WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

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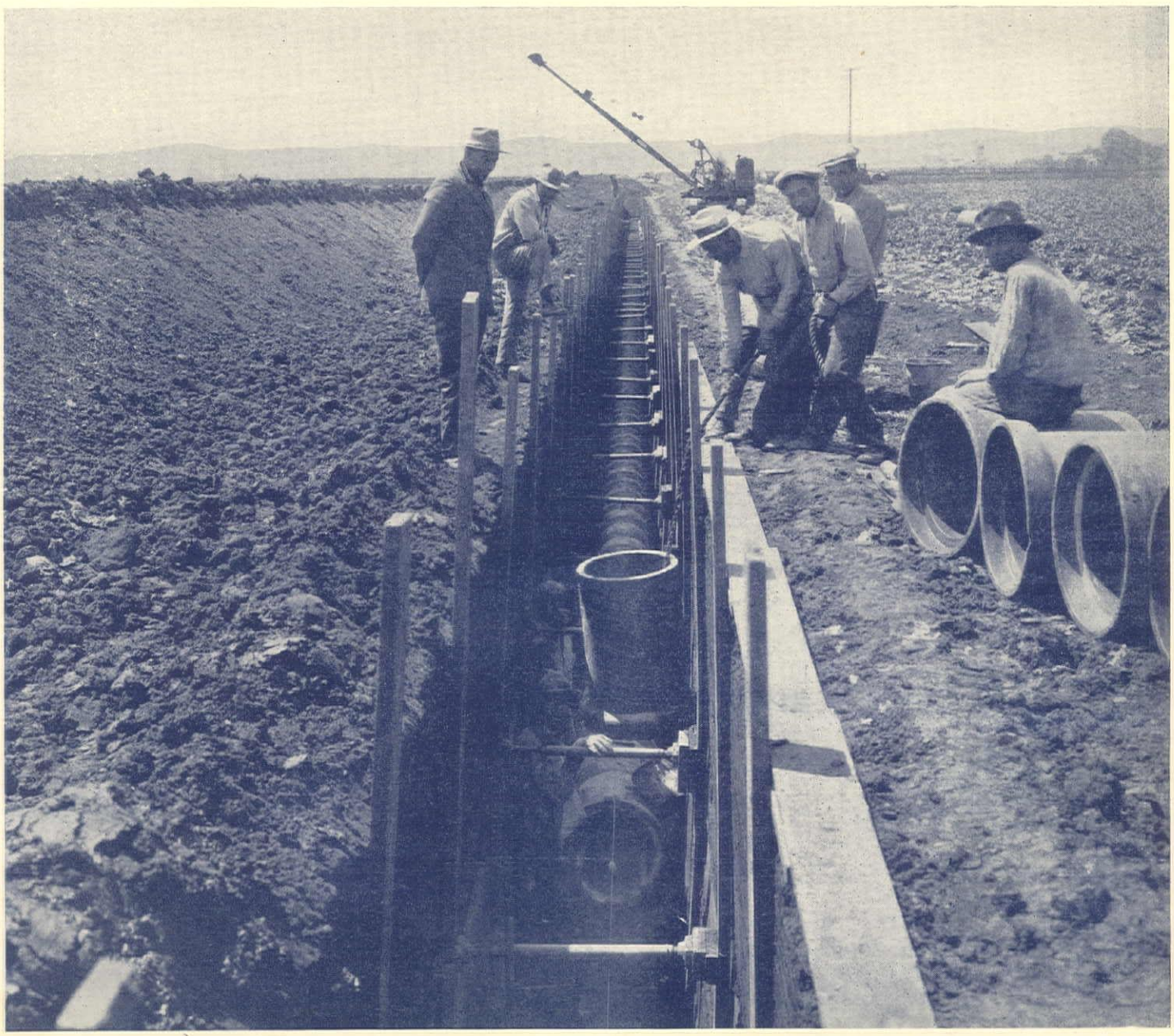

LAYING 18-IN. VITRIFIED CLAY PIPE SANITARY OUTFALL SEWER FOR CITY OF SALINAS, CALIFORNIA; GOGO & RADOS, CONTRACTORS; BURNS-McDONNELL-SMITH ENGINEERING CO., CONSULTING ENGINEERS; H. F. COZZENS, CITY ENGINEER

The DIESEL GIANT *has* GREAT RESERVE POWER...

DIGGING that would stall the average excavator does not hinder a P & H Diesel.

For the Diesel giant has great reserve power. In other words, a Diesel engine increases its torque when slowed down below 50% of normal speed by heavy digging... a feature not found in other internal combustion engines. It can always furnish reserve power in a pinch . . . can give you that extra punch that does the trick.

And so P & H Diesel Shovels, Cranes and Draglines produce from 10 to 15% more yardage than gas machines of equivalent capacity. That fact has been definitely established in nearly four years of operation by P & H Diesel Excavators in every kind of digging.

And remember that the fuel cost for Diesel operation is from 75 to 85% less than for gasoline.

You'll want to learn more of P&H Diesel Excavators. They are built in capacities from ¾ to 3½ cu. yds. Send for special Diesel Bulletins.

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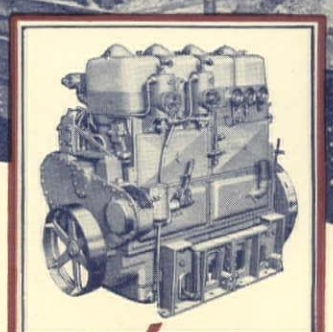

P & H *Diesel* EXCAVATORS

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Trade Mark Registered U.S. Pat. Office

Offices of the Philadelphia Suburban Water Company, Bryn Mawr, Penna.

Philadelphia Suburban Water Company —*uses* LEADITE *exclusively*

This well-known Water Company, one of the C. H. Geist properties, supplies a population of about 315,000 persons through approximately 900 miles of water mains.

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The daily per capita consumption of water is slightly under 60 gallons, which includes Domestic, Commercial and Industrial users —also fire, flushing and municipal purposes. This figure also includes all losses by leakage. These figures are excellent proof of tightness of pipe lines.

Mr. Carleton E. Davis* is Manager of the Philadelphia Suburban Water Company.

*Mr. Davis is a Past President of both the American Water Works Association and the New England Water Works Association—also former Chief Engineer of Philadelphia Bureau of Water for 11 years.

The pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

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THE LEADITE COMPANY—LAND TITLE BLDG., PHILADELPHIA, PA.

No Caulking

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

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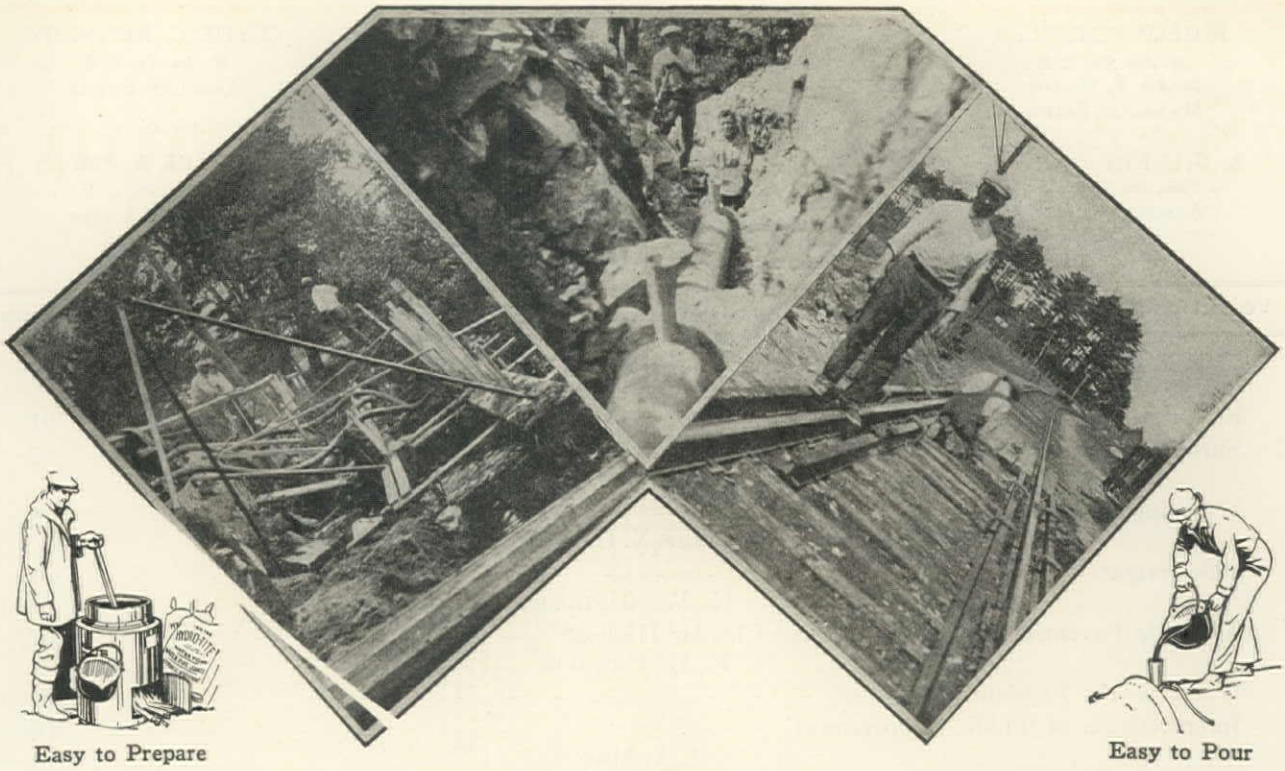

Easy to Prepare

Easy to Pour

UNDER ALL KINDS OF CONDITIONS

HYDRO-TITE MAKES BETTER PIPE JOINTS

THE pictures above show some of the worst conditions encountered when laying cast iron bell and spigot pipe. These were taken during the installation of twenty-one miles of pipe in a new water system. The picture on the left shows one of the wet sections. The center picture shows pipe being laid through ledge and the picture on the right is where the pipe is laid directly under the railroad track.

Hydro-Tite was selected as the joint material on account of its splendid record in meeting every joint requirement.

Joints made with Hydro-Tite are superior to lead—yet can be made at one-quarter the cost. They require no caulking—are easily made and are strong—tight and flexible. The proven dependability of Hydro-Tite for over 19 years has made its use sound engineering practice.

Hydro-Tite is now shipped in a new style cloth bag which has a heavy moisture proof liner. This insures dry material and a clean bag. If you are not one of the many users of Hydro-Tite we will be glad to arrange a demonstration. If you prefer we will ship you a bag for test or trial.

Write for literature and full information

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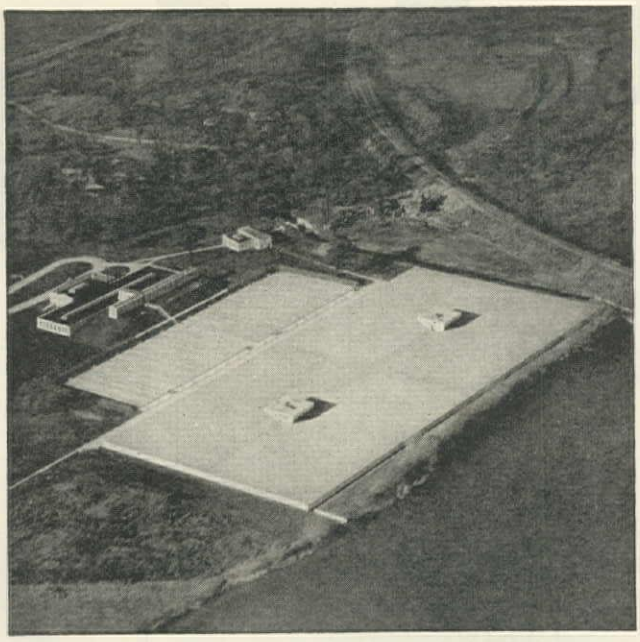
HYDRO-TITE

REG. U. S. PAT. OFF.

The MODERN JOINT MATERIAL



This is a Separate Sludge Digestion Sewage Treatment Plant..

THE modern sewage treatment plant must be attractive in appearance as well as efficient in operation. And that is one reason behind the trend toward Dorr equipped separate sludge digestion plants.

Look over the striking looking plant designed for the Sanitary District of Aurora, Illinois, by Alvord, Burdick and Howson. All equipment is under cover. Each step in the process up to digestion—grit removal, coarse screening, sedimentation, and sludge digestion—is carried out in Dorr Equipment.

The Dorr Detritor, Dorrco Bar Screen, Dorr Clarifiers and Dorr Digesters perform their duties smoothly and automatically. Plant efficiency is maintained at highest pitch as grit and solids are removed continuously from the flow by the Detritor, Bar Screen and Clarifiers.

The digestion of the sludge in Dorr Digesters is kept under positive control. No offensive odors or frothing. Power consumption for all units is low.

Our nearest office will gladly forward a booklet "Modern Sanitary Engineering Practice" and specific bulletins describing any of the machines mentioned.

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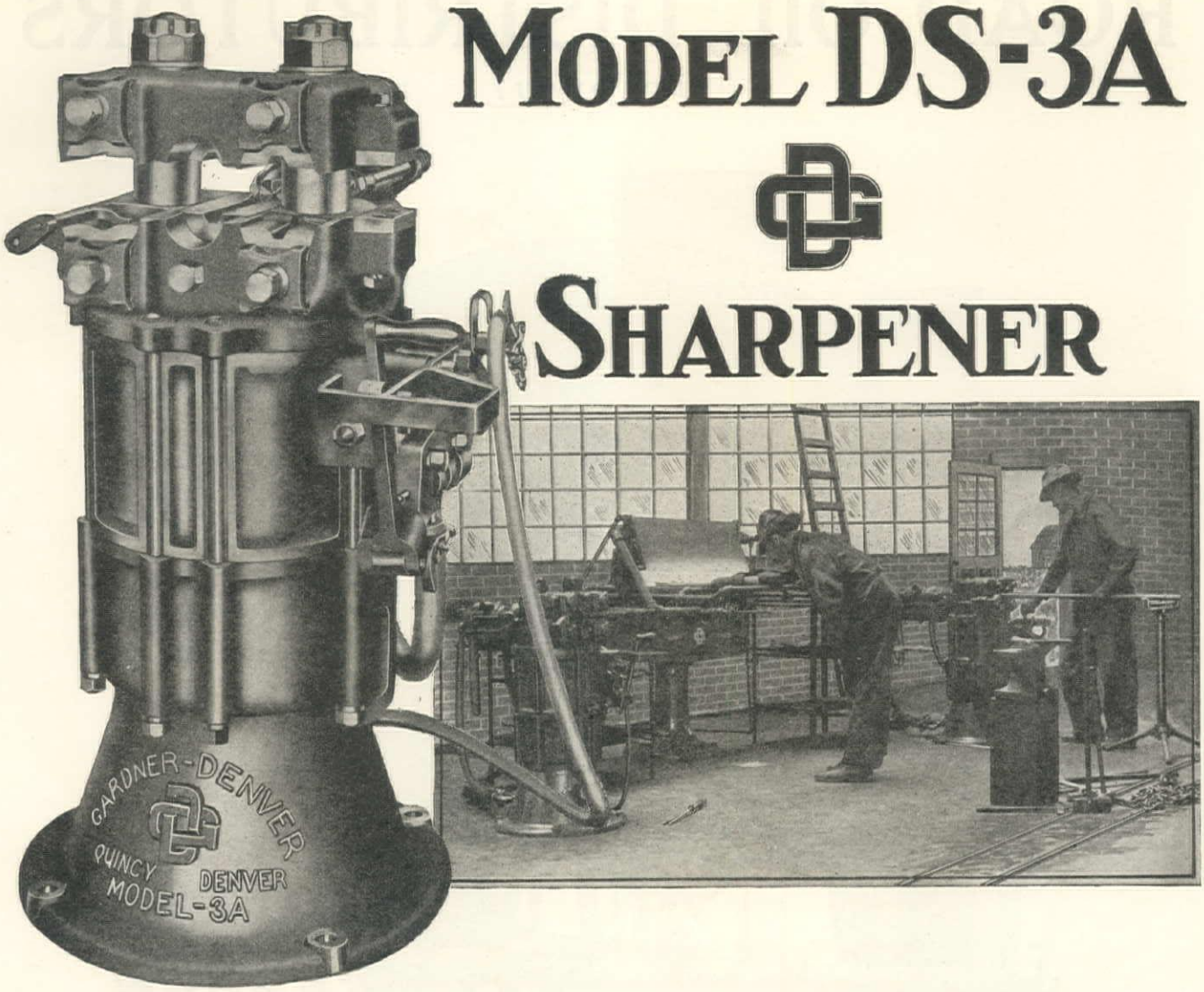
MODEL DS-3A

SHARPENER



MODEL DS-3A DRILL STEEL SHARPENER was designed and built to meet the demand for a small drill sharpener which can be used to advantage by contractors, mines, quarries and other users of rock-drills who do not use drill-bits of unusually large size and therefore should not need to make the large investment required by a large drill sharpening machine. Since its introduction about a year ago, the Model DS-3A Sharpener has been adopted by a large number of discriminating users, and is giving them entirely satisfactory and efficient service. We recommend it unreservedly for forging bits and shanks and sharpening any section of drill steel not over 1¼ inches in diameter and not requiring bits of more than 2½ inches gauge.

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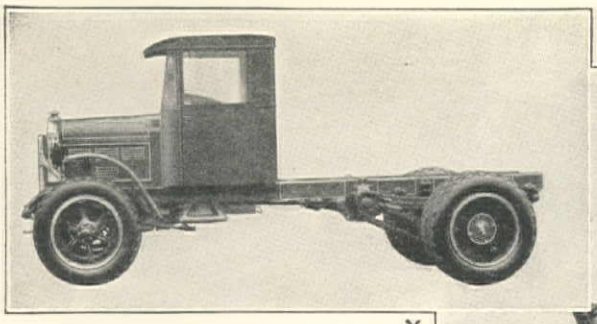


When the Job Must Go On....

DRIVER DAN SAYS:

A horse couldn't pull much without water and feed. So give your engine good gas ... keep the carburetor properly adjusted ... and you will get plenty of power from your Sterling Truck.

◆ ◆ ◆

WRITE DRIVER DAN in care of Sterling Motor Truck Co., Milwaukee, Wis., for descriptive bulletin of model shown.

It is TIME that is the important element in every contract. Delays are not to be tolerated ... the job must go on. Not only efficiency but profits depend on fast transportation. That means trucks that are *speedier* as well as more dependable ... with lower upkeep. The Sterling DC-23, 5½ to 7 tons, light, chain-drive six for heavy duty meets the situation with:

1. Quicker get-away and remarkable flexibility of speed that suits all traffic.
2. Tremendous pulling power ... reserve stamina ... moves bigger loads easily regardless of hauling conditions.
3. Fuel-saving *Red Head* Ricardo Head makes engine economical and more effective at every speed.
4. Thick-cheeked 7-bearing crankshaft ... extra-rigid girder crankcase with imbedded cylinders ... eliminates vibration, lengthens motor life.
5. Shock-absorbing *wood-lined* frame, adjustable service brakes, dual jackshaft emergency brakes ... save truck and keep hauling costs down.
6. Every feature for ease and comfort in driving.

STERLING MOTOR TRUCK CO. OF CALIFORNIA
1190-98 Howard St., San Francisco

Oakland Sacramento Fresno Stockton San Jose

Sterling TRUCKS

SMALL SHOVELS

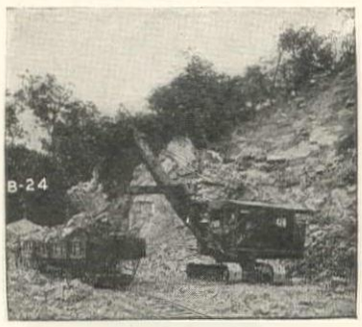
WITH A WORLD-WIDE REPUTATION

Those who know what a large proportion of the world's work in the small shovel field is being done by Bucyrus-Erie equipment are quick to appreciate the fact that unusual engineering and plant facilities are behind these small units.

From start to finish, Bucyrus-Erie small shovels are designed and built as if they alone comprised the whole product of the company. Two complete separate plants are devoted to their production and nothing else.

From its early days, this organization has built small shovels, has continuously studied conditions, on every conceivable type of job where they are used, and is responsible for many of the major improvements in this class of equipment.

As a result, Bucyrus-Erie small shovels are built, in every part, to meet the needs in their fields of operation. They have strength where strength is needed. Their weight is properly distributed. Each unit is exactly suited to the requirements. There is no make-shift construction in a Bucyrus-Erie.



Power shovels, clamshells, cranes, draglines, dragshovels—½ to 16 yard capacity — electric, steam, gasoline, Diesel, gas + air, Diesel + air. Dipper, hydraulic and placer mining dredges.

A-11-2-25-30-WCN

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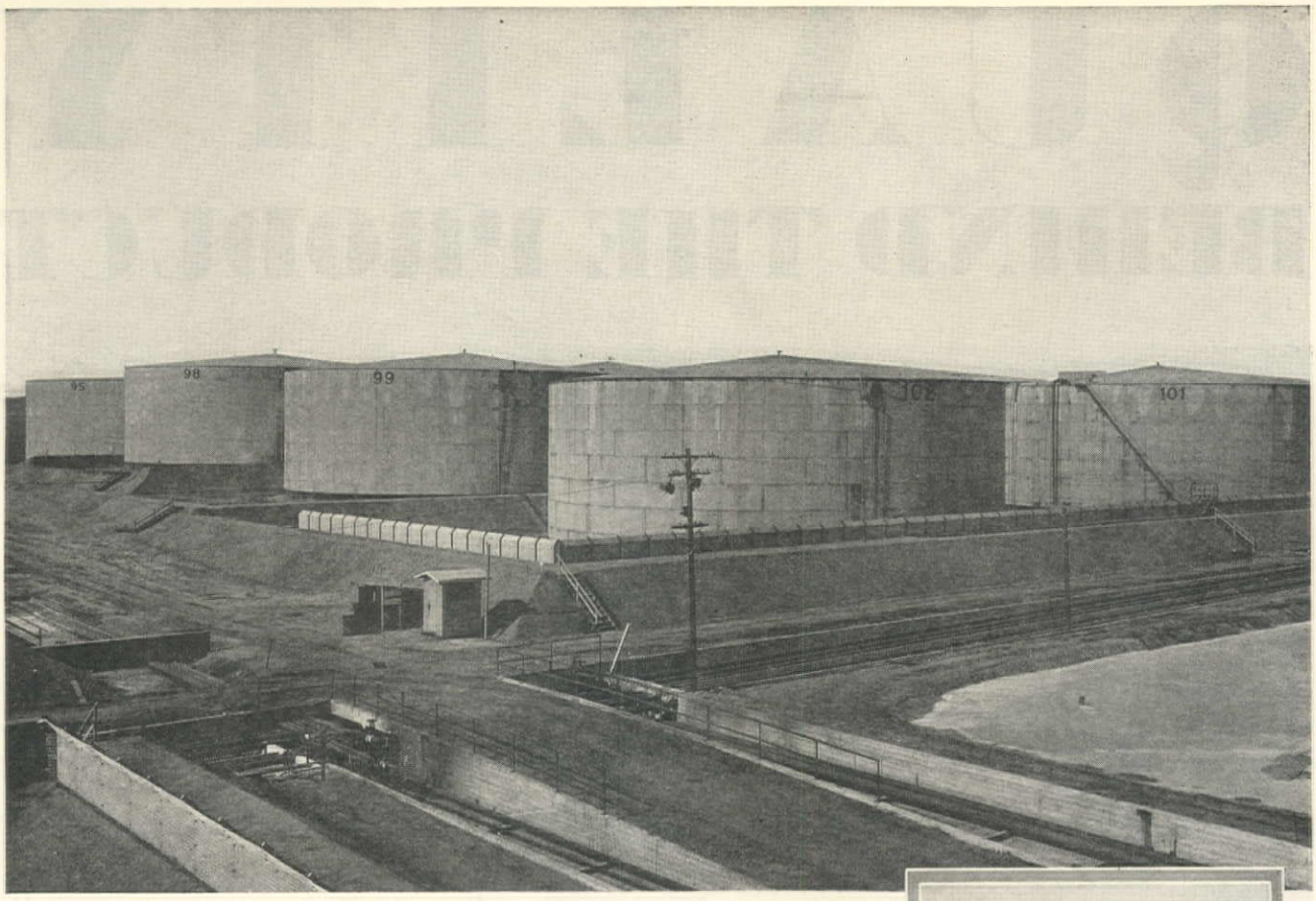
Plants: South Milwaukee, Wis., Erie, Pa., Evansville, Ind. General Offices: South Milwaukee, Wis.

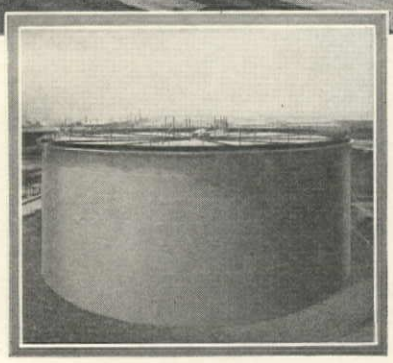
West Coast Branch Office: 989 Folsom Street, San Francisco.

Clyde Equipment Company, Portland, Ore., Seattle, Wash. Concrete Machinery & Supply Company, Los Angeles, Cal.

BUCYRUS ERIE



A typical group of 80's storing West Coast oil



Upper view: Group of 80,000-bbl. tank at a Pacific Coast refinery. Lower view: Close up view of an 80,000-bbl. tank at same place equipped with a Wiggins Floating Roof.

A TYPICAL Horton tank installation may be anything from a single 500 barrel structure to a whole farm of large storage tanks. An example of the latter is illustrated above. It is a corner of a field where twenty 80,000-barrel tanks were erected for a California refiner at one time.

At the same location there are a number of other tanks equipped with Wiggins Floating Roofs to protect the contents from evaporation and fire hazard. These roofs make sufficient savings to pay for themselves in less than a year on working tanks and a somewhat longer period on standing storage tanks.

Horton storage tanks may be purchased with either cone roofs, Wiggins Floating roofs or Wiggins Breather roofs completely installed. Wiggins Roofs are also put on existing tanks. All erection is handled by our own experienced Pacific Coast crews with headquarters at San Francisco.

Write or wire for quotations on steel storage tanks, elevated tanks or steel plate construction.

CHICAGO BRIDGE & IRON WORKS
1013 Rialto Building, San Francisco

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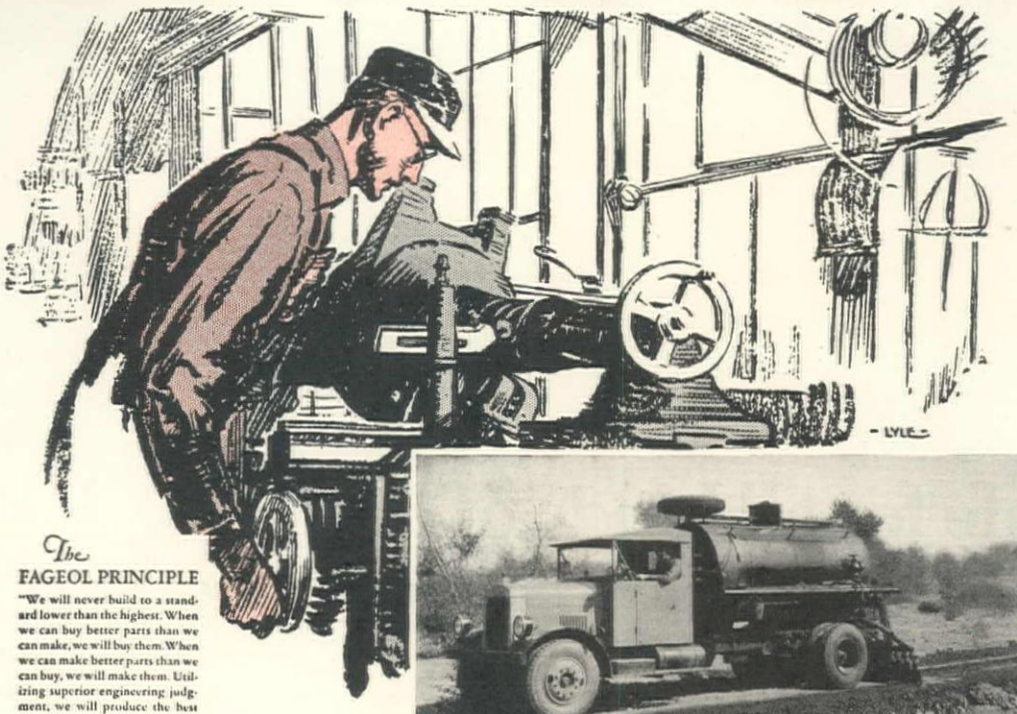
HORTON TANKS

WCN 2-25-Gray

FAGEOL



The FAGEOL PRINCIPLE

"We will never build to a standard lower than the highest. When we can buy better parts than we can make, we will buy them. When we can make better parts than we can buy, we will make them. Utilizing superior engineering judgment, we will produce the best equipment or we will produce nothing" L H BILL

WHAT *he* CONTRIBUTES...

Today a certain man is standing before a busy machine in a Fageol factory.

Each hour this man bends forward with concentrated attention. No movement misses his keen eye, and no adjustment escapes the precision of his experienced hand.

The machine before him is almost a part of himself... steel sinews responsive to a trained mind...accurately cutting steel to specifications so exacting that only the most delicate instruments can measure them.

Making a truck part? No! "Building a Motor Truck!" That's what L. H. Bill teaches his men. The part is only a means to an end. No matter how good the part... *will it work with the others?*... That's the constant question in the Fageol factory.

And this man, as hundreds of others like him in the Fageol factory, looks beyond the shaping metal under his hand. He sees a big, powerful Fageol, heavily loaded, moving along a crowded highway; its strong pulsing motor transmitting living energy to this very part on whose success or failure depends the comfort, convenience, and, sometimes, even the life of a fellowman.

That which he contributes is much, and that responsibility which every man under L. H. Bill feels is projected into the Fageol Truck and Safety Coach. Not parts ... but *precision!* Not metal nor machines... but *men!* These make a Fageol the choice of commercial drivers over the entire West.

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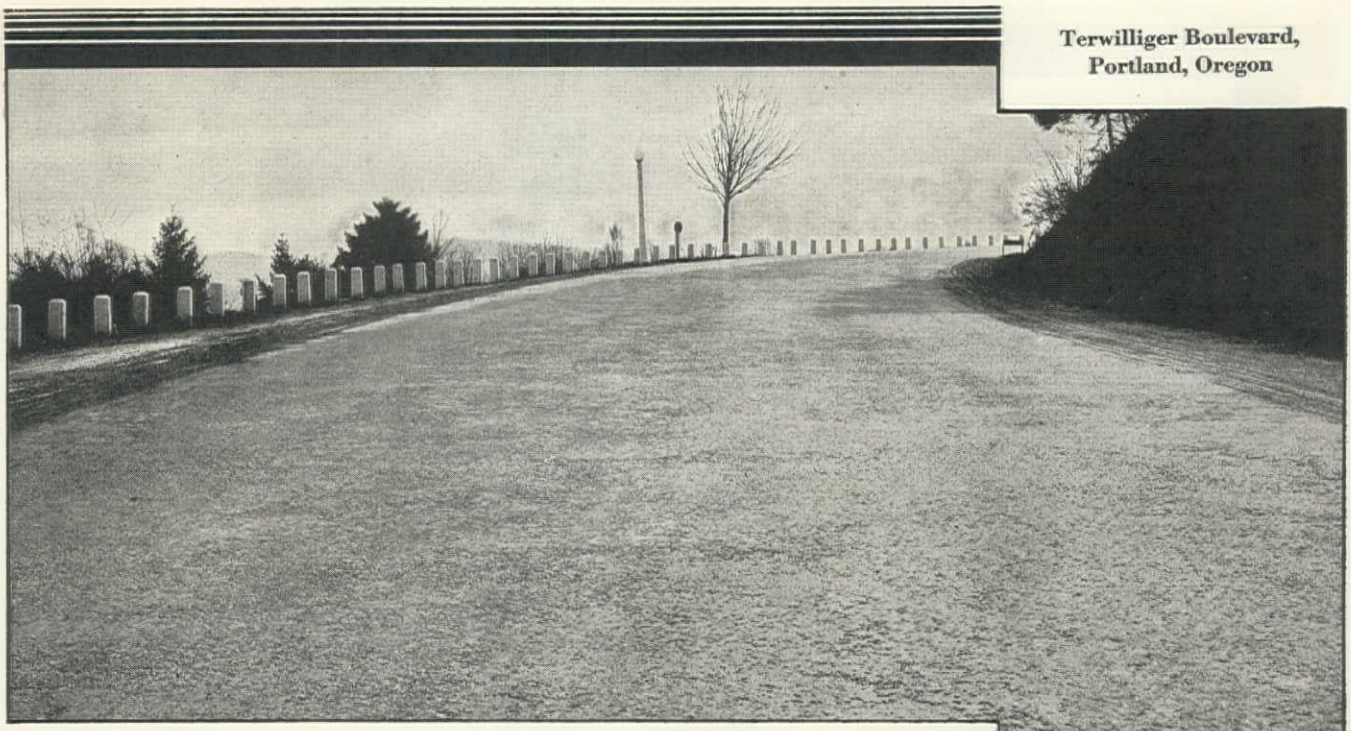

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Portland, Oregon

Safe for all kinds of driving~ Economical in construction~

THAT'S THE MODERN PAVEMENT!

CALOL ASPHALT for best results

When your paving is Non-Skid Asphaltic Concrete, heavy grades—quick stops—"hairpin" turns, hold fewer dangers! The safety factor, built right into this road surface, reduces the peril of skidding to a minimum.

Stone chips pressed into the Asphaltic Concrete surface provide a smooth attractive ribbon of highway with just enough tiny indentations to afford automobile tires a sure, firm grip in all kinds of weather.

You take safety, smooth riding, freedom from glare for granted on Asphaltic Concrete pavements, but they'll also save you money on construction costs and upkeep! Many Asphaltic Concrete highways, with practically no repairs whatever, are still standing up under heavy traffic after 15 or 20 years' service!

These are the reasons Non-Skid Asphaltic Concrete has been adopted as "Standard" by the California State Highway Commission and by some 230 odd towns and cities in the Pacific West States.

Investigate Non-Skid Asphaltic Concrete before you pave.

STANDARD OIL COMPANY OF CALIFORNIA

Asphaltic CONCRETE NON-SKID *pavements*

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1st Prize $5,500,000,000 2nd Prize $2,200,000,000
3rd Prize $1,000,000,000 4th Prize $ 750,000,000
5th Prize $ 700,000,000 6th Prize $ 400,000,000

The biggest construction program in the history of the country has been started. It is estimated that the expenditure will amount of over 10½ Billion Dollars. Building Construction wins first prize with $5,500,000,000 — the other winners in order are Roads and Streets, Public Utilities, Federal Government Construction, Waterworks and Sewers, and Steam Railway Construction.

It's a real contest for big prizes—the biggest ever. More work will be done and more profit made. Competition will be keener than ever. The men who win—the men who make the big profits will be those who use the right equipment for the job. Get in on the profits by using fast, economical machinery. We have it in stock.

EXTRA PRIZES FOR QUICKNESS

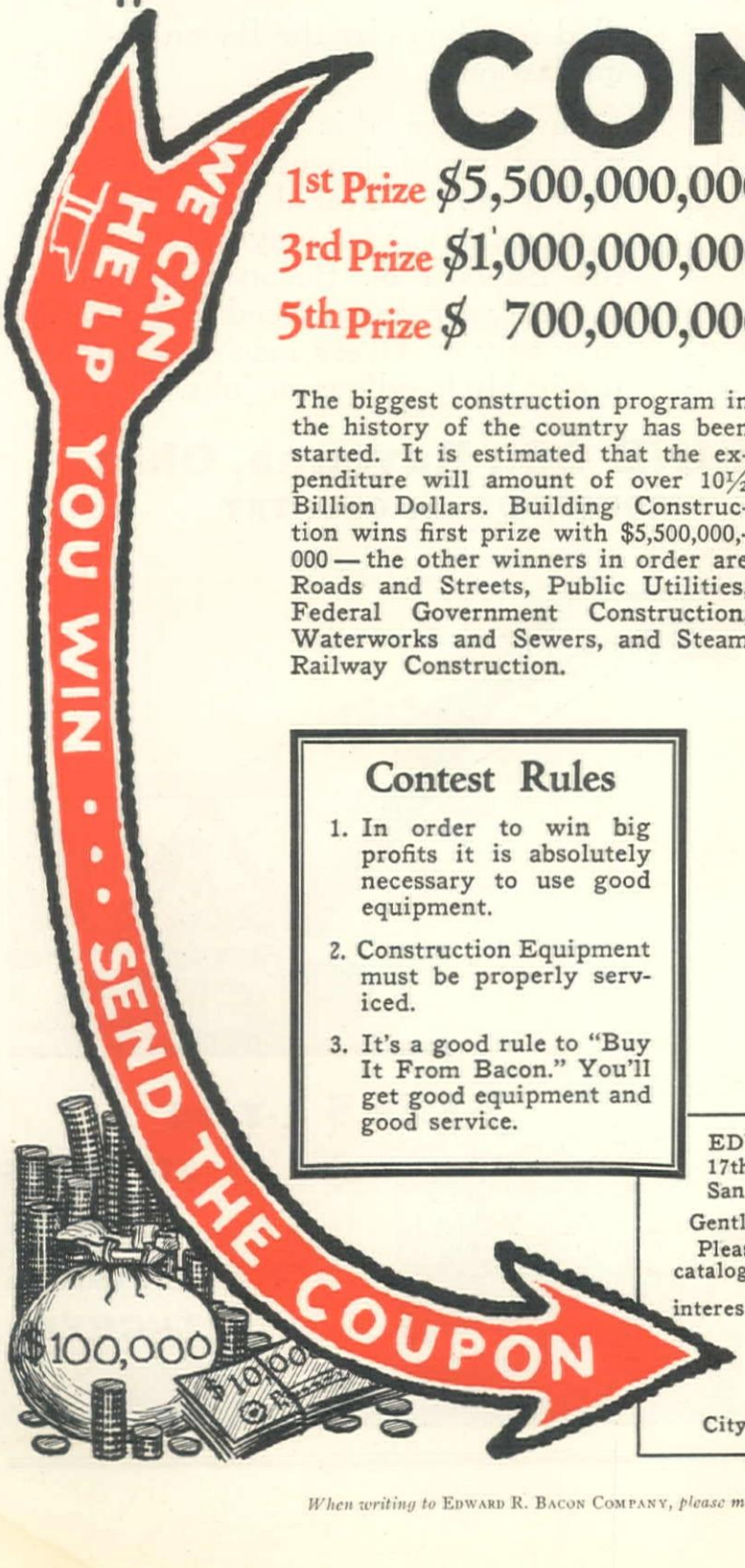
Speed earns a premium. The fewer delays on a contract, the more the profit. Good equipment, properly serviced, is necessary for fast schedules and big profits. "Buy It From Bacon" — you'll get good equipment and service.

Contest Closes December 31, 1930

The penalty for a late start is Reduced Profit. Start after yours now!

Contest Rules

1. In order to win big profits it is absolutely necessary to use good equipment.
2. Construction Equipment must be properly serviced.
3. It's a good rule to "Buy It From Bacon." You'll get good equipment and good service.



EDWARD R. BACON COMPANY,
17th and Folsom Streets,
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Gentlemen:

Please send me a *FREE* copy of your big 1930 catalog of Construction Equipment. Right now I am interested in .....

Name.....

Street.....

City.....

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BYERS complete line of shovels and cranes are coming west into San Francisco and Northern California through the Edward R. Bacon Co., Byers exclusive representative in this territory.

New machines and a stock of replacement parts will be handled for Byers by the Bacon organization.

Investigate this newly improved line of dependable excavating and material handling equipment! You may rely on the Edward R. Bacon Co. to properly serve your needs. You may rely on Byers machines to profitably handle your jobs.

THE BYERS MACHINE CO., Ravenna, Ohio

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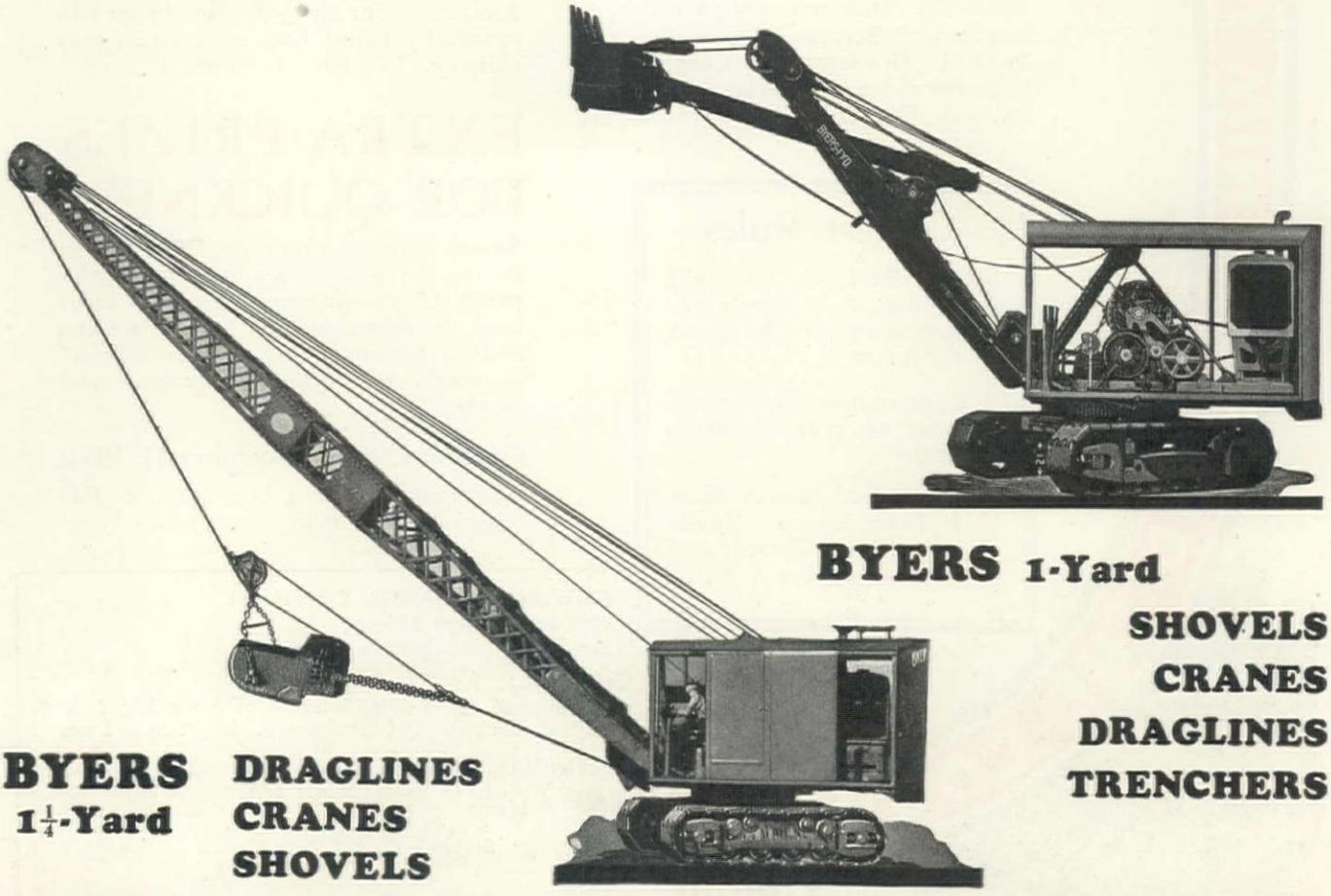

BYERS 1-Yard
SHOVELS
CRANES
DRAGLINES
TRENCHERS

BYERS 1¼-Yard
DRAGLINES
CRANES
SHOVELS

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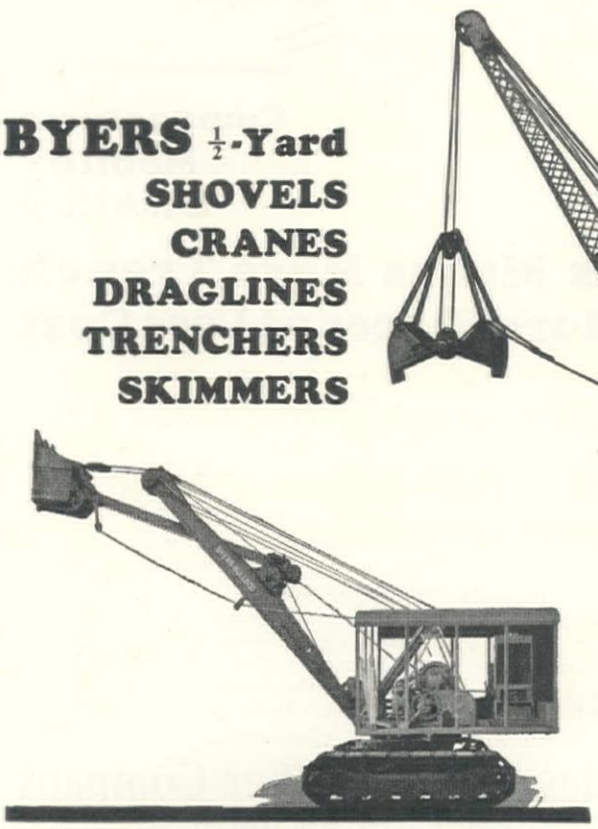
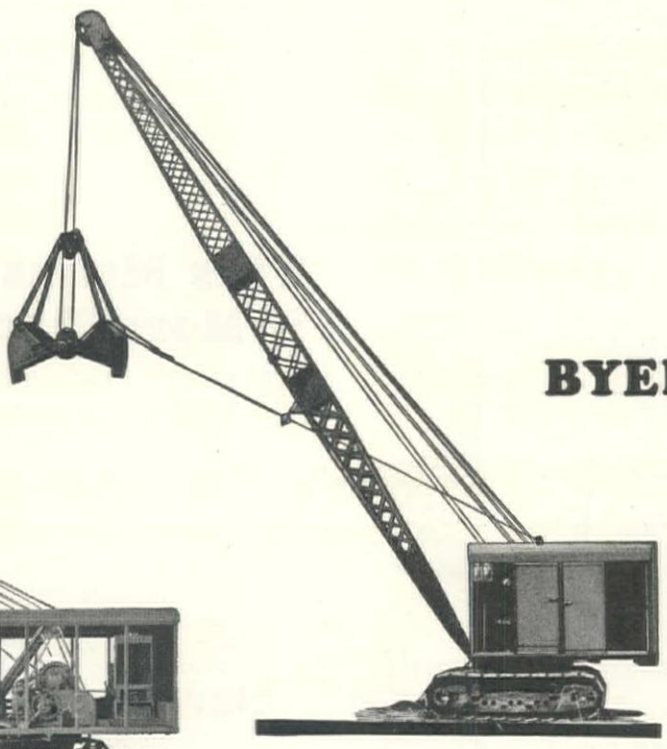




BYERS ¾-Yard
CRANES
DRAGLINES
SHOVELS
TRENCHERS
SKIMMERS

WAITING for you are **new Byers Catalogs** on all machines. Write for them directly to our San Francisco office Today. We'll be glad to send you full information promptly and without obligation.

THE EDWARD R. BACON CO.
Folsom at 17th Street, San Francisco

BYERS

SHOVELS and CRANES

Performance–
Profits–

THE 1930 MULTI FOOTE PAVER

for Speed-Service-Success

Greater Speed–

Greater Reliability–

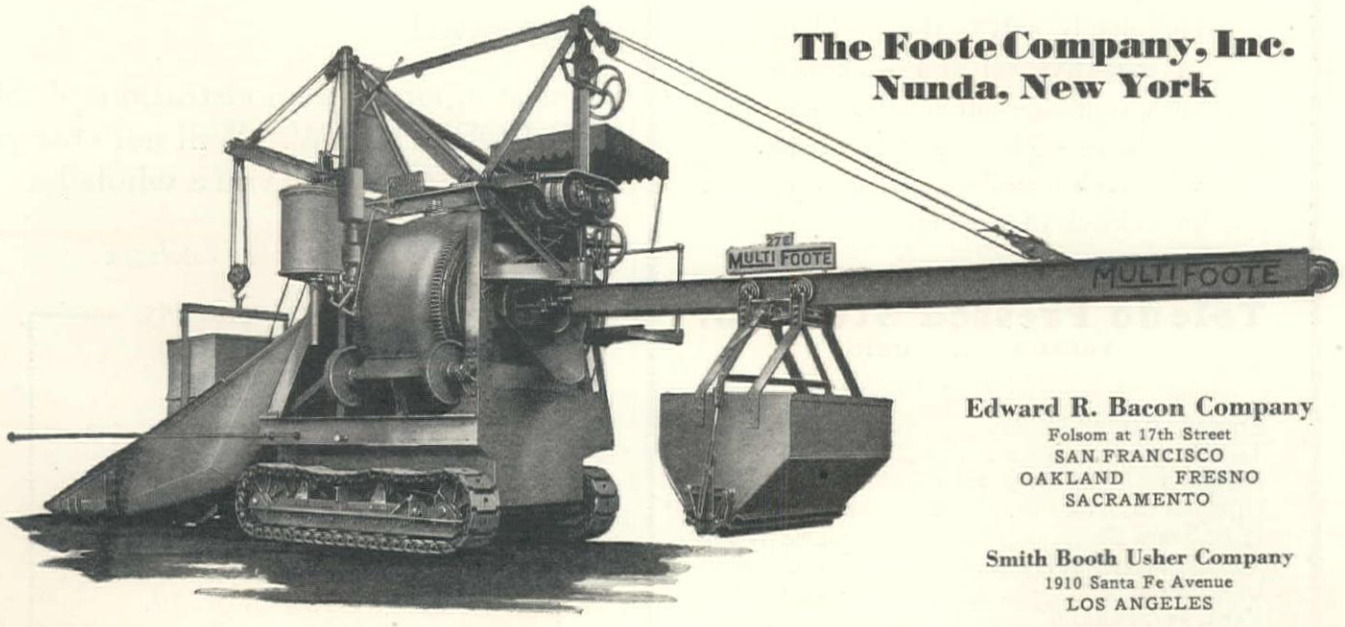
Fast, Steep Discharge–

Tried, Proven Dependable

The Record of the Multi-Foote Paver for years assures you of that steady, daily performance which means Speed and Profits. The 1930 Improvements automatically save you every possible minute.

A Paver refined to the last degree and backed by twenty-five years experience in building Road Pavers. The Best Standard Equipment throughout.

TIMKIN BEARINGS HERCULES HEAVY DUTY GASOLINE MOTORS NO-PRESSURE WATER TANK



The Foote Company, Inc.
Nunda, New York

Edward R. Bacon Company
Folsom at 17th Street
SAN FRANCISCO
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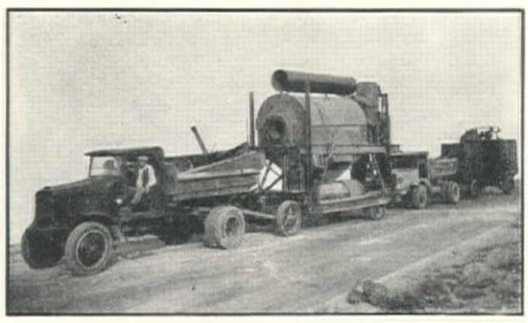
Smith Booth Usher Company
1910 Santa Fe Avenue
LOS ANGELES

World's Largest Exclusive Builders of Road Pavers

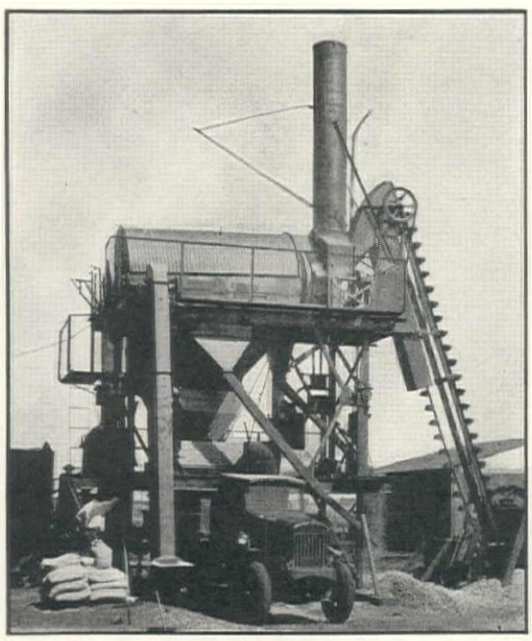
When writing to THE FOOTE COMPANY, INC., *please mention Western Construction News*

This 20-Mile Move and Set-Up Cost 3⅓c Per Ton on a 6673-Ton Job

ANOTHER GOOD JOB DONE



EN ROUTE TO THE NEXT



ALL SET UP AND READY

WHEN you can knock down, move twenty miles and set up for a 6673-ton job at an average cost of 3⅓c per ton for dismantling, moving, re-assembling your plant . . . when you can hold over-all production costs, even on a small job, to a total of 29.38 cents per ton of finished material . . . then your profitable scope of operations is greatly increased.

C. O. Sparks, 2309 East Ninth Street, Los Angeles, reports the above costs on the paving job pictured at the top of the page. He used a Madsen 1000-lb. 2-Unit Mobile Paving Plant. With the job finished, he moved 20 miles and set up for a second small job; then he went on to a third. The whole of Los Angeles County has become his field . . . because he has a plant of substantial capacity which is completely portable.

Madsen rated capacity on this Mobile plant is 1000 pounds per mix, but C. O. Sparks maintains a 1500-lb. batch schedule . . . averages 266 tons per 8-hour day. His labor cost, including two fresno teams handling aggregate to elevator hopper, is 25.84c; into this is figured fuel oil cost, including firing 20-H.P. boiler for heating asphalt of 4c per ton. Adding to this the expense of dismantling, moving 20 miles, re-assembling, gives a total production cost of 29.38c per ton.

Cost records like these will show up in your profits in 1930. Have you our new catalog on the Madsen Mobile Plant? May we send additional data, or have a representative call?

,,,,

MADSEN IRON WORKS

Established 1910

P. O. Box 601, Huntington Park, California
(Suburb of Los Angeles)

EDWARD R. BACON CO.

Distributor

Folsom and 17th Streets, San Francisco, Calif.

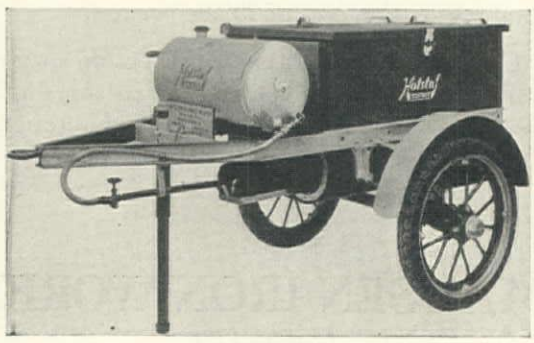
MADSEN PAVING EQUIPMENT FOR EVERY PAVING PURPOSE

HOTSTUF

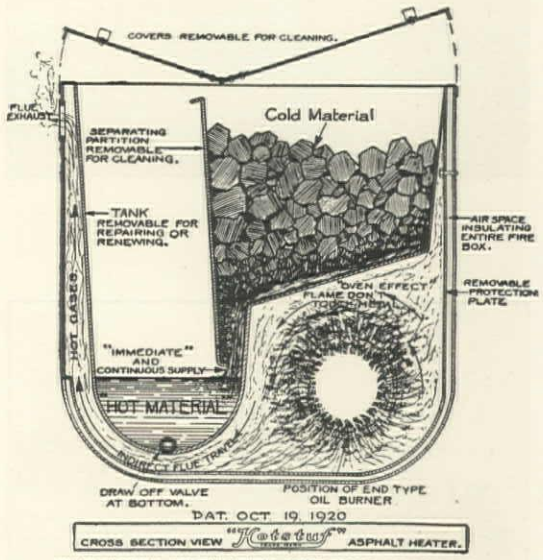
OIL BURNING ASPHALT HEATER *with* PATENTED ELEVATED MELTED CHAMBER

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

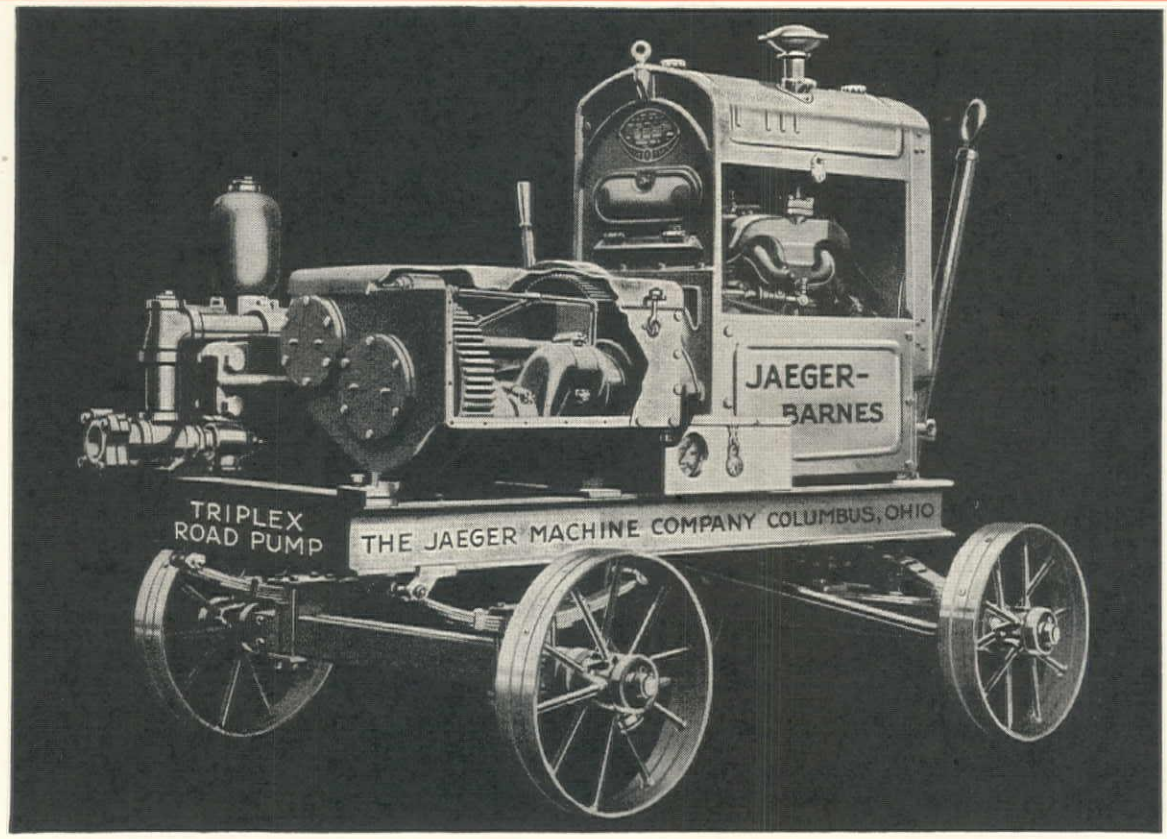
5. **Cokeing Practically Eliminated.**
   This patented construction eliminates cokeing by the natural flow of the **Hotstuff** carrying the sediment to the storage chamber where it gradually carries off through the draw-off valve.
6. **Temperature Control.**
   This process of melting and the perfect 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

The ROLLS-ROYCE of ROAD PUMPS



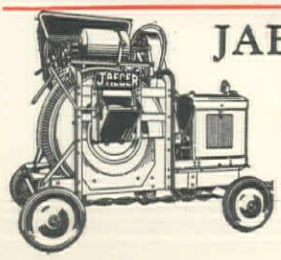
ENGINEERED to Give Unfailing Water Supply . . . TESTED and PROVEN on a Thousand Jobs!

ONLY fully self-oiling road pump with roller bearings on all shafts. Simplest oiling system, with patented, positive, rotary oiling pump. Every part works in dust-proof case.

Steel cut gears and pinions, unbreakable forged crankshaft, detachable cylinder block casting, removable cylinders, pistons hardened against wear. Reinforced steel trucks, semi-elliptic springs, automotive type front axle with steering knuckles.

Horizontal design provides better automatic lubrication, easier inspection of all parts. And more than 100 Jaeger stations assure quick service anywhere.

FORCE PUMPS—SELF PRIMING CENTRIFUGALS **JAEGER-BARNES** PLUNGER TRENCH PUMPS CONVERTIBLE DIAPHRAGMS



JAEGER 10S MIXER

All steel, short coupled, direct driven, handles like a 7S, gives heavy duty 2-bag service.

Other non-tilts 7, 14, 21, 28, 56S. Tilters 3½, 5, 7, 10S size.

Ask about "Jiffy" Placing Plant for Conveying and Hoisting.

JAEGER MIXERS...PUMPS... HOISTS — *Carried in stock by*

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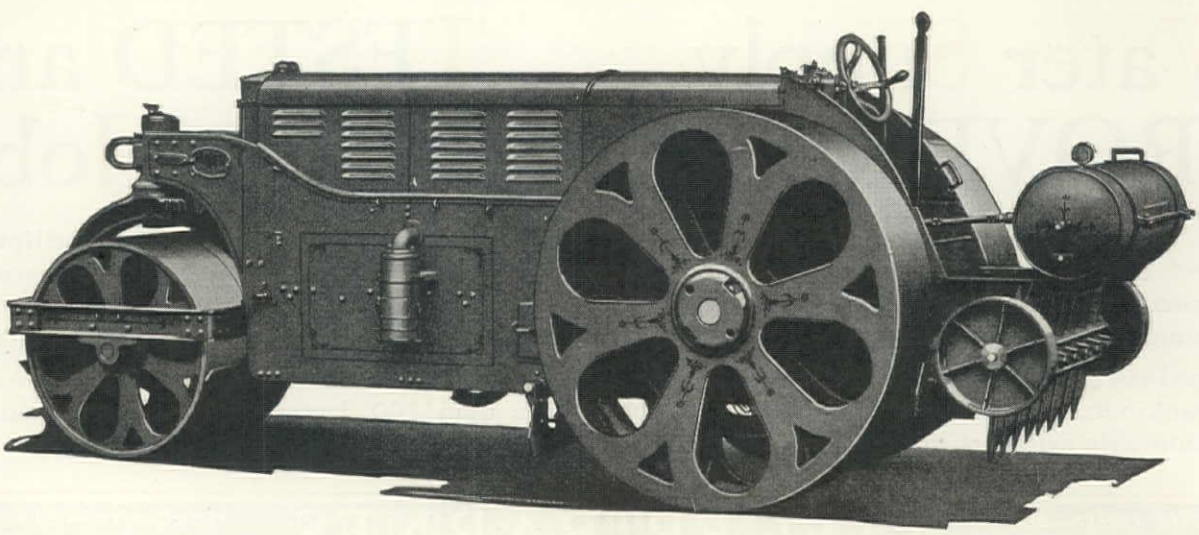
Edward R. Bacon Co., San Francisco; Smith Booth Usher Co., Los Angeles; The C. H. Jones Co., Salt Lake City; Clyde Equipment Co., Portland-Seattle; General Machinery Co., Spokane; Neil B. McGinnis, Phoenix, Ariz.

HUBER MOTOR ROLLERS
YEARS AHEAD

Huber Is Built for ALL Road Jobs

CHECK the features that have made the Huber Motor Roller the outstanding Roller of the Country. New features have been added, notably a new and improved scarifier for the 10 and 12 ton sizes. Look to Huber for the most advanced engineering features. Hundreds of satisfied owners, both in the U. S. and in foreign countries, will vouch for Huber's absolute dependability. It meets every requirement. It is built for ALL Road Jobs.

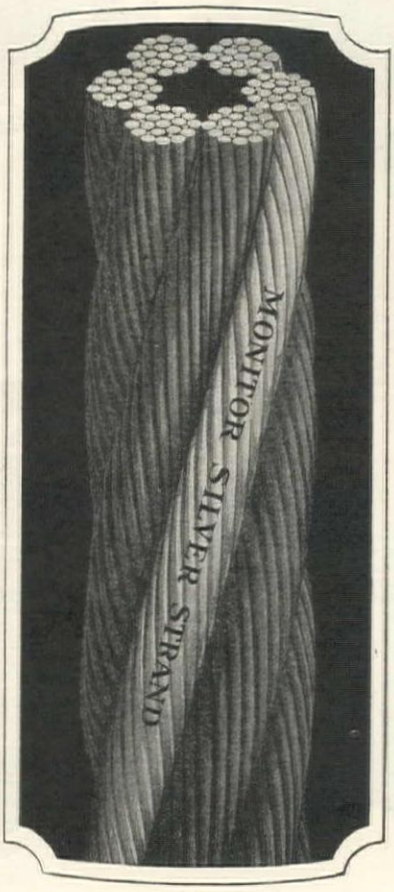
THE HUBER MANUFACTURING COMPANY
MARION, OHIO

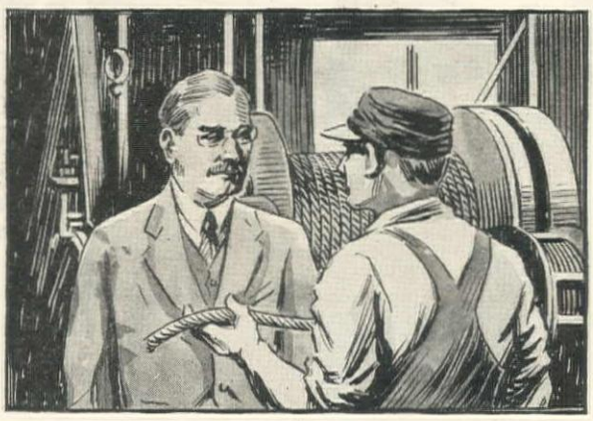


EDWARD R. BACON COMPANY
FOLSOM AT 17th STREET
SAN FRANCISCO *DISTRIBUTOR*

The Measure of Wire Rope Quality is the SERVICE it has Rendered

Which wire rope to use on your equipment—which brand will give the longest and most economical service—may be best determined by past records of performance established under similar operating conditions. This and the reputation of the maker are of paramount importance.





For over half a century American Wire Rope, made exclusively by the American Steel & Wire Company, has demonstrated its superiority—proved beyond question that its tough, flexible and abrasion-resistant nature is the best insurance against breakdowns and costly delays.

Regardless of your particular problem, you will find an American Wire Rope exactly adapted to its economical solution. Consult our nearest branch office or distributor to get the right rope for your purpose.

AMERICAN STEEL & WIRE COMPANY WIRE ROPE

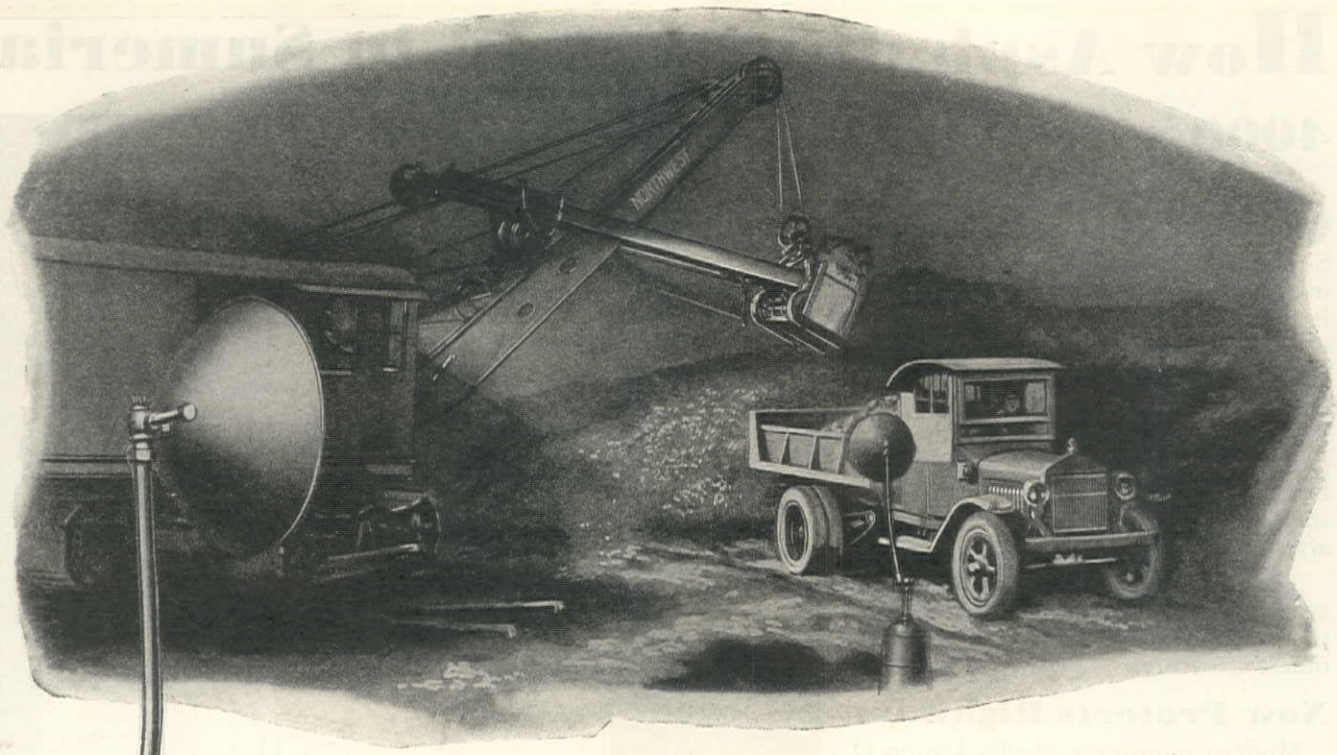
AMERICAN STEEL & WIRE COMPANY

SUBSIDIARY UNITED STATES STEEL CORPORATION

PACIFIC COAST DISTRIBUTORS

UNITED STATES STEEL PRODUCTS COMPANY

SAN FRANCISCO LOS ANGELES PORTLAND SEATTLE HONOLULU



Where work must go on—

SAFETY and efficiency demand good light. Carbic Flood Lights make night work productive. Steady and powerful rays of Carbic light insure the job proceeding with day-like rapidity and safety.

The Carbic Flood Light is simple. There are only three parts. It has unusual safety features. Any inexperienced laborer can charge it in a few minutes. A charge lasts twelve hours. The Carbic Flood Light is low in first cost and inexpensive to operate.

Speed up your job by working at night with

CARBIC LIGHT

OXWELD ACETYLENE COMPANY

Unit of Union Carbide and Carbon Corporation

NEW YORK CITY:
Carbide and Carbon Bldg.

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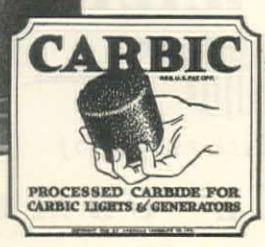
SAN FRANCISCO: Adam Grant Building



Carbic is distributed by the Union Carbide Sales Company through its national chain of warehouses and is sold by jobbers everywhere.

How Asphalt was used in Sumeria

4000 years Ago...

CENTURIES before King Tutankhamen began his colorful reign, the Sumerians developed a great city at Ur in the lower Euphrates Valley. So old is their civilization that, until recently, nothing was known of its beginning except in legend.

Recent excavations at Ur, chief city of Sumeria, have disclosed the ruins of a great tower or Ziggurat, constructed of bricks set in asphalt. The base or lower stage of the tower is still well preserved after more than 4000 years.

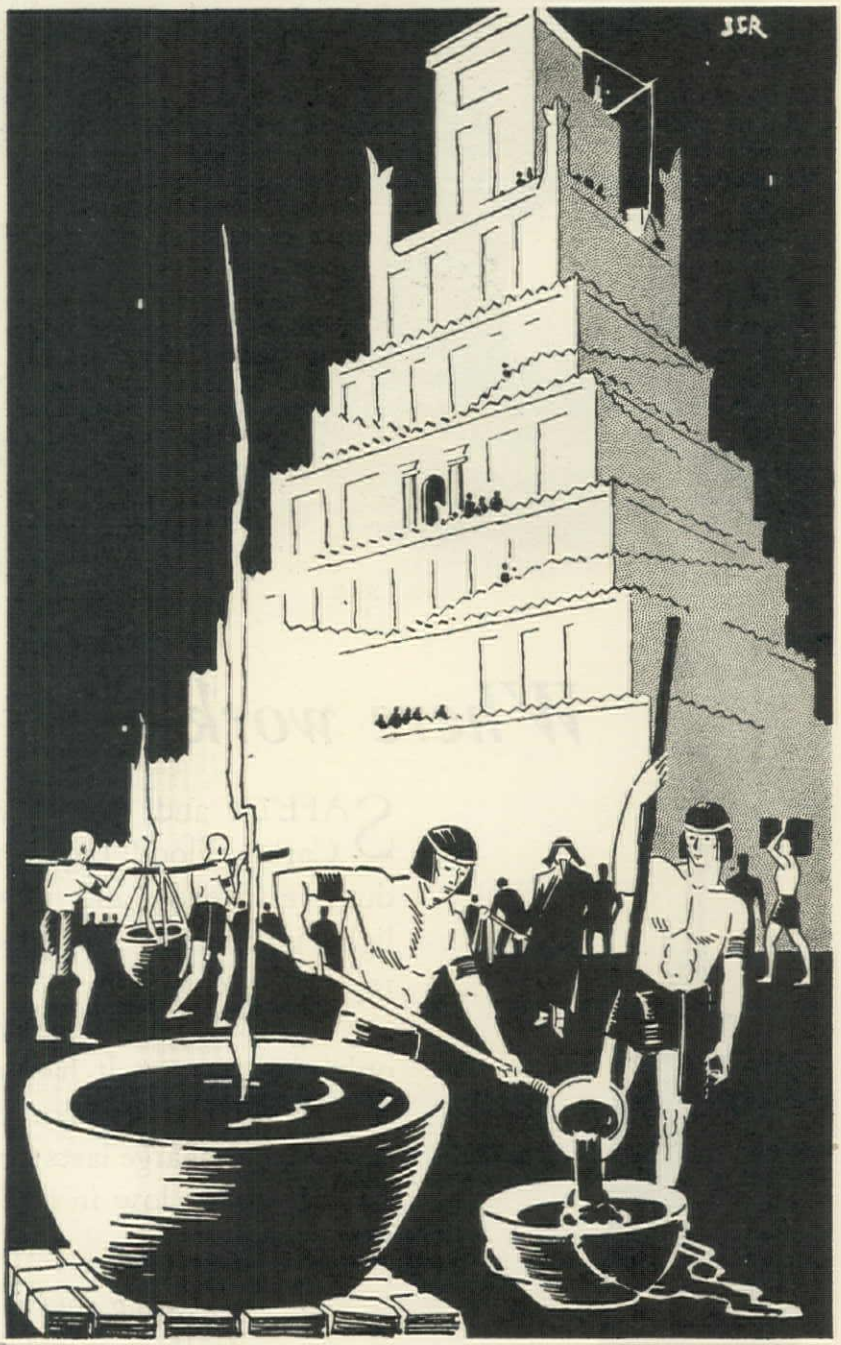
Thus has asphalt's resistance to weather and time played an important part in the preservation of many of the world's oldest structures.

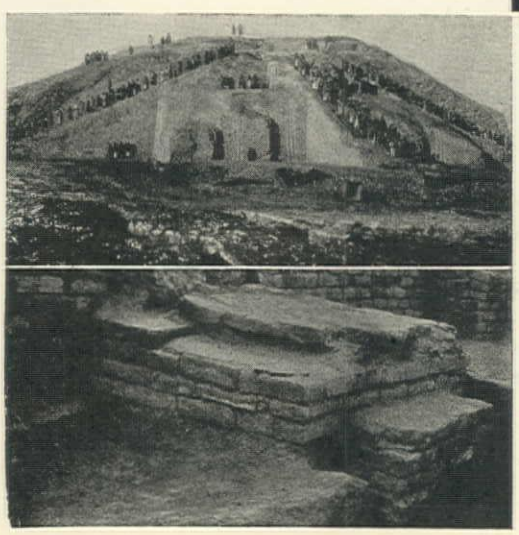
Now Protects Highways

Modern engineers specify Union D Grade Asphalt for western highway construction. They know that its moisture resistance will protect the subgrade from undermining by water. They know that asphaltic pavements are adapted to modern traffic conditions by these further advantages:

1. They absorb expansion and contraction—a protection against surface buckling.
2. They resist the wear of heavy traffic.
3. They can be opened to traffiic soon after laying.
4. They are easily replaced after being cut into for water mains, etc.
5. They are noiseless, dustless, and easily cleaned.
6. They are easily and quickly resurfaced.

Communicate with the Asphaltic Division, Union Oil Company, Los Angeles, or the nearest Union Distributing Station for complete details concerning Union D Grade, the superior, "moisture proof," asphalt.





LEFT:—*The first stage of this great tower is over 60 ft. high, and about 195 feet long by 150 ft. wide. Its clay bricks are still strongly cemented in asphalt after more than 4000 years. Photographs by Joint Expedition of British Museum and University of Pennsylvania Museum.*

ABOVE:—*The Ziggurat is believed to have consisted of seven stages, leading to a shrine at the top. The upper part of the tower, which was probably destroyed by hostile invaders, must have been about 400 feet high.*

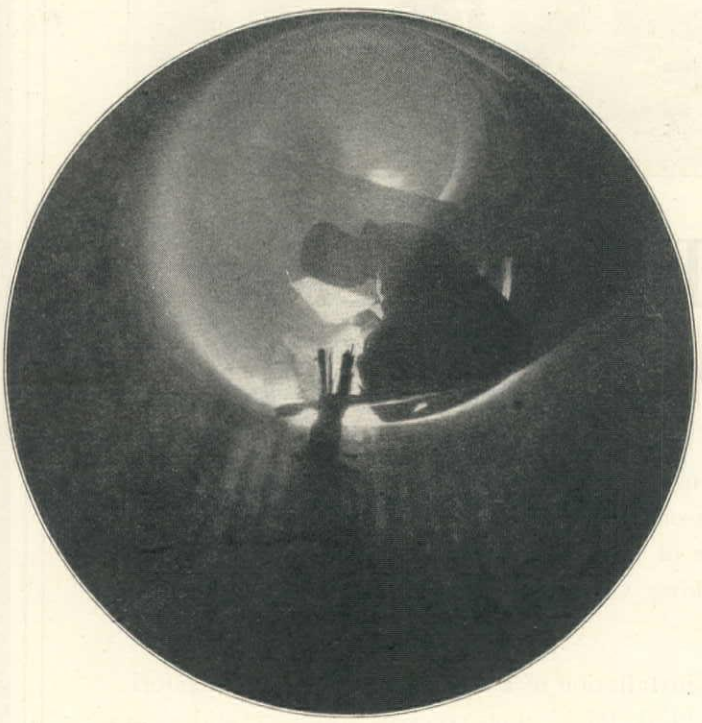
UNION D GRADE ASPHALT

UNION

It's moisture proof

UNION OIL COMPANY

ARMCO INGOT IRON



the *safe* metal for welded pipe lines

YOU need not hesitate to specify "welded construction throughout" when Armco INGOT IRON is the pipe material.

You'll find, as other engineers have found, that this highly-refined iron fulfills every expectation. It forms easily and surely. Welds are dense, tight and strong, when made by experienced welders.

Even more, both parent metal and the welds are corrosion-resisting, long-lasting. For Armco INGOT IRON is virtually freed of the harmful impurities that stimulate corrosion. It's made to last.

Our long experience in applying Armco INGOT IRON to specific engineering problems will be useful to you. Ask for the services of an Armco Development Engineer.

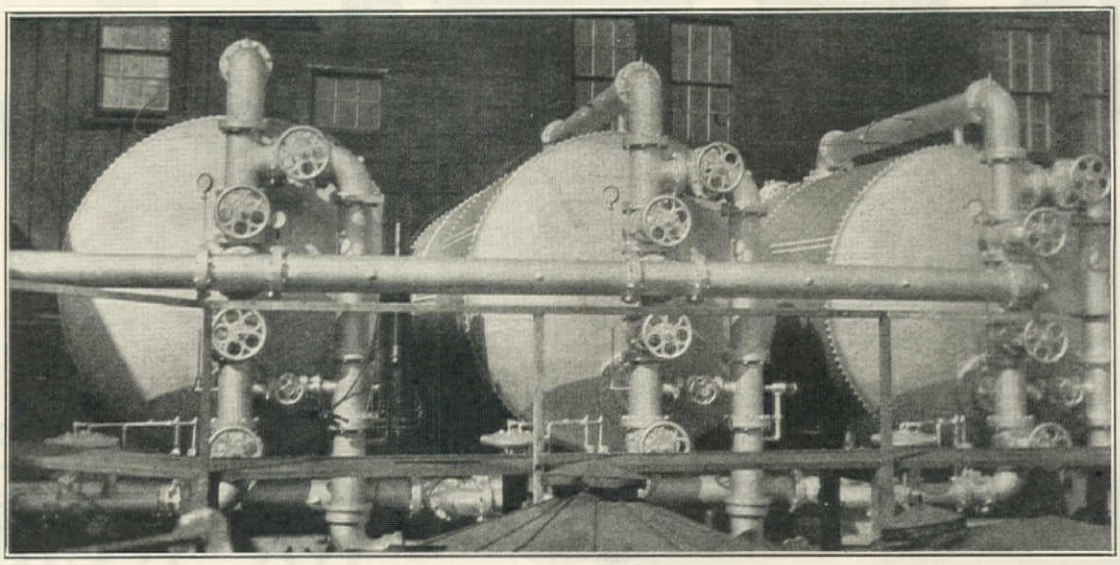
WELDING the inside circumferential joints of a section of Armco INGOT IRON pipe, destined for a 2-mile supply line in Detroit, Michigan.

Hear the famous
ARMCO CONCERT BAND
every Tuesday night
WLW - 700 K. - Cincinnati
Ten to eleven E.S.T.

ARMCO

The AMERICAN ROLLING MILL CO.
OF CALIFORNIA
540 Tenth Street, San Francisco
32 Connecticut Street, Seattle

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



California Filters Serve "Cal. Pack" Monterey Plant

THE problem at Monterey of securing sea water free of pollution from the shore and moss from the ocean without the use of costly pipe lines, has been solved by the California Packing Corporation at their Monterey Sardine Cannery.

Through the installation of a California Filter and a chlorination system, "Cal. Pack" now receives water crystal clear and free of germs, for use in washing, handling and brining. The cost of installation more than favorably compares with the cost of a pipe line substitute.

It is significant that a California Filter was chosen where the important factors were economy and efficiency. Authorities have called it ideal for the purpose.

Our Bulletin No. 40 provides complete performance data on all types of California Pressure Filters. Let us provide you with a copy.

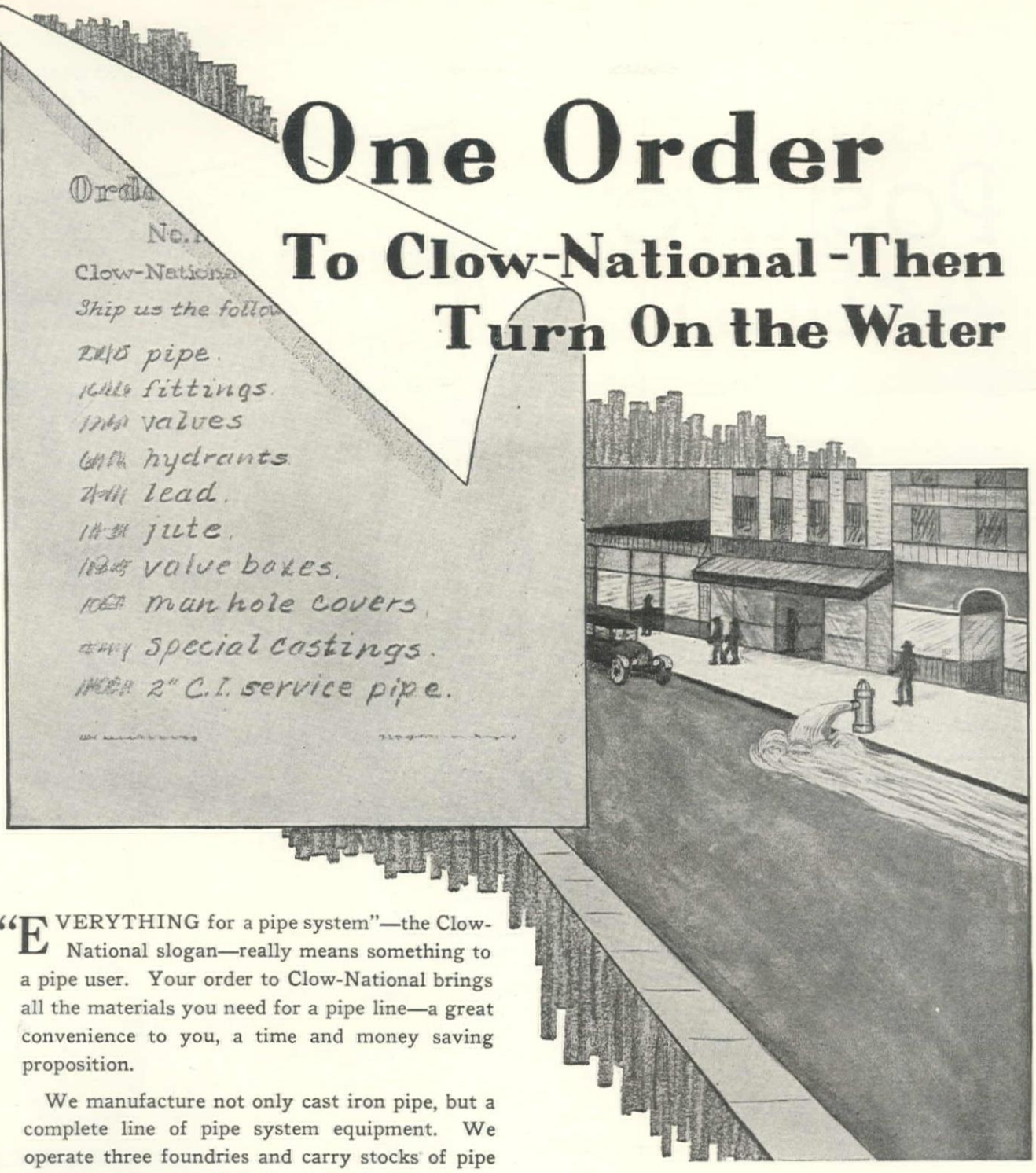
California Filter Company, Inc.

981 Folsom Street

LOS ANGELES SAN FRANCISCO SEATTLE

One Order

To Clow-National -Then Turn On the Water



"EVERYTHING for a pipe system"—the Clow-National slogan—really means something to a pipe user. Your order to Clow-National brings all the materials you need for a pipe line—a great convenience to you, a time and money saving proposition.

We manufacture not only cast iron pipe, but a complete line of pipe system equipment. We operate three foundries and carry stocks of pipe at eight different shipping points throughout the United States. Clow-National service on "l.c.l." orders is without an equal.

If you do not receive "Pipe Dreams," our monthly house organ, send us your name and address

James B. Clow & Sons
CHICAGO, ILLINOIS

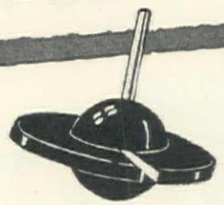
National Cast Iron Pipe Co.
BIRMINGHAM, ALABAMA

CLOW-NATIONAL
CAST IRON PIPE

"Everything for a Pipe System"

Cash Registers of the Water Works Field

Simple Positive Action



BRIEFLY, water cannot pass thru measuring chamber of Trident and Lambert Meters without causing positive movement of disc and revolution of projecting spindle. Elementally simple . . . phenomenally sensitive . . . continuously accurate.

Pioneers in Meter Progress
Yesterday TODAY Tomorrow

NEPTUNE METER CO.
THOMSON METER CORP.
50 East 42nd St., New York City
Neptune Meter Co., Ltd., Toronto, Ont.

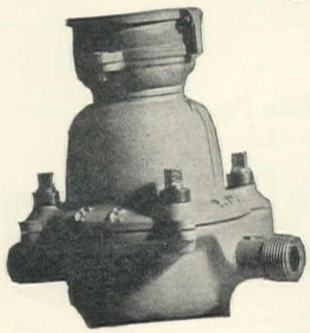
Pacific Coast Branches:
LOS ANGELES: 701 East Third Street
SAN FRANCISCO: 320 Market Street
PORTLAND: 525 Johnson Street

The measuring chamber of this meter is in the form of a central zone of a hollow sphere, having ends at the top and bottom, which are conical frustums, whose sides slope inward towards each other, and hence toward the center of the sphere. At the center of each of these conical ends is a spherical socket with its center of curvature in the center of the spherical chamber.

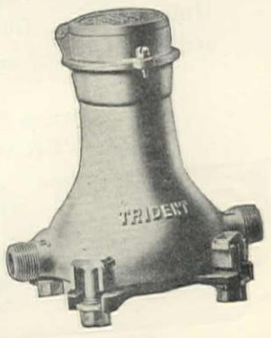
In these sockets fits a solid sphere which forms the central boss of a thin, flat, circular disc, the edge of which exactly fits the interior of the spherical chamber. This disc constitutes the piston of the chamber and has a movement of nutation or wabbling about the center of the sphere as a center of motion, the character of the movement being such that the spindle in the axis of the disc receives a conical motion, so that its end sweeps around in a circular path. The chamber is divided at one side by a vertical radial septum or partition, generally called the diaphragm, extending from the periphery of the chamber to the central sockets, and the disc is perforated with a narrow radial slit so that it may straddle the partition. The whole measuring chamber is enclosed in a case into which the water to be measured flows. From this the water enters the measuring chamber through an opening in the spherical wall on one side of the radial partition, and is discharged into the outlet pipe of the meter through an opening on the other side of the partition, the two openings in the wall of the chamber being close together, separated only by the thickness of the diaphragm.

The water cannot pass from the inlet opening to the outlet without so displacing the disc as to cause a complete mitation and a single revolution of the end of the spindle, and each of these complete movements corresponds to a quantity of water equal to the whole contents of the measuring chamber. The disc spindle engages with an arm on the end of one of the arbors of a train of gearing forming a register, and turns it with a uniform motion.

The measuring apparatus is of elemental simplicity. Functionally it consists of only two parts, the chamber and disc, for no valves are required to effect the distribution of the water in the chamber.



TRIDENT AND LAMBERT METERS



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VOLUME V | FEBRUARY 25, 1930 | NUMBER 4

A sign of greater prosperity in Far Western road building, our principal single construction activity, is given by the Government attitude toward increased Federal Aid appropriations. On January 29, the Senate approved a House resolution increasing the funds available for each of the fiscal years ending June 30, 1931, 1932, and 1933 from $75,000,000 to $125,000,000. The same measure also increased the maximum amount of Federal Aid to be extended on each mile of highway from $15,000 to $25,000—thus allowing the construction of higher type and longer-lived surfaces.

Increased Federal Aid Funds

The Pacific coast states—California, Oregon, and Washington—are seeking and expecting 'Big Industries', a natural adjunct to the inevitable large increase in population. But, one of the first questions Big Industry asks is—"Have you an abundant and cheap water supply?" Unfortunately, the cities of California must reply in the negative, whereas the problem is not so acute in Oregon and Washington. Can this California condition be corrected—yes, to a considerable extent.

Reclaimed Sewage for Industrial Water Supply

In the editorial on 'The Salt Water Barrier' in the January 25th issue, Clyde C. Kennedy clearly pointed out the gravity of the situation around San Francisco bay and how a salt water barrier would solve the problem of cheap and abundant water for industry.

We have no large rivers nor bodies of water from which big industries can secure cheap water. Our domestic water supplies are getting scarcer and will hereafter cost more to produce and deliver. Therefore, we must look to other sources for industrial water supplies. There are two sources which until very recently we have not taken into consideration—sewage and the storm water run-off from cities.

One of the objectives of the proponents of state-aid sewage research and of the California Sewage Works Association has been reclamation of sewage for the replenishment of our underground water supplies and for the use of industry. It has taken nearly six years to make the state 'Sewage Conscious'. Recently, the Standard Oil Co. employed Clyde F. Smith, sanitary engineer, to design a sewage purification plant to reclaim 6,000,000 gal. of Los Angeles sewage for use as boiler feed water at its Hyperion oil refinery. Thereupon, the Bureau of Water Works and Supply of the city of Los Angeles employed Ray F. Goudey, former assistant engineer, State Bureau of Sanitary Engineering, to prepare plans for the reclamation of as much of the sewage of Los Angeles as possible, both for replenishment of underground water supplies and industrial uses.

Nearly 150,000,000 g.p.d. of sewage is going to waste from the various communities around San Francisco bay. Since the recent announcement of the action taken in Southern California, several of the San Francisco peninsula cities are considering similar reclamation of their sewage. There is no reason why the storm water run-off from the East Bay cities and from San Francisco, and other cities, should not be collected in separate sewers and stored in large basins at strategic points along the waterfront for use by industries.

On February 10, a number of the sanitary engineers and city officials of California held a conference with Lyman M. King, director of the State Department of Finance, to discuss the proposed state-aid for sewage and trade waste research, which now has taken on additional importance as a water conservation measure. As announced on page 113 of this issue, the six-year campaign for state support has at last culminated in official sanction for the establishment of a research laboratory.

It is evident that we must carry sewage purification to the Nth degree, not only as a sanitary and aesthetic measure, but for water conservation. The support, therefore, of everyone in California is needed if we are to derive the utmost benefit from this state-aid sewage and trade waste research laboratory.

Every member of the American Society of Civil Engineers in the Far West should prepare now to attend the spring meeting at Sacramento April 23 to 25, and as the spring meeting of the California Sewage Works Association will be held April 21 and 22 immediately preceding the Society convention—in the form of an inspection and instruction trip of sewage treatment plants, starting at Chico and ending at Sacramento—many will wish to attend both of these meetings.

Three Conventions

Another convention of interest to engineers and equipment men is the third annual meeting of the Pacific Northwest Section, American Water Works Association, to be held at Portland, sometime in April or early in May.

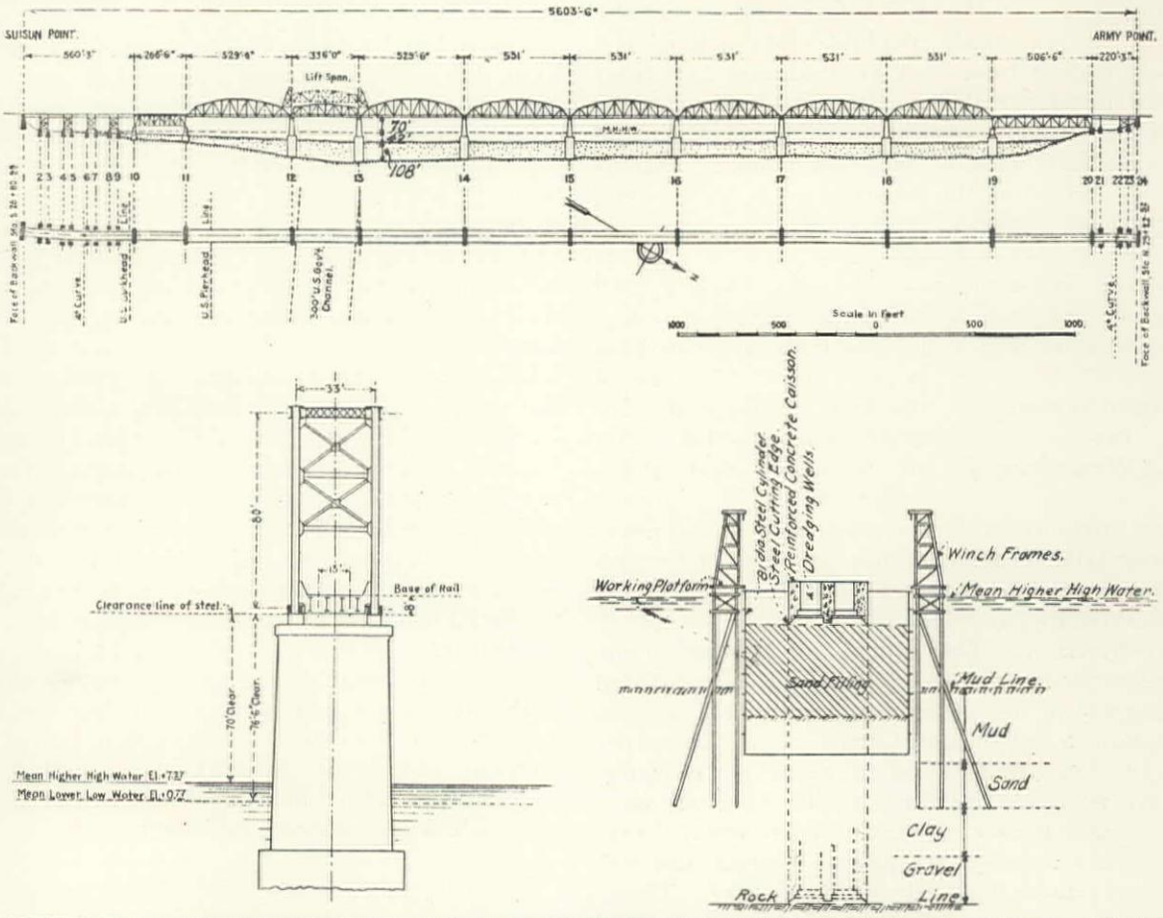
Suisun Bay Bridge for Southern Pacific Co.

Progress and Construction Methods on $12,000,000 Railroad Project

By H. I. BENJAMIN

Assistant Engineer of Bridges, Southern Pacific Co., Martinez, California

The Suisun bay bridge* of the Southern Pacific Co. is being constructed between Suisun and Army points, near Martinez, to replace the Port Costa-Benicia train ferry which has been in operation since 1879. The bridge is the main part of a $12,000,000 project including: 1.35 miles of south approach on fill between Martinez and the south abutment; 5603.5 ft. of steel bridge on concrete piers; and a north approach consisting of 0.93 mile of eastbound track on cut and fill from the north abutment to a junction switch on the present line, 3.64 miles of westbound track on cut and fill from the north abutment to a junction switch on the present line near Goodyear, and 1860 ft. of steel viaduct. Double tracking and riprapping of 3 miles of existing track between Martinez and Port Costa and enlargement of the Martinez yards are also included in the project.



(UPPER) PLAN AND ELEVATION OF SUISUN BAY BRIDGE, SHOWING DESIGNATION OF PIERS. (LOWER LEFT) TYPICAL DEEP WATER PIER FOR THROUGH SPAN. (LOWER RIGHT) SAND ISLAND METHOD OF CONSTRUCTING DEEP WATER PIERS

Approaches—The south approach is double-tracked on 14-ft. centers, has a ruling grade of 1.0%, and the maximum curvature is 4 degrees. The eastbound track on the north approach has a ruling grade of 2.2% and a 3° 30′ maximum curvature; the westbound track a ruling grade of 0.45% and 3° 30′ maximum curvature.

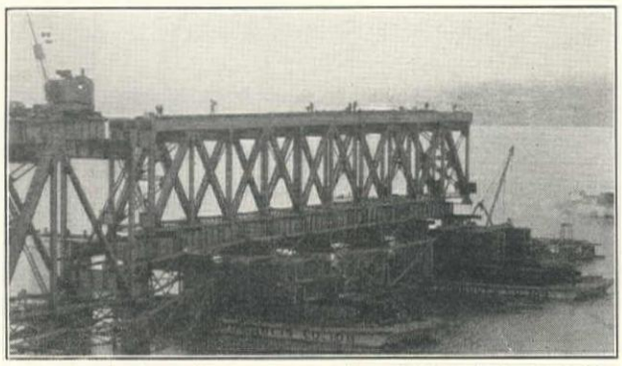
Bridge—The bridge is double-tracked on 13-ft. centers and has a 5195-ft. tangent, with 4° curves at each end, 4556.5 ft. of bridge being on level grade. The top of the bridge ties is at elev. 85.5 ft. above m.l.l.w. and the clearance of the fixed spans is 70 ft. from m.h.h.w. and 135 ft. for the lift span when raised. (The interval between m.h.h.w. and m.l.l.w. is 6.50 ft.)

The bridge consists of seven through Warren truss spans, each 526 ft. long; one deck Warren truss span 504 ft. long; one deck Warren truss span 264 ft. long; one through vertical lift span 328 ft. long; a 560-ft. viaduct with 80-ft. girders and 40-ft. towers at the south end; and a 220-ft. girder and tower viaduct at the north end. The total weight of structural steel is 44,000,000 lb., of which 25,000,000 lb. is silicon steel

*A preliminary article was published in the August 25th, 1928, issue, p. 532, and an early progress article in the August 25th, 1929, issue, p. 429.

and 5,500,000 lb. is heat-treated eyebars, the remainder being carbon steel.

There are 10 main bridge piers, and 22 pedestal piers on viaduct approaches. The piers require about 105,000 cu.yd. of concrete and 1500 tons of reinforcing steel; they are designed earthquake resistant. Piers 12 to 19 are classed as deep water piers and are constructed by the sand-island method. Piers 10 to 20 inclusive contain 100,000 cu.yd. of the total concrete in the substructure. Pier 13, at the north end of the lift span, contains about 13,500 cu.yd. of concrete and 175 tons of reinforcing, is 207 ft. from bedrock to the bridge seat, and has a base 40 by 60 ft. This is one of the deepest piers and is regarded as the key pier for progress.



Erecting Deck Span 10 for Suisun Bay Bridge, Industrial Works Locomotive Crane in Left Background, January 22, 1930. Span Floated Into Position on 40 by 125-ft. Barges

Construction Progress to February 1—The bridge was begun in April, 1929, and will be completed during November, 1930, the job now being on schedule. To February 1, there had been expended $4,500,000, and the general work was 45% complete. There have been no serious accidents on the work, and for a 35-day period ending February 1, no accidents whatsoever occurred.

The south approach was completed November 15, 1929, and the north approach will be graded by March 15, 1930, with tracklaying on this approach to start March 1. The George Pollock Co., of Sacramento, general contractor on the south approach, moved 450,000 cu.yd. of material upon a high fill in less than 144 days, averaging 3500 cu.yd. daily with an average haul of 2000 ft. On February 1, there was 65,000 cu.yd. of the 500,000 cu.yd. of excavation still to be moved on the north approach. The general contractor on that aproach, R. C. LeTourneau of Stockton, had been delayed three weeks by winter rains.

To February 1, the progress on piers totaled 50,000 cu.yd. of excavation and 41,600 cu.yd. of concrete. By that date practically all of the steel for the south viaduct approach had been erected and riveted and span 10 had been placed in position; span 19 was being erected and the placing of timber decking on the south viaduct approach was under way.

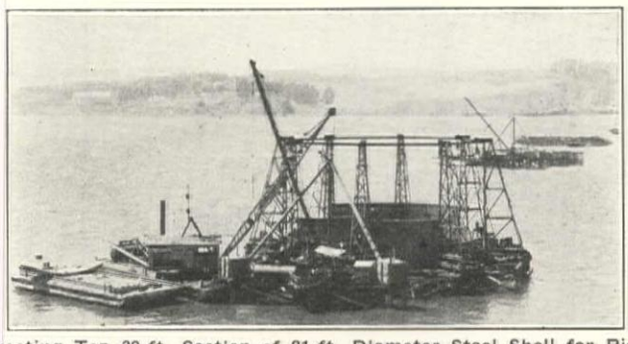
Siems, Helmers & Schaffner, Inc., of St. Paul, general contractor on the substructure, is working two shifts, using an average force of 275 men. Progress on the deep water piers follows (pier 11 having been completed). As of February 1, pier 12 was at elev. +50 ft. and the temporary cofferdam had been dismantled and moved to pier 13. For pier 13, the caisson had been completed and erection of the cofferdam was about to begin. In pier 14, concrete was being deposited for the distributing block; pier 15 being in a slightly advanced stage of construction. The caisson for pier 16 had been completed and was going down and its cofferdam was to be erected. At pier 17, there had been lowered 45 ft. of the 81-ft. diam. steel shell. All pedestal piers in the water were completed, and those on the north side on land had their footings in place. Other progress information is given in Table I.

Established elevations for deep water piers are shown in Table II.

TABLE I

Progress on Deep Water Piers

Pier	12	13	14	15	16	17	18	19
Date started	5–22–29	10–21–29	6–11–29	7–1–29	9–2–29	11–26–29	2–7–30	1–1–30
Falsework completed	6–27–29	11–11–29	7–17–29	8–2–29	10–14–29	1–3–30	.....	2–1–30
Steel shell completed	7–31–29	11–22–29	8–1–29	9–3–29	11–6–29	2–3–30	.....	.....
Sand fill completed	8–20–29	12–6–29	9–4–29	9–23–29	11–24–29	.....	.....	.....
Cutting edge and first lift	9–14–29	12–20–29	9–26–29	10–10–29	12–13–29	.....	.....	.....
Sinking started	9–16–29	12–21–29	9–27–29	10–11–29	12–14–29	.....	.....	.....
Sinking completed	11–25–29	–114 ft.	12–31–29	1–4–30	–85 ft.	.....	.....	.....
Dredging well seal	11–29–29	.....	1–15–30	1–9–30	.....	.....	.....	.....
Base completed	12–14–29	2–8–30	2–3–30	.....	.....	.....	.....	.....
Shaft completed	2–7–30	.....	.....	.....	.....	.....	.....	.....



Erecting Top 30-ft. Section of 81-ft. Diameter Steel Shell for Pier 12. July 16, 1929

TABLE II

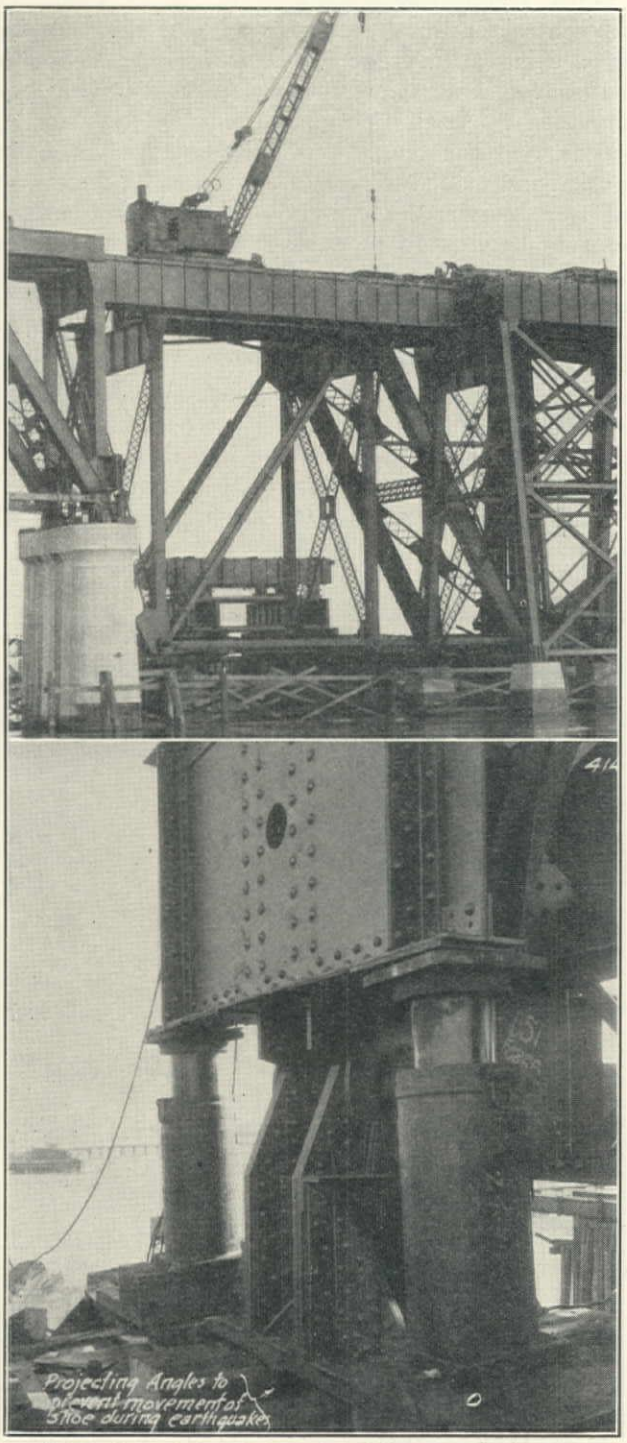
Deep Water Pier Elevations

Pier No.	Bridge Seat Elev. (Ft.)	Mud Line Elev. (Ft.)	Rock Line Elev. (Ft.)
12	+71.5	—32.3	—106.4
13	+71.5	—37.6	—135.2
14	+73.5	—40.8	—128.9
15	+73.5	—45.3	—125.8
16	+73.5	—49.6	—117.5
17	+73.5	—56.9	—118.8
18	+73.5	—50.3	—117.0
19	+14.75	—47.1	—115.0

Steel Erection—Superstructure erection began November 15, 1929, the first 80-ft. girder being placed November 20. The scheme of erection is unique. Erection started at the south or Suisun point abutment

and is proceeding toward Army point, excepting span 19, the 504-ft. northerly deck span, which is required for falsework.

The south approach viaduct, comprising spans 1 to 9 inclusive, was erected first in numerical order, excepting the west panel of girders from span 9 which is reserved for a turnout approach to the falsework trestle. This falsework trestle was built alongside and nearly parallel to the bridge, and extends north along the east side of the structure far enough to provide for erection of span 19.



(Upper) Erection of Span 9 Completed January 27, 1930. Shaft of Pier 10 Visible in Left Foreground. (Lower) Adjusting Span 10 Into Position with Two 500-Ton Hydraulic Jacks, January 25, 1930. Note Projecting Angles To Be Grouted Into Pier Seat to Prevent Shoe Movement During Earthquakes

One of the two sets of girders from the approach span 9 and the first two panels of span 19 were then erected on this falsework trestle to provide an approach track for erecting the 264-ft. deck span 10 east of and adjacent to its final position. Two 40 by 125-ft. barges, with a capacity of 300 tons per foot of draft, were placed under span 10 on the afternoon of January 22 and the completely erected span was floated into its approximate position after dark on that date. However, the span was not landed in its final position between piers 10 and 11 until January 27. Four 500-ton hydraulic jacks were used at each end to adjust the span longitudinally and transversely. These jacks were operated from a water pump, the pump being run by compressed air from the stationary plant on the south approach supplying the riveting machines. Projecting angles (6 by 6 in.) on the ends of span 10 will be grouted into recesses on top of the piers so as to prevent movement of the shoe during a possible earthquake.

With span 10 in place, the 2000-ton span 19 is being erected complete on falsework and will be floated on barges. With these barges, span 19 will be placed in a temporary position between piers 11 and 12, and will be landed on supporting bents resting upon pier shelves at elev. –20 ft. Using span 19 in its temporary position as falsework, span 11 will be erected in the ordinary way, with the aid of locomotive cranes. (There are three 60-ton and one 50-ton Industrial Works locomotive cranes, and one derrick car, and one dinkey on the work.)

Upon completion of span 11, the falsework span 19 will be returned to its original position on the falsework trestle and disconnected at panel 5. Barges will be again used and the shortened span set between piers 12 and 13 to act as falsework for the lift span 12. Span 12 will be erected in the down position and, as it is across the dredged channel, water traffic will be diverted north. After the lift span is completed, the falsework span 19 will be returned to its original supports on the trestle, reassembled, lengthened, and floated into position for the erection of span 13. The remaining through spans, 14 to 18 inclusive, will be erected in a similar manner, using deck span 19 as falsework and floating it between the various piers. On completion of the through spans, this deck span will be floated into its permanent position between piers 19 and 20 and will become an integral part of the bridge.

On account of the depth of water and deep layer of mud, pile trestle falsework could not be used for the through spans. Also, the swift currents of the bay would prevent an alternate method—barging and raising of previously erected spans. The viaduct on the Benicia side will probably be erected from the north abutment.

The American Bridge Co. is fabricating and erecting the bridge superstructure (over 22,000 tons) and is also fabricating steel for the 1860-ft. Goodyear viaduct, a contract for the erection of which has not yet been let. The American Bridge Co. is working under subcontract from the U. S. Steel Products Co. and is represented by E. E. McKeen, assistant engineer, and W. A. Glencroft, erecting foreman. A crew of 100

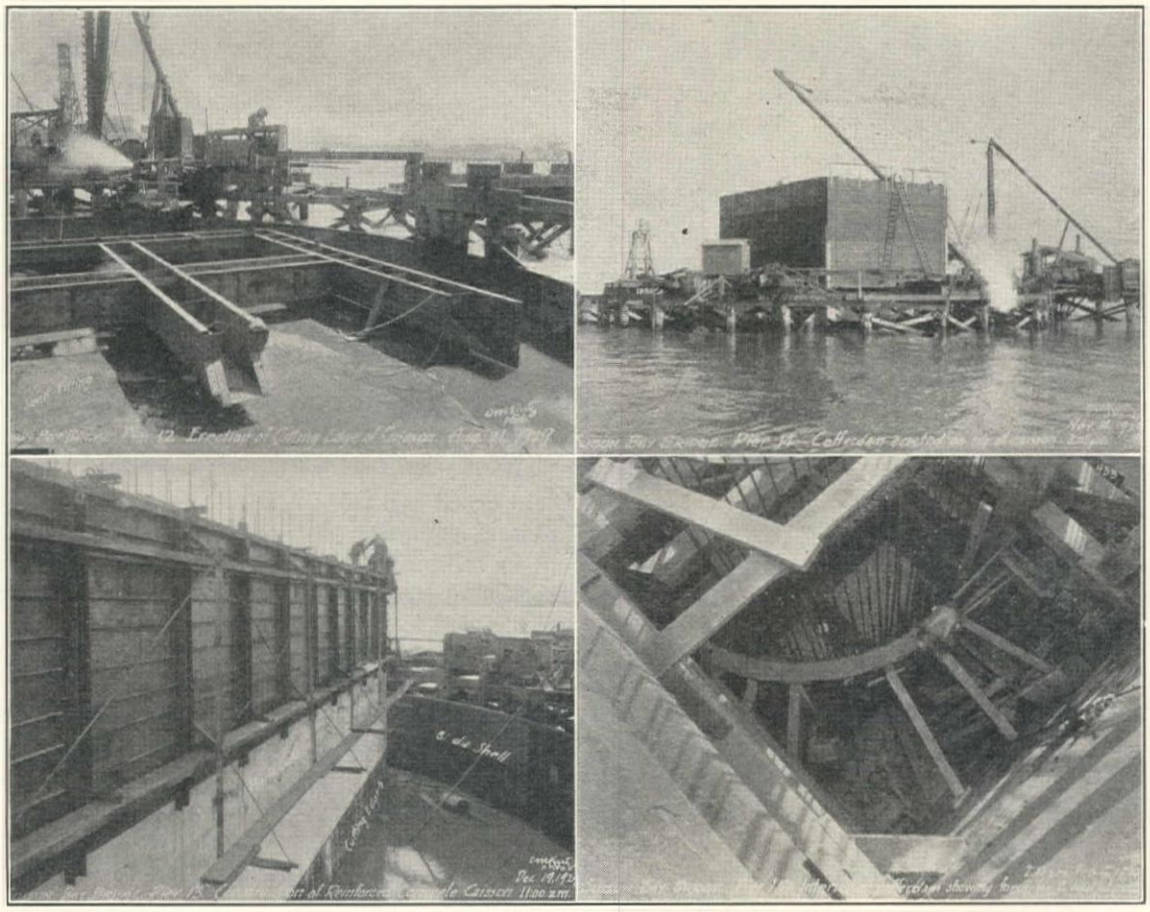
men is employed on erection. The superstructure contract includes the floor system of the bridge—the placing of untreated Oregon fir decking and ties.

The riveting plant consists of a compressor house near the south abutment, containing an Ingersoll-Rand 4600-c.f.m. Imperial type 10 electric-driven compressor,, and Chicago-Pneumatic riveting machines.

Foundations—The Suisun bay bridge is one of the first such structures where the piers are designed to withstand a given intensity of earthquake shock, protection being given by steel reinforcing against an acceleration of 5 ft. per sec.^{2} As a protection against the action of salt water, especially between high and low tides where piers become alternately wet and dry, and where deterioration might occur, the outside 12 in. of the pier shaft is composed of a veneer of 1:2:3 concrete, placed by the use of movable forms and bonded to the main body of the pier. Also, the piers are painted with two coats of 'Inertol' from 1 ft. below low water to 2 ft. above high water.

The construction of foundations is divided into: land piers and abutments; shallow viaduct pedestals; piers requiring steel sheet piling cofferdams (pedestals 9 and 9A and piers 10 and 11); and deep-water piers (12 to 19 inclusive). Pier 11 is one of the deepest ever constructed within a single-row steel sheet piling cofferdam, the distance from high water to rock foundation being 58 ft. The method of construction was briefly described in the August 25th, 1929, issue of **Western Construction News**, p. 430. The so-called deep-water piers are being built by the sand-island method, with several innovations, and their construction is described hereafter in some detail.

Constructing Deep-Water Piers—At the eight main piers, the elevation of rock is too far below the water surface to permit the use of either the open cofferdam or pneumatic processes, and an adaptation of the open dredging caisson method is being used. The ordinary open dredging caisson method is to construct a floating caulked timber box, with cutting edges attached. The box is floated into position and sunk by building up the concrete walls of the caisson. Three disadvantages of this method are that concrete is placed under unfavorable conditions; a large amount of timber remains in the finished pier; there is the hazard of overturning the floating caisson before it is sunk a sufficient distance in the mud bottom to be stable.



(UPPER LEFT) ERECTING CUTTING EDGE OF CAISSON FOR PIER 12 ON SAND ISLAND WITHIN 81-FT. DIAM. (WESTERN PIPE & STEEL CO.) STEEL SHELL. (LOWER LEFT) CONSTRUCTING REINFORCED CONCRETE CAISSON FOR PIER 13 WITHIN STEEL SHELL, USING BLAW-KNOX STEEL FORMS. (UPPER RIGHT) ERECTING TEMPORARY WOODEN COFFERDAM ON CONCRETE CAISSON FOR PIER 14. (LOWER RIGHT) INTERIOR OF COFFERDAM FOR PIER 15 AFTER SEALING WITH TREMIE CONCRETE AND UNWATERING. FORM FOR EAST END OF PIER SHAFT UNDER CONSTRUCTION ON DISTRIBUTING BLOCK

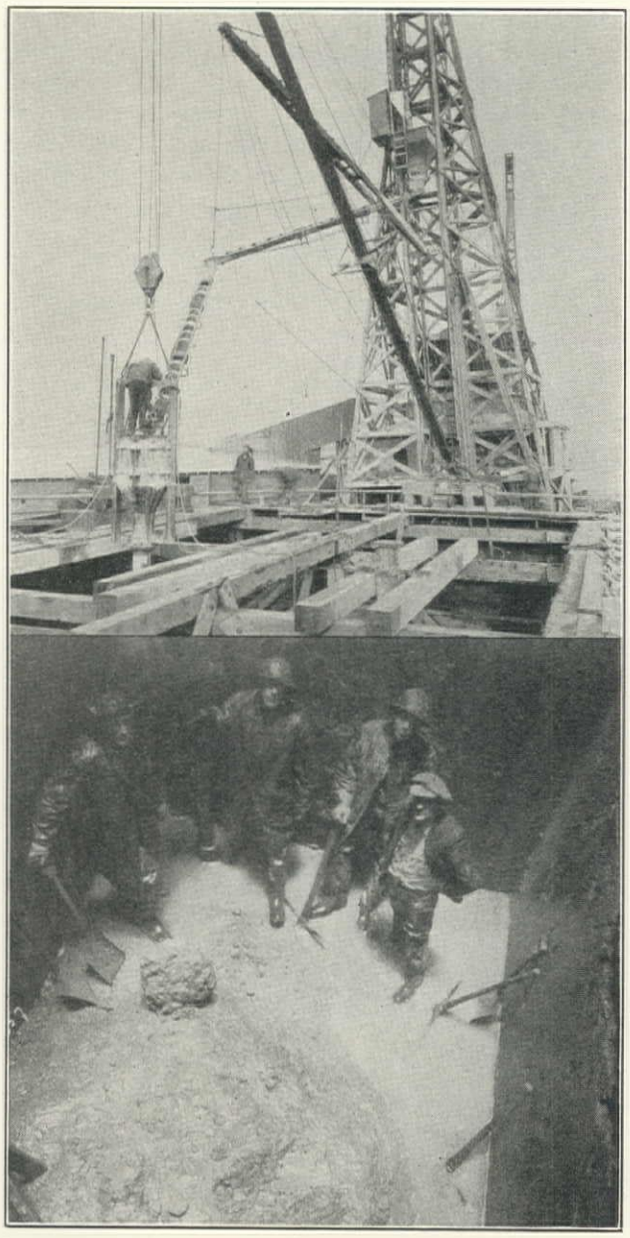
Construction of the deep-water piers may be divided into 13 steps, as outlined in Table III.

TABLE III

Steps in Constructing Deep Water Piers for Suisun Bay Bridge

Step	Operation
1.	Construct octagonal-shaped wooden pile falsework, each vertical pile being located by triangulation.
2.	Erect and sink an 81-ft. diam. steel shell within the falsework and into mud bottom.
3.	Fill the shell with sand dredged from the bay one-half mile upstream and barged to pier site.

4. Erect and rivet steel cutting edge for caisson on top of sand island.
5. Alternately erect and sink sections of reinforced concrete caisson, 38 by 56 ft. on top of cutting edge.
6. Erect temporary wooden cofferdam on top of caisson, strut, and continue sinking the combined cassion and cofferdam.
7. After caisson reaches and penetrates bedrock to a point approved by diver, six dredging wells in caisson are sealed with 35-ft. lift of tremie concrete.



(Upper) Placing 35-ft. of Seal Concrete in Dredging Well Through 12-in. Tremie Pipe, Pier 14, January 10, 1930. Concreting Barge Carries 150-ton, Self Cleaning Blaw-Knox Batcher Plant Using 8000-lb. Double Weighing Batcher; 2-yd. Ransome Stationary Mixer; and Ransome Placing Equipment. (Lower) Top of Seal Concrete in Southwest Dredging Well of Pier 15 Before Laitance Removal, January 16, 1930

8. Unwater temporary cofferdam and upper part of caisson, remove laitance from tremied concrete in dredging wells, place remaining concrete for wells in the dry.
9. Place concrete in 53 by 33 by 10-ft. distributing block, top of which is at elev. –20 ft. Function of block is to distribute weight of shaft to walls of caisson.
10. Construct pier shaft on distributing block and inside of temporary cofferdam to above highwater level.
11. Remove salvable portions of 81-ft. diam. steel shell, diver unbolting sections above mud line, knock down and transfer shell segments to another pier site.
12. Detach and remove temporary cofferdam and transfer to another pier.
13. Finish pier by placing concrete in 10-ft. lifts to final elevation of bridge seat.

Falsework and Working Platform—The first step in constructing the deep-water piers is to build an octagonal-shaped wooden pile platform or wharf, about 97-ft. outside diam. This is formed by driving 91 douglas fir piling, 95 to 125 ft. long with 24 to 26-in. butt and 10-in. tip, in a double row. Each vertical pile in the inner row is spotted by triangulation and driven true to line. As the depth of water ranges from 21 to 55 ft., batter piles are driven for stability.

The pile rows are capped and framed with 12 by 12-in. timbers and substantially braced to form a working platform. Upon the platform there are erected eight equally spaced steel hoisting towers, 45 ft. high. Under each tower is a steel girder, tied down by steel rods bolted to the piling, and used for holding sections of the steel shell at desired elevations. (Both the hoisting towers and 81-ft. diam. steel shells were furnished by the Western Pipe & Steel Co. of San Francisco.)

Provision is also made on the platform for a framed stiff-leg timber derrick, with 40-ft. mast and 84-ft. boom, the cross-section diagonal being set vertical. The derrick timber is 14 by 14 in. and the power is supplied by a 3-drum, 8½ by 10, American hoisting engine.

Steel Shell—Upon the working platform is then assembled an 81-ft. diam., 8-segment steel shell in 10-ft. sections, formed of ½-in. plates 5 ft. high and reinforced with 6 by 3-in. angles at the junction of plates. Ten-foot sections of the shell are assembled upon cribbing to a total height of 30 ft., the various sections being bolted together. The 30-ft. unit is then suspended from the steel towers and is raised by block and tackle to hand winches and the cribbing removed. The shell is then lowered by simultaneous operation of the eight winches, the downward movement being regulated to keep the shell level. When the shell has been lowered 30 ft., its movement is arrested by bolting to it the inside ends of the girders previously placed beneath the winches; the suspension cables then being removed. An additional 30 ft. of shell is then assembled, bolted together, the suspension device replaced, and the lowering operation repeated. This process continues until the shell has sunk far enough into the mud and sand of the bay bottom to be self-supporting. From there on, jetting and dredging operations assist in sinking the shell to a greater depth. In pier 12, the shell was sunk 20 ft. into the mud, but on the other piers sand was encountered and, as this gives a greater bearing resistance, the shells for these piers were sunk only an average distance of 10 ft. into the bottom. As an example of height of shell, that for pier 17 is 75 ft. high.

During the sinking, removable interior steel trusses, 60 and 40 ft. long, and steel cables, provide horizontal bracing inside the shell and prevent its distortion or collapse. After the shell comes to rest a considerable distance in the mud and sand, the trusses and cables are unbolted by a diver and removed.

Filling Shell—The shell in its sunken position is

then filled with sand to low water level. The sand is dredged from a point one-half mile upstream, barged to the pier site, and unloaded by clamshells.

Thus, the old method of building up an artificial island with long flat slopes is supplanted by a method employing a steel shell to retain the filled-in sand. The shell is sunk of its own weight, and the mud surrounded before it comes to rest is dredged out with clamshells. A typical shell required 9500 cu.yd. of sand, the top of the sand being leveled with the buckets and by jetting. Thereafter, the cylinder was unwatered to a plane about 12 ft. below the high water level.

Erecting Cutting Edge and First Lift of Caisson—Upon the artificial island inside the shell, steel cutting edges are accurately placed, then riveted together. These cutting edges form the bottom of a reinforced concrete caisson 58 by 36 ft. in plan (60 by 40 ft. for the two piers for the lift span). The caisson has walls 6 ft. thick and is divided into six dredging wells, each 11 ft. 8 in. by 10 ft. 6 in.

The first lift of concrete is 15 ft. high, subsequent lifts being 10 ft. high. Removable Blaw-Knox steel forms are used for the outside of the caisson and for the dredging wells. The forms may be loosened and raised by derrick for each successive pour. Concrete in the cutting edge is allowed a 7-day set before sinking operations are begun with the first lift, so as to prevent premature stresses in the walls of the caisson.

Alternate Sinking and Erection of Caisson Sections—Before commencing to sink the caisson, four test borings are made in the longitudinal and transverse axes of the shell to accurately determine the lay of the bedrock. This precaution is required on account of the design of the pier and method of erection, the top of the caisson being at elev. –20 ft., or 27 ft. below m.h.h.w.

After the first two lifts (25 ft.) of caisson have been constructed, clamshell buckets remove the material inside the dredging wells and the structure gradually sinks of its own weight. Care is taken to keep the caisson level and in position at all times, this being obtained by proper dredging in the several wells. After the caisson passes the bottom of the steel shell, some shooting is required to slough material into the dredging wells.

In a successive operation, 10-ft. sections of the caisson are sunk and built up, until the cutting edge rests on bedrock. During the sinking, a removable timber cofferdam is constructed on top of the caisson and extending above high water level.

When the caisson cutting edge rests on bedrock, the surface of this rock is cleaned by powerful jets, all loose and soft material being excavated and pumped out. To be certain that the cutting edge is on a satisfactory foundation, the Southern Pacific Co. employs a diver to make a careful inspection of the exposed rock surface in each dredging well, his findings being reported to the surface by telephone and recorded on a field drawing. Using a 50-lb. air pressure, this diver works in 130 ft. of water. If it is indicated that the cassion should make further descent, the dredging is continued. From three to four days is usually required for the clean-up operation.

Removable Timber Cofferdam—A removable timber cofferdam is constructed from elev. –20 ft. (the designed top of the caisson) to above high water, and in it is placed the distributing block and pier shaft. During the sinking, the cofferdam is heavily strutted, 12 by 12-in. struts, 6 by 12-in. vertical wales, 10 by 10-in. posts, and 3 by 10-in. scabbing being used. The joints are caulked with oakum and the timber painted with a light creosote oil as protection against teredo. The cofferdam is formed of 12 by 12-in. timbers, solid, and encloses the same area as the caisson.

The height of cofferdam for pier 14 is 52 ft., for pier 15 it is 46 ft., and on the remaining deep-water piers it is 30 ft. The cofferdam is tied down to the top of the caisson by 1-in. rods for the original 30-ft. section and ⅞-in. steel cables above that section, the clamping device consisting of a channel and threaded U bolt.

Sealing and Dewatering Dredging Wells—When the caisson is resting on cleaned bedrock, the six dredging wells are sealed with tremie concrete and pumped out. The method of placing seal concrete and the amount required are shown in the following example: a 12-in. tremie pipe in 10 and 20-ft. sections, total length 150 ft., is put down in a dredging well. A burlap sack filled with excelsior is placed in the pipe as a lead plug, and then a 4-cu.yd. charge of concrete is made, filling the pipe. The bottom of the tremie is raised a few inches from the bedrock and part of the concrete is flowed out. Raising of the pipe and depositing of concrete continues to a depth of 35 ft., care being taken to keep the bottom of the pipe always 4 to 5 ft. down in the fresh concrete. When necessary to shorten the pipe, sections are removed from the top. Using one 2-yd. Ransome mixer on a floating concrete plant and one pipe, the contractor placed 2300 cu.yd. of 6-sack tremie concrete in a run of two days and three nights, averaging 60 cu.yd. an hour, while running.

Keys provided in the concrete of the dredging well pockets form a bond between concrete in the caisson and wells. After the wells have been pumped out and the surface of the tremie concrete cleaned of laitance, the remaining space is filled with concrete in the dry.

Distributing Block and Pier Shaft—The caisson is so designed that a concrete distributing block, 10 ft. deep and 53 by 33 ft. in plan, can be placed immediately below elev. –20 ft. Through the use of a distributing block, the pier shaft has unquestioned bearing upon both the caisson walls and the well concrete.

The pier shafts are then constructed on the distributing block and within the removable timber cofferdam, being carried up in successive 10-ft. lifts to their full height.

After both the shell and cofferdam have been dismantled, the piers are finished to the final elevation of the bridge seat.

Salvaging Shell and Cofferdam—After the concrete has been brought a sufficient distance above high water, that portion of the steel shell above the mud line is unbolted by a diver, raised by the hand winches, further disassembled, and removed for use on piers subsequently to be built. On pier 12, for example,

there is about 30 ft. of shell left in the mud and 35 ft. has been salvaged.

Next, holdown rods on the cofferdam are detached and this structure is floated up, the walls knocked down in sections, and the sections transferred to other piers. To prevent a sudden upward movement of the cofferdam during salvage operations, it is heavily weighted by steel sheet piles spanning between the west and east walls. The speed of upward movement is regulated by taking off these pile weights.

Concrete—The concrete used in the cofferdam, distributing block, and pier shaft, is a 1:2.6:4.7 average mix by weight (2½ in. rock), using 5 sacks of cement per cubic yard of concrete in place, 3% 'Celite' mixed at the concreting plant, 6¾ gal. of water per sack, 4 in. maximum slump. Two moisture checks on sand and crushed gravel (both aggregates are delivered by barge in a washed condition), are made daily.

The concrete is designed for 2500 lb. per sq.in. at 28 days. On a typical series of tests, the following strengths were obtained: 2000 lb. at 7 days, 2400 lb. at 14 days, 3000 lb. at 28 days, 3600 lb. at 60 days, and 4000 lb. at 90 days.

The concreting plant was described in the August 25th, 1929, issue of **Western Construction News**, p. 433.

C. R. Harding, assistant to the president, and W. H. Kirkbride, engineer of maintenance of way and structures, are in charge of the entire project, with the assistance of G. W. Rear, engineer of bridges. I am in charge of construction and field work, and S. A. Roake, chief designer for the Southern Pacific Co., is checking the design of the foundation and superstructure. C. M. Kurtz is office engineer, Franz Misch inspector on piers, and C. T. Holser inspector on superstructure.

Moran & Proctor are the consulting engineers for the foundation work and the lift span is being designed by Waddell & Hardesty; the preliminary studies of the entire project being reviewed by Ralph Modjeski. The substructure contract is directed by N. F. Helmers, vice-president of Siems, Helmers & Schaffner, Inc., and M. F. Clements is consulting engineer for the contractor.

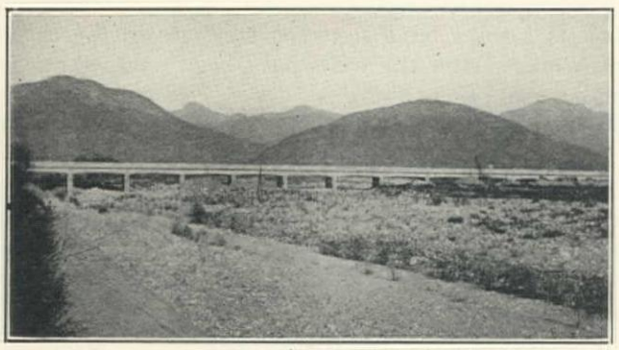
Widening San Gabriel River Bridge, California

By JAMES N. HATCH*

Pasadena, California

The widening of the San Gabriel river bridge on Foothill blvd. two miles west of Azusa, California, will bring about a long needed improvement. The roadway approaches are 50 ft. wide, with four traffic lines, while the present bridge is but 20 ft. wide between railings. This has constituted a dangerous bottle-neck on an open stretch of road where high speed is possible.

The bridge is to be widened to 40 ft. by adding 20 ft.

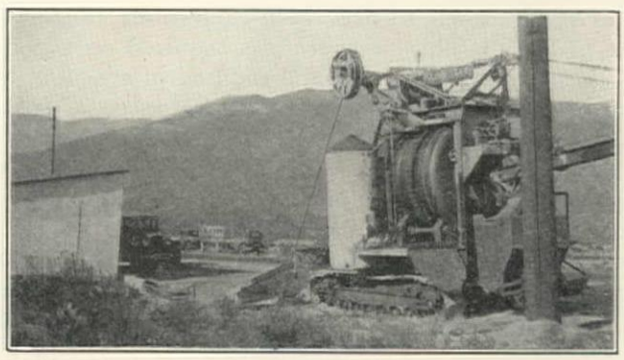


North End of San Gabriel River Bridge Showing Permanent Waterways. Portion South of Crane Will Be of Timber

on the west side. There also will be added a 5-ft. sidewalk. The present bridge is of concrete, 1004 ft. long, made up of eighteen 54-ft. spans. The new addition will have 12 concrete spans of 54 ft., corresponding to those in the present bridge at the north end of the structure, but the remaining 350 ft. will be of wood. It is expected that when the San Gabriel canyon flood control system is completed, the necessary waterway will not require over 650 ft. opening, whereas the 1000 ft. is needed at present. At that time the southern 350 ft. can be filled in.

*Member, American Society of Civil Engineers.

The appearance of the bridge from the roadway will not show that part of it is of timber, as the railing will



Looking Toward South Approach of San Gabriel River Bridge, Rex Paver in Foreground

be made to correspond throughout and the floor will be the same hard finish.

The contract was awarded by the California Division of Highways in November, 1929, to the Johnson Construction Co., Los Angeles, for $88,054. The quantities and unit prices follow:

- Structure excavation—4800 cu.yd. at $1.05
- Roadway embankment—1400 cu.yd. at $0.75
- Class 'C' concrete—1910 cu.yd. at $9.00
- Class 'A' concrete—1490 cu.yd. at $14.62
- Class 'E' concrete—46 cu.yd. at $35.00
- Reinforcing steel—293,000 lb. at $0.039
- Select all-heart structural redwood timber—67M f.b.m. at $92.50
- Dense select all-heart structural redwood timber—124 M f.b.m. at $89.00
- Remove concrete—205 cu.yd. at $16.33
- Subgrade for paving—990 sq.yd. at $0.90
- Asphalt concrete paving—1080 tons at $5.75
- Cast steel—16,000 lb. at $0.142.

Vale Irrigation Project Tunnels, Oregon

Driving and Concrete Lining 8483 ft. of 10.5-ft. Horseshoe Shaped Tunnels on Route of 70-Mile Main Canal

By H. W. BASHORE*

Construction Engineer, United States Bureau of Reclamation, Vale, Oregon

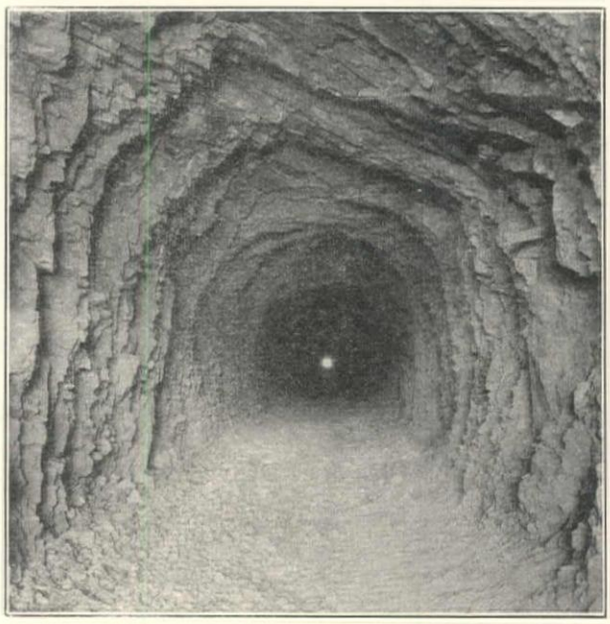
The main canal of the Vale irrigation project maintains an elevation, and is being constructed of sufficient capacity to irrigate 31,000 acres of land. The route of the canal and the lands to be irrigated are on the north and west sides of the Malheur river in Malheur county, eastern Oregon. The canal diverts water from the Malheur river by means of the Harper diversion dam one mile west of Namorf, Oregon, on the Burns branch of the Oregon Short Line railroad. Its eastern terminus, after traversing a distance of 70 miles, is at Willow creek near Jamieson, Oregon. Jamieson is on the John Day highway and on the Brogan branch of the Oregon Short Line.

Selection of Route—On account of the narrowness of the canyon in the first three miles of the canal route, the presence of the Oregon Short Line railroad occupying the route required for the canal, and the prevalence of slide rock on the steep slopes overlying unstable material on both sides of the river, field locations were made of various routes. Studies, preliminary designs, and estimates of cost of the different locations—which involved two river and two railroad crossings—were made, but the three-tunnel route, keeping entirely on the north side of the river, was finally selected as offering more safety, permanence, and nearly equal economy from the standpoint of first cost and greater economy for future operation and maintenance.

Tunnels—The first of these tunnels is 2136 ft. long, its upper portal opening through a nearly vertical rock wall directly into the river and at a point 200 ft. upstream from the Harper diversion dam. It is through this tunnel that the water supply for the Vale main canal is taken from the river. Between tunnels No. 1 and 2, there is 2360 ft. of open canal. Tunnel No. 2 is 4997 ft. long. Between tunnels No. 2 and 3, there is 1600 ft. of open canal. Tunnel No. 3 is 1360 ft. long. The maximum covering over the tunnels is 400 ft. deep. The elevation of the entrance to the first tunnel is one foot above the elevation of the floor slab of the dam, and the elevation of the outlet portal of the invert of the third tunnel is 34 ft. above the river.

Tunnel Design—The design of the tunnel section was governed by a required carrying capacity of 660 c.f.s., a slope of 0.00125, and an assumed coefficient of roughness of n=0.014. The excavation was required to be large enough to allow placing outside of the clear opening a 10-in. average or pay thickness of concrete lining, with an allowance of occasional high spots, to give a 6-in. minimum thickness of concrete.

A horseshoe section was selected as offering the most favorable hydraulic properties, and at the same time furnishing resistance to any swell of materials. The inside face of the concrete lining of this horseshoe section conforms to the arcs of circles as follows: the upper, or roof, portion is one-half the circumference of a circle of 5 ft. 3 in. radius, and the lower portion—sidewalls and invert—is composed of the arcs of three circles each of 10 ft. 6 in. radius, the centers of two



Interior of 2136-ft. Tunnel No. 1, Vale Project, Before Lining. Capacity of Completed Tunnel 662 c.f.s.

of these circles being at the opposite ends of the diameter of the half circle of 5 ft. 3 in. radius, and the center of the third circle being at the extremity of the 5 ft. 3 in. radius which is perpendicular to the diameter of the half circle. The intersection of the arcs described by these radii marks the junction point between the invert and side walls and join with the half circle, or roof section. With water flowing at a depth of 8.61 ft., or 82% of the total depth, the functions are as follows: $A = 80.84$; $V = 8.19$; $Q = 662$; $r = 3.22$; $n = 0.014$; and $s = 0.00125$.

The concrete lining is without steel reinforcing except at the closed transitions, or 15 ft. at each end. Precaution was taken for disposing of water encountered during the progress of the work and to prevent building up hydrostatic pressure on the outside of the concrete lining by providing in the plans for the installation of 6 and 8-in. tile drains, to be laid in the center of the invert and below the outside line of the concrete lining.

Contract on Tunnels—The construction of the tun-

*Member, American Society of Civil Engineers.

nels was included in a contract entered into June 19, 1928, with the Derbon Construction Co., of Seattle, Washington, which also included 4320 ft. of open canal and the Harper diversion dam.

The dam, open canal work, and tunnel lining, were sublet to other contractors, but the Derbon Construction Co. performed the tunnel excavation with its own forces and supplied the camp buildings, electric lights, water supply, and nearly all of the equipment to its subcontractors for placing the concrete lining in the tunnels.

Construction Camp and Plant—In September, 1928, the contractor began the construction of a 150-man camp; also the assembling of equipment and the installation of two compressor plants, each containing a 200-hp. Fairbanks-Morse engine and an 1170-c.f.m. Ingersoll-Rand compressor. The compressor plants were erected near the upper and lower portal of tunnel No. 2 and were operated independently. The air was transmitted through a 3-in. line for a maximum distance of 4500 ft.

The water supply for camp use and construction purposes was obtained from a well near the river and pumped into a 10,000-gal. storage tank 200 ft. above the camp.

Timbering—Provision was made in the plans and specifications for securing unit prices on several types of timbered sections which could be used in unstable material, in order to relieve the contractor of this uncertainty. The outcrop at the tunnel sites showed rock of volcanic origin, and the contractor's plans were made for drilling and excavating rock tunnels. In the entire 8493 ft. excavated, timbering was required to support the roof in various places amounting to a total length of only 155 ft.

For drilling, nine Gardner-Denver No. 7 drills were used with 1¼-in. steel, two drills to each heading. For each round of firing, there were drilled from 16 to 18 holes, consisting of from 4 to 6 cuts, 8 breakers, and 4 lifters. The cut holes were drilled a maximum distance of 10 ft.

For loading the blasted material, there were used in the beginning two Butler loaders having 4-ft. buckets and each requiring 250 c.f.m. of air; also two homemade jumbos with ⅓-yd. Crescent scrapers operated by Sullivan 2-drum air motors. All of these loading devices were finally abandoned, and shoveling by hand from steel plates was substituted.

For hauling the excavated materials, the contractor used 2.2 miles of track laid with 20-lb. rails, 36 Western and Pettler 1½-yd. two-way dump-cars; 2 Vulcan 7-ton and 2 Davenport 7-ton steam dinkey locomotives.

Ventilation—In order to produce the minimum bad effect on the air in the tunnels, coke was used for fuel instead of coal. Further precautions were taken to secure good ventilation by the use of 5050 ft. of 12-in. canvas airline, or Ventube, manufactured by the Dupont Powder Co., through which a fresh supply of air was forced to the heading by a 12-in. Buffalo blower operated by a 10-hp. motor.

Progress on Driving Tunnel—The contractor worked two shifts daily, each shift loading out, drilling, and blasting, for one round of shots. A 4-hour intermission was allowed between shifts to allow the air to become cleared after blasting. As the contractor was not paid for any material excavated outside of the line of average 10-in. thickness or for any concrete placed in excess of the 10-in. average, every precaution was taken to reduce the overbreak to a minimum. In attempting to keep the rock breakage within the required section, considerable trimming was necessary after the main portion of the excavation of each tunnel was completed. Even with this method, there was some overbreak in each tunnel as follows: tunnel No. 1—345 cu.yd., of 15% in terms of pay concrete yardage; tunnel No. 2—2200 cu.yd., or 38% in terms of pay concrete yardage; tunnel No. 3—512 cu.yd., or 33% in terms of pay concrete yardage.

The total amount of 40% dynamite used was 39,700 lb., or 3.06 lb. per pay cubic yard of excavation. The total number of 8-man shifts working on excavating and trimming tunnel No. 1 was 643; No. 2, 10-man shifts, 1559; No. 3, 10-man shifts, 345; while the average length of tunnel excavated for each shift in the various tunnels was 3.32 ft. for No. 1, 3.21 ft. for No. 2, and 3.94 ft. for No. 3. The average number of pay cubic yards of excavation at $5.20 per cu.yd. for each tunnel per linear foot was 4.55. In excavating tunnel No. 1, 0.12 c.f.s. of water was developed, and in No. 3 0.30 c.f.s., but this caused no great inconvenience as it was led away in the drains. In tunnel No. 2, excavation progressed from both ends and, as water was encountered 300 ft. from the upper portal, pumping was necessary until the bore was completed. A total of 0.75 c.f.s. was developed in this tunnel, and over half of this was near the upper portal.

Tunnel Lining—The Derbon Construction Co. sublet the placing of all concrete lining in the tunnels, closed and open transition sections, and canal lining beyond the tunnel portals, to the Cement Gun Construction Co., of San Francisco, California. This subcontractor began in June, 1929, to prepare for placing concrete lining with the use of compressed air.

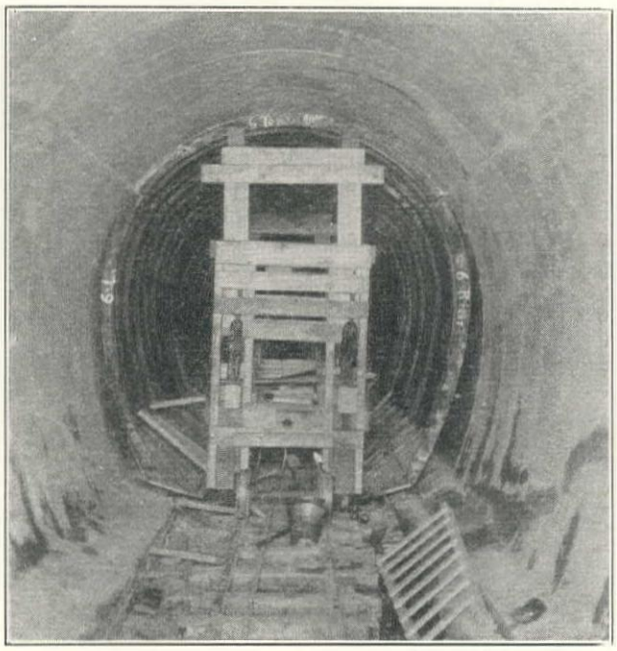
The compressor plants, tracks, pipe-lines, and other equipment of the Derbon Construction Co. were available for this work, and the subcontractor added 200 lin.ft. of 3-segment Hackley steel forms; two 2-yd. Hackley concrete guns; two Whitcomb type 'U' 3½-ton gasoline locomotives; 2000 ft. of 4-in. pipe; and the equipment necessary for construction of a plant for screening and washing sand and gravel and crushing the oversize.

Concreting—The screening plant was erected on a gravel bar along the river opposite the center of tunnel No. 2, and sand and gravel were obtained from this gravel bed and transported to the elevator of the screening plant by the use of a Bagley ½-yd. bucket on a cable having a reach of 300 ft. and operated by a 35-hp. steam hoist. The screened aggregates were placed in bins at the screening plant, and from these bins were transported by trucks to smaller storage bins at the mixing plants. Mixing plants were constructed at the upper portal of No. 3, the lower portal of No. 1, and at both portals of No. 2.

The sand and gravel were released from the bins directly into ½-yd. Smith and ½-yd. Ransome mixers, and the mixers discharged directly into the 2-yd.

Hackley concrete guns. The guns were pulled into the tunnel with Whitcomb 3½-ton gasoline locomotives and were then connected with a 6-in. discharge pipe and with the 3-in. airline. The 90-ft. length of 6-in. discharge pipe was supported and moved by the use of a framework mounted on two sets of car trucks traveling on the track. The 20-ft. lengths of steel forms were also moved by the use of a framework mounted on two sets of trucks. As the track was required to be in the center of the invert for transporting materials and moving pipe and forms, it was necessary to place the sidewalls and roof in advance of the invert. The steel forms rested at the bottom on each side on 6 by 8-in. longitudinal sills, which also acted as bulkheads for the concrete.

When the lining had been completed in No. 3 and



Lower End of Tunnel No. 3, Showing Concrete Lining and 3-Segment Hackley Steel Forms (Western Pipe & Steel Co.), with Jumbo for Moving Forms

only about one-half had been placed in tunnel No. 1, the compressor plant near the upper portal of No. 2 was put out of operation by a fire. Three Sullivan and Ingersoll-Rand portable compressors, working with the plant near the lower portal, were then used to complete No. 1, and from one to two portables working with the plant at the lower end of tunnel No. 2 for completing No. 2.

The specifications permitted the use of aggregates not exceeding 2 in. diam., and a maximum slump of 6 in. at the mixer was necessary to prevent clogging the discharge pipe. After the concrete had been forced through the gun and into place, this slump was reduced to about 3½ in. As it was not possible to do any tamping back of the forms with bars or rods, the use of an air hammer to set up a vibration in the forms opposite the concrete was substituted.

Progress on Lining—The subcontractor worked three shifts daily—two on placing concrete and one on moving forms. On tunnel No. 1, there were worked in moving forms and placing concrete a total of 73 shifts of 18 men per shift. The progress in linear feet per shift was 27, and in cubic yards 31.32. On tunnel No. 2, there were worked on forms and concreting a total of 217 shifts of 18 men per shift. The progress per shift in tunnel No. 2 in linear feet was 23, and in cubic yards 26.68. On tunnel No. 3, there were worked on forms and concreting a total of 77 shifts of 17 men per shift. The progress per shift on tunnel No. 3 in linear feet was 17, and in cubic yards 19.72.

The contractor's unit bid was $8.80 per cu.yd. of concrete. The Government furnished the cement f.o.b. Namorf, Oregon, or within a mile of the work.

The best results were obtained with air pressure just high enough and of sufficient volume to keep the discharge line clear without a high discharge velocity. It is believed that the use of the steel forms produced concrete having a coefficient of roughness not in excess of 0.013. Test cylinders taken from the concrete in place and cured in the tunnels showed an average compressive strength of 1800 lb. at 28 days. The average number of sacks of cement per cubic yard of concrete placed in all tunnels was 6.07.

Personnel—J. B. Bonney, Seattle, Washington, is president of Derbon Construction Co., and J. M. Bruce, vice-president, was also the superintendent in charge of all work under the contract. E. F. Halloran, San Francisco, California, is president of the Cement Gun Construction Co., and F. W. Case was the superintendent in charge of concreting operations.

The work was performed under the immediate supervision of C. C. Ketchum as resident engineer for the Bureau of Reclamation; I am construction engineer for the Vale project. The plans and specifications were prepared under the direction of J. L. Savage, chief designing engineer in the office of R. F. Walter, chief engineer, at Denver, Colorado, whose approval of the plans was received, as well as the administrative approval of Elwood Mead, commissioner of the Bureau of Reclamation at Washington.

Water Survey in Santa Clara County, California

On January 8, a committee of engineers was named to begin proceedings for a water survey of the northern part of Santa Clara county, California. At this meeting in Palo Alto, the water condition of the valley was discussed and the Hetch Hetchy project of the city of San Francisco was considered as a means of additional supply.

The committee includes C. F. Tolman, professor of geology, Stanford University, chairman; Robert Chandler, county engineer, Santa Clara county; W. L. Popp, city engineer, San Jose; J. F. Bixbee, city engineer, Palo Alto; N. H. Bishop, city engineer, Sunnyvale and Willow Glen; C. C. Kennedy, city engineer, Mountain View; George L. Sullivan, city engineer, Santa Clara; H. B. Fisher, city engineer, Los Gatos; and James S. James, consulting engineer, Burlingame. The chairman appointed W. L. Popp to consult with Leroy Anderson, president of the recently organized Santa Clara Water Conservation District, in an endeavor to coordinate the surveys of the two organizations.

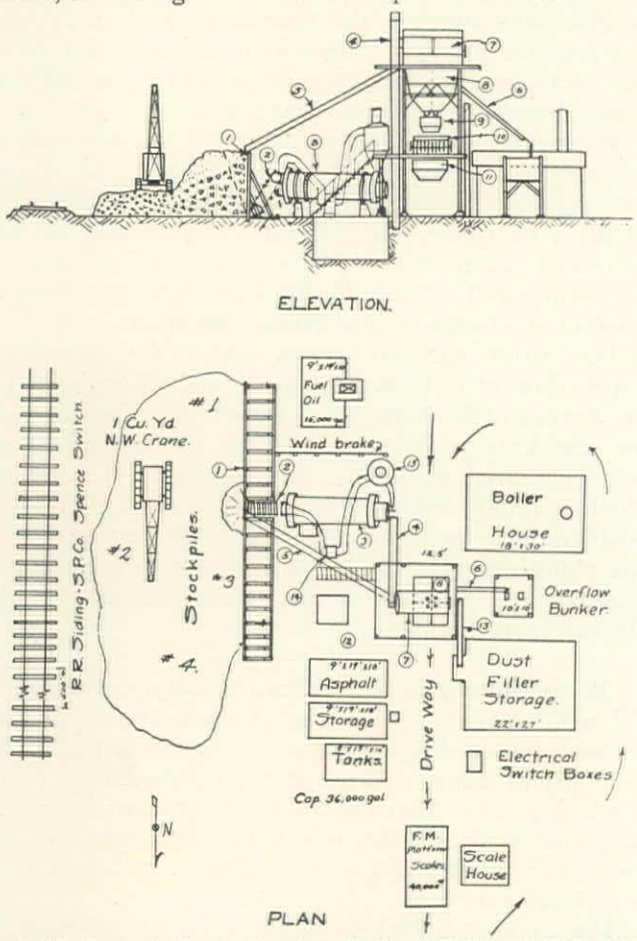
It was shown by M. J. Bartell, representing the city engineer of San Francisco, that every local source of water supply should be developed to its economic limit before additional water is taken from Hetch Hetchy.

Asphaltic Pavement Production, Salinas-Chualar Highway

By R. W. EDWARDS

Junior Highway Engineer, Division of Management, U. S. Bureau of Public Roads, Pasadena, California

A maximum production of 1101.2 tons of asphalt concrete in eight hours and a daily average of 802 tons for the entire job of 40,104 tons, is a new record on state highway construction in California, and probably establishes a national record for 8-hour production. This record production was obtained on F.A.P. 179-B, involving 10.5 miles of asphaltic concrete road



Asphaltic Concrete Plant, Showing: 1—Wood Bulkhead 15 ft. High by 66 ft. Long; 2—Cold Elevator; 3—Dryer 22 by 6 ft., with ⅜-in. Shell and 1:10 Pitch; 4—Hot Elevator; 5—Overflow Chute from Screen; 6—Overflow Chute from Bins; 7—Screens with 1100 Tons Capacity per 8-hour Day; 8—Hot Bins; 9—Weigh Box with 4000-lb. Capacity; 10—4000-lb. Pugmill Mixer; 11—Gob Box, 6.5 Tons Capacity; 12—Plant Motor, 100 hp.; 13—Dust Elevator; 14—50-in. Blower; 15—Dust Collector

construction on the Coast highway, U. S. 101, in Monterey county between Salinas and Chualar, California. The asphaltic concrete was placed over 9.5 miles of old portland cement concrete pavement with bituminous macadam shoulders, and also over 1 mile of line and grade changes. The new pavement, 20 ft. wide, varied in thickness from 7 in. at the edges to 3 or 4 in. at the center, depending upon irregularities in the old pavement. The pavement over the line and grade changes was placed in two courses—a base and surface course; while that over the old pavement was placed in three courses—a shoulder course or preliminary leveling course, a leveling course, and a surface course. A mechanical finishing machine, equipped with rake teeth, was used for the leveling and surface courses.

Contract and Progress—The contract was awarded to the Peninsula Paving Co., of San Francisco, on July 10, 1929, for $236,484, and erection of the asphalt plant was begun August 16, 1929. The plant was completed on October 5, 1929; paving was started on October 7, and completed on December 5, 1929. During this period of 59 days, including eight Sundays and Armistice Day, paving was in progress on 50 days, which resulted in a job average of 802 tons per 8-hour day.

The price received for the asphaltic concrete was $4.27 per ton,* which covered all items from furnishing and setting permanent wooden forms to finishing and rolling the pavement.

Production Management—An extensive study conducted on this project by the Bureau of Public Roads—one of many such studies being conducted throughout the United States for the purpose of increasing production and reducing time losses on highway construction—disclosed that efficient management, on the part of those directing the work, was responsible for the production obtained. This was manifested in the selection of a large capacity, well-designed asphalt plant, with auxiliary equipment which could keep pace with the plant, and in the policy of paying high wages to a high type of personnel and demanding high production in return. A production engineer was employed to increase production.

J. C. Miles, general superintendent for the Peninsula Paving Co., was in complete charge of the entire work, and Jack Logan, superintendent of plants, gave his entire time to this job. In addition to these men, there was a capable foreman for each division of the work, such as hauling, spreading and finishing, form setting and subgrade preparation. Two experienced timekeepers were employed to do the clerical work, and this enabled the manager and superintendent to devote their time to planning and supervision. Throughout the entire job, planning was done in advance of execution, and few delays resulted from management. It was the duty of each foreman to see that the equipment and personnel in his charge functioned efficiently and to immediately correct delays. Through specialization on the part of the men and through coordination on the part of the manager and superintendent, the job proceeded smoothly and at a record rate of production. The total normal personnel employed on the asphalt work averaged 55 men.

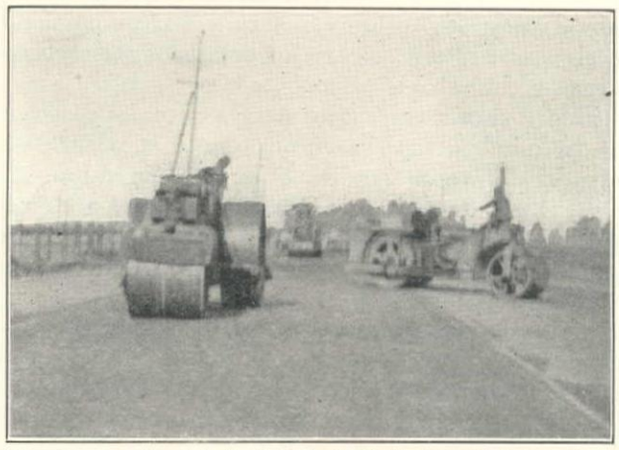
The inspection for the State of California was conducted by C. E. Schultz, resident engineer; E. D.

*A tabulation of contract quantities and unit prices was published in the July 25, 1929, issue, p. 46.

Davis, street inspector, and J. M. Chaffe, plant inspector.

The major items of equipment consisted of:

One Geiger, new all-steel portable asphalt plant, with 4000-lb. pugmill mixer and a 6 by 22-ft. dryer.
One 1¼-yd. Northwest clamshell (feeding plant).
One 1-yd. Northwest clamshell (at sand pit).
Eight Autocar trucks, hauling 6.3 tons per load.
Two Galion 9-ft. spreader boxes.



Rolling Pavement with Buffalo-Springfield 10 and 8-ton Tandem Gas Rollers, Salinas-Chualar Highway

Two Ord finishing machines (one for leveling and one for surface courses).
Two 12-ton, 3-wheel gas rollers.
Two 8-ton tandem gas rollers.
One 10-ton tandem gas roller.
One Kleiber flat-rack truck.
One Water tank truck.

All of the above equipment was in good condition.

Aggregates and Asphalt Plant—Materials other than sand were delivered by rail to the plant, which was erected on a siding near the center of the project. Sand was produced locally and hauled in trucks about one-fourth mile to the plant.

Aggregates were unloaded from the cars by a 1¼-yd. clamshell and either stockpiled or fed into the hopper of the cold elevator. This hopper was formed by a 15-ft. bulkhead in front and the slopes of the stockpiles of material at the rear and on the sides. The crane was often worked a night shift to unload cars and build up the stockpiles. Production studies of the crane operation disclosed that it could handle material for more than 1100 tons of asphaltic concrete.

Materials leaving the stockpiles passed through the dryer, where they were heated to about 375 or 400° F. They were then conveyed by bucket elevator to the screen, where they were screened and chuted into four hot storage bins, each bin containing a certain size. All aggregates passed a 1¼-in. circular screen except that for the base course, where a maximum size of 2 in. was used.

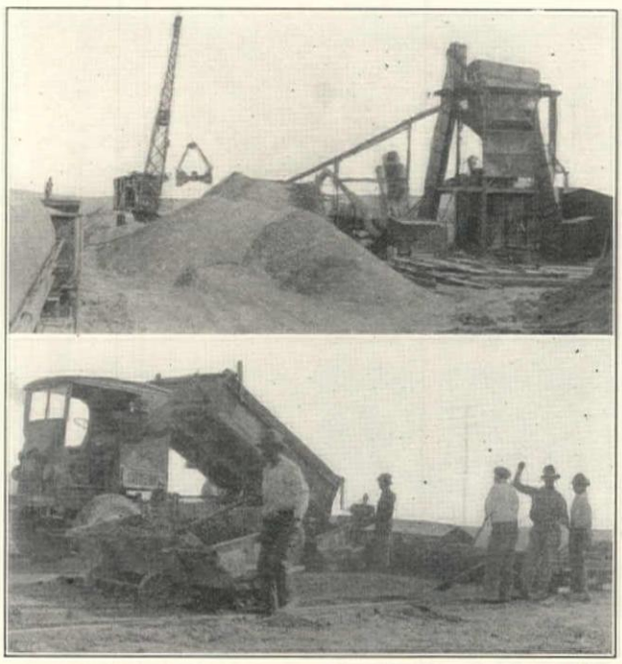
From the hot storage bins, materials were batched by weight in a weigh box suspended on multiple beam scales, permitting each size of material to be weighed accurately.

Dust was admitted by means of a screw conveyor between a hopper and the weigh-box. This screw was controlled by the batcher operator, and the weight of dust admitted was noted on the multiple beam scales in the same manner as the other aggregates. Dust was not heated. After the materials were weighed, they were dumped into the mixer box by the batcher operator. The gate of the weigh box opened at right angles to the mixer shafts, and this helped to insure an even distribution of materials in the mixer.

Asphalt cement, heated to 275° F., was weighed and admitted to the mixer, parallel to the mixer shafts, by another operator who also discharged the mixer and dumped the truck hopper or gob box. Both the mixer gate and truck hopper were operated by steam valves.

Mixing and Hauling Concrete—Charging the mixer consumed an average of 11.9 seconds, mixing 33 seconds, and discharging 13.7 seconds. This resulted in a net cycle of 58.6 seconds, or a net rate of 61.76 batches or 130.1 tons per hour, while the observed actual gross rate was 51.8 batches per hour. Thus 9.96 batches were lost each hour, through delays and other causes. These data are based on more than 325,000 seconds of stopwatch studies on mixer operation.

The asphaltic concrete, after being weighed by the inspectors for the state, was hauled to the street in pneumatic-tired Autocar trucks, equipped with tarpaulin covers. All trucks hauled three batches or about 6.3 tons at average speeds of 25 miles per hour.



(Upper) General View of Asphalt Plant Showing Northwest 1¼-yd. Clamshell Unloading Stone for Salinas-Chualar Highway Construction. (Lower) Autocar Truck Dumping Asphaltic Concrete Into Spreader Box

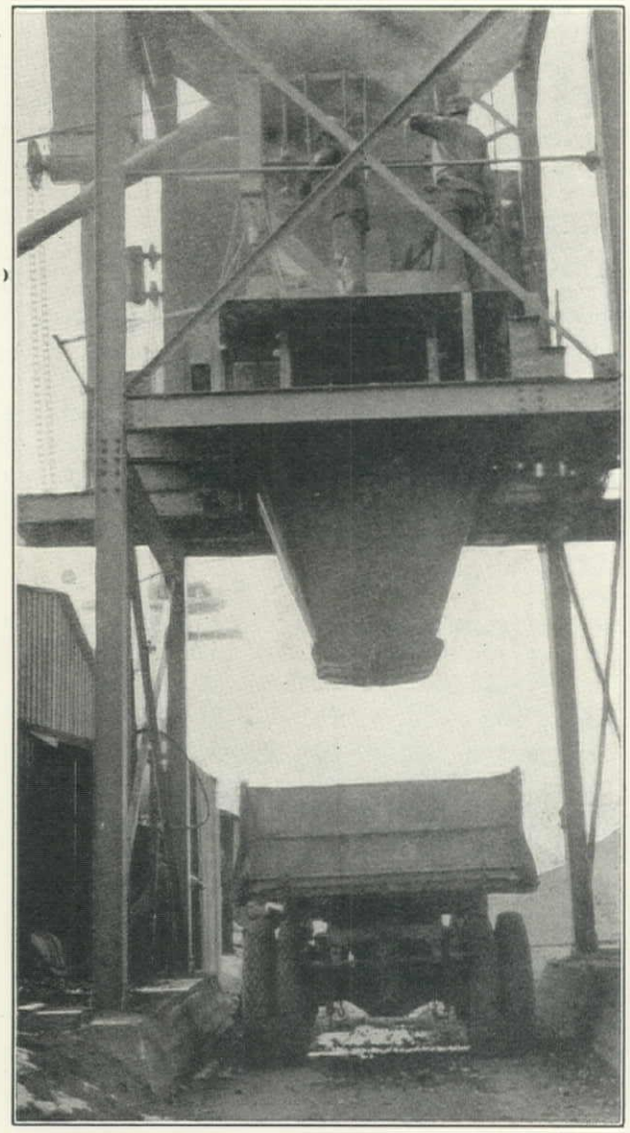
Trucks were turned about 200 ft. ahead of the finishing machine, and were backed and hooked to the Galion spreader boxes. The contents of each truck were then dumped and spread on the street ahead of the finishing machine to approximately the desired depth.

Spreading and Compacting Concrete—A finishing machine spread the material and struck it off to the desired section. Studies conducted by the Bureau of Public Roads on this machine disclosed that, at a speed of 7.5 ft. per min. this machine could not handle much over 950 tons of surface course in eight hours unless the section was thicker than 2 in. A higher tonnage of leveling course could be handled because of the

usually thicker section—lack of traction was the most apparent limitation.

Compaction was obtained by the use of five rollers. Two 12-ton 3-wheelers were used for longitudinal rolling, two 8-ton tandems for diagonal rolling, and one 10-ton tandem for rolling out bumps.

B.P.R. Management Studies—Studies of this project by the Bureau of Public Roads covered the entire paving period from October 7 to December 5, 1929, and consisted essentially of the following:



Mixer and Batcher Operators on 4000-lb. All-Steel, Portable Asphalt Plant for Salinas-Chualar Highway, California. Autocar Truck (Capacity 6.3 Tons per Load) in Place Under Loading Hopper

(1) Making several stopwatch studies each day of the key equipment, which was the asphalt plant. The purpose of these studies was to determine the precise amounts and exact causes of all loss of time at the mixer.

(2) Making daily stopwatch studies of the auxiliary equipment to determine its rates of production, and to determine whether or not it favors or limits the attainment of maximum production by the key equipment. On this job, auxiliary equipment consisted of hauling, spreading, and rolling equipment.

It is only through these stopwatch studies, made systematically, that the nature and amounts of the numerous delays of less than a minute can be ascertained and reduced.

Time Losses—For the purpose of studying production, time losses are grouped into two divisions—major and minor. Major delays are those of 15 minutes and over; minor delays are those of less than 15 minutes in length. Minor delays occur much more frequently than major delays, and usually far exceed the major delays in total time, even though each delay may be but a minute or less in length. Minor delays are probably the most serious consumer of profits. There are also major delays, usually each of one-half day or more in duration, during which time a large portion of the crew is laid off. No major delays of this type occurred on the job.

Table I shows the major delays actually observed, and the minor delays based on more than 325,000 seconds of stopwatch studies of mixer operation. To clearly illustrate the cost of time losses, they are evaluated at $2.25 per minute, which is a conservative value of personnel, equipment, and organization normally employed on this job.

These delays have occurred on probably the most efficiently managed asphalt jobs in the State of California, and it is readily seen what delays might amount to on a poorly managed job, or on even the average job.

TABLE I

Summary of Time Losses and Their Estimated Cost

(Based on working time valued at $2.25 per minute, or $135 per hour)

Classification of Losses	Minutes	Hours	Cost
Total overall working time, excluding Sundays	24,000	400.00	$54,000.00
Major delays of more than 15 min. each			
Moving finishing machine	60	1.00	135.00
Finishing machine repair	15	0.25	33.75
Asphalt distribution	20	0.33	45.00
Bin overflow	63	1.05	141.75
Chain break	45	0.75	101.25
Change material	25	0.42	56.70
Asphalt pump	55	0.92	124.20
Plant delay	27	0.45	60.75
Crane feed line	30	0.50	67.50
Water supply	20	0.33	45.00
Electrical equipment	171	2.85	384.75
Broken casting on dryer	200	3.33	450.00
Screens	15	0.25	33.75
Management	42	0.70	94.50
Total Major Delays	788	13.13	$ 1,773.90
Working time exclusive of major delays but inclusive of minor delays	23,212	386.87	$52,226.10
Minor delays of less than 15 min. each			
Lack of materials in hot bins	1,980	33.00	1,155.00
Hot storage bins overflowing	133.2	2.22	299.70
Street delay	348.0	5.80	783.00
Operative delay	359.4	5.99	808.65
Mechanical delay	202.2	3.37	454.50
Truck shortage	346.2	5.77	778.95
Miscellaneous	376.2	6.27	846.35
Total Minor Delays	3,745.2	62.42	$ 5,126.15
Net working time exclusive of all delays	19,466.8	324.45	$47,099.95
Total money value of sum of all delays			6,900.05

Efficiency—324.45 divided by 400—81.11%

Acknowledgment—I am indebted to Ramon M. Schwegler, junior engineer, Bureau of Public Roads, for part of these data. Schwegler was also assigned to a study on this project.

The Murphy Petroleum Co. is preparing to spend $1,250,000 to construct a central steam heating plant for the city of Great Falls, Montana.

Water Works Problems

Synopsis of Papers Presented at Tenth Annual Convention, California Section, American Water Works Association, Hotel Del Monte, Monterey, October 23 to 26, 1929

Monterey County Water Works, by C. S. Olmsted, superintendent. This paper was published in the January 10th, 1930, issue, p. 19-20.

East Bay Municipal Utility District, by F. W. Hanna, chief engineer and general manager, Oakland.

California is not favorably situated for developing cheap and abundant domestic water supplies along its western border. The Sierra Nevada is suited for water supply but is distant 235 miles from Los Angeles, 175 miles from San Francisco, 100 miles from the East Bay cities, 60 miles from Sacramento. The East Bay cities, comprising Richmond, El Cerrito, Albany, Berkeley, Emeryville, Piedmont, Oakland, Alameda, and San Leandro, all on the east shore of San Francisco bay, formed the East Bay Municipal Utility District in 1923. The district has an area of 78,000 acres and a population of 500,000—it might be considered as a single, consolidated city. The East Bay cities' population for 1950 is estimated at 1,000,000 and for 2000 at 2,000,000, with respective water demands of 100,000,000 and 200,000,000 g.p.d.

Until recently, the district took its water supply from San Leandro and San Pablo creeks and from wells near San Francisco bay, the supply having a total long-time yield of 30,000,000 g.p.d. In 1928 the average daily use was 34,000,000 g.p.d. and the annual rate of increase in demand has been 1,500,000 g.p.d. A new supply was imperative.

The Mokelumne river was selected as the source of supply, using a storage reservoir (Pardee) in the foothills of the Sierra Nevada four miles northeast of Valley Springs. The drainage area above Pardee dam is 536 sq.mi. and the river has three principal branches, of which the north fork has two-thirds of the drainage and three-fourths of the runoff. The watershed up to 4000 ft. elevation is well timbered; its population averages less than one person per square mile. Only small amounts of soluble salts enter the water supply from the upper drainage; minerals from the lower drainage are being satisfactorily carried away; sedimentary rocks give desirable amounts of minerals for domestic use. The water as delivered to distributing reservoirs has a total hardness of 1.9 grains per gal.

The district's new water supply includes the Pardee reservoir, East Bay aqueduct leading to the district, two subsidiary high-line aqueducts in the district, and the old reservoir and distributing system of the East Bay Water Co.

Pardee reservoir has a gross capacity of 225,000 ac.ft., of which 200,000 ac.ft. is above the aqueduct outlet. The dam across the main river is built on a narrow igneous ridge immediately below two broad, deep gulches eroded from sedimentary rock and lying parallel to the ridge. Five principal structures control the reservoir: Pardee dam, Pardee power-house (at the foot of the dam), south spillway (on the southerly rim of the reservoir), Jackson creek irrigation diversion works (on the north rim of the reservoir), and an outlet tower at the aqueduct entrance.

Pardee dam is of the curved gravity type, with a 1200-ft. radius, measured from the upstream face. It is 358 ft. high; 1347 ft. long on the crest; 241 ft. thick at the base and 16 ft. thick at the top; and contains 615,000 cu.yd. of concrete. There are two 72-in. and two 42-in. diam. cast-iron sluiceways, each controlled by a Broome roller gate at the upper end, and a Pelton-Johnson valve and a Pelton butterfly valve at the lower end.

The power plant has two vertical-type, 450 r.p.m., 7500-kw., turbo-generator sets. Water is delivered by two 72-in. cast-iron penstocks through the dam, controlled by Broome gates at the upper and 72-in. Pelton butterfly valves at the lower end.

The south spillway, 1000 ft. south of the dam, will convey flood water around the dam, discharging into the river 1500 ft. downstream. The spillway is 847.5 ft. long, 20 ft. high, ogee type, capacity 125,000 c.f.s.

The Jackson creek diversion structure is three miles north of the dam and is provided to divert flood waters into the creek for irrigation purposes if this is later desired by the farmers. It contains sixteen 5 by 12-in. self-sealing siphon spillway compartments.

The reservoir outlet tower is 19-ft. internal diam. and is 190 ft. in total height, of which 70 ft. is underground. Water can be taken into the tower at five different levels, at any one of which the inlet capacity is 200,000,000 g.p.d., to secure the most potable supply. Each inlet is controlled by three electrically operated gates, covered with ¼-in. mesh copper fish screens.

The 93.8-mile aqueduct passes through the Sierra Nevada foothills, across the San Joaquin river delta region, and through the Coast Range. It contains four concrete-lined tunnels (Pardee tunnel through the Sierra foothills, 8 ft. diam. and 2.2 miles long; Walnut tunnel at entrance to Coast Range, 8 ft. diam. and 0.5 mile long; Lafayette tunnel near middle of Coast Range, 8 ft. diam. and 3.0 miles long; Claremont tunnel in western slope of Coast Range, 9 ft. diam. and 3.5 miles long); a reinforced concrete pipe (Miller aqueduct between Walnut and Lafayette tunnels, 9 ft. diam); and a steel pipe-line (81 miles long, 61 to 65 in. diam., ⅜ to ½-in. steel plate, 30-ft. sections). The tunnels and concrete pipe carry 200,000,000 g.p.d. and the steel line carries 31,000,000 g.p.d. by gravity or 60,000,000 g.p.d. with a booster plant. Two additional steel pipes will later bring the entire line to 200,000,000 g.p.d. capacity.

The most satisfactory pipe joint was a straight bump joint, riveted or double-fillet electrically welded. The pipe was dipped in Hermastic and exteriorly wrapped with Pabco covering. Above ground, across the San Joaquin delta, the pipe was dipped in Hermastic and sprayed with aluminum paint. Three delta branches of the San Joaquin river are each crossed by two 54-in. diam. inverted steel siphons.

The aqueduct has a Pelton-Johnson throttle valve with venturi meter at the Pardee tunnel outlet; a 60,000,000 g.p.d. booster plant near Walnut tunnel; an aeration weir at the Walnut tunnel entrance; a screening chamber near the Lafayette and one at the Claremont tunnel entrance; a chlorinating plant at the Claremont tunnel outlet; two 48-in. steel-cylinder-reinforced concrete transmission and connecting aqueducts, each 5 miles long, branching from the Claremont tunnel outlet through Berkeley and through Oakland and Piedmont.

For distribution, the district acquired: four storage reservoirs with a combined capacity of 32,700,000,000 gal.; 50 distributing reservoirs and tanks with a combined capacity of 298,000,000 gal.; 3 steam and 31 electric pumping plants with a total capacity of 93,000,000 g.p.d.; 4 rapid-sand type filter plants with a combined capacity of 30,000,000 g.p.d.; 8 sterilization plants; 1400 miles of distributing mains; 127,963 metered services; 2122 hydrants; and 44,461 acres of land. With its new reservoir, four tunnels, Miller concrete aqueduct, and one steel aqueduct line completed, the district can now supply 60,000,000 g.p.d.

Testing Water Meters and Accompanying Adjustments, by V. E. Perry, manager of sales department, Spring Valley Water Co., San Francisco.

Since 1918, the Spring Valley Water Co. has on demand tested meters for a consumer who has a large bill; the excess on which cannot be satisfactorily accounted for. Suppose a consumer has had an increase of 25% in his bill and has received a regular notice from the company giving the location,

this month's delivery, previous month's delivery, and increase; also an offer to test the meter and other causes of leaks. If, after a careful examination of all plumbing and a check-up of the piping, the increase is still unaccounted for, the meter is ordered tested, either officially by the city inspector, or unofficially by the company. Water is measured through the meter into a tank holding 10 cu.ft. If the meter is within 2% of 100% efficient, it is not adjusted. As a rule, no increases in charge are made for slow test meters.

During 1928, the company tested only 494 (0.5%) out of 102,413 active metered services. Of these, 217 (43.9%) were found 100% efficient; 193 (39.1%) were slow; and 84 (17.0%) were fast. Of the fast meters, 50% were 1% fast, 25% were 2% fast, 19% were 3% fast; and 6% were 4% fast. For fast meters the company refunded $71 out of a gross 1928 revenue of $6,565,450.

Contamination of Water Systems by Consumers Water Uses, by S. B. Morris, chief engineer, Pasadena Water Department.

Danger of contaminating domestic water systems through cross-connections has been recognized by many boards of health. Laws and ordinances have been passed to restrict or prevent installation or maintenance of cross-connections between a domestic and private water supply not under laboratory control. Pasadena adopted such an ordinance about four years ago, requiring that persons having a private water supply or storage should file a declaration of the non-existence of cross-connections on their premises.

Instances of contamination by cross-connections observed by me include: (1) A complaint of excessive lime in the water supply of a limited district was received. This was caused by a water-softening plant where water was treated for boiler feed purposes. The heavy dose of lime was stored in an elevated tank, with pressure normally lower than that on the public supply. During an emergency shutdown of the water main, a check valve on the line failed to operate and the lime water from the tank was drawn into the distributing system. (2) In a school cafeteria, excess chlorine in the dishwater was discoloring silverware. No chlorinated water was supplied in the territory. Tests showed 0.1 p.p.m. of free chlorine at the cafeteria and none at a fire plug adjoining the school and direct-connected to the city main. The cafeteria was found to be receiving water from a connection to the swimming pool circulation line and a serious epidemic was apparently prevented only by a continuous excess chlorination of the swimming pool water. (3) Sewage odor was noticed in the showers of a public swimming pool. A sewage pumping plant was 500 ft. from this pool. The plant was equipped with automatic, horizontal centrifugal pumps which were intermittently operated to raise sewage 100 ft. from a concrete storage well to the public sewers. These pumps operated under a suction and were so difficult to prime that the pump tender installed a garden-valve hose connection to the public water supply. Finally, he wired one end of the hose to a stop-cock on top of the pump and forgot to close the stop-clock. As the pressure on the sewage line exceeded that of the domestic water supply, sewage backed up and contaminated the shower baths. (4) Air was found in the water over a considerable area. This was traced to a water meter which registered backward. The meter was connected to a machine shop and garage which had an air-compressor and storage tank. To diminish the water bills, the proprietor of the shop had blown air back through the water piping and reversed the water meter, passing the air off into the distributing system.

New industrial or sanitary equipment offering opportunity for contamination comes onto the market from time to time. As the water utility has no direct knowledge of the equipment or piping being installed, control is impossible unless the water department and city building and plumbing departments cooperate. As examples of this contamination: (1) A Hollywood manufacturer turns out a douche cabinet to be recessed into the bathroom wall. Chemicals are added in this cabinet, which is direct-connected to the domestic water system. If the water pressure momentarily fails, the highly poisonous contents of the cabinet would flow back into the water lines and perhaps contaminate the supply of another apartment. (2) Is the water supply of a swimming pool brought in over the top or is the pipe submerged so that the contaminated water may be drawn back in the system if the water pressure fails or a vacuum is created? (3) Are not similar hazards existent with the bath tub, laundry tray, or lavatory?

What is Adequate Pressure, by R. S. Tait, superintendent, Santa Cruz Water Department.

The fundamental principles in planning a city water system are: quality and quantity, and adequate pressure. Pressure is sometimes confused with volume, both must be present in the proper balance.

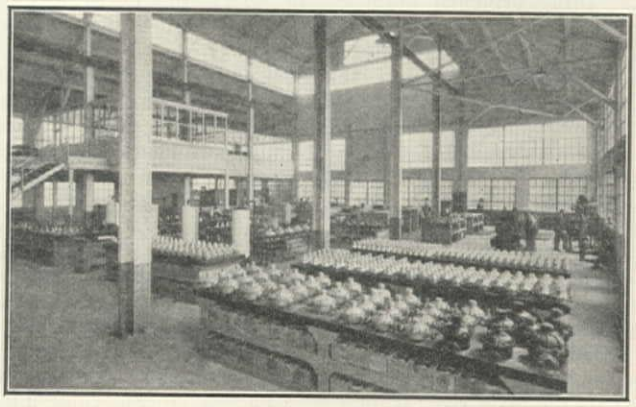
In many cities and towns, direct hydrant pressure by gravity is employed. Others pump their supply from wells or rivers and find economy in a low head, with pumping engines for fire purposes. Some pump direct into street mains, shutting off the reservoirs or standpipes in an emergency so as to bring up pressure in case of fire. This last method may lead to disaster if a section of the supply line goes out or if the pumps fail at a time when most needed.

In Santa Cruz, the mercantile or lower levels of the city use 90 to 100 lb. pressure and the residential or higher levels 65 to 75 lb., which pressures are satisfactory for ordinary purposes. An even pressure on fire hydrants at all times allows the fire department to couple on a hydrant and get water without delay. With it, smaller mains and services can be installed; it aids in the adjustment of automatic fire sprinkler heads; it allows freight elevators and hoists to be run.

Between 80 and 100 lb. is adequate pressure for general use in most cities. Over 100 lb. causes greater expense from maintenance of leaky mains and services and house plumbing disturbances.

Meter Testing and Registration, by George Read, meter and service superintendent, Los Angeles Department of Water & Power.

Water works men do not agree on how long a meter should remain in service without testing. I maintain that periodical testing under ordinary conditions is not economical when



Los Angeles Meter Testing Shop

meters are read monthly, consumption compared with former months, and inspection ordered where readings indicate a gradual falling off in registration.

By random testing of 900 meters in continuous service for one to ten years, using the same rates of delivery as when the meters were new, all tests being made in the meter shop, the following average results were obtained at Los Angeles:

Flow (Cu.ft.)	Average Per Cent of Registration — When Installed	When Removed
Fast (2 per min.)	99.43	100.71
Slow (10 per hour)	100.84	99.34

The inside of the measuring chamber and the piston of a new meter is clean and smooth. The theoretical volume of water passing through the chamber for each gyration or oscillation of the piston equals the cubical contents of the chamber, less the piston displacement. The number of gyrations or oscillations per cubic foot varies with the meter size, but over a considerable delivery range is practically constant. All meters have a high-peak registration flow and meters in good

condition, geared to record 100% on ordinary deliveries, over-register on these high peaks. Under such rates of delivery, the piston is nearer positive in displacement than at other rates.

After some service, the piston and inside walls of the measuring chamber receive a slimy deposit which slightly reduces the amount of water passing, and causes over-registration. A small flow will pass through the measuring chamber without moving the piston (for a ⅝-in. meter under 30 lb. pressure, 1½-c.f.m. will not move it). Flows through meters exceeding maximum rated capacities will cause under-registration because of friction slippage.

When a properly geared meter is set and finally removed after its operation fails, more water has passed through the measuring chamber than is recorded. All meter testing had best be done at the meter shop.

Tests on 781 of the 900 meters—those having oil-enclosed gear trains, showed that only 68% of the ones in service for five years had good lubrication. This was probably due to insufficient lubrication in the beginning. Tests on 100 of the meters containing open-type gear trains, 50 of which were in service nine years and 50 in service ten years, showed 24% and 14%, respectively, to be badly worn. Oiling materially prolongs the life of a meter and keeps the gear train sensitive.

On an average, 10% of the meters in service are removed annually at Los Angeles due to wear, damage by hot water, broken registers, street work, enlargements, discontinuance of service. About 41% of those removed for not operating have been damaged by hot water.

Service Installations, by Orla Casad, superintendent of water, Merced.

Water service connections should be standardized to meet local conditions, delivering to the consumer the required amount of water in a reasonable time. The peak demand should be of short duration, so that the efficiency of the distributing system will not be impaired. The size and number of service connections greatly affect the balance of a water system. Pipe should be of such material that it is least affected by soil conditions and will not decrease in carrying capacity.

Merced installed its water system in 1888, using AA and AAA lead service pipe until copper services were first introduced on the Pacific coast. For connections larger than 2 in., cast-iron pipe is used in place of copper. The residential lots are 50 by 150 ft. and are serviced with ¾-in. connections at 40 lb. pressure.

Corrosion of Water Pipe, by Ira D. Van Giesen, electrolysis engineer, Los Angeles Department of Water & Power.

By mechanical, electrical, and chemical means, man reduces the compounds of nature to their elementary form; then combines these elements into such forms as pipe, wire, structural members, and puts them back into the domain of nature. Immediately, nature attacks these sources of raw material and starts to recreate the elementary compounds from which they were made. This recreative action of nature is called corrosion.

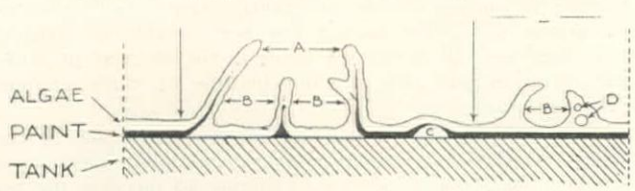


Fig. 1. Gas Action Ruptures Paint Film in Protective Pipe Coating

The water works man should work in harmony with nature, instead of against her; for if he tries to force nature, he is doomed to failure before he starts.

The author does not attempt to add anything to the existing knowledge on the mechanism of corrosion, but merely describes a few conditions of relatively rapid corrosion gathered from actual observation. He divides corrosion into four classes, as follows:

Electrolysis: Corrosion caused by stray current.

Soil corrosion: Normal corrosion of any metal in any moist soil.

Self-corrosion: The primary causal factors are inherent in the metal corroded.

Mutual corrosion: Corrosion taking place between dissimilar metals by a galvanic action.

It is to be remembered that electrolysis is caused by the leakage current from the track systems of electrical railways. All other sources of stray current are accidental and, therefore, negligible. In general, it is against common sense to blame corrosion on electrolysis where the damage is done a half-mile or so from any of the street railways' track systems or power supply points, when the pipe system is cast-iron, jointed with cement. It is possible to imagine conditions under which electrolysis can occur at such distances from the affecting railway system, such as interlacing networks of cast-iron water-pipes and wrought-iron, welded gas-pipes. Due to the electrical principles involved, electrolysis would occur under these conditions much less often than these construction conditions are found.

The inside surfaces of open, equalizing or storage, steel

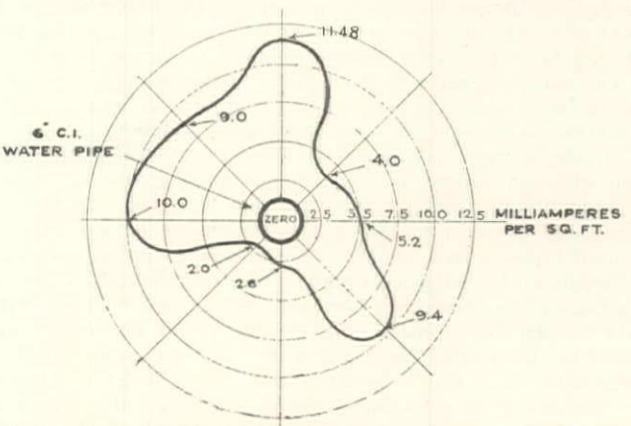


Fig. 2. Graphitic Corrosion of a 6-in. Cast-Iron Pipe in Service for 16 Years

tanks are a source of trouble. It appears impossible to find a protective coating that protects for longer than a year or two. Usually, before the tank is repainted considerable corrosion has taken place.

The conditions existing within an open equalizing tank are especially severe, due to the fact that the top layer of water changes slowly; there being but a single bottom connection. At least twice in 24 hours the water level in the tank rises and falls several feet, subjecting the top section of the tank to an alternative flushing and bearing action. During the heat of the day the water is low, subjecting the north inside section to the direct rays of the sun; during the night the tank stands full. Such conditions subject the paint on the north inside surface of the tank to extreme ranges of temperature. No paint made seems long to be able to withstand such conditions.

An equalizing tank in Los Angeles developed severe corrosion in the upper third within one year, especially in the upper 5 ft. on the north side. This tank was painted upon erection with a water-emulsified asphalt paint. The paint film was lifted and broken by gas pockets, and the tank steel then corroded (see Fig. 1). The conclusion was:

"From the facts in this case it would seem that the inception of the action took place primarily within the paint film itself, through the action of the sun on the air particles enclosed within the emulsified paint; and secondarily between the tank surface and the paint film, due to improper cleaning, leaving rust particles on the tank surface.

"The remedy would appear to be found in covering the tanks and in using other than an emulsified paint, unless the paint is emulsified under vacuum."

A good example of self-corrosion is found in what is generally called graphitic corrosion; a number of cases of which have occurred in Los Angeles. An analysis of the conditions of each case presents some startling similarities and differences. In four cases coming to notice within the past year these cases, stray current was present, ranging from a maxi- and a half, the cast-iron of the pipe could be called poor, both as to chemical mix and as to crystalline structure. In all

mum of about 7 milliamperes per square foot, discharge from the corroding pipe, to a fraction of a milliampere, alternately pick-up and discharge.

A typical example is shown in Fig. 2. A chemical analysis was made of this pipe—the outside corroded section, the inner chilled area, and the unaltered iron. The compositions, structure, and progressive graphitization were found to be typical of all the cases observed.

The one great difference observed was in the soil, which ranged from a pH value of 4.3 to 8, that is, an acidity equivalent to a 43% solution of hydrochloric acid to an alkalinity of a 33% solution of sodium hydroxide. However, as far as the action of the iron in entering solution is concerned, especially under the effect of stray current, this difference disappears and becomes a similarity; that is, the soil is always highly ionized.

Therefore, it would appear that the process of graphitic corrosion calls for an internally stressed cast-iron in which the combined carbon has a tendency to precipitate out of the solid solution as graphite, and the presence of a highly ionized soil. The primary cause is inherent in the cast-iron, and the soil is a secondary or continuing factor. The remedy, then, would be a protective coating applied to the surface of the cast-iron to insulate it from the soil moisture. This would be efficient only as long as the coating was intact. Better cast-iron is probably a more satisfactory solution.

Under mutual corrosion is included the corrosion of U-bolts on clamped lateral or service connections, and galvanized wrought-iron risers on cast-iron pipe services. In the first case, the cause of trouble is galvanic action between the different types of iron alloys. This corrosion can be reduced to a minimum by using a wrought-iron clamp, a lead gasket, and polishing all contacting surfaces before connecting. After the connection is made, the U-bolt should be welded at a spot or two to the clamp and to the cast-iron water pipe. In the latter case, zinc is positive to iron and under the top-soil conditions soon goes into solution forming salts which are capable of continuing the corrosion of the iron of the riser and fittings. The remedy is to not use a galvanized riser. To prevent mutual corrosion, always use the same metal throughout a given construction. If necessary to change the type of metal used, coat the pipes for several feet in both directions from the point of metal-change, with asphaltum compound.

Recent Extensions of Our Knowledge of Soil Corrosion, by K. H. Logan, electrical engineer in charge of underground corrosion investigations, U. S. Bureau of Standards, Washington, D. C.

Until recently the importance of soil corrosion of underground pipes has not been generally recognized. Most of the older pipes have comparatively thick walls, resulting in a life more than proportional to the wall thickness. Also, most of these pipes have been laid in northeastern and central states where soils as a class are less corrosive than in other states.

Industrial development extended south and west, and thin-walled pipe came into more general use. Interest in corrosion increased. The electrolytic theory of corrosion as applied to iron and steel above ground became established and underground corrosion was attributed to impurities in material. Thereafter, iron pipe material was developed containing not more than 0.16% impurities.

In 1922, the Bureau buried specimens of commonly used pipe in a variety of soils. As a result of these and further experiments, the following additions to the knowledge of soil corrosion have been made:

"1. While it seems probable that quality of material has an important bearing on rates of corrosion, factors exterior to the pipe appear in many cases to determine the life of the line.

"2. The phenomena connoted by the term 'soil corrosion' include not only the chemical characteristics of the soil adjacent to the pipe, but also the effects of climate and topography, and soil corrosiveness can not be determined without considering all of these factors.

"3. Under some conditions, pipe-line corrosion is accelerated by the line passing through soils differing in their electrochemical properties with respect to iron, and when this is important corrosion can be decreased by reducing the tendency of the line to collect and carry electric currents. Among the means of accomplishing this are the use of low-conductivity pipe material, insulating joints, and surface insulation of the line.

"4. Pitting can be reduced by insuring uniform contact between pipe and soil through backfilling with sand, and by thoroughly tamping the soil around the pipe as it is replaced.

"5. Usually, the rate of penetration of pits decreases as the pipe becomes older. Hence, the depreciation of a pipe-line is not proportional to its age.

"6. In locations where pitting is serious, the life of a pipe can usually be more than doubled by doubling the thickness of the pipe wall. As the cost of the pipe is usually from 50 to 80% that of the line, the economy of using thick-walled pipe in corrosive soil should be evident."

Sanitation, by Leon B. Reynolds, professor of sanitary engineering, Stanford University.

Sanitation is defined as the practical application of sanitary science through the removal or neutralization of elements injurious to health. The field also includes the abatement of nuisances. The main problem of sanitation has been to keep man's food and drink from becoming contaminated.

California passed its Sanitary Water Systems Act and Public Health Act in 1907 and established a Bureau of Sanitary Engineering in 1915. Financial support of the bureau has been reduced from what it was six years ago and for the biennium 1929-31 was but $57,050. The bureau has the same number of personnel as it had 14 years ago—in 1927 there were 2,220,000 people to each sanitary engineer in the state's employ. In the 1926-1928 biennium, the bureau gave 52 permits for sewage disposal, 12 for water supply, and 63 for swimming pools. It is estimated that 80% of the bureau's attention goes to sewage disposal, 15% to water problems, and 5% to swimming pools. The bureau is losing contact with works following their completion, because of shortage of funds and personnel.

Several years ago a survey was made of water supplies employing sanitation. At that time the average chlorination was about 50% reliable, and in many cases only a single chlorinating machine was in use. Break-downs of single machines were responsible for the 13-case typhoid epidemic at Merced Falls in 1918 and the 114-case epidemic at Pittsburg in 1920. The California death rate from typhoid for the past two years has been 2.4 per 100,000.

The A.W.W.A. has taken a strong stand on cross-connections with polluted supplies, but the bureau personnel is inadequate to survey cross-connections. Watershed sanitation is a matter which the bureau has been unable to consider. Also, there are 550 swimming pools in the state at present—their operation gets little attention because of small personnel in the bureau.

At the second annual meeting of the California Sewage Works Association, a resolution was unanimously passed urging the governor and director of finance to increase the personnel of the bureau so as to bring the operation of sewage and water purification plants to the highest efficiency. (After Reynold's paper had been presented, the California Section of the American Water Works Association, on motion of Geo. S. Pracy and seconded by S. B. Morris, passed the following resolution:

"Whereas, the efficient operation of water purification plants is contingent upon adequate supervision of the Bureau of Sanitary Engineering of the State Department of Public Health, and

"Whereas, it has been shown at this meeting that the Bureau of Sanitary Engineering is inadequately financed and that the present personnel is insufficient to furnish such supervision,

"Be it Resolved, that the representatives of this Association, appointed to confer with the governor and director of finance, be authorized to urge such additions to the personnel of the Bureau as will make it possible for the Bureau to bring the

operation of water purification plants to the highest efficiency.")

Sanitation, by Carl Wilson, biologist, Los Angeles Department of Water & Power.

We water works men are pledged to protect our consumers and to serve them with water which is not only safe but is made appetizing to thinking people by a history of clean antecedents from cloud to kitchen tap.

It is not only possible but practicable to convert the sewage of a city into pure and safe drinking water. While such procedure will probably become commonplace in the future, the thought of drinking reclaimed sewage is repugnant to most people.

It is better to maintain the purity of raw waters which are exceptionally pure than to run the risk of polluting them through human contact.

All of us have had experience with waters which could not be successfully chlorinated without filtration and have seen the best filters, lacking chlorination, fail to deliver a bacterially satisfactory effluent.

Uncertainty as to conditions surrounding catchment areas and impounding basins, inspired and promoted by irresponsible salesmen, perhaps more than any other thing is the cause of bottled water sales in Los Angeles amounting to over $2,000,000 annually. For the past eight years Los Angeles has prohibited recreational use of reservoirs. Reliance for purity is placed on natural purification during storage (requiring at least 30 days where repollution cannot take place) and chlorination. There has not been a single typhoid case ascribed to water in 27 years of municipal ownership at Los Angeles.

The proposal to throw open remote reservoirs to the public use, leaving those nearer the point of consumption fully protected, is a compromise not justified in the Los Angeles system, at least. It is too much to believe that the group of people who lightly regard infractions of law will exhibit a special veneration for sanitary regulations. I oppose recreational use of watersheds, as ardent fishermen or hunters will remain on a reservoir all day and often sacrifice sanitary obligations for convenience.

Commercial Problems, by Carl K. Chapin, commercial director, Los Angeles Department of Water & Power.

Servants in public utilities have become servants to a new king—the public. Commercial problems refer only to the recurrent sales transactions of the business. Regular commercial activity has mainly to do with opening a service account with a consumer and carrying on the sales recording and collecting end of the service until the business between the parties is closed. Commercial activity and commercial personnel are brought into more intimate contact with the public being served than any other part of a working utility system.

How do we select our personnel? How do we train and promote from time to time this human element of the business? How do we rate or measure their efficiency and performance? One false or unfortunate move on the part of an employee can do more toward upsetting a utility's business routine than the breaking of an important machine part in the physical system. We spend endless time and money while breaking in and training the human element, before we even approach the perfection of experienced help.

Intelligence tests strive to understand and analyze the human equation which confronts them. Any intelligence grading method which falls short of helping the individual to grade himself is not well suited to general application.

The following examination or rating is divided in 19 parts, the first 4 to reflect the quality quotient of the individual, the next 4 on quantity of work and ability, 4 others on dependability, and the last 7 on general suitability. Each heading has a maximum score of 5 points; the rating is applicable to the upper third of a general class analysis. The 19 parts are: clearness of thought and expression; soundness of judgment; care and competence in matters of detail; cheerfulness in relation to work and public; perseverance under all conditions; ability to make quick decisions; willingness to keep busily engaged; measure of rate of change in capacity; tenacity in holding to opinions once formed; willingness to accept responsibility; enthusiasm for work and future; moral habits on and off duty; manners, appearance, and bearing; initiative and aggressiveness; tact and courtesy in meeting and handling others; tendency to cooperate with others; modesty a natural trait; familiarity with general problems of the business; service record and age limitations prescribed.

When a group is analyzed, two essentials are at once realized. Those above the group can be stimulated and encouraged; those below can be encouraged to bring up their standing or can be weeded out.

A knowing, thinking, hopeful personnel will eventually make the utility management and the public forget that there are such things as commercial problems in the supplying of water.

GILROY SEWAGE TREATMENT PLANT

Ray Burgess, superintendent of public works, Gilroy, California, reports the following sludge analysis made since his article on the 'Gilroy Sewage Treatment Plant' was published in the December 25th, 1929, issue:

Potash—0.26%
Phosphoric acid available—2.9%
Organic matter—57.11%
Total nitrogen—2.74%
Nitrogen as ammonia—3.63%
Total phosphoric acid—3.88%

Gilroy has the first separate sludge digestion plant in California which handles cannery waste. The plant equipment was furnished by The Dorr Co.

INTERPRETATION OF 'PUBLIC IMPROVEMENT'

By H. A. MASON
Attorney-at-Law, San Francisco, California

The California Supreme Court, in a recent decision (Irish vs. Hahn, 281 Pac. 385) has furnished a broad definition as to what constitutes a 'public improvement' as those words are used in connection with the imposition of special assessments. Whatever improvement or construction that a city is authorized by law to make, necessarily gives to it the characteristic of being public, and whether the function exercised thereby is governmental or proprietary makes no difference. The distinction made by courts between functions governmental and proprietary was for the purpose of determining the liability of a municipality in tort.

In this case, the question was as to the validity of a special assessment imposed for the construction of underground conduits for placing electrical wires connected with the electric system of the city of Pasadena, thereby replacing its poles and overhead wires. This was held to be a public improvement that justified the levying of the assessment. The other requirement of law, that is—the improvement must result in a benefit to private property (that of the defendants)—was also answered in the affirmative.

In addition to the above points, the court held that the question as to whether such benefits did result was a matter which the city council was empowered to determine, and the court would not interfere with its determination except in cases of fraud or abuse of discretion.

Curing Concrete Pavements By The 'Hunt Process'

Extracts From a Paper Read at Tenth Annual Meeting, Northwest Branch, Associated General Contractors of America, Portland, Oregon, February 15, 1930

No portland cement concrete pavement is completed until the specified curing period has elapsed. Although the curing process comes after the close of actual paving operations, it must be completed satisfactorily before the contractor can load his equipment, secure his warrant, and move to the next job.

Laboratory men and engineers have found that proper curing is one of the most important requirements for high-quality concrete. It is not surprising that engineers are 'fussy' about it and insist that the pavement be cured uniformly and properly. Most specifications today require that curing operations have the first call on the contractor's water supply and that the mixer must be shut down if there is not enough water for both operations. Thus, no matter what the inconvenience may be, curing receives first consideration.

Controversies—In the curing end of the job, most of the controversies between engineer and contractor have their origin. Many have commented on this fact and practically every contractor could from experience add his own endorsement to the statement.

In a paper before the 1929 meeting, American Road Builders' Association, A. Stellhow, of Wooster, Ohio, said:

> There is so much difference of opinion and such a wide variation of practice in curing concrete that unless an unusual method is employed, all the contractor can do is to allow a reasonable figure for the cost and then satisfy the engineer. As far as saving for the contractor is concerned, any method which will accomplish the curing quickly is desirable, even though the first cost is high. There is usually more bickering and misunderstanding about curing on a concrete job than about all the other operations combined.

The same idea was expressed by F. H. Jackson and J. T. Pauls, of the U. S. Bureau of Public Roads, in a joint paper presented at the seventh annual meeting of the Highway Research Board, when they said:

> Adequate supervision of the sprinkling operation is extremely difficult, which makes this feature an endless source of contention between the engineer and the contractor. It is evident, therefore, that there is a real field for a method of curing which will be as economical, more easily controlled, and at the same time as efficient as the conventional one of applying water.

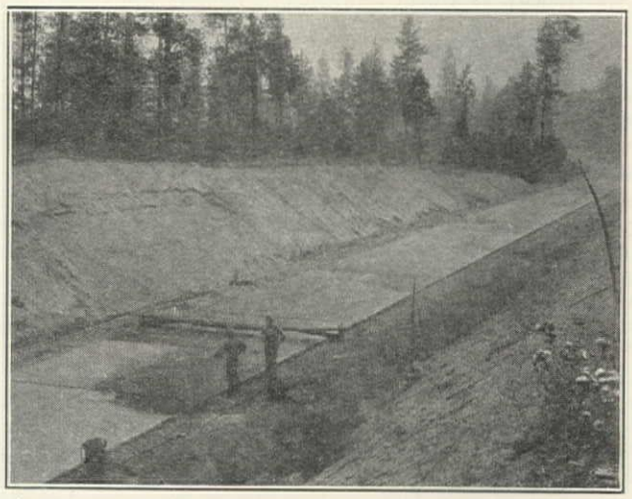
Curing—A better method of curing, such as referred to by Stellhow and Jackson, is now available. This—the 'Hunt Process'—introduces important advantages from the contractor's point of view and, at the same time, eliminates the disadvantages of the earth and water methods of curing.

When concrete is placed, it contains more than enough water to hydrate the cement. The purpose of the curing process is to retain this water, and thus bring about the conditions under which the concrete will attain its greatest strength. By applying the new type of coating immediately after the concrete is placed and finished, the mixing water is sealed in.

'Hunt Process' is a compound composed chiefly of Trinidad type lake asphalt, Bermuda asphalt, and Gilsonite, blended at a high temperature, thinned to working consistence with a petroleum solvent, and combined with pigment. When this material is sprayed onto concrete which has not yet set, it dries rapidly and forms a thin, waterproof, and airproof sheet having great flexibility and toughness. As the concrete hardens, the compound also hardens and adheres closely to it, practically becoming a part of but not penetrating the surface. A gallon of this curing agent will cover 22 sq.yd. of concrete, one intelligent laborer handling the equipment and applying the material on the average job.

Curing Methods—This new method of curing should be contrasted with older ones. Few, if any, contractors can definitely say just how much it costs per square yard to cure a concrete pavement by the dirt cover or ponding methods. There are so many items of expense that it would require an elaborate and involved cost study to arrive even at a rough figure.

One item is the amount of water required by the old



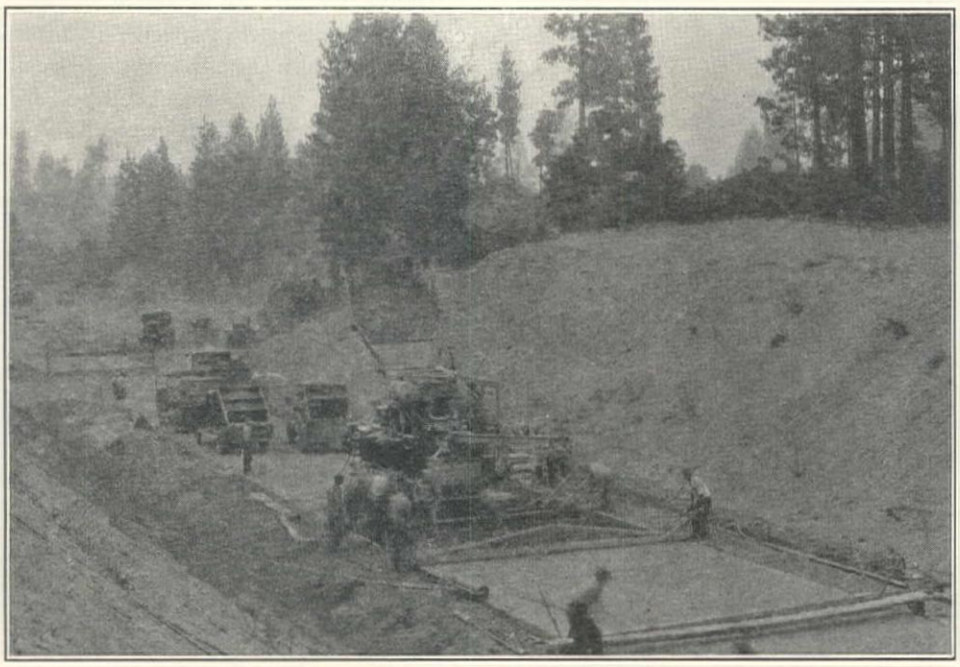
Curing Portland Cement Concrete with 'Hunt Process' on Washington State Roads 2 and 3, near Spokane

method—involving an investment in pumping equipment, pipe-lines, and other devices. Studies by the Portland Cement Association indicate that 25 to 40 gal. of water are required per square yard of concrete per day. With a 14-day curing period specified, the contractor must supply 360 to 560 gal. of water per square yard of pavement placed. Thus, to cure a 10-mile paving job, 42,000,000 to 66,000,000 gal. of water will be required. To this must be added the cost of bringing water to the pavement, and wages of the crew required to keep the pavement wet so that all portions will be uniformly cured.

Another item is the burlap required, as enough bur-

lap must be kept on hand to cover the yardage placed on the maximum day's run. Usually, two men are kept busy picking up the burlap, moving it ahead, placing it in the next position, and properly wetting it down. To replace worn-out burlap, $150 to $200 must be spent each year.

After the burlap has been taken up and moved ahead, the pavement must be covered with dirt to a minimum depth of 2 in. when wet down, or else ponding dikes must be constructed to retain the water. Thus, on a 10-mile paving job, about 8000 cu.yd. of dirt must be placed over the pavement surface by hand and watered a certain number of times each day for 14 days, then removed, and the pavement cleaned. The operations are equivalent to moving 16,000 cu.yd. of dirt by hand methods.



KOEHRING 27-E PAVER AND FLEET OF SIX BATCH TRUCKS ON COLLINS CONTRACT NEAR SPOKANE

All these items mean dollars to the contractor. They tie up investment in equipment, increase the payroll, and defer final inspection and payment.

Saving—When the new method of curing is used, these items of cost are eliminated. Time and effort are conserved, and there is no question as to whether the provisions of the contract applying to curing are carried out. A single application of 'Hunt Process' immediately after the pavement is finished, disposes of the curing problem. Completion of the job is hastened and, usually, final inspection is made following the curing period, thereby saving 10 to 15 days on the average paving contract.

When this process is used, the contractor knows the cost of curing, therefore he can definitely include this in his bid. He can be assured that there will be no shutdowns from lack of water; he can concentrate his efforts on the mixing and placing operations from which his revenue is derived; he can eliminate from his payroll the crews needed to handle burlap, cover the pavement, and wet it down; he eliminates the investment in burlap and water supply; and he can release his equipment earlier, thereby lengthening the productive season.

A Washington Contract—'Hunt Process' was used to cure 12 miles of 20-ft. portland cement concrete pavement on the J. H. Collins contract, Washington State Highways No. 2 and 3, near Spokane. The entire job was completed in a period of 62 days; without using a modern curing agent it could not have been finished in the fall of 1929. In that event, the equipment and much of the investment would have been tied up during the past winter, and the contract would have had to be completed this spring before a new construction season could be entered.

The Washington Department of Highways made compressive and flexural strength and wearing quality tests on this contract, 7000 cu.yd. being cured by water. Sixteen concrete beams were made, eight being cured by the 'Hunt Process' and eight under water. These beams were broken under the Coadmeter at 14 days and yielded comparative results shown in Table I. (The figures under 'R' were calculated according to formula, using the load at failure, plus 76 lb. for the weight of the I-beam shafting and load meter head.)

TABLE I

Hunt Process		Water Cured	
	First Batch		
Beam No.	'R'	Beam No.	'R'
1	650.45	9	550.25
2	743.36	10	652.72
3	710.24	11	629.46
4	698.74	12	668.64
	Second Batch		
5	589.58	13	591.82
6	658.38	14	482.99
7	594.04	15	623.86
8	623.30	16	556.53

Editor's Note—A short progress article on Construction of State Roads 2 and 3, Spokane county, Washington, was published in the September 25th, 1929, issue, p. 502.

Allied Steel Industries of California

Sixth Annual Convention at Del Monte, February 13 to 15, under Auspices of State Chamber of Commerce

About 200 'iron' men gathered at the Del Monte hotel (the ideal convention place) for three days—February 13 to 15—to get better acquainted, discuss the problems of the industry, promote cooperation, and thus develop a 'steel' front.

Charles F. Abbott, live-wire director of the American Institute of Steel Construction, and his able assistant Lee H. Miller, engineer, came from New York City to 'temper' the meeting.

Considerable was achieved at this meeting. A golf match each afternoon enabled practically everyone

CHARLES F. ABBOTT
Director, American Institute of Steel Construction

present to dent the other fellow's armor, and helped a lot toward the adoption of a 'code of trade practice' and the abolition of 'price cutting'—two of the 'deadly sins' of the industry which Abbott is striving hard to wipe out; upon which subjects he delivered addresses.

A. T. deForest, U. S. Steel Products Co., San Francisco, delivered a strong plea for "the adoption of a constructive program and a more uniform business selling policy, the maintenance of selling values that will bring a fair return on capital invested, quality of product, and service rendered". He stressed the importance to the steel industry of the Pacific coast of the recent acquisition of the Columbia Steel Co. by the U. S. Steel Corp. and of the Pacific Coast Steel Co. by the Bethlehem Steel Co., which should help in the establishment of sense and morale. deForest appealed to the 200 delegates as follows:

"Have we the good sense to see the necessity for calling a halt in the varied and ulterior practices that have at such frequent intervals resulted in price upheavals and bitter price competition—at times long lasting—all resulting in unprofitable business, together with possible bitterness in our personal relations?"

Wm. Simpson, of the Wm. Simpson Construction

LEE H. MILLER
Chief Engineer, American Institute of Steel Construction

Co., Los Angeles, outlined the campaign being started in Los Angeles to raise, or do away with, the limit height of buildings in the city, and how important this was to the steel industry. Simpson also spoke

IRON, STEEL, AND ALLIED INDUSTRIES OF CALIFORNIA

on the proposed building code for Los Angeles county.

Robert Sibley, University of California, read a paper on power development in California and on the Pacific coast.

Another worthwhile feature of this convention was the group meetings.

Although the American Institute of Steel Construction was started only a few years ago, it has grown rapidly, and each year is receiving more financial support from the various steel industries for its campaign of publicity, education, and promotion.

STATE-AID SEWAGE RESEARCH IN CALIFORNIA APPROVED

We are glad to be able to announce that the Hon. Lyman M. King, director of the State Department of Finance of California, has at last given his approval to the establishment of a laboratory, together with the necessary personnel, in the new Life Sciences building, University of California, under the supervision of the Bureau of Sanitary Engineering, State Department of Public Health, for the purpose of scientific research in sewage and trade waste purification and reclamation.

This state-aid sewage and trade waste research laboratory will make scientific studies of general problems, and will also cooperate with and assist municipalities and industries in the solution of their specific problems. In this way the burden of expense will be borne by the industries and municipalities, as it should be, the state supplying the scientific personnel and a well organized research laboratory.

To begin with, the personnel of the new laboratory will consist of a director, biologist, bacteriologist, chemist, and assistant engineer.

This is the culmination of a campaign started six years ago by a few sanitary engineers, and later supported by the American Society of Civil Engineers, League of California Municipalities, and California Sewage Works Association—which campaign has been frequently reported in **Western Construction News.**

We suggest that all sanitary engineers and municipalities write to Governor Young and to the Director of Finance expressing their appreciation of the establishment of the state-aid research laboratory.

UNITED STATES CIVIL SERVICE

The Commission announces unassembled examination No. 50 for associate engineer ($3200 to $3700 per year) and assistant engineer ($2600 to $3100 per year), for which applications must be on file at Washington, D. C., not later than March 12, 1930.

Eighteen options are included, as follows: 1—aeronautical, 2—agricultural, 3—architectural estimator and computer, 4—architectural specification writer, 5—chemical, 6—chemical for naval stores, 7—general civil, 8—electrical, 9—heating and ventilating, 10—highway, 11—mechanical, 12—mechanical for naval stores, 13—radio, 14—structural steel and concrete bridges, 15—structural steel and concrete buildings, 16—telegraph, 17—telephone, 18—any other specialized branch of engineering.

Applicants must show that they have been graduated with a degree in engineering, preferably along the line of the optional chosen, from a college or university of recognized standing, upon the completion of at least 118 semester hours' credit; provided, that applicants for associate or assistant architectural engineer may present a degree in architecture or engineering; and, provided further, that if the applicant has completed two full years of such a course, for each year lacking completion there may be substituted a year of engineering experience in addition to that prescribed below. All the experience so substituted must have been in strictly technical work of professional grade, of such a character as to demonstrate the possession by the applicant of a knowledge of the fundamentals of engineering, and of such scope as to provide the substantial equivalent of a complete college course. The additional requirements follow: applicants for associate engineer must have had at least three years of progressive professional experience or postgraduate college study in engineering, including at least two years of somewhat difficult and important work along the line of the optional chosen, demonstrating the applicant's initiative, a knowledge of engineering, and the ability required for the performance of difficult and responsible work in the branch of engineering selected. Applicants for assistant engineer must show that they have had at least two years of progressive professional experience in an engineering position.

MEET AT DEL MONTE FOR SIXTH ANNUAL CONVENTION

The Construction Equipment Problem

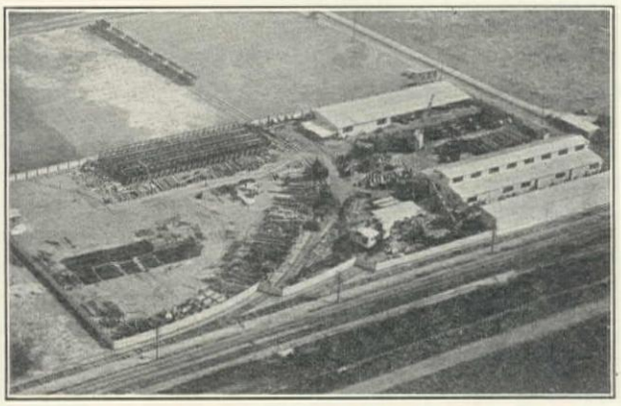
Contractors on Coolidge and Pardee Dams Join Forces in Disposing of Equipment

PHILIP SCHUYLER

Since the first contractor agreed to undertake to perform a particular piece of construction for a fixed price, the equipment problem has been a growing one.

Generally speaking, no two jobs are alike. For this reason it is impossible to employ the same equipment continuously, and contractors constantly find themselves owning idle equipment which they may need, or which they may never again use.

Some contractors consider it a good business policy to maintain constantly a large amount of equipment, while others assemble a complete independent plant for each job, in which case the disposal of the used equipment becomes a problem.



Oakland Equipment Yard

During the past two years, Lynn Atkinson and his associates have completed two dams simultaneously—the Atkinson Construction Co. being organized specifically to build the Pardee dam, and Atkinson, Kier Bros., Spicer Co. to construct the Coolidge dam. These dams were probably the largest construction contracts in the west during this period, and required the assembly of unusually large equipment plants. In fact, no dams have ever before been so completely mechanicalized.

The disposition of this equipment, representing a total investment of considerably over $1,500,000, is a problem of especial interest on account of its magnitude and variety, much of it of a type not ordinarily used on stereotyped construction, such as highways, bridges, buildings.

Due to the interest of Lynn Atkinson in both copartnerships, it was possible to jointly arrange for the disposal of this equipment, through the organization of the Atkinson Equipment Agency, announced elsewhere in this issue, with headquarters in a yard in East Oakland at 9135 Russet ave., in charge of Neil G. Gibbons, manager.

The first problem was whether to store and attempt to sell the equipment at or near each dam, and 'as is' or reconditioned.

Globe Equipment Yard—For the reason that the Coolidge dam is far from a large center, like Los Angeles, entailing a high freight rate, and as there is a market for much of this equipment among the mines of Arizona, it was decided to establish the equipment yard at Cutter Siding, 7 miles east of Globe, which is not far from the dam. This yard covers a 5-acre tract, upon which suitable corrugated iron buildings were erected, having a floor space of 20,000 sq.ft. All of the tools, machinery, and equipment used on the Coolidge dam, totaling 2000 tons, was moved to this yard, completely reconditioned, and sold under the supervision of J. H. Johnston, manager. The sales have averaged over $10,000 per month since the yard was established.

Oakland Equipment Yard—Extensive advertising during the period of completion and clean-up at the Pardee dam, resulted in the sale of a large quantity of machinery at the damsite. Nevertheless, there still remained over 2500 tons to be disposed of, a problem of considerable magnitude. The past experience of these contractors in storing machinery in Northern California emphasized the necessity for consideration of climatic conditions in the selection of a storage site.

A thorough canvass was made of all available industrial tracts in the San Francisco bay region. Numerous tracts were offered the Atkinson Equipment Agency for lease at nominal rates, but subject to removal of equipment stored within thirty to sixty days; which made a leased yard economically inadvisable. The San Francisco side of the bay was next eliminated from consideration for climatic reasons—fog and dampness. The territory from Richmond to West Oakland and the Oakland harbor area also were eliminated, practically for the same reason. The East Oakland-San Leandro area was selected as the most desirable, for its preferable climate, accessibility, and, economics, land values promising a steady increase in value.

A tract of 15 acres was purchased on Russet ave. near Jones ave., between the Southern Pacific and Western Pacific railroad tracts. Instead of erecting temporary sheds, it was decided to build substantial warehouses covering an acre of space; one warehouse being 80 by 160 ft. These warehouses are semi-fireproof, of corrugated iron and glass construction, with railroad spur tracks and concrete platforms at car-platform height, and fully equipped with machine shops, power, light, telephone, and toilet facilities.

Over $100,000 has been spent in land, buildings, and spur tracks, which investment the company expects to write off by the sale and subdivision of ten or more acres of this tract, and rental of yard and warehouse space to contractors and equipment dealers, many of whom need facilities of this kind.

Warehouse at Oakland Yard

The surplus material from the Pardee dam (listed in detail elsewhere in this issue) required 160 cars of 30,000-lb. capacity to transport. Most of this equipment has been reconditioned, painted, and sorted and stacked in perfect order (a force of 10 to 12 men being constantly employed on this work), so that any piece, large or small, can be carefully inspected by the prospect-purchaser and shipped on short notice.

It is a revelation to visit this equipment yard and compare up-to-date methods in equipment storage, maintenance, and disposal, with the junk heap storage yards in vogue with most contractors in the past. Each year one sees more mechanical equipment on all kinds of construction. This problem of storage and disposal is therefore becoming a bigger factor to the contractor—for the successful contractor must use only new, or properly reconditioned machinery and tools. It will therefore be interesting to learn how this expensive venture of Lynn Atkinson and his associates turns out.

PERSONAL MENTION

Clarence Winnett, for six years in the engineering department of Columbia county, Washington, has been appointed as county engineer, with offices at Dayton.

Henry Canty has been appointed county engineer of Mason county, Washington, succeeding W. H. Wiley, resigned. Canty was for several years engineer for the Simpson Logging Co. of Shelton, Washington.

Charles H. Williams, for nine years an assistant district engineer in the Washington Department of Highways at Chehalis, has been appointed city engineer of Olympia, Washington, succeeding Charles I. Singer.

Hugh L. Cooper, hydraulic engineer of New York City and holder of the permit for developing hydroelectric power at Z canyon on Pend Oreille river, Washington, visited Spokane early this month. Cooper has been engaged in power development for the Russian Soviet and in Egypt, the work in both countries being well advanced.

Walter N. Frickstad, formerly senior highway engineer in charge of Federal Aid in the Western Region of the U. S. Bureau of Public Roads under L. I. Hewes, has been named city engineer of Oakland, California, succeeding George N. Randle, resigned. Frickstad graduated in civil engineering from the University of California; was assistant city engineer of Oakland from 1907 to 1919 (serving in the World War); and joined the Bureau in 1921.

Andrew M. Jensen, commissioner of public works, Fresno, California, since April, 1925, is resigning to reenter private practice in municipal engineering, with offices at San Francisco. Jensen graduated from the University of California in 1917; was deputy city engineer of Fresno from 1913 to 1914; served as city engineer of Clovis and Fowler from 1919 to 1925; was a member of a special engineering commission reporting in 1922 on the sewage disposal problems of Fresno.

Thomas H. Means, George A. Elliott, and **B. A. Etcheverry** have been appointed by the supervisors of Orange county, California, as a consulting board to conduct a new engineering survey and to formulate a new flood control plan for the county, having available all data obtained by the former county flood control engineer. The members of the board are all from northern California and were selected from a list of 18 names submitted to the supervisors on request by Henry D. Dewell, president of the San Francisco section, American Society of Civil Engineers. They were selected on three principles—competence, no previous connection with the project, and the need of at least one member (Means) who is a specialist on water percolation.

Ralph L. Parshall, senior irrigation engineer, division of agricultural engineering, U. S. Department of Agriculture, stationed at the Colorado Agricultural College, Fort Collins, has been honored by having the name of the improved Venturi flume changed to the 'Parshall Measuring Flume'. This flume, a device for measuring the flow of irrigation water, was described in the April 10th, 1929, issue, p. 193. The change of name was voted at a meeting of the special committee on irrigation hydraulics, American Society of Civil Engineers, held at Eugene, Oregon, and approved by all agencies concerned.

The idea for the flume was conceived in 1914 and the first experiments were made at the Fort Collins hydraulic laboratory in 1915 by Victor M. Cone, assisted by Parshall and Carl Rohwer. Cone left the experiment station in 1918 and the work has since been continued by Parshall, assisted by Rohwer. Experimental testing of flumes having high rates of discharge was in 1917 transferred to the Cornell University hydraulic laboratory—the facilities and funds at Fort Collins being insufficient. Further investigations on smaller capacity flumes at the Fort Collins and Bellevue laboratories in 1922 and 1923 led to many improvements and a perfection of the measuring device.

The Parshall measuring flume is a highly accurate device for measuring the flow of irrigation water and many of the flumes have been installed in irrigation ditches in various parts of the world, supplanting other measuring equipment, often found to be 10 to 20% in error. Although the original idea for the flume was not Parshall's, his experiments have been of such value that it was felt the flume should bear his name.

Burns-McDonnell-Smith Engineering Co., of Los Angeles and Kansas City, has been retained by the city of Palo Alto and Stanford University, California, to make a joint report on the reconstruction of a sewer outfall combining the sewage of both places, and to study sewage treatment—first for abating the present conditions around the outlets, and second, the possibility of reclaiming sewage for irrigation of a large tract of public land fronting on the bay. The company will also report on a new garbage incinerator plant and will either recommend methods of collection and incineration or the feasibility of hog-feeding as a method of garbage disposal.

This firm was retained February 13 to study the water works system and recommend improvements for the city of Fullerton, California, preparatory to a bond issue, and will be retained as consulting engineers during the construction period.

PORTLAND CEMENT CONCRETE CONTRACTORS

The first opportunity for California contractors who do monolithic concrete work, except those specializing exclusively in the construction of cement concrete roads and large buildings, to meet and talk over ways of increasing business will be afforded by gatherings planned by the Portland Cement Association in the following cities:

City	Date	Place	Hour
San Francisco	March 5, 1930	Palace Hotel, Parlor A	7:30 p.m.
Oakland	March 7, 1930	Builders Exchange	7:30 p.m.
Sacramento	March 11, 1930	Hotel Sacramento, Gold Room	7:30 p.m.

These meetings are to be informal presentations of material gathered from 1000 leading contractors, showing by the aid of illustrations how they solve local problems, develop new markets, and increase business. One of the men who made this extensive survey will lead the discussions.

This is a fine opportunity for concrete contractors to meet and discuss important problems.

OBITUARY

Charles T. Hutchinson, president and general manager since 1922 of the McGraw-Hill Co. of California, died on February 12 at his home near the Claremont Country Club, Oakland, at the age of 54.

Hutchinson had an interesting career, carving his way from an office boy at the Union Iron Works of San Francisco to a position of leadership, not only in the technical publication field but in the electrical industry of the Far West.

From 1894 to 1907 he was with the Union Iron Works, serving in practically every capacity from office boy to general manager of the mining machinery department. From 1907 to 1912 he was engineer-manager of the mining machinery department of the Joshua Hendy Iron Works, of San Francisco.

In 1912 he became editor of 'Western Engineering' and also editor of 'Metal Trades', published in San Francisco; and from 1915 to 1922 he was associated with T. A. Rickard as vice-president and general manager of the Dewey Publishing Co., publishers of 'Mining and Scientific Press', 'Western Engineering', and 'Metal Trades'. When this publishing company was absorbed by the McGraw-Hill Publishing Co., Inc., of New York, he became general manager for the Pacific Coast District.

Hutchinson was one of the few engineers who was universally and continually popular with his colleagues. He took an active part in many organizations, and was one of the founders and 'Live Wires' of the San Francisco Electrical Development League. He also was a contributor to McFarren's 'Stamp Milling' and Janin's 'Mining Engineers' Handbook'.

He was a member of the American Society of Mechanical Engineers, Engineers Club of San Francisco, and various other professional and social organizations.

Rocky Mountain Section, A. W. W. A.

Fourth Annual Convention Held at Denver, Colorado, February 13 and 14.

The fourth annual meeting of the Rocky Mountain Section, American Water Works Association, was held at Denver, Colorado, February 13 and 14.

This section was established June 7, 1926, for 'the advancement of knowledge of the design, construction, operation, and management of water works, and the encouragement, by social intercourse among its members, of a friendly exchange of information and experience along these lines'. Any member of the American Water Works Association in good standing, residing in Arizona, Colorado, Idaho, New Mexico, Wyoming, or western Nebraska, is entitled to membership in the section without the payment of dues or fees, except those required for membership in the national Association.

The program of the fourth annual meeting follows:

Morning Session, February 13, Paul R. Revis, chairman, presiding—

(1) Chairman's opening address, by Paul R. Revis, city engineer, Cheyenne, Wyoming.

(2) 'Corrosion and Conservation of Underground Structures', by J. P. Richards, consulting chemist, Denver, Colorado.

(3) 'Water Accounts and the Public', by G. C. Culberson, water works manager, Raton, New Mexico.

(4) 'Interesting Features of the Deming Water Works', by Albert Field, manager, water department, Deming, New Mexico.

Afternoon Session, February 13, Burton Lowther presiding—

(5) 'Recent Developments in Safeguarding Cross Connections' by H. E. Halpin, engineer inspection department, Associated Factory Mutual Fire Insurance Companies, Boston, Massachusetts.

(6) Inspection trip to view manufacture of lead pipe at the plant of the Bogue-Wensley Lead Co., Denver (transportation, courtesy Denver board of water commissioners).

(7) Inspection trip to the Capitol hill pumping station of the Denver Municipal water works (transportation, courtesy Denver board of water commissioners).

Evening Session, February 13, H. L. Warner presiding—

(8) Industrial motion picture on the 'Manufacture of McWane-Pacific Cast Iron Pipe' (Pacific States Cast Iron Pipe Co.).

(9) Industrial motion picture on 'Walls Without Welds—The Story of Seamless Steel Tubes' (National Tube Co.).

(10) Industrial motion picture on the 'Manufacture of Reinforced Concrete Pipe' (Lock Joint Pipe Co.).

(11) Industrial motion picture on 'Modern Methods of Trenching and Backfilling' (Wilson Machinery Co.).

(12) Miscellaneous motion pictures.

(13) Smoker and refreshments.

Morning Session, February 14, Paul S. Fox presiding—

(14) 'The Aurora Sewage Treatment Plant', by Jay McCullough, consulting engineer, Denver, Colorado.

(15) 'The Albuquerque, New Mexico, Iron Removal Plant', by F. M. Veatch, consulting engineer, Kansas City, Missouri.

(16) 'History of the Controversy Between Colorado and Kansas Concerning the Use of Water from the Arkansas River', by C. L. Patterson, consulting engineer, Pueblo, Colorado.

(17) Discussion on 'Problems of a Watershed Patrolman', led by S. F. Glass, sanitary inspector, Denver, municipal water works.

Luncheon Session, February 14, Paul R. Revis, presiding—

(18) Business meeting with report of secretary-treasurer, election of officers, and other business.

(19) Greetings from the national Association by Jack J. Hinman, president, Iowa City, Iowa, and Beekman C. Little, secretary, Rochester, New York.

Afternoon Session, February 14, Beekman C. Little presiding—

(20) 'Legal Phases of Municipal Water Storage', by Malcolm Lindsay, attorney, board of water commissioners, Denver.

(21) 'Treating a Tropical Water Supply' (illustrated), by Jack J. Hinman, associate professor of sanitation, University of Iowa, Iowa City.

(22) Round table discussions on: (a) Water meter setting, meter boxes, protection; (b) Water works plant beautification; (c) Water use promotion; (d) Activated carbon filtration; (e) Miscellaneous water works subjects.

Dinner Session, February 14, chairman-elect presiding—

(23) Banquet and entertainment.

Special Trip, February 15, with transportation by The Dorr Co., engineers—

(24) Inspection of Aurora, Colorado, sewage treatment plant.

The following were in office for the fourth annual meeting: Chairman—Paul R. Revis, Cheyenne, Wyoming; vice-chairman—D. D. Gross, Denver, Colorado; secretary-treasurer—Dana E. Kepner, Denver, Colorado; directors—D. V. Bell, Rock Springs, Wyoming; Paul S. Fox, Santa Fe, New Mexico; E. G. Gwillim, Sheridan, Wyoming; E. A. Lawyer, Fort Collins, Colorado; W. W. Nielsen, Santa Fe, New Mexico; and A. W. Stedman, Canon City, Colorado. The program committee for the 1930 annual meeting included Burton Lowther, chairman; Paul S. Fox; and H. L. Warner. (Changes in officers were not available at the time this issue went to press.)

Construction Review

SEWER CONSTRUCTION AND WATER SUPPLY SYSTEMS

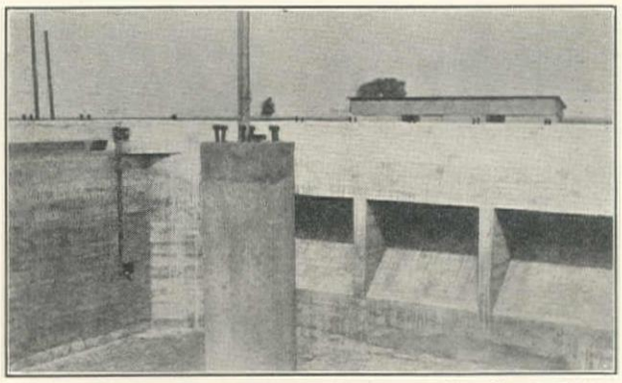
By S. J. SANDERS
Editor, Daily Construction News Service

SEWER CONSTRUCTION

Progress being made as follows on important projects:

SEWER SYSTEM AND DISPOSAL PLANT FOR SALINAS, CALIFORNIA

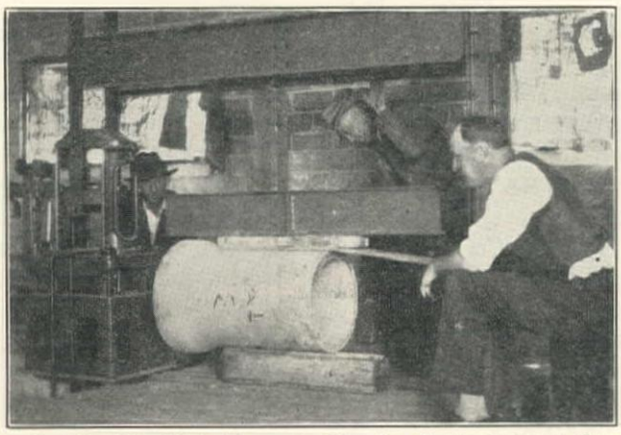
The sewage treatment plant for the city of Salinas, Monterey county, is 90% complete. All structural and concrete work on the blower house, aeration chambers,



Primary Clarifier Tank (Dorr Equipment Being Used) Salinas (California) Treatment Plant, E. M. Funk, Contractor

settling tanks, and digester is completed with the exception of the floating roof in the digester. The plant consists of preliminary clarification tank, aeration chambers, final settling tanks, and a separate sludge digestion tank with sludge drying beds, gas collection, and burning.

The principal mechanical equipment used in the



Testing Machine-Made Concrete Pipe for North Berkeley Storm Sewer, J. C. Hickey, Contractor

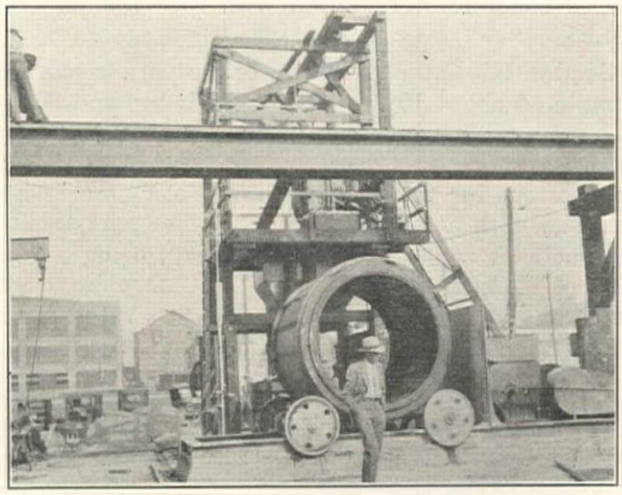
plant are Connersville air blowers, Fairbanks Morse & Co. sewage pumps, Barnes sludge pump, and The Dorr Co. clarifiers.

All structural work on sewage pumping stations is complete except the concrete roof on Cattlemens Lane station which has been delayed due to wet weather. The pumping equipment is being installed. The contract price for the above work was $102,900. E. M. Funk, of Arcadia, is the contractor on the disposal plant.

The storm water and sanitary sewer improvements are approximately 90% completed. Gladding-McBean & Co. furnished the vitrified pipe for sanitary sewer extensions and American Concrete Pipe Co. furnished the concrete pipe for sewage force main and storm water sewer extensions.

It is estimated that all work will be completed this month and the sewage treatment plant placed into operation about March 1.

Gogo & Rados, of Los Angeles, are contractors for



Hume Unit for 60-in. to 75-in. Pipe, North Berkeley Storm Sewer, J. C. Hickey, Contractor

the storm water and sanitary sewer improvements, and the contract price was $185,336.

Burns-McDonnell-Smith Engineering Co., of Los Angeles, are consulting engineers. The unit bid summary was published in the July 10th, 1929, issue.

NORTH BERKELEY SEWER SYSTEM, BERKELEY, CALIFORNIA

J. C. Hickey, of Alhambra, is making good progress on the construction of North Berkeley sewer system, Unit No. 4 of the city of Berkeley storm drain system. All pipe, 24-in. and smaller in diameter, has been manufactured by the California Concrete Products Co. at Oakland. The pipe 27-in. to 75-in. is being manufactured by the Hume centrifugal process in Oakland, by the American Concrete Pipe Co. The 75-in., 69-in., and 66-in. pipe is the largest centrifugal pipe cast to date on the Pacific Coast. Work in the field has been somewhat handicapped by weather conditions, but the

contractor is well organized and is at present laying 75-in. and 69-in. pipe on Marin Ave. near San Pablo. A Parsons ditcher is excavating an 8½-ft. trench, 15 ft. deep. The pipe is being laid with a Universal crane, and an Austin backfiller is being used. Project will be completed about May 1, 1930. The contract price was $221,666, and the unit bids were published in the Unit Bid Summary, issue of November 10, 1929. Sam A. Hart is the sanitary engineer for the city of Berkeley.

ALEMANY BLVD. STORM DRAIN, SAN FRANCISCO

Progress is being made as follows on two units of the Alemany Blvd. Storm Drain for the city and county of San Francisco:

Section A—Clinton Construction Co., of San Francisco, has completed 40% of the excavation. This excavation is being done by the Sibley Grading & Teaming Co. of San Francisco, using a 1¼-yd. Marion electric shovel. This section runs from Mission St. west. Work will be finished July 1, 1930. Project will cost $126,581, and involves in the main: 2293 lin.ft. 8-ft. 1½-in. by 10-ft. 3-in. arch section reinforced concrete storm drain with earth foundation at $41.50, and 800 lin.ft. 8-ft. 1½-in. by 10-ft. 3-in. arched section reinforced concrete storm drain with rock foundation at $31.25.

Section B—Eaton & Smith, of San Francisco, have completed about 10% of the pile-driving, and 80% of the grading in connection with this section running from Bayshore Blvd. west. H. V. Tucker Co. has the subcontract for the grading and is using an Osgood dragline with a 1¼-yd. bucket. Other equipment in use includes a pile driver, 70 ft. high, using a No. 1 Vulcan hammer 5000 lb.; a 10-hp. Caterpillar tractor for dragging the piles; and a band saw for sawing

Excavating Trench, Alemany Sewer Section A, Using Osgood Dragline, Clinton Construction Co., Contractors

form lumber. The piles average about 58 ft. long. Work will be finished about July 1, 1930. Contract awarded at $271,255, and involves in the main: 423 ft. 2-compartment 8-ft. 6-in. by 11-ft. reinforced concrete storm drain at $90; 2733 ft. 8-ft. 6½-in. by 12-ft. pile foundation, arch section reinforced concrete storm drain at $50; 300 ft. 8-ft. 6½-in. by 12-ft. earth foundation, arch section reinforced concrete storm drain at $47; 735 ft. 3-ft. by 4-ft. 6-in. reinforced concrete sewer at $10; 180 ft. 2-ft. 6-in. by 3-ft. 9-in. reinforced concrete sewer at $10; and 165,000 ft. piles, below cutoff at 35¢.

M. M. O'Shaughnessy is city engineer.

KLAMATH FALLS, OREGON

Sewer improvements for the City of Klamath Falls, Oregon, under bond issue have been completed as follows:

Unit No. 1—Construction of trunk sewer, J. F. Shea Co., of Portland, contractors. An Austin trenching machine and a Thew shovel were used. The depth of the sewer is from 7 to 17 ft. in soft wet ground. Drain tile 6-in. and cribbing were necessary on about 75% of

Constructing Chenery Reservoir, Port Costa Development, Calif. H. W. Rohl, Contractor for Embankment Placing and California Gunite Construction Co., Contractor for Lining

the work. Vitrified pipe was used, being furnished by Gladding-McBean & Co. Work cost $78,734, and involved 1583 lin.ft. 27-in. pipe sewer at $10.93; 1195 lin.ft. 21-in. pipe sewer at $7.75; 2477 lin.ft. 18-in. pipe sewer at $6.55; 4351 lin.ft. 15-in. pipe sewer at $5.30; and 1585 lin.ft. 12-in. pipe sewer at $3.90.

Unit No. 2—Consisting of pump-house for raising sewage to treatment plant, 40 ft. higher in elevation. J. F. Shea Co., of Portland, Oregon, were the contractors, and contract for the project including mechanical equipment amounted to $32,759. Two 30-hp. Fairbanks-Morse motors were used, and 312 lin.ft. of cast-iron swivel joint pipe was laid under the river. A Thew shovel was used and the pump-house was set in solid rock.

C. C. Kelley is city engineer of Klamath Falls; E. A. Thomas is assistant city engineer; and Clyde C. Kennedy, of San Francisco, was the consulting engineer.

CITY OF SAN DIEGO, CALIFORNIA

Point Loma Sewer System—Miracle Construction Co., of San Diego, completed its contract about De-

cember 1, 1929, for the construction of the Point Loma sewer system for the city of San Diego.

Work began in July, 1929, and was completed on November 28, 1929. There is 19 miles of sewer mains in the system, 16 miles of 6 and 8-in. and 3 miles of 10, 12, and 15-in., and system serves 850 acres of high-class residential property. Pipe is cement concrete. The contractor set up a plant and manufactured his pipe. Manholes are precast cement concrete. Sewage is collected in a settling tank and pumped into an existing 10-in. cast-iron outfall into the bay. This outfall was extended by adding 700 ft. of genuine wrought-iron pipe, painted with Bitumastic enamel and canvas wrapped. Trenches were all dug with Austin trenching machines, even on maximum grades of 45%.

Project was awarded at $118,567, unit bids published in our Unit Bid Summary, issue of May 25, 1929. H. W. Jorgensen is city engineer.

WATER SUPPLY SYSTEMS

Progress is being made on important projects as follows:

PORT COSTA DEVELOPMENT, CONTRA COSTA COUNTY, CALIFORNIA

Progress is being made as follows on Port Costa development of the California Water Service Co.—Public Works Engineering Corporation, engineers.

Chenery Reservoir—H. W. Rohl Co. completed em-

Laying Gunited Steel Pipe on Port Costa Development, Calif., Steel Tank & Pipe Co., Contractors

bankment, 450,000 cu.yd., on December 1, 1929. California Gunite Construction Co. completed the gunite lining of the reservoir early in January, 1930. E. H. Mellencamp has practically completed the intake and outlet towers.

Pipe-Line—American Concrete Pipe Co. has practically completed the 25,000 lin.ft. of 33-in. inside diameter Hume centrifugal concrete pipe in their contract.

Steel Tank & Pipe Co. have completed the 15,000 ft. of 36-in. inside diameter by ¼-in. welded and gunited steel pipe.

Intake Channel—The dredge 'Roberts Island', R. P. Easley, contractor, completed the dredging of the intake channel from the Sacramento river to the Mallard pumping station site early in January.

Temporary Pumping Plant—The temporary pumping plant at Mallard intake is nearly completed and it is expected that water will be pumped into the Chenery reservoir at once.

Mallard Pumping Plant—Equipment has been purchased and it is expected that construction of the station will be under way in a short time.

Chenery Filter Plant—The contract for the construction of Unit No. 1 of Chenery filter plant 4 m.g.d. capacity has been awarded to the Central Construction Co., of Oakland. Completion of this unit is expected by April 1.

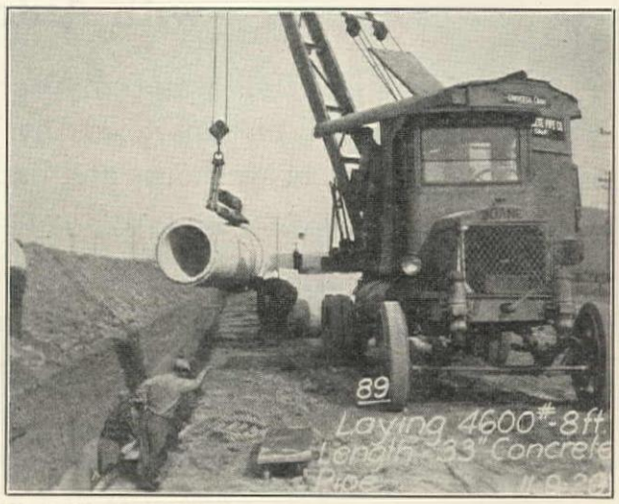
Chenery-Galindo Pipe-Line—An 18-in. pipe-line 10,850 ft. long is to be constructed in the immediate future. The contract for this work has been awarded to American Concrete Pipe Co. using centrifugally cast concrete pipe.

Completion—It is expected that water will be available for use from this project during April, 1930, and that all work will be completed by July, 1930.

E. K. Barnum is chief engineer; Oswald Speir is designing engineer; and R. F. Brown is project engineer for the Public Works Engineering Corporation.

NORTH CROW DAM, CITY OF CHEYENNE, WYOMING

A. H. Read Co., of Cheyenne, Wyoming, will complete contract about August 1, 1930, for constructing North Crow dam for the city of Cheyenne, located 29



Truck Mounted Universal Crane Laying 33-in. Concrete Pipe (4600 lb. 8 ft. length) Port Costa Development, Calif. American Concrete Pipe Co., Contractors

miles northwest of the city. The dam is earth and rock-fill type, 90 ft. high.

This work was discontinued on October 15, 1929, because of weather conditions and construction will be resumed about April 1, 1930.

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

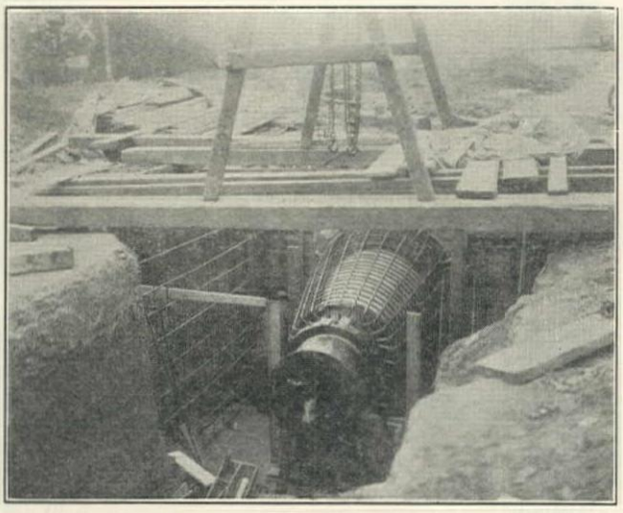
by the tractor. One Ingersoll-Rand '260' and one Gardner-Denver '220' compressors are furnishing air for the rock work. The 20-in. riveted steel pipe used in the tunnel was furnished by the Thompson Manufacturing Co., of Denver, Colorado.

Contract price $192,455, involving in the main 150,000 cu.yd. of embankment at 65¢ yd.; 25,000 cu.yd. of rock excavation at $1.20 yd.; and 1500 cu.yd. of concrete (cutoff wall) at $14.50 yd. P. R. Revis is city engineer of Cheyenne, Wyoming.

NORTHWEST PULL SHOVEL AND WHITE TRUCK IN USE ON CONDUIT NO. 13, CITY OF DENVER, LOCK JOINT PIPE CO., CONTRACTORS

CONDUIT NO. 13, CITY OF DENVER, COLORADO

Good progress is being made by the Lock Joint Pipe Co., of Ampere, N. J., and Denver, Colo., in connection with the construction of conduit No. 13 for the city of Denver.



Venturi Meter at Wgnetka, Conduit 13, Denver, Colorado, Showing Throat Ring and Reinforcing of Inlet End, Lock Joint Pipe Co., Contractors

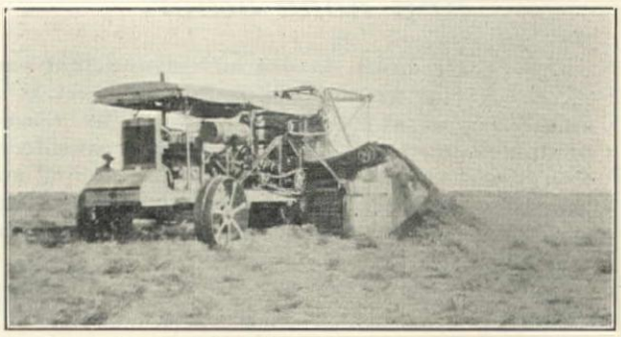
Job was bid on February 11, 1929, and an extension of three miles was obtained on August 19, all of which amounted to eleven miles of 60-in. concrete cylinder pipe, the same as manufactured for the East Bay Municipal Utilities District.

Manufacturing of this pipe was finished on November 8. Ten miles of pipe is laid, leaving 3800 ft., which includes 400 ft. of Cherry Creek crossing.

The line will be finished and tested by the end of March.

The contractor also set up on the same yard a centrifugal plant for the manufacture of five miles of 27-in. pipe which is now being laid at Greeley, together with 6000 ft. of 27-in. cylinder pipe.

The contractor is using two Northwest pull shovels, one American 25-ton crawler crane, three 8 by 6 Ingersoll-Rand compressors, two White trucks for delivery, four White trucks for hauling excess dirt away from the trench, one Jaeger one-bag mixer, one Koehring ½-yd. mixer, four C.H.& E. Mudhen diaphragm pumps, and three centrifugal pumps driven by Ford engines.



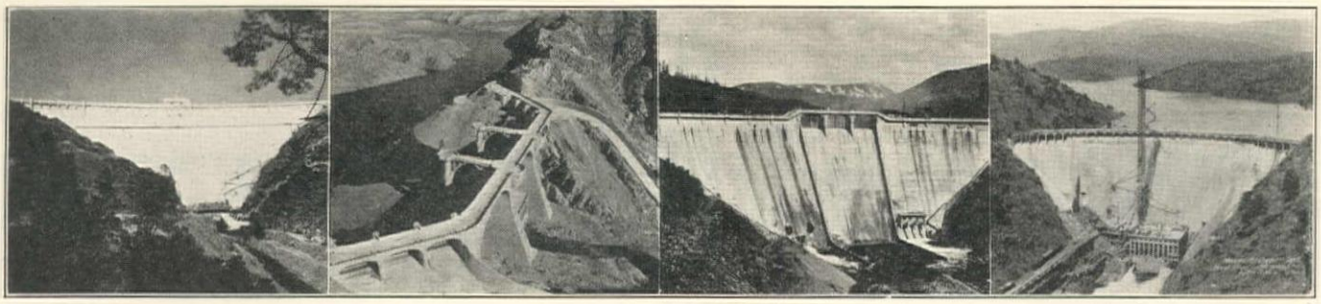
Trenching for Pipe Lines, City of Lamar, Colorado, Hayner & Burn, Contractors

On the Greeley job contractor is using one Northwest pull shovel, one Oshkosh one-bag mixer, two C.H.& E. Mudhen diaphragm pumps, one 8 by 6 Ingersoll-Rand compressor, and one White truck for delivery.

W. W. Trickey is superintendent in charge for the Lock-Joint Pipe Co. and D. D. Gross is chief engineer of the Denver Municipal Water Works. Total cost of Conduit No. 13 is $1,466,000.

PIPE SYSTEM FOR CITY OF LAMAR, COLORADO

Hayner & Burn, of Las Cruces, New Mexico, have completed their contract for constructing 12 miles of 14-in. pipe and 8 miles of 12, 10, 8, 6, 4, and 2-in. pipe



PARDEE DAM COOLIDGE DAM BULL RUN DAM EXCHEQUER DAM

Medal of merit awarded in appreciation of services at Pardee dam

PARDEE, Coolidge, Bull Run, Exchequer—each dam a lasting tribute to engineering genius—and each one built with the aid of complete rock handling plants designed and built by Bodinson engineers. Many other large dam projects in the West have likewise used our material handling equipment with complete satisfaction.

Crushing, screening, washing, classifying, conveying, weighing and loading operations are the principal functions of this type of labor saving machinery. Thirty years' experience and unexcelled manufacturing facilities in our new Bay Shore works are at your service. Bodinson engineers will promptly answer your inquiries.

Medal of merit awarded in appreciation of services at Coolidge dam

BODINSON

MANUFACTURING CO., Inc.

Labor Saving Machinery

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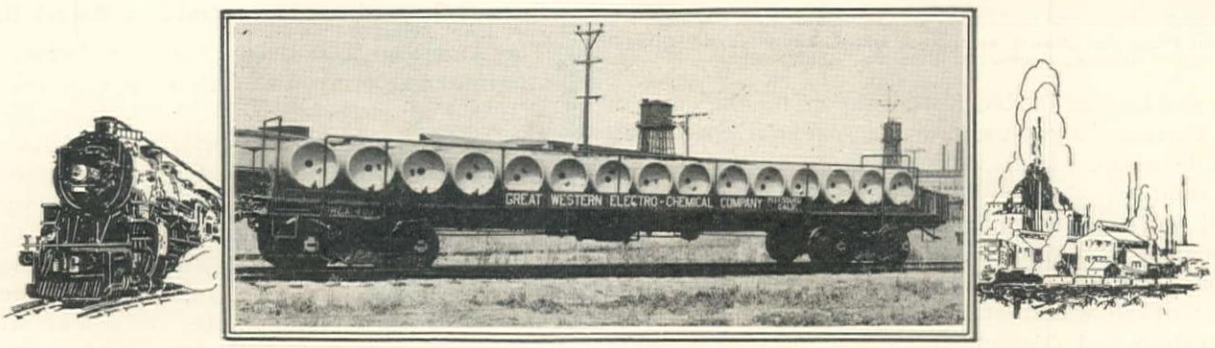


Chlorine for Sewage Plant Needs

Fourteen years ago the first chlorinating installation for a California sewage disposal plant began operation. In the same year, Great Western Electro-Chemical Company was established. Since that time eighteen more sewage disposal plants have adopted chlorination for sterilizing, and four use chlorine for odor control.

For efficient plant operation it is essential to have sufficient chlorine available, in quantities easily handled. To this end, Great Western provides chlorine in one-ton tanks, loaded on fifteen-unit cars. A ton tank is the most efficient unit for practically every sewage disposal plant—and the per-ton price is naturally more economical.

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

Great Western Electro-Chemical COMPANY

Plant at Pittsburg, Calif.

9 Main Street San Francisco

for the city of Lamar, Colorado. This work was finished in four months. Equipment used included a Buckeye trencher, an Austin trencher, a Northwest dragline, Chicago-Pneumatic compressors, and Austin backfillers. E. T. Archer & Co., of Kansas City, Mo., were engineers on the project. Contract price was $236,180.

RED BUTTE DAM, FORT DOUGLAS, UTAH

Utah Construction Co., of Ogden, Utah, have completed 64% of their contract for constructing Red Butte dam, earth-fill type to be 80 ft. high and 400 ft.

Pipe in Place for Closure Section of 4-ft. Conduit No. 13, City of Denver, Lock-Joint Pipe Co., Contractors

long and located in Red Butte canyon, for the office of the Constructing Quartermaster, War Department, Fort Douglas, Utah. Project will be finished during this summer.

All work on earth embankment construction was suspended November 23, 1929, owing to weather conditions, at which time the embankment was 81% complete; riprap was about 25% complete, outlet tunnel excavation and concrete lining had been completed; valve house at lower portal of tunnel about 25% complete; 12-in. cast-iron pipe was in place in tunnel, and sluice gates on job ready for installation at earliest date in spring.

Extensions to water distribution system at Fort Douglas have been completed.

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

ITEMS OF INTEREST

Golden Gate Bridge Studies

Borings for the Golden Gate bridge across San Francisco bay are being completed and the results are satisfactory, according to J. B. Strauss, chief engineer of the bridge commission. Detailed plans for the bridge will be completed by April and it is probable that a bond issue will be called during the fall of 1930. It is estimated that the total cost of the bridge project will not exceed $30,000,000.

Sparks, Nevada, Sewer System

Bids will be received until 8 p.m., March 24, by the city clerk of Sparks, Nevada, for the construction of an outfall sewer and sewage treatment plant, in two units. The work included in Unit No. 1 is: vitrified sewer—1391 lin.ft. of 21-in. and 150 lin.ft. of 10-in.; concrete sewer—3271 lin.ft. of 21-in. and 1275 lin.ft. of 12-in.; 13 sewer manholes; and 16,000 cu.ft. of concrete. Unit No. 2 contains: lump sum for structures and equipment for the complete sewage treatment plant, including venturi flume and outlet control box; 1700 cu.yd. grading, roadways, and fencing; 36 tons of reinforcing steel; and 2300 cu.yd. of grading for the aeration maze.

Plans can be secured from the city clerk, Sparks, or from the consulting engineer, C. C. Kennedy, Call bdg., San Francisco. C. C. Taylor is the city engineer of Sparks, Nevada.

Permit Granted for Richmond-San Rafael Bridge

The American Toll Bridge Co., San Francisco, has been granted a permit for a cantilever-type toll bridge, 17,000 ft. long, across San Pablo bay from Point San Pablo to McNears Point, California. Additional diamond drilling will be done for the main piers and plans and specifications will be issued soon, work being scheduled to commence within five months.

The bridge will consist of one 1500-ft. suspended span, one 1100-ft. cantilever span, and the remaining spans will each be 500 ft. long. One span will have a 200-ft. clearance and another a 175-ft. clearance, the rest tapering down. There will be 32 piers, 30 to 160 ft. from water surface to bedrock, and 30,000 tons of silicon and high-grade steel in the structure. The estimated cost is between $12,000,000 and $15,000,000. A more detailed description, illustrated, of this bridge will be published in the March 10th issue.

George Calder is chief engineer and Charles Derleth is consulting engineer for the American Toll Bridge Co., of which Oscar Klatt is president.

Portland Electric Power Co. to Install 2650-Hp. Boiler

The Portland Electric Power Co. will install a boiler at the East Lincoln st. steam plant, Portland, Oregon, rated capacity 2650-hp., with a heating surface of 26,500 sq.ft. The boiler will work under 450 lb. per sq.in. pressure, with steam at 725° F. The furnaces will burn hogged sawmill refuse or fuel oil.

New Equipment and Trade Notes

POMONA PUMPS FOR LOS ANGELES WATER SUPPLY

The water supply of the city of Los Angeles will be increased 10,025 g.p.m. by the installation of 6 Pomona 'Unidrive' turbine pumps at Kearsarge, in the Mono basin. The water will be pumped into the Los Angeles aqueduct, using lifts of 48 to 110 ft. A unique feature of the pumps is the fact that no oil will be used below the surface of the ground, the shafting being water-lubricated by a series of special bearings.

ANNUAL REPORT OF CATERPILLAR TRACTOR CO.

During 1929, the total earnings of the Caterpillar Tractor Co. before deducting Federal income tax were $13,059,634 as compared with $9,295,639 for 1928—an increase of 40%. For the same years, total net sales were $51,812,462 and $35,071,601 —an increase of 48%. The company operates plants at Peoria, Illinois; San Leandro, California; Minneapolis, Minnesota; and Stockton, California; and had 7368 employees at the close of 1929.

HERCULES POWDER CO. INCREASES PROFITS

The Hercules Powder Co., manufacturer of explosives, naval stores, nitrocellulose, purified cotton linters, and heavy chemicals, continued to expand both its domestic and export business last year, according to the annual report. Net profits for the period were $4,358,904 as compared to $4,038,981 for 1928. This represents earnings of $5.95 per share on the 598,000 shares of stock after payment of preferred dividends, as compared with $5.51 per share on 588,000 shares outstanding in 1928. Regular dividends of $3.00 and an extra dividend of $1.00 were paid during the year, representing an increase of $0.50 per share over dividends for the previous year.

Gross receipts for the year were $32,976,418 and surplus, December 31, following dividends and reserve transfers, was $13,380,596. Indicating the company's strong financial position, the current assets of $18,215,617 show a 13.7 ratio to current liabilities. Total assets of $44,030,051 are shown, a decrease from last year due to a change in the method of showing depreciation reserves on the statement. (An increase of $2,964,009 in total assets would otherwise have been shown.)

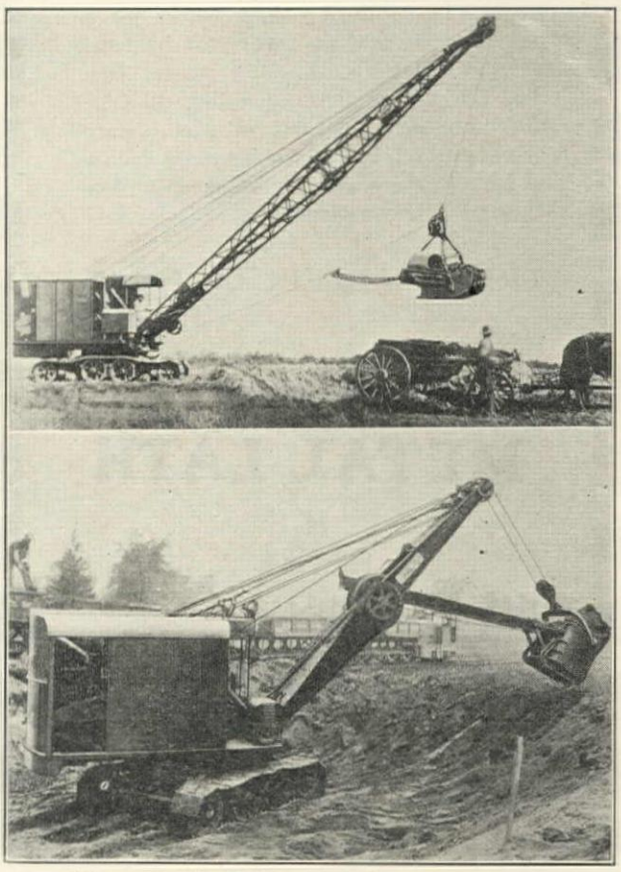
Increased efficiency in manufacturing processes, and new technical developments widening the company's markets were a feature of the business year. Units at Gillespie, New Jersey, and Bessemer, Alabama, for the manufacture of nitric acid by the oxidation of ammonia were completed during the year, and substantial additions and improvements gave increased capacity to the cotton linters and nitrocellulose plants. Expenditures for research and development were increased over those of 1928.

THE LORAIN-75-B ANNOUNCED

The Lorain-75-B, a new, improved heavy-duty 1¼-yd. machine, is announced by The Thew Shovel Co., Lorain, Ohio. Like the ¾-yd. Lorain-45, the 1-yd. Lorain-55 and the old 1¼-yd. Lorain-75-A, the new Lorain-75-B is of Thew center drive design in turntable, crawler and shovel boom. The Lorain-75-B improvements may be divided into those on the turntable and on the crawler mounting.

The general turntable changes consist of a heavying-up and increasing ruggedness throughout. Larger and more powerful power plants are provided by a Waukesha 'W.L.' gas engine rated at 97 hp., a 7 by 8½-in. Atlas imperial diesel, or a larger AC or DC electric motor. These motors have been selected for their 'follow-through' and reserve power characteristics, and any of them may be used without major changes to the turntable. Power is transmitted from these power plants through a power take-off and silent chain drive directly to the center drive pinion which in turn powers the three shafts, hoist, swing and travel or crowd. The application of power to all these shafts and operations is by means of newly designed, simplified internal expanding clutches of generous size. Roller-bearing type boosters on the hoist and swing shafts are provided for easier operation.

The primary change in the crawler mounting is that it is 12% longer than previously and 2300 lb. heavier. It is propelled by the Thew center drive, with newly designed driving pinions and, with the larger power plants, give 12% greater tractive effort. The major improvement in the propelling mechanism is on the steering and traveling clutches which are mounted on splined sections of a horizontal propelling shaft



(Upper) Lorain-75-B Center Drive 1¼-yd. Dragline
(Lower) Lorain-75-B Shovel

of increased diameter. The car body, a one-piece casting, is made heavier, with rigid radial bracing and is capable of supporting the entire dead weight of the unit, plus the tipping load of a 15-ton crane at any axle support. Any one of the four axles upon which this casting is mounted can support the entire unit by itself. All have been increased in size, the end axles being 7 by 7-in., an increase of 35%. Two crawler speeds of ¾ and 1½ m.p.h. are standard.

The standard crawler mounting has two self-laying crawler tread belts consisting of a total of 56 treads. By replacing the standard single end rollers with equalizer rocker arms, 64 and 68 tread crawlers with respective overall lengths of 14 and 15 ft. result. These mountings are available for dragline, backdigger, clamshell and crane use. Their greater length reduces ground pressures 15 to 25%, while the rocker action of the equalizer rocker arms prevents nosing-in and makes the unit self-adjusting to the unevenness of the ground in traveling.

McEVERLAST APPOINTS ADVERTISING MANAGER

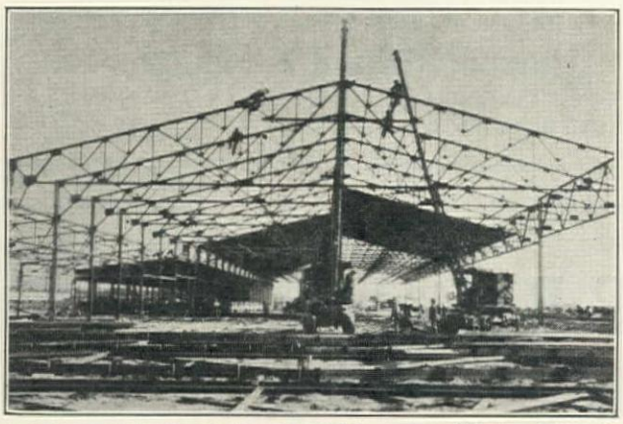
McEverlast, Inc., manufacturer and distributor of protective coatings for all types of engineering structures, and of the 'Hunt Process' method of curing concrete, announces the addition of O. A. Steller as manager of the advertising department at its Los Angeles headquarters.

For several years past, Steller has been the editor of 'Concrete', an engineering publication with an international circulation. Previously, he was in the headquarters office of the Portland Cement Association, Chicago, in the road bureau and in the advertising and publications bureau. During more than 10 years with these two organizations, Steller traveled extensively, visiting engineering projects and engineers in all sections of the country. He has contributed articles to many engineering magazines and has been active in engineering society attendance.

Previous to joining the Portland Cement Association, Steller was in responsible charge of mining engineering projects for the Peabody Coal Co. In addition, he has been employed on the engineering staffs of the Wisconsin Highway Commission; the Chicago, Milwaukee, St. Paul & Puget Sound, and the Chicago, North Shore & Milwaukee Electric railways; and the U. S. Geological Survey. He received his technical education at Marquette University and the University of Wisconsin.

UNIVERSAL CRANES FOR AIRPORT CONSTRUCTION

The Western Crane Service Corp. used two Universal cranes for steel erection on the Grand Central air terminal at Los



Two Universal Cranes Equipped with Temporary Timber Extensions Setting 100-ft. Trusses on Grand Central Air Terminal Hangar, Los Angeles

Angeles, California. This project was constructed at a cost of $1.00 to $1.10 per sq.ft. of hangar floor area.

AMERICAN HOIST & DERRICK CO. PRODUCES THE 'AMERICAN REVOLVER'

A new full-circle, long boom, broad gauge, crane and dragline is being offered by the American Hoist & Derrick Co., St. Paul, Minnesota, for use in the general construction, excavating, and sand and gravel industries. This machine will be known as the 'American Revolver'.

Its main features are a combination of advantages of both derricks and locomotive cranes—the ability to handle heavy working and lifted loads at wide working radius; ease of movement by wheel mounting on track, or skid and rollers over rough ground; simplicity of its all-steel construction, stability and ready adaptation to all classes of heavy crane, derrick, or dragline work.

Either steam, electric, diesel, or gasoline power can be furnished, and the machine mounted on 8 double-flanged wheels, wood skids, a barge, a pier, or a gantry, to suit requirements. The 'American Revolver' is available in three sizes, with booms 75, 85, or 100 ft. long, and 14 or 20 ft. turntable diameters.

The services of Inscoe R. Bailey have been secured to aid in the design and field adaptation of the new 'American Revolver'. Bailey was for some time engaged in the building and sale of similar equipment as a partner in the Dayton Whirley Co.

E. R. BACON CO. RESUMES BYERS LINES

The Byers Machine Co., Ravenna, Ohio, announces the appointment of Edward R. Bacon Co. as its sales representative in San Francisco and northern California. The Edward R. Bacon Co. will handle the entire Byers line, including ¾, 1, and 1¼-yd. shovels, cranes, draglines, trenchers, and skimmers, and will also carry replacement parts at the San Francisco headquarters.

Unusual interest attaches to this announcement, as the Bacon organization was previously the distributor in northern California for the Byers lines, with a continuous connection broken only during the past two or three years.

THICKNESS AND WEIGHT OF DeLAVAUD CAST-IRON PIPE

Apparently, it is the general belief that deLavaud pipe is manufactured only in the thicknesses and weights prescribed in the United States Government specifications.

We are pleased to announce, however, that we are making and constantly furnishing this product in strict accordance to the thickness and weights of the American Water Works Association and American Gas Association specifications and, furthermore, we are equipped to manufacture any thickness or weight which may be required. Consult our engineering force on any special pipe installations.

United States Pipe & Foundry Co.

NEW CATALOGS

Paper Bags—Taggart Bros. Co., Rochester, manufacturers of Bates multi-wall sewed-end paper bags, has published the results of a questionnaire sent to 15,420 contractors, from which 9017 replies were received. These contractors ranked the features of importance in the Bates bag as follows: non-returnable; waterproof; less costly than cloth; easier to load, unload, and handle; proof against warehouse set; breakproof; and leakproof.

Concrete Mixers—The Ransome Concrete Machinery Co., Dunellen, N. J., recently published Bulletin No. 122 on its 56 and 84-S mixers. These giant mixers are used on large construction projects, in industrial plants, in the mining industry, and for central mixing plants. Ransome has been making unusually large mixers since 1902—nine 56-S mixers were used on the Welland canal. Features claimed for this mixer are: unusually strong main frame, drum roller made of car-wheel iron, timken bearings protected by dust caps, drum roller tracks of solid locomotive tire steel, fast mixing action and accurate quality of mix, and spiral cut-off water tank.

Dry Chemical Feeders—Wallace & Tiernan Co., Inc., Newark, N. J., has released a broadside describing its new Type 'O' dry chemical feeders for water purification, water softening, sewage treatment, paper mills, industrial uses, chlorinated copperas, and dairies. This machine is designed to solve two main problems in dry feeding—it includes a flexing hopper with sufficient agitation to provide for an even flow of chemicals and an oscillating spout or feed-measuring member which is easily regulated to maintain a constant discharge. Features of the machine are said to be: adaptability for overhead feed, positive elimination of arching difficulties, continuous and uniform feed into the spout, clean and dustproof, wide feed range, sturdy construction and good finish, simple and accurate feed adjustment, no pulleys or belts, low power costs, long life, adaptable for direct and dustless feed and also for solution feed.

UNIT BID SUMMARY

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

BRIDGE AND CULVERTS

SACRAMENTO, CALIF.—REINFORCED CONCRETE—STATE—SISKIYOU COUNTY

Jacobs & Pattiani, 337 17th St., Oakland, who bid $71,548 submitted low bid to California Division of Highways, Sacramento, for reinforced concrete bridge 5½ miles north of Yreka, SISKIYOU COUNTY. Bids received on the following items:

(1) 920 cu.yd. structure excavation.
(2) 750 cu.yd. 'B' concrete.
(3) 790 cu.yd. 'F' concrete.
(4) 600 cu.yd. 'A' concrete.
(5) 22 cu.yd. 'E' concrete.
(6) 216,000 lb. reinforcing steel.
(7) 200 cu.yd. rubble masonry.
(8) Miscellaneous work.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Jacobs & Pattiani, 337 17th St., Oakland	2.95	18.00	30.00	28.00	75.00	.049	12.00	$200	$71,548
H. E. Doering, Portland	3.50	20.00	28.00	27.50	50.00	.05	14.00	450	71,990
F. J. Maurer, Eureka	4.00	16.00	33.50	28.25	62.50	.05	14.00	915	74,985
M. B. McGowan, San Francisco	4.00	13.00	36.00	29.00	65.00	.05	17.00	88	74,988
Skeels & Graham, Roseville	3.50	18.25	34.00	28.50	75.00	.055	11.50	160	76,857
Ward Eng. Co., San Francisco	3.25	16.80	33.50	28.85	93.00	.05	13.00	6,575	81,386
Lord & Bishop, Oroville	3.00	22.00	36.00	34.00	60.00	.048	9.00	100	81,688
Guy F. Atkinson, San Francisco	4.00	22.50	34.50	32.50	81.00	.047	12.00	250	81,894
Average bid	3.52	18.30	33.00	29.60	70.20	.05	12.80	1,093	77,000

SACRAMENTO, CALIF.—HUMBOLDT COUNTY—STEEL AND CONCRETE

Fred J. Maurer & Sons, Eureka, who bid $10,880, submitted low bid to California Division of Highways, Sacramento, for constructing concrete and steel undergrade crossing under the tracks of the Northwestern Pacific R.R., at Loleta, HUMBOLDT COUNTY. Bids received on:

(1) 300 cu.yd. structure excavation
(2) 1,900 ft. furnish redwood and test piles
(3) 60 each drive piles, including test piles
(4) 190 cu.yd. 'A' cement concrete
(5) 15,000 lb. reinf. steel
(6) 80,000 lb. structural steel
(7) 2,270 lb. cast steel
(8) 1 lot miscellaneous work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Fred J. Maurer & Sons, Eureka	1.40	.32	16.50	20.00	.05	.048	.12	$200	$10,880
Smith Bros. Co., Eureka	1.60	.60	15.00	17.40	.055	.05	.17	550	11,586

SEWER CONSTRUCTION

SAN FRANCISCO, CALIF.—CITY—REINF. CONC.—15TH STREET

Contract awarded to L. J. Cohn, 1 DeHaro St., San Francisco, $59,334, for constructing Sect. A of 15th St. sewer from Harrison St. to Howard St. for City. Bids from:

(1) L. J. Cohn, San Francisco $59,334
(2) Meyer Rosenberg, S. F. 62,529
(3) C. C. Haun, S. F. 64,206
(4) Rocca & Caletti, San Rafael 65,242
(5) Peter McHugh, S. F. 65,948
(6) Chas. L. Harney, S. F. $65,608
(7) M. B. McGowan, S. F. 69,291
(8) Healy-Tibbitts Const. Co., S. F. 65,819
(9) E. J. Treacy, S. F. 75,223
(10) MacDonald & Kahn, S. F. 75,769
(11) C. B. Eaton, S. F. 78,161

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
938 ft. 6 ft. 6 in. x 8 ft. 6 in. conc. sewer	41.00	46.10	44.00	43.10	46.15	47.00	47.00	48.00	53.72	57.50	57.80
232 ft. 6-ft. circular conc. sewer	30.00	30.49	29.50	30.70	32.95	30.00	35.00	30.00	34.66	32.50	40.00
1 taper connec.	$500	$500	$600	$520	$600	$400	$500	$600	$493	$580	$500
3 manholes	50.00	50.00	90.00	75.00	18.75	70.00	75.00	70.00	$100	$110	60.00
30 ft. 18-in. vit. sew.	3.00	2.00	7.00	5.00	6.70	2.25	5.50	5.00	3.50	2.50	5.00
20 ft. 15-in. vit. sew.	2.50	1.70	6.00	3.50	6.30	2.00	5.00	4.00	3.00	2.20	4.00
80 ft. 10-in. vit. sew.	1.00	1.25	3.00	3.50	1.90	1.50	3.00	3.00	2.00	1.00	1.50
1 manhole	$100	75.00	$190	75.00	75.00	90.00	$160	$100	$150	$100	$100
100 ft. 12-in. vit. drain	1.50	1.50	1.70	1.60	2.60	1.00	1.00	1.25	4.00	1.15	.75
150 ft. 10-in. vit. drain	1.40	1.30	1.40	1.25	2.50	1.00	.90	1.00	3.80	1.00	.60
300 ft. 8-in. vit. drain	1.25	1.10	1.20	.75	1.55	1.00	.40	.80	3.00	.70	.50
600 ft. 6-in. vit. drain	1.10	1.00	1.00	.50	1.60	.50	.30	.70	3.00	.60	.20
28,000 ft. piling	.40	.34	.44	.50	.40	.45	.52	.40	.41	.40	.45
Alt. high pr. pipe	$351	$500	$800	$1,500	$545	$225	$600	$320	$375	$1,050	$500

STREET AND ROAD WORK

OAKLAND, CALIF.—COUNTY—GRADING—SKYLINE BOULEVARD

Contract awarded to Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, $30,712 for grading 2¼ miles of Skyline Blvd. for County. Bids on:

(1) 90,000 cu.yd. roadway excavation
(2) 1200 ft. 12-in. corr. pipe
(3) 83,000 sta.yd. overhaul

	(1)	(2)	(3)	TOTALS
Granfield, Farrar & Carlin, S. F.	.29	2.40	.02	$30,712
J. P. Holland, S. F.	.33	1.85	.005	32,335
P. L. Burr	.325	2.25	.01	32,780
W. H. Hauser	.34	2.50	.02	35,260
Chigris & Sutro	.36	2.00	.005	35,215
C. A. Bruce & Sons	.39	2.17	.009	38,451
Marsh Bros. & Gardenier	.43	2.40	.01	41,510
R. L. Oakley	.43	2.50	.01	42,530
Larsen Bros.	.44	2.40	.01	43,310

	(1)	(2)	(3)	TOTALS
Central Constr. Co.	.45	2.50	.01	$44,330
Chas. Harlowe	.44	3.00	.02	44,860
R. G. LeTourneau	.45	3.00	.01	44,930
Kennedy-Bayles Constr.	.44	2.60	.03	45,210
Welsh & Murdock	.47	2.03	.02	46,396
Fredrickson & Watson	.48	2.75	.02	48,160
Tieslau Bros.	.50	1.50	.02	48,460
Lilly, Williard & Biasotti	.59	2.00	.015	56,745

SACRAMENTO, CALIF.—STATE—LOS ANGELES COUNTY—GRADING

H. E. Doering & Vonder Hellen & Pierson, 2442 Cedar St., Berkeley, who bid $537,629, low bid, to California Division of Highways, Sacramento, for 7.1 miles grading from Castaic School to Canton Creek, LOS ANGELES COUNTY. Bids received from:

(1) Doering & Vonder Hellen & Pierson $537,629
(2) H. W. Rohl Co., L. A. 540,264
(3) R. G. LeTorneau, Stockton 577,725
(4) Geo. Pollock Co., Sacramento 599.529
(5) T. M. Morgan Paving Co., L. A. 622,503
(6) Utah Const. Co., S. F. 638,771
(7) Guy F. Atkinson, S. F. 648,374
(8) J. G. Donovan & Sons, L. A. 653,792
(9) Sander Pearson 674,660
(10) Gist & Bell, Arcadia $684,447
(11) J. F. Shea Co., S. F. 710,063
(12) McCray Co. & Martter & Bock, L. A. 717,044
(13) Hanrahan Co., S. F. 722,677
(14) Isbell Const. Co., Fresno 794,156
(15) Fisher, Ross & MacDonald & Kahn 811,212
(16) Kern & Kibbe, S. F. 830,310
(17) Average Bid 673,000

Bids submitted on:

(A) 372 stations clearing and grubbing.
(B) 1,230,000 cu.yd. roadway excavation.
(C) 8,530,000 sta.yd. overhaul.
(D) 4,500 cu.yd. structure excavation.
(E) 715 cu.yd. "A" concrete (structures).
(F) 76.000 lb. reinf. steel.
(G) 5,222 ft. 24-in. corr. pipe.
(H) 1,218 ft. 30-in. corr. pipe.
(I) 726 ft. 36-in. corr. pipe.
(J) 340 ft. 48-in. corr. pipe.
(K) 62 6-in. reinf. conc. headers (cribbing).
(L) 150 10-in. reinf. conc. headers (cribbing).
(M) 442 6-in. reinf. conc. stretchers (cribbing).
(N) 180 8-in. reinf. conc. stretchers (cribbing).
(O) 46 10-in. reinf. conc. stretchers (cribbing).
(P) 350 ft. bank protection fence.
(Q) 11 miles new property fence.
(R) 372 stations finishing roadway.
(S) 138 monuments.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(A)	15.00	10.00	20.00	7.00	25.00	10.00	4.00	1.00	8.00	5.00	5.00	5.00	4.00	3.00	13.00	3.00	8.63
(B)	.36	.37	.35	.41	.43	.44	.46	.44	.475	.485	.48	.50	.5175	.54	.54	.585	.462
(C)	.005	.005	.01	.005	.0045	.006	.005	.0075	.005	.005	.008	.007	.005	.01	.01	.008	.0066
(D)	1.25	1.00	1.00	1.25	1.00	1.00	1.25	1.25	1.25	1.00	1.50	1.00	1.00	1.00	1.50	1.50	1.17
(E)	22.50	20.00	35.00	25.00	24.00	22.00	18.00	25.00	25.00	20.00	25.00	19.00	25.00	21.00	22.00	20.00	23.00
(F)	.045	.04	.05	.05	.05	.045	.04	.05	.04	.04	.05	.045	.05	.05	.05	.045	.046
(G)	1.00	.50	1.00	1.00	1.00	.75	.60	.80	.60	1.00	.75	.60	.50	.50	1.50	.50	.79
(H)	1.50	.70	1.35	1.25	1.25	.90	1.00	1.00	.70	1.00	1.00	.90	.50	.75	2.00	.75	1.03
(I)	2.00	1.00	1.75	1.50	1.50	1.10	1.25	1.25	.80	1.25	1.50	1.20	.75	1.00	3.00	1.00	1.36
(J)	2.50	1.00	2.50	2.00	2.25	1.75	3.00	1.50	1.20	1.50	2.00	1.50	1.00	1.50	4.00	1.50	1.92
(K)	3.50	4.00	3.75	3.50	3.65	3.80	4.00	4.35	3.85	3.50	4.40	4.00	3.50	3.80	4.00	3.40	3.81
(L)	4.50	4.50	4.75	4.75	5.00	5.15	5.00	6.15	4.90	4.50	6.00	5.15	4.75	5.00	5.00	4.70	4.99
(M)	3.00	4.00	3.25	3.25	3.35	3.00	3.00	3.55	3.10	3.50	4.00	3.05	3.00	3.15	3.50	2.90	3.29
(N)	3.50	4.00	3.75	3.50	3.85	3.60	4.00	4.40	3.55	4.00	4.70	3.65	3.60	3.75	4.00	3.40	3.83
(O)	4.00	5.00	4.75	4.50	4.75	4.60	5.00	5.65	4.45	4.50	5.75	4.65	4.50	4.85	5.00	4.35	4.77
(P)	1.00	1.00	6.00	5.00	2.75	7.00	4.50	5.00	5.00	5.00	5.00	4.00	5.00	10.00	5.00	3.50	4.67
(Q)	$500	$500	$500	$550	$400	$475	$400	$500	$500	$500	$500	$500	$500	$500	$600	$425	$491
(R)	10.00	10.00	5.00	10.00	10.00	6.00	5.00	10.00	9.00	10.00	10.00	10.00	5.00	10.00	15.00	10.00	9.07
(S)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

SAN DIEGO, CALIF.—CITY—ASPHALT—THORN AND TAMARACK STREETS

Bert Noble, 841 W. Beech St., San Diego, $226,901 as follows, only bid to City for improving Thorn and Tamarack Sts. (Bid rejected; work to be readvertised):

59,939 cu.yd. excavation ..... .96
41,641 cu.yd. embankment ..... .46
433,106 sq.ft. 6-in. asph. conc. pave. ..... .19
433,106 sq.ft. prepared subgrade ..... .03
35,472 sq.ft. sidewalk ..... .21
13,115 lin.ft. curb ..... .65
7,486 ft. 6-in. cast-iron water main 1.75
37 ft. 8-in. cast-iron water main 2.50
319 ft. 10-in. cast-iron water main 2.50
75 ft. 12-in. cast-iron water main 3.00
1 fire hydrant with anchor $150
9 fire hydrants $200
25 water services 25.00
152 ft. 6-in. cast-iron sew. main 2.50
2,087 ft. 6-in. conc. sewer main 2.00
84 ft. 8-in. cast-iron sew. main 3.00
318 ft. 8-in. conc. sewer main 2.25
5 dead ends 15.00
13 4-in. conc. sewer laterals 30.00
22 6-in. conc. sewer laterals 35.00
8 manholes $150
1 20-ft. curb inlet $200
4 type G curb inlets $180
1 type E curb inlet $200
310 ft. 18-in. rein. conc. steel culvert (heavy) 3.00
63 ft. 18-in. r.c. steel culv. med. 3.00
393 ft. 24-in. r.c. steel culv. heavy 5.00
15 ft. 12-in. corr. iron culvert 3.00
164 cu.yd. conc. in box sec. culv. 45.00
35 cu.yd. conc. in piers 40.00
364 ft. guard fence 3.00
3 clamp and shackle anchor for plugs 20.00

SALINAS, CALIF.—COUNTY—ROCK CRUSHING, ETC.

Contract awarded to A. Teichert & Sons, 1846 37th Ave., Sacramento, who bid $33,300 to County Clerk, Salinas, Monterey County, for crushing and stockpiling rock in Sup. Distr. No. 3 and 4. Bids received on the following items:

(1) 8,000 lb. broken stone, 1⅜ by ⅞-in.
(2) 4,000 lb. broken stone, ⅝ by ⅜-in.
(3) 4,000 lb. broken stone, 1¼ by ⅝-in.
(4) 2,000 lb. broken stone, ⅝ by ⅜-in.
(5) 4.000 lb. broken stone, 1¼ by ⅝-in.
(6) 2,000 lb. broken stone, ⅞ by ⅜-in.

	(1)	(2)	(3)	(4)	(5)	(6)	TOTALS
A. Teichert & Sons, Sacramento	1.25	1.55	1.35	1.65	1.30	1.60	$33,300
Meyer Rosenberg, San Francisco	1.31	1.31	1.35	1.35	1.35	1.35	31,900
Granite Construction Co., Watsonville	2.20	2.20	2.20	2.20	2.20	2.20	52,800

Bid of Meyer Rosenberg was irregular. C. F. Joy is Clerk of Board of Supervisors of Monterey County, with offices at Salinas, Monterey County. H. F. Cozzens is the County Surveyor.

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.

LARGE WESTERN PROJECTS

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

WORK CONTEMPLATED

Apartment hotel at Phoenix, Ariz., for Maude J. Kay; $1,500,000.

Manufacturing plant for Procter & Gamble at Long Beach, Calif.; $5,000,000.

Apartment on Hillcrest Road, Hollywood, Calif., for C. J. Bond; $800,000.

Hotel on Vine St., Los Angeles, for Hollywood Ritz-Carlton Holding Co.; $2,500,000.

Bridge from Richmond to San Rafael for American Toll Bridge Co., San Francisco; $12,000,000.

Purchase of land, tunnel, dam, reservoir, distributing lines, enlargement of aqueduct, for City of Los Angeles; $38,000,000.

Sewer improvements in Atherton and Fairoaks for San Mateo County, California; $278,000.

Levees, piling, etc., for Santa Clara River Protection Project, Los Angeles; $400,000.

School for City of Los Angeles, John Marshall High School; $400,000.

High school building for Newport Harbor Union High School District, Newport Beach, Calif.; $400,000.

BIDS BEING RECEIVED

Concrete paving from Freedom to North Pine, 8 miles, Spokane County, for State of Washington; bids to Mar. 4.

Concrete paving 7 miles in San Joaquin County for State of California; bids to Mar. 12.

BIDS RECEIVED

Grading in Los Angeles County, from Castaic School to Canton Creek, for California Division of Highways, H. E. Doering & Vonder Hellen & Pierson, Berkeley, $537,629, low.

Steam generator for City of Tacoma, Wash., power plant, General Electric Co., $366,000, low.

Hollow metal work for Los Angeles General Hospital, Dahlstrom Metallic Door Co., Los Angeles, $1,430,796, low.

CONTRACTS AWARDED

Immigration building at Seattle, Wash., for Government to E. Anderson, Tacoma, $517,588.

STREET and ROAD WORK

WORK CONTEMPLATED

EL CENTRO, CALIF.—Plans by City Engr., protests Feb. 26, for improving Seventh St., between Sandalwood Drive and Adams Ave., 1½-in. asph. conc. pavement on 3½-in. asph. conc. base, curbs, sidewalks, reinf. conc. water valve manholes, cast-iron frames and covers, 1-course 4-in. asph. conc. pavement. 2-14

LOS ANGELES, CALIF.—Plans by County Surveyor, protests March 17, for improving Avocado Crest Road, 11 miles involving 65,818 cu.yd. excavation, 488,225 sq.ft. 3-in., 367,170 sq.ft. 4-in., and 351,975 sq.ft., 1½-in. oil macadam, corr. pipe, etc., $128,300. 2-14

LOS BANOS, CALIF.—Plans by W. E. Bedesen, Engineer, Merced, and protests will be heard soon by City of Los Banos, for paving 16 blocks of city streets with 2½-in. gravel foundation and 5-in. asphalt paving. 2-15

MILL VALLEY, CALIF.—Plans by City Engr. F. Lascy, resolution of intention to be passed soon for paving with concrete 4 miles of city streets in burned area, $250,000. 1911-15 Acts. 2-10

SAN DIEGO, CALIF.—Plans by City Engr., H. W. Jorgensen, protests Mar. 3, for (1) Improving Nile St., involving 167,207 sq.ft. 6-in. concrete paving, 80 ft. 6-in. cast iron pipe; (2) Langley St., involving 27,166 sq.ft. 6-in. concrete paving, 720 ft. 4-in. cast iron pipe and (3) Meade Ave., involving 81,677 sq.ft. 6-in. asphalt paving, 610 ft. 4-in. cast iron pipe. 2-8

SAN DIEGO, CALIF.—Plans by H. W. Jorgensen, City Engr., for (1) Improving College Way, involving 67,025 sq.ft. 6-in. asphalt paving, 220 ft. 6-in. B cast-iron pipe, 1 settling tank; (2) Improving Edgemont St., involving 54,055 sq.ft. 6-in. concrete paving, 1448 ft. 6-in. 62 ft. 4-in. and 73 ft. 2-in. cast-iron pipe, 1 hydrant; and (3) Improving Lytton St., involving 92,872 sq.ft. 6-in. asphalt paving, 214 ft. 16-in., 1545 ft. 6-in., and 768 ft. 4-in. cast-iron pipe, 4 hydrants, concrete sewers, etc. 2-15

SAN LUIS OBISPO, CALIF.—Plans made protests Feb. 24 by County for improvement of streets in District No. 18, on portions of Bajada Ave., Dalzura Ave., Olmeda Ave., Tunitas Ave., Juanita Ave., San Jacinto Ave., Rosario Ave., Palma Ave., Traffic Way, Mariquita Ave., etc., located near the town of Atascadero, work for the Board of Supervisors of San Luis Obispo County. Work consists of paving with Bitumuls pavement wearing surface laid on water-bound macadam base, constructing gravel shoulders, header boards, corrugated iron culverts, concrete headwalls, welded iron water pipe, fittings, fire hydrants, etc. 1921 Act. 2-8

SUNNYVALE, CALIF.—Plans by Engineer H. N. Bishop, Bank of Italy Bdg., San Jose, protests Feb. 24 by City of Sunnyvale, for improving of portions of McKinley Ave., Carroll St., Iowa Ave., etc., grading, 2-in. Warrenite-Bit. surface pavement on 3-in. asphalt concrete base, cement concrete curbs, gutters, driveways, 4-in. cement concrete pipe house sewer laterals, ¾-in. galvanized water main service connections. 2-11

TRACY, CALIFORNIA—Plans by E. T. A. Bartlett, City Engr., protests Feb. 25 for improvement of portions of West Tenth St., East Tenth St., West Ninth St., East Ninth St., West Eighth St., East Eighth St., West Seventh St., East Seventh St., and other streets, work consisting of paving with 3-in. asphalt concrete surface on 4-in. cementing gravel base, constructing concrete curbs and gutters, installation of vitrified pipe sewers, galvanized iron water services, etc. 2-8

BIDS BEING RECEIVED

BERKELEY, CALIF.—Bids to 10 a.m., Mar. 4, by City Clerk for improving Boynton Ave., involving 4000 sq.ft. macadam paving, 8100 sq.ft. macadam resurfacing, etc. 2-15

LOS ANGELES, CALIF.—Bids to 2 p.m., Mar. 3, by County Clerk for improving ½ mile of Alma St., involving 4531 cu.yd. excavation, 39,965 sq.ft. 8-in. and 6-in. concrete paving, 14,400 sq.ft. 8-in. concrete paving, corr. pipe. $17,500. 2-14

LOS ANGELES, CALIF.—Bids to 2 p.m., Mar. 3, by County for improving Stockton Ave., involving 2495 cu.yd. excavation, 138,800 sq.ft. 6-in. concrete paving, etc. $36,000. 2-14

MARTINEZ, CALIF.—Bids will be opened Mar. 3 by County (received Feb. 17) for improving streets in District 3, town of San Pablo, paving with 3-in. Durite surface, 4-in. broken rock cushion, vitrified pipe. 1925 Act. E. A. Hoffman is Engineer. 2-17

MONROVIA, CALIF.—Bids to 7:30 p.m., Mar. 3, by City Clerk for improving Main St. involving: 14,250 ft. Class A curb; 27,850 sq.ft. 5-in. gutter; 1740 sq.ft. 8-in. cross gutter; 354,500 sq.ft. 6-in. asph. conc. pavement; 6850 sq.ft. 1½-in. asph. conc. pavement; 1868 ft. sewer house connections; 425 sq.ft. cement concrete pavement; reinforced concrete culverts, catch basins, and manholes; reinforced concrete pipe storm drain. 2-7

SACRAMENTO, CALIF.—Bids to 2 p.m., Mar. 12, by California Division of Highways, for the grading and concrete paving of 6.9 miles in SAN JOAQUIN COUNTY for Cherokee Station to Harney Lane, SAN JOAQUIN COUNTY. Work involves 47,800 cu.yd. roadway excavation, 33,400 cu.yd. imported borrow, 34,500 cu.yd. imported selected material, 15,000 cu.yd. concrete paving, 383,000 lb. reinf. steel, property fence, corr. pipe, 2180 bbl. fuel oil. 2-11

SACRAMENTO, CALIF.—Bids to 2 p.m., March 5, by California Division of Highways, Sacramento, for 1.4 miles grading and surfacing HUMBOLDT COUNTY from southerly boundary to Richardson's Grove, involving: 119,000 cu.yd. roadway excavation; 4050 cu.yd. gravel or stone surface; corr. pipe, etc. 2-5

SAN DIEGO, CALIF.—Bids to Mar. 3, by City Clerk for improving Yell St., etc., involving 188,000 sq.ft. 6-in. asphalt paving, 10,995 sq.ft. 6-in. concrete paving, 7217 ft. 6-in. and 868 ft. 8-in. cast iron pipe, 9 hydrants, concrete sewers, reinf. concrete and corrugated iron culverts. 2-15

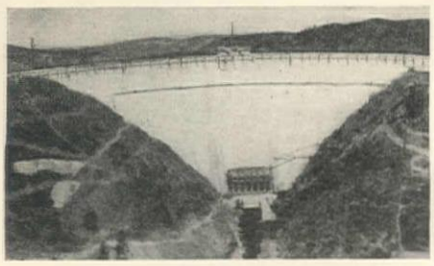
SAN JOSE, CALIF.—Bids to 11 a.m., Mar. 3, by County Clerk for: (1) Improvement of Ferguson Road, involving: 198,500 sq.ft. oil macadam pavement; (2) Improvement of Singleton Road, involving: 46,000 sq.ft. oil macadam pavement; (3) Improvement of Dempsey Road, involving: 140,150 sq.ft. oil macadam pavement. 2-6

SONORA, CALIF.—Bids to Mar. 4 by County for improving 2 miles of County Road, known as Fuller-Longway Road, 18 ft. wide and 11,213 ft. long, involving 8100 cu.yd. excavation; 26 ft. 6-ft., 202 ft. 4-ft., 26 ft. 18-in., and 708 ft. 12-in. corrugated culvert pipe; 65 cu.yd. concrete. 2-18

VENTURA, CALIF.—Bids to 11 a.m., Mar. 4, by County Clerk for improving 3.2 miles Grimes Canyon Road from Fillmore to Moorpark, involving 27,000 cu.yd. excavation, 5000 cu.yd. concrete paving, corr. pipe, etc. 2-6

CARSON CITY, NEV.—Bids to Mar. 5 by Nevada State Highway Com-

THE PARDEE DAM



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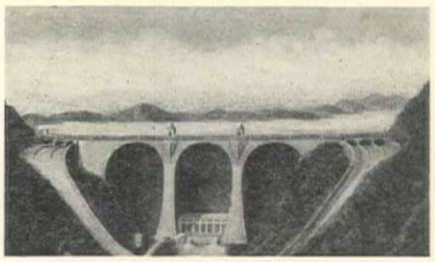

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Drill Sharpening Equipment
Electrical Equipment
Engineering Equipment
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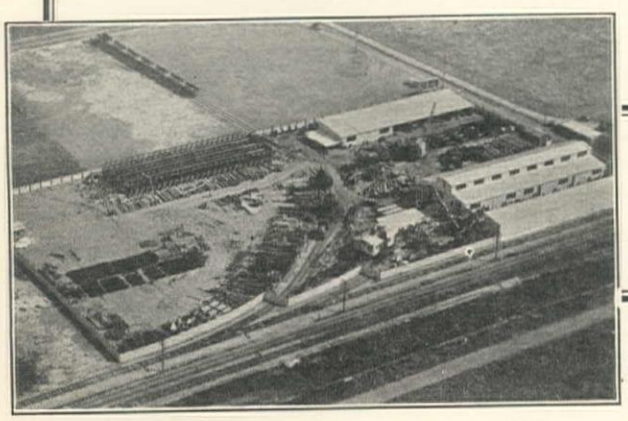
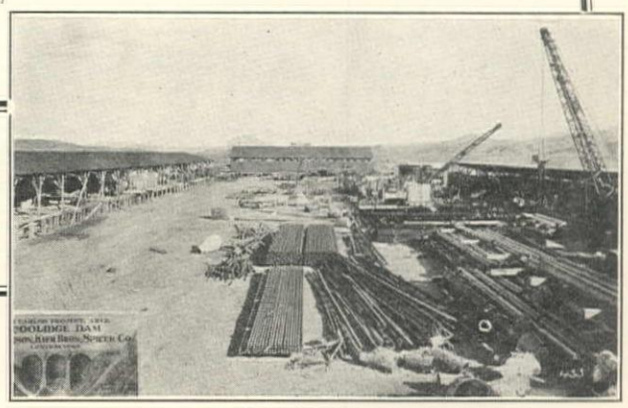


EAST OAKLAND YARD: 9135 RUSSET STREET
Between 92nd Ave. and Jones Ave.
CHARLES L. BRAINERD, *Yard Manager*

EQUIPMENT PLANTS



CUTTER SIDING YARD: 7 MILES EAST OF GLOBE, ARIZONA
J. H. JOHNSTON, *Yard Manager*

When writing to THE ATKINSON EQUIPMENT AGENCY, *please mention Western Construction News*

mission for 3.4 miles of road in Douglas County, from Minden north, involving 23,300 cu.yd. excavation, 48,532 sta.yd. overhaul, 3.44 miles preparation subgrade and shoulders, 8000 cu.yd. selected borrow excavation, 8500 cu.yd. rock or gravel, 205 cu.yd. 'A' concrete, 13,020 ft. remove and reconstruct fence. 2-18

PORTLAND, ORE.—Bids to 10 a.m., Feb. 27, by Oregon State Highway Commission: UNION AND UMATILLA COUNTIES—Kamela-Hilgard Section of the Old Oregon Trail. Construction of 14.5 miles of broken stone surfacing and furnishing broken stone in stockpiles, involving: 70,000 cu.yd. of broken stone. WILLIAMETTE VALLEY COUNTIES—Hillsboro-Eugene Rock Production Project. Furnishing approximately: 35,000 cu.yd. broken stone or crushed gravel in stockpiles along state highways in the Willamette Valley. CURRY COUNTY—Denmark-Port Orford Section of the Roosevelt Coast Highway, 10.9 miles of regrading and resurfacing work, and furnishing crushed gravel in stockpiles, involving: 63,000 cu.yd. excavation, 40,000 cu.yd. crushed gravel. JACKSON AND KLAMATH COUNTIES—Jenny Creek-Keno Section of the Green Springs Highway, 27.1 miles of roadbed widening and resurfacing work and furnishing of broken stone in stockpiles, involving: 27,000 cu.yd. excavation, 52,600 cu.yd. broken stone. KLAMATH COUNTY—Klamath Falls Oiling Project, construction of 46 miles of bituminous macadam wearing surface near Klamath Falls. LANE COUNTY—Glenada-Douglas County Line Section of the Roosevelt Coast Highway, 6.4 miles of grading, involving: 240,000 cu.yd. excavation. MALHEUR AND HARNEY COUNTIES—Vale Oiling Project. Construction of 11.4 miles of bituminous macadam wearing surface and application of 65.3 miles of bituminous surface treatment. This work is in the vicinity of Huntington, Ontario, Vale, Brogan, and Burns. MULTNOMAH AND HOOD RIVER COUNTIES—Portland-Hood River Sections of the Columbia River Highway, furnishing approximately 44,000 cu.yd. broken stone in stockpiles. 2-14

OLYMPIA, WASH.—Bids to 10 a.m., Mar. 4, by Samuel J. Humes, Washington State Highway Director, Olympia, for: KING COUNTY—Paving with cement concrete about 6.7 miles of State Road No. 1, Kent-Des Moines Road to Kits Corner. SPOKANE COUNTY—Paving with cement concrete about 8.1 miles of State Road No. 3, from Freedom to North Pine, Federal Aid Project No. 135-F. YAKIMA COUNTY—Surfacing and resurfacing with crushed stone about 10.8 miles of State Road No. 8, Toppenish to Toppenish Ridge, involving approximately: 14,620 cu.yd. crushed stone surfacing. 2-7

BIDS RECEIVED

LONG BEACH, CALIF.—D. P. Durham, 900 Raymond Ave., Long Beach, $35,306, low for improving Easy Ave., etc., with disintegrated granite paving, curbs, water mains, gas mains, etc. 2-13

OAKLAND, CALIF.—Central Construction Co., Oakland Bank Bdg., Oakland, $7438, low to Oakland Port Commission for macadam road at Transit Shed No. 2. 2-18

SACRAMENTO, CALIF.—H. E. Doering & Vonder Hellen & Pierson, 2442 Cedar St., Berkeley, $537,629, low to California Division of Highways for 7.1 miles grading from Castaic School to Canton Creek, LOS ANGELES COUNTY. (See Unit Bid Summary.) 2-13

SAN DIEGO, CALIF.—Bert Noble, 841 W. Beech St., San Diego, $226,901 low for improving Thorn and Tamarack Sts. (only bid submitted) for City, involving grading, asphalt paving, cast iron mains, concrete sewers, etc. Bids rejected, to be readvertised. 2-5

CONTRACTS AWARDED

PHOENIX, ARIZ.—To Schmidt & Hitchcock, Phoenix, $13,621 to City for improvement of Tenth Ave., between Jefferson and Adams Sts., work consisting of 5-in. bitulithic pavement on bituminous concrete 6-in. base, sidewalks, curbs, gutters, combined curb and gutter, single curb, metal street signs. 2-17

PHOENIX, ARIZ.—Awards as follows by City: (1) To J. C. Steele Const. Co., Phoenix, Ariz., $42,500 for improving Jefferson St., concrete paving, concrete pipe, etc.; and (2) To Pacific Const. Co., Phoenix, $22,225 for improving Lincoln St. and Third Ave., Warrenite and concrete paving, concrete pipe, etc.

CULVER CITY, CALIF.—To Los Angeles Paving Co., 3200 E. Vernon Ave., Los Angeles, who bid $93,172 for resurfacing Washington Blvd., between Culver Blvd. and east city limits, for City. Work involves 534,467 sq.ft. removal of surface, 6680 tons Permanite wearing surface. 2-17

FRESNO, CALIF.—To Thompson Bros., Fresno, who bid $3302 for curbs and sidewalks on Inez St., between Ventura and Huntington, for City. 2-7

HERCULES, CALIF.—To Peres & Gatto, 475 10th St., Richmond, who bid $8521 for oil macadam paving and constructing concrete bridge for the City. 2-6

HUNTINGTON BEACH, CALIF.—To V. R. Dennis Construction Co., 3911 Fifth Ave., San Diego, $54,635 to City for 1,000,000 sq.ft. 1-in. to 6-in. asphalt resurfacing of Main, Delaware, and 17th Sts. 2-5

LOS ANGELES, CALIF.—Awards as follows by City: (1) To M. J. Simunovich, 1414 Hillcrest Ave., Glendale, $55,065, for improvement of streets in Valley View Trail and Cahuenga Trail, by grading, concrete paving, curb, storm drain, sanitary sewer, and water system. (2) To Will F. Peck Co., 1120 Las Palmas Ave., Los Angeles, who bid $66,544 for improvement of Vineland Ave., between Erwin St. and Oxford St., by grading, concrete pavement, curb, sidewalk, sanitary sewer, house sewer, water system, etc. 2-7

LOS ANGELES, CALIF.—Awards as follows by City: (1) To George Kemper, 3701 Overland Ave., Palms, who bid $73,206 for improvement of Ave. 45 and Canon Crest Ave. Improvement District, by grading, concrete paving, sanitary sewer, water system, etc. (2) To Campbell-Reichert Co., Inc., 4000 Whiteside Ave., Alhambra, who bid $117,728 for improvements in Glenalbyn Drive and Glenalbun Way Improvement District, by grading, concrete paving, sanitary sewer, water system, reinforced concrete retaining walls, concrete retaining walls, reinforced concrete stairway, etc. 2-7

LOS ANGELES, CALIF.—To G. H. Oswald, 366 E. 58th St., L. A., $55,597, for improving Cerritos Ave. for County, grading, concrete paving, corr. pipe. 2-5

LOS ANGELES, CALIF.—To Geo. H. Oswald, 366 E. 58th St., L. A., $115,098, for improving Blake Ave. and Riverdale Ave., grading, concrete paving, storm drain, sanitary sewer, water system for City. 2-5

LOS ANGELES, CALIF.—To Martter & Bock, 1007 S. Harvard Blvd., Los Angeles, $22,350 for improving streets in San Fernando and Mission Blvd. Dist., grading, concrete paving, water system, etc.

MILL VALLEY, CALIF.—To Lee J. Immel, 1031 Evelyn Ave., Berkeley, $6241 for improving Circle Ave. for City, concrete paving, vitr. sewers, etc. 2-14

OAKLAND, CALIF.—To Granfield, Farrar & Carlin, 65 Hoff Ave., San Francisco, who bid $30,712 for grading 2¼ miles of Skyline Blvd., on Alternative B, for County. 2-18

OAKLAND, CALIF.—To J. H. Fitzmaurice, Builders Exchange, Oakland, who bid $0.157 to City Clerk for improvement of 35th avenue, involving: 8278 sq.ft. concrete sidewalk. 2-7

OROVILLE, CALIF.—To Western Roads Co., 1305 28th St., Oakland, who bid $10,984 to City for widening and improving Downer St., under Acq. & Imp. District No. 4, regrading, sidewalks, curbs, gutters, retaining walls, cast-iron drains, Warrenite-Bit. asphalt concrete pavement, etc. 2-5

OROVILLE, CALIF.—To C. W. Wood, P. O. Box 1435, Stockton, who bid $41,602 to City for improvement of streets in Acq. and Imp. Dist. No. 3, including Washington Ave., between Yard St. and Oro Ave., grading, macadam paving, concrete sewers, corr. culverts, etc. 2-10

PACIFIC GROVE, CALIF.—To Clark & Henery Construction Co., Chancery Bdg., San Francisco, $12,792 for improvement of 19th St. for City, work involving: 500 lin.ft. concrete curbs and gutters; 55,000 sq.ft. 3-in. rock base with 2-in. asphalt surface; 150 lin.ft. corrugated pipe; 500 lin.ft. 4-in. vitrified sewer. 2-8

ROSS, CALIF.—To A. N. Bennett, San Anselmo, $1219 for paving Poplar Ave. with Bitumuls for City. 2-14

SAN FRANCISCO, CALIF.—To Union Paving Co., Call Bdg., San Francisco, $14,868 for Topeka surfacing Pier 48 for Board of State Harbor Commissioners. 2-5

SANTA BARBARA, CALIF.—To Western Motor Transfer Co., 116 State St., Santa Barbara, $24,620 for improving Los Olivos St., paving with asphalt, vitr. sewers, etc., for City. 2-10

SANTA ROSA, CALIF.—Awards as follows by County: (1) To J. V. Galbraith, P. O. Box B2, Petaluma, $12,910 for grading 1½ miles of Hilton Road; and (2) To J. V. Galbraith, P. O. Box B2, Petaluma, $31,608 for concrete paving Sect. A, Petaluma-Point Reyes Road. 2-13

WILMINGTON, CALIF.—To Sully-Miller Contracting Co., 1500 Seventh St., Long Beach, who bid $21,787 to Union Pacific Ry. for paving and construction of sidewalks, etc., at the Ford plant, Wilmington, to connect with Badger Ave. 2-17

HOOD RIVER, ORE.—To Johnson & Rosten, Portland, Ore., $14,719 for grading Road No. 5 near Trout Creek State for County.

PORTLAND, ORE.—To C. T. Malcom, Walnut Creek, for 165,000 cu.yd. roadway excavation in connection with grading 7.7 miles Siuslaw National Forest Highway in LANE COUNTY, Oregon, for Bureau of Public Roads. Contract for this project awarded to Morrison-Knudsen Co., Boise, Idaho, at $517,472. 2-5

SALT LAKE CITY, UTAH—To Morrison-Knudsen Co., Boise, Ida., $152,620 for grading and gravel surfacing from Red Narrows to Thistle, UTAH COUNTY, for State.

BELLINGHAM, WASH.—To R. G. Stevenson, 1327 Northlake Ave., Seattle, $82,116 for paving Dupont St., Elm St., etc., for City.

OLYMPIA, WASH.—Awards as follows by State: (1) To L. J. Dowell, Seattle, who bid $97,941 for grading, draining, and surfacing 5.3 miles of State Road No. 2, from Falls City west in KING COUNTY, including widening of existing 18-ft. span concrete bridge, constructing 40-ft. reinforced concrete T-beam bridge. (2) KITSAP AND PIERCE COUNTIES—To C. L. Creelman, Seattle, who bid $12,344 for clearing, grading, draining and surfacing about 0.9 mile of State Road No. 14, Navy Yard Highway, from Burley to Pierce County line. (3) KITSAP COUNTY—To S. A. Moceri, Tacoma, who bid $50,971 for clearing, grading, draining, and surfacing 2 miles of State Road No. 21, from Silverdale to Keyport, Federal Aid Project 175 A, including pile trestle 83 ft. long with concrete dock. 2-7

BRIDGES and CULVERTS

WORK CONTEMPLATED

RICHMOND, CALIF.—Permit granted by War Department, Washington, D. C., to the American Toll Bridge, 525 Market St., San Francisco, for the construction of a toll bridge across San Pablo Bay, from Point San Pablo, north of Richmond, Contra Costa County, to McNears Point, Marin County. The first work to be done is additional diamond drilling borings for the main piers. Plans and specifications for the structure are now being prepared for submission to contractors. Work should commence within four to five months. The bridge will be similar in type to the Carquinez Bridge and will be cantilever type, 17,000 lin.ft., consisting of one 1500-ft. suspended span, one 1100-ft. cantilever span, and the remainder 500-ft. anchor spans. The clearance of one of the spans is to be 200 ft., another of the spans is to be 175 ft., and the remainder tapering down to less. Work will involve 30,000 tons of silicon and high-grade steel, and 32 piers 30 to 160 ft. to bedrock below water surface. The bridge

is to have a 30-ft. roadway and two sidewalks. Estimated cost of the above structure is from $12,000,000 to $15,000,000. Geo. Calder is Chief Engineer for the American Toll Bridge Co., and Chas. Derleth, University of California, Berkeley, is the Consulting Engineer. 2-11

BIDS BEING RECEIVED

LONG BEACH, CALIF.—Bids to 2:30 p.m., Feb. 28, by City Manager for concrete retaining wall and stairway along the ocean bluff between the easterly line of Redondo Ave. and the easterly line of 36th Place. 2-17

OROVILLE, CALIF.—Bids to 2 p.m., Mar. 3, by County for 2 reinforced concrete bridges on Clark Road, $2400. 2-7

SACRAMENTO, CALIF.—Bids to 2 p.m., Mar. 12, by California Division of Highways for reinf. concrete bridges from Lodi to Stockton, SAN JOAQUIN COUNTY, involving 1500 cu.yd. concrete, 240,000 lb. reinf. steel. 2-11

SONORA, CALIF.—Bids to Mar. 4 by County for 26-ft. concrete bridge over Curtis Creek at Soulsbyville, involving 85 cu.yd. concrete and 7970 lb. reinforcing steel; $2700. 2-18

PORTLAND, ORE.—Bids to 10 a.m., Feb. 27, by Oregon State Highway Commission for: KLAMATH COUNTY—Bridge over the Klamath River on Green Springs highway at Keno, involving 1210 cu.yd. concrete, 245,000 lb. metal reinforcement. LANE COUNTY—Dismantle old steel bridge over Willamette river at Springfield and reconstruct same over Coast Fork of Willamette river on county road one mile east of Creswell, involving 34,000 lb. structural steel, in addition to that taken from the old bridge. UNION COUNTY—Bridge over Grande Ronde River on Old Oregon Trail, about 7¾ miles west of La Grande, work involving the following approximate quantities: 840 cu.yd. concrete, 160,000 lb. metal reinforcement. CLATSOP COUNTY—Bridge over Necanicum river on Roosevelt Coast highway about 3 miles south of Seaside, involving 1600 lin.ft. piling, 390 cu.yd. concrete, 74,000 lb. metal reinforcement. Also bridge over Wahanna Creek on the Roosevelt Coast highway at the north city limits of Seaside, involving 3500 lin.ft. piling, 815 cu.yd. concrete, 148,000 lb. metal reinforcement. Included in this contract will be the construction of a bridge over a private road about 9½ miles north of Seaside, involving 78 cu.yd. concrete, 14,000 lb. metal reinforcement. 2-11

BIDS RECEIVED

SACRAMENTO, CALIF.—Jacobs & Pattiani, 337 17th St., Oakland, $71,548, low bid to California Division of Highways for reinforced concrete bridge north of Yreka, SISKIYOU COUNTY, for California Division of Highways. (See Unit Bid Summary.) 2-13

SAN RAFAEL, CALIF.—John Carcano, 122 Clorinda St., San Rafael, $1842, low for reinforced concrete bridge on Tiburon Blvd. near San Clemente. 2-11

CONTRACTS AWARDED

STOCKTON, CALIF.—To Ralph Hunter, 2825 S St., Sacramento, $7200 for reflooring with redwood Old River Bridge on Borden Highway for County. 2-17

TILLAMOOK, CALIF.—To Clackamas Const. Co., Colton, Ore., $19,076 for steel and concrete bridge over Nestucca River at Woods for County. 2-10

VALLEJO, CALIF.—To Louis Tagnon, 1735 Napa St., Vallejo, at $2654 for reinf. conc. culvert with wooden pile foundation on Sonoma St. for City. 2-15

EVERETT, WASH.—To Geo. H. Date, Everett, $16,820 for bridges No. 11 and 64 on Marysville-Arlington Road for County, bridges to be concrete and creosoted lumber.

SEWER CONSTRUCTION

WORK CONTEMPLATED

PHOENIX, ARIZ.—At election held Feb. 11 by City, proposition to vote $817,000 for sewer mains and treatment plant failed to carry. 2-13

REDWOOD CITY, CALIF.—Plans being prepared by County Surveyor, Geo. A. Kneese, Court House, Redwood City, San Mateo County, and hearing of protests have been postponed until Mar. 3, with reference to the construction of a complete sewer system in portions of the towns of Atherton and North Fairoaks. Work involves the following approximate quantities: seven miles of 6-in., 8-in., 10-in., 12-in., 15-in., 18-in., and 30-in. pipe sewer, part vitrified and part concrete; $278,000. 1921 Act. 2-18

LAS VEGAS, NEV.—Engineers, Koebig & Koebig, Rowan Bdg., Los Angeles, estimate cost of sewer improvement for City of Las Vegas, Nev., at $200,000, including pipe system to cost $120,000, and disposal plant to cost $50,000. 2-17

WALLA WALLA, WASH.—Plans by City Engr. for sewer system in southeast section of City to cost $32,000.

BIDS BEING RECEIVED

HEALDSBURG, CALIF.—Bids to 7:30 p.m., Mar. 3, by City Clerk for 7000 ft. 6-in. vitr. or concrete sewer, $7000. 2-13

OCEANSIDE, CALIF.—Bids to 7:30 p.m., Mar. 12, by City Clerk for improving The Strand from Sixth St. to Ninth St. and The Strand from Ninth St. to Pacific St., work involving 534 ft. 6-in. cast-iron sewer pump main, 1962 ft. 8-in. vitrified pipe sewer, 663 ft. 6-in. vitrified pipe sewer, 2 concrete flushtanks, 7 concrete manholes, 1 reinforced concrete pump station (100 cu.yd., with two 4-in. sewer pumps, 10-hp. motors); $12,000. 1911 Act. 2-17

SPARKS, NEV.—Bids to 8 p.m., Mar. 24, by City Clerk, Sparks, Nev., for the construction of an outfall sewer and treatment plant. Bids are being received as follows: UNIT No. 1—Work involving 1391 lin.ft. 21-in., and 150 lin.ft. 10-in. vitrified sewer, 3271 lin.ft. 21-in. and 1275 lin.ft. 12-in. concrete sewer, 13 sewer manholes, 16,000 cu.ft. concrete. UNIT No. 2—Work involving lump sum for structures and equipment for the sewage treatment plant, complete, from and including the venturi flume to and including the outlet control box, together with grading (1700 cu.yd.), roadways, and fencing; 36 tons reinforcing steel, and 2300 cu.yd. grading (aeration maze). C. C. Kennedy, Call Bdg., San Francisco, is Engineer. 2-18

CONTRACTS AWARDED

AVALON, CALIF.—To Santa Catalina Island Co., P. E. Bdg., Los Angeles, who bid $79,086 for constructing vitrified pipe sewer, rein. conc. well, cast-iron gas main, and cast-iron outfall sewer on portions of Crescent Ave., Hiawatha Ave., etc., for City. 2-5

LOS ANGELES, CALIF.—To M. Brkich, 1207 Hibernian Bdg., Los Angeles, who bid $32,995 for the construction of a sewer in Summerland Ave. and Marshall Court Sewer District, work for the City. 2-8

OJAI, CALIF.—To C. N. Hoak Co., 12 Virgal Walk, Long Beach, who bid $12,525 for construction of additions to sewerage disposal plant, including cast-iron and vitrified pipe, Imhoff tank, dosing tank, sprinkler filters, sludge digester and pump-house, etc., work for the City. 2-8

SALINAS, CALIF.—To Granite Const. Co., Watsonville, $2253 for sanitary sewer from Alisal St. to Griffin St. for City. 2-13

SAN DIEGO, CALIF.—To C. R. Abbott, 4569 Brighton Ave., Ocean Beach, who bid $7416 for a reinforced storm drain at Fallbrook, for San Diego County. 2-18

SAN FRANCISCO, CALIF.—To L. J. Cohn, 1 De Haro St., San Francisco, $59,334 for concrete sewer on 15th St. from Harrison St. to Howard St. (Section A), work for the City and County of San Francisco. (See Unit Bid Summary.) 2-14

SAN JACINTO, CALIF.—To Culjak & Zelko, 1358 So. Bonnie Beach Place, Los Angeles, $71,000 for vitr. pipe sewer, sewage disposal plant, etc., for City. Koebig & Koebig, Rowan Bdg., Los Angeles, are Engineers. 2-14

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

PHOENIX, ARIZ.—At election held Feb. 11 by City, proposition to vote $2,636,000 bonds for pipe lines, reservoir, pumps, etc., failed to carry. 2-13

LAKEPORT, CALIF.—City is considering installation of concrete water tank, 70 ft. diameter and 12 ft. deep, to cost $2885. D. F. McIntire is City Engr. 2-8

LOS ANGELES, CALIF.—Bond election in May by the City of Los Angeles to vote on issuing bonds of $38,000,000 for: $18,000,000 for purchase of Inyo and Mono County lands and water rights; $7,500,000 for tunnel from Mono basin to the present aqueduct system; $8,250,000 for dam and reservoir construction; $3,269,000 for distribution lines; $600,000 for enlargement of the aqueduct. 2-11

MARYSVILLE, CALIF.—Plans by W. C. Morse Co., Engineers, Smith Tower, Seattle, for connecting pipe, tank, etc., for City of Marysville, Wash., involving 50 cu.yd. concrete, 300 ft. 8-in. cast-iron pipe, 150 ft. 8-in. sewer pipe, 100,000 gal. steel tank with high water level elevated 100 ft. above foundations. Call for bids to be issued about March 1. Estimated cost $11,000. Work under Bond Issue of $15,000, voted. 2-15

TULARE, CALIF.—Plans by R. M. Berryhill, City Engr., for sinking well, and installing mains, etc. 2-13

ABERDEEN, WASH.—Plans by S. C. Watkins, Superintendent and Engineer of Water Department, Aberdeen, Wash., for replacing approximately five miles of 28-in. continuous wood stave pipe. This pipe was of douglas fir staves, cut and milled locally. Constructed in 1916. Call for bids will be published later, and will be considered on untreated and treated wood stave pipe, steel pipe, and concrete pipe. The line is a gravity flow line, total length 22 miles, maximum heads on replacement portion 150 ft., minimum 40 ft. Payment for work will be made from water funds; no bond issue necessary. 2-10

HOQUIAM, WASH.—Bond election Mar. 1, by City, to vote $100,000 for construction of an industrial pipe-line about 9000 ft. long, estimate based on steel pipe with no restrictions on use of wood, subject to latest specifications, pipe about 32 in. E. J. Austin is City Engineer. 2-13

BIDS BEING RECEIVED

BEVERLY HILLS, CALIF.—Bids to 8 p.m., Mar. 4, by City for installing about 3400 ft. of 8-in. outside diameter casing pipe-line for the Water Department. Salisbury, Bradshaw & Taylor, 745 Petroleum Securities Bdg., Los Angeles, are the Engineers. 2-17

BEVERLY HILLS, CALIF.—Bids to 8 p.m., Mar. 4, by City for drilling one 14-in. rotary type gravel envelope well for the Water Department. Salisbury, Bradshaw & Taylor, 745 Petroleum Securities Bdg., Los Angeles, are the Engineers. 2-17

SAN DIEGO, CALIF.—Bids to 10 a.m., March 17, by City Clerk, for construction of Morena Reservoir dam and spillway and safe duty enlargement, involving: 18,000 cu.yd. excavation and embankment, 1000 cu.yd. concrete and rubble masonry, 38 tons reinforcing and struc. steel, 22 automatic flash gates, furn. and install. Raising outlet tower and furnish and install appurtenances. 2-13

STRATHMORE, CALIF.—Bids to 7 p.m., Mar. 3, by H. B. Kober, Clerk of the Strathmore Public Utility District, Strathmore, for construction of a pumping plant. 2-17

WATSONVILLE, CALIF.—Bids to 7:30 p.m., Mar. 11, by City Clerk, M. M. Swisher, Municipal Office Bdg., Watsonville, for: (1) A concrete slope and bottom lining, concrete piers and wooden roof, together with certain piping, water measuring device, and other improvements for and at the two main distributing reservoirs at Freedom Village, about 2 miles west of north of the business district of the City of Watsonville. (2) A slow sand-filter plant having a nominal maximum capacity of 2.5 million gallons daily, embracing a sedimentation basin, 5 filter units, sand storage bin, filtered water basin, 50,000 gallon storage tank, head house, tool and store house, together with all piping and appurtenances, at and in the vicinity of Corralitos Village, about 7 miles west of north of the business district of the City of Watsonville. Work involves: 6700 cu.yd. excavation for structures; 2550 cu.yd. concrete, mostly reinforced; 212,000 ft. B.M. lumber in roofs, etc.; 6000 lin.ft. water and drain pipe, 1-in. to 20-in., and of various materials. H. B. Kitchen is City Engr. and Chas. G. Hyde is Consulting Engr. 2-10

McMINNVILLE, ORE.—Bids to 7:30 p.m., Feb. 27, by Water and Light Department, McMinnville, Ore., for one diesel engine, ranging from 1500 to 1600-hp. for stationary duty in electric generating plant. 2-18

BIDS RECEIVED

ST. HELENA, CALIF.—Tay-Holbrook Co., $340 low for galvanized pipe and fittings for City. 2-13

CONTRACTS AWARDED

CULVER CITY, CALIF.—To Boase & Allen Co., 6027 Vinedale Ave., Maywood, who bid $6537 to City for temporary pumping and pressure plant, together with laterals therefrom, in Municipal Improvement District No. 5. 2-17

LOS ANGELES, CALIF.—To Pittsburgh-Des Moines Steel Co., 322 S. San Pedro St., Los Angeles, who bid $9490 to County for hemispherical bottom tank of 150,000 gal. capacity, without structural steel support for mud drum, to be installed in County Water Works District No. 1. 2-13

MANTECA, CALIF.—To American Cast Iron Pipe Co., San Francisco, $1516 for furnishing cast-iron pipe to City. 2-7

MODESTO, CALIF.—Awards as follows by City: (1) To Osterburg Bros., Modesto, $1750 for drilling and casing well; and (2) To American Cast Iron Pipe Co., San Francisco, $2529 for furnishing 2000 ft. 10-in. and 120 ft. 14-in. cast iron pipe. 2-15

MOUNTAIN VIEW, CALIF.—To C. Dudley DeVelbiss, 354 Hobart St., Oakland, at $10,249 for water system improvements for City, consisting of reservoir, pump house, pump, motor, and fittings, well and pump complete, cast-iron pipe, etc. C. C. Kennedy, San Francisco, is Engineer. 2-13

ST. HELENA, CALIF.—To Pacific States Cast Iron Pipe Co., San Francisco, $2565 for cast-iron pipe and fittings for City. 2-13

SEATTLE, WASH.—To J. F. Ward, Inc., Lyon Bdg., Seattle, $89,196 for constructing concrete intake, sluice valves, etc., to Lake Youngs aqueduct at the diversion dam of the City of Seattle's water supply on the Cedar River. Work for City. (See Unit Bid Summary, Feb. 10 issue.) 2-8

STEVENSON, WASH.—To A. Del Guzzo, Montezano, Wash., who bid $34,913 to the City for pipe system, using steel or wood pipe, and the construction of a 200,000-gallon concrete-lined reservoir. 2-10

IRRIGATION and RECLAMATION

WORK CONTEMPLATED

BIEBER, CALIF.—Application filed by Antone Avilla, Bieber, Lassen County, California, for appropriation of 4200 ac.ft. per annum storage from Juniper Creek in Lassen County for irrigation on 1120 acres, involving 10,000 ft. earth ditch, 5 by 3 by 3 ft., and small earth diversion dam; $10,000. 2-18

COVINA, CALIF.—Permit granted to Henry Hay, Trustee of San Dimas Water Co., Covina, Los Angeles County, for appropriation of 16.8 c.f.s. of water from Puddingstone Canyon in Los Angeles County, for irrigation on 4422 acres, involving: PIPE-LINES—23,950 ft. 20-in., and 13,000 ft. 16-in. steel, concrete or reinforced concrete; $60,000. Work to start at once. 2-18

KNIGHTS LANDING, CALIF.—Application filed by T. J. Cummins Ranch Co., Knights Landing, Yolo County, for appropriation of 5.96 c.f.s. of water from Sacramento River in Sutter County for irrigation on 476 acres, involving 5000 g.p.m. pump plant, and 4800 ft. earth ditch, 20 by 4 by 3 ft. Est. cost $7000. J. Crowley Robbins, Engineer. 2-18

LODI, CALIF.—Application filed by Smith-Riddell Co., Lodi, Calif., for appropriation of 11.8 c.f.s. of water from Upland Canal in San Joaquin County for irrigation on 945 acres near Lodi, involving 3100 ft. earth ditch, 10 ft. wide on top, 4 ft. wide on bottom (depth of water, 2 ft.); 2700 ft. 24-in. reinforced concrete pipe, one 36-in. diameter corrugated pipe, one 15-in. centrifugal pump (lift 16.5 ft., electric motor, 40-hp.); $13,500. Work to start at once. Chas. H. Widdows, 327 E. Channel St., Stockton, is the Engineer. 2-18

LONG BEACH, CALIF.—Permits to Palomar Estates, Ltd., c/o C. D. Beauchamp, President, 15 Locust St., Long Beach, as follows: (1) Appropriation of 3.62 c.f.s. of water from Pauma Creek in San Diego County for irrigation and domestic use on 917 acres near Pala, Calif., involving: PIPE-LINE—606 ft. 20-in., 4566 ft. 16-in., and 1430 ft. 12-in. wood-stave and steel pipe. STORAGE DAM RESERVOIR No. 1—65 ft. high, 640 ft. long on top, 270 ft. long on bottom, 15 ft. wide on top, 2½ to 1 slope front and 2 to 1 slope back. DAM RESERVOIR No. 2—70 ft. high, 370 ft. long on top, 35 ft. on bottom and 15 ft. wide on top, slope same as above. DAM RESERVOIR No. 3—50 ft. high, 892 ft. long on top with one wing 305 ft. and the other 222 ft. long, 40 ft. long on bottom, 12 ft. wide on top, slope same as above; $115,000. Work to start at once. (2) Appropriation of 1.25 c.f.s. of water from Nigger Creek in San Diego County for domestic use near Pala, Calif., involving: SMALL DIVERSION DAM, 7212 ft. 6-in. pipe; $10,000. Work to start at once. 2-18

LOS ANGELES, CALIF.—Plans completed by Engineer, H. L. Jacques, Water and Power Bdg., Los Angeles, and bids will be called for shortly for the Santa Clara River Protection Project, made necessary by the failure of the St. Francis Dam. Work involves 70,000 lin.ft. of earth, gravel, and sand levees (about 5 cu.yd. of material to the lineal foot); 7500 lin.ft. double row 'A' creosoted timber piles, and 15,000 ft. of electric-welded steel wire mesh fence; 2300 ft. rail-type tetrahedron jetties (using old 60-lb. rails); 38,000 ft. double row pipe piling (using 4-in. to 6-in. pipe), and 76,000 ft. of wire fencing; $400,000. Funds have been appropriated to cover the cost by the City of Los Angeles. 2-17

POWER DEVELOPMENT

BIDS RECEIVED

TACOMA, WASH.—Bids as follows by Board of Contracts and Awards, 307 City Hall, Tacoma, for furnishing and erecting one 27,777-kva. steam turbine generator set and accessories for use with proposed steam power plant for City:

General Electric Co.	$366,000
Westinghouse Electric & Manufacturing Co.	368,500
Allis-Chalmers Co.	370,450

2-5

SWIMMING POOLS

WORK CONTEMPLATED

PITTSBURG, CALIF.—Plans by City Engr., Geo. Oliver, for municipal swimming pool at Municipal Park to cost $15,000. 2-7

RIVER AND HARBOR WORK

BIDS BEING RECEIVED

SACRAMENTO, CALIF.—Bids to 11 a.m., Mar. 5, by U. S. Engineer Office, California Fruit Bdg., Sacramento, for furnishing labor and materials for dredging about 1,772,000 cu.yd. of material in New York Slough and Suisun Bay, first unit of Stockton Deep Water Channel, under Prop. No. 30-267, Spec. No. 1600. 2-5

SAN FRANCISCO, CALIF.—Bids to 3 p.m., Mar. 12, by U. S. Engineer Office, 401 Custom House, San Francisco, for furnishing all labor and materials, and performing all work for dredging about 683,200 cu.yd. of material in Suisun Bay Channel. 2-11

MISCELLANEOUS

BIDS BEING RECEIVED

LOS ANGELES, CALIF.—Bids to 2 p.m., Mar. 2, by Clerk, Board of County Supervisors, for concrete smokestack adjoining east wall of the power house at Los Angeles General Hospital. It will be 130 ft. high with inside diameter of 7 ft. 10½ in. to 6 ft. 2-14

MARE ISLAND, CALIF.—Bids to 11 a.m., March 19, by Public Works Officer, Navy Yard, Mare Island, for completion of cleaning and painting of five 450-ft. steel towers at the Navy Yard, Radio Station, Mare Island. 2-11

SOUTH SAN FRANCISCO, CALIF.—Bids to 11 a.m., Mar. 26, by Public Works Officer, Navy Yard, Mare Island, for painting masts, Naval Radio Station, South San Francisco, under Spec. 5945. Work involves cleaning and painting two 225-ft. wood lattice masts, including steel connections, bolts, etc. 2-15

HAWTHORNE, NEV.—Bids to 11 a.m., Mar. 12, by Bureau of Yards and Docks, Navy Department, Washington, D. C., for construction of chimney, under Specification No. 5908, chimney to be reinforced concrete, at Naval Ammunition Depot, Hawthorne, Nevada. 2-10

SURETY BOND AND CASUALTY INSURANCE DIRECTORY

LIGHTING SYSTEMS

WORK CONTEMPLATED

SACRAMENTO, CALIF.—Plans by City Engineer, protests Mar. 3 for 8 electroliers, etc., on J St. from Ninth to Tenth Sts. 2-18

TRACY, CALIF.—Plans by City Engr., E. T. A. Bartlett, American Bank Bdg., Tracy, protests Feb. 25 for street lighting system consisting of 63 ornamental single lighting standards, with concrete foundation piers, etc., to be on Eleventh St. from West Park Subdivision to East Street. 2-8

MACHINERY and SUPPLIES

BIDS BEING RECEIVED

MADERA, CALIF.—Bids to 10 a.m., Mar. 4, by County for three fire truck chassis and equipment. 2-11

DELANO, CALIF.—Bids to 7:30 p.m., Mar. 3, by City Clerk for furnishing a motor truck for the Water Department. Alternate bids on half, one, and one and one-half ton trucks. 2-11

BIDS RECEIVED

OAKLAND, CALIF.—Pacific Coast Engineering Co., foot of 14th St., Oakland, $8468, low for dredge hull and ladder pipe for Oakland Port Commission. 2-18

TACOMA, WASH.—Pacific Water Works Supply Co., Tacoma, $5077, low for cast-iron pipe for City. 2-13

CONTRACTS AWARDED

ALHAMBRA, CALIF.—To Builders Iron Foundry Co., Providence, R.I., who bid $1350 to City of Alhambra, for furnishing water meter and recorder. 2-10

LOS ANGELES, CALIF.—To Kimball-Krogh Pump Co., at $33,112 for eight deep well pumps and motors, under Adv. 1275 for Los Angeles Water & Power Department. 2-6

OAKLAND, CALIF.—To U. S. Steel Products Co., Rialto Bdg., San Francisco, who bid $30,926 for furnishing and delivering track materials for the Ninth Ave. Pier, about 300 tons of rails and other track materials for Oakland Port Comm. 2-10

SAN ANSELMO, CALIF.—To M. Greenberg's Sons Co., San Francisco, who bid as follows for furnishing 60 fire hydrants to the City: Per 2½-in. single hydrant, $30.00; per 2½-in. double hydrant, $40.00. 2-6

BUILDING CONSTRUCTION

WORK CONTEMPLATED

PHOENIX, ARIZ.—Plans by H. B. Traver, Architect, Union Insurance Bdg., Los Angeles, for a 13-story and basement, A apartment hotel building to be erected on Washington St., between 7th and 8th Sts., for Maude J. Kay. Concrete construction, $1,500,000. 2-5

HUNTINGTON PARK, CALIF.—Plans by B. Marcus Priteca, Architect, 915 Warner Bros. Downtown Theatre Bdg., Los Angeles, for construction of a Class A theatre and store building at Huntington Park for Warner Bros. Pacific States Theatres, M. A. Silver, General Manager. Steel and concrete. $250,000. 2-14

LONG BEACH, CALIF.—Plans by W. H. Austin, Pacific South Bank Bdg., and Schilling & Schilling, Farmers & Merchants Bank Bdg., Long Beach, Architects, for a new club building on Cedar Ave., near Ocean Blvd., Long Beach, for the Long Beach Elks. Reinforced concrete. $400,000. 2-7

LONG BEACH, CALIF.—Plans by Stone & Webster, H. F. Hendrickson, local manager, Laughlin Bdg., Los Angeles, and bids will be called for shortly for construction of a large manufacturing plant on W. Seventh St., Channel No. 2, Long Beach Harbor, for Procter & Gamble, soap manufacturers. The plant will include two main buildings 100 by 700 ft. and 100 by 500 ft., a 500-ft. wharf, and 14 steel storage tanks. $5,000,000. 2-7

LOS ANGELES, CALIF.—Plans by Arthur E. Harvey, Architect, Wilshire Professional Bdg., Los Angeles, for a 12-story A apartment house at Hillcrest Road, Pinehurst Road, and Bonita Terrace, Hollywood, for Carrie Jacobs Bond. $800,000. 2-10

LOS ANGELES, CALIF.—Plans by G. B. Kaufmann, Architect, Union Bank Bdg., Los Angeles, for a Class A hotel building on a 22-acre site at the head of Vine St., extending to Beechwood Drive, for Hollywood Ritz-Carlton Holding Co., $2,500,000. 2-10

LOS ANGELES, CALIF.—Plans by A. I. Rouda, Architect, 418 Lissner Bdg., Los Angeles, for a 9-story, basement and subbasement Class 'A' apartment building on southeast corner of Hobart Blvd. and Sixth St., for A. H. Kornbloom. Concrete construction, with concrete roof slab and floors, composition roofing, etc.; $330,000. 2-17

LOS ANGELES, CALIF.—Plans by G. M. Lindsay and E. P. Eiden, Architects, 609 Union Insurance Bdg., Los Angeles, for John Marshall High School plant on Griffith Park Blvd., on block bounded by St. George St., Monon St., and East Hollywood; $400,000. 2-13

NEWPORT BEACH, CALIF.—Plans by March, Smith & Powell, Architects, 514 Architects Bdg., Los Angeles, for a new high school plant at Newport Beach Heights for the Newport Harbor Union High School District. Reinforced concrete; $400,000. 2-17

PASADENA, CALIF.—Plans by Balch & Stanbery, Architects, Film Exchange Bdg., Los Angeles, for Class 'A' theatre building to be erected on Colorado Blvd., Pasadena, for the Fox West Coast Theatres, Inc.; $350,000. 2-17

SAN PEDRO, CALIF.—Plans by B. M. Pretica, Architect, 915 Warner Bros. Downtown Theatre Bdg., Los Angeles, for a Class A theatre and store building to be erected at 488 W. 6th St., San Pedro, for the Pacific States Theatres, M. A. Silver, General Manager. Building will be of structural steel and concrete construction. $250.000. 2-14

BIDS BEING RECEIVED

OAKLAND, CALIF.—Bids to 2 p.m., Mar. 4, by Geo. B. McDougall, State Architect, for the Broom Factory, Industrial Home for Adult Blind, Oakland. Concrete walls, concrete floor, wood roof construction, and tile roof. Floor area is 10,200 square feet. 2-7

SAN DIEGO, CALIF.—Bids to 11 a.m., Mar. 3, by Public Works Office, Headquarters, Eleventh Naval District, foot of Broadway, San Diego, for addition to Hangar at the Naval Reserve Air Base, Municipal Flying Field, Long Beach, California, under Specification No. 6080. The work includes concrete foundations and floor, structural steel framing, corrugated sheet steel roofing and siding. 2-10

FORT LEWIS, WASH.—Bids to 11 a.m., Mar. 19, by Office of Constructing Quartermaster, Fort Lewis, Wash., for construction of one nurses' quarters, one field officers' quarters, three company officers' quarters, and 11 non-commissioned officers' quarters. 2-18

BIDS RECEIVED

PHOENIX, ARIZ.—Wm. Peper, Heard Bdg., Phoenix, Ariz., $139,533, low for reinforced concrete and brick wing and laundry building at Good Samaritan Hospital. Lescher & Mahoney, Phoenix, are Architects. 2-17

CORNING, CALIF.—Lindgren & Swinerton, California State Life Bdg., Sacramento, $34,999, low for veterans' memorial building at Corning for County. 2-13

ELDRIDGE, CALIF.—G. Magnusson & Co., 320 Cypress Ave., San Bruno, $7300, low for assistant physician's residence at Sonoma State Home for State. 2-5

LOS ANGELES, CALIF.—Dahlstrom Metallic Door Co., 122 E. Seventh St., Los Angeles, who bid $1,430,796, submitted low bid to Board of County Supervisors for hollow metal work for Acute Units 2, 3, 4, and 5, of the Los Angeles General Hospital. Julius Ditzmann's Ironcraft Works, 828 S. Figueroa St., Los Angeles, who bid $80,998, submitted low bid for ornamental ironwork. Dahlstrom Metallic Door Co. submitted low bid at $1,531,446 for combination of ornamental and hollow metalwork. Edwin Bergstrom, Myron Hunt, Pierpont Davis, Sumner P. Hunt, and Wm. Richards are the Architects. 2-5

NAPA, CALIF.—G. Manusson & Co., 320 Cypress Ave., San Bruno, $7345 low for assistant physicians residence at Napa State Hospital for State. 2-5

OAKLAND, CALIF.—Kenyon Electric Co., 526 13th St., Oakland, $8750, low for electric wiring at Transit Shed No. 2, Oakland Outer Harbor. 2-18

SAN FRANCISCO, CALIF.—Low bids as follows by State Architects' Office, Sacramento, for additional wings to San Francisco State building: (1) GENERAL—Vogt & Davidson, 185 Stevenson St., San Francisco, $206,643, low; (2) ELECTRICAL WORK—Porter Electric Co., 1513 Church St., San Francisco, $10,600, low; and (3) HEATING AND PLUMBING—Scott Co., 243 Minna St., San Francisco, $16,184, low. 2-13

CONTRACTS AWARDED

FLAGSTAFF, ARIZ.—To Anderson Bros., El Paso, Tex., $130,000 for library building for Arizona State Teachers' College.

BERKELEY, CALIF.—Awards as follows by City: (1) To S. O. McDonald & Sons, 2912 Deakin St., Berkeley, $12,703 for recreation building at San Pablo Park, between Ward and Russell Sts., and Mabel and Park Sts. (2) To K. E. Parker, 135 South Park, San Francisco, $210,000 for 2-story and 4-story frame and concrete public library building on Kittredge and Shattuck Aves. James W. Placheck, Mercantile Trust Bdg., Berkeley, is the Architect. 2-11

OAKLAND, CALIF.—To John E. Branagh, Millcrest and Sunnyhills Road, Oakland, $10,877 for alterations to County Court House, Oakland, for Alameda County. 2-18

SALINAS, CALIF.—To H. H. Larsen Co., 60 South Park, San Francisco, who bid $258,000 for six-story Class A bank and office building for Salinas National Bank. Steel frame, concrete walls, terra cotta and brick exterior. 2-6

SAN DIEGO, CALIF.—To Anton Johnson, 517 El Centro St., South Pasadena, who bid $133,500 for extensions to shop buildings, etc., at the Naval Operating Base, Air Station, San Diego, for the Bureau of Yards and Docks, Navy Dept., Washington, D. C. 2-14

SAN FRANCISCO, CALIF.—To Alta Electric, 938 Howard St., San Francisco, who bid $8850 for electrical work on addition to San Francisco Junior High School. 2-10

SAN JOSE, CALIF.—To W. N. Myer, Cupertino, who bid $14,386 to County for construction of a laundry building for the County Hospital. 2-17

SEATTLE, WASH.—To Evind Anderson, 517 I St., Tacoma, Wash., who bid $517,588, using concrete piles, for construction of the U. S. Immigration Station, Assay Office, etc., at Seattle, for the Treasury Department, Supervising Architect, Washington, D. C. 2-11

OPPORTUNITY PAGE

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

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West Coast Tractor Co.
W-K-M Company, Inc.

Bars, Steel
Pacific Coast Steel Co.

Beams, Channels, and Angles
Pacific Coast Steel Co.

Bins, Storage and Hopper
Bacon Co., Edward R.
Diamond Iron Works, Inc.
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, Surety
American Surety Co.
Associated Indemnity Corp.
Commerce Casualty Co.
Detroit Fidelity & Surety Co.
Fidelity & Casualty Co. of N. Y., The
Fidelity & Deposit Co. of Maryland
Glens Falls Indemnity Co.
Globe Indemnity Co.
Great American Indemnity Co.
Indemnity Insurance Co. of North America

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

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

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

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

Castings, Brass and Bronze
Greenberg's Sons, M.

Castings, Iron and Steel
American Cast Iron Pipe Co.
Industrial Brownhoist Corp.
Link-Belt Meese & Gottfried Co.
U. S. Cast Iron Pipe & Fdy. Co.

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

Cement
Portland Cement Association

Cement Guns
Cement Gun Const. Co.

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

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

Chlorine
Great Western Electro-Chemical Co.

Chutes, Concrete
Bacon Co., Edward R.
Garfield & Co.
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.
McEverlast, Inc.

Concrete Forms
Harron, Rickard & McCone Co.

Concrete Roads
Portland Cement Association

Conveyors, Portable
Diamond Iron Works, Inc.
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)
American Hoist & Derrick Co.
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.
Speeder Machinery Corp.
Thew Shovel Co., The
Universal Crane Co., The
W-K-M Company, Inc.

Cranes, Tractor
West Coast Tractor Co.

Cranes, Traveling
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Thew Shovel Co., The

Crushers
American Hoist & Derrick Co.
Bacon Co., Edward R.
Diamond Iron Works, Inc.
Garfield & Co.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Smith Engineering Works
W-K-M Company, Inc.
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.
McEverlast, Inc.

Cutting Apparatus
Oxweld Acetylene Co.

Dams
Ambursen Dam Co., Inc.

Derricks
American Hoist & Derrick Co.
Bacon Co., Edward R.
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.
General Excavator 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.
General Excavator 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.
Kartschoke Clay Products Co.
Pacific Clay Products

Drills, Rock
Bacon Co., Edward R.
GardnerDenver Co.
Harron, Rickard & McCone Co
Ingersoll-Rand Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.

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

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

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

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.
Le Roi Co.
Wisconsin Motor Co.

Excavating Machinery
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Cleveland Tractor Co., The
Garfield & Co.
General Excavator 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.
Sauerman Bros., Inc.
Speeder Machinery Corp., The
Thew Shovel Co., The
Universal Crane Co., The

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OPPORTUNITY PAGE

CONTINUED

HELP WANTED

As listed by the Engineering Societies' Employment Service, 57 Post Street, San Francisco. Applicants will please apply direct to them.

SALESMAN, experienced in architectural work, to call on architects and builders promoting the use of Art Stone for large buildings. Must have sales ability and able to carry a financial interest in the company. Salary $3000 a year to start. Apply by letter. Location, Southern California. R-2993-S.

HYDRAULIC ENGINEERS, experienced, for studies of irrigation, navigation, flood control and power development projects in Central California. Applicants should have U. S. Civil Service ratings. Apply by letter stating salary required. About 10 months' work. R-3004-S.

CERAMIC ENGINEER, 1928 or 1929 graduate who has studied ceramics and possibly had some experience with clays and refractories. $140 per month to start, with good opportunity for advancement. Apply by letter with photograph. Location, Southern California. R-2977-S.

TIMEKEEPER, not over 30, preferably singie, for paving company. Must have experience keeping construction costs and be willing to work hard for permanent opportunity. Apply by letter. Salary $150 a month to start. Location, near San Francisco. R-2995-S.

ENGINEERING DRAFTSMAN, graduate, preferably mechanical, not over 35, to begin on drafting board but position will lead to design and construction of oil refineries. Salary about $200 a month to start. Location, San Francisco.

FIELD CLERK for highway and street construction; timekeeping, payroll, cost reports, materials, work quantities, etc. Hard work, long hours. Permanent position and advancement for good man. Give references and details of training and experience. Box 850, W.C.N.

MECHANICAL ENGINEER with wide practical experience in the working of cold metals into the manufacture of pipe by means of rolls. This experience necessary for machine designing. Apply by letter with details of experience and photograph. Salary open. Location, California. R-2949-S.

CHEMIST, recent graduate, young, for position in control department. Will have to begin with routine testing as a part of training course to prepare for much better position. Salary to start $135-$145 a month. Apply by letter with photograph. Location, Southern California. R-2980-S.

THE BUYERS' GUIDE—*Continued from Page 70*

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.
Tieslau Bros.

Filters—Water
California Filter Co., Inc.

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

Flood Lights
Oxweld Acetylene Co.

Flooring, Industrial
Paraffine Companies, Inc., The

Floors, Mastic
Wailes Dove-Hermiston Corp.

Flumes, Concrete
Portland Cement Association

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

Fluxes
Oxweld Acetylene Co.

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

Freight, Water
American-Hawaiian Steamship Co.

Frogs and Switches
Bacon Co., Edward R.
United Commercial Co.

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

Gates, Cast-Iron
California Corrugated Culvert Co.

Gates, Irrigation
Bishop-Jacobsen & Co.

Gates, Radial
California Corrugated Culvert Co.

Gates, Sheet Metal
California Corrugated Culvert Co.

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

Governors, Turbine
Pelton Water Wheel Co., The

Gravel Plant Equipment
Bacon Co., Edward R.
Bodinson Mfg. Co.
Bucyrus-Erie Co.
Diamond Iron Works, Inc.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt 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.

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

Hoists, Hand and Power (Continued)
Link-Belt Meese & Gottfried Co.
Sullivan Machinery Co.
West Coast Tractor 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.

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

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

Jacks, Lifting
Jenison Machinery Co.

Kettles, Tar and Asphalt
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Montague Pipe & Steel Co.
Peerless Mchy. & Mfg. Co.
Spears-Wells Machy. Co.
Young Machy. Co., A. L.

Leadite
Water Works Supply Co.

Loaders, Power, Truck and Wagon
Haiss Mfgr. Co., Geo.
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.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
United Commercial Co.

Metal Lath
Truscon Steel Company

Meters, Irrigation
Bishop-Jacobsen & Co.

Meters, Venturi
Water Works Supply Co.

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

Mixers, Chemical
Dorr Co., The

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

Mixers, Plaster
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

Motors, Gasoline
Continental Motors Corp.

Motors, Gasoline (Continued)
Hercules Motors Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Le Roi Co.
Wisconsin Motor Co.

Oxy-Acetylene Apparatus
Oxweld Acetylene Co.

Paints, Acid Resisting
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Metal Protective
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Technical
American Bitumuls Co.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Waterproofing
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pavers, Concrete
Foote Company, Inc.
Harron, Rickard & McCone Co.
Koehring Company
Smith Co., T. L.

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

Paving, Contractor
Warren Bros. Roads Co.

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

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

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

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

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

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

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

Pipe—Centrifugal
National Cast Iron Pipe Co.

Pipe Clamps and Hangers
Kortick Mfg. Co.

Pipe Coatings
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

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

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

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

Pipe—Flanged
National Cast Iron Pipe Co.

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

Pipe, Lock-Bar
Western Pipe & Steel Co.

Pipe, Preservative
Columbia Wood & Metal Preservative Co.

Pipe, Pressure Line
American Concrete Pipe Co.
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
American Concrete Pipe Co.
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.
Union 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.
Schramm, Inc.

Portable Lights
Oxweld Acetylene 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.
Paraffine Companies, Inc., The

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

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

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OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

Filter Plant, Reservoir, Etc.

ADVERTISEMENT FOR PROPOSALS

For the Construction of a Slow Sand Filter Plant and Appurtenances, Reservoir Lining and Cover, and Other Water Works Improvements. Contract No. 1.

Watsonville, California, February 11, 1930.

Sealed proposals for constructing a slow sand filter plant and appurtenances, reservoir lining and cover, and other water works improvements for the City of Watsonville, California, endorsed "**Proposal for the Construction of Certain Water Works Improvements, City of Watsonville, California, Contract No. 1**", addressed to the City Clerk, will be received at the office of City Clerk, Municipal Office Building, Watsonville, California, until 7:30 p.m., Pacific Standard Time, on the eleventh day of March, 1930, at which time they will be publicly opened and read.

The work will comprise the following principal features:

(1) A concrete slope and bottom lining, concrete piers and wooden roof, together with certain piping, water measuring device and other improvements for and at the two main Distributing Reservoirs at Freedom Village, approximately 2 miles west of north of the business district of the City of Watsonville.

(2) A slow sand filter plant having a nominal maximum capacity of 2.5 million gallons daily, embracing a sedimentation basin, 5 filter units, sand storage bin, filtered water basin, 50,000 gallon storage tank, head house, tool and store houses, together with all piping and appurtenances, at and in the vicinity of Corralitos Village, approximately 7 miles west of north of the aforesaid business district.

In this work will be involved the following approximate quantities:

6,700 cubic yards of net excavation for structures.

2,550 cubic yards of concrete, mostly reinforced.

212,000 feet, board measure, of lumber in roofs and elsewhere.

6,000 linear feet of water and drain pipe ranging from 1 inch to 20 inches in size and of various materials.

In addition to the above there will be grading work and considerable other work of a miscellaneous nature.

The above statement is presented merely for the purpose of giving a general impression of the nature and magnitude of the work to be done and is not to be considered as exact or complete.

Each proposal must be accompanied by a certified check made payable to the order of the City Treasurer, City of Watsonville, California, in the sum of ten thousand dollars ($10,000.00).

A faithful Performance Bond, amounting to fifty (50) per cent of the contract price, and a Material and Labor Bond in equal amount, will be required of the successful bidder, in accordance with the provisions of the City Charter and Ordinances, and of State laws.

Prior to the acceptance of the completed work a Defective Workmanship Bond in the sum of five thousand dollars ($5,000.00), to hold for the term of one year, must be furnished by the contractor.

The complete contract documents may be examined at the office of the City Engineer, Mr H. B. Kitchen, Municipal Office Building, Watsonville, and at the office of the Consulting Engineer, Mr. C. G. Hyde, Berkeley, California. Copies thereof, including blueprints of the contract drawings, will be furnished to intending bidders upon request and upon the payment of a deposit of twenty-five dollars ($25.00). All such deposits will be refunded upon the return of the contract documents, including the contract drawings, in good condition, or in case they are used in filing a proposal.

No informal or irregular proposals or propositions for doing the work will be considered by the city at this time. It is the desire and purpose of the board of aldermen to let the contract for the work as a whole. The city reserves the right to reject any or all proposals and to increase or decrease within stated limits the amount of any class or portion of the work.

(Signed) M. M. SWISHER, City Clerk.

NOTICE TO CONTRACTORS

Cement, Aggregate, and Lumber

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 8:00 p.m., February 26, 1930, and will at that hour be opened, for furnishing approximately 1050 barrels of Portland cement, 800 tons of coarse aggregate, 400 tons of fine aggregate, 80,000 pounds of reinforcing steel and 55,000 feet B.M. of redwood and pine rough lumber.

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

JOHN H. KIMBALL, Secretary.

Oakland, California, February 14, 1930.

NOTICE TO CONTRACTORS

Pumping Equipment

Sealed proposals will be received at the office of the East Bay Municipal Utility District, 512 Sixteenth Street, Oakland, California, until 5:30 p.m. Tuesday, March 4, 1930, and will at that hour be opened, for constructing and furnishing, f.o.b. 22nd and Adeline Streets, Oakland, California, equipment for the Claremont, Pleasant Valley and Vine Street Pumping Plants.

Specifications for this work may be obtained from the office of the District.

JOHN H. KIMBALL, Secretary.

Oakland, California, February 20, 1930.

NOTICE TO CONTRACTORS

Overhead Crossing and Grading

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 March 19, 1930, at which time they will be publicly opened and read, for construction in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Marin County, an overhead crossing over the tracks of the Northwestern Pacific Railroad at Forbes Station (IV-Mrn-1-A), consisting of one 46-foot steel beam span and 190 feet of timber trestle on pile bents.

San Bernardino County, between The Pass and two miles down Waterman Canyon (VIII-SBd-43-A), about one and nine-tenths (1.9) miles in length, to be graded.

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

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

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

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

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

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

Dated February 19, 1930.

NOTICE TO CONTRACTORS

Grading 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 February 26, 1930, at which time they will be publicly opened and read, for construction, in accordance with the specifications therefor, to which special reference is made, of portions of State Highway, as follows:

Calaveras County, between 1½ miles north and 1½ miles south of Calaveritas Creek (X-Cal-65-B), about two and eight-tenths (2.8) miles in length, to be graded and surfaced with crusher run base and untreated crushed gravel or stone surfacing.

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

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

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

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

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

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

Dated January 29, 1930.

THE BUYERS' GUIDE—*Continued from Page 72*

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