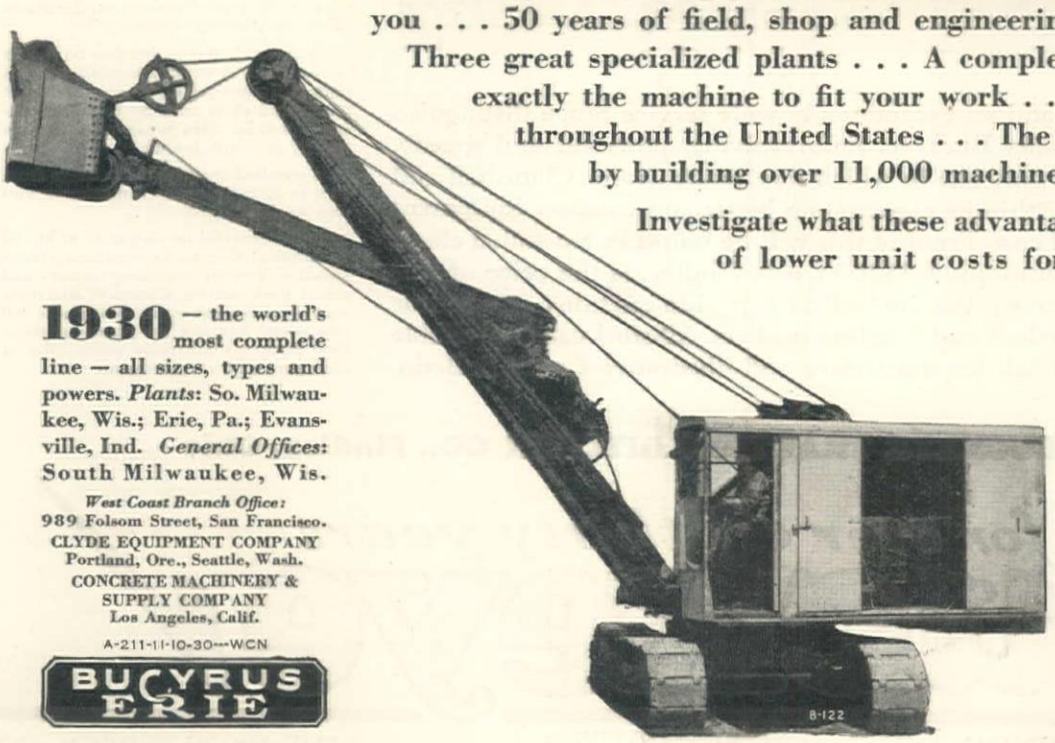
50th anniversary!

of the oldest and largest makers of excavating equipment

In November, 1880—exactly 50 years ago—this organization had its beginning. In this half-century, *not a single week* has passed but some order has been shipped.

Today, Bucyrus-Erie stands supreme not only in mere size but in its advantages in serving you. Bucyrus-Erie and no other can give you . . . 50 years of field, shop and engineering experience . . . Three great specialized plants . . . A complete line containing exactly the machine to fit your work . . . Service stations throughout the United States . . . The experience gained by building over 11,000 machines.

Investigate what these advantages mean in terms of lower unit costs for your excavating.



1930 — the world's most complete line — all sizes, types and powers. *Plants*: So. Milwaukee, Wis.; Erie, Pa.; Evansville, Ind. *General Offices*: South Milwaukee, Wis.

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A-211-11-10-30—WCN

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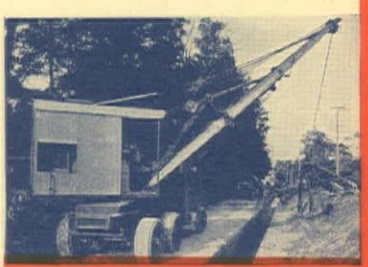
Representatives throughout the U. S. A. Offices or distributors in all principal countries. *Branch Offices*: Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Dallas, San Francisco.

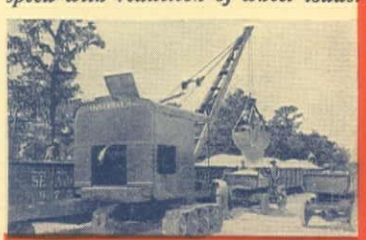
A UNIVERSAL TRUCK CRANE *to complete 1930 jobs* ON TIME!

Travels to the job at motor truck speed —always loaded and ready to go.



Does 101 different jobs cheaper than a big machine—quicker than hand labor.

Motor Truck {Christie} Crawler combines crawler traction and motor truck speed with reduction of wheel loads.



Universal 35, ½ yd. machine mounted on 2-Speed Center Drive Crawler.

WITHIN REACH of practically every contract, there is a Universal Truck Crane, loaded and ready to go, ready to help finish this year's job on time. For short service you can rent one of these machines, complete with skilled operator from any of the Universal Crane Service Companies. Or you can buy one outright for permanent service, obtaining in one investment a single machine that can

Unload cars	Drive piles
Charge bins	Handle batch boxes
Grade roads	Place pipe
Dig ditches	Remove slides
Load trucks	Dig gravel
Build culverts	Dig Bridge abutments
Build berms	Erect steel

or any of the odd clean-up jobs that can't be handled quickly or profitably by big machines.

If you have never seen one work, write us and we'll tell you where you can see an actual on-the-job demonstration.

THE UNIVERSAL CRANE COMPANY
Lorain, Ohio

Also builders of the Universal 35—⅛ yd. shovel—5 to 7 ton crane.

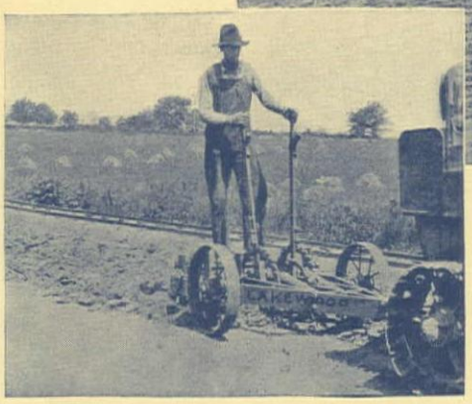
UNIVERSAL

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.

When writing to THE UNIVERSAL CRANE COMPANY, *please mention Western Construction News*

A Combination That's HARD TO BEAT



The Lakewood Steel Subgrader and Graderooter

YOU get fast, accurate subgrade operation when you use a Lakewood Steel Subgrader and Graderooter.

The *Subgrader* all steel construction, adjustable in width. Scarifying teeth on front member. Frame is strongly braced and latticed. Blades are readily adjusted to any crown. A tool that will save you plenty of money.

The Graderooter—Husky enough for the biggest tractor and the toughest soil. Four times as fast as a rooter plow if you give it sufficient power. Light enough for easy handling and suitable for light scarifying and maintenance work.

Send for the Lakewood Bulletin 46-R

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LAKEWOOD

The Lakewood Engineering Co., CLEVELAND · O.

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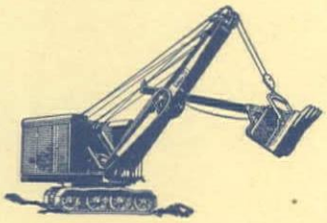
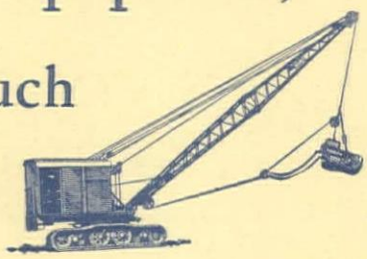
THE C. H. JONES COMPANY . . . . . Salt Lake City	H. W. MOORE EQUIPMENT COMPANY . . . Denver
CLYDE EQUIPMENT COMPANY . . Portland-Seattle	JENISON MACHINERY COMPANY . . . San Francisco

California Representatives: JENISON MACHINERY COMPANY, 58 Fremont Street, San Francisco;
SMITH BOOTH USHER CO., 1910 Santa Fe Avenue, Los Angeles

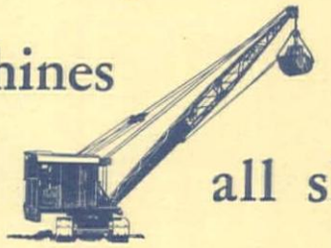
When writing to THE LAKEWOOD ENGINEERING CO., *please mention Western Construction News*



EVERY extra moving part in a machine eats up power, every extra gear means that much



more chance for wear, replacement and resulting hold up in operation. * That is why Thew Lorain machines



are built to the simplest of all shovel and crane specifications—the Center Drive, with fewer

shafts, fewer gears, fewer moving parts.

THE THEW SHOVEL CO. • *Lorain, Ohio*

THEW LORAIN

45 • 55 • 75

FEENAUGHTY MACHINERY CO.
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SMITH BOOTH USHER
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THEW CENTER DRIVE

JENISON MACHINERY CO.
SAN FRANCISCO, CALIF.

AMBLER & RITER
SALT LAKE CITY, UTAH

When writing to THE THEW SHOVEL CO., *please mention Western Construction News*

...You are the Judge ...and the Jury!

THE CONSTRUCTION FIELD OF THE FAR WEST is dominated by *Western Construction News*, the outstanding publication covering this important market for construction equipment and materials.

This statement is not based on assumptions but actual facts as told by the following figures:

Total Number of Advertising Pages Published During the First 6 Months of 1930 Compared with the First 6 Months of 1929

	1930	1929	Total Gain
Western Construction News	**704 pages**	**603 pages**	**101 pages**
Second magazine in this field	288 pages	274 pages	14 pages
Third magazine in this field	190 pages	234 pages	44 pages (Loss)

Total Number of Editorial Pages Published in 1929

Western Construction News	**975**
Second magazine in this field	282
Third magazine in this field	326

Total Number of Editorial Pages on Street and Road Work Published in 1929

Western Construction News	**316**
Second magazine in this field	205
Third magazine in this field	212

Total Pages of Advertising Published in 1929

Western Construction News	**1265**
Second magazine in this field	533
Third magazine in this field	456

Wise buying of advertising for 1931 should be based on the best possible mediums for the best possible markets for your products. The NEWS with the largest paid circulation is the most effective medium to reach the engineers and contractors who are actually doing the work in this important market.

Write nearest office for complete data.

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114 Sansome Street
San Francisco

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F. R. Jones, 201 N. Wells Street
LOS ANGELES
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first in advertising value editorial value

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A GRAVITY water supply in an elevated steel tank provides dependable pressure at all times. A reserve is held above the property it protects, ready to flow any instant.

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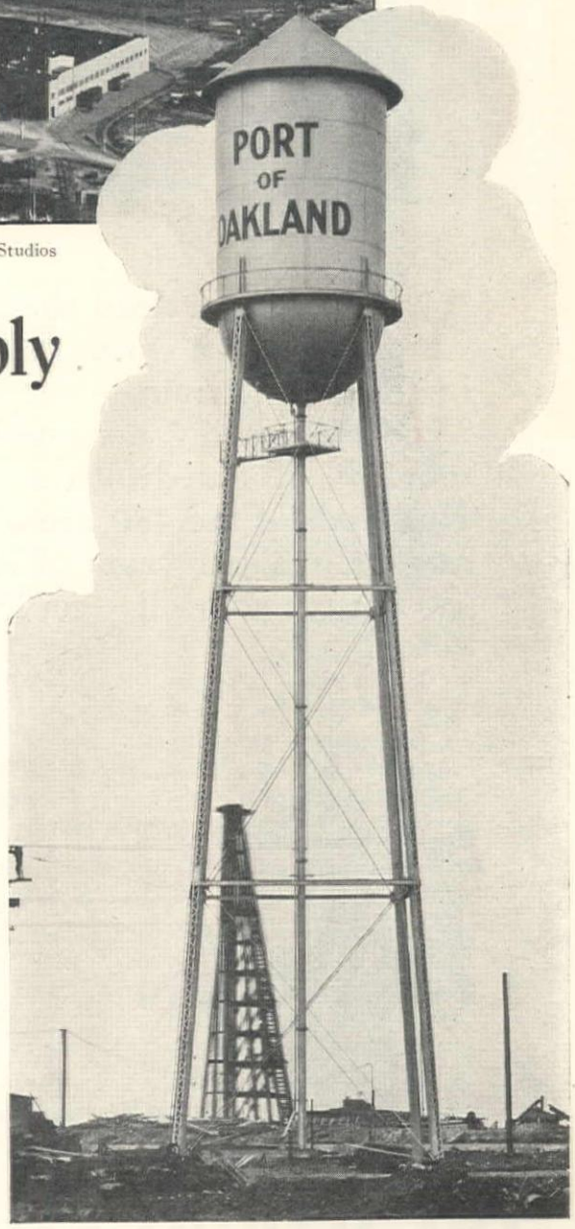

Aerial view shows Outer Harbor Terminal of the Port of Oakland, California. Lower view shows close-up of 100,000-gallon elevated tank providing fire protection at the terminal.

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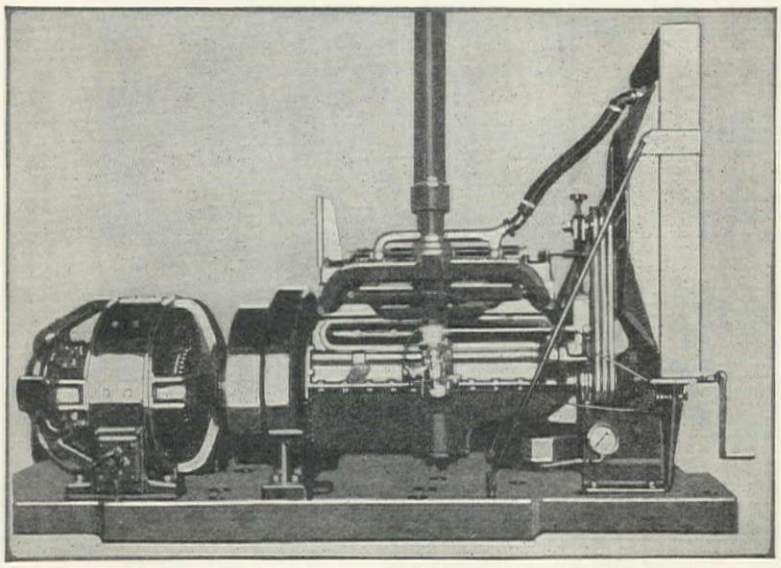

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Type 5320 - 8 yd. Steam, Electric.
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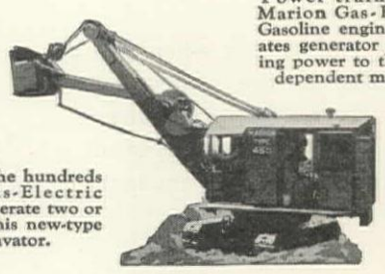
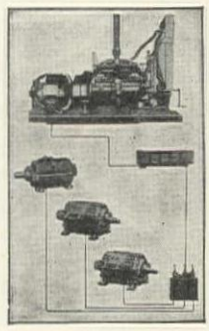


50% of the hundreds of 450 Gas-Electric owners operate two or more of this new-type excavator.

Power train of the Marion Gas-Electric. Gasoline engine operates generator supplying power to three independent motors.



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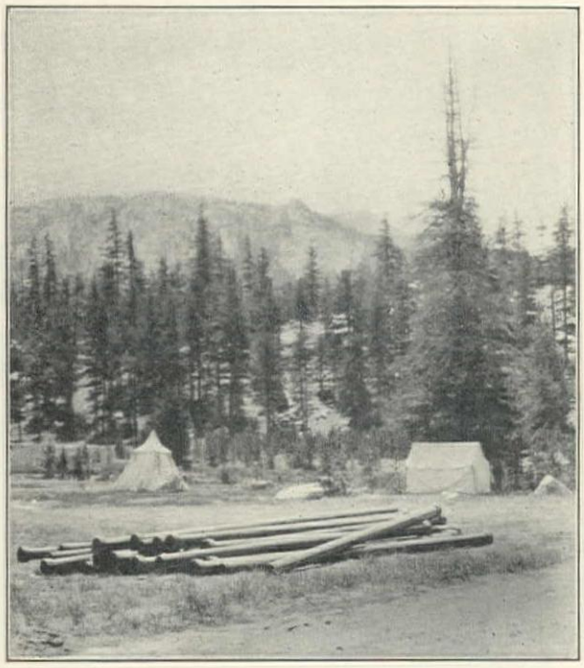

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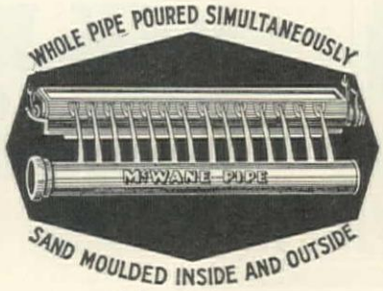

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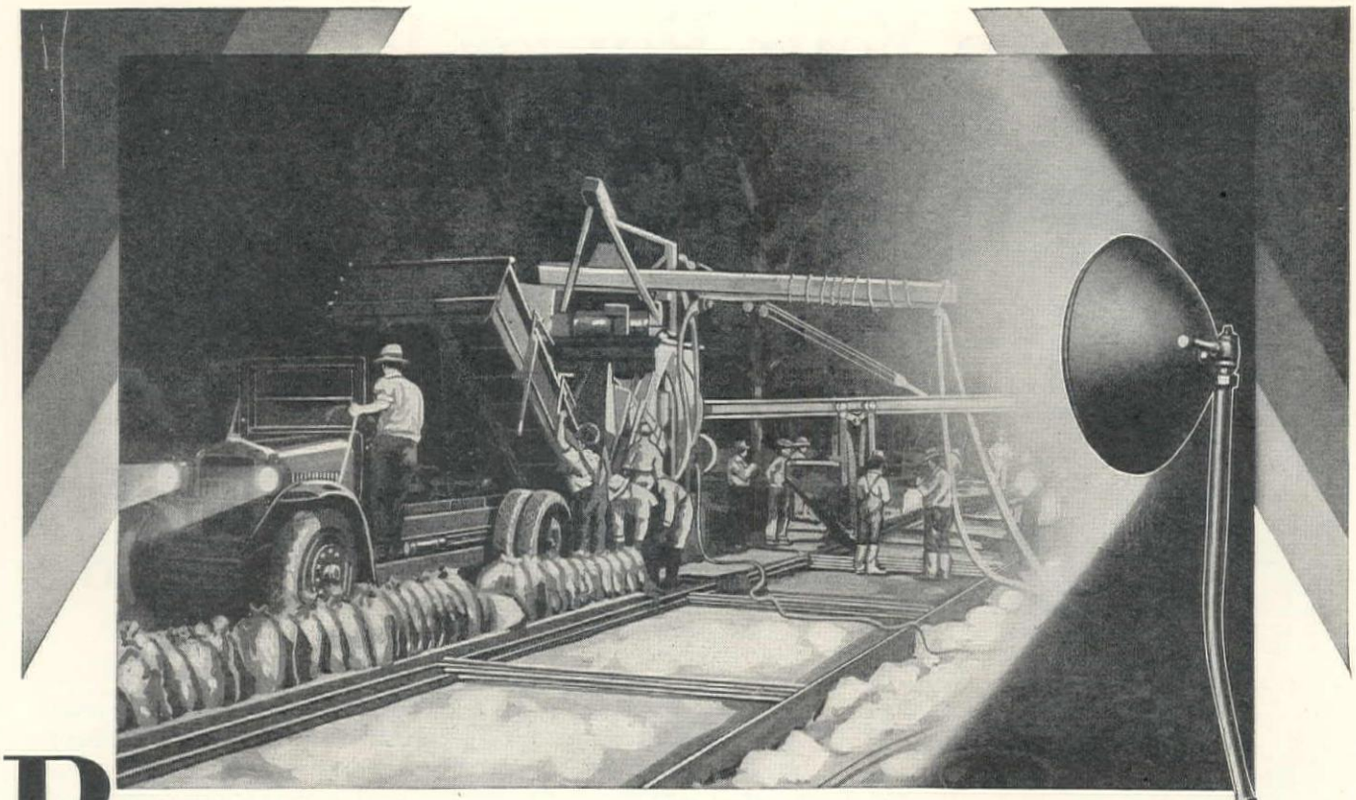

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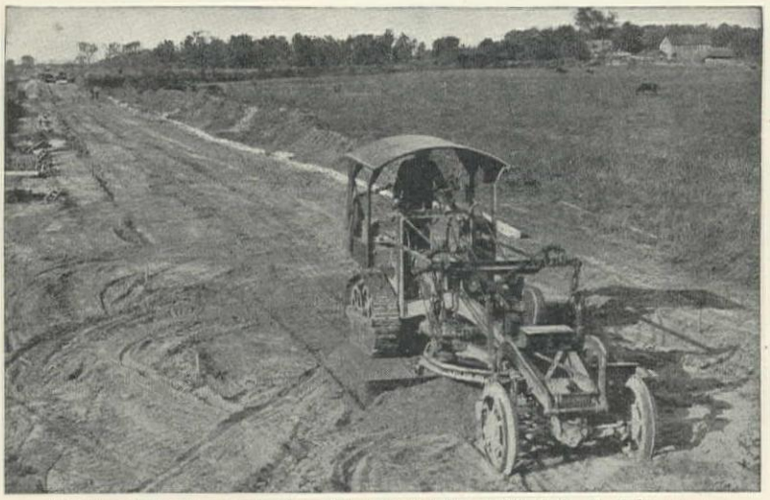

McCormick-Deering-powered grader preparing the road bed ahead of the paver. McCormick-Deering is the power heart of this and countless other types of equipment.

You'll find the solution to them in McCORMICK-DEERING Industrial Tractors

McCormick-Deering Power is operating this shovel, engaged in building approaches to the bridge shown.

On the roads the year around. During the winter months you'll see McCormick-Deering-powered units keeping the roads open, as this outfit is doing in Minnesota.

IN the selection of mobile power for the extensive road program throughout the country this season, hundreds of contractors wisely decided on McCormick-Deering Industrial Tractors. Experience and observation convinced them of the great efficiency and dependability of McCormick-Deering Power—and of the fact that it is a real money maker, especially when bids are cut to the bone.

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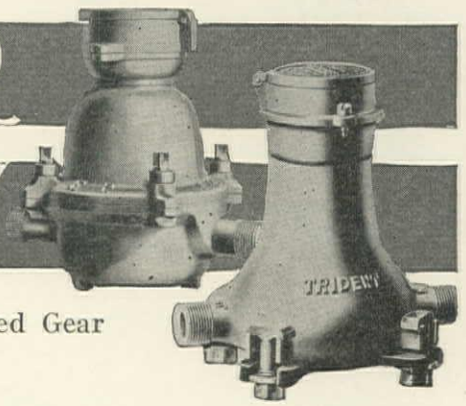

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VOLUME V | NOVEMBER 10, 1930 | NUMBER 21

Thus far during 1930 we have been able to report four California state highway paving contracts on which production records were set (February 25th, September 10th, October 10th, and November 10th issues). Two of these contracts were for portland cement concrete pavements and were made by the same contractor. On the first record project the daily average was 424 cu.yd. of 9-6-9-in., 20-ft. strip, laid with one paver, and on the second 796 cu.yd. of 11-9-11-in., 40-ft. pavement laid in two 20-ft. strips. One of the two asphaltic concrete paving records was made in 1929, the daily average being 802 tons. The second, made by an allied company in 1930, showed an average of 950 tons per day. In an early issue we will report a third asphaltic concrete paving project where the daily average was 1046 tons.

Pavement Production

These pavement production records are possible because the contractors who make them are constantly searching for new methods, improved machinery, and greater efficiency of personnel, and keep elaborate cost records. However, they could not be made unless the standards of design and construction were high and the supervision of state engineers exercised with a desire to help the contractor to an early completion of the work, sacrificing neither quality nor thoroughness in construction.

We have frequently commented in these columns on the era of tremendous engineering construction upon which the Far West is embarking. Many large bond issues were voted in various localities at the November 4th elections. Foremost, probably in point of magnitude and interest, is the Golden Gate bridge—which will be the world's greatest and most spectacular structure, and which will cost $35,000,000, exclusive of highway and terminal approaches. San Francisco will also get $10,000,000 for harbor improvements, and a number of other items of less cost.

The Far West's Huge Construction Program

Other projects under way, or soon to be started, are: Hoover dam and All-American canal, $165,000,000; Mono basin auxiliary water supply for Los Angeles, $40,000,000; Colorado river aqueduct for Metropolitan Water District of Los Angeles—bonds for which undoubtedly will be voted April next—$225,000,000; Hetch Hetchy tunnels and pipe-lines for San Francisco water supply, $20,000,000; San Francisco-East Bay bridge, $72,000,000; San Rafael-Richmond bridge, $15,000,000; Pine Canyon water storage dam and conduit for Pasadena, $10,000,000; sewer and water works improvements, Phoenix, $4,000,000; highway bond issue, Wyoming, $2,800,000; Government air bases, San Francisco bay, $7,000,000; P.G. & E. Co. and Southern California Edison hydro and steam-electric program, $60,000,000; natural gas plants and transmission lines, $10,000,000; street and highway construction, $225,000,000; hydroelectric development in Pacific northwest, very large; building construction programs, delayed but about ready to start, huge sums—and, soon to come, the huge water conservation program in California, involving many large dams, and the Columbia basin project, each to cost more than $200,000,000.

As Brisbane says, 'Don't sell the Far West short'.

Mechanical equipment is rapidly supplanting manual labor in all lines of engineering construction. Considerable of this equipment is being originated by the engineering contractor, or developed to operating efficiency in collaboration with the manufacturer. Keen competition has been a whip to ingenuity, and has enabled some contractors to undertake, and successfully complete at a profit, projects which by previous standard methods would have been suicidal. A recent instance of equipment specially designed and successfully operated is the traveling collapsible form for concrete lining the Cushman power project tunnel, described elsewhere in this issue. On the Pixley-Tipton highway paving contract, also described in this issue, the contractor used a tamping roller of his own design for subgrade preparation, a specially designed portable steel office building and blacksmith shop, and rectangular asphalt and fuel oil tanks which could be grouped on flat cars for moving between jobs.

Contractors as Designers of Equipment

Contracting is attracting to its ranks many capable engineers—electrical and mechanical as well as civil.

City Manager for Oakland—After many years of municipal control by politicians, finally terminating in the recent paving graft expose, the pendulum has swung in Oakland and the citizens have voted in favor of the city manager plan of government. Here is another opportunity for some engineer to prove that an engineering training is the prerequisite to economic management.

Cushman Power Plant No. 2 for Tacoma

Progress and Construction Methods on Second Unit of Municipally-Owned Development on Olympic Peninsula—Contractor Perfects Special Apparatus for Lining 17-foot Tunnel

Cushman No. 1 Plant—In May, 1926, the city of Tacoma completed the first unit of the Cushman hydroelectric project, consisting of Cushman dam No. 1 inundating Lake Cushman on the Skokomish river, Olympic peninsula, a constant-angle arch dam 280 ft. high impounding 440,000 ac-ft. of water; a powerhouse near the base of the dam equipped with two vertical generating units of 25,000-hp. turbine capacity each; and a 44-mile 110,000-volt transmission line to Tacoma, with a 6241-ft. span across 'The Narrows' of Puget sound; at a total cost of $5,156,211.

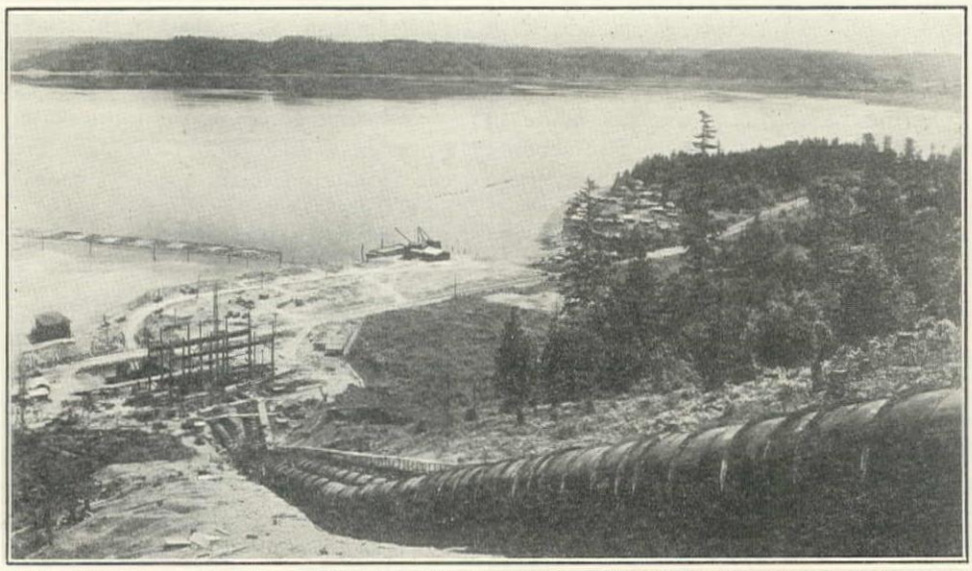
This project was constructed under the supervision of Ira S. Davisson, commissioner of public utilities; J. L. Stannard, chief engineer; B. E. Torpen, superintendent of hydraulic design and construction; A. F. Darland, superintendent of electrical design and construction; N. L. Taylor, superintendent of surveys; J. V. Gongwer, assistant engineer on design, and I. B. Shinkle, construction engineer. The contractors were A. Guthrie & Co. on the dam, tunnel, and powerhouse; Cornell Bros. & Walsh, on the spillway; Dougan & Chrisman on the city substation; Nelson & Pederson on the transmission line; and Star Iron & Steel Co. on the Narrows crossing.

This project was described in detail in the April 25th, 1928, issue.

Cushman No. 2 Plant—On April 11, 1929, the city of Tacoma received bids for various units of Cushman No. 2 project*, consisting of a diversion dam 1¼ miles below powerhouse No. 1; an outlet tunnel, 17 ft. diam. and 13,000 ft. long; a large differential surge tank; a twin penstock, 1350 ft. long; and a powerhouse on the edge of Hood canal with two 30,000-kv-a. (27,000-kw.) generators.

Work on Cushman No. 2 project is being carried on 7 days a week and 24 hours a day, as the power is urgently needed to supply the market at Tacoma.

This project is being constructed under the supervision of Ira S. Davisson, commissioner of public utilities; J. L. Stannard, chief engineer; J. V. Gongwer, superintendent of hydraulic design and construction; A. F. Darland, superintendent of electrical design and construction; and V. R. Rathbun, assistant engineer on design.



TWIN PENSTOCKS, 1350 FT. LONG, LEADING TO CUSHMAN POWERHOUSE NO. 2 ON BANK OF HOOD CANAL; CONTRACTOR'S MATERIAL WHARF BEYOND

Cushman Dam No. 2—L. H. Hoffman, of Portland, the lowest of 13 bidders, was awarded the contract for this dam on his bid of $440,547 (cement furnished by the city).

The dam is a concrete arch on an upstream radius of 135 ft., with a maximum height of 240 ft.; a thickness of 40 ft. (45 ft., including flare downstream) for the first 80 ft. above the base, and 8 ft. at the top; crest, 450 ft. long and 8 ft. wide, surmounted by a parapeted roadway 12½ ft. wide in the clear; base, 60 ft. long. The dam is flanked at the east end by a concrete gravity abutment and at the west end by a concrete thrust block 50 ft. high.

The spillway, around the west end, is 120 ft. wide in the clear, lined with concrete, and regulated by three 14½ by 40-ft. drum gates, with sluice gate manual controls and adjustable siphon automatic controls, mounted in the weir structure, 155 ft. long. These

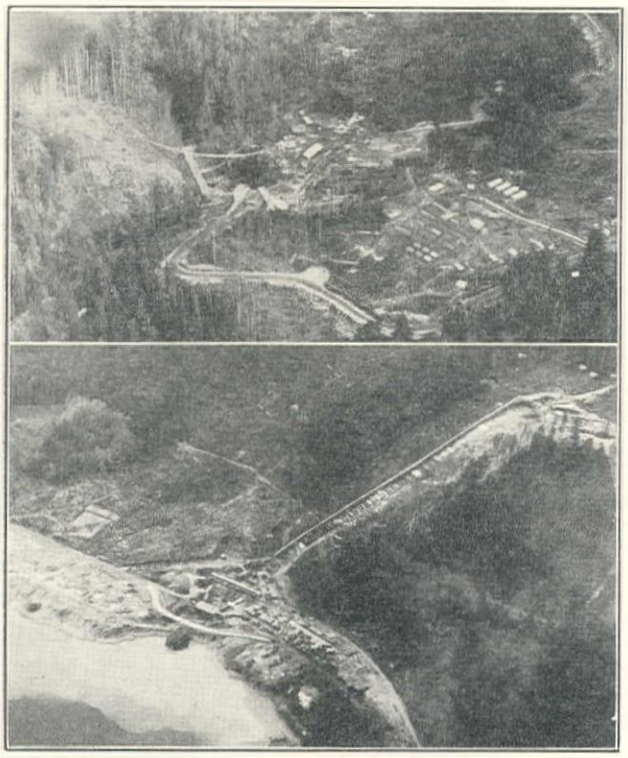
*See pre-bid description in the March 25th, 1929, issue, page 162; unit bid summary in the April 25th, 1929, issue, pages 46 and 48; and progress articles in the following issues: July 25th, 1929, page 390, December 25th, 1929, page 685, and April 25th, 1930, page 224.

gates and controls were manufactured by the Commercial Boiler Works, Seattle, who also furnished the siphon complete.

There are two 8-ft. diam. outlets through the dam near the base, steel lined, and each controlled by two 78-in., free-discharge Pelton butterfly valves in tandem; all four valves being installed in a cantilever concrete structure. The center-line of the outlet valves is at elev. 335 ft. The outlets are protected on the upstream side by trash racks. The valves were manufactured by the Pelton Water Wheel Co. of San Francisco.

The dam contains contraction joints, painted with asphaltum; copper water stops near the upstream and downstream faces; and grouting and electrical conduit pipes for temperature records.

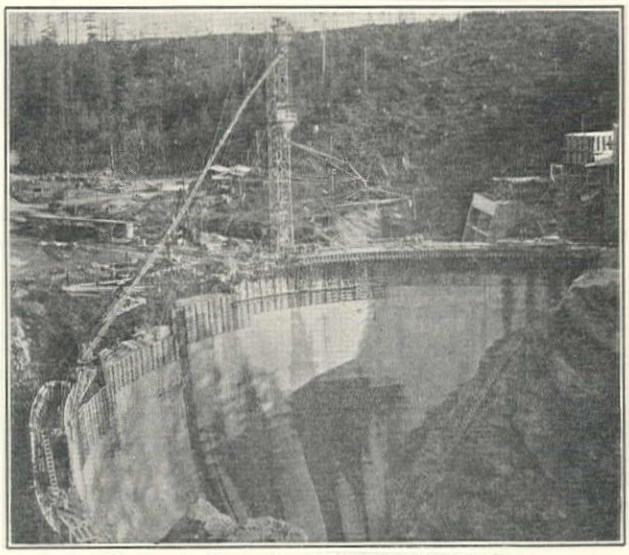
Concrete in the dam and structures is of three classes, with a minimum of one barrel of cement per cubic yard, and has been placed under laboratory control and careful supervision to secure both density and impermeability. Sacked cement (Olympic brand) was purchased by the city from Geo. Scofield & Co.,



(Upper) Contractor's Camp and Construction Plant at Cushman Dam No. 2, During Early Stage of Dam Construction. (Lower) Penstock Leading to Powerhouse No. 2 at Edge of Hood Canal

Tacoma, and delivered as required on barges at Potlatch on Hood canal, from which point it was hauled 4 miles to the job. The contractor was fully responsible for delivery, but no charge was made for cement unless it was used in his own work or wasted. The price of cement to the city is $2.48 net, delivered in any warehouse anywhere on the work between the dam and powerhouse ($2.98 per barrel less $0.40 for sacks and $0.10 for cash at 10 days).

Hoffman started construction about May 1, 1929, and on October 1, 1930, his contract was 93% completed. Hoffman's men were housed and fed in construction camp No. 1 of the Youdall Construction Co., contractors on the tunnel. On this project the contractor was relieved of the hazard of spring floods, as the city controlled the flow of the Skokomish river by Cushman dam No. 1, just upstream. It was necessary, therefore, to construct a wooden flume 900 ft. long, of only 2200 c.f.s. capacity. The spanning of this flume, 12 by 20 ft. in section, across the foundation excavation, on high posts, was difficult. There was also required a rock-filled timber crib cofferdam 23 ft. high and extending across the streambed at a point 300 ft. above the power dam. The elevation of the streambed



Cushman Dam No. 2 Nearing Completion

is 320 ft. and the foundation excavation was carried down to elev. 245 ft., or 75 ft. deep. Excavation was slow on account of large boulders and gravel. Drilling equipment included two Gardner-Denver 600-c.f.m. compressors operating Gardner-Denver air tools. Excavated material was removed in 1½-yd. skips operated by an American derrick hoist. There were eight skips, hoisted separately, and these skips dumped to 4-yd. cars which spoiled downstream from the damsite, leaving part of the river channel open. Seepage during foundation excavation was controlled by three 12-in. Byron Jackson deepwell turbine pumps. The foundation and side wall bedrock was thoroughly grouted under a maximum pressure of 145 lb. per sq.in.

Aggregates were obtained from the Pioneer Sand & Gravel Co. at a pit on Puget sound near Tacoma, and barged down the sound to the entrance of Hood canal and then up the canal to Hoodsport. A concrete mixing plant equipped with two 1-yd. mixers (T.L.Smith and Rex) on the east bank at elev. 500 ft., enabled gravity placement of concrete from bedrock to part height and thereafter through chutes suspended from a 240-ft. Archer tubular tower.

Panel forms of 1-in. tongue-and-groove flooring were used, held in place by wire tie backs and pipe struts. Lumber and materials were handled across the dam by a 'high line'.

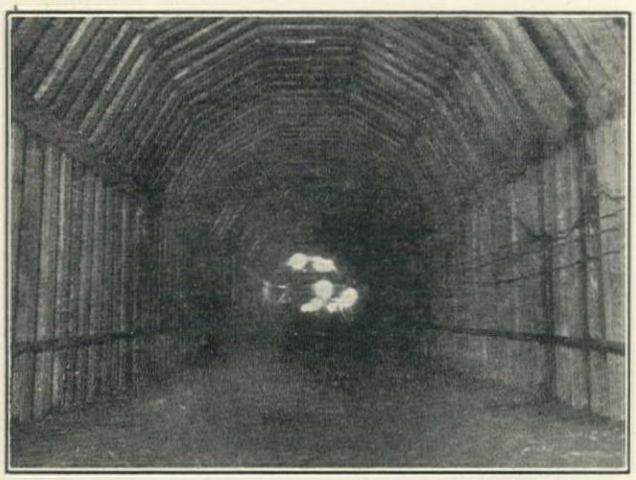
The main quantities in this contract were:

Excavation for dam, solid rock	17,498	cu.yd.
Excavation for dam, common	860	cu.yd.
Excavation for dam, solid rock, below elev. 323 ft.	15,200	cu.yd.
Excavation for dam, common, below elev. 323 ft.	4,600	cu.yd.
Excavation for spillway, solid rock	15,500	cu.yd.

Excavation for spillway, common	11,720	cu.yd.
Concrete, class 'A'	40,000	cu.yd.
Concrete, class 'B'	3,000	cu.yd.
Cement used	65,000	bbl.
Copper water stops	14,200	
Reinforcing steel in place	503,260	lb.
Steel trash rack for outlets and structural steel in drum gates	310,000	lb.
Grout holes	4,900	lin.ft.

George A. Gregory is resident engineer for the city and A. P. Dean is superintendent for L. H. Hoffman.

Cushman Tunnel No. 2—The intake to this tunnel is adjacent to the easterly end of Cushman dam No. 2



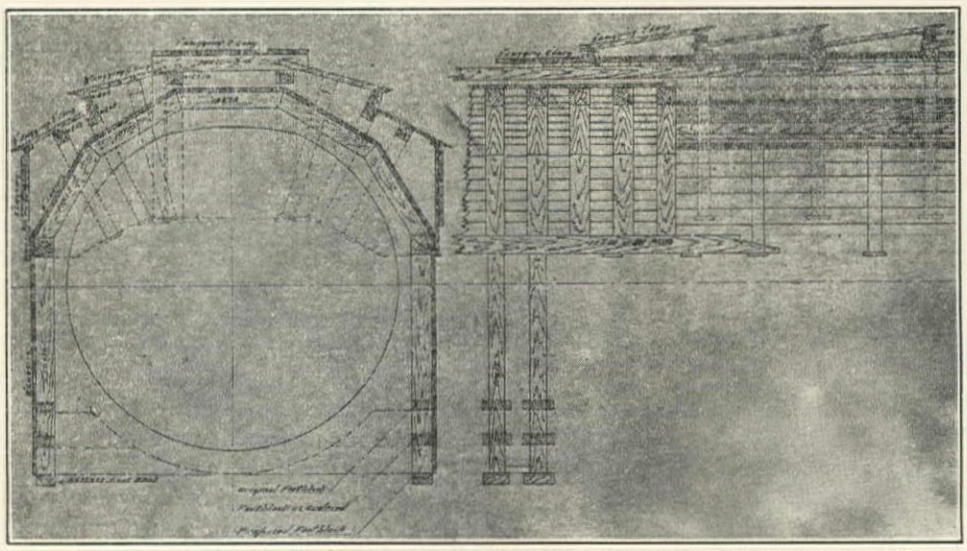
Timber-Lined Section of Cushman No. 2 Tunnel, 17 Ft. Diam.

and 250 ft. distant. It consists of a short channel 30 ft. deep, and a concrete structure equipped with trash racks and mechanical hoist, a 17 by 17-ft. Broome self-closing type headgate, and a 30-in. by-pass valve. The Newport News Shipbuilding & Drydock Co. furnished the trash racks and hoist; Phillips & Davies (Kenton, Ohio) supplied the headgate; and the by-pass valve was furnished by the Chapman Manufacturing Co.

The tunnel is 13,000 ft. long and 17 ft. diam. inside the concrete lining. The Youdall Construction Co., of San Francisco, with Roy C. Hackley as affiliate contractor, the lowest of 6 bidders, was awarded this contract on April 15, 1929, on a total bid of $1,737,933. Youdall also secured a subcontract for construction of foundations, anchors, and piers for the surge tank and penstocks. Two 225-man camps with all modern conveniences were erected; one at the intake end or west portal of the tunnel (West camp), the other (East camp) about 2000 ft. west of the east portal or outlet end at the adit to the tunnel. Water for the East camp had to be pumped from wells against a head of 700 ft., and for the West camp 350 ft. In Washington, contractors must furnish blankets and sheets as well as cots, etc.

Tunnel excavation has been carried on from six headings—the two portals, each way from an adit 3000 ft. west of the outlet or east portal, and each way from a timbered shaft (160 ft. deep to roof of tunnel) midway between the adit and west portal or intake end.

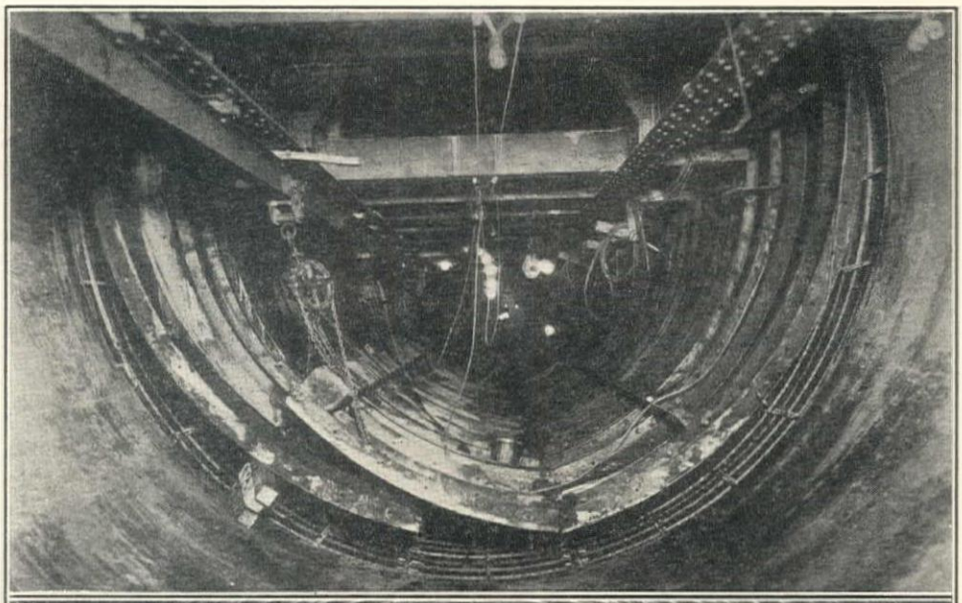
About 2700 lin.ft. is through rock (mostly near west portal, and near shaft) volcanic in character, seamy, dangerous, and requiring timbering. The remainder is through glacial till varying from loose gravel to hardpan, being mostly stratified and compacted, with a considerable clay content and minor amount of flowing water. Usually the whole bench stands vertically and quite firm when excavated. For a considerable distance no side lagging has been needed. The roof, however, is treacherous for the most part, but in two stretches could be mined out in front of the timbering as much as 20 ft. in an 8 by 8-ft. drift. (A 24 by 24-ft. trench cut through under the surge tank stood for over three weeks before shoring was put in, and then only one top waling was used, without lagging.) Tight sheathing has been needed on top and in places on the sides. For some distance in the tunnel, little or no side lagging has been used, whether in the center heading or behind the plumb posts. Some water was encountered at the west end and in the center. The maximum cover over the tunnel is 200 ft., and somewhat uniform.



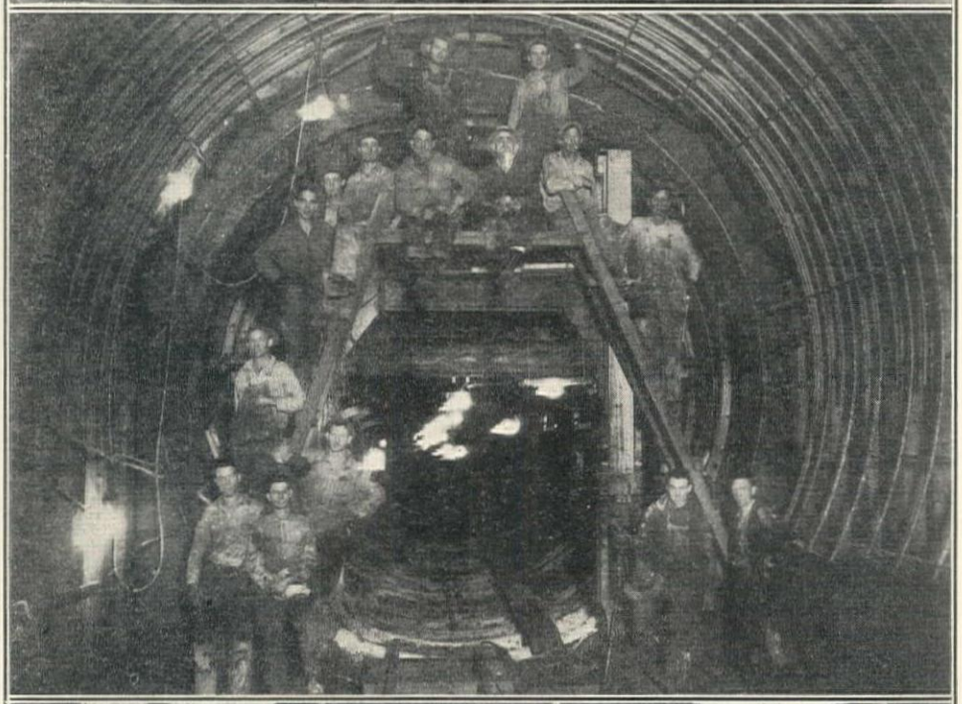
METHOD OF DRIVING AND TIMBERING CUSHMAN NO. 2 TUNNEL THROUGH GLACIAL TILL

Excavation of the adit, 2000 ft. of the lower end, the shaft, and each way from the shaft, has been done under subcontract by Swan Dalberg.

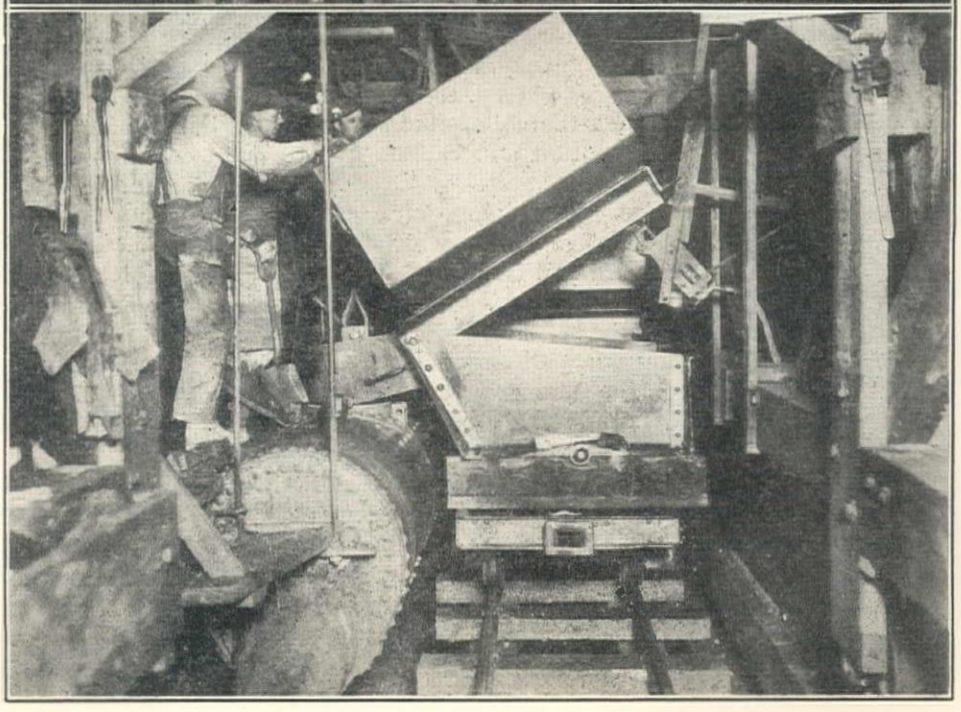
Excavated material is loaded into side-dump cars by mucking machines and hauled out with Westinghouse storage battery locomotives (two at each heading).



HACKLEY COLLAPSIBLE STEEL FORM ON TRAVELING JUMBO FOR LINING 17 FT. TUNNEL WITH CONCRETE



CONCRETE LINING CREW AFTER COMPLETING SECTION OF TUNNEL



LOADING HACKLEY PNEUMATIC CONCRETE GUN FROM 2-YD. DUMP CAR TILTED BY A SPECIALLY DESIGNED AIR HOIST, ALL OPERATED BY ONE LEVER; SHERLOCK HACKLEY (LEFT FOREGROUND), BEING THE OPERATOR

At the shaft, the material is hoisted in a 2-yd. skip to a bunker at the surface, from which it is hauled away and dumped by a side-dump bucket on a cableway rigged to a spar tree, and operated by an electric motor.

Concrete Lining—One of the most interesting features of the Cushman No. 2 project is the lining of the 13,000-ft. tunnel with specially designed equipment. Roy C. Hackley, affiliated with the Youdall Construction Co. on this contract, is the inventor and patentee

The Hackley and Youdall Families, Most of Whom Worked on the Tunnel Contract During Vacations. (Left to Right) Roy C. Hackley, Jr., Roger W. Hackley, Roy C. Hackley, Mrs. Hackley, Mrs. Youdall, Leonard F. (Dolly) Youdall, Deese Youdall, Leonard F. Youdall, Jr. (in Background), Peter Youdall, Sherlock Hackley, and Harris Youdall

of the Hackley pneumatic concrete gun and has developed (and patented) for this contract a collapsible steel form on a movable carriage that is exceptionally efficient and economical.

The liner form consists of a circular steel shell made of ¼-in. plate, 17 ft. diam. and 40 ft. long, with a special collapsible device, mounted on a steel carriage 83 ft. long. The carriage consists of two heavy plate girders 8 ft. apart, on four legs, with wheels rolling on steel rails. In each leg, near the foot, is a 25-ton ball-bearing-geared jack for lowering and raising the carriage.

The bottom segment of the liner form is hinged, and is easily swung upward by chain blocks on trolleys traveling on an I-beam of the carriage. The collapsing of the form gives a clearance of several inches, or sufficient, when the jacks are lowered, to permit moving the form ahead. When the collapsible section is lowered, it settles into position and can be quickly pinned together.

The Hackley concrete gun, piping, etc., are all mounted on a separate wooden jumbo which is operated (in movement, forward and backward) by an air hoist.

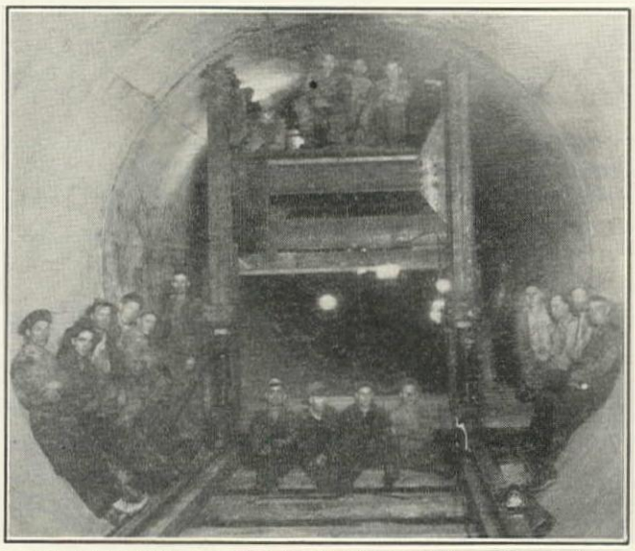
After the form has been set, the steel carriage is moved ahead 40 ft., and when the form is released it is rolled ahead 40 ft. on the carriage. It requires only 1 hour to strip or release the form, move it ahead, oil, and set it.

Hackley has three of these units on this contract, which were fabricated by the Western Pipe & Steel Co. at its South San Francisco plant. Each unit requires a total crew of 35 to 40 men, working in three shifts—a clean-up crew of 10 men, who clean up the subgrade, move the rails, strip the bulkhead at the end of the concrete pour, and move the carriage; a preparatory crew of 5 to 10 men which places the reinforcing steel, 7 to 10 tons per shift, depending on spacing, etc.; and the concrete crew of 15 to 16 men which sets the form and places the concrete. A separate jumbo is used for placing the arch steel.

All steel is bent inside the tunnel in a bender of special design. The reinforcing, depending on hydrostatic head, consists of 1-in. square transverse bars, spaced from 5¼ to 12 in. c. to c., and ¾-in. longitudinal bars, spaced 24 in. c. to c.

Concrete aggregates (graded gravel and sand) are secured from the Pioneer Sand & Gravel Co. pits at Steilacoom, Washington, transported 100 miles by barge, and unloaded into bunkers at the specially-constructed contractor's wharf on Hood canal. Cement is furnished by the city. These materials are trucked to the two portals, shaft, and adit (cement in Kenworthy 2½-ton trucks and aggregates in Mack trucks), where the concrete is mixed in Koehring 1-yd. mixers; an average of 5.7 sacks of cement to the cubic yard of concrete being used.

Concrete is dumped into 5-yd. hoppers, and hauled into the tunnels in special 2-yd. steel dump cars drawn



Concrete Lining Jumbo, Showing Raising and Lowering Jacks, and Smooth Finish of Concrete Lining

by gas locomotives. The Hackley concrete guns hold 2 cu.yd. and are operated by air pressure (100-lb. at the compressor); 1000 cu.ft. of air being necessary for each gun. Stationary compressors are used in three plants.

Another interesting feature is that the concrete for the complete perimeter is being placed, or shot, in one operation, practically a perfect job without voids being secured. An air chipping-hammer is used to vibrate the steel form for tamping concrete. Inspection doors are provided in the steel form.

The outlet end of the tunnel for 100 ft. has a steel liner (W. P. & S. Co.) embedded in the concrete.

Progress—The concrete lining has an average thickness of 15 in. An average of 40 lin.ft. of tunnel lining, or 135 to 200 cu.yd., has been placed per unit per day. At the present time, about 10,000 lin.ft. of lining has been completed and the whole tunnel contract is 95% complete. The tunnel is practically finished.

Leonard F. Youdall, R. G. Clifford, and Earl Breiting are superintendents for the Youdall Construction Co. Floyd E. Rogers is resident engineer for the city.

Surge Tank and Penstocks—The surge tank is of the Larner differential type, 65 ft. diam. and 94 ft. high, rising to elev. 518 ft., or 38 ft. above reservoir level. The bottom of the tank is connected to the tunnel liner underneath by a tee 16 ft. 2 in. diam., which has a riser pipe suspended in it by 10-in. channel brackets, the riser being 14½ ft. diam. At the end of the liner beyond the surge tank is a three-branch steel manifold, each branch 10½ ft. diam., with butterfly valves on two branches, and a blank flange (for the present) on the third, all enclosed in a valve house. These valves were manufactured by the Joshua Hendy Iron Works, of Sunnyvale, California. The manifold (see front cover illustration) is rated as the largest of its kind ever fabricated, and is embedded in concrete. The Western Pipe & Steel Co. has the contract for the penstocks and surge tank. The Gabriel Construction Co. is subcontractor on steel erection.

The twin penstocks, 1350 ft. long each, and spaced 15 ft. apart on centers, reduce in diameter by 3-in. decrements from 10½ ft. ($\frac{7}{16}$-in. plate) to 9 ft. diam.

R. G. Clifford, Partner of Leonard F. Youdall

($1\frac{1}{8}$-in. plate). They are connected at the lower end by a reducer and one length of 8 ft. pipe to the turbine inlet butterfly valves. The penstocks are supported on concrete saddle piers at 27-ft. slope centers, with heavy concrete anchors about every 300 ft. There is a sleeve-type expansion joint (with 10 rings of square graphited-flux packing, and alemite lubricated), between anchors. At each bearing on saddle piers, the pipe is reinforced with a $\frac{5}{16}$-in. sole plate welded thereto, and two 3-in. steel oil channels are set in the tops of the piers to reduce friction. On each side of the piers, the pipe is stiffened by 6 by 4 by ⅜-in. angles, while two 5 by 5 by ⅝-in. angles are riveted to the pipe at each anchor to be set in the concrete. Each section of the penstock pipe was fabricated from a single plate in 9-ft. lengths, with longitudinal seams, quadruple-riveted, and with butt straps. The girth joints are double-riveted, with outside butt straps. The penstocks are on a maximum slope of 24 degrees.

Cushman powerhouse No. 2, on the scenic Olympic highway, is 52 by 184 ft., of concrete and steel, and is being built by J. E. Bonnel & Son, Tacoma, the substructure and tailrace having been constructed by the Ward Engineering Co., of Tacoma.

The main floor of the powerhouse is at elev. +20 ft. and the basement floor at elev. +2.0 ft. The floor of the hydraucone draft tubes is at elev. –11.5 ft. (Zero of the Cushman datum is about 3 ft. below mean sea level.) All hydraucone and other curved forms, column and wall panel forms were made up in advance, the curved forms being covered with Russia iron.

Larner Differential Surge Tank and Twin Penstock for Cushman No. 2 Plant

The tailrace is flanked by curved retaining walls and crosses under the Olympic highway to connect with tidewater. Mean tide is at elev. +3.0 ft., and extreme low tide at elev. –7.0 ft.

The powerhouse superstructure is of reinforced concrete in classic design, with a structural frame which permitted commencing installation of the turbo-generator units while the erection of the building proceeded. A Whiting 125-ton crane was erected at once on the steel frame and has assisted both in installing units and to some extent in placing and removing roof forms, the roof slab being the first concrete placed by J. E. Bonnel & Son. The exterior of the building is receiving a carborundum rubbed surface, befitting its prominent location on the highway.

One Allis-Chalmers generating unit with relief valve is now assembled and connected to its penstock, and the switchboards and other electrical equipment are at an advanced stage of installation, all connections to the transmission lines being in place.

John G. Heintz is resident engineer for the city on the penstocks and powerhouse.

Pixley-Tipton Highway, California

California Construction Company Averages 950 Tons per Day on 8.6 Miles of Asphaltic Concrete Pavement in Tulare County for State—Best Previous Average 791 Tons

The California Construction Co. of San Francisco recently completed a contract for grading and asphaltic concrete paving on 8.6 miles of state highway between Pixley and a point one mile north of Tipton in Tulare county, California. In 36 full working days, 33,755 tons of asphaltic concrete was placed, the average daily production being 950 tons. The total contract required 96 full working days and was accepted July 7, 1930, the completion date being June 20. The specified contract time was 175 consecutive working days.

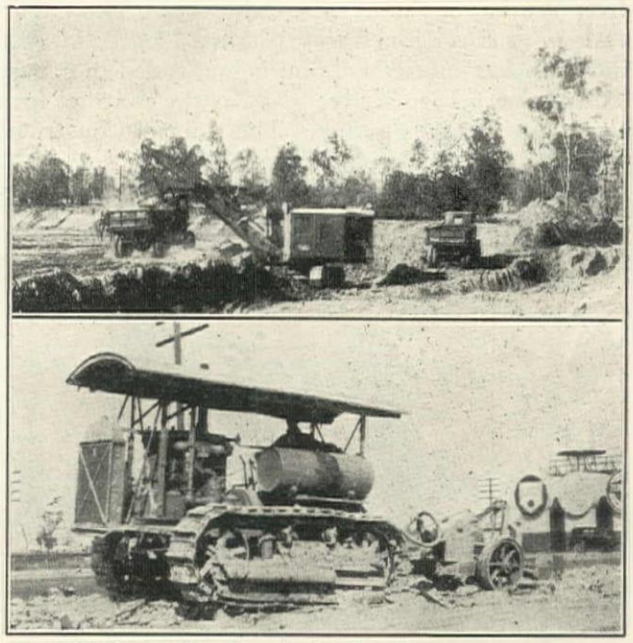
Location and Character of Work—The highway begins at a point in the existing pavement near the southerly boundary of the town of Pixley and extends northerly over an old 15-ft. portland cement concrete pavement and new rights-of-way to a point in the present state highway near Tipton crossing.

A graded roadbed was constructed 36 ft. wide and a 20-ft. width of asphaltic concrete pavement laid, with oil-treated crushed rock borders 3 ft. wide and 4 in. thick on both sides. Road connections and approaches and a widening strip on the east side of the pavement between the outside of the border and sidewalk curb through the towns of Pixley and Tipton were surfaced with a 3-in. layer of oil-treated crushed rock. Corrugated metal pipe culverts were installed and extended; reinforced concrete box culverts extended; drainage sumps excavated; and laminated timber guard rail placed on timber posts along short stretches.

Geiger 4000-lb. Asphalt Plant on Alfac Siding at Center of Pixley-Tipton Paving Contract of California Construction Co. Northwest Crane with 1-yd. Owens Rehandling Bucket on Stockpile in Right Background

Traffic was detoured over existing county roads during the paving operations, except for four sections aggregating 3 miles where it was necessary to use the new construction.

Construction Quantities—Bids for the work were received January 2, 1930, and the contract awarded on January 7 to the California Construction Co. for the low bid of $240,109. Major items in the contract included: roadway excavation—29,100 cu.yd. at $0.22; imported borrow—69,800 cu.yd. at $0.35; structure excavation—1050 cu.yd. at $1.00; class 'A' concrete in structures—135 cu.yd. at $20; reinforcing steel—11,400 lb. at $0.06; subgrade—17,900 sq.yd. at $0.09; asphalt paving—34,500 tons at $4.64; oil-treated crushed rock borders—7100 tons* at $3.00; asphalt paint binder—64,150 sq.yd. at $0.015; fuel oil for shoulders and base—2300 bbl. at $2.00; remove and dispose of concrete—132 cu.yd. at $1.60; finish roadway—456 sta. at $6.00.



(Upper) Northwest Gas Shovel with 1¼-yd. Dipper Capacity Loading Imported Borrow Into 5-Ton Truck, Production 1442 cu.yd. of Borrow Per 8-Hour Day for 53 Days. (Lower) Caterpillar '60' and Jordan Hydraulic Scarifier Breaking Old Concrete Pavement on Pixley-Tipton Highway

The unit bid summary was published in the January 25th, 1930, issue, p. 38.

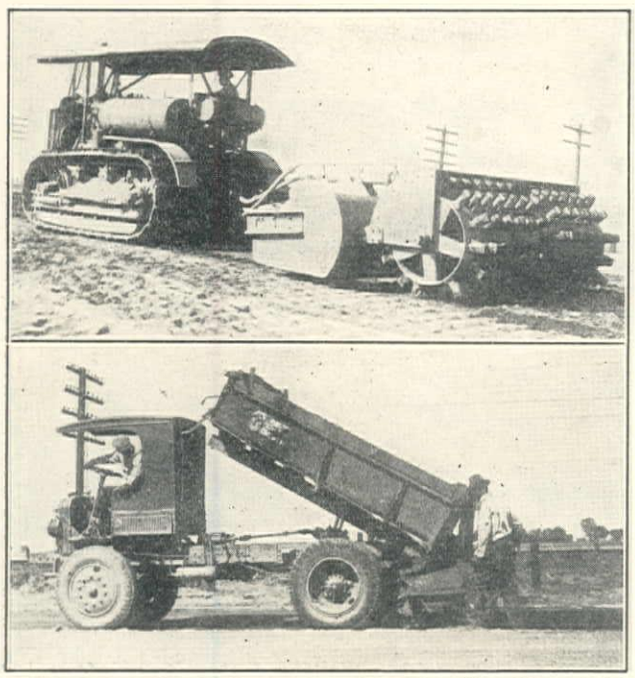
Grading—Imported borrow was loaded with a 1-yd. Northwest gas shovel, fitted with sideboards to increase the dipper capacity to about 1¼ cu.yd. This shovel loaded 1442 cu.yd. of borrow per 8-hour day for a period of 53 days.

Grading was done with a Fordson power grader, one 10-ft. Galion blade, one 10-ft. Adams blade, two Ateco hydraulic scrapers used with Caterpillar '60' tractors, and one Ateco hydraulic scraper powered by a Caterpillar '30'. Tamping of embankment was accomplished with a sheepsfoot roller designed by Ben H. Tanner, engineer for the contractor, which met California state specifications for unit weights and surface areas. This roller contained two sections 4 ft. long and 36 in. diam. and was built with welded cast-steel feet. It was attached to an Ateco scraper pulled by a Caterpillar '60' tractor.

*A total of 9283 tons of oil-mix was used in the job, as this material was substituted for 2600 cu.yd. of crusher-run base, included in the contract at the same unit price.

Headers were placed under subcontract by William Jurkovich, of Fresno.

Plant and Concrete Materials—The asphalt plant layout included a complete 4000-lb. Geiger pugmill, three portable rectangular steel asphalt tanks with a total capacity of 35,400 gal., one portable rectangular steel fuel oil tank having a capacity of 15,484 gal., and other equipment as shown in the illustration. Each asphalt tank was provided with heating coils; the four



(Upper) Compacting Embankment with Caterpillar '60' and Ateco Hydraulic Scraper Followed by Sheepsfoot Tamping Roller Designed by Ben H. Tanner of California Construction Co. (Lower) 5-Ton Autocar Truck Dumping Surface Course Into 8-ft. Galion Spreader Box

tanks were designed to fit on two flat cars. The asphalt plant was erected at the center of the job at Alfac station siding on the main line of the Southern Pacific. It had a batch cycle of 45 seconds for asphaltic concrete and 30 seconds on oil-treated crushed rock.

Sand was hauled 3 miles from a State pit, loading into 5-yd. Autocar trucks being done by team-driven scrapers working into traps and with a 1-yd. Northwest clamshell crane. Rock was obtained from the Piedra quarry of the Pacific Coast Aggregates Co. and shipped by rail. Kaweah limestone dust was used in the concrete. The Standard Oil Co. furnished asphalt and fuel oil from its Seguro refinery.

Rock was unloaded with a Northwest crane equipped with a 1-yd. Owens rehandling bucket. Three 8-hour shifts were used on this crane. The aggregates were stockpiled behind a 15-ft. timber bulkhead and fed by this crane to a small 3-compartment bunker above the elevator pit.

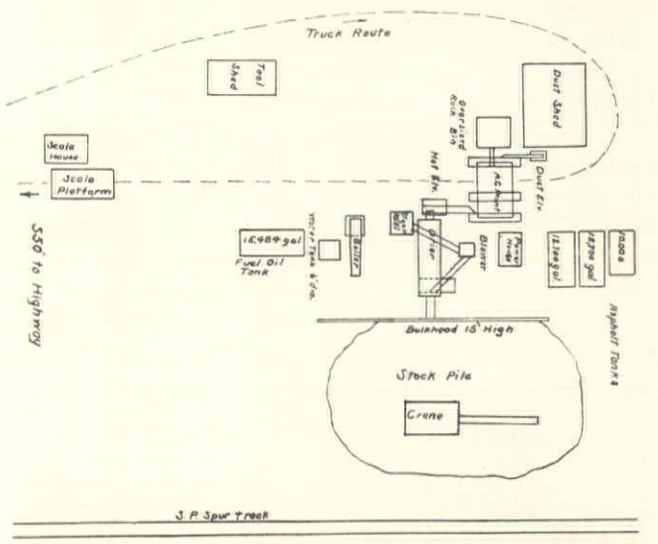
The hauling fleet for sand, borrow, and asphaltic concrete included eighteen 5-ton pneumatic-tired dump trucks, of which ten were Autocars and the majority of the others were Sterlings.

A day crew of eight men was required at the plant, including one foreman, one fireman, one mixer operator, one man on the scales, two for feeding dust, and one feeding aggregates at the bulkhead gates. Two additional firemen were employed on the night shifts.

Placing Asphaltic Concrete—The pavement was laid the full width of 20 ft. in one operation, using two 8-ft. Galion spreader boxes. It was placed in three courses, the variable base being raked and finished by hand. The leveling course, approximately 2 in. thick, was leveled and raked by a 20-ft. Ord finisher traveling on 3 by 8-in. timber headers. The 2-in. surface course was spread, raked and finished to a true surface with an Ord raking and finishing machine. The second Ord machine traveled on ¾-in. iron track bars laid on the timber headers.

A 13-man crew was required for paving, distributed as follows: seven shovelers, one raker, one Ord finisher operator, two for spreading screenings, and two for transferring the iron track bars. The trucking and roller force varied.

Screenings for the non-skid finish were dumped into an old 2-ton truck body mounted on a sled and from there shoveled to wheelbarrows. They were broadcast



Asphalt Plant Layout of California Construction Co., Pixley-Tipton Highway

from the wheelbarrows by shovelling and the truck body was hauled ahead as needed.

With the plant erected at the center of the job, paving progressed inward from each end.

Widening—The widening strip and border was placed by means of a small spreader box. For the 2½-ft. widening strip of asphalt concrete base, the spreader box was provided with one flanged wheel running on the header and a flat wheel running on existing pavement. To place the 3-ft. border, the header box was mounted on a drag.

Rolling—Compaction was obtained with two 8-ton Buffalo-Springfield tandem, one 10-ton Buffalo-Springfield 3-wheeler, and one 12-ton Austin-Western 3-wheel rollers. The rolling was so carefully done that a vialog reading of 7.4 was obtained—giving a state record for asphaltic concrete pavement.

Additional equipment included one Caterpillor '60', one Rix compressor mounted on a 1-ton pneumatic-tired G.M.C. truck, one 1-sack Jaeger concrete mixer, two portable steel buildings. These buildings were

12 by 24 ft. in plan and divided into two equal rooms. One building was used as an office and the other equipped for a blacksmith shop and tool room. Both buildings were fabricated by the Soule Steel Co., the office being made from Robertson protected metal, using plans drawn by the contractor.

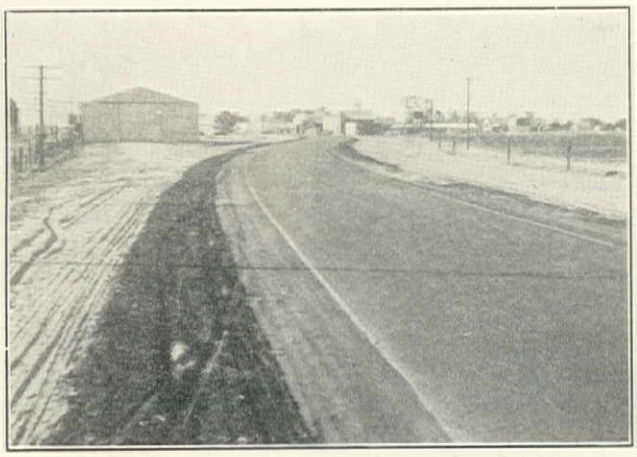
Production Study — The Division of Management, U. S. Bureau of Public Roads, made a study of time losses and their effect on pavement production on this project. Delays are classified in Table I as major (all stops of 15 minutes or longer) and minor (stops of less than 15 minutes) and further as class 'B' (avoidable) and class 'A' (unavoidable).

TABLE I

Summary of Time Losses and Their Effect

Total Delays During Available Working Time	Class A Hours	Class A %	Class B Hours	Class B %
Major				
Weather	20.00	6.41	.....	.....
Crane broken down	1.50	0.48	.....	.....
Plant, mechanical trouble	7.16	2.30	.....	.....
Finishing machine	1.00	0.32	4.60	1.47
Management	.....	.....	10.35	3.32
Total	29.66	9.51	14.95	4.79
Minor				
Bin delays	.....	.....	25.41	9.50
Mixer operator	.....	.....	4.74	1.77
Truck supply	0.76	0.28	1.97	0.74
Truck operation	0.14	0.05	0.17	0.06
Mix screenings	2.32	0.87	.....	.....
Miscellaneous	3.76	1.41	.....	.....
Total	6.98	2.61	32.29	2.07

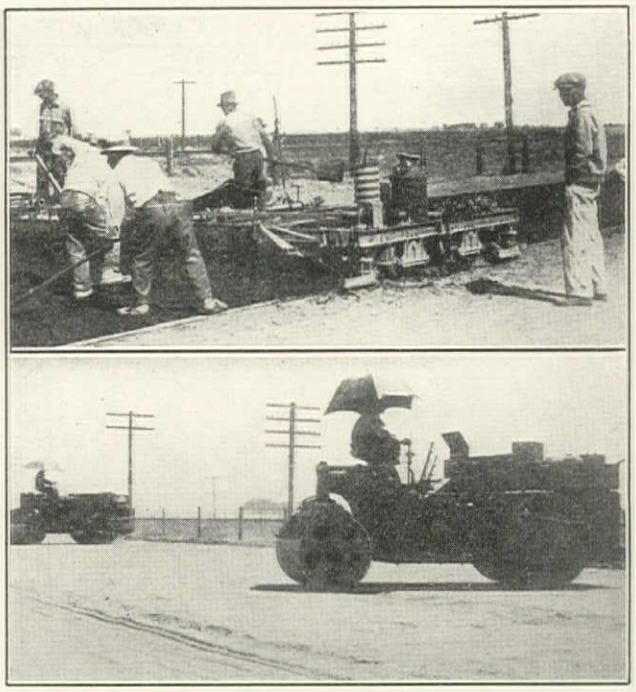
The study showed available time of 312 hours and working time of 267.39 hours for major equipment. An average of 8 trucks was used on paving, the average haul being 2⅓ miles. Major delays totalled



Oil-Treated Crushed Rock Border 3 ft. Wide and 4 In. Thick, and 20-ft. Asphaltic Concrete Pavement on Pixley-Tipton Highway

44.61 hours and averaged 1.09 hours per day for the 41 available working days. Minor delays totalled 39.27 hours, bringing the total time of operation at 100% efficiency to 228.12 hours. With unavoidable delays eliminated and avoidable delays retained, the possible operating time was 275.36 hours and possible plant production 40,750 tons. The overall efficiency of major equipment operation, based on a total estimated production of 33,756 tons was 82.8%.

Making Record Possible—The overall efficiency of 82.8% on this project can be compared with that of 81.1% on the recent Salinas-Chualar contract of the Peninsula Paving Co.—an allied organization. The improvement in efficiency was made possible by an intensive analysis leading to better job organization, an appreciation of modern construction methods and adaptation of equipment to special requirements, elaborate cost keeping, and handling of the work in a manner satisfactory to the engineers. Also, the payment of high wages and bonuses to key men in the con-



(Upper) 20-ft. Ord Finisher Working Surface Course from Iron Track Bars Laid on Timber Headers. (Lower) 12-Ton Austin-Western and 8-Ton Buffalo Springfield Rollers Compacting Surface Course. Vialog Reading of 7.4 Gave Project State Smoothness Record for Asphaltic Concrete Pavement

tractor's organization has developed an attitude such that each succeeding job is begun with the idea of bettering the previous record.

Personnel—E. E. Wallace is district engineer for district VI, California Division of Highways, at Fresno. C. H. Purcell is state highway engineer, C. S. Pope construction engineer, and Earl Withycombe assistant construction engineer for the state. W. T. Rhodes was resident engineer, and W. B. Skogerson and H. S. Low were assistant resident engineers.

The production study for the U. S. Bureau of Public Roads was made by Carl F. Izzard and C. B. Beach, junior highway engineers, under the direction of C. F. Rogers, assistant highway engineer in the Division of Management with headquarters at San Francisco.

The contractor's personnel on the Pixley-Tipton project included the following: J. C. Miles, general superintendent; A. L. Ewell, timekeeper; Archie Hoerl, grade foreman; W. C. Little and Phil Whitwam, civil engineers; Jack Logan, plant superintendent; and R. L. Gunnell, paving foreman.

GOLDEN GATE BRIDGE BONDS VOTED

Voters of the Golden Gate Bridge & Highway District gave overwhelming support to the $35,000,000 bond issue for the Golden Gate bridge at the general election on November 4. Construction of this project (see September 10th, 1930, issue) will start early in 1931.

Concrete Grain Storage Bins for Portland, Oregon, Dock Commission

Novel Problems in Design and Construction of 900,000-Bushel Unit

By JAMES R. GRIFFITH*
Professor of Structural Engineering, Oregon State College, Corvallis

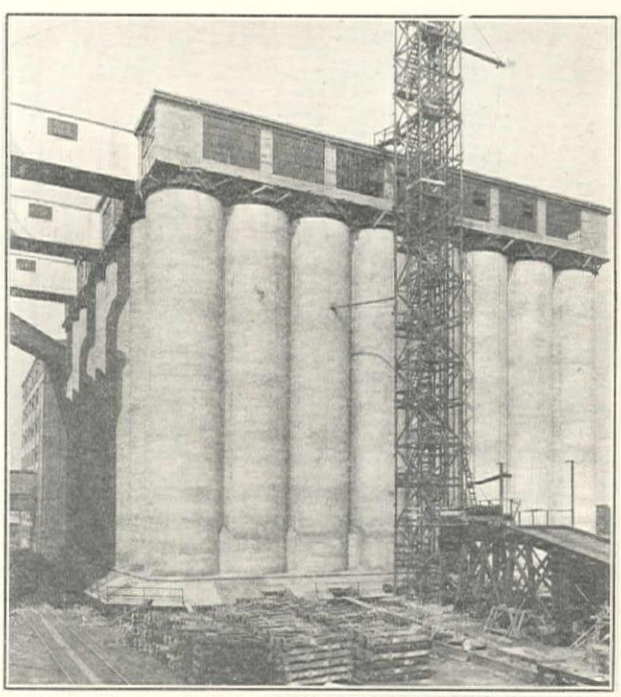
Editor's Note—James R. Griffith was born at Corinth, Mississippi, in 1894, receiving the B.S. (C.E.) degree from Purdue University in 1916 and the C.E. degree in 1922. In 1915 he was a rodman for the Toledo, St. Louis & Western and in 1916-1917 transitman for the New York Central in charge of field party on maintenance, assistant in charge of preliminary surveys for track elevation on the Pennsylvania Lines West, and instrumentman for the Interstate Commerce Commission measuring grading on the Cleveland Belt Line. During 1918-1919 he was in the U. S. Naval Reserve Force as ensign and lieutenant, junior grade, on the logistic data board and on design of fire protection and water supply systems for naval stations; also instructor at a summer surveying camp for the Massachusetts Institute of Technology. In 1919-1920 he was in charge of field parties on city subdivisions and later principal assistant engineer on construction of a brick plant in Indiana. From 1920 to 1923 Griffith was an instructor of civil engineering at the State College of Washington and in 1923 detailer and checker on light structural details for the Bates Expanded Steel Truss Co. He was a designer for the Illinois Central from 1923 to 1924 on catenary structures and signal bridges and derivation of new formulae, and while with this railroad was instrumental in making the first commercial application of the Beggs deformiter equipment. In 1924-1925 he was a structural designer for the Bureau of Design, City of Chicago, on pumping stations; structural squad boss for the U. S. Gypsum Co. in charge of design of steel mill buildings, etc.; and superintendent of construction for the Chicago Board of Education in charge of school building construction. In 1926 he was field engineer on construction of the Northwestern University stadium, and in 1927 assistant engineer for the Westchester County Park Commission on highway bridge design. Also, from 1925 to 1929 he was assistant professor of civil engineering at Armour Institute of Technology, and since 1929 has been professor of structural engineering at Oregon State College. Griffith is the author of a series of concrete design charts which is appearing in the magazine 'Concrete'.

As I contemplate upon what to say of this project without tiring the reader, I am reminded of a friend of mine. He sent me a hurried and urgent request for help. He requested a formula by which to design plain and reinforced concrete footings. My reply to him "A book could be written on the subject", might well apply here.

I first became acquainted with the many complexities of this project as a member of the design organization. In fact, when A. D. Merrill, engineer for the Portland Dock Commission, first outlined to me what he intended to do I thought him a dreamer. It was impossible. Now that I have seen it done, I must confess it is the age of miracles. The impossible has been accomplished.

Eastern Oregon and Washington produce enormous quantities of wheat. Portland is the logical port through which this grain must move for export on a down-grade haul through the Columbia river gorge. Storage capacity must be provided for handling the incoming grain while waiting for ships to take it to foreign ports. In fact, the peak year shows 37,240,987 bushels handled.

Original Grain Storage Unit—The commission of public docks of Portland built in 1919 at terminal 4, a grain elevator and storage unit capable of handling 1,000,000 bushels. This storage unit has since been proven inadequate. So, this year it was decided to build an additional storage unit with a capacity of 900,000 bushels.



New Grain Storage Unit for Portland Dock Commission, September 1, 1930, Capacity 900,000 Bushels. Conveyor Bridges Lead to Original Grain Elevator and Storage Unit Constructed in 1919

The original storage unit began to settle as soon as construction of the bin walls was started. It finally settled 34 in. before grain was ever added. In the attempt to stop settlement, pinch piling was driven around the structure. The rate of settlement decreased at about the time the pinch piling was driven. But the effect of the pinch piling has been controversial. The structure settled 8 in. more after grain was added. The foundation for this structure consisted of 54-ft. piles driven on 2½-ft. centers, having a calculated load of 18 tons per pile.

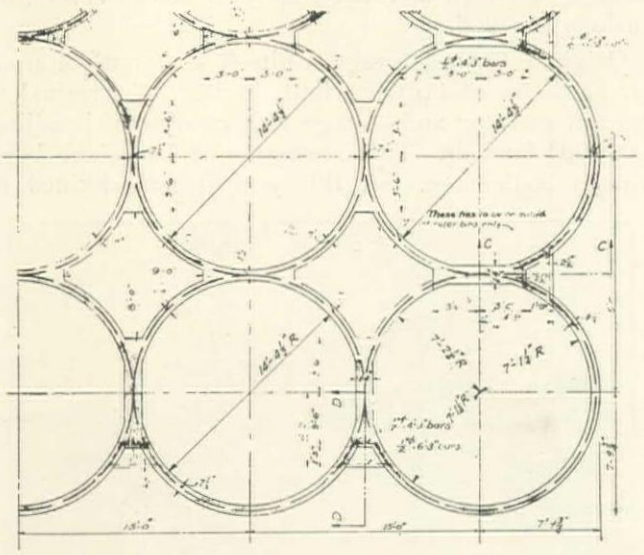
New Unit Required—The new storage unit was to be built adjacent to the old unit on similar land. Connecting the new with the old storage unit were to be

*Member, American Society of Civil Engineers.

three conveyor bridges near the top and three tunnels underground. Would settlement take place in the new structure? And if so, how much?

Like many civic organizations, the dock commission did not decide to build until late in the season. In order to pay dividends this year, the addition must be complete and ready for the September wheat. Otherwise, it must lie idle for a full year. Five days after the dock commission had given the word to start, Merrill had let the contract for driving the pinch piling, with but a pencil sketch to work from.

Pinch Piling—On May 8, 1930, the contract for driving the pinch piling was awarded to the Gilpin Construction Co., of Portland. There were to be 809



Reinforcing Plan for New Grain Storage Bins, of which there are 72, Each 14 ft. 4½ in. Inside Diameter

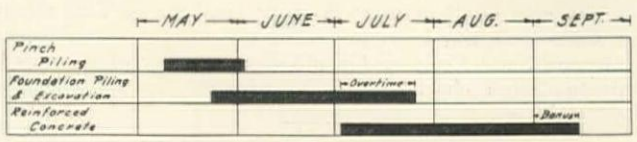
piles, 80 ft. long, driven in four rows around the proposed structure. The contract price was $19,416 and the work was to be completed within 25 days. Test borings showed 10 ft. of dry sand, and the rest wet sand with some silt and clay. One-half the contract was sublet to the Jacobsen Construction Co., of Portland. Some piles went down and some protested. An hour's driving failed to put some piles down a foot. This contract was completed by June 2 by working 24 hours a day.

Foundation Piling and Excavation—The contract for the foundation piling and excavation was awarded to the Baker Construction Co. of Portland, on May 23. There were to be 2306 piles, 100 ft. long, driven on 3-ft. centers. The contract price was $95,500 and all work was to be finished by July 2. The contract contained a penalty and bonus clause for $250 a day. This contract was not finished on time, but the contractor was not penalized due to the delays in obtaining such long piles. Two No. O Vulcan steam hammers were used on 105-ft. pile drivers. An average of 9000 ft. of piling was driven for a 24-hour working day. The 10-ft. layer of dry sand had been removed and these piles went down. Some went down almost 30 ft. at the first blow. But as Baker said, "We had to keep them going down." A stop, and nothing would have started them again. At first 18-in. piles were specified. This was changed to 16-in. to expedite delivery, and finally 14-in. piles were used to prevent serious delay. The excavation contract was sublet to Parker-Schram of Portland, who used a P & H 1½-yd. dragline.

The excavated material was hauled by one Caterpillar '60' tractor pulling a 7-yd. bottom-dump Western crawler wagon; one White truck, and one Fageol truck, each equipped with a 4-yd. dump body.

The reader will notice how the contracts overlap. It was impossible to let a general contract for the entire project as the design was not complete. It was therefore imperative that the work be so organized that a later contractor could start work before his successor finished. In the meantime, the design of the structure was progressing under high pressure. It was impossible to work 24 hours a day on design as the contractors did on construction. But, during the peak load, we did work 12 hours a day. Sundays and holidays were simply more work days. I well remember the evening of the water carnival in connection with the rose festival. The design office was on the second floor, facing the river. A band played just outside our window, loud speakers on the roof over our heads amplified the band; racing boats roared and spluttered in the river; a tumultuous crowd lined the river front. And last, fireworks were displayed from a barge anchored in the river—trying conditions for the designer, to say the least.

Remainder of Structure—A general contract was let for the remainder of the structure, with the exception of conveyor belts and conveyor rolls, bids being opened July 2. The contract called for completion by September 14, with $1000 a day penalty or bonus from that date. Apparently many of the contractors thought it an impossibility. I talked with one unsuccessful bidder. He said, "when I saw the $1000 a day penalty, I just tacked on $30,000, as I figured I would need it". The three lowest bids were by contractors experienced in this class of work, and were



Three Overlapping Contracts for New Grain Storage Unit of Portland Dock Commission

all within $5000 of each other. Albertson & Cornell Bros., Inc., of Tacoma, were awarded the contract at $267,970.68. Apparently the 68¢ was for good measure.

Construction—Merrill had practically insisted that transit-mixed concrete be used. Contractors have in the past failed to convince the engineers of the reliability of their mixes. So Merrill figured he could save $2000 in inspection alone if transit-mixed concrete was used. But the contractors were a little afraid of it. Could they depend upon the supply? At least it would save the time for erection of a mixing plant. Portland has perhaps a tremendous advantage in being the home town of pioneers in the production of transit-mixed concrete. Swigert, Hart & Yett hold many patent rights on the method and are not to be excelled in the production of this material. At no time during the job was any delay experienced. When one

truck broke down, another was ready to take its place. From 9 to 11 trucks carried the concrete in 3-yd. batches a 2-mile haul from the mixing plant. Water was admitted to the material 1 mile from the job, insuring at least 5 minutes mixing for each batch. The long time of mixing was evidenced in the results of the test cylinders taken by E. W. Lazell. In each test, the strength was found to be well over that for which the mix was designed. The amount of water necessary was found to vary. In the heat of the day, 94 gal. was added to each batch; by night, this would be cut to 86 gal.

Due to delays in obtaining foundation piles, the mat reinforcing began to go in place before the foundation piles and excavation were complete. As will be seen from the illustrations, from here on the structure grew like a mushroom. The bin walls were poured in movable forms. These forms were jacked up by a screw working on vertical jack-rods placed in the walls. The hotter the day, the faster the forms had to be jacked up to prevent sticking. The maximum rate for the bin walls was 4 ft. poured in 2 hours; the average daily lift was 12 ft.

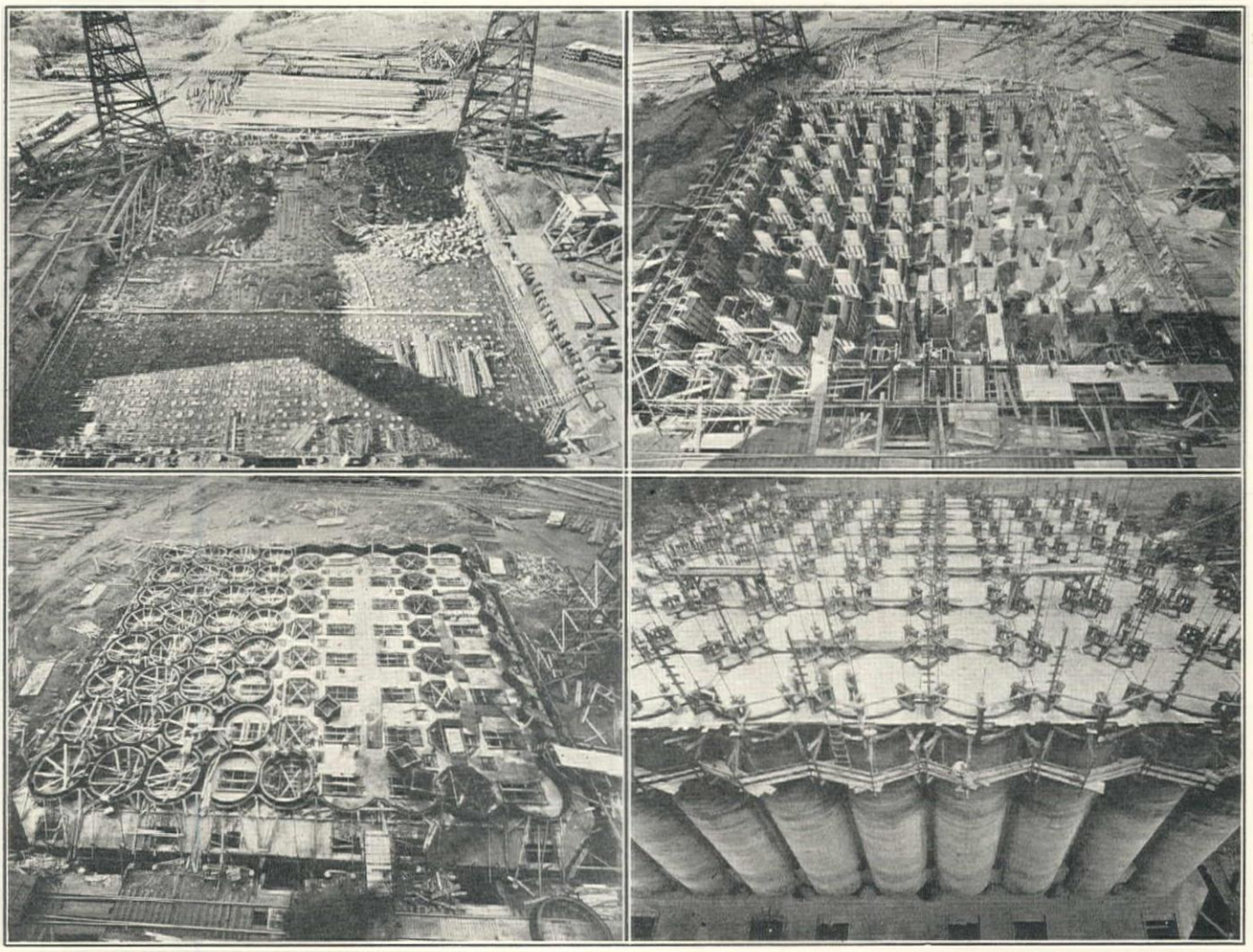
The structure was accepted on midnight of August 31, fourteen days before the time limit set. The first grain went in that same night.

The general contractor sublet the following work: Sheet metal to the American Sheet Metal Works; structural steel to the City Iron Works; electrical wiring to the National Electric Co.; plumbing to Otto Schulz—all Portland organizations.

The contract for conveyor belting was let to Munnell & Sherrell, of Portland, for $5147, and the contract for the conveyor rolls to the Western Foundry Co. of Portland, for $5234.

Design—Now a few words as to the design. The big problem was to prevent settlement as much as possible. Merrill hoped to do this by the joint action of the 80-ft. pinch piling and the 100-ft. foundation piling. The pinch piling were driven first. He expected the foundation piles to force some of the material out under the pinch piles, but compressing the soil sufficiently to minimize settlement. It must be remembered the old structure settled 34 in. from dead load alone. The foundation piles for the new structure were designed to carry 21.5 tons each, 10.5 tons from dead load, and 11.0 tons from grain. To date, as the grain is being added, the maximum settlement has been 0.02 ft. The final test will come only after the bins have been completely filled. But it certainly looks as if Merrill's assumptions were justified.

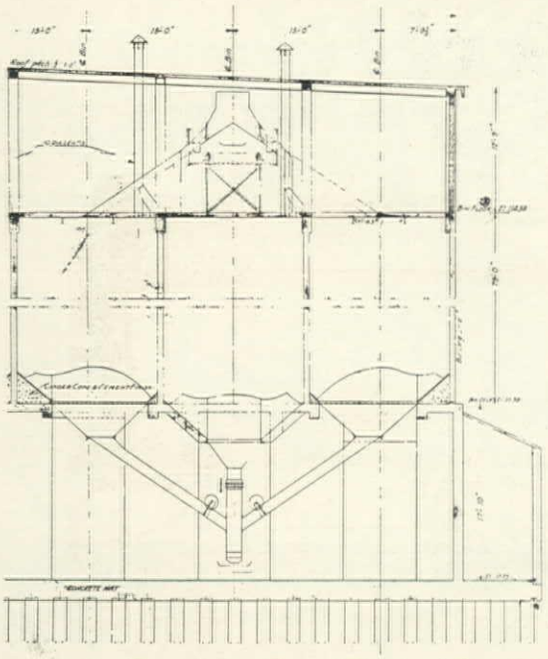
Resting on the piles was a 2-ft. foundation mat. A



(UPPER LEFT) PINCH PILING IN PLACE, LAST OF 100-FT. FOUNDATION PILING BEING CUT OFF, AND REINFORCING BEING LAID FOR 2-FT. FOUNDATION MAT, JULY 24, 1930. (UPPER RIGHT) FORMING HOLLOW COLUMNS SUPPORTING BINS, JULY 31. (LOWER LEFT) SETTING BIN FORMS, AUGUST 7. (LOWER RIGHT) BIN WALLS UNDER CONSTRUCTION, SHOWING JACKS FOR RAISING FORMS, AUGUST 15

series of hollow columns, or piers, resting on the mat, carried the 10-in. bin deck. The bins had a constant inside diameter of 14 ft. 4½ in. The bin walls varied in thickness from 7 in. to 8½ in., depending upon the amount of shear to be carried. The cantilever action of the exterior two rows of piles made it necessary to thicken the outer bin walls. At the corners, this condition was found at its worst.

There are 72 bins, 79 ft. high. The walls are so formed as to interlock and form a cellular type of structure. While grain storage bins have been built in square or rectangular shapes, the circular type is by far the best. The grain exerts an outward thrust. This outward thrust produces a buckling action in a plane surface. The circular bin transposes this thrust into pure tension, as a pipe under water pressure. The tension is carried by reinforcing consisting of ¼-in. steel flats. As will be seen from the bin plan, an interspace is left between bins. Even this interspace is utilized for the storage of grain.



Vertical Section Through One Bin and Cupola of New Portland Grain Storage Unit

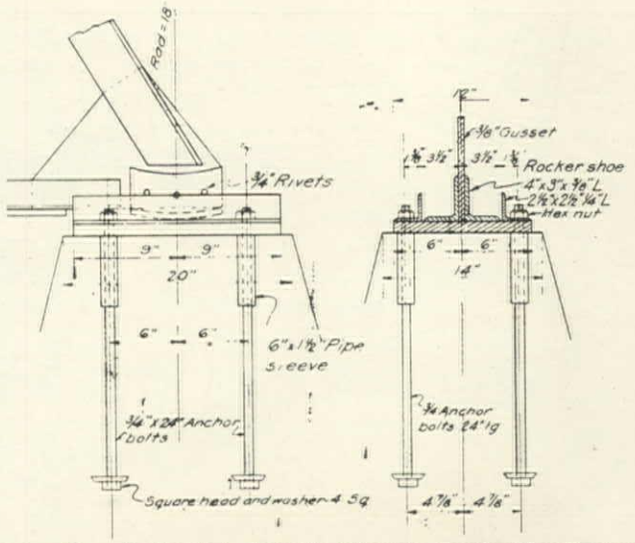
On top of the bins, a 4-in. floor carries the necessary conveyors and trippers, all housed in the so-called cupola.

The original storage unit did not settle evenly, but tipped to an appreciable extent. The conveyor bridges connecting the new with the old structure had to be designed with the possibility of settlement and tipping of the new structure. Each end of the bridge had a rocker shoe to provide for adequate bearing in case of settlement. The rocker shoe on the new structure was further designed to permit sliding in case tipping took place. The possibility of such racking made a reinforced concrete bridge impracticable, so a steel bridge was designed.

The connecting tunnels offered a somewhat similar problem. In case of settlement the tunnels would remain in place, as they were resting on the pinch piles. A sliding joint was provided at the connection of the tunnels and the new structure. To prevent seepage through this sliding joint, a wood strip was provided for calking. This will require maintenance if appreciable settlement takes place.

Personnel—The design and construction was carried on under the direction of A. D. Merrill, engineer for the dock commission. Edward F. Carter, vice-president of the John S. Metcalf Co., was retained in a consulting capacity. Ray Whiting was in charge of the field inspection.

Conclusion—Merrill was inclined to object to my giving the contract prices. He said they were not fair figures by which to base comparisons. Due to the necessity for speed, higher figures were probably paid than would be warranted if speed were not a factor. I have, however, given the prices over his objection. When speed is a commodity, it must be paid for. So the reader will please take this into consideration if comparisons are made.



Rocker Shoe Designed to Provide Adequate Bearing for Conveyor Bridge in Case of Settlement and to Permit Sliding if Tipping Should Take Place

FROM 'BOULDER' TO 'HOOVER' DAM

The 'Hoover' dam will be built in upper Black canyon on the Colorado river about 30 miles southeast of Las Vegas, Nevada, on the Arizona-Nevada state line. The original damsite investigated was in Boulder canyon about 20 miles upstream from Black canyon and gave the project its name. The Bureau of Reclamation has already constructed a Black canyon dam in Idaho and hence the one on Colorado river requires a different name in order to avoid confusion.

Because of long usage, the name 'Boulder Canyon' was retained for the proposed dam but shortened to 'Boulder'. There followed a widespread movement to have the dam named for President Hoover in recognition of his service to reclamation while Secretary of the Interior under the previous administration and to honor his many engineering and humanitarian achievements. On September 17, 1930, Ray Lyman Wilbur, Secretary of the Interior, announced that the dam would bear Hoover's name. It is fitting that this great structure should carry the name of a world-famous engineer, and we have several times urged editorially that such recognition be given our engineer-president.

Southern Pacific Suisun Bay Bridge Completed in Record Time

By H. I. BENJAMIN
Assistant Engineer of Bridges, Southern Pacific Co., Martinez, California

The superstructure of the $12,000,000 bridge project across Suisun bay was fabricated and is being erected by the American Bridge Co., subcontractor, under a contract between the Southern Pacific Co. and the United States Steel Products Co. The bridge will be officially dedicated and opened to traffic on November 1.

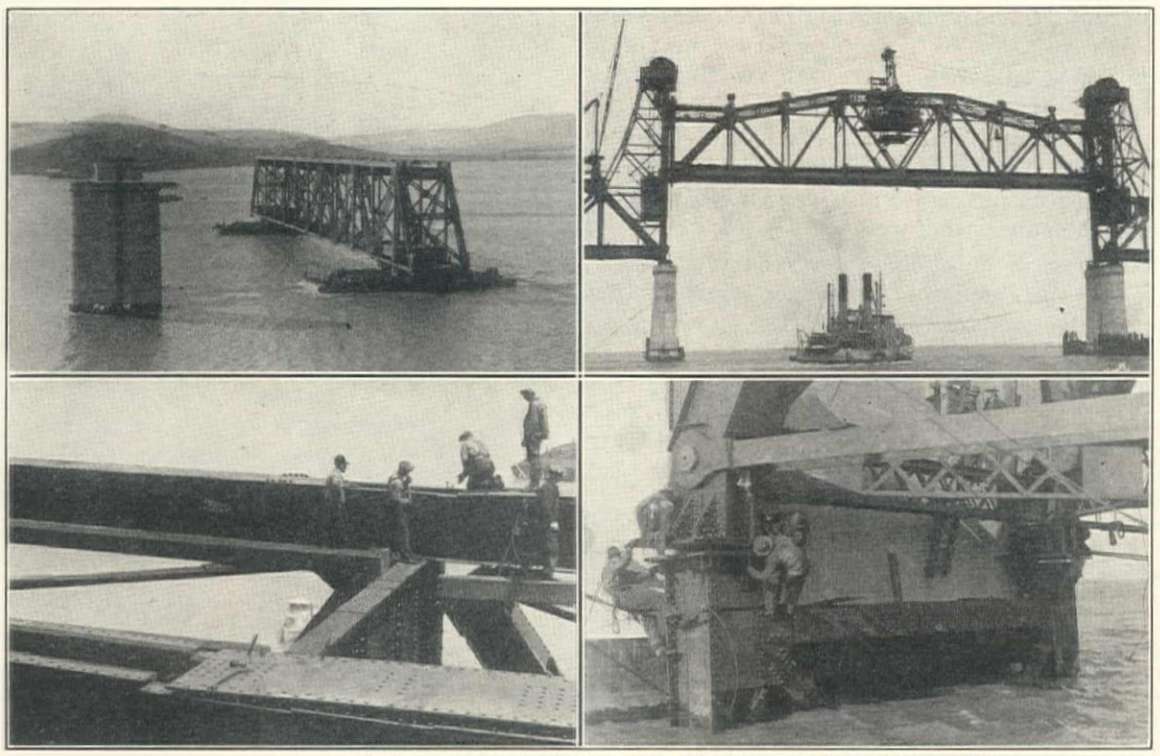
The total weight of structural steel in the bridge is 22,000 tons, of which 12,500 tons is silicon steel and 2750 tons is heat-treated eyebars, the remainder being carbon steel.

Erection Methods—The first steel erected was an 80-ft. girder of span No. 1 extending from the south abutment at Suisun point, November 20, 1929. Spans No. 1 to 9 inclusive are deck girders, 80-ft. spans with 40-ft. towers, and constitute the south viaduct approach. Upon the completion of span No. 8 (40-ft.) a temporary turnout on girders resting on falsework at the upstream side was arranged and the first two panels of the erection span (No. 19, a 504-ft. deck Warren truss) were erected on falsework driven parallel to the bridge and upstream thereto. Thence, on higher falsework, span No. 10 (a 264-ft. deck Warren truss) was erected and on January 22, 1930, was floated on barges and landed on its piers. Span No. 9 was then placed and the erection of span No. 19 continued on the falsework bents used for span No. 10, cut down to suitable elevation.

Upon its completion, the erection span was floated on the barges and warped into position between piers 11 and 12 and lowered onto temporary steel bents which were previously set on pier offsets at elevation –20 ft. The temporary steel bents were securely held in their vertical position by means of cable lashing extending to structural steel lugs placed especially for this purpose in each end of the piers during their construction.

The erection of span No. 11 then proceeded and the completed span was jacked up to clear the erection span, which was then floated on the barges and returned to the falsework. Here the erection span was disjointed at the panel points 296 ft. from the northerly end and, a few days later, the larger section was floated into position between piers 12 and 13 for erection of the 328-ft. lift span, No. 12.

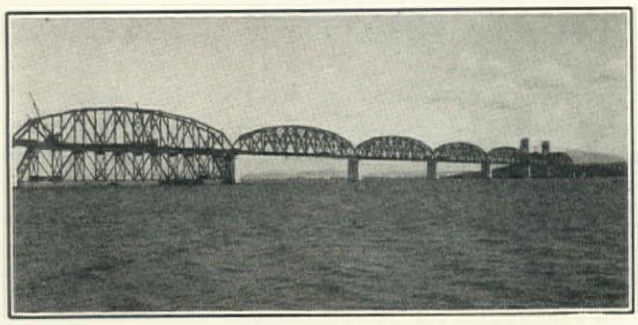
When the lift span was completed, the section of the erection span was floated back and again joined to the section left on falsework. The erection span was next floated into position between piers 13 and 14 for the erection of span No. 13. Upon completion of span No. 13, the erection span was floated and temporarily parked on bents at the piers for span No. 15 so that



(UPPER LEFT) FLOATING ERECTING SPAN No. 19 INTO OPENING FOR SPAN No. 15 OF SUISUN BAY BRIDGE. (UPPER RIGHT) LIFT SPAN No. 12 IN RAISED POSITION. (LOWER LEFT) UPPER CHORDS OF SECTIONS OF ERECTING SPAN BEING BROUGHT TOGETHER ON REJOINTING OPERATION FOLLOWING COMPLETION OF LIFT SPAN. (LOWER RIGHT) LANDING NORTH END OF SPAN No. 19 ON TEMPORARY SUPPORT AT PIER 12

the opening for span No. 14 could be kept clear for the passage of steamer traffic until the towers were completed and the lift span was ready for operation. The erection span was then (July 8, 1930) moved back to position between the piers for the erection of span No. 14 and then placed successively in position for the erection of spans No. 15, 16, 17, and 18.

Upon its release from the erection of span No. 18,



Suisun Bay Bridge from Army Point, September 8, 1930

the erection span will be placed in permanent position on piers 19 and 20, and it then actually becomes span No. 19. Span No. 20, a 40-ft. deck girder of the north viaduct approach, will then be erected. In the meantime, the two 40-ft. deck girder spans, No. 22 and 23, will have been placed by a crane working from the north. Finally, the 100-ft. deck girders of span No. 21 will be placed by cranes working over piers 21 and 22, and so finish the superstructure.

The erection span chronology is given in Table I and progress in the erection of the larger spans for the Suisun bay bridge is shown in Table II.

TABLE I

Erection Span Chronology, Suisun Bay Bridge

Erection commenced ..... Dec. 14, 1929
Erection completed ..... Feb. 21, 1930
Floated from falsework to position between piers 11-12 for erection of span No. 11..... Feb. 28, 1930
Floated from under span No. 11 to falsework..... Apr. 11, 1930
296-ft. section floated from falsework to position between piers 12-13 for erection of span No. 12.. Apr. 19, 1930
296-ft. section floated from under span No. 12 to falsework ..... May 9, 1930
Entire span floated from falsework to position between piers 13-14 for erection of span No. 13.. May 15, 1930
Floated from under span No. 13 to position between piers 15-16, leaving span No. 14 opening clear for passage of steamers during the erection of lift span, towers, etc..... June 16, 1930
Floated from between piers 15-16 to position between piers 14-15 for erection of span No. 14..... July 8, 1930
Floated from under span No. 14 to position between piers 15-16 for erection of span No. 15..... July 24, 1930
Floated from under span No. 15 to position between piers 16-17 for erection of span No. 16..... Aug. 11, 1930
Floated from under span No. 16 to position between piers 17-18 for erection of span No. 17..... Aug. 27, 1930
Floated from under span No. 17 to position between piers 18-19 for erection of span No. 18..... Sept. 12, 1930
Floated from under span No. 18 to final position between piers 19-20..... Sept. 29, 1930

Substructure Completed—The last pour of concrete for the structure took place August 18 and was in the coping of pier 19 near the north shore of Suisun bay.

Painting—Painting of the steel work and placing of the timber decking follows closely behind the erection.

Painting is being carried on by the Pacific Bridge Painting Co. of San Francisco and is following closely behind the erection. The steel is delivered with a

American Bridge Co. Erection Crew Placing Top Chord for Span No. 14

complete red lead shop coat of 28 lb. per gal. The first field coat being applied is a 26-lb. per gal. red lead paint, followed by a second and final field coat of black graphite paint. The wooden floor system is being painted with L&S portland cement paint to act as a fire preventative.

Personnel—C. R. Harding, assistant to the president, and W. H. Kirkbride, engineer of maintenance of way and structures, are in charge of the entire project for

TABLE II

Progress in Erecting Articulated Spans and Towers (Structural Steel Only) in the Suisun Bay Bridge Superstructure

Span No.	Length (ft.)	Structure Type	Weight (Tons)	Erection Commenced	Erection Completed	Calendar Days for Erection	Erected on
10	264	Deck Warren Truss	655.40	Dec. 26, 1929	Jan. 22, 1930	28	Falsework
11	526	Through Warren Truss	1955.01	Mar. 5, 1930	Apr. 10, 1930	37	Erection Span
12	328	Through Warren Truss	1209.97	Apr. 21, 1930	May 8, 1930	18	Erection Span
13	526	Through Warren Truss	1891.60	May 16, 1930	June 15, 1930	31	Erection Span
14	526	Through Warren Truss	1891.60	July 8, 1930	July 23, 1930	16	Erection Span
15	526	Through Warren Truss	1891.60	July 25, 1930	Aug. 10, 1930	16	Erection Span
16	526	Through Warren Truss	1891.60	Aug. 12, 1930	Aug. 26, 1930	15	Erection Span
17	526	Through Warren Truss	1891.60	Aug. 28, 1930	Sept. 10, 1930	14	Erection Span
18	526	Through Warren Truss	1963.28	Sept. 12, 1930	Sept. 27, 1930	16	Erection Span
19	504	Deck Warren Truss	2009.34	Dec. 14, 1929	Feb. 21, 1930	38	Falsework (Span No. 10 erected same location and between dates)
		South Tower	463.37	Mar. 28, 1930	June 7, 1930	71	Span No. 11
		North Tower	463.38	May 16, 1930	June 28, 1930	44	Span No. 13

the Southern Pacific Co., with the assistance of G. W. Rear, engineer of bridges. I am in charge of construction and field work and S. A. Roake, chief designer for the company, has checked the design of the bridge foundation and superstructure. C. M. Kurtz is office engineer and is doing all photography on the project, Franz Misch is inspector on the piers, and C. T. Holser inspector on the superstructure. The base-line and triangulation work for the location of the piers, which has made an unparalelled record for accuracy, was under the immediate charge of O. B. Misz.

Moran & Proctor were consulting engineers for the structure, Waddell & Hardesty designed the lift span, and Ralph Modjeski reviewed the entire bridge project.

Siems, Helmers & Schaffner, Inc., have the substructure contract which is being directed by N. F. Helmers, vice-president. M. F. Clements is consulting engineer for this contractor. The American Bridge Co. subcontract for steel fabrication and erection is being directed in the field by E. E. McKeen, assistant engineer, and W. A. Glencross, erecting foreman.

Editor's Note—A preliminary and historical article on the Suisun bay bridge project was published in the August 25th, 1928, issue, p. 532; an article describing the work involved, construction of approaches, and early progress on the bridge proper in the August 25th, 1929, issue, p. 429; a detailed article by H. I. Benjamin on the construction methods and progress on deep-water piers, with an explanation of the erection plan, in the February 25th, 1930, issue, p. 92; an account of heavy grading operations on the north approach in the April 25th, 1930, issue, p. 201; and a short progress article in the July 25th, 1930, issue, p. 365.

The Martinez-Benicia bridge across Suisun bay is 5603 ft. long, the longest and heaviest two-track railroad bridge west of the Mississippi. This bridge is not exceeded in load-carrying capacity by any bridge in the United States and is capable of carrying a uniform load for its full length equivalent to twice the maximum weight of a present train load. Besides the main spans listed in Table II, there is a 560-ft. viaduct at the south and a 220-ft. viaduct at the north end. The eleven main piers and 22 pedestal piers contain 105,000 cu.yd. of concrete and 1500 tons of reinforcing steel. The deepest pier is 207 ft. from bedrock to bridge seat and has a base 40 by 60 ft. The 22,000-ton superstructure includes 25,000,000 lb. of silicon steel, 5,500,000 lb. of heat-treated eyebars, and the remainder is carbon steel. To give the steel three coats, 20,000 gal. of paint was required. The bridge is 70 ft. above water and will clear 95% of the vessels now passing the site. The 328-ft. lift span weighs 1580 tons—heaviest in America—and can be raised to 138 ft. above water by either electric or gasoline power in 90 seconds.

Since the present article was written, the bridge has been completed and dedicated with appropriate ceremonies celebrating its construction in the record time of 18 months. The structure was opened to regular train service on October 15 when the 'Governor' crossed eastbound at 11:44 a.m. The formal dedication ceremony on November 1 in cooperation with the Martinez Chamber of Commerce attracted wide interest. At the dedication, Southern Pacific's locomotive No. 1, the 'C. P. Huntington', which was brought to Sacramento by sailing ship around the Horn in 1864, led the first official train across the bridge. The last trip on the Port Costa-Benicia train ferry (which had been in continuous service since 1879) was featured at the ceremonies. The United States Steel Products Co., superstructure contractor, was host to 125, using a tug to convey the party between San Francisco and the bridge site.

Five New Grade Separations in Utah

By M. HOUSECROFT
Chief Bridge Engineer, Utah State Road Commission, Salt Lake City

The Utah State Road Commission is aware of the dangers lurking at grade crossings, and their elimination through highway relocation or grade separation is progressing as rapidly as funds will permit and negotiations can be consummated. Thus far in 1930, plans for four new grade separation structures have been completed and plans for a fifth structure are now being prepared. These five projects are briefly described as follows:

State Project No. 249-B—This project, which is now under contract to Ora Bundy, of Ogden, Utah, consists of a three-span I-beam superstructure with concrete roadway 30 ft. wide, carried on reinforced concrete piers and abutments. The structure has a total length of 140 ft. 8 in. and the main span is 55 ft. center-to-center of bearings. When completed, the structure will span three tracks of the Oregon Short Line between Death curve and 24th st. near Ogden in Weber county, and will replace an obsolete frame trestle.

Considerable economy in the amount of structural steel was effected by designing the structure with the beams from the approach spans cantilevered 8 ft. 3 in. over the intermediate piers, and suspending the center beams on the cantilevers by means of toggle bars. This arrangement then necessitated a beam only 38 ft. 6 in. long for the center span, and the end reactions from the suspended span applied at the ends of the cantilever beams correspondingly reduced the bending moment in the approach spans.

Federal Aid Project No. 72-B will include a new structure over four tracks of the Denver & Rio Grande at Thistle, Utah. This structure is rather unusual, since it will form a wye-connection between U. S. highways No. 50 and 89. At this point, U. S. highway No. 50 is located around a rock cliff, at the base of which is Soldier creek, and the railroad tracks are on the bank of the creek. Close quarters were encountered in accommodating a fill slope and the creek between the railroad and the rock cliff. In developing the grade on U. S. highway No. 50 to gain elevation for crossing the tracks, a 6% grade was laid in both directions, with the apex opposite the center-line of the adjoining structure. A 500-ft. vertical curve is used at this point, which automatically provides superelevation for the branches of the wye, as the outer edges

of the structure connect at lower points on the vertical curve than do the inner edges.

This structure is of five spans of reinforced concrete, T-beam type, and extends along U. S. highway No. 89 for 196 ft. from the center of the road on U. S. highway No. 50. Bids for the project will be called for shortly.

Federal Aid Project No. 87-B consists of a three-span I-beam structure over the Los Angeles & Salt Lake tracks near Tooele, Utah. The bridge is on a 37⅓-deg. skew and has a total length of 209 ft. 1¾ in., the center span over two tracks being 92 ft. long between pier centers. The general design is similar to that used on State Project No. 249-B, employing a 68-ft. suspended span in the center, with 12-ft. cantilevers extending over the intermediate piers.

Negotiations between the state and the railroad company are being completed and the work on this grade separation structure should commence soon.

Federal Aid Project No. 114 consists of a relocation of the highway between Death curve and Washington ave. near Ogden.

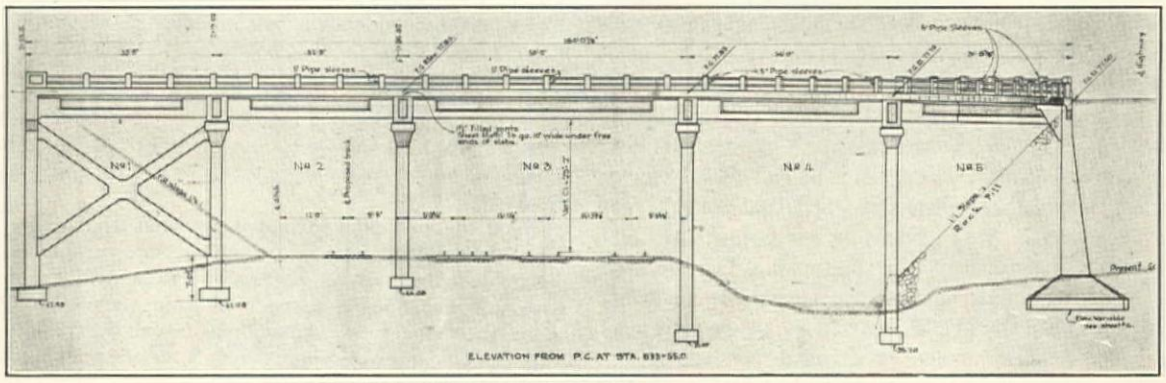
The present highway is on severe alignment and the existing grade separation structure does not provide the vertical clearance over the Bamberger Electric railroad tracks that is now required by the Public Utilities Commission. Also, the present structure has a restricted roadway width. The proposed improvement will rectify these conditions, as it provides adequate vertical clearance and a roadway width of 40 ft. between curbs. This overpass will have the widest roadway of any structure on the Utah state road system, which however is in line with the policy of building wider bridges where traffic requires them.

A steel beam-type was employed for the design of this structure, similar to those previously described, except that the beam over the center span is cantilevered 10 ft. over the intermediate piers. The structure is 182 ft. long, with a span of 54 ft. center-to-center of intermediate piers; the angle of crossing over the two tracks is about 39½ deg.

The date for commencing construction of this grade separation is indefinite, as final arrangements have not yet been made.

Federal Aid Project No. 88 includes a grade separation over the Union Pacific tracks near Henefer, Utah. The plans are in the course of preparation and are yet to be submitted to the railroad company for approval. However, subject to this approval we contemplate a structure of steel beams on reinforced concrete piers and abutments, similar to those previously described.

Conclusion—The State of Utah is endeavoring to anticipate future conditions in the needs of its bridges, and where permanent structures are being erected it is with the thought, not only of meeting the needs of today, but to meet the needs of the structure throughout its life, thereby allowing it to wear out rather than be forced to replacement because of obsolescence.



OVERHEAD CROSSING AT THISTLE, UTAH, F.A.P. 72-B

CANADIAN PACIFIC RAILROAD TUNNEL, VANCOUVER, B. C.

The Canadian Pacific Railway Co. will receive bids from a selected list of contractors until December 1 for construction of a tunnel in Vancouver, B. C., between Burrard inlet at the foot of Thurston st. and the False creek yards near the Georgia st. viaduct abutment. The proposed tunnel is 22½ ft. high and 4609 ft. long and contains 86,000 cu.yd. of material ranging from sand to rock. A 2-ft. concrete lining will be placed for the roof and sides. From the Burrard inlet (west) portal, there will be a curve 1560 ft. long, then a 2177-ft. tangent, a 679-ft. curve, and a 184-ft. tangent ending at the east portal. To allow necessary clearance on 12 to 14-deg. curves, the tunnel width will be 19 ft., that on light curves 17½ ft., and on tangents the tunnel will be 16 ft. wide. The sections of various width are as follows: 1721 ft. of 19-ft., 517 ft. of 17½-ft., and 2310 ft. of 16-ft. A slight grade exists, the east portal being 8 ft. higher than the west portal. The overburden is 58 ft. above the roof lining at Richards st. and as little as 16 ft. at the portals.

Construction of this tunnel will eliminate seven grade crossings and will be paid for by the Canadian Pacific, the city of Vancouver, the British Columbia Electric Railway Co., and the Dominion government grade crossing fund, the first two parties paying major portions of the cost.

C. A. Cottrell is general superintendent of the B. C. District, Canadian Pacific Railway Co., and Frank Lee is district engineer.

Wyoming Votes Highway Bonds

To match the additional Federal Aid funds available for the next three years, voters of Wyoming approved a $2,800,000 state highway bond issue on November 4.

Idaho Surveys Lolo Pass Highway from the Air

Bnreau of Highways Studies Routes for Lewis and Clark Highway Across Bitter Root Mountains Between Lewiston, Idaho, and Missoula, Montana—Estimated Length, 160 Miles

By J. A. CHAMBERLIN

Consulting Engineer and Economist, Idaho Bureau of Highways, Lewiston

The engineers of Idaho, the state of many mountains, have taken to the air in quest of new routes for highways across the mountain ranges. There is now being carried on aerial exploration and surveys for a trans-mountain highway across the Bitter Root mountains between Lewiston, Idaho, and Missoula, Montana, under the administration of J. D. Wood, commissioner of public works for Idaho, and B. J. Finch, district engineer for district 12 of the U. S. Bureau of Public Roads.

Four Possible Routes—The Bitter Root mountains have long been a barrier to east and west traffic which now detours this range to the north and south, as there is no highway or railway crossing for a distance of 300 miles. A definite choice of route for a highway across these mountains has not as yet been made between the four known possibilities.

Three of these possible routes are in the Clearwater country on the west side of the divide and reach Lolo and Fish lake passes. One is along the Lochsa river, a tributary of the Clearwater, one is in part along the north fork of the Clearwater, and the third is upon a long secondary range of mountains between these two rivers. The length of the proposed highway between the ends of standard highways on opposite sides of the divide is estimated as 160 miles.

The fourth route is along the Salmon river to the South, running through the famous canyon of the 'river of no return' for 150 miles from Riggins, Idaho, to North Fork. Although openings across the mountains are known to exist on these routes, little of the details had been learned, for the purpose in mind, prior to the undertaking of the aerial survey.

Exploratory Flights—The aerial work itself consists of exploration flights for the purpose of examining the country and determining upon routes and alternatives of sufficient merit to justify photography and further study, and then photographic flights over the predetermined routes. These flights are made at a speed of 80 to 90 m.p.h. in a 6-passenger Travelair monoplane powered by a 300-hp. U.6 engine, and the absence of a lower wing that would have been carried by a byplane enabled observations to be made to much better advantage than would otherwise have been the case.

On the exploration trips, the ship flies a short distance to one side of the bottom of the drainage under consideration, thus allowing a somewhat oblique view and greater clarity of vision. The elevation of the ship varies with the purpose of observation from low down for details up to 10,500 ft. for a greater scope. At times the ship circles certain areas which require more detailed observation.

The first day's trip across the mountains and back again is made in 3 hours and close to 300 miles observed. The forbidding Salmon river canyon is covered for 150 miles in less than 2 hours. The winding swings of the rivers lead on and show clearly the prospect of alternatives. A better understanding is obtained than could have been had in years upon the ground.

One particularly advantageous cutoff is found in the Clearwater country that will result in a large saving in distance and permit the avoidance of canyons by the use of side drainages. This cutoff is hidden by a false summit near the top of the divide and shows only as the mouth of a secondary stream on the lower end, and would have been overlooked by any party working directly down the main drainage from the pass.

Photographic Flights—Following the exploratory flights, a specific outline is made for the photographic

Aerial Survey Party Prior to Flying Salmon River Route. Left to Right—Robert Johnson, Pilot; A. C. Blomgren, Aeronautical Engineer for Idaho; J. J. McCreedy, District Engineer, Idaho Bureau of Highways, Lewiston; J. A. Chamberlin, Consulting Engineer and Economist; Marshall Wright, Western Representative, Aerotopograph Corp. of America

flights. An opening is cut in the bottom of the ship fuselage in which the camera is bolted, and another is cut just before the pilot's seat. A day is lost while waiting for a clear sky free of clouds between 11 a.m. and 1 p.m., as the ground must be free of cloud shadows and the sun high up for clear photography.

Again the party is in the air. The day is clear and the ship flies direct to Lolo pass. The pilot observes the ground just below through a hole in the floor between his feet. The photographer sits humped over a camera and peers into a cross-haired finder while the others watch the ground overside. The proper point is reached and the ship is 5000 ft. above the ground. The photographer, on signal, begins his work as the ground slips by below. The pilot looks ahead, then

down through the hole below and with the ship above the Lochsa, follows the winding of the river and sideslips on the sharp bends and so keeps the camera pointed straight down. The photographer pushes in a button and turns a crank three times about each 15 seconds.

Mapping Methods—The picture is not a movie but a series, with each view overlapping the previous one by 60% and, when completed, appears as a deck of overlapping cards upon a table and winds about as does the line of flight, when correctly superimposed. The scale of the picture is 1000 ft. to the inch when taken from an elevation 5000 ft. above the ground and on the grade that the line below is expected to have.

Enlargements are made to a scale of 500 ft. to the inch and, after the ground control elevations .on a chosen strip 1000 ft. wide on the accepted route have been established, the topography with 10-ft. contour intervals is worked out on the cartograph machine (Hugershoff patent), which is a development of a German range finding system.

By overlapping the pictures, it is possible to use a stereopticon while studying them and by this means

Mountainous, Wooded Terrain Studied from the Air for Lolo Pass Highway

depth and all the details are brought out. Trails, flats, slopes and cliffs show with great clearness and isolated trees appear as fuzzy-topped dandelions gone to seed and floating just above the ground, seemingly transparent. This opportunity to study the ground as a whole permits a much better understanding of relative values of any one line and a better opportunity to compare one route with another.

When flying at 5000 ft. above the ground, this particular camera includes a width of 4000 ft. in the picture and, if more width is required, additional 'strips' are flown until the desired area is covered. Photographing the ridge route is not as simple as taking the river, because the sameness in the peaks and saddles and the ridges on the sides make it more difficult to retrace the predetermined route than had been considered when flying lower down. To include more area and avoid taking two strips over this section, it is photographed at 13,000 ft.

Choosing the Route—As the project stands today (August 25) all of the photographs have been taken and are being built into mosaics. The plan is to make a study of the pictures and from them decide upon a choice of route. When a conclusion is reached, the ground control is to be placed on the ground along the chosen route. During the time that the ground control is being placed, the route will be gone over with the photographs in hand and a detailed study made of all features, including classification of material and other essentials. Following this, the contour map is made and from it the projection of the line and the estimate.

The time passed thus far would about equal that required by ground work for the gathering of a pack outfit and getting under way for reconnoissance. The increased speed in communication and transport today must be supplemented by increased speed in decision and accomplishment, or advance will stagnate in uncertainty. Engineering field methods have not kept in step with other advances, and now Idaho is breaking out of a back eddy of old methods, and the Bureau of Highways is applying a new and modern means to circumvent blockading mountains that stand the same today as they did when Lewis and Clark scaled them 125 years ago, and after whom the proposed highway will be named.

Personnel—The aerial mapping in the field is being done under contract by the Aerotopograph Corp. of America, with headquarters in Washington, D. C., under Marshall Wright, western representative. The engineering is under R. H. Shoemaker, office engineer for the Idaho Bureau of Highways. J. J. McCreedy is district engineer for the Bureau at Lewiston, A. C. Blumgren is aeronautical engineer for Idaho, and Fred Thieme is regional engineer for the U. S. Forest Service. The pilot is Robert Johnson, of Missoula, whose skillful handling of the ship materially aided the undertaking. My part as consulting engineer was to make the decision, on exploratory flights, as to what alternatives were to be photographed. I will make the cost estimate following a joint decision as to the final choice of route.

Editor's Note—See also April 10th, 1930, issue, p. 185, and August 10th, 1930, issue, p. 389.

A recent dispatch from Missoula, Montana, stated that preparations had been made for a party of eight engineers, headed by Chamberlin, to start work from Powell ranger station on a ground survey supplementing the aerial photography described in this article. The most likely route is said to be that followed by the Lewis and Clark trail along the Lochsa river, part of which has been built. Probably the definite location will not be made until further ground work has been carried out.

SHORT COURSE IN IRRIGATION, U. C. FARM, DAVIS, CALIFORNIA

The Division of Irrigation Investigations and Practice of the College of Agriculture, University of California, announces a short course in irrigation to be held November 12 to 14 at the University Farm, Davis. The purpose of this short course is to present to farmers, engineers, and others engaged in work pertaining to irrigation some of the more recent conceptions concerning soil, water, and plant relationships. No fee will be charged for the short course.

Construction Review

WATER SUPPLY SYSTEMS

By S. J. SANDERS
Editor, Daily Construction News Service

HETCH HETCHY WATER SUPPLY PROJECT FOR SAN FRANCISCO

Good progress is being made on the Hetch Hetchy water supply project for the city and county of San Francisco. Since the status of the project was reported in the October 10th, 1927, and February 25th, 1928, issues, additional progress has been made as follows:

Moccasin Reregulating Reservoir — The main, or downstream dam was completed about November 1, 1929. This dam is a rolled earth-fill structure 830 ft. long, with a maximum height of 73 ft. and crest width of 27.5 ft. at elev. 927 ft. The upstream slope is 2½:1 and the downstream slope 2:1 with a 15-ft. berm at elev. 895 ft. In cross-section, the dam contains a rolled clay core through the central portion and on both sides of a concrete core wall, a rolled earth fill adjacent to the clay core both upstream and downstream, and a rock fill on each of the two faces, the total fill aggregating 143,340 cu.yd.

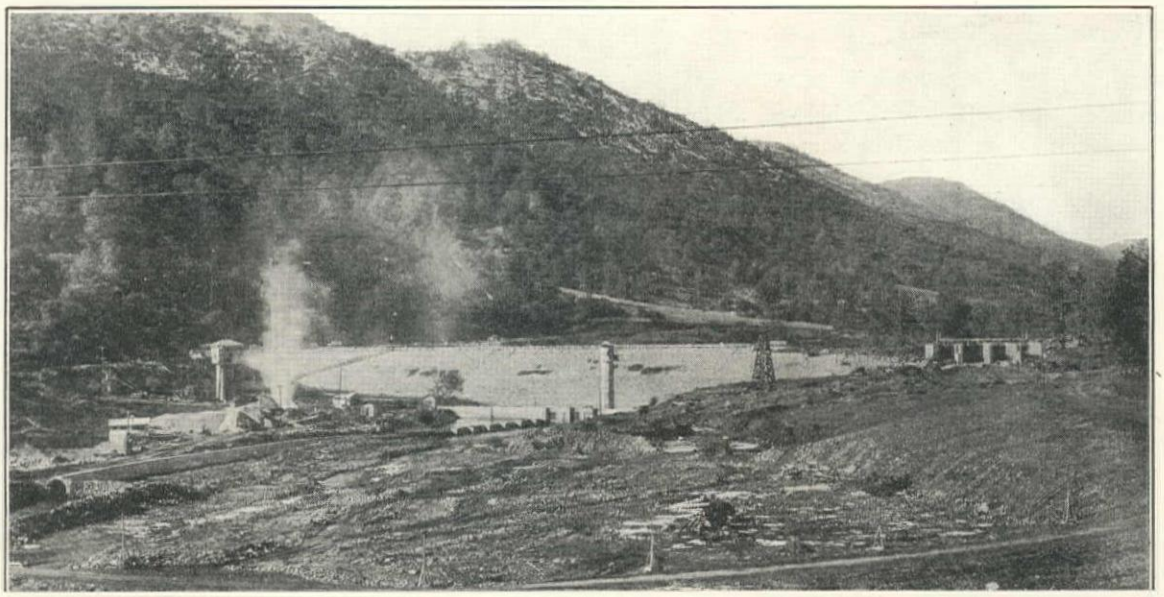
A county road passes along the crest of the dam, crossing the spillway on a concrete bridge.

Two outlet control towers were constructed in the reservoir and were completed in December, 1929. The main outlet tower holds the gates to control the flow of water into the Foothill division tunnel and contains 475 cu.yd. of reinforced concrete. The other tower, through which water will be released for draining the reservoir into Moccasin creek, contains 95 cu.yd. of reinforced concrete.

Foothill Division Tunnels — The tunnel between Moccasin portal and Brown adit was holed through December 6, 1928, excavation in all other sections of the division having been previously completed. Concrete lining was completed in September, 1929. A total of 580,480 cu.yd. of material was excavated from the 15.85 miles of tunnel and 123,070 cu.yd. of concrete was placed in the 43,176 ft. of tunnel where lining was necessary.

A surge shaft was constructed near Red Mountain east portal as a part of the Red Mountain Bar power project.

The main aqueduct is now completed as far as the Oakdale portal at the westerly end of the Foothill division, with the exception of short sections of pipe at each end of the Red Mountain Bar siphon. This siphon will connect the portion already laid under the Don Pedro reservoir of the Modesto and Turlock irrigation districts with the east and west tunnel portals.



GENERAL VIEW DOWNSTREAM OF MOCCASIN REREGULATING RESERVOIR, EARTH-FILL DAM, SPILLWAY OPENINGS, AND OUTLET CONTROL TOWERS ON JANUARY 8, 1930, HETCH HETCHY WATER SUPPLY PROJECT

Coast Range Division—Work on the 28.56 miles of tunnel in this division is being rushed, and 14.2 miles had been excavated to October 1. Tunneling is in progress at 14 faces from 4 portals and 5 shafts. A total of 5108 lin.ft. was excavated during June, 1930, for the maximum monthly progress to date.

Tunnel work on the Coast range divison is being carried on entirely by city forces which at the present total 1400 men. Of the five miles of tunnel between Tesla and Thomas, only 3429 ft. remain to be completed and progress is being made at the rate of 30 ft. per day on both headings, so that this long section should be cut through shortly after the first of Feb-

ruary. This tunnel, like all others in the 28 miles, will be lined throughout with concrete and it is hoped that the driving and lining can be completed about the middle of 1933.

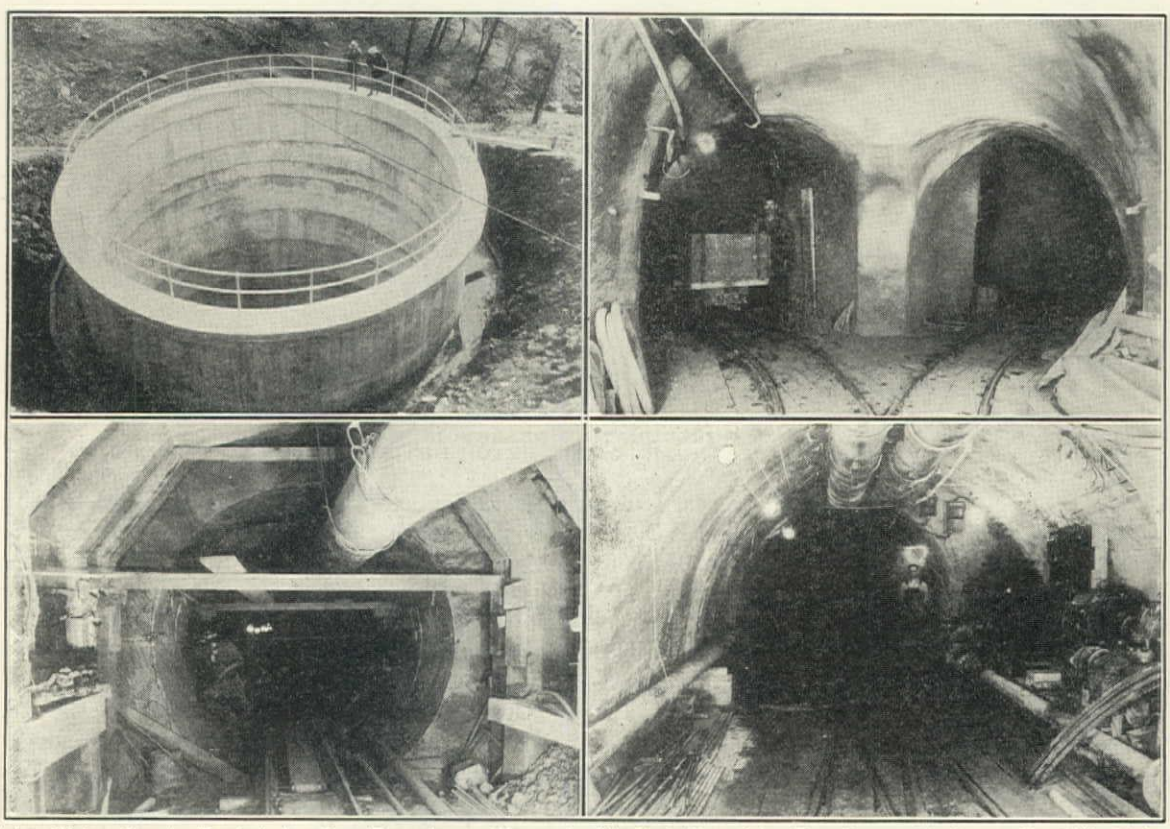
The following table shows the progress of tunnel excavation on the Coast range division to October 1, 1930, and also the distances between working points:

Working Point	Distance Driven to October 1 (lin.ft.) East	Distance Driven to October 1 (lin.ft.) West	Distance Between Working Points (lin.ft.)
Tesla Portal	.....	12,952	
			23,311
Thomas Shaft	6825	4,028	
			22,174
Mitchell Shaft	1,063	1,900	
			27,565
Mocho Shaft	4,791	3,305	
			15,303
Valle Shaft	3,220	5,073	
			26,873
Indian Creek Shaft	6,340	2,934	
			17,139
Alameda Creek E. Portal	10,542	.....	
			.....
Alameda Creek W. Portal	.....	6,034	
			18,192
Irvington Portal	6,014	.....	
Totals	38,795	36,226	150,557

Considerable difficulty with heavy and moving ground has been experienced in some portions of the Coast range tunnel and explosive gas has been encountered in several headings. Gunite lining is being placed in certain parts of the work to eliminate the necessity for retimbering and to reduce the gas hazard.

Notwithstanding the closest cooperation between the City Engineer's office and the State Industrial Accident Commission with a view to preventing accidents resulting from gas, an explosion of methane gas occurred shortly after midnight of July 17, 1930, near the Mitchell shaft, which resulted in serious loss of life. Since that time, work has been appreciably slowed down while securing and installing non-sparking storage battery locomotives to replace the standard type of storage battery locomotive previously used. Careful investigation after the accident failed to show that it was caused by either unsafe equipment or deviation from standard safety rules where gas is present. To remove from the work all equipment which might be considered capable of producing an accident, all electric lighting has been replaced with electric storage battery cap lamps and Bureau of Mines permissible locomotives are being put in service.

Major equipment on the work includes five 10,000-c.f.m Roots positive blowers (two at Mitchell shaft and one each at Thomas, Valle, and Indian creek shafts) direct-connected through Link-Belt speed reduction gears to General Electric and Westinghouse motors; Conway muckers; Ingersoll-Rand and some Sullivan air tools; twenty-seven storage-battery, permissible type mine locomotives (ten 5-ton General Electric, five 5-ton Mancha, and twelve 4-ton Westinghouse); one gravel plant at Alameda creek, capacity 100 tons per hour; etc. About 600,000 lb. of Hercules and Giant gelatine dynamite (40, 25, and 60%) is required on the Coast range division. On the Hetch Hetchy tunnels, Atlas delay all-metal blasting



Hetch Hetchy Water Supply Project for San Francisco. (Upper Left) Red Mountain Bar Surge Shaft on Foothill Division Tunnel Near Red Mountain East Portal; Shaft Protects Red Mountain Bar Power Project. (Upper Right) Indian Creek Junction Structure on Coast Range Tunnel, Showing Typical Design of Juncture of Cross-Cut Leading to Shaft and the Main Tunnel. (Lower Left) Typical Gunited Circular Section Placed in Coast Range Tunnel to Eliminate Retimbering Heavy Ground. (Lower Right) Thomas Cross-Cut on Coast Range Tunnel, Showing Arrangement of Pumping Equipment, Ventilation Piping, Etc.

caps were introduced in April, 1929, and have since been used.

A pipe-line across Alameda creek, 0.58 mile long, and a short section of pipe-line connecting the Irvington portal with the completed Bay crossing pipe-line will be constructed by the time the Coast Division tunnel is finished.

San Joaquin Division—Plans and specifications for the 47-mile pipe-line across the San Joaquin river are now being prepared, and it is expected that they will be issued in time to receive bids about the first of next year. The construction of this division of the Hetch Hetchy aqueduct will be scheduled for completion not later than the tunnel.

Emergency Connection—A contract was awarded November 5 to the Western Pipe & Steel Co. for $648,867 for a connection to lines of the East Bay Municipal Utility District at San Lorenzo and San Francisco city water department lines near Newark. This connection includes 35,000 lin.ft. of 44-in. and 32,000 lin.ft. of 36-in. welded steel pipe, etc.; construction started at once, the contract time limit being 120 days.

The connection is necessary because of an emergency water shortage in the city supply. Under a 2½-year contract period between the city and the district, this line will enable San Francisco to receive from the East Bay system a maximum supply of 20,000,000 g.p.d. For this service the city will pay $292,500 as a standby charge to cover certain necessary construction by the district, ability of the district to furnish a varying supply within the maximum delivery called for, and loss of power as a result of increased demand on the Pardee reservoir. In addition, the city will pay 4¢ per 100 cu.ft. of water, metered at the point of delivery.

Personnel—M. M. O'Shaughnessy is city engineer of San Francisco and L. T. McAfee is chief assistant engineer in charge of the Hetch Hetchy water supply project. C. R. Rankin is construction engineer on the Coast range division with headquarters at Livermore, and L. A. McAtee is in charge of preliminary studies on the San Joaquin divison. L. W. Stocker is hydraulic and mechanical engineer and P. J. Ost is chief electrical engineer in the San Francisco office.

Progress is being made on other representative water supply projects as follows:

CLOVERDALE, CALIFORNIA, MUNICIPAL WATER WORKS

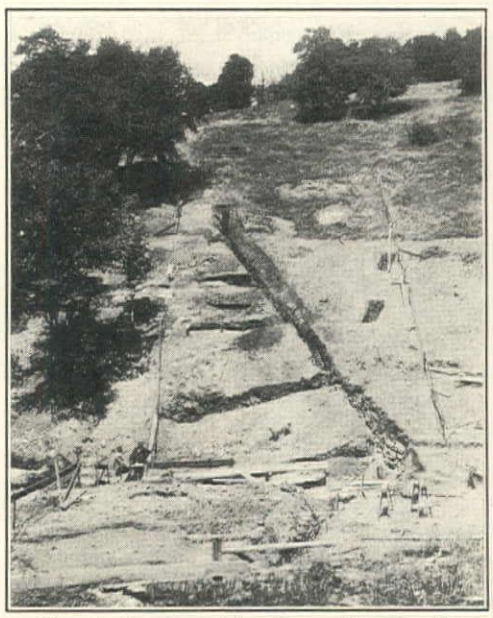
J. J. Ongaro, Jr., Fairfax, has completed his contract for extensions to the municipal water works distribution system of Cloverdale, Sonoma county, California, contract price $16,580. The project included a reservoir by-pass connection, 12,030 lin.ft. of 4-in. McWane cast-iron pipe with Hydrotite joints, 6060 lin.ft. of 2-in. McWane cast-iron pipe with screw and precaulked joints, 67 Rensselaer valves (54 for 4-in. and 13 for 2-in. lines), 31 Corey standard 2-way fire hydrants, 11 crosses and 43 tees (4-in.), 196 galvanized iron service connections, ¾-in., with Jones corporation cocks and curb stops, two 1-in., and seven 2-in. connections.

One small trencher and one small Caterpillar tractor were used on the work.

Andrew M. Jensen, San Francisco, was the consulting engineer on the Cloverdale extensions.

IONE, CALIFORNIA, ALLEN DAM FOR PRESTON SCHOOL OF INDUSTRY

George French, Jr., Stockton, will complete his contract during November for the Allen dam, a reinforced concrete structure at the Preston School of Industry near Ione, California, for the Division of



George French, Jr., Completes Excavation for Allen Dam

Architecture, State Department of Public Works. All excavation for the dam and intake has been completed, reinforcing steel delivered, and concrete placed in several buttresses. The contract price is $14,300.

George B. McDougall is chief of the Division of Architecture at Sacramento, with P. T. Poage assistant architect, W. K. Daniels deputy chief of the Division, and C. H. Kromer structural engineer.

FRESNO COUNTY, CALIFORNIA, WATER WORKS

The Edgley Co., Los Angeles, will complete a contract about January 1 for a distribution system in Fresno County (Californa) Water Works District No. 1, contract price $42,758. The contract includes: cast-iron pipe—6880 lin.ft. of 4-in. at $0.65 and 25,580 lin.ft. of 6-in. at $0.95 and 6750 lin.ft. of 8-in. at $1.38; cast-iron fittings—10,100 lb. at $0.07; gate valves—49 assorted at $12 to $32; irrigation hydrants—73 at $20; service connections—67 from 1 to 1½-in. at $12 to $16; meter boxes—67 at $2 to $3; etc. The National Cast Iron Pipe Co., of Birmingham, Alabama, is supplying the pipe.

A. Segel, Fresno, is the consulting engineer.

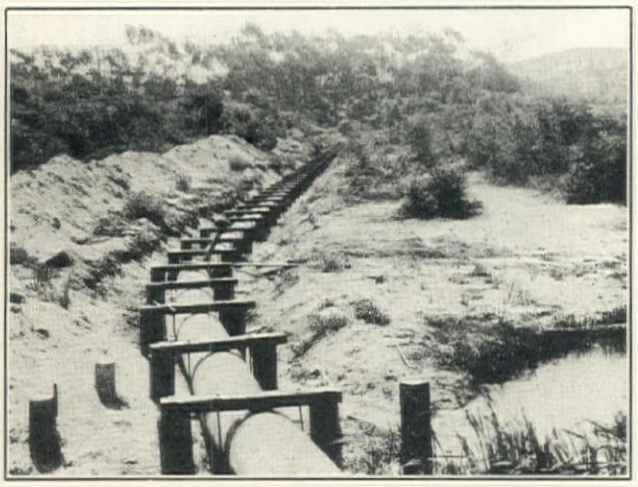
SAN DIEGO, CALIFORNIA, SECOND MAIN PIPE-LINE

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 1—To September 10, the R. E. Hazard Contracting Co. of San Diego had completed 74,500 lin.ft. (or 96%) of the trenching on schedule 1 which involves trenching and completion of backfill from mile 0 to mile 16.2. The contract price is $43,370 and the completion date is November 1. Ernest Ward, of San Diego, is doing the work on this schedule under subcontract. Schedule 1 includes the following items: 81,550 cu.yd. of unclassified excavation at $0.46; re-

move 1125 sq.ft. of pavement at $0.45; and 42,000 cu.yd. of backfill at $0.125.

Equipment includes one Parsons model 31 trencher, one Caterpillar '30', one steam shovel, one buckboard and Caterpillar tractor, one blade, and one bulldozer.

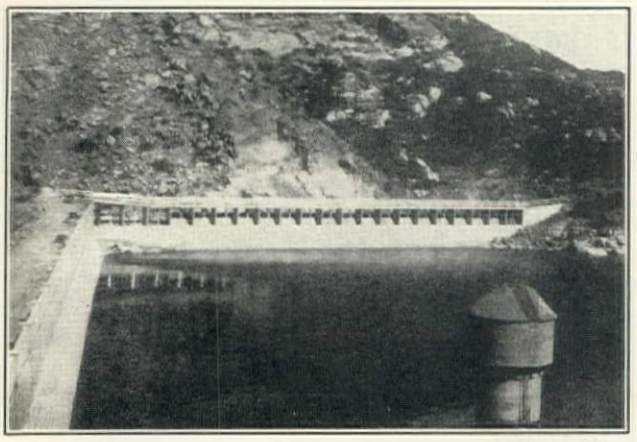
Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 2—The Western Pipe & Steel Co. of Los Angeles and San Francisco had laid 70,370 lin.ft. of electric-welded steel pipe in trench and tunnels and had completed 82% of a contract for schedule 2 on September 10, the completion date being November 1.



Sweetwater Crossing on Otay-San Diego Second Main Pipe-Line, Mile 9.0, Western Pipe & Steel Co. Contract

The schedule requires furnishing and laying 42,492 lin.ft. of 36-in. and 43,020 lin.ft. of 40-in. pipe and partial backfill between mile 0 and mile 16.2, contract price $620,982.

The U. S. Steel Products Co. is supplying the steel



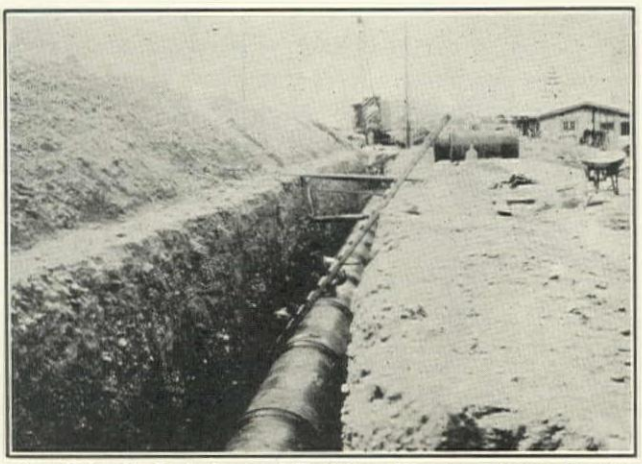
Morena Reservoir Enlargement, San Diego, Gist & Bell Contractors

plate. Fabrication of electric-welded steel pipe, dipping, and wrapping is done at the South San Francisco plant of the Western Pipe & Steel Co. Equipment on the schedule includes four portable gasoline-driven electric welding outfits, two Fordson tractors, and one crawler-type, gasoline driven crane.

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 3—To September 10, M. N. Guho and M. Miller had completed tunnel driving and had placed 4604 lin.ft. of gunite lining on their contract for schedule 3, involving the driving and gunite lining of four tunnels with a total length of 7200 ft. The contract price is $66,666 and involves the following items: tunnel excavation—7200 lin.ft. at $5.95; tunnel entrance—200 cu.yd. at $1.40; gunite lining—6800 lin.ft. of 1½-in. at $1.50; timber lining—400 lin.ft. at $3.75; concrete—90 cu.yd. at $6.75 and 550 cu.yd. at $5.75; cement—2250 bbl. at $2.20; reinforcing steel—10,500 lb. at $0.06; wire mesh—2850 lb. at $0.09; galvanized 2-in. mesh—12,000 lb. at $0.12; douglas fir timber—10 M f.b.m. at $80.

John G. Wood & Son, of San Diego, is doing the gunite lining under sub-contract, using two complete gunite outfits.

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 4—The Miracle Construction Co., San Diego, has completed trench excavation, pipe-laying, connections, backfilling, etc., on this schedule extending from mile 16.2 to mile 19.2. The contract price, $218,811, included: trench excavation—25,000 cu.yd. at $0.95;



Laying 36-in. U. S. de Lavaud Cast-Iron Pipe on Miracle Construction Co. Contract, Otay Reservoir—San Diego Second Main Pipe-Line

pavement removal and replacement—32,000 sq.ft. at $0.35; cast-iron pipe—15,863 lin.ft. of 36-in.; etc.

Henry G. Fenton, of San Diego, did the trenching under sub-contract. The pipe was furnished by the U. S. Pipe & Foundry Co.

WATSONVILLE, CALIFORNIA, RESERVOIR AND FILTRATION PLANT

Grant L. Miner, Jr., Palo Alto, will complete his contract during November for water works improvements for the city of Watsonville, California, contract price $100,481, including a slow sand filtration plant at Corallitos Village. The concrete work has been completed and grading of the plant site started. Filter sand from a nearby pit is being screened to remove coarse particles and is then placed in the filters by the use of an ejector and Nichols separator. Head, store, and tool houses have been erected and the head house equipped. A 50,000-gal. reinforced concrete tank has been completed. A Builders Iron Foundry venturi meter tube and Republic Meter Co. electrical indicating-registering-recording device at the distributing reservoirs is being installed.

The filtration plant is equipped with porous concrete slab bottoms instead of the usual type of underdrains.

C. G. Hyde, Berkeley, is consulting engineer, and H. B. Kitchen is city engineer for Watsonville.

SAN DIEGO, CALIFORNIA, MORENA RESERVOIR

Reservoir Dam and Spillway and Safe-Duty Enlargement—Gist & Bell, Arcadia, completed their contract about September 1 for enlarging the capacity of Morena reservoir from 53,700 ac-ft. to 72,800 ac-ft. capacity, contract price $61,489. The following equipment was used: one Bucyrus-Erie 1¼-yd. gas+air shovel, two Rix compressors, three 4-yd. Autocar trucks, one Ingersoll-Rand drill sharpener, one Caterpillar '30', one derrick with 110-ft. boom.

H. N. Savage is hydraulic engineer in charge of the water development department for the city of San Diego.

LONGVIEW, WASHINGTON, RESERVOIR

N. Niblett, Longview, Washington, will complete his contract about November 15 for a 1,000,000-gal. reinforced concrete water reservoir for the Washington Gas & Electric Co. at Longview. The excavation (4000 cu.yd.) has been completed, all pipe placed, the bottom of the reservoir graded, and concreting is in progress. Steel pipe was furnished by the Beall Pipe & Tank Corp. of Portland.

Stevens & Koon, Portland, Oregon, are the consulting engineers on this reservoir.

DENVER, COLORADO, ELEVEN MILE CANON DAM

The Gordon Construction Co., Denver, Colorado, will complete a contract by the spring of 1932 for a concrete reservoir in Eleven Mile canon for the Board of Water Commissioners, city and county of Denver.

Pouring Portland Cement Grout in Joints Between Porous Concrete Slabs, Watsonville Filtration Plant, Grant L. Miner, Jr., Contractor

The contract price is $469,505 and involves the following items: diversion and care of river—$12,000; excavation in earth and loose rock—4406 cu.yd. at $2.35; excavation in solid rock below elev. 8480 ft.—3950 cu.yd. at $5.50; excavation in solid rock above elev. 8480 ft. and stripping—12,580 cu.yd. total at $4.25; backfill on upper side of dam—1600 cu.yd. at $1.50; backfill on lower side of dam—4100 cu.yd. at $1.00; surfacing road—200 cu.yd. at $3.00; drill grout and drain holes—800 lin.ft. at $1.50; pressure grouting—20 cu.yd. at $60; place grout and drain pipe—25,750 lb. at $0.10; place metal grouting boxes—711 each at $1.50; place metal cutoff strips—1700 lin.ft. at $1.00; concrete in retaining walls—850 cu.yd. at $12; reinforced concrete—620 cu.yd. at $24; concrete in dam—49,000 cu.yd. at $6.40; reinforcing steel, outlet conduit lining, gate valves, and screens—570,333 lb. at $0.03; construct valve and power-house—$2800. The Board of Water Commissioners will furnish for installation by the contractor all cement, outlet piping, gates, and valves.

D. D. Gross is engineer for the Denver municipal water works and John Burgess is office engineer.

WEISER, IDAHO, FILTRATION PLANT

Reader & Lowe, Weiser, Idaho, will complete their general contract about January 1 for water system improvements at Weiser, involving a rapid sand filtration plant and a new intake line from Snake river, contract price $47,153. The total cost of the improvements is $60,000. Excavation for the filtration plant has been completed and on October 4 the concrete

Caterpillar '30' Equipped with Loader on Schedule A, Otay Reservoir-San Diego Second Main Pipe-Line

work was 60% complete. Pipes, valves, and pumping equipment have been delivered.

The intake is a 12-in. cast-iron line 500 ft. long, laid in a trench in the river bottom with 'Duplex Simplex' joints. The filtration plant has a designed capacity of 1000 g.p.m. and is arranged to permit operation at one-half this capacity. The plant was described in the September 10th, 1930, issue, p. 425.

The pumping equipment contract was awarded to the DeLaval Steam Turbine Co. for $3565 and the filter equipment contract to the McFarland Engineering Co. for $9282. All pipe and fittings are furnished by the American Cast Iron Pipe Co. and valves by the Rensselaer Valve Co. The Oregon Portland Cement Co. is furnishing the cement. The four DeLaval pumping units in the new plant are powered with Westinghouse motors. Simplex rate-of-flow controllers and gauges, Omega chemical dry-feed machines, Connersville blowers and vacuum pumps, and Builders Iron Foundry meters are included in the installation. A 500-g.p.m. Byron Jackson direct-connected centrifugal pump and Wallace & Tiernan chlorinating equipment, both used in the old system, are being installed in the new plant.

The Burns-McDonnell-Smith Engineering Co. of Los Angeles and Kansas City are designing and supervising engineers. Lyle Wood is city engineer and water superintendent for Weiser, Idaho.

California Water Works Men Meet at Pasadena

Water—rapidly becoming the most precious commodity in the Far West—is making the annual conventions of the various sections of the A.W.W.A. take first rank, as evidenced particularly by the unprecedented attendance at the eleventh annual convention of the California Section at The Huntington, Pasadena, October 29 to November 1. The registration was 756, or 106 more than at the national convention in San Francisco in 1928, and 200 more than at San Jose in 1927. Of course, the accessibility of the large group of Southern California cities and the attractiveness and spaciousness of the Huntington Hotel, helped to draw such a large crowd; and ideal weather conditions prevailed. A number of water works men came from Oregon, Washington, Idaho, Utah, Nevada, Arizona, and New Mexico.

A big convention really requires a hostelry sufficiently large to accommodate all exhibits, meetings, and banquets. In this way the delegates do not stray away, more attend the meetings, visit the exhibits, and get better acquainted. One of the big objects of a convention is the breaking down of reserve and getting to know the other fellow better, not only among water works men from various localities, but between the water works superintendents and manufacturers.

As heretofore, the burden of arrangements and entertainment was borne by the manufacturers; and again all must thank J. R. Barker, Pacific coast manager of the Neptune Meter Co., and his principal assistants for their untiring efforts to make this convention so complete and worth while. The exhibitors presented 'Jim' Barker with a fine traveling bag in appreciation.

Exhibits—There were 55 exhibitors, who spared neither time nor expense to make their exhibits most attractive and interesting; and, every one was in shape for the opening of the convention Wednesday morning. These were housed for the most part under a canopy in the patio of the hotel.

Golf is now established as the opening gun of this convention. It was an all-day, 36-hole, party, at the Flintridge golf club, with more than 60 participating. Rivalry was keen and merriment at its highest during the 19th-hole buffet lunch in the club house, where 'Bill' Goble, of Alhambra, acted as host and manager of the tournament. As usual, there were a number of upsets as to winners and losers, resulting in the following winners, the prizes being awarded by J. R. Barker during the manufacturers' dinner dance on Friday evening.

1st prize	Jerry O'Leary, 6 irons
2nd prize	Harold E. Howard, golf bag
3rd prize	Peter Diederich, 6 irons
4th prize	S. H. Wade, 3 woods
5th prize	F. W. Schooley, golf bag
6th prize	Philip Schuyler, zipper bag
7th prize	Evan Green, 3 woods
8th prize	A. P. Lovell, zipper bag
9th prize	Claude T. Faw, 12 balls
10th prize	O. A. Stone, 12 balls
11th prize	A. D. Mars, Jr., 12 balls
12th prize	K. W. Brown, 12 balls
13th prize	W. R. Updegraft, jacket
14th prize	J. X. Smith, putter
15th prize	Jim Peters, putter
16th prize	Harry Reinhardt, sweater
17th prize	W. C. Mills, golf hose
18th prize	S. E. Tiberg, jacket
19th prize	V. E. Perry, golf cap
20th prize	Harry Carr, shag bag and balls

The informal business dinner was held on Thursday evening, 300 attending and enjoying a most interesting illustrated talk on 'Some Problems of the Los Angeles Water Supply' by H. A. Van Norman, chief engineer and general manager, Bureau of Water Works and Supply, as well as a talk by George H. Fenkell, of Detroit, and president of the American Water Works Association, who was the honored guest of the California Section. Fenkell had visited the experimental sewage reclamation plant of the Los Angeles water department, and apparently was so impressed that he ventured to suggest that hereafter sewage reclamation might rightfully be considered a function of the water works superintendent. How the picture has changed since the national convention at Chicago in 1927, when it was voted not to include a sanitary section.

The well-known Orpheus Quartette of Los Angeles, augmented for the occasion by H. M. Dudley, of the Pacific States Cast Iron Pipe Co., and former basso-member of the quartette, made everyone happy with their famous repertoire. This was followed by a demonstration of fencing with three types of swords, and several more excellent numbers. R. W. 'Bob' Martindale, Pacific coast manager, U. S. Pipe & Foundry Co., was responsible for the entertainment features.

SOME OF THE 750 WATER WORKS MEN AT ELEVEN AMERICAN WATER WORKS ASSOCIATION, AT

The following officers were elected: president, W. W. Hurlbut; vice-president, W. F. Goble; secretary-treasurer, E. W. Green; executive committee, Louis L. Farrell and Orla Casad. It was decided to hold the 1931 convention in Stockton. Oakland has applied for the 1932 convention.

Ham and Eggs Breakfast—In some ways, this might be considered the 'piece de resistance' of the convention. At 8:30 Friday morning, the gong sounded and 250 delegates and their wives responded—many having had but 2 hours sleep. The breakfast tables were grouped on the lawn and under the trees surrounding the beautiful swimming pool of the hotel (see front cover illustration, October 25th issue). Incidentally, we wish here to correct a statement in the October 25th issue, p. 530 (Editor's Note). The filtration equipment for this pool was installed by the California Filter Co. and not by the International Filter Co. Fanchon & Marco provided the entertainment, consisting of a director of swimming, who illustrated

various types of swimming and diving, past and present methods, and directed spirited swimming and diving contests between five 16-year-old girls; and also, to prove that swimming is a pastime for young and old, introduced two 5-year-old experts—a boy and a girl—an 83-year-old man and a 73-year-old woman, both holding long distance records.

Frank Brooks, manager of the Art Concrete Works of Los Angeles, busied himself taking movies of the 'Ham and Eggs' and the various aquatic events, which movies he showed at the dinner dance, Friday evening.

Manufacturers' Dinner Dance—This is always the big event of the California Section, when everyone is a guest of the manufacturers. Fortunately, the Stanford-U.C.L.A. night football game, somewhat of a novelty, attracted a few, or else the attendance would have exceeded the capacity of the dining room—600 delegates and their wives and sweethearts were there. Adjournment was taken then to the ballroom where dancing and additional entertainment were enjoyed, following which parties visited various suites to get better acquainted.

Pine Canyon Dam Excursion—On Saturday morning, nearly 150 motored up the San Gabriel river canyon to inspect the Pine canyon damsite; where the city of Pasadena, under the supervision of Samuel B. Morris, chief engineer of the Pasadena water department, will soon start the construction of a high concrete dam. A picnic luncheon was served, and progress in driving the diversion tunnel, under construction, and foundation explorations were described by 'Sam' Morris.

Each year more of the delegates bring their wives—an excellent idea. Under the leadership of Mrs. Samuel B. Morris, chairman of the Ladies Entertainment Committee, with Mrs. Alexander Bell as principal assistant, the ladies enjoyed a variety of events, including visits to the Huntington Library and Art Galleries and the Pasadena Community Playhouse.

Technical Discussions—These sessions were held on Thursday afternoon and Friday, starting with illustrated talks by Samuel B. Morris on the **'Pasadena Water Department'**, and by F. E. Weymouth, chief engineer, on the **'Metropolitan Water District of Southern California'.** These interesting papers were followed by a **'Symposium on Practical Water Works Topics'**, including the following discussions: **'Protective Pipe Coatings'**, by K. H. Logan; **'Electric-Welded Steel Pipe-Lines'**, by F. W. Hanna; and **'Fundamental Consideration in Determining the Cost of Rendering Public Fire Hydrant Service'**, by Edward B. Mayer. **'Water Rights'**—a vital subject in California especially—was most comprehensively discussed Friday morning by W. G. Irving, attorney-at-law, Riverside, an authority on the subject. This paper will be published in an early issue of **Western Construction News. 'Development of Deep Wells'** was discussed by Rosco Moss and D. A. Lane. **'The Colorado River Project'**, from the angle of the ancient geology of this mighty river, was outlined by Creighton O. Waldorf, Beverly Hills. **'Maintenance Equipment for Water Works'** was considered too big a subject for one meeting by C. R. Manbert, so he treated it in a humorous vein to the delight of his audience. This paper likewise will be published soon in the **News.** The most discussed subject of all—**'Reclamation of Treated Sewage'**—was ably presented by R. F. Goudey, sanitary engineer, Bureau of Water Works and Supply, Los Angeles. Goudey awakened his audience to the possibilities of replenishing water supplies, especially in arid and semi-arid countries, by scientific sewage reclamation. He referred to **Western Construction News,** September 25th and October 25th issues, for details of the work being done by his department. **'Corrosion Problems'**—always a subject of vital interest to all water works men—was capably discussed by Ira F. Van Giesen, electrolysis engineer, Bureau of Water Works and Supply, Los Angeles. Van Giesen has contributed several papers on this subject to the **News** during the past five years. **'Relation of Politics to the Management of Municipally Owned Water Systems'**—Fred M. Randlett, Pacific coast manager, Robert W. Hunt Co., and formerly chief engineer of the water works of Portland, Oregon, presented a strong plea to free all water works of political interference. **'Stand-By Charges for Water Service'** were discussed by C. E. Thatcher, East Bay Municipal Utility District, Oakland. **'Billing and Collection Methods'** was the subject chosen by Carl K. Chapin, of Pasadena. **'Cost Keeping and Budget Control'**—F. M. Faude of the Loveland Engineers, Inc., of San Francisco, made a strong plea for this most essential factor in the economic management of water works. **'Distribution Reservoir Design'**—Chester A. Smith, of Burns-McDonnell-Smith Engineering Co., Los Angeles and Kansas City, both from his wide experience and considerable research, was able to present a valuable contribution on this subject.

(Left to Right) 'Doc' Arnold, 'Tom' Leary, 'Jim' Peters, 'Bob' Martindale on Flintridge Golf Course

TH ANNUAL CONVENTION, CALIFORNIA SECTION, THE HUNTINGTON, PASADENA, OCTOBER 31

An abstract of all these papers will be published in an early issue of the **News.**

Take it all in all, from every angle, and in every detail, the 1930 convention was a huge success.

Western Construction News published and distributed a roster of attendance at the convention, copies of which, supplemented by the names of all late arrivals, will be mailed to anyone upon request.

Fresno to Own Water System

By a 3 to 1 vote on November 4, the citizens of Fresno, California, passed a $2,520,000 bond issue for the purchase of the Fresno properties of the California Water Service Co.

C. S. W. A. and California Municipalities

Joint Convention at Long Beach, October 6 to 11

The rapid growth of the California Sewage Works Association—membership 225 in less than three years—and the active and growing interest of its members and municipal officials in the subject of sewage and trade waste reclamation, is well nigh remarkable. More than 150 registered at the third annual convention at Long Beach, October 8 and 9.

The meeting was held, as heretofore, in conjunction with the thirty-second annual convention of the League of California Municipalities, which reached a record registration of more than 1450. The Hotel Virgina—an ideal place for a large convention—was the main headquarters; some of the sessions of the many departments of the League being held, nevertheless, at other hotels.

The C. S. W. A. meetings were held in the Breakers Hotel, starting with a breakfast meeting of the board of directors on Wednesday, October 8, followed by a business meeting at which the following officers were elected: President, B. J. Pardee, city manager of Visalia, succeeding F. A. Batty, sewer maintenance engineer of Los Angeles, who was elected a director to succeed A. W. Wyman, plant superintendent, Pasadena Sewage Department. W. A. Allen, assistant superintendent of sewage disposal, Pasadena, was elected first vice-president, and John Jacobsen, superintendent of construction, University of California Farm, Davis, second vice-president. E. A. Reinke, sanitary engineer, State Department of Public Health, Berkeley, was re-elected secretary-treasurer.

THIRD ANNUAL CONVENTION, CALIFORNIA SEWAGE WORKS ASSOCIATION, LONG BEACH, OCTOBER 8 AND 9, IN FRONT OF BREAKERS HOTEL

Award of Merit—It was decided preferable to award the bronze plaque (annual gift of Wallace & Tiernan Co., Inc.) and $25 cash prize for the best maintained sewage treatment plant, at spring meeting in April or May.

Odor Control—L. L. Rose, of Los Angeles, presented a paper on odor control by the chlorination method, which was discussed by F. S. Currie, R. L. Patterson, R. F. Goudey, H. H. Hall, A. M. Kivari, W. T. Knowlton, C. A. Smith, and Philip Schuyler. The design and operation of plants to reduce the odor nuisance was submitted by John Jacobsen, and discussed by E. M. Hilton and Alva J. Smith.

The reclamation of sewage for water supply replenishment, as being successfully accomplished by the Bureau of Water Works and Supply of the City of Los Angeles, was described briefly by Carl Wilson, director of sanitation, who pointed out that in the arid districts of the country, especially, it is but natural to expect that sewage reclamation will soon be placed under the jurisdiction and control of the municipal water departments. (See September 25th and October 25th issues for articles by Carl Wilson and R. F. Goudey).

Without question, this successful experiment in sewage reclamation by the City of Los Angeles ranks as the greatest step in advance ever made. Hundreds of engineers and municipal officials who have visited this plant have been converted, and sewage treatment and disposal has received an impetus that will advance the art faster on account of this important economic aspect than would occur if it were dependent on the sanitary aspect alone.

Protective Paints—Carl Tennant and J. H. Van Norman reported that aluminum paint was preferable to an asphaltic base paint as a protective coating for wood and metal; and W. A. Allen stated that non-metallic base paints had given good results at the Pasadena sewage treatment plant.

Inspection Trips—At least 150 in a caravan of 46 automobiles motored to the Los Nietos plant of the Pacific Clay Products Co.—the largest plant of its kind under one roof in the United States. An excellent buffet lunch was served by the company, during which the factory employees' band, mostly Mexicans, played entertainingly. The 150 guests were then piloted through the plant and witnessed crushing and hydraulic pressure tests on a new type of clay pipe, developed by the Pacific Clay Products Co., of greater strength and impermeability and without the salt glaze coating, than any clay pipe so far developed (see later issue for details).

The caravan then proceeded to the Pasadena activated sludge plant, where fertilizer is being produced in quantity and sold at a good price. Then the party visited the sewage reclamation plant of the water department of Los Angeles, where nearly everyone drank the sparkling clear and most palatable effluent, only 75 feet from the point of entry of the raw sewage.

Thursday morning another caravan of 30 cars formed at the Hyperion sewage screening plant of the City of Los Angeles, and then visited the Poggi ranch plant of the Los Angeles County Sanitation Districts; following which a demonstration of sewer cleaning was held at Wilmington.

Thursday Luncheon—More than 100 attended the luncheon at the Breakers Hotel, following which a group photograph was taken.

Handling Sludge and Screenings—Papers were read by T. R. Haseltine, H. P. Banta, and Herbert Paterson, from the

SAFE—QUICKLY INSTALLED ECONOMICAL

Armco Corrugated Iron Pipe

FOR

Storm Sewers

MUNICIPAL construction demands drainage structures that are safe, quickly installed and dependable and economical in the service rendered.

For over 24 years Armco Corrugated Iron Pipe has been used under the railroads and highways of the country. During this time it has been subjected to the dead loads of high fills and the impact of heavy railroad traffic under shallow fills—a service record that assures ample strength and safety when installed as storm sewers under city streets.

Armco Corrugated Iron Pipe is quickly obtainable. Of a light weight, flexible construction, it is shipped, hauled, and installed with the minimum of expense and effort.

There is no prolonged period during which open trenches hinder the use of streets and the conduct of business.

Once installed, Armco Corrugated Iron Pipe can be forgotten. Its 24-year record of continuous service is Nature's proof that pure iron endures. The consistent uniformity of Armco Ingot Iron is your assurance that Armco storm sewers installed today will return the same enduring service as those early veterans placed in the ground years ago.

Further information as to the ways Armco Corrugated Iron Pipe is fitted to meet your municipal drainage needs will be sent upon request without any obligation on your part.

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The R. Hardesty Mfg. Co.
DENVER, COLO.—MISSOULA, MONT.

Spokane Culvert & Tank Co.
SPOKANE, WASH.

Western Metal Manufacturing Co.
HOUSTON—DALLAS—SAN ANTONIO—EL PASO

angle of digestion, and discussed by R. F. Goudey, M. C. Polk, and D. C. McMillan. A paper on this subject from the angle of fertilizer as a by-product, was read by A. W. Wyman. The subject of sewage sludge as a fertilizer was then discussed by A. S. Thornton, a large manufacturer and dealer in fertilizer, under the trade name 'Nitroganic', who buys all the Pasadena dried sludge. Thornton stressed the great value of this by-product, and the crying necessity for more sewage sludge to be reclaimed to supplement the rapidly growing shortage of fertilizer in California. H. Clay Kellogg, another dealer who purchases wet sludge from several sewage treatment plants and sells to orchardists under the trade name of 'Sludgen', stressed the great value of this by-product and likewise urged that more of it be reclaimed. This should add another important economic argument and incentive for sewage reclamation.

Grease Removal—W. A. Allen presented a paper on the 'Imhoff Method', and G. A. Parkes on the 'Los Angeles Method'.

Inspection Trip—A group of members then visited the Long Beach screening plant and one of the city's sewage pumping plants.

Banquet—Most of the members attended the banquet and dance of the League of California Municipalities Thursday evening in the Hotel Virginia, and some went on the all-day boat ride Friday to Catalina.

An abstract of each of the papers and discussions will be published in an early issue of **Western Construction News;** and in full in the 1930 C. S. W. A. Journal.

The 1930 Journal, which is underwritten and published by **Western Construction News,** will be ready for distribution about January first.

THE CITY BUILDING CODE

(A Short Course at the University of Southern California, Los Angeles)

A knowledge of the details and provisions of a city building code is of daily use to every architect, builder, and contractor. However, there seems never to have been any means of learning the scope of the details and necessary provisions of the Los Angeles code except by hard knocks or experience—and perhaps disapproval at the hands of those charged with its enforcement. The School of Citizenship and Public Administration, the civic center branch of the University of Southern California, Los Angeles, offers a formal college course in this subject with classes held in room 400, City hall, Thursdays at 7 p.m., under S. B. Barnes, formerly assistant chief engineer of the Department of Building and Safety, Los Angeles. The course, which extends for twelve weeks, aims at a comprehensive survey and analysis of the city building code and the application of fundamental principles of construction to practical building details to comply with requirements of health, safety, and a diminution of the fire hazard. Building inspectors, architectural draftsmen, designers, and draftsmen in the building trade should support this class.

PERSONAL MENTION

R. A. B. Smith, head of the road promotional department of the British Portland Cement Association, headquarters London, is engaged in a three-months tour of engineering projects in the United States, particularly studying the uses of concrete. Smith has spent some time in the Pacific coast states.

C. J. Mohme has returned to the United States after 10 years in the Hawaiian Islands and is seeking employment on engineering construction in California. For 6 years, Mohme was with the U. S. Engineer Department on fortifications, river and harbor work, general construction, and surveying. During his last 4 years in the Islands, he was engaged in contracting, principally on highways. Mohme was superintendent for E. C. Mellor, Maui, T. H., on the 27.5-mile Haleakala road, a Federal and Territorial grading and asphalt paving project extending through virtually virgin country to the Haleakala crater.

Harry Lee Hess, for the past 9 years with the Oakland Port Commission, first as assistant engineer and later as harbor engineer, has been appointed assistant chief engineer of the Berkeley Water Front Co., which has started the development of the entire water front of San Francisco bay from the Key System pier to Richmond. Hess graduated as a civil engineer from Stanford University in 1910. From 1910 to 1917 he was associated with the Yuba Consolidated Gold Fields, the Natomas Consolidated Dredging Co., of California, and the Tacoma Dredging Co., of Seattle. He then served 2 years as lieutenant in the Artillery Corps during the World War. From 1919 to 1921 he was designing engineer in the dredging department for the Union Construction Co. of Oakland.

OBITUARY

Carl F. Bierbauer, 51, superintendent of the Hercules, California, explosives plant of the Hercules Powder Co. since 1929, died suddenly October 28 from heart disease. Bierbauer was born at Girard, Pennsylvania, and graduated as a chemical engineer from Pennsylvania State College in 1902. He joined the Hercules organization in 1915, in 1917 became first director of the company's experimental station at Kenvil, New Jersey, and in 1922 became assistant superintendent of the Hercules, California, plant. Bierbauer was an active member of the American Chemical Society, the American Institute of Chemical Engineers, and the Rotary Club of Richmond, California.

Alex Simpson, Jr., 53, building contractor and secretary of the Rocky Mountain Branch of the Associated General Contractors at Denver, Colorado, died October 20. Simpson was born in Scotland, moving to New York City at an early age. He entered the contracting business in New York City and moved to Denver 25 years ago, where he built or was connected with many of the larger office buildings.

Simpson was the president and owner of the Alex Simpson Co., of which his son, William M., is vice-president and his brother, T. J., superintendent. He was a member of local clubs and of the Shrine; he is survived by his widow and one son.

Louis David Blauvelt, 63, state highway engineer of Colorado since 1921, died at his home in Denver on October 26 following a year's illness.

Blauvelt was born in Rockland county, New York, and was educated at Rutgers Preparatory School and College; he had been a resident of Colorado since 1887. In 1889 he began a three years' job on investigation, location, and construction of the Colorado Springs & Cripple Creek Railway, after which he became associated with the Moffat Road (now the Denver & Salt Lake Railroad). He remained with the Moffat Road for 16 years, during which period he became chief engineer and general manager. During his association with the Moffat Road, Blauvelt conceived, and made investigations and plans for what later became the outstanding engineering feature of the Rocky Mountain region—the Moffat tunnel. About a year after his appointment as state highway engineer, the Moffat Tunnel Commission offered him the position of chief engineer at a salary much larger than that he was receiving with the Colorado Highway Department, but he declined this offer. He later became one of the board of consulting engineers of the Moffat Tunnel Commission. From 1918 to 1919, Blauvelt served as a major in the construction division of the U. S. Army, being connected with the building of a $6,000,000 cartridge plant at Alton, Illinois, and the $70,000,000 Edgewood Arsenal, at Edgewood, Maryland. From 1919 to 1921 he was consulting engineer for the Colorado Railroad Commission, which body was charged with the study and promotion of necessary trans-continental divide tunnels in Colorado.

Blauvelt was a member of the American Society of Civil Engineers and of the Colorado Society of Engineers. He was a former president of the American Association of State Highway Officials and for several years one of the members of the executive committee. He is survived by his wife and one daughter.

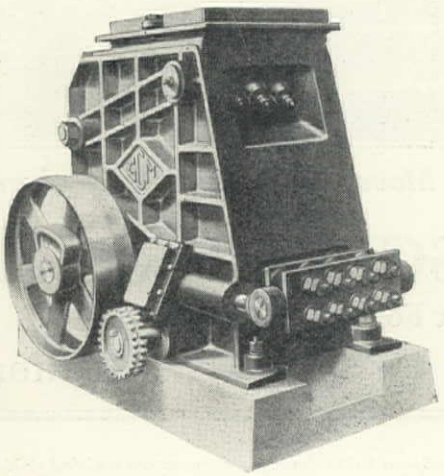
It is not likely that the appointment of a new state highway engineer for Colorado will be made at the present time.

New Equipment and Trade Notes

NEW GUEST JAW CRUSHER HAS YIELDING JAW AND ROLLER BEARINGS THROUGHOUT

Guest Crushing Machines, Inc., 107 Annandale blvd., Los Angeles, California, has perfected a jaw crusher with a yielding jaw and equipped throughout with roller bearings. The crushing action after material is crushed to size is downward for one-eighth of each revolution, thus giving added impetus over a freely falling body. This crushing action is such as to accelerate the passage of sticky material that in other types of crushers might ordinarily ball up.

The new Guest crusher may be used as a primary or secondary crusher, or for both purposes. When set at ¼-in.



opening, the 6 by 16-in. crusher illustrated will handle 9 tons of rock per hour, taking a maximum feed of 6-in. material and delivering a uniform crushed product of $\frac{5}{16}$-in. size (reduction ratio 19:1).

This crusher has a breakable shear pin which prevents throwing the motor shaft out of alignment if foreign material becomes lodged in the jaws, besides provision for instant release of the foreign material without the use of explosives or expensive dismantling. All working parts are readily accessible and size adjustment on the finished product may be made while the crusher is in operation. The crusher has Hoffmann roller-type bearings with positive oil and dust seal. Before assembly in the crusher, the unit comprising the fly-wheel, pulleys, shaft, and bearings is precision-balanced. The manganese steel jaw plates are easily removable without dismantling the crusher. In relation to weight, GCM crushers are said to have a capacity 50% greater than any other type of crushing machine. It is claimed that in power consumed the Guest machines will operate 25% under any other crusher of similar size, based on quantity of crushed product delivered per hour.

The new crusher has been developed by William W. Guest who for 40 years has been occupied with the development, design, and operation of mine equipment and for the past 5 years has supervised the manufacture of advanced types of rock and ore crushers.

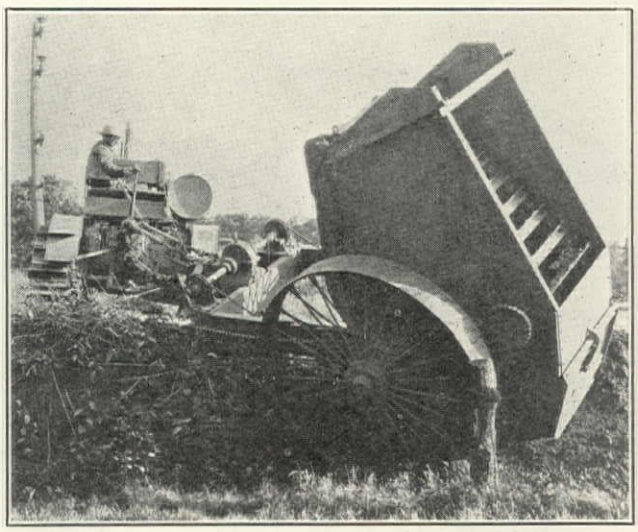
HAYNES STELLITE REDUCES MAINTENANCE COSTS ON SNOW PLOW EQUIPMENT

When road plows pushed by crawler tractors are used to remove heavy snowfalls from highways, the abrasive action of ice and packed snow may wear down the heavy tractor treads. Application of a hard-surfacing material, such as Haynes Stellite, to the treads has been successfully used to increase the life of the treads from one winter of service when untreated to a second winter when treated. An added advantage from the use of Haynes Stellite is the elimination of side slipping and an increase in traction, as the treated tread has four projecting cleats which grip the ground firmly. Haynes Stellite is a nonferrous alloy composed mainly of cobalt, chromium, and tungsten, and is extremely resistant to abrasion.

THE HIGHWAY TRAILER ONE-MAN SCRAPER

The Highway Trailer Co., Edgerton, Wisconsin, manufacturer of trailers, earth-boring machines, winches, bodies, pole-derricks, etc., has developed a power-driven, self-loading scraper in 2, 3½, and 5½-yd. capacities. This is a rear-dump scraper operated with a power take-off from a Caterpillar tractor by the tractor driver; it is a rugged, flexible piece of equipment which does its own plowing or scarifying. It is claimed that one of the 5½-yd. machines with a Caterpillar '60' and one man will move 400 to 600 cu.yd. of dirt per day, depending on the length of haul.

The scraper pan is carried on the axle in a channel-steel frame supported by two wheels, and is hooked to the tractor by a drawbar and pin. Power is taken from the rear of the tractor and carried to the scraper transmission by a compound universal joint and drive shaft. Two levers control distribution of power to the rakers by sprockets and chains, and to raising and lowering the pan by means of steel cables winding in sheaves. In starting the scraper, the pan is lowered to the desired depth and the rakers used to pull dirt back from the bit, rising with the dirt as the pan continues to fill. When full, the pan is up-ended and wheeled the desired distance without



Highway Trailer One-Man Scraper with Caterpillar '60'

loss of any part of the load. Pulling a rope releases the latch of the dumping door, and the door levels the load to any suitable lift as it passes over the discharged material.

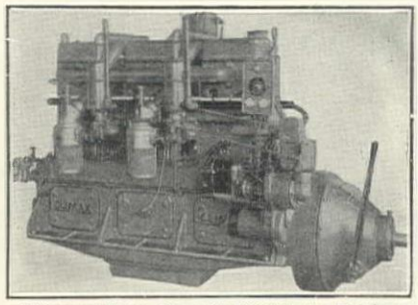
The cutting bit is of plow steel, reversible, and can be quickly changed; it is said to last an entire season. The universal joint allows the tractor to turn at an angle of 120 deg. and the entire outfit to turn in a 24-ft. circle. All wearing parts of the scraper are of manganese steel.

CLIMAX BLUE STREAK DISTILLATE ENGINES

The Climax Engineering Co., Clinton, Iowa, has applied equipment for burning distillate in its new line of 'Blue Streak' engines, according to Allen C. Staley, director of sales and engineering. High power with the economy of a cheaper fuel

than gasoline is an outstanding feature of these engines which come in five sizes of 70 to 200-hp.

All cylinders on the Blue Streak engines are of chrome nickel iron; detachable engine heads are of the same metal and are cast in pairs; crank shafts are drop-forged; main bearings are babitted and bronze-backed; valves are fully enclosed in the motor head; a lubrication pressure of 20 lb. is used for all bearings; an eccentric-vane type pump is furnished; water circulation is maintained by a centrifugal pump with shrouded



Climax 'Blue Streak' Distillate Engine

impeller; special Zenith carburetors are used, the intake manifold being jacketed with exhaust heat; the heat-control mechanism consists of a sylphon similar to that used in spark control and actuated by pressure change in the intake manifold. To permit high power output and high compression heads, water is automatically injected into the intake manifold for throttle positions greater than three-quarter openings. At full-load operation, 0.2 lb. of water is required per brake horsepower per hour to secure maximum power output for loads under three-quarter capacity.

SULLIVAN ROLLER SHEAVES

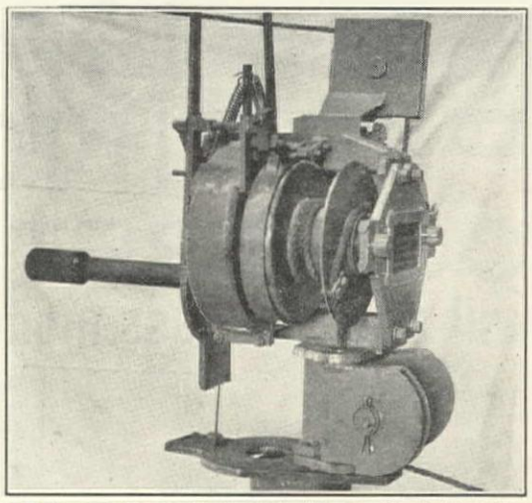
The Sullivan Machinery Co., Chicago, announces a new roller bearing sheave or tail block to use in scraper loading or slushing operations with its compressed air and electric portable hoists. Underground scraper loading depends for its success on freedom from delay. The Sullivan roller sheaves are 8, 10, and 12-in. diam., with respective minimum rated

capacities of 6000, 10,000, and 140,000 lb. They are made of manganese steel, with electric steel casting side plates; the swivel hook is of drop-forged alloy steel. The Hyatt roller bearing supporting the sheave revolves on a hollow hardened steel shaft, serving as a lubricant reservoir. To prevent jamming or undue wear on the rope, the sheave is recessed into the side blocks. Snatch block construction is used, and the block can be opened by removing a pin. The rope opening at the top of the sheave will permit passage of a square knot in wire rope.

LE TOURNEAU POWER TAKE-OFF

A double-cable-winch, power take-off for Caterpillar tractors has been designed, thoroughly tested, and is now being built by R. G. Le Tourneau, Inc., Stockton, California, manufacturer of earth-moving equipment. The inspection plate on the rear end of the tractor is replaced by a compact winch carrying two 6-in. drums on which the tractor driver can operate the cables while the machine is either in motion or standing still. This winch has a line pull of 2000 lb. and a line speed of 200 ft. per min.; it is made of steel plates and bars, electric-welded, and runs on Timken bearings.

The new power take-off is being used to operate Le Tourneau 12-yd. dump carts, 7-yd. scrapers, bulldozers, and hardpan



Le Tourneau Power Take-Off with Double-Cable Winch

rooters. It can also be used with a derrick to handle heavy material such as concrete pipe, or in many other ways. Le Tourneau has discarded hydraulic, pneumatic, and electric methods of controlling tractor-drawn machines, as it is his opinion that the direct power take-off is the most efficient and trouble-proof.

EUCLID HYDRAULIC OPERATED BULLDOZER

The road machinery division of the Euclid Crane & Hoist Co., Euclid, Ohio, announces a hydraulic-operated bulldozer which is light in weight but unusually strong. Its features include a specially designed hydraulic pump and lifting jack—small, compact, powerful—leaving the drawbar free for all use; even balance to eliminate the necessity for a two-way jack; complete hydraulic control within easy reach of the tractor driver; simple attachment to the tractor.

WESTATES PRODUCTS CO. FORMED

Arthur J. Swanson announces the formation of the Westates Products Co., with main offices in the Rialto bdg., San Francisco, to represent several national manufacturers of building products as the western branch and factory distributor. These manufacturers include: Knapp Bros. Mfg. Co., Chicago; Northwestern Steel Products Co., Chicago; Receivador Sales Co., Grand Rapids. The new company is represented by dealers and agents in the principal cities of the Far West.

Swanson was for 11 years with the Northwestern Expanded Metal Co. of Chicago, the last two as sales manager and five years of the period as district sales manager with headquarters at Los Angeles.

WORTHINGTON ACQUIRES GILMAN MFG. CO.

The Worthington Pump & Machinery Corp., of New York City, has acquired the Gilman Manufacturing Co., of East Boston, Massachusetts. The Gilman line of rock-drilling equipment will supplement the Worthington line of feather-valve air compressors and allow expansion of the latter company's pneumatic service.

UNIT BID SUMMARY

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

WATER SUPPLY SYSTEM

GRANTS PASS, ORE.—CITY—PIPE LAYING AND RESERVOIR LINING

Contract awarded as follows by the City of Grants Pass, Oregon, for water system improvements:
(A) Contract awarded to George French, Jr., Box 675, Stockton, who bid $25,518 to the city of Grants Pass, for the installation of a distribution system. Bids received on the following items:

(1) 10,000 cu.yd. excavation and backfill
(2) Laying 4,500 lin.ft. 16-in. cast iron pipe
(3) Laying 10,000 lin.ft. 12-in. cast iron pipe
(4) Laying 1,200 lin.ft. 10-in. cast iron pipe
(5) Laying 13,000 lin.ft. 8-in. cast iron pipe
(6) Laying 24,000 lin.ft. 6-in. cast iron pipe.
(7) Setting 110 gate valves
(8) Setting 93 hydrants
(9) Installing 70,000 lb. cast iron fittings

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
George French, Jr., Stockton	2.00	.20	.18	.16	.14	.08	35.00	20.00	.03	$25,518
R. I. Stuart & Sons, Medford	6.00	.45	.34	.30	.26	.20	52.00	18.00	.02	29,278
George Mitchell Co.	3.00	.55	.40	.40	.25	.20	65.00	12.00	.03	32,917
Calvert, Calvert, Schroeder & Lium, Grants Pass	2.50	.60	.46	.42	.35	.20	39.50	20.00	.025	34,990
Argentieri & Colorossi	5.00	.50	.35	.33	.30	.25	62.00	10.00	.10	36,290

(B) Contract awarded to Calvert, Calvert, Schroeder & Lium, Grants Pass, Ore., $24,709 for reservoir lining. Bids received on:
(1) 600 cu.yd. concrete
(2) 38,000 lb. reinf. steel
(3) 2 truss roofs, 66x103 ft.

	(1)	(2)	(3)	TOTALS
Calvert, Calvert, Schroeder & Lium	$20	.07	$4,342	$24,709
Kern & Kibbe	$23	.06	$3,000	23,738
H. E. Wilder Co.	$19	.06	$5,200	24,991
Geo. French, Jr.	$24	.05	$4,400	25,182
R. I. Stuart & Sons	21.00	.07	$6,000	$25,995
C. Dudley DeVelbiss	21.50	.055	$5,280	26,467
F. C. Gregoire	17.00	.085	$7,400	26,740
Parker-Schramm Co.	27.00	.06	$6,100	29,981

Baar & Cunningham, Spalding Bdg., Portland, Oregon, are Consulting Engineers.

SAN FRANCISCO, CALIF.—CITY—STEEL PIPE-LINE—ALAMEDA COUNTY

Western Pipe & Steel Co., 444 Market St., San Francisco, who bid $671,507 using lock-bar steel pipe and $648,867 using welded steel pipe, only regular bid to the Board of Public Works, City Hall, San Francisco, for 12-mile pipe-line to connect with system of the East Bay Municipal Utility District and to run from San Lorenzo to near Newark, Alameda County. Montague Pipe & Steel Co., San Francisco, submitted bid on welded steel pipe, but gave a time limit of 170 days, which will not be considered as time limit on this project is 120 days. Contract awarded on basis of welded steel pipe. Bids from:

(1) Western Pipe & Steel Co., S. F.
(2) Montague Pipe & Steel Co., S. F.

	(1)	(2)
35,000 lin.ft. 44-in. lock-bar steel pipe (furnish)	7.87	
OR		
35,000 lin.ft. 44-in. welded steel pipe (furnish)	7.47	8.20
32,000 lin.ft. 36-in. lock-bar steel pipe (furnish)	5.73	
OR		
32,000 lin.ft. 36-in. welded steel pipe (furnish)	5.46	5.88
35,000 ft. 44-in. lock-bar st. p. (deliv. and inst.)	1.68	
OR		
35,000 ft. 44-in. welded st. p. (deliver and inst.)	1.68	1.95
32,000 ft. 36-in. lock-bar st. p. (deliv. and inst.)	1.40	
OR		
32,000 ft. 36-in. welded st. p. (deliver and inst.)	1.40	1.71
100 furnish and install beveled courses for curved section, Sect. A	52.50	60.00
100 furnish and install beveled courses for curved section, Sect. B	40.20	45.00
4 expansion joints for 44-in. pipe, Sect. A	540.00	480.00
4 expansion joints for 36-in. pipe, Sect. B	456.00	480.00
40 manholes	97.10	90.00
20 8-in. nozzles	84.25	82.00
20 6-in. nozzles	66.70	63.00
2,000 lb. structural steel	.21	.18
8,000 lb. install metal work furnished by City	.10	.15
8,000 cu.yd. excava. more than 1 ft. in depth	2.42	2.00
10,000 cu.yd. excava. less than 1 ft. in depth	2.42	2.15
40 cu.yd. Class 'A' concrete	32.50	40.00
200 cu.yd. Class 'B' concrete	23.40	30.00
30,000 lb. reinforcing steel	.08	.07
2,000 sq.ft. broken rock paving	.13	.20
100 M ft. b.m. redwood timber	95.00	100.00
300 M ft. b.m. douglas fir timber	85.00	88.00
4,000 lb. bolts, nuts, etc.	.13	.15

OCEANSIDE, CALIF.—CITY—CAST-IRON MAINS, VALVES, AND HYDRANTS

Contract awarded to F. A. Rhodes, 4066 Lark Street, San Diego, who bid $17,527 to the City of Oceanside, San Diego County, for the installation of water system improvements in South Oceanside. Bids received from the following concerns:

(1) F. A. Rhodes, San Diego, Calif. $17,527
(2) R. O. Peters, Whittier 17,966
(3) Oceanside Plumbing Co. 19,345
(4) Thomas Haverty Co., L. A. $19,450
(5) Geo. A. Shepard, Los Angeles 20,713

	(1)	(2)	(3)	(4)	(5)
5,311 lin.ft. 8-in. cast-iron pipe	1.50	1.70	1.53	1.65	1.70
5,061 lin.ft. 6-in. cast-iron pipe	1.20	1.32	1.19	1.35	1.40
1,068 lin.ft. 4-in. cast-iron pipe	1.00	1.13	.93	1.15	1.10
9 8-in. gate valves	45.00	49.27	45.00	45.00	48.00
19 6-in. gate valves	27.00	29.47	30.00	30.00	30.00
2 4-in. gate valves	16.00	17.00	20.00	16.00	18.00
30 cast-iron valve boxes and covers	1.75	12.00	12.00	4.00	12.00
13 fire hydrants (Rich. Calif. Type)	75.00	51.75	75.00	80.00	$120
1 6 by 6 by 6 by 6-in. cast-iron cross	24.00	15.70	25.00	25.00	20.00
1 8 by 8 by 6 by 6-in. cast-iron cross	24.00	19.00	25.00	25.00	25.00
1 8 by 8 by 8 by 8-in. cast-iron cross	25.00	22.50	25.00	25.00	30.00
1 12 by 12 by 6 by 6-in. cast-iron cross	37.00	31.05	50.00	40.00	35.00
7 6 by 6 by 6-in. cast-iron tees	14.00	12.00	16.00	15.00	15.00
8 8 by 8 by 8-in. cast-iron tees	19.00	17.78	21.00	20.00	20.00
1 8 by 8 by 4-in. cast-iron tees	18.00	15.52	19.00	20.00	20.00
1 4 by 4 by 4-in. cast-iron tees	10.00	7.95	11.00	12.00	8.00
2 6-in. special ells	27.00	10.80	20.00	25.00	30.00

Work under 1911 Act. R. L. Loucks is City Engineer. Engineer's estimate $18,301.

STREET AND ROAD WORK

SACRAMENTO, CALIF.—STATE—IMPERIAL COUNTY—GRADING AND ASPHALT PAVING

R. E. Hazard Contracting Co., 2528 Kettner Boulevard, San Diego, who bid $489,125, low bid to California Division of Highways, Public Works Bdg., Sacramento, for 13.1 miles grading and asphalt paving from Arroyo Salado to northerly boundary, IMPERIAL COUNTY. Bids received from:

(A)	R. E. Hazard Contr. Co., San Diego	$489,125	
(B)	Hanrahan Co., S. F.	499,584	
(C)	Southwest Paving Co., L. A.	521,596	
(D)	Clark & Henery Const. Co., S. F.	532,487	
(E)	Peninsula Paving Co., S. F.	534,971	
(F)	New Mexico Const. Co.	552,207	
(G)	Griffith Co., L. A.	544,400	
(H)	V. R. Dennis Const. Co., San Diego	544,473	
(I)	H. W. Rohl, Los Angeles	$549,411	
(J)	Gibbons & Reed	549,682	
(K)	Geo. R. Curtis Paving Co., L. A.	597,795	
(L)	Geo. H. Oswald, Los Angeles	551,415	
(M)	Chas. E. Heuser, Glendale	571,072	
(N)	Basich Bros. Const. Co., L. A.	575,571	
(O)	Cent. Calif. Roads Co. and So. Calif. Roads Co.	583,454	
(P)	Allied Contractors, Inc., Omaha, Neb.	670,749	

Bids received on the following items for the construction of this project:

(1) 361,000 cu.yd. roadway embank.
(2) 222,000 sta.yd. overhaul
(3) 10,000 cu.yd. structure excavation
(4) 140,800 sq.yd. subgrade for paving
(5) 62,000 tons asphalt conc. paving
(6) 11,700 sq.yd. asphalt paint binder
(7) 540 bbl. fuel oil (detour)
(8) 118 ft. 18-in. corr. pipe
(9) 30 lin.ft. 24-in. corr. pipe
(10) 53,910 ft. furnish treated piles
(11) 1,787 each drive piles
(12) 759 M redwood (dense sel. all heart struct.)
(13) 556 M redwood (select all heart structural)
(14) 1,130 cu.yd. remove concrete
(15) 692 sta. finishing roadway
(16) 100 monuments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(A)	.24	.03	.90	.065	3.55	.06	3.00	.50	.50	.70	10.00	75.00	70.00	1.50	2.50	3.00
(B)	.20	.02	.50	.08	3.67	.02	2.25	.50	.75	.72	10.00	90.00	85.00	1.50	5.00	2.00
(C)	.25	.01	.71	.24	3.08	.03	2.25	.50	.70	.76	16.00	90.00	90.00	3.50	5.00	3.00
(D)	.22	.03	1.00	.10	3.50	.02	3.00	1.00	1.00	.87	16.00	90.00	90.00	2.00	10.00	3.00
(E)	.22	.01	.63	.10	3.75	.01	4.00	.60	.75	.85	14.00	92.00	92.00	1.60	6.00	3.00
(F)	.23	.01	1.00	.08	3.85	.02	3.00	1.00	1.00	.85	16.00	94.00	94.00	1.00	8.00	3.00
(G)	.30	.015	1.10	.09	3.50	.02	3.20	.55	.70	.80	13.00	90.00	90.00	1.40	5.00	3.00
(H)	.27	.01	.30	.14	3.50	.05	3.00	1.00	1.50	.85	15.00	95.00	85.00	3.00	10.00	4.00
(I)	.30	.01	.50	.10	3.75	.02	3.00	.50	1.00	.80	10.00	90.00	90.00	2.00	5.00	3.00
(J)	.31	.01	.70	.09	3.70	.03	2.50	.50	.75	.73	12.60	90.15	84.85	2.50	6.00	2.50
(K)	.30	.01	1.00	.09	4.50	.03	6.00	1.00	1.50	.72	12.00	90.00	85.00	2.00	5.00	3.00
(L)	.23	.02	.60	.075	4.05	.025	4.50	.75	1.00	.80	11.65	96.00	89.00	3.00	5.00	3.00
(M)	.22	.015	1.00	.12	4.10	.03	3.00	.75	1.00	.90	15.00	92.00	90.00	2.50	10.00	2.00
(N)	.271	.01	.87	.07	3.80	.01	3.00	.90	.90	.90	17.30	$103	$100	1.25	6.75	2.00
(O)	.16	.044	.53	.08	5.04	.03	3.67	.79	1.05	.77	10.00	94.30	87.50	2.10	3.15	2.68
(P)	.30	.015	.80	.10	5.41	.03	2.36	.50	.50	.86	15.00	95.00	90.00	1.10	4.50	2.50

DENVER, COLO.—GRADING—COLORADO—GOVT.

Bids received as follows by the U. S. Bureau of Public Roads, Denver, Colorado, for roadwork in the State of Colorado:

(A) Award of contract recommended to A. R. Mackey, Fort Morgan, Colorado, $75,147 for 5 miles grading Black Mesa Project in Gunnison Forest, GUNNISON COUNTY, Colorado. Bids on:

(1) 35 acres clearing
(2) 12 acres grubbing
(3) 84,000 cu.yd. roadway excavation
(4) 600 cu.yd. structure excavation
(5) 5 mi. finish earth graded road
(6) 2,200 sq.ft. log cribbing
(7) 100 cu.yd. cement rubble masonry
(8) 1,230 lin.ft. 18-in. corr. pipe
(9) 806 lin.ft. 24-in. corr. pipe
(10) 302 lin.ft. 30-in. corr. pipe
(11) 1,500 cu.yd. hand-laid rock embank.
(12) 300 lin.ft. rubble underdrain

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
A. R. Mackey, Fort Morgan	$75	$100	.60	5.00	$250	1.50	14.00	1.45	2.80	3.90	3.00	3.00	$75,147
Cole Bros., Denver, Colo.	$40	$40	.745	1.00	$100	.80	15.00	1.75	2.50	3.03	4.00	2.00	81,647
C. A. Switzer, Arvada, Colo.	$100	$50	.90	2.00	$250	1.00	15.00	2.00	3.00	4.00	2.00	2.00	96,988
Engineer's estimate	$100	$50	.71	2.00	$200	.75	15.00	2.00	3.00	4.00	1.50	1.50	79,323

(B) Award of contract recommended to Utah Construction Co., Ogden, Utah, who bid $81,653 for 5 miles grading Rabbit Ears Pass Project, Routt Forest, GRAND AND JACKSON COUNTIES, Colorado. Bids received on:

(1) 50 acres clearing
(2) 18 acres grubbing
(3) 116,170 cu.yd. roadway excavation
(4) 1,400 cu.yd. structure excavation
(5) 85,000 sta.yd. overhaul
(6) 5 mi. finish earth graded road
(7) 231 cu.yd. 'A' concrete
(8) 24,590 lb. reinf. steel
(9) 235 cu.yd. cement rubble masonry
(10) 1,920 lin.ft. 24-in. corr. pipe
(11) 174 lin.ft. 30-in. corr. pipe

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	TOTALS
Utah Construction Co.	$150	$100	.44	1.00	.03	$250	22.00	.055	15.00	2.50	3.25	$ 81,653
Morrison-Knudsen Co.	$100	$75	.49	1.50	.03	$350	35.00	.07	17.00	2.65	3.50	89,886
J. F. Roberts & Sons, Denver	$75	$150	.58	1.00	.03	$250	28.00	.065	20.00	2.70	3.25	98,262
J. N. Gordon, Denver, Colo.	$100	$10	.60	1.50	.03	$250	26.00	.07	19.00	3.00	4.00	100,197
C. A. Switzer, Arvada, Colo.	$150	$100	.65	2.00	.03	$500	25.00	.07	15.00	3.00	4.00	110,849
Hinman Bros. Const. Co.	$200	$150	.79	2.00	.03	$250	26.00	.09	17.00	2.70	3.90	130,166
Engineer's estimate	$80	$50	.55	1.50	.03	$250	28.00	.08	14.00	2.75	3.25	92,926

MISSOULA, MONTANA—GOVT.—GRADING

Award of contract recommended to L. T. Lawler, Butte, Montana, who bid $75,278 for grading 10 miles of Clark Fork Highway, in CABINET NATIONAL FOREST, Montana, work for the Bureau of Public Roads. Bids on:

(1) 65 acres clearing
(2) 52 acres grubbing
(3) 159,000 cu.yd. roadway excav.
(4) 105,000 sta.yd. overhaul
(5) 10 miles finish earth graded road
(6) 214 cu.yd. Class 'B' concrete
(7) 21,400 lb. reinf. steel
(8) 55 cu.yd. cement rubble masonry headwalls
(9) 1,382 ft. 18-in. corr. pipe
(10) 167 ft. 24-in. corr. pipe
(11) 36 ft. 30-in. corr. pipe
(12) 2,000 cu.yd. loose riprap

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
L. T. Lawler, Butte, Mont.	$100	$90	.295	.02	$100	25.00	.07	10.00	1.50	2.00	3.00	1.50	$ 75.278
Jas. T. Tobin	$90	$90	.33	.03	$200	28.00	.08	12.00	1.35	2.00	2.55	1.00	82.075
S. Orino, Spokane, Wn.	$100	$75	.34	.03	$100	26.00	.07	10.00	1.50	3.10	3.00	1.25	82.541
Jas. Crick, Spokane	$150	$100	.32	.04	$150	26.00	.08	15.00	2.00	3.00	3.50	1.25	87.103
W. L. Geist, St. Maries	$100	$100	.38	.02	$100	26.00	.075	12.00	1.60	2.15	2.66	1.50	90.391
Morrison-Knudsen Co.	$110	$125	.39	.025	$250	28.00	.07	14.00	1.75	2.70	4.00	2.00	97.609
C. Nyberg, Spokane	$65	$100	.42	.03	$400	25.00	.08	12.00	2.00	3.00	5.00	1.50	98.844
Triangle Const. Co.	$120	$125	.40	.02	$250	28.00	.075	15.00	1.90	2.60	3.70	1.50	99,012
Clifton-Applegate & Toole, Spokane	$190	$150	.40	.02	$150	26.00	.07	12.00	1.60	2.50	3.25	1.00	101.269
Wheeler & England, Moreland, Ida.	$200	$100	.43	.03	$100	28.00	.08	14.00	1.50	2.25	3.00	.75	104,504

SALT LAKE CITY, UTAH—STATE—GRADING AND SURFACING—UTAH COUNTY

Contract awarded to Morrison-Knudsen Co., Salt Lake City, Utah, $129,348 for 5.3 miles grading and surfacing Thistle Connection on Thistle-Castella Highway, UTAH COUNTY, for State. Bids received on the following items:

(1) 171,000 cu.yd. roadway excavation
(2) 256,000 sta.yd. overhaul
(3) 11,950 cu.yd. gravel surface, loading
(4) 16,100 yd.mi. gravel surface, hauling
(5) 5.2 mi. placing gravel surface
(6) 1,600 cu.yd. structure excav.
(7) 27 cu.yd. Class 'A' concrete
(8) 97 cu.yd. Class 'B' concrete
(9) 300 cu.yd. cement rubble masonry
(10) 7,550 cu.yd. rock faced fill
(11) 1,300 cu.yd. grouted riprap
(12) 9,270 lin.ft. guard rail

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
Morrison-Knudsen Co.	.46	.01	.77	.20	$345	1.40	25.00	25.00	12.00	1.40	3.00	.88	$129,348
S. H. Newell & Co., Kamas, Utah	.45	.02	.70	.18	$500	1.50	25.00	30.00	12.00	2.50	6.00	.70	141,748
Utah Const. Co., Ogden, Utah	.52	.03	.70	.20	$350	2.00	18.00	18.00	9.00	1.75	3.00	.90	146,069
F. S. Whiting, Kaysville, Utah	.53	.04	.70	.20	$300	1.00	18.00	18.00	10.00	1.50	3.00	.75	144,887
Reynolds-Ely Const. Co.	.55	.03	.60	.20	$400	1.25	22.00	17.50	8.00	1.50	4.00	1.00	149,221
Platt-Rogers, Inc., Pueblo	.52	.03	.90	.25	$500	2.00	20.00	20.00	10.00	1.40	5.00	1.00	149,042
B. D. Palfreyman, Provo, Utah	.54	.02	.55	.22	$300	2.00	21.00	21.00	10.00	3.00	4.00	.80	155,248
A. O. Thorne, Springville, Utah	.60	.03	.65	.22	$300	1.75	20.00	20.00	12.00	1.00	5.00	.80	155,528
Wheelwright Const. Co.	.62	.03	.65	.20	$200	1.00	21.00	20.00	8.00	1.00	4.00	.85	155,611
Gibbons & Reed, Salt Lake City	.67	.03	.85	.17	$500	1.50	20.00	20.00	5.00	1.50	4.00	.76	169,911
W. W. Clyde and J. W. Whiting, Springville, Utah	.65	.04	.65	.20	$400	1.50	19.00	19.00	8.00	2.00	4.00	.80	171,890
Engineer's estimate	.45	.025	.75	.25	$400	1.50	22.00	22.00	10.00	3.00	7.00	.90	149,450

PHOENIX, ARIZ.—STATE—FLORENCE-TUCSON HIGHWAY—GRADING

Contract awarded to Stanley Jaicks Co., Oak Park, Ill., who bid $75,878 for 8.3 miles Florence-Tucson Highway from Pinal-Pima County Line toward Tucson, for State Highway Commission. Bids received from:

(1) Stanley Jaicks Co., Oak Park, Ill. $75,878
(2) Dudley & Amesbury, El Paso 78,253
(3) F. D. Shufflebarger, New Mexico 79,289
(4) Hodgman & MacVicar, Pasadena 80,283
(5) Veater & Davis, New Mexico 80,698
(6) F. W. Teschke, Hollywood $ 81,498
(7) Packard & Tanner, Phoenix 82,674
(8) V. R. Dennis Const. Co. 83,672
(9) M. G. Hill & Co., Phoenix 94,326
(10) O. F. Fisher, Phoenix, Ariz. 102,502

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
46,379 cu.yd. exc. borrow	.27	.21	.27	.25	.23	.32	.24	.20	.40	.45
11,033 cu.yd. subgr. stab.	.70	.60	.45	.55	.60	.50	.55	.85	.60	.85
44,096 cu.yd.mi. haul stab.	.12	.14	.14	.16	.15	.13	.15	.10	.14	.20
341 cu.yd. 'A' concrete	18.00	20.00	20.00	20.00	20.50	19.00	19.20	21.50	23.00	22.50
24,762 lb. reinf. steel	.04	.05	.0485	.045	.045	.055	.055	.045	.045	.05
STRUCTURES OVER 20-FT. CLEAR SPAN										
1,941 cu.yd. dr. excava.	.25	.40	.60	.30	.35	.30	.82	.60	.30	.60
1,944 cu.yd. str. excava.	.70	.40	.90	.75	.75	.90	1.50	1.00	1.00	1.00
1,848 cu.yd. 'A' concrete	18.00	20.00	19.00	20.00	20.50	19.00	19.20	21.50	23.00	22.50
131,185 lb. reinf. steel	.04	.05	.0485	.045	.045	.055	.055	.045	.045	.05

IRRIGATION AND RECLAMATION

BURLEY, IDAHO—CANAL EXCAVATION, CONCRETE WORK, ETC.—GOVT.

Morrison-Knudsen Co., Boise, Ida., who bid $208,969, submitted low bid to the U. S. Bureau of Reclamation, Burley, Idaho, for constructing section of Milner-Gooding Canal from Stat. 3139-97 to 3317-21 and channel change and bridge over Little Wood River. Bids received from:

(1) Morrison-Knudsen Co., Boise, Ida. $208,969
(2) Utah Const. Co., Ogden, Utah 218,711
(3) Winston Bros. Co., Minneapolis 225,969
(4) S. H. Newell & Co., Portland, Ore. 231,592
(5) J. B. Bonny, Inc., Seattle, Wash. 239,174
(6) A. Guthrie & Co., Inc., Portland $250,954
(7) General Const. Co., Seattle 262,872
(8) John Phillips & Co., S. F. 286,452
(9) Mittry Bros. Const. Co., L. A. 299,522
(10) Haas, Doughty & Jones, S. F. 324,295

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
48,000 cu.yd. canal and chan. exc., Class 1	.12	.125	.15	.10	.15	.18	.14	.11	.15	.15
3,000 cu.yd. canal and chan. exc., Class 2	.30	.35	.40	.70	.30	.40	.60	.25	.40	.40
6,000 cu.yd. canal and chan. exc., Class 3	1.65	1.50	1.60	1.75	1.60	2.10	1.75	1.50	1.86	1.60
47,000 cu.yd. excav. for conc. bench flume and gunited rock sections	1.63	1.20	1.75	1.40	1.75	1.50	2.00	2.00	1.95	2.30
1,500 cu.yd. comp. rock fill (flume)	1.25	.75	1.00	.70	1.00	.50	1.50	5.00	3.00	3.00
2,000 sta.yd. overhaul	.05	.05	.02	.10	.30	.15	.10	.05	.15	.10
1,400 struct. excava., Class 1, per yd.	.50	.60	1.00	.60	.75	.75	.75	1.00	1.50	.85
50 cu.yd. str. excav., Class 2	1.00	1.00	2.00	2.00	1.00	1.00	1.50	2.00	2.00	2.00
200 cu.yd. str. excav., Class 3	3.50	3.50	8.00	8.00	3.00	5.00	3.50	3.00	6.00	4.00
50 cu.yd. excav. of embankment cutoff trenches, Class 3	5.00	3.50	1.75	3.00	5.00	5.00	3.50	3.00	5.00	4.00
1,400 cu.yd. backfill around str.	.40	.60	.40	.50	.50	.50	.65	.75	.75	.70
250 cu.yd. puddling or tamp. backfill	.70	.75	.75	1.00	.50	1.00	1.50	1.00	2.00	.70
150 cu.yd. dry rock paving	3.00	3.00	2.50	5.00	4.50	5.00	5.00	2.50	5.00	6.00
1,000 cu.yd. concrete in bottom of gunited rock sect.	10.00	12.00	10.50	14.00	11.00	10.00	11.00	16.00	19.00	13.00
5,660 cu.yd. concrete in bench flume sect. and adjacent transitions	11.75	15.50	14.00	16.00	16.00	17.00	16.00	19.00	20.00	22.50
350 cu.yd. conc. in flume and wasteway, Big Wood River	20.00	22.00	16.00	22.00	20.00	28.00	25.00	28.00	19.00	29.00
75 cu.yd. concrete (other structures)	20.00	20.00	20.00	25.00	23.00	28.00	30.00	27.50	30.00	27.00
315 cu.yd. gunite	25.00	30.00	16.00	20.00	18.00	27.00	40.00	20.00	35.00	22.00
400 cu.yd. rubble masonry	10.00	10.00	6.50	12.00	7.50	12.00	10.00	10.00	14.00	15.00
775,000 lb. place reinf. steel	.015	.022	.017	.02	.015	.025	.015	.022	.022	.027
12,200 lb. erect str. steel (bridge)	.05	.05	.05	.04	.08	.05	.06	.06	.05	.05
22½ M erect timber (bridges, etc.)	25.00	25.00	20.00	40.00	35.00	30.00	30.00	40.00	35.00	24.00
62 ft. erect 84 metal flume	1.00	1.00	1.00	1.00	5.00	2.00	3.00	4.00	3.00	1.00
16 ft. lay 30-in. corr. pipe	1.50	1.00	1.00	1.00	1.00	1.00	1.50	3.00	3.00	2.00
100 cu.yd. surfacing highway bridge approaches	3.00	2.00	2.50	2.00	3.00	2.50	3.50	3.00	3.00	3.50

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 October, 1930, for Engineering Construction projects in the Far Western States, totaling $21,350,000, as follows:

Paving	$ 2,100,000
Grading, highways	5,950,000
Bridges	700,000
Sewer construction	900,000
Water supply systems	2,300,000
Irrigation and reclamation	600,000
Power development	7,000,000
River and harbor work	1,150,000
Lighting systems	650,000
	$21,350,000

LARGE WESTERN PROJECTS

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

WORK CONTEMPLATED

Reservoir and two steel standpipes for City of Seattle, Wash., $775,000.
Bascule bridge at Park St., Alameda, for Alameda County, $700,000.
Pipe-lines, tunnels, reservoir, etc., for City of Phoenix, Ariz., $2,200,000.
Pier 23 for State Harbor Comm., San Francisco, $450,000.
Treatment plant and sewers for City of Phoenix, Ariz., $1,000,000.

BIDS BEING RECEIVED

Grading and Bit. macadam paving in Marin County for State of California, 3 miles, bids to Nov. 17.

Tunnel, to be 4600 ft. long, for Canadian Pacific Railway, Vancouver, B. C., bids to Dec. 1.

BIDS RECEIVED

Steel pipe-line from San Lorenzo to Newark, Alameda County, for City and County of San Francisco, Western Pipe & Steel Co., San Francisco, $648,867 low.

CONTRACTS AWARDED

Grading and tunnel construction in Yosemite Valley, Calif., for Bureau of Public Roads, to A. C. Goerig, Seattle, $627,224.

Buildings for Engineering Group at University of California, Berkeley, to Barrett & Hilp, San Francisco, $465,560.

STREET and ROAD WORK

WORK CONTEMPLATED

LOS ANGELES, CALIF.—Plans by County Surveyor, protests Nov. 17, for improving 1 mile of Banning Blvd. south of Rocha St., involving 6750 cu.yd. excavation, 106,000 sq.ft. 2-in. Bitumuls paving with 4-in. disint. rock base, vitr. sewers, etc. $35,500. 10-23

LOS ANGELES, CALIF.—Plans by J. E. Rockhold, County Surveyor, for improving Sawtelle Blvd. from Barman Ave. to Jefferson Blvd., involving 10,245 cu.yd. excavation, 177,520 sq.ft. 9-7-in., 39,456 sq.ft. 8-in., and 16,510 sq.ft. 6-in. concrete paving, 62,000 sq.ft. 2-in. asphalt surface, 237,000 sq.ft. 5-in. dis. rock base, corr. pipe, drainage gates, vitr. sewers, etc. Bids after Nov. 17. $92,000. 10-25

MONTEREY PARK, CALIF.—Plans by Engrs., Olmsted & Gillelen, Hollingsworth Bdg., Los Angeles, protests Nov. 10 by City, for improving Garvey Ave., involving 451,750 sq.ft. 9-7-in. concrete paving, 485,430 sq.ft. disintegrated granite subbase, corr. pipe, reinf. concrete pipe, lighting system, etc. $250,000. 11-1

OAKLAND, CALIF.—Plans by City Engr., protests Nov. 13, for improving Hopkins St. from Coolidge Ave. to High St., involving 344,626 sq.ft. grading, 270,000 sq.ft. 7-in. concrete paving, vitr. pipe conduits and sewers, etc. 10-28

SALINAS, CALIF.—Plans by H. F. Cozzens, City Engr., protests Nov. 17, for improving Pajaro St., involving 29,240 sq.ft. 6-in. concrete paving, etc. $7827. 10-31

SAN DIEGO, CALIF.—Plans by City Engr., H. W. Jorgensen, protests Nov. 24, for improving Madison Ave. and 40th St., involving 127,700 sq.ft. 6-in. asphalt paving, 1841 ft. 5-in. and 332 ft. 4-in. cast-iron pipe, 4 hydrants, etc. 11-1

SAN FRANCISCO, CALIF.—Plans by City Engineer's Office for grading Section A of Alemany Blvd. from Mission St. to Bayshore Highway. $300,000. 10-25

SEBASTOPOL, CALIF.—Plans by City Engr., protests Nov. 3, for improving Burnett St., involving 13,000 sq.ft. 5-in. concrete paving. 10-25

TAFT, CALIF.—Plans by City Engr., protests Nov. 17, for sidewalks, curbs, gutters, etc., on San Emidio St. and Lower Second St. 10-23

BIDS BEING RECEIVED

FRESNO, CALIF.—Bids to Nov. 14 by County for paving Mt. Whitney Avenue in town of Riverdale, Road District No. 13, work consisting of 2500 lin.ft. of paving to be 45 ft. wide, consisting of 3-in. Permanite asphalt concrete surface, and 5000 lin.ft. of curbs and gutters. Plans from Engineer, Chas. E. Sloan, Santa Fe Bdg., San Francisco. 11-1

LONG BEACH, CALIF.—Bids to 2 p.m., Nov. 17, by City for improving Wilmington Blvd. between Pico Ave. and Perris Ave. Work involves grading complete, 143,392 sq.ft. concrete paving, 160 ft. 6-in. cast-iron pipe, 5460 ft. 4-in. cast-iron pipe, 20 gate valves. 10-25

SACRAMENTO, CALIF.—Bids to 2 p.m., Nov. 26, by California Division of Highways, Sacramento, for (1) IMPERIAL COUNTY—6 miles from Araz to Yuma, involving 211,900 cu.yd. roadway excavation, 29,100 tons asphalt concrete paving, 131 M ft. BM redwood timber, corr. pipe, etc.; and (2) SANTA CLARA COUNTY—10.7 miles from San Felipe to 1 mile east of Bell Station, involving 191,000 cu.yd. roadway excavation, 35,300 cu.yd. creek run gravel base, 12,100 tons broken stone, 950 tons emulsified asphalt, 1240 bbl. light fuel oil, corr. pipe, concrete structures, etc. 10-29

SACRAMENTO, CALIF.—Bids to 2 p.m., Nov. 19, by California Division of Highways for: (1) MARIN COUNTY—3 miles grading from Alto to Waldo, involving 300,000 cu.yd. roadway excavation, 2,400,000 sta.yd. overhaul, 3980 cu.yd. structure excavation, 7500 tons broken stone, 390 tons Emulsified asphalt, 18,900 tons crusher run base, concrete structures, timber piling, 4500 tons riprap, etc.; and (2) SANTA BARBARA COUNTY—0.3 mile at Nokoqui Creek, involving 20,300 cu.yd. roadway excavation, 800 cu.yd. concrete in paving and structures, etc. 10-22

SAN DIEGO, CALIF.—Bids to Nov. 17 by City for improving Eads Ave., involving 191,155 sq.ft. 6-in. concrete paving, 3807 ft. 6-in. cast-iron pipe, 5 hydrants, concrete sewers, etc. 11-1

SAN FRANCISCO, CALIF.—Bids to 2:30 p.m., November 12, by the Playground Commission, Room 376, City Hall, San Francisco, for grading playground site located at the junction of Ocean Avenue and Aptos Avenue adjoining the Aptos School. Work involves 40,000 cu.yd. of excavation. 11-3

SANTA ANA, CALIF.—Bids to 11 a.m., Nov. 12, by County for repaving portions of Laguna Road. 10-24

STOCKTON, CALIF.—Bids to 11 a.m., Nov. 17, by County for improving 3.5 miles of Manteca Road Division Ave. from Ave. B to Ferry Road. 10-30

DENVER, COLO.—Bids to 10 a.m., Nov. 7, by State for: (1) Improving 6 miles from Fraser to Granby, GRAND COUNTY, involving 80,000 cu.yd. excavation, 22,500 tons gravel or rock surfacing, concrete structures, corr. pipe, etc.; and (2) 1 mile of roadway and overhead crossing in FREMONT COUNTY from Florence to Portland, involving 63,500 cu.yd. roadway excavation, 1010 cu.yd. concrete, 117,000 lb. reinf. steel, corr. pipe, concrete piling, etc.

DENVER, COLO.—Bids will be received early in the season of 1931 by the Bureau of Public Roads, 301 Custom House Bdg., Denver, Colo., for constructing or improving Proj. 1-A-2, 1-B, and 1-C-1 surfacing and oiling (Obsidian Cliff-Firehole Cascades) of the Grand Loop National Park Highway, located within the Yellowstone National Park, Wyoming. The length of the project to be constructed or improved is approximately 24 miles and consists of applying on a previously graded road, two courses of crushed rock or crushed gravel surfacing, and oil processing of the top course. Also, the rebuilding of a cement rubble masonry wall at Gibbons Falls on Sec. B. This project extends from the Obsidian Cliff, located between Mammoth and Norris Junction, and the Firehole Cascades, located between Madison Junction and Old Faithful. This information is issued at this time so that prospective bidders may look over the location before it becomes covered with snow, as the bids will be opened in the early part of the spring before snow is gone, which would usually preclude any determination of the character of the work. The engineer of the Bureau of Public Roads has rough draft plans of the proposed work on the ground of the improvement which may be inspected by responsible contractors up to Nov. 15, 1930. 10-23

DENVER, COLO.—Bids will be received early in the season of 1931 by the Bureau of Public Roads, 301 Custom House Building, Denver, Colorado, for constructing and improving Project 1-A, B, C, and D, surfacing and oiling of the North and South Highway, located within the Mesa Verde National Park, County of Montesuma, Colorado. The length of the project to be constructed or improved is approximately 7.45 miles and consists of placing on a previously graded road two courses of crushed rock or crushed gravel surface and the oil processing of the top course. This project extends from the North Entrance of the Mesa Verde National Park to Engineer's station 630, near the head

of Moccasin Canyon. This information is issued at this time so that prospective bidders may look over the location before it becomes covered with snow, as the bids will be opened in the early part of the spring before snow is gone, which would usually preclude any determination of the character of the work. The engineer of the Bureau of Public Roads has rough draft plans of the proposed work on the ground of the improvement which may be inspected by responsible contractors up to Nov. 15, 1930. 10-23

DENVER, COLO.—Bids will be received early in the season of 1931 by the Bureau of Public Roads, 301 Custom House Bdg., Denver, Colorado, for constructing or improving Project 5-A, B, and C Oiling of the East Entrance Highway, located within the Yellowstone National Park, State of Wyoming. The length of the project is 16 miles and includes the oil processing of the top three inches of a previously graded and surfaced road extending from East Entrance of Yellowstone National Park to Lake Butte. This information is issued at this time so that prospective bidders may look over the location before it becomes covered with snow, as bids will be opened in the early part of the spring before snow is gone, which would usually preclude any determination of the character of the work. The engineer of the Bureau of Public Roads has rough draft plans of the proposed work on the ground of the improvement which may be inspected by responsible contractors up to November 15, 1930. 10-23

HELENA, MONT.—Bids to 9:30 a.m., Nov. 7, by State Highway Comm. for: (1) 20,000 cu.yd. gravel surfacing on Lewiston-Grass Range Road, FERGUS COUNTY; (2) 16,000 cu.yd. gravel surfacing on 9 miles of Grass Range-Jordan Road, FERGUS COUNTY; (3) 15 miles Miles City-Broadus Road, CUSTER COUNTY, involving 267,656 cu.yd. roadway excavation, corr. pipe, etc.; (4) 42,000 cu.yd. gravel surfacing on 18 miles of Shelby-Cut Bank Road, TOOLE AND GLACIER COUNTIES; (5) 9 miles of Stryker-Roosville Road, LINCOLN COUNTY, involving 244,500 cu.yd. roadway excavation, etc.; and (6) 10 miles Kalispell-Belton Road, FLATHEAD COUNTY, involving 189,993 cu.yd. roadway excavation, etc.

OLYMPIA, WASH.—Bids to 10 a.m., Nov. 18, by Washington State Highway Comm. for SNOHOMISH COUNTY—Widening shoulders on about 2.2 miles of State Road No. 1, Everett south, involving 8360 cu.yd. excavation; YAKIMA COUNTY—7.6 miles of State Road No. 3, Grandview to Sunnyside, Fed. Aid Project No. 132-H, involving 101,880 cu.yd. excavation; KLICKITAT COUNTY—3 miles of State Road No. 8, Wishram Hill to Museum, Fed. Aid Proj. No. 174-C, involving 65,320 cu.yd. excavation; and GRAYS HARBOR COUNTY—2.9 miles State Road No. 9, Thurston-Grays Harbor County Line to Oakville, involving 15 acres clearing, 107,210 cu.yd. excavation. 10-25

OLYMPIA, WASH.—Bids to 10 a.m., Nov. 25, by State Highway Dept. for: (1) WALLA WALLA COUNTY—4.2 miles, Wallula east, involving 246,730 cu.yd. excavation; (2) FERRY COUNTY—0.7 mile, Republic vicinity, involving 89,610 cu.yd. excavation, 62 cu.yd. concrete, timber bridge 191 ft. long; (3) KLICKITAT COUNTY—5.3 miles, Goldendale northeast, involving 108,410 cu.yd. excavation; and (4) CLALLAM COUNTY—9.3 miles, end of pavement to Sequin, involving 285,120 cu.yd. excavation, 1581 cu.yd. concrete. 11-1

BIDS RECEIVED

LOS ANGELES, CALIF.—Chas. A. Ladeveze, 8459 Elizabeth Street, South Gate, who bid $5633, submitted low bid to the Division of Highways, Office of the District Engineer, Los Angeles, for furnishing and applying heavy fuel oil to roadbed between La Canada and two and one-half miles northerly in LOS ANGELES COUNTY, a distance of 2.4 miles. 10-30

LOS ANGELES, CALIF.—A. D. Chalmers, 305 Coolidge Avenue, Los Angeles, $109,645 low to Board of Public Works for the improvement of streets in Sunshine Terrace and Blue Canyon Drive Improvement District, grading, paving with concrete, concrete curbs, storm drains, sanitary sewers, and water system. 10-31

OAKLAND, CALIF.—J. H. Fitzmaurice, 354 Hobart St., Oakland, low bid to City for sidewalks, curbs, and gutters on Harrison St. from First to Fourth Sts. 10-30

REDWOOD CITY, CALIF.—Hanrahan Co., Standard Oil Bdg., S. F., $15,075 low bid to County for improvement of portion of Hillside Blvd., paving with asphalt. 11-3

SACRAMENTO, CALIF.—Dan Munro, 1355 Quintero, Los Angeles, who bid $18,525, submitted lowest regular bid to California Division of Highways for 5.3 miles clearing in LOS ANGELES COUNTY from 4 miles north of La Canada to Colby Canyon. 10-22

SAN DIEGO, CALIF.—Street Improvement Co., 3028 Gilroy St., Los Angeles, $29,500 low bid to Public Works Officer, 11th Naval Dist., for oil treating Flying Field Areas 2 and 3 at Air Station. 11-1

SAN FRANCISCO, CALIF.—C. B. Eaton, 715 Ocean Ave., S. F., $19,215 low for improving Cayuga Ave. from Oneida Ave. to Seneca Ave. and from Otsego Ave. to Alemany Blvd., grading, vitr. sewers, and paving with concrete base and asphalt surface. 10-30

DENVER, COLO.—Low bids as follows by State: (1) C. A. Switzer, Arvada, Colo., $91,500 low for grading and gravel surfacing and bridges on 2 miles from Hayden to Craig, ROUTT COUNTY; (2) Blanchard Bros., Denver, Colo., $144,200 for 10 miles grading and surfacing near Fort Collins, LARIMER COUNTY; and (3) Mt. States Const. Co., Pueblo, Colo., $25,650 low for 2 miles grading near Parlin, GUNNISON COUNTY.

PORTLAND, ORE.—Low bids as follows by Oregon State Highway Comm.: (1) LANE COUNTY—C. R. Johnson, 309 14th St. North, Portland, Ore., $96,077 low for 4.46 miles grading Lincoln County Line-China Creek Sect. of Roosevelt Coast Highway; and (2) WASCO AND CLACKAMAS COUNTIES—Fisher Brothers, Oregon City, who bid $30,048, low for furnishing broken stone for the Mt. Hood-Bear Springs Section of the Wapinitia Highway. 11-3

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Phoenix-Tempe Stone Co., Phoenix, $44,150 for Warrenite Bit. paving Polk St., 15th Ave., etc., for City.

LONG BEACH, CALIF.—To Sully Miller Contracting Co., 1500 W. 7th St., Long Beach, who bid $75,145 to City for paving Wardlow Road between Long Beach Blvd. and Cherry Street with concrete. 11-3

LOS ANGELES, CALIF.—To Hall-Johnson Co., 905 Westminster St., Alhambra, who bid $116,775 for improvement of Sunset Blvd. and Ellis Lane, between Duarte Road and Pomona Blvd., 2.5 miles at Temple, for County, involving grading, paving with 2-in. Warrenite Bit. surface with 4-in. asphalt base, etc. 10-30

MENLO PARK, CALIF.—To B. F. Cain, Menlo Park, $6365 for improving Hoover St., paving with 4-in. waterbound rock base with ½-in. Colas surface for City. 10-22

MONTEREY, CALIF.—To E. H. Sundberg, Pacific Grove, who bid $2185 to the City of Monterey for construction of a brick pavement in and over the recreational area in the Friendly Plaza in the City of Monterey, California, adjoining Colton Hall Park. 10-30

SACRAMENTO, CALIF.—To R. E. Hazard Contracting Company, 2528 Kettner Boulevard, San Diego, who bid $489,125 to the California Division of Highways, Public Works Building, Sacramento, for 13.1 miles grading and asphalt paving from Arroyo Salado to northerly boundary, in IMPERIAL COUNTY. (See Unit Bid Summary.) 10-28

SACRAMENTO, CALIF.—To McGillivray Const. Co., Capitol National Bank Bdg., Sacramento, $8500 for asphalt shoulders on Fairoaks Blvd. and $1200 for asphalt shoulders on 65th St. for County. 10-31

SACRAMENTO, CALIF.—To Chigris & Sutsos, 2211 18th St., San Francisco, who bid $15,020 to the California Division of Highways, Sacramento, for grading and surfacing 0.4 of a mile at High Rock Hill, HUMBOLDT COUNTY. 10-24

SAN DIEGO, CALIF.—To Griffith Co., 2104 Main St., San Diego, $10,912 for improving Sixth St. from Date to Laurel Sts., grading, asphalt paving, etc., for City. 10-29

SAN FRANCISCO, CALIF.—Award recommended to A. C. Goerig, 413 Fairview Ave. North, Seattle, $627,224 for grading and tunnel construction of Sect. A5, Route 2, Wawona Route, and Sect. B2, Route 1, South Road, Yosemite National Park, for Bureau of Public Roads (See Unit Bid Summary, Oct. 25th issue.) 10-21

SAN FRANCISCO, CALIF.—To Nate Lovelace, 3433 N Street, Sacramento, who bid $99,653 to the bureau of Public Roads for 3.4 miles grading Section A, Route 21, Deer Creek National Highway, Lassen National Forest, TEHAMA COUNTY. 10-21

STOCKTON, CALIF.—To L. Moreing, Hotel Stockton Annex, Stockton, $9504 to County for grading and oiled rock surfacing of 1.47 miles of Bruml Road at Lockeford. 10-28

DENVER, COLO.—Awards of contract recommended as follows by Bureau of Public Roads: (1) To Utah Const. Co., Ogden, Utah, $81,653 for 5 miles grading Rabbit Ears Pass Project, Routt Forest, GRAND AND JACKSON COUNTIES, COLORADO; and (2) To A. R. Mackay, Ft. Morgan, Colo., $75,147 for 5 miles grading Black Mesa Project, Gunnison Forest, GUNNISON COUNTY, Colo.

BOISE, IDA.—Contracts awarded as follows: (1) To Sutherland & Burns, Missoula, Mont., $15,805 for 2 miles grading from Challis south, CUSTER COUNTY; (2) To Wheeler & England, Moreland, Ida., $31,382 for grading and surfacing 2 miles from Harrison north, KOOTENAI COUNTY; (3) To Wheeler & England, Moreland, Idaho, $69,741 for 8 miles grading and gravel surfacing from Chester to Ashton, FREMONT COUNTY; and (4) To Idaho Contracting Co., Boise, Ida., $43,811 for 10 miles gravel surfacing from Bridge to Utah Line, CASSIA COUNTY.

BOISE, IDA.—To Allsop & Pond, Grace, Ida., $14,792 for 4.6 miles grading from Henry to Wayan, CARIBOU COUNTY, for State.

MISSOULA, MONT.—Award recommended to L. T. Lawler, Lewisohn Bdg., Butte, Montana, $37,413 for 3.3 miles grading Pipestone Pass Project, Deer Lodge National Forest, Montana, for Bureau of Public Roads.

MISSOULA, MONT.—Award of contracts recommended as follows by Bureau of Public Roads: (1) To L. T. Lawler, Butte, Montana, $75,278 for grading 10.14 miles Clarks Fork Highway, Cabinet National Forest, SANDERS COUNTY, Montana; and (2) To L. T. Lawler, Butte, Montana, $35,908 for 3.2 miles grading Pipestone Pass Project, Deer Lodge, National Forest, JEFFERSON COUNTY, Montana.

ALAMOGORDO, N. M.—To J. W. Zempter, Amarillo, Tex., $51,435 for paving with Bitumuls streets for City in Dist. 1.

PORTLAND, ORE.—Awards as follows by Oregon State Highway Comm.: UMATILLA COUNTY—To Knute Lien, La Grande, Oregon, $30,220 for furnishing broken stone for the Adams-Milton Creek Section of the Oregon-Washington Highway; DESCHUTES AND CROOK COUNTIES—To Rust Brothers, Blachly, Oregon, who bid $19,952 for grading 3.11 miles of Middle Unit, Bear Creek-Millican Section of the Crooked River Highway; JACKSON COUNTY—To Morrison Trucking Company, Foot of E. Salmon Street, Portland, Oregon, who bid $122,179 for regrading and resurfacing Eagle Point-Trail Section of the Crater Lake Highway; LANE COUNTY—To Saxton & Looney, Corvallis, Oregon, who bid $79,440 for surfacing 9.27 miles of the Hendricks Bridge-Doyle Hill Section of the McKenzie Highway; LANE COUNTY—To William Endicott, Madras, Oregon, who bid $98,363 for grading 3.83 miles of Lincoln County Line-China Creek Section of the Roosevelt Coast Highway; and UMATILLA COUNTY—To Clyde R. Seitz, La Grande, Oregon, who bid $26,085 for furnishing 21,000 cu.yd. broken stone for the Pendleton-Emigrant Hill Section of the Old Oregon Trail. 11-3

SALT LAKE CITY, UTAH—To Morrison-Knudsen Company, Boise, Idaho, who bid $129,348 to the State Road Commission for grading 5.305 miles between Thistle and Castella in UTAH COUNTY. (See Unit Bid Summary.) 10-30

PORT ANGELES, WASH.—To A. Feldscham, Hillsboro, Ore., $20,608 for constructing sidewalks for City.

SEATTLE, WASH.—Awards as follows by County: (1) To Kesterson, Fisher & House, Inc., Seattle, $16,305 for 3 miles grading and gravel surfacing Old Military Road; (2) To N. Fiorito, Seattle, $26,820 for grading 1 mile of Maple Valley-Black Diamond Road; and (3) To Rogers & Olds, 1947 Jefferson Ave., Tacoma, $9530 for 1.5 miles grading at Vashon Heights.

BRIDGES and CULVERTS

WORK CONTEMPLATED

OAKLAND, CALIF.—Preliminary plans and specifications are being prepared by County Surveyor, George A. Posey for the construction of Park Bridge to be Bascule Type with a 250-ft. clear span—$700,000. Application for permit will be filed with the War Department shortly. 10-28

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Bids to 2 p.m., Nov. 17, by County for timber bridge on Ellis Lane over Eaton Wash. 10-30

MERCED, CALIF.—Bids to 11 a.m., Nov. 12, by County for: (1) Bridge No. 218, concrete, over canal on County Road in Road District No. 3; (2) Bridge No. 219, concrete, over canal on County Road in Road District No. 3; (3) Bridge No. 220, concrete, over canal on County Road in Road District No. 3; (4) Bridge No. 221, concrete, over canal on County Road in Road District No. 3; (5) Bridge No. 222, concrete, over canal on County Road in Road District No. 3; (6) Bridge No. 223, concrete, over canal on County Road in Road District No. 3; (7) Bridge No. 224, 400-ft. timber pile bridge on the Fremont Ford Road, in Road District No. 4. 10-29

SACRAMENTO, CALIF.—Bids to 2 p.m., November 26, by the California Division of Highways, Sacramento, for the construction of a bridge in MARIN COUNTY over Richardson's Bay and over the tracks of the Northwestern Pacific Railroad Co. at Manzanita. Work involves: 60,000 ft. douglas fir piles, 32,850 ft. redwood piles, 1100 cu.yd. concrete, 72,000 lb. reinf. steel, 315,000 lb. structural steel, 1120 M ft. BM redwood, etc. 10-29

SACRAMENTO, CALIF.—Bids to 2 p.m., Nov. 19, by California Division of Highways for substructure for bridge over North Fork of Feather River at Pulga, BUTTE COUNTY, involving 230 cu.yd. tunnel excavation, 1000 cu.yd. concrete, 31,600 lb. reinf. steel. 10-22

HELENA, MONT.—Bids to 9:30 a.m., Nov. 7, by State Highway Comm. for bridges and structures on Section A, Miles City-Broadus Road, CUSTER COUNTY, involving 85,100 lb. structural steel, 148 M ft. b.m. timber, 131 20-ft., 62 25-ft., 4 30-ft., 9 35-ft., and 4 40-ft. timber piles, etc.

OLYMPIA, WASH.—Bids to 10 a.m., Nov. 25, by Washington State Highway Dept. for: (1) KING COUNTY—Bridge over Snoqualmie River on State Road No. 2, involving 220-ft. steel span, 2 35-ft. and 3 50-ft. concrete girder approach spans; and (2) KLICKITAT COUNTY—Bridge over Little Klickitat River on State Road No. 8, involving 1 90-ft. steel span, 2 30-ft. concrete girder approach spans. 10-31

BIDS RECEIVED

EUREKA, CALIF.—Smith Brothers Company, Eureka, who bid $4247 to the District Engineer, California Division of Highways, Eureka, awarded contract for replacing timber lift span of bridge over Eureka Slough at Eureka, HUMBOLDT COUNTY. 10-28

LONG BEACH, CALIF.—R. Palmquist, 912 Sunbury Ave., Los Angeles, who bid $19,875, submitted low bid to the City of Long Beach for constructing concrete retaining wall and returns and two stairways along the ocean bluff. 10-30

OAKLAND, CALIF.—V. DiZillo, 1022 53rd St., Oakland, low bid to City for reinf. conc. retaining wall on Hopkins St. and High St. to cost about $6000. 10-30

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) SAN MATEO COUNTY—Bodenhamer Const. Co., 4866 Mansfield Ave., San Diego, $35,756 low for reinf. conc. bridge over Redwood Slough near Redwood City; and (2) LOS ANGELES COUNTY—Robt. E. McKee, Central Bdg., L. A., $29,785 low for concrete bridge over Santa Fe RR. at Manhattan Beach. 10-29

SAN LUIS OBISPO, CALIF.—San Atas Construction Co., San Luis Obispo, $9483, low bid to District Engr., California Division of Highways, for repairing timber bridge over San Carpojo Creek, 11 miles north of San Simeon, SAN LUIS OBISPO COUNTY. 10-29

CONTRACTS AWARDED

TUCSON, ARIZ.—To J. J. Garfield Building Co., Tucson, Arizona, who bid $71,398 to the City for reinforced concrete culvert covering the Arroyo, to be 8 by 10 ft., and 2010 ft. long. (See Unit Bid Summary, Oct. 25th issue.) 10-22

OAKLAND, CALIF.—To C. J. Nystedt, 3281 Lakeshore Avenue, Oakland, $15,536 to County for repairs to Fruitvale Avenue Bridge. 10-21

SACRAMENTO, CALIF.—To Geo. J. Ulrich Construction Co., P.O. Box 773, Modesto, who bid $11,462 to the California Division of Highways, Sacramento, for widening 5 concrete bridges in SOLANO COUNTY, from Vacaville to Dixon. 10-24

SAN LUIS OBISPO, CALIF.—To Wm. Lane, Paso Robles, $4988 to Dist. Engr., California Division of Highways, for timber bridge over Santa Maria River near Santa Maria, SANTA BARBARA COUNTY. 10-28

SANTA ANA, CALIF.—To W. M. Ledbetter, 5399 Alhambra Ave., Los Angeles, who bid $5280 to the County Board of Supervisors, Santa Ana, for the construction of a wooden bridge over Coyote Creek on the Buena Park-La Habra Road. 10-30

STOCKTON, CALIF.—To J. Hachman, P.O. Box 206, Stockton, $1180 for concrete and timber bridge over Little John Creek on Kaiser Road for County. 10-28

YUBA CITY, CALIF.—To M. A. Jenkins, 36th and Y Sts., Sacramento, $11,000 for two reinf. concrete bridges near Robbins for Joint Highway Dist. 12. 11-1

BOISE, IDA.—To Dan J. Cavanagh, Twin Falls, Ida., $14,994 for concrete bridges over Raft River and Minidoka Canal for State, CASSIA COUNTY.

PORTLAND, ORE.—To Hargreaves & Lindsay, Eugene, Ore., $17,980 for reinf. conc. bridge over Pudding River near Hubbard, CLACKAMAS AND MARION COUNTIES, for State.

SALT LAKE CITY, UTAH—Awards as follows by State: (1) To Moss Bros., 2656 Chadwick St., Salt Lake City, Utah, $8602 for three wooden frame trestles in JUAB COUNTY; (2) To Ora Bundy, Ogden, Utah, $6778 for timber bridges over Saleratus and Otter Creeks, RICH COUNTY; and (3) To L. S. Fetzner, Templeton Bdg., Salt Lake City, $3151 for timber bridge over Curlew Creek, BOX ELDER COUNTY.

SPOKANE, WASH.—To C. A. Power, Spokane, Wash., $33,100 for reinf. concrete bridge over south channel of Spokane River at Howard St. for City.

SEWER CONSTRUCTION

WORK CONTEMPLATED

PHOENIX, ARIZ.—Plans by Engrs., C. C. Kennedy, Call Bdg., San Francisco, and Holmquist & Maddock, Phoenix, Ariz., and will be presented to City about Dec. 15, for sewage treatment plant and mains, to cost $1,000,000. 11-3

REDWOOD CITY, CALIF.—Plans by County Surveyor, Geo. A. Kneese, protests Dec. 1, for vitr. sewer system at Colma, to cost $145,000. 11-3

WESTMORELAND, CALIF.—Plans by Currie Engineering Co., Anderson Bdg., San Bernardino, San Bernardino County, and protests November 13 by the Westmoreland Sanitary District, Westmoreland, Imperial County, for constructing 20,000 lin.ft. of 8-in. to 12-in. vitrified pipe. 1911 Act. 10-27

SEATTLE, WASH.—Plans by City Engr., R. H. Thomson, and City Sanitary Engr., E. F. Chase, for Charleston St. unit of Lake Washington intercepting sewer system, involving 546 lin.ft. 8-in., 3596 lin.ft. 15-in., and 1145 lin.ft. 21-in. vitrified sewer, 3468 lin.ft. 42-in. concrete sewer, 3 pumping plants and grit chamber, 2 gate chambers, 2 overflow manholes, 2 6-in. pumps, 1000 g.p.m., 20-ft. head, 1 6-in. pump, 1000 g.p.m., 40-ft. head, 2 12-in. pumps, 3600 g.p.m., 40-ft. head. $180,000. 11-3

BIDS BEING RECEIVED

BAKERSFIELD, CALIF.—Bids to 5 p.m., Dec. 1, by City for 1333 ft. 6-in. concrete pipe sewer in Dist. 609. 11-1

BIDS RECEIVED

RICHMOND, CALIF.—A. W. Kitchen, 110 Market St., S. F., $16,730 low for 100 ft. 6 by 6-ft. monolithic concrete storm sewer at Richmond Inner Harbor for Berkeley Waterfront Co. 10-28

SAN FRANCISCO, CALIF.—Low bids as follows by Board of Public Works: (1) J. Varano, 1648 Grant Ave., S. F., $21,905 low for vitr. sewers on Sect. C, Alemany Blvd. storm drain system; and (2) L. J. Cohn, 1 DeHaro St., S. F., $11,961 low for reinf. concrete sewer on Army St. from Pennsylvania Ave. to Mississippi St. 10-29

CONTRACTS AWARDED

OAKLAND, CALIF.—To W. J. Tobin, 527 Balfour Avenue, Oakland, $23,448, using plain and reinforced concrete pipe conduits, for sewers in Hopkins Street, Midvale Avenue, etc., for City. 10-21

RIVERSIDE, CALIF.—To C. Stahlman, 1455 Cypress Avenue, Riverside, $17,900 to the City for storm drain from the Riverside Water Company's canal to Tequesquite Arroyo, involving reinf. conc. pipe ranging from 36-in. to 54-in. dia. with 53-in. gates, corrugated iron pipe, etc. 10-23

SAN DIEGO, CALIF.—To F. A. Rhodes, 4066 Lark Street, San Diego, $26,000 to the City for sewage disposal plant and sanitary sewer system at the site of the San Diego State Teachers College. 10-21

WESTMORELAND, CALIF.—To Chas. E. Farrell, El Centro, who bid $12,980 to the Westmoreland Sanitary District, Westmoreland, Imperial County, for constructing Imhoff tank and vitrified outfall for City. 10-27

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

PALO ALTO, CALIF.—Formation election will be held November 3rd, by the Santa Clara County Water Works District No. 1, which district contemplated the installation of a water system to serve a portion of South Palo Alto, Santa Clara County. If formation of district is approved by County Supervisors of Santa Clara County, the district will then hold bond election to vote on issuing bonds in the amount of $30,630 for water improvements. Plans and specifications are to be prepared by Consulting Engineers, Burns-McDonnell-Smith Engineering Company, Western Pacific Building, Los Angeles. 10-28

SAN DIEGO, CALIF.—Plans by H. W. Jorgensen, City Engr., protests Nov. 17, for 3288 ft. 6-in. 'B' cast-iron pipe and 4 hydrants in Blocks 71, 78, 98, 106, and 127, City Heights. 10-21

SAN JOSE, CALIF.—Preliminary plans and specifications are being prepared by City Engineer, W. L. Popp, City Hall, San Jose, Santa Clara County, for the construction of an earth fill dam in Alum Rock Park at Cherry Flats. Call for bids will be issued by the City Council

about December 15. Estimated cost is $50,000. Investigation of damsite is now in progress. 10-28

SANTA CRUZ, CALIF.—Plans by City Engr., R. Fowler, for 8800 ft. 20-in. cast-iron pipe from Crossing St. pumping plant to Bay St. Reservoir. City will advertise for bids for pipe in about one month, and City will install same. 10-21

WALNUT CREEK, CALIF.—The City Council has accepted the recommendation of Andrew M. Jensen, Consulting Engineer, 68 Post Street, San Francisco, and has signed a contract with the California Water Service Company, Federal Reserve Bank Bdg., San Francisco, to purchase water at wholesale for the supply of the municipality. The City will hold a bond election in the spring to vote on issuing bonds in the amount of $50,000 to $60,000, for the construction of a distributing system. 10-28

HAWTHORNE, NEV.—Plans by Bureau of Yards & Docks, Washington, D. C., bids in about a month or so, for the construction of a reservoir at the Naval Ammunition Depot, Hawthorne, Nevada. $150,000. 11-1

SEATTLE, WASH.—Plans by City Water Supt., William B. Severyns, City Hall, Seattle, Washington, and bids will be called for shortly: (1) Two steel standpipes, each with capacity of 1,000,000 gallons, to be constructed at Fourth Ave. SW. and W. Trenton Street, each to be 30 ft. high and 92 ft. in diameter, cost $75,000; and (2) Construction of 75,000,000-gallon reservoir at West Barton Street and W. Cloverdale Street, cost $700,000. R. H. Thomson is City Engineer of Seattle. 10-24

BIDS BEING RECEIVED

PHOENIX, ARIZ.—Plans by Engr., C. C. Kennedy, Call Bdg., San Francisco, bids to be opened December 2 by City, for water system improvements consisting of main supply line 25 miles in length to a new reservoir of 20,000 gallons capacity, and 6½ miles of pipe-line to city, also improvements to distribution system. Bids will be taken on alternative routes for the main supply line, one route to have 20,000 lin.ft. of 5½ by 7-ft. tunnel and the alternate route to have tunnels 3000 and 2500 ft. long. Alternative bids will be taken on cast-iron pipe; welded steel pipe; and reinforced concrete pipe in sizes of 54-in., 48-in., and 45-in. The pipe-line from the reservoir to the City will be 6½ miles in length, of 48-in., 45-in., and 36-in. cast-iron pipe; or welded steel pipe; or lock joint pipe; or Hume centrifugally cast reinf. concrete pipe; or steel pipe centrifugally lined with concrete and gunite coating on outside. Work will also include a sand removal apparatus. $2,200,000. Bonds have been sold for the above improvements. 11-3

BEVERLY HILLS, CALIF.—Bids to 8 p.m., Nov. 12, by City for reinf. conc. sedimentation basin, mixing tanks, clarifier structure at Water Treatment Plant No. 2. $28,000. 10-24

MONTEREY, CALIF.—Bids up to 10:30 a.m., November 25, by J. W. Denton, Captain, G. M. C., Quartermaster, Presidio of Monterey, Monterey County, California, for: (1) Water system extension, involving 750 ft. 6-in. cast-iron pipe, 7 fire plugs, also valves and fittings (Government will furnish pipe, contractor to furnish balance); and (2) Drainage system, involving 250 ft. 12-in. Armco drainage pipe, 1000 lin.ft. concrete gutter. 10-31

WASHINGTON, D. C.—Bids to 10:30 a.m., November 24, by the General Purchasing Officer, The Panama Canal, Washington, D. C., for furnishing an elevated steel tank. Schedule 2602 on the above work may be obtained from Assistant Purchasing Agents, Fort Mason, San Francisco, Calif. 10-30

RENTON, WASH.—Bids to 5 p.m., November 11, by City Clerk, Agnes Edwards, Renton, Wash., for furnishing 850 water meters. 10-29

RENTON, WASH.—Bids to 5 p.m., Nov. 18, by City for: (1) 4200 ft. 10-in. 'B' cast-iron pipe; and (2) 850 water meters.

BIDS RECEIVED

SAN FRANCISCO, CALIF.—Western Pipe & Steel Co., 444 Market St., S. F., $671,507 using Lock-bar steel pipe and $648,867 using welded steel pipe, only regular bid to Board of Public Works for 12 miles of 44-in. and 36-in. pipe line to connect with system of East Bay Municipal Utility District and to run from San Lorenzo to near Newark, Alameda County. (See Unit Bid Summary.) 10-29

CONTRACTS AWARDED

BEVERLY HILLS, CALIF.—To Lee R. Weber, 603 20th Street, Santa Monica, Calif., who bid $4853 to City for 2610 ft. of 6-in. and 8-in. cast-iron pipe-lines. 10-24

LOS ANGELES, CALIF.—Awards as follows by L. A. City Purchasing Dept.: (1) Contract awarded to Pacific States Cast Iron Pipe Co., Los Angeles, who bid 64½¢ per lin.ft. for 30,000 lin.ft. 6-in. cast-iron pipe, f.o.b. Hewitt St. Yard; (2) Contract awarded to National Cast Iron Pipe Co., Los Angeles, who bid 65¢ per lin.ft. for furnishing 30,000 ft. 6-in. cast-iron pipe f.o.b. Hewitt St. Yard; (3) Contract awarded to American Cast Iron Pipe Co., Los Angeles, who bid as follows: 65¢ per lin.ft. for furnishing 30,000 lin.ft. 6-in. cast-iron pipe, f.o.b. Compton Avenue and Slauson St. Yard and 95½¢ per lin.ft. for furnishing 30,000 lin.ft. 8-in. cast-iron water pipe f.o.b. Hewitt St. Yard; and (4) Contract awarded to U. S. Pipe & Foundry Co., Wright & Callender Bdg., Los Angeles, who bid as follows for cast-iron pipe: 61¢ per lin.ft. for furnishing 10,000 lin.ft. 6-in. cast-iron pipe, f.o.b. First and Meyler St. Yard; 91¢ per lin.ft. for furnishing 20,000 lin.ft. 8-in. cast-iron pipe, f.o.b. Slauson and Compton Ave. Yard; 92¢ per lin.ft. for furnishing 10,000 lin.ft. 8-in. cast-iron pipe, f.o.b. Aetna and Vesper St. Yard; $2 per lin.ft. for furnishing 10,000 lin.ft. 12-in. cast-iron pipe, f.o.b. Aetna and Vesper St. Yard. 10-24

LOS ANGELES, CALIF.—To Western Pipe & Steel Co., Los Angeles and San Francisco, who bid $110,190 as follows for furnishing to City Purchasing Agent welded steel pipe, coated with McEverlast protective coating: 6720 ft. 54-in. pipe (11/32-in. plate), $6.65 ft.; 1176 ft. 54-in. pipe (⅜-in. plate), $6.20 ft.; 10,585 ft. 40-in. pipe, $5.50 ft. 11-1

LOS ANGELES, CALIF.—To Water Works Supply Co., 2326 E. 8th Street, Los Angeles, who bid as follows for furnishing gate valves: 150 12-in. gate yaives, $70.80 ea.; 20 16-in. upr. geared gate valves, $180.85 ea.; 10 20-in. upright geared gate valves and by-passes, $338 ea. 11-1

OCEANSIDE, CALIF.—To F. A. Rhodes, 4066 Lark St., San Diego, $17,527 for cast-iron mains, valves, hydrants, etc., in So. Oceanside for City. (See Unit Bid Summary.) 10-31

STRATFORD, CALIF.—To E. W. Redman, Dudley St., Fresno, $20,787 to Stratford Public Utility District for water improvements, involving welded casing, 30,000-gal. steel tank, pumps, valves, hydrants, etc. J. B. Benedict, Rt. 1, Box 225, Hanford, is Engr. 10-31

PUEBLO, COLO.—To Arthur & Allen, 409 No. Grand Ave., Pueblo, $5770 for constructing reservoir embankment for City.

GRANTS PASS, ORE.—Awards as follows by City: (1) To Calvert, Calvert, Schroeder & Lium, Grants Pass, Ore., $24,709 for reservoir lining; and (2) To Geo. French, Jr., Box 675, Stockton, $25,518 for pipe laying. (See Unit Bid Summary.) 10-31

PORTLAND, ORE.—To D. P. Slater, Dallas, Ore., $26,000 for water improvements for Mt. Scott Water Dist., involving 4-in. to 2-in. pipelines, reinf. conc. reservoir and 50 g.p.m. pumping plant.

SEATTLE, WASH.—To Atlantic Const. Co., Seattle, $7808 for water mains in Magnolia Blvd. for City.

SPOKANE, WASH.—To Morrison-Knudsen Co., Boise, Idaho, who bid $81,283 for constructing one concrete tank with capacity of 1,250,000 gallons, work for the City of Spokane. 10-24

TACOMA, WASH.—Contract awarded to Pacific Water Works Supply Co., Seattle, $1923, for furnishing gate valves to City. Bids from: (1) Pacific Water Works Supply Co., $1923; (2) A. P. Smith Co. (R. L. Polk, Agent), $2226; (3) Rensselaer Valve Co., $2257; (4) Tacoma Plumbing Supply Co., $2314.

	(1)	(2)	(3)	(4)
4 24-in. valves	$295	$366	$355	$359
2 16-in. valves	$165	$159	$180	154.60
3 12-in. valves	55.00	38.40	58.00	61.60
9 6-in. valves	18.50	20.00	22.50	31.30
8 4-in. valves	10.25	11.20	12.50	12.80

10-29

MUNICIPAL IMPROVEMENTS

WORK CONTEMPLATED

SOUTH SAN FRANCISCO, CALIF.—Plans by City Engr., Geo. A. Kneese, protests Nov. 17, for improving Industrial Way, involving grading, paving, concrete storm sewers, sanitary sewers, and electroliers, etc. $200,000. 10-23

IRRIGATION and RECLAMATION

WORK CONTEMPLATED

EL NIDO, CALIF.—Bond election Nov. 17, by the El Nido Irrigation District, El Nido, Merced County, to vote on issuing bonds in the amount of $135,000 for irrigation works. Work involves the installation of: (1) Twelve miles of main canal, involving: 150,000 cu.yd. canal excavation, 65,000 sq.ft. 2-in. concrete lining; (2) Fifteen miles of lateral canals, involving: 120,000 cu.yd. canal excavation; (3) Construction of 24-in. to 48-in. siphons with headwalls, bridges, drops, stop-gates and sidegates, etc. E. E. Blakesley, care of Merced Irrigation Dist., Merced, is Engr. 10-28

SACRAMENTO, CALIF.—D. A. Foley, Grant Bdg., Los Angeles, who bid .0945¢ per cu.yd., submitted the low bid to the U. S. Engineer's Office, Sacramento, for raising the existing levee along the westerly side of Yolo Bypass, near Yolanda Station. 10-29

BIDS BEING RECEIVED

SACRAMENTO, CALIF.—Bids to 3 p.m., Nov. 19, by U. S. Engrs Office, California Fruit Bdg., Sacramento, for raising levee along west side of Yolo By-Pass, from Rec. Dist. 2068 to Liberty Island Recl. Dist., involving 157,000 cu.yd. earthwork. 10-31

BIDS RECEIVED

SACRAMENTO, CALIF.—J. R. Reeves, 12th and American River, Sacramento, $2000 low bid to City for drainage canal at Municipal Airport, involving 20,000 cu.yd. excavation. 10-31

BURLEY, IDA.—Morrison-Knudsen Co., Boise, Ida., $208,969 low bid to Bureau of Reclamation for constructing Milner-Gooding Canal, channel change, bridge, and structures. (See Unit Bid Summary.) 10-27

CONTRACTS AWARDED

MODESTO, CALIF.—To H. E. Macauley, 4157 Manila Street, Oakland, who bid as follows to Modesto Irrigation District, Modesto, Stanislaus County, for improvement of Upper Main Canal: SCHEDULE No. 1—Placing 131,500 sq.ft. of 2½-in. concrete lining and 6500 sq.ft. 2-in. concrete lining, at .069 per sq.ft. SCHEDULE No. 2—Placing with reinforcing steel of 200 cu.yd. of concrete in sidewalls, weir, etc., at $25.33 per cu.yd. SCHEDULE No. 4—Raising concrete sidewalls of Upper Canal, involving 940 cu.ft. of concrete, at $1.00 per cu.ft. District will furnish cement, the admixture, reinforcing steel and aggregates for concrete work. 10-27

HAMILTON, MONT.—To Brown & Pinson, Victor, Mont., $5325 for constructing canal for Bitter Root Irrigation Dist.

MANSON, WASH.—Awards as follows by Lake Chelan Irrigation Dist.: (1) To Rumsey & Jordan, Seattle, $9900 for excavation for pipe-line, $5025 for hauling materials; (2) To National Pipe & Tank Co., Portland, $24,300 for furnishing wood pipe; and (3) To Beall Pipe & Tank Co., Portland, $15,740 for furnishing steel pipe.

SURETY BOND AND CASUALTY INSURANCE DIRECTORY

SURETY BONDS are required on all Public Work and are being required more and more on Private Contracts. The present day contractor must be in a position to furnish corporate surety bonds guaranteeing the fulfillment of his contracts. These companies are prepared to furnish such bonds promptly for experienced and responsible contractors. Communicate with one of them and arrange for your bond before you submit your next bid.

LIGHTING SYSTEMS

WORK CONTEMPLATED

RED BLUFF, CALIF.—Plans by City Engr. for 20 electroliers on Walnut St. Protests Nov. 10. 10-23

BIDS BEING RECEIVED

VISALIA, CALIF.—Bids to 7:30 p.m., Nov. 17, by City for 51 2-light Union Metal Mfg. Co. electroliers on N. and S. Locust, N. and S. Court St., etc. 1911-15 Acts. $22,000. 10-25

CONTRACTS AWARDED

SAN RAFAEL, CALIF.—To A. C. Rice, 540 Alcatraz, Oakland, who bid $5388 to the City for installation of a street lighting system on Fourth St. from E St. to H St., work consisting of 24 Westinghouse Milton 15 trusteel stand., conduit, transformers, lamps, etc. 10-22

POWER DEVELOPMENT

WORK CONTEMPLATED

BENBOW, CALIF.—Plans by Ambursen Dam Co., Alexander Building, San Francisco, for a power project for the Benbow Company, Benbow, Humboldt County, involving construction of an Ambursen type dam to be: 375 ft. long, including 240 ft. spillway with maximum height of 25 ft. with 9-ft. flashboards and one taintor gate, one fish gate; also power house of two units to develop 350 h.p. to 700 h.p. Estimated cost of dam is $50,000. Estimated cost of the power plant is $25,000. The Benbow Company, Benbow, Humboldt County, will purchase all materials and will do the construction by their own forces. 10-28

BIDS BEING RECEIVED

PASADENA, CALIF.—Bids to 11 a.m., Nov. 28, by City for furnishing and installing following for light plant at Glenarm and Raymond Ave.: Two 15,000-sq.ft. boilers, including boiler proper, steel supporting members, super-heater water columns, valves, and appurtenances; and two sets of tubes, headers, connections, recirculators, inlet boxes and appurtenances for side, rear, and front furnace walls for use in conjunction with the boilers. 10-27

CONTRACTS AWARDED

VANCOUVER, B. C.—To General Const. Co., Ltd., Granville Island, B. C., for 350,000 cu.yd. rock excavation in connection with hydro-electric power project at Corra Linn Falls, Kottenay River, for West Kottenay Power & Light Co.

TUNNEL CONSTRUCTION

BIDS BEING RECEIVED

VANCOUVER, B. C.—Bids to 12 m., December 1, by Canadian Pacific Railway Co., Vancouver, B. C., for constructing tunnel to be 4600 ft. long and 22½ ft. high and 19 ft. to 16 ft. wide. Tunnel is to connect the Canadian Pacific Railway Company right-of-way on Burrard Inlet with the False Creek Yard. 10-27

RIVER and HARBOR WORK

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans by Chief Engr., F. G. White, State Harbor Comm., Ferry Bdg., S. F., bids soon, for substructure for Pier 23, concrete jacketed piles and reinf. conc. deck. $450,000. 11-3

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Bids to 3 p.m., December 3, by the U. S. Engineer's Office, 751 Figueroa Street, Los Angeles, for repairing the breakwater at Long Beach Harbor. 11-3

BIDS RECEIVED

RICHMOND, CALIF.—Delta Dredging Co., Pittsburg, Calif., who bid $1.65 per lin.ft., submitted low bid to Berkeley Waterfront Company, care of Engineer R. A. Beebee, 1 Montgomery Street, San Francisco. 10-29

FORT MASON, CALIF.—Healy-Tibbitts Const. Co., 64 Pine St., S. F., $1120 for repairs to East Garrison Wharf at Ft. McDowell. 10-21

MACHINERY and SUPPLIES

WORK CONTEMPLATED

CAVITE, P. I.—Bids will be called for soon by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing reciprocating air compressors at the Naval Air Station, Pensacola, Florida, and at the Naval Station, Cavite, P. I. Work includes the furnishing and installing for motor-driven and steam-driven air compressors on foundations to be furnished by the Government. Specifications No. 6187 from Commandant, Navy Yard, Mare Island. 10-24

BIDS BEING RECEIVED

MARE ISLAND, CALIF.—Bids to 11 a.m., November 26, by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for a 40-ton electric gantry crane and runway at the Navy Yard, Mare Island, Calif. Specification No. 6310 from Commandant, Navy Yard, Mare Island, Calif. 11-3

BUILDING CONSTRUCTION

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Plans by Frank G. White, Chief Engr., State Harbor Comm., Ferry Bdg., S. F., for reinf. conc. and steel shed for Pier 15. $200,000. 11-3

HAWTHORNE, NEV.—Plans by Bureau of Yards and Docks, Navy Department, Washington, D. C., for reinf. concrete, brick, and hollow tile mine filling plant, to be located at the Naval Ammunition Depot, Hawthorne, Nevada. $285,000. 11-3

BIDS BEING RECEIVED

CALISTOGA, CALIF.—Bids to Nov. 24 by Calistoga Jt. Union Grammar School Dist. for brick grammar school. $75,000. Davis-Pearce Co., Stockton, are Architects. 10-23

LIVERMORE, CALIF.—Bids to 10 30 a.m., Nov. 18, by County for stucco and reinf. concrete club, auditorium, and lodge. $65,000. H. H. Meyers, Kohl Bdg., S. F., is Architect. 10-22

SANTA ROSA, CALIF.—Bids to 2 p.m., Nov. 17, by Santa Rosa Junior College for brick and frame building. $40,000. W. H. Weeks, Hunter-Dulin Bdg., S. F., is Architect. 10-27

SCHOFIELD BARRACKS, T. H.—Bids to Nov. 14, by the Department Quartermaster, Construction Division, Fort Shaffer, T. H., for the construction of 49 sets of non-commissioned officers' quarters and one bachelor non-commissioned officers' building, including grading and utilities at Wheeler Field, Schofield Barracks, T. H. 10-30

BIDS RECEIVED

HAWTHORNE, NEV.—Schuler & McDonald, 1723 Webster Street, Oakland, who bid $8344, low bid to the Bureau of Yards and Docks, Navy Department, Washington, D. C., for constructing steel frame greenhouse, to be 18 x 75 ft. with concrete foundation at the Naval Ammunition Depot, Hawthorne, Nevada. 10-30

ALBUQUERQUE, NEW MEXICO—N. P. Severin Co., Chicago, Illinois, who bid $503,000, submitted the low bid to the U. S. Supervising Architect, Treasury Department, Washington, D. C., for the construction of a postoffice building to be located at Albuquerque, New Mexico. 10-30

CONTRACTS AWARDED

ANTIOCH, CALIF.—To Mathews Const. Co., Forum Bdg., Sacramento, $111,500 for brick Senior and Junior High School. Davis-Pearce Co., Stockton, are Architects. 10-23

BERKELEY, CALIF.—Awards as follows by the University of California, Berkeley, for group of steel frame and reinforced concrete Engineering buildings on the University Campus, Berkeley: GENERAL CONTRACT—To Barrett & Hilp, 918 Harrison St., San Francisco, $465,660 (on alternates); ELECTRIC WIRING—To NePage-McKenny Co., 7 Front St., San Francisco, $19,704; PLUMBING AND HEATING—To Turner Co., 329 Tehama Street, San Francisco, Calif., $56,355 (on alternates). 10-21

EUREKA, CALIF.—Awards as follows by California Division of Highways: (1) To McCarthy & Johanns, 748 14th St., S. F., $10,648 for maintenance station at Garberville; and (2) To Oliver Almlie, 1445 24th Ave., S. F., $13,868 for maintenance station at Idlewild. 10-42

UPPER LAKE, CALIF.—To Petaluma Const. Co., Petaluma, $29,999 for reinf. conc. school for Upper Lake Union School Dist. 11-3

OPPORTUNITY PAGE

RATES: *Situations wanted, 5c per word,* MINIMUM CHARGE, *$1.00;* HELP WANTED, *no charge to Subscribers;* OFFICIAL BIDS, *15c per line;* ALL OTHERS, *$2.00 per column inch or fraction thereof*

THE BUYERS' GUIDE

Refer to advertisements for addresses of companies listed. Advertisers index on page 68

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

Acetylene Generating Apparatus
Oxweld Acetylene Co.

Air Compressors
Bacon Co., Edward R.
Gardner-Denver Co.
Ingersoll-Rand Co.
Jenison Machinery Co.
Leitch & Co.
National Brake & Electric Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.
West Coast Tractor Co.

Air Compressors—Engines
Atlas Imperial Diesel Engine Co.

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

Asphalt, Emulsified
American Bitumuls Co.
Shell Oil Co.

Asphalt Plants and Equipment
Bacon Co., Edward R.
Jenison Machinery Co.
Link-Belt Co.
Spears-Wells Mchy. Co., Inc.
Standard Boiler & Steel Works
Union Tank & Pipe Co.

Asphalt Paving
Warren Bros. Roads Co.

Back Fillers
Austin Machy. Corp.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Harnischfeger Sales Corp.
Jenison Machinery Co.
Link-Belt Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Robinson Tractor 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.

Bins, Storage and Hopper
Bacon Co., Edward R.
Blaw-Knox Co.
Diamond Iron Works, Inc.
Heltzel Steel Form & Iron Co., The
Jenison Machinery Co.
Link-Belt Co.

Blades—Fresno and Graders
Solano Iron Works

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

Boilers
Montague Pipe & Steel Co.
Water Works Supply Co.

Bolts, Nuts and Rods
Claussen & Co., C. G.
Kortick Mfg. Co.

Bonds (Street) Bought
W. P. Bullock

Bonds, Surety
Aetna Casualty & Surety Co.
Associated Indemnity Corp.
Commerce Casualty Co.
Consolidated Indemnity & Insurance Co.
Detroit Fidelity & Surety Co.
Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
Great American Indemnity Co.
Indemnity Insurance Co. of North America
Maryland Casualty Co.

Bonds, Surety (Continued)
Massachusetts Bonding & Insurance Co.
New Amsterdam Casualty Co.
Rolph, James Jr., Landis & Ellis

Brick, Common
Gladding Bros. Mfg. Co.

Buckets, Elevator and Conveyor
Bacon Co., Edward R.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Lakewood Engr. Co.
Link-Belt Co.

Buckets, Dredging
Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Owen Bucket Co.

Buckets, Excavating
Bacon Co., Edward R.
Bucyrus-Erie Co.
Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Marion Steam Shovel Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Taylor & George
Williams Co., G. H.
Worden Co., W. H.

Buckets, Rehandling
Industrial Brownhoist Corp.
Jenison Machinery Co.
Lakewood Engr. Co.
Orton Crane & Shovel Co.
Owen Bucket Co.

Cableways
American Steel & Wire Co.
Bacon Co., Edward R.
Jenison Machinery Co.
Leschen & Sons Rope Co., A.
Worden Co., W. H.
Young Machy. Co., A. L.

Carbide
Union Carbide Sales Co., The

Cars, Industrial
Bacon Co., Edward R.
Jenison Machinery Co.
Lakewood Engr. Co.

Carts, Concrete
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.
Ransome Concrete Machinery Co.

Castings, Iron and Steel
American Cast Iron Pipe Co.
Link-Belt Co.
U. S. Cast Iron Pipe & Fdy. Co.

Castings, Street and Sewer
U. S. Cast Iron Pipe & Fdy. Co.

Cement
Portland Cement Association

Chemicals
California Filter Co., Inc.
Great Western Electro-Chemical Co.

Chlorinators
California Filter Co., Inc.
Wallace & Tiernan
Water Works Supply Co.

Chlorine
Great Western Electro-Chemical Co.

Chutes, Concrete
Bacon Co., Edward R.
Haiss Mfg. Co., Geo.
Jenison Machinery Co.
Lakewood Engr. Co.
Ransome Concrete Machinery Co.

Clarifiers, Water
Dorr Co., The
Wallace & Tiernan Co.

Clay Products
Gladding, McBean & Co.
Pacific Clay Products Co.

Concrete Buckets
Jenison Machinery Co.
Young Machy. Co., A. L.

Concrete Curing
Concrete Curing Co.
Inertol Company, Inc.
McEverlast, Inc.

Concrete Forms
Bacon Co., Edw. R.
Blaw-Knox Co.

Concrete Roads
Portland Cement Association

Conveyors, Portable

Conveyors, Elevating and Conveying
Bacon Co., Edward R.
Bodinson Mfg. Co.
Jenison Machinery Co.
Link-Belt Co.

Cranes, Electric, Gasoline Locomotive
American Hoist & Derrick Co.
Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Power Shovel Co., The
Orton Crane & Shovel Co.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
W-K-M Company, Inc.

Cranes, Tractor
Harnischfeger Sales Corp.
West Coast Tractor Co.

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

Crushers
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Diamond Iron Works, Inc.
Jenison Machinery Co.
Smith Engineering Works
W-K-M Company, Inc.
Young Machy. Co., A. L.

Crushers—Engines
Atlas Imperial Diesel Engine Co.

Culverts, Concrete
Portland Cement Association

Culverts, Metal
California Corrugated Culvert Co.
U. S. Cast Iron Pipe & Fdy. Co
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Culverts, Part Circle
California Corrugated Culvert Co.
Western Pipe & Steel Co.

Culverts, Vitrified
Gladding, McBean & Co.
Pacific Clay Products

Curing, Concrete
Concrete Curing Co.
Inertol Company, Inc.
McEverlast, Inc.

Cutting Apparatus
Jenison Machinery Co.
Diamond Iron Works, Inc.
Haiss Mfg. Co., Geo.
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Cutting Edges
Solano Iron Works

Dams
Ambursen Dam Co., Inc.

Derricks
Bacon Co., Edward R.
Jenison Machinery Co.
Young Machy. Co., A. L.

Diesel Engines
Atlas Imperial Diesel Engine Co.

Ditch Machinery
Bacon Co., Edward R.
Bucyrus-Erie Co.
Cleveland Trencher Co.
Harnischfeger Sales Corp.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co., The
Orton Crane & Shovel Co.
Thew Shovel Co., The

Draglines
Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.
Sauerman Bros., Inc.
Spears-Wells Machy. Co.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
Worden Co., W. H.
Young Machy. Co., A. L.

Dragline—Diesel Engines
Atlas Imperial Diesel Engine Co.

Drain Tile
Gladding, McBean & Co.
Gladding Bros. Mfg. Co.
Pacific Clay Products

Drills, Rock
Bacon Co., Edward R.
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Company
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.

Dump Cars
Bacon Co., Edward R.
Jenison Machinery Co.

Dump Wagons
Le Tourneau Mfg. Co.
West Coast Tractor Co.

Engineers
Ambursen Dam Co., Inc.
Burns-McDonnell-Smith Engr. Co.
Hunt Co., R. W.
Porter, Geo. J.

Engines, Diesel, Gasoline and Steam
Atlas Imperial Diesel Engine Co.
Bacon Co., Edward R.
Continental Motors Corp.
Hercules Motors Corp.
Ingersoll-Rand Co.
International Harvester Co.
Jenison Machinery Co.
Le Roi Co.
Novo Engine Co.

Excavating Machinery
American Tractor Equipment Co.
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Excavating Equipment Dealers, Inc.
Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.

(Continued on page 64)

OPPORTUNITY PAGE

CONTINUED

SHOVELS CRANES DRAGLINES PULLSHOVELS

Factory Rebuilt with New Machine Guarantee

(1/2 to 2 cu. yd.)

We have a limited number of these machines which have been completely rebuilt in our factory and carry the same guarantee as our new equipment!

NORTHWEST ENGINEERING CO.

23 MAIN STREET, SAN FRANCISCO, CALIF.
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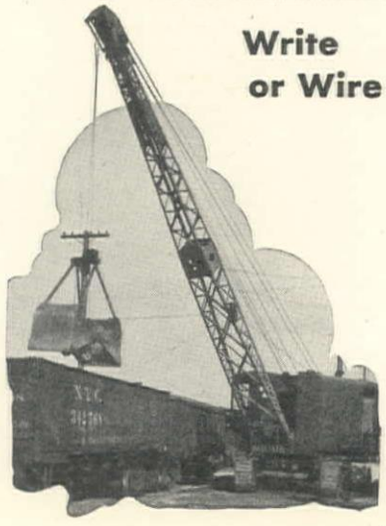
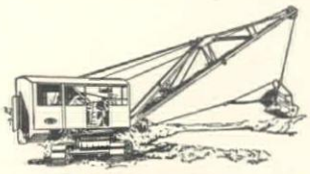


WONDERFUL BUYS IN USED



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ALL SIZES DRAGLINE AND CLAMSHELL BUCKETS

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1—25-ton Industrial Locomotive Crane. Standard gauge. 8-wheel MCB trucks. Boiler is Parker scale-proof type, oil-fired AMSE. Length of boom 50 ft. Complete with 1½-cu.yd. high-speed scraper type clamshell bucket. Crane purchased new in 1926. Available for immediate delivery at a very attractive price.

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1—Bucyrus Diesel, 2-cu.yd. 50-B.

1—P&H Gasoline, 1½-cu.yd., 700.

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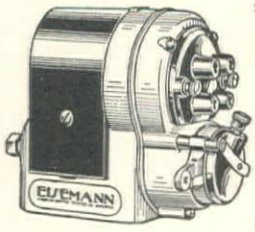

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No. 4 Russell Motor Patrol with metal cab and scarifier attachment. Front wheels 32x5, rubber-tired, Timken bearings. Powered with 2-ton Caterpillar Tractor, equipped with road plates. Price, $2000.00.

One "Twenty" Caterpillar Tractor with steel sun top and road plates. Price $1000.00.

Both machines used only six months on surfacing work; are in perfect condition and will carry same guarantees as new machines. Write or wire Harry W. Boles, Hollywood, Calif., 118 N. Crescent Height Blvd.

THE BUYERS' GUIDE—*Continued from Page 62*

Excavating Mchy.(Continued)
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Sauerman Bros., Inc.
Shaw Excavator & Tools Co.
Speeder Machinery Corp., The
Thew Shovel Co., The
Universal Crane Co., The

Excavating Mchy.—Diesel Engines
Atlas Imperial Diesel Engine Co.

Expansion Joints
Industrial & Municipal Supply Co.
U. S. Cast Iron Pipe & Fdy. Co.
Water Works Supply Co.

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

Equipment—Rental
Atkinson Construction Co.
Contractors Mchy. Exchange
Tieslau Bros.

Filters, Water
California Filter Co., Inc.

Fire Hydrants
Industrial & Municipal Supply Co.
Rensselaer Valve Co.
Water Works Supply Co.

Floating Roofs
Chicago Bridge & Iron Works

Flood Lights
Oxweld Acetylene Co.
Taylor & George

Flooring, Industrial
Paraffine Companies, Inc., The

Floors, Mastic
Wailes Dove-Hermiston Corp.

Flumes, Concrete
Portland Cement Association

Flumes, Metal
California Corrugated Culvert Co.
Montague Pipe & Steel Co.

Fluxes
Victor Welding Equipment Co.

Forms, Steel
Blaw-Knox Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Form Ties
J. M. Willard Co.

Freight, Water
American-Hawaiian Steamship Co.

Gas Holders
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Gates, Cast-Iron
California Corrugated Culvert Co.

Gates, Radial
California Corrugated Culvert Co.

Gates, Sheet Metal
California Corrugated Culvert Co.

Governors, Steam Engine
Gardner-Denver Co.
Young Machy. Co., A. L.

Governors, Turbine
Pelton Water Wheel Co., The

Grader Blades
Solano Iron Works

Gravel Plant Equipment
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Diamond Iron Works, Inc.
Harnischfeger Sales Corp.
Jenison Machinery Co.
Link-Belt Co.
Smith Engineering Works
Young Mach. Co., A. L.

Hammers, Steam Pile
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Kratz & McClelland, Inc.
Union Iron Works, Inc.

Hoists, Hand and Power
Bacon Co., Edward R.
Gardner-Denver Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.

Hoists, Hand, Power (Cont.)
Ingersoll-Rand Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Link-Belt Co.
Novo Engine Co.
Sullivan Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.
Young Machy. Co., A. L.

Hoppers, Steel
Bacon Co., Edward R.
Blaw-Knox Co.
Haiss Mfg. Co., Geo.
Jenison Machinery Co.
Lakewood Engr. Co.
Link-Belt Co.

Hose, Steam, Air and Water
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The

Hydro-Tite
Industrial & Municipal Supply Co.

Insurance, Casualty
Aetna Casualty & Surety Co.
Associated Indemnity Corp.
Commerce Casualty Co.
Consolidated Indemnity & Insurance Co.
Detroit Fidelity & Surety Co.
Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
Great American Indemnity Co.
Indemnity Insurance Co. of North America
Maryland Casualty Co.
Massachusetts Bonding & Insurance Co.
New Amsterdam Casualty Co.
Rolph, James Jr., Landis & Ellis

Iron, Plates and Sheets
American Rolling Mill Co., The

Jacks, Lifting
Jenison Machinery Co.

Kettles, Tar and Asphalt
Bacon Co., Edward R.
Montague Pipe & Steel Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Leadite
Water Works Supply Co.

Loaders, Power, Truck and Wagon
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
Jaeger Machine Works, The
Jenison Machinery Co.
Link-Belt Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Locomotives, Electric, Gas and Steam
Jenison Machinery Co.

Lumber
McCormick Lumber Co.

Metal Lath
Truscon Steel Company

Meters, Venturi
Water Works Supply Co.

Meters, Water
Industrial & Municipal Supply Co.
Neptune Meter Co.

Mixers, Chemical
Dorr Co., The

Mixers, Concrete
Bacon Co.,Edward R.
Foote Company, Inc.
Garfield & Co.
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Lakewood Engr. Co.
National Equipment Corp.
Ransome Concrete Machinery Co.
Young Machy. Co., A. L.

Mixers, Plaster
Bacon Co., Edw. R.
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

Motors, Gasoline
Continental Motors Corp.
Hercules Motors Corp.
Jenison Machinery Co.
Le Roi Co.

Oxy-Acetylene Apparatus
Oxweld Acetylene Co.

Oxygen in Cylinders
The Linde Air Products Co.

Paints, Acid Resisting
Columbia Wood and Metal Preservative Co.
Inertol Company, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Metal Protective
Columbia Wood and Metal Preservative Co.
Inertol Company, Inc.
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Technical
American Bitumuls Co.
Columbia Wood and Metal Preservative Co.
Inertol Company, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Waterproofing
Columbia Wood and Metal Preservative Co.
Inertol Company, Inc.
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pavers, Concrete
Bacon Co., Edw. R.
Foote Company, Inc.
Harron, Rickard & McCone Co.
Kratz & McClelland, Inc.
National Equipment Corp.
Ransome Concrete Machinery Co.

Paving Breakers
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.

Paving, Contractor
Warren Bros. Roads Co.

Paving Plants
Bacon Co., Edward R.
Jaeger Machine Works, The
Jenison Machinery Co.
Standard Boiler & Steel Works

Paving Tools
Bacon Co., Edward R.
Harron, Rickard & McCone Co.

Penstocks
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Pittsburgh-Des Moines Steel Co.
Water Works Supply Co.
Western Pipe & Steel Co.

Pile Drivers
Bacon Co., Edward R.
Bucyrus-Erie Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jenison Machinery Co.
Kratz & McClelland, Inc.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Thew Shovel Co., The
Union Iron Works, Inc.

Piles, Concrete
Raymond Concrete Pile Co.
MacArthur Concrete Pile Corp.

Piling
Pacific Coast Steel Corp.

Piling, Redwood
Union Lumber Co.

Pipe, Bell and Spigot
National Cast Iron Pipe Co.

Pipe, Cast-Iron
American Cast Iron Pipe Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
National Cast Iron Pipe Co.
Pacific States Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.
Water Works Supply Co.

Pipe, Cement Lined
American Cast Iron Pipe Co.
National Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.

Pipe, Centrifugal
National Cast Iron Pipe Co.

Pipe Clamps and Hangers
Kortick Mfg. Co.

Pipe Coatings
American Concrete Pipe Co.
Inertol Company, Inc.
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pipe, Concrete
American Concrete Pipe Co.
Lock Joint Pipe Co.
Portland Cement Association

Pipe, Culvert
California Corrugated Culvert Co.
Gladding, McBean & Co.
Pacific Clay Products
Western Pipe & Steel Company

Pipe Fittings
American Cast Iron Pipe Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
National Cast Iron Pipe Co.
Pacific Pipe Co.
Pacific States Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.
Weissbaum & Co., G.

Pipe, Flanged
National Cast Iron Pipe Co.

Pipe Line Machinery
Bacon Co., Edward R.
Harnischfeger Sales Corp.
Jenison Machinery Co.
W-K-M Company, Inc.

Pipe, Lock-Bar
Western Pipe & Steel Co.

Pipe, Preservative
Columbia Wood & Metal Preservative Co.

Pipe, Pressure Line
Lacy Manufacturing Co.
Lock Joint Pipe Co.
Western Pipe & Steel Co.

Pipe, Riveted Steel
Lacy Mfg. Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Pipe, Sewer
Gladding, McBean & Co.
Pacific Clay Products

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

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

Pipe, Welded Steel
California Corrugated Culvert Co.
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Steel Tank & Pipe Co.
Union Tank & Pipe Co.
Western Pipe & Steel Co.

Plows, Road
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Jenison Machinery Co.
Spears-Wells Machy. Co.

Pneumatic Tools
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Schramm, Inc.

Po'es, Redwood
Union Lumber Co.

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

Power Units
Bacon Co., Edw. R.
Continental Motors Corp.
Hercules Motors Corp.
International Harvester Co.
Jenison Machinery Co.
Novo Engine Co.

Preservative, Wood, Metal, etc.
Columbia Wood & Metal Preservative Co.
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

(Continued on page 66)

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Grading—California

San Francisco, California, November 3, 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 25th day of November, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading Section B and placing Selected Material on Sections A and B of Route 73, Laguna National Forest Highway, in Cleveland National Forest, San Diego County, California.

The length of the project is 10.86 miles, and the principal items of work are approximately as follows:

Clearing, 21 acres.
Excavation, unclassified, 28,750 cu.yd.
Excavation, unclassified for structures, 200 cu.yd.
Overhaul, 5000 cu.yd.
Preparing roadbed, 6.5 miles.
Corrugated metal pipe in place, 1096 lin.ft.
Selected material in place, 19,000 cu.yd.

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 at 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 and twenty-five (125) 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 o'clock p.m. on November 25, 1930.
Sections A and B, Laguna National Forest Highway, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER, District Engineer

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Surfacing—Arizona

Phoenix, Arizona, November 6, 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 26th day of November, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for supplying and placing crushed material for subgrade reinforcement on Sections G and H of Route No. 19, Clifton-Springerville National Forest Highway, Apache County, Arizona.

The length of the project is 11.32 miles, and the principal items of work are approximately as follows:

Crushed rock or crushed gravel for subgrade reinforcement, 14,800 cu.yd.

Hauling crushed rock or crushed gravel, 59,000 sta.yd.

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 the 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 and fifty (150) 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 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 Subgrade Reinforcement. To be opened 2:00 o'clock p.m. on November 26, 1930.
Sections G and H, Clifton-Springerville National Forest Highway, 506 Mills Building, Phoenix, Arizona.

C. H. SWEETSER, District Engineer

NOTICE TO BIDDERS

Vitrified or Concrete Sewers

Bids will be received up to 4 o'clock p.m. on Monday, November 17, 1930, by the Board of Public Works of the City of Palo Alto for the Construction of Storm Water Sewers on Lytton Avenue between Waverley Street and Webster Street.

All bids must be accompanied by a certified check of not less than 10% of the amount of the bid.

Plans and specifications are obtainable at the office of the City Engineer.

E. L. BEACH, City Clerk.

SITUATIONS WANTED

POSITION WANTED by Draftsman on pipeline work and maps. Four years' experience. References can be furnished. Write H. L. Page, 32 Plaza Drive, Berkeley.

ENGINEER DESIGNER, 38, with a wide range of first-class experience, including 10 years' foreign service, covering Mine Development and Operation, Recovery and Treatment Plants, various production plants and the Steel Industry. Desire a permanent connection either as Engineer Plant Superintendent or in the Sales Field where ability, foresight and business acumen are recognized and rewarded with equitable remuneration. Employed at present. Box 505, Western Construction News.

THE BUYERS' GUIDE—*Continued from Page 64*

Pumps, Deep Well
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.
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
Claussen & Co., C. G.

Reinforcing Bars
Pacific Coast Steel Corp.
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
Bacon Co., Edward R.
Blaw-Knox Co.
Heltzel Steel Form & Iron Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Road Graders and Scrapers
American Tractor Equipment Co.
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Caterpillar Tractor Co.
Jenison Machinery Co.
Jumbo Scraper Co.
Robinson Tractor 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
American Tractor Equipment Co.
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Huber Manufacturing Co.
Jenison Machinery Co.
Spears-Wells Machinery Co.
Taylor & George

Roofing
Paraffine Companies, Inc., The

Rules, Steel, Wood and Aluminum
Lufkin Rule Co., The

Saws, Portable
Ingersoll-Rand Co.
Jenison Machinery Co.
Young Machinery Co., A. L.

Scarifiers
American Tractor Equipment Co.
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Jenison Machinery Co.
Le Tourneau Mfg. Co.
Robinson Tractor Co.
Spears-Wells Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.

Scrapers, Dragline, Fresno, Wheeled
American Tractor Equipment Co.
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Jenison Machinery Co.
Jumbo Scraper Co.
Sauerman Bros., Inc.
Shaw Excavator & Tools Co.
Solano Iron Works
West Coast Tractor Co.

Screens, Sand and Gravel
Bacon Co., Edward R.
Bodinson Manufacturing Co.
Diamond Iron Works, Inc.
Haiss Mfg. Co., Geo.
Jenison Machinery Co.
Link-Belt Co.
Smith Engineering Co.
Young Machinery Co., A. L.

Screens, Sewage
Dorr Co., The
Link-Belt Co.

Screens, Vibrating
Link-Belt Co.
Smith Engineering Works

Second-Hand Equipment
Atkinson Construction Co.
Contractors Mchy. Exchange
Excavating Equipment Dealers, Inc.
Tieslau Bros.

Sewage Disposal Apparatus
Dorr Co., The
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.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Excavating Equipment Dealers, Inc.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Spears-Wells Machinery Co.
Speeder Machinery Corp., The
St. Louis Power Shovel Co.
Thew Shovel Co., The
Young Machy. Co., A. L.

Shovels, Hand
Jenison Machinery Co.
Worden Co., W. H.

Sluice Gates
California Corrugated Culvert Co.
Water Works Supply Co.

Spreaders, Gravel, Rock and Asphalt
Bacon Co., Edward R.
Jenison Machinery Co.

Standpipes
Chicago Bridge & Iron Works
Montague Pipe & Steel Co.
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.

Steel Joists
Truscon Steel Co.

Steel Piling
Pacific Coast Steel Corp.

Steel Windows
Truscon Steel Co.

Subgraders
Bacon Co., Edward R.
Blaw-Knox Co.
Lakewood Engineering Co.

Swimming Pool Equipment
California Filter Co., Inc.

Tamping Rollers
American Tractor Equipment Co.

Tanks, Air Compressor
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

Testing Laboratories
Hunt Co., R. W.

Tie Plates
Pacific Coast Steel Corp.

Ties, Redwood
Union Lumber Co.

Timbers, Redwood
Union Lumber Co.

Torches, Welding and Cutting
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Towers, Transmission
Pacific Coast Steel Corp.
Water Works Supply Co.

Tractors
Bacon Co., Edward R.
Caterpillar Tractor Co.
Cleveland Tractor Co.
International Harvester Co.
Linn Mfg. Corp., Division of La France-Republic Corp.
National Brake & Electric Co.
Robinson Tractor Co.
West Coast Tractor Co.
Worden Co., W. H.

Tractor Parts
Taylor & George

Trailers—Heavy Duty
Williams Co., G. H.

Tramways
American Steel & Wire Co.
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