WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

PUBLISHED SEMI-MONTHLY
VOLUME IV NUMBER 20

SAN FRANCISCO, OCTOBER 25, 1929

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WATER SUPPLY IN THE MAKING

OBSERVATORY FOR NEVADA COOPERATIVE SNOW SURVEY ON MT. ROSE, NORTH OF LAKE TAHOE, AT ELEV. 10,800 FT.

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DIESEL Torque Increases as Speed Decreases

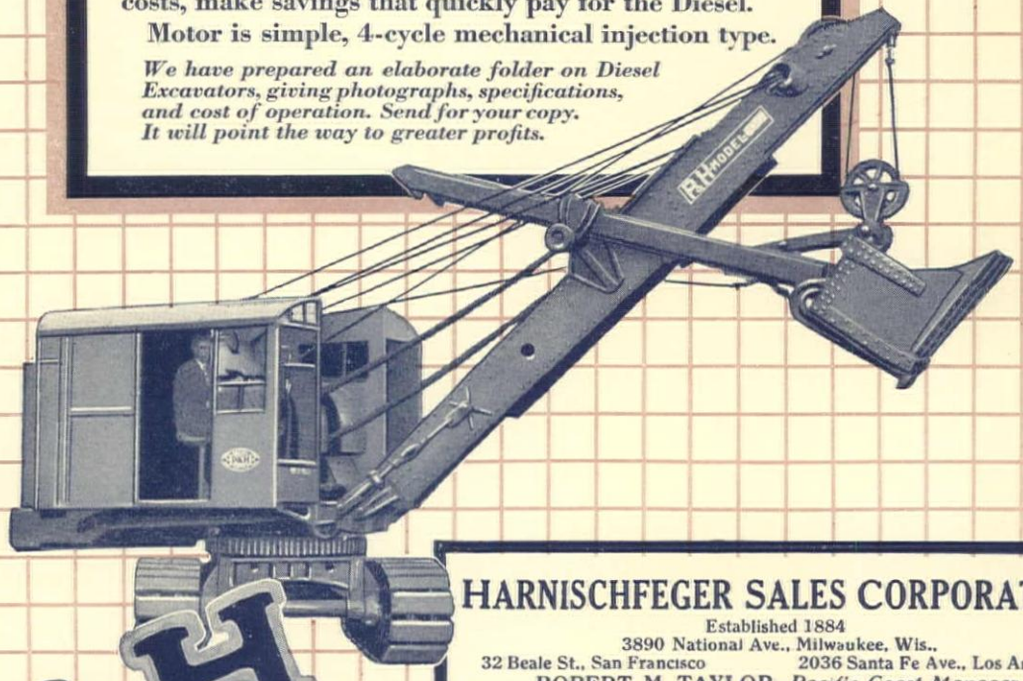
That's Why
10 to 15% More Yardage

THE P & H, engineered to take full advantage of the remarkable ability of the Diesel motor to exert greater torque when motor speed decreases — has established new excavating records.

The push-like, follow-through power of the P & H Diesel—together with the 75 to 85% reduction in fuel costs, make savings that quickly pay for the Diesel.

Motor is simple, 4-cycle mechanical injection type.

We have prepared an elaborate folder on Diesel Excavators, giving photographs, specifications, and cost of operation. Send for your copy. It will point the way to greater profits.



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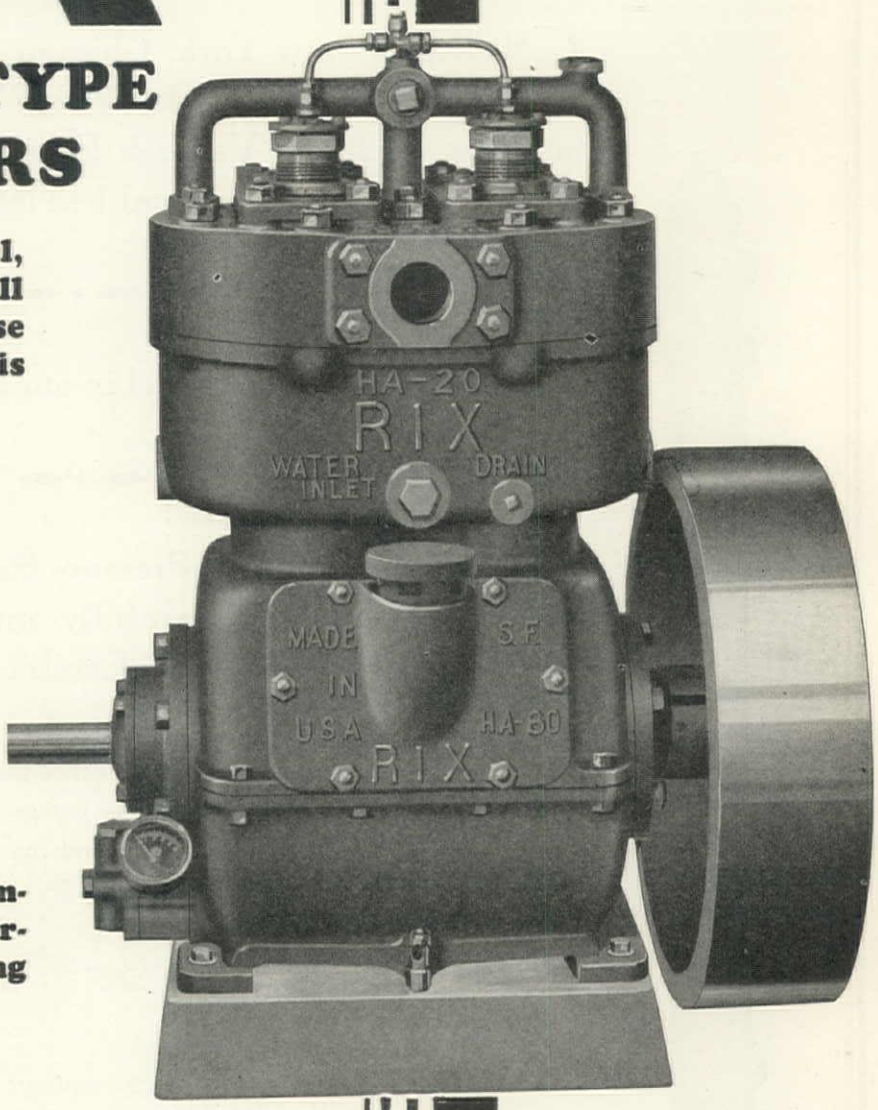

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DEVOTED TO CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

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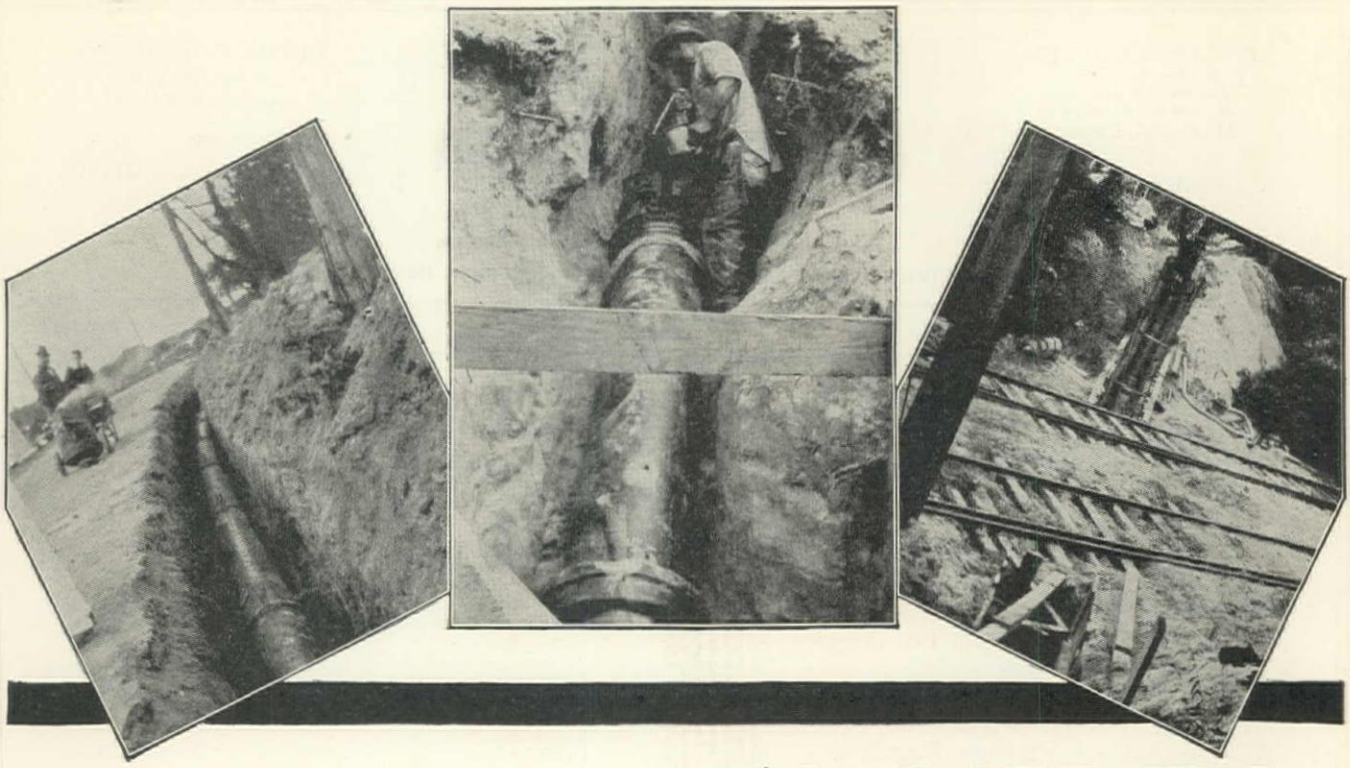

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of strong, tight joints

Easy to Prepare

THE above pictures were taken at Warwick, R. I. They show different sections of the 53 miles of pipe being installed for the new Warwick water system. Every joint in this 53 miles of 6″ to 16″ cast iron pipe will be made with Hydro-Tite. In selecting Hydro-Tite the engineers, the town and the contractors are assured of strong, tight and flexible joints.

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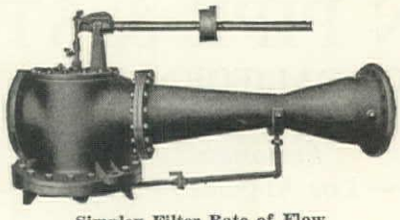

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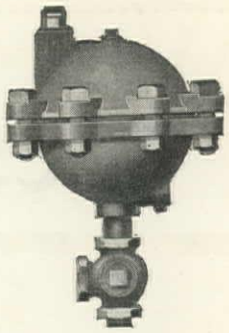

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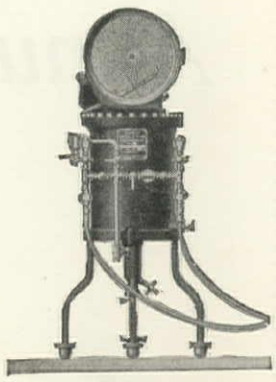

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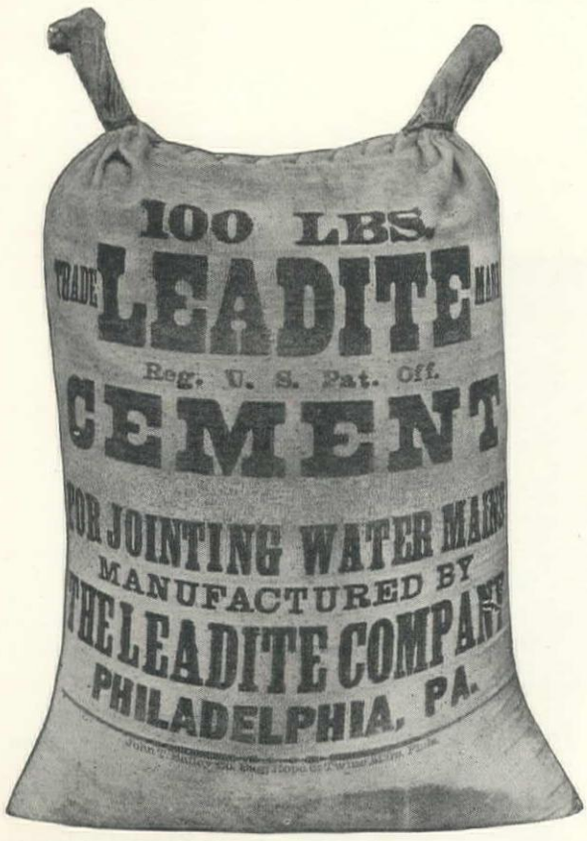
LEADITE Users are LEADITE Boosters



EAST or West, North or South, take your pick of the cities—and you'll find many of them on the customer list of LEADITE. The country's principal cities, large and small—the country's representative water works engineers, construction companies and water works departments of industrial plants, railroads and mines are strong for LEADITE for jointing cast iron water mains—

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What, for instance?—

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LEADITE is the pioneer self-caulking material for c. i. pipe

Be Sure It Is LEADITE and Accept No Imitations

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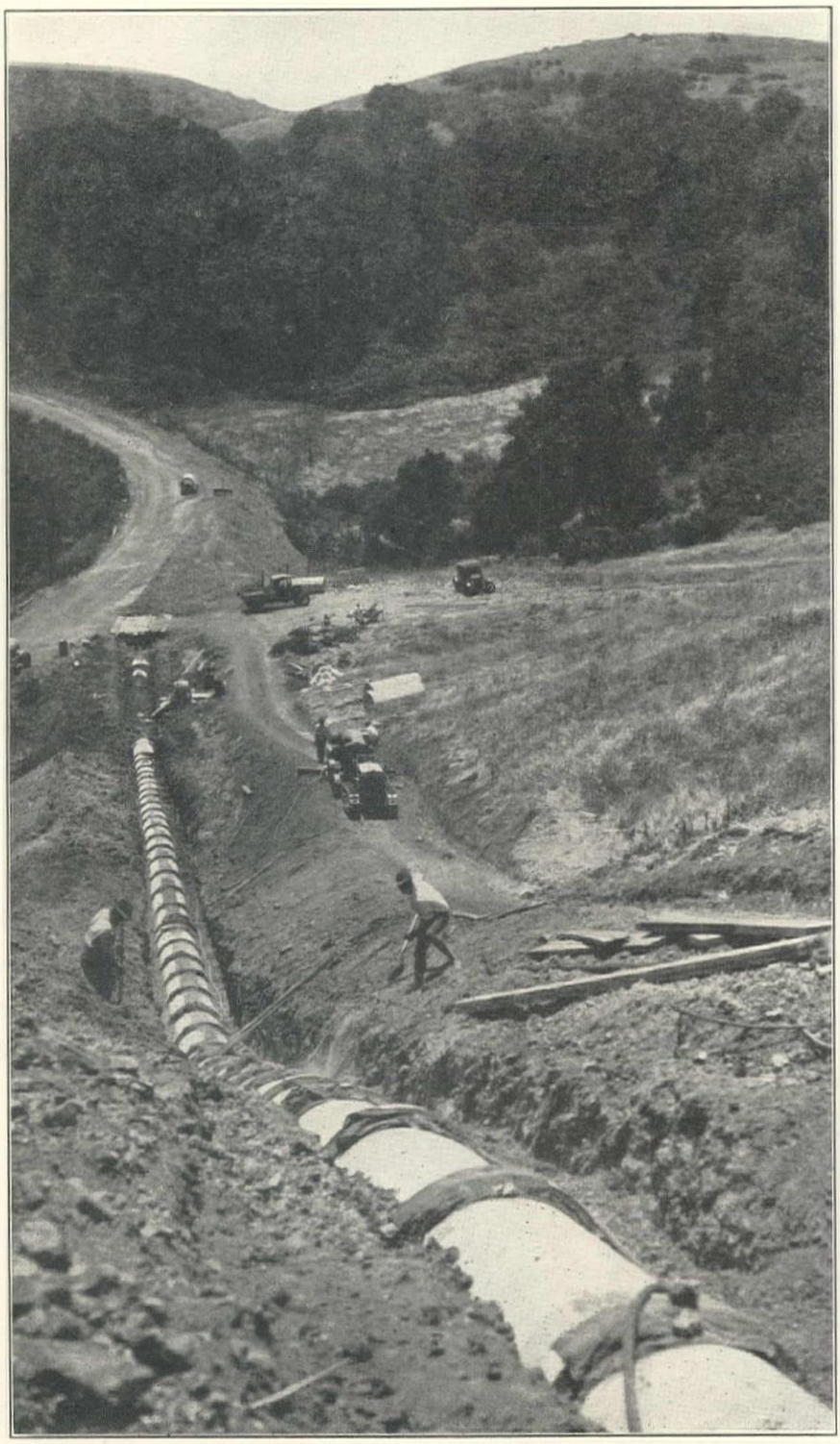
for Sewers and Water Transmission



Moraga Aqueduct, East Bay Municipal Utility District, Oakland, California.
8800 feet of 30 and 36-in. Hume Pipe, 25 to 115-ft. head.

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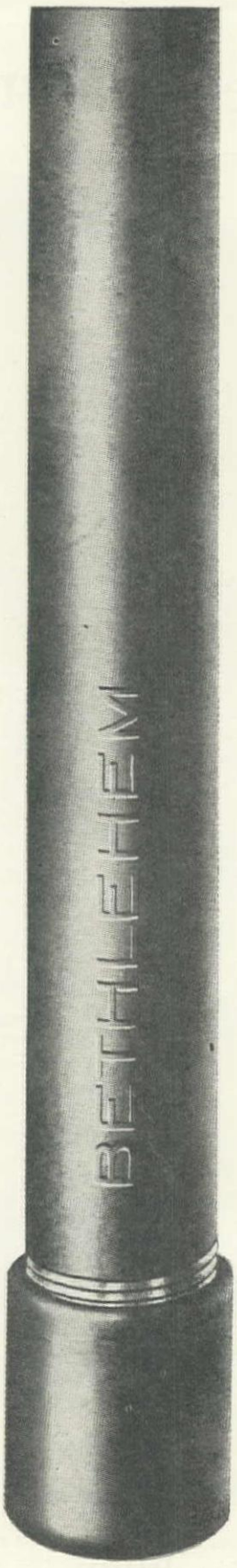
TACOMA OAKLAND LOS ANGELES SAN DIEGO PHOENIX

Pipe as *fine* as can be made



Adequate stock line pipe carried at Wilmington, Calif. Plain end and threaded and coupled for prompt shipment

Take a length of Bethlehem Steel Pipe. Test it in any way you please. Note its strong weld, its freedom from scale, its exceptional softness and ductility. See how easily it is cut and threaded, how clean and strong the threads are!

This is quality pipe! Pipe that will meet any test. Pipe that you can use with confidence on the most difficult jobs, where the requirements are most exacting—pipe that is as fine as can be made.

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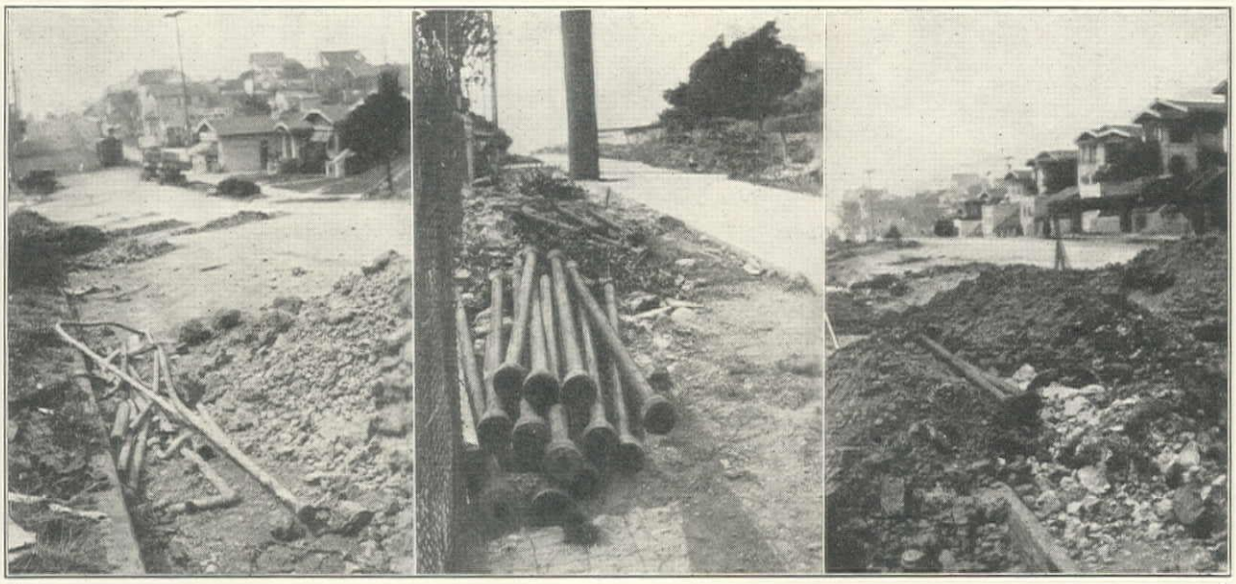
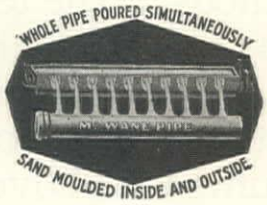


Permanent Pipe under Permanent Paving

WHEN a street is to be paved in these days of heavy traffic, it's no time to trust to luck about the services. What kind of service pipe to use calls for thought. And thought in the case of this big California city led to the inescapable and logical conclusion that McWane-Pacific 1¼ and 2-inch *cast iron* pipe, with Precalked Joints, was the one best bet. Photos above show the preliminary work of removing old services under way; and a pile of 1¼-inch *cast iron* pipe ready to begin serving by the century. For Cast Iron Pipe *lasts,* forever free from rust or rot.

Another growing field for 2-inch cast iron pipe is for parallel mains in residential districts. Cut pavement and future trouble is guarded against by running a large main down one side of the street for fire protection service, and paralleling it on the other with a 2-inch cast iron main laid in the parkway, to serve residences on that side of the block. Ask for details.



McWane-Pacific cast iron pipe—with or without Precalked Joints—is available for the West in sizes as large as 12 inches, in standard lengths, and by fast all-rail hauls from the only large commercial pipe foundry west of the Rockies. No better cast iron pipe is made anywhere; no other cast iron pipe so combines "the best of the old with the best of the new" in pipe-making.

WRITE FOR ILLUSTRATED LITERATURE

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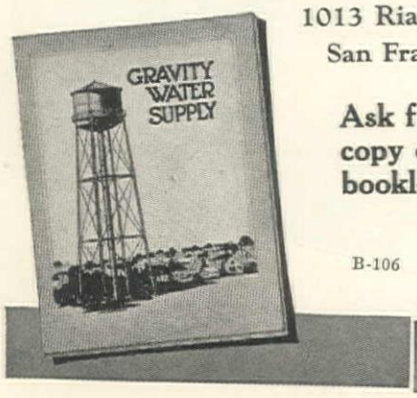
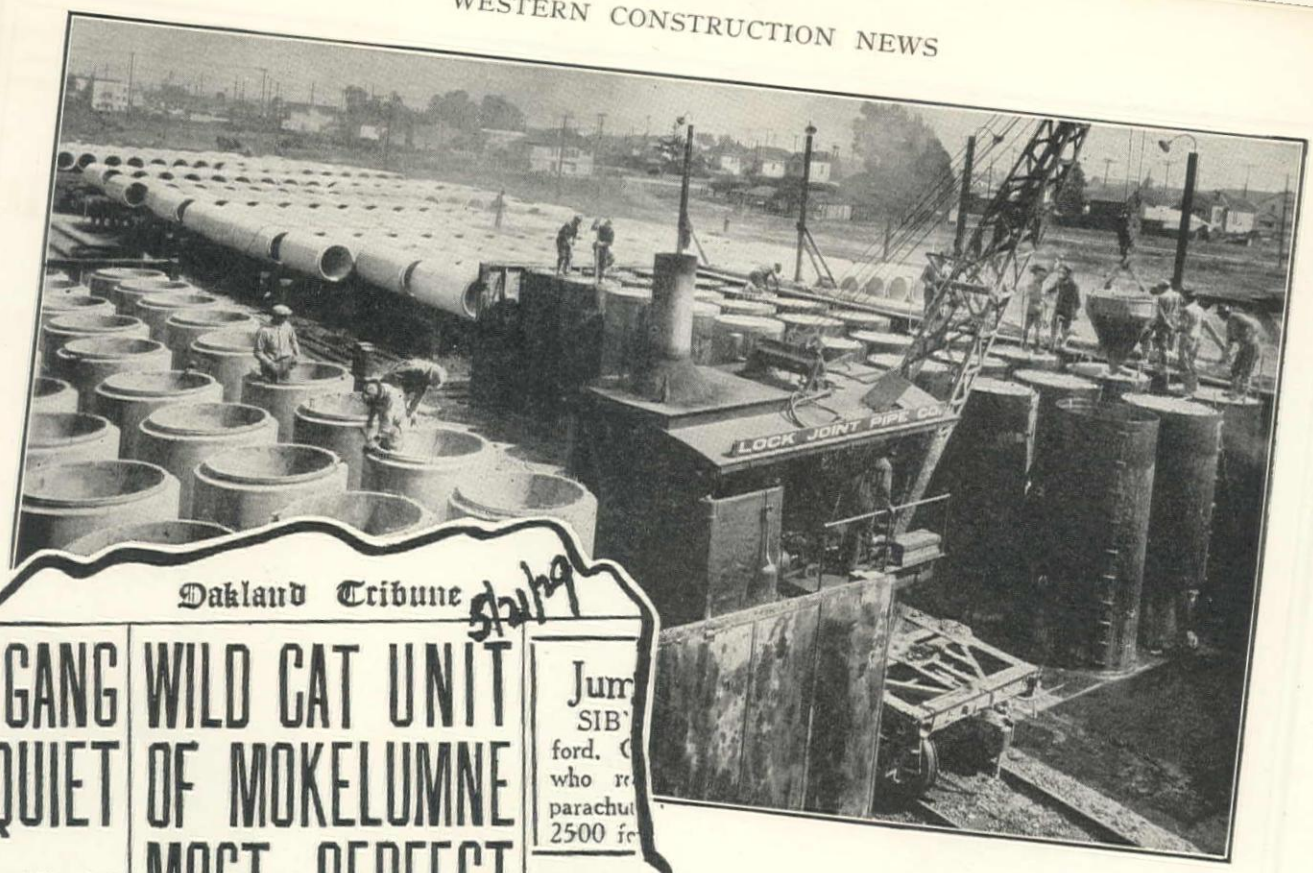


Ask for a copy of this booklet

B-106

HORTON TANKS



Oakland Tribune 5/21/29

GANG QUIET

—(AP)—Any foot to free nnsylvania g a year's concealed secrecy. e Corozzo aders and ne under- for Phila- e situa- they re- rrapevine was be- l of the

nal at- een ap- pone re- opening day. As- had ar- failed The at-

WILD CAT UNIT OF MOKELUMNE MOST PERFECT

Retiring Chief Engineer Reports No Project in Nation Is Better.

With no visible leaks apparent on its face and a six-and-a-half per cent of the leakage allowed by the contract showing on the aqueduct, the Wild Cat unit of the Mokelumne project of the East Bay Municipal Utilities district is one of the most perfect of its type in the United States, according to the latest report made by Arthur P. Davis, retiring chief engineer and general manager

Davis concludes his report that Oakland is now safe from any water shortage "within any perio foreseeable at present.

Jum SIB ford. who re parachut 2500 fe

SAN L GIVE TO

Carr Ma

---From the Oakland, Cal., Tribune of May 21, 1929

The Testimony of a Satisfied Lock Joint Customer

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE
LOCK JOINT PIPE CO. *Ampere — N.J.*

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This remarkable ship—the "Mauretania"—has not deteriorated with age but progresses serenely from one new conquest to another. Recently, for instance, after more than 20 years of service, she not only created a speed record by traveling 663 miles in one day, but crossed the Atlantic in the amazing time of 5 days, 3 hours and 17 minutes.

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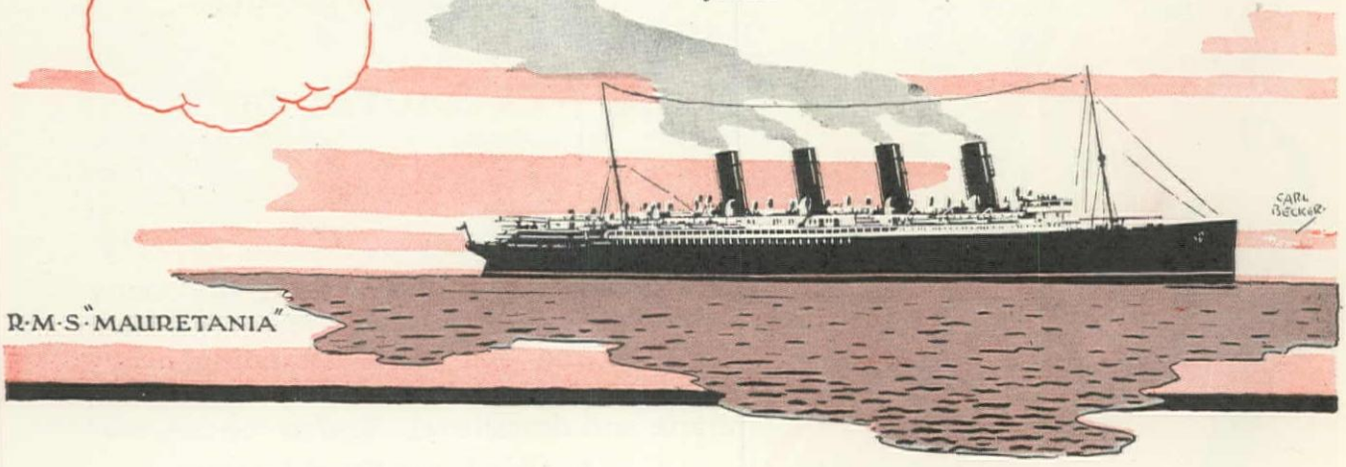

Bitumastic Enamel prolongs the life of every metal surface—on a ship, on a pipe line, under ground or under water. And it proves of *greatest* value where corrosion is most severe. In the bilges of a ship, for instance, no other form of coating can stand up for so long a period of time, and on pipe lines, buried in corrosive soil, ***Bitumastic Enamel*** has long outlasted any other type of coating ever used. "There is no substitute for experience." ***Bitumastic*** gives you PROOF dating back for more than forty years.

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Complete Catalog and Specifications covering the standardized, fully portable, Madsen Paving Plants.

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Six pages of valuable data upon the latest type of Madsen Portable Maintenance and Paving Plants.

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Complete specifications and Illustrations of 60-Inch Diameter Dryers for Various Requirements.

BULLETIN P-104
Condensed information on 1000, 2000, and 3000-pound Standard Portable Paving Plants.

BULLETIN P-103
Pug Mill Mixers for the mixing of paving and other materials, either wet or dry.

BULLETIN P-105
A convenient catalog of modern paving tools which represent twenty years of paving experience.

NONE too early to begin thinking about 1930 Paving Profits. They will be bigger with the best of modern equipment to cut down labor costs, speed up operations, introduce new short-cuts to better work and greater savings.

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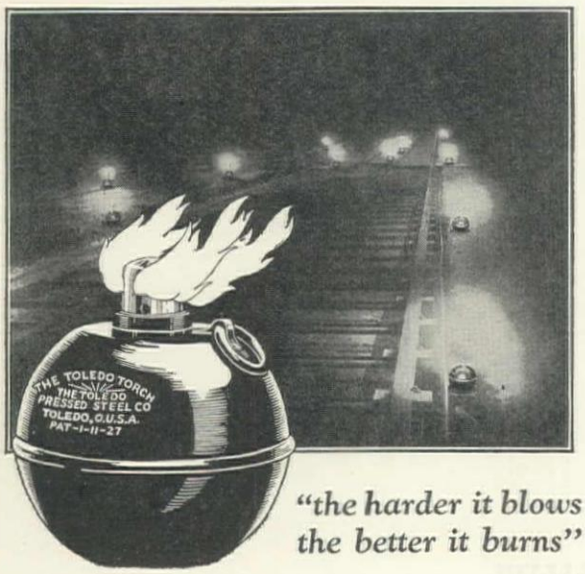

"the harder it blows the better it burns"

THE *Economy Burner*

completely solves the problems of excessive oil and wick consumption. No other safety light combines such rugged durability with such unfailing performance in all kinds of weather.

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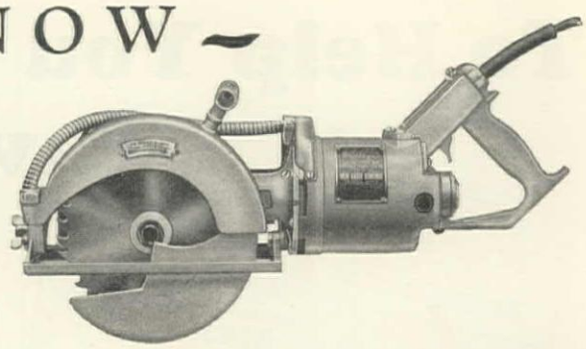

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SUPER PORTO SAW way

which does it cheap, fast and easy. The moment you get your hands on a SUPER PORTO SAW you will feel the difference.

When you see it work—when its features prove themselves on the job—when your SUPER PORTO SAW goes through work that would stop an ordinary electric hand saw—then you will realize why users wouldn't trade one SUPER PORTO SAW for three of the old-fashioned kind.

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Write for descriptive catalogue

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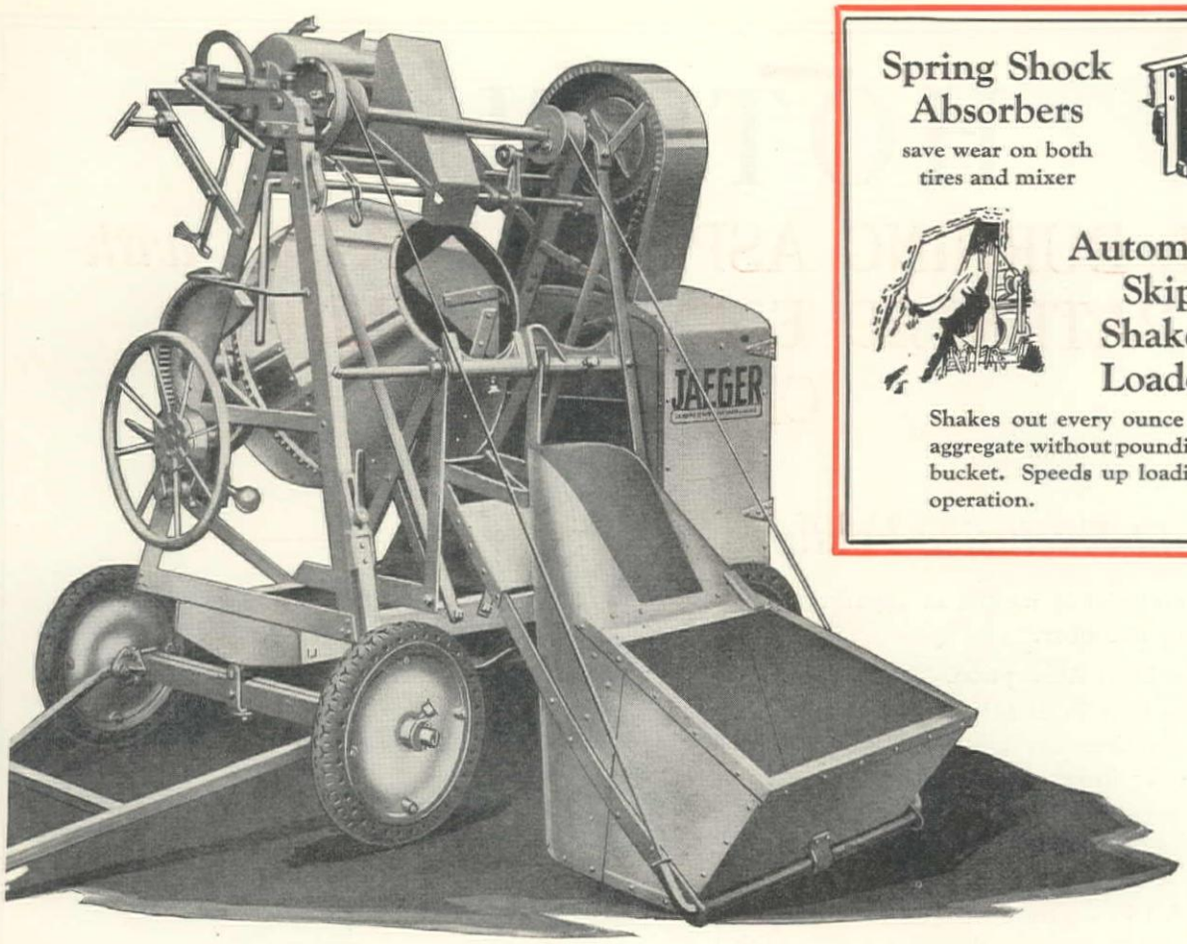
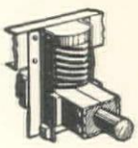
SEATTLE, WASH.

IT'S BACON IN SAN FRANCISCO



Spring Shock Absorbers

save wear on both tires and mixer

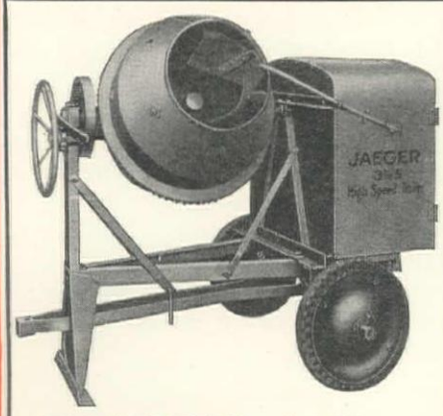


Automatic Skip Shaker Loader

Shakes out every ounce of aggregate without pounding bucket. Speeds up loading operation.

Timken Bearing, One Bag Jaeger Tilter - FASTEST 7S BUILT... USUAL ½ BAG PRICE!

(3½S - 5S - 10S Sizes Proportionately Low Priced)



TRAILERS - $169 up

Full ½ bag trailers, built of steel with "Flat Spot" Drum, roller bearings, husky power plants. Jaeger Heavy Duty Trailer, illustrated, rides on springs, Timken bearings, cushion tires—outlasts any other half-bag trailer built.

ENGINEERED and built for fast, low cost mixing by the world's largest makers of concrete mixers. With Skip Shaker loader, fast Accurate Measure Water Tank and *5 second discharge* it has no equal for speed. All-steel, with Timken Bearings and Spring Shock Absorbers, it's lighter, easier handled and 50% stronger. Endorsed by over 75,000 Jaeger users. Backed by quick service from over 100 Jaeger stations in U. S.

Mail slip below for prices, specifications, terms on Jaeger mixers—all sizes, types.

NON-TILTERS up to 28 ft. Sizes

PLASTER MIXERS

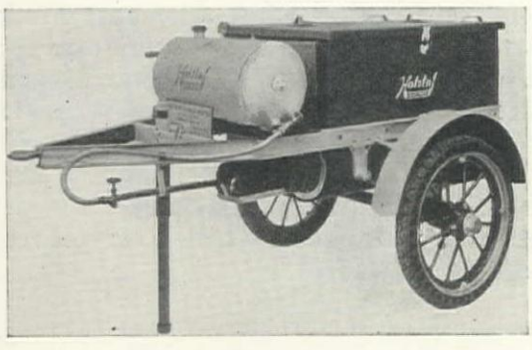
CARRIED IN STOCK BY
Edward R. Bacon Co., San Francisco
Smith Booth Usher Co., Los Angeles
The C. H. Jones Co., Salt Lake City
Clyde Equipment Co., Portland—Seattle
General Machinery Co., Spokane

HOTSTUF

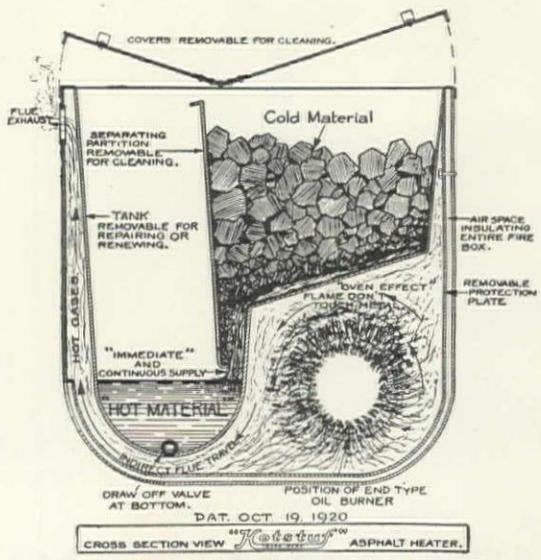
OIL BURNING ASPHALT HEATER *with* PATENTED ELEVATED MELTING CHAMBER

Eight Exclusive Features

1. Cold material is melted in separate **Elevated Melting Chamber.**
2. **Greater Heat Absorption.**
   Intense heat is circulated directly under the **Elevated Chamber** and then indirectly down and under lower storage chamber.
3. **Oven Effect.**
   This indirect heat circulation produces an oven effect—holding the intense heat long enough to penetrate and utilize 30 to 50 per cent more heat units than is possible with the usual design.
4. **Distinct Hot and Cold Chambers.**
   The **Elevated Melting Chamber** is separated from the lower storage chamber by a solid removable partition plate with an opening at the bottom. Therefore it distinctly separates the cold material from the **Hotstuff** and makes it possible to reload with cold material without cooling the **Hotstuff.**



MODEL "T"



PATENTED ELEVATED MELTING CHAMBER

5. **Cokeing Practically Eliminated.**
   This patented construction eliminates cokeing by the natural flow of the **Hotstuff** carrying the sediment to the storage chamber where it gradually carries off through the draw-off valve.
6. **Temperature Control.**
   This process of melting and the perfect temperature control eliminates all danger of overheating and of destroying the life of the material.
7. **Longer Life.**
   Due to the position of the Burner, the flame does not come in direct contact with the metal, thereby practically eliminating the danger of burning out the inner tank.
8. **Heat Insulation.**
   The entire bottom and walls of the fire-box are insulated by separate lining plates forming a one-inch air space.

WRITE FOR CATALOG

EDWARD R. BACON COMPANY

17th and Folsom Streets :: :: :: :: San Francisco

WHERE SPECIFICATIONS ARE MINUS 3/4"

Here is a completely portable rig using two crushers producing minus 3/4" specification stone. It is operated by the Hamilton-Gleason Company, of Denver. Two weeks after watching the successful performance of this particular outfit, they purchased another Cedar Rapids Tandem One-Piece Outfit for use on other jobs. Where capacity production of minus 3/4" specification stone is desired, this equipment is the thing.

Iowa Manufacturing Co.

Cedar Rapids, Iowa

Manufacturers of Crushing Equipment Exclusively

WESTERN DEALERS

Edw. R. Bacon Co., San Francisco, Northern California and Nevada

H. W. Moore Equipment Co., Denver, Colo., and Wyoming

Smith Booth Usher, Los Angeles, Southern California

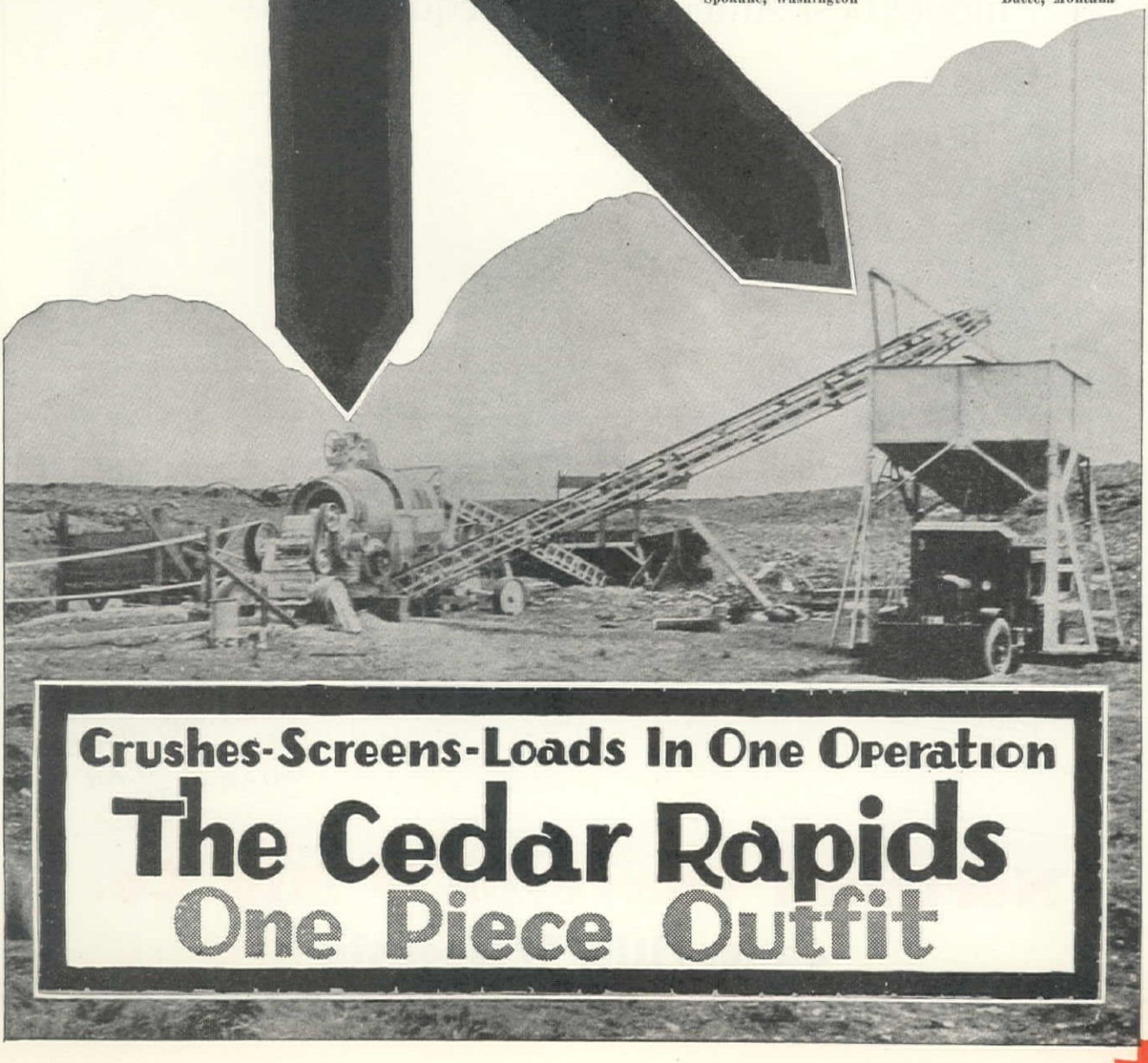
Lund & Co., Salt Lake City, Utah, Southern Idaho

Jerry Caldwell Co., Seattle, Washington

Steel Products Corporation, El Paso, Texas

General Machinery Company, Spokane, Washington

Hall-Perry Machinery Co., Butte, Montana



Crushes-Screens-Loads In One Operation

The Cedar Rapids One Piece Outfit

THE NORTHERN "BUILT BETTER" MATERIAL HANDLING EQUIPMENT

Material Handling Equipment

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

UNIVERSAL BELT

IN THE GRAVEL PIT

CONVEYOR and SHAKER SCREEN

WESTERN REPRESENTATIVES

EDW. R. BACON CO.
SAN FRANCISCO
SACRAMENTO OAKLAND

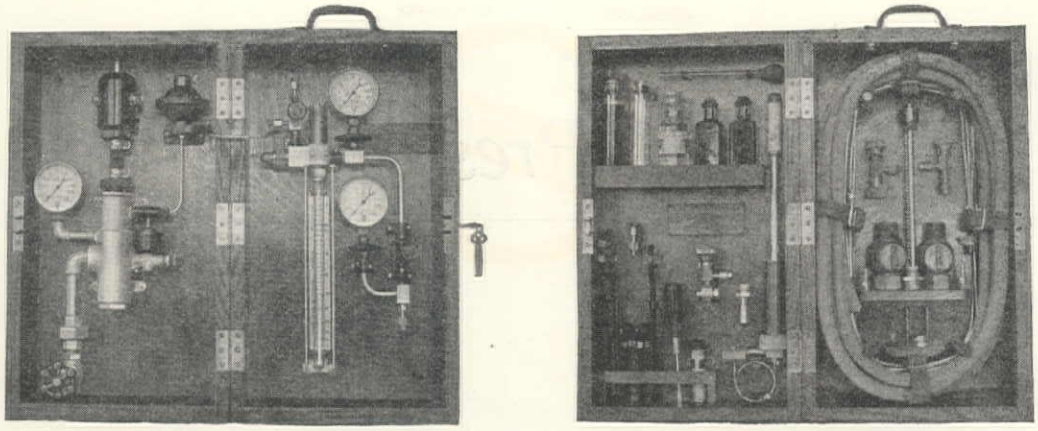
McCRACKEN-RIPLEY CO.
PORTLAND, ORE.

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

SOLD ON CONVENIENT TERMS AND BEARS OUR FIVE YEAR GUARANTEE

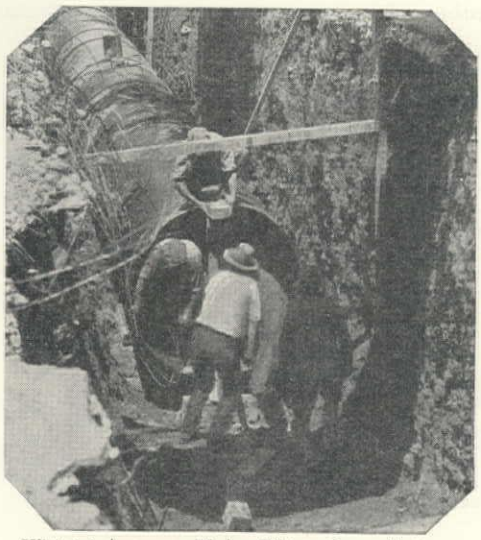
Northern Conveyor & Mfg. Co.

Janesville, Wisconsin



W&T PORTABLE CHLORINATING EQUIPMENT FOR MAIN STERILIZATION AND EMERGENCY USES

All New Mains are Polluted and should be Chlorinated . . .



With their boots on — Mud — Filth — Gross pollution — Into the main — One of the many reasons why water mains should be sterilized by chlorine

EVERY waterworks man knows how impossible it is to prevent pollution of new mains during construction, or old ones while repairs are being made. Trench filth, leakage from sewers, surface drainage—gross pollution . . . *a positive menace to the public health*. No amount of flushing will completely eliminate such pollution. The main must be STERILIZED to kill disease germs. Chlorine is the cheapest and best chemical to use.

With the W & T Portable Chlorinating Equipment, new mains can be easily and quickly sterilized and the necessary control tests made to assure complete disinfection. It is applicable for emergency uses of all kinds. Every waterworks should own one.

WRITE FOR OUR TECHNICAL BULLETIN NO. 98

"The Only Safe Main is a Sterilized Main"

WALLACE & TIERNAN

COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

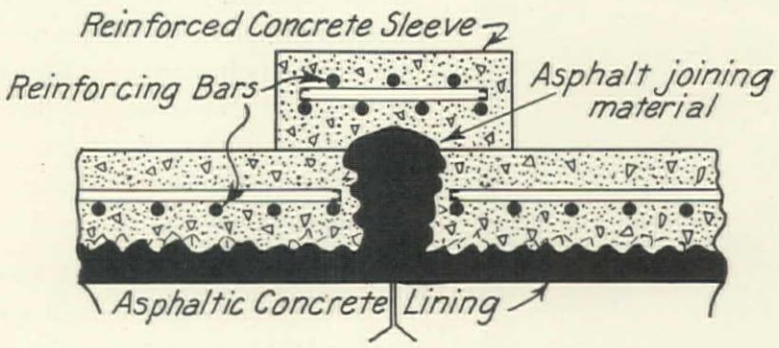
NEWARK - NEW JERSEY

NEW YORK CHICAGO KNOXVILLE SAN FRANCISCO MINNEAPOLIS PITTSBURGH DALLAS KANSAS CITY
LOS ANGELES SEATTLE ST. LOUIS BUFFALO INDIANAPOLIS DETROIT BOSTON JACKSONVILLE
CHATTANOOGA CHARLOTTE OKLAHOMA CITY PHILADELPHIA SPOKANE OGDEN

Sa-19 WALLACE & TIERNAN, LTD., TORONTO, CANADA WALLACE & TIERNAN, LTD., LONDON, ENGLAND

Concrete Pipe for High-Pressure Water Lines

Demonstration Line Tested to 400 lb. Hydraulic Pressure without Leakage. This Pipe was Spun by the Moir-Buchanan Centrifugal Process, and Asphalt Lined by the Billé-Ligonnet Method.



Expansion and Contraction Joint Used in Above Pipe.

Also Manufacturers of:

Concrete pipe--plain and reinforced--for every purpose--sewerage, irrigation, drainage, and high-pressure water service --in all sizes from 4 to 108 in. diameter.

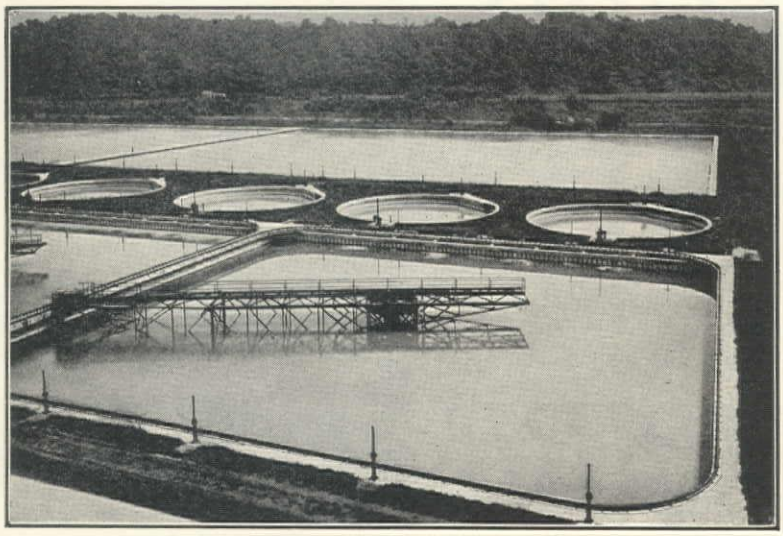
United Concrete Pipe Co., Inc.

General Office: 1347 West 208th Street, Los Angeles
Mail Address: Station H, Box 1, Los Angeles
Northern Headquarters Office: Modesto

Plants at:

Los Angeles (Torrance), Compton, Ventura, Merced, Delhi, Modesto, Tracy, Sacramento, and Woodland, California

In the New Water Treatment Plant at St. Louis



THIS is one of the four large Dorr Traction Clarifiers which are installed at the new Missouri River Treatment Plant at Howard Bend, near St. Louis, Missouri.

These Clarifiers are used for both presedimentation and secondary sedimentation after coagulation, and are so arranged that more or less units can be thrown into either service, depending on the character of the water being treated.

The continuous removal in the presedimentation Clarifiers of the bulk of the mud and silt from the raw water means great savings in chemicals; continuous removal of practically all of the precipitated sludge in the secondary Clarifiers eliminates frequent cleaning out of the final settling basins, thus further cutting down the cost of plant operation.

Two recently published bulletins "Modern Sanitary Engineering Practice" and "Modern Sewage and Water Treatment Plants", tell the story of the work that Dorr Equipment is doing in the field of Sanitary Engineering. Drop a postcard to our nearest office and copies will be sent you promptly.

DORRCO

THE DORR COMPANY

ENGINEERS

247 PARK AVENUE NEW YORK CITY

INVESTIGATION TESTS DESIGN EQUIPMENT

DENVER, COLO.
1009 17th Street

CHICAGO, ILL.
333 North Michigan Avenue

LOS ANGELES, CAL.
108 West 6th Street

WILKES BARRE, PA.
Miners Bank Building

JOPLIN, MO.
319 Joplin National Bank Building

ATLANTA, GA.
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MELBOURNE, AUSTRALIA
Crossle & Duff Pty., Ltd., 360 Collins Street

TOKYO, JAPAN
Andrews & George Co., Inc., Central P. O. Box F-23

TORONTO, ONT.
330 Bay St.

LONDON
The Dorr Company, Ltd.
Abford House, Wilton Rd., S. W. 1

BERLIN
Dorr Gesellschaft m. b. H.
Kielganstr, 7 W. 62

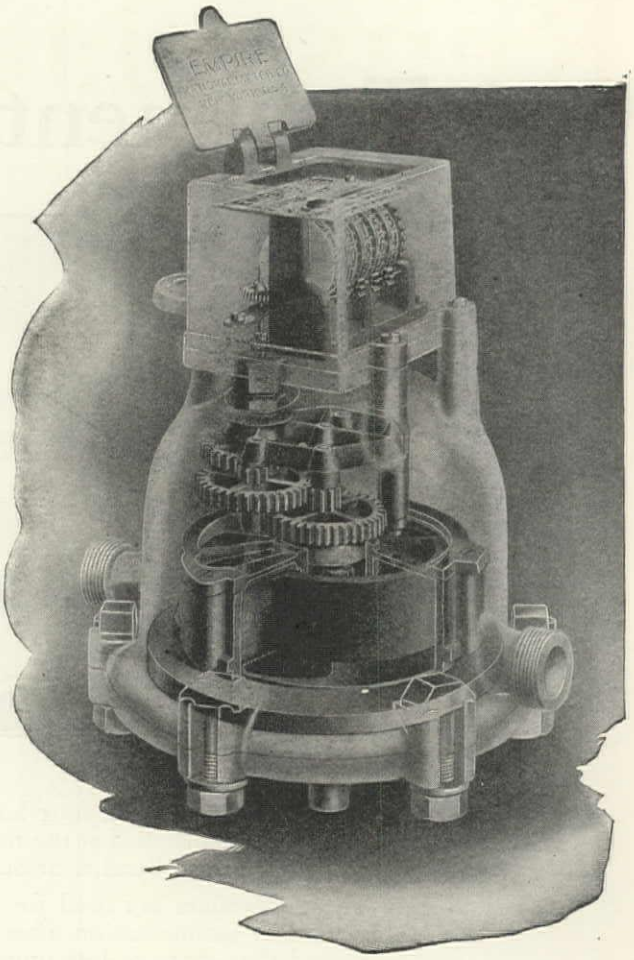
PARIS
Societe Dorr et Cie
26 Rue de la Pepiniere

JOHANNESBURG, S. A.
E. L. Bateman
Locarno House.

WATER METERS

Be Sure to Stop in at Booth 37 and See

THE EMPIRE



THERE is no better place than the Convention for renewing old acquaintances, for checking up on new developments, and for making plans for the days to come.

Meters have been our business for nearly sixty years, and we shall be glad to talk them over with you whenever you feel like it.

Besides the EMPIRE, we make Disc, Velocity, Compound, Rotary Piston and even Venturi type meters. Our watchword is:

Always at your service.

THE EMPIRE *is an Oscillating Piston meter, entirely different from every other type both in design and operation. It was originated by us in 1884, and has never been surpassed for accuracy, long life, and low cost of upkeep. It is made in all sizes, from 5/8 to 6 inches, inclusive.*

NATIONAL METER COMPANY

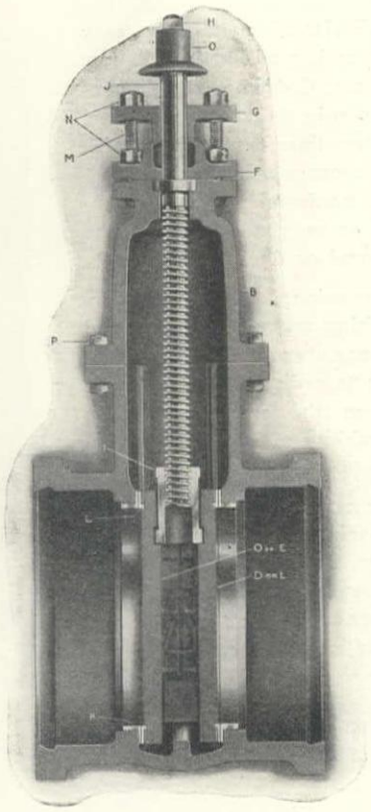
299 Broadway, New York

Pacific Coast Branches:

1048 Folsom Street, San Francisco 645 Santa Fe Ave., Los Angeles

CHICAGO BOSTON ATLANTA
CINCINNATI SAN ANTONIO
TORONTO

Rensselaer Valves



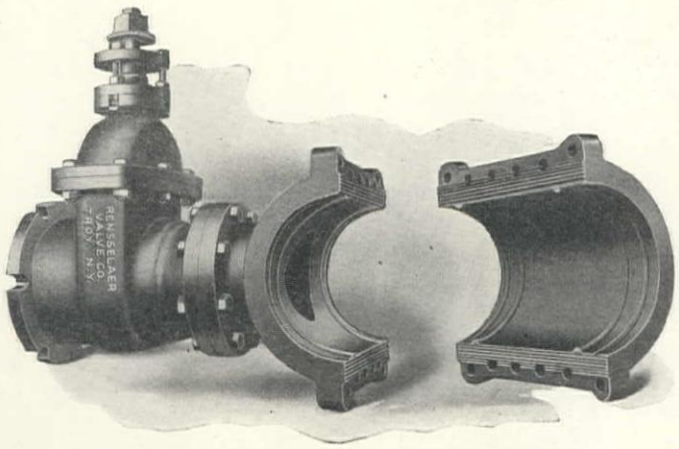
Section of Double Gate Valve

Some Points of Superiority of "Rensselaer" Valves

1. Ease of operation.
2. Greater Dependability.
3. Greater Interchangeability.
4. Lowest cost in service.
5. Wedges to take care of operating conditions.
6. Stems and Stem Nuts solid bronze with exceptional strength.
7. Gate Rings Bronze Riveted through entire gate.
8. Proper distribution of metal to develop full strength all parts.
9. Parallel Discs with freedom from scored rings.

Prompt Service from Our San Francisco and Los Angeles Stocks

"RENSSELAER" TAPPING SLEEVES and TAPPING VALVES



RENSSELAER *"One-way" Tapping Sleeve with One Tapping Valve Attached*

Some Points of Superiority of "Rensselaer" Tapping Sleeves

1. Extra heavy construction.
2. Hubs on the ends are of greater thickness.
3. Raised lead ring (see cut) is a part of the casting.
4. Require less lead for calking.
5. Easier to center sleeve on pipe before pouring.
6. Sleeve may be revolved on pipe.
7. No iron washers required for bolts.
8. Bolting flanges are made the full length of the sleeve.
9. Each size carefully designed for the required working pressure.
10. We are prepared to furnish promptly any size that you may want.

Rensselaer Tapping Valves are so well known that it hardly seems necessary to say more here. We shall be glad to send illustrated Book No. 11, and prices, to anyone upon request.

RENSSELAER VALVE COMPANY

821 SHARON BUILDING
SAN FRANCISCO

743 SUBWAY TERMINAL BUILDING
LOS ANGELES

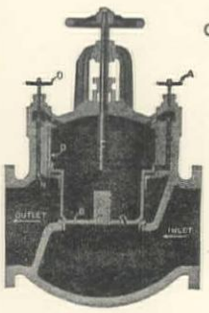
509 ARCTIC BUILDING
SEATTLE, WASH.

Golden-Anderson

Automatic Cushioned Water Service Valves

GOLDEN-ANDERSON

Pat. Automatic Cushioned Check and Hand Stop Valve



1. Adapted for water service and boiler feed lines.
2. Always cushioned in opening and closing.
3. Quickly regulated for fast or slow closure.
4. No water hammer or shock any time.
5. Sizes 3" to 24" inclusive.

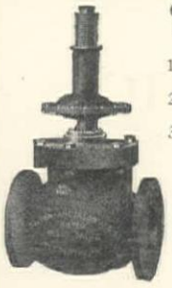
GOLDEN-ANDERSON

Pat. Automatic Cushioned Controlling Float Valve

1. Automatically maintains uniform level in heaters, tanks, etc.
2. Air and water cushioned.
3. No metal-to-metal seats.
4. No waste of water.
5. No water hammer or shock.
6. Angle or Globe patterns to 24 in.

GOLDEN-ANDERSON

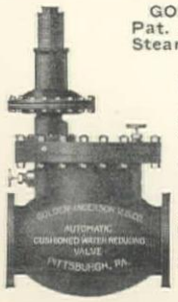
Pat. Cushioned Water Relief Valves



1. Automatically relieve excess pressure.
2. Prevent stress, strain and bursting of mains.
3. Correct mechanical construction.
4. Perfect air and water, cushioning.
5. No metal-to-metal seats. No hammering or shocks.
6. Angle and Globe pattern. Sizes 3 to 24 in.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Steam Pressure Reducing Valves



1. Maintain a constant reduced pressure.
2. Thoroughly cushioned.
3. No hammering, chattering or sticking.
4. No auxiliary valves or small by-passes to clog up.
5. No wire drawing.
6. Only one adjustment from the outside.
7. Double extra heavy throughout — practically indestructible.

Every Valve with an Absolute Guarantee

"Also Made with Stop Starter" Attachment

No Metal-to-Metal Seats, No Water Hammer

GOLDEN-ANDERSON Automatic "Cushioned" Controlling Altitude Valves

These valves are always cushioned in closing and opening. They are extensively used for automatically maintaining a uniform stage of water in reservoirs, tanks and standpipes.

No floats or fixtures, inside or outside of tanks. No freezing troubles.

The valves can be closed in three ways:

1st—Automatically by Water.
2nd—By Electricity, if desired.
3rd—By Hand.

May also be arranged to automatically close when a break occurs in the mains.

When necessary they may be connected as to "work both ways" on a single line of pipe.

Made with stop starter attachment for centrifugal pumps.

"Every valve made with an absolute guarantee." Write for details.

GOLDEN-ANDERSON

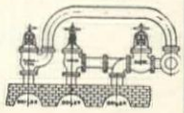
Patent Automatic Double Cushioned Triple Acting Non-Return Valves

"4500"

1. Prevent shut-downs due to reversal of steam flow.
2. Instantly close and isolate a boiler when a tube bursts.
3. Cut off steam flow from every boiler instantly when a steam pipe ruptures.
4. Automatically cut a boiler into line.
5. Prevent backflow into cold boiler.
6. The only valve that can be tested in service.

Ordered by the Iron and Steel Industry

Angle, Globe or Elbow



GOLDEN-ANDERSON

Pat. Automatic Double Cushioned Check Valves

1. Especially adapted for Water Service.
2. For High or Low Pressure.
3. Thoroughly Cushioned. No chattering hammering, or sticking.
4. Globe or Angle Patterns up to 24-in.
5. Especially adapted for hydraulic elevator service.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Water Pressure Regulating Valves

1. Maintain a constant reduced pressure regardless of fluctuations on high pressure side.
2. Perfectly Cushioned by water and air. No metal-to-metal seats.
3. The best valve made for maintaining a constant low pressure where consumption is continuous.
4. Operates quickly or slowly as required.—No attention necessary.
5. Positively no hammering or sticking. Sizes to 24 in.

GOLDEN-ANDERSON

Pat. Automatic Cushioned Water Float Valves

1. Automatically Maintain Uniform Water Levels in Tanks, Standpipes, etc.

Sizes ½" to 24".

2. Instantly Adjusted to Operate Quickly or Slowly.
3. Floats Swivel to any Angle—Most Satisfactory Float Valves known.
4. No metal-to-metal Seats—No Water Hammer or Shock.
5. Cushioned by Water and Air.

GOLDEN-ANDERSON

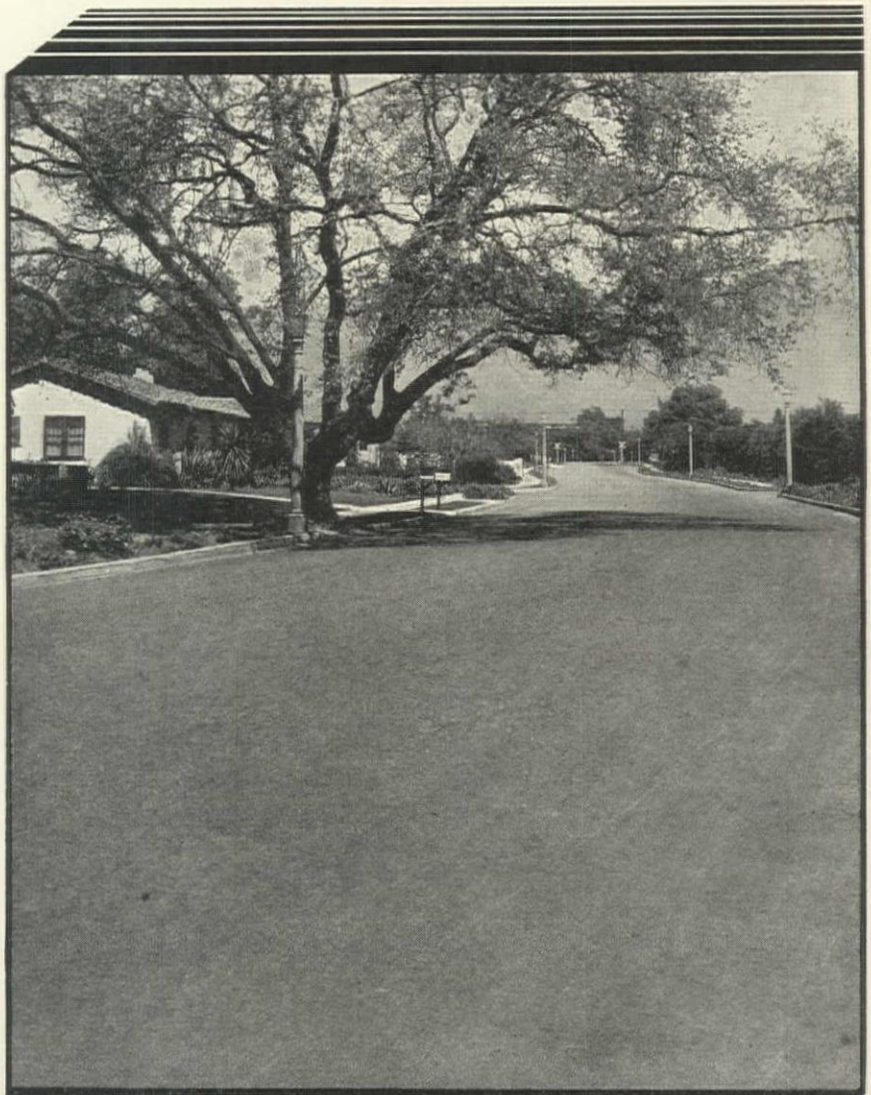
Pat. Cushioned Electric Water Service Valves

1. Give instant control of water distribution from pumping station in case of fire.
2. Open or close by electricity from distant points—a.c. or d.c. circuits. Also close by hand.
3. No waste of electricity. Current is on only a few seconds.
4. Cushioned in opening and closing.
5. No water hammer, shock, sticking, surging or chattering.

No Water Hammer or Shock Heaviest Valves Made

Golden-Anderson Valve Specialty Co., 1337 Fulton Bldg., Pittsburgh, Pa.

Only a great pavement can measure up to these standards



Mulock Tract, San Gabriel, California. Paved with asphaltic concrete in 1927

The pavements chosen by developers of high-class residential subdivisions, where lots run from $5,000 and up, must measure up to the standards set for the properties themselves.

These men demand "value". In a pavement, that means not only durability, but appearance as well.

The widespread preference shown for asphaltic concrete by realtors throughout the Pacific West States, is proof, therefore, that here is a truly great pavement.

Asphaltic concrete pavements not only enhance the beauty of any residential district, with their pleasing, dark surface . . . but they last!

Scores of asphaltic concrete pavements in the Pacific West States have given from 15 to 20 years of service, with little or no upkeep costs whatever.

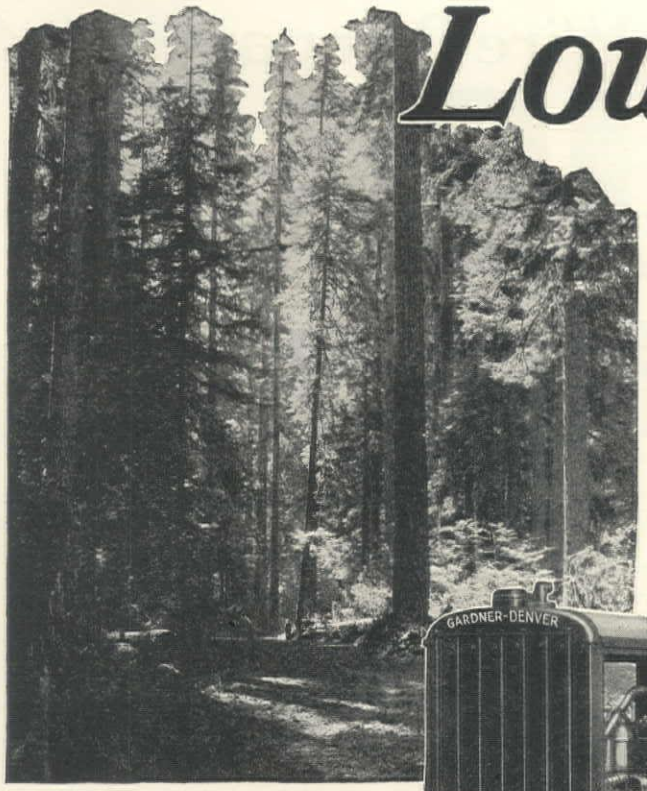
And they cost no more to lay than other hard-surface pavements,— usually a little less. Why not, therefore, investigate asphaltic concrete—before you pave?

STANDARD OIL COMPANY OF CALIFORNIA

CALOL ASPHALT for best results

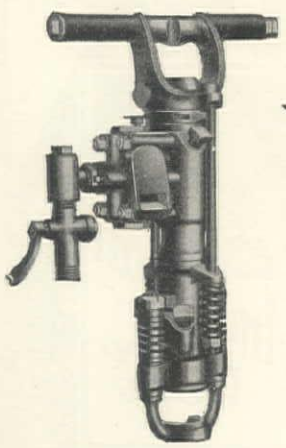
Asphaltic CONCRETE NON-SKID *pavements*

Maximum Service at Lowest Cost



When you find it necessary to use compressed air and air tools, it is with a feeling of assurance that you turn to the Gardner-Denver Company for your needs. Because of the high standard of performance that is "built" in all Gardner-Denver products, a maximum service at the lowest possible cost can always be depended upon.

We will gladly furnish Bulletins on request.



GARDNER-DENVER COMPANY
ROCK DRILL DIVISION
DENVER, COLORADO
Sales Offices Throughout the World

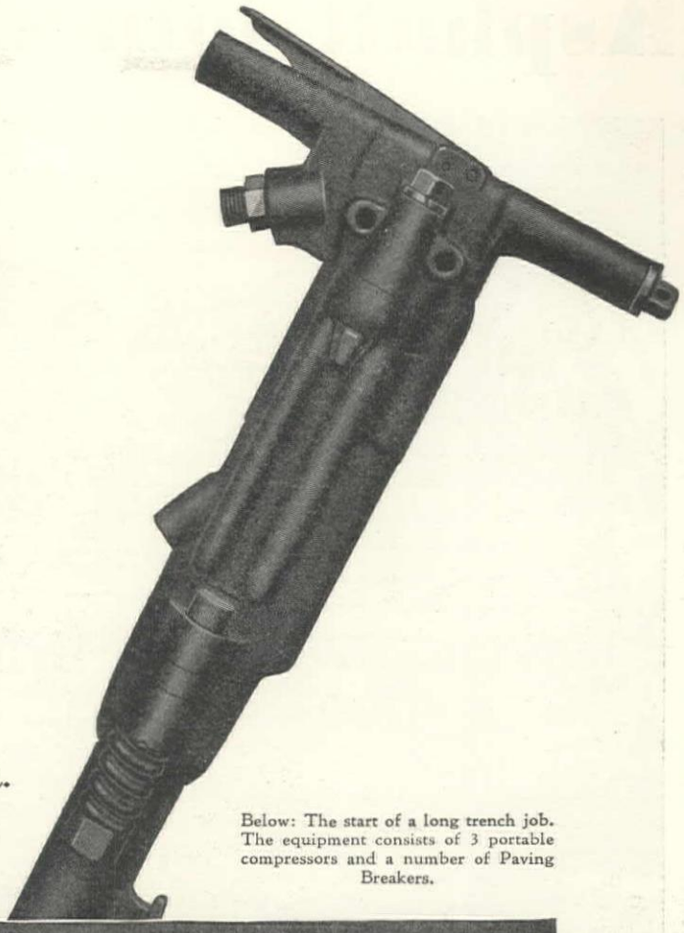
GARDNER-DENVER

A Real Labor-Saver

The unit pictured at the right is an Ingersoll-Rand CC-45 Paving Breaker. It is probably the world's best-known tool for ripping up asphalt, concrete, and other forms of street surfacing.

Groups of these Paving Breakers can be seen any day around the streets of your city. They are used extensively by road contractors, engineers, and public utilities of all classes. Men who have made a detailed study of costs find that one Paving Breaker will replace from 8 to 15 hand laborers, the actual number depending upon the class of work undertaken.

For best results, operate your tools from Ingersoll-Rand portable air compressors. These units are available in 6 sizes, the largest of which will furnish air for eight CC-45 Paving Breakers.



Below: The start of a long trench job. The equipment consists of 3 portable compressors and a number of Paving Breakers.

INGERSOLL-RAND COMPANY OF CAL.

Branches or distributors in principal cities the world over

350 Brannan Street, San Francisco, Calif.

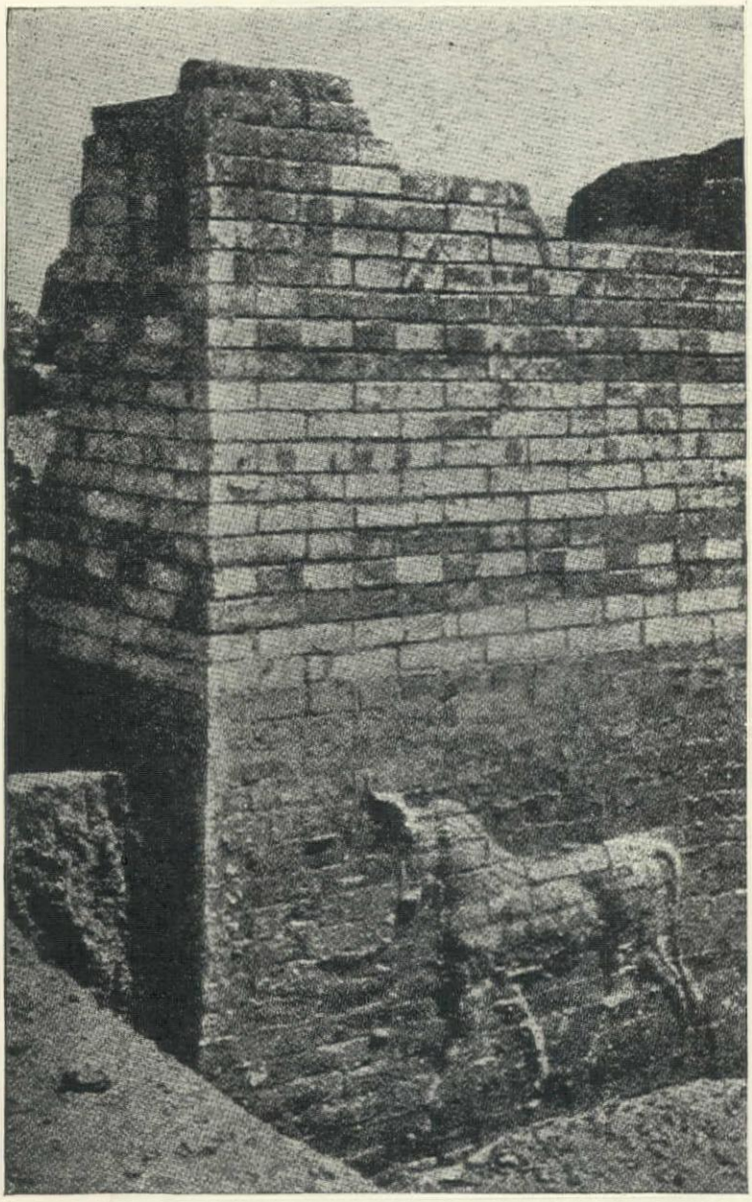
1460 E. Fourth Street, Los Angeles, Calif.

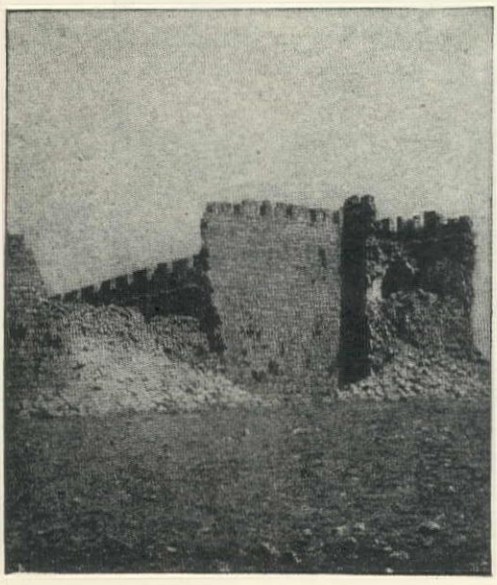
First Avenue, South, Seattle, Wash.

217-PC

Asphalt joined the walls of Ancient Babylon

....Now it paves the highways of the West





Above: Figure of a bull, embossed on colored, glazed tiles. These walls of Babylon have been preserved for nearly 4000 years, firmly sealed with moisture-proof asphalt.

Left: Section of asphalt sealed castle wall built about 1500 B. C. Was entirely intact until the part shown fell down 25 years ago.

ABOUT 2500 B.C. in the valley of the Euphrates, there arose a mighty city . . . called Babylon.

Its walls were built of many stones firmly joined together with asphalt to seal them from the deteriorating action of moisture, wind and rain.

This asphaltic protection was unusually effective. Many of the Babylon's walls still stand in perfect condition after a lapse of nearly 4000 years.

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The Record

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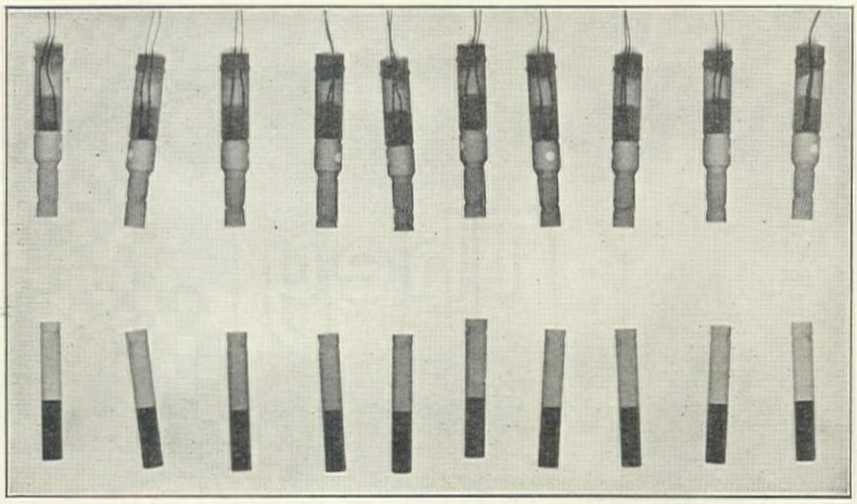
MARION, OHIO, U. S. A.



This illustrates the use of X-ray photography in testing for uniformity in Hercules delay electric blasting caps. The X-ray reveals, from top to bottom of each delay electric blasting cap, the lead wires, firing head, delay fuse (in which only the powder train shows), and the blasting cap.

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In making these tests, many branches of science are utilized. The X-ray looks through the copper shells to search out any flaw which previous to this scientific operation, could only be found by destroying the detonators. Microphotography is called upon to tell a significant story to the explosives chemist. All standard tests of recognized value as well as special tests devised in the Hercules laboratories are used to insure the reliability of Hercules detonators.

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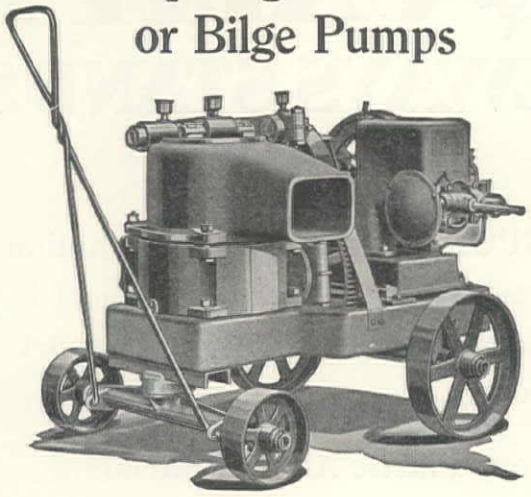

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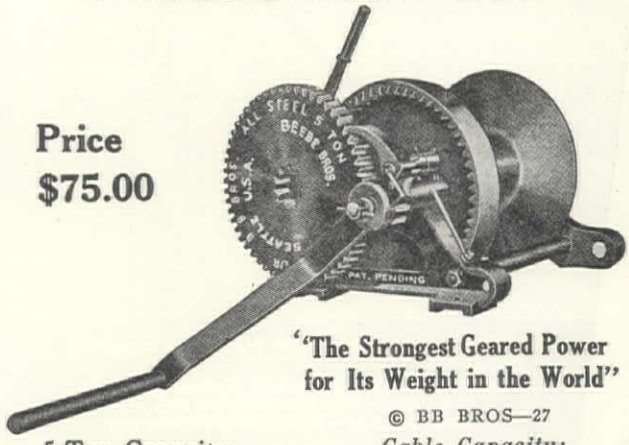

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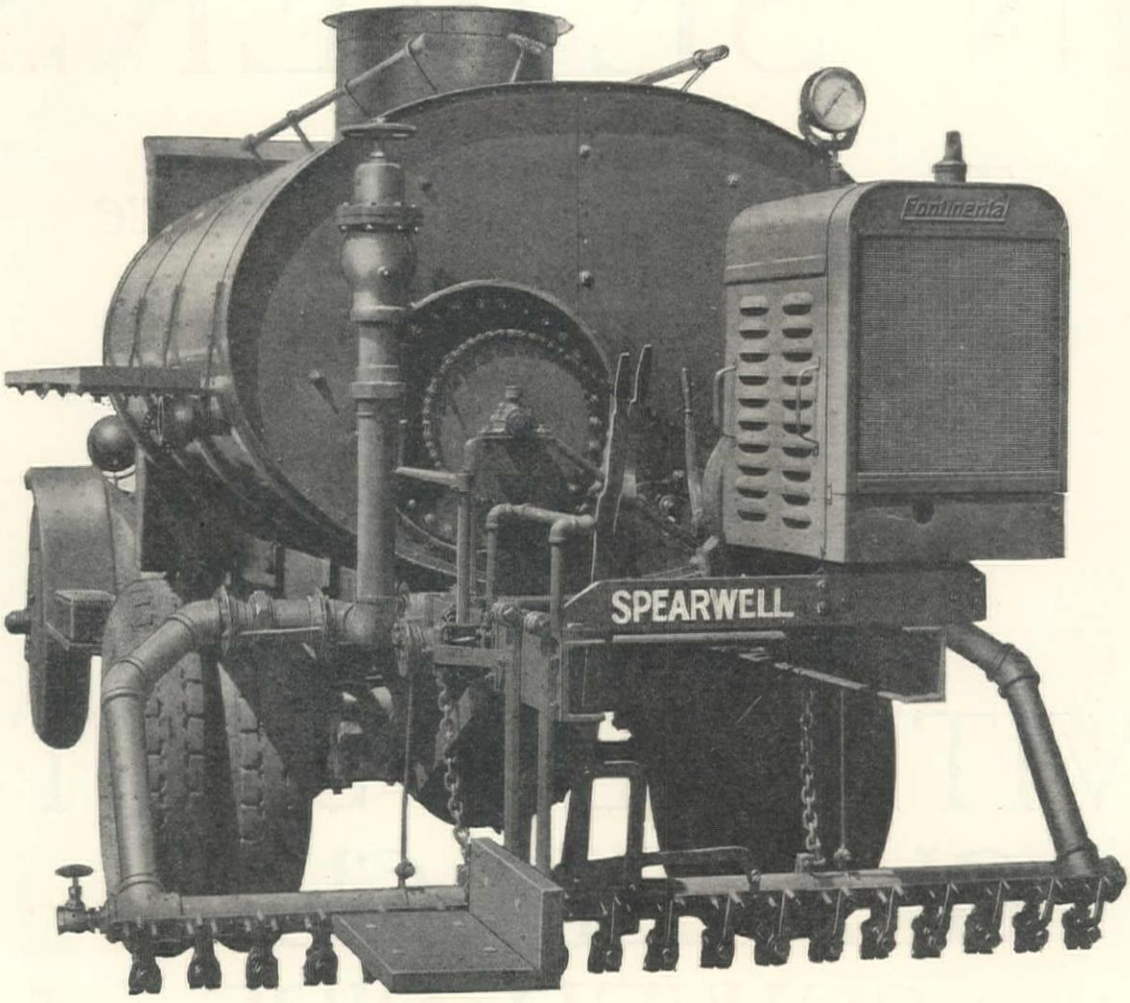

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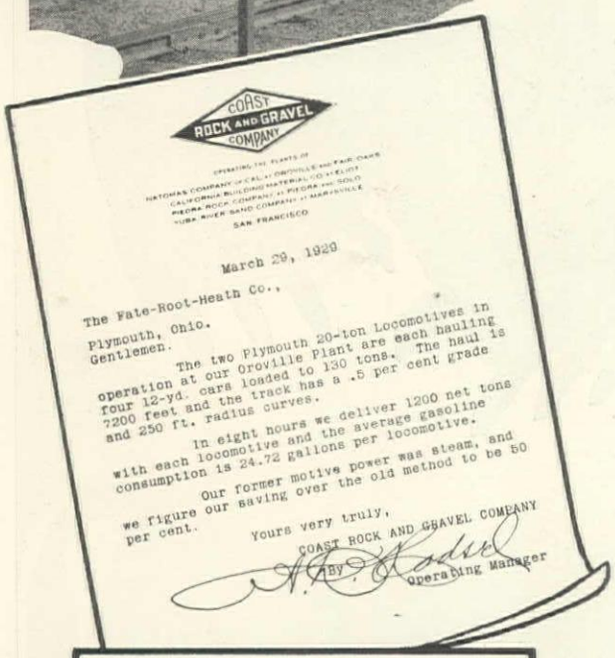
The two 20-ton Plymouth Gasoline Locomotives shipped to their Oroville, California, plant in June and August, 1927, have a real eight hour day's work to do—each hauling 1200 net tons, 7200 feet, in four 12 yard cars.

They have made a careful check on the gasoline consumption and their report to our San Francisco representative, Garfield & Company, on March 29, 1929, states it averages only 24.72 gallons for each locomotive per day.

When you pay the price of Plymouths for Locomotives you deserve Plymouth quality.



COAST ROCK AND GRAVEL COMPANY
SAN FRANCISCO

March 29, 1929

The Fate-Root-Heath Co.,
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Gentlemen.

The two Plymouth 20-ton Locomotives in operation at our Oroville Plant are each hauling four 12-yd. cars loaded to 130 tons. The haul is 7200 feet and the track has a .5 per cent grade and 250 ft. radius curves.

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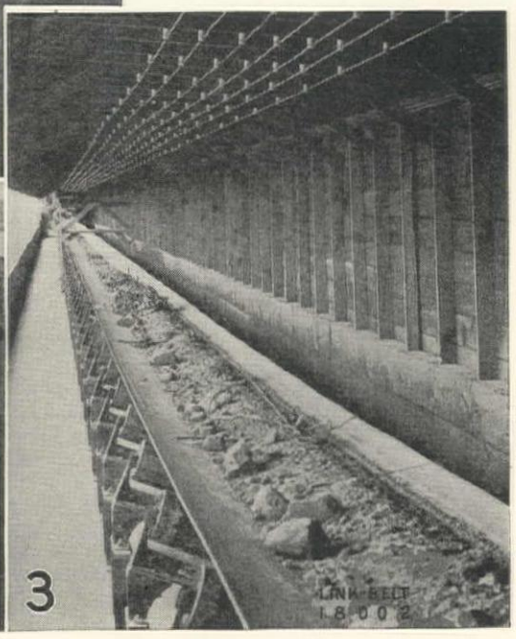
Gasoline and Diesel Locomotives

Conveying Denny-Hill to the Sea on Link-Belt Anti-Friction Belt Conveyors

The journey begins with the material being loaded by shovel onto the field conveyors, shown in illustration No. 1. These deliver to the receiving end of elevated belt conveyor shown in illustration No. 2, which conveys the material 2,850 ft. to scows in Elliott Bay, at the rate of 600 cu. yds. an hour. Illustration No. 3 shows the carrying run of Timken equipped Link-Belt Anti-Friction Belt Conveyor seen in illustration No. 2.



AFTER making a careful study of modern handling methods, W. B. Barkhuff, Seattle's Chief Engineer, in conference with Link-Belt Engineers, selected belt conveyors to move the 5,000,000 cu. yds. of earth from Denny-Hill Regrade Project No. 2.

The contract was awarded to Geo. Nelson & Co., who are using Link-Belt Anti-Friction Belt Conveyors. The conveyor sections are 1,360 ft., 920 ft., and 600 ft., and the field conveyors 200 ft.

This belt conveyor system handles the material at a reasonable cost, eliminates wear and tear on city streets by trucks, and interference with traffic. The conveyors are practically noiseless. Night and day they convey the material, never stopping, never speeding, never slowing.

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VOLUME IV | OCTOBER 25, 1929 | NUMBER 20

California Section, American Water Works Association

Capping the climax to nine years of rapid growth and marked achievements, the California Section of the American Water Works Association acquired a nation-wide recognition in June, 1928, as hosts during the national convention in San Francisco. The tenth annual convention of the California Section promises to excel the 1927 record convention at San Jose. No more attractive or fitting place for this convention could have been selected than Del Monte.

Some A. W. W. A.'s in the Limelight

W. W. HURLBUT
Office Engineer, Los Angeles Department of Water and Power, and Secretary-Treasurer of California Section.

JOHN BURT
Manager, Marin Municipal Water District, and President of California Section.

CHAS. S. OLMSTED
Superintendent, Monterey County Water Works, and Vice-President of California Section.

J. R. BARKER
Pacific Coast Manager, Neptune Meter Co., and Chairman of Exhibits Committee, California Section.

GEO. W. PRACY
Superintendent, City Distribution, Spring Valley Water Co., San Francisco, and Chairman, Reception Committee, California Section.

ALEXANDER BELL
Pacific Coast Manager, Wallace & Tiernan Co., Inc., and Chairman, Entertainment Committee, California Section.

The Rising Cost of Pure Water

We believe that every department of municipal government should stand on its own financial legs, just as every department of a big industry must show a profit and not be supported by the rest of the industry. This is especially true of municipal water works. Some earn an apparent profit on a low rate to the consumer; and frequently this 'profit' is diverted to other departments. This is of course wrong, for, when extensions and improvements must be made, it becomes necessary to resort to a bond issue.

The result is that the public does not understand why water costs forty cents a thousand gallons in some cities—Oakland and San Francisco for instance—and only ten cents in some other communities.

As a matter of fact, bringing water to a city from a mountain supply two hundred miles away costs money; and, when the cost of filtration, distribution, chlorination, and sometimes softening, is added, cheap water is out of the question.

The East Bay Municipal Utility District and the San Francisco water department are each faced with heavy bonded indebtedness, and the task of delivering pure, clear, sparkling, soft water—the public is each year getting more fastidious—and, it remains to be seen how much and how soon this high rate to the consumer can be reduced.

Pre-Estimating Snow-Fall Run-Off

Thirty years ago in the far west and California especially, the farmer and many of the municipalities depended on the old hydraulic miner for his estimate as to the probable spring and summer run-off from the snow pack in the mountains. This estimate or guess was based merely on years of observation and was in terms of good, fair, or poor.

When hydroelectric utility companies and irrigation districts began to build storage reservoirs, they soon realized the necessity for accurately determining the run-off from snowfall. Several of the states are now cooperating in these snow surveys, the methods used and results obtained being interestingly outlined by Harlowe M. Stafford in his article on 'Cooperative Snow Surveys in California', published elsewhere in this issue.

C.S.W.A.

The second annual meeting of the California Sewage Works Association, held in conjunction with the thirty-first annual convention of the League of California Municipalities at Oakland, October 7 to 11, firmly established this organization as the leading factor in the campaign to secure state-wide recognition of sewage purification and disposal as one of the most important functions of municipal government. The C.S.W.A. meeting started with a 200-mile inspection trip of sewage treatment works of varied types in five communities; eighty making the trip in forty automobiles. The following two days were devoted to discussions of papers presented on various phases of sewage treatment disposal, together with two luncheon-inspection trips to a concrete pipe and a vitrified clay pipe plant. The registration at the convention was one hundred. The November 10th issue will contain a review of this second annual meeting.

These C.S.W.A. meetings have demonstrated their value as a school of education for the sewage works operator, and it is to be hoped that within another two years every municipality will send its personnel to these meetings. The directors of the C.S.W.A. have several innovations in mind which should make these gatherings more worthwhile.

At the meeting a member suggested that some less 'odious' term be devised as a substitute for 'sewage purification' or 'sewage disposal'. It would seem to us preferable to educate the public to a better appreciation of, and respect for, this necessary function of municipal improvement.

Typhoid Prevention

One equipment manufacturer has adopted the slogan that 'the only safe water is a sterilized water'. This seems well brought out by the recent typhoid epidemic at Ogden, Utah, where the failure to chlorinate a mixed water supply is the evident cause of several fatalities. On page 549 of this issue an acocunt of that epidemic is given. The repeated refusal of local governmental authorities to act promptly and effectively in curbing a menace, first realized in the summer of 1928, is shown in the review of the Ogden situation.

Water Purification Research

In the 1928 Water Works issue of June 10, Carl Wilson discussed the 'Control of Algal Growth in Water Storage Reservoirs', and we urged, editorially, that the states and other agencies should appropriate sufficient funds for extended research into this little known branch of water purification. In this issue Carl Wilson describes a case of Crenothrix growth contradictory to accepted theories regarding this species of the algal family.

Although most industries today recognize research as an important adjunct to their business, it is difficult to convince the municipal, state, and federal authorities that research is an economic function of government.

Swimming Pools

For several centuries during the height of the Roman and Greek empires bathing pools were legion, though it is doubtful that the masses had the opportunity to use them, and swimming or races were certainly not a feature. Then, for centuries, bathing apparently was 'taboo.'

Although bathing and swimming have been much indulged in during the past century, it is only within the past ten years that we have witnessed a wave of enthusiasm for swimming. Municipal and private swimming pools in California and the far west have become so numerous that it is impossible to secure a complete list of recent installations. The three new swimming pools at Stanford University, and their equipment, are described elsewhere in this issue.

Cooperative Snow Surveys in California

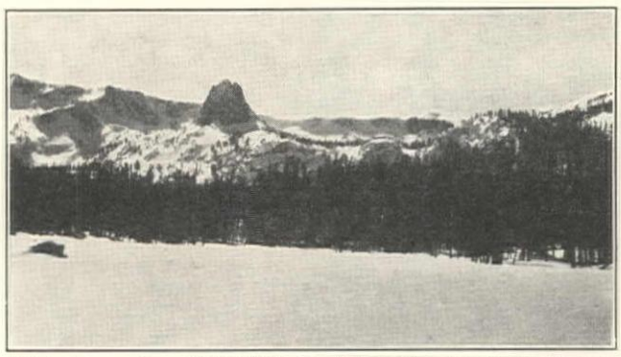
By Harlowe M. Stafford*
Hydraulic Engineer, Division of Water Resources, State Department of Public Works, Sacramento

Through appropriation by the 1929 Legislature of $30,000 for 1929-1931 biennium, the state of California, acting through its Department of Public Works, Division of Water Resources, has definitely entered the field of snow surveying. In so doing, California follows the action of neighboring states where such work has heretofore been in progress: in Nevada, beginning in a small way as early as 1909; in Utah, beginning in 1923; and in Oregon, beginning in 1928. This is not, however, the first work of such character to be done by the state of California. Beginning about 1918, Major Norboe, then chief assistant state engineer, effected an informal cooperation with Nevada for surveys at a few stations, and this cooperative effort was continued until about 1923 when California withdrew because further funds for the work were not then available. During this period, the cooperative snow surveys were conducted in the Yuba, Tahoe, Truckee, Carson, and Walker basins, and at crest stations of the American and Mokelumne river basins.

Within the past two years there has appeared a growing demand that California re-enter the snow survey work, and in response to this, the California Economic Research Council and the California Irrigation Districts Association were successful in securing the appropriation at the last Legislative session which enabled the work to be started.

The purpose of a state-wide snow survey and the objects to be attained are self evident. The power companies and a few of the irrigation districts have recognized the value of knowing from snow surveys in the early spring what to expect as runoff from the snow in the period from April to July or August. These agencies have, therefore, been doing snow survey work in California for some time, varying from thirteen years for the South Yuba surveys of the Pacific Gas & Electric Co. to one or two years' work recently started by irrigation districts on the Middle Yuba, Merced, and South Kings rivers. To regulate storage properly, the power company or the irrigation district must know to a fair certainty what the runoff to its reservoir will be when snow melting commences, and, if possible of estimate, what the monthly distribution of that runoff will be. Where, as is now the case in California, storage in one stream basin has been developed by both irrigation and power interests for a coordinated use of the water, an accurate estimate of snow runoff becomes doubly important. Beyond this, conditions have now developed where the power system of one stream basin is interconnected with the systems of other basins and a considerable portion of the power from the interconnected system may be used for irrigation pumping throughout the valleys. In this case, regulation requires not only a knowledge of the runoff to be expected for a single basin, but for a group of basins. And, looking into the not distant future, under the consummation of plans for a state-wide coordinated use of water, now the subject of intensive administrative and legislative investigation and planning, a single great reservoir or group of reservoirs on one stream may be required to coordinate as many as seven apparently conflicting uses of water. Such uses are: irrigation, power, flood control, municipal, navigation, salinity control, and hydraulic mining. In the intricate regulation that will be here required, the value and necessity of runoff forecasts as derived from snow surveys and meteorological observations can hardly be questioned. The benefits to be derived from an adequate system of state-wide snow surveys and runoff predictions are not confined to the immediate practical or local uses by power companies, irrigation districts, municipal districts, and other agencies in the administration of their projects. The broader necessity is for such information to guide the use of water from year to year, over large areas such as the entire length of the Sacramento, the San Joaquin, and the Kings rivers.

The purpose of the California snow survey is not to supplant the work that is now being done by individual agencies but rather to cooperate with these agencies; to correlate, standardize, and expand the present work and, as funds permit, to so extend the surveys that annual forecasts of runoff for all of the major stream basins of the Sierra Nevada may be possible.



High Sierra Snowfield With Ideal Location for Snow Course

Investigation was made of the methods used and results obtained in snow surveying by the agencies that have been doing this work in California and in other states. It was found that in nearly every case the surveys, when carefully conducted, had proved of practical value and that reliable forecasts of runoff were possible.

As to the methods of snow surveying, the one most successful and most widely used is that pioneered and

*Associate Member, American Society of Civil Engineers.

developed by J. E. Church, of the University of Nevada. The Nevada cooperative survey has been using this method for many years and with more or less modification it has been adopted by the states of Oregon and Utah, by agencies in the state of Washington, and in California by the Pacific Gas & Electric Co., the Nevada Irrigation District, the Merced Irrigation District, the Tulare Lake Water Storage District, the Southern Sierras Power Co., the San Joaquin Light & Power Corp., and the city of Los Angeles.

Broadly, snow surveys may be grouped into two classes. One, under which for a given area an actual volumetric determination of the snow and its water content is made and the other under which for a given area, the percentage of snow cover and water content as related to a normal, or as related to the snow of other seasons, is determined. The first method may be possible and practicable for a small basin but manifestly for large stream basins and such a great territory as that of the Sierra Nevada it is not feasible. The second, or percentage method, is that developed by Church and the one which the state of California proposes to use in its work. Briefly, the procedure under the percentage method comprises the determination of the water content of the snow cover at properly selected 'snow courses' in each basin or region by means of suitable sampling apparatus and from the data obtained, the determination of the percentage relationship of the seasonal snow cover of that basin to

Observing Snow Depth by Means of Sample Tube

its normal; under the assumption that such percentage is indicative of a corresponding percentage which the coming seasonal runoff in the stream below bears to its normal.

The percentage method relies upon the fact that the large storms which furnish the bulk of the winter snow are comparatively uniform in intensity over considerable areas and it is therefore possible to select a few snow survey courses distributed over characteristic parts of a stream basin, the averaged data from which will furnish a close index of the seasonal percentage of snow cover for the entire basin.

The selection of snow courses properly to represent each basin requires considerable care and, after a year or two, it may be necessary to change or to substitute for some of the first selections finally to obtain suitable and representative courses. In general, the site of a snow course must be one where the snow will lie uniformly and where ground irregularities are a minimum. Usually a sheltered flat or meadow furnishes the best location. It should be of sufficient size that a fairly long 'major' course, and possibly a 'minor' course at approximately right angles, may be laid out. With courses 500 ft. long, or less, the measurements of snow depth and water content are made at 25-ft. intervals. With longer courses, the interval may be 50 or 100 ft. Each course is accurately located at the angle points and ends by suitable markers placed above maximum snow depth so that on each survey the measurements

J. E. Church Under Pack on Mt. Rose, North of Lake Tahoe

will be taken at identical points, as determined by tape measurements from the same initial point.

The essential equipment in the determination of snow depth and water content at points along the courses, comprises a light, jointed steel sampling tube equipped with a serrated annular cutting bit, and a scale. The tubes are made up in 5-ft. sections for convenience in transportation. Narrow slots cut in the walls of the tubing provide windows through which to observe the column of snow within, and through which to insert a tool for cleaning out the snow. The outside of the tubes is graduated to read in inches. The scale may be supported on the ski staff and, when a core of snow has been obtained with the tube, the tube and snow are weighed together by placing the tube in the supporting cradle suspended from the scale. Previously, the scale pointer is set to zero with the empty tube only in the cradle, so that when the core is weighed the scale shows only the weight of snow.

The various agencies doing snow survey work are using many modifications of the sampling equipment as above described but there is a certain standard equipment as developed by Church and the Nevada cooperative survey known as the 'Mount Rose Snow Sampler' which is manufactured and listed by some instrument makers. In the California work, the Mount Rose sampler has been adopted with minor modifications. The cutting edge on the tube of this sampler has a diameter of exactly 1.5 in., and the spring scales with light aluminum case are so calibrated that, with this diameter of cutting edge, the weight of core is given directly in inches of water.

The work done by the Pacific Gas & Electric Co. in

the South Yuba river basin in cooperation with the Nevada snow survey furnishes a good illustration of the methods and procedure in snow surveying selected as 'Standard' for the state work. In this basin the 'snow courses' are as follows:

Location	Elevation ft.	Number of Courses
Lake Spaulding	4800	1
Cisco	5700	2
Lake Fordyce	6500	1
Furnace Flat	6600	2
Saw Mill Flat	7000	2
Lake Sterling	7000	1
Summit	7019	3
Red Mountain	7200	1
Meadow Lake	7200	1

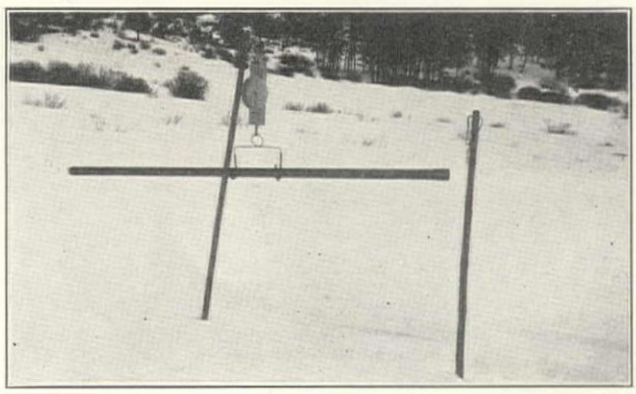
The main survey is made about April first of each year in an endeavor to select the time when the greatest percentage of the seasonal snowfall will have occurred, and yet before the spring melting has commenced. If considerable snow falls after the date of the survey, then a supplemental survey, made about the first of May, may be necessary. By using the snow sampler as described, the average water content for each snow course and for each location is determined. In obtaining the average water content for the entire basin, it has been found best to group the courses in accordance with elevation, making a segregation to crest, intermediate, and low elevations. The average water content for each group is then weighted by the area of the watershed lying between the elevations of that group and the weighted averages are then used to determine the average for the entire basin. By this method, proper account is taken of the effect of early melting in the lower elevations. With a long-time record of surveys the normal for the individual courses and for the basin is developed, and the water content as obtained for each year may be expressed as a percentage of that normal. At the beginning of surveys in a given basin, it may only be possible to express the results of one year as a percentage of those of the previous years of record. If, however, there is available a long-time record of the stream flow at a station reflecting the runoff of the basin surveyed, a normal for the snow survey can be tentatively assigned by reference to the runoff normal. For example, the average water content for a basin is found to be 37 inches for two years of record. For these two years the average runoff is found to be 78% of its normal. The normal for the snow cover will then be taken provisionally at $\frac{37}{0.78}$, or 47 inches.

The results of the April 1st snow survey are used to estimate the April to July, or April to August, seasonal runoff. With the addition of supplementary surveys at key stations once a month, both prior and subsequent to April 1 and with supplementary information as to rainfall, temperatures, condition of the soil as to whether saturated or dry, etc., it should be possible to develop not only close estimates of the total runoff to be expected, but maxima, minima, and monthly distribution data as well.

The following data, furnished by the Pacific Gas & Electric Co., show runoff forecasted from snow surveys as compared with the actual runoff in the South Yuba basin work:

Seasonal Year	Period of Forecast	South Yuba Basin Run-Off Acre-Feet By Forecast	By Measurement	Percentage Variation
1921-22	May 1-Aug. 31	332,234	312,659	+ 6.1
1922-23	Apr. 1-July 31	217,795	248,100	—12.3
1923-24	Apr. 1-July 31	69,165	73,030	— 5.2
1924-25	Apr. 1-July 31	200,608	219,590	— 8.5
1925-26	Apr. 1-July 31	161,693	138,800	+16.5
1926-27	Apr. 1-July 31	331,164	319,994	+ 5.2

As to the program for the work as now being developed, the scope includes the correlation and standardization of all work being done by present agencies and as great an extension to the unsurveyed territory as may be possible with the funds available. As a working basis, a skeleton selection of crest, intermediate, and low-level snow courses for each major stream basin in the Sierra Nevada has been adopted. This follows quite closely an outline for a comprehensive snow survey of the Sierra Nevada as submitted to the California state engineer by Church in 1923. The filling-in of the skeleton will be accomplished by cooperating with the present agencies for standardization of their work in partial basins, and by endeavoring to develop additional cooperation such that each basin will be adequately surveyed. With the funds available, the state itself cannot develop an organization to make the actual surveys. It can furnish the standard equipment and forms and provide the necessary supervision to coordinate all work. It can also share to some extent in the costs of the surveys, the construction of shelter cabins, and their stocking with provisions, bedding, and other supplies. The personnel and detail arrangements for, and conduct of, the surveys can be economically handled only through cooperative arrangements with the agencies most interested in a particular stream basin.



Snow Sampling Tube with Core of Snow Being Weighed to Determine Water Content. Scales Are Supported on Ski Staff

In the contacts that have been made to date with the agencies now doing snow survey work, the earnest desire to cooperate and the expressed willingness to make such changes as may be necessary to conform to 'standard practice', have been most gratifying. As an example of the cooperative arrangements, the agency may have been taking only scattered single-point snow depth observations over a certain portion of a stream basin. The state now asks that this work be expanded by including certain snow courses where the water content will be measured, and selects the courses. With little additional work, it may also be feasible to

CALIFORNIA COOPERATIVE SNOW SURVEYS

Location of Snow Courses, Proposed, Established, or Now Surveyed, Cooperating Agencies, Etc.

Snow Survey Courses
(C) Crest course; roman type, proposed; *italics*, just established; SMALL CAPS, now surveyed
(K) Key course where surveys will be or are now made once a month

Stream Basin	Snow Survey Courses	Cooperating Agency	Remarks
Pit	**Cedar Pass* 6500, **Eagle Peak* 7500, **Adin Mts.* 6500, Lassen Peak (K), Crater Peak, Grizzly Peak		*Surveys to be made by I. M. Ingerson, in charge of Division of Water Resources, Pit River Investigation
McCloud	Mt. Shasta (K), Black Fox Mt., Mt. Hoffman		
Upper Sacramento	Mt. Shasta (K), China Mountain		
Feather	Lassen Peak (C) (K), Grizzly Mt. (C), Table Mt., Bucks Mt., Cammel Peak, Onion Valley, Gold Lake		
North Fork	*Harkness Flat* 6500, *North Fork* 5000, *Warner Cr.* 5000, *Mt. Stover* 5800, *Chester Flat* 4600, *Humbug Ridge* 5000, *Mt. Dyer* 8000, *Susanville Summit* 5500, *Clear Cr. Meadow* 6500, *Mill Creek Flat* 5800, *Haskins Flat* 5300 (K)	Great Western Power Co.	Courses around Almanor and Bucks Creek developments
Yuba	Gold Lake Ridge (C), *WEBER PK. (C) 8000, †SUMMIT (C) 7019 (K), La Porte (K)	*Nevada Cooperative Surveys †Pac. Gas & Elec. Co. and Nev. Coop. Sur.	
North and Middle Forks	BOWMAN LAKE 5630, ENGLISH MT. 7100, FINDLEY PK. 6500, *Jackson Meadows* 6200, *Haypress Valley* 6800.	Nevada Irrigation District	Jackson Meadows and Haypress Valley are courses added for state
South Fork	LAKE SPAULDING 4800, CISCO 5700, LAKE FORDYCE 6500 (K), FURNACE FLAT 6600, SAWMILL FLAT 7000, LAKE STERLING 7000, RED MOUNTAIN 7200, MEADOW LAKE 7200.	Pacific Gas & Elec. Co. and Nevada Cooperative Surveys	These courses have been surveyed for many years
Truckee	*SUMMIT (C) 7019 (K), TRUCKEE 5800, BOCA 5600, CRYSTAL PEAK (C) 7700, MT. ROSE (C) 10,000 (K), BIG MEADOW 8700	*Pacific Gas & Elec. Co. and N.C.S. Nevada Cooperative Surveys	Courses surveyed for many years
Tahoe	MT. ROSE (C) 10,000 (K), MARLETTE LAKE 8000, DAGGETTS PASS 7500, FREEL PEAK 8300, *Myers* 5400, LAKE LUCILE (C) 8700, RUBICON PEAK (C) 8000, WARD CR. 7000, TAHOE CITY 6200	Nevada Cooperative Surveys	Courses surveyed for many years
American	**Sixmile Valley* 6000, *CISCO (C) 5700, *SUMMIT (C) 7019 (K), Duncan Peak, †WARD CREEK (C) 7000, Gerle, †LAKE LUCILE (C) 8700, Union Valley, **Carson Pass* (C) 8600, *SILVER LAKE 7300 (K)	*Pacific Gas & Elec. Co. †Nevada Cooperative Surveys	Recent cooperation with P.G.& E.Co. for Carson Pass and Silver Lake courses
Carson	*WILLIAMS 7700, *BURNSIDE LAKE 8300, **Grovers Springs* 6200, †BLUE LAKES (C) 8100 (K)	*Nevada Cooperative Surveys †Pacific Gas & Elec. Co. and N.C.S.	
Mokelumne	*BLUE LAKES (C) 8100 (K), †Leek Spring, *Pacific Valley* 7600, ‡BEAR VALLEY RIDGE 6700	*Pacific Gas & Elec. Co. ‡Pacific Gas & Elec. Co.	†Leek Spring course close to divide between *Cosumnes* and Mokelumne. Pacific Valley course non-cooperative
Stanislaus	**Kennedy Meadows* (C) 7600, †SONORA PASS (C) 9200, **Relief Dam* 7300, ‡*Pacific Valley* 7600, Eagle Meadows, Bloods, §Duck Lake, §Clover Meadow, **Niagara Flat* 6500 (K), **Strawberry Lake* 5700 (K)	*Pacific Gas & Elec. Co. †Nevada Cooperative Surveys and N.C.S. §Proposed cooperation with Utica Mining Co.	‡Pacific Valley course is in Mokelumne Basin but close to Stanislaus divide. Non-cooperative course
Walker	SONORA PASS (C) 9200, PICKLE MEADOW 7200, PICKLE-LEAVITT BENCH 7000, LEAVITT MEADOW 7200, WILLOW FLAT 8300, *Buckeye Hot Springs* 6900, BUCKEYE CREEK 8000, BUCKEYE FORKS 8500, CENTER MT. (C) 9300	Nevada Cooperative Surveys	These courses have been served for a number of years
Tuolumne	*CENTER MT. (C) 9300, †*Strawberry Lake* 5700 (K), ‡DANA MEADOWS (C) 9700, ‡TIOGA PASS (C) 9900 (K), §Dorothy Lake (C), §Benson Lake, §Wilmer Lake, §*Mercur Peak* 7800, §*Lyle Fork* 9000, §*Tuolumne Meadows* 8500, §*White Wolf* 8000, §*Tuolumne Pass* (C) 9800, §Laurel Lake, §Gin Flat	*Nevada Cooperative Surveys †Pacific Gas & Elec. Co. ‡Southern Sierras Power Co. §Yosemite Park Service, Modesto, Turlock and Waterford Irr. Dist., and City of San Francisco	†On divide between Stanislaus and Tuolumne ‡Has been surveyed for a number of years
Merced	*Gin Flat, **White Wolf* 8000, *Snow Flat* 8700 (K), *Lake Tenaya* 8100, *Tuolumne Pass* (C) 9800, *Isberg Pass* (C) 10,000, *Merced Lake* 7200, *Peregoy Meadow* 7100, Moraine Meadows	Yosemite National Park and Merced Irrigation District	*Close to divide between Tuolumne and Merced Basins
Mono	TIOGA PASS (C) 9900 (K), RHINEDOLLAR LAKE 9500, SADDLEBAGS LAKE 10,000, SYLVESTER MEADOWS 7500, DAVIS LAKE 10,000, GEM LAKE 9200, SILVER LAKE 7300, GRANT LAKE 7200	Southern Sierras Power Co.	These courses have been surveyed for a number of years. All courses except Davis Lake are surveyed *monthly* from Jan. 1
San Joaquin	**Thousand Island Lake* (C) 10,000, †*Isberg Pass* (C) 10,000, ‡*Red Meadows* 7700, ‡*Mono Creek-Pioneer Basin* (C) 11,000, **Humphrey Basin* (C) 11,000, §Florence Lake (K), §Huntington Lake, §Kaiser Pass, ¶*Burnt Corral Meadow* (C) 9700, ¶*Chilkoot Lake* 7500, Jackass Meadow, Hoffman Meadow, ¶*Blackcap Basin* (C) 10,500, ‡MAMMOTH PASS (C) 9500 (K), *DARWIN CREEK (C) 11,000 (K)	*Southern Sierras Power Co. †Yosemite Nat'l Park and Merced I.D. ‡City of Los Angeles §Proposed cooperation with Southern Calif. Edison Co. ¶San Joaquin Light & Power Corp.	*Course added by S.S.Power Co. for state ‡Course to be added by City of L.A. for state Burnt Corral Meadow and Blackcap Basin are in North Kings Basin but close to San Joaquin divide Darwin Creek is in Bishop drainage but close to San Joaquin divide
Owens	MAMMOTH No. 1 (C) 9500 (K), MAMMOTH No. 2 8300, MINARETS No. 1 9000, MINARETS No. 2 8300	City of Los Angeles	Courses surveyed since 1926
Mammoth Creek			
Rock Creek	ROCK CREEK No. 1 10,000, ROCK CREEK No. 2 9050, ROCK CREEK No. 3 8700	City of Los Angeles	Courses surveyed since 1926
Bishop Creek	DARWIN CREEK (C) 11,000 (K) LAMARCK CR. 10,500, BLUE LAKE 10,300, SAWMILL 10,200, NORTH LAKE 9500, SOUTH FORK 9000, BISHOP PARK 8500	Southern Sierras Power Co.	Courses surveyed for a number of years
Big Pine Creek	BIG PINE CREEK 10,000 (K), BIG PINE CREEK 9800, BIG PINE CR. 9700	City of Los Angeles	Courses surveyed since 1926
Cottonwood Creek	COTTONWOOD CREEK (C) 11,100 (K), COTTONWOOD CREEK 10,600	City of Los Angeles	Courses surveyed since 1926
Kings	*Statum Meadow* 8300, *Cliff Camp* 6300 (K), *Woodchuck* 9000, *Beard Meadow* 9700, *Blackcap Basin* (C) 10,500, *Post Corral* 8300, *Long Meadow* 8400, *Burnt Corral Meadow* (C) 9700, *Sand Meadow* 8100 (K), *Helms Meadow* 8500, *Swamp Meadow* 9000, *Dinkey* 5600, *Bear Ridge* 7200, *Fred Meadow* 7000	San Joaquin Light & Power Corp.	Single-point observations have been taken in past years but courses just established
North Fork			
Middle and South Forks	**Dusy Lake* (C) 11,000, Woods Lake (C), Bullfrog Lake (C), †*Moraine Meadow* 8400, †*Rowell Meadow* 9200, †*Horse Corral Meadow* 7600, †*Kennedy Meadow* 7600, †*Big Meadow* 7660, †*General Grant Park* 6660 (K)	*Southern Sierras Power Co. †General Grant and Sequoia National Park Service, Tulare Lake Water Storage Dist., and Fresno office, U. S. Weather Bureau	*Course added by S.S.Power Co. for state †Single-point observations in past years, but courses just established
Kaweah	**Big Meadow* 7660, J. O. Pass, Lonepine Meadow, Redwood Meadow, Mineral King (K), Hockett Meadows, Giant Forest (K), Columbine Lake (C)	*Tulare Lake Water Storage Dist., Sequoia and General Grant National Park Service, and Fresno office, U. S. Weather Bureau	*In south Kings Basin but very close to Kaweah divide
Kern	Sand Meadows (C), Columbine Lake (C), Moraine Lake, *Rock Creek-Army Pass, Wet Meadows, Whitney Meadows (K), †*Grey Meadow* 6200, †*Lloyd Meadows* 5500, †*Long Meadow* 8500, †*Ramshaw Meadows* 8700, †*Casa Vieja Meadows* 8500, †*Beach Meadows* 7800, †*Monache Meadows* 8000 (K), †*Windy Springs* 6200, †*Paloma Meadows* 8500, †*Big Meadow* 7800, †*Cannell Meadow* 7500	*City of Los Angeles †Proposed cooperation of Kern County Land & Water Co., Miller & Lux, Buena Vista Water Storage Dist., Southern California Edison Co., and Empire Development Co.	*Proposed extension over Army Pass from Cottonwood Lakes course of city of Los Angeles Some observations at Windy Springs and Monache Meadows in previous years

extend the survey route to include a much needed course just over the crest and in another watershed. This may only require the construction and stocking of an additional shelter cabin. By cooperative agreement, then, the state can furnish the equipment and forms and pay for the additional costs of the survey due to the establishment of snow courses and to the additional course outside the stream basin.

The accompanying table gives the data for the major stream basins as to the snow courses proposed, established, or now being surveyed; shows the cooperating agencies; and otherwise indicates the progress of the state's work to date.

In the extension of work to fill in the gaps and supplement the present surveys, the problems are not simple. Where the snow-cover runoff relation is confined to the upper basins and high altitudes, the physical difficulties are considerable, but those attendant upon the interpretation of data and analysis are comparatively slight. Coming to the lower elevations, however, and attempting to forecast runoff at foothill and valley points, the zone of early melting snow and precipitation as rain is encountered, and the difficulties increase. The snow survey must be definitely tied in with the many precipitation stations of the U. S. Weather Bureau at the lower elevations, if proper forecasts for the lower points are to be made. The state also will supplement the U. S. Weather Bureau stations by installing precipitation stations at many places in, and adjacent to, the National Forests where there are permanent residents.

There are many modifying factors which must be taken into account in forecasting the runoff at a certain point and from a given snow cover. The temperatures prior to and during the snowfall period as well as during the runoff period are an important consideration. Wind velocity and direction, evaporation, humidity, and soil conditions are other factors not to be neglected. To provide information as to such factors, it is planned to establish certain 'key' stations for the observation of fairly complete meteorological data, and, in addition, a number of thermographs at strategic points.

Observers on a 'Crest' Course at 11,100-ft. Elevation

The plans call for one complete survey at all courses about April 1 of each year, for the preparation of the main forecast bulletin as of about that date. At selected stations, however, the survey will be conducted monthly or at frequent intervals so as to furnish data for supplementary forecasts prior and subsequent to the main forecast. Obviously, for some time, definite forecasts will be possible only for those basins or partial basins where the data from surveys conducted previous to the present time are available for purposes of comparison. Except for such locations, therefore, and until 'normals' or data for yearly comparisons are developed, the bulletins can supply only the actual measurements of the surveys. However, with an unbroken continuation of the work for a period of years, it appears reasonable to anticipate valuable forecasts, not alone of the total seasonal runoff but of the monthly or periodic distribution of runoff.

The California cooperative snow survey is an activity coming under Harold Conkling, deputy in charge of water rights of the Division of Water Resources, Department of Public Works. B. B. Meek is director of the department and Edward Hyatt is chief of the division and state engineer. I am directing the work and Spencer M. Munson has immediate charge as my assistant.

SAN GABRIEL DAM

Construction of the San Gabriel dam for the Los Angeles County Flood Control District was stopped on October 15, pending further exploration of the foundation rock. This action was taken by the board of county supervisors on recommendation of E. Court Eaton, chief engineer, and following a report of investigation by Louis C. Hill and A. J. Wiley, consulting engineers, and Robert T. Hill and C. F. Tolman, consulting geologists.

A summary of findings and recommendations from the report follows:

Findings—(1) stresses in the dam and foundation are extremely high and call for the best of rock foundations; (2) the diorite rock, of which the foundation is composed, when not crushed by faulting or weakened by weathering would form a suitable foundation; (3) the east abutment is satisfactory; (4) excavation on the west abutment has not reached any sound unweathered rock, and exploration tunnels and shafts indicate that sound rock will not be reached at reasonable depth, if at all; (5) the fault-zone passes under or near the proposed downstream toe and nearly parallel to the axis (this is a most dangerous condition, especially when possible future movement along the fault line is admitted); (6) a safe dam of the proposed height cannot be built at this site.

Recommendations—(1) that exploration be continued to determine the area of rock outside of the fault-zone and also the height of dam which can be constructed with safety at the forks site (this estimated maximum height is 250 ft.); (2) that immediate surveys be made of sites in the upper portions of the watershed to determine the feasibility and cost of a series of low dams fully to control and conserve the flood waters of San Gabriel river. A reconnaissance gives encouragement that such sites exist.

Eaton will continue the exploration and studies during the next 60 days, by which time the Los Angeles County Flood Control District can definitely determine a satisfactory solution of the problem.

Fisher, Ross, MacDonald & Kahn, Inc., are the contractors, and have excavated over 700,000 cu.yd. of material from the abutments.

Bacterial Examination of California Water Supplies

By C. G. GILLESPIE*

Chief, Bureau of Sanitary Engineering, California State Department of Public Health

Until 1920 one could count on the fingers of a single hand the water works in California which depended on other than the State Board of Health for bacteriological analysis of their water supplies. In 1923 the shrinkage of support compelled discontinuance of routine analyses by the Board. Each water department was thereupon urged to arrange to continue this measure of operation control through a laboratory within, or closely available to, its department. A recent survey of the extent to which that group of supplies most subject to contamination problems has 'carried on', shows that not only have they done so, but as an average, and leaving out Los Angeles, they now handle ten times as many water samples as the state laboratory could handle for them at the height of the work. Few of the water departments having surface water supplies have let laboratory control lapse.

The laboratories of the Public Service Department of Los Angeles, of which Carl Wilson is director, now analyze bacterially about 13,000 samples of water per year, against 72 by the state when it was making analyses of the city supplies.

Of the group surveyed, 51% have the laboratory within the department, 13% depend on the local health department, and 18% send the samples to a private laboratory. In the last case, the amount of work done is meagre. The survey does not extend to the water analysis activities of the various other city and county health departments, whose work reaches into thousands of water analyses each year.

Such has been the result of state pioneering in the field of water supply examination in Calforinia. In 1915, when the State Board of Health established a laboratory for the purpose of its new Bureau of Sanitary Engineering, it took actual coaxing to get water works men to send in a few samples. But they soon found that the reports aided them in their work. It told them if their operations were on the right track for a safer water, and it enabled them to answer the fears of consumers. It is safe to say that these water works will never cease their local laboratory control. In fact, the list will lengthen with the years.

The most common test made by these laboratories is that for the coli-aerogenes group as an indication of the presence of sewage, animal or human. None of the laboratories stop at the 'presumptive test' for these organisms, but carry the test through to confirmation on endo medium or eosine methylene blue agar.

The laboratories of the Pacific Gas & Electric Co., and a few others, do not make the B. coli test, but do make agar counts before and after chlorination, depending on a high percentage reduction for the conclusion that the water is safe.

Nearly all the departments which reported using chlorine say that they make free chlorine tests also.

Bacterial tests alone, however, do not tell the whole story. It is one of the most common of misimpressions that the laboratory man can test a water and tell all about it. In bacterial analyses particularly, there is much error in sampling. Also, soil organisms and animal manure confuse the result. A negative result in one sample is of far more importance than a positive on another sample from the same water, because the latter is probably poor sampling. But, taken with the field information, the bacterial analysis gives the water superintendent an understanding of the sanitary condition of his water works which he can get in no other way.

Comparison of Amount of Bacterial Control of 60 Water Supplies by (a) State Department of Public Health and (b) Local Laboratories Which Succeeded It

Town	Company	(a) By State in highest year, B. Coli tests	(b) By local laboratory Yearly samples B. Coli tests	Total bacterial count	Year began
Avalon	Santa Catalina Is. Water Dept.	0	48	48	1929
Amador City	P.G. & E. Co.	0	0	156	1925
Auburn	P.G. & E. Co.	17	0	156	1925
Bakersfield	Cal. W. Ser. Co.	1	144	144	1927
Belvedere	Cal. W. Ser. Co.	5	72	72	1927
Benicia	Benicia W. Co.	18	(None since May, 1928)		
Brawley	City	28	0	0	
Calexico	City	54	104	104	1929
Chico	Cal. W. Ser. Co.	2	72	72	1927
Colfax	P.G. & E. Co.	52	0	156	1925
Corona	City	0	24	24	1926
Dixon	Cal. W. Ser. Co.	8	35	35	1925
El Centro	City	70	48	48	1929
Escondido	E. Mut. Water Co.	101	48	48	1928
Eureka	City	48	110	110	1918
Firebaugh	City	0	0	0	
Fresno	Cal. W. Ser. Co.	2	216	216	1927
Glendale	City	71	500	0	1922
Hanford	Cal. W. Ser. Co.	0	72	72	1928
Hemet	City	42	0	0	
High Grove	E. Riverside W. Co.	0	0	0	
Ione	P.G. & E. Co.	1	0	156	1925
Jamestown	P.G. & E. Co.	12	0	156	1925
Lincoln	City	48	0	0	
Livermore	Cal. W. Ser. Co.	13	156	156	1925
Loomis	P.G. & E. Co.	28	0	156	1925
Los Banos	City	52	0	0	
Marin Mun. W. Dist.	Marin Mun. W. Dist.	82	350	350	1923
Merced Falls	Yosemite Lbr. Co.	50	0	0	
Monterey Co. W. W.	Monterey Co. W. W.	54	0	0	
National City	Sweetwater W. Co.	43	150	150	1918
Newcastle	P.G. & E. Co.	14	0	156	1925
Oroville	Cal. W. Ser. Co.	39	312	312	1927
Pasadena	City	0	935	935	1913
Petaluma	Cal. W. Ser. Co.	55	624	624	1928
Pittsburg	City	45	0	0	
Port Costa Sys.	Cal. W. Ser. Co.	50	2,500	2,500	1927
Redding	Cal. W. Ser. Co.	50	312	312	1925
Redlands	City	0	400	400	1927
Redondo Beach	Cal. W. Ser. Co.	1	72	72	1927
Roseville	Pub. Util. Calif. Corp.	25	24	24	1927
Sacramento	City	38	1,500	1,500	1924
San Bernardino	City	0	130	130	1920
San Diego	City	46	2,000	2,000	1915
San Jose	San Jose W. W.	49	500	500	1915
Santa Barbara	City	3	400	400	prior to 1923
Santa Cruz	City	54	60	60	1926
Santa Paula	Santa Paula W. W.	40	200	200	1928
Scotia	Pacific Lbr. Co.	29	0	100	1918
Sonora	P.G. & E. Co.	50	0	312	1925
South Pasadena	City	0	364	0	1924
Stockton	Cal. W. Ser. Co.	5	72	72	1925
Sutter Creek	P.G. & E. Co.	1	0	156	1925
Vallejo	City	62	52	52	
Visalia	Cal. W. Ser. Co.	2	72	72	1927
Vista	Vista Irrig. Dist.	2	48	48	1927
Watsonville	City	53	0	110	1923
Willows	Cal. W. Ser. Co.	1	72	72	1925
Los Angeles	City	72	13,000±		
San Francisco	Spring Valley W. Co.	273	324	324	1923
Totals		1,961	26,122	14,028	

*Member, American Society of Civil Engineers.

East Bay Municipal Utility District

Construction and Operation Methods

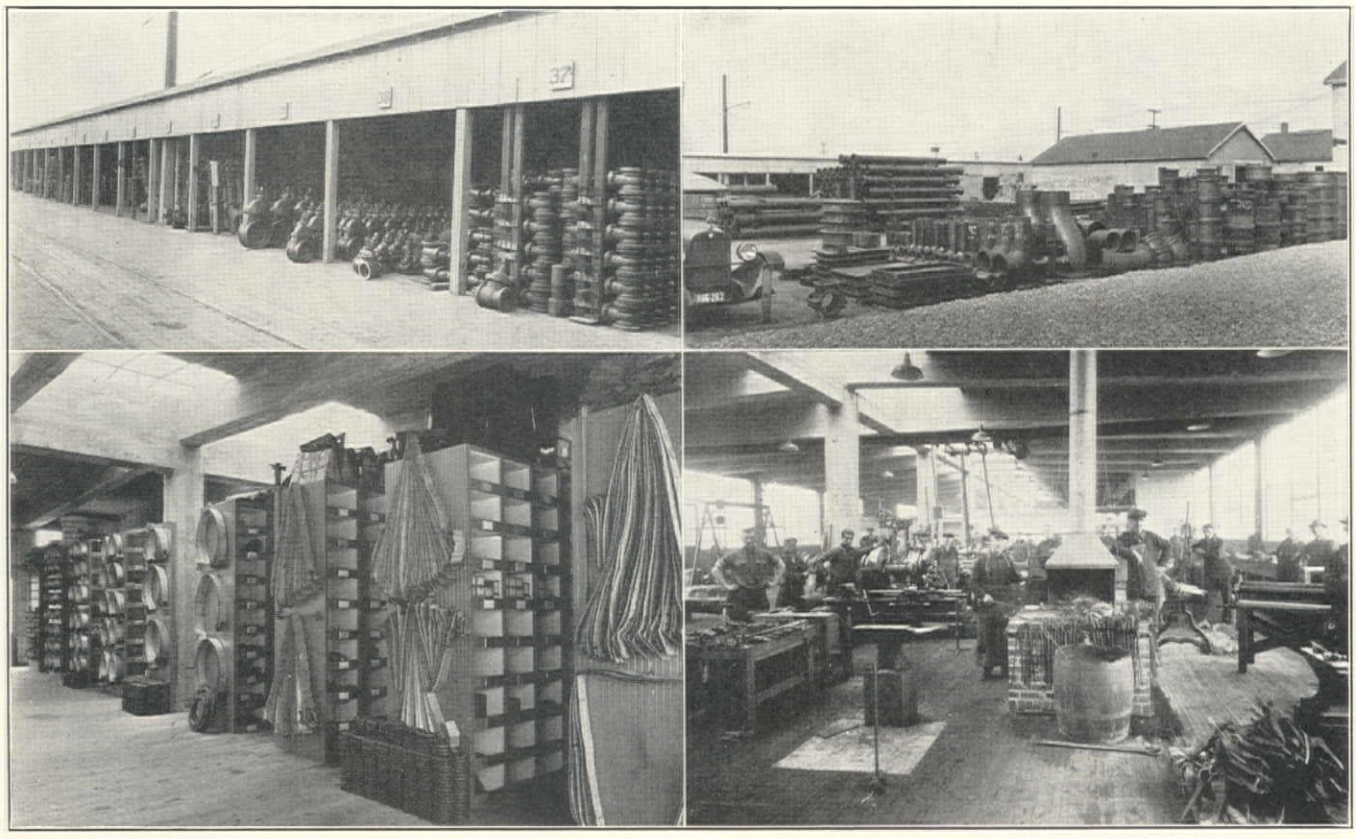
By LOUIS L. FARRELL
Superintendent of Construction and Operation

The cities of Oakland, Berkeley, Alameda, Piedmont, Richmond, Emeryville, San Leandro, El Cerrito, and Albany, with their contiguous suburbs, are operated and maintained from headquarters at Twenty-second and Adeline st., Oakland. These quarters, known as the 'Corporation Yard', house the offices of G. A. Hunter, who has charge of all building construction and maintenance of structures; L. J. Traver, master mechanic in charge of pumping plants; J. S. Stevens, yard superintendent in charge of garage, machine shops, meter shop, and the distribution of material and supplies used over the entire system; and the office of the superintendent of construction and operation. Here an adequate office force, as well as a field force of 400 men, are employed on construction and maintenance work in the entire local system, with the exception of Richmond. At Richmond there is a small maintenance crew, which, however, reports to headquarters.

The local system (consisting of properties purchased from the former East Bay Water Co.) has 1403* miles of transmission and distribution mains, ranging in size from 2-in to 54-in.; 138,980 active services; 128,729 active meters; and 4775* fire hydrants.

*Figures as of Jan. 1, 1929.

Meters—All meters in use are the property of the East Bay Municipal Utility District and are maintained by the construction and operation department as far as possible without removing them from service. Meters that are badly damaged internally or have ceased to register properly are removed and sent to the meter shop for a general overhauling. After overhauling, the meters are set at zero before being again placed in service. All minor repairs, such as defaced dials, broken glasses, repacking, leaking cases or spindles, are made while the meter is in service. All cleaning of large meters is done without removing them, for usually the larger meter supplies a factory or an industry where much interruption to the service is of vital importance. No charge is made for meter installation for bona fide service within the confines of the district. While the 5/8-in. meter installation predominates, many larger sizes both for fire sprinkler systems and for domestic use are in service. Ordinarily, the size depends entirely upon the needs of the consumer and the necessary approval of the District's management, with consideration given the various sized mains in the particular area. Due to the fact that we have a so-called 'stand-by' charge, depending upon the size of the meter, many customers are prone



CORPORATION YARD, OAKLAND, CALIFORNIA, OF EAST BAY MUNICIPAL UTILITY DISTRICT

to meter undersize rather than oversize; a condition that rarely exists in other cities. This has a tendency to make it disagreeable for the distribution department. All small size meters are installed in concrete boxes with concrete covers, and the larger types in reinforced concrete structures built by our own forces. Conditions permitting, meters are installed at the curb line, and all meters 2 in. and over are equipped with a fish trap.

Services are installed without cost to the consumer; 95% of the installations have a ¾-in. main tap, ¾-in.

Meter Stock Room, Corporation Yard, Oakland. Over 90% of Meters Used Are 'Trident'

copper joints, and the regulation ¾-in. galvanized-iron service pipe with a ¾-in. curb cock. Other sizes and types are used, depending upon the consumer's requirements, soil conditions and, in recent years, the kind of pavement.

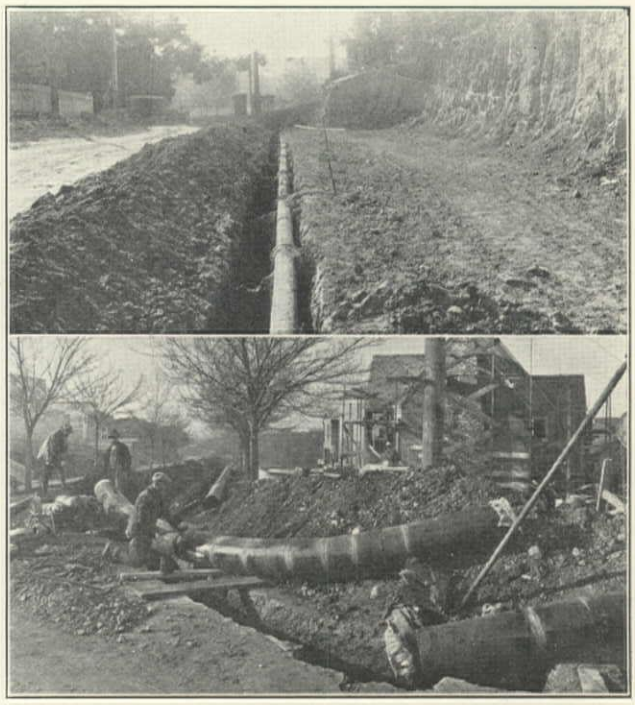
Where corrosion due to soil conditions is pronounced, and where permanent type pavement is being installed, a satisfactory installation has been found by using 1¼-in. cast-iron pipe with a 1-in. tap at the main; the service usually reaching two or more meters. This type of service is particularly free from soil corrosion, and, by using an insulated joint at the main, cement joints, and an insulted curb cock, is practically free from electrolysis. The same type has been used extensively under new pavements in certain localities so as to preclude any disturbance of the pavement for future building improvements.

Practically all service connections, regardless of size, are made under pressure, cast-iron mains being drilled and tapped, and sheet steel mains having connections soldered on for the smaller sizes, and the larger sizes electric welded. We have many 12-in., and even larger services, that have been made under pressure, where conditions would not have permitted closing down for dry taps.

Services are insulated where possible, both at the main and at the meter. On the smaller size services, fiber tubing is used, replacing the common ½ by ¾-in. bushing used between the regulation ⅝-in. meter coupling and the ¾-in. main cock, and ¾ by ½-in. tubing between the copper main connection and the regulation service pipe. Special insulated flanges are used on all larger sizes. These are generally installed as close to the meter as is practical.

In recent years, the practice of repairing services has been entirely eliminated. When a service begins to leak, it has been found advisable entirely to renew it. This practice applies in most cases where new pavement is being installed, or in the older sections of the cities where macadam is being replaced with a more permanent type of pavement.

Fire Hydrants—All fire hydrants served are district property, with the exception of those of the city of Oakland where the hydrants are owned and, in part, maintained by the fire department. Various types and



(Upper) Lowering Cast-Iron Water Main Under Pressure as Street Grade Is Cut Down. (Lower) Welding Steel Pipe to Fit Curved Trench in Berkeley

sizes of hydrants are used both in the different municipalities and in the several incorporated fire districts in unincorporated territory. The majority of hydrants have 6-in. inlets, while a few in the older districts have 4-in.; none, however, being smaller than 4-in. All hydrants are installed with an independent shut-off valve. Fire department officials have usually designated the location, make, and size of hydrant desired. Consequently, while the East Bay cities are practically one community, we have a multitude of various makes and sizes of hydrants, and an extremely serious condition confronts the fire departments when outside assistance is necessary. This because Oakland, Alameda, San Leandro, and Emeryville use one size steamer conection, Piedmont another size, and still another size is used in Berkeley and the Contra Costa county communities. Where there are 2½-in. standard outlets, Richmond, El Cerrito, and the San Pablo fire district insist on 'National threads', and the re-

maining cities use the Pacific Coast type. During the Berkeley conflagration in September, 1923, these conditions were apparent when outside fire equipment sent to Berkeley's assistance, in many cases was unable to use Berkeley type steamers. The same conditions existed recently in a disastrous fire in Marin county.

Hydrants are regularly inspected by the different fire departments and any necessary repairs immediately made by the district.

Distribution Mains—The past practice of using cast-iron pipe generally up to 12-in. diam., and riveted sheet

Welding Sections of 30-in. Steel Pipe, Gunite Covered

steel, and more recently welded sheet steel for the larger sizes, will be abandoned to a certain extent and more cast-iron used. While the first cost will undoubtedly be greater, the ultimate saving will be enormous, considering the lasting qualities of cast-iron and also the salvage value when necessary to abandon existing mains and replace them with large sizes as the growth of the communities continues. Because of present-day traffic conditions, mains are installed as close to the curb-line as circumstances will permit, with 3 or 4 ft. of cover.

Pipe Joints—Cement is used almost exclusively as a joint filler, both on cast-iron and sheet steel pipe; lead, leadite, and lead hydrotite being practically eliminated, except for emergency repair work and wet connections where cement would not have the 24 to 48 hours required for a proper 'set'. Neat portland cement, with about 10% water by volume, furnishes a more substantial joint than any other material. It is not only lower in cost, but is free from sweating or leaks regardless of pressure, heavy traffic over street, or rolling trenches over pipe or subgrade for new pavements. It is not only superior in these respects, but as a preventive against electrolysis it has proved a decided success both in our construction and by other utilities throughout the country.

Practically all mains installed by this district are protected every 160 ft. with some type of insulated joint, cement being used exclusively for cast-iron and sheet-iron mains, and special flanged unions with the various sizes of wrought-iron pipe. These flanges are bolted together with a fiber gasket between the faces and a special fiber tubing around the body of the bolt, and a fiber washer under the bolt head as well as under the nut. This same type of insulation is used on all meters 2 in. and over.

Welding, both electric and oxy-acetylene, has been used exclusively for sheet steel installation for the past ten years and has been an entire success. I do not recall a single failure on welded lines from faulty welding, this undoubtedly being due to our method of employing welders. Instead of hiring welders and putting them to work, we usually first put them to work and afterward hire them.

Gate Valves—Probably every type of gate valve ever manufactured is represented in this system, and occasionally we find valves that defy any classification. Left-handed operating gate valves have been used exclusively in recent years; but many of the older gate valves of all sizes and kinds are right-handed, making operating and emergency conditions rather difficult, particularly in the downtown district where the distributing mains consist of three distinct old water systems, namely: Contra Costa Water Co., Oakland Water Co., and the Union Water Co.; all interconnected in many places. All gate valves are installed at street intersections, care being exercised to set the

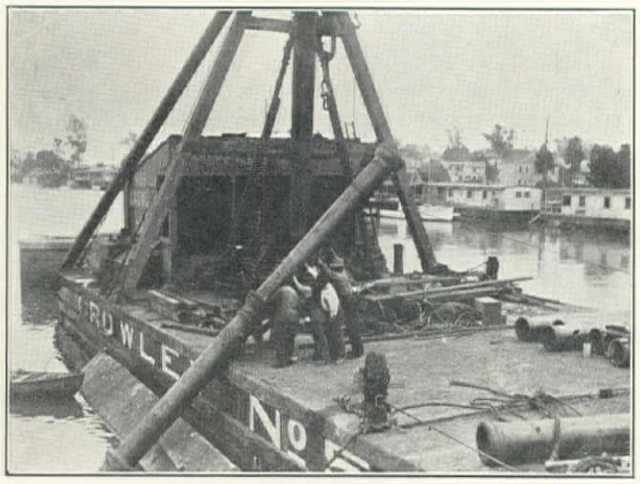
Encasing 37½-in. Riveted Steel Supply Main (40 Years Old, on East 14th St., Oakland) Under Pressure, by Welding on a Jacket of ⅜-in. Steel Plates

gate valve exactly opposite the property line of the intersecting street. Practically all gate valves are straight operating, mostly without bypasses. All upright operating gate valves, as well as curb cocks, are covered with cast-iron covers, and all geared gate valves are covered by reinforced concrete structures, allowing clearance for any necessary repairs. All of the gate valves are manually operated.

Practically all gate valves in the downtown districts are inspected and operated yearly; others, espe-

cially large gate valves on transmission lines, are used frequently either for connections of some sort or repairs; consequently, their general condition is good. No regular gate men are employed.

All shut-downs of mains or districts of any consequence are supervised by P. J. Horan, assistant superintendent, who devotes practically his entire time to work of this nature. Most shut-downs of any consequence for new installations, affecting large areas or



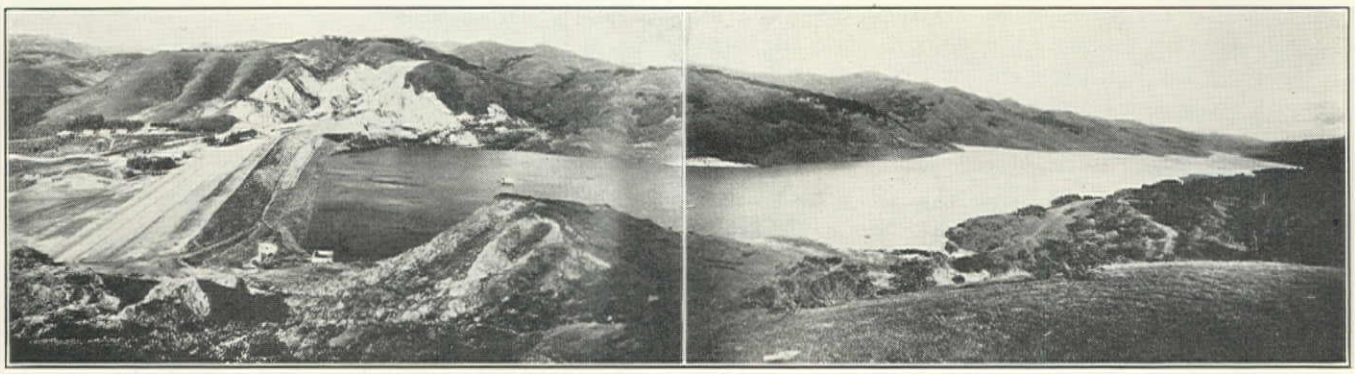
Laying 12-in. 'Ward Joint' Cast-Iron Pipe Main Across Alameda Estuary Between Oakland and Alameda

the so-called business districts, are made during the night. Large areas are never shut off during the day, except in cases of emergency. Smaller districts may be without water for short periods during the day, but only after the consumers have received a written notice a reasonable time in advance. Fire departments are always notified when hydrants are out of service either for ordinary shut-downs or when emergencies arise, necessitating the closing down of any part of the system. All fire alarms are reported to the general offices through a regulation signal system and general alarms are ordinarily responded to by a member of this department, either day or night.

All Paving and Resurfacing, as well as most concrete base, is cared for by this department. During the year 1928 individual repairs were made ranging in size from a few to several thousand square feet. In all, a total of 830,438 sq.ft. was repaired. Patent pavement repairs are contracted to one of the local firms; for convenience these are usually awarded to the one having the city work. We find that by doing our own paving many criticisms are avoided. Rarely does a construction crew finish its work before a paving crew is starting to resurface, and while public sentiment enters considerably, the actual saving in cost amounts to many thousands of dollars yearly. Our paving equipment consists of 6, 8, and 10-ton rollers, six oil tanks, eight heavy-duty dump trucks, and one oil tank and pumping outfit mounted on a 5-ton truck. This branch of the department has a personnel of about 25 men.

Emergency crews are constantly maintained for night and Sunday work, two crews reporting every night at 4:00 p.m. and working until midnight, and one crew reporting at midnight and remaining on duty until 8:00 a.m. Three regular day maintenance crews work all Sundays and holidays, these foremen and two men from their respective crews alternating for Sunday duty. Outside of extreme emergencies, no man is permitted to work more than 8 hours in one 24-hour period. Regular equipment is maintained for night crews. This equipment is painted white with orange running gear, making an outfit that can be readily distinguished even on the darkest night. The trucks are also equipped with both stationary and portable flood lights, making night work practically as safe as day work. Many of the maintenance and construction foremen keep their motor equipment at their place of residence and, as these trucks usually contain emergency tools, fittings, gate keys, lanterns, etc., extra men may be called at a moment's notice. While the distribution system is probably 65 miles in greatest length, there is hardly a spot that cannot be reached in 30 minutes, either day or night.

Much equipment is necessarily in use. This department has at the present time about 50 trucks (ranging from Ford pick-ups to 5-yd. rock trucks), four portable compressors mounted on 1-ton or 1½-ton trucks; six rollers, six hot oil tanks, one tank wagon, three trenching machines, seven tractors, one portable electric generator, and numerous portable pumps.



SAN PABLO HYDRAULIC-FILL DAM BUILT IN 1921; 165 FT. HIGH ABOVE STREAMBED; 1230 FT. LONG ON CREST; 50 FT. WIDE ON CREST; CONTENTS, 2,250,000 CU.YD.; RESERVOIR CAPACITY, 43,000 ACRE-FEET

The construction and operating department, functioning directly under the district's construction engineer, C. R. Manbert, is composed of myself as superintendent; P. J. Horan, assistant superintendent in charge of operation and construction; B. E. Carroll, assistant superintendent in charge of maintenance; Raymond Lange, in charge of office records; and Kathryn Gede, secretary, assisted by Florence McGrath and Helen Creighton.

Cast-Iron Service Pipe in Los Angeles

In January, 1924, the Bureau of Water Works and Supply, of the city of Los Angeles, began the use of small cast-iron service pipe under varying conditions. Satisfactory results were obtained from the first installations, and this type of service pipe has been adopted as standard. Within 4½ years from January, 1924, Los Angeles purchased 1,280,000 lin.ft. of 2-in. cast-iron pipe, of which 1,120,000 lin.ft. was installed. This installation was at the average rate of 250,000 lin.ft. of service pipe per year. Of the 1927 and 1928 installations, 323,000 lin.ft. of 2-in. service pipe was furnished by the Pacific States Cast Iron Pipe Co., of Provo, Utah.

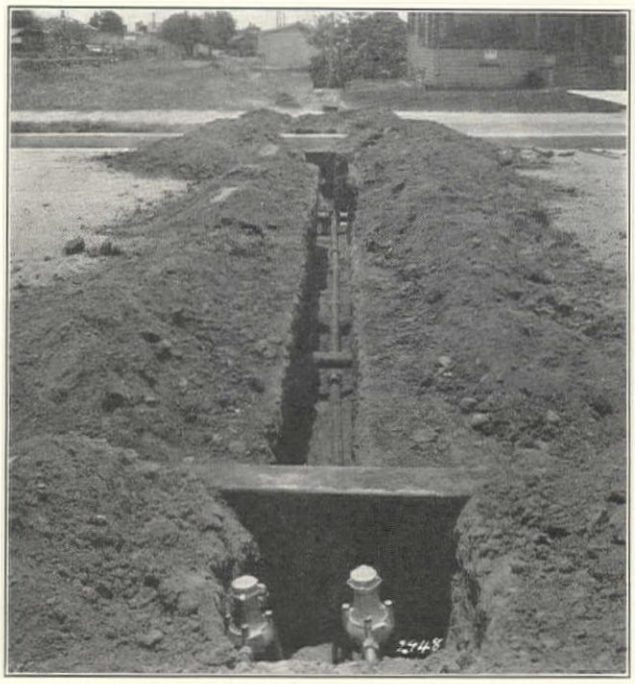
Developments—Until the past seven or eight years, little 2-in. cast-iron pipe was manufactured in this

Pile of 2-in. Cast-Iron Pipe for Service Connections of East Bay Municipal Utility District, Oakland, California

country. Much of the American pipe was made in weights and by processes which resulted in high costs. In recent years, the developments in foundry practice have extended to small cast-iron pipe and have resulted in a desirable service pipe of moderate cost. The establishment of a plant near the Pacific Coast has materially lowered the cost of delivering the product.

The installation of cast-iron service pipe is made simpler by casting in 5-ft. sections. This provides sufficient joints to give flexibility to the line and to facilitate handling. The pipe has 2-in. inside diameter, ¼-in. wall thickness, weighs approximately 6 lb. per ft., and will stand 350 lb. working pressure. It is available in bell and spigot, bell and thread, spigot and spigot, and with either open bell or factory-made precaulked joint. Opposed bosses are cast on every section to allow for easy tapping.

Method of Connection—In Los Angeles the 2-in. service pipe is connected as follows: The piece entering the curb is equipped with a standard 2-in. pipe thread. The inside diameter of the pipe at the thread end is slightly reduced in the internal diameter to compensate for weakening at the thread. From the curb piece to the main, bell and spigot pieces are used. The fill-in piece between the bronze corporation cock and the bell and spigot section is made with a piece of double-beaded 2-in. cast-iron pipe to prevent slipping. This double-beaded pipe is in standard 5-ft. lengths with a single bead on each end and double beads spaced 7½ in. apart. The pipe is cut between the double beads, which gives nearly the length required; adjustment being made inside the curb. The bronze corporation cock has a bell end to take the 2-in. cast-iron pipe and a 2½-in. iron pipe thread to screw into the saddle on the main. The threaded piece entering the curb is equipped with an extra heavy galvanized iron 90-degree elbow and an extra heavy galvanized iron riser, on the top of which is screwed a 2-in. extra heavy galvanized iron tee fitted with bronze bushings according to the sizes of the services required. Each joint of the pipe, when it is not bedded on the bottom



Laying 2-in. Cast-Iron Water Service in a Street in Los Angeles, Feeding Two Lots Through ¾-in. Trident Metered Services

of the trench, is cradled on blocks placed under the bell to insure perfect alignment, support the pipe, and prevent settlement while being puddled and backfilled. The end of the service pipe inside the curb is also blocked back of the ell.

This installation provides for two ¾-in., two 1-in., and two 1½-in. services. The ¾-in. services may be enlarged in the future, if desired, to a 1-in. and a 1½-in. or a single 2-in. service. The necessity for enlarging services due to the change of use of property is an important item, especially in a growing city. With services up to 2-in., this may be accomplished at a

small cost and without digging into the street. The 2-in. service pipe is installed 2 ft. off the property line and the connections inside the curb are set 8 and 12 ft., respectively, along the curb from the 2-in. pipe. This makes the location of the meters 10 ft. inside the property lines. The location of the 2-in. service pipe does not conflict with the placement of poles or fire hydrants, and the meter location does not interfere with private driveways. By the use of 2-in. cast-iron pipe from the main to the curb for the supply of small services, appreciable friction loss through the small service pipes is eliminated, especially where the service crosses the street. Lead joints are used exclusively and are of three types, the prepared or 'precaulked' joint furnished with the pipe by the manufacturer; pure lead strips, two required to the joint, each strip $\frac{3}{16}$ in. thick, 1¼ in. wide, and 7.85 in. long; and the poured joint, made by standard practice.

Advantages—The favorable elements in the use of this 2-in. service pipe are found to be: strength and durability; self-protection against corrosion and marked resistance to electrolysis; adequate capacity for satisfactory service and consequent reduction of loss of head over smaller sizes; small incrustation; not injurious to health or to esthetic taste; simple installation and low cost (since only one tap is required in the main), only one box is required with an outside meter-setting, the maintenance of connections under pavement is reduced, meter readings can be made quickly; and the fact that both mains and services may be purchased at the same source.

The 2-in. service has a growing use in parallel or dual mains in residential districts. In such cases a larger main, of adequate capacity for full fire protection in the area, can be laid on one side of the street and the service lines then laid on that side. A parallel 2-in. main can then be laid on the opposite side of the street, preferably in the parkway back of the curb, with tie-in lines to the larger main at street intersections. This small parallel main will carry all residence service pipes on its side of the street. In this method only at one point in the block is it necessary to run a water line across beneath the pavement; also, equal water pressure is given on both sides of the street.

Other California installations of 2-in. cast-iron service pipe include: 49,450 lin.ft. in various suburban communities around Los Angeles; 13,700 lin.ft. in Pasadena; 33,300 lin.ft. in Oakland; 54,900 lin.ft. in Long Beach. In the three years since the establishment of the Pacific States Cast Iron Pipe Co. plant at Provo, Utah, the use of this 2-in. service pipe in all of the eleven far western states has steadily grown.

H. A. Van Norman is general manager and chief engineer, F. E. Weymouth is chief hydraulic engineer, George Read is superintendent of the water and service division, and Wm. W. Hurlbut is office engineer of the Bureau of Water Works and Supply of the city of Los Angeles.

Crenothrix

Some New Hypotheses Which Upset Accepted Theories as to What Produces This 'Bugaboo' of the Waterworks Superintendent

By CARL WILSON

Director, Biological Laboratory, Department of Water and Power, City of Los Angeles

Crenothrix is a relatively new and little understood subject to the water works man, yet it is likely to cause him consternation when he learns that it has invaded his system. To him it means bad water and vociferous complaints, but if you ask him what it is, he will be hard put to answer your question. Perhaps he will tell you it is an 'iron bacterium', and that it lives in iron-bearing waters; but his knowledge of it as an organism will probably end with that statement. What else is there to know about crenothrix and what are the conditions that encourage its growth? David Ellis has written a most interesting book upon the subject, as has Edmund Cecil Harder, while numerous shorter papers are available; but careful study of these works reveals the fact that none too much is known about this energetic troublemaker, and, consequently, any actual observations which add, even in slight measure, to our meagre knowledge must prove interesting and useful.

This much seems to be certain; that the presence of iron, manganese, or aluminum in small amounts is necessary to its manifestation, but those who undoubtedly know the most about the subject are not at all in accord as to how or for what purpose it uses these metals. The statement has frequently been made that at least one part of iron in five million parts of water is required to promote growths, but I have found one case in which crenothrix flourishes in a water which contains only one part of iron, as Fe, in forty million parts of water. Moreover, the iron in this water is not naturally present there, but is added in the process of purification. Surely, here is food for thought. The facts, presented in orderly array so that they may be intelligently appraised, are as follows:

The supply in question belongs to the Los Angeles Department of Water and Power and is used in the Wilmington area. It is a ground-water derived from wells ranging from 350 to 900 ft. in depth, and it has been in constant use for over twenty years without having once shown evidence of crenothrix growths, or any of the troubles which invariably accompany them. The water travels underground for some thirty miles from the mountains toward the ocean, and grows progressively harder as it approaches the wells. This fact is abundantly demonstrated by samples from wells along the line of movement. Wells between Wilming-

ton and the mountains, and at some little distance from sharply defined waterways, do not produce uniform waters; in fact, they are liable to be decidedly different. It is impossible to determine before drilling whether a new well will produce good water or iron, manganese, or sulphur. This irregularity is generally assigned to the numerous cycles of upheaval and depression to which the coastal plain has been subjected during geologic ages, resulting in lenticular deposits of various sorts which have been irregularly laid down, sometimes brought by fresh water from the mountains, and at others deposited under shallow arms of the ocean.

Underlying the Wilmington and Long Beach area are extensive beds of peat, through which the water must percolate on its way to the wells. These beds exert an effect upon the ground-water which is quite similar to that of the oil measures; that is to say, calcium and magnesium are almost completely replaced by sodium, while sulphates give way to bicarbonates. Of course, much organic matter is dissolved out of the peat, giving the water a beautifully rich, though hardly desirable, amber hue. Methane is abundant, even to the danger point, for many wells produce so much of this gas that it will burn with a flame several feet high. Hydrogen sulphide is also likely to be present, but it has never caused trouble at the Wilmington plant. Iron, manganese, and aluminum are not present in these wells in quantities as large as one in fifty million.

Because of the high color (125 p.p.m.) and the poor keeping qualities of the water, it was thought desirable to attempt purification, and a great deal of experimental work has been done in the search for a practical process. Aluminum sulphate proved unsatisfactory, as did many other methods, but a combination of this chemical with potassium permanganate was better. Complete color removal could be obtained, but at prohibitive cost, and it seemed impossible to remove the last traces of the added manganese. Finally, ferric chloride alone, and in economical quantity, was found to be successful, with many rather unexpected advantages. The residual iron was only one in forty million, at which low level it was easily held. So little iron was believed of no consequence. An experimental treatment plant with a conventional capacity of 72,000 g.p.d. was built and placed in operation. The effluent was apparently perfect in color, odor, taste, and keeping qualities; but it was soon found that copious growths of crenothrix appeared in the treated water when allowed to stand in glass-stoppered bottles for three days. No similar experience is to be found in the literature, and the explanation of this phenomenon must be of value to the profession. My views, as given below, are offered, not as an explanation, but as suggestions which it is hoped others may criticize, or, if possible, verify.

Is it not possible, nay, probable, that crenothrix may manifest itself differently under change of environment? This is observed to be the case with many other organisms. Some writers assert that iron cannot be utilized as a source of energy—others say only ferrous bicarbonate can be so used, but assert that in the absence of this iron compound no growth of crenothrix can be obtained. Other investigators state that iron must be present in the organic form, and that only the organic radical is used by the organism, the iron itself being rejected and deposited upon the sheath of crenothrix more by accident than by intent. In our case, the iron added to the water in the course of purification is in the form of ferric chloride, which has never been considered available to this organism.

Considering the above facts, is it not reasonable to assume that crenothrix has always been present in these waters, but that it has escaped observation because there was no iron to produce its familiar manifestations?

Complete sterilization of the filter by strong chlorine solution allowed to act continuously for a week, eliminated crenothrix from the effluent for a few days, but it promptly returned, and remained constantly present unless restrained by continuous dosages of copper sulphate or chlorine.

The literature is replete with experiences which show that crenothrix troubles have followed the admission of swamp water to wells, and the inference that the organism normally lives in swamps, although not apparent in its familiar form, seems all but proved. I had a personal experience with a well in Long Beach, California, which unmistakably was infected by such a process. Swamp water was blocked out of this well by a new casing, following which the well was successfully sterilized by the heroic use of copper sulphate, and crenothrix has never reappeared.

The Wilmington wells all penetrate peat deposits which are really only deeply buried swamps, and it seems to me that crenothrix may have been laid down with the peat to remain there until the present time, but masquerading in some phase of a life history, at present not entirely unknown. We find cellulose-splitting bacteria in the water from these wells, without doubt the descendants of those which flourished in these bogs ages ago, and if they have survived, why should not crenothrix?

Further evidences of the present day activities 'in situ' of these cellulose-splitters, is the presence of hydrogen sulphide and methane in these waters. The chain of evidence supporting this hypothesis is not complete, but it seems strong enough to invite the search elsewhere by other workers for its corroboration.

Stewart Mountain Dam

Completion of the Stewart mountain dam of the Salt river project, Arizona, is scheduled for March, 1930. This dam, to cost $2,300,000, is of the variable-radius, arch type, with a gravity section on the west and an overflow section on the east end. There will be 100,000 cu.yd. of concrete in the dam.

The overall length is 1200 ft., the spillway length 400 ft., the height from bedrock is 180 ft., and the elevation of the crest is 1535 ft. above sea level. With an area of 1300 acres and a length of 10 miles, the capacity of the storage reservoir will be 70,000 acre feet. The drainage area is 100 square miles; a spillway capacity of 150,000 c.f.s. will be provided. The power plant will have a capacity of 15,000 hp. under 116 ft. head.

ELEVATED TANK FOR SEATTLE

Seattle is supplied with water from Cedar river, the point of diversion being at Landsburg, about 25 miles from the city. The water is conveyed from the intake to Lake Youngs in two gravity pipe-lines, 12 miles long, one of 44-in. and the other of 60-in. diameter. Lake Youngs is a natural impounding reservoir with an area of 600 acres and a usable capacity of 13,000

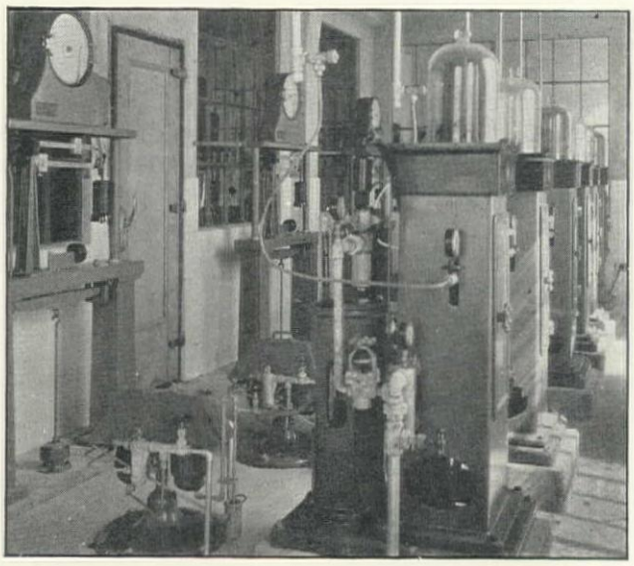


Fig. 1. Three Duplicate Sets of Wallace & Tiernan Full Automatic Vacuum Solution Feed Type 'ASVM' Chlorinators at the Lake Youngs Control Works of the Seattle Water Supply

acre feet. From Lake Youngs, the water goes through a tunnel, two miles long and of 8-ft. internal diameter, to controlling works. Here it is passed through screens in the standpipes shown in Fig. 2, and is chlorinated. From the controlling works, water is taken to the city reservoirs by gravity pipe-lines, 42, 52, and 66-in. diameter and 18 miles long. A relatively small amount of water is redistributed to standpipes from booster stations. The daily water consumption in Seattle is 104 gal. per capita.

An elevated steel tank was constructed at the control works solely to furnish water under 125-lb. pressure for operating Wallace & Tiernan full automatic vacuum solution feed type 'ASVM' chlorinators. These machines are installed in duplicate on each of the three pipe-lines and are actuated through the use of venturi tubes. They can be set to dose at a certain rate in parts per million and will automatically vary the dose to maintain that rate, regardless of the volume of water flowing through the line. There is but one other similar and larger installation on the Pacific coast, that one being at Los Angeles. Water is pumped from the transmission mains to the tower by two Worthington triplex pumps, each with a capacity of 120 g.p.m.

The tank was fabricated and erected by the Chicago Bridge & Iron Works. Erection was completed May 31, 1929, the work being in charge of J. W. Fitzgerald. The structure has a capacity of 100,000 gal. and is 245 ft. to the bottom. Although this particular installation is probably more than twice as high as the average elevated steel tank, standard design and construction were used throughout. The tower is of 4-post design, and consists of seven panels of post sections built up from 15-in. channels, with a plate on the inside and latticed bars on the outside. The standard pitch of 1 in. per ft. was used.

The tank shell has a diameter of 28 ft. 8 in. and is 16 ft. deep. The bottom is ellipsoidal in design and has a maximum depth of 7 ft. 2 in. The riser pipe, 3 ft. 6 in. diameter, is built of steel plates of the same quality as those used in the tank and is riveted directly to the bottom of the tank so as to support a portion of the water load.

The entire structure is of riveted construction. The tower post sections, balcony, and other small units were riveted up in the shop and the rest of the riveting was done in the field.

W. D. Barkhuff is the city engineer and T. H. Carver is the water supply engineer of Seattle. W. B. Severyns is the superintendent of water.

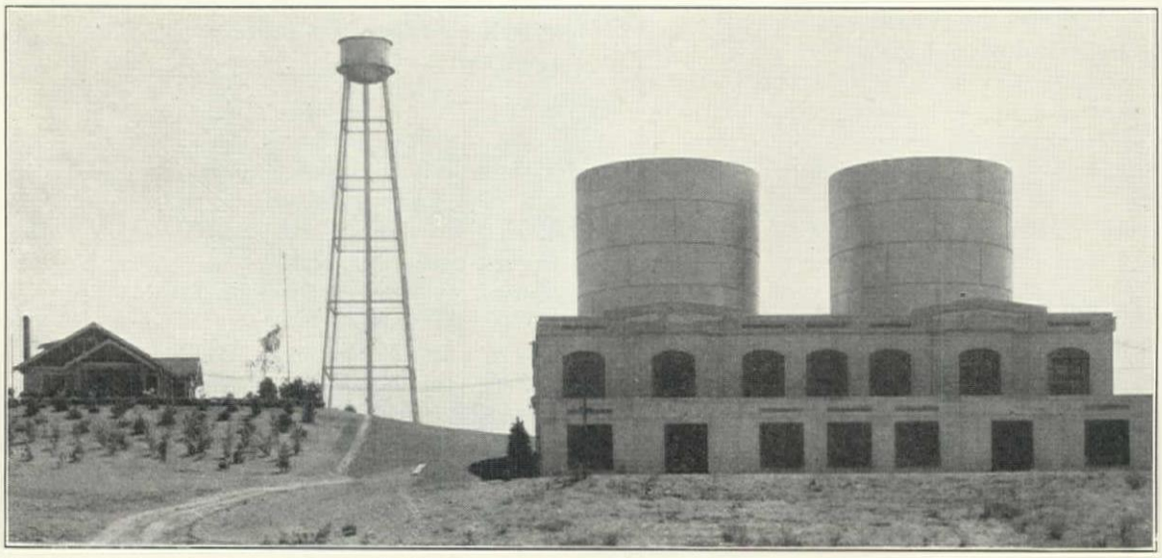


FIG. 2. LAKE YOUNGS CONTROL WORKS SHOWING STANDPIPES AND 245-FT. STEEL TANK, CAPACITY 100,000 GAL., FOR FURNISHING WATER TO OPERATE CHLORINATORS

Larner-Johnson Pressure Regulator

By Ray S. Quick*
Executive Engineer, The Pelton Water Wheel Co., San Francisco

Among the essential characteristics of a successful regulator for water works distribution are:

1. Conversion of a variable upstream pressure into a constant and adjustable lower downstream pressure, while handling all demands within the capacity of the supply line.
2. Travel of the main plunger element made adjustable and so limited in rate as to protect effectively against objectionable water hammer surges.
3. Absence at all openings of any periodic chatter, slamming, or vibration which would impair or endanger the service or equipment.
4. Design such that ample forces are available for operation.
5. All sliding contact surfaces to be lined with rustless materials so that corrosion and its products will not interfere with the normal operation of the mechanism, or reduce unduly its economic life.
6. Accessibility of control elements for inspection, maintenance, and the removal of debris.
7. Minimum loss of head and obstruction to flow when in the wide open position.

Pressure Regulation—In the smaller sizes where the forces to be handled are small, direct operation of a regulator valve is possible with a spring-loaded diaphragm or piston of suitable long wearing properties. However, as the sizes or pressures increase, it is necessary to employ a main plunger or relay element which is under the control, at all times, of a small capacity, sensitive pilot or pressure governor. The method of control must be such that the operation is stable and economical in the use of control pressure water.

The Larner-Johnson hydraulic valve, which has demonstrated its unique characteristics so favorably in the water power and irrigation fields, has been adapted to pressure regulator service and should have wide application in major installations such as high pressure feeder lines discharging at constant downstream pressure into distribution net works. Due to its hydraulic balance, the Larner-Johnson valve can be built in the very largest commercial sizes, making a compact installation, and having ample forces at all times for operation, since it uses hydraulic pressure within the line. Mechanically operated valves, on the other hand, become increasingly difficult to design and operate since the forces grow larger with increasing size and pressure.

Description of Regulator—Fig. 2 shows the shop view of a Larner-Johnson regulator having an 8¾-in. inlet and a 12-in. outlet. The valve body is cylindrical in shape and forms a direct, straight flow portion of the pipe-line in which it connects. The operating cylinder is concentric with the body and is supported within it by integral struts, thus forming an annular passage for the normal flow. The water flow passages are stream-lined and offer a minimum of obstruction to create turbulence and resulting loss of head. The operating cylinder, closed at the downstream end, contains a differential area plunger which seats against a ring in the upstream end of the valve body when

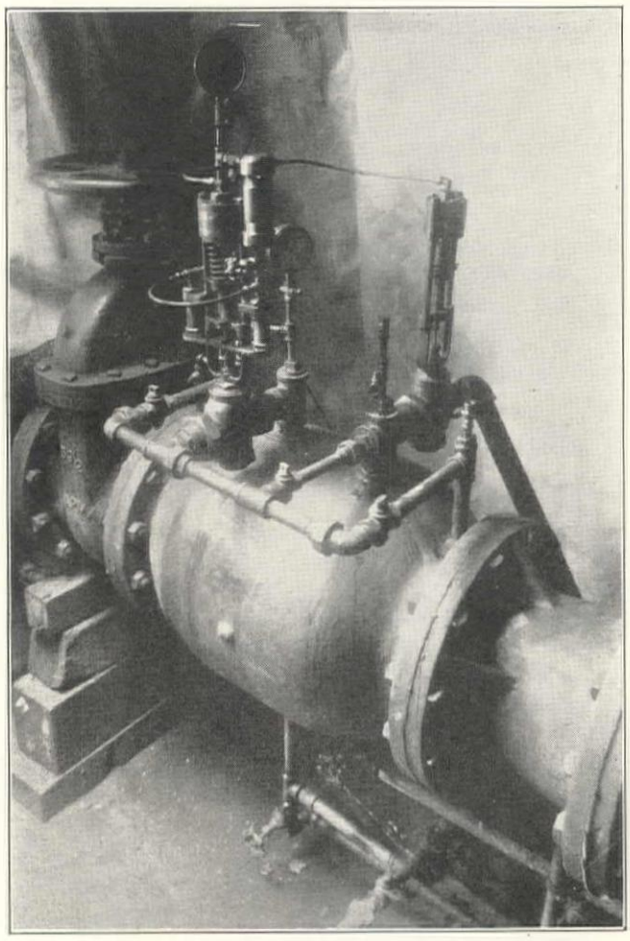


Fig. 1. Larner-Johnson Pressure Regulator Serving Presidio Heights District of the Spring Valley Water Co., San Francisco

in the closed position. The movement of this plunger results from hydraulic forces on the cone and within the operating chambers of the cylinder. The plunger moves against the flow when closing. Since all principal elements of the valve are circular, there is no tendency for distortion or binding, resulting from hydraulic forces.

The operating pressure for the cylinder is taken from the upstream conduit through suitable external duplex strainers and a throttling orifice. The discharge from the operating chamber passes into the downstream conduit and is regulated by a control pilot

*Associate Member, American Society of Mechanical Engineers.

whose position is fixed by the downstream pressure. This pilot is of special construction to eliminate all objectionable friction and any tendency of the valve to bind. It is adjustable and operates over a small range in pressure corresponding to the changes in demand. The auxiliary pilot, actuated by the same downstream pressure, produces emergency closure whenever that pressure reaches an adjustable amount slightly above the one of the control pilot setting. This device operates only on rare occasions, such as when some obstruction is lodged in the main valve or its control pilot.

Taking a leaf out of the book of long experience with the operation of hydraulic speed governors, a novel and reliable restoring mechanism has been incorporated in the design of the pressure regulator so as to prevent any tendency for periodic surges, and to increase the stability by damping out any such disturbances initiated by sudden changes in water demands. This device, consisting of a compensator with dual dashpots and adjustable bypass, is shown in Fig. 2.

Such a mechanism provides an absolute safeguard against any sudden plunger movements, but permits the normal relations to be performed promptly at an

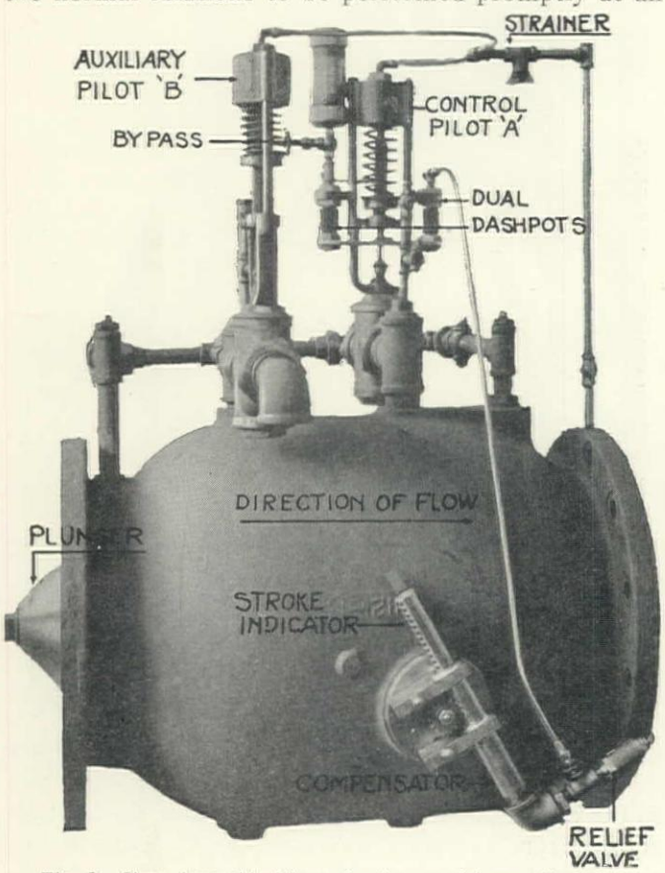


Fig. 2. Shop Assembly View of a Larner-Johnson Pressure Regulator

adjustable rate which suits the surge period of the system. A relief valve protects the compensator against undue pressure which might arise with abnormal operation or adjustments. An indicator showing the plunger position is built into the device.

Maintenance Features—Any mechanism such as a pressure regulator may on occasion require overhauling for maintenance or the removal of silt or debris carried by the water. Consequently, where such a device is the sole control of an esential continuous supply, duplicate regulators should be installed in parallel so that either may be removed without interfering with service.

The pressure water to the control and auxiliary pilots, and to the operating chambers, should be strained to prevent the entrance of debris. If raw water is being handled where silt and debris are frequent, then adequate trash racks, strainers, and settling basins should be employed at the inlet of the main feeder line as well.

An interesting installation of the Larner-Johnson regulator has been made for the Presidio heights dis-

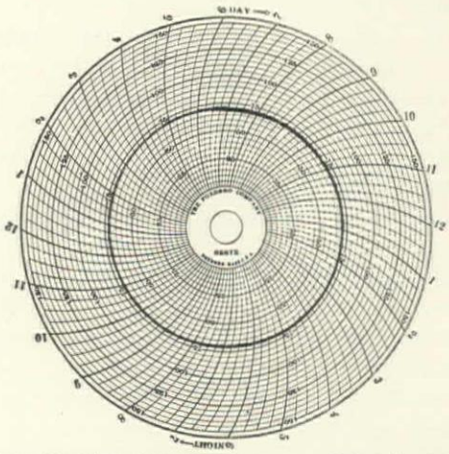


Fig. 3. Chart Showing Constant Pressure Maintained for 24-Hour Period at Downstream End of Larner-Johnson Regulator (Taken from Recording Gauge)

trict of San Francisco by George W. Pracy, superintendent of city distribution, Spring Valley Water Co. Two 12 by 8¾-in. regulators are installed in parallel in a special pit constructed at the intersection of Washington and Lyon st. An actual view of one of them in service, being the same valve as shown in Fig. 2, appears in Fig. 1. The feeder line is about 31,000 ft. long, starting at the Central Pumping Station, and consists of 24, 20, and 16-in. plate steel pipe. This line serves several districts near its start and has floating on it the Stanford heights reservoir and Clarendon heights tank, the static head at the pressure regulators being about 140 lb., with distribution into the Presidio heights net work at 75 lb. per sq.in. While the primary object of the regulator is to maintain a constant downstream pressure of 75 lb., in following the changes in demand, it is fully appreciated that a sudden closure of the regulator might produce a serious pressure rise due to water hammer in the feeder line. For this reason the controls are proportioned so that the rate of closure at all times is within permissible limits.

The downstream end of the feeder line connects with a Y having 45-degree outlets, which, through corresponding elbows, connect again to the regulators. Shut-off valves are placed at upstream and downstream ends of the assembly for convenient handling.

One regulator is of ample capacity to handle the requirements of the district, estimated at 6 million g.p.d. Fire demand during peak load may increase the flow to about 9 million g.p.d. for a short period.

The first of the two regulators was placed in service

on May 8, 1929. Fig. 3 and 4 show performance charts for a 24-hour period; these record the upstream and downstream pressures and plunger travel. Close pressure regulation throughout the entire period is apparent, as well as the absence of periodic surges. As the natural oscillation period of the feeder line is a few seconds and the complete chart represents 24 hours, it is evident that surges would produce a broad upstream pressure line. The fact that this line is narrow and follows the changes in head corresponding to demand, indicates a desirable operating condition.

Flexibility of Device—The Larner-Johnson pressure regulator may be adapted, by suitable modification of certain details, to various special control services. For example, by making the pilot responsive to upstream pressure, the device becomes a pressure relief valve or upstream pressure governor. Again, by making it responsive to the velocity head in the conduit, the device becomes a flow controller. Throughout this variety of services, the precise, powerful, and economical characteristics maintain, thus extending the usefulness of the Larner-Johnson valve over an ever widening field.

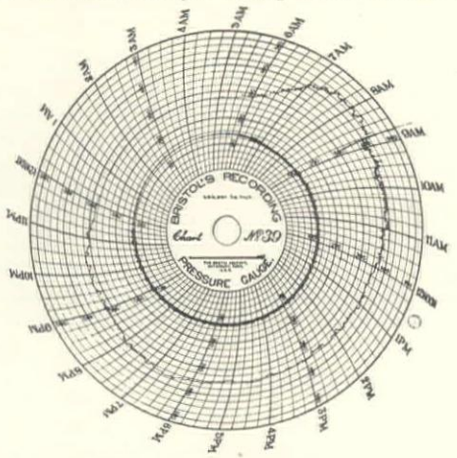


Fig. 4. Chart from Larner-Johnson Pressure Regulator. Outer Curve Indicates Movement of Valve Plunger, the Inner Circle Showing Upstream Pressure. No Evidence of Periodic Surge

OGDEN TYPHOID EPIDEMIC

Ogden, Utah, a city of 30,000 population, suffered a typhoid epidemic in late June and early July, probably of water-borne origin. Ogden takes its water supply mainly from 44 artesian wells, ten miles distant from the city. During the summer months, beginning in June, this supply must be augmented by water from Wheeler creek, seven miles from the city, which has a normal flow of 3,000,000 g.p.d. The Wheeler creek auxiliary supply rises in springs in a canyon much frequented by people.

Before the typhoid outbreak, the creek water was mixed with artesian water in a ratio of one to five, respectively; neither supply being protected by chlorination. This mixed water was then delivered by gravity to a distributing reservoir on the edge of the city, where a two-day supply could be stored.

About one year ago, the State Board of Health failed to certify Ogden city water as meeting Treasury Department standards for railroads to use for watering dining cars in interstate traffic. This Board had found the Wheeler creek supply to be contaminated and had made recommendations that either its use be discontinued or chlorination resorted to (under the state law the Board has no legal authority to stop the use of a polluted water supply). At this time the city authorities agreed to discontinue the use of Wheeler creek water, although the local Wallace & Tiernan representative offered to loan sufficient chlorinating equipment to care for the situation during the period of water shortage. His offer was declined and the surface supply was turned out of the system. In the summer of 1928, and after Wheeler creek had been out of the system for two weeks, samples taken from various parts of the city still showed that the water was contaminated. Nothing, however, was done.

During the past winter, and after pressure from the railroads, city authorities stated that Wheeler creek water would not again be turned into the city supply without chlorination; also that they would so maintain the system as to reach Treasury Department standards and get certification from the State Board of Health. In June, 1929, one W & T type 'MSPM' chlorinator was ordered for the Wheeler creek supply, then said by local officials to amount to but 500,000 to 2,000,000 g.p.d. As this machine was stocked at Ogden, it was suggested that it be installed immediately and put in operation. However, construction of the chlorinator house was not begun until July 10 and in the meantime Wheeler creek water had been turned into the city mains. By July 13, a typhoid epidemic broke out, and again the city was offered the loan of W & T equipment, with which to chlorinate the entire water supply. In the meantime Wheeler creek had been cut out of the system. This offer was refused, as the commissioners did not feel that Wheeler creek was the cause of contamination, even though chlorination again had been recommended by health authorities.

By July 15 the number of cases and fatalities had increased and the W & T representative offered to use portable equipment and to sterilize all of the city mains in order to prevent further spread of the epidemic. This offer was also refused. In the meantime it was urged that people should boil their drinking water and take inoculations against typhoid. The Wheeler creek chlorinator was installed and ready for operation by June 14, but it was not connected by the city until June 25, and then only for a working test. By the 26th of the month, the reservoir level was so low that it was decided again to put in Wheeler creek water, and the chlorinator was set in operation.

Subsequently, and following inspection and recommendation by an official of the U. S. Public Health Service, two W & T type 'MDPM' dry-feed chlorinators were ordered for use in treating the entire supply at the point where it enters the reservoir.

The typhoid has not been definitely traced to city water (contaminated food being one suggested source) but the evidence shows that on June 10 and 11 and on June 16 and 17, rains occurred on the Wheeler creek watershed. These rains were followed by two distinct typhoid outbreaks, occurring after an interim equivalent to the usual incubation period. No cases occurred before the end of the first incubation period and none following the second rain.

How the Press Can Help the Water Works Superintendent*

By PHILIP SCHUYLER†

Water is the most precious of all our commodities. Without it we could neither physically exist nor materially thrive. Unfortunately, it is the least appreciated and understood. Water is just water to the big majority, and is taken for granted. If it is clear and cold and palatable and pure, it is merely what it ought to be. Does the water works superintendent get any particular credit for it? No. But if anything goes wrong, how quickly he is censured.

The water works superintendent holds a position of great responsibility, as he is to a large extent the 'guardian angel' over the health of every man, woman, and child in his community. Therefore, he should be accorded the distinction he deserves, and should receive a salary commensurate therewith. He should be allowed to travel and learn how water is produced, treated, and distributed in other communities; and also should be allotted a special fund for research.

Instead, the water works superintendent, except in the big cities, is expected to wear overalls all the time, and be on the job night and day; is required to be everything from purificationist to pick-and-shovel laborer; and at the same time be up-to-date on the thousand-and-one angles of water works practice; and all on a salary of $150 per month.

This all can be rectified if the public is properly enlightened; and it is up to each water works superintendent to educate the consumers on his system, and at the same time educate himself, so that the public will understand what water really is and will also appreciate the value of his services.

The water works superintendent must remember that success is based largely on good salesmanship. He has two things to sell—the 'story of water', and, 'himself'—if he wants to make a success of his water works, and secure greater remuneration. Toward accomplishing these ends, he has at his command the smallest tool in his kit—the pen—a tool mightier than the wrench. He should become as adept with it as he is with his other tools.

Therefore, the press—both popular and technical—can be of great help to the water works superintendent. First, through the medium of the technical periodical he can exchange ideas with superintendents in other cities, and thus rapidly increase his knowledge of water works practice; and secondly, he can take extracts from these periodicals and incorporate them in special articles to be published regularly in the local press or popular magazines, for the enlightenment and education of the consumers and public at large.

One of the best campaigns of publicity of which I know was the series of articles published by R. H. Corey, general manager of the Coos Bay Water Co., Oregon, in the local press about four years ago and republished in 'Water Works Engineering'. He told the public all the facts about the water supply, its treatment, and its distribution.

The consumers and the public should be informed on the following points:

1. **Source of Supply**—Whether it is adequate or inadequate; how soon an additional supply should be secured.

2. **Character of Water**—Whether hard or soft; its chemical analysis, and why it varies from season to season; why it is sometimes turbid and should be filtered; why it sometimes has an algae taste, and how difficult it is to prevent algal and crenothrix growths. Why a soft water is preferable to a hard water, and how much a soft water saves in the laundry, in heating systems, in boilers.

(While on the subject of water, the fact should be stressed that we know very little about water and its relation, chemically, to industry, health, and plant life. We do not know what combination of minerals in water are the best for the health of human beings and animals; or how they affect the various products of industry. We have determined only recently that the mineral characteristics of the raw-water supply have a direct bearing on sewage purification. Undoubtedly, the same relation exists toward some of the products of industry.)

3. **Storage Reservoirs**—Why adequate reservoir capacity, distributing as well as storage, is necessary. Of what the present storage consists, and why additional storage is necessary. How the source of supply and reservoirs are protected from pollution.

4. **Distribution**—Of what the distribution system consists; sizes and kinds of pipe. Why 'permanent' types of pipe of adequate size should be laid in preference to temporary lines of small size. The necessity for complete circulation, and control by sufficient gate valves. The big reduction in fire insurance rates accorded by the Fire Underwriters to systems rating A-1.

5. **Pressures**—What pressures are maintained in the distribution system, and reasons therefor.

6. **Filtration**—Why filtration is usually necessary. What filtration does and what it costs.

7. **Chlorination**—Why chlorination is essential; how it is applied; how it works; and that a taste of chlorine in the water instead of being harmful, is an 'insurance policy' against typhoid and other water-borne diseases.

8. **Operation**—Why the municipal water works should be entirely self-supporting; independent of all other functions of city government; and absolutely free from politics.

9. **Water Rates**—Give the public the detailed cost of producing and delivering water; show why the rates should be high enough to provide a fund for extensions and retirement of bonded indebtedness.

10. **Meters**—Why the 'all-metered' system is the only just method for the sale of water. How it reduces waste, conserves supply, and thereby keeps down the water rates. That meters can not over-register, but, when damaged or worn out under-register. Why water used in city parks, street flushing, fire-fighting, should be paid for by the particular department using it, in order that the water department will be on a strictly business basis.

11. Urge the consumers to visit the reservoirs, filtration and chlorination works, and pumping plants. Show them that a few dollars in beautification is money well spent.

12. In other words, take the public into your confidence, and they will back you with all the money you need. This is very important when it is necessary to 'put over' a bond issue. A carefully planned campaign of publicity will ensure success.

So much for the education of the public. Now, how

*Paper read at second annual meeting, Pacific Northwest Section, American Water Works Association, Spokane, May 17, 1929.

†Member, American Society of Civil Engineers, and American Water Works Association.

can the water works superintendent become better educated so that he can tell the public all of the foregoing, and also make his water works the equal to, or better than, any other water works?

He must remember that 'big oaks from little acorns grow', and that water works practice of today and the resultant modern water works have grown from the small 'acorn' ideas of thousands of superintendents.

Modern improvements are the result of the interchange of these experiences and new ideas. This interchange can be accomplished quicker and better through the medium of technical periodicals than by word of mouth only; although affiliation with the American Water Works Association, and attendance at all the conventions and participation in the discussions, must not be neglected.

This is the 'when' and the 'how' and the 'why' of the technical periodical. It is the medium at your command. Bear in mind that for every experience or new idea you pass on to the other fellow, you will get hundreds in return; or thousands if you all follow this method. Do not hesitate because you think you cannot write. Write it out in your own way, in pencil if a pen is not handy. Let the editor help you put it in shape.

Many times it is the short items that are the most valuable and interesting. Remember that what may be regular routine or common practice for you, may be an innovation to someone else.

Take your pen and get in print. You will make clients of your readers and put yourself in line for a better job.

Water Works Problems

How Do You Protect Your Supply Lines Against Side Hill Erosion, Stream Bank Cutting, or Bridge Washouts?

Editor's Note—It is the opinion of many engineers and water works superintendents that the water works problems of the eleven far western states are peculiar to this section and can best be discussed by the men in direct contact with them. Their solution is not always possible through application of the methods used in other sections of the country and now generally reported in national publications. **Western Construction News** invites from its subscribers material for a symposium on any practical subject of water works design, operation, and maintenance. Such discussions will be published at frequent intervals.

W. A. Kunigk,* superintendent, water division, department of public utilities, Tacoma (by letter):

The water division of the Department of Public Utilities of the city of Tacoma has two bad river crossings along the Green river gravity pipe-line that have required some river protection and maintenance work. The particular crossings referred to are the ones at White river, where the pipe-line crosses underneath the stream, and on the Puyallup river near McMillin, where the pipe-line crosses the river on a steel bridge.

Fig. 1 (upper left) shows the detail of a rock and brush mattress used near the White river crossing of the Green river gravity pipe-line. This type of construction was used to prevent further erosion along the pipe-line where the river had washed out a chan-

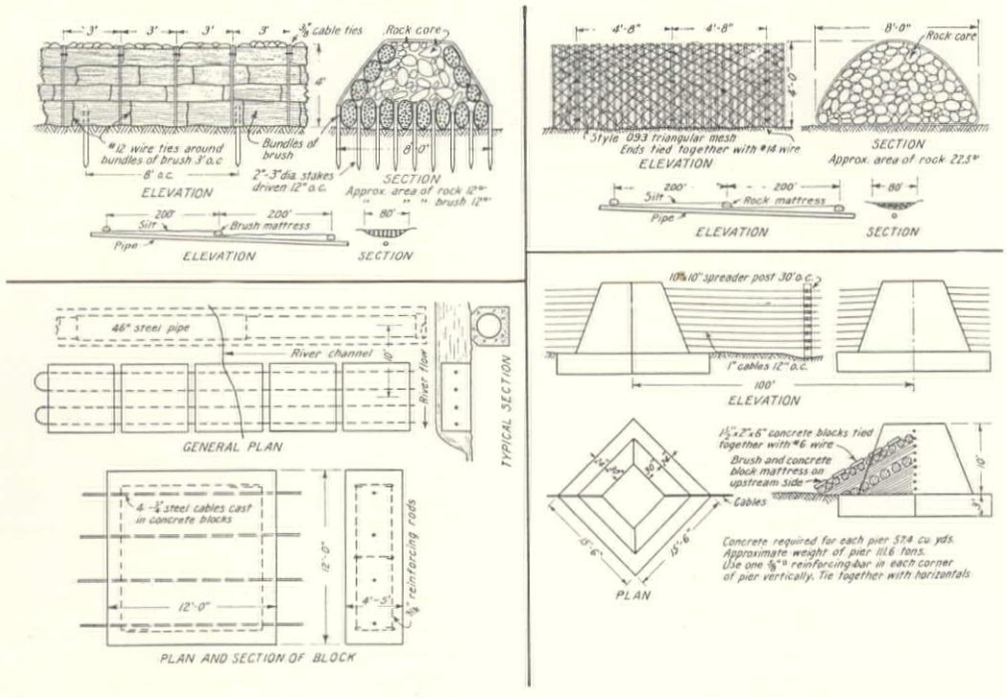


FIG. 1. METHODS OF PROTECTING WATER SUPPLY LINES FOR CITY OF TACOMA

(Upper Left) Detail of Rock and Brush Mattress for White River Protection Work. (Upper Right) Detail of Rock Mattress for White River Protection Work. (Lower Left) Design of Concrete Block Mattress for White River Crossing. (Lower Right) Design of Drift Barrier for Puyallup River Control

nel for several hundred feet, parallel to the pipe-line and from 40 to 80 ft. wide. Building these mattresses across the eroded channel about 200 ft. on centers stopped further erosion and, after several floods had passed, the backfill was restored by silting between these structures.

Fig. 1 (upper right) was used where rock was more plentiful than brush. One advantage of this type of mattress is that it can be built in running water without great difficulty. The wire mesh covering can be made up of one continuous sheet of sufficient length and width for a single mattress and rolled across the channel where erosion is to be stopped. The rock is then placed as shown, and the wire mesh pulled over and lapped over the top in the direction of the current and wired together.

At the point where the pipe-line of the Tacoma water supply passes under the White river, more substantial construction was necessary than is indicated by Fig. 1 (upper) on account of the high velocities in the river during floods at this location. At this point, the top of the pipe-line had been exposed and it became necessary to place a permanent flexible concrete block mattress across the river, about 10 ft. downstream from the pipe-line. These concrete blocks were cast 12 ft. square and 4 to 5 ft. thick, reinforced, and anchored together by four 1½-in. galvanized cables as indicated in Fig. 1 (lower left). Velocities in the river at this crossing were so high that rip-rap, consisting of boulders of 3 and 4 cu.yd. content, were readily swept away by the current. The first flood after the construction of this mattress restored the backfill over the pipe-line and no trouble has been had since this time.

Fig. 1 (lower right) illustrates the type of drift barrier that has been used successfully by the Tacoma water division to confine the Puyallup river to a permanent channel for a distance of about one-half mile above the McMillin pipe-line bridge.. Barriers of this type were built out from the eroded river banks approximately at right angles to the direction of the current and extending to the line that would form the outline of the permanent channel to be established. This type of structure, but without the brush mattress, has been used on inter-county river work for Pierce and King counties, Washington, by W. J. Roberts, consulting engineer, of Tacoma. On account of the sandy and silty conditions of the Puyallup river in this vicinity, quicker results were obtained wherever the brush mattress was added. The Puyallup river carries a large amount of debris, logs, stumps, and silt during flood stages and the silting-in process continues quite rapidly after the barriers have become tight.

M. M. O'Shaughnessy,* city engineer, San Francisco, (By letter):

The city is now concerned in building a main line aqueduct, 156 miles long, through the hills and mountains, in the shape of a tunnel of 10 ft. 6 in. diameter, and we are in no conflict whatever with surface activities. In the hilly portions, the aqueduct is so low as to be immune from surface movements, and in the valley portions we have inverted siphon pipes. The tops of the pipes are at least 3 ft. below the surface of the ground and the natural drainage is taken care of, so we have no erosion and no stream bank cutting.

Harry C. Jessen, city engineer, Salt Lake City, (By letter):

We have had no experience in this problem of protection. It so happens that the supply lines coming from the canyons to the city are laid through solid rock or material of which a large percentage is heavy, loose rock. There is, of course, no danger of erosion under such conditions. The conduits do not follow the streams and therefore stream bank cutting or bridge washouts also are not involved.

S. B. Morris,* chief engineer, Pasadena water department, (By letter):

In my opinion the subject is too general for definite treatment. Each supply line is a particular job in itself, involving topography, geology, culture, rainfall, and drainage existing in the particular case.

We have few supply lines in side-hill construction. We find them best protected where given adequate cover of earth. In some instances, we cover with wooden planking and, of course, aim to design bridges which will not wash out. Where necessary, we protect stream banks from erosion by proper rebutment.

F. W. Hanna,* chief engineer and general manager, East Bay Municipal Utility District, Oakland, (by letter):

We have no difficulties from any of these methods of destroying water supply systems, neither within the boundaries of the district nor on the main aqueduct outside of it.

*Member, American Society of Civil Engineers.

Natural Hot Water for Boise, Idaho

The General Water Works and Electric Corp., Fort Worth, owns and operates the Boise (Idaho) Water Corp. and Natatorium Co. Two wells, equipped with 10-in. deep well turbine pumps set at a depth of 160-ft., are bringing in 1,000,000 g.p.d. of water at a temperature of 170 deg. F. at the wells. This water is supplied to a swimming pool, said to be the second largest indoor natural hot water pool in the world; to public and private natural hot water and steam baths; and to some 200 premises for residential heating. The swimming pool has a capacity of 300,000 gal. and the water is continuously recirculated; it is coagulated, filtered, and sterilized every 16 hours.

The natural hot water supply has been in continuous operation for 39 years. It dates to 1890 when a 6-in. prospect hole was sunk to a depth of 400 ft. in a one-acre tract several miles east of Boise and close to the foothills. The natatorium was opened in 1892. Flat-rate charges are made for the service, as no satisfactory hot water meter has been found practicable.

Stanford University Swimming Pools

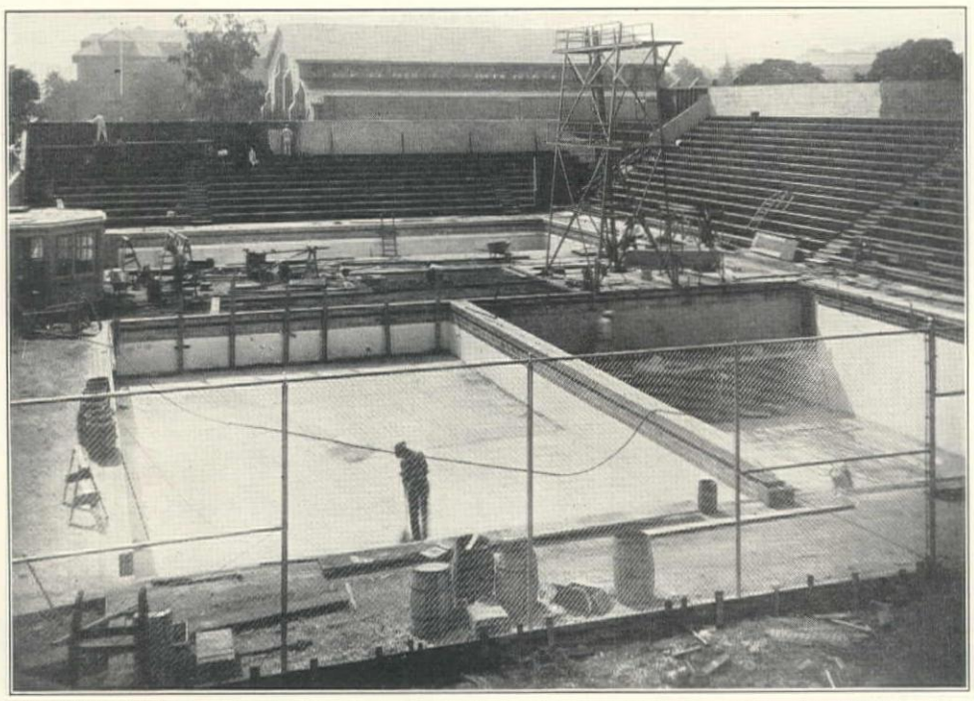
By ORVILLE H. TUCKER
Engineer, Board of Athletic Control, Stanford University

As a fitting tribute to Ernst Brandsten, director of swimming instruction at Stanford University, and to the class of champions trained under his direction, the Board of Athletic Control decided to place swimming among the important sports sponsored by the University.

Usually, swimming pools are designed to handle three classes of sports: swimming races, water polo, and diving. Owing to the popularity of each of these classes of sport at Stanford, it was decided that three separate pools should be constructed. The pools were built adjacent to each other in such manner that the bleachers which surround them allow adequate means for observing activity in all the pools.

Pool Arrangement—The class pool for swimming instruction is 33 ft. 4 in. wide by 60 ft. long, with an average depth of 4 ft. 3 in. The varsity pool, used for water polo and swimming meets, is 40 ft. wide by 75 ft. long, with an average depth of 6 ft. 9 in. The third pool, used exclusively for diving purposes, is 40 ft. wide by 60 ft. long, with an average depth sloping from 9 ft. 6 in. to 12 ft. at the spring boards and diving tower. The class pool and the diving pool are placed parallel to each other, the central wall being common for both pools. Extending at right angles to the diving and class pools, and separated from them by the diving platforms and promenade, is the varsity pool. Under the promenade is the mechanical equipment, including pumps, filters, and chlorinator. On the promenade above the filter room is the swimming instructor's office. This office contains the only access to the mechanical equipment. When any one of the pools is in use, an instructor will be present besides an operator for the filtration, heating, and chlorinating equipment.

There are no unusual features in the concrete construction of the pools, except that the common wall between the class and diving pools is designed to withstand water pressure at full depth when either one is empty. The walls and bottom slab of each pool are plastered with Medusa white cement. The scum gutter and curb are of green terra cotta tile, set flush with the face of the wall; the scum gutters being provided with outlets placed on 10-ft. and 12-ft. centers and drained to the main sewer. Around the pools are walks 10 ft. and 12 ft. wide, sloping away from the pool curbs, and provided with drainage. The curbs are not elevated above the pool walls, but are constructed with a non-slipping surface as a safety measure. An interesting feature is the sand pit adjacent to the pools and so arranged that bathers who use it can not enter the pools without first passing through showers.

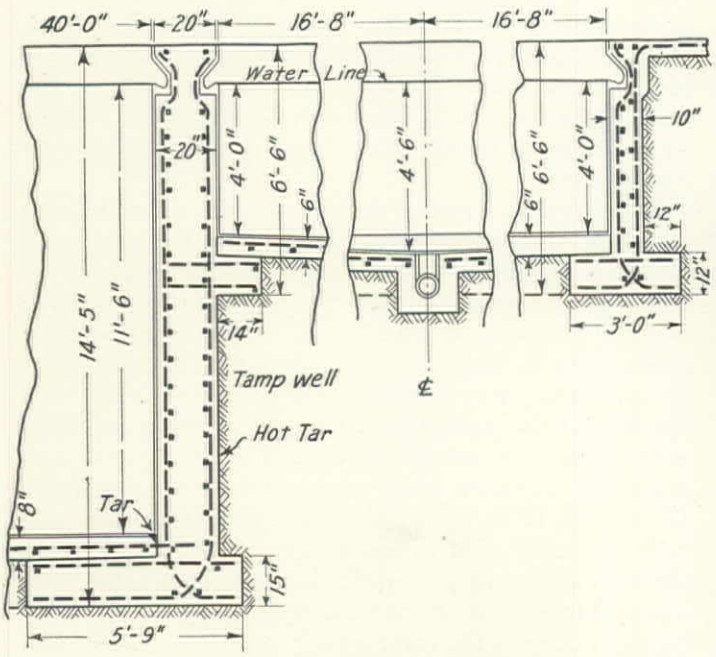


CONSTRUCTING NEW SWIMMING POOLS AT STANFORD UNIVERSITY. VARSITY POOL IN BACKGROUND, CLASS POOL IN LEFT FOREGROUND, AND DIVING POOL IN RIGHT FOREGROUND

Water Circulation and Purification—The pools are to be used by men students only, as the lockers, showers, and toilet room facilities of the men's gymnasium are adjacent to them and are most easily accessible. It is estimated that 300 to 400 students will use the pools daily; therefore ample provision has been

made for circulation and purification of water. The bleachers will accommodate 2200 spectators.

The water supply is derived from a deep well in the filter room. This well furnishes ample water for the pools and for washing the filters; it is arranged to discharge to the University standpipe at the power-house. The circulating system is so designed that water is withdrawn by a separate pump from the main drain

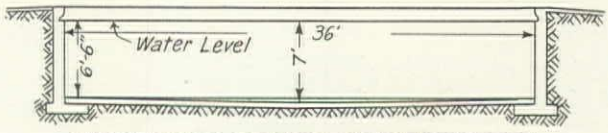


Section Along East and West Center Line of Diving and Class Pools, Showing Structural Details

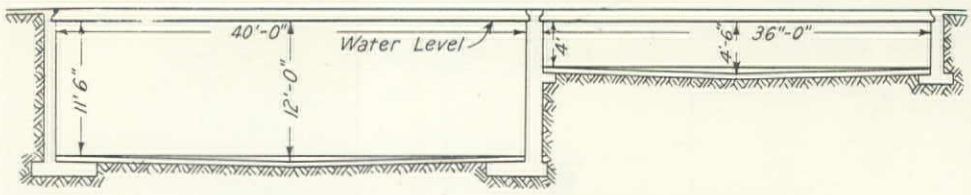
connection at the center of the floor slab of each pool. These separate pumps discharge through two horizontal pressure filters, each 8 ft. diameter by 16 ft. long. The pump and filter capacities are calculated for a complete turnover of each pool in 7½ hours. The filters discharge to a heater which is provided with by-pass connections so that the water can be circulated and heated to different temperatures. Filtered water then discharges to outlets below the water line in the walls on all four sides of each pool. This prevents short circuiting and gives a complete circulation of the entire pool. Each pool is provided with vacuum cleaner connections, also installed below the water line. These connections are at convenient points on all four sides, so that the bottom can be kept free from any accumulations of foreign matter. A Wallace & Tiernan type 'MSPM' solution-feed chlorinator is installed in the filter room. It is now connected to the filter discharge line, dosing into a common header for the three pools at the point where the water leaves the heater. A three-way distributor is now being considered by the Board. This would have a cock in each line and would discharge to each of three inlets in the respective pools, giving a controlled dosage which can be fitted to the varying bathing loads.

Personnel—The general layout and mechanical equipping of the pools was made under my direction. The contract for the concrete construction was performed by Grant Miner, of Palo Alto; mechanical equipment was furnished and installed by the California Filter Co., of San Francisco; the terra cotta tile was furnished by Gladding, McBean & Co. All contracts were performed on a time schedule so that the pools would be ready for service at the opening of the academic year on October 1. Thomas A. Storey is dean of the Department of Physical Education and Alfred Masters is general manager of the Board of Athletic Control.

The Director of Swimming and Two Stars at Stanford. On the Left, 'Dave' Fall, Center 'Ernie' Brandsten, Right 'Pete' des Jardine



LONGITUDINAL SECTION OF VARSITY POOL



LONGITUDINAL SECTION OF DIVING AND CLASS POOLS

Cracks in Burbank Reservoir

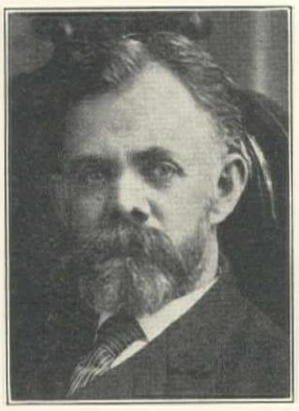
The 7,000,000-gal. municipal reservoir No. 4, at Burbank, California, developed four cracks on September 8. State and special consulting engineers will probably assist in examining the reservoir.

Reminiscences of the Pioneer Engineers of California*

By Otto von Geldern†
Consulting Engineer, San Francisco

Part II

That is what happened in California. It developed the mining and hydraulic engineer; these experts were more efficient perhaps in hydraulics than in metallurgy as an applied science, because the process of



ROSS E. BROWNE

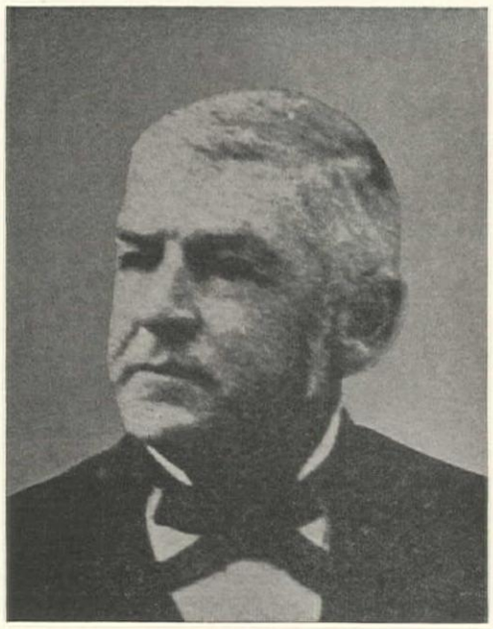
getting the gold out of the ground was specifically a hydraulic one; it involved the application of storage water under a high head, by means of long pipe-lines, to the gravels where the gold was to be gleaned. In this art the early California mining engineer was unequaled anywhere; his services were sought everywhere, from South Africa to South America and from Alaska to Siberia. Names like those of Ross E. Browne, Augustus J. Bowie, Alexis Janin, H. A. Brigham, Hamilton Smith, and many others became internationally known and famous. The investigations by

P. J. FLYNN

Hamilton Smith of hydraulic flow in pipes under a high head were probably the first of the kind ever made. His literature on that subject has become classic and is authoritative today.

When hydraulic mining was enjoined by the courts because its byproduct in the shape of detritus, silt, and slickens threatened to destroy the agricultural lands of the Sacramento valley and the navigability of its streams, the hydraulic engineer turned his attention to the far greater value of the Sacramento valley as a perennial agricultural asset, and he developed methods of irrigation, reclamation, and storage of water for this specific purpose. While the general principles of this new development were known to him, he had to learn from actual experience how to apply these principles to a new environment, and to make use of these methods on a large scale.

One of the pioneers of irrigation engineering in California was my old friend, P. J. Flynn, an Irish patriot, who had been an irrigation official in India for the English Government; he was at that time one



A. W. VON SCHMIDT

of the best qualified men whom we had in California, where he had the opportunity to make full use of his erudition and practical experience.

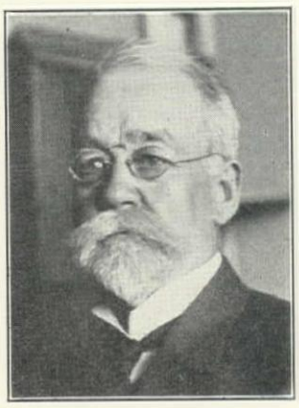
He published a book on the subject in San Francisco in 1892—I helped him in the edition of it—entitled 'Irrigation Canals and Other Irrigation Works, Including the Flow of Water in Irrigation Canals and Open and Closed Channels Generally'; this work contained a very complete set of tables, which simplified and facilitated the application of the formulas of Kutter, Darcy, and Bazin. The text contained 393 pages and the tables 283 more, making up a book of 676 pages, which was widely read at the time. While it is out of print and somewhat behind the time, it is still an extremely useful book, particularly that part of it which contains the tables, of which there are seventy. The book, if wanted today, is priced at $25, which

*Part I was published in the September 25th issue.

†Otto von Geldern is a Life Member of the American Society of Civil Engineers; Past President of the Astronomical Society of the Pacific; a Vice-President of the California Academy of Sciences; President of the Mechanics Institute of San Francisco; and a Regent of the University of California. He is the father of Edward von Geldern, civil engineer, Yuba City, California.

shows that it still has a value. Its author died a year or so after its publication in the very prime of his useful and active life.

The most prominent and best known engineer of the early days was Colonel A. W. von Schmidt, a Courlander of Teutonic stock, who came to California in 1849 when a young man. He was one of the most picturesque characters of his time. It was he who



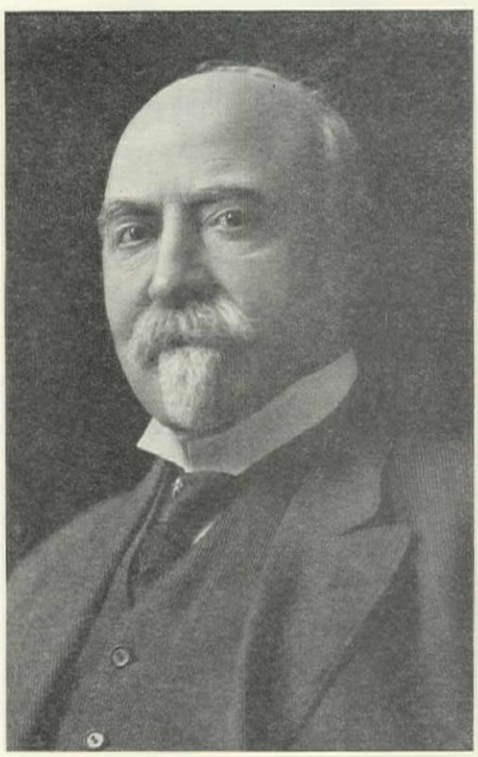
WILLIAM HAMMOND HALL

brought the first Spring Valley Water Co.'s supply to San Francisco from the peninsular resources of the Pilarcitos, on the Fourth of July, 1862; a holiday never to be forgotten in the history of San Francisco. He established a portion of the boundary between California and Nevada, from Lake Tahoe on. He succeeded in blowing away Blossom rock in San Francisco bay, by tunneling it from above and filling it full of black powder. He lowered it to a depth of 24 feet at low water. This was done in the early or middle seventies, and it appealed to the public as an attractive and spectacular piece of engineering.

He built the first drydock at Hunters Point in San Francisco bay; and in fact, he appeared to be in evidence at all times in whatever work of any magnitude was carried on in our state. During the latter part of his life he took up hydraulic dredging, which he carried on as a specific business, after he had settled his difficulties with another one of the pioneer engineers of California, one A. B. Bowers, who claimed to be the inventor of the hydraulic dredging method, and who fought every one in court for what he considered the slightest infringement on his patent rights. This versatile man, Bowers, who seemed never to grow old, spent half of his life in the courts of the country, traveling from state to state, and from one part of the world to another, until he died comparatively recently in New England at the age of ninety-two. During my boyhood days I knew these two competitors; later on in life I became quite well acquainted with them and saw them very frequently, particularly the old Colonel, who remained true to California to the end of his days. He died in 1906, immediately after the great earthquake.

Another of the earlier engineers, and one who is still alive at the age of about eighty years, is William Ham. Hall, the originator of the Golden Gate park in San Francisco, and the first one who found ways and means of preparing the sand dunes of the ocean beach so that they could be made to bring forth vegetation, which led to a final cultivation of what had always been a sandy desert prior to that time. He went to Holland and studied the methods in use there for this purpose. Mr. Hall was the first state engineer of California, and as such he was connected with every important investigation made by the authority of the state. Under his direction physical data of our great valleys were gathered of every available kind; the rivers were gauged, the floods measured, rainfall and run-off were determined, wells were sounded, and a general systematic study of the physical conditions of the most vital part of our state was carried on by a force of young assistants, and placed on record in the shape of reports and charts that are still available and of use in engineering investigations at the present time.

Mr. Hall spent some years in South Africa where he became a personal friend of Oom Paul. He lives a retired life in San Francisco now, although apparently



HERMANN SCHUSSLER

hale and hearty. I visited him several months ago at his home and spent a portion of an afternoon with him in chatting about old times and recalling old memories. There is a certain delight in doing this, and every human being of mature age appears to have the same trait or trend of mind; that is, to remember the past in the sense of all that was pleasant and agreeable about it, and to forget whatever there may have been of a disagreeable nature. The older one gets, the more one lives in the pleasant memories of the past, of that which is never to return again in just that way. Before I close I shall have something more to say about that phase of life.

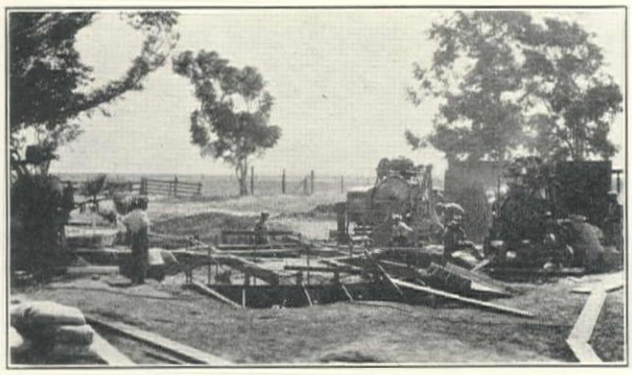
One of the early hydraulic engineers of our state, whose name is connected more particularly with the water supply of San Francisco, was Herman Schussler, who came to California in the early sixties from Germany, when about twenty-one years old. By his energy and ability he made himself the chief engineer of the Spring Valley Water Company. In fact, he grew up with this water system from the year 1863.

(To Be Continued)

Water Works of Pittsburg, California

Pittsburg, California, is a thriving industrial city at the junction of the San Joaquin and Sacramento rivers. In 1925 the population was 7500; the estimated 1929 population is 10,000. The principal industries are those of the Columbia Steel Co., Johns-Manville Corp., Pioneer Rubber Co., F. E. Booth Canning Co., Great Western Electro-Chemical Co., and Redwood Manufacturers Co. Coal was formerly mined near Pittsburg in commercial quantities.

The present city occupies the site of Rancho Los Medanos, a 10,000-acre Mexican grant of 1835. The old townsite was the 'New York of the Pacific' which,



Placing Reinforced Concrete Foundation for New Pittsburg Standpipe

in 1850, made a strong but unsuccessful attempt to obtain the state capitol, then at San Jose. For the past five years Pittsburg has been under the city manager form of government with Roy A. Watkins incumbent. R. L. Heck has recently been placed in charge of the water distribution and service department.

Old Water System—Pittsburg originally took its water from the San Joaquin river but, subsequent to the typhoid epidemic of 1920, it became necessary either to get potable water from another source or else install a filtration system. A $100,000 bond issue for a filtration system was defeated in the 1925 election and the city manager decided on well supply as the other alternative. During 1928 three wells were sunk in the city park and were connected by a 12-in. line to the old 100,000-gal. wooden tank, 100 ft. high, in the business district.

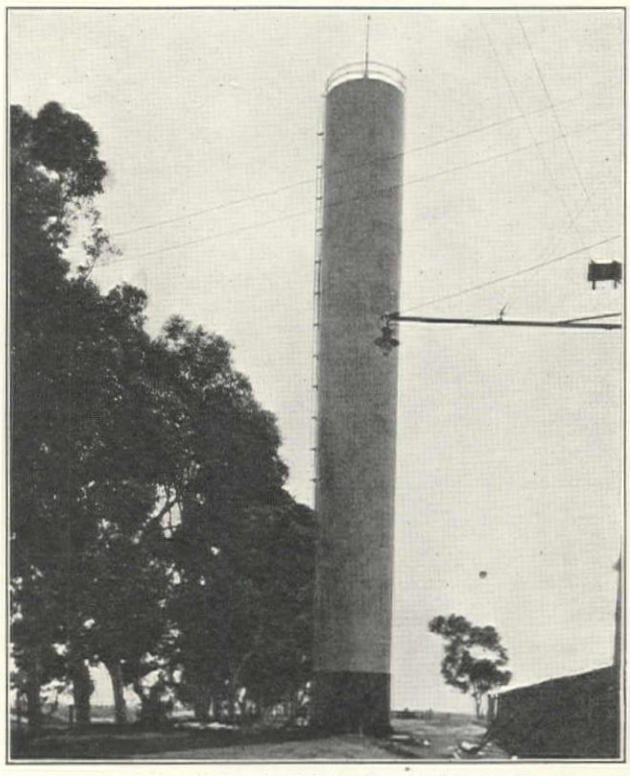
The well supply is protected by a Wallace & Tiernan semi-automatic, type 'SASPM' solution feed chlorinator which starts whenever the pumps begin operation. This injects from 1 to 1½ lb. of chemical per day and gives a 0.2 p.p.m. residual of free chlorine with one pulsation each 10 seconds.

The city uses 555,000 to 800,000 g.p.d. during the summer; this consumption being decreased by one-third during the winter. There is 18 miles of distribution mains working against a pressure of 38 lb. per sq.in. Neptune trident meters are used on the distribution system and Sparling meters are used on the production system. Each well is protected by a sand trap, the design being that of Roy A. Watkins, city manager. To further improve the system, a modern standpipe has recently been erected in the city park, at the highest elevation within the present city limits, and near the production wells. As it is desired to keep from overloading the present distribution line, the pumps have been taken off the direct distribution mains and no longer deliver through the general system.

Pittsburg has three cased wells, as follows:

Well No.	Depth (ft.)	Output (g.p.m.)	Chlorine Analysis (grains per U. S. gal.)	Hardness (grains)
1	160	525	3.08	19
2	212	525	4.92	15
3	225	437	4.92	13

The wells are equipped with Argo deep-well pumps powered by 30-hp., 440-v., 3600-r.p.m. United States Electric Co. motors. These units deliver 440 g.p.m. each at 60-lb. pressure. Time-delay relays control the starting so that only one pump may start when the supply becomes depleted; the second and third pumps then come in at intervals of 1½ minutes. An especially designed selector allows rearrangement of the starting line-up and permits the operator to shift and



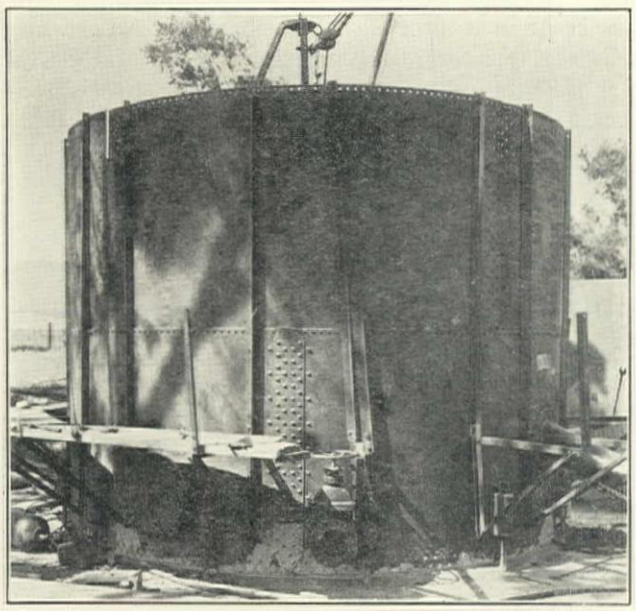
Completed Steel Standpipe at Pittsburg. Height 125 ft., Diameter 15.5 ft., Capacity 175,000 gal.

equally distribute the operating frequency of any pump.

New Standpipe—The new standpipe is designed to hold 175,000 gal.; it is 125 ft. high and 15.5 ft. in diameter. The pressure on the ⅝-in. cold rolled steel tank bottom is 54 lb. per sq.in. The tank walls are $\frac{7}{16}$ in. thick and are erected in 4-segment, 6-ft. lifts;

there is 653 tons of structural steel in the walls and a steel top which weighs 125 tons. With the tank full, the total weight above the foundation is 1647 tons. The base is 32 ft. in diameter and 3.5 ft. deep and contains 102 cu.yd. of concrete with 8 sacks of Calaveras cement per cubic yard. A 3-min. dry mix was used, the mix being designed for 2000-lb. concrete at 3 days. There is 7½ tons of reinforcing in the foundation, arranged as follows: a mat of ½-in. square bars woven on 5-in. centers with 5 circular bars at radii of 6, 7½, 10, 12, and 14 ft.; overlying the mat are 196 square bars (1½-in.) laid center to end in a circle. The steel is set 6 in. above the bottom of the foundation. The design of the tank and foundation was made by Abbot A. Hanks, Inc., engineers, of San Francisco; construction being supervised by George T. Oliver, city engineer of Pittsburg.

The new standpipe has several unique features and was characterized by a construction period of only 60 days from the time the council authorized the work. Excavation for the foundation was made with a 1-ton Caterpillar and a scoop in one day's time; the ground walls being used for the forms. The reinforcing was laid in one day, August 12. All concrete was poured in 11 hours on August 13; three one-bag mixers being used. City forces excavated for and laid the foundation under the direction of V. A. Kauferberg. Reinforcing steel was supplied by Gunn Carle & Co., of San Francisco.



Erecting Second Lift of the Pittsburg Standpipe. Steel Base Already Has Been Anchored to Reinforced Concrete Foundation

Steel erection was done by the Berkeley Steel Construction Co., Duncan Nielsen, president, with R. P. Armstrong, foreman on the work. The tank was erected from a working barge of 8 by 8-in. timbers on the inside (raised and lowered by water) and from hook scaffolds on the outside. Painting was done as the barge was lowered. A Rix 'Six' gas-driven air-compressor, Thor riveters, and an Ingersoll-Rand caulker were used by the erecting crew.

The tank is connected to the production line by 390 ft. of 10-in. Belgian cast-iron pipe, laid with 'Leadite' joints. Inside of the tank there is a 40-ft. riser of 12-in. standard screw pipe of American manufacture. The outflow is through a separate 10-in. line. All new pipe and fittings were supplied by Grinnell & Co.

Meter Rates—Pittsburg water is sold on the following schedule:

Meter Reading (Cu.Ft.) From	To	Charge	Equivalent Price per 1000 Gal. Cents
0	500	$1.75	46.7
500	600	1.95	43.3
600	700	2.15	40.9
700	800	2.35	39.2
800	900	2.55	37.8
900	1000	2.75	36.7
1000	1100	2.90	35.2
1100	1200	3.05	33.9
1200	1300	3.20	32.9
1300	1400	3.35	31.9
1400	1500	3.50	31.1
1500	1600	3.65	30.4
1600	1700	3.80	29.8
1700	1800	3.95	29.2
1800	1900	4.10	28.8
1900	2000	4.25	28.3

For each 100 cu.ft. above 2000 the rate is 12½¢ or the equivalent of 16⅔¢ per 1000 gal.

Water Filtration Plant for Manila

Plans and specifications have been prepared and bids for construction advertised for a water filtration plant for the Metropolitan Water District of Manila, Philippine Islands. The plant consists of eight filters, designed for a normal rating of 5,000,000 U. S. gal. daily, but able to deliver a daily maximum of 7,000,000 gal. Further information can be obtained from the Purchasing Agent, Bureau of Insular Affairs, U. S. War Department, New York City.

San Francisco Bay Bridge

Federal representatives authorized by President Hoover for the San Francisco Bay Bridge commission include: Army—Col. G. B. Pilsbury and Maj. E. L. Daley; navy—Rear Admirals W. R. Standley and L. C. Gregory; the President—Mark L. Requa. C. C. Young, governor of California, has named four state representatives, as follows: Arthur H. Breed, state senator, of Oakland, for the Eastbay region; George T. Cameron, publisher, of San Francisco, for that city; Charles D. Marx, professor emeritus of civil engineering at Stanford University; and C. H. Purcell, state highway engineer. Mark L. Requa, consulting mining engineer, of Piedmont, has been named chairman of the joint commission, which recently held its first meeting in San Francisco, and inspected the bay region by airplane.

Vitrified Sanitary Sewers for Missoula

The city of Missoula, Montana, has received and taken under advisement the following bids for the south side vitrified pipe sanitary sewer system: Morrison-Knudsen Co., Boise—$464,420; J. F. Shea, San Francisco, and Clifton, Applegate & Toole, Spokane—$469,419; J. C. Maguire, Butte—$481,505. The engineer's estimate was $470,260.

Cast Iron Pipe

Evolution in Foundry Practice—Use of 60-Inch Cast-Iron Supply Line for Delivering a Large Volume of Water at Low Head—Centrifugal Pipe in 18-Foot Lengths Meets Emergencies Arising from Depleted Supply

Although centrifugal process de Lavaud cast-iron pipe is made only in sizes up to 20-in. diameter, pit cast pipe in larger sizes, of metal having high tensile strength and improved physical qualities, is now coming into extensive use for supply lines which operate under low heads.

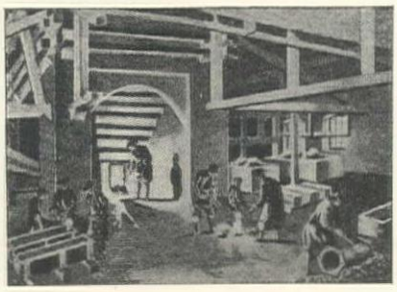


Fig. 1. Casting Pipe on the Bank in 3 or 4-ft. Lengths, 1800

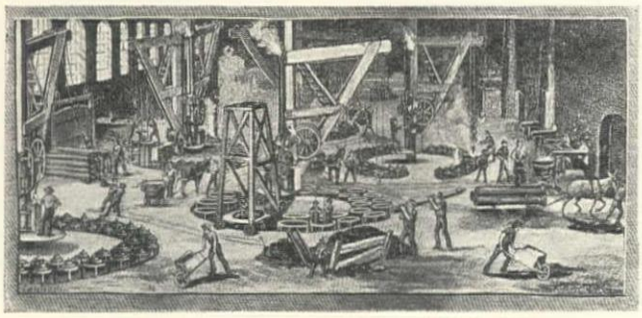


Fig. 2. Casting Pipe in a Pit in 8 or 9-ft. Lengths, 1860

Foundry Practice—The evolution of foundry practice in the manufacture of cast-iron pipe may be divided into four typical periods, namely: 1800, 1860, 1910, and 1929. In the foundry practice of 1800, pipe was cast on the bank in 3 to 4-ft. lengths (see Fig. 1). By 1860, casting was done in a pit in 8 to 9-ft. lengths (see Fig. 2). In 1910, pipe was cast vertically in 12-ft. or 5-metre lengths (see Fig. 3). By 1929 (see Fig. 4), foundry practice for the smaller diameter pipe had been changed to centrifugal casting in 12 or 18-ft. lengths. Thus, with the development of metal core bars and flasks, and the use of dry molds, great improvement in the manufacture of cast-iron pipe has taken place. Within a century, the length of pipe sections increased from 3 ft. to 16 ft. Also, modern pit cast pipe is more uniform in thickness and contains less impurities than the older type of pipe.

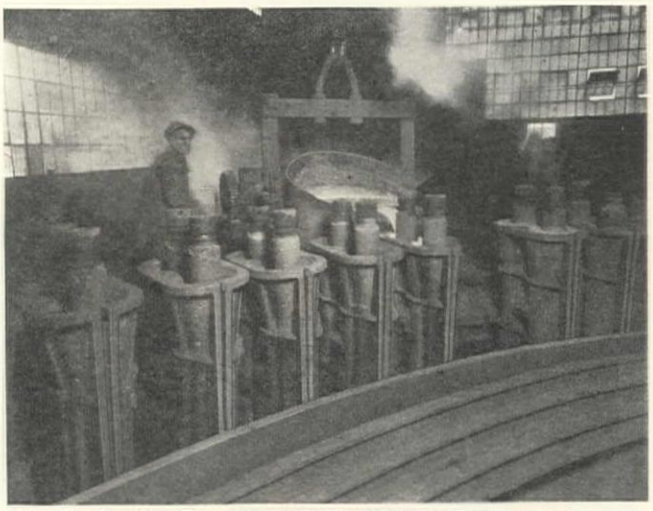


Fig. 3. Casting Pipe Vertically in 12-ft. or 5-m. Lengths, 1910

A 60-in. Diameter Cast-Iron Supply Line—The use

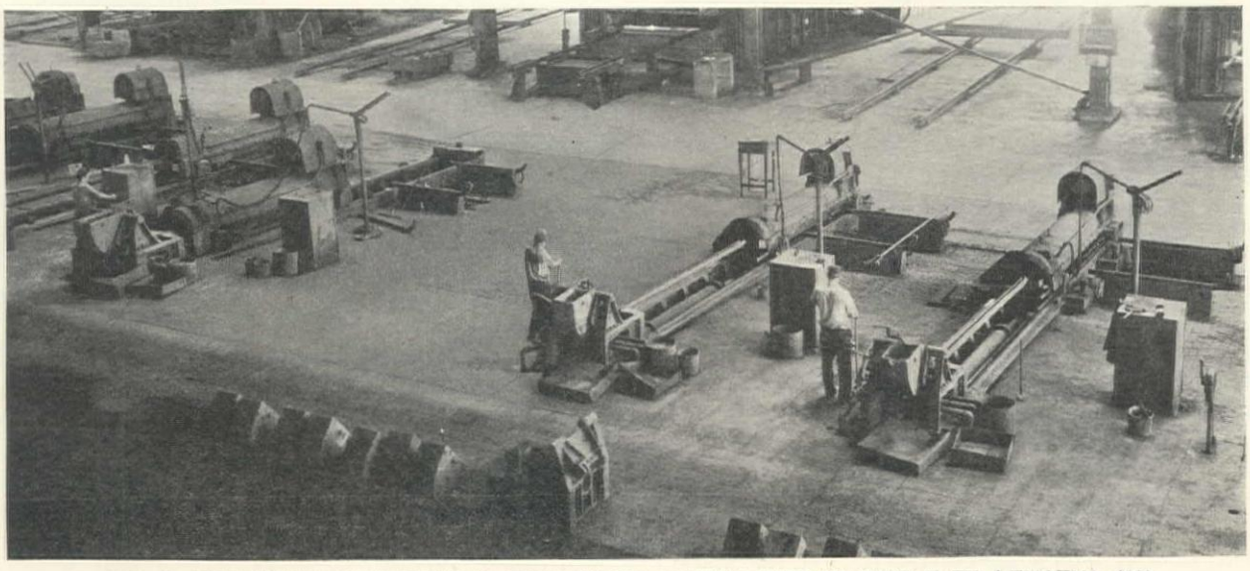


FIG. 4. DE LAVAUD CENTRIFUGAL PROCESS OF CASTING PIPE IN 12 OR 18-FT. LENGTHS, 1929

of cast-iron pipe of large diameter is well suited to installations where a considerable amount of water must be delivered at low head, with consequent low velocity, and with certainty of service. As an example, there was recently installed at Atlantic City, New Jersey, a 60-in. diameter cast-iron pipe-line, 9600 ft. long, to augment the existing water supply which was being delivered by a 42-in. wood-stave conduit.

In this installation, the pipe was unloaded from gondola cars by a locomotive crane. It was then trucked to a distribution point 1½ miles distant. Here it was transferred to a special trailer, equipped with caterpillar treads, and hauled to the trench by a caterpillar tractor. Three different unloading points were established along the right-of-way. A mechanical ditch digger, mounted on caterpillar treads, was used in the work. With a gasoline crane, also mounted on caterpillar treads, it was possible to lay as many as 16 lengths of the 60-in. pipe per day.

The terrain was marshy in spots (see Fig. 6) but had a firm sand and sandy clay subsoil, the spongy surface

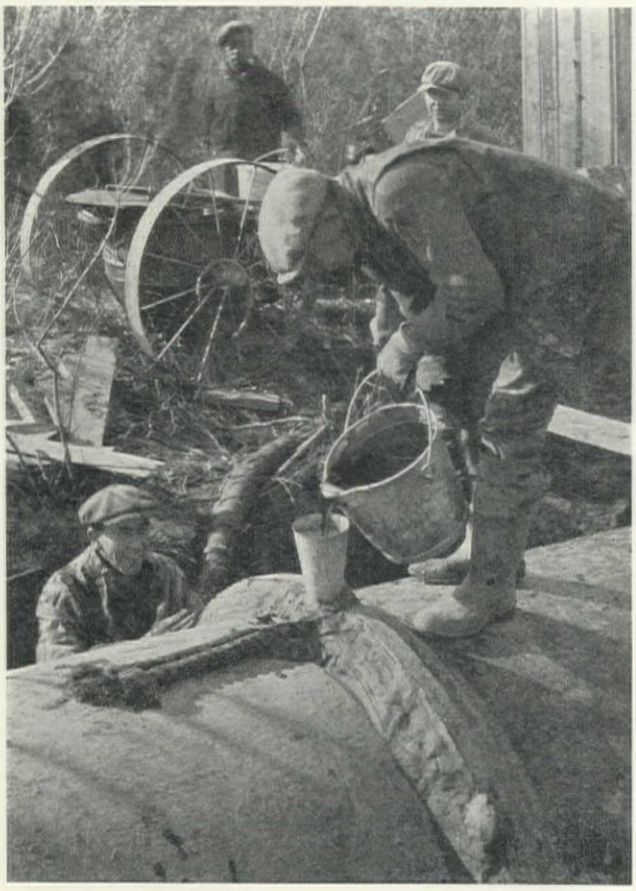


Fig. 5. Pouring a Joint on a 60-in. Cast-Iron Supply Line

soil being of little depth. The pipe was lowered by gasoline crane and was supported in the trench by cross boards, two planks being required for each length of pipe. A gasoline pump was used to keep the trench free from water.

This 60-in. line has twice the capacity of a 42-in. conduit. The weight of one standard 60-in. pipe length is 1000 lb. less than that of two equivalent 42-in. cast-iron pipe lengths. Also, the use of one large line reduces the number of joints, the points of possible leaks, and the reduction in pipe surface lessens the internal friction. Pouring of joints in the 60-in. line is shown in Fig. 5 and a section of the finished line in Fig. 6.

Emergency Installation in Texas—One solution of the problem of installing cast-iron pipe to meet emergencies arising from depleted supply, sudden increase in demand, or similar exigencies, is the use of pipe in long laying lengths. This longer pipe can be handled with ease and the lesser number of joints greatly increases the speed with which the line can be completed.

At Turkey, Texas, recently, the water supply was being rapidly exhausted. The city was threatened with a complete water famine unless a new supply could be located and put into immediate use. A sufficient supply was found at wells 4 miles southwest of Turkey and a contract was awarded for drilling new

Fig. 6. Section of a Completed 60-in. Cast-Iron Supply Line Laid on Slight Grade Through Marsh Land

wells. By the time the wells were completed and tested, a preliminary pipe-line survey had been finished and the amount and size of pipe determined, de Lavaud centrifugal pipe in 18-ft. lengths being chosen. The pipe was ordered before final plans and specifications had been finished. It was delivered, distributed, and ready to lay within five days after the final plans had been completed and the formal contract signed. Unloading from gondola cars was in this case handled by a gin pole. The 18-ft. lengths were hauled to the site on standard length trucks. Two men, using slip ropes, were required to lower the pipe into the ditch.

CALIFORNIA CIVIL ENGINEERS REGISTRATION BOARD

On October 14, the Hon. C. C. Young, governor of California, appointed the three members of the board to administer state registration of civil engineers as per A.B.No.174, passed by the 1929 Legislature, as follows:

Donald M. Baker (M.Am.Soc.C.E.) consulting engineer, Los Angeles; Henry J. Brunnier (M.Am.Soc. C.E.) consulting structural engineer, San Francisco; and Albert Givan (M.Am.Soc.C.E.) general manager and chief engineer of the Sacramento Municipal Utility District.

Practising civil engineers have until June 30, 1930, to make application for registration without examination. Applications should be addressed to James F. Collins, director of Professional and Vocational Standards, State Capitol, Sacramento.

PERSONAL MENTION

Elwood Mead, United States commissioner of reclamation, has been in Mexico in attendance at a joint meeting of the American and Mexican sections of the International Water Commission.

Ralph A. Stevenson, sanitary chemist and bacteriologist, of Sacramento, left on September 23 for a month's visit to eastern filtration plants. He was sent by the city of Sacramento to investigate the latest designs in sedimentation basins.

George McAneny, for seven years president of the New York and Associated Cities' Planning Commission, and an authority on city planning, recently spoke at the Jonathan Club, Los Angeles, on the proposed razing of Bunker Hill.

Paul Bailey has been employed by the city council of Lodi, California, to make a survey and report on the underground water from Mokelumne river. He will also testify in suits pending in Calaveras and San Joaquin counties against the diversion of water from this river.

M. C. Poulsen, office engineer in the department of public works, Fresno, resigned on October 15 to become chief engineer of the Clay Products Institute of California. Poulsen was instrumental in the development of the uniform building code of the Pacific Coast Building Officials Conference.

Robert W. Hunt Co. has been employed by Robinson & Steinman, consulting engineers, to perform mill, shop, and field inspection of all steel and cables for the new St. Johns bridge in Multnomah county, Oregon. This company recently furnished a similar service on the Bear Mountain bridge in New York state.

Horace E. Plummer, of Portland, was elected president of the Pacific Coast Builders Conference at the annual convention in Portland on September 6. S. P. Koch, of Berkeley, was named first vice-president; H. C. Vandewater, Glendale, secretary; and D. H. Merrill, Los Angeles, managing secretary-treasurer. The 1930 convention will be held at Long Beach.

George A. Posey, county engineer of Alameda county, California, has been named as engineer for the Alameda-Contra Costa Joint Tunnel-Highway District, which is to direct the construction of a new low level Broadway tunnel and highway from Walnut Creek to the northerly end of Broadway, Oakland. His associate is Ralph R. Arnold, county engineer of Contra Costa county.

Charles D. Marx, professor emeritus of civil engineering at Stanford, has sailed for the world engineering congress at Tokyo as the representative of the American Society of Civil Engineers and Stanford University. He will return in December. Other delegates from the far west include F. W. Bradley, C. E. Grunsky, J. B. Lippincott, and D. C. Henny. Some 200 American and European engineers will attend the congress, which opens on October 29.

Development Engineers, Inc., a civil engineering firm specializing in all branches of municipal engineering, has established a main office in the Financial Center bdg., Oakland, for operation in the San Francisco bay territory. Bert J. Mehl is the resident manager. At present the firm has a considerable practice in southern California and Arizona. E. Earl Allen is president of the corporation and Glenn L. Lewis is chief engineer and consultant for California projects; in Arizona H. W. Oakes is manager and S. M. Morse is chief engineer.

George Hawley, of Berkeley, has been appointed by Governor C. C. Young as the deputy in charge of all dams in California, other than federal structures. Hawley is a graduate of Stanford University. His experience on water projects in the state includes the San Pablo and Upper San Leandro projects of the East Bay Water Co.; construction of the Woodward dam, and reservoir control for the South San Joaquin Irrigation District; consulting engineer for the irrigation of 100,000 acres in the Davis-Woodland area; a report on the diversion, storage, and treatment works making Sacramento river waters available for domestic and industrial use in the Port Costa area; hydroelectric investigations for the Oregon Electric Railway Co. Hawley will serve in the department of public works under Edward Hyatt, state engineer.

ASSOCIATIONS

Western Washington Section, American Society of Civil Engineers—At the regular monthly meeting on September 30, John Clayton Hoyt, former vice-president of the Society, was a guest. The meeting was largely devoted to announcements by the committee on public relations on the program adopted by the Section last spring. The aim of this program was given editorial comment in the 'proceedings', part 2, of the national Society and in our September 25th issue.

Los Angeles Section, American Society of Civil Engineers—This Section was founded in 1914; the present membership being 505. Regular meetings are held on the second Wednesday evening of each month at the Engineers Club.

At the meeting on September 11, a detailed description was given of the Pasadena water development plan, including the $10,000,000 Pine Canyon storage dam on the San Gabriel river. The city of Pasadena has rights in the new storage project only to the water which would under natural conditions flow to the sea. The dam must, therefore, pass all water which normally would percolate into subterraneous reservoirs and all appropriated waters. The speakers on the program, all from the staff of the Pasadena water department, were: S. B. Morris, chief engineer; C. W. Sopp, assistant engineer; C. A. Pearce, designing engineer; and James M. H. Howard, special counsel.

Shortly before the last regular meeting, many members of the section visited both the Pine Canyon damsite and the San Gabriel damsite of the Los Angeles County Flood Control District.

Colorado Section, American Society of Civil Engineers—This Section was founded in 1908; the present membership being 93. Regular business meetings are held at the Denver Athletic Club at 8 p.m. on the second Monday of each month, except during July and August. These meetings are usually preceded by an informal 6:30 dinner; weekly luncheons are held each Wednesday.

At the 184th regu'ar meeting on September 16 there were 22 members and guests present. L. G. Carpenter, consulting engineer, of Denver, gave an illustrated address depicting the life and attainments of the famous engineer of early times, Leonardo da Vinci. Jay Turley, civil engineer and lawyer, of New Mexico, briefly discussed some of the problems of the Colorado river. Robert Follansbee, district engineer of the U. S. Geological Survey, was appointed representative of the Colorado Section to the World Engineering Congress to be held in Japan this November.

The new officers of the section are: president, Ivan E. Houck; vice-president—Norman W. Funk; secretary-treasurer—Lyman F. Copeland.

LEAGUE OF CALIFORNIA MUNICIPALITIES

The 31st annual convention of the League of California Municipalities was held at the Hotel Oakland, 13th and Harrison St., Oakland, on October 7 to 11. The attendance exceeded 1300. Long Beach was selected for the 32nd annual convention, to be held in October of 1930.

New officers of the League follow: president—G. Gordon Whitnall, Los Angeles; director-manager—William J. Locke, Alameda; treasurer—H. A. Mason, San Francisco. The various departments of the League, and their heads, are: public health—president, W. H. Dickie, M. D., director of the state department of public health, Sacramento; engineers and street superintendents—president, Henry S. Gierlich, Monrovia; city attorneys; city managers—president, Oscar Weissgerber, San Mateo; clerks, auditors, assessors, and treasurers—president—Ivan A. Swartout, San Fernando; mayors and councilmen—president, Oscar Hauge, Long Beach; city planning—president, C. J. S. Williamson, planning commissioner of Santa Monica; municipal utilities association (a new department)—president, F. W. Hanna, Oakland; vice-president, R. L. Criswell, Los Angeles; directors, S. B. Morris of Pasadena and Clark T. Henderson of Burlingame, and secretary, William J. Locke.

The presidents of these departments, with the general officers, constitute the executive committee of the League.

Exhibitors at the 31st annual convention were:

American Concrete Pipe Co.
Art Concrete Works
California Corrugated Culvert Co.
California Pottery Co.
Clark & Sons, N.
Dorr Co., Inc., The
Forni Meter Co.
General Electric Co.
Gladding, McBean & Co.
Greenberg & Sons, M.
Hersey Mfg. Co.
Kartschoke Clay Products Co.
McWane-Pacific Co.
Muddox, Inc., H. C.
Neptune Meter Co.
Northern Street Lighting Co.
Oakland, City of
Oakland, City Planning Commission of
Pacific Clay Products Co.
Pacific Co.
Pacific States Cast Iron Pipe Co.
Pittsburgh Equitable Meter Co.
Prizmalite Co., The
Portland Cement Association
Street Lighting Equipment Co.
Union Metal Mfg. Co.
Warrenite Bitulithic
Westinghouse Electric & Mfg. Co.

Portions of the 1929 meetings of special interest to city engineers, street superintendents, and city planners, have been extracted from the official program as follows:

MONDAY, OCTOBER 7

General Session

8 to 9:30 a.m. (Ivory ballroom)—Registration. 9:30 a.m.—Music; opening address by H. C. Bottorff, president of the League; address of welcome by J. L. Davie, mayor of Oakland; business; report of committee on division of the gasoline tax (with discussion); 'Work of the California Commission on Public Safety' by Ralph W. Robinson, committee chairman.

Engineers and Street Superintendents

2 p.m. (Blue room) Chairman—Chas. R. Blood, assistant city engineer, Sacramento. (1) Consideration of proposed new constitution for the League; (2) 'Regulation of Aircraft and Airports' by C. B. Hegardt, city engineer and manager of the port of Oakland; (3) 'Selection of a Municipal Airport Site' by R. U. St. John, president of the Sacramento airport committee; (4) 'Municipal Water Supply Problems' by F. W. Hanna, chief engineer and general manager, East Bay Municipal Utility District. Appointment of nominating committee.

City Planners

Afternoon (Oak room)—(1) Consideration of proposed amended constitution for the League; (2) Selection of members of the nominating committee; (3) 'Montebello's Problems Under the Master Plan Act' by Louis Burke, city attorney and planning commissioner (with discussion led by Kenneth Garner, city plan engineer of San Diego); (4) 'Preserving Open Spaces Upon Residential Lots' by Arthur B. Clark, chairman of the planning commission, Palo Alto (with discussion led by L. D. Tilton, director of the planning commission, Santa Barbara county); (5) 'Necessity of Some Agency in Sacramento to Centralize Planning Matters' by Reeve Conover, planning commissioner, Pacific Grove (with discussion led by E. D. Landels, attorney, Oakland Traffic Commission.

Special Event

8 p.m. (Ivory ballroom)—Public reception with addresses.

TUESDAY, OCTOBER 8

General Session

8 to 9:30 a.m. (Ivory ballroom)—Registration. 9:30 a.m.—(1) Appointment of committee on resolutions; (2) 'Problem of Transportation in Cities' by A. J. Lundberg, president, Key System Transit Co. (with discussion led by W. W. Cooper); (3) 'How the Cities May Be of Help to the Railroad Commission' by Wm. J. Carr, member of the Railroad Commission (with discussion led by Preston Higgins, city attorney of Oakland).

Engineers, Street Superintendents and City Planners

1:30 p.m. (Left on ferryboat 'San Mateo' from foot of Broadway)—Inspection of Oakland harbor and facilities, Posey tube, and recent public engineering construction in Oakland and vicinity.

WEDNESDAY, OCTOBER 9

General Session

9:30 a.m. (Ivory ballroom)—(1) 'Bridging the Gap' by F. W. Browning, M.D., of Hayward; (2) 'Municipalities as the Pacemakers of Public Progress' by R. E. McDonnell, Los Angeles; (3) 'Municipal Liability for Accidents and Liability Insurance' by C. H. Christensen, mayor, Palo Alto (with discussion); (4) progressive report of the committee on resolutions.

Engineers and Street Superintendents

2 p.m. (Blue room)—Joint meeting with California Sewage Works Association until 4 p.m.

City Planners

12:30 p.m. (Stephen's Union on the University of California campus)—Luncheon. 2 p.m. (Room 112, Library bdg., University of California)—(1) 'Why Zone Our City?' by Mrs. W. R. Kimball, planning commissioner, Long Beach (with discussion by Gordon Whitnall, director, Los Angeles City Planning Commission); (2) 'Applying the Principle of Zoning to Our City' by Andrew M. Jensen, commissioner of public works and planning commissioner, Fresno (with discussion led by H. H. Jaqueth, city plan engineer, Sacramento); (3) 'Problems Confronting a New Planning Commission' by George R. Wells, president, Santa Ana Planning Commission (with discussion led by R. B. Taplin, city plan engineer, Long Beach).

Special Events

2 p.m.—Organization meeting of the Municipal Utilities Association of California, with opening address by George C. Pardee, president of the East Bay Municipal Utility District. Symposium on 'Commercial Value of Courtesy and How to Promote It', 'Collection of Delinquent Water Bills', 'The Equity of a Stand-by Charge'.

9 p.m.—Public dance for delegates and visitors, under auspices of City of Oakland. Industrial Exhibition, Hotel Oakland.

THURSDAY, OCTOBER 10

General Session

9:30 a.m. (Ivory ballroom)—(1) Greetings by the Hon. C. C. Young, Governor of California; (2) 'Catastrophe Work in the San Francisco Earthquake and Fire of 1906' by C. G. Gillespie, chief, Bureau of Sanitary Engineering, State Department of Public Health; (3) business, including election of officers, and adjournment.

Engineers and Street Superintendents

2 p.m. (Blue room)—(1) 'Legal Limitation of Special Assessments Necessary' by Roy A. Knox, director, Bureau of Budget and Efficiency, city of Los Angeles (with discussion); (2) 'The City Engineer and the City Manager' by W. B. Hogan, city manager, Stockton (with discussion); election of chairman and adjournment.

City Planners

Afternoon (Oak room)—(1) 'Redwood Empire Association Plan of Highway Beautification' by Edward Morris, president of the Association (with discussion led by Hugh R. Pomeroy, president, South Gate Planning Commission); (2) 'Street Tree Planting' by W. L. Bigham, president, Anaheim Planning Commission (with discussion led by C. H. Diggs, director, Los Angeles Regional Planning Commission); (3) election of officers and adjournment.

Special Events

12:15 p.m.—Luncheon to visiting engineers under auspices of the Oakland Engineers Club. (Also a separate luncheon to visiting ladies).

1:30 p.m.—Inspection of the Oakland airport and Posey tube (accompanied by group lecturers on the proper construction and regulation of airports).

Evening—Banquet to the League by the city of Oakland.

FRIDAY, OCTOBER 11

Morning—City engineers visited the Pardee dam, near Valley Springs, of the East Bay Municipal Utility District, as guests of the Atkinson Construction Co. The contractor served a dinner at the damsite.

Construction Review

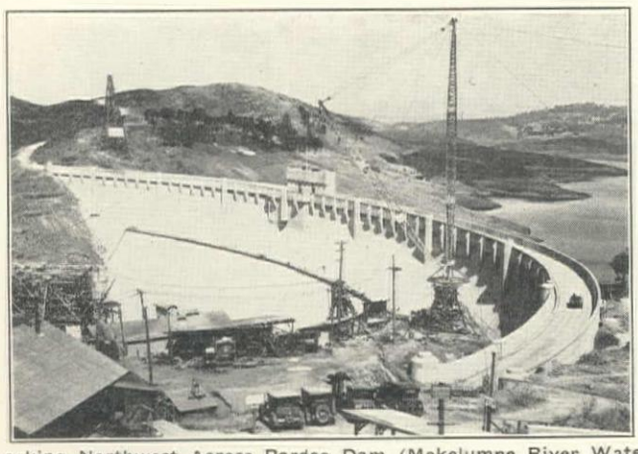
WATER SUPPLY SYSTEMS

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

IMPORTANT PROPOSED PROJECTS

PHOENIX, ARIZ.—City of Phoenix, Ariz., will set date for bond election soon to vote on issuing $3,093,700 bonds for water system: 22-mile 48-in. concrete or steel flow line from sand trap to reservoir, $1,309,700; 48-in. main from reservoir to 16th and Thomas Sts., $566,000; 42-in. main from 12th and McDowell Sts. to 16th and Thomas, $146,000; 24-in. main from Thomas to 7th Ave., $140,000; distributing mains, $138,000; meters to be installed, $150,000; wells, five, $25,000; pumping stations, $24,000; protection work, Verde river, $110,000; reservoir, 10,000,000 gallons, $92,000; well field (160 acres), $8000. W. J. Jamieson is City Engineer and R. T. Gardner is City Water Supt.

WHITTIER, CALIF.—Bond election Nov. 19, by City of Whittier, Los Angeles County, to vote $310,000 for water improvements: Wells, including motors, pumping, buildings, etc., $45,030; 36-in. pipe-line from wells to settling basin, $21,600; settling basins, $23,800; 30-in. pipe-line from settling basin to reservoir, including meter, $57,790; 10,000,000-gal. reservoir, $75,095; 10-in. pipe-line from reservoir to Rideout Heights reservoir, $2130; Rideout Heights reservoir, $8500; 24-in. pipe-line connection 10,000,000-gal. reservoir and Greenleaf reservoir, $22,500; 16-in. pipe-line from Greenleaf reservoir to Painter reservoir, $4500; two booster plants, including pumps, etc., to connect reservoir, $5000, and one booster plant to connect Greenleaf and Painter reservoir, $3000; one booster plant, College Hills, $3000; repairs and Corliss engine and signals, $10,000; repairs to Greenleaf reservoir, $5000; water mains, 4-in., $8500; 6-in., $4500; and 8-in., $6500. M. R. Bowen is City Engineer of Whittier, Los Angeles County.



Looking Northwest Across Pardee Dam (Mokelumne River Water Supply Project of East Bay Municipal Utility District) from Atkinson Construction Co. Camp

WATSONVILLE, CALIF.—Bond election Nov. 19, by City of Watsonville, Santa Cruz County, to vote $125,000 for water system as follows: Improving Ford St. wells, including 2 deep well pumps, pump house, piping, water measuring and recording device, $5000; improving main reservoir, grading, concrete work, wooden roof with concrete piers, Venturi meter, etc., $32,300; construct filter plant at Corralitos, grading, filter plant structures, underdrains and sand, piping and equipment, by-pass, water measuring and recording devices to cost $69,900; filtered water reservoir at Corralitos, $12,000; elevated reservoir at Corralitos, including excavation and structure and main pipe-line and pressure control, $7800. H. B. Kitchen is City Engineer and Chas. Gilman Hyde, Berkeley, is Consulting Engineer.

PASADENA, CALIF.—Bonds voted, $10,000,000, by City for: DAM—To be located at Pine Canyon site in San Gabriel Canyon, to be 295 ft. high above canyon floor and 377 ft. high above foundation base, involving in the main: 420,000 cu.yd. excavation, 720,000 cu.yd. concrete, 682,000 bbl. portland cement, 1,500,000 lb. reinforcing steel; 1,000,000 lb. structural steel, 1,250,000 lb. gates, valves, etc. CONDUIT—17.8 miles long from Pine Canyon to Mountain Street reservoir, consisting of: 14,000 lin.ft. concrete pressure tunnel, 56,000 lin.ft. 60-in. steel pipe-line, 24,100 lin.ft. reinforced concrete pipe-line. S. B. Morris is Chief Engineer of the Water Department.

Lowering 54-in. Rensselaer Valve Into Trench, Condult No. 13 for City of Denver, Colorado, Lock-Joint Pipe Co., Contractors

GREAT FALLS, MONT.—City is considering improvements to the water system to cost $750,000, as follows: Construction of 4,000,000-gallon storage reservoir; extension of present filtration plant; installation of water mains, etc. M. L. Morris is City Engineer.

TEMPE, ARIZ.—Bonds voted, $40,000, by City for water system improvements.

RIVERSIDE, CALIF.—Bonds voted, $690,000, by Riverside County Water District No. 1 for: Installation of 24 deep wells and pumping plants, 3300 lin.ft. reinf. double-strength conc. pipe, 7900 lin.ft. 16-in., 39,000 lin.ft. 14-in., 29,000 lin.ft. 12-in., and 3000 lin.ft. 10-in. D.S. rein. conc. pipe, 105,000 ft. high-pressure rein. conc. pipe, 210,000 ft. low-pressure rein. conc. pipe.

SAN DIEGO, CALIF.—Plans by City Hydraulic Engr., H. N. Savage, City Hall, San Diego, for the construction of the second Otay Pipe-Line. Work involves: 89,000 lin.ft. of trenching, 43,150 lin.ft. 40-in. and 43,000 lin.ft. 36-in. welded steel pipe, 15,270 lin.ft. 36-in. cast-iron pipe, 7200 lin.ft. of tunnel; also enlargement to Chollas Heights reservoir, $500,-

000. Work is to be done under $2,350,000 bond issue, bonds voted but not yet sold.

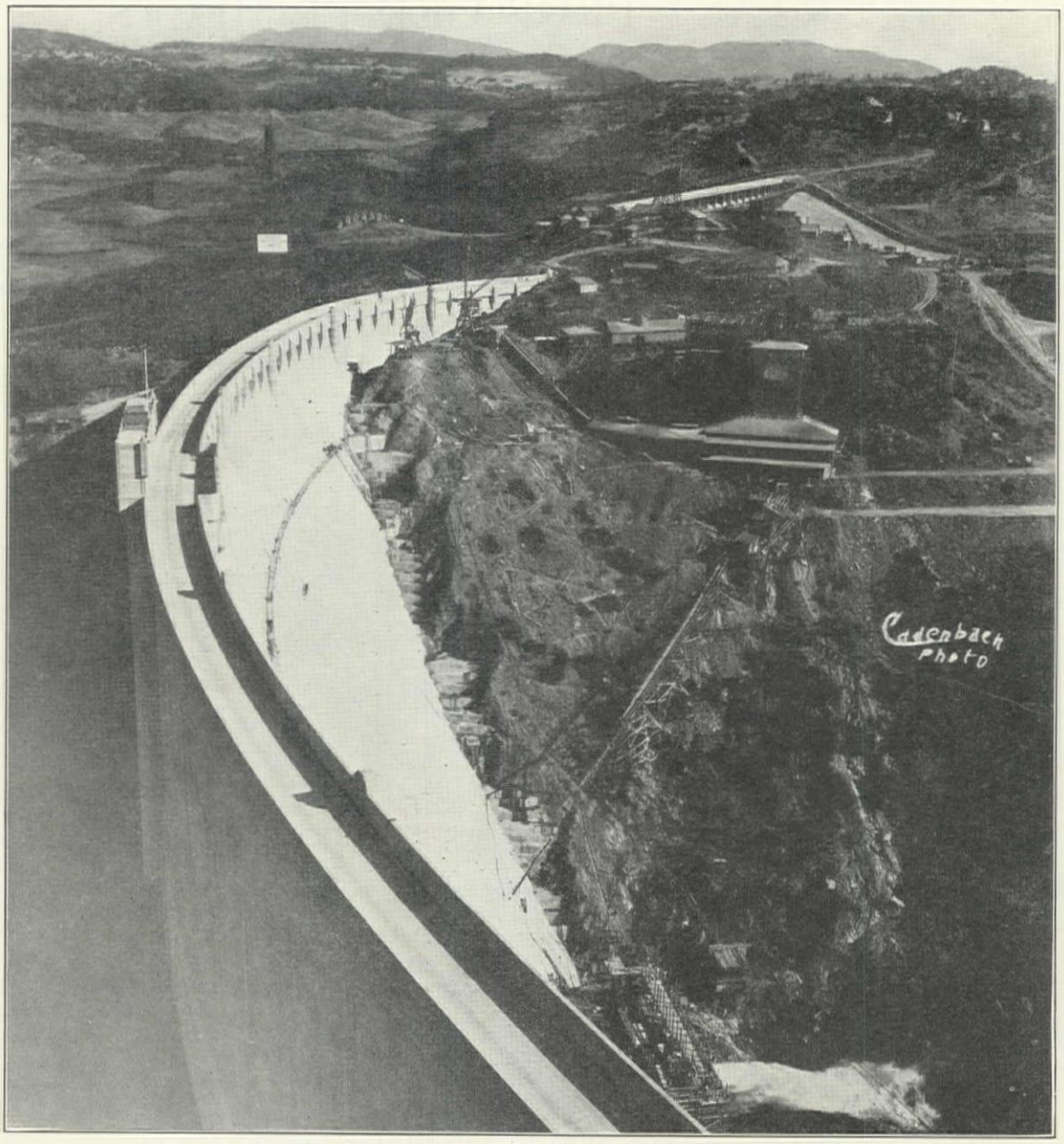
VALLEJO, CALIF.—Surveys by City Engineer, T. D. Kilkenny, for pipe-line from Fleming Hills reservoir to City; $90,000.

COQUILLE ORE.—Bonds voted by City in amount of $85,000 and bids will be called for soon for the following water system improvements: (1) Installation of larger water mains; (2) Increasing height of storage dam; and (3) Installation of water meters. Stevens & Koon, Spalding Bdg., Portland, Ore., are Consulting Engineers.

pipe-line, 200,000-gal. reservoir, and power plant. Bond issue is contemplated.

FULLERTON, CALIF.—City is considering $192,850 bond election for: (1) 12-in. main to be provided east and west for the south side of the town to be laid along Valencia St., $40,581; (2) Cypress Ave. water line, well, and first unit of 1,321,828 gallons of 5,000,000-gal. reservoir, $102,185; (3) Dorothy Lane and Valley View main line, $50,082.

LOS ANGELES, CALIF.—Plans by H. A. Van Norman, Chief Engineer of Los Angeles Water & Power Bureau, for a 36,000 ac.ft. capacity reservoir, to be built in the Chatsworth District. This reservoir will replace the storage reservoir of the St. Francis dam; $4,500,000.



PARDEE DAM, MOKELUMNE RIVER WATER SUPPLY PROJECT, EAST BAY MUNICIPAL UTILITY DISTRICT OF OAKLAND, CALIFORNIA. LOOKING EAST TOWARD MAIN SPILLWAY. CONCRETE MIXING PLANT ON LEFT BANK, ATKINSON CONSTRUCTION CO. (CONTRACTORS) CAMP ADJOINING, AND E.B.M.U.D. PERMANENT QUARTERS ON HILL BEYOND. DAM IS 358 FT. HIGH AND 1220 FT. LONG ON CREST

LONGVIEW, WASH.—Studies being made by Engineers, Stevens & Koon, Spalding Bdg., Portland, Ore., for water system to include filtration plant, pumping plant and reservoirs at Longview for Washington Gas & Electric Co.; $300,000.

BAKER, ORE.—Plans being made by Engineers, Stevens & Koon, Spalding Bdg., Portland, for increasing water supply and municipal power project for City.

STEVENSON, WASH.—Plans by Miller Engineering Co., Burke Bdg., Seattle, for water system and power improvements to cost $70,000 for City, involving 2½-mile

SANTA ANA, CALIF.—Bonds voted by J. T. Carpenter Water Co., $200,000, and by Serrano Water Association, Santa Ana, $200,000, to pay their portion of cost of constructing earth dam, hydraulic fill type, on Santiago Creek in Orange County for the John T. Carpenter Water Co., the Serrano Water Association, and the Irvine Co., the latter company to pay $350,000 as their part of the project. Plans are being prepared by Engineers Howells & Howells, Hobart Bdg., San Francisco, and call for the

construction of a dam to be 725 ft. long on top with 105-ft. spillway, length on bottom to be 300 ft., width on top to be 30 ft., and slope to be 2½ to 1 and 2 to 1.

LOS ANGELES, CALIF.—Plans by Engineers, Burns-McDonnell, Smith Engineering Co., Western Pacific Bdg., Los Angeles, for the construction of water system improvements for Downey County Water District at Downey, Los Angeles County, $150,000.

RENO, NEV.—Sierra Pacific Power Co., Reno, Nev., will install the following water system improvements at Reno, Nev.: Water mains to cost $200,000; wells to cost $60,000.

SAN LUIS OBISPO, CALIF.—Bids to 3 p.m., Nov. 4, by County Clerk, Court House, San Luis Obispo, for improvements in Ocean Heights Dist. 1, involving: 9600 lin.ft. 10-in. vitrified sewer, 1120 lin.ft. 8-in. vitrified sewer, 8140 lin.ft. 6-in. vitrified sewer, 8000 lin.ft. 4-in. vitrified sewer, 334 tees, 19 manholes, 9 lampholes, one septic tank and fittings, 660 lin.ft. 6-in. cast iron mains, 4000 lin.ft. 4-in. cast iron mains, 8000 lin.ft. 2-in. cast iron mains, 8500 lin.ft. ¾-in. services, one 25,000 gal. redwood tank and foundation, 22 valves, 8 hydrant risers, 334 ¾-in. service cocks. Cost $45,000. Work under 1921 Act. Plans from Engineer, N. H. Nelson, Morro Bay, by payment of $5.

EVERETT, WASH.—Bids will be received up to 10:30 a.m., October 24, by City Clerk, Everett, Wash., for the following work on Sultan River Project: Sec. 4—Sultan River Dam—work involving: 6150 cu.yd. excavation, 3760 cu.yd. concrete, racks, gates, etc., install. Estimated cost $75,000. Sec. 5—Pipe-Line, Ebey Slough to Everett—work involving: 21,500 cu.yd. trench excav. and backfill, 11,960 lin.ft. 48-in. steel pipe, 7750 lin.ft. 40-in. steel pipe, 1920 lin.ft. 36-in. steel pipe, 24,000 lin.ft. piling (partly temporary). This section includes Ebey Slough and Snohomish river submerged pipe-line crossings. Estimated cost $350,000. Plans and specifications obtainable from Baar & Cunningham, Spalding Bdg., Portland, Oregon.

SAN JOSE, CALIF.—Formation election will be held Nov. 5 by Santa Clara County to vote on the formation of the Santa Clara Water Conservation District. Construction work proposed will cost $5,000,000.

FAIRFIELD, CALIF.—The City of Fairfield, Solano County, is considering installation of a new well, a 100,000 gallon water tank and a new 12-in. water main.

PROGRESS REPORT

RED BUTTE DAM, FORT DOUGLAS, UTAH

Progress is being made as follows in connection with the construction of the Red Butte dam, earth-fill type, to be 80 ft. high and 400 ft. long, and located in Red Butte canyon for the office of the Constructing Quartermaster, War Department, Fort Douglas, Utah.

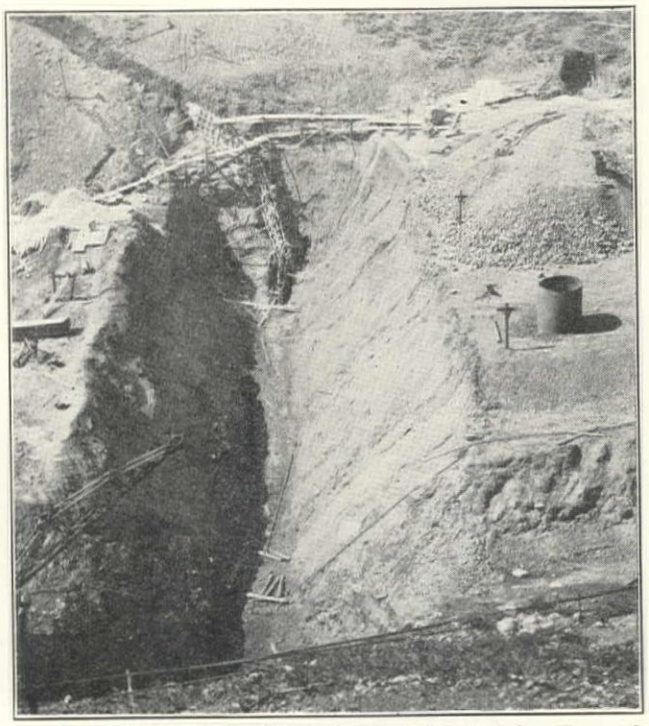
The Utah Construction Co., of Ogden, Utah, since June 27, has diverted stream around damsite, performed all preliminary operations of clearing, stripping, etc., and has completed earth embankment to an elevation of 60 ft. above lower toe. Total material deposited to date is 50,000 cu.yd., and cutoff trench has been excavated and contractor is now engaged in backfilling same with clay material. Driving of outlet tunnel is about 78% complete and work of concrete lining has been commenced at upper end. Extensions to distribution system at Fort Douglas, thus far under-

Utah Construction Co. Placing Earth Embankment in Red Butte Dam, Utah. Cutoff Trench Excavation in Progress in Lower Right Background

taken, consist of sprinkling systems for the Post Parade Ground, Rifle Range and Officers' Circle. Project will be completed about June 1, 1930.

All material in earth embankment is hauled, by trucks and wagons, an average distance of one-quarter mile from borrow pit below dam, deposited in 8-in. layers on dam, sprinkled, and rolled.

The principal items of equipment used by the contractor are as follows: two Bucyrus 50-B steam



View of Cutoff Trench Red Butte Dam, Utah, Showing Forms for Concrete Cutoff Walls at Far End. Trench is 70 ft. Wide at Top, 10 ft. at Bottom, and 30 ft. Deep. Utah Construction Co. Are Contractors

shovels; one P&H 600 gasoline shovel and dragline; one Best '60' Caterpillar bulldozer; two Rohl tampers; two Best '60' Caterpillar tractors; one Caterpillar '60' tractor; ten 5-yd. trucks; twelve 1¼-yd. bottom dump wagons.

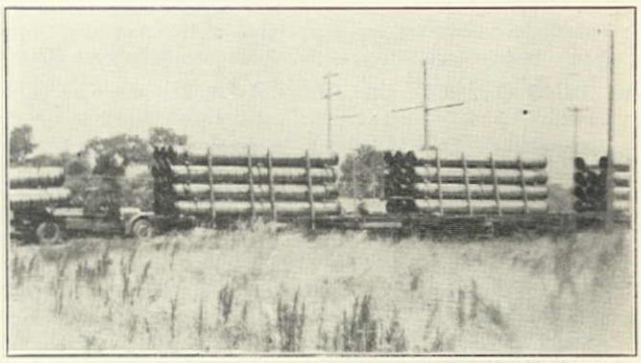
First Lieutenant Charles F. Fletter, Q.M.C., is constructing quartermaster and R. W. Rea, associate civil engineer, War Department, is superintendent of construction. Contract price was $235,000.

MOKELUMNE RIVER PROJECT, EAST BAY MUNICIPAL UTILITY DISTRICT, CALIFORNIA

Moraga Aqueduct—Four schedules of the Moraga aqueduct for the East Bay Municipal Utility District as follows have been completed: **Schedule 1A**—Twohy Bros. and J. F. Shea Co., of San Francisco, completed their contract for this section of aqueduct from Station 0-00 to Station 32-42 on August 1. Electric welded steel pipe was used, being furnished by the Steel Tank & Pipe Co., of Berkeley. The major items of construction equipment were one 1¼-yd. Northwest dragline, one '60' Caterpillar tractor; two electric welding machines; and two Ingersoll-Rand compressors. Contract price was $30,272; and the main construction items were 500-lin.ft. of 48-in. electric welded steel

Laying 36-in. Reinforced Concrete Pipe on Schedule 2A, Moraga Aqueduct, East Bay Municipal Utility District, Bent Concrete Pipe Co., Contractors (Now American Concrete Pipe Co.)

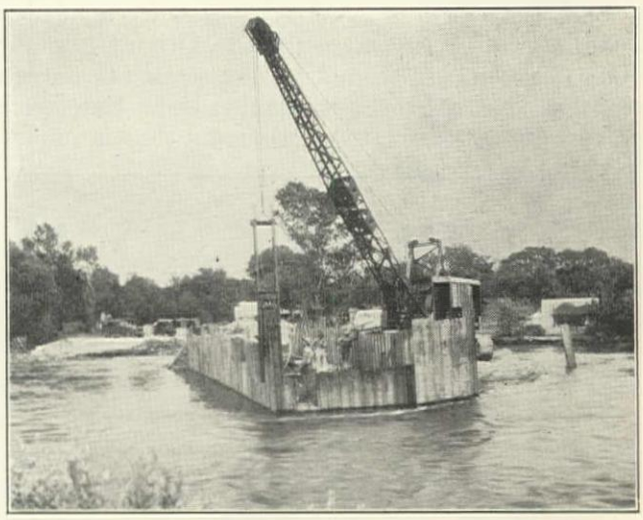
pipe at $10.25 and 2579 lin.ft. of 36-in. electric welded steel pipe at $6.52. **Schedule 2A**—The contractors on this section from Station 32-42 to 86-68 were Bent Concrete Pipe Co. (now American Concrete Pipe Co.) and work was completed August 1. Precast reinforced concrete pipe was used and was manufactured and furnished by the Bent Concrete Pipe Co. from their Oakland plant. Contract was awarded at $38,368, and included 5450 lin.ft. of 36-in. precast reinforced concrete pipe at $5.90. Contractor used one 1¼-yd. Northwest dragline; one Universal truck crane; two 5-ton White trucks with trailers; and two 5-ton Sterling trucks with trailers. **Schedule 3A**—Bent Concrete Pipe Co. (recently merged with the Western Concrete Pipe Co., and now known as the American Concrete Pipe Co.) completed on August 1 their contract for this section of aqueduct, calling for the use of precast reinforced concrete pipe, from Station 86-68 to Station 119-21. The project, which includes 3330 lin.ft. of 30-in. precast reinforced concrete pipe at $4.90, was contracted at $19,578. Main items of construction equipment included one 1¼-yd. Northwest dragline, one Universal truck crane, two 5-ton White trucks with trailers, and two 5-ton Sterling trucks with trailers. The concrete pipe was manufactured and furnished by the Bent Concrete Pipe Co. from their Oakland plant. **Schedule 4A**—



30-in. Steel Pipe for the Moraga Aqueduct, Schedule 4A, East Bay Municipal Utility District, Western Pipe & Steel Co., Contractors

This section of aqueduct from Station 119-21 to Station 247-50 was completed September 1. Western Pipe & Steel Co. were the contractors and electric welded steel pipe was used, the hauling of the pipe being done with 5-ton White trucks with trailers. Other equipment used included one 1¼-yd. Marion pull shovel, one 1-yd. P&H dragline, three Ingersoll-Rand compressors and Jackhamers. Contract was awarded at $59,812, and included 12,250 lin.ft. of 30-in. electric welded steel pipe at $4.47.

Geo. B. Sturgeon was division engineer on above work, and F. W. Hanna is general manager and chief



Constructing Platte River Crossing, Conduit No. 13 for City of Denver, Colorado, Lock Joint Pipe Co., Contractors

engineer of the East Bay Municipal Utility District with headquarters at Oakland.

CONDUIT No. 13, CITY OF DENVER, COLO.

Lock Joint Pipe Co. has completed 80% of the second portion of this conduit for the city of Denver. The contract has been extended to cover the third portion of the conduit, thereby providing for the completion of the conduit, total length of which will be 11.8 miles and will cost $1,466,000. Manufacture of the pipe to

be used in the construction of the third portion has been started. The conduit is to be 60-in. reinforced concrete, the major portion of the line being cylinder reinforced type and the balanced bar reinforced type.

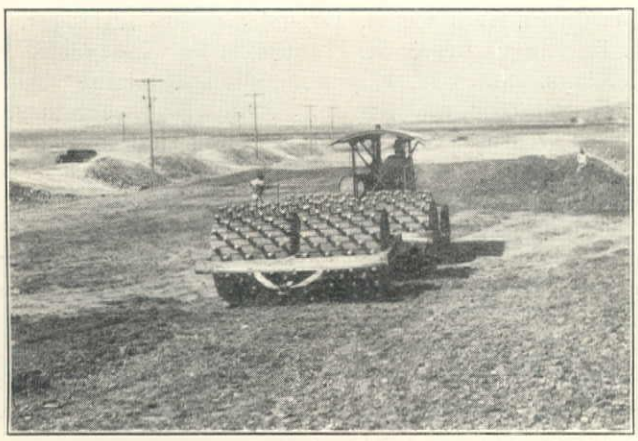
Equipment being used consists of three Northwest pull shovels of 1¼-yd. capacity to excavate trench 8 ft. wide and 9 to 15 ft. deep. Two of the shovels lay pipe

Rough Trimming Embankment Slopes on Chenery Reservoir, Port Costa Development, H. W. Rohl Co., Contractors

as they proceed and a 25-ton American crane is used to lay pipe for the third shovel, also for setting the large valves in the line. A 25-ton locomotive crane is in use at the manufacturing plant. The plant is located at W. Yale Ave. and Santa Fe Tracks, Denver, and the daily output is 360 ft. or 30 sections each 12 ft. long. W. W. Trickey is superintendent in charge for the Lock Joint Pipe Co. and D. D. Gross is chief engineer for the Board of Water Commissioners. Project will be completed about March 1, 1930.

PORT COSTA DEVELOPMENT, CALIFORNIA WATER SERVICE COMPANY

Progress is being made as follows for water supply project, Public Works Engineering Co., engineers for the California Water Service Co., to serve Concord,



Rohl Tamper on Chenery Reservoir, Port Costa Development, California. H. W. Rohl Co., Contractors

Martinez, Crockett, Port Costa, and other towns in Contra Costa county:

Chenery Reservoir—H. W. Rohl Co., of Los Angeles, who has the contract for the placing of fill, had placed 205,000 cu.yd. on October 1 of a total of 450,000 cu.yd. of fill. The stripping has been practically completed and the Rohl contract should be finished by November 1. The California Gunite Construction Co., of Los Angeles, who has the contract for placing the gunite facing, will start work shortly. Following is a list of equipment being used by H. W. Rohl Co.: one '700' P&H gas shovel, 1½ yd., three 1½-yd. Northwest gas shovels, one ¾-yd. Northwest dragline, seven Sterling trucks, 10-cu.yd. bodies, ten Sterling trucks, 7-cu.yd. bodies, four MacMillan scrapers, 3 cu.yd., five '60' Best Caterpillar tractors, one '30' Best Caterpillar tractor, one 12-ft. Adams blade scraper, one 12-ft. Adams blade scraper, six Rohl sheepsfoot tampers.

B. F. Wells is general superintendent, Jack Beal is assistant superintendent, and Mike Kelly is master mechanic for H. W. Rohl Co.

Pipe-Lines—Contracts were recently awarded for pipe-line in connection with the above work. The American Concrete Pipe Co., of San Francisco and Los Angeles, received the contract for the reservoir end of the pipe-line involving 25,000 lin.ft. of 33-in. Hume process centrifugally cast reinforced concrete pipe with 4½-in. walls and 200-ft. head; and the Steel Tank & Pipe Co., of Berkeley, received the contract for the lower portion of the pipe-line, involving 16,300

Marion Shovel and White Trucks on North Crow Dam for City of Cheyenne, Wyoming, A. H. Read Co., Contractors

lin.ft. of 36-in. ¼-in. plate electric welded steel line to be Hermastic dipped and gunite coated on the outside.

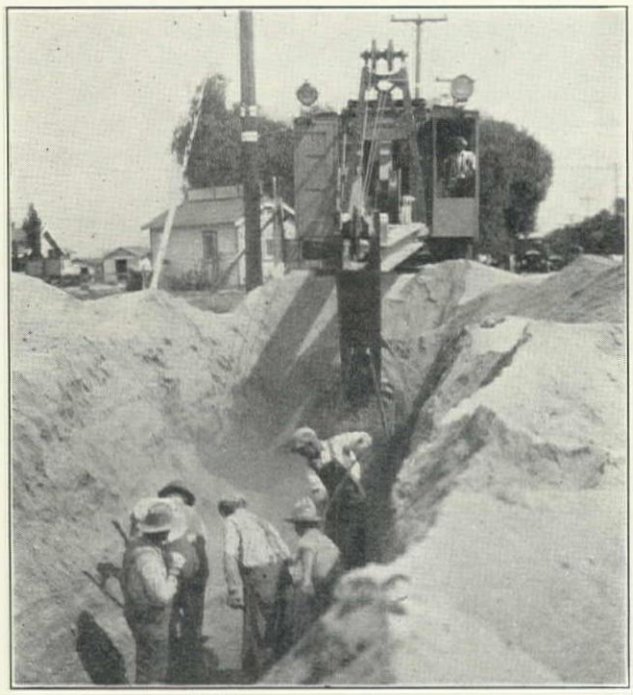
E. K. Barnum is chief engineer, Oswald Spier is designing engineer, and R. F. Brown is project engineer for the Public Works Engineering Corp.

NORTH CROW DAM, CITY OF CHEYENNE, WYOMING

A. H. Read Co., of Cheyenne, Wyoming, has placed over 55,000 cu.yd. earth fill and over 5000 cu.yd. rock fill, in connection with the contract for constructing North Crow dam for the city of Cheyenne, located 29 miles northwest of the city. The dam is earth and rock-fill type, 90 ft. high. Spillway is being excavated, and the tunnel, tunnel plug, piping, and cutoff wall have been finished. Two 10-hours shifts are working; the dam area is electrically lighted at night. One ¾-yd. P&H electric shovel is being used for loading rock; one ¾-yd. Marion power shovel is being used for loading earth; and seven 5-yd. White trucks, six 3-yd. White trucks, and five 1-yd. Ford trucks are being used for hauling earth and rock. Earth is spread by a Galion grader pulled by a 20-ton tractor. Roller of the Rohl type is being used for rolling earth pulled

by the tractor. One Ingersoll-Rand '260' and one Gardner-Denver '220' compressors are furnishing air for the rock work. The 20-in. riveted steel pipe used in the tunnel was furnished by the Thompson Manufacturing Co., of Denver, Colorado.

Project will be completed about March 15, 1930. Contract price $192,455, involving in the main 150,000 cu.yd. of embankment 65¢ yd.; 25,000 cu.yd. of rock



Constructing Hume Reinforced Concrete Van Owen Avenue Pipe-Line for City of Los Angeles, Using Link-Belt Trench Hoe Excavator, American Concrete Pipe Co., Contractors

excavation $1.20 yd.; and 1500 cu.yd. of concrete (cut-off wall) $14.50 yd. P. R. Revis is city engineer of Cheyenne, Wyoming.

RESERVOIR, CITY OF BURBANK, CALIFORNIA

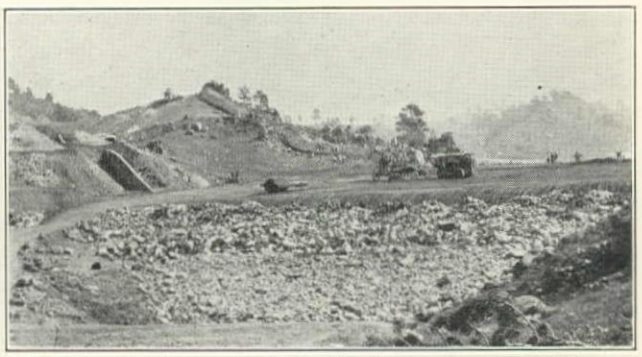
Whipple Engineering Co., of Monrovia, will complete its contract about December 1, 1929, for the construction of Reservoir No. 5 west of Sunset Canyon Country Club for the city of Burbank, Los Angeles county. Excavation and embankment has been completed and pouring of footings has been started. Satisfactory service was obtained from the Linn 9-yd. caterpillar trucks which were used. The contract price was $28,860. H. I. Stites is city engineer of Burbank.

STEEL PIPE-LINE, CITY OF SACRAMENTO

Harry Gould, of Sacramento, will complete his contract about November 30 for the construction of an auxiliary connection from the filtered water basin to the high-lift pumps, consisting of a 60-in. riveted steel conduit 200 ft. long with gate valve. This conduit conducts the filtered water to the pumps supplying the city mains, and parallels the present concrete conduit used for the same purpose. The steel conduit will be laid in a trench 28 ft. deep which has been completed. The pipe is being furnished by the Western Pipe & Steel Co. Contract was awarded at $24,400, and included 38 lin.ft. of 60-in. riveted steel pipe, $\frac{5}{8}$-in. plate at $31.60, and 167 lin.ft. of 60-in. riveted steel pipe, $\frac{7}{16}$-in. plate, at $30. B. C. Clark is city engineer of Sacramento.

VAN OWEN AVE. LINE, CITY OF LOS ANGELES

American Concrete Pipe Co., of Los Angeles, will complete its contract about December 1 for the construction of the Van Owen ave. pipe-line for the De-



Constructing North Crow Earth and Rock Dam for City of Cheyenne, Wyoming, A. H. Read Co., Contractors

partment of Water and Power of the city of Los Angeles. The line is 19,000 ft. long of 18-in. to 51-in. centrifugally spun reinforced concrete pipe, heads varying from 15 in. to 80 ft., and is a collecting line for the Lankershim wells. Work will cost $67,974. Pipe laying is well under way and equipment being used includes a Link-Belt trench hoe excavator, a Universal truck crane, and a Buckeye backfiller. H. A. Van Norman is general manager of the Department of Water and Power and W. W. Hurlbut is engineer of water distribution.

INDUSTRIAL WATER FOR THE EAST BAY

The eastbay cities on San Francisco bay are seeking cheap industrial water and a special committee has been appointed to investigate the problem. The committee includes Charles H. Lee, chairman, C. H. Boardman, Wallace B. Boggs, Gerald H. Hager, S. T. Harding, Chester R. Hunt, Charles G. Hyde, Fred J. Klaus, James H. L'Hommendieu, Romaine Myers, E. E. Peterson, and Raynor E. Anderson, secretary.

Some features of the study are: (1) Industrial water uses—amount used by various industries, quality of water needed, relation between water costs and profit; (2) industrial water requirements of the region; (3) industrial water rates—comparison of the local rate of schedule with those in effect in other western and eastern cities, the maximum or permissible rates for certain industries; (4) the salt water barrier project; (5) sources of industrial water for the local industries —an analysis of all present sources and a survey of all sources capable of development.

Filtration Plant at Camas, Washington

The California Filter Co., of San Francisco and Seattle, has been awarded a contract for the design and construction of a water filtration plant for the Crown-Willamette Paper Co., at Camas, Washington. This plant, of 15,000,000 g.p.d. capacity, will have sedimentation basins, followed by filtration.

New Equipment and Trade Notes

THE AMERICAN WELL WORKS

The American Well Works announces their new 6-in. and 8-in. deep well turbines. These turbines have been built in response to a demand for a turbine to fit smaller bored wells. The deep well turbine consists of the turbine head proper, which is the driving unit, the supporting pipe, which encloses the driving shaft, and the turbine itself, which consists of the number of stages necessary for the specific requirements.

American Turbine for 6 to 8-in. Bored Wells

The turbine head consists of the vertical motor mounted on a very rigid and compact base. The thrust bearing of the motor is designed to carry the load of the line shaft and impellers.

To the turbine is attached the supporting pipe, to the lower end of which is attached the turbine proper.

The turbine proper is a special style of turbine type of centrifugal, and is designed with the special features that have made 'American' deep well turbines so reliable and efficient.

All bearings are oil lubricated by gravity feed from the surface, the gravity feed being electrically controlled.

Provision is made for complete drainage of all waste oil and water leakage and the discharge pipe is located above the floor level, which permits of easy access.

Engineering data and construction details of these turbines may be had from the engineering department of the American Well Works, Aurora, Illinois.

FUSION WELDING CORP. DEVELOPS TYPE-T METAL

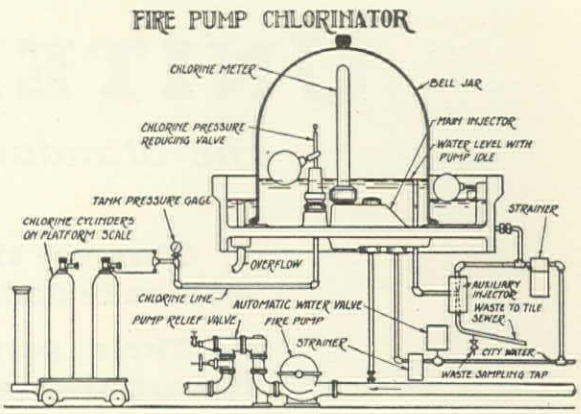
The Fusion Welding Corp., of Chicago, manufacturers of welding and cutting equipment and supplies, has developed a new complex alloy steel, type-T metal, in the form of a welding rod. This rod can be used to apply a highly wear-resistant surface by oxy-acetylene or metallic arc welding processes on tools used largely for cutting metal, drilling rock, and working in soil. In addition to hardness, type-T metal is said to possess ductility. Descriptive Bulletin No. 3, copies of which are available on request, gives the properties of the alloy, operating technique, method of applying the gas deposit, recommended tip sizes, method of applying the metallic arc deposit, recommended current values, and discusses heat treatment and the initial hardness obtainable with this metal.

BYRON JACKSON CO. ANNOUNCES NEW PUMPS

The Byron Jackson Co., manufacturers of pumps for water supply, the oil industries, dredging, special service, and mining uses, has released Bulletin 295 which describes the improved line of type 'S' double suction single-stage horizontally split case centrifugal pumps. As early as 1890 type 'S' centrifugal pumps had been developed by Byron Jackson in sizes up to 50 in. Recently, improvements in materials, process of manufacture, and hydraulic efficiency have been made in this popular line of pumps.

W & T FIRE PUMP CHLORINATOR

Wallace & Tiernan Co., Inc., have installed over 70 fire pump chlorinators at industrial plants in New York state where cross connections are maintained between the fire system from a secondary source and the public water supply. Standard vacuum type solution feed chlorinator equipment is used with



Wallace & Tiernan Fire Pump Chlorinators

Factory Mutual type double check valves. Small auxiliary injectors, operating continuously from the city water system, discharge to waste from one to two pounds of chlorine per day and keep the chlorinators in readiness for emergency use when the fire pumps are put in operation. Then water from the fire system supplies the main injector and automatically feeds chlorine to the fire pump supply at constant predetermined rates set by the State Board of Health.

DE LAVAL STEAM TURBINE CO. EXHIBIT

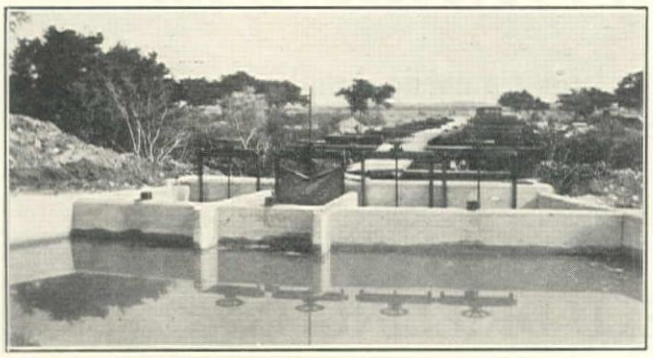
At the 1929 convention of the California Section, American Water Works Association, Del Monte, the De Laval Steam Turbine Co. will exhibit new and small equipment for power production. This exhibit will include: a combined turbine-driven boiler feed centrifugal pump for capacities up to 200 g.p.m. and pressures up to 250 lb. per sq.in.; a small worm gear speed reducer; and a small double suction impeller which has been in service as a second stage impeller of a turbine-driven boiler feed pump having a capacity of 150 g.p.m. against 150 lb. per sq.in. at 22,000 r.p.m. Two of the impeller units were built in Sweden in 1902 and were for many years operated in an industrial plant at Philadelphia.

GREAT WESTERN IRRIGATION METERS

ANSWER YOUR WATER MEASUREMENT PROBLEMS

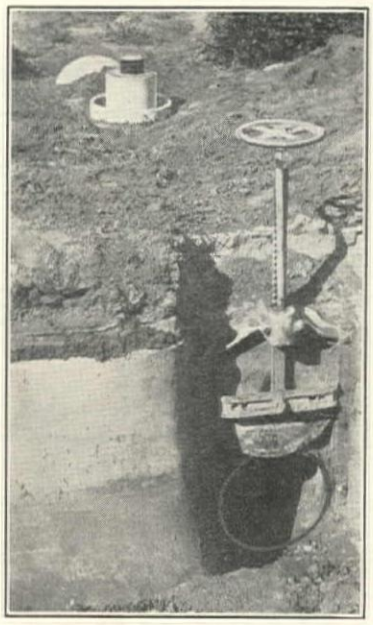
WE have incorporated simplicity of design, accessibility, trashproofness, tamperproofness, and ease of servicing in this practical, low cost installation.

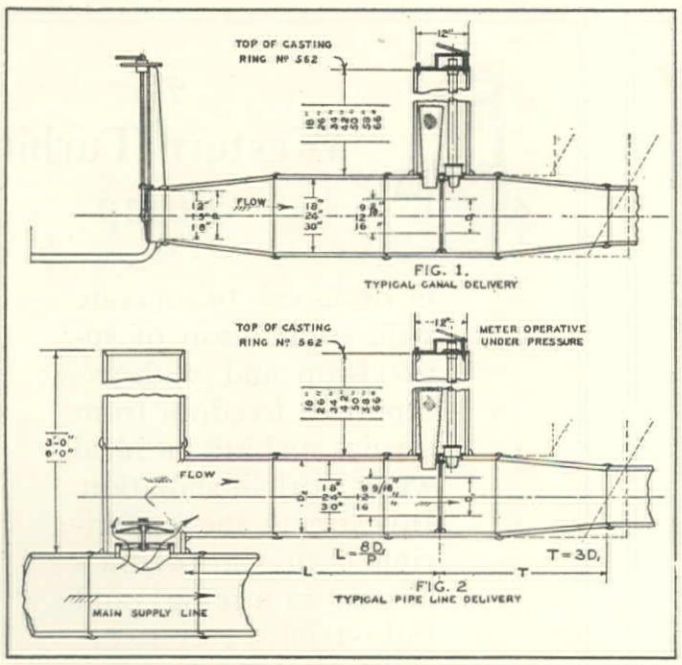
Standard pipe lengths are a feature of our structures, making it possible to use these structures for an embankment pipe line to open laterals.



ABOVE: *Head Gate installation using three orifices. Range—5 sec. ft. up to 150 sec. ft.*

AT RIGHT: *Great Western Meter installed in embankment pipe to open lateral. Also applicable to pressure line—where pipe line system is used. Minimum head loss required 3/8 inch. The Smitham Gate illustrated.*





SECTIONAL VIEW OF EMBANKMENT AND PIPE LINE STRUCTURES

A Few Satisfied Users:

HAWAII

EWA PLANTATION COMPANY
LIHUE PLANTATION CO.
KOLOA PLANTATION CO.
OAHU SUGAR COMPANY
WAIMANILO SUGAR CO.
WAIALUA AGRICULTURAL CO.

CALIFORNIA

MERCED IRRIGATION DISTRICT
BANTA CARBONA IRRIGATION DISTRICT
MADERA CANAL & IRRIGATION DISTRICT
WESTERN CANAL COMPANY

TEXAS

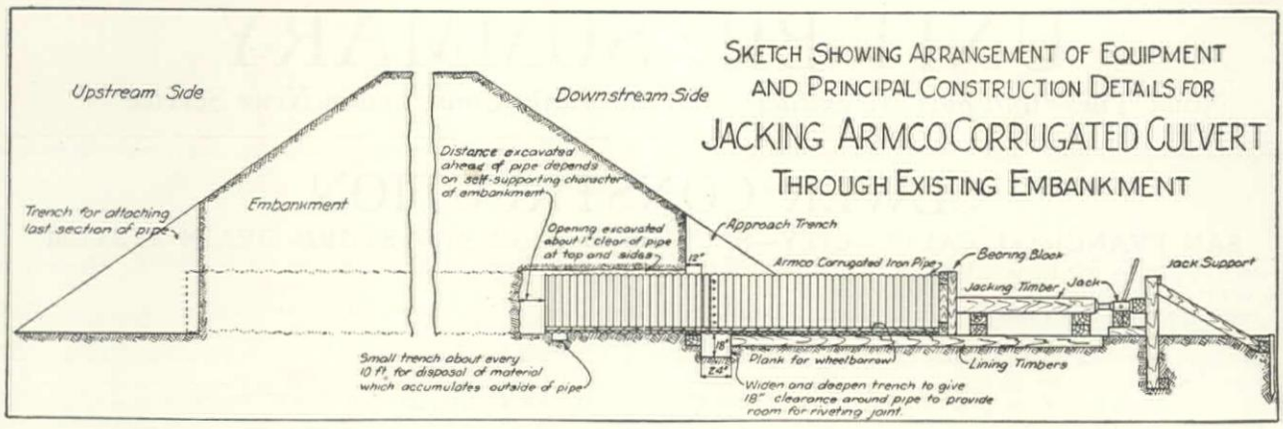
CAMERON COUNTY DISTRICT NO. 7
HIDALGO COUNTY DISTRICT NO. 2
HIDALGO COUNTY DISTRICT NO. 7

BISHOP-JACOBSEN AND CO.

1290 POWELL ST., OAKLAND, CALIFORNIA

Sole Distributors:
GREAT WESTERN
IRRIGATION METERS

Manufacturers' Agents:
SMITHAM, and BANKS MILLER
IRRIGATION GATES



Here's a way to save time and money in passing a culvert through an embankment...

. . . without interrupting traffic!

IT SOMETIMES happens that a culvert must be passed through an existing fill or embankment where traffic is constant and cannot be stopped . . . where detours are of prohibitive cost . . . or where the embankment is of such proportions that excavation is unduly expensive.

When such a situation arises, you will find a logical solution in the process of "jacking".

It's just like jacking up a car or a building, except that it's done horizontally instead of vertically. The diagram above shows the principal details. We'll be glad to show you exactly how it can save time and money for you on a particular job. Write us.

CALIFORNIA CORRUGATED CULVERT COMPANY

Los Angeles:
424 Leroy Street

calco ARMCO **products**

Berkeley:
417 Parker Street

6729

UNIT BID SUMMARY

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

SEWER CONSTRUCTION

SAN FRANCISCO, CALIF.—CITY—SECTION B, ALEMANY STORM DRAIN SYSTEM

Eaton & Smith, 715 Ocean Ave., San Francisco, $271,255 low bid to Board of Public Works for Section B, Alemany Blvd. storm drain system, from Bayshore Blvd. west:

(1) Eaton & Smith, San Francisco $271,255
(2) Chas. A. Shea, San Francisco 286,140
(3) Fredrickson & Watson, Oakland 291,144
(4) Ward Engineering Co., S. F. 311,380
(5) L. J. Cohn, San Francisco 284,471
(6) Clinton Const. Co., S. F. 276,198
(7) C. C. W. Haun, San Francisco $284,038
(8) Chas. L. Harney, San Francisco 369,791
(9) Healy-Tibbitts Const. Co., S. F. 271,864
(10) Gould & Pollock, Sacramento 315,811
(11) MacDonald & Kahn, San Francisco 284,128
(12) S. P. Doyle, San Francisco 312,998

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
423 ft. 2 comp. 8 ft. 6 in. x 11 ft. reinf. conc. storm drain	90.00	81.20	95.00	93.00	80.00	88.00	91.00	139.14	90.00	96.00	83.63	83.40
2,733 ft. 8 ft. 6½ in. x 12 ft. pile foundation, arch sect. reinf. conc. storm drain	50.00	45.50	47.50	53.00	40.00	43.50	46.00	67.25	46.50	48.00	45.76	52.00
300 ft. 8 ft. 6½ in. x 12 ft. earth foundation, arch sect. reinf. conc. storm drain	47.00	40.05	45.00	51.50	40.00	45.50	44.00	66.15	60.00	55.00	45.08	50.00
735 ft. 3 ft. x 4 ft. 6-in. reinf. conc. sewer	10.00	16.80	11.00	18.00	12.00	13.00	14.00	13.84	16.00	30.00	14.34	12.20
180 ft. 2 ft. 6 in. x 3 ft. 9 in. reinf. conc. sewer	10.00	9.11	14.50	16.60	17.00	12.00	15.00	13.36	12.00	24.00	12.51	11.80
315 ft. 21-in. vitr. sewer (embedded in concrete)	6.00	6.70	7.15	8.80	7.00	6.10	7.00	4.50	6.00	10.00	7.47	7.00
85 ft. 18-in. vitr. sewer	4.00	5.00	3.40	4.00	2.00	2.90	3.00	3.00	4.00	3.00	2.16	2.50
1 taper connection	$1,625	$1,318	$1,590	$1,800	$ 2,145	$2,000	$1,850	$2,343	$2,000	$1,800	$1,591	$2,100
1 reinf. conc. special structure	$6,600	$5,320	$5,700	$8,000	$10,000	$7,000	$6,900	$8,112	$5,000	$8,000	$5,078	$5,500
1 special manhole	150.00	100.00	150.00	340.00	185.00	170.00	170.00	200.00	200.00	200.00	221.00	200.00
19 manholes, cast-iron frames and covers	50.00	50.00	100.00	105.00	40.00	45.00	79.00	100.00	50.00	100.00	65.56	100.00
2 manholes with pile foundations	100.00	100.00	135.00	118.00	100.00	111.00	125.00	100.00	100.00	200.00	157.74	125.00
13 21x6 in. Y branches	5.00	5.00	3.50	7.00	2.00	2.00	4.50	10.00	10.00	3.00	7.17	3.50
1,200 ft. 6-in. vitr. underdrain	.45	1.00	1.50	1.80	.60	1.55	1.10	1.00	.90	.50	.86	1.00
1,000 ft. 8-in. vitr. underdrain	.70	1.25	1.50	2.15	.75	1.85	1.20	1.35	1.25	.75	1.08	1.25
1,000 ft. 10-in. vitr. underdrain	.85	1.50	1.50	2.85	.85	2.00	1.60	1.50	1.50	1.00	1.30	1.50
165,000 ft. piles below cutoff	.35	.50	.45	.42	.59	.445	.45	.45	.35	.485	.4825	.53
10,000 ft. 2-in. asphalt surf. on 8-in. macadam base	.12	.40	.45	.25	.15	.21	.13	.14	.12	.20	.224	.50
400 ft. granite curb reset	.25	.50	.85	.25	.30	1.15	.25	.40	1.00	.20	.60	.50
1 wood intake and grate on 18-in. sewer	50.00	100.00	140.00	180.00	100.00	90.00	135.00	38.55	200.00	150.00	323.00	100.00
1 wood intake and grate on 3 ft. x 4 ft. 6-in. sewer	75.00	100.00	260.00	330.00	150.00	150.00	253.00	61.20	350.00	200.00	283.00	200.00
1 reinf. concrete junction struct.	200.00	100.00	460.00	380.00	200.00	350.00	290.00	200.00	350.00	600.00	165.00	200.00

SAN FRANCISCO, CALIF.—CITY—SECTION A, ALEMANY BLVD. STORM DRAIN SYSTEM

Clinton Const. Co., 923 Folsom St., S. F., at about $126,000, low bid to Board of Public Works for Sect. A of Alemany Blvd. storm drain system from Mission St. west. Bids from:

(1) Chas. A. Shea, San Francisco $145,142
(2) Eaton & Smith, San Francisco 135,270
(3) Fredrickson & Watson, Oakland 146,152
(4) H. C. Vensano, San Francisco 168,421
(5) Ward Engineering Co., S. F. 147,564
(6) Clinton Const. Co., S. F. 126,581
(7) C. C. W. Haun, San Francisco 133,480
(8) California Const. Co., S. F. $137,983
(9) Chas. L. Harney, S. F. 182,765
(10) Healy-Tibbitts Const. Co., S. F. 128,599
(11) H. Gould & Pollock, Sacramento 151,298
(12) MacDonald & Kahn, S. F. 137,110
(13) S. P. Doyle, San Francisco 145,304

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
2,293 ft. 8 ft. 1½ in. x 10 ft. 3 in earth found. arch sect. reinf. conc. drain	42.10	44.00	45.50	53.00	46.00	41.50	39.00	45.25	59.59	32.00	47.50	43.40	44.90
800 ft. 8 ft. 1½ in. x 10 ft. 3 in. rock found. arch sect. reinf. conc. drain	49.60	38.50	43.00	49.50	39.50	31.25	44.75	35.00	48.80	58.00	46.50	37.15	42.70
30 lin.ft. 21-in. vitr. pipe	5.00	5.00	3.50	5.00	12.00	4.15	7.00	5.00	3.00	4.00	3.00	4.60	8.00
67 lin.ft. 18-in. vitrified pipe	5.00	4.00	3.00	13.00	17.00	4.80	9.00	5.00	2.75	4.00	3.00	6.64	7.00
70 lin.ft. 15-in. vitrified pipe	5.00	3.00	2.50	4.30	9.40	2.65	4.00	2.50	2.50	3.00	2.00	7.74	4.00
50 lin.ft. 12-in. vitrified sewer	5.00	2.00	2.00	3.50	4.50	2.60	2.20	1.80	1.75	2.50	2.00	7.60	3.00
1 taper connect. from culv. to sewer	$471	$400	$545	$650	$585	$700	$600	$500	$628	$600	$500	$521	$550
1 taper connect. from sewer to sewer	$521	$400	$525	$650	$645	$700	$600	$500	$770	$600	$500	$796	$1200
11 manholes, cast iron frames and cov.	50.00	50.00	90.00	95.00	$104	60.00	80.00	65.00	$100	60.00	$100	75.30	$100
3 manholes	$100	$100	$100	$150	$160	$100	$140	$120	$100	80.00	$100	$251	$150
1,000 lin.ft. 6-in. vitr. pipe underdrain	1.50	.30	1.50	.85	1.55	.90	1.25	.95	1.00	1.50	.50	.92	1.00
1,000 lin.ft. 8-in. vitr. pipe underdrain	2.00	.40	1.50	1.00	1.75	1.15	1.50	1.15	1.25	2.00	.75	1.15	1.25
1,000 lin.ft. 10-in. vitr. pipe underdrain	2.50	.50	1.50	1.15	1.95	1.25	1.80	1.30	1.50	2.50	1.00	1.40	1.50

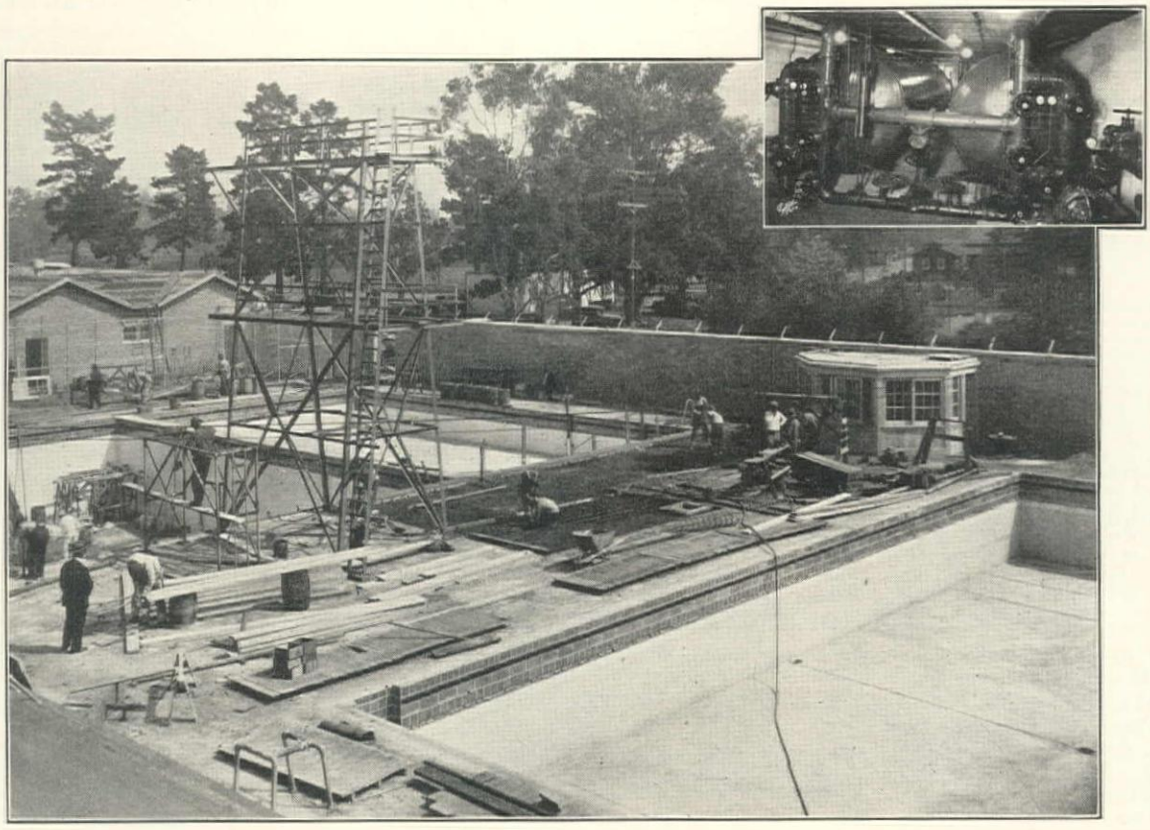
MISSOULA, MONT.—VITRIFIED—CITY—SOUTH SIDE DISTRICT

Contract awarded to Morrison-Knudsen Co., Boise, Ida., who bid $464,420 for constructing south side vitrified pipe sewer for City. Bids from:

(1) Morrison-Knudsen Co. $464,420
(2) J. F. Shea, Portland, and Clifton, Applegate & Toole, Spokane $469,419
(3) J. C. Maguire, Butte $481,505

	(1)	(2)	(3)
1,280 cu.yd. solid rock excavation	6.00	5.00	7.00
1,998 cu.yd. intermediate	2.25	2.75	3.00
131,500 cu.yd. gravel and earth	1.83	1.90	1.85
300 cu.yd. embankment	1.00	.50	.80
14,415 ft. 8-in. D.S. vitrified pipe	.90	1.00	1.05
4,430 ft. 9-in. D.S. vitrified pipe	1.15	1.20	1.25
38,768 ft. 10-in. D.S. vitrified pipe	1.20	1.25	1.25
1,430 ft. 12-in. D.S. vitrified pipe	1.40	1.50	1.80
4,847 ft. 15-in. D.S. vitrified pipe	2.40	2.50	2.85
6,740 ft. 18-in. D.S. vitrified pipe	3.40	3.50	3.65
3,302 ft. 21-in. D.S. vitrified pipe	4.40	4.50	4.90
3,493 ft. 30-in. D.S. vitrified pipe	8.90	8.00	9.00
657 8-in. 2½' by 6" Ys	3.00	3.20	4.00
286 9-in. 2½' by 6" Ys	4.00	4.00	4.75
2,196 10-in. 2½' by 6" Ys	4.00	4.50	5.00
4 12-in. 2½' by 6" Ys	6.00	6.00	5.50
23 15-in. 2½' by 6" Ys	10.00	8.00	7.50
16 18-in. 2½' by 6" Ys	16.00	10.00	12.50
5 21-in. 2½' by 6" Ys	25.00	20.00	18.00
4 30-in. 2½' by 6" Ys	40.00	30.00	30.00
194 standard concrete manholes	155.00	140.00	150.00
280 ft. extra height, per ft.	10.00	8.00	7.50
46 flush tanks	250.00	200.00	300.00
450 sq.yd. paving replacement	5.00	5.25	3.00
1 concrete bulkhead	100.00	70.00	75.00
6,445 ft. B.M. lumber	50.00	60.00	45.00
4,375 ft. ¾-in. galv. pipe	.25	.20	.20

Engineer's estimate for the above work was $470,260.



Califilter Goes Collegiate In Latest Pool Development

STANFORD UNIVERSITY'S new swimming plant pictured above, is composed of three pools to permit the most efficient handling of candidates for the three classes of water sports. The large pool in the foreground is for varsity races and water polo; the smaller pool to the left is for diving, and the shallow pool in the background is for swimming instruction. The three pools have a combined capacity of 454,000 gallons, and it is estimated that between 300 and 400 students will use the pools daily. Accommodations are possible for 2200 spectators.

In this latest development in specialized pool planning, complete mechanical equipment was furnished by California Filter Company, and includes three pumps, one for each pool, and two horizontal pressure Califilters of the type shown in the inset, each 8 ft. in diameter by 16 ft. long. The pump and filter capacities are designed for a complete turnover of each pool in 7½ hours.

This new Stanford swimming plant is one of the finest in the country, and marks a great step in the refinement of swimming pool planning for specialized purposes. The choice of California Filter Company to supply complete mechanical equipment for the plant is a tribute to the sustained high calibre and dependability of Califilter performance.

CALIFORNIA FILTER COMPANY, INC.

981 Folsom Street

SEATTLE SAN FRANCISCO LOS ANGELES

STREET AND ROAD WORK

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

New Mexico Const. Co., 4015 Galapago St., Denver, Colo., $384,533 low to California Division of Highways, Sacramento, for 22.4 mi. grading and surfacing from 1½ mi. west of Siberia to 6 mi. east of Amboy, SAN BERNARDINO COUNTY. Bids received from:

(1) New Mexico Const. Co., Denver $384,533
(2) Hodgman & MacVicar, Pasadena 387,749
(3) Allied Contractors, Omaha, Neb. 396,107
(4) S. J. Hales, Santa Ana 399,747
(5) V. R. Dennis Const. Co., San Diego 411,224
(6) Geo. Herz & Co., San Bernardino 418,955
(7) Dillon & Boles, Los Angeles 419,135
(8) Lord & Bishop, Grier & Taylor; W. K. McMillan, Sacramento $436,762
(9) C. R. Adams, Nevada City 439,090
(10) Fredrickson & Watson Const. Co. and Fredrickson Bros., Oakland 439,203
(11) Isbell Constr. Co., Fresno 460,504
(12) P. J. Akmadzich, Los Angeles 535,826
(13) Average bid 427,500

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
363,500	cu.yd. roadway excavation	.26	.30	.27	.30	.27	.34	.32	.26	.36	.316	.30	.50	.32
373,000	sta.yd. overhaul	.01	.01	.01	.01	.02	.02	.02	.03	.01	.01	.02	.02	.016
5,670	cu.yd. struct. excavation	1.00	1.00	1.00	1.00	.60	.85	1.00	1.25	1.00	.75	1.00	1.30	.98
7,000	M gallons water	2.50	2.50	2.50	2.80	3.10	3.75	3.00	4.00	4.00	4.25	3.50	5.00	3.41
59,600	tons oil tr. gravel or stone surf.	2.10	1.90	2.18	2.10	2.36	1.80	1.85	2.65	2.10	2.50	2.67	2.20	2.20
1,180	cu.yd. gravel or stone (screenings)	2.00	2.00	3.00	1.80	3.00	2.30	2.50	2.50	2.00	3.00	2.67	2.75	2.46
1,042	bbl. fuel oil	2.80	2.25	2.50	2.25	3.00	2.40	2.50	2.50	2.50	3.10	3.00	2.50	2.61
412	ft. 18-in. corr. pipe	.50	.50	.50	.50	.60	.50	1.00	.50	.50	.50	.75	.60	.58
62	ft. 24-in. corr. pipe	.70	.60	.60	.60	.75	.60	1.00	.75	1.00	.50	1.00	.70	.73
384	ft. 36-in. corr. pipe	.80	.75	.80	.80	1.00	.90	1.50	1.00	1.50	.60	1.50	1.00	1.01
27,240	ft. creo. Douglas fir piles, furnish	.90	.90	.90	.92	.88	.91	.95	.85	.95	.90	.90	.97	.91
1,332	each drive above piles	12.00	10.00	13.00	9.35	13.00	18.00	20.00	12.00	12.00	8.50	14.00	18.00	13.30
287	M BM untr. Douglas fir timber	72.00	80.00	75.00	75.00	75.00	80.00	74.00	70.00	80.00	74.00	98.00	$105	79.80
379	M BM redwood (dense sel. all ht. struct.)	98.00	$100	$100	$100	$100	$101	$110	$100	$105	95.00	$110	$115	$103
284	M BM redwood (select all ht. struct.)	98.00	$100	95.00	93.50	85.00	96.00	$100	90.00	$100	$100	$100	$115	97.70
308	cu.yd. dry rubble (retain. walls)	3.00	6.00	4.00	8.00	3.00	3.00	4.00	4.00	8.00	11.25	6.00	10.00	5.85
1,181	sta. finishing roadway	3.70	3.00	3.50	4.00	5.00	4.00	5.00	6.00	3.00	4.00	3.00	5.00	4.10
279	monuments	2.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.50	2.50	3.00	2.87

PHOENIX, ARIZ.—STATE—OIL PROCESSING

Unit bids as follows by State for oil processing highways: Southwest Paving Co., Washington Bdg., Los Angeles, $66,749 low for 16 miles oil processing Globe-Safford Highway. Bids from the following concerns:

(1) Southwest Paving Co., L. A. $66,749
(2) Lee Moor Cont. Co., El Paso, Tex. 68,680
(3) J. C. Compton, McMinnville, Ore. 71,978
(4) V. R. Dennis Const. Co., San Diego $72,834
(5) L. A. Decomp. Gra. Co., L. A. 76,474
(6) Schmidt-Hitchcock, Phoenix, Ariz. 82,738

		(1)	(2)	(3)	(4)	(5)	(6)
	FEDERAL AID 87-C						
3,457	cu.yd. add. material	.65	1.00	1.00	1.00	1.50	1.50
3,457	cu.yd.mi. add. mat. haul	.19	.20	.20	.20	.14	.30
62,227	gal. oil applied to roadway	.08	.08	.075	.08	.10	.075
3.9	mi. mix, lay, and finish roadway	$340	$1200	$550	$500	$600	$350
	NON-FEDERAL AID WORK						
185	cu.yd. add. material	.65	1.00	1.00	1.00	1.50	1.50
397	cu.yd.mi. add. mat. haul	.19	.20	.20	.20	.14	.30
3,329	gal. oil applied to roadway	.08	.08	.075	.08	.10	.075
0.21	mi. mix, lay, and finish roadway	$400	$1200	$550	$500	$600	$350
	FEDERAL AID 15-A AND B						
1,444	cu.yd. add. material	.65	1.00	1.00	1.00	1.50	1.50
3,908	cu.yd.mi. add. mat. haul	.19	.20	.20	.20	.14	.30
25,996	gal. oil applied to road	.08	.08	.075	.08	.10	.075
1.641	mi. mix, lay, and finish road	$340	$1200	$550	$500	$600	$350
	FEDERAL AID 87-A						
29,564	sq.yd. prepare subgrade	.015	.025	.01	.03	.02	.01
44,346	gal. oil applied to road	.08	.08	.075	.08	.10	.075
2.8	mi. mix, lay, and finish road	$340	$1200	$550	$500	$600	$350
171,524	sq.yd. prepare subgrade	.0175	.01	.01	.01	.02	.01
21,441	gal. oil applied to subgrade	.08	.08	.075	.08	.10	.075
17,500	tons plant mix	2.30	2.30	2.70	2.75	2.80	3.50
72,446	tons plant mix, haul	.13	.14	.15	.11	.11	.12
16,243	mi. spread and finish	$315	$300	$150	$300	$300	$100
	NON-FEDERAL AID WORK						
812	tons plant mix, stockpile	2.30	2.30	3.00	2.75	2.40	3.50
3,362	ton mi. plant mix, haul, pile	.13	.14	.15	.11	.12	.12

SACRAMENTO, CALIF.—STATE—HUMBOLDT COUNTY—GRADING AND SURFACING

E. C. Coats, Loleta, Humboldt County, and Sixth and Y Sts., Sacramento, $130,767 submitted low bid to California Division of Highways, Sacramento, for 2.9 miles grading and surfacing with gravel or stone from Fish Creek to Stephens Grove, HUMBOLDT COUNTY. Bids submitted on the following items for construction of the project:

(1) 26 acres clearing and grubbing
(2) 226,700 cu.yd. roadw. excavation
(3) 491,250 sta.yd. overhaul
(4) 1,230 cu.yd. struc. excav.
(5) 8,350 cu.yd. untreated cr. gravel or stone surfacing
(6) 626 M gal. water
(7) 1,200 cu.yd. screenings (stockp.)
(8) 166 cu.yd. 'A' conc. (struct.)
(9) 14,450 lb. reinf. steel
(10) 310 lin.ft. 12-in. corr. pipe
(11) 1,876 lin.ft. 18-in. corr. pipe
(12) 800 lin.ft. 24-in. corr. pipe
(13) 104 lin.ft. 30-in. corr. pipe
(14) 28 lin.ft. 18-in. met. flume (part circ.)
(15) 1,210 ft. 8-in. perf. met. pipe underdrain
(16) 154 stations finish road
(17) 86 monuments (each)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	TOTALS
E. C. Coats, Sacramento	$250	.37	.01	1.00	2.30	3.00	2.30	25.00	.06	.60	.70	.90	1.10	1.00	1.65	5.00	3.00	$130,767
Wren & Greenough, Portland	175	.43	.01	1.25	2.00	1.75	2.00	28.00	.06	.50	.75	1.00	1.00	.75	1.50	8.00	2.50	139,940
W. H. Hauser, Oakland	500	.37	.01	2.00	2.50	3.00	2.25	40.00	.06	.50	.70	.90	1.00	1.00	1.50	10.00	2.50	143,101
J. M. DeLuca, Oakland	200	.46	.01	1.25	2.15	2.50	2.15	25.00	.07	.50	.60	1.00	1.25	.50	1.25	5.00	3.00	147,956
J. F. Knapp, Oakland	2 0	.45	.02	1.25	2.50	2.00	2.50	25.00	.06	.60	.75	.90	1.00	1.00	1.50	5.00	3.00	154,009
J. E. Johnston, Stockton	2 0	.48	.02	1.50	3.00	3.00	3.00	30.00	.05	1.00	1.25	2.00	2.25	1.25	1.00	6.00	3.00	168,832
Mercer-Fraser Co., Eureka	460	.53	.01	1.50	2.70	3.00	2.70	30.00	.06	.75	.80	1.25	1.50	1.50	1.50	10.00	3.00	177,362
C. R. Johnson, Portland	450	.54	.02	1.50	2.25	2.25	2.60	22.00	.07	.40	.40	.50	.50	.50	1.10	7.50	3.50	177,894
D. McDonald, Sacramento	300	.54	.01	1.50	2.80	2.00	2.25	30.00	.06	1.00	1.50	1.50	1.50	1.50	.70	15.00	3.00	178,091
Kennedy-Bayles Const. Co.	400	.57	.01	2.00	2.00	2.00	2.00	30.00	.06	.60	.70	.85	1.10	.60	1.75	5.00	3.00	178,646
Guy F. Atkinson Co., S. F.	600	.52	.01	1.50	2.50	4.00	3.50	25.00	.07	.60	.75	1.00	1.50	2.00	1.50	12.50	3.00	179,585
Ariss-Knapp Co., Oakland	400	.55	.02	2.00	2.50	3.00	2.50	30.00	.05	1.50	1.75	2.00	2.50	2.00	.75	10.00	3.00	187,195
S. H. Palmer Co., San Francisco	350	.60	.01	1.50	2.50	2.50	3.10	30.00	.06	.60	.85	1.10	2.00	3.00	1.50	7.50	2.50	190,022
Jasper-Stacy Co., S. F.	480	.68	.02	2.40	3.90	3.80	3.00	28.00	.08	.60	.80	1.20	1.70	1.50	1.00	8.00	4.00	229,412
Average bid	350	.51	.013	1.58	2.54	2.70	2.56	28.45	.06	.70	.88	1.15	1.42	1.29	1.26	8.18	3.00	170,300

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

Fredrickson & Watson Const. Co., 354 Hobart St., Oakland, Calif., who bid $95,450, submitted low bid to California Division of Highways, Sacramento, for 1.5 miles grading and concrete paving at San Ardo, MONTEREY COUNTY. Bids received from:

(1) Fredrickson & Watson Const. Co. ..... $ 95,450
(2) Prentiss Paving Co., San Jose 95,947
(3) Peninsula Paving Co., S. F. 96,620
(4) W. A. Dontanville, Salinas 97,444
(5) J. F. Knapp, Oakland 98,278
(6) M. J. Bevanda, Stockton 98,316
(7) C. T. Malcom, Walnut Creek 102,621
(8) Granite Const. Co., Watsonville 104,750
(9) McCray Co., Los Angeles $106,548
(10) Isbell Const. Co., Fresno 110,089
(11) Wimmer & Shepardson, Bakersfield 112,400
(12) Cornwall Const. Co., Santa Barbara 113,184
(13) Meyer Rosenberg, San Francisco 113,781
(14) Ariss-Knapp Co., Oakland 131,802
(15) Average bid 105,400

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
4 acres clearing and grubbing	$175	50.00	$200	$125	$200	$100	$100	$200	$100	$150	$200	$100	$150	$150	$143
83,700 cu.yd. roadway excavation	.35	.30	.28	.29	.30	.35	.32	.39	.40	.34	.32	.35	.40	.40	.34
1,129,000 sta.yd. overhaul	.005	.0055	.006	.009	.01	.005	.01	.006	.007	.005	.0175	.015	.01	.02	.01
17,000 cu.yd. imported borrow	.35	.30	.17	.39	.30	.43	.40	.40	.40	.50	.35	.50	.40	.60	.39
2,225 cu.yd. structure excavation	.80	.75	.75	1.00	1.00	1.60	1.00	.90	.80	2.00	1.00	1.00	1.00	1.50	1.08
17,100 sq.yd. subgrade for pavement	.10	.10	.08	.09	.09	.10	.09	.09	.12	.10	.10	.09	.09	.12	.10
3,515 cu.yd. A concrete (pavement)	10.50	11.00	12.30	10.50	10.25	10.50	10.50	10.77	11.00	12.00	11.50	10.50	12.00	12.00	11.09
23 cu.yd. A concrete (structure)	20.00	22.00	24.00	25.00	22.00	25.00	25.00	26.00	25.00	30.00	25.00	25.00	28.00	30.00	25.10
175 cu.yd. A concrete (slope pave.)	16.00	20.00	15.00	16.00	15.00	16.00	15.00	20.00	16.00	25.00	15.00	15.00	10.00	15.00	16.40
89,400 lb. reinf. steel	.045	.0475	.053	.0475	.05	.05	.05	.055	.05	.06	.05	.05	.045	.05	.05
122 lin.ft. 18-in. corr. pipe	.50	.75	.70	.50	.50	.50	.50	.40	.40	.50	.50	1.00	.75	1.00	.61
230 lin.ft. 24-in. corr. pipe	.50	1.00	.80	.75	.60	.60	.50	.60	.50	.75	.50	1.25	1.00	1.50	.78
82 lin.ft. 30-in. corr. pipe	.60	1.00	.90	1.00	.75	.75	1.00	.70	.60	1.00	.75	1.50	1.50	1.75	.99
106 lin.ft. 36-in. corr. pipe	.60	1.50	1.00	1.50	.90	1.00	1.50	.80	.70	1.50	1.00	1.75	1.75	2.00	1.25
62 lin.ft. 24-in. rein. conc. pipe	3.75	2.75	3.00	3.00	5.00	4.00	3.00	4.00	3.50	2.00	3.00	3.00	3.50	3.00	3.32
2.4 miles new property fence	$450	$500	$500	$500	$500	$400	$500	$500	$500	$500	$450	$600	$500	$600	$500
4,200 lin.ft. solid timber guard rail	.80	.90	.90	1.00	1.00	.75	1.00	.90	1.00	.90	.60	1.25	1.00	1.00	.93
800 cu.yd. remove and dispose of conc	1.00	3.50	3.00	1.25	2.50	.50	3.00	1.50	1.50	2.00	3.00	2.00	3.00	2.50	2.16
84 stations finish roadway	4.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	5.00	10.00	5.00	5.00	6.00	10.00	5.86
33 monuments (each)	2.50	3.00	3.00	3.25	3.00	3.00	3.00	1.80	3.00	3.00	4.00	3.00	3.00	3.00	2.97

SACRAMENTO, CALIF.—STATE—LOS ANGELES COUNTY—GRADING AND CONCRETE PAVING

McCray Co., 4482 E. Worth St., Los Angeles, $69,087 low bid to California Division of Highways for 1.1 mile grading and paving from Newhall Tunnel to Newhall, LOS ANGELES COUNTY. Bids from:

(1) McCray Co., Los Angeles $69,087
(2) C. G. Willis & Sons, L. A. 72,698
(3) A. E. Cox and B. W. Kuhn, L. A. 76,523
(4) Matich Bros., Elsinore 77,511
(5) O. A. Lindberg, Newhall 93,588
(6) Gibbons & Reed, Burbank $94,541
(7) Geo. Mitchell Co., Huntington Park 98,179
(8) McWilliams & Ritchey, L. A. 98,437
(9) Average bid 85,100

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
59 sta. clearing and grubbing	7.00	8.00	20.00	25.00	20.00	40.00	10.00	30.00	20.00
85,000 cu.yd. roadway excavation	.39	.45	.44	.45	.58	.59	.64	.56	.51
635,000 sta.yd. overhaul	.009	.0075	.009	.01	.01	.01	.01	.015	.01
600 cu.yd. structure excavation	1.00	1.00	1.50	1.00	1.25	1.00	1.50	2.00	1.28
10,902 sq.yd. subgrade for pave.	.12	.10	.11	.09	.10	.10	.15	.25	.13
2,240 cu.yd. 'A' conc. (pavement)	8.75	8.90	9.50	9.60	11.00	11.00	10.40	11.00	10.02
120 cu.yd. 'A' conc. (structures)	20.00	15.00	27.00	20.00	25.00	22.00	30.00	25.00	22.90
65,000 lb. reinforcing steel	.05	.05	.045	.04	.05	.05	.05	.048	.048
330 ft. 24-in. corr. metal pipe	.50	.50	.60	.50	1.00	1.00	1.00	1.00	.76
250 ft. 42-in. corr. metal pipe	.70	.75	1.00	1.50	1.75	3.00	2.00	2.00	1.59
1.5 mile new property fence	$500	$350	$500	$550	$500	$500	$750	$700	$543
225 lin.ft. bank protection fence	4.00	4.00	4.00	5.00	8.00	3.00	5.00	8.00	5.12
1 mile remove and reset prop. fence	$300	$200	$225	$500	$350	$300	$400	$650	$365
59 sta. finishing roadway	5.00	8.00	5.00	5.00	5.00	10.00	10.00	8.00	7.00
72 monuments (each)	3.00	4.00	3.00	3.00	3.00	3.00	4.00	2.50	3.19

SACRAMENTO, CALIF.—STATE—GRADING AND SURFACING—INYO COUNTY

F. W. Nighbert, Box 436, Bakersfield, $63,297 low bid to California Division of Highways for 3.7 miles grading and oil treated gravel or stone surfacing from Little Lake to Coso Junction, INYO COUNTY. Bids from:

(1) F. W. Nighbert, Bakersfield....$63,297 (2) A. J. Grier, Oakland....$70,214 (3) Average bid $66,756

	(1)	(2)	(3)
33,600 cu.yd. road excav.	.65	.70	.68
77,102 sta.yd. overhaul	.02	.02	.02
11,600 cu.yd. imported borrow	.50	.70	.60
300 cu.yd. structure excav.	1.00	1.25	1.13
3,900 cu.yd. binder for subgrade	.60	.70	.65
850 M gal. water for subgr. and surf.	2.00	2.00	2.00
8,200 tons crusher run base	1.65	1.60	1.63
5,940 tons oil tr. cr. gravel or stone surf.	2.00	2.40	2.20
320 tons cr. gr. or stone screen	1.70	2.00	1.85
175 bbl. fuel oil (seal coat)	2.55	2.40	2.48
65 cu.yd. 'A' conc. (struct.)	25.00	30.00	27.50
7,600 lb. reinf. steel (struct.)	.06	.06	.06
112 lin.ft. 18-in. corr. pipe	.70	.50	.60
186 lin.ft. 24-in. corr. pipe	.70	1.00	.85
44 lin.ft. 30-in. corr. pipe	.70	2.00	1.35
193 sta. finishing roadway	5.00	5.00	5.00
30 monuments (each)	3.00	3.00	3.00

WATER SUPPLY SYSTEMS

SEATTLE, WASH.—CITY—LAKE YOUNGS REINFORCED CONCRETE AQUEDUCT

Contract awarded to Elliot, Stroud Bros. & Seabrook, 4959 34th St., San Diego, Calif., $351,720 for Lake Youngs Aqueduct for City of Seattle. Bids received on from three lowest bidders:

(1) 3 acres clearing and grubbing
(2) 10,202 lin.ft. 96-in. reinf. conc. pipe
(3) 30,000 cu.yd. excav. for pipe, earth
(4) 10,000 cu.yd. excav. for pipe, rock
(5) 600 cu.yd. excavation, tunnel invert
(6) 2 manholes and vent pipe
(7) 1 blow-off including 30-in. gate valve
(8) 160 lin.ft. install 30-in. cast iron pipe
(9) 400 cu.yd. conc. protect. river crossing
(10) 200 cu.yd. concrete blocking

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Elliot, Stroud Bros. & Seabrook, San Diego	$600	30.00	.60	1.00	3.00	$1300	$1350	4.40	15.00	15.00	$351,720
Coluccio & Arcorace	$600	29.00	1.25	1.25	2.00	$1500	$1600	3.00	18.00	18.00	365,183
American Concrete Pipe Co. of Washington	$600	31.80	1.00	2.00	2.00	$1250	$1500	3.00	22.50	20.00	395,425

SEATTLE, WASH.—CITY—CEDAR RIVER PIPE-LINE NO. 4—WOOD-STAVE

Hans Pederson, 1105 Second Ave., Seattle, who bid $780,419, low for Cedar River Pipe No. 4 for City of Seattle. Bids rejected.

(1) Hans Pederson, Seattle $780,419

(2) Federal Tank & Pipe Co., Seattle $918,417

	(1)	(2)
25 acres clearing and grubbing	500.00	300.00
70,000 cu.yd. trench excavat.	1.00	.60
15,000 cu.yd. grading	.50	.45
11,500 ft. remove 44-in. wood pipe	1.00	.50
600 cu.yd. conc. blocking	20.00	22.50
2,500 cu.yd. excav. for saddles	2.00	1.30
7,600 ft. piling, creo. (trestle)	1.00	.90
43 M ft. BM lumber, creo. (trestle)	100.00	85.00
118,128 lb. steel plate specials	.10	.14
84 cu.yd. concrete (spillway)	30.00	28.00
370 M ft. BM creo. timber, saddle	100.00	80.00
WOOD STAVE PIPE		
39,792 ft. 5/8" bands, 6" spacing	9.50	12.83
1,919 ft. 5/8" bands, 5 7/16" spacing	10.00	13.20
1,884 ft. 5/8" bands, 4 13/16" spacing	10.00	13.59
1,600 ft. 5/8" bands, 4 9/16" spacing	10.00	13.94
2,369 ft. 3/4" bands, 6" spacing	11.00	14.17
803 ft. 3/4" bands, 5 9/16" spacing	11.00	14.56
820 ft. 3/4" bands, 5 1/4" spacing	11.00	14.87
2,029 ft. 3/4" bands, 4 7/8" spacing	11.00	15.31
627 ft. 3/4" bands, 4 5/8" spacing	11.00	15.63
242 ft. 3/4" bands, 4 3/8" spacing	11.50	15.99
72 ft. 3/4" bands, 4 1/8" spacing	11.50	16.37
120 ft. 3/4" bands, 3 13/16" spacing	11.50	16.71

	(1)	(2)
121 ft. 3/4" bands, 3 3/4" spacing	11.50	17.08
119 ft. 3/4" bands, 3 9/16" spacing	12.00	17.49
902 ft. 3/4" bands, 3 7/16" spacing	12.00	17.80
434 ft. 3/4" bands, 3 1/4" spacing	12.00	18.29
82 ft. 3/4" bands, 3 1/8" spacing	13.00	18.65
82 ft. 3/4" bands, 3" spacing	13.00	19.01
82 ft. 3/4" bands, 2 7/8" spacing	14.50	19.45
82 ft. 3/4" bands, 2 13/16" spacing	14.50	19.66
82 ft. 3/4" bands, 2 11/16" spacing	16.00	20.15
84 ft. 3/4" bands, 2 5/8" spacing	16.00	20.41
170 ft. 3/4" bands, 2 1/2" spacing	17.00	20.95
2 each 60" 50-lb gate valves	$3500	$3975
1 48" 150-lb. gate valve	$3300	$2310
2 42" 50-lb. gate valves	$2000	$1235
3 36" 150-lb. gate valves	$1700	$1250
14 blowoffs and 6" gate valves	250.00	130.00
600 ft. 6" cast iron pipe	2.25	1.50
13 standpipes	$1000	$500
7 air valves	475.00	419.00
60,000 steel castings	.15	.19
2 floor stands, 60" valves	$1500	$1300
1 floor stand, 48" valve	$1200	$1300
3 floor stands, 36" valves	$1100	$1300

IRRIGATION AND RECLAMATION

COALVILLE, UTAH—EARTH DAM, CANALS, ETC.—GOVT.

S. H. Newell & Co., 1254 Reed College Place, Portland, Ore., $141,214, low bid to Bureau of Reclamation for earth diversion dam, etc., Weber-Provo Diversion canal, Salt Lake Basin Project, Coalville, Utah. Bids from:

(1) S. H. Newell & Co., Portland $141,214
(2) Morrison-Knudsen Co., Boise, Ida 159,185
(3) Platt Rogers, Inc. 159,998
(4) Utah Construction Co. 171,187
(5) Martin Day Co., Inc. $174,797
(6) S. J. Groves & Sons Co. 221,321
(7) Derbon Construction Co. 225,097

SCHEDULE NO. 1—Construct Diversion dam and headworks except left embankment:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
5,000 cu.yd. excavat. struct. Cl. 1	.40	1.00	.75	.75	1.60	1.50	2.00
6,800 cu.yd. excav. embank. and channel, 1	.20	.40	.29	.45	.30	.35	.20
2,000 cu.yd. overhaul	.05	.05	.03	.04	.05	.04	.05
1,800 cu.yd. strip for embank. dam	.20	.50	.50	.80	.20	.50	.50
3,600 cu.yd. compact. embankment	.25	.40	.15	.20	.50	.10	.50
2,900 cu.yd. backfill about struc	.25	.50	.50	.40	.50	.40	.50
900 cu.yd. puddle or tamp. backf	1.00	.75	.20	.40	.50	.15	.50
230 cu.yd. riprap	2.00	2.50	1.50	2.50	3.00	3.00	2.00
1,485 cu.yd. concrete	18.00	14.00	14.50	16.00	21.00	20.00	13.00
41,000 lb. reinforcing steel	.03	.03	.0175	.025	.02	.03	.02
25,400 lb. gates, install and paint	.03	.03	.05	.04	.06	.08	.06
TOTAL SCHEDULE NO. 1	$37,612	$37,660	$33,849	$38,085	$49,987	$48,316	$41,025

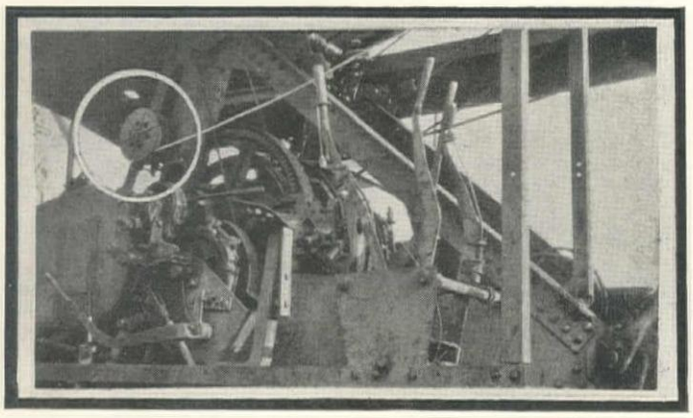
SCHEDULE NO. 2—Earthwork and structures, diversion canal, outlet end of headworks structure to Station 423-07 and appurtenant work:

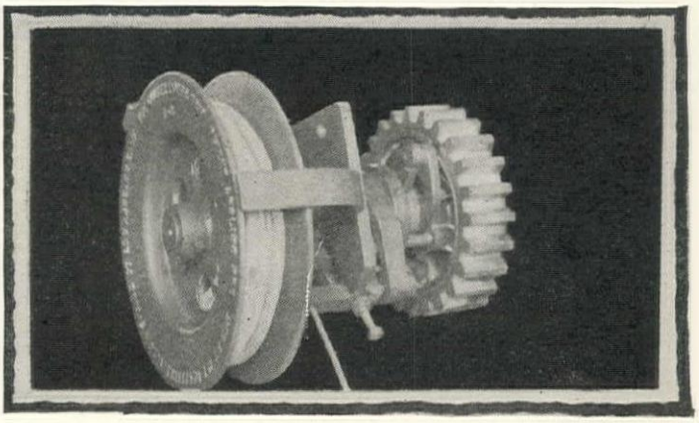
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
160,000 cu.yd. excavat. canal, Cl. 1	.10	.10	.12	.13	.10	.22	.20
27,000 cu.yd. excavat. canal, Cl. 2	.50	.26	.30	.30	.30	.45	.35
1,640 cu.yd. excavat. canal, Cl. 3	1.00	1.25	.80	1.50	1.50	2.00	1.50
200,000 sta.yd. overhaul for blank	.02	.02	.01	.03	.02	.02	.02
30,000 sta.yd. overhaul not blank	.03	.03	.02	.04	.02	.03	.025
12,000 cu.yd. place earth blankets	.15	.35	.25	.50	.50	.20	1.00
13,000 cu.yd. excav. struc. Cl. 1	.10	.50	1.00	.40	.25	.50	1.00
3,600 cu.yd. strip embank. dam	.20	.40	.34	.80	.15	.50	.50
29,000 cu.yd. compact. embankment	.25	.35	.15	.15	.40	.10	.50
10,400 cu.yd. backfill	.15	.50	.50	.40	.40	.40	.50
2,100 cu.yd. puddle or tamp backf	.50	.75	.20	.50	.50	.15	.50
960 cu.yd. riprap	1.00	2.50	2.00	2.50	2.00	3.00	2.00
500 sq.yd. dry rock pavement	1.50	1.50	.85	1.50	2.00	1.50	1.50
590 cu.yd. concrete	18.00	20.00	16.00	24.00	20.00	25.00	22.00
37,000 lb. reinf. steel (place)	.03	.03	.02	.025	.02	.03	.015
160 MBM erect timber	20.00	35.00	30.00	30.00	22.00	50.00	50.00
1,230 ft. 12-in. corr. pipe, lay	.30	.25	.60	.50	.20	.30	.10
1,730 ft. 15-in. corr. pipe, lay	.35	.30	.75	.60	.25	.35	.15
1,420 ft. 18-in. corr. pipe, lay	.40	.30	1.00	.80	.25	.40	.20
620 ft. 21-in. corr. pipe, lay	.45	.30	1.25	1.00	.30	.45	.25
560 ft. 24-in. corr. pipe, lay	.50	.35	1.50	1.25	.30	.50	.30
TOTAL SCHEDULE NO. 2	$69,257	$83,699	$82,599	$90,760	$80,246	$105,266	$122,655

SCHEDULE NO. 3—Earthwork and structures, Diversion canal. Sta. 423-07 to Sta. 477-75:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
170,000 cu.yd. excavat. canal, Cl. 1	.17	.18	.22	.20	.22	.35	.30
70,000 sta.yd. OH, blank., over 1000 ft	.02	.02	.01	.03	.02	.02	.02
10,000 sta.yd. OH, blank., less 1000 ft	.03	.03	.02	.04	.03	.03	.025
3,000 cu.yd. earth blankets, place	.20	.35	.25	.50	.50	.20	1.00
120 sq.yd. dry rock pavement	1.50	2.00	1.50	1.25	1.00	1.50	4.00
80 cu.yd. concrete	18.00	20.00	16.50	24.00	20.00	25.00	22.00
20 MBM erecting timber	20.00	30.00	30.00	30.00	30.00	50.00	50.00
TOTAL SCHEDULE NO. 3	$34,344	$37,825	$43,550	$42,342	$44,564	$67,739	$61,417

CULVER POWER TRIP





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This device is designed to operate the latch on the bucket door at the touch of a finger and with lightning-like speed. It weighs approximately 85 pounds, therefore, is easily and quickly installed.

THE CULVER POWER TRIP can be installed in an hour by any shovel crew. There are no delicate parts requiring skilled mechanics to keep in adjustment. Simple and effective in operation.

THE CULVER POWER TRIP WILL INCREASE YOUR SHOVEL'S OUTPUT AT LEAST FIFTEEN TO TWENTY PER CENT.

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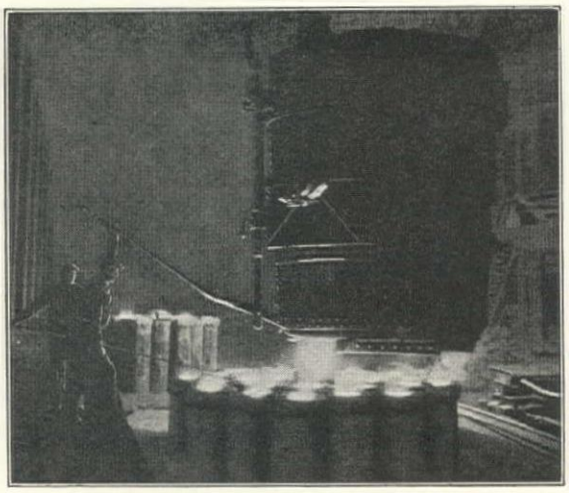

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FLOOD CONTROL WORK

LOS ANGELES, CALIF.—CONCRETE ARCH HANSEN DAM—FLOOD CONTROL DISTRICT

Edwards, Wildey & Dixon Co., Edwards-Wildey Bdg., 609 South Grand St., Los Angeles, who bid $717,245 low bid to Board of Supervisors of the Los Angeles County Flood Control District, for construction of Hansen Dam in the Big Tujunga Canyon, about one mile above Hansen's Lodge and 12 miles northeast of Sunland, the dam to be a concrete arch structure with earth fill wing and will be about 204 ft. high above streambed and 300 ft. between abutments, earth fill wing on the north end, valve outlets, and a spillway. Bids received from:

(1) Edwards, Wildey & Dixon, Los Angeles.....$717,245
(2) Guy F. Atkinson, San Francisco..... 728.535
(3) R. A. Wattson, Los Angeles 735.944
(4) Ward Engineering Co., San Francisco..... 757,000
(5) Bent Bros., Los Angeles 764,140
(6) Claude Fisher, Los Angeles.....$765,290
(7) Geo. Pollock, San Francisco 769,545
(8) M. Simunovich, Los Angeles 840,816
(9) Utah Construction Co., San Francisco..... 854,115
(10) O. A. Lindberg, Newhall 939,525

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
90,000 cu.yd. excav. "A"	3.24	2.75	2.50	2.80	3.40	3.00	3.00	3.90	3.00	3.50
18,000 cu.yd. excav. "B"	1.00	2.00	1.50	.60	2.60	.60	1.50	1.50	2.00	1.00
10,000 cu.yd. earth fill	.90	.60	.75	.40	.85	.70	.75	2.00	.75	.50
90,000 cu.yd. conc., plain	3.85	4.20	4.55	4.85	3.70	4.75	4.30	3.90	5.15	6.00
2,500 cu.yd. reinf. conc.	9.45	12.00	12.20	12.00	13.50	12.89	15.00	20.00	19.00	9.00
5,500 sq.ft. reinf. conc. face slab	.12	.25	.21	.10	.08	.25	.25	.50	.25	.25
4,000 ft. drill grout hole	1.50	2.00	2.36	.75	2.00	.63	3.00	2.50	2.00	2.00
250 holes place pipes	2.00	10.00	9.50	2.40	2.00	1.56	1.00	5.00	2.00	5.00
250 cu.yd. press. grout	42.00	40.00	42.00	36.00	40.00	10.00	50.00	50.00	30.00	40.00
10,000 lb. reinf. steel, place	.02	.02	.024	.02	.03	.02	.03	.025	.03	.03
50,000 lb. trash racks, place	.02	.03	.031	.02	.025	.03	.03	.06	.04	.03
100,000 lb. steel outlet piles, place	.03	.015	.026	.02	.02	.0225	.03	.03	.02	.03
150,000 lb. valves and gates, place	.03	.02	.04	.025	.02	.025	.03	.035	.03	.06
8,000 lb. iron pipe railing, place	.05	.08	.038	.04	.025	.06	.04	.10	.08	.15
4,000 ft. water and grout stops, place	.40	.50	.38	.75	2.50	.65	1.00	.75	.60	.75
800 ft. tile drain, place	.20	.40	.95	.35	.50	.25	1.00	.02	.50	.50

F. Court Eaton is Chief Engineer of the Los Angeles County Flood Control District.

BRIDGES AND CULVERTS

SANTA CRUZ, CALIF.—CITY—CONCRETE—RIVERSIDE AVE.

Rocca & Caletti, P. O. Box 243, San Rafael, who bid $48,493, low bid to City for construction of a reinforced concrete bridge on Riverside Ave. over the San Lorenzo River, and replacing the present wooden structure commonly known as the Cut Bias Bridge in the City of Santa Cruz. Bids received on the following items:

(1) Removal of old bridge (lump sum)
(2) 120 cu.yd. excav. above elev.
(3) 880 cu.yd. excav. below elev.
(4) 6,000 ft. timber piles, furnish
(5) 200 timber piles, drive
(6) 770 cu.yd. "A" concrete (piers, abutments, etc.)
(7) 700 cu.yd. "A" concrete (girders, roadway, etc.)
(8) 60 cu.yd. "F" concrete (railings)
(9) 160,000 lb. reinforcing steel in place
(10) Lighting system

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Rocca & Caletti	$ 300	5.00	5.00	.29	10.00	19.90	19.90	35.00	.045	$ 900	$48,493
Ben C. Gerwick, San Francisco	1,500	1.00	5.00	.25	12.00	20.00	22.00	45.00	.04	799	50,619
M. B. McGowan, San Francisco	1,500	2.00	8.00	.35	13.00	20.00	20.70	40.00	.055	1,000	55,570
C. C. Gildersleeve	2,000	2.00	9.00	.45	20.00	19.00	21.00	40.00	.043	1,500	56,970
Thompson Bros.	1,584	3.60	12.93	.34	17.00	25.57	23.04	30.62	.0541	1,002	66,147

BOISE, IDAHO—STEEL—BONNER COUNTY—STATE

Contract awarded to Sam R. Boudrye, Clarkston, Wash., who bid $53,781 for 344 ft. steel bridge over the Priest River on Clarks Fork Highway in BONNER COUNTY for State. Bids on:

(1) 745 cu.yd. excavation
(2) 512 cu.yd. Class "A" concrete
(3) 59 cu.yd. concrete seal
(4) 67,080 lb. reinforced steel
(5) 3,090 lin.ft. wood piling
(6) One steel superstructure in place

	(1)	(2)	(3)	(4)	(5)	(6)	TOTALS
Sam R. Boudrye, Clarkston, Wash.	8.00	24.00	20.00	.06	.43	$29,000	$53,781
C. F. Dinsmore & Co., Ogden, Utah	5.00	24.10	14.50	.055	.50	34,000	55,986
Portland Bridge Co., Portland	4.00	20.00	20.00	.05	.40	37,700	56,690
Triangle Const. Co., Spokane, Wash.	6.00	24.00	24.00	.05	.50	33,800	56,873
C. H. Ludberg, Spokane, Wash.	4.00	24.50	21.00	.05	.70	35,090	57,370
Illinois Steel Bridge Co.	4.00	25.00	20.00	.05	.50	35,980	57,839
Northwest Contract Co.	10.60	28.00	23.00	.05	.60	29,202	58,000
W. P. Roscoe, Billings, Mont.	6.00	23.55	20.00	.055	.70	35,000	58,560
J. J. Badraun, Portland, Ore.	4.00	20.00	20.00	.05	.40	40,000	58,990
Engineers estimate	10.00	27.00	27.00	.07	1.00	35,625	66,277

SEWER AND WATER SYSTEMS

SAN DIEGO, CALIF.—CAST-IRON MAINS AND CEMENT SEWERS—CHESTERTON DIST.—COUNTY

Butterfield Const. Co., Box 157, San Diego, $81,313 low bid to City for sewer and water improvements in Chesterton and Chesterton Extension. Bids from:

(1) Butterfield Const. Co.....$81,313
(2) Miracle Const. Co.....$85,032
(3) Hazard Contr. Co.....$94,255

	(1)	(2)	(3)
10,842 ft. 6-in. conc. sewer	1.20	1.20	1.22
15,805 ft. 8-in. conc. sewer	1.35	1.26	1.45
60 ft. 8-in. cast-iron sewer	1.80	2.09	2.00
78 ft. 10-in. cast-iron sewer	2.50	2.36	2.90
85 manholes	$80	$96	$77
10 drop manholes	$95	$102	$89
4 double drop manholes	$95	$105	$99
13 chimneys	20.00	11.50	12.00
25 dead ends	10.00	11.50	5.00
1 settling tank	$2500	$2875	$2725
100 cesspools	12.00	7.90	21.00
2,312 ft. 4-in. cast-iron pipe	1.20	1.15	1.40
16,421 ft. 6-in. cast-iron pipe	1.35	1.50	1.90
3,934 ft. 8-in. cast-iron pipe	1.80	2.05	2.10
17 fire hydrants	$135	$161	$125

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 September, 1929, for construction projects in the Far Western States total $49,604,328, of which $26,467,328 was for *Building Construction, balance of $23,137,000 for Engineering Construction, as follows:

Paving	$ 5,165,000
Grading, highways	5,740,000
Bridges	1,425,000
Sewers	2,325,000
Water supply systems	2,225,000
Irrigation and reclamation	600,000
Power development	850,000
Railroad construction	610,000
Lighting systems	597,000
River and harbor work	600,000
Oil pipe lines	3,000,000
	$23,137,000
Building construction	26,467,328
	$49,604,328

*Building permits compiled by S. W. Straus & Co.

LARGE WESTERN PROJECTS

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

WORK CONTEMPLATED

Pipe-lines, wells, pumps, reservoirs for City of Whittier, Calif. $310,000.

Pipe-lines, meters, wells, pumps, reservoir, etc., for City of Phoenix, Ariz. $3,093,700.

Pipe-lines, pumping plants, etc., for City of Anacortes, Wash. $600,000.

Bank and office building on Montgomery St. near California for Pacific National Bank, San Francisco. $750,000.

Surgical wing to Stanford Hospital, San Francisco. $1,000,000.

Office building on 6th and Salmon Sts., Portland, for Edw. Owen. $2,000,000.

Hotel on Third Ave. and Seneca St., Seattle. $1,250,000.

Apartment hotel on 7th Ave. and Seneca St., Seattle. $1,000,000.

Cedar River Pipe-Line 4 for City of Seattle, wood, concrete or steel. $900,000.

Railroad, 150 miles, from Brockway, Mont., to Lewiston, Ida., for Northern Pacific RR. $6,000,000.

BIDS BEING RECEIVED

Piers for Lake Union Bridge in Seattle for Washington Highway Comm., bids to Nov. 19.

Grading 7 miles in Siskiyou County from Klamath River to Yreka, for California Division of Highways, involving 624,500 cu.yd. excavation, bids to Nov. 6.

Pipe-line for City of Everett, Wash., bids to Oct. 24. $350,000.

BIDS RECEIVED

Dam, concrete arch type Hansen dam for Los Angeles County Flood Control District, Edwards, Wildey & Dixon, Los Angeles, $717,245 low.

CONTRACTS AWARDED

Wood-stave pipe-line, Cedar River No. 4 for City of Seattle, to Hans Pederson, Seattle, $780,419.

Reinf. concrete Lake Youngs aqueduct for City of Seattle, to Elliot, Stroud Bros. & Seabrook, San Diego, $351,720.

Office building on S. Spring St. for Banks-Huntley & Co., to Edwards, Wildey & Dixon, Los Angeles, $1,000,000.

Grading and surfacing in San Bernardino County for California Division of Highways, to New Mexico Const. Co., Denver, Colo., $384,533.

STREET and ROAD WORK

WORK CONTEMPLATED

LOS ANGELES, CALIF.—Plans by County Surveyor for: (1) 121st from Vermont Ave. to Western Ave., 1 mile, involving 16,363 cu.yd. excavation, 168,326 sq.ft. 8-in. and 6-in. concrete paving, cement sewers, $92,500; and (2) Harlan Ave. in Baldwin Park, involving 56,771 cu.yd. excavation, 845,243 sq.ft. 3-in. oil macadam paving, corr. pipe, $120,000. Bids after Oct. 28. 10-12

OROVILLE, CALIF.—Plans by S. J. Norris, City Engineer, for improving streets in District 3, on portions of Washington Ave., McClellan Ave., etc., involving 13,300 cu.yd. grading, 132,000 sq.ft. 4-in. oil-macadam paving, concrete sewers, etc. Bids after Oct. 21; $60,528. 10-4

SAN ANSELMO, CALIF.—Plans by Geo. Manley, City Engr., for improving San Anselmo Ave., Sycamore Ave., etc., reinf. concrete bridge, electroliers, concrete and asphalt paving, corr. culverts. Bids after Oct. 21. 10-12

SAN DIEGO, CALIF.—Plans by City Engineer, H. W. Jorgensen, for improving Coronado Ave., etc., involving 32,947 cu.yd. excavation, 683,244 sq.ft. 6-in. asphalt paving, 12,278 ft. 6-in. cast-iron main, concrete sewers, etc.; (2) Newton Ave., etc., involving 96,911 sq.ft. 8-in. and 252,897 sq.ft. 6-in. asphalt paving, 5153 ft. 6-in. cast-iron mains, 3 hydrants, reinforced concrete pipe; and (3) Upas St., involving 45,686 sq.ft. 6-in. asphalt paving, 2119 ft. 4-in. cast-iron pipe, etc. Bids after Oct. 28. 10-4

BIDS BEING RECEIVED

PHOENIX, ARIZ.—Bids to 2 p.m., Nov. 4, by Arizona State Highway Comm. for 22.5 miles of Holbrook-Lupton Highway and steel bridge, involving 70,144 cu.yd. roadway excavation, 108,000 cu.yd. borrow, 2500 cu.yd. concrete (structures), 158,000 lb. reinforcing steel, and 342,515 lb. structural steel. 10-10

SACRAMENTO, CALIF.—Bids to 2 p.m., Oct. 30, by California Division of Highways for: (1) INYO COUNTY—21.3 miles grading and surfacing from Coso Junction to Olancha, involving 122,000 cu.yd. roadway excavation, 48,250 tons crusher-run base, 35,650 tons oil-treated gravel or stone surfacing, etc.; (2) MENDOCINO COUNTY—8.7 miles surfacing from Arnold to Sherwood-Laytonville Road, involving 10,250 cu.yd. gravel or stone surfacing, and 2800 cu.yd. screenings; (3) HUMBOLDT COUNTY—7.3 miles surfacing from Bean Creek to Fish Creek, involving 8600 cu.yd. gravel or stone surfacing and 2360 cu.yd. screenings; and (4) LOS ANGELES and VENTURA COUNTIES—19.6 miles oil borders from Calabasas to Conejo Summit, involving 12,200 tons oil-treated rock borders. 10-2

SACRAMENTO, CALIF.—Bids to 2 p.m., Nov. 6, by California Division of Highways, for: (1) SISKIYOU COUNTY—7 miles grading and surfacing from Yreka to Klamath River, involving 624,500 cu.yd. roadway excavation, 1,223,700 sta.yd. overhaul, 6850 cu.yd. structure excavation, 8890 cu.yd. crusher run base, 9560 cu.yd. gravel or stone surfacing, 940 cu.yd. concrete (structures), 105,400 lb. reinforcing steel, 1075 cu.yd. dry rubble and 1670 cu.yd. rubble masonry (retaining walls), 1345 lin.ft. arched masonry parapet, etc.; and (2) KERN COUNTY—2 miles grading and bit. macadam surfacing east of Lost Hills, involving 9900 cu.yd. roadway excavation, 2990 tons broken stone, and 142 tons asphalt oil. 10-9

SALINAS, CALIF.—Bids to 7:30 p.m., Nov. 4, by City Clerk for: (1) Improving California, Pajaro, and other streets, involving 170,575 sq.ft. 5-in. concrete paving, grading, curbs, etc., $40,594; and (2) Villa St., Park St., etc., involving 78,271 sq.ft. 5-in. concrete paving, grading, curbs, sidewalks, etc., $19,701. **10-9**

SAN FRANCISCO, CALIF.—Bids will be opened during March or April, 1930, by Bureau of Public Roads for 2.6 miles grading 1D2 Halstead Meadows-Lodgepole-North Park Boundary Section, Generals Highway, Sequoia National Park, TULARE COUNTY, involving 115,000 cu.yd. excavation. As country adjacent to project will be covered with snow, contractors should inspect work before Oct. 26, 1929. 10-7

VENTURA, CALIF.—Bids to Nov. 13 by Joint Highway Dist. 6 for grading 6 miles of Maricopa Highway up Pine Mountain, $200,000. C. W. Petit is Engr. 10-11

VENTURA, CALIF.—Bids to 11 a.m., Nov. 15, by County Clerk for improving Del Norte Ave., involving 15,700 cu.yd. excavation, 978 cu.yd. concrete paving, etc. 10-12

CARSON CITY, NEV.—Bids to 2 p.m., Oct. 30, by Dept. of Highways for 33.91 miles in NYE AND ESMERALDA COUNTIES, involving 48,500 cu.yd. excavation, 49,400 cu.yd. gravel or rock surfacing. 10-12

PORTLAND, ORE.—Bids will be opened in Spring by: (1) West Side Highway Project No. 2C1, Mt. Rainier National Park, Washington, Pierce County, 2.2 miles grading a standard 18-ft. roadbed. (2) White River Road Project No. 3B1, 2, 3, surfacing Mt. Rainier National Park, Washington, Pierce County, 10.3 miles. (3) East Entrance-Kerr Notch Grading and Surfacing, Project No. 5A2B, in Crater Lake National Park, Oregon, Klamath County, 4.7 miles. (4) West Side Highway Project No. 2C2, clearing in Mt. Rainier National Park, Washington, Pierce County, 4 miles. (5) Transmountain Highway, Project No. 1DE, grading, in Glacier National Park, Montana, Glacier County, 8 miles. (6) Babb-Many Glacier, Project No. 3A1B1, in Glacier National Park, Montana, Glacier County, 4.4 miles, grading 3.3 miles, surfacing 4.4 miles of standard 16-ft. roadbed, and two small bridges. Contractors are requested to examine the line of survey before winter conditions prevent. 10-12

OLYMPIA, WASH.—Bids to Nov. 5 by Washington State Highway Comm. for: (1) GRAYS HARBOR AND JEFFERSON COUNTIES—Resurfacing with crushed stone 21.6 miles of Olympic Highway, from Lake Quinault Junction to Harlow Creek. (2) WHATCOM COUNTY—Clearing, grading, and draining, and surfacing two miles of Pacific Highway, from Bellingham to Austin Pass, Terminal Lake south. 10-12

BIDS RECEIVED

BERKELEY, CALIF.—Peres & Gatto, 475 10th St., Richmond, $2478 low for macadam paving Rose St. for City. 10-15

DAVIS, CALIF.—A. Teichert & Sons, 1846 37th St., Sacramento, $48,000 low bid to University of California for asphalt roads at University Farm, Davis. 10-12

OAKLAND, CALIF.—Western Roads Co., 1305 28th St., Oakland, $30,813 low for improving Estates Drive from Moraga Ave. to McAndrew Drive, grading, 3-in. asphalt base with 2-in. asphalt surface, vitr. conduit, and corr. culverts for City. 10-9

REDDING, CALIF.—Hemstreet & Bell, Marysville, $11,137 low for gravel or stone surfacing for shoulders from Butte County Line to Red Bluff, TEHAMA COUNTY, for State. 10-8

SACRAMENTO, CALIF.—C. R. Merrill, Williams, $11,251 only bid to California Division of Highways for 6.9 miles widening road from Colusa to Meridiah, COLUSA COUNTY. 10-12

SAN RAFAEL, CALIF.—Low bids as follows by County: (1) Pacific States Const. Co., Call Bdg., S. F., $25,962 low for improving streets in town of Bolinas, paving with asph. penetration macadam, redwood timber, corr. pipe, etc.; and (2) P. S. Harless, P.O. Box 594, San Rafael, $8995 low for asphalt paving in town of Tiburon. 10-15

CONTRACTS AWARDED

PHOENIX, ARIZ.—Awards as follows by State for oil processing highways: (1) To Southwest Paving Co., Washington Bdg., Los Angeles, $66,749 for 16 miles Globe-Safford Highway. (2) To E. B. Skeels, Box 835, Tucson, Ariz., and Roseville, Calif., $16,211 for 7.5 miles Benson-Douglas Highway. 10-3

TUCSON, ARIZ.—To White & Miller, Yuma, $98,660 to City for paving Fifth St., between Main St. and the Southern Pacific Railway tracks, paving with 2½-in. bituminous base and 1½-in. asph. conc. surf., curbs, gutters, sidewalks, etc. 10-10

AZUSA, CALIF.—To J. H. Showalter, 500 Catalina St., L. A., $23,641 for improving Coney Ave. for City, grading, macadam paving, water system. 10-11

EL MONTE, CALIF.—To Hall-Johnson Co., 905 Westminster, Alhambra, $46,082 for improving Washington St., paving with 4-in. Durite asphalt, cast-iron mains, gate valves, etc. 10-10

LOS ANGELES, CALIF.—To Kovacevich & Price, Inc., 1553 Loma Ave., Long Beach, $250,341 to County for improvements in Beverly Blvd. west of Montebello, from west boundary of Rancho Rapetto, east to Hendricks St., 1.63 miles, by excavation, compressed concrete pavement, rein. conc. pipe, rein. conc. box culvert, cement pipe, lighting system. 10-9

LOS ANGELES, CALIF.—To Lewis Construction Co., 300 S. Juanita St., Los Angeles, who bid $52,394 to Board of County Supervisors for improvement of La Brea Ave. and Vernon Ave., from south boundary of Los Angeles to Highland Ave. in the Baldwin Hills, 2.02 miles, work involving in the main: 128,256 cu.yd. excavation, 560,000 sta.yd. overhaul, 329,139 sq.ft. oil and rock surfacing; 95 ft. 18-in., 100 ft. 24-in., 110 ft. 30-in., and 245 ft. 36-in. corrugated iron pipe. 10-4

OAKLAND, CALIF.—Awards as follows by City: (1) To Western Roads Co., 1305 28th St., Oakland, $18,598 for improving 101st, 102nd and 103rd Aves., grading, paving with 3-in. macadam foundation, 3½-in. asphalt base, and 1½-in. National surface, etc.; and (2) To California Construction Co., Standard Oil Bdg., San Francisco, $46,111 for improving Foothill Blvd. from 90th Ave. to Jones, grading, paving, with 6-in. concrete base with 2-in. Warrenite Bit. wearing surface, vitr. pipe conduits. 10-9

OAKLAND, CALIF.—To Oakland Paving Co., 5000 Broadway, Oakland, $1560 for asphalt surfacing dry fruit area of Warehouse B for Oakland Port Comm. 10-15

OCEANSIDE, CALIF.—To Miracle Construction Co., 4751 Monroe St., San Diego, $158,741 for improvement of Hill St. from Morse to Eaton St. and portions of Tremont St., Broadway, Commercial and other streets, grading, paving with compressed concrete, curbs, sidewalks, concrete storm drains, vitrified pipe sewers, guard fence and sewage pumping station. 10-5

PALO ALTO, CALIF.—To N. M. Ball, 1889 Yosemite Road, Berkeley, $45,657 for improving Embarcadero Road, etc., for City, concrete paving. 10-1

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways, Sacramento: (1) To New Mexico Const. Co., 4015 Galapago St., Denver, Colorado, $384,533 for 22.4 mi. grading and surfacing from 1.5 mi. west of Siberia to 6 mi. east of Amboy, SAN BERNARDINO COUNTY. (2) To E. C. Coats, Loleta, and Sixth and Y Sts., Sacramento, $130,767 for 2.9 mi. grading and surfacing with gravel or stone from Fish Creek to Stephens Grove, HUMBOLDT COUNTY. (3) To Fredrickson & Watson Const. Co., 354 Hobart St., Oakland, $95,450 for 1.5 mi. grading and concrete paving at San Ardo, MONTEREY COUNTY. (4) To The Adams Co., Angels Camp, $5984 for 1.6 mi. surfacing with screened gravel, TUOLUMNE COUNTY, between 1 mile northwest of Shaws Flat and the Columbia-Sonora Road. (5) To The Adams Co., Angels Camp, $5028 for 2.2 miles surfacing with screened gravel between 2 and 4 miles south of Mokelumne Hill, CALAVERAS COUNTY. (6) To Smith Bros. Co., Eureka, $16,346 for furnishing and installing metal pipe underdrains from Elk Valley to 1.5 miles south of Smith River, DEL NORTE COUNTY. (7) To Fred W. Nighbert, Box 436, Bakersfield, $63,297 for 3.7 miles grading and oil treated gravel or stone surfacing from Little Lake to Coso Junction, INYO COUNTY. (8) To McCray Co., 4482 E. Worth St., Los Angeles, $69,087 for 1.1 miles grading and concrete paving from Newhall Tunnel to Newhall, LOS ANGELES COUNTY. 10-15

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: TEHAMA COUNTY—To A. F. Giddings, PO Box 1020, Sacramento, $95,757 for surfacing from Paynes Creek to Morgan Springs. ORANGE COUNTY—To Matich Bros., Elsinore, $8872 for 0.2 miles grading and concrete paving west of San Clemente. 10-1

SAN FRANCISCO, CALIF.—To F. C. Amoroso & Sons, Wallace and Keith Sts., S. F., $15,897 for sidewalks and retaining wall at State Teachers College at Laguna and Haight Sts. 10-9

SAN FRANCISCO, CALIF.—Award recommended by C. B. Caswell & Son, Ft. Dick, Del Norte County, $1.40 yd. for loading, hauling, and spreading 7500 cu.yd. selected material on North Fork Highway, MADERA COUNTY, for Bureau of Public Roads. 10-11

SAN JOSE, CALIF.—To San Jose Paving Co., San Carlos and DuPont Sts., San Jose, $2550 for asphalt paving Sunol St. for County. 10-8

SAN LUIS OBISPO, CALIF.—To M. J. Bevanda, Savings & Loan Bank Bdg., Stockton, $134,576 for improvement of streets in Atascadero, Dist. 16, grading, asphalt base with Warrenite Bit. surface, asphalt macadam paving, vitrified sewers, corr. culverts, cast-iron water mains, rein. conc. sewage treatment plant, and Union Metal Mfg. Co. lighting standards, for County. 10-8

SAN RAFAEL, CALIF.—Awards as follows by County: (1) To A. J. Raisch, Burrell Bdg., San Jose, $19,802 for concrete paving from Salinas-Monterey Road from Hilltown Bridge to the Spreckels Road. (2) To W. A. Dontanville, Salinas, $6079 for surfacing roads in Lighthouse Reservation. 10-15

SAN RAFAEL, CALIF.—To L. E. Kingsley, Villa Grande, $8603 for concrete paving Center St. from J to K Sts. for City. 10-15

SANTA BARBARA, CALIF.—To Western Motor Transfer Co., 116 State St., Santa Barbara, $16,752 for asphalt surfacing on La Cumbre Road and Patterson Ave. for County.

SANTA BARBARA, CALIF.—To Hunter & Richardson, Santa Barbara, $44,849 for improving Laguna St., etc., for City, paving with 3½-in. asphalt base with 1½-in. asphalt surface, vitrified sewers, etc.

SANTA CRUZ, CALIF.—To Granite Const. Co., Watsonville, $2046 for oil surfacing Capitola Ave. for Santa Cruz County. 10-8

BOISE, IDA.—Awards as follows by State Highway Comm.: (1) To E. N. Thompson, Boise, Ida., $7772 for 2 miles grading of Oneida Highway, ONEIDA COUNTY; (2) To E. N. Thompson, Boise, Ida., $15,705 for 2 miles grading Bannock Highway from Pocatello to Crystal; and (3) To Dan J. Cavanagh, Twin Falls, Ida., $17,480 for 2 miles grading Sawtooth Highway from Hailey to Ketchum.

HELENA, MONT.—Awards as follows by State Highway Commission: Grading 11.778 miles of the Great Falls-Fort Benton Road in CHOUTEAU COUNTY, northeasterly from the Town of Carter, Frank S. Smith, of Sweet Grass, $32,431.10; grading 7.62 miles of the St. Regis-Tarkio Road in MINERAL COUNTY to L. T. Lawler, of Butte, $60,071.

BRIDGES and CULVERTS

BIDS BEING RECEIVED

PLACERVILLE, CALIF.—To Hector Williamson, Placerville, who bid $2000 as follows: for reinf. conc. culvert over Friedmans Canyon, $900; and concrete slab bridge over Kelly Creek near Rescue, $1100. 10-10

SACRAMENTO, CALIF.—Bids to 2 p.m., Nov. 6, by California Division of Highways for overhead crossing over Northwestern Pacific RR. at California Park, MARIN COUNTY, involving 15,700 ft. redwood piling, 375 M ft. BM redwood, 1940 cu.yd. concrete, 143,000 lb. reinforcing steel, and 550,000 lb. structural steel. 10-9

SACRAMENTO, CALIF.—Bids to 2 p.m., Oct. 30, by California Division of Highways for: (1) LOS ANGELES COUNTY—Bridge widening over San Gabriel River on Foothill Blvd. near Azusa, involving 3500 cu.yd. concrete, 293,000 lb. reinforcing steel, 191 MBM redwood; and (2) MARIN COUNTY—Overhead crossing over Northwestern Pacific RR near Greenbrae, involving 550 cu.yd. concrete, 68,000 lb. reinforcing steel. 10-2

SALINAS, CALIF.—Bids to 10 a.m., Oct. 25, by County for 2 trestle bridges, one over San Lorenzo Creek near Lonoak and one over Panchorico Creek near San Ardo, involving 2565 lin.ft. steel H piling, 218,000 lb. structural steel, 420 cu.yd. concrete, 65,590 lb. reinforcing steel. 10-11

SAN FRANCISCO, CALIF.—Bids to 2 p.m., Oct. 28, by Golden Gate Bridge and Highway District, Room 1514, Claus Spreckels Bdg., 703 Market St., San Francisco, for land and water test borings in the sites of the main piers and anchorages of the Golden Gate Bridge between Fort Point and Lime Point, San Francisco Harbor. 10-5

OLYMPIA, WASH.—Bids to 10 a.m., Nov. 19, by Washington State Highway Commission for two main piers and two anchor piers for 800-ft. deck cantilever span of Lake Union Bridge at Aurora Ave., Seattle, work involving 25,000 cu.yd. structure excavation, 150,000 lin.ft. timber bearing piles, 21,000 cu.yd. concrete, 465,000 lb. steel reinforcing bars and anchorage metal. 10-5

OLYMPIA, WASH.—Bids to Nov. 5 by State Highway Comm. for 375-ft. conc. bridge over Methow River at Pateros, OKANOGAN COUNTY. 10-14

BIDS RECEIVED

EUREKA, CALIF.—D. E. Burgess, 602 S. Center St., Stockton, $5795 low to Dist. Engr., California Division of Highways, for painting, re-

pairing, and placing riprap around pier of Smith River steel bridge in DEL NORTE COUNTY. 10-2

SACRAMENTO, CALIF.—McDonald & Maggiora, 236 2nd St., Sausalito, $20,035 low for reinf. conc. bridge over San Antonio Creek, near Petaluma, SONOMA AND MARIN COUNTIES, for California Division of Highways. 10-11

SACRAMENTO, CALIF.—A. Young, Yreka, $19,948 for 2 timber bridges near Happy Camp, SISKIYOU COUNTY, for California Division of Highways. 10-3

SAN RAFAEL, CALIF.—W. L. Proctor, Santa Rosa, $1162 low for concrete culvert on Upper Black Point Road near Novato for County. 10-15

SANTA CRUZ, CALIF.—Rocca & Caletti, P.O. Box 243, San Rafael, $48,493 low for reinf. conc. bridge on Riverside Ave. over San Lorenzo River for City. (See Unit Bid Summary.) 10-15

SEATTLE, WASH.—General Const. Co., Colman Bdg., Seattle, $149,688 low for west approach to W. Spokane St. Bridge for City. 10-14

CONTRACTS AWARDED

CHICO, CALIF.—To T. H. Polk, Chico, who bid $675 to Bidwell Park and Playground Commission, Chico, for reinforced concrete bridge over Chico Creek at Sycamore Pool in Bidwell Park. 10-1

EUREKA, CALIF.—To Smith Bros. Co., Eureka, who bid $6598 to County for construction of one 64-ft. steel truss bridge and two 18-ft. wooden approaches, over Upper Mattole River. 10-3

MARYSVILLE, CALIF.—To M. A. Jenkins, 36th and Y Sts., Sacramento, $7163 to County for five reinf. concrete bridges; one to be 29 ft. long; one 26 ft.; and three 16 ft. with 20-ft. roadways. 10-10

OROVILLE, CALIF.—Awards as follows by County: (1) To T. H. Polk, Chico, $1307 for reinf. conc. bridge over Dead Horse Slough at Chico; and (2) To John Berlinger, Orland, $7580 for rein. concrete bridge over Cherokee Canal on the Biggs-Princeton Road, 4 miles west of Biggs. 10-11

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) To Geo. G. Wood, 1805 Arthur St., Fresno, $28,962 for concrete bridge over Cottonwood Creek, MADERA COUNTY. (2) To C. H. Gildersleeve, Napa, $8738 for concrete girder bridge over Coon Creek overflow near Ewing, PLACER COUNTY. 10-15

SACRAMENTO, CALIF.—To Mercer-Fraser Co., 109 G St., Eureka, who bid $97,650 for steel bridge over south fork of Trinity River, 2 miles west of Saylor, HUMBOLDT COUNTY, for California Division of Highways. 10-3

SANTA BARBARA, CALIF.—To J. J. Munnemann, Santa Barbara, $4900 for 420-ft. timber trestle at Goleta Sandpit for County. 10-9

STOCKTON, CALIF.—To Nelson Bros., Escalon, who bid $2075 for concrete bridge over Lone Tree Creek on Steinegul Ave., Stockton, for County. 10-8

VISALIA, CALIF.—To R. Hodson & Son, Porterville, who bid $1641 to County for rein. concrete bridge over Deep Creek. 10-8

WOODLAND, CALIF.—No bids received by County for arch reinforced concrete bridge over Cache creek at Rumsey, involving two 108-ft. spans to cost $40,000. Work will be done by day labor under supervision of County Surveyor, Asa G. Proctor. 10-2

BOISE, IDA.—To Sam Boudrye, Lewiston, Ida., $53,781 for 344-ft. steel bridge over Priest River on Clarks Fork Highway, BONNER COUNTY, for State. 10-14

HELENA, MONT.—Awards as follows by State Highway Commission: Construction of seven timber trestles, ranging from 19 ft. to 114 ft. in length on the Miles City-Terry Road, in PRAIRIE COUNTY, to Mackin & Berg Co., of Brockway, $15,425.50. Construction of a 56-ft. bridge across Dry Creek and a 138-ft. bridge across Beaver Creek, near Wibeaux on the Red Trail, to J. J. Rue & Sons, Bismark, N. D., $17,258.33. Construction of a 60-ft. bridge and an 80-ft. bridge across Ray Creek, and the lengthening of bridges across the east and middle forks of the Madison River on the Three Forks-Carpenter Road in GALLATIN COUNTY, to H. B. Berkey, of Bozeman, $24,212.20.

SEWER CONSTRUCTION

WORK CONTEMPLATED

LOS ANGELES, CALIF.—Plans by County, bids after Oct. 21, for 19,700 ft. 8-in. and 13,600 ft. 6-in. cement sewers in Deane Ave., Rimpau and other streets; $43,700. 10-1

SEBASTOPOL, CALIF.—City is considering installation of sewers. C. E. Mueller is City Engr. 10-7

LAS VEGAS, NEV.—Koebig & Koebig, Engrs., Rowan Bdg., Los Angeles, have been retained by the Las Vegas city council in connection with the proposed sewer system extensions. 10-7

YAKIMA, WASH.—City is considering additional improvements for sewage disposal plant to cost $65,000. Chas. F. Wilson is City Engr. 10-7

BIDS RECEIVED

SAN FRANCISCO, CALIF.—Low bids as follows by City for reinf. conc. Alemany Blvd. Storm Drain system: (1) Clinton Const. Co., 923 Folsom St., S. F., $126,581 low for Sect. A, from Mission St. west; and (2) Eaton & Smith, 715 Ocean Ave., S. F., $271,255 low for Sect. B, from Bayshore Blvd. west. (See Unit Bid Summary.) 10-3

CONTRACTS AWARDED

BERKELEY, CALIF.—To Rocca & Caletti, P.O. Box 243, San Rafael, $83,509 based on hand-made concrete pipe for Unit 3 of City Storm sewer system. 10-8

LOS ANGELES, CALIF.—To J. Artukovich, 4928 West Blvd., Los Angeles, $92,354 for vitrified sewers in Hooper Ave. Unit No. 2, 73rd, 75th Sts., etc., for County. 10-10

MISSOULA, MONT.—To Morrison-Knudsen Co., Boise, Ida., at $464,420 for construction of south side sanitary sewer system, for city of Missoula, Montana. (See Unit Bid Summary.) 10-4

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

PHOENIX, ARIZ.—City will set date for bond election soon to vote on issuing $3,093,700 bonds for water system: 22-mile 48-in. concrete or steel flow line from sand trap to Reservoir, $1,309,700; 48-in. main from Reservoir to 16th and Thomas Sts., $566,000; 42-in. main from 12th and McDowell St. to 16th and Thomas, $146,000; 24-in. main from Thomas to 7th Aves., $140,000; distributing mains, $138,000; meters to be installed, $150,000; wells, five, $25,000; pumping stations, $24,000; protection work Verde River, $110,000; reservoir, 10,000,000 gallons, $92,000; well field (160 acres), $8000. 10-7

FAIRFIELD, CALIF.—City is considering installation of well, a 100,000-gallon water tank, and new 12-in. water main. 10-9

SACRAMENTO, CALIF.—At election held Oct. 10 by City of Sacramento, proposition to vote $11,600,000 for the Silver Creek Water Project, involving dams, conduits, etc., failed to carry. 10-11

SAN ANSELMO, CALIF.—Bonds voted by City for extension of the fire alarm system, installation of additional fire hydrants, and the remodeling of the present quarters of the fire department. 10-7

SAN JOSE, CALIF.—Formation election Nov. 5 by Santa Clara County to vote on the formation of the Santa Clara Water Conservation District. Construction work proposed will cost $5,000,000. 10-9

WATSONVILLE, CALIF.—Bond election Nov. 19, by City, to vote $125,000 for: Improving Ford St. wells, including two deep well pumps, pump house, piping, water measuring and recording device, $5000; improving main reservoir, grading, concrete work, wooden roof with concrete piers, Venturi meter, etc., $32,300; construct filter plant at Corralitos, grading, filter plant structures, underdrains and sand, piping and equipment, by-pass, water measuring and recording devices to cost $69,900; filtered water reservoir at Corralitos, $12,000; elevated reservoir at Corralitos, including excavation and structure and main pipe line and pressure control, $7800. H. B. Fisher is City Engineer and Chas. Gilman Hyde, Berkeley, is Consulting Engineer. 10-7

WHITTIER, CALIF.—Bond election Nov. 19 by City to vote $310,000 for: Wells, including motors, pumping, buildings, etc., $45,030; 36-in. pipe line from wells to settling basin, $21,600; setling basins, $23,800; 30-in. pipe line from settling basin to reservoir, including meter, $57,790; 10,000,000 gal. reservoir, $75,095; 10-in. pipe line from reservoir to Rideout Heights reservoir, $2130; Rideout Heights reservoir, $8500; 24-in. pipe line connection 10,000,000 gal. reservoir and Greenleaf reservoir, $22,500; 16-in. pipe line from Greenleaf reservoir to Painter reservoir, $4500; two booster plants, including pumps, etc., to connect reservoir, $5000, and one booster plant to connect Greenleaf and Painter reservoir, $3000; one booster plant, College Hills, $3000; repairs and Corliss engine and signals, $10,000; repairs to Greenleaf reservoir, $5000; water mains, 4-in., $8500; 6-in., $4500; and 8-in., $6500. M. R. Bowen is City Engineer. 10-7

PUEBLO, COLO.—Plans by A. A. Weiland, Engr., First National Bank Bdg., Pueblo, for reservoir for City Water Works Dist. 2 to cost $75,000.

TERRY, MONT.—City is considering installation of 50,000-gallon conc. reservoir and pumping plant, 7000 ft. pipe, and 75,000-gallon standpipe to cost $32,000. 10-12

ANACORTES, WASH.—W. C. Morse Co., Engineers, Smith Tower, Seattle, will submit a report to the City of Anacortes shortly, with reference to water system improvements, involving pipe-lines, pumping plants, etc. Cost $300,000 to $600,000. 10-10

SEATTLE, WASH.—Plans by W. D. Barkhuff, City Engr., for Cedar River pipe-line No. 4, wood, concrete or steel pipe. Contract awarded to Hans Pederson (see Unit Bid Summary) at $780,419 rescinded. 10-14

BIDS BEING RECEIVED

NOGALES, ARIZ.—Bids to 8 p.m., Oct. 28, by City for: (1) Complete installation and construction of a building, crane, I-beams, pump pit, sump, excavation for pipe, electric wiring, leveling of roadway, and construction of drain ditches for the installation of a pumping unit at the City Pumping plant on Santa Cruz River; and (2) Complete installation of one Diesel Engine and one triplex pump at the City Pumping plant on Santa Cruz River. 10-10

PHOENIX, ARIZ.—Bids to 2 p.m., October 28, by Arizona Highway Commission, Phoenix, for two wells as follows: One well is proposed for a site 1 mile west of Piedra, which is 16 miles west of Gila Bend on the Southern Pacific Railroad. The other is 3½ miles west of Welton. Probable depth of the first well will be between 250 and 300 ft., and of the second, 100 to 125 ft. 10-4

OAKLAND, CALIF.—Bids to 5:30 p.m., Nov. 4, by East Bay Municipal Utility Dist. for: (1) 2300 ft. 24-in. welded sheet steel pipe-line for distributing system; and (2) Booster plant equipment for El Cerrito Booster Plant. 10-15

SAN LUIS OBISPO, CALIF.—Bids to 3 p.m., Nov. 4, by County Clerk for improvements in Ocean Heights Dist. 1, involving 9600 lin.ft. 10-in., 1120 lin.ft. 8-in., 8140 iin.ft. 6-in., 8000 lin.ft. 4-in. vitrified sewer, 334 tees, 19 manholes, 9 lampholes, one septic tank and fittings, 660 lin.ft. 6-in., 4000 lin.ft. 4-in., and 8000 lin.ft. 2-in. cast-iron mains, 8500 lin.ft. ¾-in. services, one 25,000-gal. redwood tank and foundation, 22 valves, 8 hydrant risers, 334 ¾-in. service cocks. $45,000. 1921 Act. N. H. Nelson, Morro Bay, is Engr. 10-9

EVERETT, WASH.—Bids to 10:30 a.m., Oct. 24, by City for Sultan River Project: Sec. 4—Sultan River Dam, work involving: 6150 cu.yd. excavation, 3760 cu.yd. concrete, racks, gates, etc., install. Estimated cost, $75,000. Sec. 5—Pipe-line, Ebey Slough to Everett, work involving: 21,500 cu.yd. trench excav. and backfill, 11,960 lin.ft. 48-in., 7750 lin.ft. 40-in., and 1920 lin.ft. 36-in. steel pipe, 24,000 lin.ft. piling (partly temporary). $350,000. Baar & Cunningham, Spalding Bdg., Portland, are Engrs. 10-8

CONTRACTS AWARDED

COMPTON, CALIF.—To Gadza & Gogo, 3236 Garden Ave., Los Angeles, $58,367 to City for cast-iron mains and vitrified sewers east of Long Beach Blvd. from Olive St. northerly. 10-10

PLEASANTON, CALIF.—Awards as follows by City: (1) To C. E. Prentiss, 5th and Keyes Sts., San Jose, who bid $14,829 for furnishing and installing 17,000 ft. 4-in. cast iron pipe; (2) to E. M. Cramer, Irvington, who bid $4112 for pumping plant and cistern. 10-4

SAN DIEGO, CALIF.—To Butterfield Const. Co., Box 157, San Diego, at $81,313 for cement sewers and cast iron mains in Chesterton and Chesterton Extension for City of San Diego. (See Unit Bid Summary.) 10-2

SAN FRANCISCO, CALIF.—Awards as follows by Public Works Engineering Co., Hunter-Dulin Bdg., San Francisco, for pipe-line for water supply project in Contra Costa County, to serve Concord, Martinez, Crockett, Port Costa, and other towns: (1) To American Concrete Pipe Co., Chancery Bdg., San Francisco, for constructing reservoir end of pipe-line involving 25,000 lin.ft. 33-in. Hume process centr. cast reinf. concrete pipe with 4½-in. walls and 200 ft. head; (2) to Steel Tank & Pipe Co., 1100 Fourth St., Berkeley, for lower portion of pipe-line, involving 16,300 lin.ft. 36-in. ¼-in. plate electric welded steel line to be Hermastic dipped and Gunite coated on outside. 10-4

ASHLAND, ORE.—To Beall Tank & Pipe Corp., Portland, Ore., $2.46 lin.ft. for 4730 lin.ft. 24-in. electric arc welded steel pipe for City. Other bids: Steel Tank & Pipe Co., Portland, $2.65 ft; Western Pipe & Steel Co., S. F., $3.40 ft. 10-5

EVERETT, WASH.—Awards as follows by City: (1) To Phillips & Davies, $7600 for roller gates; (2) To Rensselaer Valve Co., $14,024 for 24-in. to 36-in. gate valves; (3) To Agnew Hardware Co., $5110 for one Crispin Valve and $1125 for 1-in. to 12-in. gate valves; and (4) To Coffin Valve Co., $2912 for one 6 by 6 emergency gate, two 6 by 6 sluice gates, and one 3 by 3 waste gate. 10-11

SEATTLE, WASH.—Awards as follows by City: (1) To Hans Pederson, 1105 Second Ave., Seattle, $780,419 for Cedar River Pipe Line No. 4, using wood stave pipe; and (2) To Elliot, Stroud Bros. & Seabrook, 4959 34th St., San Diego, $351,720 for Lake Youngs reinf. concrete aqueduct. (See Unit Bid Summary.) 10-10

SPOKANE, WASH.—To Clifton, Applegate & Toole, Hutton Bdg., Spokane, $110,000 for laying 15,000 ft. each 48-in. and 36-in. steel pipe (pipe furnished by City). 10-9

RIVER AND HARBOR WORK

BIDS BEING RECEIVED

SAN FRANCISCO, CALIF.—Bids to 2 p.m., Oct. 30, by State Harbor Comm. for repairs to concrete beams and girders at Pier 26. 10-14

BIDS RECEIVED

SAN FRANCISCO, CALIF.—Low bids as follows by U. S. Engineer's Office, 85 Second St., S. F.: (1) M. A. Jenkins, 3560 4th St., Sacramento, $11,423 low for reinf. conc. buttress gate wall near Knights Landing; and (2) J. W. Bell, 11th and E Sts., Marysville, $10,260 low for construction of 3500 ft. levee with revetment on Hamilton Bend on Feather River. 10-3

CONTRACTS AWARDED

SAN FRANCISCO, CALIF.—To Healy-Tibbitts Construction Co., 64 Pine St., San Francisco, $246,300 for pier No. 1, reinf. concrete, with concrete jacketed piles, located on north end of Ferry Bdg., for State Harbor Commissioners. 10-10

FLOOD CONTROL WORK

BIDS RECEIVED

LOS ANGELES, CALIF.—Edwards, Wildey & Dixon, Edwards-Wildey Bdg., L. A., $717,245 low for concrete arch Hansen Dam in Big Tujunga Canyon for Los Angeles County Flood Control Dist. (See Unit Bid Summary.) 10-15

LIGHTING SYSTEMS

CONTRACTS AWARDED

LAS VEGAS, NEV.—To John R. Davies Co., 2131 Santee St., Los Angeles, who bid $23,980 for street lighting system for the City. Contract awarded on Marbelite standards. 10-7

IRRIGATION and RECLAMATION

WORK CONTEMPLATED

DOS PALOS, CALIF.—Plans by Engineer, E. E. Blackie, 3404 Clay St., San Francisco, for drainage ditches and wells for the Dos Palos Irrigation District, Dos Palos, Merced County. Bonds voted, $97,000, for above. 10-9

BIDS RECEIVED

LA MESA, CALIF.—Low bids as follows by La Mesa, Lemon Grove & Spring Valley Irrigation District: (1) SIPHON B—American Concrete Pipe Co., 542 So. Broadway, L. A., $6613 low for 710 ft. 45-in. Hume reinf. concrete pipe-line; and (2) SIPHON C—American Concrete Pipe Co., 542 So. Broadway, L. A., $9282 low for 1015 ft. 42-in. Hume reinf. concrete pipe. 10-9

VALE, ORE.—Low bids as follows by Bureau of Reclamation for earthwork and structures on Bully Creek West Bench Lateral system, Vale Project, Oregon: Schedules 1 to 7—W. H. Puckett Co., Boise, Ida., $44,880 low. Schedules 8 to 15—Gabbey & McNeil, Boise, Ida., $36,516 low. 10-14

COALVILLE, UTAH—S. H. Newell & Co., 1254 Reed College Place, Portland, $141,214 low to Bureau of Reclamation for earth dam, canals, etc., on Salt Lake Basin Project. (See Unit Bid Summary.) 10-11

CONTRACTS AWARDED

BRENTWOOD, CALIF.—To Alldrin & Anderson, Turlock, $15,038 for 128,000 sq.ft. 3-in. concrete lining Main Lateral No. 6 south for East Contra Costa Irrigation Dist. 10-9

YUBA CITY, CALIF.—To M. J. Treaster, 2608 Fifth Ave., Sacramento, who bid 27¢ per cu.yd. for improvement of 800 ft. of levee at Shanghi Bend, about 3 miles south of Yuba City, involving about 5000 cu.yd. of slabbing and raising with earth or sand fill, for Levee Dist. 1. 10-2

FAIRFIELD, MONT.—To J. A. Terteling & Sons, Moscow, Idaho, at $142,540 to Bureau of Reclamation on Schedules 1 and 2, for construction of earthwork and structures on the Spring Valley Canal, Sun River project, Montana. (See Unit Bid Summary, Oct. 10th issue.) 10-5

POWER DEVELOPMENT

BIDS BEING RECEIVED

HAWTHORNE, NEV.—Bids to 11 a.m., November 6, by Bureau of Yards and Docks, Navy Dept., Washington, D. C., for electric and telephone transmission line consisting of poles, messenger cables, conductor cables and accessory pole line material at the Naval Ammunition Depot, Hawthorne. Work under Spec. 6016. 10-7

MACHINERY and SUPPLIES

BIDS BEING RECEIVED

BEVERLY HILLS, CALIF.—Bids to 8 p.m., Oct. 29, by City Clerk for 800 ft. 6-in. standard screw pipe, 520 ft. 3-in., 1160 ft. 4-in. and 550 ft. 6-in. O. D. casing. 10-5

MARE ISLAND, CALIF.—Bids to 11 a.m., Nov. 13, by Bureau of Yards and Docks, Navy Dept., Washington, D. C., for three electrically operated revolving hammerhead cranes, each with a capacity of 5 tons at a radius of 95 ft. and 10 tons at 50 ft., erected complete on foundations furnished by the Government at the Navy Yard, Mare Island. 10-15

CONTRACTS AWARDED

LONG BEACH, CALIF.—To U. S. Cast Iron Pipe & Fdy. Co., Wright & Callender Bdg., Los Angeles, who bid $183,592 to City of Long Beach, for furnishing cast-iron pipe. 10-7

MERCED, CALIF.—To Yosemite Portland Cement Co., S. F., $2.61 bbl. for cloth and $2.41 bbl. for paper for 4000 bbl. cement for Merced Irrigation Dist. 10-9

PASO ROBLES, CALIF.—To Pacific States Cast Iron Pipe Co., San Francisco, for furnishing cast-iron pipe as follows to City: 3500 ft. 4-in. cast-iron pipe at 43.7¢; and 500 ft. 6-in. cast-iron pipe at 64¢ ft. 10-9

MISCELLANEOUS

BIDS BEING RECEIVED

MARE ISLAND, CALIF.—Bids to 11 a.m., October 30, by Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing and installing 6-ton ammonia compressor, condensor modifications, compressor foundation, piping, valves, automatic control and safety devices at the Navy Yard Hospital, Mare Island, Calif. 10-4

SWIMMING POOLS

CONTRACTS AWARDED

SAN MATEO, CALIF.—To H. R. Park, 1230 Broadway, Burlingame, for mechanical equipment, including filters, pumping system, two swimming pools, one in the San Mateo High School and the other in the Burlingame High School. 10-14

RAILROAD CONSTRUCTION

WORK CONTEMPLATED

BROCKWAY, MONT.—Application filed by Northern Pacific Railway, St. Paul, Minn., with the Interstate Commerce Commission, for permission to extend its line a distance of 150 miles from Brockway, Montana, to Lewiston, Idaho. $6,000,000. 10-14

BUILDING CONSTRUCTION

WORK CONTEMPLATED

BERKELEY, CALIF.—Plans by James W. Plachek, Architect, Mercantile Trust Bdg., Berkeley, for frame and concrete public library building on Kittredge and Shattuck Ave., for the City; $275,000. 10-1

CHOWCHILLA, CALIF.—Plans by Swartz & Ryland, Architects, Brix Bdg., Fresno, for a brick and stucco gymnasium building for Chowchilla Union High School District. $35,000. 10-8

EUREKA, CALIF.—Plans by Balch & Stanbery, Architects, Film Exchange Bdg., Los Angeles, for a two-story class A theatre building at Eureka, for Fox West Coast Theatres, Inc., Washington St. and Vermont Ave., Los Angeles; $200,000. 10-1

HOLLISTER, CALIF.—Plans by Wm. H. Weeks, Architect, Hunter-Dulin Bdg., San Francisco, for unit to the high school group, for Hollister Union High School District, concrete construction with tile roofing; $50,000. 10-2

PALO ALTO, CALIF.—Plans by Bakewell & Weihe, Architects, 251 Kearny St., San Francisco, for steel and concrete gymnasium building on University Campus, Palo Alto, for Stanford University. $225,000. 10-7

PASO ROBLES, CALIF.—Plans by Albert H. Larsen, Architect, 447 Sutter St., San Francisco, for a steel and concrete theatre, hotel, and apartment for the Paso Robles Realty Co. $165,000. 10-7

SAN FRANCISCO, CALIF.—Plans by Willis Polk & Co., 277 Pine St., San Francisco, for concrete office and laboratory building on Fell St. and Van Ness Ave. for the Viavi Company; $125,000. 10-2

SAN FRANCISCO, CALIF.—Plans by L. P. Hobart, Architect, Coerk Bdg., San Francisco, for addition to the California Academy of Sciences building, Golden Gate Park, for the California Academy of Sciences; $250,000. 10-1

SAN FRANCISCO, CALIF.—Plans by O'Brien & Peugh, Architects, 315 Montgomery St., San Francisco, for a 16-story A bank and office building on the site of the old Stock Exchange, Montgomery St., near California St., for Louis R. Lurie. Pacific National Bank are the Lessees. $750,000. 10-7

SAN FRANCISCO, CALIF.—Plans by Bakewell & Brown, Architects, 251 Kearny St., S. F., for surgical wing to Stanford Hospital building on Buchanan St. and Clay St., for Stanford Hospital. $1,000,000. 10-7

SAN FRANCISCO, CALIF.—Plans by M. I. Schwartz, Architect, 110 Sutter St., San Francisco, for C auto service station and garage for Firestone Tire Co. $60,000. 10-8

SAN JOSE, CALIF.—Plans by George De Colmesnil, Architect, deYoung Bdg., San Francisco, for a two-story concrete and steel store on South First St., for P. C. Hale & Co. Sears, Roebuck & Co. are the lessees; $100,000. 10-5

SAUSALITO, CALIF.—Plans by Engr. Dept., Pacific Telephone & Telegraph Co., 140 New Montgomery St., San Francisco, E. V. Cobby, Architect, for repeater's station, Sausalito; $100,000. 10-1

WATSONVILLE, CALIF.—Plans by Wm. H. Weeks, Architect, Hunter-Dulin Bdg., San Francisco, for a gymnasium building for the Watsonville High School District; $65,000. 10-1

LA GRANDE, ORE.—Plans by G. S. Underwood, Architect, Hibernian Bdg., L. A., for brick depot for Union Pacific at La Grande, Ore.; $85,000. 10-5

PORTLAND, ORE.—Plans by Bennes & Herzog, Architects, Chamber of Commerce Bdg., Portland, for 27-story 'A' office building on 6th and Salmon Sts. for Edw. Owen. $2,000,000.

SEATTLE, WASH.—Plans by Architects, Stuart & Wheatley, Walker Bdg., Seattle, for 21-story reinf. conc. and steel hotel on Third Ave. and Seneca St. $1,250,000.

SEATTLE, WASH.—Plans by Architect, E. W. Morrison, Lumber Exchange Bdg., Seattle, for 20-story reinf. conc. Mark Twain apartment hotel on 7th Ave. and Seneca St. $1,000,000.

BIDS BEING RECEIVED

SAN DIEGO, CALIF.—Bids to 2 p.m., Nov. 5, by Geo. B. McDougall, State Architect, Public Works Bdg., Sacramento, for steel and concrete library and science building for Teachers College, San Diego, for the State. $300,000. 10-10

RENO, NEV.—Bids to Oct. 24, by Reno School Dist. 1, for high school and gymnasium; $225,000. G. A. Ferris & Sons, Reno, are Architects. 10-5

CONTRACTS AWARDED

ALMADEN, CALIF.—To W. M. Meyer, Cupertino, $37,400 for frame and stucco school. R. S. Tuttle, Los Gatos, is Architect. 10-7

BERKELEY, CALIF.—To C. C. Moore & Co., Sheldon Bdg., S. F., $174,000 for mechanical equipment in central heating plant at University of California. 10-8

LOS ANGELES, CALIF.—To Edwards, Wildey & Dixon, Edwards & Wildey Bdg., Los Angeles, for A office building, to be 13 stories and basement, at 634 S. Spring St. John B. and Donald B. Parkinson, 808 Title Insurance Bdg., are the Architects. Banks-Huntley & Co., Stock Exchange Bdg., Los Angeles, are the owners. $1,000,000. 10-7

OAKLAND, CALIF.—To Pacific Coast Engr. Co., ft. of 14th St., Oakland, who bid $20,884 for steel transit shed framework for 14th St. Wharf for Oakland Port Commission. 10-8

PALO ALTO, CALIF.—To J. L. McLaughlin, 251 Kearny St., S. F., $187,500 for reinf. conc. apartment on University and Cowper for J. M. Blackburn. B. M. Clark, Palo Alto, is Architect. 10-2

PALO ALTO, CALIF.—To Clinton-Stephenson Const. Co., Monadnock Bdg., S. F., $300,000 for 7-story 'A' apartment on Cowper and Forest Ave. for J. M. Blackburn. 10-12

ROSEVILLE, CALIF.—To J. Fernandz, 711 11th St., Sacramento, who bid $18,719 for Veterans Memorial Building for the city. 10-1

SAN FRANCISCO, CALIF.—To Monson Bros., 475 Sixth St., S. F., for 3-story B garage and gas meter repair building on Folsom and 19th Sts., for Pacific Gas & Electric Co. $300,000. 10-9

SO. SAN FRANCISCO, CALIF.—To Barrett & Hilp, 918 Harrison St., S. F., for steel and hollow tile factory buildings on Linden and Tanforan Sts. for Heintz & Kaufman, Inc., to cost $65,000. 10-12

VISALIA, CALIF.—To W. T. Harris, 557 McKinley St., Fresno, $18,757 for administration building for Tulare-Kings County Joint Tubercular Hospital Assn. E. J. Kump, Fresno, is Architect. 10-4

HAWTHORNE, NEV.—To M. H. Pagenhart & Co., 2130 Locust St., Philadelphia, who bid $59,940 for equipment for boiler and refrigerating plants at Naval Ammunition Depot. 10-8

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, etc., required by the Act of Congress of August 24, 1912, of Western Construction News, published semi-monthly at San Francisco, California, for October 1, 1929.

State of California, City and County of San Francisco, ss.: Before me, a Notary Public in and for the state and county aforesaid, personally appeared S. J. Sanders, who, having been duly sworn according to law, deposes and says that he is the owner of the Western Construction News and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher—Western Construction News, Incorporated, 114 Sansome St., San Francisco, Calif.

Editor—Philip Schuyler, 1462 Trestle Glen Road, Oakland, Calif.

Managing Editor—Philip Schuyler, 1462 Trestle Glen Road, Oakland, Calif.

Business Manager—S. H. Wade, 637 55th St., Oakland, Calif.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

Western Construction News, Inc., 114 Sansome St., San Francisco, Calif.; S. J. Sanders, 1848 San Ramon Ave., Berkeley, Calif.; S. H. Wade, 637 55th St., Oakland, Calif.; Philip Schuyler, 1462 Trestle Glen Road, Oakland, Calif.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

S. J. SANDERS, Owner.

Sworn to and subscribed before me this 30th day of September, 1929.

(Seal) ELEANOR J. SMITH.

Notary Public in and for the City and County of San Francisco, State of California.

(My commission expires December 29, 1930.)

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Spears-Wells Machy. Co., Inc.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The

Bars, Steel
Pacific Coast Steel Co.

Beams, Channels, and Angles
Pacific Coast Steel Co.

Bins, Storage and Hopper
Bacon Co., Edward R.
Butler Bin Co
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Madsen Iron Works

Blacksmithing—Drop Forgings
Payne's Bolt Works

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

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

Bolts, Nuts and Rods
Claussen & Co., C. G.
Kortick Mfg. Co.
Payne's Bolt Works

Bonds, Street and Road Improvement
Elliott-Horne Co., The

Bonds, Surety
American Surety Co.
Globe Indemnity Co.

Brick, Common
Kartscboke Clay Products Co.

Bridge Plates, Bronze Expansion
Greenberg's Sons, M.
Western Iron Works, S. F.

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

Buckets, Dredging
Harnischfeger Sales Corp.
Slick, R. R.

Buckets, Excavating
Bacon Co., Edward R.
Bucyrus-Erie Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jacobs Co., Murry
Jenison Machinery Co.
Marion Steam Shovel Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Slick, R. R.
Williams Co., G. H.

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

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

Camp Supplies
Thomson-Diggs Company

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

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

Castings, Brass and Bronze
Greenberg's Sons, M.

Castings, Iron and Steel
American Cast Iron Pipe Co.
Industrial Brownhoist Corp.
Link-Belt Meese & Gottfried Co.
U. S. Cast Iron Pipe & Fdy. Co.

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

Cement
Portland Cement Association

Cement Guns
Cement Gun Const. Co.

Chemicals
Great Western Electro-Chemical Co.

Chlorinators
Wallace & Tiernan
Water Works Supply Co.

Chlorine
Great Western Electro-Chemical Co.

Chutes, Concrete
Bacon Co., Edward R.
Garfield & Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.

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

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

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

Concrete Curing
Concrete Curing Co.

Concrete Forms
Harron, Rickard & McCone Co.

Concrete Roads
Portland Cement Association

Conveyors, Portable
Harron, Rickard & McCone Co.
Jenison Machinery Co.

Conveyors, Elevating and Conveying
Bacon Co., Edward R.
Bodinson Mfg. Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.

Cranes (Electric, Gasoline Locomotive)
Bacon Co., Edward R.
Bucyrus-Erie Co.
Garfield & Co
Hackley Equipment Co., P. B.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Power Shovel Co., The
Orton Crane & Shovel Co.
Osgood Co., The
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
Willamette-Ersted Co.

Cranes, Traveling
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Thew Shovel Co., The

Crushers
Bacon Co., Edward R.
Garfield & Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Smith Engineering Works
Young Machy. Co., A. L.

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.

Dams
Ambursen Dam Co., Inc.

Derricks
Bacon Co., Edward R.
Clyde Iron Works Sales Co.
Garfield & Co.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Young Machy. Co., A. L.

Ditch Machinery
Bacon Co., Edward R.
Bucyrus-Erie Co.
Cleveland Trencher Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Power Shovel Co., The
Orton Crane & Shovel Co.
Osgood Co., The
Thew Shovel Co., The

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

Drain Tile
Gladding, McBean & Co.

Drills, Rock
Bacon Co., Edward R.
GardnerDenver Co.
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Rix Company, Inc., The
Sullivan Machinery Co.

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

Dump Wagons
Le Tourneau Mfg. Co.

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

Engineering Instruments
American Paulin System, Inc., The

Engines, Gasoline and Steam
Bacon Co., Edward R.
Continental Motors Corp.
Clyde Iron Works Sales Co.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
Ingersoll-Rand Co.
Jenison Machinery Co.

Excavating Machinery
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Osgood Co., The
Owen Bucket Co.
Parsons Co., The
Sauerman Bros., Inc.
Speeder Machinery Corp., The
Thew Shovel Co., The
Universal Crane Co., The

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OPPORTUNITY PAGE

CONTINUED

HELP WANTED

ENGINEER, mechanical or civil, 26-30 years of age, preferably American born, for designing, drafting and estimating work in central office of large manufacturing company. Permanent opportunity. Salary to start about $200 per month. Location, San Francisco. R-2760-S.

CIVIL ENGINEER, with established practice in Eastern Oregon wishes to dispose of his equipment, records and good will. Business nets $5000 per year and will sell for value of inventory. Correspondence invited. R-2733-S.

DRAFTSMAN, for plant maintenance work. Should be recent graduate, mechanical or electrical, with at least two years' drafting experience. Salary $175 month. Permanent. Apply by letter. Location, Contra Costa County. R-2702-S.

DRAFTSMAN AND COMPUTER, familiar with highway work. Must be neat and rapid letterer. Salary $170-$200 per month. Apply by letter. Location, Northern California. R-2667-S.

ENGINEER, preferably young civil engineer, to develop into sales engineer for bituminous road products. Highway experience and sales personality are important assets. Permanent opportunity. Apply by letter with recent photo. Location, Northwest. R-2749-S.

ENGINEER, preferably young civil engineer, to develop into sales engineer for bituminous road products. Highway experience and sales personality are important assets. Permanent opportunity. Apply by letter with recent photo. Location, Northwest. R-2749-S.

ENGINEER, 26-35 years, preferably technical graduate, with experience in design and construction, for refinery work. Would probably start as designer with the expectation of developing into refinery engineer. Salary about $200 month to start. Apply by letter. Location, California. R-2759-S.

THE BUYERS' GUIDE—*Continued from Page 84*

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
Hackley Equipment Co., P. B.
Stamford Equipment Co.

Filters
Water Works Supply Co.

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

Floating Roofs
Chicago Bridge & Iron Works

Floors, Mastic
Wailes Dove-Hermiston Corp.

Flumes, Concrete
Portland Cement Association

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

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

Freight, Water
American-Hawaiian Steamship Co.

Frogs and Switches
Bacon Co., Edward R.
United Commercial Co.

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

Gates, Cast-Iron
California Corrugated Culvert Co.

Gates, Radial
California Corrugated Culvert Co.

Gates, Sheet Metal
California Corrugated Culvert Co.

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

Governors, Turbine
Pelton Water Wheel Co., The

Gravel Plant Equipment
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Smith Engineering Works
Young Mach. Co., A. L.

Gunite Lining
Cement Gun Const. Co.

Hammers, Steam Pile
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.

Hardware, Shelf and Heavy
Thomson-Diggs Company

Hoists, Hand and Power
Bacon Co., Edward R.
Clyde Iron Works Sales Co.
Gardner-Denver Co.
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Ingersoll-Rand Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Link-Belt Meese & Gottfried Co.
Sullivan Machinery Co.
Willamette-Ersted Co.
Young Machy. Co., A. L.

Hoppers, Steel
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.
Link-Belt Meese & Gottfried Co.
Madsen Iron Works

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

Hydro-Tite
Industrial & Municipal Supply Co.

Jacks, Lifting
Jenison Machinery Co.

Kettles, Tar and Asphalt
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Littleford Bros. Co.
Montague Pipe & Steel Co.
Peerless Mchy. & Mfg. Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Leadite
Water Works Supply Co.

Lighting Standards
United Iron Works

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

Locomotives (Electric, Gas and Steam)
Bacon Co., Edward R.
Brookville Locomotive Co.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Plymouth Locomotive Works
United Commercial Co.

Meters, Venturi
Water Works Supply Co.

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

Mixers, Chemical
Dorr Co., The

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

Mixers, Plaster
Chain Belt Co.
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

Motors, Gasoline
Continental Motors Corp.
Hercules Motors Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.

Paints, Acid Resisting
General Paint Corp.
McEverlast, Inc.
Wailes Dove-Hermiston Corp.

Paints, Metal Protective
General Paint Corp.
McEverlast, Inc.
Wailes Dove-Hermiston Corp.

Paints, Technical
American Bitumuls Co.
General Paint Corp.
McEverlast, Inc.
Wailes Dove-Hermiston Corp.

Paints, Waterproofing
General Paint Corp.
McEverlast, Inc.
Wailes Dove-Hermiston Corp.

Pavers, Concrete
Chain Belt Co.
Foote Company, Inc.
Harron, Rickard & McCone Co.
Koehring Company
Smith Co., T. L.

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

Paving, Contractor
Warren Bros. Roads Co.

Paving Plants
Bacon Co., Edward R.
Jaeger Machine Works, The
Jenison Machinery Co.
Madsen Iron Works

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

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

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

Piles, Concrete
Raymond Concrete Pile Co.

Pipe, Cast-Iron
American Cast Iron Pipe Co.
Claussen & Co., C. G.
Industrial & Municipal Supply 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.
U. S. Cast Iron Pipe & Fdy. Co.

Pipe Clamps and Hangers
Kortick Mfg. Co.

Pipe Coatings
McEverlast, Inc.
Wailes Dove-Hermiston Corp.

Pipe, Concrete
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.
Pacific Pipe Co.
Pacific States Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdy. Co.
Weissbaum & Co., G.

Pipe Line Machinery
Bacon Co., Edward R.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.

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 Company

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.
Weissbaum & Co., G.

Pipe, Vitrified
Gladding, McBean & Co.
Kartschoke Clay Products Co.
Pacific Clay Products

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

Plows, Road
Bacon Co., Edward R.
Galion Iron Works & Mfg. Co.
Hackley Equipment Co., P. B.
Jenison Machinery Co.
Spears-Wells Machy. Co.

Pneumatic Tools
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.

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

Power Units
Continental Motors Corp.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
Jenison Machinery Co.

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

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

Pumps, Deep Well
American Well Works, The
Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Jenison Machinery Co.
Pacific Pumping Co.
Pelton Water Wheel Co., The
Woodin & Little

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OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

Welded Steel Pipe Line

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 5:30 o'clock p.m., November 4, 1929, and will at that hour be opened, for constructing and furnishing of 2300 linear feet of ¼-in. thickness 24-in. diameter welded sheet steel pipe for the Distribution System, East Bay Municipal Utility District.

Plans and specifications for this work may be obtained by application to the office of the District, Oakland, California.

JOHN H. KIMBALL, Secretary.
Oakland, California, October 10, 1929.

Booster Plant

NOTICE TO CONTRACTORS

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 5:30 o'clock p.m., November 4, 1929, and will at that hour be opened, for constructing and furnishing, f.o.b., 22nd and Adeline Streets, Oakland, California, Equipment for El Cerrito Booster Plant.

Specifications for this work may be obtained from the office of the District.

JOHN H. KIMBALL, Secretary.
Oakland, California, October 9, 1929.

NOTICE TO CONTRACTORS

Grading-Surfacing and Overhead Crossing

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 30, 1929, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Humboldt County, between Dean Creek and Fish Creek (I-Hum-1-B), about seven and three-tenths (7.3) miles in length, to be surfaced with untreated crushed gravel or stone.

Mendocino County, between 2 miles south of Arnold and the Sherwood-Laytonville Road (I-Men-1-F, G), about eight and seven-tenths (8.7) miles in length, to be surfaced with untreated crushed gravel or stone.

Marin County, an overhead crossing over the tracks of the Northwestern Pacific Railroad near Greenbrae (IV-Mrn-1-C), consisting of one 38-foot and two 21-foot reinforced concrete girder spans on concrete piers and abutments with wing walls.

Los Angeles County, (VII-L.A-9-G), a bridge across San Gabriel River, on Foothill Boulevard, near Azusa, to be widened by constructing eleven 54-foot and one 31-foot reinforced concrete girder spans and twenty-one 18-foot timber trestle spans.

Los Angeles and Ventura Counties, between Calabasas and Conejo Summit (VII-L.A-Ven-2-C, A, B), about nineteen and six-tenths (19.6) miles in length, to be widened with oil treated rock borders.

Inyo County, between Coso Junction and Olancha (IX-Iny-23-H, I), about twenty-one and three-tenths (21.3) miles in length, to be graded and surfaced with oil treated crushed gravel or stone.

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 October 2, 1929.

OFFICIAL BIDS

NOTICE TO CONTRACTORS

Grading-Surfacing and Overhead Crossing

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 November 6, 1929, 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:

Siskiyou County, between Yreka and the Klamath River (II-Sis-3-C), about seven (7.0) miles in length, to be graded and surfaced with untreated crushed gravel or stone.

Marin County, an overhead crossing over the tracks of the Northwestern Pacific Railroad at California Park (IV-Mrn-1-C), consisting of one 150-foot steel truss span on concrete piers, one 41-foot 1 inch and one 28-foot 1 inch steel beam spans on steel frame bents, and approximately 686 feet of timber trestle on pile bents and frame bents.

Kern County, between five miles and seven miles east of Lost Hills (VI-Ker-33-C), about two (2) miles in length, to be graded and surfaced with bituminous macadam.

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 October 9, 1929.

NOTICE TO CONTRACTORS
STATE OF CALIFORNIA, DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

Paving and Surfacing

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 November 13, 1929, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Humboldt County, between Garberville and Bluff Creek (I-Hum-1-B), about one and two-tenths (1.2) miles in length, to be graded and surfaced with untreated crushed gravel or stone.

Orange County, between Sunset Beach and Newport Beach (VII-Ora-60-A), about six and four-tenths (6.4) miles in length, to be graded and paved with Portland cement concrete.

San Bernardino County, a reinforced concrete slab bridge near Cajon Station (VIII-S-Bd-31-B), consisting of three 20-foot spans on concrete

OFFICIAL BIDS

piers and abutments with wing walls, and about .16 mile of roadway to be graded.

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 October 16, 1929.

SITUATIONS WANTED

WANTED—Steady employment by ambitious young man, age 24, I. C. S. student civil engineering, two years' experience highway engineering. Opportunity considered above salary. References. Box C. W. S., care of News.

THE BUYERS' GUIDE—*Continued from Page 86*

Pumps, Dredging and Sand
Jenison Machinery Co.
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