WCN-07-1930

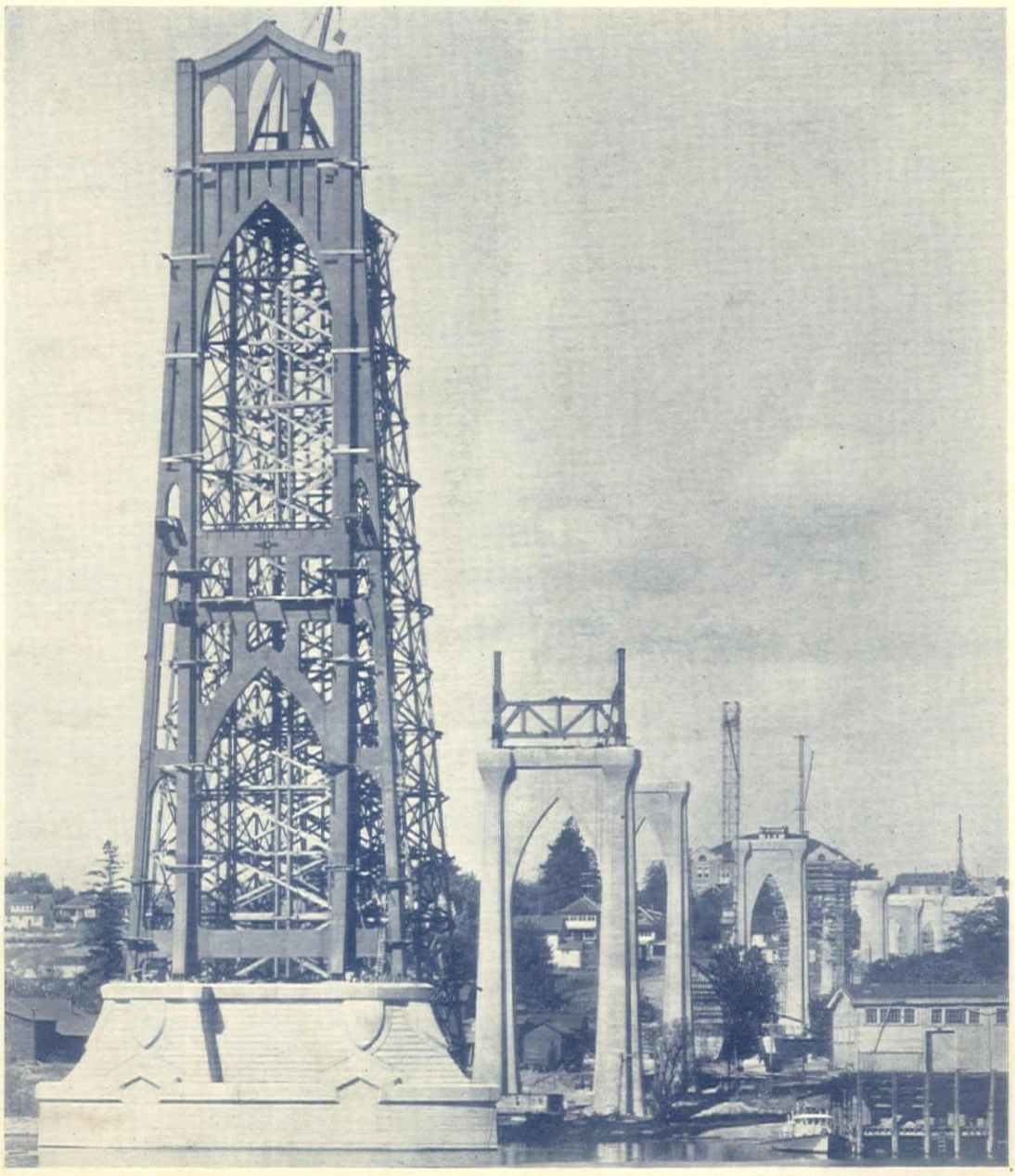
WESTERN CONSTRUCTION NEWS

CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

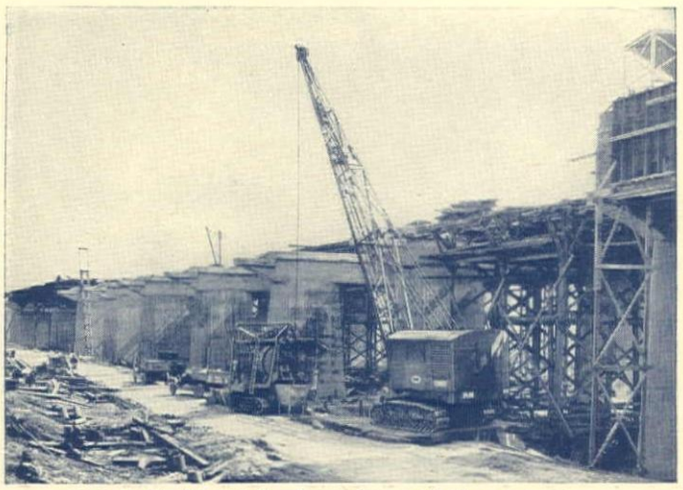
PUBLISHED SEMI-MONTHLY
VOLUME V NUMBER 14

SAN FRANCISCO, JULY 25, 1930

25 CENTS A COPY
$3.00 PER YEAR



ERECTING MAIN TOWER PIER, ST. JOHNS SUSPENSION BRIDGE, WILLAMETTE RIVER, PORTLAND. TIMBER ERECTION TOWER 100 FT. SQUARE ON BASE, NEARLY 300 FT. HIGH, CONTAINS FOUR HUNDRED THOUSAND F.B.M. AND MOUNTS 60-TON STIFF-LEG DERRICK. J. H. POMEROY & CO. ERECTORS; ROBINSON & STEINMAN CONSULTING ENGINEERS FOR MULTNOMAH COUNTY



P & H Model 600 Corduroy Crane placing concrete on Commerce Street viaduct job, Dallas, Texas.

P & H Model 300-A equipped with clamshell bucket handling sand for Commerce Street viaduct.

P & H Model 400 placing concrete on Commerce Street viaduct job.

4 P & H's for the Austin Bridge Co., Dallas, Texas

On the great new viaduct in Commerce Street, Dallas, to be one of the largest in the Southwest—the Austin Bridge Company, contractors, have three P & H Corduroy (crawler) Cranes. One is a Model 300-A, ½ cu. yd. capacity; one is a Model 400, ¾ cu. yd.; and the other is a Model 600, 1 cu. yd. All are shown at the left. Since these pictures were taken, the fourth P & H, a Model 700-B, was purchased.

Here is a job requiring the handling of immense amounts of material . . . 32,000 cu. yds. of concrete, 1,000 tons of reinforcing steel and 750,000 pounds of structural steel, besides vast quantities of temporary materials. Speed and reliability were the requirements imposed upon the cranes to be used. P & H's were chosen. Their fast line and swing speeds, easy operation and rugged unit-steel construction have justified their reputation; for the work is ahead of schedule as you read this.

P & H Corduroy Cranes are built in a range of sizes from ½ to 4 cu. yds. Descriptive bulletins will be mailed on request.

HARNISCHFEGER SALES CORPORATION

Established 1884

3890 National Ave., Milwaukee, Wis.,

32 Beale St., San Francisco 2025 Santa Fe Ave., Los Angeles

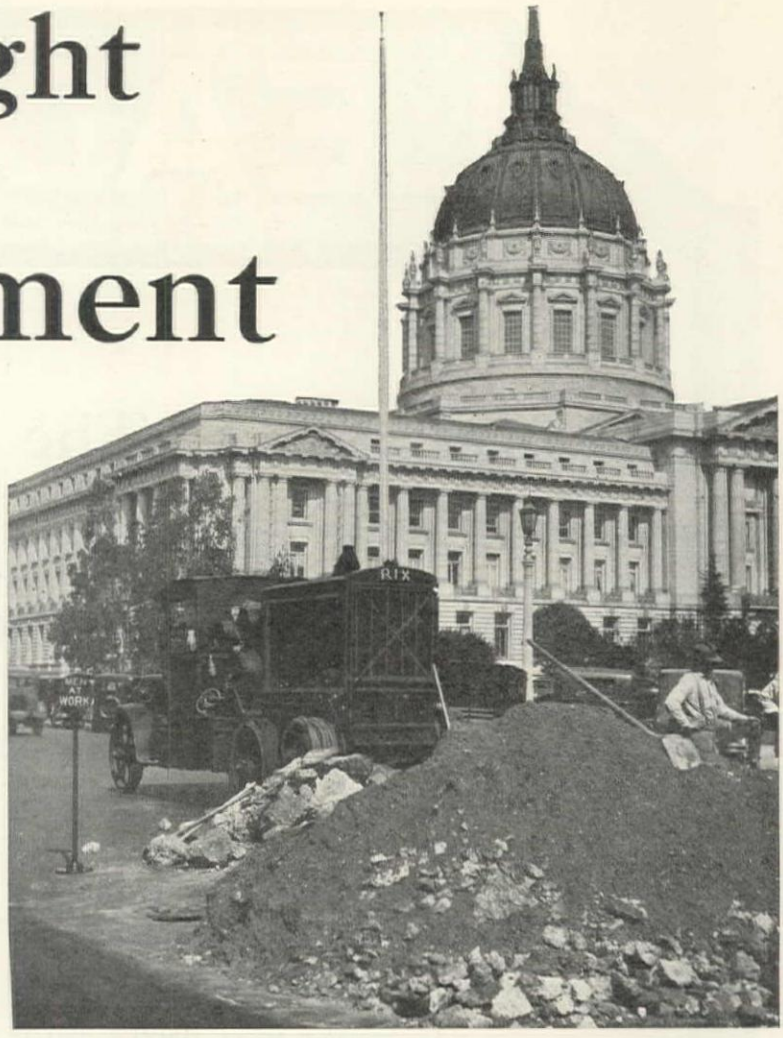
ROBERT M. TAYLOR, *Pacific Coast Manager*

Service Stations, Complete Repair Part Stocks and Excavators at San Francisco, Los Angeles and Seattle, Wash.

P & H "Corduroy" CRAWLER CRANES

The Height *of* Achievement

in Domes ...*and* Compressors



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

Since 1877

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

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

RIX "6"

PORTABLE AIR COMPRESSORS

THE RIX COMPANY, Inc.

San Francisco - - -	400 4th Street
Los Angeles - - -	684 Santa Fe Avenue
Portland - - - -	312 E. Madison Street
Seattle - - - -	1729 First Avenue South

The Compressor with the SUPER-CHARGER

PHILIP SCHUYLER
M. Am. Soc. C. E.
M. Am. W. W. Assn.
MANAGING EDITOR

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

WESTERN CONSTRUCTION NEWS

CLYDE C. KENNEDY
M. Am. Soc. C. E.
ASSOCIATE EDITOR

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

DEVOTED TO CIVIL ENGINEERING AND CONSTRUCTION IN THE FAR WEST

VOLUME V | JULY 25, 1930 | NUMBER 14

CONTENTS

SUBSCRIPTION RATES

THE annual subscription rate is $3 in the United States and foreign countries where extra postage is not required. To Canada $4 and to foreign countries where extra postage is necessary the annual rate is $5. Single copies 25 cents.

Published semi-monthly by
WESTERN CONSTRUCTION NEWS, INC.
Eastern Representatives:

Main Office:
114 SANSOME STREET
SAN FRANCISCO, CALIF.

F. R. JONES, 201 N. Wells Street
Chicago, Ill.
H. B. KNOX, JR., 101 Park Ave.
New York, N. Y.

Branch Office:
422 WESTERN PACIFIC BDG.
LOS ANGELES, CALIF.

S. H. WADE, *President and General Manager*
S. J. SANDERS, *Vice-President* PHILIP SCHUYLER, *Managing Editor*
Entered as second-class matter at the postoffice at San Francisco, California, under the Act of March 3, 1879

HYDRO-TITE
joints are
TIGHT

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

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

Easy to Prepare

Hydro-Tite is not a substitute for any jointing material. It was first compounded and placed on the market twenty years ago for a specific purpose. This purpose is to make joints stronger, tighter, and more flexible without caulking.

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

Easy to Pour

HYDRO-TITE

REG. U. S. PAT. OFF.

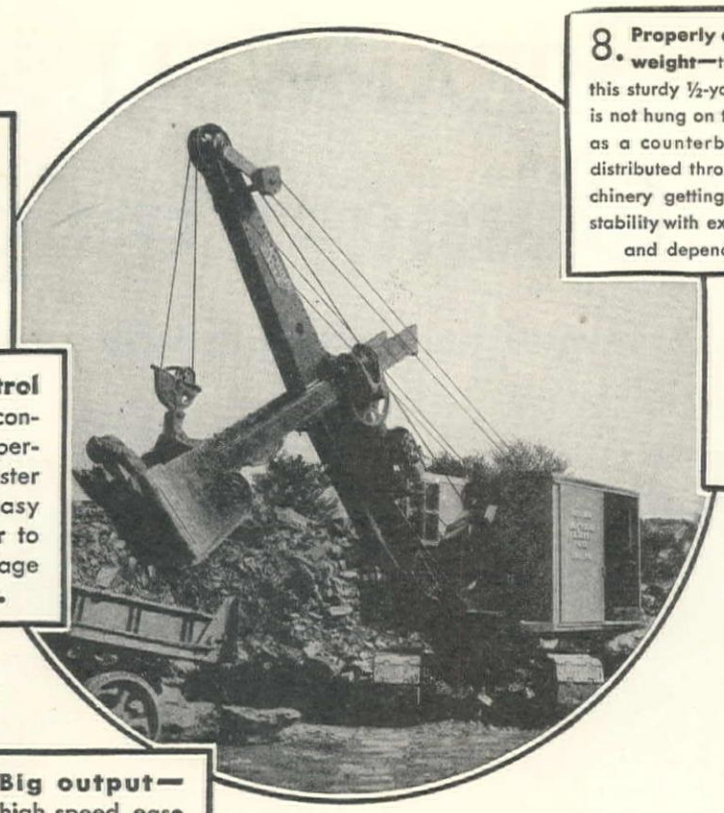
A DEPENDABLE SELF-CAULKING JOINT COMPOUND
FOR CAST IRON BELL AND SPIGOT PIPE

HYDRAULIC DEVELOPMENT CORPORATION

50 Church Street, New York, N. Y.

INDUSTRIAL & MUNICIPAL SUPPLY CO., Inc.
SAN FRANCISCO: 7 Front St. LOS ANGELES: 6800 Avalon Blvd.

Northwestern Distributors:
PACIFIC WATER WORKS SUPPLY CO.
Atlantic Street Terminal, Seattle, Wn.



1. **Profit-making speed**—because of surplus power and strength, faster hoisting and faster swing is possible on every kind of work.

2. **Ease of control**—three levers control the whole operating cycle. Booster bands make it easy for the operator to produce big yardage **all day long.**

3. **Sturdy dependability**—the rugged construction throughout insures long and dependable performance.

4. **Big output**—high speed, ease of operation and dependability mean increased daily output week after week, month after month.

5. **Economical performance**—operating and maintenance costs minimized because of simplicity of design, accessibility of parts and dependability of machine.

6. **Anti-friction bearings** on all continuously running shafts and the bevel gear unit for swinging and propelling insure maximum power, simpler lubrication and lower upkeep.

7. **Completely enclosed and bath lubricated** transmission gears, reversing bevel gear swing unit boom hoist and caterpillar bevel gears.

8. **Properly distributed weight**—the weight of this sturdy ½-yard machine is not hung on the rear end as a counterbalance but distributed through the machinery getting maximum stability with extra strength and dependability.

9. **Quality**—Fifty years of progressive engineering development in the manufacturing of excavation equipment are back of the design and construction of every Bucyrus-Erie machine.

9 REASONS WHY YOU NEED THE 1020 IN YOUR BUSINESS

Now is the time to find out more about the 1020 — how it will speed up your job, cost you less to operate and put more dollars in the profit column. Write us today for the story in detail.

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

BUCYRUS-ERIE COMPANY, General Offices: South Milwaukee, Wisconsin. Plants: South Milwaukee, Wisconsin; Erie, Pennsylvania; Evansville, Indiana.

BUCYRUS ERIE

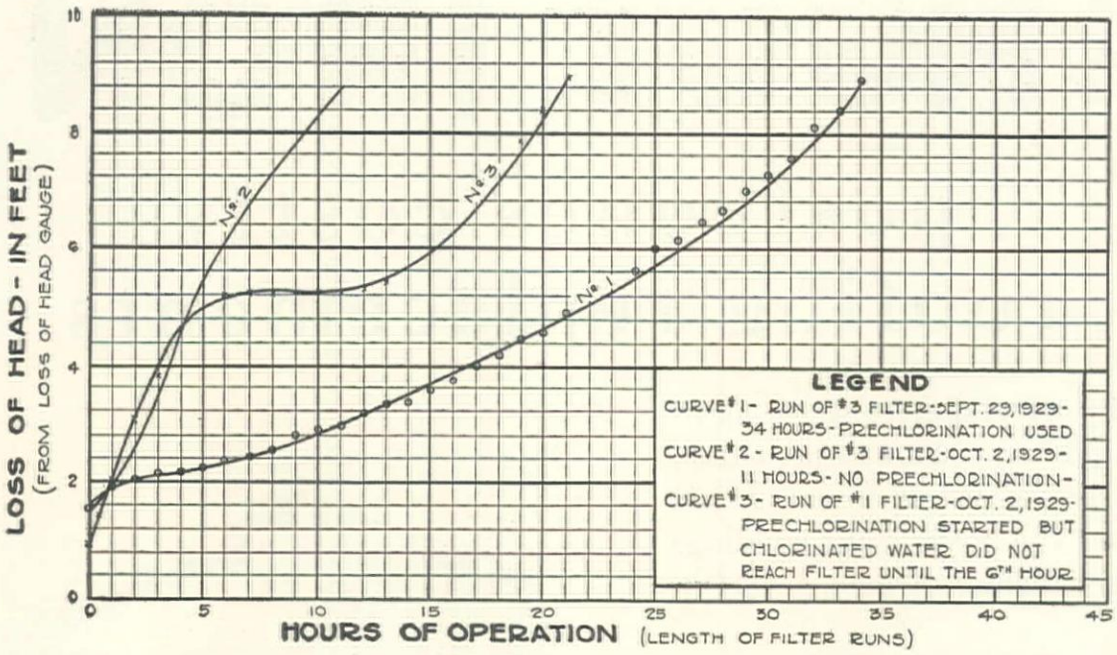
WEST COAST BRANCH OFFICE: 989 Folsom Street, San Francisco

Clyde Equipment Company
Portland, Ore., Seattle, Wash.

Concrete Machinery & Supply Company
Los Angeles, Calif.

A-121—7-25-30—WSN

They TRIPLED their FILTER RUN by PRECHLORINATION



EFFECT OF PRECHLORINATION ON FILTER RUNS

Filtration Plant, Barberton Water Dept., Barberton, Ohio

Prechlorination has saved both time and money at the Barberton, Ohio, Filtration Plant. The above diagram proves that conclusively.

Prechlorination is real economy at nearly every water works plant, because:

It lengthens filter runs.
Saves wash water—also filtered water to waste.
Reduces labor.
Controls micro-organisms in basins.
Gives protection against heavy bacterial loads to filters.
Improves coagulation.

"The Only Safe Water is Sterilized Water"

Prechlorination with W. & T. chlorinators is proving a profitable investment in many plants. Write us for technical bulletins on **prechlorination.**

WALLACE & TIERNAN

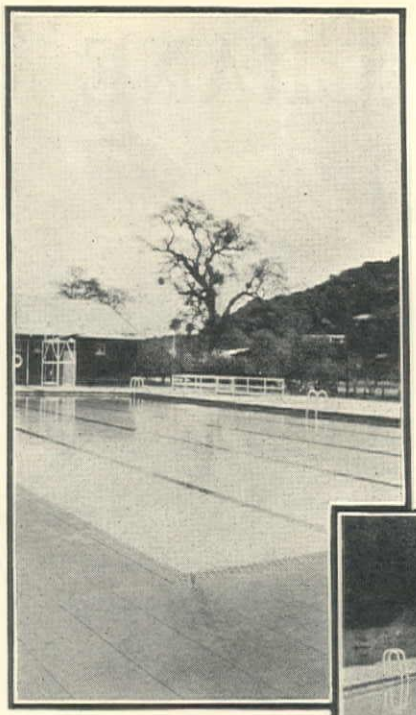
COMPANY, INCORPORATED

Manufacturers of Chlorine Control Apparatus

NEWARK - - - NEW JERSEY

SA-22

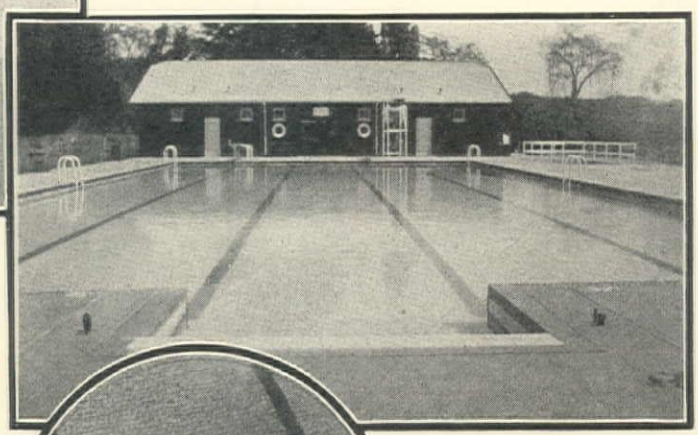
BALTIMORE, BOSTON, BUFFALO, CHARLESTON, CHARLOTTE, CHATTANOOGA, CHICAGO, CLEVELAND, DALLAS, DENVER, DETROIT, INDIANAPOLIS, JACKSONVILLE, KANSAS CITY, KNOXVILLE, LEXINGTON, LINCOLN, LOS ANGELES, MINNEAPOLIS, NEW YORK, OGDEN, OKLAHOMA CITY, PHILADELPHIA, PITTSBURGH, ROANOKE, SAN FRANCISCO, SEATTLE, SPOKANE, ST. LOUIS, SYRACUSE. WALLACE & TIERNAN, LTD., TORONTO, WINNIPEG, CANADA. WALLACE & TIERNAN, LTD., LONDON, ENGLAND



CLEAR AS CRYSTAL IF WATER EVER WAS:

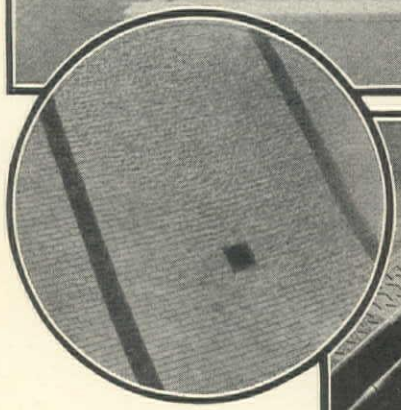
The Emporium Pool at Emporium, California, Filtered and Purified by California Filter Installation

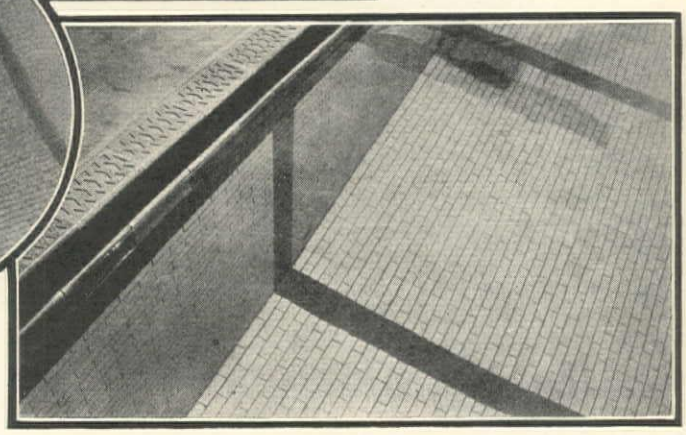
ABOVE AND RIGHT: *General views of Emporium Pool.*



BELOW: *Looking through 7½ ft. of water from the low dive.*

CIRCLE: *Looking down from the high dive, 10 ft. above surface, through 9 ft. of water.*





THE swimming pool for employees maintained by The Emporium, San Francisco department store, at Emporium, California, gives a striking demonstration of the effectiveness of filtration and chlorination in providing pure, absolutely clear water for swimmers.

This pool, of championship size, is 105 feet by 50 feet, with graduated depth from 3½ feet to 7½ feet. Its 200,000-gallon capacity is kept under constant circulation, and as the views above show, the water is so clear as to be hardly discernible except where the surface is rippled by the wind.

California Filter equipment is made to meet the needs of swimming pools of any size. Detailed information on all sizes and arrangements of filters is contained in our booklet No. 40, which we shall be glad to send on request.

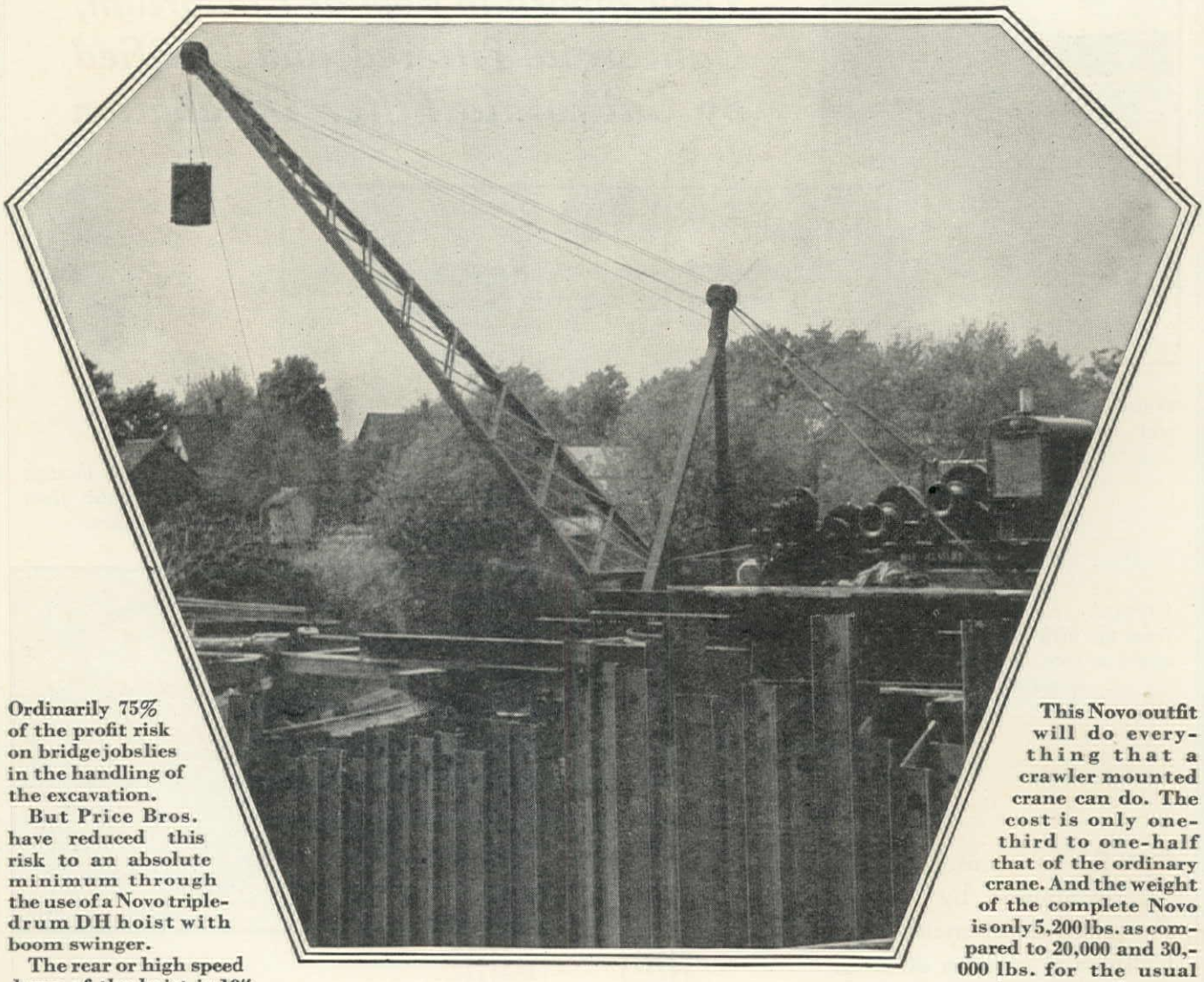
CALIFORNIA FILTER COMPANY, Inc.

981 Folsom Street, San Francisco

SEATTLE **LOS ANGELES**

BETTER THAN A CRANE

at 1/3 the Cost



Novo Triple Drum Hoist with boom swinger handling pile driver—being moved across false wood on the Price Brothers' bridge job at Bellevue, Mich.

Ordinarily 75% of the profit risk on bridge jobs lies in the handling of the excavation.

But Price Bros. have reduced this risk to an absolute minimum through the use of a Novo triple-drum DH hoist with boom swinger.

The rear or high speed drum of the hoist is 18" in diameter and is used for pile driving.

The two front drums are 12" in diameter and are used for handling the clam shell inside the coffer dam. Slow digging is advisable so that it will not tear up the coffer dam sheeting.

This Novo outfit will do everything that a crawler mounted crane can do. The cost is only one-third to one-half that of the ordinary crane. And the weight of the complete Novo is only 5,200 lbs. as compared to 20,000 and 30,000 lbs. for the usual crawler mounted crane. Because of the light weight, the Novo can work its way across the stream on the false work supported by the piles which it drives.

The Novo Hoisting Handbook details many construction jobs such as the above. Write for your copy today.

NOVO
PUMPS—ENGINES—HOISTS

NOVO ENGINE COMPANY
256 Porter Street - Lansing, Michigan
Clarence E. Bement, Vice-Pres. and Gen. Mgr.

STAR MACHINERY CO.
1731-1741 First Ave., South
SEATTLE, WASH.

CROOK COMPANY
1220 South Grand Ave.
LOS ANGELES, CALIF.

MCCRAKEN-RIPLEY CO.
65 Albina Avenue
PORTLAND, ORE.

KRATZ & MCCLELLAND, INC.
522 Bryant Street
SAN FRANCISCO, CALIF.

When writing to NOVO ENGINE CO., *please mention Western Construction News*

can you afford to buy a shovel without anti-friction bearings?

LIMA "101"

TIMKEN BEARING EQUIPPED

The very minute a shaft or drum equipped with bronze or babbitt bearings is started in operation there begins a wear which increases until replacement of bearings is necessary; to say nothing of the destructive vibrations transmitted to the operating machinery as the wear increases. The consequent misalignment of shafts and improper meshing of gears are the major causes for repairs and breakdowns—an expense you eliminate by purchasing a LIMA "101".

West Coast Representatives:

Western Road Machinery Company
Seattle :: Portland

A. L. Young Machinery Company
San Francisco

Tyee Machinery Co., Ltd.
Vancouver, B. C.

H. E. Lowe
Los Angeles, Calif.

The Ohio Power Shovel Co.

Division of Lima Locomotive Works Incorporated

Western Office
846 Straus Bldg.,
Chicago

Lima, Ohio

Eastern Office
2351 Graybar Bldg.,
New York

308

LIMA "101"

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

Construction Equipment SINCE 1910

FOR CONCRETE ROADS

Adams Graders
Byers Shovels
Carr Subgraders
Dinuba Scarifiers
Jaeger Road Pumps
Johnson Bins and Hoppers
Hotchkiss Steel Road Forms
Huber Rollers
Freeman Truck Turntables
Multifoote Pavers
Ord Finishers
Toledo Torches and Steel Horses

FOR ASPHALT ROADS

Adams Graders
Burch Spreaders
Dinuba Scarifiers
Byers Shovels
Carr Subgraders
Ord Finishers
Freeman Turntables
Huber Rollers
Madsen Asphalt Plants
Toledo Torches and Horses

FOR GRAVEL ROADS

Adams Graders
B. L. J. Oilers
Burch Spreaders
Byers Shovels
Cedar Rapids Crushers
Freeman Turntables
Dinuba Scarifiers
Indiana Hand Shovels
Mohawk Asphalt Heaters
Toledo Torches

FOR ROAD MAINTENANCE

Adams Graders
Adams Maintainers
Adams Scarifiers
B. L. J. Oilers
Mohawk Asphalt Heaters

FOR BUILDING CONSTRUCTION

Indiana Hand Shovels
Jaeger Hoists
Jaeger Placing Plants and Chuting
Western Hoists
Jaeger Mixers
Jaeger Tubular Towers
Sterling Wheelbarrows and Carts
Schramm Compressors

FOR INDUSTRIES

Homelite Pumps and Lighting Plants
Trackson Cranes and Crawlers
"Hyster" Hoists
McCormick-Deering Industrial Tractors

This is a partial list of the equipment we stock exclusively.

If you have not received your copy of our new catalog - write

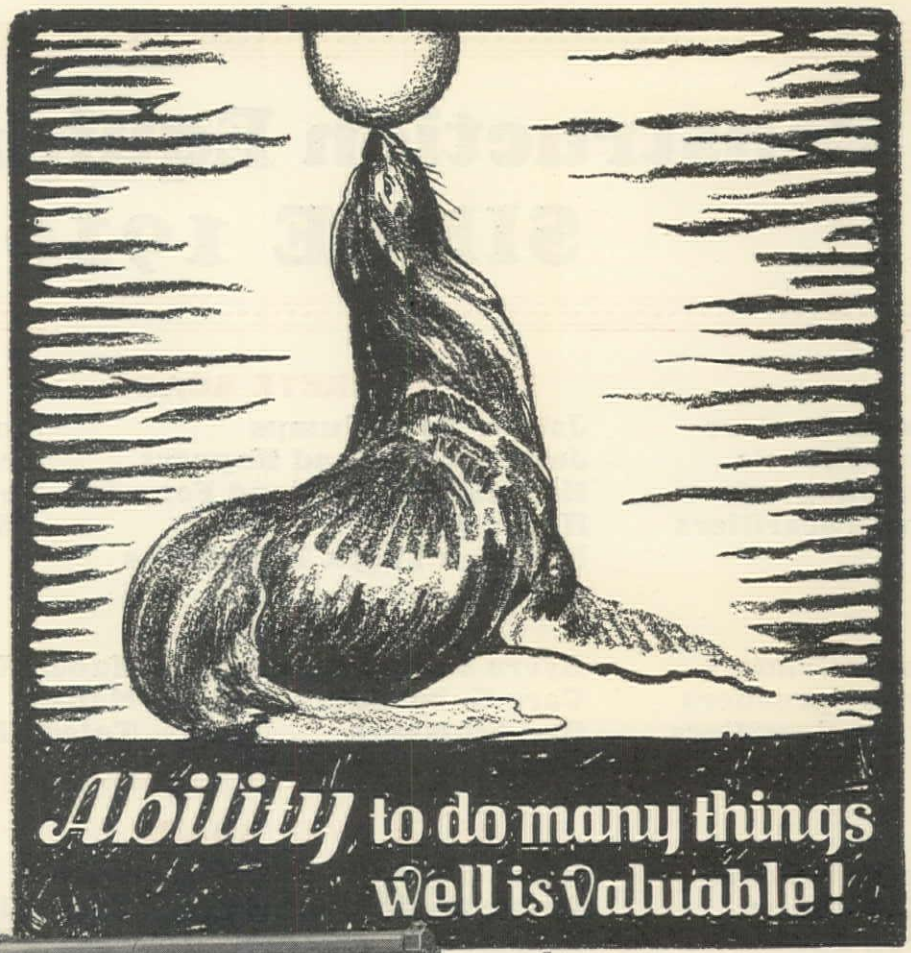
EDWARD R. BACON COMPANY

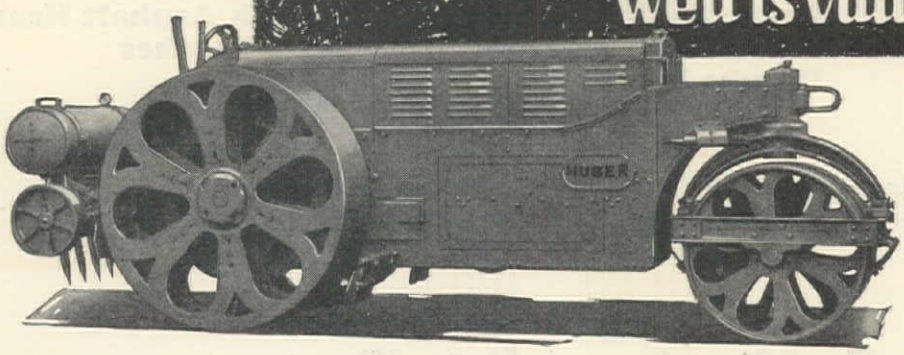
17th and Folsom Streets — Telephone HEmlock 3700

SAN FRANCISCO

Sacramento • Oakland • Reno • San Jose • Fresno • Honolulu

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





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

Write for the *New* HUBER Roller Catalog

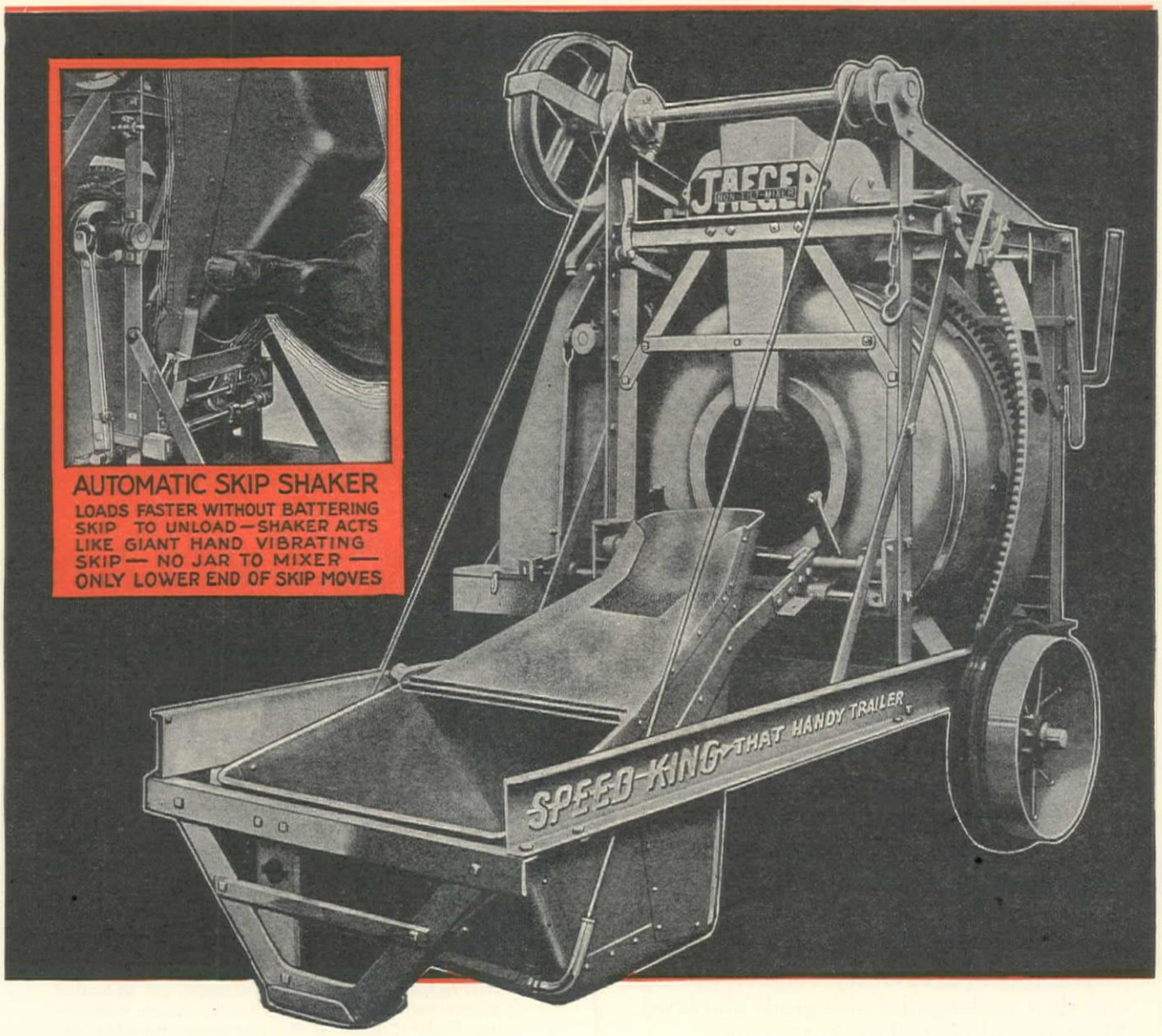
EDWARD R. BACON COMPANY

17th and Folsom Sts., San Francisco **Phone HEmlock 3700**

HUBER MOTOR ROLLERS

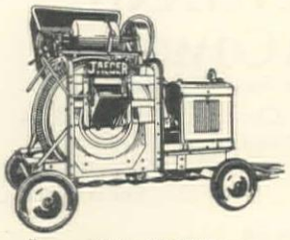
When writing to THE HUBER MFG. CO., *please mention Western Construction News*

AUTOMATIC SKIP SHAKER
LOADS FASTER WITHOUT BATTERING SKIP TO UNLOAD—SHAKER ACTS LIKE GIANT HAND VIBRATING SKIP— NO JAR TO MIXER — ONLY LOWER END OF SKIP MOVES



Outselling all Other 7S Mixers

that Fast . . . End Discharge SPEED KING TRAILER



Jaeger 10S and 14S Heavy Duty Mixers are fast, rugged and portable. Send for new catalog and prices.

NOTHING in mixer history like this all-purpose one bagger that takes about 6 ft. of street room, charges in 7 seconds, discharges in 7 to 10 seconds and trails anywhere on dual tires, springs and roller bearings.

When it outsells all other 7S machines combined, there are reasons. Those reasons are speed, all around handiness, Jaeger all-steel sturdiness and Jaeger patented features—backed by quick Jaeger service from over 100 stations.

USE SPEED KING WITH SPOUT and save wheelers on alley, floor and form work.

CLIP . . AND MAIL COUPON

TILTING MIXERS
3½-5-7-10-14 Feet
TRAILERS
Priced $169 up

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

When writing to THE JAEGER MACHINE COMPANY, *please mention Western Construction News*

IT'S BACON IN SAN FRANCISCO

Mr. Contractor!

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

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

FULL Loads Are PAY Loads

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

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

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

"It moves the Earth"

Simple Design Rugged Construction Easy Operation

Sold in Northern and Central California by:

EDWARD R. BACON CO.
FOLSOM AT SEVENTEENTH STREET
SAN FRANCISCO, CALIF.

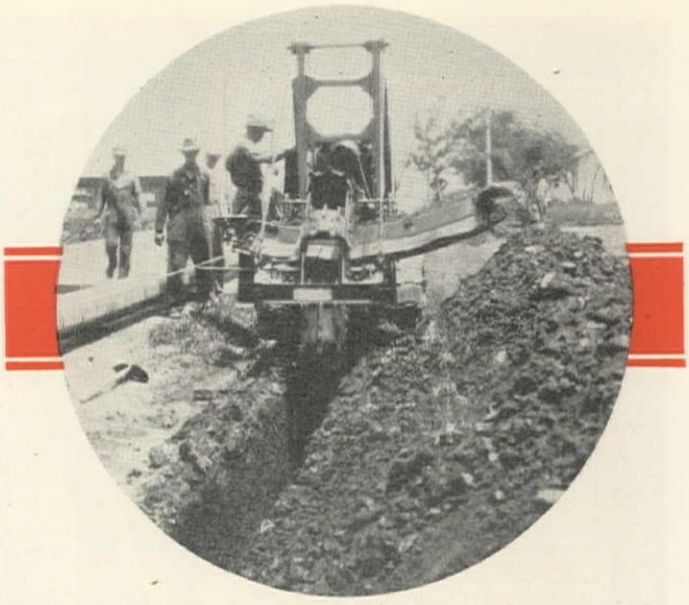
Manufactured by:

MASTER EQUIPMENT COMPANY
BOX 517, FLORENCE BRANCH
LOS ANGELES, CALIF.

Western Representatives:

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

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



THE CLEVELAND BABY DIGGER

Delivers Maximum Trench Footage at Minimum Costs Because

Inches Count. The Baby Digger, because of its compactness, is the indicated trencher—with its extreme width of 58 inches. It gives you machine-trenching economy where hand-labor would be the only other method.

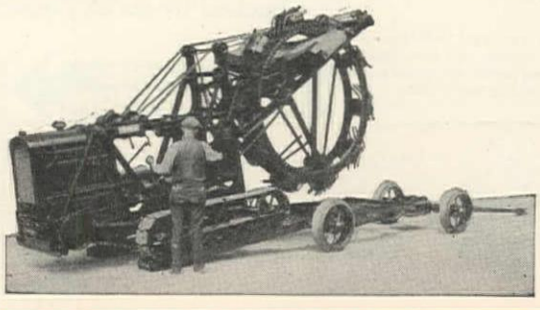
Pounds Are Important. The Baby Digger, carrying no unnecessary poundage, weighing only four tons, is a safe machine to handle when working over sidewalks, soft ground, etc.

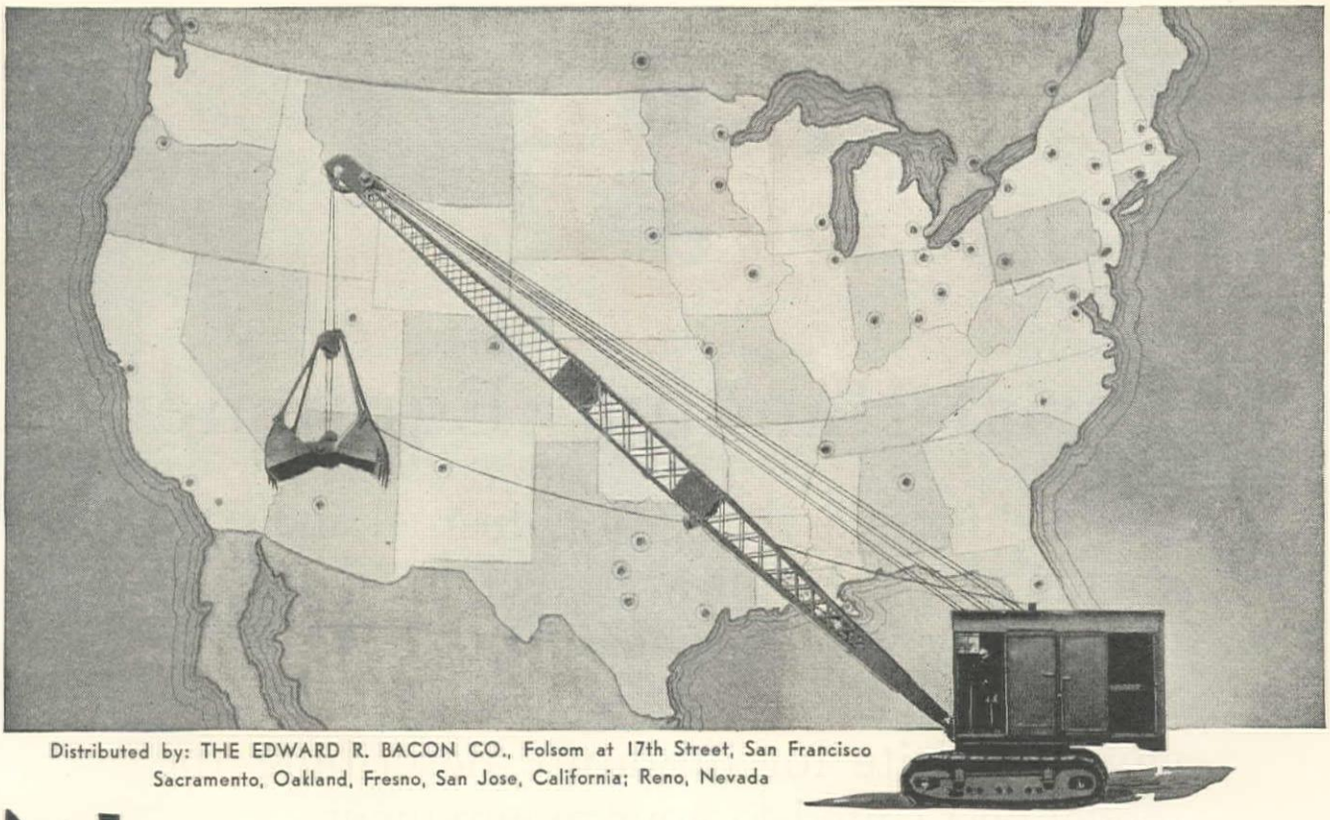
Mobility Is Essential. Loaded or unloaded on its own specially built trailer in five minutes the Baby Digger gives maximum mobility insuring more productive time.

Durability Is Demanded. With a design as modern as tomorrow, yet tested and proved by experience of nine years, the Baby Digger meets squarely the demands for durability.

Write today for full information

THE CLEVELAND TRENCHER COMPANY
"Pioneers of the Small Trencher"
20100 St. Clair Avenue, Cleveland, Ohio, U. S. A.
Distributed by
EDWARD R. BACON CO. :: :: San Francisco, Calif.
FRANK T. HICKEY CO. :: :: :: Los Angeles, Calif.





Distributed by: THE EDWARD R. BACON CO., Folsom at 17th Street, San Francisco
Sacramento, Oakland, Fresno, San Jose, California; Reno, Nevada

NEAR YOU — *wherever you are*

WHEREVER contractors and engineers move dirt and handle construction materials you will find a nearby Service Station and distributor for Byers excavating and material handling tools.

This Byers Organization is more substantial and complete than ever before. With these picked representatives you can talk over, in a helpful way, problems concerning new equipment, maintenance and operation difficulties which arise on your jobs.

Byers nation-wide—yes, world-wide—organization could not spring up mushroom fashion—overnight. It required almost 40 years of cultivating, pruning, controlled growth.

The result? A definite benefit through special service to Byers owners. This is over and above the profit earning power of the complete improved line of Byers machines.

These machines have been brought to their highest peak this year. Advanced engineering, simplified design and high grade construction make these 1930 Byers shovels and cranes actually the leaders in a new decade for excavating equipment. The Byers Machine Co., Ravenna, Ohio. Sales and service throughout the country.

BYERS

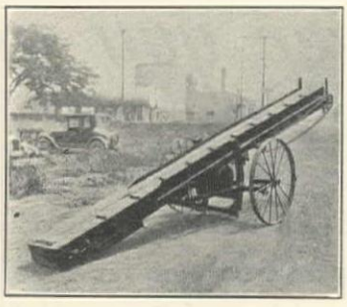
Shovels and Cranes

When writing to THE BYERS MACHINE CO., *please mention Western Construction News*

THE NORTHERN 'BUILT BETTER' MATERIAL HANDLING EQUIPMENT

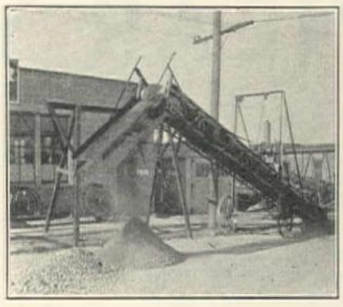
Material Handling Equipment

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



UNIVERSAL BELT

IN THE GRAVEL PIT



CONVEYOR and SHAKER SCREEN

WESTERN REPRESENTATIVES

EDW. R. BACON CO.
SAN FRANCISCO
SACRAMENTO OAKLAND

McCRAKEN-RIPLEY CO.
PORTLAND, ORE.

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

SOLD ON CONVENIENT TERMS AND BEARS OUR FIVE YEAR GUARANTEE

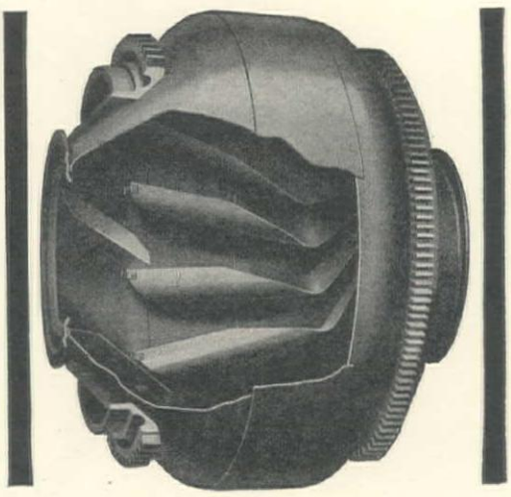
Northern Conveyor & Mfg. Co.

Janesville, Wisconsin

When writing to NORTHERN CONVEYOR & MFG. CO., *please mention Western Construction News*

MULTI FOOTE PAVER

And Its 100% MIXING DRUM



100% Perfect Mixing Action—

No Clogging or Building up of Concrete—

Result of 26 Years of Constructive Engineering

For over twenty years the Foote double-cone drum has been a distinctive feature of Multi-Foote Pavers. It has three important advantages:

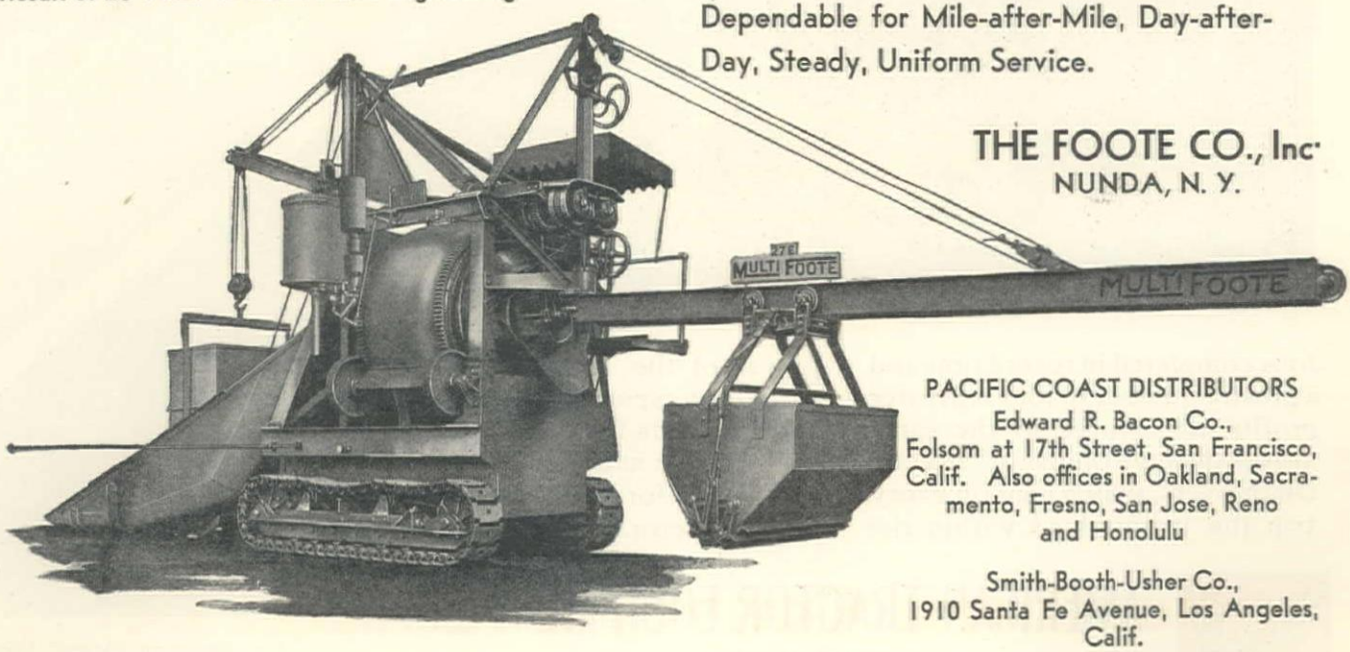
Even Running, due to the load being carried at all times at the center of the drum.

Fast and Effective Mixing, which results from its natural tendency to throw the batch from each end toward the middle of the drum.

A Natural Scouring and Cleaning Action—Concrete has little chance to accumulate or clog in a MultiFoote mixing drum. There are no corners as in a cylinder drum. This is very important where early-strength cements or calcium chloride is being used.

Each drum roller in the 27E is mounted on two Timken bearings of the size ordinarily used in the rear end of a five-ton motor truck.

Built by Specialists in the Paving Mixer Industry for the most severe tests of Road Paving. Dependable for Mile-after-Mile, Day-after-Day, Steady, Uniform Service.



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

PACIFIC COAST DISTRIBUTORS

Edward R. Bacon Co.,
Folsom at 17th Street, San Francisco, Calif. Also offices in Oakland, Sacramento, Fresno, San Jose, Reno and Honolulu

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

World's Largest Exclusive Builders of Road Pavers

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

IN SAN FRANCISCO IT'S BACON

Full Loads *with*

"Ateco" Hydraulic Dirtmovers and "Caterpillar" Tractors

Jobs completed in record time and a greater number of jobs at greater profits are assured to the earth mover through the use of "Ateco" Dirtmovers, which haul on every trip the largest load within the power of the Tractor.* Compare these capacities---2 cu. yds. and 8 ft. wide for the "Caterpillar" Thirty: and 4 cu. yds. and 10 ft. wide for the "Caterpillar" Sixty Tractor.

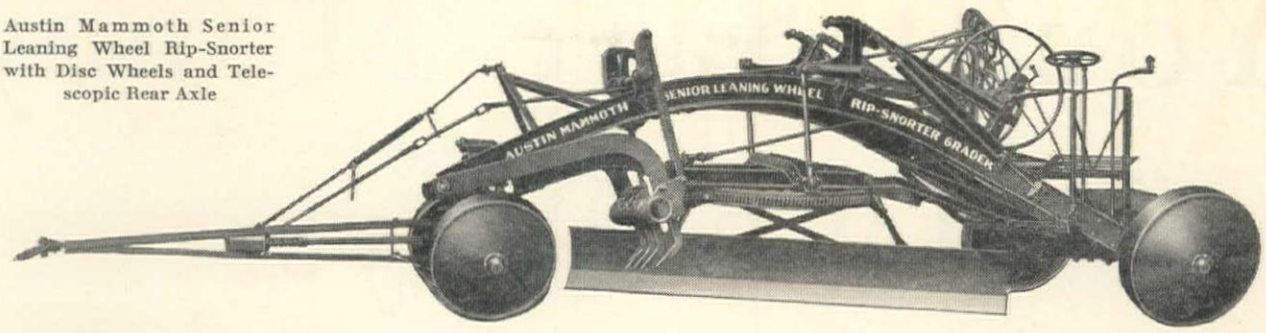
AMERICAN TRACTOR EQUIPMENT CO.

MANUFACTURER

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

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

Austin Mammoth Senior Leaning Wheel Rip-Snorter with Disc Wheels and Telescopic Rear Axle



More work per horse power!

This dual purpose Austin Rip-Snorter is typical of the exceptional values in the entire Austin-Western line .....

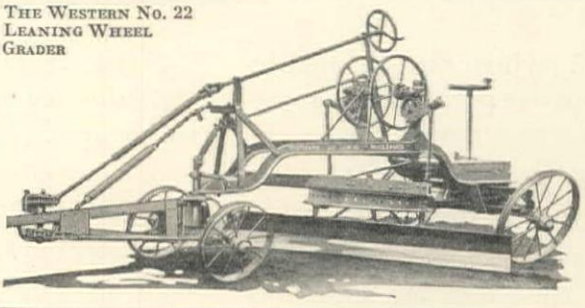
GRADER and scarifier in one—a sturdy and well-balanced outfit that bites into the hardest soil and keeps it rolling before the blade. A machine that tears up worn-out roads or rough sub-grades and regrades in one operation, thus eliminating several slow and expensive operations.

The Austin Mammoth Senior Leaning Wheel Grader, equipped with the Rip-Snorter scarifier as shown above, was the first combination grader-scarifier ever designed and is still the leader in its field. These machines are made in five sizes, ranging in weight from 5,300 to 11,200 pounds. Leaning or straight wheels may be had with all sizes, spoke or disc in the 12′ and 10′ models; spoke wheels only, in the three smaller sizes.

The famous and exclusive Austin Telescopic Axle may be had in all Austin leaning wheel graders. This valuable feature enables work to be done under difficult conditions with much greater efficiency than would be possible with graders having one-piece axles. This is just one of the many improvements to be found in Austin-Western Road Machinery — features which result in better, faster work and at less cost per mile, whatever the operation.

Write for complete information about the equipment you are most interested in. Special bulletins are available which provide much data of interest and value. Address The Austin-Western Road Machinery Co., 435 Brannan Street, San Francisco, California. Chicago Office: 400 North Michigan Avenue.

THE WESTERN No. 22 LEANING WHEEL GRADER

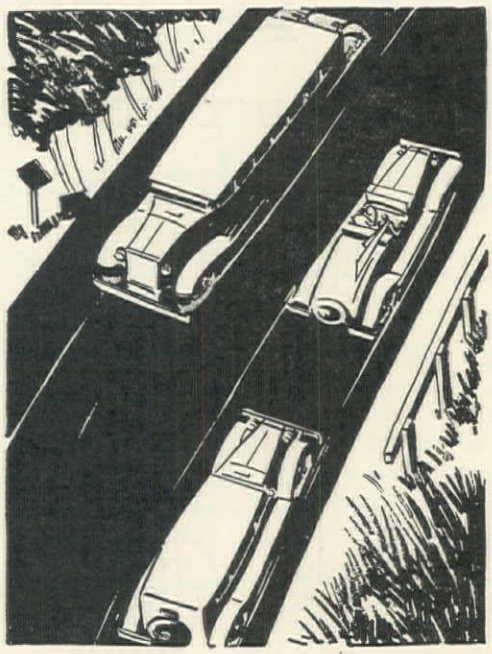


A strong, easily handled patrol grader that is also ideal for finishing shoulders, smoothing rough sub-grades, light grading and ditching. Has leaning wheels, shiftable rear axle and Timken bearings. Six horses or a light tractor can handle it. Can be supplied with a steerable offset engine hitch if desired. Write for details.

Austin-Western
ROAD MACHINERY

You'll Save Money Two Ways

If you pave with Asphaltic Concrete



THE laying cost of asphaltic-concrete pavements is somewhat *less* than other types.

Their *greatest economy,* however, lies in the fact that they *last longer.*

Many asphaltic concrete pavements are still giving satisfactory service *fifteen years* after the original jobs were laid.

These two facts are important to taxpayers. But there are other reasons also why engineers are recommending asphaltic concrete for the country's finest pavements.

1. Asphaltic concrete pavements don't sag or crack due to undermining by water because the "sealing" properties of the asphalt prevent moisture from reaching the subgrade.

2. They automatically absorb expansion and contraction so don't buckle up.

3. They effectively resist the wear of heavy traffic.

4. They can be opened to traffic soon after laying.

5. They are easily replaced after being cut into for water mains, gas mains, etc.

6. They are noiseless, dustless, and easily cleaned.

7. They are easily and quickly resurfaced.

In Southern California alone over 40,000,000 square feet of Asphaltic Concrete Pavement were laid in 1929—testimony to the increasing popularity of this better type of pavement.

Communicate with the nearest UNION OIL Company distributing station for prices and further information.

UNION "D" *Grade* Asphalt

UNION OIL COMPANY

The Right Compressor~
The Right Mounting~
The Right Drill~

can be chosen from the I-R line

I-R Portables are available in so many convenient sizes that you can readily choose an outfit for any set of drilling conditions. Each compressor is supplied on various types of running gear.

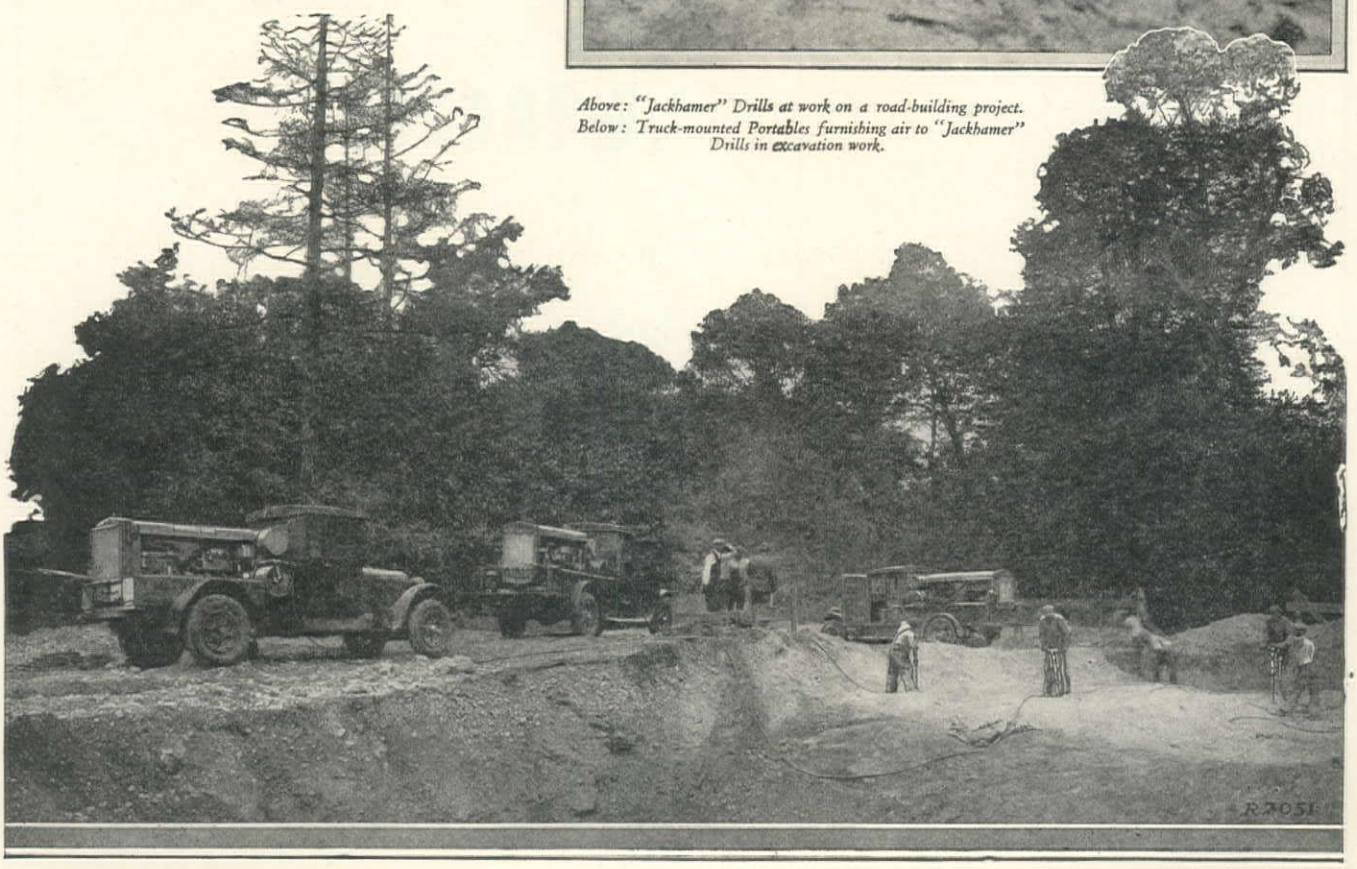
In rock work you are assured of the most economical results by operating "Jackhamer" drills from these machines. "Jackhamers" can be obtained in eight different sizes, all of which are suitable for use with I-R portables.

INGERSOLL-RAND CO.

Branches or distributors in principal cities the world over.

San Francisco, Cal. New York, N. Y.
Los Angeles, Cal. Seattle, Wash.

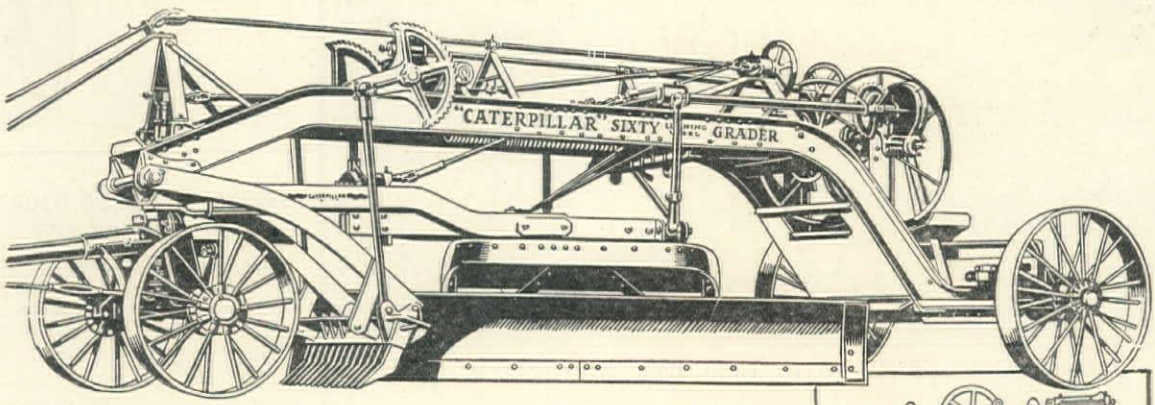
Above: "Jackhamer" Drills at work on a road-building project.
Below: Truck-mounted Portables furnishing air to "Jackhamer" Drills in excavation work.

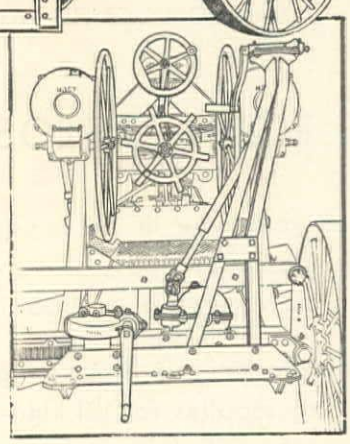


Ingersoll-Rand

CATERPILLAR
REG. U.S. PAT. OFF.

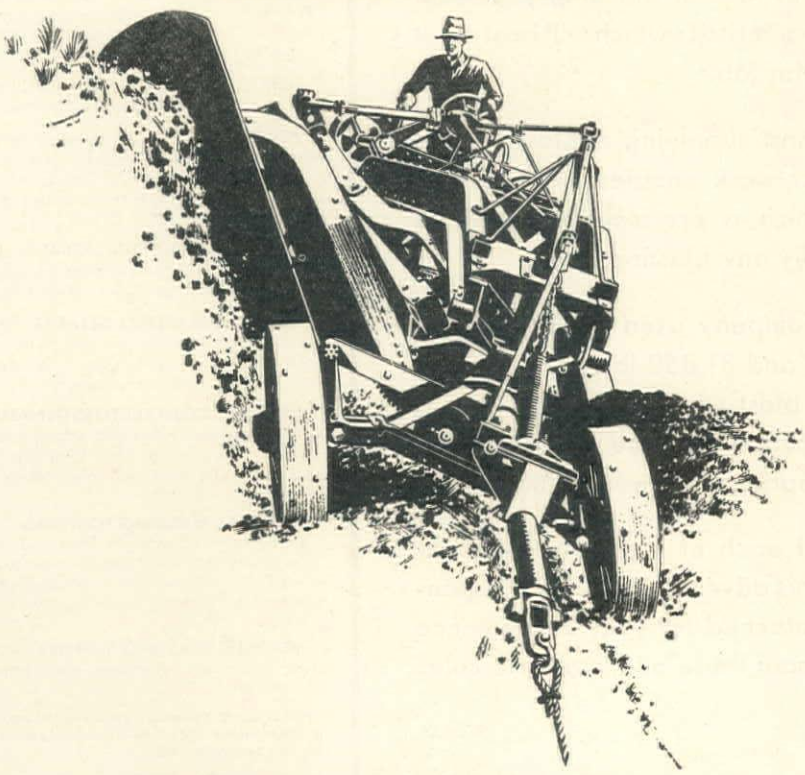
LEANING WHEEL GRADER





Price with Scarifier $2348.00
Price without Scarifier $2074.00

F. O. B.
SAN LEANDRO, CAL.



CUTTING BANK AT 60° ANGLE

BUILT TO MEET A WIDE RANGE OF OPERATING CONDITIONS

West Coast Tractor Company

1175 Howard Street, San Francisco

"ATECO" DIRT MOVERS :: KILLEFER IMPLEMENTS

BONUS or PENALTY?

LINN Tractors are helping

Contractors to increase profits

Patent No. 1,270,531
" " 1,521,454
" " 1,685,641
" " 1,685,676
1,701,979
Other Patents Pending

When "Old Man Weather" has turned dry earth to muck and mire . . . when other hauling equipment cannot move . . . when progress is menaced by idle shovels . . . when *penalties* threaten profits . . .

LINN defies the elements and keeps the job on schedule, despite ground and grades . . . and it frequently wins the *bonus!* Because the LINN was designed for the tough jobs and built to work under difficult conditions, it can also lengthen the contractor's working season.

More and more, contractors are conquering weather and controlling profits by their choice of equipment. And more and more, they are putting the LINN tractor on their jobs. LINN is the only hauling unit that lays its own road as it carries pay load . . . the only tractor operating on *flexible* traction . . . the only tractor which transfers all weight to the ground through a moving anti-friction contained roller chain system.

LINN performance facts are available to anyone interested in more efficient and more economical heavy hauling. Write or wire for them.

LINN MANUFACTURING CORPORATION

Division of LaFRANCE-REPUBLIC Corporation

Manufacturers of American La-France Trucks, Linn Tractors, Republic Trucks

Factories: Alma, Mich. - Morris, New York

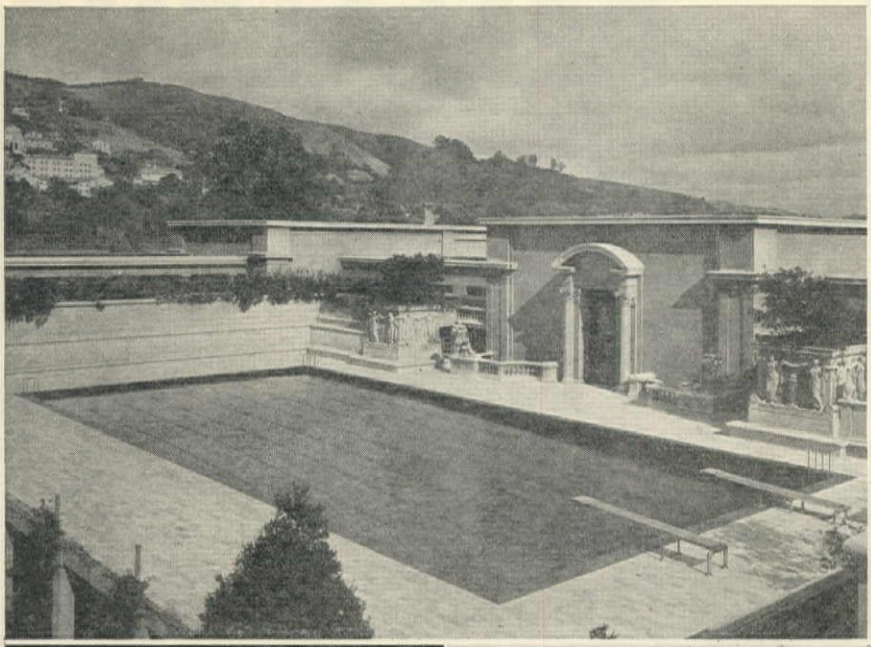
Represented in:

New York City	Boston	Philadelphia	Chicago	Tulsa, Okla.	Salt Lake City	San Francisco
Skowhegan, Maine	Charlotte, N. C.	Pittsburgh	St. Louis	Omaha, Nebr.	Denver	Portland, Ore.
New Haven, Conn.	Memphis, Tenn.	Louisville, Ky.	Kansas City, Mo.	Sioux Falls, S. D.	Jerome, Ariz.	Spokane
Baltimore	Johnson City, Tenn.	Detroit	Little Rock, Ark.	St. Paul, Minn.	Los Angeles	

105 direct distributors located throughout the United States and 49 distributors located in 30 foreign countries

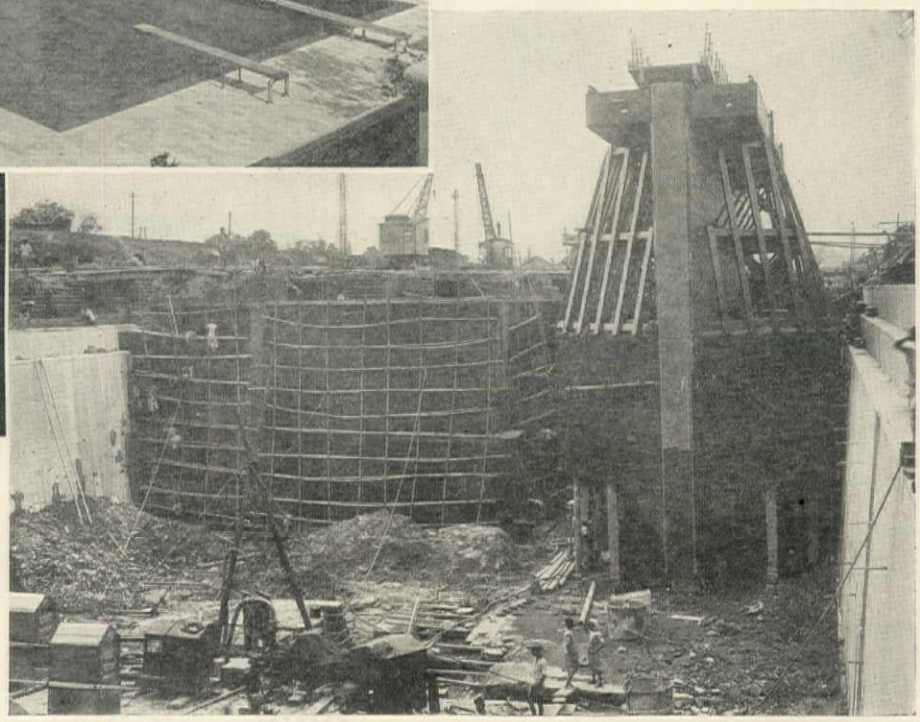
Canadian Linn Distributors: Mussens Limited, Montreal

When writing to LINN MANUFACTURING CORPORATION, *please mention Western Construction News*



Malthoid Dampcourse Membrane waterproofs three swimming pools of the Hearst Memorial Gymnasium at University of California at Berkeley. Julia Morgan, architect.

King George's Dock, Calcutta, India, is waterproofed with Floatine, and Malthoid Dampcourse Membrane.



PABCO MULTIPLE PROTECTION

"World wide apart and yet akin"

THESE two striking Pabco installations—strongly contrasting in location, size and purpose—typify the scope and importance of the world-wide uses of the membrane method of Malthoid Dampcourse waterproofing.

With time-proven Pabco methods and materials, and the cooperation of our engineering force at your command, it is a comparatively simple matter to work out the one best method of waterproofing any job.

Malthoid Dampcourse is a member of the great family of Pabco Products which unite in giving Pabco Multiple Protection to the structural, industrial and engineering industries.

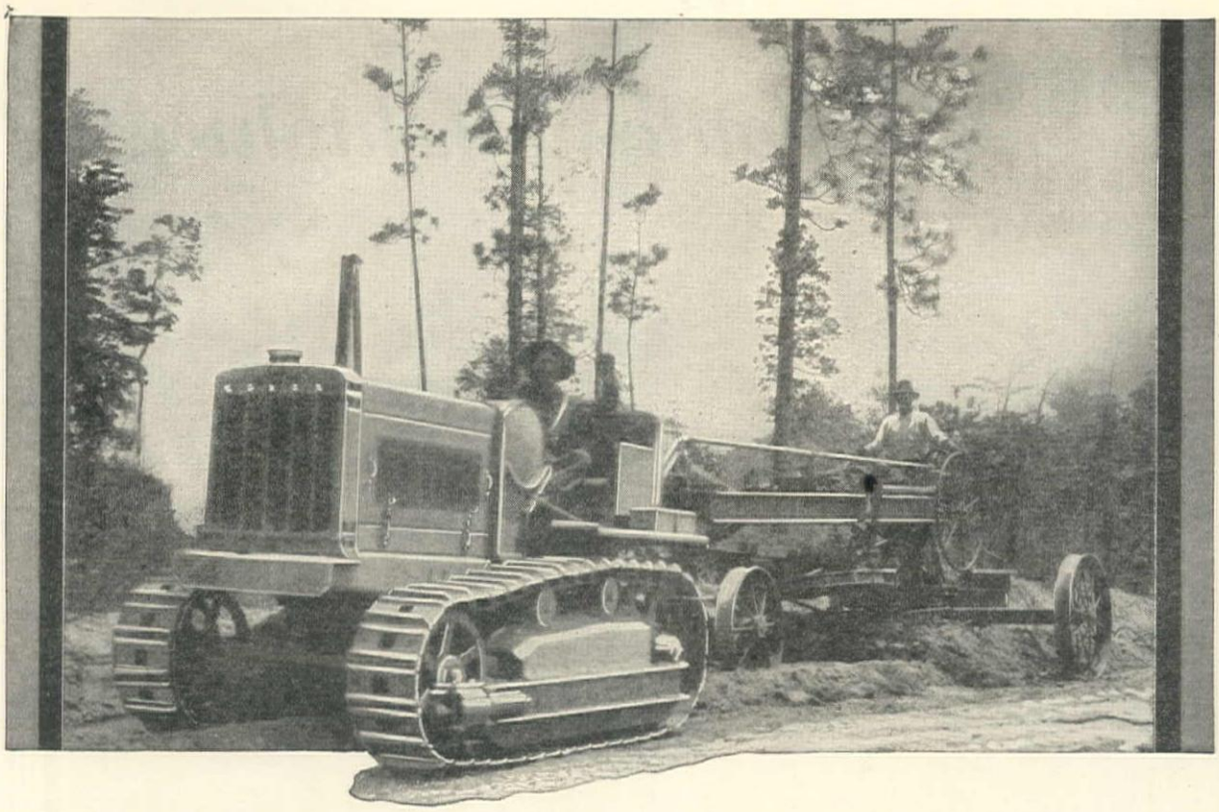
Consult our nearest office as to how we can serve you in connection with any protection problem. Or write us direct.

THE PARAFFINE COMPANIES, INC.

LOS ANGELES · OAKLAND · SAN FRANCISCO
PORTLAND · SEATTLE
Kansas City Somerville, N. J. · New York City
London, England · Sydney, Australia

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

PABCO Waterproofing



Handles the Toughest Job with Power to Spare

The extraordinary traction and power of the Bates "Steel Mule" Tractor easily handles the toughest grading job with ample power to spare. The long wide crawlers give maximum foothold to pull the load where the going is tough.

The original cost of the Bates "Steel Mule" Tractor is easily offset by the extremely low cost of production and maintenance. It is easily the lowest priced tractor when based on the cost per year of service.

The heat treated and hardened gears—proper selection of material and precision of manufacturing methods are inherent qualities of all Bates "Steel Mule" Tractors as in all other Foote Bros. Gear and Machine Co. products.

FOOTE BROS. PRODUCTS

Established 1859

BATES Steel Mule TRACTORS

W. H. Worden Company

DISTRIBUTORS

355 Fremont Street, San Francisco, Calif.

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

WIDENING *bottle-neck highways?*

SAVE THE FIRST COST AND MAINTENANCE YOU'VE PUT INTO THEM!

If your county's outgrowing its old narrow highways—remember your investment in them—don't tear them up, they're a base for new roads.

With Non-Skid Asphaltic Concrete shoulders and resurfacing right over the worn paving, you can have highways—wide, smooth, safe in any weather—that add greatly to your property value—but less to your *tax rate* than any other type of pavement. For Asphaltic Concrete stands up.

At little or no upkeep cost whatever—durable Asphaltic Concrete has taken the pounding from constantly increasing traffic for 10 years—and more—in over sixty-five Western communities.

And if you want a quick paving job—you can lay Asphaltic Concrete in record time—as fast as 1,100 tons per eight hour day on highway work—at a cost no greater than for other hard-surface materials—usually somewhat less.

Before you pave—be sure to investigate Asphaltic Concrete—the longest-lived pavement.

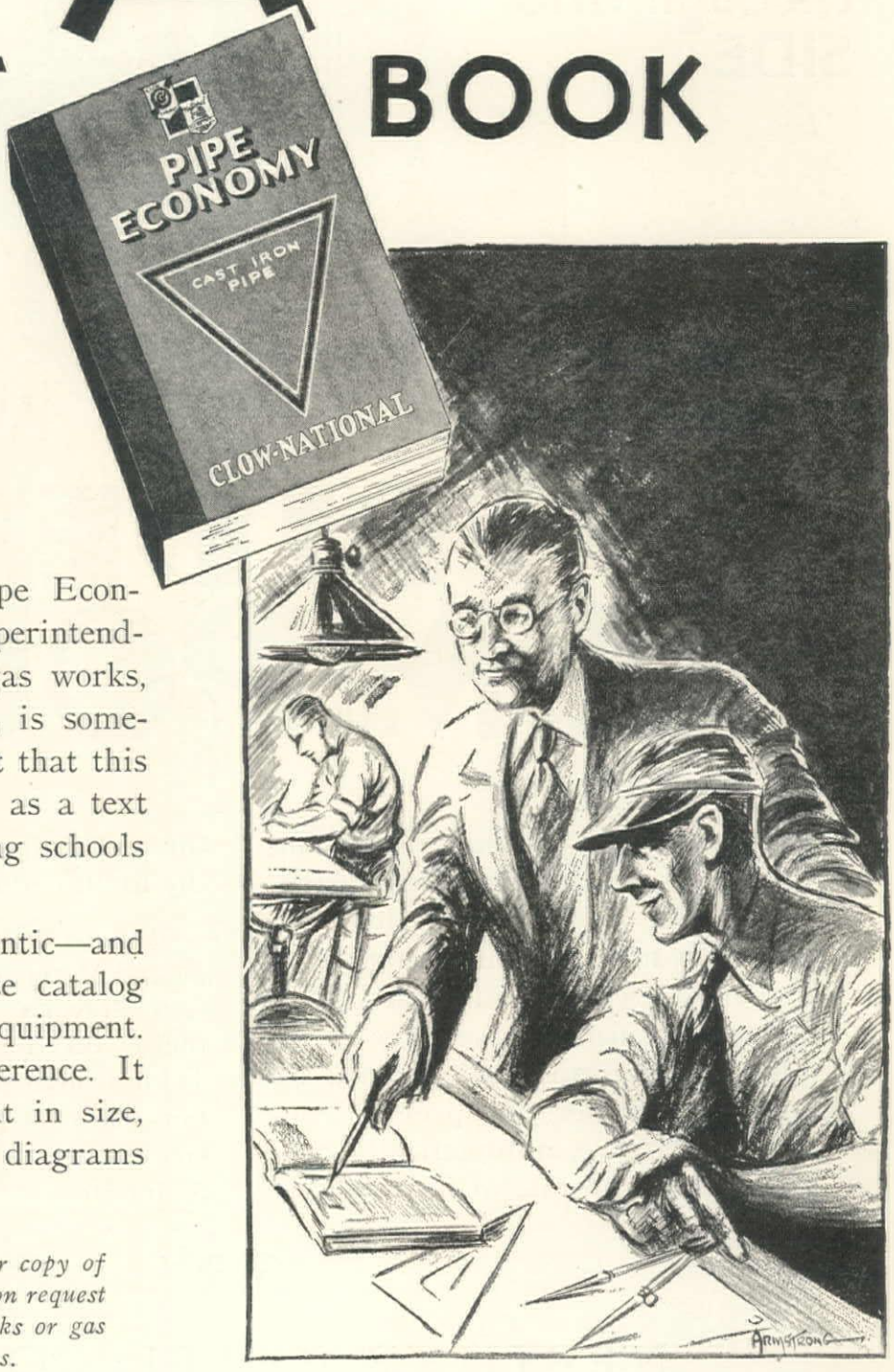
STANDARD OIL COMPANY OF CALIFORNIA

CALOL ASPHALT
A Standard Oil Product
FOR BEST RESULTS

Asphaltic CONCRETE NON-SKID PAVEMENT

When writing to STANDARD OIL COMPANY OF CALIFORNIA, *please mention Western Construction News*

A TEXT BOOK for ENGINEERING SCHOOLS AND COLLEGES . . .



THE popularity of "Pipe Economy" catalog with superintendents of water works or gas works, engineers and contractors, is somewhat explained by the fact that this same book is widely used as a text book in leading engineering schools and colleges.

It is recognized as authentic—and perhaps the most complete catalog published on pipe system equipment. It is arranged for ready reference. It is nicely bound, convenient in size, with over 2000 separate diagrams and illustrations.

If you have not received your copy of this book, it will be sent free upon request to superintendents of water works or gas works, contractors and engineers.

James B. Clow & Sons
Chicago, Illinois

National Cast Iron Pipe Co.
Birmingham, Ala.

CLOW-NATIONAL
CAST IRON PIPE
"Everything for a Pipe System"

PHILIP SCHUYLER
M. Am. Soc. C. E.
M. Am. W. W. Assn.
MANAGING EDITOR

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

WESTERN CONSTRUCTION NEWS

CLYDE C. KENNEDY
M. Am. Soc. C. E.
ASSOCIATE EDITOR

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

VOLUME V | JULY 25, 1930 | NUMBER 14

As Kipling wrote, "And then it was belts". Seattle, mover of mountains, is not content to bask like Rome on her seven hills. In the struggle to overcome broken topography, during the past quarter century Seattle has moved 50,000,000 cu.yd. of material in grades and regrades. Her latest project, the 4,500,000-yd. Denny hill regrade no. 2, is being attacked by electric shovels and sent into Elliott bay on belts and self-dumping scows, as described elsewhere in this issue.

'And Then It Was Belts'

An example of adjustment of modern excavating and transporting methods to the restrictions of grading in the heart of a crowded and busy city, this project has attracted wide interest and comment from contractors and engineers. From it, many lessons have been learned which will affect similar grading and regrading projects in the west, the foremost of which probably will be the razing of Bunker hill in Los Angeles, a 20,000,000-yd. regrade, where again 'belts' will play a prominent part.

There are but few men, and among engineers still fewer, who are 'nation-minded'—men who will get behind an idea and push it with all their energy and private resources, without thought of recompense, for the good of the community. Such a man is Robert Bradford Marshall, formerly chief topographer of the U. S. Geological Survey. Although Marshall had no preliminary engineering education, he became one of the foremost topographers and map authorities in the United States, and can be credited with securing a nation-wide appreciation for the value of topographic maps.

An Engineer with a Vision

About ten years ago, Marshall submitted to the Governor of California his plan (known as the Marshall plan) for the conveyance of Sacramento river water from the northern part of the State by canals to the San Joaquin Valley. His plan at that time was ridiculed as legally, technically, and financially preposterous by many engineers. In spite of this opposition, Marshall toured the State in its behalf, donating his own time and money to the neglect of his ranch and other interests.

Nevertheless, this started the water resources investigation by the state, authorized in 1921, which has culminated in the coordinated plan, and incidentally brought the State Engineer's office again to the front after 38 years of somnolence since the active regime of William Ham Hall.

Two years ago he was defeated at the primary election for State Senator, and then lost his voice following an operation. He was then offered the position of landscape engineer for the State Division of Highways, by Bert B. Meek, Director of Public Works, which at first he declined because of doubt of being physically able to give equivalent service, but was prevailed on to accept. Meek at this time stated: "The State of California can never repay you for what you have done."

So Marshall, an old hand at Federal Park activities, is advising on state and privately endowed parks and recreational areas as related to the highway system, and the full development of their use by visitors. This service includes the search for, and protection from, exploitation of strategic scenic vantage points.

More recently, he has submitted to President Hoover and to all members of Congress 'A Plan to Control the Mississippi River Floods by Diversion', another example of his vision and the determination to be of benefit to the community. As the mighty Mississippi has so far defied man's efforts to control it within levees, Marshall's logical, feasible, and economical plan should receive consideration.

Unfortunately, those who have this vision and who are willing to sacrifice all toward its fulfillment, do not receive their reward during their lifetime.

Today the successful contractor has a highly trained personnel and not only makes a thorough analysis for job organization, but also seeks to design or adapt equipment to fit his special needs. Residential paving in built-up subdivisions demands this careful job organization and equipping to hasten the work, keep its necessarily scattered divisions in harmony, and lessen the inconvenience to persons whose homes face the improvement.

Organization and Special Equipment

For placing 750,000 sq.ft. of cement concrete pavement and accompanying services in the Blake ave. and Riverdale improvement district, Los Angeles, Oswald Bros. successfully used a portable central wet mixing plant, the four units of which were mounted on solid-tired trucks; special-body trucks to haul, dump, and partly spread the concrete; and an efficient, modern method for curing the pavement. Much of the equipment was designed and built by Oswald Bros. and operated as described elsewhere in this issue.

Uplift Pressure in Gravity Dams

Assumptions for Design—Measurements at Existing Dams—Uplift Effects

By IVAN E. HOUK*

Senior Engineer, U. S. Bureau of Reclamation, Denver, Colorado

The consideration of uplift pressure in the design of gravity dams is an important matter. Some of the older dams which have thus far safely withstood the loads to which they have been subjected were designed and built without any allowance for uplift. This is true for certain dams built in the United States as well as for many built in foreign countries. It is understood that the usual practice in designing masonry dams in India at the present time is to ignore uplift. However, it is quite likely that many of the dams built without making allowances for uplift pressures are actually being acted upon by such forces and, consequently, may have relatively small factors of safety against failure, particularly as regards failure by sliding.

Assumptions for Design—Allowances for uplift in the design of gravity dams are usually made on the basis of two assumptions: first, an assumption of the uplift pressure intensity at different locations between the two faces of the dam; and second, an assumption of the proportion of the horizontal area on which the assumed uplift pressures act. Uplift pressure intensities are usually assumed to vary on a straight line from full reservoir pressure at the upstream face of the dam to zero, or tailwater pressure, at the downstream face. These intensities are then applied over one-third, one-half, two-thirds, or the full horizontal area of the base, the particular proportion selected being dependent on the character of the foundation rock and the plans for grouting and draining the foundation. The same assumptions are usually made in investigating horizontal cross-sections of the dam at different elevations above the base, uplift pressures being assumed to act within the concrete as well as on the base of the dam, primarily because of the presence of horizontal construction joints at which satisfactory bond may not be secured.

In designing the Owyhee dam, a 405-ft. curved gravity dam now being built on the Owyhee Project of eastern Oregon, uplift pressure intensities were assumed to vary as straight lines from full reservoir pressure at the upstream face of the dam to one-half of reservoir pressure at the location of the drains, then to zero, or tailwater pressure, at the downstream side. This particular diagram of uplift pressure intensity was adopted because of its similarity to actual pressure curves obtained at various existing dams where the grouting of bedrock and installation of vertical drains corresponded to those specified for the Owyhee dam. The pressure intensities shown by the assumed curve were applied to the full horizontal area of the base, or to the full horizontal concrete areas at different elevations above the base, although it was recognized that some proportions of the areas must be in direct contact with the concrete or rock below and consequently could not be subjected to uplift pressure. The assumptions made in the design of the Owyhee dam correspond approximately to the assumption of uplift pressure intensities varying on a straight line from full reservoir pressure at the upstream side of the dam to zero, or tailwater pressure, at the downstream side, applied over two-thirds the horizontal areas. A complete description of the design of the Owyhee dam was published in **Western Construction News** for May 10th, 1928.[1]

In designing the Willwood diversion dam, a 55-ft. concrete overflow dam built on the Shoshone Project, Wyoming, in 1922 and 1923, uplift pressures were assumed to vary on a straight line from full reservoir pressure at the upstream face of the dam to zero, or tailwater pressure, at the downstream face, and these pressures were assumed to be applicable to one-half the horizontal areas. This assumption was also used in designing the Gibson dam,[2] a 200-ft. arch dam recently completed on the Sun River Project, Montana. In designing the American Falls dam, an 80-ft. concrete gravity dam recently built on the Minidoka Project, Idaho, similar assumptions were made, except that the uplift pressures were applied to one-third the horizontal areas instead of to one-half the areas. Foundation rock was sandstone and shale at the Willwood dam, limestone at Gibson dam, and columnar basalt at American Falls dam. The Willwood dam was described in Engineering News-Record for October 27th, 1927,[3] and the American Falls dam, in **Western Construction News** for September 25th, 1929.[4]

Thus far, no definite assumptions of uplift have been adopted for use in designing the 727-ft. Boulder canyon (Black canyon) dam to be built on the Colorado river near Las Vegas, Nevada. The effects of all the above-mentioned assumptions are being calculated for each of the various alternative designs under consideration, and definite assumptions regarding the uplift pressure curve and the proportion of the horizontal area on which such pressures are to be applied will be made before the final designs are prepared.

Measurements at Existing Dams—Measurements at

*Member, American Society of Civil Engineers.

[1] 'Owyhee Dam; Details of Design of 405-ft., Concrete Arch-Gravity Dam for Owyhee Irrigation Project, Eastern Oregon', by J. L. Savage, chief designing engineer, U. S. Bureau of Reclamation, **Western Construction News**, May 10th, 1928, pages 284 to 291.

[2] A brief description of the Gibson dam, including plan and sections, was published in the August 25th, 1926, issue, and construction progress recorded in the August 10th, 1926; January 10th, March 25th, April 25th, and August 10th, 1927; March 25th, July 10th, and November 25th, 1928; February 25th and July 25th, 1929, issues.

[3] 'New Design Features in Willwood Diversion Dam', by Ivan E. Houk, senior engineer, U. S. Bureau of Reclamation; Engineering News-Record, October 27th, 1927, pages 660 to 664.

[4] 'American Falls Dam, Minidoka Project, Idaho', by Ivan E. Houk, senior engineer, U. S. Bureau of Reclamation; **Western Construction News**, September 25th, 1929, pages 480 to 490.

existing gravity dams have shown that uplift pressures usually occur at some locations on the foundation level, even though the foundation rock may be of an ideal character, comparatively free from cracks and seams, and even though thorough grouting may be done and an elaborate drainage system installed near the upstream face of the dam. Whether or not uplift pressures actually exist within the concrete, or on the horizontal construction joints within the dam, has not been determined thus far, although investigations for the purpose of making such determinations are being conducted at a few comparatively large dams including the Gibson dam forementioned, and the Bull Run dam near Portland, Oregon. Thus far, the measurements at the Gibson dam have not shown appreciable uplift pressures within the dam at any of the horizontal joints. It is understood that a similar lack of uplift pressure within the concrete has been noted at the Bull Run dam. However, the existence of uplift pressures within the St. Francis dam at the time of its failure, in the upper sections of the dam as well as near the base, is indicated by the unusually large seepage from the concrete which in some places continued for several months after the collapse of the structure.

Uplift pressure intensities at foundation levels in concrete or masonry dams founded on rock, have been measured at the Willwood and American Falls dams forementioned, at the Oester and Neye dams in Germany, at the Brule River dam in Wisconsin, at the Medina dam in Texas, at the Pit River No. 3 dam in California, and at the Mulholland dam in California. Similar measurements may have been made at other dams, but no data regarding such investigations are available to me at the present time. The measurements at the Willwood and American Falls dams were discussed briefly in the references forecited, and were described in detail in the Transactions of the American Society of Civil Engineers for 1929.[5] Measurements at the Oester and Neye dams were described by R. Schaefer in Zeitschrift fuer Bauwesen for 1913, abstracts of which were subsequently published in Engineering and Contracting[6] and Engineering News[7]. Data regarding measurements at the Brule River dam were furnished to Engineering News-Record by D. W. Mead and C. V. Seastone, consulting engineers, of Madison, Wisconsin, and were described in the February 18th, 1926, issue of that magazine.[8] So far as is known to me, no descriptions of the measurements at the Medina, Pit River No. 3, or Mulholland dams have ever been published in engineering literature. Data regarding uplift pressure observations at these dams were obtained from C. H. Kearny, of San Antonio, Texas, who was in charge of the Medina Project when the earlier uplift measurements were made; from R. A. Monroe, formerly of the Pacific Gas & Electric Co., San Francisco, California, which company built the Pit No. 3 dam; and from the Los Angeles Bureau of Water Works and Supply, which bureau built the Mulholland dam and later secured the uplift pressure data at that structure.

Maximum Observed Uplift—Fig. 1 is a composite diagram which shows the maximum observed uplift pressures at the foundations of existing gravity dams built on rock foundations. Measurements during reservoir stages at, or very close to, the ultimate heights to be expected were available in practically all cases. The observed pressures are shown as percentages of the total head. The total head was taken as the difference between the tailwater and reservoir water surface

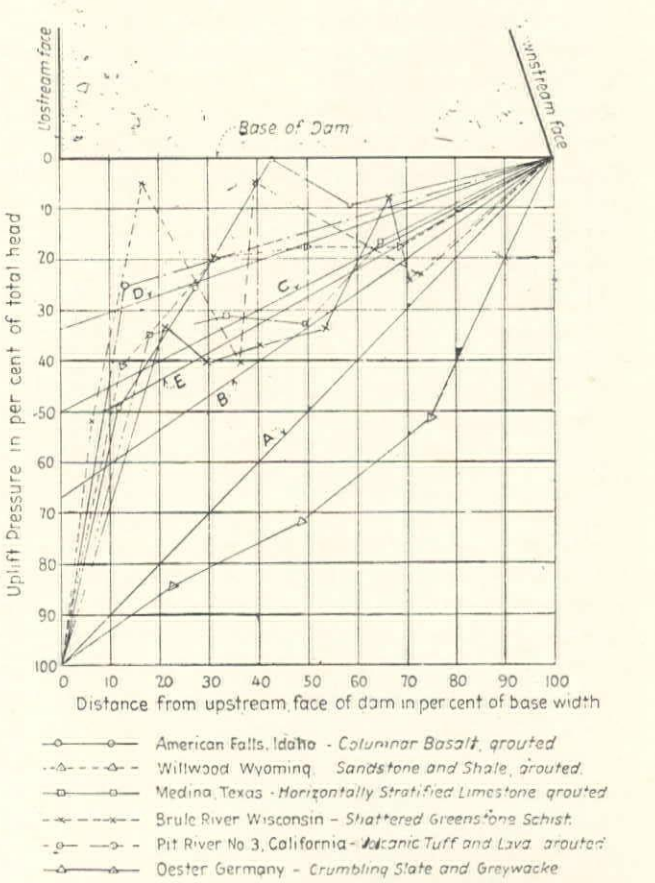


Fig. 1.- Maximum Observed Uplift Pressure under Existing Gravity Dams on Rock Foundations

elevations, and all pressure readings were corrected to the level of the tailwater surface. Locations of uplift pressure measurements with respect to the upstream face of the dam are shown as percentages of the total base width. Although the adjustment of the various observations to the percentage basis required some approximations, it is believed that the resulting curves furnish valuable information. Curves representing observed uplift pressures have been arbitrarily extended as straight lines from the values observed at the pipes farthest upstream to the 100% value at the upstream edge of the base; also as straight lines from the values observed at the pipes farthest downstream to the 0% value at the downstream edge. The latter is probably an accurate assumption. The former may indicate uplift pressures greater than those actually existing,

[5]'Upward Pressures Under Dams: Experiments by the United States Bureau of Reclamation', by Julian Hinds, Transactions, American Society of Civil Engineers, Volume 93, 1929, pages 1527 to 1550; also discussion by Ivan E. Houk, same volume, pages 1565 to 1571.

[6]'German Studies of Uplift on Masonry Dams', abstracted by Alfred W. Hoffman, Engineering and Contracting, September 22nd, 1915, pages 218 to 221.

[7]'Experiments on Uplift in Masonry Dams', by C. R. Weidner, Engineering News, July 31st, 1913, pages 202 to 205.

[8]'Tests of Water Pressure Under Brule River Dam', Engineering News-Record, February 18th, 1926, pages 274 and 275.

especially in cases where thorough grouting of the foundation was done along the upstream edge of the base, as was the case at several of the dams represented on the diagram.

All of the dams forementioned as having been subjected to actual measurements of uplift pressure on the base, are represented on Fig. 1, except the 200-ft. curved gravity Mulholland dam in Hollywood, California. At the Mulholland dam, 16 holes drilled vertically into the sandstone foundation along the toe of the dam where the concrete was about 10 ft. thick, at a time when the water surface in the reservoir was 23 ft. below the spillway level, showed no water at all in 5 holes, some water below the base of the dam in 3 holes, and uplift pressures on the base varying from 2 to 25 ft. of head at the remaining 8 holes. However, no uplift measurements were made at locations nearer the upstream face of the dam and, consequently, no attempt has been made to show the data on Fig. 1. Observed uplift pressure curves shown for the Willwood, American Falls, and Medina dams, where uplift measurements were made at more than one cross-section, are for selected sections where the uplift pressures were either typical or slightly greater than the average. The data shown for the Oester dam were observed at section A-B where the uplift pressures were most intense. Uplift pressures at the Pit River No. 3 dam were measured at 4 pipes, all equally distant from the upstream face. Consequently, in this case the maximum observed pressures were averaged and shown as one point.

For comparative purposes, curves of uplift pressure intensity usually assumed in designing gravity dams are also shown on Fig. 1. Curve 'A' is a straight line drawn from full reservoir pressure at the upstream face of the dam to zero pressure at the downstream face. Curve 'B' shows the uplift pressures which, if applied to the full horizontal area, will give the same effect as the curve 'A' pressures applied to two-thirds the area. Similarly, curves 'C' and 'D' show the uplift pressures which, if applied to the full horizontal area, will give the same effects as the curve 'A' pressures applied to one-half and one-third the areas, respectively. Curve 'C' represents the assumptions used in designing the Willwood and Gibson dams forementioned, and curve 'D' represents the assumptions used in designing the American Falls dam. Curve 'E' shows the uplift assumption used in designing the 405-ft. Owyhee dam, the pressures in this case being applied to the full horizontal areas.

Results of Measurements—In studying the results of the uplift pressure measurements at foundation levels, recorded on Fig. 1, it must be remembered that no data are available regarding the areas on which the observed pressures act. All that is known is that the observed pressures cannot act on more than 100% of the horizontal base area. Since appreciable proportions of the concrete areas must be in direct contact with the foundation rock at most existing dams, the effective areas acted upon by uplift forces are doubtless considerably less than 100%. A possible exception to this general conclusion would be the case of dams built on relatively porous, coarse-grained sandstone formations where the effective areas may approach the 100% value, as indicated by the experiments on uplift in pervious soils conducted by H. De B. Parsons a few years ago[9]. However, if the maximum observed uplift pressures applied to the full horizontal areas produce uplift forces and uplift moments smaller than those used in design, it may be safely concluded that the design assumptions were adequate.

The observed uplift pressure curves in Fig. 1 show that the effects of uplift pressure should never be ignored in designing gravity dams. Leaving out of consideration the Oester dam in Germany, where the foundation rock was not ideal and where, apparently, modern precautions of grouting and draining the foundation were not taken, it will be noticed that the observed pressure curves are fairly well grouped and are located mostly between curve 'B' and the base of the dam. This grouping and location of the observed curves would indicate that uplift assumptions for purposes of design, assuming satisfactory foundation rock and adequate grouting and draining operations, should usually be chosen somewhere between curves 'B' and 'D'. In other words, it will seldom be necessary to apply curve 'A' to more than two-thirds the horizontal base area; or seldom advisable to apply curve 'A' to less than one-third the horizontal base area. However, curve 'E' seems to represent the most logical uplift assumption to make at the present time; although it may sometimes be possible to reduce the uplift pressure shown, keeping the same general shape of curve. Curve 'E', as before stated, is applied to the full horizontal area and assumes a straight line decrease in uplift pressure from full reservoir pressure at the upstream edge of the base to one-half of reservoir pressure at the location of the drains, then to zero pressure at the downstream edge. Sometime in the future, definite data may be secured regarding the ratio of the effective area on which uplift pressures act to the total horizontal area for different kinds of foundation rock and, when that time comes, it may be possible to apply curve 'E' to a portion of the horizontal area instead of to the full area.

Results of uplift pressure measurements at Gibson dam, received just as this issue is going to press, show that uplift pressures on the base of this dam are much less intense and occur at much fewer locations than at any of the dams represented in Fig. 1.

Effect of Grouting and Draining — Grouting the foundation rock near the upstream edge of the dam undoubtedly has a beneficial effect in reducing uplift pressure, but does not completely eliminate uplift. Installation of foundation drains near the upstream edge of the dam also has a beneficial effect, inasmuch as the drains tend to remove the percolation and seepage water which might otherwise build up pressure under the base of the dam. The drains also intercept percolation and seepage in rock seams for some distances below the base, depending on the depth of the drains, thus tending to prevent the accumulation of water and building up of pressures in horizontal rock seams within the foundation at short distances below

[9]"Hydrostatic Uplift in Pervious Soils', by H. De B. Parsons, Transactions, American Society of Civil Engineers, Volume 93, 1929, page 1317.

the base. Uplift pressures in such seams, because of the relatively small weight of the intervening rock, would be almost as dangerous as uplift on the base of the concrete section. The installation of foundation drains along the upstream edge of the Willwood dam was not necessary because of the relatively small size of the structure. However, if such drains had been installed, the observed uplift pressures would undoubtedly have been smaller.

As time progresses, the drains may gradually become clogged with chemical incrustations, deposited by the drainage water. However, similar depositions probably clog the percolation passages through the rock before the drains become completely filled, thus reducing the uplift pressures on the base and removing the necessity for the drains. Deposition of silt at the upstream face of the dam also helps to reduce the uplift pressure on the base, since it tends to close the entrances to the percolation passageways through the foundation. At the Oester dam, where considerable seepage and unusually high uplift pressures developed when the reservoir was first filled, both seepage and uplift pressure decreased gradually as time progressed. At a location about 19 ft. from the upstream face of the dam, uplift pressures amounting to 85% of reservoir pressure in 1907, when the reservoir was first filled, decreased to values about 71% of reservoir pressure in 1910.

Uplift Action—Uplift pressures may act in several different ways. They may act on the base of the dam, in horizontal construction joints, in tension cracks, or within the concrete. The last condition occurs if the concrete materials have not been proportioned so as to obtain a dense impervious product, and if an efficient drainage system has not been installed near the upstream face. If the dam is comparatively thin so that tension occurs at the upstream face, water will tend to enter the horizontal joints and tension cracks as well as the pores in the concrete, and cause uplift pressure. In such cases, the uplift will tend to widen the joint or crack openings and to extend the cracks to greater depths from the upstream face, besides tending to increase the tension in the concrete. Such effects may also occur when the usual stress analysis, ignoring uplift, indicates the presence of compressive stresses at the upstream face of the dam, provided the compressive stresses are sufficiently lower than the unit water pressures at corresponding elevations.

A thorough treatment of uplift problems would have to include discussions of effects produced by many different assumptions of uplift on many different types of dams. Brief notes regarding opinions of various engineers on the different effects of uplift, together with references to the publications in which such opinions were expressed, were given in an article by A. Floris, published in **Western Construction News** for January 25th, 1928[10]. Reference should also be made to the articles on the subject of uplift, by C. E. Pearce, published in **Western Construction News** for September 10th and October 25th, 1928[11].

[10]'Uplift Pressure in Gravity Dams', by A. Floris, **Western Construction News**, January 25th, 1928, pages 58 to 62.
[11]'Uplift Under Dams', by C. E. Pearce, Western Construction News, September 10th, 1928, pages 569 to 570, and October 25th, 1928, pages 662 to 664.

Uplift does not change the total pressure on the foundation, or the distribution of the foundation pressures, so long as the uplift does not exceed the concrete stress, except for the slight increase in the weight of the structure which results from the presence of water in the pores of the concrete, an effect which is negligible in any well-built dam and consequently can quite properly be ignored. Of course, if only a part of the area of the base is in contact with the foundation, and no uplift forces are acting, the pressure on the areas in contact are proportionately greater than they would be if the whole area were in contact. Consequently, when uplift pressures develop in the areas not in contact they transmit part of the load to the foundation and thus partly relieve the

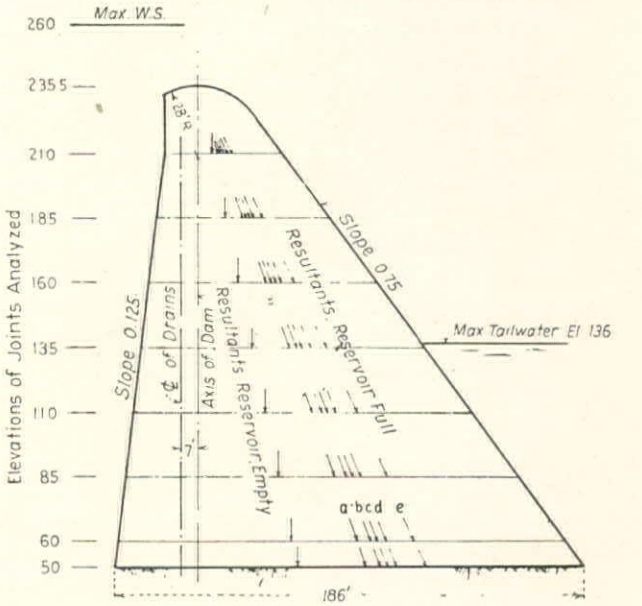


Fig. 2. - Effect of Variations in Uplift Pressure on Location of Resultant

stresses on the areas actually in contact. Uplift pressures within the pores of the concrete act in the same way, reducing the compressive forces carried by the small concrete struts which are 100% solid, or increasing the tension as the case may be.

Effect on Sliding—One effect of uplift which has not received much emphasis in the various published discussions of the subject, but which is probably the most important effect of all, is the effect on the factor of safety against failure by sliding. Only the areas of the base in direct contact with the foundation can develop friction forces opposed to the tendency to slide. Since the friction forces developed at such areas are directly proportional to the loads being transmitted, a reduction in load through the introduction of uplift pressure in adjacent porous areas means a direct reduction in the force available to prevent sliding.

The effect of an increasing uplift pressure on the tendency of a dam to slide is shown by the downstream movement of the resultant as well as by the

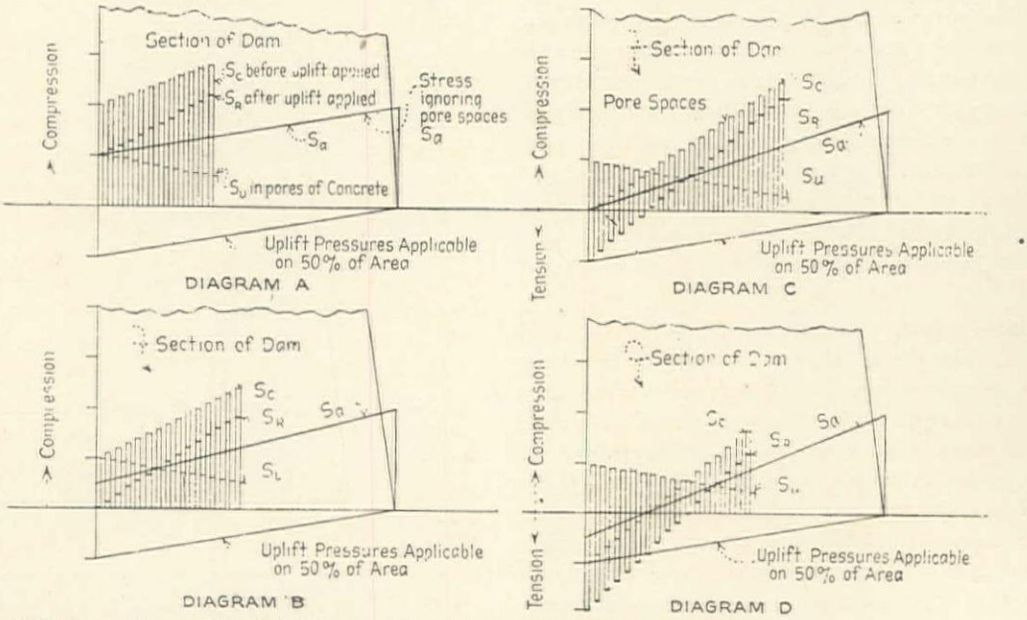
increasing value of the sliding factor, the sliding factor being the ratio of the total horizontal forces to the total vertical forces. Fig. 2 shows the effect of variations in uplift pressure on the location of the resultant in a massive gravity dam of moderate height, the resultant lines being drawn so as to pierce the horizontal joints and the base at the proper locations rather than to represent accurately the slopes of the resultants. Table 1 shows the increase in the value of the sliding factor for the same cross-section and the same uplift assumptions, also the sliding factor for the Owyhee dam uplift assumption represented by curve 'E', Fig. 1. It will be noticed that the sliding factors calculated for the Owyhee assumption are approximately the same as those calculated for the two-thirds uplift assumption; that is, for the assumption of curve A. Fig. 1, applied to two-thirds the horizontal area. As far as the calculation of sliding factors is concerned, it is not material whether the assumed uplift pressures act in the pore spaces within the foundation rock, in pore spaces within the concrete, in cracks or seams in the foundation near the base of the dam, or in cracks in the concrete.

Effect on Stress—Fig. 3 shows the effect of uplift on stress in an uncracked dam built with a porous concrete, in which one-half the horizontal area is made up of pore spaces, the usually large percentage of porosity being assumed in order to facilitate the preparation of the diagrams. The true concrete stress is shown for different assumptions of the usual stress diagram, for conditions occurring both before and after uplift forces began to act. Uplift pressures are assumed to vary on a straight line from a fixed amount at the upstream side of the dam to zero at the downstream side, and to be applicable to one-half the horizontal area, that is, to the areas assumed to be occupied by pore spaces. The uplift assumptions are the same for all diagrams.

Let S_a = stress, assuming no pore spaces present.
Let S_c = stress for actual concrete areas before uplift occurs.
Let S_R = stress for actual concrete areas after uplift occurs.
Let S_u = stress in pore spaces caused by uplift.

Stresses platted upward from the base line represent compression; those platted below represent tension. The uplift diagram shown below the base line simply indicates the assumed uplift pressure intensities at different locations between the two faces of the dam. S_a, calculated on the assumption that there are no pore spaces in the concrete, is the stress obtained in the usual analyses of forces acting on a dam. It corresponds to the stress measured when a concrete cylinder is broken in a testing machine. Since the areas occupied by the pore spaces are taken equal to one-half the total area, S_c, the actual stress in the concrete struts between pores before uplift develops, is always twice as great at S_a.

S_u, the stress in the pore spaces caused by uplift, is seen to reduce the actual compression in the concrete struts in diagrams A and B, to cause tension in the concrete struts in diagram C, and to increase the tension in the concrete struts in diagram D. The effect of uplift on the actual concrete stress, S_c, has a maximum value at the upstream side of the dam, decreases uniformly toward the downstream side, and becomes zero when the downstream side is reached,



Notation:- S_c = Stress in Concrete, deducting pore spaces, before uplift is applied. S_a = Stress if no pore spaces present. S_R = Stress in Concrete, deducting pore spaces, after uplift is applied. S_u = Stress in pore spaces due to uplift.

FIGURE 3 - DIAGRAMS SHOWING EFFECT OF UPLIFT ON CONCRETE STRESS

TABLE I

Effect of Uplift on Sliding Factors at Dam Shown in Fig. 2

	Sliding Factors for Uplift Assumptions as noted below					
Elev. Ft.	No. Uplift (a)	⅛ Uplift (b)	⅓ Uplift (c)	Owyhee Uplift Assumption	⅔ Uplift (d)	Full Uplift (e)
210	0.394	0.468	0.517	0.563	0.577	0.752
185	0.424	0.494	0.539	0.582	0.594	0.742
160	0.438	0.510	0.555	0.598	0.608	0.754
135	0.445	0.516	0.562	0.606	0.616	0.762
110	0.448	0.533	0.590	0.661	0.659	0.862
85	0.451	0.547	0.612	0.708	0.695	0.954
60	0.452	0.556	0.629	0.746	0.723	1.032
50	0.453	0.560	0.635	0.759	0.733	1.061

in accordance with the assumed uplift pressure intensity curves platted below the base lines. The action of uplift pressure in relieving compressive stress in the concrete struts is similar to the effect of uplift in reducing the loads carried by the areas of the base of the dam in direct contact with the foundation, as previously discussed. That is, as soon as uplift pressure is developed in the pore spaces, a part of the load which had previously been carried by the concrete struts, is transmitted through the water to the concrete or rock below. On the other hand, if the usual stress analysis indicates the presence of tensile stress in the concrete elements, the development of uplift pressure in the pore spaces increases the pull on the concrete.

Since S_c is always greater than S_a, regardless of the exact proportion of pore space, it is plain that the development of uplift pressure in the pores can cause no tension in the concrete when S_a is compression and has a greater value than S_u. Furthermore, since S_u at the upstream face of the dam can never exceed full reservoir pressure, it is plain that the development of uplift pressure in the pores can cause no tension at the upstream face when S_a at that location is compression and has a value greater than the water pressure; or, in other words, when the criterion proposed by Maurice Levy is fulfilled. However, the studies recorded in Fig. 3 would indicate that this criterion is too severe. For the concrete considered therein, S_R is zero at the upstream face when S_a is 50% of S_u at that location; that is, when the ratio of S_a to S_u is the same as the porosity of the concrete. A simple mathematical treatment shows that this same relation holds for other values of porosity. Consequently, it appears that no tension can be caused at the upstream face when S_a at that location is compression and is the same percentage of the water pressure that the total area of the pore spaces is of the total area of the cross-section. When this percentage becomes zero, S_a becomes zero and the resultant pierces the base at the downstream edge of the middle third, the criterion which has been followed in the design of many gravity dams. This criterion, in the case of large and important dams, is probably as much on the side of danger as Maurice Levy's criterion is on the side of safety.

The above reasoning leads to the conclusion that gravity dams, instead of being designed to meet the extreme criterion proposed by Maurice Levy, or according to the frequent practice of having the resultant pierce the base at the downstream edge of the middle third, should be designed so that the stress at the upstream face of the dam, calculated in the usual way, ignoring uplift, is compression and is a definitely greater proportion of the water pressure than the total area of the pore spaces in the concrete is of the total area of the cross-section. H. M. Westergaard, senior mathematician, Bureau of Reclamation, in a special study of concrete porosity, concluded that an irregular section, such as would probably represent a plane of fracture, might contain pore spaces totaling 20% of the horizontal area, in the case of a concrete having 6% voids by volume. Consequently, I believe that important gravity dams should be designed so that the stress at the upstream face of the dam is compression and has a value at least 50% as great as the water pressure at all elevations.

Acknowledgments — Bureau of Reclamation dams are designed under the direction of J. L. Savage, chief designing engineer. All engineering and construction of the Bureau is under the direction of R. F. Walter, chief engineer, with headquarters at Denver, Colorado, and all activities of the Bureau are under the general charge of Elwood Mead, commissioner, with headquarters at Washington, D. C.

Editor's Note—Additional articles on the Owyhee dam were published in the following issues: June 25th, 1928, p. 25; February 25th, 1929, p. 119; June 10th, 1929, p. 287; July 25th, 1929, p. 385; and December 25th, 1929, p. 687; and references to the American Falls dam as follows: April 10th, 1926, p. 41; July 10th, 1926, p. 50; October 10th, 1926, p. 136; December 25th, 1926, p. 37; April 25th, 1927, p. 51; and May 25th, 1927, p. 57.

NATIONAL HYDRAULIC LABORATORY

After a seven-year effort on the part of engineers, Congress has passed a bill providing for the establishment of a national hydraulic research laboratory in the Bureau of Standards at Washington, D. C., for the determination of useful fundamental data, including the behavior and control of river and harbor waters, the study of hydraulic structures and water flow, and the development and testing of hydraulic instruments and accessories. The bill was signed by President Hoover on May 14. It was fathered by John R. Freeman, consulting hydraulic engineer; sponsored by Joseph E. Ransdell, senator, and James O'Conner, representative, both from Louisiana; and supported by American Engineering Council.

An appropriation of $350,000 was authorized for the construction and equipping of this laboratory.

CENSUS OF CONSTRUCTION

Before turning over the Census of Construction (see April 10th, 1930, issue, p. 190) to supervisors and field enumerators for completion by personal canvass in cities of more than 10,000 people, about 175,000 report blanks were distributed by mail. Alanson D. Morehouse, chief of the construction section in the division of distribution, U. S. Bureau of the Census, estimates that between 75,000 and 100,000 general and subcontractors did at least a $25,000 business in 1929 and thus fall within the Census.

For census purposes, general contracting includes buildings; highways; bridges and culverts; street paving; sewer, gas, water, and other conduits; dams and reservoirs; waterworks; dredging; rivers and harbors; levees; railroads; foundations; power plants; etc. Subcontracting includes carpentering; concreting; steel erection; stone work; wrecking; excavating; and specialty trades.

Reports were mailed to 31,949 contractors in twelve western states, as follows:

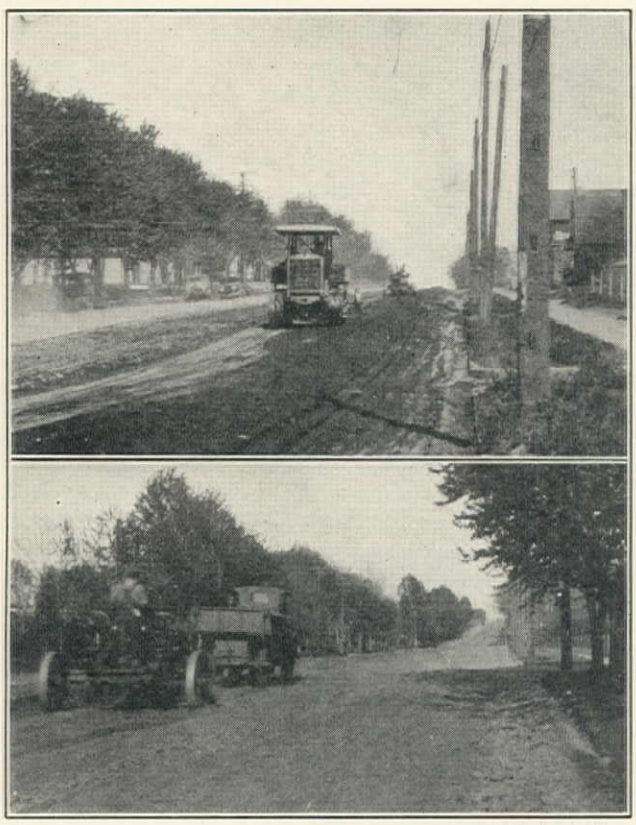
Arizona	634	New Mexico	243
California	18,956	Oregon	1,423
Colorado	1,704	Texas	4,995
Idaho	325	Washington	2,095
Montana	505	Wyoming	212
Nevada	223	Utah	634

Englewood-Littleton Highway, Colorado

By JOSEPH C. COYLE, *Englewood, Colorado*

The state of Colorado and Arapahoe county recently completed oil surfacing on 3½ miles of heavily traveled road between the towns of Englewood and Littleton, at a cost of about $4000 per mile. This road, mostly 30 ft. wide and formerly surfaced with gravel, traverses the rolling breaks of Platte river and has a subsoil of sandy loam. Although well drained by Armco culverts at intersections, it became extremely dusty during the summer months. The surface type was improved as follows:

Replenishing Road Metal—Old gravel surfacing was reclaimed and enough pit-run gravel taken from Platte river and added so as to cover the road to a depth of 3 in. The pit-run material was dug by a ½-yd. Speeder dragline and by a 1-yd. Sauerman cableway bucket, the latter operated by a 2-drum C.M.C. hoist and a Buda gasoline engine. The cableway sheaves were carried on a 55-ft. stiff-leg timber tower. Gravel was



(Upper) Graders at Work on Oil Mix for Englewood-Littleton Highway. (Lower) Galion Grader Turning and Drying Gravel

dumped into a 15-yd. loading hopper at the rate of 1 cu.yd. per minute and thence to dump trucks (Coleman, Mack, White, and G.M.C.).

Spreading, Discing, and Oiling—The surfacing was turned by a Galion grader and, after thorough drying, the gravel was spread and disced. Traffic lanes were left open at all times.

To give employment to surplus labor and avoid screening and crushing, the oversize gravel (¾-in. and up) was removed by hand raking, loaded into trucks, and delivered as concrete aggregate to the site of a 20 by 20-ft. arch culvert. The stone was delivered at about 60% of the cost of screening and crushing.

Three applications of 80-90 asphalt road oil were required, oiling being at the rate of ½ gal. per sq.yd. per application. Between each application, double discing was done with a 4-gang disc harrow pulled by a Cletrac tractor. This disc harrow closely followed a

Speeder ½-yd. Dragline and Sauerman 1-yd. Cableway Bucket Taking Pit-Run Material from Platte River, Englewood-Littleton Highway

900-gal. Etnyre distributor, two distributors being operated alternately. Three booster tanks, each holding 900 gal., were used to transfer oil to the distributors on the road. Half the width of road was oiled at a time, the other half being left clear for traffic.

Oil was used at the rate of one car per day, and a total of 112,000 gal. was required. Tank cars were spotted on a spur at one end of the road and a Continental pumper, formerly the property of the Denver Fire Department, was furnished with an extension stack and used to heat the oil in the cars. A 3-in. Goulds centrifugal pump, mounted on a truck chassis and run by the truck engine, pumped oil from the cars.

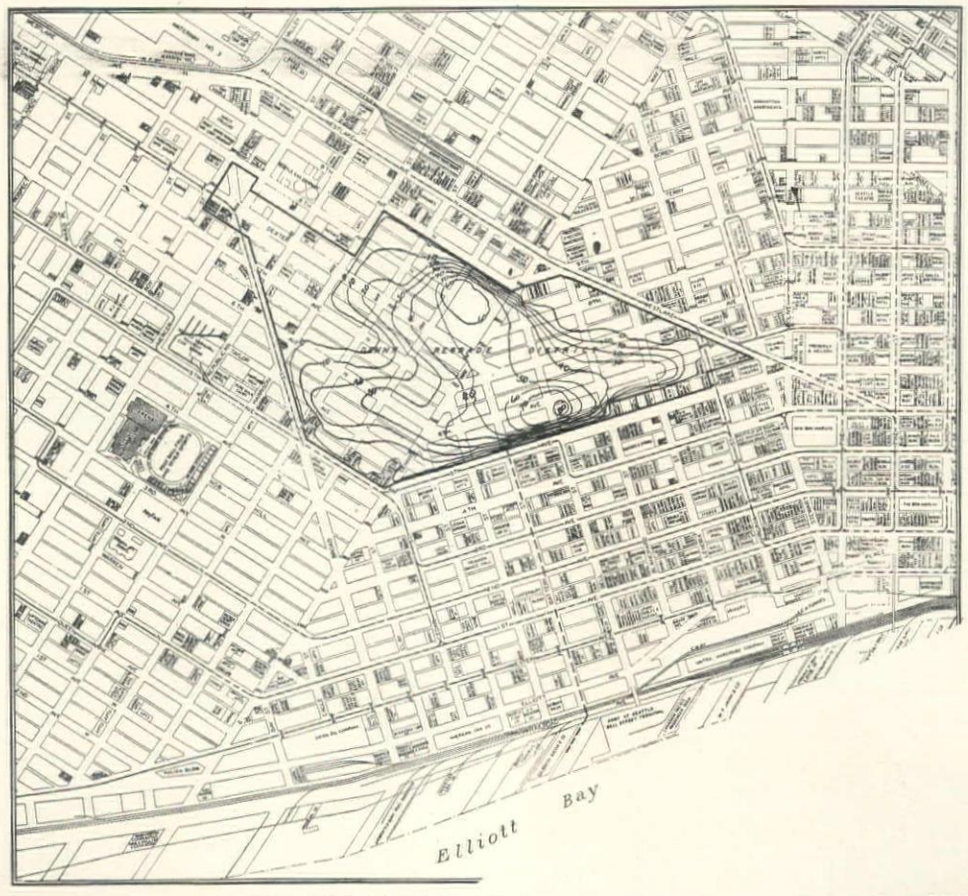
After oiling, the surface was mixed by turning 25 to 30 times. For this work, Galion and Austin graders were used, powered by Caterpillar, Cletrac, and Bates 'Iron Mule' tractors. Stain tests were made and, when these showed the proper consistence, the surfacing was laid with the graders and traffic turned on it while another section was prepared. A Wehr one-man grader was used to maintain the surface.

Personnel—L. D. Blauvelt is state highway engineer of Colorado. This work was in division 1 of the Colorado State Highway Department, of which E. E. Montgomery, Denver, is division engineer. T. W. Shearer, county road superintendent for Arapahoe county, was in direct charge of the work.

Denny Hill Regrade No. 2, Seattle, Washington

Overhead Fixed and Portable Field Conveyors Fed by Electric Shovels Moving 4,500,000 cu.yd. of Earth from 38 City Blocks (95 Acres) to Elliott Bay—Contract Completion Date September 14, 1930

Historical—To overcome broken topography, the city of Seattle, public utilities, and private owners have moved 50,000,000 cu.yd. of material in regrades, fills, and sanitary fills since this work was first begun in 1906. The above total is exclusive of the Lake Washington ship canal and the Duwamish commercial waterway. Prior to 1910, about 14,000,000 cu.yd. had been moved, the largest being the Jackson st. regrade (3,424,263 cu.yd.) and Denny hill regrade no. 1 (5,397,700 cu.yd.). The largest project between that date and 1928 was the Dearborn st. regrade, for which a final estimate of 1,259,836 cu.yd. was issued in 1912. In 1928, Denny hill regrade no. 2 was commenced, the contract completion date being September 14, 1930. This project is officially known as Sixth ave., et al.



DENNY HILL REGRADE No. 2, SEATTLE, GEO. NELSON, CONTRACTOR. LINK-BELT OVERHEAD FIXED CONVEYOR PASSING DOWN BATTERY ST. TO ELLIOTT BAY

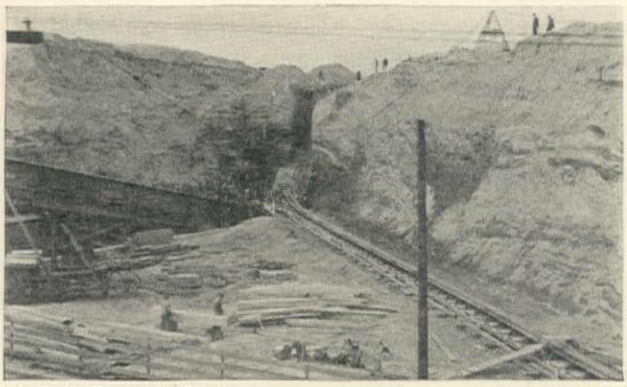
Present Project—Denny hill regrade no. 2 includes 4,500,000 cu.yd. of excavation from 95 acres within a space of 38 city blocks. The regrade district is irregular in shape (see contour map), the principal boundaries being: Westlake and 9th ave. n., Virginia and Broad st., and 5th ave. The maximum cut is 89 ft. Material is excavated by power shovels, loaded onto portable field belt conveyors radiating from a central collecting point at 5th ave. and Battery st., transferred to a permanent elevated belt conveyor on Battery st., moved along this conveyor to a pierhead on Elliott bay, delivered to self-dumping scows, and wasted into deep water a short distance off shore.

Denny Hill Regrade No. 1—The present project begins about where Denny hill regrade no. 1 (started in 1906 and completed in 1910) left off. Regrade no. 1 extended from Pine st. on the south to Denny way on the north, and from 2nd ave. on the west to 6th ave. on the east, embracing an area one-fourth mile wide and about one mile long. It had a maximum cut of 110 ft. at 4th ave. near Blanchard st.

Prior to regrade no. 1, the site of the old Denny Hill hotel had been lowered by a private contractor, who employed steam shovels and a hydraulic giant connected to the city mains. Both these methods with the equipment originally installed proved inadequate to remove the hard, blue shale from the lower levels of

the hill with the speed desired. A pumping plant using sea water was then installed. This plant delivered 3500 g.p.m. at 100-lb. nozzle pressure to a group of hydraulic giants, and the private enterprise was completed on time.

The contract was awarded for regrade no. 1 on August 17, 1907, with a time limit of 30 months for completion and a unit price for excavation of $0.27 per cu.yd. A pumping plant and sluicing equipment with 3000 cu.yd. per day capacity was required in the specifications. Nozzles of 3 to 3½-in. opening were used. Water and earth was delivered to large pipes and debris sluiced through a tunnel along Bell st., empty-



Link-Belt Portable Field Conveyor Feeding to Fixed Overhead Conveyor Through Central Collecting Point, Denny Hill Regrade No. 2

ing into flumes which led to the bay. Steam shovels delivering into industrial cars were used to supplement the hydraulic method; these cars dumped into the tunnel and the debris was broken down by jetting.

Denny Hill Regrade No. 2 — For hydraulic operations on the first regrade, auxiliary means were required to properly handle the material and convey it to points from which it could be disposed of by flowline water. Also, the giants might play on closely

Overhead Conveyor on Battery St., Showing Substantial Housing, Denny Hill Regrade No. 2

compacted material for relatively long periods before breaking down the banks. Where there is heavy traffic on improved streets surrounding an area such as Denny hill, transportation of material at street level would be obstructed and dynamiting should be kept to a minimum. For these reasons the hydraulic method was discarded as not being practicable on Denny hill regrade no. 2 and a belt conveyor system costing $7 per lin.ft. and fed by power shovels was selected for the project. (A temporary tunnel had been considered, but this would have had to be solidly backfilled after completion of the regrade and its estimated cost was $45 per lin.ft.)

One main conveyor line is provided, consisting of three fixed and eighteen movable sections. The fixed sections are housed in an elevated timber structure safely above street level, extending from a central collecting point to a scow-loading point on Elliott bay. Self-dumping scows deposit the material in deep water. The movable belt sections are each 250 ft. long, and the line of these belts radiates from the central collecting pit. The several steps in removing Denny hill are detailed hereafter.

Contract—The present project includes the removal of 4,242,000 cu.yd. from Denny hill (one contract); grading and 7 to 9-in. cement concrete paving on 132,000 sq.yd. of streets and alleys; 34,800 sq.yd. of concrete sidewalk; 13,240 lin.ft. of 12 to 30-in. cast-iron water pipe; and 21,260 lin.ft. of 8 to 21-in. vitrified pipe sewers. The project was authorized July 3, 1928, and a contract awarded to Geo. Nelson, Seattle, the lowest of seven bidders, on September 14, 1928, work being ordered September 25 for a time limit of 720 days. The total bid was $1,516,974 (average bid $1,700,000), for which the main item was 2,688,500 cu.yd. excavation at $0.25 (restricted to streets and alleys and 1:1 side slopes). Private property grading was estimated at 1,500,000 cu.yd. and was included in

Reversible Scow Discharging 400-cu.yd. Load in Elliott Bay

the contract; a separate contract was let for 354,000 cu.yd. in the two-block area of Denny park. On both of the latter estimates the unit price of $0.25 applies and the job cost is actually increased to nearly $2,000,000. The unit bid summary, published in the September 25th, 1928, issue, p. 34, includes the following items in addition to excavation: cement concrete pavement—$1.65 per sq.yd. for 7-in., $1.85 per sq.yd. for 8-in., $2.10 per sq.yd. for 9-in.; cement concrete sidewalk — $1.40 per sq.yd.; vitrified sewer — $2.00 per lin.ft. for 8-in. side sewers, $3.25 per lin.ft. for 15-in., $3.75 per lin.ft. for 18-in., $4.75 per lin.ft. for 21-in.; class 'C' cast-iron water pipe—$2.70 per lin.ft. for 12-in., $8.00 per lin.ft. for 20 and 24-in., $11.00 per lin.ft. for 30-in.

The project will be paid for through assessment district funds, the owners of 92% of the private property having agreed to this method of payment.

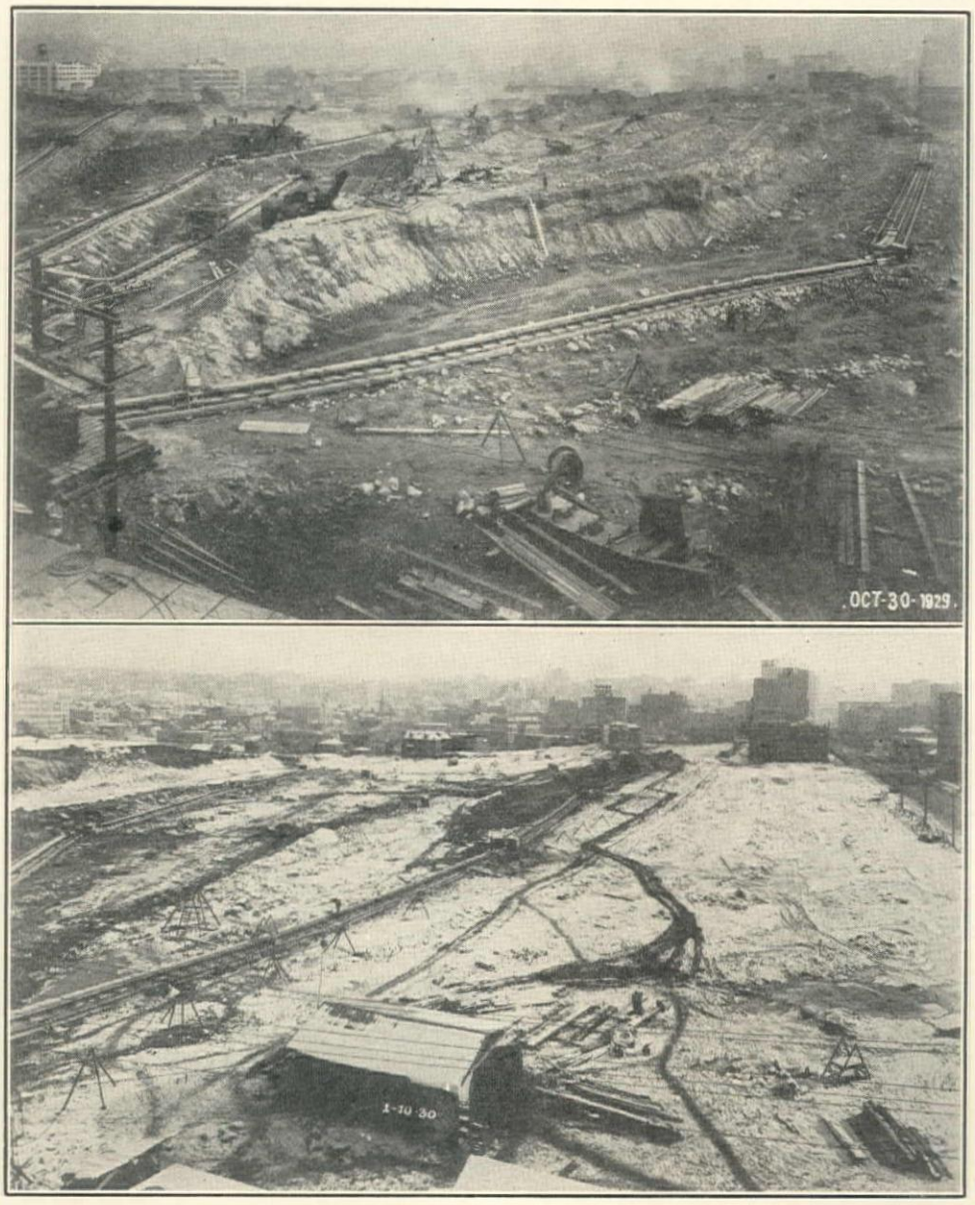
Excavation — Four 2-yd. Marion type 80 electric shovels, one 1½-yd. Bucyrus-Erie no. 30-B gas-electric, and one 1¼-yd. Marion type 32 steamer are used to excavate material from Denny hill. The excavation ranges from wet sand to hardpan, much of it being a blue clay. Some boulders have been uncovered and these are handled by a special crew. No powder is used in the excavation.

Excavation has been carried on from a working face at the level of 5th ave. and extending south from the collecting point, and from benches at a higher level (shovels on the top bench make a 40-ft. cut). Each shovel discharges into 2½-yd. portable steel hoppers mounted above a movable belt section. The hoppers are carried on double-flanged wheels and can be run on timbers laid upon wooden skids projecting from the field belts. The hoppers unload by means of steel apron feeders, chain-driven and electrically operated. Delivery to the movable belt sections is regulated so as to prevent any overload.

The hoppers were specially designed by A. Lincoln, general superintendent for George Nelson, and were built by Bacon & Matheson, Seattle. The apron feeders, movable, and fixed belts, were designed and built by the Link-Belt Co.

Movable Belt Sections—There are 4725 lin.ft. of portable field conveyor, made up in 250-ft. interchangeable sections, each equipped with a 20-hp. General Electric motor. The sections are so constructed that each may spill material onto the one next in the direction of the central collecting pit. Flexibility in length and alignment of field belts is possible through the use of these skid-mounted sections. (From their first to final positions, the field belts will turn through a straight angle.)

The portable conveyors are equipped with 36-in. belts traveling at a speed of 400 ft. per min., and having a capacity of 600 cu.yd. per hour. The belt is of 7-ply canvas with a ⅛-in. rubber facing on the top side and a $\frac{1}{16}$-in. bottom cover; manufactured by the Goodrich Rubber Co., Emsco Belting Co., and Goodyear Rubber Co.



BATTERY OF 2-YD. MARION ELECTRIC SHOVELS DISCHARGING INTO PORTABLE STEEL HOPPERS AND THENCE TO MOVABLE BELT SECTIONS. DENNY HILL REGRADE No. 2 ON OCTOBER 30, 1929, AND JANUARY 10, 1930

Central Collecting Point—At a point on Battery st. near the future southwest corner of 6th ave., material from the movable belt sections discharges through a main hopper to the fixed belt leading to Elliott bay.

Fixed Belt Sections—The permanent belt is in three sections, extending along the south side of Battery st. and thence on an angle to the pier head. All of the

fixed belt is in an elevated structure 18 ft. above the street level and is boarded full height on the south side for prevention of dust nuisance and on the north to above the belt level to protect passersby. The first section is 943 ft. long and extends from the central point to slightly beyond 3rd ave., having three street crossings on timber trusses. This section is driven by a 100-hp. General Electric motor, providing for 33% overload capacity, and includes an incline against the load. The second section is 1455 ft. long and ends at

Marion 2-yd. Electric Shovel Near Central Collecting Point for Denny Hill Regrade No. 2

Railroad ave., having five street crossings. It is mostly on a downgrade and is powered by a 50-hp. General Electric motor, providing 33% overload capacity. Between Railroad ave. and a discharge chute on the pier, the third section is placed. This is 400 ft. long and is powered by a 75-hp. Westinghouse motor.

The 'anti-friction' belts are carried on trough cradle supports at 4-ft. centers, each support having one horizontal and two slope rollers. The rollers are specially lubricated and are Timken-equipped.

through use of a pressure belt holding the main belt against the drive pulley. All belt motors are electric signal controlled for starting and stopping and stopping in sequence, so as to avoid overloads or floating.

Final Disposal—Self-dumping wooden scows (100 by 34 by 9½ ft.) carry 400 cu.yd. of excavated material weighing 3002 lb. per cu.yd. when wet. The scows are built reversible with two decks for alternate loading and intermediate eccentric chambers for water or air. The scow fleet dumps in specified harbor areas at minimum depth of 64 ft. below low water, the actual depth used being 71 ft. When a scow is ready to dump, seacocks are opened into eccentric tanks and the overturning accomplished within 3 minutes. The emptied barge then rises and the eccentric tanks are drained by gravity in a period of 8 minutes. Thereafter a new load can be placed on the reversed deck. The haul is short as the water is deep close to shore and the side slopes are steep.

Progress—Denny hill regrade no. 2 was 50% complete on April 25 and 70% complete (58% as to earthwork) on June 1. Sewers, house connections, and watermains are being laid in the excavated area south of Battery st. and electric conduits are being installed in this area by public utility companies. Paving in the excavated area began about July 1. The contract time expires September 14, 1930.

Excavation and removal of Denny hill has been at the rate of 12,000 to 12,500 cu.yd. per day; the maximum output was on March 4, 1930, when about 15,000 cu.yd. was moved (24-hour day).

Personnel—W. D. Barkhuff is city engineer of Seattle and O. A. Piper, D. W. McMorris, and T. H. Carver are assistant city engineers. Assistant engineers are: C. L. Wartelle on plans and specifications and street lighting, L. R. Andrews on paving and concrete construction, I. W. Embury on sewers and grading,

DENNY HILL REGRADE No. 2 ON MARCH 12, 1930, LOOKING SOUTH FROM SIXTH AVE. AND BATTERY ST.

The main belt has a speed of 600 ft. per min. and a capacity of 900 cu.yd. per hour. The motor on the loaded downgrade belt-section operates as a generator and has the same function as a brake. By providing a solenoid brake on the motor, the belt can be stopped and held even though the downgrade portion is loaded. The first and second sections of the main belt are both mechanically and electrically connected. A counterweighted automatic takeup is provided on the first two fixed belt-sections to compensate for slack and hold the tension uniform. This takeup is vertical in position and has a travel of 15 to 30 ft. In addition, wear on the belt in the second section is decreased

J. H. Quense on water supply, and H. F. Faulkner on inspection and testing of materials.

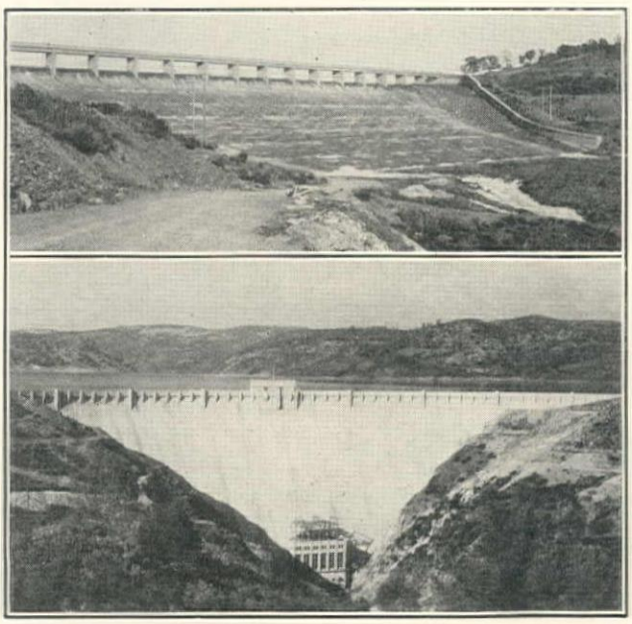
For George Nelson, Alfred Lincoln is general superintendent, and Ollie Halpin is secretary. Harold Brunyer is superintendent of shovels for the Nevada Contracting Co. and J. Davis is superintendent of sewers and paving for S. Moceri.

Excavation was sublet to the Nevada Contracting Co., Fallon, Nevada, and to Copenhagen & Copenhagen, Portland; sewers and paving to S. A. Moceri, Seattle; and the disposal of material in deep water to Croft & Johnson, Seattle. Geo. Nelson retained the transportation of material between shovels and scows.

Pardee Power Plant of the East Bay Municipal Utility District, California

By F. W. HANNA*
Chief Engineer and General Manager, East Bay Municipal Utility District, Oakland

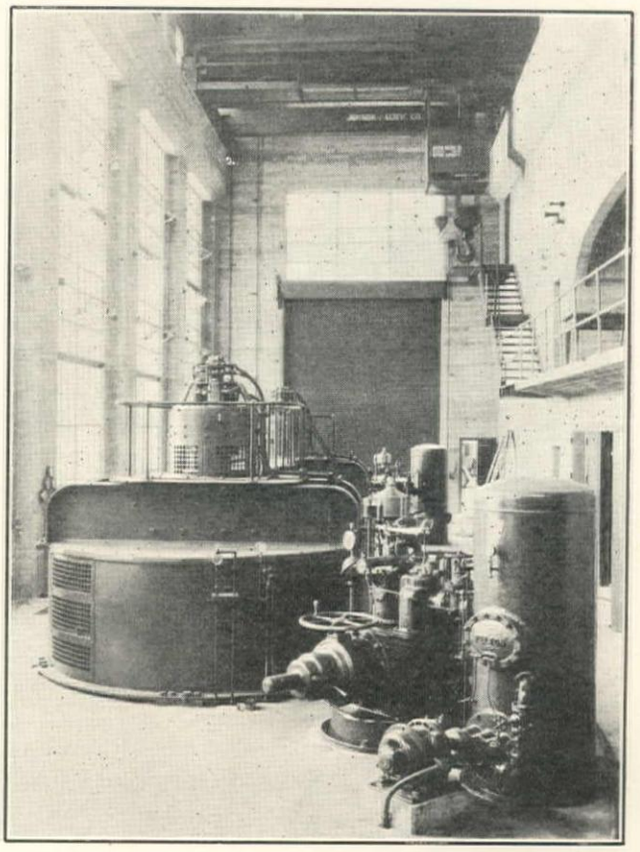
The first unit of the East Bay aqueduct of the Mokelumne river project carries one-fifth of the East Bay Municipal Utility District's ultimate water supply of 200,000,000 g.p.d., and this ultimate supply takes only one-fourth of the entire average flow of the Mokelumne river. Consequently, the annual runoff of this river is far in excess both of the present and of the future estimated amount of water required for the district. This surplus water, together with that necessary to let through the Pardee dam for prior appropriators and riparian owners on the Mokelumne river below the dam, is available for the development of power.



(Upper) South Spillway of Pardee Reservoir on May 13, 1930.
(Lower) Pardee Dam and Reservoir on May 11

The Pardee reservoir, as in the case of all reservoirs on rivers, has the larger part of its capacity in the upper part of the storage basin, and as a consequence water let out through the dam can be released under a good head before the elevation of the storage is greatly lowered. The spillway elevation above sea level of the Pardee dam is 567.5 ft., and that of the water in the riverbed below the dam is 240.0 ft., thus giving a maximum head on the power plant of 327.5 ft., when the reservoir is full, with some additional amount in case of water overflowing the spillway. Within the upper 77.5 ft. of the reservoir there is contained 122,000 of the total 197,000 ac-ft. held by the reservoir above the aqueduct outlet; and it is anticipated that the power plant can normally be operated with the reservoir level between elevations 490 and 567.5 ft. in practically all years. Considering the flood period and the excess storage capacity in the upper part of the reservoir, the power plant will normally operate under a head of 300 ft., with a range from 240 to 327.5 ft.

The water wheels consist of two vertical-shaft reaction turbines, each designed to develop 10,000 hp. when operating under a net effective head of 300 ft. at a speed of 450 r.p.m. One of the turbines is designed to rotate clockwise and the other counter-clockwise. The speed of each turbine is controlled by a standard oil-pressure governor, designed to give accurate speed control. The guaranteed full-load efficiency of the turbines is 84%. Water for operating the turbines is brought through the dam in two 72-in. diam. flanged cast-iron pipes, controlled at the upper end by means of emergency Broome gates, and at the lower end, prior to entering the scroll cases of the turbines, with butterfly valves. The turbines and the oil-pressure governors are of Pelton Water Wheel Co. manufacture.



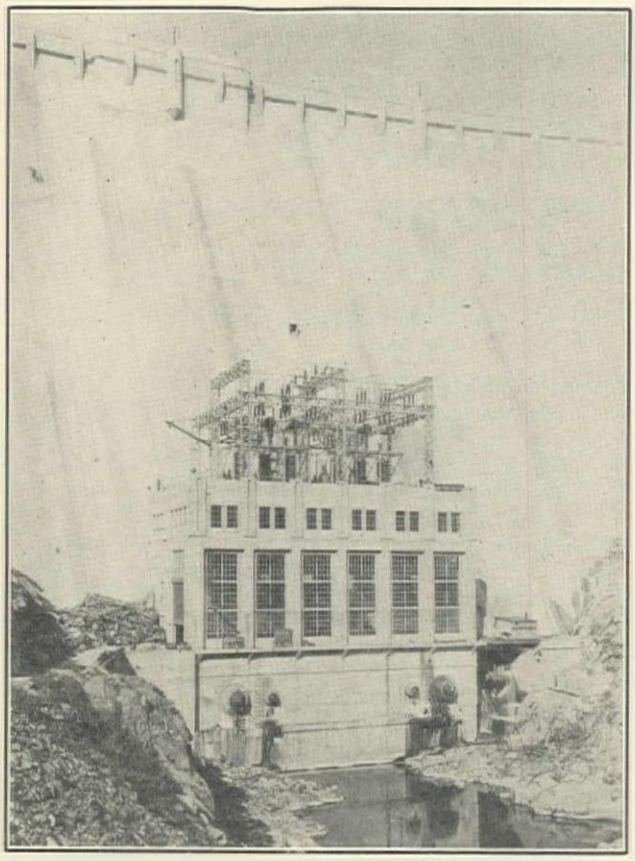
Interior of Powerhouse at Pardee Dam, Showing Two 9375-kv-a. General Electric Generators, Pelton Oil-Pressure Governor Equipment, and Judson Crane

The generating plant consists of two 16-pole, 9375-

*Member. American Society of Civil Engineers.

kv-a., 0.8-p.f., 6900-volt, 3-phase, 60-cycle, partly enclosed vertical water wheel generators, designed to operate at 450 r.p.m. The generators are provided with spring thrust and guide bearings and direct-connected exciters. One of the generators operates in clockwise rotation and the other in counter-clockwise rotation. The temperature rise of the generators is guaranteed not to exceed 50° on the stator and 60° on the rotor above an ambient temperature of 40° C. The guaranteed full-load efficiency of the generators is 96.9%.

The main-line transformer equipment consists of six 3125-kv-a., 6600-volt, single-phase, oil-immersed, water-cooled, outdoor-type transformers designed to step the current up to 110,000 volts, and equipped with complete switchboard-mounted temperature indicators



Exterior View of Pardee Power Plant on April 2, Showing General Electric Transformer Equipment and Pelton Valves

capable of being operated in connection with any one of the six transformers. The guaranteed efficiency of the transformers is 98.9%.

The lightning arrester equipment is installed on the roof of the powerhouse and consists of two 3-phase oxide film outdoor-type 110,000-volt lightning arresters with choke coils.

The plant is also equipped with oil-circuit breakers, complete switchboard apparatus including three 30-kv-a., 6600 to 115/230-volt, single-phase, oil-immersed, self-cooled outdoor-type transformers for switchboard and powerplant equipment, a switchboard storage battery, a water-cooled air compressor, a 40-ton capacity electric traveling crane, a 20-ton capacity hoisting crane, and other necessary apparatus.

The generators, transformers, oil circuit breakers, lightning arresters, switchboard and apparatus, disconnecting switches, and switchboard storage battery are of General Electric Co. manufacture. The air compressor was manufactured by The Rix Co., and the traveling crane and transformer hoists are of the Judson Pacific Co. make. All machinery for the Pardee power plant was furnished under a general contract with the General Electric Co.

In addition to the transformer equipment for the switchboard and powerplant machinery, the plant furnishes current off the bus bars at 6600 volts for transmission to Camp Pardee and to the outlet tower, where it is stepped down to 110 volts for lighting and to 220 volts for heating and operation of gates and screens.

The Pardee dam powerplant was started July 1, and has been operating satisfactorily since, delivering current at 75% load capacity.

The district has contracted the output of the powerplant except that needed at the dam, Camp Pardee, and the outlet tower, to the Great Western Power Co. for a period of five years. The annual output varies from about 70,000,000 to 125,000,000 kw-hr. Of this output, a large percentage is primary power.

OPERATION OF E.B.M.U.D. WATER WORKS

Water storage in the various reservoirs of the East Bay Municipal Utility District, character of water, consumption, etc., as of July 16, are given in the following table:

Storage

Reservoir	Above Outlets (Gal.)	Loss or Gain in Storage (Gal.)
(Main Reservoir)		
Pardee	59,035,800,000	—3,848,400,000
(Local Reservoirs)		
San Pablo	5,625,200,000	+ 219,200,000
Upper San Leandro	2,082,800,000	+ 113,300,000
Lower San Leandro (Chabot)	155,400,000	— 17,200,000
Temescal	26,100,000	— 400,000
Total in Local Reservoirs	7,889,500,000	+ 314,800,000

Average Daily Consumption

From	Gal.
Reservoirs	40,170,000
Wells and Springs	820,000

Pumping from wells was discontinued permanently on July 3.

Character of Water

Reservoirs	Hardness (P.P.M.)	Turbidity (P.P.M.)
Pardee	37	----
San Pablo	60	15
Upper San Leandro	80	12
Lower San Leandro	185	15

Practically all water is filtered.

The following are the water rates for domestic and industrial consumption:

General Use Service Charge per Meter per Month

Meter Size	Charge per Month	Meter Size	Charge per Month
5/8-in.	$0.55	3-in.	$ 8.80
3/4-in.	1.10	4-in.	13.75
1 -in.	1.65	6-in.	27.50
1½-in.	2.75	8-in.	44.00
2 -in.	4.95	10-in.	62.70
		12-in.	84.70

Rates for Water Used (Add to Service Charge)

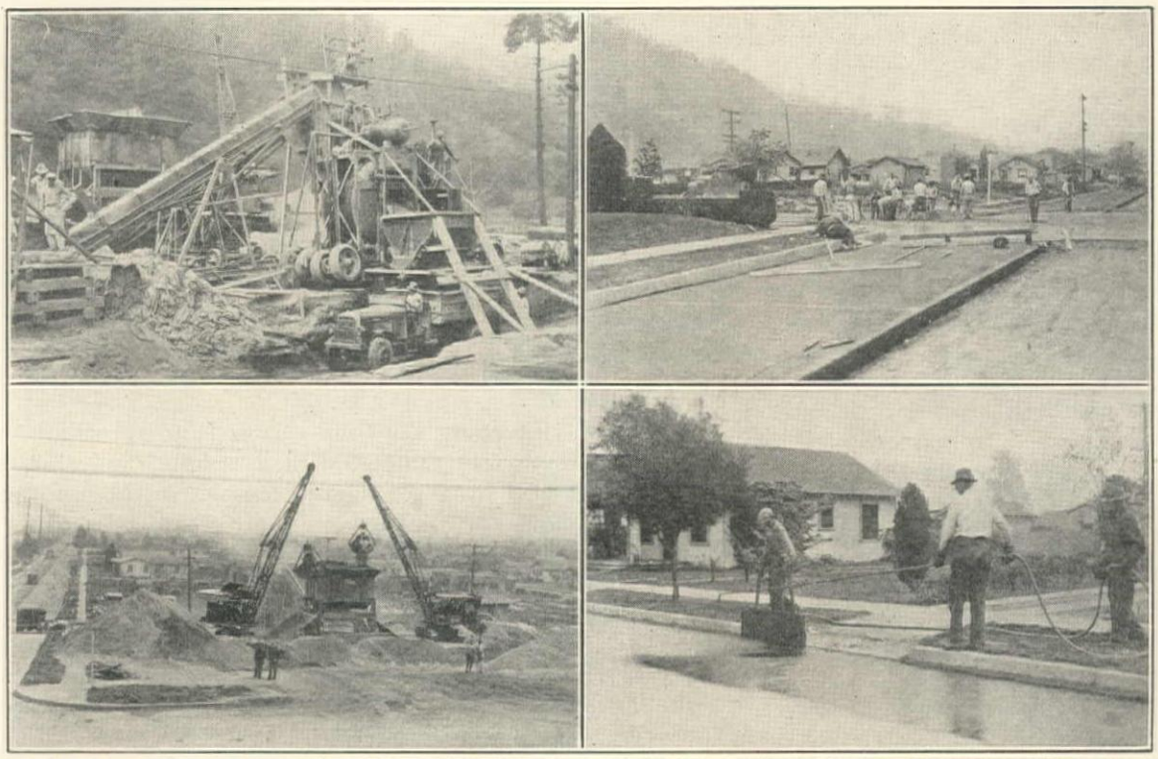
First 50,000 cu.ft. per month ..... $0.253 per 100 cu.ft.
Over 50,000 cu.ft. per month ..... $0.209 per 100 cu.ft.

Blake Ave. and Riverdale Improvement District, Los Angeles

Oswald Bros. Use Portable Central Mixing Plant and Special Trucks to Pave 15 Residential Streets with Cement Concrete in District Between Riverside Drive and the Los Angeles River

Oswald Bros., Los Angeles, recently completed their contract for grading, 750,000 sq.ft. of 6-8-6-in. cement concrete paving, a water system, sewers, and storm drains in the Blake ave. and Riverdale improvement district, city of Los Angeles, contract price $115,099. The contract was awarded February 3, 1930, with 110 working days for completion, and was financed under the 1911 Act by 10-year bonds.

This improvement is in a residential district which is between 60 and 70% built up. It covers 30 city blocks adjacent to Elysian park between the Los Angeles river and Riverside drive. The work extended over thirteen north and south and two east and west streets and one alley, involving 25,000 lin.ft. of 30-ft. pavement in 50-ft. streets and 515 lin.ft. of 15-ft. alley. Most of the curb and walk had been laid prior to this contract.



BLAKE AVE. AND RIVERDALE IMPROVEMENT DISTRICT, LOS ANGELES. (UPPER LEFT) CENTRAL WET MIXING PLANT WITH TRUCK IN POSITION BENEATH CONCRETE LOADING HOPPER. (UPPER RIGHT) PATCHING AND FINISHING AN INTERSECTION. (LOWER LEFT) P&H CRANES WITH 1-YD. OWENS CLAMSHELL BUCKETS LOADING AGGREGATE BUNKER. (LOWER RIGHT) APPLYING 'HUNT PROCESS' TO CURE FINISHED PAVEMENT

Design—The cement concrete pavement was laid 6 in. thick, with 8 in. at the longitudinal center joint and all transverse expansion joints. It was placed in 15-ft. slabs, with ½ by 8-in. transverse expansion joints, every 100 ft., dummy joints 2 in. deep and ⅜ in. wide every 25 ft., and a ½-in. center joint. A premoulded joint filler was used. The 'Hunt Process' was employed as the curing medium in place of dirt and water.

The concrete was a blended mix (about 1:2:3½), with three gradings of rock and one of sand.

Organization—Through the use of a central wet mixing plant, some special truck equipment, and careful job organization, Oswald Bros. made quantity production and minimum interference to residents of the district features of this job. Grading was done during the period in which the mixing plant site was chosen and the set-up made. Because of its residential character and the number of intersections and private driveways, generally the streets in this district were paved one-half at a time, keeping alternate intersections open. The paved side of the street was kept closed during the 14-day curing period.

The central wet mixing plant was placed on six 25-ft. lots at the corner of Riverside drive and Riverdale st., centrally located with respect to the volume of work, and adjoining a 70-ft. concrete paved highway. Thus, it was easily accessible to the trucks hauling aggregate, sacked cement, and other supplies. Rock and sand were secured from three plants of the Consolidated Rock Co. in the San Fernando valley and were transported 15 miles in 6-wheel heavy-duty trucks, the deliveries varying from 1500 to 1800 tons per day. About 30,000 tons of rock and sand were used in the work. Cement was purchased from the

California Portland Cement Co. and hauled about 54 miles from a plant at Colton, using trucks and trailers with an average total capacity of 400 sacks per load. The job required delivery of 5000 to 6000 sacks per day, the total requirement being 100,000 sacks.

Division of Work—This contract was organized with a resident superintendent (Clyde Ainsbury), a mixing plant foreman (W. A. Holten), and a grade and concrete foreman (J. B. Cilveti). It was carried out under the direct supervision of John P. Oswald, copartner, and Edward O. Earl, manager for Oswald Bros.

The mixing plant required 20 men. Concrete was hauled in 10 to 12 pneumatic-tired dump trucks, 7½ tons total load, and was partly spread by the trucks. One large crew was also employed on spreading and a small crew followed on curbs and patching. A separate crew was used for curing the pavement.

Mixing Plant—The central wet mixing plant consisted of four mobile units mounted on specially-built solid-tired trailers, all of which were towed by heavy-duty 6-wheel trucks. The units were arranged so that the plant could be taken down, moved, and set up within a 5 to 20-mile radius in a period of about three days. For operation, the units were jacked off their wheels and blocked up to convenient heights. The four units consisted of a proportioning and weighing bunker, a rock and sand conveyor, a cement conveyor, and a concrete mixer, including hoppers. The mixer was powered by a 6 by 7-in. Hercules gas engine and the conveyors by a type 'DV' Waukesha gas engine.

The weighing bunker, of Oswald Bros. make, had four compartments—three for rock and one for sand. This bunker was fed from stockpiles by two model 206 P&H cranes equipped with 1-yd. Owens clamshell buckets. After proportioning by weight, aggregates were dropped through a hopper onto a 48-in. belt conveyor 50 ft. long and moving at a speed of 300 ft. per min. This conveyor delivered to a stationary hopper over the mixer drum. Sacked cement was taken directly off the trucks and 20 sacks (one batch) deposited in bulk on a belt conveyor running at right angles to the aggregate conveyor. The cement conveyor was 24 in. wide, 35 ft. long, completely encased in metal, and traveled at a speed of 500 ft. per min., delivering to the same hopper as the aggregates. The assembled batch was dumped to a 3½-yd. mixer, also of Oswald Bros. manufacture, and was mixed for 60 seconds. Water control was effected with a system designed by the contractors. Concrete was dumped into a stationary hopper holding slightly more than one full batch, and the trucks were fed by gravity from this loading hopper. As the hopper was equipped with a rack-and-pinion oval gate driven by a gasoline engine, the size of truck load could be readily controlled.

The plant had an average daily production of 804 cu.yd. and a maximum of 946 cu.yd. It had been used with marked success on previous work and had established an all-job maximum of 1200 cu.yd. per day. The plant was designed and built by Oswald Bros. from plans by the firm's manager, Edward O. Earl.

Placing Concrete—Special Oswald Bros. trucks were used to haul and partly spread concrete, between 400 and 500 truck loads being handled per day. The frame, trucks, rear axle, and motor for these units were bought and the body, hoist, tail gate, etc., built in Oswald Bros. shops. These trucks were balloon-tired 3-wheelers weighing 8500 lb. empty and hauling 4 to 4½ tons (2 cu.yd.) of concrete. They were equipped with a patented self-cleaning body and spreader designed by Earl. Cleaning was done by a vertical plate running on trunnions and controlled on either side by chains and sprockets. This plate had its bottom corners curved to fit the body and was forced down toward the tail-gate either by gravity or by power from the truck motor, using a cable whenever it hung up. The cleaner was pulled back into place with a hand wheel. The special spreader was a vertical plate integral with the tail gate and extending within 8 to 6 in. of subgrade when the hoist was up. This device partly spread the load, since it knocked off high spots in the freshly deposited concrete as the truck backed in on the grade and dumped. Further spreading was done by customary hand methods.

The concrete pavement was placed in 19 days, 50% of it being laid in 10 consecutive days from March 24. The second half was completed in 9 days beginning April 11. For the first 10-day paving period, the average daily production was 37,400 sq.ft. and in the second period 41,500; the average for the entire job being 39,370 sq.ft. per day. The maximum run for any one day was 44,100 sq.ft.

Finishing Concrete—After hand spreading, the concrete was tamped with a templet and this was followed by a corrugated templet in order to bring the mortar to the surface. Both templets ran on headers, one false header being used. The concrete was hand floated and then longitudinal floated, after which it was twice belted.

The entire job was cured by two men using a portable machine for applying the 'Hunt Process', a processed asphaltic coating which effectively sealed the mixing water into the slabs.

Personnel—The firm of Oswald Bros. is composed of Geo. H. and John P. Oswald, with Edward O. Earl as manager. J. J. Jessup is city engineer, H. P. Cortelyou engineer of general construction, and D. M. True office engineer for the city of Los Angeles.

STOCKTON DEEP WATER CHANNEL PROJECT

Bids will be received until 2 p.m. August 26 by the U. S. Engineer's Office, Sacramento, California, for additional units of the Stockton Deep Water Channel Project, as follows: 20 miles (863,600 cu.yd.) of levee or embankment construction by dragline excavators along San Joaquin river; and 20 miles (2,616,000 cu.yd.) of levees or embankments by clamshell dredges. This channel project was described in the June 10th, 1930, issue, p. 287.

Construction Review

BRIDGE CONSTRUCTION AND RIVER AND HARBOR WORK

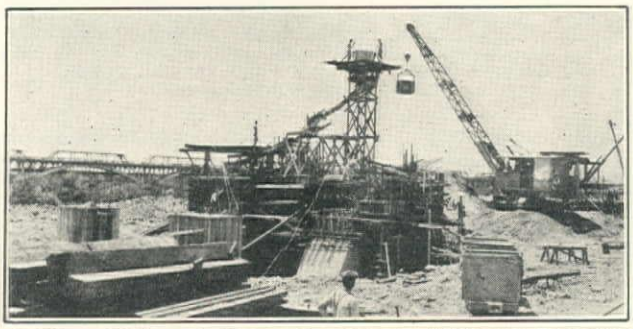
By S. J. SANDERS
Editor, Daily Construction News Service

BRIDGE CONSTRUCTION

Progress is being made on important bridge projects as follows:

ARIZONA STATE HIGHWAY BRIDGES

Salt River Bridge at Tempe—The Lynch-Cannon Engineering Co., Los Angeles, will complete a contract about August 1, 1931, for a 10-span multi-arch reinforced concrete bridge across the Salt river at Tempe, 10 miles southeast of Phoenix, contract price $397,608. The length of each clear span is 140.0 ft. Major activity is now concentrated on the south and north abutments so that approach fills can be in place by the time the bridge is completed. On July 2, concrete in both abutments was 6.75 ft. above the springline and the substructure on the south abutment was completed. On pier 2, concrete was at the same point as on the south abutment, and the substructure was completed. Footings and shafts for pier 3 were completed to 5 ft. below the springline. On pier no. 4, an abutment, the excavation was completed and ready for footing concrete on that date. Although excavation on piers 5 to 10 had been opened up, there was little activity at those points.



Salt River Bridge at Tempe for Arizona Highway Department, Lynch-Cannon Engineering Co. Contract. Link-Belt Type K-2 Crane and 30-cu.ft. Containers Placing Concrete in 4-cu.yd. Batches for Cap of South Abutment

Items in the contract are: 12,252 cu.yd. excavation at $3; 241 cu.yd. 'A-A' concrete above curbs at $60; 299 cu.yd. 'A-A' concrete in sidewalks at $30; 10,274 cu.yd. 'A' concrete in bridge at $18.55; 6584 cu.yd. 'B' concrete in bridge at $10; 426 cu.yd. sand fill for south and north abutments at $2.50; 1,791,083 lb. reinforcing steel and expansion plates at $0.041; and a lighting system at $6500.

Major equipment includes one 24-in. gauge, 6-ton Cummings gas dinkey and one 4½-ton Plymouth gas dinkey; 2000 lin.ft. of track; one 210-c.f.m. Ingersoll-Rand compressor; one type K-2 Link-Belt crane with ¾-yd. Owens clamshell bucket; two stiff-leg derricks with 40 to 70-ft. booms, steam and gas hoists, and no. 3 and no. 7 McKiernan-Terry pile hammers; two 12-in. Peerless vertical centrifugal pumps; one 'Rex' 28-S concrete mixer with electric drive; one 8000-lb. Butler weighing hopper; storage tanks; etc.

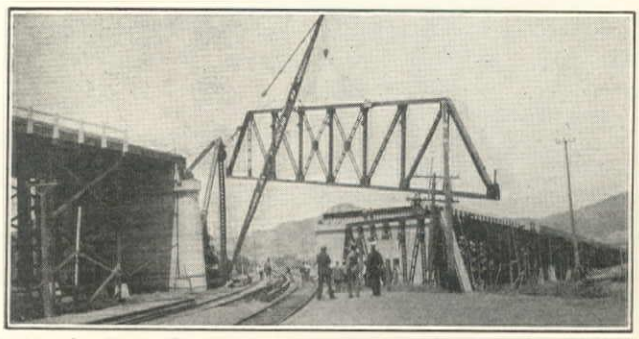
W. W. Lane is state highway engineer for Arizona with R. A. Hoffman, bridge engineer. A. F. Rath is resident engineer on the Salt river bridge.

CALIFORNIA STATE HIGHWAY BRIDGES

California Park Overhead, Marin County—Fredrickson & Watson Construction Co., Oakland, and Fredrickson Bros., Stockton, will complete their contract late in July for an overhead crossing at the Northwestern Pacific tracks, California Park, Marin county. This overhead has a total clear width of 45 ft. and a total length of 974 ft., of which 219 ft. is steel spans and the remainder is redwood timber trestle on redwood piling. The deck, which is entirely of concrete, is 45 ft. above ground at the highest point.

The contract price, $121,683, includes 2000 cu.yd. structure excavation at $1.25; furnishing 15,700 lin.ft. redwood piles at $0.60; driving 284 redwood piles at $14; 220 M f.b.m. dense select all-heart structural redwood at $77; 155 M f.b.m. select all-heart structural redwood at $72; 735 cu.yd. 'B' concrete at $17; 660 cu.yd. 'A' concrete in bridge at $17; 545 cu.yd. 'A' concrete paving at $12; 143,000 lb. reinforcing steel at $0.05; 555,000 lb. structural steel at $0.07; 5200 lb. cast steel at $0.16; and miscellaneous work.

Steel trusses 150 ft. long and weighing 33 tons each were erected on the ground and placed by a special stiff-leg derrick. Concrete was mixed in a no. 2 Jaeger mixer. Excavation and timber placing was handled by a Northwest gas shovel. Piling was driven with a no. 1 Vulcan hammer using 100-ft. leads, some of the piles being 90 ft. long. Two Pangborn sandblasting outfits were used to blast and clean all steel work preparatory to field painting.



California Park Overhead for California Division of Highways, Fredrickson & Watson Construction Co. and Fredrickson Bros. Contract. Raising 33-Ton Steel Truss 150 ft. Long

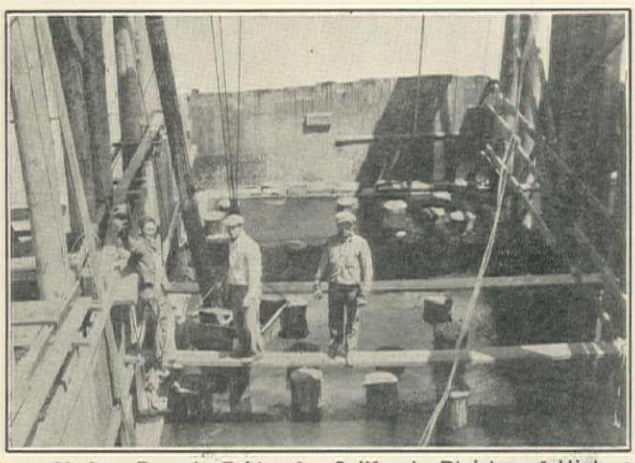
T. E. Ferneau is resident engineer and D. E. Marsh

assistant resident engineer. Andrew Fredrickson is the contractors' superintendent.

Cottonwood Creek Bridge, Tehama and Shasta Counties—The Bodenhamer Construction Co. has completed its contract for a reinforced concrete bridge over Cottonwood creek near Cottonwood, contract price $159,827, and acceptance date May 16, 1930.

Corte Madera Bascule Bridge, Marin County—The Butte Construction Co., San Francisco, will complete a contract about August 15 for the Corte Madera creek bascule bridge at Greenbrae, Marin county. This is a steel, concrete, and timber structure. All piling has been completed, as have the approaches. On June 19, the concrete deck was being placed, the structural steel work was ready for erection, and the main trunnion pier was well under way, with the rest of the piers completed. The project was 50% complete on that date.

The contract price, $157,339, includes the following principal items: 2000 cu.yd. channel excavation at $0.867; 1300 cu.yd. structure excavation at $3; furnish 7300 lin.ft. douglas fir piling at $0.42; furnish 27,500 lin.ft. redwood piling at $0.72; drive 605 piles at $10; 120 tons gravel backfill at $2.50; 300 cu.yd. 'A' tremie concrete at $12.50; 750 cu.yd. 'A' bridge concrete at $15; 806 cu.yd. 'A' concrete pavement at $11; 140,000 lb. reinforcing steel at $0.046; 335,000 lb. structural steel at $0.073; 3250 lb. cast steel at $0.15; 308 M f.b.m. dense select all-heart structural redwood at $83; 150 M f.b.m. select all-heart structural redwood at $78; 11 M f.b.m. select structural douglas fir; 335 sq.yd. Elastite wearing surface at $3.60; operating machinery



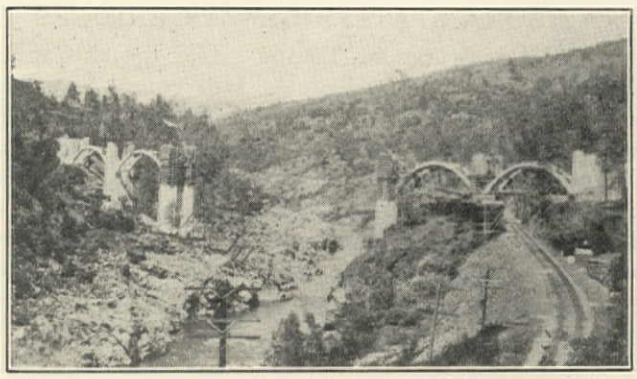
Corte Madera Bascule Bridge for California Division of Highways, Butte Construction Co. Contract. Placing Tremie Seal in Trunnion Pier

complete at $17,250; electrical equipment complete at $3543; remove existing bridge at $985.

Major equipment includes a 1½-yd. clamshell dredger in the channel and a ½-yd. orange-peel for excavation inside caissons; sixteen 5-ton portable Beebe winches for lowering caissons; four 4-in. vertical and two 4-in. horizontal pumps (Byron Jackson and Kimball-Krogh); a complete diving outfit; a no. 7 McKiernan-Terry hammer with 65-ft. leads for driving 85-ft. piling; three 2-sack Jaeger mixers and special tremie pipe; one 210-c.f.m. Ingersoll-Rand and one 110-c.f.m. Rix compressors; one 20-ton Lidgerwood steam hoist for steel erection; one 5-ton Williams electric winch with 20-ft. boom and one 2-drum Ersted winch for placing timber; three cable power saws and one 5-ft. swing saw.

T. E. Ferneau is resident engineer and H. C. Farris is assistant engineer on the Corte Madera bascule bridge. Robert Badger is superintendent for the Butte Construction Co. on this project.

Feather River Arch Bridge, Butte County—Paul M. White, Santa Monica, will complete his contract about September 1 for a bridge across Feather river and the Western Pacific tracks 4½ miles east of Oroville. This bridge consists of one 280-ft. open spandrel reinforced concrete arch across the river and four 88-ft. open



Looking Upstream at Feather River Arch Bridge for California Division of Highways on May 21. Paul M. White, Santa Monica, Contractor

spandrel reinforced concrete arches, two at each end. The south approach crosses the railroad. On June 19, the project was 66% complete. All piers, approach arch rings, and abutments and wings were complete and deck forms for approach span no. 4 were being started, with the deck for approach span no. 5 in progress. Falsework was being placed for arch rings on span no. 3 on that date. Progress has been retarded as the result of high water washing out the falsework.

The contract price, $169,947, involves 2400 cu.yd. structure excavation at $2; 2920 cu.yd. 'A', 1880 cu.yd. 'B', and 1180 cu.yd. 'F' concrete at $22.18; 57 cu.yd. 'E' concrete at $88; and 585,000 lb. reinforcing steel at $0.047.

I. O. Jahlstrom is resident engineer and I. T. Johnson is assistant resident engineer on the Feather river arch bridge.

Mojave River Bridge, San Bernardino County—J. F. Knapp, Oakland, will complete his contract about March 21, 1931, for a steel and concrete bridge over the Mojave river 3 miles north of Victorville. The project is getting under way and was 4% complete on June 19, with the detour and footings complete and excavation for the first pier in progress.

The contract price is $118,460, involving 5900 cu.yd. roadway excavation at $0.50; 50,000 sta.yd. overhaul at $0.01; remove bridge at $3000; 1400 cu.yd. structure excavation at $2.50; 1430 cu.yd. 'A' concrete at $16.50; 260,000 lb. reinforcing steel at $0.04; 750,000 lb. structural steel at $0.065; 12,900 lb. cast steel at $0.14; 6220 lb. bronze expansion plates at $0.35; 19,200 lb. cast-iron and 62,000 lb. structural steel railing at $0.10; and minor items.

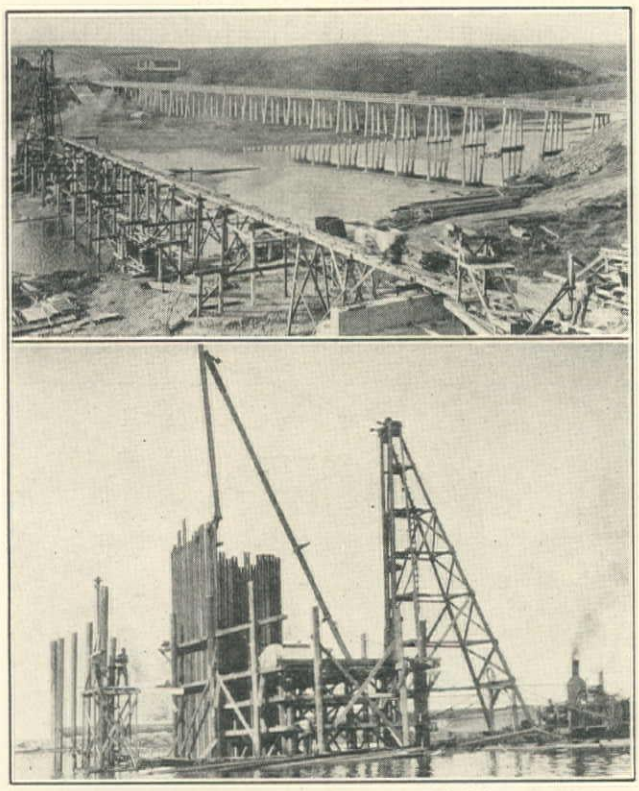
W. B. Piper is resident engineer and J. P. Winslow assistant resident engineer on this project.

San Joaquin County Bridges—Jacobs & Pattiani, Oakland, will complete their contract about August 1 for four reinforced concrete bridges between Lodi and Stockton. Concrete has been placed on bridges at Calaveritas river and Live Oak, footing concrete placed on the Mosher bridge, and excavation completed on the Bear creek bridge, ready for footing concrete. The contract price is $48,875. Equipment includes a 2-sack Koehring mixer, two Caterpillar '60' tractors and two McMillan scrapers, the grading equipment belonging to Payton Bros., subcontractors.

H. Carter is resident engineer and W. E. Sutton and R. W. Hutchinson are assistant resident engineers. J. F. O'Conner is superintendent for Jacobs & Pattiani.

San Luis Rey River Bridge, San Diego County—Gutleben Bros., Oakland, will complete their contract about November 18 for a steel bridge over the San Luis Rey river near Oceanside, contract price $281,542. The bridge consists of three 265-ft. steel deck spans and two 60-ft. steel stringer spans, and was 45% complete on June 19. Piers 1, 3, and 4, and both abutments, were complete and sheet piling for pier 2 was being driven on that date.

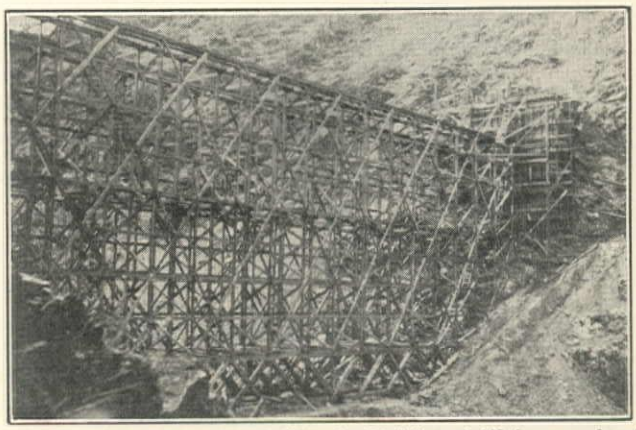
Main items in the contract are: $600 for clearing and grubbing; 3700 cu.yd. structure excavation at $5; 15,500 cu.yd. roadway excavation at $0.40; furnish 19,440 lin.ft. douglas fir piling at $0.40; drive 216 douglas fir piles at $33; 300 cu.yd. 'A' tremie concrete at $18; 1700 cu.yd. 'A' structure concrete at $14; 700 cu.yd. 'A' concrete pavement at $11; 1365 cu.yd. 'B' concrete at $12; 256,000 lb. reinforcing steel at $0.045; 2,675,000 lb. structural steel at $0.058; 36,000 lb. cast steel at $0.12; 1800 lb. phosphor bronze at $0.40; 110 tons broken stone bituminous macadam at $5; 4 tons emulsified asphalt at $30; remove bridge at $6400.



San Luis Rey River Bridge for California Division of Highways, Gutleben Bros. Contract. (Upper) Transporting Concrete for Piers 3 and 4. (Lower) Setting Interlocking Steel Sheet Piling for Cofferdam

A. S. Kennedy is resident engineer, and J. H. Horn and R. D. Thorson are assistant resident engineers on the San Luis Rey river bridge.

Trinity River Bridge, Humboldt County—Mercer-Fraser Co., Eureka, California, will complete a contract about August 15 for a steel bridge across the south fork of Trinity river two miles west of Saylor. On June 19, the project was 40% complete, with piers 1 and 2 finished, excavation for bent 3 started, falsework for the cantilever arm on the Eureka side under construction, and the cantilever arm on the Redding side completed. Work was held up during the winter by rain and snow.



Bridge North of Yreka for California Division of Highways, Jacobs & Pattiani Contract, Showing Falsework and Forms for Spring of Arch

The contract price, $97,650, involves 2700 cu.yd. bank excavation at $1.75; 600 cu.yd. structure excavation at $3.10; 358 cu.yd. 'A' concrete at $27.50; 520 cu.yd. 'B' concrete at $19.25; 82,500 lb. reinforcing steel at $0.05; 810,000 lb. structural steel at $0.078; 18,500 lb. cast steel rockers and bearings at $0.13; and 1000 lin.ft. timber rail at $1.50.

A. A. Lernhart is resident engineer on this bridge.

Bridge North of Yreka, Siskiyou County—Jacobs & Pattiani, Oakland, will complete their contract about November 15 for a reinforced concrete bridge 5½ miles north of Yreka, contract price $71,548. On June 19, the project was 20% complete, with piers 11, 12, and 13 completed and falsework nearing completion on the entire bridge.

Principal items include 920 cu.yd. structure excavation at $2.95; 750 cu.yd. 'B' concrete at $18; 790 cu.yd. 'F' concrete at $30; 600 cu.yd. 'A' concrete at $28; 22 cu.yd. 'E' concrete at $75; 216,000 lb. reinforcing steel at $0.049; 200 cu.yd. rubble masonry at $12.

Equipment includes one 14-S Davis mixer, one 70-hp. P&H 2-drum hoist operating 900 ft. of high-line and one 35-hp. C.H.&E. 2-drum hoist operating 600 ft. of high-line, pumps, saws, trucks, etc.

W. H. Johnson is resident engineer and W. H. Croft is assistant resident engineer on this bridge.

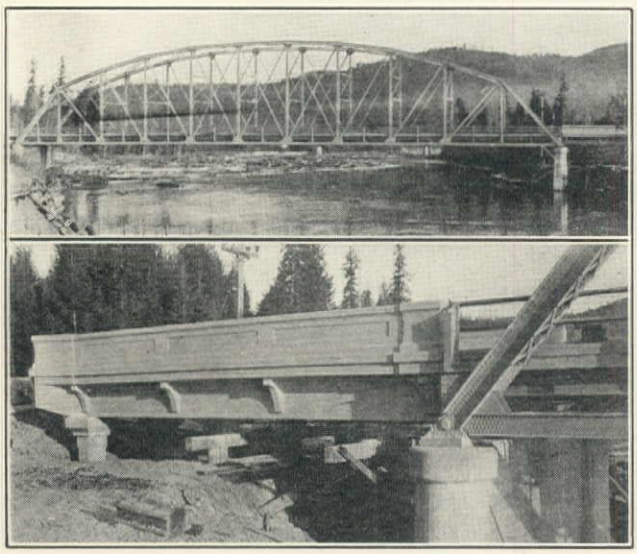
C. H. Purcell is state highway engineer for California and Chas. E. Andrew is bridge engineer, with A. H. Stover designing engineer of bridges.

IDAHO STATE HIGHWAY BRIDGES

Coeur d'Alene River Bridge near Harrison—The Portland Bridge Co., Portland, has begun preliminary

work on a steel and timber bridge over the Coeur d'Alene river near Harrison, Kootenai county, contract price $49,927. The project will be completed about January 20, 1931.

Priest River Bridge at Priest River—Sam Boudrye, Clarkston, Washington, has completed a 344-ft. steel and concrete bridge over Priest river on the Clarks Fork highway at Priest River, Bonner county, the acceptance date being May 22. The contract price was $53,781, and included 512 cu.yd. 'A' concrete at $24; 67,080 lb. reinforcing steel at $0.06; 3090 lin.ft. wood



Priest River Bridge for Idaho Bureau of Highways, May 11, Showing Main Steel Span and Details of Concrete Approach Span, Sam Boudrye Contract

piling at $0.43; and one steel superstructure in place at $29,000. After the bridge was swung and off the falsework, it withstood a heavy log jam.

J. D. Wood is commissioner of public works, R. H. Shoemaker is office engineer, Chas. A. Kyle is bridge engineer, and C. R. Black is assistant bridge engineer for the Idaho Bureau of Highways. Joseph A. Murphy was resident engineer on the Priest river bridge.

MONTANA STATE HIGHWAY BRIDGES

Missouri River Bridge near Wolf Point—The Missouri Valley Bridge & Iron Co., Leavenworth, Kansas, completed a steel bridge across the Missouri river six miles below Wolf Point, contract price $427,644, and the bridge was opened to traffic on June 3. A description of the project was published in the January 10th, 1930, issue, p. 17 to 18.

P. M. Hegdal was resident engineer and John Frazer contractor's superintendent on this bridge.

Yellowstone River Bridge, Stillwater County—The W. R. Roscoe Co., Billings, Montana, will complete a contract about November 1 for a steel and concrete bridge over the Yellowstone river on the Reed Point-Columbus highway, Stillwater county, contract price $77,792. The bridge consists of one 484-ft. span and two 43-ft. approach spans. The contract involves 1233 cu.yd. foundation excavation at $6; 852 cu.yd. 'A' concrete at $17.25; 380 cu.yd. 'D' concrete at $22.40; 607,450 lb. structural steel at $0.067; 8400 lb. cast steel at $0.15; 89,500 lb. reinforcing steel at $0.056; and 42 4-in., 13-lb. cast-iron drains at $5.

On June 23, two concrete piers and the south approach were in place and the concrete base for the north shore pier had been poured, with one more river pier to be constructed. As the W. P. Roscoe Co. also holds a contract for a reinforced concrete viaduct over the Northern Pacific and three smaller concrete bridges, all on the same project, work was concentrated on these structures while high water held up construction on the Yellowstone river bridge.

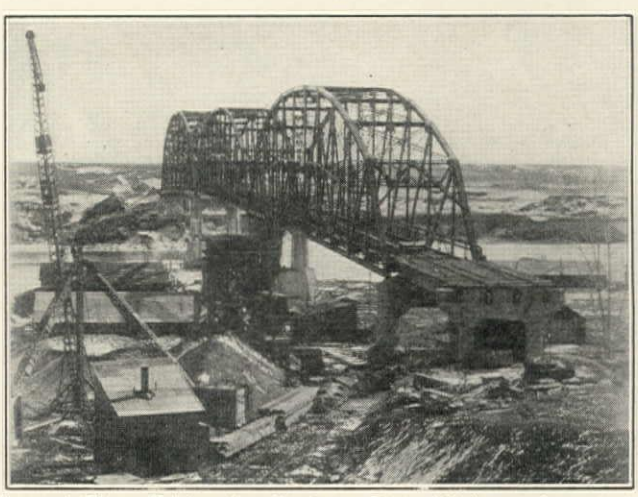
R. D. Rader is state highway engineer and M. S. Hopkins is bridge engineer for the Montana State Highway Commission.

OREGON STATE HIGHWAY BRIDGES

Rogue River Bridge near Gold Beach, Curry County—The Mercer-Fraser Co., Eureka, California, will complete a contract about January 1, 1932, for a reinforced concrete bridge on the Roosevelt coast highway at Rogue river one mile above the mouth and near Gold Beach, Curry county, consisting of seven 230-ft. arch spans and 360 ft. of viaduct. The two end piers are on solid rock and the intermediate piers on piling and gravel. Piers 3 and 6 are the abutments. The roadway will be 63 ft. above low water. On June 23, excavation for four of the six piers was complete and foundation piling had been driven for two piers.

The contract price, $568,181, involves 10,000 cu.yd. excavation at $8; 1000 cu.yd. excavation below elevations shown on plans at $10; 42,000 lin.ft. foundation piling at $0.50; 2500 cu.yd. seal concrete at $18; 11,000 cu.yd. 'A' concrete and 1800 cu.yd. 'D' concrete at $24; 1,675,000 lb. cwt. metal reinforcement at $4.50; 82,000 lb. cwt. structural steel at $10; and 3892 lin.ft. concrete handrail at $5.50.

Five derricks, powered by steam donkeys and equipped with clamshell buckets, are being used on the excavation. A Vulcan no. 1 hammer is being used



Missouri River Bridge for Montana State Highway Commission, Showing Structure Ready for Concrete Deck

to drive foundation piling. Aggregates are taken from Rogue river near the bridge site.

Rogue River Bridge at Grants Pass, Josephine County—John K. Holt, Salem, Oregon, will complete his contract about April 1, 1931, for a reinforced concrete bridge on the Pacific highway over Rogue river at Grants Pass, Josephine county. This project was originally awarded to the Northwest Contracting Co.,

Portland, at $119,600, who failed to furnish the required bond and defaulted. Holt was the second bidder at $119,915. The bridge will consist of three 150-ft. arch spans and two 50-ft. approach spans. The arches are of the half-through type, with the deck intersecting the arch rings at about the quarter points. The roadway is 27 ft. wide and there is a 5-ft. sidewalk on each side. The foundations are in cemented gravel, no piling being required.

On June 23, the excavation for two of the piers was complete and footings had been poured for one pier; falsework was then about 50% complete.

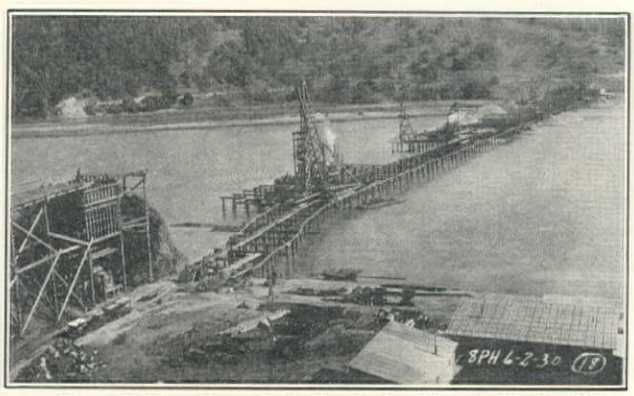
The contract items include: 2300 cu.yd. excavation at $5; 100 cu.yd. excavation below elevations shown on plans at $6; 1900 cu.yd. 'A' concrete at $22; 600 cu.yd. 'B' and 650 cu.yd. 'D' concrete at $20; 360 cu.yd. seal concrete at $18; 411,000 lb. reinforcing steel at $0.045; 1186 ft. concrete handrail at $4.25; remove bridge and maintain traffic at $3000.

A steam derrick with a Stockton bucket is being used for excavating overburden, the remainder of the excavation being done by hand. Falsework piling is being driven with a no. 1 Vulcan hammer. Aggregates are taken from Rogue river near the bridge site.

Roy A. Klein is state highway engineer, C. B. McCullough bridge engineer, and G. S. Paxon field engineer in the bridge department of the Oregon State Highway Commission.

WASHINGTON STATE HIGHWAY BRIDGES

Lake Union Bridge, Seattle—The Pacific Bridge Co., Portland, is making good progress on its $502,274 contract for two main piers and two anchor piers on



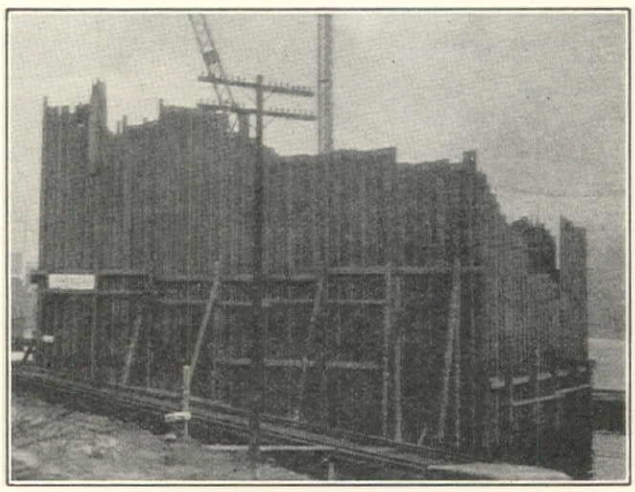
Rogue River Bridge Near Gold Beach for Oregon State Highway Commission, Mercer-Fraser Co. Contract, Showing Progress to June 2. Vulcan Hammer Driving Foundation Piles for Near Pier

the Lake Union cantilever bridge, Seattle, Washington. Excavation has been nearly completed and bearing piles are being driven and will soon be completed. Pier excavation is being done with a derrick scow operating a 3½-yd. clamshell bucket with Williams mechanism. A McKiernan-Terry double-acting hammer operating under water is used to drive 60 to 120-ft. wood bearing piles to final position. The main piers rest 60 ft. below the lake surface.

L. Coluccio & Co., Seattle, has begun excavation with two power shovels for reinforced concrete approaches and the remaining piers, contract price $335,808.

R. M. Murray is resident engineer and E. G. Osborne assistant resident engineer for the Washington Department of Highways. The bridge was designed in the office of Jacobs & Ober, consulting engineers, Seattle. Philip Hart is manager for the Pacific Bridge Co., F. W. Crocker chief engineer, and A. H. Graham superintendent of construction. The project was described in detail in the May 10th, 1930, issue, with supplemental facts in the July 10th, 1930, issue.

Yakima River Bridge at Prosser—McRae Bros., Seattle, began work early in July for a reinforced con-



Lake Union Bridge Substructure, Pacific Bridge Co. Contract. Placing Lackawanna Interlocking Sheet Piling for Main Pier

crete bridge over the Yakima river at Prosser, contract price $83,075.

Samuel J. Humes is director of highways and O. R. Elwell is bridge engineer for the Washington Department of Highways.

ALAMEDA COUNTY BRIDGES, CALIFORNIA

Bay Farm Island Bridge—Healy-Tibbitts Construction Co., San Francisco, has placed over 2200 lin.ft. of creosoted timber piling and 3000 f.b.m. of creosoted timber on a contract for repairing the Bay Farm Island bridge, contract price $38,725. To June 30, no work had been done on the approaches.

Geo. A. Posey is county surveyor of Alameda county, California.

SACRAMENTO COUNTY BRIDGES, CALIFORNIA

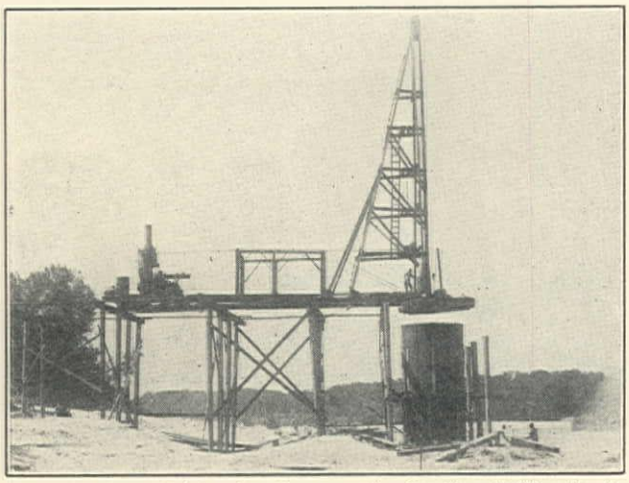
American River Bridge, Sacramento—Lord & Bishop, Sacramento, will complete their contract about December 1 for a bridge across the American river at 2nd st., Sacramento, total cost $240,000. An 1824-ft. trestle approach on the north side was completed on June 17 except for the concrete deck slab. Besides the north approach, the bridge consists of two 140-ft. approach spans, 350 ft. of steel center span, and a 600-ft. sand fill on the south approach.

The sand fill was made by dredge. The swing span (center) is made up of the old Webster st. bridge from the Alameda estuary. This bridge had been held in storage at Antioch since completion of the estuary subway. It was floated in three sections on a 600-ton barge and placed on piling at the bridge site, three days being required to move and place each section.

Cylinders 1 and 2 on the south bank, 12 ft. diam. by 35 ft. long, were landed on adobe at a depth of 28 ft.

To sink these cylinders, four piles were driven outside of each shell and four 15-ton steamboat pull jacks fastened to the top of the cylinder and each pile above water. Excavation was done with a clamshell and the downward pull of the jacks furnished the sinking power. On June 17, four other 12-ft. diam. and one 37½-ft. diam. cylinders remained to be sunk. A gas shovel with boom attachment will be used for excavation on the main pier.

Bunkers on the south side have been completed and equipped with a bucket line elevator, 40-ft. centers, for raising materials to the bins. A model 54 Johnson



American River Bridge for Sacramento County, California, Lord & Bishop Contract. Placing Driving Cap on Cylinder 12 ft. Diam. and 35 ft. Long Preparatory to Sinking to Ground Level

weigh batcher has been installed. There are two mixers on the job, one 1-yd. stationary electric and one 7-S portable. A stiff-leg derrick barge with 80-ft. boom is used for work in the main river channel.

Chas. W. Deterding, Jr., is county engineer for Sacramento county and H. S. Lord is in charge for the contractors.

MULTNOMAH COUNTY BRIDGES, OREGON

St. Johns Bridge near Portland—The St. Johns suspension bridge connecting the suburb of St. Johns with St. Helens road, will be completed about July, 1931. This bridge has a main span of 1207 ft. and anchor spans of 430 ft. 3 in. each; with approaches the length is 8935 ft. The clear height at the center of the main span is 205 ft. above low water (datum). The main tower piers rest at elev. –50 ft. on the east and at –25 ft. on the west side. The east pier base is carried on 1068 foundation piles and has its top at elev. +60 ft. Structural steel extends from this elevation to +355.5 ft., and the top of the ornamental finials will be at elev. +408.7 ft.

Progress to June 23 on the several divisions of the project was as follows:

Division A—Substructure—The Gilpin Construction Co., Portland, had completed all piers but no. 8 (which was 80% complete); the east concrete approach; 90% of the west concrete abutment; tunnels for the west anchorage; all of the east anchorage. Contract price $1,026,897.

Division B—Bridge Steel—The Wallace Bridge & Structural Steel Co., Seattle, subcontracted erection of this work to J. H. Pomeroy & Co., Portland. The east main pier had been erected to elev. +355.5 ft. and the west main pier to elev. +90 ft. Contract price $986,446.

Division C—Cables—John A. Roeblings Sons Co., Trenton, N. J., had practically completed the cables ready for shipment and field equipment was being installed. Contract price $472,200.

Division D—West Approach—La Pointe Construction Co., Portland, had completed 90% of the grading, placed all steel excepting a 90-ft. girder on the Mill st. concrete encased steel viaduct, and was placing forms for the concrete encasement. The bridge work has been sublet to the Gilpin Construction Co., Portland, and Poole & McGonigle, Portland, the latter firm having the steel fabrication. Contract price $267,603.

Division E—Viaduct Steel—U. S. Steel Products Co., Portland, had practically all of the steel for seven spans totalling 1541 ft. fabricated and ready for shipment and was installing field equipment. Contract price $290,000.

Division F—Concrete Deck—Lindstrom & Feigenson, Portland, had not begun work under this $146,000 contract.

Division G—Electrical Work—The National Electric Co., Portland, has laid conduit, etc., on this $33,000 contract.

The St. Johns bridge is being built by Multnomah county, with Clay S. Morse, Grant Phegley, and Fred W. German commissioners and Melville E. Reed county bridge engineer. Robinson & Steinman, New

American River Bridge for Sacramento County, California, Lord & Bishop Contract, Showing Intake and Discharge for Sand Fill on Approach

York, are consulting engineers for the county and R. Boblow is resident engineer.

CITY OF SANTA CRUZ, CALIFORNIA

Riverside Ave. Bridge—Rocca & Caletti, San Rafael, California, began work November 1, 1929, and completed the Riverside ave. bridge for the city of Santa Cruz on May 10, contract price $48,493. This is a

reinforced concrete bridge across the San Lorenzo river.

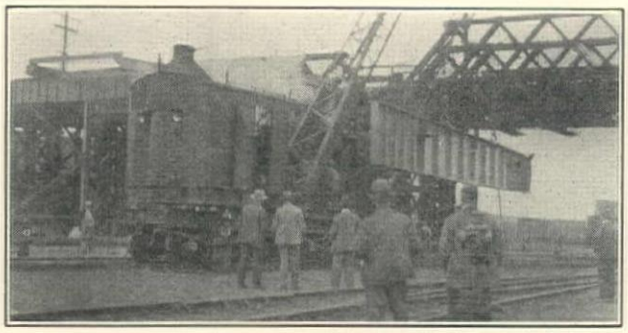
Roy W. Fowler is city engineer and street superintendent for Santa Cruz.

CITY OF TACOMA, WASHINGTON

East 11th St. Viaduct — Lindstrom & Feigenson, Portland, will complete their contract about November for the east 11th st. viaduct, city of Tacoma. The contract price is $434,596, and involves 6000 cu.yd. of concrete, 532,000 lb. of reinforcing steel, 4,677,500 lb. of structural steel, and 68,000 lin.ft. of douglas fir piling.

On June 19, the river piers were completed and the east concrete approach was in place. About 35% of the structural steel had been erected. The center and south lines of pedestals had been constructed and forms were being set for the concrete deck slab.

This viaduct has three lines of columns and is being built half width westward from bent 41 and full width eastward from this point. By building half at a time, roadway traffic can be maintained on the old viaduct, except for street car service, for which buses have been substituted.



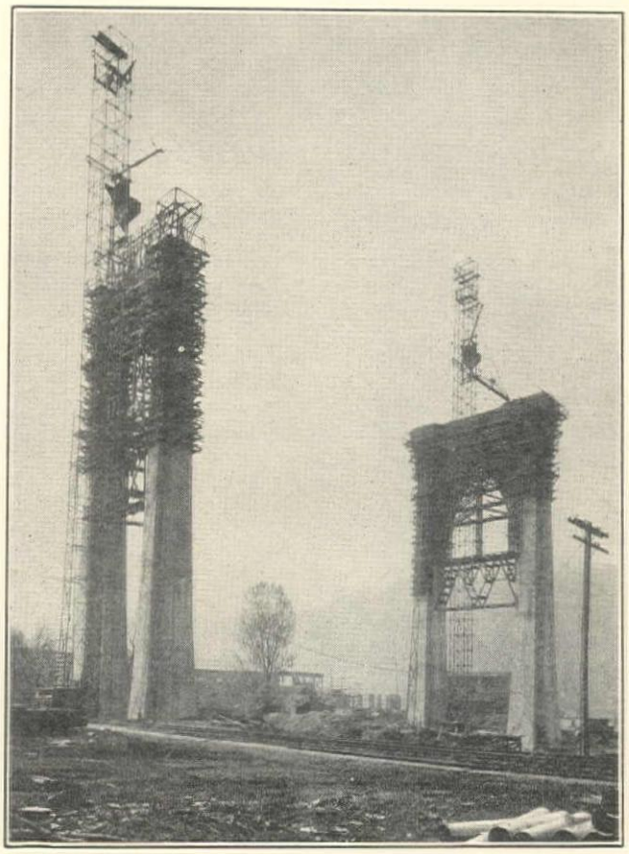
Eleventh St. Viaduct, Tacoma, Washington, Lindstrom & Feigenson, Contractors. Browning and American Locomotive Cranes Lifting 15-Ton Girder Between Trolley Wires

Equipment includes one no. 1 and one no 2 Vulcan steam pile hammers, one no. 9-B-2 McKiernan-Terry steam hammer on a convertible American locomotive crane and pile driver, two Koehring pavers, and one 15-ton Browning locomotive crane on steel erection.

C. E. Putnam is city engineer and A. M. Truesdell is assistant city engineer for Tacoma.

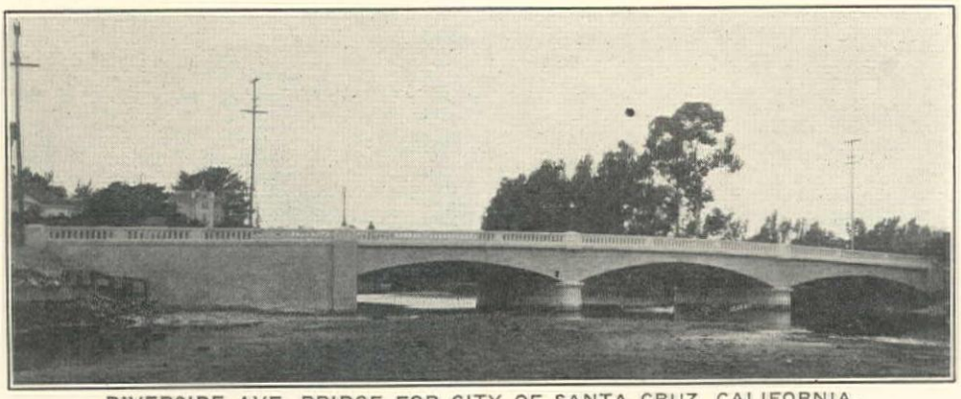
SOUTHERN PACIFIC CO. BRIDGES

Suisun Bay Bridge, California — On June 18, the substructure for the Suisun bay bridge was completed except for piers 17, 18, and 19. Pier 17 was completed shortly thereafter and the reinforced concrete caisson for pier 18 was close to bedrock on that date. Rapid progress was being made by Siems, Helmers & Schaffner, Inc., in constructing and sinking pier 19. At this pier, because of treacherous material overlying bedrock, it was necessary to sink the 81-ft. diam. steel shell to a height of 110 ft., whereas 60 to 70 ft. sufficed for other deep water piers.



St. John's Bridge, Multnomah County, Oregon, on April 5, Showing Equipment for Placing Transit-Mixed Concrete on Piers 9 and 10

Superstructure erection between the south abutment and pier 13 was complete on June 18 except for the north tower of the lift span (subsequently finished and the lift span over the official channel now in operation). Erection of the 1860-ft. Goodyear viaduct on the north approach westbound track had been completed, with timber decking and painting in progress. The



RIVERSIDE AVE. BRIDGE FOR CITY OF SANTA CRUZ, CALIFORNIA, ROCCA & CALETTI CONTRACT

project will be completed about November 15. It was described in detail in the August 25th, 1929, issue, and in the February 25th and April 25th, 1930, issues.

C. R. Harding, assistant to the president, and W. H. Kirkbride, engineer of maintenance of way and structures, Southern Pacific Co., are in charge of the entire $12,000,000 project, with the assistance of G. W. Rear, engineer of bridges. H. I. Benjamin is in charge of construction and field work. N. F. Helmers represents the substructure contractors, Siems, Helmers & Schaffner, and E. E. McKeen of the American Bridge Co. is in charge of superstructure erection.

RIVER AND HARBOR WORK

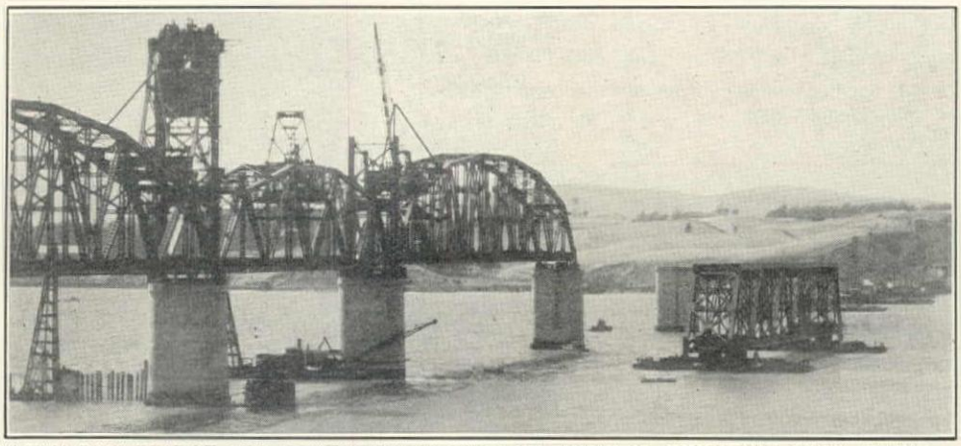
Progress is being made on important harbor projects as follows:

OAKLAND, CALIFORNIA

Ninth Ave. Pier — Schuler & McDonald, Oakland, substructure contractors; A. W. Kitchen Co., subcontractor on pile driving; and Herrick Iron Works and Spivok & Spivok, subcontractors on the transit shed; will complete this pier for the Port of Oakland about October 1. To June 20, all jacketed piles (1763) had been driven, 1400 or 83% of the concrete piles had been driven, and 270 or 50% of the creosoted wood piles were in place. All concrete piles and practically all jackets had been fabricated by that date. The deck slab was 50% complete, 140,000 sq.ft. of 10 and 8½-in. concrete being in place. Structural steel for the transit shed was being erected, with all contracts let for the shed. The pier substructure contract was $825,000.

Plans call for a total berthing space of 1510 ft., 1100 ft. of which is along Brooklyn basin channel and 410 ft. on the Alameda estuary proper, and a pier width of 224 ft. The concrete piles vary in length from 70 to 90 ft. and in cross-section from 18 by 18-in. to 20 by 20-in. A no. 0 Vulcan hammer is used for driving concrete piles and a no. 1 Vulcan hammer for wood piles. Nearly all of the piles are driven from falsework.

G. B. Hegardt is secretary, port manager, and chief



SUISUN BAY BRIDGE FOR SOUTHERN PACIFIC CO. JUNE 16, ERECTING SPAN BEING FLOATED FROM UNDER SPAN 13 TO POSITION BETWEEN PIERS 15 AND 16. AMERICAN BRIDGE CO. SUBCONTRACTORS ON ERECTION

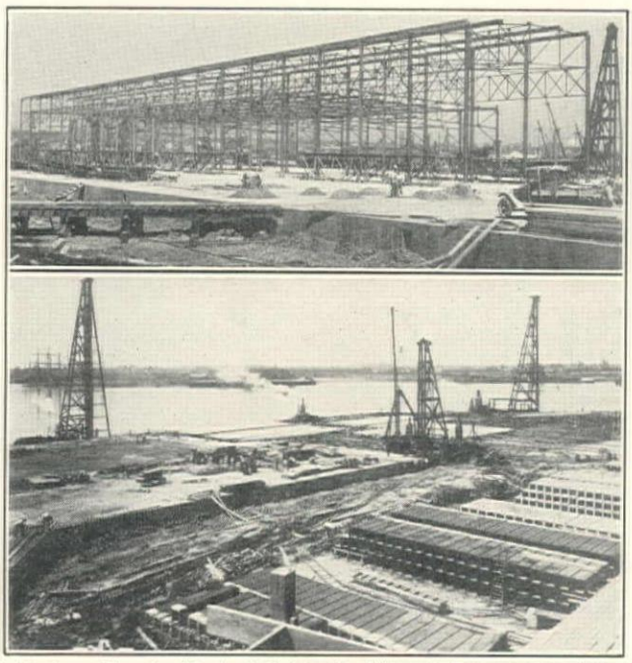
HOW 9TH AVE. PIER FOR PORT OF OAKLAND WILL LOOK FOLLOWING COMPLETION. (PHOTO COPYRIGHT—CLYDE SUNDERLAND STUDIOS, OAKLAND)

engineer for the Board of Port Commissioners, Port of Oakland, and A. H. Abel is assistant port manager and assistant chief engineer.

RICHMOND HARBOR, CALIFORNIA

Training Wall Extension for U. S. Engineers—Kern & Kibbe, Portland, will complete their contract about August 5 for an extension to the training wall in Richmond harbor, between sta. 30 and 65. The project involves about 140,000 tons of core rock at $0.68 and 23,000 tons of facing rock at $1.80. To July 1, 118,636 tons of core rock and 11,495 tons of facing rock had been placed at a total cost of $101,363.

Equipment includes two gas shovels, three trains of 5 cars and one gasoline engine each, two 150-hp. diesel



Ninth Ave. Pier for Port of Oakland. (Upper) Progress to June 12 on East End Shed. (Lower) View of West End on June 12, Showing Pile. Casting Yard

engine tugs, two 5-ton steam derrick scows, ten flat rock barges, two conveyor rock barges, one well-hole driller.

This work is in the Pacific division of the U. S. Engineers office, Thomas M. Robins, lt.-col., Corps of Engineers, division engineer, and under the San Francisco district office, of which Eli H. Ropes, major, Corps of Engineers, is district engineer and Henry S. Pond, senior engineer, is principal civilian assistant.

SAN FRANCISCO, CALIFORNIA

Pier No. 15, Board of State Harbor Commissioners—The Healy-Tibbitts Construction Co., San Francisco, is getting fairly under way on a $323,240 contract for constructing pier no. 15 at San Francisco for the Board of State Harbor Commissioners. A casting yard has been prepared on the pier site and a few jackets have been cast. The mixing plant at the pier is under construction.

Frank G. White is chief engineer of the Board of State Harbor Commissioners at San Francisco.

CALIFORNIA MAPS $39,000,000 PROGRAM

For the fiscal year beginning July 1, 1930, the California Department of Public Works program calls for an expenditure of $38,807,425, according to B. B. Meek, director. Of this sum, $33,300,000 will be spent for state highway construction, reconstruction, and maintenance; $4,823,000 for architectural projects, including an appropriation of $1,100,000 for a new State building at Los Angeles; and $684,425 for various projects—reclamation, channel improvements, etc.

Texas-Chicago Natural Gas Pipe-Line

The Bechtel-Kaiser Construction Co., of San Francisco, has signed a contract to construct Section 2 (140 miles—contract about $1,000,000) of the first division (500 miles) of the 1000-mile natural gas pipe-line to be laid from the Amarillo oil fields in the Panhandle of Texas to Chicago.

Section 2 of this project extends from Forgan, Oklahoma, to Larned, Kansas, a distance of 140 miles; and consists of 24-in. seamless steel pipe $\frac{5}{16}$ in. thick, the average length of section being 32 ft. The pipe will be furnished by the National Tube Co., and the A. O. Smith Corp. The pipe-line will be laid in 80 to 90-ft. sections, with oxy-acetylene electric welded field joints and Dresser couplings between sections. There are three main river crossings which will have oxy-acteylene field joints. S. D. Bechtel will have general supervision of this contract.

The Texas-Chicago pipe-line is being laid by the Continental Construction Co., in which the following companies are interested: City Service Co., Insull Son & Co., Inc., Standard Oil Co. of New Jersey, Southwest Development Co., The Texas Corporation, Phillips Petroleum Co., Skelly Oil Co., and Columbia Carbon Co.

CALIFORNIA DIVISION OF HIGHWAYS—CONTRACT ACCEPTANCES

Contractor	Address	Project Location	Work	Approx. Cost	Accepted
Beerman & White	Stockton	Gazelle-Yreka, Siskiyou Co.	Furnish Rock	$ 39,800	July 8, 1930
Bradley Truck Co.	———	Elwood Overhead—Goleta and Carpinteria-Rincon Cut-off, Santa Barbara Co.	Oil Shoulders	$ 4,300	July 8, 1930
California Const. Co.	San Francisco	Pixley-Tipton, Tulare Co.	Grade and Pave	$254,000	July 8, 1930
Casson, J.	Hayward	Milford-Nevada Line, Lassen and Sierra Co.	Oil	$ 12,600	July 8, 1930
Duncanson-Harrelson Co.	San Francisco	San Francisco Bay	Bay Bridge Borings	$ 29,000	July 8, 1930
Ellis, G. W.	Glendale	Pentland-San Emigdio Road, Kern Co.	Place Rock and Oil	$ 55,900	July 10, 1930
Gilmore Oil Co.	Los Angeles	Buckhorn Cr.-Cuyama R., Santa Barbara Co.	Oil	$ 4,250	July 8, 1930
Grier & Taylor	Oakland	Baya-Lamoine, Shasta Co.	Rock Crushing	$ 88,320	July 10, 1930
McReynolds, O.	Madeline	Gazelle-Yreka, Siskiyou Co.	Haul Rock	$ 12,800	July 8, 1930
Nighbert, F. W.	Bakersfield	S. Boundary-Little Lake, Inyo Co.	Grade and Oil	$112,600	July 8, 1930

PERSONAL MENTION

WALKER R. YOUNG, CHIEF CONSTRUCTION ENGINEER FOR BOULDER DAM

Walker R. Young, senior engineer, U. S. Bureau of Reclamation, was selected in May, 1930, as chief construction engineer for the Boulder dam, a $165,000,000 Government project on the Colorado river near Las Vegas, Nevada. Under his direction, construction of this huge and difficult project has already begun (see July 10th, 1930, issue, p. 330, for an outline of the preliminary work). This is a fitting selection, as Young has grown up in the Bureau of Reclamation, first entering the service in 1911, and has altogether had 23 years of varied engineering experience.

Young was born at Butler, Indiana, May 7, 1885, and attended common and high schools at Duluth, Minnesota. He graduated from the University of Idaho in 1908 with the degree of Bachelor of Science in Mining Engineering, having a long record of extra-curricula activities. Prior to and immediately following graduation, Young spent 2½ years on land, railroad, and mine surveying; mining; assaying; and drafting in Minnesota, Wisconsin, Idaho, Arizona, Washington, and Canada. From June, 1910, to July, 1911, he was an assistant engineer with the state engineer of Idaho, working on plans and computations in connection with Carey Act projects. In July, 1911, he joined the U. S. Reclamation Service and from then until October, 1916, was assistant engineer on the Arrowrock

WALKER R. YOUNG

dam, Idaho, serving as designer on the construction camp and plant, diversion works, dam, spillway, logway, etc. Part of this period was spent on concrete inspection.

From November, 1916, to December, 1920, Young was assistant engineer and engineer, U. S. Reclamation Service, in charge of the mechanical and dam division, designing department, chief engineer's office, at Denver, Colorado. Besides the design and standardization of gates and mechanical devices for irrigation structures, this assignment included designs and estimates for storage works—dams of all types, spillways, outlet works, etc.

His early experience with the Colorado river extended from January, 1921, to April, 1924, when as engineer for the U. S. Reclamation Service, he was in charge of investigations looking to the development of that stream. This work included field studies at four damsites in the vicinity of Boulder and Black canyons, and designs and estimates for dams and appurtenant structures at Glen canyon, Diamond creek, Bridge canyon, Boulder canyon, Black canyon, Bulls head, Mohave canyon, and Parker.

As engineer for the Bureau of Reclamation between May, 1924, and April, 1926, Young was in charge of investigations of the proposed Salt Water Barrier in San Francisco bay below the mouth of the Sacramento and San Joaquin rivers, and of the proposed Iron Canyon Project for the irrigation of 225,000 acres in the Sacramento valley, California. From May, 1926, to May, 1930, he was construction engineer for the Bureau of Reclamation, in charge of construction on the Kittitas division of the Yakima Project, Washington. This project is for the irrigation of 72,000 acres at an estimated cost of $9,000,000, exclusive of water rights. Between March and May, 1930, at which later date he began his present assignment, Young was in general charge of investigations being made by the Bureau of Reclamation of water resources of the state of California. This work involved a study of the conservation and utilization of all available water within the Sacramento and San Joaquin valleys.

Young is a member of the American Society of Civil Engineers, the Phi Delta Theta fraternity, and Rotary International. He is married and has one daughter.

George H. Dern, governor of Utah, dedicated the Zion-Mt. Carmel road in Zion National Park, southwestern Utah (see March 10th, 1928, issue) on July 4.

Douglas MacArthur, major general, U. S. A., will exchange posts this fall with John L. Hines, major general, when the latter gives up his command of the Ninth Corps Area to take over the Department of the Philippines. MacArthur was district engineer at San Francisco for the Corps of Engineers about 1905.

Harold F. Gray, sanitary engineer of Berkeley, California, has been appointed engineer for the Alameda County Mosquito Abatement District, which includes all of Alameda county except Murray and Pleasanton townships and Albany. Pending the time (July 1, 1931) when this district can operate under its own funds, the Alameda county board of supervisors is financing the work by special appropriation and has retained Gray as its sanitary engineer.

The abatement work got under way too late for control measures against the 1930 crop of mosquitoes but in sufficient time to plan and organize the 1931 campaign so as to obtain the best results from the funds available. One of the first proposed steps is to map the salt marsh areas by aerial photographic methods, bids for which are now being asked.

Henry S. Stevens, consulting engineer of Seattle, has recently been appointed special Pacific Northwest representative for the Hoosier Engineering Co. of Chicago, erectors of substations and transmission lines. Stevens has been identified since 1902 with power development on the Pacific coast and in the Orient. From 1919 to 1921 he was electrical engineer and construction superintendent for the San Joaquin Light & Power Co. of Fresno; from 1922 to 1924 advisory engineer in charge of construction of a dam and powerhouse for Thebo, Starr & Anderton on a 50,000-hp. hydroelectric development in Japan; from 1924 to 1926 in charge of construction of a 2500-bbl. cement plant at Redwood City, California, and assistant on a report for harbor development at La Libertad, San Salvador, C. A.; from 1926 to 1927 electrical engineer for the Key System Transit Co. on appraisal work, electrical designer and resident engineer for Thebo, Starr & Anderton on the 12,000-kw. Glines Canyon hydroelectric development near Port Angeles, Washington, and appraiser of hydroelectric properties and a railroad for a Japanese power company; and since 1928 Stevens has been in private practice.

The Hoosier Engineering Co. has been in business for 10 years and has erected transmission lines in 18 states and in two Canadian provinces.

OBITUARY

J. A. Pritchard, 70, former city engineer of Tacoma and county engineer of Pierce county, Washington, died June 27 at Tacoma. Pritchard had extensive and responsible experience with several transcontinental railroads.

W. H. Seaver, 59, for 20 years Pacific coast sales manager and for 30 years an employe of the U. S. Steel Products Co., died in Berkeley July 13 following a heart attack. Seaver was born in Boston and graduated from the Massachusetts Institute of Technology. He is survived by his widow and three children.

New Equipment and Trade Notes

NORTHWEST ENGINEERING CO. ANNOUNCEMENT

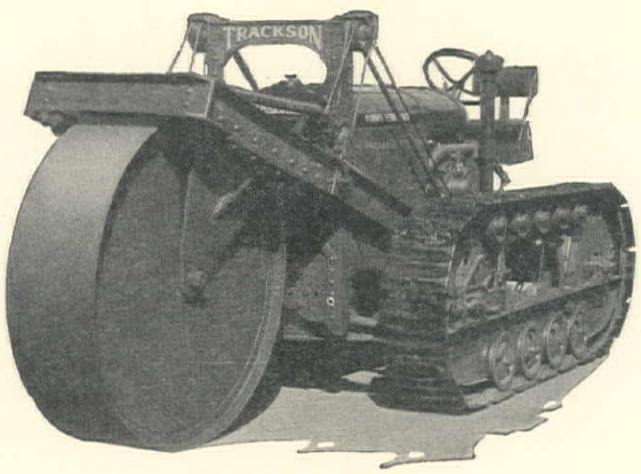
F. E. Awalt, formerly district sales manager for the Harnischfeger Sales Corp. in the Los Angeles territory, has recently joined the sales staff of the Northwest Engineering Co. at San Francisco. Awalt is well known in Northern California where he was at one time chief engineer for the Natomas Co.

SOULE STEEL CO. PURCHASES L. G. BRADFIELD CO.

The L. G. Bradfield Co., manufacturer of Bradfield folding, sliding, and entrance doors and folding gates, will hereafter operate as a unit of the Soule Steel Co. This unit will be under the direction of L. G. Bradfield and its personnel will remain unchanged.

TRACKSON TRENCH ROLLER

The Trackson Co., Milwaukee, manufacturer of full crawlers and tractor equipment, announces a trench roller which provides a simple, effective, and economical method of packing down dirt over newly laid cable, conduit, or pipe-line. This roller, built for mounting on the model DH Trackson McCormick-Deering crawler tractor, consists of a steel shell filled



Trackson Trench Roller

with concrete and weighing 3000 to 4000 lb., a 3500-lb. roller being suited to average soil conditions. The crawler tractor, with ground pressures of less than 4½ lb. per sq.in., reduces the danger of cave-ins.

Operation and maintenance costs for this unit are low and the roller will replace about 20 laborers with hand tampers, rolling as much as 2600 lin.ft. of 4-ft. trench per day. This puts back all dirt except that displaced by the pipe or cable.

Trackson front-end tractor equipment is interchangeable, and the mechanical hoisting assembly of the trench roller is identical with that of the company's shovel and bulldozer.

CATERPILLAR TRACTOR CO. ANNOUNCEMENT

B. C. Heacock, first vice-president of the Caterpillar Tractor Co. since 1925, has been elected president to succeed R. C. Force who has been made chairman of the executive committee. This committee now consists of C. L. Best, H. H. Fair, Force, Heacock, and O. L. Starr. The change precedes an organization plan whereby the operating staff of the company will be transferred to the major plants at Peoria, Illinois, where manufacture of the five tractor models will be concentrated.

The corporate home office at San Leandro will be continued and the research division of the company will be established there, with all development facilities, laboratories, and personnel, under the direction of O. L. Starr and C. L. Best. Western distribution of all prime products of the company will be handled through this office.

CHICAGO BRIDGE & IRON WORKS

The Chicago Bridge & Iron Works, manufacturer of elevated tanks, steel storage tanks, floating roofs, digesters, steel pipe, and steel plate construction, has placed R. L. Hilton in charge of its Seattle office, with headquarters in the Smith tower. Hilton was formerly with the San Francisco office.

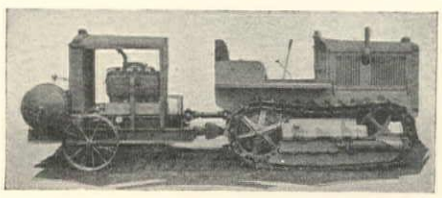
LINK-BELT CO. SAN FRANCISCO PLANT

The Link-Belt Co., Pacific division, has moved from its old location at 19th and Harrison st., San Francisco, to a new plant at Paul ave. and the Bayshore highway. The present site contains 7½ acres and the plant consists of three buildings—office, warehouse, and shop. Construction of this plant was begun in November, 1929, by The Austin Co. It provides a warehouse with a total floor area of 28,800 sq.ft., manufacturing and service facilities, and a convenient Pacific coast headquarters.

Link-Belt Co. had its beginning in 1872. A Seattle office was opened about 1910 and Los Angeles and San Francisco offices followed in 1913 and 1916. In 1923, Link-Belt purchased the business of Meese & Gottfried in San Francisco and an office was opened in Portland. Later, a store was opened in Oakland, giving the Pacific division of the company five centers for the distribution of elevating, conveying, screening, and power transmission equipment.

SCHRAMM TRACTOR-OPERATED COMPRESSORS

Schramm, Inc., West Chester, Pennsylvania, manufacturer of air compressor has developed 120-c.f.m. and 240-c.f.m. compressor attachments to operate from the power take-off of Caterpiller '15' and '30' tractors, respectively. The attachment



Schramm 120-c.f.m. Compressor Attachment for Caterpillar '15' Tractor

is made by a Universal drawbar coupling and the drive from the power take-off shaft, using a double universal joint and long spline shaft coupling. A flexible hookup results which lends itself to all road conditions and does not destroy the usefulness of the tractor for other pulling or power purposes.

This combination is said to be especially adapted to the needs of road builders, general contractors, state and county highway departments, municipalities, gas and water works, bridge builders, iron and steel erectors, quarries, and other users of pneumatic tools. It is described in bulletin 3056.

LE TOURNEAU MANUFACTURING CO.

J. W. Le Tourneau, commonly known as 'Bill', has been appointed sales manager for the Le Tourneau Manufacturing Co. of Stockton, California, of which R. G. or 'Bob' Le Tourneau is president.

UNIT BID SUMMARY

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

STREET AND ROAD WORK

SAN FRANCISCO, CALIF.—GOVT.—GRADING—COCONINO COUNTY, ARIZONA

Award of contract recommended to Jasper-Stacy Co., Sheldon Bdg., San Francisco, who bid $241,910, grading 4.9 miles Section A, Route 28, Houserock, Canyon National Forest Highway, Kaibab National Forest, COCONINO COUNTY, Arizona, work for U. S. Bureau of Public Roads. Bids from:

(1) Jasper-Stacy Co., S. F. $241,910
(2) C. R. Johnson, Portland 244,109
(3) J. G. Donovan & Son, L. A. 247,974
(4) Gist & Bell, Arcadia 296,619
(5) B. B. Boyd, San Diego $298,634
(6) Merritt, Chapman & Scott Corp. 299,716
(7) Morrison-Knudsen Co., Boise 305,007
(8) Engineer's estimate 243,537

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
16.536 acres clearing	64.00	250.00	65.00	50.00	100.00	50.00	100.00	150.00
198,077 cu.yd. unclas. excav.	.96	1.00	.945	1.15	1.23	1.22	1.24	.95
1,250 cu.yd. struc. excavation	2.80	1.50	2.00	2.00	1.23	1.50	2.50	2.00
10,231 cu.yd. borrow excav.	.43	.50	.60	.60	.60	.50	.70	.50
142,378 sta.yd. overhaul	.025	.03	.015	.05	.04	.02	.03	.03
4.927 mi. finish earth grad. road	$400	$300	$750	$200	$200	$500	$500	$300
8½ M. ft. BM untreated timber	97.00	80.00	90.00	$120	80.00	$100	$100	65.00
1,550 cu.yd. cem. rubble masonry	16.70	12.00	21.50	23.50	18.00	20.00	18.00	19.00
1,348 ft. 18-in. corr. pipe	2.90	2.50	2.65	3.00	2.50	1.90	2.50	2.20
422 ft. 24-in. corr. pipe	4.40	3.50	4.00	4.00	4.00	2.70	3.50	3.00
765 cu.yd. handlaid rock embk.	1.50	2.00	3.00	5.50	2.00	5.00	2.50	1.50
Maintenance of existing road	$2000	$2000	$2000	$2000	$2000	$2000	$2000	$2000
98 right of way monuments	3.00	4.00	3.00	5.00	4.00	12.00	10.00	3.75
78 sq.yd. bitum. wearing surf.	2.00	4.00	4.00	5.00	3.00	5.00	3.00	2.25
3,986 cu.yd.mi. haul backfill	.30	.20	.25	.25	.30	.50	.50	.40

SACRAMENTO, CALIF.—STATE—BIT. MACADAM—LOS ANGELES COUNTY

Southwest Paving Co., Washington Bdg., Los Angeles, Calif., $134,330 low bid to California Division of Highways, for surfacing about 12.6 miles between 1.3 miles and 13.9 miles north of Castaic School, LOS ANGELES COUNTY. Bids from:

(1) Southwest Paving Co., L. A. $134,330
(2) Gibbons & Read Co., Burbank 139,420
(3) McCray Co., Los Angeles 140,590
(4) G. W. Ellis, Los Angeles $145,390
(5) Fred W. Nighbert, Bakersfield 149,988
(6) V. R. Dennis Const. Co., San Diego 184,020

	(1)	(2)	(3)	(4)	(5)	(6)
25,600 tons broken stone (bit. macadam)	4.20	4.40	4.50	4.60	4.73	5.95
1,120 tons emulsified asphalt (bit. macadam)	23.00	23.00	22.00	24.00	25.00	27.50
300 cu.yd. remove and dispose conc.	3.50	3.40	2.50	2.50	3.00	3.00

SAN FRANCISCO, CALIF.—GOVT.—GRADING—TEHAMA COUNTY

Award of contract recommended to Nate Lovelace, 3433 N St., Sacramento, who bid $99,653 for 3.4 miles grading Sect. A, Route 21, Deer Creek National Highway, Lassen National Forest, TEHAMA COUNTY, for Bureau of Public Roads. Bids received from:

(1) Nate Lovelace ..... $ 99,653
(2) B. B. Boyd, San Diego 101,844
(3) Chas. Harlowe, Jr. 104,994
(4) Kennedy-Bayles Const. Co. 105,937
(5) Jasper-Stacy Co., S. F. $117,289
(6) H. H. Boomer, San Francisco 124,968
(7) Engineer's estimate 91,610

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
25 acres clearing	350.00	150.00	350.00	300.00	400.00	200.00	250.00
127,500 cu.yd. roadway excav.	.65	.70	.68	.70	.76	.85	.60
325 cu.yd. structure excavat.	1.25	1.50	2.50	2.50	2.60	2.00	2.00
14,045 sta.yd. overhaul	.03	.04	.05	.03	.03	.04	.04
3.408 miles finish roadway	250.00	200.00	200.00	300.00	400.00	700.00	250.00
140 sq.ft. crib face	2.00	3.00	.75	2.00	1.50	1.20	.50
62 ft. double 6x6-ft. log culvert	4.00	20.00	15.00	25.00	30.00	15.00	18.00
818 lin.ft. 18-in. corr. pipe	2.25	2.20	2.00	1.85	2.10	3.00	1.85
260 lin.ft. 24-in. corr. pipe	3.00	3.50	2.75	2.65	3.00	4.00	2.65
32 lin.ft. 30-in. corr. pipe	3.75	4.00	3.50	3.40	4.00	5.00	3.50
276 lin.ft. 36-in. corr. pipe	4.90	5.00	5.50	6.00	5.50	6.00	5.40
344 cu.yd. hand laid rock embankment	4.00	2.00	5.00	2.00	3.25	4.00	4.00
100 right-of-way monuments	3.50	5.00	5.00	3.50	3.00	4.00	3.50

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

A. Teichert & Sons, 1846 37th St., Sacramento, $141,335 low bid to California Division of Highways for 13.9 miles grading and surfacing with oil treated crushed gravel or stone from 1½ miles east of Cottonwood Creek to Democrat Springs, KERN COUNTY. Bids received on:

(1) 21,000 cu.yd. roadway excavation
(2) 4,000 cu.yd. gutter excavation
(3) 20,000 sta.yd. overhaul
(4) 25,000 cu.yd. imported borrow
(5) 500 cu.yd. structure excavation
(6) 35,000 tons oil tr. gravel or stone surf.
(7) 1,000 tons screenings (seal coat)
(8) 600 bbl. fuel oil (seal coat)
(9) 880 lin.ft. 18-in. corr. pipe
(10) 250 cu.yd. rubble masonry walls
(11) 1,500 move and reset guard rocks
(12) 734 stations finishing roadway

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	TOTALS
A. Teichert & Sons	1.10	1.10	.01	.75	2.00	2.37	2.20	1.65	.75	15.00	1.00	2.50	$141,335
Hartman Const. Co., Bakersfield	1.235	2.10	.02	.60	2.10	2.25	2.25	1.75	.60	16.00	.30	5.00	141,483
G. W. Ellis	1.60	1.50	.02	.60	1.50	2.33	1.75	1.60	.60	3.00	.50	3.00	144,240
J. P. Holland	3.40	3.00	.01	1.16	1.50	2.53	2.65	2.00	.75	13.00	.50	6.00	214,814

A New Calco Product

Calco Spiral Welded Pipe

YEARS of thorough research work bring a new Calco Product. Experiments and tests have been successful! Calco Spiral Welded Pipe joins the list of other popular Calco Products with its future as sure as its high quality.

Automatic welding has made the seams actually as strong as the material. Field joints are acetylene-welded or firmly made with Dresser or Dayton couplings. Both methods produce strong, serviceable and economical pipe lines.

The smooth interior and the true circular form of Calco Spiral Welded Pipe make possible higher carrying capacity for conveying water, gas, oil, and air.

Prices, sizes and complete information will be sent to you on request.

California Corrugated Culvert Company

LOS ANGELES: 424 Leroy Street **BERKELEY: 417 Parker Street**

calco products

When writing to CALIFORNIA CORRUGATED CULVERT COMPANY, *please mention Western Construction News*

YUBA CITY, CALIF.—CONCRETE OR ASPHALT PAVING—JOINT HIGHWAY DISTRICT 12

J. E. Johnston, Weber Ave. and E St., Stockton, low for paving with concrete and 4-in. crusher run base; paving with asphalt on 4-in. crusher run base and paving with asphalt on 5-in. crusher run base; and Basich Bros. Construction Co., 3788 S. Vermont St., Los Angeles, low for reinf. concrete paving on 4-in. crusher run base, in connection with 9.9 miles paving from Robbins to Yuba City, for Joint Highway District 12. Bids on:

TYPE A—Concrete paving on 4-in. crusher run base; TYPE B—Reinf. concrete paving on 4-in. crusher run base; TYPE C—Asphalt paving on 4-in. crusher run base; and TYPE D—Asphalt concrete paving on 5-in. crusher run base. (Bids under advisement until July 8.)

	TYPE A	TYPE B	TYPE C	TYPE D
(1) J. E. Johnston, Weber Ave. and E St., Stockton	$234,824	$263,294	$205,962	$212,262
(2) Basich Bros. Const. Co., Los Angeles	236,521	259,871	.....	.....
(3) C. W. Wood, Stockton	248,307	274,678	.....	.....
(4) M. J. Bevanda, Stockton	252,437	277,160	257,769	266,519
(5) N. M. Ball, Berkeley	254,801	282,271	.....	.....
(6) Fredrickson & Watson Const. Co., Oakland	258,823	284,293	.....	.....
(7) J. F. Knapp, Oakland	277,087	299,063	.....	.....
(8) Clark & Henery Const. Co., Sacramento	.....	.....	.....	286,719
(9) Valley Paving & Const. Co., Visalia	.....	.....	258,644	268,794
(10) A. Teichert & Sons, Sacramento	284,435	308,609	257,133	265,338
(11) Central California Roads Co., Oakland	285,096	312,566	289,789	295,029
(12) Hanrahan Co., San Francisco	287,468	311,092	274,670	285,170
(13) Engineers' estimate	259,499	286,969	245,209	253,959

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
36,000	cu.yd. road. exc.	.25	.30	.20	.40	.35	.25	.30	.37	.23	.25	.45	.20	.30
17,000	sta.yd. overhaul	.01	.01	.01	.02	.02	.04	.02	.02	.01	.02	.025	.04	.02
14,800	tons crusher run base	1.80	2.50	2.30	2.50	1.95	2.50	3.00	....	2.90	2.85	1.75	3.00	2.50
17,700	tons crusher run base	1.80	....	2.20	2.50	2.15	2.50	2.80	2.81	2.90	2.75	1.70	3.00	2.50
36,250	sq.yd. subgrade	.05	.09	.07	.10	.10	.08	.09	.10	.15	.10	.09	.10	.10
21,330	cu.yd. "A" conc. paving	9.00	8.47	9.40	9.00	9.55	9.50	10.00	....	....	10.48	10.85	10.60	9.50
21,330	cu.yd. "A" asph. surf.	7.60	....	....	9.25	....	....	....	9.92	9.30	9.20	11.07	10.00	9.00
21,330	cu.yd. "A" Warrn. surf.	....	....	....	....	....	....	....	....	....	....	11.57	....	9.50
21,330	cu.yd. Willite surf.	....	....	....	....	....	....	....	....	....	9.67	....	....	9.50
549,400	lb. reinf. steel	.05	.0425	.048	.045	.05	.05	.04	....	....	.044	.05	.043	.05
50	ft. 12-in. corr. pipe	1.60	1.50	1.50	2.00	2.00	1.80	2.00	1.80	3.00	2.50	2.00	2.00	1.70
20	ft. 24-in. corr. pipe	3.69	3.75	3.00	3.50	5.00	4.00	4.00	3.50	4.00	4.50	5.36	5.00	3.75
40	ft. 36-in. corr. pipe	7.00	6.85	5.50	6.50	8.00	6.80	7.00	6.70	5.00	8.50	8.90	9.00	7.00
100	ft. 42-in. corr. pipe	9.00	9.00	8.00	9.40	10.00	10.00	10.00	9.50	6.00	12.00	12.00	12.00	9.60
60	ft. 48-in. corr. pipe	12.00	12.00	10.00	10.75	12.00	12.00	12.00	11.00	8.00	14.00	13.50	15.00	12.00
12	ft. 60-in. corr. pipe	16.90	20.00	14.00	18.50	20.00	16.00	20.00	18.00	10.00	20.00	20.50	20.00	17.00
1,740	ft. guard rail	2.00	1.00	1.00	1.00	1.00	.80	1.00	1.25	1.00	1.00	1.55	1.00	1.25
525	sta. finish roadway	3.00	4.00	3.00	5.00	5.00	4.50	5.00	7.00	3.50	5.50	6.50	5.00	4.00

SACRAMENTO, CALIF.—STATE—CONCRETE PAVING—SACRAMENTO COUNTY

Fredrickson & Watson, 354 Hobart St., Oakland, and Fredrickson Bros., First National Bank Bdg., Stockton, $89,029 low bid to California Division of Highways for 2.6 miles concrete paving from south of Arno to Cosumnes River, SACRAMENTO COUNTY. Bids from:

(1) Fredrickson & Watson, Oakland, and Fredrickson Bros., Stockton $89,029
(2) N. M. Ball, Berkeley 96,464
(3) T. M. Morgan Paving Co. 99,973
(4) C. W. Wood, Stockton $100,015
(5) Basich Bros. Construction Co., L. A. 103,303
(6) M. J. Bevanda, Stockton 129,602

		(1)	(2)	(3)	(4)	(5)	(6)
15,000	cu.yd. road exc.	.24	.30	.50	.25	.40	.40
26,400	cu.yd. imp. borrow	.33	.45	.50	.50	.45	.75
230	cu.yd. struct. exc.	1.00	1.00	1.00	1.00	1.00	1.25
5,950	cu.yd. A conc. pave.	9.00	9.20	9.23	9.50	8.95	10.25
152,100	lb. reinf. steel	.04	.045	.05	.05	.051	.05
29	cu.yd. "A" conc. (sl. pav.)	12.00	15.00	25.00	16.00	12.00	20.00
174	sq.yd. rein. steel	.45	.45	1.00	.25	.47	.50
4	cu.yd. conc. (struct.)	24.00	30.00	30.00	20.00	40.00	35.00
298	ft. 12-in. corr. pipe	.50	.50	.50	.50	.30	.80
32	ft. 18-in. corr. pipe	.50	.50	.75	.50	.40	1.00
60	ft. clean and relay pipe	.50	.50	.75	1.00	.50	1.50
3,740	cu.yd. cush. course	1.00	.65	1.00	.80	.75	2.50
4,040	cu.yd. salv. surface	.75	1.00	.50	.80	2.10	2.00
2,700	cu.yd. gr. or st. surf.	2.35	2.75	2.00	2.90	2.97	2.50
170	M gallons watering	2.00	2.00	2.00	2.00	2.50	3.50
840	bbl. fuel oil	2.00	2.00	2.00	2.00	2.30	2.25
1.38	mi. new prop. fence	150.00	400.00	400.00	700.00	350.00	500.00
12	move and reset headwalls	10.00	15.00	20.00	8.00	10.00	400.00
Remove	detour bridge	50.00	100.00	200.00	200.00	500.00	900.00
137	sta. finish roadway	4.50	5.00	8.00	4.00	5.00	5.00
3	monuments	2.50	3.00	5.00	3.00	3.00	5.00

SACRAMENTO, CALIF.—STATE—SURFACING—DEL NORTE COUNTY

Hemstreet & Bell, Marysville, $88,405 low bid to California Division of Highways for surfacing 12.7 miles between southerly boundary and Wilson Creek, DEL NORTE COUNTY. Bids on the following quantities:

(1) 2,600 cu.yd. roadway excavation
(2) 42,500 sta.yd. overhaul
(3) 7,130 cu.yd. gravel or sand shoulders
(4) 18,600 cu.yd. gravel or stone surf. (rd. mix)
(5) 436 M. gallons watering
(6) 1,000 tons cut-back asph. road oil
(7) 12.7 mi. mix oil and cr. gravel or stone
(8) 670 stations finishing roadway

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Hemstreet & Bell, Marysville	.50	.02	1.85	1.85	2.50	27.60	$600	3.50	$ 88,405
Engelhart Paving & Const. Co.	.60	.01	2.25	2.00	2.50	28.75	$400	5.00	93,497
Heafey Moore Co., Oakland	.95	.015	1.95	1.90	2.50	32.50	$670	6.00	98,470
Hein Bros. Basalt Rock Co.	.70	.015	2.25	1.95	3.00	33.44	$550	6.00	100,523
J. P. Holland, Inc., S. F.	.39	.01	2.15	2.76	3.00	25.90	$160	5.00	100,694
M. J. Bevanda, Stockton	.80	.02	2.00	2.50	3.50	38.00	$540	7.00	114,764

SACRAMENTO, CALIF.—STATE—YOLO COUNTY—ASPHALT

Jones & King, Atherton & Jackson Sts., Hayward, $129,575, low bid to California Division of Highways for 5.8 miles asphalt paving from Bretona to Dunnigan, YOLO COUNTY. Bids from:

(1) Jones & King Hayward $129,575
(2) A. Teichert & Sons, Sacramento 133,214
(3) Valley Pav. & Const. Co., Visalia 144,271
(4) Clark & Henery Construction Co. $147,265
(5) Heafey-Moore Co., Oakland 148,275

		(1)	(2)	(3)	(4)	(5)
10,000	cu.yd. road excavation	.25	.20	.28	.38	.25
500	sta.yd. overhaul	.02	.03	.02	.02	.02
33,400	cu.yd. imp. borrow	.50	.40	.42	.46	.47
700	cu.yd. struct. excav.	1.00	.75	1.20	1.00	1.00
9,100	sq.yd. subgrade	.09	.10	.09	.10	.10
45,000	sq.yd. asp. pt. bind.	.015	.015	.02	.02	.025
21,800	tons asphalt pave.	4.43	4.83	5.18	5.12	5.20
170	tons gr. or stone sur.	2.50	2.75	2.50	2.85	2.50
260	cu.yd. "A" conc. (struc.)	20.00	18.00	20.00	22.00	25.00
26,000	lb. reinf. steel	.05	.04	.045	.06	.05
66	ft. 12-in. corr. pipe	.50	.40	.60	.50	.50
188	ft. 18-in. corr. pipe	.50	.50	.60	.60	.50
64	ft. 24-in. corr. pipe	.50	.60	.60	.75	.60
64	ft. clean and relay pipe	1.00	1.00	1.25	1.50	1.50
14	move and reset headwalls	12.00	10.00	15.00	15.00	20.00
12	cu.yd. remove concr.	3.00	7.50	8.00	3.00	20.00
0.8	mi. new prop. fence	450.00	400.00	450.00	500.00	450.00
1.5	mi. move and reset fence	300.00	300.00	250.00	300.00	300.00
3,392	ft. rem. and sal. gd. rail	.08	.005	.25	.25	.25
1,436	ft. timber guard rail	.90	1.00	1.00	1.25	1.00
300	sta. finish roadway	6.00	5.00	5.00	7.00	6.00
24	monuments	3.00	3.00	2.50	3.00	3.00

SAN FRANCISCO, CALIF.—GOVT.—GRADING AND SURFACING—EL DORADO COUNTY

Award of contract recommended to Finnell Company, Inc., 1630 39th St., Sacramento, who bid $112,573 for grading and surfacing 5.14 miles of Section D and Section C, Route 32, Placerville-Lake Tahoe National Forest, El Dorado National Forest, EL DORADO COUNTY, work for the U. S. Bureau of Public Roads. Bids received from:

(1) Finnell Co., Inc., Sacramento $112,573
(2) Chas. Harlowe, Jr., Oakland 134,678
(3) Engineer's estimate $126,944

		(1)	(2)	(3)
21	acres clearing	$300	$300	$250
61,194	cu.yd. rdwy. excav.	.75	.84	.75
700	cu.yd. struc. excav.	2.00	2.50	2.00
26,000	sta.yd. overhaul	.02	.05	.03
2.32	mi. fine grading subgrade and shoulders	$250	$500	$350
14,000	cu.yd. crush. rock surfacing	2.45	3.25	3.25
700	cu.yd. suppl. rock	2.40	3.25	3.00
Lump sum,	provide and maintain water plant	$300	$1000	$500
804	M. gal. watering	2.00	2.00	2.50
107	cu.yd. rub. masonry	14.00	15.00	14.00
1,520	ft. 18-in. corr. pipe	2.25	2.50	2.15
270	ft. 24-in. corr. pipe	3.00	3.00	3.10
40	ft. 30-in. corr. pipe	4.00	3.75	4.00
120	ft. 36-in. corr. pipe	4.90	5.00	6.00
200	ft. 6-in. underdrain	1.00	1.00	1.00
Maintenance of detours		$2000	$2000	$2000
1.04	miles move and reset fences	$300	$400	$300
58	monuments	3.50	3.50	3.50
2,550	yd. coarse sereening	3.00	3.50	3.75
1,050	yd. fine screenings	3.00	3.50	3.75

LOS ANGELES, CALIF.—CITY—CAHUENGA BLVD. AND YUCCA ST.—CONCRETE

Will F. Peck Co., 1120 North Las Palmas avenue, Los Angeles, Calif., $813,613 low bid to Board of Public Works for improving Cahuenga boulevard and Yucca street. Bids received from the following concerns:

(1) Will F. Peck Co., L. A. $813,613
(2) Southern Calif. Roads Co., L. A. 821,297
(3) Geo. R. Curtis Paving Co., L. A. 825,902
(4) J. L. McClain, Los Angeles 830,907
(5) Geo. H. Oswald, Los Angeles $838,321
(6) Griffith Co., Los Angeles 839,194
(7) Los Angeles Paving Co., L. A. 839,325
(8) O. A. Lindberg, Stockton 840,574

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Grading, lump sum	$57,500	$68,700	$75,000	$79,600	$88,000	$90,000	$87,000	$60,000
602,316 sq.ft. 8-in. conc. pav.	.1825	.19	.1755	.171	.18	.18	.18	.185
411,793 sq.ft. 8-in. conc. pav. (calcium chloride treated)	.19	.192	.182	.183	.18	.18	.18	.20
195,844 sq.ft. 7-in. conc. pav.	.155	.17	.157	.153	.16	.16	.16	.169
103,411 sq.ft. 8-in. asph. conc. paving	.18	.18	.1775	.185	.195	.18	.18	.205
38,316 sq.ft. asph. conc. pav. varying thickness	.115	.125	.16	.12	.145	.12	.16	.08
35,338 ft. patented curb bar	.22	.20	.18	.20	.21	.18	.20	.23
11,030 ft. light curb	.35	.35	.35	.33	.35	.36	.30	.37
32,030 ft. heavy curb	.41	.40	.40	.42	.45	.42	.35	.41
307,933 sq.ft. 1 course side	.10	.115	.106	.103	.105	.115	.10	.11
Storm drain complete	$140,000	$150,000	$150,000	$160,000	$154,000	$158,000	$150,000	$160,000
Sanitary sewers compl.	88,000	84,000	87,000	89,000	84,500	86,000	86,000	90,000
16,899 ft. vitr. sewers	1.55	1.50	1.65	1.70	1.65	1.40	1.50	1.55
Water system complete	$ 32,000	$ 30,000	$ 32,000	$ 30 000	$ 30,000	$ 31,500	$ 30,000	$ 32,000
Ornamental light. system	132,000	110,000	120,000	116,000	116,000	112,000	180,000	115,000

CHEYENNE, WYOMING—GRADING—STATE—FREMONT COUNTY

Sharrock & Pursel, low bid to Wyoming Highway Commission for grading 13 miles of Hudson-Riverton Road, FREMONT COUNTY. Bids received on:

(1) 208,400 cu.yd. earth excav.
(2) 33,210 cu.yd. rock excav.
(3) 163,490 sta.yd. overhaul
(4) 6,600 cu.yd. sub-base
(5) 32 cu.yd. "B" concrete
(6) 4,900 ft. corr. pipe
(7) 275 cu.yd. riprap
(8) 3,800 ft. wire cable guard fence
(9) 128,325 ft. right-of-way fence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	TOTALS
Sharrock & Pursel	.21	.75	.025	.55	23.00	.30	2.50	.75	.0375	$87.762
Chas. B. Owen	.23	.90	.025	.60	20.00	.40	2.00	.80	.05	99.502
Stevens Bros.	.225	1.50	.025	1.00	30.00	.40	3.00	.75	.06	122.798
Engineers estimate	.23	1.15	.025	.40	26.00	.60	3.50	.90	.05	108,423

SANTA ANA, CALIF.—GRADING—JOINT HIGHWAY DISTRICT No. 15

Contract awarded to H. W. Rohl, 4351 Alhambra Ave., Los Angeles, who bid $173,256 for 6.2 miles grading for Joint Highway District No. 15, Santa Ana, on the Ortega Highway from San Juan Hot Springs, Orange County, to Morrill Canyon, Riverside County. Bids received from:

(1) H. W. Rohl Co. $173,256
(2) Eltinge T. Brown, Los Angeles 197,263
(3) Lang Transportation Co., L. A. 204,665
(4) J. P. Holland, Inc., San Francisco 209,740
(5) Macco Const. Co., Clearwater 210,418
(6) J. W. Breedlove Co., Los Angeles 240,726
(7) Geo. Pollock Co., Sacramento 255,261
(8) Gist & Bell, Arcadia $258,293
(9) Robinson-Roberts Co., L. A. 262,087
(10) O. A. Lindberg, Stockton 272,722
(11) Lewis Const. Co., L. A. 282,960
(12) Yglesais Bros., San Diego 332,626
(13) Munro-Travers Co., L. A. 339,448
(14) J. G. Donvan & Sons, L. A. 348,229
(15) Watson & Sutton, San Diego 370,201

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
320	sta. clear. and grub.	25.00	25.00	22.50	30.00	17.00	20.00	15.00	40.00	27.00	35.00	60.00	30.00	25.00	47.50	15.00
320,000	cu.yd. roadway excav.	.33	.384	.38	.42	.39	.44	.55	.52	.53	.53	.60	.75	.76	.78	.91
2,500	cu.yd. struc. excav.	1.00	1.75	1.25	1.50	2.00	1.50	1.50	2.00	1.25	2.00	1.50	2.00	2.00	1.50	1.20
5,000	cu.yd. chan. change exc.	.30	.384	.30	.80	.25	.60	.50	.40	.50	.50	.60	.75	.76	.36	.91
960,000	sta.yd. overhaul	.01	.0075	.01	.0075	.015	.02	.01	.01	.01	.015	.01	.015	.02	.015	.0125
916	ft. 15-in. corr. pipe	1.65	1.80	2.20	1.71	2.25	3.43	2.20	2.50	2.10	2.00	2.00	1.75	2.00	1.91	2.00
2,092	lin.ft. 18-in. corr. pipe	1.85	2.10	2.45	1.94	2.75	3.68	2.50	2.75	2.55	2.50	2.25	2.00	2.37	2.32	2.25
1,172	lin.ft. 24-in. corr. pipe	3.10	3.15	3.70	2.75	3.95	4.47	3.50	4.00	3.60	3.35	3.25	3.00	3.41	3.38	3.15
562	lin.ft. 30-in. corr. pipe	3.70	4.00	4.05	3.44	5.00	5.00	4.40	5.00	4.50	4.00	4.00	4.00	4.02	4.20	4.15
292	lin.ft. 36-in. corr. pipe	5.60	6.70	6.35	5.53	7.80	7.89	7.00	7.75	7.18	6.60	6.50	6.50	6.77	6.56	6.40
126	lin.ft. 42-in. corr. pipe	8.60	9.75	9.10	7.83	11.00	10.29	9.55	11.50	10.64	8.25	10.00	9.10	9.95	9.27	9.00
306	lin.ft. 48-in. corr. pipe	9.70	11.50	10.25	9.17	12.70	11.44	11.00	12.00	12.00	11.00	11.00	11.00	12.38	10.66	10.50
468	lin.ft. 54-in. corr. pipe	13.00	16.00	13.75	12.00	17.40	15.37	15.00	15.00	16.25	14.25	16.00	15.00	16.32	14.49	15.00
100	lin.ft. 60-in. corr. pipe	14.00	18.00	15.30	13.88	19.50	16.49	17.00	16.00	18.30	16.00	20.00	17.00	17.65	16.00	16.00
47	concrete drop inlets	25.00	35.00	40.00	20.00	37.50	60.00	40.00	40.00	35.00	35.00	60.00	70.00	25.00	100.00	20.00
1,327	cu.yd. cement rub. mas.	8.00	10.00	15.00	13.00	10.00	12.00	14.00	15.50	19.50	20.00	8.00	15.00	15.00	14.00	12.00
1	70-ft. steel truss bridge	$10,000	$10,000	$10,000	$9,070	$11,600	$14,000	$9,000	$8,500	$10,550	$14,000	$13,000	$10,000	$9,701	$12,550	$10,388

A. C. Fulmor, Riverside, is Engineer for Joint Highway District 15.

OGDEN, UTAH—GOVT.—GRADING—IDAHO

Bids received as follows by U. S. Bureau of Public Roads, Ogden, Utah:

(A) Award of contract recommended to J. A. Terteling & Sons, Moscow, Idaho, who bid $152,979 for 5.9 miles grading North Fork Payette Road, PAYETTE NATIONAL FOREST, Valley and Boise Counties, Idaho. Bids received from:

(1) J. A. Terteling & Sons, Moscow, Idaho $152,979
(2) W. H. Puckett Co., Boise, Idaho 174,859
(3) Robinson Const. Co., Twin Falls 185,010
(4) Gibbons & Reed, Salt Lake City $188,383
(5) Utah Const. Co., Ogden, Utah 188,991
(6) Engineer's estimate 204,410

		(1)	(2)	(3)	(4)	(5)	(6)
45	acres clearing	100.00	125.00	60.00	90.00	200.00	175.00
21	acres grubbing	75.00	100.00	60.00	100.00	200.00	150.00
217,230	cu.yd. roadway excavation	.60	.68	.75	.76	.72	.80
1,110	cu.yd. structure excavat.	2.50	2.50	3.00	1.75	1.50	2.50
31,000	sta.yd. overhaul	.05	.04	.03	.05	.05	.05
5.92	mi. finish earth graded road	200.00	400.00	200.00	350.00	350.00	350.00
104	cu.yd. Class 'C' concrete	27.00	30.00	28.00	27.00	35.00	30.00
910	lb. reinforcing steel	.10	.10	.10	.10	.10	.10
1,656	lin.ft. 18-in. corr. pipe	2.25	2.25	1.90	2.00	2.50	2.50
328	lin.ft. 24-in. corr. pipe	2.75	3.25	2.80	2.75	4.00	3.25
232	lin.ft. 36-in. corr. pipe	5.50	6.00	5.20	5.50	5.50	6.00
15,400	lin.ft. furrow ditch	.01	.10	.15	.05	.10	.05
3,500	cu.yd. slide removal	.60	.60	.60	.69	.60	.75

(B) Award of contract recommended to Union Const. Co., Ogden, Utah, who bid $88,864 for 6.95 miles grading Salmon-Montana Line Project, Salmon National Forest, LEMHI COUNTY, Idaho. Bids received from:

(1) Union Const. Co., Ogden, Utah $88,864
(2) W. H. Puckett Co., Boise, Idaho 92,711
(3) J. C. Maguire and L. T. Lawler, Butte 95,270
(4) C. & F. Team & Truck Co., Butte, Mont. ..... $ 97,388
(5) Utah Const. Co., Ogden, Utah 104,236
(6) Engineer's estimate 102,567

		(1)	(2)	(3)	(4)	(5)	(6)
38	acres clearing and grubbing	200.00	40.00	95.00	95.00	100.00	100.00
111,000	cu.yd. roadway excavation	.51	.58	.63	.65	.68	.65
1,000	cu.yd. structure excavation	1.50	2.25	1.00	1.00	1.50	2.25
53,300	sta.yd. overhaul	.05	.05	.03	.04	.05	.05
6.95	miles finish earth graded road	200.00	300.00	150.00	125.00	300.00	150.00
246	cu.yd. 'B' concrete	30.00	32.00	29.00	28.50	30.00	32.00
95	cu.yd. 'C' concrete	31.50	31.00	29.00	28.50	29.00	30.00
27,700	lb. reinf. steel	.08	.08	.075	.07	.10	.10
100	lin.ft. 12-in. corr. pipe	1.90	1.50	1.75	1.80	1.40	1.75
772	lin.ft. 18-in. corr. pipe	2.50	2.40	2.45	2.25	2.00	2.50
168	lin.ft. 24-in. corr. pipe	3.60	3.40	3.35	3.40	3.00	3.20
142	lin.ft. 30-in. corr. pipe	4.50	4.00	4.10	4.20	3.75	5.25
308	lin.ft. 36-in. corr. pipe	6.25	6.00	5.00	4.90	6.00	6.25
12,000	lin.ft. furrow ditch	.03	.08	.07	.065	.04	.05
1	30-in. metal headgate	75.00	80.00	25.00	40.00	25.00	50.00
1,180	cu.yd. select. material surf.	.65	.60	.42	.45	.60	1.00
One	4-in. screwed end gate valve and pipe	20.00	40.00	10.00	25.00	20.00	25.00

SACRAMENTO, CALIF.—STATE—ASPHALT PAVING—SAN JOAQUIN COUNTY

Clark & Henery Const. Co., Chancery Bdg., S. F., $57,147 low bid to California Division of Highways for 1.4 miles asphalt paving from Forest Lake to north boundary, SAN JOAQUIN COUNTY. Bids from:

(1) Clark & Henery Con. Co...$57,147 (2) Heafey-Moore Co., Oakland..$59,581 (3) Valley Pav. & Con. Co., Visalia..$62,162

		(1)	(2)	(3)
15,500	cu.yd. road excav.	.39	.36	.50
160,500	sta.yd. overhaul	.015	.025	.02
445	cu.yd. struct. excav.	1.50	1.50	1.35
7,440	sq.yd. subgrade	.10	.10	.10
130	cu.yd. conc. (struct.)	20.00	30.00	30.00
11,600	lb. reinf. steel	.05	.05	.06
6,430	tons asph. paving	6.23	6.00	6.50
170	tons gr. or stone surf.	2.45	3.00	2.00
8,100	sq.yd. asph. pt. binder	.02	.02	.02
10	M gallons watering	3.00	3.00	3.50
500	bbl. fuel oil	2.00	3.00	2.00
14	ft. 12-in. corr. pipe	.50	.50	.50
218	ft. 18-in. corr. pipe	.75	.60	.50
60	ft. 36-in. corr. pipe	1.00	.75	.50
59	ft. corr. pipe, clean	1.00	1.50	1.40
0.7	M. redwood timber	$100	$100	$120
5	move and reset headwalls	10.00	15.00	15.00
360	cu.yd. remove concr.	3.80	6.00	2.50
0.4	mi. property fence	$500	$700	$650
74	sta. finish roadway	6.00	6.00	5.00
5	monuments	3.00	3.00	2.50

PORTLAND, OREGON—GOVT.—SURFACING—WASHINGTON

Award of contract recommended to A. C. Goerig, Seattle, Wash., who bid $99,035 for 10 miles surfacing White River Road, Mt. Rainier National Park, Washington, work for the Bureau of Public Roads. Bids from:

(1) 7,500 cu.yd. slide excavation.
(2) 10.3 miles fine grading.
(3) 14,000 cu.yd. crushed rock bottom course.
(4) 16,000 cu.yd. crushed rock top course.
(5) 2,000 cu.yd. supplemental crushed rock.
(6) 1,000 mi.yd. binder haul.
(7) Water plant.
(8) 1,600 M gallons watering.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
A. C. Goerig, Seattle, Wash.	.75	$200	2.65	2.65	2.55	.25	$ 100	4.00	$ 99,035
Wren & Greenough, Portland	.50	200	2.75	2.75	2.75	.25	200	5.00	102,260
Newport Const. Co., Portland	.80	300	2.85	2.85	2.80	.25	1,000	3.00	106,240
A. C. Greenwood, Portland	.70	500	3.00	3.00	2.50	.25	1,000	3.50	112,250

SACRAMENTO, CALIF.—STATE—GRADING—MODOC COUNTY

Chas. N. Chittenden, 2046 First St., Napa, $51,532 low bid to California Division of Highways for 1.4 miles grading and gravel or stone surfacing from 3 miles to 4.4 miles east of Alturas, MODOC COUNTY. Bids on:

(1) 41,500 cu.yd. roadway excavation
(2) 340,000 sta.yd. overhaul
(3) 150 cu.yd. structure excavation
(4) 2,850 cu.yd. gravel or stone surf.
(5) 140 M. gallons watering
(6) 8 cu.yd. 'A' concrete (structures)
(7) 310 lb. reinf. steel
(8) 220 ft. 18-in. corr. pipe
(9) 72 ft. 24-in. corr. pipe
(10) 75 stations finishing roadway
(11) 28 monuments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	TOTALS
Chas. N. Chittenden	.85	.015	1.50	3.25	3.00	30.00	.075	.75	1.00	8.50	4.00	$51,532
Dunn & Baker	1.45	.01	1.50	3.25	3.50	30.00	.10	.60	1.00	10.00	3.50	74,875

SEWER CONSTRUCTION

SAN FRANCISCO, CALIF.—WOODEN SEWER—ISLAIS CREEK RECLAMATION DISTRICT

M. B. McGowan, Call Bdg., San Francisco, who bid $120,586, low bid to Islais Creek Reclamation District, Room 373, City Hall, San Francisco, for constructing wooden drain, the first unit of Reclamation Project. Bids received on:

(1) 45,000 lin.ft. piling, below cutoff
(2) 3,465 lin.ft. 14-ft. x 8-ft. wooden box drain, Oregon pipe stringers and redwood lining
(3) 1,000 lin.ft. center partition
(4) 50 lin.ft. 14x10-ft. wooden drain
(5) 1 S. P. trestle
(6) 14 manholes
(7) 16 side ports

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	TOTALS
M. B. McGowan, San Francisco	.45	27.00	1.25	23.00	$3283	60.00	15.00	$120,568
Healy-Tibbitts Const. Co.	.32	29.00	1.50	60.00	$4000	80.00	14.00	124,729
L. J. Cohn, San Francisco	.75	25.75	1.50	30.00	$4000	50.00	20.00	127,033
Clinton Construction Co., S. F.	.485	28.50	1.60	50.00	$2300	64.00	27.00	128,305
Merritt, Chapman & Scott Corp., San Pedro	.385	35.95	1.87	44.40	$2531	60.00	20.00	149,672
Macdonald & Kahn, S. F.	.45	35.80	1.30	30.00	$2000	45.00	16.00	149,983
Pan Pacific Piling & Const. Co., Oakland, L. A.	.72	47.00	3.00	87.00	$4623	68.00	40.00	208,820

LONG BEACH, CALIF.—REINF. CONC. SEWERS AND PUMPING PLANT—DIST. No. 2—CITY

A. Dalmatin and R. N. Nikcevich, 841 W. 62nd St., Los Angeles, who bid $248,980, submitted the low bid to the City of Long Beach, Los Angeles County, for constructing sewers in Storm Drain District No. 2. Bids received from the following concerns:

(1) Dalmatin & Nikcevich, L. A. $248,980
(2) M. T. Markovich, L. A. 256,361
(3) Mlagenovich & Gillespie, L. A. 267,500
(4) Geo. W. Kemper, L. A. 269,049
(5) John Artukovich, L. A. $269,056
(6) Thos. Haverty Co., L. A. 274,000
(7) Leo Vuksich and Joe Vukoja, L. A. 284,759
(8) C. Anili Co., Los Angeles 285,100

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1,119 ft. 12-in. cement pipe, depth 5.4 ft.	1.76	1.10	1.20	1.22	1.35	1.00	1.75	1.15
3,209 ft. 15-in. cement pipe, av. depth 5.8 ft.	2.09	1.35	1.35	1.56	2.50	1.45	2.00	1.46
323 ft. 18-in. cement pipe, av. depth 6.5 ft.	2.57	1.90	1.20	1.86	3.00	2.00	2.50	1.88
221 ft. 21-in. cement pipe, av. depth 9.5 ft.	3.26	2.25	2.50	2.40	3.25	2.10	3.25	2.75
154 ft. 16-in. reinf. conc. pipe, depth 10 ft.	3.20	2.50	2.75	2.48	3.50	3.00	4.10	4.40
915 ft. 22-in. reinf. conc. pipe, depth 7.4 ft.	3.91	2.45	2.80	3.07	4.00	3.15	4.45	3.23
1,138 ft. 22-in. reinf. conc. pipe, depth 5.7 ft.	3.91	2.50	2.80	3.13	4.00	3.20	4.60	3.18
1,144 ft. 24-in. reinf. conc. pipe, depth 9.2 ft.	3.91	2.75	3.30	3.36	5.00	3.70	5.00	4.63
400 ft. 24-in. reinf. conc. pipe, depth 5.5 ft.	3.91	3.00	3.30	3.20	5.00	3.80	5.15	3.52
673 ft. 27-in. reinf. conc. pipe, depth 10.2 ft.	4.47	3.75	4.10	4.46	6.00	4.80	5.95	4.39
966 ft. 27-in. reinf. conc. pipe, depth 11.2 ft.	4.47	4.00	4.30	4.56	6.00	4.90	6.10	5.95
370 ft. 30-in. reinf. conc. pipe, depth 9.3 ft.	5.25	4.25	4.90	5.10	6.00	5.10	6.45	4.80
2,026 ft. 30-in. reinf. conc. pipe, depth 8.1 ft.	5.25	4.70	4.90	4.68	6.50	5.20	6.65	5.47
1,104 ft. 33-in. reinf. conc. pipe, depth 8.5 ft.	5.55	5.10	5.75	4.80	7.00	5.50	6.85	5.80
666 ft. 33-in. reinf. conc. pipe, depth 8.7 ft.	5.55	5.50	5.40	5.21	7.00	5.70	7.10	5.69
2 634 ft. 36-in. reinf. conc. pipe, depth 11.7 ft.	6.05	6.75	5.75	6.00	8.00	6.15	7.70	6.90
776 ft. 39-in. reinf. conc. pipe, depth 11.2 ft.	6.89	6.00	9.00	6.36	8.00	7.00	8.20	8.05
356 ft. 39-in. reinf. conc. pipe, depth 14.4 ft.	6.89	6.50	6.90	6.24	9.00	7.15	8.40	7.55
2,611 ft. 42-in. reinf. conc. pipe, depth 12.3 ft.	7.77	7.00	11.00	7.35	10.00	7.50	9.00	9.82
1,128 ft. 45-in. reinf. conc. pipe, depth 11.7 ft.	8.92	8.00	11.00	7.86	11.00	8.30	10.10	10.04
1,207 ft. 4-ft. 3-in. semi-elliptic sec.	16.78	11.00	15.00	10.80	27.50	10.20	12.00	13.38
891 ft. 5-ft. 6-in. semi-elliptic sec.	18.78	20.00	18.00	15.60	27.50	16.90	17.00	21.19
82 ft. 2-ft. 6-in. x 1-ft. concrete box	7.80	4.00	3.50	7.20	3.00	6.60	4.00	6.41
242 ft. 8-in. vitrified pipe	6.50	.90	1.30	2.40	2.00	1.05	2.00	2.40
117 ft. 4-in. cast iron pipe	1.00	1.00	.80	1.20	2.00	.65	1.50	1.20
4,479 ft. 10-in. cement pipe	1.10	1.75	1.05	.96	1.50	1.30	1.35	1.20
9 "A" manholes	75.00	100.00	70.00	100.00	100.00	67.50	70.00	79.20
11 "C" manholes	70.00	50.00	60.00	80.00	85.00	80.00	55.00	79.20
12 "D" manholes	70.00	85.00	65.00	80.00	100.00	93.50	63.00	79.20
31 "E" manholes	80.00	100.00	80.00	90.00	110.00	125.00	78.00	108.00
106 A-1 catchbasins	60.00	50.00	40.00	55.00	26.00	56.00	55.00	47.28
13 "G" catchbasins	110.00	75.00	55.00	80.00	30.00	80.00	77.00	77.78
Discharge lines outside pump sta.	$ 4,800	$ 4,500	$ 2,222	$ 2,840	$ 1,550	$ 2,640	$ 3,000	$ 2,705
Pumping station complete with forebay	71,838	100,000	96,717	115,741	60,000	112,380	97,000	103,268

It's what —not how!

Compound sewer joints are rapidly gaining favor and the main question is no longer what type of joint but what kind of compound.

RIC-WIL
Joint Compound

is the answer because it embodies more nearly all of the characteristics required in a "perfect" sewer pipe joint. It has adhesion, strength and flexibility and is virtually indestructible and impervious to ground or sewer chemicals. It provides an easy-to-pour joint that is water-tight and root-tight.

Write for analysis and instructions for pouring a RIC-WIL *Joint. Testing samples mailed on request.*

THE H. G. SPERRY COMPANY

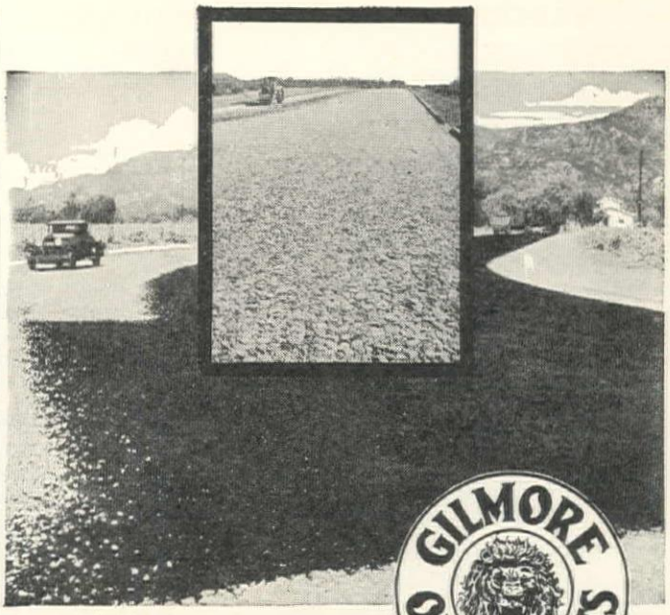
415 Call Bldg., San Francisco — Phone DOuglas 6408

207 Calo Bldg., Los Angeles — Phone TUcker 8015

REG. U. S. PAT. OFF.

RIC-WIL

SEWER AND DRAIN PRODUCTS



ABOVE... Section of water bound macadam prior to surfacing with Gilmore Roadamite Asphaltic Road Oil.

BELOW... The Los Angeles-Flintridge cut-off showing surface after application of Gilmore Asphaltic Road Oil, ready for final covering of fine rock.

A. O. Nelson, Contractor

GILMORE OIL PRODUCTS — MONARCH OF ALL

More Durable Miles per Dollar

The economy of construction and durability of highways constructed of water bound macadam base with wearing surface of Gilmore Asphaltic Road Oil has merited the commendation of municipal, state and federal road engineers. The popularity of this type of construction is due to its low cost and high resistance to rigorous traffic conditions.

For economical and durable highways let the Gilmore staff of road oil engineering experts cooperate with you.

Gilmore Oil Co.
2423 East 28th St.
Los Angeles

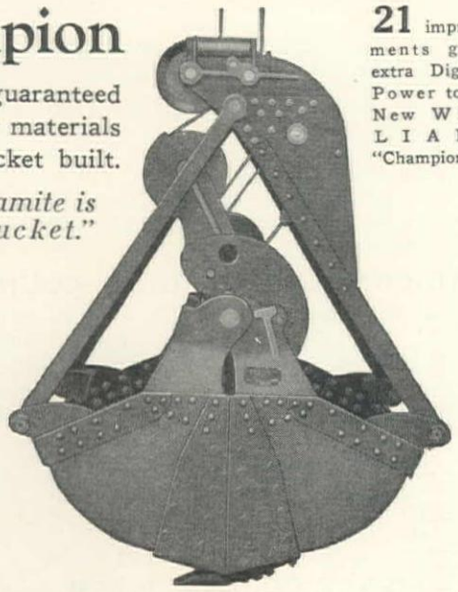
GILMORE *Roadamite* ROAD OIL

5934

The *NEW* WILLIAMS Champion

Definitely guaranteed to dig harder materials than any bucket built.

"The Dynamite is in the Bucket."



21 improvements give extra Digging Power to the New WILLIAMS "Champion."

Write us, and we'll arrange a trial—make your own comparisons. *A real champion welcomes competition!*

G. H. WILLIAMS COMPANY

606 Haybarger Lane, Erie, Pa.

Branch Offices: NEW YORK, PITTSBURGH, CHICAGO

152 **WILLIAMS** BUCKETS--TRAILERS

MARTINEZ, CALIF.—VITRIFIED AND CONCRETE SEWERS AND PILING—COUNTY

Contract awarded to M. J. Bevanda, Stockton Savings & Loan Bdg., who bid $141,079 for constructing sewer system in Acquisition and Improvement Dist. No. 5 of Contra Costa County on portions of Monterey St., Carl Ave., San Joaquin and Burlingame Ave. for County. Bids on:

(1) 2,950 lin.ft. 30-in. vitrified pipe
(2) 5,500 lin.ft. 36-in. vitrified pipe
(3) 326 lin.ft. 36-in. reinf. conc. sewer
(4) 1,875 lin.ft. 48-in. reinf. conc. sewer
(5) 32 brick manholes
(6) 2 concrete manholes
(7) Storm sewer reconstruction
(8) 2,700 lin.ft. timber foundation
(9) 14,000 lin.ft. douglas fir piles
(10) 40 concrete piers
(11) 1 junction chamber

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	TOTALS
M. J. Bevanda	7.50	10.25	23.00	20.75	85.00	150.00	$2000	1.25	.50	12.00	$300	$141,079
Heafey-Moore Co.	7.25	10.00	36.60	21.50	88.00	135.00	$1500	1.06	.60	10.00	$739	145,618
O. U. Miracle	8.00	9.50	32.60	22.50	90.00	140.00	$1400	1.40	.75	18.00	$450	148,479
Jasper-Stacy Co.	9.62	10.87	33.34	23.56	119.34	278.50	$1651	1.91	.61	26.55	$662	164,655
J. Kristich	8.60	10.40	26.00	26.00	100.00	250.00	$2500	2.50	.80	12.00	$500	164,926
P. & H. Const. Co.	9.25	11.10	40.00	30.00	105.00	300.00	$2400	2.10	.85	9.50	$600	182,577
J. C. Hickey	13.00	16.00	40.00	33.00	150.00	300.00	$2200	3.00	.80	12.00	$500	229,145

Work is to be done under the 1925 County Act. Ross L. Calfee, 322 Arlington Ave., Berkeley, is Consulting Engineer.

RICHMOND, CALIF.—CENTR. CAST CONC. AND VITRIFIED—CITY

O. U. Miracle, 1604 Dale St., San Diego (represented by H. R. Breeden, Hotel Oakland, Oakland), who bid $99,209 low bid to City of Richmond, Contra Costa County for centr. cast reinf. concrete and vitrified pipe sewers on Dock Ave., Hall Ave., 14th, and 10th Sts. Bids received from the following concerns:

(1) O. U. Miracle, San Diego $ 99,209
(2) Jasper-Stacy Co., San Francisco 139,946
(3) Healy-Tibbitts Const. Co., San Francisco $146,173
(4) J. C. Hickey, Berkeley 186,857

	(1)	(2)	(3)	(4)
3,041 ft. 42-in. centr. cast reinf. conc. pipe on reinf. concrete cradle	15.00	19.60	22.00	27.00
1,350 ft. 39-in. centr. cast reinf. conc. pipe	9.00	15.40	18.00	26.00
24 ft. 21-in. vitrified pipe sewer	6.00	5.20	16.00	18.00
2,030 ft. 18-in. vitrified pipe on timber cradle	5.00	9.20	13.00	13.00
4 ft. 18-in. vitrified pipe	5.00	8.20	10.00	10.00
64 ft. 10-in. vitrified pipe	3.00	4.10	6.00	5.50
12 ft. 20-in. cast iron pipe	12.00	9.80	25.00	13.00
30 ft. reinf. concrete pipe jacket	6.00	7.60	20.00	3.00
8 B manholes on piles	140.00	197.00	100.00	200.00
3 B manholes	100.00	145.00	100.00	200.00
5 G manholes on piles	100.00	124.00	100.00	200.00
35,000 ft. Douglas Fir timber piling	.65	.85	.50	.80
840 ft. creosoted timber piling	1.60	2.50	1.00	1.00
1 storm water inlet	100.00	80.00	100.00	150.00
1 overflow structure and outlet	$4,500	$5,550	$6,833	$10,000

BRIDGES AND CULVERTS

SAN FRANCISCO, CALIF.—GOVT.—CONCRETE BRIDGES—TULARE COUNTY

Award of contract recommended to W. A. Bechtel Co., 206 Sansome St., San Francisco, who bid $86,396 for constructing Lodgepole, Clover Creek and Silliman Creek Bridges between Stations 223-50 and E. 270-67, Section C2, and D1, Generals Highway, Route 1, Sequoia National Park, TULARE COUNTY, work for the U. S. Bureau of Public Roads, San Francisco. Bids received from:

(1) W. A. Bechtel Co., S. F. $ 86,396
(2) Dan Munro, Los Angeles 103,972
(3) Schuler & McDonald, Oakland $126,974
(4) Engineer's estimate 88,880

	(1)	(2)	(3)	(4)
Clearing lump sum bid	$200	$250	$500	$100
10,700 cu.yd. roadway excavation	1.35	1.30	3.00	1.20
1,030 cu.yd. structure excavation	3.00	5.00	4.50	4.00
3,000 sta.yd. overhaul	.05	.04	.05	.03
Lump sum finish earth grad. road	$300	$1000	$1100	$850
770 cu.yd. Class 'A' concrete	35.00	38.00	38.00	33.00
58,850 lb. reinforcing steel	.07	.085	.08	.08
1,532 cu.yd. cement rubble masonry	17.00	22.50	26.00	18.00
30 lin.ft. 18-in. corr. pipe	2.50	2.25	2.50	2.50
216 sq.yd. arched ring facing	30.00	32.00	35.00	30.00
85 lin.ft. curb stones	1.50	2.00	2.50	2.00
615 sq.yd. membrane waterproof'g	1.00	3.00	2.10	.75
4,000 cu.yd. select mater. for backfill	.50	1.00	1.00	.75
6,000 cu.yd.mi. haul selected mater.	.30	.30	.25	.50

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

Whipple Engineering Co., 183 N. Madison St., Monrovia, who bid $83,000, low bid to California Division of Highways, Sacramento, for bridge over Trinity River near Douglas City, TRINITY COUNTY, steel and concrete. Bids on:

(1) 1,050 cu.yd. structure excavation
(2) 150 cu.yd. Class 'A' concrete (tremie)
(3) 1,170 cu.yd. Class 'A' concrete
(4) 285 cu.yd. Class 'B' concrete
(5) 40 cu.yd. Class 'E' concrete
(6) 201,000 lb. reinforcing steel
(7) 335,000 lb. structural steel
(8) 12,200 lb. cast steel
(9) 175 lb. bronze expansion plates
(10) Miscellaneous work

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	TOTALS
Whipple Engineering Co., Monrovia	5.40	20.00	24.00	22.00	50.00	.0485	.0745	.17	1.00	$1025	$ 83,000
Fred J. Maurer, Eureka	3.50	25.00	25.00	19.00	60.00	.05	.084	.14	.80	$482	85,010
M. B. McGowan, San Francisco	6.00	20.00	25.00	20.00	70.00	.05	.08	.15	.60	$919	86,754
Oberg Bros., Los Angeles	8.00	23.00	23.00	23.00	60.00	.05	.085	.14	.50	$1000	89,823
Rocca & Caletti, San Rafael	10.00	25.00	32.00	32.00	60.00	.055	.075	.15	.60	$100	101,425

PORTLAND, ORE.—STEEL—GOVT.—PIERCE COUNTY, WASH.

Award of contract recommended to Albert F. Berni, 1095 Savier St., Portland, Ore., who bid $54,260 for constructing bridge over Frying Pan Creek, White River Road, Mt. Rainier National Park, PIERCE COUNTY, Washington, work for the Bureau of Public Roads. Bids received on:

(1) 6,000 cu.yd. unclassified excavation
(2) 700 cu.yd. structure excavation
(3) 770 cu.yd. Class "A" concrete
(4) 1,115 cu.yd. Class "D" concrete
(5) 95,000 lb. reinf. steel
(6) 460 cu.yd. cement rubble masonry
(7) 227,800 lb. structural steel
(8) 254 ft. steel handrail

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	TOTALS
Albert E. Berni, Portland	.50	3.50	21.00	21.00	.045	18.00	.074	3.00	$54,260
J. W. Bailey Construction Co., Seattle	1.20	7.60	20.50	24.00	.05	30.75	.075	4.10	68,209
Kuckenberg-Wittman Co., Portland	1.25	2.50	30.00	30.00	.06	25.00	.07	3.00	69,808
A. C. Goerig, Seattle	.70	6.00	35.00	35.00	.045	24.00	.0725	4.00	72,321

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

Paving streets for City of Miles City, Mont.; $560,000.

Bascule Bridge at Third St. for City & County of San Francisco; $550,000.

Outfall & sewage treatment plant for City of Palo Alto, Calif., & Stanford University; $295,000.

Pier at Long Beach, Calif., for Neptune Pier Co.; $1,500,000.

Dam for Carpenter Water Co.. Serrano Water Association & Irvine Co., near Santa Ana, Orange County.

BIDS BEING RECEIVED

Railroad, 111 miles from Keddie, Plumas County, to Bieber, Lassen County, for Western Pacific Railroad Co., San Francisco, bids to July 25; $9,824,669.

Subway at Broadway St. for City of Tucson, Ariz., bids to Aug. 4; $330,000.

Office building for State of California at Los Angeles, bids to Aug. 5; $1,500,000.

Grading and surfacing 40 miles of highway in Santa Barbara and San Luis Obispo Counties, for California Division of Highways, bids to Aug. 13.

Tunnel and 1 mile of highway at Newcastle, Placer County, for California Division of Highways, bids to Aug. 13.

CONTRACTS AWARDED

Asphalt and concrete paving 8th St. for City of Los Angeles to Griffith Co., Los Angeles; $571,591.

Concrete paving Manchester Ave. for Los Angeles County to Griffith Co., Los Angeles; $499,441.

Concrete paving in San Mateo County from So. S. F. to Burlingame, for California Division of Highways to Basich Bros. Const. Co., Los Angeles; $402,982.

Grading and surfacing 28 miles from Amboy to Essex, San Bernardino County, for California Division of Highways to Geo. Herz & Co., San Bernardino; $507,402.

Steel superstructure for Lake Union Bridge, in Seattle, for Washington State Highway Comm., to U. S. Steel Products Co., Seattle; $1,247,888.

Concrete & asphalt paving Cahuenga Blvd. & Yucca St. for City, to Will F. Peck, Los Angeles; $813,613.

Grading and surfacing in Clearwater County for State of Idaho to Ryberg, McHugh & Cowley, Boise, Ida.; $319,040.

Bridge over Canadian River near Amarillo, Texas, for Santa Fe Railroad Co., to Union Bridge & Const. Co., Kansas City; $1,000,000.

STREET and ROAD WORK

WORK CONTEMPLATED

GUSTINE, CALIF.—Plans by Engr., A. E. Cowell, 21 Maryland Ave., Berkeley, protests July 22, by City for improving streets involving 600,000 sq.ft. grading and paving with gravel & clay binder base with 1-in. emulsified asphalt surface, corr. culverts, etc. 7-18

LOS ANGELES, CALIF.—Plans by County Surveyor, protests July 28 by County for improving 13,700 ft. Carmenita Road, involving 17,903 cu.yd. excavation, 304,788 sq.ft. 2-in. and 281,672 sq.ft. 3-in. asphalt paving, reinf. concrete culvert, $85,000. 7-12

RICHMOND, CALIF.—Plans by City Engr. for improving Pullman Ave., grading, 6-in. asphalt base with 4-in. rock cushion, centr. cast reinf. conc. pipe, culverts, etc. Bids after July 28. 7-15

SAN DIEGO, CALIF.—Plans by H. W. Jorgensen, City Engr., for improving Steele St., etc., involving 3464 cu.yd. excavation, 4428 ft. curb, 22,200 sq.ft. sidewalk, 2904 ft. 6-in., and 64 ft. 4-in. cast iron water main, 4 hydrants, concrete sewers, etc. Bids after July 28. 7-12

MILES CITY, MONTANA—Plans by City Engr., J. W. Hall, protests July 14 for paving streets with 8-in. reinf. concrete; 6-in. reinf. concrete; 6-in. reinf. concrete with 2-in. Warrenite Bit. surface; 5-in. reinf. concrete with 2-in. Warrenite Bit. surfacing; 6-in. reinf. concrete with 2-in. asphalt; and 5-in. reinf. concrete with 2-in .asphalt: (1) District No. 90, involving 15,000 sq.yd. paving, vitr. sewers to cost $48,000 to $63,000; (2) Dist. 91, involving 50,000 sq.yd. paving, vitrified sewers to cost $146,000 to $185,000; (3) Dist. 92, involving 75,000 sq.yd. paving, vitrified sewers, etc., to cost $265,000 to $325,000.

BIDS BEING RECEIVED

BELL, CALIF.—Bids to 8:30 p.m., Aug. 15, by City for improving Loma Vista Ave., involving 75,800 sq.ft. 2½-in. oil macadam paving, vitr. sewers, etc. 7-18

BERKELEY, CALIF.—Bids to 8 p.m., Aug. 4, by Board of Education for resurfacing playground at Cragmont School.

BURBANK, CALIF.—Bids to 7:30 p.m., Aug. 5, by City for improving 3 miles of O'ive Ave., 8-in. concrete paving, 5-in. asphalt paving, fire hydrants, cast iron water mains, corr. culverts, etc. 7-18

LONG BEACH, CALIF.—Bids to 2 p.m., Aug. 1, by City for: (1) Improving Washington St., 55th St., etc., involving 23,730 ft. concrete curbs, 39,000 ft. concrete gutter, 110,000 sq.ft. sidewalk; (2) Locust Ave. involving 2625 ft. concrete curb, 4000 ft. concrete gutter and 13,000 sq.ft. cement sidewalk; and (3) Brayton Ave. involving 7127 ft. concrete curb, 35,000 sq.ft. cement sidewalk. 7-18

MARTINEZ, CALIF.—Bids to Aug. 4, by County for asphalt macadam paving as follows: Road C31&C32 near Concord to cost $6600; and Crow Canyon Road near San Ramon to cost $7000. 7-8

MARYSVILLE, CALIF.—Bids to 8 p.m., July 28, by City for improving F, 12th Sts., etc., involving 19,521 sq.ft. 2½-in. asphalt base with 1½-in. Warrenite Bit. surface. 7-15

OROVILLE, CALIF.—Bids to 2 p.m., Aug. 5, by County for ¾ of a mile of Lumpkin Road involving 13,000 cu.yd. grading. 7-14

REDDING, CALIF.—Bids to Aug. 1, by Joint Highway District No. 11, for the grading of 3 miles of the Weed-Klamath Falls Road. Estimated cost $66,000. C. Mau, Redding, is Engr. 7-18

SACRAMENTO, CALIF.—Bids to 2 p.m., Aug. 13, by California Division of Highways for (1) SANTA BARBARA & SAN LUIS OBISPO COUNTIES—37.9 miles grading & oil treated surfacing from second crossing of Cuyama River to east county boundary, involving 148,850 cu.yd. roadway excavation, 68,800 tons crusher run base, 57,700 tons oil treated rock or gravel surfacing, 2600 bbl. fuel oil, redwood timber, etc.; (2) SAN DIEGO COUNTY—8.4 miles oiling from La Posta to Tecate Divide, involving 5640 bbl. heavy fuel oiling; (3) LOS ANGELES & ORANGE COUNTIES—3.1 miles from Anaheim St. to Seal Beach, involving 8375 cu.yd. concrete paving, 1700 tons broken stone, 200,000 lb. reinf. steel, 55,000 cu.yd. roadway excavation, 110,000 cu.yd. imported borrow; and (4) ORANGE COUNTY—3.3 miles from Seal Beach to Sunset Beach, involving 51,000 cu.yd. roadway embankment, 4000 cu.yd. concrete paving, etc. 7-16

SACRAMENTO, CALIF.—Bids to 3 p.m., July 28, by District Engineer, California Division of Highways, 247 Third St., San Bernardino, San Bernardino County, for 34.3 miles heavy fuel oil to be furnished and applied to the shoulders in SAN BERNARDINO COUNTY from San Bernardino to Victorville. 7-17

SACRAMENTO, CALIF.—Bids to 2 p.m., Aug. 6, by California Division of Highways for (1) SAN DIEGO COUNTY—5.4 miles paving from Balboa Ave. to Torrey Pines Road, involving 19,500 cu.yd. concrete paving, 455,000 lb. rein. steel, etc.; (2) LOS ANGELES COUNTY—4.3 miles bit. rock borders from Santa Clara River to Castaic School involving 3600 tons bituminous treated rock borders; and (3) MONO COUNTY—12.9 miles from Sonora Junction to 4 miles south of Coleville, involving 259,000 cu.yd. roadway excavation, 630,200 sta.yd. overhaul, concrete structures, etc. 7-9

SAN BRUNO, CALIF.—Bids to 8 p.m., July 30, by City for improving streets in Fifth Addition, involving 12,000 cu.yd. grading, 220,000 sq.ft. 4-in. waterbound macadam base & 3-in. asphalt surface, 40,000 sq.ft. 6-in. waterbound macadam base and 3-in. asphalt surface, sewers, etc. 7-15

SAN FRANCISCO, CALIF.—Bids to 2 p.m., Aug. 5, by Bureau of Public Roads, 461 Market St., S. F., for 8.3 miles grading Sect. E, Quincy-Beckwith National Forest Highway, Plumas National Forest, PLUMAS COUNTY, involving 212,083 cu.yd. roadway excavation, etc. 7-16

SAN FRANCISCO, CALIF.—Bids to 2 p.m., July 29, by U. S. Bureau of Public Roads for 8.58 miles surfacing Yuba Pass National Forest, Sierra County, involving 14,700 cu.yd. crushed rock surfacing. 7-9

SAN FRANCISCO, CALIF.—Bids to 2:30 p.m., July 30, by City for improving Ulloa St. and 36th and 37th Aves., involving 7599 cu.yd. excavation, 16,261 cu.yd. embankment, 56,766 sq.ft. 6-in. concrete base with 2-in. asphalt surface, vitrified sewers, etc., $28,000. 7-15

SAN RAFAEL, CALIF.—Bids to 8 p.m., July 29, by City for improving Palm Avenue district, involving 110,000 sq.ft. 5-in. concrete paving with 4-in. stone base, vitr. sewers, corr. culverts, etc. 7-15

SANTA FE, NEW MEXICO—Bids to 10 A.M., July 23, by New Mexico State Highway Comm., for (1) GUADALUPE COUNTY—19 miles surfacing east and west from Santa Rosa involving 20,000 cu.yd.; (2) McKINLEY COUNTY—21 miles from Gallup to Guam, involving 25,013 cu.yd. gravel surfacing; (3) GUADALUPE COUNTY—6.3 miles from Santa Rosa to Pastura, involving 11,358 cu.yd. selected material surfacing; (4) SOCORRO COUNTY—2.9 miles gap improvement, involving 8059 cu.yd. gravel surfacing.

SANTA FE, NEW MEXICO—Bids to July 23, by State Highway Engineer for (1) 1.9 miles grading and concrete paving and two steel girder bridges 837 ft. long in EDDY COUNTY from Carlsbad to Junction; and (2) 7.6 miles grading & surfacing and 4 treated timber bridges in MORA COUNTY from Watrous to Wagon Mound.

KLAMATH FALLS, ORE.—Bids to 8 p.m., July 28, by City for improvement of Manzanita, Fremont and Le Roy Streets, District 84, involving: 7500 cu.yd. excavation, 7700 sq.yd. cement concr. asphaltic concr. or Warrenite Bit. pavement, 3500 lin. ft. storm sewer pipe, 5400 lin.ft. concrete curb, $42,304. 7-11

PORTLAND, ORE.—Bids to 10 a.m., July 23, by U. S. Bureau of Public Roads, New Postoffice Bdg., Portland, for 11.77 miles West Entrance-Paradise Inn Sect., Mt. Rainier National Park, Washington, work involving: 1300 tons Emulsified asphalt, 1000 cu.yd. coarse aggregate (base), 153,000 sq.yd. asphalt macadam surface. 7-11

PORTLAND, ORE.—Bids to 10 a.m., July 30, by U. S. Bureau of Public Roads for 5 miles of Canyon City-Burns Highway, Malheur National Forest, HARNEY COUNTY, Ore., involving 53,200 cu.yd. excavation, 24,000 cu.yd. gravel borrow, etc. 7-18

PORTLAND, ORE.—Bids will be received up to 10 a.m., July 24, by Oregon State Highway Comm.: BENTON & LINCOLN COUNTIES —5.47 miles of broken stone or gravel surfacing near Summit, Oregon, work involving: 6800 cu.yd. broken stone or gravel; HARNEY COUNTY—10.66 miles grading Silver Creek-Sage Hen Hill Section of Central Oregon Highway, work involving: 140,000 cu.yd. excavation; LINN COUNTY—2.37 miles grade widening and gravel shoulder construction of Tangent-Shedd Section of Pacific Highway, work involving: 40,000 cu.yd. excavation, and 9000 cu.yd. pit rnu gravel; MALHEUR COUNTY—10.0 mi. regrade and resurf. Dead Ox Flat and Weiser Spur Sections of Old Oregon Trail, work involving: 76,000 cu.yd. excavation and 43,500 cu. yd. crushed gravel; POLK COUNTY 2.8 mi. grade widening and gravel shoulder construction of Clow Corner-Monmouth Section of West Side Pacific Highway, work involv.: 38,000 cu.yd. excavation, and 10,000 cu.yd. pit-run grav.; TILLAMOOK COUNTY—3.0 miles resurfacing and furnishing crushed gravel for maintenance and betterment purposes for the Pleasant Valley-Hemlock Section of the Roosevelt Coast Highway, work involving: 13,000 cu.yd. pit run gravel; 5600 cu.yd. crushed gravel. 7-12

SALT LAKE CITY, UTAH—Bids to 2 p.m., July 30, by Utah Road Commission for 9.9 miles surfacing UTAH COUNTY from Moark to Spanish Fork and from Moark to Springville, involving 11,800 cu.yd. gravel surface (loading); and 29,500 cu.yd. gravel surface (hauling).

SEATTLE, WASH.—Bids to Aug. 4, by County for: (1) Redmond Road Revision, 1½ miles involving 65,000 cu.yd. excavation; (2) Tablequah Road grading 1.3 miles involving 25,000 cu.yd. roadway excavation; and (3) Three Tree Point Road involving 75,000 cu.yd. grading, 3600 cu.yd. gravel surface.

SEATTLE, WASH.—Bids to Aug. 11 by County for (1) 5.2 miles concrete paving 15th Ave. Northeast; and (2) Regrading and graveling Sellick Road.

BIDS RECEIVED

LOS ANGELES, CALIF.—Low bids as follows by City: (1) Geo. H. Oswald, 366 E. 58th St., Los Angeles, low $120,350 for improving Virgil Ave. from Geneva St. to Sunset Blvd., work consisting of grading, paving with asphalt, lighting system, etc.; (2) Geo. H. Oswald, 366 E. 58th St., Los Angeles, who bid $149,360 low for improving streets in 117th St. and Denver Ave. Improvement District, work consisting of grading, paving with concrete, water system, reinf. concrete culverts. 7-17

MILL VALLEY, CALIF.—A. J. Raisch, 46 Kearny St., S. F., $80,232 low for asphalt paving Corte Madera Ave., Summit Ave., Magee Ave., etc., for City. Bids rejected and plans will be drawn for concrete paving. 7-16

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) MODOC COUNTY—Chas. N. Chittenden, 2046 First St., Napa, $51,532 low for 1.4 miles grading and surfacing from 3 miles to 4 miles east of Alturas; (2) KERN COUNTY—A. Teichert & Sons, 1846 37th St., Sacramento, $141,335 low for 13.9 miles grading and oil treated gravel or stone surfacing from east of Cottonwood Creek to Democrat Springs; and (3) SAN JOAQUIN COUNTY—Clark & Henery Const. Co., Chancery Bdg., S. F., $57,147 low for 1.4 miles asphalt paving from Forest Lake to north boundary. (See Unit Bid Summary.) 7-16

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) DEL NORTE COUNTY—Hemstreet & Bell, Marysville, $88,405 low for gravel or stone surfacing and oiling 12.7 miles from south boundary to Wilson Creek; (2) YOLO COUNTY—Jones & King, Atherton & Jackson Sts., Hayward, $129,575 low for 5.8 miles asphalt paving from Bretona to Dunnigan; and (3) SACRAMENTO COUNTY—Fredrickson & Watson, 354 Hobart St., Oakland, and Fredrickson Bros., Stockton, $89,029 low for 2.6 miles concrete paving from south of Arno to Cosumnes River. (See Unit Bid Summary.) 7-9

SACRAMENTO, CALIF.—Low bids as follows by California Division of Highways: (1) LOS ANGELES COUNTY—Southwest Paving Co., Washington Bdg., Los Angeles, $134,330 low for 12.6 miles bituminous macadam surfacing north of Castaic School; and (2) RIVERSIDE COUNTY—Steele Finley, 204 E. 4th St., Santa Ana, $34,402 low for 6.2 miles widening from north boundary to west of Beaumont. (See Unit Bid Summary.) 7-10

DENVER, COLO.—N. V. Anderson, W. A. Sheldon and M. Miller, Alma, Colo., $69,669, low for grading and bridges on 1.6 miles highway from Kenosha to Webster, PARK COUNTY, for State.

DENVER, COLO.—Threet Bros., Lovell, Wyo., $70,723, low for 6.1 miles grading Wind River-Jackson Park Section, Teton National Forest, TETON COUNTY, Wyo., for U. S. Bureau of Public Roads.

DENVER, COLO.—Collier-Latimer, Inc., Denver, Colo., $132,156 low for graveling streets, curbs, gutters, etc., in District 150 for City.

BUTTE, MONTANA—L. T. Lawler, Butte Montana, $88,406 low for grading 9 miles of Nine Mile Road and Little Basin Creek Road for County.

PORTLAND, ORE.—Stillwell Bros., 3220-9th St. South, Seattle, $136,180, only bid to U. S. Bureau of Public Roads for 11 miles emulsified asphalt surfacing West Entrance-Paradise Inn Section, Mt. Rainier National Park, Washington. Bid rejected, to be readvertised. 7-7

PORTLAND, ORE.—Low bids as follows by City: (1) Edlefsen-Weygandt Co., Portland, $137,259, low for concrete paving East Broadway from Sandy Blvd. to Union Ave., and (2) Oregon Contract Co., Portland, $60,809, low for asphalt paving E. Burnside St. from E. 13th St. to E. 32nd St.

PORTLAND, ORE.—A. C. Greenwood, Portland, $49,507 low bid to Bureau of Public Roads for 1.1 miles grading Randle-Yakima Highway, LEWIS COUNTY, Wash.

SALT LAKE CITY, UTAH—Low bids as follows by Utah Road Comm.: (1) A. G. Young & Co., Richfield, Utah, $13,012 low for grading and surfacing 2.3 miles Farmington-Weber Canyon Road, DAVIS COUNTY; and (2) A. O. Thora, Springville, Utah, $21,838 low for gravel surfacing 10 miles of Elsinore-Sevier Road, SEVIER COUNTY.

TACOMA, WASH.—Anderson & Liljebeck, Tacoma, $7532 low for paving North 19th St. for City.

CONTRACTS AWARDED

EUREKA, CALIF.—To J. P. Holland, Inc., 1834 McKinnon, S. F., who bid $40,525 for emulsified asphalt paving 25 mi. of roads for County. 7-9

LOS ANGELES, CALIF.—To Griffith Co., Los Angeles Railway Bdg., L. A., $571,591, to Board of Public Works for improving 8th St., from Figueroa St. to Windsor Blvd. Work consists of: Grading, asphalt paving, 8-in. conc. base, sidewalk, curb, storm drain system, sanitary sewers, water system complete, lighting system. 7-7

LOS ANGELES, CALIF.—To Griffith Co., Los Angeles Railway Bdg., Los Angeles, who bid $499,441 to county for improvement of Manchester Ave., between Inglewood and Playa Del Rey, from Freeman Avenue to Pershing Drive, work involving excavation; curb and gutter; conc. pavement; dist. rock sub-base; oiled subgrade; reinf. conc. pipe; corrugated metal pipe; vitrified pipe; and cast iron pipe. 7-7

LOS ANGELES, CALIF.—To Will F. Peck, 1120 North Las Palmas Avenue, Los Angeles, Calif., $813,613, to the Board of Public Works for improving Cahuenga Boulevard and Yucca St. Work involves: Grading lump sum, conc. paving, asph. paving, curb, sidewalks, storm drain, sanitary sewers, water system, and ornamental lighting system. (See Unit Bid Summary.) 7-10

SACRAMENTO, CALIF.—To Tieslau Bros., 1315 Allston Way, Berkeley, $122,807 for 7.2 miles surfacing from Airport to Yuba Pass, PLACER and NEVADA COUNTIES for California Division of Highways. (See Unit Bid Summary, July 10th issue.) 7-9

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: SAN MATEO CO.—To Basich Bros. Const. Co., 3788 S. Vermont St., Los Angeles, $402,982, for 5.2 miles concrete paving from South San Francisco to Burlingame. SAN BERNARDINO CO.—To Geo. Herz & Co., 456 E. St., San Bernardino, $507,402, for 28.7 miles grading and oil tr. gravel or stone surfacing from 6 miles east of Amboy to 1½ miles east of Essex. (See Unit Bid Summary, July 10th issue.) 7-9

SACRAMENTO, CALIF.—To Englehart Paving & Cont. Co., Eureka, $22,043 for 0.6 miles concrete paving near Eureka, HUMBOLDT CO., for California Division of Highways. 7-12

SALINAS, CALIF.—Awards as follows by County: (1) To Granite Construction Co., Watsonville, who bid $3986 for rock and oil surfacing portions of the San Miguel Road. (2) To Granite Construction Co., Watsonville, who bid $5898 for improvement of portions of Mud Flat Road, by rock and oil surfacing. 7-9

SAN CARLOS, CALIF.—To Union Paving Co., Call Bdg., S. F., $34,464 for paving with rock macadam base with 3-in. asphalt surface Arroyo Ave., Chestnut St., Elm St., etc., for City, also vitrified sewers. 7-16

SAN FRANCISCO, CALIF.—Award recommended to Finnell Co., Inc., 1630-39th St., Sacramento, $112,573, for grading and surfacing 5.1 miles Sections D&C, Route 32, Placerville-Lake Tahoe National Forest, Eldorado National Forest, ELDORADO COUNTY, work for Bureau of Public Roads. (See Unit Bid Summary.) 7-8

SAN FRANCISCO, CALIF.—Award recommended to Jasper-Stacy Co., Sheldon Bdg., S. F., $241,910 for 4.9 miles grading Sect. A, Route 28, Houserock Canyon National Forest Highway, Kaibab National Forest, COCONINO COUNTY, Arizona, for Bureau of Public Roads. (See Unit Bid Summary.) 7-10

SAN FRANCISCO, CALIF.—Award recommended to Nate Lovelace, 3433 N St., Sacramento, $99,653 for 3.4 miles grading Sect. A, Route 21, Deer Creek National Highway, Lassen National Forest, TEHAMA COUNTY, for U. S. Bureau of Public Roads. (See Unit Bid Summary.) 7-17

SAN LUIS OBISPO, CALIF.—To Irving L. Ryder, San Carlos and Dupont Sts., San Jose, who bid $9962 for the improvement of Garden, Pacific, and Pismo Sts., by grading, paving with 6-in. concrete, concrete sidewalks, concrete curbs, culverts and catchbasins. 7-3

SAN MATEO, CALIF.—To Union Paving Co., Call Bdg., S. F., $37,682 for concrete and asphalt paving, vitr. and concrete sewers on Glendale Road, St. Matthews Ave., Ranelagh Road, etc., for City. 7-18

SANTA ANA, CALIF.—To H. W. Rohl, 4351 Alhambra Avenue, Los Angeles, who bid $173,256 to Joint Highway District 15, Court House, Santa Ana, Orange County, for grading, cement rubble walls, corr. pipe, and constructing 70-ft. steel truss bridge on 6.2 miles of the Ortega Highway from San Juan Hot Springs, Orange County, to Morrill Canyon, Riverside County. 7-12

UKIAH, CALIF.—To Ellison Bros., Fort Bragg, $4040 for grading Soda Creek Bluffs Project for County. 7-16

VALLEJO, CALIF.—To John W. Huggard, 17 Brooklyn Ave., San Jose, $3651 for concrete paving Indiana St. from Colusa to Amador Sts., work for the City. 7-16

YUBA CITY, CALIF.—To J. E. Johnston, Weber Ave. and E St., Stockton, who bid $212,262, using Type D asphalt paving on 5-in. crusher run base, work for Joint Highway Dist. 12. (See Unit Bid Summary.) 7-9

BRUSH, COLO.—To C. B. Hansen, Brush, Colorado, $18,305 for constructing curbs, gutters, and sewers in Dist. 4 for City.

DENVER, COLO.—To Lumsden-Hall Construction Co., Grand Junction, Colo., $30,330 for 5.5 miles oil processing East of Avondale, PUEBLO COUNTY, for State.

BOISE, IDAHO—Awards as follows by State: (1) CLEARWATER COUNTY—To Ryberg, McHugh & Cowley, 1014 N. 10th St., Boise, Idaho, who bid $319,040 for 15 miles grading, 3.4 miles gravel surfacing and concrete bridges from Lenore to Orofino. Quantities our issue of June 28. (2) BENEWAH COUNTY—To Carl Nyberg, Box 387, Colfax, Wash., $72,843 for 6.5 miles grading and surfacing from Plummer south. Quantities issue of July 1. (3) BENEWAH COUNTY—To J. C. Maguire & L. T. Lawler, Butte, Montana, $124,847 for 5.4 miles grading from Parker Pass to Rocky Point. Quantities issue of June 26. (4) BONNEVILLE COUNTY—To Sutherland & Burns, Kalispell, Mont., $26,783 for 1.4 miles grading near Swan Valley. (5) BONNEVILLE COUNTY—To Robinson Const. Co., Twin Falls, Ida., $84,228 for 11.8 miles grading and surfacing from Idaho Falls to Ririe. (6) JEFFERSON COUNTY—To J. C. Maguire, Butte, Mont., $47,087 for 8 miles grading from Roberts to Hammer. (7) CLARK COUNTY—To Wm. Hoops, Twin Falls, Idaho, who bid $51,778 for 7.3 miles gravel surfacing from Duboise to Spencer. (8) KOOTENAI COUNTY—To J. F. Konen, Lewiston, Idaho, who bid $61,358 for 6.9 miles grading and rock surfacing. (9) BENEWAH COUNTY—Contract awarded to J. F. Konen, Lewiston, Idaho, who bid $55,362 for 5.2 miles grading. (10) LINCOLN COUNTY — To Quinn-Robbins Const. Co., Boise, Ida., $94,490 for 10 miles grading and gravel surfacing from Blaine County line to Shoshone. (11) BLAINE COUNTY —To Quinn-Robbins Co., Boise, Idaho, $63,080 for 8.9 miles grading and gravel surfacing from Hailey to Lincoln County Line.

BOISE, IDA.—Awards as follows by State: (1) To Triangle Const. Co., Spokane, Wash., $9825 for 5 miles rock surfacing at Mesa Hill Sect., ADAMS COUNTY; (2) To Wm. Hoops, Twin Falls, Ida., $25,479 for 3.6 miles grading north of Challis, CUSTER COUNTY; (3) To Idaho Contracting Co., Boise, Ida., $48,732 for 7.4 miles grading and rock surfacing from Cambridge to Adams County Line, WASHINGTON COUNTY; (4) To Hargrave Const. Co., Spokane, Wash., $15,798 for 17 miles oiling Cottonwood-Grangeville Section, IDAHO COUNTY; (5) To Dan Knight, Gooding, Ida., $5592 for 0.3 miles grading Sawtooth Park Highway, LINCOLN COUNTY; (6) To Sutherland & Burns, Missoula, Mont., $21,598 for 4 miles grading Jerome West, JEROME COUNTY; (7) To Robinson Const. Co., Twin Falls, Ida., $52,988 for 3.5 miles grading and gravel surfacing and constructing Thomas Fork Bridge, BEAR LAKE COUNTY; and (8) To Hargrave Const. Co., Spokane, Wash., $20,562 for 25 miles oiling from Coeur d'Alene to Algoma, KOOTENAI and BONNER COUNTIES.

SANDPOINT, IDAHO—To Elliott & Nesbitt, Sandpoint, Ida., $7517 for paving Lake St. and Second Ave. for City.

MISSOULA, MONT.—Award recommended as follows by Bureau of Public Roads (1) To A. R. Douglas, Kalispell, Mont., $45,595 for grading Columbia Falls-Glacier Park Highway; and (2) To W. L. Giest, St. Maries, $30,415 for grading Clarks Fork Section west of Noxon.

CARSON CITY, NEV.—Awards as follows by State: (1) EUREKA COUNTY—To J. N. Tedford, Fallon, Nev., who bid $58,223 for 11.65 miles grading and surfacing from Hay Ranch to Eureka; (2) LYON COUNTY—Contract awarded to A. D. Drumm, Jr., Fallon Nevada, who bid $22,173 for asphaltic oiling 11.72 miles from Yerington to Wilsons. 7-10

GALLUP, NEW MEXICO—To New Mexico Const. Co., Albuquerque, N. M., $138,240 for paving with Warrenite Bit., Maloney Ave., Coal Ave. and other streets for City.

PORTLAND, ORE.—Awards of contract recommended as follows by Bureau of Public Roads: (1) To Yunker-Wiecks Co., Corvallis, Ore., $51,586 for 4 miles grading Salmon River Bridge from Rose Lodge to Roosevelt Coast Highway, LINCOLN COUNTY, Ore.; and (2) To Columbia Power Investment Co., Stevenson, Wash., $61,511 for 4.8 miles grading Wind River Project, Columbia National Forest, Skamania County, Washington.

PORTLAND, ORE.—Award recommended to A. C. Goerig, Seattle, $99,035 for 10 miles rock surfacing White River Road, Mt. Rainier National Park, Washington, for Bureau of Public Roads. (See Unit Bid Summary.)

PORTLAND, ORE.—Awards as follows by State Highway Comm.: (1) UNION COUNTY—To Union Construction Co., Portland, who bid $41,218 for 7.96 miles grade and widening La Grande-Hot Lake Section of Old Oregon Trail; (2) WASCO COUNTY—To Barnet & Mitchell, Kent, Ore., who bid $37,555 for 7.4 miles grading Wapintia-Maupin Junction Section of the Wapinitia Highway; (3) CLACKAMAS COUNTY—To Jacobson-Jensen Co., 407 Stanton St., Portland, Ore., who bid $182,840 for 6.80 miles concrete paving Multnomah County Line-Sandy Section of the Mt. Hood Highway; (4) WASHINGTON COUNTY—To J. A. Lyons, 1001 Halsey St., Portland, Ore., who bid $112,410 for 9.3 miles grading and surfacing Multnomah County Line-Middleton Section of the West Side Pacific Highway. 7-11

OGDEN, UTAH—Award of contracts recommended as follows by Bureau of Public Roads: (1) To Utah Const. Co., Ogden, Utah, $35,274 for 15 miles surfacing Heber-Fruitland Project, Uinta National Forest, Wasatch County, Utah; (2) To J. A. Terteling & Sons, Moscow, Ida., $152,979 for 5.9 miles grading North Fork Payette Road, Payette National Forest, Valley and Boise Counties, IDAHO; and (3) To Union Const. Co., Ogden, Utah, $88,864 for 6.9 miles grading Salmon-Montana Line Road, Salmon National Forest, LEMHI COUNTY, Idaho. (See Unit Bid Summary.) 7-14

OKANOGAN, WASH.—To M. E. Nelson Const. Co., $13,267 for improvement of Wakefield south lateral highway for County.

OLYMPIA, WASH.—To Diesel Oil Sales Co., Seattle, $61,930 for 38 miles oil treatment of Inland Empire Highway from Chewelah to Kettle Falls Park for State.

OLYMPIA, WASH.—Awards as follows by State: (1) To Norris Bros., Burlington, Wash., $62,395 for 1.6 miles concrete paving from North Pine to Whitman County Line; (2) To Albertson & Cornell Bros., Inc., Tacoma, Wash., $42,180 for 2.1 miles concrete paving from Puyallup to Sumner; and (3) To F. R. Hewitt, Spokane, Wash., $29,000 for stockpiling surfacing material from Rosalia to Pullman.

RAYMOND, WASH.—To Harbor Sand & Gravel Co., Aberdeen, Wash., $8500 for surfacing road for County.

SEATTLE, WASH.—To Moceri Bros., Inc., Seattle, $59,147 for concrete paving 35th Ave. SW for City.

SPOKANE, WASH.—To Geo. Weller, Spokane, Wash., $49,997 for concrete paving Wellesley Ave. and Division St. for City.

TACOMA, WASH.—To Paine & Gallucci, Tacoma, $11,598 for paving East I St. for City.

WOODLAND, WASH.—To J. G. Niblett, Longview, Wash., $11,350 for grading and paving street for City.

CHEYENNE, WYO.—To A. H. Read Const. Co., Cheyenne, Wyo., $41,991 for curbs, gutters, graveling and grading streets in Dist. 14 for City.

CHEYENNE, WYO.—Awards as follows by State Highway Comm.: (1) To R. D. McGlanahan, $14,875 for surfacing Cheyenne-Torrington Road; (2) To Taggart Const. Co., $21,469 for surfacing Worland-Greybull Road; (3) To Stevens Bros., $48,150 for grading Node Van Tassel Road; (4) To A. C. Evans, $11,042 for bridges on Node-Van Tassel Road; (5) To A. O. Thorn, $30,576 for grading Federal Aid Project 180-D; (6) To M. R. Deakin, $29,079 for reconstructing Laramie-Buford Road; and (7) To Sharrock & Pursel, $87,762 for grading Hudson-Riverton Road.

BRIDGES and CULVERTS

WORK CONTEMPLATED

SAN FRANCISCO, CALIF.—Specifications are being completed by the City Engineering Department, City Hall, San Francisco, and call for bids will be issued about August 1 by the Board of Public Works, City Hall, San Francisco, for the construction of the Third St. Bridge to be bascule type including superstructure, substructure & approaches over Channel St. waterway at Third St. Clearanec between fenders 103 ft. and span to be 140 ft., with 30-ft. depth of water at low tide. Provision to be made for six lanes of traffic in addition to two 6-ft. pedestrian walks. Moving leaf to be 140 ft. long and 80 ft. wide, also provision for two street car tracks and one belt line railroad track. $550,000. Bidders are to furnish their own specifications. 7-11

BELLINGHAM, WASH.—Plans by County Engr., Carl McCoy, for constructing steel Acme Bridge, $35,000.

BIDS BEING RECEIVED

PHOENIX, ARIZ.—Bids to 2 p.m., July 28, by State Highway Comm. for reinf. conc. bridge on Tucson-Nogales Highway, involving 207 cu.yd. concrete and 16,500 lb. reinf. steel. 7-18

RIVERSIDE, CALIF.—Bids to 10 a.m., July 28, by County for steel or wooden Sobaba-San Jacinto River Bridge, involving: STEEL BRIDGE —197,700 lb. structural steel; 38,875 lb. reinforcing steel; 270 cu.yd. Class "A" concrete; 13,400 cu.yd. roadway embankment; 1690 cu.yd. roadway surfacing. WOODEN BRIDGE—2220 lin.ft. Dougl. Fir creo. piles; 35,640 ft. BM Douglas fir (Selected common stringers); 38,590 ft. BM Douglas Fir (Selected common structural); 6108 ft. BM Redwood timber; 13,400 cu.yd. roadway embankment; 1690 cu.yd. roadway surfacing. 7-14

SACRAMENTO, CALIF.—Bids to 2 p.m., Aug. 13, by California Division of Highways, Sacramento, for: (1) HUMBOLDT CO.—Overhead crossing over Northwestern Pacific R. R. 2½ miles north of Beatrice, involving 10,000 ft. Douglas Fir piles, 143 M ft. b.m. redwood, 745 cu.yd. concrete, 53,000 lb. reinf. steel and 187,000 lb. structural steel; and (2) LOS ANGELES CO.—Reinf. concrete bridge over San Gabriel River near Seal Beach, involving 9250 cu.yd. channel excavation, 2600 cu.yd. structure excavation, 23,000 ft. Douglas Fir piles, 4541 cu.yd. concrete, 554,000 lb. reinf. steel. 7-16

SACRAMENTO, CALIF.—Bids to 2 p.m., Aug. 6, by California Division of Highways for widening 3 bridges east of Ontario, SAN BERNARDINO COUNTY, involving 450 cu.yd. concrete, 34,000 lb. reinforcing steel, and 700 tons asphalt paving. 7-9

SAN JOSE, CALIF.—Bids to 11 a.m., Aug. 4, by County for reinf. concrete culverts on Canada Road, McAbee Road and Blossom Hill Road and two corr. culverts on Short Road. 7-15

BIDS RECEIVED

OAKLAND, CALIF.—Robt. B. McNair, 3745 Rhoda Ave., Oakland, low for 270 ft. 27-in. and 445 ft. 33-in. reinf. concrete culvert, on Penniman Ave. and Sutter St. for City. 7-17

SACRAMENTO, CALIF.—Ralph Hunter, 3408 Brockway, Sacramento, $25,105 low for reinf. concrete bridge over south fork of American River at Riverton, ELDORADO COUNTY, for California Division of Highways. 7-17

SACRAMENTO, CALIF.—Whipple Engr. Co., 183 N. Madison St., Monrovia, $83,000 low for reinf. conc. and steel bridge over Trinity River near Douglas City, TRINITY COUNTY, for California Division of Highways. (See Unit Bid Summary.) 7-9

CONTRACTS AWARDED

LOS ANGELES, CALIF.—To General Engineering Co., 740 S. Broadway, L. A., $204,320 for reinf. conc. Washington St. Bridge over Los Angeles River for City. 7-16

OAKLAND, CALIF.—To Herrick Iron Works, Oakland, who bid $2464 for furnishing one 80-ft. steel span and one 34-ft. steel approach span over Upper San Leandro Creek in Contra Costa County (District to install timber flooring and piers) for East Bay Municipal Utility District. 7-10

SACRAMENTO, CALIF.—Awards as follows by California Division of Highways: (1) SISKIYOU COUNTY—To Rocca & Caletti, Toll Road, San Rafael, who bid $97,884 for constructing reinforced concrete bridge over the Shasta River about 7½ miles north of Yreka; (2) COLUSA COUNTY—To R. B. McKenzie, Red Bluff, who bid $19,966 for the construction of reinforced concrete bridge over Bear Creek, 28 miles west of Williams. 7-12

SACRAMENTO, CALIF.—By California Division of Highways to Rocca & Caletti, Toll Road, San Rafael, $77,779, for reinforced concrete bridge over Klamath River, 10 miles north of Yreka, SISKIYOU COUNTY. (See Unit Bid Summary, July 10th issue.) 7-9

SAN CARLOS, CALIF.—To Wiggins & Kaiser, 6230 Mills St., Oakland, $9834 for reinf. conc. culverts for City. 7-16

SAN FRANCISCO, CALIF.—Award recommended to W. A. Bechtel Co., 206 Sansome St., San Francisco, $86,396 for concrete Lodgepole, Clover Creek and Silliman Creek Bridges in Sequoia National Park, Generals Highway, TULARE COUNTY, for Bureau of Public Roads. (See Unit Bid Summary.) 7-15

SAN JOSE, CALIF.—To Frank Neves, 891 Harrison St., San Jose, $15,483 for reinf. concrete bridge over Guadalupe River on Auzerais Ave. for City 7-15

SAN JOSE, CALIF.—To Collins & Martin, 1386 Whitton Ave., San Jose, $9794 for wooden truss Pratt bridge on Hellyer Ave., over Coyote Creek for County. 7-8

UKIAH, CALIF.—To Pacific Coast Engineering Co., Oakland, who bid $2955 for one 100-ft. steel span to be constructed over Calpella Creek for County. 7-16

OREGON CITY, ORE.—To Northwest Equipment Co., American Bank Bdg., Portland, Ore., $20,997 for steel and concrete bridge over Mollala River near Canby for County. 7-3

PORTLAND, ORE.—Award recommended to Albert F. Berni, 1095 Savier St., Portland, $54,260 for steel and concrete bridge over Frying Pan Creek, White River Road, Mt. Rainier National Park, PIERCE COUNTY, Wash., for Bureau of Public Roads. (See Unit Bid Summary.) 7-18

PORTLAND, ORE.—Award recommended to Concrete Const. Co., Seattle, Wash., $45,920 for concrete Clear Fork Bridge in Mt. Rainier National Forest, WASHINGTON, for U. S. Bureau of Public Roads.

SALEM, ORE.—Awards as follows by City. (1) To Roberts & Horstkotte, Salem, Ore., $5999 for reinf. conc. Pringle Creek on S. Winter St.; and (2) To Jas. R. Hugh, Salem, Ore., $15,520 for reinf. conc. North Mill Creek bridge at North Commercial St.

CATHLAMET, WASH.—To H. R. Blumback, Ilwaco, Wash., $10,545 for constructing Wahkiahkum Bridge for County.

OLYMPIA, WASH.—To U. S. Steel Products Co., 1054 4th St. South, Seattle, who bid $1,247,888 to Washington State Highway Commission for constructing steel superstructure for Lake Union Bridge at Aurora St. in City of Seattle. 7-3

CHEYENNE, WYOMING—Awards as follows by State Highway Comm. (1) To Carruth & Son, $36,378 for bridges on Granger-Lyman Road; and (2) To F. J. Anderson, $39,214 for bridges on Hudson-Riverton Road.

AMARILLO, TEX.—To Union Bridge & Const. Co., Kansas City, Mo., $1,000,000 for constructing 1736-ft. bridge over Canadian River near Amarillo, Texas, for Santa Fe R. R.

SEWER CONSTRUCTION

WORK CONTEMPLATED

ORANGE, CALIF.—Plans by C. C. Bonebrake, City Engr., for constructing storm drain system for City, $75,000. 7-18

PALO ALTO, CALIF.—The Burns-McDonnell-Smith Engineering Co., Los Angeles, has submitted its report to the City Council of Palo Alto, California, recommending the following improvements to the sewerage systems of Palo Alto and Stanford University: Construction of a joint outfall sewer to replace the present two separate outfalls, and a joint sewage treatment plant, at a total cost of $295,000, pro-rated as follows: Palo Alto's share, $220,500; Stanford University, $74,500. The sewage treatment plant will probably be built in the vicinity of the present city dump, and will consist of settling tanks, separate sludge digestion tanks, sludge drying beds, and pumping plant. 7-11

SAN FRANCISCO, CALIF.—Plans being prepared by City, call for bids to be issued about July 30, for: (1) Construction of Section E of Alemany Storm Drain from Bayshore Highway to Toland St., work involving the following approximate quantities: 915 lin.ft. two compartment 8 ft. by 11 ft. Monolithic concrete sewer; 350 lin.ft. 2-ft. 6-in. x 3-ft. 9-in. reinf. concrete sewer; 77,000 lin.ft. piling; $165,000. (2) Construction of Section D of the Alemany Storm Drain system from Toland St. to Oakdale Ave., work involving the following approximate quantities: 1200 lin.ft. 8-ft. x 14-ft. wooden box sewer; 200 lin.ft. 3-ft. x 4-ft. 6-in. wooden box sewer; 7000 lin.ft. piling; $50,000. 7-18

BIDS BEING RECEIVED

SAN DIEGO, CALIF.—Bids to 2 p.m., Aug. 5, by Geo. B. McDougall, State Architect, Public Works Bdg., Sacramento, for installation of sewer, steam, water, fire protection, gas and storm drain services at San Diego State Teachers College. 7-14

BIDS RECEIVED

LOS ANGELES, CALIF.—Chas. H. Johnston, 947 N. Orange Drive, L. A., $334,920 low bid to City for reinf. conc. Sect. 3 Jefferson St. Storm Drain system. 7-11

RICHMOND, CALIF.—O. U. Miracle, 1604 Dale St., San Diego, $99,209 low bid to City for vitrified & centr. cast reinf. conc. sewers on Dock Ave., Hall Ave., etc. (See Unit Bid Summary.) 7-8

KLAMATH FALLS, ORE.—To J. F. Shea Co., Henry Bdg., Portland, $34,800 for 15th Sewer Unit for City. 7-16

SEATTLE, WASH.—Queen City Const. Co., Seattle, Wash., $149,770 low for constructing Lakeside Ave. trunk sewer for City.

CONTRACTS AWARDED

GUSTINE, CALIF.—To John Pestana, 1232 35th Ave., Oakland, $17,496 for vitrified sewer outfall for City. 7-8

LONG BEACH, CALIF.—To A. Dalmatin & R. N. Nikcevich, 841 W. 62nd St., Los Angeles, $248,980 for cement & reinf. concrete sewers in Storm Drain Pump Dist. No. 2, also discharge lines and pumping station. (See Unit Bid Summary.) 7-10

LOS ANGELES, CALIF.—Awards as follows by South Bay Sanitation Dist.: (1) To M. Nikcevich, 1540 McDonald Ave., Wilmington, $11,730 for main trunk sewer extensions, using vitrified and concrete pipe; and (2) To Simonds Mchy. Co., $642 for sewage pumping equipment. 7-9

MARTINEZ, CALIF.—To M. J. Bevanda, Stockton Savings & Loan Bank Bdg., Stockton, $141,079 for vitrified & reinf. concrete Sewer in Stege Dist. (County Dist. No. 5) on portions of Monterey St., Carl Ave., etc., for County. (See Unit Bid Summary.) 7-7

MODESTO, CALIF.—Awards as follows by City: (1) To Dorr Company, Los Angeles, $6014 for furnishing one sewage clarifier mechanism; (2) To Industrial & Municipal Supply Co., San Francisco, who bid $486 for furnishing one duplex sludge pump. 7-11

SAN FRANCISCO, CALIF.—To M. B. McGowan, Call Bdg., San Francisco, who bid $120,586 to Islais Creek Reclamation District, Room 373, City Hall, San Francisco, for constructing wooden drain. (See Unit Bid Summary.) 7-12

GREAT FALLS, MONT.—To Omholt & Lindstrom, Great Falls, Mont., $17,900 for constructing 30-in. vitrified sewer in Gibson Park for City.

SEATTLE, WASH.—To Queen City Construction Co., c/o N. Badalato, 3100 Mount Baker Boulevard, Seattle, who bid $159,570 for the construction of the Lakeside Sewer system work for the City. 7-18

WALLA WALLA, WASH.—Awards as follows by City to Geo. Harding, Walla Walla, Wash., $9198 for constructing Catherine St. Sewer; and $15,353 for constructing Waterton St. sewer.

WATER SUPPLY SYSTEMS

WORK CONTEMPLATED

FRESNO, CALIF.—Plans by Engr., A. Segel, 512 Griffith-McKenzie Bdg., Fresno, and Consulting Engr., Perry F. Brown, 702 Peralta St., Fresno, for water distribution system for Fresno County Water District No. 1. Work involves 7000 lin.ft. 4-in. pipe line; 25,000 lin.ft. 6-in. pipe line; 7000 lin.ft. 8-in. pipe line; $55,000. Work under bond issue. 7-3

SANTA ANA, CALIF.—A. Kempkey, Hobart Bdg., San Francisco, has been appointed to prepare plans for the construction of a dam in Santiago Canyon on Santiago Creek for the John T. Carpenter Water Company; the Serrano Water Association; and the Irvine Company. Dam will probably be earth fill type. Exploration of the dam-site is now underway. 7-15

WALNUT CREEK, CALIF.—The City Council has accepted the recommendation of Andrew M. Jensen, consulting engineer, 68 Post St., S. F., that the city sign a contract with the California Water Service Co., to purchase water at wholesale for the supply of the municipality at 24.2 cents per 1000 gallons. The City will probably start proceedings immediately to vote bonds ($50,000 to $60,000) for a new distribution system. The California Water Service Co., Hunter-Dulin Bdg., S. F., will construct a 12-in. pipe line, 14 miles long, from the Galindo pump station near Chenery reservoir through Walnut Creek to the Mt. Diablo Country Club, serving water to various consumers and communities enroute, providing the company can secure sufficient revenue contracts. 7-7

PUEBLO, COLO.—Plans by Pueblo Water Works for reservoir. D. P. Porter, 319 W. 4th St., Pueblo, is Supt.

BIDS BEING RECEIVED

CLOVERDALE, CALIF.—Bids to 8 p.m., Aug. 5, by City for 12,080 ft. 4-in. and 2155 ft. 2-in. cast iron pipe, 3735 ft. 4-in. or 2-in. cast iron pipe, gate valves, fire hydrants to be furnished and installed. Cash job. A. M. Jensen, 68 Post St., S. F., is Engr. 7-18

LOS ANGELES, CALIF.—Bids to 10 a.m., July 30, by Los Angeles Harbor Department, City Hall, Los Angeles, for furnishing and installing pumping equipment, motors, etc., for the Fish Harbor Salt Water supply line for the Los Angeles Harbor Department. Work will involve the furnishing and installing of three 5000 g.p.m. centrifugal pumps, one 250 g.p.m. centrifugal pump, motors, vacuum pumps and incidental work. Spec. 865. 7-18

CONTRACTS AWARDED

MANHATTAN BEACH, CALIF.—Awards as follows by City: (1) To Pacific States Cast Iron Pipe Co., $2406 for furnishing 3000 ft. 4-in., 6-in., and 8-in. cast iron pipe. (2) To Reliable Iron Foundry Co., $2406 for furnishing fittings. (3) To Crane Co., Los Angeles, California, $147 for hydrants; $225 for lead; and $13.47 for oakum. 7-10

OAKLAND, CALIF.—Awards as follows by East Bay Municipal Utility District for second Lafayette Pumping Plant: (1) To DeLaval Steam Turbine Co., S. F., $9304 for pumping equipment. (2) To Rensselaer Valve Co., $231 for gate valves. (3) To Pelton Water Wheel Co., S. F., $2215 for check throttle valve. 7-10

FRANKLIN, IDA.—To Mullins & Wheeler, 2839 Imperial St., Salt Lake City, $11,175 for constructing pipe line extensions for City.

LONGVIEW, WASH.—To N. Niblett, Longview, Washington, for the construction of a 1,000,000-gallon capacity reinforced concrete water reservoir to be constructed at Longview, Washington, for the Washington Gas and Electric Company. Plans for the above were prepared by Consulting Engineers, Stevens & Koon, Spalding Bdg., Portland, Ore. 7-12

OLYMPIA, WASH.—To Pacific Water Works Supply Co., Seattle, $14,472 for 7780 ft. 16-in. cast iron pipe for City.

PROSSER, WASH.—To Fairbanks, Morse & Co., Seattle, Washington, who bid $1045 for furnishing and installing one deep well turbine pump for the City of Prosser, Washington. 7-18

SEATTLE, WASH.—Awards as follows by City for watermains: (1) To A. Scarsella, Seattle, $14,705 for watermains on 35th Ave. S.W.; and (2) To A. Scarsella, Seattle, $10,087 for watermains on 11th Ave. S.W.

WALLA WALLA, WASH.—To King Bros., Portland, Ore., who bid $13,845 for furnishing and delivering 10,000 lin.ft. 20-in. 10-ga. steel slip joint pipe to the City. 7-11

IRRIGATION and RECLAMATION

WORK CONTEMPLATED

BILLINGS, MONT.—Plans by Base Line Dist. Drain Commission for ditches involving 160,000 cu.yd. earthwork.

YAKIMA, WASH.—Plans by L. M. Holt, Sup. Engineer, U. S. Indian Service, Box 156, Yakima, Washington, and bids will be called for at once to be opened about August 18 for pumping plants as follows: One 25 cu.ft. per second pump and one 50 cu.ft. per second pump. Pumps are to be direct connected to 2300 volt, three phase, 60 cycle automatically controlled vertical induction motors. Lift of pumps is to be 27 ft. Water is to be delivered through 90 lin.ft. of concrete pipe, 30-in. and 42-in. diameter, respectively. 7-17

BIDS BEING RECEIVED

BAKERSFIELD, CALIF.—Bids to 2 p.m., July 31, by Kern River Levee Dist., Bank of Italy Bdg., Bakersfield, for reinforcing levee on south side of Kern River near Oak St. Bridge. 7-15

CONTRACTS AWARDED

BURLEY, IDA.—To Utah Const. Co., Ogden, Utah, $36,000 for railroad culvert on Minidoka project, for Bureau of Reclamation.

VALE, ORE.—Awards as follows by Bureau of Reclamation for 101-in. diameter steel Bully Creek Fairman Coulee siphons: SCHEDULE No. 1—To W. H. Puckett Co., Boise, Ida., $55,401 for excavation. SCHEDULE No. 2—To Western Pipe & Steel Co., 444 Market St., S. F., $228,000 for steel siphon. 7-9

POWER DEVELOPMENT

WORK CONTEMPLATED

SODA SPRINGS, IDA.—Plans by City for $30,000 hydro-electric power plant. Bond election will be held July 29.

BIDS BEING RECEIVED

TACOMA, WASH.—Bids to 2 p.m., July 28, by Board of Contracts & Awards for circulating water piping in the Municipal Steam Power Plant No. 2. 7-17

CONTRACTS AWARDED

EUGENE, ORE.—Awards as follows by Eugene Water Board for furnishing machinery and equipment for the steam auxiliary power plant: (1) Contract awarded to Gordon & Finkbeiner Co., Portland, $56,896 for furnishing one 1150 h.p. bent tube type water boiler; (2) To General Electric Co., $96,500 for one 5000 k.w. turbo-generator set. Bids for one surface condenser have been rejected, low bid from Allis-Chalmers Mfg. Co. $21,900. Specifications will be revised and new bids called for. Stevens & Koon, Spalding Bdg., Portland, are Engrs. 7-18

TUNNEL CONSTRUCTION

BIDS BEING RECEIVED

SACRAMENTO, CALIF.—Bids to 2 p.m., Aug. 13, by California Division of Highways for tunnel and 1 mile of roadway through Newcastle, PLACER COUNTY, involving 531 ft. 36-ft. diameter tunnel, 240 ft. concrete lining, 291 ft. Redwood timber tunnel lining, 71,000 cu.yd. roadway excavation, concrete structures, surfacing, vitr. pipe, etc. 7-16

RIVER and HARBOR WORK

WORK CONTEMPLATED

LONG BEACH, CALIF.—Plans by Engr., R. D. Van Alstine, Heartwell Bdg., Long Beach, for the new pier to be 1465 ft. long, and 380 ft. wide, for the Neptune Pier Co., Silver Spray Pier, Long Beach, involving: 650,000 cu.yd. hydraulic fill; 60,000 tons rock riprapping; 2000 tons steel; 9100 cu.yd. concrete; 70,000 ft. wooden piling; steel sheet pile bulkhead, $1,500,000. 7-12

BIDS BEING RECEIVED

MONTEREY, CALIF.—To C. D. Todd, 225 Congress St., Pacific Grove, who bid $1397 to the City for improvements to Municipal Wharf No. 2. 7-17

SAN FRANCISCO, CALIF.—Bids to 11 a.m., Aug. 11, by Islais Creek Reclamation District, Room 375, City Hall, San Francisco, for dredging channel and constructing rock wall. Work involves 325,000 cu.yd. dredging, 475,000 tons of rock in place, $493,000. 7-17

CONTRACTS AWARDED

ALAMEDA, CALIF.—To Duncanson & Harrelson Const. Co., DeYoung Bdg., San Francisco, at about $50,000 for the construction of wood pile bulkhead, wood pile breakwater, and wood pile pier. Work is to be located at the Alameda Airport and is for the Curtiss-Wright Airport Co., Alameda Mole, Alameda. 7-11

SUBWAY CONSTRUCTION

BIDS BEING RECEIVED

TUCSON, ARIZ.—Bids will be received up to 8 P.M., Aug. 4, by City for constructing Broadway Subway under S. P. tracks, involving: SECTION No. 1—8297 cu.yd. concrete, 32,200 cu.yd. excavation, 553,350 lb. reinforcing steel, 3811 sq.yd. concrete pavement. SECTION No. 2—4400 lin.ft. piling, 758,690 BM ft. framing timbers, 473 tons structural steel, 27,861 sq.ft. waterproofing. Cost—$330,000. G. T. Grove is City Engineer. 7-9

LIGHTING SYSTEMS

WORK CONTEMPLATED

PORTERVILLE, CALIF.—Plans by City Engr., W. Pease, protests Aug. 5, for 56 Union Metal Mfg. electroliers, etc., on Main St. 1911-15 Acts. 7-17

REDWOOD CITY, CALIF.—Plans by City Engr., protests July 28 for installation of 17 double standard electroliers on Broadway and Brewster Avenue and 37 single standard electroliers on Broadway and Hopkins Avenue. 7-12

CONTRACTS AWARDED

SACRAMENTO, CALIF.—To E. E. Burgess, 430 Natoma St., S. F., $11,660 for 48 electroliers on H St., from 6th St. to 12th St. Work for City. Work to be done under 1911 Act. 7-12

RAILROAD CONSTRUCTION

BIDS BEING RECEIVED

SAN FRANCISCO, CALIF.—Bids to July 28 by Western Pacific Railroad Co., Mills Bdg., S. F., for constructing 111 miles of railroad from Keddie, Plumas County, to Bieber, Lassen County (The Western Pacific portion of joint line from Keddie to Klamath Falls, Oregon). Work involves: Clearing—392 acres heavy; 394 acres medium; 476 acres light; and 217 acres sagebrush, 1,264,354 cu.yd. solid rock excavation, 788,148 cu.yd. loose rock excavation, 779,903 cu.yd. common excavation, 256,626 cu.yd. loose rock borrow, 560,291 cu.yd. common borrow, 3,655,771 sta.yd. overhaul, 6500 ft. tunnels, 17x22 ft., 5100 tons struct. steel (viad. & bridges), 275,000 ft. BM Douglas Fir, 3300 ft. piling, 1733 cu.yd. conc. (foot), 416,971 Douglas fir cross ties, 17,845 tons 85-lb. rail, 354,000 cu.yd. gravel or volcanic cinders, also steel & wooden tanks, sidings, line protection. Following are prospective bidders: W. A. Bechtel Co., 206 Sansome St., S. F.; Utah Const. Co., Phelan Bdg., S. F.; A. Guthrie & Co., Sherlock Bdg., Portland; Hauser Const. Co., Multnomah Hotel, Portland; Northern Construction Co., Seattle; Stewart & Welch, Vancouver, B. C.; List Construction Co., Kansas City, Mo.; Morrison-Knudsen Co., Boise, Ida.; Twohy Bros., Underwood Bldg., San Francisco, & 2001 Halsey, Portland; Geo. Pollock Co., Forum Bldg., Portland; R. B. Porter, Spokane, Wash.; Siems & Helmers, St. Paul. Cost $9,824,669. 7-7

SURETY BOND AND CASUALTY INSURANCE DIRECTORY

CONTRACTS AWARDED

OAKLAND, CALIF.—To Worden & Forsythe, 264 Sybil Ave., San Leandro, $10,000 for track-laying, etc., at 9th Ave. Pier for Oakland Port Comm. 7-15

BUILDING CONSTRUCTION

BIDS BEING RECEIVED

FLAGSTAFF, ARIZ.—Bids to 10 a.m., August 9, by Office of U. S. Property & Disbursing Officer, Capitol Bdg., Phoenix, Arizona, for installation of water, sewer and electric systems & construction of 18 mess halls, 3 latrines, warehouse, administration building, power house, infirmary, and guard house, all of brick construction, at the National Guard Camp, Flagstaff, Arizona. 7-14

BERKELEY, CALIF.—Bids to 8 p.m., Aug. 4, by Board of Education for brick and steel frame addition to Longfellow School on California & Ward Sts., $100,000. 7-10

EMERYVILLE, CALIF.—Bids to 4 p.m., August 19, by the Emeryville School District, High School, Emeryville, Alameda County, for the construction of a brick elementary school building to be known as the Sutter School.; $15,000. 7-18

FORT MASON, CALIF.—Bids to 11 a.m., Aug. 5, by Constructing Quartermaster, for 3 reinf. concrete wards at Letterman General Hospital, $150,000. 7-8

LOS ANGELES, CALIF.—Bids to 2 p.m., August 5, by George B. McDougall, State Architect, at the Office of the Division of Architecture, 1025 Associated Realty Bdg., Los Angeles, for the construction of the State Office Building at Los Angeles. The State Office Building at Los Angeles will be a limit height Class "A" structure faced with granite and terra cotta. It will be located at the new Civic Center on property bounded by First, Spring, Broadway, and Court Sts. $1,500,000. 7-10

MARCH FIELD, CALIF.—Bids to 11 a.m., Aug. 25, by Constructing Quartermaster, March Field, Riverside, Riverside County, for the constructing of masonry air corps hospital and a group of twelve sets of non-commissioned officers' quarters to be located at March Field, Riverside; $250,000. 7-18

SANTA CRUZ, CALIF.—Bids to 8 p.m., July 29, by Board of Education for Mission Hill Jr. High School (16 classrooms) at Santa Cruz, to be 2 stories and basement, class B, plaster exter. fin., reinf. conc. frame. $160,000. 7-8

YOUNTVILLE, CALIF.—Bids to 1 p.m., July 28, by Yountville Grammar School Dist. for reinf. conc. and stucco school, $20,000. 7-14

BIDS RECEIVED

PRESCOTT, ARIZ.—Two lowest bids as follows by U. S. Treasury Department, Washington, D. C., for postoffice at Prescott, Ariz.: (1) Stone; and (2) Terra Cotta: Robt. E. McKee, El Paso, Tex., (1) $207,200; (2) $206,700. Los Angeles Construction Co., Los Angeles, (1) $209,000; (2) $207,800. 7-15

EUREKA, CALIF.—Mercer-Fraser Co., Eureka, $77,875 low for concrete, stone and terra cotta club house for County on H and 10th Sts. 7-16

MT. VIEW, CALIF.—Young & Horstmeyer, 461 Market St., S. F., $27,931 low for reinf. conc. building for Leon Robert Post of American Legion. 7-17

SANTA CRUZ, CALIF.—Wilson & McGranahan, Santa Cruz, $49,475 low for reinf. conc. and stucco Gault Grammar School for City. 7-9

CONTRACTS AWARDED

BERKELEY, CALIF.—Awards as follows by State Architect's Office, Sacramento, for the construction of reinforced concrete addition to school and employees' cottage at the California School for Blind, Berkeley: GENERAL CONTRACT—To Sorenson & Haggmark, 2652 Harrison St., S. F., $45,700; HEATING & PLUMBING—To Geo. A. Schuster, 4712 Grove St., Oakland, $5262; ELECTRICAL WORK—To Geo. Woolf, 717 Alcatraz Ave., Oakland, $1783. 7-12

BERKELEY, CALIF.—To Chas. H. McCullough, 1634 Berkeley Way, Berkeley, $15,520 for the construction of two temporary school buildings, to be located at Bancroft Way between Grove and Milvia Sts. (Academic Bdg.), and to be three classrooms each. 7-10

EUREKA, CALIF.—To Halsby & Lax, Eureka, $8640 for the construction of a primary school (2 classrooms and playroom), to be located at East Side of Summer Street, Eureka, Calif. 7-10

FORTUNA, CALIF.—To Carl Nelson, 1421 E. Channel St., Stockton, who bid $32,800 for the construction of a 2-story reinforced concrete and stucco grammar school building for the Fortuna Grammar School District. 7-18

KING CITY, CALIF.—To the Minton Co., Front St., Mountain View, who bid $21,670 for constructing reinforced & stucco fine arts building for the King City Union High School Dist. 7-3

REDWOOD CITY, CALIF.—Awards as follows by County for reinf. concrete Hospital addition at Beresford: GENERAL CONTRACT—To Sorenson & Haggmark, 2652 Harrison St., San Francisco, $83,900. HEATING—To F. J. Klimm, 456 Ellis St., San Francisco, $13,875. ELECTRICAL WORK—To Atlas Electric Co., San Mateo, $10,199. 7-14

SAN LUIS OBISPO, CALIF.—To Theo Maino, 1414 Mill St., San Luis Obispo, Calif., who bid $61,234 to the Board of School Trustees for 1-story and basement, brick Jr. High School addition and remodel. 7-10

OPPORTUNITY PAGE

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

THE BUYERS' GUIDE

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

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

Acetylene Generating Apparatus
Oxweld Acetylene Co.

Air Compressors
Bacon Co., Edward R.
Gardner-Denver Co.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Jenison Machinery Co.
Leitch & Co.
National Brake & Electric Co.
Rix Company, Inc., The
Schramm, Inc.
Sullivan Machinery Co.
West Coast Tractor Co.

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

Asphalt, Emulsified
American Bitumuls Co.

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

Asphalt Paving
Warren Bros. Roads Co.

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

Beams, Channels, and Angles
Pacific Coast Steel Corp.

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

Blacksmithing, Drop Forgings
Payne's Bolt Works

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

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

Bolts, Nuts and Rods
Claussen & Co., C. G.
Kortick Mfg. Co.
Payne's Bolt Works

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

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

Brick, Common
Gladding Bros. Mfg. Co.

Bridge Plates, Bronze Expansion
Greenberg's Sons, M.
Western Iron Works, S. F.

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

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

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

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

Carbide
Union Carbide Sales Co., The

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

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

Castings, Brass and Bronze
Greenberg's Sons, M.

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

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

Cement
Portland Cement Association

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

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

Chlorine
Great Western Electro-Chemical Co.

Chutes, Concrete
Bacon Co., Edward R.
Garfield & Co.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.

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 Pipe
American Concrete Pipe Co.

Concrete Roads
Portland Cement Association

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

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

Cranes, Electric, Gasoline Locomotive
American Hoist & Derrick Co.
Austin Machy. Corp.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Garfield & Co.
Hackley Equipment Co., P. B.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
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
Austin Western Road Machy. Co., The
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.
Victor Welding Equipment Co.

Dams
Ambursen Dam Co., Inc.

Derricks
Bacon Co., Edward R.
Garfield & Co.
Harron, Rickard & McCone Co.

Derricks (Continued)
Industrial Brownhoist Corp.
Jenison Machinery Co.
Young Machy. Co., A. L.

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

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

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

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

Drill Sharpening
Compressor Service & Tool Co.

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.

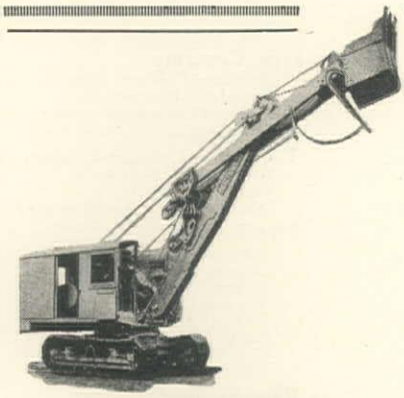
Engines, Gasoline and Steam
Bacon Co., Edward R.
Continental Motors Corp.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
Ingersoll-Rand Co.
International Harvester Co.
Jenison Machinery Co.
Le Roi Co.
Novo Engine Co.

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

(Continued on page 64)

OPPORTUNITY PAGE

CONTINUED



SHOVELS CRANES DRAGLINES PULLSHOVELS

Factory Rebuilt with New Machine Guarantee

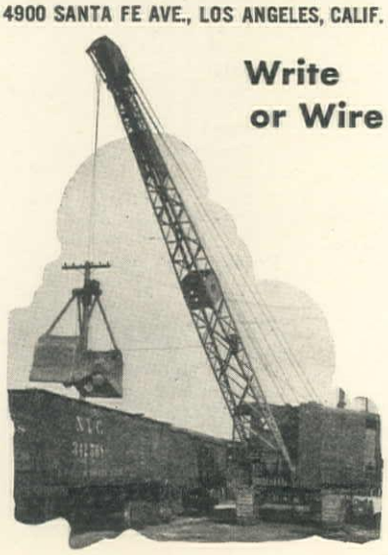
(1/2 to 2 cu. yd.)

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

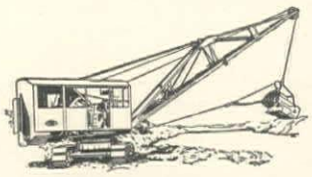
NORTHWEST ENGINEERING CO.

23 MAIN STREET, SAN FRANCISCO, CALIF
4900 SANTA FE AVE., LOS ANGELES, CALIF.

Write or Wire



WONDERFUL BUYS IN USED



DRAGLINES :: SHOVELS :: CLAMSHELLS
TRUCK CRANES :: TRENCHERS

ALL SIZES DRAGLINE AND CLAMSHELL BUCKETS

EXCAVATING EQUIPMENT DEALERS, Inc.

2657 Ninth Street, Berkeley — THornwall 3367
2248 East 37th Street, L. A. — LAfayette 1787

STORAGE SPACE FOR RENT

For Rent or Will Contract

1¼-cu.yd. Gas Shovel, Crane Dragline or Clamshell

E. SMARIO

836 Bayshore Blvd., San Francisco
Phone DElaware 3778

PORTABLE COMPRESSOR

9x8—250 cu.ft.—Ingersoll-Rand
Guaranteed first-class
FOR RENT OR SALE

P. B. Hackley Equipment Co.

625 Market Street — San Francisco
Telephone SUtter 0978

FOR SALE

CRANE

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

SHOVELS

1—Marion Electric, 2½-cu.yd., 490.

1—Bucyrus Diesel, 2-cu.yd. 50-B.

1—P&H Gasoline, 1½-cu.yd., 700.

Write for our 1930 general catalog. It will enable you to effect real economies in your purchasing.

"SERVICE AND QUALITY AT A SAVING IN COST"

EASTERN IRON & METAL COMPANY

634 South 4th West — Salt Lake City, Utah
WABUSKA, NEVADA

Enjoy our

Dining Car Service

Club Breakfast
Table d'Hote
Lunch and Dinner

Dining Cars on Sacramento Valley Limited and Meteor

SACRAMENTO NORTHERN RY.

FOR RENT OR SALE

Portable Air Compressors
Concrete-Breakers

W. H. COWEN

1114 Sutter Street — Phone ORdway 0173

CATERPILLAR

For Sale -- Reconditioned

"SIXTY" LOGGING CRUISER
"TWENTY" STANDARD

West Coast Tractor Co.

1175 HOWARD ST., SAN FRANCISCO
Telephone MArket 8020

HOISTS

Lidgerwood 10x10—3 drum steam hoist with boiler :: 50-hp. electric hoist—3 drum with swinger—Guaranteed first-class

P. B. Hackley Equipment Co.

625 Market Street — San Francisco
Telephone SUtter 0978

THE BUYERS' GUIDE—*Continued from Page 62*

Excavating Mchy.(Continued)
Orton Crane & Shovel Co.
Owen Bucket Co.
Sauerman Bros., Inc.
Speeder Machinery Corp., The
Thew Shovel Co., The
Universal Crane Co., The

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

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

Equipment—Rental
Atkinson Construction Co.
Contractors 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.
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
Victor Welding Equipment Co.

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

Freight, Water
American-Hawaiian Steamship Co.

Frogs and Switches
Bacon Co., Edward R.
United Commercial Co.

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

Gates, Cast-Iron
California Corrugated Culvert Co.

Gates, Irrigation
Great Western Meter Co.

Gates, Radial
California Corrugated Culvert Co.

Gates, Sheet Metal
California Corrugated Culvert Co.

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

Governors, Turbine
Pelton Water Wheel Co., The

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

Hammers, Steam Pile
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.

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

Hoists, Hand and Power (Continued)
Jenison Machinery Co.
Link-Belt Co.
Novo Engine Co.
Sullivan Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.
Young Machy. Co., A. L.

Hoppers, Steel
Bacon Co., Edward R.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Lakewood Engr. Co.
Link-Belt Co.

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

Hydro-Tite
Industrial & Municipal Supply Co.

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

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

Jacks, Lifting
Jenison Machinery Co.

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

Leadite
Water Works Supply Co.

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

Locomotives, Electric, Gas and Steam
Bacon Co., Edward R.
Garfield & Co.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
United Commercial Co.

Lumber
McCormick Lumber Co.

Metal Lath
Truscon Steel Company

Meters, Irrigation
Great Western Meter Co.

Meters, Venturi
Water Works Supply Co.

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

Mixers, Chemical
Dorr Co., The

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

Mixers, Plaster
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Young Machy. Co., A. L.

Motors, Gasoline
Continental Motors Corp.
Hercules Motors Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Le Roi Co.

Oxy-Acetylene Apparatus
Oxweld Acetylene Co.

Oxygen in Cylinders
The Linde Air Products Co.

Paints, Acid Resisting
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Metal Protective
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Technical
American Bitumuls Co.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Paints, Waterproofing
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

Pavers, Concrete
Foote Company, Inc.
Harron, Rickard & McCone Co.
National Equipment Corp.

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

Paving, Contractor
Warren Bros. Roads Co.

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

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

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

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

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

Piling
Pacific Coast Steel Corp.

Pipe, Bell and Spigot
National Cast Iron Pipe Co.

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

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

Pipe, Centrifugal
National Cast Iron Pipe Co.

Pipe Clamps and Hangers
Kortick Mfg. Co.

Pipe Coatings
McEverlast, Inc.
Paraffine Companies, Inc., The
Wailes Dove-Hermiston Corp.

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

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

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

Pipe, Flanged
National Cast Iron Pipe Co.

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

Pipe, Lock-Bar
Western Pipe & Steel Co.

Pipe, Preservative
Columbia Wood & Metal Preservative Co.

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

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

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

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

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

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

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

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

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

Power Units
Continental Motors Corp.
Harron, Rickard & McCone Co.
Hercules Motors Corp.
International Harvester Co.
Jenison Machinery Co.
Novo Engine Co.

Preservative, Wood, Metal, etc.
Columbia Wood & Metal Preservative Co.
Paraffine Companies, Inc., The

Pumps, Centrifugal
Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Ingersoll-Rand Co.
Jaeger Machine Works, The
Pelton Water Wheel Co., The
Rix Company, Inc., The
Washington Iron Works
Woodin & Little

(Continued on page 66)

OPPORTUNITY PAGE

CONTINUED

OFFICIAL BIDS

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Surfacing

San Francisco, Calif., July 8, 1930.

Sealed bids, in single copy only, subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 29th day of July, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for surfacing Sta. 196+00 to Sta. 664+13 on Sections C and D of the Yuba Pass national forest highway, route 26, in Tahoe National Forest, Sierra County, California.

The length of the project to be surfaced is 8.58 miles and the principal items of work are approximately as follows:

Unclassified excavation, 500 cu.yd.
Fine grading subgrade and shoulders, 8.58 miles.
Crushed rock surfacing, 14,700 cu.yd.
Supplemental crushed rock, 1500 cu.yd.
Providing and maintaining water plant or plants, lump sum.
Watering, 750 M. gals.
Right of Way monuments in place, 150 each.

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

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

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

Performance bond will be required as follows: In the amount of one hundred (100) per cent of the total contract price. Performance shall begin within ten (10) calendar days after date of receipt of notice to proceed and shall be completed within one hundred fifty (150) calendar days from that date, exclusive of any time that may intervene between the effective date of orders of the Government to suspend operations on account of weather conditions and the effective date of orders to resume work and subject to such extension as may be provided for under the Special Provisions.

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

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

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

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

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

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

Bid for Road Construction. To be opened 2:00 p.m., July 29, 1930.

California Forest Highway Project 26-C2, D2, Yuba Pass National Forest Highway, 807 Sheldon Bldg., 461 Market Street, San Francisco, California.

C. H. SWEETSER,
District Engineer.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

Grading

San Francisco, Calif., July 14, 1930

Sealed bids, in single copy only subject to the conditions contained herein, will be received until 2:00 o'clock p.m. on the 5th day of August, 1930, and then publicly opened, for furnishing all labor and materials and performing all work for grading Section "E" of Route 23, Quincy-Beckwith National Forest Highway, in Plumas National Forest, Plumas County, California. The length of the project to be graded is 8.335 miles and the principal items of work are approximately as follows:

Clearing, 26.55 acres.
Unclassified excavation, 212,083 cu.yd.
Structural excavation, 887 cu.yd.
Overhead, 42,398 sta.yd.
Finishing, 8.335 miles.
Treated timber in place, 16.9 M b.m.
Treated timber piling in place, 400 lin.ft.
Concrete in place, 174.5 cu.yd.
Reinforcing steel in place, 6350 lb.
Corr. metal pipe in place, 4166 lin.ft.
Bituminous wearing surface in place, 140 sq.yd.
Hauling and piling logs, lump sum.
Right of way monuments in place, 150 each.

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

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

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

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

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

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

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

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

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

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

Bid for ROAD CONSTRUCTION.
To be opened 2 00 o'clock p.m., Aug. 5, 1930.
Blairsden-Delleker Section, Quincy-Beckwith National Forest Highway, 807 Sheldon Bldg., 461 Market St., San Francisco, California.

C. H. SWEETSER, District Engineer.

HELP WANTED

As listed by the Engineering Societies' Employment Service, 57 Post Street, San Francisco. Applicants will please apply direct to them.

SALES ENGINEER, technical graduate, not over 35 years, with experience estimating and detailing various types of steel structures. Some sales experience also required. General line of shapes, plates, bars, etc. Salary $200 mo. plus car allowance and commission on sales over quota. Apply by letter. Location, Northwest. R-3185-S.

SALES ENGINEER, graduate, preferably civil engineer, about 5 years' experience in construction and sales, for steel bars and building materials. Apply by letter with details of experience, training, etc., including photo. Location, Pacific Coast. Headquarters, S. F. R-3190-S.

ENGINEER, young, either employed now or recently employed on design of hydraulic equipment, particularly centrifugal pumps. Apply by letter, giving all details of experience, salary, etc. Location, Middle West. K-297-W-1288-C-S.

POSITION WANTED

POSITION WANTED — Estimator, accountant, office manager, wishes to make new connection with general contractor. Experienced in road work, sewers and excavation. Box 556, Western Construction News.

THE BUYERS' GUIDE—*Continued from Page 64*

Pumps, Deep Well
Byron Jackson Pump Mfg. Co.
Industrial & Municipal Supply Co.
Jenison Machinery Co.
Pelton Water Wheel Co., The
Pomona Pump Co.
Woodin & Little

Pumps, Dredging and Sand
Jenison Machinery Co.

Pumps, Hydraulic
Jenison Machinery Co.

Pumps, Power
Gardner-Denver Co.
Jaeger Machine Works, The

Pumps, Road
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jaeger Machine Works, The
Jenison Machinery Co.
Novo Engine Co.
Woodin & Little

Pumps, Sewage
Dorr Co., The
Fairbanks, Morse & Co.
Industrial & Municipal Supply Co.

Pumps, Sewage Ejector
Industrial & Municipal Supply Co.

Pumps, Sludge
Dorr Co., The

Pumps, Water Works
Fairbanks, Morse & Co.
Industrial & Municipal Supply Co.
Jenison Machinery Co.
Pelton Water Wheel Co., The
Pomona Pump Co.
Washington Iron Works

Rails
Bacon Co., Edward R.
Claussen & Co., C. G.
United Commercial Co.

Reinforcing Bars
Pacific Coast Steel Corp.
Soulé Steel Co.

Reinforcing Wire Fabric
Soulé Steel Co.

Reservoirs, Steel
Chicago Bridge & Iron Works
Western Pipe & Steel Co.

Riveting Machines
Ingersoll-Rand Co.
Rix Company, Inc., The

Road Finishers
Bacon Co., Edward R.
Blaw-Knox Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Road Forms
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Heltzel Steel Form & Iron Co.
Jenison Machinery Co.
Lakewood Engr. Co.

Road Graders and Scrapers
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Caterpillar Tractor Co.
Jenison Machinery Co.
Spears-Wells Machinery Co.
Taylor & George
West Coast Tractor Co.
Worden Co., W. H.
Young Machinery Co., A. L.

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

Road Oil, Emulsified
American Bitumuls Co.

Road Rollers
Austin Western Road Machy. Co., The
Bacon Co., Edward R.
Hackley Equipment Co., P. B.
Huber Manufacturing Co.
Jenison Machinery Co.
Spears-Wells Machinery Co.

Roofing
Paraffine Companies, Inc., The

Rules, Steel, Wood and Aluminum
Lufkin Rule Co., The

Saws, Portable
Harron, Rickard & McCone Co.
Ingersoll-Rand Co.
Jenison Machinery Co.
Young Machinery Co., A. L.

Scarifiers
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Jenison Machinery Co.
Le Tourneau Mfg. Co.
Spears-Wells Machinery Co.
West Coast Tractor Co.
Worden Co., W. H.

Scrapers, Dragline, Fresno, Wheeled
Austin-Western Road Mchy. Co., The
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Sauerman Bros., Inc.
West Coast Tractor Co.

Screens, Sand and Gravel
Bacon Co., Edward R.
Bodinson Manufacturing Co.
Diamond Iron Works, Inc.
Haiss Mfg. Co., Geo.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Co.
Smith Engineering Co.
Young Machinery Co., A. L.

Screens, Sewage
Dorr Co., The
Link-Belt Co.

Screens, Vibrating
Harron, Rickard & McCone Co.
Link-Belt Co.
Smith Engineering Works

Second-Hand Equipment
Atkinson Construction Co.
Contractors Mchy. Exchange
Excavating Equipment Dealers, Inc.
Hackley Equipment Co., P. B.
Harron, Rickard & McCone Co.
Tieslau Bros.

Sewage Disposal Apparatus
Dorr Co., The
Industrial & Municipal Supply Co.
Link-Belt Co.
Wallace & Tiernan
Water Works Supply Co.

Sewer Joint Compound
Ric-Wil Co., The

Sharpeners, Rock Drill Steel
Gardner-Denver Co.
Ingersoll-Rand Co.

Sheet Piling
Pacific Coast Steel Corp.

Shovels, Electric, Gasoline, Steam
American Hoist & Derrick Co.
Bacon Co., Edward R.
Bucyrus-Erie Co.
Excavating Equipment Dealers, Inc.
Garfield & Co.
Hackley Equipment Co., P. B.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Industrial Brownhoist Corp.
Jenison Machinery Co.
Link-Belt Co.
Marion Steam Shovel Co.
National Equipment Corp.
Northwest Engineering Co.
Ohio Power Shovel Co.
Orton Crane & Shovel Co.
Spears-Wells Machinery Co.
Speeder Machinery Corp., The
St. Louis Power Shovel Co.
Thew Shovel Co., The
Young Machy. Co., A. L.

Shovels, Hand
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Worden Co., W. H.

Sluice Gates
California Corrugated Culvert Co.
Water Works Supply Co.

Spreaders, Gravel, Rock and Asphalt
Bacon Co., Edward R.
Jenison Machinery Co.

Standpipes
Chicago Bridge & Iron Works
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Steel, Drill
Gardner-Denver Co.
Ingersoll-Rand Co.
Leitch & Co.
Rix Company, Inc., The

Steel Plate Construction
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Steel, Structural
Pacific Coast Steel Corp.
Western Iron Works
Western Pipe & Steel Co.

Street Sweepers, Sprinklers, Flushers
Austin Western Road Machy. Co., The
Jenison Machinery Co.

Steel Joists
Truscon Steel Co.

Sheet Piling
Pacific Coast Steel Corp.

Steel Windows
Truscon Steel Co.

Subgraders
Bacon Co., Edward R.
Blaw-Knox Co.
Harron, Rickard & McCone Co.
Lakewood Engineering Co.

Swimming Pool Equipment
California Filter Co., Inc.

Tanks, Air Compressor
Ingersoll-Rand Co.
Lacy Manufacturing Co.
Rix Company, Inc., The
Western Pipe & Steel Co.

Tanks, Corrugated
California Corrugated Culvert Co.
Western Pipe & Steel Co.

Tanks, Elevated Steel
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Montague Pipe & Steel Co.
Pittsburgh-Des Moines Steel Co.
Western Pipe & Steel Co.

Tanks, Oil Storage
Chicago Bridge & Iron Works
Lacy Manufacturing Co.
Steel Tank & Pipe Co.
Western Pipe & Steel Co.

Tapes, Measuring, Steel and Fabric
Lufkin Rule Co., The

Testing Laboratories
Hunt Co., R. W.

Tie Plates
Pacific Coast Steel Corp.

Torches, Welding and Cutting
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Towers, Transmission
Pacific Coast Steel Corp.
Water Works Supply Co.

Tractors
Bacon Co., Edward R.
Caterpillar Tractor Co.
Cleveland Tractor Co.
International Harvester Co.
Linn Mfg. Corp.
Division of La France-Republic Corp.
National Brake & Electric Co.
West Coast Tractor Co.
Worden Co., W. H.

Tractor Parts
Taylor & George

Trailers—Heavy Duty
Williams Co., G. H.

Tramways
American Steel & Wire Co.
Bacon Co., Edward R.
Leschen & Sons Rope Co., A.

Transmission Machinery, Power
Bodinson Mfg. Co.
Link-Belt Co.

Transportation, Water
American-Hawaiian Steamship Co.

Trench Excavators
Cleveland Trencher Co., The
Garfield & Co.
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Link-Belt Co.
Thew Shovel Co., The

Truck Cranes
Harnischfeger Sales Corp.
Harron, Rickard & McCone Co.
Jenison Machinery Co.
Universal Crane Co., The

Trucks
Fageol Motors Co.
International Harvester Co.
La France Republic Corp.
Linn Mfg. Corp.
Division of La France-Republic Corp.
Sterling Motor Truck Co.

Tunnel Shovels
Bucyrus-Erie Co.
Jenison Machinery Co.
Marion Steam Shovel Co.
St. Louis Power Shovel Co.

Turbines, Hydraulic
Pelton Water Wheel Co., The
Water Works Supply Co.

Turntables
Bacon Co., Edward R.
Harron, Rickard & McCone Co.
Jenison Machinery Co.

Unloaders, Car and Wagon
Bacon Co., Edward R.
Jenison Machinery Co.
Link-Belt Co.

Valves
California Corrugated Culvert Co.
Claussen & Co., C. G.
Industrial & Municipal Supply Co.
Pacific Pipe Co.
Water Works Supply Co.

Valves, Gate
California Corrugated Culvert Co.
Claussen & Co., C. G.
Pelton Water Wheel Co., The
Water Works Supply Co.

Valves, Hose Gate
Greenberg's Sons, M.

Valves, Hydraulic
California Corrugated Culvert Co.
Pelton Water Wheel Co., The
Water Works Supply Co.

Washers, Sand and Gravel
Diamond Iron Works, Inc.
Jenison Machinery Co.
Smith Engineering Works

Water Purification
California Filter Co., Inc.
Industrial & Municipal Supply Co.
Wallace & Tiernan
Water Works Supply Co.

Water Softeners
California Filter Co., Inc.

Water Supply Installations
California Filter Co., Inc.
Industrial & Municipal Supply Co.
Wallace & Tiernan
Water Works Supply Co.

Water Transportation
American-Hawaiian Steamship Co.

Water Wheels
Pelton Water Wheel Co., The
Water Works Supply Co.

Water-Works Supplies
American Cast Iron Pipe Co.
California Filter Co., Inc.
Industrial & Municipal Supply Co.
Wallace & Tiernan
Water Works Supply Co.

Welding Apparatus (see Torches)
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Welding Equipment
Victor Welding Equipment Co.

Welding Rods and Wire
Victor Welding Equipment Co.

Welding Supplies
Oxweld Acetylene Co.
Victor Welding Equipment Co.

Well Casing
Montague Pipe & Steel Co.

Wheelbarrows
Harron, Rickard & McCone Co.
Jenison Machinery Co.

Windows, Steel
Truscon Steel Company

Wire Rope
American Steel & Wire Co.
Edwards Co., E. H.
Jenison Machinery Co.
Leschen & Sons Rope Co., A.
Worden Co., W. H.

PROFESSIONAL DIRECTORY

A. A. Brown
Consulting Engineer
MATSON BUILDING
215 MARKET STREET, SAN FRANCISCO

Abbot A. Hanks, Inc.
Engineers and Chemists
CONSULTING—TESTING—INSPECTING
CONCRETE—STEEL—MATERIALS
624 SACRAMENTO STREET
SAN FRANCISCO

Black & Veatch
Consulting Engineers
Sewerage, Sewage Disposal, Water Supply, Water Purification, Electric Lighting, Power Plants, Valuations, Special Investigations and Reports.
LOS ANGELES, CALIF., *307 South Hill Street*
NEW YORK CITY, *230 Park Avenue.* KANSAS CITY, MO., *Mutual Building.*

Burns-McDonnell-Smith
Engineering Company
CONSULTING ENGINEERS
Water Supply, Waterworks, Sewerage and Sewage Disposal, Power Plants, Valuations and Rate Investigations of Municipal Utilities
LOS ANGELES:
WESTERN PACIFIC BUILDING
KANSAS CITY, MO.:
INTERSTATE BUILDING

A. J. Cleary
Consulting Civil Engineer
Water and Power Projects
Valuations
439 MILLS BUILDING, SAN FRANCISCO
Phone DOuglas 0482

Arthur L. Collins
Consulting Engineer
Problems relating to Power, Irrigation, Water Supply, Filtration, Ground Waters, Pumps.
Meters and Equipment on hand for efficiency tests and experiments.
7 FRONT STREET, SAN FRANCISCO
2221 PRINCE STREET, BERKELEY, CALIF.

H. W. Crozier
Consulting Engineer
58 SUTTER STREET, SAN FRANCISCO
Cable: CROZIENGR, SAN FRANCISCO

Engineering Societies Employment Service
For Employers of Chemists and Engineers
57 POST STREET, SAN FRANCISCO
Phone SUtter 1684

Hyde Forbes
Engineering Geologist
Geological investigation in re-foundations for dams, buildings, and engineering structures; reservoir sites and tunnels. :: Underground water investigations, water supply developments and drainage.
HUMBOLDT BANK BUILDING
SAN FRANCISCO

Harold F. Gray
Sanitary and Hydraulic Engineer
2540 BENVENUE AVENUE
BERKELEY, CALIF.

Robert W. Hunt Company
251 Kearny Street, San Francisco
Testing and Inspecting Engineers
Bureau of Inspection, Tests and Consultation
LOS ANGELES SEATTLE PORTLAND
And all large manufacturing centers

Clyde C. Kennedy
Consulting Engineer
Municipal Engineering and Public Improvements
543 CALL BUILDING
SAN FRANCISCO

Charles H. Lee
Consulting Sanitary
—and—
Hydraulic Engineer
58 SUTTER STREET, SAN FRANCISCO
Phone KEarny 5670

Quinton, Code & Hill-Leeds & Barnard
Members American Society of Civil Engineers
Engineers Consolidated
SUITE 712 STANDARD OIL BUILDING
Tenth Street at Hope Street
LOS ANGELES, CALIF.

Louis F. Leurey
Consulting Electrical Engineer
58 SUTTER STREET, SAN FRANCISCO
Telephone SUtter 6931

ENGINEERING OFFICES
J. B. Lippincott
Consulting Engineer
WATER SUPPLY :: IRRIGATION :: SEWAGE AND SEWAGE DISPOSAL
VALUATION AND RATE INVESTIGATIONS
543 PETROLEUM SECURITIES BUILDING
LOS ANGELES

Fred A. Noetzli, D. Sc.
Consulting Hydraulic Engineer
. . . . Specializing in . . . .
DAM DESIGN
928 CENTRAL BUILDING
LOS ANGELES, CALIF.

J. R. Pennington
Consulting Engineer
Specialist in Underground Water, Surveys, Investigations and Development
CARSON CITY :: :: NEVADA

Christopher Henry Snyder
Designing and Consulting Engineer
STRUCTURAL
251 KEARNY STREET, SAN FRANCISCO
Phone SUtter 4284

Stevens & Koon
Consulting Engineers
POWER, IRRIGATION, MUNICIPAL WATER SUPPLY, FILTRATION, SEWERAGE, SEWAGE DISPOSAL, APPRAISALS
SPALDING BUILDING, PORTLAND, OREGON

Waddell & Hardesty
Consulting Engineers
Steel and Reinforced Concrete Structures, Vertical Lift and Bascule Bridges, Difficult Foundations, Reports, Checking of Designs, Advisory Services, and Appraisals.
150 BROADWAY :: NEW YORK

AERIAL MAPPING
for Engineers by an Engineer
George S. Young
AERIAL MAPPING—GEOLOGICAL MAPPING
829 WAWONA AVENUE, OAKLAND
Phone GLencourt 7908

THIS SPACE FOR SALE

Are you represented in this Directory?
The Proper medium to cover the Far West.

INDEX TO ADVERTISERS

Dash Indicates Advertisement Appears in Every Other Issue