# WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

PUBLISHED MONTHLY
VOLUME XV, No. 12

DECEMBER • 1940

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$2.00 PER YEAR

## IN THIS ISSUE



THE TRESTLE is the principal feature of the concrete placing system at Friant Dam, which is being built by Griffith Co. and Bent Co. for the Bureau of Reclamation


**Extra POWER ⟶ Extra OUTPUT ⟶ Extra PROFITS on Every Job!**

**In Thor's new No. 23** medium weight paving breaker you have at last a machine for the scores of jobs that demand a heavy weight's power, but the handling ease of a light weight tool. Jobs where lighter weight means faster handling . . . less fatigue . . . and far greater output.

The No. 23's surprising new combination of more power and less weight is the result of new Thor construction features: A block type piston hammer that greatly increases the foot pound blows . . . A new cylinder that gives full effect to every hammer blow . . . Perfect balance . . . A handle that's remarkably cool . . . And a new Latch Type Retainer that's positive, simple and fast in operation.

Get the extra power . . . extra output . . . and extra profits that Thor's new No. 23 paving breaker can offer you! For full information, send a penny post card for Bulletin JMC-26B.


Thor
Portable Power
TOOLS

COCHISE ROCK DRILL MFG. CO.
A Division Of The
INDEPENDENT PNEUMATIC TOOL CO.
6200 E. SLAUSON AVE., LOS ANGELES, CALIF.

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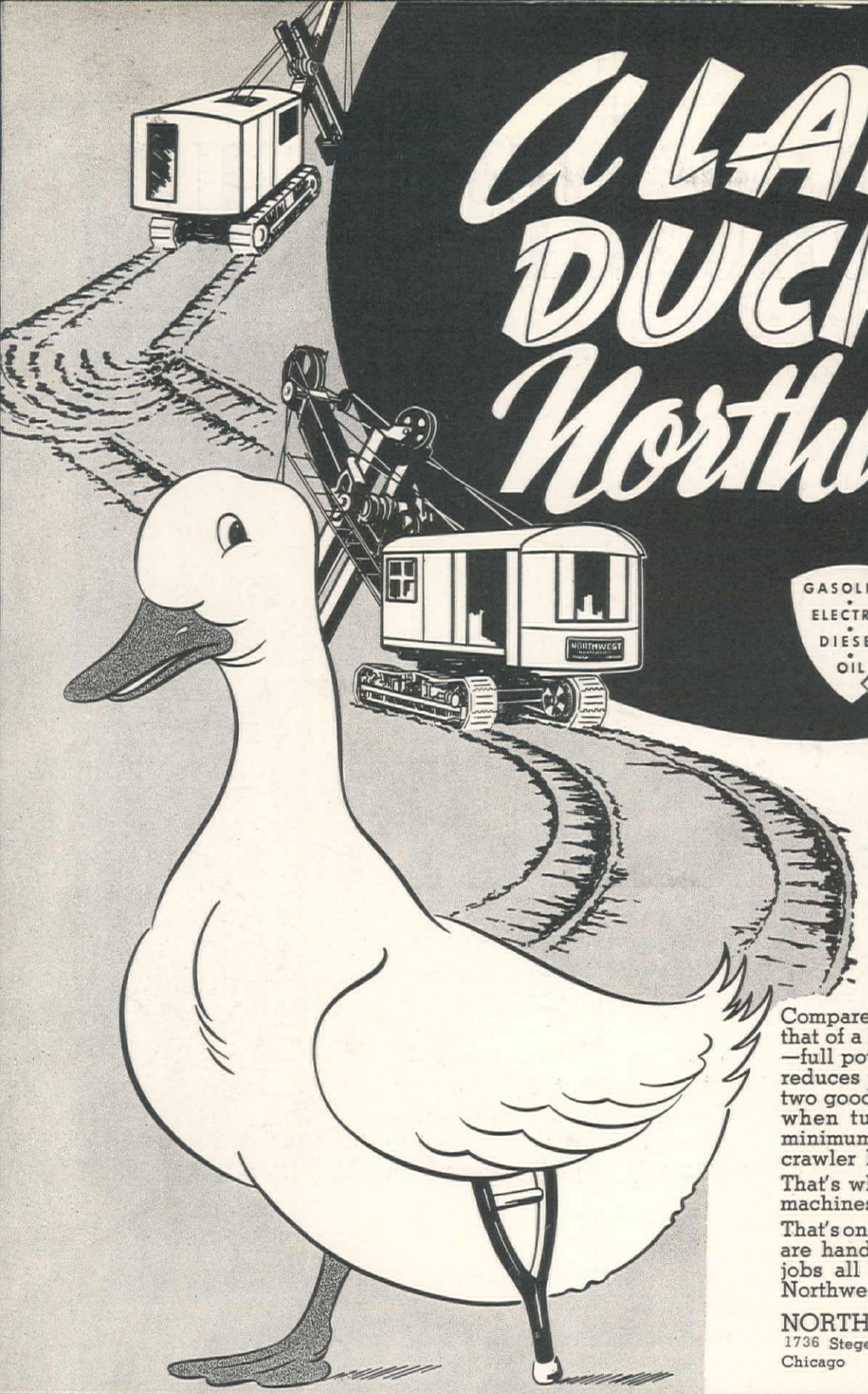
# A LAME DUCK or a Northwest?




GASOLINE
• ELECTRIC
• DIESEL
• OIL

Built in a range of 18 SIZES 3/8 yd. capacity and Larger

DOES your machine limp around the corners with only one live crawler—forcing the blocked crawler through the resisting surface crust of the earth—miring down in soft going—binding with destructive friction as it slides around—setting up strains that must eventually show themselves in repair bills and delays?

Compare this "Lame Duck" action with that of a Northwest—smooth easy travel—full power on both crawler belts that reduces the danger of miring down—two good feet pushing all the time, even when turning—strains reduced to a minimum—a long life, easily handled crawler base.

That's why Northwests go where other machines can't travel.

That's one of the reasons why Northwests are handling millions of yards on big jobs all over the country. Ask about Northwest Steering.

NORTHWEST ENGINEERING CO.
1736 Steger Building, 28 East Jackson Boulevard
Chicago Illinois

# NORTHWEST

BUILT to help you Earn MORE MONEY!

BRANCH OFFICES: 255 Tenth Street, San Francisco, California; J. L. TALLMAN, 1631 - 16th Ave., Seattle, Washington; 3707 Santa Fe Avenue, Los Angeles, California

NORTHWEST SALES AGENTS: ARNOLD MACHY. CO., INC., 149 W. 2nd South St., Salt Lake City, Utah; MINE & SMELTER EQUIPMENT CO., P. O. Box 788, Phoenix, Arizona

# TRUCKS STAND UP!

## ... Hauling Mountains of Oklahoma Chat

**BUCYRUS-ERIE SHOVEL** loading one of Cardin's International Trucks. Shovels and trucks lubricated 100% with TEXACO, including *Texaco Crater* on open gears and wire rope.

HAULING mountains of heavy ore over hot, dusty, unpaved roads in its fleet of International Trucks, this Oklahoma fleet operator has lengthened engine, chassis, and wheel bearing life, stepped up mileage between lubrications.

For 5 years, Cardin Mining and Milling Company trucks, shovels, and equipment in 3 mills have been lubricated with TEXACO.

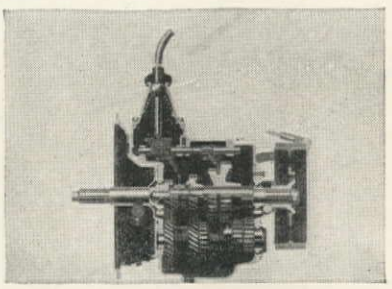
*Texaco 303 Motor Oil* keeps engines clean and rings free, assuring piston seal and full power.

*Texaco Marfak* protects wheel bearings and chassis parts against wear twice as long as ordinary grease.

*Texaco Thuban* provides efficient lubrication for transmissions and differentials under the heaviest loads.

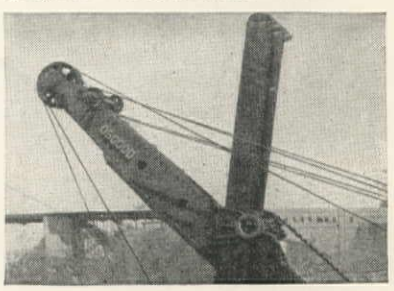
Texaco engineers will gladly cooperate in showing how you, too, can make savings with Texaco truck lubricants. Phone the nearest of more than 2300 Texaco warehousing points in the 48 States, or write:

The Texas Company, 135 E. 42nd St., New York, N. Y.



***TEXACO THUBAN*** for truck transmissions and differentials—assures easy gear shifting in winter weather, reduces drag.

***TEXACO MARFAK*** is adhesive and cohesive, clings to metal, seals itself in while dirt, grit, and wheel splash are sealed out.



***TEXACO CRATER*** penetrates wire rope, protecting each strand against wear and weather . . . on open gears, reduces friction, prevents corrosion.

**TEXACO DEALERS INVITE YOU TO ENJOY**

**FRED ALLEN** in a full-hour program every Wednesday night. CBS, 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.

**METROPOLITAN OPERA** every Saturday afternoon, NBC. See local newspaper for time and station.

**TEXACO Fuels and Lubricants**

# WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

ABC

J. I. BALLARD, Editor

## Late News . . .

MARTIN WUNDERLICH, Jefferson City, Mo., the contractor who has been working on Vallecito dam near Durango, Colo., for the past two years, submitted the low bid to the Panama Canal Commission at Washington, D. C., for excavation of about 12,000,000 cu. yd. of material for the new Gatun Locks at the Panama Canal. Combined with Wunderlich in submitting the bid of $8,517,100 was the Oakes Construction Co. Second low bidder was the combination of W. E. Callahan Construction Co. and Gunther & Shirley Co., Los Angeles, Calif. with a figure of $8,846,200. S. A. Healy Co., White Plains, N. Y., was third at $8,892,900.

•

MacDonald & Kahn, Inc., San Francisco, Calif., were awarded a $1,550,000 contract for construction of a temporary camp at Fort Lewis, Wash., by the Constructing Quartermaster, Washington, D. C.

•

Mojave Corp., Los Nietos, Calif., and Person & Hollingsworth, Los Angeles, were awarded a contract of $1,530,000 by the Bureau of Yards and Docks, Navy Department, for construction of a pier and transit shed at San Diego, Calif.

•

Strong & McDonald, Tacoma, Wash., have been awarded a $342,-250 contract by the U. S. Engineer Department for reconstruction of the north jetty at the entrance to the Coquille River near Bandon in Coos County, Oregon.

•

N. M. Ball Sons, Berkeley, Calif., will grade 6.2 mi. of highway between Watsonville and Rob Roy Junction in Santa Cruz County, Calif., under a $251,087 contract recently awarded by the California Division of Highways.


**SUBSCRIPTION RATES**

The annual subscription rate is $2 in the United States and foreign countries where extra postage is not required. To Canada and to foreign countries where extra postage is necessary the annual rate is $3. Single copies 25 cents.


## Contents for December, 1940




**WESTERN CONSTRUCTION PUBLICATIONS, Inc.**

Office of Publication . . . 333 Kearny Street, San Francisco, California

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EASTERN OFFICE

733 Highland Ave., Glen Ellyn, Illinois (Suburb of Chicago - Telephone Glen Ellyn 1554)
DONALD F. FORSTER, Mgr.

•

*Please address correspondence to the executive offices, 333 Kearny Street San Francisco, California*

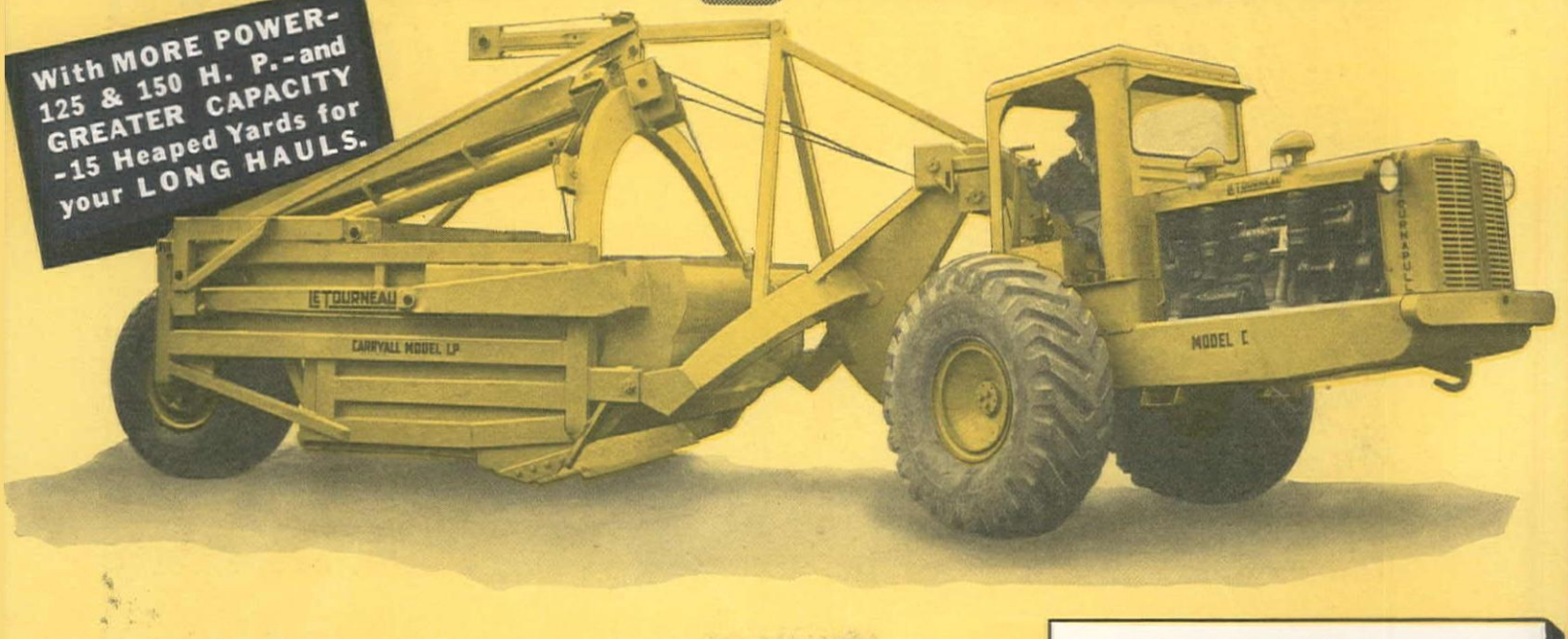
Entered as Second Class Matter at the Post Office at San Francisco, California, under the Act of March 3, 1879.

# Announcing

A NEW COMPANION TO THE FAST-MOVING STANDARD C TOURNAPULL

# THE SUPER C TOURNAPULL

**With MORE POWER-125 & 150 H. P.-and GREATER CAPACITY -15 Heaped Yards for your LONG HAULS.**




LESS than six months ago we announced the Standard C Tournapull (90 H.P.) with LS Carryall Scraper (11 heaped yards). Alert contractors the country over bought one and two for trial, quickly found them to be the fastest, cheapest method of long-haul earthmoving on the market, soon became fleet users.

### FOR MORE YARDAGE PER HOUR

Profitable as the Standard C has proved, many contractors have asked us for a Tournapull of similar size but with more power and greater capacity for use on jobs demanding still more yardage per unit per hour. Our answer is the Super C Tournapull, powered by either a 125 or 150 H.P. Diesel engine, to handle an LP Carryall Scraper with 15 heaped yards capacity.

### SAME PROFITABLE SPEED

Like the fast-moving, job-proved Standard C, the bigger-powered Super C Tournapull utilizes the power of a "Caterpillar" D8 pusher unit to cut loading time and heap on capacity Carryall loads in a hurry. It attains high-gear hauling speed quickly, spreads its load on the fill without stopping and high-balls back to the cut for another load—all in one continuous operating cycle. No need for special spreading equipment on the fill . . . no waiting in line at a shovel . . . thus you further increase earthmoving efficiency, cut costs and earn more profit on larger long-haul jobs. Try the Super C Tournapull. See for yourself . . . NOW . . . what it can do for you.

### SPECIFICATIONS IN BRIEF

| | Standard C | Super C |
|---|---|---|
| Horsepower | 90 | 125 or 150 |
| Shipping Weight | 25,300 lbs. | 30,500 lbs. |
| Carryall Model | LS | LP |
| Heaped Capacity | 11.2 yds. | 15 yds. |
| Struck Capacity | 8.2 cu. yds. | 12.1 cu. yds. |

Ask your LeTourneau-"Caterpillar" dealer to demonstrate . . . or write Dept. WC for more details.

### SUPER C TOURNAPULL is Completely Equipped — No Extras to buy.

Standard equipment on the Super C Tournapull includes brakes on both Tournapull and LP Carryall Scraper; front crankcase guard with front pull hook and bumper; electric lights*, starter*, and horn*; operator's cab; Carryall pusher block*. There are no extras to buy—your first price includes everything.

*Also standard equipment on Standard C Tournapull—brakes, guard and cab optional at slight extra cost.

Part of Cavanaugh Construction Company's fleet of four 90 h.p. Standard C Tournapulls with LeTourneau LS Carryall Scrapers (11 heaped yards) handling the long-haul earthmoving on Carey Dam, near Carey, Idaho.

(Below) 150 h.p. Super C Tournapull, with LP Carryall Scraper (15 heaping yards capacity), designed for pusher loading to get capacity yardage fast.

**LETOURNEAU**

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

CARRYALL* SCRAPERS, ANGLEDOZERS*, BULLDOZERS, ROOTERS*, POWER CONTROL UNITS, DRAG SCRAPERS, CRANES, PUSHDOZERS, SHEEP'S FOOT ROLLERS, TOURNAPULLS*, TOURNATRAILERS*.

*Name Reg. U. S. Pat. Off.



## TWO TYPES

SUPER-Harbord PLYCRETE is engineered for maximum reuse, and is the only type suitable for excessive moisture or for climatic conditions of the tropics and semi-tropics. If necessary, it can be boiled or steamed for sharp radii, if ordinary cold bending or soaking forbids proper curvature.

The second type, Harbord PLYCRETE, exceeds all National Bureau of Standards performance specifications for special concrete form plywood.

*SUPER-Harbord PLYCRETE and Harbord PLYCRETE are priced properly, and in accordance with economical cost-per-use.*

## ★ Because it is the lowest-cost-per-foot used Concrete Form Panel

PLYCRETE isn't just ordinary plywood—it's a specially engineered plywood and produced specifically for concrete form work. PLYCRETE is manufactured by only one company—the HARBOR PLYWOOD CORPORATION.

Plycrete has demonstrated itself to be the lowest-cost-per-foot used concrete form panel available. It is manufactured to exacting standards, and each panel gives the same high uniform performance. And uniform performance enables concrete men to figure costs accurately. In making job estimates, panel costs can be predetermined. It is thus routine to calculate how much of the form material costs must be amortized to any one job and how much can be salvaged—what choice of types is necessary.

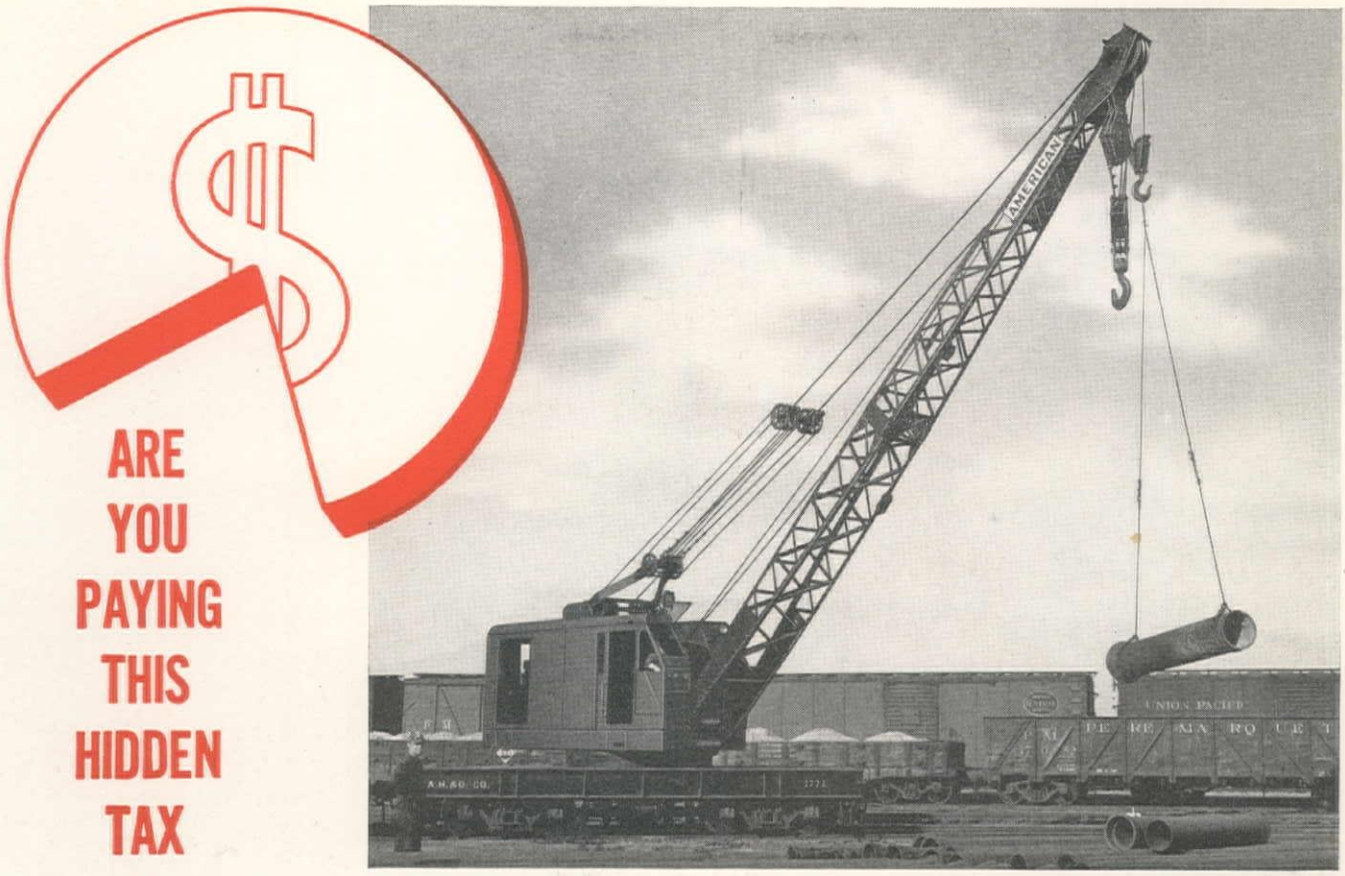
You have a selection of two principal types: One Super-Harbord PLYCRETE, and two, Harbord PLYCRETE. Plycrete should be ordered by name. Stocks are available at distributing warehouses strategically located throughout the country.

**Super-Harbord Plycrete bears the supplementary industry type mark "EXT-DFPA." Harbord Plycrete bears the supplementary industry grade mark "Plyform."**

# HARBOR PLYWOOD CORPORATION

Mills and General Offices, Hoquiam, Washington

DISTRIBUTING WAREHOUSES: Altoona, Atlanta, Baltimore, Chicago, Cincinnati, Cleveland, Columbus, Indianapolis, Jacksonville, Los Angeles, Miami, Milwaukee, New Orleans, Philadelphia, Pittsburgh, San Francisco, St. Paul, Tampa, Toledo, Washington, D. C., Watertown. REPRESENTATIVES: Billings, Denver, Kansas City, Omaha, Worcester.




# ARE YOU PAYING THIS HIDDEN TAX ?

If your handling problem is heavy and continuous and you are moving materials with cranes bought even as recently as five years ago, you may be paying a staggering hidden tax on inefficiency.

The old Mauretania was a great liner twenty-five years ago; the Spirit of Saint Louis was the wonder plane of 1927, but they could not compete with the advanced types of 1940; neither can the cranes of five years ago — no matter how well they have been kept up — compare with the new Gasoline, Diesel and Diesel-Electric **AMERICAN Locomotive Cranes.**

Take the first step toward lower material handling costs RIGHT NOW; write for complete information on the new AMERICAN Locomotive Cranes —

| | |
|---|---|
| Model 825 | 25 ton |
| Model 830 | 30 ton |
| Model 408 | 40 ton |
| Model 508 | 50 ton |

## AMERICAN HOIST & DERRICK CO.

NEW YORK SAINT PAUL, MINNESOTA CHICAGO

AMERICAN TERRY DERRICK CO. SOUTH KEARNY, N. J.

FOR *Safety* WHEREVER WIRE ROPE IS FASTENED


STANDARDIZE ON THE *Genuine* CROSBY CLIP

PERFECT GRIP . . . DROP FORGED STEEL . . . HOT GALVANIZED

*DEALERS WITH STOCK IN ALL PRINCIPAL CITIES*

# DEFENSE CONSTRUCTION

CALLS FOR

# *Speed and Capacity*

# ...AND EUCLIDS

## HAVE PROVEN THEIR ABILITY TO DELIVER THESE ESSENTIALS ON MAJOR DIRT-MOVING PROJECTS

Speed . . . speed . . . and MORE speed! Greater capacity than ever before . . . in order to realize in the shortest possible time and with the greatest possible economy those basic structures required for home defense! Whether it be a matter of preparing the groundwork for new highways, new airports, new manufacturing plants, or the many kinds of public works so necessary for increased national security, BOTTOM - DUMP EUCLIDS bring you the experience of YEARS, speeding peacetime construction. Their greater capacity, faster dumping, easier maneuvering over all sorts of terrain promise an immediate solution to the need for equipment that can get the maximum of work DONE in the minimum of time allowed. Detailed information on BOTTOM-DUMP EUCLIDS, and all the other kinds of Euclid earth hauling equipment particularly suited to the needs of the day, will be sent on request. Send for descriptive literature today, so you'll have it readily available for reference at a moment's notice!

*Witness:*

CALIFORNIA AIRBASE PROJECT — Two 12-YARD EUCLIDS handled 2200 tons of rock every 8 hours over a 1/5 mile haul up a 3% grade.

PENNSYLVANIA TURNPIKE CONTRACT — After hauling heap loads down a 20% grade, BOTTOM-DUMP EUCLIDS dumped and turned on the fill in 18 seconds . . . considerably faster than other conventional equipment on same job.

ILLINOIS GRAVEL PIT — One 8-YARD EUCLID maintains an average 100 cubic yard production over a quarter-mile haul.

OHIO STATE HIGHWAY — Loaded by a 1½-yard shovel, four 13-YARD EUCLIDS averaged 31 pay yards per hour per unit over a full mile haul, including 2000 feet up a 6% grade.

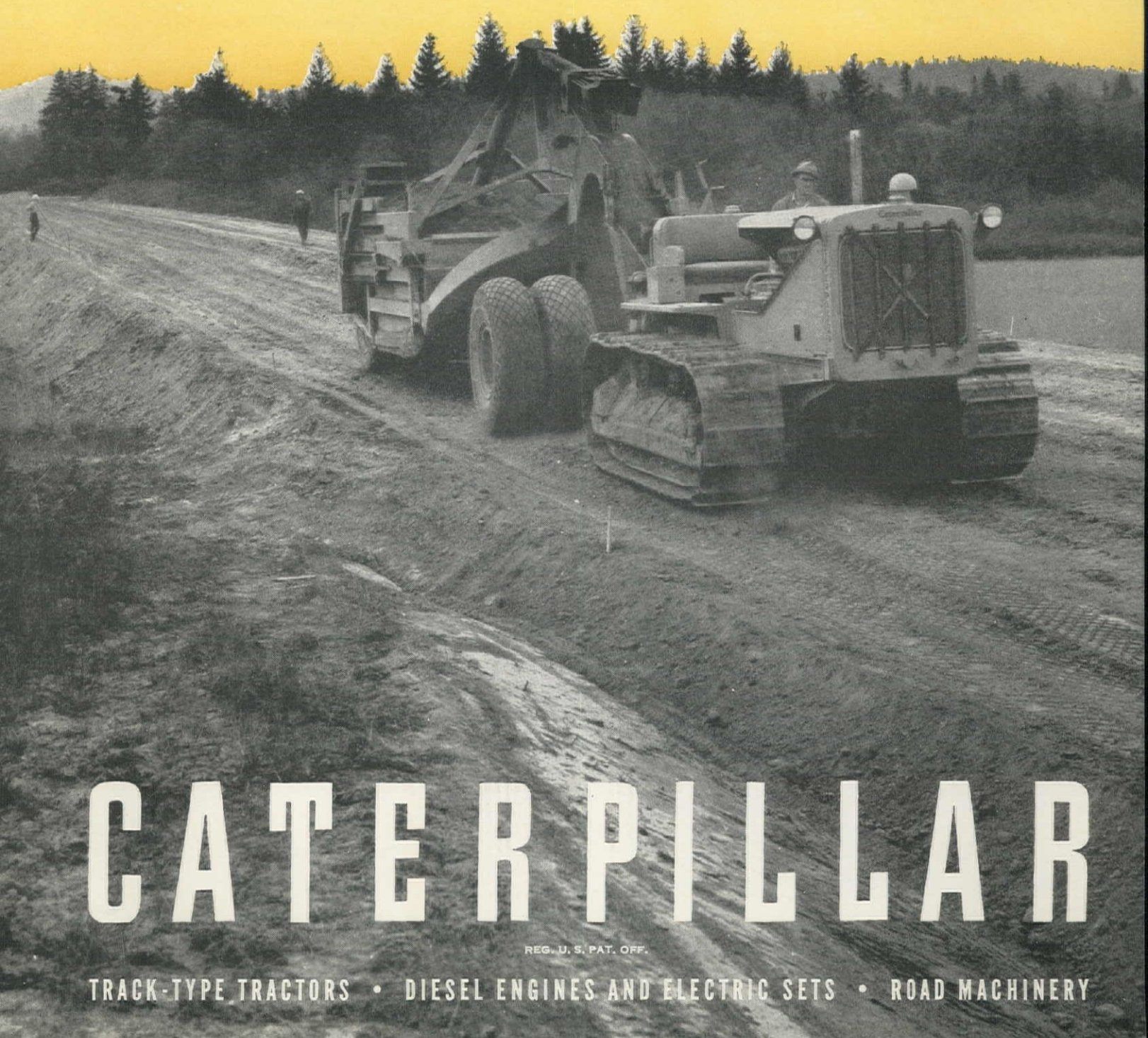
THESE ARE BUT A FEW OF THE COUNTLESS INSTANCES WHERE BOTTOM-DUMP EUCLIDS HAVE PROVED THEIR GREATER SPEED AND CAPACITY ON MAJOR EARTH MOVING PROJECTS EVERYWHERE . . . PROOF THAT THEY ARE ABLY QUALIFIED TO HANDLE ANY EMERGENCY ASSIGNMENT!

**THE EUCLID ROAD MACHINERY CO., Cleveland, Ohio**

Distributors: INTERMOUNTAIN EQUIPMENT CO., Boise • HALL-PERRY MACHINERY CO., Butte • F. W. McCOY COMPANY, Denver • CROOK COMPANY, Los Angeles • THE RIX COMPANY, San Francisco

EUCLID
THE PIONEER

# "OUR 'CATERPILLAR' DIESELS ARE =@#!!



# CATERPILLAR

REG. U. S. PAT. OFF.

TRACK-TYPE TRACTORS • DIESEL ENGINES AND ELECTRIC SETS • ROAD MACHINERY

says: P. R. BERKE, BERKE BROS., PORTLAND, OREGON

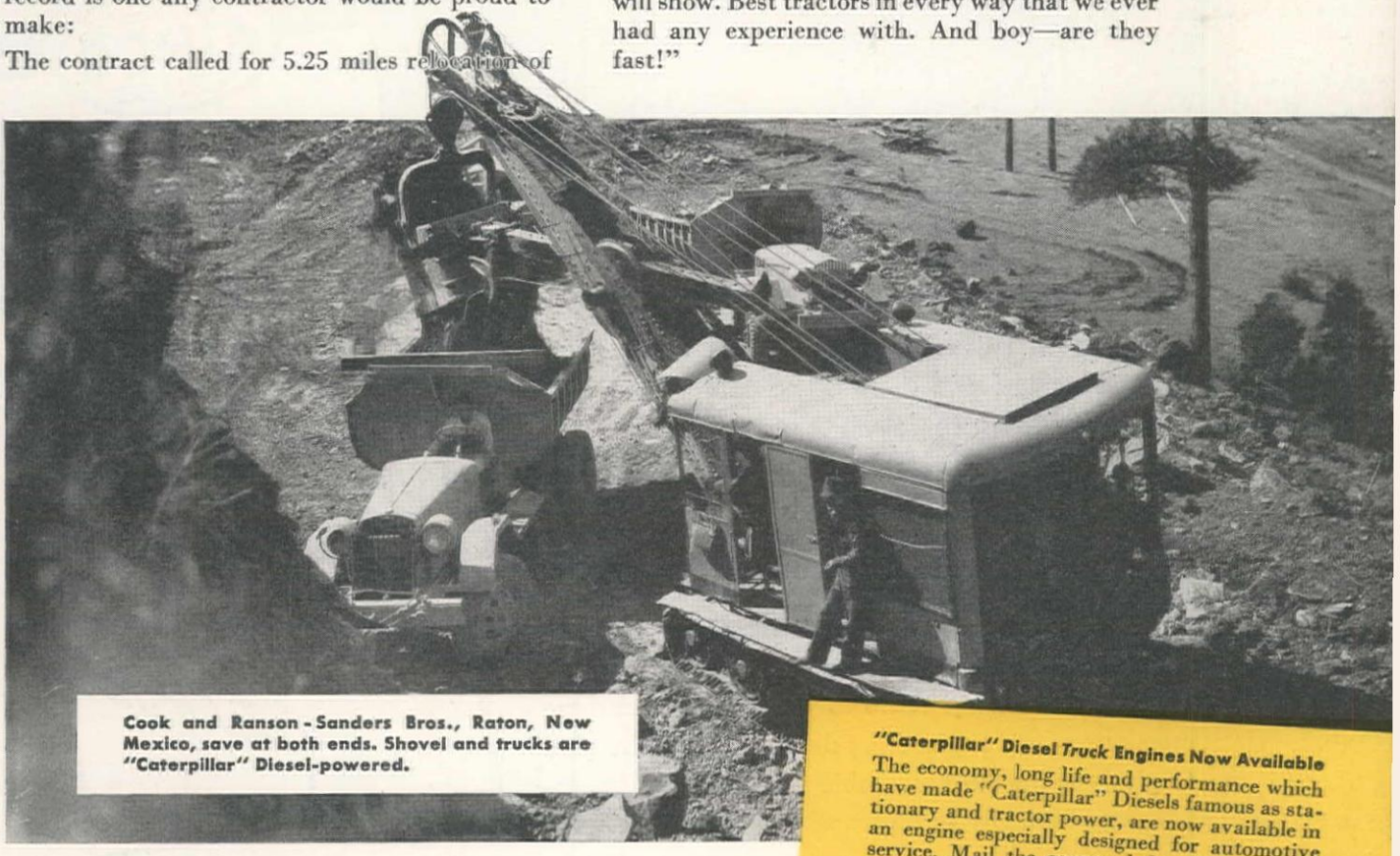
# !-GOOD MACHINES"

**O. E. and P. R. Berke** own and operate the highly regarded contracting firm of Berke Bros. They're recognized throughout the West as men who know dirt-moving from on-the-job experience. They've worked with many types of equipment and their tribute to the performance of "Caterpillar" Diesels on their Oregon State Job near Eugene is offered after carefully considered comparisons.

Look over the description of job conditions and tractor performance as provided by Berke Bros. and see if you don't agree that their 6-week record is one any contractor would be proud to make:

The contract called for 5.25 miles relocation of Route F, 6 miles west of Eugene, Oregon. The material to be moved was hard, dry clay with a great deal of long overhaul, much of it up to 6,000 feet. In 6 weeks, 2 "Caterpillar" D8 Tractors with LeTourneau Carryalls moved 148,000 cu. yds. of this heavy, hard-packed dirt. And—they found time for clearing and other odd jobs as well.

**No wonder Mr. P. R. Berke says, emphatically,** "Our 'Caterpillar' Diesels are dirt-moving fools—they're #$%&') (*! good machines as their 148,000-yd. record on our Eugene relocation job will show. Best tractors in every way that we ever had any experience with. And boy—are they fast!"



**Cook and Ranson-Sanders Bros., Raton, New Mexico, save at both ends. Shovel and trucks are "Caterpillar" Diesel-powered.**

**"Caterpillar" Diesel *Truck* Engines Now Available**

The economy, long life and performance which have made "Caterpillar" Diesels famous as stationary and tractor power, are now available in an engine especially designed for automotive service. Mail the coupon below for complete information on this new Diesel.

**The kind of tractor** performance experienced by Berke Bros. is the kind every contractor wants. Your "Caterpillar" Dealer will show you how "Caterpillar" Diesels can deliver the money-making performance you have a right to expect, but he won't ask you to take his word for it—he'll gladly place a "Caterpillar" Diesel Tractor on your own job so you can convince yourself by a demonstration.

**CATERPILLAR TRACTOR CO. • SAN LEANDRO, CALIF. • PEORIA, ILL.**

**CATERPILLAR TRACTOR CO., SAN LEANDRO, CALIF.**

Please send data on repowering my present trucks with "Caterpillar" Diesels

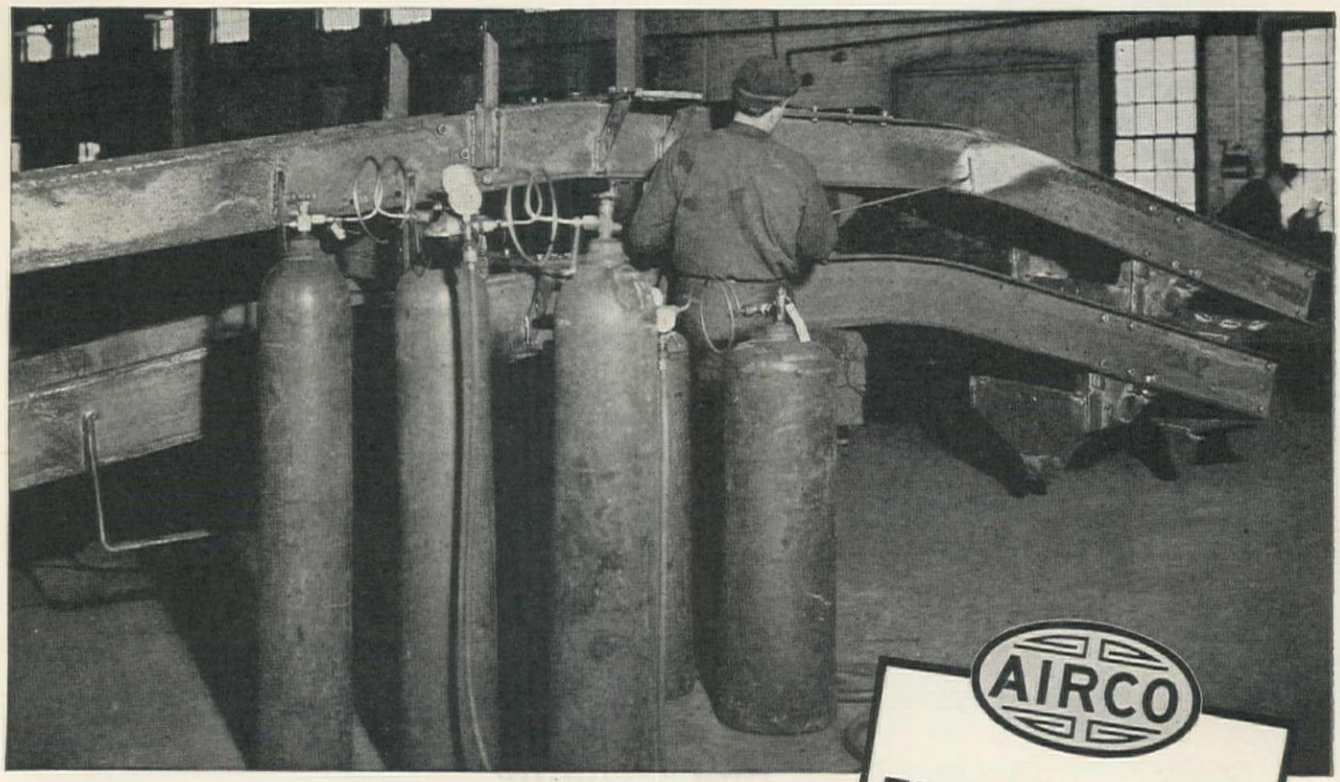
TRUCK MODEL_____ H.P. REQUIRED_____

NAME_____

STREET_____

CITY_____ STATE_____

# FOR A LASTING PAINT JOB ON STEEL



Flame cleaning and dehydrating a "99" road grader frame in the Aurora, Illinois, plant of the Austin-Western Co. A saving of 80¢ per frame has been effected here by using the Airco process.

AIRCO

## FLAME CLEAN and DEHYDRATE *Before you paint*

Moisture and loose millscale is removed from the surface of the steel, and provides, after wire brushing, a surface conducive to a lasting paint job. Danger of under paint surface failure is minimized. The apparatus used in the process is standard, portable and flexible. It can be operated by available personnel and is safe and simple.

Now is the time to avoid the usual worry and expense that repainting steel frequently involves when steel is not properly surface-conditioned prior to initial primer painting. Write us your problem and the members of our engineering department will be glad to give you the most workable solution.

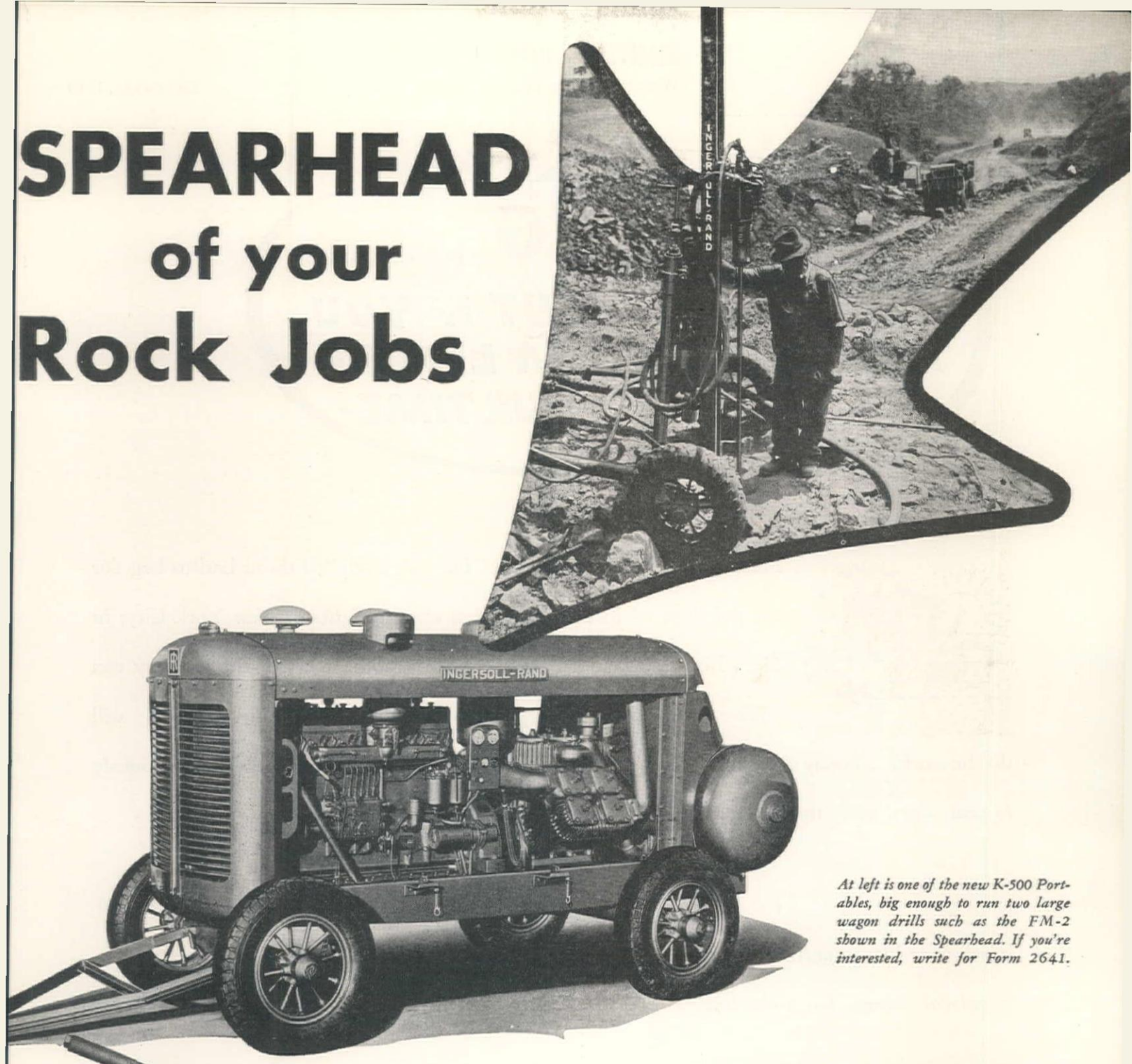
## AIR REDUCTION

**WESTERN OFFICES and PLANTS:**

**EMERYVILLE, Calif. • LOS ANGELES, Calif. • PORLAND, Ore. • SEATTLE, Wash.**

AIRCO *Anything and Everything for* GAS WELDING or CUTTING and ARC WELDING WILSON

# SPEARHEAD of your Rock Jobs




*At left is one of the new K-500 Portables, big enough to run two large wagon drills such as the FM-2 shown in the Spearhead. If you're interested, write for Form 2641.*


## *That's why every piece of your drilling equipment must stay on the job*

You can't afford to take chances with obsolete or worn-out machines that get into the habit of breaking down. Not if you want to keep ahead of your shovels and trucks, and avoid time losses.

It pays to use modern, dependable equipment, and that's why Ingersoll-Rand builds *reliability* into every piece of the drilling combination . . . compressors, drills, bits and bit-sharpening equipment. To a contractor, it means dollars saved.

Make a check on your drilling equipment today. And by all means consult an I-R representative regularly. He can keep you posted on new developments, and be helpful in many other ways.

*Communicate directly with any of the following Ingersoll-Rand Branch Offices:*

Butte, Mont. . . . . 845 S. Montana St.
Denver, Colo. . . . . 1637 Blake St.
El Paso, Texas. . . . . 1015 Texas St.
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St. Louis, Mo. . . . . 2327 Locust Blvd.

*Branches or Distributors in principal cities the world over.*

# IT'S A LONG STORY — BUT IF YOU MOVE DIRT FOR A LIVING IT'S WORTH YOUR TIME-

**Fulton's steamboat was called "Fulton's Folly"; Edison had to beg for the privilege of installing the first electric lights in New York City; in 1924 Buick announced 4-wheel brakes, and the cry of the industry was "Why use twice as many parts to stop the car when half as many will do the work?". Today all of these things enjoy universal acceptance—because they are obviously *logical, worthwhile* improvements.**

*In 1940 WOOLDRIDGE MANUFACTURING COMPANY announced its new line of scrapers, equipped with a 3-line two lever power control unit, a radical change from the long established 2-line control.*

Let's look at the background for just a moment, to see what it was that would cause WOOLDRIDGE, or any other manufacturer for that matter, to spend tens of thousands of dollars on a development of this kind. In the early days a 9 yard (struck measure) scraper was the largest size built. This scraper weighed approximately 8 tons. But scrapers got bigger fast. Today the most popular range between 15 and 18 tons. Obviously, the size of the front apron and the load ejector has grown larger and heavier in direct proportion to the increased size of the unit. The whole purpose of the WOOLDRIDGE 3-line development swings around this point.

The 8 ton scrapers were equipped with a 2-line control—one line for the scraper hoist; one line for the load ejector or tailgate and the front apron. The manufacturer in those days recommended 1/2" or 9/16" cable. *The same size cable is still recommended today on 18 ton scrapers.* Is it logical to suppose that the same size cable can do twice the work with the same efficiency? Obviously not. The evidence is found in the problem of steadily mounting cable maintenance costs.

*3-Line control is the answer. WOOLDRIDGE front aprons and load ejectors are heavier and larger, to be sure, and we too recommend 1/2" or 9/16" cable;—**but,** by using independent front apron control with one line and operating the load ejector with an independent line, the load otherwise carried by one cable is divided between two cables. The savings in cable wear and maintenance are immediately evident.*

The practical benefits only begin with this saving. The 3-line principal at all times gives the operator positive, individual, control of the three fundamental actions of a scraper; namely, hoist, front apron, and load ejector. The advantages of this individual control in handling difficult excavation, rock, sand, gravel, or sticky wet material are plain.

**But the best proving ground is not white paper — but a dirtmoving job. These 3-line WOOLDRIDGE scrapers and power control units are in action all over the United States. We urge you to observe one of them in action—or better yet—let us demonstrate on your own job.**

# WOOLDRIDGE MANUFACTURING CO.

## SUNNYVALE, CALIFORNIA

# Correct rope reeving saves wire rope dollars . .

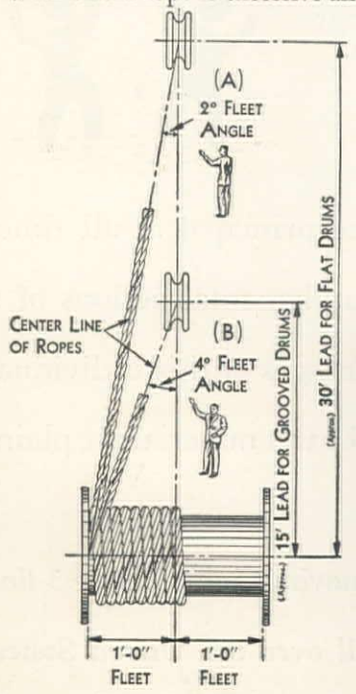
*This is No. 6 in a series of informative articles for wire rope users prepared by the Macwhyte Wire Rope Company.*

## Avoid excessive fleet angles on your equipment

The fleet angle is that angle included between lines drawn from the center of the drum, and from the flange of the drum, to the lead (first) sheave. Both (a) and (b) below are illustrations of fleet angles.

*Wire rope is often seriously damaged* when this fleet angle is excessive. Side wear and severe scuffing result. Often individual wires become misplaced, bruised, crushed.

*Grooved drums are damaged, too,* by wide fleet angles. Ropes wear against the groove walls, grinding them down. Wear on the rope is excessive also.




*WHAT TO DO*

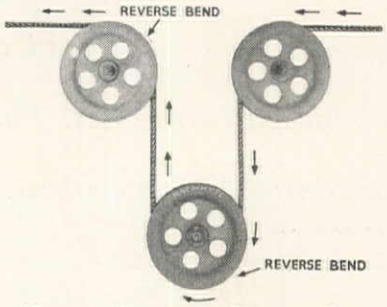
Check the fleet angles on your equipment. Keep the angle as small as possible. A fleet angle between 1° and 1½° is ideal. Fleet angles as low as ½° and up to 2° for flat faced drums and 4° for grooved drums are permissible for most hoisting equipment. If the fleet angle exceeds these values, then look out for excessive drum wear or poor spooling.

## Guard against reverse bends

Years of experience and many tests have proved that reverse bending and excessive wire fatigue reduces rope life as much as 50%.

Where reverse bending cannot be eliminated, use the largest sheaves possible and place them as far apart as you can. By getting the MAXIMUM distance between reverse bends, you reduce fatigue—provide for longer service.

*Keep sheaves aligned, too.* Countless rope dollars have also been lost because sheaves are out of line.



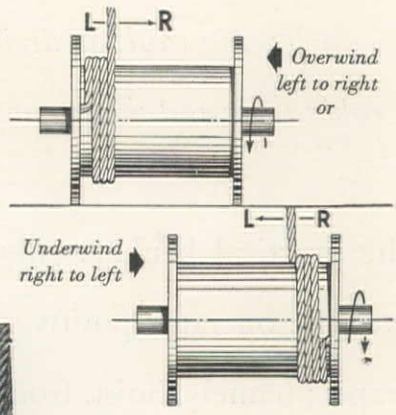

You can detect misalignment by uneven groove wear. Keep sheaves in line. You'll save money.

## Steer clear of slip-shod spooling

Make sure the rope is wound on your drum in the *correct direction.* Rope wraps will then be close to each other and in line. Rope wear will be reduced to a minimum.

If rope is started in the *wrong direction,* however, uneven winding will result. Ropes cross and crush each other, causing a "burning" and scuffing of wires.

The following drawings show correct spooling for right lay rope when observer stands behind drum looking toward the direction of rope travel:




*SEVERAL LAYER WINDING*

There is usually considerable wear and scuffing against drum flanges when ropes change from one layer to the next. You can offset this condition in two different ways:

FIRST, and most effective, use rope of such length that there will be only one layer of winding; or when this is not possible . . .

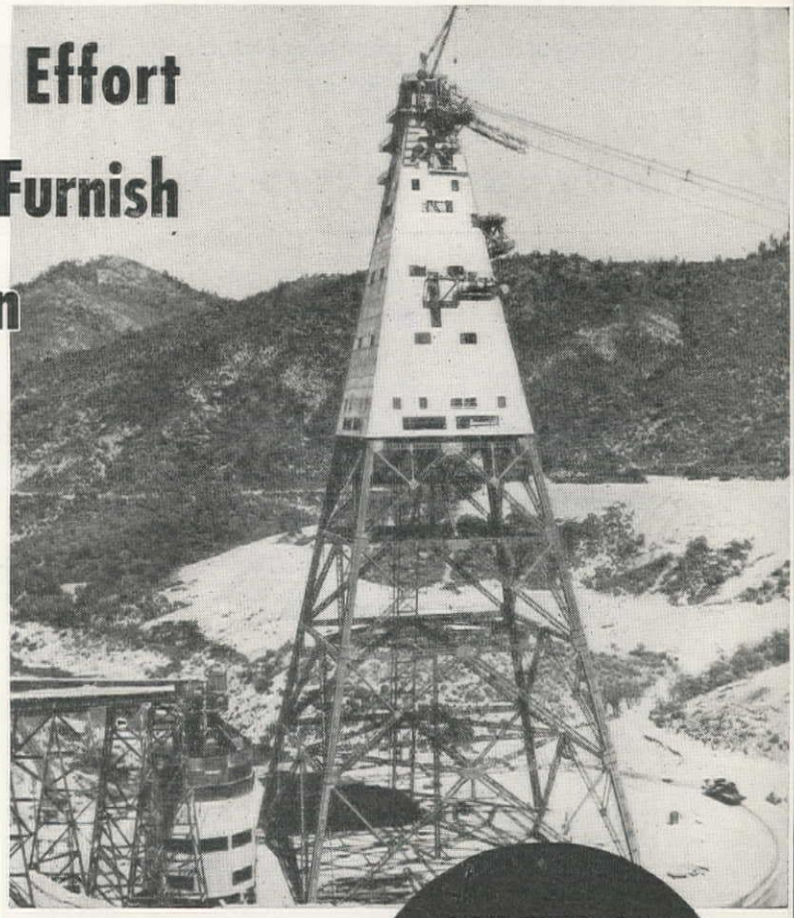
SECOND, use a rope of MORE than sufficient length so that a short section can be cut from the drum end occasionally. This moves up the point of wear.

Previous articles in this series are available on request on your company letterhead, also G-13 general wire rope catalog containing much helpful information.

# HIGHER THAN GRAND COULEE--

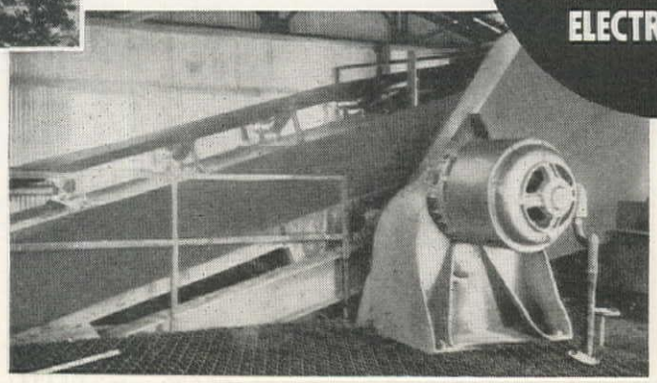
# SHASTA DAM

## California's Mighty Effort to Curb Floods and Furnish Water for Irrigation



Note how the 460-ft take-off tower for the seven Lidgerwood cableways dwarfs the mixing plant at its base. Three of these cableways use G-E variable-voltage drive to save money by means of faster round trips.

The start of the 9.6-mile conveyor system. Aggregate is carried from Redding, Cal., to the dam site over rivers, highways, and mountains.



(Right) One of the twenty-six 200-hp Pacific G-E motorized speed reducers which keep the conveyor moving—night and day.

# a Paying investment

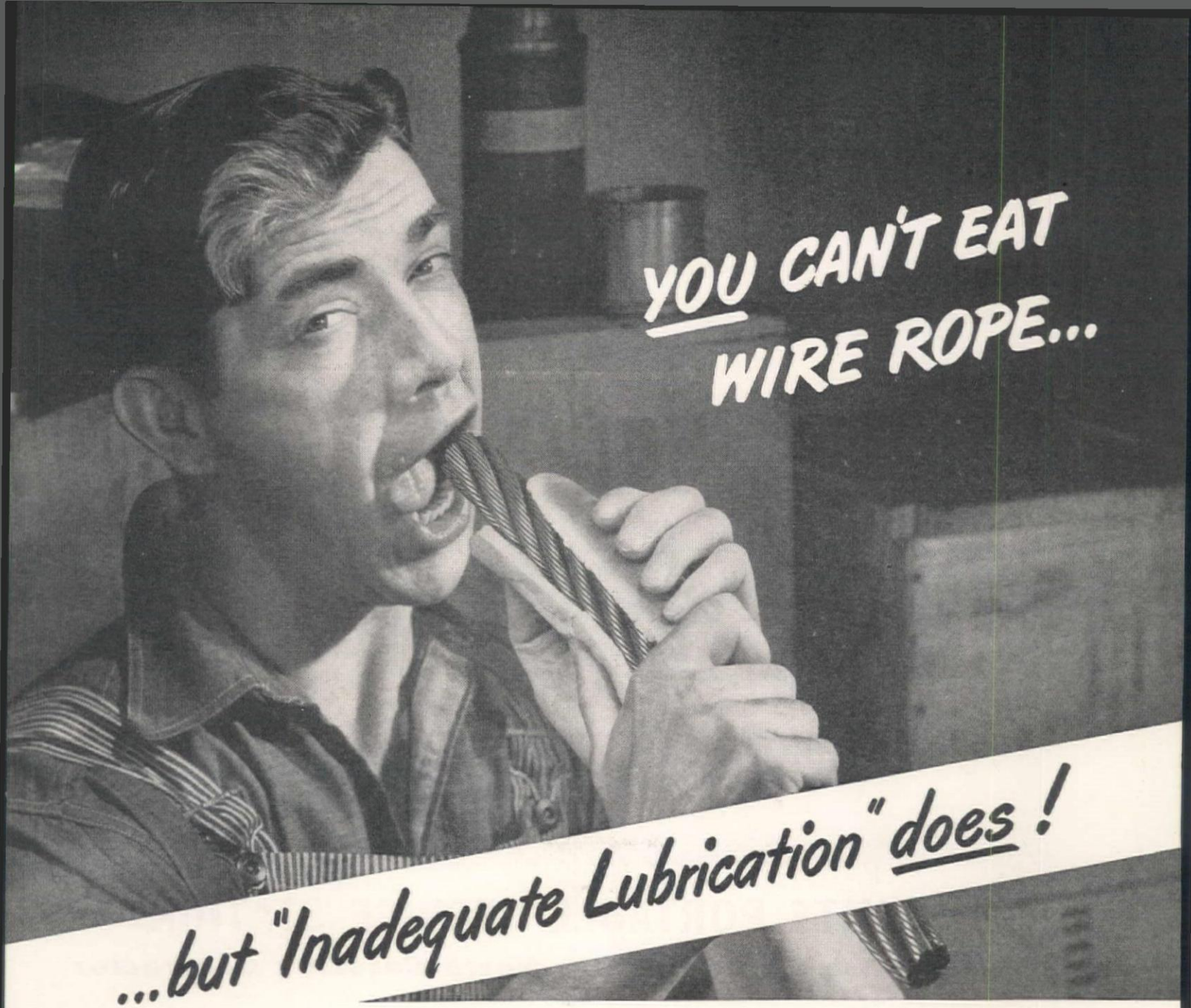
Stripped of all unnecessary weight by the use of modern steels, plus the latest mechanical features in excavator design, LIMA shovels, draglines and cranes are pushing forward all along the construction and material handling fronts, establishing new records for big production and low cost operation. LIMA excavators are modern throughout. They qualify to meet the toughest kind of assignments. If you have a tough job coming up, turn it over to a LIMA and know that you have the finest excavator that money can buy and one that will complete the job with a profit.

## LIMA LOCOMOTIVE WORKS, INCORPORATED, Shovel and Crane Div.

In the West: Seattle Branch Office, 1932 1st Ave. So. Spokane: General Machinery Co., E. 3500 Block, Riverside. Portland: Feenaughty Machinery Co., 112 S. E. Belmont St. Boise: Feenaughty Machinery Co., 600 Front. San Francisco: Garfield & Co., 1232 Hearst Building. Los Angeles: Smith Booth Usher Co., 2001 Santa Fe. Denver: F. W. McCoy Company, 956 Cherokee St. Phoenix: Smith Booth Usher. Helena, Mont.: Steffect Equipment Company, Main and Cutter Streets.

Convertible LIMA Shovels Draglines Cranes

SHOVELS, ¾ YD. to 3 YDS. DRAGLINES, VARIABLE CRANES, 13 TONS to 60 TONS




Perhaps you never thought of lubrication in just this way — but picture to yourself thousands of tiny "bearings" sliding and pressing against each other. Naturally, they must be lubricated — and naturally you'll see that they are lubricated in your wire ropes — when you realize what it means in dollars and cents.

A proper wire rope lubricant regularly applied to the rope on the job, forms a protective coating that keeps those thousands of "bearings" operating with minimum friction. The result: — Wire fatigue and corrosion checked; more uniform wear; longer rope life.

Be sure your lubricant is the *right* one, that you are applying it properly and with sufficient frequency.

JOHN A. ROEBLING'S SONS CO.
OF CALIFORNIA
San Francisco, Seattle, Los Angeles, Portland

## CORRECT LUBRICATION:

1. *Reduces Rope Wear*
2. *Prevents Corrosion*
3. *Prolongs Rope Life*
4. *Lowers Operating Cost*
5. *Provides Greater Safety*

*This advertisement is published in the interest of all wire rope users to help them obtain greater safety, service and efficiency from their wire rope.*

# ROEBLING
## *Wire Rope*

*Ask about* **ROEBLING "BLUE CENTER" WIRE ROPE** *... either preformed or standard*


# ALEMITE PORTABLE SERVICE STATION

## *Pays for itself quickly, says North Carolina Contractor*

TOYLE NASH, who is lubrication engineer for Morrison Knudsen Company, Inc., at Sylva, North Carolina, says their Alemite Portable Service Station *cuts lubrication time in half!* They used to spend three hours a day lubricating their various machines on the job. Now the job is done in an hour and a half.

The rig shown in the photograph is charged at $12 per hour. Call that a fair average for their other cats, scrapers, shovels, and trucks. The saving effected by Alemite Power Lubrication on the job is *not less than $18 a day.* At that rate the Alemite equipment will be paid for long before this job is finished!

Tell us what machines you'd like to lubricate on your next big job, and let us plan an Alemite Portable Service Station *for your particular needs.* It's amazing how much time can be saved by having Alemite High Pressure and Low Pressure Guns and Alemite Motor Oil Dispensers *always ready on the job*—with an ample supply of air for all needs, too! *Get the facts now!*

**ALEMITE**
REG. U. S. PAT. OFF.
*Industrial* LUBRICATION
ANOTHER STEWART-WARNER PRODUCT
1819 Diversey Parkway, Chicago, Ill. • Belleville, Ont.


*Ask Anyone in Industry!*

# HORTONSPHERES FOR STORING SEWAGE GAS

AN increasing number of sewage treatment plants are installing facilities for utilizing gas produced in the digestion process. In order to do this efficiently, it is often necessary to install a gas holder to iron out irregularities in the supply collected from the digesters.

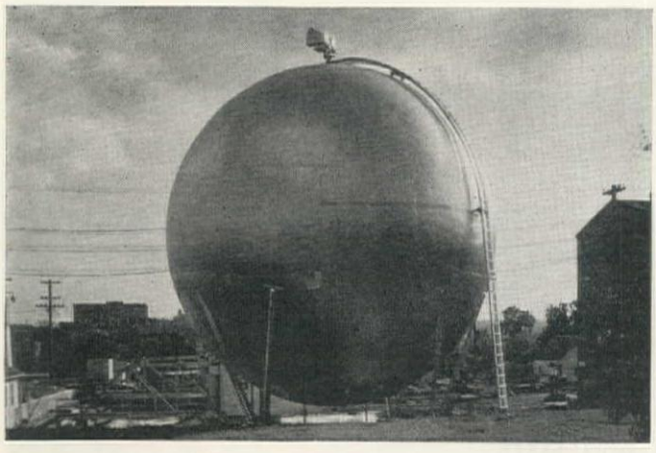
The Hortonsphere is an ideal container for this purpose. It is relatively small in size and pleasing in appearance. The shell of the holder does not come in contact with the sewage, eliminating discoloration and the need for frequent repainting.

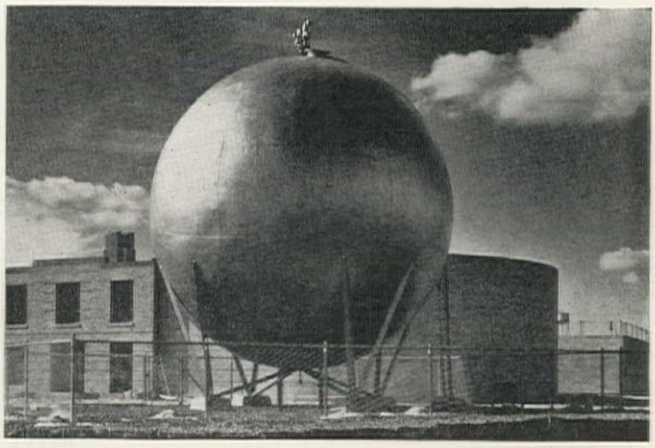
An example of this service is being demonstrated at a Midwest city, where the Hortonsphere shown at the right is installed. This unit operates at 30 lbs. per sq. in. pressure and has a capacity of 35,000 cu. ft. of free gas. When the rate of gas production exceeds the rate of consumption, the excess gas is pumped into the holder. When consumption is greater than demand, a pressure reducing valve from the holder to the supply main will open automatically and furnish any deficiency in the production. This gas will be used primarily for driving a gas engine and for auxiliary heating. Write for further information.

BELOW, LEFT: *36 ft. diameter Hortonsphere installed at a sewage disposal plant in Sioux Falls, S. D.*

• • •

BELOW, RIGHT: *28 ft. 8 in. diameter Hortonsphere used to store 25,000 cu. ft. of sewage gas at a large New England sewage disposal plant.*





## CHICAGO BRIDGE & IRON COMPANY

| | | |
|---|---|---|
| San Francisco.....1013 Rialto Bldg. | Dallas .....Praetorian Bldg. | Cleveland .....Rockefeller Bldg. |
| Los Angeles.....1444 Wm. Fox Bldg. | Houston.....918 Richmond Avenue | New York.....165 Broadway Bldg. |
| Birmingham....1598 N. Fiftieth Street | Tulsa .....Hunt Bldg. | Philadelphia...1700 Walnut St. Bldg. |
| Chicago .....McCormick Bldg. | Detroit .....Lafayette Bldg. | Boston.....Consolidated Gas Bldg. |

*Plants at* BIRMINGHAM, CHICAGO, and GREENVILLE, PA. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

WESTERN CONSTRUCTION NEWS
WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER
December, 1940 Vol. 15, No. 12



## Two Schools of Design Opinion

SINCE the collapse of the Tacoma Narrows bridge more than a month ago, engineering opinion appears to be dividing itself between two rather well defined reactions. On the one hand there is an attitude developing among those engineers who might be termed the conservative group—for want of a better term—which leads toward the conclusion that the elements of sound design for an engineering structure of bridge type had been exceeded in this particular project, with results which might well have been anticipated. On the other hand, there is another group which appears to be inclining toward the opinion that modern engineering knowledge has advanced far enough to provide answers to this type of problem, if all facilities of design study had been applied. The first group will counsel that any time a civil engineering structure has to be model-tested in a wind-tunnel, it can no longer be considered adequate for its normal function; the other group will counter that progress points to this form of modern engineering testing as being useful in providing the probable answer to this special design problem.

Civil engineering design will always stay fairly close to the side of sturdy stability, with due regard for economy, as long as that economy will not affect the use of the structure. In every consideration of this type, there is a point where practical elements govern. As an example, several years ago a large public utility became concerned with the mounting cost of cast-iron manhole covers. The engineering staff set to work on the problem to cut costs through the designing of lighter covers, and carried out detailed and highly technical studies, including the use of the theory of curved beams, to complete a new design that was considerably lighter in weight, but at the same time most adequately strong. A cover was built according to the new design, and when it was installed for a test, the first truck rattled it out of position. The practical problems of traffic made the new cover impracticable, although technically correct.

A structure must serve its intended purpose in every respect if the design is to be considered adequate and proper. Undue flexibility in a bridge which forms a unit in a highway system, where the users are accustomed to stability in line and grade, does not provide a structure in accord with the criteria set up to cover its intended service. It is possible that stability may be provided by adding design features which can be determined by studies based on entirely new methods of analysis, and if this is true, then there has been a new advance in the field of civil engineering. On the other hand, if the proposed new methods of analysis cannot provide the answer of assured stability for structures which are accepted by the public as being rigid, so far as ordinary sensation goes, then it will be logical and necessary to secure this element of stability by resorting to more generally accepted methods.

## Utah Studies Pavement Scaling

WESTERN highway engineers are directly concerned with the lead taken by Levi Muir, materials engineer of the Utah State Road Commission, in his study of the widely recognized problem of surface scaling on concrete highway paving. The most usually accepted cause of this difficulty is the use of chemicals for fighting ice conditions during the winter months. A theory holds that the resulting chemical solutions in contact with the concrete surface, followed by freezing and thawing conditions, has been an important factor in aggravating this scaling. As a result, one solution has been to eliminate the use of chemicals as a weapon in fighting icy pavements. Recently, however, the National Highway Safety Council has rendered an opinion to the effect that the use of chemically treated sand is one of the most effective means of combating ice on the highway. This will make another solution to the problem necessary, if the cause of scaling has been properly diagnosed as coming principally from the use of chemicals. To meet this problem, Utah is taking the lead among western states in conducting a large-scale field study in the use of a synthetic resin as an admixture to cement to be used for concrete paving. This follows the experience in several eastern states, which indicates that such a process was effective in rendering concrete less susceptible to scaling. The comprehensive investigation of this problem by Utah will bear close watching by other western highway departments.

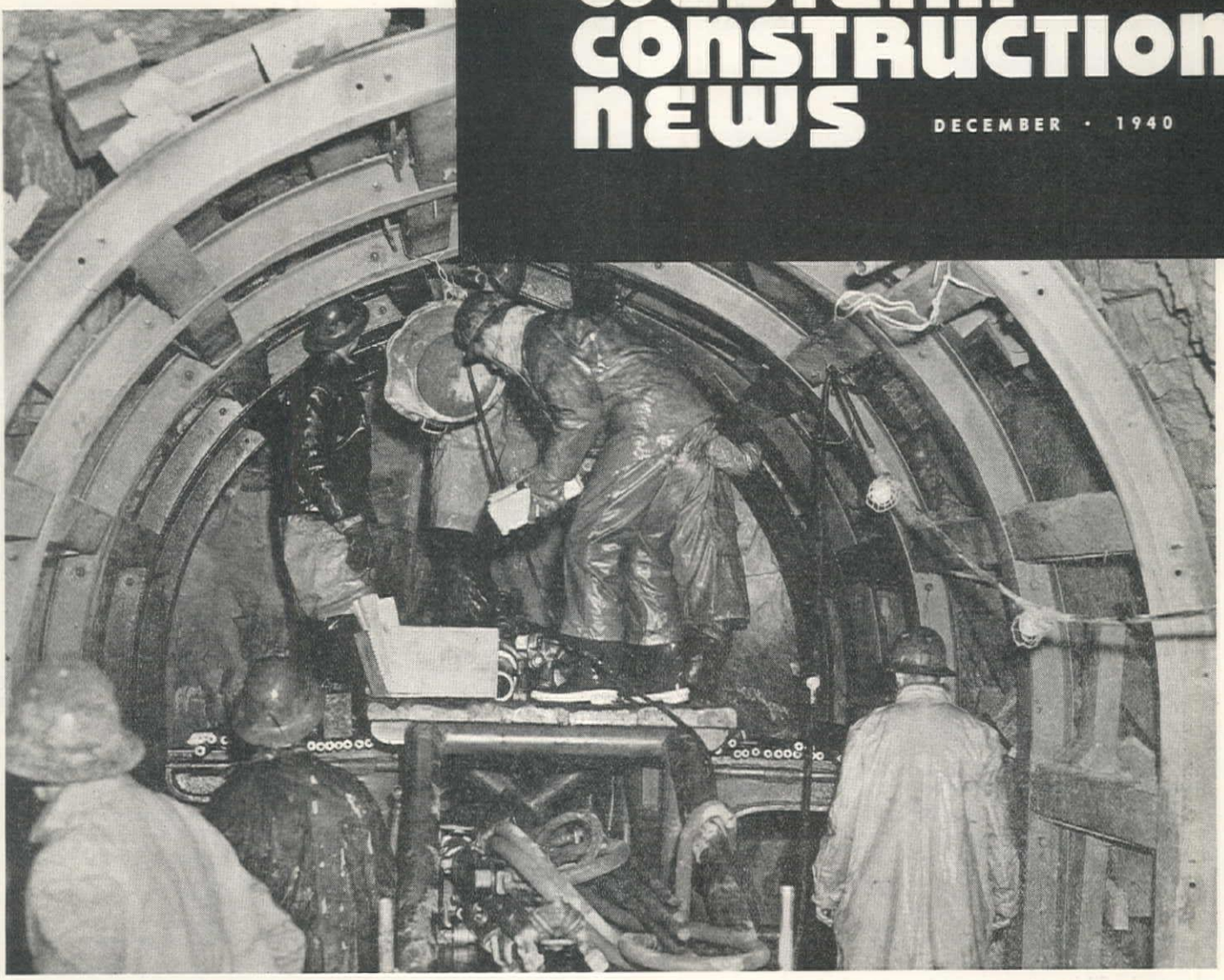
## Tunneling the Continental Divide

ONE of the most important construction operations now under way in the West is the driving of the Trans-Continental Divide tunnel, which will form an essential part of the Colorado-Big Thompson project, being built by the Bureau of Reclamation in Colorado. The long and somewhat involved history of the bidding on this job, and the importance of the 13-mi. bore through the backbone of the Rocky Mountains, combined with the earlier history of the driving of the Moffet Tunnel, makes this job of direct interest to all those in either engineering or construction work who are connected with tunneling in the West. At present, work is well advanced on the first 8,000-ft. section of the job, and the work, which is reviewed on another page of this issue, provides the initial chapter in the history of one of the West's most striking tunnel projects.

## Contract Construction for Defense

THE National Defense Program provides a most striking indication of the effectiveness with which the contract type of construction work is esteemed by Federal agencies where action and results are required, as compared to the functioning of the WPA. It should be gratifying to contractors that their abilities for carrying out construction assignments with speed and economy have been recognized in this type of emergency work. Such recognition should be used to proper advantage in the fight to stop further encroachments of WPA.

WESTERN CONSTRUCTION NEWS
DECEMBER · 1940



*Photos by Thomas J. Barbre*

# Continental Divide Tunnel

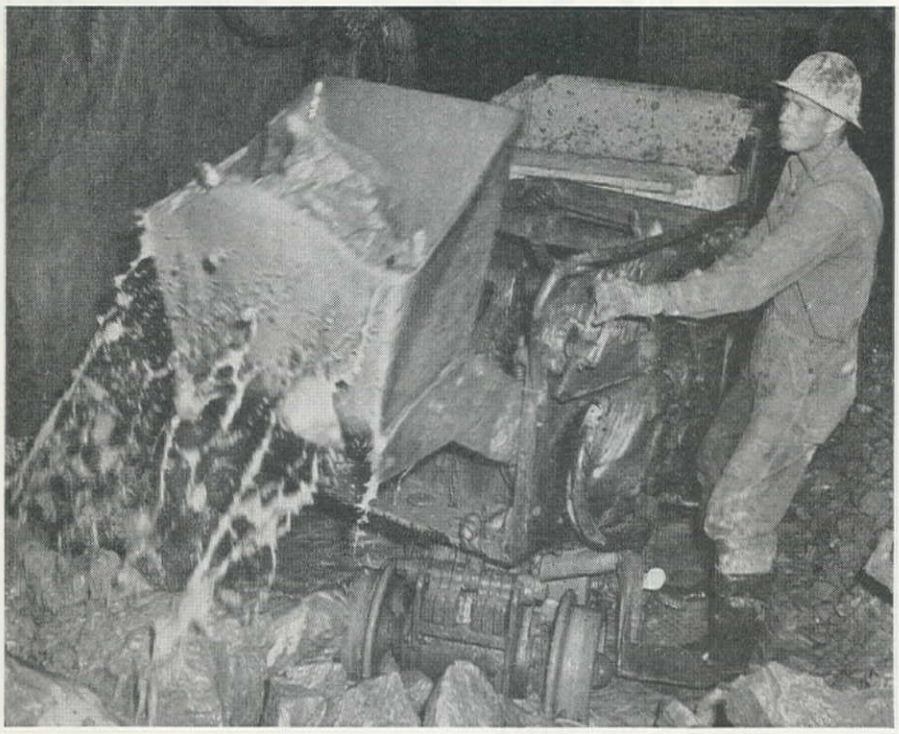
## Driving methods of S. S. Magoffin Co. on this major feature of the Colorado-Big Thompson project being built by Bureau of Reclamation

DRIVING forward at a steady rate averaging 45 ft. per day, the first contract for 8,000 ft. on the east end of the Continental Divide Tunnel is being advanced through good rock by S. S. Magoffin Co. on the Colorado - Big Thompson Project of the Bureau of Reclamation. Since the start of tunneling operation the driving rate has been 32.5 ft. per day elapsed time. The heading is in more than 5,000 ft. (Nov. 13) and the work has been featured by good organization and smooth procedure. This article will be confined to a review of the work on the East Portal contract.

### General information

The Continental Divide Tunnel forms the key feature in the $54,000,000 Colorado-Big Thompson Project for irrigation and hydro-electric power development on the east slope of the Rocky Mountains in northern Colorado. The general features of this comprehensive program of trans-mountain diversion to provide supplemental irrigation water in the valley of the South Platte and its tributaries, with accompanying power development, have already been reviewed in *Western Construction News* (August, 1937). The comprehensive program, which was the subject of extensive investigations and studies by the Bureau of Reclamation for several years before the project was authorized, represents an essential development for the continuation of irrigation agriculture in northern Colorado. At the present time, agriculture along the South Platte River Valley has been seriously affected by shortage of water during the late season, and in some years this deficiency resulted in extensive crop damage. The area raises an extensive acreage of sugar beets, and is also important in producing feed for the fattening of lambs and cattle on their way to eastern markets.

With all of the local water supplies exhausted, the only solution to the problem of providing a supplemental supply was diversion from streams on the western slope through a tunnel piercing the Continental Divide. The location of this tunnel, which was fixed after extensive studies, is directly beneath Rocky Moun-



**MUCKING out a 7-ft. round which averages 30-cu. yd. in a loading time of about 1 hr. 30 min. Rounds are loaded with about 250 lb. of 40% or 45% explosive (60% in the lifters).**

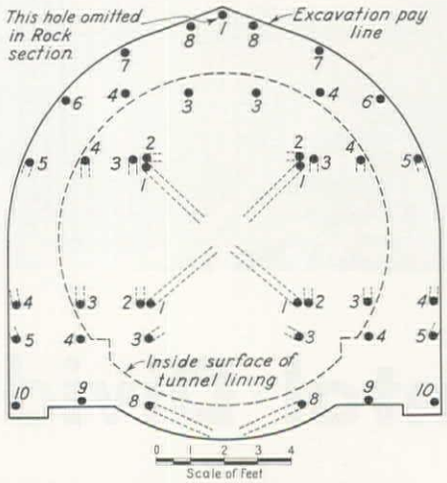
tain National Park, with portals located outside of the park boundaries. The tunnel is slightly more than 13 mi. in length. The supply of water coming through this tunnel will be used through a series of hydroelectric plants (developed as need requires) before it is delivered in the existing canals on the east slope.

This comprehensive plan has necessitated the developing of replacement storage on the west slope to meet existing demands. This storage will be provided by the construction of Green Mountain Dam, which is now under contract. The plan also requires the storage of water which will be turned through the tunnel, and pumping facilities to elevate this supply to the west portal, where it will pass through the Continental Divide by gravity. This storage is essential to the economic use of power, and will permit only off-peak power to be used for this pumping load. Details of this program do not form a part of this present review.

### Tunnel design

In cross-section, the tunnel will have a finished circular diameter of 9 ft. 9 in. Plans call for a 6-in. minimum concrete lining to complete the tunnel, although the lining does not form part of the present contract work.

To facilitate hauling and other driving operations in the relatively small tunnel, the plan provides that the sidewalls are to be extended vertically downward to the elevation of finished invert, and that the small arc of invert section is to be excavated below this level. This cross-section arrangement is indicated in the accompanying drawing. The contractor on driving is permitted to backfill the invert section to provide ballast for the hauling track.




**RESTRICTIONS on overbreak, provided in the specifications, have resulted in careful attention to drilling and shooting. The original plan to pull 9-ft. rounds resulted in sufficient overbreak to justify a reduction to an average round of 6 to 7 ft., with the holes spaced as indicated.**

Plans indicated the possible use of both 5 or 6-in. H steel rib supports, or the alternate of 10 or 12-in. timber sets. In each type of support, the plans provided for use of a bottom strut in case the external loads warranted this additional member in the supporting system. Up to the present time, the contractor has standardized on the use of 5 or 6-in. steel ribs at 4 and 5-ft. spacing.

At the portal, area has been made available to the contractor for disposing of excavated material. This area is located in the bottom of the Wind River canyon, immediately outside of the National Park boundary. In order to prevent the unsightliness of a tunnel dump immediately adjacent to the park, plans call for a dam across the canyon below the disposal area, which will ultimately form a lake that will cover and conceal the waste deposit. This dam is being built partly with tunnel muck as a feature of the present contract.

### Bid calls and bidding

The original bids covering the driving and lining of the entire tunnel were opened June 7, 1939, and the three proposals, including a cost plus 8% of labor submitted by S. S. Magoffin Co., were rejected by the Bureau of Reclamation as being too high. The low bid was presented by Shasta Construction Co. at $10,759,405. As a result of a subsequent bid call, which excluded excavation at both portals, the second opening took place Sept. 21, 1939, at which time a regular bid from the Keystone Co. was presented at $10,350,105, and the Warner Construction Co. presented a lower bid which involved an elaborate group of stipulations. The complete tabulation of unit bids presented in these two openings was published in *Western Construction News*, January, 1940. These bids were also rejected.

On April 8, bids were opened for the driving of the first 8,000 ft. of the tunnel from the eastern portal. Thirteen bids were received under this set of specifications, which did not include the placing of concrete lining, and the low offer was made by S. S. Magoffin Co. at $471,123. A tabulation of these bids appeared in *WCN*, May, 1940. Contract was awarded to the low bidder, and work began immediately.

During this bidding period, the Bureau of Reclamation had carried forward the construction of modern highway connections to both tunnel portals, and had also completed the portal excavation work. Subsequently, bids were called for the driving of the first 6,600 ft. from the western portal, and this contract, which did not include the concrete lining, was awarded to Platt Rogers, Inc. (unit bids, *WCN*, September, 1940). This work is now well under way, but does not form a part of the present review.

## S. S. Magoffin Co. Operations

### Drilling procedure

Drilling operations at the east heading are being carried out from a track-mounted jumbo, of rather standard design, carrying four drills. Provision is made for the adding of a fifth drill in the crown position to carry forward an advance pilot hole if there is evidence of bad ground or sufficient water to justify this precaution. The drill jumbo operates in the usual manner at the face, and is removed to a passing track during shooting and mucking operations.

Although the number of holes in the rounds, and their arrangement, vary according to the rock encountered, the average round calls for about 36 to 40 holes, and the accompanying diagram indicates the arrangement and the firing sequence. A special problem is introduced in the drilling operations as a re-

sult of a provision in the specifications regarding the amount of overbreak outside of the "B" line. The specifications state that:

> "Upon completion of the contract, the contracting officer will compute the total amount of material excavated in all sections of the tunnel, except those supported by steel liner plates, and, if the total amount of such excavation exceeds the total volume within the excavation pay lines for such sections, a deduction of fifteen dollars ($15) per cubic yard for each cubic yard of such excess excavation will be made from the final payment due the contractor under the contract."

As a result of this requirement, the contractor is using unusual care in driving close to required section. The original plan to pull 9-ft. rounds resulted in sufficient overbreak to justify a reduction to an average round of 6 to 7 ft.

### Drill steel and its handling

One of the most unusual features of the drilling operations is the use of detachable bits which are removed and replaced at the grinding shop near the tunnel portal, with all work at the face carried on as if the steel were of the conventional type. This procedure eliminates all the bit changing at the face. According to Superintendent Merrick, this procedure includes the following advantages: (1) bit changing can be accomplished more efficiently, and with closer inspection for jammed threads and other injury to the steel; (2) total amount of drill steel is reduced to not more than three complete sets; and (3) sharpening crew is reduced to a minimum.

The steel for a complete drilling round (3, 5, 7 and 9-ft. lengths) is loaded at the shop, and hauled into the heading, as would be done with conventional steel. The detachable bits are of 1¾-in. original size, and in the grinding process are reduced by 1/16 of an inch to a minimum of 1½ in. final size. This provides five uses, and four regrindings of each bit. Bits of less than 1½ in. size are not considered economical for use under present drilling conditions.

The grinding shop is equipped to provide most accurate control for these operations. The used bits from the heading are first detached at the shop, and the threads and shanks carefully inspected. The bits are then put through the sharpening process, including the drawing of the temper, grinding, and finally the accurate re-tempering, using oil-fired furnaces with accurate pyrometer control. Sharpened and re-tempered bits are stored in bins, where they are available for replacing on the drill steel. This sharpening shop, which operated with a 4-man crew, is able to turn out 150 sharpened bits per hour as a maximum speed, and one-shift operation in this shop is sufficient to supply bits for the three-shift work in the tunnel.

Drilling time in the average rock formation encountered provides about four minutes for every 2-ft. length of steel, including changing time. The average time for the drilling, blasting and getting back into the heading is about 2 hr.

The average round is loaded with about 250 lb. of 40 or 45% explosive (60% in the lifters), and this pulls a round which measures about 30 cu. yd. of muck. In the harder rock this powder requirement may run as high as 8.7 lb. per cu. yd.

### Mucking procedure

Loading at the face is done with a small mine-drift type of mucker, which handles the 30 cu. yd. in about 1 hr. 30 min., loading into 3½-yd. cars. The rock breaks sufficiently for successful handling with this small type of loader. Switching is done behind the face with a "California Switch" that is pulled along on top of the track as driving proceeds.

At the present time, the hauling trains constitute four or five cars, but as the work advances, this hauling procedure will be modified to make up trains of 12 to 15 cars, carrying the muck from the entire round on the long haul to the portal. These long trains will be made up behind the California Switch.

The cars are of special design which permits automatic dumping at the portal. Arriving outside the tunnel, the train is stopped while special brackets are placed on each car; this work requires only a few moments' time. The train is then pulled along the dump track and these arms engage a stationary tripper. The action tilts the car bodies (see illustration), and the dumping of the train is accomplished in a few seconds. The car bodies are tipped back into position by the same tripper, the brackets removed, and the train is ready to enter the tunnel again. This car tripper can be pulled along the track to any desired position, and as the track is thrown over on the dump, the car tripper remains in its same relative position to the track. This system of car-dumping, developed by the C. S. Card Co. of Denver has only been used previously on the Carlton Tunnel project.

### Air and ventilation

The main compressor plant consists of a single motor-driven unit of 1,100-c.f.m. capacity. A smaller auxiliary unit is used during the day shift when the sharpening shop is working. Compressed air and water lines are carried into the tunnel in the usual manner, supported on the steel ribs.

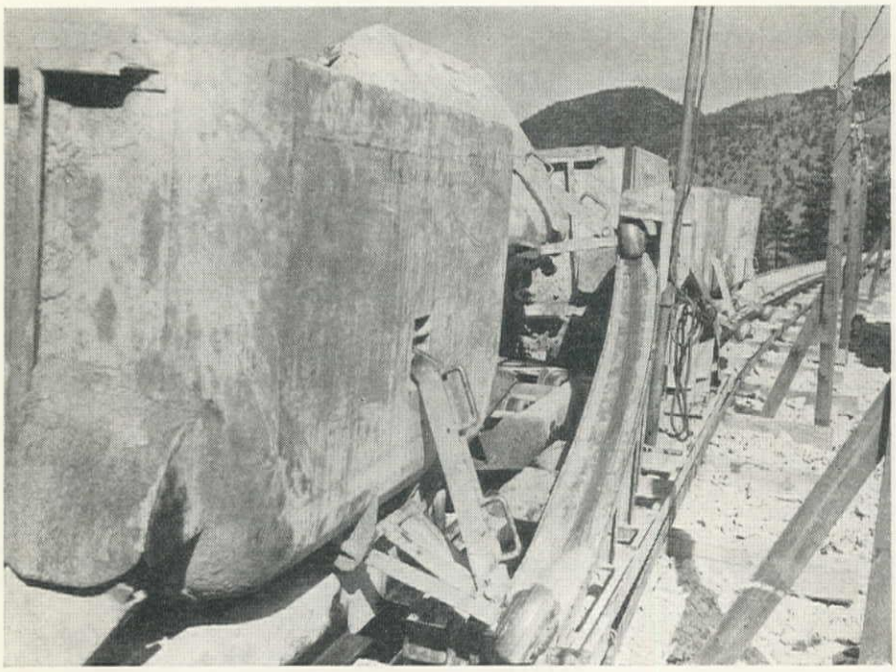
Ventilation is provided with a 40 hp. blower supplying a metal line hung from the steel ribs. This pipe was of 16-in. size for the first several hundred feet of tunnel, and the pipe size was then changed to 20 in. This new pipe is dipped to provide a protective coating, is made up in 30-ft. lengths outside the tunnel, and has flanged joints which are bolted up with a gasket seal. The smaller size pipe near the portal will be replaced later with the 20-in. size.

The blower pressure is not reversed

#### Major Units of Equipment

Compressor (Type XCB—1,100 c.f.m.—Ingersoll-Rand.
Bit grinding equipment — Ingersoll-Rand.
Bit tempering equipment — Ingersoll-Rand.
Detachable bits—Ingersoll-Rand.
Blower—Western Blower Co.
Drills (DA 35)—Ingersoll-Rand.
Explosives—DuPont.
Mucker—Eimco Co.
Locomotives—Mancha Steel Mule.
Muck cars and car dumping equipment—C. S. Card Iron Works.

**GRINDING AND TEMPERING of the detachable bits is carried out during one shift in a modern shop equipped to provide accurate control. Original bits are of 1¾-in. size and five uses and four re-sharpenings reduce them to 1½-in. Bits are changed at the shop and not in the heading.**



**CAR DUMPING by means of brackets, attached as shown, which travel up inclined rail tilting 3½-yd. car and then returning it to upright position. The brackets are lifted off by hand before the train re-enters the tunnel.**

after shooting, and following a delay of from 15 to 20 min., the crew rides through the smoke to the fresh air at the face.

### Progress

The tunnel is being advanced principally through granite and some schist formation, and only a small amount of water has been encountered, which has not materially delayed the driving operations. About 54% of the tunnel which has been driven to date is supported with the steel rib sections on 4-ft. and 5-ft. centers. The remainder of the tunnel is unsupported. Pressures have not required use of heavier sets, or closer spacing.

The driving record follows:

| | |
|---|---|
| From June 18 to 30 | 275 ft. |
| July (one holiday) | 932 ft. |
| August | 1,113 ft. |
| September (Labor Day holiday) | 1,041 ft. |
| October (1 day lost grouting) | 1,147 ft. |
| From November 1 through 11th | 432 ft. |
| Maximum day | 54 ft. (unsupported) |
| Maximum day | 50 ft. (supported) |
| Maximum week (160 hr.) | 306 ft. |

### Organization

The Colorado-Big Thompson Project is being carried out by the Bureau of Reclamation under the general supervision of the Denver Office. Porter J. Preston is supervising engineer in administrative charge of the entire project. C. H. Howell is construction engineer, directing work on the Continental Divide Tunnel.

Operations of the S. S. Magoffin Co. are under the general supervision of F. R. Purvis. Frank Merrick is general superintendent, and Jake Brotzman is night walker. The shift bosses are Jack Guthrie, L. S. Spensko, C. J. Knight and Emery Gardner.

# Power Plant for Shasta Dam

BIDS for furnishing four steel penstocks, each 15 ft. in diameter, for carrying water through Shasta Dam and down to the power plant at its base, have been called by the Bureau of Reclamation, to be opened January 2, 1941, in Denver. The penstocks will be welded plate-steel pipes, varying in length from 807 to 935 ft., passing through the concrete dam about 260 ft. below the top. Outside the dam they will extend down the west slope of the Sacramento River Canyon to the powerhouse which is under construction on the west bank.

Ralph Lowry, construction engineer, Bureau of Reclamation, reports that concrete pouring for the foundation of the powerhouse is being rushed in order to get the substructure of the heavily-reinforced building above the elevation of probable high water this winter. The draft tubes, through which water discharged from the turbines will flow back into the river, already have been built into the base concrete. About 25,000 cu. yd. of concrete and 800 tons of steel reinforcement bars have been placed in the powerhouse to date, along with 360,000 cu. yd. of concrete in the dam, under the general construction contract held by Pacific Constructors, Inc.

The Bureau also has called bids for furnishing and installing an electric elevator for passenger and freight service between the seven floors of the powerhouse. These bids were opened in Denver, December 9.

The penstock advertisement calls for fabrication of the pipes, which are to be delivered to Coram, the railroad station a mile downstream from the dam site. As an alternative the successful bidder may elect to erect a penstock fabricating plant at Coram. Government inspectors will test the welds by x-ray. The penstocks, which will weigh a total of about 5,000 tons, are to be installed by Pacific Constructors.

The four hydraulic turbines for the power plant and the four electric generators to be turned by the turbines, are being manufactured in the East under contracts totaling $4,334,000 which were awarded by the Bureau of Reclamation early in 1939. Work on the turbines, each of 103,000 h.p., is under way in the plant of Allis-Chalmers Manufacturing Co. at Milwaukee, Wis. This company also will furnish four oil-pressure governors to regulate the speed of the turbines at 138½ revolutions per minute. The generators, each rated at 75,000 k.v.a., are being built by the General Electric Co. in Schenectady, N. Y., with the first scheduled to be ready for shipment in July, 1941. Each generator will weigh 850 tons and will require 35 railroad cars for shipment in parts from Schenectady to Shasta Dam.

These four main units to be installed initially will have a total generating capacity of 300,000 k.w. Space is being provided in the building for a fifth main unit, affording an ultimate plant capacity of 375,000 k.w. which is expected to produce about 1½ billion kilowatt-hours of electric energy annually.

Part of the Shasta power will be used to operate Central Valley Project pumping plants on the Contra Costa Canal and the San Joaquin Pumping System and the remainder will be available for sale to parties through purchase contracts.

In addition to the main units, the Shasta Power Plant will include two small service-station units to generate electricity for operation of machinery and for lighting at Shasta Dam. The 3,500-h.p. station-service turbines are being manufactured in Ohio and the 2,500-k.v.a. generators in New York.

For installation and maintenance work on this machinery, the Bureau of Reclamation recently ordered two big traveling cranes from the Lakeside Bridge and Steel Co. of Milwaukee on a successful bid of $172,560. The cranes, each capable of lifting 250 tons, will be mounted on overhead tracks runing almost the length of the 450-ft. powerhouse. The largest pieces the cranes will have to carry are the generator rotors, each weighing 450 tons, which will be handled by the cranes working in tandem.

# Collapse of the Tacoma Bridge

**A REVIEW of the deck failure on this 2,800-ft. suspension structure which indicates the disaster was caused by "aerodynamic instability"—Comparative design data on important suspension bridges**

THE SPECTACULAR, disastrous collapse of the deck of the main span of the Tacoma Narrows Bridge on November 7 with accompanying severe injury to side spans, towers and cables undoubtedly constitutes a major landmark and turning point in the design of long span suspension bridges.

Ever since the bridge was completed last July rolling undulations had developed in the deck, even in light winds. These undulations had always been free from transverse tilting, the waves passing along the supporting cables simultaneously, equally, in phase. But on the morning of November 7, with a 42-mi. wind blowing up Puget Sound, the cables got out of phase and the deck began to tip and seesaw transversely in a manner previously unknown. At a point where one main cable was lifting, the opposite point on the second cable was sagging and the deck rocked back and forth, building up to an extreme tilt estimated as much as 45 deg. with the horizontal.

After several hours of this racking something failed near midspan and with roar and crash long sections of the deck tore loose and fell into the Narrows, while broken suspenders whipped crazily and the main cables, freed of their loads, sprung up and down. With the balance thus destroyed the side spans suddenly sagged 30 ft. or more, pulling back the towers, springing and whipping. Final quieting and settling down came with stub sections of the main span deck remaining at the towers, the side spans sagged deeply with both girders buckled near the low points, the tops of both towers pulled shoreward about 12 ft. and the towers showing some buckling on the compression side about 10 ft. above the pier tops, and to a lesser extent at several points above. The main 17-in. cables are bent to a noticeable extent over the girder tops at the Tacoma anchorage and an examination by two daring steel men who worked their way across the main span from tower to tower reported they had suffered "some" damage which could be repaired.

What failed first cannot be stated with certainty. The great waves in the deck entailed sharp curvature in the girders with corresponding high stresses. The suspenders consisted of four 1-in. ropes, two of which passed through slots in the outer flange of the stiffening girder and two through the inner flange, with their socketed ends attached to the girder web about 2 ft. below the flange.

Since the girder flange tipped transversely with the deck while their loads kept the suspenders vertical there must have been a continual shifting of load from inner to outer ropes adjusted by slippage over the cable bands on the main cables. There was also the sharp kinking and bending of the suspenders at the top flange as the web of the girder tipped in and out. There were special zinc-filled fittings at these points that partially corrected this but they had been designed for no such angular changes as occurred. The connection angles between floor beams and girders (25 ft. o.c.), constituted the principal connection between deck and girders. Assuming some one suspender to fail first there follows a sudden increase of load thrown on adjoining over-taxed suspenders, their failure, then a progressive series of failures sweeping along one side, lightening the cable above, letting the deck fall, throwing all the load on the other cable, and so on to the final end.

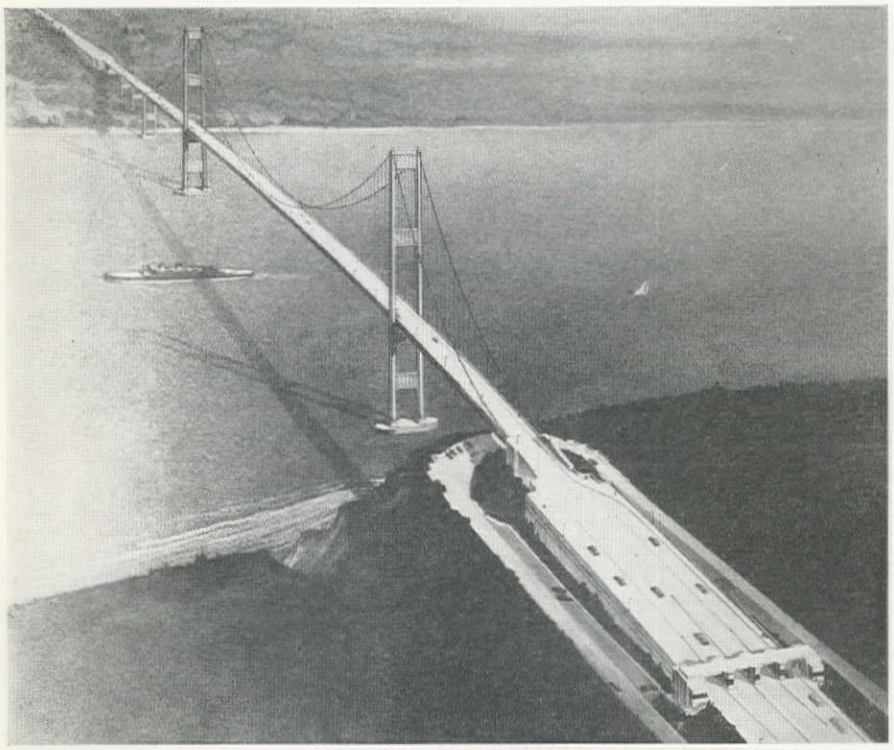
The main cause of the collapse is generally attributed to aerodynamical instability. This is another way of saying that the cause was wind blowing against the bridge and building up movements and distortions which it ultimately was unable to resist. That the catastrophe was wholly unexpected and unanticipated by everyone, even by those intimately connected with the project, is indicated by the fact that Professor Farquharson, University of Washington, was on the main span almost to the time of its collapse, calmly taking movies of its antics. Professor Farquharson has for many months supervised work with the structure's model at the University of Washington, testing and seeking methods to minimize or eliminate the normal deck undulations.

Experiments in the University's wind tunnel only shortly before the disaster indicated definitely that winds blowing squarely against the stiffening girders and eddying over their flanges produces fluctuating air pressures on the deck and were responsible for the movements. Holes through the model's girder webs above and below the roadway slab largely eliminated the movements; a semicircular fairing or "streamlining" on the outer sides of the girders did so almost completely; a small segment of nosing fixed a short distance out from the girder was also quite effective in reducing the action. A decision to install a 30-in. fairing on the girders had been reached several days before the disaster.

## Comparative data

In an accompanying table are given the principal dimensions and their ratios of the country's largest suspension bridges whose stiffening trusses are of the open web type and beside them are listed the same dimensions of the four largest bridges whose "stiffening trusses" are plate girders. All of these of the plate girder type have developed longitudinal undulations in the deck, although none but Tacoma to more than

**WHAT WAS LEFT of the 2,800-ft. main span of the bridge after its failure on November 7. A section of the 8-ft. plate girder is shown hanging from the suspenders. Note the lamp post and the two floor beams with connecting stringers.**



**ARTIST'S SKETCH of the Tacoma Narrows bridge indicating the relation of 2,800-ft. main span, side spans, anchorages and approaches. The view is toward the west, with the toll plaza in the foreground.**

a trifling extent under the remedial measures adopted. The narrow width of the Tacoma bridge in relationship to span is shown by its ratio of 1 to 72 in comparison with the nearest's, Golden Gate's 1 to 46.6. In this respect, however, it is significant that the amount of horizontal displacement prior to collapse reported by Professor Farquharson—2 ft.—is indeed slight and apparently demonstrates that reliance can be placed on the cables to provide the necessary lateral stiffness to the deck. It is in respect to longitudinal stiffness that departure from other bridges is most pronounced. The ratio of vertical truss depth to span is 1 to 350 compared with Whitestone's 1 to 209. This is not the measure of stiffness, however. Stiffness, resistance to longitudinal deformation, is measured by the ratio of moment of inertia to span. With plate girders the moment of inertia is not an exact function of the depth, but approximately it varies with the depth, cubed. On this basis the longitudinal stiffness of Tacoma Narrows is but one-third that of Whitestone, and Whitestone in turn is by far the most flexible of any of the other long span bridges. It is evident, therefore, that there were opportunities for increased undulations in the deck with this increased flexibility.

It appears probable that towers and cables will have to be taken down and reconstructed. There will be a considerable salvage value in them, of course. There is no indication of damage to the piers.

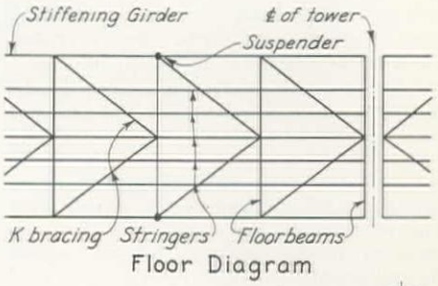
### General features

The Narrows Bridge was built by the Washington Toll Bridge Authority to span the arm of Puget Sound separating the area adjacent to Tacoma from the Olympic Peninsula. The project had been under consideration for a number of years, having had the support of the local interests, but it did not become a reality until the establishment of the state authority. The structure was designed to facilitate communication between Tacoma and the recreational area on the peninsula, together with establishing a more direct communication to Bremerton and the Navy Yard at that location.

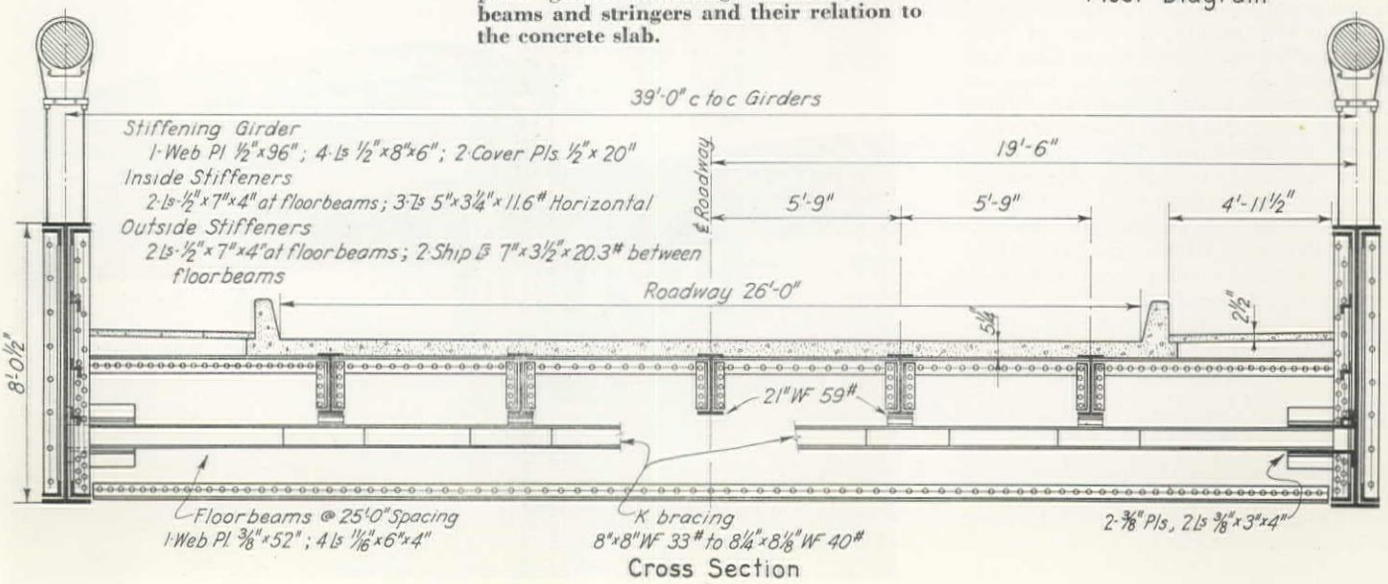
The project became one of the first to be studied by the Toll Bridge Authority after its formation in 1937, and engineering work advanced to the stage of definite designs providing a suspension structure with a 2,800-ft. main span, and at this stage PWA assistance was secured in financing. The usual grant of 40% was made to the Toll Bridge Authority, and the RFC purchased the revenue bonds to complete the financing plan.

### Design features

The design provides for a 5,000-ft. length of structure, with 2,800-ft. center span flanked by 1,100-ft. side spans, and a 450-ft. approach on the west side. Concrete piers, which formed one of the most difficult engineering problems because of their depth in swift tidal waters, support steel towers 425 ft. high.




Floor Diagram




**DESIGN details of the deck showing the plate girder stiffening members, floor beams and stringers and their relation to the concrete slab.**

Cross Section

# Principal Dimensions of Major Suspension Bridges

## Open Web Stiffening Members — Plate Girder Stiffening Members

| | Golden Gate San Francisco | George Washington New York | S.F.-Oakland Bay San Francisco | Ambassador Detroit | Tacoma Narrows Tacoma | White-stone New York | Deer Island Coast of Maine | Thousand Island Across St. Lawrence between N.Y. & Canada |
|---|---|---|---|---|---|---|---|---|
| Main Span.....Ft. | 4200 | 3500 | 2310 | 1850 | 2800 | 2300 | 1080 | 800 |
| Side Span.....Ft. | 1125 | 650 | 1160 | 817 | 1100 | 735 | 484 | 350 |
| Cable Sag.....Ft. | 475 | 325 | 231 | 209 | 232 | 200 | ... | ... |
| Depth of Stiffening Truss.Ft. | 25 | { o* / 41 } | 30 | 22 | 8 | 11 | 6.5 | 6.0 |
| Spacing of Cables.....Ft. i. e., Horiz. Truss Depth. | 90 | 106 | 66 | 59.5 | 39 | 74 | ... | 30.5 |
| RATIOS: | | | | | | | | |
| Side Span to Main Span.... | 1: 3.70 | 1: 5.4 | 1: 2.0 | 1: 2.26 | 1: 2.54 | 1: 3.13 | 1: 2.23 | 1: 2.29 |
| Cable Sag to Main Span.... | 1: 8.85 | 1: 9.3 | 1: 10 | 1: 8.9 | 1: 12 | 1: 11.5 | ... | ... |
| Vertical Truss Depth to Main Span..... | 1: 168 | 1: 85 | 1: 77 | 1: 84 | 1: 350 | 1: 209 | 1: 166 | 1: 133 |
| Horizontal Truss Depth to Main Span..... | 1: 46.6 | 1: 33 | 1: 35 | 1: 31 | 1: 72 | 1: 31 | ... | 1: 26 |
| Dead Load per l. f. Bridge .....Lb. | 22100 | 39000 | 18700 | 6200? | 6300 | 11000 | ... | ... |
| Live Load per l. f. Bridge .....Lb. | 4000 | 8000 | 7000 | 3300 | 1000 | 3000 | ... | ... |
| Live Load to Dead Load.... | 1: 5.53 | 1: 4.87 | 1: 2.67 | 1: 1.83 | 1: 6.00 | 1: 3.67 | ... | ... |

*At present has only upper deck, stiffened by top chord of stiffening truss which is to be built when lower deck is added. However, there are 8 heavy longitudinal deck stringers and 2 facia girders.

Anchors are of the stepped gravity type, and contain 25,000 cu. yd. of concrete. A two-lane width of deck was considered adequate for all of the traffic requirements, and this was a factor in establishing the relatively narrow width of the structure as compared to the span length. A 26-ft. roadway is flanked on each side by 5-ft. sidewalks. Navigation requirements made it necessary to provide a 195-ft. vertical clearance above lower low tide.

The cables are spaced 39 ft. apart, which provides a 1:72 ratio for width-to-span. Each of the main cables is of 17¼-in. diameter, formed of 19 strands made up of 332 wires each. The suspenders are spaced at 50-ft. intervals.

### Foundation construction

The foundation problems centered around the sinking of false bottom type caissons in the swift tidal water of the Narrows. The details of this work were reviewed in *Western Construction News*, June, 1939.

### Stiffening truss and deck design

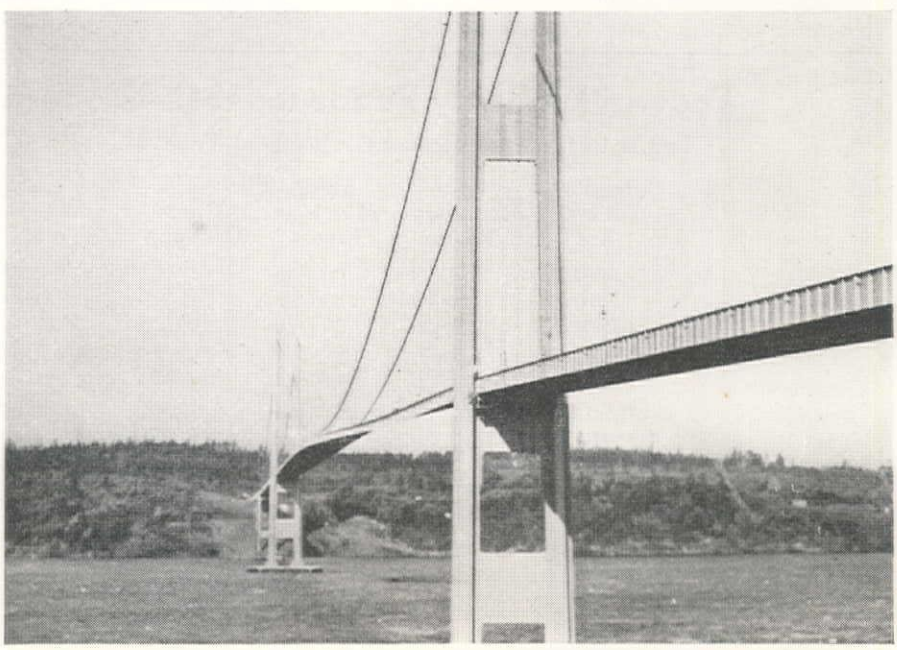
The outstanding design feature of the deck stiffening system includes the use of 8-ft. steel girders in place of a truss design usually used. The details of these plate girders, the floor beams, stringers, and concrete slab are indicated in the accompanying drawing. The floor beams are of a built-up section with a ⅜x52-in. web plate, and four 11/16x4x6-in. angles. These floor beams are spaced at 25-ft. intervals, providing two per panel length. The stringers are of 21-in. WF 59-lb. section, and are spaced 5 ft. 9 in.

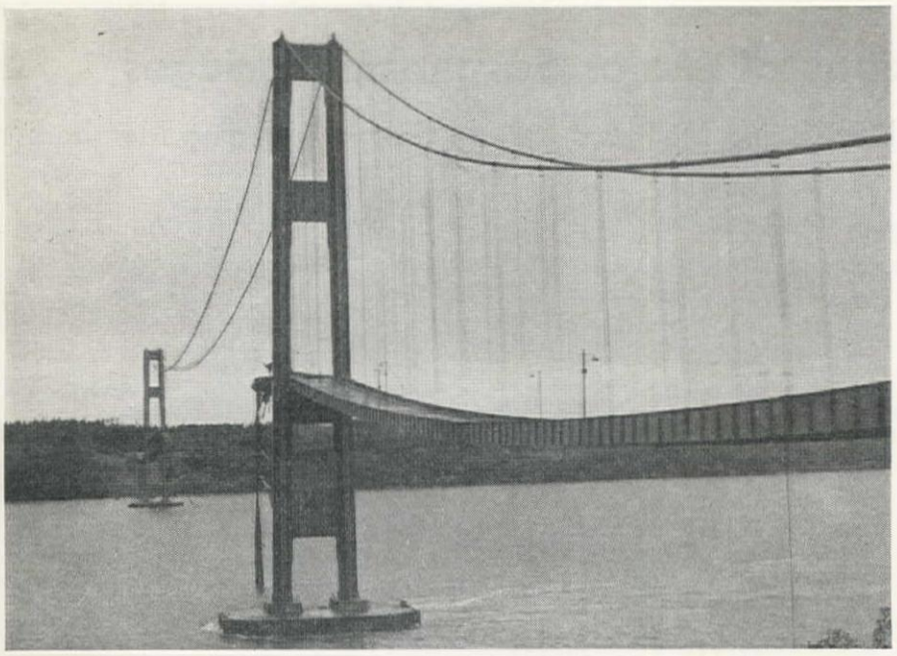
The deck, itself, consists of a 5¼-in. concrete slab which is located vertically at about the neutral axis of the stiffening girders.

To provide additional stiffness in the girders longitudinal beams were added (see drawing), and the entire system was designed to take partial advantage of the stiffness in the concrete deck.

Beneath the floor, a system of K-bracing was provided, using 8½x8½-in. WF 48-lb. beams of silicon steel near the towers, and diminishing in size to 8x8-in. WF 33-lb. beams of carbon steel near mid-span. Lateral loads were reported as

**VIOLENT WAVE motion racked the structure for several hours immediately preceding the collapse of the deck of the main span. Observations indicated that the tilting of the deck, as shown in the photograph, reached an angle of 45 deg.**





**AFTER the collapse of the main span, only a short section of deck remained in position beyond the tower on the Tacoma side. Note the sag in the side span in the foreground caused by the unloading of the cables in the main span.**

taken at 30 lb. per sq. ft. of area on 1½ times the projected area and on the live load.

### Reconstruction plans

Plans for reconstruction of the bridge are still indefinite. It is too early to formulate plans. But in the few months of its life the present bridge did definitely prove its value to a volume of traffic much larger than had been anticipated and created in the city of Tacoma a feeling of pride and interest that certainly will bring about its speedy reconstruction.

### Organization

The structure cost $6,400,000, including the $2,880,000 grant made by the PWA and the loan of $3,520,000 made by the RFC.

Lacey V. Murrow (now in the U. S. Army on leave) is chief engineer of the Washington Toll Bridge Authority and director of highways. Clark H. Eldridge is bridge engineer on the Tacoma Narrows project. The consulting board was headed by Charles E. Andrew, who served as principal consultant in direct charge of the project. Detail designs relating to the suspension structure were prepared under the supervision of Leon S. Moissieff, consulting engineer of New York.

The general contract for the structure was held by Pacific Bridge Co., San Francisco, General Construction Co., Seattle, and Columbia Construction Co., Bonneville, with the work carried out under the active direction of the Pacific Bridge Co. Under a subcontract, John A. Roebling's Sons Co. erected the main cables and the suspender ropes, with the superstructure steel fabricated and placed by the Bethlehem Steel Co.

## Federal Highway Funds for 1941-42

**Funds to Be Apportioned Each Fiscal Year**

| | Regular Federal Aid | Secondary Roads | State Matching Funds | Grade Crossing | Total |
|---|---|---|---|---|---|
| Arizona | $ 1,423,000 | $ 249,000 | $ 652,000 | $ 128,000 | $ 2,452,000 |
| California | 3,798,000 | 665,000 | 3,236,000 | 741,000 | 8,440,000 |
| Colorado | 1,809,000 | 317,000 | 1,694,000 | 251,000 | 4,071,000 |
| Idaho | 1,226,000 | 215,000 | 984,000 | 162,000 | 2,587,000 |
| Montana | 2,027,000 | 355,000 | 1,848,000 | 264,000 | 4,494,000 |
| Nevada | 1,271,000 | 222,000 | 228,000 | 97,000 | 1,818,000 |
| New Mexico | 1,603,000 | 281,000 | 1,206,000 | 166,000 | 3,256,000 |
| Oregon | 1,639,000 | 287,000 | 1,215,000 | 223,000 | 3,364,000 |
| Utah | 1,125,000 | 197,000 | 522,000 | 129,000 | 1,973,000 |
| Washington | 1,573,000 | 275,000 | 1,660,000 | 300,000 | 3,808,000 |
| Wyoming | 1,252,000 | 219,000 | 909,000 | 131,000 | 2,511,000 |
| Total | $18,746,000 | $3,282,000 | $14,154,000 | $2,592,000 | $38,774,000 |

## Colorado River Water For Salt River Valley

SURVEYS are being carried out to determine the most feasible route for an aqueduct to convey water from the Colorado River into the Salt River Valley territory near Phoenix, Ariz. An extreme water shortage during the past season has emphasized the need for a supplemental water supply in this important agricultural area. At the present time, the supply comes principally from storage on the Salt River and the Bartlett dam on the Verde River. The ultimate source for additional water is the Colorado River, and interests in Phoenix and vicinity have prepared preliminary estimates on the cost of this project which would divert at Parker Dam.

Survey parties of the Bureau of Reclamation, operating under the direction of M. E. Bunger, have started field work on the determination of possible routes. This work will include the determination of canal length, the pumping lifts required and preliminary cost estimates. At the same time, studies are being made to determine the amount of supplemental water which will be required in the Salt River Valley, and the need for this supply.

## State of California Plans Dams for Institutions

THE State of California is conducting a survey of several dam sites near Napa which might be developed to store water for a group of state institutions in the vicinity of that city. Three of the dam sites are located on Rector Creek. A dam to store 1,900 ac. ft. is estimated to cost about $600,000, but an additional $200,000 would be required for necessary pumping plant and pipe lines to the institutions. An alternate plan to store water on Conn Creek for the same purpose would involve an estimated project cost of about $2,000,000.

Incidental to this planning by the State of California is the fact that the City of Vallejo is faced with possible deficiencies in its water supply because of the greatly increased activity at the Mare Island Navy Yard. There is also a possibility that the water conservation plan might be co-ordinated with flood control in the Napa Valley now being studied by the U. S. Engineer Department.

## More 4-Lane Highway Planned

PLANS for the completion of a 4-lane highway route between Modesto and Turlock, California, have been advanced by the award of contracts totaling about $215,000 for the widening of a section between Keyes and Hatch Crossing, including the building of a concrete bridge over a ditch of the Turlock Irrigation District.

# Utah Studies Pavement Scaling

**Synthetic resin admixture in cement used for first time in West as part of investigation to solve problem attributed to use of chemicals in combating ice conditions during winter**

AN EXTENSIVE field experiment, involving 3 mi. of 10-ft. highway slab and a corresponding control section, is being carried out by the Utah State Road Commission in the interest of studying a new method for reducing the scaling of concrete paving during winter weather, and especially after the application of ice-melting chemicals. For the first time in the West, the use of a synthetic resin as an admixture in portland cement is being tried as a solution to this highway engineering problem. Although results of the study will probably not be available for several seasons, the initiating of this comprehensive test, which parallels experimental work already carried out in eastern states, is news of interest to western highway engineers, and is reported briefly in this article.

The Utah State Road Commission, in common with other state highway departments, has been studying, for several years, the problem resulting from the surface scaling of portland cement concrete pavements during winter weather, and particularly as a result of using chemicals for ice removal. At least, this is the commonly accepted cause for much of the scaling which constitutes one of the highway engineering problems in regions of severe winter weather and ice-forming conditions. It is a theory that the use of chemicals—sodium chloride or calcium chloride—on concrete pavements during winter weather has a tendency to introduce solutions into surface voids which, through the wetting and drying cycle, produce crystals that have a progressive action in breaking down the surface structure. This problem of crystaline action, which is accepted by many as a serious factor in surface scaling, has been studied extensively by eastern highway departments, and has been the subject of much laboratory and field experimentation. Although there are other causes which are advanced as of equal importance, the study of this particular problem has attracted widespread attention among materials and testing engineers.

Among the efforts made to improve the characteristics of concrete paving slabs so they would be more resistant to the matter of surface scaling, the New York State Highway Department has introduced the admixture of natural cement, with favorable results being reported. A further development in this test program pointed to the fact that the animal fat, or tallow, which was introduced during the grinding of the natural cement, was the element which contributed to the satisfactory results in the experiments to reduce scaling. There followed further tests with the introduction of tallow to the cement for effecting the satisfactory improvement. About this time, a synthetic resin, marketed under the name of "Vinsol Resin," was introduced as a cement admixture in an effort to secure results comparable to those obtained with the use of animal fat or tallow.

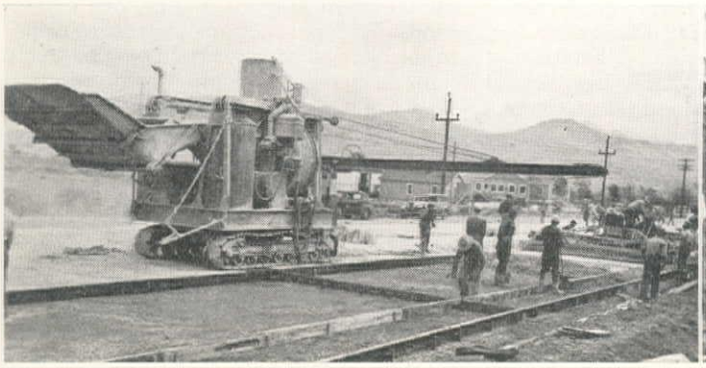
The theories as to the action of this admixture, and definite results on its effect, remain involved in considerable controversy. Current literature contains considerable discussion of the subject as it relates to the experiments made in eastern states. In general, it is believed that the tallow or the resin has a tendency to increase workability, eliminate surface water, and, in general, improve the durability of the concrete surface.

In order to confirm or disprove the effectiveness of this eastern development as it applied to conditions on Utah highways, the State Road Commission authorized the carrying out of an extensive field test on a current highway paving job. The work is considered purely as experimental in so far as the introduction of the resin for scaling reduction is concerned, but it represents the first time that this process has been used on a western highway.

In its present application, the experiment consists of introducing a small amount of vinsol resin to the cement immediately before its final grinding. The admixture is of small volume, representing only 0.05% of the cement by weight, or about ⅔ oz. per sack. One of the Utah cement mills cooperated in this experiment to the extent of making a special grind for this cement and admixture. The cement is exactly the same in appearance as the usual product, and its field use is unchanged from usual procedure.

At the time this experiment was authorized, the Utah State Road Commission had a project which involved the widening of the main highway leading west from Salt Lake City city limits to

SINCE this article was prepared a report of the National Highway Safety Council has been released which recommends the use of chemically treated abrasives as the best method of controlling ice on pavements, and, as a result, the district engineers of the Utah State Road Commission have been authorized to use chemicals wherever necessary for safety. This decision favoring the use of chemicals for treating icy highways will tend to emphasize the need for solving the scaling problem, according to Levi Muir, Materials Engineer, of the Utah State Road Commission. During the past few years he has been instrumental in having the use of salt eliminated from winter maintenance operations, and reports that "we have had practically no surface scaling on our recent Salt Lake projects." However, as a result of the new authorization for the use of chemicals he has indicated that he will insist on the use of resin-treated cement for future concrete paving projects in Utah.—*Editor.*



**PLACING concrete mixed with resin-treated cement which reduces the tendency for free water to appear on the surface during finishing, and is reported to eliminate factors which promote surface scaling.**

**CURING of the test sections was carried out under a waterproof membrane, as indicated, which was placed on the pavement and held down by small ridges of dirt.**

the municipal airport. This 2-lane portland cement concrete highway was carrying a volume of traffic which made widening imperative. Plans were developed for adding a 12-ft. lane on either side of the existing pavement, and then introducing a raised strip along the center line to effect a divided highway of 4-lane width.

This improvement program provided an ideal situation for the proposed test because one of the strips could be paved as a "control" under normal procedure and materials, with the corresponding lane paved with the concrete using the cement admixture.

The operations were carried out under contract by Christensen and Gardner, Salt Lake City contractors, and included standard procedure. Preparation of the subbase and the adding of selected material for a base course was carried out by the usual methods. Concrete placing was carried out from a paver operating on the existing highway, followed by mechanical finisher and the usual hand floating. Curing was done under a waterproof membrane.

On the lane where the resin-treated cement was used for the mix, inspection and the statements of the concrete crew indicated that the concrete was highly workable, and handled well under the finishing processes. Further, it was observed that there was a definite elimination of excess surface moisture at the conclusion of the finishing work.

The characteristics of the mix in which the admixture was used were as follows:

| | |
|---|---|
| Cement | 94 lb. |
| Sand | 243 " |
| Gravel | 285 " |
| Water | 6⅓ " |
| Slump | 1-2 in. |

### Organization

E. C. Knowlton is chief engineer of the Utah State Road Commission. Levi Muir is materials engineer, and has been directly responsible for the initiating of the present field experiment.

The contract operations of Christensen and Gardner have been carried out under the direction of A. E. Christensen.

# Two Small Projects Approved

THE NEWTON irrigation project in Utah and the Mancos project in Colorado were approved for construction by the Bureau of Reclamation during October. Both projects are of the work relief type and only part of the total costs are reimbursable.

The Newton project consists of 2,225 ac. located in Cache County in north central Utah. Construction will cost an estimated $595,000, of which $350,000 is to be repaid by water users in not more than 40 annual installments.

The project is the seventh "stabilization" irrigation project to receive approval for construction under the Case-Wheeler Act of 1939 and the Interior Department Appropriation Act for 1940 and 1941 which made available $8,500,000 for the construction of "stabilization" work relief projects in the Great Plains and other arid western regions.

The projects aim at steadying the agricultural life of the regions in which they are located. They will employ WPA relief labor and CCC boys in their construction, and will offer settlement opportunity for landless and jobless farmers and their families including drought refugees. This type of project not only provides work relief employment necessary in the locality but also creates sound irrigation structures of permanent value. Investigation shows that the irrigation development of a single acre of land in the Great Plains region stabilizes the livestock and agricultural operations of 20 to 25 neighboring acres.

The Newton project is the smallest of the seven work relief projects in both acreage and cost. Largest is the Buffalo Rapids project in eastern Montana. The six projects previously approved, their location, acreage, total estimated cost and the portion reimbursable under Reclamation law, are as follows: Buffalo Rapids, Mont., 27,100 ac., $3,675,000 - $1,360,000; Buford-Trenton, N. Dak., 13,400 ac., $1,500,000-$630,000; Rapid Valley, S. Dak., 12,000 ac., $2,910,000-$1,-230,000; Mirage Flats, Neb., 12,000 ac., $2,560,000 - $985,000; Bismarck, N. Dak., 4,876 ac., $590,000 - $250,000; and Eden, Wyo., 20,000 ac., $2,445,000 - $1,200,000.

The Newton project lands are located near the towns of Newton and Clarkston, Utah. The proposed work involves the construction of a reservoir of 5,200 ac. ft. capacity on Clarkston Creek to supplement the water supply for 1,660 ac. of irrigated land and to provide a full supply for 565 ac. of good arable land, all near Newton, Utah. The Clarkston area, above the reservoir site, will participate in the project to the extent that unlimited diversions will be possible in the irrigation season, instead of 15 days out of 20, as at present.

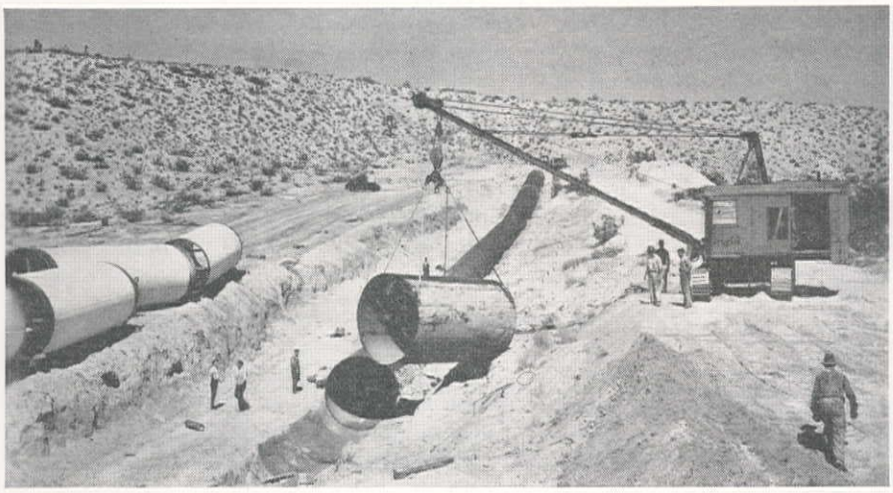
The principal engineering feature of the project will be an earth-fill dam 109 ft. high above the steam bed, and 640 ft. long on the crest. The water distribution system has already been constructed. The Bureau of Reclamation will construct the dam, reservoir and appurtenant works, operate the dam after it is built and negotiate contracts with the water users for the repayment of construction charges.

The Mancos project is the eighth "work relief" irrigation development approved by the President for construction by the Bureau of Reclamation. It is the second within a week. It is estimated to cost $1,600,000, of which $680,000 will be repaid by the farmers in not more than 40 annual installments.

The Mancos project lands comprise 10,000 ac. in Mancos Valley, one of the oldest irrigated sections in western Colorado. The valley was settled over 60 years ago. At present it is practicable to raise only grain and forage crops even though the soil and climate of Mancos Valley are adapted to other crops. Only 5,000 of the 10,000 acres in the project area have been actively cultivated in recent years.

The construction of the project by the Bureau of Reclamation will provide a dependable supplementary supply of storage water. The storage will protect the valley from drought and permit more diversified farming.

# Replacing 11-ft. Steel Siphons



**Sections of the structures on 27-year old Los Angeles Aqueduct between Haiwee and San Fernando reservoirs prove to be too light — Careful planning required for shutdown and construction schedule**

By E. S. MAMRELLI
Office Engineer
Los Angeles Aqueduct Division, Bureau of Water Works & Supply, Department of Water & Power, Los Angeles, Calif.

ON Nov. 1, 1940, after nearly 27 years of almost continuous service, the Los Angeles Aqueduct has again been placed in use following a shutdown of forty-five days for the first major replacement of steel siphon pipe, made necessary by time and service. The following summary of this reconstruction work recently undertaken on portions of the large diameter steel inverted siphons may be of possible interest to many readers.

This great carrier brings to the City of Los Angeles the waters from the melting snows and mountain springs in the High Sierra Mountains in Inyo and Mono Counties through 233 mi. of canals, covered conduit, tunnels, reservoirs, and steel inverted siphons.

After five years of construction, costing approximately $23,500,000, this aqueduct was placed in service on Nov. 5, 1913, and approximately 12 mi. of inverted steel siphons varying in diameter from 7½ to 11 ft. were included in the 233 miles of length. These siphons were necessary to span the deep canyons encountered along the tortuous route. In the years that have intervened since the completion of the aqueduct, population of the city has tripled and its area and distribution system have increased to a point where the continued service of the aqueduct has become an indispensable necessity. Large industrial consumers, as well as individual house owners and apartment dwellers, depend upon this great artery for the continued replenishment of the life-stream of the metropolis.

### Shutdown carefully planned

The City of Los Angeles receives more than 70% of its water supply from the Los Angeles-Owens River Aqueduct, therefore, far-sighted planning is necessary if strict rationing of water is to be avoided during an aqueduct shutdown of more than a few days. The time of year must be chosen when consumption is at a minimum and all the distribution reservoirs must be filled to capacity, and the collecting system balanced before actual secession of service. Proposed work upon the aqueduct must be thoroughly planned in detail and the duration of time and storage carefully estimated.

Any protracted shut-down during the run-off season when the mountain streams are swollen by the melting snows, as well as during the subsequent summer months when warm weather encourages extensive use of water in the city, is impossible. Thus the only possible time when work of protracted length may be performed is in the fall or early spring.

In the high mountain country, where most of the aqueduct is situated, freezing temperatures and bad weather are the rule rather than the exception during winter months. It may therefore be understood that the performance of work on the Los Angeles Aqueduct must not only include protection for new work from injurious frost action, but also must surmount the many difficulties attributable to inclement weather. Work completion must be achieved within the time limit prescribed in order that the water supply of one and a half million people will not be curtailed.

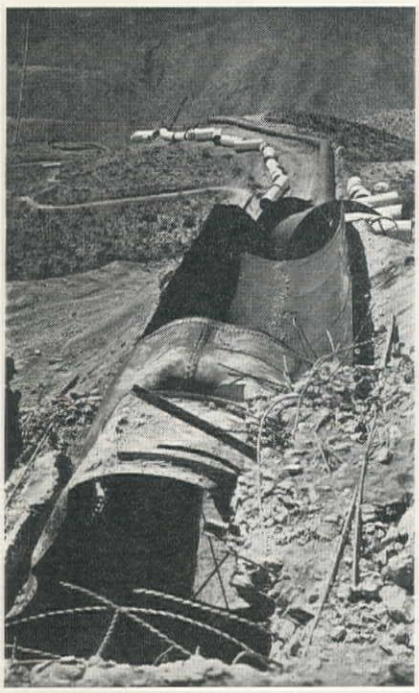
### Light siphons replaced

In the aqueduct system there are fourteen steel siphons and for the past few years repairs have been necessitated by small leaks in the lighter steel plate forming the upper and lower ends of the siphons. A study of the causes for these leaks indicated that the portions of pipe fabricated from ¼ and 5/16-in. plate were too light to withstand the recurrent stresses occasioned by the surge of the water. This surge occurs at the upper ends of the siphons where the pipe is often only partially filled and causes a constant flexure of the steel. The plate buckles at the supports when not under pressure and has a tendency to collapse when the siphons are emptied. These actions, together with gradual corrosion, have worn out the lighter sections. Siphons upon which work was found necessary are situated between Haiwee and San Fernando reservoirs.

The accompanying table presents pertinent data on the siphons in the system.

### Pipe protection

Coal tar primer and coal tar enamel were furnished by the Bureau of Water Works and Supply—all other materials, equipment and labor were furnished by the contractor. All interior of pipe was coated with coal tar enamel in the steel fabrication plant with the exception of the ends which were welded in the field and painted at the job site. Exterior surfaces of the welded steel pipe and appurtenances exposed to the weather received a shop coat of synthetic red lead enamel, a shop coat of synthetic white enamel, and a finish coat of aluminum paint. Pipe which was buried was painted with coal tar primer, coal tar enamel, and



**DEMOLITION is started on the transition structure and old 10-ft. steel pipe at the north end of Big Jawbone siphon.**

a finish coat of water resistant whitewash.

Original design and construction of the fourteen riveted steel siphons did not include installation of anchor blocks. Sufficient flexibility in the riveted joints on the steel pipe eliminated the necessity for anchor block installation on the vertical and horizontal angles and protected, to a great extent, the concrete transitional structures at both ends of the siphons. This flexibility is not obtained in welded steel pipe, therefore, anchor blocks are necessary at vertical and horizontal angles to retain the welded pipe in place.

Included in the contract is (1) construction of new reinforced concrete transitional structures, anchor blocks at all vertical and horizontal angles of pipe exposed to the weather, and piers; (2) demolition of existing transitional structures, piers; (3) dismantling and disposing of the old riveted pipe which was replaced; (4) all excavating and backfilling incident to the work. Advantage was taken of this required replacement to improve upon design of alignment and grade of siphon pipe where economically feasible.

### Six siphons replaced

The siphons chosen for renewal at this time were the Dove Springs, San Antonio, Big Jawbone, Deadman, and Soledad.

The contract covered the following estimated quantities:

Electric fusion welded steel pipe—3/8-in. wall thickness with protective coating, furnished and installed complete:

8 ft. 6 in. Inside Diam.—1746 lin. ft.
10 ft. 0 in. Inside Diam.—5251 lin. ft.
10 ft. 3 in. Inside Diam.—1724 lin. ft.

Removal and disposition of riveted steel pipe of 1/4 and 5/16 in. wall thickness:

9 ft. 0 in. Normal Diam.—1727 lin. ft.
10 ft. 0 in. Normal Diam.—2326 lin. ft.
11 ft. 0 in. Normal Diam.—4175 lin. ft.

Demolition and removal of 766 lin. ft. of 10-ft. I.D. concrete pipe.

Common excavation—68,000 cu. yd.
Rock excavation—6,000 cu. yd.
Screened backfill—7,500 cu. yd.
Common backfill—7,300 cu. yd.
Concrete:
Piers—870 cu. yd.
Anchors—5,167 cu. yd.

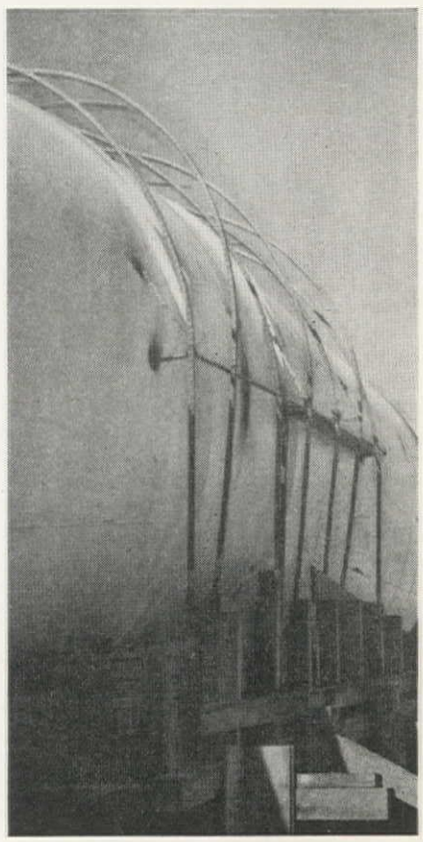
Reinforced concrete transitional structures were scheduled for lump sum price on each structure as detailed:

9 simple transitions for $26,323.00.

Total contract price for entire construction on the five siphons involved amounted to $496,253.50.

### Fabrication

With the exception of angles and closing sections the pipe was fabricated in 30-ft. lengths weighing approximately 8 tons each. The Dove Springs and San Antonio siphons span small canyons with relatively flat slopes through sandy soil. These two pipes are buried and have a maximum cover of 1½ ft. of screened backfill. Jawbone siphon traverses one of the steepest and most rugged canyons along the aqueduct route and the length of pipe, together with the rugged terrain encountered in this canyon, necessitated the construction of a special dolly to transport the pipe to the job site. Several curves had to be widened and two underpasses beneath the old siphon deepened and widened to permit the dolly and tractor clearance.



**REINFORCING steel in place for an anchor block on Big Jawbone siphon. Concrete was poured with the pipe under water pressure.**

Work at this latter siphon was started simultaneously at both ends of the old riveted steel and as new pipe was installed the water level in the siphon was raised and kept as nearly as possible up to the new work; this water was carried in 4-in. pipes from its source behind sack dams in the aqueduct tunnel. The water in the pipe helped maintain a more even temperature, therefore allowing a minimum of expansion and contraction due to temperature variations.

Anchor blocks which were placed at all vertical and horizontal angles on all exposed pipe were poured up to the saddle only. The concrete was poured in the upper portions with water in the pipe under pressure. This method was used to assure maximum roundness in the steel pipe and to obtain as nearly as possible

## PERTINENT DATA ON SIPHON REPLACEMENTS

| Siphon | Diameter | Thickness | Length | Length of replacement |
|---|---|---|---|---|
| | ft.—in. | in. | ft. | ft. |
| Nine Mile | 9 6 | 1/4 to 5/16 | 1,408 | 1,408 |
| No Name | 9 3 | 1/4 to 9/16 | 2,017 | 1,131 |
| Sand Canyon | 10 0 & 8 6 | 1/4 to 9/16 | 2,508 | 757 |
| Grapevine | 9 3 | 1/4 to 9/16 | 2,340 | 885 |
| Dove Springs | 9 0 | 1/4 | 1,032 | 1,032† |
| San Antonio | 9 0 | 1/4 | 695 | 695† |
| Big Jawbone | 10 0 to 7 6 | 1/4 to 1 1/8 | 7,096 | 1,836† |
| Little Jawbone | 10 0 | 1/4 | 1,000 | 1,000 |
| Pine Tree | 9 0 | 1/4 to 3/4 | 3,802 | 1,043 |
| Antelope | 10 0 | 1/4 to 3/8 | 15,597 | 10,947 |
| Deadman | 11 0 | 1/4 to 1/2 | 3,431 | 1,334‡ |
| | 10 0 | Conc. Pipe | 766 | 766‡ |
| | | | (Replaced with steel) | |
| Soledad | 10 0 & 11 0 | 1/4 to 1/2 | 8,042 | 3,227‡ |
| Quigley | 11 0 | 1/4 | 612 | 612 |
| Placerita | 11 0 | 1/4 | 1,573 | 1,573 |

†Undertaken during recent shut-down.
‡To be undertaken in the spring of 1941.

**PLACING new pipe on Big Jawbone siphon. Work was started simultaneously at both ends and the water level kept as nearly as possible up to the work to maintain an even temperature.**

the working conditions of the pipe and anchor blocks.

### Construction delays avoided

To assure a minimum of delay in construction, special requirements were placed upon the contractor to have all pipe, cement, aggregate, equipment, and labor at the job site before the shutoff of the water would be permitted. Mill test reports were required of all steel plate; tests and samples were required of all reinforcing steel, cement, aggregate, and other materials used in the work.

Rigid supervision was maintained as to the quality of steel, cement, aggregate and other materials used in the replacement work. Bureau of Water Works and Supply inspectors supervised fabrication and coating of the pipe in the steel plant and also enforced specification requirements on all phases of the work in the field.

Dove Springs, San Antonio and Jawbone siphons have been completed and the contractor has performed preliminary work at Deadman and Soledad siphons. It is planned to complete the work on these two siphons during the thirty-day shutdown in January and February of 1941.

Dove Springs, San Antonio and Jawbone siphons are situated in the hills contiguous to Red Rock Canyon, approximately 130 miles north of Los Angeles. Deadman and Soledad siphons are located relatively close to the City—Soledad crosses the Mint Canyon highway and Deadman crosses the Bouquet Canyon road approximately two miles northeasterly of Saugus. This work completes the only major replacement on steel siphons since 1913.

### Organization

Plans and specifications for replacement of portions of the siphons were prepared under the supervision of H. A. Van Norman, chief engineer and general manager of the Bureau of Water Works and Supply, under jurisdiction of the late J. E. Phillips, engineer in charge of maintenance and operation of the Los Angeles Aqueduct. A contract covering this and pertinent work on five of the siphons was let on March 20, 1940, to the J. F. Shea Construction Co. This contract included installation of electric fusion welded pipe of 3/8-in. shell thickness fabricated and coated to meet our standard specifications which are almost identical to American Water Works Association standard specifications Nos. 7A.3 and 7A.5, and steel plates meeting the requirements of A. S. T. M. (A-78-33 Grade-B).

W. F. Rennebohm supervised the contractor's operations. H. L. Jacques, engineer of major construction for the Bureau was in charge of the replacement with M. K. Socha as contract coordinating engineer. Fabrication and coating of the welded pipe was done by the Consolidated Steel Co., at the Los Angeles plant, and pipe was hauled to the job by Belyea Truck Co.

## Will Build Garage Facilities Under San Francisco Park

THE LAST legal barrier which has been delaying the construction of underground storage and garage facilities on the site of Union Square in San Francisco has been removed, and it is anticipated that this important improvement project may be started soon. The plan provides for the development of parking space under the entire block now occupied by Union Square in the center of the San Francisco retail district. The present park would be removed and later replaced exactly in its present condition. Private interests have negotiated arrangements with the San Francisco Park Commission to carry out this project, and the present friendly suit was to determine the legal right of the Park Commission to enter into such an agreement. With the clearing up of this legal problem the beginning of actual construction work may be expected in the near future.

## Western Highway Income $156,729,000 Last Year

HIGHWAY departments of the eleven western states had a total income of $156,729,000 during 1939, and spent $150,415,000, according to reports of the states to the Public Roads Administration. Expenditures were divided into construction, 41.5%; maintenance, 18%; administration, 12% (including purchase of equipment, state highway police and interest on debt); debt retirement, 12%; transferred to local roads and streets, 14%; other highways not on the state sytem, 0.5%; and for non-highway purposes, 2%. The total income and expenditures by states were as follows:

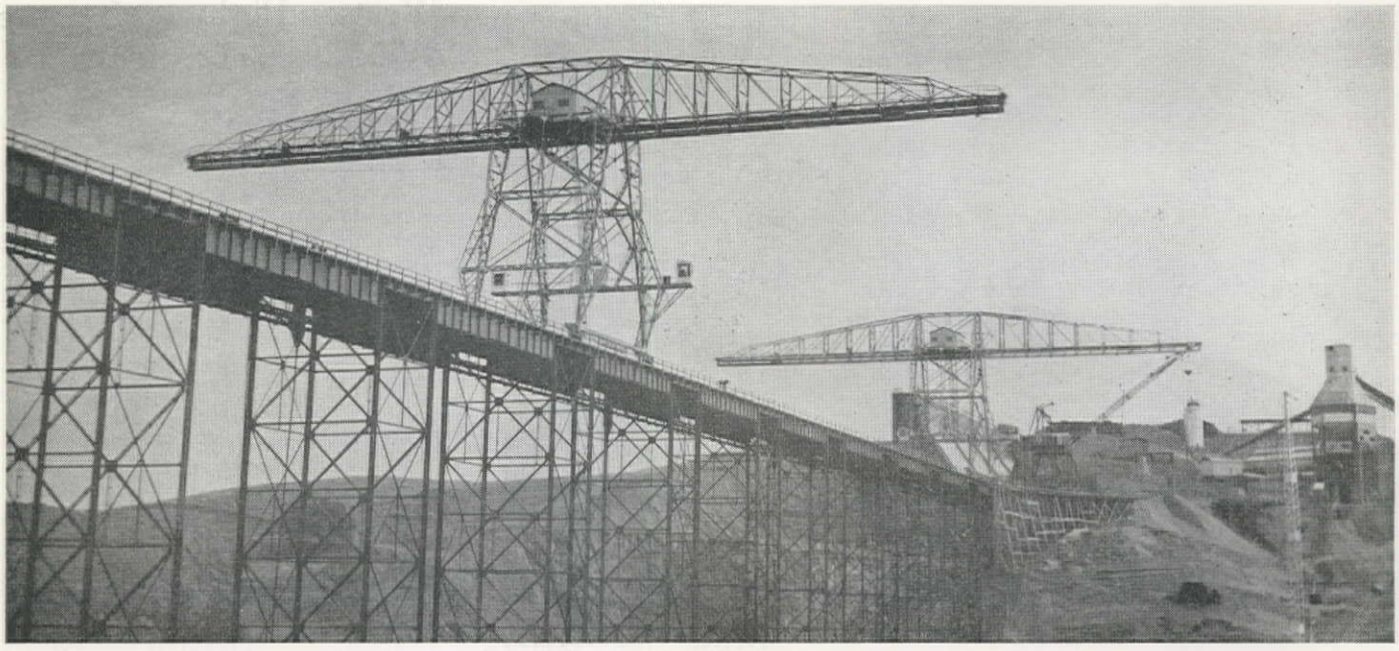
| | Income | Expenditures |
|---|---|---|
| Arizona | $ 6,959,000 | $ 6,598,000 |
| California | 48,846,000 | 41,907,000 |
| Colorado | 13,531,000 | 14,623,000 |
| Idaho | 6,771,000 | 7,064,000 |
| Montana | 10,721,000 | 9,919,000 |
| New Mexico | 11,923,000 | 9,798,000 |
| Nevada | 4,274,000 | 4,064,000 |
| Oregon | 16,907,000 | 16,182,000 |
| Utah | 7,198,000 | 11,332,000 |
| Washington | 24,716,000 | 24,289,000 |
| Wyoming | 4,883,000 | 4,639,000 |
| Totals | $156,729,000 | $150,415,000 |

## Forest Service Allocated Funds for Flood Control

FOR upstream flood control work on the Los Angeles River watershed, the U. S. Forest Service has been allocated $1,410,000 to carry forward the first project of its type in this country. The program, which will involve intensified forest fire control, the stabilization of slides, the revegetation of denuded lands, and the construction of debris barriers, has been developed as a result of extensive experiments carried on by the Forest Service. The benefits of the program are designed to supplement and extend the flood control work now being carried on in Los Angeles County by the U. S. Engineer Department and the Los Angeles County Flood Control District.

The present funds will be allocated almost exclusively to the Arroyo Seco drainage area, but present plans call for an ultimate expenditure of $8,500,000 for the entire river drainage area. A breakdown of immediate expenditures will include the following: $250,000 for fire control; $60,000 for planting and other work on the forest cover; $170,000 for road improvements, and $690,000 for channel barriers and improvements. An area of 31,000 sq. mi. is involved.

The Department of Agriculture considers the Los Angeles River watershed area as an excellent site for an initial demonstration of flood control and water conservation measures in headwater areas. The carrying out of this program, and the results obtained will form a guide to future programs.



# Friant Dam Concreting System

**Trestle 2,200 ft. long is key unit in placing mass concrete—Stiff leg derricks on ground supplement hammerhead and revolving cranes on trestle—Mixing plant capacity 6,000 cu. yd. per hour—Seams treated in foundation preparation**

WITH the foundation excavation nearly finished and the concreting system practically completed, Griffith Co. and Bent Co. have begun the placing of mass concrete in Friant Dam. The concreting system is similar to that used at Grand Coulee Dam in that the concrete is being placed from a high trestle which will eventually be embedded in the dam.

Friant Dam, second reservoir of the Central Valley Project, will be a concrete gravity structure about 320 ft. high and 3,430 ft. long, containing about 2,200,000 cu. yd. of concrete. It is being built on the San Joaquin River, about 20 mi. northeast of Fresno, Calif., where the stored water will be released to the Friant-Kern and the Madera canals. Preliminary work for the structure was started by the contractor about a year ago, and previous articles in *Western Construction News* have described the progress of excavation and the construction of the aggregate processing plant. Earlier articles concerning Friant Dam are listed in a separate tabulation in this article.

### Trestle

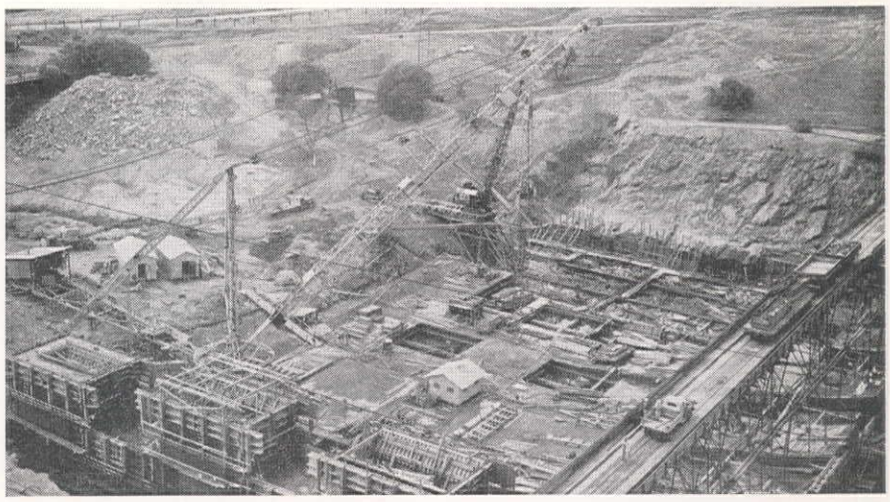
The major part of the mass concrete will be placed from a large trestle 129 ft. downstream from the axis of the dam, extending from block 17 to block 65. The trestle will be 2,200 ft. long and will have a maximum height above bedrock of about 210 ft. In construction, the trestle is similar to that used at Grand Coulee Dam, although it is somewhat lighter, and is slightly different in the deck construction. The deck is supported by 4-column rectangular steel towers of wide-flange sections, with 70 ft. between towers except in the river section where there are two 82-ft. spans and two 73-ft. spans. The deck girders between towers are fabricated from plates and angles, and are about 8 ft. deep. Through the towers, 33-in. WF sections are used. Cross beams are 33 and 36-in. WF sections spaced at 23 to 25 ft., the deck width being 38 ft. The timber deck is made up in rectangular sections of varying size which may be removed for pouring concrete directly under the trestle. Each removable section has sunk in the deck two heavy steel eyes by which the section can be lifted from place.

Erection of the trestle was started at the south abutment, and continues across the river channel by a revolving crane, which was erected directly on the trestle after the first section had been completed. For erection of the towers, a safety net is hung between the columns, and until the decking is completed, a larger section of net is hung between towers below the deck. This main trestle will be used exclusively for concreting, and supports two 294-ft. double hammerhead cranes and two revolving cranes. The crane rails are spaced at 38 ft., with the power cables located along the upstream side of the trestle.

### MAJOR ARTICLES ON FRIANT DAM

Two sets of tracks for the concreting trains extend the full length of the trestle, with an approach trestle of timber construction located near the south end for rail connection with the mixing plant. Air, water and power lines are carried along the girder of the main trestle, and underneath alternate towers are located storage hoppers for sandblast sand.

For handling forms, embedded materials and various items other than concrete, the contractor has erected a smaller trestle about 116 ft. downstream from the main trestle. The service trestle is about 650 ft. long and carries a single track which is connected to the nearby railroad spur. Materials to be placed in the dam can be brought out onto the service trestle where they can be picked up by the cranes on the main trestle. Construction of the service trestle frees the main trestle of all miscellaneous traffic, and permits it to be used for concreting exclusively.



**STIFFLEG derricks are set up at the downstream edge of the spillway apron for concreting in the spillway. Concrete trains operating on short tracks in the spillway aid in spotting buckets and reduce booming of the derricks.**

### Derricks

Two stiffleg derricks, with 180-ft. booms, are being used in a number of different locations for placing concrete and erecting equipment. During the life of the job, they will have been set up at at least five different locations (see map). During the preliminary work and the setting up of the concreting plant, both derricks were located at the south abutment, where derrick No. 1 erected the concreting plant, the first section of the main trestle, the first revolving crane, and derrick No. 2. Derrick No. 2 then erected the second revolver and the two placed concrete in Blocks 8-17. Following completion of the Blocks 8-17, both derricks were moved to the downstream end of the spillway apron, where they are, at present, being used to place concrete in the spillway and training wall sections beyond the reach of the hammerheads. When the spillway has been completed, both derricks will be moved almost directly upstream, where they will place mass concrete in upstream sections of the dam which are also out of reach of the hammerheads. Following this, they will be moved to the north abutment to place concrete beyond the north end of the main trestle. Each move requires dismantling the derricks.

In addition to the stiffleg derricks, a 125-ft. guy derrick has been used at two locations, the first being at the downstream diversion dam and the second at the carpenter shop, where it is being used to handle forms.

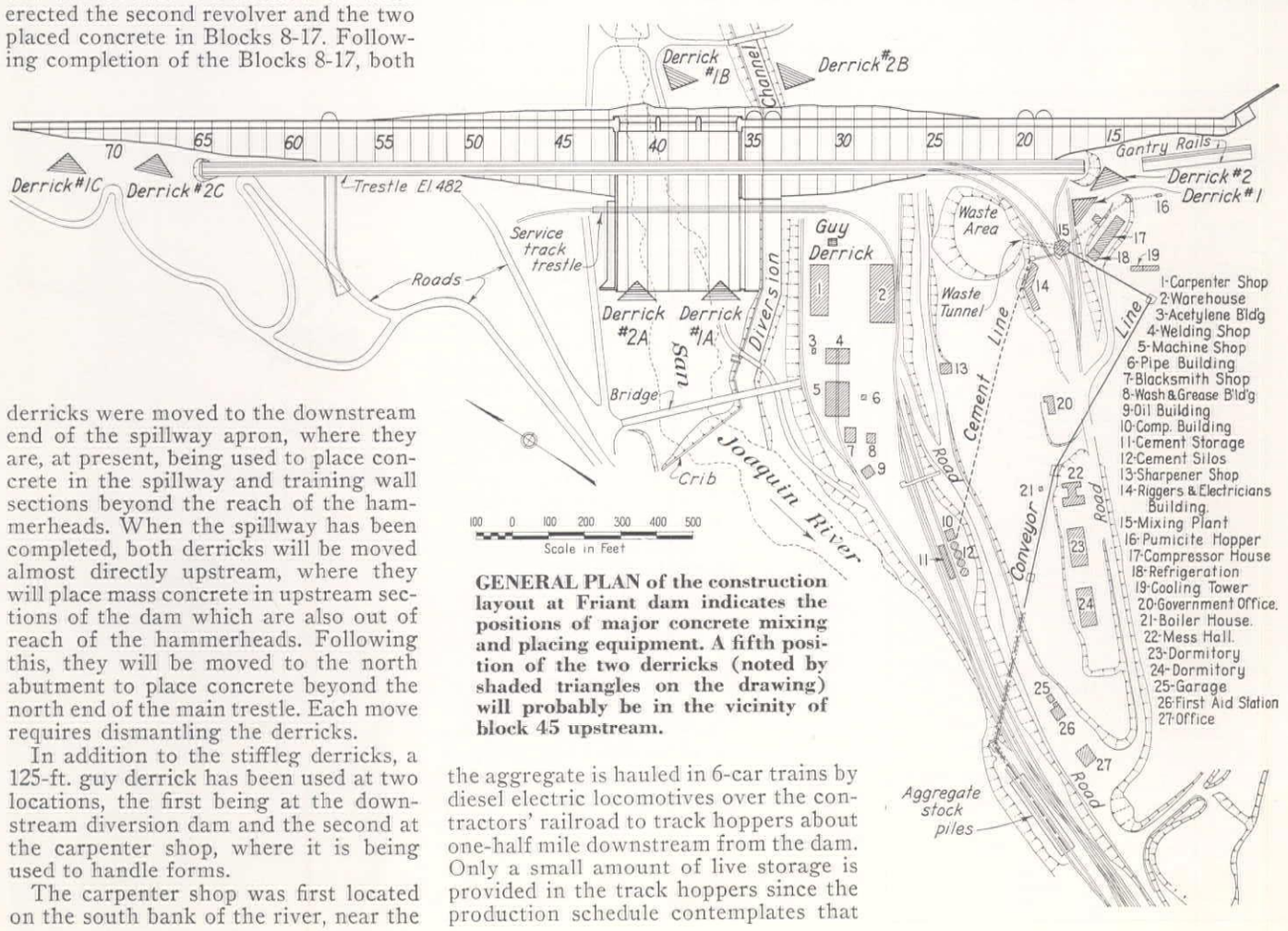
The carpenter shop was first located on the south bank of the river, near the spillway section. Here, most forms have been prefabricated before moving out to the dam. Due to relocation of the river outlet in this area, the carpenter shop is being moved to a location near the aggregate plant 2 mi. downstream from the dam. Forms will be transported to the dam over facilities built for aggregate hauling.

### Aggregate

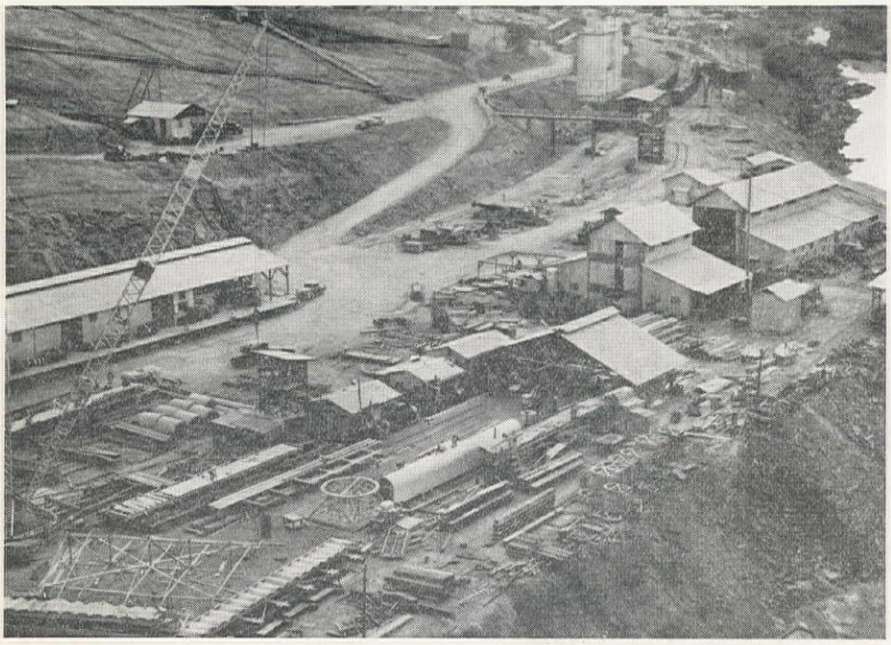
Aggregate is secured and processed at a deposit about 2½ mi. downstream from the dam site. From storage at the plant, the aggregate is hauled in 6-car trains by diesel electric locomotives over the contractors' railroad to track hoppers about one-half mile downstream from the dam. Only a small amount of live storage is provided in the track hoppers since the production schedule contemplates that the aggregate plant will produce material at about the rate required by the plant, and uninterrupted transportation of aggregate from the plant to the dam is possible.

Seven bins in the track hoppers provide 800-cu. yd. storage for each of the three medium gravel sizes, and double that amount for sand and for cobbles. The possibility of pit shortage in the cobble size caused the contractor to install the double storage of this sized aggregate at the plant.

Five flights of 36-in. conveyor belt




**GENERAL PLAN of the construction layout at Friant dam indicates the positions of major concrete mixing and placing equipment. A fifth position of the two derricks (noted by shaded triangles on the drawing) will probably be in the vicinity of block 45 upstream.**



**CARPENTER SHOP is located on the right bank just downstream from the dam. A change in plans will make it necessary to move the shop to a location near the aggregate plant about 2 mi. further downstream.**

carry aggregate from the track hopper 1,900 ft. to the batching bins over the mixing plant. The belt is loaded through air-operated gates, which are operated from a control room over the batching bins.

Pumicite, which is used as an admixture in most of the mass concrete, is hauled by truck from a deposit 3 mi. upstream and stored in a 250 cu. yd. circular steel bin near the mixing plant.

## Major Items of Equipment

**Concrete Plant**
- C. S. Johnson automatic, air-operated batchers
- Koehring 4-cu. yd. tilting mixers (4)

**Cement Handling**
- Fuller-Kinyon remote control unloaders (2)
- Fluxo cement pump

**Cranes**
- Colby double cantilever hammerhead—294 ft. (2)
- American Revolver—125-ft. boom; 54-ft. gantry (2)
- Consolidated Steel Stiffleg—180-ft. boom (2)
  - American 3-drum, 200-hp. hoist (1)
  - American double-drum, 200-hp. hoist (1)
- Insley guy derrick—125-ft. boom
- Lima 2-cu. yd. (2)

**Locomotives**
- General Electric 43-ton electric (3)
  - Cummins diesel engines
- Davenport 10-ton diesel (7)
  - Caterpillar diesel engines

**Refrigeration**
- Vilter Mfg. Co. Pak-icers (3)
- Ammonia Coils
- Designed and installed by Gay Engineering Corp.

From storage, it is conveyed to the plant by a 200-ft. covered conveyor belt. In the batching plant, an extra bin was converted to use for pumicite by installing a small conical hopper within the bin, from which the pumicite could be drawn into the batcher.

### Cement and water

Bulk cement is unloaded from box cars by remote control unloaders into four 5,900-bbl. capacity cement silos. A compressor installation at the cement storage location provides air for pumping cement 900 ft. to the mixing plant.

One of the unusual requirements for mixing the concrete is pre-cooling of the mix before placing. Temperature of the mass concrete, when deposited in the dam, is not permitted to be more than 70 deg. F. during the summer months, and varies from that to 58 deg. F. during winter months. In order to assure these temperatures, the contractors have installed a 2-stage cooling plant adjacent to the mixers. Water is pumped from the job supply intake, about 2,000 ft. upstream from the dam, and cooling water for circulation through the embedded coils arrives at the dam through a 14-in. line embedded in a sawdust-filled flume. It is not precooled.

During the months when artificial cooling is required, water for the concrete mix passes first through a preliminary cooling, which consists of the usual installation of ammonia coils, lowering the water temperature to 32 deg. F.

A second cooling stage consists of three Pak-icers which form a snow-like slush, which is mixed with the 32-deg. water in varying amounts and pumped to the water batcher. Each Pak-icer consists of a closed cylinder jacket inside of which the ammonia expands. Precooled water is admitted to the interior of the machine, freezes on contact with the jacket and is scraped off in the form of fine snow which is flushed out in the excess water and pumped to the mixer supply tank. During the summer months about 10% of the mixing water is made up of ice from these machines. In the late fall months, it has been possible to shut down the refrigerating plant completely, and use water directly from the river.

The batching and mixing plant is of the usual type with storage bins above the batchers, and mixers below. The batching equipment is all air-operated and electrically controlled from a single board. Four 4-cu. yd. tilting mixers are charged from a common collecting cone, and discharged through a common hopper into 4-cu. yd. cylindrical buckets, which are then moved out onto the trestle by small diesel electric locomotives. Each locomotive handles a single car with four buckets, and space for a fifth, to speed the handling by cranes. The locomotives are controlled from a platform on the car, so that a single operator can be beside the buckets at all times. A conveyor has been installed under the mixing plant to remove lost material to a waste area near the plant.

### Concrete mixes

Mass concrete which will be used in the greater part of the structure is pro-

**ERECTION of the trestle has been carried out by one revolving crane as the rest of the work continued. The diversion flume is seen under the trestle at this point.**

portioned as follows (parts by weight of cement):

| Material | Mass Concrete with Pumicite | Mass Concrete without Pumicite |
|---|---|---|
| Sand | 3.14 | 2.51 |
| No. 4–¾ in. | 2.19 | 1.76 |
| ¾–1½ in. | 2.46 | 1.97 |
| 1½–3 in. | 2.81 | 2.25 |
| 3–6 in. | 1.32 | 1.06 |
| Water | .65–.70 | .52–.58 |
| Pumicite | .20 | 0 |

The cement content of the mass concrete with pumicite is 0.8 bbl. per cu. yd. Concrete placed in the spillway, and in the downstream face of the dam through the spillway section, contains no pumicite and proportions, therefore, vary as shown in the third column with a cement content of 1 bbl. per cu. yd. The gravel sand ratio of the concrete is 2.8, and the mix is designed for a slump of 1½ to 1¾ in. These proportions are, of course, subject to minor changes in order to accommodate variations in the aggregate pit grading.

Preliminary tests indicate that the concrete with pumicite has a somewhat lower strength at ages up to about 90 days, but at later ages the strength of the pumicite concrete approaches, and may equal or even exceed that of the concrete without pumicite.

Concrete placing was started in the blocks at the south abutment, and blocks Nos. 8 to 17 have been completed to nearly their finished height. This rather unusual procedure was requested by the contractors in order to place the plant in operating condition, and because additional excavation in the lower foundation was delaying the start of concreting there. At the present time, concreting is being rapidly completed in the spillway, and has been started in the river section of the dam. Much of the concrete in the spillway is being placed by the two stiffleg derricks previously mentioned. In order to save booming up and down, a short section of track has been installed in the spillway under each stiffleg, and the concrete trains take buckets from the hammerhead crane on the trestle above, moving them to a position under the stiffleg boom.

For the first pours in each block, forms are built in place on the rock. As soon as the entire block is off the foundation, prefabricated forms are brought from the carpenter shop and placed on the blocks, being raised as the lifts proceed. Following completion of each 5-ft. lift, the surface of each block is sand-blasted, cooling pipes are placed, and the next lift poured. One of the unusual features of concreting in the dam structure is the fact that blocks are continuous through the entire width of the dam. Along the axis of the dam, most blocks are 50 ft. wide in accordance with the usual practice. Some of the blocks in the spillway section of the dam, however, are as much as 270 ft. long and 56 ft. wide.

Concrete is placed in alternate high and low blocks with a maximum height differential of 15 ft. for adjoining blocks. Each lift of concrete is 5 ft. deep and is placed in 1-ft. layers beginning at the downstream face of the dam. In order to maintain the exposed area of fresh concrete at the most practical minimum, the concrete is built up in successive layers to the full width of the block but over a restricted area. Each layer of concrete is vibrated with internal vibrators.

### Foundation problems encountered.

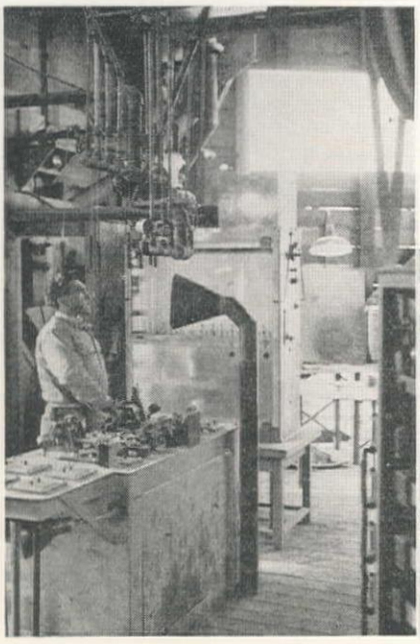
Most of the foundation area was excavated to sound rock by the removal of a small amount of top soil and an average amount of weathered rock varying from 15 to 30 ft. in depth. Preliminary drilling had revealed an area on the left abutment from blocks 24 to 33, striking obliquely across the foundation, that would require the removal of weathered rock to a considerably greater depth than in the remainder of the foundation.

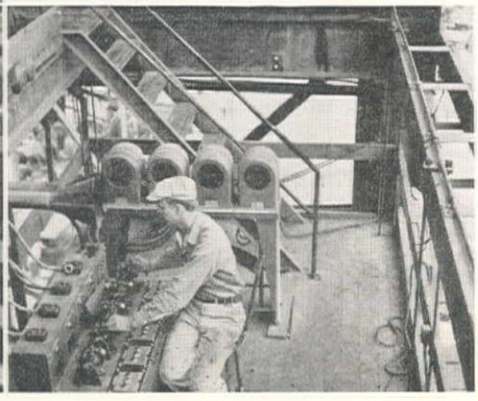
When the excavation had proceeded to a depth that eliminated the weathered and stained rock, it was decided that further treatment of the parallel seams crossing this area was advisable. Generally these seams, which were filled with crushed rock carrying some gouge material, were quite narrow, in places scarcely wide enough for men to work. The dip of the seams was downstream between 65 and 70 deg. They were excavated to depths varying from 8 to 30 ft. depending upon the average width of the seam.

**MIXING plant is located at the south abutment with facilities for direct discharge into buckets on concrete trains.**

In order to increase the percolation factor of the three seams, a shaft was sunk near the upstream end of each and another close to the downstream toe of the dam, six shafts in all. In the wider seams a grouting system was installed on the hanging wall before the seams were backfilled with concrete. Grouting systems were installed in the six shafts with pipes carried to the surface, and a concrete backfill was placed through elephant trunks in 10-ft. lifts. The grouting of seams and shafts is still in progress, being carried on in conjunction with the "B" hole grouting that covers the entire area of the oblique seams.

Diversion of the river channel has been effected by construction of a concrete cutoff wall 650 ft. upstream, which turns the river into a combination channel and flume. The cofferdam is reinforced by an earth fill on both sides, and the contractors have built several smaller concrete walls across the old river channel between the diversion and dam site to reduce the necessary pumping. The downstream diversion structure consists of an earth and timber crib, located just above the outlet of the diversion channel.





**BATCHING controls (left) are all electric and batching equipment is air operated. Weight and consistency of each batch is recorded by the instrument beyond the speaking tube. Mixer controls (below) are likewise electrically operated and the mixers air operated.**

At the present time, the river is being carried through the dam site in a 36-ft. timber flume located in the site of block 34. Outside of the dam structure, the diversion channel consists chiefly of Gunited natural rock surfaces, with some sections of concrete wall.

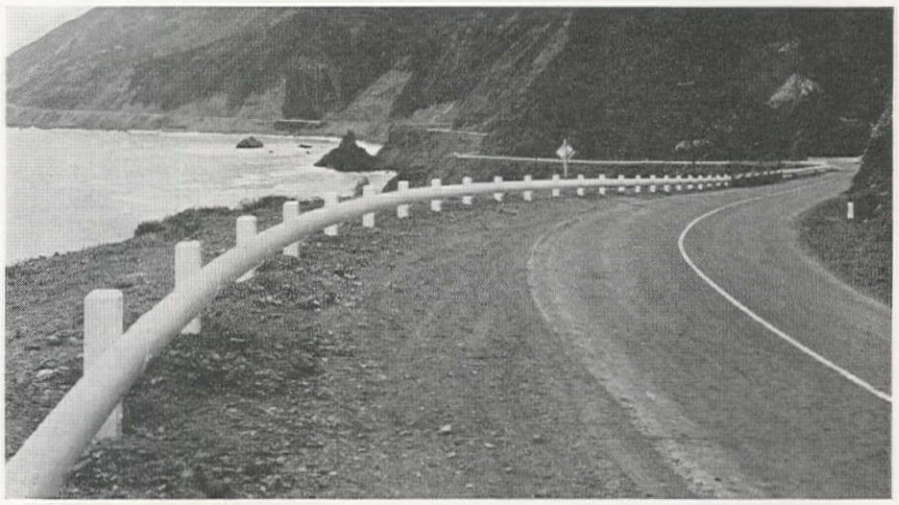
### Organization

Friant Dam is being constructed by the Bureau of Reclamation as the second storage unit of the California Central Valley Project. All work of the Bureau of Reclamation is under the general direction of John C. Page, commissioner, S. O. Harper, chief engineer, and Walker R. Young, assistant chief engineer. J. L. Savage is chief design engineer, and K. B. Keener is engineer of dam design. R. S. Calland is acting supervising engineer of the Central Valley Project. R. B. Williams is construction engineer of the Friant Division, in charge of all work at Friant Dam. J. H. Warner is resident engineer on the dam; D. S. Walter is field engineer; B. L. Pickett is office engineer; O. I. Craft in charge of surveys, and C. T. Douglass is concrete technician.

The work of Griffith Co. and Bent Co. is under the general direction of H. Stanley Bent, project manager, and M. H. Slocum, general superintendent. E. L. Causey is engineer for the contractors. Russell Brown is superitendent of concreting; J. A. McGowan is rigger superintendent; H. S. Bent, Jr., is superintendent of trestle, mixing plant and concrete transportation; J. M. Doyle is superintendent of railroads; Elwin Simpson is carpenter superintendent; P. O. Hayes is aggregate plant superintendent; Guy E. Smith is chief electrician; and J. V. Devine is master mechanic. Frank Backman, assisted by Howard Yocum, is superintendent of embedded metals; James Walker is grouting superintendent, and Al Geiger is superintendent of pumps.

**THREE SEAMS in the foundation on the south side of the river were cleaned and backfilled with concrete. The depth of the excavation varied from 8 to 30 ft. depending upon the width which was generally quite narrow.**

# Thirty Miles of Guard Rail



*California Highways and Public Works.*

THE largest guard rail installation ever placed under one contract in California has recently been completed along the Roosevelt highway (State route 1), better known as the Carmel-San Simeon highway. Extending over a distance of 46.6 mi. between the San Luis Obispo County line to the Big Sur River about 27 mi. south of Carmel, the guard rail actually totals slightly more than 12 mi. in length, and has been completed at a cost of about $80,000.

In July a contract was awarded to the Union Paving Co., San Francisco, for installation of 63,662 lin. ft. of guard rail in 294 different locations along the 47 mi. of highway. An additional installation of guard posts includes some 3,649 units placed in 289 locations covering about 18 mi. of roadside. The two installations together provide protection of more than 30 roadside miles.

For the greatest possible protection and as best adapted to the conditions a beam-type metal guard rail on timber posts was selected for the installation. The rail is supported by steel brackets attached near the bottom of the posts which gives the rail resiliency and tends to absorb the impact of a car with a minimum of breakage.

Posts are redwood or cedar 8x8 in. and 6 ft. long set 3½ ft. into the ground. The steel bracket is of spring steel 7/16 in. thick, 4 in. wide and curved to fit the rail holding it about 5 in. away from the post at the top of the rail. The bracket has a tensile strength of more than 100,000 lb. per sq. in. and is held to the post by two galvanized bolts.

The steel rail itself is 12 in. wide, curved in section, 5/32 in. thick with a tensile strength of more than 80,000 lb. per sq. in. Both edges of the rail are rolled to remove sharp edges which might be dangerous to a car or passenger in case of an accident. The rail comes in 10-ft. sections which can be bolted together for longer installations, and is fastened to the brackets by two galvanized bolts.

In addition to the guard rail protection, locations which were considered less hazardous but where marking was considered essential because of fog conditions, were protected by guide posts 3 x 8 in. in cross-section and 5⅓ ft. long, spaced about 50 ft. apart. To permit quick repairs and replacements in case of damage additional posts, brackets and railing and guide posts were furnished under the contract and stored at the two maintenance stations located within the limits of the contract.

Installation of the guard rail and guide posts was made by the California Division of Highways, C. H. Purcell, state highway engineer. L. H. Gibson is district engineer of District V in which the work was located, and Barney Booker is district construction engineer. Paul I. Wagner was inspection engineer in direct charge of the work for the Division of Highways.

Ray Byers was in charge of the installation work for the Union Paving Co., with Al Sanders as superintendent. U S. Tuthill Beam Type Metal guard rail was furnished by the U. S. Spring & Bumper Co., of Los Angeles, Calif.

# Construction Design Chart

## LX . . . Earth Ditch Discharge—2-ft. Bottom

By JAMES R. GRIFFITH
Professor of Structural Engineering
Oregon State College

THE conventional method for computing the flow of water in open channels is by the Chezy formula:

$$V = C\sqrt{r\,s}$$

$V$ = Velocity, ft. per sec.

$r$ = Hydraulic radius, ft.

The coefficient ($C$) in this formula may be computed by the Kutter formula:

$$C = \frac{\dfrac{1.811}{n} + 41.66 + \dfrac{0.00281}{s}}{1 + \dfrac{n}{\sqrt{r}}\left(41.66 + \dfrac{0.00281}{s}\right)}$$

$n$ = coefficient of roughness

$s$ = slope or grade of channel.

Any chart for the computation of open channel flow which would contain all variables, would be exceedingly complicated. Therefore it has been considered advisable to present a group of simple charts for the more common cases. Earth ditch conditions have been assumed, using a coefficient of roughness of $n = 0.030$ which represents average conditions. Side slopes of 1½ to 1 have been taken. With these assumed conditions, a group of nomographic charts will be presented for channels of various bottom widths.

The accompanying chart has been designed to give the discharge, on the basis of the above assumptions, for a 2-ft. bottom width as indicated. A straight line intersecting all scales is necessary for a solution. A solution line has been drawn for a water depth of 15 in. and a channel gradient of 1.5 ft. per 1,000 ft. On the discharge scale the following values will be noted:

Discharge = 6.6 cu. ft. per sec.

Discharge = 13.2 acre ft. per day.

Table No. 26 of "Handbook of Water Control"[1] gives a discharge of 6.6 cu. ft. per sec. for the above conditions. Table No. 1 of the same reference gives the value 1 cu. ft. per sec. = 1.983 acre ft. per 24 hr. Thus the discharge would also be $1.983 \times 6.6 = 13.1$ ac. ft. per day.

Table No. 17 of "Hydraulic and Excavation Tables,"[2] by interpolation, gives the values

Hydraulic radius, $r = 0.76$

Area, $A = 4.71$

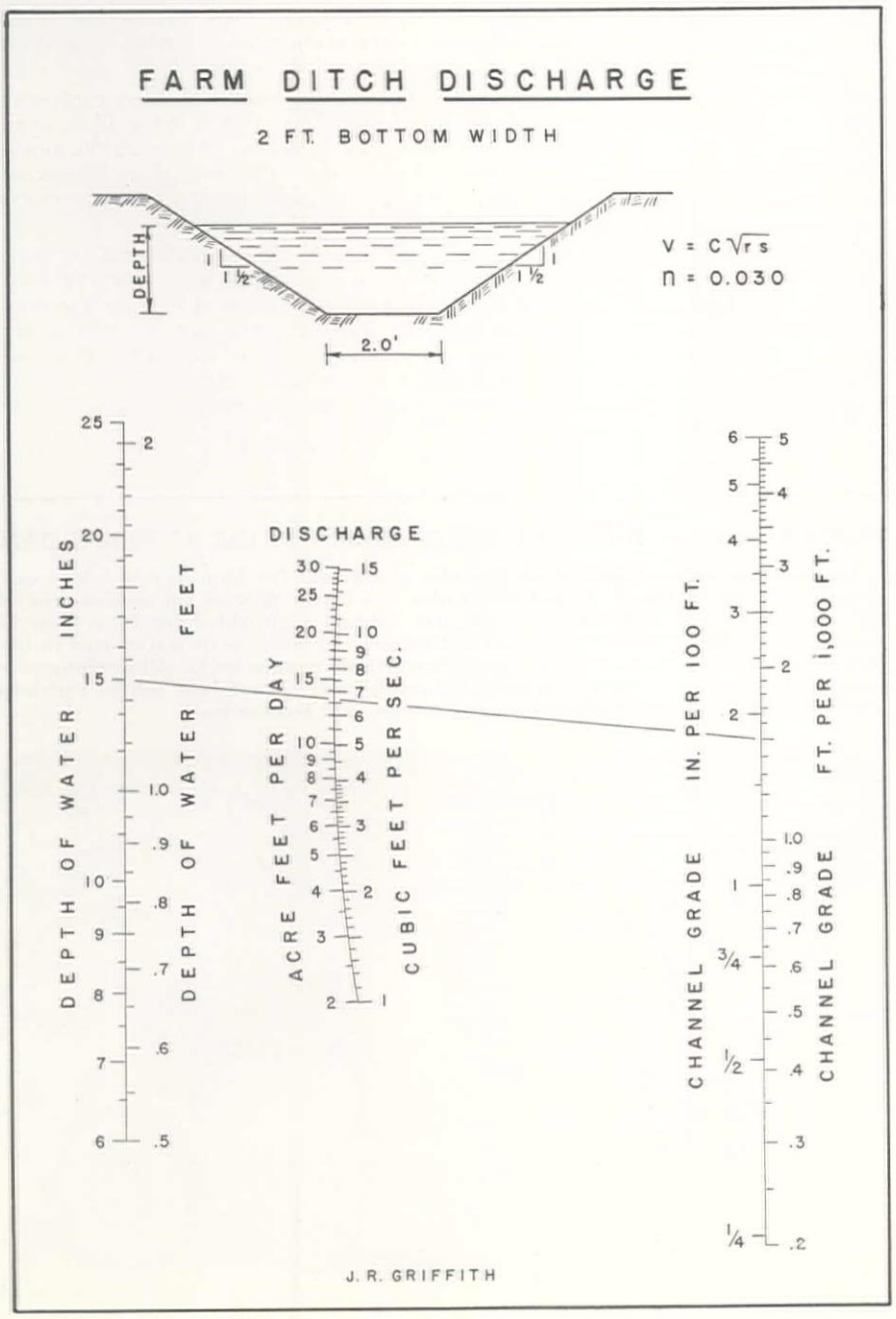
for a bottom width of 2 ft., side slopes of 1½ to 1, and a water depth of 15 in. Table No. 10, of the same reference, for a gradient of 0.0015 and $r = 0.76$, gives by interpolation a velocity of $V = 1.40$ ft. per sec. The computed discharge is then $Q = A\,V = 4.71 \times 1.40 = 6.6$ cu. ft. per sec.

While many tables are available for computing the flow of water in open channels, intermediate values require troublesome interpolations. Such intermediate values are readily obtained from a chart. For example let us assume that it is desired to determine the depth of water for a discharge of 2 cu. ft. per sec. in a ditch of the assumed channel characteristics having a gradient of 0.5 ft. per 1,000 ft. If a line be drawn on the chart through these assumed values, a depth of 11.2 in. will be obtained. Table No. 26, Ref. 1, gives the following values:

| Water Depth | Discharge |
|---|---|
| In. | Cu. ft. per sec. |
| 9 | 1.3 |
| 12 | 2.3 |

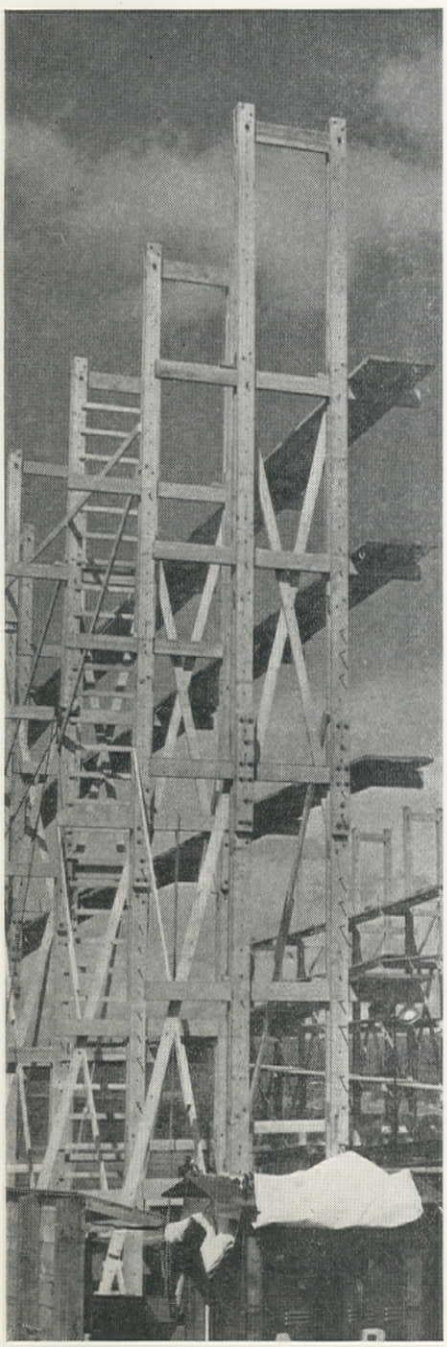
By interpolating between these two values we have a depth of 11.1 in. for the discharge of 2 cu. ft. per sec.

1. Armco Culvert Mfrs. Assoc.
2. U. S. Reclamation Service.




# Prefabricated Wood Scaffold

## SPEED AND ADJUSTABILITY



THE new shipyard of the Seattle-Tacoma Shipbuilding Corp. affords an unusual example in prefabrication of wood in the construction of the scaffolding for the shipways. This scaffolding is a development of the Henry Mill & Timber Co., Tacoma, whose pioneer work in prefabricating Douglas fir lumber was a feature of the Narrows Bridge project.

The new shipyard was started on Oct. 8, 1939, and completely finished Feb. 15, 1940. The main frame of the loft building was erected in two weeks; and the same was true of the shop plate and assembly building. A major factor in such speed was prefabrication (and sub-assembly where possible), much of which was done by the Henry Co. Three million feet of Douglas fir lumber went into the general construction of the plant.

When it came to scaffolding, speed was again of the essence and so was economy. Ready adjustability to varying heights was also imperative to enable the welding crews to carry on without costly delays. The Henry Co. solved all these problems with the fabricated wood scaffolding shown in the accompanying pictures.

There are 20 uprights 44 ft. high, and 100, 54 ft. high. Each upright is made of two pieces of 3 x 9-in. select structural Douglas fir, with 3½ x 8-in. spacing blocks between them, 10 ft. on centers.

The spalls, or cross pieces, are 3 x 9-in. select structural Douglas fir. They rest on pins for which holes 11 in. apart were provided in the framing plant of the Henry Company, where all the framing and prefabricating were done.

The uprights are spaced 5 ft. apart laterally and 15 ft. longitudinally. Diagonal bracing is placed both laterally and longitudinally. Two by twelve select structural Douglas fir is used for scaffold plank.

Of interest, too, is the way each scaffold plank was tested, on a 15-ft. span, was done by means of four 200-lb. blocks of concrete; and attested and stenciled by the Washington State Department of Labor and Industries.

Ordinarily there would not be more than two or three men working on a plank—a maximum of four or five men. Any scaffold plank which showed any sign of distress at all, under this test, was immediately rejected and another brought onto the testing rack to take its place.

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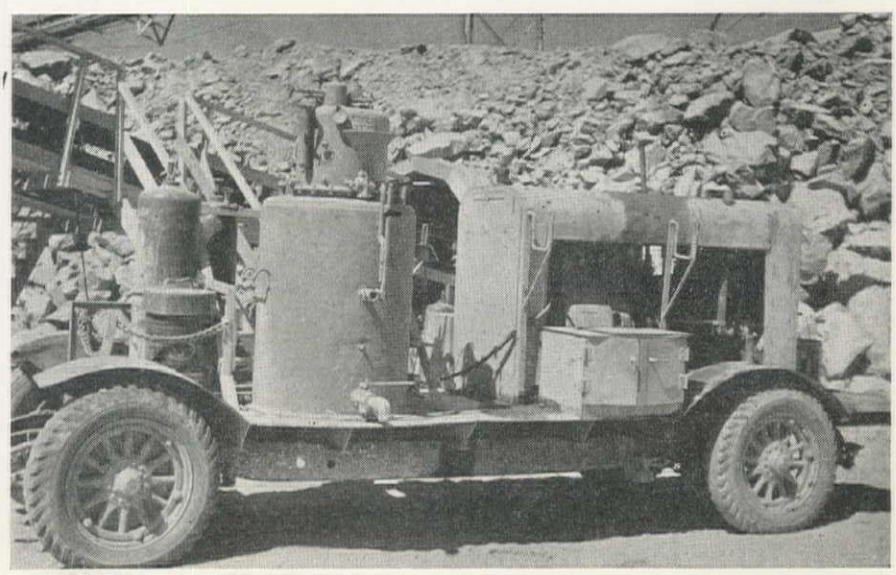
## PORTABLE GAS AND ELECTRIC WELDING UNIT IN USE AT FRIANT DAM

**A combination welding unit which includes equipment for both oxy-acetylene and electric welding on the same portable trailer is a handy item of equipment around the aggregate plant at Friant dam. Electric welding is provided for by a General Electric arc welder powered by a Ford V-8 engine. Acetylene is manufactured in the Oxweld generator and racks on the opposite side hold oxygen tanks. All equipment is mounted on an old automobile chassis that can be towed around the job by a pickup truck. Tool boxes provide space for rods, nozzles and accessories.**



# NEWS OF WESTERN CONSTRUCTION

DECEMBER, 1940


## Defense Contracts Total $50,000,000

CONTRACTS totaling well over $50,000,000 were awarded for construction work in the eleven western states during the month of November by the Constructing Quartermaster division of the U. S. Army and the Bureau of Yards and Docks of the U. S. Navy. In addition to the actual contract awards there were allotted to the Douglas Aircraft Co. of Santa Monica, and the Vultee Aircraft Division, Los Angeles, a total of more than $15,000,000 for plant construction, a large portion of which will be required for construction.

Eighteen contracts exceeded one million dollars in amount, the largest going to Ford J. Twaits Co., Los Angeles, and Morrison-Knudsen Co., Inc., Boise, for construction of an army camp near Paso Robles, Calif., at a price of $6,018,733. The work will consist chiefly of temporary building construction together with water, sewer and gas lines and roads. The same organization also received an additional contract of $3,000,000 for continuation of similar work at Fort Ord near Monterey, Calif., where the firm has been engaged on two contracts totaling well over $6,000,000.

The Hawaiian Dredging Co. and associates who are engaged in constructing the Pacific naval air bases were awarded a $4,244,400 contract for housing units to be erected in Honolulu, and G. L. Tarlton Contractors, Inc., of St. Louis, Mo., were awarded a $4,115,478 contract for erection of hospitals and nurses' quarters at Forts Clayton and Gulick in the Panama Canal Zone.

Sound Construction and Engineering Co., Seattle, Wash., and Peter Kiewit Sons Co., Omaha, Neb., were jointly awarded a contract of $3,075,000 for construction of 540 buildings and two concrete reservoirs at Fort Lewis between Olympia and Tacoma, Wash. Brown & Root, W. S. Bellows and Columbia Construction Co., Oakland, Calif., received an additional $3,116,325 contract for the construction of the naval air station at Corpus Christi, Texas, upon which they are now engaged. W. E. Kier Construction Co., of San Diego, Calif., will construct a troop replacement center at San Diego under a $2,199,492 contract. A $1,970,000 contract for similar construction at Fort Francis E. Warren, near Cheyenne, Wyo., was awarded to Mead & Mount Construction Co., Denver, Colo. The same organization received a smaller award of $248,000 for construction of an engine test building at Hill Field, near Ogden, Utah.

Puget Sound Bridge & Dredging Co. and Rumsey Co., both of Seattle, Wash., were awarded a $2,000,000 contract for construction of a pier at Bremerton, Wash. Other contracts awarded for construction at Bremerton include $1,812,300 to the West Coast Construction Co. for housing facilities and $95,000 to the Austin Co., Seattle, for improvements at the Navy Yard.

Contractors, other than those previously mentioned, who have received awards of more than a million dollars, include Clinton Construction Co., San Francisco, $1,800,000; Hauser Construction Co., Geo. H. Buckler Co. and Natt McDougall, Portland, Ore., $1,142,056; Del E. Webb Construction Co., Phoenix, and White & Miller Contractors, Inc., Tucson, Ariz., $1,140,346; Siems Spokane Co. and associates, Seattle, Wash., $1,628,000; Johnson, Drake & Piper, Alameda, Calif., $1,897,000; Al Johnson Construction Co. and James Leck, Minneapolis, Minn., $1,705,000; E. E. Black, Honolulu, T. H., $1,650,000, and Siems Spokane Co. and associates, Seattle, Wash., $1,575,000.

### Board to Study Tacoma Bridge

TO STUDY the collapse of the Tacoma Narrows Bridge the Public Works Administration has appointed the following board of engineers: Othmar H. Ammann, director of engineering for the New York Port Authority; Theodore Von Karman, director of the Daniel Guggenheim Aeronautical Laboratory at the California Institute of Technology; and Glenn B. Woodruff, consulting engineer, who was design engineer on San Francisco-Oakland Bay Bridge.

## Los Angeles Sewerage Plan Totals $17,580,000

THE city council of Los Angeles has approved the general plan of the city engineer for a $17,580,000 program of improvement to the sewage disposal and sanitary facilities of the

RESERVOIR FORMS BEHIND CONCHAS DAM IN NEW MEXICO

City of Los Angeles. The city council approved the program by a vote of 13 to 1, and referred to committee the matter of submitting a charter amendment to the people at an election next April, which would authorize the levying of a 9-cent tax for a 12-year period to finance the program. In general, the plan calls for work totaling almost $10,000,000 during the first six years, including repairs to the north outfall sewer and the construction of the Hyperion treatment plant. These two features alone represent a cost of nearly $7,000,000. For the following three years of the program, the plans call for $4,000,000 of work, including a treatment plant at Vernon and a submarine outfall line. The final stage of the program from the 10th to 12th year call for about $4,000,000 of construction work, including the completion of the treatment plant at Vernon and a treatment plant in San Fernando Valley.

## Idaho Gas Tax Funds for 1940 Total $5,250,000

IDAHO will collect for gasoline tax purposes to be used on highways more than $5,250,000 during 1940, judging by figures at the conclusion of the November tax collection period. Figures show that for the first eleven months of 1940 the state received $4,849,247, as compared with $4,467,043 for the corresponding period of 1939, and $4,894,029 during the entire year of 1939.

These receipts are subject to two deductions. Ten per cent of the total receipts must be laid aside for refunds to users not using state highways. This includes tractors in the fields and the use of gasoline in woods tractors, motor boats and the like. In 1939 the total use fell slightly below the 10% allowed for this refund purpose. That means a return to the state highway fund. In 1940 there will be a slight increase over the 1939 figures.

Officials of the refund department estimate that there is an average of 50 new claims per month for motor fuel refund (as compared with previous years) which means that the 8500 motor fuel refunds claimed in 1939 will be greatly increased.

Another deduction is a 10% drawback of all revenues in excess of refunds and other fixed charges for the administration of the bureau. The bureau reports a substantial balance, however, in its costs as a result of a rigid economy program put into effect.

Of the more than $4,500,000 net profit accruing to the bureau, about $2,000,000 is earmarked for maintenance on state highways. A large share of this maintenance is attributable to the cost of snow removal on the high plateau roads where drifts frequently attain huge depths.

Despite the fact of a change of administration, the highway bureau is laying plans for the 1941 program, the details of which will not be available for several months.

## "Total Defense" is Theme Of A. G. C. Convention

TOTAL defense—air, military, naval and civil—will keynote the 22nd annual convention of the Associated General Contractors of America, Northern California Chapter, to be held at the Fairmont Hotel, San Francisco, December 20-21-22. This is believed to be the first construction industry convention yet held in the United States to consider modern defense in all its phases. Representatives at the conference will include officials of the Army and Navy, State and civic bodies, general contractors, engineers, material suppliers and industrial leaders.

Defense construction authorities from Washington, D. C., will address the convention. Western speakers will include California State Director of Public Works Frank W. Clark; State Highway Engineer C. H. Purcell; Gordon Garland, Speaker of the State Assembly; Almon E. Roth, president of the San Francisco Employers' Council, and Mayor Angelo J. Rossi of San Francisco, who will open the convention.

During the period June 1 to Oct. 31, 1940, defense building contracts valued at $32,483,000 were let with northern California contractors and contracts of $47,622,000 were awarded southern California contractors. Contracts for defense construction in the Pacific Islands, the Canal Zone and Alaska totalled $67,325,000 during this period.

Over 1500 experts from all branches of the western construction industry are expected to attend convention discussions on defense construction in the western states and Pacific Islands.

## Sacramento River Bridge Repaired and In Service

THE Sacramento River Bridge on the railroad relocation for the Shasta Dam Project has been repaired and is now in service again. This structure is located near Redding at the beginning of the 30-mi. railroad relocation required by the building of Shasta Dam. The flood of last March, which established a new discharge record in this vicinity, damaged two of the bridge piers, requiring the deepening of these foundations.

The American Bridge Co. has recently completed the reconstruction of these two bridge piers, and the structure is again in service and is being used by the Southern Pacific Company to haul ballast for the remainder of the relocation project. Only two major structures remain to be completed on the entire railroad relocation: the Salt Creek Bridge and the Pit River Bridge.

Equipment and steel are expected to arrive shortly at the Salt Creek Bridge site, and erection by the American Bridge Co. will be started at once. This company also plans to begin steel erection work on the Pit River Bridge before the end of the year. Work on the substructure for the Pit River job was reviewed in the November issue of *Western Construction News*. This contract is being carried out by the Union Paving Co., and will be continued while steel erection begins on the approach spans.

This railroad relocation work is being carried out by the Bureau of Reclamation as a feature of the Central Valley Project. Ralph Lowry is construction engineer in charge of the railroad work and the building of Shasta Dam.

## Fifteenth Annual Meeting Of Highway Conference

THE fifteenth annual Rocky Mountain Highway Conference, which is held under the auspices of the Civil Engineering Department of the University of Colorado, will meet at Boulder on Jan. 9 and 10. As in the past, highway officials, contractors and interested agencies will convene at the conference to participate in mutual problems and facts related to the highway industry. Complete programs of speakers and topics will be available the latter part of December.

## San Diego Votes Bonds for Water System Improvements

BOND ISSUES totaling $4,300,000 were voted by the City of San Diego, Calif., last month to provide partial financing for the construction of the San Vincente Dam, a pipe line connecting this storage with the existing system and extensive improvements to the water supply system within the city limits. The dam will be of gravity concrete type, and is estimated to cost about $3,500,000. It will supplement the present storage available for the city, and is necessary because of increased demands through population and industrial growth.

The bonds voted for improvement of the distribution system will provide for $1,300,000 of pipe line construction, including 14,000 ft. of 42-in. line between El Capitan and Murray Reservoir, estimated to cost $250,000, and 24,500 ft. of 24-in. line from University Heights to Old Town Bridge, estimated to cost $250,000. The rest of the work will also include several large size pipe line projects.

## Highway Contractors of Colorado To Hold Meeting

THE Colorado Association of Highway Contractors will hold its eighth annual convention at Denver on Jan. 14 and 15. Convention headquarters will be located at the Shirley Savoy Hotel. It is anticipated that the largest attendance to date will be had.

The program is scheduled to begin

with an intra-industrial luncheon, at which time L. B. Teets, director of Colorado Unemployment Division, will speak on "Construction Records of Experience Plan" and George S. Hallen will talk on "Highway Contractor's Experience with Workmen's Compensation Act." The afternoon will be taken up with committee reports and the report of the managing director. The following day will involve unfinished business of the association with a membership luncheon, at which time election of officers for the ensuing year will be made.

In the evening the annual banquet will be held, with the guest speaker being Col. Willard Chevalier of New York, who will speak on "The Open Road." Following the dinner program a dance will be held for the members and their guests.

## Colorado Engineers to Meet in Denver, Jan. 10

THE Colorado Society of Engineers, the largest state engineering organization of its kind, will hold its twenty-fifth annual convention at Denver on Jan. 10-11. Preparations are now under way to make the two-day program of intense interest to the anticipated attendance of 1500 engineers and members of allied interests. Convention headquarters will be located at the Shirley Savoy Hotel. Ralph Hubbard, engineering director of the development department of Public Service Co., has been named as general chairman, and Richard Lindsey, chief engineer of the Denver office of the Telephone & Telegraph Co., as convention chairman. It is expected to have speakers of national reputation to participate in the two-day program, which will be followed by a banquet and stage entertainment. Porter J. Preston, Bureau of Reclamation engineer, is president of the Colorado Society of Engineers.

## Obituaries . . .

**Edward C. Koppen,** construction engineer for the Bureau of Reclamation at Parker Dam, died Nov. 25, in Phoenix, Ariz. Among the projects on which he had been engaged for the Bureau of Reclamation, before being assigned to Parker Dam, were the Klamath Project in Oregon and California, and the Boise Project in Idaho.

•

**Donald A. Mayo,** 37, inspector for the Bureau of Reclamation at Shasta Dam, near Redding, Calif., was killed on Nov. 3, when a rock slide occurred in a grouting cut at the west abutment of the dam.

•

**George Windsor,** Oakland, Calif., immediate past president of the General Contractors and Builders Association of the East Bay, died Oct. 14 following an automobile accident.

# Washington News

## . . . for the Construction West

By ARNOLD KRUCKMAN

**Washington, D. C.**—The Budget Bureau, early in December, finishes its hearings of the appeals of the Government agencies for funds to operate during the next fiscal year, 1941-42. With the precipitate of these estimates the President will go before the new Congress the middle of January and present his budget. Apparently normal expenditures will be cut to the bone. FDR has intimated that $500,000,000, or 10% of the usual non-defense outlay, should cover next year's ordinary new peacetime outlay. That would apparently mean no new Reclamation projects, no new Federal highways, no new Rivers and Harbors work, and no fresh normal undertakings in the West of interest to the construction industry.

The situation was forecast in these columns, but the condition nevertheless causes considerable confusion and worry here in the Capital. There is nothing certain that enables an agency to determine how far it may go with contemporary jobs, or what it may plan for the next year. The Reclamation people very properly proceed according to the program approved by Congress, and expect to carry on until the White House definitely orders them to do otherwise.

### River and harbor work

There will undoubtedly be considerable shifting of Rivers and Harbors funds from the ordinary peacetime projects to the projects that may be classified as defense undertakings. It is regarded as certain that the defense program will markedly augment the usual Rivers and Harbors work.

At this stage it appears the Federal Aid Highway program will be the chief sufferer. Allocations usually announced at the close of the year have been made and total $134,072,000, which is patently a very steep descent. Allocations as usual have been classified as regular Federal aid, secondary roads, and grade crossings; but it has been made clear here that the States will be expected to spend the Federal money on the roads built for national defense, chiefly as special access roads and streets. Normal highway additions are expected to be abandoned, and all current Federal highway funds, and prospective funds, as well as State and local funds, presumably will be spent on military roads and highways. The long promised military highway report has been shelved.

### Defense contracts

From October 15 to November 15 the West Slope received total defense funds awards and contracts aggregating $258,540,597. Of this sum there was allocated to construction $47,120,801. The grand total of defense awards allocated to the West Slope since July 1 is $1,599,958,302. An analysis made by the National Defense Advisory Commission, as of November 1, revealed that the funds put in work on the West Slope are exceeded only by the sums awarded to the region centering around New York, New Jersey, and Pennsylvania.

It may interest you to know that California is credited with $975,442,000 defense funds, virtually one-seventh of the total expended thus far in the entire nation; and that 60% of this sum has been

### FORT PECK, THE WORLD'S LARGEST EARTHFILL DAM, COMPLETED

**FORT PECK DAM, the largest earthfill dam ever constructed, was raised to its final height of 250.5 ft. above the Missouri River bed on Oct. 11, when J. A. Terteling and Sons moved the last cubic yard of material required to complete their contract for topping out the structure. The Corps of Engineers directed work on the project.**

poured into the Los Angeles area. The Pacific Northwest received a total of $407,965,000, all of which, except $3,000,000, went into the Seattle-Tacoma area. The Denver-Pueblo area was awarded $6,564,000; Nevada received $2,200,000; and the Salt Lake City-Ogden area received $3,037,000 in contracts. San Diego is credited with $135,202,000; San Francisco, $265,277,000.

### Power shortage reported

We are told here, off the record, that the West is suffering a shortage of power. However, authentic sources also reveal that this power shortage is growing in every industrial center of the United States. They say, however, that the Los Angeles area feels the pinch most acutely; and that you need more power in San Francisco, in the Seattle-Tacoma area, in Portland, and in the Denver area and around Salt Lake City and Ogden. They tell us there also is a power shortage in prospect down in some areas of New Mexico.

Apparently potentials at Boulder Dam are to be rushed to production as a national defense emergency; and other potentials in the Bonneville-Grand Coulee development are to be brought to production by every method of forced development. They talk here about the power that should be brought into use as swiftly as possible from the Central Valley and other projects; and from the works in the intermountain and plains region.

Philip Norton, of Philip Norton, Inc., Los Angeles, was appointed special housing consultant for the National Defense Advisory Commission, with headquarters at Los Angeles. It will be his job to tell builders what the Defense people want. Winters Haydock, San Francisco, has been brought to the Capital as Regional Coordinator for the National Defense Advisory Commission. He is a growing influence in problems of all kinds that concern the West.

### Lumber production

The National Defense people have announced that Oregon and Washington will produce 7,500,000,000 ft. lumber for the emergency; and that the Western Pine region will contribute 5,000,000,000 ft. The Federal Government seeks to purchase 2,100,000,000 ft. immediately, and the United Kingdom has asked for an unnamed large quantity of hard and soft woods. The buying for Government, we are told here, is chiefly done on the Pacific Coast by Lt.-Col. C. O. Thrasher, Ft. Mason, Calif., chief procurement planning officer for all the western district.

Persons with technical training or equivalent practical experience, will be trained for defense jobs by the Federal Government as production engineers, supervisors, designers, inspectors, in industries of construction, building, and materials, chemicals, explosives, aircraft structures, power units, instruments, machinery, equipment, tools, dies, and as physical metallurgists and marine engineers. The U. S. Office of Education is in charge and Congress has provided $9,000,000 to pay the bills.

## *Personally* speaking...

**Russell G. Cone,** chief engineer of the Golden Gate Bridge at San Francisco, Calif., has been selected as one of three members of a board to investigate the failure of the Tacoma Narrows Bridge at Tacoma, Wash., for the Washington State Toll Bridge Authority. A separate board of inquiry has been appointed by the PWA.

•

**Fred Nicholson,** for the past several years with the San Francisco-Oakland Bay Bridge, has accepted a position as structural designer in the Panama Canal Zone, and is now located in Balboa Heights, C. Z.

•

**Paul Ritterspach and Eugene Eyer,** engineers with the Bureau of Reclamation, have been transferred from the Colorado-Big Thompson project to the Denver offices, where they are in the dam design department.

•

**John C. Sonnichsen,** formerly assistant city engineer of Pullman, Wash., has accepted a position as bridge draftsman with the Washington State Highway Department at Olympia, Wash.

**John Stearns,** assistant executive director of the Los Angeles County Housing Authority, has accepted a position as principal engineer for the Bureau of Yards and Docks, U. S. Navy, in connection with the construction of a fleet operating base at Long Beach, Calif.

•

**E. A. Lull,** former Denver engineer with the Public Works Administration, has accepted a position as engineer with the Vanadium Corp. of America. His new position is located at the Colorado mine, which is in the central western part of the State.

•

**Lou Osborne,** city engineer of Loveland, Colo., has obtained a temporary leave of absence to supervise the designing and construction of a sewage disposal plant in connection with the defense enlargement construction program at Fort Francis E. Warren, near Cheyenne, Wyo.

•

**Lieut.-Col. R. C. Hunter,** Corps of Engineers, has been appointed district engineer in charge of the Sacramento district of the U. S. Engineer Department. He will also serve as secretary of the California Debris Commission.

•

**Kenneth A. Godwin,** formerly regional director for the PWA at San Francisco, is now a member of the civil engineering staff of the 11th Naval District at San Diego, Calif.

•

**N. A. Sansteby,** well known construction plant designer, is now designing engineer for Caddoa Constructors on John Martin Dam, near Lamar, Colo. He is engaged in designing a concrete mixing plant, together with cement handling equipment and the accessory conveyors and elevators.

•

**George Merchant,** Denver enegineer, has been retained by the State of Colorado to design several National Guard structures, including hangars, warehouses and administrative buildings. Merchant has been recognized in Denver construction in the past as a concrete and steel structural designer.

•

**Stevens & Koon,** consulting engineers of Portland, Ore., are preparing preliminary plans for construction of a $9,000,000 ammunition depot for the U. S. Army, near Pendleton, Ore. Construction work will probably start early next year, and will be under the direction of Capt. Robert C. Williams, constructing quartermaster.

•

**Brig.-Gen. John C. H. Lee,** North Pacific division engineer for the Corps of Engineers, has been transferred to San Francisco, where he has taken over the command of the port of embarkation, Fort Mason. Gen. Lee has been succeeded as division engineer by **Col. Richard Park,** formerly district engineer at Mobile, Ala.

•

**Headman, Ferguson and Carollo,** consulting engineers of Phoenix, Ariz., are in charge of the design work for buildings and services to be constructed at Fort Huachuca, Ariz., at a cost of $1,250,000. A cost-plus-a-fixed-fee contract has been awarded to Del E. Webb Construction Co. of Phoenix and White and Miller of Tucson.

•

**M. C. Warner,** formerly materials engineer of physical tests for the Wyoming Highway Department, has accepted a position of junior marine engineer in the Navy Yard at Mare Island, Vallejo, Calif. He is one of a group which has been selected by the Navy Department for specialized training in marine engineering.

•

**Lieut.-Col. C. N. Iry,** district engineer for the U. S. Engineer Department at Fort Peck, Mont., has been transferred to Fort Belvoir, Va., where he will assume new duties in connection with the National Defense Program. Col. Iry was

one of the first army engineers assigned to Fort Peck Dam, and became district engineer a short time ago.

•

**William E. Hoy,** assistant resident engineer at Mud Mountain Dam, near Enumclaw, Wash., has been appointed resident engineer of the project, succeeding Capt. James Lang. **A. H. Rodes,** formerly chief inspector, has been appointed assistant resident engineer, and **Frank Wojack** has been promoted to chief inspector, succeeding Rodes.

•

**Earle H. Carter,** chief field engineer for the Tipton Engineering Co. of Denver, has been sent to Cheyenne, Wyo., where he will have complete charge as representative of the Tipton Co., in connection with an enlargement construction program at Fort Francis E. Warren. Mead & Mount Construction Co. of Denver was awarded the contract by the Government for the construction of the project which includes barracks, water system, streets and sewage treatment plant.

•

**Charles Thompson,** who has served on the engineering staffs of the contracting organizations during the entire construction period of Grand Coulee Dam, has recently accepted a position as engineer for Guy F. Atkinson-George Pollock on the fleet operating base being built by the U. S. Navy at Terminal Island in Los Angeles Harbor. During the last few years, Thompson served on the engineering staff of Consolidated Builders, Inc., in direct charge of form design, construction and handling.

•

**John S. Longwell,** chief engineer and general manager of the East Bay Municipal Utility District, Oakland, Calif., was elected chairman of the California Section, A. W. W. A., during the recent convention in Los Angeles. Other officers of the section for the coming year are **Morris S. Jones,** chief engineer and general manager of the Pasadena Water Department, vice chairman; **Gerald Arnold,** chief water purification engineer for the San Francisco Water Department, secretary-treasurer. **A. C. Beyer,** district manager of Wallace & Tiernan Sales Corp., is chairman of the purification division, and **Claude W. Sopp,** assistant chief engineer and general manager of the Pasadena Water Department, is vice chairman of the purification division.

•

**Burton S. Grant** has been appointed to the position of engineer in charge of maintenance and operation of the Los Angeles Aqueduct, which was recently vacated due to the death of James E. Phillips, an account of which appeared in the November issue.

Mr. Grant, who has been associated with the Division which he now heads since 1927, started his professional career with the Los Angeles Bureau of Water Works and Supply in 1925 after attending the University of California at Los Angeles. His first position was that of draftsman, being promoted in 1927 to office engineer of the Aqueduct Division. In January 1939 he was appointed chief assistant to the engineer of Los Angeles Aqueduct.

During 1939 and 1940 Mr. Grant served as secretary-treasurer of the California Section, American Water Works Association, and at present is a member of the Executive Committee of that Section.

**ARIZONA HIGHWAY OFFICIALS were photographed by the field editor as they stopped to inspect stabilized shoulders near Buckeye, Ariz. Left to right, they are E. W. McIntire, resident engineer; W. R. Hutchins, state highway engineer; R. C. Perkins, district engineer (north); J. W. Powers, materials engineer.**

## *Supervising* the Jobs...

**E. M. McIntosh,** superintendent for White and Miller, contractors of Tucson, Ariz., and Del E. Webb Construction Co., Phoenix, Ariz., is in charge of the construction of buildings and utilities at Fort Huachuca, Cochise County, Ariz. He is assisted by **M. C. Shelley. Ed. G. Shaver** is office manager, and **Louie Graham** is engineer. The contractors presented a joint bid and were awarded the contract on a cost plus a fixed fee basis at $1,250,000.

•

**Morris Schnitzer** is supervising the demolition, removal and salvage of fixed properties of the Exposition Company, and buildings of the State of California, from Treasure Island, San Francisco, Calif. Dulien Steel Products Co. of San Francisco was awarded this contract at $105,000.

•

**W. B. Coombs** is superintendent for the United Concrete Pipe Corp. on the construction of the Antler Bridge, a part of the highway relocation north of Redding, Calif. **Ray Aydelott** is carpenter foreman, and **Bill Arave** is labor foreman. Construction of the bridge piers has been completed by the United Concrete crews and erection of the structural steel is being carried on by crews of the American Bridge Co. Placing of the concrete deck will be completed by United Concrete Pipe Corp.

•

**L. B. DeWitt** is project manager and **Robert Schriber** is general superintendent for Ford J. Twaits Co. and Morrison-Knudsen Co., Los Angeles, in charge of Camp Nacimiento, near Paso Robles, Calif. **Thomas Allen** is chief engineer for the contractor, and **Fred Craddock** is office manager. The contract for $6,018,700 includes temporary building construction, as well as roads and services for a new army camp.

•

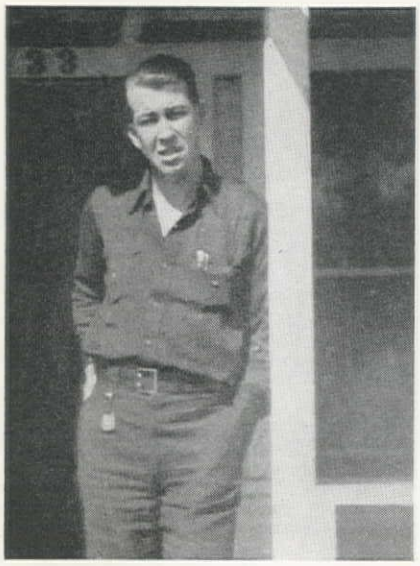
**C. E. Jones** is supervising construction of an AC double hangar at Hickam Field, Hawaii. Robert E. McKee, Los Angeles, Calif., was awarded the contract on a bid of $359,500. **O. L. Wylie** is chief engineer for the project, and other engineers include **C. E. Kistenmacher, R. L. Sargent, A. J. Blaha, H. A. Holland,** and **J. S. McKee. J. D. Neely** is chief clerk.

•

**C. W. Holford** has been appointed general superintendent by Henry Thygesen & Co., Albuquerque, New Mexico, in charge of 15.1 mi. grading, draining, 14 multiple span concrete box culverts and miscellaneous construction on State Highway 26, between Deming and Florida in Luna County, New Mexico. The job was awarded in two separate contracts, one at $96,750 and the other at $78,146. **Paul D. Cross** is grade superintendent.

•

**Lee Davis** is in charge of 21 mi. of grading, draining and miscellaneous work on the Gillette-Douglas Road in Converse County, Wyo. **H. C. Kirby** is



**LEE DAVIS is superintendent of a Wyoming highway job for Sharrock & Pursel.**

bookkeeper on the job which was awarded to Sharrock & Pursel, Casper, Wyo., at $124,070.

•

**L. W. Hanson** has been appointed general superintendent by Gibbons & Reed, Salt Lake City, Utah, for construction of concrete paving and drainage for apron areas at the Salt Lake Municipal Airport, Salt Lake City, Utah. **Wallace L. Smith** is engineer and **Loren Cunningham** is timekeeper on the project. This contract was awarded to Gibbons & Reed at $171,300.

•

**Ivan M. Dobyns** is superintendent for the construction of 237 mi. of transmission lines in Deschutes and Jefferson Counties, Ore. The $168,391 contract is held by Homer G. Johnson, Portland, Ore. **Charles H. Seeman** is superintendent on a similar contract for 90 mi. of transmission lines in the vicinity of Myrtle Point, Ore. The latter job was awarded to the same contractor.

•

**Tom Paul** is supervising the construction of 1,560 temporary buildings for the National Guard troops at Fort Lewis, Wash. **Fred W. Higgins** is foreman of steel construction. The $7,786,000 contract, which was awarded to the Sound Construction and Engineering Co., Seattle, Wash., and Peter Kiewit Sons Co., Omaha, Nebr., is to be completed in 90 days.

•

**A. D. Mullis** and **George B. Davis** are supervising the construction of a 2-story reinforced concrete engineering layout and machine shop building at 1705 Victory Place, Burbank, in Los Angeles County, Calif. **Henry Teeklinburg** is accountant and **H. H. Calvin** is materials foreman. H. W. Baum, of Los Angeles, was awarded the contract at $300,000.

•

**Evald Anderson** is job manager for Rumsey & Co. and Puget Sound Bridge & Dredging Co., both of Seattle, Wash., in charge of constructing a $2,000,000 pier at the Puget Sound Navy Yard at Bremerton in Kitsap County, Wash. **L. G. Murray,** formerly general superintendent for Pontoon Bridge Builders, is superintending construction on the job. This joint contract was awarded on a cost-plus-a-fixed-fee basis.

•

**George Mashon,** superintendent, **Jock Arave,** structure foreman, and **Andy Larsen,** excavation foreman, are in charge of construction of an undergrade crossing and 0.1 grade and surface on approaches under the AT&SF RR at Huntington Drive, Arcadia, in Los Angeles County, Calif. J. E. Haddock, Ltd., Pasadena, Calif., holds the $163,059 contract for this job.

•

**J. A. Sheldon** is supervising the construction of 4.6 mi. of grading and surfacing between Peach Tree Valley and Mustang Ridge in Monterey County, Calif. **Vernon H. James** is timekeeper, and **J. Henry** and **E. F. Lawrence** are shifters. Harms Brothers of Sacramento, Calif., were awarded the contract at $187,013.

•

**Bob Rathgen** is general foreman for Larson Brothers Construction Co. on a highway contract near Kremmling, Colo. **Paul Jenness** is office manager and **Pete Goddard** is master mechanic. **O. H. Lindstrom** has sub-contracted the structures on the project, and is being assisted by **J. H. Davis,** general foreman, and **T. J. Flanary,** carpentry foreman.

•

**Fred Hoops** is superintendent for Hoops Construction Co., Twin Falls, Ida., on 4.7 mi. grading, drainage structures, and surfacing with crushed gravel on the Lemhi Highway in the vicinity of Salmon, in Lemhi County, Idaho. **William Chase** is grade foreman, and **W. Osterloh** is timekeeper. Low bid for the job was $76,905.

•

**I. F. "Ike" Lindsay,** well known bridge superintendent, is supervising the construction of the new bridge across the Kern River, near Bakersfield, Calif., for A. Teichert & Son, Sacramento, Calif. The project also includes construction of a smaller bridge for a 4-lane highway crossing over an irrigation canal.

•

**Van K. Drouillard,** superintendent for Myers Brothers, Los Angeles, Calif., is in charge of the construction of the 1,000-man recruit reception center buildings at Fort McArthur, San Pedro, in Los Angeles County, Calif. **Joseph Hoylen** is labor superintendent. Contract for the job amounted to $287,000.

•

**Donald O. Nelson,** formerly job engineer for the Guy F. Atkinson Co. at Mud Mountain Dam, has been transferred to Long Beach, Calif., where he will be chief engineer for Guy F. Atkinson Co. and George Pollock Co. on the $18,000,000 fleet operating base being constructed for the U. S. Navy Department.

•

**J. C. Moore** has been appointed general superintendent by the W. E. Kier Construction Co., San Diego, Calif., to supervise construction of an army replacement center on Kearny Mesa, near San Diego, Calif. **S. M. Saunders** is purchasing agent for the contractor. Contract price of the job is $2,199,500.

•

**F. A. Norton,** formerly with Caputo and Keeble on the Austin Corners job, is now foreman for the Granite Construction Co., Watsonville, Calif., on the Salinas airport project. The job includes grading for hangar floor, aprons and streets, and is scheduled for completion by the middle of January.

•

**T. T. Mackie** is superintending the construction of a new Post Office building at Gresham, in Multnomah County, Ore. **Lee Adams** is foreman on the job which was awarded to L. F. Dow Co., Los Angeles, Calif., on a low bid of $64,646.

•

**T. H. Taylor** is in charge of highway tunnel construction near Golden, Colo., for Ed Honnen, Colorado Springs. **R. A. Burns** is office manager, **Jack Hatton** is master mechanic, and **J. L. Hayes** is foreman on the project.

•

**H. L. Patrick** will be superintendent for Chester T. Lackey on the Sage Hen Hill Project of the Central Oregon Highway near Burns. The project, which consists chiefly of crushed rock in stockpiles, was awarded on a bid of $18,835.

•

**Lewis L. Sheddy,** superintendent for Kern & Kibbe, Portland, Ore., is supervising work on the north jetty improvement of the Umpqua River, near Reedsport, Ore. Contract price of the job was $723,320.

•

**Guy V. Isbell** is supervising construction of a highway between Antelope Summit and Willow Creek, in Lassen County, Calif., for the Isbell Construction Co. **Earl Stewart** is grade foreman on the job.

•

**Harold E. McNally** is master mechanic for the Utah Construction Co. at Andrews, North Carolina, where an earth and rockfill dam is being constructed for the Nantahala Power Co.

•

**Emil Erickson** is supervising 3 mi. of grading and surfacing on the Whitehall-Butte Road near Butte, Mont., for

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Charles Shannon of Butte. Contract price for the job was $78,690.

•

**S. A. Kapus,** superintendent for Tiffany Construction Co., is in charge of a 10-mi. oil surfacing contract near Showlow, Ariz.

•

**E. R. Porter** is concrete foreman for L. E. Dixon Co. on the government camp job at San Luis Obispo, Calif.

•

**Paul Lukasko** is mechanic and welder for Parish Brothers on the levee job in Sutter County, Calif.

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# UNIT BID SUMMARY

## Highway and Street . . .

### Colorado—Gilpin & Clear Creek Counties—P. R. A.—Surface

Contract awarded to Northwestern Engineering Co., Rapid City, S. D., $154,835, by Public Roads Administration, Denver, for 21.2 mi. grade, surface on Boulder-Idaho Springs Forest Hwy. Rt., Roosevelt & Arapahoe National Forest. Bids were received from the following:

(1) Northwestern Engineering Co. ..... $154,835
(2) Western Paving Construction Co. ..... 155,823
(3) Carl E. Nelson ..... 162,145
(4) Hamilton & Gleason Co. ..... $169,047
(5) Blanchard Bros. ..... 186,020

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| 3,000 | cu. yd. unclassified excavation | 1.40 | .50 | .75 | .75 | 1.00 |
| 330 | cu. yd. unclass. excav. for structures | 2.00 | 1.00 | 3.00 | 2.00 | 4.00 |
| 3,000 | cu. yd. local subgrade reinforcement | 1.40 | .50 | 1.00 | 1.00 | 1.00 |
| 11,000 | ton crusher run top course | 1.20 | .75 | 1.10 | .90 | 1.75 |
| 330 | unit watering | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| 150 | hr. roller operation | 3.50 | 3.50 | 3.00 | 3.00 | 5.00 |
| 1 | ea. furnishing roller | $200 | $100 | $500 | 50.00 | $250 |
| Lump Sum | water plant or plants for project | $200 | $100 | $300 | 50.00 | $250 |
| 150,000 | gal. MC-1 cutback asphalt for prime coat | .08 | .09 | .10 | .095 | .08 |
| 29,000 | ton class "F" dense plant mixture, grade A | 2.15 | 2.56 | 2.20 | 2.75 | 3.15 |
| 2,600 | ton cover aggregate | 4.50 | 3.00 | 3.50 | 4.00 | 4.50 |
| 328,000 | gal. MC-5 cutback asphalt for class "F" | .08 | .08 | .10 | .085 | .08 |
| 110,000 | gal. RC-2 cutback asphalt for class "F" | .09 | .09 | .11 | .095 | .08 |
| 1,000 | lin. ft. 6-in. perf. C. S. M. P. underdrain | 1.10 | 2.50 | 1.25 | 1.75 | 2.00 |
| 71 | ea. concrete maintenance posts | 10.00 | 8.00 | 5.00 | 7.00 | 10.00 |
| 5,000 | lin. ft. wire cable guard rail | 1.15 | 1.25 | 1.25 | 1.10 | .70 |
| 620 | ea. reflector guard posts | 2.00 | 3.00 | 2.00 | 2.50 | 2.00 |

### California—Plumas County—P. R. A.—Grade & Surface

Contract awarded to Isbell Construction Co., Reno, Nevada, $169,559, by the Public Roads Administration, San Francisco, for 5.7 mi. grade, surf., bituminous treat. of subgrade on Rt. 22 North Fork Feather River Natl. Forest Hwy., Plumas Natl. Forest. Bids were received from the following:

(A) Isbell Construction Co. ..... $169,559
(B) E. L. Gates ..... 170,860
(C) Hemstreet & Bell ..... 175,896
(D) Johnston Rock Co. ..... 188,300
(E) Fredrickson Bros. ..... 196,197
(F) Poulos & McEwen ..... 198,000
(G) Heafey-Moore Co. and Fredrickson & Watson Construction Co. ..... 198,938
(H) McNutt Brothers ..... $202,401
(I) Piombo Bros. & Co. ..... 207,659
(J) A. Teichert & Son, Inc. ..... 226,842
(K) Harms Bros. ..... 240,770
(L) R. A. Bell ..... 257,039
(M) Fredrickson & Westbrook ..... 292,942

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( 1) | As req'd F. A. obliteration of exist. road | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | (K) | (L) | (M) |
| ( 2) | As req'd F. A. rem. exist. timber bridges and deepen channel | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 | $500 |
| ( 3) | As req'd F. A. replace irrigation ditch | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 | $200 |
| ( 4) | As req'd F. A. pilot car traffic control | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 | $400 |
| ( 5) | 41 acre clearing | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 | $250 |
| ( 6) | 41 acre grubbing | $250 | $200 | $200 | $200 | $300 | $175 | $170 | $150 | $300 | $280 | $250 | $250 | $400 |
| ( 7) | 258,000 cu. yd. unclassified excavation | 50.00 | $100 | 50.00 | $100 | $125 | 50.00 | 90.00 | 90.00 | $100 | 80.00 | $150 | $200 | $200 |
| ( 8) | 3,300 cu. yd. unclass. excav. for struct. | .23 | .295 | .33 | .30 | .34 | .39 | .35 | .38 | .35 | .45 | .45 | .54 | .60 |
| ( 9) | 31,300 cu. yd. unclass. excav. for borrow | 1.50 | 1.00 | 1.25 | 1.50 | 1.45 | 1.75 | 2.47 | 2.00 | 1.25 | 3.50 | 2.00 | 2.00 | 2.00 |
| (10) | 502,600 sta. yd. overhaul | .20 | .24 | .20 | .25 | .22 | .26 | .30 | .17 | .35 | .25 | .40 | .26 | .40 |
| (11) | 99,800 cu. yd. mi. borrow haul | .01 | .005 | .003 | .01 | .005 | .003 | .006 | .005 | .004 | .003 | .005 | .01 | .01 |
| (12) | 6,254 mi. finishing earth graded road | .10 | .08 | .09 | .12 | .12 | .10 | .094 | .12 | .11 | .09 | .12 | .07 | .15 |
| (13) | 6,000 1,000 gal. watering | $100 | $250 | $250 | $300 | $300 | $250 | $385 | $400 | $400 | $350 | $400 | $500 | $250 |
| (14) | 5.652 mi. shaping, compacting and mixing | 1.25 | 1.00 | 1.00 | 1.25 | .95 | 1.00 | 1.00 | 1.50 | 1.00 | .80 | 1.25 | 2.00 | 1.50 |
| (15) | 530 ton MC-2 cutback asphalt | $500 | $500 | $600 | $750 | $700 | $500 | $500 | $450 | $750 | $620 | $800 | $700 | $600 |
| (16) | 200 cu. yd. blotter material | 16.50 | 17.00 | 16.00 | 17.00 | 16.00 | 13.00 | 18.00 | 20.00 | 17.00 | 16.00 | 16.00 | 17.00 | 17.00 |
| (17) | 710 cu. yd. class A concrete | 2.50 | 1.00 | 2.00 | 2.50 | 2.90 | 4.00 | 3.00 | 3.00 | 2.50 | 2.40 | 2.00 | 2.00 | 3.00 |
| (18) | 93,000 lb. reinforcing steel | 28.50 | 25.00 | 21.50 | 22.00 | 28.00 | 28.00 | 26.00 | 24.00 | 30.00 | 26.00 | 32.00 | 22.00 | 30.00 |
| (19) | 376 lin. ft. 8-in. corr. galv. S. M. P. | .055 | .0525 | .05 | .05 | .05 | .05 | .053 | .05 | .06 | .06 | .06 | .05 | .06 |
| (20) | 64 lin. ft. 12-in. corr. galv. S. M. P. | 1.00 | .90 | 1.00 | 1.25 | .95 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.25 | 1.00 |
| (21) | 2,070 lin. ft. 18-in. corr. galv. S. M. P. | 1.25 | 1.20 | 1.50 | 1.50 | 1.22 | 1.25 | 1.30 | 1.25 | 1.40 | 1.20 | 1.20 | 1.75 | 1.50 |
| (22) | 770 lin. ft. 24-in. corr. galv. S. M. P. | 1.60 | 1.65 | 1.70 | 2.00 | 1.70 | 1.70 | 1.85 | 1.80 | 2.00 | 1.70 | 2.00 | 2.20 | 2.00 |
| (23) | 68 lin. ft. 30-in. corr. galv. S. M. P. | 2.50 | 2.10 | 2.50 | 2.75 | 2.55 | 2.50 | 2.80 | 2.70 | 2.80 | 2.70 | 3.00 | 3.00 | 3.25 |
| (24) | 196 lin. ft. 42-in. corr. galv. S. M. P. | 3.40 | 3.10 | 3.20 | 3.75 | 3.15 | 3.50 | 3.40 | 3.30 | 3.50 | 3.20 | 4.00 | 4.00 | 4.00 |
| (25) | 48 lin. ft. 54-in. corr. galv. S. M. P. | 6.25 | 5.60 | 5.60 | 6.00 | 6.00 | 5.00 | 6.50 | 7.35 | 6.50 | 6.00 | 6.00 | 6.00 | 6.00 |
| (26) | 364 lin. ft. 60-in. corr. galv. S. M. P. | 8.50 | 7.70 | 8.50 | 9.00 | 8.65 | 8.00 | 9.00 | 10.00 | 7.50 | 8.50 | 9.00 | 9.00 | 8.00 |
| (27) | 6 each type A spillway inlets | 10.00 | 9.00 | 9.30 | 13.00 | 9.85 | 8.50 | 10.00 | 11.00 | 12.50 | 10.00 | 10.00 | 12.00 | 10.00 |
| (28) | 4 each 8-in. corr. galv. sheet metal pipe elbow | 18.00 | 11.30 | 15.00 | 20.00 | 15.65 | 15.00 | 17.00 | 15.00 | 15.00 | 17.00 | 15.00 | 15.00 | 20.00 |
| (29) | 2 each 60-in. corr. galv. sheet metal pipe elbow | 15.00 | 9.50 | 5.00 | 10.00 | 5.75 | 10.00 | 8.50 | 5.00 | 8.00 | 9.00 | 7.00 | 7.00 | 10.00 |
| (30) | 368 lin. ft. remove, clean and relay or stockpile exist. C. M. P. | $100 | 95.00 | 70.00 | 80.00 | 92.50 | 50.00 | 75.00 | 75.00 | 90.00 | 90.00 | 75.00 | 75.00 | 60.00 |
| (31) | 65 lin. ft. 90-in. corr. galv. multiplate metal pipe | 1.00 | 1.00 | 1.00 | 1.00 | .85 | 1.00 | 1.20 | .75 | 1.50 | .80 | 1.00 | 1.00 | 1.00 |
| (32) | 50 lin. ft. 90-in. corr. galv. multiplate metal pipe | 20.00 | 16.50 | 19.00 | 18.00 | 18.15 | 18.00 | 20.00 | 19.50 | 20.00 | 23.00 | 20.00 | 23.00 | 20.00 |
| (33) | 380 cu. yd. hand-laid riprap | 25.00 | 20.00 | 23.00 | 23.00 | 22.50 | 20.00 | 23.00 | 24.00 | 26.00 | 27.00 | 24.00 | 25.50 | 25.00 |
| (34) | 90 cu. yd. sacked concrete riprap | | | | | | | | | | | | | |
| (35) | 450 lin. ft. 8-in. perf. corr. sheet metal pipe underdrain | | | | | | | | | | | | | |
| (36) | 150 sq. yd. mortar backfill seal | | | | | | | | | | | | | |
| (37) | 6 each drop inlets—18-in.—type 1 | | | | | | | | | | | | | |
| (38) | 1 each drop inlets—18-in.—type 5 | | | | | | | | | | | | | |
| (39) | 2 each drop inlets—24-in.—type 1 | | | | | | | | | | | | | |
| (40) | 9 each steel inlet covers | | | | | | | | | | | | | |
| (41) | 64 each right of way monu.—type A | | | | | | | | | | | | | |
| (42) | 4 each concrete maintenance posts | | | | | | | | | | | | | |
| (43) | 130 each culvert markers | | | | | | | | | | | | | |
| (44) | 170 each wood guide posts | | | | | | | | | | | | | |

*(Continued on next page)*


# IT TAKES A LORAIN TO STOMACH ROCK LIKE THIS

Run your experienced eyes over this rock job, Mr. Contractor. It's a bruiser from start to finish but a swell spot to test a shovel's guts. Strains, stresses, jolts and jars—you get them all in one big, continuous dose, here, and the machine that can take it and come back for more is capable of socking its dipper into any kind of digging, anywhere.

Does a Lorain qualify on this basis? Again your eyes will give you the answer. Notice how this shovel has cuddled right up to the rock face. It isn't waiting for the material to be delivered in easily digested chunks. It's right in there slugging it out with the toughest digging—and from all indications "The Rock" is on the ropes.

Write today for booklet titled "The Rocky Road to Success." It outlines the features of Center Drive design that put new power, strength and speed into shovel operation—lays more evidence right on the line to prove that Lorains will move rock profitably in every shape and form.

**THE THEW SHOVEL COMPANY**
**LORAIN, OHIO**

THEW CENTER DRIVE

## LORAINS 19 MODELS 3/8 to 2 1/2 YDS.

*Distributed by* LeROI-RIX MACHINERY CO., Los Angeles; PETRIE MACHINERY CO., Billings, Mont.; CATE EQUIPMENT CO., Salt Lake City; LIBERTY TRUCKS & PARTS CO., Denver; COAST EQUIPMENT CO., San Francisco; WILSON EQUIP. & SUPPLY CO., Cheyenne, Wyo.; A. H. COX & CO., INC., Seattle; COLUMBIA EQUIPMENT CO., Portland, Spokane, Boise; McCHESNEY-RAND EQUIPMENT CO., Albuquerque; ARIZONA-CEDAR RAPIDS CO., Phoenix, Ariz.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (33) | 15.00 | 4.00 | 3.00 | 8.00 | 3.50 | 3.00 | 6.00 | 4.00 | 4.00 | 6.00 | 5.00 | 3.50 | 7.00 |
| (34) | 18.30 | 9.00 | 10.00 | 10.00 | 9.50 | 15.00 | 13.00 | 11.50 | 10.00 | 11.00 | 10.00 | 15.00 | 10.00 |
| (35) | 2.40 | 1.50 | 1.75 | 2.50 | .95 | 1.50 | 2.25 | 1.00 | 2.50 | 2.00 | 3.00 | 1.75 | 2.50 |
| (36) | .50 | .50 | .40 | 1.00 | .85 | 1.00 | 1.25 | 1.50 | 1.00 | .80 | 1.00 | 2.00 | 1.00 |
| (37) | 40.00 | 25.00 | 40.00 | 60.00 | 35.00 | 40.00 | 50.00 | 27.50 | 50.00 | 50.00 | 50.00 | 40.00 | 60.00 |
| (38) | 60.00 | 30.00 | 50.00 | 60.00 | 48.00 | 45.00 | 50.00 | 27.50 | 75.00 | 60.00 | 70.00 | 60.00 | $100 |
| (39) | 50.00 | 30.00 | 50.00 | 70.00 | 36.00 | 55.00 | 60.00 | 27.50 | 60.00 | 50.00 | 60.00 | 40.00 | 75.00 |
| (40) | 25.00 | 15.00 | 25.00 | 40.00 | 17.50 | 25.00 | 50.00 | 2.00 | 50.00 | 28.00 | 15.00 | 20.00 | 30.00 |
| (41) | 4.00 | 3.00 | 3.00 | 4.00 | 3.00 | 4.00 | 3.00 | 3.00 | 3.00 | 3.50 | 3.00 | 3.00 | 3.00 |
| (42) | 10.00 | 6.00 | 10.00 | 15.00 | 5.50 | 10.00 | 5.00 | 10.00 | 10.00 | 7.00 | 8.00 | 4.00 | 10.00 |
| (43) | 3.00 | 2.50 | 2.00 | 4.00 | 2.50 | 4.00 | 2.50 | 2.00 | 3.00 | 3.00 | 3.00 | 2.00 | 3.00 |
| (44) | 3.00 | 2.50 | 3.00 | 4.00 | 2.50 | 4.00 | 3.65 | 2.50 | 3.00 | 4.00 | 3.00 | 3.00 | 3.00 |

## Oregon—Josehine County—State—Grade

Contract awarded to M. L. O'Neil & Son, Eugene, $194,923, by Oregon State Highway Commission, Portland, for 1.9 mi. grade, surface and construction of small drainage structures on Sexton Mountain Section of the Pacific Highway. Bids were received from the following:

| | | | |
|---|---|---|---|
| (A) | M. L. O'Neil & Son | $194,923 | |
| (B) | McNutt Bros. | 286,844 | |
| (C) | Leonard & Slate | 264,440 | |
| (D) | Whites Trucking Co. | 248,755 | |
| (E) | A. C. Greenwood Co., Inc. | 318,778 | |
| (F) | Roy L. Houck | 246,783 | |
| (G) | K. L. Goulter | 255,658 | |
| (H) | C. J. Eldon | 291,361 | |
| (I) | Nat McDougal Co. | $334,531 | |
| (J) | Berke Bros. | 263,573 | |
| (K) | Kuckenberg Construction Co. | 273,222 | |
| (L) | J. A. Lyons | 290,800 | |
| (M) | Sam Orino | 282,310 | |
| (N) | A. Teichert & Son | 277,267 | |
| (O) | E. L. Gates | 296,991 | |
| (P) | Frank Penepacker | 276,829 | |

| | | (A) | (B) | (C) | (D) | (E) | (F) |
|---|---|---|---|---|---|---|---|
| ( 1) | 54 acre clearing and cleaning-up | $130 | $240 | $100 | $140 | $250 | $300 |
| ( 2) | 15 acre grubbing | $130 | $195 | $100 | $100 | $250 | $250 |
| ( 3) | 4 acre extra clearing | $130 | $200 | $100 | $140 | $300 | $300 |
| ( 4) | 4 acre extra grubbing | $130 | $150 | $100 | $100 | $300 | $250 |
| ( 5) | 50 sq. ft. felling danger trees | 2.00 | 1.00 | 3.00 | 2.00 | 2.00 | .75 |
| ( 6) | 2,600 cu. yd. trench excav., unclassified | .75 | .90 | 1.50 | 1.00 | 1.50 | .50 |
| ( 7) | 257,000 cu. yd. gen. excav., stas. 566 to 621, unclass. | .18 | .22 | .27 | .22 | .23 | .225 |
| ( 8) | 213,000 cu. yd. gen. excav., stas. 621 to 630+40, com. | .18 | .22 | .27 | .16 | .23 | .225 |
| ( 9) | 135,000 cu. yd. gen. excav., stas. 621 to 630+40, sol. rk. | .18 | .40 | .27 | .52 | .56 | .225 |
| (10) | 27,000 cu. yd. gen. excav., stas. 630+40 to 667, uncl. | .18 | .22 | .27 | .16 | .23 | .225 |
| (11) | 440,000 yd. mi. truck haul | .08 | .15 | .10 | .08 | .14 | .10 |
| (12) | 10,000 lin. ft. rounding cutbanks | .07 | .05 | .07 | .08 | .10 | .06 |
| (13) | 1.85 mi. finishing roadbed and slopes | $300 | $400 | $300 | $300 | $400 | $300 |
| (14) | 750 lin. ft. 9-in. perf. corr. metal pipe | 1.20 | 1.20 | 1.25 | 1.10 | 1.50 | 1.25 |
| (15) | 420 lin. ft. 24-in. extra str. C.M.P., protected inv. | 4.00 | 4.50 | 4.10 | 4.00 | 5.00 | 4.30 |
| (16) | 300 lin. ft. 18-in. concrete pipe | 2.20 | 2.50 | 2.25 | 2.50 | 3.00 | 2.33 |
| (17) | 160 lin. ft. 24-in. concrete pipe | 2.85 | 3.20 | 3.00 | 3.10 | 4.00 | 3.00 |
| (18) | 30 lin. ft. 36-in. concrete pipe | 5.80 | 6.25 | 6.00 | 6.00 | 7.00 | 5.50 |
| (19) | 320 lin. ft. 18-in. extra str. concrete pipe | 2.50 | 2.75 | 2.50 | 2.85 | 3.50 | 2.65 |
| (20) | 1,060 lin. ft. 24-in. extra str. concrete pipe | 3.20 | 3.50 | 3.25 | 3.60 | 4.50 | 3.45 |
| (21) | 850 lin. ft. 36-in. extra str. concrete pipe | 7.25 | 7.50 | 7.00 | 7.00 | 8.00 | 6.75 |
| (22) | 10 lin. ft. metal ditch lining, No. 30 | 1.05 | 1.25 | 4.00 | 2.00 | 1.50 | 1.50 |
| (23) | 30 lin. ft. metal ditch lining, No. 42 | 1.25 | 1.50 | 5.00 | 2.00 | 2.00 | 2.00 |
| (24) | 160 cu. yd. rock or gravel backfill in drain | .90 | 2.00 | 3.00 | 1.50 | 3.00 | 1.00 |
| (25) | 600 cu. yd. class "A" concrete | 18.00 | 22.50 | 23.00 | 20.00 | 24.00 | 22.00 |
| (26) | 90,000 lb. metal reinforcement | .0525 | .05 | .055 | .055 | .06 | .06 |
| (27) | 1,100 lin. ft. guard rail | 1.10 | 1.25 | 1.40 | 1.00 | 1.40 | 1.20 |
| (28) | 800 cu. yd. pit-run gravel in surfacing | .85 | .90 | 1.00 | .85 | 1.50 | 1.00 |
| (29) | 250 cu. yd. ¾"-0" material in surfacing | 2.75 | 3.00 | 3.00 | 2.25 | 3.50 | 2.00 |
| (30) | 70 cu. yd. filler | .35 | .50 | .30 | .30 | .70 | .40 |
| (31) | 70 yd. mi. hauling filler | .20 | .10 | .20 | .10 | .20 | .10 |
| (32) | 60 M. gal. sprinkling | 1.50 | 2.00 | 1.00 | 1.50 | 3.00 | 2.00 |

| | | (G) | (H) | (I) | (J) | (K) | (L) | (M) | (N) | (O) | (P) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ( 1) | | $150 | $250 | $165 | $200 | $150 | $200 | $150 | $250 | $175 | $100 |
| ( 2) | | $150 | $250 | $200 | $150 | $150 | $200 | $100 | $130 | $100 | 75.00 |
| ( 3) | | $150 | $250 | $200 | $200 | $175 | $200 | $150 | $300 | $200 | $100 |
| ( 4) | | $150 | $250 | $200 | $150 | $175 | $200 | $100 | $200 | $150 | 75.00 |
| ( 5) | | 3.00 | 2.50 | 2.00 | 1.00 | 2.00 | 3.00 | 3.00 | 2.00 | 2.00 | 5.00 |
| ( 6) | | 1.00 | 1.50 | 2.50 | 1.00 | 1.00 | 1.00 | .50 | .75 | 1.00 | 1.50 |
| ( 7) | | .20 | .24 | .27 | .24 | .24 | .25 | .22 | .15 | .32 | .20 |
| ( 8) | | .20 | .18 | .27 | .18 | .16 | .22 | .22 | .27 | .22 | .26 |
| ( 9) | | .50 | .58 | .59 | .44 | .38 | .45 | .40 | .58 | .60 | .50 |
| (10) | | .20 | .22 | .27 | .20 | .16 | .25 | .22 | .15 | .18 | .23 |
| (11) | | .08 | .10 | .125 | .10 | .14 | .12 | .15 | .10 | .07 | .10 |
| (12) | | .05 | .10 | .10 | .08 | .05 | .08 | .10 | .10 | .08 | .10 |
| (13) | | $500 | $500 | $300 | $450 | $250 | $500 | $300 | $300 | $200 | $500 |
| (14) | | 1.35 | 1.30 | 1.30 | 1.20 | 2.00 | 1.30 | 1.10 | 1.10 | 1.25 | 1.30 |
| (15) | | 4.25 | 4.35 | 4.30 | 3.95 | 5.00 | 3.75 | 4.10 | 2.85 | 4.00 | 4.10 |
| (16) | | 2.25 | 2.60 | 2.65 | 2.00 | 3.50 | 2.25 | 2.25 | 2.10 | 2.25 | 2.40 |
| (17) | | 3.00 | 3.40 | 3.40 | 2.55 | 5.00 | 3.00 | 3.00 | 3.00 | 2.88 | 3.00 |
| (18) | | 5.50 | 6.36 | 7.50 | 5.25 | 8.00 | 6.50 | 5.50 | 5.50 | 5.60 | 6.50 |
| (19) | | 2.50 | 2.85 | 3.00 | 2.25 | 4.00 | 2.60 | 2.50 | 2.40 | 2.50 | 2.75 |
| (20) | | 3.35 | 3.80 | 3.85 | 2.90 | 5.00 | 3.50 | 4.00 | 3.35 | 3.25 | 3.50 |
| (21) | | 6.75 | 7.60 | 8.00 | 6.50 | 8.50 | 8.00 | 7.50 | 6.10 | 7.00 | 7.50 |
| (22) | | 1.25 | 1.20 | 3.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.20 | 1.60 | 2.00 |
| (23) | | 1.50 | 1.50 | 4.00 | 2.25 | 3.00 | 2.00 | 1.25 | 1.60 | 1.80 | 3.00 |
| (24) | | 2.00 | 2.50 | 3.50 | 2.00 | 3.00 | 2.50 | 1.00 | 2.70 | 2.25 | 3.00 |
| (25) | | 25.00 | 22.00 | 28.00 | 23.00 | 26.00 | 25.00 | 25.00 | 20.00 | 20.00 | 25.00 |
| (26) | | .06 | .05 | .06 | .055 | .06 | .055 | .07 | .06 | .0475 | .05 |
| (27) | | 1.25 | 1.80 | 1.50 | 1.35 | 1.00 | 1.25 | 1.10 | 1.25 | 1.25 | 1.50 |
| (28) | | 1.25 | 1.50 | 2.50 | 2.00 | 2.00 | 1.50 | 1.00 | 1.00 | 2.60 | 1.50 |
| (29) | | 1.25 | 2.50 | 3.50 | 2.50 | 3.00 | 4.00 | 1.50 | 3.00 | 2.60 | 3.25 |
| (30) | | .50 | .40 | 1.00 | .50 | 1.00 | 1.00 | .75 | .50 | .25 | .50 |
| (31) | | .10 | .20 | .50 | .20 | .20 | .25 | .25 | .20 | .10 | .20 |
| (32) | | 2.00 | 3.00 | 5.00 | 1.00 | 3.50 | 3.00 | 2.00 | 2.25 | 1.00 | 3.00 |

## California—Los Angeles County—U. S. E. D.—Grade

United Concrete Pipe Corporation, Los Angeles, $648,414, low to U. S. Engineer Office, Los Angeles, for Los Angeles River Improvement located along the Los Angeles River from a point 305 ft. downstream from the center line of Randolph Street, to a point 415 ft. downstream from the center line of Stewart and Gray Road, in the cities of Bell and Southgate and adjacent unincorporated area of Los Angeles County. The work to be done consists of furnishing all necessary plant, equipment, labor, and material (except cement to be furnished by the Government) for channel improvements and appurtenant work complete. It includes the following principal items of work: Care of water and drainage during construction; removing existing structures and obstructions; common and structure excavation; furnishing and driving steel sheet piles; compacted and uncompacted fill and backfill; rock toes and paving; concrete for grouting rock toes and for miscellaneous structures; and plant-mixed surfacing. Between Randolph Street and Stewart and Gray Road, the existing channel is trapezoidal in section with ungrouted rock paving on the channel banks and ungrouted rock toe protection. The existing rock toe protection will be removed and replaced with grouted derrick stone toes. A portion of the existing ungrouted rock paving will be removed and replaced with grouted

*(Continued on next page)*

rock paving, and concrete parapet walls will be constructed along the top of the channel banks. In addition to the above improvement of the existing channel, a section of trapezoidal channel with grouted rock paving on the side slopes and derrick stone toes will be constructed downstream from Stewart and Gray Road. Bids were received from the following:

(A) United Concrete Pipe Corporation....$648,414
(B) Floyd Shofner ..... 686,617
(C) Griffith Co. ..... 692,965
(D) Winston Brothers Co..... 693,368
(E) J. E. Haddock, Ltd..... 738,164
(F) Ralph A. Bell.....$786,212
(G) Oswald Bros. ..... 793,424
(H) W. E. Callahan Construction Co..... 877,534
(I) Mittry Bros. Construction Co..... 924,667

( 1) Lump Sum remove structures
( 2) 1,230 squares rem. ungrouted rk. pave.
( 3) 194,000 cu. yd. common excavation
( 4) 17,000 cu. yd. structure excavation
( 5) 11,500 cu. yd. backfill, compacted
( 6) 41,000 cu. yd. backfill, uncompacted
( 7) 3,570 sq. ft. stl. sht. piling, 22 lb.
( 8) 96,500 cu. yd. derrick stone toe protect.
( 9) 760 cu. yd. derrick stone riprap
(10) 58 each rock mats
(11) 3,480 squares 12-in. grouted rk. paving
(12) 3,550 cu. yd. gravel backing
(13) 30 squares rem. and replace ungrouted rock paving
(14) 5,840 cu. yd. concr., parapet walls
(15) 15,000 cu. yd. concr., grouting derrick stone toe protection
(16) 229,000 lb. reinforcing steel
(17) 34,300 sq. yd. 3-in. plantmixed surfacing

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) |
|---|---|---|---|---|---|---|---|---|---|
| ( 1) | $4000 | $5000 | $2800 | $3400 | $5000 | $4000 | $10000 | $8940 | $1500 |
| ( 2) | 4.00 | 3.00 | 2.50 | 2.00 | 3.60 | 7.50 | 1.35 | 6.00 | 5.00 |
| ( 3) | .27 | .35 | .28 | .30 | .30 | .44 | .40 | .36 | .40 |
| ( 4) | .55 | .90 | .28 | .70 | .50 | 1.00 | .75 | .45 | 1.20 |
| ( 5) | .60 | .35 | .38 | 1.00 | .50 | .25 | .75 | .50 | .60 |
| ( 6) | .15 | .15 | .10 | .15 | .10 | .20 | .22 | .15 | .15 |
| ( 7) | 1.25 | 1.25 | 1.05 | 1.20 | 1.25 | 1.25 | 1.20 | 1.50 | 2.10 |
| ( 8) | 3.50 | 3.25 | 3.93 | 3.30 | 3.65 | 4.00 | 4.20 | 5.00 | 5.00 |
| ( 9) | 3.00 | 3.25 | .60 | 3.00 | 2.60 | 4.55 | 1.25 | 2.00 | 3.00 |
| (10) | 25.00 | 10.00 | 3.50 | 3.00 | 20.00 | 5.00 | 2.50 | 8.00 | 20.00 |
| (11) | 26.00 | 26.00 | 28.00 | 27.50 | 28.00 | 31.00 | 27.00 | 30.00 | 32.00 |
| (12) | 2.00 | 1.50 | 1.56 | 1.50 | 2.25 | 1.60 | 2.25 | 2.20 | 2.00 |
| (13) | 30.00 | 40.00 | 20.00 | 30.00 | 50.00 | 12.50 | 22.00 | 24.00 | 50.00 |
| (14) | 7.80 | 15.00 | 10.55 | 14.00 | 17.75 | 12.00 | 14.00 | 13.00 | 14.50 |
| (15) | 3.00 | 3.50 | 3.38 | 4.00 | 3.75 | 3.50 | 3.25 | 4.50 | 4.60 |
| (16) | .04 | .04 | .044 | .045 | .048 | .045 | .05 | .05 | .05 |
| (17) | .60 | .50 | .40 | .60 | .61 | .54 | .54 | .55 | .80 |

# Bridge and Grade Separation . . .

## California—Los Angeles County—State—Grade & Structures

Contract awarded to J. E. Haddock, Ltd., Pasadena, $163,060, by California Division of Highways, Sacramento, for construction of an undergrade crossing under the tracks of the Atchison, Topeka, & Santa Fe Ry. and approaches about 0.1 mi. in length to be graded and surfaced with asphalt concrete in Arcadia at Huntington Drive, between 2nd and 3rd Avenues, Los Angeles. Bids were received from the following:

(A) J. E. Haddock, Ltd.....$163,060
(B) Byerts & Dunn..... 165,415
(C) Griffith Co. ..... 168,740
(D) Oscar Oberg ..... 172,493
(E) Carlo Bongiovanni ..... 175,172
(F) Baruch Corporation ..... 185,277
(G) Oswald Bros. .....$189,019
(H) United Concrete Pipe Corporation..... 193,408
(I) Sander Pearson ..... 194,204
(J) Mittry Brothers Construction Co..... 205,146
(K) Charles J. Dorfman..... 212,733

( 1) Lump Sum clearing and grubbing
( 2) 600 cu. yd. removing concrete
( 3) 1,540 M. gal. water
( 4) 9,000 cu. yd. rdwy. excav. w/o class.
( 5) 5,100 cu. yd. structure excavation
( 6) 2,900 cu. yd. structure backfill
( 7) 68,000 cu. yd. imported borrow
( 8) 7,800 sq. yd. preparing subgrade
( 9) finishing raodway
(10) 5 tons liq. asph., SC-2 (prime coat)
(11) 700 tons min. aggregate (P. M. S.)
(12) 40 tons liq. asph., ROMC-4 or ROMC-5 (P. M. S.)
(13) 2,760 tons asphalt concrete
(14) 4 tons asphaltic emulsion (seal ct.)
(15) 290,000 lb. furn. bar reinf. steel
(16) 290,000 lb. placing bar reinf. steel
(17) 2,695 cu. yd. cl. "A" P.C.C. (struct.)
(18) 331,000 lb. furn. struct. carbon steel
(19) 187,000 lb. furn. struct. alloy steel
(20) 518,000 lb. erecting structural steel
(21) 50,000 lb. furn. ballast plate
(22) 50,000 lb. erecting ballast plate
(23) 12,000 lb. cast steel
(24) 2,250 lb. misc. iron and steel
(25) 2 M.F.B.M. Douglas fir timber
(26) 275 cu. yd. cl. "A" P.C.C. (conc. blank.)
(27) 125 ea. pav't dowels (conc. blanket)
(28) 170 lin. ft. 18-in. C.M.P.
(29) 80 lin. ft. 8-in. P.M.P. underdrains
(30) 200 cu. yd. rock filling material
(31) 24 lin. ft. 4-in. cast iron pipe
(32) 124 lin. ft. 2-in. std. galv. pipe
(33) 300 cu. yd. cl. "A" P.C.C. (curbs, gutters and sidewalks)
(34) 150 lin. ft. curb armor
(35) 28 lin. ft. 4-in. pipe handrail
(36) 450 lin. ft. 2-in. pipe handrail
(37) 930 sq. yd. waterproofing
(38) 530 sq. ft. galv. corrugated metal
(39) 550 lin. ft. copper strips
(40) 1 lot resetting street lighting system
(41) 1 lot traffic protection structures
(42) 15 ea. portable timber barricades
(43) 12 cu. yd. protective covering
(44) 1 lot misc. items of work

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | (H) | (I) | (J) | (K) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ( 1) | $250 | $500 | $300 | $300 | $300 | $120 | $750 | $500 | $300 | $250 | $2000 |
| ( 2) | 1.50 | 1.00 | 2.00 | 1.50 | 1.75 | 1.20 | 1.50 | 1.50 | 2.00 | 1.50 | 4.50 |
| ( 3) | 1.00 | 1.00 | .44 | 1.00 | .10 | .30 | .60 | 1.00 | 1.00 | 1.00 | 1.00 |
| ( 4) | .35 | .25 | .30 | .35 | .30 | .55 | .40 | .35 | .40 | .40 | .55 |
| ( 5) | .70 | .75 | .53 | .50 | .65 | 1.20 | .75 | .70 | .85 | .80 | 1.10 |
| ( 6) | .50 | .30 | .80 | .50 | .50 | .55 | 1.00 | .70 | .40 | .60 | .55 |
| ( 7) | .32 | .39 | .40 | .40 | .35 | .47 | .50 | .42 | .50 | .60 | .575 |
| ( 8) | .10 | .20 | .09 | .12 | .10 | .13 | .12 | .12 | .10 | .10 | .13 |
| ( 9) | $250 | $200 | $300 | $300 | $200 | $180 | $550 | $250 | $300 | $250 | $150 |
| (10) | 12.50 | 15.00 | 12.00 | 12.00 | 10.00 | 11.00 | 10.00 | 20.00 | 13.25 | 14.00 | 12.00 |
| (11) | 1.90 | 2.00 | 1.86 | 2.50 | 3.00 | 2.50 | 1.75 | 2.10 | 2.15 | 3.00 | 2.00 |
| (12) | 7.00 | 8.00 | 8.00 | 8.10 | 10.00 | 8.50 | 7.50 | 8.00 | 9.50 | 14.00 | 8.65 |
| (13) | 2.30 | 2.00 | 2.20 | 2.37 | 2.60 | 3.00 | 2.20 | 2.40 | 2.25 | 3.00 | 2.00 |
| (14) | 30.00 | 20.00 | 22.00 | 20.00 | 20.00 | 32.00 | 40.00 | 20.00 | 21.75 | 40.00 | 25.00 |
| (15) | .033 | .035 | .03 | .028 | .03 | .035 | .034 | .03 | .034 | .0325 | .0274 |
| (16) | .007 | .005 | .008 | .01 | .01 | .0081 | .01 | .01 | .009 | .01 | .00735 |
| (17) | 14.00 | 13.00 | 15.30 | 15.00 | 16.00 | 13.00 | 15.75 | 18.00 | 16.00 | 16.50 | 15.25 |
| (18) | .067 | .08 | .07 | .07 | .071 | .08 | .074 | .08 | .0794 | .08 | .0677 |
| (19) | .077 | .09 | .08 | .079 | .082 | .095 | .085 | .09 | .091 | .09 | .0788 |
| (20) | .022 | .01 | .021 | .024 | .0228 | .026 | .0237 | .027 | .0275 | .03 | .0187 |
| (21) | .08 | .10 | .08 | .08 | .084 | .095 | .087 | .09 | .091 | .08 | .0788 |
| (22) | .04 | .02 | .04 | .037 | .039 | .05 | .04 | .04 | .046 | .05 | .0432 |
| (23) | .21 | .20 | .20 | .19 | .21 | .20 | .22 | .25 | .28 | .20 | .205 |
| (24) | .26 | .25 | .29 | .29 | .24 | .25 | .24 | .26 | .295 | .30 | .265 |
| (25) | $115 | $100 | $130 | $110 | $100 | 80.00 | 90.00 | 70.00 | $115 | $100 | $150 |
| (26) | 12.75 | 10.00 | 10.00 | 11.40 | 13.00 | 7.00 | 12.00 | 11.00 | 10.00 | 10.00 | 13.60 |
| (27) | .25 | .20 | .27 | .16 | 1.00 | 1.00 | .12 | .11 | .15 | .40 | .35 |
| (28) | 1.65 | 2.50 | 2.00 | 2.00 | 2.00 | 2.70 | 1.90 | 2.00 | 1.80 | 3.00 | 2.00 |

*(Continued on next page)*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (29) | .90 | 1.50 | 1.05 | 1.40 | 1.00 | 1.00 | 1.00 | 1.20 | 1.00 | 1.50 | 1.00 |
| (30) | 1.50 | 2.00 | 2.00 | 2.00 | 2.00 | 1.00 | 1.50 | 2.50 | 1.50 | 3.00 | $120 |
| (31) | 1.00 | 2.00 | 1.25 | 1.00 | 2.00 | .80 | .85 | 1.00 | .76 | 3.00 | 1.00 |
| (32) | .35 | .50 | .41 | .40 | .50 | .70 | .35 | .30 | .36 | .50 | .40 |
| (33) | 12.00 | 15.00 | 11.30 | 12.00 | 14.00 | 13.00 | 12.50 | 10.50 | 12.00 | 15.00 | 13.00 |
| (34) | .90 | 1.00 | 1.00 | 1.00 | 1.00 | 1.10 | 1.00 | 1.00 | 1.00 | 1.50 | 1.50 |
| (35) | 5.50 | 5.00 | 5.80 | 4.80 | 5.00 | 6.00 | 5.00 | 5.00 | 5.62 | 6.00 | 5.25 |
| (36) | 2.10 | 2.00 | 2.20 | 2.00 | 1.91 | 2.00 | 2.00 | 2.00 | 2.12 | 3.00 | 2.00 |
| (37) | .30 | .40 | .30 | .30 | .40 | .30 | .30 | .25 | .41 | .40 | 1.25 |
| (38) | .40 | .50 | .55 | .50 | .50 | .20 | .15 | .30 | .53 | .30 | .65 |
| (39) | .80 | 1.00 | 1.50 | 1.00 | 1.00 | .40 | .50 | .50 | .85 | .60 | .50 |
| (40) | $450 | $1000 | $470 | $800 | $800 | $900 | $500 | $1500 | $500 | $950 | $420 |
| (41) | $1600 | $500 | $450 | $800 | $700 | $440 | $2350 | $2500 | $1280 | $500 | $1000 |
| (42) | 18.00 | 20.00 | 25.00 | 18.00 | 20.00 | 10.00 | 30.00 | 35.00 | 45.00 | 20.00 | 20.00 |
| (43) | 45.00 | 30.00 | 37.50 | 30.00 | 40.00 | 5.00 | 45.00 | 15.00 | 45.00 | 50.00 | 10.00 |
| (44) | $1750 | $3000 | $700 | $2400 | $3395 | $1800 | $1750 | $2000 | $2000 | $1000 | $2113 |

# Irrigation . . .

### Washington—Yakima County—Bur. of Recl.—Earthwork, Pipe Lines and Structures

Contract awarded to Ray Schweitzer & Fife & Co., Parma, Idaho, $66,202, by Bureau of Reclamation, Yakima, for construction of earthwork, pipe lines, and structures for gravity laterals and sublaterals, Yakima Ridge canal, Roza division, Yakima Project. The work is located from 12 to 20 mi. SE of Yakima. The contractor shall complete all work within two hundred calendar days from the date of receipt of such notice. The undetermined stability or porosity of the material in which these sections will be constructed and which will form the lateral banks, or other causes, may make it desirable during the progress of the work to vary the slopes and the dimensions dependent thereon. On account of the steep grades and the necessity for construction of siphons to reach high lands, the majority of many of the laterals and sublaterals will consist of pipe lines. The pipe used for the pipe lines shall be stand. conc. irrig. pipe, extra-strength conc. irrigation pipe, and bell-and-spigot concrete sewer pipe, and the type and size of pipe used in various locations shall be as shown on the drawings or as directed by the contracting officer. For the purpose of the specifications, concrete-pipe culverts are considered to be structures and not pipe lines. All concrete irrigation pipe shall be furnished by the contractor. The pipe shall be furnished with joints of the tongue-and-groove type and will be standard or extra-strength pipe in accordance with the requirements shown on the drawings. The pipe shall be manufactured and tested in accordance with the "Standard Specifications for Concrete Irrigation Pipe" (A.S.T.M. Designation: C118-39) of the American Society for Testing Materials. Workmen who are skilled and experienced in laying tongue-and-groove concrete pipe will be employed by the contractor for the laying and jointing of the pipe. Alternate bids for Sched. 2 for shipments of concrete pipe to Buena were to be made on Government bills of lading. Bids were received from the following:

(1) Ray Schweitzer and Fife & Co. ..... $66,202
(2) D. A. & Z. P. Richardson ..... 70,105
(3) Valley Construction Co. ..... 74,565
(4) Maccri Bros. and L. Coluccio ..... $78,173
(5) Natt McDougall Co. ..... 83,797
(6) H. J. Adler Construction Co. ..... 90,769

| | | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|---|
| 69,500 | cu. yd. common excav. for laterals | .17 | .21 | .22 | .25 | .18 | .35 |
| 500 | cu. yd. rock excav. for laterals | .50 | .21 | 1.00 | .50 | .75 | .80 |
| 7,000 | sta. cu. yd. overhaul | .025 | .04 | .03 | .03 | .03 | .04 |
| 4,950 | cu. yd. compact embankments | .30 | .20 | .20 | .45 | .30 | .40 |
| 17,100 | cu. yd. common excav. for pipe trenches | .28 | .33 | .30 | .25 | .31 | .30 |
| 200 | cu. yd. rock excav. for pipe trenches | .50 | .33 | 2.00 | 1.20 | .75 | 1.00 |
| 2,360 | cu. yd. common excav. for structures | .50 | .33 | .50 | 1.10 | .80 | .80 |
| 50 | cu. yd. rock excav. for structures | 1.00 | 2.00 | 2.00 | 1.50 | 1.00 | 2.00 |
| 1,600 | cu. yd. backfill about structures | .14 | .30 | .20 | .20 | .15 | .25 |
| 800 | cu. yd. puddle or tamp backfill about struct. | .48 | .30 | .25 | .45 | .50 | .50 |
| 15,600 | cu. yd. backfill of pipe trenches | .14 | .15 | .15 | .20 | .29 | .20 |
| 670 | cu. yd. concrete in structures | 22.00 | 18.50 | 19.00 | 24.00 | 31.00 | 28.00 |
| 53,600 | lb. place reinforcement bars | .03 | .025 | .03 | .03 | .03 | .03 |
| 300 | sq. yd. dry-rock paving | 1.75 | 2.00 | 3.40 | 2.50 | 2.25 | 3.00 |
| 10 | MFBM erect timber in structures | 20.00 | 15.00 | 25.00 | 55.00 | 40.00 | 30.00 |
| 20,000 | lb. install gates and misc. metalwork | .05 | .04 | .05 | .08 | .05 | .05 |
| 29,500 | lin. ft. furn. and lay 6-in. Std. conc. irrig. pipe | .25 | .30 | .29 | .24 | .30 | .30 |
| 13,750 | lin. ft. furn. and lay 8-in. Std. conc. irrig. pipe | .30 | .36 | .35 | .32 | .37 | .34 |
| 10,250 | lin. ft. furn. and lay 10-in. Std. conc. irrig. pipe | .35 | .42 | .45 | .38 | .51 | .45 |
| 7,060 | lin. ft. furn. and lay 12-in. Std. conc. irrig. pipe | .47 | .52 | .61 | .50 | .63 | .57 |
| 3,910 | lin. ft. furn. and lay 15-in. Std. conc. irrig. pipe | .73 | .70 | .90 | .75 | .86 | .80 |
| 2,010 | lin. ft. furn. and lay 18-in. Std. conc. irrig. pipe | 1.00 | 1.05 | 1.40 | 1.10 | 1.20 | 1.15 |
| 560 | lin. ft. furn. and lay 21-in. Std. conc. irrig. pipe | 1.41 | 1.60 | 1.75 | 1.50 | 1.75 | 1.50 |
| 25 | lin. ft. furn. and lay 24-in. Std. conc. irrig. pipe | 1.88 | 2.50 | 3.50 | 2.20 | 2.55 | 2.00 |
| 144 | lin. ft. furn. & lay 6-in. ext. strg. conc. irrig. pipe | .53 | .50 | .55 | .55 | .57 | .50 |
| 480 | lin. ft. furn. & lay 8-in. ext. strg. conc. irrig. pipe | .54 | .60 | .62 | .65 | .69 | .60 |
| 96 | lin. ft. furn. & lay 10-in. ext. strg. conc. irrig. pipe | .62 | .75 | .70 | .75 | .80 | .70 |
| 188 | lin. ft. furn. & lay 12-in. ext. strg. conc. irrig. pipe | .82 | .90 | .85 | .95 | .97 | .85 |
| 96 | lin. ft. furn. & lay 15-in. ext. strg. conc. irrig. pipe | 1.25 | 1.50 | 1.50 | 1.50 | 1.50 | 1.30 |
| 108 | lin. ft. furn. & lay 18-in. ext. strg. conc. irrig. pipe | 1.41 | 1.60 | 1.55 | 1.65 | 1.65 | 1.45 |
| 144 | lin. ft. furn. & lay 21-in. ext. strg. conc. irrig. pipe | 2.00 | 2.50 | 2.20 | 2.25 | 2.35 | 2.00 |
| 48 | lin. ft. furn. & lay 24-in. ext. strg. conc. irrig. pipe | 2.28 | 2.75 | 3.50 | 2.85 | 2.75 | 2.50 |
| 700 | lin. ft. furn. & lay 4-in. concrete sewer pipe | .24 | .30 | .30 | .24 | .45 | .30 |

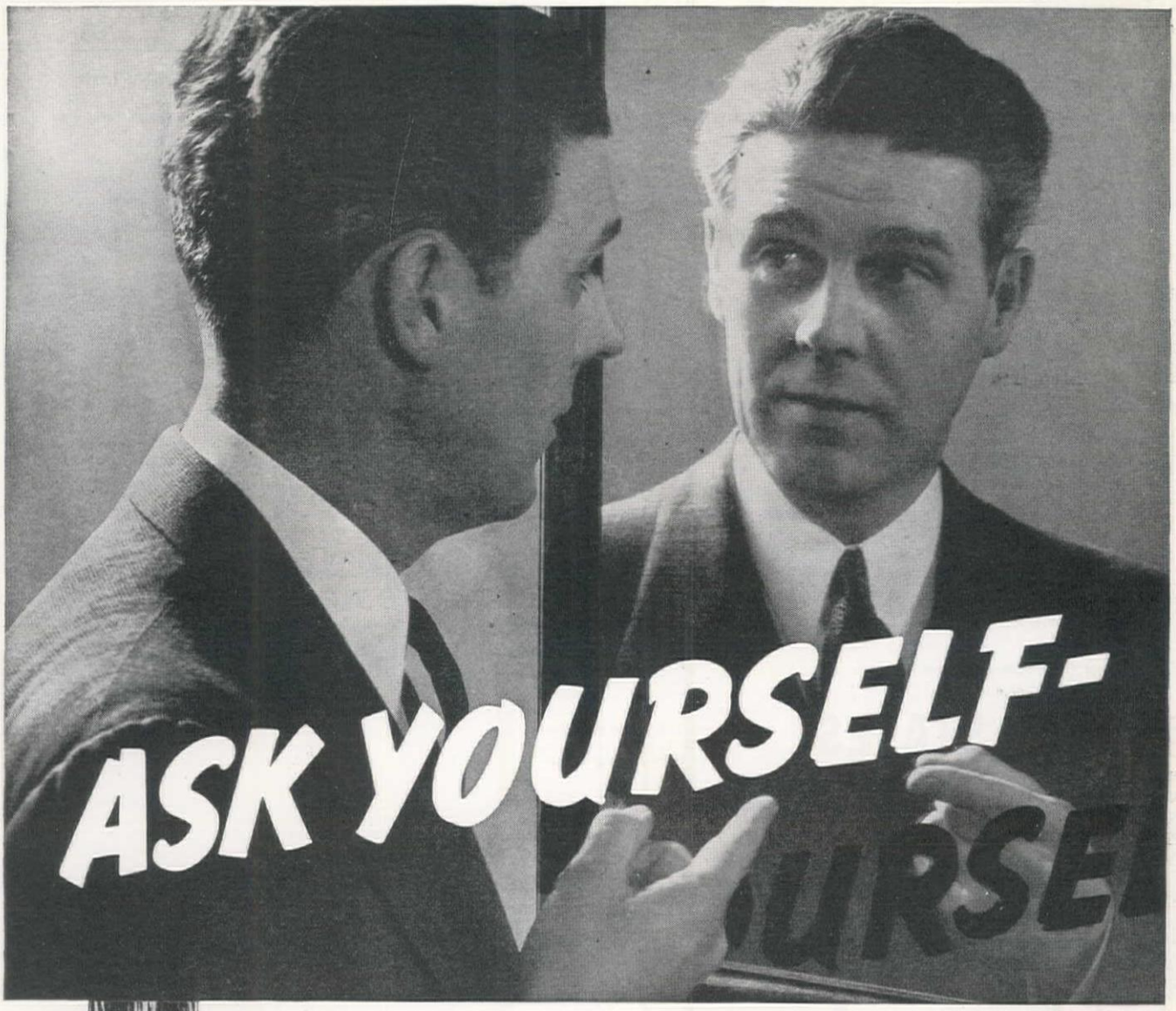
# Dam . . .

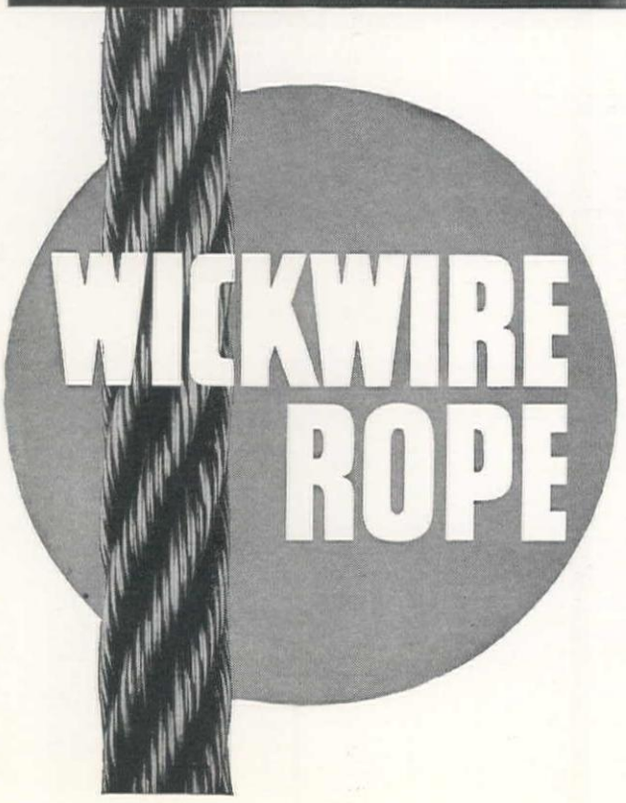
### Arizona—Coconino County—City—Earthfill

Contract awarded to Fisher Contracting Co., Phoenix, $30,000, by City Council, Flagstaff, for construction of an earthfill dam as a storage reservoir for the city's water supply system. The bids listed below were rejected by the City Council and a contract in the amount shown above awarded by negotiation. Bids were received from the following:

(1) Fisher Contracting Co. ..... $38,895
(2) Pearson & Dickerson ..... $39,943

| | | (1) | (2) | | | (1) | (2) |
|---|---|---|---|---|---|---|---|
| 8,000 | sq. yd. strip dam site | .08 | .007 | 18 | cy. conc. outlet tower | 45.00 | 53.00 |
| 11,000 | sq. yd. strip bor. area | .08 | .007 | 2.6 | cy. conc. tower base | 25.00 | 20.00 |
| 462 | cy. exc. cut-off trench | .60 | 5.00 | 1,050 | lb. reinf. steel | .10 | .07 |
| 100 | cy. exc. outlet pipe tr. | 2.00 | 5.00 | 4,380 | sq. yd. 6-in. riprap dam facing | .60 | .44 |
| 32,000 | cy. exc., earth, spillway and borrow | .45 | .485 | 1,970 | sq. yd. 12-in. riprap dam facing | .90 | .90 |
| 8,000 | cy. exc., rock, spillway and borrow | 1.60 | 1.67 | 80 | cy. dry wall masonry | 14.00 | 3.00 |
| 322,000 | cy. trips, compact emb. | .003 | .003 | 50 | cy. conc., spillway | 15.00 | 17.00 |
| 462 | cy. comp. backf. cutoff | .50 | .40 | L. S. | place outlet pipe & gates | $400 | 65.00 |
| 50 | cy. comp. backf. outlet | 1.00 | .40 | L. S. | erect foot bridge | $800 | $1015 |




*"Am I getting the lowest possible per-unit-of-use cost from my wire rope?"*

If you have not already tried Wickwire Rope, do so. The longer life of Wickwire Rope, far beyond that of rope built only to standard specifications, is showing rope users everywhere new "lows" in rope costs. If you are already using a Wickwire Rope, you are entitled to and should take advantage of Wickwire Spencer Engineering Service. Request a representative to verify the particular kind and lay of rope as best suited for your job. Send for a free copy of "Know Your Ropes" and put into practice its many money-saving hints in the care of rope in use.

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# Sewerage . . .

## California—Siskiyou County—City—Treatment Plant

Contract awarded to Manuel Smith, Oakland, $42,289, by City Council, Tulelake, for construction sewage collecting system, force and main, pumping plant and sewage treatment plant in Tulelake. Bids were received from the following:

(1) Manuel Smith ..... $42,289

(2) Clifford A. Dunn ..... $44,974

| | (1) | (2) |
|---|---|---|
| 9,996 lft. 6-in. vitr. pipe | .972 | 1.00 |
| 1,506 lft. 8-in. vitr. pipe | 1.35 | 1.20 |
| 1,105 lft. 10-in. vitr. pipe | 1.89 | 1.50 |
| 430 lft. 6-in. cast iron pipe | 1.35 | 2.00 |
| 85 lft. 10-in. cast iron pipe | 2.16 | 3.00 |
| 9 ea. lampholes | 21.60 | 26.00 |
| 9 ea. drop manholes | 81.00 | $100 |
| 13 ea. standard manholes | 70.20 | 90.00 |
| 255 ea. 6-in. x 4-in. vitr. wyes | .81 | 2.20 |
| 28 ea. 8-in. x 4-in. vitr. wyes | .972 | 3.20 |
| L. S. sew. pump sta., comp. | $8,100 | $8,577 |
| L. S. (3620 lft.) 7-in. wd. stave force main | $4,017 | $3,978 |
| L. S. sewage treatment plant | $11,340 | $13,389 |
| 1,000 cu. yd. extra excav. | .54 | .50 |
| 1,000 cu. yd. imp. borrow fill | 1.62 | 1.00 |

## California—San Mateo County—City—Sewerage

Contract awarded to Conner & Brant, Redwood City, $4,347, by Board of Trustees, Menlo Park Sanitary District, Menlo Park, for construction and installation of a sanitary sewer system in Ringwood Park. Bids were received from the following:

(1) Conner & Brant ..... $4,347

(2) O. G. Richey ..... 4,969

(3) W. J. Tobin ..... $6,017

(4) F. C. Stolte ..... 6,281

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| 2,601 lin. ft. 10-in. vitrified clay pipe | 1.00 | 1.10 | 1.54 | 1.45 |
| 165 lin. ft. 10-in. cast iron pipe, Class "B" | 2.00 | 2.75 | 4.00 | 3.48 |
| Lump Sum, 90 lft. 18-in. bore and mud around cast iron pipe | $400 | $750 | $400 | $887 |
| 8 each manholes, cast iron, frames and covers | 85.00 | 75.00 | 80.00 | 88.00 |

# Waterway Improvement . . .

## Oregon—Coos County—U. S. E. D.—Jetty

Strong & MacDonald, Inc., Tacoma, Wash., $342,250 low to U. S. Engineer Office, Portland, Oregon, for reconstruction north jetty at the entrance to the Coquille River at Bandon. Bids were received from the following:

(1) Strong & MacDonald, Inc. ..... $342,250

(2) Kern & Kibbe ..... 374,590

(3) Henry Kuckenberg ..... 380,500

(4) Gilpin Construction Co. ..... $400,000

(5) Ralph A. Bell ..... 534,000

(6) Engineer's Estimate ..... 337,670

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| 55,000 tons stone, jetty and cofferdam | 3.75 | 3.96 | 3.90 | 3.90 | 5.00 | 2.90 |
| Lump Sum 40-ton truck scale | $4500 | $5500 | $4500 | $5000 | $4500 | $3700 |
| 10,000 cu. yd. concrete | 13.00 | 15.00 | 16.00 | 17.90 | 25.00 | 19.75 |
| 300 cu. yd. demolish and rem. conc. breakw. | 5.00 | 4.30 | 5.00 | 5.00 | 15.00 | 2.00 |

## California—Los Angeles County—U. S. E. D.—Structure

Contract awarded to Oberg Brothers, Los Angeles, $263,261, by U. S. Engineer Office, Los Angeles, for construction of the Los Angeles Junction Railroad Bridge at River Mile 17.20 about 1 mi. downstream from Downey Road bridge in City of Vernon and adjacent unincorporated area of Los Angeles. Bids were received from the following:

(A) Oberg Bros. ..... $263,261

(B) Sordal & Bishop ..... 263,310

(C) Griffith Co. ..... 283,666

(D) Carlo Bongiovanni ..... 284,464

(E) Oscar Oberg ..... 287,105

(F) William T. Loesch ..... 292,830

(G) Macco Construction Co. ..... 293,680

(H) W. E. Callahan Construction Co. ..... 293,896

(I) Oswald Bros. ..... $306,115

(J) Charles J. Dorfman ..... 306,336

(K) United Concrete Pipe Corporation ..... 307,552

(L) Tavares Construction Co. ..... 310,000

(M) Byerts & Dunn ..... 313,800

(N) Mittry Bros. ..... 316,362

(O) Ralph A. Bell ..... 319,256

(P) J. E. Haddock Company, Ltd. ..... 344,721

| | | (A) | (B) | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|---|---|
| ( 1) | 5,750 cu. yd. com. excav., uncl. | .25 | .50 | .22 | .20 | .35 | .203 | .30 |
| ( 2) | 6,400 cu. yd. bridge excav. | 3.20 | 4.50 | 3.30 | 3.50 | 5.00 | 4.11 | 5.60 |
| ( 3) | 3,900 cu. yd. backf. & fill, uncomp. | .10 | .20 | .20 | .05 | .10 | .242 | .20 |
| ( 4) | 4,200 cu. yd. backf. & fill, compact. | .15 | .25 | .26 | .20 | .35 | .42 | .40 |
| ( 5) | 6 each test piling | $100 | $150 | 55.00 | $153 | $100 | 86.10 | $150 |
| ( 6) | 23,700 lft. tr. timber piling | 1.20 | 1.15 | 1.53 | 1.25 | 1.25 | 1.35 | 1.20 |
| ( 7) | 3,110 cu. yd. conc., bridge piers & abut. | 9.00 | 11.00 | 11.20 | 9.00 | 10.50 | 7.32 | 10.00 |
| ( 8) | 150 cu. yd. conc., rock toe | 5.00 | 7.00 | 5.40 | 5.00 | 4.50 | 5.97 | 4.00 |
| ( 9) | 36 cu. yd. conc-parapet walls, side drainage and misc. struct. | 18.00 | 18.00 | 23.00 | 18.00 | 25.00 | 27.00 | 20.00 |
| (10) | 181,000 lb. steel reinforcement | .04 | .04 | .037 | .04 | .036 | .042 | .035 |
| (11) | 1,910,000 lb. bridge steel | .085 | .076 | .086 | .0925 | .087 | .0946 | .09 |
| (12) | 80 MFBM timber deck | $100 | 97.00 | $130 | $120 | $110 | 136.18 | $100 |
| (13) | 250 lb. misc. metalwork | .20 | .25 | .30 | .20 | .25 | .645 | .20 |
| (14) | 40 lin. ft. fencing | 1.00 | .75 | .80 | 2.00 | 2.00 | 1.23 | 1.00 |
| (15) | 790 cu. yd. derrick stone | 3.50 | 5.00 | 3.70 | 5.65 | 4.50 | 6.32 | 4.00 |
| (16) | 40 sq. grouted rock paving | 30.00 | 30.00 | 40.00 | 35.00 | 30.00 | 21.93 | 30.00 |
| (17) | 120 cu. yd. gravel backing | 1.50 | 2.25 | 2.60 | 2.50 | 2.00 | 1.52 | 2.00 |
| (18) | 70 sq. yd. plant-mixed surf. | 1.00 | 1.00 | .70 | 2.00 | 1.00 | .88 | 1.00 |

| | (H) | (I) | (J) | (K) | (L) | (M) | (N) | (O) | (P) |
|---|---|---|---|---|---|---|---|---|---|
| ( 1) | .30 | .18 | 1.50 | .50 | .25 | .20 | .30 | 1.50 | .48 |
| ( 2) | 5.00 | 2.50 | 6.00 | 6.00 | 7.00 | 5.00 | 4.50 | 7.60 | 10.00 |
| ( 3) | .15 | .18 | .20 | .20 | .20 | .15 | .15 | .50 | .45 |
| ( 4) | .75 | .85 | .50 | .30 | .73 | .20 | .60 | .80 | .90 |
| ( 5) | $200 | 50.00 | $200 | 60.00 | $130 | $100 | 80.00 | $300 | $175 |
| ( 6) | 1.15 | 1.50 | 1.38 | 1.15 | 1.40 | 1.35 | 1.50 | 1.25 | 1.54 |
| ( 7) | 10.00 | 11.70 | 12.00 | 11.30 | 12.00 | 10.00 | 16.00 | 10.00 | 13.00 |
| ( 8) | 6.00 | 5.00 | 4.30 | 10.00 | 5.20 | 5.00 | 5.00 | 12.00 | 5.65 |
| ( 9) | 30.00 | 16.00 | 24.00 | 15.00 | 16.00 | 20.00 | 25.00 | 15.00 | 23.40 |
| (10) | .05 | .0433 | .0422 | .042 | .0407 | .05 | .045 | .05 | .049 |
| (11) | .089 | .10 | .085 | .091 | .086 | .10 | .09 | .09 | .086 |
| (12) | $125 | $125 | $108 | $150 | $112 | $100 | $125 | $100 | $165 |
| (13) | .20 | .30 | .25 | .30 | .26 | .20 | .50 | .20 | .30 |
| (14) | .80 | .50 | 15.00 | 3.00 | .75 | 1.00 | 1.00 | 2.50 | 2.80 |
| (15) | 5.00 | 1.00 | 3.40 | 5.00 | 5.20 | 6.00 | 4.00 | 3.00 | 4.90 |
| (16) | 40.00 | 35.00 | 34.00 | 40.00 | 36.50 | 20.00 | 40.00 | 1.50 | 43.00 |
| (17) | 1.50 | 1.40 | 2.50 | 2.00 | 1.95 | 2.00 | 2.10 | 1.50 | 4.70 |
| (18) | .70 | .50 | 1.00 | .60 | 1.15 | 2.00 | 1.00 | 1.56 | 1.25 |

# A NEW WAGON-TYPE ROCK DRILL...

*for*

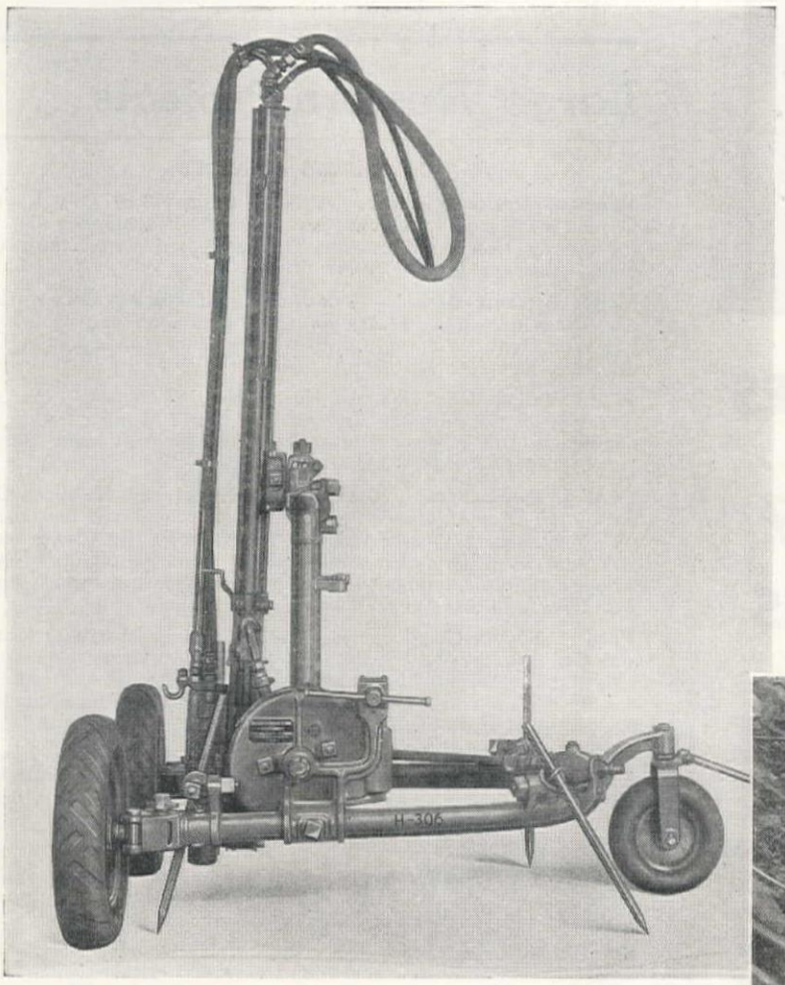
» ADAPTABILITY
» FOOTAGE
» ECONOMY

*the*

## WORTHINGTON

# UPW-35

## ROCK MASTER



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STATIONARY AIR COMPRESSORS
PORTABLE AIR COMPRESSORS

ROCK HAMMERS
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•

V-BELT DRIVES

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STEAM TURBINES

RDO-4A

**UNIVERSAL MOUNTING** . . . permits setting up for drilling in any position. Provides sturdy simple mechanism for operating the U-arm.

**PNEUMATIC FEED** . . . gives the operator positive control, for fast drilling in all kinds of rock. An important modern feature that multiplies man power.

**WATCH THE WORTHINGTON UPW-35 ON YOUR JOB** . . . let this drill tell its own story. It will give you speed . . . footage . . . and air economy . . . with the lowest of maintenance costs.

**WORTHINGTON PUMP AND MACHINERY CORPORATION**
***General Offices:* HARRISON, NEW JERSEY**
*Nation-wide Sales and Service through District Offices and Dealers*

# WORTHINGTON

# CONSTRUCTION SUMMARY

**NOTE: This summary of construction awards and proposed projects has been changed to present a more readable form in which news of specific projects may be more easily found. The county name leading each item is that in which the project is located.**

## Large Western Projects...

### CONTRACTS AWARDED

**Johnson, Drake & Piper,** Oakland, Calif., $1,897,000, by the Bureau of Yards & Docks, Navy Dept., Washington, D. C., for construction of 600 housing units at Naval Air Station, Alameda, Alameda County, Calif.

**Vultee Aircraft Division, Aviation Manufacturing Corporation,** Los Angeles, Calif., $4,294,798 (cost plus fixed fee basis), by the War Dept., Washington, D. C., for plant expansion in Los Angeles, Los Angeles County, Calif.

**P. J. Walker Co.,** Los Angeles, Calif., $5,000,000 (approximately), by the Douglas Aircraft Co., Santa Monica, Calif., for construction of an aircraft manufacturing plant at Long Beach, Los Angeles County, Calif.

**Ford J. Twaits Co.,** Los Angeles, and **Morrison-Knudsen Co., Inc.,** Los Angeles, Calif., $6,018,733 (cost plus fixed fee basis), by Constructing Quartermaster, Washington, D. C., for construction of a semi-permanent replacement center for 21,000 troops at Camp Nacimiento, between King City and Paso Robles, Monterey and San Luis Obispo Counties, Calif.

**Ford J. Twaits Co.,** Los Angeles, Calif., and **Morrison-Knudsen Co.,** Los Angeles, Calif., $3,000,000 (approximately) (cost plus fixed fee basis), by Constructing Quartermaster, Washington, D. C., for construction of barracks and other buildings for 8,000 men at Fort Ord, Monterey, Monterey County, Calif.

**W. E. Kier Construction Co.,** San Diego, Calif., $2,199,492 (cost plus fixed fee basis), by Constructing Quartermaster, Washington, D. C., for construction of a semi-permanent troop replacement center at San Diego, San Diego County, Calif.

**Mead & Mount Construction Co.,** Denver, Colo., $1,970,720 (cost plus fixed fee basis), by Constructing Quartermaster, Washington, D. C., for construction of a troop replacement center at Fort Francis E. Warren, Laramie County, Wyo.

**MacDonald Construction Co.,** and **G. L. Tarlton,** St. Louis, Mo., $2,256,090 (Fort Clayton) and $1,759,388 (Fort Gulick), by Constructing Quartermaster, Washington, D. C., for construction of hospital and nurses' quarters at Forts Clayton and Gulick, Canal Zone.

**Hawaiian-Raymond-Turner,** Alameda, Calif., $4,197,000, by the Bureau of Yards and Docks, Washington, D. C., for construction of 1300 housing units in Honolulu, T. H.

**Sound Construction & Engineering Co.,** Seattle, Wash., and **Peter Kiewit Sons' Co.,** Omaha, Nebr., $3,075,000 (cost plus fixed fee), by Constructing Quartermaster, Washington, D. C., for construction of 540 buildings and two concrete reservoirs at Fort Lewis, Pierce County, Wash.

## Highway and Street...

### CONTRACTS AWARDED

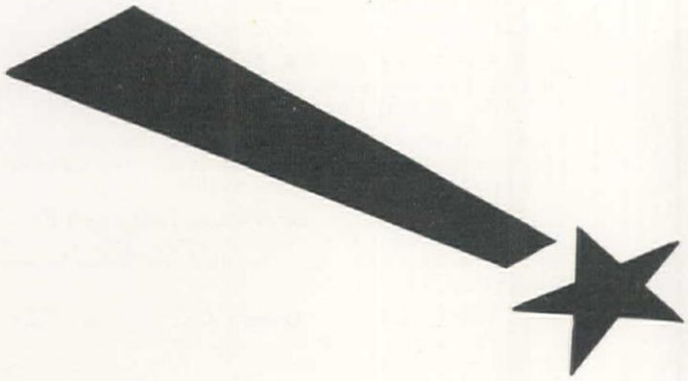
#### Arizona

COCONINO CO.—**W. E. Orr,** 302 W. Monte Vista Road, Phoenix—$12,986 for 5¾ mi. furn. and place aggreg. base crse. over graded rdwy. on Flagstaff-Lake Mary Hwy., extend. from junct. 1½ mi. S. of Flagstaff—by Arizona State Highway Commission, Phoenix.

MARICOPA CO.—**Daley Corporation,** San Diego, Calif.—$19,994 for grade, drain, select matl. and Portland cement conc. pave. on the Mesa-Casa Grande Ruins Hwy.—by Arizona State Highway Department, Phoenix.

YAVAPAI CO.—**Fisher Contracting Co.,** 516 S. 7th St., Phoenix—$61,470 for grade, drain, aggreg. base crse. and special bitum. surf. treat., Prescott-Ashford Hwy.—by Arizona State Highway Department, Phoenix.

# PRICES REDUCED



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Now it's easier than ever before to own a Mack! Owner satisfaction has increased sales to the point where a substantial price cut is now made possible on the light capacity models—without sacrifice of traditional Mack Bulldog stamina and quality. These light Macks, Models ED and DE, give small haulers every advantage that makes the heavy-duty Macks the most famous trucks in the world. Also—reduced prices now in effect on cab-over-engine Mack models. See these outstanding truck values before you buy another truck!

**MODEL — ED**

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Los Angeles . . . Sacramento . . . Fresno . . . San Francisco . . . Seattle . . . Portland

**The most complete line of trucks in the world 1 to 45 tons and all "heavy duty"**

## California

DEL NORTE CO.—**Mercer-Fraser Co.,** 2nd and Commercial Sts., Eureka—$12,326 for 200-ft. grade and stabil. embank., 4.5 mi. S. of Crescent City—by California Division of Highways, Eureka.

KERN CO.—**Griffith Co.,** 1060 South Broadway, Los Angeles—$18,059 for improve. 21st St., Bakersfield—by City Council, Bakersfield.

KERN CO.—**Griffith Co.,** 502 L. A. Railway Bldg., Los Angeles—$119,372 for 4.7 mi. grade and apply roadmix surf. treat. betw. San Luis Obispo Co. line and 0.2 mi. S. of Kings Co. line—by California Division of Highways, Sacramento.

LOS ANGELES CO.—**P. J. Akmadzich,** 9750 Oswego, Sunland—$15,725 for asph. conc. pave of ditches on various sts., Glendale—by City Council, Glendale.

LOS ANGELES CO.—**Macco-Case Co.,** 815 Avalon Blvd., Clearwater—for grade road from Avalon to Catalina airport—by Santa Catalina Island Co., Avalon.

LOS ANGELES CO.—**Griffith Co.,** 1060 South Broadway, Los Angeles—$20,809 for improve. Imperial Hwy. from Hawthorne Ave. to Irwin Ave., Los Angeles—by Los Angeles County Supervisors, Los Angeles.

LOS ANGELES CO.—**Osborn Co.,** 1570 San Pasqual, Pasadena—$10,127 for 5,900 lin. ft. grade and surf. West Dr. and Salvia Canyon Road, Pasadena—by City Council, Pasadena.

SAN BENITO AND SANTA CLARA COS.—**Heafey-Moore** and **Fredrickson & Watson Construction Co.,** 873-81st Ave., Oakland—$131,221 for 2.6 mi. grade and plantmix surf. betw. Prunedale Junct. and Sargent overhead—by California Division of Highways, Sacramento.

SAN FRANCISCO CO.—**Charles L. Harney,** Call Bldg., San Francisco—$14,300 for improve. 44th Ave. betw. Quintara and Rivera Sts., includ. crossing of 44th Ave. and Quintara St., San Francisco—by Department of Public Works, San Francisco.

SAN FRANCISCO CO.—**Eaton & Smith,** 715 Ocean Ave., San Francisco—$20,959 for grade, pave. and const. sewer on various Sec. of Miguel, Beacon and Harry Sts., San Francisco—by Department of Public Works, San Francisco.

SAN FRANCISCO CO.—**Charles L. Harney,** Call Bldg., San Francisco—$24,912 for asphalt conc. pave., sewers, etc., on Hahn St. betw. Visitacion and Sunnydale Aves., San Francisco—by Department of Public Works, San Francisco.

SAN FRANCISCO CO.—**Charles L. Harney,** Call Bldg., San Francisco—$14,800 for grade, asph. conc. pave and sewers on 34th Ave., betw. Noriega and Ortega Sts., and on Ortega St. betw. 31st and 36th Aves., San Francisco—by Department of Public Works, San Francisco.

SAN JOAQUIN CO.—**Lee J. Immel,** Box 65, Sta. "A," Berkeley—$13,024 for const. 1½ in. bitum. penet. type road surf. crse. at Stockton Airport, Stockton—by Constructing Quartermaster, Fort Mason.

SANTA CRUZ CO.—**Heafey-Moore & Fredrickson & Watson Construction Co.,** 873-81st Ave., Oakland—$52,995 for 1 mi. grade and apply roadmix surf. treat. betw. Davenport and 1½ mi. S.—by California Division of Highways, Sacramento.

STANISLAUS CO.—**M. J. B. Construction Co.,** 322 Elks Bldg., Stockton, and **F. Kaus,** 2626 E. Main St., Stockton—$213,980 for 5.5 mi. grade, portions conc. pave, plantmix surf. on conc. base, const. borders of cr. run base adj. to new pave., and const. reinf. conc. bridge, betw. Keyes and Hatch Crossing—by California Division of Highways, Sacramento.

TUOLUMNE CO.—**Johnston Rock Co.,** Weber Ave. and "E" St., Stockton—$87,465 for 1.9 mi. grade and roadmix surf. on cr. rock or grav. base betw. Columbia Wye and Sonora—by California Division of Highways, Sacramento.

VENTURA CO.—**Sander Pearson,** 711-16th St., Santa Monica—$30,773 for grade and plantmix surf. on imported subgrade matl. and const. curbs, gutters and sidewalks on roads in hospital grounds at Camarillo State Hospital, near Camarillo—by California Division of Highways, Los Angeles.

YOLO CO.—**Fredericksen & Westbrook,** Forum Bldg., Sacramento—$34,031 for 1.5 mi. grade S. lane of divided hwy. betw. Swingle and Yolo Causeway—by California Division of Highways, Sacramento.

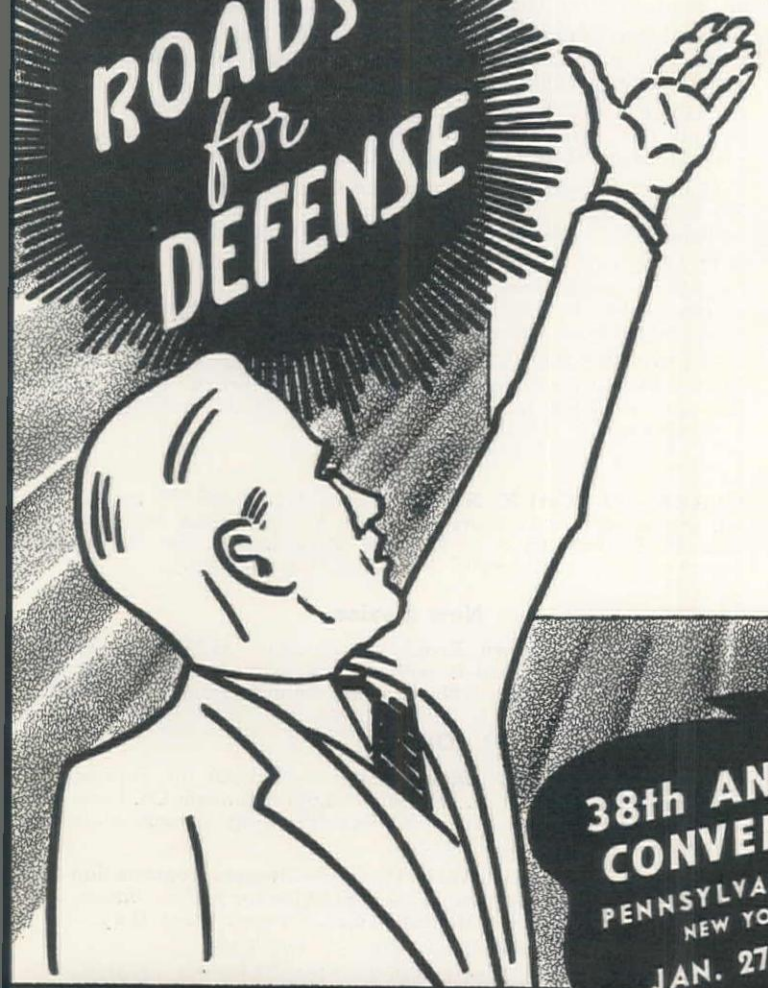
## Colorado

LINCOLN CO.—**U. S. Siegrist,** 1428 S. University Blvd., Denver—for 12.918 mi. grav. surf. and subgrade stabil. betw. Limon and Hugo on SH No. 8—by Colorado State Highway Department, Denver.

# Come and get the Answers!

- What does military transport do to roads?
- A new field for the contractor—the airport!
- Super highways—the big jobs of the future!
- What about new things in Snow and Ice Control?
- *Your* bidding problems—what are they?
- The legal angle on contracting—things you need to know!
- How shall we redesign intersections?
- Why develop the interregional roads?
- How do taxes affect your profits?
- Traffic—how to analyze it!

ROADS for DEFENSE



These subjects are close to your pocketbook—men who have found the answers are going to tell you about them—give you a chance to discuss them—ask questions! Here's the year's opportunity to get real help on the things that are bothering you most. *Note the date—plan now to come!*

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NEW YORK CITY
JAN. 27-31, 1941

AMERICAN ROAD BUILDERS ASS'N.
International Building Washington, D.C.

RIO BLANCO CO.—**H. I. Gardner,** 1128 Grand Ave., Glenwood Springs—$128,891 for 10.1 mi. grav. surf. betw. Rio Blanco and Meeker, SH No. 13—by Colorado State Highway Department, Denver.

### Idaho

BEAR LAKE CO.—**Carl E. Nelson,** Logan, Utah—$106,700 (recommended) for 14.2 mi. grade and surf., Montpelier-Geneva Forest Hwy.—by Public Roads Administration, Ogden, Utah.

BLAINE CO.—**K. L. Goulter,** 212 W. Hudson St., Seattle, Wash.—$116,359 (recommended) for 3.3 mi. grade and surf., Ketchum-Clayton For. Hwy., Sawtooth Natl. For.—by Public Roads Administration, Ogden, Utah.

IDAHO CO.—**F. H. DeAtley & Co.,** 208 Salsberg Bldg., Lewiston—$131,718 for 4.1 mi. grade, drain and surf. with cr. rock on Camas Prairie Hwy. betw. Harpester and Stites—by Commissioner of Public Works, Boise.

LEMHI CO.—**Hoops Construction Co.,** Twin Falls—$76,905 for 4.7 mi. grade, drain and surf. with cr. grav. on Lemhi Hwy., from Salmon SE—by Commissioner of Public Works, Boise.

### Montana

BLAINE CO.—**E. O. Howe,** Great Falls—$11,055 for 4.6 mi. surf. with cr. grav., Sec. A, Harlem North Rd., at North town limits of Harlem—by Montana State Highway Commission, Helena.

GLACIER CO.—**Frank J. Haas,** Great Falls—$14,396 for 4.1 mi. surf. with cr. grav., Sec. C, Cutbank No. Rd.—by Montana State Highway Commission, Helena.

PARK AND MEAGHER COS.—**C. A. Wagner Construction Co.,** Sioux Falls, S. D.—$93,215 for 8.7 mi. regrade, surf. with cr. grav., bitum. surf. treat. of wear. surf. and const. small drain. structs. on Sec. B and C, Wilsall-White Sulphur Sprgs. Rd.—by Montana State Highway Commission, Helena.

PONDERA CO.—**Thomas Staunton,** Great Falls—$27,536 for 5.9 mi. surf. with cr. grav., Sec. D, Valier East Rd.—by Montana State Highway Commission, Helena.

PRAIRIE CO.—**J. L. McLaughlin,** Great Falls—$22,778 for 10.5 mi. surf. with cr. grav., Sec. C and D, Terry-Brockway Rd. —by Montana State Highway Commission, Helena.

VALLEY CO.—**Inland Construction Co.,** Omaha, Nebr.—$23,-789 for 11.4 mi. surf. with cr. grav., Sec. B and C, Glasgow-Opheim Rd.—by Montana State Highway Commission, Helena.

WIBAUX CO.—**L. A. Woodward Co.,** Great Falls—$75,704 for 6.9 mi. grade, surf. with cr. grav. and const. small drain structs. on Sec. B, Baker-Wibaux Rd.—by Montana State Highway Commission, Helena.

YELLOWSTONE CO.—**Nolan Brothers, Inc.,** Minneapolis, Minn.—$45,731 for 7.7 mi. surf. with cr. grav., Sec. C, D and E, Billings-Broadview Rd.—by Montana State Highway Commission, Helena.

### Nevada

CLARK CO.—**Carl E. Nelson,** Logan, Utah—$55,506 for 6.8 mi. grade, surf., etc., approx. 4½ mi. W. of Nelson to junct. with U. S. Hwy. 95 S. of Railroad Pass, Rt. 60, Sec. A—by Directors of Department of Highways, Carson City.

### New Mexico

CATRON CO.—**Brown Bros.,** Albuquerque—$53,767 for 2.4 mi. grade, etc., of Datil-Reserve Dry Creek For. Hwy. Rt., Apache Natl. For.—by Public Roads Administration, Santa Fe.

### Oregon

BENTON CO.—**F. C. Dillard,** Eugene—$11,920 for approx. 8,000 cu. yd. cr. rock or cr. grav. in stockpiles, Lincoln Co. Line-Alsea Mt. Rock Prod. Proj., on Alsea Hwy.—by Oregon State Highway Commission, Portland.

CLATSOP AND TILLAMOOK COS.—**Rogers Construction Co.,** P. O. Box C-4, Dayton, Wash.—$110,108 for 9.07 mi. bitum., macad. surf., Hug Point-Manzanita Sec., Oregon Coast Hwy.—by Oregon State Highway Commission, Portland.

COOS CO.—**Roy L. Houck,** Salem—$101,373 for 1.3 mi. grade and pave on No. Marshfield and Marshfield-Bunker Hill Sec., Oregon Coast Hwy.—by Oregon State Highway Commission, Portland.

JACKSON CO.—**Norris Bros.,** Burlington, Wash.—$16,509 for improve. of various streets in Medford—by City Council, Medford.

gene—$236,390 for 1.9 mi. grade, Sexton Mt. Sec., Pacific Hwy. —by Oregon State Highway Commission, Portland.

LINCOLN CO.—**Homer G. Johnson,** Imperial Hotel, Portland—$90,320 (using tar), for 5.4 mi. grade and 7.8 mi. surf. and oil Siletz-Toledo Sec., Siletz Secondary Hwy.—by Oregon State Highway Commission, Portland.

MULTNOMAH, WASHINGTON AND CLACKAMAS COS.—**Jacobsen-Jensen Co.,** 517 N. E. Stanton St., Portland—$88,793 for 3.6 mi. grade, surf. Barbur Blvd.-Boones Ferry Rd. Sec. of West Portland-Hubbard Hwy.—by Oregon State Highway Commission, Portland.

UNION CO.—**D. C. & A. L. Williams,** Condon—$10,236 for approx. 8,000 cu. yd. cr. grav. in stockpiles, La Grande Rock Prod. Proj. on Wallowa Lake and Old Oregon Trail Hwys.—by Oregon State Highway Commission, Portland.

### Utah

EMERY CO.—**W. W. Clyde & Co.,** Springville—$23,488 for 10.4 min. const. grav. surf. road betw. Ferron and Emery—by Utah State Highway Commission, Salt Lake City.

GARFIELD CO.—**Carl E. Nelson,** Logan—$60,454 (recommended) for 7.1 mi. grade and surf., Panguitch-Tropic Forest Hwy., Powell Natl. Forest—by Public Roads Administration, Ogden.

RICH CO.—**W. W. Clyde & Co.,** Springville—$98,099 for 4.5 mi. roadmix bitum. surf. road, includ. 175-ft. I-beam bridge betw. Sage Jct. and Wyoming line—by Utah State Highway Commission, Salt Lake City.

SANPETE CO.—**T. G. Rowland Construction Co.,** 1558 Yale Ave., Salt Lake City—$57,435 for 4.4 mi. const. grav. surf. road betw. Fairview and Manti Forest Boundary—by Utah State Highway Commission, Salt Lake City.

### Washington

LEWIS CO.—**Lucich Co.,** 3001-21st St., Seattle—$129,437 (recommended) for const. and improve. about 0.4 mi. Randle-Yakima Hwy., Natl. For. Rd. Proj., Columbia Natl. For.—by Public Roads Administration, Portland, Ore.

LEWIS CO.—**Sam Orino,** Foot of S. W. Porter St., Portland, Ore.—$118,603 (recommended) for .3 mi. reconst. grade, .5 mi. grade and .03 mi. tunnel, Mt. Rainier Natl. Park, Stevens Canyon Hwy., Natl. Park Rd. Proj., within Mt. Rainier Natl. Park —by Public Roads Administration, Portland, Ore.

LEWIS CO.—**E. L. Gates,** Trail, Ore.—$133,727 (using conc. pipe) for about 0.7 mi. grade and structs. of Mt. Stevens Canyon Hwy., Mt. Rainier Natl. Park—by Public Roads Administration, Portland, Ore.

SPOKANE CO.—**Roy L. Bair,** 1220 Ide Ave., Spokane—$43,-261 for 0.9 mi. clear, grade, drain, surf. and const. light bitum. surf. treat. and steel and reinf. conc. undercrossing on Sec. State Hwy. No. 3-H, Fairfield south—by Director of Highways, Olympia.

STEVENS CO.—**C. E. O'Neal,** Ellensburg—$119,296 for 2.2 mi. grade and surf. Unit 2, Proj. 20-I, and 1.9 mi. (incl. 0.06 mi. bridge) on Unit 1, Kettle Falls Bridge, Inchelium County Road and Republic-Kettle Falls Hwy., Wash. Forest. Hwy. Project —by Public Roads Administration, Portland, Oregon.

STEVENS CO.—**Elliott & Co., Inc.,** 2155 Northlake Ave., Seattle—$71,435 for 6.2 mi. clear, grade, drain and surf. Prim. St. Hwy. No. 22, Lancey's Mill Pond to Fruitland—by Director of Highways, Olympia.

STEVENS CO.—**Diesel Oil Sales Co.,** 2155 Northlake Ave., Seattle—$75,500 for 6.6 mi. clear, grade, drain and surf. Prim. St. Hwy. No. 22, Ft. Spokane to Lancey's Mill Pond—by Director of Highways, Olympia.

YAKIMA CO.—**N. Fiorito, Inc.,** 844 W. 48th St., Seattle—$255,509 for 2.2 mi. clear, grade, drain, surf., pave and const. two reinf. conc. bridges and one overcrossing, Prim. St. Hwy. No. 3 and Sec. St. Hwy. No. 3-A, Union Gap to Parker—by Director of Highways, Olympia.

YAKIMA CO.—**Joslin & McAllister,** 303 North Haven St., Spokane—$26,685 for ballast and surf. 5.9 mi. Wenas Rd.—by County Commissioners, Yakima.

YAKIMA CO.—**Sather & Sons,** 12039 Greenwood Ave., Seattle, Wash.—$48,783 for pave 2⅛ mi. from Wapato west—by County Commissioners, Yakima.

### Wyoming

CAMPBELL CO.—**Teton Construction Co.,** Cheyenne—$15,960 for 6.8 mi. const. base crse. surf. and misc. work on Gillette-

Broadus (Little Powder River) road—by Wyoming State Highway Commission, Cheyenne.

TETON CO.—**Barnard-Curtiss Co.,** 808 Phoenix Bldg., Minneapolis, Minn.—$39,130 (official) for 9.5 mi. grade and structs., Wind Riv. For. Hwy. Rt., Teton and Washakie Natl. For.—by Public Roads Administration, Denver, Colo.

### PROPOSED PROJECTS

#### Arizona

GILA CO.—Until Feb. 27, bids will be received by the Public Roads Adminis., Phoenix, for approx. 1.7 mi. grade and const. bridge on Secs. D and E, Rt. 9, Bridgeport-Roosevelt Dam Natl. For. Hwy., Tonto Natl. For.

#### California

KERN CO.—A sum of $125,000 will be spent on improving State Hwy. Rt. 125, betw. San Luis Obispo and the Kings County line.

LOS ANGELES CO.—The City Engineer has asked the City Council for an authorization to proceed with plans for improving Topanga Canyon Blvd., S. from Ventura Blvd. Estimated cost of the proj. is $49,000.

LOS ANGELES CO.—The City Council has authorized the City Engineer to proceed with the proposed widening the blvd. to 150-ft. from Sepulveda Blvd. along the north boundary of the Municipal airport to connect with the Inglewood-Redondo Rd. Estimated cost is $138,854.

LOS ANGELES CO.—All bids received by City Clerk, South Gate, for planing and resurf. on Long Beach Blvd. have been rejected.

PLUMAS CO.—Bids will be received until March 6, 1941, by the Public Roads Administration, San Francisco, for grade and bitum. treat. of the subgrade on 3.7 mi. of the Almanor Natl. For. Hwy.

SAN FRANCISCO CO.—Plans to extend Junipero Serra Blvd. from Sneath Lane to San Bruno Ave., San Francisco, have been approved at an estimated cost of $200,000.

SAN MATEO CO.—The bid of A. Teichert & Son, Inc., 1846 37th St., Sacramento—$14,669 for 0.4 mi. grade and roadmix surf. treat. at Montara Creek has been rejected by the California Division of Highways, Sacramento.

#### Montana

PARK CO.—The only bid to the Montana State Highway Commission, Helena, for 0.5 mi. landscaping area adj. to wye at jct. of Fed. Aid Rts. No. 2 and No. 11 nr. W. city limits of Livingston, includ. grade, surf. with cr. grav. and road mix oil treat. of surf. crse. in Livingston has been rejected and will be readvertised at a future date.

#### Nevada

ELKO CO.—Bids will be received until March 4, 1941, by Public Roads Admin., San Francisco, for 25.6 mi. grade, base course and bitum. treat. surf. (roadmix and plantmix) on Sec. A, B, D, E and G of Rt. 18, Owyhee Riv. Natl. For. Hwy. and on Fed. Lands Hwy. proj.

#### Oregon

GRANT CO.—Bids received by Oregon State Hwy. Commission, Portland, for 4.3 mi. grade, surf. and oil E. Unit, Dixie Summit-Austin Sec., John Day Hwy., have been rejected.

JOSEPHINE AND DOUGLAS COS.—Bids will be readvertised for the improvement of the Sexton Mt. Sec., Pacific Hwy., betw. Roseburg and Grants Pass, in the latter part of November. Approx. cost of the project is $145,000.

#### Washington

PIERCE CO.—The Federal Govt. has provided an addtl. $395,000 for the improv. of the Stevens Canyon Rd., an 18.6 mi. blvd. along side of Mt. Rainier. It is expected to be completed by 1944.

## Bridge & Grade Separation...

### CONTRACTS AWARDED

#### California

ALAMEDA CO.—**Earl W. Heple,** 494 Delmas Ave., San Jose—$139,068 for const. Silver Sprgs. Hwy. crossing under tracks of W. P. R. R. at Sunol—by California Division of Highways, Sacramento.

## Professional Directory

The advertising rate for each professional directory card is $25.00 per year, payable in advance.

**Abbot A. Hanks, Inc.**
*Engineers and Chemists*
CONSULTING - TESTING - INSPECTING
CONCRETE - STEEL - MATERIALS
624 Sacramento Street
San Francisco

**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 in United States and Europe*

## OFFICIAL BIDS

The Panama Canal intends to advertise in the near future for proposals for excavating the approach channels and the sites for lock structures at Pedro Miguel and Miraflores, Canal Zone. Prior to the time specifications can be furnished a prescribed form, which may be obtained from the General Purchasing Officer of the Panama Canal, Washington, D. C., must be executed and returned, together with a deposit of $25.00 for each complete set requested.

BUTTE CO.—**Frank J. Reilly Co.,** 6350 Fulton St., San Francisco—$16,116 for const. reinf. conc. bridge and 0.5 mi. grade and surf. with cr. run base and sealcoat on appr., at Campbell Creek Overflow, 5½ mi. NW of Oroville—by California Division of Highways, Marysville.

KERN CO.—**Griffith Co.,** 1060 S. Broadway, Los Angeles—$10,928 for const. 3 timber bridges on 30th St., Bakersfield—by City Council, Bakersfield.

KERN CO.—**A. Teichert & Son, Inc.,** 1846-37th St., Sacramento—$192,339 for const. two bridges, one across Kern Riv. and the other across Beardsley Canal, 1 and 2 mi., respectively, north of Bakersfield—by California Division of Highways, Sacramento.

LOS ANGELES CO.—**J. E. Haddock, Ltd.,** 3578 E. Foothill Blvd., Pasadena—$163,060 for const. undergrade crossing under tracks of A. T. & S. F. R. R. and 0.1 mi. appr. grade and asph. conc. surf. in Arcadia at Huntington Dr. betw. 2nd and 3rd Aves., Los Angeles—by California Division of Highways, Los Angeles.

MERCED CO.—**Roy Kruger,** Gustine—$9,600 for const. tbr. bridge on conc. ftgs. over Los Banos Creek, and tbr. on pile bridge on Sunset Short Rd. over Canal—by Board of Supervisors, Merced.

SANTA CLARA AND SAN BENITO COS.—**C. W. Caletti & Co.,** P. O. Box 243, San Rafael—$124,082 for const. steel girder bridge on conc. piers and abut., 340-ft. long, across Pajaro River, 6 mi. south of Gilroy—by California Division of Highways, Sacramento.

TULARE CO.—**Louis Biasotti,** P. O. Box 587, Stockton—$10,000 for const. of reinf. conc. slab bridge and drain facil. across Cameron Creek, 5 mi. E. of Visalia—by California Division of Highways, Fresno.

### Colorado

RIO GRANDE CO.—**Ted C. Briggs,** 1005 Colorado Ave., La Junta—$10,801 for const. treat. timber bridge with grav. surf. approaches 0.2 mi. long, betw. Monte Vista and Alamosa on S. H. No. 10—by Colorado State Highway Department, Denver.

### Idaho

BONNER CO.—**Roy L. Bair,** 1220 Ide Ave., Spokane, Wash.—$14,956 for 0.2 mi. grade, drain, surf. with cr. grav. and const. 96.1 ft. steel and timber bridge with pile bent abuts., Colburn-Culver Rd., Pack Riv. Bridge Sec., E. of Colburn—by Commissioner of Public Works, Boise.

### Montana

WIBAUX CO.—**Prahl & Sawtell, Inc.,** Miles City—$10,823 for const. 4 treat. timber pile trestle bridges and a std. timber stock-pass on Sec. B, Baker-Wibaux Rd.—by Montana State Highway Commission, Helena.

### Oregon

LINCOLN CO.—**J. F. Johnston,** 800 Sheridan St., Newberg—$14,033 for const. reinf. conc. bridge, Nashville Bridge Sec., Eddyville-Blodgett Sec. Hwy.—by Oregon State Highway Commission, Portland.

UNION CO.—**Colonial Construction Co.,** W. 326 1st Ave., Spokane, Wash.—$26,425 for const. Minam Hill Viaduct, Wallowa Lake Hwy.—by Oregon State Highway Commission, Portland.

### Washington

KING CO.—**Newkirk Bros.,** 412 E. John St., Seattle—$129,672 for const. 3 reinf. conc. bridges on 0.1 mi. of Prim. St. Hwy. No. 2, Preston-North Bend Sec. 1—by Director of Highways, Olympia.

#### PROPOSED PROJECTS

### California

LOS ANGELES CO.—Bids will be called shortly by Los Angeles County Supervisors for const. of a reinf. conc. bridge over Verdugo Wash at Glorietta Ave., in Glendale.

SAN FRANCISCO CO.—The only bid received by the Dept. of Public Works, San Francisco, for repair of 4th St. bridge over Channel St. waterway, San Francisco, has been rejected.

### Oregon

GRANT CO.—Bids received by Oregon State Hwy. Commission, Portland, for const. reinf. conc. bridge on Goose Rock Sec. of John Day Hwy. have been rejected.

LAKE CO.—Bids received by Oregon State Hwy. Commission, Portland, for 4.3 mi. grade, surf. and oil; const. two composite type pile trestle bridges and 3 conc. culv., Forest Boundary-Cottonwood Crk. Sec., Klamath Falls-Lakeview Hwy., have been rejected.

## Water Supply . . .

#### CONTRACTS AWARDED

### California

LOS ANGELES CO.—**Associated Piping & Engineering Co.,** 2332 E. 38th St., Los Angeles—$13,274 for furn. and install. high pressure feed water and steam piping at Burbank steam plant, Burbank—by City Council, Burbank.

RIVERSIDE CO.—**McEuen & Van Winkle,** Hemet—$5,740 for drill, test and complet. grav. wall well No. 6 at March Field—by Constructing Quartermaster, March Field.

SAN DIEGO CO.—**Walter H. Barber,** P. O. Box 1523, San Diego—$1,758 for const. of Flume 19, Dulzura Conduit involving 330-ft. excav. for and instl. 48-in. conc. pipe furn. by city, Dulzura—by Purchasing Agent, San Diego.

SAN FRANCISCO CO.—**Fred T. Fairey,** 1874-25th Ave., San Francisco—$1,448 for laying 6-in. C. I. main in Maddux Ave., from Scotia St. to Topeka Ave., San Francisco—by Public Utilities Commission, San Francisco.

SAN FRANCISCO CO.—**Leo Epp,** 4745 Geary St., San Francisco—$40,377 for const. reinf. conc. cover for main supply reservoir at Presidio of San Francisco, San Francisco—by Constructing Quartermaster, Fort Mason, San Francisco.

SAN FRANCISCO CO.—**San Francisco Water Dept.,** 425 Mason St., San Francisco—$3,036 for lay 6-in. and 8-in. C. I. mains in 38th and 44th Aves. and Noriega St., San Francisco—by Public Utilities Commission, San Francisco.

SANTA CLARA CO.—**Oakland Sewer Construction Co.,** P. O. Box 178, Walnut Creek—$32,088 for const. water supply and sanitary sewer syst. at Ames Aeronautical Laboratory, Moffett Field—by National Advisory Committee for Aeronautics, Moffett Field.

SOLANO CO.—**W. J. Tobin,** 5708 Glenbrook Drive, Oakland—$11,112 for const. a 20-in. C. I. water dist. pipe line on the line of Missouri St., Sacramento St. and County Rd. No. 594, in Vallejo Township—by City Council, Vallejo.

### Utah

SALT LAKE CO.—**Pittsburgh Des Moines Steel Co.,** Des Moines, Ia.—$21,943 for const. 1,200,000 gal. elev. steel water tk. at Salt Lake Municipal Airport—by Constructing Quartermaster, Hill Field, Ogden.

### Territories

ALASKA—**Pittsburgh Des Moines Steel Co.,** 1120-8th Ave. S., Seattle, Wash.—$75,527 net for furn. and erect. a 500,000 gal. elev. steel tank, piping and access. at Elmendorf Field, Anchorage—by Constructing Quartermaster for Air Bases, Fort Mason, San Francisco.

#### PROPOSED PROJECTS

### California

CONTRA COSTA CO.—On Jan. 21st, the city of Martinez will vote on $284,000 in bonds to finance const. of water treat. plant, 14-in. main pipeline and pumping plant, to connect the city's water syst. with Vine Hill Reservoir, of the Contra Costa conduit, Central Valley Proj.

CONTRA COSTA CO.—Bonds totaling $125,000 were voted by the Pleasant Hill County Water District, Walnut Creek, for construction of two 10,000 gal. tanks and one 40,000 gal. tank and extension of laterals.

SAN DIEGO CO.—A $1,300,000 bond issue to finance const. of a water dist. syst. in San Diego has been voted by the city. Bid call on the first work probably will be issued in two months.

## Sewerage . . .

#### CONTRACTS AWARDED

### California

LOS ANGELES CO.—**B. D. Zaich & Son,** 1416 Ethel St., Glendale—$1,343 for const. sewer relief line betw. 1st alley N. of Park Way and exist. manhole in Santa Monica Blvd. at in-

tersection with Canon Drive, Beverly Hills—by City Council, Beverly Hills.

LOS ANGELES CO.—**J. L. Kruly,** 1759 N. Eastern Ave., Los Angeles—$3,798 for const. sewer in alley SE of Alhambra Ave., Los Angeles—by Board of Public Works, Los Angeles.

LOS ANGELES CO.—**J. L. Kruly,** 1449 S. Reeves, Los Angeles—$2,098 for const. sewer in Southwest Blvd., betw. 112th St. and Vermont Ave., Los Angeles—by Board of Public Works, Los Angeles.

SAN DIEGO CO.—**Fred J. Early, Jr.,** 369 Pine St., San Francisco—$21,000 for furn. and install. equipt. for a sewage disposal syst. at U. S. Marine Corps Base, San Diego—by Los Angeles Contracting Co. and O. W. Karns, Los Angeles.

SAN DIEGO CO.—**Walter H. Barber,** Box 1523, La Mesa, San Diego—$1,075 for const. sewer in Elizabeth St., San Diego—by City Council, San Diego.

SAN DIEGO CO.—**Fred J. Early, Jr.,** 369 Pine St., San Francisco—$50,000 (cost plus fixed fee basis) for const. sewage disposal plant at Camp Elliott, nr. San Diego—by Constructing Quartermaster, Washington, D. C.

SAN MATEO CO.—**Conner & Brant,** 1222 Whipple St., Redwood City—$4,347 for const. and install sanitary sewer syst. in Ringwood Park—by Menlo Park Sanitary District, Menlo Park.

KINGS CO.—**R. H. Hougham,** Corner Kaweah and Neville Sts., Hanford—$6,698 for const. reinf. conc. settling tank with sludge collector, reinf. conc. screen chamber, pump it and install. of pumps, valves, pipe, wire and switches, Corcoran—by City Council, Corcoran.

SAN MATEO CO.—**Hays McLellan,** Broadway and Pacific, San Mateo—$2,253 for const. and instl. reinf. conc. underground pump chamber, two sewage pumps and one sump pump, in Arroyo Court, San Mateo—by City Council, San Mateo.

SOLANO CO.—**Bundesen & Louritzen,** P. O. Box 470, Pittsburg, Calif.—$38,750 (official) for const. 24-in. conc. outfall sewer from site of 600 low cost housing units, nr. Vallejo, to Napa River, about 2,890 ft.—by Public Works Officer, U. S. Navy Yard, Mare Island.

YOLO CO.—**Holdener Construction Co.,** 2608 "R" St., Sacramento—$7,255 for const. of the second unit of the campus drainage syst. University of California Branch of the College of Agriculture, Davis—by Regents of the University of California, Berkeley.

### PROPOSED PROJECTS

### California

LOS ANGELES CO.—The City Engineer, with authorization from the City Council, will prepare plans for reconst. Mareno St. storm drain S. from Oak St. to Alhambra Rd., South Pasadena.

LOS ANGELES CO.—Bids received by Board of Public Works, Los Angeles, for const. storm water control chamber and safety by-pass for the North Outfall sewer nr. Jackson Ave., in Culver City, were rejected.

SANTA CLARA CO.—Plans and specifications have been completed by Dist. Engineer and protests will be heard Nov. 20 by Sanitary Board of Sunol Sanitary Dist., Sunol Element. School, near San Jose, for furnish matls. for const. of sewer syst. in Sunol Sanitary District. Work is to be done by WPA labor. A grant of $96,978 has been received from Federal Gov't.

## Waterway Improvement...

### CONTRACTS AWARDED

### California

LOS ANGELES CO.—**J. E. Burrell & Son,** 518 W. 7th St., Long Beach—$22,086 (recommended) (Items 1 and 3) for repairs to wharf at Target Repair Base, San Pedro—by 11th Naval District, San Diego.

LOS ANGELES CO.—**United Concrete Pipe Corporation,** Box 1, Sta. H, Los Angeles—$648,414 (recommended) for Los Angeles River Improvement, Sec. VIII, Randolph St. to Stewart and Gray Rd., Los Angeles—by U. S. Engineer Office, Los Angeles.

LOS ANGELES CO.—**Ray Schweitzer,** 5633 Lexington, Los Angeles—$21,977 for const. earth channel, levees and wire revets. in Santa Anita Wash from Huntington Drive to 3,000 ft. above El Camino Real, Los Angeles—by Los Angeles County Supervisors, Los Angeles.

MENDOCINO CO.—**Bundesen & Lauritzen,** P. O. Box 470, Pittsburg, Calif.—$47,483 for 70,870 cu. yd. dredge matl. in Noyo River—by U. S. Engineer Office, San Francisco.

SAN DIEGO CO.—**Standard Dredging Corp.,** Central Bldg., Los Angeles—$294,890 (official) for 3,700,000 cu. yd. dredg. in Area M, San Diego Harbor—By U. S. Engineer Office, Los Angeles.

SAN MATEO CO.—**American Dredging Co.,** 255 California St., San Francisco—$243,246 for dredg. 2,789,520 cu. yd. matl. in San Francisco Bay adj. to airport, South San Francisco, San Francisco—by U. S. Engineer Office, San Francisco.

### Washington

GRANT CO.—**Max J. Kuney Co.,** Hutton Bldg., Spokane—$249,000 for widen river channel and shore protect., Columbia Riv. Reserv., Columbia Bas. proj.—by Bureau of Reclamation, Coulee Dam.

KING CO.—**Andrew McLean,** 14th N. W. and Shilshole, Seattle—$17,242 for reconst. with timber of the Hanford St. wharf, Seattle—by Seattle Port Commission, Seattle.

KITSAP CO.—**Puget Sound Bridge & Dredging Co.,** 2929-16th Ave. S. W., Seattle, and **Rumsey & Co.,** 3821 Airport Way, Seattle—$2,000,000 (cost plus fixed fee) for const. pier at Puget Sound Navy Yard, Bremerton—by Navy Department, Bureau of Yards & Docks, Washington, D. C.

#### PROPOSED PROJECTS

### California

SAN DIEGO CO.—Application has been made by (City of San Diego) for approval by War Dept. for dredg. and filling in westerly portion of San Diego Bay, loc. betw. Bay Channel and the mainland in the vic. of La Playa and Roseville.

### Nevada

WASHOE CO.—Bids are now being received by the Department of Interior, San Francisco, for const. channel change and const. canal and structs. involv. excav. of about 75,000 cu. yd. earth and 65,000 cu. yd. rock nr. Pyramid Lake, 40 mi. NE of Reno.

## Dam . . .

#### CONTRACTS AWARDED

### Arizona

COCONINO CO.—**Fisher Contracting Co.,** 516 S. 7th St., Phoenix—$30,000 for const. of an earthfill dam, Flagstaff—by City Council, Flagstaff. Bids were previously received, rejected and the contract awarded by negotiation.

### New Mexico

EDDY CO.—**Henry Thygesen Co.,** Albuquerque—$56,775 for const. of retent. dam on Rio Penasco, 45 mi. NW of Carlsbad and 12 mi. west of Hope—by Hope Water Users Association, Hope.

#### PROPOSED PROJECTS

### California

SAN DIEGO CO.—An issue which provides $3,000,000 for the const. of a dam on San Vicente Creek 4 mi. N. of Lakeside and $1,300,000 for a dist. syst. recently carried at an election. Included are eleven major pipe lines and addtl. filter facil. at the University Heights Reservoir.

SAN DIEGO CO.—The Carlsbad Mutual Water District, Carlsbad, has received a state permit for const. of a $100,000 earthfill dam. Bid call will be issued about December 18, with bid openings about three weeks later.

SAN DIEGO CO.—A $3,000,000 bond issue to finance in part the const. of San Vincente Dam (gravity section concrete) and a pipeline to exist. facil. has been voted by the city of San Diego. Bids are expected to be called about March, 1941, for this estimated $3,550,000 project.

## Irrigation . . .

#### CONTRACTS AWARDED

### Nevada

WASHOE CO.—**Poulos & McEwen,** P. O. Box 1017, Sacramento, Calif.—$93,961 for const. channel change and canal and structs. near Pyramid Lake, about 40 mi. NE of Reno—by Office of Indian Affairs, U. S. Department of Interior, San Francisco.

### Oregon

MULTNOMAH CO.—**Curtis Gardner,** 3830 NE 32nd Place, Portland—$11,545 for const. pump. plant and appurt., Peninsula Drain. District No. 1, Portland—by U. S. Engineer Office, Portland.

### Washington

YAKIMA CO.—**Ray Schweitzer & Fife & Co.,** Parma, Idaho—$66,201 for const. earthwork, pipelines and strucs., laterals and sublaterals, Yakima Ridge Canal, Roza Div., Yakima Proj.—by Bureau of Reclamation, Yakima.

## Tunnel . . .

#### CONTRACTS AWARDED

### California

SISKIYOU CO.—**J. A. Terteling & Sons,** 2223 Fairview Ave., Boise, Idaho—$172,096 for const. of Tule Lake Tunnel, Modoc Div., Klamath Proj., Oregon-California—by Bureau of Reclamation, Klamath Falls, Oregon.

## Buildings . . .

#### CONTRACTS AWARDED

### Arizona

COCHISE CO.—**M. M. Sundt Construction Co.,** 440 S. Park Ave., Tucson—$94,000 (negotiated contract) for construction of 30 housing units at Ft. Huachuca—by Quartermaster General, Washington, D. C.

COCHISE CO.—**Del E. Webb Construction Co.,** Phoenix, and **White & Miller,** Tucson—$1,250,000 (cost plus fixed fee) for const. bldgs. and util. at Ft. Huachuca—by Constructing Quartermaster, Ft. Huachuca.

MARICOPA CO.—**Del E. Webb Construction Co.,** 1633 W. Jefferson St., Phoenix—$350,000 for const. retail store building in Phoenix—by F. W. Woolworth Co., San Francisco.

### California

ALAMEDA CO.—**K. E. Parker,** 135 S. Park St., San Francisco—$394,289 for const. transit shed, garage, firehouse and public works shops at Oakland—by Bureau of Yards & Docks, Washington, D. C.

ALAMEDA CO.—**Johnson, Drake & Piper,** Latham Square Bldg., Oakland—$1,897,000 for const. 600 housing units at Naval Air Station, Alameda—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

ALAMEDA CO.—**Monson Bros.,** 475-6th St., San Francisco—$938,831 (general work) for const. Peralta Villa Low Rent Housing Project, betw. 8th, 12th, Cypress and Union Sts., Oakland—by Housing Authority, Oakland.

MARIN CO.—**A. T. Beckett,** 366 40th St., Oakland—$54,989 for const. one QM warehouse, includ. util., at Hamilton Field—by Construction Quartermaster, Fort Mason.

LOS ANGELES CO.—**C. L. Peck,** H. W. Hellman Bldg., Los Angeles—$172,000 (approx.) for const. 2-story and basement, Class A dept. store bldg. (80x175 ft.) in area, at 394 E. Colorado St., Pasadena—by F. W. Woolworth Co., San Francisco.

LOS ANGELES CO.—**Ted R. Cooper Co.,** 323 Western Pacific Bldg., Los Angeles—$60,000 for const. a 3-story factory bldg. to be built at 502 Moline St., Los Angeles—by California Mill Supply Co., Los Angeles.

LOS ANGELES CO.—**C. L. Peck,** H. W. Hellman Bldg., Los Angeles—$80,000 (church) and $200,000 (mausoleum) for completion of reinf. conc. structs., at 1712 Glendale Ave., Los Angeles—by Forest Lawn Co., Los Angeles.

LOS ANGELES CO.—**Vultee Aircraft Division,** Aviation Manufacturing Corp., 842 Lakewood Blvd., Los Angeles—$4,294,798 (cost plus fixed fee basis) for plant expansion—by War Department, Washington, D. C.

LOS ANGELES CO.—**Joshua H. Marks-Charde Co.,** 816 W. 5th St., Los Angeles—$350,000 for const. 1-story, steel frame warehouse bldg. and reinf. conc. 2-story warehouse, delivery

dept. and office bldg. on the NE corner of Alameda and 49th Sts., Los Angeles—by Ducommun Metals and Supply Co., Los Angeles.

LOS ANGELES CO.—**P. J. Walker Co.,** 3900 Whiteside Ave., Los Angeles—$5,000,000 (approx.) for const. an aircraft manufacturing plant at Long Beach—by Douglas Aircraft Company, Santa Monica.

MARIN CO.—**Franceschi Construction Co.,** 465 Avila St., San Francisco—$241,400 for const. temp. housing at Ft. Barry—by Constructing Quartermaster, Ft. Mason.

MONTEREY CO.—**Ford J. Twaits Co.,** 816 W. 5th St., Los Angeles, and **Morrison-Knudsen Co.,** Title Guarantee Bldg., Los Angeles—$3,000,000 (approx.) (cost plus fixed fee) for const. barracks and other bldgs. for 8,000 men at Fort Ord, Monterey—by Constructing Quartermaster, Washington, D. C.

MONTEREY AND SAN LUIS OBISPO COS.—**Ford J. Twaits Co.,** 816 W. 5th St., Los Angeles, and **Morrison-Knudsen Co., Inc.,** Title Guarantee Bldg., Los Angeles—$6,018,733 (cost plus fixed fee) for const. semi-permanent replace. center for 21,000 troops at Camp Nacimiento, loc. betw. King City and Paso Robles—by Constructing Quartermaster, Washington, D. C.

PLACER CO.—**Campbell Construction Co.,** 800 "R" St., Sacramento—$70,237 const. 3-story reinf. conc. bldg. to house jail and sheriff's office in Auburn—by County of Placer, Auburn.

SAN BERNARDINO CO.—**Pozzo Construction Co.,** 2403 Riverside Drive, Los Angeles—$71,900 for const. warehouse and mess hall, Southern California State Prison, Chino—by State Architect, Sacramento.

SAN DIEGO CO.—**W. E. Kier Construction Co.,** 747-3rd Ave., San Diego—$650,000 (cost plus fixed fee), for const. of bldgs. for mobilization center at Ft. Rosecrans, San Diego—by Quartermaster General, Washington, D. C.

SAN DIEGO CO.—**W. E. Kier Construction Co.,** 747-3rd St., San Diego—$2,199,492 (cost plus fixed fee basis) for const. semi-permanent troop replace. center at San Diego—by Constructing Quartermaster, Washington, D. C.

SAN FRANCISCO CO.—**Leo Epp,** 4745 Geary St., San Francisco—$251,877 for const. temp. housing, includ. utilities, at Ft. Scott, Ft. Funston and Ft. Miley, San Francisco—by Constructing Quartermaster, Ft. Mason.

SAN FRANCISCO CO.—**Barrett & Hilp,** 918 Harrison St., San Francisco—$1,000,000 (approx.) for const. 4-story reinf. conc. studio and office bldg., NE corner of Taylor and O'Farrell Sts., San Francisco—by National Broadcasting Co., San Francisco.

SAN JOAQUIN CO.—**E. H. Riley,** 601 S. San Joaquin Ave., Stockton—$225,370 for const. 5-story brick wing to San Joaquin County Hospital—by City Council, Stockton.

SAN MATEO CO.—**H. H. Larsen Co.,** 64 South Park, San Francisco—$51,232 for const. 1-story and basement reinf. conc. addition to San Mateo County Court House, Redwood City—by County of San Mateo.

SOLANO CO.—**Cahill Bros.,** 206 Sansome St., San Francisco, and **Ben C. Gerwick, Inc.,** 112 Market St., San Francisco—$858,000 (cost plus fixed fee), for const. 250 housing units at Mare Island—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

VENTURA CO.—**Zoss Construction Co.,** 1015 W. 4th St., Los Angeles—$484,660 for const. Maritime Training Station, Hueneme—by Federal Works Agency, Public Buildings Administration, Washington, D. C.

### Colorado

ARAPAHOE CO.—**N. E. Petry,** Denver—$115,645 for const. temp. housing facil. (about 13 bldgs.) at Fort Logan—by Constructing Quartermaster, Lowry Field, Denver.

DENVER CO.—**Bradbury & Marchant,** Albuquerque, New Mexico—$220,880 for const. 25 bldgs. for temp. housing facil., Denver—by Constructing Quartermaster, Fitzsimmons General Hospital, Denver.

### Idaho

IDAHO CO.—**Busboom & Rauh,** 100 E. Iron Av., Salina, Kansas—$64,200 for const. U. S. Post Office at Grangeville—by Federal Works Agency, Washington, D. C.

### Nevada

CLARK CO.—**Paul S. Webb,** Boulder City—$60,000 for const. of an office and laboratory bldg. to be built in Boulder City—by U. S. Bureau of Mines, Washington, D. C.

WASHOE CO.—**M. R. Peterson,** 1116 "O" St., Sacramento, Calif.—$169,447 for const. of the Engineering Bldg. at the University of Nevada, Reno—by Regents of University of Nevada, Reno.

### New Mexico

BERNALILLO CO.—**Lembke Construction Co.,** Albuquerque —$300,000 (approx.) (cost plus fixed fee) for const. 100 frame and stucco dwellings nr. Albuquerque Municipal Airport, Albuquerque—by War Department, Washington, D. C.

### Oregon

MULTNOMAH CO.—**Hauser Construction Co.,** Multnomah Hotel; **George H. Buckler Co.,** Lewis Bldg., and **Natt McDougall Co.,** Sherlock Bldg., Portland—$1,142,056 (cost plus fixed fee) for const. 120 temp. bldgs. for air corps cantonment at Portland—by Constructing Quartermaster, Washington, D. C.

MULTNOMAH CO.—**L. F. Dow Co.,** 245 North Bundy Drive, Los Angeles, Calif.—$64,646 for const. of post office at Gresham —by Federal Works Agency, Washington, D. C.

### Utah

SALT LAKE CO.—**R. D. Merrill Construction Co.,** Helena, Mont.—$151,906 (items 1, 2, 3 and 4) for const. temp. bldgs. at Ft. Douglas—by War Department, Washington, D. C.

TOOELE CO.—**R. D. Merrill Construction Co.,** Helena, Mont. —$159,572 for const. temp. housing facil. and util. at Wendover Bombing Range, Wendover—by Constructing Quartermaster, Hill Field, Ogden.

WEBER CO.—**Al Johnson Construction Co.,** Foshay Tower, Minneapolis, Minn., and **James Leck Co.,** 211 S. 11th St., Minneapolis, Minn.—$1,705,000 for const. 7 warehouses, incl. util., at Utah General Depot, Ogden—by Constructing Quartermaster, Hill Field, Ogden.

WEBER CO.—**N. P. Severin Co.,** 222 W. Adams St., Chicago, Ill.—$326,500 for one engine repair bldg., includ. utilities, to be const. at Hill Field—by U. S. Army Department, Washington, D. C.

WEBER CO.—**Mead & Mount Construction Co.,** Denver Natl. Bank Bldg., Denver, Colo.—$248,000 for const. an engine test bldg. at Hill Field—by Constructing Quartermaster, Hill Field, Ogden.

### Washington

KING CO. — **Henrikson-Alstrom Construction Co.,** Textile Tower, Seattle—$464,450 for const. defense housing proj. known as Sand Point Housing Project—by Housing Authority, Seattle.

KITSAP CO.—**West Coast Construction Co.,** Textile Tower, Seattle—$1,812,300 for const. 600 frame dwell. units, includ. plumbing, heating, elec. work, water and sewer systs., street work and landscaping, Bremerton—by Bremerton Housing Authority, Bremerton.

OKANOGAN CO.—**Mattson & Potucek,** Tacoma—$57,370 for const. U. S. Post Office at Omak—by Federal Works Agency, Washington, D. C.

PIERCE CO.—**Sam Bergesen,** Tacoma—$130,100 for const. reception center, includ. 10 barracks, mess hall, infirmary and officers' quarters at Ft. Lewis—by Constructing Quartermaster, Ft. Lewis.

PIERCE CO.—**L. H. Hoffman,** Portland—$404,983 for const. 75 bldgs. for the cantonment of the 115th Cavalry at Ft. Lewis—by Constructing Quartermaster, Ft. Lewis.

### Wyoming

LARAMIE CO.—**Mead & Mount Construction Co.,** Denver Natl. Bank Bldg., Denver, Colo.—$1,970,720 (cost plus fixed fee basis), for const. troop replacement center at Ft. Francis E. Warren—by Constructing Quartermaster, Washington, D. C.

### Territories

ALASKA—**Siems-Spokane Co. & Associates,** 2929-16th Ave. S. W., Seattle—$1,575,000 (cost plus fixed fee) for 250 defense housing units for Kodiak, 125 units at Sitka and 75 units at Unalaska—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

CANAL ZONE—**MacDonald Construction Co.** and **G. L. Tarlton,** St. Louis, Mo.—$2,256,090 for const. hospital and nurses' quarters at Ft. Clayton and $1,759,388 for similar work at Ft. Gulick, Canal Zone—by Constructing Quartermaster, War Department, Washington, D. C.

HAWAII — **Hawaiian-Raymond-Turner,** Naval Air Station, Alameda, Calif.—$4,197,000 for const. 1300 housing units, Honolulu—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

HAWAII—**R. E. McKee,** 2700 San Fernando Road, West Los Angeles—$358,700 for const. Gun Battalion Barracks No. 2, Schofield Barracks, Hawaii—by Constructing Quartermaster, Ft. Mason, California.

HAWAII—**E. E. Black,** Honolulu—$1,650,000 (cost plus fixed fee) const. 550 housing units, 250 at Kamehameha and 300 at Hickam Field—by War Department, Washington, D. C.

#### PROPOSED PROJECTS

### California

ALAMEDA CO.—The War Department contemplates establishment of a $20,000,000 Quartermaster Corps Supply Depot in the San Francisco Bay Dist., probably in the Outer Harbor, Oakland, which would serve the entire Pacific Coast.

LOS ANGELES CO.—Plans for const. of a 35,000 kw steam geno. plant are under consideration by the Pasadena Municipal Light & Power Dept. Estimated cost of the project is $2,000,000.

NEVADA CO.—Plans and specs. are being completed and work is expected to start within 60 days (company forces), by Pacific Gas & Electric Co., San Francisco, for const. of a generating plant to be located above Dutch Flat on Bear River. Estimated cost is $3,200,000.

RIVERSIDE CO.—An allocation of $394,700 has been given to the War Department for the const. of various bldgs. at March Field.

SANTA BARBARA CO.—The War Department is completing plans for a 750-bed general army cantonment hospital in the Casa Loma Area at an estimated cost of $1,000,000. The hospital will consist of a group of bldgs.

### New Mexico

BERNALILLO CO.—The War Department has announced funds allocated for const. of a proj. totaling $1,200,000 for temporary bldgs. and facilities at Albuquerque.

### Oregon

CLATSOP CO.—Secretary of the Navy has announced that an air patrol stat. will be establ. at Tongue Point, about 3 mi. from Astoria. Estimated cost of the project is $3,500,000.

MULTNOMAH CO.—The War Department has received an allocation of $1,304,450 for const. of the new Army Air Corps station at Portland.

### Washington

CLARK CO.—The War Department has announced that authority has been given for const. of a 750-bed cantonment-type General Hospital at Vancouver Barracks to serve military personnel in Northwest States Area.

## Miscellaneous . . .

#### CONTRACTS AWARDED

### California

ALAMEDA CO.—**Clinton Construction Co.,** 923 Folsom St., San Francisco—$1,800,000 (cost plus fixed fee), for const. aviation storage facil. at Naval Supply Depot, Oakland—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

LOS ANGELES AND SAN DIEGO COS.—**Griffith Co.,** 1060 S. Broadway, Los Angeles, for four curve changes betw. Los Angeles and San Diego—by Santa Fe Railway, Los Angeles.

SAN FRANCISCO CO.—**Macco Construction Co.,** 915 Paramount Blvd., Clearwater—for excav. for Risdon shipbuilding plant at 20th and Illinois Sts., San Francisco—by Bethlehem Steel Company, San Francisco.

SAN FRANCISCO CO.—**Dulien Steel Products,** Administration Bldg., Treasure Island—$105,000 for demolition, remove and salvage all fixed properties of Exposition Co. and Bldgs. of State of California, Treasure Island, San Francisco—by Golden Gate International Exposition, Treasure Island, San Francisco.

### Colorado

PHILLIPS CO.—**E. A. Reiter,** Aitken, Minn.—$127,823 for const. 185 mi. trans. line—by High Electric Association, Holyoke.

### Idaho

NEZ PERCE CO.—**Homer G. Johnson,** Imperial Hotel, Portland, Ore.—$53,722 for const. 73 mi. trans. line—by Clearwater Valley Light & Power Association, Lewiston.

### Montana

BIG HORN CO.—**Peter Kiewit & Sons Co.,** Omaha Natl. Bank Bldg., Omaha, Nebr.—$149,195 for const. 166 mi. trans. line—by Big Horn Electrical Cooperative, Hardin.

STILLWATER CO.—**D. M. Manning,** Hysham—$239,448 for const. 227 mi. of trans. line—by Beartooth Electric Cooperative, Absarokee.

### Oregon

MULTNOMAH AND CLATSOP COS.—**J. E. Chandler,** Arcadia, Calif.—$135,855 for const. 82 mi. trans. lines betw. dead-end tower of Willamette crossing No. 2 nr. St. Johns and substat. nr. Astoria—by Bonneville Power Administration, Portland.

WASCO AND MULTNOMAH COS.—**Fritz Ziebarth,** Vancouver, Wash.—$248,989 for const. 38 mi. 115-kv trans. line betw. Bonneville and The Dalles—by Bonneville Administration, Portland.

### Utah

DUCHESNE CO.—**H. A. Risk Pipe & Construction Co.,** Nebraska City, Nebr.—$91,610 for const. 147 mi. trans. line at Mt. Emmons—by Moon Lake Electrical Association, Mt. Emmons.

### Washington

COLUMBIA CO.—**City Electric Co.,** Nampa, Idaho—$120,363 for const. 205 mi. trans. line—by Columbia County Rural Electrical Association, Incorporated, Dayton.

JEFFERSON CO.—**MacDonald Building Co.,** 1517 S. Tacoma Way, Tacoma—$307,082 (cost plus fixed fee) for const. water, sewer and elec. dist. systs. at Fts. Flagler and Casey, on Puget Sound—by Constructing Quartermaster, Washington, D. C.

KITSAP CO.—**The Austin Co.,** Dexter Horton Bldg., Seattle, Wash.—$95,000 for const. improve. at Puget Sound Navy Yard, Bremerton—by Bureau of Yards & Docks, Navy Department, Washington, D. C.

KITTITAS AND YAKIMA COS.—**Fritz Ziebarth,** Vancouver—$39,452 for const. 30-mi. power trans. line betw. Yakima and Ellensburg—by Bonneville Power Administration, Portland, Oregon.

KLICKITAT CO.—**Homer G. Johnson,** Imperial Hotel, Portland, Ore.—$50,230 for const. 70 mi. trans. line—by Klickitat County Public Utilities District No. 1, White Salmon.

PIERCE CO.—**Macri Brothers & L. Coluccio,** 1642 Lane St., Seattle—$183,263 (water and sewer), and **NePage Electric Co.,** 804-6th Ave. S., Seattle—$56,120 (electric) for const. water, sewer and electrical systs. at Ft. Lewis—by Constructing Quartermaster, Ft. Lewis.

PIERCE CO.—**Sound Construction & Engineering Co.,** Northern Life Tower, Seattle, and **Peter Kiewit Sons Co.,** Omaha Natl. Bank Bldg., Omaha, Nebr.—$3,075,000 (cost plus fixed fee), for const. 540 bldgs. and two conc. reservoirs at Ft. Lewis—by Constructing Quartermaster, Washington, D. C.

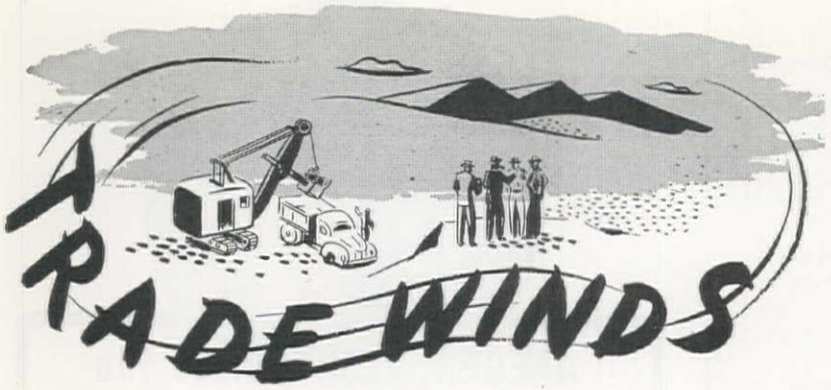
PIERCE CO.—**MacDonald & Kahn Co., Ltd.,** Financial Center Bldg., San Francisco—$66,955 for const. water, sewer and electrical dist. systs. for 500 and 700-bed hospital at Ft. Lewis—by Constructing Quartermaster, Washington, D. C.

### Wyoming

BIG HORN CO.—**Big Horn Construction Co.,** Sheridan—$93,346 for const. 141 mi. trans. line—by Big Horn Electric Company, Basin.

### Territories

ALASKA—**Siems-Spokane Co.,** 412 Realty Bldg., Spokane, Wash.; **Johnson, Drake & Piper,** Latham Square Bldg., Oakland, Calif., and **Puget Sound Bridge & Dredging Co.,** 2929-16th Ave. S. W., Seattle, Wash.—$1,628,000 for improve. at Sitka and Kodiak—by Bureau of Yards & Docks, Navy Department, Washington, D. C.




## News of Men Who Sell to the Construction West

**Donald A. Robison,** general sales manager of the *Caterpillar Tractor Co.,* has been made vice president of that organization, with administrative direction of all selling and advertising activities. He is a native of Nevada, and was graduated from the University of Nevada shortly before joining the Caterpillar Tractor Co. organization. Since 1926 he has advanced rapidly through various activities in the credit and treasury department to the office of assistant treasurer, treasurer, and finally general sales manager.

* * *

**Gail E. Spain,** for the past two years manager of the sales development division of the *Caterpillar Tractor Co.,* will succeed Robison as general sales manager. Spain is a graduate of Oregon State College, and for nine years was employed in the engineering and sales departments of the Willamette Iron & Steel Works at Portland, Ore. In 1929 he joined the Caterpillar Tractor Co. organization at San Leandro, Calif., and was transferred to Peoria, Ill., later in the same year. He has held positions in the merchandise, engine sales and general sales departments.

* * *

**The Midland Implement Co.,** Billings, Mont., has been appointed sales and service representative in Montana for the *Universal Crusher Co.* of Cedar Rapids, Iowa. Midland will handle crushing, pulverizing, screening, washing and conveying equipment, as well as the new combination chip spreader and roller.

* * *

**H. T. Lintott** has been appointed manager of industrial relations for the *Columbia Steel Co.,* San Francisco, Calif. Lintott, who has been general superintendent of Columbia's plant at Torrance, Calif., succeeds E. M. Stephens, who has been on a temporary assignment since 1939 from the U. S. Steel Corp. Lintott joined the Columbia Steel Co. staff in 1928 as chief electrician of the Torrance plant, was advanced to assistant general superintendent in 1929, and general superintendent in 1939.

**Otto A. Kresse,** assistant general superintendent of the *Columbia Steel Co.* plant at Torrance, has been appointed general superintendent to succeed Lintott. Kresse has been with the Columbia Steel Co. since 1910, and from 1923 until 1928 was open hearth superintendent at Pittsburg, Calif.

**DONALD A. ROBISON has been appointed vice-president of the Caterpillar Tractor Co.**

* * *

*Columbia Steel Co.,* San Francisco, Calif., a subsidiary of the U. S. Steel Corp., is removing its wire rope and fence manufacturing plant from Sixteenth and Folsom Streets in San Francisco to Pittsburg, Calif. On the Sixteenth and Folsom site, the company plans to erect a steel warehouse which will serve to distribute company products to the northern California area. The removal of the wire rope and fence plant was made necessary by the acquisition of the company's warehouse at 20th and Illinois Streets by the U. S. Navy. The company plans to construct a new building covering 197,000 square feet on Columbia Steel Co. property to the west of the Santa Fe railroad tracks in Pittsburg.

* * *

**Roy Robinson,** formerly *Caterpillar Tractor Co.* distributor and machinery dealer in Montana, has recently formed an organization to distribute the Caterpillar products and allied lines in Arizona. The new firm, which will be known as the *State Tractor and Equipment Co.,* has taken over the building and organization of the Crawford Tractor Co. Officials of the new organization, in addition to Mr. Robinson as president, are Grady Watson, sales manager, and Fred Elder, agricultural sales manager. Stores with complete displays of machines and stocks of parts will be maintained at Phoenix, Buckeye, Coolidge and Mesa, with no change in personnel.

* * *

**Walter Crawford,** veteran Caterpillar distributor, and head of the *Crawford Tractor Co.,* Phoenix, Ariz., retired from active duty on Nov. 16, 1940. He had been a distributor of Caterpillar products at Phoenix since 1935, and prior to that time was head of a similar organization at Cedar Rapids, Iowa.

* * *

**The Bergstrom Steel Co., Ltd.,** of Los Angeles and Oakland, Calif., has been appointed distributor by the *Sullivan Machinery Co.,* Michigan City, Ind., for their detachable rock drill bits, and will stock a complete line of the bits in its warehouses at both Los Angeles and Oakland. The new distributor has a force of sales engineers experienced in the practical application of drill bits, and is fully equipped to make and supply detachable bit rods and to resharpen bits. The Bergstrom Steel Co. was not only the first operator in the United States of a commercial drill steel conversion shop, but was also the first distributor of detachable bits.

* * *

**Dr. W. D. Coolidge** and **Stuart M. Crocker** have been appointed new vice presidents of the *General Electric Co.,* Schnectady, N. Y. Dr. Coolidge has been, and will continue as director of the General Electric Research Laboratory in Schenectady, Mr. Crocker will relinquish management of the air conditioning and refrigeration department at Bloomfield, N. J., to make his headquarters in New York City, where he will cooperate with all commercial departments in furthering the general interests of the company.

* * *

*The Smoot Machinery Co.,* Salt Lake City, Utah, has moved to new quarters at 2320 Neffs Lane. The new location will give them more room and enable them to better serve their customers.

* * *

**Stuart L. Rawlings,** executive vice president of the Calaveras Cement Co., died on Nov. 9, 1940.

* * *

*The Edward R. Bacon Co.,* San Francisco, Calif., has recently made several changes in personnel. **Aubrey Mendel** has joined the San Francisco staff, in charge of the sales promotion department. **Larry Southwick,** who formerly worked out of the Oakland office, has been transferred to San Francisco, where he will cover the territory be-

tween San Francisco and the Oregon line. **L. C. Petrie,** formerly in San Francisco, is now located in the Oakland office, handling sales. **Al P. Hahn** has established his headquarters in Sacramento. **John A. Carroll** has joined the organization of the Sacramento office.

* * *

**O. R. Rabel,** president of the *Star Machinery Co.,* Seattle, Wash., has recently announced a profit sharing plan whereby all permanent salaried employees of the organization will benefit. A bonus will be determined quarterly on the basis of profits for the preceding six months. About 80 employees will share during the fourth quarter of this year, for which the rate will be ten per cent. The Star Machinery Co. was founded in 1900 by Christian Rabel and his son, now president. The organization represents 94 manufacturers. **C. E. Rabel** is vice president, and **R. R. Rabel** is secretary.

* * *

**J. C. Gilbert,** who resigned a position as salesman with the *Howard-Cooper Corp.* in 1938 to operate a garage in Spokane, Wash., has again joined the Seattle sales force of Howard-Cooper.

* * *

*The Clyde Equipment Co.,* Seattle, Wash., and Portland, Ore., has been appointed distributor for equipment from Grand Coulee Dam by Consolidated Builders, Inc. Release of the equipment has begun, and is expected to continue for the next six or eight months.

* * *

**The Clyde Equipment Co.** has taken over the distribution of the Buda-Hubron earth drill, manufactured by the *Buda Co.,* Harvey, Ill. The Clyde organization will handle the drills in Oregon and Washington.

* * *

**Stanley Stone,** factory representative for the *Delta Mfg. Co.* of Milwaukee, Wis., recently moved his office from Los Angeles, Calif., to Seattle, Wash.

* * *

**H. B. McManus,** veteran salesman in the Seattle branch of *Fairbanks-Morse & Co.,* has been called to active duty by the U. S. Navy, and assigned to the Sand Point Naval Air Station. **Ray Miller,** formerly of Portland, Ore., has succeeded McManus at Seattle.

* * *

The *Industrial Equipment Co.,* Oakland, Calif., has been appointed exclusive distributor for the *Manitowoc Engineering Works,* Manitowoc, Wis. Industrial's territory will include California, Nevada, Utah, and Arizona, in which it will handle the complete line of crawler and truck cranes, draglines and shovels.

* * *

**John Jorgenson** has been elected president of the Construction Equipment Distributors, San Francisco, for 1941. Other officers of the organization include **Ned Jenison,** director; **E. E. Richter, Jr.,** 1st vice president; **A. Ruxton,** 2nd vice president and treasurer, and **A. E. Mason,** 3rd vice president and secretary.

* * *

**S. I. Harris,** recently with the John Deere Plow Co., and prior to that for 14 years with the Union Oil Co., has been appointed district representative for the *LaPlant-Choate Mfg. Co.,* with headquarters at San Leandro, Calif. He will cover all sales in the central section of the West Coast.

* * *

The *Le Roi-Rix Machinery Co.,* Los Angeles, Calif., has been appointed representative of the *Cleveland Rock Drill Co.* in southern California.

The *Nelson Equipment Co.,* Los Angeles, Calif., has been appointed distributor of Byers shovels in the southern California territory by the *Byers Machine Co.,* Ravenna, Ohio.

* * *

**Roy Thrailkill,** well known in the construction industry of southern California, has accepted a position with the Western Machinery Co., Los Angeles, Calif.

* * *

The *Lee and Thatro Equipment Co.,* Los Angeles, Calif., has been appointed as distributor by the *Michigan Power Shovel Co.* and the *Cochise Rock Drill Mfg. Co.* Lee and Thatro will handle the lines of the two manufacturers in southern California.

# *New* Materials and *Equipment* . . .

## Safety Belt Tail Line

*Manufacturer:* Mine Safety Appliances Co., Pittsburgh, Pa.

*Equipment:* Steel Safety Belt Tail Line.

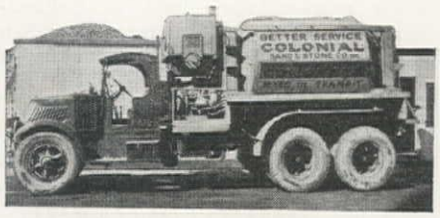
*Features claimed:* This new unit is a belt anchor with high strength, durability and versatility in application, yet permits freedom of action. The line consists of an aircraft-type cable, light and flexible although tested to 3,900 lb. Drop forged steel snaps at both ends are swaged on by the exclusive velocity power process which makes a joint equal in strength to the cable, itself. The cable is available in any length, and may be furnished with a covering for firm and comfortable grasp. A line can be quickly attached to the D-ring of a safety belt.

## High Discharge Truck Mixers

*Manufacturer:* Chain Belt Co., Milwaukee, Wis.

*Equipment:* Complete line of high discharge moto-mixers and agitators.

*Features claimed:* A new mixing principle makes the drum self-cleaning while mixing. The mixing action scours the drum since there are no inaccessible places for cement to build up. A single opening is used for both charging and discharging, with the entire opening available for both purposes. A large rear charging hopper serves as a receiving hopper for aggregate charging as a stationary throw-back blade while mixing, and at




the same time affords visibility or sampling of the batch. The "Hi-Discharge" can place concrete over 20 to 22-ft. areas on all types of jobs. It discharges low slump mixtures quickly, and gives added inches of discharge height needed to pour concrete directly into sidewalks and curbing from the street. A spout with five chuting lengths and the Rex zipper spout suspension aid the high discharge. Other features include a completely closed anti-freeze water system, an improved chain belt drive, and a twin clutch transmission. A large inspection hatch has a quick-acting removable door, which is large enough to allow the passage of a man for general inspection.

## Large Diesel Truck Engine

*Manufacturer:* Mack Trucks, Inc., Long Island City, N. Y.

*Equipment:* Model END-605 Mack-Lanova diesel engine.

*Features claimed:* This larger edition of the Model ED diesel engine is similar in design and principle, but has a piston displacement of 605 cu. in., and a bore and stroke of 4⅝ in. It operates at the same maximum speed of 2,000 r.p.m., and develops 144 hp. at that speed. The maximum torque at 1,100 r.p.m. is 455 lb. ft. One of the most important features of the new diesel is its combination of smokeless combustion with high power, high speed, and smooth operation.

# *Literature*...Catalogs

**The following booklets may be obtained by sending your request directly to the manufacturer or to WESTERN CONSTRUCTION NEWS, 333 Kearny Street, San Francisco.**

**J. D. Adams Co.,** Indianapolis, Ind.—Form 4018, specification sheet devoted to Motor Grader No. 311, equipped with 50-hp. diesel engine.

**Wm. Bros Boiler and Manufacturing Co.,** Minneapolis, Minn.—Form 383, covering a reversible trip-blade plow, designed for use with trucks on highway snow removal work.

**Worthington Pump and Machinery Corp.,** Harrison, N. J.—Bulletin H-850-B52B, covering gasoline driven portable compressors in sizes of 60 to 315 cu. ft. of air. A table of specifications for the five sizes is included.

**The Galion Iron Works & Mfg. Co.,** Galion, Ohio—Bulletin 260 on a light weight general service portable roller for various kinds of patching and compacting work. Weight of the machine is variable from 7,500 to 10,000 lb.

**Davenport Manufacturing Co.,** South Gate, Calif.—A folder on jumbo earthmoving equipment, including a hydraulic car-

rying revolving scraper for use with small horse power tractors, and a junior ripper with automatic lift.

**Templeton, Kenly & Co.,** Chicago, Ill.—Catalog No. 40 is a junior catalog which readily fits into the vest pocket. It describes the construction, application, and gives specifications for more than 300 sizes and types of simplex jacks.

**Ransome Concrete Machinery Co.,** Dunellen, N. J.—Bulletin No. 172 illustrates and describes a new welding positioner designed to facilitate the handling of material in welding shops.

**Stout Pipe Coupler Co.,** San Francisco, Calif.—A folder describing an automatic quick lock pipe coupler especially designed for irrigation, fire protection and temporary water supply lines.

**Caterpillar Tractor Co.,** Peoria, Ill.—Form 6423, a specification folder on the D13000 diesel engine for locomotive service, including a description of the engine specifications and maximum performance curves.

**Kennedy-Van Saun Mfg. and Engineering Corp.,** New York, N. Y.—Bulletin 35, Second Edition, a general catalog of Kennedy products used in mining, crushing, chemical and cement plants.

**The Sisalkraft Co.,** Chicago, Ill.—A folder describing and illustrating the Sisalkraft road blankets for general protection of materials, tools and machines on the job. A sample of the all-purpose road paper is attached to the folder.

**J. D. Adams Co.,** Indianapolis, Ind.—Form 4024, devoted to two models of the motor grader—No. 501, powered by 66½ hp. gasoline engine, and No. 511, powered by 68½ hp. diesel engine. Design and operating features are pointed out and described in detail. Specification sheet is also included.

**Magnus Chemical Co.,** Garwood, N. J.—A series of detailed performance reports from operators of truck fleets, outlining improvements effected by the use of properly selected cleaners for motors, chasses, bodies and radiators.

**Sellstrom Manufacturing Co.,** Chicago, Ill.—Catalog 18 devoted to all types of eye protectors, including shields, goggles, lenses, filters, etc.

**Littleford Brothers,** Cincinnati, Ohio—A folder describing in detail the new "Spray Master" pressure distributor.

## OFFICIAL BIDS

UNITED STATES DEPARTMENT OF THE INTERIOR
(Bureau of Reclamation)

Washington, D. C., November 16, 1940

Sealed bids (Specifications No. 941) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 p. m., January 2, 1941, and will at that hour be opened, for furnishing and delivering at Coram, California, four 15-foot diameter welded-plate-steel, main-unit penstocks complete with branches to station-service units and all supports and appurtenances for the Shasta Dam, Central Valley project, California. All of the materials will be installed by the Government. No charge for copies of specifications to prospective bona fide bidders; to others, $3.50 not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado, or Washington, D. C.

JOHN C. PAGE, Commissioner.

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