WCN-09-1930

# WESTERN CONSTRUCTION NEWS

ENGINEERING CONSTRUCTION IN THE FAR WEST

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VOLUME V NUMBER 17

SAN FRANCISCO, SEPTEMBER 10, 1930

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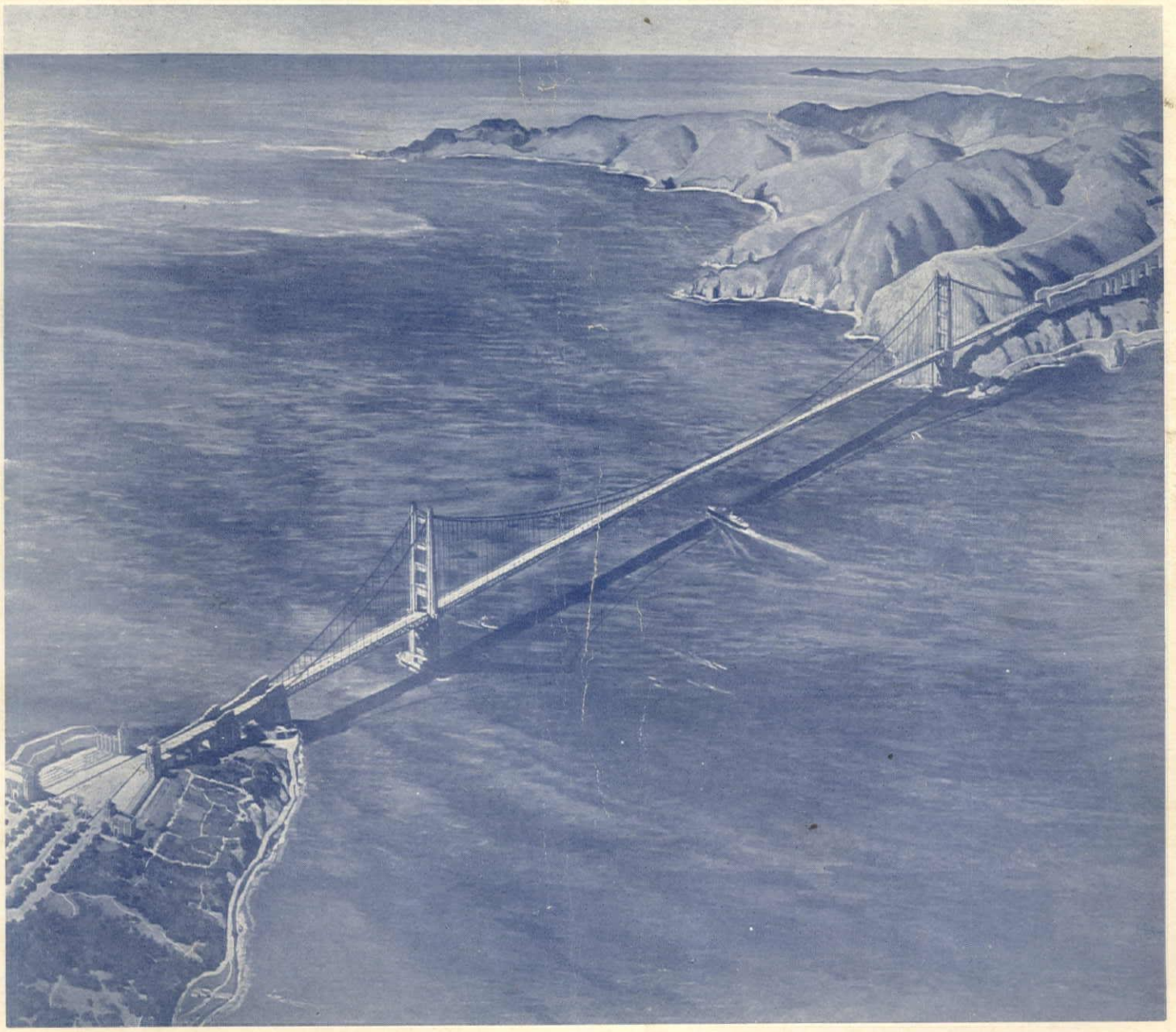
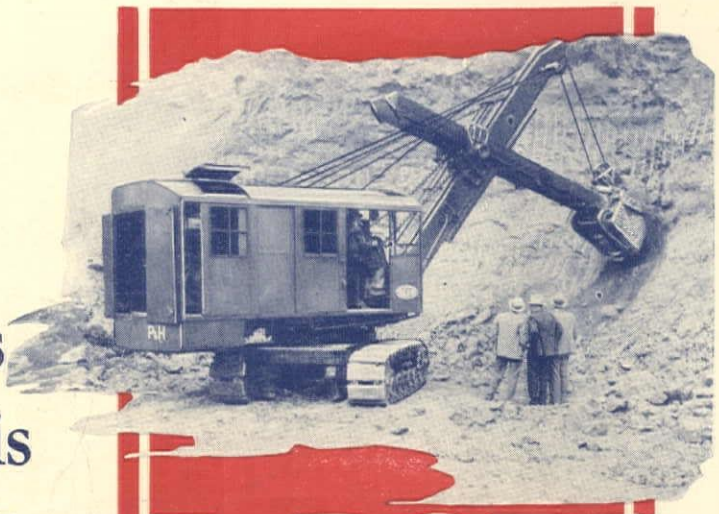


PROPOSED GOLDEN GATE BRIDGE ACROSS SAN FRANCISCO BAY BETWEEN FORT AND LIME POINTS, LENGTH 8943 FT. BETWEEN PLAZAS, MAIN SPAN 4200 FT., CENTER CLEARANCE 220 FT., JOSEPH B. STRAUSS, CHIEF ENGINEER

# *The* Strength and Rigidity of P&H Excavators *are* Based on this STEEL CAR BODY



The P&H Excavator has a car body cast in one single massive piece of steel. All bearings are cast integral, so that propelling shafts are held permanently in alignment. The combined swing gear and roller path is securely anchored to the car body, thus giving additional reinforcement.

This unit cast steel car body forms a permanent foundation for the entire machine. This is the basic reason for the famous strength and rigidity of P&H Excavators. And these inherent qualities are found in the crawler frames, revolving frame, and side stands, all of which are also single-piece steel castings.

P & H Excavators keep alignment permanently in the most severe service, and unit cast steel construction is the reason. *Write for full details.*

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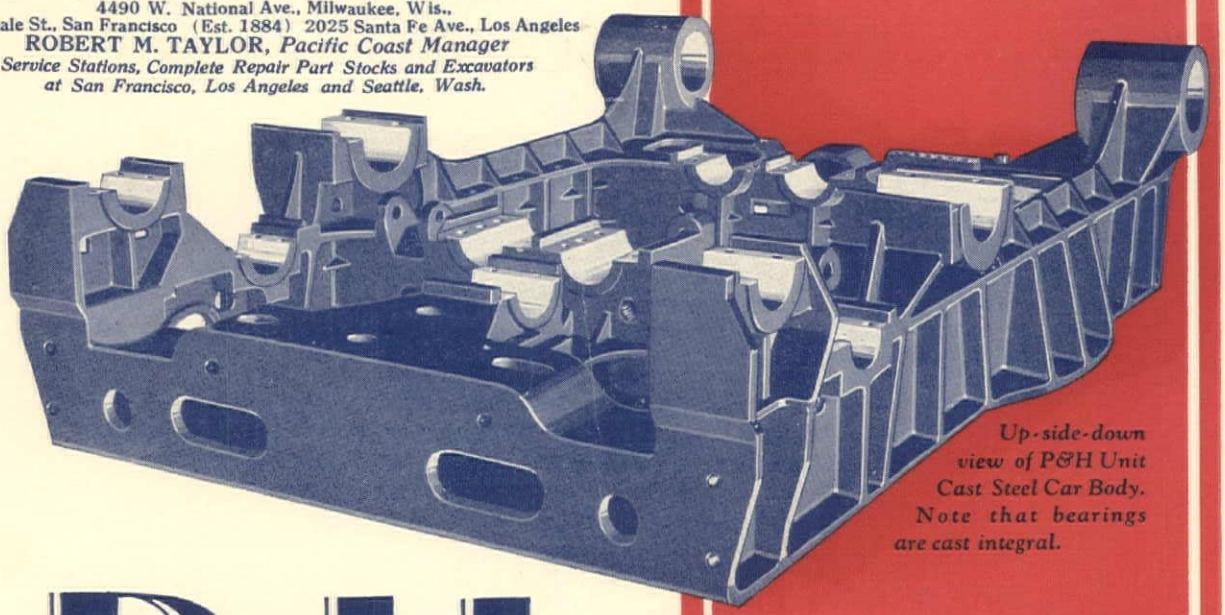
4490 W. National Ave., Milwaukee, Wis.,
32 Beale St., San Francisco (Est. 1884) 2025 Santa Fe Ave., Los Angeles
ROBERT M. TAYLOR, *Pacific Coast Manager*
*Service Stations, Complete Repair Part Stocks and Excavators at San Francisco, Los Angeles and Seattle, Wash.*

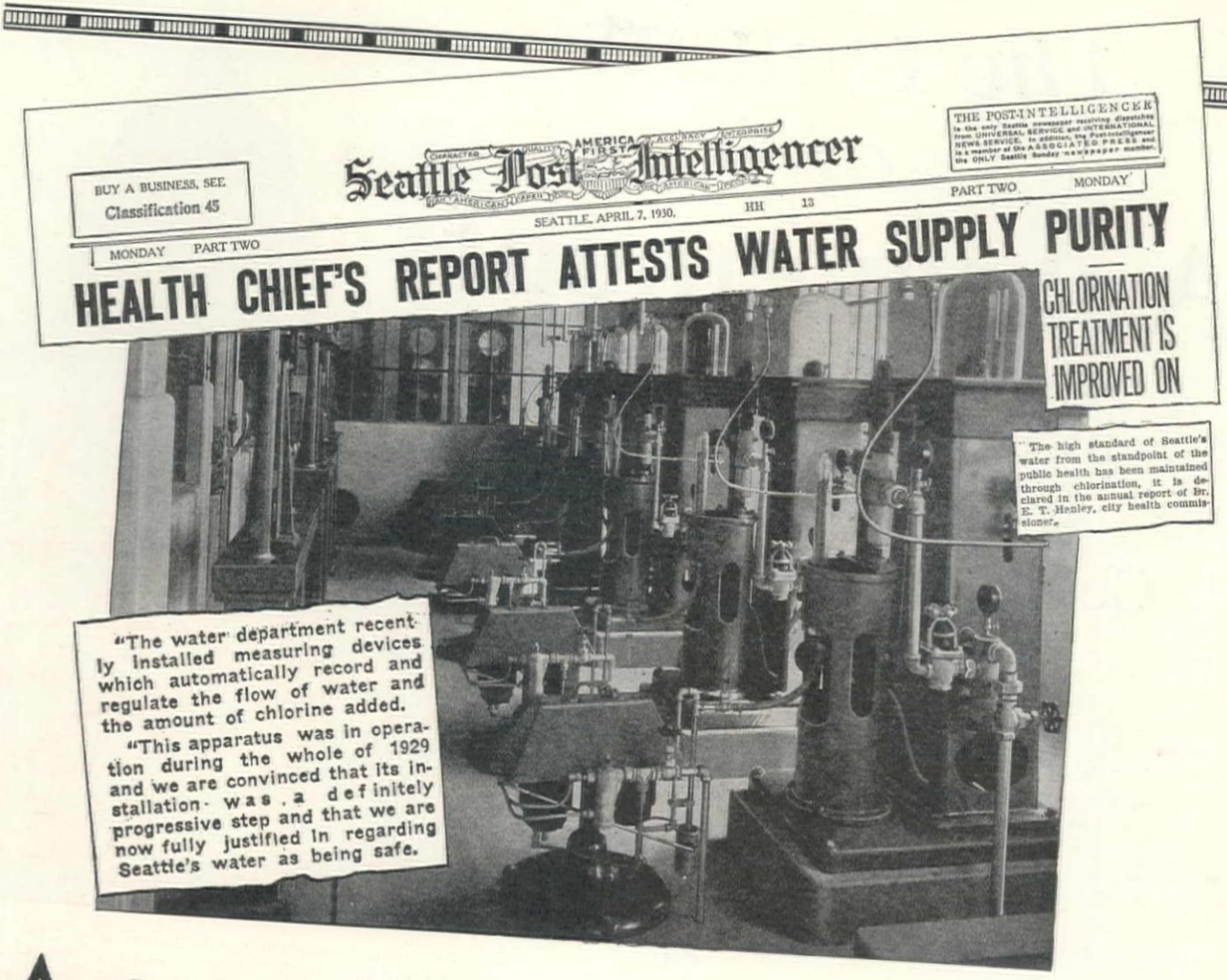
*A Complete Line of Excavators*
— from ½ to 4 Cubic Yards — GASOLINE — DIESEL — ELECTRIC
*All Quickly Convertible*



*Up-side-down view of P&H Unit Cast Steel Car Body. Note that bearings are cast integral.*

# P&H

*Gas — Diesel — Electric*
EXCAVATORS



BUY A BUSINESS, SEE Classification 45

Seattle Post-Intelligencer

THE POST-INTELLIGENCER is the only Seattle newspaper receiving dispatches from UNIVERSAL SERVICE and INTERNATIONAL NEWS SERVICE. In addition, the Post-Intelligencer is a member of the ASSOCIATED PRESS and the ONLY Seattle Sunday NEWSPAPER member.

MONDAY PART TWO SEATTLE, APRIL 7, 1930. HH 13 PART TWO MONDAY

HEALTH CHIEF'S REPORT ATTESTS WATER SUPPLY PURITY

CHLORINATION TREATMENT IS IMPROVED ON

"The high standard of Seattle's water from the standpoint of the public health has been maintained through chlorination, it is declared in the annual report of Dr. E. T. Henley, city health commissioner.

"The water department recently installed measuring devices which automatically record and regulate the flow of water and the amount of chlorine added.

"This apparatus was in operation during the whole of 1929 and we are convinced that its installation was a definitely progressive step and that we are now fully justified in regarding Seattle's water as being safe.

# Automatic Chlorination — Solves Seattle's Problem

*"The Only Safe Water is a Sterilized Water"*

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

## WALLACE & TIERNAN COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

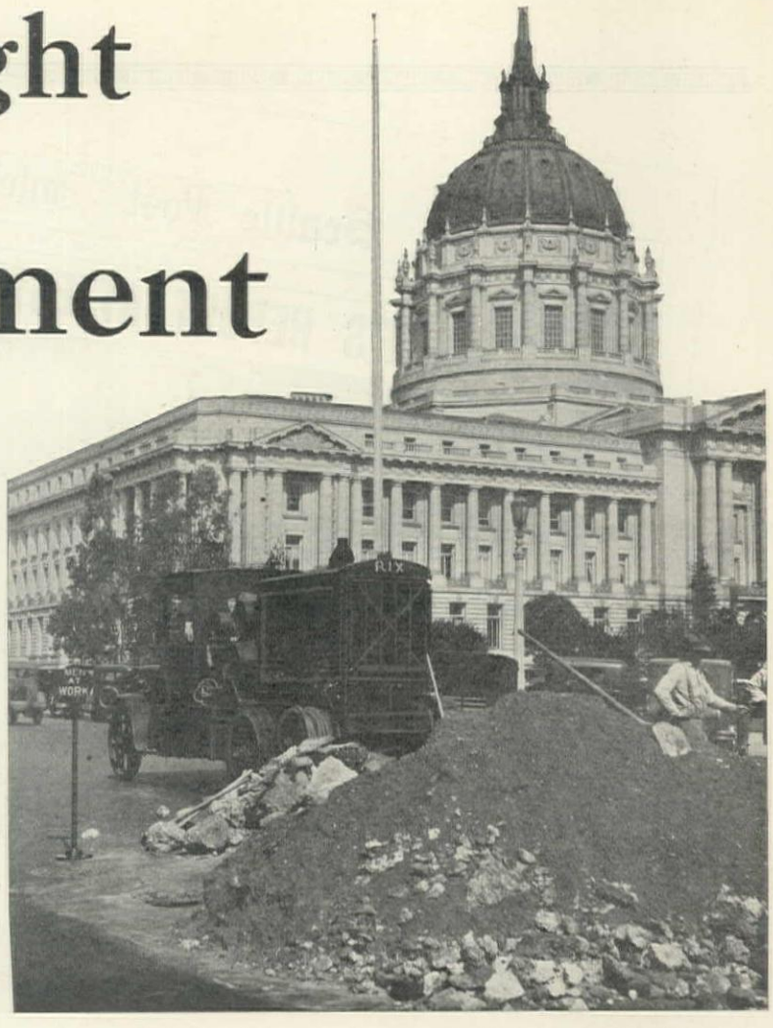
NEWARK ✦ NEW JERSEY

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

3A-23

# *The* Height *of* Achievement

## in Domes ...*and* Compressors



RIX "6" Compressor No. 2, with patented *Super-Charger*, owned by Pacific Gas & Electric Co., speeding street work in front of San Francisco City Hall.

SAN FRANCISCO'S City Hall is famous for its height and its magnificence — the dome is several feet higher than the dome of the National Capitol at Washington, D. C. In the same way, RIX performance towers above that of ordinary compressors. A *Super-Charger*, a patented RIX device, steps up single-stage rating to 2-stage performance. 26% more efficient. A size smaller RIX "6" actually does as much work as other compressors a size larger. Dependability proven in over half a century, and RIX *"Express"* service with every RIX rig. If you need air, you need RIX. Write for Bulletin 3-L.

THE RIX COMPANY, INC.
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LOS ANGELES....684 Santa Fe Avenue
PORTLAND.....312 E. Madison Street
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## Since 1877

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.

# RIX "6"

**PORTABLE AIR COMPRESSORS**

## .... The Compressor with the *Super-Charger*

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MANAGING EDITOR

A. GILBERT DARWIN
*Jun. Am. Soc. C. E.*
ASSISTANT EDITOR

# WESTERN CONSTRUCTION NEWS

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*M. Am. Soc. C. E.*
ASSOCIATE EDITOR

❖

CHESTER A. SMITH
*M. Am. Soc. C. E.*
ASSOCIATE EDITOR

DEVOTED TO ENGINEERING CONSTRUCTION IN THE FAR WEST

VOLUME V — SEPTEMBER 10, 1930 — NUMBER 17

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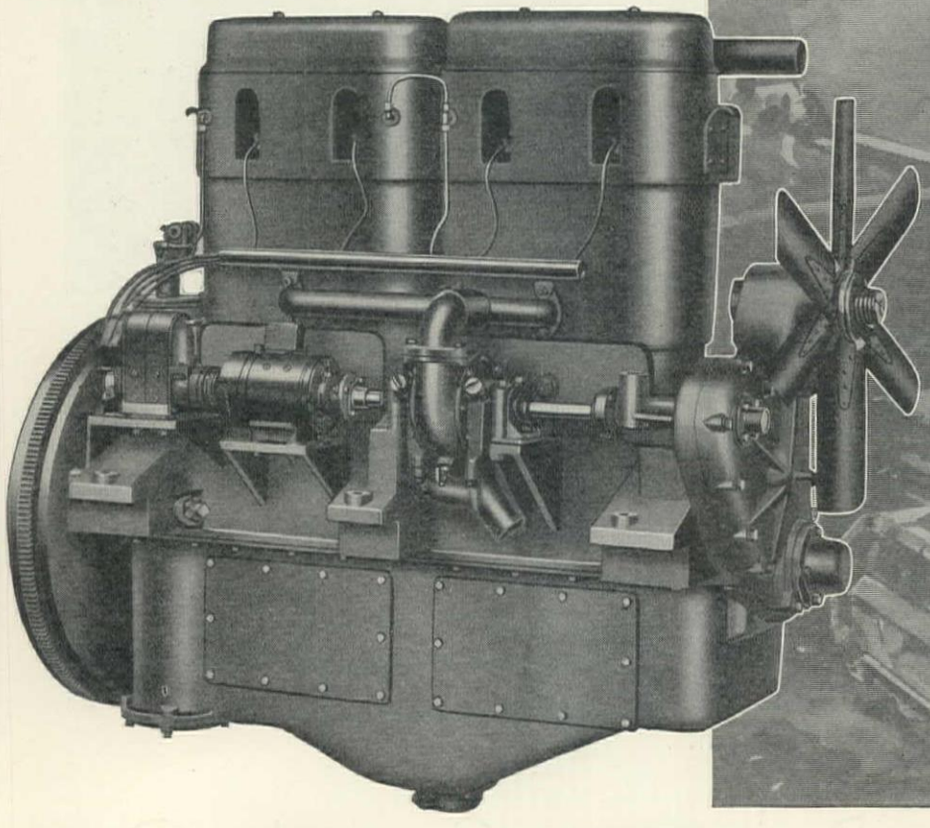
## THAT'S WHAT YOU WANT

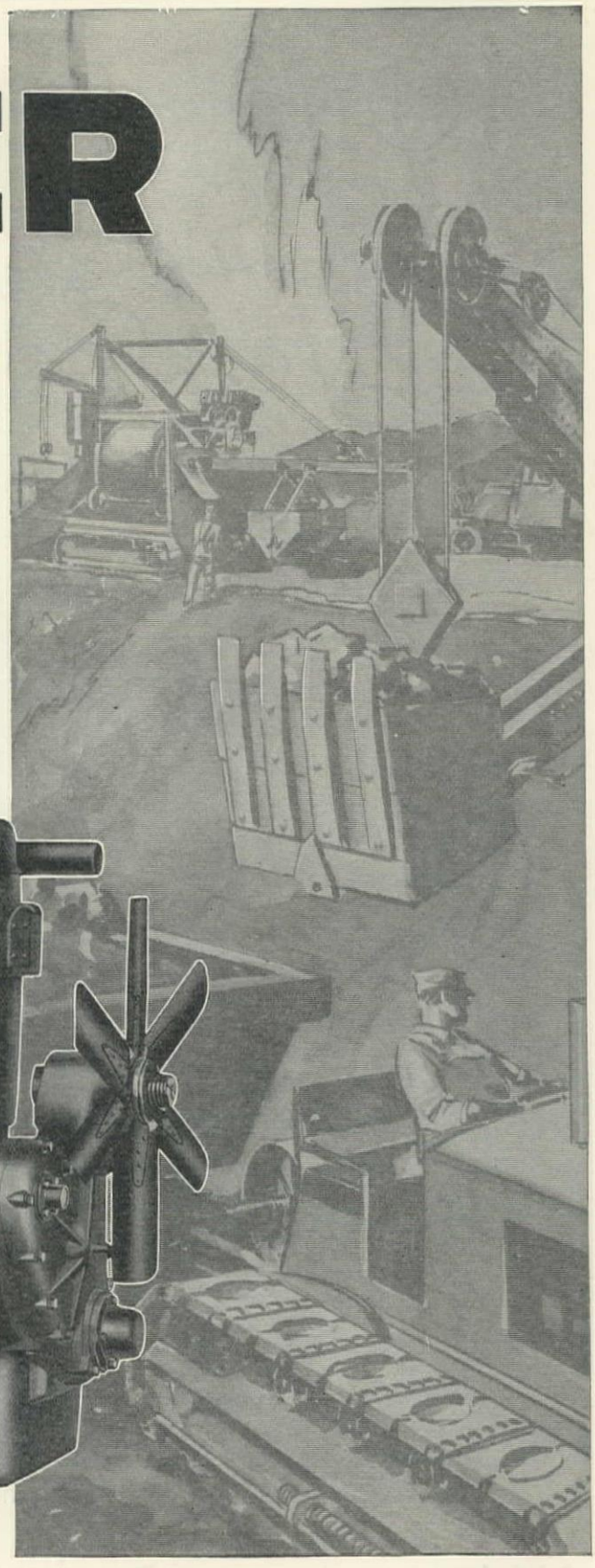
SMOOTHER POWER . . . vibrationless power bespeaks LeRoi Engine quality . . . quality in design and materials. So completely has this quality been apparent to its world-wide users, that they are now using LeRoi gasoline engines in the "toughest" of heavy duty service of manifold variety.

And LeRoi's performance bears out its staunch build . . . in road-building . . . in logging . . . in dirt-moving and hundreds of other applications. Its efficiency is told in its low operating costs . . . its ability to provide "full-measure" power under capacity load . . . and its long years of faultless service.

Those using the LeRoi Engine know of its flexibility, of its smooth acceleration and of its low upkeep costs. You can look to the LeRoi for Dependable Power . . . always!

**LE ROI COMPANY, Milwaukee, Wisconsin**





# LE ROI ENGINES

## FOR DEPENDABLE POWER

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

# Swing dirt instead of steel!

It's design—not mere bulk and weight—that makes capacity in a dragline.

Compare Northwest design with that of other machines. All the operating mechanism is and always has been back of the center pin eliminating much of the excess counter-weight employed by other manufacturers.

The high gantry decreases the cable stress, the boom pressure at the hinge pin and boom weight.

The patented positive traction which permits longer crawlers than those on machines of equal capacity insures lower ground pressure often eliminating the need for mats.

Northwest design assures greater capacity per weight of machine.

Swing dirt instead of steel!

**NORTHWEST ENGINEERING CO.**

*The world's largest exclusive builders of gasoline, oil burning and electric powered shovels, cranes and draglines*

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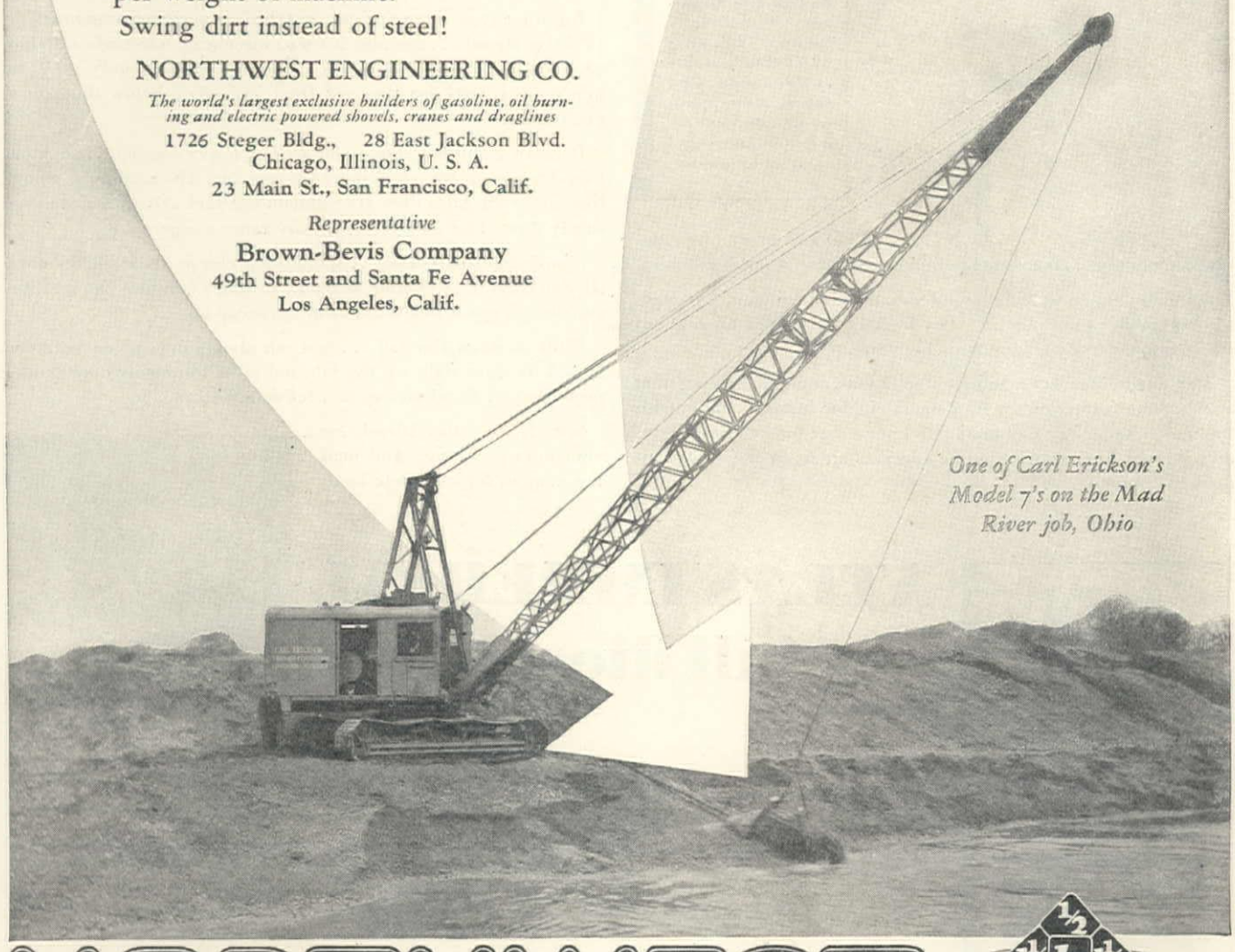


*One of Carl Erickson's Model 7's on the Mad River job, Ohio*

**NORTHWEST**

WCN 9-10-Gray

# THOSE LOW DIRT MOVING COSTS YOU'RE HEARING ABOUT

## ARE BEING MADE WITH ATLAS DIESELS

**USED IN**

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

INTRODUCED and proved by Atlas seven years ago . . . the diesel-powered excavator is *not* a new idea.

On many of the world's largest construction projects, hundreds of excavators, powered with Atlas Diesels, have been turning out phenomenal dirt-moving records for years.

The engine has been selling itself. One contractor hears that another, the former owner of a steam rig, for instance, has cut his fuel costs from $20 a day to $3. He knows that only a Diesel operates at such low costs . . . so he specifies an Atlas Diesel, for his next excavator.

No other type of engine can match the operating economies of an Atlas Diesel . . . because it uses only cheap, low-grade oil, that costs ⅓ - ¼ as much as gasoline . . . and it consumes only ½ - ⅓ as much. Fuel costs are thus cut from 75% - 85% below those of a gas. engine.

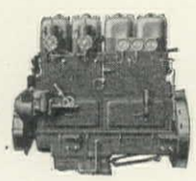
Because it doesn't choke and stall in heavy digging . . . an Atlas Diesel turns out 10% - 15% more yardage, too. The harder the going, the harder an Atlas digs. Its common-rail fuel system maintains a steady flow of power over the entire range of speeds.

Simple in construction . . . operators prefer an Atlas Diesel, once they've tried it. No boiler to tend. No water troubles. No ignition system. No spark plugs. Starts in ten seconds.

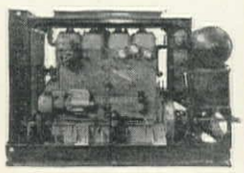
Built to stand the gaff . . . you can always depend on an Atlas Diesel. It stays right on the job, and gives uniformly outstanding performance. Rigid factory inspection assures it.

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

*P & H shovel, powered with an Atlas Diesel Engine.*



*Atlas Diesel for excavators. 4 cylinder, 4 cycle. Dust proof.*



*The Atlas* PORTABLE *Diesel Power Unit. Cheaper fuel costs and more power—for all types of stationary uses. Mail coupon for facts.*

# ATLAS IMPERIAL full diesels

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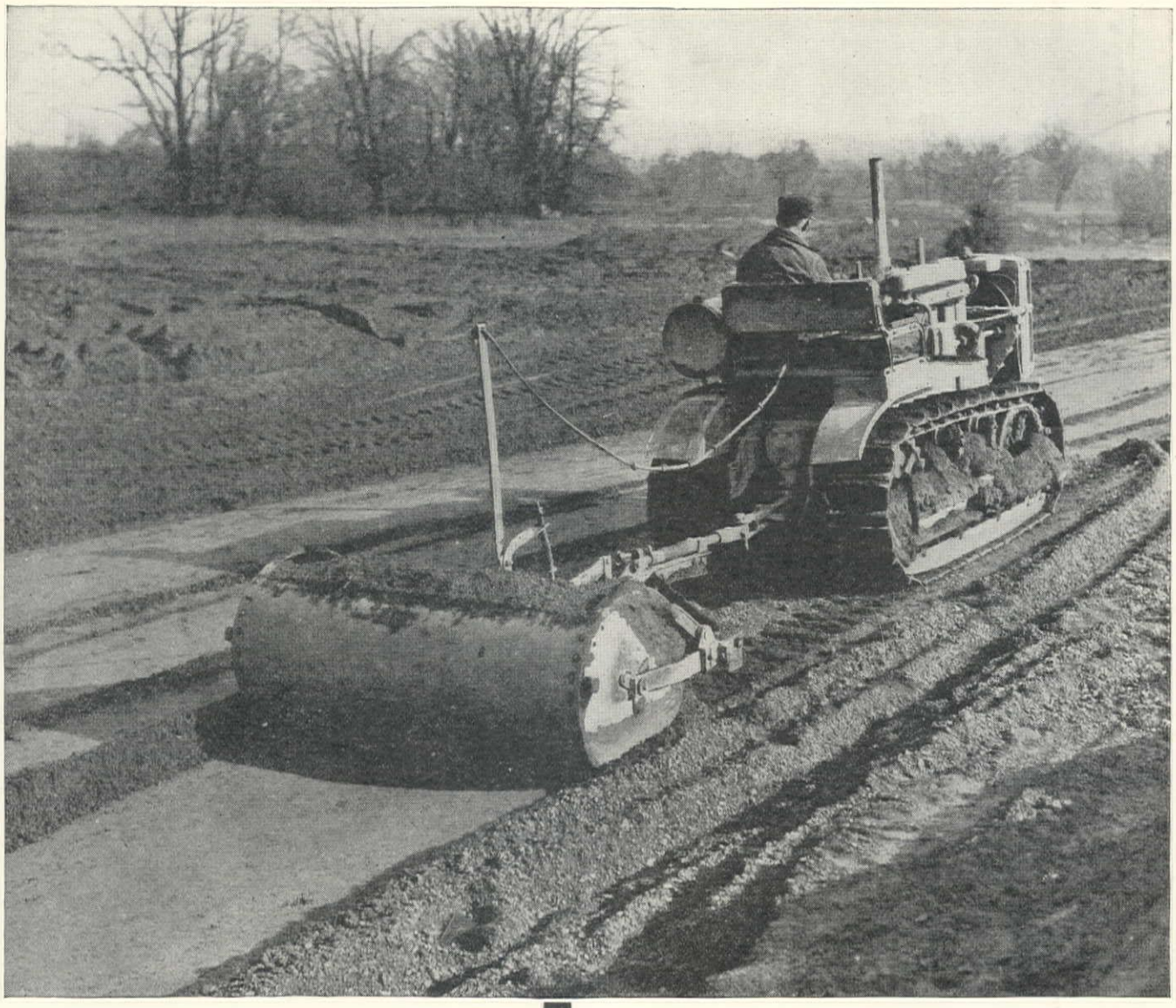

This Thirty walks right along with a well-loaded Euclid 6-ft. rotary scraper —the "Caterpillar's" tracks ride high and safe although the gravel is loose and fine. It is the *balance* of power and traction that has won for "Caterpillars" their supremacy in the tractor field— the ability to go anywhere at any time. These qualities translate themselves into speedier work at lower cost.

*Prices—f.o.b. Peoria, Illinois*

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| TEN . . . . . | $1100 | TWENTY . . . | $1900 |
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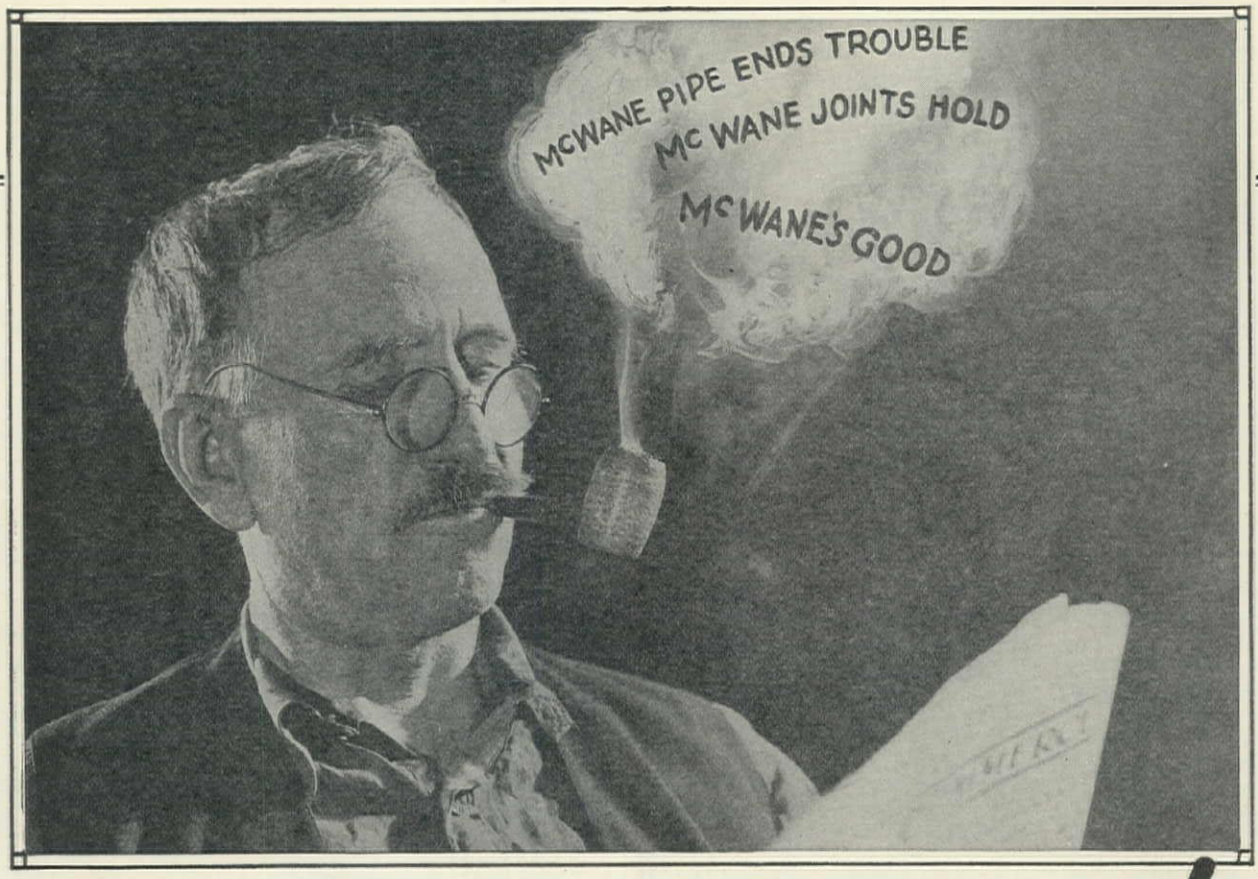
## Caterpillar Tractor Co.

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

# ALWAYS
## plenty of traction

CATERPILLAR
REG. U.S. PAT. OFF.
TRACTOR




# Two Pipes of Peace!

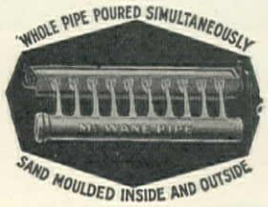
TO have peace in his mind, a water works man's got to have cast iron pipe in his mains. *Then* the old cob pipe hits on all six, and he can rest without a worry. For with cast iron he *knows* that rust or rot won't harm his distribution system. They can't, for cast iron *lasts.*

The wiser ones are carrying this sound idea of permanence downward into the smaller lines and services, too, now. Including the two-main systems that are becoming so popular in residential districts. (A small main on the opposite side of the street from the one carrying the fire protection. Services no longer need to cross the street or be laid in advance of paving them.)

*McWane-Pacific cast iron pipe is sold with or without the famous McWane Precalked Joints. It is sand-cast, yet modern weights and strengths.*

*McWane-Pacific Pipe is western-made—from Utah iron and coal by Utah labor. No longer is it necessary for the intermountain and Coast country to use substitutes for everlasting cast iron now. Write nearest office for new catalog and prices before buying* ANY *kind of pipe.*

WRITE FOR ILLUSTRATED LITERATURE




McWANE CAST IRON PIPE

CAST IRON PIPE

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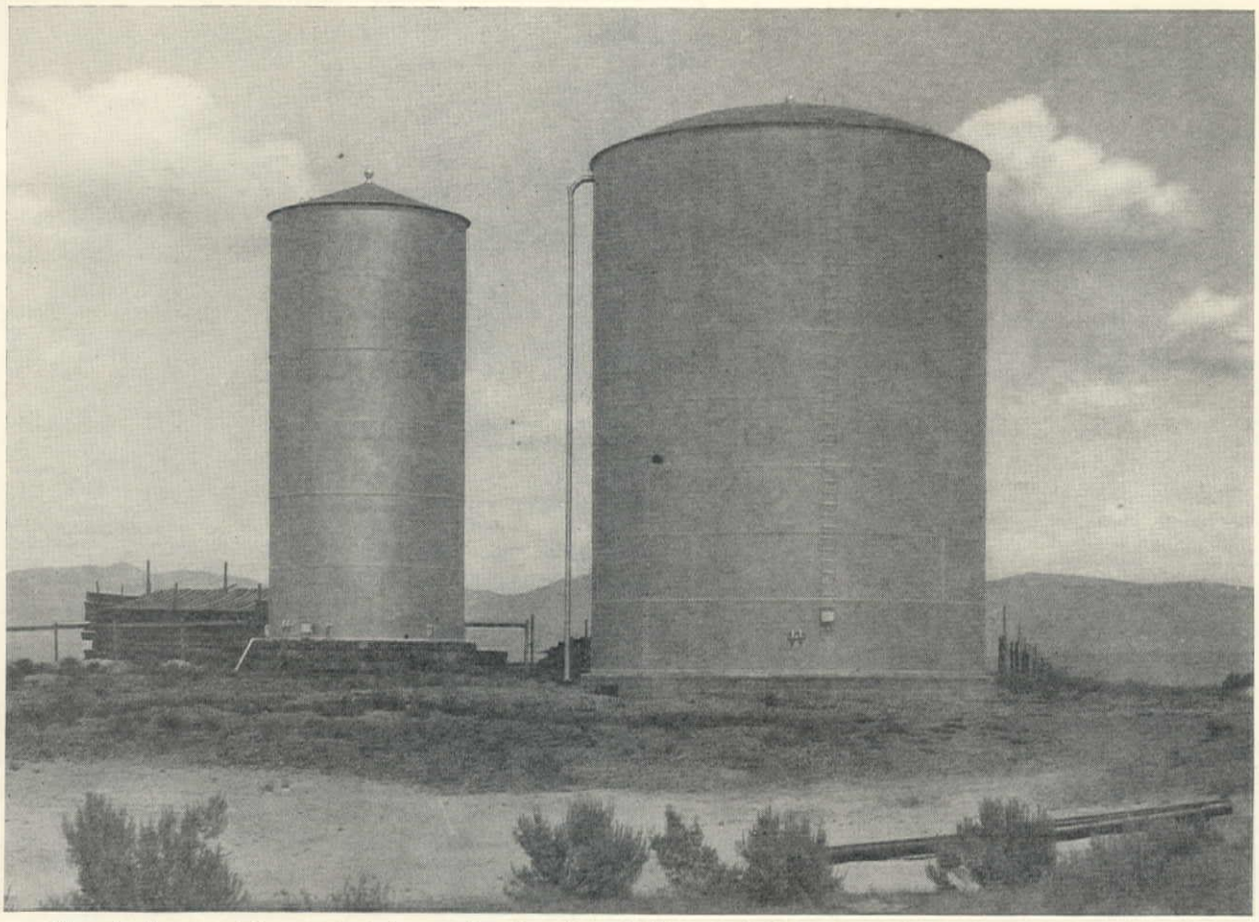


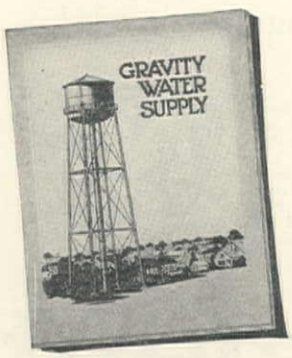
*Two tanks providing water storage for the city of Alturas, California. The larger one is 36 feet in diameter and 46 feet high, holding 345,000 gallons*

# Every water system needs water storage

THE only conditions under which a water system wouldn't need water storage would be to have the consumption rate absolutely uniform at all times. In as much as this ideal condition probably never is encountered, every system needs water storage located near to or within the distribution area.

The most effective storage is the type which will flow back into the distribution mains by gravity. Usually this is done by means of elevated tanks. In some instances, however, a fortunately located hill or mountain makes it possible to install a flat-bottom tank at such an elevation that the water flows into the system by gravity.

We will be pleased to send you information on the importance of storage in water systems, or to make up estimating figures on the cost of installing complete, with our own Pacific Coast erection facilities, the type of storage tank you may need in your system.




*Ask for a Copy of this Booklet*

## CHICAGO BRIDGE & IRON WORKS

SAN FRANCISCO ..... 1013 Rialto Building
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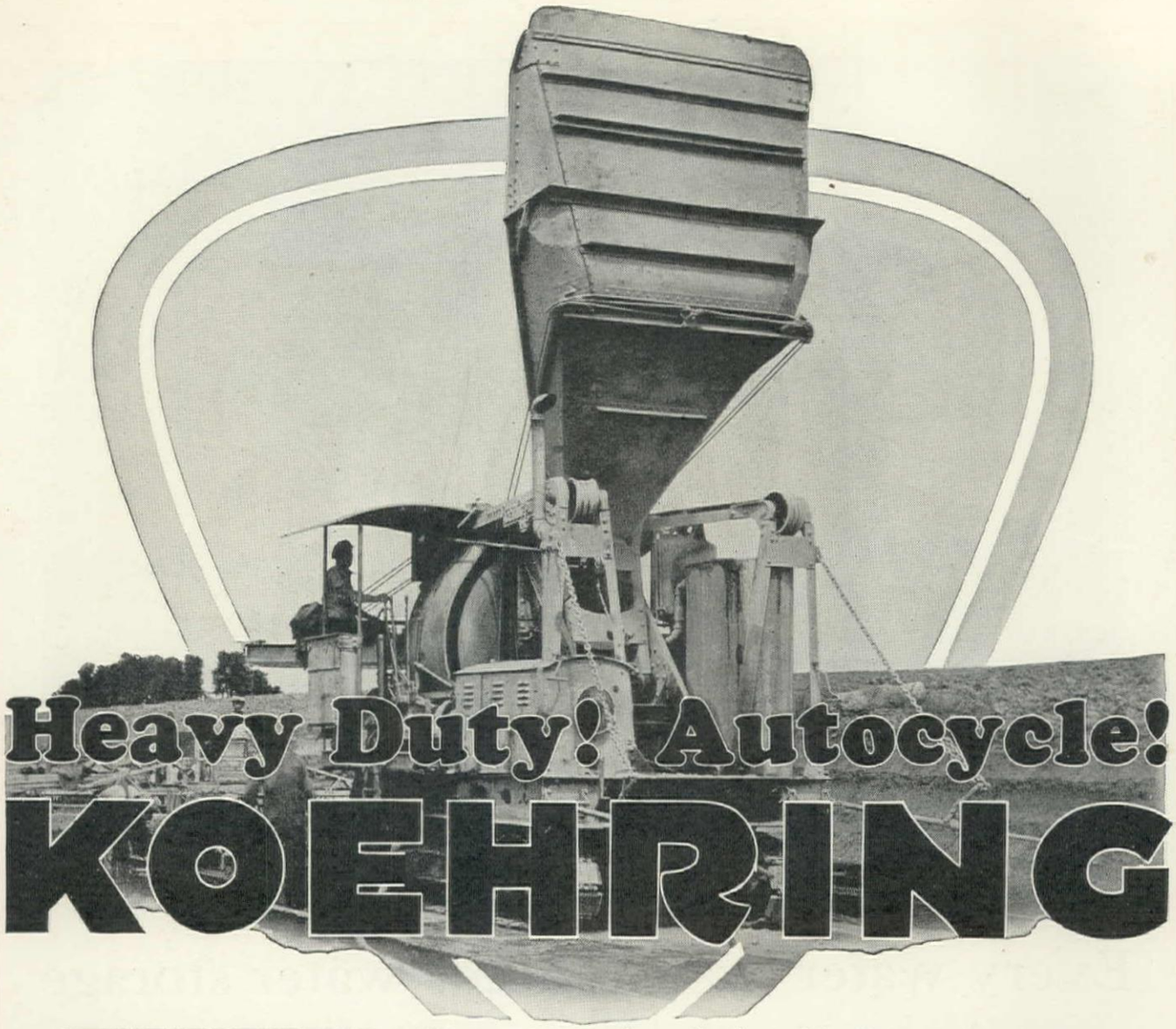

# Heavy Duty! Autocycle! KOEHRING

THE KOEHRING still is, as it has always been, the Heavy Duty Paver.

—and now the Koehring Autocycle synchronizes high speed actions into a positive sequence of operations that sends materials into drum and concrete on the subgrade with no possibility of lost motion. It sets the *pace* for the whole job! It's a consistent, ever-alert money-maker.

Know the Heavy Duty Koehring! Know the extra yardage possibilities of Koehring Autocycle!

**N. E. C. PRODUCTS**

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

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# National Equipment Corporation

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**Milwaukee, Wisconsin**

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

# FOR THE HARDER JOBS

## *You know the kind!*

The 1030 Bucyrus-Erie is a big output ¾-yard machine for the man who runs into all kinds of jobs—especially the *tough* ones. Foundation excavations of stiff clay and shale—grading with lots of rock classification—contracts where peak output all the time is needed to make profits.

This man wants lots of power, and he has it here. His machine must stand severest use—that was kept in mind in designing each part of the sturdy 1030. He can't afford breakdowns or even small mechanical troubles, and he soon learns that he can depend on his 1030 to give unfailing service, month after month, with minimum repair and operating costs.

Big oversize clutches and simple controls give this machine faster swing, faster crowd and a fast hoist through hardest materials. No other gas machine performs anything like it.

Of course it is a convertible. A quick field change makes it shovel, crane, clamshell, dragline or dragshovel—in each capacity a profit maker for the harder jobs. Electric or Diesel power, if you prefer. Send for complete details.

A-148—9-10-30-WCN

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

BUCYRUS-ERIE COMPANY, manufacturers of the only complete line—all sizes, types and powers. *Plants:* South Milwaukee, Wisconsin, Erie, Pennsylvania, Evansville, Indiana—*General Offices:* South Milwaukee, Wisconsin.


An I-R Compressor that supplied air on the pipe line job mentioned below.

Left: Two of the drilling crew.

Right: One section of the trench as it looked before the pipe was laid.

# In the Snow-Capped Rockies

## Uinta Pipe Line Company Used I-R Portables for Work in Isolated Section

Above are shown several views of a pipe line job that crosses an isolated section of the Rocky Mountains. Since the work was carried on at a considerable distance from the nearest railroad, the company needed equipment that would operate with a minimum of attention over long periods of time.

For the rock work, it was decided to use Ingersoll-Rand paving breakers, "Jackhamers," and portable compressors. Although the job presented more than the usual difficulties, progress was rapid, and the company reports that the I-R machines operated to its entire satisfaction.

Outfits of this sort are being used with increasing frequency on pipe line work throughout the country. At each I-R Branch Office there are experienced men who will be glad to recommend the proper equipment for your job. Descriptive bulletins and full operating data will be furnished on request.

**INGERSOLL-RAND CO. - 11 Broadway - New York City**

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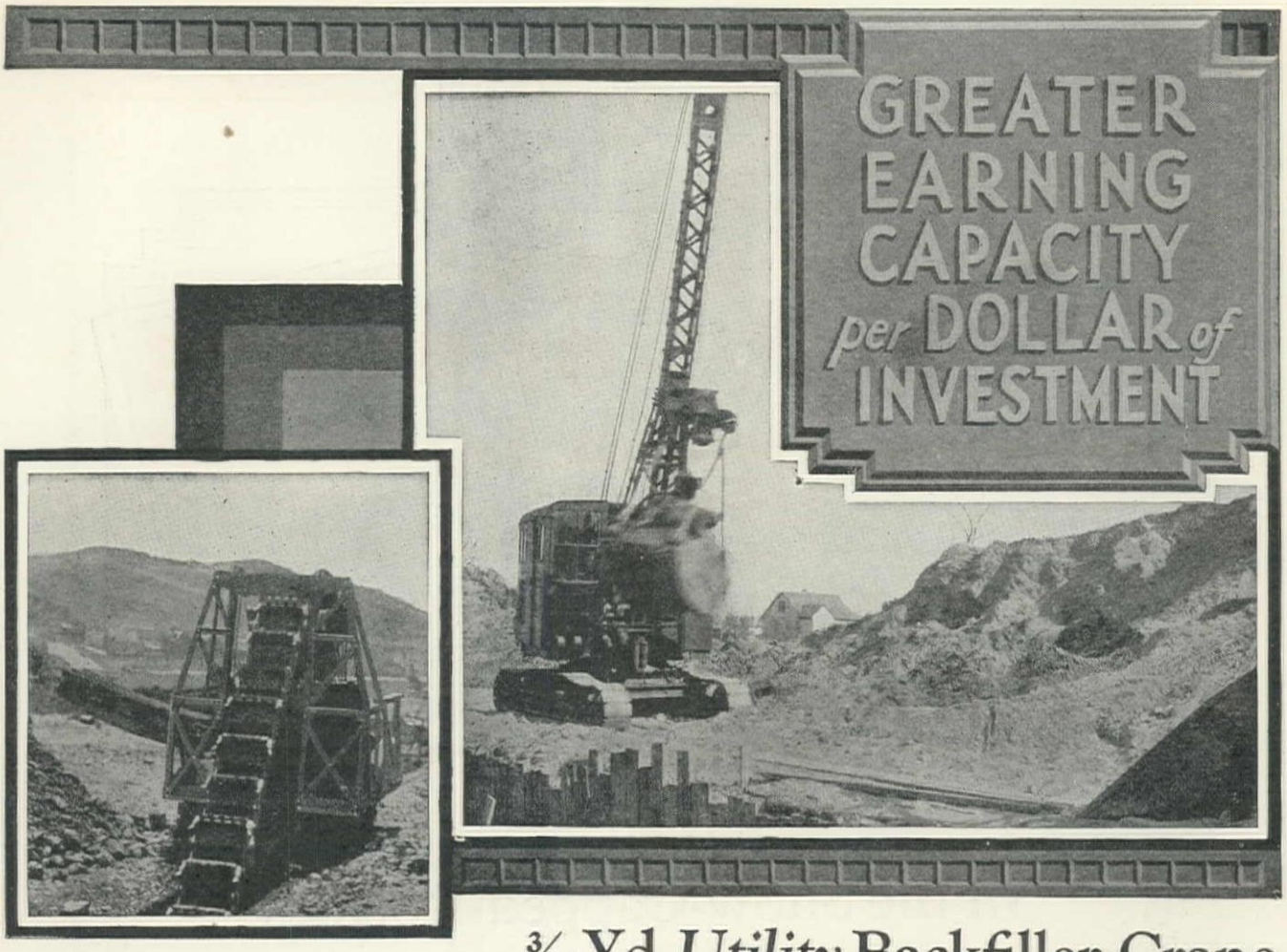


## Model 140 *Service* Trencher

This little chain-and-bucket type excavator embodies the dependable ruggedness characteristic of all Buckeyes and reinforces it with exceptional compactness and mobility. Expressly designed to meet the peculiar requirements of service line needs, it works equally well in tight quarters and on smaller main trenches.

Through heavy duty transmission controls, it places at the operator's command 3 road speeds, 3 bucket line speeds and 12 digging speeds. Six cutting widths range from 16 to 26 inches, with a maximum cutting depth of 9 feet. Easy steering is assured by over-size Twin Disc clutches. Other favorite mechanical features include steel tread Alligator crawlers; box girder boom with high speed hoist; no under cutting of Alligators; reversible bucket teeth; two-speed reversible conveyor, power shifted and highly mounted; 52 h.p. medium speed, industrial type motor; and steel construction throughout.

Model 140 is another Buckeye profit maker. Let us send you complete specifications and its price—both will interest you.

## ⅜-Yd. *Utility* Backfiller-Crane

Most Buckeye owners standardize on them exclusively, often employing them in great numbers. That is trustworthy proof of thousands of users' enthusiastic satisfaction with the earning power of their equipment.

The profits to be derived from investing in a ⅜-yard Utility Buckeye are made possible by its remarkable diversified working ability. Quick convertibility—without drum lagging—to Clamshell, Crane, Dragline, Orange-peel or Backfiller, multiplies its service range.

Chief of its distinguishing mechanical features are: Two speeds for all operations, including traction; Twin Disc clutch controls; upper and lower bases both of one-piece electric steel castings; cable drums mounted on separate shafts; Timken roller bearings; adjustable-length boom; full-circle swing; and Buckeye steel tread Alligator crawler wheels with brakes for safe operation on grades.

Write for complete specifications and performance records of this compact, speedy Buckeye Backfiller-Crane which pays its way every day on some construction job or other.

THE BUCKEYE TRACTION DITCHER CO.
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*for over thirty years*

**Buckeye**

REPRESENTATIVES:

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[SEE SIX JENISON MACHINERY COMPANY PAGES FOLLOWING]

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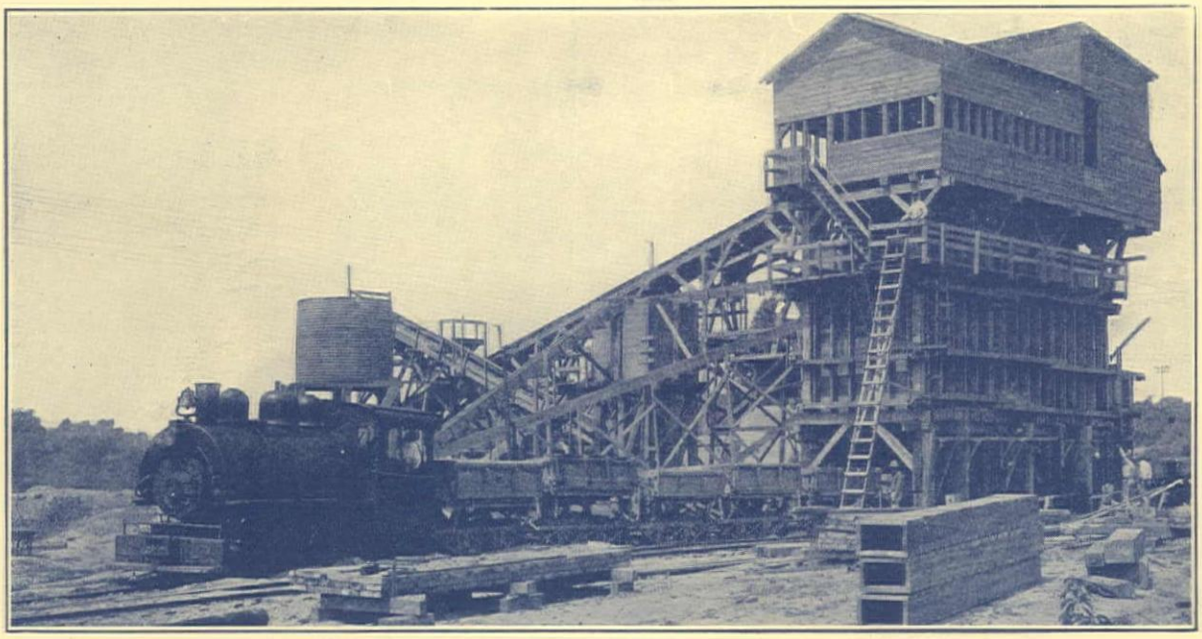

# Building the Carpenter Dam ▲▲▲

## this Telsmith Plant supplies the sand and gravel

Six miles south of Hot Springs, Ark., on the Ouachita River, the Phoenix Utility Co. is constructing the Carpenter Dam for the Arkansas Light and Power Co. The dam and connecting structures will be approximately 1165 ft. wide and 80 ft. high and will require 175,000 to 200,000 cu. yds. of concrete. The sand and gravel is excavated from a bar three miles upstream and transported to the sand and gravel plant. Telsmith not only designed the plant but furnished the machinery.

Trucks dump the material into a receiving hopper equipped with a 30 in. x 5 ft. Telsmith Plate Feeder. A 30 in. x 181 ft. Telsmith Belt Conveyor, equipped with roller bearing idlers, elevates material to the top of the plant and discharges onto a 42 in. x 7 ft. Telsmith Rail Bar Grizzly, with 3 in. openings. Material passing the grizzly drops into a wash box and is flumed to a 48 x 20 ft. Telsmith Standard Washing Screen, having a 9 ft. sand jacket with cleaning rollers, which washes and separates the sand and two sizes of gravel. Sand and water are flumed to a No. 8 Telsmith Automatic Settling Tank. Grizzly rejections and oversize from the washing screen are chuted to a jaw crusher. Crusher discharges to an 18 in. x 81 ft. Telsmith Belt Conveyor which takes crushed product back to the main conveyor.

The gravel washing plant has a steady capacity of 100 cu. yds. hourly. Screen and tank are located over a 3-compartment bin. A narrow gauge railroad runs underneath, carrying the finished product three miles to the concrete mixing plant, which is equipped with Telsmith Boquad Gates, Belt Conveyors, Screw Conveyor and Vertical Elevator.

Like most hydro-electric developments, this was an urgent job. Telsmith engineers hastened to Hot Springs to push through the drawings. Equipment was built under pressure, with the operating men calling for rush service. It was no time for fumbling . . . and there was no fumbling. The advantages of Telsmith Balanced Service were never so conspicuous.

Both gravel and mixing plants have run easily and smoothly with a steady flow of material from the time they started last July. That's not exceptional . . . it's a fixed habit with Telsmith. Bulletin No. G-26 tells why . . . *write for it.*

**TELSMITH**

**JENISON MACHINERY COMPANY**
58 Fremont Street, San Francisco

G-7

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**SMITH ENGINEERING WORKS, 1826 Holton St., MILWAUKEE, WIS.**

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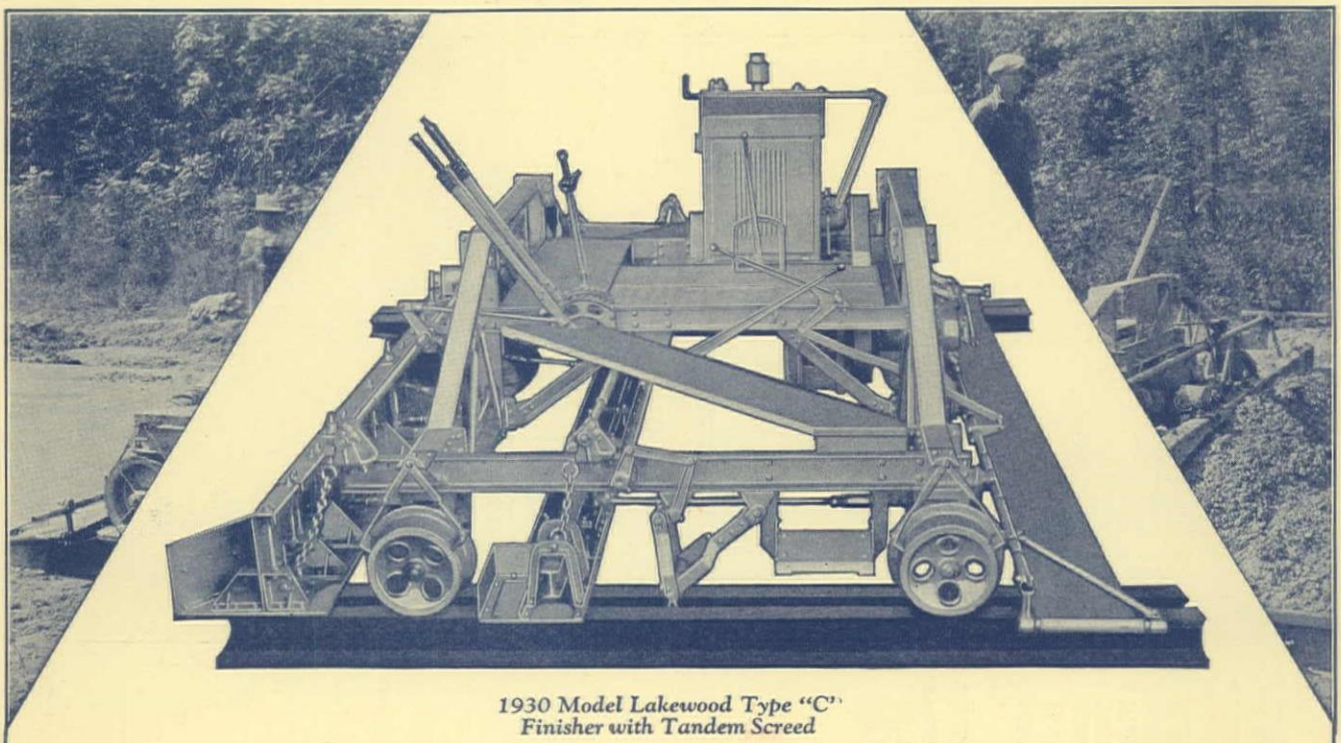
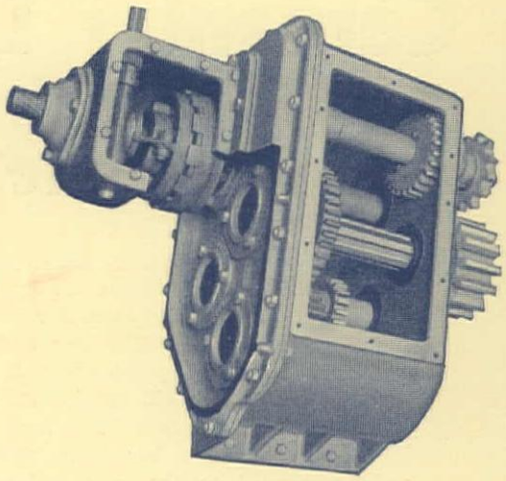


*1930 Model Lakewood Type "C" Finisher with Tandem Screed*

# 4 *years without a replacement*

## That's the Record of the main transmission of the Lakewood Type "C" Finisher



*Automotive transmission means alloy steel, heat treated gears and shafts running in oil mounted on Timken bearings.*

WITH hundreds of machines in operation all over the world - no replacement gears or shafts have ever been furnished for this gear box which transmits power to all operating parts of the machine. That record stands as silent testimonial of the value of the automotive type transmission obtainable only in the Lakewood Type "C" Finisher.

*Write for Bulletin 47*

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*The Lakewood Engineering Co.*, CLEVELAND - O.

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

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# SPECIAL
# Water Works Issue
## October 25th

## ANNUAL CONVENTION
### American Water Works Association, California Section
### PASADENA, OCTOBER 29th to NOVEMBER 1st

THE Water Works Convention issue of WESTERN CONSTRUCTION NEWS will again be entirely devoted editorially to modern methods of Water Works practice in the Far West.

Our editorial department has consistently carried on an educational campaign, editorially as well as by a selection of articles on water purification, filtration, water conservation by metering, greater distribution capacity, and adequate fire protection. In fact, WESTERN CONSTRUCTION NEWS is the only magazine, especially in the Far West, which is continually advocating water, clear and sparkling, and more of it.

It is conceded that the standing of an industry is reflected in no better way than the class of representative trade paper it supports, and with this thought in mind, we succeeded last year in giving the Water Works profession an extremely good issue that was much in demand long after the convention.

This issue will be well illustrated, and worthy of your representation in our advertising pages. It will contain an extra run for wide distribution at the convention, and will be a valuable souvenir which Water Works engineers and superintendents will want to retain in their libraries.

We urge you to let us have your space reservation at the earliest possible date so that you may have preference of position.

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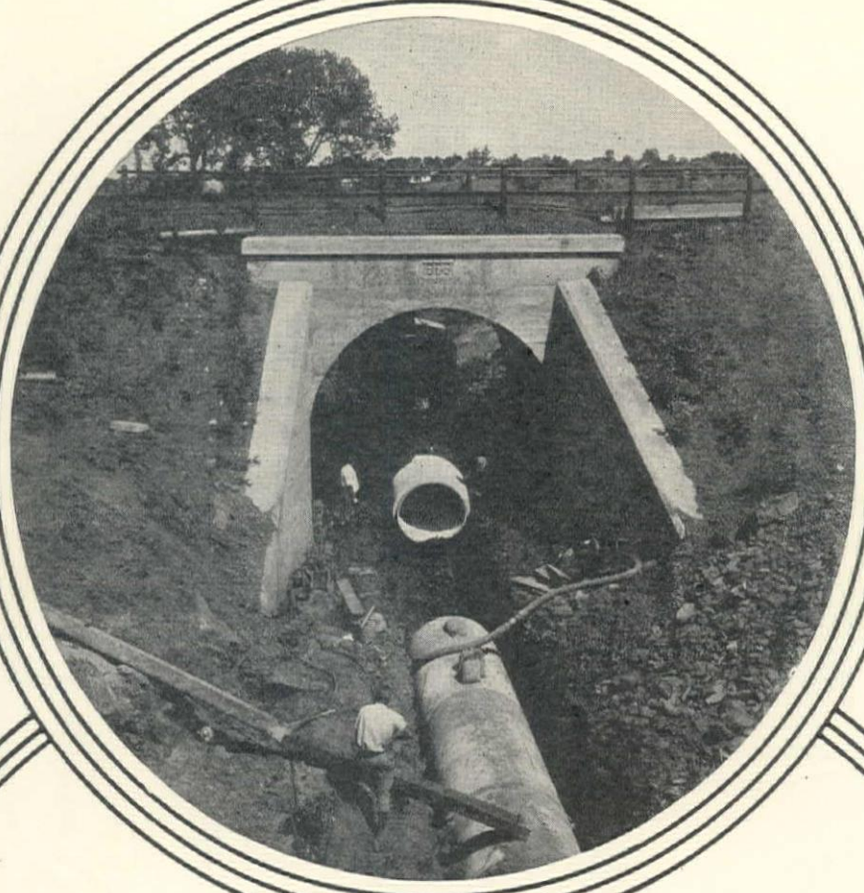

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THE ease with which we can lay Lock Joint Pressure Pipe, even under difficult conditions such as in the highway underpass depicted above, is nothing as compared with the ease with which Lock Joint Pressure Pipe lines demonstrate their capabilities to squarely and successfully meet every exacting operating condition, with undiminished mastery, as the decades add up.

Their Strength, their Water-Tightness, their remarkable Joints all help insure this highly desirable result.

Summed up, these capabilities spell Lock Joint High Potentiality.

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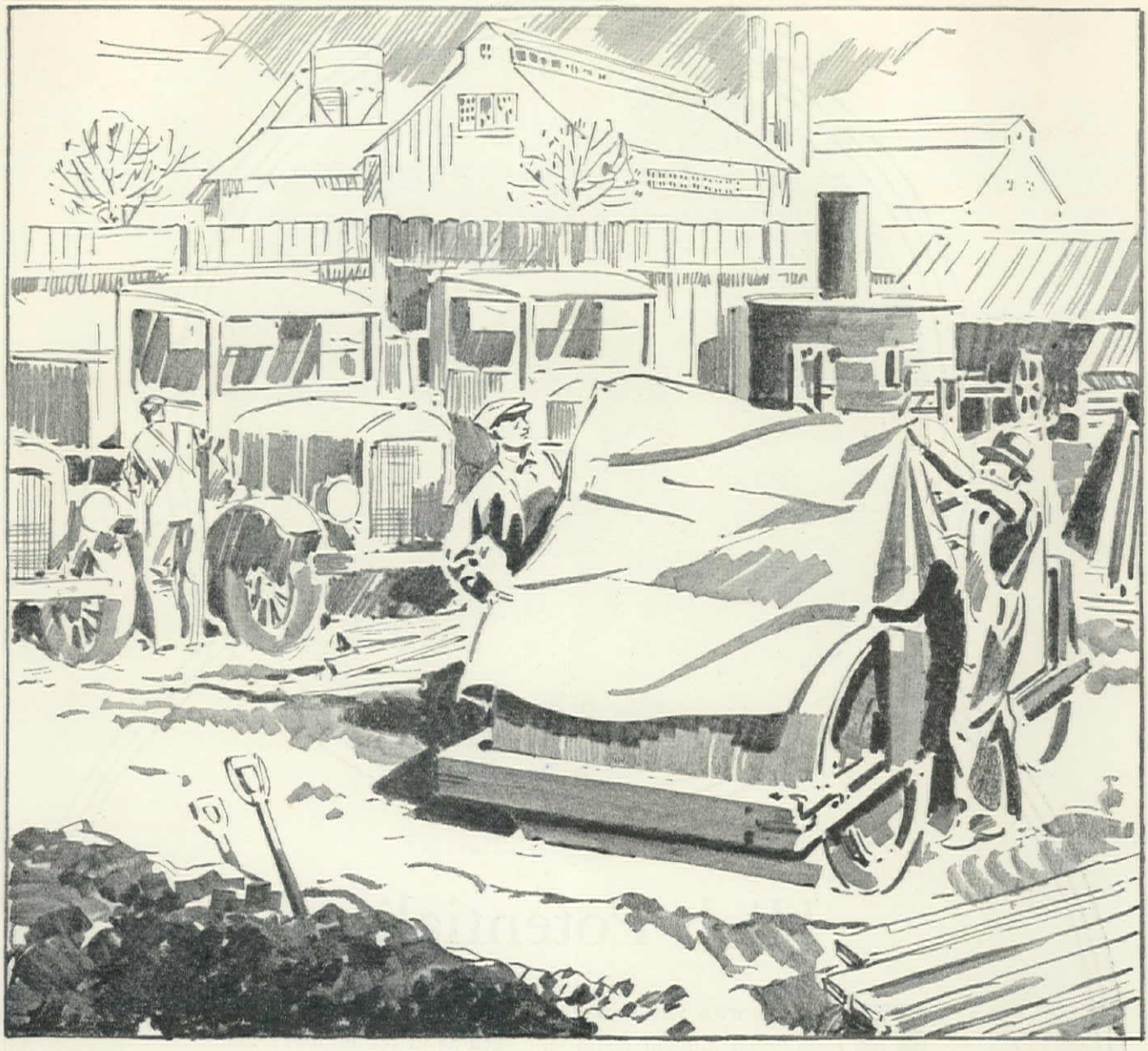

# The road-building season *isn't* over!

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

SHELL COLAS REG. TRADE MARK

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

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*Half million feet Gunite sprayed on silt levee, San Gabriel wash. Manager Cassiere says superior performance of Sullivan Vibrationless Compressors evident on concrete shooting work.*

# Compressed Air Helps Control Destructive Flood Waters

ON ONE contract alone, near Artesia, California, compressed air coated a dirt levee with a half million feet of concrete. Without this protection, the dirt would be swept swiftly away by the churning waters of the San Gabriel.

The levee is 12,000 feet long, 13 feet high,. and 8 feet wide at the top with an easy slope to the bottom.

Over the silt is laid a layer of reinforcing steel. Around this, the mix is shot with Cement Guns, operated by Sullivan Vibrationless air compressors. The concrete coat is 1½ inches thick at the crest of the levee, increasing to 3½ inches in the toe mat.

Compressors run constantly at top speed. "And on this work, where pressure is so important"—says Manager Cassiere of the Pneucrete Company—"the superior delivery of the Vibrationless Compressor is outstanding."

Smooth running, trouble-saving, fuel-saving air compressors are only one of several Sullivan contributions to more profitable contracting.


*Send for the picture book, "Speed Up with Air"*

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"up to 2 cu. yds. per minute"

*Patented

# THE HAISS is the only Loader

## with a propeller self-feeding device*

The revolving paddle self-feeding device originated on Haiss Loaders.* It and the slow-speed, worm drive, continuous crowding motion give Haiss machines a digging ability beyond competition. Think of digging into a pile of gummy, tar-bound "cold patch" as it is mixed up for road repair. *Haiss Loaders do it.* Think of excavating in a sand pit and eating into a tightly bedded gravel formation. *Haiss Loaders do it.*

Think of a machine so strong that you can put it at work tough enough to stall the 41 H. P. motor without breaking links or safety devices to protect elevator chains and sprockets. *Haiss Loaders have none.* Think of how much less it will cost you to buy a Loader that will do most work at the lowest lifetime cost per yard. *The Haiss Loader is that kind.* Better have a copy of Catalog 527 and get acquainted in detail.

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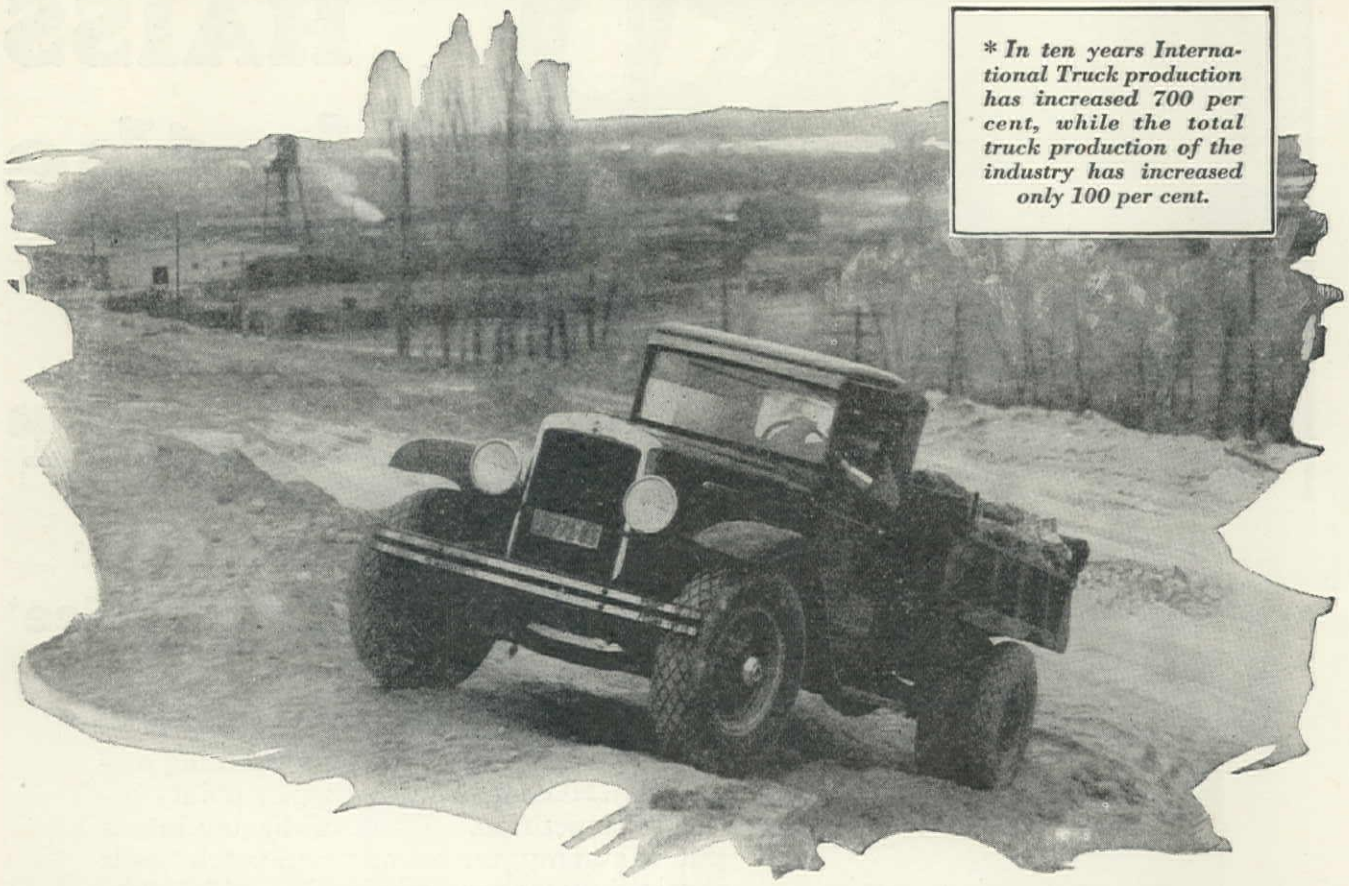
HAISS "Path Digging" LOADERS

H-669

# Topping a Remarkable Record!



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CLIMAXING International Harvester's record* of extraordinary growth and progress, comes the introduction of four new 6-cylinder Speed Trucks . . . 1½, 2, and 3-ton capacities. All have the same slim, sleek, speedy appearance, which is so much in demand today. And beneath their handsome exteriors are features of design and construction which contribute to improved performance and operating economy.

In these new models, sound engineering, extensive manufacturing facilities, and highly skilled workmen combine to advance the high standards set by other International Trucks.

The requirements of various classes of service are taken care of with a wide choice of wheelbase lengths, providing for the use of van, stake, panel, bus, dump, and tank bodies.

International Harvester branches and dealers now have these new Speed Trucks on display. Visit the nearest showroom and see for yourself the features of each model. A convincing demonstration will be arranged on request.

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**606 So. Michigan Ave. of America (Incorporated) Chicago, Illinois**

**Model AL-3 —1½ tons**

6 cylinders—4 speeds forward —138", 152", and 164" wheelbases—Spiral bevel drive.

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6 cylinders—5 speeds forward —145", 156", 170" and 185" wheelbases—Spiral bevel drive.

**Model A-5—3 tons**

6 cylinders—5 speeds forward —140", 156", 170", 190", and 210" wheelbases—Spiral bevel drive.

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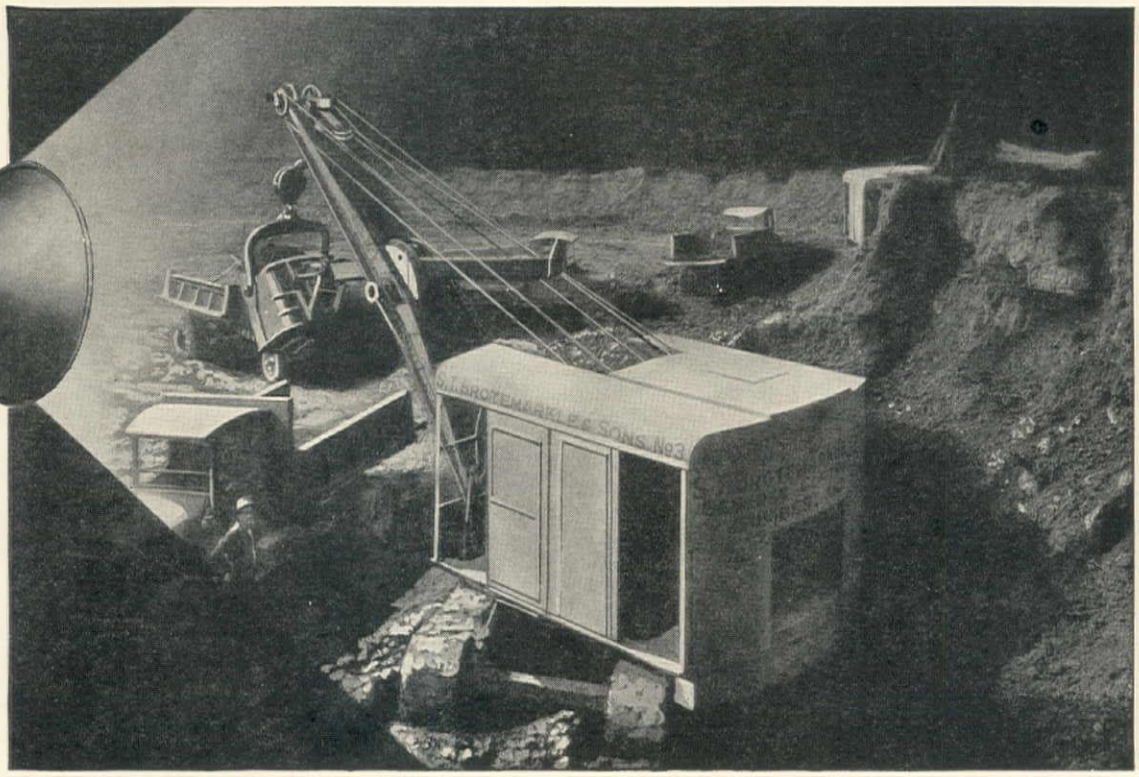
# INTERNATIONAL TRUCKS

# WHEN EVERY HOUR COUNTS

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**Carbic Flood Lights are portable. Any workman can operate them. They last indefinitely. Initial cost is low, and the operating expense is negligible. Your name and address sent in on the coupon below will bring you complete information about every model.**

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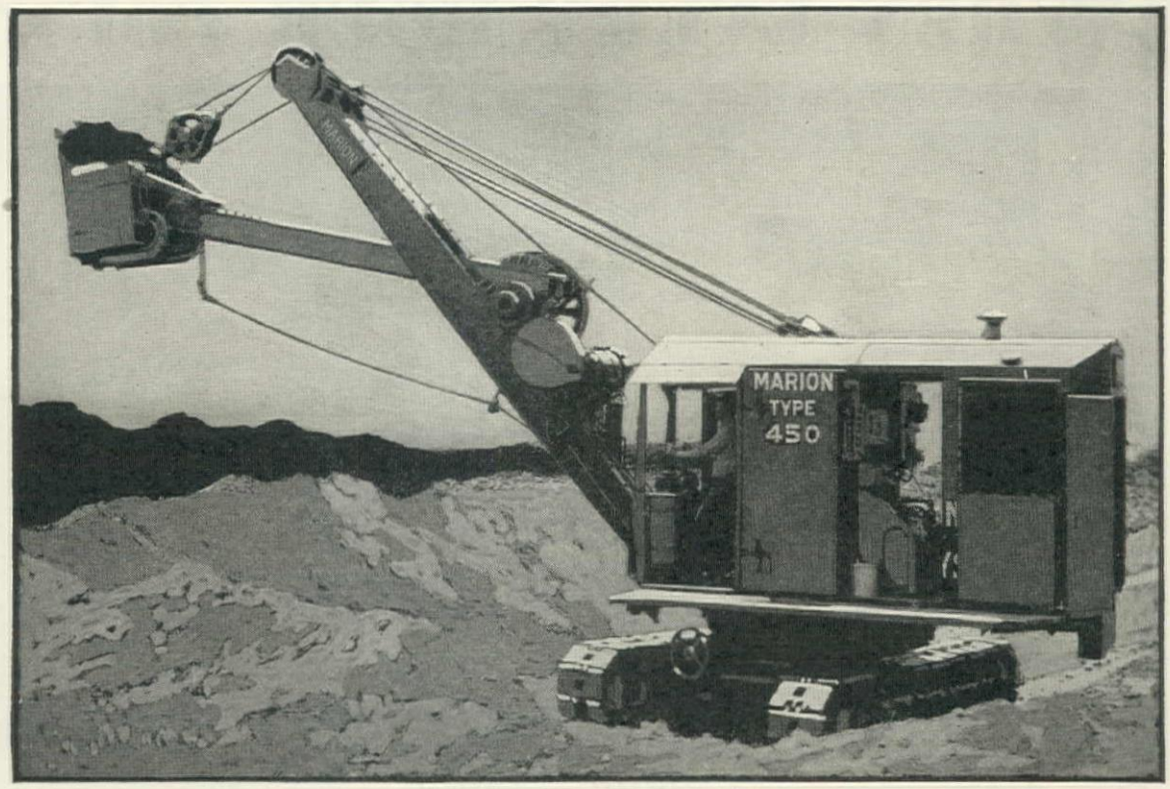


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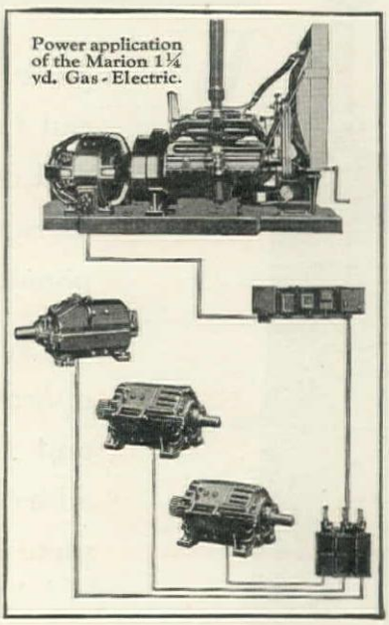
POWER is transmitted through *wires* instead of clutches on this shovel—power under control of the operator's hand—ready to out-dig and out-live any clutch-type shovel in the field. 50% of hundreds of owners operate two or more of this new-type excavator Find out for yourself, first-hand, what a 450 Gas-Electric will do for you—get in touch with a Marion man today!

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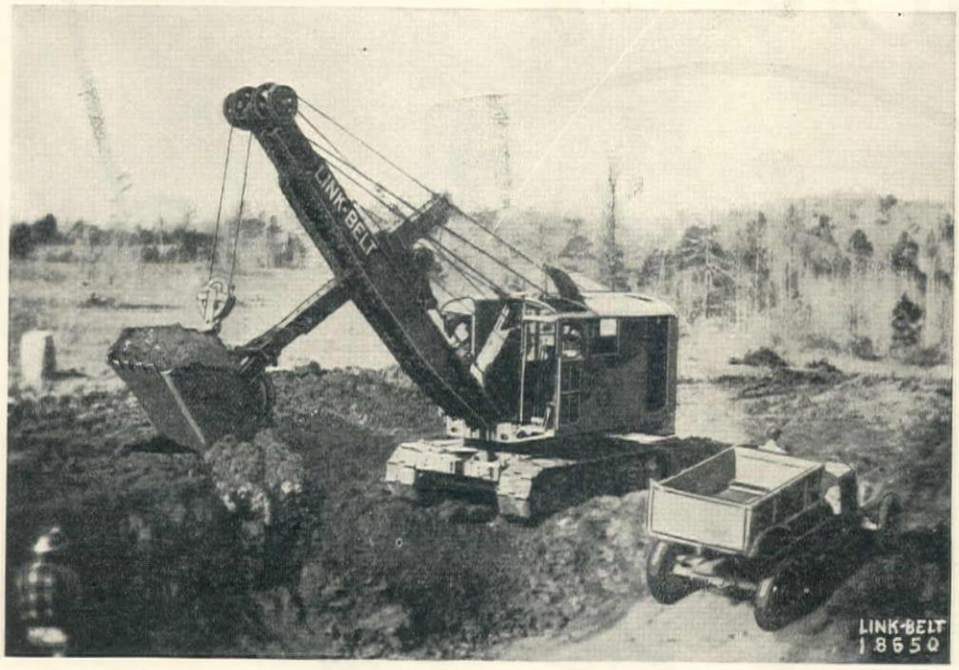
# 1106 Cu. Yds. in 10 Hours *with a 3/4-yd. Shovel*




*An average of 1,000 yards per 10-hour day is handled with one shovel and four 1-ton trucks.*

*Expert handling, instant response to controls, and a heaping-full dipper every trip, combine to increase output, lower costs.*

EVEN under the most ideal conditions, excavating 1106 cu. yds. in a 10-hour day, with a 3/4-yard shovel, is an exceptional record.

Yet the report of this Link-Belt Shovel owner, the Brackin Construction Co., Mobile, Ala., mentions that it was accomplished in spite of shallow cutting and a 2 to 1 back slope, working in a very sticky clay, or "gumbo."

The machine is a Link-Belt Type K-25, with a line-of-plate capacity rating of 3/4 cu. yds. It is being used for highway construction work in Red River Parish, Louisiana. Both the owner and operator are enthusiastic in praising their Link-Belt Shovel's speedy, dependable performance.

Send for a copy of Book No. 1095. It gives complete information about Link-Belt power shovel equipment. Address

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ASSOCIATE EDITOR

VOLUME V | SEPTEMBER 10, 1930 | NUMBER 17

Each year for the past four years we have advocated and pleaded support for the Daylight Saving Plan. The people of the state of California will have the opportunity to vote for this important measure at the state election in November, when it will appear on the ballot as an initiative measure. Daylight Saving has become practically universal in all the Eastern and middle Western states. For several years past, many of our large corporations, as well as most of the Army and Navy offices, in the Far West, have operated on the Daylight Saving Plan, much to every one's satisfaction. In spite of the fact that there is no real argument against it, it will require support to secure the necessary majority vote.

**Daylight Saving and 13-Month Calendar**

Another much-needed change in our archaic method of existence is a revision of our calendar. The present calendar of 12 months is cumbersome and absolutely unfitted to our needs. The Cotsworth 13-month calendar of 28 days has been declared about as good as can be devised. It would greatly simplify all lines of business. Here is another measure that has practically no argument against it. We hope that this will soon be put on the ballot for approval.

---

Every now and then, and all too frequently, our municipal guardians when annually harassed with the problem of setting the tax rate—ever increasing—or an empty treasury, turn to the water works as a handy source of revenue. A recent instance occurred in San Francisco when some of the Board of Supervisors, faced with an increase in the tax rate for 1930-31, suggested transferring the profits from the water department—recently acquired by bond-issue purchase from the Spring Valley Water Co.—to the general fund. After a bitter fight, it was voted to delay appropriation of profits from the water department until water rates can be reduced.

**Keep Politics Out of Water Works**

San Franciscans have voted $121,000,000 in bonds for the purchase of the Spring Valley water works and construction of the Hetch Hetchy water supply project, which must be retired in due course of time. Every dollar of revenue, therefore, should go toward paying off this indebtedness and providing a sinking fund for improvements and extensions. Also, the water rates are very high and should be reduced. Regardless of these facts, the San Francisco water department as well as all other municipal water works should be operated on a strictly business basis, and no revenues—seldom are they actually profits—should ever be diverted to other uses.

---

The long dreamed about and more recently discussed bridge across the Golden Gate of San Francisco bay looms as a reality. When preliminary plans and estimates were made a year or so ago, the discussion centered on the economic phase, and many opposed it on the grounds it would never, or at least not for many years, pay.

**Golden Gate Bridge**

Since then the picture has changed and the value of the bridge as an outlet for expansion and communication for San Francisco is the uppermost consideration. San Franciscans, many times criticized for being slow to act, nevertheless 'come through' when the occasion demands, and it will not be surprising to see a record vote in November in favor of the $35,000,000 bond issue, 85% of which is San Francisco's share.

The Golden Gate bridge project is described in detail in this issue.

---

A record to be proud of has been made by the Southern Pacific Co.—'During the last ten years no passenger has lost his life in a steam-train accident on the Pacific lines of the Southern Pacific'. When we take into consideration that 404,709,492 passengers were carried a cumulative distance of 15,915,677,462 miles, this record in comparison with automobile, street railway, and pedestrian traffic, seems almost unbelievable. The nearest approach is the air-mail passenger service, which has a remarkable record, especially considering its infancy.

**Traffic Safety**

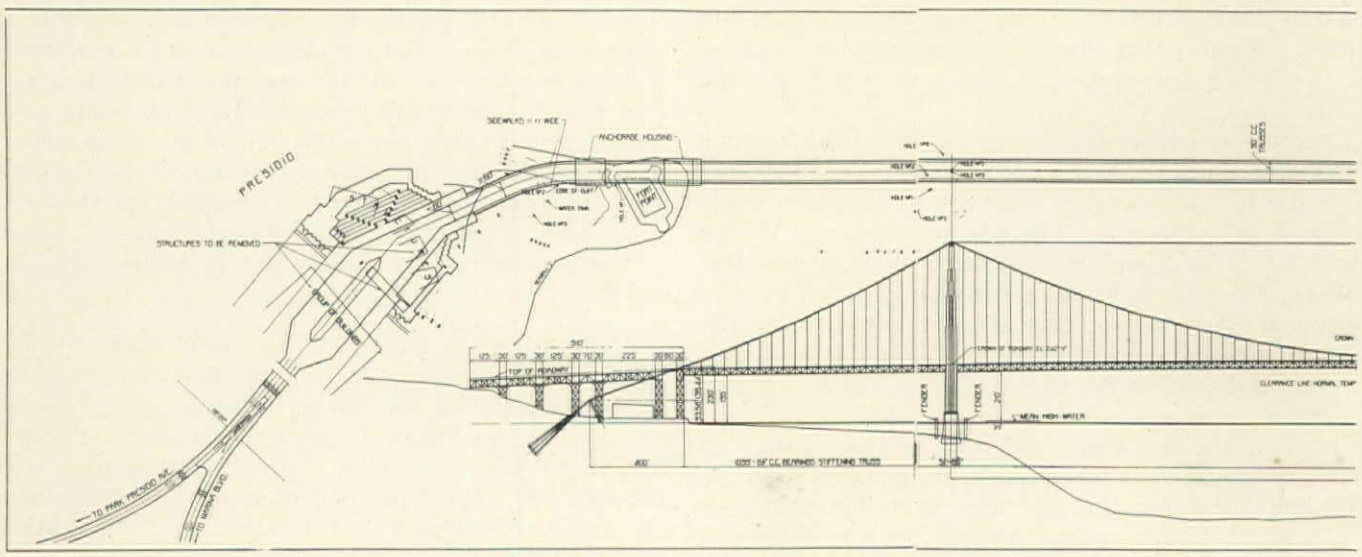
As stated in the Southern Pacific Bulletin for April —"Railroad safety depends on the perfect functioning of many human and mechanical factors. Modern equipment, solid roadbed, and the longest automatic block system maintained by any railroad in the world, could not achieve such a safety record if it were not for the all-important human element, the part played by every individual railroader".

The traffic problem of the present day is the rapidly mounting auto toll on our streets and highways. Here again the human element is all-important. As there can be no coordination and cooperation among automobile drivers, such as was achieved by the Southern Pacific personnel, the solution is still more difficult. Here again the engineer must play a big part.

# Golden Gate Bridge for San Francisco Bay

***Final Report Made on Suspension Bridge with 4200-ft. Main Span—Government Approval Obtained—Bond Issue for $35,000,000 in November, 1930—Joseph B. Strauss is Chief Engineer***

For over fifty years a bridge across the Golden Gate between Fort point in the Presidio of San Francisco and Lime point in Marin county has been a northern California dream and the talk of engineers throughout the world. During the past eight years this project has been actively studied. A design has been developed and plans prepared for a suspension bridge between these points, a bridge and highway district has been created by the State of California to build and operate the structure, a War Department permit granted, and a $35,000,000 bond issue prepared for the approval of the voters of the District in the November 4th election of this year. The report of the chief engineer has just been issued and is a most interesting and enlightening document. The following data have been taken from this report with the consent of the chief engineer.




The Golden Gate bridge will be the only bridge connecting two United States military reservations, authorized by Government grant to terminate on United States property, and being designated as a direct aid in military operations. It will be the first bridge in the world to span the outermost entrance to any great harbor and will be an aid to navigation, serving as a marine grade crossing to reduce the peril attendant on congested ferry service. It will be a beautiful and inspiring structure, using vertical lines —the first application of the modernistic treatment to bridge architecture.

**Historical** — In 1922, M. M. O'Shaughnessy, city engineer of San Francisco, invited Joseph B. Strauss, president and chief engineer of the Strauss Engineering Corp. of Chicago, to undertake a study of this bridge project. Preliminary surveys and soundings were made by the city and county of San Francisco and a practical project with preliminary plans and estimates was compiled and verified by Strauss. In March, 1924, an application (joined in by Marin county) was made for a provisional War Department permit on the basis of these plans and the formal hearing was held May 16 of that year. General authority was granted by the Secretary of War on December 20, 1924, for a bridge in substantial compliance with the application plans, provided certain stipulations were met. These stipulations included: (1) bridge to be turned over to Government in time of war, (2) bridge to be toll-free to Government at all times, (3) military work affected to be replaced, etc.

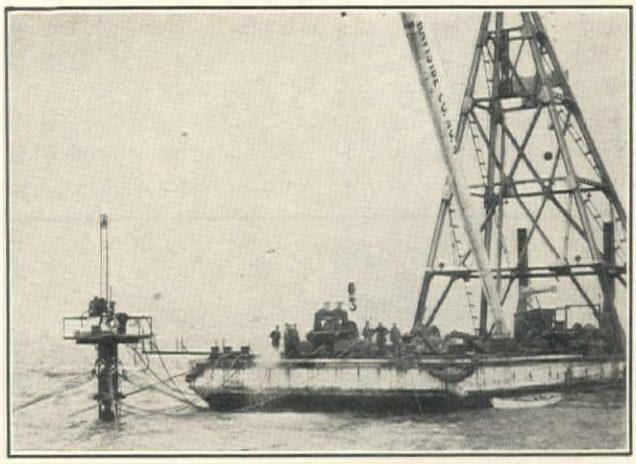
For the ensuing five years, litigation testing the validity of the legislation creating the District was conducted, with a victory for the District in every court, including the Supreme Court of the United States. At the close of the litigation, the Golden Gate Bridge & Highway District (comprising San Francisco, Marin, Sonoma, Napa, part of Mendocino, and Del Norte counties) was organized December 3, 1928, under the Bridge and Highway Act of California, and a non-profiting public corporation was formed, officers and directors being appointed and William P. Filmer of San Francisco named president. Joseph B. Strauss was appointed chief engineer of the district on August 15, 1929, and the following consulting engineers were named to cooperate with him: O. H. Ammann and Leon S. Moiseiff, New York City, and Charles Derleth, Jr., Berkeley (see August 25th, 1929, issue, p. 440). A local engineering office was established, the field work initiated, and a contract let for the diamond drill borings to determine the exact character of the sub-

strata. Based on these data, the final detail plans were submitted to the District for approval in May, 1930.

An additional public hearing on these plans was held June 30 and July 1, 1930, in San Francisco before a board of army engineers appointed by Patrick J. Hurley, secretary of war. This board included Thomas M. Robins, lt.-col., William H. Lanagan, major, and Eli H. Ropes, major, all of the Corps of Engineers. At this hearing civic bodies unanimously urged construction of the bridge. Shipping interests contended for a 250-ft. central clearance with 225 ft. at the piers, whereas revised plans submitted for the hearing showed 220 ft. central and 210 ft. pier clearances. The Secretary of War authorized construction on the basis of designs submitted (10 ft. higher than the original designs) and a permit was granted August 11. This permit stipulated that the bridge should be begun within three years and completed within seven years thereafter.

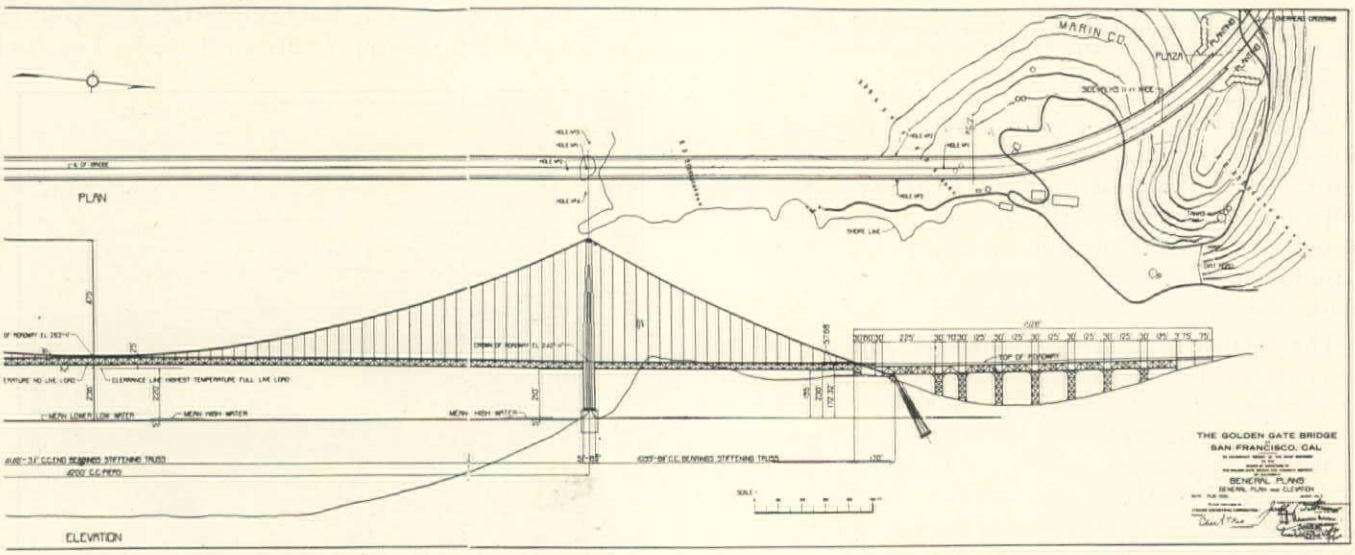
The full general plans and estimates forming part of the final report of the chief engineer of the district were made public August 28, and work is now being rushed to place the project on the November ballot.

**Need of Bridge**—Nature has given San Francisco a natural land-locked harbor 40 miles long and with



E. J. Longyear Exploration Co. Taking Diamond Drill Borings for Golden Gate Bridge

Bridges are inseparably identified with the world's progress as the signposts of civilization. Ferries, which are now San Francisco's chief means of outlet to the north and east, are the second stage in an evo-




many port sites. The area of this harbor is greater than that of the combined harbors of Adelaide, Halifax, Havana, Liverpool, New York, Perth, Sydney, and Vancouver. San Francisco is at the tip of a long and narrow peninsula, invested by water on three sides and cut off from the mainland by mountain barriers on the south. Isolated as is no other great city, adequate passages across the bay are urgently needed. Some of these bay passages have been built—Carquinez, Dumbarton, San Mateo-Hayward, and Antioch bridges—and these are supplemented by ferry service at other points. The Golden Gate bridge is the next crossing to be made ready and it will be immediately followed by the San Francisco-Oakland bridge and the Richmond-San Rafael bridge.

It has been aptly said that the life course of society is maintained by four great circulatory systems—railway, automotive, maritime, and aerial. The first two systems require rights-of-way and roadbeds — they require continuity. Continuity means bridges, and bridges, therefore, are an integral part of society.

lution from the fording to the bridging of the bay. Only bridges can be built wide enough for great traffic and cheap enough for common use.

The need of a community is traffic bringing more people, transient and permanent, and increasing the market. Creation of a new traffic artery is an obvious need, since improvement of facilities greatly stimulates traffic flow. The multiplication of traffic links between contiguous centers materially stimulates growth and well-being of the communities. Time and cost of travel, and not artificial boundaries, limit the extent of metropolitan areas. The motor vehicle density of a community depends on the average purchasing power of its inhabitants and opportunity for use.

The Golden Gate bridge has as its tributary area the entire Pacific coast west of the Sierra Nevada and Cascade mountains. It would convert the Redwood

and Pacific highways into through trunk lines, providing a continuous route along the narrow coastal strip from Mexico to British Columbia for all-year traffic. Also, it would make more attractive the so-called 'triangular' transcontinental auto tours and would furnish a belt line connecting San Francisco with the communities of the East Bay.

**Finance**—The Golden Gate bridge will be a public bridge operated on a toll basis until the required bond issue is retired. It will be built on the basis of a users' tax, thereby relieving the local taxpayer of the burden. It would operate on the same plan as water and irrigation districts, and would yield both direct and indirect returns. Examples of similarly financed and successfully operated public toll bridges are the Interstate bridge over the Columbia river, the Philadelphia-Camden bridge, and the Arthur Kill bridge in New York state.


Section of Hudson River Bridge Cable Weighing 30,000 lb. in Hydraulic Press Under 720 Tons Pressure. Similar Cables Proposed for Golden Gate Bridge

The estimated cost of the bridge and approaches, as made by the chief engineer and later independently verified by the consulting engineers, is $32,815,000. The engineering fee is 4% on the cost of the physical structure, less approaches. A budget for the past fiscal year of $300,000 was secured from a six-county tax levy of 3¢ per $100 assessed valuation (see August 25th, 1929, issue, p. 434). At a meeting in August, 1930, the directors of the district voted an additional 2¢ levy, raising $160,000 for preliminary expenses and setting aside $90,000 of this sum for the proposed bond election. The funds so secured pay for all the engineering, legal, and other costs of the District since the date of organization and up to the bond election.

The total bond issue to be voted is $35,000,000. Only $32,000,000 will be issued. This amount, with premiums, will cover the construction. The $3,000,000 unissued will be maintained as a reserve. With estimated total earnings of $110,942,800 for the 40-year period of the bond issue and estimated expenditures for redemption, interest, and upkeep of $93,700,000, the accumulated reserve would be $17,242,800. Starting with an average toll 15% less than the present ferry rates, it is estimated that tolls for the last 10 years could be reduced to a minimum of 25¢. Public sentiment, as evidenced by the last hearing and by a straw vote of a San Francisco daily newspaper, is overwhelmingly favorable to the bond issue and to the early construction of this important project.

**Field Studies**—Surveys by the chief engineer were started September 10, 1929, and completed early in 1930.

The contract for the diamond drill borings was awarded to the E. J. Longyear Exploration Co., Minneapolis, for $29,640, and work was begun November 25, 1929. Boring operations were hampered and delayed by abnormal weather conditions but were satisfactorily completed on February 25, 1930 (see issue of that date, p. 50). Three holes were put down at the south or San Francisco anchorage, six at the south pier site, four at the north or Marin pier site, and three at the north anchorage. The penetration of these holes varied from 15 to 141 ft. in rock, depending on the character of the foundation.

Supplementing the borings, a pressure test conducted on a typical exposure of serpentine at Fort point showed a supporting strength of 32 tons per sq.ft., whereas the piers are designed for a maximum of 14 tons. This test was run between February 25 and March 5, 1930, using a 10-ft. diameter pit excavated to high-water level and a 20 by 20-in. post supporting a platform and water tank. With the tank empty, the weight was 12 tons and settlement 0.005 ft. to firm bearing pressure. Other settlements observed were as follows: 22 tons—0.007 ft., 32 tons—0.009 ft., 42 tons—0.012 ft., 57 tons—0.015 ft., 72 tons—0.017 ft., 92 tons—0.021 ft., 12 tons (after unwatering)—0.013 ft.

Pressure Test on Serpentine Exposure at Fort Point, Presidio

Andrew Lawson, professor of geology at the University of California, who was appointed by Strauss as consulting geologist, reported on the bridge foundation as follows:

South anchorage—in serpentine in rather badly sheared condition, with feeble coherence and very low tensile strength. Anchorage will have to be designed to depend on dead load.

South pier—on serpentine not uniform in strength. Rock has increased in volume by hydration and suffered internal shearing and now consists of an aggregate of ellipsoids or

spheroids of strong rock embedded in a matrix of sheared rock of very small strength.

North base—on compact, fine-textured intrusive greenstone locally recognized as diabase and containing numerous inclusions of radiolarian chert. A shear plane traverses the islet on which the pier is located, dipping north about 20 deg. Rock is strong and amply sufficient to support the pier, the load of the latter being about 200 lb. per sq.in.

North anchorage—in excellent rock, part sandstone and part greenstone of the nature of diabase.

Traffic studies were made by Sydney W. Taylor, Jr., appointed by the chief engineer as traffic engineer. His figures show that traffic on the Golden Gate ferries will be 1,927,800 vehicles and 5,242,100 rapid-transit passenger trips in 1935 at the time the bridge could begin operation. Vehicular and commuting traffic, plus concessions, would at the end of the first year of operation and disregarding stimulation, pay interest on the total bond issue, pay all operating expenses for the year, repay the preliminary fund obtained by tax

Chief Engineer and Consultants Make Field Inspection for Golden Gate Bridge. Left to Right—O. H. Ammann, Chas. Derleth, Jr., Andrew Lawson, Joseph B. Strauss, and Leon S. Moiseiff

levy, and leave a balance of $183,850. Using toll schedule C from Taylor's studies (84.3¢ average per vehicle) and an annual traffic volume of 2,142,950 vehicles in the first five years of bridge operation, the gross yearly revenue from this service is $2,142,450. On the basis of growth increase over a forty-year period, the total earnings are estimated as $110,942,800.

**Bridge Design**—The distance between Fort point in the Presidio of San Francisco and Lime point in Fort Baker, Marin county, is 5310 ft.—the narrowest crossing available. The bridge proper is 6400 ft. end to end with a center span of 4200 ft. (700 ft. longer than the new Hudson river bridge), two side spans of 1100 ft. each, a 1582-ft. viaduct on the south, a 910-ft. viaduct on the north, and approaches. The total length of the main bridge between plazas is 8943 ft. The clearances are 4105 ft. horizontally between piers and 220 ft. vertically above m.h.w. at the center

The Golden Gate is about 360 ft. deep at the center of the channel (see general plan and elevation), but a shelf at a depth of 55 to 65 ft. extends 1000 ft. out from Fort point. The south main pier rests on this shelf with its base 80 ft. below the water. The north main pier rests on a projecting rock—use of the land pier on the north being made possible by increasing the length of main span from 4000 ft. to 4200 ft.

The cross-sectional width center to center of cables and trusses is 90 ft. A 6-lane roadway and two 11-ft. sidewalks will meet current and early traffic demands. The bridge roadway can be widened as traffic increases, and another deck may even be added. (A study has been made on bus service and rapid transit). Aside from the cables, the bridge will contain 75,000 tons of structural steel and the foundations and anchorages will require 110,000 cu.yd. of concrete. The towers are 740 ft. above m.h.w., with glass-enclosed observation platforms at the tops, reached by elevators. These towers would command a birdseye view of 27½ miles.

The two main steel cables will each be 7700 ft. long, weighing 43,750,000 lb. when wrapped. Each main cable will contain 27,600 individual strands, eye-bars being provided at the anchorages. The sag at the center of the span is 475 ft.

Surveys of approach roads including alignment, topography, and cross-sections, have been made. These approaches will have easy grades and curves, no tunnels, and a highly scenic location. They make approved connections to trunk lines of the California Division of Highway on both sides and to secondary lines and local county roads.

The bridge is designed for a maximum traffic capacity of 260,000 vehicles per day, or five times that of the heaviest trafficked bridge now in operation. Its estimated earnings are based on a capacity of but 5870 vehicles per day. Construction of the Golden Gate bridge would effect an average time saving in commuting traffic of 53 minutes per round trip.

## WESTERN PACIFIC RAILROAD

The Utah Construction Co. and W. A. Bechtel Co., joint contractors on the 112-mile W.P.-G.N. railroad connection between Keddie, California, and the Bieber yard, were awarded this contract by the Western Pacific Railroad Co. as they are particularly well fitted from past experience to complete this rough-country job within the time specified (see July 10th, August 10th, and August 25th issues for details of project). They have divided the project into various sections and awarded the following subcontracts for clearing, grading, and structures:

Keddie to Mile 4—Morrison-Knudsen Co., Boise
Mile 4 to Mile 8—Paul J. Tyler, Oroville
Mile 8 to Mile 15—Lewis Construction Co., Los Angeles
Mile 15 to Mile 19—Paul J. Tyler, Oroville
Mile 19 to Mile 23—Utah Construction Co., San Francisco
Mile 23 to Mile 25—W. A. Bechtel Co., San Francisco
Mile 25 to Mile 40—Heiselt Construction Co., Salt Lake City
Mile 40 to Mile 78—Lewis Construction Co., Los Angeles
Mile 78 to Mile 96—Fredrickson & Watson Construction Co., Oakland
Mile 96 to Bieber—W. H. Puckett Co., Boise

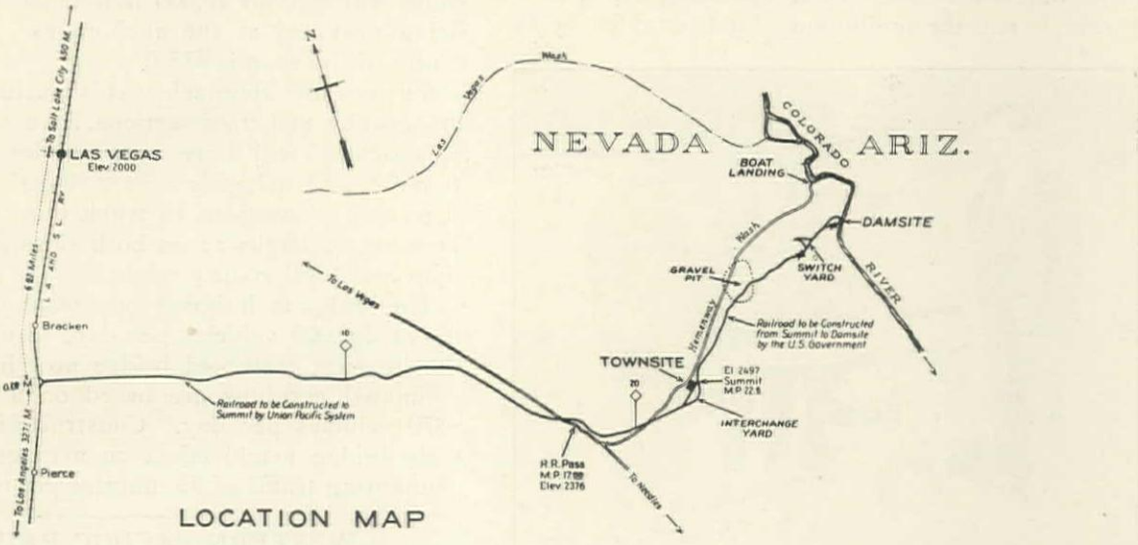
Laying of ties and rails, and ballasting will be arranged for later.

**Errata**—'Hayward-Niles Highway', August 10th, 1930, issue, p. 376 (near bottom). U. S. Steel Products Co. furnished reinforcing steel for this project—not Soule Steel Co., as stated.

# Boulder Dam, Colorado River

**Inauguration Ceremonies**—On September 17, commencement of construction of this $165,000,000 project will be fittingly celebrated by the ceremony of turning the first dirt with a gold pick and shovel on the construction railroad near Las Vegas, Nevada.

**Boulder Dam Construction Railroad**—The Union Pacific Railroad received bids on September 5 for the construction of 22.71 miles (schedule 1, 'L' line) of the Boulder dam branch construction railroad from Bracken junction on the Los Angeles & Salt Lake railroad (7 miles south of Las Vegas, Nevada) easterly toward the damsite to a point called Summit. This contract will also include 5.16 miles of secondary trackage.



LOCATION MAP

From Summit (also the townsite and interchange yard) the remainder of the railroad to the damsite in Black canyon (Schedules 2, 3, 4, and 5) will be built by the Bureau of Reclamation under contracts soon to be advertised. Schedule 2, of the 'L' line, from Summit to dam terminal, is 7.69 miles, including the loop at the terminal and 1.02 miles of secondary track. Schedule 3, the 'LA' line or Hemenway Wash branch, 5.75 miles, includes 0.57 mile of secondary track at the townsite. Schedule 4, Hemenway Wash branch, canyon section, is 2.11 miles, including 0.57 mile of secondary track. Schedule 5 is the incline or funicular railroad to the damsite.

There are three tunnels between Bracken junction and Summit, 810, 155, and 610 ft. long.

The Boulder dam railroad crosses two summits as shown on the accompanying map—Railroad Pass, elev. 2376 ft., and Summit, elev. 2497 ft. The maximum ascending grade from Bracken to Summit is 1.35%. From Summit to the canyon wall the descent is rapid, the maximum grade being 5.12%. It will be necessary to change to a different type of locomotive at the interchange yard at Summit.

The Hemenway Wash covers an area 10 miles long by 2 miles wide, where satisfactory aggregates for concrete will be obtained. The railroad 'LA' line (schedule 3) crosses this wash and descends to river level 1.67 miles above the damsite, at elev. 700 ft., or probable maximum high-water. A 2.11-mile extension (schedule 4) will be built down the canyon to the lower tunnel portals, which will include 10 timber trestles, total length 680 ft., and 11 tunnels, total length 995 ft. The 'LA' line will also be used to haul 4,670,000 cu.yd. of excavated material from the damsite and tunnels during the first years of construction.

The funicular or incline railroad will be patterned after the one used so successfully at the Diablo dam, near Seattle. It will be 1288 ft. long, 50 ft. wide between outside rails, and drop from elev. 1425 ft. to 690 ft. on a grade of 0.693. The funicular cars will have platforms 14 ft. wide, capable of transporting loaded freight cars, as well as men and loose materials.

The Boulder dam railroad will have to handle the following quantities of equipment and materials: Cement, 1,000,000 tons; reinforcing and structural steel, 14,000 tons; conduit lining, penstocks, pumps, piping, etc., 17,000 tons; gates and valves, 10,000 tons; electrical equipment, 20,000 tons; hydraulic equipment, 8000 tons; concrete aggregates, 7,320,000 tons; construction equipment, 253,000 tons.

**The townsite** will be laid out in a most comprehensive manner, with all modern municipal improvements, to accommodate between 4000 and 5000 people; and will be permanent. An appropriation of $525,000 has been provided for the town and highway to the damsite. Contracts for construction of utilities, etc., will soon be advertised. Town lots can be leased from the government.

**Electric Power**—An appropriation of $1,750,000 was also voted by Congress for electric power for construction, either by building a long transmission line or temporary power plant.

# Weiser, Idaho, Water Treatment Plant

## *Rapid Sand Filtration of Snake River Supply—New Intake Line*

By MAX C. BARTLETT
*Associate Engineer, Burns-McDonnell-Smith Engineering Company, Los Angeles*

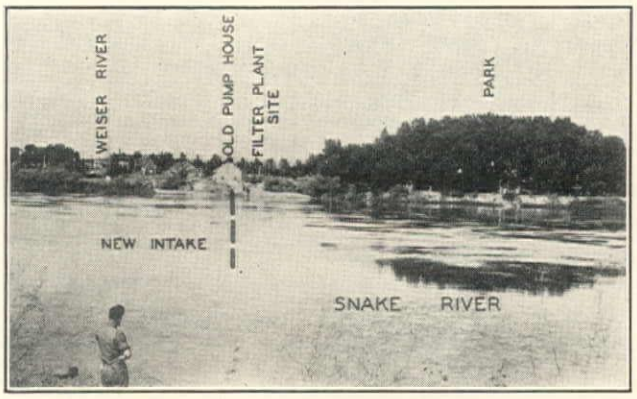
Filtration of the Snake river water supply, after aeration, coagulation, sedimentation, and chlorination will be accomplished in the water treatment plant now under construction by the city of Weiser, Idaho.

Situated on the bank of the river, the city has taken its supply direct, with no treatment other than chlorination. Extreme turbidity of the water and unpleasant tastes and odors from algae growths and vegetation have been the cause of numerous complaints from citizens and tourists, and unfavorable publicity for the city for many years. In 1919, the city employed the Burns-McDonnell-Smith Engineering Co. to study the problem and report on the possibility of the sources of supply and treatment of the river water. An investigation of all streams in the region showed that insufficient flow, poor quality of water, difficulty of securing water rights and cost of long pipe-lines required, eliminated all possibility of a surface supply other than from Snake river. Available logs of shallow wells and wildcat oil wells, and study of geological formations of the area, all tended to show that a well supply could not be developed. The Snake river offered an abundant supply of water, which could be made safe and palatable by treatment with proven methods, and the engineers recommended the continuance of the river supply and the construction of a filtration plant for water treatment.

Due to unfamiliarity with results which might be secured by water treatment, the citizens at that time refused to consider any expenditures for betterment of the river supply. During the next ten years, various schemes were proposed for securing another supply, none of which materialized, and in 1928 the city authorized some 1500 ft. of test drilling in a vain attempt to locate a well supply. In the meantime, the neighboring city of Lewiston had constructed and placed in operation a modern filtration plant to treat its water supply from the Clearwater river. The excellent results obtained from this plant, as certified by the State Sanitary Engineer, the universal satisfaction of water users, and the general benefits and favorable publicity accruing to Lewiston from its pure water supply during five years of operation demonstrated to the city of Weiser the advantages of water treatment.

Accordingly, the civic clubs, service clubs, and city officials began a campaign to familiarize the citizens with water filtration and what pure water would mean to them. As a result of this campaign, at a special election held on February 25, 1930, the voters authorized the issue of $64,000 in bonds to cover the cost of constructing a filtration plant and necessary improvements of existing supply works. Twenty-year bonds bearing 5¼% interest were sold, plans were prepared, and contracts for construction and equipment were awarded on June 24, 1930.

**Improvements to Supply Works**—The present supply is obtained through a 12-in. universal joint cast-iron pipe extending 450 ft. into the Snake river. Water flows by gravity through this pipe into a concrete sump where it is chlorinated, and pumped to the city mains and reservoir. Due to the fact that lower stages of the river may be expected in the future, it was considered necessary to lay a new 12-in. cast-iron intake line into this sump at a lower elevation and to extend this new line 50 ft. farther into the main river channel. Work is now under way on this intake, which is being laid in a trench in the river bottom. The last 30 ft. of




Site of New Intake Line and Filtration Plant for Weiser, Idaho, Looking Across Snake River from Oregon Bank

pipe is perforated with ½-in. holes, and the end screened with a 4-mesh no. 9 bronze screen.

**Filtration Plant**—The filtration plant has a designed capacity of 1000 g.p.m. and is so arranged as to permit operation at 500 g.p.m. if desired.

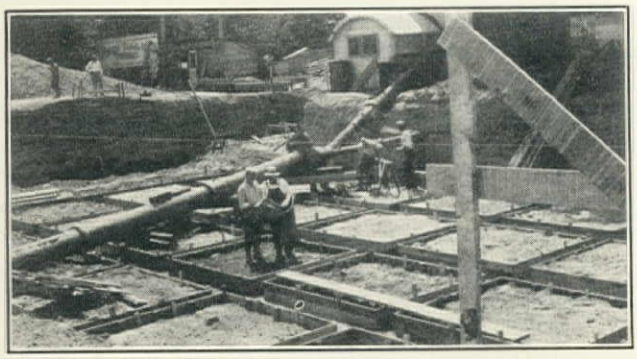
Water will be pumped by low service pumps from the intake sump into an aeration basin, having a 5-min. detention period. The basin is baffled to prevent short circuiting, and air under 2 lb. pressure will be introduced into the water through porous filtros plates, enabling the operator to secure thorough aeration and remove objectionable tastes, odors, and gases. Immediately above the aeration basin is the chemical feed machine floor, on which are mounted two dry-feed machines to introduce the desired amount of coagulating chemicals into the water. Machines will be charged through extension hoppers from the chemical storage floor above. Coagulants may be applied to the water at any point in the aeration basin, or may be applied as the water leaves the aerator and enters the mixing tank. An enclosed chlorine room, also on the machine floor level, will house chlorinating apparatus so arranged as to allow prechlorination of the raw

water, application of ammonia if desired, and final chlorination of filter effluents.

The mixing tank is 15 ft. square by 12 ft. deep, giving a retention period of 20 minutes. It will be equipped with a Dorr impeller agitator to insure thorough mixing of the water and assist in coagulation and floc formation.

From the mixing tank, water will flow to two settling basins, giving a combined sedimentation period of 4 hours. The basins are so baffled as to give a length of water travel of 136 ft. from inlet to outlet weir. Sludge will be flushed to the river through 10-in. cast-iron drains.

After sedimentation, water will pass to the two filter units, each 15 by 17 ft. in plan. The filter beds will be built up of 18 in. of gravel, overlaid with 30 in. of filter



Weiser Filtration Plant. Excavation and Footings for Settling Basins in Foreground, with Excavation for Pipe Gallery and Clear Well in Background

sand, and provided with a cast-iron underdrainage system. Two wash troughs will be provided for each unit.

The effluent from the filters will pass through rate controllers into a channel where chlorine dosage will be applied, and then to the clear well, or filtered water storage well, beneath the filters and aerator basin. This clear well will have a capacity of 37,000 gal., providing water supply for washing filters, and acting as an equalizing reservoir between the filters and the high service pumps which supply filtered water to the distributing system. Pressure for washing filters will be furnished by a 5000-g.p.m. direct-connected centrifugal pump.

**Chemical Handling and Storage**—The bags of lime and alum used as coagulants will be trucked from railroad cars to the filter plant, placed on transfer platforms, and raised by an electric hoist to the chemical storage floor, above the feed machine floor.

**Pumping Equipment**—Present pumping equipment consists of two motor-driven triplex pumps and one 500-g.p.m. direct-connected Byron-Jackson centrifugal pump. The condition of the triplex pumps, after long service in pumping muddy and gritty river water, was such that it was considered economical to discard them in the new layout. The Byron-Jackson unit is in good condition and will be used in the new installation.

New De Laval pumping units direct-connected to Westinghouse motors will be installed as follows:

One 500-g.p.m. low-service pump; one 1000-g.p.m. low-service pump; one 1000-g.p.m. high-service pump; one 5000-g.p.m. wash-water pump. Pumps will be installed on the basement floor of the new building and will be primed by means of connections to a vacuum pump. Blowers for furnishing air to the aeration basin will be placed on this floor, as well as pipe gallery piping and valves, the heating plant, and coal storage bin. Pumps, blowers, and primer will be controlled by push-button stations conveniently grouped on the operating floor above.

**Operating Tables, Gauges, and Meters**—Control valves will be hydraulically operated by levers mounted on operating tables. The usual loss-of-head gauges, clear-well gauge, sampling devices, rate-of-flow indicators, meters, and pressure gauges will be conveniently placed for guidance of the operator.

**Plant Building**—The plant is located on a small island between the Snake and Weiser rivers, and will be immediately in front of the entrance to an attractive amusement park which occupies the upper half of the island. The building will be of brick, with metal sash, and asbestos shingle roofing, presenting a neat, substantial appearance. An office, a laboratory, and a toilet room are provided at one end of the operating floor.

**Cost of Plant**—The total cost of the improvements is $60,000, divided as follows: General contract for river intake and construction of filtration plant, awarded to Reader & Lower, of Weiser—$47,153.

Pumping equipment, awarded to De Laval Steam Turbine Co.—$3565.

Filter equipment, awarded to McFarland Engineering Co., Kansas City, Missouri—$9282.

Simplex rate-of-flow controllers and gauges, Omega chemical dry-feed machines, Rensselaer valves, and Connorsville blowers and vacuum pump will be installed. Cast-iron pipe and fittings are being supplied by the American Cast Iron Pipe Co. and meters are being furnished by the Builders Iron Foundry Co. Wallace & Tiernan chlorinating equipment, now in use, will be moved to the new plant.

The Burns-McDonnell-Smith Engineering Co., of Los Angeles and Kansas City, are designing and supervising engineers, and Lyle Wood is city engineer and water superintendent for Weiser, Idaho. Work was begun in July and will be completed by January 1.

## KEEPING THE WATER CONSUMER POSTED

The Detroit Bureau of Governmental Research has recently issued a 2-page folder entitled 'Just a Minute —About Purifying Water', which briefly describes the method of filtration and sterilization of muddy and polluted river water as employed by the municipal water works of Detroit, Michigan.

All water works should issue periodically similar bulletins of information to consumers, on the subjects of supply, storage, purification, distribution, metering, and administration.

The War Department has announced allotments to California under the Rivers and Harbors Act as follows: Klamath and Eel rivers—$1000 each; Mad river —$4000; Sacramento river—$35,150; San Joaquin river —$22,650; and Kern river—$4200.

# Logandale-Willows Highway, California

## *Basich Bros. Construction Company of Los Angeles Averages 424 cu.yd. of Portland Cement Concrete Paving per 8-Hour Shift and Makes Maximum Run of 452 cu. yd. on 5.2-Mile Section of California State Highway—Best Previous Record 389 cu. yd.*

By A. W. WALKER

*Superintendent, Basich Bros. Construction Co.*
*Willows, California*

Highway contractors and engineers are interested in quantity production on paving projects constructed under proper supervision. It has been my good fortune to have charge of paving on a Basich Bros. contract for 5.2 miles of California state highway construction from Logandale north to the south city limits of Willows. As we have established what is believed to be a record for placing 20-ft. portland cement concrete pavement, a short account of the equipment and methods used will be of interest.

Work on this contract was begun May 17 and will be completed during the present fall. The contract price, $146,319, involves: roadway excavation—2000 cu.yd. at $0.30, subgrade for paving—58,800 sta.yd. at $0.09, sub-base and shoulders—43,000 cu.yd. pit-run gravel at $0.57, class 'A' portland cement concrete pavement—11,240 cu.yd. (9-6-9-in., 6-sack) at $9.00, reinforcing steel for pavement—277,000 lb. at $0.05, laminated timber guard rail—100 lin.ft. at $1.00, finishing roadway—269 sta. at $3.00. There were eight bidders on this project, the average bid being $161,000.*

After subgrading in prevailing adobe soil, pit-run gravel was placed for the sub-base and part of the gravel in the shoulders was laid. The gravel was then graded to within 0.1 ft. of finished subgrade before setting headers. Equipment on this work included one Carr subgrader, two Caterpillar '30' tractors, two blades, one 12-ton Galion roller, and two 2-up fresno team outfits to take out the tailings.

As the pavement was to be placed in two 10-ft. strips, two lines of headers were required for the first half of the work. The gravel was cementaceous in character and it was both difficult and expensive to drive header stakes. Breakage and loss of these stakes was excessive. As the average progress was 2050 lin.ft. per day, we found that 4100 ft. of headers on one side was a lot to set without loss of efficiency. However, the paver at no time had to close down and wait for grade.

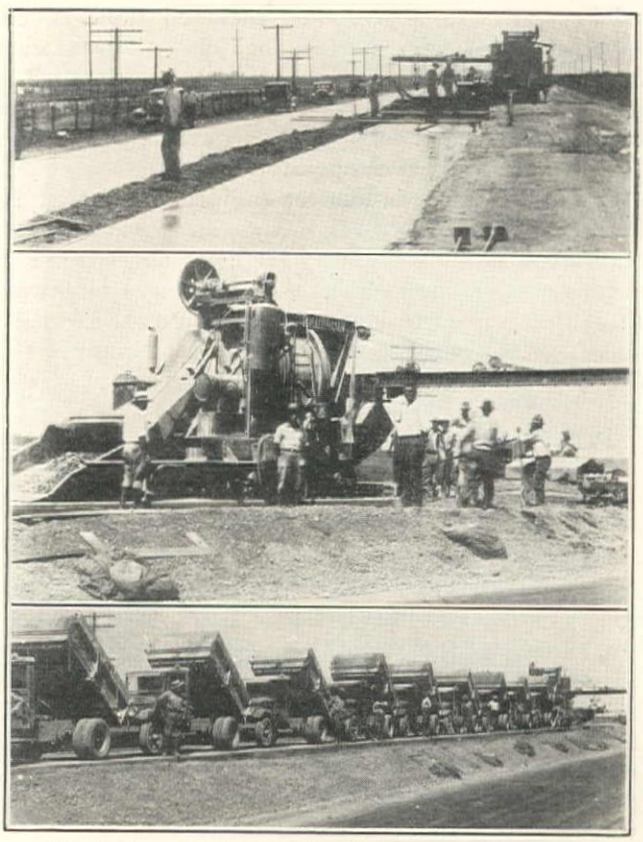
Subgrade and header construction was begun July 8. Paving was started from the Willows end of the project on July 22 and completed on August 24. The uniformity of output of about 56 cu.yd. per hour for the last 24 days of the 27-day run shows a high efficiency of operation.

**Batching and Materials**—Rock and sand were furnished by the Stony Creek Sand & Gravel Co. from a plant at Orland, 17 miles north of Willows. Aggregates were shipped by rail via Southern Pacific. Santa Cruz portland cement was used throughout the job.

*Editor's Note—See April 10th, 1930, issue, p. 54, for the unit bid summary and August 25th, 1930, issue, p. 410, for a short progress article.

The W. H. Bakerbower Truck Co., of Los Angeles, subcontracted the unloading and batching. We credit much of our success in making a record paving run on this contract to the excellent service rendered by this subcontractor who kept two trucks in front of the paver at all times. The average haul was 3 miles.

Equipment on this part of the work included one Northwest 1¼-yd. clamshell, one 75-ton rock bunker



Logandale-Willows Highway. (Upper) Pavement Behind Ransome 27-E Master Paver and Ord Finishers. (Center) Record-Breaking Ransome Paver which Averaged 424 cu.yd. per 8-Hour Shift. (Lower) Fleet of Reo 3-Batch Trucks Lined Up During Lunch Hour

for two sizes of rock, one 50-ton sand bunker. All materials were weighed. The rock was loaded first, the truck then taken to the cement platform where the cement was added, and finally returned to the sand bunker where this aggregate was loaded. Cement being in the center of the batch, all loss of this material in transit was eliminated. Reo 3-batch trucks were used exclusively on this contract.

**Paving**—We considered the setup ideal for a record run, as there were no engineering or traffic problems to overcome. Accordingly, provision was made for

a large supply of water, using a 4-in. pipe-line with a pumping plant capable of delivering 150 g.p.m. at the south end of the job. Risers were installed every 300 ft. so that we might use two alternate hoses, thereby eliminating loss of time in changing a long hose.

Paving was done with a Ransome 1930 model 'R' 27-E master paver. (Two of these pavers will be used on our Bayshore contract.) Two Ord finishers were used. With a batch cycle of 64 seconds we were able to place 450 batches on several different days, our high run being 452 batches, the limit set by the state. The average paving rate was 424 cu.yd. per 8-hour shift and the best previous state record was 389 cu.yd.

**Personnel**—I do not regard this as an exceptional job. The credit belongs to the organization as a whole. With present-day equipment and a good organization before the construction begins, this record can be improved upon. We were unfortunate in getting away to a start of 150 batches the first day and 360 the second day. Otherwise, we might have set a record to 'shoot at'.

The contractor's personnel included Paul Wilcox, superintendent who started the job and was transferred to our Bayshore contract about the time we began to place concrete, myself as superintendent succeeding Wilcox, Veolis Cox as paver foreman, and Joseph Miller as paver operator.

C. H. Whitmore is district engineer of district III, California Division of Highways, at Sacramento. C. H. Purcell is state highway engineer and C. S. Pope is construction engineer for the Division of Highways. E. J. Peterson is resident engineer and A. C. Briney and J. W. Corvin are assistant resident engineers on the Logandale-Willows project.

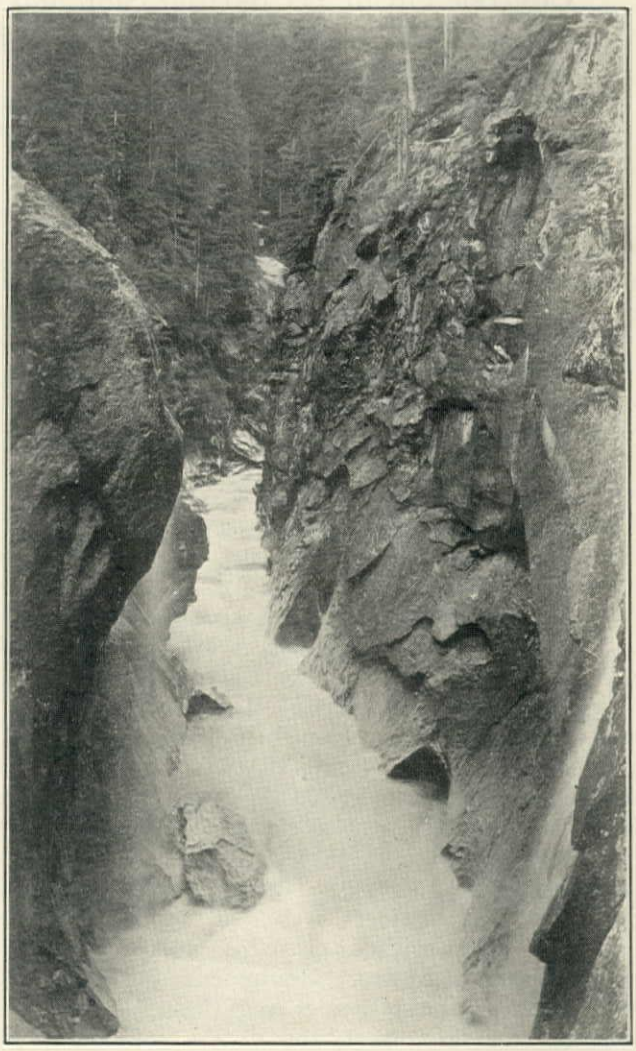
## PORTLAND CANAL POWER CO., ALASKA

The Portland Canal Power Co., Seattle, of which Willis T. Batcheller is president, plans a hydroelectric development on Davis river 12 miles south of Hyder, Alaska, of 20,000 hp. ultimate capacity, to cost $3,000,000. The power will be used to supply Hyder, Alaska, and Stewart, B.C., and mining districts along the Salmon and Bear rivers.

The damsite is said to be the only commercially feasible one in the district. The initial installation will be at least 10,000 and perhaps 15,000 hp. Davis river has a natural fall of 110 ft. in 1200 ft. from tidewater. It is planned to construct an arch dam to produce a head of 350 ft. for the initial development, this to be later increased to 500 ft. as the power market expands. As originally constructed, the dam will create a reservoir 2 miles long. A power tunnel 800 ft. long and steel penstocks 400 ft. long will deliver water to turbines in a concrete powerhouse on tidewater. There is a steep drop along the side of the canal at the powerhouse site and machinery and supplies can be unloaded direct from the boats, with but little docking facilities. Ample deposits of sand and gravel exist nearby.

A preliminary permit has been granted by the Federal Power Commission and a license will be sought after field work has been completed. The first survey party, in charge of Edwin R. Wright, resident engineer, left Seattle August 18 for Hyder, at the end of Portland canal. Field surveys and investigations will start this fall, with construction scheduled as soon thereafter as plans are completed.

As the damsite formation is especially favorable to low construction cost and the center of power distribution is nearby, it is claimed that low power cost will result from this development, and that mining activity in the district will be materially increased. It is also claimed that the enterprise will be financially successful from its commencement.



Davis River Damsite in Box Canyon Near Hyder, Alaska. Bare Granite Walls Extend Almost Vertically for 150 ft. Above Streambed

## U. S. PUBLIC LAND ROAD BILL

Under the Oddie-Colton bill signed by President Hoover, Federal cooperation would be authorized in construction of roads through unreserved public and Indian lands in those states having more than 5% of their area in non-taxable Federal lands. The eleven far western states would receive the greatest benefit from a proposed annual authorization of at least $3,500,000. The proportion of unreserved public and Indian lands to the total area of certain states is:

| | | | |
|---|---|---|---|
| Arizona | 66.8% | New Mexico | 37.7% |
| Colorado | 32.2% | Oregon | 45.6% |
| Idaho | 57.3% | Utah | 66.3% |
| Montana | 30.8% | Washington | 30.6% |
| Nevada | 84.2% | Wyoming | 51.8% |

# Ocean Outfall Experiments*

By A. M. RAWN†
*Assistant Chief Engineer, Los Angeles County Sanitation Districts, Los Angeles, California*

Certain fairly well defined laws appear to control the dilution of sewage or fresh water when discharged into a body of water which has the salinity of ordinary ocean water. By trial and experiment, certain relationships which exist between the depth, direction, and quantity of discharge of the sewage jet, and the rapidity with which the sewage water absorbs salt water or is absorbed into it, are fairly well established, and have been set out in analytical form by engineers of the Los Angeles County Sanitation Districts in a discussion published in the proceedings of the American Society of Civil Engineers for May, 1929.

Sewage discharged below the surface of ocean

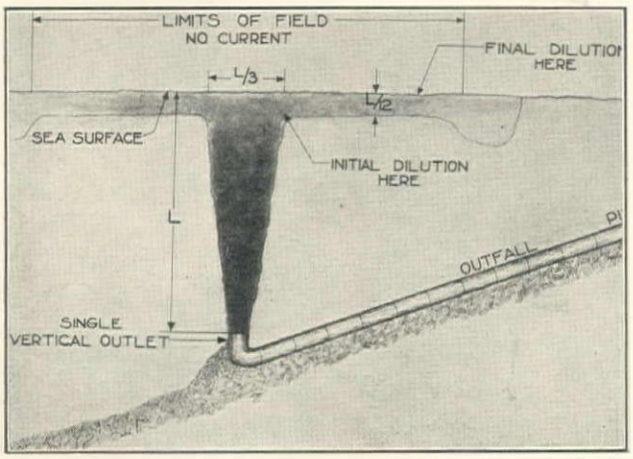



**Fig. 1. Behavior of a jet of fresh water discharging vertically in salt water.**

water will, because it is lighter than the salt water, tend to rise immediately to the surface of the salt water; this action following the natural law of gravity. The rapidity with which it rises from the larger outlets is evidenced by a boiling field of sewage usually appearing over the outlet.

Sewage discharged from an outlet pointed directly upward will rise in the form of an inverted cone, the cross section of the cone expanding as it nears the ocean surface, and the diameter of the base of the cone at the surface being equal to about one-third of the distance from the point of discharge under water to the ocean surface. Sewage discharged horizontally under sea water will rise to the surface of the sea water along a path resembling the curve of the path of a stone thrown horizontally, except that the curve is inverted. For this case, as before, the cross-sectional area of the curved sewage column or cone expands as the surface of the salt water is approached, and the area of the column or cone at the salt water surface is equal to about one-third of the length of the path traveled from the outlet to the surface.

During its rise from the outlet to the ocean surface, the sewage obtains what is termed its initial dilution. By this is meant its first mixture with salt water before it comes into sight at the ocean surface. This dilution remains constant for uniform conditions of discharge.

As soon as the mixed sewage and sea water has reached the ocean surface its tendency is to spread laterally over the surface in all directions. During the process of spreading, it mixes with sufficient sea water to give it what is termed its final dilution. The term stratification is used to define the action of the mixed sewage and sea water floating on top of the ocean water. It does this because it is lighter and, following the law of gravity, it continues to float until such time as it has mixed with sufficient sea water to so increase its specific gravity that it will mingle intimately with the sea water underneath. The thickness of this floating sewage field remains fairly constant and is equal to about one-half of the distance from the sewage outlet to the ocean surface.

Dilution is most rapid during the rise of the sewage from the outlet to the ocean surface and is dependent upon the surface area of the rising column or cone of sewage exposed to the surrounding sea water. Thus it depends upon three factors, depth, direction, and quantity from a given orifice or outlet; and because initial dilution is such a strong determining fac-

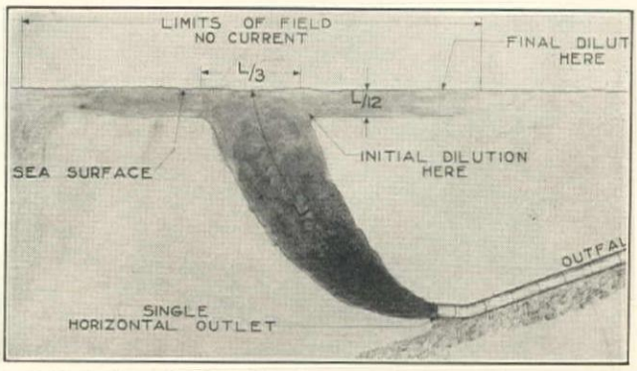



**Fig. 2. Behavior of a jet of fresh water discharging horizontally in salt water. The path of the rising water is a cubical parabola. This type is more efficient than the vertical outlet because the longer path to the surface increases the initial dilution.**

tor in the field area these factors should be carefully considered in the design of an outlet.

To obtain high initial dilution with a given quantity of sewage and a given depth of sea water at the point of discharge, it is advantageous to discharge the sewage from the outlet laterally, as nearly horizontal as possible, thus increasing the length of column or cone. The use of multiple outlets is advantageous, but it is necessary to avoid the error of so spacing them that the rising columns of sewage will mingle or conflict before reaching the ocean surface. Should the columns merge below the ocean surface, the surface area of the columns in contact with the

*Reprinted from California Sewage Works Association 1929 Journal.
†Member, American Society of Civil Engineers.

clear salt water is reduced and the initial dilution correspondingly decreased.

The benefit of multiple outlets is well demonstrated by experience with the new Long Beach city outfall. Following the sanitation districts' study of the be-

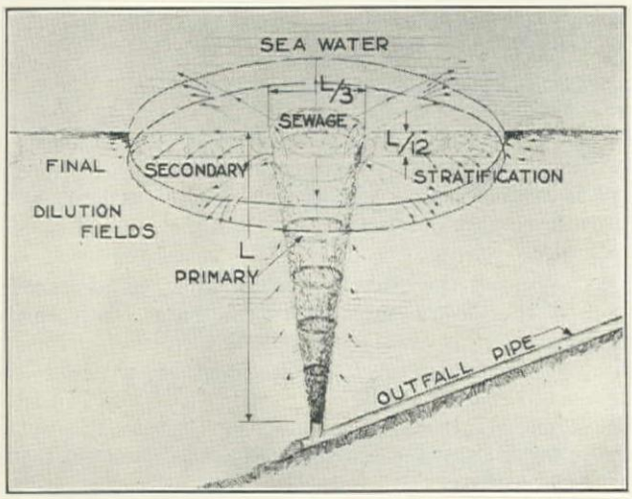



Fig. 3. Diagram illustrating the progressive dilution of the sewage as it rises to the surface of the salt water, and then spreads laterally. Dilution is more rapid in the rising column than in the spreading field, because in rising, the velocity being greater, there is more agitation and it is surrounded on all sides by salt water. In the spreading field the surface of contact is confined to the bottom.

havior of sewage in sea water and the efficiency of multiple outlets, Long Beach engineers placed over the new Long Beach outlet, discharging into the harbor entrance, a four outlet diffuser cap. Prior to placing the cap, and while sewage was being discharged vertically upward from a single outlet, a bacteriological survey showed an area of 342 acres polluted to 100 B. coli per c.c.—six surveys following the erection of the cap showing an average of 127 acres contaminated to the same extent. The 10 B.

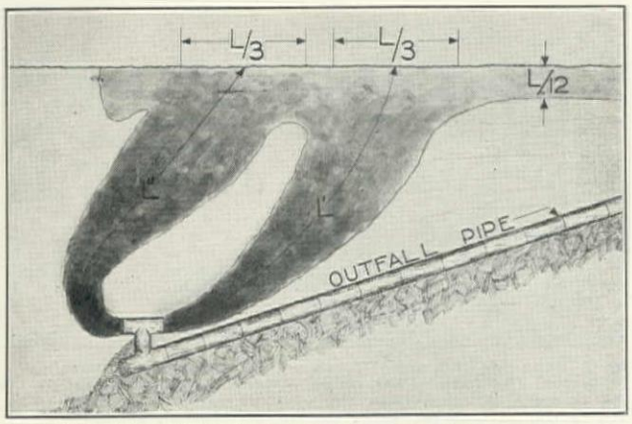



Fig. 4. Behavior of two horizontal jets in a strong current of sea water. The actual lengths of path from the outlet to the surface will be different if referred to the stationary outlet, but when referred to a point moving with the salt water, each will be equal to the length of path in calm water. A current in the salt water promotes dilution only when it becomes strong enough to create agitation. The field will travel against the current until the velocity of the field equals that of the current regardless of the dilution at this point. When the velocities become equal, the surface water will be drawn under and travel with the ocean current.

coli areas are not compared because the 10 line extended beyond the limits of the first survey.

The importance of initial dilution is demonstrated by a comparison between the old Long Beach outlet and the present Hyperion outlet. The former, with a field approximating 50 acres per cubic foot per second for an initial dilution of 2 (1 part of sewage water to 1 part of sea water), the latter with a field approximating 5 acres per cubic foot per second for an initial dilution of 14 (1 part sewage water to 13 parts of sea water). Other conditions being equal, it can be said with a fair degree of certainty that the area of the sewage field varies inversely with the square of the initial dilution.

Upon reaching the surface of the salt water, the mixed sewage and sea water, as has been stated, spreads laterally, if unrestricted, in all directions, and during this spread, dilution continues, but much more slowly than during the period of initial dilution. It continues to float, or stratify, until the specific gravity of the mixed sewage and sea water is as nearly equal to that of the clear sea water underneath, that the two fluids mingle; the outer limits of the field being marked by the location of such intermingling.

The effect of an ocean current is to elongate the field in the direction of the current. Those who are familiar with outlets along the Pacific Coast have probably observed, at times, the elongated segmental shape of sewage fields. This is due to the fact that

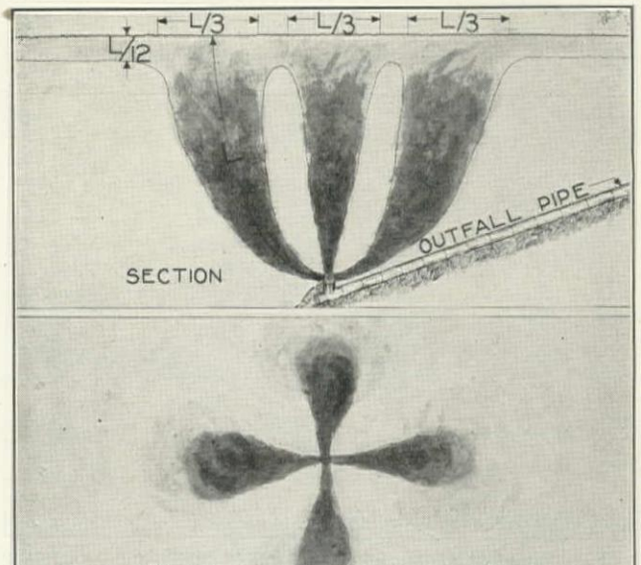



Fig. 5. Behavior of a 4-outlet diffuser. The division of the sewage into several jets results in the increased dilution due to the smaller quantity in each, but if too many jets are employed they will interfere beneath the surface and decrease the area in contact with salt water. Except in very shallow water, not more than six outlets should be used, and in very deep water, not more than four.

the sewage in spreading over the ocean surface pushes its way against the current as far as it has the power to do so, and there stops in a well defined visible line, the force of the spreading sewage and the force of the ocean current being equalized at such a line. The spread of the sewage is, however, greatly facilitated in the opposite direction and consequently moves out rapidly with the current, still spreading laterally across the current at all times.

This action of the two forces results in a roughly segmental field, which can be mathematically shown to occupy about the same area as a circular field resulting from discharge into calm, quiet water. The distance of travel from the outlet is, however, much grater, being the sum of the velocity of the ocean current and the velocity of the spreading sewage combined. This feature is to be reckoned with in design.

Discharge of sewage into a narrow confined channel will result in a larger field than though the sewage were discharged into the open ocean. The sewage field

being approximately constant in depth on the ocean surface, it must absorb sea water along its plane of contact with the pure sea water underneath, and, whenever the depth of the field equals the depth of the sea water, dilution will cease until a further supply of sea water is available. It must, therefore, move out from its shallow location to where it can again find its stratum above the sea water, in order that it may continue dilution. It must be remembered also that it will probably move out in a long streamer, because it has lost its initial lateral velocity, and will tend to remain in an elongated field rather than to spread laterally.

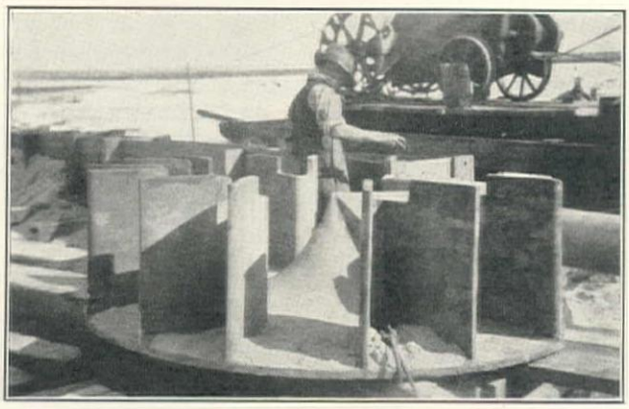


Fig. 6. A cast iron diffuser used on the outfall at Long Beach. The use of this diffuser reduced the size of the sewage field to one-third its former size.

A choppy, rough sea will undoubtedly assist in mixing the sewage and sea water, provided the stratum of mixed sewage and sea water is not too thick. Sea traffic will also in some measure increase dilution, although this factor is not very important. The type of pre-treatment of the sewage prior to discharge into the ocean has important bearing upon the field appearance and, if it is possible to remove a large percentage of the grease from the sewage, such should most certainly be done, in order that the visible, sleek field may be minimized.

The criterion for design at a given outfall site should probably be a calm sea surface at lower, low tide coupled with the peak flow of sewage and the most pronounced effective ocean current observable at the selected site. These three combined, probably will result in the maximum field obtainable at the maximum distance of sewage travel from the outfall site. By careful observation of the direction and intensity of the ocean currents, the available depth at the outfall site, proximity to shores which would suffer from contamination as well as proximity to open ocean waters, it is felt that the designer may equate the factors of depth, direction, and quantity so as to erect an outfall with a field of predetermined area and distance of travel.

# Tongass National Forest Highway, Alaska

The Bureau of Public Roads received bids July 16 and awarded a contract on August 1, 1930, to R. H. Stock, Ketchikan, on a bid of $88,685, for 2.95 miles of the Wards cove-Mud bay section of the Tongass highway, Alaska. This is a national forest road project beginning near the village of Wacker, 6½ miles from Ketchikan.

Ketchikan is one of the largest ports in Alaska and the usual transportation facilities are available, a gravel-surfaced road connecting this port with Wacker village. The last two miles of the project, being adjacent to the Tongass narrows, are accessible for water transportation. Most of this contract is through a densely timbered country carrying a heavy overburden of duff and moss. Clearing and grubbing operations will be of considerable importance in the construction. Much of the material handled will be common excavation, and it is expected that some soft muskeg areas will be encountered, requiring several thousand feet of log corduroy as supporting base for the gravel surface.

A performance bond in the amount of 100% of the total contract price was required, work to begin within 10 calendar days after receipt of notice to proceed and to be completed within 300 calendar days from that date, excluding suspensions ordered as a result of inclement weather. The estimated quantities include 16.5 acres of clearing; 9.0 acres of grubbing; 13,600 cu.yd. of common, 7700 cu.yd. of solid rock, and 400 cu.yd. of structure excavation; 5300 cu.yd. of crushed rock bottom course and 2000 cu.yd. of crushed rock top course; 750 cu.yd. of supplemental crushed rock; 30 M f.b.m. of untreated timber trestles; 3100 sq.ft. of log cribbing; 1440 lin.ft. of corrugated metal pipe culvert; and 3000 lin.ft. of log corduroy.

This project is in district 11, Bureau of Public Roads, for which M. D. Williams, Juneau, is district engineer, with Ivan E. Winsor associate highway engineer. L. I. Hewes, deputy chief engineer, is regional director for the western region of the Bureau at San Francisco, with J. S. Bright, construction engineer, as first assistant, and G. W. Mayo, senior highway bridge engineer, in charge of forest highways.

## PROGRESS ON RUSKIN HYDROELECTRIC PROJECT

The Ruskin powerhouse of the B. C. Electric Railway Co. is nearing completion and hydraulic equipment is now being installed. Over 50% of the concrete for the Ruskin dam has been placed, both penstock tunnels have been driven and lined, and the steel penstock has been completed. The first unit of the Ruskin project, 47,000 hp., will probably be in operation by October 1. For an illustrated description of this project see the September 10th, 1929, issue, p. 455. The Western Bridge Co., Vancouver, has been awarded a $65,000 contract for seven tainter gates, 33 by 26 ft., for Ruskin dam, their combined weight being 400 tons. The dam has a total height of 211 ft., or 185 ft. without gates.

# Denver Continues Flood Prevention Work

## *Six Blocks of New Channel for Platte River Constructed in Packinghouse District*

By JOSEPH C. COYLE
*Englewood, Colorado*

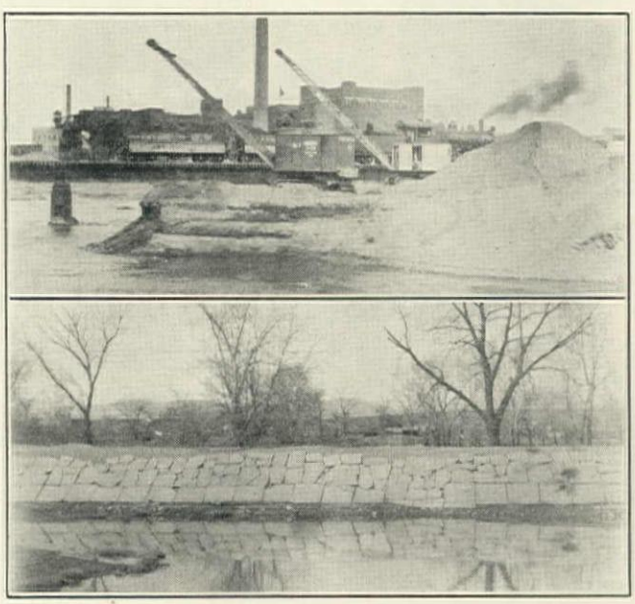
Important progress in flood prevention along the Platte river will be made by the city of Denver during 1930. For several years, two draglines have been kept busy dredging and straightening the channel of the stream and each year some of the more important sections have been walled in. (See article in August 10th, 1928, issue.) Each year an appropriation is made from the general funds, sufficient to carry on the work. Eventually, the river will be confined between concrete retaining walls from one side of the city to the other, as Cherry creek has already been confined.

Operations during 1929 included the straightening of the channel near w. Alameda ave. and building a stretch of retaining wall there, and marked the beginning of another new channel for straightening the river near the stock yards, now being excavated. Valuable use was made of concrete sidewalk slabs, obtained in widening Cherry creek drive, for riprapping 400 ft. of the river bank near w. 3rd ave. and another 400 ft. at w. Mississippi. The slabs were placed against the dirt fill and this year, after both the slabs and banks have fully settled, the cracks will be grouted in. While this riprapping will eventually be replaced with concrete walls, it involved little expense for installation and will temporarily protect the new fill from erosion. Where retaining walls are not to be built at once, the river banks are being filled on a 2:1 slope, with a 1½:1 slope back of the 12-ft. roadway along the fill. The channel is widened to 200 ft.

Near w. Mississippi, where s. Santa Fe drive skirts the river, 261 ft. of retaining wall has just been built, to replace a section of old wall which failed about two years ago. Like most of the retaining wall now being constructed, this is 12 ft. high above flow line, 2 ft. thick at the base and 18 in. thick at the top. The footing is 5 ft. thick and 8 ft. wide, placed over two rows of wood piling driven to refusal (about 20 ft. long). The row of piling next the stream is spaced 5 ft. by 3 ft. 6 in., and the back row piles are 10 ft. apart.

A dragline was placed in the channel and the wall excavation made, banking the material in the edge of the channel for backfilling. Forms were constructed in sections and used over and over. In order to get close to the work, a movable platform was constructed and the ½-yd. mixer set out over the excavation, with the outer edge of the platform resting on the studs of the wall forms. Steel pipe, set into the top of the retaining wall, will hold a wire mesh, replacing a wooden railing along the stream at this point.

A sharp bend in the river near the Union stock yards, which has previously threatened the safety of large packing houses at this point, is being eliminated by cutting through the bend for a distance of 6 blocks, making a new channel and filling the excavated material along the banks. About 200,000 cu.yd. of material was moved, using teams on part of the excavation for hauling and casting the waste dirt, with draglines over the other section. As the C.B.& Q. railroad crosses the river at this point, dump cars were used in hauling part of the waste dirt to fill in the old river channel beneath the tracks. Most of the excavation was made before the river was cut through the new channel, a narrow section being left until the last to hold back the water.



Platte River Channel Improvement Through Denver. (Upper) Draglines Loading Cars on Trestle and Casting Into Piles. (Lower) Embankment Riprapped with Old Concrete Sidewalk Slabs

Sections of retaining wall were constructed on both sides of the river at this point. These were of the same dimensions as that previously described and totaled 500 ft. long. In the early operations, 20 dump wagons were used and two to three draglines were employed throughout the job.

The work is under the direction of F. J. Altvater, city and county highway commissioner, and A. K. Vickery, city engineer. Four dragline operators are employed regularly on the river and about 25 men are used from time to time in constructing retaining walls, etc.

River improvements during 1929 involved an expenditure of $25,000, and $50,000 is to be spent in 1930. When the entire river is walled, parks will probably be made of some of the adjacent waste lands, according to Vickery, who estimates that flood prevention measures will finally total $5,000,000.

# San Gabriel River Bridge Near Azusa

*Another Bottleneck Eliminated by California Division of Highways*

By M. E. WHITNEY

*Resident Engineer, Bridge Department, California Division of Highways, Monrovia*

In 1922 a concrete bridge was built across the San Gabriel river three miles west of Azusa on the Los Angeles - San Bernardino road, replacing an old wooden structure washed out by the spring floods of that year. This bridge consisted of one 31-ft. and eighteen 54-ft. spans on concrete piers, with a roadway width of 21 ft. 9 in. and standard concrete curbs and railing.

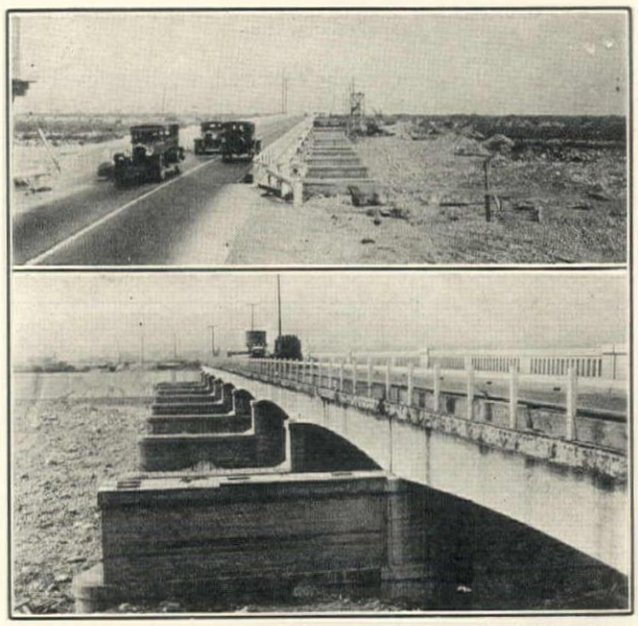
At that time, the roadway width was sufficient to adequately care for traffic but, with increase in the use of automobiles and recent widening of the highway between Monrovia and Azusa to four traffic lanes, the old bridge became a bottleneck and source of constant danger and inconvenience to the traveling public. This bottleneck caused long lines of traffic to pile up, particularly on the east end of the bridge on Sunday evenings when the mountain recreationists were returning home. A traffic count on Sunday, January 12, 1930 (between 6 a.m. and 10 p.m.), showed 11,193 vehicles using the bridge, and on January 13 the bridge was crossed by 5533 vehicles. These counts readily show the inadequacy of the present structure.

**Bridge Widening Project**—On November 21, 1929, a contract was awarded to the Johnson Construction Co., Los Angeles, for widening the San Gabriel river bridge, contract price $88,054.* This new addition of 1004 ft. on the south or downstream side of the old structure consists of one 31-ft. concrete approach span, eleven 54-ft. concrete spans, and twenty-one 18-ft. redwood timber spans. Flood control in the San Gabriel river canyon is the reason for constructing part of the bridge of redwood, as 625 ft. is deemed sufficient width to take care of future flow. Thereafter, the redwood could be replaced with a fill and the timber used for other bridge work.

The new roadway width will be 42 ft. between concrete curbs, with a 5-ft. sidewalk in addition. The roadway of the old and new sections of the bridge will be paved with type 'A' asphaltic surface, thereby making it one riding unit. The approaches, when completed, will be 74 ft. wide, allowing a 15-ft. parking space off the pavement on each side. At 300 ft. each way from the bridge, the new asphaltic surface ties in with the recently completed 40-ft. highway. A standard concrete rail and sidewalk will extend the full length of the bridge, and the old rail will be refinished so that the whole structure will have a pleasing appearance. The present contract was completed about August 1, 1930.

**Excavation and Demolition** — Excavated material consisted of boulders, gravel, and sand Although the yardage moved was in excess of the pay quantity, it was deemed cheaper to allow the sides of the excavation to take natural slopes rather than to use cribbing. Excavation, backfill, and roadway embankment were done with a ¾-yd. Link-Belt gasoline dragline and a ¾-yd. Link-Belt gasoline shovel, using two 5-ton Packard trucks. An average of about 100 cu.yd. of material was moved per 8-hour day.

Bank protection at both ends of the bridge was opened to permit construction, and replaced before the winter rains. To date no trouble has been experienced by water from the river, although a small flow has resulted from each of two rainy spells. All excavation was done in the dry before the first rain in January, 1930.



(Upper) San Gabriel River Bridge With Piers for Extension on Right and Concreting Tower in Background. Note 'Bottleneck'. (Lower) Bridge from Opposite Direction

The old concrete rail on the south side was removed with compressed air guns (two portable Ingersoll-Rand compressors operating three guns) and a temporary railing was constructed to protect traffic. The steel projecting from the old deck was burned off with acetylene torches and the rough edge brought to a straight line by grouting.

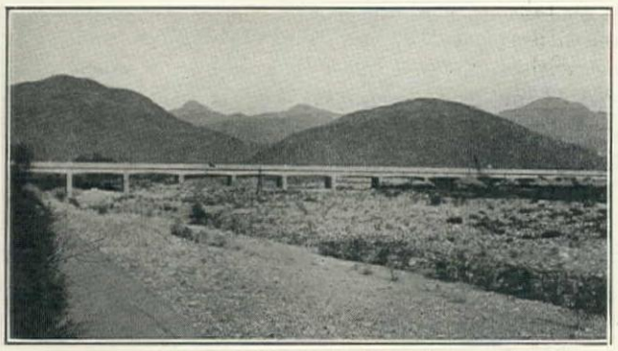
**Footings, Piers, and Posts**—The concrete pier footings were set at the same elevation as the old ones—about 23 ft. below streambed. The new 12 by 12-in. redwood posts were set 12 ft. below streambed on concrete pedestals 3 ft. square at the base. These posts are sheeted on both sides with seven 2 by 12-in. planks

*See unit bid summary in the October 10th, 1929, issue, p. 52, and a short article in the February 25th, 1930, issue, p. 98.

to prevent debris clogging among the bents. A small hoisting engine was used to erect the redwood timbers.

**Concrete and Timber Spans** — The reinforced concrete spans are of the 3-girder type, and the timber spans are of 17 lines of 6 by 16-in. stringers, with 3 by 6-in. laminated decking. At each alternate pier, a set of cast steel expansion plates and rockers is installed, and a set of angles is placed at deck grade and covered with a steel plate to keep the asphalt surface from encroaching on the 1½-in. Elastite joint between spans.

**Concreting**—Concrete was manufactured with a Rex 21-E paver set in the streambed near the point of



San Gabriel River Bridge from Downstream, Showing Pier Excavation

work. After the concreting reached a point level with the mixer, a portable 1-yd. hoist was constructed. From this hoist the concrete was transported in 6 buggies over planked runways. Two small sheet-iron hoppers and twelve elephant trunks, 3 ft. long, were used to deposit concrete for the piers.

Pier concrete was class 'C', 4.2 sacks to the cu.yd.,

(Upper) Link-Belt ¾-yd. Gas Shovel Loading Backfill for Redwood Bents. (Lower) Link-Belt ¾-yd. Dragline Excavating Pier Footings

as against class 'A', 6 sacks to the cu.yd. in the remainder of the structure (excepting the rail, where 9-sack concrete was used). Four grades of aggregate were supplied by a nearby rock plant and, with a frequent screen analysis, the mix was held well within specified limits. Five per cent hydrated lime by weight was added to the curb and railing to increase their visibility at night. All materials for the bridge were purchased locally.

Finish on the concrete decks was roughened to create a bond with the asphaltic surfacing; the average thickness of this surfacing is 3 in. and that of the approaches 6 in. The sidewalks, railings, curbs, curb brackets, cantilever, and outside of the outer girder were finished by rubbing in a mortar with carborundum stones, and brushing out.

Additional equipment on the work included two 1-ton White trucks, one Kohler electric light plant, one 'Skillsaw' electric saw, one Ingersoll-Rand electric drill, one 5000-gal. water tank, one General Electric pumping plant, seven 4-ft. wheelbarrows, and one 1-yd. hopper.

**Personnel**—C. H. Purcell is state highway engineer; Charles E. Andrew state bridge engineer; S. V. Cortelyou district engineer of district VII; and V. A. Endersby construction engineer of the southern bridge department. I was resident engineer on the San Gabriel river bridge widening and J. H. Flansburg was the contractor's superintendent.

## PACIFIC GAS & ELECTRIC CO.

The State Railroad Commission of California on May 14 approved the application of the Pacific Gas & Electric Co. for the acquisition of stock control through the North American Co. in the Great Western Power Co., San Joaquin Light & Power Corp., Midland Counties Public Service Corp., and their subsidiaries. The P.G.&E.Co. by this transaction will acquire 62% of the outstanding stock of the G.W.P.Co., 52% of the S.J.L.&P.Corp., and all of the M.C.P.S.Corp. It is expected that outstanding capitalization and floating indebtedness will be materially reduced, and an annual saving effected in operation cost of $1,000,000 to $1,500,000.

This merger makes P.G.&E. or 'Pacific Service' the largest gas and electric utility company in California, and one of the three largest in the United States, with assets of $650,000,000 and gross annual revenues of $87,000,000. The area served extends from Bakersfield north to the Oregon state border (all of Northern California), embracing 45 counties and 84,667 sq.mi., with a population of 2,725,000.

The following statistics are of interest:

| | Unit | P.G.&E. | G.W.P. | S.J.Co. | M.C.P. | Total |
|---|---|---|---|---|---|---|
| Reservoirs | No. | 107 | 3 | ..... | ..... | 110 |
| Storage Capacity | Ac-Ft. | 388,000 | 1,450,000 | 50,000 | ..... | 1,888,000 |
| Hydro Power Plants | No. | 34 | 3 | 10 | ..... | 47 |
| Steam Power Plants | No. | 8 | 5 | 3 | ..... | 16 |
| Hydro Power Installed Capacity | HP. | 674,597 | 245,200 | 150,275 | ..... | 1,070,072 |
| Steam Power Installed Capacity | HP. | 244,369 | 89,000 | 69,705 | ..... | 403,074 |
| Transmission and Distributing Lines | Miles | 18,488 | 3,424 | 8,630 | 1,119 | 31,661 |
| Electric Consumers | No. | 549,816 | 74,306 | 82,109 | 12,830 | 719,061 |
| Gas Plants | No. | 18 | ..... | 2 | ..... | 20 |
| Gas Output | Million Cu.ft. | 22,041 | ..... | 1,117 | ..... | 23,158 |
| Gas Mains | Miles | 5,498 | ..... | 192 | ..... | 5,690 |
| Gas Consumers | No. | 479,986 | ..... | 11,610 | ..... | 491,596 |
| Water Mains and Ditches | Miles | 896 | 39 | 20 | ..... | 955 |
| Water Consumers | No. | 8,009 | ..... | 1,109 | ..... | 9,118 |

State and county road building programs for 1930 in the entire country will total more than $1,600,000,000, an increase of $250,000,000 over 1929.

# Seattle Dedicates Diablo Dam

Official dedication ceremonies for Diablo dam, a unit in the upper Skagit river power development by the city of Seattle, were held August 27, Roland H. Hartley, governor of Washington, and Frank Edwards, mayor of Seattle, participating. The first unit in the municipal hydroelectric development of this stream was the Gorge plant, completed in 1924. A third unit, Ruby dam above the headwaters of Diablo reservoir, remains to be constructed. Seattle had the distinction of installing the first municipal hydroelectric plant in the United States in 1904.

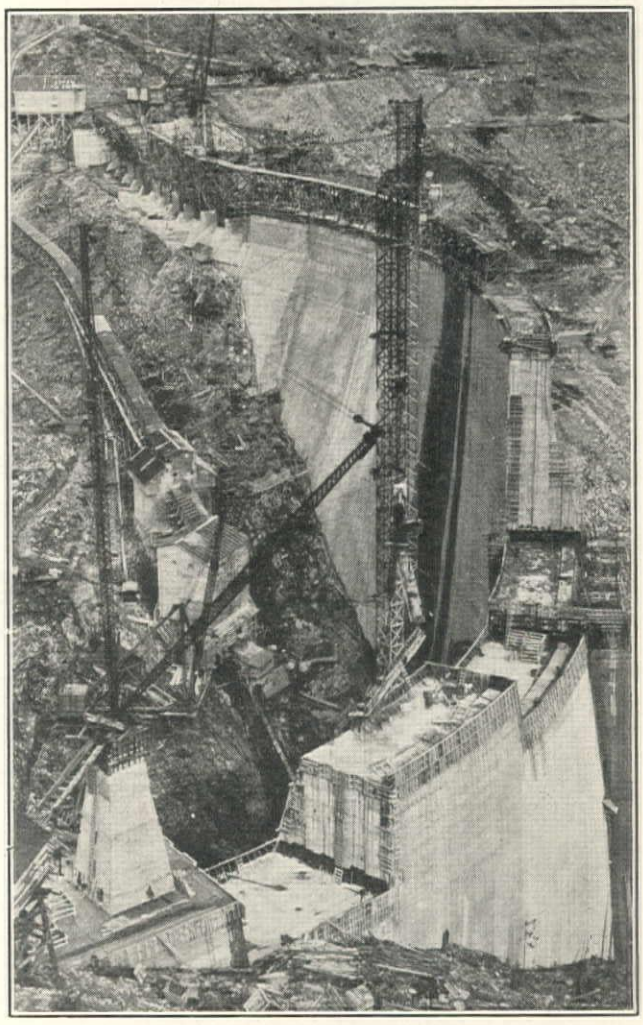
Construction of the Diablo dam was commenced January 1, 1928, by the Seattle office of Winston Bros. Co., the first concrete being placed July 12 of that year. The dam is a constant-angle arch designed by Lars Jorgensen and is 389 ft. high; the construction cost was $3,500,000 (see May 25th, 1929, issue for detailed description). Two construction features were the funicular railway and high line.

The funicular railway climbs a 68% grade for 600 ft., connecting the main line project railroad at Reflector bar with high-level trackage leading to the cement shed and aggregate bunkers. This funicular railway has a vertical rise of 313 ft. and a capacity load of 158,000 lb., permitting the handling of fully-loaded freight cars. A 400-hp. electric motor is used to lift the carriage, the raise requiring 6 minutes.

The high line is 1985 ft. long between saddles and 2¼-in. diameter. The ends are anchored in concrete cylinders embedded in the rock walls, no towers being used. The cylinders each weigh 24 tons and are reinforced with eight 60-lb. rails 8 ft. long. The high line has a capacity of 15 tons and is 500 ft. above the river at the lowest point of the sag. Loads are handled with a 300-hp. electric motor.

The following statistics are taken from a booklet on Diablo dam, recently issued by Winston Bros. Co.:

| | |
|---|---|
| Highest elevation dam above sea level | 1221 ft. |
| Elevation foundation above sea level | 832 ft. |
| Length dam along crest | 1180 ft. |
| Length arch portion | 588 ft. |
| Arch thickness at bottom of dam | 140 ft. |
| Arch thickness at crest | 16 ft. |
| Narrowest width Diablo gorge | 19 ft. |
| Ultimate power development at Diablo | 225,000 hp. |
| Capacity first units | 167,000 hp. |
| Reservoir storage capacity | 90,000 ac-ft. |
| Length Diablo storage reservoir | 6 miles |
| Maximum flood water flow Skagit river | 100,000 c.f.s. |
| Normal spring flood water flow | 30,000 c.f.s. |
| Minimum flow | 500 c.f.s. |
| Number 20-ft. spillway gate openings | 19 |
| Elevation spillway sills above sea level | 1187 ft. |
| Depth excavation below water level | 50 ft. |
| Length 20 by 20-ft. river diversion tunnel | 650 ft. |
| Distance diversion tunnel intake above dam | 250 ft. |
| Length 19½-ft. diameter power tunnel | 2000 ft. |
| Elevation power tunnel above sea level | 1080 ft. |
| Diameter emergency outlet pipes | 8 ft. |
| Solid rock excavation for dam | 230,000 cu.yd. |
| Concrete in dam | 350,000 cu.yd. |
| Cement used | 1758 cars |
| Gravel aggregate used | 630,000 tons |
| Daily capacity concrete plant | 1500 cu.yd. |
| Maximum daily yardage concrete placed | 1500 |
| Reinforcing steel | 625 tons |
| Wire rope used for construction | 39 miles |
| Lumber required in construction | 100 cars |
| Lumber used in formwork alone | 85 cars |
| Iron and copper tie wire used for formwork | 235,000 lb. |
| Total copper tie wire used | 35,000 lb. |
| Total iron tie wire used | 210,000 lb. |
| Pipe-lines required | 86,541 ft. |
| Total material handled daily | 3338 tons |
| Total length 24 and 30-in. cement and aggregate belt conveyors | 700 ft. |



Diablo Dam on March 13, 1930

| | |
|---|---|
| Elevation chuting towers above crest dam | 80 ft. |
| Two chuting towers, one 324 ft. and other 432 ft. high | |
| Upstream cofferdam | 250 ft. long by 40 ft. high, steel sheeted |
| Motor-driven pumps for unwatering | 20 |
| Pumping lift for unwatering | 90 ft. |
| Crew required | 500 to 600 |

Engineering on the project was directed by the late W. D. Barkhuff, city engineer; T. M. Carver, assistant city engineer; H. F. Faulkner, engineer of tests; E. D. Alexander, resident engineer; R. R. Hubbard, concrete technologist; and M. L. Gerber, instrumentman. J. D. Ross is superintendent of lighting for the city.

Construction by Winston Bros. Co. was directed by

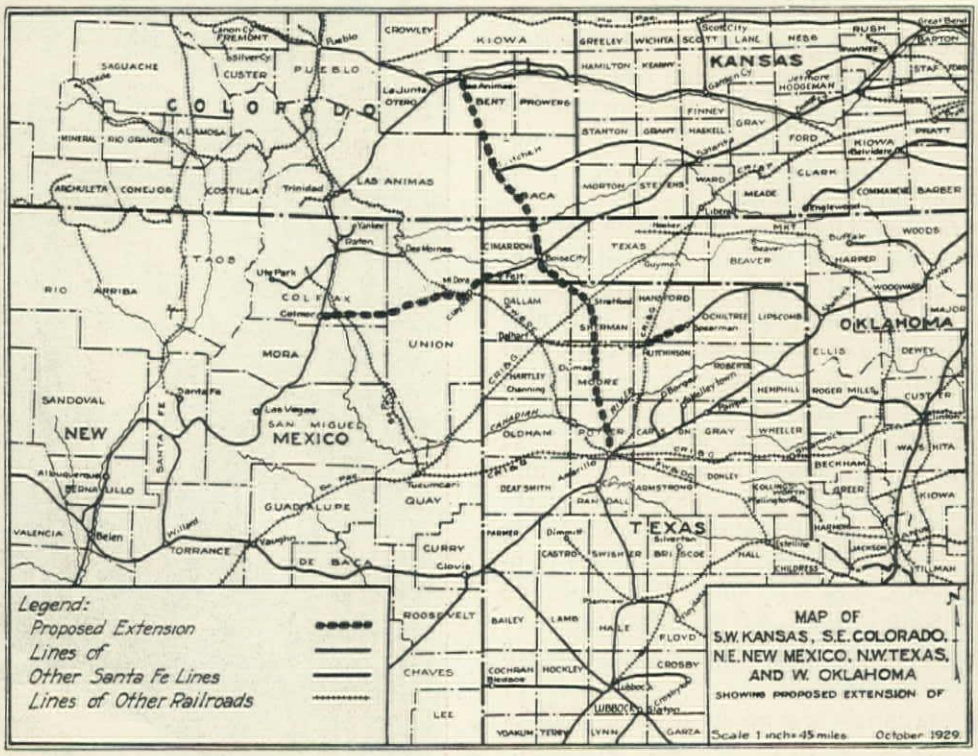
the following department heads: L. S. Oakes, president; W. O. Winston, vice-president in charge until his death on June 18, 1929; W. H. Gardiner, district manager; Matt S. Glavin, superintendent; F. T. Hillman, engineer; G. M. Mann, chief accountant; E. R. Clarke, purchasing agent and camp manager; Ralph Kennan, general foreman; Charles Weston, concrete foreman; A. G. Stonewall, master mechanic; A. J. McGowan, master rigger; and J. C. R. Cootes, chief electrician.

Diablo dam has been reported in previous issues of **Western Construction News** as follows: June 10th, 1927, p. 45; August 25th, 1927, p. 52; September 25th, 1927, p. 60; December 10th, 1927, p. 61; February 25th, 1928, p. 132; July 10th, 1928, p. 458; February 25th, 1929, p. 121; May 25th, 1929, p. 254; July 25th, 1929, p. 389; and December 25th, 1929, p. 684.

## SANTA FE RAILROAD EXTENSIONS

The Atchison, Topeka & Santa Fe Railway Co.'s 1930 program includes the construction of 380 miles of connecting lines in Texas, Oklahoma, Colorado, and New Mexico.

The Union Bridge & Construction Co., of Kansas City, Missouri, has a contract for constructing a viaduct bridge across the Canadian river 19 miles north of Amarillo, Texas. This viaduct is 1736 ft. long, and consists of four 220-ft. deck truss spans, four 100-ft. girder spans, four 70-ft. girder spans, two 60-ft. girder spans, and two 28-ft. beam spans. The base of rail is 104 ft. above high water. The main portion is carried on braced steel towers, 100 ft. high, resting on concrete caissons, 16 ft. diameter at bottom and 14 ft. at top, extending 100 ft. below high water.




## TERMITES AND TERMITE DAMAGE

The **Termite Investigations Committee,** 215 Market st., San Francisco, has published its preliminary report on the first two years' intensive research. This report is titled, 'Termites and Termite Damage', and is known as Circular No. 318 of the Experiment Station, College of Agriculture, University of California. This circular is published at this time to present "the best methods of repairing structures damaged by termites and of preventing their attacks by proper building methods". It is divided into three parts: (1) biological information, edited by S. F. Light, professor of zoology, University of California; (2) the use of chemicals in termite-proof construction and repair work, edited by Merle Randall, professor of chemistry, University of California; (3) construction methods, edited by Frank G. White, chief engineer, California State Board of Harbor Commissioners, and Walter Putnam, superintendent of building, city of Pasadena.

Sharp & Fellows, of Los Angeles, have the contract for constructing 121 miles of line from Amarillo, Texas, north to Boise City, Oklahoma, which includes 1,300,000 cu.yd. of excavation and 3,000,000 cu.yd. of embankment.

Construction of the line between Spearman and Dumas, or probably Dalhart, Texas, is held up pending approval of the Interstate Commerce Commission.

Engineering parties are at work locating the lines between Felt, Oklahoma, and Colmor, New Mexico, and between Boise City, Oklahoma, and Las Animas, Colorado.

The accompanying map shows the location of these lines.

## RUSSIAN SOVIET HIGHWAY PROGRAM

The Soviet government is reported to be embarking on a 5-year program of low-priced road construction involving 5,000,000 miles and an expenditure of $1,250,000,000 under the supervision of American engineers.

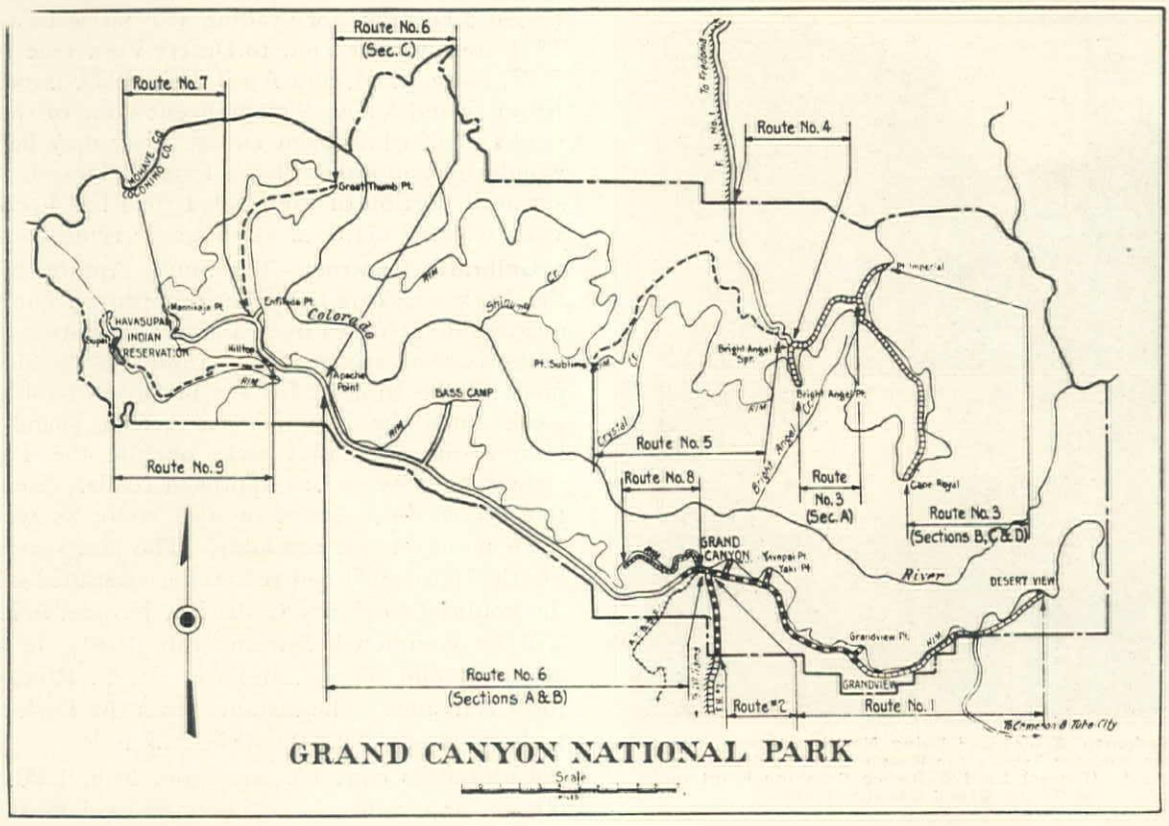
# Grand Canyon National Park Highways, Arizona

Grand Canyon National Park in Arizona is rapidly being provided with a system of improved highways. Since the interbureau agreement between the National Park Service and the Bureau of Public Roads in the spring of 1926, all major highway surveys and construction within national parks have been under the supervision of the Bureau. Grand Canyon National Park is in District No. 2 of the Bureau of Public Roads, with the district office at San Francisco in charge of C. H. Sweetser, district engineer.

**Lang and Boyd Contracts**—Prior to 1930, there had been 26 miles of road graded on the North Rim on Park Route No. 3. Of this total, the Lang Transportation Co., Los Angeles, graded about 17 miles (see June 25th, 1928, issue, p. 30, and April 25th, 1929, issue, p. 204) and B. B. Boyd, San Diego, graded the remainder. The roadway width varies from 16 to 18 ft. The contract of the Lang Transportation Co. covered the road from Far View to Cape Royal, and from Bright Angel Point—where the splendid new U. P. Lodge is located—to Fuller Canyon. Boyd's contract (see July 10th, 1927, issue, p. 62; November 25th, 1927, issue, p. 51; and April 25th, 1929, issue, p. 204) extended from Fuller Canyon to Far View and also included the Point Imperial section. The North Rim is constantly becoming more popular with tourists, and many excellent views of the canyon are obtained from points along the road.

The amount earned by the Lang Transportation Co. was $182,108, while the total cost to the Government of the contract, including engineering and materials, was $207,752. B. B. Boyd earned $204,557, while his contract cost the Government a total of $229,753. Both of these contracts were completed in 1929.

**Lord & Bishop Contracts**—At present, Lord & Bishop, Oroville, California, have a contract for surfacing the graded road (see December 25th, 1929, issue, p. 46, and May 25th, 1930, issue, p. 270). The total length of their contract is 25.85 miles and the surfacing consists of 3 to 4 in. of crushed rock base course and a 3-in. oil-treated crushed rock top course. The contract amounts to $251,552, main items being 30,700 tons of crushed rock base course at $2.75 and 34,550 tons of oil-treated crushed rock top course at $4.25. The contract time is 285 calendar days from June 3, 1930. The surfacing is a two-season job and the contractors plan to lay only base course this year and to place the oil-treated top course next year.




Major items of equipment in use are:

One 200-hp. diesel power plant
One 18 by 36-in. primary crusher
One 3 by 38-in. reducing crusher
One 4 by 8-ft. vibrating screen
One hoisting engine with a 1-yd. dragline outfit and necessary elevators at screening and crushing plant
One 30-hp. tractor with mechanical scraper
Four 5-ton White dump trucks (new)
One 60-hp. Caterpillar gas engine
One 300-c.f.m. Sullivan stationary air compressor
One electric welding outfit

Lord & Bishop have a contract (see July 10th, 1930, issue, p. 52) for surfacing 18.46 miles on the South Rim road with 4 in., loose measure, of plant-mix oiled crushed-rock surfacing. The contract amount is $113,950 exclusive of oil, which is furnished by the Government. The estimated total cost of the contract is $147,000. This job is to be completed this season, the contract time of 150 calendar days beginning July 14, 1930. The width being surfaced is 18 to 20 ft.

**Hodgman & McVicar Contract**—There is also a grading contract in progress on the North Rim this year. Hodgman & McVicar, Pasadena, California, are grading the North Entrance Road, Grand Canyon National Park Route No. 4, from the north park boundary to Bright Angel Springs (see December 25th, 1929, issue, p. 46, and May 25th, 1930, issue, p. 269). This ties into the other graded road, the new road having a length of 10 miles and width of 18 ft.

(Upper) Hodgman & McVicar Using Northwest 1-yd. Gas Shovel and 5-ton Autocar Trucks for Rough Grading Grand Canyon Route 4. (Lower) Lord & Bishop Crushing Plant for Surfacing Grand Canyon Route 3

The contract totals $73,942, the major item being 83,450 cu.yd. of unclassified excavation at $0.60. The contract time of 140 calendar days began June 3, 1930, and from present indications the work will be completed by October 20.

Major equipment on this contract includes:

One 60-hp. tractor
One 1-yd. Northwest gas shovel
Three 30-hp. tractors with scrapers
Two 1-ton trucks
Three 5-ton Autocar trucks
One 10-ft. blade
One 8-ft. blade
One scarifier
One 110-c.f.m. air compressor
One 1-yd. fresno
Twenty-six head of stock

**Vallandingham and Pearson & Dickerson Contracts**—Just a short distance in an air line—but many miles by road from the North Rim—is the South Rim. Pack trains can pass by going down into the canyon and crossing the Colorado river on a suspension bridge, but this is a long and weary trip. On the South Rim, too, where the Park headquarters and the famous El Tovar Inn are located, tourists are being provided with excellent roads.

Prior to 1930, thirty-four miles of road within the park had been graded and 14.5 miles surfaced with penetration macadam. James Vallandingham, Salt Lake City, Utah, graded 10.26 miles and surfaced the 14.5 miles, the width being 18 and 20 ft. (see January 10th, 1927, issue, p. 70; March 10th, 1927, issue, p. 53; June 25th, 1927, issue, p. 60; and April 25th, 1929, issue, p. 205). Vallandingham earned $338,321, and the total cost of his contract to the Government was $380,854.

Pearson & Dickerson, Riverside, California, completed a contract for grading 15.3 miles to a width of 18 ft. from Grand View to Desert View (see June 10th, 1927, issue, p. 64, and April 24th, 1929, issue, p. 205). From Grand View, a magnificent view of the Canyon is obtained, while from Desert View may be seen the wonderful panorama of the Painted Desert. The unsurfaced portion of the graded road has been covered with selected material as subgrade reinforcement.

**Galbraith Contract**—The South Approach Road to the Park was originally an unimproved county road, impassable at times due to mud and snow. A special authorization was made by Congress to the Department of the Interior for the purpose of building this road, since the law did not permit spending Park money on roads that were outside the Park, even though they served as approach roads. Some Forest money has been spent on this route as well as the Park money made available. The last section of the South Approach Road remaining ungraded is now under contract to Henry Galbraith, Jerome, Arizona, and will be completed November 6, 1930. It joins the National Old Trails Highway, U. S. Route No. 70, near Williams. The distance from the Park boundary to U. S. Route No. 70 will be 52.7 miles.

Galbraith's contract (see June 10th, 1930, issue, p. 60) is for grading 17.57 miles of road to a width of 18 ft. The contract amount is $66,494, of which major items are 13,000 cu.yd. of unclassified excavation at $1.25 and 98,000 cu.yd. of borrow at $0.35. The time allowed is 150 calendar days from June 10, 1930. On all but this 17.57 miles, selected material has been applied as subgrade reinforcement and will be on this section as well. It is expected that this reinforcement will be placed as soon as the grading is completed, assuring a good winter road to the Park this year and a firm base for future oiled surfacing.

A progressive highway construction program for Grand Canyon National Park is planned and will be carried out as fast as funds are made available. The natural wonders so plentiful in this scenic park will be more and more accessible to the traveling public by the continued construction of wide, safe, and well-surfaced highways.

# Drilling Oil Wells With Diesel Power

By O. H. BARNHILL, *Pasadena, California*

The Standard Oil Co. of California is using a novel adaptation of drilling machinery for sinking a new oil well in the Inglewood field, near Los Angeles. Diesel engines are being employed for motive power in this district, where fuel oil and water for generating steam are cheap and accessible, as are also gasoline, dry gas, and electricity. Instead of connecting the engines direct to draw-works and mud pumps, the diesels are used to generate direct current for motors running the well machinery. (Alternating current is the only kind available from power lines in that district.) Besides being the most flexible of the two types, direct current eliminates any danger of stalling the motor under sudden heavy load.

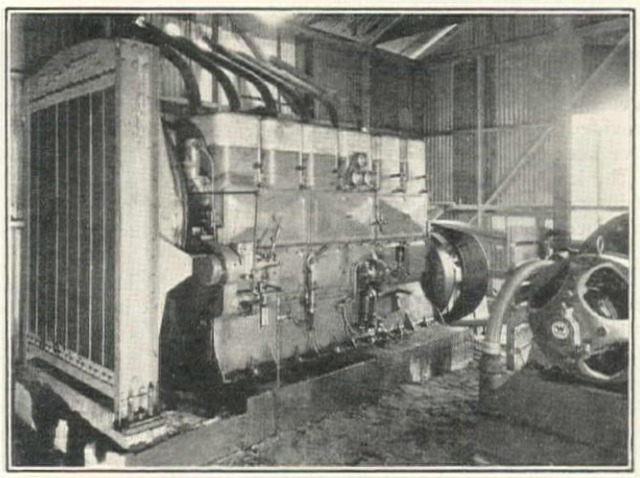
The 6-cylinder, 4-cycle, 200-hp. Atlas Imperial diesel engines are connected by Vulco rope drives to two 125-kw. direct-current Westinghouse generators. The generators are wired through a switching panel to a 250-hp. direct-current motor which is direct-connected to a reduction gear and thence by chain to the draw-works.

The diesels are run at 450 r.p.m. and burn 24-gravity fuel oil at a cost of 3 to 4¢ per gal. These engines are of the solid-injection type and are each air-cooled by an automobile-type front radiator. Exhaust lines lead outside through the corrugated sheet-iron shed in which the machinery is housed. Oil is forced into the combustion chambers under 2500 to 4500-lb. pressure. The cylinders of these diesels are 9 in. bore by 10½ in. stroke and are provided with removable liners of special-cast nickel-alloy iron. The hold-down studs are securely fastened to the base and extend up through the center frame, making a rigid connection and assuring perfect bearing alignment under all conditions. Full force lubrication is provided by a built-in distribution system.

A 125-hp., 450-r.p.m., 250-volt, direct-current Westinghouse motor is connected by a 3.26:1 reduction gear to a 4-speed draw-works, a magnetic brake being installed on the motor shaft for handling light loads. A 125-hp., 900-r.p.m., 250-volt, compound-wound, direct-current Westinghouse motor is connected by Tex rope to a 6 by 16-in. mud pump. The motor has a speed of 1350 r.p.m. when idling and 900 r.p.m. under full load. Running at about 400 r.p.m., the motor will slow down and stall when overloaded, much as will a steam engine. This feature is important, as a regular alternating current motor would continue to run under similar conditions and, in case of emergency, would probably break the pump or pipe-lines before stalling. When additional power is required, a simple button-control cuts out the mud-pump motor and the two machines are hooked together in series to double the voltage and the power available. An adaptation of the Ward-Leonard variable voltage control system gives the power plant flexibility nearly equal to that of a steam engine and permits both the drilling and pump motors to be controlled by a single throttle wheel.

Another feature of this diesel-electric installation is its ability to drill several wells without moving the power plant, simply by extending the transmission lines. The well now being sunk is 300 yd. from the engines and motors. Besides high torque at low speeds and smooth, gradual acceleration, the installation shows high efficiency under all loads and even at low speeds.

Minimum water requirements and low fuel costs are important advantages of diesel engines, especially



Atlas-Imperial 200-hp. Diesel Engine Connected by Vulco Rope Drive to 125-kw. D.C. Westinghouse Generator. Used at Inglewood Power Plant of Standard Oil Co. of California

in 'wild cat' districts where fuel and water have to be hauled long distances or the local water supply is unsuited to engine use. Finally, all equipment may be successfully salvaged.

The power plant at Inglewood is well adapted to deep drilling, as it is designed to sink a well to 10,000 ft. It is especially suited to such districts as the new Kettleman hills oil field, California, where deep wells are the rule. Electricity is being used for well drilling in Kettleman hills and in some other districts, and diesel generation of curent is regarded with favor.

A 4-cylinder, 150-hp. Atlas-Imperial diesel drilling engine and a 3-cylinder, 110-hp. mud pump engine of the same make were used a few years ago by the Shell Oil Co. for sinking a well in the Brea district near Los Angeles to 5825 ft. The larger of these engines weighed 14 tons, compared to less than 5 tons for the 200-hp. diesel now employed at Inglewood.

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At a recent conference in North Africa, a plan to send a commission to California to study irrigated farming in desert regions was approved.

# Building Code for Dams

## *The Sword of Damocles—Being Thoughts on Some Uncertainties in Dam Design with Remarks on the Wisdom of Providing an Ample Margin of Safety*

By M. H. GERRY, JR.*
*Consulting Engineer, San Francisco*

According to legend, there lived in the ancient city of Syracuse long before the Christian era, a man by the name of Damocles who was a close friend and loyal supporter of his king. He was a happy but thoughtless individual who gave no serious heed to the many dangers of the times which were all about him. In order to impress him with the uncertainties of life his sovereign prepared a great banquet and gave him the place of honor at his right hand. In the midst of the entertainment Damocles happened to look upward and perceived a huge naked sword suspended over his head by a single hair. The sight filled him with dismay and we are told that it taught him to realize ever after on how slight a thread may depend security for all human undertakings.

To this day, we have not learned how strong was the hair supporting the sword, but it must have been near the breaking point, else Damocles would not have been so deeply moved. We know, too, that had a sufficient number of hairs been provided, a strong cord would have resulted and there could have been no occasion for alarm. In this case, it was the will of the king that caused the support to be made weak in order to impress a moral lesson on his friend, but the danger would have been no less real had the deficiency been due to cupidity, ignorance, or error.

Somewhat similar conditions prevail in the building of engineering structures, and they are strong or weak in proportion to the skill, knowledge, prudence and honesty of the designers. Many important dams now standing are so close to the limit of structural failure that a small increase in head, or a slight departure from the assumptions as made, may cause their destruction. This is a matter of grave concern, for a great storage dam is so closely identified with the public welfare, and a failure so disastrous, that its construction becomes a matter of solicitude above that of any other engineering work.

In a semi-arid country like California, it is well understood that an ever-increasing storage of water is an essential requirement for the continued growth and prosperity of the State. This requires the building of more and more dams, but expanding populations and greatly enlarged financial investments, demand also adequate protection for life and property.

**Safety of Dams**—Under the law, a person of sound mind may risk his own life in the due course of his business or occupation. However, no individual, corporation, or community has the right to unnecessarily put in jeopardy the life or property of others. This principle has long been recognized in connection with fire and other public hazards and applies equally to the construction of dams. It is the duty of the State to protect its citizens in this particular.

If a public building code for dams is to be considered, the first condition to be fixed ought to be the placing of a definite limit on the risk. Before it is possible to design for economy or efficiency, it is necessary to know the lowest permissible degree of safety, in order that this limit may always be exceeded. While there is no absolute safety, it is still quite feasible to agree on a reasonable and ample limit, above the point where probable failure is to be expected as a result of the known forces acting under conditions formulated for the structure.

**'Factor' or 'Margin' of Safety**—A proper specification for safety must include all causes of structural failure, and it ought to be stated in a form clearly understood and definitely expressed. The common phrase 'factor of safety' is not well suited for the purpose, for the reason that it now has a widely accepted but limited meaning as the measure of the safe bounds of fiber stress in construction materials. Dams seldom fail from over-stress, but far more often from sliding on the base, yielding of the foundations, or other deficiencies. In order to avoid all misunderstanding I prefer to use the expression 'margin of safety' and to state this definitely, as a percentage, in terms of the increased weight over water, necessary for a hypothetical fluid, if acting in the place of water, to cause initial yielding of the structure. Specified in this way, a dam having a margin of safety of 100% would be one that would reach the point of failure only when subjected to pressures resulting from a fluid having a weight of 125 lb. per cu.ft., acting at maximum head.

At first thought it might seem that a dam said in common parlance to have a 'factor of safety of two', would possess the same degree of safety as one designed for a 'margin of safety of 100%'; but an examination of the facts will disclose a remarkable difference in the hazard imposed. Many gravity dams for which announced claims are made that they were designed for 'factors of safety of more than two against overturning', on careful analysis show actual structural margins of safety of not more than 5% and in some cases even less. Such limits of safety are much smaller than are permitted in other engineering structures and constitute an unjustifiable public risk. Perhaps the chief reason for the failure of so many dams has been this inexcusable practice of building 'on the ragged edge of safety'.

I believe that a margin of safety of 100% as herein defined, is the smallest figure permissible for important dams. However, there may be a difference of opinion on this point and it is well therefore to examine some of the common assumptions as made for design, in order to form a judgment of how dependable are the supposed facts on which so much reliance is usually placed. It should never be forgotten by engineers, that structures can be well designed on the 'basis of assumptions as made' and still the same structures when built may fail quite readily in service, for the very good reason that it is the actual state of things which supports or destroys and not merely what we have thought or assumed that state to be.

**Foundations**—Consider in the first place the supporting rocks at the base and abutments of dams. These are commonly assumed to be immovable, impervious, and unyielding. Foundations as a rule have additional qualities. Most rocks are elastic bodies only under low stress; they are plastic, and flow and yield unless strongly confined. It is well known that foundations and abutments when first loaded, frequently take decided sets far in excess of any possible elastic compression.

It is not uncommon, also, for vibrations to cause slight movements, and chemical and physical changes may produce like results. Rocks expand and contract not alone by reason of temperature variations, but in many cases to a far greater extent due to water saturation and drying out. Experiments on certain hard building sandstones have shown an increase in length of over 1 in. per 100 ft. as a result of change from a dry to a wet state. With absorption of water, certain clay rocks swell still more, and even granitic rocks expand slightly. Flood control dams and sometimes reservoir dams are subject to conditions of this kind.

It follows that the foundations of a dam may move up or down, and the abutments in or out, depending on the nature of the rocks and the varying physical conditions; the movements being quite apart from those resulting from normal stress or temperature change acting on an elastic medium. It is idle indeed to assume fixed abutments or unyielding foundations, for the sake of convenience in computation, under con-

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ditions where displacements are almost certain to occur in amount sufficient to vitiate the conclusions. If proper provision be made in design, such movements may be rendered harmless, but merely disregarding their existence will not protect the structure.

A common assumption made for the foundations of dams is that the rocks are impervious, save where water enters through cracks or other like openings. This is not correct, as all rocks are pervious in some degree and many sound rocks permit water to pass quite freely through their interstices. This error of assuming that rocks are impervious is a fundamental one and is the chief reason for the discrepancies in determining uplift under dams. The error in this respect alone is frequently greater than the entire margin of safety of the structure as provided by the design.

**Concrete in Dams**—Examine now the concrete of which dams are built and it will be found to be quite a variable material of which we have after all but a limited knowledge. In order to apply mathematical analysis it is frequently assumed to be a uniformly elastic material, and that the distribution of stress throughout the mass is linear. These are most convenient assumptions for computation, but unfortunately they are far from the truth. It has long been known that only at low unit stress is concrete truly elastic and the manner in which stress is distributed in a great mass like a dam has never as yet been determined with certainty.

Concrete is a plastic material without definite elastic limit, and it flows under stress and changes in volume in ways not fully understood. It expands with the absorption of water and contracts as much as ½-in. per 100 ft. on drying out. This is a permanent condition of the material quite apart from the initial contraction at the time of setting or any change of dimensions due to temperature.

Thus, the body of a dam may move on its base or rise or subside, and great forces may develop at the abutments or at other points, all in ways differing from the anticipated results following the usual assumptions. That actions of this nature often take place, we have certain evidence, and that they contribute to the failure of structures having narrow margins of safety, there can be no doubt.

**Vibrations**—There are forces other than water-pressure and gravity that produce stress within the mass of a dam and tend to change its position. These forces are both physical and chemical. Vibrations due to various causes have a marked effect on the stability and permanency of large bodies of masonry. Earthquakes cause powerful vibrations for short periods of time but the chief danger from this source in masonry dams arises from the loosening of the bond at the base and abutments, while for earth dams the danger is from fissuring and from subsidence.

Vibrations from other causes when long continued may be even more serious, and often produce measurable movements quite sufficient to alter the distribution of stress and change the coefficient of friction. Water falling over on a spillway is a common cause of heavy vibrations and should these become periodic the masonry will suffer damage. While conditions of this kind cannot be fully known in advance, still there is no reason why their existence should not be recognized and provided against in the 'margin of safety', but this is not done at the present time.

**The reactions sustaining dams** require careful consideration. For masonry dams of the gravity type as usually built, friction at the base alone prevents their sliding out of place. This resistance depends upon the weight and a coefficient of friction known to vary widely with the nature of the surfaces in contact. It has been the common practice in design to assume a value of about 0.75 for this coefficient; an arbitrary figure without scientific or adequate experimental basis. Such data as we have on this subject were derived nearly a century ago for conditions not comparable with those of the present day, and there has been no modern research in this direction.

It is well known, however, that coefficients of friction differ as much as 40% with the nature of the rock surfaces, and as the total resistance to sliding out of place by gravity dams depends upon the coefficient and the weight (this last also being subject to some uncertainty), it is evident that the possible error from this cause may be of at least the same order. When it is realized that under the usual assumption for design, the margin of safety as provided in the sliding factor is rarely over 10%, the necessity for a change in practice is apparent.

**Designing Practice**—Dams of all kinds are subject to identical natural laws and are fundamentally the same, differing only in form, dimensions, and materials. At this time, masonry dams are designed by approximate methods having only a limited mathematical basis; while earth and rockfill dams are frankly empirical in dimensions. The present practice in design is mostly the result of tradition, rather than the application of science, and many of the assumptions commonly used are without any adequate basis of fact. Karl Pearson, an eminent English authority on the design of dams, in a paper before the Institution of Civil Engineers (Great Britain), made this pertinent remark in reference to the designing of gravity dams: The current theory is wholly inapplicable and merely serves to screen the purely empirical design by a fallacious appearance of theoretical justification.

It would be quite possible to cite other uncertainties and errors in connection with the designing of dams, but the purpose here is merely to point out that such conditions exist and to urge a change in methods. Constructively, one of the first requirements for reform is a new line of thought in the minds of engineers responsible for design. Unsupported theories, old guesses, and approximate methods must give way to a more orderly procedure founded on modern science, supported by technical research. Above all, the hazards must be fully recognized and provided against by a liberal margin of safety, ample in amount to cover the contingencies of the unknown. There is no virtue or economy in unnecessary risk, and the highest possible cost is that of failure. To build a dam without adequate safety simply to reduce the initial investment is neither an engineering nor is it a financial achievement, but merely an ill-conceived and foolhardy act.

**Security and Permanency**—On purely economic grounds, security and permanency are of first importance. A great reservoir dam ought to be one of the most lasting works of man and, as such, its building can be financed much more advantageously than would be the case for an enterprise involving the element of great hazard. Interest and carrying charges are largely dependent upon the risk and are lowest when safety and long life are assured. Strong dams cost more than weak ones, but the difference is not so great as commonly supposed, nor is the amount prohibitive for an important development. Public money will be voted more readily and private capital made more easily available when doubt and uncertainty are removed. Happily there is in existence a sufficiently sound scientific basis for the design of dams which, when applied logically will insure a very high degree of security.

Investigation has shown that there are not less than a thousand undeveloped damsites within the confines of California, which ultimately may be utilized with commercial advantage. The cost will be large, but the benefits will be in even greater proportion. However, one of the principal obstacles in the path of progress is the latent fear in the minds of men that danger ever lurks near all dams; and unfortunately, history only confirms this view.

If water-storage on a large scale is to become an established public policy, then the existing uncertainty regarding the safety of dams must be definitely put aside. This result cannot be accomplished by law or by propaganda and will only be attained when dams are built in such a secure manner as to meet the universal approval of the engineering profession.

For years past, the present methods of designing dams have been severely criticized by able engineers from many countries. Notwithstanding this well-known fact, a coterie of designers has clung to an antiquated procedure, and tragic results have only too often followed. The appalling disaster of the St. Francis dam near Los Angeles, and the unnecessary waste of public money represented by the subsidence of the Lafayette dam near Oakland are still fresh in the minds of many.

**Conclusion**—For thousands of years, the Sword of Damocles has been proverbial as illustrative of unseen dangers near at hand deferred only by the narrowest of margins. A condition like this exists in connection with the building of dams,

and it constitutes a distinct bar to industrial progress, as well as an indictment against the engineering profession.

Fear is one of the most potent factors controlling the motives of men and, when supported by a reasonable basis of fact, it can be eradicated only by the removal of the basic cause. Following every period of high water, numerous reports in the public press show that many dams fail when filled to the top, and laymen and conservative engineers alike recognize that the reason for this is defective design, abetted by an altogether inadequate margin of safety.

Enlightened public opinion has at last demanded a drastic change and the Legislature of the State of California has attempted by law to control the evil. The enactment was a necessary one under the existing circumstances and it will produce some beneficial results. Unfortunately, however, structures cannot be made safe by law or decree alone, especially so in this case where it is the accepted practice that is fundamentally wrong, and not so much the acts of individual engineers. Technical revision in a broad way must come from within the engineering profession, and it is due the State that this assistance be rendered promptly and adequately.

The Sword of Damocles should be removed, and American engineers ought to be leaders in the reform.

# PERSONAL MENTION

**B. V. Howe** has been named state sanitary engineer of Colorado to succeed the late M. J. Lonergan.

**Andrew M. Jensen,** consulting engineer of San Francisco, has been employed to construct extensions to the sewerage system of Madera, California.

**H. E. Hilts,** general manager of the Denver water works, has resigned. His successor is **C. C. Shrepferman,** who was formerly president of the Denver Water Board.

**C. C. Kennedy,** consulting municipal engineer of San Francisco, was recently employed by the town of Soledad, California, to design and construct a sewerage system, including treatment plant.

**Burns-McDonnell-Smith Engineering Co.,** of Los Angeles and Kansas City, is preparing plans and specifications for a sewerage system for the town of Gonzales, California, including treatment plant.

**Merritt-Chapman & Scott Corp.,** of New York City and San Pedro, California, announces the organization of a marine department which will conduct all salvage, diving, derrick, and lighterage operations of the corporation.

**E. G. Scheibley,** consulting civil and mechanical engineer of San Francisco, has been elected 1930-31 president of the San Francisco Section of the American Society of Mechanical Engineers. Scheibley is also a member of the American Society of Civil Engineers.

**The Aerotopograph Corp. of America** is preparing a detailed topographic map of the Boulder canyon damsite for the U. S. Bureau of Reclamation, using a combination of air and ground methods. **Brock & Weymouth** have a contract for a similar survey of territory adjacent to the damsite.

**Charles E. Grubb,** county engineer, New Castle county, Delaware, has been appointed engineer-executive, county highway officials' division, American Road Builders Association, with headquarters in the National Press bdg., Washington, D. C. W. A. Van Duzer is president of the association.

**R. H. Thomson** has been appointed city engineer of Seattle to succeed the late W. D. Barkhuff. Thomson has been in consulting practice for a number of years and was city engineer under several past administrations. He is a member of the American Society of Civil Engineers and served one term as a director of the Society.

**John C. Baxter,** formerly vice-president and contract manager of A. Guthrie & Co., Inc., at New York City, is now a partner in Carey, Baxter & Kennedy, engineering contractors of New York City. Baxter directed construction of the new Cascade tunnel of the Great Northern Railway. (See March 25th, 1929, issue.)

# OBITUARY

**J. L. Smith,** 46, a partner in the J. L. Smith Construction Co., engineering contractors of Seattle, died August 16 following a heart attack.

**Walter Rehorn,** 48, for the past 20 years city engineer of Walla Walla, Washington, received fatal injuries August 7 in an automobile accident near Dayton.

**R. A. Edwards,** manager of the San Francisco branch of Foster & Kleiser Co., died on July 13. He was a member of the San Francisco Section of the American Society of Civil Engineers.

**R. E. L. Collier,** 70, civil engineer of Salt Lake City, died August 5 following a long illness. He had a wide experience in engineering construction, particularly on municipal, railroad, and mill projects.

**John C. Wilson,** associate member, American Society of Civil Engineers, and formerly member of the San Francisco Section, died recently in Texas, where he was engaged in state highway engineering. Wilson was formerly with the California Division of Highways.

**Melvin Scott,** 65, for the past nine years an employe of the Idaho Bureau of Highways, died recently at Lewiston, Idaho. Scott had previously been employed by the Lewiston street department and was a resident of that community for 30 years. He is survived by two brothers and two sisters.

**N. B. Putnam,** civil engineer of Salt Lake City, died recently following a long illness; being well past 70 years of age. Putnam was educated at Massachusetts Institute of Technology, University of Glasgow, and Cambridge university, and devoted most of his life to railroad engineering. An article by Putnam on 'Easement and Banking of Highway Curves' was published in the December 10th, 1929, issue; discussions of which are to be published shortly.

**Hans Henrik Rode,** professor, Norges Tekniske Höiskole, Trondhjem, Norway, and during 1924-27 resident engineer at Portland, Oregon, for Gustav Lindenthal on the design and construction of the Burnside, Ross Island, and Sellwood bridges over the Willamette river, was killed on July 20, together with his wife, in an automobile accident in southern Europe. Rode also taught mathematics at Reed College, Portland, during his sojourn in Oregon.

# ASSOCIATIONS

**Southwest Water Works Association**—The 19th annual convention will be held at Amarillo, Texas, September 15 to 18. Lewis A. Quigley, superintendent of the Fort Worth water works, is secretary-treasurer of the association.

**International Road Congress**—The sixth International Road Congress and exposition of road machinery and materials will be held in Washington, D. C., October 6 to 11, under the auspices of the American Road Builders Association. This is the first such congress ever to be held outside of Europe. Sixty-nine papers by engineers in 20 different countries are being published for the Congress.

## SAN FRANCISCO 'ASCES' TO HAVE PARTY

The first annual convention of the San Francisco Section, American Society of Civil Engineers, will be held September 20 at the Union League Golf and Country Club for the entertainment of members of this and the Sacramento section and the California and Stanford student chapters, their ladies and guests. The club is between San Bruno and Millbrae and west of the Peninsula highway. Beginning at 2 p.m. there will be golf, tennis, and bridge tournaments; at 7 p.m. there

will be an informal banquet; and at 8 p.m. a program of dancing and bridge.

Ralph G. Wadsworth is general chairman of the entertainment committee. I. E. Flaa is in charge of the bridge tournament, S. S. Gorman of music and general arrangements, Edward M. Knapik of the banquet, A. V. Saph of the tennis tournament, and I. C. Steele of the golf tournament. The reception committee includes the following officers of the San Francisco section and their wives: H. D. Dewell, L. B. Reynolds, George W. Pracy, I. C. Steele, and Harold B. Hammill.

## LOS ANGELES 'ASCES' HAVE OUTING AT LONG BEACH

A regular monthly meeting of the Los Angeles Section, American Society of Civil Engineers, was held at Long Beach on July 19. The meeting was in the nature of an outing, with a social gathering in the evening in which the ladies were included. Eighteen members of the local section are residents of Long Beach and an arrangements committee of 15 members, with A. H. Adams as chairman, worked out a delightful program for the visitors.

In the afternoon, a party including 145 members and guests inspected the aeroplane carrier 'Saratoga', at anchor in the harbor. A golf tournament was held at Recreation Park for members preferring that sport, first and second prizes going to F. C. McMillan and Vaughn Wood. Several members who made the trip to the 'Saratoga' afterwards swam in the Rainbow Pier lagoon. A dinner dance was held at the Recreation Park Club House. During the dinner, an exhibition of fancy dancing, arranged by Mrs. A. J. Newman, was enjoyed. Toastmaster Adams called on A. L. Ferver for an address of welcome and on A. F. Barnard for the response. C. T. Leeds and Walter E. Jessup spoke briefly and Franklin Thomas, director, gave a short account of his trip to attend the summer meeting of the Society at Cleveland, dancing followed.

## N. E. L. A.

San Francisco was host, June 15 to 21, to 4000 members and guests of the National Electric Light Association who attended the 53rd annual convention. The Palace Hotel was headquarters and the business sessions were held in the Exposition Auditorium, Civic Center.

A feature of this convention was the special lighting effects at the Civic Center and of prominent buildings throughout the city such as the Ferry bdg., P. G. & E., Pacific Telephone, and Shell Corner. Many prominent men in the electrical industry attended this convention. As commented upon editorially in the June 25th issue, the Engineering Section was noteworthy for being 'short and snappy'. There were but four papers, which were carefully prepared and especially well delivered, and devoted to the economic aspect and not engineering details. Alex D. Bailey, of the Commonwealth Edison Co. of Chicago, acted as chairman and made excellent introductions of the speakers. He referred to N. E. L. A. as the greatest organization in the world, stressed the responsibility of membership therein, and pointed out that the Easterners had come West to this convention as observers.

'The Future of Water Power Development in California' was discussed most comprehensively and comprehendingly by A. H. Markwart, vice-president in charge of engineering of the P. G. & E. Co. Markwart discussed in great detail the economic relation between hydro and steam generation in California, a few highlights being: In 1930, the ratio is 1,705,000 kv-a. of hydro to 999,000 kv-a. of steam; cost of hydro development is increasing; efficiency of hydro is near its peak; efficiency of steam production is increasing (at present 28% thermal eff.), which, together with present abundance and low price of fuel oil and natural gas, makes steam generation preferable economically; trend is toward 100% steam development; practically all hydro development will require ½ kw. of steam to every 1 kw. of hydro to care for dry-year emergencies; construct steam plants to carry load until hydro plants are completed; hydro as a by-product in connection with irrigation, water supply, water conservation, etc., is economically profitable and necessary, but must be at same price as steam generation; effect of development of piped natural gas cannot yet be determined.

Mathew S. Sloan of the New York Edison Co., retiring president of N. E. L. A., made a few succinct remarks stressing that it was the engineers who have built the electrical business, and it would be up to the engineers to coordinate production and sales so that an increase in volume can be secured at a decrease in cost, in spite of rising cost of development.

A. H. Kehoe, chief electrical engineer of The United Electric Light & Power Co. of New York, was emphatically of the opinion that it is up to the engineers to keep down system costs and that sales must be increased. Since 1923, there has been a reduction in plant costs of 12%, but system costs have increased 20% (from $312 to $375 per kw-hr.); nevertheless total investment cost per kilowatt hour sold has dropped from 15¢ to 14¢ since 1926. Steam stations represent 70% of the total installed capacity and 60% of the output. The outstanding requisite of the electrical industry is detail data on construction and operation costs; and, "more system capacity per dollar of investment".

Fred B. Lewis, a vice-president of the Southern California Edison Co., was unable to attend the convention and his paper on 'Trend of Power Generation in Southern California' was read by H. A. Barre, executive engineer. Lewis discussed the present economic relationship between hydro and steam development in California, and stated that conditions favor steam generation for an indefinite period. His company is concentrating on the enlargement of the Long Beach steam powerplant, which since 1923 has been increased to 400,000 hp., and plans drawn for six additional turbines of 100,000 hp. each. Lewis pointed to recent legal decisions in favor of riparian rights as a big retard to hydro development, and also unjustifiable political attacks on hydro water rights. He gave large credit to the manufacturers for improvements in production and distribution and to the State Railroad Commission for fair cooperation.

Alex D. Bailey was elected president for the ensuing year.

One of the big features of the convention was the luncheon tendered by the Electrical Development League of San Francisco, at the Palace Hotel on Monday, the attendance being 827.

Incidentally, the San Francisco members want it known that N. E. L. A. stands for National Electric Light Association, and not, as some Los Angeles wit interpreted the big signs—'North End Los Angeles'.

## A. E. R. A.

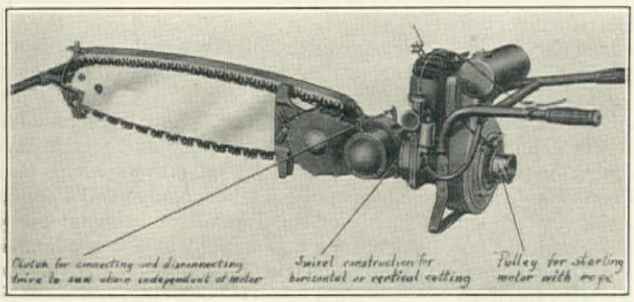
Many of those who attended the N. E. L. A. convention remained in San Francisco for the 49th annual meeting of the American Electric Railway Association, June 23 to 26, with headquarters at the Fairmont Hotel on 'Nob Hill'. The program committee was certainly ambitious in arranging numerous long sessions, with numbers of papers and reports, and round-table luncheon conferences of various groups. Paul Shoup, chairman of the boards of the Pacific Electric Railway and Southern Pacific Co., and president of A. E. R. A., made a particularly fine address. The A. E. R. A. delegates were entertained on Monday at luncheon by the San Francisco Electrical Development League (attendance 550), Charles Gordon, managing director of the A. E. R. A., being the speaker. Samuel Kahn, president of the Market Street Railway Co., San Francisco, introduced Gordon and stated that although the electric traction industry has gone through a serious economic illness, the crisis has passed and it would soon recover. This confirms Lundberg's prediction as commented on editorially in the May 25th issue. Gordon discussed the subject of traffic congestion as brought about by the automobile, the individual use of which is turning us backward instead of forward in the solution of the problem, and is resulting in the death of central business districts and the birth of innumerable small shopping centers. Mass transportation can only be efficiently handled by street railways, one two-track street railway being better than four express boulevards, with grade separation, etc.

A feature of this convention was the number of entertainments and excursions. Not only around San Francisco, but to Del Monte for a golf tournament, and thence to Los Angeles and San Diego and environs. Also, the Fageol family held open house at their palatial home at the Orinda Country Club.

# New Equipment and Trade Notes

## 'WOLF' PORTABLE TIMBER SAWING MACHINE

The Reed-Prentice Corp., Worcester, Mass., manufacturer of 'Wolf' electric and air-driven saws, announces the 16 and 24-in. gasoline-driven 'Wolf' portable timber sawing machine. These saws are adapted for cutting large timber and for felling and bucking trees. The 16-in. capacity unit weighs 52 lb. and the 24-in. weighs 92 lb., both are driven by air-cooled, 4-hp., single cylinder, 2-cycle, gas motors equipped with Bosch magnetos. The gasoline tank carries 2 qt. of gasoline



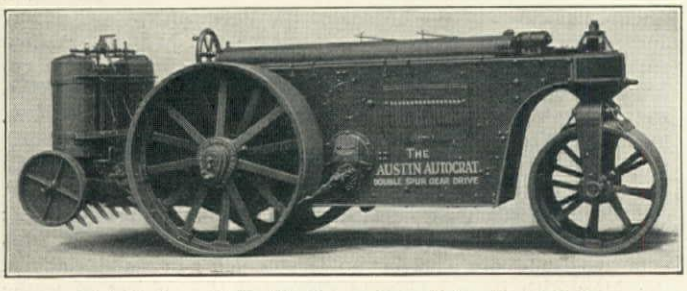

'Wolf' Gasoline-Driven Portable Sawing Machine

and cylinder oil in the proportion of 9 to 1. The engine crankshaft is drop-forged and ball bearings are used for main bearings.

The throttle operates from the left-hand handle. To stop and start the chain independent of the motor, a multiple disc clutch is furnished. When the saw has a tendency to stall, the clutch will slip rather than stall the motor, thus eliminating necessity for starting and stopping the engine. The saw is made with a swivel movement so that cutting can be performed either vertically or horizontally, allowing the engine to remain vertical. The motor is started by a rope wound on the pulley shown in the illustration.

## AUSTIN 'AUTOCRAT' DOUBLE SPUR GEAR DRIVE ROLLER

The Austin-Western Road Machinery Co., Chicago, announces the 'Autocrat' double spur gear drive roller. Outstanding features of this machine, as stated in catalog No. 10, are: an efficient double spur gear drive; an abundance of power for rolling and scarifying; a short wheel base (10½ ft.) which




The 'Autocrat' Double-Spur, Gear-Drive Road Roller

adds to maneuverability in close quarters; ease of steering and handling; and a low center of gravity to insure smooth work by eliminating side sway.

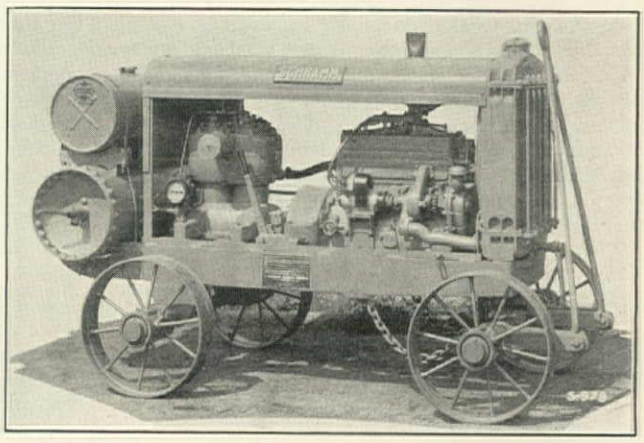
The single-cylinder Austin motor roller of 1907 was the first of this type of American manufacture and was followed by the first tandem motor roller and the first 'pup' roller. Two-cylinder and four-cylinder models replaced the 1907 model and the double spur gear drive 'Autocrat' is the latest addition to the line.

Special attachments for the 'Autocrat' include a pneumatic scarifier, a wheel sprinkling system for rolling 'hot stuff', and an operator's cab.

## SCHRAMM PORTABLE ENGINE-DRIVEN COMPRESSOR

Schramm, Inc., West Chester, Pa., announces a 72-c.f.m. portable engine-driven compressor, a description of which appears in Bulletin 303. This unit combines the features found in larger Schramm compressors, including a clutch that permits starting the engine independent of the compressor, an automatic cutout or slow-down which decreases the 800-r.p.m. engine speed when the compressor is unloaded, a heavy-duty, tractor-type Buda gas engine, a hot-riveted A.S.M.E. code tank, and a one-piece cast steel frame. The model 72 compressor has a shipping weight of 2200 lb. The air compressor is of the vertical type, with two cylinders in line.

This compressor can be used as an auxiliary unit for replacing larger machines on work where only one air tool is needed, and is said to be a good investment for contractors who re-



Schramm 72-c.f.m. Portable Engine-Driven Compressor

quire a small outfit for occasional rock drilling, pavement breaking, demolition, clay digging, tamping, riveting, etc.

Edward R. Bacon Co. has been appointed Schramm distributor in Northern and Central California and Western Nevada, stocking models 72, 120, 180, 240, and 360—for all of which maximum working pressures of 100 lb. per sq.in. are recommended. The compressors are available with standard steel wheels, rubber-tired wheels with or without springs, truck mounting, and a 2-wheel special mount for operation from a tractor power take-off.

## HERCULES POWDER CO. PERSONNEL

C. C. Gerow, director of sales, explosives department, Hercules Powder Co., is taking a 6-weeks business tour of the far west, spending considerable time at the branch offices in Salt Lake City and San Francisco.

C. F. Bierbauer, superintendent of the Hercules, California, explosives plant of the Hercules Powder Co., recently visited the home office at Wilmington, Delaware.

H. V. Chase, for the past two years superintendent of the Kenvil, New Jersey, explosives plant, has been appointed assistant director of operations in the explosives department and will assist W. C. Hunt in overseeing operations in the company's eleven plants. W. S. Brimijoin succeeds Chase at Kenvil.

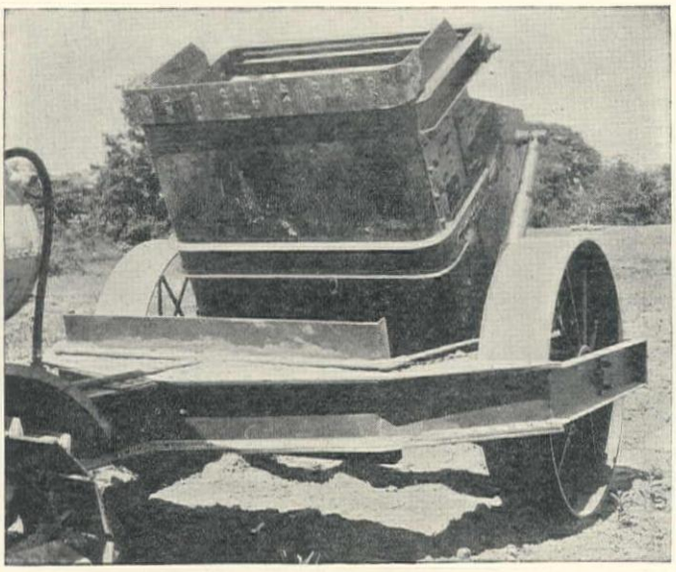
J. S. Marks, plant superintendent, and R. K. Hallett, construction engineer, are supervising rearrangement of facilities at the Carthage, Missouri, explosives plant, estimated cost $175,000.

## HAISS MATERIAL HANDLING EQUIPMENT

The George Haiss Manufacturing Co., Inc., New York City, has released catalog 230, an 80-page illustrated engineering data book and catalog describing its line of material handling equipment. The company's products include revolving, vibrating, shaking, and stationary screens; continuous, centrifugal, and V-bucket elevators; fixed belts, flight, slat, and spiral conveyors; bin, tunnel, and bunker gates; chutes; clamshell buckets; storage distribution systems; portable truck and wagon loaders; portable belt conveyors; and the caterpillar-mounted 'Haiss' excavator for grading and stockpiling.

## SHAW 'TRUE CUT' SCRAPER

The Shaw Excavator and Tools Co., Worthington, Ohio, announces the 'True Cut' scraper. This scraper is made in model '50' for tractors of 50 or more draw-bar horsepower, having 4 cu.yd. capacity; model '30' for 2¼ cu.yd.; and model '20' for 1½ cu.yd. The desired depth of cut is obtained by



Shaw 'True Cut' Scraper

setting the cylinders which control the bucket. The scraper fills like a dragline.

Features of this scraper are: a hydraulic pump consisting of telescopic hydraulic cylinders, one at each side of the bucket, controlled from a single lever at the driver's seat on the tractor, by which the bucket can be raised or lowered without stopping or changing gears; high-grade ship channel steel frame; 14-in. tread wheels assuring traction in soft ground; moderate price. With the 'True Cut' scraper it is claimed that one man and a tractor can move 500 cu.yd. of dirt 500 ft. in a 10-hour day.

## FULLER ROTARY AIR COMPRESSORS AND VACUUM PUMPS

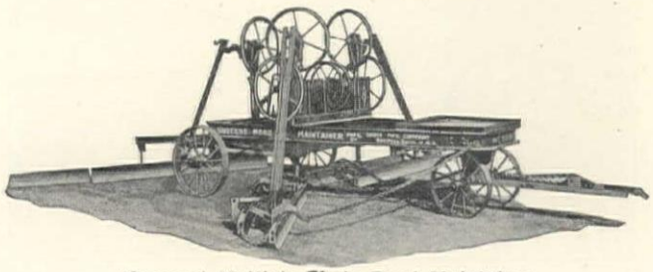
The Fuller Co., Catasauqua, Penn., is now manufacturing rotary air compressors and vacuum pumps for high pressures and vacuums, having checked the successful performance of many European installations and secured the American rights for these designs. Advantages claimed for the compressors and pumps include: a direct-connected motor, no-load starting, overload release, only one valve (non-return valve on discharge), small wear (only at contact of rotor blades with shell), simple forced feed lubrication, elimination of guide rings, water cooling in cylinder wall and heads.

The single unit or stage compressor comprises a water-jacketed stator casing, having a cylindrical central bore, and provided with a gas inlet on one side and an outlet for compressed gas on the opposite side. The rotor is mounted eccentrically on the same vertical center-line with the central bore. Milled radial grooves in the rotor guide machined blades of special steel alloy. The eccentric mounting forms a crescent-shaped free space, divided by the blades into a series of cells. Centrifugal motion forces the blades outward into contact with the cylinder walls. The single-stage units have capacities up to 3500 c.f.m. and pressures up to 55 lb. gauge. Two-stage compressors have the same capacities and will handle pressures from 55 to 170 lb. gauge.

Vacuum pumps with essentially similar design have maximum capacities of 3500 c.f.m., with vacuums as high at 29½ in.

## 'SUCCESS' ROAD MAINTAINER

The Shunk Mfg. Co., Bucyrus, Ohio, recently took over from the Success Road Machine Co., of Jacksonville, Ill., the 'Success' multiple-blade heavy-duty maintainer for gravel, crushed stone, black top, oiled, or untreated earth roads. This

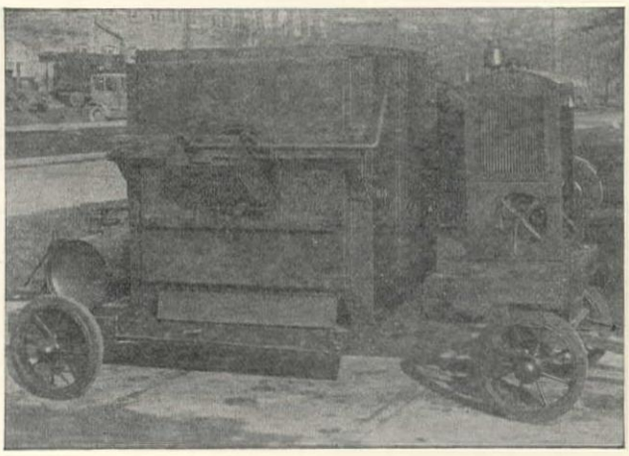


'Success' Multiple-Blade Road Maintainer

maintainer has a frame of 6-in. channel steel, well braced and riveted. The entire weight of the machine can be placed on the twin dual blades; a three-point draft puts the pull low down near the center of the blades; a 15 to 30-hp. tractor will handle the unit, but with a safety pin feature greater power may be used without injury. Each set of dual blades is separately controlled by three large hand wheels; the blades are double-edged and are of high-carbon steel.

## CHAUSSE PORTABLE SAND DRIER AND RE-HEATER

The Chausse Oil Burner Co., Elkhart, Indiana, has developed a portable sand drier or re-heater for paving mixes. This machine can be used to rapidly heat and dry sand or stone for railway and contractor's uses or for re-heating pre-mixed and natural asphaltic paving repair materials. It consists of a rotating drum with internal cascading blades, ball bearing mounted and steel housed. The drum is turned through a



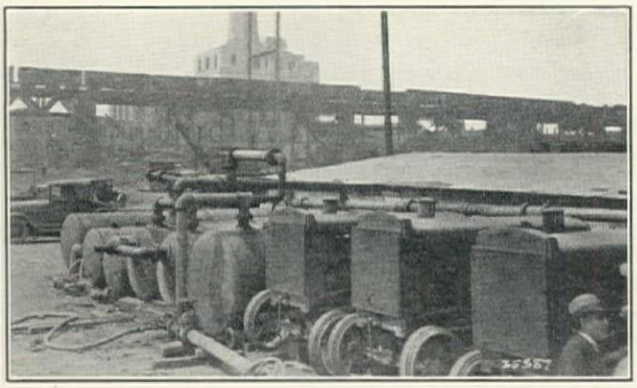
Chausse Portable Sand Drier and Re-heater

hardened roller chain by a single-cylinder, 4-hp. LeRoi engine. Heat is applied indirectly through two Chausse self-generating kerosene burners in the steel housing beneath the drum. The machine is mounted on rubber-tired steel wheels and has a towing tongue.

Kratz & McClelland are agents for northern California, R. P. Carmein for southern California, and the Howard-Cooper Corp. in Oregon and Washington.

## I-R PORTABLE COMPRESSORS FOR FOOTINGS

For placing footings on the Pennsylvania terminal improvement at West Philadelphia, the Underpinning & Foundation Co., Inc., is using a portable compressor plant to supply the varying volumes of air required by pile hammers and blow-off pipes. Three 310-c.f.m. Ingersoll-Rand portable compressors are connected to an 8-in. pipe and five air receivers are also connected by 8-in. lines, permitting storage of a large amount of air and greatly reducing pressure drop in the lines. The compressors are set to unload at 95-lb. pressure,



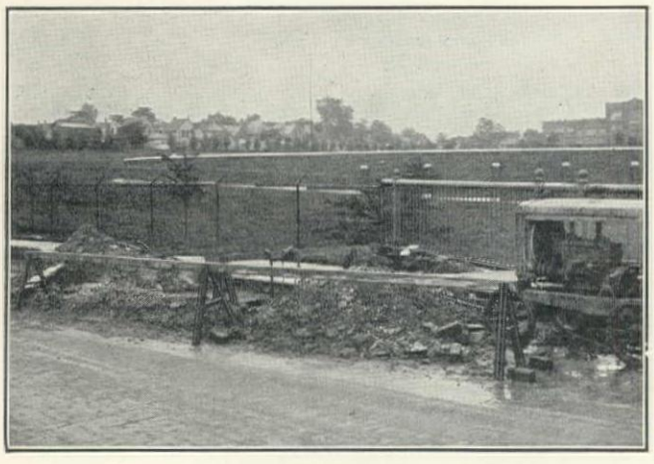
Battery of Three 310-c.f.m. Ingersoll-Rand Portable Compressors Supplying Pile Hammers and Blow-off Pipes

80-lb. working pressure being used with a 92B McKiernan-Terry pile hammer and for blowing purposes.

Such an installation is said to have many advantages over large stationary units, as the machines can be taken to the job, the receivers piped up, and the equipment placed in service in a few hours' time. One, two, or three compressors may be operated according to the air requirements. No foundations are needed. One or all of the machines can be disconnected from the line and quickly taken to any other point where compressed air is required.

## TOLEDO FOLDING STEEL HORSE

The Toledo Pressed Steel Co., Toledo, Ohio, announces a folding steel horse which is useful in barrier construction for adequate job protection, safety of the public, and safety of workmen. Besides this use for road commissions, street railways, and other public service operations, contractors find the Toledo horses useful for miscellaneous supports, temporary branches, and scaffolds.



Toledo Folding Steel Horse

A pair of these horses consists of two steel A-frames made from heavy gauge 3-in. ribbed channels. Any standard size stick of timber can be dropped between the jaws and the feet of the A-frames spread until the lumber is gripped on three sides. To securely lock the rail and legs, it is only necessary to step on the toggle joint. Rails may be butt-jointed, one A-frame to each joint, for long lines of barrier. There are no loose clamps, bolts, or other parts; the folded A-frame occupies less space than an ordinary shovel. The wooden rail may be easily removed and utilized for other purposes, as it is not mutilated in the horses.

## BACON TAKES RODAX PAVEMENT BREAKING MACHINE AGENCY

The Edward R. Bacon Co. has accepted distributorship for the Rodax pavement breaking machine in Northern and Central California and Western Nevada.

Although weighing but 87 lb., the Rodax is a complete, self-contained gasoline-driven tool for tamping, concrete breaking, pile driving, etc. It strikes 1000 blows per minute, yet is so small that it can be carried easily from job to job by one man. As it is of simple construction, the Rodax can be entirely dismantled in a few minutes with a screw driver and monkey wrench; when not in use it requires but little more space than a sledge hammer. The Rodax is composed of the following principal parts: cylinder, piston, anvil, two springs, one spark plug, timer, and gasoline tank with simple check valve carburetor. A box containing a dry battery and ignition coil are attached by insulating cable. Two gallons of gasoline are sufficient to operate the Rodax all day.

Two Rodax Pavement-Breaking Machines in Action

Already, despite its newness, the Rodax is finding favor with contractors. Floyd S. Lee, southern California contractor, recently used five of these machines to break pavement consisting of 2 in. of asphaltic concrete top course and 6 in. of portland cement concrete base course for a 33-in. trench two miles long, in Pasadena.

## CLIMAX ENGINEERING CO. APPOINTS DEALERS

The Climax Engineering Co., Clinton, Iowa, and Chicago, Illinois, manufacturer of 'Blue Streak' distillate burning engines, announces appointment of the following new dealers: Steeples Engineering Co., Seattle; Construction Equipment Co., Spokane; British Columbia Equipment Co. and Brown-Frazier Equipment Co., Vancouver; Hall Perry Machine Co., Butte; and Commercial Iron Works, Portland. The latter company replaces the former dealer, the J. S. Latture Equipment Co.

## UNION CARBIDE AND CARBON CORP. EXHIBIT

The following units of the Union Carbide and Carbon Corp., New York City, will exhibit jointly at the 12th annual National Metal Congress and Exposition, to be held at the Hotel Stevens, Chicago, September 22 to 26; the Linde Air Products Co., the Prest-O-Lite Co., Inc., Oxweld Acetylene Co., Haynes Stellite Co., the Oxweld Railroad Service Co., and the Union Carbide Sales Co.

# On the MENEFEE Airport

## ARMCO Perforated Pipe Is Meeting A Severe Test

*Installing Armco Perforated Iron Pipe on the Menefee Airport, New Orleans, Louisiana. The site of this port was originally a swamp.*

ONCE a swamp, the Menefee Airport at New Orleans, Louisiana—recently drained by Armco Perforated Iron Pipe—now offers safe landing conditions to visiting planes.

Continuity of construction, made necessary by unstable soil conditions, was secured by the use of Armco Perforated Pipe. The long sections of this pipe, securely joined into one continuous line, give a drain that will not disjoin or lose its alignment even in the unfavorable soil conditions in which it is laid.

Strength to withstand impact of landing planes was demanded by conditions which permitted only shallow installation of the drains. The flexible construction of Armco Perforated Pipe, with its strength proved by years of railway service, fully meets this requirement.

Additional advantages accrued to the use of Armco Perforated Iron Pipe during the installation. The thin walls required the minimum amount of hand excavation, made necessary by unstable soil conditions. The long, light weight sections of pipe were securely joined together on the bank of the trench and lowered into place in the partially water-filled ditches to an accurate alignment and grade.

Rapid runoff was secured by the high infiltration efficiency of the drain used and a shell backfill graded to meet the slope of the runway. The runways are usable in the minimum length of time following rains.

The Menefee Airport is only one of many ports that are securing safety and thereby advancing the progress of aviation by a drainage system of Armco Perforated Iron Pipe—a product now Nature-tested by over 24 years of service.

A request will bring further information on this dependable subdrain without any obligation on your part.

ARMCO Ingot Iron

***Address***

## Armco Culvert Manufacturers Association

### Middletown, Ohio

***OR THESE MEMBERS***

The Burnham Mfg. Co.
WOODS CROSS, UTAH—BOISE, IDAHO

Colorado Culvert & Flume Co.
PUEBLO, COLO.

Pure Iron Culvert & Mfg. Co.
763-769 GLADSTONE AVENUE, PORTLAND, ORE.

California Corrugated Culvert Co.
WEST BERKELEY—LOS ANGELES

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

Spokane Culvert & Tank Co.
SPOKANE, WASH.

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

# UNIT BID SUMMARY

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

# STREET AND ROAD WORK

## SAN FRANCISCO, CALIF.—CITY—SUNSET BOULEVARD—SECTION B

Meyer Rosenberg, 1755 San Bruno, San Francisco, who bid $83,766, low bid to City for improving Section B, Sunset Boulevard from Santiago to Yorba Sts. Bids received from:

(1) Meyer Rosenberg, S. F. ..... $83,766
(2) C. B. Eaton, S. F. ..... 86,695
(3) Granfield, Farrar & Carlin, S. F. ..... 95,213
(4) J. P. Holland, Inc., S. F. ..... 92,904
(5) Fay Improvement Co., S. F. ..... $95,823
(6) Sibley Grading & Teaming Co. ..... 92,890
(7) Chas. L. Harney, S. F. ..... 88,974
(8) California Const. Co. ..... 92,899

| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|---|
| 83,800 | cu.yd. excavation | .20 | .21 | .28 | .21 | .263 | .26 | .20 | .26 |
| 192,000 | ft. 2½-in. asph. surf. 10-in. waterbound macadam base | .125 | .153 | .14 | .16 | .138 | .14 | .13 | .147 |
| 29,400 | ft. 2½-in. asph. and 6-in. conc. base | .18 | .22 | .22 | .18 | .222 | .20 | .25 | .22 |
| 300 | tons asphalt conf. paving | 6.00 | 5.00 | 7.00 | 5.00 | 5.63 | 5.50 | 7.00 | 5.00 |
| 88,500 | sq.ft. 4-in. waterbound macadam pav. | .05 | .03 | .04 | .02 | .028 | .03 | .03 | .04 |
| 44,900 | sq.ft. 6-in. waterbound macadam pav. | .05 | .04 | .06 | .024 | .042 | .04 | .05 | .05 |
| 14,200 | sq.ft. concrete sidewalk | .12 | .12 | .13 | .13 | .12 | .12 | .16 | .14 |
| 13,080 | ft. concrete curb | .70 | .40 | .60 | .65 | .69 | .60 | .70 | .50 |
| 480 | lin.ft. reset conc. curb | .50 | .25 | .25 | .25 | .28 | .30 | .20 | .20 |
| 17,800 | ft. 2-in. x 6-in. redwood headers | .10 | .08 | .06 | .08 | .106 | .10 | .12 | .07 |
| 265 | ft. 15-in. vitrified sewer | 2.00 | 2.00 | 2.00 | 2.00 | 2.53 | 2.40 | 3.00 | 1.75 |
| 700 | ft. 10-in. vitrified culvert | 1.35 | 1.00 | 1.00 | 1.00 | 2.25 | 1.00 | 1.00 | 1.00 |
| 3 | brick manholes | 80.00 | 75.00 | 85.00 | 85.00 | $100 | 80.00 | 90.00 | 85.00 |
| 12 | brick catchbasins | 80.00 | 75.00 | 85.00 | 75.00 | 88.00 | 80.00 | 75.00 | 85.00 |
| 5 | brick catchbasins, reset | 60.00 | 50.00 | 40.00 | 50.00 | 40.00 | 50.00 | 40.00 | 20.00 |
| 640 | ft. 3-in. black pipe cond. | .35 | .80 | .75 | .75 | .97 | .60 | .60 | .75 |
| 1,700 | ft. 1½-in. black pipe conduit | .25 | .50 | .40 | .40 | .39 | .40 | .30 | .30 |
| 3 | 9-unit yellow reflectors | 30.00 | 25.00 | 15.00 | 15.00 | 17.00 | 20.00 | 25.00 | 20.00 |
| 6 | Keep-to-Right signs | 30.00 | 75.00 | 12.50 | 12.50 | 6.50 | 5.00 | 25.00 | 7.00 |
| 9,700 | cu.yd. loam | .90 | 1.00 | 1.00 | 1.40 | 1.00 | 1.25 | 1.00 | 1.00 |
| 1,820 | cu.yd. manure | 2.00 | 2.50 | 3.00 | 3.00 | 3.85 | 2.50 | 3.00 | 3.20 |
| 2 | tons hay | 50.00 | 40.00 | 20.00 | 50.00 | 38.00 | 75.00 | 50.00 | 50.00 |

## SOUTH SAN FRANCISCO, CALIF.—CITY—ASPHALT PAVING, SEWERS, BRIDGES AND ELECTROLIERS

Hanrahan Company, Standard Oil Bdg., San Francisco, $79,848, low bid to City Clerk, South San Francisco, San Mateo County, for improvement of portions of Linden Avenue from Railroad Avenue to city limits. Bids from the following concerns:

(1) Hanrahan Company, S. F. ..... $79,848
(2) Union Paving Company, S. F. ..... 82,371
(3) Fay Improvement Co., S. F. ..... $89,799

| | | (1) | (2) | (3) |
|---|---|---|---|---|
| 6,000 | cu.yd. grading | .30 | .25 | .35 |
| 11,000 | ft. conc. curb | .70 | .70 | .66 |
| 37,000 | sq.ft. sidewalk | .13 | .14 | .149 |
| 210,000 | sq.ft. asph. pav. | .198 | .18 | .20 |
| 475 | tons resurfacing | 6.00 | 5.00 | 5.36 |
| 1,500 | ft. redwood header | .10 | .10 | .14 |
| 2,339 | ft. 8-in. vitr. sewer | .70 | 1.00 | .66 |
| 60 | ft. 12-in. vitr. sewer | 1.10 | 1.50 | 1.40 |
| 58 | ft. 18-in. vitr. sewer | 1.90 | 2.00 | 2.15 |
| 40 | ft. 10-in. conc. sewer | .80 | 1.00 | .90 |
| 132 | ft. 12-in. conc. sewer | 1.10 | 1.00 | 1.10 |
| 488 | ft. 15-in. conc. sewer | 1.30 | 2.00 | 1.50 |
| 2,605 | ft. rein. conc. slab under sewer | .70 | .60 | 1.05 |
| | Reinf. conc. bridge | $4,700 | $8.000 | $9,455 |
| | Reinf. conc. bridge | 1,500 | 3,000 | 3,000 |
| 1 | box culvert | 500 | 1,000 | 575 |
| 12 | manholes | 55.00 | 55.00 | 55.00 |
| 10 | catchbasins | 45.00 | 55.00 | 66.00 |
| 2 | reinf. conc. headwalls | $200 | $200 | $420 |
| | Lighting system (including 44 electroliers, etc.) | 8,500 | 9,000 | 10,000 |

## CARSON CITY, NEVADA—STATE—CLARK COUNTY—OILING

Contract awarded to Nevada Paving Co., Reno, Nevada, who bid $32,799 for 20.22 miles oiling in CLARK COUNTY from Crystal to West Slope of Mormon Mesa, work for the Nevada State Highway Commission. Bids from:

(1) Nevada Paving Co., Reno, Nev. ..... $32,799
(2) Basalt Rock Co., Napa, Calif. ..... 34,203
(3) General Const. Corp., Las Vegas ..... 34,810
(4) P. J. Akmadzich, Los Angeles ..... $35,416
(5) A. D. Drumm, Jr., Fallon, Nevada ..... 36,343
(6) Engineers' estimate ..... 39,977

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| 376,285 | gal. asphaltic fuel oiling | .056 | .06 | .06 | .06 | .063 | .074 |
| 20.22 | miles mixing fuel oil with surface | $550 | $525 | $530 | $585 | $575 | $550 |
| 20.22 | miles rebuild. and finish shoulders | 30.00 | 50.00 | 75.00 | 50.00 | 50.00 | 50.00 |

## REDDING, CALIF.—GRADING—JOINT HIGHWAY DISTRICT 11

Contract awarded to W. C. Colley and Frank Cuffe, Masonic Bdg., San Rafael, Calif., who bid $51,684 for grading 3 miles of the Weed-Klamath Falls Road, for Joint Highway District No. 11, in SHASTA COUNTY. Bids from

(1) W. C. Colley & Frank Cuffe ..... $51,684
(2) Clyde Wood, Stockton ..... 54,126
(3) Axel Frisk & Co., Tennant ..... $55,439
(4) J. P. Brennan, Redding, Calif. ..... 57,155

| | | (1) | (2) | (3) | (4) |
|---|---|---|---|---|---|
| 9.8 | acres clearing | 200.00 | 300.00 | 135.00 | 205.00 |
| 56,059 | cu.yd. unclassified excavation | .81 | .85 | .90 | .93 |
| 113 | cu.yd. unclassified excavation structure | 2.00 | 2.00 | 1.00 | 1.50 |
| 40,364 | sta.yd. overhaul | .03 | .02 | .03 | .015 |
| 2.9166 | mi. finishing earth graded road | 300.00 | 200.00 | 150.00 | 270.00 |
| 8 | cu.yd. Class C concrete | 40.00 | 30.00 | 25.00 | 26.00 |
| 91 | lb. reinforcing steel | .10 | .10 | .10 | .06 |
| 582 | lin.ft. 18-in. corr. metal pipe | 2.50 | 2.50 | 2.50 | 1.80 |
| 50 | concrete monuments | 4.00 | 4.00 | 4.50 | 3.50 |

## SAN FRANCISCO, CALIF.—GOVT.—TULARE COUNTY—GRADING

Award of contract recommended to A. J. and J. L. Fairbanks, South San Francisco, who bid $87,452 to U. S. Bureau of Public Roads, Sheldon Bdg., San Francisco, for grading Section 1B, Generals Highway, Hospital Rock to Giant Forest, Sequoia National Park, TULARE COUNTY, 4.5 miles. Bids from:

(1) A. J. & J. L. Fairbanks.....$87,452 (2) W. A. Bechtel Co., S. F.....$92,061 (3) Engineers' estimate .....$79,202

| | (1) | (2) | (3) |
|---|---|---|---|
| 8.76 acres clearing | $300 | $500 | $300 |
| 43,400 cu.yd. roadway excavation | .96 | 1.05 | .90 |
| 500 cu.yd. struc. excav. | 2.00 | 3.00 | 2.00 |
| 5,500 cu.yd. borrow | .96 | .80 | .90 |
| 30,861 sta.yd. overhaul | .04 | .05 | .03 |
| 5,400 cu.yd. crush and place subgr. reinf. material | 3.30 | 3.25 | 2.75 |
| 300 cu.yd. supple. subgr. reinforcement material | 3.30 | 3.25 | 2.50 |
| 14,000 yd.mi. haul subgrade reinf. materials | .45 | .30 | .35 |
| 82 cu.yd. cement rubble masonry | 20.00 | 20.00 | 18.00 |
| 560 ft. 18-in. corr. pipe | 2.00 | 3.25 | 2.00 |
| 276 ft. 24-in. corr. pipe | 3.00 | 3.75 | 3.00 |
| 330 ft. 30-in. corr. pipe | 3.80 | 4.50 | 4.00 |
| 82 ft. 36-in. corr. pipe | 5.00 | 6.50 | 5.00 |
| 320 cu.yd. rock embankment | 5.00 | 6.00 | 4.00 |
| 84 ft. haul and place corr. pipe | 1.00 | 2.50 | 1.25 |
| 6,000 yd.mi. haul borrow | .45 | .30 | .35 |
| 1,500 ft. stone guard rail | .60 | 1.00 | 1.00 |

## LOS ANGELES, CALIF.—CITY—OLYMPIC BOULEVARD—CONCRETE PAVING

George H. Oswald, 366 E. 58th Street, Los Angeles, $458,137 low bid to Board of Public Works for improving streets in Olympic Boulevard and Stanley Avenue Improvement District. Bids from the following concerns:

(1) Geo. H. Oswald, Los Angeles.....$458,137
(2) Tryon & Brain, Los Angeles..... 471,735
(3) Martter & Bock, Los Angeles..... 510,065
(4) Griffith Co., Los Angeles..... 510,091
(5) John Papac, Los Angeles..... 520,402
(6) J. A. Thompson, Los Angeles.....$522,029
(7) Geo. R. Curtis Paving Co., Los Angeles..... 548,269
(8) J. L. McClain, Los Angeles..... 555,088
(9) Miracle Construction Co., Los Angeles..... 555,504

| Grading | (1) $48,000 | (2) $49,000 | (3) $45,000 | (4) $72,650 | (5) $49,000 | (6) $40,000 | (7) $65,000 | (8) $86,000 | (9) $63,756 |
|---|---|---|---|---|---|---|---|---|---|
| 879,186 sq.ft. 7-in. conc. pav. com. | .215 | .218 | .25 | .22 | .2525 | .26 | .26 | .23 | .245 |
| 166,837 sq.ft. av. 7-in. conc. pav. | .205 | .21 | .24 | .22 | .2525 | .25 | .26 | .23 | .245 |
| 101,340 sq.ft. 6-in. conc. pav. com. | .185 | .185 | .225 | .20 | .2375 | .24 | .25 | .215 | .225 |
| 17,850 sq.ft. 4-in. conc. paving | .14 | .125 | .15 | .12 | .14 | .14 | .13 | .15 | .15 |
| 52,360 sq.ft. 5-in. conc. paving | .1125 | .12 | .13 | .14 | .15 | .14 | .115 | .12 | .18 |
| 206,397 sq.ft. 6-in. conc. pav. | .15 | .144 | .16 | .19 | .16 | .165 | .158 | .17 | .185 |
| 6,244 ft. light curb | .40 | .36 | .40 | .42 | .32 | .40 | .40 | .45 | .60 |
| 23,800 ft. heavy curb | .45 | .45 | .44 | .42 | .36 | .45 | .45 | .50 | .60 |
| 91,772 sq.ft. walk | .115 | .11 | .125 | .12 | .11 | .12 | .12 | .14 | .15 |
| Storm drain | $65,000 | $72.200 | $70,000 | $70,000 | $78,880 | $75,000 | $75,000 | $80,000 | $66,631 |
| Sanitary sewer | 7,350 | 7,900 | 8,300 | 9,000 | 7,100 | 8,000 | 9,000 | 17,000 | 17,263 |
| Water system | 4,300 | 4,650 | 4,500 | 4,300 | 4,580 | 4,600 | 4,700 | 5,000 | 7,168 |

## HAYWARD, CALIF.—CITY—EMULSIFIED ASPHALT PAVING

Contract awarded to M. J. Bevanda, Stockton Savings & Loan Bank Bdg., Stockton, who bid $44,561 to the City of Hayward, Alameda County, for improvement of Smalley Ave., from Western Blvd. to Belmar St., and Belmar and Princeton Sts. from A St. to Laurel Ave. Bids on:

(1) 10,720 lin.ft. concrete curb
(2) 21,200 sq.ft. concrete gutter
(3) 42,850 sq.ft. cement sidewalk
(4) 340 lin.ft. concrete and corrugated iron culvert
(5) 159 ft. redwood headers
(6) 1,350 lin.ft. 4-in. vitrified sewer
(7) 1,300 lin.ft. 6-in. vitrified sewer
(8) 36 6-in. by 4-in Y branches
(9) Per lamphole
(10) 165,450 sq.ft. 6-in. Emulsified asphalt macadam paving and grading

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | TOTALS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| M. J. Bevanda, Stockton | .58 | .28 | .19 | 4.00 | .40 | .95 | 1.20 | 1.00 | $28 | .12 | $44,561 |
| Jack Casson | .95 | .26 | .17 | 4.50 | 1.00 | .95 | 1.05 | 1.00 | 20 | .15 | 52,248 |
| Heafey Moore Co. | 1.00 | .30 | .20 | 5.00 | .60 | .80 | 1.00 | 1.00 | 20 | .195 | 62,203 |

J. B. Holly is City Engineer. Work is to be done under the 1911 Act.

## DENVER, COLORADO—GOVT.—GRADING—NEW MEXICO

Cook & Bansom, Ottawa, Kansas, who bid $69,712, low bid to Bureau of Public Roads for 7.5 miles grading Holman-Rio Pueblo Project, Sect. 3B, Taos County, New Mexico, for the Carson National Forest. Bids received on:

(1) 72,100 cu.yd. roadway excavation
(2) 2,600 cu.yd. structure excavation
(3) 7.51 miles finish earth graded road
(4) 9.6 M ft. b.m. untreated timber
(5) 81 cu.yd. Class 'B' concrete
(6) 630 cu.yd. cement rubble masonry
(7) 2,580 lin.ft. 24-in. corr. pipe
(8) 108 lin.ft. 30-in. corr. pipe

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | TOTALS |
|---|---|---|---|---|---|---|---|---|---|
| Cook & Bansom, Ottawa, Kansas | .64 | 1.50 | $150 | 90.00 | 30.00 | 10.00 | 2.50 | 3.50 | $ 69,712 |
| Grant Shields, Denver, Colo. | .63 | 1.50 | 200 | 90.00 | 18.00 | 11.00 | 2.60 | 3.20 | 69,787 |
| H. C. Lallier Const. & Engr. Co., Denver, Colo. | 1.30 | 3.00 | 300 | $100 | 30.00 | 20.00 | 3.00 | 4.00 | 133,241 |
| Engineer's estimate | .60 | 1.50 | 200 | $100 | 30.00 | 12.00 | 3.25 | 5.50 | 71,360 |

# RIVER AND HARBOR WORK

## SACRAMENTO, CALIF.—STOCKTON DEEP-WATER CHANNEL—CLAMSHELL DREDGING

Bids received on the following items by the U. S. Engineers Office, California Fruit Bdg., Sacramento, for clamshell dredging on the San Joaquin River in connection with the Stockton Deep Water Channel:

MEASURED IN BORROW PITS
(1) PART 1—1,827,000 cu.yd. dredging
(2) PART 2— 325,400 cu.yd. dredging
(3) PART 3— 464,000 cu.yd. dredging

MEASURED IN THE BUCKET
(4) PART 1—1,827,000 cu.yd. dredging
(5) PART 2— 325,400 cu.yd. dredging
(6) PART 3— 464,000 cu.yd. dredging

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Franks Contracting Co., 260 Calif. St., S. F. (low on 1 and 3) | .093 | | .072 | .074 | | .0686 |
| Calif. Delta Farms, Belding Bdg., Stockton (low on 2) | | .066 | | | .066 | |
| Olympic Dredging Co., San Francisco | .1492 | | | .164 | | |
| Engineers' estimate | .117 | .093 | .093 | .151 | .119 | .119 |

PART 1—From Mormon Channel to Turners Cut and cutoff across McDonald Tract; PART 2—From Turner Cut to west side of Spud Island; and PART 3—From McDonald Tract to near Camp 8, Venice Island.

## SACRAMENTO, CALIF.—STOCKTON DEEP WATER CHANNEL—DRAGLINE WORK

Bids received as follows by the U. S. Engineers Office, California Fruit Bdg., Sacramento, for constructing levees or embankment by dragline excavators along the San Joaquin River in connection with Stockton Deep Water Channel:

(1) IF AWARDED ONLY PART ONE OF THE WORK. Bids on the following items:

(A) Per cu.yd. measured in borrow pits, Sec. A.

| | (A) | (B) |
|---|---|---|
| E. T. Fisher, 2520 Hale Drive, Burlingame (low) | .073 | .073 |
| John Phillips, San Francisco | .08 | .08 |
| Paris Bros., Berkeley | .13 | .13 |

(B) Per cu.yd. measured in buckets, Sec. A.

| | (A) | (B) |
|---|---|---|
| Delta Dredging Co. | .13 | .16 |
| Schweitzer Bros., L. A. | .148 | .148 |
| Engineers estimate | .117 | .151 |

(2) IF AWARDED ONLY PART TWO OF THE WORK. Bids on the following items:

(A) Per cu.yd. measured in borrow pits, Sec. B.

| | (A) | (B) |
|---|---|---|
| E. T. Fisher, 2520 Hale Drive, Burlingame (low) | .073 | .073 |
| John Phillips, San Francisco | .12 | .12 |
| Paris Bros., Berkeley | .13 | .13 |

(B) Per cu.yd. measured in buckets, Sec. B.

| | (A) | (B) |
|---|---|---|
| Delta Dredging Co. | .12 | .15 |
| Schweitzer Bros., L. A. | .151 | .151 |
| Engineers estimate | .126 | .164 |

(3) IF AWARDED ONLY PART THREE OF THE WORK. Bids on the following items:

(A) Per. cu.yd. measured in borrow pits, Sec. C.
(B) Per cu.yd. measured in borrow pits, Sec. D.
(C) Per cu.yd. measured in buckets, Sec. C.
(D) Per cu.yd. measured in buckets, Sec. D.

| | (A) | (B) | (C) | (D) |
|---|---|---|---|---|
| Paris Bros., 2415 Oregon Street, Berkeley, (low) | .13 | .13 | .13 | .13 |

| | (A) | (B) | (C) | (D) |
|---|---|---|---|---|
| Delta Dredging Co. | .12 | .15 | .12 | .15 |
| Engineers estimate | .131 | .171 | .136 | .177 |

(4) IF AWARDED ONLY PARTS ONE AND TWO OF THE WORK. Bids on the following items:

(A) Per cu.yd. measured in borrow pits, Sec. A.
(B) Per cu.yd. measured in borrow pits, Sec. B.
(C) Per cu.yd. measured in buckets, Sec. A.
(D) Per cu.yd. measured in buckets, Sec. B.

| | (A) | (B) | (C) | (D) |
|---|---|---|---|---|
| E. T. Fisher, 2520 Hale Drive, Burlingame (low) | .073 | .073 | .073 | .073 |
| John Phillips, S. F. | .08 | .18 | .08 | .12 |

| | (A) | (B) | (C) | (D) |
|---|---|---|---|---|
| Paris Bros., Berkeley | .13 | .13 | .13 | .13 |
| Delta Dredging Co. | .12 | .11 | .15 | .1375 |
| Schweitzer Bros., L. A. | .148 | .151 | .148 | .151 |

(5) IF AWARDED ONLY PARTS TWO AND THREE OF THE WORK. Bids on the following items:

(A) Per cu.yd. measured in borrow pits, Sec. B.
(B) Per cu.yd. measured in borrow pits, Sec. C.
(C) Per cu.yd. measured in borrow pits, Sec. D.
(D) Per cu.yd. measured in buckets, Sec. B.
(E) Per cu.yd. measured in buckets, Sec. C.
(F) Per cu.yd. measured in buckets, Sec. D.

| | (A) | (B) | (C) | (D) | (E) | (F) |
|---|---|---|---|---|---|---|
| E. T. Fisher, 2520 Hale Drive, Burlingame | .073 | | .15 | .073 | | .15 |
| John Phillips, San Francisco | .12 | .35 | .35 | .12 | .35 | .35 |
| Paris Bros., Berkeley | .13 | .13 | .13 | .13 | .13 | .13 |
| Delta Dredging Company | .11 | .11 | .11 | .1375 | .1375 | .1375 |

(6) IF AWARDED ONLY PARTS ONE AND THREE OF THE WORK. Bids on the following items:

(A) Per cu.yd. measured in borrow pits, Sec. A.
(B) Per cu.yd. measured in borrow pits, Sec. A.
(C) Per cu.yd. measured in borrow pits, Sec. D.
(D) Per cu.yd. measured in buckets, Sec. A.
(E) Per cu.yd. measured in buckets, Sec. A.
(F) Per cu.yd. measured in buckets, Sec. D.

| | (A) | (B) | (C) | (D) | (E) | (F) |
|---|---|---|---|---|---|---|
| E. T. Fisher, 2520 Hale Drive, Burlingame | .073 | | .15 | .073 | | .15 |
| John Phillips, San Francisco | .08 | .35 | .35 | .08 | .35 | .35 |
| Paris Bros., Berkeley | .13 | .13 | .13 | .13 | .13 | .13 |
| Delta Dredging Company | .13 | .12 | .12 | .16 | .15 | .15 |

(7) IF AWARDED ENTIRE PROJECT, PARTS ONE, TWO AND THREE OF THE WORK. Bids on:

(A) Per cu.yd. measured in borrow pits, Sec. A.
(B) Per cu.yd. measured in borrow pits, Sec. B.
(C) Per cu.yd. measured in borrow pits, Sec. C.
(D) Per cu.yd. measured in borrow pits, Sec. D.
(E) Per cu.yd. measured in buckets, Sec. A.
(F) Per cu.yd. measured in buckets, Sec. B.
(G) Per cu.yd. measured in buckets, Sec. C.
(H) Per cu.yd. measured in buckets, Sec. D.

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) |
|---|---|---|---|---|---|---|---|---|
| E. T. Fisher, Berkeley | .073 | .073 | | .073 | .073 | .073 | | .073 |
| John Phillips, S. F. | .08 | .12 | .35 | .35 | .08 | .12 | .35 | .35 |
| Lewis Construction Co., L. A. | .08 | .15 | .12 | .20 | .08 | .15 | .12 | .20 |
| Paris Bros., Berkeley | .1249 | .1249 | .1249 | .1249 | .1249 | .1249 | .1249 | .1249 |
| Delta Dredging Company | .119 | .104 | .104 | .104 | .15 | .13 | .13 | .13 |

Work involves:
PART ONE (SEC. A.) 478,800 cu.yd.
PART TWO (SEC. B.) 268,700 cu.yd.
PART THREE (SEC. C.) 50,000 cu.yd.
PART THREE (SEC. D.) 66,100 cu.yd.

# IRRIGATION AND RECLAMATION

## TURLOCK, CALIF.—CONCRETE LINING—TURLOCK IRRIGATION DISTRICT

Contracts awarded as follows by the Turlock Irrigation District, Turlock, Stanislaus County, for 2-in. concrete lining of various canals of the District: SCHEDULES 5, 6, 7, 8, 9 and 11—Awarded to Carlson Bros., Box 304, Turlock, total bid, $27,356. SCHEDULES 1, 3, 4 and 12—Awarded to Ed Erickson, Turlock, total bid of $15,404. SCHEDULES 2 and 10—Awarded to M. B. Clipper, care of Turlock Irrigation District, Turlock, bid $13,744. Bids received on the following items for the construction of this project:

(1) SCHEDULE 1— 73,400 sq.ft. 2-in. conc. lining
(2) SCHEDULE 2— 99,900 sq.ft. 2-in. conc. lining
(3) SCHEDULE 3— 69,600 sq.ft. 2-in. conc. lining
(4) SCHEDULE 4— 70,915 sq.ft. 2-in. conc. lining
(5) SCHEDULE 5—179,845 sq.ft. 2-in. conc. lining
(6) SCHEDULE 6— 70,300 sq.ft. 2-in. conc. lining
(7) SCHEDULE 7— 11,850 sq.ft. 2-in. conc. lining
(8) SCHEDULE 8— 57,000 sq.ft. 2-in. conc. lining
(9) SCHEDULE 9— 70,630 sqft. 2-in. conc. lining
(10) SCHEDULE 10—139,200 sq.ft. 2-in. conc. lining
(11) SCHEDULE 11— 78,000 sq.ft. 2-in. conc. lining
(12) SCHEDULE 12— 37,760 sq.ft. 2-in. conc. lining

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Carlson Bros. | | | | | .0585 | .0585 | .0585 | .0585 | .0585 | | .0585 | |
| Ed Erickson | .059 | .059 | .06 | .06 | .06 | .06 | .06 | .06 | .059 | .0575 | .06 | .07 |
| M. B. Clipper | | .0583 | | | .0619 | .0663 | .0687 | .0654 | .0612 | .0569 | .0673 | |
| Alldrin & Anderson | .0624 | .0624 | .0624 | .0649 | .0624 | .0624 | .075 | .0649 | .0624 | .0649 | .0648 | .08 |
| John Kristich | .075 | .075 | .075 | .075 | .077 | .075 | .08 | .077 | .075 | .077 | .075 | .075 |
| L. W. Terrill | .063 | .065 | .067 | .07 | .063 | | | | | | | |
| H. A. Polker | | | | | | .074 | .074 | .074 | .074 | | .079 | |
| Pacific Construction Co. | | | | | .092 | | | | | .092 | | |
| O. W. Chance | | | | | | | | | | | .092 | |

# SEWER CONSTRUCTION

## SAN FRANCISCO, CALIF.—ALEMANY STORM DRAIN

Bids received as follows by City for sections of Alemany Storm Drain. (A) SECTION C—Healy Tibbitts Construction Co., 64 Pine St., San Francisco, $128,493, low. Bids on:

(1) 915 ft. 2 comp. 8 ft. 6-in.x11-ft. reinforced conc. drain
(2) 394 ft. 2-ft. 6-in.x3-ft. 9-in. reinforced concrete sewer
(3) 310 ft. 8-in. vitrified pipe underdrain
(4) 620 ft. 10-in. vitrified pipe underdrain
(5) 900 ft. 12-in. vitrified pipe underdrain
(6) 8 manholes
(7) 138,000 lin.ft. timber piling

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | TOTALS |
|---|---|---|---|---|---|---|---|---|
| Healy Tibbitts Construction Co., San Francisco | 102.00 | 12.00 | 1.00 | 1.25 | 1.50 | 50.00 | .20 | $128,493 |
| Ward Engineering Co., San Francisco | 92.00 | 20.00 | 1.30 | 1.45 | 1.50 | 90.00 | .26 | 131,312 |
| L. Cohn, San Francisco | 113.50 | 25.00 | 2.80 | 2.90 | 3.00 | 50.00 | .30 | 160,868 |
| C. C. W. & H. H. Haun, San Francisco | 90.00 | 13.00 | 1.50 | 1.75 | 2.00 | 65.00 | .36 | 141,022 |
| MacDonald & Kahn, San Francisco | 88.50 | 14.50 | 2.00 | 2.25 | 3.00 | 100.00 | .375 | 143,955 |
| C. J. Nystedt, Sacramento | 92.50 | 21.00 | 1.50 | 1.75 | 2.10 | 72.00 | .38 | 149,367 |
| C. B. Eaton, San Francisco | 90.00 | 12.80 | 1.00 | 1.20 | 1.30 | 50.00 | .40 | 145,217 |
| E. J. Treacy, San Francisco | 98.00 | 13.75 | 1.50 | 1.50 | 1.50 | 100.00 | .45 | 160,732 |
| Chas. L. Harney, San Francisco | 92.00 | 10.00 | 1.00 | 1.00 | 1.00 | 50.00 | .50 | 159,350 |

(B) SECTION D—C. B. Eaton, 715 Ocean Ave., San Francisco, $41,970, low. Bids received on:

(1) 16,200 ft. timber piling
(2) 1,195 ft. 14-ft.x8-ft. wood sewer
(3) 600 ft. timber center partition
(4) 226 ft. 3x4-ft. 6-in. wood sewer
(5) 188 ft. 12-in. vitrified sewer
(6) 125 ft. 10-in. vitrified sewer
(7) 4 timber manholes
(8) 3 side conn. ports
(9) 1 connection

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | TOTALS |
|---|---|---|---|---|---|---|---|---|---|---|
| C. B. Eaton, San Francisco | .30 | 28.00 | 1.25 | 8.00 | 2.00 | 1.50 | 60.00 | 13.00 | 250.00 | $41,970 |
| Healy Tibbitts Construction Co., San Francisco | .10 | 38.00 | 1.50 | 9.00 | 3.00 | 2.00 | 70.00 | 15.00 | 600.00 | 51,703 |
| M. B. McGowan, San Francisco | .25 | 34.00 | .75 | 20.00 | 2.50 | 8.00 | 50.00 | 25.00 | 379.00 | 53,819 |
| MacDonald & Kahn, San Francisco | .40 | 33.00 | 1.30 | 27.00 | 3.00 | 1.75 | 45.00 | 14.00 | 355.00 | 54,156 |
| C. J. Nystedt, Sacramento | .46 | 37.00 | 1.60 | 18.00 | 3.00 | 2.75 | 65.00 | 22.00 | 25.00 | 57,953 |
| Meyer Rosenberg, San Francisco | .51 | 32.00 | 1.50 | 21.00 | 2.00 | 1.50 | 60.00 | 22.50 | 800.00 | 53,819 |
| C. C. W. & H. H. Haun, San Francisco | .55 | 34.00 | 1.20 | 22.00 | 2.00 | 4.50 | 50.00 | 16.00 | 500.00 | 56,918 |

# BRIDGES AND CULVERTS

## SACRAMENTO, CALIF.—COUNTY—CONCRETE AND STEEL—SNODGRASS SLOUGH BRIDGE

Following bids received by Board of Supervisors, Court House, Sacramento, for construction of a steel draw span and timber trestle bridge over Snodgrass Slough. Bids received on the following alternative propositions: (A) ALL REDWOOD CONSTRUCTION; (B) ALL CREOSOTED DOUGLAS FIR CONSTRUCTION; and (C) UNTREATED TIMBER CONSTRUCTION. Bids from:

| | PROP. A | PROP. B | PROP. C |
|---|---|---|---|
| (1) M. A. Jenkins, 36th and Y Sts., Sacramento | $59,477 | $59,695 | $45,269 |
| (2) C. J. Nystedt, Sacramento, Calif. | 60,062 | 60,217 | 44,966 |
| (3) Ralph Hunter, Sacramento, Calif. | 63,625 | 62,146 | 46,986 |
| (4) Ben C. Gerwick, San Francisco | 64,222 | 65,719 | 53,632 |
| (5) Lord & Bishop, Sacramento | 64,419 | 66,804 | 49,752 |
| (6) C. Emil Force, Piedmont, Calif. | 68,267 | 67,437 | 53,151 |
| (7) Lindgren & Swinerton, Sacramento | 73,553 | 73,170 | 54,840 |
| (8) Healy Tibbitts Construction Co., S. F. | 74,743 | 73,788 | 58,572 |

### PROPOSITION A—ALL REDWOOD CONSTRUCTION

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| 144 cu.yd. pier concrete | 15.00 | 15.00 | 12.00 | 20.00 | 30.00 | 15.00 | 38.00 | 25.00 |
| 1,050 lin.ft. found. piling | .60 | 1.35 | .60 | .21 | .75 | .58 | .65 | .35 |
| 403 lin.ft. steel cylinders | 8.50 | 7.50 | 14.00 | 4.00 | 9.00 | 12.75 | 8.75 | 30.00 |
| 240,000 lb. struc. steel | .07 | .0725 | .074 | .07 | .076 | .08 | .065 | .072 |
| 15,500 lb. cast steel and machinery | .30 | .2925 | .27 | .56 | .30 | .32 | .38 | .38 |
| 8,500 ft. Redwood piling | .77 | .73 | .70 | .70 | .75 | .85 | 1.66 | .65 |
| 233,700 BM Redwood lumber | 74.00 | 79.70 | 85.00 | 80.00 | 82.00 | 90.00 | 80.00 | 85.00 |
| 313 cu.yd. floor concrete | 14.50 | 12.87 | 14.00 | 20.00 | 14.00 | 13.40 | 20.00 | 25.00 |
| 31,434 lb. reinforced steel | .045 | .05 | .05 | .06 | .045 | .06 | .05 | .05 |
| 3,700 sq.ft. mastic surfacing | .40 | .18 | .40 | .14 | .20 | .40 | .35 | .10 |
| 720 ft. Dolphin piling | .75 | .60 | .60 | 1.00 | 1.00 | .53 | .625 | .50 |

### PROPOSITION B—ALL CREOSOTED DOUGLAS FIR CONSTRUCTION

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| 144 cu.yd. pier concrete | 15.00 | 15.00 | 12.00 | 20.00 | 30.00 | 15.00 | 38.00 | 25.00 |
| 1,050 lin.ft. found. piling | .60 | 1.35 | .60 | .21 | .75 | .58 | .65 | .35 |
| 403 lin.ft. steel cylinders | 8.50 | 7.50 | 14.00 | 4.00 | 9.00 | 12.75 | 8.75 | 30.00 |
| 240,000 lb. struc. steel | .07 | .0725 | .074 | .07 | .076 | .08 | .065 | .072 |
| 15,500 lb. cast steel and machinery | .30 | .2925 | .27 | .56 | .30 | .32 | .38 | .38 |
| 8,500 ft. creosoted piling | .92 | .85 | .84 | .70 | 1.00 | .95 | 1.80 | .80 |
| 175,400 B.M. creosoted Douglas fir timber | 78.00 | 85.00 | 85.00 | $100 | $100 | 95.00 | 87.50 | 87.50 |
| 26,900 ft. Redwood timber | 95.00 | $106 | 85.00 | $100 | 70.00 | $100 | 66.00 | 85.00 |
| 313 cu.yd. floor concrete | 14.50 | 12.87 | 14.00 | 20.00 | 14.00 | 13.40 | 20.00 | 25.00 |
| 31,434 lb. reinforcing steel | .045 | .05 | .05 | .06 | .045 | .06 | .05 | .05 |
| 3,700 sq.ft. mastic surfacing | .40 | .18 | .40 | .13 | .20 | .40 | .35 | .10 |
| 720 lin.ft. Dolphin piling | .75 | .60 | .60 | 1.00 | 1.00 | .53 | .625 | .50 |

### PROPOSITION C—UNTREATED TIMBER CONSTRUCTION

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| 144 cu.yd. pier concrete | 15.00 | 15.00 | 12.00 | 20.00 | 30.00 | 15.00 | 38.00 | 25.00 |
| 1,050 lin.ft. found. piling | .60 | 1.35 | .60 | .21 | .75 | .58 | .65 | .35 |
| 403 lin.ft. steel cylinders | 8.50 | 7.50 | 14.00 | 4.00 | 9.00 | 12.75 | 8.75 | 30.00 |
| 187,000 lb. struc. steel | .08 | .0775 | .08 | .08 | .083 | .085 | .068 | .077 |
| 15,500 lb. cast steel and machinery | .30 | .2925 | .27 | .56 | .30 | .32 | .38 | .38 |
| 8,700 lin.ft. creosoted Douglas fir piling | .92 | .85 | .84 | .70 | 1.00 | .95 | 1.77 | .80 |
| 134,000 ft. untreated lumber | 42.00 | 52.00 | 53.00 | 70.00 | 50.00 | 70.00 | 48.00 | 63.75 |
| 720 lin.ft. Dolphin piling | .75 | .60 | .60 | 1.00 | 1.00 | .53 | .625 | .50 |
| 90,900 F.B.M. Redwood lumber | 58.00 | 50.00 | 55.00 | $100 | 52.00 | 70.00 | 47.00 | 70.00 |

# CONSTRUCTION NEWS SUMMARY

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

## TABULATION OF AWARDS

Awards for the month of August, 1930, for Engineering Construction projects in the Far Western States, total $28,478,196, as follows:

| | |
|---|---|
| Paving | $ 6,972,000 |
| Grading, highways | 6,462,000 |
| Bridges | 998,764 |
| Sewer construction | 786,432 |
| Water supply systems | 1,900,000 |
| Lighting systems | 450,000 |
| Railroad construction | 5,000,000 |
| Oil pipe lines | 4,000,000 |
| River and harbor work | 600,000 |
| Tunnel construction | 209,000 |
| Power development | 500,000 |
| Irrigation and reclamation | 600,000 |
| | $28,478,196 |

## LARGE WESTERN PROJECTS

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

### WORK CONTEMPLATED

Concrete paving Tweedy Road for City of Southgate, Calif. $470,000.
Grading and oiling roads for County, Tucson, Ariz. $700,000.
Bascule Bridge over Coos Bay for Oregon State Highway Com. $250,000.
Reservoir for City of Long Beach, Calif. $400,000.
Pipe lines, pumping plants and reservoir for Bear Gulch Water Co. at Menlo Park, Calif. $325,000.
Wells, pumps, water mains, reservoirs, etc., for City of Torrance, Calif. $400,000.
Reservoir in West Seattle, for City of Seattle, Wash. $650,000.
Pumping plants, canals, etc., for Randolph Irrigation District, Florence, Ariz. $392,000.
Power project in Alaska for Portland Canal Power Co. of Seattle, Wash. $3,000,000.
Dredging, piling and rock bulkhead for Berkeley Waterfront Co., Richmond, Calif. $400,000.

### BIDS BEING RECEIVED

Bridge on Bullard St. for City of Vancouver, B. C., bids October 31. $1,500,000.
Sewer, College Hill Tunnel project for City of San Francisco, bids to Sept. 17. $320,000.

### CONTRACTS AWARDED

Gas pipe line, 167 miles long to serve cities of Klamath Falls, Bend, The Dalles, Oregon, to Hutchinson Company, Oakland.

## STREET and ROAD WORK

### WORK CONTEMPLATED

**TUCSON, ARIZ.**—Bond election by County to vote $700,000 for grading and oiling roads and constructing bridges.

**SOUTHGATE, CALIF.**—Plans by Engr., E. M. Lynch, Central Bdg., L. A., bids soon by City, for improving Tweedy Road from Atlantic Ave. to Alameda St., involving 321,741 sq.ft. grading, 143,538 sq ft. 5-in. disintegrated rock or cementitious gravel sub-base, 112,628 sq.ft. 10-8-in. conc. paving, cast-iron mains, sewers, street lighting system. $470,000. 8-27

**PUEBLO, COLO.**—Plans by City Engr., protests soon by City, for improving streets to cost $87,000, including paving and sewers.

### BIDS BEING RECEIVED

**PHOENIX, ARIZ.**—Bids to 2 p.m., Sept. 22, by the Arizona State Highway Comm. for 7.4 miles of the Ashfork-Kingman Highway. Work involves 53,000 cu.yd. borrow excavation, 4700 cu.yd. subgrade stabilizer, 1200 cu.yd. concrete, 90,000 lb. reinf. steel and 410,000 lb. structural steel. 9-2

**LOS ANGELES, CALIF.**—Bids to 2 p.m., Sept. 15, by County Clerk for improving 2 miles of Avalon Blvd., north of 216th Street, work involving 62,850 cu.yd. excavation, 805,200 sq.ft. 7-9-in. concrete paving, 49,000 sq.ft. 8-in. concrete paving, 882,300 sq.ft. 5-in. disintegrated granite sub-base, corr. pipe, etc. 8-23

**LOS ANGELES COUNTY**—1 mile at Castaic Creek, involving 22,000 cu.yd. roadway excavation, 2400 cu.yd. concrete paving, 56,000 lb. reinf. steel. 9-3

**OAKLAND, CALIF.**—Bids to 12 m., Sept. 12, by City Clerk for improving E. 12th St. from First Ave. southeast, involving 42,104 sq.ft. grading, 24,846 sq.ft. 6-in. concrete base with 2-in. asphalt surface, 23,737 sq.ft. resurfacing, 108,000 sq.ft. remove block paving and resurfacing, sidewalks, curbs, vitr. conduits, etc. 8-29

**OAKLAND, CALIF.**—Bids to 12 m., Sept. 18, by City Clerk, for improving Marguerite Drive, involving 7789 sq.ft. macadam paving, vitr. pipe conduit, etc. 9-3

**OAKLAND, CALIF.**—Bids to 10:30 a.m., Sept. 23, by County Clerk, for oiling Redwood Canyon Road at 35th Ave., involving 245,000 sq.ft. oil surfacing and screenings. $4800. 9-3

**SACRAMENTO, CALIF.**—Bids to 2 p.m., October 1, by California Division of Highways, for: SAN MATEO COUNTY—7.3 mi. surfacing from San Mateo to Redwood City, involving: 73,800 tons crusher run base, 9350 tons screenings, 600 tons Emuls. asphalt, 2100 bbl. fuel oil.

**SACRAMENTO, CALIF.**—Bids to 2 p.m., Sept. 24, by California Division of Highways for: (1) SAN MATEO COUNTY—0.9 mile through South San Francisco, involving 5950 cu.yd. 'A' concrete paving, 169,000 lb. reinf. steel, etc.; (2) COLUSA COUNTY—8 miles surfacing from Williams to Maxwell, involving 71,000 cu.yd. gravel base; (3) EL DORADO COUNTY—1.7 miles from Clarks Corner to Placerville, involving 90,000 cu.yd. roadway excavation, concrete structures, etc.; and (4) TRINITY COUNTY—0.7 mile from west boundary to Burnt Ranch, involving 56,200 cu.yd. roadway excavation, etc. 8-28

**SACRAMENTO, CALIF.**—Bids to 2 p.m., Sept. 15, by District Engr., California Division of Highways, Dist. 3, Sacramento, for: (1) 5 miles pit run gravel borders from south of Arbuckle to Genevra, COLUSA COUNTY; (2) 5 miles pit run gravel borders from Chico to north county line, BUTTE COUNTY; and (3) 5.9 miles pit run gravel borders from Cache Creek to Zamora, YOLO COUNTY. 8-30

**SACRAMENTO, CALIF.**—Bids to 2 p.m., Sept. 17, by California Division of Highways, Public Works Bdg., Sacramento, for grading and surfacing 4.3 miles from Amador City to Martell, AMADOR COUNTY. Work involves 11 acres clearing and grubbing, 116,000 cu.yd. roadway excav. (loc. 'A'), 42,000 cu.yd. roadway excav. (loc. 'B'), 530,000 sta.yd. overhaul, 3307 cu.yd. structure excavation, 13,100 cu.yd. untreated grav. or stone surf., 280 cu.yd. 'A' concrete (structures), 23,100 lin.ft. reinforcing steel, corr. culverts, 10 M ft. b.m. redwood. 8-20

**SAN DIEGO, CALIF.**—Bids to 10 a.m., Sept. 15, by City for improving West Point Loma Blvd., involving 158,000 sq.ft. 6-in. asphalt paving, 3066 ft. 6-in. 'C' cast-iron pipe, etc. 8-27

**SAN FRANCISCO, CALIF.**—Bids to 2:30 p.m., Sept. 17, by Board of Public Works, City Hall, San Francisco, for the improvement of Sunset Boulevard, Section 'D', from Noriega Street to Irving Street. Work involves 133,600 cu.yd. excavation, 61,700 cu.yd. imported borrow, 192,900 sq.ft. 2½-in. asph. surface on 10-in. waterbound macadam base, 38,600 sq.ft. 2½-in. asph. surface on 6-in. 'F' concrete base, 90,700 sq.ft. 4-in. waterbound macadam pavement, 45,700 sq.ft. 6-in. waterbound macadam pavement, sidewalks, curbs, vitr. sewers, etc. $123,000. 8-28

**SAN FRANCISCO, CALIF.**—Bids to 2 p.m., Sept. 18, by the Supt. of Lighthouses, Custom House, San Francisco, for grading, rock excavation, concrete landings, concrete stairways, reinf. concrete retaining walls, roadways, concrete rainshed and installation of pipe-lines, water tanks, hoisting derricks, etc. 8-28

**SAN RAFAEL, CALIF.**—Bids to 10 a.m., Sept. 13, for: (1) Improving Second St., involving 60,000 sq.ft. 5-in. concrete paving with 4-in. stone sub-base, vitr. sewers, corr. pipe, etc.; and (2) Improving Mission Ave. and Belle Ave., involving 23,258 sq.ft. 5-in. concrete paving with 4-in. stone sub-base, corr. pipe, etc. 9-2

**STOCKTON, CALIF.**—Bids to 11 a.m., Sept. 15, by County for 1.47 miles of Bruml Road, grading and paving with oil treated rock. $10,000. 8-23

**DENVER, COLO.**—Bids to 2 p.m., Sept. 9, by U. S. Bureau of Public Roads for: (1) 10.8 miles Fall River-West Side Project, Fall River National Highway, Rocky Mt. National Park, COLORADO, involving 287,800 cu.yd. Type 'A' excavation, 27,789 cu.yd. Type 'B' excavation, concrete structures, 15,000 cu.yd. rock embankment, etc.; and (2) 7 miles of Granite Creek-Shell National Highway, Big Horn National Forest, WYOMING, involving 50,000 cu.yd. roadway excavation, corr. pipe, etc.

**CARSON CITY, NEV.**—Bids to 2 p.m., Sept. 10, by State for 11.65 miles fuel oiling in EUREKA COUNTY from Hay Ranch to Eureka, involving 230,459 gal. asph. fuel oil applied to roadway surface, 11.65 miles mixing oil with crushed rock or crushed gravel surf., 11.65 miles rebuild and finish shoulders. 8-28

**PORTLAND, ORE.**—Bids to 10 a.m., Sept. 12, by Bureau of Public Roads for grading 4.835 miles of the Tonasket-San Poil Project, located in the Colville National Forest, State of Washington, OKANOGAN AND FERRY COUNTIES. Work involves 14 acres clearing, 14 acres grubbing, 112,830 cu.yd. excavation, unclassified, corr. pipes, etc. 9-2

**SALT LAKE CITY, UTAH**—Bids to 2 p.m., Sept. 8, by the Utah State Road Commission for 7.014 miles of gravel surfaced road, F.A.P. No. 117-A, between Panguitch and Bryce Canyon Junction, in GARFIELD COUNTY. Work involves 83,000 cu.yd. excavation, unclassified, 15,500 cu.yd. gravel surface, loading. 8-25

**SALT LAKE CITY, UTAH**—Bids to Sept. 13 by State Road Commission for 700 tons Utah rock asphalt on 1 mile of highway in CARBON COUNTY from Price to County Line.

**SALT LAKE CITY, UTAH**—Bids to Sept. 8 by State Road Comm. for 3.7 miles in RICH COUNTY in Laketown Canyon, involving 18,000 cu.yd. roadway excavation.

**OLYMPIA, WASH.**—Bids to 10 a.m., Sept. 16, by Director of Highways for grading 5.3 miles State Road No. 3, from Swauk to Ellensburg City Wells, involving 276,580 cu.yd. excavation, 1,464,270 cu.yd. overhaul, concrete structures, corr. pipe, etc. 8-23

## BIDS RECEIVED

**BERKELEY, CALIF.**—Oakland Paving Co., 5000 Broadway, Oakland, $19,300 low for asphalt cross campus road for University of California. 9-3

**SACRAMENTO, CALIF.**—J. F. Knapp, Financial Center Bldg., Oakland, $96,126 low for 4.1 miles grading in SAN MATEO COUNTY from Redwood City to Willow Road for California Division of Highways. 9-3

**SAN DIEGO, CALIF.**—R. E. Hazard Contracting Co., 2548 Kettner Blvd., San Diego, $21,525 low bid to City for improving Gillette St., involving grading, curbs, sidewalks, cast iron mains, etc. 9-2

**SAN FRANCISCO, CALIF.**—M. Rosenberg, 1755 San Bruno, S. F., $83,766 low bid to Board of Public Works for improving Sect. B, Sunset Blvd. from Santiago to Yorba Sts., grading, paving with 2½-in asphalt surface on macadam and concrete base, vitr. sewers, etc. (See Unit Bid Summary.) 9-3

**SOUTH SAN FRANCISCO, CALIF.**—Hanrahan Co., Standard Oil Bldg., S. F., $79,849 for improving Linden Ave. from Railroad Ave. to City limits, for City, grading, asphalt paving, vitr. and concrete sewers, concrete bridges, lighting system, etc. (See Unit Bid Summary.) 9-3

**YOSEMITE, CALIF.**—Following bids received by C. G. Thomson, Superintendent, Yosemite National Park, Calif., for furnishing and spreading road oil as follows: (1) 4200 bbl. 50-60 road oil, (2) 4200 bbl. 60-70 road oil:

| | (1) | (2) |
|---|---|---|
| L. C. Pulley, 1960 Alamitos, Long Beach (low) | 3.38 | 3.48 |
| Pacific Tank Co. | 3.55 | 3.70 |
| Peres Bros., Richmond | 4.23 | 4.38 |

Bids rejected. 8-29

**DENVER, COLO.**—Bids as follows by City: (1) W. F. Pigg & Son, Denver, Colo., $21,000 low for paving alleys in Dist. 197; and (2) J. P. O'Connell, Denver, $85,000 low for gravel surfacing streets in Dist. 152.

**PORTLAND, ORE.**—J. A. Gudgel, Kalispell, Mont., $10,350 low for 10 miles clearing East Side-Logan Pass Road, Glacier National Park, MONTANA, for Bureau of Public Roads.

**PORTLAND, ORE.**—Low bids as follows by City: (1) Kern & Kibbe, Portland, Ore., $110,989 low for concrete paving Burnside St. from Third to Park St.; and (2) J. Rebman, Portland, Ore., $30,979 low for concrete paving E. 7th St.

**SALT LAKE CITY, UTAH**—W. W. Clyde & Co. and J. W. Whiting, Springville, Utah, $50,016 low for grading 16 miles Monticello-Colorado State Line Highway for Utah State Road Commission.

**SALT LAKE CITY, UTAH**—Hall & Co., Mesa, Colo., $73,099 low bid to State for grading and graveling 7 miles from Cisco to Utah-Colorado Line.

**SEATTLE, WASH.**—Low bids as follows by City: (1) Moceri Bros., Seattle, $63,025 low for paving 36th Ave. N.E.; (2) Moceri Bros., Seattle, $47,215 low for paving E. 47th St.; and (3) W. J. Gallagher, Seattle, $7000 low for grading 22nd Ave.

## CONTRACTS AWARDED

**PHOENIX, ARIZ.**—To J. C. Steele Const. Co., Phoenix, Ariz., $75,700 for paving portions of Jefferson St., etc., for City.

**ARCADIA, CALIF.**—To Osborn Co., 450 California Terrace, Pasadena, who bid $130,406 for improving Huntington Drive, between Pacific Electric Co. right-of-way north and west and between the west city boundary, Colorado St., between Huntington Drive and the west city boundary. 8-25

**ARCATA, CALIF.**—To Englehart Paving & Construction Company, Eureka, Calif., who bid $8000 for emulsified asphalt paving various streets in the City of Arcata, HUMBOLDT COUNTY. 8-25

**BELMONT, CALIF.**—To J. P. Lawlor, 327 7th Avenue, San Francisco, who bid $5879 to City for waterbound macadam paving streets in Belburn Village, curbs, sidewalks, and gutters. 8-21

**HAYWARD, CALIF.**—To M. J. Bevanda, Stockton Savings & Loan Bank Bdg., Stockton, $44,561 for improving Smalley Ave., Belmar St., etc., for City, paving with 6-in. Emulsified asphalt macadam, vitr. sewers, etc. (See Unit Bid Summary.) 8-21

**HOLLISTER, CALIF.**—To Granite Construction Co., Watsonville, $16,545 for bituminous macadam surfacing Bolsa Road, Lucy Brown Lane, Hamilton Road, etc., for County. 9-3

**LOS ANGELES, CALIF.**—To M. Miller, 208 W. 2nd St., Los Angeles, who bid $115,354 for improvement of streets in Yorkshire Drive and Parish Avenue Improvement District, for City of Los Angeles. Work consists of grading, concrete paving, curb, sidewalks, storm drain, sanitary sewer, fire hydrant, reinforced concrete stairway, and wooden guard rail. 9-2

**MARYSVILLE, CALIF.**—Awards as follows by County: (1) To Hemstreet & Bell, Marysville, who bid $12,441 for constructing 2½-ft. shoulder on 10 miles of District No. 10, using 4-in. plant mix oil surfacing; and (2) To Hemstreet & Bell, Marysville, who bid $2635 for construction of 1300 ft. 18-ft. oil surfacing with plant mix on Feather River Boulevard. 8-20

**OAKLAND, CALIF.**—To Heafey-Moore Co., 344 High Street, Oakland, $9000 to City for the improvement of Russett Street from 54th Avenue to 85th Avenue, oil surfacing. 8-26

**REDDING, CALIF.**—To W. C. Colley & Frank Cuffe, Masonic Bdg., San Rafael, Calif., who bid $51,684 for grading 3 miles of Weed-Klamath Falls Road, for Joint Highway District No. 11, SHASTA COUNTY. (See Unit Bid Summary.) 8-27

**REDWOOD CITY, CALIF.**—To W. O. Tyson, 42 Jefferson St., Redwood City, $50,379 for concrete paving, sewers, etc., on Pearl, Opal Sts., etc., for City. (See Unit Bid Summary.) 8-26

**RICHMOND, CALIF.**—To Union Paving Co., Call Bdg., San Francisco, who bid $132,125 for improvement of Pullman Ave. from Cutting Blvd. to Panhandle Blvd. for City, grading, paving with 6-in. asphalt base, 4-in. rock cushion, and 2-in. asphalt surface, some concrete paving with asphalt surface, 8-in. oil macadam paving, corr. pipe, reinf. conc. culvert, etc. (See Unit Bid Summary, Aug. 25th issue.) 8-19

**SACRAMENTO, CALIF.**—Awards as follows by California Division of Highways: SACRAMENTO COUNTY—Contract awarded to Pereira & Reed, 545 Roosevelt Ave., Tracy, Calif., $7224 for 4.6 miles from Twin City School to 1 mile northeast of Herald with crushed gravel or stone borders; and SANTA BARBARA COUNTY—Contract awarded to Santa Maria Construction Co., Santa Maria, who bid $11,344 for oiling 4 miles between El Capitan Creek and Tajiguas Creek. 8-25

**SACRAMENTO, CALIF.**—To L. C. Pulley, 1960 Alamitos, Long Beach, who bid $13,336 to Calif. Division of Highways, Sacramento, for 8.4 miles fuel oiling in SAN DIEGO COUNTY from La Posta to Tecata Divide. 8-26

**SACRAMENTO, CALIF.**—To Hartman Construction Company, Bakersfield, who bid $6277 to the California Division of Highways for oiling shoulders between Atascadero and Paso Robles on the Coast Highway. 8-26

**SACRAMENTO, CALIF.**—To Lang Transportation Co., 5501 Santa Fe, Los Angeles, who bid $261,612 to the California Division of Highways, Sacramento, for 37.9 miles grading and oil treated surfacing, SANTA BARBARA AND SAN LUIS OBISPO COUNTIES, from Cuyama River to east boundary. 8-20

**SACRAMENTO, CALIF.**—To Southwest Paving Co., Washington Bdg., Los Angeles, who bid $16,425 to the California Division of Highways, Public Works Bdg., Sacramento, for 4.3 miles bit. rock borders from Santa Clara River to Castaic School, LOS ANGELES COUNTY. 8-20

**SACRAMENTO, CALIF.**—To F. C. Adams, Angels Camp, California, who bid $5994 to Division of Highways, District Engineer, District 3, Sacramento, for bituminous surfacing 6.2 miles between Fresh Pond and three-quarters of a mile east of Riverton in EL DORADO COUNTY. 8-20

**SACRAMENTO, CALIF.**—To A. Teichert & Sons, 1846 37th St., Sacramento, who bid $4092 to District Engineer, California Division of Highways, Sacramento, for 2.9 miles bituminous surface treatment in PLACER COUNTY from Roseville to Rocklin. 8-20

**SAN FRANCISCO, CALIF.**—To Charles Harlowe, Jr., 378 Belmont St., Oakland, who bid $118,295 for 8.335 miles grading, Section E, Route 23, Quincy-Beckwith National Forest Highway, Plumas National Forest, PLUMAS COUNTY, Calif., work for the U. S. Bureau of Public Roads. (See Unit Bid Summary, Aug. 25th issue.) 8-21

**SAN FRANCISCO, CALIF.**—Award of contract recommended to A. J. & J. L. Fairbanks, South San Francisco, Calif., who bid $87,452, low bid to U. S. Bureau of Public Roads, San Francisco, for grading portions of Section 1-B, Generals Highways, Hospital Rock to Giant Forest, Sequoia National Park, TULARE COUNTY, Calif., 4.514 miles. (See Unit Bid Summary.) 8-21

**SAN JOSE, CALIF.**—Awards as follows by County: (1) To Union Paving Co., Call Bldg., San Francisco, $14,748 for asphalt paving North Tenth St.; (2) To A. J. Raisch, Burrell Bldg., San Jose, $20,934 for asphalt paving Locust St., Alma Ave., Lick Ave., etc. 9-3

**SAN JOSE, CALIF.**—To Granite Const. Co., Watsonville, who bid $47,861 for oil macadam paving the Hecker Highway in Supervisor District No. 1 for County. 8-19

**SAN RAFAEL, CALIF.**—To A. J. Raisch, 46 Kearny St., San Francisco, who bid $18,357 for improving streets in Fairfax Heights for County, paving with 3-in. rock cushion with 2½-in. asphalt surface, constructing corr. culverts, concrete curbs and gutters, concrete retaining walls. 8-19

**HELENA, MONT.**—Awards as follows by State Highway Comm.: (1) To Tomlinson-Arkwright Const. Co., $20,000 for 7 miles grading Fort Benton-Havre Road, HILL COUNTY; (2) To Tomlinson-Arkwright Const. Co., Great Falls, Mont., $23,488 for paving ½ mile of Great Falls-Fort Benton Road; (3) To J. E. Hilson & Sons, Miles City, Montana, $41,738 for 9 miles grading Broadus-Wyoming Road, POWER RIVER COUNTY; (4) To Syster & Rathbun, Shelby, Montana, $42,667 for graveling 13 miles of Dodson-Malta Road, PHILIPS COUNTY; (5) To L. T. Lawler, Butte, Montana, $63,803 for 11 miles grading Helena-Townsend-Three Forks Road, BROADWATER COUNTY; and (6) To Powers Const. Co., Helena, Montana, $62,500 for 12 miles grading Glendive-Sidney Road, DAWSON COUNTY.

**MISSOULA, MONT.**—Award of contract recommended to Sam Orino, Spokane, Wash., $59,815 for 1.8 miles grading from Kings Hill to White Sulphur Springs for U. S. Bureau of Public Roads.

**CARSON CITY, NEV.**—Awards as follows by Nevada State Highway Commission: (1) To Nevada Paving Co., Reno, Nev., who bid $32,799 for 20.22 miles oiling in CLARK COUNTY from Crystal to West Slope of Mormon Mesa; and (2) To Nevada Rock & Sand Co., Reno, Nev., who bid $24,912 for 2.54 miles grading and rock or gravel surfacing in WASHOE COUNTY from Sparks to Vista. (See Unit Bid Summary.) 8-21

**HILLSBORO, ORE.**—To United Contracting Co., Portland, Ore., $14,605 for asphalt paving streets for City.

**PORTLAND, ORE.**—Awards of contracts as follows by Oregon State Highway Comm.: (1) To Joslin & McAllister, Spokane, Wash., $74,922 for 5.7 miles grading and surfacing BAKER COUNTY, Haines-Baker Section of the Old Oregon Trail; (2) To R. L. Houck, Independence, Ore., $10,830 for grading approaches to Necanicum and Wahanna Bridges on Roosevelt Coast Highway; and (3) To Joslin & McAllister, Spokane, Wash., $36,570 for 3 miles resurfacing Pleasant Valley-Hemlock Section of the Roosevelt Coast Highway.

**ELLENSBURG, WASH.**—To Rumsey & Jordan, Seattle, $9800 for grading 1 mile of Highway 16 for County.

**SEATTLE, WASH.**—Awards as follows by City: (1) To Moceri Bros., $6935 for paving Second Ave. northeast.

**OLYMPIA, WASH.**—Awards as follows by State: (1) To Rowland Const. Co., Seattle, $83,835 for surfacing 4.5 miles in CLALLAM COUNTY from Lairds Corner to Port Angeles; and (2) To Myers & Goulter, Seattle, $6739 for 0.3 miles grading from Parvin Road to Colfax, WHITMAN COUNTY.

# BRIDGES and CULVERTS

## WORK CONTEMPLATED

**TUCSON, ARIZ.**—Plans by City Engr., Geo. T. Grove, bids soon by City, for double reinf. conc. box culvert covering the Arroyo, to be 8 ft. by 10 ft. with a total length of about 2010 lin.ft. Work involves 3395 cu.yd. Class A concrete, 538 cu.yd. Class B concrete, 451,589 lb. reinforcing steel, 32 lin.ft. A cast-iron pipe, 7132 cu.yd. unclassified excavation, 8231 cu.yd. backfill. 8-28

**CRESCENT CITY, CALIF.**—Plans by County Surveyor, H. M. Malpas, for 60-ft. bridge over Little Mill Creek, involving 100 cu.yd. concrete. 8-19

**SAN DIEGO, CALIF.**—Plans by Engrs., T. J. Allen & R. R. Rowe, 309 G St., San Diego, for First St. Bridge for City, involving 700 tons structural steel, 21,400 sq.ft. concrete steel paving, 6000 cu.yd. embankment, 350 cu.yd. concrete. $155,000. Bids will be called during October. 1911 Act. 8-27

**SALEM, ORE.**—Plans by State Bridge Engr., C. B. McCullough, Oregon State Highway Comm., Salem, Oregon, and call for bids will be issued during October, for the construction of a double-leaf bascule highway bridge, 140-ft. clear span with 1700 ft. of viaduct approach (roadway width 27 ft. plus two 3½-ft. sidewalks). Bridge is to be constructed over Coos Bay. Alternative bids will be taken on the viaduct approach: (1) For reinf. concrete; and (2) For timber superstructure on concrete foundations. $250,000.

## BIDS BEING RECEIVED

**LOS ANGELES, CALIF.**—Bids to 2 p.m., Sept. 15, by the County Clerk, for a bridge over the Los Angeles River at Atlantic Ave., north of Maywood. Alternate bids are being received on a reinforced concrete arch bridge or steel plate girder bridge with reinforced concrete deck. Work involves 4975 cu.yd. concrete, 603,600 lb. reinforcing steel, 1,120,900 lb. struc. steel (alternate), 12,686 ft. concrete piling, 5340 cu.yd. excavation, 15,112 lb. steel castings, 10,295 lb. steel plates, 5156 lb. expansion angles, 1225 ft. 1½-in. conduit, 160 Class D cable. $175,000. 8-21

**OAKLAND, CALIF.**—Bids to 10:30 a. m., Sept. 23, by County, for two bridges over Crandall Slough on Alvarado-Centerville Road; involving 3000 cu.yd. structure excavation, 1570 cu.yd. concrete, 267,000 lb. reinf. steel, macadam paving, etc. 9-3

**REDWOOD CITY, CALIF.**—Bids to 3 p.m., Sept. 15, by City for reinf. conc. retaining wall on Stafford St. at Cordilleras Creek, involving 71 cu.yd. concrete, 6200 lb. reinf. steel. 9-2

**SACRAMENTO, CALIF.**—Bids to 2:00 p.m., Oct. 1, by California Division of Highways, for bridge over Alamitos Bay near Long Beach, LOS ANGELES COUNTY, involving 16,000 ft. Creosoted Douglas Fir piles, 238M Redwood, 540 cu.yd. concrete, 48,000 lb. reinf. steel, 92,000 lb. structural steel. 9-3

**VANCOUVER, B. C.**—Bids to 12 m., October 31, by William McQueen, City Clerk, Vancouver, B. C., for the construction of the Burrard Street Bridge. Work involves 3200 tons of structural steel, 50,000 cu.yd. concrete, 2000 tons of reinforcing steel, 18,000 sq.yd. paving. Bridge is to be 2817 ft. long and 80 ft. wide. 8-22

## BIDS RECEIVED

**SACRAMENTO, CALIF.**—Carpenter Bros., 457 N. Canyon Drive, Beverly Hills, $31,149 low bid to California Division of Highways for reinf. concrete bridge, ½ mi. north of Castaic Junction, LOS ANGELES COUNTY. 9-3

**SACRAMENTO, CALIF.**—G. O. Griffith & H. Gunther, Sacramento, $6577 low for reinf. concrete bridge east of Oroville, BUTTE COUNTY, for State. 8-28

**PORTLAND, ORE.**—Low bids as follows by Oregon State Highway Comm.: (1) Clackamas Const. Co., Oregon City, Ore., $39,240 for reinf. concrete bridges over Hoquarton, Dougherty, and Hall Sloughs, TILLAMOOK COUNTY; (2) Clackamas Const. Co., Oregon City, Ore., $18,750 low for over-crossing of S.P. Railway north of Tillamook, TILLAMOOK COUNTY; and (3) Clackamas Const. Co., Portland, Ore., $44,342 low for bridges over Wilson River and Slough, north of Tillamook, TILLAMOOK COUNTY.

## CONTRACTS AWARDED

**CHICO, CALIF.**—To T. H. Polk, Chico, $4403 for widening reinf. concrete bridge on Main St. for City. 8-21

**REDWOOD CITY, CALIF.**—To V. Dizillo, 1022 53rd St., Oakland, $7502 for reinf. concrete culverts on Woodside Road for City. 9-3

**SAN JOSE, CALIF.**—To Thermotite Const. Co., 580 Stockton Ave., San Jose, who bid $4198 for widening concrete bridges on Quito Road, for County. 9-3

**SANTA ROSA, CALIF.**—To W. L. Proctor, Santa Rosa, who bid $2567 for two reinforced concrete culverts on Paula Road for Sonoma County. 9-3

**SANTA ROSA, CALIF.**—To W. L. Proctor, Santa Rosa, who bid $7208 for three timber trestles at Ballou Ranch, for County. 9-3

**SACRAMENTO, CALIF.**—To Fred J. Maurer, Eureka, who bid $50,320 to the California Division of Highways, Sacramento, Calif., for the construction of overhead crossing over the tracks of the Northwestern Pacific Railroad, 2½ miles north of Beatrice, HUMBOLDT COUNTY. 8-26

**MISSOULA, MONT.**—To Sam Orino, Spokane, Wash., $34,980 for constructing concrete bridge over Blue Creek and Bull River for Bureau of Public Roads.

**PORTLAND, ORE.**—Awards as follows by Oregon Highway Comm.: (1) To C. A. Catching, Roseburg, Ore., $21,919 for concrete bridges over Dobbin, Wolf, and Canyon Creeks on Santiam Highway, LINN COUNTY; and (2) To C. J. Montag, Portland, Ore., $8640 for widening bridge over Milton Creek at St. Helens.

**WENATCHEE, WASH.**—To H. Hegman, Cashmere, Wash., $65,798 for reinf. concrete bridge over Wenatchee River at Monitor for County.

# SEWER CONSTRUCTION

## WORK CONTEMPLATED

**MADERA, CALIF.**—Plans by Engr., A. M. Jensen, 68 Post St., S. F., for sewer extensions for City. $20,000. Bonds voted. 9-2

**SAN FRANCISCO, CALIF.**—Plans by City Engr. Office for Army St. Main Sewer from Pennsylvania Ave. to Mississippi St., involving 895 lin.ft. 2 ft. 6-in. by 3 ft. 9-in. reinf. concrete sewer, involving 332

cu.yd. concrete and 32,000 lb. reinforcing steel, also vitrified brick invert. 8-27

### BIDS BEING RECEIVED

**SAN FRANCISCO, CALIF.**—Bids to 2:30 p.m., Sept. 17, by Board of Public Works, City Hall, S. F., for College Hill Tunnel Sewer, involving 4319 lin.ft. 4 ft. by 6 ft. 6 in. rein. conc. tunnel, 1508 lin.ft. 4 ft. by 6 ft. rein. conc. sewer, 318 lin.ft. 3 ft. 6 in. by 5 ft. 3 in. rein. conc. sewer, 315 lin.ft. 6-ft. circular rein. conc. sewer, 6500 ft. 6-in. to 12-in. vitr. underdrain. $320,000. 8-21

### BIDS RECEIVED

**YUMA, ARIZ.**—Seccombe Bros., Yuma, Ariz., $18,310 for vitrified and $17,660 for concrete, low bid to City for sewers in Dist. 8.

**LOS ANGELES, CALIF.**—Wallace & Tiernan Co., Los Angeles and San Francisco, who bid $37,330, low bid to the Board of Public Works, City Hall, Los Angeles, for chlorination equipment for the Hyperion Outfall Plant. 8-22

**SAN FRANCISCO, CALIF.**—Low bids as follows by Board of Public Works: (1) Healy-Tibbitts Const. Co., 64 Pine St., S. F., $128,493 low for Section C (reinf. conc.) Alemany storm drain; and (2) C. B. Eaton, 715 Ocean Ave., S. F., $41,970 low for Sect. D (wooden construction) Alemany storm drain. (See Unit Bid Summary.) 9-3

### CONTRACTS AWARDED

**BERKELEY, CALIF.**—To W. J. Tobin, 527 Balfour Ave., Oakland, for vitr. sewer on Hilldale Ave. near Marin Ave., for City. 9-2

**MOUNTAIN VIEW, CALIF.**—To C. Dudley DeVelbiss, 354 Hobart St., Oakland, $6924 for sewage pumping plant and equipment for City. 8-21

**DOLORES, COLO.**—To Hasselman & Keller, Pueblo, Colo., $25,830 for sanitary sewer in District 1 for City.

**PORT ANGELES, WASH.**—To L. Coluccio, Seattle, $70,667 for concrete pipe sewer system in east section for City.

## WATER SUPPLY SYSTEMS

### WORK CONTEMPLATED

**LONG BEACH, CALIF.**—Plans by City Water Supt., C. H. Shaw, City Hall, Long Beach, Los Angeles County, for the construction of a 54,000,000-gal. reservoir on Reservoir Hill. This reservoir will be built in units and the first unit will cost about $400,000. 8-29

**MENLO PARK, CALIF.**—Preliminary plans are being made by H. B. Foster, Engineer, University of California, Berkeley, for the following work for the Bear Gulch Water Co., Menlo Park, San Mateo County (which water company is owned by the University of California): PIPE-LINES—Either riveted or welded steel pipe with soiled proof wrapping or reinforced concrete pipe as follows: 35,400 lin.ft. 24-in. pipe-line; PUMPING PLANT—Diversion to be by pumping, capacity of pumping plant to be 11,200 g.p.m.; STORAGE RESERVOIR NO. 2—To have capacity of 880 acre-feet. Estimated cost of the above project is $325,000. Project will not mature until 1931. E. Britton, Menlo Park, is the Supt. 8-29

**TORRANCE, CALIF.**—Bond election Sept. 2 by the City of Torrance for issuing bonds, $400,000, for water supply and distribution system, including wells, pumps, tanks, reservoirs, distributing mains, and land equipment, in Municipal Improvement District No. 1. F. R. Leonard is City Engineer. 8-25

**WALNUT CREEK, CALIF.**—The City Council has accepted the recommendation of Andrew M. Jensen, Consulting Engineer, 68 Post St., San Francisco, and has signed a contract with the California Water Service Company, Federal Reserve Bank Bdg., San Francisco, to purchase water at wholesale for the supply of the municipality. The City will hold a bond election during September or early in October to vote on issuing bonds in the amount of $50,000 to $60,000 for the distributing system. The California Water Service Co., Federal Reserve Bank Bdg., San Francisco, will construct a 12-in. pipe-line, 14 miles long, from the Galindo pump station near Chenery reservoir through Walnut Creek to the Mt. Diablo Country Club, serving water to various consumers and communities en route, providing the company can secure sufficient revenue contracts. 8-29

**YOSEMITE, CALIF.**—Application has been filed by C. G. Thomson, Superintendent, Yosemite National Park, California, for the appropriation of 2 cu.ft. per second from Raynor Creek in Mariposa County for domestic use at Mariposa Grove of Big Trees. Work involves 14,000 lin.ft. 4-in. cast-iron pipe, small concrete diversion dam. $30,190. 8-27

**SEATTLE, WASH.**—Plans by Wm. Severyns, City Water Superintendent, for 80,000,000-gal. capacity reservoir to be built at 1st Avenue South and Leo Street, in West Seattle, and a gravity pipe-line system from Leo Street across the Duwamish Valley to the reservoir. $650,000. It is planned to start work this fall. 8-29

### BIDS BEING RECEIVED

**IONE, CALIF.**—Bids to 2 p.m., September 16, by State Architect George B. McDougall, Public Works Bldg., Sacramento, for two concrete tanks and piping for domestic water system at Preston School of Industry at Ione, Amador County. $11,000. 9-3

**OAKLAND, CALIF.**—Bids to Sept. 23, by County Clerk, Court House, Oakland, for construction of Arroyo del Valle Dam near Arroyo Sanitorium, 3 miles from Livermore. Reinforced concrete construction, $4100. 9-3

**OAKLAND, CALIF.**—Bids to 8 p.m., Sept. 24, by the East Bay Municipal District, 512 16th St., Oakland, for furnishing 2222 tons of cast-iron pipe, diameters ranging from 4-in. to 16-in., inclusive. 8-29

**GRANTS PASS, ORE.**—Bids to 5 p.m., September 18, by C. R. Duer, City Auditor, City Hall, Grants Pass, Oregon, for furnishing: 45,000 lin.ft. cast-iron or steel pipe, 16-in. to 6-in.; 90 fire hydrants; 110 gate valves, 16-in. to 6-in. Specifications from Engineers, Baar & Cunningham, Spalding Bdg., Portland, Oregon. 9-2

**SPOKANE, WASH.**—Bids to 1:30 p.m., September 11, by City Council for 4300 ft. cast-iron pipe sewer for drainage of the airport. 9-2

**SPOKANE, WASH.**—Bids to 1:30 p.m., September 11, by City Purchasing Agent for furnishing and delivering: (1) Furnishing 50 6-in. fire hydrants; (2) Furnishing one 6800-g.p.m. and one 2700-g.p.m. pump with valves, connections, etc., and one 50-hp. motor. 9-2

### CONTRACTS AWARDED

**FRESNO, CALIF.**—To Edgley Co., 800 E. 61st Street, Los Angeles, who bid $42,758 to County for water distributing system in Fresno County Water Works District No. 1. (See Unit Bid Summary, Aug. 25th issue.) 8-23

**SAN FRANCISCO, CALIF.**—Awards as follows by Park Comm.: (1) To Industrial & Municipal Supply Co., 7 Front St., S. F., $2336 for two deep well turbines and motors at Sharp Park; and (2) To Kimball-Krogh Pump Co., S. F., $2674 for deep well turbine and motor near Murphy Windmill, Golden Gate Park. 8-30

**PROVO, UTAH**—To T. G. Rowland, 23 E. Third St. South, Salt Lake City, $72,110 for constructing 5,000,000-gallon reinforced concrete reservoir for City.

**SEATTLE, WASH.**—To Argentieri & Colarassi, Seattle, Wash., $18,310 for water mains in 35th Ave. northeast for City.

## IRRIGATION and RECLAMATION

### WORK CONTEMPLATED

**FLORENCE, ARIZ.**—Plans by Engrs., Scott Engineering Co., 606 Ellis Bdg., Phoenix, Arizona, for the construction of works for the Randolph Irrigation District, Florence, Arizona, to embrace 9600 acres. Work involves 34 complete pumping plants and wells, 136,000 lin.ft. of gunite lined canals and laterals, 76 turnout structures, 35 culverts. Work is to be done under $392,000 bond issue, bonds not yet voted. 9-2

**EL NIDO, CALIF.**—Plans by Engineer, A. Blakesley, c/o Merced Irrigation District, Merced, Merced County, for the construction of works for the El Nido Irrigation District, El Nido, Merced County. Work involves: (1) 12 miles of main canal, involving 150,000 cu.yd. canal excavation, 65,000 sq.ft. 2-in. concrete lining; (2) 15 miles of lateral canals, involving 120,000 cu.yd. canal excavation; (3) Construction of 24-in. to 48-in. siphons with headwalls, bridges, drops, stop-gates and sidegates, etc. Work is to be done under $135,000 bond issue, bonds not yet voted. 8-30

**EL TORO, CALIF.**—Application filed by Louis Robinson, El Toro, Orange County, for the appropriation of 1½ cu.ft. per second from Trabuco Creek in Orange County, for the irrigation of 249 acres of land and for domestic use. Work will involve the installation of the following: PIPE-LINES—Involving 2240 lin.ft. 10-in. concrete pipe, 9420 lin.ft. 12-in. steel pipe. $24,750. 8-29

**FRESNO, CALIF.**—Application has been filed by Fresno Irrigation District, J. Allen Hall, secretary, Griffith-McKenzie Bldg., Fresno, Fresno County, for the appropriation of 750 cu.ft. per second from San Joaquin River in Fresno and Madera Counties and 200,000 ac-ft. per annum storage for irrigation of 241,300 acres of land, and 3600 cu.ft. per second for power development. Work will involve the construction of the following works:

POWER PLANT—To develop 76,000 hp.
DIVERSION DAM—To be concrete, 120 ft. high and 1470 ft. long.
STORAGE DAM—Concrete, to be 247 ft. high and 3400 ft. long and located at Friant.

Geo. L. Swendsen is Chief Engineer of the Fresno Irrigation Dist., Griffith-McKenzie Bldg., Fresno. 9-2

**IRVINE, CALIF.**—Plans by C. Roy Browning, Consulting Engineer, for the Irvine Company, owners of the Irvine Ranch, Irvine, Orange County, Calif., for two dams—one to be located within 1000 ft. of tidewater at head of upper Newport Bay, to be 35.5 ft. high and to store 12,000 ac-ft. The estimated cost is $115,000. The other dam to be located in Peters Canyon is to store 1000 ac-ft., and cost $40,000. Dams are to be of the rolled earth-filled type. Pumping plants and conduits to be built in connection with these dams, $140,000. 8-27

**LINDEN, CALIF.**—Plans by Engr., F. H. Tibbetts, Alaska Commercial Bdg., San Francisco, and plans and application will be filed with the State Engineer at Sacramento for permission to hold bond election to vote $105,000 bonds for the following improvements for the Linden Irrigation District, Linden, San Joaquin County: Construction of low diversion dam on Calaveras River to divert water into gravel beds of

Mormon Channel and old channels, where several ponding dams will be built, for replenishment of ground water supply, therein, where there are already numerous pumping plants. One or more small pumping plants also are to be installed to pump water from river to small unirrigated unit of District. Public hearing will be held by the State Engineer about November 1. 8-30

**MARYSVILLE, CALIF.**—Permit granted to the Estate of California E. Hale, Marysville, Yuba County, for the appropriation of 1.75 cu.ft. per second water from the Feather River in Sutter County for the irrigation of 140 acres of land. Work involves: Pumping plant, to have capacity of 5000 gallons per minute and to cost $3000; concrete pipeline, to cost $1200. 8-30

**MERIDIAN, CALIF.**—Application has been filed by McGrath Bros., et al., by D. C. Smith, E. I. McGrath, and S. M. McKeehan, agents, c/o S. A. McKeehan, Meridian, Sutter County, for the appropriation of 131 cu.ft. per second from Butte Slough in Sutter County for the irrigation of 5245 acres of land in Sutter County. Diversion will be by pumping and capacity of pumping plant will be 58,950 gallons per minute. 9-2

**SAN FRANCISCO, CALIF.**—Application filed by B. P. Lilienthal, Trustee, 315 California St., San Francisco, for the appropriation of 5 cu.ft. per second from Sacramento River in Sutter County for the irrigation of 400 acres of land near Meridian, Sutter County. Work will involve 2500 lin.ft. 12 by 2 by 3-ft. earth ditch, 180 lin.ft. 20-in. welded steel pipe, pump to have capacity of 5300 gallons per minute. $5000. 9-2

### BIDS RECEIVED

**SACRAMENTO, CALIF.**—A. Mitchell, 128 J Street, Sacramento, $20,696 low bid to U. S. Engineer's Office, Sacramento, for clearing brush and trees from certain areas along the San Joaquin River between Turners Cut and Criminal Point, about 8½ miles and 16½ miles, respectively, below Stockton, Calif. 8-21

**YAKIMA, WASH.**—Bids received as follows by the Supervising Engineer, L. M. Holt, U. S. Indian Service, for two pumping plants:

| | Item 1 | Item 2 |
|---|---|---|
| Austin Henderson, Spokane | $4554 | $7700 |
| United Iron Works, Oakland (combined bid) | $11,970 | |
| Kimball-Krogh Pump Co. | 3450 | |
| Pelton Water Wheel Co. | 2986 | 4212 |
| Byron-Jackson Pump Mfg. Co. | 3847 | 7087 |
| Worthington Co. | 3080 | 6109 |
| Economy Pump Mch. Co. | 3077 | 5750 |

8-20

### CONTRACTS AWARDED

**TURLOCK, CALIF.**—Awards as follows by Turlock Irrigation District for concrete lining of Canals: (1) To Carlson Bros., Box 304, Turlock, $27,356, for Schedules 5, 6, 7, 8, 9 and 11; (2) To Ed Erickson, Turlock, $15,404 for Schedules 1, 3, 4 and 12; and (3) To M. B. Clipper, $13,744 for Schedules 2 and 10. (See Unit Bid Summary.) 9-3

## RIVER and HARBOR WORK

### WORK CONTEMPLATED

**OAKLAND, CALIF.**—Plans by Engr. Department, Western Pacific Railroad Co., Mills Bdg., San Francisco, and permit has been granted by Oakland Port Commission, for the construction of a new wharf to be used by the Western Pacific RR. as a freight terminus, to be located 800 ft. west of the extension of Adeline Street, Oakland. Construction of the new wharf will require filling of a concrete bulkhead area 750 ft. wide by 435 ft. long, the wharf to be 75 ft. wide and 418 ft. long. 8-29

**RICHMOND, CALIF.**—Plans by R. A. Beebee, Consulting Harbor Engineer, 1 Montgomery St., San Francisco, and permit has been granted by U. S. Engineers to the Berkeley Waterfront Co. and Blair S. Shuman, for proposed fill in Richmond Inner Harbor and along the Berkeley waterfront. Work involves dredging and creosoted piles, and rock faced bulkhead. Dredging will involve approximately 2,100,000 cu.yd., and the entire project is estimated to cost $400,000 8-28

### BIDS BEING RECEIVED

**SACRAMENTO, CALIF.**—Bids to 3 p.m., Sept. 23, by U. S. Engineer's Office, California Fruit Bdg., Sacramento, Calif., for levee 8700 ft. long on the left bank of the Feather River near the Lake of the Woods, about 1 mile above the mouth of the Bear River in YUBA COUNTY, and 3 miles upstream from the town of Nicolaus, Calif. Work involves 215,000 cu.yd. embankment. 8-25

### BIDS RECEIVED

**LOS ANGELES, CALIF.**—Bids as follows by U. S. Engineer's Office, Los Angeles, for repairing revetment at Reservation Point, Los Angeles Harbor: S. F. Bridge Co., 14 Montgomery St., S. F. (low) (1) using 20-ton derrick plant, $71,900; (2) using clamshell dredges, $73,000. Merritt, Chapman & Scott Corp., San Pedro, using clamshell dredges, $81,300. 8-29

**LOS ANGELES, CALIF.**—Standard Dredging Co., Central Bdg., L. A., $33,780 low bid to U. S. Engineer's Office for 111,000 cu.yd. dredging at Berths 144 to 147, West Basin, Los Angeles Harbor. 8-22

**SACRAMENTO, CALIF.**—Blake Bros. Co., Balboa Bdg., S. F., $14,250 low bid to U. S. Engineer's Office, Sacramento, for furnishing and placing riprap stone along Sacramento River near Chicory Bend. 8-19

**SACRAMENTO, CALIF.**—Low bids as follows by U. S. Engineer's Office, Sacramento, for clamshell dredging on San Joaquin River in connection with Stockton Deep Water Channel. (1) Franks Contr. Co., 260 California St., S. F., who bid .093 per cu.yd. low for 1,827,000 cu.yd. dredging in Part 1 and .072 per cu.yd. low for 464,000 cu.yd. dredging in Part 3; and (2) California Delta Farms, Belding Bdg., Stockton, who bid .066 per cu.yd. low for 325,400 cu.yd. dredging in Part 3. (See Unit Bid Summary.) 8-26

**SACRAMENTO, CALIF.**—E. T. Fisher, 2520 Hale Drive, Burlingame, who bid .073 per cu.yd. low bid to U. S. Engineer's Office, Sacramento, for 858,000 cu.yd. dragline excavation for levees along the San Joaquin River in connection with Stockton Deep Water Channel. (See Unit Bid Summary.) 8-26

**SACRAMENTO, CALIF.**—Hydraulic Dredging Co., Central Bank Bdg., Oakland, who bid .0947 per cu.yd. low bid to U. S. Engineer's Office for 779,000 cu.yd. dredging in New York Slough for U. S. Engineer's Office. 8-28

**SANTA BARBARA, CALIF.**—Merritt, Chapman, Scott Corp., P.O. Box 698, San Pedro, Calif., who bid $118,750, only bid submitted to the City for supporting and protecting wall or revetment (being a portion of East Cabrillo Blvd.). Wall is to be of riprap construction with sheet piling 3000 ft. long. 8-23

## LIGHTING SYSTEMS

### BIDS RECEIVED

**PALO ALTO, CALIF.**—Butte Elect. & Mfg. Co., 956 Folsom St., S. F., $4185 low for street lighting system at U. S. Veterans' Hospital. 8-29

### CONTRACTS AWARDED

**PORTERVILLE, CALIF.**—To R. A. Wattson, 1026 No. McCadden Place, Los Angeles, $21,252 for 56 electroliers (Union Metal Mfg. Co.), conduit system, etc., on Main street for City. 8-20

## POWER DEVELOPMENT

### BIDS BEING RECEIVED

**DENVER, COLO.**—Bids to 3 p.m., Sept. 23, by the Bureau of Reclamation, Wilda Bdg., Denver, Colorado, for furnishing one 5000-kv-a. alternating-current generator, three or four 1667-kv-a. 2300 to 19100/33000 Y-volt transformers, two gang-operated disconnecting switches, and one switchboard and auxiliary apparatus, for the Shoshone power plant, Shoshone project, Wyoming. 9-2

**DENVER, COLO.**—Bids to 3 p.m., Sept. 29, by the U. S. Bureau of Reclamation, Wilda Bdg., Denver, Colo., for the construction of a power plant and transmission lines near the Boulder Dam site to furnish power for construction of the dam. 8-27

### WORK CONTEMPLATED

**SEATTLE, WASH.**—Plans by Willis T. Batcheller (Consulting Engineer, Dexter Horton Bdg., Seattle), President of the recently formed Portland Canal Power Company, for the construction of a power project in Alaska to serve the towns of Hyder, Alaska, and Stewart, British Columbia. Work will involve: POWER PLANT—Located 12 miles south of Hyder, Alaska, initial development to be less than 10,000 hp., ultimate development to be 20,000 hp; DAM—To be concrete arch type, of sufficient height to produce a head of 350 ft. for the initial development and later to be increased to 500 ft.; POWER TUNNEL—To be 800 ft. long; PENSTOCKS—Steel, to be 400 ft. long and to deliver the water to turbines located in a concrete power house on tidewater; TRANSMISSION LINES—To carry the power to Hyder and Stewart, up the Salmon River and Bear River and down the east side of the canal. $3,000,000. Surveying party in charge of Edwin R. Wright, Resident Engineer for the Company, are now at the site. 8-27

## MACHINERY and SUPPLIES

### BIDS BEING RECEIVED

**MARE ISLAND, CALIF.**—Bids to Sept. 16, by U. S. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for 10 main fuel tanks for Mare Island and 26 main fuel tanks for San Diego, Schedule 4007. Specifications from Naval Purchasing Agent, 310 California St., San Francisco. 9-3

# SURETY BOND AND CASUALTY INSURANCE DIRECTORY

### BIDS RECEIVED

**LOS ANGELES, CALIF.**—Bids as follows by Purchasing Agent, City of Los Angeles, for: (1) 80,000 ft. 2-in. A bell and spigot pipe, (2) 32,500 ft. 2-in. B bell and spigot pipe, (3) 32,500 ft. 2-in. B bell and thread pipe:

| | (1) | (2) | (3) |
|---|---|---|---|
| Crane Company, L. A. | .16 | .19 | .17 |
| Pacific States Cast Iron Pipe Co., L. A. | .1633 | .195 | .165 |
| Grinnell Co. of Pacific | .184 | .199 | .184 |
| Amer. Cast Iron Pipe Co. | .195 | .225 | .20 |

8-29

**WASHINGTON, D. C.**—Scott Bros. Well Drilling Co., 4541 Stern, Los Angeles, $104,000 low bid to Bureau of Yards and Docks, Washington, D. C., for repairing oil wells at Elk Hills District, Kern County, California. 9-3

### CONTRACTS AWARDED

**SANTA MONICA, CALIF.**—To Rensselaer Valve Co., Subway Terminal Bdg., Los Angeles, who bid $675 each for 9 30-in. hub-end double dics non-rising steam gate valve, to be delivered at trenchside on Sawtelle Boulevard. 8-25

## TUNNEL CONSTRUCTION

### CONTRACTS AWARDED

**SACRAMENTO, CALIF.**—To T. M. Morgan Paving Co., Edwards & Wildey Bdg., Los Angeles, who bid $209,755 to the California Division of Highways, Sacramento, for 36 ft. diameter, and 1 mile of roadway through Newcastle, PLACER COUNTY. 8-20

## RAILROAD CONSTRUCTION

### CONTRACTS AWARDED

**SAN FRANCISCO, CALIF.**—The Utah Construction Co. and W. A. Bechtel Co., joint contractors on the 122-mile railroad connection between Bieber and Keddie, Calif., have awarded two more sub-contracts for sections southerly from Bieber as follows: (1) To Fredrickson & Watson, 354 Hobart St., Oakland, Calif.; and (2) To Lewis Construction Co., 426 South Spring St., Los Angeles, Calif. 8-26

**SAN FRANCISCO, CALIF.**—Sub-contracts awarded as follows by the Utah Construction Co. and W. A. Bechtel Co., San Francisco, in connection with 111 miles of railroad from Keddie, Plumas County, to Bieber, Lassen County, for Western Pacific Railroad:

FROM KEDDIE NORTHERLY IN ORDER OF SEQUENCE: (1) To Morrison-Knudsen Co., Boise, Ida., 4 miles; (2) To Paul J. Tyler, Oroville, 4 miles; (3) 7-mile section across Valley to Greenville not awarded; (4) To Paul J. Tyler, Oroville, 4 miles; (5) Utah Const. Co., Phelan Bldg., S. F., will do 4 miles; (6) W. A. Bechtel Co. will do 4 miles; (7) To Heiselt Construction Co., 1611 Hot Springs Ave., Salt Lake City, Utah, 15 miles;

FROM BIEBER SOUTHERLY AS FOLLOWS: (1) To W. H. Puckett Co., Boise, Idaho, 14 miles. 8-19

## PIPE LINE CONSTRUCTION

### CONTRACTS AWARDED

**SAN FRANCISCO, CALIF.**—To Hutchinson Co., 1450 Harrison St., Oakland, for the construction of 167 miles of gas pipe-line ranging in diameters up to a maximum size of 10-in. for the Natural Gas Corporation of Oregon, to serve the cities of Klamath Falls, Bend, The Dalles, Hood River, La Grande, Bandon, Coquille, and other cities. The cost of the work to be done in Oregon by the above company is $1,025,000. Contract for steel pipe, 4-in. to 10-in. diameter, awarded to Crane Company, San Francisco, pipe to be oxy-acetylene welded. Propane gas, liquefied, will be used. Thebo, Starr & Anderton, Sharon Bdg., S. F., Engineers. 8-30

## BUILDING CONSTRUCTION

### BIDS BEING RECEIVED

**IONE, CALIF.**—Bids to 2 p.m., Sept. 16, by the State of California, Public Works Bdg., Sacramento, for brick and steel frame shop building, and a 2-story brick residence (Preston School of Industry) to be located near Ione, Amador County, Calif. $40,000. 8-20

**STOCKTON, CALIF.**—Bids to 11 a.m., Sept. 29, by County, for First Unit of County Hospital at French Camp. $250,000. 9-2

### CONTRACTS AWARDED

**BERKELEY, CALIF.**—To Chas. D. Vezey & Sons, 3220 Sacramento St., Oakland, $103,885 for brick and steel frame addition to the Longfellow School for the Board of Education. 8-19

**BERKELEY, CALIF.**—To Chas. D. Vezey, 3220 Sacramento St., Berkeley, Calif., who bid $52,870 for the construction of a brick and hollow tile, steel frame gymnasium building for the Burbank Junior High School to be located at Addison and Curtis Sts., Berkeley, Calif. 8-30

**BURLINGAME, CALIF.**—To Chas. Pedersen, 734 Prospect, San Mateo, Calif., who bid $47,360 for the construction of a 1-story and basement, reinf. concrete, steel and brick or plaster Class 'B' library building to be located at Burlingame. 8-26

**CERES, CALIF.**—To Ernest Green, 825 Sycamore St., Modesto, $65,500 for brick and frame grammar school building for Ceres Grammar School District. W. H. Weeks, San Francisco, is the architect. 8-30

# OPPORTUNITY PAGE

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

# THE BUYERS' GUIDE

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

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

**Acetylene Generating Apparatus**
Oxweld Acetylene Co.

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

**Air Compressors—Engines**
Atlas Imperial Diesel Engine Co.

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

**Asphalt, Emulsified**
American Bitumuls Co.
Shell Oil Co.

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

**Asphalt Paving**
Warren Bros. Roads Co.

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

**Beams, Channels, and Angles**
Pacific Coast Steel Corp.

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

**Blades—Fresno and Graders**
Solano Iron Works

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

**Boilers**
Industrial Brownhoist Corp.
Montague Pipe & Steel Co.
Water Works Supply Co.

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

**Bonds (Street) Bought**
W. P. Bullock

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

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

**Brick, Common**
Gladding Bros. Mfg. Co.

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

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

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

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

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

**Carbide**
Union Carbide Sales Co., The

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

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

**Castings, Iron and Steel**
American Cast Iron Pipe Co.
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.
Haiss Mfg. Co., Geo.
Jenison Machinery Co.
Lakewood Engr. Co.
Ransome Concrete Machinery Co.

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

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

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

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

**Concrete Forms**
Blaw-Knox Co.

**Concrete Roads**
Portland Cement Association

**Conveyors, Portable**

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

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

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

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

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

**Crushers—Engines**
Atlas Imperial Diesel Engine Co.

**Culverts, Concrete**
Portland Cement Association

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

**Culverts, Part Circle**
California Corrugated Culvert Co.
Western Pipe & Steel Co.

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

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

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

**Cutting Edges**
Solano Iron Works

**Dams**
Ambursen Dam Co., Inc.

**Derricks**
Bacon Co., Edward R.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Young Machy. Co., A. L.

**Diesel Engines**
Atlas Imperial Diesel Engine Co.

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

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

**Dragline—Diesel Engines**
Atlas Imperial Diesel Engine Co.

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

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

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

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

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

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

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

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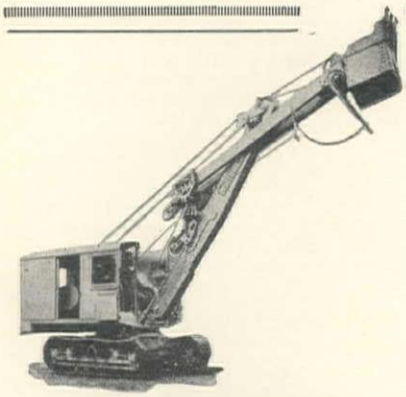
# OPPORTUNITY PAGE

CONTINUED



## SHOVELS CRANES DRAGLINES PULLSHOVELS

**Factory Rebuilt with New Machine Guarantee**

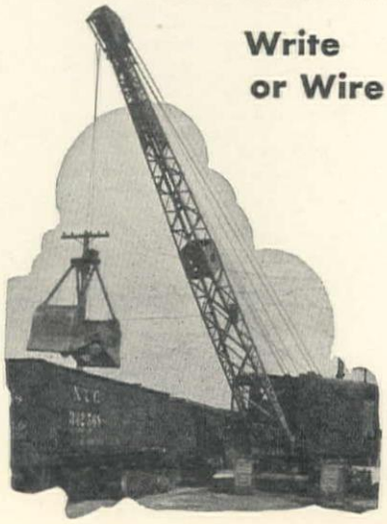
*(1/2 to 2 cu. yd.)*

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

NORTHWEST ENGINEERING CO.

23 MAIN STREET, SAN FRANCISCO, CALIF.
4900 SANTA FE AVE., LOS ANGELES, CALIF.

**Write or Wire**



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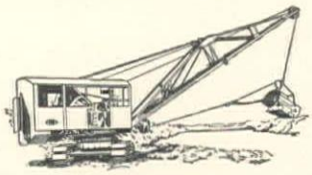

**DRAGLINES :: SHOVELS :: CLAMSHELLS**
**TRUCK CRANES :: TRENCHERS**
ALL SIZES DRAGLINE AND CLAMSHELL BUCKETS
**EXCAVATING EQUIPMENT DEALERS, Inc.**
2657 Ninth Street, Berkeley — THornwall 3367
2248 East 37th Street, L. A. — LAfayette 1787
STORAGE SPACE FOR RENT

**For Rent or Will Contract**
1¼-cu.yd. Gas Shovel, Crane Dragline or Clamshell
**E. SMARIO**
836 Bayshore Blvd., San Francisco
Phone DElaware 3778

**TRENCH MACHINE**
For Sale at Bargain Price
P & H MODEL 10-30
**P. B. Hackley Equipment Company**
625 Market Street San Francisco
Phone SUtter 0978

## FOR SALE

**CRANE**

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

**SHOVELS**

1—Marion Electric, 2½-cu.yd., 490.

1—Bucyrus Diesel, 2-cu.yd. 50-B.

1—P&H Gasoline, 1½-cu.yd., 700.

Write for our 1930 general catalog. It will enable you to effect real economies in your purchasing.

"SERVICE AND QUALITY AT A SAVING IN COST"

**EASTERN IRON & METAL COMPANY**
634 South 4th West — Salt Lake City, Utah
WABUSKA, NEVADA

## PIPE

**Used Pipe & Screw Casing**
New Threads and Couplings.
Tested, dipped and guaranteed.
30 to 50 Per Cent Saving.
**G. Weissbaum & Co.**
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**FOR RENT OR SALE**
**Portable Air Compressors**
**Concrete-Breakers**
W. H. COWEN
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Best Among Meters
**The Hoff Current Meter**
SAVES TIME
Gives reliable results
Is easy to operate
**Scientific Instrument Co.**
1441 Walnut Street
Berkeley, Calif.

**FOR SALE CHEAP**
Two Eight-Foot McMillan Hydraulic Dirt Movers used only three months.
Guaranteed First Class
PEART PETERSON CO.
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Simple Graphical Solution
of Kutter's Hydraulic Formula for Determining Rate of Flow in Canals and Pipes
Price, $1.25 on paper—$1.50 on cloth
also simplified 'Beam Diagrams'
at same price
JOHN R. JAHN
406 Charleston Bdg., San Francisco

# THE BUYERS' GUIDE—*Continued from Page 62*

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

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

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

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

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

**Filters, Water**
California Filter Co., Inc.

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

**Floating Roofs**
Chicago Bridge & Iron Works

**Flood Lights**
Oxweld Acetylene Co.
Taylor & George

**Flooring, Industrial**
Paraffine Companies, Inc., The

**Floors, Mastic**
Wailes Dove-Hermiston Corp.

**Flumes, Concrete**
Portland Cement Association

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

**Fluxes**
Victor Welding Equipment Co.

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

**Form Ties**
J. M. Willard Co.

**Freight, Water**
American-Hawaiian Steamship Co.

**Frogs and Switches**
Bacon Co., Edward R.

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

**Gates, Cast-Iron**
California Corrugated Culvert Co.

**Gates, Radial**
California Corrugated Culvert Co.

**Gates, Sheet Metal**
California Corrugated Culvert Co.

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

**Governors, Turbine**
Pelton Water Wheel Co., The

**Grader Blades**
Solano Iron Works

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

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

**Hoists, Hand and Power**
Bacon Co., Edward R.
Gardner-Denver Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Link-Belt Co.
Novo Engine Co.
Sullivan Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.
Young Machy. Co., A. L.

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

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

**Hydro-Tite**
Industrial & Municipal Supply Co.

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

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

**Jacks, Lifting**
Jenison Machinery Co.

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

**Leadite**
Water Works Supply Co.

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

**Locomotives, Electric, Gas and Steam**
Bacon Co., Edward R.
Jenison Machinery Co.

**Lumber**
McCormick Lumber Co.

**Metal Lath**
Truscon Steel Company

**Meters, Venturi**
Water Works Supply Co.

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

**Mixers, Chemical**
Dorr Co., The

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

**Mixers, Plaster**
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

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

**Oxy-Acetylene Apparatus**
Oxweld Acetylene Co.

**Oxygen in Cylinders**
The Linde Air Products Co.

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

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

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

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

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

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

**Paving, Contractor**
Warren Bros. Roads Co.

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

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

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

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

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

**Piling**
Pacific Coast Steel Corp.

**Pipe, Bell and Spigot**
National Cast Iron Pipe Co.

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

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

**Pipe, Centrifugal**
National Cast Iron Pipe Co.

**Pipe Clamps and Hangers**
Kortick Mfg. Co.

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

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

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

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

**Pipe, Flanged**
National Cast Iron Pipe Co.

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

**Pipe, Lock-Bar**
Western Pipe & Steel Co.

**Pipe, Preservative**
Columbia Wood & Metal Preservative Co.

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

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

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

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

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

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

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

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

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

**Power Units**
Continental Motors Corp.
Hercules Motors Corp.
International Harvester Co.
Jenison Machinery Co.
Novo Engine Co.

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

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

(Continued on page 66)

# OPPORTUNITY PAGE

## CONTINUED

## OFFICIAL BIDS

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 8:00 p.m., September 24, 1930, and will at that hour be opened, for furnishing approximately 2022 tons of cast-iron pipe of diameters ranging from 4 in. to 16 in., inclusive.

Specifications may be obtained upon application at Room 33 of the office of the District.

JOHN H. KIMBALL,
Secretary.

Oakland, California, August 28, 1930.

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UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

### Electrical Equipment

Washington, D. C., August 13, 1930.

Sealed bids (Specifications No. 513) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 3:00 o'clock p.m., September 23, 1930, and will at that hour be opened, for furnishing one 5000-kv-a. alternating-current generator, three or four 1667-kv-a. 2300 to 19100/33000 Y-volt transformers, two gang-operated disconnecting switches, and one switchboard and auxiliary apparatus, for the Shoshone power plant, Shoshone Project, Wyoming. All apparatus will be installed by the Government. For particulars, address the Bureau of Reclamation, Powell, Wyoming; Denver, Colorado; or Washington, D. C.

P. W. DENT,
Acting Commissioner.

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NOTICE TO CONTRACTORS

### Grading, Surfacing and Bridge

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, California, until 2 o'clock p.m. on October 1, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

San Mateo County, between San Mateo and Redwood City (IV-S.M-68-C), about seven and three-tenths (7.3) miles in length, to be surfaced with bituminous treated crusher run base.

Los Angeles County (VII-L.A.-60-F), a bridge across Alamitos Bay near Long Beach, consisting of fifteen 19-foot timber spans with concrete deck and one 41-foot 4-inch steel beam removable span.

Los Angeles County, at Castaic Creek (VII-L.A.-4-A), about one (1.0) mile in length, to be graded and paved with Portland cement concrete.

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

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

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

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

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

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

Dated September 3, 1930.

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NOTICE TO CONTRACTORS

### Grading, Surfacing and Paving

Sealed proposals will be received at the office of the State Highway Engineer, Public Works Building, Sacramento, California, until 2 o'clock p.m. on September 24, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Trinity County, between Westerly Boundary and Burnt Ranch (I-Tri-20-C), portions about eight-tenths (0.8) mile in length, to be graded.

Colusa County, between Williams and Maxwell (III-Col-7-B, C), about eight and one-tenth (8.1) miles in length, to be surfaced with a gravel base.

El Dorado County, between Clark's Corner and Placerville (III-E.D.-11-C), about one and seven-tenths (1.7) miles in length, to be graded and surfaced with untreated crushed gravel or stone.

San Mateo County, through South San Francisco (IV-S.M.-68-A), about nine-tenths (0.9) mile in length, to be graded and paved with Portland cement concrete.

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

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

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

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

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

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

Dated August 27, 1930.

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NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 8:00 p.m., September 24, 1930, and will at that hour be opened, for furnishing approximately 50,000 feet of ¾" seamless copper tubing.

Specifications may be obtained upon application at Room 33 of the office of the District.

JOHN H. KIMBALL,
Secretary.

Oakland, California, September 5, 1930.

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## HELP WANTED

As listed by the Engineering Societies' Employment Service, 57 Post Street, San Francisco. Applicants will please apply direct to them.

SAFETY ENGINEER, single, graduate mining engineer who has had actual mine underground experience and a general knowledge of mining; experienced in milling and smelting; also general knowledge of electricity and railway practices, the safety policies of large corporations and the channels of information. Should be able to plan and execute safety programs and instruct foreman and laborers in safety practices and first aid. Several years experience as safety engineer with good references required. Salary open. Apply by letter with photo. Location, South America. Headquarters, New York. R-3251-S.

ENGINEER, young, either employed now or recently employed on design of hydraulic equipment, particularly centrifugal pumps. Apply by letter, giving all details of experience, salary, etc. Location, Middle West. K-297-W-1288-C-S

HELP WANTED—By reliable manufacturer of construction equipment, competent factory sales representative for West Coast. State qualifications and full experience in first letter. Box 425, Western Construction News.

WANTED—First-class mechanic having wide experience on gas shovels, trucks, compressors, pumps, and electrical equipment. To take complete charge; salary open; long road job in the mountains. A-1 camp conditions. References required. Write full details of experience in first letter. Box 400, W.C.N.

## SITUATIONS WANTED

SITUATION WANTED—A labor foreman, experienced, sewer construction, concrete, street, curb and gutter walks, pipe lines, general work. R. Smith, 404 Chestnut Street, Redwood City, Calif.

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

**Pumps, Dredging and Sand**
Jenison Machinery Co.

**Pumps, Hydraulic**
Jenison Machinery Co.

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

**Pumps, Road**
Bacon Co., Edward R.
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.
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Jenison Machinery Co.
Pelton Water Wheel Co., The
Pomona Pump Co.
Washington Iron Works

**Rails**
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Soulé Steel Co.

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

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Rix Company, Inc., The

**Road Finishers**
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Blaw-Knox Co.
Jenison Machinery Co.
Lakewood Engr. Co.

**Road Forms**
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Blaw-Knox Co.
Heltzel Steel Form & Iron Co.
Jenison Machinery Co.
Lakewood Engr. Co.

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

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

**Road Oil, Emulsified**
American Bitumuls Co.
Shell Co.

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Huber Manufacturing Co.
Jenison Machinery Co.
Spears-Wells Machinery Co.
Taylor & George

**Roofing**
Paraffine Companies, Inc., The

**Rules, Steel, Wood and Aluminum**
Lufkin Rule Co., The

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Young Machinery Co., A. L.

**Scarifiers**
American Tractor Equipment Co.
Austin-Western Road Mchy. Co., The
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Jenison Machinery Co.
Le Tourneau Mfg. Co.
Spears-Wells Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.

**Scrapers, Dragline, Fresno, Wheeled**
American Tractor Equipment Co.
Austin-Western Road Mchy. Co., The
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Jenison Machinery Co.
Jumbo Scraper Co.
Sauerman Bros., Inc.
Shaw Excavator & Tools Co.
Solano Iron Works
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**Screens, Sand and Gravel**
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Bodinson Manufacturing Co.
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Haiss Mfg. Co., Geo.
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Link-Belt Co.
Smith Engineering Co.
Young Machinery Co., A. L.

**Screens, Sewage**
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Ric-Wil Co., The

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Ingersoll-Rand Co.

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Ohio Power Shovel Co.
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Thew Shovel Co., The
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Pacific Coast Steel Corp.
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Austin Western Road Machy. Co., The
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Western Pipe & Steel Co.

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Pittsburgh-Des Moines Steel Co.
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Lacy Manufacturing Co.
Steel Tank & Pipe Co.
Western Pipe & Steel Co.

**Tapes, Measuring, Steel and Fabric**
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Hunt Co., R. W.

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Oxweld Acetylene Co.
Victor Welding Equipment Co.

**Towers, Transmission**
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Water Works Supply Co.

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Linn Mfg. Corp., Division of La France-Republic Corp.
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American-Hawaiian Steamship Co.

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Cleveland Trencher Co., The
Harnischfeger Sales Corp.
Jenison Machinery Co.
Link-Belt Co.
Thew Shovel Co., The

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Jenison Machinery Co.
Universal Crane Co., The

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La France Republic Corp.
Linn Mfg. Corp., Division of La France-Republic Corp.
Sterling Motor Truck Co.

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Harnischfeger Sales Corp.
Jenison Machinery Co.
Marion Steam Shovel Co.
St. Louis Power Shovel Co.

**Turbines, Hydraulic**
Pelton Water Wheel Co., The
Water Works Supply Co.

**Turntables**
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Jenison Machinery Co.

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Claussen & Co., C. G.
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Pelton Water Wheel Co., The
Water Works Supply Co.

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Pelton Water Wheel Co., The
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Water Works Supply Co.

**Water Transportation**
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**Water Wheels**
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**Water-Works Supplies**
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**Welding Apparatus (see Torches)**
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Victor Welding Equipment Co.

**Welding Equipment**
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Victor Welding Equipment Co.

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Victor Welding Equipment Co.

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