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WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

PUBLISHED SEMI-MONTHLY
VOLUME V NUMBER 12

SAN FRANCISCO, JUNE 25, 1930

25 CENTS A COPY
\$3.00 PER YEAR



30
CEDAR RIVER PIPE-LINE No. 4 FOR SEATTLE WATER SUPPLY, SHOWING SECTION OF HANS PEDERSON CONTRACT FOR 54,500 LIN.FT. OF 78-IN. CREOSOTED WOOD-STAVE PIPE, BETWEEN WEST PORTAL OF LAKE YOUNGS AQUEDUCT AND EXISTING LINES NEAR MOLASSES CREEK CONTROL WORKS



TWO BIG EXCAVATORS —FAST AND MOBILE

ANY idea that large capacity excavators must, of necessity, be slow, goes glimmering when you consider these two great P & H Machines.

Both are fast...fast of swing, fast of line speed, fast of travel and maneuver. They are of identical design and construction, the $2\frac{1}{2}$ -3-yd. model being but a smaller edition of the $3\frac{1}{2}$ -4-yd. one. Provided with steering brakes, either machine can be steered by the operator in the cab without the use of chocks.

All the vast experience of P & H in building over 3,000 excavators and in perfecting the application of Diesel power to this type of equipment, is embodied in these new machines.

There are important modern features which appeal at once

to men familiar with excavating requirements...roller bearings on all main shafts above the deck...the celebrated P & H Chain crowd...maximum delivery of power to the digging end...unit cast steel frames with engine securely mounted directly upon the revolving frame...

**TYPE
800
 $2\frac{1}{2}$ -3 YDS.**

built heavy to stand the tremendous strain of Diesel or electric power in hard digging...quickly convertible into dragline. These are but *some* of the features.

Acquaint yourself with the full details of these fast, powerful, new excavators. Write for Bulletin.

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Service Stations, Complete Repair Part Stocks
and Excavators at San Francisco,
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**TYPE
900
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— A COMPLETE LINE OF EXCAVATORS—CAPACITIES FROM $\frac{1}{2}$ TO 4 YDS. —

P & H DIESEL EXCAVATORS

(A-521)

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Melting Leadite prior to pouring joint.



"Yarning" joint with Braided Hemp.



Pouring the Leadite Joint.

Oklahoma City has laid 500,000 feet of water mains with LEADITE Joints

FOLLOWING are quotations taken from a letter sent to us by Mr. S. E. Bretz, Superintendent and Engineer, Oklahoma City Water Department, Oklahoma City, Oklahoma.

"... we have installed approximately 500,000 lineal feet of Cast Iron Water Mains, varying in size from 6 inches to 30 inches."

"In all of this work, we have found LEADITE to be very satisfactory. The allowable leakage—150 gallons per inch diameter per mile of pipe—and all tests have very easily made the leakage requirement. . . . We have absolute faith in LEADITE joints. Tests made on cast iron pipe were made at 150 pounds pressure. Working pressure 80 pounds."

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Tested and used for over 30 years.

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When writing to WATER WORKS SUPPLY COMPANY, please mention Western Construction News



RIX "6" No. 4, with Super-charger, owned by Von der Hellen & Piersen, Contractors, in operation on their Ridge Route road contract

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The PIONEER RIX line includes compressors of all sizes for all purposes. Rix Co. are also agents for COCHISE Drills, and exclusive distributors for THOR Pneumatic Tools in Los Angeles and Seattle territories.

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with the Super-Charger

Moving
Mountains
● at a profit

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PORTABLE AIR COMPRESSORS

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DEVOTED TO CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

VOLUME V

JUNE 25, 1930

NUMBER 12

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WOULDN'T it be ideal that all of the bell and spigot joints in your pipe lines were perfectly tight? Also that these joints would never open up nor blow out thus causing worry, loss of time and loss of water?

You can have this protection if you resolve now to make the first joints on your next line with Hydro-Tite. We know if you will but use Hydro-Tite on these first few joints you will be sure to finish a strong Hydro-Tite booster. If you are one of those who are still using lead, a substantial saving will result; also a positive knowledge of a better joint.

Hydro-Tite is not a substitute for any



Easy to Prepare



jointing material. It was first compounded and placed on the market twenty years ago for a specific purpose. This purpose is to make joints stronger, tighter, and more



Easy to Pour

flexible without caulking.

Let us tell you more about this better material—our proposition to furnish Hydro-Tite with no risk to you. Write now for full details.

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A DEPENDABLE SELF-CAULKING JOINT COMPOUND
FOR CAST IRON BELL AND SPIGOT PIPE

HYDRAULIC DEVELOPMENT CORPORATION

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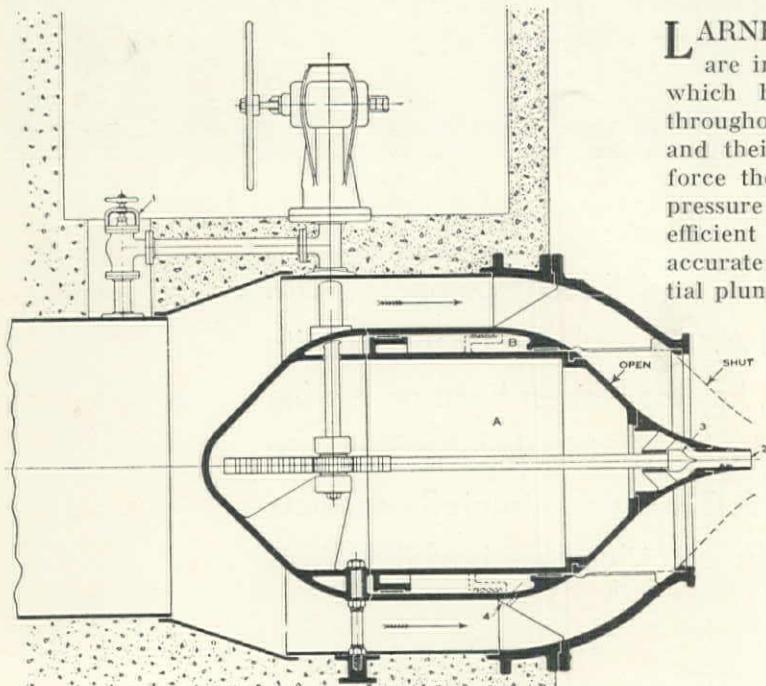
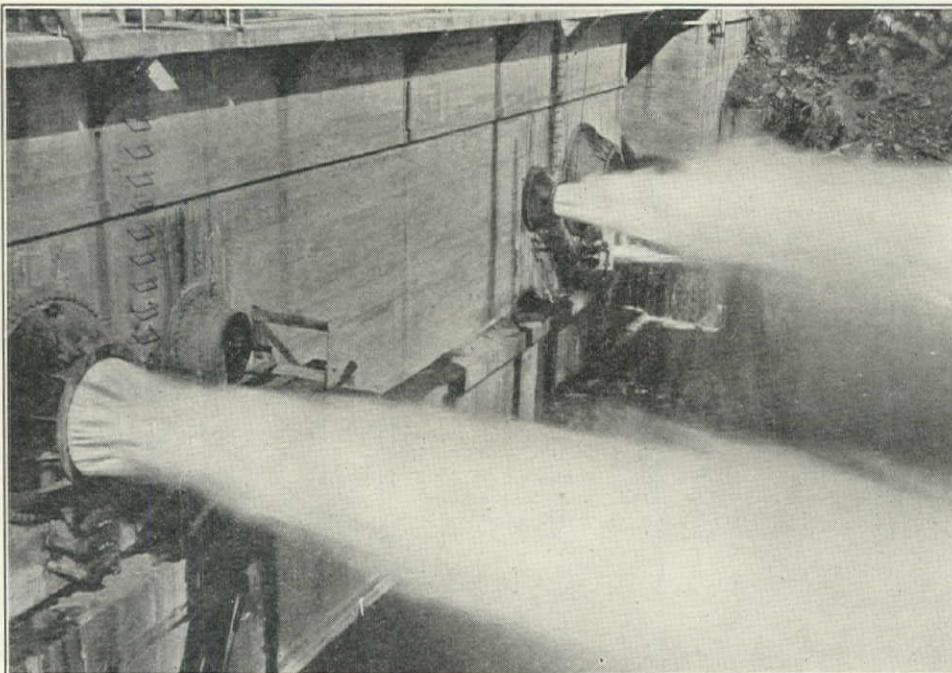
FOR Southern California Edison Company, Ltd. Power House 2-A. This plant, combined with Power House No. 2, has the highest head on the Big Creek-San Joaquin hydro-electric development, viz: 2,418 feet. W. P. & S. Co. has constructed penstocks for the principal hydro-electric projects of the West.

**Western Pipe & Steel Co.
of California**



No Other Type of Discharge Valve

Can Fulfill
All the
Require-
ments as
Dam
Outlets



LARNER-JOHNSON free discharge regulators are inherently ideal as reservoir outlets—a fact which has been proven by many installations throughout the West. Due to their cylindrical form and their use of water pressure as an operating force there is practically no limit to the size or pressure which may be used. They are equally efficient at all openings and provide a means for accurate regulation at any position of the differential plunger.

Operating Sequence

The valve is shown in open position in the section drawing at the left. To close, pilot valve (3) is moved into orifice (2) by external hand or motor control, allowing pipe line pressure admitted through throttle valve (1) to be established in chamber A. This pressure, which exceeds all pressures tending to keep the valve open, causes the plunger to move to the closed position, the movement corresponding to that of the pilot valve. The opening movement is a reversal of the closing operation.

THE PELTON WATER WHEEL COMPANY

HYDRAULIC ENGINEERS

2985 Nineteenth Street, SAN FRANCISCO

33 Rector Street, NEW YORK

ASSOCIATED COMPANIES: I. P. Morris & De LaVergne, Inc., Philadelphia, Pa.; Dominion Engineering Works, Ltd., Montreal. PACIFIC COAST REPRESENTATIVE for Larner Engineering Co., Philadelphia, Pa.



For many months now, we've been using these pages to tell you about the 1020 — ½-yard shovel, crane, clamshell, dragline. But these advertisements with their parade of facts can't tell you the complete story. If you are considering a half-yard machine for this season's work you'll want to know all about this fast, powerful, dependable and profit-building, convertible shovel. We'll be glad to send you the latest 1020 bulletin. Write us today!

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

BUCYRUS-ERIE COMPANY,

manufacturers of the only complete line—all sizes, types and powers. *Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind.*

A-122 -7-10-30 WCN

BUCKEYERUS ERIE

WEST COAST BRANCH OFFICE: 989 Folsom Street, San Francisco

Concrete Machinery & Supply Company
Los Angeles, Cal.

When writing to BUCYRUS-ERIE COMPANY, please mention *Western Construction News*.

HUME Centrifugally Spun Reinforced Concrete *Advancement*

1. Higher Pressures and Safety

Announcement to Users of Concrete Pipe for Pressure Lines:

THE manufacture of centrifugal concrete pipe by the Hume process has made greater steps forward during the past year than during the entire time that the process has been available in the United States. Higher pressures can be handled with complete certainty and safety.

The improvements resulted from an increase in knowledge of the application of the centrifugal process in all the details and steps of the manufacture, such as the relation of the aggregate to the steel; the correct placement and definite fixation of the steel; the proper quantities and proportions of aggregate and steel; the use of thick walls, and additional improvements.

The opposite page describes the installation of a line to operate under pressures that would not have been undertaken by this Company six months before this particular contract was actually signed. With the application of the above improvements, the line has been successfully installed and is giving complete satisfaction in its service.



AMERICAN CONCRETE PIPE COMPANY

SUCCESSOR TO
WESTERN CONCRETE PIPE CO. and BENT CONCRETE PIPE CO.

TACOMA OAKLAND LOS ANGELES SAN DIEGO PHOENIX DALLAS

Concrete Pipe--the Modern Pipe for Pressure Lines



INSTALLATION of Hume centrifugally spun reinforced concrete pressure line for the California Water Service Company. Approximately 25,000 linear feet of 33-inch pipe, designed to operate under a maximum head of 200 feet. Individual pipe tested to 300 feet and higher without seepage. The line runs from a point near the Sacramento River, below Pittsburg, to Chenery reservoir at Clyde, Calif.

Colonel Thomas Wiggin, Chief En-

gineer of the Public Works Engineering Corporation, New York City, was Chief Engineer of the project. E. K. Barnum, Vice-President and Chief Engineer of the Western Division of the Public Works Engineering Corporation, was Engineer in charge of design and installation.



AMERICAN CONCRETE PIPE COMPANY

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TACOMA OAKLAND LOS ANGELES SAN DIEGO PHOENIX DALLAS

For Low Absorption & High Strength



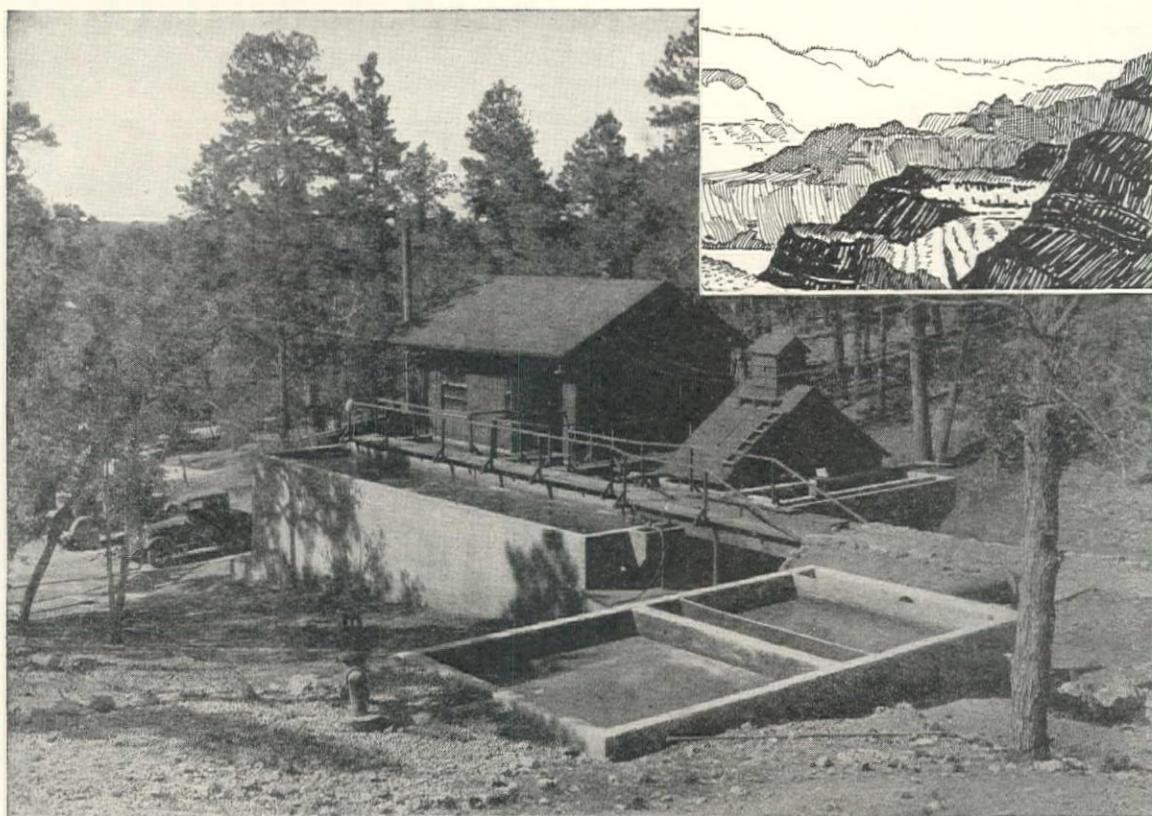
THE City of San Francisco is constructing what is known as the Alemany Boulevard Storm Drain. Section A consists of about 3,000 lin. ft., 8 ft. 11 $\frac{1}{2}$ " by 10 ft. 3" arch section. Clinton Construction Company, Contractors. The illustration above shows use of our Renton pavers, known among engineers as the world's finest paving brick. They were selected for this storm drain because of their low absorption quality, high strength, and uniformity.

Gladding, McBean & Co.

San Francisco
Los Angeles

Oakland
Portland

Seattle
Spokane



CHLORINE salvages useful water from SEWAGE

*"The Only Safe Water
is
Sterilized Water"*

At the Grand Canyon, where water is brought in from the outside by the carload, waste must be kept at a minimum.—And so the sewage is purified, and after use for sanitary purposes the water is again available for industrial use.

As the last stage of this purification, to avoid any possible transmission of disease, two W & T MSV Chlorinators are used to chlorinate the effluent. Then it is used as boiler feed water, for engine cooling water, for irrigating lawns and gardens and for many other purposes to cut down the consumption of fresh water. W & T are always ready to co-operate with engineers in working out the unusual problem.

Bulletins on the use of chlorine in sewage disposal will be sent on request.

WALLACE & TIERNAN CO., Inc.

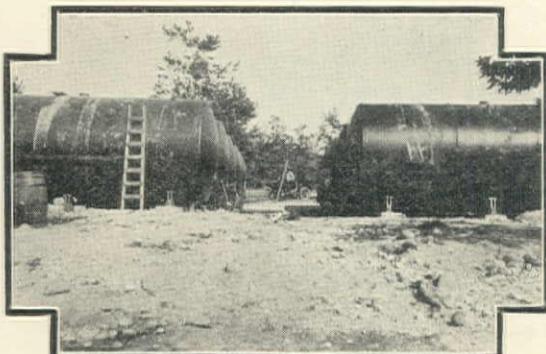
Manufacturers of Chlorine Control Apparatus
NEWARK - - - NEW JERSEY

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WALLACE & TIERNAN, LTD., TORONTO,
WINNIPEG, CANADA. WALLACE & TIERNAN,
LTD., LONDON, ENGLAND

CITY of REDLANDS, California

Installs California Filters

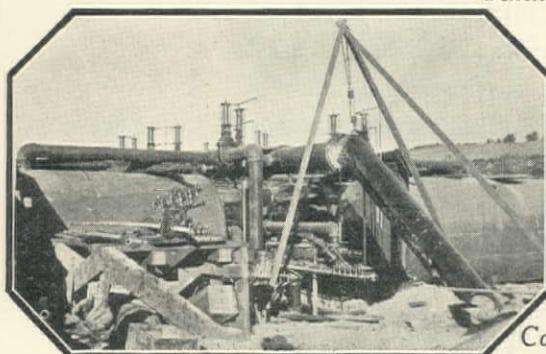
THE Municipal Water Supply of the City of Redlands, California, is purified through a battery of ten 8' x 22' horizontal steel pressure filter tanks, fed by a 20-inch steel pipe line from a raw water reservoir. The entire filtration equipment, views of which are shown here, was provided and its installation supervised by California Filter Company, Inc. The plant has a capacity of 5,000,000 gallons per day.



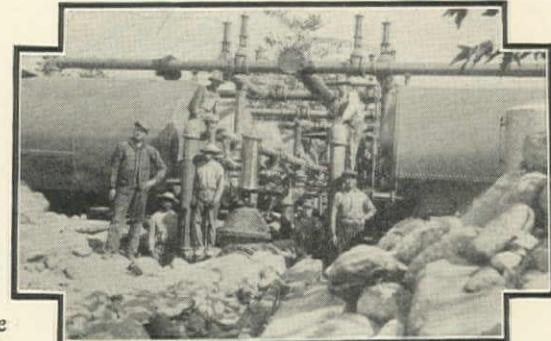
The ten 8x22 steel filter tanks.



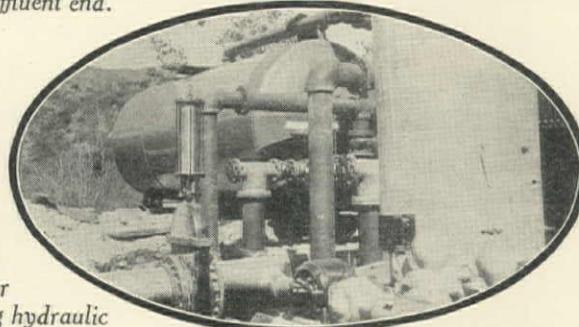
Raw water influent trench.



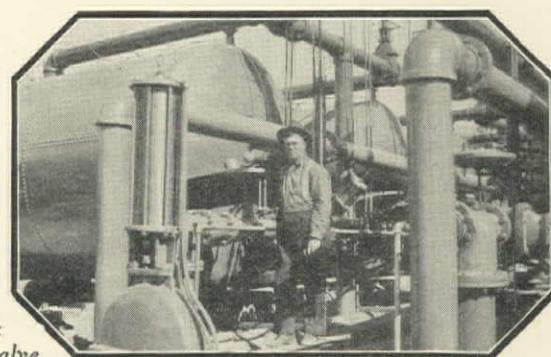
Coupling 20-inch intake pipe.



Pipe gallery, effluent end.



Right: Pressure system for operating hydraulic valves.



Right: Hydraulic effluent valve and rate controller.

Our Booklet No. 40 provides complete information on Califilter equipment for every type of water purification problem. A copy will gladly be sent on request.

**981 Folsom Street, San Francisco
SEATTLE :: LOS ANGELES**

CALIFORNIA FILTER COMPANY, Inc.

ARMCO INGOT IRON

the proof is in the performance

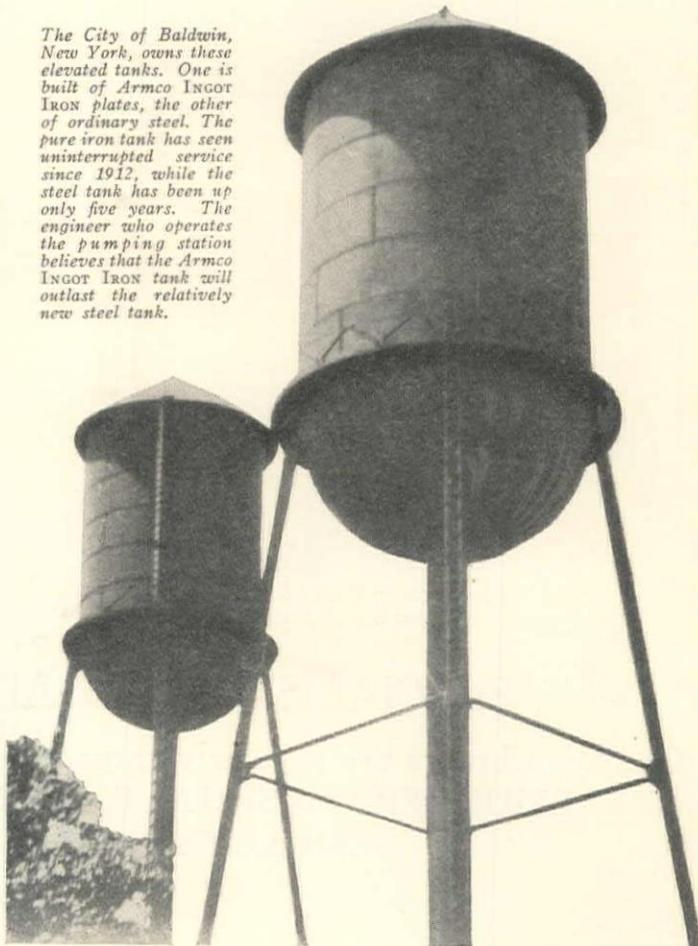
Armco INGOT IRON pipe
and storage tanks
have met the test of time

YOU can specify Armco INGOT IRON plates for pipe lines and storage tanks with full assurance of long, economical service. For this uniform pure iron has the longest record of *actual service* of any low-cost, rust-resisting sheets and plates.

Even more, Armco INGOT IRON offers a plus-value that is also of importance to the water works official: it welds speedily and firmly, and reduces the cost of installation.

Your problem in pipe or tank materials is of interest to us. Perhaps one of our service engineers could help you solve it. He will be glad to talk it over at your convenience. Just get in touch with the nearest office.

The City of Baldwin, New York, owns these elevated tanks. One is built of Armco INGOT IRON plates, the other of ordinary steel. The pure iron tank has seen uninterrupted service since 1912, while the steel tank has been up only five years. The engineer who operates the pumping station believes that the Armco INGOT IRON tank will outlast the relatively new steel tank.



The AMERICAN ROLLING MILL CO.
OF CALIFORNIA

540 Tenth Street, San Francisco
32 West Connecticut Street, Seattle



Back of this familiar symbol is nearly thirty years' experience in the manufacture of special analysis iron and steel sheets and plates. When you seek a rust-resisting, low-cost metal be sure to see this triangle and the words "Armco INGOT IRON." It is assurance of dependable, economical service.

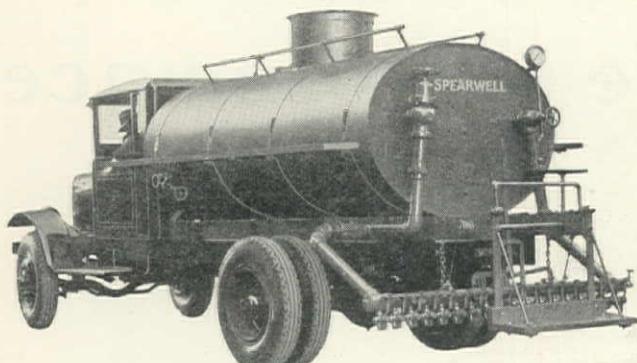
"BE SURE IT'S MADE OF ARMCO INGOT IRON"

When writing to THE AMERICAN ROLLING MILL CO., please mention Western Construction News.

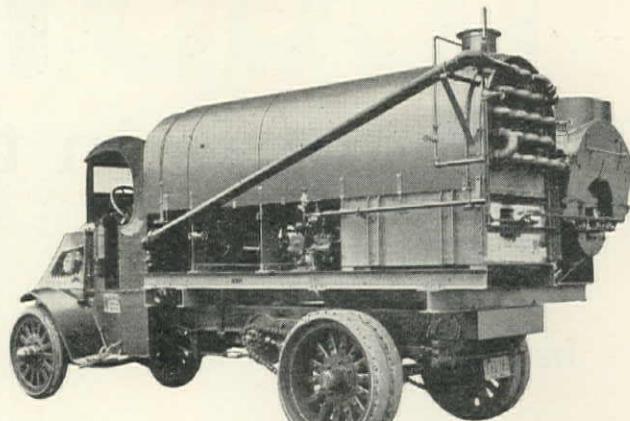
SPEARWELL

Road Oiling Equipment

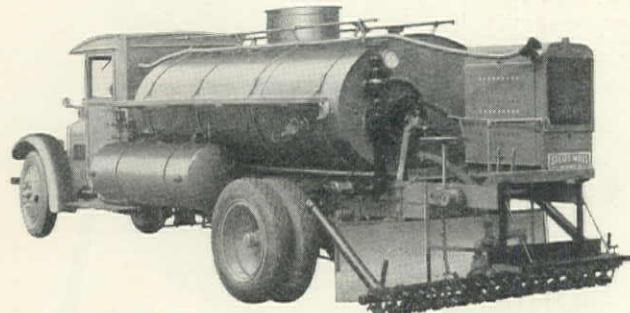
A few of our recent installations



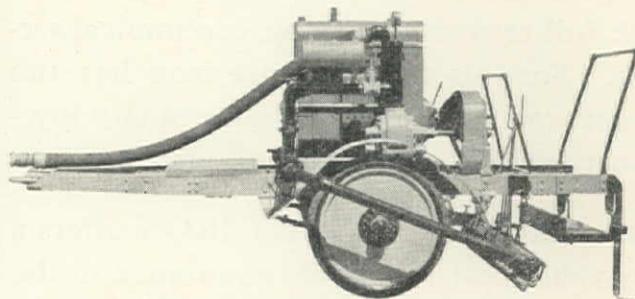
Standard California Distributor



The Best Retort Made



First Oil Distributor Built to Meet the New Oregon Specifications



First Commercial Trailer Oiler to Meet California Fuel Oil Conditions

SPECIALISTS IN ROAD OILING EQUIPMENT

Our Distributors are regularly spreading HOT OIL, FUEL OIL, CUT BACK EMULSIFIED ASPHALT, HOT OIL WITH SOAP WATER EMULSIFYING BOAT AND TANKS

... also ...

Retorts, Boilers, Screenings Spreaders, Drags, Etc.

Spears-Wells Machinery Company, Inc.

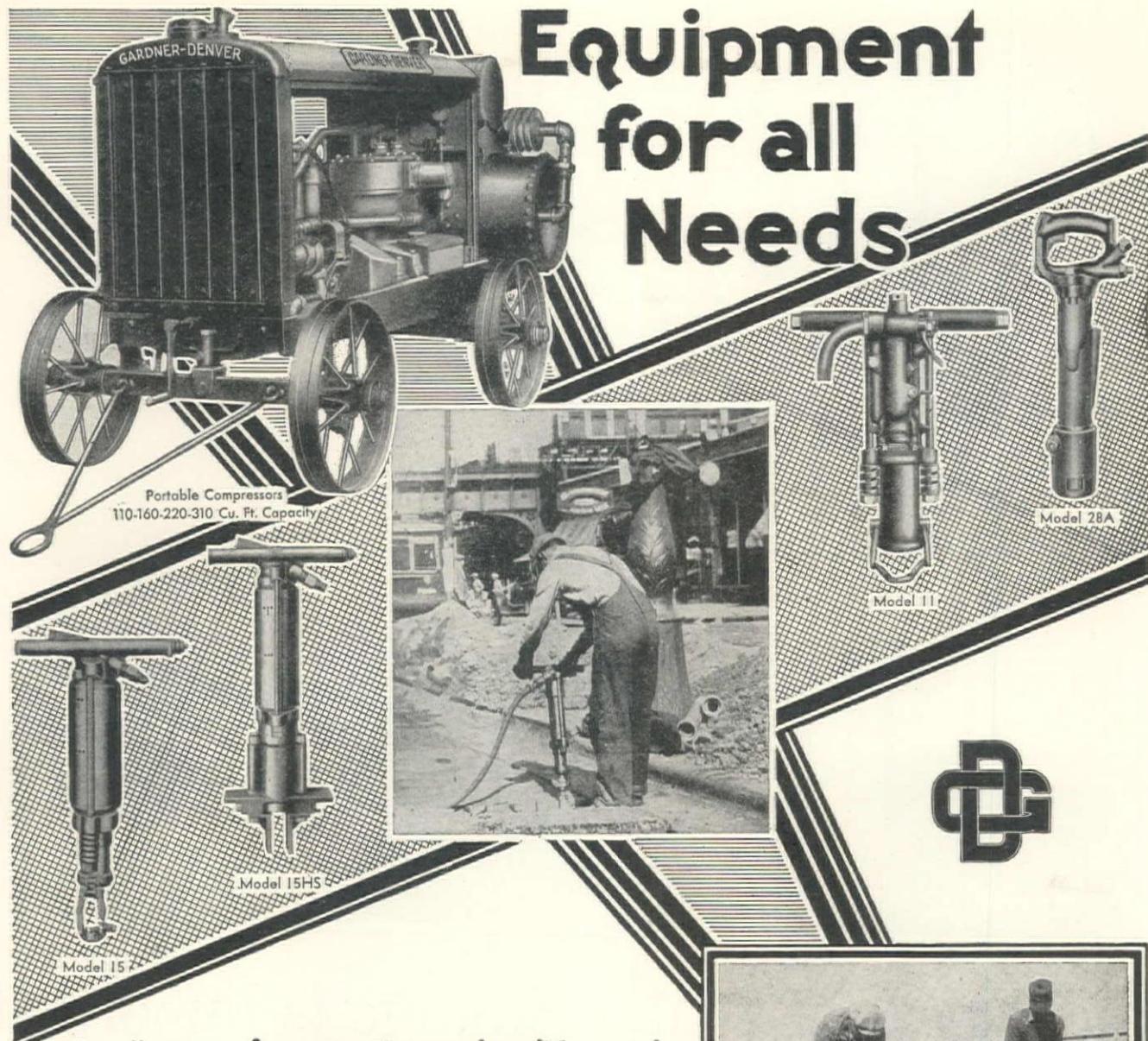
Manufacturers and Distributors of

ROAD CONSTRUCTION AND MAINTENANCE EQUIPMENT

1832 W. 9th Street

OAKLAND

Holliday 4100



On all types of construction or demolition work where air powered tools are necessary, you will find that **Gardner-Denver Portable Compressors and Air Tools** stand alone where a certain amount of work must be accomplished in a given period of time. The ability to stay on the job day in and day out, gives the operator that feeling of assurance that good tools in the hands of competent operators always do.

Let our representative call and convince you.

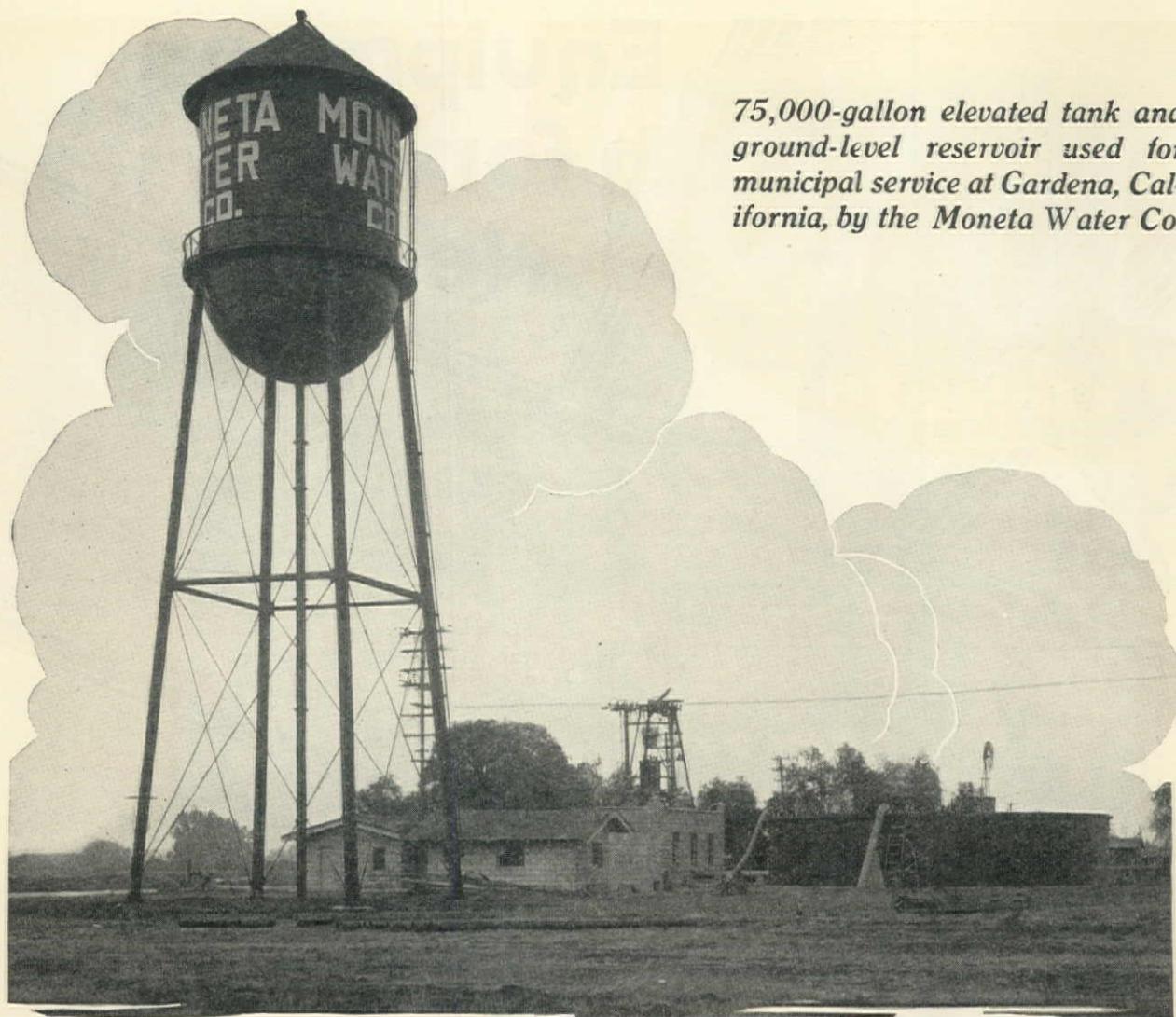
GARDNER-DENVER COMPANY

QUINCY, ILL. DENVER, COLO.

Sales Offices Throughout the World



GARDNER-DENVER



75,000-gallon elevated tank and ground-level reservoir used for municipal service at Gardena, California, by the Moneta Water Co.

The *TYPE* of Water Storage Is Important

THREE are two distinct types of water storage tanks; ground-level and elevated. Each has its particular use and it is important that the proper type is selected for the service it is to render.

Flat-bottom steel reservoirs are used to store water at ground level to insure a system against interruption of supply in case of temporary failure at the source. They are also used to provide a gravity pressure supply if they can be located on natural elevations sufficiently above the areas served to create satisfactory pressure.

On the other hand, elevated tanks are used to furnish gravity pressure for the distribution system where no natural elevation

is available. In contrast to a reserve on the ground, the water in an elevated tank will provide service even though pumping equipment is stopped for repairs or there is a temporary power failure.

Gravity water systems are also economical to operate. The pumping equipment need only be large enough to meet average demands, as the peaks are supplied from the tank. It can be operated at a constant rate and with maximum efficiency.

Write us for estimates on either elevated or flat-bottom steel tanks to meet your particular requirements. They are erected complete, with our own experienced Pacific Coast field crews.

CHICAGO BRIDGE & IRON WORKS
1013 Rialto Building, San Francisco

B-154

HORTON TANKS

When writing to CHICAGO BRIDGE & IRON WORKS, please mention Western Construction News

Do You Know that—



- 1 The LIMA "101" is equipped throughout with anti-friction bearings—a Timken at every vital bearing point.
- 2 The LIMA "101" has an independent differential crowd—one that responds instantly to the slightest motion of the crowd lever.
- 3 The single line hoist on the LIMA "101" has a hoist pull of 32,000 pounds at a maximum speed of 80 to 100 feet in one minute.
- 4 All main shafts on which are mounted sliding members are splined for accuracy in fit and elimination of vibration due to wear and back-lash.
- 5 All main machinery shafts are only 24 inches from the floor, giving low center of gravity for heavy duty digging.
- 6 The LIMA "101" has the largest roller path on record—73 inches in diameter. This oversize construction insures stability of the upper deck in heavy digging and relieves strain on center pin.
- 7 98% of all castings used in LIMA "101" are specially treated steel.
- 8 The LIMA "101" clutch and brake bands are of the outside type, 5 1/4" wide—largest ever used on a shovel of 1 1/4 yard capacity. All clutches and all bands are interchangeable.
- 9 All levers are clamped to squared shafts. No keys to work loose.
- 10 The pressed steel heavy duty boom used on the LIMA "101" eliminates 50% of the bolts and rivets required in ordinary types and requires no outriggers, truss rods, or turn buckles.
- 11 The LIMA "101" dipper handle is of pressed steel construction to eliminate bolt and rivet trouble and to withstand all strains and stresses imposed by heavy duty.
- 12 The ease of operation of the LIMA "101" is incomparable—only three levers to control—just as with steam.

THE OHIO POWER SHOVEL COMPANY

Division Lima Locomotive Works Incorporated

Lima.

Western Office
2351 Graybar Bldg.,
New York

Ohio

Western Office
846 Straus Bldg.,
Chicago, Ill.



LIMA "101"

*West Coast
Representatives:*

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Road Machinery
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A. L.
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Company
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Tyee
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Los Angeles, Calif.

Blast Holes Drilled with Speed by a Hercules-Powered Rig

To drill blast holes for dynamiting ahead of the shovels, the Cable Company of Canton, Ohio, used a Hercules-Powered Cyclone Drill in completing a million-cubic-foot excavation for the Goodyear-Zeppelin Air Dock at Akron.

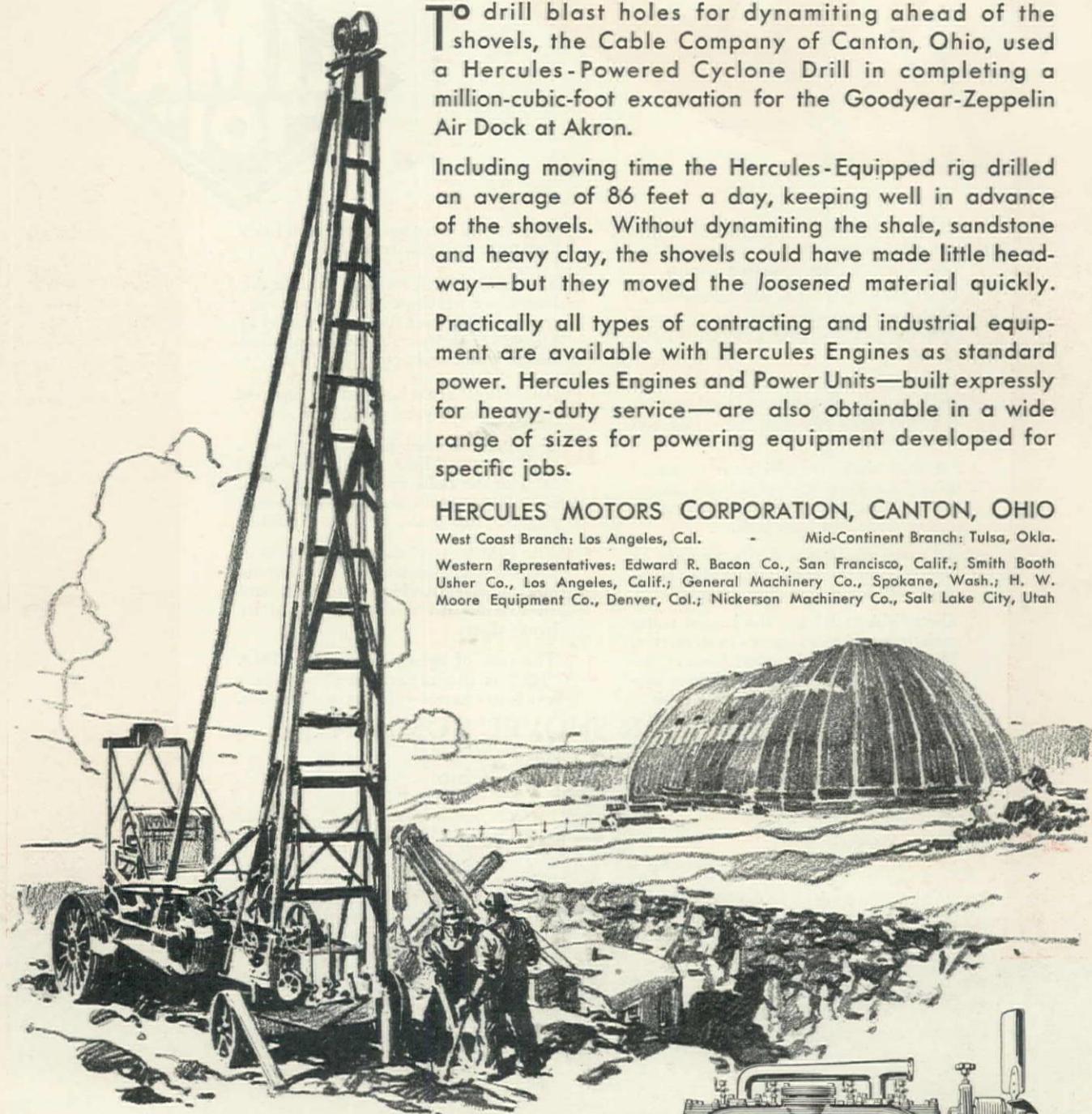
Including moving time the Hercules-Equipped rig drilled an average of 86 feet a day, keeping well in advance of the shovels. Without dynamiting the shale, sandstone and heavy clay, the shovels could have made little headway—but they moved the loosened material quickly.

Practically all types of contracting and industrial equipment are available with Hercules Engines as standard power. Hercules Engines and Power Units—built expressly for heavy-duty service—are also obtainable in a wide range of sizes for powering equipment developed for specific jobs.

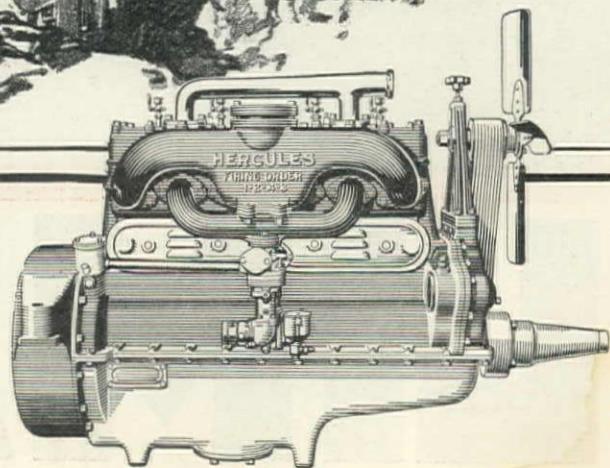
HERCULES MOTORS CORPORATION, CANTON, OHIO

West Coast Branch: Los Angeles, Cal. - Mid-Continent Branch: Tulsa, Okla.

Western Representatives: Edward R. Bacon Co., San Francisco, Calif.; Smith Booth Usher Co., Los Angeles, Calif.; General Machinery Co., Spokane, Wash.; H. W. Moore Equipment Co., Denver, Col.; Nickerson Machinery Co., Salt Lake City, Utah



HERCULES ENGINES



When writing to HERCULES MOTORS CORPORATION, please mention Western Construction News



Three Hundred and Thirty Years Ago

—SIR FRANCIS BACON SAID:

“It is generally better to deal by speech than by letter.”

During the twenty years that we have been meeting the demands and needs of construction equipment users, we have grown more and more firmly convinced that Francis knew his stuff. We could print advertisements for the next 330 years and they would never be as convincing as a machine out in the field earning a daily profit for its owner.

We have good construction equipment, honestly manufactured, sold and serviced. Our equipment has earned enviable performance records — records that we believe cannot be approached by any other line. But, writing about our equipment is pretty weak stuff compared to letting the machines talk for themselves. Come on out to our display rooms at 17th and Folsom and we'll demonstrate. If there's a piece of equipment there that can't earn its right to be on your pay roll, we'll have nothing more to say.

EDWARD R. BACON COMPANY

CONSTRUCTION  EQUIPMENT.

SINCE

1910

SACRAMENTO — OAKLAND — FRESNO — RENO — HONOLULU
17TH AND FOLSOM STREETS — SAN FRANCISCO

When writing to THE EDWARD R. BACON CO., please mention Western Construction News

IT'S
BACON
IN SAN FRANCISCO

IN SAN FRANCISCO
IT'S
BACON

Mr. Contractor!

Do you know that the MASTER SCRAPER loads on a turn as easily as it does on a straight pull?

And has it ever occurred to you how many hard-earned DOLLARS you are losing whenever you work tractor scrapers that you cannot load on the turn?



FULL Loads Are PAY Loads

The MASTER will load on a turn, and YOU are LOSING hard-earned DOLLARS every day you move dirt without one.

Why not throw away those old, obsolete scrapers, TODAY, NOW, and get yourself a MASTER?

The MASTER Rotary Scraper will cut and skip, underspill, finish grade and level. Manual load control or Automatic.

"It moves the Earth"

Simple Design Rugged Construction Easy Operation

Sold in Northern and Central California by:

EDWARD R. BACON CO.

FOLSOM AT SEVENTEENTH STREET
SAN FRANCISCO, CALIF.

Manufactured by:

MASTER EQUIPMENT COMPANY

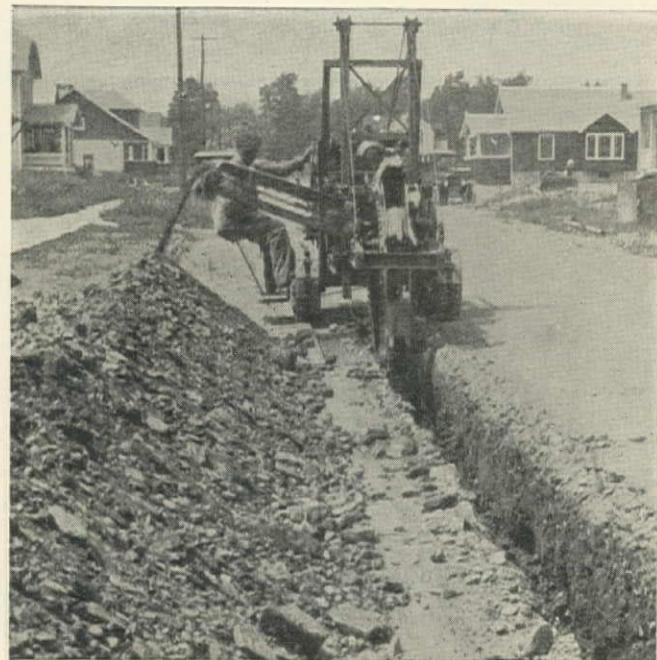
Box 517, FLORENCE BRANCH
LOS ANGELES, CALIF.

Western Representatives:

CROOK COMPANY.....	Los Angeles, Calif.
COUSINS TRACTOR CO.....	Hanford, Calif.
BARTH & SHEPHERD.....	Marysville, Calif.
JERRY CALDWELL CO.....	Seattle, Wash.
LUKE & LIVINGSTON.....	Santa Maria, Calif.
PETRIE TRACTOR & EQUIPMENT CO.....	Missoula, Mont.
HALL PERRY MCHY. CO.....	Butte, Mont.
ROB'T T. TWEDT CO.....	Cheyenne, Wyo.

"It's MASTER Equipment, it MUST Be Better"

THE CLEVELAND BABY DIGGER for RESULTS!



PUBLIC UTILITIES and contractors in all parts of the country have found the speed and economy of the Baby Digger so effective that they have been able to greatly increase the number of extensions of their lines, thus bringing additional revenue. It has dug hundreds of miles of trench in the heart of some of the largest cities, where underground pipes abound, with minimum disturbance to property owners and general public.

Compact, mobile, powerful, sturdy and fast, the Baby Digger is especially designed to deliver maximum results in trench digging.

It is only fifty-eight inches in extreme width. Think what this means when your line of trench must pass close to trees, buildings, poles, etc., along the edge of the highway or down a narrow alley. It slips easily by, around, and between these obstructions.

Easily and quickly transported on its own specially built trailer from job to job, the Baby Digger materially increases productive time.

You can not afford to be without Baby Digger economies in your 1930 trenching work. Write today for full information.

THE CLEVELAND TRENCHER COMPANY

"Pioneers of the Small Trencher"

20100 St. Clair Avenue, Cleveland, Ohio, U. S. A.

Distributed by

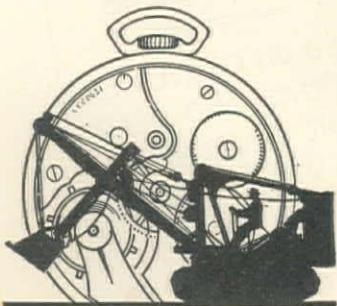
EDWARD R. BACON CO. :: :: San Francisco, Calif.
FRANK T. HICKEY CO. :: :: Los Angeles, Calif.

THE CLEVELAND BABY DIGGER

IT'S
BACON
IN SAN FRANCISCO

Here YOU are, Inspecting BYERS NEW BEAR CAT for the first time

Radically improved over original Bear Cat—tested, proved design adapted from Byers full circle line—weight as shovel under 10 ton limit—Independent all cable crowd—power clutches—large 12 in. diameter drums—long cable leads—double steer—worm boom hoist— $\frac{3}{8}$ yd.— $\frac{3}{4}$ swing—unit casting construction—Timkin roller bearings—high quality at low price.



BUILT JUST LIKE A FINE
WATCH . . . CAREFULLY . . .
PRECISELY . . . COMPACTLY

IN a flash! One look at this machine will start you thinking of dozens of places around your jobs where it will economically replace heavier, more expensive equipment.

Byers new light clean-up machine! It is built with exclusive features never before designed into a unit of this size. Its price is lower than you'd ever imagine.

Whatever you do, see this snappy little 1930 rig before you decide anything about your next buy. See one near you, or come here to Ravenna and study the assembly and performance.

Catalog and other literature are ready. Write—right now! The Byers Machine Co., Ravenna, Ohio. Sales and Service throughout the country.

Distributed
by the

**EDWARD R.
BACON CO.**
Folsom at 17th St.
SAN FRANCISCO

Branch
Offices in
SACRAMENTO
OAKLAND
FRESNO
SAN JOSE
RENO
HONOLULU

BYERS
 $\frac{3}{8}$ YD. $\frac{3}{4}$ SWING
BEAR-CAT
A WORTHY ADDITION TO BYERS FULL CIRCLE LINE

IN SAN FRANCISCO
IT'S
BACON

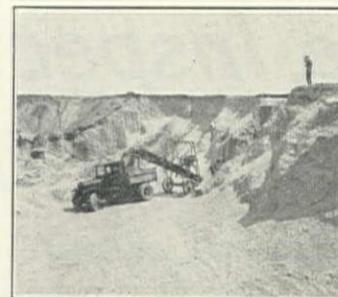


Material Handling Equipment

A model for every type of industrial and contractor use. The new gravel car unloader successfully works beneath all drop bottom cars without a pit for the unloader or conveyor. Write for literature describing the model best suited to your requirements.



UNIVERSAL BELT

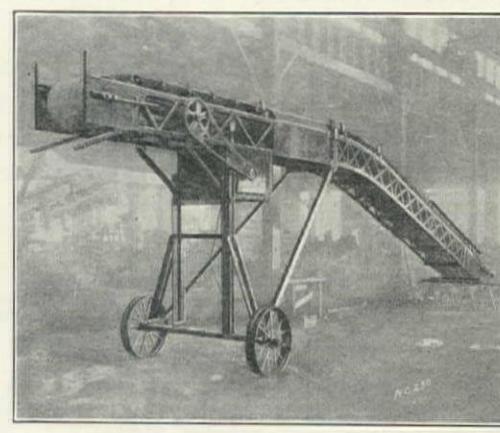


IN THE GRAVEL PIT



CONVEYOR and SHAKER SCREEN

WESTERN REPRESENTATIVES
EDW. R. BACON CO.
SAN FRANCISCO
SACRAMENTO OAKLAND
MCCRACKEN-RIPLEY CO.
PORTLAND, ORE.



THERE IS A NORTHERN
OF THE TYPE AND
CAPACITY TO FILL
YOUR NEEDS

SOLD ON CONVENIENT
TERMS AND BEARS
OUR FIVE YEAR
GUARANTEE

Northern Conveyor & Mfg. Co.
Janesville, Wisconsin

IN SAN FRANCISCO
IT'S BACON

Repeat Orders...

from Satisfied Customers place the
Highest Stamp of Approval on the

MULTI FOOTE PAVER

Built for the most severe tests by
"Specialists" in the Paving Mixer
Industry. The World's Largest
Exclusive Builders of Road
Pavers.

Dependable for Mile-after-Mile,
Day-after-Day, Steady, Uniform
Service.

Become a MultiFoote User —
Understand why many of the
Largest and most Successful
Contractors continue to buy
MultiFootes.

NO-PRESSURE WATER TANK—An open-top auxiliary supply tank delivers water to the MultiFoote Measuring Tank but without pressure. It is the simplest and most dependable system for accurate water control.

THE POWER BOOM SWING — This new equipment speeds the handling of each batch and so gains yardage each day.

THE POWER OPERATOR — A time saver. Allowing the Operator ample time for full supervision.

HERCULES HEAVY DUTY GASOLINE
ENGINE — It handles all operations with
ample power.

REFINEMENTS, without sacrificing strength;
STRENGTH, without accumulating weight;
MECHANICAL OPERATIONS, without
complicated mechanism. SIMPLE, but com-
plete in every detail.



THE FOOTE CO., Inc.
NUNDA, N. Y.

PACIFIC COAST DISTRIBUTORS

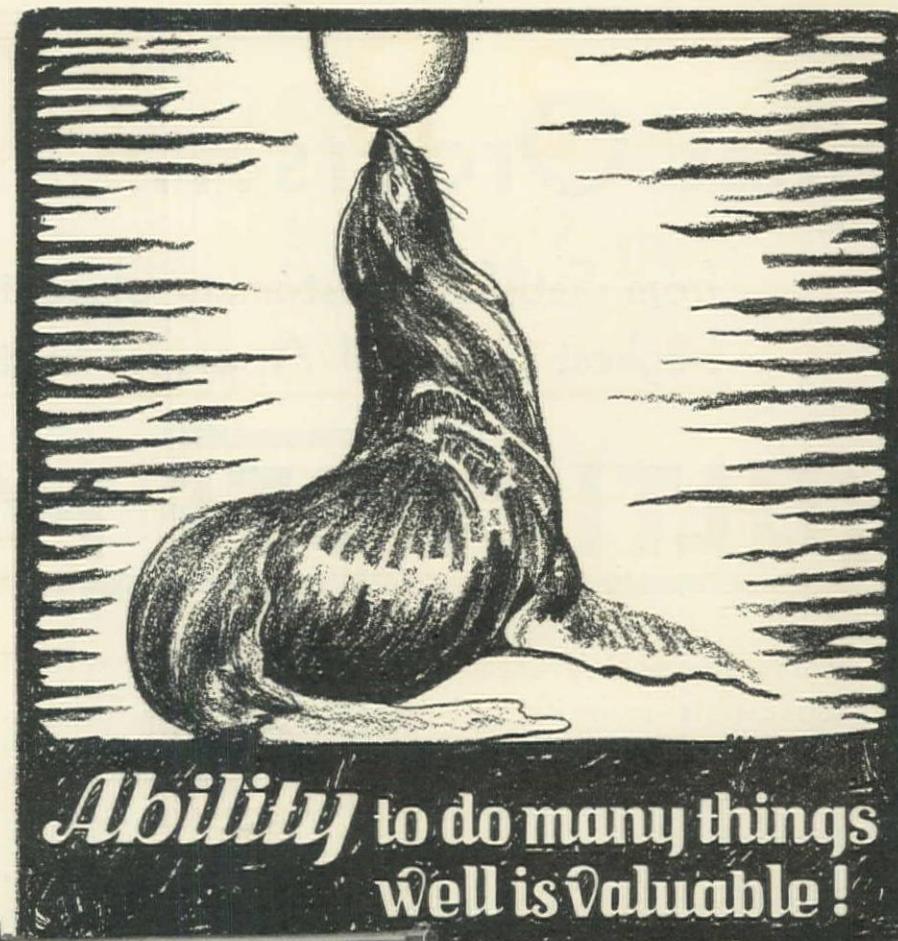
EDWARD R. BACON CO.,
Folsom at 17th Street,
SAN FRANCISCO, CALIF.
Oakland, Sacramento, Fresno,
San Jose, Reno and Honolulu

Smith Booth Usher Co.,
1910 Santa Fe Avenue,
Los Angeles, Calif.

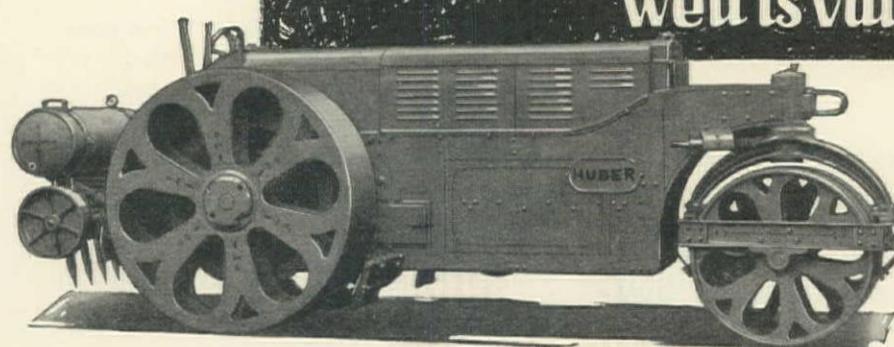
World's Largest Exclusive Builders of Road Pavers

When writing to THE FOOTE COMPANY, INC., please mention Western Construction News

IN SAN FRANCISCO
IT'S BACON



*Ability to do many things
well is valuable!*



You'll like a *Huber* because of its all-round ability to do all types of road work. It takes the place of a number of different pieces of equipment—and does the work efficiently and economically! A *Huber* with sprinkling attachment is ideal for rolling hot asphalt—with scarifier it tears up old roads and streets to any accurate depth—with grader blade it levels off old roads in a hurry—many operations with one machine. Made in sizes from 5 to 15 tons.

Write for the *New HUBER* Roller Catalog

EDWARD R. BACON COMPANY

17th and Folsom Sts., San Francisco

Phone HEmlock 3700

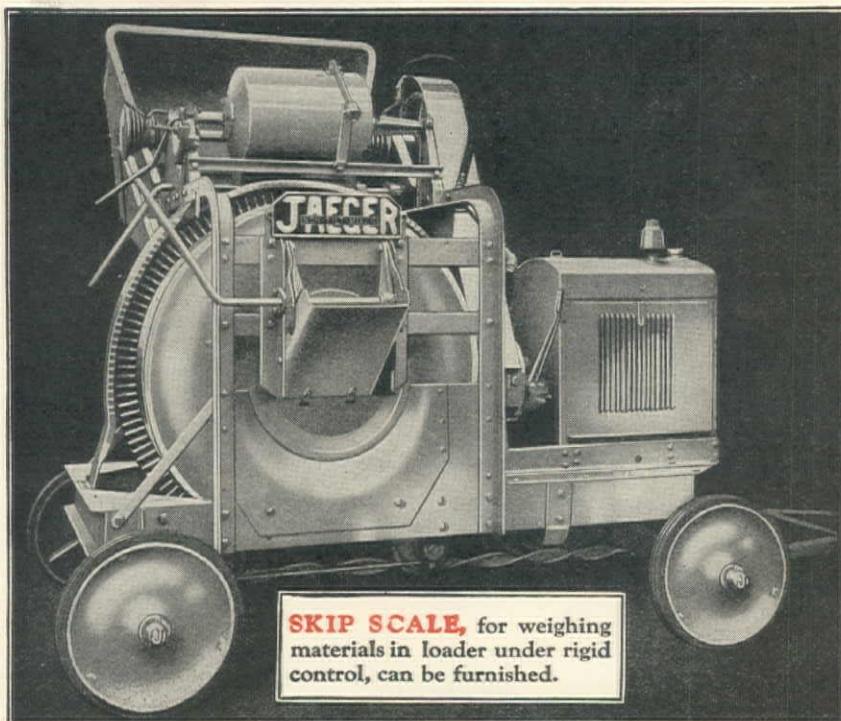
HUBER
MOTOR ROLLERS

When writing to THE HUBER MFG. CO., please mention Western Construction News

IT'S
BACON
IN SAN FRANCISCO

1 and 2 Bag Mixers

.... Again Stepped Up in the Features
 that mean SPEED and EASY HANDLING
 ... to Make You Money on 1930's Jobs!



10S Handles like a 7...

50% extra strength...1000 lbs. less weight...all-steel, Short coupled, direct driven, 100% ball bearing, Dual tire wheels, roller bearings, springs, Patented Skip Shaker loading, faster discharge, rigid water control with fast tilt and pour tank, One man end control.



7S SPEED KING Handles like Any TRAILER

Outsells all other One Bag Mixers!

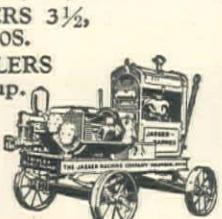
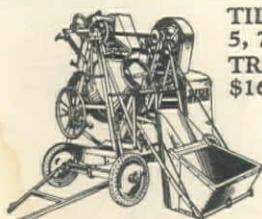
STOUTER, faster than ever, this sensational mixer is ready to hang up new 1930 records. Finest construction with all Jaeger features (Skip Shaker, Accurate Water Tank, ball bearings, one man control) plus advantage of end discharge and many new improvements.

Contractors have proved it out...buy more Speed Kings than any other 7S mixer built.

OTHER NON-tilts 14, 21, 28, 56S.

TILTERS 3 1/2,
5, 7, 10S.

TRAILERS
\$169 up.



JAECER-BARNES PUMPS

Self-Priming
Centrifugals

Triplex
Road Pumps

All other
types



JAECER MIXERS...PUMPS ...HOISTS...

Carried in stock by

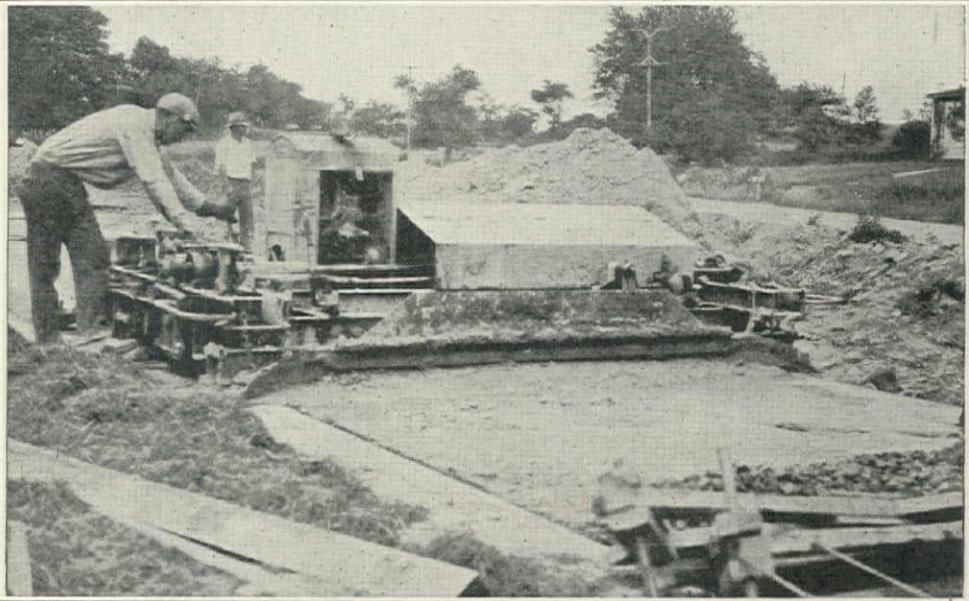
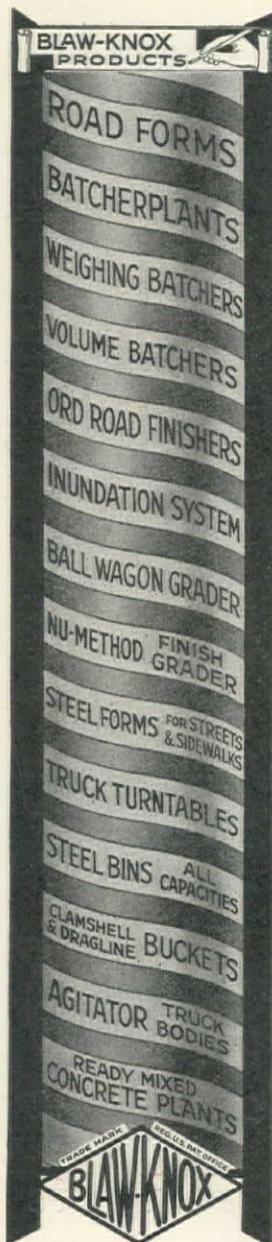
Edward R. Bacon Co., San Francisco
 Smith Booth Usher Co., Los Angeles
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IN SAN FRANCISCO
IT'S
BACON

YOUR KEY PIECE
OF EQUIPMENT
SHOULD BE A

dependable

ORD



the original double screed

finisher

BLAW-KNOX COMPANY

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EDWARD R. BACON CO. GARLINGHOUSE BROS.
Folsom at Seventeenth Street 16th Street and Santa Fe
San Francisco Avenue, Los Angeles

L. A. SNOW CO.
348 Hawthorne Avenue
Portland, Ore.

1032 Sixth Avenue
Seattle, Wash.

BLAW-KNOX

Full Loads with “Ateco” Hydraulic Dirtmovers and “Caterpillar” Tractors



Jobs completed in record time and a greater number of jobs at greater profits are assured to the earth mover through the use of “Ateco” Dirtmovers, which haul on every trip the largest load within the

power of the Tractor.* Compare these capacities---2 cu. yds. and 8 ft. wide for the “Caterpillar” Thirty; and 4 cu. yds. and 10 ft. wide for the “Caterpillar” Sixty Tractor.

*The picture shows an “Ateco” Dirtmover and a “Caterpillar” being used to enlarge the airport at Long Beach, California.



AMERICAN TRACTOR EQUIPMENT CO.

MANUFACTURER

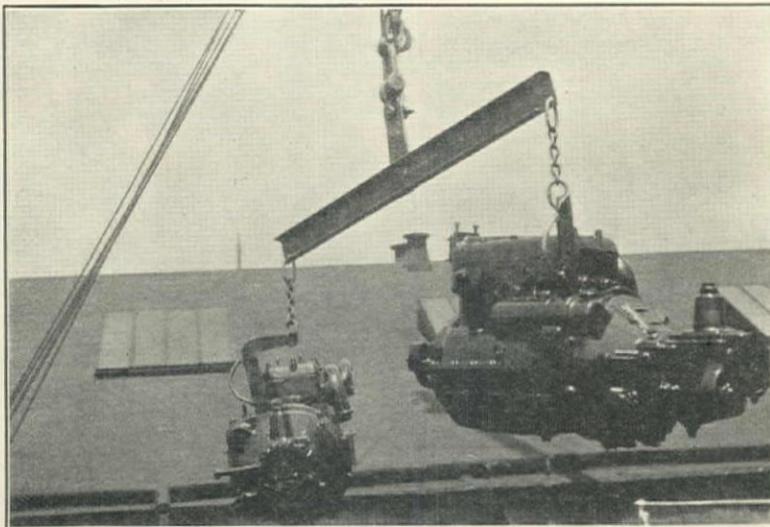
Peoria, Illinois, and Oakland, California, U. S. A.

When writing to AMERICAN TRACTOR EQUIPMENT COMPANY, please mention Western Construction News

THE RIGHT GEAR

for

EVERY CARGO



Automobile engines being loaded at Philadelphia for a Pacific Coast assembly plant.

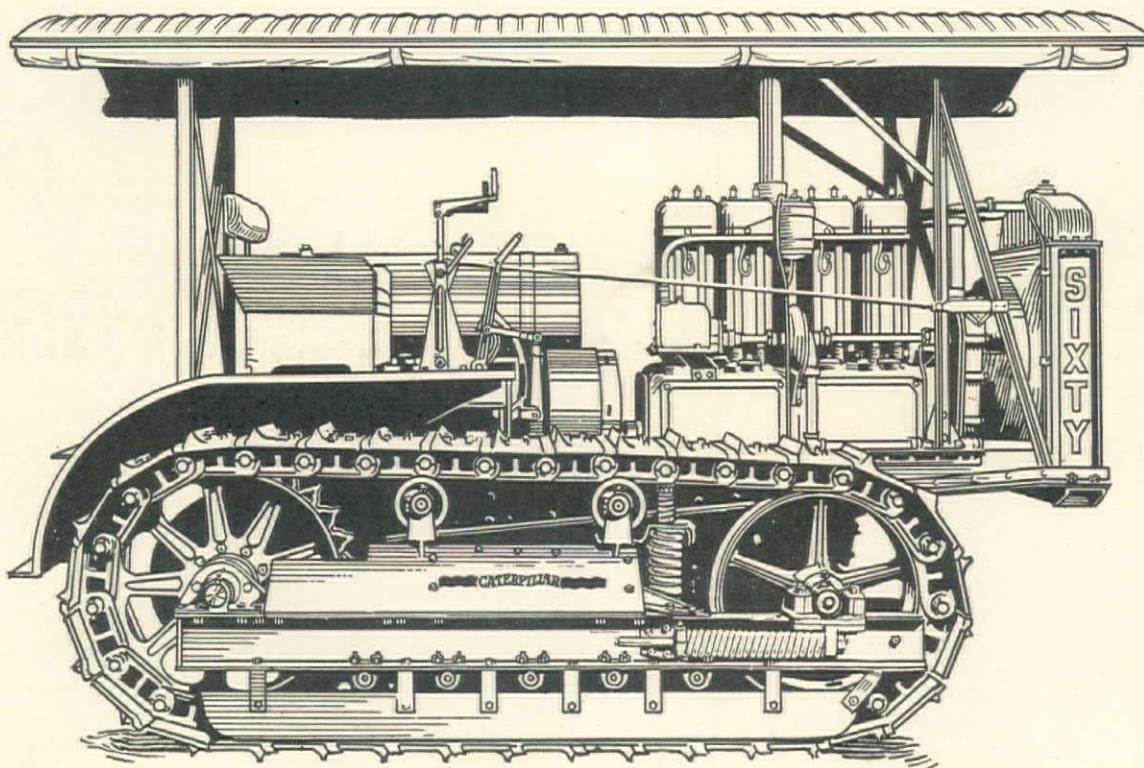
Every piece of cargo transported by American-Hawaiian service is handled with gear best suited for its particular requirements. Automobile engines consigned to Pacific Coast assembly plants arrive in perfect condition. They are loaded and unloaded by means of a "spreader" with angle arm (plug) hooks, permitting speedy handling with absolute safety to the machinery.

Water transportation is swift, dependable, and, above all things, economical. Investigate its application to your products.

AMERICAN-HAWAIIAN STEAMSHIP CO.

Superior Coast-to-Coast Service

"ACTION TRACTION SATISFACTION"



WITH A
"CATERPILLAR"
TRACTOR



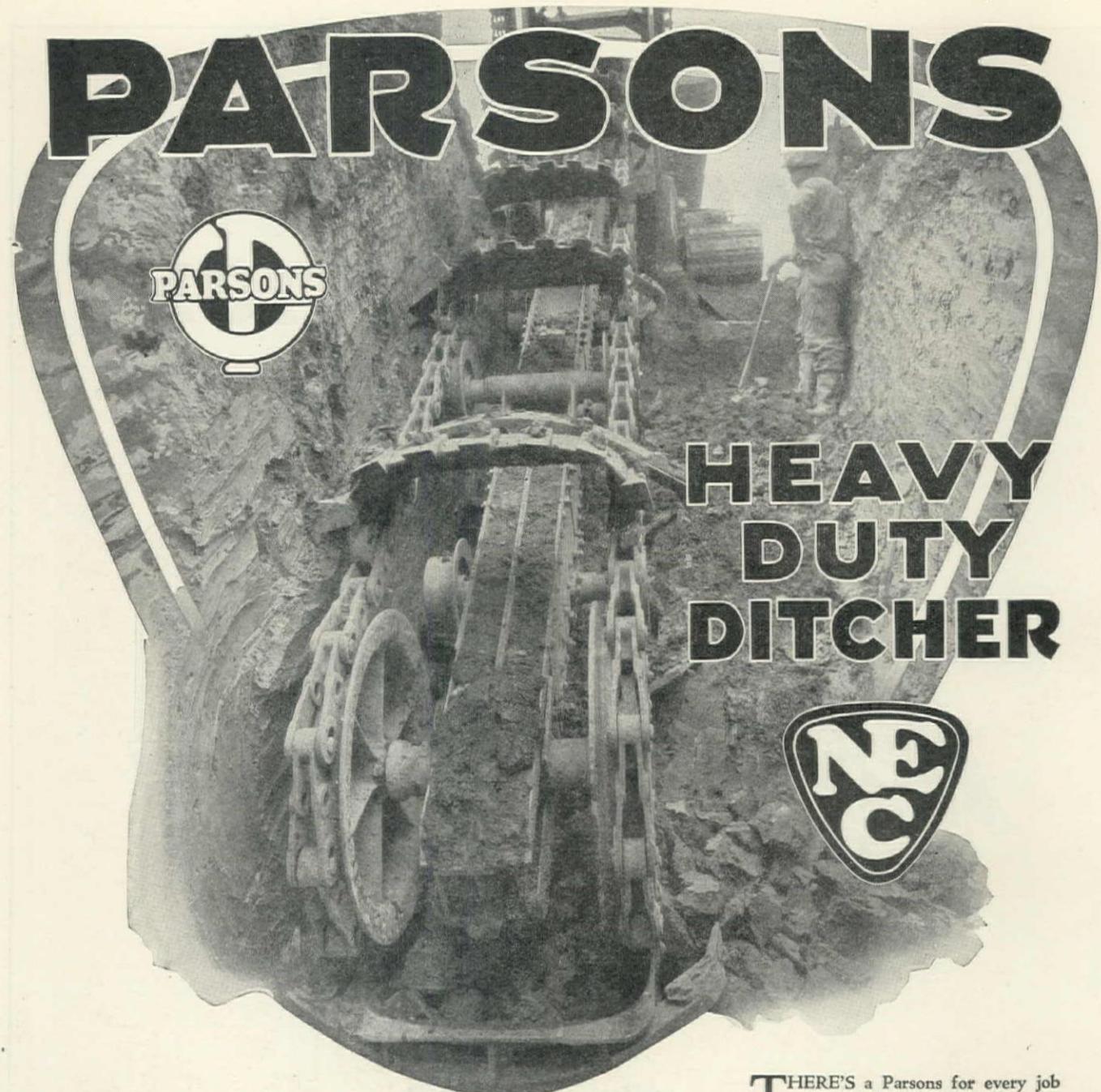
West Coast Tractor Company

1175 Howard Street, San Francisco

"ATECO" DIRT MOVERS

::

KILLEFER IMPLEMENTS



EVERY Parsons size for every class of work is *Heavy Duty* — has the power and construction to do its job! *Outstandingly so!*

It is the adaptable dumper with the range of digging, traction and conveyor speeds to meet every ground condition—with the offset boom that digs in center or towards either side of the machine and within inches of curbs or poles, and with a conveyor that spills on either side!

THERE'S a Parsons for every job — city work and public utility, irrigation, long distance pipe lining — and every one is Heavy Duty! Write N. E. C.

N. E. C. PRODUCTS

KOEHRING — Pavers, Mixers; Power Shovels, Pull Shovels, Cranes, Draglines; Dumpers. 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.

National Equipment Corporation

30th St. & Concordia Ave.
Milwaukee, Wisconsin

Harron, Rickard & McCone Co., 1600 Bryant St., at 15th, San Francisco, Calif.
Harron, Rickard & McCone Co. 2205 Santa Fe Ave., Los Angeles, Calif.
Wilson Machinery Co. 1936 Market Street, Denver, Colorado

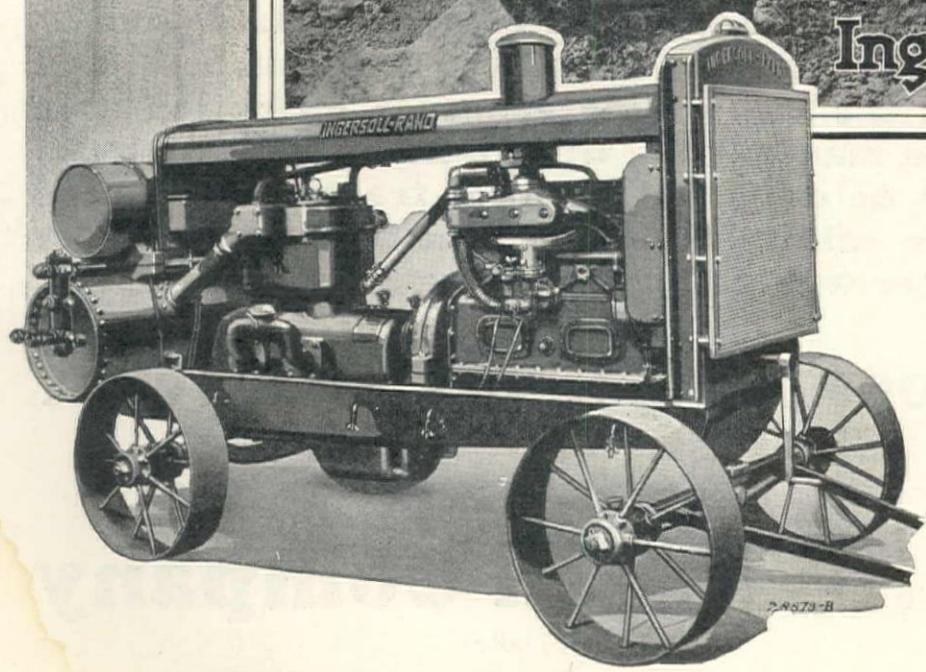
When writing to NATIONAL EQUIPMENT CORPORATION, please mention Western Construction News

Lund & Company 49 N. Second, West, Salt Lake City, Utah
Northwest Equipment Co., Inc. Great Northern Tracks, Great Falls, Montana
L. A. Snow Company, 1082 Sixth Ave., S., Seattle, Wash., Portland, Spokane

A 5777-I



Ingersoll-Rand
33578



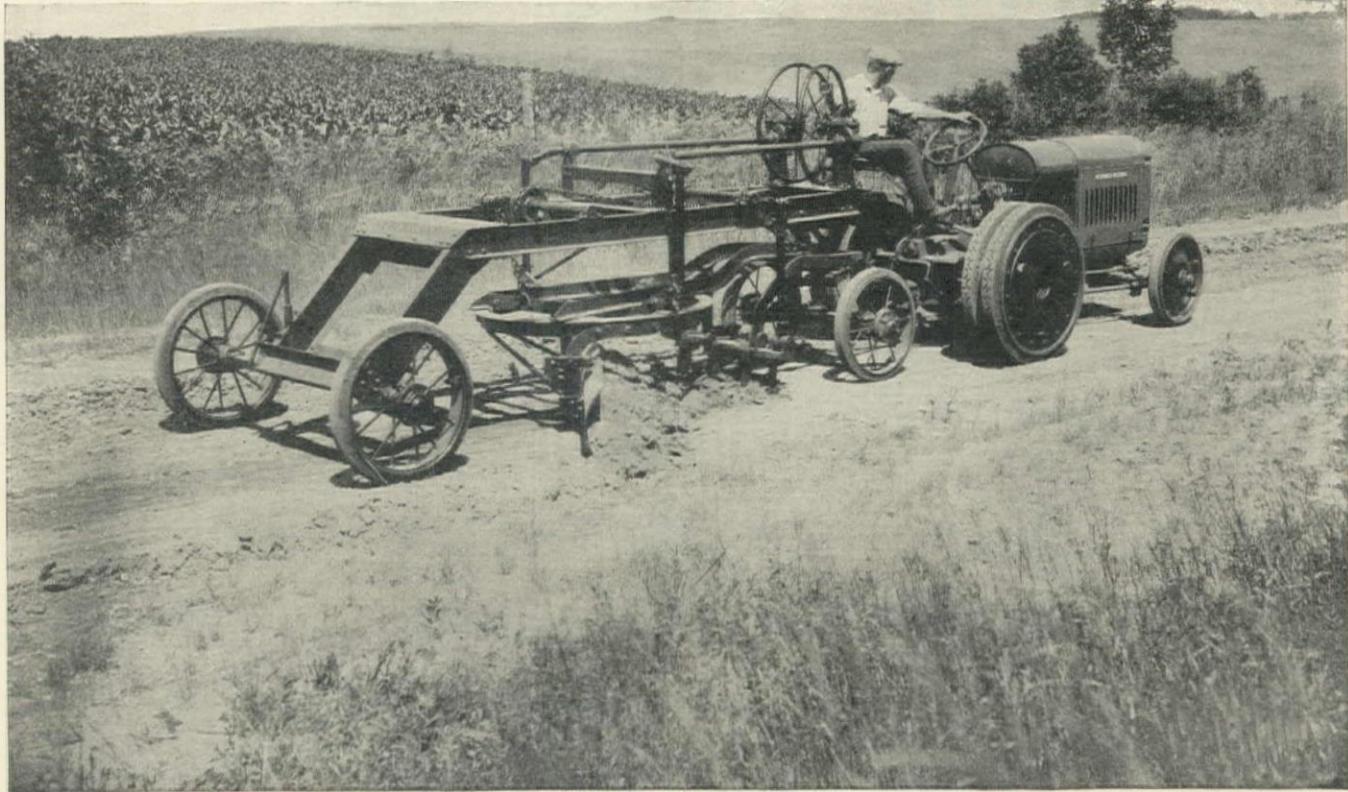
Cost Cutters

The superior performance of I-R "Jackhamer" Drills and Portable Compressors has lead to their adoption by a great many contractors and public utility companies throughout the world.

These outfits are powerful, well-constructed, and thoroughly reliable; they speed operations and lower costs under all working conditions.

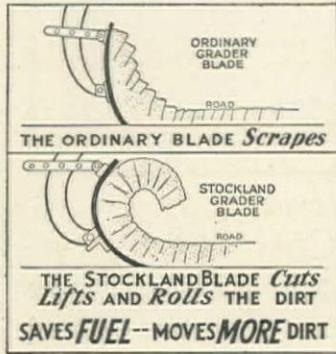
INGERSOLL-RAND CO.
Branches or distributors in principal cities the world over.
San Francisco, Cal. New York, N. Y.
Los Angeles, Cal. Seattle, Wash.

STOCKLAND Road Graders



International-ONE MAN-Road Maker

[THE STOCKLAND WHIPPET No. 1]



The Stockland Whippet is the pioneer—four wheel—pull type—one man control grader. The Whippet is pulled, not pushed, and has the same wide range of operation as a two man outfit. Q The Stockland Whippet can be detached from the tractor in less than two minutes, leaving the tractor free for other work, thus insuring maximum use of the power plant.

THERE'S A STOCKLAND MODEL FOR EVERY GRADER JOB

"Ask for Our Stockland Grader Book"

W. H. Worden Company

DISTRIBUTORS

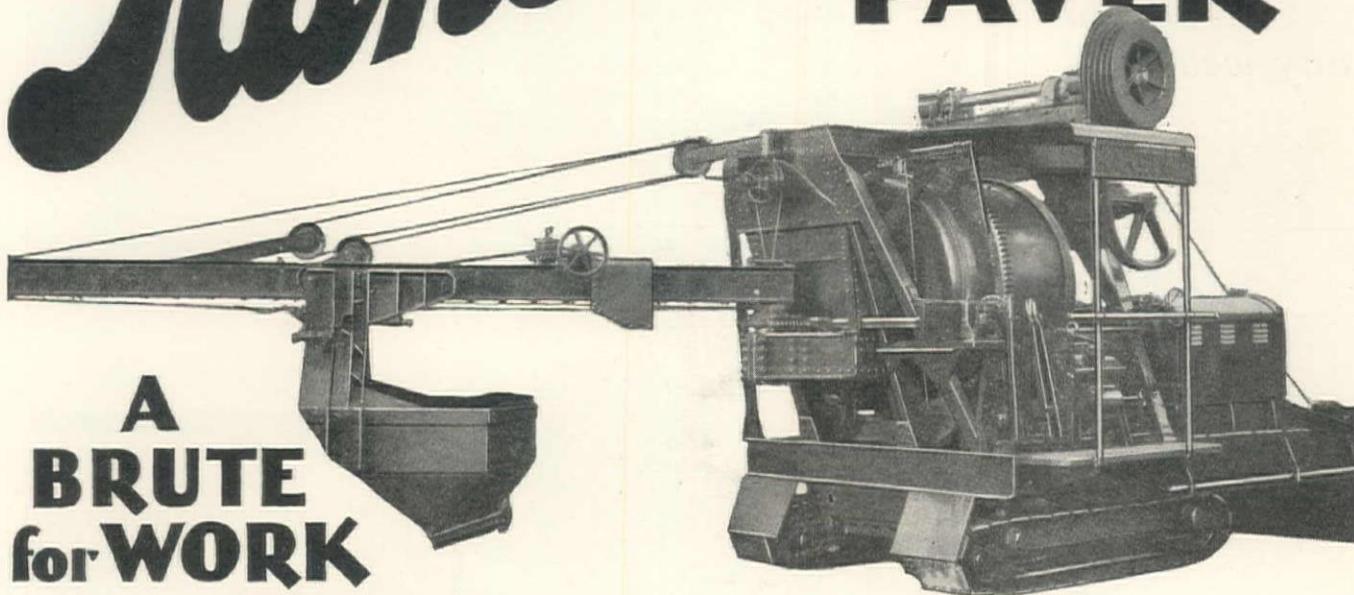
355 Fremont Street, San Francisco, Calif.



Established 1859

When writing to W. H. WORDEN COMPANY, please mention Western Construction News

The New MASTER Ransome 27-E PAVER



**A
BRUTE
for WORK**



MORE powerful... sturdier... faster... lower in height... simpler in design than ever.

Water control is accurate. It is not affected by grades or by sudden starting or stopping of the paver when tank is discharging into drum. Adjustment is made by a handwheel carried to operator's platform. Water valve, non-by-passing type.

The traction reverse bevel gears and the jaw clutch are now included in the main gear unit.

Reduction gears and traction reverse gears with their clutches are now mounted in main gear box.

Another enclosed gear box takes care of the power discharge and boom bucket gearings.

A third enclosed gear box is used for the power boom swing.

Two speed traction.

Boom swings through an arc of 170 degrees.

Powered by a 6-cylinder, heavy duty, 65-70 h. p. gasoline engine.

Start the New Master 27-E Paver earning profits for you.

Send today for the Bulletin

Ransome Concrete Machinery Company
Dunellen **1850 — Service for 80 Years — 1930** **New Jersey**

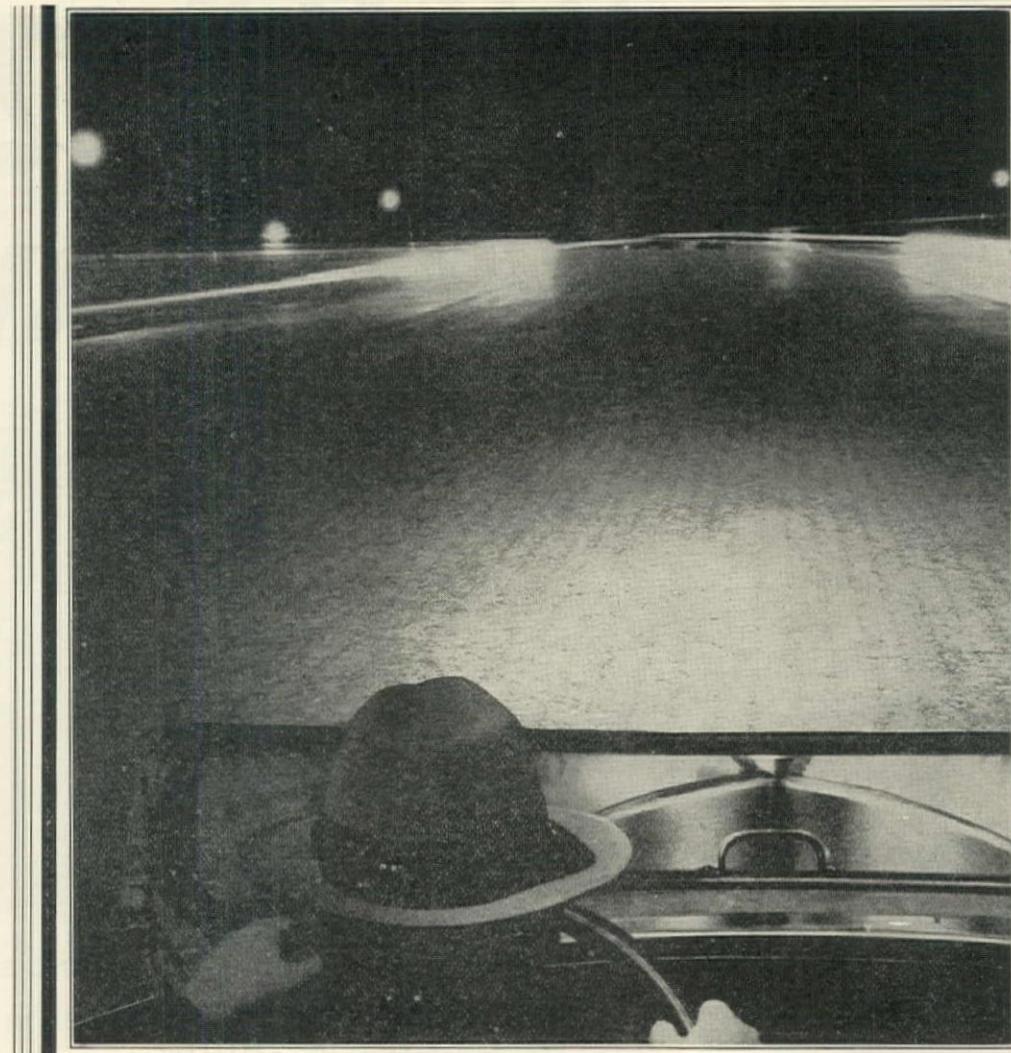
Crook Co.
 Los Angeles, Calif.

Kratz & McClelland, Inc.
 San Francisco, Calif.

McCraken-Ripley Co.
 Portland, Ore.

Star Machinery Co.
 Seattle, Wash.

*Non-skid,
glare free
pavements—
Safe for
night driving—
Safe in
any weather—*



A SAFE INVESTMENT *for* PROPERTY OWNERS

ON CROWDED HIGHWAYS—at night—even in the rain you're lucky if you're skimming along Non-Skid Asphaltic Concrete pavement.

It's *safe*—because stone chips—coated with Asphalt and pressed right into the top coat—give your tires a sure, firm grip in any weather—at any traffic speed!

Asphaltic Concrete highways usually cost less to build than other pavements—always

considerably less to maintain! McAdam Street, Oakland, California—paved in 1909—is still taking the hammering of heavy trucks with negligible repair costs! Scores more are serving faster and faster traffic after 15 or 20 years with practically no maintenance at all!

Wherever you go—from Washington to San Diego—Reno to Phoenix—you'll see *durable* Asphaltic Concrete Pavement. Investigate it.

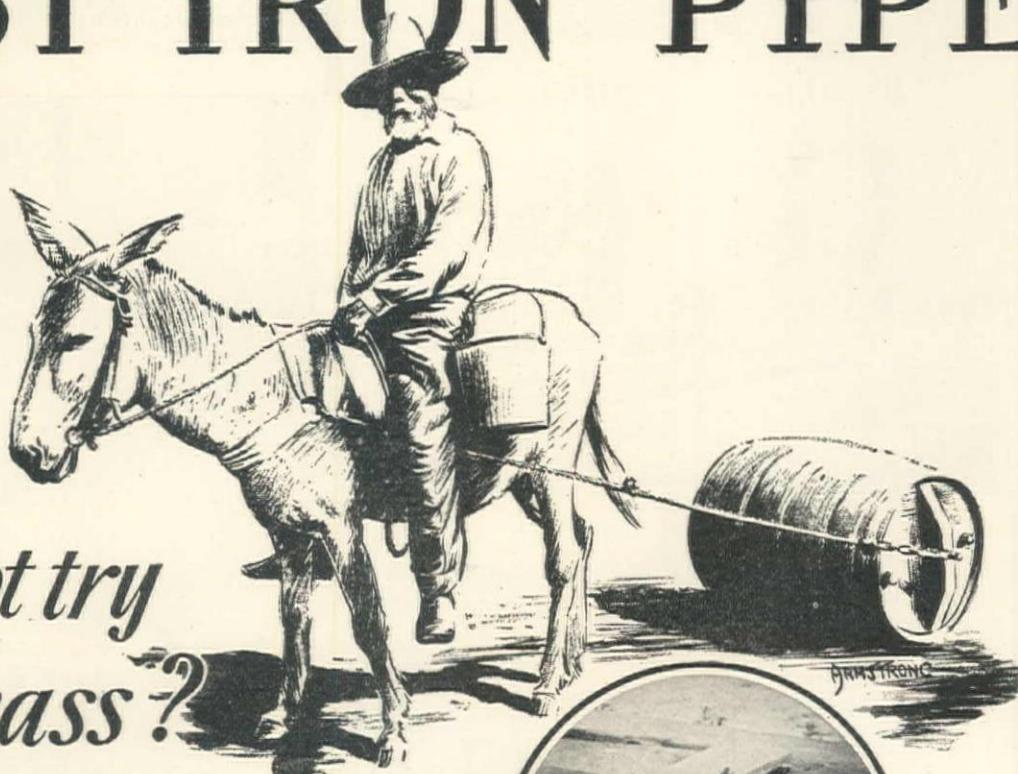
STANDARD OIL COMPANY OF CALIFORNIA



Asphaltic CONCRETE NON-SKID PAVEMENT

If you must use a substitute for CAST IRON PIPE

*Why not try
a Jackass?*



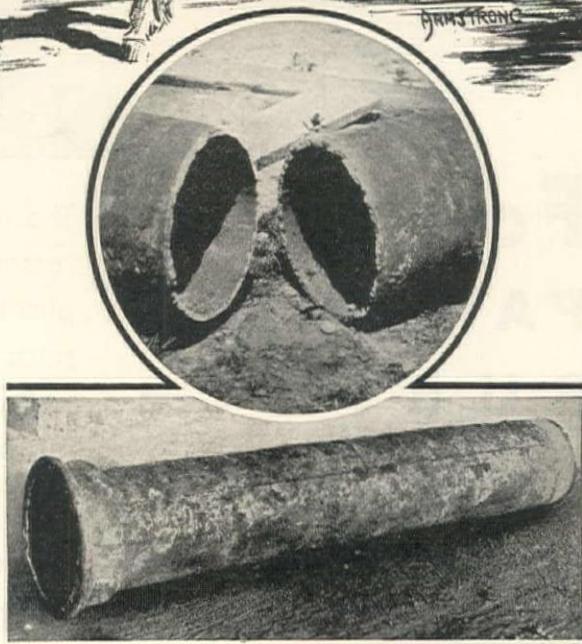
THE burros of South America, when used as water carriers, are called "regadoras." This drawing is made from an actual photograph of one of the last of these ancient "water systems."

But, even the regadoras have their good points. They have been known to deliver water continuously for ten years and longer. That's more than can be said of other substitutes for cast iron pipe.

When you need cast iron pipe—the pipe everlasting—call a Clow-National man. There is one near you . . . 23 sales offices scattered from one end of the country to the other. And remember, that Clow-National makes "everything for a pipe system," including valves, hydrants, joint materials, special fittings of every kind.

"*Pipe Economy*," eighth edition, shows complete line of pipe system equipment, 250 pages of valuable information, over 2000 illustrations, free for the asking.

Address either company.



Top: 10" cast iron pipe laid at Portage, Wis., in 1887, taken up in perfect condition and relaid. Below: Cast iron pipe laid at Philadelphia, Pa., in 1819, removed during South Broad Street Subway excavation and found in perfect condition.

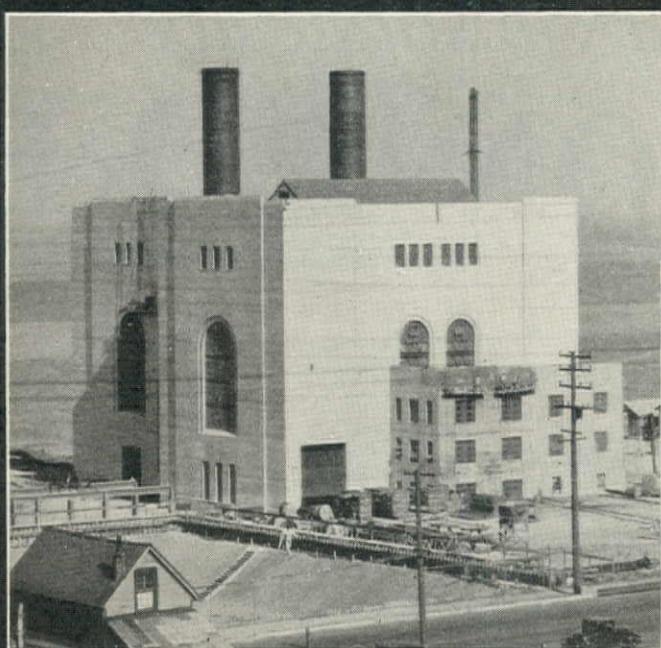
James B. Clow & Sons
Chicago, Illinois

National Cast Iron Pipe Co.
Birmingham, Ala.

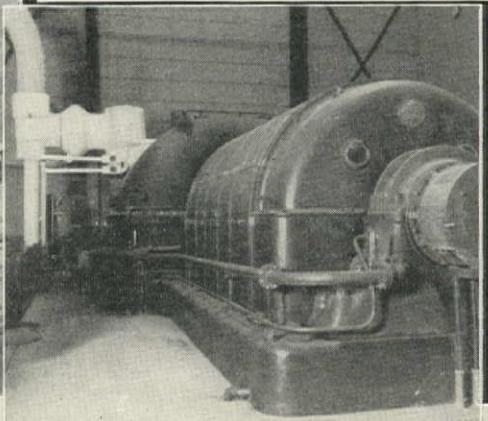
CLOW-NATIONAL
CAST IRON PIPE

"Everything for a Pipe System"

PABCO Multiple Protection



Stand-by Plant of Great Western Power Co., San Francisco. Pabco Multi-Service Paints and Pabco Lacquer used throughout the interior. This plant is also protected by a Pabco 20-year Built Up Roof.



The Consolidated Paper Box Co.'s San Francisco plant is effectively protected from the elements by Pabco Multi-Service Paints.



•FOR EVERY PAINTABLE SURFACE

The illustrations above serve to visualize the versatility of PABCO protection. From power plant to factory, from bridge to huge skyscraper—in every type of building construction—**Pabco Multi-Service Paints** are protecting paintable surfaces of every description from the ravages of wear and the elements.

Whether your paint job is large or small, exterior or interior, simple or involving new and unusual difficulties, there is a Pabco Paint that will do the work easily and quickly and insure long years of protection.

The paint specialists of our engineering department are at your service—without expense or obligation.

THE PARAFFINE COMPANIES, INC.
LOS ANGELES • OAKLAND • SAN FRANCISCO
PORTLAND • SEATTLE
Kansas City • Somerville, N. J. • New York City
London, England • Sydney, Australia

Manufacturers of

Pabco Multi-Service Paints, Varnishes, Lacquers and Enamels, Pabco Waterproofing Paints and Compounds, Mastipave, Pabco 10, 15 and 20 Year Roofs, Malthoid Membrane Dampcourse, Pabcobond and Other Products.

© 1930

PABCO Multi-Service PAINTS

WHEN THE JOB IS DIFFICULT GET RESULTS WITH A LINN



Here the LINN is operating on a difficult highway fill in the Black Hills of South Dakota, for Chaulk and Birdsall, contractors



HAULS
PAY LOAD
AS IT LAYS
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San Francisco was, literally, all 'lit up' for a whole week in welcome to the 4000 who attended the fifty-third annual convention of the National Electric Light

Association, June 15 to 20. Many prom-

N. E. L. A.inent and nationally known executives Convention of this great industry prophesied still greater achievements in electricity. The Engineering Section meeting deserves particular mention for the reason that there were but four speakers, each with a most carefully prepared and well delivered address on the economics of engineering, and not on technical details of design or construction. The consensus of opinion was that the economic success of the electric power industry in the future must rest on the shoulders of the engineer. This is just another confirmation of our contention that the opportunities for the engineer are unlimited.

As reported in the June 10th issue, John N. Edy, civil engineer and city manager of Berkeley, California, since 1923, recently resigned to become city manager of Flint, Michigan, at a decided in-

City Managercrease in salary. Many engineers, some with experience as city managers, applied for the vacancy, but the city council, by a majority of one vote, selected Hollis R. Thompson, who for the past three years has been managing director of the Berkeley Chamber of Commerce. His salary will be \$7000, or \$3000 less than that paid Edy.

Very likely Thompson will make an efficient city manager, but we have come to look upon engineering training as a prerequisite to the position of city manager, and it is therefore to be regretted that the city council did not select one of the many engineer-applicants with city management experience. Also, it is unfortunate that the salary has been decreased. There have been a number of instances of engineers who have made excellent records as city managers, only to be later ousted or forced to resign because the city council decided to 'economize'.

An efficient manager of any large corporation—a city is certainly a big corporation—is entitled to and receives a commensurate salary. For a city the size of Berkeley, the salary should be at least \$15,000.

The citizens of both Oakland and San Francisco will have the opportunity at the primary election in August to vote on the city manager plan. We hope the vote will be successful in each case, and that large enough

salaries will be established to attract capable men. The various engineering associations should take an active part in the city manager movement.

Beginning with this issue, we are publishing the first connected and complete account to appear in the technical press of the irrigation and power development of

We Cover Salt river by the Salt River Valley Water Users' Association of Phoenix, Arizona, the Field planned and constructed in the ten years since 1920. This is in line with our policy to give the subscribers to **Western Construction News** a complete and accurate picture of major engineering-construction projects in the far west.

The Salt River project was the first and largest irrigation development authorized by the Reclamation Act of 1902 and undertaken by the Federal government. Early construction included Roosevelt dam and power plant, Granite Reef diversion dam, a canal and distribution system, etc., with total expenditure of \$10,000,000 between 1903 and 1917, when the project was acquired by the Association. A comprehensive program was thereafter adopted and subsequent work included three major dams and power plants—Horse Mesa, Mormon Flat, and Stewart Mountain; the Cave Creek flood control dam; installation of pumping plants for drainage and irrigation; improvements in the irrigation distribution system; a power system; and other items; bringing the capital investment to \$29,000,000.

The project is unique in that hydroelectric power is economically developed, distributed, and sold as an aid to irrigation, both in connection with the storage of water in the mountains and the pumping of water in the valleys.

To bid intelligently and to successfully manage a going contract, it is essential that unit construction costs be accurately known and that at all times they

Unit Costs can be quickly obtained. H. K. Church, of **Construction** in this issue, offers a practical method by which unit excavation costs, for instance, can be studied from several angles. Contractors, and engineers as well, will find his illustrated suggestions of merit. In a period of close competition, the contractor who knows—rather than the one who guesses—survives.

Salt River Project, Arizona

Irrigation and Hydroelectric Development by Salt River Valley Water Users' Association—Six Major Dams

By T. A. HAYDEN

Assistant Engineer, Salt River Valley Water Users' Association, Phoenix

Editor's Note—T. A. Hayden was a student at Sheffield Scientific School, Yale University, but moved west for his health prior to graduation. From 1906 to 1908 he was in private practice with H. S. DuVal, and from 1908 to 1910 was in charge of construction on the Urraca dam, Colfax county, New Mexico. In 1911, he was on drainage work in the Florida Everglades. From 1912 to 1915 he was city engineer and in private practice at Santa Fe, New Mexico. Hayden was with the U. S. General Land Office from June, 1915, to September, 1918, and in October of that year joined the Salt River Valley Water Users' Association, serving as assistant chief engineer until July, 1920, when he became assistant engineer on general utility work. For one-third of a four-year period he was editor of the 'Arizona Producer', a farm magazine owned by the Salt River Valley Water Users' Association.

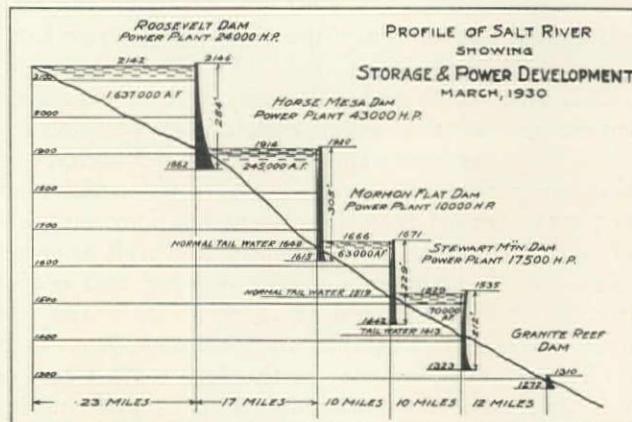
PART I

The finishing in March, 1930, of the Stewart Mountain dam and hydroelectric power plant, on the Salt River Irrigation project, Arizona, marked the completion of a comprehensive program for the general development of the storage and power possibilities of Salt river, supplementing the Roosevelt dam and power plant, built by the U. S. Government in 1906-11. The outstanding features of this later construction are the Horse Mesa, Mormon Flat, and Stewart Mountain dams and power plants. These dams and plants have all been built in the last six years and with Roosevelt, form a continuous chain of lakes along the river, 60 miles in length. With the Granite Reef diversion dam, built in 1906-07, and Cave creek flood control dam, built in 1922-23, this makes six major dams on the one irrigation project. The Horse Mesa, Mormon Flat, and Stewart Mountain dams, due to their magnitude, the nature of their design, and the manner in which they are welded together as part of a single coordinated system, offer striking points of interest to the engineer.

Project Described—A brief description of the Salt River project and its main engineering features is necessary in order to establish a complete connection between the early development by the U. S. Reclamation Service, beginning with Roosevelt dam, and the later development by the Salt River Valley Water Users' Association, the farmers' organization owning the land and using water under the dam. It may be assumed that the early development mentioned is familiar to most people, and particularly to engineers, since descriptions of it have appeared in many government and other publications, and in practically all modern books concerning dams and kindred matters. The subsequent development, however, has not, so far, been described, except in the form of brief, unconnected progress notes, which do not constitute a complete account of the scope, nature, or purpose of

the work or the relation of the different features to each other.

The Salt River project is the first and largest of the great irrigation developments by the United States under the Reclamation Act of 1902. It is in south-



central Arizona, and its main purpose is the irrigation of 250,000 acres of highly fertile land in Salt river valley on both sides of Salt river. The valley is fringed with picturesque mountains on the north, south, and east sides, with the river flowing westerly in the approximate center. The Granite Reef diversion dam is at the upper edge of the valley where the river emerges from the deep canyons and rugged mountains to the east. The Stewart Mountain, Mormon Flat, Horse Mesa, and Roosevelt dams are on the river in this canyon region, occurring in the order named, from below upward.

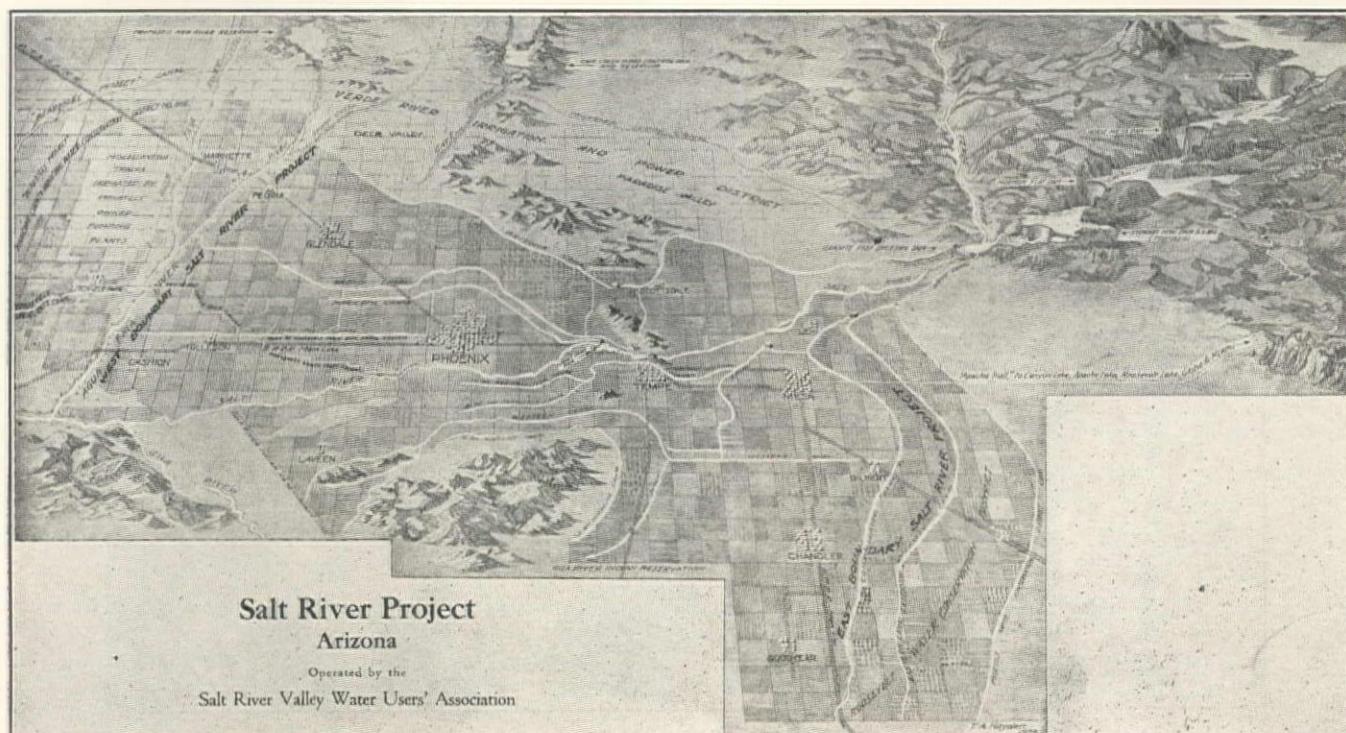
Historical—The development at first considered by the Government, in 1903, consisted of the Roosevelt dam only, estimated to cost \$4,000,000. In order to establish a complete, successful irrigation project, however, it was found necessary to provide the diversion dam at Granite Reef, a canal and distribution system, power plants, and other items, so that the total expenditure by the Government eventually reached \$10,000,000. The project was operated by Reclamation Service forces until November, 1917, at which time it was taken over by the Water Users' Association, subject to the repayment of the construction cost over a 20-year period, without interest. The installation of pumping plants for drainage and irrigation, improvement of the distribution system, the building of a flood control dam, and the construction of the power system, with other project works, have brought the total capital investment up to \$29,000,000, although the actual replacement value today would greatly exceed this amount. The farmers of the project have fi-

nanced this development without outside aid and, in addition, have paid over \$5,000,000 of the construction debt to the Government. These funds have been provided by bond issues aggregating \$10,000,000, through power revenues, and by direct assessments. Through the efficient and successful management of its affairs and the consequent high standing and credit of the Association in the financial world, it was able to dispose of its bond issues on very favorable terms. It is believed that the price of \$97.64, received in August, 1924, for the 6% Horse Mesa bonds, is the highest price ever received for an irrigation security of its class.

In 1920, the Association had an existing investment of \$4,500,000 in its hydroelectric power system, consisting of the Roosevelt plant of 14,000 hp., and four plants constructed at drops on the canal system in the valley with a combined generating capacity of 9000 hp. The gross yearly power output was from 60,000,-

in connection with the favorable circumstance that cheap competing power was not available, was responsible for an exhaustive investigation by the Association of the possibilities of supplying this market with power developed in connection with the project. This study covered a period of two years and the results were put into concrete form in February, 1922, in a comprehensive report on 'Additional Hydroelectric Power Development of the Salt River', by C. C. Cragin*, general superintendent and chief engineer of the Association. F. J. O'Hara†, assistant chief engineer, and H. J. Lawson, electrical engineer, collaborated in the preparation of the report.

The controlling physical features consisted of the possibility of utilizing an average annual irrigation draft of 750,000 ac-ft. from Roosevelt reservoir, in connection with a total fall of 604 ft. in the 45 miles of canyon from the tail water of Roosevelt dam (elev. 1914 ft.) to Granite Reef dam (crest elev. 1310 ft.).



000 to 70,000,000 kw-hr. About 7,000,000 kw-hr. was used for project purposes and the remainder, less losses, was sold commercially. The total annual power load for the entire state of Arizona was 500,000,000 kw-hr., which was rapidly increasing and of which 400,000,000 kw-hr. was used within a radius of less than 100 miles of the Association's plants; half of this load being already in touch with the Association's existing transmission lines. Most of this power was generated by steam at a cost approximating 1¢ per kw-hr. On account of high freight rates, fuel oil costs ranged from \$1.80 to \$2.25 per bbl., so that these figures were not susceptible of being greatly lowered, even in the most modern steam plant. Power to meet the growing load and to replace too costly steam power was an obvious necessity, which, if not met by the expansion of the Association's system, would have to be supplied from other sources and by competing interests. The protection of its existing investment,

Above this, was the Roosevelt plant, then operating under a maximum head of 213 ft. with the reservoir full to the spillway crests. As there was no regulating storage below, however, the output of this plant was dependent entirely on the time and rate of use of water for irrigation, giving a heavy flow for 7 months of the year and a very light one for 5 months. The storage capacity of Roosevelt was 1,367,000 ac-ft., impounding the runoff from nearly 6000 sq.mi. of country, varying in elevation from 1914 to 12,000 ft. above sea-level, with annual precipitation ranging from 8 in. on the low lands, to a maximum, in the high mountains, of 35 in. The watershed embraces everything from arid desert to dense forest. The stream flow is highly erratic, dropping to a few hundred cubic feet per second and rising to 200,000 c.f.s. in large floods. In addition to the controlled flow of the Salt river, the

*Member, American Society of Civil Engineers.

†Member, American Institute of Electrical Engineers.

project also uses water to the capacity of its canal system (4000 c.f.s.) from the uncontrolled flow of the Verde river, which drains 6000 sq.mi. of watershed similar to that of the Salt river and which discharges into the Salt river four miles above Granite Reef dam. The supply available from these sources is supplemented by a large number of high-capacity pumps utilizing water from comparatively shallow depths in the valley.

Fundamental Principles and Favorable Conditions—
In considering the factors affecting additional power development in connection with the irrigation project, two fundamental principles were assumed as governing: (1) that the power development must not interfere with the irrigation water supply, since, while the value of an acre-foot of water for power is but a few

is an irrigation pumping load, which, on the project system in 1929 was nearly 100,000,000 kw-hr.)

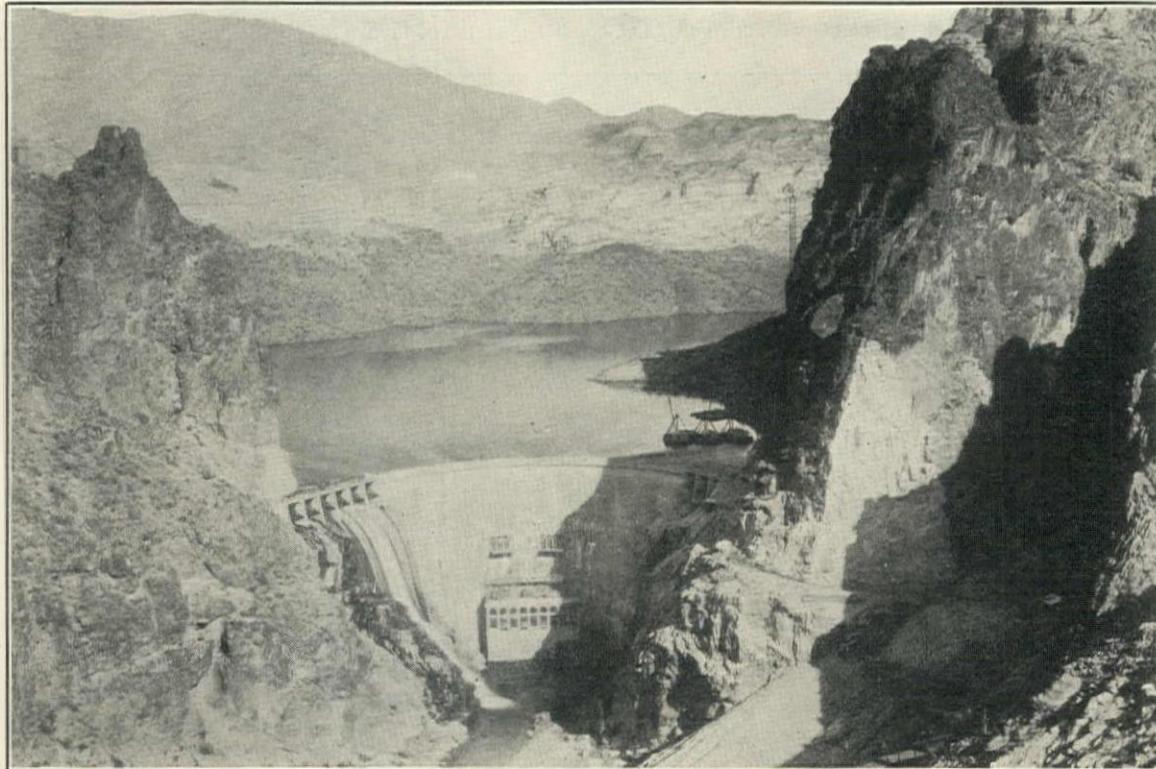
2. The physical and hydrological conditions were unusually favorable. The \$4,000,000 Roosevelt dam, charged entirely to irrigation, was available as part of the system; 270,000 ac-ft. additional storage and 15 ft. additional head being possible at the relatively small cost of 19 tainter gates; and ideal sites for regulating and pressure dams occurred at strategic points at Horse Mesa, Mormon Flat, and Stewart Mountain.

3. The high cost of steam and other competing power, on which the local power rates are based, assured adequate revenues and made possible the securing of favorable contracts in advance of issuing bonds.

4. Economical financing was made possible by the following factors:

(a) The contracts mentioned provided minimum annual payments throughout the life of the bonds sufficient to pay interest and principal.

(b) In addition to the security afforded by these contracts,



HORSE MESA DAM AND POWERHOUSE FOR THE SALT RIVER VALLEY WATER USERS' ASSOCIATION, COMPLETED 1927,
HEIGHT 305 FT., GENERATING CAPACITY 43,000 HP., STORAGE 245,000 AC-FT.

dollars, the availability of an acre-foot of water when needed may mean to the irrigation project uncertainty or failure of agricultural operations, and in some cases the possible loss of the entire investment of individual farmers in land, buildings, and improvements; (2) the assurance of a margin of profit greatly in excess of the profit which would be considered adequate in a purely commercial power development independent of an irrigation system, this being essential in order to avoid any possibility that the power system might, in case of water shortage or other period of stress, become a burden to the irrigated land.

The conditions found to exist on the Salt River project favored the additional hydroelectric development to an unusual degree, in the following respects:

1. The market was assured in advance; the power load being also unusually well adapted to the characteristics of the generating system. (The ideal load for such a power project

240,000 acres of highly developed project land appraised at more than \$50,000,000, was available as security, with so wide a margin of safety that the hazard involved was negligible and did not endanger the interests of the Association or its individual shareholders.

(c) The machinery for collecting assessments, should they be needed, is especially efficient, since water cannot be obtained for the land by individuals until assessments are paid.

5. If the Association failed to develop additional power to supply the growing market and protect its existing investment, it was certain that the development would be made by outside competing interests, occasioning interference with the irrigation system and probably resulting in loss of revenue due to lower rates and loss of customers.

6. Incidental irrigation benefits were possible from the construction primarily undertaken for power purposes, these benefits being as follows:

(a) Storage of runoff from 370 sq.mi. of watershed between Roosevelt and Stewart Mountain dams provided a water supply for 10,000 acres of additional land.

(b) A saving of water was effected and better irrigation

service made possible by the closer regulation secured by reducing the distance from storage reservoir to diversion dam 75%.

(c) The availability of cheap power for irrigation and drainage pumping on the project resulted in the economical protection of project lands against seepage damage and provided a supplemental water supply capable of producing 1½ ac-ft. per year for each acre of land on the project.

7. The transmission costs and losses were small, since the entire load was within 100 miles of the main power plants and a large part of the lines was already built.

8. Stand-by steam power was available from plants operated by the local power company and nearby mines, both already power customers of the Association. Appropriate contracts with the organizations mentioned put this service at the call of the Association with a comparatively small investment and this, together with the favorable nature of the load on the Association's lines, made possible the disposal of a high percentage of the system output as firm power and the maintenance of a high load factor.

9. A collateral improvement made possible in connection with, and as a result of the power expansion, was the extension of the transmission lines to deliver power for domestic and farm use to every individual shareholder on the project. Through an agreement with the local power company, providing, among other things, for allocation of territory to be served exclusively from the respective systems, and for parity of rates, service was effected without any duplication of investment or conflict due to competition for business and different rates.

10. Finally, viewed from the standpoint of a strictly commercial proposition, conservative estimates of the net ultimate annual power revenues place them at \$2,500,000, or more than 6% on an investment of \$40,000,000, although the actual total investment in the project's power system is only \$18,000,000.

The Cragin report outlined a plan for the development of the power resources of the river as a whole in the one coordinated system, and showed the ultimate economic feasibility of utilizing the entire fall of 832 ft. from the top of the gates proposed at Roosevelt to the crest of Granite Reef dam.

As finally worked out, with modifications of details in accordance with additional data secured by studies continued through the construction period, the total head at present available, including Roosevelt, is 729 ft., leaving only 103 ft. from Stewart Mountain to Granite Reef, which may at some later time be developed by means of a power canal. The three new dams and the gates at Roosevelt have increased the project storage capacity from 1,367,000 ac-ft. to 2,015,000 ac-ft. and the generating capacity of the entire power system has been raised from 23,000 hp. to 103,000 hp. (maximum instantaneous generating capacity). The gross annual power output of 65,000,000 kw-hr. and revenue of \$500,000 have been increased to 250,000,000 kw-hr. and \$2,500,000 respectively, which should be materially improved once the reservoirs are filled.

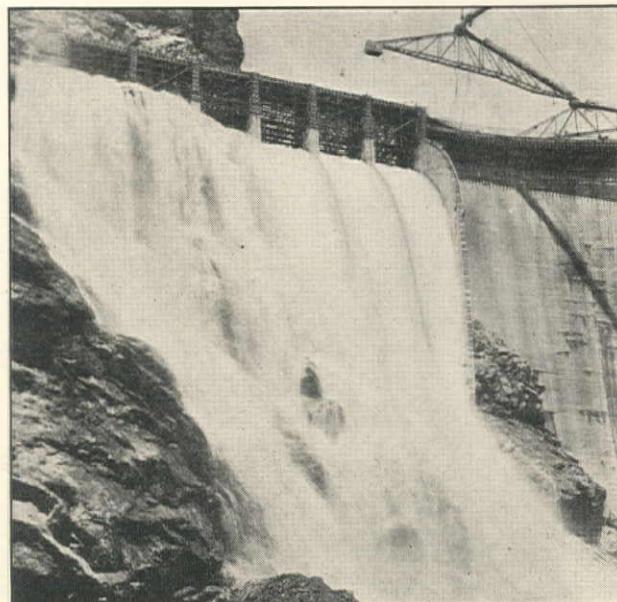
The plans required approval by the secretary of the Interior of the United States, this being necessary in connection with any major undertaking on a United States reclamation project. This approval had been obtained, bonds voted to cover the cost of the first stage of the development, and actual preliminary work begun by January 4, 1923. Construction has been nearly continuous up to the completion of the Stewart Mountain project in March, 1930.

Order of Work—The work was planned and carried

out in the order named below, in three stages, partly overlapping, under three separate bond issues, and embraced the following major items:

1. **Mormon Flat Development**—This work consisted of the Mormon Flat development proper, financed by a bond issue of \$1,800,000, which did not include the construction of the power plant, the latter feature, costing \$470,000, being financed by funds advanced under a power contract with the Central Arizona Light & Power Co. The work known as the Mormon Flat development consisted of the following:

(a) Installation of 15-ft. tainter gates in the spillways at



Horse Mesa Dam After Completion, First Water Passing Over Spillway

Roosevelt dam, thus adding 270,000 ac-ft. storage and increasing the average head on the turbines by 15 ft.

(b) Installation of an additional 7500 kw-a. generator to the Roosevelt power plant and construction of a new transformer house.

(c) Construction of a 229-ft. dam at Mormon Flat, 27 miles below Roosevelt in Salt river canyon, the main purpose of which was to make immediately available a regulating reservoir of 63,000 ac-ft. capacity.

2. **Horse Mesa Development**—This work was financed by a bond issue of \$4,743,000 and consisted of the following:

(a) Construction of a 305-ft. dam and 43,000 hp. power plant at Horse Mesa, 17 miles below Roosevelt and 10 miles above Mormon Flat.

(b) Changing 165 miles of transmission line from 45,000 volts to 110,000, with additional transformer and switching stations and equipment.

3. **Stewart Mountain Development**—This work was financed under a bond issue of \$4,100,000, of which \$3,500,000 was for the development and \$600,000 for other purposes. The work involved the following:

(a) Construction of a 212-ft. dam at Stewart Mountain, 10 miles below Mormon Flat and 12 miles above Granite Reef, with a 17,500-hp. generating plant, transmission lines, etc., the cost being \$2,300,000.

(b) Construction of 600 miles of power lines for service of electricity to every farm home on the project, including substations and other necessary installations, the cost being \$1,200,000.

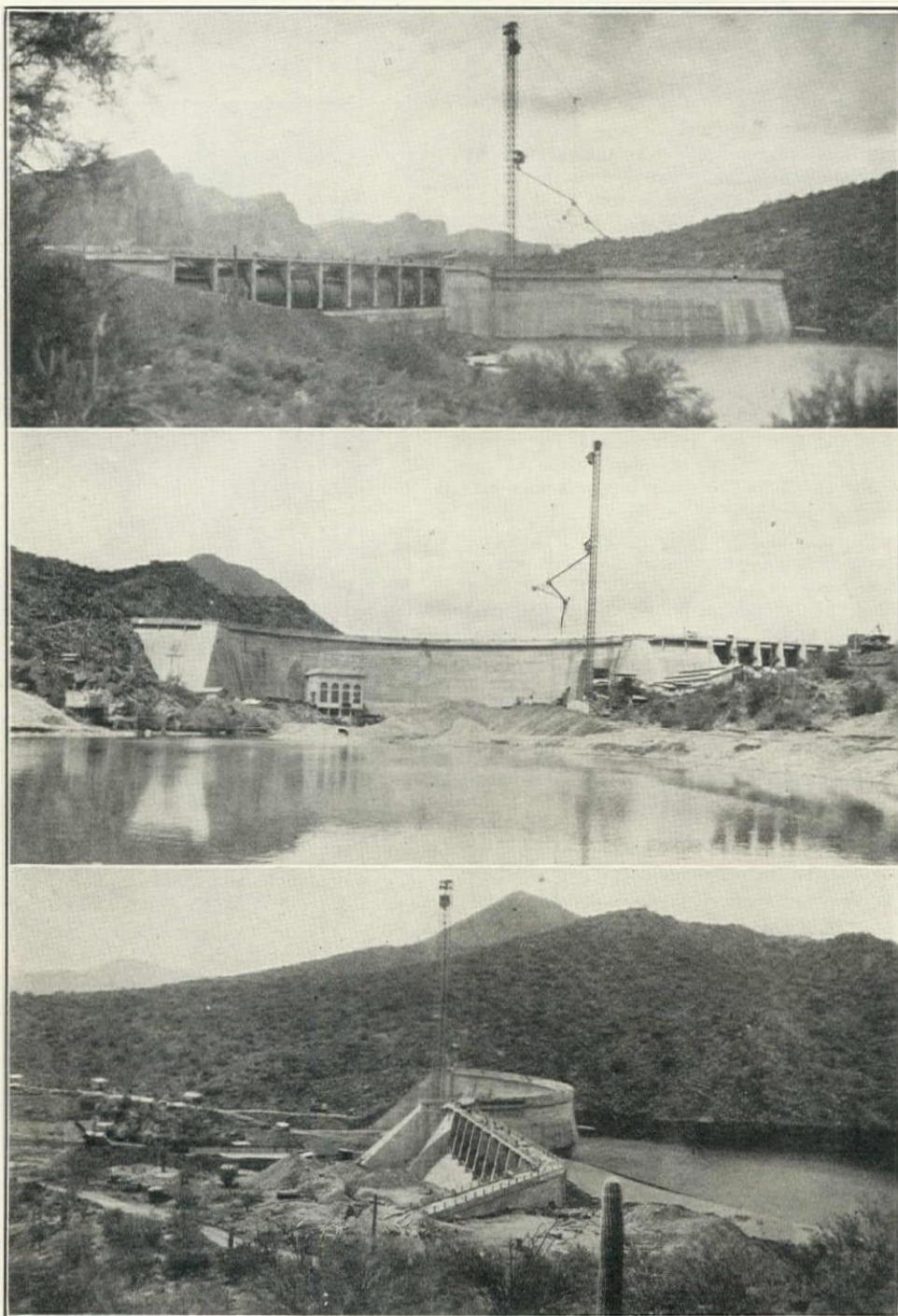
Order of Construction—Financing and construction of the entire development followed the chronological order stated below:

Mormon Flat development bonds voted.....January 4, 1923
Mormon Flat development bonds sold.....March 26, 1923

Work at Roosevelt dam begun.....	December, 1922
Work at Roosevelt dam finished.....	September, 1924
Work on Mormon Flat dam begun.....	February, 1923
Dam completed.....	April, 1925
Contract made for financing Mormon Flat power plant.....	June 29, 1925
Work on power plant begun.....	July, 1925
Work on power plant finished and plant in service.....	May 12, 1926

Stewart Mountain bonds sold.....	August 30, 1928
Bond money available and construction begun.....	October 1, 1928
Last concrete placed at Stewart Mountain dam.....	March 8, 1930
Stewart Mountain plant first on line (test run).....	March 7, 1930

Construction Forces—The entire construction program was carried out by the Association forces. The letting of the work by contract was considered and



STEWART MOUNTAIN DAM AND POWERHOUSE FOR THE SALT RIVER VALLEY WATER USERS' ASSOCIATION, COMPLETED 1930, HEIGHT 212 FT., GENERATING CAPACITY 17,500 HP., STORAGE 70,000 AC-FT.

Horse Mesa development bonds voted.....	July 29, 1924
Horse Mesa development bonds sold.....	August 29, 1924
Horse Mesa construction begun.....	August 23, 1924
Last concrete placed at Horse Mesa dam.....	August 4, 1927
Horse Mesa plant in operation (under partial head).....	April 2, 1927
Stewart Mountain bonds voted.....	May 8, 1928

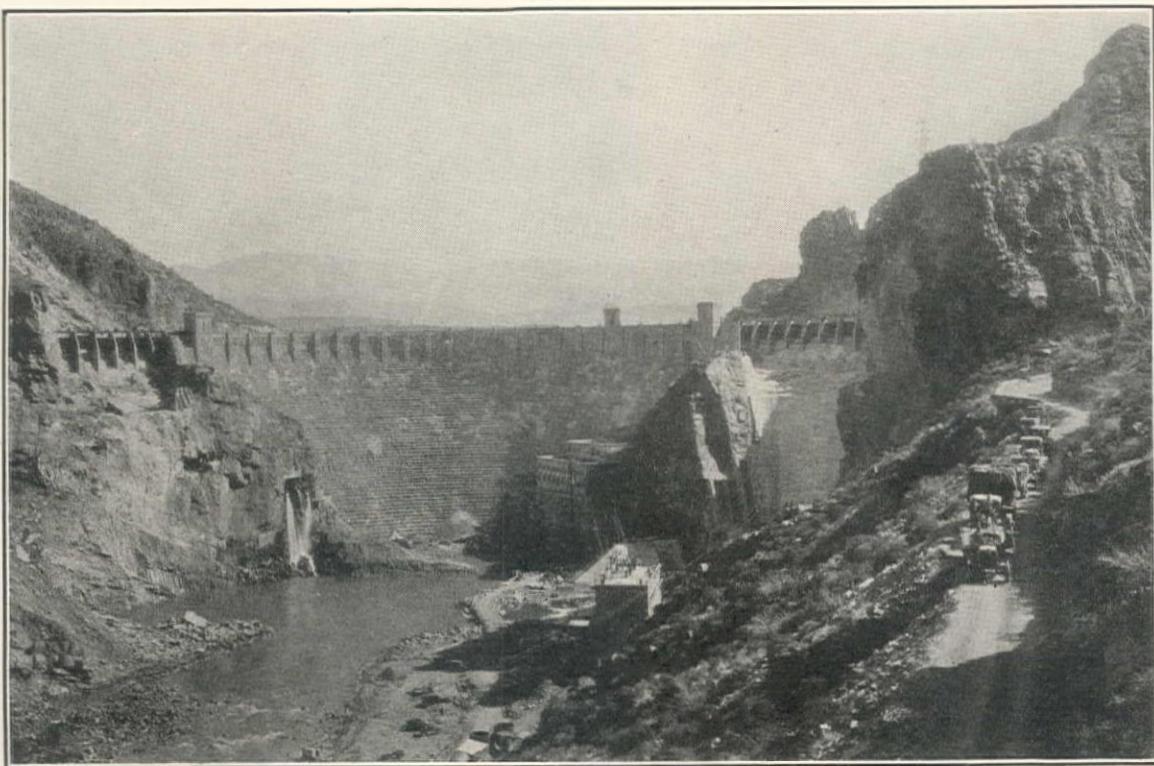
the matter was reviewed by a number of general contractors engaged in this class of construction. However, in view of the advantages possessed by the Association over a contractor who must bring in plant and equipment from the outside and maintain a large special organization and other overhead expense, it was decided to do the work by force account. The Asso-

ciation already had its engineering and construction organization, and possessed a large quantity of equipment and material from other recent large construction, such as camp and commissary equipment, trucks, large excavating machines, pumps, hoists, derricks, electrical equipment of all kinds, shop facilities for any kind of work, warehouses, storage yards, and miscellaneous items, all of which constitute a considerable proportion of the cost on any big construction job. Some of this equipment, such as pumps and motors, was merely borrowed for the time being from the 180 drainage and irrigation pumping plants of the project. Another important factor which worked in the Association's favor was the ability to coordinate construction and operation activities so that the work did not interfere with the irrigation or power system. The Roosevelt dam not only afforded assurance against flood damage to the construction below it, but also made it possible, when necessary, to shut off the

ing plants, trucks, crusher, cables, machine and carpenter shops, motors, transformers, etc. It was unnecessary to consider contractor's profits on any of the work, and it is believed that the estimate of 25% saving in cost over that if done by contract is on the conservative side.

ROOSEVELT DAM

Roosevelt Dam—The increase in the capacity of Roosevelt reservoir from 1,367,000 ac-ft. to 1,637,000 ac-ft., a gain of 20%, was effected by the relatively small cost of 19 tainter gates 15 ft. 9 in. high and 20 ft. wide, installed in the spillways. This increased capacity is of value for power purposes only, since the hydrographic records indicate that water would not be impounded to the added height frequently enough to warrant the irrigation of any additional acreage. The spillway crests were lowered 9 in. so as not to decrease their capacity by the piers between the gates. These piers depart from the ordinary gravity design and re-



ROOSEVELT DAM AND POWERHOUSE FOR THE SALT RIVER VALLEY WATER USERS' ASSOCIATION, COMPLETED (BY U. S. GOVERNMENT) IN 1911 WITH SUPPLEMENTAL WORK IN 1913 AND 1923, HEIGHT 284 FT., GENERATING CAPACITY 24,000 HP., STORAGE 1,637,000 AC-FT. THREE NEEDLE VALVES HAVE BEEN REMOVED

flow in the river below the dam for the purpose of making or changing connections to bypass flumes, leaving nothing but seepage water to be cared for by the pumps. This could be done with a minimum of inconvenience and friction with construction directed by Association forces. A great deal of the plant equipment could be moved from job to job as the work progressed, since the dams were not under construction concurrently. Equipment which saw service at Mormon Flat, Horse Mesa, and Stewart Mountain included the following: Three excavating machines, two 1-yd. Smith concrete mixers, one 105-ft. steel guy derrick, one 340-ft. Insley steel tower, six high capacity deep well pumps with motors, air-compressors, hoists, counter balances, gravel screening and wash-

sist the overturning moment by heavy steel reinforcing in the upstream part, deeply embedded and keyed in the solid rock. The gates are power-operated, but may, if needed, be operated by hand.

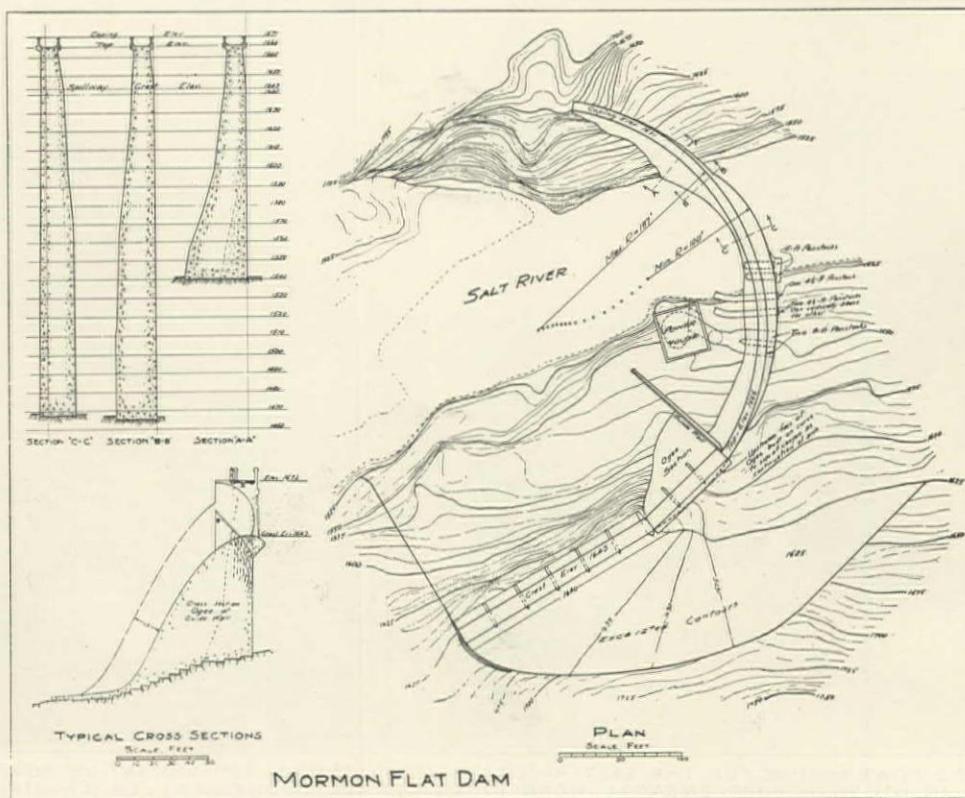
To feed the new 10,000-hp. generating unit in the power plant, it was necessary to provide an additional 10-ft. penstock. To accomplish this, a tunnel 14 ft. diam. and 180 ft. long had to be driven through the base of the cliff at the south or left haunch of the dam, from the main sluice-gate chamber to the new turbine. The only outlet to this chamber, originally designed for sluicing, was a 7-ft. penstock leading to generating units numbers 1, 2, and 3 (part of the original power plant), operating either from this source or from the power canal built before the construction of the dam. In order to permit the operation of these units, it was

necessary to make the connection of the new penstock to the gate chamber and to close it with a temporary bulkhead, so that the excavation might proceed. This bulkhead was under a pressure of more than 6 tons per sq.ft., or 1,000,000 lb. in all; the surface of the water in the reservoir at the time being at the 200-ft. level. A practically water-tight job was secured by a double layer of 12 by 12-in. timbers, braced with other 12 by 12's set diagonally and thrusting against footings cut in the sides of the tunnel, the joints being thoroughly caulked with oakum.

A defect in the original layout at the Roosevelt power plant consisted of the location of the building containing the transformer and switching apparatus. This was 700 ft. below the powerhouse and the 2300-volt cables from the powerhouse to the transformer house passed directly over the south spillway. In 1915, in 1916, and again in 1920 water flowed continuously over the spillways for months at a time, in one instance for six months. The spray made by the

above it, could be operated during the winter months when the water was not needed by the farmers; the released water being stored at Mormon Flat until required for irrigation in the spring. This regulating function has been in large measure transferred to Stewart Mountain dam with the completion of that structure in March, 1930. The upper portion of the 63,000-ac-ft. reservoir at Mormon Flat, however, is still available for regulation without interference with the power plant. The power plant is a 10,000-hp. installation, the funds for which were advanced under the power contract before described. The Mormon Flat power development furnishes one instance where a material irrigation benefit accrued as an incidental to a power project, in the providing of a water supply for 10,000 acres of additional land by the impounding of runoff from the watershed below Roosevelt dam.

Geology and Topography—The Salt river at the damsite flows westerly through a deep box canyon, with sides either vertical or steeply sloping. Room



water in its 225-ft. descent caused considerable inconvenience and interruption in operation. This disadvantage was corrected by the construction of an additional story on the powerhouse to contain the transformers and switching apparatus. This construction was spaced for the 110,000-volt installation planned in connection with the Horse Mesa development, although the change from 45,000 volts to 110,000 volts was not made until the Horse Mesa work was done. The old transformer house building thus released was put to use as a much needed permanent storehouse.

The cost of this feature of the Mormon Flat development was \$562,863.

MORMON FLAT DAM

Mormon Flat Dam—The original purpose of the Mormon Flat dam was to provide regulating storage so that the Roosevelt and Horse Mesa power plants,

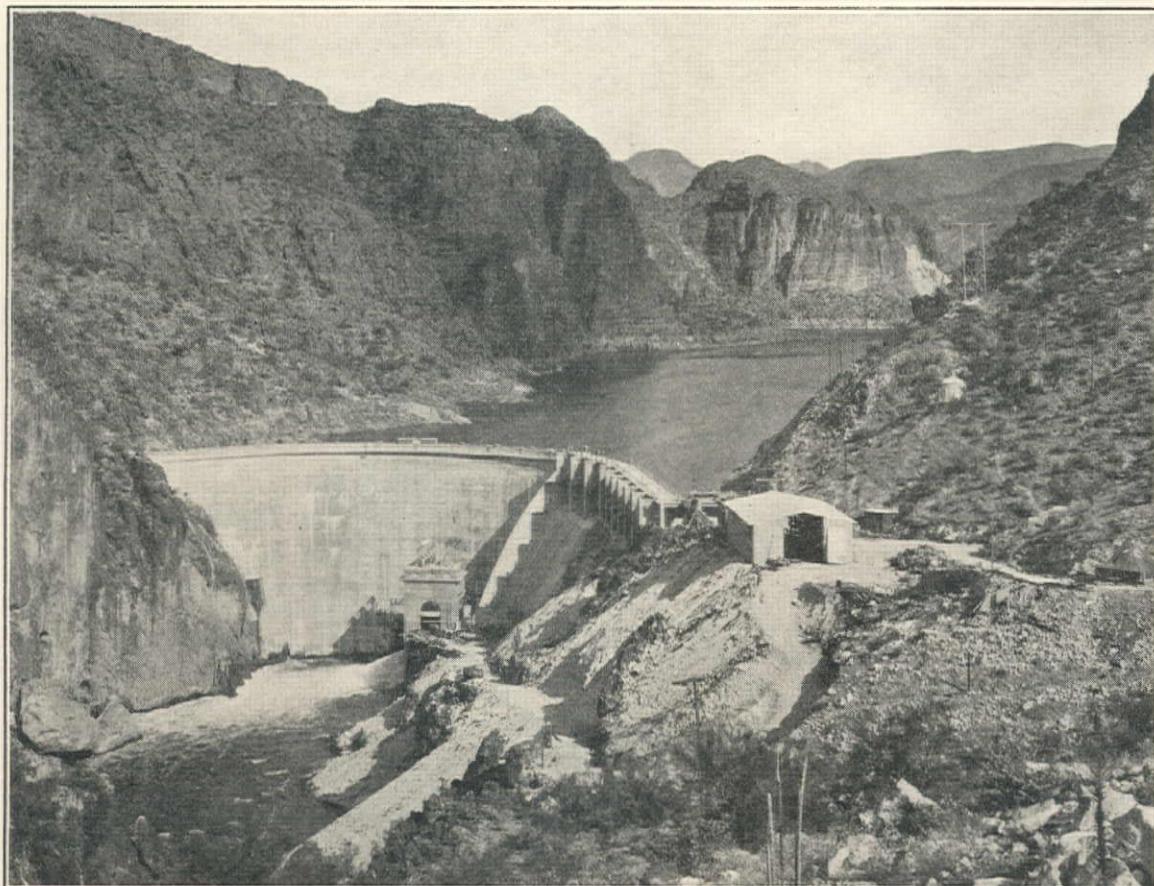
for camp and construction layout was more or less limited. The rock covering this entire section of the country for several hundred square miles is a fairly uniform, hard, dense, homogeneous rhyolite breccia, of a light buff color. At the sides and bottom of the canyon at the damsite it was of excellent character, being free from seams, checks, or soft material, which made it possible to secure a water-tight dam without grouting.

Design of Dam—The canyon wall at the damsite is nearly vertical on the north side and has an irregular slope on the south side averaging 1 vertical to 1½ horizontal. The width at the bottom is only 90 ft. and at the crest of the dam, 350 ft. The dam designed to fit this situation consists of a variable radius concrete arch, with an overflow spillway on the south end.

Two-thirds of the spillway is excavated in the rock side of the sloping canyon wall and the remaining third is an ogee overflow section, which also takes the thrust of the upper part of the arch. The end of the arch next the spillway is reinforced to carry the thrust downward into the ogee. The total height of dam from lowest bedrock to top of coping is 229 ft. The thickness of the arch at the top is 8 ft. and at the base varies from 20 to 29 ft. The arch was designed on the cylinder theory, using a maximum working stress of 350 lb. per sq.in. The radius of the upstream face varies from 100 to 187 ft. The outlets consist of two 8-ft., two 6-ft., and three 4½-ft. penstocks. The spillway is closed by nine tainter gates, 23 ft. high and 27 ft. wide, motor operated. Three of these are above

main Phoenix-Roosevelt road, better known as the Apache Trail. The first step in the preliminary work was to construct a road into the damsite and to build 1½ miles of temporary 45,000-volt transmission line from the main Phoenix-Roosevelt line which follows the Apache Trail, the temporary line being for the purpose of furnishing power for construction; all of the equipment, except two excavating machines, being electrically operated. The camp and construction layout were all within one-fourth mile of the site. Water for camp use was pumped from the river 370 ft. to a tank on the hillside and chlorinated.

The gravel and sand excavated from the streambed at the base of the dam were deposited so as to form a cofferdam on both upstream and downstream sides,



MORMON FLAT DAM AND POWERHOUSE FOR THE SALT RIVER VALLEY WATER USERS' ASSOCIATION, COMPLETED 1926, HEIGHT 229 FT., GENERATING CAPACITY 43,000 HP., STORAGE 63,000 AC-FT.

the ogee section and six in the excavated section. The total capacity of the spillway is 150,000 c.f.s. with water standing at the top of the coping. The area of the watershed is 6030 sq.mi., of which all but 270 sq.mi. is above Roosevelt reservoir and all but 160 sq.mi. above Horse Mesa dam, the combined storage capacity of the two upper dams being 1,882,000 ac-ft. The dam contains 42,980 cu.yd. of concrete.

The arch ring was poured in four sections, providing three evenly spaced contraction joints, with keyed faces and copper water stop strips near the upstream face of the dam. The placing of concrete to close the openings between the last sections was timed to take place in the winter months.

Construction—The damsite is 1½ miles from the

timber bulkheads being placed in the center for additional water-tightness. The lower part of the excavation in the deepest portion of the pit, where bedrock was 70 ft. below the surface, was accomplished by digging a vertical-sided pit, heavily timbered against caving, the material being hoisted from the excavation by derricks. The normal irrigation draft from Roosevelt had to be bypassed throughout the work so as not to interfere with the irrigation project. This was done and provision was made as well for floods occurring below Roosevelt by construction of a wooden flume 30 ft. wide on the bottom, 15 ft. high, and 350 ft. long, built on a bench along the south side of the canyon. The capacity was 7500 c.f.s. Seepage water from the pit was efficiently and inexpensively handled

by a battery of five 18-in. Kimball deep-well screw-type pumps borrowed from the valley pumping system. These pumps were operated by 150-hp. General Electric motors and were capable of delivering 12 c.f.s. each.

Gravel of good quality for concrete was available in the riverbed from one-third to two-thirds of a mile upstream from the damsite. No crusher was required. The screening and washing plant was at the gravel pits. The material was excavated by a Monighan 2-yd. dragline, which had been used in making the excavation for the cofferdams and base of the dam. A road was built along the south side of the canyon and the segregated sand and gravel hauled by trucks from the screens to the storage piles in the spillway and bins over the mixers. A small stiff-leg wooden



Mormon Flat Dam June 8, 1924. Concreting Plant Included Smith Mixer and Insley Placing Equipment

derrick handled material from piles to bins, when necessary.

The mixing plant consisted of a 1-yd. Smith mixer in place, with a second in reserve for emergency use. The capacity of the plant was 200 cu.yd. per 8-hr. shift. A 25,000-sack cement shed, at the end of the road, a little above the end of the spillway, was connected with the mixing plant with an inclined industrial track. The concrete placing equipment consisted of a 240-ft. Insley steel tower, placed at the mixer, with 16-in. chutes suspended from a sky-line passing over the top of the tower on the south end and anchored in the cliff on the north. A 105-ft. Insley steel guy derrick was erected on the south side of the canyon at the base of the downstream face of the dam, and connected with a loading frame at the cement shed by a second inclined track.

Approximately 3½ miles of the main Apache Trail and the Phoenix-Roosevelt transmission line were within the area to be submerged by the reservoir and their reconstruction was included in the work. Most of the road work was done by a 1-yd. P&H gasoline shovel, first used in excavating the spillway of the dam. All the land occupied by the dam and reservoir was unsurveyed public domain withdrawn from entry in 1903 for the benefit of the Salt River project under the

Reclamation law, so that there were no rights-of-way or land damage problems. The work was done without notable incident, although one flood of 8000 c.f.s. occurred on Christmas day, 1923, before the excavation for the base of the dam had been completed. The damage was small, consisting of a break in the flume and submergence of the Monighan dragline.

The cost of the dam (not including the power plant) is as follows:

Mormon Flat Dam

Bond expense	\$ 57,189
Hospital fund	4,072
Engineering, including preliminary investigations and diamond-drilling	43,125
Road to damsite	18,291
Camp and water supply	39,463
River control	109,755
Temporary wiring and substations	39,346
Excavation, dam, haunches, spillway	196,199
Concrete, sand and gravel plant	86,757
Operation of sand and gravel plant	106,121
Concrete, cement, mixing, placing, forms, etc.	368,291
Sluice gates, cost of, installing, etc.	14,172
Spillway gates and hoist, cost of, installing, etc.	91,660
Telephone line	1,246
Move 40,000-volt line out of reservoir	13,814
Re-locate Apache Trail	27,589
Miscellaneous	13,440
 Total Cost of Dam	\$1,230,530

Note—This does not include an item of \$26,721, being one-third of the valuation of three 54-in. needle valves transferred from Roosevelt, two being later removed to Stewart Mountain. The three valves had an installation valuation at Mormon Flat of \$80,162.

Mormon Flat Power Plant—The Mormon Flat power plant was originally planned for installation at a considerably later date. Because it was intended to use the reservoir mainly for regulating purposes to increase the output of merchantable power from the upper plants, the firm power capacity of the plant was limited by direct irrigation use. A contract was made on June 29, 1925, however, with the Central Arizona Light & Power Co., who agreed to advance the funds to finance the construction, repayable out of power bills, and to take the output of the plant up to 7000 kw. This made the installation possible without investment on the part of the Association and without adding any lien on the project lands. With the construction of the Stewart Mountain dam a large part of the Mormon Flat output becomes firm power. The plant consists of a single 10,000-hp. generating unit (13,000 hp. installed turbine capacity), with provision for an additional unit for future construction. The generator is a Westinghouse, with a rated installed capacity of 10,000 kw. and an actual rating of 8750 kw-a. Water is delivered to the turbine through the two 8-ft. penstocks, which unite them into a single penstock. The penstocks were fabricated by the Arizona Steel Tank & Pipe Co.

The cost of the power plant was \$412,577, which, with necessary changes in the power system, costing \$59,287, gives a total cost for this feature of the development of \$471,864.

(To be continued)

Editor's Note—Part II, scheduled for the July 10th issue, will describe in detail the design and construction of the Horse Mesa and Stewart Mountain dams and powerhouses.

Los Angeles Improves Riverside Drive

A contract for paving 3.6 miles of Riverside drive between Los Feliz and Victory blvd., Los Angeles, was signed by Geo. R. Curtis Paving Co. and the City on January 13, 1930, and work was begun shortly thereafter. The contract price totalled \$120,524 and the contract time expired June 12, 1930. Paving consists of a 4-in. asphaltic concrete base and a 2-in. wearing surface of the same material. The width of pavement is 40 ft. and there are 5-ft. shoulders of decomposed granite with oiled surface on each side, giving a total width of 50 ft.

The contract included the following items:

Grading—\$18,000

Decomposed granite roadway shoulders with oiled surface—190,562 sq.ft. at \$0.04

Asphaltic concrete (4-in. base, 2-in. surface)—706,000 sq.ft. at \$0.12.

Center-line markers (6-in.)—1592 at \$0.045

Gutter-line markers (4½-in.)—3106 at \$0.30

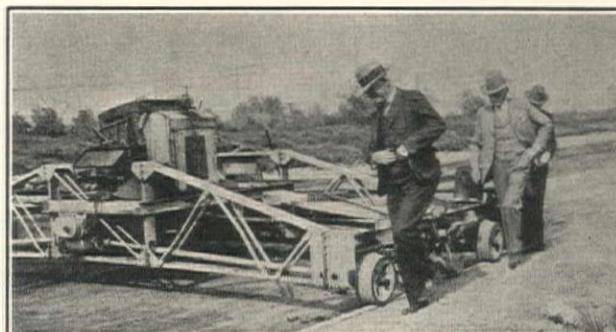
Wooden guard rail—607 lin.ft. at \$1.00

Guard fence—269 lin.ft. at \$1.00

Storm drain (widen culverts only)—\$1100

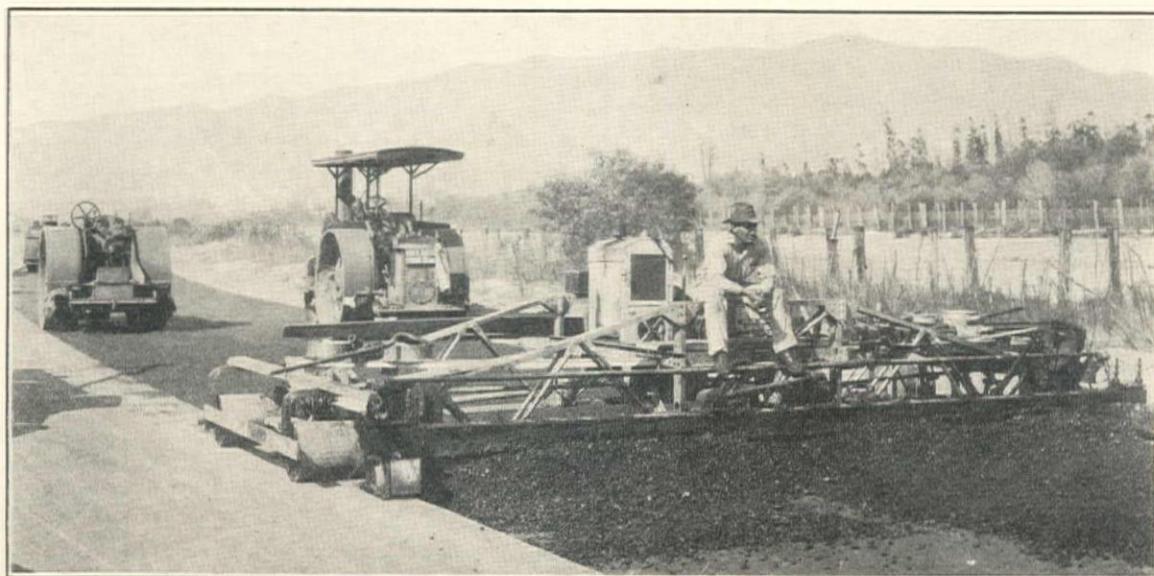
For placing paving material, a Lakewood concrete finishing machine was utilized. A few minor changes were necessary to adapt it to spread the asphaltic con-

J. J. Jessup is city engineer, Ralph W. Stewart chief deputy, D. M. True office engineer, and L. W. Armstrong storm drain engineer for the city of Los Angeles. Plans for the Riverside drive contract were prepared in the Bureau of Engineering under the



J. J. Jessup, City Engineer, Inspecting Riverside Drive

direct supervision of C. J. Shults, engineer of street design. The construction was supervised by E. A. Parker, and Henry Shill acted as resident engineer. Harry Curtis was superintendent for the contractor, and the working force varied from 10 to 60 men. Construction methods were watched with interest by engineers and contractors.



BUFFALO-SPRINGFIELD ROLLERS AND 20-FT. LAKEWOOD FINISHER PLACING ASPHALTIC CONCRETE ON RIVERSIDE DRIVE BETWEEN LOS FELIZ AND VICTORY BLVD., LOS ANGELES

crete base and wearing surface. The pavement was laid in two strips, each 20 ft. wide. Headers were placed along the outside and false headers on the inside of each strip, and upon these traveled the wheels of the spreader. A daily average of 625 tons of asphaltic concrete was laid, the maximum being 640 tons. The Lakewood finisher was powered with a Le Roi engine. For preparing the subgrade, a Caterpillar '30' and Adams leaning wheel grader were used. There were six rollers on the work, four of which were Buffalo-Springfield.

BRITISH COLUMBIA ROAD CONTRACTS

Three highway projects recently awarded by the Department of Public Works, Victoria, B. C., are as follows: to Westminster Construction Co., New Westminster, \$49,000 for Dewdney road; to General Construction Co., Ltd., Vancouver, \$123,000 for Dewdney road and \$25,000 for Yale road. The latter company will probably be awarded a \$191,462 road contract near Nelson.

Graphing the Unit Costs of Highway Construction

A Practical and Original Means for the Highway Constructor to Easily and Accurately Determine His Unit Costs Without Recourse to Bookkeeping, Proper Consideration Being Given Unavoidable Shutdowns

By H. K. CHURCH

*Junior Highway Engineer, Division of Management, United States Bureau of Public Roads, Washington, D. C.**

Purpose—What is my unit cost to date? Sometime during the course of a job—and probably many times—the contractor would like to answer this important question to within a tenth of a cent and in less than ten minutes. The question is usually loosely and inaccurately answered after two hours of hasty ransacking of books by the bookkeeper. The importance of some quick and accurate means of determining this unit cost cannot be overemphasized, for it means the difference between proper management and poor management and the difference between profit and loss.

The three variables which fix the unit cost of highway construction are: (1) the available working days to date, since the beginning of the contract period; (2) the actual working days to date, exclusive of days lost because of inclement weather conditions and unavoidable shutdowns; (3) the average daily production to date (the total production divided by the available working days). It is a simple matter to take these three variables and graphically turn them into an accurate expression of unit cost.

Method—Equipment, labor, and materials are the three items which make up unit cost. The item of materials is a fixed part of the unit costs. However, equipment and labor are two fluctuating items which depend upon the three variables aforementioned. The problem, therefore, becomes one of graphing the unit cost of equipment and labor, to which may be added that of materials, in order to arrive at the total unit cost. Grading jobs are usually free from the item of materials, and here I refer to excavation and not to the incidental items of clearing and grubbing, fencing, etc., which usually form a minor part of the total work. Paving jobs bring in the item of materials. The treatment of any kind of highway construction is the same, and a typical example is analyzed herein.

Problem—To graph the unit costs of a grading project, given these data: 1,000,000 cu.yd. of unclassified excavation, requiring blasting for the most part, and being a mixture of decomposed rock; contract time 400 days; layer fills to be wetted; bid price of 45¢ per cu.yd., including overhaul.

Treatment—The job is such that it can be handled by two shovels, working two shifts each per day. Twelve truck-hauling units, owned by the contractor, will be used. Experience says that two drilling and blasting crews can keep ahead of a gross production of 6000 cu.yd. per day, and assumes a powder charge of 3¢ per cu.yd. of material.

Explanation of the Graph—With the argument of actual working days as a percentage of available

working days, the graph is going to produce an average daily operating expense—equipment and labor—to date. To this will be added the unit cost of powder, perhaps assumed, or else a unit cost based on actual powder consumption records, and the sum is the desired unit cost.

Data for the Graph

Finding the Average Daily Operating Expense to Date—If the outfit is shut down for a whole day, it is subject to an 'idle time expense', representing the following:

Equipment

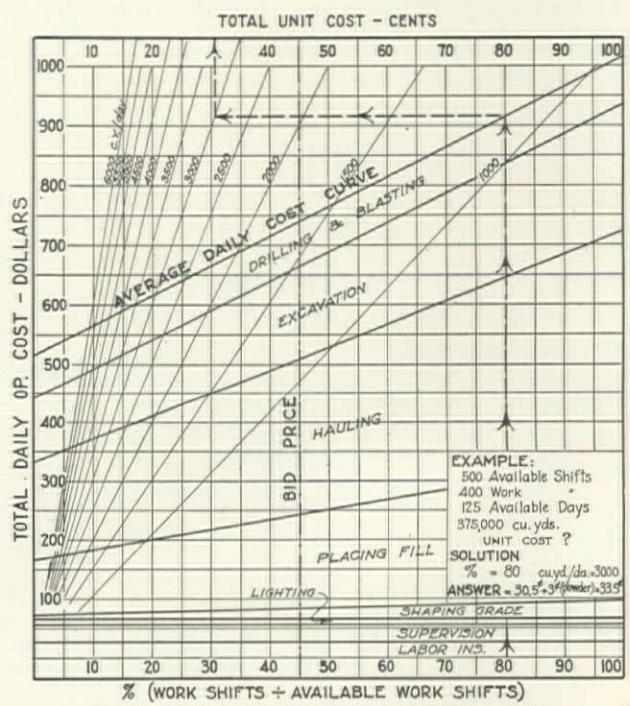
1. Depreciation
2. Interest
3. Taxes and insurance
4. Average field and shop repairs

Labor

5. Supervision
6. Full time men
7. Insurance

Total daily fixed charge for equipment (sum of 1 to 4)

Total daily fixed charge for labor (sum of 5 to 7)



Graphical Solution of Unit Excavation Costs

If the outfit is working for a whole day, it is subject to a 'working time expense', representing the following:

Equipment

8. Total daily fixed charge
9. Fuel and oil, etc.

Labor

10. Total daily fixed charge
11. Part time men

Total daily variable charge for equipment (sum of 8 and 9)

Total daily variable charge for labor (sum of 10 and 11)

If a baseline for the graph is selected, representing

*At present engaged on management studies in the Far West and working under C. F. Rogers, assistant highway engineer, with headquarters at District No. 2, Bureau of Public Roads, San Francisco.—Editor.

0 to 100% working time (available working days divided into actual working days), and if ordinates are erected at the extremities, the 0 ordinate being the sum of the fixed charges and the 100 ordinate being the sum of the variable charges, and the points connected by a straight line, then follows the solution of the problem of average daily operating expense over a period of time. The manner of securing the ordinates is as follows:

Daily Operating Expense

Item	Idle Time Expense (In dollars)	Working Time Expense (In dollars)
Drilling and blasting—		
2 compressors, \$7000, written off in 4 years of 250 days. Yearly fixed charge: Depreciation 25% Interest 6% Taxes and insurance 1% Repairs 5%	37%	10.40
6 jackhammers, \$900, written off in 400 days	2.25	2.25
1 ton of drill steel, \$100, written off in 400 days	0.25	0.25
Pipe and hose, \$400, written off in 400 days	1.00	1.00
Blasting equipment, \$100, written off in 400 days	0.25	0.25
Fuel and oil for compressors	8.25	
Blacksmith shop, \$500, written off in 400 days	1.25	1.25
Labor: Blacksmith and helper	11.50	11.50
4 drillers and 2 powdermen	45.00	45.00
	71.90	80.15
Excavation—		
2 power shovels, \$32,000, written off in 4 years of 250 days. Yearly fixed charge 37%	47.30	47.30
Fuel and oil	39.60	
Labor: 6 bank slopers	36.00	
4 pitmen	24.00	
4 runners	44.00	
2 foremen	20.00	
	111.30	210.90
Hauling—		
12 trucks, \$78,000, written off in 4 years of 250 days. Yearly fixed charge 47% (10% for tires)	146.50	146.50
Fuel and oil	79.20	
Labor: 24 drivers	144.00	
Mechanic and 2 greasers	18.00	18.00
	164.00	387.70
Dumping and placing fill—		
Pumping equipment, to be written off in 400 days:		
Main pump \$ 3,500		
Booster pump 1,500		
Reservoirs 1,500		
Pipe-line, 6 miles 3,000		
Fittings 500		
Water rights 1,000		
	\$11,000	
Interest for 1.5 years 900		
	\$11,900	29.70
Fuel and oil	6.60	6.60
Labor attendant	5.00	5.00
2 tractor bulldozers, \$12,400, written off in 4 years of 250 days, yearly fixed charge 37%	18.40	18.40

Item	Idle Time Expense (In dollars)	Working Time Expense (In dollars)
Fuel and oil		26.40
2 tractor rollers, \$10,000, written off in 4 years of 250 days, yearly fixed charge 37%	14.80	14.80
Fuel and oil		16.50
Labor: 8 tractor operators		56.00
4 dumpmen		24.00
4 hosemen		24.00
2 foremen	20.00	20.00
	94.50	241.40
Shaping and Maintaining Grade, etc.—		
Tractor and blade grader, \$5800, written off in 4 years of 250 days, yearly fixed charge 37%	8.60	8.60
Fuel and oil		6.60
Labor: tractor operator and blademan		13.00
	8.60	28.20
Lighting—		
2 gasoline generator outfits, \$1300, written off in 4 years of 250 days, yearly fixed charge 37%	1.90	1.90
Lighting fixtures, \$200, written off in 400 days	0.50	0.50
Fuel and oil		3.30
Labor: electrician		6.00
	8.40	11.70
Supervision, etc.—		
Superintendent	15.00	15.00
Assistant superintendent	10.00	10.00
Timekeeper	5.00	5.00
	30.00	30.00
Labor insurance at 5% of \$520 payroll	26.00	26.00
Grand total daily expense	514.70	1,016.05

Note: In the above analysis it is seen that the major equipment has been given a life of 1000 working days. Naturally, this assumed life probably will not hold for double shifting. The experience of the contractor ought to determine the assumed life of equipment, as well as the matter of fuel consumption, and so forth.

That portion of the graph representing average daily operating expense may now be plotted, with extreme ordinates of \$514.80 and \$1016.05.

Finding the Average Unit Cost to Date—Having determined the average daily operating expense by securing the percentage of full operation, it is apparent that the average daily expense divided by the average daily production will produce the desired unit cost. The inclined average production lines, therefore, may be determined by selecting an average daily operating expense and then trial dividing by the assumed productions, all lines to go through the center of coordinates. Thus, for the 4000 cu.yd. daily production, the unit cost for an expense of \$1000 is \$0.25. Therefore, one point on the 4000-yd. line is determined; the other is the center. The graph is completed as shown in the accompanying illustration.

Solving Problems with the Graph—A typical example has been worked out on the graph, with the three given variables. In 125 available working days, the shovels have operated 400 shifts of a possible 500, with a total production of 375,000 cu.yd. It is desired to know the unit cost. The answer is 30.5¢ plus the constant powder charge of 3.0¢.

A variety of interesting problems can be solved by use of the graph, and a few are outlined on page 306:

1. What does it cost the contractor to place his fill in wetted layers, with an average production of 4000 cu.yd. per day? Answer: At a production of 4000 cu.yd. and 'going at full blast', it is seen that the intercept of the 'placing fill' zone on the 100% ordinate is \$240 daily. Carrying this intercept to the 4000-cu.yd. line and projecting to the unit cost axis, there is found an intercept of 6.0¢ per cu.yd.

2. Because of a long haul and a shortage of trucks, the average daily production has dropped to 3000 cu.yd., with a total delay at the shovels of about 25%. Assuming that four trucks, hired at \$28 per day each, will increase the production 15%, is the contractor justified in hiring the trucks? Answer: The unit cost at present is determined to be 34.0¢. The daily operating expense is \$1016. Four trucks will increase the cost to \$1240, with an anticipated output of 3450 cu.yd. The new unit cost becomes 36.0¢. The expense is not justified.

3. Is it justifiable to assume that the shovels will have the following record throughout the job, provided the material is well blasted and the weather reasonable: Percentage of operation 90 and average daily production 4000 cu.yd. What will be the profit? Answer: The unit cost becomes 24.0¢ plus 3.0¢, equals 27.0¢. The profit becomes 18.0¢ per cu.yd.

Suggestions—A similar graph can be drawn for each shovel and shovel shift, thus making it possible for direct comparison between shovels and operators. In addition, zones may be added to represent each truck serving the shovel, so that unit costs on different hauls can be readily calculated. The graph, if properly determined by accurate figures, will do everything for the contractor except shout figures back to him. Its adaptability to any form of highway construction has been stressed.

Economy in Steel Bridge Design and Erection

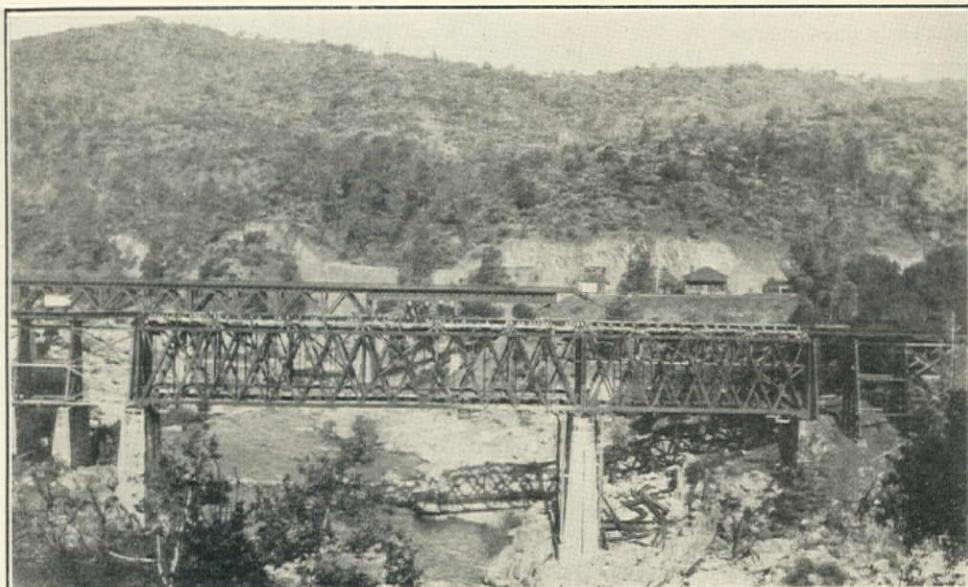
By WILLIAM GOTTLIEB, *Sales Engineer*,

AND

C. H. BROWN, *Erection Superintendent*,
Pacific Coast Engineering Co., Oakland, California

The recent replacement of an old wooden Howe-truss bridge by a steel bridge on a logging railroad presented some interesting problems in bridge eco-

of competing with the cost of a timber bridge. The problem was solved by combining several features in the design. The weight of steel and its cost of fabri-



LOGGING RAILROAD BRIDGE NEAR OROVILLE, CALIFORNIA. REPLACING HOWE WOOD TRUSSES WITH STEEL SPANS, THE FORMER BEING USED FOR FALSEWORK

nomics. The site of this bridge is over the middle fork of the Feather river about 10 miles north of Oroville, California, on the Swayne Lumber Co. property. Here the old bridge consisted of two timber spans, 130 and 66 ft. long, both spans being 24 ft. center to center of chords and 16 ft. center to center of trusses, with the top of the rail about 100 ft. above a swift stream.

The designers were faced with the problem of erecting a steel bridge on the existing concrete piers and

cation were kept down to the minimum consistent with sound engineering practice; the dimensions were selected so as to make it possible to erect the new bridge inside of the old one and then dispose of the wooden trusses by ripping them off the piers.

The new steel spans were designed by Ellison & Russell, structural engineers, San Francisco. By using only rolled shapes for chords, main web members, and bracing, a great saving in steel and cost of fabrication

was made. The chords consist of Bethlehem H-columns placed with their flanges vertical. The upper trough of the top chords is filled with concrete to provide bearing surface for the track ties and the web of the lower chords is punched at intervals to provide for drainage. The main web members consist of wide flanged Bethlehem I-beams. For laterals and sway bracing, I-beam diagonals were designed to take compression or tension, with short I-beam struts to reduce the unsupported length. The weight of the 130-ft. span is 65 tons and that of the 66-ft. span 20 tons.

To simplify erection and allow the new bridge to be placed inside the old one, the distance center to center of trusses was made 10 ft. Also, the depth of the main steel span was fixed at 20 ft., center to center of chords. This made it possible to place the new span on heavy

siderable care when removing parts of the old bridge. Before cross frames or tie rods were removed, the wooden trusses were braced by connecting them with heavy cross timbers spiked to the top chords.

With the steel spans erected, riveted, and swung, the wooden trusses were prepared for wrecking. The old bottom laterals were cut out and the tie rods burned off. Three timber deck beams (lashed to the steel span) were left in place to keep the Howe trusses from swaying while the wrecking cables were adjusted. These cables were attached at two points of the upper chord and the deck beams sawed off and a hoisting engine was then used to pull the truss past the center of gravity. Here, close observation showed that the truss leaped away from the piers after passing the center of gravity, turned a full 180 deg. in the air, dropped like a plummet, and landed clear of the piers. The removal of the four trusses was accomplished in 6 hours and without mishap or injury to the old piers or to the new bridge. Erection and demolition was done by the Pacific Coast Engineering Co.

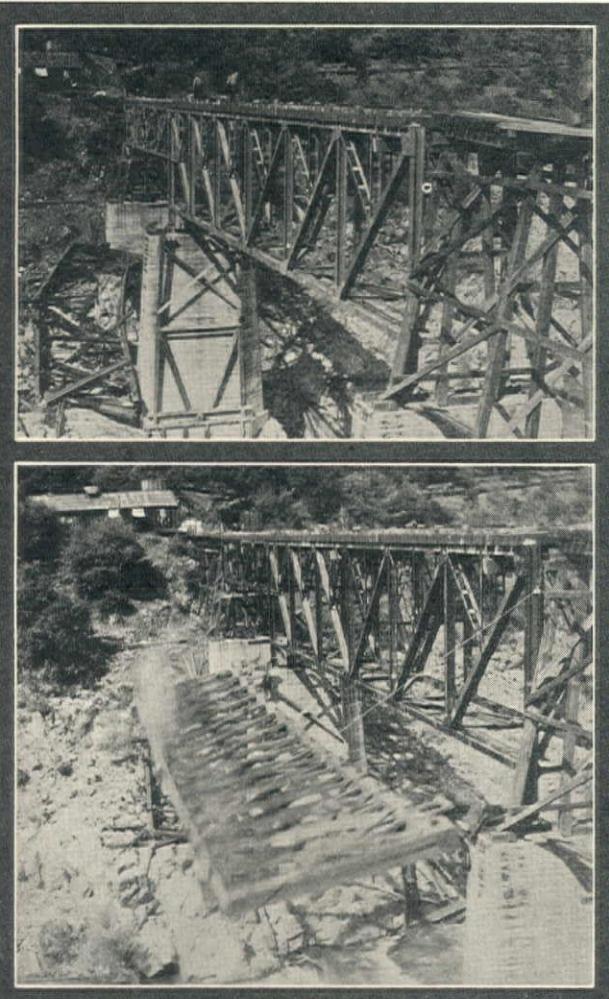
HUGE MAUSOLEUM AT PRESIDIO OF SAN FRANCISCO TO COST \$20,000,000

Preliminary sketches and estimates of cost are being prepared in the office of the constructing quartermaster, War Department, Fort Mason, San Francisco, by O. W. Degen, civilian engineer, for a monumental mausoleum to be constructed in the National Cemetery at the Presidio of San Francisco. The capacity of the cemetery is rapidly being reached, with more than 11,700 graves, and 6 to 10 burials daily. Degen, who has had this project in mind for years, has determined that a maximum of only 500 bodies can be interred underground per acre. Underground interment will be discontinued when the mausoleum is built.

The first unit of this project, probably in the form of a pyramid, will be about 400 ft. square, and will cost between \$1,000,000 and \$2,000,000. It will contain a crematory, chapel, and rotunda, and will be equipped with a ventilating system, elevators, lighting system, etc. Additional units will be constructed every 20 years, with estimated ultimate capacity of 200,000 or more bodies at the end of 100 years, and an expenditure of more than \$20,000,000. A census is now being taken to determine the probable yearly capacity requirements.

This mausoleum project was sponsored by the commanding general of the U. S. Army, and was recently endorsed by the Spanish War veterans. Endorsement by the Veterans of Foreign Wars, American Legion, and Civil War veterans is expected soon.

The California Division of Highways will receive bids until 2 p.m. July 2 for 28.7 miles of 20-ft. road in San Bernardino county, extending across open desert country from 6 miles east of Amboy to 1½ miles east of Essex. The project is on the main highway between Barstow and Needles and is paralleled by the Santa Fe railroad. The contract time is 300 working days. Work consists of grading, surfacing, establishment of a system of storm water protection ditches, and 44 wooden bridges.



(Upper) Steel Trusses in Place, with Wreck of Wooden Truss on Bank. (Lower) Wooden Truss Leaving Piers During Wrecking Operation

timber cross beams resting on the lower chords of the Howe truss. By so doing, the bottom laterals of the old bridge could be easily removed and the top chords of the steel span would come above those of the wooden span and could therefore be laid without interference. The order of erection was as follows: first the bottom chords were laid on timber cross beams and the lower steel laterals and web members were then framed and the cross frames set. It was thereafter a simple matter to lay the top chords and ties. As the work progressed, the erectors had to use con-

Construction Review

SEWER CONSTRUCTION AND WATER SUPPLY SYSTEMS

By S. J. SANDERS

Editor, Daily Construction News Service

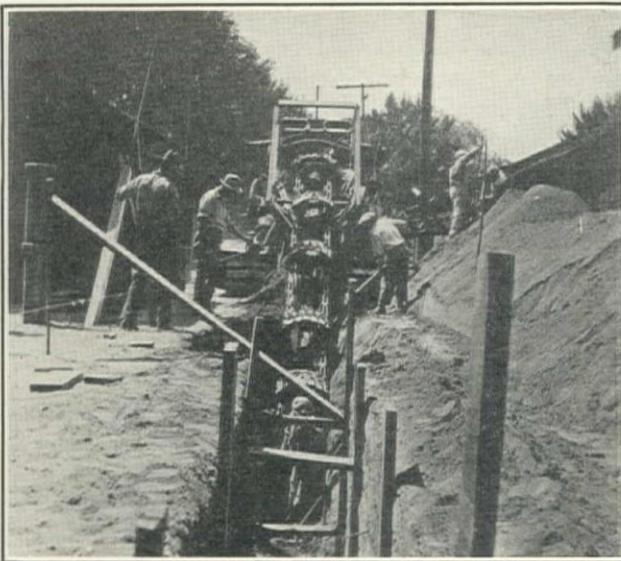
SEWER CONSTRUCTION

Progress is being made on important projects as follows:

ATWATER PIPE SYSTEM, PUMPING, AND TREATMENT PLANTS

W. J. Tobin, Oakland, will complete his contract about July 15, 1930, for the Atwater, California, sewerage system, including a vitrified pipe installation, pumping plant, cast-iron force main, and treatment plant. The contract price, \$54,673, includes: 20,866 lin.ft. 8-in. vitrified pipe at \$0.75; 684 4-in. Y's on 8-in. pipe at \$0.60; 5848 lin.ft. 10-in. vitrified pipe at \$0.90; 96 4-in. Y's on 10-in. pipe at \$0.75; 1657 lin.ft. 12-in. vitrified pipe at \$1.28; 148 lin.ft. 8-in. cast-iron pipe at \$1.62; 54 concrete manholes at \$50; 19 8-in. vitrified pipe lampholes at \$10; pumping pit and pumps (lump sum) \$4750; 6821 lin.ft. 8-in. cast-iron force main at \$1.25; treatment plant (lump sum) \$12,750.

On May 27, the vitrified pipe system was 95% complete and laying of the cast-iron main was scheduled



W. J. Tobin Trenching for Atwater Vitrified Pipe System

to begin June 10. Satisfactory progress is being made on the pumping and treatment plants. The pump pit is 13 ft. 8 in. diam. by 20 ft. deep and is equipped with two 4-in. Dayton-Dowd sewage pumps. The treatment plant is Dorr-equipped and includes a 25-ft. diam. clarifier tank and a 22-ft. diam. digester tank. Gladning, McBean & Co. furnished the vitrified clay pipe.

W. E. Bedesen, Merced, is city engineer of Atwater, and G. E. Winton is resident engineer on the sewerage system.

BERKELEY STORM DRAIN SYSTEM, Unit No. 4

J. C. Hickey, Alhambra, will complete his contract

about July 15 for unit No. 4 of the Berkeley, California, storm drain system. The contract price is \$221,666, of which \$13,000 is payable in cash and the balance under the 1911 Act. Items in the contract follow: trench excavation—38,875 cu.yd. at \$1.40; reinforced concrete pipe—560 lin.ft. 70-in. at \$16, 1210 lin. ft. 69-in. at \$14, 765 lin.ft. 66-in. at \$13, 940 lin.ft. 60-in. at \$12, 785 lin.ft. 57-in. at \$11, 410 lin.ft. 51-in. at \$10, 680 lin.ft.



Austin Model BF-4 Backfiller Following Austin Model 42-15 Trencher on J. C. Hickey Contract for Unit 4 of Berkeley Storm Drain System

48-in. at \$9, 120 lin.ft. 45-in. at \$8, 1500 lin.ft. 42-in. at \$7, 1765 lin.ft. 39-in. at \$6.50, 2145 lin.ft. 36-in. at \$5.50, 2915 lin.ft. 33-in. at \$5.25, 1565 lin.ft. 30-in. at \$5, 1675 lin.ft. 27-in. at \$4, 2425 lin.ft. 24-in. at \$3, 475 lin.ft. 21-in. and 920 lin.ft. 18-in. at \$2.50, 1075 lin.ft. 15-in. at \$2; vitrified pipe—750 lin.ft. 12-in. and 1260 lin.ft. 10-in. at \$2, 200 lin.ft. 8-in. and 100 lin.ft. each of 6 and 4-in. at \$1; manholes—69 standard and 2 water seal at \$100; catchbasins—55 type 1 and 7 type 3 at \$100, 5 type 2 at \$150; curb inlets—3 type 1 at \$90 and 10 type 2 at \$75; sanitary intercepts—12 at \$25; concrete—50 cu.yd. 'A' at \$30 and 40 cu.yd. 'B' at \$25; reinforcing steel—20 cwt. at \$5; foundation rock—30 cu.yd. at \$5; paving—1000 sq.ft. asphalt at \$0.50 and 3000 sq.ft. oil macadam at \$0.25.

Trench excavation has been done with an Austin model 42-15. With attachments, this machine digs to a maximum width of 112 in. and a maximum depth of 16 ft.; it is said to have been quite satisfactory on curved and narrow streets and on grades steeper than 10%. For lateral stubs and catchbasins, a Barber-Greene ditcher was used. Ingersoll-Rand air tools, powered by a Rix 120 compressor, were used to remove pavement. Considerable rock has been encountered, but much of this was soft enough to remove with the trenchers.

The work has been carefully done to lessen inconvenience to the considerable traffic on the narrow and winding residential streets. Provision for automobile entrance and exit across the trench has been made wherever possible, and Hickey has furnished storage for vehicles during the time any owner's driveway was blocked by trenching. Care has also been taken to protect valuable shrubbery and trees along the line of the trench.

For laying 8-ft. lengths of centrifugal pipe, 30-in. diam. and larger, from the transporting truck, a Universal crane mounted on a Mack 'Bulldog' truck is used. This method has made it possible to keep from blocking the streets, as would have been the case if



Marion 1 1/4-yd. Electric Shovel and Caterpillar with Bulldozer on Section 'A' of Alemany Storm Drain, Sibley Grading & Teaming Co. Subcontract



Typical Storm Drain Construction, San Francisco

pipe was strung along the work. Pipe 27-in. and smaller is laid by tripod and hand winch, or directly by hand. Wherever necessary to close a narrow street, pipe laying and backfilling have been kept close behind the trencher.

Backfilling is done with an Austin model BF-4. Excess material, of which there is 14,000 cu.yd., is collected by a Killifer loader mounted on a Fordson rubber-tired tractor and is hauled by a fleet of five 'AB' Mack trucks to the Berkeley airport, where it is used for fill. Hauling is done under subcontract by the Bay Trucking Co., San Leandro, of which G. E. Houghton is manager.

Manholes, catchbasins, curb inlets, and sanitary intercepts were constructed of truck-mixed concrete, supplied by the Pacific Coast Aggregates Co., a total of 2000 cu.yd. being required. Vitrified pipe is furnished by Gladding-McBean & Co., and is being laid with cement joints. Reinforced concrete (Hume) pipe

27-in. and larger is supplied by the American Concrete Pipe Co. and that 24-in. and smaller by the California Concrete Products Co.



Marion 1 1/4-yd. Electric Shovel and Caterpillar with Bulldozer on Section 'A' of Alemany Storm Drain, Sibley Grading & Teaming Co. Subcontract

Harry Goodridge is city engineer and superintendent of streets for Berkeley and Chester C. Fisk is assistant city engineer. S. A. Hart of Sacramento was until recently storm drain engineer for Berkeley.

LOS ANGELES STORM DRAIN SYSTEM (JEFFERSON ST.)

J. Artukovich, Los Angeles, will complete his contract about August 15 for section 5 of the Jefferson st. storm drain, contract price \$323,271. The project was 56% complete on May 22, with construction in progress simultaneously at several points. On that date, precast concrete pipe (27-in.) was being laid at 28th and Main st. and resurfacing was under way at San Pedro and Washington st. A cut was opened during May at Maple ave. and Jefferson st., a point where construction is handicapped by the narrow width of Maple ave., the proximity of street car tracks, and the depth of excavation.



Section 'B', Alemany Drain, San Francisco, Eaton & Smith Contract

J. J. Jessup is city engineer, D. M. True is office engineer, and L. W. Armstrong is storm drain engineer for Los Angeles.

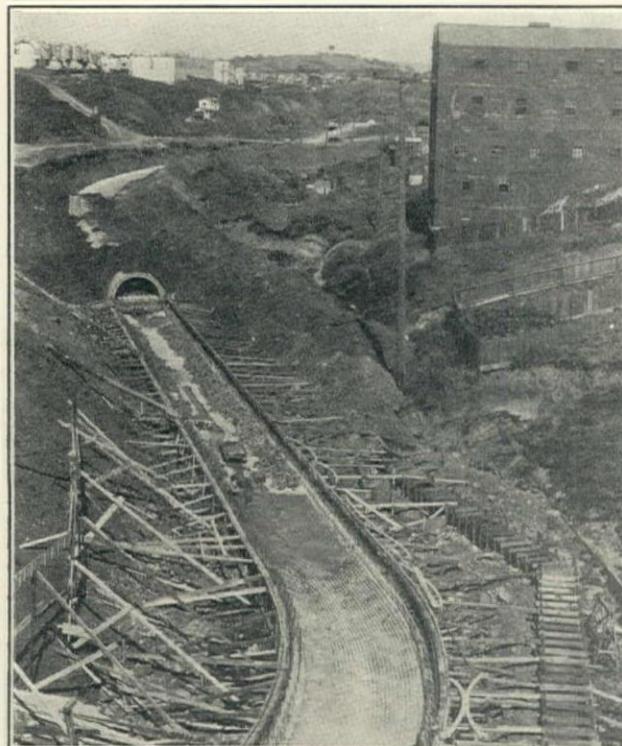
SAN FRANCISCO SEWER PROJECTS

Alemany Blvd. Storm Drain System—Eaton & Smith, San Francisco, will complete their contract about August 1 for section B of the Alemany blvd.

storm drain system. On May 20, the excavation was 70% complete, piling 44% complete, and concreting 3% complete. Equipment in use includes one Osgood 1½-yd. dragline, one Thew-Lorain 1-yd. clamshell, one Vulcan 5000-lb. hammer and a pile driver with 80-ft. leads, one Caterpillar '10' for dragging piles (average length of piles 58 ft.) Concrete has been supplied from a central mixing plant.

The contract price, \$271,255, includes 423 lin.ft. of two-compartment, 8.5 by 11-ft., reinforced concrete storm drain at \$90; 2733 lin.ft. of 8.54 by 12-ft. pile foundation, arch section, reinforced concrete storm drain at \$50; 300 lin.ft. of 8.54 by 12-ft. earth foundation, arch section, reinforced concrete storm drain at \$47; 735 lin.ft. of 3 by 4.5-ft. and 180 lin.ft. of 2.5 by 3.75-ft. reinforced concrete sewer at \$10; and 165,000 lin.ft. piling below cutoff at \$0.35.

Fifteenth St. Sewer—L. J. Cohn, San Francisco, will complete his contract about August 1 for section 'A' of the 15th st. sewer between Harrison and Howard st. The contract price, \$59,334, involves the following main items: Concrete sewer—938 lin.ft. 6.5 by 8.5-ft. box section at \$41 and 232 lin.ft. 6-ft. circular section



Section 'A' of Alemany Storm Drain for City of San Francisco, Clinton Construction Co. Contract

at \$30; taper connections—1 at \$500; manholes—3 at \$50 and 1 at \$100; piling—28,000 lin.ft. at \$0.40.

Equipment includes one Northwest convertible crane having ¾-yd. dragline and clamshell buckets, one 5000-lb. Vulcan hammer in 84-ft. leads, one Rix compressor with a No. 1 Ingersoll-Rand air hammer for driving lagging. Concrete was supplied from a central mixing plant.

Fillmore St. Sewer—L. J. Cohn, San Francisco, began his contract late in May and will complete it by March, 1931, for section B of Fillmore st. sewer between Harrison st. and Van Ness ave. on 10th and

Fell st., contract price \$112,031. The work includes: reinforced concrete sewer—3084 lin.ft. 6.75-ft. circular section at \$34.40 and 41 lin.ft. 2.5 by 3.75-ft. box section at \$18.25, 30 lin. ft. 2.25-ft. circular section with vitrified invert lining at \$11; vitrified culvert—55 lin.ft. 10-in. at \$1.78; manholes—14 on new sewer at



Clarifier, Suction Piping, and Scum Drain for Sebastopol Sewage Treatment Plant, A. F. Anderson, Contractor

\$83 and 3 on existing sewer at \$108; vitrified underdrain—300 lin.ft. 12-in. at \$1.33, 400 lin.ft. 10-in. at \$1.21, 1100 lin.ft. 8-in. at \$1.07, and 1284 lin.ft. 6-in. at \$0.95.

Geary St. and 23rd Ave. Sewer—Peter J. McHugh, San Francisco, began work late in May and will complete his contract about November 1 for the Geary st. and 23rd ave. sewer system from 27th ave. and Geary st. to 23rd ave. and Lake st. The contract price is \$66,751, and includes: vitrified pipe—48 lin.ft. 21-in. at \$5; reinforced concrete—1673 lin.ft. 2 by 3-ft. box section at \$10.50, 276 lin.ft. 2.5 by 3.75-ft. box section at \$11.00, 706 lin.ft. 3.5 by 5.25-ft. box section at \$14.50, 1391 lin.ft. 4 by 6-ft. box section at \$23.65; reinforced concrete taper connections—1 at \$200 and 1 at \$225; junction structures—1 each at \$100, \$200, and \$1000; manholes—14 at \$75.

Ingalls St. Sewer—J. Varano, San Francisco, will complete his contract about August 15 for sewers on Ingalls st. from Carroll to Bancroft ave. and on Bancroft ave. from Jennings to Ingalls st., contract price \$20,105. Pile driving on this contract was begun about May 20.

M. M. O'Shaughnessy is city engineer, Clyde Healy assistant city engineer, and L. G. Tegtmeyer sewer engineer for San Francisco.

SEBASTOPOL SEWAGE TREATMENT PLANT

A. F. Anderson, Oakland, will complete his contract about September 1 (awarded April 11) for the Sebastopol, California, sewage treatment plant. Excavation for footings and wet and dry wells has been completed and grading of levees is under way. The contract price is \$21,260. The following work and equipment is involved: 2150 lin.ft. 15-in. vitrified sewer pipe; 2 manholes; 183 cu.yd. structure and 5300 cu.yd. common excavation in sandy loam; one operating house; one 26-ft. Dorr tractor clarifier and skimmer; one 4-in. Dayton-Dowd sewage pumping system; one 4-in. Barnes sludge pumping system; a separate sludge digester with gas collection and sludge heating, using

Byers wrought-iron pipe in the heating coil, and one No. 21 Tobasco heater; one effluent distributor system with 12-in. cement pipe and Snow alfalfa-type valves; two sludge drying beds; clearing ground by removal of an existing rubbish dump. The pipe is being laid with 'Hydrotite' joints and Rensselaer valves are being used throughout, with 'Mono-cast' cast-iron piping at the plant. Two Hazelton water level controllers are provided.

C. E. Muller is city engineer of Sebastopol and John A. Mitchell, city engineer of St. Helena, is the consulting engineer.

HAWTHORNE NAVAL AMMUNITION DEPOT IMPROVEMENTS

The Thos. Haverty Co., Los Angeles, general contractor, began work April 16 and will complete a contract by October 18 for improvements at the U. S. Naval Ammunition Depot, Hawthorne, Nevada. The improvements include a sewage disposal plant; steam, oil, and electrical systems; sidewalks; and concrete and bituminous macadam roads; the contract price being \$286,885.

By May 21 there had been placed 7500 lin.ft. of 8 to 12-in. and 2600 lin.ft. of 3 to 6-in. vitrified sewer pipe and 8 out of 34 precast concrete manholes. Concrete work on the septic tank was scheduled to begin at that time, and excavation for drain tile in the dis-

posal field was in progress. There will be 7000 lin.ft. of 3-in. drain tile in the disposal field.

Over 2400 lin.ft. of concrete ducts for the electric and telephone distribution systems is in place and 5 reinforced concrete combination electrical and telephone manholes have been completed. The Newbery Electric Corp., Los Angeles, has a subcontract for this work. None of the remaining sections of the general contract had been started on May 21.

Gladding-McBean & Co. is furnishing the drain tile and the vitrified pipe, and the precast concrete manholes are being manufactured by the American Concrete Pipe Co. On trench excavation for sewer pipe and ducts, a gas-driven Buckeye traction ditcher is being used, the trench reaching a maximum depth of 10 ft. For backfilling sewer trenches, a bulldozer with 9½-ft. blade, powered by a Caterpillar '30', is used. Concrete is mixed in a 7S Rex mixer and is distributed to the transformer vaults and ducts by a dump bucket mounted on the rear end of a Ford model 'AA' truck.

A. L. Parsons is chief of the Bureau of Yards and Docks, Navy Department, Washington, and C. H. Cotter, Lt.-com. (CEC), U. S. Navy, is the officer in charge of construction. E. A. Jensen is superintendent for the Thos. Haverty Co. and A. Winkler is in charge of construction for the Newbery Electric Corp.

WATER SUPPLY SYSTEMS

GLENDALE RESERVOIR IN GRAND PARK

Orosel & Kitchen, Los Angeles, will complete their contract about October 1 for the Grand Park reservoir, Glendale, California, capacity 10,500,000 gal. The contract price is \$88,540 and involves 35,400 cu.yd. excavation, 47,800 cu.yd. embankment, 3450 cu.yd. concrete, and 60,000 sq.ft. wooden roof, etc. The site has been cleared, 30-in. reinforced concrete storm drains and outlet pipes installed, and over 20% of the embankment placed. The storm drain and outlet pipes were furnished by the American Concrete Pipe Co.

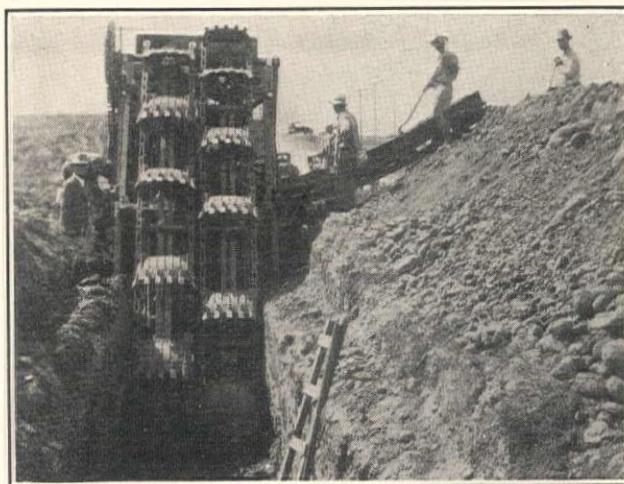
J. C. Albers is city engineer of Glendale, and P. Diederich is superintendent of water, light and power service.

SAN DIEGO WATER IMPROVEMENTS

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 1—R. E. Hazard Contracting Co., San Diego, will complete a contract about October 1 for trenching and completion of backfill between mile 0 and mile 16.2, contract price \$43,370, for the second main pipe-line to the city of San Diego, California. Items involved are as follows: 81,550 cu.yd. unclassified excavation at \$0.46; remove 1125 sq.ft. pavement at \$0.45; and 42,000 cu.yd. backfill at \$0.125. The total length of trenching required is 78,312 ft., of which 4700 lin.ft. had been completed on May 20. This work is being done under subcontract by Ernest Ward,

of San Diego, who is using one Parson model 31 trencher.

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 2—The Western Pipe & Steel Co., Los Angeles and San Francisco, will complete its contract about October 1, 1930, for furnishing and laying steel



Parsons Model 31 Trencher on Schedule 1, Otay Reservoir-San Diego Second Main Pipe-Line, R. E. Hazard Contracting Co. (Ernest Ward, Sub-contractor)

pipe and partial backfill of trench between mile 0 and mile 16.2. The contract price is \$620,982 (see unit bid summary, January 10, 1930, issue, p. 50). A total of 42,492 lin.ft. of 36-in. (9500 lin.ft. delivered and 2119

lin.ft. laid on May 20) and 43,020 lin.ft. of 40-in. electric-welded steel pipe (none delivered on May 20) is required.

Steel plates are being supplied by various plants of the U. S. Steel Products Co. Fabrication of electric-welded steel pipe and dipping and wrapping is being done by the Western Pipe & Steel Co. at its South San Francisco plant. The company's Los Angeles organization is installing the pipe, using a crawler-type, gas-driven crane, two Fordson tractors, two portable gas-driven electric welding outfits, etc.

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 3—M. N. Guho and M. Miller will complete



Western Pipe & Steel Co. Unloading 36-in. Electric-Welded Steel Pipe on Schedule 2, Otay Reservoir-San Diego Second Main Pipe-Line

their contract about October 1 for driving and gunite lining four tunnels on this project. The estimated total length of the tunnels is 7200 lin.ft., of which 2621 lin.ft. had been driven and 88 lin.ft. gunited by May 20. The contract price, \$66,666, involves 7200 lin.ft. tunnel excavation at \$5.95; 200 cu.yd. tunnel entrance at \$1.40; 6800 lin.ft. 1½-in. gunite lining at \$1.50; 400 lin.ft. timber lining at \$3.75; 90 cu.yd. con-



Pipe Yard of Miracle Construction Co., Contractor on Schedule 4, Otay Reservoir-San Diego Second Main Pipe-Line. Crane Handling Section of 36-in. Cast-iron Pipe Furnished by U. S. Pipe & Foundry Co.

crete at \$6.75 and 550 cu.yd. at \$5.75; 2250 bbl. cement at \$2.20; 10,500 lb. reinforcing steel at \$0.06; 2850 lb. wire mesh at \$0.09; 12,000 lb. galvanized 2-in. mesh at \$0.12; 10 M f.b.m. douglas fir timber at \$80.

Gunite lining is being done under subcontract by John G. Wood & Son, San Diego, using one gunite machine and compressor. The general contractors are

using three air compressors, operating hoists, drills, and spades.

Otay Reservoir-San Diego Second Main Pipe-Line, Schedule 4—Miracle Construction Co., San Diego, will complete excavation, pipe-laying, connections, backfilling, etc., for the section from mile 16.2 to mile 19.2 about October 1. The contract price, \$218,811, involves 25,000 cu.yd. trench excavation at \$0.95; 32,000 sq.ft. pavement removal and replacing at \$0.35; 15,863 lin.ft. 36-in. cast-iron pipe, etc. (see unit bid summary, January 10, 1930, issue, p. 52). By May 20, 710 lin.ft. of trenching had been completed, nearly all of the pipe delivered, and 500 lin.ft. of pipe laid. Trenching is being done under subcontract by Henry G. Fenton, San Diego. Major equipment includes one crane, one drag shovel, one clamshell crane, all crawler-type and gas-driven. The United States Pipe & Foundry Co. is furnishing the pipe. Pipe is loaded by truck-mounted crane and hauled on 6-wheel, pneumatic-tired Federal 'Big-Six' trucks, three pipe lengths to a load.

Morena Reservoir Enlargement—Gist & Bell, Arcadia, will complete their contract for enlarging the capacity of Morena reservoir from 53,700 ac-ft. to 72,800 ac-ft. about September, 1930. The contract price is \$61,489 (unit bids were published in the April



Miracle Construction Co. Laying 36-in. Cast-iron Pipe (U. S. Pipe & Foundry Co.) on Schedule 4, Otay Reservoir-San Diego Second Main Pipe-Line

10, 1930, issue, p. 54). A rubble masonry wall (600 cu.yd.) for strengthening the concrete parapet wall has been completed. The work also required 800 cu.yd. excavation and placing sixty 1-in. wall anchors for a new concrete parapet wall above the old one. The additional dam embankment, 12,000 cu.yd. of rock, was 75% complete on May 27. All 1 and 2-in. holes in masonry for tying new and old concrete, total length 1800 ft., have been drilled. The outlet tower is being raised, a new parapet wall is being built, and excavation for the spillway channel is in progress. The 22 automatic flash gates required were being fabricated on May 27.

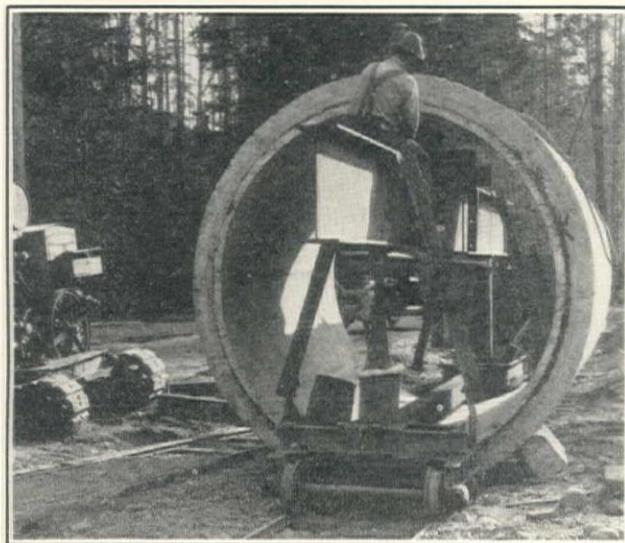
Major equipment includes one 1½-yd. Bucyrus-Erie gas-air shovel; two Rix air compressors (one 320 c.f.m. and one 110-c.f.m.); three 4-yd. Autocar trucks; one Ingersoll-Rand Leyner type drill sharpener; one derrick with 110-ft. boom; one Caterpillar '30' tractor.

W. M. Bonham is resident engineer for the city of San Diego on the Morena dam enlargement. H. N.

Savage is hydraulic engineer in charge of the San Diego Water Department, with Fred D. Pyle and R. C. Wueste as engineers.

SEATTLE WATER SUPPLY LINES

Intake to Lake Youngs Aqueduct—J. F. Ward, Inc., Seattle, will soon complete a contract for the Lake Youngs aqueduct intake at the Landsburg diversion dam, contract price \$89,196. Principal items include



Special Pipe Car for Handling Sections of 96-in. Precast Concrete Pipe Used on Lake Youngs Aqueduct, Seattle, Elliott, Stroud Bros. & Seabrook Contract

14,000 cu.yd. excavation at \$0.80; 6 traveling screens at \$3476; 740 cu.yd. concrete in retaining walls, parapet, and weir at \$14; 550 cu.yd. concrete in linings at \$18; one screen house at \$17,252. The unit bid summary was published in the February 10th, 1930, issue, p. 44.

Lake Youngs Aqueduct—Elliott, Stroud Bros. & Seabrook, Seattle and San Diego, began laying two miles of 96-in. precast concrete pipe for this aqueduct on November 1, 1929, and completed the work May 16, 1930. The contract price, \$351,720, involved: 3 acres clearing and grubbing at \$600; 10,202 lin.ft. 96-in. reinforced concrete pipe (weighing 42,000 lb. per section) at \$30; 30,000 cu.yd. earth excavation for pipe at \$0.60; 10,000 cu.yd. rock excavation for pipe at \$1.00; 600 cu.yd. tunnel invert excavation at \$3.00; two manholes and vent pipes at \$1300; one blowoff (including 30-in. gate valve) at \$1350; installing 160 lin.ft. 30-in. cast-iron pipe at \$4.40; 400 cu.yd. concrete protection for river crossing at \$15; 200 cu.yd. concrete blocking at \$15.

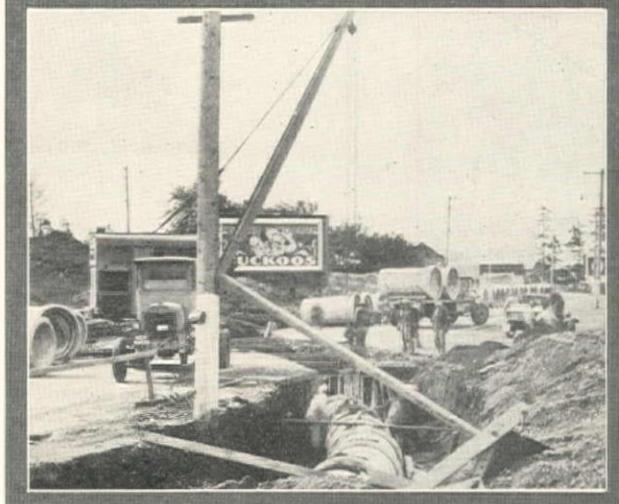
Lake Youngs aqueduct will give an independent supply of 300,000,000 g.p.d. between Landsburg and Lake Youngs settling reservoir, and is needed to protect existing lines and to insure ample supply during summer months.

The following principal equipment was used: one Link-Belt K-55 dragline and crane; one Northwest dragline; one Thew-Lorain '75' shovel; six 18-ton Blackhawk hydraulic jacks; five Beebe hand hoists; one Parsons backfiller; one Rex paving mixer with a specially constructed tower; one Ersted truck crane for handling pipe forms. Material used in this contract included 74,000 sacks of 'Diamond' cement,

12,000 cu.yd. of sand and gravel, 850 tons of $\frac{1}{2}$ -in. reinforcing steel, 160 tons of steel plate, 30 tons of lead wool.

To place and spade concrete for each section of pipe required about one hour of labor. The backfiller was used to roll pipe from the yard to an industrial track where pipe sections were loaded individually onto specially designed cars and hauled into the Lake Youngs aqueduct tunnel (3000 ft. long). These cars were also used for placing pipe in the tunnel, the method being to detach the front truck and set it inside of a section already laid, then to jack up the new section of pipe with two of the 18-ton jacks and connect the sections by pulling into place with one of the hand hoists. About five sections could be laid every 24 hours in this manner. A 7-ton Whitcomb gas locomotive handled both the pipe and muck cars.

Cedar River Pipe-Line No. 4—Hans Pederson, Seattle, is completing his contract for Cedar river pipe-line no. 4, a 78-in. creosoted wood-stave pipe extending 54,500 lin.ft. from the west portal of the Lake Youngs aqueduct tunnel to a connection with existing lines near Molasses creek controlling works (see 'Front Cover' illustration). The various band-



(Upper) Northwest 1 1/4-yd. Hoe Shovel Excavating for Wells Pipe-Line, Tacoma Water Division. (Lower) Universal Crane on Doane Truck Laying Section of 42-in. Hume Concrete Pipe at Tacoma, American Concrete Pipe Co., Contractor

ings and bank spacings averaged about \$10 per lin.ft. To May 1, over 53,000 lin.ft. of pipe was completed and the total expenditure was \$852,700. The unit bid summary on this contract was published in the October 25th, 1929, issue, p. 70.

W. D. Barkhuff is city engineer of Seattle and T. H.

Carver is assistant city engineer on municipal water supply and hydroelectric developments. J. H. Quense is assistant engineer on water supply. W. B. Severyns is superintendent of water and A. M. Lewis is assistant superintendent of distribution.

TACOMA PIPE-LINE

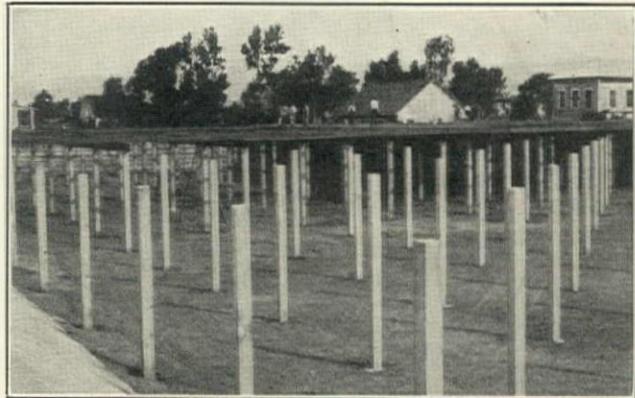
The American Concrete Pipe Co., Tacoma, Washington, will complete a contract about July 15 for 16,045 lin.ft. of 42-in. diam. centrifugally spun concrete pipe on the Wells pipe-line. Work was 50% complete on May 22. The estimated cost of this line is \$180,965, of which \$127,520 is for manufacture, laying, and installing pipe and appurtenant equipment in the trench. All excavation, subgrading, backfilling, and other miscellaneous work is being done by the Water Division, city of Tacoma. Some unit prices follow: 42-in. diam. concrete pipe, heavy type, at \$7.75 per lin.ft. in place; 42-in. diam. concrete pipe, standard type, at \$6.75 per lin.ft. in place; cast steel manholes at \$60; 4-in. air valve saddles at \$25; 6-in. air valve saddles at \$35; 6-in. blowoff saddles at \$35. Trench excavation is being done with a 1 1/4-yd. Northwest hoe shovel and a Universal portable crane is being used for laying pipe.

W. A. Kunigk is superintendent of the Water Division, Department of Public Utilities, city of Tacoma, Washington.

WATSONVILLE RESERVOIR AND FILTER PLANT

Grant L. Miner, Palo Alto, will complete his contract about September 1 for waterworks improvements for the city of Watsonville, California, contract price

ness district, and a slow sand filter plant having a nominal capacity of 2.5 m.g.d., embracing a sedimentation basin, five filter units, a sand storage bin, a filtered water basin, a 50,000-gal. storage tank, etc., at Corralitos Village seven miles northwest of the Watsonville business district. Award of contract to Miner was based on elimination of the grading and concrete lining of the reservoir (to be done by the city), and of an electric generator and water wheel.



Placing Redwood Roof on Cast-in-Place Concrete Piers for Reservoir No. 1 Near Freedom Village, Watsonville Water Improvements

Improvement of the two distributing reservoirs (completed May 15) required 284 cast-in-place reinforced concrete piers with spread footings; a redwood roof covering 85,600 sq.ft. and utilizing 150,000 f.b.m. of lumber; and a 16-in. steel pipe, gate-controlled, connecting the reservoirs. The pipe was forced through the embankment by a ratchet pipe jack and the clay core was removed at intervals with a well-drilling auger.

Structure excavation for the filter plant and appurtenances, completed in April, totalled 6000 cu.yd. During May, the covered reinforced concrete filtered water basin was completed. This structure is 80 ft. square in the inside, has a working water depth of 8.5 ft., and holds 407,000 gal. Progress on the sedimentation basin, five filter units, and sand storage bin is well advanced. These structures are divided into independent sections by contraction joints, utilizing copper waterproofing strips. The sedimentation basin is 228 by 40 ft., with 10.5 ft. average depth, and has a capacity of 642,000 gal. The filters are each 81 by 45 ft. above the sand line, with a total depth of 12.1 ft.; the filter area is 0.42 acre and the rate of filtration is 6.0 m.g.d. per acre. The sand storage bin is 187.2 by 15 ft., with 9.25 ft. average depth, and has a capacity of 940 cu.yd.

A Link-Belt gas shovel was used for structure excavation. Concrete is mixed in a 2-sack Jaeger mixer. The Grinnell Co. of the Pacific is supplying the cast-iron pipe.

H. B. Kitchen is city engineer of Watsonville and Chas. G. Hyde is consulting engineer for the reservoir and slow sand filter plant. R. E. Davis, structural engineer, assisted Hyde in the designs; W. W. Wurster was the architect.



Link-Belt K-55 Crane Laying Section of 96-in. Precast Concrete Pipe Weighing 42,000 lb. for Lake Youngs Aqueduct, Seattle, Elliott, Stroud Bros. & Seabrook Contract

\$100,481. Bids were received March 11 for concrete slopes and bottom linings, concrete piers, and wooden roofs at the main distributing reservoirs at Freedom Village, two miles northwest of the Watsonville busi-

Denver Municipal Asphalt Plant

Reclaiming Used Asphalt Effects Saving in Maintenance of Street Surfacing

By JOSEPH C. COYLE
Englewood, Colorado

A well-equipped asphalt plant, purchased in 1918 from a contractor and improved in various ways since that time, enables the city of Denver to keep its asphalt surfaced streets in repair at a reasonable cost. An outstanding feature of the plant is the equipment for grinding and renovating sheet asphalt removed in making repairs. The entire plant covers 3 acres of ground, and is valued, with equipment, at \$68,000. There is storage room for 4000 tons of used asphalt topping; 2000 cu.yd. of sand; 2000 cu.yd. of crushed rock; 300 tons of new asphalt; and 40,000 gal. of fuel

tioned at this point controls the flow of aggregates to the 8-in. bucket elevator which feeds the 24-ft. by 54-in. dryers. A hot elevator carries the aggregates from the dryer to two hoppers above the mixer, holding 15 cu.yd. of sand and rock. There is also a hopper holding 20 tons of lime dust. Plant equipment includes a Corliss engine, in use 40 years or more, and a Heinie boiler.

Each aggregate is carefully weighed in a Barber weigh box holding 9 cu.ft., which turns out 1000 lb. at a batch. Asphalt is pumped from the storage tank



(UPPER LEFT) MAIN ASPHALT PLANT OF DENVER DEPARTMENT OF IMPROVEMENTS AND PARKS.
(UPPER RIGHT) EQUIPMENT FOR RECLAMING USED ASPHALT FROM DENVER STREETS.
(LOWER LEFT) SORTING OLD ASPHALT ON STORAGE PILE. (LOWER RIGHT)
MAKING A LARGE PATCH ON A DENVER STREET

oil. A tank serving the main plant holds 260 tons of asphalt. Storage sheds hold 3 carloads of cement, Celite, and filler.

Aggregates used are crushed granite, shipped in from Golden, Colorado, and two grades of sand, trucked in by contractors, one of the latter being commonly known as yellow loam. A 1-yd. derrick, with 80-ft. mast and 75-ft. boom, is used in storing aggregates, loading trucks, and filling the hoppers serving the main plant. It is equipped with an Orton $\frac{3}{4}$ -yd. clamshell and operated with a 4-drum American hoist and 37-hp. General Electric motor. The three hoppers in the main plant hold 20 cu.yd. each. A man sta-

into two 10-ton melting kettles by a 3-in. Kinney pump, and from the kettles to the asphalt weighing bucket by a 2-in. Kinney pump.

The mix for sheet asphalt is 12% lime dust, 4 $\frac{1}{2}$ % Celite, 12% asphalt, and the remainder sand of two grades mixed half and half. For coarse aggregates 6 $\frac{1}{2}$ % filler, 7% asphalt, 57% rock (sized $\frac{1}{4}$ to $\frac{3}{4}$ in.) and 30% sand, is used. Steam coils in storage tanks keep the asphalt hot for both plants. The main plant has a capacity of 2000 cu.yd. daily.

The small plant, made by Warren Bros., is used for renovating used asphalt, and the drum has a dryer at one end and mixer at the other. It is operated by a

40-hp. Fairbanks-Morse motor and is equipped with a Kewanee boiler and an Iroquois asphalt pump; (this plant was formerly operated by steam). The used asphalt is ground in two hammer crushers—a Noyes, operated by a 20-hp. Fairbanks-Morse motor, and a Williams, with 20-hp. General Electric motor. From 2 to 4% new asphalt is added to the crushed material. The plant has a capacity of 800 cu.yd. daily.

Tests have proved that only light oils evaporate from the asphalt under ordinary conditions and, by careful selection, material is salvaged in which the bitumen content remains practically full strength. Though occasional cracking has occurred in the renovated material, general results have been good, according to C. H. Draney, superintendent of the asphalt plant. The renovated asphalt is partly used hot and partly employed in cold patching during the winter months, being mixed with a small amount of road oil for the latter purpose. Some of this patching remains in good condition throughout the following summer and is not replaced.

In making repairs, some spots are cut out, saving the asphalt if good; some are trenched around and covered with a fresh top, when such procedure seems feasible because of the sunken surface; other places are repaired by the surface heating method. Two Equitable heaters are used. Hot asphalt is hauled from the plant in steel-bodied dump trucks, covered with canvas to retain the heat. Two repair crews are employed, one with an 8-ton roller, Ingersoll-Rand and Gardner-Denver 160-cu.ft. portable air compressors, each with two paving breakers of like make, and an oil-burning tool heater. The hot material is spread with rakes and rolled in after dusting with dry cement. The second crew, working on cuts made by public utilities, and other small repairs, carries an oil-burning tool heater, hand roller, and asphalt truck. The plant operates from March 1 to December 1, employing 60 men as drivers, cement handlers, etc.

Additional equipment of the plant includes one Littleford tank wagon, two tank wagons (improvised), a small wheel kettle, an 18-ton truck for moving rollers, and a blacksmith shop for making plant repairs. Activities of the department include repairs to concrete alleys, stone and brick pavement, wood block pavement, and some concrete curb and gutter work, as well as miscellaneous small jobs for other departments.

The first asphalt paving in the city was laid in 1891. In 1923 there was 1,393,573 sq.yd., and at the close of 1929 a total of 3,318,662 sq.yd. At this time there is 2,000,000 sq.yd. under maintenance. Also, in addition, there is 2,000,000 sq.yd. of alley paving and 207,000 sq.yd. of stone and wood block paving under maintenance by the department. Twelve trucks, of various sizes and makes, are used and maintained by city shops. The sum of \$118,055 was spent last year for asphaltic cement, stone, and resurfacing, including \$4356 for filling cracks.

Denver's first municipal asphalt plant was installed in 1910, at which time there was 529,475 sq.yd. under maintenance by the city and county at a cost of \$0.114 per sq.yd. The asphaltic concrete pavement maintenance during 1929 averaged \$0.054 per sq.yd. for a

total area of 1,480,889 sq.yd. Some additional 1929 cost data follows:

Asphalt repairs by the cut-out method.....	\$1.578 per sq.yd.
Surface heater asphalt repairs and resurfacing..	0.849 per sq.yd.
Stone and brick repairs.....	\$ 6,466
Wood block repairs	1,925
Cement concrete alley repairs.....	11,784
Cement concrete curb and gutter repairs.....	3,978
Work for other departments (park, fire, police, auditorium, and water).....	9,140
Work for outside parties in replacement of pavements opened for underground construction and repair (public utilities, street car, contractors).....	63,404

A statement of asphalt paving during 1929 follows:

**CITY & COUNTY OF DENVER
STATEMENT OF ASPHALT PAVING FOR 1929**

Kind of pavement	Sq. Yd.	Sq. Yd.	Total
	1891 to 1928 incl.	1929	Sq. Yd.
Sheet asphalt and asphaltic concrete on concrete base.....	946,546	6,748	953,294
Sheet asphalt and asphaltic concrete on macadam base.....	348,210	.....	348,210
Asphaltic concrete on black base	688,193	44,122	732,315
Asphaltic concrete on slag base	45,979	.....	45,979
Asphaltic concrete on rock and black base	934,605	67,738	1,002,343
Amiesite on slag base.....	76,815	.....	76,815
Amiesite on macadam base.....	3,600	.....	3,600
Asphalt macadam	34,017	.....	34,017
Asphalt on bridges & viaducts	94,249	1,173	95,422
Alleys	22,312	.....	22,312
Rock asphalt	4,355	.....	4,355
Totals	3,198,881	119,781	3,318,662



(Upper) Trenching and Filling Sunken Surface with New Topping.
(Lower) Patching Crew at Work Cutting Out Damaged Pavement. Oil-Burning Tool Heater in Foreground

C. D. Vail, manager of parks and improvements, heads the department. C. H. Draney is superintendent in charge of the plant and paving operations, and J. R. Banning is assistant superintendent. A. K. Vickery is city engineer.

You can have confidence in the new products of old firms



Now Calco Introduces Spiral Welded Pipe

YEARS of research, experimenting, testing, lie behind the new Calco Spiral Welded Pipe—years devoted to an intensive effort to produce a pipe worthy of the name of CALCO. Successful, CALCO now offers this pipe to wise buyers.

Automatically welded with a strength that equals its material, truly circular *always* to simplify field welding or coupling, uncommonly smooth inside for high carrying capacity, and free from plate offsets and projecting rivet heads, Calco Spiral Welded Pipe provides new efficiency in the conveyance of water, gas and oil.

Low in price and available in diameters from four to twelve inches, Calco Spiral Welded Pipe is ready for you. Ask for complete details.

California Corrugated Culvert Company

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BERKELEY: 417 Parker Street

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ASSOCIATED EQUIPMENT DISTRIBUTORS

The 1930 executive board of the Associated Equipment Distributors is as shown in the accompanying illustration and consists of: (top row) A. C. Blaisdell, Dan R. Brown, Mark Kaplan, H. W. Fletcher, (center row) Oscar B. Bjorge, A. A. Fuchs, N. Floyd, Jr., (bottom row) Carl Borchert, E. K. Hurst, M. R. Hunter, and T. W. Rosholt. The Associated Equipment Distributors, representing a combined investment of \$50,000,000, has in the past nine years grown through the efforts of a few pioneers to include some of the best known and largest distributors of construction equipment in the United States. With the assistance of other distributors, many benefits which the Association can offer may be realized and the status of the dealers much improved.

Positions held by members of the executive board are as follows:

Board Member	Assoc. Equipment Distrib.	Business Connection
A. A. Fuchs.....	President.....	Vice-president, Fuchs Equipment Co., Omaha



N. Floyd, Jr.....	First vice-president.....	Treasurer, Hubbard-Floyd Co., Inc., New York City
Oscar B. Bjorge.....	Second vice-president.....	Manager, Clyde Equipment Co., Portland, Oregon
A. C. Blaisdell.....	Secretary.....	Secretary, Queen City Supply Co., Cincinnati
H. W. Fletcher.....	Treasurer.....	Treasurer and general manager Clyde Co., New Orleans
Carl Borchert.....	Director.....	President, Borchert-Ingersoll, Inc., St. Paul
Dan R. Brown.....	Director.....	President, Brown-Bevis Co., Los Angeles
M. R. Hunter.....	Director.....	President, Hunter Machinery Co., Detroit and Milwaukee
E. K. Hurst.....	Director.....	President and general manager Western Material Co., Sioux Falls
T. W. Rosholt.....	Director.....	President, T. W. Rosholt Co., Minneapolis

W-K-M ANNOUNCEMENT

The W-K-M Co., Inc., Houston, Texas, manufacturer of oil-field, pipe-line, and industrial equipment, announces the appointment of Alexander J. Duaci as manager of sales, western territory, at 205 west Wacker drive, Chicago. Duaci was born in Amsterdam, Holland, and educated in New York and European universities. For the past eleven years he was with the Johns-Manville Co., being for seven years manager of the public utilities division. Duaci has a broad knowledge of pipeline materials and underground construction practices.

GENERAL WHEELBARROW CO. PRODUCTS

The General Wheelbarrow Co., Cleveland, has released a highway equipment bulletin describing its line of grading plows and rooters, all-steel plows, solid pressed bowl drag scrapers, square back scrapers, master rotary scrapers, ox shovels, backfillers, fresno scrapers with eveners, road drags,

and 'planetainers'. A second bulletin describes the 'Speedbarrow' line of barrows. These are said to have speed, rigidity, balance, and durability, with the advantage of interchangeability of parts.

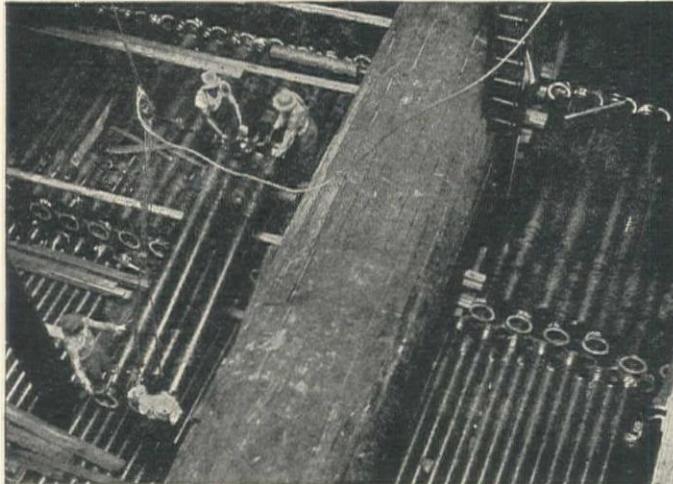
Explosives—The Hercules Powder Co., Wilmington, Del., has published a brochure containing a series of articles by chemists, engineers, and officers of the company, describing the Hercules processes and products and the ways in which industry is served by them.

The Bradford Pump Mfg. Co., San Jose, California, announces the appointment of Eck L. Baughn as sales manager. Baughn has for many years been actively engaged in sales work on the Pacific coast for well known pump manufacturers.

"EXCELENTE!"



... that's what General Carriedo would exclaim, if he could inspect Manila's water supply system today!

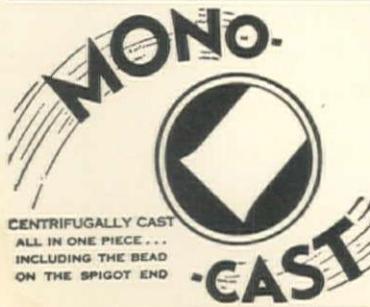


Mono-Cast Pipe on shipboard bound for Manila

NEARLY two centuries ago a Spanish nobleman, General Francisco E. Carriedo, envisioned a water supply system for Manila, of the Philippines, and his will contained a bequest of 10,000 pesos for that purpose. The original system was completed in 1865 by Spanish engineers. How the old "don" would swell with pride if he could see Manila's modern water works system today!

Since the original installation 65 years ago, the system has been remodeled and enlarged several times. The most recent enlargement included a 50,000,000 gallon per day distribution system. Cast iron pipe was used throughout the distribution system, and much of it was modern *Mono-Cast* centrifugal pipe!

Two centuries from now, *Mono-Cast* included in the system will be serving just as satisfactorily as today.



Manufactured by the
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LOS ANGELES, SEATTLE.

630

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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.

STREET AND ROAD WORK

SACRAMENTO, CALIF.—STATE—SANTA CLARA COUNTY—CONCRETE AND ASPHALT PAVING

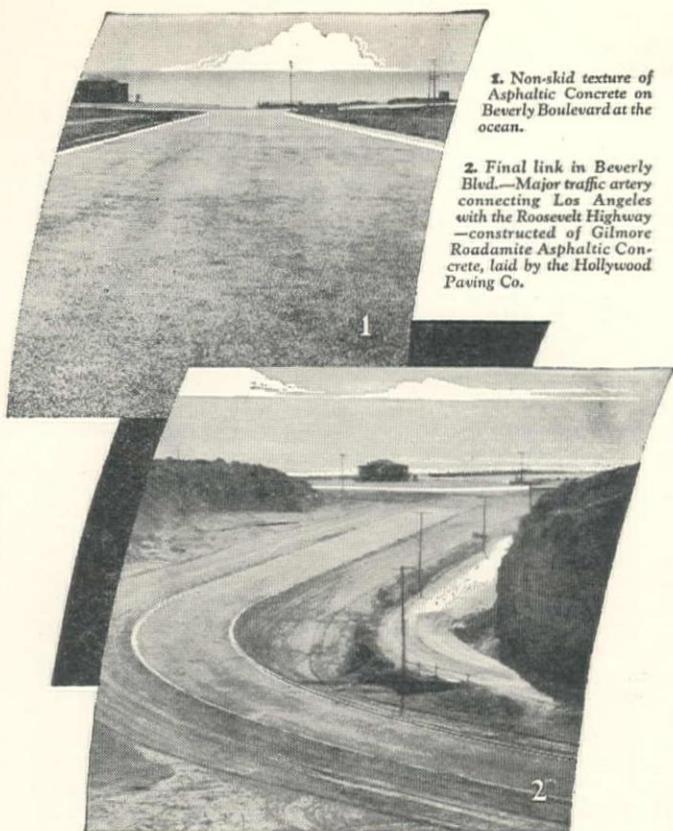
Hanrahan Company, Standard Oil Bdg., San Francisco, who bid \$204,904, low bid to the California Division of Highways, Sacramento, for 4.9 miles grading and paving with concrete and asphalt from San Antonio Ave. to Sunnyvale, SANTA CLARA COUNTY. Bids received from:

(1) Hanrahan Co., San Francisco.....	\$204,904	(4) A. J. Raisch, San Francisco.....	\$209,771	
(2) Union Paving Co., San Francisco.....	208,986	(5) Central California Roads Co., Oakland.....	233,386	
(3) N. M. Ball, Porterville and Berkeley.....	210,045			
3,550 cu.yd. roadway excavation.....		(1) .25	(2) .30	(3) .60
22,500 cu.yd. imported borrow (embankment).....				(4) .30
900 cu.yd. imp. borrow (park area).....				(5) .40
2,000 sta.yd. overhaul.....				
2,780 cu.yd. structure excavation.....				
33,300 sq.yd. subgrade for paving.....				
5,300 tons crusher run base.....				
13,700 tons asphalt concrete.....				
7,800 cu.yd. 'A' concrete (paving).....				
1,370 cu.yd. 'A' concrete (structures).....				
168 ft. 15-in. corr. pipe.....				
390 ft. 18-in. corr. pipe.....				
255,000 lb. reinforcing steel.....				
1,103 each remove trees, size 1.....				
354 each remove trees, size 2.....				
62 each remove trees, size 3.....				
30 each remove trees, size 4.....				
200 cu.yd. remove concrete.....				
800 sq.yd. remove asphalt surface.....				
53,000 sq.yd. asphalt paint binder.....				
250 tons screenings (Bit. surface).....				
18 tons Emulsified asphalt (Bit. sur.).....				
127 cu.yd. 'A' concrete (curbs and sidew.).....				
20 cu.yd. rubble masonry (ret. walls).....				
258 stations finishing roadway.....				
75 monuments.....				

CARSON CITY, NEVADA—STATE—GRADING AND SURFACING—ELKO COUNTY

Contract awarded to Nevada Rock & Sand Co., Reno, Nev., who bid \$134,533 for 31 miles grading and surfacing in ELKO COUNTY from Elko to Deeth, work for the Nevada State Highway Commission. Bids from:

(1) Nevada Rock & Sand Co.....	\$134,533	(6) Gibbon & Reed, Salt Lake City.....	\$160,008	
(2) Robinson Const. Co., Twin Falls.....	146,320	(7) Utah Const. Co., Ogden, Utah.....	160,342	
(3) Dodge Bros., Fallon, Nev.....	149,515	(8) Wm. Hoops, Twin Falls, Idaho.....	160,431	
(4) J. N. Tedford, Fallon, Nev.....	150,942	(9) Engineer's estimate.....	165,999	
(5) Isbell Const. Co., Carson City.....	156,541			
		(1) .21	(2) .25	(3) .25
166,500 cu.yd. road, exca.....				(4) .25
33,600 cu.yd. sel. borrow.....				(5) .25
194,964 sta.yd. overhaul.....				
25 mi. prepare subgrade and shoulders.....	75.00	\$100	75.00	\$100
6.35 mi. widen surface.....	75.00	\$200	100.00	\$150
7 demolish headwalls.....	5.00	2.00	5.00	5.00
83 corr. culv. extensions.....	10.00	10.00	10.00	10.00
73,500 cu.yd. crushed rock or gravel surfacing.....	.72	.80	.75	.80
550 cu.yd. crushed rock or gravel (stockpiles).....	.72	.70	.75	.80
2 cattleguards.....	\$700	\$650	\$750	\$650
11 gates.....	22.00	50.00	50.00	20.00
352 cu.yd. 'A' concrete.....	30.00	27.00	32.50	32.00
105 cu.yd. 'B' concrete.....	30.00	27.00	32.50	32.00
26 ft. 15-in. corr. pipe, inst.....	.50	.60	.50	.50
1,482 ft. 18-in. corr. pipe, inst.....	.50	.60	.50	.60
538 ft. 24-in. corr. pipe, inst.....	.50	.60	.50	.50
304 ft. 30-in. corr. pipe, inst.....	.50	.80	.75	.75
236 ft. 36-in. corr. pipe, inst.....	.50	1.00	.75	1.00
54 ft. remove 15-in. corr. pipe.....	.50	.30	.50	.50
28 ft. remove 18-in. corr. pipe.....	.50	.40	.50	.50
Demolish bridge.....	\$350	\$200	\$250	\$600
17,160 lb. remove and reset structural st. beams.....	.025	.02	.02	.02
632 ft. timber guard rail.....	1.00	1.00	1.00	.90
87 remove and reset monum.....	2.00	1.50	3.00	2.00
24,800 ft. remove fence.....	.02	.015	.01	.02
6,985 ft. remove and reconst. fence.....	.06	.03	.05	.08
46,512 ft. wire fence, 5 barbed wires.....	.105	.08	.09	.12
1,700 ft. fence, 6 barbed wires and 5 boards.....	.90	.20	.40	.25
3 posts for markers.....	10.00	2.00	4.00	10.00
12 sign posts.....	5.00	2.00	4.00	10.00



1. Non-skid texture of Asphaltic Concrete on Beverly Boulevard at the ocean.

2. Final link in Beverly Blvd.—Major traffic artery connecting Los Angeles with the Roosevelt Highway—constructed of Gilmore Roadamite Asphaltic Concrete, laid by the Hollywood Paving Co.

Engineers Select Asphaltic Concrete for Major Traffic Artery

Economy, Durability, Resiliency, Quietness and Safety are the advantages of Gilmore Roadamite Asphaltic Concrete. These advantages make it the choice of the West's foremost road engineers. It was selected for surfacing Beverly Boulevard, which it is estimated will be one of the heaviest travelled major arteries of Southern California.

Gilmore Oil and Asphalt Engineers are qualified to cooperate with you in planning the most economical and practical type of road construction suited to your needs and are at your service.

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MONARCH OF ALL
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ROADAMITE ASPHALT

1936

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Count on these large, wide-spreading Owen Type "S" Rehandlers to make fast time on the job. And how! A full Owen-sized load every time . . . overloads where the material is deep . . . quick, clean dumping . . . nothing left for clean-up. A Bigger Day's Work—yes sir, that's under guarantee.

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OWEN BUCKET CO. Oakland, Calif.
BROWN-BEVIS CO. Los Angeles, Calif.
BALZER MACHINERY CO. Portland, Ore.
H. J. ARMSTRONG. Seattle, Wash.

PORTLAND, ORE.—GOVERNMENT—GRADING AND SURFACING

Awards of contracts recommended as follows by the U. S. Bureau of Public Roads, New Postoffice Bdg., Portland, Ore.: (A) 13.9 miles surfacing Siuslaw National Forest, Oregon, Roosevelt Coast Highway surfacing, award of contract recommended to Hefty & Johnson, Portland, Ore., \$146,541. Bids on:

(1) 5,000 cu.yd. 'A' excavation	(6) 4,200 cu.yd. cr. rock, top course	(11) 4,500 cu.yd. suppl. rock, Class 'B'
(2) 40,000 cu.yd. 'B' excavation	(7) 4,200 cu.yd. cr. rock, keystone	(12) 4,200 cu.yd. suppl. rock, Class 'C'
(3) 8,000 cu.yd. borrow exc.	(8) 4,200 cu.yd. cr. rock screenings	(13) 4,500 cu.yd. suppl. rock, Class 'D'
(4) 13.9 mi. finish earth graded road.	(9) 20,000 $\frac{1}{2}$ mi.yd. haul, slide, borrow	(14) 115,000 $\frac{1}{2}$ mi.yd. haul for suppl. rock
(5) 28,000 cu.yd. cr. rock, bottom course	(10) 8,000 cu.yd. suppl. rock, Class 'A'	
	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14)	TOTALS
Hefty & Johnson.....	.40 .15 .40 \$150 2.20 2.30 2.30 .12 1.15 1.18 1.23 1.30 .09	\$146,541
Milne & Dussault.....	.40 .20 .40 \$250 2.15 2.30 2.20 .10 1.25 1.30 1.30 1.30 .10	149,775
Newport Const. Co.....	.40 .20 .40 \$150 2.19 2.19 2.19 .14 1.32 1.32 1.32 1.32 .09	155,533
A. C. Greenwood.....	.50 .35 .40 \$300 2.40 2.60 2.60 .15 1.50 1.60 1.60 1.60 .12	177,350

(B) Award of contract recommended to A. Milne, 1853 Broadway, Portland, Ore., \$74,920 for 13 miles surfacing Willamette Highway in Cascade National Forest, Oregon. Bids on:

(1) 5,000 cu.yd. unclass. slide exc.	(5) 23,000 cu.yd. rock or gravel, bottom course	(8) 1,000 M gallons watering
(2) 5,000 cu.yd. unclass. borrow exc.	(6) 8,000 cu.yd. rock top course	(9) 3,500 cu.yd. suppl. cr. rock, Class 'A'
(3) 5,000 cu.yd. sub-base	(7) 1,300 cu.yd. suppl. cr. rock	(10) 3,500 cu.yd. suppl. cr. rock, Class 'B'
(4) 13.1 mi. fine grading	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)	TOTALS
A. Milne .....	.40 .40 1.45 \$250 1.45 1.50 .95 2.25 .95 1.00 .95	\$74,920
Washburn & Hall, Portland.....	.40 .40 1.50 \$200 1.60 1.65 1.15 2.00 1.15 1.15 1.15	81,410
Hefty & Johnson, Portland.....	.30 .40 1.55 \$150 1.67 1.72 1.33 2.00 1.33 1.33 1.33	83,703
Interstate Const. Co., Portland.....	.45 .45 1.60 \$150 1.60 2.00 1.25 2.00 1.20 1.25 1.20	85,025
Newport Const. Co., Portland.....	.50 .40 1.80 \$200 1.80 1.80 1.34 2.50 1.34 1.34 1.34	92,284
Kelly & Sullivan, Portland.....	.40 .30 1.95 \$200 2.00 2.25 2.25 1.00 1.75 1.75 1.65	102,790

(C) Award of contract recommended to Bauers & Bauers, Dayton, Wash., \$76,250 for 5.2 miles grading Pendleton-John Day Highway in Umatilla National Forest, Oregon. Bids on:

(1) 30 acres clearing	(4) 300 cu.yd. struct. excav.	(7) 5.2 mi. finish earth graded road
(2) 25 acres grubbing	(5) 1,000 cu.yd. borrow excav.	(8) 50 trees and snags remove
(3) 85,000 cu.yd. roadway excav.	(6) 18,000 sta.yd. overhaul	(9) 1,500 ft. 18-in. corr. pipe
	(1) (2) (3) (4) (5) (6) (7) (8) (9)	TOTALS
Bauers & Bauers, Dayton, Wash.....	\$125 \$125 .74 2.00 .60 .05 \$200 10.00 1.75	\$76,250
Clifton, Applegate & Toole, Spokane.....	\$120 \$145 .77 1.50 .50 .03 \$220 10.00 2.35	79,614
A. C. Greenwood, Portland.....	\$350 \$300 .70 1.50 .70 .03 \$500 15.00 2.75	86,965
F. C. Dilliard, Medford, Ore.....	\$275 \$275 .75 2.00 .60 .04 \$300 10.00 2.75	87,260
J. A. Terteling & Sons.....	\$150 \$100 .86 2.00 .50 .05 \$250 10.00 2.50	87,890
Siems Spokane Co., Spokane.....	\$145 \$215 .90 1.45 .50 .05 \$300 7.50 2.30	93,685
Morrison-Knudsen Co., Boise, Ida.....	\$200 \$200 1.10 2.00 .40 .05 \$400 10.00 2.50	112,990

(D) Award of contract recommended to C. R. Johnson, 309 14th St. North, Portland, Ore., \$68,682 for 8 miles grading Canyon City-Burns Highway, Malheur National Forest, Oregon. Bids on:

(1) 50 acres clearing	(5) 65,000 sta.yd. overhaul	(9) 45 M ft. BM untreated timber
(2) 45 acres grubbing	(6) 8 mi. finish earth graded road	(10) 1,300 ft. 18-in. corr. pipe
(3) 116,000 cu.yd. road. excav.	(7) 1,500 cu.yd. shale surfacing	(11) 450 ft. 24-in. corr. pipe
(4) 6,600 cu.yd. borrow excav.	(8) 2,500 $\frac{1}{2}$ mi.yd. haul surf.	
	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)	TOTALS

C. R. Johnson, Portland.....	\$40 \$40 .42 .42 .03 \$300 .30 .20 50.00 2.00 3.00	\$68,682
J. A. Terteling & Sons.....	\$36 \$26 .46 .35 .03 \$60 .60 .15 60.00 2.25 3.50	71,735
Morrison-Knudsen Co.....	\$65 \$50 .45 .30 .04 \$250 .40 .15 60.00 2.00 3.00	74,870
Ryberg, McHugh & Cowley.....	\$63 \$50 .50 .25 .05 \$150 1.50 .10 65.00 2.08 3.20	81,811
C. E. Silbaugh, Burns, Ore.....	\$36 \$36 .52 .40 .03 \$150 1.00 .12 70.00 2.50 3.50	82,395
W. C. Elliott, Eugene, Ore.....	\$110 \$110 .58 .50 .05 \$100 1.50 .15 70.00 1.50 2.50	97,160
Union Const. Co., Portland.....	\$135 \$125 .51 .40 .03 \$150 1.00 .15 65.00 2.60 4.00	90,405
A. C. Greenwood, Portland.....	\$150 \$150 .55 .55 .03 \$300 .75 .10 70.00 2.50 4.00	99,085

(E) Award of contract recommended to O. D. Wolfe, Washougal, Wash., \$71,281 for 3.2 miles grading Pendleton-John Day Highway, in Umatilla National Forest, Oregon. Bids on from 6 lowest bidders:

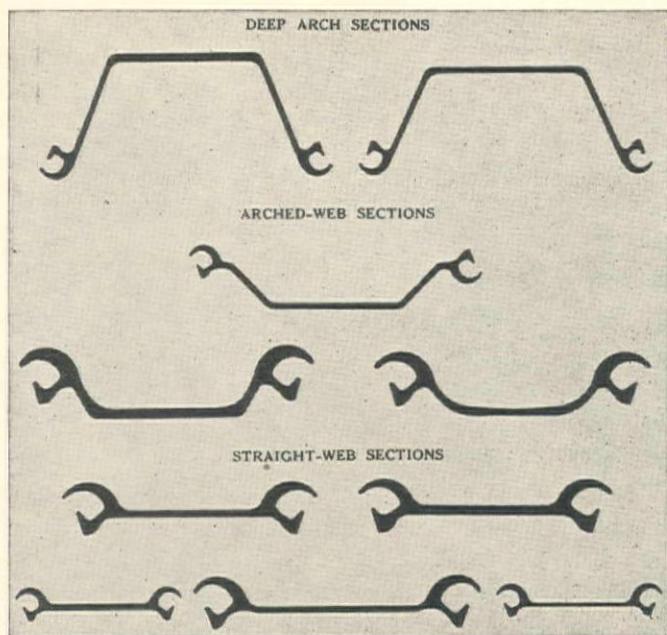
(1) 16 acres clearing	(4) 2,000 cu.yd. borrow excavation	(7) 15 cu.yd. Class 'B' concrete
(2) 13 acres grubbing	(5) 70,000 sta.yd. overhaul	(8) 500 lin.ft. 18-in. corr. pipe
(3) 82,000 cu.yd. roadway excavation	(6) 35 M ft. BM untreated timber	(9) 900 cu.yd. handlaid riprap
	(1) (2) (3) (4) (5) (6) (7) (8) (9)	TOTALS
O. D. Wolfe, Washougal, Wash.....	\$300 \$200 .64 .40 .02 70.00 40.00 2.25 2.75	\$71,281
F. C. Dilliard, Medford, Ore.....	\$150 \$150 .70 .50 .02 60.00 30.00 2.00 2.50	72,245
Clifton, Applegate & Toole.....	\$110 \$137 $\frac{1}{2}$.72 .40 .0225 50.00 30.00 2.05 2.75	72,811
A. C. Greenwood, Portland.....	\$350 \$300 .65 .50 .02 60.00 30.00 2.25 3.00	75,030
Newport Const. Co., Portland.....	\$175 \$175 .74 .35 .04 75.00 35.00 2.00 2.50	77,325
Bauers & Bauers, Dayton, Wash.....	\$125 \$75 .82 .82 .03 65.00 35.00 1.45 3.00	82,413

LOS ANGELES, CALIF.—CITY—CONCRETE AND WARRENITE—SUNSET BLVD.

W. F. Crawford, 6900 Washington Blvd., Culver City, who bid \$563,698 low bid to the City of Los Angeles for the improvement of Sunset Blvd. from Normandie Ave. to Hayvenhurst Drive. Bids from:

(1) W. F. Crawford, Culver City (low bidder).....	\$563,698	(5) Griffith Co., Los Angeles.....	\$600,445
(2) Geo. H. Oswald, Los Angeles.....	574,956	(6) Geo. R. Curtis Paving Co.....	639,150
(3) L. A. Paving Co., Los Angeles.....	582,768	(7) General Engr. Corp.....	646,900
(4) Southern California Roads Co.....	599,440		
Grading, lump sum bid.....	\$39,200	(1) (2) (3) (4) (5) (6) (7)	\$75,000
1,245,900 sq.ft. 6-in. concrete base and Warrenite Bit. surf.....	.198 .22 .20 .198 .20 .225 .20		
35,800 ft. heavy curb.....	.44 .44 .40 .45 .45 .45 .40		
27,000 ft. curb bar.....	.20 .24 .28 .22 .25 .20 .22		
49,145 sq.ft. sidewalk.....	.099 .11 .11 .12 .15 .12 .12		
202,685 sq.ft. 8-in. comb. gutter.....	.18 .18 .20 .20 .20 .238 .20		
Storm drains and culverts.....	\$66,000 \$60,000 \$58,000 \$64,500 \$65,000 \$66,000 \$48,000		
Sanitary sewers.....	\$77,000 \$60,000 \$65,800 \$76,200 \$70,000 \$77,000 \$82,000		
17,600 ft. house sewers.....	1.35 1.50 1.25 1.50 1.50 1.50 1.90		
Water system.....	\$4,868 \$4,650 \$4,800 \$5,000 \$4,750 \$4,900 \$5,350		
Lighting system complete.....	\$23,400 \$23,500 \$21,500 \$26,000 \$25,000 \$27,000 \$30,000		

LACKAWANNA

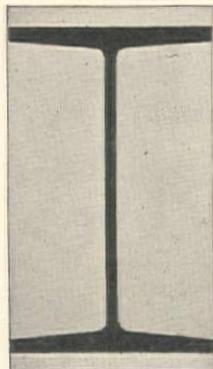


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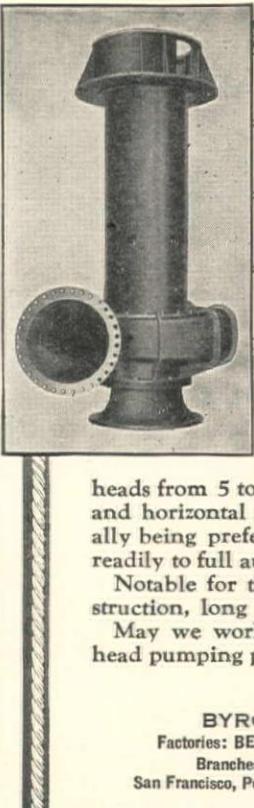
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HELENA, MONT.—STATE—GRADING

Contract awarded as follows by the Montana State Highway Commission:

(A) POWELL COUNTY—Contract awarded to Max J. Kuney Co., Spokane, Washington, who bid \$158,485 for 15 miles grading Bearmouth-Deer Lodge Highway, Section E. Bids from:

(1) Max J. Kuney, Spokane, Wash.	\$158,485	(4) J. C. O'Conner, Butte, Montana	\$171,710
(2) L. T. Lawler, Butte, Montana	162,041	(5) Sam Orino, Spokane, Wash.	176,684
(3) C. & F. Teaming & Trucking Co., Butte	190,756	(6) Engineer's estimate	201,806
194,072 cu.yd. spec. excavation and borrow	.35	.25	.24
77,439 cu.yd. rock excavation	.35	.70	.90
1,267 cu.yd. structure excavation	2.00	1.00	.90
6,480 cu.yd. earth cushion material	.35	.40	.60
8,221 cu.yd. sub-base material	.35	.50	1.00
131,510 sta.yd. overhaul	.05	.03	.04
1,200 lin.ft. 15-in. reinf. conc. culv.	2.00	2.00	2.75
1,604 lin.ft. 18-in. reinf. conc. culv.	3.00	2.75	3.00
2,196 lin.ft. 24-in. reinf. conc. culv.	4.00	3.60	3.00
209 lin.ft. 30-in. reinf. conc. culv.	7.00	5.00	5.70
386 lin.ft. 36-in. reinf. conc. culv.	9.00	6.75	7.30
72 lin.ft. 18-in. reinf. conc. siphon	3.50	3.25	3.70
264 lin.ft. 24-in. reinf. conc. siphon	4.50	4.25	5.00
318 cu.yd. 'A' concrete	30.00	22.50	25.00
21 cu.yd. 'D' concrete	30.00	30.00	25.00
43 ft. conc. curb and rail	5.00	2.50	2.50
25,226 lb. reinf. steel	.10	.07	.09
5,700 cu.yd. hand laid riprap	1.50	2.50	3.75
Lump sum for clearing and grubbing	\$5000	\$3450	\$2000
			\$1500
			\$1500
			\$1500

(B) LAKE COUNTY—Contract awarded to James Crick, Spokane, Wash., \$115,539 for 15 miles grading Pablo-Rollins Highway. Bids received on:

(1) 65,249 cu.yd. rock excav.	(5) 3,426 cu.yd. earth cushion	(9) 455 cu.yd. 'A' concrete
(2) 156,284 cu.yd. spec. excav.	(6) 2,060 ft. 15-in. corr. pipe	(10) 22,854 lb. reinf. steel
(3) 1,361 cu.yd. struct. exc.	(7) 1,710 ft. 18-in. corr. pipe	(11) 1,700 cu.yd. handlaid riprap
(4) 37,960 sta.yd. overhaul	(8) 160 ft. 36-in. corr. pipe	(12) Clearing and grubbing
	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)	TOTALS
James Crick, Spokane	.36 .36 1.00 .02 .32 2.00 2.50 6.00 30.00 .10 1.50	\$3000 \$115,539
Max J. Kuney	.35 .35 2.00 .05 .50 1.30 2.00 7.00 30.00 .10 2.50	3000 116,355
L. T. Lawler, Butte	.79 .27 1.00 .03 .40 1.35 1.55 5.00 23.00 .08 2.50	700 122,244
Lucker Bros., Dillon	.97 .23 1.09 .03 .30 1.00 1.16 3.52 25.20 .07 2.00	200 124,861
Thos. Staunton, Great Falls	.80 .25 1.00 .04 .32 1.37 1.50 3.83 26.00 .075 3.00	4000 125,004
Sam Orino, Spokane	1.00 .30 2.00 .04 .40 1.25 1.60 4.00 25.00 .08 2.00	3000 144,386
C. & F. Teaming Co.	1.25 .34 1.25 .05 1.00 2.10 2.30 5.00 28.50 .09 5.00	1750 175,598
Engineer's estimate	1.10 .30 1.00 .04 .40 1.35 1.55 4.10 27.00 .08 3.50	2194 152,410

SACRAMENTO, CALIF.—STATE—GRADING AND SURFACING—SHASTA AND LASSEN COUNTIES

Mathews Construction Co., Forum Bdg., Sacramento, \$278,251 low bid to California Division of Highways, Sacramento, for 17.9 miles grading and surfacing with untreated crushed gravel and stone in SHASTA AND LASSEN COUNTIES from Fall River Mills and Big Valley. Bids received from the following concerns for the construction of this project:

(1) Mathews Const. Co., Sacramento	\$278,250	(3) Isbell Const. Co., Fresno	\$339,938
(2) Jasper-Stacy Co., San Francisco	324,039	(4) Granfield, Farrar & Carlin, San Francisco	351,531
480 stations clearing and grubbing		(1) (2) (3) (4)	
211,800 cu.yd. roadway excavation (Location A)		25.00 66.00 33.00	57.00
12,800 cu.yd. roadway excavation (Location B)		.48 .55 .57	.48
649,200 sta.yd. overhaul		.43 .41 .57	.50
13,250 mi.yd. overhaul (Location B)		.0175 .01 .01	.015
2,500 cu.yd. structure excavation		.12 .22 .20	.30
50,400 cu.yd. untreated crushed gravel or stone surfacing		1.00 1.70 2.00	1.00
1,400 M gallons watering		2.35 2.60 3.00	3.40
375 cu.yd. 'A' concrete (structures)		2.00 2.20 3.00	2.50
33,000 lb. reinforcing steel (struct.)		27.00 30.00 35.00	28.00
44 ft. 12-in. corr. pipe		.06 .07 .06	.06
3,456 ft. 18-in. corr. pipe		.75 .50 .50	.80
800 ft. 24-in. corr. pipe		.80 .50 .50	.90
524 ft. 30-in. corr. pipe		1.25 .65 .75	1.00
110 ft. 36-in. corr. pipe		1.50 1.00 1.00	1.10
92 ft. 42-in. corr. pipe		2.00 1.40 1.25	1.25
947 stations finishing roadway		2.00 2.00 2.00	1.50
188 monuments		5.00 6.00 8.00	7.00
		3.00 2.50 3.50	6.00

SACRAMENTO, CALIF.—STATE—MARIN COUNTY—BITUMINOUS MACADAM

Contract awarded to Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, who bid \$94,892 to California Division of Highways for 4.4 miles bituminous macadam surfacing in MARIN COUNTY from San Rafael to Alto. Bids on:

(1) 4,000 cu.yd. roadway excavation	(4) 9,450 tons broken stone (bituminous macadam surfacing)	(6) 5,085 ft. laminated timber guard rail
(2) 100,000 sta.yd. overhaul		(7) 800 timber guide posts
(3) 28,900 tons crusher run base	(5) 650 tons emulsified asphalt	(8) 235 stations finishing roadway
	(1) (2) (3) (4) (5) (6) (7) (8)	TOTALS
Granfield, Farrar & Carlin	.35 .005 1.75 2.20 20.45 1.00 2.30 6.00	\$ 94,892
C. W. Wood, Stockton	.35 .01 1.85 2.35 19.50 1.00 2.00 5.00	98,607
M. J. Bevanda, Stockton	.50 .01 2.00 2.40 20.00 1.00 1.80 5.00	104,180
Heafey-Moore Co., Oakland	.60 .005 2.10 2.84 20.00 1.00 2.50 4.50	111,570
Ariss-Knapp Co., Oakland	.50 .02 2.16 2.50 25.00 .90 2.00 10.00	114,825
Fredrickson & Watson & Fredrickson Bros.	.48 .01 1.90 3.10 21.00 .95 2.50 5.00	108,780
A. Teichert & Son, Sacramento	.70 .015 2.10 3.12 20.00 1.00 3.50 7.50	117,121



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For efficient plant operation it is essential to have sufficient chlorine available, in quantities easily handled. To this end, Great Western

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Great Western was the pioneer electrolytic chlorine plant of the Pacific Coast, and during the fourteen years of its activity has gained valuable experience in the problems of sewage sterilization. We shall be glad to help you with your chlorine problems.

Great Western Electro-Chemical

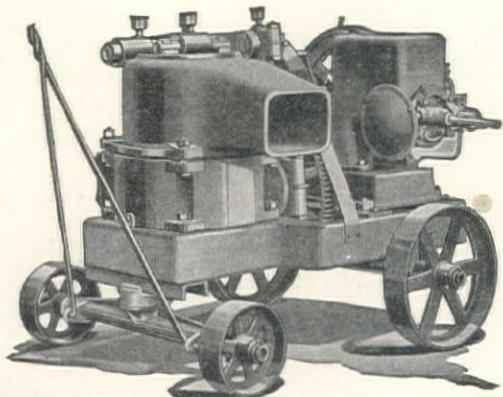
Plant at
Pittsburg, Calif.

COMPANY

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San Francisco

CH&E "Mud Hen"

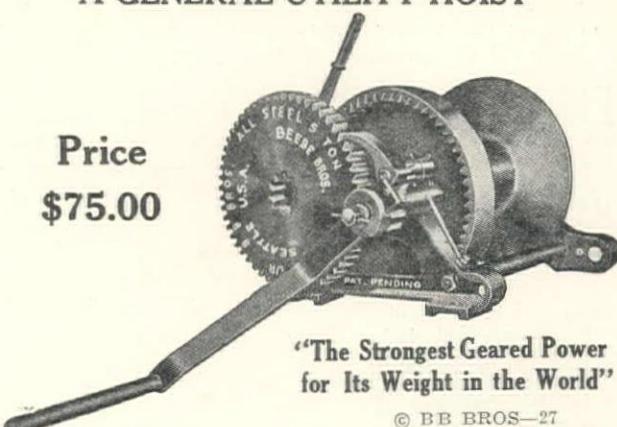
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A GENERAL UTILITY HOIST



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5-Ton Capacity
Weight:
Hoist 100 lbs.
Handle 10 lbs.
Dimensions:
16 in. x 17 in.
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Cable Capacity:
160 ft. of 5/8 in. Rope
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445 ft. of 3/8 in. Rope
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Positive Internal Brake

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SAN FRANCISCO, CALIF.—GOVT.—GRADING AND SURFACING—PLUMAS COUNTY

Award of contract recommended to Isbell Construction Co., Carson City, Nev., and P.O. Box 584, Fresno, who bid \$74,469 for grading and surfacing 9.9 miles Sections C and D of Route 23, Quincy-Beckwith National Forest Highway in Plumas National Forest, PLUMAS COUNTY, work for the Bureau of Public Roads. Bids received from:

(1) Isbell Const. Co., Carson City.....	\$74,469	(5) Hemstreet & Bell, Marysville.....	\$ 87,570
(2) Tiffany, McReynolds & Tiffany and McDonald & Failing, San Jose.....	76,451	(6) Chas. Harlowe, Jr.	91,249
(3) Finnell Co., Sacramento.....	85,521	(7) Tieslau Bros., Berkeley.....	93,219
(4) Geo. Pollock Co., Sacramento.....	85,806	(8) O. A. Lindberg	103,599
		(9) Engineer's estimate	98,737
		(1) (2) (3) (4) (5) (6) (7) (8) (9)	
41,203 cu.yd. excavation .....	.52	.47 .55 .36 .48 .54 .43 .35 .55	
605 cu.yd. struct. excav.	1.25	1.50 1.50 2.00 1.50 2.00 2.00 1.50 2.00	
61,883 sta.yd. overhaul .....	.02	.015 .03 .01 .04 .04 .02 .02 .05	
6.55 mi. fine grading	\$260	\$300 \$300 \$600 \$300 \$350 \$350 \$300 \$300	
21,255 cu.yd. crushed rock on gravel surface	1.49	1.60 1.85 2.15 2.00 2.10 2.40 3.00 2.25	
1,000 cu.yd. supplemental crushed rock or gravel.....	1.49	1.60 1.80 2.15 2.00 2.10 2.40 3.00 2.25	
Provide and maintain water plant.....	\$700	\$300 \$300 \$400 \$500 \$1000 \$250 \$500 \$500	
1,064 M gals. watering	1.75	3.00 2.00 1.80 2.50 2.00 2.25 2.00 2.00	
232 cu.yd. 'B' concrete	27.00	30.00 25.00 25.00 30.00 27.50 23.00 30.00 35.00	
26 cu.yd. 'C' concrete	27.00	25.00 25.00 24.00 30.00 27.50 25.00 30.00 33.00	
22,507 lb. reinf. steel .....	.06	.06 .06 .06 .06 .06 .07 .07 .07	
978 ft. 18-in. corr. pipe.....	1.50	2.17 2.05 2.90 2.00 1.50 2.50 2.50 2.25	
276 ft. 24-in. corr. pipe.....	2.85	2.84 2.75 4.80 3.00 2.40 3.50 3.00 2.75	
1,000 ft. tile underdrain .....	.90	1.00 1.00 1.10 1.25 1.00 1.65 1.00 1.00	
Maint. existing road	\$600	\$600 \$600 \$600 \$600 \$600 \$600 \$600 \$600	
128 monuments	2.50	3.00 3.00 4.00 3.50 3.50 3.50 3.50 3.50	
Hauling and piling logs	\$1200	\$300 \$2000 \$1000 \$500 \$500 \$1000 \$1000 \$1500	

LOS ANGELES, CALIF.—CITY—MAIN AND 90th STS.—CONCRETE

Geo. H. Oswald, 366 E. 58th St., Los Angeles, \$426,100 low bid to the Board of Public Works, City Hall, Los Angeles, for the improvement of streets in Main St. and 90th St. Improvement District. Bids received from the 8 lowest bidders as follows on main items of construction:

(1) Geo. H. Oswald, Los Angeles.....	\$436,100	(5) Tryon & Brain	\$471,720	
(2) Griffith Co., Los Angeles.....	441,280	(6) P. P. Janich, Los Angeles.....	479,140	
(3) C. L. Peck Co., Los Angeles.....	467,060	(7) J. Sutalo, Los Angeles.....	486,860	
(4) J. L. McClain, Los Angeles.....	470,000	(8) L. B. Konjevod, Los Angeles.....	488,669	
		(1) (2) (3) (4) (5) (6) (7) (8)		
Grading, lump sum bid.....	\$25,000	\$29,200	\$19,100 \$26,500 \$26,000 \$15,600 \$30,600 \$18,000	
376,800 sq.ft. 8-in. concrete paving.....	.165	.165 .16875 .175 .178 .175 .173 .1825		
966,900 sq.ft. 6-in. concrete paving.....	.1215	.125 .13625 .139 .133 .15 .14 .155		
1,389,130 sq.ft. Type AA resurfacing.....	.0125	.014 .013 .013 .013 .0125 .015 .014		
10,447 lin.ft. light concrete curb.....	.32	.32 .40 .36 .38 .40 .33 .40		
11,000 lin.ft. heavy concrete curb.....	.40	.40 .45 .45 .47 .50 .40 .46		
89,600 sq.ft. cement sidewalk .....	.10	.12 .105 .10 .108 .135 .11 .115	
Storm drain system	\$44,000	\$45,000	\$55,000 \$50,000 \$48,200 \$48,000 \$54,000 \$48,000	
Sanitary sewers	\$100,000	\$86,000	\$103,000 \$94,000 \$108,000 \$100,000 \$98,000 \$100,000	
65,566 lin.ft. house sewers .....	.635	.75 .68 .77 .68 .80 .80 .80	

PHOENIX, ARIZ.—GOVT.—GRADING—APACHE NATIONAL FOREST

O. F. Fisher, Security Bdg., Phoenix, Ariz., \$39,162 low for 6.1 miles grading Section H of Route 19, Clifton-Springerville National Forest Highway in Apache National Forest, APACHE COUNTY, Arizona, work for the Bureau of Public Roads. Bids from:

(1) O. F. Fisher, Phoenix, Ariz.....	\$39,162	(3) R. S. Black, Clifton, Ariz.....	\$47,727
(2) Skousen Bros., Santa Fe, N. M.....	43,315	(4) Engineer's estimate	52,598
		(1) (2) (3) (4)	
37,200 cu.yd. roadway excavation.....		.65 .70 .84 .95	
275 cu.yd. structure excavation.....		1.00 1.25 1.25 1.50	
7,027 cu.yd. excavation, borrow.....		.30 .45 .35 .40	
700 sta.yd. overhaul .....		.03 .10 .06 .05	
6,181 miles finishing		\$150 50.00 \$100 \$200	
14 M ft. BM untreated timber.....		75.00 90.00 80.00 80.00	
32 cu.yd. cement rubble masonry.....		9.00 15.00 15.00 18.00	
1,180 ft. 18-in. corr. pipe.....		2.60 2.00 2.15 2.00	
596 ft. 24-in. corr. pipe.....		3.40 3.00 3.20 2.75	
130 ft. 30-in. corr. pipe.....		3.95 4.00 3.80 4.35	
140 ft. 36-in. corr. pipe.....		5.00 6.00 5.95 4.75	
520 ft. untreated timber piling.....		1.25 2.25 2.40 1.40	
75 cu.yd. hand-laid riprap.....		2.00 2.50 4.00 8.00	
29,370 ft. protection ditch.....		.03 .06 .05 .06	
5 cattle guards		\$400 \$475 \$450 \$500	
108 monuments		3.00 6.00 3.50 3.50	

SALINAS, CALIF.—COUNTY—GRADING AND SURFACING—SALINAS-WATSONVILLE ROAD

Contract awarded to Granite Construction Co., Watsonville, who bid \$257,552 for grading and paving of the Salinas-Watsonville Road from Salinas to Old Toll Road near Watsonville Junction, about 14 miles, for County. Bids from:

(1) Granite Const. Co.....	\$257,552	(2) Peninsula Paving Co.....	\$258,822	(3) W. A. Dantaville.....	\$283,869
		(1) (2) (3)		(1) (2) (3)	
136,680 cu.yd. excav.....	.41	.31 .35	10,387 tons 1/2-in. rock screenings.....	2.78	3.10 2.90
209,000 sta.yd. overhaul .....	.015	.015 .01	72 ft. 12-in. corr. culv.....	.25	.30 .50
500 cu.yd. excavation for pipe.....	1.00	1.25 1.50	1,976 ft. 15-in. corr. culv.....	.31	.50 .60
21,670 cu.yd. rock from present road replace in base for new road.....	.65	.90 .95	74 ft. 18-in. corr. culv.....	.35	.50 .75
47,296 tons base rock in finished road.....	1.68	1.85 2.10	20 ft. 24-in. corr. culv.....	.50	.60 1.00
19,258 tons 2-in. rock in finished road.....	2.48	2.55 2.65	7,150 bbl. cold measure 90-95% road oil.....	3.78	3.25 4.30

County will furnish corr. culverts. H. F. Cozzens is County Surveyor.

RIC-WIL CONDUIT

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After trench is graded, lay Ric-wil Base Drain end to end like dominoes—the center bead serves as an alignment guide. Wedge Pipe Support saddles between every sixth section.



Set on bottom conduit sections—every sixth section has a pipe support hole. Install and test the pipes—exceptionally easy, as the pipes are in the open.



Pack Dry-pac Filler around pipes, put top conduit section in place, cement bells and Loc-lip Side Joint. Job is ready to backfill.

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- 21—1½ yard, 24" gauge, all steel, Koppel Dump Cars
- 28—2 yard, 24" gauge, wood body, Western Dump Cars
- 8—3 yard, 36" gauge, all steel, center Dump Batch Cars
- 15—4 yard, 36" gauge, wood body, Koppel Dump Cars

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United Commercial Company, Inc.

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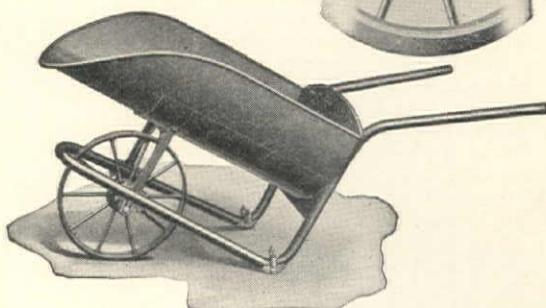
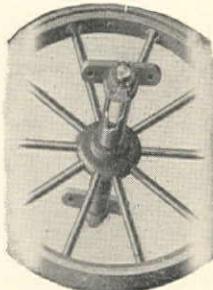
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SACRAMENTO, CALIF.—STATE—GRADING—BUTTE COUNTY

Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, who bid \$248,528, low bid to California Division of Highways for 1.8 miles grading in BUTTE COUNTY from Bardees Creek to Pulga. Bids from:

(1) Granfield, Farrar & Carlin	\$248,528	(5) R. H. Travers, Los Angeles	\$372,446				
(2) Utah Construction Co., S. F.	293,280	(6) H. H. Boomer, San Francisco	396,802				
(3) J. F. Shea Co., San Francisco	344,087	(7) J. J. Donovan & Sons, L. A.	401,622				
(4) E. C. Coats, Miranda	359,367	(1) (2) (3) (4) (5) (6) (7)					
97 stations clearing and grubbing	35.00	15.00	40.00	20.00	25.00	30.00	50.00
245,600 cu.yd. roadway excavation	.69	.895	1.05	1.15	1.10	1.24	1.20
934,000 sta.yd. overhaul	.02	.015	.02	.01	.025	.02	.02
6,200 cu.yd. structure excavat.	1.75	2.00	3.00	2.00	2.50	3.00	2.40
255 cu.yd. 'A' conc. (structures)	23.00	25.00	26.00	25.00	30.00	25.00	30.00
31,000 lb. reinf. steel (struct.)	.05	.05	.05	.055	.055	.07	.08
16 ft. 12-in. corr. pipe	.50	.50	1.00	.75	.70	1.00	.75
644 ft. 18-in. corr. pipe	.60	.60	1.25	1.00	.85	1.00	1.00
360 ft. 24-in. corr. pipe	.70	.70	1.50	1.10	1.10	1.00	1.25
720 ft. 42-in. corr. pipe	1.00	1.20	3.00	2.00	1.75	3.00	2.00
3,210 cu.yd. rubble masonry (retaining walls)	11.25	11.00	10.00	13.00	15.00	12.00	17.00
97 stations finishing roadway	10.00	6.00	10.00	5.00	10.00	15.00	10.00
92 monuments	3.00	3.00	3.00	5.00	3.50	4.00	3.00

SACRAMENTO, CALIF.—STATE—NEVADA AND PLACER COUNTIES—SURFACING

Bids received on the following items by the California Division of Highways for 10.8 miles surfacing with crusher run base and untreated gravel or stone surfacing in NEVADA AND PLACER COUNTIES from south fork of Yuba River to Soda Springs, low bid submitted by Hemstreet & Bell, 124 High St., Marysville, \$157,089:

(1) 52,200 tons crusher run base	(2) 29,020 tons unt. gravel or stone surf.	(3) 3,416 M gal. water applied to base and surf.
(1) (2) (3) TOTALS	(1) (2) (3) TOTALS	
Hemstreet & Bell	1.85 1.85 2.00 \$157,089	J. P. Holland, Inc. 2.61 2.61 2.50 \$220,524
C. Harlowe, Jr.	1.94 1.94 2.00 164,398	Geo. Pollock Co. 2.70 2.82 1.40 227,558
Englehart Pav. & Const. Co.,		Hein Bros. Basalt Rock Co.,
Eureka	2.30 2.70 2.00 205,246	Petaluma 2.855 2.855 2.00 238,715
A. Teichert & Son	2.44 2.58 2.75 211,633	Isbell Const. Co. 2.90 2.90 3.00 245,786

DENVER, COLORADO—GOVT.—WYOMING

Award of contract recommended to S. L. Smith, Gering, Nebraska, who bid \$55,100 for grading 4.16 miles Hoback Canyon in Teton National Forest, TETON COUNTY, Wyoming, bids received by Bureau of Public Roads, Denver, Colorado. Bids on:

(1) 27 acres clearing and grubbing	(5) 4.16 miles finishing	(9) 628 lin.ft. 18-in. corr. pipe
(2) 81,000 cu.yd. roadway excavation	(6) 135 cu.yd. Class 'B' concrete	(10) 596 lin.ft. 24-in. corr. pipe
(3) 300 cu.yd. structure excavation	(7) 32 cu.yd. Class 'C' concrete	(11) 32 lin.ft. 36-in. corr. pipe
(4) 30,300 sta.yd. overhaul	(8) 11,100 lb. reinf. steel	
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) TOTALS		
S. L. Smith, Gering, Nebr.	\$100 .495 4.00 .03 \$100 27.00 27.00 .07 2.75 3.50 5.50	\$55,100
Western Bridge & Const. Co., Omaha, Nebr.	\$200 .53 2.50 .03 \$250 32.00 32.00 .10 2.50 3.50 7.50	61,884
Threet Bros., Lovell, Wyo.	\$75 .60 5.00 .03 \$200 30.00 30.00 .10 2.10 3.10 5.80	63,843
Morrison-Knudsen Co., Boise, Idaho	\$75 .63 3.00 .03 \$500 38.00 30.00 .12 2.50 3.50 6.00	68,719
Engineer's estimate	\$50 .55 3.00 .03 \$200 34.00 30.00 .08 2.50 3.50 5.00	59,300

SEWER CONSTRUCTION

REDWOOD CITY, CALIF.—VITR., CONCRETE AND CAST IRON SEWERS, PUMPING PLANT, ETC.—COUNTY

Contract awarded to Purdin, Sandberg, Ek & Lind, Franz Bdg., Portland, Oregon, who bid \$208,848 for the construction of sewer system in North Fairoaks Sanitary District, work for the Board of County Supervisors of San Mateo County, Court House, Redwood City. Bids received from:

(1) Purdin, Sandberg, Ek & Lind, Portland, Ore.	\$208,848	(4) Union Paving Co., S. F.	\$228,112		
(2) Heafey-Moore Co., Oakland	221,289	(5) M. J. Bevanda, Stockton	263,730		
(3) R. A. Wattson, Los Angeles	223,788	(1) (2) (3) (4) (5)			
113,000 lin.ft. 6-in. vitrified pipe	.53	.53	.58	.632	.59
14,500 lin.ft. 8-in. vitrified pipe	.71	.70	.72	.704	.82
9,900 lin.ft. 10-in. vitrified pipe	.85	.83	.92	.825	1.10
1,900 lin.ft. 12-in. vitrified pipe	1.00	1.00	1.16	.99	1.25
6,200 lin.ft. 15-in. concrete pipe	1.30	1.45	1.48	1.32	1.38
12,500 lin.ft. 18-in. concrete pipe	1.75	1.90	1.98	1.782	2.20
7,400 lin.ft. 30-in. concrete pipe	5.59	5.90	6.14	6.96	8.69
108 lin.ft. 6-in. cast-iron pipe	1.72	4.85	1.58	3.30	2.76
204 lin.ft. 8-in. cast-iron pipe	2.30	5.25	1.80	4.40	3.90
36 lin.ft. 16-in. cast-iron pipe	4.90	7.20	4.90	6.92	4.14
48 lin.ft. 18-in. cast-iron pipe	6.59	7.80	5.70	10.01	7.90
4,100 6 by 4-in. Ys	.52	.50	.45	.44	.69
170 8 by 4-in. Ys	.72	.70	.55	.616	.82
140 10 by 4-in. Ys	1.00	.95	.85	.858	1.38
Per 12 by 4-in. Y	1.29	1.25	1.10	1.10	1.40
130 15 by 4-in. Ys	1.30	.90	.90	.825	1.10
180 18 by 4-in. Ys	1.68	1.25	1.20	1.10	1.38
10 30 by 4-in. Ys	2.60	1.85	1.70	1.65	2.00
545 manholes	56.00	60.00	57.60	55.00	69.00
1 steel reinf. special manhole	325.00	640.00	465.00	555.00	276.00
1 sump and pump pit	\$3,900	\$4,500	\$3,843	\$5,060	\$5,796
1 pump house	\$650	\$1,200	\$656	\$330	\$483
Pumping plant equipment, including pumps, motors, etc.	\$5,486	\$5,200	\$4,680	\$4,422	\$6,276
One redwood settling tank	\$7,996	\$11,400	\$8,386	\$5,860	\$10,833
Pipe, valves, etc.	\$1,950	\$2,200	\$1,904	\$1,468	\$2,152
Gravel sludge bed	\$975	\$890	\$1,081	\$1,100	\$1,380

Work is to be done under the 1911 and 1915 Acts. Geo. A. Kneese is the County Surveyor.

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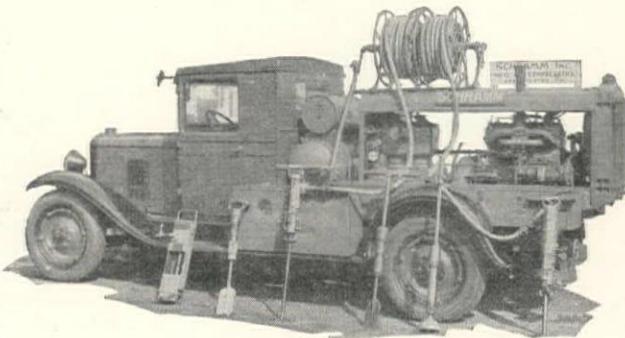
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SEWER AND WATER IMPROVEMENTS

SANTA ANA, CALIF.—CONCRETE SEWERS AND CAST-IRON WATER MAINS—CITY

Drainage Construction Co., Lynwood, who bid \$61,432 for the improvement of portions of Main St., Cypress Ave., etc., for City of Santa Ana, Orange County, by installation of concrete sewers and cast-iron water mains. Bids received on:

(1) 3,671 lin.ft. 10-in. concrete sewer	(5) 9 concrete flushtanks	(9) 5,636 lin.ft. 8-in. c.i. water pipe
(2) 960 lin.ft. 8-in. concrete sewer	(6) 12 concrete lampholes	(10) 4,150 lin.ft. 6-in. c.i. water pipe
(3) 19,426 lin.ft. 6-in. concrete sewer	(7) 2,833 lin.ft. 4-in. c.i. force main	(11) 21,409 lin.ft. 4-in. c.i. water pipe
(4) 58 concrete manholes	(8) Pumping plant, complete	(12) 25 fire hydrants
	(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)	TOTALS
Drainage Const. Co. ....	.95 .80 .70 60.00 \$120 10.00 .70	\$3,500 1.45 1.10 .80 \$140
F. W. & W. Seccombe	2.00 1.50 .73 60.00 105 7.00 .60	3,580 1.40 1.00 .70 75
L. R. Weber	1.89 1.15 .65 90.00 145 24.00 .88	3,400 1.34 1.01 .75 145
S. M. Milovich	1.67 1.59 .97 60.00 96 25.00 .76	2,765 1.32 1.08 .77 120
C. Anili Co.	1.03 .87 .81 82.50 145 24.00 .73	2,932 1.50 1.32 .98 103
Gogo & Rados	1.35 1.00 .85 65.00 95 25.00 .75	6,100 1.65 1.25 .91 100
E. W. Lana	1.35 1.14 1.03 60.00 110 20.00 .94	4,250 1.63 1.25 .94 100
Edw. D. Dahl	1.45 1.10 1.00 80.00 140 20.00 .80	5,000 1.55 1.15 .90 125
Butterfield Const. Co.	2.00 1.10 1.05 70.00 120 15.00 .90	3,500 1.30 1.10 1.00 130
M. Sego	2.00 1.50 1.25 75.00 125 25.00 1.00	10,000 2.00 2.50 1.00 25
		95,470

BRIDGES AND CULVERTS

LOS ANGELES, CALIF.—CITY—SIXTH ST. UNDERCROSSING

Robt. E. McKee, Central Bdg., Los Angeles, who bid \$181,883, low bid to Board of Public Works, City Hall, Los Angeles, for the construction of Sixth St. undercrossing at the Santa Fe Railroad tracks at Santa Fe Ave. and Sixth St. Bids from:

(1) Robt. E. McKee, Los Angeles.	\$181,883	(5) Clinton Const. Co., Los Angeles.	\$206,383					
(2) Oberg Bros., Los Angeles.	186,540	(6) E. J. Gass, Los Angeles.	208,750					
(3) J. Scarlett, Los Angeles.	198,740	(7) Fisher, Ross, MacDonald & Kahn.	232,530					
(4) Bent Bros., Inc., Los Angeles.	199,023	(8) A. O. Nelson, Los Angeles.	242,282					
	(1) (2) (3) (4) (5) (6) (7) (8)							
Reinforcing steel.	\$28,500	\$27,000	\$32,000	\$29,779	\$23,000	\$31,000	\$37,000	\$31,000
6,925 cu.yd. 'F' concrete.	14.75	16.00	16.90	12.10	19.00	18.40	22.00	21.30
50 cu.yd. 'D' concrete.	10.00	10.00	8.00	8.00	10.00	7.00	7.00	15.00
Reinf. conc. piles.	\$20,500	\$24,000	\$27,000	\$24,000	\$23,000	\$24,000	\$22,000	\$28,000
Grading, lump sum.	5,000	500	1,950	36,000	500	500	1,200	2,000
Sanitary sewer and drains.	10,500	11,000	12,838	13,500	12,900	12,000	9,500	20,000
Paving complete.	8,500	6,000	6,000	6,576	5,700	7,000	6,000	7,000
Ornamental hand rails.	3,000	3,000	2,500	3,000	2,200	2,500	2,500	5,000
Lighting system.	2,000	2,500	2,500	3,115	2,300	2,800	2,500	3,000

SACRAMENTO, CALIF.—STATE—NEVADA COUNTY—STEEL AND CONCRETE

Bodenhamer Construction Co., 4886 Mansfield Ave., San Diego, who bid \$55,851 low bid to California Division of Highways for overhead crossing over tracks of Southern Pacific Railroad near Yuba Pass, NEVADA COUNTY, consisting of one 112-ft. deck plate girder span, one 66-ft. deck plate girder span, one 54-ft. deck plate girder span, all on concrete piers, and 279 ft. timber trestle approach on framed bents and rubble masonry abutments. Bids received from:

(1) Bodenhamer Const. Co., San Diego.	\$55,751	(4) M. B. McGowan, San Francisco.	\$60,593		
(2) Ward Engineering Co., San Francisco.	59,308	(5) T. E. Connelly, San Francisco.	65,564		
(3) Lindgren & Swinerton, Sacramento.	59,458				
1,175 cu.yd. structure excavation.		(1) (2) (3) (4) (5)			
475 cu.yd. 'B' concrete.	22.25	2.40	4.00	5.00	1.50
375 cu.yd. 'A' concrete (structures).	22.00	21.00	21.75	18.00	26.00
127 cu.yd. 'A' concrete (paving).	23.50	21.00	23.50	23.00	32.00
57,000 lb. reinforcing steel.	14.00	21.00	14.75	14.00	16.00
270,000 lb. structural steel. ....	.0475	.048	.0495	.055	.07
6,000 lb. cast steel. ....	.065	.07	.0655	.07	.0725
60 M ft. BM redwood timber (dense select all heart struct.). ....	.17	.19	.18	.15	.20
45 M ft. BM redwood timber (select all heart structural).	87.00	110.00	99.00	104.00	95.00
120 cu.yd. rubble masonry.	86.00	95.00	95.00	102.00	93.00
Miscellaneous work.	12.50	11.00	12.00	10.00	16.00
	\$200	\$1000	\$500	\$800	\$850

IRRIGATION AND RECLAMATION

PLACERVILLE, CALIF.—EARTH FILL DAM, TUNNEL, AND SPILLWAY

R. W. Littlefield and American Engineering Co., 337 17th St., Oakland, \$293,900 low bid to El Dorado Irrigation Dist., Placerville, El Dorado County, for constructing Webber Creek Dam, to be 1000 ft. wide at bottom, 800 ft. long at top, and 160 ft. high, hydraulic fill type. Bids received from the following concerns:

(1) R. W. Littlefield and American Engr. Co.	\$293,900	(4) Geo. Pollock Co., Sacramento.	\$395,015		
(2) Utah Construction Co., S. F.	354,316	(5) Engineer's estimate (including 30% for contingencies)	354,750		
(3) Merritt-Chapman & Scott, San Pedro.	394,590				
Clearing and stripping dam-site.	\$3,000	(1) (2) (3) (4) (5)			
2,750 cu.yd. puddled trench excavat.	1.50	3.00	1.40	2.00	2.00
804,100 cu.yd. embankment in place. ....	.25	.31	.40	.40	.25
850 lin.ft. tunnel excavation (6 ft. diam.).	20.00	30.00	20.00	16.00	20.00
250 cu.yd. portal excavation.	5.00	1.50	2.00	2.50	2.00
140 lin.ft. shaft excavation.	27.50	38.00	20.00	15.00	20.00
750 cu.yd. concrete (tunnel and shaft lining).	35.00	26.00	28.00	30.00	20.00
350 cu.yd. concrete (wasteway).	35.00	20.00	28.00	22.00	20.00
20,000 lb. reinforcing steel. ....	.07	.06	.06	.05	.06
15,000 cu.yd. wasteway excavation.	1.25	1.20	.50	.90	1.25
50,000 lb. transporting, installing, and placing valves, operating mech., etc. ....	.10	.04	.05	.08	.02
150 cu.yd. concrete (cutoff walls).	25.00	18.00	16.00	20.00	20.00

Bids have been taken under advisement.

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W. M. GARLAND BUILDING
LOS ANGELES

UNIT BID SUMMARY

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

LARGE WESTERN PROJECTS

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

WORK CONTEMPLATED

Wells, pumps, transmission lines, pipe lines and reservoirs for Camelback Water Conservation Dist., Phoenix, Ariz., \$425,000. Pumps, wells and concrete lined canals for Randolph Irrigation District, Ariz., \$400,000. Dam, pipe lines, etc., for Southern California Water Supply Co., San Francisco. Dam, pipe lines, ditches, etc., for Martin Judge, Jr., San Francisco, in Lake County, \$400,000. Dam, canals, pipe lines, tunnels, etc., for Mojave River Irrigation District, Victorville, Calif. Pipe line, reservoir, pumps, etc., for City of Anacortes, Wash., \$500,000.

BIDS BEING RECEIVED

Concrete and asphalt paving Cahuenga Blvd. for City of Los Angeles, \$900,000, bids to July 2. Concrete paving 5 miles in San Mateo County for California Division of Highways, bids to July 2. Grading and surfacing 28 miles in San Bernardino County for California Division of Highways, bids to July 2. Grading 6 miles of Ortega Highway for Joint Highway Dist. 15, Santa Ana, Calif., \$325,000, bids to July 9. Power plant equipment for City of Eugene, Ore., \$400,000, bids to July 1. Sewers in Jefferson St. Storm Drain Dist., Sect. 3, for City of Los Angeles, \$300,000, bids to July 9.

BIDS RECEIVED

Hotel at Eureka, Calif., for Pickwick Stage system, J. L. McLaughlin, San Francisco, \$500,000 low. Aptos Jr. High School for City of San Francisco, Macdonald & Kahn, San Francisco, \$531,500 low.

CONTRACTS AWARDED

Piers for flanking spans of Lake Union Bridge, Seattle, for Washington State Highway Comm., to L. Coluccio & Co., Seattle, \$335,808. Earth-fill Webber Dam for El Dorado Irrigation District, Placerville, Calif., to R. W. Littlefield & American Engr. Co., Oakland, \$293,000. Railroad 125 miles for Santa Fe RR. Co., from Amarillo, Tex., to Boise City, Okla., to Sharp & Fellows, Los Angeles. Concrete paving Main and 9th St. for City of Los Angeles to Geo. H. Oswald, Los Angeles, \$426,100. Concrete & Warrenite Paving Sunset Blvd. for City of Los Angeles to W. F. Crawford, Culver City, \$563,698. Levees, piling, etc., on Santa Clara River Protection Project, to Thos. Haverty Co., Los Angeles, \$312,500.

STREET and ROAD WORK

WORK CONTEMPLATED

SAN LEANDRO, CALIF.—Plans by City Engr. for 1 mile of sidewalks on Washington Ave. Bids after July 2. 6-19 SAN MATEO, CALIF.—Plans by City for improving 23rd Ave., 24th Ave., Flores St., etc., involving 134,600 sq.ft. 5-in. asphalt paving with 3-in. rock cushion, 14,000 sq.ft. 6-in. asphalt paving on 3-in. rock cushion, concrete pipe, 12 electrolytes, etc. Bids after July 7. 6-19

BIDS BEING RECEIVED

JUNEAU, ALASKA—Bids to 9 a.m., July 16, by Bureau of Public Roads for 3 miles Tongass Highway, Wards Cove-Mud Bay Section, involving 13,600 cu.yd. excavation, 7700 cu.yd. rock excavation, 5300 cu.yd. crushed rock base, 2000 cu.yd. crushed rock surface, etc. 6-12

EUREKA, CALIF.—Bids to July 15, by County Clerk, Court House, Eureka, for surfacing with emulsified asphalt about 25 miles of County Road. 6-12

LOS ANGELES, CALIF.—Bids to 10 a.m., July 2, by Board of Public Works, City Hall, Los Angeles, for the improvement of Cahuenga Boulevard from Highland to Melrose Ave., and portions of other streets, involving 16,510 sq.ft. 4-in., 601,500 sq.ft. 8-in., 200,900 sq.ft. 7-in., and 419,000 sq.ft. 8-in. concrete paving, 15,000 sq.ft. 4-in., 24,000 sq.ft. 6-in., and 108,900 sq.ft. 7-in. asphalt paving, 34,000 lin.ft. curb bar, 44,000 lin.ft. concrete curb, 328,000 sq.ft. cement sidewalk, 7700 sq.ft. conc. gutter, storm drain system, sanitary sewer system, 18,900 ft. vitr. house sewers, 3000 ft. cement house sewers, retaining walls and

reinf. conc. structures, ornamental lighting system, water system complete, \$900,000. 6-7

LOS ANGELES, CALIF.—Bids to 2 p.m., June 30, by County for improving 1 mile of Anaheim-Telegraph Road, involving 13,900 cu.yd. excavation, 190 sq.ft. 10-in. to 7-in. concrete paving, cement sewers, lighting system, etc., \$147,000. 6-19

LOS ANGELES, CALIF.—Bids to 10 a.m., July 2, by Board of Public Works, City Hall, Los Angeles, for the improvement of portions of Western Ave. from Santa Barbara Ave. to 24th St., work involving 12,550 cu.yd. grading, 4460 tons asphalt concrete base, 5250 tons asphalt conc. surface, 44,239 sq.ft. 6-in. and 100,500 sq.ft. 8-in. concrete paving, 12,700 ft. curb bar, 15,000 ft. heavy conc. curb, 98,800 sq.ft. cement sidewalk, storm drain, sanitary sewer, vitrified sewers, lighting system conduit, etc. \$145,000. 6-13

MARTINEZ, CALIF.—Bids to 11 a.m., July 21, by County Clerk for: (1) Grading 1.44 miles of Buchanan Road, involving: 17,200 cu.yd. excavation, \$5000. (2) Grading 2.7 miles of Road D-14 located 2 miles west of Pittsburg involving: 16,950 cu.yd. excavation, \$5200. (3) Emulsified asphalt paving of Lone Tree, Fairview and Brentwood Roads, to cost \$25,678. 6-16

NAPA, CALIF.—Bids to 10 a.m., July 1, by County for 12.64 miles bit. macadam surfacing 12 miles of County Roads. 6-12

PASADENA, CALIF.—Bids to 10 a.m., July 1, by City for improving Walnut St., involving 4300 cu.yd. grading, 118,200 sq.ft. 7-in. concrete paving, 30,000 sq.ft. 5-in. and 11,000 sq.ft. 4-in. asphalt paving, 5000 lin.ft. concrete curb, 28,500 sq.ft. cement sidewalk, lighting system, sewer system, etc. 6-13

SACRAMENTO, CALIF.—Bids to 2 p.m., July 2, by California Division of Highways for: (1) SAN MATEO COUNTY—5.2 miles from South San Francisco to Burlingame, involving 85,000 cu.yd. imported borrow, 32,050 cu.yd. concrete paving, 1025 tons asphalt, 14,500 tons crusher run base, 867,000 lb. reinf. steel, fuel oiling, riprap, timber work, etc.; (2) SAN BERNARDINO COUNTY—28.7 miles from east of Amboy to Essex, involving 375,100 cu.yd. roadway excavation, 285,000 cu.yd. ditch and channel excavation, 18,000 cu.yd. pit run gravel sub-base, 11,000 cu.yd. structure excavation, 81,100 tons oil treated gravel or stone surface, 39,900 ft. douglas fir piles, 380 M ft. b.m. douglas fir, 880 M ft. b.m. redwood, etc.; (3) HUMBOLDT COUNTY—0.6 mile from $\frac{1}{2}$ mile south of Eureka to Eureka, involving 1200 cu.yd. concrete paving, etc.; and (4) SHASTA COUNTY—From La Moine to north boundary and from Montgomery Creek to Haynes Ranch, involving 4500 cu.yd. screenings, 432 tons asphalt road oil, and 213 bbl. fuel oil. 6-4

SACRAMENTO, CALIF.—Bids to 2 p.m., July 16, by California Division of Highways for: (1) MODOC COUNTY—1.4 miles near Alturas, involving 41,500 cu.yd. roadway excavation, 2850 cu.yd. gravel or stone surfacing; (2) KERN COUNTY—13.9 miles from east of Cottonwood Creek to Democrat Springs, involving 21,000 cu.yd. roadway excavation, 25,000 cu.yd. imported borrow, 35,000 tons oil treated gravel or stone surfacing; and (3) SAN JOAQUIN COUNTY—1.4 miles from Forest Lake to north boundary, involving 15,500 cu.yd. roadway excavation, 430 tons asphalt paving, etc. 6-18

SACRAMENTO, CALIF.—Bids to 2 p.m., July 9, by California Division of Highways for: DEL NORTE COUNTY—12.7 miles surfacing from south boundary to Wilson Creek, involving 7130 cu.yd. gravel or stone (base and shoulders), 18,600 cu.yd. gravel or stone (surfacing—road mix), 1000 tons cut-back asphalt road oil, and 12.7 mi. mix oil and gravel or stone; SACRAMENTO COUNTY—2.6 miles from south of Arno to Cosumnes River, involving 15,000 cu.yd. roadway excavation, 26,400 cu.yd. imported borrow, 5950 cu.yd. concrete paving, 152,100 lb. reinf. steel, etc.; YOLO COUNTY—5.8 miles from Bretona to Dunnigan, involving 10,000 cu.yd. roadw. excavation, 33,400 cu.yd. imported borrow, 21,800 tons asphalt concrete, concrete structures, etc.; RIVERSIDE COUNTY—6.2 miles widening from county line to west of Beaumont, involving 33,000 cu.yd. roadway excavation, concrete structures, etc.; and LOS ANGELES COUNTY—12.6 miles north of Castaic School, involving 25,600 tons broken stone and 1120 tons Emulsified asphalt. 6-11

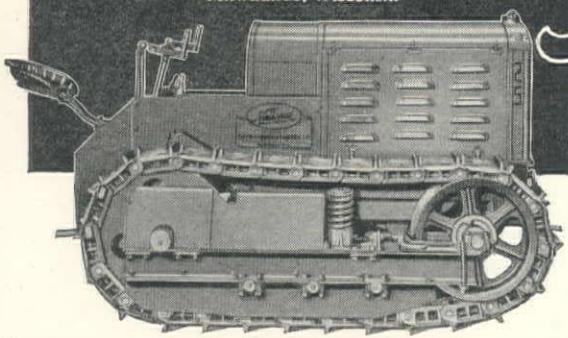
SALINAS, CALIF.—Bids to 2 p.m., July 7, by County for: (1) Improving San Miguel Canyon Road, involving 1450 tons rock and 178 bbl. road oil; and (2) Portion of Mud Flat Road, involving 2700 tons rock and 140 tons road oil. 6-10

SAN FRANCISCO, CALIF.—Bids to 2 p.m., June 26, by Bureau of Public Roads for 2.3 miles Sect. C, Glenbrook National Highway, Tahoe National Forest, DOUGLAS COUNTY, Nevada, involving 62,361 cu.yd. roadway excavation, concrete structures, corr. pipe, etc. 6-6

SAN FRANCISCO, CALIF.—Bids to 2 p.m., June 26, by Bureau of Public Roads for 2.3 miles Sect. B, Lake Tahoe National Forest, WASHOE COUNTY, Nevada, involving 57,000 cu.yd. roadway excavation, etc. 6-7

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 10, by U. S. Bureau of Public Roads, 461 Market St., S. F., for 4.9 miles Sect. A, Route 28, Houserock Canyon National Forest Highway, Kaibab National Forest, COCONINO COUNTY, Arizona, involving 16 $\frac{1}{2}$ acres clearing, 198,077 cu.yd. roadway excavation, 10,231 cu.yd. borrow excavation, 1550 cu.yd. cement rubble masonry, etc. 6-11

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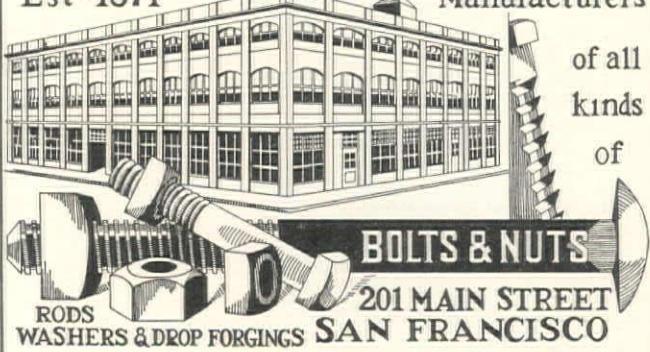
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SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 8, by Bureau of Public Roads, 461 Market St., S. F., for 5 miles surfacing Placerville-Lake Tahoe National Forest Highway, Eldorado National Forest, ELDORADO COUNTY, involving 21 acres clearing, 61,195 cu.yd. roadway excavation, 14,000 cu.yd. crushed rock surfacing, etc. 6-11

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 1, by Bureau of Public Roads, Sheldon Bdg., S. F., for grading 2.58 miles and surfacing 14.8 miles Topaz National Forest Highway, MONO COUNTY, Calif., and DOUGLAS COUNTY, Nev., involving 24,400 cu.yd. roadway excavation, 27,700 cu.yd. crushed rock and 8700 cu.yd. crushed gravel surfacing, 125 cu.yd. concrete. 6-10

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 17, by Bureau of Public Roads, 461 Market St., S. F., for 3.4 miles grading, Deer Creek National Highway, Lassen National Forest, TEHAMA COUNTY, involving 25 acres clearing, 127,500 cu.yd. roadway excavation, etc. 6-18

SAN LUIS OBISPO, CALIF.—Bids to 7:30 p.m., June 30, by City Clerk for improving Garden, Pacific & Pismo Sts., paving with 6-in. concrete. 6-19

SAN MATEO, CALIF.—Bids to 8 p.m., July 7, by City Clerk for improving Glendale Road, St. Mathews Ave., etc., involving 5000 cu.yd. grading, 59,100 sq.ft. 5-7-in. and 5150 sq.ft. 6-in. concrete paving, 13,100 sq.ft. 4½-in. concrete base, 1½-in. asphalt surface, 10,800 sq.ft. 6-in. concrete base with 2-in. asphalt surface, 31,520 sq.ft. 4-in. asphalt base with 2-in. asphalt surface, vitr. and concrete sewers, etc. 6-17

SANTA ANA, CALIF.—Bids to July 9 by Joint Highway Dist. 15. Santa Ana, for grading of 6.3 miles of the Ortega Highway connecting Elsinore and San Juan Capistrano. Work involves 325,000 cu.yd. excavation. \$225,000. A. C. Fulmor, Court House, Riverside, is Engr. 6-7

SANTA ANA, CALIF.—Bids to 10 a.m., July 9, by Joint Highway District No. 15, Court House, Santa Ana, Orange County, for improvement of 6.2 miles of the Ortega Highway from San Juan Hot Springs, Orange County, to Morrill Canyon, Riverside County. Work involves 320 stations clearing and grubbing, 320,000 cu.yd. roadway excavation, 2500 cu.yd. structure excavation, 5000 cu.yd. excavation for channel changes, 950,000 sta.yd. overhaul, 1325 cu.yd. cement rubble masonry, one 70-ft. steel truss bridge, corr. pipe, etc. 6-9

SANTA ROSA, CALIF.—Bids to 12 m., June 27, by County for 10½ miles asphaltic oil surfacing on Healdsburg-Napa Highway. 6-13

YUBA CITY, CALIF.—Bids to 2 p.m., July 1, by Joint Highway District No. 12, Second and C Sts., Yuba City, Sutter County, for the paving of 9.9 miles on portions of road from Robbins to Yuba City. Work involves the following approximate quantities: 36,000 cu.yd. excavation and subgrade, 17,000 tons crusher run base, 21,500 cu.yd. paving. Alternative bids as follows on paving: Class 'A' concrete paving, asphalt concrete base and asphalt surface, asphalt conc. base and Warrenite surface, asphalt conc. base and Willite surface. 6-6

PORTLAND, ORE.—Bids to 10 a.m., June 27, by Bureau of Public Roads for 3.8 miles grading Tonasket-San Poil Road, Colville National Forest, OKANOGAN AND FERRY COUNTIES, Washington, involving 140,900 cu.yd. roadway excavation, concrete structures, etc. 6-14

OLYMPIA, WASH.—Bids to 10 a.m., July 1, by Washington Dept. of Highways for: WHITMAN COUNTY—Paving with concrete 1.6 miles of State Road No. 3 from North Pine to the Whitman County Line; WHITMAN COUNTY—Stockpiling of top course surfacing material for a portion of the Inland Empire Highway, Eastern Route, from Rosalia to Pullman, involving 18,000 cu.yd. crushed stone surfacing, 1000 cu.yd. roadway excavation; and PIERCE COUNTY—2.1 miles concrete paving from Puyallup to Sumner. 6-7

BIDS RECEIVED

PHOENIX, ARIZ.—O. F. Fisher, Security Bdg., Phoenix, Ariz., \$39,162 low for 6 miles grading Sect. H, Route 19, Clifton-Springerville National Forest Highway, Apache National Forest, APACHE COUNTY, for Bureau of Public Roads. 6-9

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) SANTA CRUZ COUNTY—O. A. Lindberg, 448 North American St., Stockton, \$127,229 low for 2.6 miles grading and bit. treated waterbound macadam surfacing from Waterman Switchback to Saratoga Gap; (2) SAN JOAQUIN COUNTY—Larsen Bros., Box 274, Galt, \$42,828 low for 1.8 miles grading and gravel or stone surfacing from French Camp to Stockton; and (3) SAN JOAQUIN COUNTY—3.3 miles grading and concrete and crusher run base widening from Houston School to Forest Lake—C. W. Wood, PO. Box 1435, Stockton, \$38,390 low. 6-18

SAN FRANCISCO, CALIF.—E. J. Treacy, Call Bdg., San Francisco, who bid \$5608, low bid to City for improving Louisburg St. from Mt. Vernon Ave. to Ridge Lane, work consisting of grading, concrete curbs, 8-in. vitrified sewers and 6-in. Class "E" concrete paving. 6-19

PORTLAND, ORE.—Low bids as follows by Bureau of Public Roads: (1) LANE COUNTY—A. Milne, 1853 Broadway, Portland, Ore., \$74,920 low for 13.1 miles Willamette Highway surfacing, Project No. 21-A1, B, Cascade National Forest, Oregon; (2) UMATILLA COUNTY—O. D. Wolfe, Washougal, Wash., \$71,281 low for 3.2 miles grading Pendleton-John Day Highway, Umatilla National Forest, Oregon; (3) GRANT COUNTY—C. R. Johnson, 309 14th St. North, Portland, Ore., \$68,682 low for 8 miles grading Canyon City-Burns project, Malheur National Forest, Oregon; (4) LINCOLN COUNTY—Hefty & Johnson, Portland, Ore., \$146,541 low for 13 miles surfacing Roosevelt Coast Highway, Siuslaw National Forest, Oregon; (5) GRANT AND UMATILLA COUNTIES—Bauers & Bauers, Dayton, Wash., \$76,250 low for 5.2 miles grading Pendleton-John Day Highway, Umatilla National Forest, Oregon; (6) JEFFERSON COUNTY, Wash., in Deschutes National Forest—E. C. Peck, Hoquiam, Wash., \$43,465 low; (6) UMATILLA COUNTY, Oregon—Interstate Const. Co., Portland, Ore., \$28,894 low for 5 miles surfacing Weston-Elgin Highway. (See Unit Bid Summary.) 6-9

OGDEN, UTAH—Low bids as follows by U. S. Bureau of Public Roads: (1) Utah Const. Co., Ogden, Utah, \$49,727 low for 10 miles grading Ketchum-Clayton Sect. of Sawtooth National Forest, BLAINE AND CUSTER COUNTIES, Idaho; (2) Olof Nelson, Logan, Utah, \$18,092 low for surfacing 5 miles of Teton Highway, Targhee National Forest, TETON COUNTY, Idaho; and (3) Utah Const. Co., Ogden, Utah, \$38,971 low for 2.6 miles grading Salina-Emery Road, Fish Lake National Forest, Utah. (See Unit Bid Summary.)

OLYMPIA, WASH.—C. J. Erickson, ft. of Wheeler St., Seattle, Wash., \$109,836 (road mix) low bid to Washington State Highway Commission for 53.1 miles rock surfacing and bituminous treating of State Road 2 on SUNSET HIGHWAY from North Bend to Cle Elum. 6-13

CONTRACTS AWARDED

HOLLISTER, CALIF.—To W. A. Dontanville, Salinas, \$7390 for grading Paicines and New Idria Road for County. 6-14

LOS ANGELES, CALIF.—Awards as follows by City: (1) To Geo. H. Oswald, 366 E. 58th St., Los Angeles, \$426,100 for the improvement of street in Main St. and 90th St. Improvement Dist. Work consists of grading, concrete paving, resurfacing, concrete curb, cement sidewalks, storm drain system, and sanitary sewers. (2) To W. F. Crawford, 6900 Washington Blvd., Culver City, \$563,698 for the improvement of Sunset Blvd. from Normandie Ave. to Hayvenhurst Drive. Work consists of grading, 6-in. conc. base and 2-in. Warrenite Bit. surf., storm drains and culverts, sanitary sewers, water system, and lighting system complete. (See Unit Bid Summary.) 6-16

LOS ANGELES, CALIF.—To Geo. H. Oswald, 366 E. 58th St., L. A., \$94,954 for improving 116th St. from Central Ave. to Alameda St. for County, grading, concrete paving, corr. pipe, vitrified sewers. 6-19

MANHATTAN BEACH, CALIF.—To E. T. Brown Co., Petroleum Securities Bdg., L. A., \$26,965 for improvement of portions of E. Raffroad St., grading, 4-in. macadam paving. 6-9

OAKLAND, CALIF.—To Hutchinson Co., 1450 Harrison St., Oakland, \$3588 for improving 77th Ave. and Hegenberger Road crossing, paving with 3½-in. asphalt base with 2½-in. asphalt surface for City. 6-11

RICHMOND, CALIF.—To S. C. Rogers, 22 4th St., Richmond, \$1533 for improving Pennsylvania Ave., asphalt paving for City. 6-17

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) NEVADA AND PLACER COUNTIES—To Hemstreet & Bell, 124 High St., Marysville, who bid \$157,089 for 10.8 miles surfacing with crusher run base and untreated gravel or stone surfacing from south fork of Yuba River to Soda Springs. (2) LOS ANGELES COUNTY—To Griffith Co., Los Angeles Railway Bdg., Los Angeles, \$36,319 for 1 mile grading and asphalt paving from Citrus Ave. to Glendora. (See Unit Bid Summary.) 6-16

SACRAMENTO, CALIF.—To D. McDonald, P.O. Box 170, Sacramento, who bid \$1121 for oiling Gerber Road, Elk Grove-Florin Road, Kennedy Road, Excelsior School Road, etc., work for Sacramento County. 6-17

SACRAMENTO, CALIF.—To Hanrahan Co., Standard Oil Bdg., San Francisco, who bid \$204,904 for the grading and paving with asphalt and concrete of 4.9 miles in SANTA CLARA COUNTY from San Antonio Ave. to Sunnyvale, work for the California Division of Highways. (See Unit Bid Summary.) 6-17

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) To Mathews Construction Co., Forum Bdg., Sacramento, who bid \$278,251 for 17.9 miles grading and surfacing with untreated crushed gravel or stone in SHASTA AND LASSEN COUNTIES from Fall River Mills to Big Valley; and (2) To Granfield, Farrar & Carlin, 65 Hoff Ave., S. F., \$248,528 for 1.8 miles grading in BUTTE COUNTY from Bardees Creek to Pulga. (See Unit Bid Summary.) 6-10

SACRAMENTO, CALIF.—To Granite Construction Co., Watsonville, who bid \$257,552 for the grading and paving of the Salinas-Watsonville Road from Salinas to Old Toll Road near Watsonville Junction, about 14 miles, for County. (See Unit Bid Summary.) 6-6

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) LASSEN AND MODOC COUNTIES—To D. McDonald, P.O. Box 170, Sacramento, who bid \$21,509 for 57 miles oiling from Hillside to Alturas; and (2) SHASTA AND TRINITY COUNTIES—Contract awarded to Basalt Rock Co., Napa, \$19,126 for 58 miles oiling as follows: 5.2 miles from Tower House to Greenhorn, 12.3 miles from Ashers to Montgomery Creek, 24.1 miles from Haynes Ranch to Fall River, and 17.1 miles from Grass Valley Creek to Weaverville. 6-3

SACRAMENTO, CALIF.—To Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, who bid \$94,892 for 4.4 miles bituminous macadam surfacing in Marin County from San Rafael to Alto, work for the California Division of Highways. (See Unit Bid Summary.) 6-7

SAN BERNARDINO, CALIF.—To G. M. Duntley, 722 S. San Pedro St., Los Angeles, who bid \$1685 for 1.5 miles fuel oiling on shoulders from Holtville to Sand Hills, IMPERIAL COUNTY, work for the California Division of Highways. 6-10

SAN FRANCISCO, CALIF.—Awards as follows by California Division of Highways: MENDOCINO COUNTY—Contract awarded to A. Teichert & Sons, 1846 37th St., Sacramento, who bid \$6975 for 12.5 miles oiling from Cloverdale to Hopland; and SONOMA COUNTY—Contract awarded to A. Teichert & Sons, 1846 37th St., Sacramento, who bid \$2280 for 4 miles oiling from Belane to Shellville. 6-9

SAN FRANCISCO, CALIF.—Award of contract recommended to Isbell Construction Co., Carson City, Nev., and Fresno, \$74,469 for 9.9 miles grading and surfacing Sections C and D, Route 23, Quincy-Beckwith National Forest Highway, Plumas National Forest, PLUMAS COUNTY, work for Bureau of Public Roads. (See Unit Bid Summary.) 6-10

SAN FRANCISCO, CALIF.—Contract officially awarded to Mathews Const. Co., Forum Bdg., Sacramento, \$83,941 for 7.7 miles grading Sect. E, Route 1, Loop Route, Lassen Volcanic National Park, for U. S. Bureau of Public Roads. (See Unit Bid Summary, May 25th issue.) 6-11

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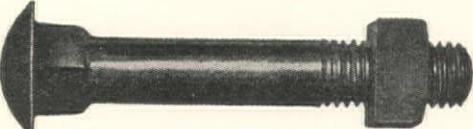
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SAN FRANCISCO, CALIF.—Award recommended to Tiffany, McReynolds & Tiffany, Box 475, Oroville, and McDonald & Failing, Box 495, Tres Pinos, \$39,745 for surfacing Sect. B, Strawberry-Phillips Sect., Placerville-Lake Tahoe National Forest, Eldorado National Forest, EL DORADO COUNTY, for Bureau of Public Roads. 6-17

SAN FRANCISCO, CALIF.—Award recommended to Tieslau Bros., 1315 Allston Way, Berkeley, \$34,140 for 6 miles surfacing Sect. A, Route 71, and Sect. D, Route 1, Lassen Volcanic National Forest, TEHAMA COUNTY, for Bureau of Public Roads. 6-12

SAN FRANCISCO, CALIF.—To Eaton & Smith, 715 Ocean Ave., San Francisco, who bid \$1560 to Board of State Harbor Commissioners for laying Topeka surface on platform of Pier 46. 6-4

SAN JOSE, CALIF.—Awards as follows by County: To A. J. Raisch, Burrell Bdg., San Jose, \$5199 for Trimble Road; \$3998 for Yerba Buena Road and \$2799 for Story Road, oil macadam paving. 6-17

SAN LUIS OBISPO, CALIF.—To Granite Const. Co., Watsonville, \$5744 for 5.9 miles seal coat to be applied to macadam surfacing in SAN LUIS OBISPO COUNTY from Estrella River to Sacramento Ranch, for California Division of Highways. 6-9

SAN RAFAEL, CALIF.—To P. S. Harless, P.O. Box 594, San Rafael, who bid \$4030 for improving 6th St. from Cottage Ave. to E St. for City, asphalt paving with stone base. 6-11

SAN RAFAEL, CALIF.—To Highway Builders, Ltd., 640 Redhill Ave., San Anselmo, who bid \$4600 for surfacing with emulsified asphalt and screenings two sections of Lower Novato-Black Point Road at Railroad Ave. and at Black Point Cutoff, work for County. 6-10

WILLOW GLEN, CALIF.—To San Jose Paving Co., San Carlos and Dupont Sts., San Jose, \$13,190 for improving Bird Ave., grading, 4-in. Durite asphalt paving, curbs, gutters, corr. iron culverts. 1911-15 Acts. 6-10

BOISE, IDA.—Awards as follows by State: (1) To Olof Nelson, Logan, Utah, \$55,150 for 1.9 miles concrete paving Old Oregon Trail from Pocatello to Inkom, BANNOCK COUNTY; (2) To Triangle Const. Co., Spokane, Wash., \$15,540 for 8 miles gravel surfacing from Starkey to Tamarack, ADAMS COUNTY; (3) To Roy Green, Grangeville, Idaho, \$30,800 for 18 miles resurfacing from Cottonwood to Grangeville, IDAHO COUNTY; (4) To Triangle Const. Co., Spokane, Wash., \$57,530 for 12 miles resurfacing North and South Highway in BONNER COUNTY; (5) To C. H. Ludberg, Spokane, Wash., \$86,759 for 3 miles concrete paving from Pine Creek to Kellogg, SHOSHONE COUNTY.

HELENA, MONT.—Awards as follows by State Highway Comm.: (1) S. C. & B. Const. Co., Billings, Mont., \$56,320 for 9 miles grading STILLWATER COUNTY—Columbus Reed Point Road; (2) J. Chick, Spokane, Wash., \$115,540 for 16 miles grading LAKE COUNTY—Pable Rolling Road; (3) M. Kuney, Spokane, Wash., \$158,490 for 15 miles grading POWELL COUNTY—Barmouth Deer Lodge Road and (4) J. L. McLaughlin, Livingston, Mont., \$20,175 for 22 miles oiling Livingston-Bozeman Road and Livingston-Gardner Road. (See Unit Bid Summary.)

CARSON CITY, NEV.—To Nevada Rock & Sand Co., Reno, Nev., \$134,533 for 31 miles grading and surfacing in ELKO COUNTY from Elko to Deeth, for Nevada State Highway Comm. (See Unit Bid Summary.) 6-14

CARSON CITY, NEV.—Awards as follows by State: (1) to A. D. Drumm, Jr., Fallon, Nevada, who bid \$43,855 (only bid submitted) for furnishing asphaltic oil, applying and mixing same on 22.24 miles of highway in PERSHING COUNTY from Woolsey to 2 miles south of Humboldt House. (2) To A. D. Drumm, Jr., Fallon Nevada, \$4771 for furnishing of asphaltic oil, heating and applying same on highway in DOUGLAS COUNTY from Minden to 3.44 miles north. 6-19

SANTA FE, N. M.—Awards as follows by State: (1) SAN JUAN COUNTY—To E. J. Maloney, Gallup, N. M., \$235,847 for 15 miles grading and bridges from Shiprock to Colorado State Line; (2) To Armstrong & Armstrong, Roswell, N. M., \$84,381 for 9 miles grading and bridges in OTERO COUNTY from Alamogordo to Newman; and (3) OTERO COUNTY—To Veater & Davis, El Paso, Tex., \$41,072 for 21 miles hauling and crushed gravel surfacing from Orogrand to Alamogordo.

PORTLAND, ORE.—To I. L. Young, Henry Bdg., Portland, Ore., \$181,422 for concrete paving of portions of the Canyon Road for County.

NEWPORT, WASH.—To Cook, Colburn & Atkinson, Walla Walla, Wash., \$24,068 for County highway project.

OLYMPIA, WASH.—To Standard Asphalt Paving Co., Spokane, Wash., \$38,226 for 28.3 miles bituminous treating of road from Pullman to Colfax and from North Pine to Thornton, work for the Washington State Highway Commission. 6-13

OLYMPIA, WASH.—To F. G. Redmon, Yakima, Wash., \$97,365 for 13.8 miles surfacing of the Inland Empire Highway from Colton to Pullman, work for the Washington State Highway Comm., Olympia, Wash., and located in WHITMAN COUNTY. 6-7

SACRAMENTO, CALIF.—Bids to 2 p.m., June 30, by County for: (1) Wooden bridge on Marquardt St. and Walker St. over Coyote Creek; and (2) Wooden bridge over Walnut Creek on Big Dalton Ave. 6-13

NAPA, CALIF.—Bids to 10 a.m., July 1, by County for: (1) Drainage structures in Berryessa Valley, involving 275 cu.yd. concrete, 22,000 lb. reinf. steel and corr. culverts; and (2) Bridge over Napa River near Barro Station, involving 101 cu.yd. concrete, 9800 lb. reinf. steel, and one 100-ft. steel span. 6-12

SACRAMENTO, CALIF.—Bids to 2 p.m., July 16, by California Division of Highways for reinf. concrete bridge over south fork of American River at Riverton, ELDORADO COUNTY, involving 600 cu.yd. concrete, 80,000 lb. reinf. steel, etc. 6-18

SACRAMENTO, CALIF.—Bids to 2 p.m., July 9, by California Division of Highways, Sacramento, for concrete and steel bridge over Trinity River near Douglas City, TRINITY COUNTY, involving 2600 cu.yd. concrete, 201,000 lb. reinf. steel, and 335,000 lb. structural steel. 6-11

SACRAMENTO, CALIF.—Bids to 2 p.m., July 2, by California Division of Highways for: (1) COLUSA COUNTY—Concrete bridge over Bear Creek, 28 miles west of Williams, involving 520 cu.yd. concrete, 86,000 lb. reinf. steel; (2) SISKIYOU COUNTY—Bridge over Shasta River, 7½ miles north of Yreka, involving 2750 cu.yd. concrete, 365,000 lb. reinf. steel; and (3) SISKIYOU COUNTY—Bridge over Klamath River, 10 miles north of Yreka, involving 1890 cu.yd. concrete and 268,000 lb. reinf. steel. 6-4

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 15, by Bureau of Public Roads, 461 Market St., S. F., for Lodgepole, Clover Creek and Stillman Bridges, Sequoia National Park, TULARE COUNTY, involving 10,700 cu.yd. roadway excavation, 1030 cu.yd. structure excavation, 770 cu.yd. concrete, 58,850 lb. reinf. steel, 1532 cu.yd. cement rubble masonry, etc. 6-19

SAN JOSE, CALIF.—Bids to 11 a.m., July 7, by County for wooden truss Pratt Bridge on Hellyer Ave. over Coyote Creek. 6-19

SAN LUIS OBISPO, CALIF.—Bids to 7:30 p.m., June 30, by City Clerk for reinf. concrete bridge and retaining wall on Ida St. 6-13

SANTA ROSA, CALIF.—Bids to 12 m., June 27, by County for (1) Culvert on Washington Ave., involving 50 cu.yd. concrete and 5700 lb. reinf. steel; (2) Culvert on Skaggs Springs Road, involving 20 cu.yd. concrete and 2300 lb. reinf. steel; and (3) 2 culverts on Adobe to Eureka School Road, involving 124 cu.yd. concrete, 13,700 lb. reinf. steel, and 5700 cu.yd. roadway fill. 6-13

UKIAH, CALIF.—Bids to 2 p.m., July 15, by County for one 100-ft. steel span bridge over Calpella Creek. Bids on either (1) Furnishing steel only; and (2) Furnishing steel and constructing bridge. 6-12

VENTURA, CALIF.—Bids to 7:30 p.m., June 30, by City Clerk for reinf. conc. retaining wall at Crimea St. and Buena Vista St. 6-19

OREGON CITY, ORE.—Bids to 10 a.m., July 1, by County Clerk, Court House, Oregon City, Ore., for bridge over Molalla River near Canby, work involving 300 cu.yd. excavation, 1600 lin.ft. cedar piling, 165 cu.yd. Class 'B' and 145 cu.yd. Class 'D' concrete, 32,000 lb. reinf. steel, 15,000 ft. lumber, 137,000 lb. structural steel, 210 ft. trestle superstructure. 6-13

PORTLAND, ORE.—Bids to 10 a.m., June 26, by Oregon State Highway Comm., Multnomah County Court House, Portland, Ore., for bridge over Drift Creek on Silverton-Willard Market Road, near Silverton, MARION COUNTY, work involving 60 cu.yd. excavation, 145 cu.yd. concrete, 34,000 lb. reinf. steel. 6-13

BIDS RECEIVED

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) TEHAMA AND SHASTA COUNTIES—C. W. Wood, P.O. Box 1435, Stockton, \$135,058 low for undergraduate crossing and 0.9 miles grading of roadway and concrete paving at Cottonwood Creek; and (2) PLACER COUNTY—Lord & Bishop, Native Sons Bdg., Sacramento, \$57,816 low for reinf. concrete undergraduate crossing near Emigrant Gap. 6-18

SACRAMENTO, CALIF.—Bodenhamer Const. Co., 4886 Mansfield Ave., San Diego, \$55,851 low for overhead crossing over S. P. near Yuba Pass, NEVADA COUNTY, steel and concrete, for California Division of Highways. (See Unit Bid Summary.) 6-11

CONTRACTS AWARDED

EUREKA, CALIF.—To E. McKee, Eureka, \$4746 for reinf. concrete culvert over Cooks Gulch near Petrolia, for County. 6-17

EUREKA, CALIF.—To Engelhart Paving & Construction Co., Eureka, Calif., who bid \$40,687 for steel truss bridge over Trinity River on road to Hoopa, for County. 6-17

REDDING, CALIF.—To Rolla Arbuckle, Anderson, Calif., who bid \$3486 for 60-ft. concrete and timber bridge over the Middle Fork of Cottonwood Creek in Shasta County. 6-17

SACRAMENTO, CALIF.—To R. B. McKenzie, Red Bluff, \$12,544 for timber bridge over Salt Creek, SHASTA COUNTY, work for California Division of Highways. 6-10

SACRAMENTO, CALIF.—To H. E. Doering, Yreka, Calif., who bid \$256,563 to the California Division of Highways for a steel and concrete bridge over the Salinas River at Bradley, MONTEREY COUNTY. 6-13

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) AMADOR AND ELDORADO COUNTIES—To C. Emil Force, 70 Bellevue Ave., Piedmont, who bid \$21,795 for timber bridge over Cosumnes River, 10 miles south of Eldorado. (2) NEVADA COUNTY—To Alturas Const. Co., 2213 Third Ave., Sacramento, \$13,935 for reinf. conc. bridge over south fork of Yuba River near Indian Springs. 6-16

SACRAMENTO, CALIF.—To T. S. Downar, E. Robla St., North Sacramento, who bid \$1990 for constructing 2 reinf. concrete culverts on Del Paso Boulevard, work for Sacramento County. 6-17

BRIDGES and CULVERTS

WORK CONTEMPLATED

OAKLAND, CALIF.—Plans by City Engr., protests June 26, for constructing reinf. conc. culverts between Penniman Ave. and Suter St. 1911 Act. 6-7

SAN CARLOS, CALIF.—Bonds voted, \$14,000, by City for 4 culverts along Pulgas Creek and concrete bridge over Cordilleras Creek. 6-5

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Robt. E. McKee, Central Bdg., L. A., \$181,883 low for reinf. concrete 6th St. undercrossing at Santa Fe RR. tracks for City. (See Unit Bid Summary.) 6-13

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SAN JOSE, CALIF.—Awards as follows by County for reinf. concrete bridges: (1) To Thermotite Const. Co., 580 Stockton Ave., San Jose, \$9931 for 40-ft. bridge over Penetencia Creek; and (2) To Geo. G. Wood, 1805 Arthur St., Fresno, \$16,200 for 80-ft. bridge on Bloomfield Ave. over Carnadero Creek. 6-16

VALLEJO, CALIF.—To Pacific Constr. Co., 2235 E. 7th St., Oakland, who bid \$15,475 for construction of a steel and concrete bridge at Sacramento St., to be 93 ft. long and 40 ft. wide, for City of Vallejo. 6-4

BOISE, IDA.—To J. J. Badraun, Portland, Ore., \$53,748 for steel and timber bridge over Boise River at Eagle, ADA COUNTY, for State. 6-4

OREGON CITY, NEV.—To Lindstrom & Feigenson, Railway Exchange Bdg., Portland, \$38,708 for constructing reinf. concrete bridge over Clackamas River at Carver for County. 6-7

OLYMPIA, WASH.—To Chas. G. Huber, Seattle, who bid \$68,214 for constructing bridge over the Queets River at Harlow crossing in JEFFERSON COUNTY, consisting of two 260-ft. steel through spans on concrete piers and 124 ft. of timber approaches, 17-ft. roadway with timber deck throughout, work for the Washington State Highway Commission. 6-7

OLYMPIA, WASH.—To L. Coluccio & Co., 1638 Lane St., Seattle, Washington, who bid \$335,808 to Washington State Highway Commission for the construction of approaches and piers for the flanking spans of the Lake Union Bridge in City of Seattle, KING COUNTY. Work involves 16,300 cu.yd. excavation, 18,100 lin.ft. reinf. conc. piles, 1350 ft. 6-in. drain and sewer pipe, 11,140 cu.yd. concrete, 1,733,000 lb. reinforcing steel, 130,000 lb. structural steel. 6-13

SEWER CONSTRUCTION

WORK CONTEMPLATED

RICHMOND, CALIF.—Plans by City Engr., protests to be heard June 23, for the construction of centrifugally cast reinforced concrete and vitrified storm sewers on Dock Ave., Hall Ave., 14th and 10th Sts., etc. \$120,000. Work under 1911 Act. 6-5

STOCKTON, CALIF.—Plans by City Engr., protests June 23, for 1534 ft. 6-in. vitr. sewer on E. Main St. 6-9

BIDS BEING RECEIVED

GUSTINE, CALIF.—Bids to 8 p.m., July 7, by City for sewer improvements involving 6200 ft. 24-in. vitrified pipe and 14 manholes, \$20,000. 6-17

LONG BEACH, CALIF.—Bids to 2 p.m., July 1, by City for sewers in Pump Dist. 2, involving 5000 ft. 12-in. to 21-in. cement pipe, 17,000 ft. 16-in. to 45-in. reinf. concrete pipe, 1207 ft. 4 ft. 3-in. and 891 ft. 5 ft. 6-in. semi-elliptic section, 82 ft. 2 ft. 6-in. box section, pumping station, etc. 6-17

LOS ANGELES, CALIF.—Bids to 10 a.m., July 9, by Board of Public Works for Jefferson St. Storm Drain Section 3, involving cement and reinf. concrete pipe, \$300,000. 6-19

MARTINEZ, CALIF.—Bids to 11 a.m., July 7, by County for sewers on Monterey St., Carl Ave., etc., involving 2950 ft. 30-in. and 5500 ft. 36-in. vitrified pipe, 325 ft. 36-in. and 1875 ft. 48-in. reinf. concrete pipe, 14,000 ft. Douglas Fir piles, etc. Ross L. Calfee, 322 Arlington Ave., Berkeley, is Engr. 6-16

BIDS RECEIVED

LOS ANGELES, CALIF.—Low bids as follows by County Sanitation Dist. 8: (1) Carpenter Bros., 457 N. Canon Drive, Beverly Hills, \$13,995 low for sewage pumping station; and (2) Southwest Engineering Corp., L. A., \$1450 low for pumping plant. 6-13

UKIAH, CALIF.—Oakland Construction Co., 755-60th St., Oakland, \$3393 low for sewer system for City. 6-9

CONTRACTS AWARDED

FULLERTON, CALIF.—To S. M. Milovich, Cochrum Bdg., Montebello, who bid \$13,890 for furnishing and installing cast-iron water mains and vitrified pipe sewers in Municipal Improvement District No. 140, work for the City. 6-6

REDWOOD CITY, CALIF.—To Purdin, Sandberg, Ek & Lind, Franz Bdg., Portland, Ore., \$208,848 for vitr. concrete and cast iron sewers, pumping plant, settling tank, sludge bed, pipe, valves, etc., in North Fair Oaks Sanitary District for County. (See Unit Bid Summary.) 6-16

SANTA CRUZ, CALIF.—To Merritt, Chapman & Scott, P.O. Box 698, San Pedro, \$14,750 to City for repair and anchorage of existing outfall sewer in the Pacific Ocean. 6-11

SEATTLE, WASH.—To F. Arcorace, Seattle, \$35,998 for sewers on 28th Ave. Northwest for City. 6-11

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

ANACORTES, WASH.—Plans by Engineers, W. C. Morse Co., L. C. Smith Bdg., Seattle, Wash., and bids will be called for at once by the City of Anacortes, Wash., for the construction of water system improvements as follows: 12 miles of 20-in. main from the Skagit River to an equalizing reservoir; construction of equalizing reservoir; 11,000 lin.ft. 16-in. industrial main from filtration plant to the industrial section of the city; auxiliary pump station to be installed at Whitsle Lake. Bonds voted, \$500,000. 6-19

BIDS BEING RECEIVED

SANTA MONICA, CALIF.—Bids to 7:30 p.m., July 7, by City Clerk for deep well pumping plant, etc. 6-18

BIDS RECEIVED

MONTEREY, CALIF.—Bids as follows by Quartermaster, Presidio of Monterey, Calif., for furnishing and installing two horizontal centrifugal pumps in Building No. 21: United Iron Works, Oakland, \$2820 with 25-hp. motors and \$2760 with 20-hp. motors; Byron-Jackson Pump Mfg. Co., Berkeley, \$4965 with pole line and \$3365 without pole line; Fairbanks-Morse & Co., San Francisco, \$4558 (deduct \$510 if pole line installation by Govt.) and alternative bid of \$4424. 6-6

CONTRACTS AWARDED

MODESTO, CALIF.—To Byron-Jackson Pump Mfg. Co., Berkeley, who bid \$4163 for furnishing and installing one 2000-g.p.m. deep well turbine pump and motor, work for the City. 6-6

ORANGE, CALIF.—To Pacific States Cast Iron Pipe Co., Orange, who bid \$1987 for furnishing cast-iron pipe to the City. 6-19

SAN DIEGO, CALIF.—To G. W. Cushing, 2002 Market St., San Diego, who bid \$2187 to the 11th Naval District, Ft. of Broadway, San Diego, for construction of water main at the Naval Operating Base (Air Station). 6-17

SANTA ANA, CALIF.—To Drainage Construction Co., Lynwood, \$61,432 for improving Main St., Cypress Ave., etc., for City, involving concrete sewers, cast iron mains, pumping plant, fire hydrants, etc. 6-18

IRRIGATION and RECLAMATION

WORK CONTEMPLATED

PHOENIX, ARIZ.—Plans by Engr., Donald Scott, Ellis Bdg., Phoenix, Ariz., for installation of 34 wells and pumping plants, and concrete lined canal system for Randolph Irrigation District in Pinal County, Arizona. Bond election will be held soon to vote \$400,000. 6-17

PHOENIX, ARIZ.—Plans by Engrs., Reed & Baker, Fleming Bdg., Phoenix, Ariz., for works for Camelback Water Conservation Dist., involving: Eight 20-in. diameter drilled wells to be equipped with deep well turbine pumps and motor, 150-hp. capacity; seven booster pumps from 10-hp. to 200-hp. capacity; eight miles of 11,000-volt transmission line; 100,320 lin.ft. of plain and reinforced concrete pipe, 12-in. to 24-in. diameter; three miles of 4-in. to 8-in. cast-iron pipe; two reservoirs of approximately 50,000 gallons capacity each; necessary gates and appurtenances. \$425,000. The project is now before the State Certification Board for approval. 6-6

LOS ANGELES, CALIF.—Permit granted to Big Rock Ranch Co., c/o W. C. Petchner, 731 Rowan Bdg., Los Angeles, for the appropriation of 6000 ac-ft. per annum water from Big Rock Creek in Los Angeles County for irrigation and domestic use in 2520 acres of land. Work involves: Small concrete diversion dam, water behind submerged dam to be recovered by pumping. Six 10-in. centrifugal pumps, capacity of each 4 cu.ft. per second, with 75 ft. lift. Pipe line consisting of 21,120 ft. 16-in. concrete pipe. Power to be utilized by diesel engines or electric motors, 450 hp. Ralph Bennett, Central Bdg., Los Angeles, is consulting engineer. 6-16

SAN FRANCISCO, CALIF.—Permit has been granted to the Burnham Chemical Company, Westend, San Bernardino County and 433 California St., San Francisco, for the appropriation of water from springs in Inyo County. Work involves 20,494 ft. 34-in., 2950 ft. 1 1/4-in., 7460 ft. 2-in., 11,892 ft. 2-in., 7720 ft. 1 1/2-in., 79,000 ft. 3-in. 6-17

SAN FRANCISCO, CALIF.—Application filed by the Southern California Water Supply Company, F. M. Faude, vice-president, Room 1010, Bank of Italy Bdg., San Francisco, for the appropriation of 18.6 cu.ft. per second water from Sweetwater River in San Diego County and 40,000 acre feet per annum storage for irrigation and domestic use near El Cajon, San Diego County. Work involves: STORAGE DAM—To be concrete, 204 ft. high, 800 ft. long on top with capacity of 35,000 ac-ft. PIPE LINE—To be welded steel or concrete: 33,000 lin.ft. 18-in. pipe line, 59,400 lin.ft. 25-in. pipe line. Plans by Loveland Engineers, Inc., 485 California St., San Francisco. 6-17

SAN FRANCISCO, CALIF.—Application has been filed as follows by Martin Judge, Jr. & Co., Crocker-First National Bank Bdg., San Francisco: (1) Appropriation of 250 cu.ft. per second from the north fork of Cache Creek in LAKE COUNTY, involving: DAM—To be concrete, 160 ft. high, 600 ft. long on top with capacity of 150,000 ac-ft. PIPE LINE—285,000 lin.ft. 48-in. concrete pipe. Estimated cost of above is \$3,000,000. (2) Appropriation of 175,000 ac-ft. per annum storage for irrigation of 50,000 acres of land in Yolo and Solano Counties. Involves: STORAGE RESERVOIR—To be located in Indian Valley. DITCH—90,000 lin.ft. of ditch to be 20-ft. wide on top, 8 ft. wide on bottom and with 4-ft. depth of water. \$1,000,000. 6-17

VICTORVILLE, CALIF.—Application filed by the Mojave River Irrigation District, Victorville, San Bernardino County, for the appropriation of 30,000 ac-ft. per annum from Deep Creek and west fork of Mojave River in San Bernardino County for the irrigation of 26,878 acres of land. Work involves: STORAGE DAM—150 ft. high, 450 ft. long on top, hydraulic earth fill, 85,000 ac-ft. capacity. DIVERSION DAM—From Deep Creek to West Fork Reservoir, involving 2400 ft. concrete lined canal and 6800 ft. tunnels, 6 ft. by 7 ft. MAIN CANAL—From West Fork Reservoir to East Boundary of District, involving: 2300 ft. 33-in. steel pressure main, 5000 ft. 42-in. reinf. conc. siphons, 63,100 ft. concrete lined canal. 6-17

OPPORTUNITY PAGE

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H. P. RINGGOLD, Manager
458 So. Spring Street, Los Angeles
Phone: FABer 1321

THOMAS F. FINN-GUS A. ELBOW COMPANY, General Agents, 324 Sansome Street, San Francisco

BIDS BEING RECEIVED

VISTA, CALIF.—Bids to 2 p.m., July 19, by Vista Irrigation District, Vista, San Diego County, for (1) Furnishing 49,000 lin.ft. 3-in. to 8-in. diameter, steel pipe. (2) Trenching for above pipe line. 6-16

BIDS RECEIVED

DENVER, COLO.—Stacey-Schmidt Co., York, Pa., \$13,700 low for 42-in. int. differential needle valves for Yakima River Crossing Wasteway, Kittitas Division of Yakima Project, Washington, for Bureau of Reclamation. 6-5

DENVER, COLO.—Bids as follows by Bureau of Reclamation, Denver, Colorado, for 42-in. internal differential needle valves for the Yakima River Crossing Wasteway, Yakima Project, Washington: (1) Bid price; (2) Freight; and (3) Delivered cost: 6-17

	(1)	(2)	(3)
Stacey-Schmidt Mfg. Co.	\$13,700	\$574	\$14,274
Hardie-Tynes Mfg. Co.	14,644	492	15,136
Joshua Hendy Iron Wks.	15,980	379	16,359
Commercial Iron Works	15,921	187	16,108
Terminal Supply Co.	17,725	479	18,204
Ogden Iron Works Co.	20,000	913	20,913
Amer. Locomotive Works	29,479	479	29,958

6-16

CONTRACTS AWARDED

BAKERSFIELD, CALIF.—To C. W. Hartman, P.O. Box 695, Bakersfield, \$3072 for grading and surfacing levees for Kern River Levee Dist. 6-13

LOS ANGELES, CALIF.—To Thos. Haverty Co., 316 E. 8th St., L. A., \$312,500 for Santa Clara River Protection Project, made necessary by failure of St. Francis Dam, involving earth, gravel and sand levees, piles, etc. 6-19

PLACERVILLE, CALIF.—To R. W. Littlefield and American Engr. Co., 337 17th St., Oakland, \$293,000 for Webber Creek earth fill dam, tunnel, and concrete work for El Dorado Irrigation District. (See Unit Bid Summary.) 6-13

RIVERSIDE, CALIF.—To John Strona, Chino, who bid \$59,679 for diversion weir, headworks and conduit at the mouth of the canyon of the Santa Ana River in San Bernardino County, work for the Water Conservation Association, 3596 Main St., Riverside. (See Unit Bid Summary, June 10th issue.) 6-13

TERRA BELLA, CALIF.—To West Coast Pipe & Steel Co., L. A., \$4806 for steel pipe-lines for Terra Bella Irrigation Dist. 6-9

POWER DEVELOPMENT

BIDS BEING RECEIVED

EUGENE, ORE.—Bids to 7 p.m., July 1, by Eugene Water Board for equipment for steam power plant: (A) One 1150-hp. bent tube type water tube boiler; (B) One 6000-kw. turbo-generator set; (C) One surface condenser. Stevens & Koon, Spalding Bdg., Portland, Ore., are Engrs. Cost \$400,000. 6-14

CONTRACTS AWARDED

SEATTLE, WASH.—To American Brown-Boveri Co., who bid \$61,945 for furnishing transformers, etc., for the City Lighting Department. 6-15

FLOOD CONTROL WORK

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To Chapman Valve Mfg. Co., who bid \$17,921 to L. A. County Flood Control District, L. A., for rectangular slide gates with hydraulic operating mechanism. 6-4

MACHINERY and SUPPLIES

BIDS RECEIVED

LOS ANGELES, CALIF.—Consolidated Steel Corp., 1200 N. Main St., L. A., \$5.56 ft. low for 1272 ft. 36-in. welded steel pipe for City Water & Power Bureau. 6-12

SAN FRANCISCO, CALIF.—Food Machinery Corp. (John Bean Mfg. Co.), \$844.75 per unit low for 16 deep well turbine plants for City. 6-12

SAN FRANCISCO, CALIF.—U. S. Pipe & Fdy. Co., S. F., as follows low bid to City for cast-iron pipe, cement lines: 2200 ft. 16-in. cast-iron pipe.....\$2,4675 ft. 3100 ft. 12-in. cast-iron pipe.....1,442 ft.

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To Western Pipe & Steel Co., 444 Market St., S. F., as follows for welded steel pipe:

5000 ft. 20-in. $\frac{1}{4}$ -in. plate.....	\$2.65 ft.
5300 ft. 20-in. $\frac{3}{8}$ -in. plate.....	2.24 ft.

6-12

RAILROAD CONSTRUCTION

CONTRACTS AWARDED

AMARILLO, TEX.—By the Santa Fe Railroad Company to Sharp & Fellows, Central Bdg., Los Angeles, for the construction of from 100 to 125 miles of railroad from Amarillo, Texas, to Boise City, Oklahoma. Sub-contracts have been awarded as follows by the Sharp & Fellows Co.: (1) To Marsh Bros. & Gardener, Monadnock Bdg., San Francisco; and (2) To Crook & Henno, Angelus Hotel, Los Angeles. 6-13

LIGHTING SYSTEMS

BIDS BEING RECEIVED

FUSTINE, CALIF.—Bids to 8 p.m., July 7, by City for street lighting system. Bonds voted, \$5000. 6-17

CONTRACTS AWARDED

FORT MASON, CALIF.—To Severin Electric Co., 172 Clara St., San Francisco, who bid \$5771 for night lighting system at Crissy Field, Presidio of San Francisco, bids opened by the Constructing Quarter-master's Office, Fort Mason, San Francisco. 6-16

FRESNO, CALIF.—To H. H. Walker Const. Co., 1323 Venice Blvd., Los Angeles, who bid \$16,144 for furnishing and installing 76 single-light electroliers complete on Fresno St. from O St. to Divisadero St. and on portions of Divisadero St., North Fresno St., etc., for the City. 6-6

RIVER and HARBOR WORK

BIDS RECEIVED

SACRAMENTO, CALIF.—Low bids as follows by State Division of Resources: (1) Christie & Allen, 511 Crocker Bdg., S. F., \$4575 low for 170-ft. rock jetty at mouth of Navarro River near Fort Bragg; and (2) O. G. Ritchie, 154 N. 11th St., San Jose, \$7208 low for levee repair on Sacramento River near Isleton. 6-17

BUILDING CONSTRUCTION

BIDS BEING RECEIVED

KING CITY, CALIF.—Bids to 1 p.m., July 1, by Clerk, King City Union High School Dist. for reinf. conc. fine arts building. \$56,000. 6-9

MCLOUD, CALIF.—Bids to 8 p.m., July 1, by Siskiyou Union High School District for frame high school addition at McCloud. 6-9

REDWOOD CITY, CALIF.—Bids to 10 a.m., July 7, by County for reinf. conc. hospital wing addition at Beresford. \$155,000. 6-6

SAN JOSE, CALIF.—Bids to 8 p.m., June 27, by Franklin School Dist., c/o Mr. Hancock, County Supt. of Schools, San Jose, for Franklin Grammar School (Spanish style) located near San Jose, to be brick or frame and stucco. \$45,000. 6-17

BIDS RECEIVED

EUREKA, CALIF.—Jas. L. McLaughlin, 251 Kearny St., San Francisco, low for cast stone and reinf. concrete 'B' hotel for the Pickwick Stage System, 9 Main St., San Francisco, on 4th and F Sts., Eureka. O'Brien Bros. and W. D. Peugh, 315 Montgomery St., San Francisco, are the Architects. 6-17

SAN FRANCISCO, CALIF.—Low bids as follows for reinf. concrete and stone Apts Jr. High School on Apts Ave. and Upland Drive: GENERAL—Macdonald & Kahn, Financial Center Bdg., S. F., \$531,500 low; PLUMBING—Scott Co., 243 Minna St., S. F., \$34,988 low; ELECTRICAL—R. Flatland, 1899 Mission St., S. F., \$37,332 low, and MECHANICAL EQUIPMENT—Scott Co., 243 Minna St., S. F., \$53,867 low. 6-18

SANTA CRUZ, CALIF.—The Minton Co., Mt. View, \$59,997 low for Laurel Grammar School for City. 6-11

YOUNTVILLE, CALIF.—Gauthier Bros., 4735 Brookdale Ave., Oakland, \$15,750 low for reinf. concrete guard house at Veterans Home, Yountville, for State Architects Office. 6-18

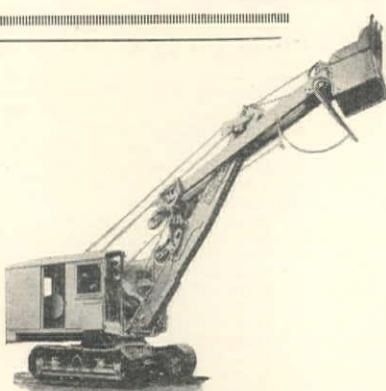
CONTRACTS AWARDED

KING CITY, CALIF.—To the Minton Company, Mt. View, \$10,557 for reinforced concrete and brick grammar school addition for the King City Grammar School District. 6-6

PALO ALTO, CALIF.—To K. E. Parker, 135 South Park, S. F., \$341,650 for 'A' terra cotta and reinf. conc. hospital for City. Reed & Corlett, Oakland, are Architects. 6-10

OPPORTUNITY PAGE

CONTINUED



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with New Machine

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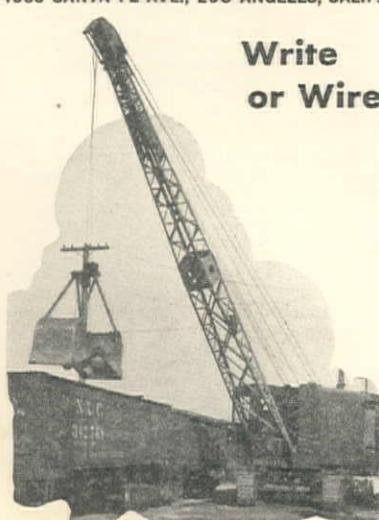
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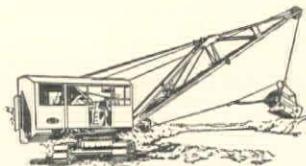
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3—Standard Gauge 50-Ton All-Steel Hopper Bottom Railroad Cars.
2—No. 9 Allis Chalmers Gyratory Crushers, style "K."
1—No. 8 Allis Chalmers Gyratory Crusher, style "K."
1—Clyde Iron Works 3-Drum Electric Contractor's Hoist, complete with 80-hp. motor and swinger.
1—American Size 7x10 Three-Drum Steam Hoist.
1—Minneapolis 2-Drum Gasoline Hoist with 50-hp. Buda engine.

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Refer to advertisements for addresses of companies listed. Advertisers index on page 72

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Oxweld Acetylene Co.

Air Compressors

Bacon Co., Edward R.
Gardner-Denver Co.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone 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.

Asphalt

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

Asphalt, Emulsified

American Bitumuls Co.

Asphalt Plants and Equipment

Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Co.
Spears-Wells Machy. Co., Inc.
Standard Boiler & Steel Works
Union Tank & Pipe Co.

Asphalt Paving

Warren Bros. Roads Co.

Back Fillers

Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Spears-Wells Machy. Co., Inc.
Speeder Machinery Corp.
The Shovel Co., The
Universal Crane Co., The
West Coast Tractor Co.
W-K-M Company, Inc.

Beams, Channels, and Angles

Pacific Coast Steel Corp.

Bins, Storage and Hopper

Bacon Co., Edward R.
Diamond Iron Works, Inc.
Harron, Rickard & McCone Co.
Heltzel Steel Form & Iron Co., The
Jenison Machinery Co.
Link-Belt Co.

Blacksmithing, Drop

Forgings

Payne's Bolt Works

Blasting Supplies

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

Boilers

Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Montague Pipe & Steel Co.
Water Works Supply Co.

Bolts, Nuts and Rods

Claussen & Co., C. G.
Kortick Mfg. Co.
Payne's Bolt Works

Bonds, Surety

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.

Bridge Plates, Bronze

Expansion

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

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.
Garfield & Co.
Haiss Mfg. Co., Geo.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Marion Steam Shovel Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Williams Co., G. H.

Buckets, Rehandling

Bacon Co., Edward R.
Garfield & Co.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Lakewood Engr. Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Williams Co., G. H.

Cableways

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

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.

Castings, Brass and Bronze

Greenberg's Sons, M.

Castings, Iron and Steel

American Cast Iron Pipe Co.
Industrial Brownhoist Corp.
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.
Garfield & Co.
Haiss Mfg. Co., Geo.

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

Chlorines, Water

Dorr Co., The
Wallace & Tiernan Co.

Clay Products

Gladding, McBean & Co.
Pacific Clay Products Co.

Concrete Buckets

Harron, Rickard & McCone Co.
Jenison Machinery Co.
Young Machy. Co., A. L.

Concrete Curing

Concrete Curing Co.
McEverlast, Inc.

Concrete Forms

Harron, Rickard & McCone Co.

Concrete Pipe

American Concrete Pipe Co.

Concrete Roads

Portland Cement Association

Conveyors, Portable

Diamond Iron Works, Inc.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
Jenison Machinery Co.

Conveyors, Elevating and

Conveying

Bacon Co., Edward R.
Bodinson Mfg. Co.
Harron, Rickard & McCone 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.
Garfield & Co.

Harnischfeger Sales Corp.

Harron, Rickard & McCone Co.

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Marion Steam Shovel Co.

Northwest Engineering Co.

Ohio Power Shovel Co., The

Orton Crane & Shovel Co.

Speeder Machinery Corp.

The Shovel Co., The

Universal Crane Co., The

Young Machy. Co., A. L.

Derricks (Continued)

Industrial Brownhoist Corp.

Jenison Machinery Co.

Young Machy. Co., A. L.

Ditch Machinery

Bacon Co., Edward R.

Bucyrus-Erie Co.

Cleveland Trencher Co.

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Young Machy. Co., A. L.

Drain Tile

Gladding, McBean & Co.

Gladding Bros. Mfg. Co.

Pacific Clay Products

Drills, Rock

Bacon Co., Edward R.

Gardner-Denver Co.

Harron, Rickard & McCone Co.

Ingersoll-Rand Co.

Rix Company, Inc., The

Schramm, Inc.

Sullivan Machinery Co.

Drill Sharpening

Compressor Service & Tool Co.

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Jenison Machinery Co.

United Commercial Co.

Dump Wagons

Le Tourneau Mfg. Co.

West Coast Tractor Co.

Engineers

Amburgen Dam Co., Inc.

Burns-McDonnell-Smith Engr. Co.

Hunt Co., R. W.

Porter, Geo. J.

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Bacon Co., Edward R.

Continental Motors Corp.

Harron, Rickard & McCone Co.

Hercules Motor Corp.

Ingersoll-Rand Co.

International Harvester Co.

Jenison Machinery Co.

Le Roi Co.

Novo Engine Co.

Wisconsin Motor Co.

Excavating Machinery

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.

Garfield & Co.

Haiss Mfg. Co., Geo.

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.

(Continued on page 68)

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Grading

San Francisco, California, June 10, 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 10th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading from Sta. 440+50 to Sta. 700+31 on Section A of Route No. 28, Houserock Canyon, National Forest Highway, in Kaibab National Forest, Coconino County, Arizona. The project is 4.927 miles in length and the principal items of work are approximately as follows:

Clearing, 16,536 acres.

Unclassified excavation, 198,077 cu.yd.

Structural excavation, 1250 cu.yd.

Borrow excavation, 10,231 cu.yd.

Overhaul, 142,378 sta.yd.

Finishing earth graded road, 4,927 miles.

Untreated timber in place, 8.5 M BM.

Cement rubble masonry, 1550 cu.yd.

18-in. corr. metal pipe, 1348 lin.ft.

24-in. corr. metal pipe, 422 lin.ft.

Hand laid rock embankment, 765 cu.yd.

Maintenance of existing road, extra work, and sections accepted. Estimate for traffic, \$2000.

Right of way monuments, 98 each

Bituminous wearing surface, 78 sq.yd.

Hauling approved backfill material, 3986 cu.yd. miles.

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

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

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

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within three hundred (300) 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.

Liquidating 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.

Award of contract will not be made unless and until the necessary funds therefor are appropriated by Congress or otherwise made available.

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

Bid for Road Construction. To be opened 2:00 p.m., July 10, 1930.

Arizona Forest Highway Project 28-A, House-Rock Canyon National Forest Highway, 807 Sheldon Building, 461 Market street, San Francisco, California.

C. H. SWEETSER, District Engineer.

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Grading

San Francisco, California, June 9, 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 1st day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading Sta. 7+00 to Sta. 140+97 and surfacing Sta. 7+00 to Sta. 603+71 of the Topaz National Forest Highway in Mono County, California, and surfacing Sta. 603+71 to Sta. 780+16.25 of the Topaz National Forest Highway in Douglas County, Nevada, all in Mono National Forest. The length of the project to be graded is 2.58 miles and to be surfaced is 14.80 miles. The principal items of work are approximately as follows:

Unclassified excavation, 24,400 cu.yd.

Structural excavation, 600 cu.yd.

Overhaul, 9000 sta.yd.

Fine grading subgrade and shoulders, 12.22 miles.

Crushed rock surfacing, 27,700 cu.yd.

Crushed gravel surfacing, 8700 cu.yd.

Supplemental crushed rock, 1200 cu.yd.

Supplemental crushed gravel, 350 cu.yd.

Providing and maintaining water plant, lump sum.

Watering, 1800 m.gals.

Class B concrete, 75 cu.yd.

Class C concrete, 50 cu.yd.

Reinforcing steel, 7000 lb.

C. M. pipe (in place), 1018 lin.ft.

Moving and resetting fences, 2.25 miles.

Right of way monuments (in place), 268 each.

Removing existing C.M.P. culverts, 120 lin.ft.

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

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

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

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within two hundred fifty (250) calendar days from that date exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

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

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

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

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

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

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

Bid for Road Construction. To be opened 2:00 p.m., July 1, 1930.

California Project 36-A1, B, Topaz Highway, Nevada Project 5-A1, Topaz Lake Highway, 807 Sheldon Bldg., 461 Market Street, San Francisco, California.

C. H. SWEETSER, District Engineer.

COMBINATION

Crane, Shovel, and Dragline

1/2-yr. Industrial Brownhoist gasoline operated—Guaranteed first-class

P. B. Hackley Equipment Co.
625 Market Street San Francisco
Telephone Sutter 0978

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Grading

San Francisco, California, June 17, 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 17th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading Section A of Route No. 21, Deer Creek National Forest Highway, in Lassen National Forest, Tehama County, California. The length of the project to be graded is 3.408 miles and the principal items of work are approximately as follows:

Clearing, 25.32 acres.

Unclassified excavation, 127,500 cu.yd.

Structural excavation, 325 cu.yd.

Overhaul, 14,045 sta.yd.

Finishing, 3,408 miles.

Crib face in place, 140 sq.ft.

Double 6 by 6-ft. log culvert in place, 62 lin.ft.

Corr. metal pipe in place, 1386 lin.ft.

Hand laid rock embankment, 344 cu.yd.

Right of way monuments, 100 each.

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.

Guaranteed 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 eighty (180) calendar days from that date, exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

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

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

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

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

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

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

Bid for Road Construction. To be opened 2:00 p.m., July 17, 1930.

Cold Spring-Calf Creek Section, Deer Creek National Forest Highway, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER, District Engineer.

THE BUYERS' GUIDE—Continued from Page 66

Excavating Mch'y. (Continued)

Orton Crane & Shovel Co.
Owen Bucket Co.
Sauerman Bros., Inc.
Speeder Machinery Corp., The
Theew Shovel Co., The
Universal Crane Co., The

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 Mch'y. Exchange
Hackley Equipment Co., P. B.
Tieslan Bros.

Filters, Water

California Filter Co., Inc.

Fire Hydrants

Greenberg's Sons, M.
Industrial & Municipal Supply Co.
Rensselaer Valve Co.
Water Works Supply Co.

Floating Roofs

Chicago Bridge & Iron Works

Flood Lights

Oxweld Acetylene Co.

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

Oxweld Acetylene Co.
Victor Welding Equipment Co.

Forms, Steel

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

Freight, Water

American-Hawaiian Steamship Co.

Frogs and Switches

Bacon Co., Edward R.
United Commercial Co.

Gas Holders

Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Gates, Cast-Iron

California Corrugated Culvert Co.

Gates, Irrigation

Great Western Meter 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

Gravel Plant Equipment

Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Diamond Iron Works, Inc.
Harron, Rickard & McCone Co.
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.
Industrial Brownhoist Corp.

Hoists, Hand and Power

Bacon Co., Edward R.
Gardner-Denver Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jaeger Machine Works, The

Hoists, Hand and Power (Continued)

Jenison Machinery Co.
Link-Belt Co.
Novo Engine Co.
Sullivan Machinery Co.
West Coast Tractor Co.
Young Machy. Co., A. L.

Hoppers, Steel

Bacon Co., Edward R.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
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

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

Glen 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.
Harron, Rickard & McCone Co.
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

Bacon Co., Edward R.

Garfield & Co.

Hackley Equipment Co., P. B.

Harron, Rickard & McCone Co.

Jenison Machinery Co.

United Commercial Co.

Lumber

McCormick Lumber Co.

Metal Lath

Truscon Steel Company

Meters, Irrigation

Great Western Meter Co.

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.

Young Machy. Co., A. L.

Mixers, Plaster

Harron, Rickard & McCone Co.
Jaeger Machine Works, The

Jenison Machinery Co.

Young Machy. Co., A. L.

Motors, Gasoline

Continental Motors Corp.

Hercules Motors Corp.

Harron, Rickard & McCone Co.

Jenison Machinery Co.

Le Roi Co.

Wisconsin Motor Co.

Oxy-Acetylene Apparatus

Oxweld Acetylene Co.

Paints, Acid Resisting

Paraffine Companies, Inc., The

Wailes Dove-Hermiston Corp.

Paints, Metal Protective

McEverlast, Inc.

Paraffine Companies, Inc., The

Wailes Dove-Hermiston Corp.

Paints, Technical

American Bitumuls Co.

Paraffine Companies, Inc., The

Wailes Dove-Hermiston Corp.

Paints, Waterproofing

McEverlast, Inc.

Paraffine Companies, Inc., The

Wailes Dove-Hermiston Corp.

Pavers, Concrete

Foote Company, Inc.

Harron, Rickard & McCone Co.

National Equipment Corp.

Paving Breakers

Gardner-Denver Co.

Harron, Rickard & McCone 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.

Northwest Engineering Co.

Orton Crane & Shovel Co.

Theew Shovel Co., The

Piles, Concrete

Raymond Concrete Pile Co.

MacArthur Concrete Pile Corp.

Piling

Pacific Coast Steel Corp.

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

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.

Harron, Rickard & McCone Co.

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

Gl

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF PUBLIC ROADS

Grading and Surfacing

San Francisco, California, June 10, 1930
 Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 p.m. on the 8th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading and surfacing Section D, and surfacing a portion of Section C of Route No. 32, Placerville-Lake Tahoe National Forest Highway, located in the Eldorado National Forest, Eldorado County, California. The length of the project to be graded is 2.82 miles and to be surfaced is 5.14 miles. The principal items of work are approximately as follows:

Clearing, 21 acres.
 Unclassified excavation, 61,194 cu.yd.
 Structural excavation, 700 cu.yd.
 Overhaul, 26,000 sta.yd.
 Fine grading subgrade and shoulders, 2.32 miles.
 Crushed rock surfacing, 14,000 cu.yd.
 Supplemental crushed rock, 700 cu.yd.
 Watering, 804 M. gals.
 Cement rubble masonry, 107 cu.yd.
 C. M. pipe (in place), 1,950 lin.ft.
 6-in. porous tile underdrain, in place, 200 lin.ft.
 Maintenance of detours, extra work estimate \$2,000.
 Move and reset fences, 1.04 miles.
 Right of way monuments (in place), 58 each.
 Coarse screenings, 2,550 cu.yd.
 Fine screenings, 1,050 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 of San Francisco.

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

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within one hundred sixty (160) 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.

Award of contract will not be made unless and until the necessary funds therefor are appropriated by Congress or otherwise made available.

Envelopes containing bids must be sealed, marked, and addressed as follows: Bid for Road Construction. To be opened 2:00 o'clock, p.m., July 8, 1930.

Section C-1D, Riverton-Kyburz, Placerville-Lake Tahoe National Forest Highway, 807 Sheldon Building, 461 Market street, San Francisco, California.

C. H. SWEETSER, District Engineer.

UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

Bridges

San Francisco, California, June 16, 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 15th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for constructing the Lodgepole, Clover Creek and Silliman Creek Bridges and approaches between Stas. 223+50 and E 270+67 on Sections C2 and D1 of the Generals Highway, Route No. 1, in Sequoia National Park, Tulare County, California. The principal items of work are approximately as follows:

Clearing, lump sum.
 Unclassified excavation, 10,700 cu.yd.
 Structural excavation, 1030 cu.yd.
 Overhaul, 3000 sta.yd.
 Finishing earth graded road, lump sum.
 Class A concrete, 770 cu.yd.
 Reinforcing steel, 58,850 lb.
 Cement rubble masonry, 1532 cu.yd.
 18-in. corr. metal pipe in place, 30 lin.ft.
 Arch ring facing, 216 sq.yd.
 Curb stones, 85 lin.ft.
 Membrane waterproofing, 615 sq.yd.
 Selected material for backfill, 4000 cu.yd.
 Hauling selected material, 6000 cu.yd.m.i.

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

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

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

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within two hundred (200) calendar days from that date, exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extensions as may be provided for under the Special Provisions.

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

Partial payments will be made as the work progresses for work and material delivered if

such work and material meet the approval of the Contracting Officer.

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

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

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

Envelopes containing bids must be sealed, marked, and addressed as follows: Bid for Road Construction. To be opened 2:00 p.m., July 15, 1930.

Lodgepole, Clover Creek and Silliman Creek Bridges, Sequoia National Park, 807 Sheldon Bdg., 461 Market St., San Francisco, California.

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

HELP WANTED

As listed by the Engineering Societies' Employment Service, 57 Post Street, San Francisco. Applicants will please apply direct to them.

SUPERINTENDENT WANTED — Experienced contractor would be pleased to get in touch with superintendent with experience on road surfacing. Must have sufficient capital to back own judgment. Would be willing to take such a man into firm. Box 400, care Western Construction News.

SALES ENGINEER, technical graduate, not over 35 years, with experience estimating and detailing various types of steel structures. Some sales experience also required. General line of shapes, plates, bars, etc. Salary \$200 mo. plus car allowance and commission on sales over quota. Apply by letter. Location, Northwest R-3163-S.

CIVIL ENGINEER, experienced and qualified to act as assistant in making studies of a large river basin with a view to the formulation of general plans for the most effective improvement for the purpose of navigation, water power and flood control. Applicant must have experience in the design of high storage or power dams, including estimates of costs, in the general design and estimates of power houses, penstocks and other major structures and also in making studies and estimates of the effect of storage on navigation and increased output of power houses. Salary dependent on qualifications. Apply only by letter. Location, South. W-1017-C.

PROFESSOR of civil engineering and head of the department, at least 32, with good health and freedom from physical defects. Bachelor's degree and at least one year of subsequent post-graduate work leading to an appropriate degree required and at least five years' successful teaching experience during two of which the position has carried marked responsibility. Subjects taught include kinematics, engineering design, general surveying, topographic surveying, pumping, railroad surveying, mechanics, graphic statics, masonry and concrete construction, heat power engineering, strength of materials, and hydraulics. Applicants should submit complete educational, professional and personal data, a photograph and a comprehensive list of persons from whom references may be obtained and lowest acceptable salary. Term, 9 months, beginning Sept. 1, 1930; location, South. W-1039-C.

BONDS *Glens Falls*

811 Garfield Building, Los Angeles
 Ben C. Sturges, Manager

INDEMNITY COMPANY
of Glens Falls, New York

Pacific Coast Department
 R. H. Griffith, Vice-President
 354 Pine Street, San Francisco
 C. H. Desky, Fidelity and Surety Sup't.
 R. Lynn Colomb, Agency Sup't.

Contractors

Surety
Fidelity

311-13 Alaska Building, Seattle
 R. G. Clark, Manager

THE BUYERS' GUIDE—Continued from Page 68

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.
 Harron, Rickard & McCone Co.
 Jaeger Machine Works, The
 Jenison Machinery Co.
 Novo Engine Co.
 Woodin & Little

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

Pumps, Sewage Ejector
 Industrial & Municipal Supply Co.

Pumps, Sludge
 Dorr Co., The

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

Rails
 Bacon Co., Edward R.
 Claussen & Co., C. G.
 United Commercial Co.

Reinforcing Bars
 Pacific Coast Steel Corp.
 Soule Steel Co.

Reinforcing Wire Fabric
 Soule 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.
 Harron, Rickard & McCone Co.
 Heltzel Steel Form & Iron Co.
 Jenison Machinery Co.
 Lakewood Engr. Co.

Road Graders and Scrapers
 Austin Western Road Machy.
 Co., The
 Bacon Co., Edward R.
 Caterpillar Tractor Co.
 Jenison Machinery Co.
 Spears-Wells Machinery Co.
 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.

Road Rollers
 Austin Western Road Machy.
 Co., The
 Bacon Co., Edward R.
 Hackley Equipment Co., P. B.
 Huber Manufacturing Co.
 Jenison Machinery Co.
 Spears-Wells Machinery Co.

Roofing
 Paraffine Companies, Inc., The
Rules, Steel, Wood and
Aluminum
 Lufkin Rule Co., The

Saws, Portable
 Harron, Rickard & McCone Co.
 Ingersoll-Rand Co.
 Jenison Machinery Co.
 Young Machinery Co., A. L.

Scarifiers

Bacon Co., Edward R.
 Jenison Machinery Co.
 Le Tourneau Mfg. Co.
 Spears-Wells Machinery Co.
 West Coast Tractor Co.

Scrapers, Dragline, Fresno, Wheeled

Bacon Co., Edward R.
 Harron, Rickard & McCone Co.
 Jenison Machinery Co.
 Sauerman Bros., Inc.
 West Coast Tractor Co.

Screens, Sand and Gravel

Bacon Co., Edward R.
 Bodinson Manufacturing Co.
 Diamond Iron Works, Inc.
 Haiss Mfg. Co., Geo.
 Harron, Rickard & McCone Co.
 Jenison Machinery Co.
 Link-Belt Co.
 Smith Engineering Co.
 Young Machinery Co., A. L.

Screens, Sewage

Dorr Co., The
 Link-Belt Co.

Screens, Vibrating

Harron, Rickard & McCone Co.
 Link-Belt Co.
 Smith Engineering Works

Second-Hand Equipment

Atkinson Construction Co.
 Contractors Mech. Exchange
 Excavating Equipment
 Dealers, Inc.
 Hackley Equipment Co., P. B.
 Harron, Rickard & McCone Co.
 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, Electric, Gasoline, Steam

American Hoist & Derrick Co.
 Bacon Co., Edward R.
 Bucyrus-Erie Co.
 Excavating Equipment Dealers, Inc.
 Garfield & Co.
 Hackley Equipment Co., P. B.
 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

Harron, Rickard & McCone Co.
 Jenison Machinery Co.

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.
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 Link-Belt Co.

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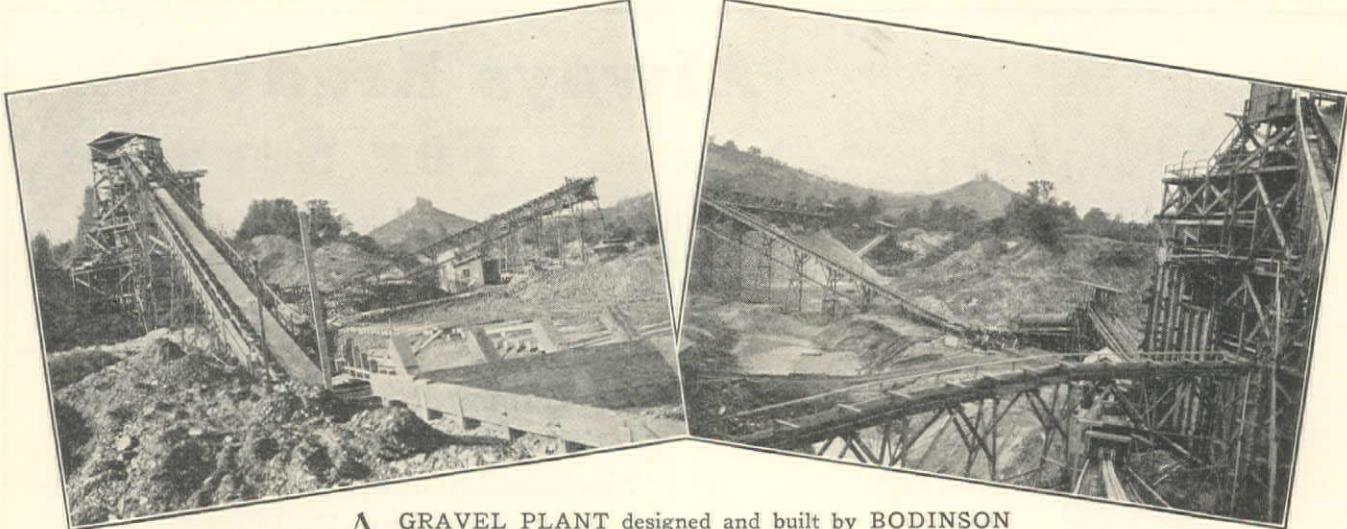


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