WESTERN CONSTRUCTION

FEATURED THIS ISSUE

Plans for the West's First Prestressed Concrete Bridge

●

Simple Method for Deciding How Many Shovels Per Truck

●

Steel Piles to 360-ft. Depth For Idaho Bridge Foundation

●

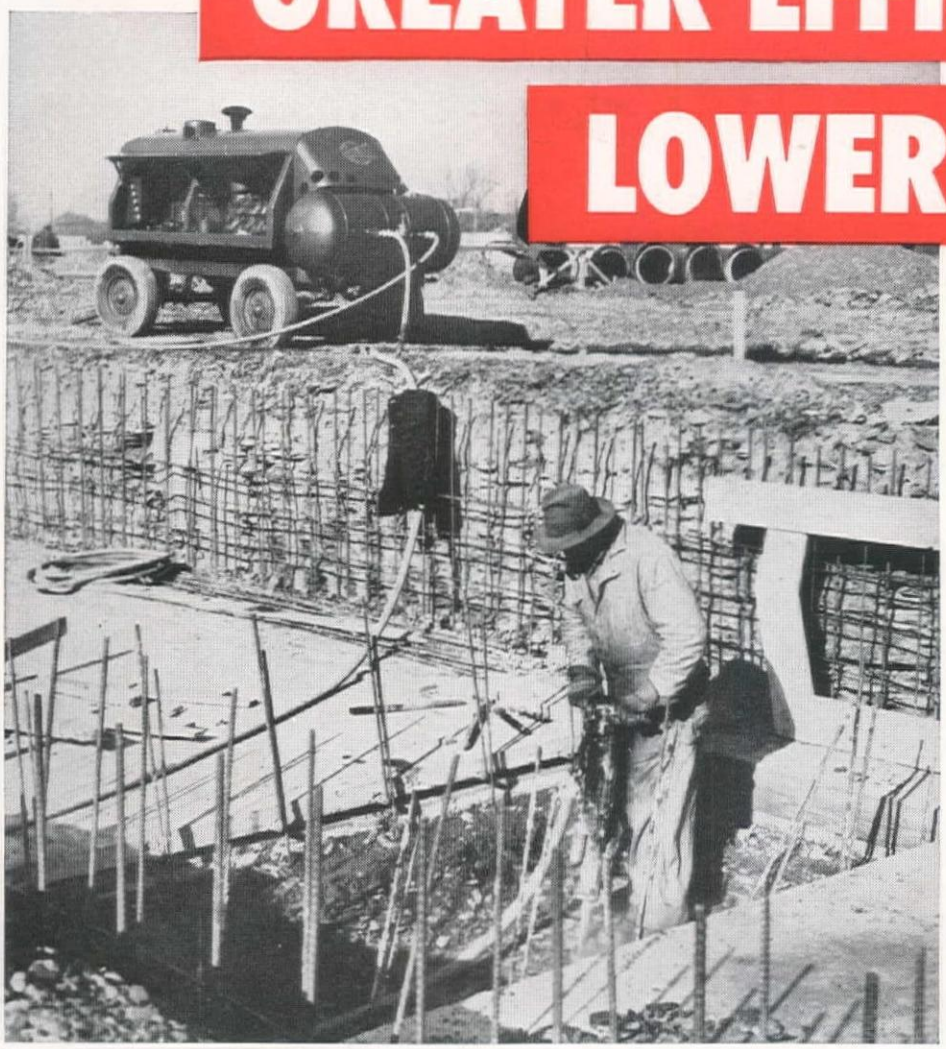
Day-to-Day Field Problems in Placing Lightweight Concrete

●

Ingenuity in Providing a Small Town With a New Sewage System

DECEMBER 1950

GREATER EFFICIENCY LOWER COSTS



Use the Texaco air compressor oil recommended for your specific operating conditions

No one lubricant can be used effectively for *all* air compressor operations. Different operating conditions demand different lubricants. Texaco offers a complete line of air compressor oils that assure greater efficiency and lower maintenance costs whatever your set-up may be. For example:

1. "Wet cylinder" conditions call for Texaco compounded air compressor oils.
2. Where rust is a problem, Texaco specially inhibited air compressor oils are best.
3. Where excessive carbon and gum formations are present, use Texaco heavy-duty air compressor oils.
4. For normal operation Texaco straight mineral oils are recommended.

When used as recommended, all the oils in the Texaco air compressor series improve performance, assure *clean* compressors and systems, and bring down maintenance costs.

A Texaco Lubrication Engineer will gladly help you select the proper oil for your particular operation. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Air Compressor Oils

FOR ALL OPERATING CONDITIONS

TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

ANOTHER BIG DAM JOB

Northwest Equipped!

Northwests moved most of the material at Hungry Horse and now on Chief Joseph Dam on the Columbia River, one of the Pacific Northwests toughest excavation jobs, Northwests are handling the removal of the 4,000,000 cu. yds. of mixed rock and earth.

Rock is the big problem! It is hard granite, heavily seamed and not at all decomposed, lying in benches and hilly outcroppings. Here is a place where the Northwest Dual Independent Crowd, Northwest Uniform Pressure Swing Clutches, the Northwest "Feather-Touch" Clutch Control and other Northwest Rock Shovel advantages are proving that if you have a real Rock Shovel you never have to worry about output.

The General Construction Company of Seattle, found out a long time ago what equipment meant in moving material. They are now operating their 23rd Northwest and four Northwests are showing dirt movers what speed is at Chief Joseph.

There is no better guarantee of service than a repeat order by a responsible contractor who has handled millions of yards of tough digging. Think it over and make your plans ahead now to have a Northwest on your job.

NORTHWEST ENGINEERING COMPANY
135 South LaSalle Street, Chicago 3, Illinois

local NORTHWEST sales agents

BUTTE, MONTANA
Hall-Perry Machinery Co.

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★

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B.F.Goodrich

The tire that thrives on a diet of mud and razor-sharp rocks

TIRES hauling ore-bearing clay from pit to mill in barite mining service lead a difficult life. The tires on the equipment shown being examined above, operated by the Baroid Sales Division of the National Lead Company, Potosi, Mo., have been working under the following routine:

One minute they are backing out on raw clay in the pits — a clay that has the consistency of putty when moist, but like rough stone when dry. Next, they are carrying a twelve-ton load to the mill over a road of flint and quartz — a surface similar to broken razor blades.

Yet, the operators report they have experienced *no road delays due to tire trouble* since B. F. Goodrich tires were put into service in 1947. This big cut in operating costs is largely due to the exclusive protection of the patented *nylon shock shield* found only in B. F. Goodrich tires (with *double* nylon shock shield in larger sizes). Layers of nylon cord, built between the tread and body plies, shield the cord body by smoothly distributing shocks and strains.

These BFG tires have a special deep tread designed for just such service. The BFG Rock tires shown above have wide, continuous-running ribs that give more wear at vital points. The heavy, non-directional cleats on the shoulders give a deep bite in forward or reverse, on moist clay or hard quartz. And the tread material is compounded to resist cutting.

Regardless of the type of tire service your equipment demands, your B. F. Goodrich retailer has a cost-cutting answer. See him and be sure to specify BFG tires for your new equipment. Enjoy the extra savings of patented nylon shock shield protection at no extra cost. *The B.F.Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER

Here is the New Yardstick for

Allis-Chalmers Model HD-20

Hydraulic Torque Converter Tractor...

- **BIG AND RUGGED** . . . 41,800 lb. of properly balanced weight . . . long, wide, sure-gripping tracks. Handles the toughest jobs in stride!

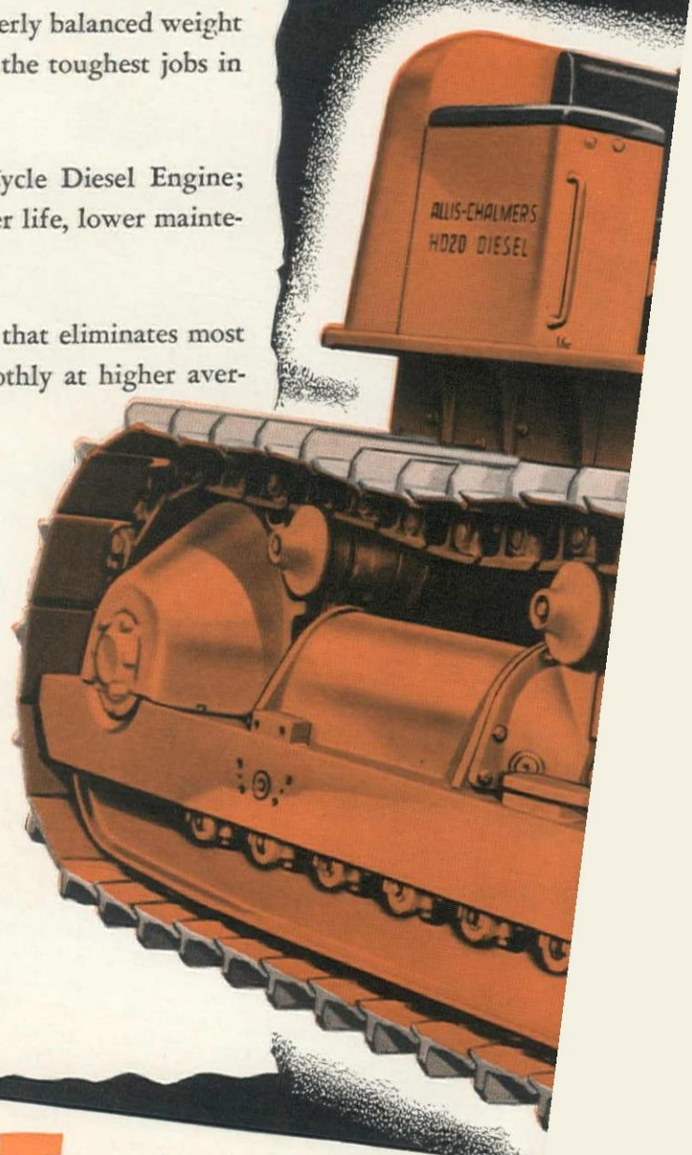
- **POWERFUL** . . . Newest, latest GM 2-Cycle Diesel Engine; Model 6-110. Plenty of POWER . . . for longer life, lower maintenance, increased production.

- **HYDRAULIC TORQUE CONVERTER DRIVE** that eliminates most gear shifting and keeps tractor working smoothly at higher average speeds.

- **SIMPLE UNIT ASSEMBLY** . . . major assemblies removed and repaired or replaced without removing adjacent parts.

- **EXTENDED LUBRICATION PERIODS THROUGHOUT** . . . plus 1,000-hour periods on truck wheels, track idlers and support rollers with A-C's POSITIVE SEAL.

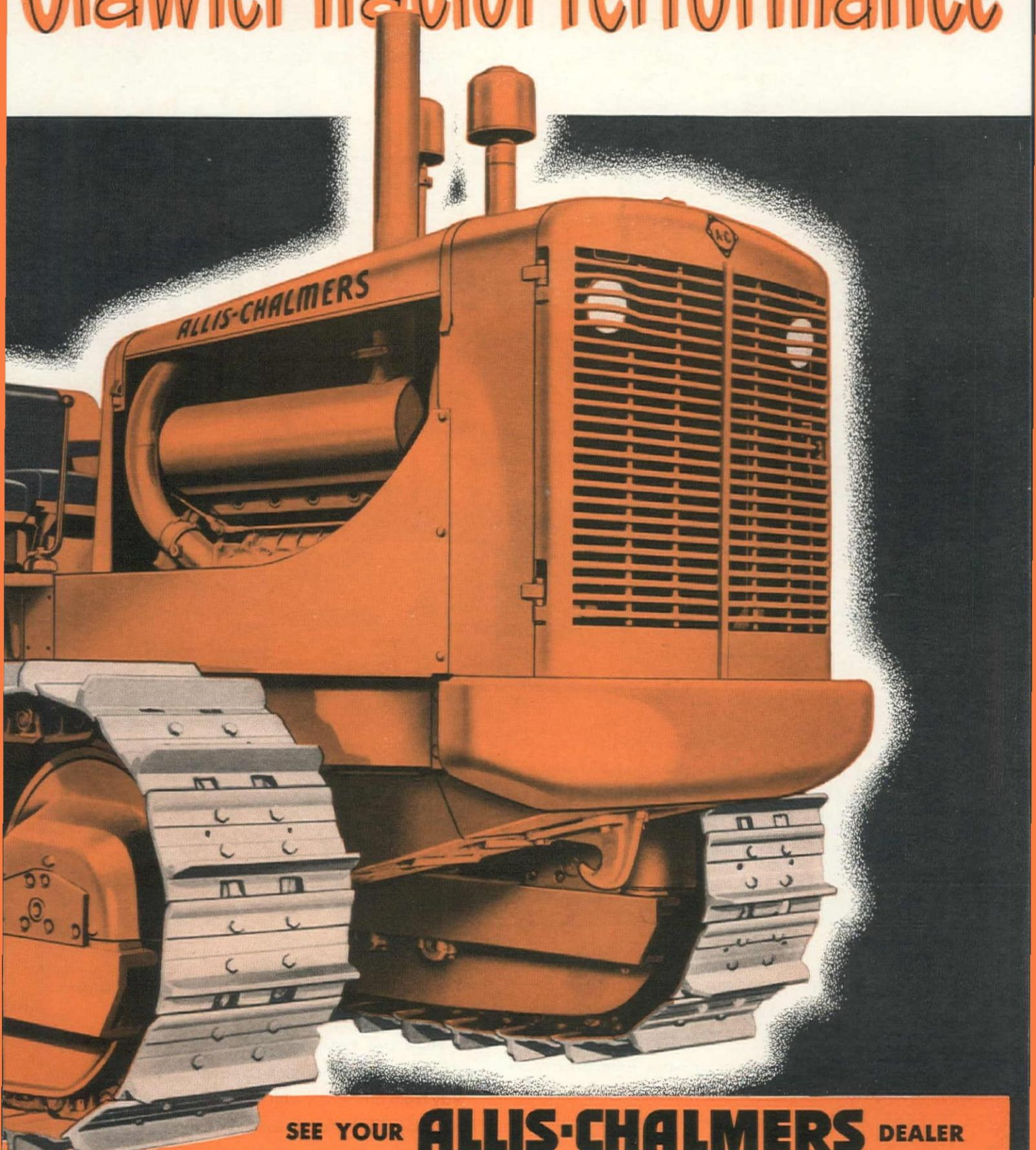
- **EVERY OPERATOR COMFORT** . . . seat, platform, controls, visibility . . . hydraulic finger-tip steering, self-energizing brakes, practically no gear shifting.



World's Finest Tractor

Get the full story from your Allis-Chalmers dealer. Arrange for a demonstration on your job at the earliest opportunity.

Crawler Tractor Performance



SEE YOUR ALLIS-CHALMERS DEALER

ARIZONA: Phoenix—Neil B. McGinnis. **NORTHERN CALIFORNIA: Oakland and Eureka**—Buran Equipment Company; **Modesto**—J. M. Equipment Co.; **Fresno**—Peerless Tractor and Equipment, Food Machinery and Chemical Corp.; **Salinas and King City**—Livingston Bros. Tractor Co.; **No. Sacramento, Stockton, Redding**—Moore Equipment Company, Inc.; **Mountain View**—Redwine Tractor Co.; **Visalia**—Tulare County Tractor Co. **SOUTHERN CALIFORNIA: Bakersfield**—San Joaquin Tractor Co.; **Los Angeles, San Diego and Santa Barbara**—Shaw Sales & Service Company. **IDAHO: Idaho Falls and Boise**—Southern Idaho Equipment Company. **MONTANA: Missoula**—Mountain Tractor Company; **Sidney**—Northland Machinery Company; **Billings**—Seitz Machinery Company, Inc. **NEVADA: Elko**—C. W. Paul Hardware and Machinery; **Reno**—Moore Equipment Company, Inc. **OREGON: Eugene, Roseburg and North Bend**—Farm and Industrial Equipment Co.; **The Dalles**—Dielschneider Equip. Oreg. Ltd.; **La Grande**—Oregon Tractor Company; **Medford**—Tractor Sales and Service, Inc.; **Klamath Falls**—West Hitchcock Corp.; **Portland**—Wood Tractor Company. **UTAH: Salt Lake City**—Cate Equipment Co., Inc. **WASHINGTON: Seattle, Tacoma and Wenatchee**—A. H. Cox & Company; **Walla Walla**—Northern Harris; **Spokane**—American Machine Company. **WYOMING: Casper**—Studer Tractor & Equipment Co.

2 giant new "Caterpillar" Earthmovers

...built to outspeed, outwork and outlast all comers!

With their high speeds and huge capacities, these two new "Caterpillar" Earthmovers have what it takes to push work through ahead of schedule. For national defense or private enterprise—on roads, dams, levees, airports or general construction—you can count on them for peak production.

Both these giants are powered by the new 225-HP., 6-cylinder "Cat" Diesel Engine. The 4-wheel DW20, with top speed of 26.6 m.p.h., is available with three matched units: the W20 Wagon, the No. 20 Scraper and the No. 20S 'Dozer. The 2-wheel DW21 has a top speed of 20 m.p.h. and trails the No. 21 Scraper. Features are described on the opposite page.

Here are typical reports on the DW20-W20 unit (25 cu. yds. heaped capacity): "You can run away from other rigs with it," says Operator Robert England. "The dump control is handy and easy to operate. It's got good brakes—you can stop it still, loaded. It's safe on turns and grades. It shifts easy and fast. The engine's got guts." Dragline Operator R. D. Johnson adds: "It's good and wide—you don't waste a bucket. It gets in and out faster than any I ever loaded."

THE DW20 TRACTOR AND W20 WAGON UNIT

This big-capacity unit offers:

17 cu. yds. capacity, struck; 25 cu. yds., heaped.

Travel speeds, through five gear ratios, from 2.88 to 26.6 m.p.h.

Wide-mouthed hopper to provide easy-to-hit target for shovel or dragline loading.

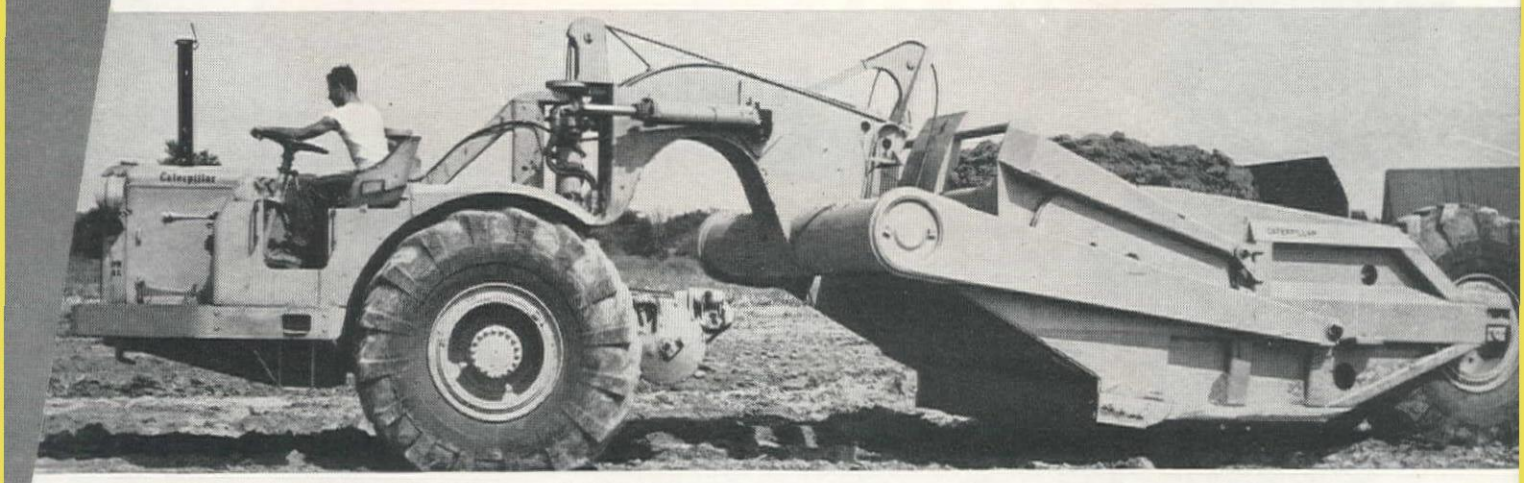
Controlled dumping — openings can be varied without mechanical adjustment — permitting either dumping or windrowing.

Accurate hydraulically controlled dumping with positive mechanical lock on dump doors.

The DW20 Tractor with No. 20 Scraper offers:

The same capacities, speeds and general specifications (except in type of gooseneck) as the No. 21 Scraper.

The DW20 Tractor is also available with the No. 20S Bulldozer.



THE DW21 TRACTOR AND NO. 21 SCRAPER UNIT

This big-capacity unit offers:

Full 90° turn each way—non-stop turn in 35 ft.

15 cu. yds. capacity, struck; 19½ cu. yds., heaped. With available 12" extensions: 18 cu. yds., struck; 22½ cu. yds., heaped.

Travel speeds, through five gear ratios, from 2.16 to 20 m.p.h.

Bowl and apron designed to promote "boiling" action of earth through center of load—for full-measure yardage, minimum loading time.

Large low-pressure tires for easy load flotation.

'Dozer-type ejection for positive "kicking out" of sticky material; dependable spring-action ejector return.

Open bowl design for visible loading under shovel or dragline.

Adjustable rear axle to permit level cuts and desired settings.

Double bottom of special alloy steel. Self-sharpening, reversible cutting edge.

High apron lift, low center of gravity.

Built to the exacting standards that characterize all "Caterpillar" equipment, these big yellow earthmovers are production boosters from the word "go!" What's more, your nearby "Caterpillar" dealer is on call for immediate service. For full information about these rigs, see him or write the factory.

•

Caterpillar Tractor Co., San Leandro, Calif.; Peoria, Ill.

DW20 AND DW21 TRACTOR FEATURES

NEW ENGINE: The completely new 6-cylinder "Cat" Diesel Engine . . . 225 HP. at 1900 r.p.m. available at the flywheel . . . 275 HP. peak capacity at 2000 r.p.m. tested in accordance with A.S.M.E. Power Test Codes.

TRANSMISSION: Constant-mesh transmission and heavy-duty clutch. Special locking device prevents gears from becoming disengaged.

STEERING: Hydraulic booster steering follows the natural "feel-of-the-road" hand guidance. Heavy steel stops keep gooseneck of drawn equipment from jack-knifing.

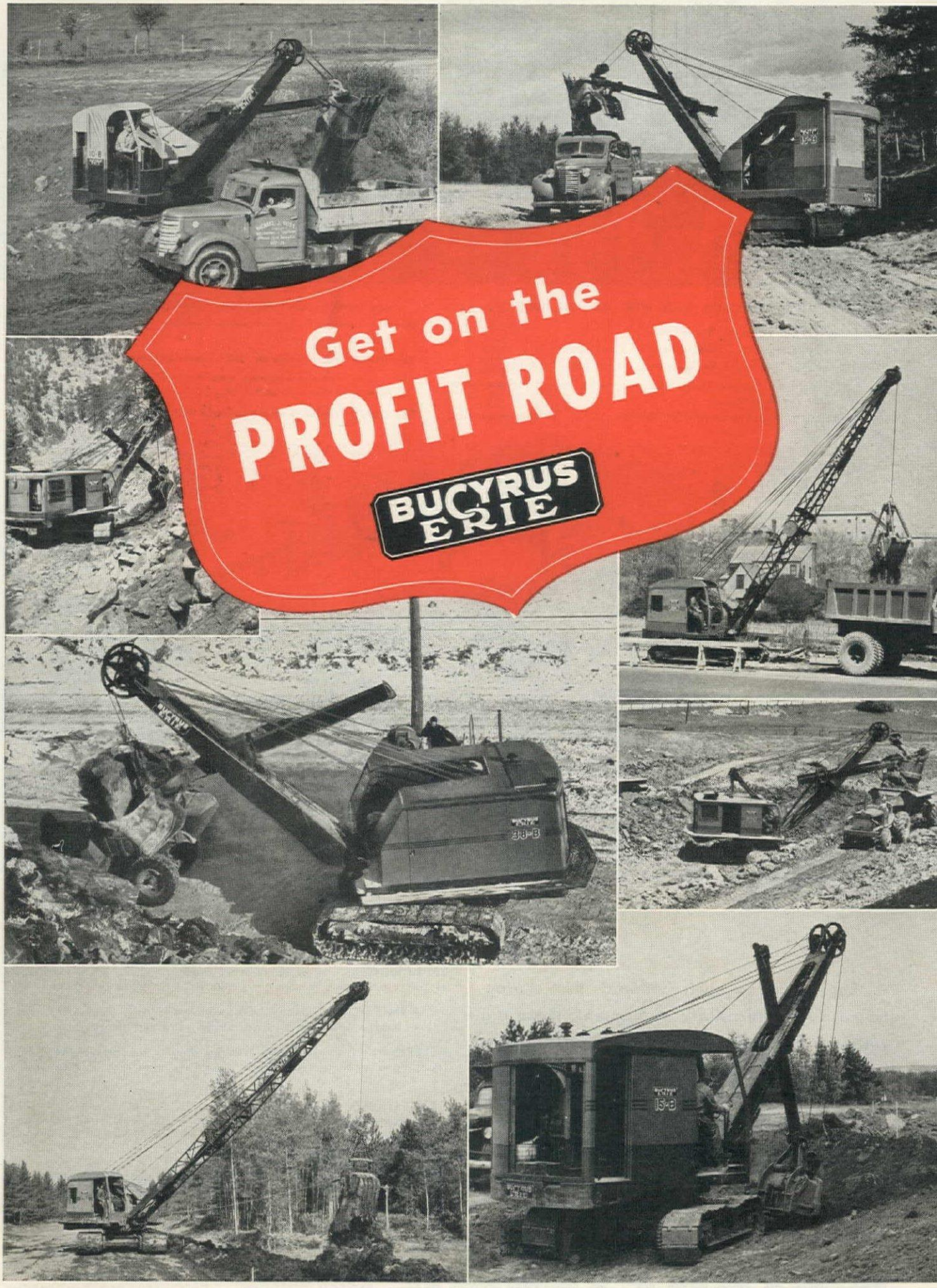
BRAKES: Each large, heavy-duty brake is 22" in diameter, 7" wide. Compressed air energized brakes on both tractor and drawn member of unit. Handy control valves for applying both sets of brakes, and to either right or left driving wheel.

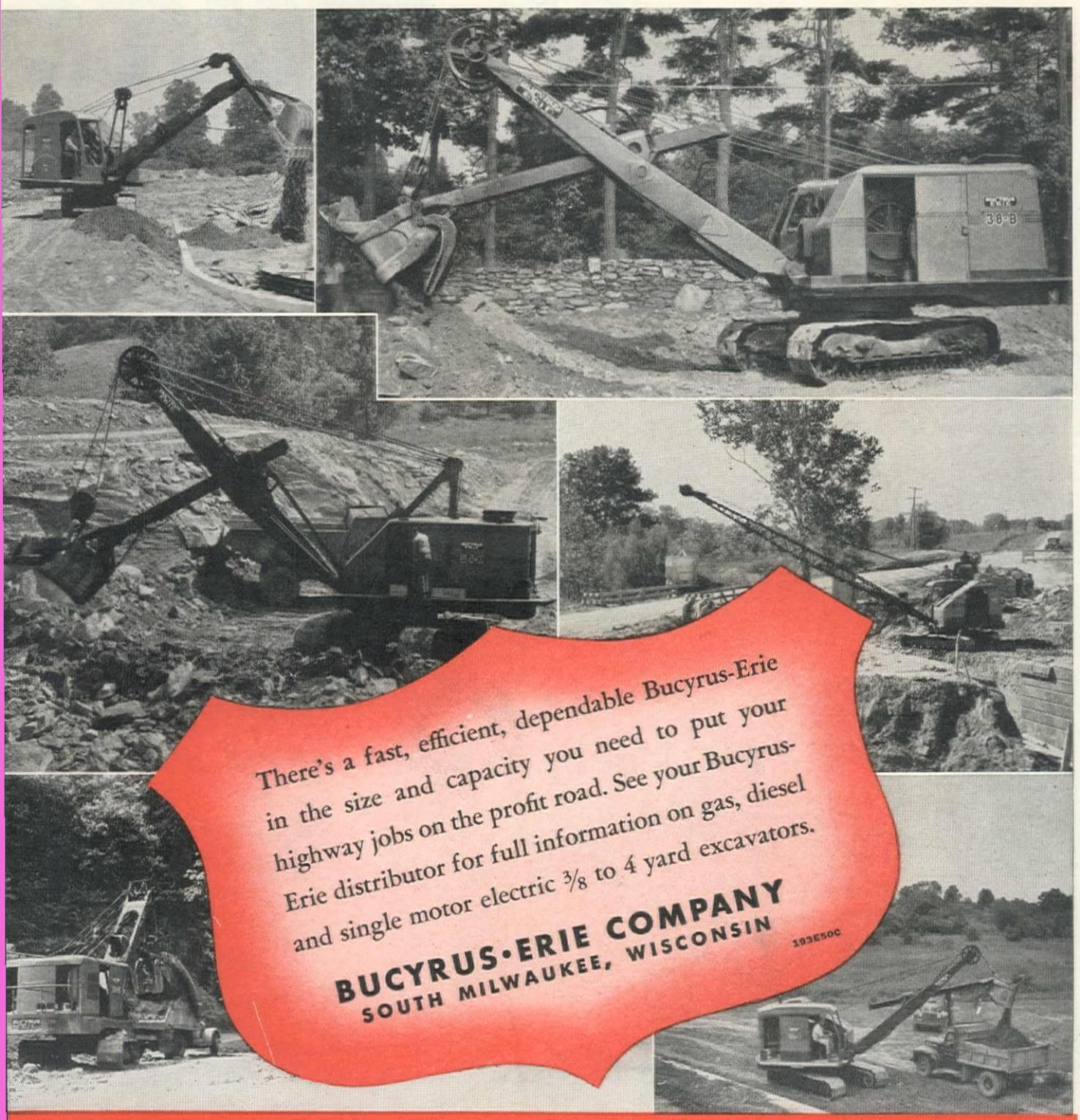
OPERATOR COMFORT: Airfoam rubber cushion on bucket-type seat mounted on coil spring with hydraulic snubber. All controls within easy reach. Excellent visibility.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS
MOTOR GRADERS • EARTHMOVING EQUIPMENT


Get on the
PROFIT ROAD
BUCYRUS
ERIE



There's a fast, efficient, dependable Bucyrus-Erie in the size and capacity you need to put your highway jobs on the profit road. See your Bucyrus-Erie distributor for full information on gas, diesel and single motor electric 3/8 to 4 yard excavators.

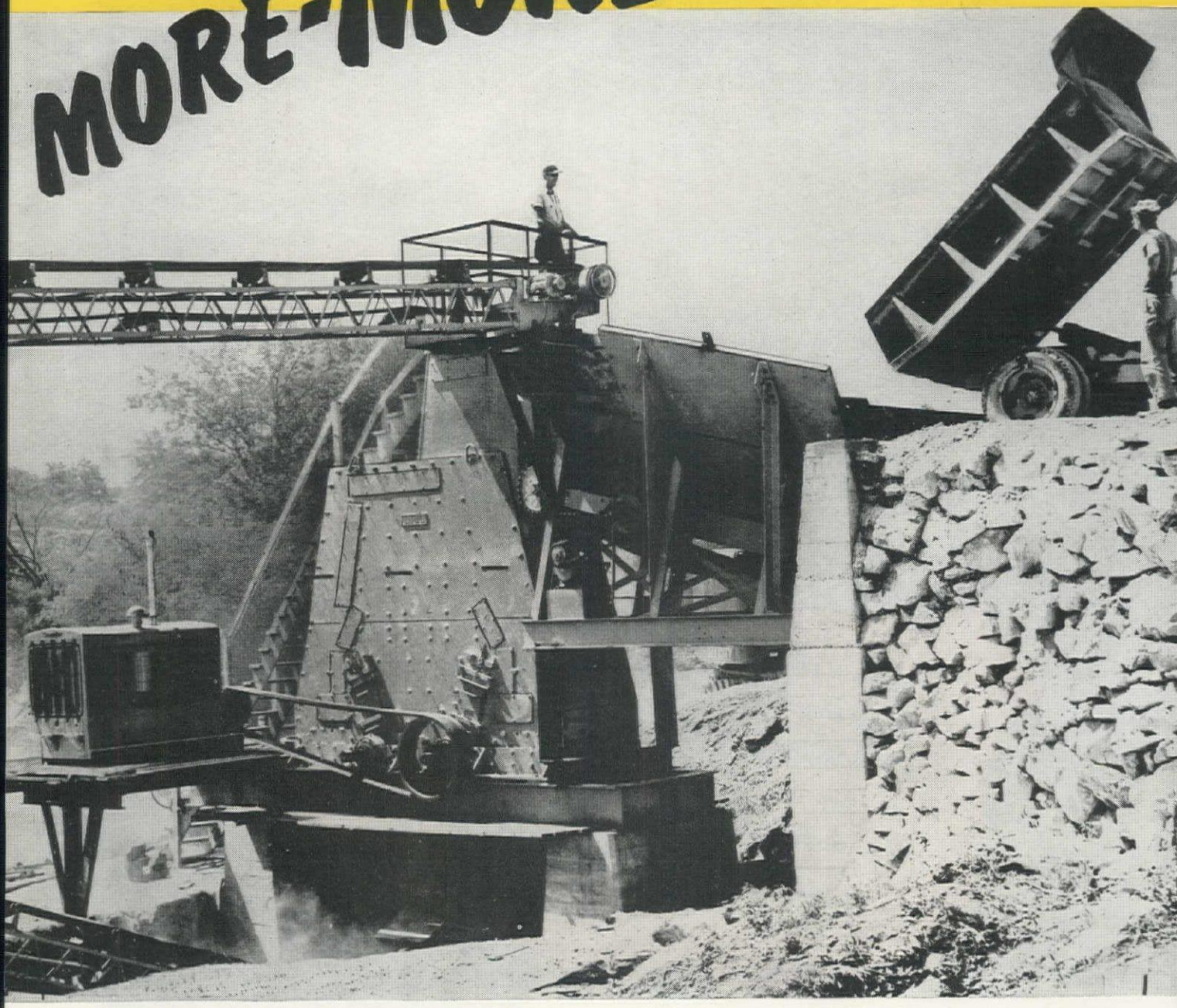
BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

193E50C

See Your Bucyrus-Erie Distributor

BROWNING-FERRIS MACHINERY CO.	DALLAS & HOUSTON
CLYDE EQUIPMENT COMPANY	PORTLAND & SEATTLE
THE COLORADO BUILDERS' SUPPLY CO.	DENVER
CONTRACTORS MACHINERY CO.	SAN ANTONIO
CROOK COMPANY	LOS ANGELES
GREAT NORTHERN TOOL & SUPPLY CO.	BILLINGS
R. L. HARRISON COMPANY, INC.	ALBUQUERQUE
INTERMOUNTAIN EQUIPMENT COMPANY	BOISE, POCATELLO, SPOKANE
THE LANG COMPANY	SALT LAKE CITY
THE MERRILL-BROSE COMPANY	SAN FRANCISCO
NEVADA EQUIPMENT SERVICE	RENO
THE O. S. STAPLEY COMPANY	PHOENIX
TRI-STATE EQUIPMENT COMPANY	EL PASO
WESTMONT TRACTOR & EQUIPMENT COMPANY	MISSOULA & KALISPELL

MORE-MORE-MORE



TYPICAL of dozens of installations, this Model 5050 Cedarapids Double Impeller Impact Breaker is producing tops in tonnage—and at lower cost. In a dolomite installation in Ohio, one operator claimed 720 tons per hour using two 150 H.P. Motors. In Florida, one Cedarapids Breaker is doing the work of three previous crushers in reducing a very abrasive coral rock down to minus 1". Ask your Cedarapids distributor for more field-proved facts on Double Impeller Impact Breaker action.

THE IOWA LINE *of Material Handling Equipment Is Distributed by:*

HALL-PERRY MACHINERY CO., Butte, Great Falls, Missoula and Billings, Mont.; INTERMOUNTAIN EQUIPMENT CO., Boise and Pocatello, Idaho, and Spokane, Wash.; WORTHAM MACHINERY CO., Cheyenne, Wyo.; KIMBALL EQUIPMENT CO., Salt Lake City, Utah; H. W. MOORE EQUIPMENT COMPANY, Denver, Colo.; JACK SAHLBERG EQUIPMENT CO., 300 Aurora Avenue, Seattle 9, Wash.; CONTRACTORS EQUIPMENT CORP., Portland, Oregon; CASSON-HALE CORP., Hayward, Calif.; ARIZONA CEDAR RAPIDS CO., Phoenix, Ariz.; R. L. HARRISON CO., INC., Albuquerque, N. M.; SIERRA MACHINERY CO., Reno, Nevada; BROWN-BEVIS EQUIPMENT CO., Los Angeles, Calif.

PRODUCTION

of Ideal Cubical Shaped Aggregate

with Cedarapids

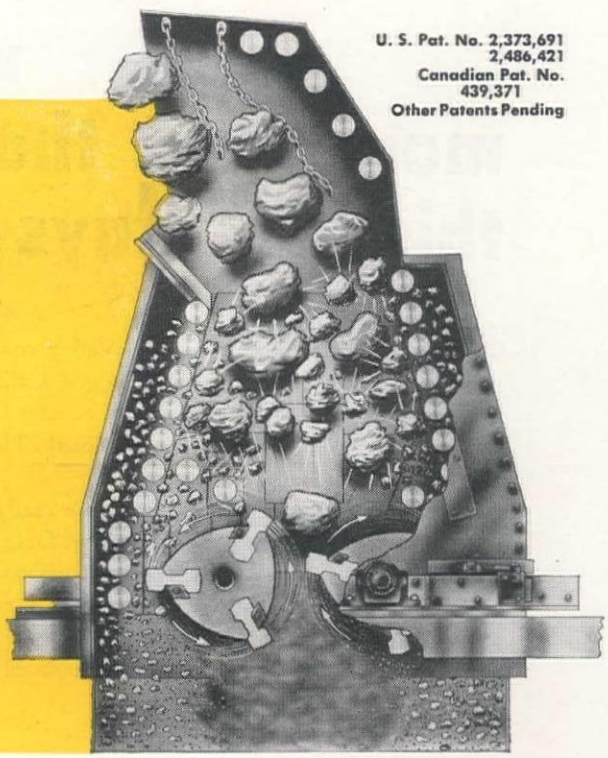
DOUBLE IMPELLER IMPACT BREAKER

(formerly made by New Holland)

HERE'S the unit that will give you greater hourly tonnage capacities, better quality and shape of finished products, lower horsepower per ton of aggregate produced and a higher reduction ratio.

The Cedarapids Model 5050 Double Impeller Impact Breaker can produce up to 400 tons per hour of minus 4" clean, cubical aggregate required in so many specifications today. The smaller models — 4040, 3030 and 2020 can deliver from 75 tons per hour — up, depending on the material fed, horsepower used and size product desired.

You can use the Cedarapids Double Impeller Impact Breakers for basalt, cinders, tuff, perlite, limestone, coral rock, sandstone, coal, copper ore, lead zinc ore, low grade iron ore, or dozens of other materials with a relatively low silica content. They will operate in wet, sticky material that jams, packs or clogs conventional machines.



U. S. Pat. No. 2,373,691
2,486,421
Canadian Pat. No.
439,371
Other Patents Pending

Set up your plants NOW— for stepped up capacity

PUT *your* plant in the big money picture with the high capacity production made possible by the Cedarapids Double Impeller Impact Breaker. Think of the profit in producing greater hourly tonnage of a better product . . . and at the same time reducing your power and maintenance costs, with a lower plant investment! The illustration at the right shows how it is done . . .

Rock is broken by impact (not crushed) into the ideal cubical aggregate required in so many specifications. And a high percentage of the material is *broken in mid-air* by rock striking rock! Result . . . the Breaker can be fed larger rocks, handles greater volume, reduces pit run material to specification size *in one pass*. This extremely high ratio of reduction reduces your plant investment because it eliminates the need for much accessory equipment such as screens, conveyors, secondary crushers, etc.

Stone broken in mid-air requires no power . . . you save on horsepower. Approximately 50% less contact of stone on metal keeps replacement and maintenance costs low.

Get this big volume, low cost set-up operating in your plant now!

IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U. S. A.

Cedarapids

Built by IOWA

"MORE POWER, WEIGHT *and* SPEED

makes these TD-24's do more work than any other tractor on this job," says contractor R. K. Nickols

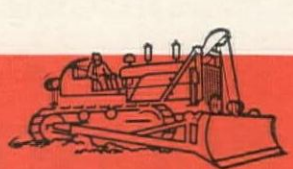
Taking the twists out of Carmel Valley road involves moving 340,000 cubic yards of rugged California terrain. Both Mehren Construction Co. and Los Gattos Construction Co. chose International TD-24's for bulldozing and push-loading here.

R. K. Nickols, contractor, says, "We really get good service from these tractors. They are faster at push-loading our scoops. They have more power, weight and speed and do more work than any other tractors on this job. When push-loaded by TD-24's, scrapers get 15% to 20% more loads on the fill in a day."

And so the story goes from coast to coast, wherever construction and earthmoving jobs are too tough for ordinary tractors, contractors call on the TD-24. These "Champions" dig in and deliver payloads where other tractors have trouble in traveling.

It will pay you to find out what's in the TD-24 for you. Drop in at your nearby International Industrial Power Distributor's place of business and let him show you the reasons why the International TD-24 is known across the nation as the "Champion of Crawlers."

INTERNATIONAL HARVESTER COMPANY, Chicago

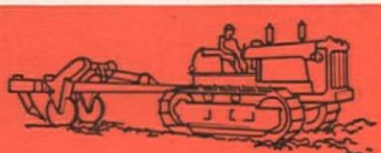


'Dozing rocky obstacles out of the way on this California mountainside demands TD-24 power.

Push-loading scrapers is faster, more profitable when you have the power, weight and speed of the TD-24 on the job.

INTERNATIONAL HARVESTER

INTERNATIONAL
INDUSTRIAL POWER



You hear it from coast to coast.*..

"It's BLUE BRUTES For My Money!"

***OREGON**

It's another Blue Brute UMW Wagon Drill. Ready to swing into action at any angle, it is here helping to cut through a road out where the timber grows tallest. The Kuckenberg Construction Company of Portland, Ore., are the owners and the report from this firm says they **"wish all their other machines on the job were as good . . . and are going to change to Blue Brutes in future replacements."**

***PENNSYLVANIA**

A 315′ Portable Compressor and UMW Wagon Drill, one of many Blue Brute teams owned by Cramer Construction Co. of Lebanon, Pa. Pres. G. B. Cramer writes: **"We have used Blue Brutes for several years, and on our Lebanon Veterans' Hospital job have five Blue Brute Compressors powering Worthington Wagon Drills and Rock Hammers. As evidence of their entirely satisfactory performance we recently purchased another 315′ Blue Brute Compressor."**

***OHIO**

In Waterville, Ohio, the Crawford Steel Construction Co., Inc., of Cincinnati, erected the structural steel on the new highway bridge across the Maumee River. Company official J. A. Crawford says: **"Our 210′ Blue Brute Compressor is efficient, well constructed and rugged. It has given us excellent service, and we are more than willing to recommend it highly . . . This first experience with your products is evidence to us of Blue Brutes' superiority.**

***WISCONSIN**

Opening up a new limestone quarry in Sussex, Wisconsin, is easy work for these rugged, hard-hitting Blue Brute team-mates. The fast, versatile UMW Wagon Drill is drilling 6-foot holes for explosive charges. Power source is a 315′ Blue Brute Compressor, that gets all the air out of every drop of fuel. Vice-President Lloyd Wolf of the Quality Limestone Corporation, reports: **"After thorough investigation we decided Worthington equipment was best . . . They are fine machines."**

From the Atlantic to the Pacific you'll find Blue Brute owners — on every type of construction project, from the smallest to the largest — glad to tell you of the cost-cutting, trouble-free performance that is helping make estimates pay handsomely.

There are a lot of sound reasons for this country-wide acclaim — all adding up to the fact that *there's more worth in Worthington*. Your nearby Worthington-Blue Brute Distributor is ready with those reasons, and can make immediate deliveries. See him, or write us direct.

Worthington Pump and Machinery Corporation
Construction Equipment Department
Harrison, New Jersey

Distributors In All Principal Cities

WORTHINGTON

BUY BLUE BRUTES

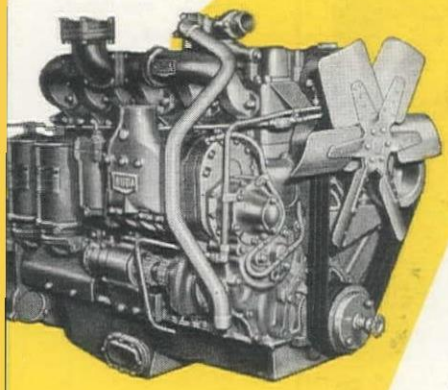
HO.5

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

MORE POWER
BUDA 6-DAS 844
280 h.p. at 2100 r.p.m.

MORE POWER
CUMMINS NHS-600
275 h.p. at 2100 r.p.m.

. . . Now your choice in LaPLANT-CHOATE MOTOR SCRAPERS

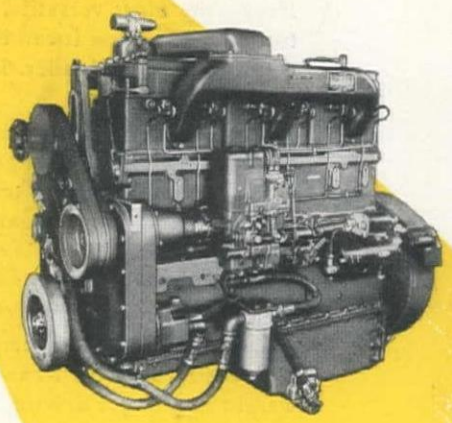


BUDA DIESEL 6-DAS 844—Here's a newer, bigger Buda Diesel that gives you 20 *h.p. per struck yard* of capacity . . . a new high in power and performance!

HERE'S a power boost for the already powerful Motor Scraper . . . a step-up from 225 h.p. to your choice of either 275 or 280 h.p.! Two great Diesels, Buda or Cummins, whichever fits your set-up best. Power to spare in the toughest going! Power that's useable through a heavier final drive! Power that provides new highs in average haul road speeds!

In addition, you get all the original Motor Scraper features: — big capacity . . . big tires . . . double-acting hydraulic steering . . . four-wheel air brakes . . . faster, easier loading . . . positive forced ejection *plus* high apron lift, and many others — your assurance of more yards per trip . . . more trips per hour.

Don't overlook the profit potential of the TS-200—the little earthmoving giant in the 9 to 12 yard class, now available with the Cummins HRB-600, 165 h.p. Diesel.



CUMMINS DIESEL NHS-600—275 h.p. that steps up Motor Scraper production performance and profits to new heights!

LaPlant-Choate Manufacturing Co., Inc.
Cedar Rapids, Iowa

LaPlant-Choate Sales and Service
1022 77th Ave., Oakland, Calif.

LaPLANT CHOATE

INDUSTRIAL EQUIPMENT COMPANY
4441 Santa Fe Avenue LOS ANGELES 11, CALIFORNIA

LaPLANT-CHOATE SALES AND SERVICE
1022 - 77th Avenue OAKLAND, CALIFORNIA

WESTERN EQUIPMENT COMPANY
. O. Box 2196, 3400 E. Olive St. SPOKANE, WASHINGTON

ESTERN CONSTRUCTION EQUIPMENT CO.
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GENERAL EQUIPMENT COMPANY
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ENGINEERING SALES SERVICE, INC.
410 Capitol Boulevard BOISE, IDAHO

EQUIPMENT SALES CO.
720 So. 19th Avenue PHOENIX, ARIZONA

STUDER TRACTOR & EQUIP. CO.
East Yellowstone Hwy., P. O. Box 779, CASPER, WYOMING

ARNOLD MACHINERY CO., INC.
433 West Second South St. Salt Lake City 1, Utah

H. W. MOORE EQUIPMENT CO.
Sixth and Acoma Streets DENVER 1, COLORADO

N. C. RIBBLE CO.
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COLUMBIA EQUIPMENT CO.
1240 S. E. 12th Ave. 5030 1st Ave. South
PORTLAND, OREGON SEATTLE, WASHINGTON

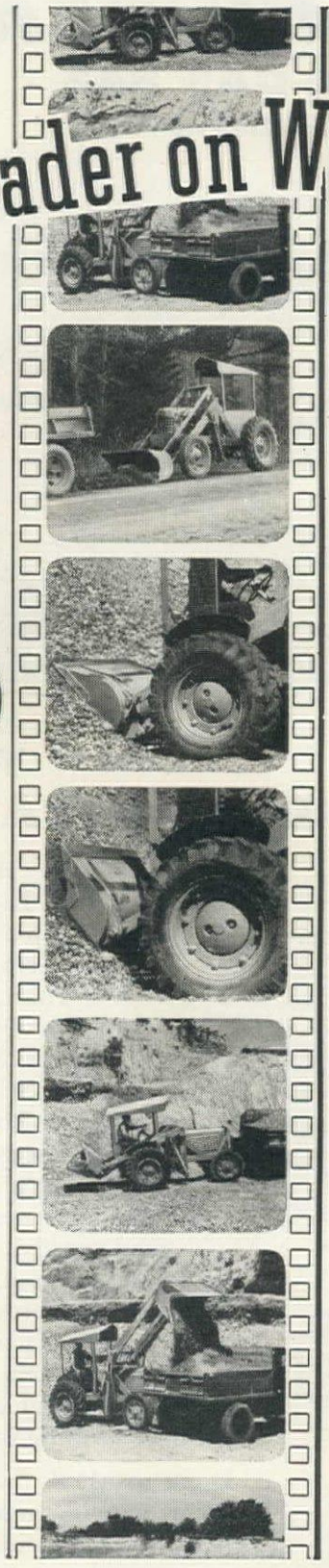
Now... the Most Versatile Loader on Wheels!

Here's the most versatile, practical loader ever developed for wheel tractors. It can dig in front . . . dump in front like the conventional loader. BUT, it can also dig in *back* and load in *front.*

You can dig in back . . . move straight forward to the truck . . . the bucket swings *straight over* the roof . . . and the load is dumped into the truck. Thus you eliminate the turning necessary with ordinary front end loaders . . . eliminate *half* the gear shifts and *half* the clutch wear. You save time and fuel . . . cut operator fatigue. You speed loader operations . . . *can load at better than a yard a minute.*

You get far greater traction and almost effortless steering with the Strait-Line. Rear-carried bucket load adds needed weight to the rear driving wheels . . . subtracts weight from the front steering wheels. Increased traction plus the new PUSH-TILT bucket with extended loading lips, enables you to get bigger bucket loads. Two levers control all operations.

Add them all up . . . ability to select your type of digging, front or back as the job requires . . . Strait-Line operation with back digging which gives you faster operation, greater traction and easy steering . . . fuller buckets . . . and you'll see where your operations can profit with the Strait-Line. For information and literature, see your Oliver Industrial Distributor or write direct to The OLIVER Corporation, 19300 Euclid Avenue, Cleveland 17, Ohio.



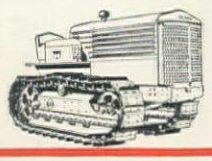
Conventional front digging, primarily used with Strait-Line where unit digs and moves straight ahead to load.

Back digging. Note how extended loading lips easily penetrate the bank.

PUSH-TILT action which lifts cutting edge 20" and thrusts it into bank.

Carrying position—bucket is tilted to retain load and is carried low enough to increase both traction and stability.

Dumping position. Bucket has been carried over the roof and dumps in front.



THE OLIVER CORPORATION

THE OLIVER CORPORATION

State of Arizona: **Guerin Implement Co., Phoenix, 1401 S. Central St.;** ***State of California:*** **Gustafson Tractor Co., Eureka; Mechanical Farm Equipment Dist., Inc., San Jose; Ashton Implement Co., Salinas; Comber & Mindach, Modesto; Cal-Butte Tractor Co., 820 Broadway, Chico; Tractor & Equipment Co., San Leandro; Flood Equipment Co., Sacramento; W. J. Yandle Co., Santa Rosa; Jim Ingle Co., Fresno, Hanford and Tulare; Oliver Implement Co., Bakersfield and Shafter; Turner & Chapin, Whittier and Covina; Farmers Tractor & Implement Supply Company, Colton.** ***State of Washington:*** **Inland Diesel & Machinery Company, Spokane; Pacific Hoist & Derrick Co., Seattle and Puyallup; Melcher-Ray Machinery Co., 202 East Alder Street, Walla Walla; Central Tractor and Equipment Co., Wenatchee.** ***State of Oregon:*** **Loggers & Contractors Machinery Co., Portland and Eugene.** ***State of Idaho:*** **Idaho Cletrac Sales Company, Lewiston and Cottonwood; Engineering Sales Service, Inc., Boise.** ***State of Montana:*** **Western Construction Equipment Company, Billings and Missoula.** ***State of Nevada:*** **B & M Tractor & Equipment Corp., 1420 S. Virginia St., Reno.** ***British Columbia:*** **Pacific Tractor & Equipment, Ltd., 505 Railway Street, Vancouver.**

Bottom-Dump Euclids have a struck measure capacity of 13 to 25 cu. yds. . . . powered by a diesel engine of 190 or 300 h.p. . . . loaded top speeds range up to 35 m.p.h.

"Eucs"

TEAM UP FOR YOUR EARTH MOVING PROFITS!

Here's a team — the Euclid Bottom-Dump and the Euclid Loader — that has set new records for low cost earth moving on a wide range of jobs... dams, levees, airports, highway and railroad construction, industrial plant grading and overburden removal.

Bottom-Dump Euclids combine rugged construction, large capacity and fast travel speeds for more profit per load. Designed and built for rugged off-the-highway hauling, "Eucs" provide dependable performance and low hauling cost per pay yard. Owners say: "Bottom-Dumps sure do the job, and at lower cost, too."

Built to match the speed and efficiency of other Euclid earth moving equipment, the Euclid Loader is designed for use with Bottom-Dump "Eucs" and other large capacity hauling units. It provides fast, mobile loading of practically any material, from loose sand to hard clay and shale, in a short travel distance.

The EUCLID ROAD MACHINERY Co.
Cleveland 17, Ohio
CABLE ADDRESS: YUKLID — CODE: BENTLEY

The Euclid Loader leaves a smooth, clean cut when grading uneven contours. Operator has instant control of belt movement and adjustment of the cutting blade for depth and angle of the cut.

EUCLID THE PIONEER

EUCLIDS *Move the Earth*

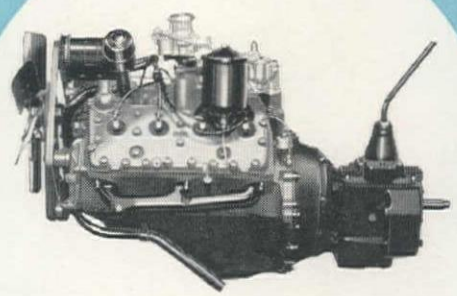
PICK FORD POWER...

RIGHT 3 WAYS!

1 **RIGHT POWER** for your job . . . five great engines in the Ford Industrial Engine line. Available as complete power units or engine assemblies—both with a variety of attachments.

2 **RIGHT FEATURES.** Ford Industrial Engines and Power Units incorporate the newest advancements of Ford's famed progressive engineering.

3 **RIGHT SERVICE**—as near as your Ford Dealer, clear around the world!



Ford 239 V-8 Industrial Engine, with four-speed transmission. (Displacement—239 cu. in.)

Athey APCOR Products

A Ford Industrial Engine is the power plant for the Athey Force-Feed Loader, made by the Athey Products Corporation of Chicago. In such highway maintenance operations as loading scarified macadam and excess windrowed dirt, as well as piled leaf and snow removal in urban areas, this self-propelled loader has demonstrated its effective and economical operation in the hands of hundreds of operators. Where power, reliability and ease of service are important, Athey finds Ford Industrial Engines *right* for their product.

Ford INDUSTRIAL ENGINES

● For the *right* power, pick Ford! Five models from which to choose—a Four with 120 cu. in. displacement . . . two Sixes—226 cu. in. and 254 cu. in. displacement . . . two V-eights—239 cu. in. and 337 cu. in. Available both as engine assemblies and complete power units. Completely new, and completely right for farming . . . construction . . . power generating . . . material handling . . . pumping . . . lumbering, many other applications. Write today for specifications.

See your nearest Ford Dealer, Ford District Sales Office, or write direct to

INDUSTRIAL ENGINE DEPARTMENT

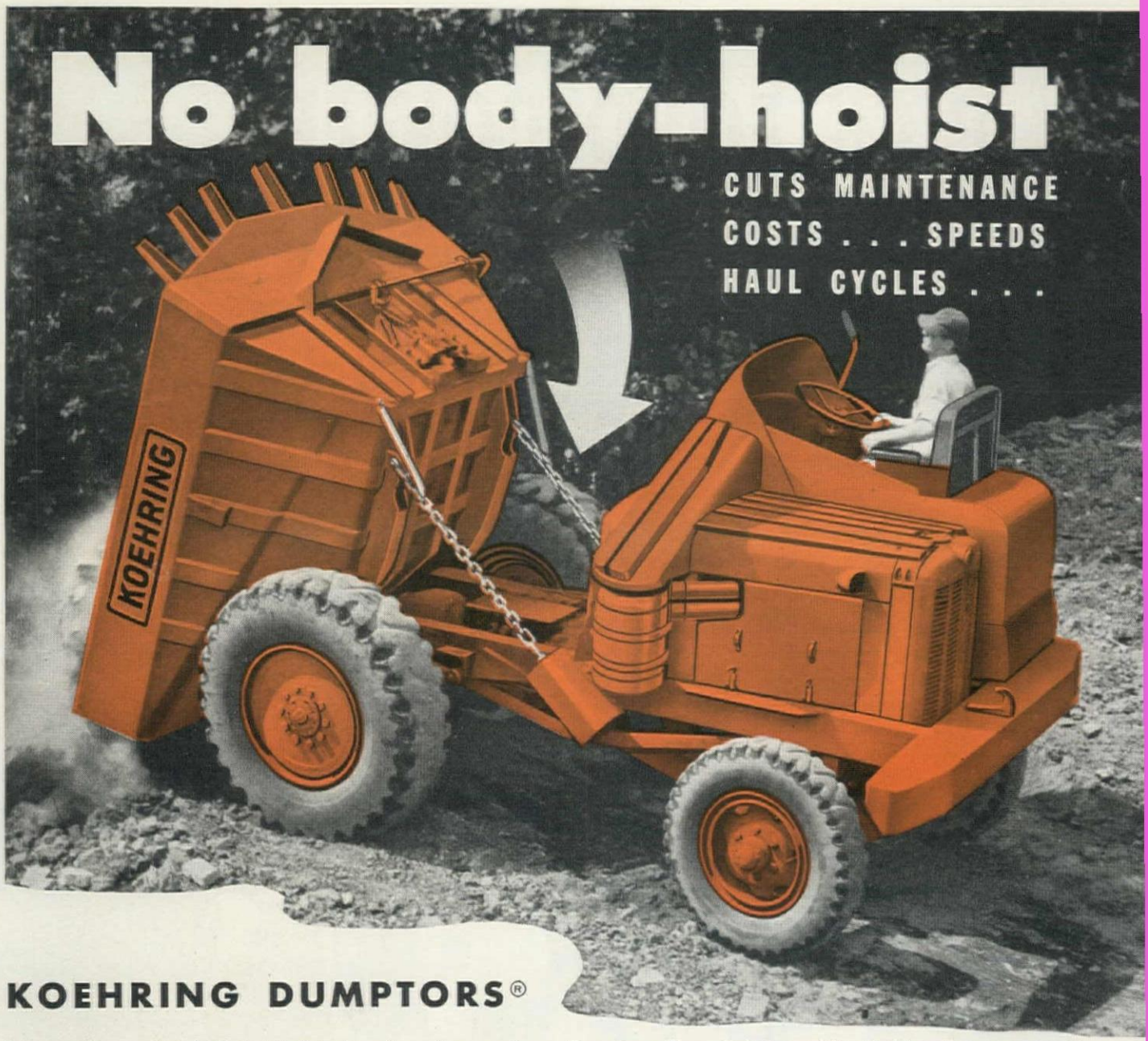
FORD MOTOR COMPANY

Dearborn, Michigan

YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED

No body-hoist

CUTS MAINTENANCE COSTS . . . SPEEDS HAUL CYCLES . . .



KOEHRING DUMPTORS®

have no slow-working body hoists. Trip the release lever and gravity dumps the 6-yard load in one second. It's as simple as that! No complicated mechanical hoists to slow up haul cycles . . . no expensive replacement parts, costly hoist maintenance or down time to eat into your profits. And gravity dump is instantaneous and trouble-free in all temperature extremes . . . never wears out.

No costly spring maintenance is another money-saving advantage you get with Koehring Dumptors. There is just one big, double-coil chassis spring on steering axle . . . none on driving axle. Extra big, shock-absorbing drive tires eliminate need for more. You save spring maintenance time and replacement costs.

Check your body hoist and spring maintenance costs for a year . . . see how much you'll save by using Dumptors. What's more, Dumptor's no-turn shuttle haul and constant-mesh transmission for 3-speed travel forward and reverse, increase your production . . . and your profits.

CK114

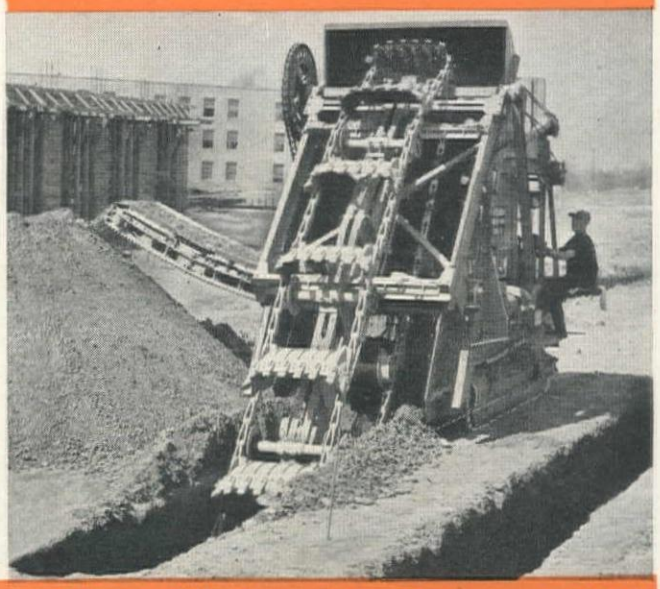
SEE YOUR KOEHRING DISTRIBUTOR FOR COMPLETE FACTS

Pacific Hoist & Derrick Co., *Seattle, Washington*
Western Machinery Co., *Spokane, Washington*
Columbia Equipment Co., *Boise, Idaho; Portland, Oregon*
Harron, Rickard & McCone Co. of Southern California, *Los Angeles, California*
McKelvy Machinery Co., *Denver, Colorado*
Kimball Equipment Co., *Salt Lake City, Utah*
Neil B. McGinnis Co., *Phoenix, Arizona*
The Harry Cornelius Co., *Albuquerque, New Mexico*
San Joaquin Tractor Co., *Bakersfield, California*
Engineering Sales Service, Inc., *Boise, Idaho*
Koehring Company, West Coast Division, *Stockton, California*

PARSONS TRENCHLINERS®

45 digging feeds on the 310 . . . from 8" to 15'-6" per minute . . . provide maximum trenching efficiency under any working condition. This big-capacity Trenchliner also has 2 optional speed selections for travel, bucket line and conveyor belt. All operations are simultaneous and reversible. You get clean, smooth trenches 1½' to 4½' wide, 17' deep with single boom . . . up to 6' wide and 11' depth with dual booms. Single boom shifts across full width of carriage for off-set digging. Reversible power-shift spoil conveyor dumps right or left. Get facts on this 310, or any of the 4 smaller Trenchliners.

Pacific Hoist & Derrick Co.	Seattle
Western Machinery Co.	Spokane
Columbia Equipment Co.	Portland
Harron, Rickard & McCone Co. of So. Calif.	Los Angeles
McKelvy Machinery Co.	Denver
Kimball Equipment Co.	Salt Lake City
Neil B. McGinnis Co.	Phoenix
The Harry Cornelius Co.	Albuquerque
San Joaquin Tractor Co.	Bakersfield
Engineering Sales Service, Inc.	Boise
Koehring Company, West Coast Division	Stockton



JOHNSON Roadbuilders BINS

Flexible for transit-mix operation . . . this Johnson Roadbuilders All-Welded Bin can be used as a portable batch plant for handling 2, 3 or 4 aggregates or converts to Transit-Mix Plant, illustrated, or Central-Mix Plant, for bulk cement handling plus 2 or 3 aggregates. Can be equipped with 1 or 2 multiple-material Hi-Speed Batchers, size 34 Roadbuilders Batcher, or with a truck-mixer charging batcher in 2, 3 or 4 yd. sizes. Bin available in 2, 3 or 4 compartments, 50 to 125 cu. yds. Has easy charging 11' width, extra wide openings for fill and discharge, steep, 50° bottom slopes for fast flow.

Bow Lake Equipment Co., Inc.	Seattle
Western Machinery Co.	Spokane
Cramer Machinery Co.	Portland
Harron, Rickard & McCone Co. of So. Calif.	Los Angeles
Western Machinery Co.	Salt Lake City
Neil B. McGinnis Co.	Phoenix
The Harry Cornelius Co.	Albuquerque
San Joaquin Tractor Co.	Bakersfield
Coast Equipment Company	San Francisco
King and Kringel Machinery Corp.	Denver
Engineering Sales Service, Inc.	Boise

KWIK-MIX bituminous MIXERS

Non-tilt, end discharge, 10, 14 cu. ft. . . . Kwik-Mix Bituminous Mixers offer you many time and money-saving features: non-tilting drum . . . wide, flow-line, power-raised skip . . . pug-mill mixing action . . . blades specially designed to thoroughly coat all aggregates . . . accurate heat control, even oil distribution for top-texture mix . . . 6-second discharge. Both sizes can be used with handy Tower Loader attachment (illustrated), for overhead discharge into trucks. See us for more information about Kwik-Mix 3½-S, 6-S, 11-S and 16-S concrete Dandies ᴿ, 6-P and 10-P plaster-mortar mixers, 4 h.p. power wheelbarrow.

Pacific Hoist & Derrick Co.	Seattle
Western Machinery Co.	Spokane
Columbia Equipment Co.	Boise, Portland
Harron, Rickard & McCone Co. of So. Calif.	Los Angeles
McKelvy Machinery Co.	Denver
Kimball Equipment Co.	Salt Lake City
Neil B. McGinnis Co.	Phoenix
The Harry Cornelius Co.	Albuquerque
San Joaquin Tractor Co.	Bakersfield
Engineering Sales Service, Inc.	Boise
Koehring Company, West Coast Division	Stockton

For service in the construction field your best specification is Roebling Preformed Lang Lay "Blue Center" Steel Wire Rope with Independent Wire Rope Core. Records show that this rope minimizes replacement time, brings fewer shut-downs and effects substantial dollar savings.

Preformed that lasts longer and saves money!... that's why

Today it's Roebling!

YOU WANT ROPE that's *extra* tough, *extra* long-lived! And you *get* these extras in Roebling Preformed "Blue Center" Wire Rope, for "Blue Center" steel has completely superior resistance to abrasion, shock and fatigue. Roebling developed and is the only maker of "Blue Center" steel... and Roebling research, workmanship and modern, precision machines are your added assurance of rope quality that pays off.

But for everything wire rope can give, be sure to get Preformed. Roebling Preforming makes rope easier to handle and install. It can be cut without seizing. It spools better . . . is not inclined to set or kink . . . minimizes vibration and whipping.

There's a Roebling wire rope of the right construction, grade and size for every type and make of rope-rigged equipment. Have your Roebling Field Man tell you which rope will give the best and the lowest-cost performance for every installation. John A. Roebling's Sons Company of California — San Francisco — Los Angeles — Seattle — Portland.

ROEBLING

A CENTURY OF CONFIDENCE

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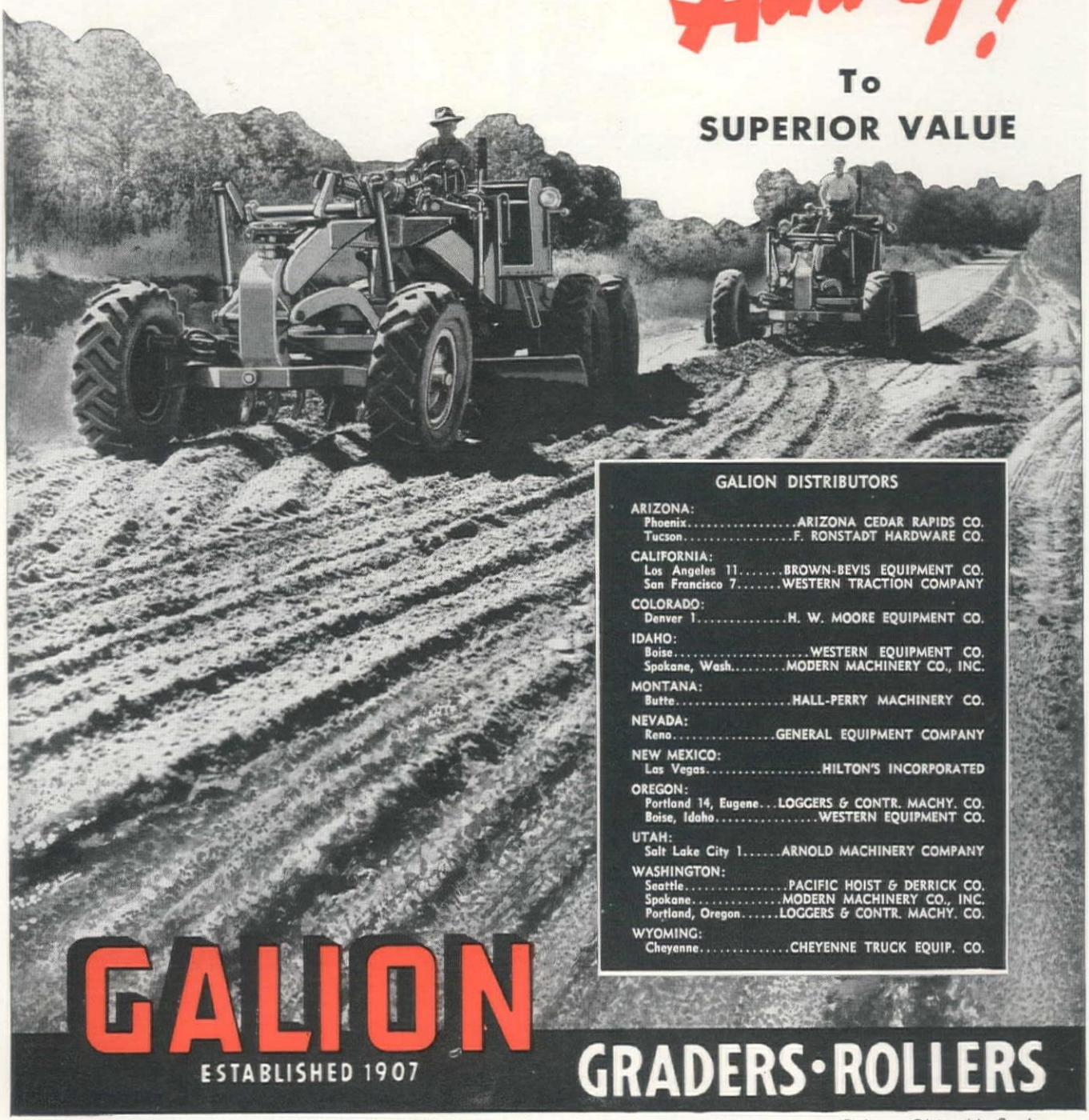
Galion DESIGN CONSTRUCTION PERFORMANCE Add Up!

To
SUPERIOR VALUE



GALION DISTRIBUTORS

ARIZONA:
Phoenix.....ARIZONA CEDAR RAPIDS CO.
Tucson.....F. RONSTADT HARDWARE CO.

CALIFORNIA:
Los Angeles 11.....BROWN-BEVIS EQUIPMENT CO.
San Francisco 7.....WESTERN TRACTION COMPANY

COLORADO:
Denver 1.....H. W. MOORE EQUIPMENT CO.

IDAHO:
Boise.....WESTERN EQUIPMENT CO.
Spokane, Wash.....MODERN MACHINERY CO., INC.

MONTANA:
Butte.....HALL-PERRY MACHINERY CO.

NEVADA:
Reno.....GENERAL EQUIPMENT COMPANY

NEW MEXICO:
Las Vegas.....HILTON'S INCORPORATED

OREGON:
Portland 14, Eugene...LOGGERS & CONTR. MACHY. CO.
Boise, Idaho.....WESTERN EQUIPMENT CO.

UTAH:
Salt Lake City 1.....ARNOLD MACHINERY COMPANY

WASHINGTON:
Seattle.....PACIFIC HOIST & DERRICK CO.
Spokane.....MODERN MACHINERY CO., INC.
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WYOMING:
Cheyenne.....CHEYENNE TRUCK EQUIP. CO.

GALION
ESTABLISHED 1907

GRADERS·ROLLERS

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
Cable address: GALIONIRON, Galion, Ohio

Barber-Greene

Model 522

Paying Off On Jobs Like Yours . . . .

Want to speed up loading from stock piles? Or have you a variety of truck loading jobs, or clean-up work? Either way, the B-G Model 522 has the portability and the performance you're after.

Companion to the larger B-G Heavy-Duty Loaders, the 522 is a leader in its own right. On its pneumatic tires it's highly maneuverable and is readily towed behind your truck. With its synchronized spiral feed it masters all types of bulk materials to give the constant flow that cuts loading time, cuts costs.

The 522 is ideal for loading, leveling and cleaning up—as so many Barber-Greene users well know. For your information, see your B-G distributor.

1. *Low Boom Swivel Conveyor 522 (shown above) has advantages of low clearance—and side discharge to trucks driving parallel to loader.*
2. *High Boom Swivel Spout 522. For high clearance work where swivel conveyor is not necessary.*
3. *Friction clutch and brake steering. Hi-cleat pneumatic tires.*
4. *Patented B-G Overload Release gives positive protection against overload damage.*

FOR SALE BY:

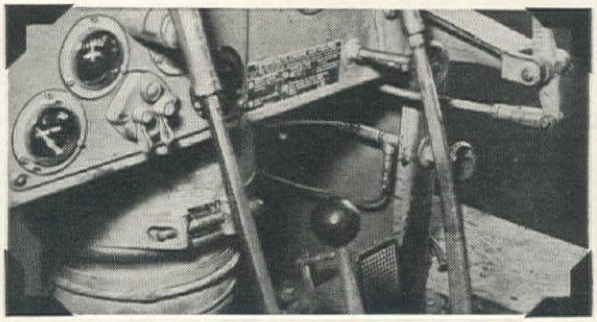
BROWN-BEVIS EQUIPMENT CO., Los Angeles 58, California; COLUMBIA EQUIPMENT CO., Spokane, Washington, Seattle, Washington, Boise, Idaho, Portland 14, Oregon; WILSON EQUIPMENT & SUPPLY CO., Cheyenne, Wyoming, Casper Wyoming; CONTRACTORS' EQUIPMENT & SUPPLY CO., Albuquerque, New Mexico; RAY CORSON MACHINERY CO., Denver 9, Colorado; JENISON MACHINERY CO., San Francisco 7, California; WESTERN CONSTRUCTION EQUIPMENT CO., Billings, Montana, Missoula, Montana; KIMBALL EQUIPMENT COMPANY, Salt Lake City 10, Utah; STATE TRACTOR & EQUIPMENT CO., Phoenix, Arizona.

STANDARD ENGINEER'S REPORT

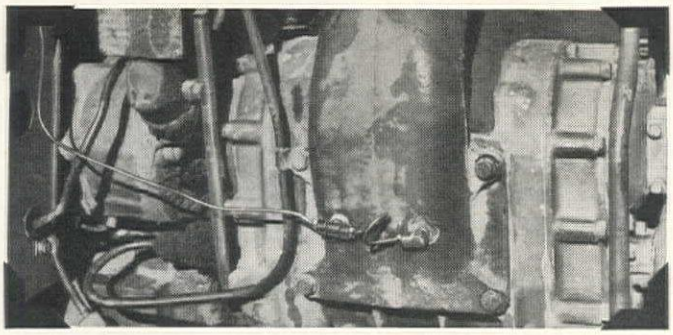
DATA

PRODUCT	Chevron Starting Fluid
UNITS	A.C. diesel engines HD-7 tractors
CONDITIONS	25° below zero weather—parked in open shed
EQUIPMENT	Permanent primer with atomizers on blower
FIRM	John W. Graves Heppner, Oregon

Engine starts on first turn at 25° below zero!

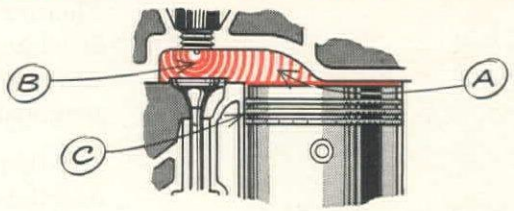


CHEVRON STARTING FLUID started this engine instantly every time during a severe Oregon winter, even when the tractor had been idle for several days in temperatures down to 25° below zero! John W. Graves, owner, says, "Power in the starter battery would last only for two or three revolutions of the engine, but Chevron Starting Fluid required only one turn to kick it off." With one or two strokes of the dash-mounted pump, fluid was forced from the storage tank (left center) into the "blower", before the starter button was pushed.



ATOMIZER NOZZLES, as shown on this diesel "blower", are also used to inject Chevron Starting Fluid into intake manifolds of gasoline engines. Complete primer equipment may be purchased from your fluid supplier. Chevron Starting Fluid comes in 3-pint cans, and capsules of two sizes—7CC's and 17CC's, packed 12 and 24 per can. It is approved by leading engine manufacturers.

How CHEVRON Starting Fluid Starts Gasoline and Diesel Engines Instantly



A. Atomizes in lowest temperatures and provides powerful, easily fired vapor in combustion chamber.

B. Pressure, or the weakest spark, fires mixture—turns engine and heats air for regular fuel mixture.

C. Contains lubricant and additives—prevent cylinder wear and ice formation in primer equipment.

HOT NEWS for COLD ENGINES

FREE BOOKLET gives you more facts on Chevron Starting Fluid—shows where it should be applied in different type engines. Write or ask for it today.

CHEVRON STARTING FLUID

TRADEMARK REG. U.S. PAT. OFF

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA

Fit Thermoid Quality and Experience into Your Belting Picture

Thermoid high quality stems from continuing research and product development. To complete this picture, your Thermoid distributor and the Thermoid field representative, working as a team, offer you practical experience in solving your particular problem.

Whether it's run-of-the-mill or something "special", your Thermoid distributor can help you select the right Thermoid Conveyor Belt. And the down-to-earth advice of Thermoid field representatives is welcomed by men faced with belting trouble in mining, quarrying and construction operations. They know this advice is the result of day-by-day experience with conditions *in the field.*

It Will Pay You to *Specify* Thermoid

If your belting fails prematurely—if you're stumped with a tough belting problem—call your Thermoid distributor. Together with the Thermoid field representative, he can help you get greater economy, efficiency and tonnage for your belting dollar.

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

Western Offices and Factory • Nephi, Utah, U.S.A.

Main Offices and Factory • Trenton, N. J., U. S. A.

Industrial Rubber Products • Friction Materials • Oil Field Products

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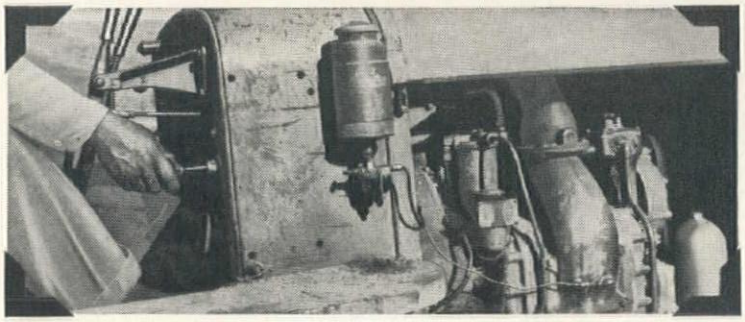

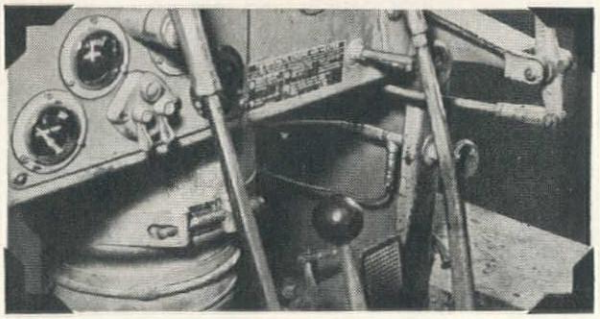

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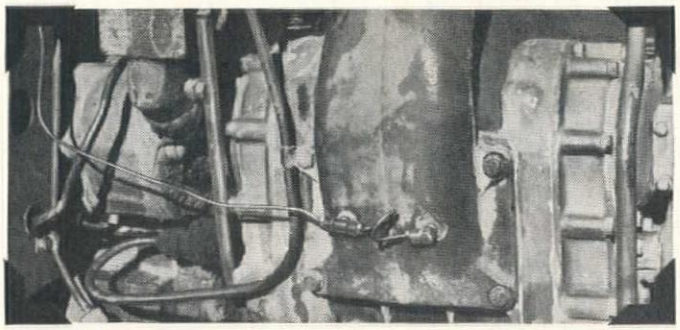

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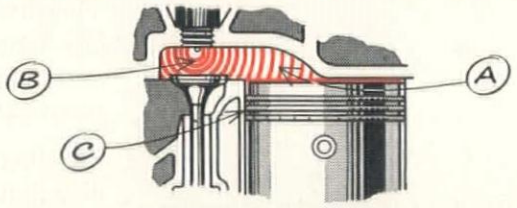

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Whether it's run-of-the-mill or something "special", your Thermoid distributor can help you select the right Thermoid Conveyor Belt. And the down-to-earth advice of Thermoid field representatives is welcomed by men faced with belting trouble in mining, quarrying and construction operations. They know this advice is the result of day-by-day experience with conditions *in the field.*

It Will Pay You to *Specify* Thermoid

If your belting fails prematurely—if you're stumped with a tough belting problem—call your Thermoid distributor. Together with the Thermoid field representative, he can help you get greater economy, efficiency and tonnage for your belting dollar.

Thermoid Quality Products: Transmission Belting • F.H.P. and Multiple V-Belts • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Molded Products • Industrial Brake Linings and Friction Materials.

Thermoid Company

Western Offices and Factory • Nephi, Utah, U.S.A.

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Industrial Rubber Products • Friction Materials • Oil Field Products

MM INDUSTRIAL WHEELERS

FLEXIBILITY • SPEED • HIGH CAPACITY
WITH MINIMUM OPERATOR FATIGUE

"Drawbar Designed*"

FOR PULL-BEHIND ATTACHMENTS

* MM Industrial Wheelers are available with adjustable pintle hook or swinging drawbar for a wide range of job applications . . . they give you extra utility and greatest flexibility.

A selection of single or dual rear tire equipment is available for maximum flotation and grip on all surfaces.

Front, side, and rear power take-offs provide direct drive for all hydraulically or mechanically operated equipment.

"Front-End Designed*"

FOR FRONT-END ATTACHMENTS

* Dependable performance of MM Industrial Wheelers is obtained by heavy-duty industrial design. Their outstanding efficiency for handling all jobs is largely the result of their flexibility in operation with a complete selection of attachments.

Heavy-duty H-section front axle, front wheels that are heavy cast and inset for easy steering, and oversize tires provide load capacities up to 10,000 lbs. without overloading.

The "shuttle gear" for fast reversing . . . roller steering that makes easier handling of any load . . . enable MM Industrial Wheelers to handle more loads per hour on loading and dozing jobs with less operator fatigue.

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Get Complete Information
FROM YOUR NEAREST MM DEALER

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MINNEAPOLIS 1, MINNESOTA

Big and Strong... Better than Ever...

MARION 111-M

Machine illustrated has Diesel power with electric swing. Also available as full Ward-Leonard Electric machine.

MARION gave the industry a new conception of excavating equipment in 1946 when the MARION 111-M was introduced. Here was a 3½-4 cu. yd. machine with all of the benefits of Diesel power PLUS all of the advantages of electric swing. Big enough for high daily yardage, yet easily moved from one job to another. Power enough to stand up to big jobs without flinching. Heavy enough to be steady on its long, wide crawlers.

Now—the MARION 111-M is bigger and stronger—better than ever. It is a thoroughly field-proven machine, piling up performance records that are truly impressive. (Write for copies of letters from 111-M owners.)

Regardless of whether you have seen the MARION 111-M before, you should see it today if a 3½-4 cu. yd. machine has a logical place in your operations. It's a rugged, heavy machine as a shovel or dragline with power and strength to spare.

The 111-M is an important new tool for heavy-duty material handling. Get the full story from your MARION representative or write to the factory for information.

SEE YOUR MARION DISTRIBUTOR

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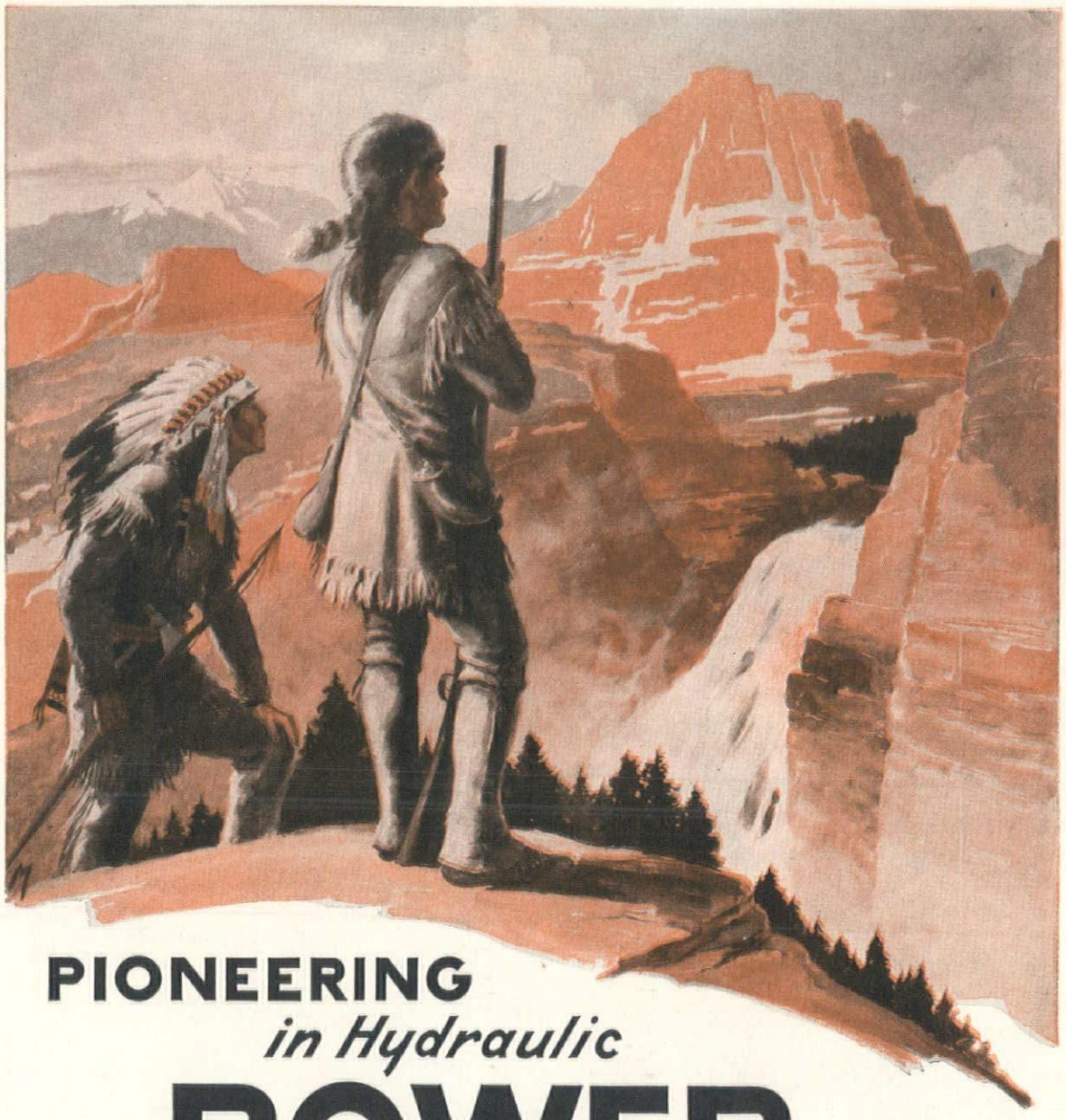
STAR MACHINERY COMPANY.....1741 First Avenue, South, Seattle, Wash.
M & F EQUIPMENT COMPANY.....2521 Isleta Highway, Albuquerque, N. M.
MARION POWER SHOVEL COMPANY.....2505 N. E. 33rd Avenue, Portland, Ore.
RASMUSSEN EQUIPMENT & SUPPLY CO...1960 So. Second West, Salt Lake City, Utah
BROWN-BEVIS EQUIPMENT COMPANY....4900 Santa Fe Ave., Los Angeles 11, Calif.
C. H. GRANT COMPANY.....1401 Eastshore Highway, Berkeley 10, Calif
STAR MACHINERY COMPANY.....E. 415 Sprague Avenue, Spokane 8, Wash.
STAR MACHINERY COMPANY.....701 Larson Building, Yakima, Wash.
MARION POWER SHOVEL COMPANY.....114 W. Adams Street, Phoenix, Ariz.



PIONEERING *in Hydraulic* POWER –

The Pioneers - those who devoted their lives to the harnessing of one of nature's mightiest forces - water - contributed greatly to this nation's progress! For 75 years, we have built turbines for high, medium and low heads, many types of valves, hoists and gates, pumps, trash rack rakes and kindred hydraulic equipment. Put your problem up to us.

S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.

Here's Why

YOU GET TOP PERFORMANCE FROM BUCYRUS-ERIE DREDGES

Bucyrus-Erie has been building successful dredges since 1884 . . .

. . . scores of these dredges now in operation bear out the superiority of Bucyrus-Erie's "years ahead" engineering design . . .

. . . "on the spot" control of all stages of production — in our own laboratories, shops and foundries — assures you of top craftsmanship and finest materials in your Bucyrus-Erie dredge . . .

. . . Bucyrus-Erie manufactures all types of dredges to deliver top output on any job site.

At Bucyrus-Erie, the first step toward building a successful dredge is the gathering of complete information about your job. Such considerations as availability of power, distance to spoil area, water conditions, type of material to be excavated, source of fresh water for cooling purposes —to name only a few — are carefully analyzed.

With the complete picture thus obtained, Bucyrus-Erie's "years ahead" engineering sets to work. Your dredge is designed to deliver outstanding performance with low operating cost year after year. Engineering experience and foresight combine to assure this goal.

Next, Bucyrus-Erie's extensive foundries, laboratories and shops "bring to life" the custom design. Casting, metal-hardening, testing, machining and assembling are done in our own shops and laboratories under the guidance of skilled engineers and foremen schooled in years of "know how." Special alloy steels and heat treating procedures, for example, receive the continuous surveillance that guarantees best results.

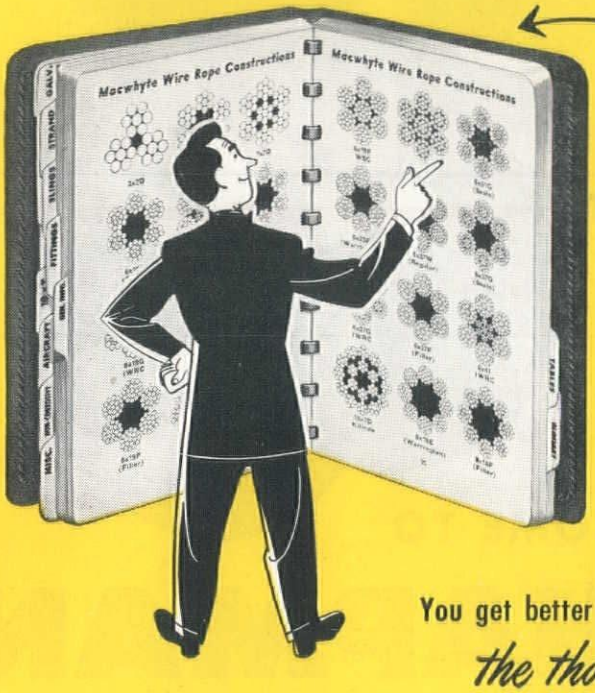
When your dredge is completed, you can anticipate — as have Bucyrus-Erie customers for over 65 years — long-term peak performance.

30D50

Bucyrus-Erie Company, South Milwaukee, Wisconsin

BUCYRUS ERIE

WHY guess about wire rope selection?



GET the right wire rope for each job!

You get better service when you order the right rope from

the thousand and one wire ropes made by **MACWHYTE**

A Macwhyte representative will gladly supply you with specifications for the correct rope to use on each machine you have. Call your Macwhyte distributor, or write direct to Macwhyte Company for recommendations. Catalog on request.

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Manufacturers of Monarch Whyte Strand PREformed, Internally Lubricated Wire Rope, ATLAS Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal and Stainless Steel Wire Rope.

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List 58½ — (Short face to face), Rising Stem, Low Pressure, Double Disc Iron Gate Valve

List 25 — Rising Stem, Solid Wedge, Iron Gate Valve

COME TO CHAPMAN

for Standard Gate Valves

. . . For all purposes . . . For all pressures . . . In all sizes

Be sure to check Chapman first whenever you need standard gate and check valves. Here you'll find iron valves in a complete range of sizes—both solid wedge and double disc types—for a complete range of working pressures from 25 to 800 lbs. for steam, water, oil or gas service. Operation may be by hand wheel, with or without bevel or spur gearing, floor stand, electric motor, hydraulic or pneumatic cylinder.

If, however, you need bronze valves — we have them. Just as we have a complete line of steel valves. And valves of many other types such as tilting disc, iron and steel check valves. Whenever special valves for unusual service are required, Chapman engineers will be glad to help you develop them.

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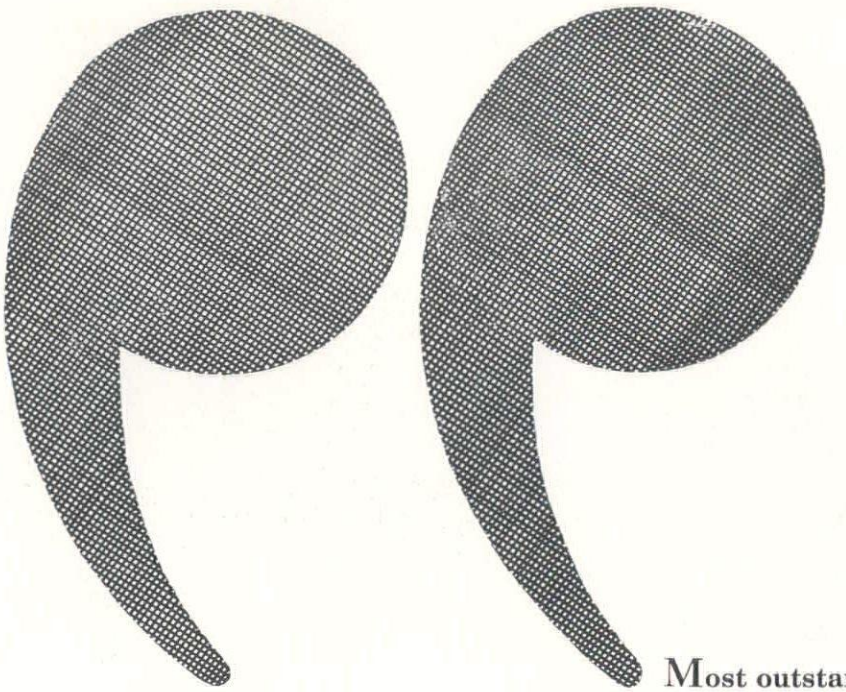

Most outstanding increase in steel-making capacity in the West (since World War II) has been that of the Kaiser Fontana plant . . .

THAT quotation from *Iron Age*, authoritative journal of the steel industry, is confirmed by these facts:

Kaiser Steel's Fontana plant has increased ingot production from 553,000 tons in 1944 to an estimated 1,200,000 tons for 1950—doubling the output of the peak war year!

Equally important is the diversification which has taken place in the past nine years. Kaiser Steel now makes the following products which were not produced in the seven western states prior to World War II: Plates, continuous weld pipe, electric weld pipe, cold rolled strip and sheet, alloy bars, and certain sizes of structural shapes.

Today, when more steel is vitally needed, Kaiser Steel looks forward to further expansion.

This constant growth is another reason why the West's only integrated *independent* steel plant is bringing more industry, more jobs, more wealth to the West!

It's good business to do business with

Kaiser Steel

built to serve the West

PROMPT, DEPENDABLE DELIVERY AT COMPETITIVE PRICES • plates • continuous weld pipe • electric weld pipe • hot rolled strip • hot rolled sheet • alloy bars carbon bars • structural shapes • cold rolled strip • cold rolled sheet • special bar sections • semi-finished steels • pig iron • coke oven by-products
For details and specifications, write: **KAISER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**

P&H GREAT

LETS YOU PUT MORE O

Now You Can Get Maximum Work Capacity

But you require more than engine power alone . . . you must have stability. Every action has an equal and opposite reaction. The hook load limit is what your machine will lift without losing its stability. P&H excels in lower center of gravity . . . in better weight distribution . . . resulting in a higher ratio of lifting capacity in relation to gross weight. Thus, stability is actually a measure of lifting capacity. P&H gives you more of it. You can prove it for yourself.

P&H

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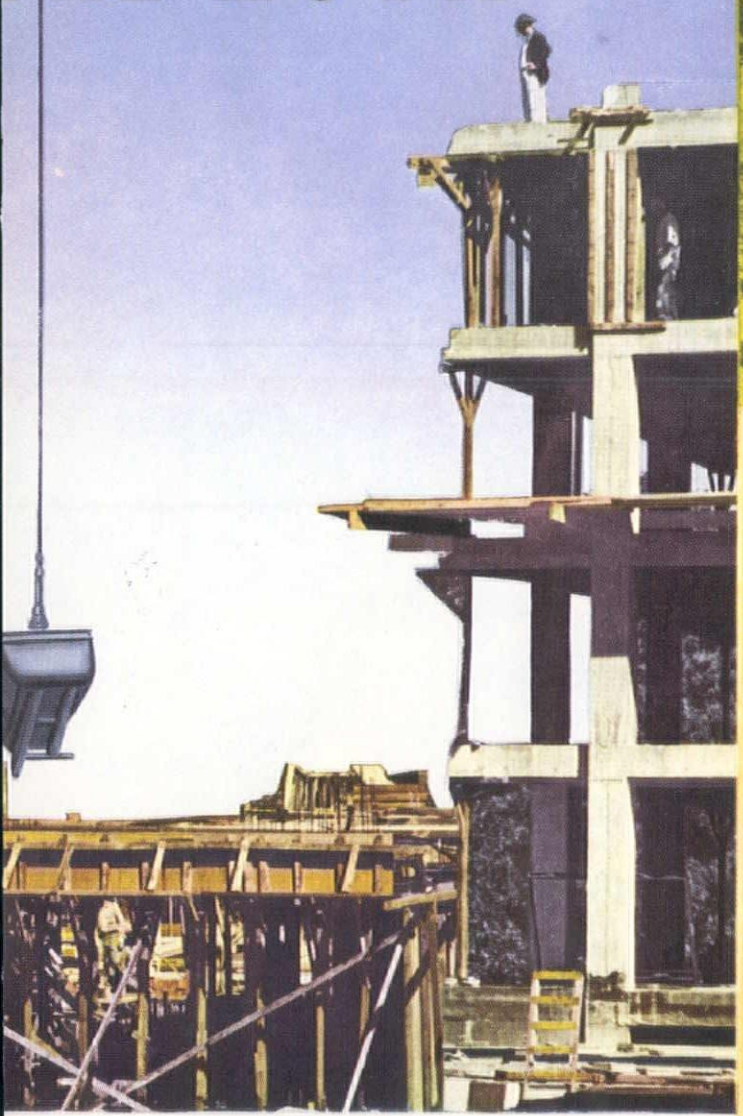
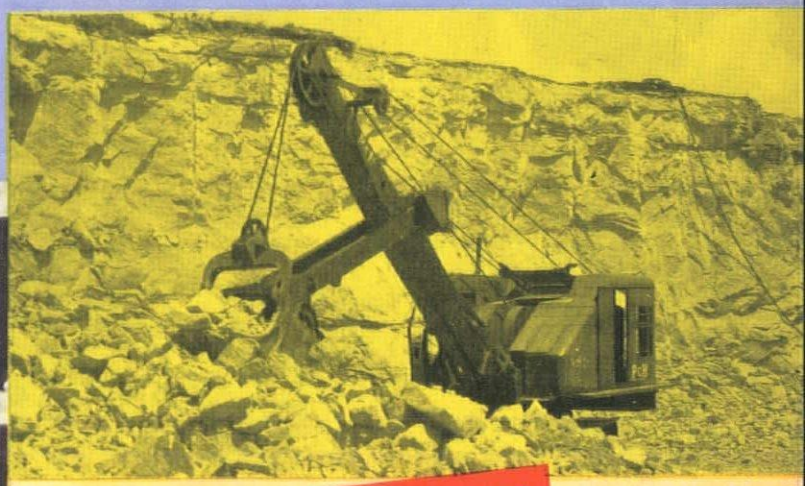
THE HOOK





LOOK TO **P&H** FOR ADDED VALUES

GIVES YOU MORE POWER AT THE TOOTH POINT

Stability is the major function of digging power, too. The same stability which gives P&H greater lifting capacity also gives you more tooth point digging power. Without useless deadweight, you have more power available . . . faster overall operation . . . lower production costs.

1. All welded construction of rolled alloy steels . . . originated by P&H . . . more highly developed by P&H.
2. True tractor type crawlers, most efficient traction on any excavator. You can make sharp or gradual or about-face turns.
3. Low pressure hydraulic control is smoother . . . more responsive . . . easier on both operator and machine.
4. Rapid reversing planetary chain crowd gives you faster, more positive bite. Crowd chain outlasts 20 to 30 crowd cables.
5. Simpler design gives you an easier machine to work on . . . simplifies maintenance . . . reduces lay-up time . . . cuts costs.

Only P&H gives you these Added Value features and at no extra cost.

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Ask any user . . . you'll find them everywhere

In scores of industries, users of Wickwire Rope have developed an affectionate respect for its performance, safety and long life. And, for true economy, they use Wickwire's WISSCOLAY® Preformed. It lasts longer — is easier to cut, splice and install. It's kink-resistant and safer to handle. Wickwire Distributors and Rope Engineers, in key cities everywhere, are prepared to render prompt service in meeting your wire rope needs. Wickwire Rope Sales Office and Plant — Palmer, Mass.

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IN THE ROCKIES—The Colorado Fuel and Iron Corp.
Continental Oil Bldg., Denver, Colo.
ON THE WEST COAST—The California Wire Cloth Corp.
1030—19th Ave., Oakland 6, Cal.

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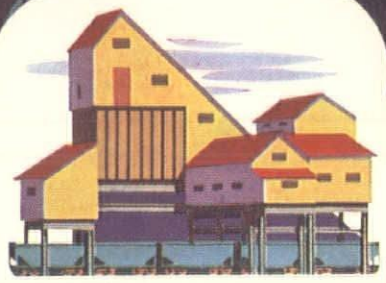
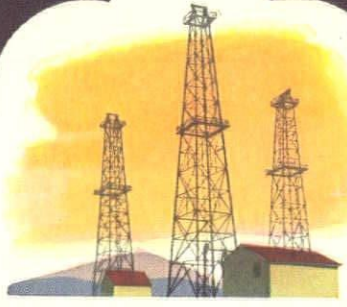
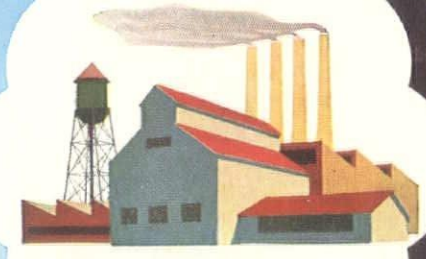
TRANSPORTATION



MINING

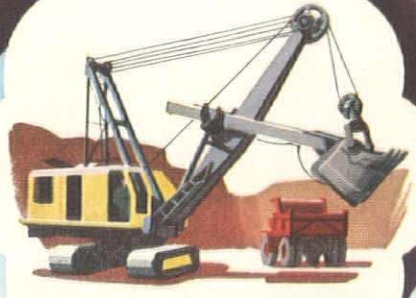


PETROLEUM



MANUFACTURING

MARINE



CONSTRUCTION

A. E. Brolman

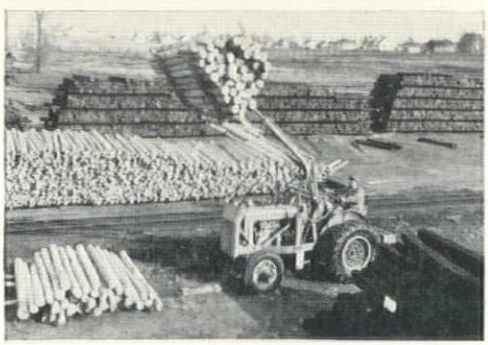
Operators Know . . . the LULL Shoveloader is SAFER TO OPERATE

SAFER

from MOVING PARTS and FALLING ROCKS

WOULD YOU like to operate a loader which required you to sit directly between the working lift arms? Of course not! Neither would operators. They too know the danger of falling boulders and moving arms.

● SIT IN SAFETY in the LULL SHOVELOADER . . . designed for maximum operator safety.



THE LULL LOG LIFTING FORK, like all other LULL attachments, has the same LULL safety design as the SHOVELOADER. Even with the high lift of the lifting fork, the operator is well clear of falling logs and moving arms. Log stacking can be dangerous but not with a LULL LOG LIFTING FORK.

OPERATORS KNOW their position on a loader is important to their safety. On a LULL SHOVELOADER, they know they are well clear of moving arms and falling rocks. They know they have full freedom of movement without fear of the giant they operate.

OPERATORS ARE CONFIDENT in the SHOVELOADER'S safe, versatile operation. They like its safer lifting, loading, scraping, bulldozing, digging and transporting. Accidents cost man hours, law suits, and increase insurance rates. Get the facts about LULL SHOVELOADER'S safety today!

It's important that you MAIL THIS COUPON NOW for full details.

LULL Manufacturing Company
3612 East 44th Street, Minneapolis 6, Minn.
Please send illustrated literature on:
LULL SHOVELOADER AND ATTACHMENTS

Name..... Title.....

Company .....

Address .....

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LULL Manufacturing Company
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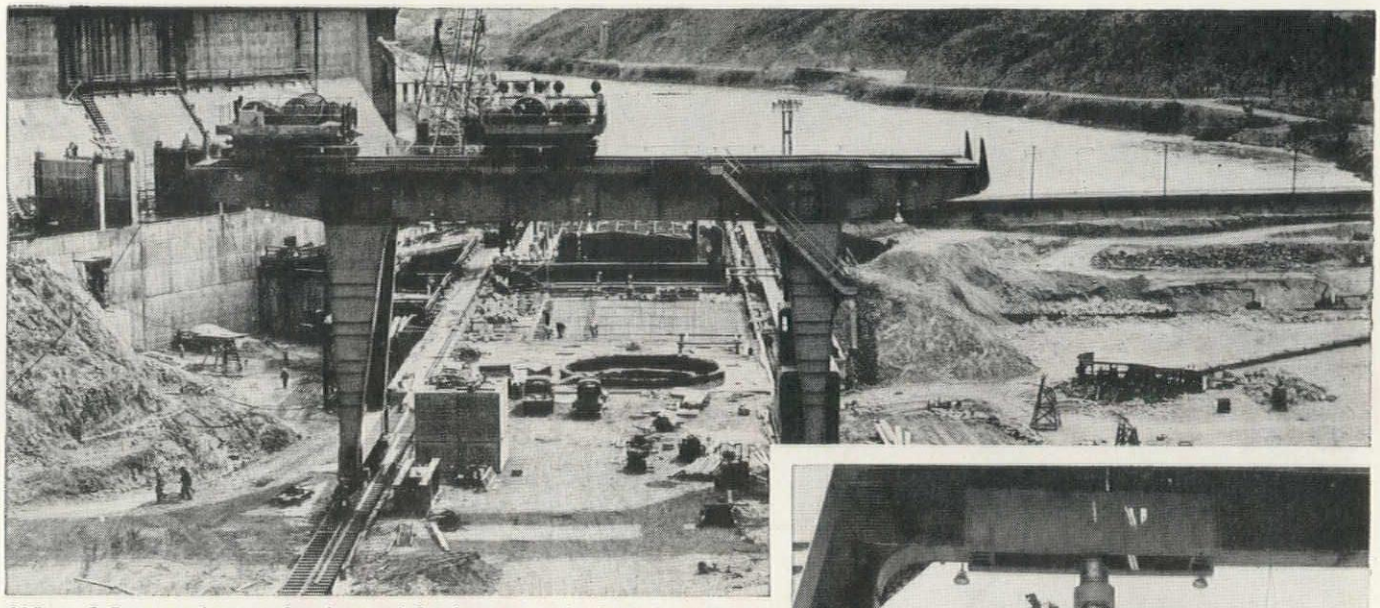
Designers and Builders of The Largest Line of Allied Equipment for Industrial Wheel Type Tractors

SHOVELOADERS ● UNIVERSAL LOADERS ● FLUID-DRIVEN SWEEPERS ● LULLDOZERS ● SHOULDER MAINTAINERS



325-ton G-E powered gantry Star Iron and Steel crane at the Davis Dam site on the Colorado River. The crane must operate almost continuously during installation of five turbine generators.

Jogging a 325-ton load 1/10,000 inch at a time

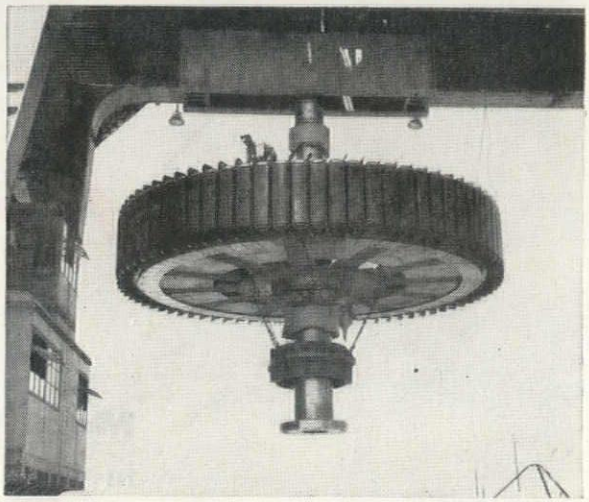
... Electrically

G-E powered DAVIS DAM CRANE positions heaviest loads accurately, smoothly, safely

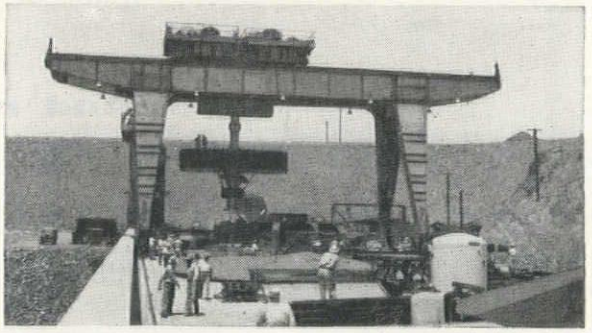
It's an unusually versatile crane drive that can either handle an empty hook at twice rated speed, or jog a 325-ton load to within 1/32 inch. Bureau of Reclamation's specifications for Davis Dam outdoor powerhouse crane called for just that type of operation.

The General Electric drive beat the requirements for this job by a wide margin—the full-load jogging accuracy in the lowering direction was .000114 inch.

Electrified construction equipment can work for you too—can give you the fast, safe, efficient service your job calls for. And when you combine G-E motors and control with a G-E power distribution system, you'll get all that electrified equipment can offer with the extra benefits of G-E engineering assistance in application, installation and service. *Apparatus Dept, General Electric Company, Schenectady 5, N. Y.*



G-E hoist motors and control lift and accurately position turbine-generator rotors weighing over 300 tons.



From hoist and trolley motors atop the bridge to master switches inside the cab, all G-E equipment on this Star Iron and Steel crane works smoothly to move heavy loads accurately and safely.

Ask him Today!

Whether you buy or build construction equipment, your G-E representative can show you how to do a better job—at lower cost—by complete electrification. Write him now, and he'll call on you at your convenience.

WESTERN PLANTS OR SERVICE SHOPS: Anaheim, Denver, Los Angeles, Oakland, Ontario, Portland, Richland, Salt Lake City, San Diego, San Francisco, San Jose, Seattle. WESTERN SALES OFFICES: Albuquerque, Bakersfield, Butte, Denver, Eugene, Fresno, Los Angeles, Medford, Oakland, Pasco, Phoenix, Portland, Riverside, Sacramento, Salt Lake City, San Diego, San Francisco, San Jose, Seattle, Spokane, Stockton, Tacoma.

Electrified Construction
BETTER PRODUCT
LOWER COST

GENERAL ELECTRIC

664-13

Tiger Brand Wire Rope provides the muscles for the world's largest crane... this 8400-ton giant at San Francisco Naval Shipyard has lifted 630 tons.

Tiger Brand Wire Rope is manufactured from raw ore to finished product under the strict quality controls of United States Steel. To help you get all the stamina engineered into American Tiger Brand, the services of a Field Specialist are available without charge.

Contact your Tiger Brand distributor or write Columbia Steel Company, Room 1422, Russ Bldg., San Francisco 4.

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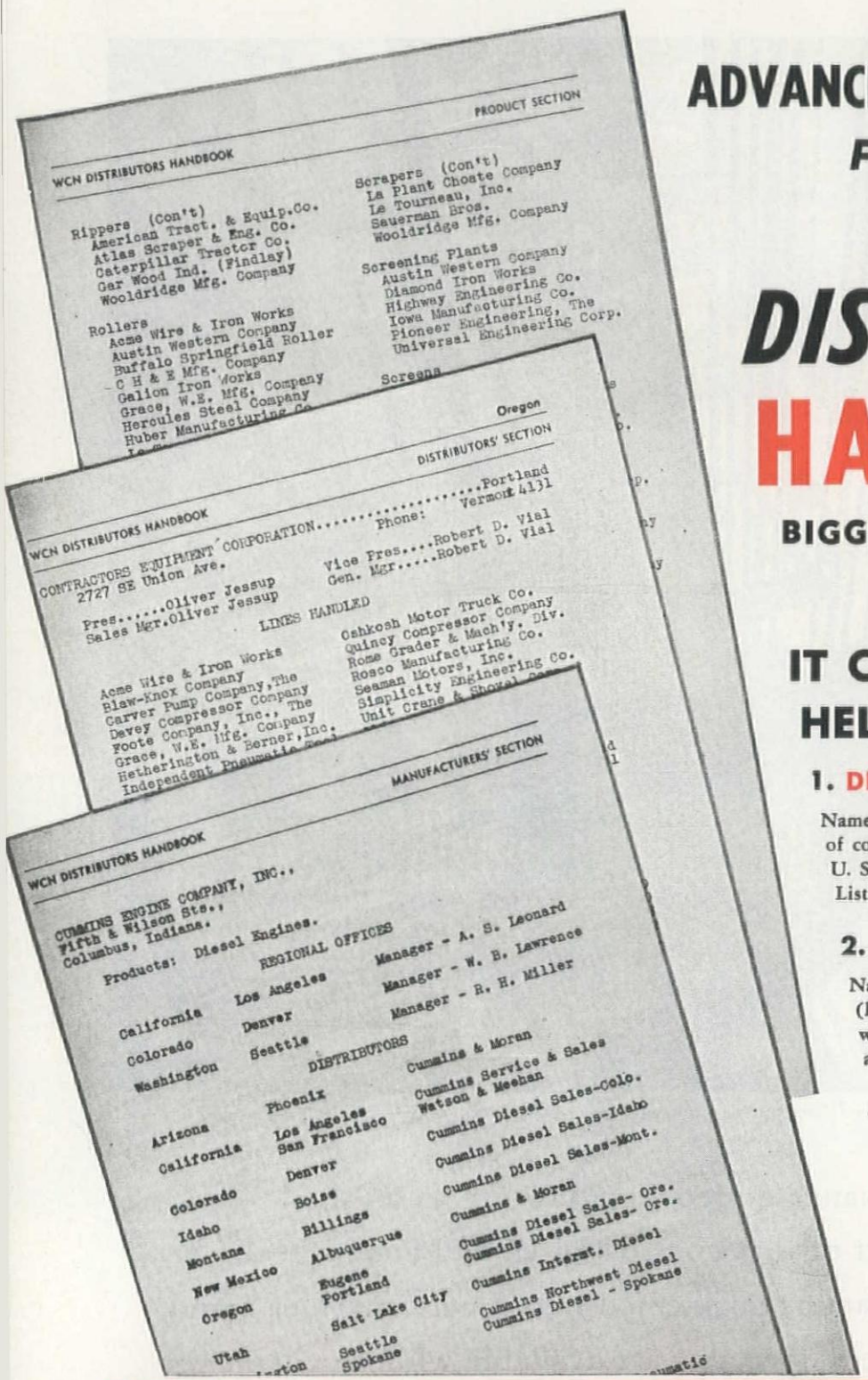
USS **U·S·S TIGER BRAND Wire Rope**

UNITED STATES STEEL



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for Uniform cubical aggregate with

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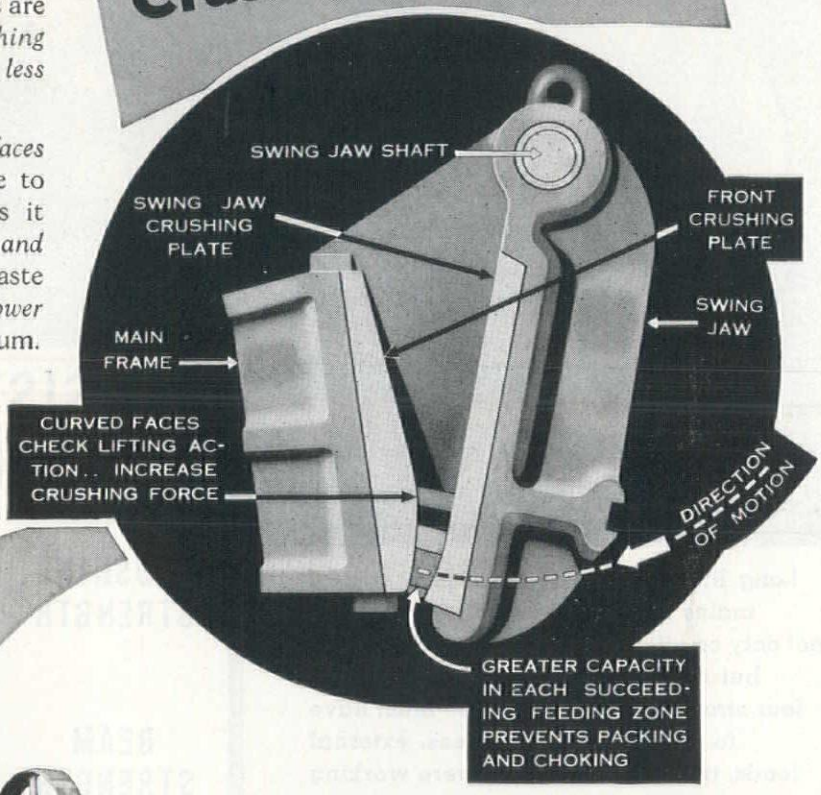
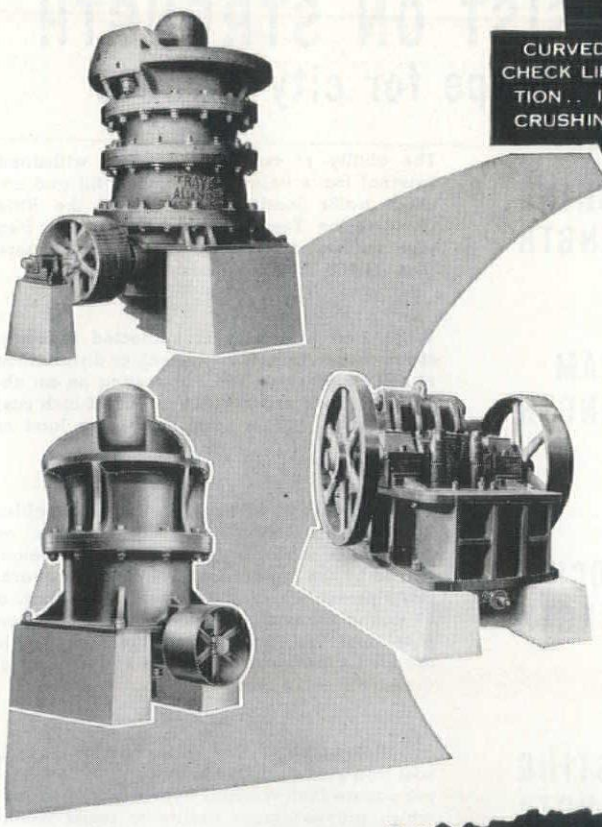
CURVED Crushing Surfaces

All Traylor Jaw and Gyratory Crushers are standard equipped with *Curved Crushing Surfaces* to produce *better aggregate* at *less cost* per ton.

Traylor *Curved Crushing Surfaces* apply power as a *direct* crushing force to quickly nip and reduce each rock as it enters the crushing chamber. *Lifting and churning is eliminated.* Consequently waste fines, slivers and discs . . . *as well as power loss* . . . are reduced to an absolute minimum.





No Choking . . . No Packing Keeps Work on Schedule

With Traylor *Curved Crushing Surfaces* each succeeding feed zone has greater capacity than the preceding zone. As material is reduced it drops *freely* into the next stage of reduction. Traylor *Curved Crushing Surfaces* insure a steady, *balanced* flow of uniform, cubical aggregate through every stage of primary and secondary stone reduction. *Write for free bulletins on the Traylor Crushers you need.*

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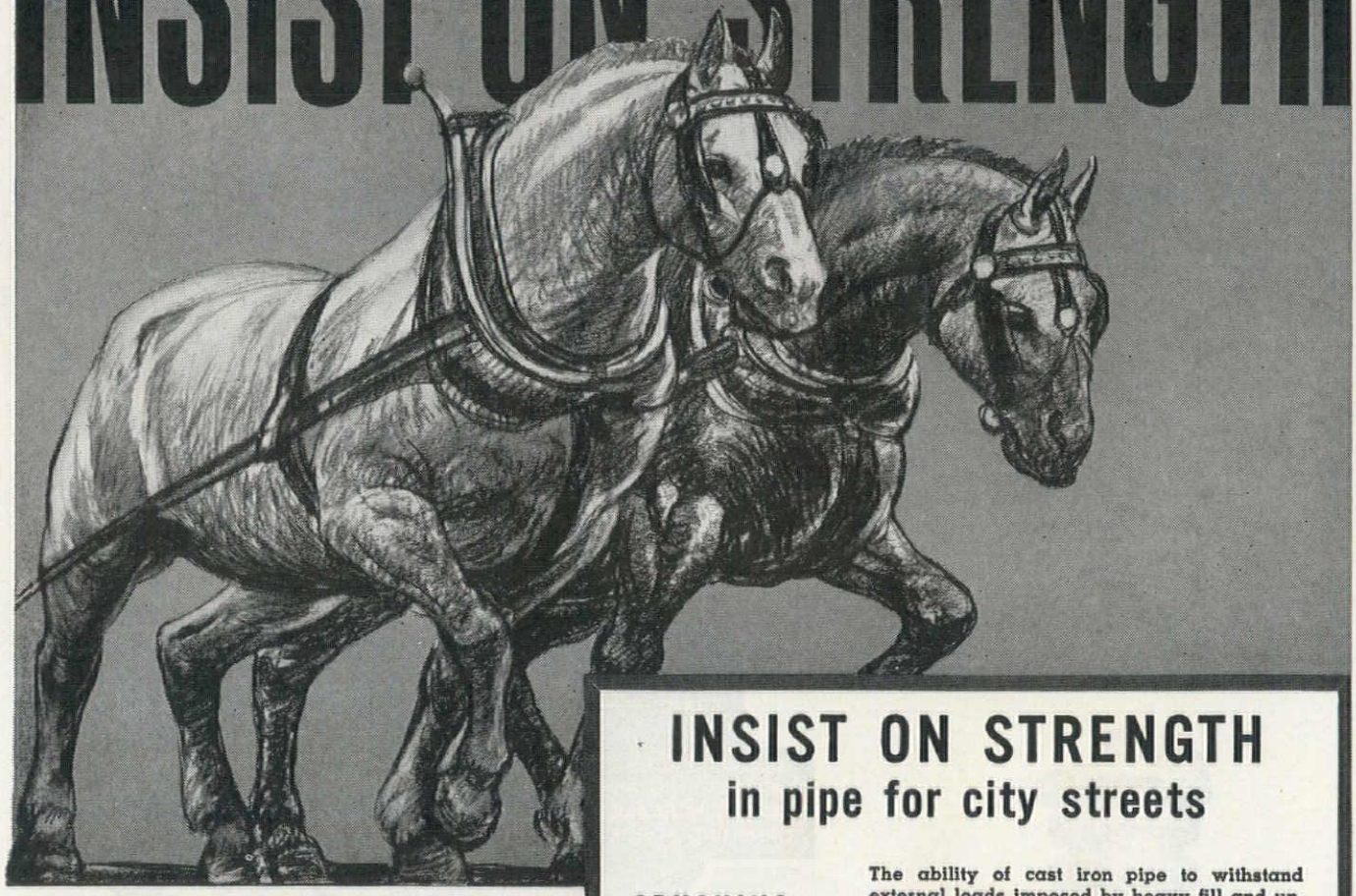
Rod Mills . Crushing Rolls
Apron and Grizzley Feeders

A "TRAYLOR" LEADS TO GREATER PROFITS

INSIST ON STRENGTH



Long life and low maintenance cost of mains laid under city streets depend not only on effective resistance to corrosion but on definite strength factors. The four strength factors that pipe must have to withstand beam stress, external loads, traffic shocks and severe working pressures, are listed in the box opposite. No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns or villages. Cast iron water and gas mains, laid over a century ago, are serving in the streets of more than 30 cities in the United States and Canada. Such service records prove that cast iron pipe not only resists corrosion but combines all the strength factors of long life with ample margins of safety.

CAST IRON

INSIST ON STRENGTH
in pipe for city streets

CRUSHING STRENGTH

The ability of cast iron pipe to withstand external loads imposed by heavy fill and unusual traffic loads is proved by the Ring Compression Test. Standard 6-inch cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

BEAM STRENGTH

When cast iron pipe is subjected to beam stress caused by soil settlement, or disturbance of soil by other utilities, or resting on an obstruction, tests prove that standard 6-inch cast iron pipe in 10-foot span sustains a load of 15,000 lbs.

SHOCK STRENGTH

The toughness of cast iron pipe which enables it to withstand impact and traffic shocks, as well as the hazards in handling, is demonstrated by the Impact Test. While under hydrostatic pressure and the heavy blows from a 50 pound hammer, standard 6-inch cast iron pipe does not crack until the hammer is dropped 6 times *on the same spot* from progressively increased heights of 6 inches.

BURSTING STRENGTH

In full length bursting tests standard 6-inch cast iron pipe withstands more than 2500 lbs. per square inch internal hydrostatic pressure, which proves ample ability to resist water-hammer or unusual working pressures.

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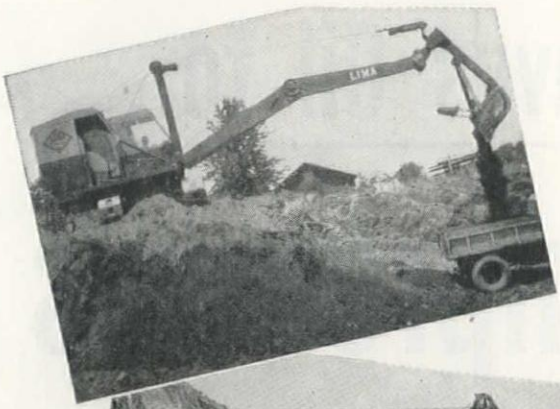

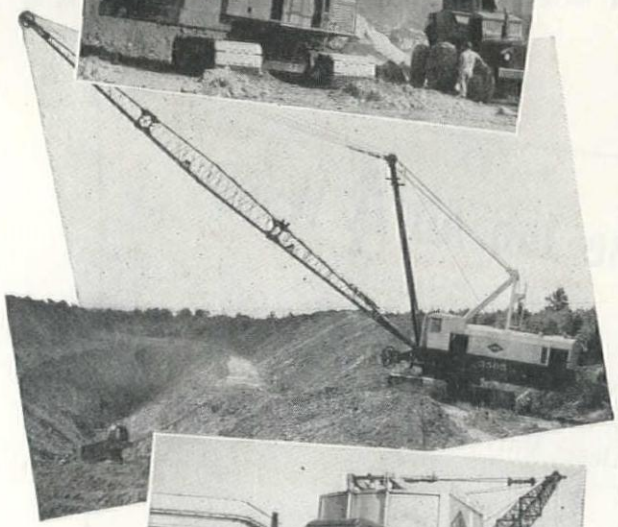

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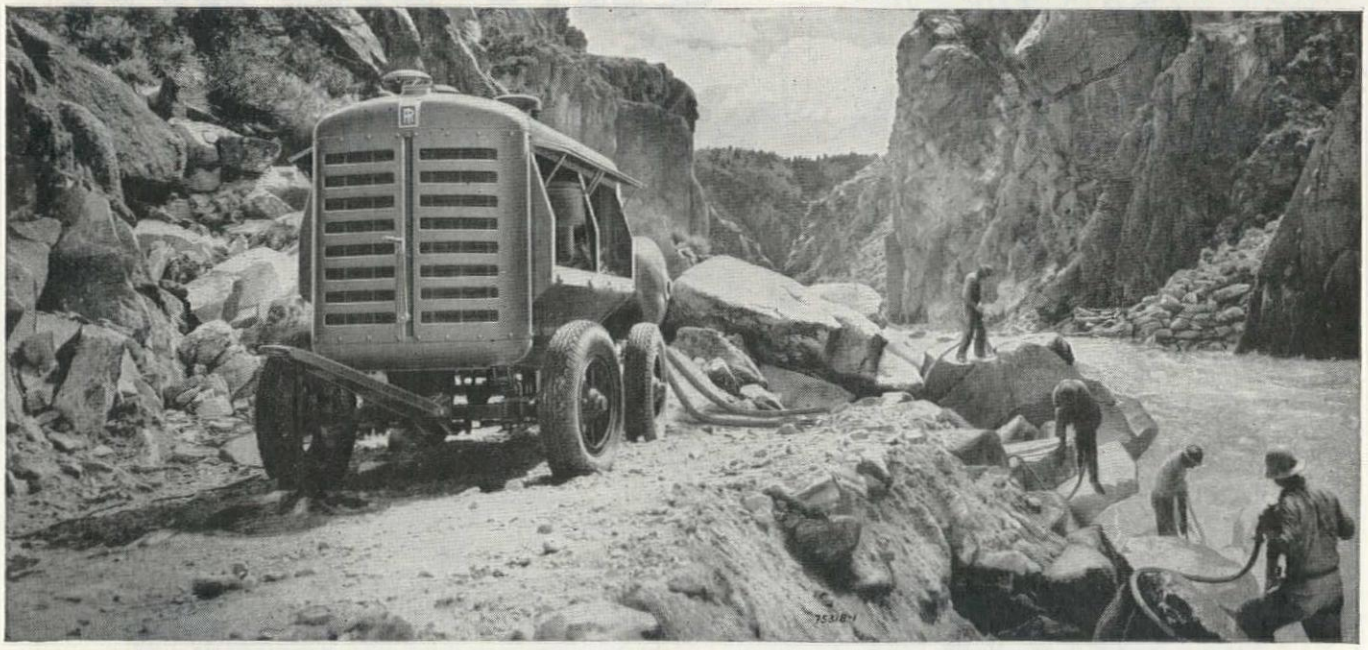

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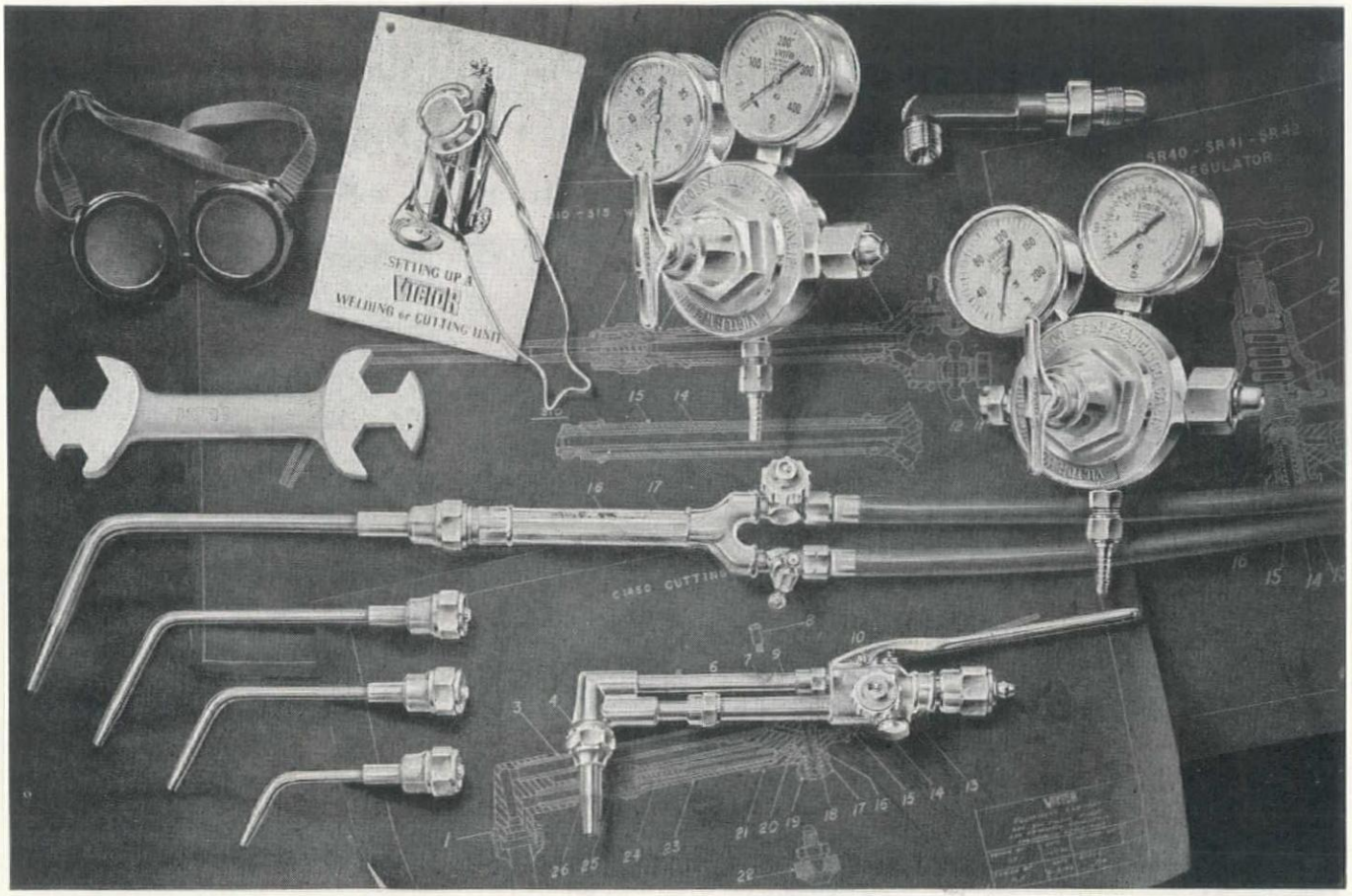

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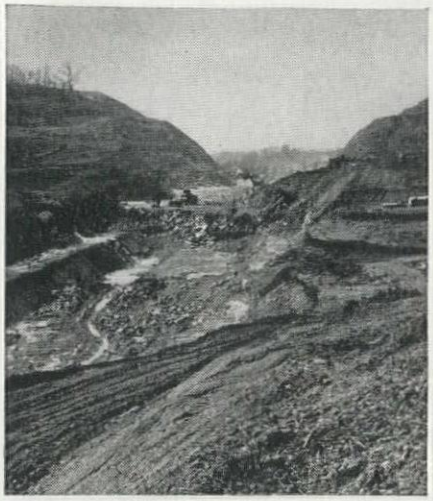
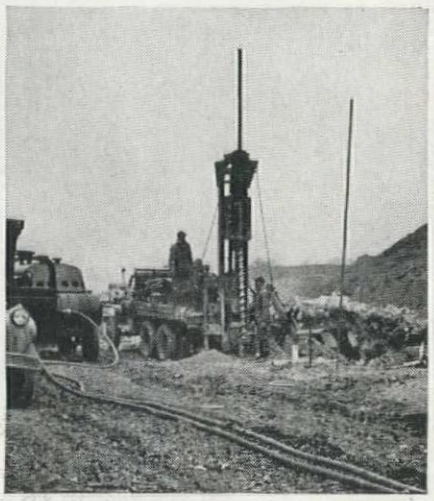
HOW EFFICIENT BLASTING SPEEDS RAILROAD IMPROVEMENTS

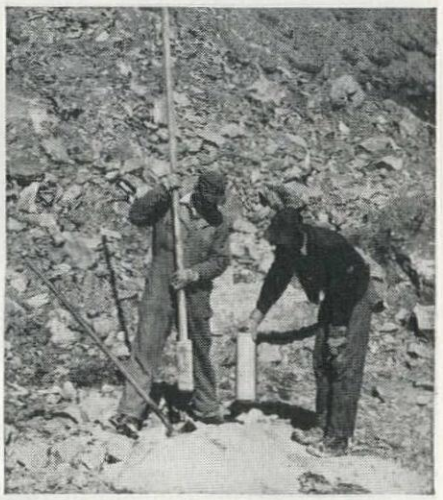
Du Pont explosives give better fragmentation ... greater economy on 6 million yard excavation



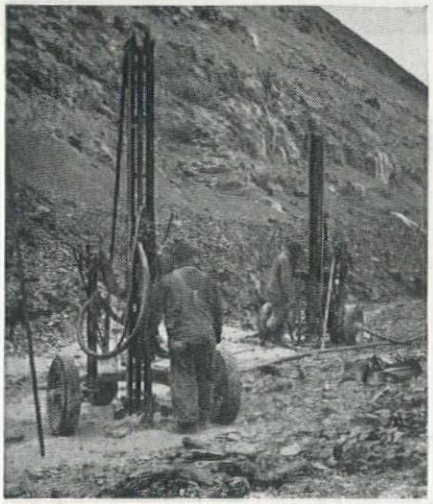
This open cut, 4,000 ft. long, 220 ft. maximum depth and 600 ft. wide at the top, is typical of Pennsylvania Railroad excavations to eliminate tunnels between Bowerston and Broadacres, Ohio, on its Panhandle Division.



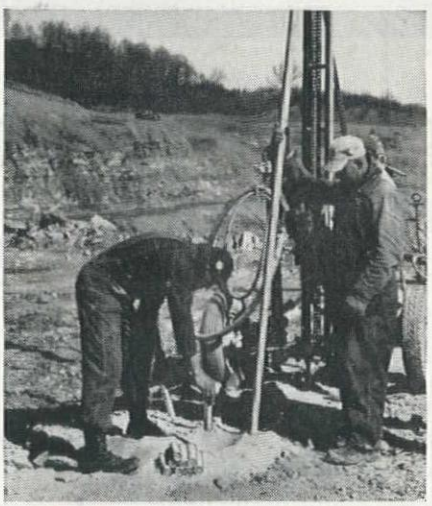
Truck-mounted augers drill 6 in. holes varying in depth from 20 to 35 ft. at the center of the cut. Rock ranges from soft shale through sandy shale to a firm sandstone.



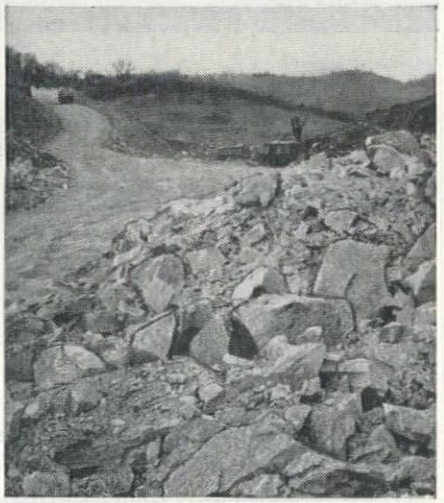
Holes at the center of the cut are loaded with Du Pont "Red Cross Extra" 40%—widely used in blasting operations of this type. It is dependable . . . has considerable water resistance.



Wagon drills are used for 2½ and 3 in. diameter holes on slopes of the cut. Crews space holes on a 6 x 8 ft. pattern, drilling holes to depths varying up to 18 ft.



Du Pont "Red Cross Extra" 50% and "Gelex" No. 2 are loaded into wagon drill holes. And Du Pont "MS" Delay Electric Blasting Caps are used in the primers.



Results of plan have been reduced back break, decreased vibration and better fragmentation. Rock is well broken all along the cut, permitting faster, more economical removal.

JOBS LIKE THIS confirm the efficiency, economy and dependability of Du Pont explosives and blasting accessories. Ask any Du Pont Explosives representative for complete information about these or any other Du Pont Explosives products. He'll be glad to help you with any blasting problem you have. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

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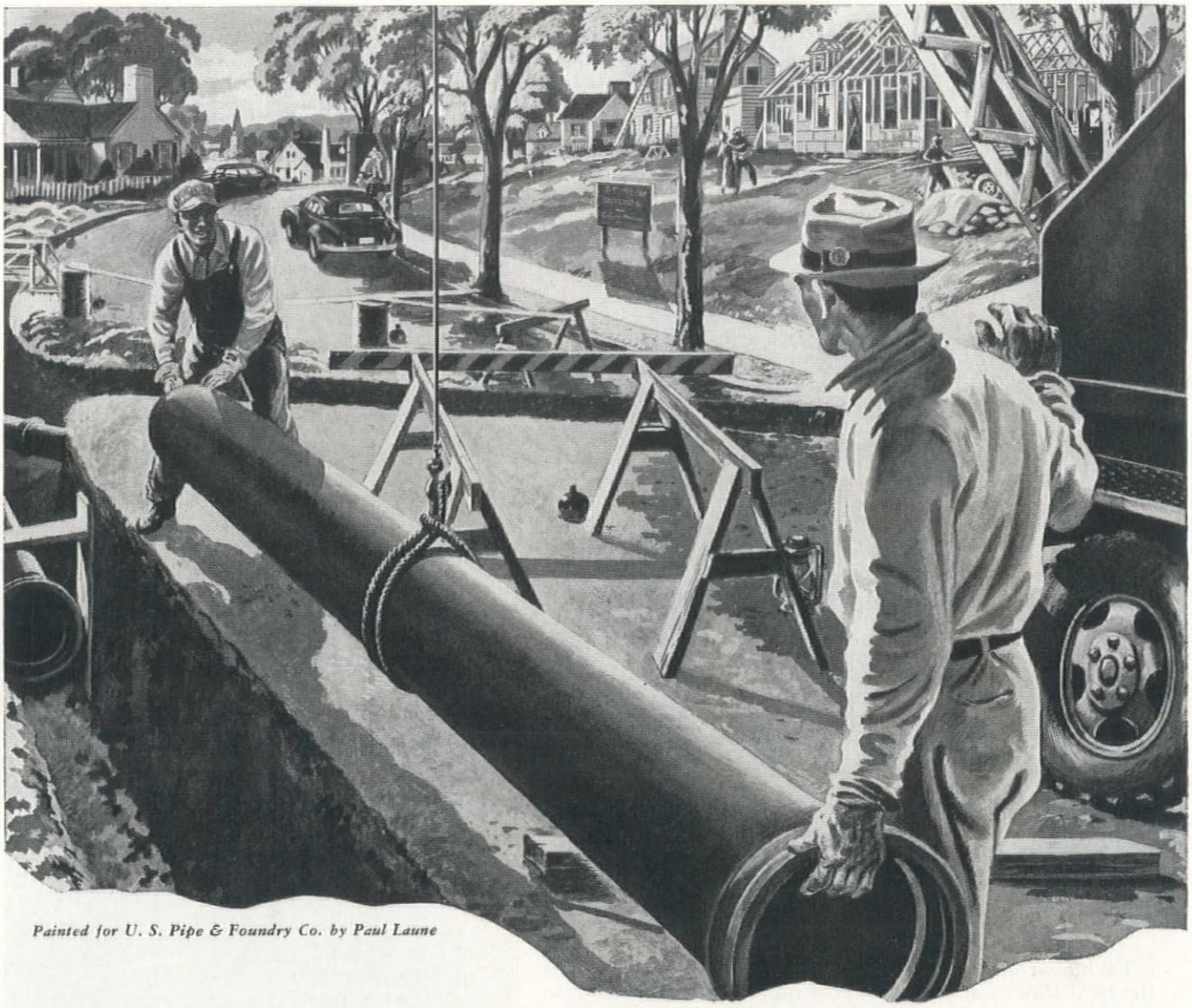

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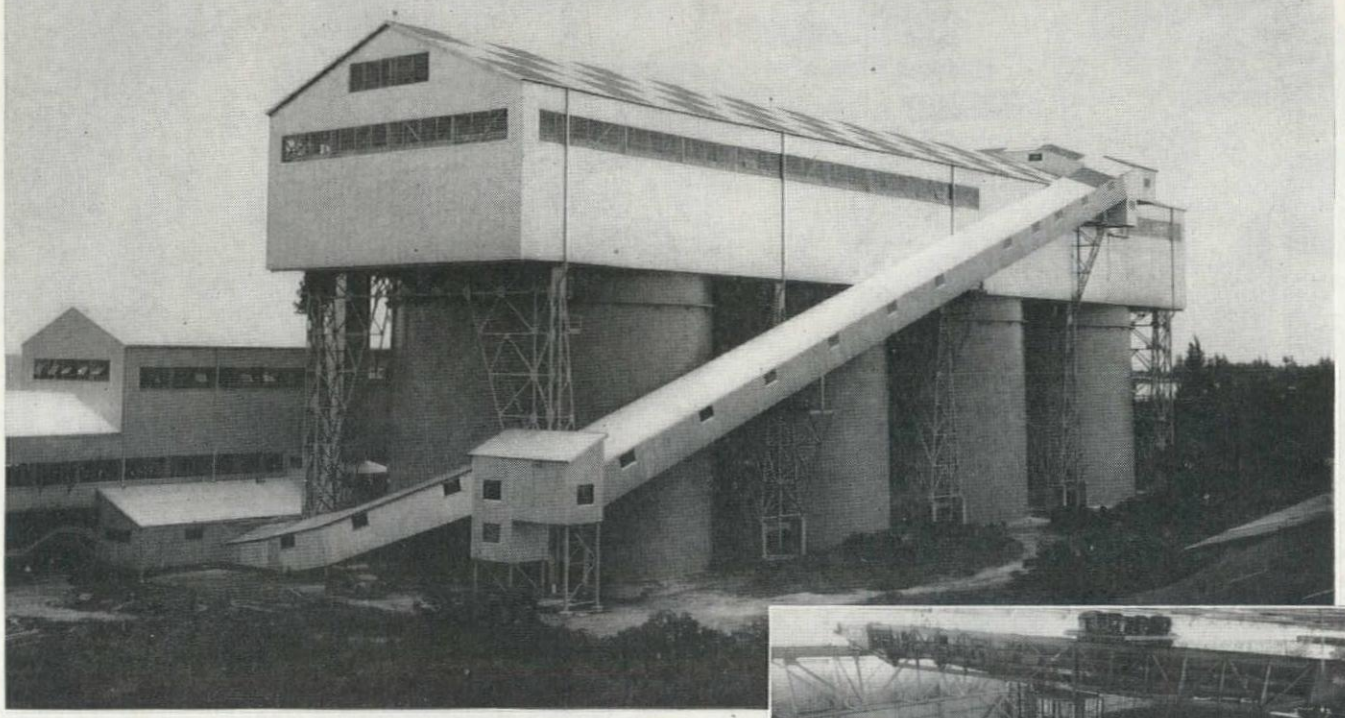
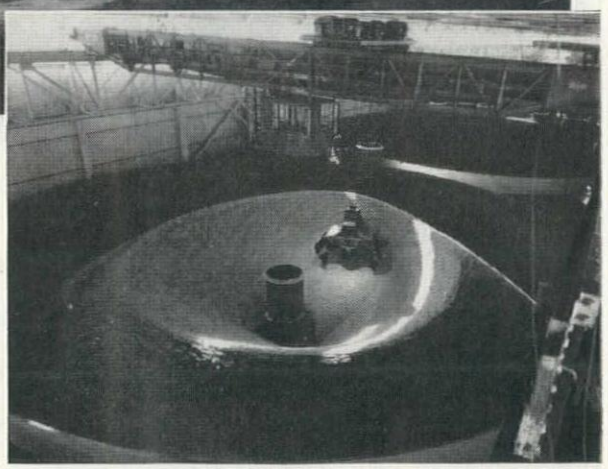
Hawaiian Bulk Sugar Storage Plant Uses Welded Steel Tanks





Each year about 450,000 tons of raw sugar—nearly half the total Hawaiian output—are shipped from the islands to the refineries in bulk, rather than in 100-lb. bags.

To store the raw sugar produced on the island of Hawaii, the Matson Navigation Co. recently installed the tanks shown above at Hilo. Each tank is 80 ft. in diameter by 76 ft. high and stores 10,000 tons of sugar. The sugar is transported from the plantation by trucks, weighed in the scale house at the left and then carried to the top of the tanks by the inclined conveyor.

Storage facilities are essential at Hilo in order to build up sufficient tonnage for steamer arrivals. Horton welded steel tanks offer two added advantages for this type of service. First, welded joints have a high efficiency—they are strong as the metal itself. Second, these tanks are easy to maintain because their surfaces are SMOOTH—there are no lap joints or rough edges to collect paint-deteriorating dirt and water.

These sugar storage tanks are an example of the steel plate structures we build. Write our nearest office for a quotation when you need storage tanks or other steel structures.

The illustration at the top of the page shows four Horton welded steel tanks for storing raw sugar at Hilo, Hawaii.

The view directly above shows one tank nearly full of bulk raw sugar and the crane and clamshell used to discharge the sugar. The clamshell picks up the sugar and drops it down the sectional discharge pipe shown in the center of the tank. Conveyors then carry the sugar to the docks. The discharge tube is removed section by section as the level of the sugar in the tank becomes lower.

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Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE, PA. *In Canada*—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

WESTERN CONSTRUCTION

December 1950 Vol. 25, No. 12

Contracting Is a Business

THE YOUNG and ambitious contractor is usually long on field ability and short on cost information. He is well experienced in the output to be expected from his equipment and his crews, under various conditions, but probably would have a hard time answering questions on his costs per unit of time or machine. In other words, he knows more about construction than he knows about business. To advance successfully into larger opportunities, the ambitious contractor must become a businessman.

To draw a parallel, a small manufacturer doing a gross annual business equal to that of a contractor will know the costs in each step of his operations, and the balance to be maintained in the use of machines for achieving minimum costs. This manufacturer will grow as he develops sharper cost figures. The contractor is no different, and the faster he gets away from thinking in terms of "yards-per-hour" and starts to think about "cost-per-yard-per-machine" the quicker will his operations graduate from gambling to business.

Since many young contractors come up the ladder of directing field operations, it is only natural that they measure the results of the day's work in units of volume, rather than dollars. It may never occur to them that a different scheduling of equipment might cut down the output, but increase the profit.

A simple example could relate to the efficiency of a shovel loading trucks. Mr. Average Contractor will say that any good superintendent could tell by observation what this set-up should be. But will it cost more to have some waiting time on the shovel than to add another truck, and how much? Mr. Smart Contractor will know the exact answer, and his profit, as well as his bid on the next job will reflect this information to his advantage. This type of simple cost analysis problem is solved in clear and easy steps on another page in this issue. The method will open the way to meeting more serious problems.

But, Mr. Average Contractor will contend that unforeseen factors will rule out any exact solution—"It's O.K. as to theory, but no good in the field." However, Mr. Smart Contractor will admit this and use the paper work as a starting solution to be modified and adjusted as required.

Finally, Mr. Average Contractor will insist that the cost of analyzing field problems on paper is more than the value of the result—especially since he is so expert in these problems. Mr. Smart Contractor knows that his growth and expansion will depend on the time he spends studying costs. With all its elements of uncertainty, its intangibles of men, weather and the whims of the "resident," and just plain breaks-of-the-game, a contracting enterprise is still a business and will grow as business methods are applied.

Compromise for the Columbia Compact

A CHANCE to forestall the establishing of a Valley Authority over the states of the Columbia River Basin is in the making. The existing commission which was set up to represent the five states, has appointed a legal committee to draft an interstate compact for river development and utilization. In spite of all the conflict of interests among these states, the advantages to be realized make any effort toward a successful compact seem small.

The physical plans for developing the Columbia for beneficial use are not of pressing concern at this point. In addition to the construction projects already completed and in progress there are plans in the blueprint stage which could be the basis for another stage of development. Further, engineering talent continues to study the ultimate possibilities for useful control.

Today's problem concerns reaching an agreement on the interests and needs of the several states, to the end that a unified front can be presented against the threat of an Authority. If the states of the basin wish to control and direct the utilization of this great resource, then the initial step of framing a compact must be vigorous and prompt. It is now a matter of water development philosophy and not engineering. There is precedent for reaching an interestate agreement, and it is not necessary to squabble over an inadequate supply as it was among the Colorado Basin states. With an earnest desire to allocate an adequate resource, the framework of an agreement should not be impossible.

All elements of the construction industry should use their influence in promoting an atmosphere of willingness to compromise, to the end that the compact can be consummated.

A Bridge Worth Watching

NEVER RELUCTANT to adopt new engineering ideas, the bridge department of the California Division of Highways is making a field-size study of a prestressed concrete bridge. This European development, which is being tried in Philadelphia for the first time in America, may or may not be adaptable to the bridge problems of the West. At the present stage the field operations that are dictated by prestressed design tend to require additional man-hours on the job, which may over-balance the savings in materials. Western engineers are accustomed to consider reinforced concrete as a material to be used without too serious concern over yardage. Generous supplies of aggregates in the West and contractors with adequate equipment tend to keep the unit cost of the concrete low. At least this approach is quite different from the European regard for concrete as an engineering material. On the other hand, possibly Western engineers, teamed with Western construction talent, will develop field methods which will make it possible to utilize some of the peculiar advantages of prestressed concrete. At least Western bridge engineers, and all others interested in designing with reinforced concrete will watch with interest this full-scale field test.

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BEST For What Ails Your Roads

Blading in reverse is easy, thanks to All-Wheel Steer.

All-Wheel Drive provides ample power for heavy ditch cuts.

Riding the bank to reach extra high with the 13-foot blade.

The Loader Attachment solves the ditch and shoulder cleaning problem.

The Roller Attachment has many construction and reconstruction uses.

"Controlled Traction," an exclusive feature, moves more material, farther and faster.

BEST, because All-Wheel Drive makes every pound of weight a powered pound, harnessed to a driving wheel. For maximum traction—primary element in Power Grader efficiency—*there is no substitute for All-Wheel Drive.*

BEST, because All-Wheel Steer directs and controls this tremendous traction to maximum advantage, provides superb earth-moving ability, and mastery of all types of work.

BEST, because of the additional values offered by specialized attachments—many exclusively Austin-Western—which greatly increase the usefulness and profit-making ability of the grader.

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Foundations to Record Depth For a Unique Bridge in Idaho

Four-leg towers consisting of steel-and-concrete columns developed by the Bureau of Public Roads to reach rock at maximum depth of 325 ft. below grade—Contractor uses pontoon barges

REACHING down a maximum of 325 ft. below profile grade a unique foundation has been completed for the Blue Creek Bay Bridge, being built by the U. S. Bureau of Public Roads. The project is located across an arm of Lake Coeur d'Alene on Idaho Forest Highway Route 7 and on U. S. Highway 10 just east of Spokane. Of exceptional interest to bridge engineers is the design of the substructure, providing steel and concrete columns extending through a maximum mud depth of about 215 ft., and contractors will be interested in the construction methods used for placing these columns and the tower system of bracing. The contract is being carried out by Paul Jarvis, Inc., of Seattle, on a bid of $871,155.

Location problems at the site of this 1,300-ft. crossing and the studies which reviewed comparative designs were described in *Western Construction,* April 1950, pg. 96. The present article reviews the methods and procedures developed by the contractor in constructing the substructure. The field problems can best be appreciated by a brief review of the three key features: (1) structural steel towers, (2) steel casings extending to, and into foundation rock, and (3) steel cores (piles).

Towers—Key to the design was the requirement that the long columns have lateral support through about 80 ft. of water. The solution provided that the four piles in each of the seven piers be placed in, and stiffened by the 24-in. cylindrical corner posts of 30-ft. square towers. These towers acted as templates for placing the 18-in. casings and piles. The two end towers (Nos. 1 and 7) were designed to extend to rock, and the intervening five reach about 20 ft. into mud bottom. The four corner cylinders are braced in a conventional manner in 30-ft. vertical panels (see drawing).

Casings—Inside each corner cylinder an 18-in. steel casing was to be inserted and driven to rock. It was then to be drilled at least 5 ft. into rock to form a socket for the pile. These casings were to extend up inside the cylinders a distance of 20 ft. and there be cut off. The annular space was to be filled with grout. Purpose of the casings was to insure direction and seating of the piles.

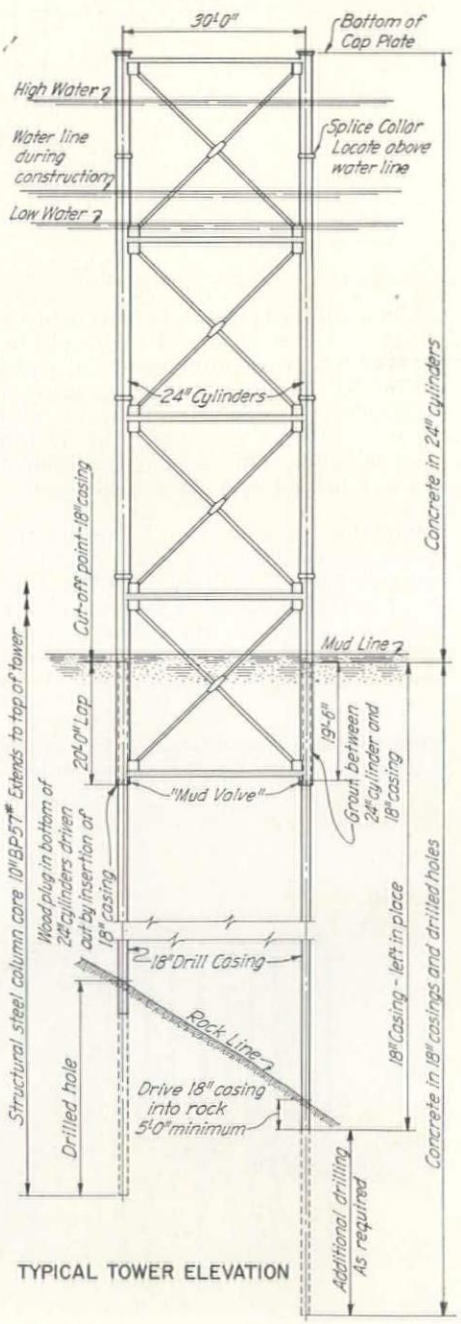
Cores—Finally, inside the cylinders and the casings the column cores (10-in. BP 57-lb. steel bearing piles) were to be threaded and seated in the rock sockets. The last step required the cleaning out of the casing and cylinder, and filling with tremie concrete.

Estimated quantities involved were:

Structural steel in towers	820,000 lb.
Casings (18-in.) left in place	3,200 ft.
Cores (steel piling)	370,000 lb.
Concrete filling	1,180 cu. yd.

Falsework

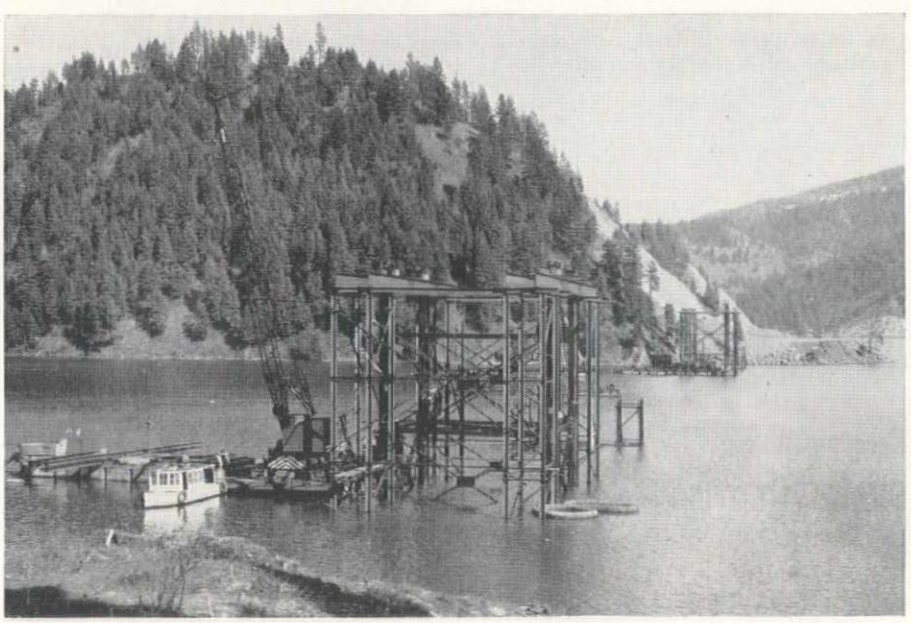
At the four end towers (Nos. 1, 2, 6 and 7) the contractor used steel piles to support the working platform, and to hold and lower the tower as it was as-

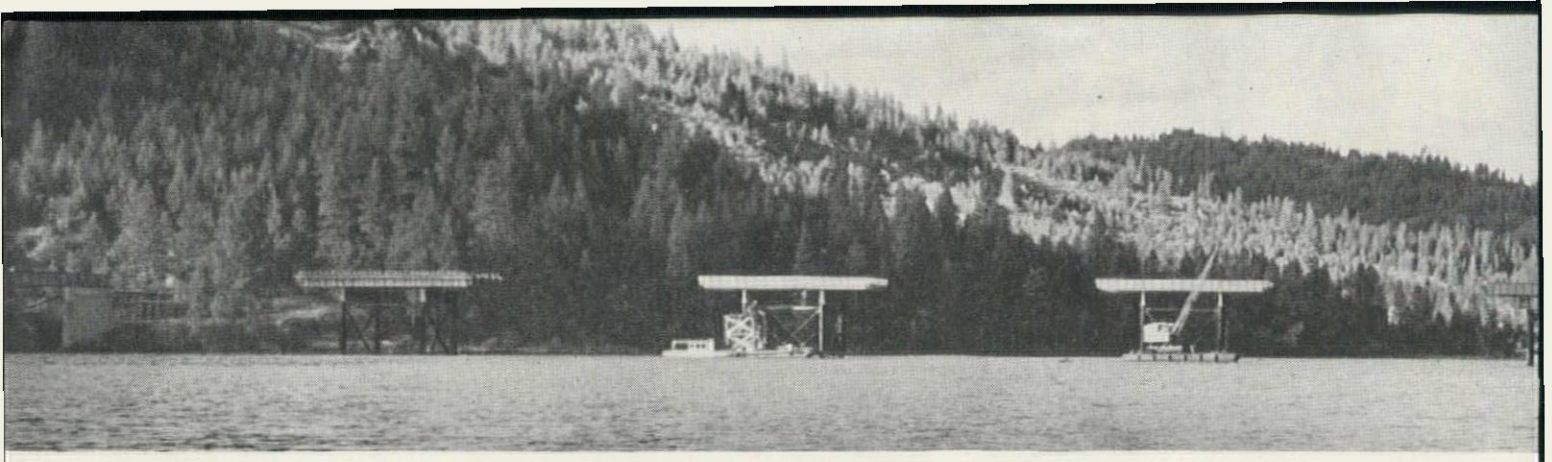


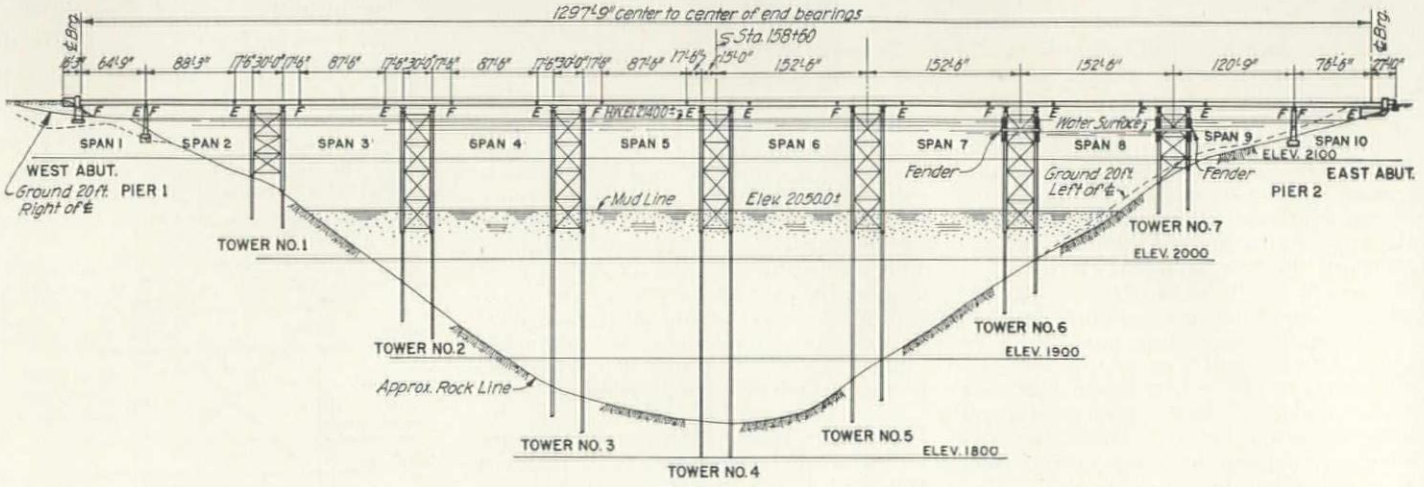
TYPICAL TOWER ELEVATION

RIGHT—Design features of the foundation towers indicating braced section through water and concrete-encased steel piles reaching to sockets drilled into rock.

BELOW—Shore towers were built from pile falsework, which supported four beams with 15-ton hand winches used to lower fabricated sections of towers as they were assembled.







ELEVATION

sembled. Sixteen piles were driven, made up of an inner group of eight (10-in. BP 57-lb.) and an outer group of eight (10-in. BP 42-lb.). Across the tops of these piles were placed four beams (30-in. WF 108-lb.) carrying four 15-ton hand winches. This supporting system was well braced with all-welded connections.

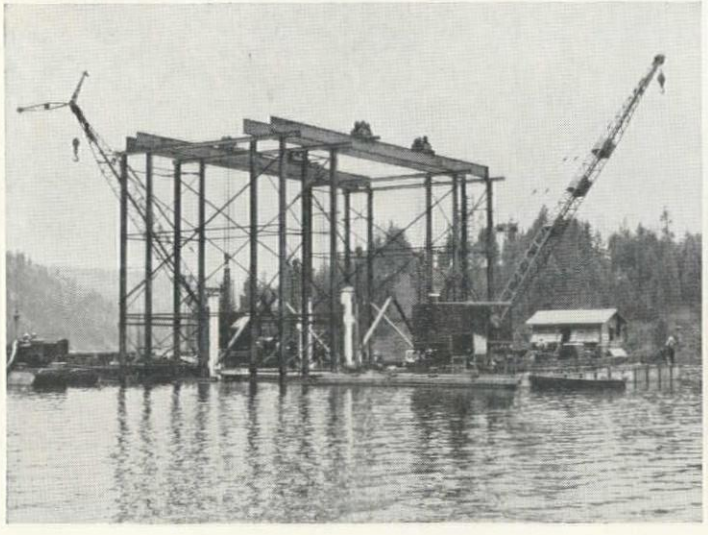
For the three central locations the contractor used floating falsework. Two pontoon barges, each 20 x 60 ft., were tied together with steel trusses, at the proper spacing. On these barges were set the top frames, cross-beams and hoists from the fixed falsework. Thus equipped, and anchored at the location, the barges were ready to support and lower the towers.

Anchors consisted of 1-cu. yd. concrete cubes, each provided with twenty 1¼-in. bars extending out from the concrete face 12 in. Lines were adjustable and the barges were spotted by instrument and held to within the 3-in. tolerance. Wind forces did not develop any problems with this anchorage system.

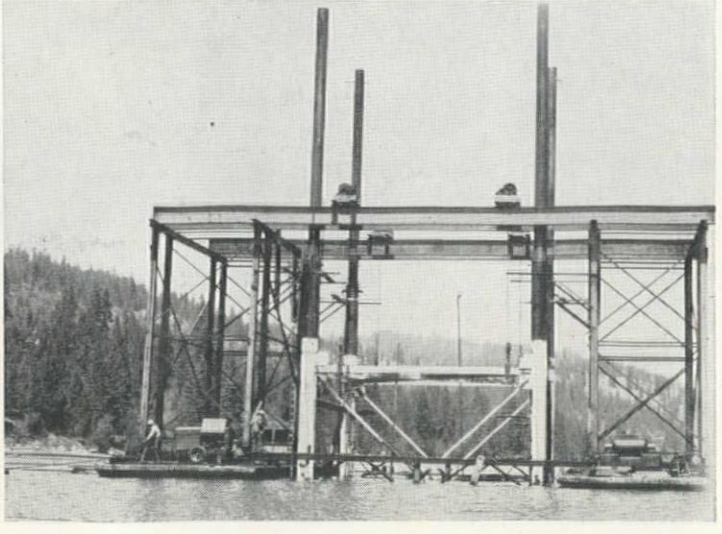
Steel for the towers was shop-fabricated, delivered to Coeur d'Alene, Idaho, by rail, and from there to the site by barge. The tower sections were not assembled in the shop during fabrication and because of the tubular corner columns there was some concern over the field assembly, but the sections went together without difficulty and the positioning of the gusset plates on the cylinders was accurate.

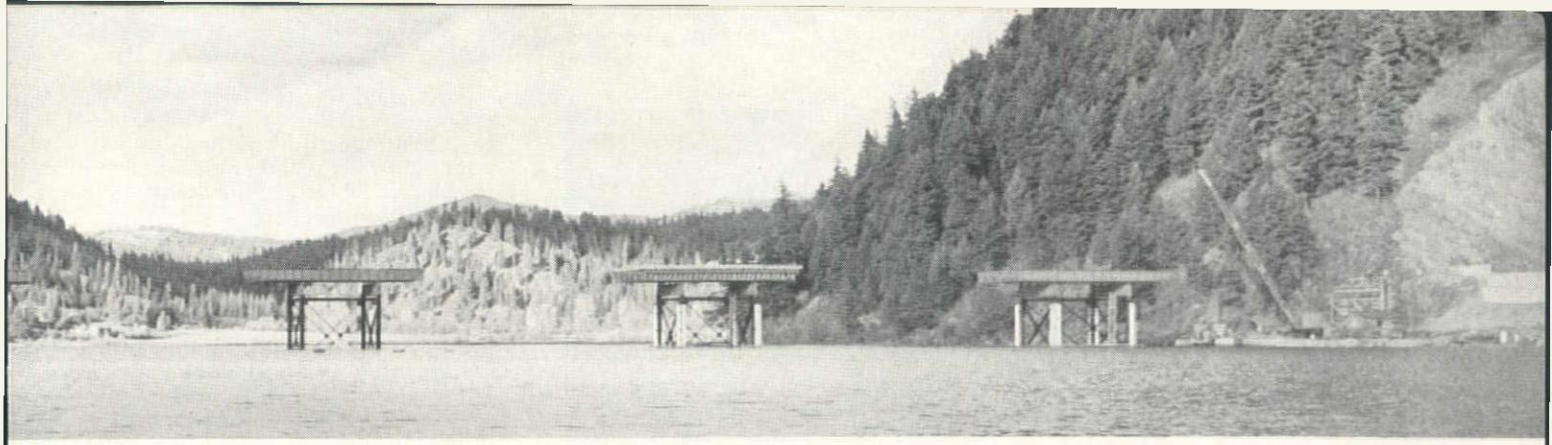
Working from pile falsework or from barges the 30-ft. depth panels of the tower were placed in position and held by four hand winches. After the connecting members and bracing were placed, the section was lowered by the hand winches to a position where the next 30-ft. panel could be assembled. This process was repeated to include three of the tower sections. The con-

TOWER 6 being erected from pile falsework, showing the winches used to support and lower the 30-ft. square sections as they were assembled.



THREADING down through the 24-in. corner cylinders are the 18-in. casings which will be driven through mud and into sockets in the rock.





TOP—Seven towers completed and ready for 87½-ft. sections of deck. The four central towers were constructed entirely from floating equipment anchored and held on line within 3-in. tolerance.

LEFT—Foundation rock, covered with 230-ft. maximum depth of mud, shown in section through the site, dictated unusual design for the towers.

tractor elected to omit the top tower section until after the casings had been placed. The complete tower as suspended from the falsework or barges weighed approximately 60 tons.

Specifications provided for a 3-in. tolerance in both directions for the positioning of the towers. On those towers built from pile falsework the exact position was fixed by means of set screws adjusted from the falsework. For the towers set from barges the position was checked constantly by instrument. The results have been gratifying and indicate that the 3-in. tolerance was not exceeded in the longitudinal direction and the lateral alignment was within 1½ in.

Towers were put together with high tensile strength field bolts. These field connections were tightened with an impact wrench until the tension in the bolt was slightly less than the yield point of the steel. Time required for the erection of the end towers from falsework was about one week for each.

According to plans all towers except those at the two ends were to be lowered about 20 ft. into the mud bottom. However, field work indicated that the mud provided enough support, particularly under the horizontal steel bracing, to hold the towers above this penetration. As a result, the contractor resorted to jetting to secure the 20-ft. depth into mud. This was done by welding 2½-in. perforated pipes on the underside of all bottom struts and jetting with fire pumps.

With the towers in position, they were ready for the next operation of inserting and lowering the 18-in. casing which extended through the deep mud and into foundation rock.

Placing casing

Casing of 18-in. diameter and ⅜-in. steel thickness was assembled by welding 20- or 40-ft. lengths and lowering into position through the corner cylinders. The casings were centered in the cylinders by means of guides. Normally the casings sunk about 25 ft. into mud under their own weight and were then driven through intervening layers to rock line.

After the casings reached rock a churn drill was used to drill the required socket for the core (pile). The churn drill with a 13-ft. length of stem weighed about 3,500 lb. and was operated with a 24-in. stroke. The drilled holes averaged 30 ft. deep into rock. As the drilling progressed the casings were driven from 5 to 10 ft. into rock. Drilling was then continued an extra 20 ft. below the bottom of the casing to help bond the concrete between the lower end of the pile and the rock. Drilling was continued until hardness indicated that solid rock had been reached and that the casing had sealed off all seams.

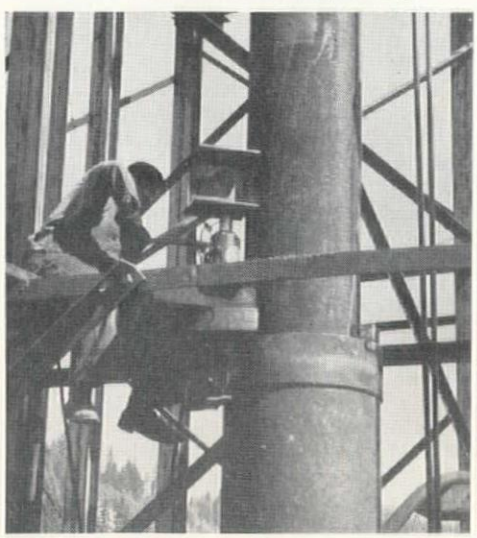
Drill holes were then cleaned out. The operation included both flushing and baling. Flushing did not prove too successful because of the pressure built up in the casing and the tendency to stir up mud above the rock.

Cutting off the casing

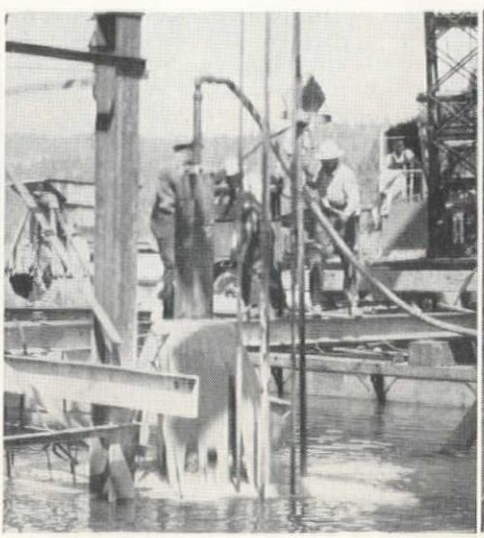
After cleaning was completed, the next step was to cut off the casing 20 ft. above the bottom of the surrounding corner cylinder. This provided the 20-ft. lap and an annular ring which was to be filled with grout. The contractor developed an interesting device for cutting off the casing at a depth of about 80 ft. below the water line on the deep towers. This device provided four horizontal cutting wheels turned by a 6-in. drill pipe which was turned by hand on the working platform. First attempts to cut the casing were not too successful because it had become slightly out-of-round during driving and the cutters did not hit the entire wall. This difficulty was overcome by a tapered swedge which forced the pipe into true cylindrical form, permitting the cutters to work around the entire periphery. After this addition the cutting device proved most successful and required only about one hour for each operation.

According to the original design plans, the sequence was to include: (1) lowering the towers into position, and to required depth, followed by (2) inserting and driving the casings. However, the

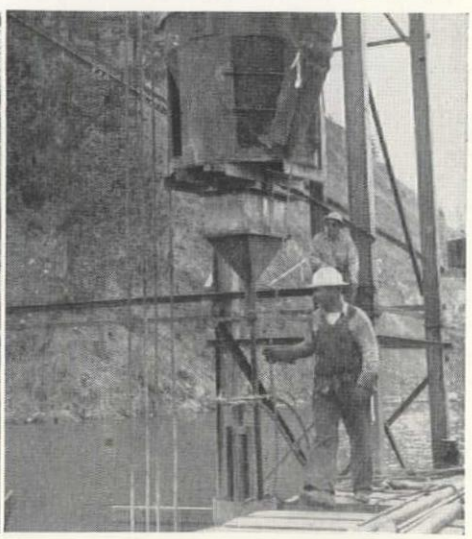
JACKING tower down the required 20 ft. into mud against resistance of the deep casings.

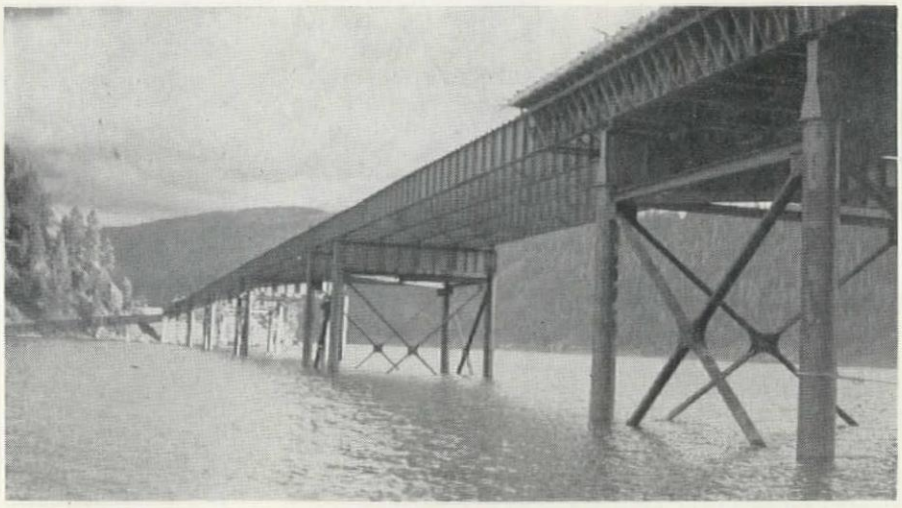


SLUICING out the casing for a tower leg to clean out mud before filling with concrete.



GROUTING the annular space between the cylinder and casing by tremie using 2-in. pipe.





THIS LOCATION was studied for a suspension span, a pontoon bridge and a rockfill causeway, any one of which would have cost almost $2,000,000 as compared to the bid price of $871,155 for the unique design finally developed.

contractor elected to assemble the three, 30-ft. panels of the deep towers, and then hold them suspended by the winches, while the casings were inserted, welded to required length, and driven. Then, the towers were completed, lowered, and jetted to position, using the casings as a guide. This procedure proved acceptable and in the interest of speed and economy.

Steel core, or bearing pile

With the casing in place and cut, the steel bearing pile member was then assembled by splicing 60-ft. lengths of 10-in., 57-lb. section and lowering to final bearing at the bottom of the rock socket. The sections were butt-welded and splice plates were also welded on the flanges. These steel cores were centered in the columns by means of guide lugs welded on the piles at 20-ft. spacing.

With the four steel cores in place for the tower, the remaining operations related to placing grout in the annular space between the cylinder and the casing and then filling the entire cylinder from the bottom of the footing to the water surface. Grout was placed in the annular space by the tremie method, using a 2-in. pipe. This pipe was charged without difficulty, using a wooden plug forced down through the pipe by the grout. Only about 1½ hr. were required for setting up the tremie pipe and placing the material. The surface of the grout was kept about 2 ft. below the top of the 18-in. casing to avoid overflow which would drop to the bottom of the column.

The next and last step was to fill the entire cylinder and casing down to its final depth. This provided definite problems since it included placing concrete by tremie method to depths up to almost 350 ft. By comparison, concrete placed under water at the Tacoma Narrows Bridge and the San Francisco-Oakland Bay Bridge was only about 220 ft. The preliminary operation consisted of cleaning of all silt from the socket and soundings were made to determine that solid rock was exposed. Concrete was more correctly a grout of 1:3 mix using ⅜-in. maximum aggregate and an 8-in. slump.

For the first piers, concrete was placed through a 3-in. pipe which was provided with an air-operated valve at the lower end to control discharge. As lowered, the tremie pipe filled with water and the pipe was charged by forcing a wooden plug down under pressure of the concrete. Concrete was deposited in the pipe from a hopper and at all times a head of not less than 30 ft. was kept on the valve at the bottom. About 20 min. was required to remove each 20-ft. length of pipe as pouring advanced. Time required for placing concrete in one of the columns which was 190 ft. long was 5 hr.

For placing concrete in the columns at towers 3, 4 and 5 the 3-in. tremie was replaced with a 4-in. pipe to avoid plugging of the tremie pipe and the bottom valve. The open 4-in. tremie, using a wooden plug with a canvas attached to form a pocket for the concrete, proved very satisfactory. Use of the 4-in. tremie also speeded the concrete operation by about 50%.

Construction plant

The contractor's plant was located on the east shore of the bay. Equipment included a 2-yd. mixer and necessary batching plant, with a crawler crane to handle aggregate. Mixed concrete was dumped into hoppers and moved by barge to place of pour where it was handled by barge-mounted crane.

Steel was moved from shore to towers on pontoon barges and there erected by a 20-ton floating crane equipped with a 75-ft. boom.

Practically the entire barge fleet was built up with 5 x 7 x 5-ft. pontoons. These were assembled to provide various sizes of barges for the floating plant. The false work barges were 20 x 60 ft., made up of 10 x 20 x 6½-ft. pontoons used in the erection of the three deep towers. The largest barge for the floating equipment was 36 x 70 ft.

Physical construction of the bridge was commenced on March 15 when the ice went out. The seven towers were complete about October 15 and steel erection was finished about November 15. About one-third of the floor slab was poured by November 10, and unless weather is bad, the contractor will complete the work, except for painting, this fall.

Organization

Operations of the contractor have been carried out under the personal direction of Paul Jarvis and Paul Jarvis, Jr. Steel for the towers and the casings was provided and fabricated by Consolidated Western Steel Corp.

The project is being carried forward under the direction of the Bureau of Public Roads by L. M. Huggins, district engineer for Idaho, and W. H. Lynch, division engineer at Portland, Ore. The type of bridge was conceived and recommended by R. B. McMinn, bridge engineer in the Portland office. The design was prepared in the Western Headquarters at San Francisco under the direction of H. R. Angwin, principal bridge engineer. Charles E. Andrew of Tacoma, Wash., served as consultant, and John Zoss is resident engineer.

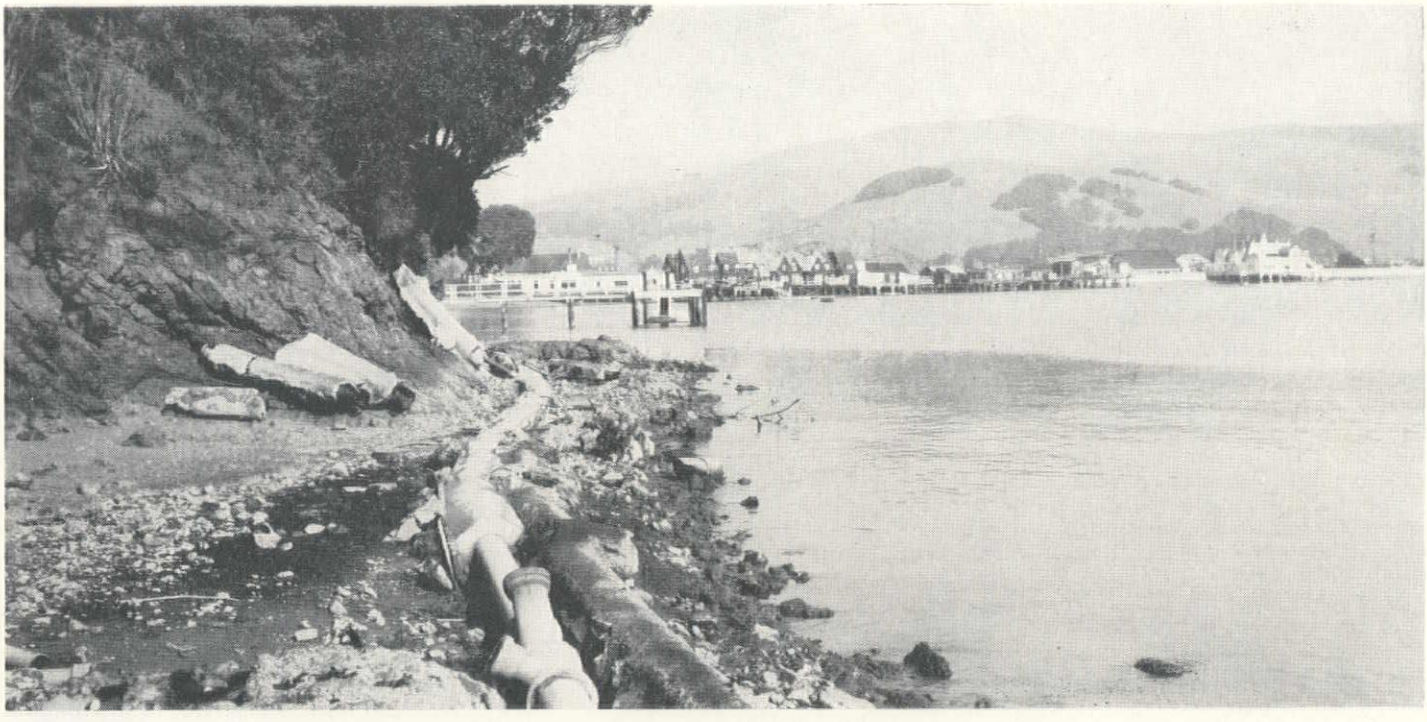
Power Plant on the Line At Anderson Ranch Dam

THE PACIFIC Northwest's newest hydroelectric power plant, situated at Anderson Ranch Dam in southern Idaho, was placed in production on November 20, with the Bureau of Reclamation putting the first of three 13,500-kw. generators on the line. In addition to producing power, Anderson Ranch Dam is providing supplemental water for 255,000 acres in the Boise Federal Reclamation project, which heretofore have suffered periodical shortages. It will also aid in the control of floods in the Boise Valley. The second of Anderson Ranch Dam's three generators is scheduled to go into operation next year. At some future date, the third unit may be added.

The power plant will be operated by the Bureau of Reclamation in coordination with existing Bureau plants on the Boise and Minidoka Projects to obtain a greater output of firm power. The combined system will provide energy for pumping on the Boise, Owyhee and Minidoka Projects, serve a Rural Electrification Administration cooperative at Fairfield, and provide additional power for the Raft River REA at Malta, Idaho. A small amount of peaking power and the surplus energy will be sold to the Idaho Power Co.

Anderson Ranch Dam is the highest earth-fill dam in the world. The crest is 456 ft. above bedrock. The structure is 2,650 ft. wide at the base, 1,350 ft. long at the crest, and contains 9,653,300 cu. yd. of earth and rock. Its reservoir has a storage capacity of 493,200 acre-feet.

Construction of the new dam was begun in August 1941. Due to wartime conditions, including stop-orders, diversion of critical materials to war industries, labor shortages and other reasons, the embankment was not finished until 1949. The power plant, spillway and outlet works are being completed this fall.



Problems at Belvedere, Calif., Show That—

Small-town Sewerage Can Be Complex

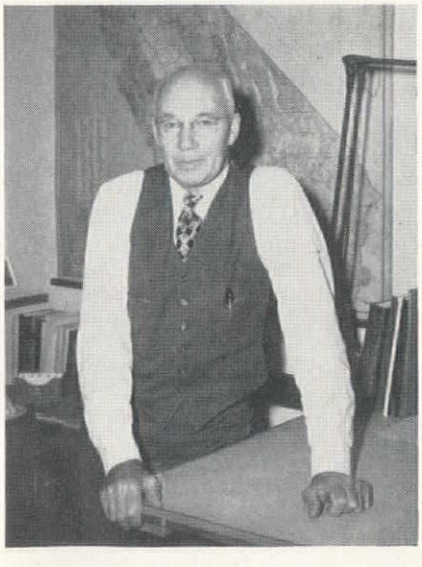
Providing new disposal facilities for a municipality of 700 population requires ingenuity of both engineer and constructors — System designed to take best advantage of city's tidal water frontage

By CHARLES H. LEE
Consulting Engineer
San Francisco, Calif.

PUBLIC WORKS in small municipalities may not be as spectacular as those undertaken by metroplitan areas or by the federal government. But, in their small way, they can be complex and present problems which demand as great ingenuity and resourcefulness on the part of the engineer and construction organization. This is illustrated by the municipal sewage system recently constructed for the City of Belvedere in Marin County, Calif.

Belvedere is an incorporated city of the 6th class with a population of about 700. It is located 6 mi. north of San Francisco and has tidal water frontage on Richardson Bay, San Francisco Bay, Belvedere Cove, and Raccoon Strait. It includes Belvedere Island and the west portion of Corinthian Island, both of which slope steeply to narrow, rocky beaches submerged at high tide. Sand spits connect the islands and extend to the mainland so as to enclose a controlled tidal lagoon. A large tract of marsh land in the lagoon area was recently reclaimed and subdivided with prospect of rapid growth in population.

Belvedere has long been a select suburban community with no industries or public resorts. It is popular as an aquatic recreational area and is a center of yachting activity in San Francisco Bay. Many of the existing residential lots of the city and most of the newly subdivided lots have water frontage, making it desirable that the shores and adjacent waters be attractive in appearance and free from bacterial pollution.



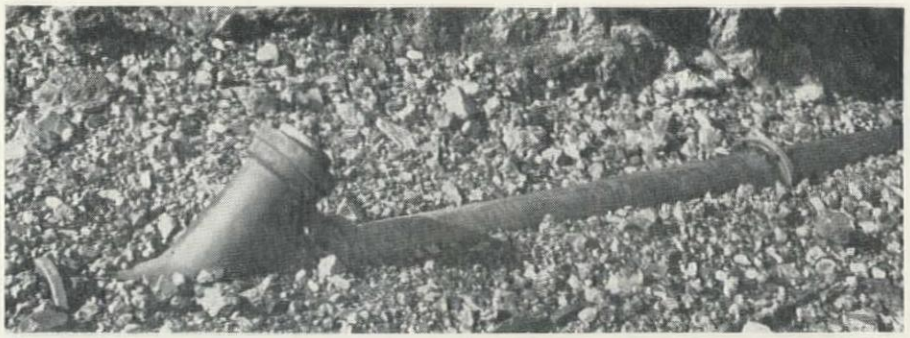
At the outset it was recognized that there are few cities in the world which have natural advantages for sewage disposal equal to that of the City of Belvedere. The southern tip of Belvedere Island drops off steeply into 180 ft. of water and is washed by a continuous tidal stream amounting to 700,000 cubic feet per second on the flood tide and 800,000 cfs. on the ebb, flowing with a maximum velocity of 3 to 4 ft. per sec. The total amount of dissolved oxygen contained in the tidal stream passing the point of the island during a cycle is at least 7,600 tons. With adequate diffusion this is sufficient to oxidize and render innocuous the sewage from a population of 50,000,000.

With this background of diverse topography, tide-washed perimeter, shallow ground-water, exacting sanitary requirements, and low property values, the engineer was called upon to design a complete sewer system adequate to serve the ultimate population, but so separated into units that the city could proceed to final plans and construction of either the whole system or a part thereof as necessity arose and finances permitted.

The older portion of the community was sewered prior to 1900, but facilities

PICTURED AT TOP OF PAGE—

BEACH OUTFALL sewer on Belvedere Island showing 8-in. cast-iron pressure pipe encased in concrete with 6-in. "Y"-branch cleanout and 4-in. "T" for lateral connection. Lengths of old corrugated culvert sewer with gunited top lying to left.

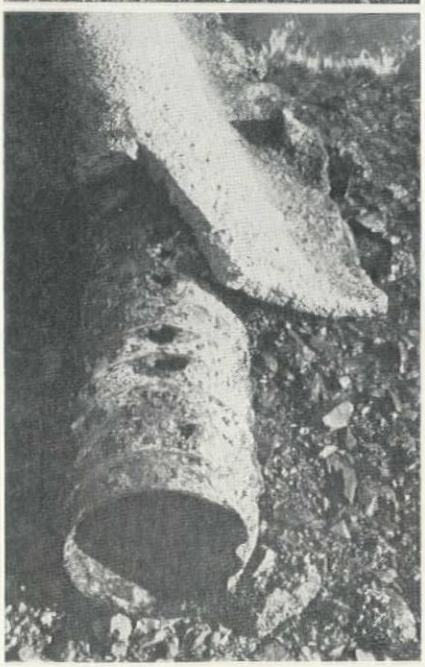


CLOSE-UP of 6-in. "Y"-branch cleanout and mechanical joint sealed with rubber gasket, on the Belvedere Island beach outfall sewer.

had deteriorated with age and were inadequate for the increasing population which might ultimately reach 3,000. Most of the west side of the island was without sewers and dependent upon individual septic tanks. Raw sewage from the northern portion of the city was discharged into Richardson Bay. Due to the flat grade of collecting lines in this area, tidal backwater would often cause overflow from toilet fixtures. Sanitary outlets from houses on the thickly built-up west slope of Corinthian Island discharged directly onto the tidal beach with resulting pollution of the shore line.

TOP—Vitrified clay sewer pipe, 50 years old, shows almost complete deterioration of cement joint material. Most of clay pipe was still in good condition.

BOTTOM—Corrugated culvert sewer pipe with perforated crown caused by gas from decomposing sewage solids.



The main sewer outlet from Belvedere Island and the southern sand spit was a 10-in. vitrified clay line 4,700 ft. in length laid within the tidal range along the beach on the west side of Belvedere Cove. This flowed into a rock tunnel at the southerly point of the island from which sewage was discharged into San Francisco Bay.

Much of the pipe was exposed and in many places had been broken by the action of waves and drift during winter storms. The original joint material was cement and had largely disappeared due to action of salt water. A section of pipe, 500 ft. in length, had deteriorated so badly that in 1938 it had been replaced with 10-in. No. 14 gage, asbestos bonded and hot-asphalt-dipped corrugated culvert pipe. Blockage from heavy debris in the vitrified line beyond the new section prevented free flow, and the hydrogen sulfide gas, generated by decomposition of accumulated organic solids, attacked the metal in the crown of the arch and soon perforated it, leaving a shell of asbestos. In 1946 the upper portion of the pipe was gunited on the outside to prevent structural collapse. This prolonged the life but did not clear the pipe of sludge or prevent the escape of raw sewage into Belvedere Cove through openings in the side of the pipe.

Initial plans

To remedy these unsanitary conditions, plans were initially prepared for extending the collecting system into all unsewered areas, for providing trunk lines, including sewage pumping plants, and for replacing the defective outfall sewer. A plant for primary treatment of raw sewage was also provided in order to meet the requirements of the State Health Department whose rules would not permit the discharge of either raw sewage or digested sludge into San Francisco Bay.

Bid sheets initially submitted to contractors called for construction of a complete municipal sewage system consisting of

9,718 ft. of 6-in. vitrified clay sewer pipe.
3,223 ft. of 8-in. vitrified clay sewer pipe.
64 manholes.
1,159 ft. of 4-in. B&S cast-iron force main.
1,153 ft. of 6-in. B&S cast-iron force main.
1,220 ft. of 6-in. cast-iron mechanical joint pipe (Corinthian Island beach line).
2,628 ft. of 10-in. Transite pipe (beach outfall line).
5 sewage pumping plants
1 primary sewage treatment plant located on the shores of Belvedere Cove and supported on fill protected by rock sea-wall. Digested sludge was to be pumped up 120 ft. to Bay View Ave., a select residential street, where it could be loaded onto tank trucks for disposal.

The engineer's estimate for this work as of January 1949 was $174,485, based upon prices of early 1948, with percentage added for increased cost of labor and material during the year 1948. One partial bid was received for the work on city streets only. Another bid was for the complete project, including work on the beaches but amounting to $325,239. This exceeded funds available for construction as well as the total bonding limit of the city which was approximately $225,000.

Such an unexpectedly large bid price was not an uncommon experience in those days of rapidly rising construction prices, but it was felt that in addition it reflected a greater allowance for hazard than was warranted on beach pipe lines and treatment plant, as well as for occurrence of rock in trenches. All bids were rejected by the city council, and the engineer was authorized to prepare modified plans for immediately necessary items whose cost would be within funds available to the city.

Modified plans

The most important changes in the plans, other than elimination of sewer lines not immediately needed, were made in the treatment plant and outfall sewer. At the treatment plant the principal change was the elimination of the sludge pumping and loading facilities. This was accomplished through a modification of the State Health Department rule, adopted March 11, 1946, which forbade the discharge of digested sludge into natural waters. The rule was changed so as to permit such discharge along with the clarified effluent if digested sludge was released in small quantities so as not to create unsightly conditions or form sludge beds.

In connection with this matter, conditions were examined at Portland, Ore., where, after joint investigation by the state sanitary authorities of Washington and Oregon, the city was planning to discharge sludge into the Columbia River from a treatment plant being designed to handle intercepted raw sewage formerly discharged into Willamette River. Investigation was also made of experiments under way in Southern California in connection with disposal of digested sludge by the Los Angeles County Sanitation District.

The beach outfall sewer presented a

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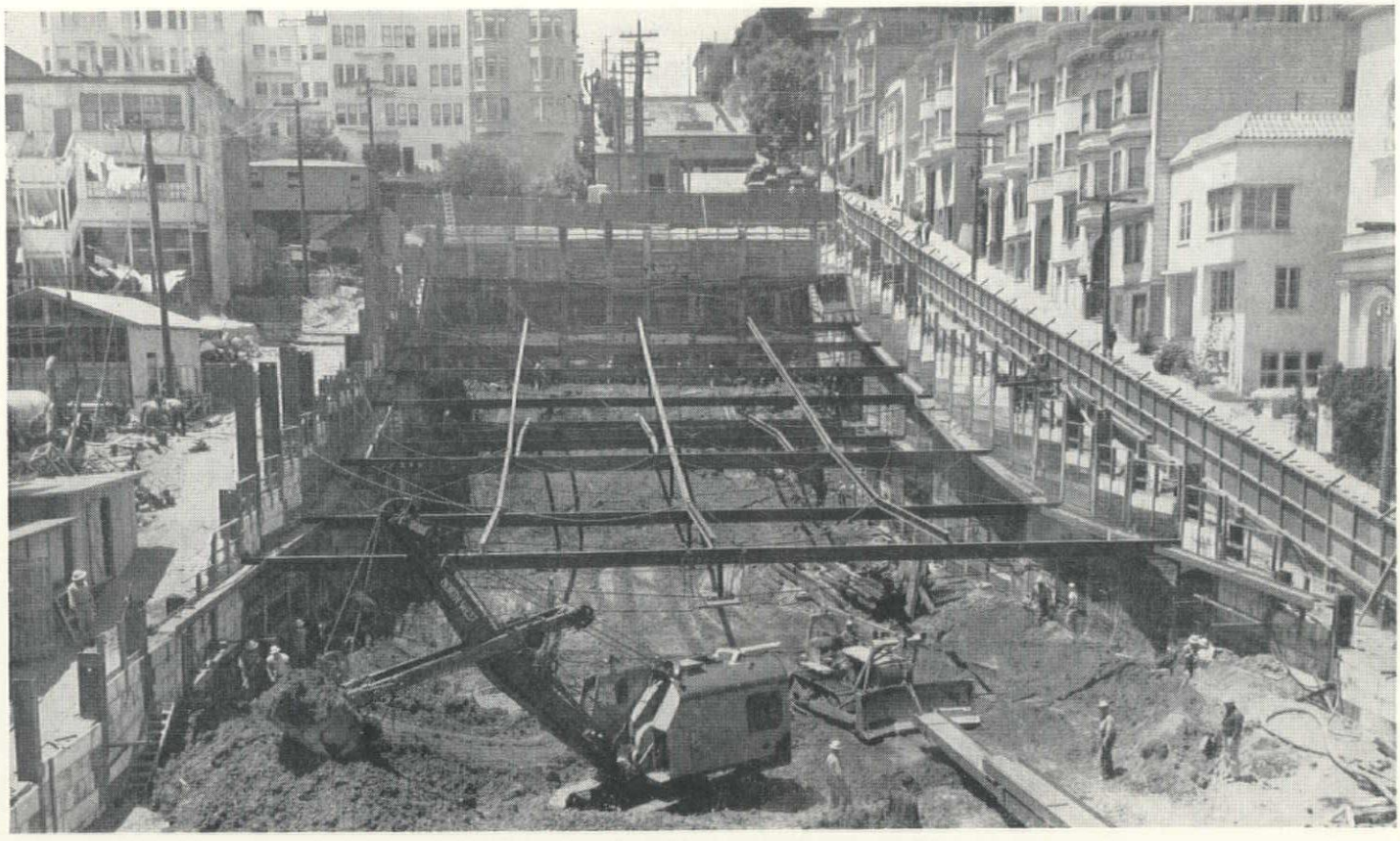


Going Underground in the Heart of a Big City Driving—

San Francisco's Twin Tubes for Traffic

Morrison-Knudsen Co., Inc. begins excavation for Broadway Tunnel — Project extends 3,300 ft. through heavily built-up section—Complete survey made of all nearby buildings before blasting

By
HARRY KIRMOND
Assistant Project Manager
Morrison-Knudsen Co., Inc.

THE CITY of San Francisco is now building one of the most up-to-date vehicular tunnels in the world. Known as the Broadway Tunnel, it will provide a new traffic arterial through historic Russian Hill and create a new route from the downtown district to the northwesterly portion of the city and the Golden Gate Bridge. The tunnel will relieve traffic congestion on narrow Pacific St., and tend to alleviate crowded conditions on Bush, Pine and California Sts. The entire project, including tunnel approaches, extends from Powell St. on the east to Polk St. on the west, a distance of 3,300 ft.

Up-to-date design

The portals of the tunnel extend from a point between Mason and Taylor St. to a point between Leavenworth and Hyde St. Broadway, originally laid out as a wide street, provided the ideal location for such a tunnel as this. The distance between the portals of the tunnel will be 1,616 ft., with a maximum grade of 3%. The tunnel consists of twin bores, each 28½ ft. wide, and each providing for two lanes of traffic in one direction plus a sidewalk. Except for a short distance from the portal, the two bores will be about 35 ft. apart.

The tunnels will be supported by steel ribs fabricated from 10-in. I-beams and lined with 2 to 3 ft. of concrete, depending upon the type of ground. The inside facing will be of light-colored ceramic tile and illuminated by an ultra-modern lighting system. A ventilating building will be constructed at each end of the tunnel, providing fresh air to the tunnels and removing noxious gases. The amount of air forced through the tunnels is controlled automatically according to the percentage of carbon monoxide existing in the tunnels. Due to the fact that the prevailing winds in this part of San Francisco come from the west, the ventilating system in the ventilating building at the east end is designed to deliver more air than the system at the west portal.

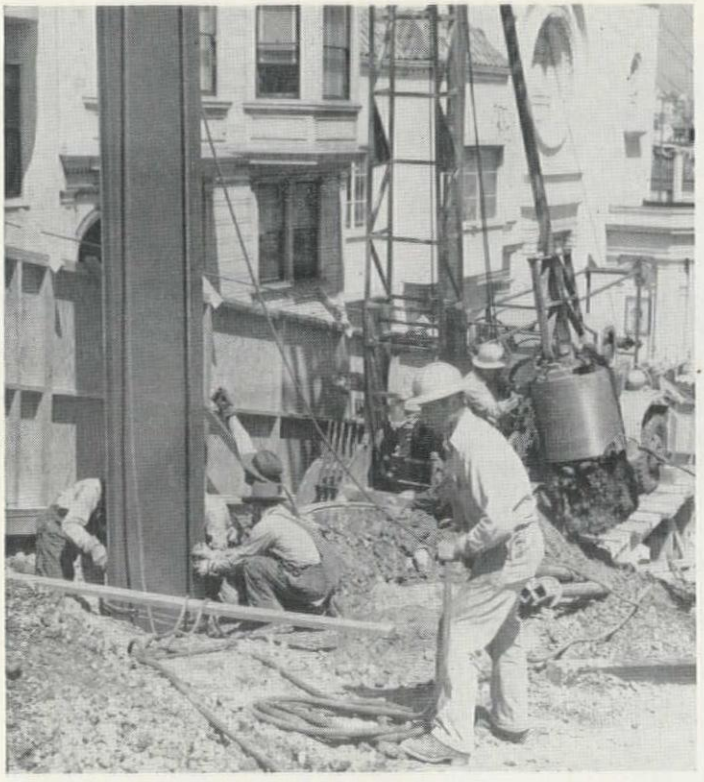
During a portion of the construction period it has been necessary to suspend operation of the historic old cable cars on Mason and Hyde St. These have been temporarily replaced by buses, but it is expected that when the bridges at Hyde and Mason Sts. have been constructed service will be resumed.

PICTURED AT TOP OF PAGE—

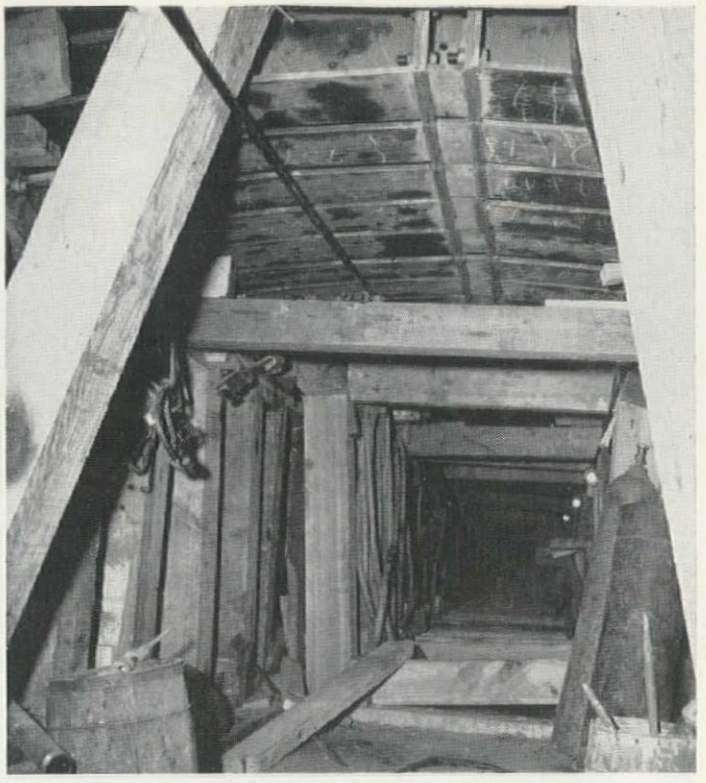
EXCAVATION for the east approach and ventilating building. Soldier beams around excavation are to 65-ft. depth. Spaces between beams were filled solidly with wooden lagging as excavation progressed.

An 85-year history

The conception of a tunnel under Russian Hill is not a new one. City records show that as far back as 1865 proposals for construction of such a tunnel were presented to the city council. In 1876, proponents of a tunnel in this location again tried to secure enough support for the construction of such a project. A great deal of opposition was encountered, however. One of the principal ob-



SETTING soldier beams at the east approach. Rig in background is drilling holes for the beams a number of feet below final sub-grade.



TOP HEADING at east approach with arch ribs in position. Excessive settlement necessitated pouring concrete footings from drifts.

jections was that it would be a menace to health, as people entering a dark, damp tunnel from the open air would be subject to colds. It was also suggested at this time that an open cut be made through the crest of the hill. Nothing definite was done about the project, however, until the voters approved its construction and a bond issue in 1946.

Planning and problems

Plans for the project were prepared by the city engineer's office under the direction of Ralph G. Wadsworth, city engineer, and Sherman P. Duckel, director of public works. Ole Singstad, world authority on tunnels and consulting engineer of New York, was retained by the city on a consulting basis to advise on the basic design. The contract for the construction of the project was awarded February 8, 1950, to Morrison-Knudsen Company, Inc., on a bid of $5,253,552. The official starting time was May 1, 1950, and the scheduled completion date is April 30, 1952. Morrison-Knudsen Company assigned T. Y. Johnson of the M-K Los Angeles district as project manager to have general supervision of the entire project.

In order to secure sufficient right-of-way for the portals to the tunnel, it was necessary for the city to buy 40 parcels of land, all occupied by buildings ranging from single dwellings to 12-unit apartment buildings. Some of these have been moved back to clear the right-of-way, others have been moved to other locations and a great many of the older buildings have been demolished.

Constructing a tunnel in the heart of a city presents problems such as are not encountered in the ordinary course of tunnel driving. In constructing tunnels in the mountains and in the wide open spaces, relations with the public are practically non-existent and the danger of damage to surrounding property is also negligible. Such is not the case, however, in constructing a tunnel through a highly-developed portion of a metropolitan area. Here, the general public becomes a major factor in controlling the work and methods used in construction. It can be readily seen how a project of this kind, with its unavoidable accompanying noises, relocation of sidewalks, streets, and utilities, and the accompanying dust and dirt could easily upset the well ordered and routine lives of the residents in the locality. The necessity of protecting houses, apartments, and other buildings from settlement damage is also apparent. These factors made it necessary to make a complete analysis of all the property and buildings in the vicinity of the tunnel for the protection of the public, the city, and the contractor.

Area survey

An area survey was made under the direction of the writer, in which 12 engineers and architects were employed, and every room in every building and every foundation and retaining wall were minutely examined in order to determine their present condition and their ability to withstand such shocks as might occur due to blasting. These surveyors worked in pairs, each pair being assigned to a different block. In each case they requested the owner of the property or the owner's representative to accompany them while making the survey. The owner was then requested to sign the report, together with the survey team. In cases where there were already rather serious defects occurring in the buildings, photographs were taken which were appended to the written report.

Property owners cooperate

The degree of cooperation given to the contractor by the property owners has been remarkably high. It has been the contractor's experience on other projects that owners were continuously trying to take advantage of the contractor to secure repairs to their property which in a great many cases had been needed before the project was even conceived. Thus far, the contractor has encountered nothing of this nature in dealings with the residents of Russian Hill. The chief difficulty encountered in the survey was due to the fact that a great many residents of this area are Chinese, and many do not speak English. This problem was solved by employing several young Chinese engineers and assigning them to the various teams working in the area.

The contractor thus had a documentary record of the existing condition of all buildings in the area before work commenced. In driving a tunnel and working in the type ground so far encountered, the contractor has realized that some settlement is to be expected regardless of any precautions which may be taken to prevent it. This being the case, the record of the survey will enable the contractor to determine the extent to which various properties have been damaged since construction began. This will also greatly assist anyone in making a fair settlement to the owners. In order to study and control the size of the charges to be used in blasting, a seismograph was purchased and read-

ings are always taken when blasting is in progress.

Before the actual construction of the tunnel and approaches, a great deal of preliminary work was made necessary by the relocation of sewers, water lines, electric services, and telephone lines. With the exception of sewer work, which was done by Morrison-Knudsen forces, the various utility companies performed their own relocations. The work on the project commenced with the excavation for the East Ventilating Building and the East Approach. This was accompanied simultaneously by the drilling of holes for a series of soldier beams extending completely around the excavation east of the tunnel portals. These holes were drilled to a depth up to 65 ft., extending a number of feet below final sub-grade. Soldier beams, the largest being 36-in. WF, 230 lb. per ft., were then placed in these holes and concrete poured to a point below final subgrade. These beams were then connected by whalers, struts and diagonals, and the spaces between the beams were filled solidly with wooden lagging as the excavation progressed. This network of beams and struts was designed to support an ultimate load considerably greater than that for which the walls of the permanent structures of the tunnel were designed.

In view of the contractor's later experience, this was a fortunate precaution. In order to determine the actual loading of the steel in place, electronic strain gages were placed on the struts and diagonals. On a few exceptionally hot days the strain gage readings were extremely high, due to the expansion of the steel. In order to prevent a recurrence of this high strain, the entire steel network was painted with aluminum paint, and in some cases covered with aluminum foil. The struts were covered with burlap which was kept wet, either by spraying or by seepage garden hoses placed on the web.

Hill really old fill

The contractor had assumed from the pre-bid information furnished by the city that the material comprising the hill from Mason to Taylor St. was original ground. As excavation progressed, it was discovered that work was continuing in an old fill, up to a depth of some 35 ft. Old bottles, timbers, shoes, cooking pots, bullets, and numerous other articles were discovered down at these depths. Later, the contractor managed to secure a picture of Russian Hill showing that in 1856, all of the portion of Broadway covering the East Approach and the East Tunnel Portal was a draw or ravine which at some later date had been filled. This fill material was also permeated with streams and water arising either from natural springs, leaky water lines or broken sewers. These conditions caused far greater pressures than had been anticipated to be placed upon the supporting steel network. Because of these increased pressures, the city redesigned portions of the retaining walls and ventilating buildings in order to sustain greater stresses.

It was the contractor's original intention to drive the tunnels by the top heading method, placing wall plates and arch tunnel ribs in position, and then excavating the remaining core with an electrified Northwest 6 shovel which has had both the boom and dipper stick shortened. The excavated material would have been removed from the tunnel by means of 10-cu. yd. end-dump Euclid trucks, equipped with "scrubbers" to prevent the exhaust gases from entering and polluting the tunnel. The geological report indicated that a stratum of Franciscan sandstone would be first encountered, followed by a hard blue sandstone which would be self-supporting.

Settlement changes plans

The unit bids for driving the tunnel had been based on two types of tunnel. The "A"-type section would be used in that portion of the tunnel where the ground was not considered to be self-supporting, and the lining of this section would consist of 3 ft. of concrete and a curved invert of concrete 3 ft., 6 in. thick. The "B"-type section of tunnel was to have been used in rock sections where the ground would be considered self-supporting, or nearly so, and only 2 ft. of concrete would be used, without invert, as a tunnel lining. According to the plans prepared by the city, it was anticipated that less than 100 ft. at the East Portal would be "A"-type tunnel. After driving the top heading and wall plate drifts, and placing the steel ribs, the contractor found that there was too much settlement in the tunnel. It appeared that the entire hill was showing settlement all the way from the tunnel portals to Taylor St., a distance of 200 ft. This settlement, while very gradual, continued for several weeks. In view of this fact, it became necessary to pour a concrete footing on which to set the tunnel ribs. The contractor proceeded to drive 2-ft. drifts in the North Bore, one extending about 210 ft. into the hill. Curb forms were then placed, and foot blocks and curbs poured in one pour using a Rex Pumpcrete machine.

Thus far in the longest drift, the formation is composed of an extremely fragmented soft sandstone, interspersed with lenses of slick clay. Very little blasting has been done to date. Most of the material has been removed with pneumatic spades and picks, Joy HL20 mucking machines being used to load the excavated material into the mine cars. Most of the material excavated thus far has been hauled to Islais Creek fill site, a distance of 5½ mi. across the city. If the character of the material changes as the drifts progress, so that the rock will break to a minimum of 6 in. and be reasonably free from dirt, then much closer dumping sites can be secured. Ingersoll-Rand jackleg drills have been adopted for drilling. These are mounted on two 3-deck jumbos carried on trucks which were designed and built in the contractor's Southgate, Calif., shops. In order to reduce concussion to a minimum, milli-second delay blasting caps will be used.

Present plans

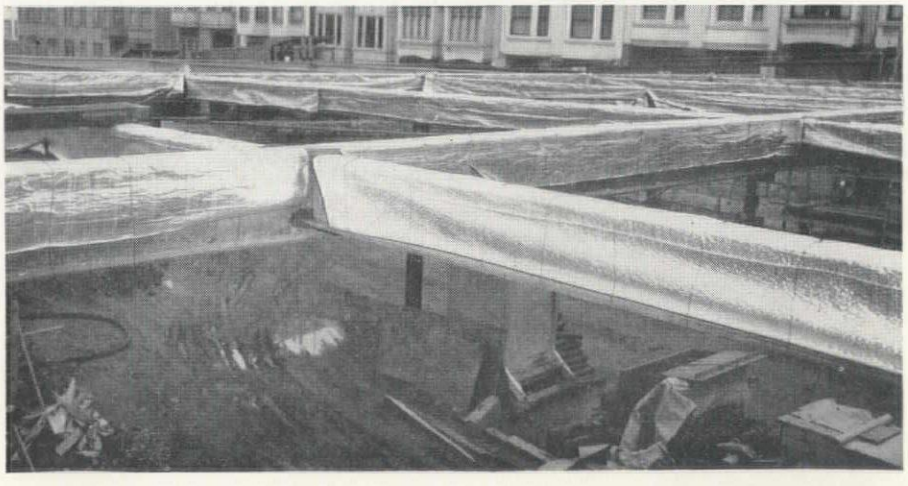
It is planned at present to place the concrete lining near the portals before removing the center core. Air supply for the tunnel is delivered by a battery of three model XLE Ingersoll-Rand compressors, delivering a total of 2,550 cfm. A 6-in. air line has been laid the entire length of the project to deliver air to the West Portal. It was planned to drive the major part of the tunnels from the east end, although now that it is considered necessary to open up only a short length of tunnel before concreting, it will probably be necessary to do some driving from the West Portal in order to keep up with the proposed schedule.

Personnel

For the San Francisco Department of Public Works, Sherman P. Duckel is director, and Ralph G. Wadsworth is city engineer. Resident engineer in the field is George Partridge.

For Morrison-Knudsen Co., Inc., T. Y. Johnson is project manager; Harry Kirmond is assistant project manager; L. B. Wheeler is project engineer; John Erdle is office engineer; Dan Butler is office manager; Carl Larson is tunnel superintendent; Axel Hallberg is building superintendent, east side; Ken Gooding is building superintendent, west side, and Paul Benner is master mechanic.

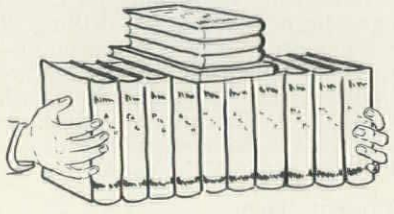
ALUMINUM PAINT, aluminum foil and wet burlap are being used to prevent high temperatures from causing strains in the steel network at the east approach.



THE *A B C* OF PRESTRESSED CONCRETE

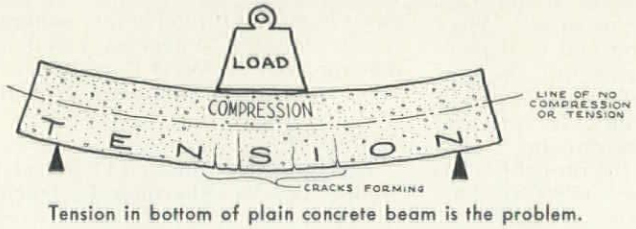
BASED on the engineering fact that concrete is strong in compression, but weak in tension, designers have worked for years to improve methods for using this basic material in a most economical manner, considering: (1) the cost of labor and (2) the cost of materials.

A simple beam provides a quick illustration of the problems involved. To support a load—even its own weight—this simple engineering member must sustain forces of compression along its upper surface and corresponding forces of tension along the lower edge. Cast in plain concrete such a simple beam would be weak and limited to the tension which could be sustained by the concrete in the lower section of the beam. However, by using steel bars to take care of this tension, engineers design concrete beams and girders to combine the properties of concrete and steel in an economical method.



A simple analogy—squeezed together, a "beam" of books can support a load.

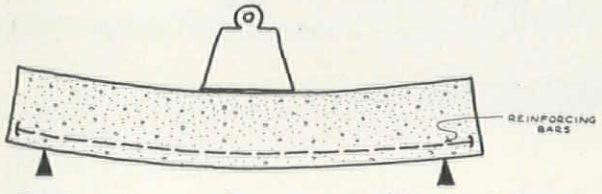
Considering the problem further, it was obvious that the reinforcing steel merely embedded in the concrete does not exert any initial force on the concrete to help



Tension in bottom of plain concrete beam is the problem.

resist the applied load and resulting tendency for cracking along the bottom of the beam. Since the steel is not being stretched, it is not able to "go to work" as fast in resisting any tension resulting from the load. To use a simple illustration, a weight placed on an unstretched rubber band will cause more sag that a similar weight placed on one which has been stretched tight. Any stretching of the steel will tend to open up small cracks, which is undesirable even though not directly affecting the strength of the beam. Further, this situation is an uneconomical design since it brings a small proportion of the concrete (lower part of the beam) up to the point of overload before the rest of the concrete is up to anywhere near working strength.

For years, engineers recognized the fact that if steel of proper strength could be inserted in the concrete and then given an initial load (stretched) the result would

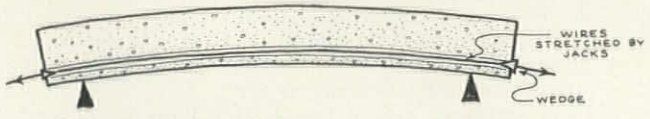


Reinforced beam combines properties of steel and concrete.

place the concrete in compression before it had received any dead or live load. Theoretically, if the steel could be pulled just the right amount, and clamped, it would compress the concrete with a force equal to the effect of the load, which would bring the concrete back to "no load."

The action of stretching the steel and applying this force to compress the concrete is called prestressing. This procedure allows a more economical use of both materials, but involves new principles of design, new techniques in the field, a greater amount of labor on the job.

This same basic principle was being used in the design and construction of cylindrical tanks for storing water and other liquids. When these tanks were cast in plain concrete the pressure of liquid on the inside would tend to pull apart the concrete wall, producing cracks, leakage and potential failure. Engineers recognized the possibility of putting tension of hoops around this concrete and subjecting it to compression to balance the load imposed by the water when the tank was filled. An original design to meet this problem was developed by William S. Hewett about 1921, and many concrete tanks were built with steel bands around the outside which were pulled tight by turnbuckles. The size, number and tightness of these bands were determined by the pressure of water to be sustained. More recently, the Preload Corporation extended this idea by developing a method for wrapping the concrete wall with steel wire which was applied under stress. The net result was the same—placing the concrete under compressive load before it was called upon to sus-

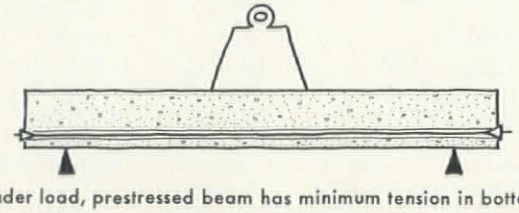


In prestressing, stretched wires compress bottom concrete.

tain the inside force. Tanks of this design are being built in the West by The Preload Pacific Corp., San Francisco.

In general, two methods have been developed for "prestressing" a simple concrete beam:

1. Steel wires (about 0.2-in. diam.) are placed in the proper position in the lower section of the form and held under tension while the concrete is poured. After the concrete has taken final set, the pull on the wires is released, and this force is transferred to the concrete by the bond between the wires and the concrete. The process puts compression in the concrete. This procedure was first developed by a German engineer, and is called the Hoyer process of prestressing.
2. Pipes or tubes are inserted in the form—with or without wires already in place—and the concrete poured, leaving longitudinal holes at the locations where the wire-reinforcing is required. After the concrete has set and the form stripped, these wires are stretched to proper tension by hydraulic jacks and wedges applied at the ends of the pipe. This places compression on the concrete and introduces the prestress.



Under load, prestressed beam has minimum tension in bottom.

During the past several years, a Belgian engineer (G. Magnel) and a French engineer (M. Freyssinet) have led the technical studies in developing the theory of prestressed concrete, and its field applications.

The first time this method was applied to a bridge structure in the United States was in the design and construction of a bridge for the City of Philadelphia. The project has been under way during the past year and watched with interest by engineers and contractors throughout the country.

Now, a Western bridge has been designed using the principle of prestressed concrete, and *Western Construction* presents a description of the structure and its design features in the following article.

California Division of Highways Building the West's—

First Bridge of Prestressed Concrete

Pedestrian bridge in Los Angeles, with single span of 110 ft., considered ideal structure for experimental use of method—Design data to be obtained by careful measurement of stresses and deflections—Many details of construction materials and procedures left to discretion of contractor

By
LEONARD C. HOLLISTER
Engineer of Design
Bridge Department
California Division
of Highways

BRIDGE DESIGNERS of the California Division of Highways have been watching with interest the recent developments being made in prestressed concrete design. There have been many useful and economical applications made of prestressed concrete in other fields of construction and it is felt that there may be many useful places for it in highway bridge construction as well.

What are the advantages?

The advocates of prestressed concrete design claim several advantages over standard reinforced concrete designs. For instance many feel that under favorable conditions a prestressed design could be made to show economy over a standard reinforced concrete design.

We do know that a prestressed concrete design can be made to show considerable economy of materials such as concrete and especially reinforcing steel. In normal times this saving of materials might not be of particular significance unless it could also be translated into a saving in dollars. However, there was a period not long ago, during the last world war, when a saving in reinforcing steel was a definite advantage in itself, and of course, we cannot tell when that condition may again return.

We also know that a prestressed concrete girder design can be made with a much smaller depth to span length ratio. In the design of our many freeway structures we often find ourselves very limited for head room. Therefore a prestressed concrete design with its reduction in headroom requirements could in many cases be a useful facility to have at the disposal of the bridge engineer.

In addition to this the architect often feels that he could make our concrete freeway structures more attractive if he had more slender and graceful members to deal with. It is possible therefore, that a prestressed concrete design could be made to show a considerable advantage in this field.

In the southern area of California where the state highways cross deserts at many points there are hundreds of timber bridges which some day soon must be replaced. These structures are located in remote areas and in climates that make construction very difficult.

It is entirely possible that prestressed precast concrete members will make an excellent solution to this problem. These members could be precast in an area close to labor and materials. Being light in sections they could easily be transported to the site and erected with the minimum of men and equipment.

These then are some of the possible advantages of prestressed concrete design that we hope to investigate.

Avoiding dictatorial specs

While the theory of prestressed concrete design is quite simple and fairly well established it is not easy to jump in and start designing and constructing bridge structures so radically different from standards that have been developed over the past 20 years.

In the first place the two principal methods of prestressing are patented and it was our desire to prepare the plans and special provisions so as not to eliminate any of the accepted methods of prestressing concrete girders.

It was, therefore, necessary to make considerable investigation before adequate plans and special provisions could be prepared that would not dictate any particular type or method and yet would be specific enough to maintain a sufficiently firm control over materials and construction to insure a first class structure when completed.

Since both design and construction experience had to be developed, it was felt that the first few jobs would be considered experimental and should be on not too large a scale.

Arroyo Seco pedestrian bridge

The pedestrian bridge across the Arroyo Seco in the Los Angeles area appeared to be an ideal structure with which to start our prestressed concrete experience. It is a small structure with a fairly long single span carrying moderate live loads not subject to extreme overloads and located in an accessible area for experimental work.

The Arroyo Seco pedestrian bridge has a span of 110 ft. between supports, is simply supported, and provides for an 8-ft. clear sidewalk, with a live load of 55 lb. per sq. ft.

The final section of this structure as designed is shown on page 68.

In preparing the design and special provisions for this job it was our thought that it should be left open to any of the accepted methods of prestressing available to the construction industry. Accordingly we secured as much information as possible from the Pacific Bridge Company, which is interested in the Mangel or Belgian method of prestressing, and with the Raymond Concrete Pile Co., which is interested in the Freyssinet method.

The plans, therefore, did not show specific details as to size, number or strength of wires, wire enclosures, distribution and anchorage plates or jacking details. The special provisions made the following requirements.

Working stresses

The unit working stresses used were conservative, being 1,700 psi. for concrete testing 5,000 psi. at 28 days, and for the prestressing wires 0.6 of the ultimate tensile strength with a minimum ultimate strength of 200,000 psi. In this case wires with an ultimate strength of 200,000 psi. would be worked at 120,000 psi.

To allow for shrinkage in the concrete, and creep in both the steel and concrete this 120,000 psi. will gradually be reduced by approximately 15%, or $0.85 \times 120{,}000 = 102{,}000$ psi.

Prestressing wires

As with the ultimate strength requirements for the wire the special provisions are open as to exact size of wire that might be used stating only that the wire must have a diameter of not less than 0.100 in. and not more than 0.300 in., and comply with ASTM oil-tempered steel spring wire Designation A 229-41 or wire with equal or better physical characteristics.

Distribution plates and anchorage

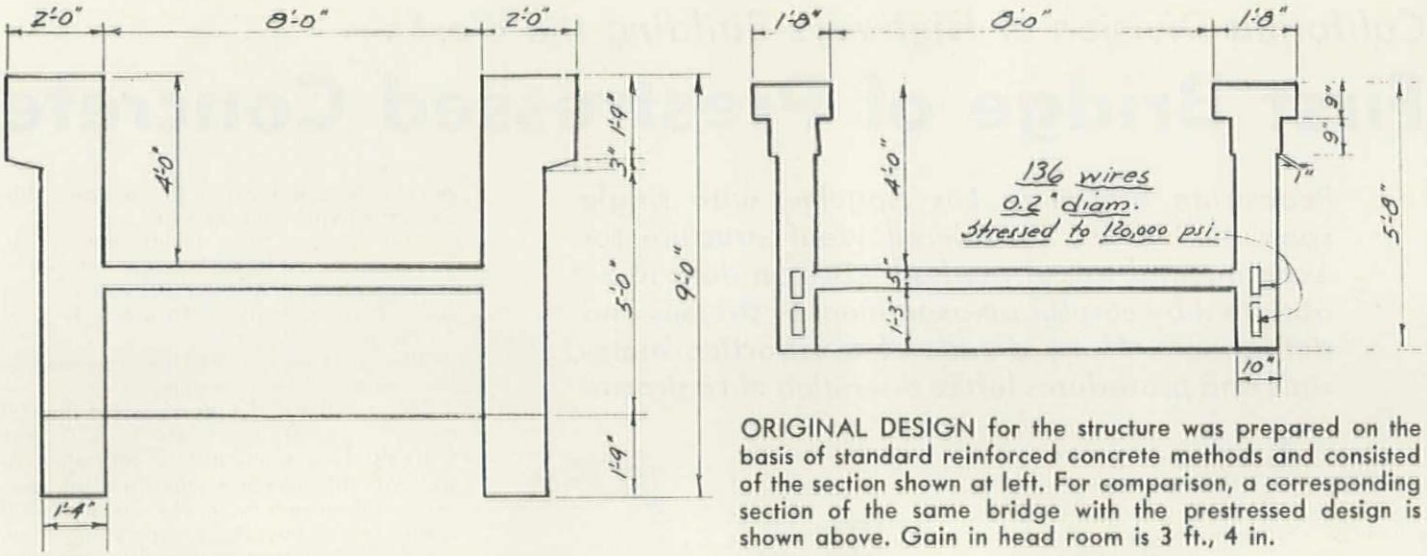
Details for distribution plates and anchorage devices were not detailed on the plans. These were left to the contractor with the following provisions.

All wires are to be secured to the ends of the girders by means of approved anchoring devices which will be of such nature that they will not kink, neck-down or otherwise damage the wire.

Anchorage devices shall hold the wire without creep or slip of more than ⅛ in. at a load of 150% of the working stress.

Distribution plates consisting of welded steel or cast steel bearing assemblies for the support and distribution of the load from the anchorage de-

NOTE: The prestressed concrete design for the Arroyo Seco pedestrian bridge was previously discussed by Mr. Hollister before the annual convention of the Structural Engineers Association of California at Coronado, Calif., October 12-14.—Editor.



ORIGINAL DESIGN for the structure was prepared on the basis of standard reinforced concrete methods and consisted of the section shown at left. For comparison, a corresponding section of the same bridge with the prestressed design is shown above. Gain in head room is 3 ft., 4 in.

vices shall be provided. They shall meet the following requirements:

1. Bearing stress on concrete not to exceed 3,000 psi.
2. Maximum bending stress in plates 20,000 psi.
3. Bearing pressure to be distributed evenly from wires to concrete girders.

Prestressing

Immediately after placing wires the ends of wire enclosures are to be sealed to prevent moisture from entering. After concrete is poured and in place for 28 days seals are to be removed and wires stressed by hydraulic jacks. Jacks are to be actuated by means of a hydraulic pump. Jacks are to have pressure gages to permit computing stress in steel wires at any time.

Wires are to be stressed to 110% of working stress and held for 2 minutes, then lowered to 106% of working stress and anchored. Wires can be stressed individually or in pairs as would be done by the Mangel method or in groups of 12 as by the Freyssinet method.

Cost comparison with standard design

Since one of our main objectives in the use of prestressed concrete is eventual economy it is fair that we should compare this first prestressed job with a standard reinforced concrete design for the same location.

The original design for this structure was prepared on the basis of standard reinforced concrete methods and consisted of section with proportions as shown in the drawing above.

For comparison the typical section of the prestressed design is shown alongside.

A comparison of quantities between the two sections is:

	Standard	Prestressed
Concrete	88 cu. yd.	50 cu. yd.
Reinforcing steel	40,000 lb.	7,000 lb.

This indicates a savings of 38 cu. yd. of concrete and 33,000 lb. of reinforcing steel.

Assuming that the amount of falsework and forms would be approximately the same for either design, the savings would be the cost of furnishing and placing 38 cu. yd. of concrete. At $20.00 per cu. yd., this would be

$$38 \times 20 = \$760.00$$

The savings in reinforcing steel would be $33{,}000 \times 11 = \$3{,}630$.

The total of these two items is $4,390 against which must be charged the cost of the prestressing wire and the prestressing operations.

For this work the contractor has bid $5,000.

Actually for a true cost comparison consideration should have been given to the fact that the standard design would have required somewhat larger abutments, and larger ramps.

Thus it can be seen that for our first prestressed job we have not effected much economy, if any. This was as anticipated, however, on the first job. Ultimate economy we feel will come as greater facility for both design and construction is developed. This can be done only by experience and we feel that now is the time to gain that experience.

A tabulation of the four bids received accompanies this article. Walter Kaucher of Los Angeles was low bidder and he proposes to have the Prestressed Concrete Corp. of Kansas City, Mo., do the prestressing.

Field measurements of concrete stresses

Since this structure is to be considered as an experiment from which not only the Division of Highways but also the construction industry of the West can gain valuable information for possible application on future jobs, tests are to be made.

The Division of Highways has made arrangements with the Institute of Traffic and Transportation Engineering at the University of California to make certain tests.

From these tests it is hoped to determine:

1. Stress distribution in the concrete during prestressing and immediately after.
2. Loss of prestressing in concrete.
3. Stress distribution in concrete due to design live load and double design live load.
4. Deflections.

Twelve Carlson gages are to be embedded in the two girders in the north half of the span. Three gages will be placed at the CL section and 3 at the ¼-point section.

One of the advantages of prestressed concrete is the resulting low unit stress for diagonal tension because of the concrete being held in compression. The calculated maximum unit stress for diagonal tension was 12 psi. It was therefore necessary to use only a nominal amount of shear reinforcing. U-stirrups of ½-in. diameter at 18-in. centers were used, except at the ends where concentration of prestressing forces

From This Month's Unit Bid Summary

Prestressed Concrete Pedestrian Bridge in Los Angeles

California—Los Angeles County—State. Walter Kaucher, Los Angeles, with a bid of $23,770, was low before the California Division of Highways for constructing a prestressed concrete girder pedestrian bridge over Arroyo Seco Channel near Avenue 58 in Arroyo Seco Park, Los Angeles County, Calif. Unit bids were as follows:

(1) Walter Kaucher $23,770
(2) J. E. Haddock, Ltd. 24,810
(3) McClain Construction Co., Inc. $42,280
(4) Concrete Const. Service, Inc. 46,811

	(1)	(2)	(3)	(4)
5 cu. yd., removing concrete	20.00	10.00	10.00	23.00
300 cu. yd. structure excavation	4.00	5.00	5.00	9.87
110 cu. yd. class "A" P.C.C. (structure)	65.00	60.00	107.00	74.00
50 cu. yd. class "E" P.C.C. (girders)	120.00	112.00	185.00	182.00
170 lin. ft. concrete railing	10.00	10.00	13.00	37.00
8 cu. yd. class "A" P.C.C. (curb and sidewalk)	50.00	40.00	45.00	58.00
17,000 lb. bar reinforcing steel	.11	.12	.12	.24
1,000 lb. miscellaneous iron and steel	.35	.50	.50	1.15
Lump sum, prestressing and reinforcement (girders)	$5,000	$6,500	$14,600	$14,511

was high and in this area ¾-in. stirrups were used.

Computations for deflections indicate that the girders will deflect about 0.8 in. from their poured-in-place position under dead load. A live load of 55 lb. per sq. ft. will produce a deflection of about 0.58 in.

After completion of the structure it is planned to take readings on the Carlson gages and measure deflections periodically until no appreciable change in stress or deflection is noted.

Method of prestressing

During the preparation of these plans much helpful information was received from Pacific Bridge Co. of San Francisco, The Preload Enterprises Inc. of N. Y., the Raymond Concrete Pile Co., and The John A. Roebling's Sons Co.

The Pacific Bridge Co. has the rights to the Mangel prestressing process on the West Coast, and the Raymond Concrete Pile Co. has the rights to the Freyssinet prestressing methods in the United States.

Information from the contractor is to the effect that he does not propose to use either the Mangel or the Freyssinet method, but proposes to prestress the girders by a method which has been patented by the Prestressed Concrete Corp. of Kansas City.

It consists chiefly of threading five wires through a stressing block which is a steel block with a 4- by 1-in. face and 3½ in. deep. After the wires are threaded through drilled holes in these stressing blocks ⅝-in. washers are placed and a button head is formed on the end of each wire with a high pressure hydraulic press. The Prestressed Concrete Corp. assures us that these fastenings will meet specifications without creep or slip of more than ⅛ in. at 150% of design load.

The wires are then placed in metal sheaths and erected accurately in place in the girder forms before pouring any concrete.

After the concrete girders have been poured and before concrete has reached its full 28-day strength of 5,000 psi., a small initial tension is placed on the wires.

After concrete has reached its full strength of 5,000 psi., the jacking operations will commence by jacking, one at a time, the stressing blocks, each of which will stretch five ¼-in. wires with a hydraulic jack. In order to induce a stress of 120,000 psi. in the wires which are approximately 110 ft. long it will be necessary to jack them 5.3 in. for a modulus of elasticity of 30,000,000. However, the jacks are to have accurate gages for measuring the force exerted. To stretch five ¼-in. wires the required amount the jacks need not have a capacity larger than 20 tons. After all wires have been prestressed to the required amount, the wires will be pressure grouted through 1-in. holes in the large steel jacking blocks which are approximately 20 in. long by 6½ in. wide and 3 in. deep.

Girders to be prefabricated

We also understand from the contractor, Walter Kaucher, that he proposes to prefabricate each of the girders to one side and lift them into place. Each girder will weigh approximately 50 tons. This method of erection will save the cost of falsework and permit construction of the girders during the winter months at a time when the flood control district will not permit falsework in the Arroyo Seco channel.

Thus the contractor proposes to make use of one of the advantages of prestressed concrete; that is, that it requires a smaller section with a considerable reduction in weight. The standard concrete design would have required waiting until next spring for falsework in the channel or lifting girders weighing 88 tons, rather than 50 tons, into place.

Will Winter Put the "Freeze" on Your Equipment?

WITH Old Man Winter just around the corner in some places and really here in others, it's high time to get your equipment in tip-top condition for snow and zero weather. Battling snow, ice and frozen ground isn't easy, but it can be made easier if your equipment is ready for winter work.

Follow these suggestions to get ready to meet cold weather.

Cooling system

Perhaps the most important step in cold weather is to keep the cooling system of your earthmoving equipment ready for freezing weather. Check the radiator for leaks, making sure that all the hoses and gaskets are in good condition, and that all connections are tight. Use a good grade of antifreeze—preferably a permanent, ethylene glycol antifreeze solution because it has a boiling point higher than 185 deg. F. Test the solution periodically to make sure it is strong enough for protection against prevailing temperatures.

Winter lubrication

Change crankcase, transmission and final drive case oil to the correct winter grade. An oil that is too heavy in cold weather will cause such a drag on the starting motor that the engine will not start, even though the battery is in good condition. Manufacturers' operators manuals give the details of where and when to lubricate. If you don't already have the information, write the manufacturer of the machine concerned for it. Most lubrication charts can be obtained for little or no cost. In requesting manuals or charts be sure to give the make and serial number of the machine for which you want the information.

Fuel

Last summer's fuel may be a little heavy for winter operation, so be sure the pour point is low enough to permit it to flow freely under prevailing operating temperatures. For cold weather operating, lighter fuels such as No. 1 Diesel have a lower pour point. Your own oil man will be able to fix you up with the correct grade of oil. After you get the proper fuel, be sure to keep it clean.

Check batteries

In extreme cold weather, there is danger of batteries freezing if the specific gravity of the solution is low. Batteries with a specific gravity of 1.225 will freeze at —35 deg. F. Make sure there is charge enough to withstand freezing weather. Check the water level often, but do not add water to batteries at the end of the day's work as the water added at that time will freeze overnight. Add the water during the day when the water will have a chance to mix with the solution in the battery. A good battery will mean quicker starting.

Overnight parking

A good point to keep in mind is parking your equipment. Many equipment owners, when they have to park their equipment for any length of time, follow the practice of parking their equipment on planks. If that is not practical for you to do, at least make sure that the dozer blade and scraper bowl are resting on blocks or planks when parked in cold weather areas. By doing this, you make sure that the dozer blade or scraper bowl won't be frozen down if allowed to rest for a considerable time on the ground itself.

In addition, be sure to clean off your dozer blade and your scraper bowl and blade. If dirt is left on, it might freeze on so hard you'll have to thaw it out before you can do any work. It's a good practice to spray a thin film of oil in the scraper bowl and on the dozer blade. This will be added protection to keep dirt from freezing.

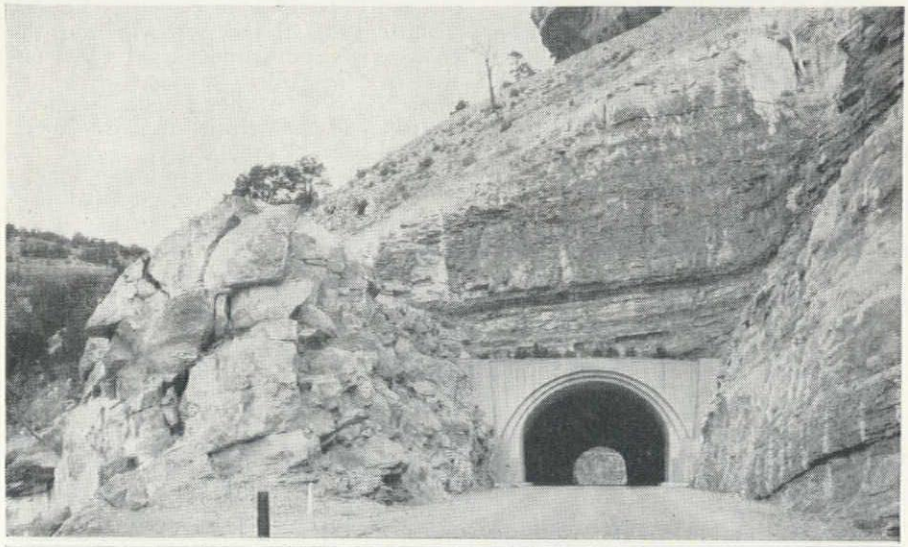
Be sure to keep all these points in mind. You'll find that by following them, cold weather operation will be made much easier.

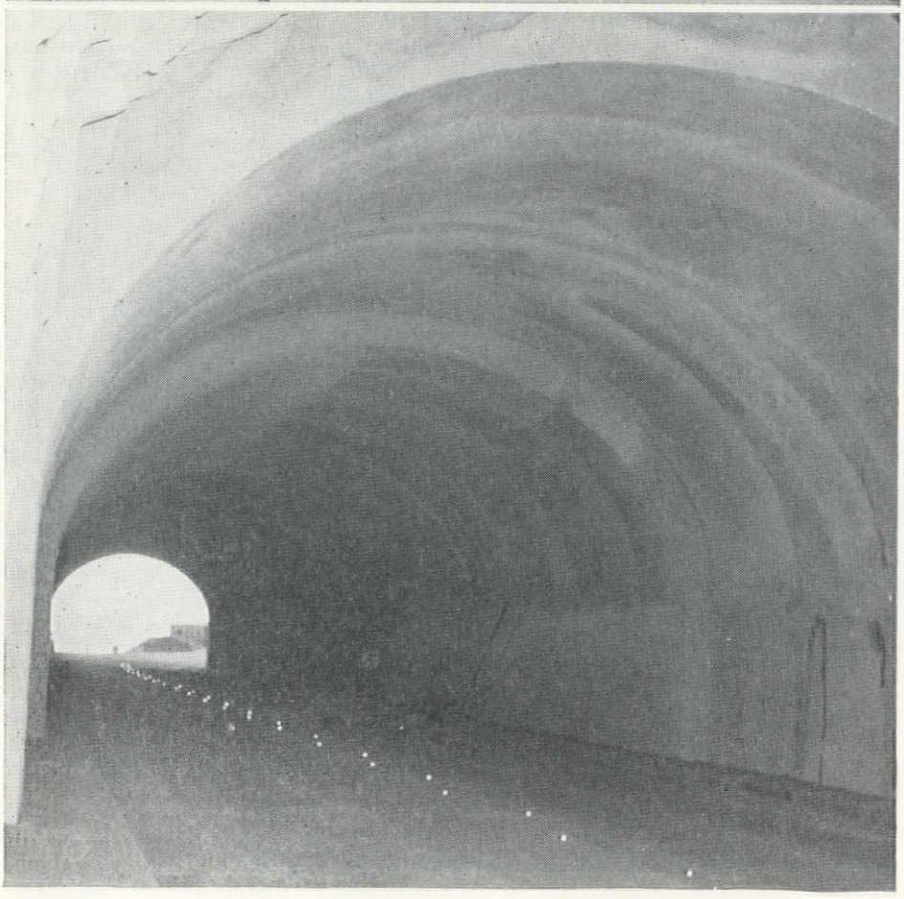
These tips and the accompanying cartoon were prepared by the Service Department of R. G. LeTourneau, Inc.

On the Alamogordo-Cloudcroft Highway—

New Mexico's First Vehicular Tunnel

500-ft. tunnel required to preserve alignment through rough terrain for new highway replacing narrow and steep route—Tunnel lined with both reinforced concrete and gunite





TOP—View of west portal. Jutting limestone ridge obstructed optimum alignment.

BOTTOM—Interior view. Final ⅜-in. gunite coating covers initial reinforced concrete and gunite lining. Photographer's flash bulb lit up center line reflectors.

RECONSTRUCTION of the Alamogordo-Cloudcroft Forest Highway Route 35 in New Mexico is progressing at an accelerated rate to compensate for the abandonment of a branch line of the Southern Pacific Railroad. A 16.9-mi. section of New Mexico State Highway 83 provides a modern highway connection from Cloudcroft, located on the crest of the Sacramento Mountains, with U. S. Highway 70 just north of Alamogordo. To accomplish this, the U. S. Bureau of Public Roads has expended $1,864,000 for contract construction of the easterly 13.5 mi. since 1946. In addition, a contiguous 3.4-mi. section has been completed through the bituminous surfacing stage by the New Mexico State Highway Department as a Federal-aid Secondary project.

Alignment considerations

The new highway saves 5.5 mi. of distance between Alamogordo and Cloudcroft over the routing afforded by the old highway. The old highway, circuitous in alignment, narrow and steep, was functionally obsolete for the traffic load even prior to abandonment of the rail line in 1947. Cloudcroft is the center of a vast recreational and logging area in the Sacramento Mountains. The improvment of the highway was essential to serve the heavy recreational, logging and commercial traffic demand.

The easterly 13.5 mi. constructed by the U. S. Bureau of Public Roads traverses exceptionally rough terrain. At an intermediate point where the route traverses a secondary rim within Fresnal Canyon, it was necessary to construct a 500-ft. vehicular tunnel through a limestone ridge to preserve alignment. The construction of this tunnel was of unusual interest in that it is the only vehicular tunnel in New Mexico. Details attending the construction, as taken from the final construction reports prepared by Bureau of Public Roads engineers A. O. Stinson and T. A. Smith, follow:

The tunnel was excavated by the contracting firm of Henry Thygesen and Co. and Frank P. Llewellyn, Albuquerque, bidding as partners. Tom Taylor was the superintendent in charge of tunnel work for the contractor, and A. O. Stinson was the project engineer for the Bureau of Public Roads.

After the tunnel was excavated, temporary arch timber supports were installed and the tunnel was opened to traffic for a year and a half before permanent lining, paving and portals were provided. This latter work was accomplished as two separate projects. The contractor for these projects was Henry Thygesen and Co. His superintendent was C. W. Holford, and T. A. Smith was project engineer for the Bureau of Public Roads.

The tunnel section was designed to

provide a 26-ft. finished roadway between curbs and a 14-ft. minimum vertical clearance after lining and paving. Narrow sidewalks were provided along both curbs. To afford this, the excavation required 30-ft. width. The tunnel length from portal to portal is 520 ft. Prior to excavating the main bore, a pioneer bore 6 by 7 ft. was driven along the centerline of the proposed tunnel at the crest of the arch.

Excavating pioneer bore

In prosecuting this work the contractor organized his forces on the basis of three 8-hr. shifts of six men each using two 3½-in. drifters mounted on a small drill standard. Thirty-five to forty holes, 4 to 6 ft. deep, were drilled for each round and loaded with about 75 lb. of 40% stick dynamite. Average advance per round in the pioneer bore was 4.5 ft.

Removal of excavated material was accomplished by a small mucking machine loading into ½-cu. yd. steel cars running on a narrow gauge track. Loaded cars rolled downgrade by gravity to the dump; empty cars were pulled upgrade to the mucker by a compressed air winch. Timbering was necessary for an intermediate 48-ft. section in the pioneer bore where fissured material was encountered. Conventional square-set timbering, using untreated native Douglas fir, was used. Work on the pioneer bore began February 28, 1947 and was completed April 18, 1947.

After completion of the pioneer bore an inspection was made by Bureau of Public Roads engineers of the rock structures encountered. On the basis of this inspection, 358 ft. of the tunnel was designated for excavation to accommodate lining. The remainder of the bore to a point 4 ft. from the east portal was designated for excavation to the neat tunnel section. Further inspections after construction permitted a reduction in the length of the tunnel that was ultimately lined.

Completing the excavation

Excavation of the main bore was accomplished with the aid of a twin-deck drill jumbo. Six 3½-in. drifters were used, two at each level. Two 500-cu. ft. compressors supplied the air. Eighty to one hundred holes were drilled per shift, using 9- to 15-ft. steel. The longer steel was used in the more solid rock which did not require timbering. Holes were loaded with 40% stick dynamite with no springing or stemming. Shooting was accomplished with delay caps, using ten stages of delay shooting consecutively from the pioneer bore. Approximately 3 lb. of powder per cubic yard of excavation was required.

The drilling shift, working from 4 p. m. until midnight, erected the timbering, drilled, loaded and shot the face. The mucking shift, working from 8 a. m. until 3 p. m., loaded out the muck, using a ¾-cu. yd. power shovel with a short boom and five dump trucks. At 3 p. m. the engineer marked grade and line for the next round of drilling and a small crew laid the track for the jumbo. Excavation of the main bore began on May 21 and progressed with an average advance of nine feet per day until completion on July 25, 1947. A total of 12,000 cu. yd. of tunnel excavation was required.

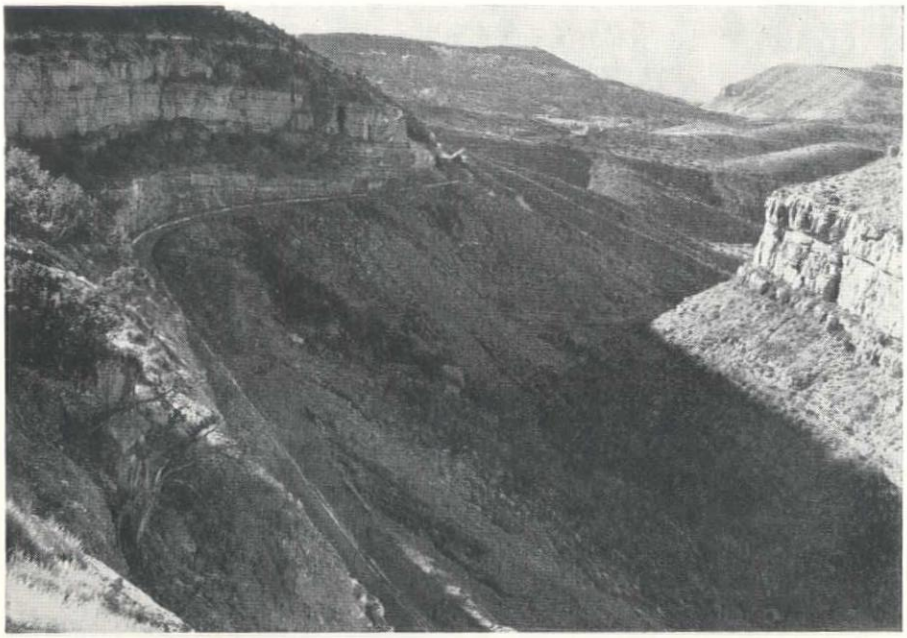
Lining and paving

The lining and paving operations began March 21, 1949. Timber arch lining forms were fabricated in Alamogordo and hauled to the site by truck. Initial plans called for 25 ft. of reinforced concrete lining at the east portal, 30 ft. at the west portal and approximately 100 ft. at intermediate sections within the tunnel. During construction, however, it became necessary to line an additional 100 ft. of tunnel due to unstable rock conditions encountered.

The completed tunnel has a reinforced concrete lining for approximately 50% of its length, with two reinforced concrete portals. All sections of the tunnel which were not lined by reinforced concrete were provided with a pneumatically applied mortar (gunite) coat approximating 1½-in depth.

Lining operations progressed upgrade from the west portal to the east portal. An intermediate 100-ft. section, which required special treatment due to the unstable rock conditions, was the last section to receive the reinforced concrete lining in the tunnel. In this section the temporary timber arch sets were left in place and incorporated within the concrete lining. Footings were excavated to solid rock on both sides of the timber supports and the walls poured to spring line before setting the arch forms. The arch was poured in 12-ft. sections with each section being bulkheaded off and completely filled with concrete supplied by pumpcrete machine. Drains were placed in back of the lining to carry water which might seep down through the fractured rock strata. After completion of the reinforced concrete lining and all paving, all tunnel interior walls were given a final gunite coat ⅜ in. thick, using white cement to improve visibility within the tunnel and ease the transition between the tunnel and the daylight. This operation was completed on November 15, 1949. The gunite operations were subcontracted and performed by C. N. Hanes Construction Co., Denver, Colo.

All tunnel work was accomplished without accident. In one instance a cave-in occurred during lining operations and six men were entrapped by the shattered form lining for a short period of time, but were extricated without injury. The safety record for the tunnel work is a tribute to the superintendents who were in charge of construction activities.



FROM ABOVE the tunnel's west portal, a bird's-eye view of a portion of the Alamogordo-Cloudcroft highway. Rough terrain is typical of south-central New Mexico.

INSPECTING the completed tunnel. Left to right—Henry Thygesen, contractor of Albuquerque; T. B. White, district engineer, and C. G. Grosvenor, construction engineer, both of the New Mexico Highway Department, and W. J. Keller, district engineer, Bureau of Public Roads.

Field Tips for Handling and Placing of

Experience provides the answers to such day-to-day problems on a "lightweight" job as—

—How to control water in the mix
—What methods keep the mix workable
—How to handle and deliver batches
—What precautions avoid stiffening
—How to get along with the inspector

By
PAUL A. ELSNER
Chief Engineer
Lindgren & Swinerton, Inc.
San Francisco, Calif.

ALTHOUGH the advantage of lightweight aggregate in the reduction of dead loads is generally recognized, perhaps there is no place in the country where its advantages are greater than on the West Coast where earthquake protection must be provided for structures.

Like any other material just beginning to come into general use, the problems which arise in putting lightweight concrete to use in major structures are no longer problems after they have been met, recognized and mastered. Accordingly, the following information is presented not in criticism of the material but in the hope that our experiences among the pioneers in its structural use will help eliminate some of the conditions which have contributed to the difficulty and cost of handling and placing "lightweight" in its first major uses.

Transporting aggregates

The fact that sources of supply are not yet as thoroughly developed or as wide-spread for lightweight as for rock concrete is of course a contributing factor to the cost of using the material. This necessitates careful attention to arrangements for long distance transportation of aggregates and careful scheduling and expediting to see that ample supplies are readily available for use to prevent delays in pouring.

Perhaps the most persistent day-to-day problem is the control of water in the concrete. The very nature of the material, with its many air cells, makes this control difficult under the many various conditions of temperature, time lapses for evaporation and absorption, and re-handling of the material which takes place from stockpile to final position in the forms. To trace these operations briefly on a typical job, the aggregate is stockpiled, pre-saturated, drained of excess moisture, batched, mixed, transported, dumped into a skip, hoisted, discharged into a hopper, loaded into buggies, wheeled to position on the deck, poured, shoveled into place and vibrated. During the course of this dozen or so operations, we have found that serious changes take place in the amount of free water in the mix, and consequently in the difficulty of handling the concrete. Perhaps the best way to illustrate is to follow the procedure from stockpiling to placement and describe some of the conditions we have encountered.

How to control water content

In order to prevent the mixing water from being immediately absorbed by the aggregate, some method of pre-saturation is essential. In locations such as Los Angeles and San Francisco, where suppliers have set up separate facilities for handling lightweight aggregate, the metal bins equipped with sprinklers adequately take care of pre-saturation of the material. In locations away from such permanent and adequately equipped sources, however, pre-saturation represents a very real problem. The problems of pre-saturation in these areas are presented in the following remarks. Coarse aggregates and medium aggregate are not too difficult to saturate adequately, and provision must simply be made to soak the aggregate thoroughly and then to allow it to drain for approximately 8 hours before using.

The matter of saturating the lightweight sand, however, has not proven so simple. We have had as much as a 20-gal. variation in water content in successive 5-cu. yd. batches, which we have traced primarily to lack of uniform saturation of the sand. To control this condition and to obtain reasonably uniform saturation of the sand, we first attempted to puddle each square yard of the surface of sand, stockpiled about 3 ft. deep. We found that even this procedure left some dry pockets and we finally found it necessary to insert a hose into the stockpile for a period of 15 to 30 seconds in each square foot of the pile. After such treatment, the sand is allowed to drain for about 8 hours before using, and a careful visual inspection is maintained to see that sand fed to the batching plant does not appear too dry.

Sand left in the bunkers shows a tendency to lose moisture more rapidly against the sides of the bunker than in the middle. This condition has caused considerable variation in the free water which must be added, especially during long or fast pours when the sand supply is drawn low in the bunkers.

Lightweight aggregates will not absorb their maximum moisture unless completely inundated. For instance a Rocklite sand which will absorb 30% moisture completely saturated will absorb a maximum of only 26% in stockpile. This condition causes the concrete first batched into a mixer to have about a 3-in. greater slump than the same concrete at the end of five minutes mixing. As previously stated, these conditions apply only where permanent well equipped mixing plants are not available.

Handling problems

In our early experiences we found that batches caused trouble, and investigation of this condition showed that the early morning sun had heated the standing truck drums sufficiently to affect the moisture content of the first batch. The condition was remedied by simply supplying enough cold water to the drums before introduction of any concrete to reduce the temperature satisfactorily.

Slump tests taken all along the route of delivery, from the batching plant to point of deposit, show a progressive decrease in slump at each point where time elapses or where concrete is transferred from one conveyance or hopper to another, all out of proportion to the decrease in slump of standard rock concrete at the same points. This decrease in slump will average 3½ to 4½ in. for normal operations.

We have found that considerable care must be taken to see that all drums, skips, hoppers and carts used in convey-

ENGINEERS and contractors are probably quite familiar with the subject of lightweight concrete from the standpoint of general information and design. Mr. Elsner has by-passed this phase of the subject and presents instead the thoughts and experiences of those men who are involved in the detailed down-to-earth day-to-day operations necessary where lightweight concrete is used for major building projects. His article therefore represents a valuable accumulation of grass-roots experience in the procurement, handling and placing of this promising structural material. The experience of Lindgren & Swinerton, Inc., has extended to the use of lightweight concretes using the several major types of lightweight aggregate, and has ranged from small jobs to such structures as the 22-story Standard Oil Building Annex in San Francisco (*Western Construction*—August 1950, pg. 61) and the new State Capitol Addition in Sacramento. Mr. Elsner previously discussed the same subject before the annual convention of the Structural Engineers Association of California at Coronado, Calif., October 12-14. —*Editor.*

Lightweight Concrete

ing the concrete are kept at as nearly the temperature of the mix as reasonably possible. These conditions considerably facilitate the handling of the lightweight concrete.

We have found it advisable to dump an entire truck load into a receiving hopper at one time. Our best results have been obtained when the hopper contains not more than 2 cu. yd. More than this quantity tends to cause the mix to adhere to the hopper sides and to clog the opening. The same is true of deck hoppers and carts; any excessive amount or excess time may cause stiffening and clogging of the hoppers. Even in the use of elephant trunks we have several times had to remove the trunks and beat out the lightweight concrete which had stiffened sufficiently to fail to run through. We have run into extreme cases where on lowering a vibrator into an elephant trunk carrying lightweight concrete we have been unable to get the vibrator back out until we removed the concrete bit by bit.

Precautions for placing

After being received at the point of deposit and placed in the forms, care must be taken to see that segregation does not take place. The light aggregate has a tendency to float, and even the action of a vibrator left in a wall form for as long as one minute may cause a serious rock pocket. We have found it necessary to carefully instruct our vibrator operators to keep the vibrators moving rapidly from place to place to prevent formation of pockets.

Unless lightweight concrete is extremely wet, it cannot be moved after a few minutes in the forms. It will not run, even under persuasion of a vibrator, so it is necessary to give special attention to pouring under windows and other similar different locations.

In pouring walls, stairs or beams we have found a relatively wet mix, with a slump of 5½ to 6 in. at point of deposit, vibrated lightly, to be advisable. In slabs, on the contrary, we have found it necessary to pour as stiff a mix as we could handle to prevent the fine aggregate from floating to the surface. On more than one occasion we have had to tamp the mix in order to force the aggregate back down.

This situation is accentuated when it is necessary to finish the surface of the slabs. We have found it very difficult to finish lightweight slabs without first tamping and bull-floating the concrete and then sprinkling on a dry mixture of cement and standard weight sand. We believe that separate topping should be used wherever possible.

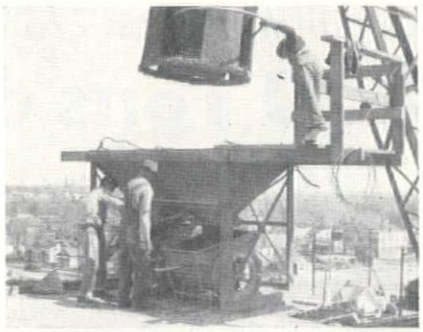
Admix found essential

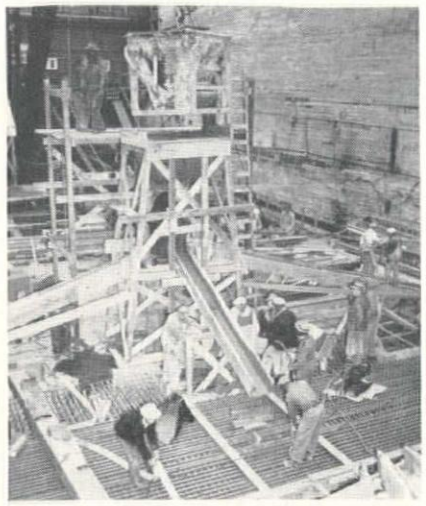
We have found the use of admix to be almost essential in making the lightweight concrete workable enough to pour satisfactorily. Because of the natural quick setting tendency of the mix, we avoid like the plague any admix that seems to accelerate the setting, and much prefer the use of an admix having a retardant action. While we recognize the value of air entraining admixes, we are not over enthusiastic about compounding the difficulties of controlling the concrete by using both lightweight concrete and one of the types of air entraining agents more difficult to control. An air entraining agent which is not difficult to control, on the contrary, aids in handling the lightweight.

One other thing in connection with the use of lightweight concrete which we have occasionally had trouble controlling is the inspector or the designer. We have chipped several loads of hardened concrete out of hoppers and other handling equipment on several occasions before we have been able to convince the designer that his mix contained insufficient water and that the material could not be handled the same as regular concrete.

To summarize and to draw a few brief pointers from our own experience, we hold the following opinions:

1. Lightweight concrete is not easy to handle, and deserves careful attention directed toward easier handling and placement.
2. The pre-saturating, batching and mixing of lightweight, while well taken care of in the major supply centers, is still a problem in locations not normally equipped to handle the material.
3. The free water in the concrete is quickly absorbed into the aggregate, resulting in rapid loss of slump, stiffening, and setting of the concrete.
4. Considerably more water must be used in the mix than in standard weight concrete to make adequate handling possible.
5. The use of an admix is advisable to assure workability.
6. Special care must be taken during placement to avoid rock pockets and to assure satisfactory placing in portions of the forms difficult to reach.
7. Care must be taken not to vibrate the concrete in the forms excessively to prevent segregation.
8. Satisfactory finishing of slabs is difficult, and we have found applied topping advisable.
9. Extremely lightweight concrete is more difficult to handle than concrete containing more natural sand and weighing slightly more. The breaking point seems to us to be somewhere very close to 105 lb.
10. Designers and inspectors, as well as builders, must realize the nature of the material and treat it as what it is, rather than as rock concrete.

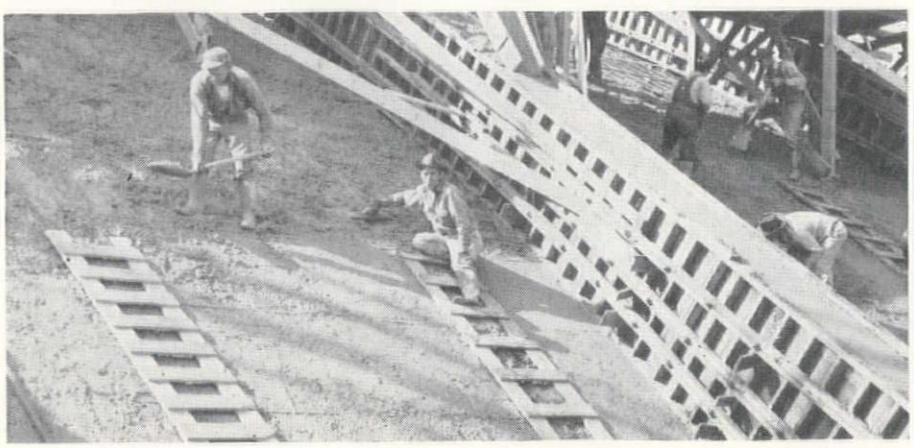




TOP—Tendency of lightweight mix to harden fast makes special handling set-up necessary, such as this intermediate hopper arrangement.

BOTTOM—Slope of chute must be steep enough to handle sluggish mix. This chute is lined with galvanized sheet to reduce sliding friction.

ADAPTABILITY of a stiff mix on slopes makes lightweight concrete valuable under special conditions. But slump and aggregate saturation are difficult to control in the field.



Completing San Francisco's Big Airport Project with—

800 Tons of Asphalt Paving Per Day

GRADING AND PAVING, begun in 1935 and given a spurt during the wartime direction of the Corps of Engineers, is nearing completion at record breaking speed at the San Francisco Municipal Airport. Morrison-Knudsen Co., Inc., Boise, Idaho, is doing the work under a $2,595,000 contract by the San Francisco Public Utilities Commission which states that no less than 2,500 tons compacted rock base and 800 tons surface pavement must be placed each working day.

This unusual clause relating to daily progress requirements in the field is in the contract because of the great quantity of work to be done before the fall moisture appears. A minimum daily achievement is stated for both rock base and pavement, with the understanding that appurtenant work such as grading, prime and seal coating, be done as fast as is required.

Work recently completed was done to bring up to C.A.A. standards two remaining runways, 1R-19L and 10L-28R. Work on runway 28R, the instrument runway, had to be completed in 90 days. It was enlarged from 150 to 200 ft. width, 7,750 to 8,870 ft. in length. It consists of 12-in. crushed rock base and 3-in. pavement, laid at the rate of 756 sq. yd. per calendar day. In this case the prime coat was 0.4 gal. per sq. yd. of MC-1. Although SC-1 gives better penetration, it could not be used because of the speed required during construction.

Sequence of current work

Other work such as miscellaneous paving on warm-up strips, drainage trench, and pipe completes the contract. Drainage has been given careful attention, particularly since the 13-ft. fill is at elev. 14, just a few feet above the high tide level. The largest item for drainage is over 35,000 lin. ft. of grade Los Angeles type extra strength vitrified 6-in. clay pipe, a material built to withstand the crushing stresses from both compaction and live loading. All pipe in the trenches is laid with an open joint on a crushed rock base, so that each drain also serves as a subdrain. Twelve pumps located in four sumps give a total discharge capacity of 148,000 gpm.

A typical runway cross-section shows a 13-ft. fill (placed in 1947) on bay mud, 12 in. of compacted crusher run base, and 3-in. asphaltic concrete pavement. The base is compacted to 97% density, which in this case is 139 of a possible 143 lb. per cu. ft. for solid rock. This high density is due to strict aggregate grading and compacting by a 12-ton 3-wheel roller. The rock is laid in 5¼-in. lifts, and compacted to 4 in. A custom-built spreader box, extra heavy and 11 ft. wide, is pushed by an HD 19 tractor. About 345,000 tons of crusher run base, plus the subsequent pavement on the contract, are being laid by five 8-ton and three 12-ton rollers. The base rock is given a 1-in. minus surface coat, amounting to 475,000 sq. yd., and bladed with a motor grader to a ⅜-in. fine grading tolerance.

The rock is procured at the Macco Corp. Brisbane Rock Co. plant, located 7½ mi. north of the airport. The plant produces aggregates from eight crushers and sand from crusher rolls.

An average of 14 grid roller passes is necessary for 95% compaction. Alternating with the grid roller at the beginning of compaction is a conventional sheepsfoot tamper. The sheepsfoot is specified not only as to unit weight, but as to total number, three, of drums that must be used, each not less than 10 tons. This assures compaction in the center of each pass. The grid roller is a 32,000-lb. Hyster model, with 3½-in. spacing between grids. Following sheepsfoot and grid rolling, a 100-ton rubber tired Porter compactor is run over the fill. The 100-ton compactor is operated primarily to give the fill a load test, and not for further compaction. It is loaded to 66 tons in the field, for the reason that under rough surface conditions, 30 tons, or almost half the load, sometimes is transferred to the outside of the four wheels. Since this roller is operated for a physical test to failure rather than for compactive effort, the maximum unit load on the rubber tires must be kept constant.

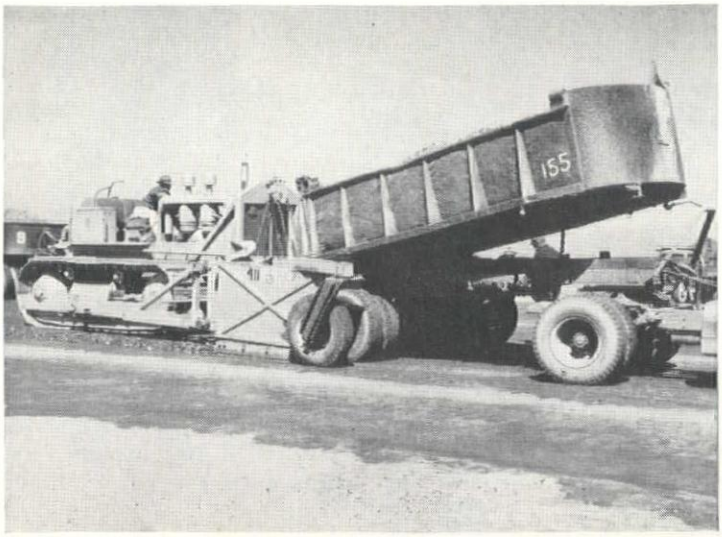
Whenever failure, or indication of

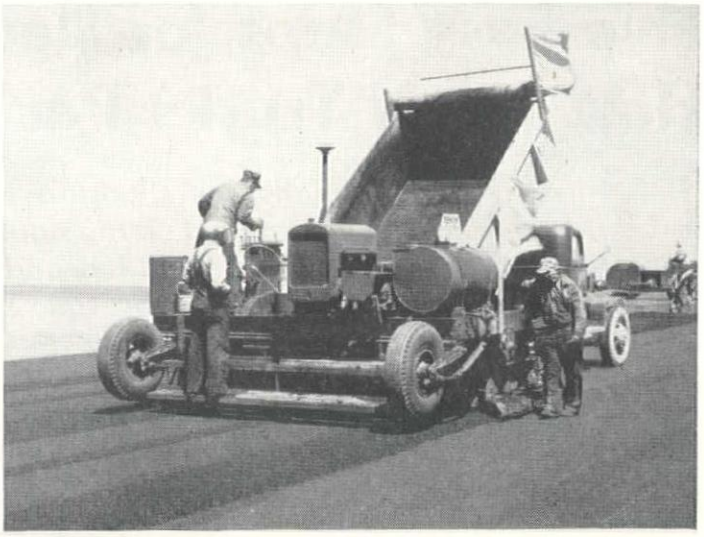
FROM an initial $100,000 investment of San Francisco businessmen in 1927, the San Francisco Municipal Airport has progressed in size, stage by stage, until at the present time it ranks among the six largest in the United States. Four stages of construction have been underway since the initial developments, with their pavements of flexible coat asphalt, asphalt stabilized earth bases and macadam, until at the present time the airport represents an actual and planned investment of $50,000,000, with runway and terminal facilities double that which they were prewar. The topography of San Francisco has forced the city to go 12 mi. south into the next county to establish its airport.

The new terminal to be built under subsequent contract will handle 3,000,000 revenue passengers per year (expected by 1956) with an ultimate capacity assumed at 10,000,000 per year. Traffic in air express, air mail, and air freight as well, is increasing at such a rate that parallel runways, one each for landings and takeoffs, are necessary to accommodate this heavy volume of traffic.

Airport land holdings have been gradually expanded from the original 1,112 ac. in 1927 to the present 3,701 ac., giving San Francisco an airport of roughly 10% of the city's area. The airport today includes reclaimed areas raised by filling, and former swamp and tide lands filled expressly for runway extensions. This has required 19,500,000 cu. yd. of fill material, making the airport one of the largest earthmoving projects in the entire West (*Western Construction*—July 1949, pg. 65). The entire airfield sits over former tidal marsh between 30 and 80 ft. deep, and the material is a soft and compressible silty clay, with an average California bearing ratio of 3.—*Editor.*

FOUR TYPES of compactors used as paving progresses. Left to right—Hyster grid roller alternates with sheepsfoot for compacting fill; Galion "Chief" 3-wheel 12-ton roller compacts crusher run base; Buffalo-Springfield 3-drum tandem gives the hot asphalt course the "breakdown roll," and a 2-wheel Buffalo-Springfield, weighing 8 to 12 tons with water ballast, provides "finish roll."





LEFT—Rock for crusher run base is laid in 5¼-in. lifts from custom-built spreader box.

RIGHT—Adnun paver lays a blanket of hot mix.

future failure, becomes evident under the heavy test load, work is stopped at that point until the cause is found. Reasons uncovered in failures to date have been either unsatisfactory drainage or material. Test core samples are taken on the spot and the faulty material excavated immediately.

The original estimate was for 450 hours on the sheepsfoot roller, and 630 hours on the grid. Because of changes in field practice, the sheepsfoot was used 600 hr., a 33% increase, and the grid roller used 980 hr., an increase of 55%. This is because more compactive effort with grid and sheepsfoot rollers is necessary due to the nature of the fill material, resulting in reduced number of hours on the rubber-tired roller.

Borrow pit material

Over 900,000 tons imported borrow is being supplied from the nearby Millbrae pit, one of the largest open pit borrow sites in the world, for the fill on the new runway (*Western Construction*—April 1947, pg. 73). The compaction specified is 95%, measured by the AASHO T-99-38 Proctor test, modified. In this test, laboratory compaction is achieved with a 10-lb. hammer, instead of 5.5 lb., through an 18-in. drop instead of 12 in., and using five equal layers instead of three, to determine 100% density rating.

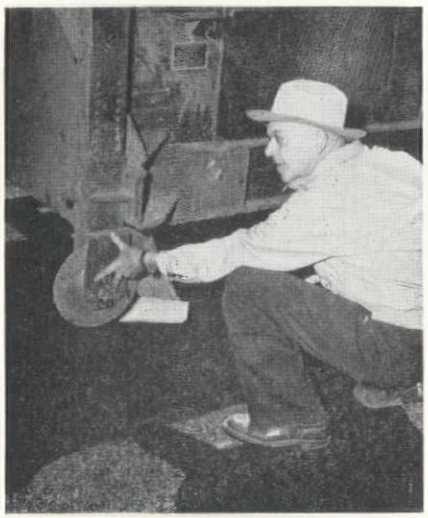
When earthwork began during the war, the soils laboratory was in nearby Berkeley, in connection with the University of California. At that time, all possible borrow pits were well selected and explored, and samples were taken as deep as 150 ft. from possible sites. At Millbrae, the California bearing ratio tests show the material to be halfway between a rating of 20, the minimum specified, and 40.

Personnel

A. O. Olsen is Chief Engineer and Manager of the San Francisco Public Utilities Commission. Construction is under the direction of H. E. Lloyd, Construction Engineer, and G. D. Burr, Design Engineer. J. E. Parks is Resident Engineer.

O. H. Tucker is Project Manager for Morrison-Knudsen Co., Inc. Superintendents include A. J. "Buck" Hope; Joseph H. Miller, paving; and F. F. Smith, pipe. Completion is scheduled for Fall, 1950, on the entire contract.

WHEEL CUTTER of 12-in. diameter was rigged by contractor on side of the "finish roll" compactor to cut and trim pavement for neat construction joint.



Work on Two Cofferdams for Spillway At Albeni Falls Dam Will Start Soon

CONSTRUCTION of Albeni Falls Dam on the Pend Orielle River, 4 mi. west of Priest River, Idaho, will start about January 1, 1951 according to Lt. Col. John P. Buehler, District Engineer of the Seattle District, Corps of Engineers. Plans and specifications for the first construction contract were issued November 10 and will be opened in December.

This initial contract, estimated to cost between $500,000 and a million dollars, will include the preliminary rock excavation for the spillway dam; necessary clearing, widening, and deepening of the right or north channel which will be used for diversion purposes during construction of the spillway, and construction and unwatering of the cofferdams upstream and downstream from the spillway.

Completion of this work is scheduled for May 1, 1951 to permit immediate construction of the spillway.

The cofferdams will be of rock and earthfill construction, material to be obtained from the excavation. Approximately 180,000 cu. yd. of excavation will be required, most of which will be rock from the island in the channel.

The cofferdams will be placed in three sections. The longest will be located a short distance downstream from the axis of the dam, extending from the south abutment to the north island in mid-channel. The length of this cofferdam will be about 700 ft., and it will be constructed to the 2060-ft. elevation.

Upstream from the axis of the spillway dam another cofferdam will be placed in two sections. One section, about 200 ft. long, will extend from the south abutment out to the rock which forms the south island in the channel. The other section will be approximately 300 ft. long and will block the channel between the south and north islands. The upstream cofferdams will be built to elev. 2065 ft.

All cofferdams are designed to permit construction of the spillway throughout normal spring flood periods in the Pend Orielle River. Only floods of the 1948 and 1894 magnitude would exceed the height of the cofferdams.

The channel where the spillway dam will be located is presently about 80 ft. wide. Removal of part of the rock island in the center of the river channel will provide space for a spillway dam 472 ft. long. Ten vertical-lift type gates 40 ft. wide and 32 ft. high will be mounted between nine eight-foot wide piers and two abutment sections

Five Easy Steps for Deciding How Many Trucks Per Shovel

Hit-and-miss methods for choosing truck and shovel combinations can eat up the small contractor's profits—Here is a simplified and accurate method for determining the best ratio before the job gets under way

By ARTHUR L. ROBERTS
Assistant Professor of Industrial Engineering
Oregon State College
Corvallis, Ore.

HOW MANY TRUCKS? Every contractor using power shovels or similar material handling equipment should ask this question every time a new job is started. Through trial and error, many now arrive at the correct combination, but by then they may be too far behind schedule or have eliminated any chance to make a profit on the job.

Determination of the correct shovel-truck ratio quickly and by more accurate means may result in more profit, better bidding, less time being required for a job and fewer trucks needed.

To illustrate how you may determine the correct shovel-truck ratio for yourself in 5 easy steps, a typical job problem is given.

The "X" Construction Company is to move dirt from point "A" to point "B" a distance of 2.6 mi. This company has one power shovel and five dump trucks. The problem is—how many of these five trucks should be put on this job for best performance both from a cost and from a time standpoint.

Step 1—Study the Equipment

The equipment of the "X" Construction Co. is studied. We find:

1. The shovel, working at point "A" can dig and load a 3-cu. yd. dump truck in 6 min., including the time for the truck to get into position by the shovel.

2. The trucks travel 30 mph. when empty and 20 mph. when loaded.

3. The trucks require approximately 1 min. to dump their load and turn around at point "B."

4. Each truck can haul 3 cu. yd. of dirt when loaded.

Step 2—Determine Costs

The cost to operate the shovel and each truck per hour should be determined. The following costs will be used in our example:

	Shovel	Each Truck
Operating costs per hour*....	$ 8.00	$5.00
Labor (operators) per hour..	2.00	2.00
Total costs per hour.....	$10.00	$7.00

* Includes fuel, insurance, taxes, maintenance, lubrication, depreciation, etc.

Step 3—Analyze the Operation

Analyzing the facts and figures that we have obtained in Steps 1 and 2 we find that traveling loaded 2.6 mi. at 20 mph. plus 1 min. to dump and turn around and returning empty at 30 mph. gives us the truck-shovel charts shown by Figures 1, 2, 3 and 4. These charts show graphically the time relationship of the shovel with different combinations of trucks.

When using only one truck with the shovel, note that the shovel is idle for 14 min., while the truck goes to point "B," dumps and returns. If two trucks are used with the shovel as shown in Fig. 2 then the shovel is idle only 8 min. If three trucks are used as in Fig. 3 the shovel is idle only 2 min., while if 4 trucks are used the shovel is working continuously and each truck is idle for 4 min., or a total of 16 min. idle time as shown by Fig. 4. We will not consider 5 trucks since the shovel is still governing the output on the entire job.

Our problem may now take two different approaches: (1) the time required to move a load of material, or (2) the cost of moving a load of material.

Step 4—The Time Approach

If time is the most important factor, then we find in our example that with one truck we move a load (3 cu. yd.) every 20 min., or 6.7 min. per cu. yd. With two trucks we haul 2 loads every 20 min., containing 6 cu. yd. of material or 3.3 min. per cu. yd. With three trucks, we move 3 loads in 20 min., or 2.2 min. per cu. yd. With 4 trucks we move 4 loads (12 cu. yd.) every 24 min., or 2 min. per cu. yd. Therefore, if we use 4 trucks we will move the material in the shortest possible time. The fifth truck would not reduce the time any further unless a second shovel was put on the job.

Step 5—The Cost Approach

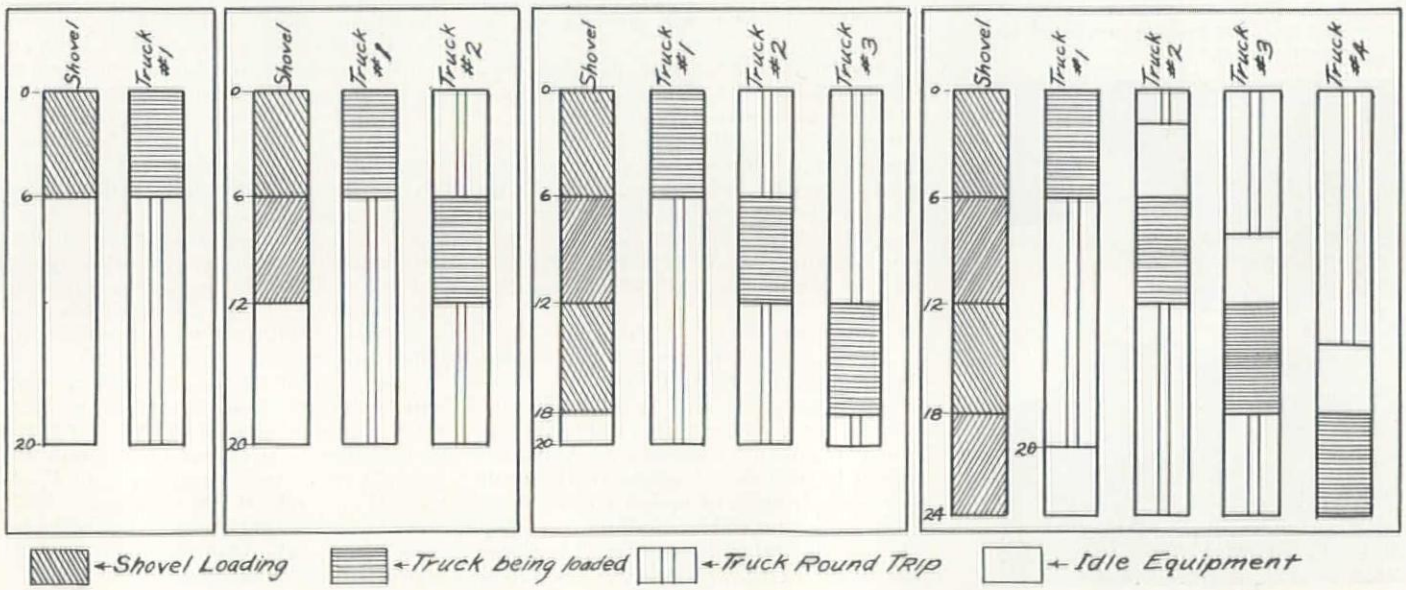
If the cost of moving material from one point to another is more important, which is the usual case, and using the same figures that were used in Step 4 we obtain:

FIG. 1—One truck leaves shovel idle.

FIG. 2—Two trucks still leave idle time.

FIG. 3—Three trucks almost keep shovel busy for full cycle.

FIG. 4—With four trucks, shovel can work continuously but trucks are idle.



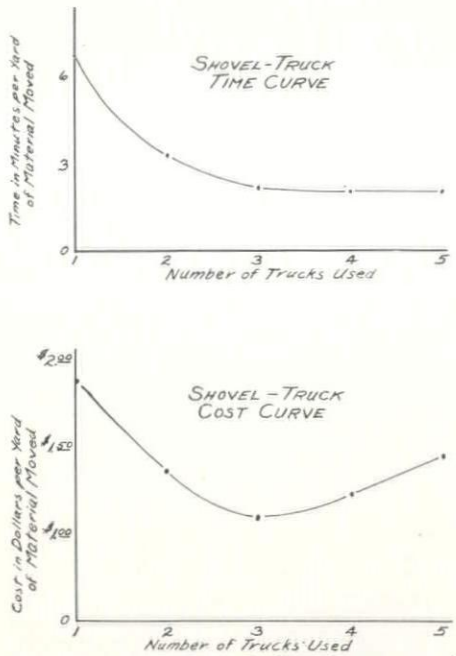


FIG. 5—Typical truck-shovel time and cost curves. Top curve shows that 4 trucks is most desirable in this case for moving most material in a given time, but bottom curve indicates that overall costs would be less using 3 trucks.

Using one truck

Shovel cost = 20 min./60($10.00) = $3.33
Truck cost (1) = 20 min./60($7.00) = $2.33
Total cost = $5.66 per load
$5.66/3 = $1.89 per yard.

Using two trucks

Shovel cost = 20 min./60($10.00) = $3.33
Truck cost (2) = 20 min./60(2)($7.00) = $4.67
Total cost = $8.00 for two loads
$8.00/6 = $1.33 per yard.

Using three trucks

Shovel cost = 20 min./60($10.00) = $3.33
Truck cost (3) = 20 min./60(3)($7.00) = $7.00
Total cost = $10.33 for 3 loads
$10.33/9 = $1.15 per yard.

Using four trucks

Shovel cost = 24 min./60($10.00) = $4.00
Truck cost (4) = 24 min./60(4)($7.00) = $11.20
Total cost = $15.20 for 4 loads
$15.20/12 = $1.27 per yard.

Conclusions

From a time standpoint, 4 trucks is most desirable since with that number the most material will be moved in the shortest possible time, as shown by Figure 5.

From a cost standpoint, three trucks is the most desirable combination since the cost of all idle equipment time is at a minimum. A typical shovel-truck cost curve is shown by Figure 5.

It should be pointed out that these conclusions apply to this particular example only, and may change as costs or times vary for other jobs or other companies. A separate solution will be necessary for each new job.

Grants for Western Airport Projects Scheduled by CAA

THE LIST of airport construction and development programs to be undertaken in the West under the Federal Aid Airport Program during fiscal year 1951 has been announced by D. W. Nyrop, Administrator of Civil Aeronautics. Projects in nine Western States (Oregon and Wyoming had no programs submitted for fiscal year 1951) represent a cost to the federal government of $4,544,692 with local or state sponsors providing an additional $3,912,330.

California is receiving the largest portion of federal aid with $2,112,833, and Arizona is next with $1,020,345. Grants in the other seven Western States are: Colorado, $595,170; Washington, $340,000; Utah, $270,355; New Mexico, $87,151; Nevada, $63,125; Montana, $43,201, and Idaho, $12,512.

The program is based upon funds provided from unexpended balances at the end of fiscal year 1950, and $21,200,000 made available for fiscal year 1951 after a reduction from the original appropriation of $36,700,000 for projects throughout the country.

The program for the nine participating Western States is tabulated below:

Loc. and Name of Airport	Class Pres.	Class Prop.	Federal Funds	Total Funds	Proposed Work
ARIZONA					
Bisbee Douglas Int.	6	6	14,934	24,550	Paving, lighting.
Flagstaff Mun.	3	3	25,184	41,400	Bldgs., paving, misc.
Nogales International	4	4	82,729	136,000	Bldgs., prep. site, paving, misc.
Phoenix, Sky Harbor	5	5	846,754	1,392,000	Bldgs., paving, lighting, misc.
Prescott Mun.	4	5	17,998	29,587	Prep. site, paving.
Tucson Mun. No. 2	5	5	30,313	49,833	Paving, lighting, misc.
Yuma County Mun.	5	5	2,433	4,000	Bldgs., misc.
CALIFORNIA					
Chico Mun.	6	6	6,000	11,082	Paving.
Fresno Air Terminal	6	6	43,312	80,000	Prep. site, paving.
Imperial County	2	3	21,656	40,000	Bldgs., prep. site, paving, misc.
Los Angeles International	5	7	770,091	1,417,012	Prep. site, paving, lighting, misc.
Monterey Peninsula	4	4	32,000	59,106	Prep. site, paving.
Napa County	4	4	20,000	36,941	Prep. site, paving.
Oakland Mun.	5	5	200,000	354,000	Paving, lighting, misc.
Ontario International	5	5	40,828	60,000	Paving, lighting, misc.
Los Angeles, Palmdale	5	5	80,000	226,752	Prep. site, paving, misc.
Sacramento Mun.	5	5	27,000	108,000	Land.
Montgomery Field, San Diego	2	6	10,000	40,000	Land.
Lindbergh Mun., San Diego	8	8	108,280	200,000	Bldgs., paving.
San Francisco Airport	7	7	746,166	1,378,216	Paving, misc.
Sonoma County	4	4	7,500	13,853	Paving, lighting, misc.
COLORADO					
Alamosa Mun.	3	3	5,864	11,000	Prep. site, paving.
Stapleton Airfield, Denver	6	8	589,306	1,107,400	Land, bldgs., prep site, paving, lighting, misc.
IDAHO					
Gooding	3	4	12,512	22,500	Paving.
MONTANA					
Flathead County	3	3	21,412	40,000	Paving.
Sunburst	1	1	21,789	42,197	Land, bldgs., prep. site, paving, misc.
NEVADA					
Davis Dam Airport	0	1	6,250	10,000	Prep. site, misc.
Elko Mun.	4	4	17,500	28,000	Prep. site, paving.
McCarran Field	5	5	30,625	49,000	Paving, misc.
Yerington Mun.	3	2	8,750	17,000	Land, prep. site.
NEW MEXICO					
Lea County Airport	3	3	52,744	80,000	Bldgs., paving, lighting, misc.
Roswell Mun.	4	4	34,407	60,512	Bldgs., prep. site, paving, lighting, misc.
UTAH					
Cedar City Mun.	3	3	6,994	11,250	Paving.
Logan Cache	3	4	44,361	71,355	Prep. site, paving, misc.
Robert H. Hinckley, Ogden	3	3	19,000	30,561	Paving.
Salt Lake Mun. No. 1	5	5	200,000	330,069	Prep. site, paving, misc.
WASHINGTON					
Boeing Field, Seattle	7	7	340,000	843,846	Prep. site, paving, misc.

Where Western Engineering Graduates Are Finding Jobs

MOST of the men who graduated from Western civil engineering schools during the past year now have jobs, and indications are that the expectation of an over-supply of graduate engineers was unduly pessimistic.

Typical of the Western schools is the Washington State College at Pullman. The civil engineering department at WSC graduated 40 men during the past year, all of whom are now placed on jobs. The job distribution is as follows: state highway department, 16; United States Geological Survey, 7; Bureau of Reclamation, 6; municipal engineering departments, 4; Corps of Engineers, 3; graduate work, 2; Bonneville Power Administration, 1; Department of Agriculture, 1. Also typical of the other Western schools is that only nine of the graduates left the state (including 3 to Alaska and 2 to Oregon).

210 Ft. of Corrugated Pipe Jacked Beneath Railroad

A PIPE JACKING job that ties the Pacific Coast record for continuous length—210 ft.—has recently been completed by Stolte-Early-Harrelson, Oakland, Calif., joint-venture contractor. The work was done under unfavorable earth and rock conditions as part of the $4,800,000 contract for sections 5 and 6 of the south interceptor, East Bay Municipal Utility District, Special District No. 1. To carry water, telephone, and power lines underneath eleven tracks, including two main passenger tracks and a main freight line of the Southern Pacific, and the principal interchange track of the Santa Fe Rail traffic, the line was jacked for 210 ft. of the total 250-ft. length. During the entire job no delays or slowdown orders were needed for such well known trains as the Daylight, Cascade, and City of San Francisco.

Grade at sea level

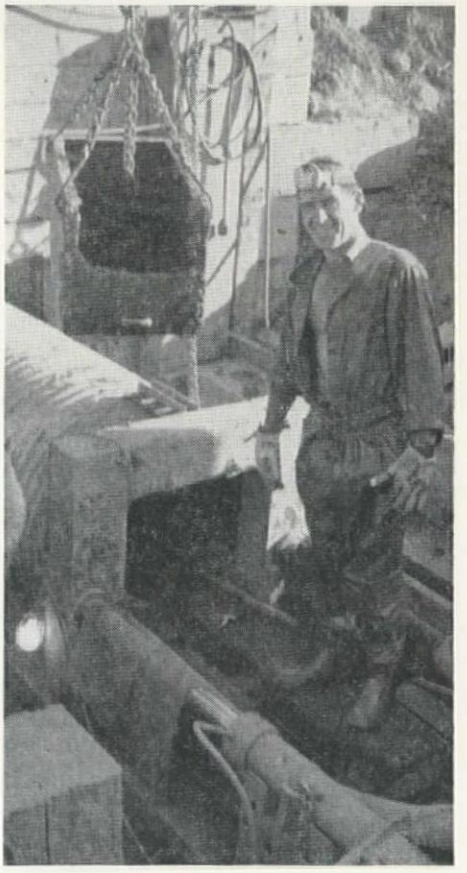
In addition to special jacking problems caused from length alone, the job was also tough because the grade line was practically at sea level, making it difficult to drive the bore through saturated adobe which is plentiful at the site. To complicate the work further, large granite rip-rap was encountered, which had been placed along the Bay side of the original main line by the railway many years previously to protect the roadbed from wave action.

Despite these conditions, overall progress was good, and the average speed was slightly better than three-quarters of a foot per hour of working time. Under similar conditions, one foot of progress per hour of time worked is usually considered satisfactory under normal conditions. At one time, however, the progress was only two feet in two days, totaling six shifts. This occurred when the pipe was being jacked through the granite rip-rap. The procedure at this point consisted of splitting the granite slabs by the pin and feather method. Once the interfering edge of each slab was split into sizes small enough, it was removed as part of the mucking operation.

Hydraulic rams

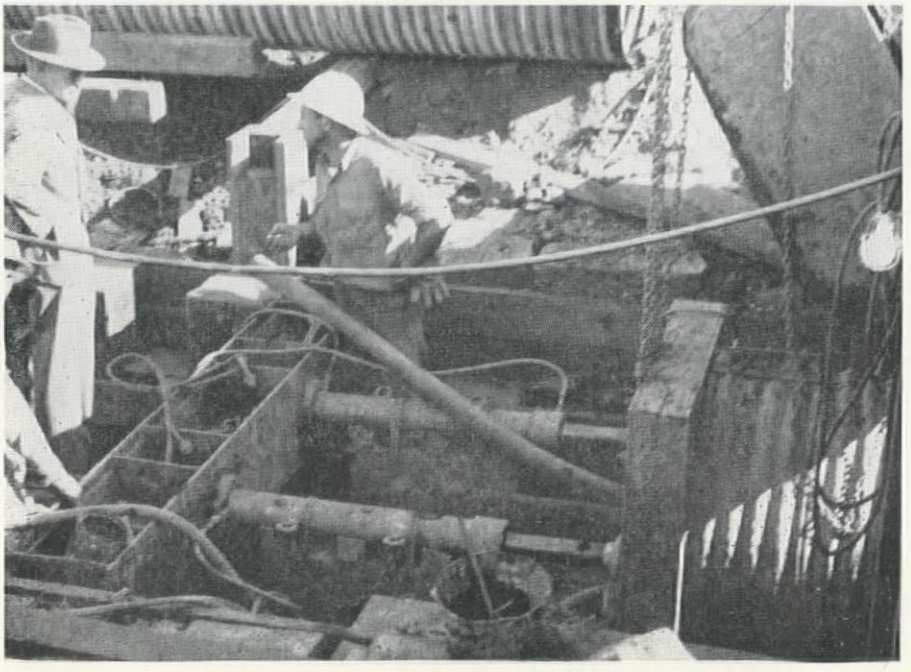
Satisfactory progress under the abnormal conditions was made possible by the contractor's ingenious hydraulic ram setup. Unusually careful preparation went into heavy 16- by 16-in. timber backstops, heavy lining frames, and working pit and jacking collars. A feature of the system is the manner in which two 50-ton Rogers hydraulic jacks are operated. They are supplied with pressure from the oil pump in such a manner that they can be operated together or independently on both the 30-in. power stroke and return. The contractor thus insured "fingertip" control capable of instant change, at the pressure end of the pipe (allowing easy inspection of work during its progress). The jacks were mounted on a heavily reinforced section of steel beam, in turn bucked up by the 16-in. square backstops. The backstops were placed on 4½-ft. centers, but were used also in conjunction with booster blocks 2½ ft. long to make up for the difference in ram travel. The working pit was built just long enough to handle the 20-ft. lengths of pipe. The pipe was worked entirely by hand, without cranes of any kind. It was stockpiled beside the job and handled from a timber frame equipped with hoist and tackle.

The timber frame also handled the ingenious conveyor system for removing muck, dug from the heading by one man working from the head end of the pipe. Once outside the pipe, the muck was handled by an overhead bucket. Both the practical mucking system and the hydraulic jack rigging were primarily responsible for enabling the line to be forced through soft, saturated adobe that would have almost certainly stuck a job of half the length or less, if tried after only the usual preparation.



DIRT BUGGY in background was used to elevate muck from working pit. The working pit was excavated just long enough to handle the 20-ft. lengths of pipe.

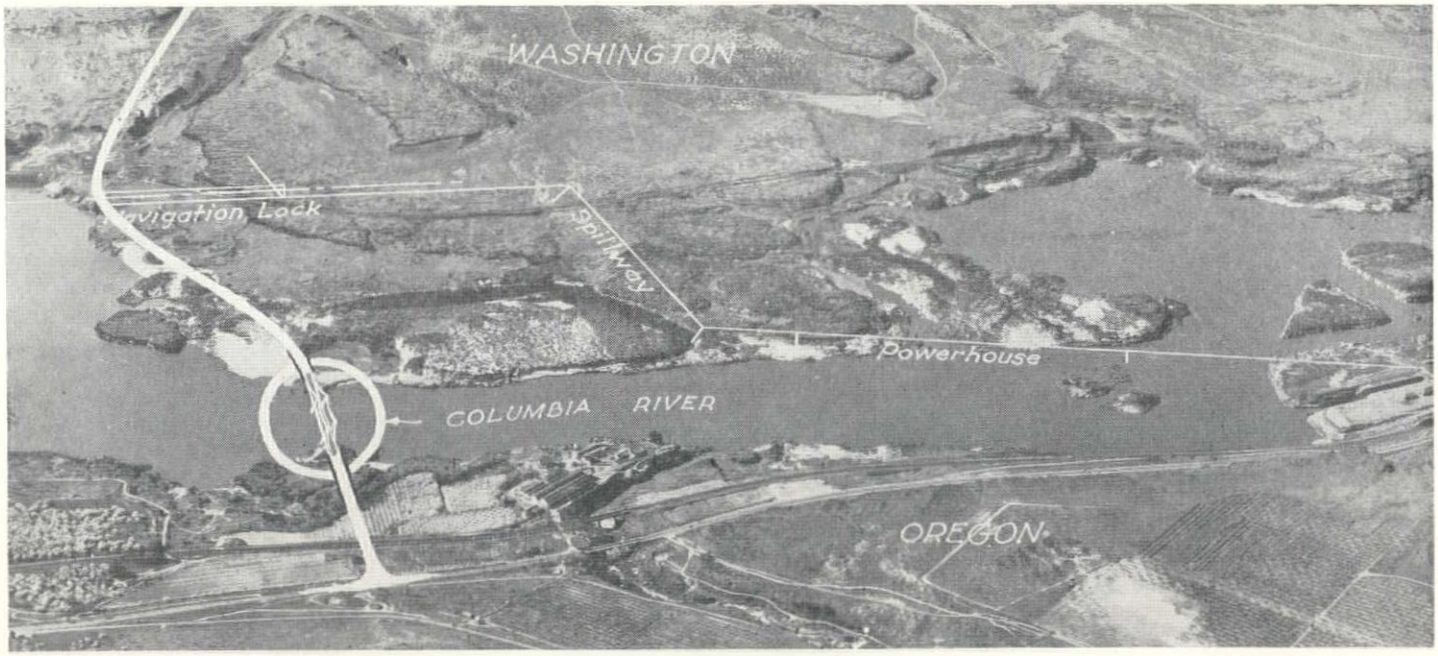
SETUP for one foot of progress per hour. Visible are backstops, movable jacking thrust block, the hydraulic jacks and oil lines leading from jacks to oil pump.



The jacked pipe is 36-in. Armco asbestos-bonded asphalt coated corrugated iron pipe, 10 gage. The joints were made by field riveting. The utilities lines will be put into a concrete cover, poured by hand, since there is not enough room inside the bore to control a pumpcrete line. The concrete will be placed from the sand muck bucket shown in the picture.

Personnel

Fred Weiss is the project engineer for the contractor, and in charge of the field procedure. Otto Bohl is resident engineer for the utility district. The main features of the East Bay Municipal Utility District project were reported in *Western Construction*—June 1950, pg. 59, and April 1949, pg. 72.



Steel Cantilever Bridge to Replace Columbia River Ferry at The Dalles

THE FIFTH BRIDGE to cross the Columbia River between Washington and Oregon has passed the design stage and bids will be opened this month on the proposed structure. Estimated to cost $2,850,000, the new bridge is to be located at The Dalles, Ore., and will serve north-south U. S. Hwy. 97 traffic at the point where it is intersected by the Oregon Trail Hwy. and Hwy. 830 on the Washington side. At the present time, traffic is served by a ferry at the site, one of six now in operation on the river between the two states. The new bridge is to be built by Wasco County, Ore.

The structure is of conventional steel cantilever design, 2,700 ft. long including approaches of plate girder spans, and a clear span 576 ft. long over the river. It will carry two lanes of traffic at H-20 loading. Bids are being called in two parts, piers and highway approaches in one; superstructure steel and light weight concrete decking in the other. Steel construction is scheduled to begin at the north end and continue to the middle of the main span. The balance will be completed by working from the south end. An estimated saving of $100,000 is anticipated by elimination of simultaneous construction from both ends. With liberal contract time, plus additional time allowances based on time lost due to floods, the bridge is expected to be in service about July of 1952.

Ferry purchased

Preliminary interest in the project is focused on the outstanding cooperation between the three agencies of government involved and the details of finance. Preliminary studies of the project were financed by equal loans from both states and Wasco County. Preliminary designs by the Tudor Engineering Co., San Francisco, consultant on the project, were the basis to sell revenue bonds in the amount of $2,850,000, of which the first $450,000 was allotted for the purchase of the ferry at the site, test borings, engineering and other expenses. The city of The Dalles, holder of an option to buy the ferry at $300,000, assigned its option to the sponsoring county, and the ferry has been purchased. The effect of this is to provide adequate funds for complete engineering as well as purchase of the competing ferry. The sale of bonds amounting to one and one-half times the $300,000 purchase price of the ferry is quite unusual, and based strictly upon the high earning capacity of the ferry rather than the total of its physical assets. The current substantial net earnings of the ferry are expected to continue until the bridge is opened, and are being devoted to debt retirement. During study of the project, it was determined that if for any reason the bridge was not built, the ferry would rapidly retire its own debt. Since the ferry has an established record of performance and earnings, it is not considered necessary to borrow funds equal to interest for six months, as is frequently done on a new project.

The bonds are for 25 years and pay 3½% interest. They were discounted to yield about 4%. They are revenue bonds secured solely by tolls to be collected on the ferry until the bridge is opened, and thereafter on the bridge. It is estimated that tolls will be sufficient to retire all bonds within about 13 years. Arrangement has been made so that the bond house, A. C. Allyn and Co., Chicago, may purchase an additional $500,000 in bonds if bids are higher than originally estimated.

PICTURED ABOVE—

LOCATION of the bridge (in circle) and approach routes does not conflict with location of features of The Dalles Dam as planned by Corps of Engineers. City of The Dalles is 3 mi. downstream.

Operating costs

The estimated cost of bridge maintenance is $9,300 per year, and of operation, $40,000 per year. These costs will be paid from revenues. Under existing law, it is possible for Klickitat County in Washington to levy property tax on the Washington State portion of the bridge until 1954. If the Klickitat County tax, $23,500, has to be met, the Oregon Highway Commission has agreed to advance funds to cover the amount, and accept repayment from tolls collected after all bonds are retired.

Highway Planning Studies Described in BPR Report

THE BUREAU of Public Roads has published a 48-page "Bibliography of Highway Planning Reports," which is now for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 30 cents a copy. Interest in highway planning, already widespread, is continually increasing both for practical application and for theoretical research. This bibliography makes available, for the first time, an extensive listing of reports on the subject.

The bibliography comprises a listing of highway planning and related reports issued during the 20-yr. period from 1930 to April 1950. Included are reports of traffic, origin-destination, location, and highway-needs studies prepared by city, county, and State agencies, and by private consultants. The reports range in scope from long-term State-wide studies to location surveys for specific routes and city traffic counts.

CONSTRUCTION DESIGN CHART

By
JAMES R. GRIFFITH
Dean of Engineering
Portland, Ore.
University of Portland

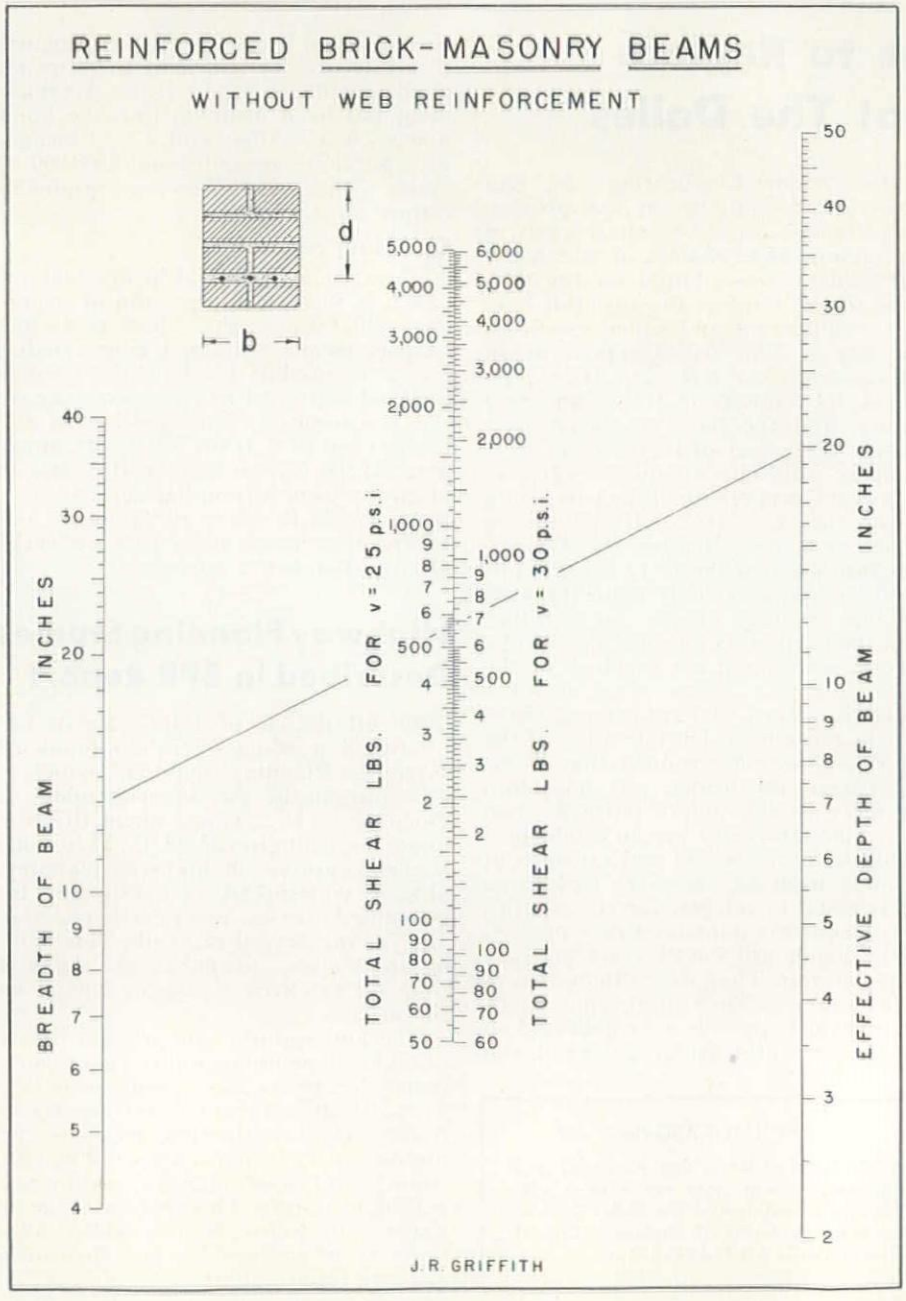
CXXVI...Reinforced Brick-Masonry Beams Without Web Reinforcement

IT IS POSSIBLE to construct a reinforced brick masonry beam in which vertical web reinforcement is specified. In such cases, reinforcement is usually of the "Z" type stirrup. Due to the added labor cost of laying brick around the web reinforcement, I would recommend avoiding its use whenever possible.

The principal economic advantage in reinforced brick masonry beams will be found in its application to structural lintels in brick walls. In such applications there is usually an adequate sectional area so that the use of web reinforcement may be avoided if desired.

The Seattle Building Code requires the presence of an approved city inspector to supervise the construction of the reinforced brick masonry. In order to keep the additional cost of this city inspection to a minimum, the designer should include only the minimum portion of the wall for his beam. Shear will usually be the determining factor which will dictate the minimum section required.

The accompanying chart has been prepared to quickly determine the minimum section of the brick-masonry beam so that no web reinforcement is necessary. Unit shear at both 25 and 30 p.s.i. has been provided for in conformity with the Seattle Building Code allowable values when test prisms are not available. The lower value of unit shear, 25 p.s.i., is for cement-lime-sand mortar. The higher value, 30 p.s.i., is for cement-sand grout.



The chart is solved by a single straight line intersecting all scales. The thickness of the wall will usually be the beam breadth b, and will be pre-determined. The total end shear may be computed, and then the necessary beam section may be determined from the chart. In the June 1950 issue, a chart for balanced tensile reinforcement was presented. Thereon an illustrative problem was solved using values of $b = 13$ in., $d = 20$ in., with cement grout. On the accompanying chart I have drawn a solution line for the same beam section described above. On the scale for the total shear, $v = 30$ p.s.i., it will be noted that an end shear of 680 lb. is indicated as being permissible without web reinforcement.

In reinforced brick-masonry beams, it is customary to figure the unit shear in the same manner as in reinforced concrete beams. Substituting the values from the chart, we would then have

$$\text{Unit shear, } v = \frac{V}{b\,j\,d} = \frac{680}{13 \times \frac{7}{8} \times 20}$$
$$= 29.9 \text{ p.s.i.}$$

which is a reasonable check on the assumed allowable limit.

I have designed the structural elements for a number of store fronts for architects wherein the conventional lintel of structural steel was omitted by placing a few small reinforcing bars in one joint and using lime-cement-sand mortar for a few courses. Invariably the result has been to the economic advantage of the building owner, a factor which should always be the immediate concern of the designer.

STONE & WEBSTER, Incorporated, has formed a Canadian subsidiary, to be known as Stone & Webster Canada Limited. The Canadian company, with present offices at 50 King Street West, Toronto, Ont., has been organized for the purpose of making the services of the whole Stone & Webster organization available to Canadian industry. Alfred T. Krook, previously district manager of the Stone & Webster Engineering Corporation for the Southwestern area, with headquarters in Houston, Tex., has been named president.

NEWS OF WESTERN CONSTRUCTION

DECEMBER 1950

Concrete Lining Complete For Delta-Mendota Canal

MACHINE-PLACED concrete lining operations have been completed for the entire 97-mi. concrete-lined section of the Delta-Mendota Canal in California, principal artery of the Central Valley Project which will transfer water a total distance of 115 mi. between Tracy Pumping Plant and Mendota Pool. The canal proper now reaches as far south as Ora Loma, and only the southerly 18-mi. earth-lined section, on which construction is already well under way, remains to be completed by next July, the target date for initial integrated operation of the Central Valley Project.

Construction of the Delta-Mendota Canal was begun September 6, 1946, at its northern or Tracy end, and since that time more than 32,000,000 cu. yd. of earth have been moved and about 700,000 cu. yd. of concrete has been placed, utilizing 900,000 bbl. of cement. The quantity of earth moved is equivalent in mass to more than three times that of Grand Coulee Dam—world's largest concrete structure—and the quality of concrete placed for the 97-mi. concrete-lined portion of the canal is more than sufficient to build a sidewalk 3 ft. wide and 4 in. thick between San Francisco and New York City.

Automatic Gaging Stations For Bonneville Reservoir

THREE water gage stations, comprising a radio network, will soon be checking the water levels in Bonneville Dam reservoir—automatically and at 10-min. intervals, according to the Corps of Engineers.

The radio network will consist of the water gage stations (each at a different location), a relay station on the side of a mountain overlooking the lake, and a pickup station at the Bonneville power house. Concrete towers, each about 50 ft. tall, will house the gaging stations. They will be erected at Stevenson, 6 mi. from the dam; at Hood River, 24 mi. away, and at Lyle, 37 mi. away. Bottoms of the towers will be lower than any expected low water stage of the lake and the tops higher than any expected low water stage. Each tower is to be fitted with a system of gears and revolving arms which will produce coded signals showing water level to within 1/100 ft.

Radio signals will be sent in this manner. A transmitter at the Bonneville powerhouse will send a tone signal to the relay station on the side of Augsburger Mountain, 15 mi. east of Bonneville. This station will relay the tone to the particular gage station which is tuned to that tone, and the signal will activate the transmitter in that station, which will then start the coding arm and send a message back to the relay station giving the water depth at that instant. When the coded signal reaches the powerhouse, it will be recorded on a chart. Then the tone will be changed slightly and the process completed with another station to catch the water depth at that point.

Bonneville will receive the exact water depths at Lyle, Hood River and Stevenson six times per hour, giving the operators of the power units in the dam a complete report every six hours on the water supply approaching the turbines and generators.

Link Radio Corp., New York, and Leopold & Stevens, Portland, were low bidders at $13,000 before the Corps of Engineers for furnishing and installing the radio and coding devices.

"Building Tomorrow's West"

WITH THIS ISSUE, *Western Construction* completes 25 years of serving the construction-civil engineering fraternity in the West. The January 1951 issue will be a special Silver Anniversary number with the theme "Building Tomorrow's West." Although single copies of the special number will sell for $1.00, subscribers will receive the issue at no extra charge.

THE 1950 ANNUAL INDEX begins on page 127 of this issue. All of the editorial features pubished in the twelve issues of *Western Construction* during 1950 are indexed for easy reference. Also, unit bid abstracts are indexed by location and the type of construction involved.

MILLIONTH CUBIC YARD OF CONCRETE PLACED AT HUNGRY HORSE

GENERAL-SHEA-MORRISON passed a milestone in construction of the Bureau of Reclamation's Hungry Horse Dam on the Flathead River in Montana when the millionth cubic yard of concrete was placed at 4:30 p.m. on November 7. *Mel Hord*, left, assistant to the project manager for G-S-M, looks happy as he prepares to dump the illustrious bucket with the help of *E. J. Nieman*, right, field engineer for the Bureau. The event came 14 months to the day after the first concrete was placed in the dam on September 7, 1949.

New Cement-Mortar Lining for Old Small Diameter Pipelines

A CEMENT-MORTAR lining for old, small diameter pipe lines, that gives new pipe line performance at a fraction of new pipe line costs, is announced by Pipe Linings, Inc., newly-formed subsidiary of American Pipe and Construction Co., Los Angeles, Calif. Licensed for nationwide operations under Tate pipe lining patents, the new company has complete facilities for servicing water, gas and oil pipe lines of 4-in. diameter and larger, according to Robert C. Sargent, manager. The Centriline Corporation of New York has been licensed to handle service in the eastern part of the United States.

The work can be carried out on pipe lines in place, without discontinuing regular service, and all operations are handled by trained and experienced personnel.

Through the use of specialized, patented equipment, the process first cleans corroded matter and tubercles from inside pipe walls, and then applies a smooth cement-mortar lining to the walls. As a result, leaks are eliminated, flow coefficients are restored and pumping costs are reduced. All the advantages of concrete and steel pipe construction are obtained, including elimination of water discoloration, elimination of further cleaning for all time, and protection against bacteria.

In recent years over 1,200,000 ft. of cast-iron, wrought-iron and steel pipe have been treated with success. Installations have run all the way from a few hundred feet to many miles, and results have been uniformly good. Equipment used is portable by special trucks so that all types of locations can be handled.

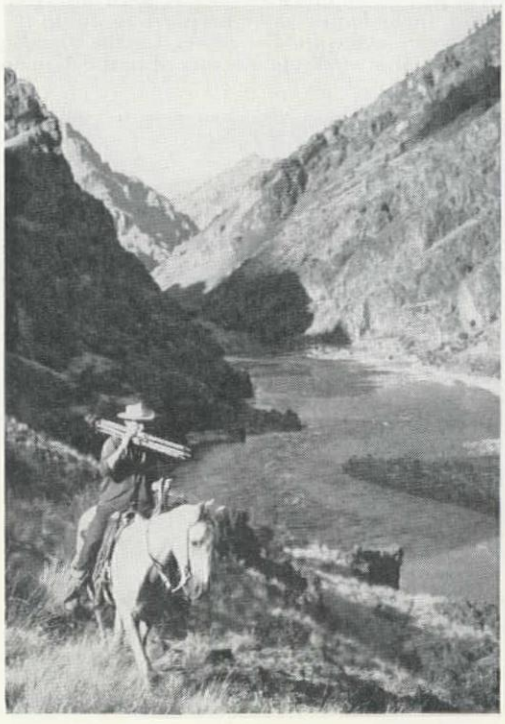
Heretofore large diameter pipes have been lined by Centriline Division of the American Pipe and Construction Co. and this work will continue to be done by the Centriline Division. Small diameter pipes have been lined for many years by Tate Pipe Linings, Inc., of Andover, Mass. Tate Pipe Linings, Inc. is in the process of dissolution, and Pipe Linings, Inc. has acquired most of its equipment and key personnel for use by the new company.

This Month's Front Cover

PLACING the concrete lining for an irrigation ditch in the Peoria Irrigation District near Phoenix, Arizona. First operation on this job was to grade the ditch site with a bulldozer-equipped Caterpillar D6 tractor. Then the tractor pulled a pan breaker to put in the center line. Next, the ditch was excavated and formed in an average of five trips with a Fullerform ditcher, also pulled by the tractor. Final operation (see cover) was placement of the concrete lining with the tractor pulling a portable ditch form and concrete being supplied by ready-mix trucks. Average speed of the liner was ½ mi. of ditch every two hours. R. Fuller of Phoenix was the contractor on the job.

ROUGH GOING, BUT SOME FUN ON HELLS CANYON DAM SITE SURVEY

A SEVEN-MAN Bureau of Reclamation survey party, which has been taking topography for access roads and other purposes at the proposed site for Hells Canyon Dam on the Snake River in Idaho, has had to work in an area where even a mountain goat would feel unsafe. But the tough job has had its compensations. At left below, a dependable horse carries *Lynn Brown* and his transit to another survey point. At right, *Bob Bond* is shown displaying a 100-lb. sturgeon. The survey party cooked its own food, slept in sleeping bags and was subjected to such other everyday (in the life of a surveyor) hardships as rattlesnakes underfoot and an abundance of poison oak. The dam is planned to be 742 ft. in height—highest in the world—and in the deepest gorge in the country.



California Conference on Highway Problems Scheduled

MAIN EVENT of 1950 for road men from every part of California—the Third California Conference on Street and Highway Problems — has been scheduled for January 24-26, 1951, on the Berkeley campus of the University of California.

Presented by the Institute of Transportation and Traffic Engineering, University of California, the annual Conference provides officials from all levels of government and private organizations with the opportunity to discuss mutual problems and new techniques. Following the pattern developed in previous conferences, the program for 1950 will include both general and special sessions, the latter broken down as urban, county, traffic engineering, and construction and maintenance.

Chairman of the 1950 Conference is Ralph G. Wadsworth, San Francisco city engineer. The program, under development since midsummer, is being arranged to provid ample time for discussion of each major problem now confronting road men throughout the state.

Maintenance organization and planning, secondary streets, and parking are principal topics in the urban sessions. Of particular interest to county men will be discussions of road mixing, standards for subdivision streets, and financing. Engineer-contractor relations, inspection practices, yard and shop maintenance, and pavement renovation will be taken up by the construction and maintenance group. Traffic engineers will place emphasis on the applications of traffic engineering in rural counties.

The general sessions will relate current road problems to the general transportation situation, including national defense.

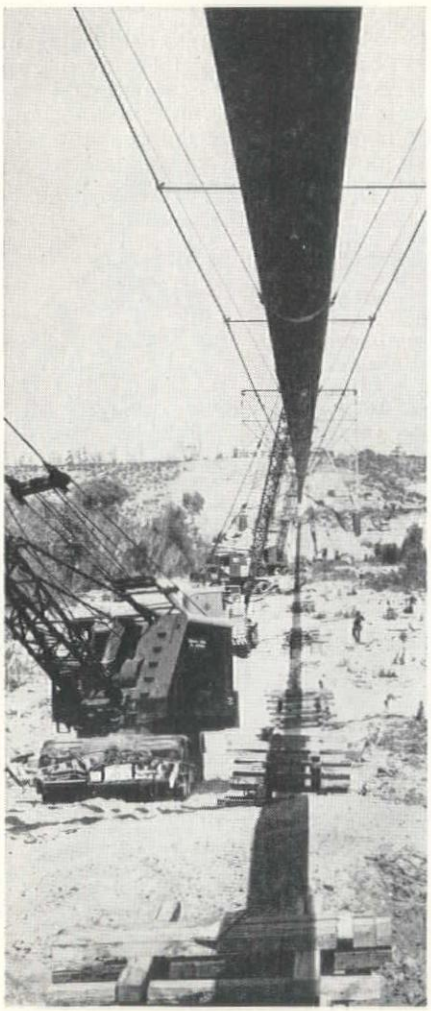
Inaugurated in 1949, the California Conference has rapidly established itself as a forum for road men throughout the state—attendance has averaged 500. An even larger registration is expected in 1951.

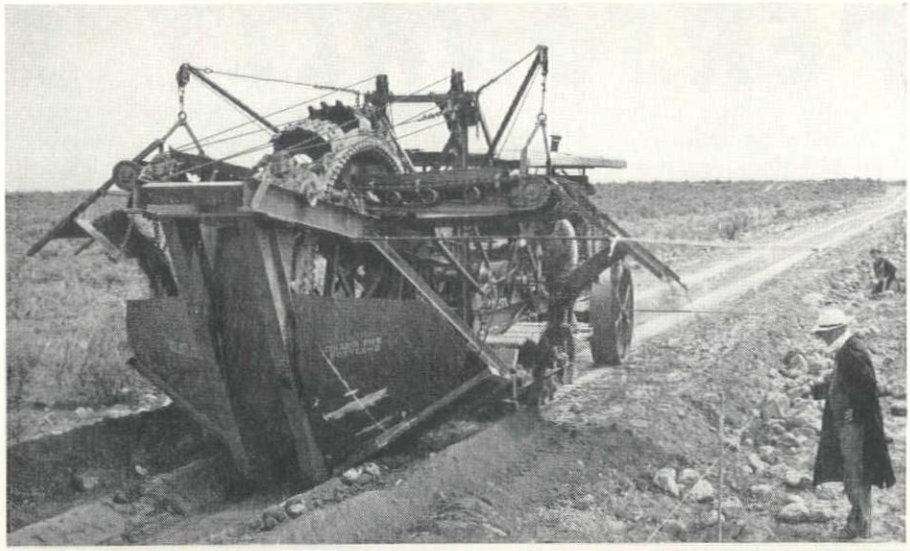
Texas-Arizona Natural Gas Pipeline Approved by FPC

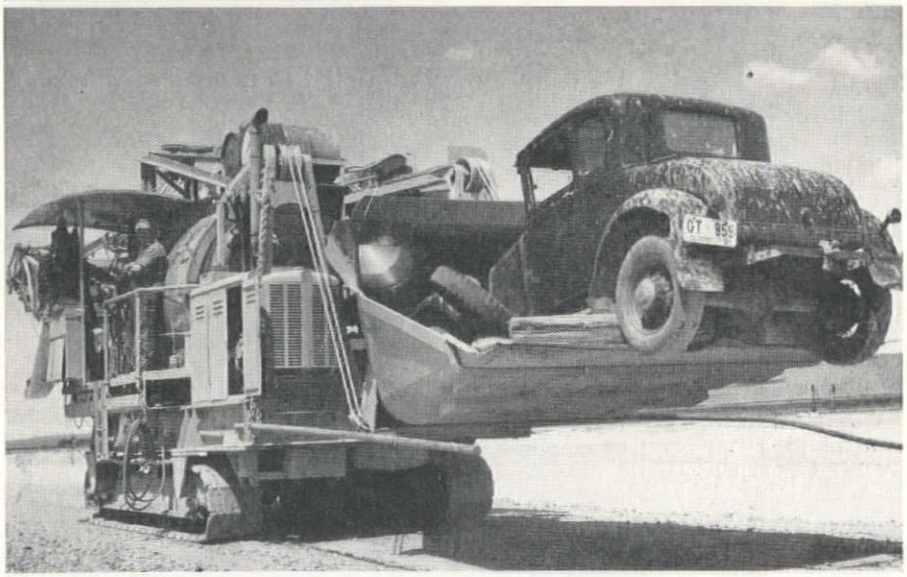
A TEMPORARY certificate has been granted by the FPC to El Paso Natural Gas Co., of El Paso, Texas, for the construction of pipeline facilities designed to increase natural gas deliveries to the Phoenix, Ariz., area. The construction program, estimated to cost $1,038,404, will include approximately 31 mi. of combination 16-in. and 10-in. line; about 11.5 mi. of 4½-in. line; approximately 5.5 mi. of 12¾-in. line; and six new city gate metering and regulating stations.

A NEW WRINKLE for housing jobs is the adaptation of this Allis-Chalmers HD-5G Tracto-shovel to handle roofing on a 100-home project near North Bend, Ore. A special fork developed by Bower-Edmonds Corp., Portland, enables the unit to hoist a half load of 16-ft. sheetings and a bucketful of asphalt shingles in one operation.

THE LARGEST suspension pipeline bridge to be erected in Southern California is shown being maneuvered into position by crews and equipment of Consolidated Western Steel Corp. A single section of 22-in. pipe 750 ft. long was hoisted into position by five cranes, working slowly and in unison. The long pipe was made by welding together a number of 30-ft. lengths. The bridge, over the Santa Ana River near Riverside, carries the last leg of the new Texas-California natural gas loop line for Southern California Gas Co.



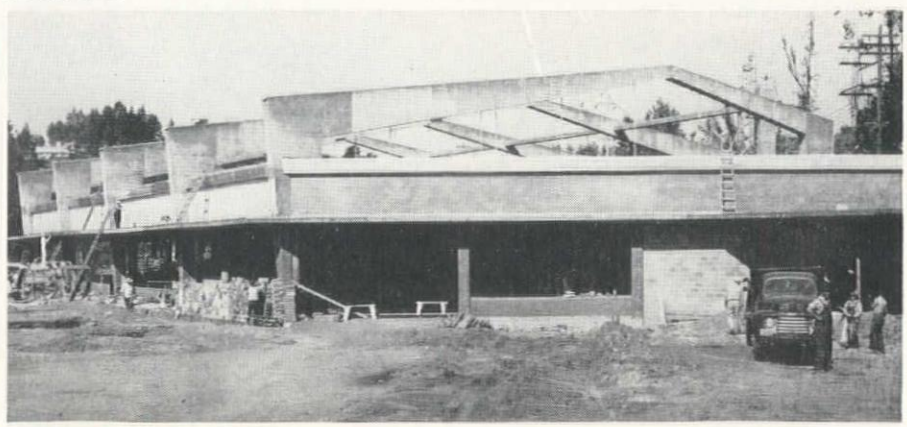




TOP—Take a Buckeye Reel Ditcher, add a pair of wings and a few other items and you have a rig that digs small canals. That's what Collins Pipe of Portland did for this machine which is adjustable for depth, width and shape of cut. Here, the rig is digging a canal with base width of 2 ft. and bank height of 2½ ft. for a distribution system in Block 40 of the Columbia Basin Project in Washington.

BOTTOM—When *Merle Gossage*, operator of a concrete mixer on the West Canal of the Columbia Basin Project, wants to move to another part of the job, he picks up his Model A on the charging skip and treads off down the canal bank.

FIVE CONCRETE TRUSSES exposed above the building's roof provide an interesting design for the new Fred Meyer Burlingame shopping center in Portland, Ore. A total of 40,000 sq. ft. of floor space without pillars is the desirable result. Roof and ceiling are hung by rods from the bottom chord of the trusses. The trusses were lightened by use of Lite-Rock aggregate, an expanded shale produced by Empire Building Co. of Portland. Leslie Poole is the designer; A. M. Hocken of Portland is the builder.



PERSONALLY SPEAKING

Maurice Housecroft, chief bridge engineer of the Utah state road commission, retired recently after serving in that capacity for over 25 years.

* * *

COREY

Lester S. Corey, president of the Utah Construction Co., San Francisco, has been named winner of the 11th annual non-member award for outstanding contributions to construction progress by The Moles, an association of leaders in the heavy construction industry. Award winners were announced last month at a dinner held at the Roosevelt Hotel, New York, and presentation of the plaques and citations will take place January 31 at the Waldorf-Astoria. Corey, who rose from timekeeper of his company in 1901 to its president in 1940, has been closely associated with the direction and management of the construction of such famous dams as Grand Coulee, Bonneville, Hoover, and Davis. Recently his firm was awarded a $32,000,000 contract to build Big Eildon Dam in Australia.

* * *

Lieutenant Colonel Jackson Graham, formerly executive of the Los Angeles District, Corps of Engineers, was appointed acting district engineer last month replacing **Brigadier General Walter D. Luplow,** who has been reassigned to command an engineer brigade at Camp Rucker, Ala. Prior to his post in Los Angeles, General Luplow was assistant chief of engineers for military operations in Washington, D. C.

* * *

Walter F. Winters, formerly special projects engineer at the Asphalt Institute's Denver office, was recently named chief engineer. Winters, who has had 19 years of county, city and state engineering experience in the State of Washington, now has direction of the national staff, promoting the use of asphalt and developing research on the various uses of this material.

* * *

Frank Nash, pioneer Alaska road engineer and for over 25 years on employee of the Alaska Road Commission, retired November 25 as district engineer in Fairbanks. In recognition of his service, he has been recommended for the meritorious service award of the Department of the Interior.

* * *

W. D. Frans is the new district engineer assigned to the north central Washington district Bonneville Power Administration office. He will help direct the sale of Bonneville and Grand Coulee power. This newly-designed district was formerly a branch of the Seattle office.

* * *

More than 300 members of the San Francisco building and construction industry gathered recently at a banquet in the Fairmont Hotel to honor **Henry J. Brunnier,** San Francisco structural engineer of national reputation. Brunnier received an award as the year's outstanding member of the industry in Northern California.

* * *

Milton Schwartz is now resident engineer for the California Division of Highways on construction of the Salt River Bridge and approaches near Fernbridge, Calif. The new bridge is being constructed to replace one in imminent danger of collapse.

* * *

KENNEDY

The East Bay Municipal Utility District in Oakland has appointed **Robert C. Kennedy** to the post of chief engineer. In his new position he will coordinate and be responsible for the engineering functions of the district and will continue to supervise the design and construction of the sewage disposal project until its completion next year. Kennedy, who has an excellent technical background and 25 years of service with the district, joined the staff as a designing engineer and worked on the first Mokelumne Aqueduct and the Pardee Dam. He has since advanced through assistant chief engineer and assistant general manager to his present post.

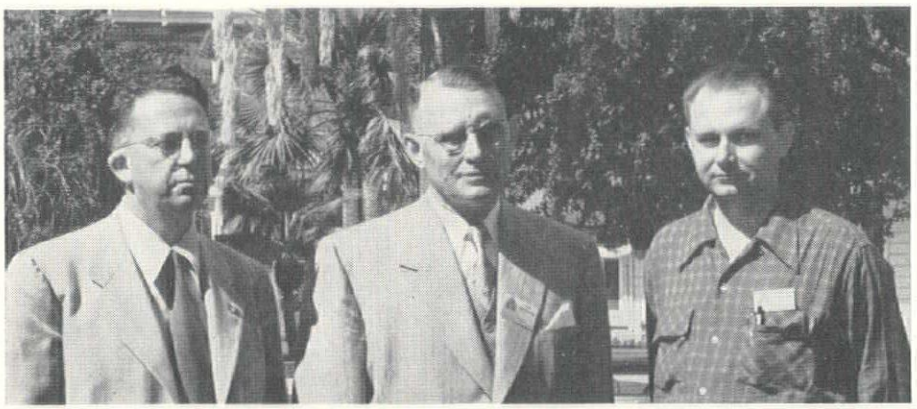
* * *

H. A. Parker, recently-appointed manager of Bureau of Reclamation's Columbia River District, has announced the reorganization of the Irrigation Division into the Irrigation Construction, the Project Development, and the Irrigation Operation and Maintenance divisions, with headquarters at Ephrata, Wash. Heading up the three new divisions, in the order noted above, are: **L. V. Downs,** acting supervising engineer; **W. W. Johnston,** acting supervisor; **E. H. Neal,** acting supervisor. The personnel, land, legal, supply and finance, and information sections are tentatively assigned to the Irrigation Construction Division pending transfer of district headquarters to Ephrata next spring. As development of the basin progresses—the first water is to be available for 87,000 acres in 1952—the three divisions will rise and fall in importance, according to Parker.

* * *

Two new appointments to the staff of the Western Highway Institute in San Francisco have been announced recently. **Bert Trask,** Boise, Idaho, has been named associate director and will work closely with Western state truck-

FIRST TURTLE CLUB MEMBER to be registered in this country is *David J. Jones*, inspector for the Bureau of Reclamation on the Riverton Project, Wyoming. Jones is shown receiving his certificate and lapel pin from Project Engineer *T. A. Clark*. Safety engineers *Miller Prose*, left, and *H. P. Vogt* witness the ceremony. Jones became eligible when a hard hat saved his life (*Western Construction*—September 1950, pg. 102). Membership application blanks are available from *Western Construction*, 609 Mission St., San Francisco.



NEWLY-ELECTED OFFICERS of the Structural Engineers Association of California. Left to right—*Harold King*, Los Angeles, vice president; *Arthur W. Anderson*, San Francisco, president, and *Henry Degenkolb*, San Francisco, secretary-treasurer. The men were elected at the organization's 19th annual convention held at the Hotel del Coronado, Coronado, Calif., October 12-14.

ing associations and other motor carrier organizations, and with Institute members on problems of interstate licensing of motor carriers. He has an impressive background of 20 years' experience in the highway transportation field. **Clarence G. Taylor,** Mountain View, Calif., has been named research director for the Institute. He has had a number of years of experience in editorial and research work and for the past 6 years he has been with the Washington headquarters of the American Automobile Association.

* * *

Hugh P. Crawford, for 3½ years field engineer for the Bureau of Reclamation on the Klamath Project at Klamath Falls, Ore., has recently joined the Columbia River Basin Project at Ephrata. He is now serving as civil engineer in the lateral design section.

* * *

J. C. Neufeld is the new city engineer for Lethbridge, Alberta. Neufeld, a well known civil engineer in Winnepeg and Vancouver, succeeds **James Haimes,** who retires at the end of this year.

* * *

The Structural Engineers Assn. of Oregon installed new officers at their annual dinner meeting in Portland recently. The new officers are: **R. Evan Kennedy,** president; **Guy H. Taylor,** vice president, and **James R. Griffith,** secretary-treasurer. Kennedy is an associate of the firm of Cooper and Rose, consulting engineers of Portland. Taylor is a partner in the engineering consulting firm, Moffatt, Nichol and Taylor in Portland. Griffith is Dean of Engineering at the University of Portland and is well known to readers of *Western Construction* for his Construction Design Charts which have appeared in the magazine since 1935.

* * *

At a recent meeting of the county defense council in Spokane, **Clyde J. Chaffins,** county engineer, was named civil defense director for the county.

* * *

Peter Luiten of Odessa, Wash., has recently retired after serving 42 years as road foreman for Lincoln County. When Luiten started with the county each township took care of its own roads, and he was in charge of one of the 6-mi. sq. areas. In these early days he won the $25 suit of clothes offered the foreman building the best half mile of road on the present Wilbur-Odessa state highway.

* * *

R. E. McCormick has resigned as city engineer of Great Falls, Mont., according to **Mayor Truman G. Bradford. A. J. "Jack" Richardson** was appointed acting city engineer.

* * *

John E. Ryckman succeeds the late **Max Stern** as information officer in Region 2 of the Bureau of Reclamation. Before joining the bureau staff, Ryckman was director of public relations for the American Independent Oil Co. at San Francisco.

* * *

Howard Phelps, retired Washington State College engineering professor, has been temporarily appointed county engineer for Whitman County, Wash. He replaces **Wayne Arrasmith,** who left for army duty on November 2. Prior to his position at State College, which he held for 31 years, Phelps served as city engineer for Boulder, Colo. **Peder Hemstead,** assistant engineer for several years, will be in charge of the road office.

* * *

One of the Northwest's key reclamation officials, **Wilfred L. Karrer,** transfers from the Lewiston Orchards Project in Idaho to the position of construction engineer of the Yakima Project in eastern Washington. Karrer, who has been with the Bureau of Reclamation since 1929, has served as regional engineer in the Pacific Northwest headquarters and has been with the Lewiston Orchards development since construction began in July 1947.

OBITUARIES . . .

Adler M. Larsen, 52, Nevada and California building contractor, died suddenly on October 25 in Reno, Nev. In 1937, Larsen joined Norman Biltz of Reno in establishing the Sierra Construction Co.

* * *

Walter Leonard Denison, 54, road contractor and principal in the firm of Walter L. Denison, died at his home in Albuquerque on October 24, after an extended illness. Denison had been engaged in road construction in the Albuquerque area for 10 years and in Las Vegas prior to that.

* * *

Lee L. Page, 67, construction foreman with the Los Angeles County road department, died October 25.

* * *

Gayle G. Armstrong, principal in the firm of Armstrong & Armstrong, highway contracting firm of Roswell, N. Mex., died October 15. Long active in the national affairs of the Associated General Contractors of America, he was a nominee for the 1951 vice presidency.

* * *

Hans Jacob Jeppson, 86, active in pioneer transportation construction in the West, died recently in his Salt Lake home. In his youth he worked on early road and railroad construction in Utah. He also participated in freight operations with horse teams for mining companies in Butte and Helena, Mont., and took part in construction of the Canadian Pacific railroad through the Canadian Rockies.

* * *

Edwin Erbentraut, 55, partner in the firm of Erbentraut and Summers, San Francisco building contractors, died of a heart attack October 18 in Reno, Nev.

* * *

Charles W. Paul, 70, retired Denver building contractor, died on October 21. He had been active in the contracting and building business since 1903.

* * *

E. W. Heple, 45, prominent San Jose contractor, drowned on October 27 while expediting work on a San Jose Water Works dam project near Los Gatos, Calif. While trying to dislodge dirt and debris clogging the opening of a 700-ft. outlet pipe at the dam's base, he slipped into the mouth of the pipe and was forced through it by water pressure estimated at 8,000 lb. Heple built his firm into one of the largest bridge and road building organizations in California. Among his projects was the $500,000 concrete viaduct over the American River at Sacramento.

* * *

Halbert Stevens Kerr, 85, retired chief engineer for the Utah State Road Commission, died October 30 at his home in Salt Lake City. Before joining the road commission in 1917, Kerr helped pioneer the location and construction of railroads in the Intermountain West.

SUPERVISING THE JOBS

Edward Hauser is job superintendent for R. J. Daum Construction Co., Inglewood, Calif., for constructing an addition to the administration building, University of California at Los Angeles. **Edward Jockola** is general foreman and **Harold Perone** is engineer on the $1,298,254 four-story, reinforced concrete and brick building.

* * *

Jerry Fox is superintendent for Kemper Construction Co., Los Angeles, Calif., for installing concrete lining in the 2,240-ft. horseshoe tunnel on Colorado River, Grand Valley Project, Colo. **Fargo Hodges** is walker and **Pete Peterson** is master mechanic on the $250,747 project.

* * *

R. G. Cook is job superintendent for Covina Construction Co., Covina, Calif., for construction of 21.5 mi. of access roads at the Naval Ordnance Testing Station, Inyokern, Kern County, Calif. **J. B. Hodges** is field office manager on the $212,000 project.

* * *

Norman Jacobs is job superintendent for Paul W. Larsen, Inc., Salt Lake City, Utah, for construction of a plant to generate process and heating steam at reactor testing station in Idaho, a $362,589 project.

* * *

L. G. "Bud" Waigand is job superintendent for Peter Kiewit Sons' Co., Arcadia, Calif., constructing the $1,259,940 concrete Salt Lake Terminal Reservoir, Provo River Project, Utah. **W. B. Whitton** is job engineer and **O. K. Hoeppner** is job office manager on the Bureau of Reclamation project.

* * *

H. L. Gourlie is job superintendent for Morrison-Knudsen Co., Inc., Boise, Idaho, for constructing 30 mi. of the Big Butte Springs Pipeline No. 2, which will supplement the water supply of Medford, Ore. **C. V. Johnson** is clerk on the $423,669 project.

* * *

R. E. Robertson is job superintendent for Carl M. Halvorson, Inc., Portland, Ore., on a $800,251 highway project in Oregon. **Daryl K. Mason** is concrete superintendent, **Fred C. Peters** is engineer, and **Lee Means** is foreman on the job which consists of grading and surfacing 2.9 mi. of the Canyonville section of the Oregon Pacific Highway.

* * *

George Waters is project manager for Stolte, Inc., and Duncanson-Harrelson, Oakland, joint venturers on a $213,262 construction project at Delta-Mendota Canal head works, Central Valley Project, Calif. **Charlie Champion** is field superintendent; **Charlie Ballard,** carpenter superintendent; **Virgil Welton,** excavation superintendent; **Vic McFarland,** concrete superintendent; **Bill Giddings,** engineer; **Verne Barker,** master mechanic; and **Ed Ford,** accountant. The work consists of constructing a pilot fish screen structure, appurtenant work, and a 13.8-kv. distribution line.

* * *

E. George Smith is supervising a $258,160 dredging operation at three sites along the Stockton deep water channel, between Pittsburg and Stockton, Contra Costa and San Joaquin Counties, Calif. **Roland Davies** is chief engineer and **Morris Walgraeve** is shore superintendent for Hydraulic Dredging Co., Oakland, Calif., on the project.

* * *

George Posch, George Berry, and **William Padgett** are supervising a $156,089 highway project for M. L. & C. R. O'Neil, North Powder, Ore., consisting of grading, topping and structures in the North Powder River section of the Old Oregon Trail, Union and Baker Counties, Ore.

* * *

Jack Keane is job superintendent for Utah Construction Co., San Francisco, Calif., holder of a $297,285 contract for railroad rehabilitation at Lathrop Sharpe General Depot in San Joaquin County, Calif.

KEY PERSONNEL ON THE BROADWAY TUNNEL JOB (see article, pg. 63)

ABOVE—*T. Y. Johnson*, project manager for Morrison-Knudsen Co., Inc., and *George Partridge*, resident engineer for the City of San Francisco.

BELOW—*Charles Ray*, assistant tunnel superintendent, and *Carl Larson*, tunnel superintendent for Morrison- Knudsen.

* * *

Richard Babler and **Howard McInroe** are supervising construction of 51.7 mi. of Alaska highway for Rogers Construction Co. & Babler Bros., Portland, Ore. **Jim Folstrom** is job engineer on the $1,884,391 project which includes grading and bituminous surfacing from Big Delta to Sears Creek, Alaska.

* * *

J. W. Harryman is job superintendent for M. J. Brock & Sons, Inc., Los Angeles, Calif., for constructing remaining buildings and facilities at the naval reactor testing station near Arco, Idaho. **W. W. Lassetter** is field engineer on the $1,018,000 project.

* * *

Supervising construction on the $1,701,845 sewage tunnel being built by Kuckenberg Construction Co., Portland, Ore., for the city of Portland is **Lee Gordon. Merrill C. Henderson** is job engineer and **Bert Soucie** is office manager on the 2-mi. tunnel, to be known as the Grand Avenue sewage interceptor unit, which will serve the entire southeast district of Portland.

* * *

L. R. Rieter is job superintendent and **C. S. Muir** is general superintendent for McLaughlin, Inc., Great Falls, Mont., on a $250,812 highway project between Great Falls and Fort Benton in Cascade and Chouteau Counties, Mont. **A. R. Pearce** is foreman on the job which consists of grading, gravel, drainage, and bituminous surfacing of 10.3 mi.

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D. G. "Bob" Roberts is general superintendent for Daum-Donaldson Construction Co., Phoenix, Ariz., for construction of a $116,370 swimming pool in Encanto Park, Phoenix.

* * *

George K. Thatcher is in charge and **R. R. Byerts** is assisting on the construction of a $515,000 reinforced concrete bridge on San Gabriel River Parkway in Los Angeles County. **W. E. Byerts** is in charge of purchasing for the joint venture firm of Byerts & Sons and Geo. K. Thatcher, Los Angeles, Calif.

* * *

W. C. Treadwell is job superintendent for Schutt Construction Co., Inc., Genoa, Wis., on a $362,999 clearing project 4.5 mi. above Detroit damsite, Ore. **Earl Sanders** and **Leonard Mosier** are assistants to Treadwell on the job, which consists of clearing two areas near the reservoir on south side of North Santiam River and on the north and west sides of Breitenbush River.

* * *

Bert Collins is job superintendent and **Tom Collins** is general superintendent for J. H. Welsh & Son Contracting Co., Phoenix, Ariz., on a $114,115 contract for building a water supply system. **Pete Lalande** is in charge of purchasing on the project which will serve the Arcadia

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* * *

Phil S. Johnston is general superintendent and **George Taylor** is office manager for Skousen-Hise Contracting Co., Albuquerque, N. Mex., on its New Mexico highway construct between Dunlap and Va

* * *

Glen H. Prosise is supervising construction of a $150,000 drive-in theatre at Goleta, Calif., for M. J. Brock & Sons, Los Angeles, Calif.

* * *

Carl Jacobson is general superintendent and **Gordon Wainwright** is assistant superintendent for Fisher Contracting Co., Phoenix, Ariz., on a $296,000 contract for constructing a 2,160-ft. suspension bridge across the Gila River at Gillespie Dam for the El Paso Natural Gas Co. The bridge will carry the Texas-San Francisco 30-in. gas pipeline across the river.

* * *

C. W. Miller is supervising construc-

* * *

Harold C. Morton is project manager for The Austin Co., Oakland, for constructing the $140,000 John C. Lynch Warehouse and Office Building, San Francisco, Calif.

* * *

B. M. Collins is project manager for Collins Construction Co. on its $938,855 highway construction project between Midland and Odessa, Midland and Ector Counties, Texas. **A. C. Melton** is general superintendent and **W. H. Clem** is assistant superintendent on the job which includes grading and asphaltic concrete surfacing for a four-lane road.

* * *

tion Co., Twin Falls, Idaho, on a highway relocation job 13 mi. north of Cascade, Idaho.

Ben Sloter is supervising construction of the addition to Jordan High School, Long Beach, Calif., for Tom E. Norcross, Long Beach. **Don Redd** is project engineer on the $721,000 contract.

* * *

Glenn Veater is general superintendent for Allison & Haney, Albuquerque, N. Mex., constructing 18 mi. of sewers, laterals, and manholes on a $192,000 contract with the city of Albuquerque.

* * *

Louis A. Wilson is project manager and **Dick Yeager** is project engineer for Pioneer Constructors, Tucson, Ariz., on its $400,000 paving and sewer construction contract on a military housing project, Roswell, N. Mex.

* * *

F. J. "Hux" Huxtable is general superintendent and **Joe Collins** is assistant superintendent for T-S Construction Co., Los Angeles, Calif., for constructing the May Co. Lakewood department store at Long Beach, Calif. **John Dashiell** is foreman on this $5,000,000 project.

* * *

Wes Gemmell is job superintendent for B. C. Bridge & Dredging Co., Ltd., Vancouver, B. C., on its $3,500,000 modernization program of the No. 1 generating plant of B. C. Electric Co. **Norm Wilde** is timekeeper; **Val Bril** is powderman; **Slim Morrison,** bridgeman foreman, and **Pat Murray** is chief engineer on the project which is located at Lake Buntzen, B. C.

* * *

Frank D. Manning is project manager, **Arthur Ellison** is general superintendent, and **Roy Franceschina** is assistant superintendent for Winston Bros., Monrovia, Calif., on the company's $1,000,000 contract for sinking two shafts for the Southwest Potash Corp. The project is located 30 mi. northwest of Carlsbad, N. Mex.

* * *

Guy H. James is project manager and **R. E. Leech** is general superintendent for Guy H. James Construction Co., Oklahoma City, Okla., on its $1,851,726 railroad relocation job between Kopperl and Blum, Texas, on the Santa Fe track.

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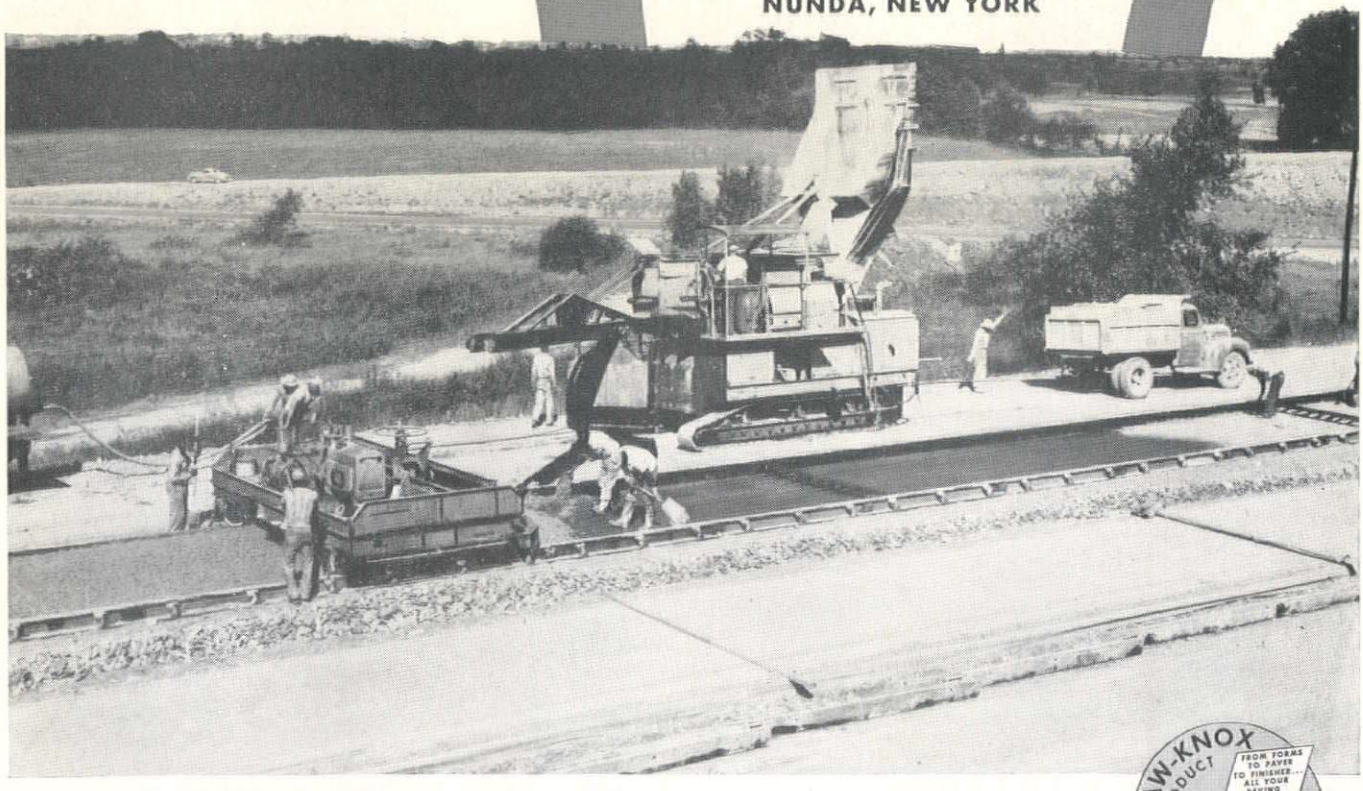

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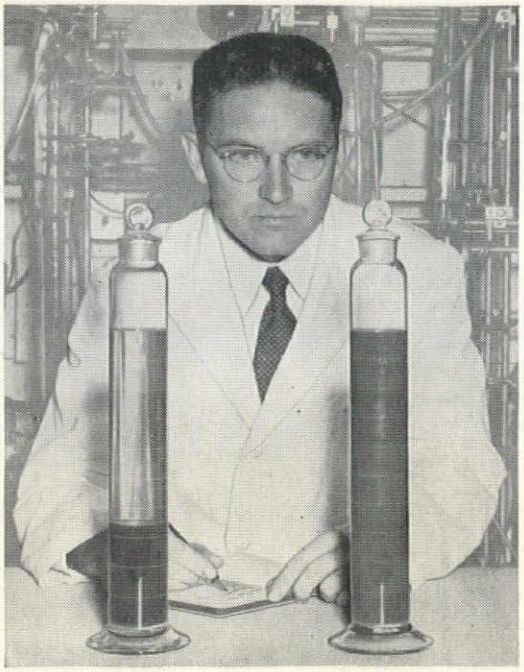

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Contracts . . .

A Summary of Bids and Awards For Major Projects in the West

Arizona

$325,766—**W. J. Henson,** P. O. Box 471, Prescott, Ariz.—Low bid on 7.6 mi. grading and new alignment on Topock-Kingman Hwy.; by State Highway Commission.

$267,908—**J. & J. Construction Co.,** 1801 Petroleum Building, Oklahoma City, Okla.—Contract for 215 mi. rural distribution lines in Pima County; by Trico Electric Cooperative, Inc., Tucson.

$399,843—**Acme Materials-Daley Construction Co.,** 2400 S. 16th St., Phoenix—Low bid on 10 mi. of Phoenix-Tucson Hwy., Pima County.

$126,822—**Tiffany Construction Co.,** P. O. Box 846, Phoenix—Low bid for East Broadway Road, Phoenix, 4.5 mi. grading and surfacing; by State Highway Commission.

$284,448—**Fisher Contracting Co.,** P. O. Box 4135, Phoenix—Contract for grading and alignment on Superior-Miami Hwy.; by State Highway Commission.

California

$363,308—**Dimmit & Taylor and T. M. Page,** Monrovia, Calif.—Low bid for 15.5 mi. surfacing and reinforced concrete bridge at Clear Creek between Democrat Springs and Bodfish, Kern County; by California Division of Highways.

$1,010,900—**Monson Bros.,** 475 6th St., San Francisco—Contract for reinforced concrete building for the Hastings College of Law, San Francisco; by the Regents of the University of California.

$946,610—**Frederickson Bros.,** 1259 65th St., Emeryville, Calif.—Contract for 4.4 mi. grading and surfacing with plant mix on cement treated base, including bridges, in Humboldt County between Robinson Ferry Bridge and Alton Grade Crossing; by Division of Highways.

$895,580—**United Concrete Pipe Corp.,** P. O. Box 425, Baldwin Park, Calif.—Contract for PCC pavement on cement treated subgrade, and construction of two bridges, between Tulare Airport and Tagus, Tulare County; by Division of Highways.

$2,871,212—**Frederickson & Watson and M. & K. Corp.,** joint venture, 873 81st Ave., Oakland—Contract for construction of PCC pavement highway and separation structures on 4.2 mi. of the Eastshore Freeway between Lewelling Blvd. and 0.1 mi. north of Oakland south city limit, Alameda County; by Division of Highways.

$533,704—**Griffith Co.,** 1060 South Broadway, Los Angeles—Low bid for 14.8 mi. graded and surfaced with road mix surfacing on imported base material between Imperial County line and 3 mi. southeast of Mecca, Riverside County; by Division of Highways.

$385,574—**K. B. Nicholas,** P. O. Box 551, Ontario, Calif.—Low bid for highway improvements in city of San Bernardino at 5th and "I" St., including structural steel railroad overhead and approach; by Division of Highways.

$191,806—**John F. Blakemore,** 902 South 5th St., El Monte, Calif.—Contract for grading and paving 3.4 mi. of state highway, including reinforced concrete slab bridge, near Hot Springs Canyon Road, Fresno County; by Division of Highways.

$277,946—**McGuire and Hester,** 796 66th Ave., Oakland—Contract for installation of Section 2 of Alameda interceptor sewer and appurtenances, Alameda; by East Bay Municipal Utility District.

$253,795—**P. and J. Artukovich Co.,** 13305 South San Pedro St., Los Angeles—Contract for Schedule I of Section 1 of the Alameda Interceptor, and Section 1-B of the South Interceptor, Oakland; by East Bay Municipal Utility District.

$1,949,000—**Louis C. Dunn, Inc.,** 799 Monadnock Building, San Francisco—Contract for construction of 22 three and four-story reinforced concrete buildings for Bernal Dwellings Housing Project, San Francisco; by the San Francisco Housing Authority.

$308,800—**J. E. Haddock, Ltd.,** 3538 E. Foothill Blvd., Pasadena—Low bid for Van Ness Ave. bridge, Hollywood Freeway, Los Angeles; by Division of Highways.

$1,508,000—**Haas and Rothschild,** 274 Brannan St., San Francisco—Low bid for construction of reinforced concrete and steel frame Public Works Building annex, Sacramento; by Division of Architecture.

$259,323—**Bosko Construction Co., Inc.,** 1728 Greenwood Ave., Los Angeles—Low bid for Valley Blvd. sewer work; by City of Los Angeles.

$272,079—**H. Earl Parker, Inc.,** 12th and F Sts., Marysville, Calif.—Contract for 2 mi. grading and surfacing of state highway near Placerville; by Division of Highways.

$184,368—**Western Construction Co.,** 307 W. Hampton Way, Fresno—Contract for additions to sanitary sewer system section 5; by City of Fresno.

Colorado

$516,516—**Malcolm W. Larson,** 4080 Galapaga St., Denver—Low bid for construction of the 72-mi. Brighton-Hoyt-Brush 115-kv. transmission line, for the Colorado-Big Thompson Project; by Bureau of Reclamation.

$469,955—**B-Line Construction Co.,** 520 First National Bank Bldg., Oklahoma City, Okla.—Contract for construction of 108-mi. transmission line; by K. C. Electric Association, Hugo, Colorado.

$542,799—**Brown Construction Co.,** 1530 E. Abriendo Ave., Pueblo—Low bid for 4 mi. grading and structures near Clear Creek Canyon, Jefferson County; by State Highway Department.

$741,740—**Adler Construction Co.,** Dickinson, North Dakota—Contract for construction of Pole Hill Power Plant and access road, Estes Park-Foothills power aqueduct, 14 mi. west of Loveland; by Bureau of Reclamation.

$1,222,000—**Mead and Mount Construction Co.,** 240 Railway Exchange Building, Denver—Low bid for construction of brick and concrete addition to Colorado State Hospital, Pueblo.

$134,883—**Carl V. Hill,** Greeley—Low bid for 7.8 mi. surfacing and structures on state hwy. 12, Las Animas County; by State Highway Department.

Idaho

$121,125—**Henly Construction Co.,** Lewiston—Low bid for construction of steel Priest River Bridge and approaches, Coolin Road, Kaniksu National Forest, Bonner County; by Bureau of Public Roads.

$374,198—**J. H. Wise and Son, Inc.,** 424 Broadway, Boise—Contract for construction of 909-ft. steel and concrete interstate bridge across the Snake River at Weiser; by Idaho State Highway Commission.

$1,018,000—**M. J. Brock & Sons, Inc.,** 2894 Rowena Ave., Los Angeles—Contract for office and laboratory, and sewage treatment facilities at Arco; by Westinghouse Electric Corp., for the Atomic Energy Commission.

$334,790—**Oliver, Blumhagen, Walker & Von Cannon,** Sandpoint, Idaho—Contract for clearing operations on 27.7 mi. of the Lake Pend Oreille section of the Spokane-Hot Springs transmission line; by the Bonneville Power Administration.

Montana

$302,798—**Williston Construction Co.,** Williston, N. Dak.—Contract for 313 mi. of electric line; by Sheridan County Electric Cooperative, Inc., Medicine Lake.

$222,925—**W. D. Savalis,** Oroville, Calif.—Contract for right of way clearing in Sanders County, on Spokane-Hot Springs transmission line; by Bonneville Power Administration.

$598,713—**Dudley Construction Co.,** Great Falls—Contract for state home for the aged at Lewiston; by State.

New Mexico

$528,489—**J. H. Ryan,** Albuquerque—Contract for concrete and steel Rio Grande Bridge, Albuquerque, U. S. 66; by State Highway Department.

$788,206—**Brown Contracting Co.,** P. O. Box 1479, Albuquerque—Contract for grading, culvert work, and two steel bridges, and asphalt pavement for 9.9 mi. of U. S. 66 between Tucumcari and San Jon; by State Highway Department.

$582,137—**Lowdermilk Bros.,** Los Alamos—Contract for 10 mi. of U. S. 64 between Eagle Nest-Cimarron Road, Colfax County; by State Highway Department.

$680,301—**Jack Adams,** Santa Fe—Contract for 12 mi. grading U. S. 66 between state line and San Jon, Quay County; by State Highway Department.

$233,112—**Lowdermilk Bros.,** P. O. Box 4150, Denver—Contract for grading and culvert work on 14.5 mi. of state route 112 between Parkview and El Vado; by State Highway Department.

$208,249—**Wylie Bros.,** P. O. Box 4025, Albuquerque—Contract for 12.9 mi. highway work routes 350 and 351, from Espuela west, Eddy County; by State Highway Department.

$336,262—**Macco Corp.,** 14409 South Paramount Blvd., Paramount, Calif.—Contract for earthwork and structures on main canal, laterals, and wasteways on Fort Sumner Project, Fort Sumner; by Bureau of Reclamation.

$849,900—**Robert E. McKee,** P. O. Box 1706, Santa Fe—Low bid for 115-bed hospital in Albuquerque; by Bataan Memorial Methodist Hospital.

$149,546—**W. T. Bookout,** Las Vegas, New Mex.—Low bid for grading and structures for 9.4 mi. of state route 344 between Edgewood and Cedar Grove; by State Highway Department.

$633,445—**Basanda Construction Co.,** 2925 N.W. 39th St. Terrace, Oklahoma City, Okla.—Contract for 473 mi. rural distribution lines in Lincoln County; by Central New Mexico Electric Cooperative, Inc., Mountainair.

Oregon

$440,229—**Roy L. Houch & Son,** Salem, Ore.—Contract for 1.85 mi. grading and paving on Canyonville section of Pacific Highway, at Canyonville; by State Highway Commission.

$509,302—**Berke Bros.,** Portland—Low bid for 17 mi. grading and topping of Willow Creek-Boardman section of Columbia River highway; by State Highway Commission.

$110,240—**Porter W. Yett,** Portland—Contract for 8.4 mi. paving of Yamhill River-Salt Creek section of Dallas-Coast secondary highway; by State Highway Commission.

$444,705—**Lindstrom Bros., Inc.,** Portland—Low bid for 689-ft. reinforced concrete and steel bridge, including approaches, on Payette spur of Old Oregon Trail Highway, Malheur County; by State Highway Commission.

$245,700—**Spada Bros.,** Portland—Low bidder for Drake Creek-Adel Section of Warner secondary highway, 25 mi. N.E. of Lakeview, including 7 mi. of grading and surfacing; by State Highway Commission.

$162,908—**Miller and Strong,** 3871 Royal Road, Eugene—Low bid for 2.2 mi. grading of Little River Road, Umpqua National Forest, Douglas County; by Bureau of Public Roads.

$324,176—**The Shea Company,** 2801 West Mission Road, Alhambra, Calif.—Low bid for diversion tunnel and relocation of a section of railroad at the site of Big Cliff Dam, 4 mi. downstream from Detroit Dam on the North Santiam River; by Portland District, Corps of Engineers.

$793,065—**George W. Lind,** Portland—Low bidder for construction of the lateral system for Portland Grand Ave. intercepting sewer; by City of Portland.

$326,760—**Miller & Strong,** 3871 Royal Road, Eugene—Low bid for 2.3 mi. grading and clearing North Umpqua Hwy., Douglas County; by Bureau of Public Roads.

$1,701,845—**Kuckenberg Construction Co.,** 11104 N.E. Holman St., Portland—Low bid for 2-mi. Grand Ave. interceptor unit of Portland sewer project; by the City of Portland.

Texas

$7,801,064—**Falcon Dam Constructors,** Houston, consisting of **C. F. Lytle Co.,** Sioux City, Iowa, et al—Contract for Schedule 1-b, United States portion of work, on Falcon Dam and Power Plant on the Rio Grande, 75 mi. downstream from Laredo, Texas; by the United States Commissioner, International Boundary and Water Commission, El Paso.

Utah

$855,400—**Paulsen Construction Co.,** Salt Lake City—Contract for Southeast Junior High School, Salt Lake City.

$573,800—**Kenneth Witt,** Payson, Utah—Low bid for Lehi Elementary School, Lehi.

$344,701—**W. W. Clyde & Co.**, Springville—Contract for construction of Skull Rock Pass Road, King Canyon, Millard County; by State Road Commission.

$419,000—**Groneman & Co.**, Provo—Low bid for Orem Elementary School Building, Orem.

$132,057—**A. O. Thorn Construction Co.**, Springville—Contract for New Harmony Road, U. S. 91, Washington County; by State Road Commission.

Washington

$25,967,921—**L. E. Dixon Co.**, San Gabriel, Calif., and the **Arundel Corp.**, Baltimore, Md.—Contract for second stage work on Chief Joseph Dam, Columbia River, near Bridgeport. Work includes all concrete within first cofferdam, cofferdam removal, construction of second cofferdam, and enclosing and concrete work inside second cofferdam on south side of dam; by Seattle District, Corps of Engineers.

$548,636—**General Construction Co.**, 3840 Iowa St., Seattle—Low bid for clearing, grading, and construction of steel truss bridge with concrete approaches on 1.9 mi. of Concrete-Sauk Valley Road, Skagit County; by Department of Highways.

$472,606—**Manson Construction and Engineering Co.**, 821 Alaskan Way, Seattle—Contract for 710-ft. reinforced concrete bridge over Yakima River at Richland; by Atomic Energy Commission.

$650,000 approx.—**Waale-Camplan Co.**, 2100 S.W. Jefferson St., Portland—Low bid for military construction at Richland; by Seattle District, Corps of Engineers.

$1,043,274—**J. A. Terteling and Sons, Inc.**, P. O. Box 1428, Boise—Low bid for 1.4 mi. earthwork and concrete lining Main Canal, between stations 255 and 326, Columbia Basin Project, 5 mi. south of Coulee City; by Bureau of Reclamation.

$484,923—**J. A. Terteling and Sons, Inc.**, P. O. Box 1428, Boise—Contract for earthwork and structures on West Canal, 6 to 17 mi. south of Quincy, Columbia Basin Project; by Bureau of Reclamation.

$398,258—**Fiorito Bros.**, 1100 Leary Way, Seattle—Contract for grading and highway work, including 2.8 mi. of state highway 1, Barnes Park north; by Department of Highways.

$1,667,800—**Poston Construction Co.**, 2471 Aurora Ave., Seattle—Contract for construction of the C. W. Sharples Junior High School building, Seattle; by Seattle School District 1.

$1,555,085—**Walsh Construction Co.**, 785 Market St., San Francisco—Low bid for construction of 27 mgd. primary treatment plant for Tacoma; by City of Tacoma.

$1,500,000 approx.—**J. Burchell**, E. 13325 15th St., Opportunity, and **M. K. Stoldz**, E. 1012 Augusts St., Spokane—Contract for construction of 168 houses in north Spokane, Pineview addition.

$2,000,000—**L. H. Hoffman Co.**, 715 S.W. Columbia St., Portland—Contract for addition to pulp mill; by Weyerhaeuser Timber Co., Tacoma.

$1,154,203—**Sound Construction Co.**, Seattle—Low bid for control and development laboratory at Hanford; by Atomic Energy Commission.

Wyoming

$729,629—**Sharrock and Pursel**, Casper—Contract for schedules 2 and 5, earthwork, canal lining, and structures for the Riverton Project, 25 mi. north of Riverton; by Bureau of Reclamation.

$418,402—**Williston Construction Co.**, Sydney, Mont.—Contract for construction of 321-mi. transmission line; by Tri-County Electric Association, Sundance, Wyo.

$319,045—**Boatright-Smith**, Rawlins—Contract for construction of 4.5 mi. of highway on Sheridan Road, Sheridan County; by State Highway Department.

$683,000—**Riedesel & Lowe**, Cheyenne—Low bid for construction of a new sewage disposal plant, Cheyenne; by City of Cheyenne.

Alaska

$3,582,782—**Morrison-Knudsen Co., Inc.**, Boise, and **Peter Kiewit Sons' Co.**, Omaha—Low bid for warehouse buildings at Fort Richardson; by Alaska District, Corps of Engineers.

$966,000—**Haddock Engineers, Ltd., and Associates**, P. O. Box 390, Montebello, Calif.—Low bid on schedule 5, dam intake and

treatment plant for Ship Creek Dam, and intake and water treatment plant; by Alaska District, Corps of Engineers.

$370,918—**S. Marci Construction Co.,** P. O. Box 732, Anchorage—Low bid on schedule 1 supply main for Ship Creek Dam and intake water treatment plant, East Fort Richardson, 14 mi. from Anchorage; by Alaska District, Corps of Engineers.

$262,291—**Munter Construction Co.,** Vance Building, Seattle—Contract for five bridges in Alaska; by Alaska Road Commission. Included are Eklutna River Bridge, Noyes Slough Bridge, Sinona River Bridge, Tulsona River Bridge, and Gulkana River Bridge.

$1,884,491—**Babler Bros. and Rogers Construction Co.,** 4617 S.E. Milwaukie St., Portland—Contract for surfacing of 52 mi. of Alaska Hwy., from Big Delta to Sears Creek; by Alaska Road Commission.

$3,790,000—**McLaughlin Construction Co.,** Ford Bldg., Great Falls, Mont.—Contract for surfacing Richardson Hwy. from Valdez to mile 36; by Alaska Road Commission.

British Columbia

$1,000,000 approx.—**Marwell Construction Co., Ltd.,** 410 Seymour St., Vancouver, B. C.—Contract for housing developments at Dawson Creek, B. C., and Whitehorse, Yukon Territory; by Canadian Commercial Corp., Ottawa, Ont.

$2,400,000 approx.—**Northern Construction Co.,** and **J. W. Steward, Ltd.,** 1304 Hornby St., Vancouver, B. C.—Contract for two units of nurses' home at Vancouver General Hospital.

$2,348,000—**Bennett and White, Edmonton, Ltd.,** 11239 83rd St., Edmonton, Alberta—Contract for apartment project in Edmonton; by Strathearn Heights Ltd., Edmonton.

Territory of Hawaii

$295,788—**Ben Hayashi,** Honolulu—Low bid for construction of a sea wall at the Ala Wai yacht harbor; by Territorial Harbor Board.

$989,000—**Oahu Construction Co., Ltd.,** Honolulu—Low bid for construction of Manoa elementary school, Manoa.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

The *Osgood Co.* and the *General Excavator Co.*, Marion, Ohio, have combined their sales management and policies for the distribution of Osgood and General power shovels, cranes, draglines, clamshells, hoes and Mobilcranes. Functions other than sales will be carried on by the individual companies as before. L. O. McLEAN, former sales manager for General Excavator, has been appointed director of sales development for the combined operation, and JAMES S. FORTINER, former assistant to the vice president of the Osgood

McLEAN

FORTINER

and General companies, has been appointed sales manager. KENNETH O. WILLIAMSON has been named assistant sales manager. Announcement of the retirement of GEORGE DAY, after 30 years with the company, was made by Osgood. With his retirement, Day culminates 45 years of service in the power shovel industry.

☆ ☆ ☆

W. B. TALMAGE, formerly with the Inland Tractor Co., has joined the *J. I. Case Co.* of Oakland, Calif., as industrial representative in this territory. Talmage replaces N. W. NELSON who has become sales manager with the new Case dealer, *Hayward Equipment Co.* of Los Angeles.

☆ ☆ ☆

H. TOM LYNN has been appointed district manager of Findlay Division, *Gar Wood Industries, Inc.* Formerly district sales manager for all divisions of Gar Wood, Lynn will have coverage of the 11 Western States and will make his headquarters at the Richmond, Calif., offices. Ross MILLER, formerly Western region sales manager, has been transferred to Chicago as regional manager of the Wayne Division.

☆ ☆ ☆

Edward R. Bacon Co., San Francisco, announces the promotion of AL HAHN, formerly assistant sales manager, to the position of sales promotion manager. Appointed to the position of manager of field salesmen is L. C. PETRIE, who returns to the Bacon Co. after 5½ years in the ready-mix concrete and contracting business in Contra Costa County.

☆ ☆ ☆

R. G. OVERPACK has been appointed to the newly established position of assistant service manager of *Caterpillar Tractor Company's* Western Division. Overpack has been active in every phase of Western service activity since joining the company in 1937.

☆ ☆ ☆

Appointment of *Evans Engine & Equipment Co., Inc.*, of Seattle as western Washington dealer for Chrysler industrial gasoline engines was jointly announced by A. G. CUNNINGS, *Chrysler Engine Corp.* representative, and A. V. EVANS, presi-

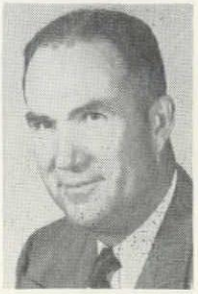
EVANS CUNNINGS

dent of Evans Engine. Adding gasoline engines to the Evans line of marine and industrial diesel engines provides the customer with a complete range of power plants for a variety of industrial uses.

☆ ☆ ☆

Schramm Inc. announces the establishment of factory branches in Los Angeles and San Francisco. KARL BURLIE heads the Los Angeles branch, located at 1021 E. 8th St., and K. T. "KEN" WINSLOW is in charge of the San Francisco branch, at 1315 Howard St. Both men have been supervising Schramm interests in the West for many years. HARRY IZENOUR will be sales engineer and C. H. FITZSIMMONS service engineer at the Los Angeles branch, which will serve Southern California, Arizona, and eastern Nevada. Serving Northern California and western Nevada, the San Francisco branch will have VINCENT HALLSTED as office manager and WILLIAM CHESSICK as sales engineer.

☆ ☆ ☆



NICHOLSON

REX L. NICHOLSON is president and B. NEUSTADT vice president of the newly-formed *Columbia Tractor & Implement Co.* of Portland (*Western Construction* — November 1950). As owners of the *Pacific Tractor & Implement Co.*, Richmond, Calif., both Nicholson and Neustadt are well-known figures in Bay Area automotive, construction, and banking circles. Nicholson served in various governmental posts during the war. He later organized Builders of the West, Inc., and in 1946, at the request of the Secretary of Interior, he reorganized the administration of all federally-owned lands in the country. Neustadt, in addition to his other duties, serves as a director of the Peterbilt Motor Co. of Oakland and the Seaboard Finance Co. of Los Angeles. Vice president and general manager of the new firm is PAUL HENRY of Portland.

☆ ☆ ☆

General Electric Supply Corp. has officially dedicated its new $500,000 warehouse in Emeryville, Calif. The 71,000 sq. ft. building more than triples the corporation's former warehouse facilities in Oakland.

☆ ☆ ☆

As part of the plywood industry's program to provide market level service, two new field representatives have been added to the staff of the *Douglas Fir Plywood Association*. RICHARD E. ANDERSON, formerly district sales engineer for Timber Structures, Inc., of Portland, is the new Southwest field representative, with headquarters in Dallas. STUART WILLIAMSON,

ANDERSON

WILLIAMSON

formerly a free-lance industrial engineer, will travel from San Francisco headquarters. This brings to seven the number of technically trained field representatives stationed in key market areas. Other field promotion offices are in Tacoma, Chicago,

Washington, D. C., New York City, and Ames, Iowa.

☆ ☆ ☆

Stoody Co. of Whittier, Calif., manufacturer of hard-facing tools, has announced the following new distributors: In California: *Agricultural Supply Co.*, Escondido; *Hust Bros., Inc.*, Marysville; *Moore's Welding Supply Co.*, Sacramento; *G. S. Parsons Co.*, San Diego; *California Welding Supply Co.* and *Hickinbotham Bros., Ltd.*, Stockton. In Oregon: *Eugene Welders Supply Co.*, Eugene; *Industrial Air Products Co.*, Portland. In Washington: *Western Oxygen, Inc.*, Seattle.

☆ ☆ ☆

JULIAN MUNYON, development engineer of the *Barber-Greene Co.*, was a recent visitor on the West Coast. Accompanying him on his trip was E. L. BENSON, sales manager in the San Francisco Bay Area.

☆ ☆ ☆

ARCHER

W. D. "WIN" ARCHER has acquired an interest in the *Foulger Equipment Co.*, Salt Lake City. He has been elected vice president and will also act as general sales representative in the intermountain territory. Foulger has also announced the expansion of its facilities into a new, specially designed building at 1361 So. 2nd West. One of the most modern in the area, the new structure will provide facilities for servicing and parts for the company's many well-known lines, such as Blaw-Knox, Lima shovels, Wayne cranes, Wickwire rope, Esco manganese castings, and Euclid road machinery.

☆ ☆ ☆

COBB

GEORGE L. COBB, formerly district sales manager of *Soule' Steel Co.* in Northern California and Nevada, has been promoted to assistant general sales manager for the firm's coastwide operations. STANLEY E. SOULE', who has been in charge of special products sales, will move up to Cobb's former position.

☆ ☆ ☆

RAY FELLOWS, assistant sales manager of *Wisconsin Motors Corp.*, was a recent visitor to the Coast. He made his Bay Area headquarters with *E. E. Ruchter & Son*, the company's distributor in Emeryville.

☆ ☆ ☆

Cate Equipment Co. of Salt Lake City has been named distributor for Utah, southwestern Wyoming, and Elko County, Nev., by the *Wooldridge Manufacturing Co.* of Sunnyvale, Calif. The Wooldridge equipment handled includes the 225-hp. Terra Cobra self-propelled earthmover,

Continued on page 100

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 99

Terra Clipper and Boiling Bowl tractor-drawn scrapers, rippers, bulldozers, power control units, and the Terra Cobra Wagon. DAVID E. HUGHES is president and sales manager, DAVID L. ANDERSON, service manager, and ROBERT M. EVANS, office manager, of the newly appointed firm.

☆ ☆ ☆

Coast Equipment Co., San Francisco, announces the following appointments: PAUL R. EGLI, formerly assistant manager, is the new general manager, directing operations throughout the company's Northern California sales area. A. J. WEIBELL, formerly purchasing agent, advances to Egli's post as assistant manager.

☆ ☆ ☆

SHEERE

A. M. Byers Co., Pittsburgh, Pa., America's largest wrought-iron manufacturer, announces the appointment of A. D. SHEERE as manager of its San Francisco division, succeeding P. D. TABLER, who is retiring. Sheere, who joined Byers in 1924, was formerly manager of the Houston division.

☆ ☆ ☆

Mine & Smelter Supply Co., with headquarters in Denver and offices in Salt Lake City and El Paso, is newly-appointed distributor for *Webster Manufacturing Incorporated*, Tiffin, Ohio. The company will carry a complete line of conveying and transmission equipment, as well as complete tipples and coal crushers.

☆ ☆ ☆

Appointment of *Western Gear Works*, Seattle, as exclusive sales and service representative for the Fuller line of high efficiency rotary compressors and vacuum pumps is announced by PAUL FORSYTHE, Western Gear's area sales manager. The firm will represent the *Fuller Co.*, of Castasaqua, Pa., in Washington, Oregon, Idaho, Montana and Alaska. *Pacific Coast Geared Products*, Portland representative of Western Gear Works, will handle sales and service in southwestern Washington and Oregon. J. O. BORST, recently appointed special member of the engineering staff, will assist in Fuller compressor and pump contacts.

☆ ☆ ☆

Intermountain Tractor Sales Corp. of Salt Lake City is operating under new owners, L. F. WEIR and WALTER R. YOUNG, formerly of Portland, and JAMES A. YOUNG of Gilroy, Calif. The manufacturers of Dearborn farm machinery and

Continued on page 102

UNIT BID SUMMARY

Water Supply . . .

Two Concrete-Lined Reservoirs with Connections to Salt Lake Aqueduct

Utah—Salt Lake County—Bureau of Reclamation. Peter Kiewit Sons' Co., Arcadia, Calif., with a bid of $1,259,940, was low before the Bureau of Reclamation for constructing earthwork and structures for the terminal reservoir of the Salt Lake Aqueduct, Aqueduct Division, Provo River Project, Utah. Work includes the following: excavation for and construction of two 20,000,000-gal. capacity concrete reservoirs, with inlet and outlet connections to the 69-in. diam. Salt Lake Aqueduct; a venturi meter measuring structure; a chlorination and control house; a 48-in. diam. concrete pipe wasteway approximately 3,650 ft. long; and approximately 3,340 ft. of 7-ft. chain-link fence. Work is situated near Salt Lake City. Unit bids were submitted as follows:

(1) Peter Kiewit Sons' Co. $1,259,940
(2) A. S. Horner Construction Co. 1,306,676
(3) J. Kenneth Thayn 1,351,867
(4) United Concrete Pipe Corp. $1,424,449
(5) Wonderly Construction Co. 1,491,298
(6) Engineer's estimate 1,491,352

		(1)	(2)	(3)	(4)	(5)	(6)
134,400	cu. yd. excavation, common	.40	.97	.40	.50	.423	.50
3,000	cu. yd. excavation, rock	3.00	2.00	1.25	.50	3.70	2.00
10,400	cu. yd. removing and stockpiling topsoil	.15	.60	.50	.35	.345	.60
22,000	cu. yd. excavation, borrow, for embankments	.37	.50	.40	.60	.465	.50
42,500	cu. yd. compacting embankments	.15	.15	.30	.25	.30	.35
46,700	cu. yd. backfill	1.25	.50	.30	.40	.60	.40
3,770	cu. yd. compacting backfill	3.00	5.00	4.00	4.00	2.80	2.00
1,160	M gal. furn. wat. for embank. mat'l in zone 2	3.00	.25	2.50	2.00	2.50	3.00
7	sq. yd. dry rock paving	13.00	12.00	20.00	10.00	3.30	7.00
61	cu. yd. riprap	14.00	8.00	10.00	10.00	2.50	6.00
15	cu. yd. gravel bedding under riprap	6.00	12.00	3.00	10.00	5.00	5.00
3,245	lin. ft., furnishing materials and constructing graded sand & gravel drains without sewer pipe	.50	.75	.75	1.25	.83	1.20
3,066	lin. ft., furnishing materials and constructing grad. sand & gravel drains with 4-in. sewer pipe	1.40	1.75	2.00	2.50	2.03	2.00
850	lin. ft., furnishing and laying 6-in. sewer pipe with cemented joints	1.20	.80	1.50	.75	1.06	1.50
850	cu. yd., furnishing and placing one course surf.	4.00	2.00	3.00	2.00	3.45	2.50
28	lin. ft., removing 42-in. concrete pipe	5.00	10.00	3.00	8.00	5.30	4.00
Lump sum,	breaking into 69-in. conc. pipe at Sta. 2189-40	100.00	125.00	100.00	300.00	121.00	100.00
4	cuts, cutting 69-in. concrete pipe	75.00	50.00	100.00	300.00	93.00	75.00
247	lin. ft., removing and salvaging 69-in. conc. pipe	3.00	4.00	5.00	6.00	2.54	8.00
7,270	cu. yd. concrete in reservoir floor slabs, slope walls, and column pedestals	16.50	22.50	24.00	20.00	19.47	22.00
7,160	cu. yd. concrete in reservoir roof slabs, column capitals, and vertical walls	33.50	38.00	47.00	46.50	65.39	.60.00
800	cu. yd. concrete in monolithic pipe, pipe wyes, pipe bends, and pipe anchors	60.00	62.50	80.00	90.00	93.14	70.00
980	cu. yd. concrete in structures	70.00	41.50	55.00	90.00	80.90	60.00
24,315	bbl., furnishing and handling cement	4.70	4.10	5.00	4.50	4.04	5.00
2,737,400	lb., furnishing and placing reinforcement bars	.11	.10	.10	.11	.0993	.10
12,673	lin. ft., placing 6-in. rubber water stops	.20	.20	1.00	2.00	.222	1.25
476	lin. ft., placing 9-in. rubber water stops	.25	.30	1.50	2.25	.40	1.50
7,670	sq. ft., furnishing and placing elastic joint filler	1.30	1.20	1.00	2.00	1.27	1.50
105	sq. yd., dampproofing walls	1.00	.90	1.00	1.00	1.10	1.60
914	sq. ft., furnishing and placing insulation and coal-tar-saturated-felt roofing	1.00	.50	1.00	1.00	.765	1.00
Lump sum,	furnishing and installing metal doors, metal-sash wind. & met. louvers for chlorination house	$2,500	$2,000	$3,000	$3,500	$2,973	$2,700
20	lin. ft., installing 69-in. concrete-pipe sections	7.00	9.00	10.00	6.00	10.80	15.00
120	lin. ft., furnishing and laying 18-in. diameter standard-strength concrete pipe	4.50	3.50	5.00	3.50	4.55	4.15
385	lin. ft., furnishing and laying 36-in. diameter standard-strength concrete pipe	12.00	9.60	10.00	11.00	12.40	10.00
3,430	lin. ft., furnishing and laying 48-in. diameter extra-strength concrete pipe	21.50	22.50	18.00	18.00	21.10	16.00
55	lin. ft., furnishing & laying corr.-metal-pipe arch	7.00	4.75	6.00	7.00	6.10	4.25
870	lin. ft., furnishing and laying copper pipe	1.30	1.35	1.50	2.25	1.65	.80
3,340	lin. ft., furnishing and erecting chain-link fence	2.30	2.00	2.00	2.00	2.20	3.00
83,820	lb., furnishing and install. sluice gates & hoists	.50	.45	.60	.55	.495	.45
193,000	lb., furn. & install. metal pipe, fittings & valves	.13	.15	.12	.12	.13	.40
320	lb., furnish. & install. reservoir level recorders	6.75	4.00	4.00	6.00	4.15	4.50
1,200	lb., furn. & install. flowmeter and venturi rings	2.40	1.90	3.50	4.00	3.37	2.00
2,750	lb., furn. & install. spiral stairs & handrail	.80	.50	.90	1.00	1.20	.60
1,600	lb., furnishing & installing trolley hoist & beam	.70	.30	.50	.50	.375	1.00
19,440	lb., furnishing and installing frames, covers, gratings, and ladder rungs	.60	.30	.50	.50	.678	.35
3,290	lb., furnishing and install. misc. metalwork	.70	.30	1.00	.60	.775	.50
Lump sum,	furnishing and install. electrical systems	$9,766	$9,000	$1,400	$12,000	$12,300	$7,500

Irrigation . . .

Pneumatically Applied Mortar Canal Lining

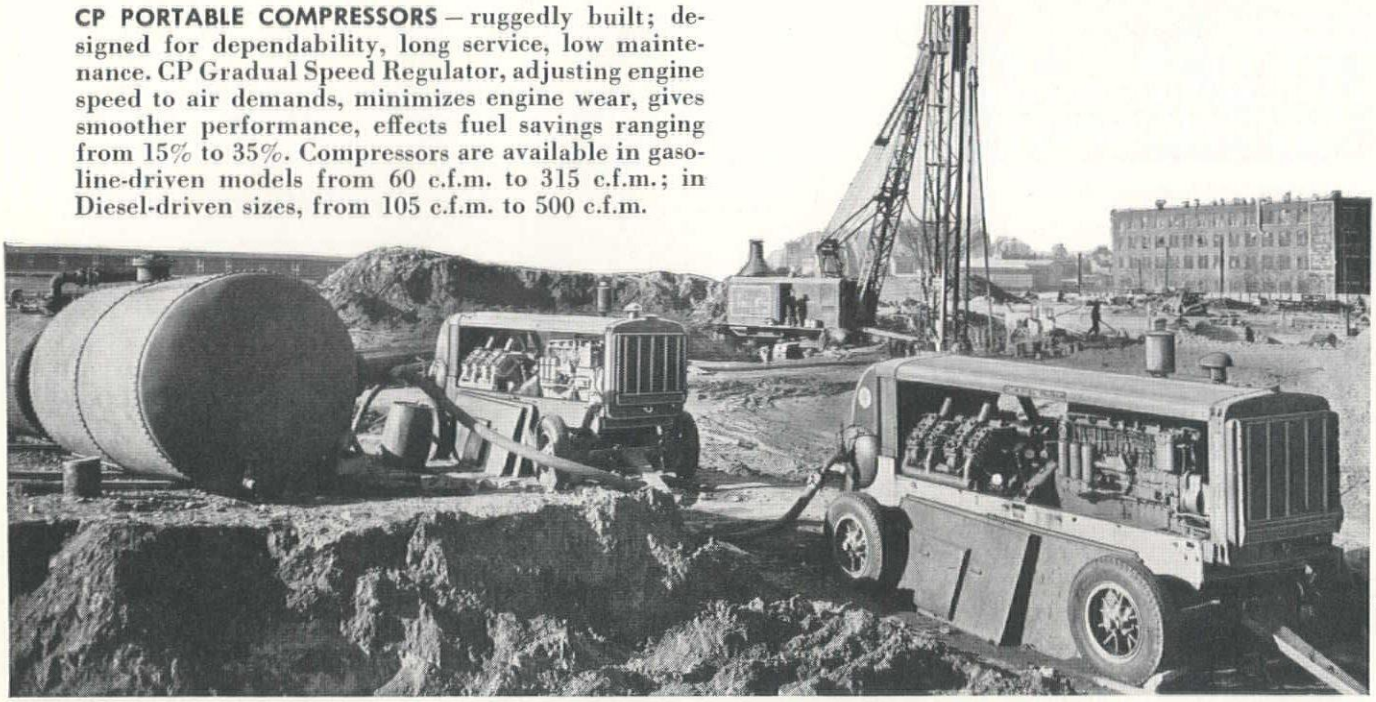
New Mexico—De Baca County—Bureau of Reclamation. Macco Corp., Paramount, Calif., with a bid of $336,264, was low before the Bureau of Reclamation for constructing earthwork, pneumatically applied mortar lining, and structures for the Main Canal, and for earthwork and structures on Main Canal Laterals and Wasteways, Fort Sumner Project, N. Mex. Unit bids were as follows:

(1) Macco Corp. $336,264
(2) R. L. Hanes & Co. 342,264
(3) G. I. Martin 370,982
(4) Otto B. Ashbach & Sons, Inc. $409,892
(5) Engineer's estimate 311,926

		(1)	(2)	(3)	(4)	(5)
Lump sum,	clearing and grubbing	$11,000	$15,000	$35,000	$26,600	$10,000
32,000	cu. yd. excavation, common, for canal, first 32,000 cu. yds.	.57	.40	.40	.57	.38
32,000	cu. yd. excavation, common, for canal, over 32,000 cu. yds.	.45	.35	.30	.43	.32
130	cu. yd. excavation, rock, for canal	2.00	2.00	4.00	12.00	2.00
400	cu. yd. excavation, common, for drainage channels and dikes	.50	.60	.30	1.22	.60
4,500	cu. yd. excavation, common, for structures	1.30	1.50	1.00	1.22	1.25
130	cu. yd. excavation, rock, for structures	2.00	2.00	4.00	18.00	3.00
16,000	cu. yd. excavation, borrow	.80	.30	.10	.49	.65
20,000	mi. cu. yd. overhaul	.15	.20	.10	.50	.30
28,700	sq. yd., trimming foundations for pneumatically applied mortar lining, first 28,700 sq. yds.	.35	.30	.35	.42	.44

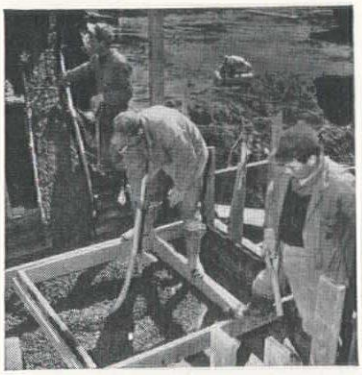
Continued on next page

CP PORTABLE COMPRESSORS — ruggedly built; designed for dependability, long service, low maintenance. CP Gradual Speed Regulator, adjusting engine speed to air demands, minimizes engine wear, gives smoother performance, effects fuel savings ranging from 15% to 35%. Compressors are available in gasoline-driven models from 60 c.f.m. to 315 c.f.m.; in Diesel-driven sizes, from 105 c.f.m. to 500 c.f.m.

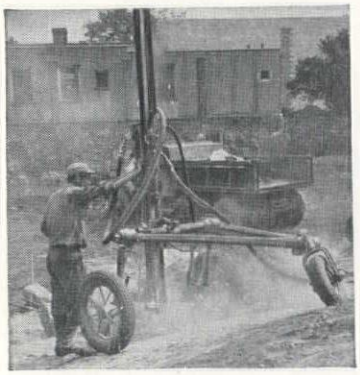


YOU CAN DEPEND

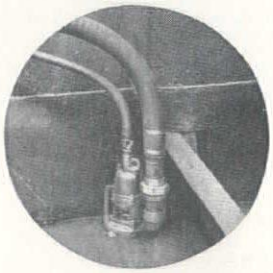
on CP Equipment



CP-220 HICYCLE ELECTRIC VIBRATOR — one-man operation; no flexible shaft; easily handled electric cable can be bent around corners, over forms. Powered by gasoline-driven generator, vibrator can be used anywhere within 400-ft. radius without moving generator. *Write for details.*



CP-20 SUMP PUMP operating with 60 c.f.m. compressor at 40 lbs. pressure against a 15-ft. head, has capacity of 200 gallons a minute; with a 105 c.f.m. compressor at 80 lbs. pressure against a 50-ft. head, 225 gallons a minute. Requires no priming. *Write for SP-3017.*



G-150 light-weight CP WAGON DRILL is designed for use with new CP 59-lb. Sinker or 3-inch Drifter. Increases footage up to 100% over hand-held methods. *Write for SP-3010.*

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 100

Ford tractors, whose products the Sales Corp. handles, greeted the new owners at a sales meeting in Newhouse Hotel and extended best wishes to the sellers of the enterprise, KENNETH G. SELF, HENRY I. DWORSHAK, GERALD R. HYDE and JAMES DUKE.

☆ ☆ ☆

The *Tom W. Carpenter Equipment Co., Inc.*, Amarillo, Texas, has been named by the *Koehring Co.* of Milwaukee as Western Texas distributor of its line of heavy duty construction equipment. Carpenter will also handle products of three Koehring subsidiaries, C. S. Johnson, Kwik-Mix and Parsons companies. Koehring concurrently named *Sioux Road Equipment, Inc.*, of Sioux Falls, S. Dak., exclusive distributor and representative in South Dakota. The company maintains offices and sales and service departments in Sioux Falls, Aberdeen and Rapid City. GEORGE E. FISHER is president of the firm and C. T. VADER is general manager.

☆ ☆ ☆

HARRY BREHMER, of the *J. D. Adams Manufacturing Co.*, recently conducted sales schools in the West: in Los Angeles, San Francisco, Reno, Boise and Portland.

☆ ☆ ☆

Kimball Equipment Co. of Salt Lake City is a newly-named Utah distributor for *Shield Bantam Co.* of Waverly, Iowa, and *Meili-Blumberg Co.* of New Holstein, Wis.

☆ ☆ ☆

DALEY

EDWARD DALEY, formerly San Francisco district manager for Marion Power & Shovel Co., has been appointed assistant regional manager for *Cummins Engine Co.*, with headquarters in Los Angeles.

☆ ☆ ☆

LLOYD BEIRNES joins the sales staff of the Billings, Mont., branch of *Fruehauf Trailer Co.* The company also announces the addition of the Elston Cargo Heater to its line of truck and trailer accessories at the Billings branch. This unit is operated on propane gas and is a boon to truckers hauling perishable goods in extremely cold weather.

☆ ☆ ☆

United States Plywood Corp. has opened two new warehouses in California, one at Fresno, the other at Culver City, bringing to six the number of warehouses operated by the company in California.

☆ ☆ ☆

DAVID RISOR, assistant sales manager of *Marion Power Shovel Co.* of Ohio, was a recent visitor to the West Coast.

28,700	sq. yd., trimming foundations for pneumatically applied mortar lining, over 28,700 sq. yds.	.30	.25	.30	.30	.42
3,000	cu. yd. backfill about structures	.25	.75	.50	.49	.60
1,250	cu. yd. compacting backfill about structure	4.50	1.00	4.00	3.30	2.00
5,000	cu. yd. compacting embankments	.50	.75	.75	1.10	.60
120	sq. yd. dry-rock paving	2.00	4.00	10.00	8.50	8.00
400	cu. yd. riprap	6.00	6.00	8.00	12.00	7.00
Lump	sum, removing existing structures	$2,500	$9,800	$20,000	$8,000	$8,000
28,700	sq. yd. pneumatically applied mortar in canal lining, first 28,700 square yards	1.00	1.50	1.37	2.16	1.10
28,700	sq. yd. pneumatically applied mortar in canal lining, over 28,700 square yards	.80	1.30	1.22	1.00	1.00
800	cu. yd. concrete in structures	95.00	82.00	90.00	90.00	70.00
3,627	bbl., furnishing and handling cement, first 3,627 barrels	8.00	8.00	6.60	6.80	6.00
3,627	bbl., furnishing and handling cement, over 3,627 barrels	7.00	7.00	6.00	6.40	5.90
59,800	lb., furnishing and placing reinforcement bars in structures	.15	.15	.22	.16	.15
190	sq. ft., furnishing and placing elastic filler material in joints	1.30	2.00	4.00	2.44	2.00
10	m.b.m., furnishing and erecting untreated timber in struct.	300.00	250.00	300.00	330.00	270.00
70	m.b.m., furnishing and erecting treated timber in structures	380.00	300.00	310.00	396.00	320.00
636	lin. ft., furnishing and laying 15-in. diam. conc. irrig. pipe	3.00	3.00	3.50	6.70	2.00
1,248	lin. ft., furnishing and laying 18-in. diameter standard strength concrete culvert pipe	5.00	5.00	5.00	7.30	5.00
180	lin. ft., furnishing and laying 24-in. diameter standard strength concrete culvert pipe	8.00	7.50	7.00	9.50	7.10
48	lin. ft., furnishing and laying 30-in. diameter standard strength concrete culvert pipe	12.00	12.00	15.00	11.20	9.25
44	lin. ft., furnishing and laying 36-in. diameter standard strength concrete culvert pipe	17.00	15.00	18.00	16.60	11.80
340	lin. ft., laying 24-in. diameter galv.-corrugated metal pipe	1.00	1.00	2.00	8.80	1.75
30,000	lb., installing metal slide gates	.15	.20	.25	.18	.25
3,800	lb., installing miscellaneous metalwork	.25	.25	.25	.43	.30

Tunnel . . .

Concrete Lining for Tunnel on Grand Valley Project

Colorado—Mesa County—Bureau of Reclamation. Kemper Construction Co., Los Angeles, with a bid of $250,747, was low before the Bureau of Reclamation for lining with concrete approximately 2,240 lin. ft. of 12-ft. horseshoe section tunnel and performance of incidental grouting and earthwork in Tunnel No. 3, Main Canal, Grand Valley Project, near Palisade, Colo. Unit bids were as follows:

(1) Kemper Construction Co. $250,747
(2) G. L. Tarlton Contracting Co. 25,625
(3) Rhoades-Shofner Constr. Co. & Grafe-Callahan Construction Co. 272,081
(4) Gardner Construction Co. $311,781
(5) Engineer's estimate 239,676

		(1)	(2)	(3)	(4)	(5)
550	cu. yd. excavation, all classes, in tunnel	6.00	50.00	10.00	45.00	40.00
10	m.b.m., dismantling and removing flume	50.00	250.00	434.00	400.00	75.00
4,430	cu. yd. concrete in tunnel lining	44.40	38.50	44.70	52.00	37.80
20	supports, realigning existing steel tunnel supports	100.00	100.00	200.00	250.00	75.00
6,645	bbl., furnishing and handling cement	6.60	7.00	8.35	6.25	6.50
27,700	lb., furnishing and placing reinforcement bars	.13	.20	.17	.15	.15
250	lin. ft., drilling grout and weep holes	1.50	2.50	1.00	3.00	2.00
250	lb., furnishing and placing grout pipe and connections	1.25	1.00	.60	.50	1.00
400	cu. ft. pressure grouting	3.00	5.00	3.00	6.00	3.00
700	lb., installing access door	.30	.20	.18	.30	.25

Bridge and Grade Separation . . .

Timber Trestle Approaches and Steel Beam Bridge

California—Solano County—State. Al Erickson & Co., Napa, with a bid of $23,928, was low before the California Division of Highways for constructing a bridge consisting of a steel beam span and constructing timber trestle approach spans across Cutoff Slough, about 5.5 mi. southeast of Suisun. Unit bids were as follows:

(1) Al Erickson & Co. $23,928
(2) Chittenden & Chittenden & B. S. McElderry 25,863
(3) Ben C. Gerwick, Inc. $27,674
(4) C. C. Gildersleeve 28,978

		(1)	(2)	(3)	(4)
34	m.f.b.m., treated Douglas fir timber	315.00	310.00	350.00	400.00
9	cu. yd. class "A" P.C.C.	70.00	100.00	70.00	100.00
39,000	lb., structural steel	.18	.18	.22	.20
1,380	lin. ft., furnish treat. Douglas fir piling	1.70	1.60	2.00	1.60
29	ea., driving piles	108.00	175.00	126.00	150.00
600	lb. bar reinforcing steel	.15	.20	.25	.20

Structural Steel Cowlitz River Bridge

Washington—Cowlitz County—State. Peter Kiewit Sons' Co., Longview, Wash., with a low bid of $1,352,345, was awarded a contract by the Washington Department of Highways for constructing the Cowlitz River Bridge at Kelso. Unit bids were as follows:

(1) Peter Kiewit Sons' Co. $1,352,345
(2) Guy F. Atkinson Co. 1,393,346
(3) Kuckenberg Construction Co., Inc. 1,428,373
(4) Bates & Rogers Construction Corp. $1,469,473
(5) General Construction Co. 1,498,096
(6) N. Fiorito Co. 1,549,509

		(1)	(2)	(3)	(4)	(5)	(6)
2,190	cu. yd. common excavation, including hauling	1.00	.82	1.50	1.40	2.00	1.00
80	cu. yd. structure excavation	5.00	4.00	5.00	2.20	3.00	3.00
1	day pneumatic-tired roller	35.00	100.00	150.00	55.00	100.00	100.00
7	days mechanical tamping	25.00	60.00	50.00	55.00	40.00	75.00
5.1	stas. (100-ft.) finishing roadway	40.00	10.00	25.00	33.00	30.00	20.00
20	M gal. water in place	2.50	2.50	3.00	3.85	3.00	5.00
650	cu. yd. selected roadway borrow in place	1.65	1.65	2.50	2.20	2.50	2.00
130	cu. yd. crushed stone surf. top course in place	4.00	3.50	3.50	5.00	4.00	5.00
	ONE COURSE CONCRETE PAVEMENT						
2,097	sq. yd. cement conc. pav. std. 14-day mix 8-in. Sec. in place	3.80	4.80	4.50	4.40	5.00	4.50
72	only, dowel bars with rubber caps in place	.40	.50	.75	.50	.75	.75
72	lin. ft. pavement headers in place	1.00	.90	1.00	.60	1.00	2.50
	OTHER ITEMS						
1,000	lin. ft. integral cement concrete curb in place	1.00	1.00	2.00	.40	1.00	1.50
175	lin. ft. pl. conc. or v.c. sew. pipe 6-in. dia. in pl.	1.00	1.00	2.50	.95	1.10	1.00

Continued on next page

BARRETT* PROTECTIVE PRODUCTS
COVER EVERY PIPE-COATING NEED

1 **Pipeline Enamel**
2 **Millwrap Enamel**
3 **A.A. Enamel**
4 **Asbestos Felt**
5 **Materials for Special Uses**

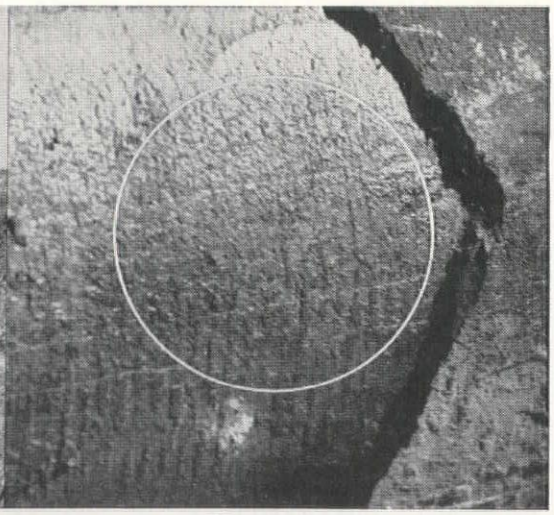
BARRETT* PIPELINE ENAMEL

After more than 20 years' use under the most widely varying conditions, Barrett* Pipeline Enamel has conclusively demonstrated its ability to protect pipe lines against corrosion. When used properly, the need for constant inspection by line walkers is practically eliminated, as far as leaks from corrosion are concerned.

Barrett Pipeline Enamel is reinforced with inert flake minerals which provide toughness and maximum resistance to underground stress effects. It is non-absorbent, and is impermeable by soil waters. Like other Barrett coal-tar enamels, it is practically unaffected by soil composition or bacteria. It can be depended upon to give uniformly satisfactory service under the most punishing conditions of underground service.

HERE'S PROTECTION THAT PROTECTS!

This line was protected in 1927 with Barrett Pipeline Enamel. When taken up for relocation 16 years later, the steel was found to be free from corrosion.



Note how clearly visible the original mill knurl marks are in this unretouched enlargement.

✓ *Memo:* FOR CORROSION ENGINEERS

Barrett coal-tar materials for special uses are all dependable, durable and economical. Eternium* Paint for exposed metal work. CA-50 Heavy Duty Cold Application coating for concrete and metal exposed to extremely corrosive conditions. Marine Enamel for ships, barges and off-shore service vessels. Service Cement and Pipeline Fabric for field joints — no torching required. Asbestos Pipeline Felt for soil stress shield. Tank Bottom Compound for sour crude storage. 34 YB Paint for exposure to salt water spray conditions.

Barrett®

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Reg. U. S. Pat. Off.

NEWS of MANUFACTURERS

Barber-Greene Co., Aurora, Ill., manufacturer of material handling, paving and ditching equipment, has announced new assignments for four key members of its sales force. EARL D. STEARNS, general sales manager for the past 14 years, has become manager of the Conveyor Division. Taking over the duties of general sales manager is WALTER B. HOLDER, former sales manager of the Construction

STEARNS HOLDER

Division. Holder, who has been with the company for 24 years, served as wartime representative in Washington, D. C. To assist in administration of Barber-Greene's sales, two area sales managers have been called back to the main office in Aurora. ED HOLT, manager of Area II in Washington, D. C., has been named manager of the Eastern Division. LOWELL LARSON, manager of Area VI at Minneapolis, heads the Western Division.

☆ ☆ ☆

SHEA

In keeping with accelerated sales activities in several new markets, *Athey Products Corp.* of Chicago announces two promotions within its sales organization. TOM SHEA, formerly district representative in the 13 Northeastern States and Eastern Canada, becomes general sales manager. Earlier in the year A. T. MARCHUK was advanced from assistant domestic sales manager to domestic sales manager. Shea, who entered the construction business 15 years ago, has been connected with the Harnischfeger Corp. and the Le Roi Co. Marchuk has been with Athey since 1936.

☆ ☆ ☆

The appointment of DONALD B. OLEN to the newly-created position of works manager of the *Four Wheel Drive Auto Co.* has been announced by R. A. OLEN, vice president and general manager. He will have direct supervision of the engineering and manufacturing phases of FWD operations. The objective is to unite production and process engineering functions into one manufacturing facility. Assisting Olen in

Continued on page 105

3 only, catch basins in place	100.00	100.00	175.00	222.00	100.00	150.00
91 sq. yd. one course Portland cem. con. side. in pl.	2.25	7.50	3.25	4.15	3.75	3.00
230 lin. ft. pipe handrail, complete, in place	5.50	9.00	2.50	5.30	7.00	4.06
1 only, adjusting manhole to grade	90.00	250.00	125.00	33.00	100.00	50.00
1 only, adjusting water valve box to grade	25.00	25.00	75.00	16.50	100.00	15.00
1 only, adjusting curb inlet to grade	75.00	60.00	35.00	33.00	100.00	25.00
924 lin. ft., removing cement concrete curb	.40	.25	.35	.45	.50	.50
2 only, removing curb inlet	30.00	40.00	25.00	22.00	25.00	10.00
139 sq. yd., removing cement concrete sidewalk	.75	.25	.50	1.10	1.00	1.00
15 lin. ft., relaying pl. conc. sewer pipe 6-in. diam.	1.00	1.00	2.50	1.25	1.00	1.00
BRIDGE						
8,200 cu. yd. structure excavation	1.25	2.00	5.00	1.70	2.50	4.00
Lump sum, shoring and cribs						
5,475 cu. yd. concrete, class A, in place	55.50	59.00	65.00	72.20	74.00	70.00
1,160 cu. yd. concrete, class B, in place	26.00	27.00	30.00	33.45	31.00	35.00
2,320 cu. yd. concrete, class F, in place	21.00	23.00	30.00	25.95	26.00	35.00
160 cu. yd. concrete, class H, in place	21.00	19.00	30.00	27.25	26.00	30.00
2,250 lin. ft. reinf. conc. bar rail, in place	8.00	8.00	10.00	5.85	10.00	9.50
1,760,000 lb. steel reinforcing bars in place	.094	.095	.10	.106	.0975	.09
2,585,000 lb. structural carbon steel in place	.182	.18	.17	.181	.175	.185
52,000 lb. cast steel in place	.31	.35	.35	.406	.35	.45
38 only, bridge drains complete in place	60.00	76.00	60.00	54.00	100.00	75.00
474 lin. ft. down spouts in place	7.00	10.00	7.00	5.30	10.00	5.00
305 lb. copper seals in place	2.00	2.00	1.50	2.15	2.50	3.00
21,400 lin. ft., furnishing precast concrete piling	3.30	4.50	3.00	3.30	3.50	4.20
534 only, driving precast concrete piles	28.00	37.00	56.00	31.20	33.00	32.00
17,200 lin. ft., furnishing steel piling	3.55	3.25	3.50	3.83	4.19	4.20
391 only, driving steel piles in place	23.00	65.00	50.00	33.05	55.00	65.00
11,800 lin. ft., furnishing timber piling (untreated)	.50	.44	.35	.45	.52	.55
261 only, driv. timber piles (untreated) in place	16.00	35.00	45.00	37.60	29.00	40.00
2 only, furnishing & driv. precast conc. test piles	550.00	230.00	400.00	210.00	800.00	300.00
3 only, fur. & driv. steel test piles	750.00	700.00	350.00	530.00	900.00	$1,000
1 only, furnish. & driving timber test piles	400.00	600.00	300.00	375.00	350.00	500.00
Lump sum, lighting system						
3,100 cu. yd. special backfill in place	1.35	2.10	1.50	3.50	2.00	2.50

Reinforced Concrete Bridge With Cast-in-place Concrete Piles

New Mexico—Valencia County—State. J. R. Ryan, Albuquerque, with a low bid of $240,067, was awarded a contract by the New Mexico State Highway Department for excavation and construction of a steel and concrete bridge across the Rio Grande east of Belen, New Mexico. Unit bids were as follows:

(1) J. H. Ryan $240,067
(2) Sharp & Fellows 250,066
(3) F. D. Shufflebarger 262,673
(4) E. M. Silver $264,300
(5) Engineer's estimate 251,120

	(1)	(2)	(3)	(4)	(5)
Lump sum, Removal of old structures	$5,000	$9,600	$6,800	$3,000	$9,700
6,760 cu. yd. Excavation unclassified	.30	.30	.70	50.00	.30
1,540 sta. yd. overhaul	.03	.02	.02	.03	.02
13,590 mi. yd. haul	.06	.06	.08	.12	.06
80 hr. Rolling—Sheepsfoot roller	10.00	5.00	10.00	10.00	6.00
40 hr. Rolling—Pneumatic tired roller	6.00	4.00	8.00	5.00	6.00
250 M gal. watering	1.00	2.00	2.50	2.00	2.00
2 ea. Monuments & markers	50.00	50.00	50.00	15.00	50.00
10 ea., Right of way markers	10.00	6.00	6.00	6.00	5.00
0.1 mi., Obliterating old road	$1,000	500.00	750.00	100.00	200.00
56 cu. yd., Excavation for structures	10.00	3.00	4.00	5.00	3.00
30 hr., Mechanical tamping	5.00	4.00	5.50	5.00	6.00
522.94 cu. yd., "AE AR" Concrete—Superstructure	55.00	62.00	70.00	65.00	65.00
148.51 cu. yd., "AE AR" Concrete—Substructure	60.00	72.00	70.00	65.00	65.00
199,069 lb., Reinforcing steel	.115	.125	.15	.12	.12
24,630 lb., Wire fabric	.22	.23	.21	.24	.25
574,935 lb., Structural steel	.155	.475	.16	.165	.16
970 ton, Derrick stone fill	7.00	5.15	5.00	6.00	8.00
955 cu. yd., Wire enclosed riprap	8.00	7.00	5.00	10.00	7.00
662 cu. yd., Excavation for bank protection	2.00	1.50	2.00	2.00	2.00
235 lin. ft., Steel stakes for riprap	2.00	2.20	1.75	1.75	2.00
6,830 lin. ft., Cast in place concrete piles	8.50	9.25	9.00	10.00	8.00

Dam . . .

Repair of Spillway Face at Grand Coulee Dam Using Floating Caisson

Washington—Grant County—Bureau of Reclamation. Pacific Bridge Co., San Francisco, with a bid of $2,662,866, was low before the Bureau of Reclamation for river improvements and repair of spillway face and spillway bucket at Grand Coulee Dam, about 30 mi. northeast of Odair, Wash. Work to be performed consists of the following:

(a) Underwater slope protection. Placing of underwater riprap, armor rock, and concrete blocks, on the right tailrace slope.

(b) Dredging work will include dredging in the left tailrace in front of station-service units and main units L1 and L2. A small amount of dredging may also be required in the spillway bucket, main river channel downstream of the spillway bucket, and in the drydock approach channel.

(c) Maneuvering and operation of equipment will include the maneuvering and operation of specially designed equipment for use in repairing damaged concrete surfaces of the spillway face and bucket.

(d) The repair of damaged concrete surfaces will include the excavation of damaged and defective concrete from surfaces of the spillway bucket and of the spillway face, and the placing of concrete to restore such surfaces.

(e) Miscellaneous work will include repair of the fender barges; alterations to floating caisson equipment; removal of beams from left powerhouse wall; furnishing and installing diesel engines in sea mules; removal of puller houses and equipment from right and left powerhouse draft-tube bridges; removal of steel powder magazines; removal of wooden bridge superstructure; and extension of portal of drainage tunnel in left tailrace slope. Unit bids were as follows:

(1) Pacific Bridge Co. $2,662,866
(2) Morrison-Knudsen Co., Inc. & Peter Kiewit Sons' Co. 2,977,670
(3) Haas & Rothschild, Fred J. Early Jr. Co., & Stolte, Inc. $4,281,900
(4) Engineer's estimate 2,401,410

	(1)	(2)	(3)	(4)
50 hr., operation of cableway for the government	50.00	88.50	100.00	50.00
500 ton dredging	15.00	15.75	60.00	4.00
1,000 cu. yd. dredging in left tailrace	15.00	10.95	30.00	25.00
34,000 ton, placing riprap rock for underwater slope protection	3.55	2.35	2.50	1.00
1,000 pcs., placing armor rock for underwater slope protection obtained from left riverbank	51.80	63.00	75.00	40.00
5,000 pcs., placing armor rock for underwater slope protection obtained from right riverbank between lines B-1 and E-1	32.00	85.00	30.00	50.00
120 blks., placing concrete blocks for underwater slope protection	71.80	85.00	250.00	45.00
120 hrs., furnishing diving service	100.00	172.95	100.00	85.00

Continued on next page

NEWS of MANUFACTURERS

Continued from page 104

his new capacity will be G. D. SIMONDS, chief engineer, and F. D. HURLEY, director of manufacturing.

☆ ☆ ☆

Air Reduction Co., Inc., has announced the appointment of LEIGH W. HAEFLE as assistant chief engineer of the general engineering department. Haefle, who has been with the firm since 1938, was responsible for much of the engineering work connected with the expansion of the Airco oxygen and acetylene producing facilities during World War II.

☆ ☆ ☆

Among the officers and directors elected by the American Institute of Steel Construction at its annual convention in Houston were: Second vice president, J. PHILIP MURPHY, *Judson Pacific-Murphy Corp.*, Emeryville, Calif.; director, R. N. ALLEN, *Star Iron & Steel Co.*, Tacoma, Wash.

☆ ☆ ☆

Caterpillar Tractor Co. of San Leandro, Calif., announces broadening of its executive structure with the following appointments: HARMON S. EBERHARD, vice president since 1942, has been named to a newly-created executive vice presidency; WILLIAM BLACKIE, vice president since 1944, will coordinate administration of the San Leandro, Calif., and Joliet, Ill., plants and the new British subsidiary, Caterpillar Tractor Co., Ltd., with the company's Peoria, Ill., plant; E. W. JACKSON, director of parts and service, and RALPH M. MONK, director of industrial relations, have been named vice presidents. Caterpillar also announces promotion of four members of the Manufacturing Department: J. R. MUNRO, general factory manager, has been appointed to the new position of director of manufacturing; C. A. WOODLEY has been named general factory manager; W. L. NAUMANN and LLOYD J. ELY have been appointed assistant general factory managers.

MUNRO

☆ ☆ ☆

M. B. PREEMAN has been appointed vice president and general manager of the Road Machinery Division of *Standard Steel Corp.*, Los Angeles, pioneer West Coast heavy processing equipment manufacturer. Preeman, who joined Standard in 1946, has been actively connected with the paving field since 1926.

☆ ☆ ☆

Associated Wood Products Co. of Portland and the *Triangle Truss Co.* of Seattle, two of the West's outstanding companies in the field of roof trusses and structural laminating, have consolidated to form the

Continued on page 106

NEWS of MANUFACTURERS

Continued from page 105

Associated Wood Products Company of the Northwest. The new firm will be one of the largest companies of its kind in the United States. The Seattle plant will specialize in glue lamination, and the Portland plant will concentrate on fabrication and erection of timber roof and bridge structures.

☆ ☆ ☆

JONES

Link-Belt Co., manufacturer of materials handling and power transmission equipment, has appointed BERTRAM V. JONES advertising manager, succeeding JULIUS S. HOLL, deceased.

☆ ☆ ☆

Thew Shovel Co., Lorain, Ohio, announces the following appointments: M. B. GARBER, director of sales; J. T. CUSHING, sales manager; Q. J. WINSOR, manager of development sales.

☆ ☆ ☆

ROBERT S. KIRKSEY retired in November from active duty as vice president of the *Fruehauf Trailer Co.* He will continue, however, to serve in an advisory capacity and as a member of the board of directors. Kirksey has been connected with the sale of Fruehauf trailers in the Pacific Coast area for the past 20 years.

☆ ☆ ☆

On November 1 the widely known and respected corporate name of *Paraffine Companies, Inc.*, was replaced by the name, *Pabco Products, Inc.* The change was made because there was no similarity or direct connection between the names "Pabco" and "Paraffine." The new name will thus identify both the company and the products it manufactures.

☆ ☆ ☆

MAURICE N. TRAINER, formerly first vice president of *American Brake Shoe Co.*, is the recently elected president of the company. He succeeds WILLIAM B. GIVEN, JR., president for 21 years, who was elected chairman of the board. Trainer, who joined the company in 1916, was formerly with the Brake Shoe and Castings Division; he is also president of Dominion Brake Shoe Co., Ltd., a Canadian subsidiary. The promotion of WILLIAM T. KELLY, JR., as president of the American Brakeblok Division, was also announced by the company.

☆ ☆ ☆

ERVIN C. BREKELBAUM, formerly chief executive engineer, has been appointed vice president in charge of engineering of the *Harnischfeger Corp.*, Milwaukee. He is widely known in the field of arc welding and is an outstanding authority on welded design.

30 hrs., furnishing additional diving service	100.00	115.00	100.00	85.00
3 operations, preparation of drydock for operating season	$2,000	$7,081	$10,000	$4,000
3 operations, preparation of drydock for submergence	$1,000	$4,425	$10,000	$2,000
Lump sum, repair of fender barges	$10,000	$15,186	$10,000	$1,200
3 operations, installation of fender barges	$1,000	$3,054	$10,000	$1,500
3 operations, removal of fender barges	800.00	$2,124	$10,000	$1,000
Lump sum, preparation of puller machine installation for storage	$14,000	$23,962	$10,000	$15,000
3 operations, reinstallation of caisson equipment and machinery	$18,000	$21,243	$80,000	$10,000
Lump sum, alterations to floating caisson piping	$5,000	$1,531	$10,000	500.00
3 operations, sweeping approach channel	$1,200	$1,000	$10,000	$2,000
6 operations, mov. floating caisson betw. drydock & spillway bucket	$3,500	$2,735	$30,000	$4,500
8 operations, operating floating caisson	$30,000	$49,921	$60,000	$6,000
3 operations, storing caisson equipment	$6,000	$8,045	$70,000	$6,000
2 operations, moving face caisson between mooring and spillway face	$5,000	$2,765	$20,000	$1,500
3 operations, operating face caisson	$25,000	$18,865	$40,000	$5,000
6 operations, assembly of steel frame for seat construction	$9,000	$15,489	$47,000	$20,000
2 operations, placing steel frame for full seat construction	$75,000	$36,600	$60,000	$60,000
3 operations, placing steel frame for cont. of one side & one end seat	$30,000	$32,413	$60,000	$45,000
1 operation, placing steel frame for construction of end seat	$25,000	$87,549	$50,000	$20,000
Lump sum, furnishing and setting steel plate for repair of block 31	$80,000	$67,057	100,000	125,000
Lump sum, furnishing and setting steel plate for repair of block 64	$110,000	$67,057	100,000	125,000
16,200 lin. ft., drilling holes for anchor bars and grouting bars in place	9.00	4.70	10.00	7.00
3 sets, installing sets of 8 anchor rods and sleeves	$3,000	$1,303	$8,000	$1,000
Lump sum, installing anchor bolts on left training wall	$7,500	$4,257	$4,000	$5,000
Lump sum, installing temporary anchor in block 54	$2,000	740.00	$3,000	500.00
80 cu. yd. excavation of concrete on spillway face above tailwater	500.00	566.00	300.00	200.00
90 cu. yd. excavation of concrete using face caisson	300.00	460.00	500.00	300.00
1,340 cu. yd. excavation of concrete using floating caisson	300.00	372.00	300.00	325.00
150 recesses, excavation of concrete in recesses	150.00	88.50	220.00	20.00
2,500 sq. ft. refinishing concrete surfaces	5.50	6.90	4.00	3.50
23,000 lb., furnishing and installing steel screeds	.60	1.25	2.00	.90
73,000 lb., placing reinforcement bars	.20	.14	.40	.12
120,000 lb., furnishing reinforcement bars	.10	.13	.15	.06
2,130 cu. yd. concrete in spillway bucket	200.00	127.40	250.00	200.00
80 cu. yd. concrete in spillway face above tail water	225.00	309.00	300.00	250.00
90 cu. yd. concrete in spillway face using face caisson	200.00	177.00	400.00	250.00
90 cu. yd. prepakt concrete for seat construction	350.00	319.00	500.00	150.00
110 cu. yd. prepakt grout in blocks 31 and 64	280.00	336.00	500.00	200.00
Lump sum, removal of steel beams from left powerhouse wall	$2,000	$4,142	$55,000	$1,500
Lump sum, furnishing and installing diesel engines in 2 sea mules	$45,000	$46,426	$40,000	$30,000
Lump sum, furnishing and installing timber fender on steel workbarge	$2,500	$3,610	$2,000	$1,000
Lump sum, dismantling wooden bridge superstructure	$5,000	$4,425	$10,000	$1,800
Lump sum, extending drainage tunnel in left tailrace slope	$5,000	$4,425	$8,500	$2,000
Lump sum, dismantling 3 powder magazines	$5,000	$3,186	$5,000	750.00
500 ton, transp. materials betw. railhead at Odair, Wash, & work site	15.00	15.00	15.00	11.00

Clearing Reservoir Site at Detroit Dam

Oregon—Marion County—Corps of Engineers. Schutt Construction Co., Inc., Genoa, Wis., with a bid of $362,999, was low bid before the Corps of Engineers for clearing areas F and G in the reservoir area, 4½ mi. above Detroit Damsite. Area F lies on the south side of the North Santiam River and Area G lies on the north and west sides of the Breitenbush River. Part A consists of clearing Area F, approx. 280 acres; Part B consists of clearing Area G, approx. 510 acres. Bids were submitted as follows:

	Part A	Part B	A & B
(1) Schutt Construction Co., Inc.	.....	.....	$362,999
(2) Petersen Engineering Co.	$162,000	$246,894	408,894
(3) E. L. Gates & Co., Inc.	222,600	219,300	441,900
(4) Keechelus Logging Co.	168,000	306,000	474,000
(5) Utah Construction Co.	252,000	280,500	532,500
(6) M. A. Pithoud	210,000	329,715	539,715
(7) Penrod Construction Co., Inc.	294,000	252,450	546,450
(8) Guy F. Atkinson Co.	284,840	282,800	567,640
(9) Thompson-Hendrickson Logging Co.	290,500	320,500	611,000
(10) Engineer's estimate	210,000	265,200	475,200

Highway and Street . . .

Grading and Paving With Portland Cement Concrete and Plant-Mix Surfacing on Eastshore Freeway

California-Alameda County—State. Fredrickson & Watson Construction Co. and M. & K. Corporation, Oakland, Calif., with a bid of $2,871,212, was low before the California Division of Highways for grading and paving with portland cement concrete and plant-mix surfacing about 4.2 mi. and constructing highway separation structures on Eastshore Freeway between San Leandro and San Lorenzo. Unit bids were as follows:

(1) Fredrickson & Watson Construction Co. and M. & K. Corporation $2,871,212
(2) Guy F. Atkinson Co. 2,920,371
(3) Peter Kiewit Sons' Co. 2,943,746
(4) United Concrete Pipe Corp. $2,983,665
(5) Harms Bros. & N. M. Ball Sons 2,985,286
(6) Fredrickson Bros. and Bates & Rogers Construction Corp. 3,078,943

	(1)	(2)	(3)	(4)	(5)	(6)
1,900 cu. yd. remove concrete	1.00	3.00	1.70	3.00	5.00	3.00
Lump Sum, clear and grub	$30,000	$8,000	$24,000	$50,000	$26,535	$10,000
324,300 cu. yd. roadway excavation	.29	.24	.38	.31	.40	.32
24,300 cu. yd. structural excavation	2.00	2.00	1.90	1.75	2.40	2.50
6,260 cu. yd. structural excavation (bridges)	1.56	2.20	2.30	1.20	2.00	2.15
3,420 cu. yd. structural backfill (bridges)	2.15	2.20	3.00	1.75	2.00	4.50
5,600 cu. yd. channel excavation	.45	.35	.60	.60	.25	.75
3,850 cu. yd. ditch and channel excavation	1.00	1.00	1.25	1.20	.60	1.00
315,000 sq. yd. compact. orig. ground	.26	.04	.04	.05	.06	.04
5,200,000 sta. yd. overhaul	.0034	.003	.0015	.0025	.003	.003
572,100 ton imp. borrow	.51	.62	.61	.75	.66	.75
230,500 ton I. B. M.	1.05	.79	1.00	1.00	.92	.91
440 ton sand backfill	3.35	3.00	2.50	2.50	3.00	4.00
232,200 sq. yd. cultivat. (preparatory landscaping)	.026	.07	.06	.07	.02	.06
Lump sum, develop water supply & furnish water equip.	$12,000	$5,000	$17,000	$8,000	$7,000	$8,000
24,300 M gal., apply water	1.00	1.30	1.00	1.10	1.45	1.35
Lump sum, finish roadway	$12,000	$5,000	$8,750	$3,500	$4,000	$8,000
121,000 sq. yd. mix and compact (C.T.S.)	.20	.20	.15	.16	.20	.20
8,250 bbl. P. C. (C.T.S.)	3.93	3.20	3.40	4.00	4.00	4.00
38,300 ton C. R. B.	2.48	2.70	2.30	2.10	2.50	2.55
215 ton liquid asphalt SC-1 (pr. ct. & pen. tr.)	27.00	26.00	26.50	24.00	28.00	28.00
54 tons liquid asphalt (SC-2 (pen. tr.)	27.00	26.00	25.25	23.00	24.00	28.00
29 ton liquid asphalt SC-6 (armor coat)	30.00	26.00	29.00	22.00	37.00	28.00
730 ton sand (pen. tr. & sl. ct.)	4.50	4.50	4.50	4.00	4.00	4.30
160 ton asphalt emuls. (cur. sl. c.t.s. & sl. ct.)	32.00	36.00	35.00	40.00	45.00	37.00
500 ton screenings (armor ct. & sl. ct.)	6.30	5.50	5.00	4.00	5.00	5.50

Continued on next page

Common-Sense Equipment Protection during STEEL SHORTAGES

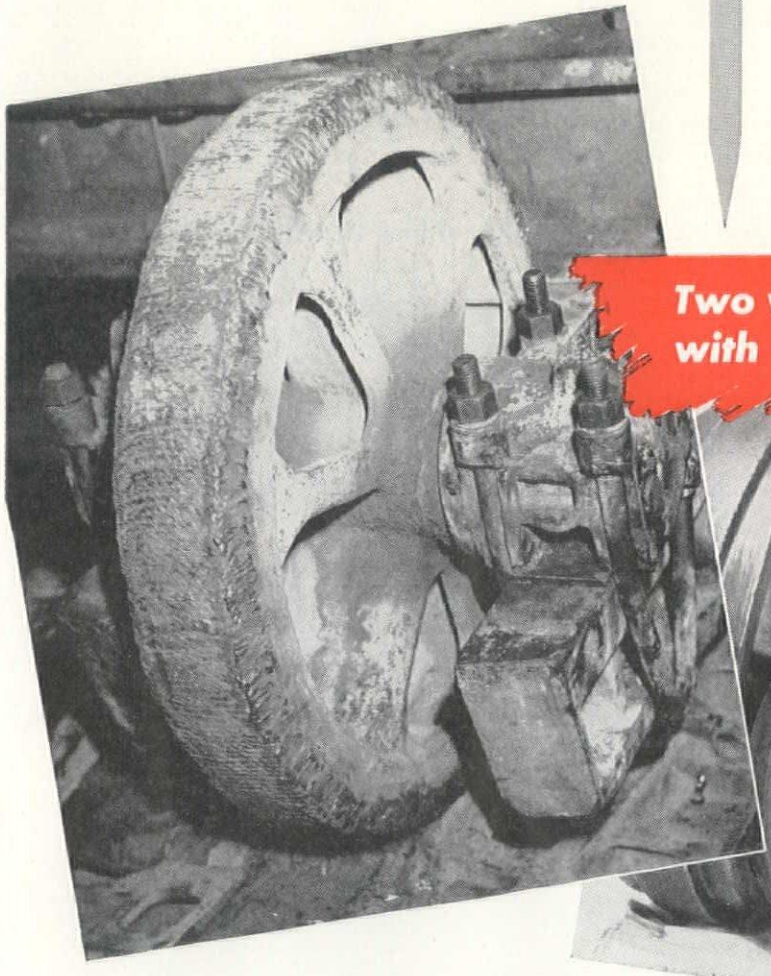
WITH SHORTAGES again threatening, Stoody Hard-Facing returns to war-time importance . . . the job of keeping equipment on the go, of combating all replacement scarcities by making the old parts do.

Surprisingly, Stoody Hard-Facing not only reclaims worn equipment, *but actually restores it to better-than-new condition* at less than new-part cost. Since only the areas of concentrated wear need protection, the job is simple and economical.

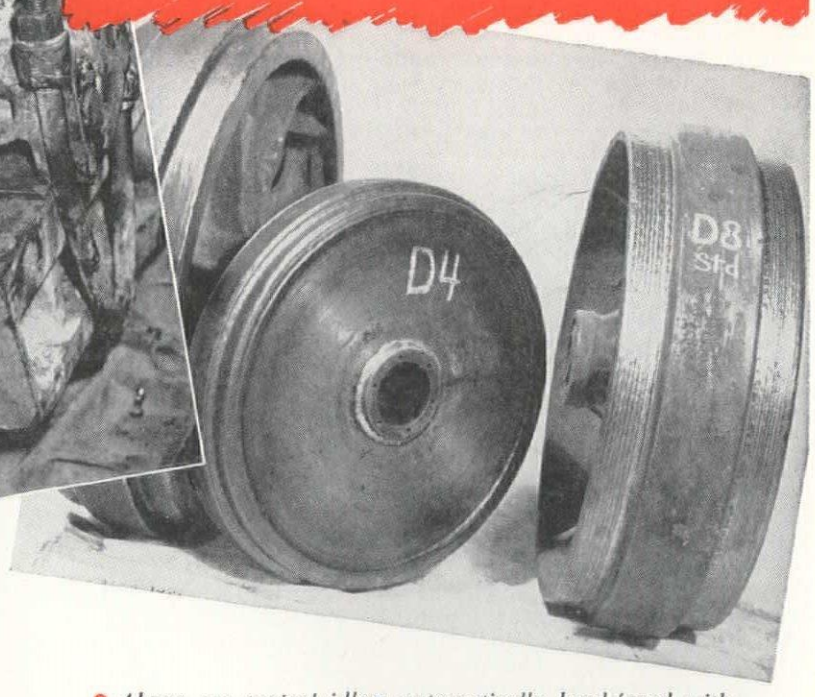
A part whose life is doubled—or tripled—not only conserves dollars but protects your precious inventory of spare parts when replacements become difficult or impossible to obtain.

Start making your steel go farther now with this common-sense protection . . . Hard-face all wearing parts with STOODY ALLOYS, touch up as required for ultimate life. It's your best insurance against wear at *all* times.

Two ways to fight steel shortages with STOODY ALLOYS



● *This illustration shows a worn RD-8 Tractor Idler wheel manually hard-faced with Stoody Self-Hardening. It outwore two new wheels. Application cost was only a fraction of replacement cost.*



● *Above are typical idlers automatically hard-faced with Stoody 105. Automatic welding insures greater smoothness and uniformity of deposit besides lowering cost.*

STOODY COMPANY 11956 EAST SLAUSON AVENUE, WHITTIER, CALIFORNIA

Small-town Sewerage

. . . Continued from page 62

different type of problem. The original plans were for a gravity line of 10-in. Transite pipe specified as cement pressure pipe, Class 150, with collar and rubber gasket joints for ease in making connections under water. This pipe is tough to withstand shock from wave action and is non-corrosive in salt water. It is lighter than cast iron and more easily handled in laying but requires concrete anchor blocks at every length to prevent uplift when submerged.

The cost of this pipe was considerably less than cast iron of the same size. Vitrified clay, although cheaper than Transite and equally resistant to salt water, is brittle and subject to breakage from impact of waves and drift, as shown by past experience. Cement joints are subjected to action of salt water, and hot-poured joints cannot be satisfactorily made when the pipe is wet.

The greatest saving in cost for the beach outfall was finally found obtainable by use of 8-in. mechanical joint cast-iron pipe to be laid in the old existing trench where no rock cut would be required. This line was to be operated under pressure. Head for pressure flow was obtained from the main pumping station by raising the lower end of the 6-in. force main from elev. 15 to elev. 26 where it discharged into a manhole at the inlet to the beach outfall.

This head was sufficient to insure a strong flow in the beach line even at highest tide when the discharge end of the sewer would be submerged under 7 ft. of water. It also provided carrying velocities at low tide, which would keep the line clear of solids. To prevent leakage at vertical lateral connections, of which there were more than twenty, 6- and 4-in. cast-iron T-connections were made to the pressure sewer and extended up 10 ft. above tide level. In lieu of manholes, 8- by 8- by 6-in. Y branches were used, having brass caps threaded into brass rings leaded into the bell end of the Y-branch.

Another reduction in final cost was accomplished by pumping sewage from the west side over the top of Belvedere Island. This eliminated a gravity line 2,350 ft. in length around the south end of the island, including one rock section 800 ft. in length where grade was 8 to 18 ft. below road surface. The pumping head was 130 ft., and the length of 4-in. cast-iron force main was 480 ft. in shallow trench. Existing gravity sewers were used to convey the effluent from the crest of the island to the outfall line on the beach.

Final contract price

Three complete bids were received on modified plans, the low bid amounting to $201,080. The other two bids were for $262,105 and $296,022. The low bidder was also low considering the treatment plant alone, the amounts bid being $90,236, $98,900, and $102,170. As even the low bid exceeded the funds available, the city exercised the option of eliminating the treatment plant, thus re-

Continued on page 111

15,250	ton min. aggr. (P.M.S.)	4.35	4.50	4.75	3.70	4.50	4.20
660	ton pav. asphalt (P.M.S.)	22.00	23.00	4.75	19.00	4.50	20.00
130	ton liq. asph. MC-3 or MC-4 (P.M.S. detours)	22.00	25.00	4.75	20.00	23.00	24.00
230	lin. ft. raised traffic bars	1.40	1.50	1.00	1.00	1.30	1.70
26,354	cu. yd. class "B" P.C.C. (pavement)	12.18	12.00	11.85	12.50	12.50	12.25
19,000	ea., pavement tie bolt assemblies	.52	.50	.50	.50	.56	.45
8,660	cu. yd. class "A" P.C.C. (struc.)	41.00	48.70	43.00	41.00	40.00	47.85
430	lin. ft. Rubber waterstops	3.30	2.50	2.20	2.00	4.00	2.80
2,977,000	lb. struc. steel	.09	.09	.10	.09	.082	.088
Clean and paint struc. steel		$33,000	$30,000	$30,000	$30,000	$29,932	$31,254
1,215,000	lb. bar reinf. steel	.093	.09	.10	.09	.088	.093
113,000	lb. Misc. iron & steel	.22	.27	.20	.22	.21	.275
3,879	lin. ft. steel railing	6.40	6.00	6.00	6.00	5.85	6.20
36,010	lin. ft. Furnish. conc. piling	3.05	3.25	2.75	3.00	2.90	3.00
1,061	ea., driving piles	44.00	40.00	30.00	35.00	52.00	36.50
34	cu. yd. Filter material	8.00	7.00	6.50	5.00	8.00	7.60
62	lin. ft. 4-in. steel downdrains	3.00	5.00	3.50	4.00	3.00	2.50
70	cu. yd. Broken conc. riprap	12.00	20.00	15.00	6.00	15.00	14.00
6,400	cu. yd. Cl. "B" P. C. C. (curbs & gutters)	28.60	27.00	25.00	26.00	31.00	32.00
500	cu. yd. Cl. "B" P. C. C. (sidewalks)	28.60	26.00	25.00	28.00	26.75	27.00
100	cu. yd. Cl. "B" P.C.C. (island surf.)	28.60	25.00	25.00	28.00	23.54	25.00
185	ea. Right of way monuments	6.00	6.00	7.00	5.00	7.00	4.50
31	ea. Survey monuments	23.00	30.00	25.00	20.00	25.00	20.00
5,600	lin. ft. metal plate guard rail	2.80	3.25	3.00	2.80	3.20	3.00
450	ea. Culv. mkrs., guide posts & monu. mkrs.	5.00	6.00	8.00	5.00	6.00	4.00
40	ea. Horiz. reflector units	6.50	14.00	10.00	7.00	8.00	8.00
51,600	lin. ft. chain link fence	1.60	1.80	1.60	1.90	1.91	1.70
8	ea. Chain link fence walkgates	60.00	80.00	60.00	80.00	75.00	60.00
9,575	lin. ft. 12-in. R.C.P. (std. str.)	2.40	2.00	2.70	2.50	2.50	2.10
195	lin. ft. 12-in. R.C.P. (3,000 "D")	2.70	2.50	3.00	2.75	3.00	2.35
2,230	lin. ft. 15-in. R.C.P. (std. str.)	3.00	2.50	3.00	3.00	3.00	2.60
4,970	lin. ft. 18-in. R.C.P. (std. str.)	3.50	3.25	4.00	3.50	4.00	3.30
280	lin. ft. 18-in. R.C.P. (3,000 "D")	4.40	4.25	4.50	4.40	4.50	4.20
1,080	lin. ft. 21-in. R. C. P. (std. str.)	4.40	4.50	4.50	4.50	5.00	4.20
1,260	lin. ft. 24-in. R. C. P. (std. str.)	5.00	5.50	6.00	5.00	6.00	5.35
520	lin. ft. 30-in. R.C.P. (std. str.)	5.75	6.50	7.00	6.50	8.00	6.55
20	lin. ft. 30-in. R.C.P. (3,000 "D")	8.50	8.50	8.50	8.00	8.75	8.25
920	lin. ft. 33-in. R. C. P. (std. str.)	8.00	8.50	8.50	8.00	9.00	7.90
320	lin. ft. 48-in. R. C. P. (std. str)	13.00	13.50	13.00	12.50	16.00	13.35
530	lin. ft. 12-in. C.M.P. (16 ga.)	2.40	2.50	3.00	2.00	2.00	2.20
5	ea. Salv. manhole fr. & covers	18.00	20.00	18.00	10.00	15.00	12.00
102	lin. ft. new manholes	31.00	50.00	22.00	15.00	26.00	22.00
14	ea., new manholes fr. & covers	56.00	55.00	55.00	40.00	60.00	50.00
8	ea. Remodeling exist. manholes	90.00	100.00	115.00	50.00	150.00	175.00
8	ea. Adjust. manholes to grade	55.00	35.00	40.00	25.00	70.00	60.00
370	lin. ft. welded steel pipe	2.00	4.00	3.00	1.70	1.85	1.15
15,000	sq. yd. Salvag. P. M. S.	.09	.10	.12	.25	.07	.14
	Drain, pump, equip, (Washington Ave. Inter.)	$6,000	$7,000	$10,000	$6,000	$8,661	$6,610
	Drain, pump, equip. (Williams St. Over.)	$6,300	$7,000	$10,000	$6,000	$8,968	$6,605
	Pump house elect. equip. (Wash. Ave. Inter.)	$2,100	$2,100	$3,000	$2,000	$1,085	$2,300
	Pump house elect. equip. (Williams St. Over.)	$2,400	$2,400	$3,000	$2,100	$2,285	$2,300
127	ea. Single electroliers	575.00	580.00	600.00	650.00	559.00	615.00
2	ea. Double electroliers	700.00	$1,300	$1,300	$1,000	565.00	685.00
	Electrical work on struc.	$6,700	$6,500	$10,000	$5,000	$5,185	$3,100

Mineral Aggregate for Bituminous Penetration Macadam

Washington—Walla Walla County—State. J. Arlie Bryant, Spokane, with a low bid of $40,770, was awarded a contract by the Department of Highways for mineral aggregate for bituminous penetration macadam in stockpile on the highway from Wallula to Oregon state line, Walla Walla County. Unit bids are as follows:

(1)	J. Arlie Bryant	$40,770	
(2)	Bauline & Frieske Const. Co.	42,220	
(3)	F. H. DeAtley & Co.	43,780	
(4)	Carbon Bros.	$45,480	
(5)	Peter Kiewit Sons' Co.	48,925	
(6)	Ray Weist	59,663	

		(1)	(2)	(3)	(4)	(5)	(6)
17,000	tons crushed stone surf. top coarse in stockpile	$ .80	$ .85	$ .90	$1.00	$ .95	$1.15
28,100	tons ballast, in stockpile	.70	.70	.80	.80	.75	.98
3,300	tons base rock, 1¼"-¾" in stockpile	1.00	1.35	1.00	1.00	1.95	2.00
800	tons Keystone, ¾"-½" in stockpile	1.00	1.35	1.00	1.00	1.95	2.25
1,500	tons coarse cr. screen. ½"-No. 4 sieve in stkple.	2.00	1.35	1.00	1.00	1.95	2.25
400	tons fine crushed screen No. 4 sieve 0 in stkple.	1.00	1.35	1.00	1.00	1.95	2.00

Gravel Base Course, Bituminous Surface Treatment, Reinforced Concrete Culverts

Wyoming—Sheridan County—State. Peter Kiewit Sons' Co., Sheridan, Wyo., with a low bid of $426,427 was awarded a contract by the Wyoming Highway Department for grading, draining, base course surfacing, base course stabilization, 3 continuous span bridge, 4 reinforced concrete culverts, and miscellaneous work on 7.4 mi. of the Montana state line-Sheridan road in Sheridan County. Unit bids were as follows:

(1)	Peter Kiewit Sons' Co.	$426,427	
(2)	Stanley H. Arkwright, Inc.	428,469	
(3)	J. H. & N. M. Monaghan	441,487	
(4)	Northwestern Engineering Co.	$442,754	
(5)	Lowdermilk Bros.	483,670	
(6)	Engineer's estimate	421,717	

		(1)	(2)	(3)	(4)	(5)	(6)
480,000	cu. yd. excavation	.25	.2424	.25	.23	.29	.21
76,800	cu. yd. excavation (selected embankment)	.35	.305	.30	.33	.30	.30
338,000	cu. yd. sta. overhaul	.01	.01	.01	.01	.01	.01
338,000	cu. yd. mi., cubic yard mile haul	.12	.15	.10	.10	.15	.15
6,270	M gal. watering (emb.)	.75	1.50	1.00	1.50	1.00	1.50
2,100	hr. sheep's foot roller operation	7.00	9.00	10.00	11.00	9.00	9.00
250	hr. pneumatic tired roller operation	5.00	6.00	6.50	5.20	6.50	7.00
125	hr. smooth steel roller operation	7.00	8.00	7.00	6.00	10.00	7.00
432	cu. yd. structure excavation	2.00	3.50	3.00	2.50	4.50	3.00
505	hr. mechanical tamping	7.00	6.00	6.00	6.00	5.50	6.00
265	cu. yd. class 1 riprap	12.00	15.00	12.00	7.80	12.50	7.00
50	cu. yd. grouted riprap	20.00	20.00	16.00	15.00	22.50	10.00
1,550	cu. yd. excavation for pipe culverts	1.00	2.00	2.00	2.00	1.50	2.00
1,925	cu. yd. special backfill	2.00	1.50	3.00	3.20	2.25	1.50
500	lin. ft. 12-in. std. R.C.P.	3.00	2.65	3.10	2.65	4.00	2.50
1,236	lin. ft. 18-in. std. R.C.P.	5.00	4.85	5.10	4.90	5.25	4.50
1,424	lin ft. 24-in. std. R.C.P.	7.00	7.00	7.15	7.10	7.10	6.50
376	lin. ft. 30-in. std. R.C.P.	10.00	10.00	10.70	9.60	10.50	9.00
32	lin. ft. 18-in. C.M.P.	4.00	5.00	3.95	3.70	4.50	3.50
192	lin. ft. 18-in. siphon R.C.P.—type A	8.00	6.80	8.00	10.80	10.35	7.00
176	lin. ft. 24-in. siphon R.C.P.—type B	10.00	9.20	10.75	15.00	13.00	8.00
300	lin. ft. 8-in. perforated C.M.P.	2.00	1.75	2.00	2.00	3.00	2.00
80	cu. yd. excavation for drains	3.00	3.50	2.50	2.40	2.50	2.50
75	cu. yd. gravel for drains	5.00	5.00	3.00	2.40	3.50	2.50
418	lin. ft. relaying pipe	1.50	2.25	2.50	2.00	2.00	1.50
0.5	M.B.M. untreated timber	250.00	250.00	400.00	350.00	400.00	250.00
205	ea., reflectorized guide posts	4.00	5.00	5.00	4.80	5.00	4.00

Continued on next page

How to keep a batch of concrete from becoming a batch of trouble

Even a minor breakdown can cost you hundreds of dollars when you're hauling ready-mix concrete.

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INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY CHICAGO

4,000	lin. ft. metal plate guard fence—type B	3.00	3.25	2.90	3.00	2.90	3.00
17,700	lin. ft. standard R-W fence	.15	.145	.19	.18	.18	.16
5,350	lin. ft. type A R-W fence	.22	.235	.30	.25	.35	.23
45	ea., end panels	15.00	10.50	12.00	12.00	9.00	13.00
65	ea., brace panels	10.00	9.50	10.00	10.00	11.00	12.00
7,300	lin. ft. removing and resetting R-W fence	.10	.12	.12	.12	.14	.12
35	ea., fence posts	1.00	1.00	2.00	1.50	2.00	1.00
50	ea., R-W markers	8.00	10.00	10.00	12.00	10.00	10.00
43,500	ton crushed gravel base course (2-in. max.) grading A	.69	.385	.55	.58	.50	.50
27,850	ton crushed gravel base course (1-in. max.)	.75	.48	.70	.62	.70	.60
332,500	t. mi., haul of surfacing material	.06	.065	.08	.08	.08	.08
1,500	M gal. watering (base)	1.00	1.50	1.00	1.50	1.00	1.50
600	hr. roller operation	7.00	6.00	7.00	5.50	7.50	7.00
609.1	cu. yd. class B concrete	43.00	47.50	46.00	50.00	52.50	45.00
68,910	lb. reinforcing steel	.10	.115	.13	.13	.125	.13
66,250	lb. structural steel	.14	.17	.16	.16	.15	.16
Lump sum	removing existing structures	750.00	615.00	$1,500	$4,000	$8,500	$1,500
160	cu. yd. dry excavation for bridges	2.00	2.00	3.00	2.00	3.50	5.00
672	lin. ft. cast in place concrete piles	11.00	12.00	12.00	12.00	12.50	8.00
160	lin. ft. preboring of holes for piling	2.00	10.00	10.00	4.00	4.00	2.00
1	ea., prov. & maint. field test. lab. bldg.	400.00	250.00	500.00	600.00	780.00	400.00
870	ton sand	4.00	5.00	5.00	5.50	3.50	4.00
425	ton asphaltic material MC-3	30.00	30.00	33.00	34.00	37.50	35.00
95	ton asphaltic material RC-2	32.00	33.00	35.00	34.00	37.50	35.00
113,300	sq. yd. processing	.06	.05	.08	.09	.07	.07

2-in. Road-mix Bituminous Surface

Utah—Washington County—State. Thorn Construction Co., Inc., Springville, Utah, with a bid of $132,057, was low before the State Road Commission of Utah for constructing 5.7 mi. of roadway between New Harmony and U. S. Highway 91, Washington County, Utah. Unit bids were as follows:

(1) Thorn Construction Co., Inc. $132,057
(2) Parson & Fife Construction Co. 132,297
(3) J. M. Sumsion & Sons Co. 135,384
(4) R. M. Jensen 138,158
(5) W. W. Clyde & Co. $143,917
(6) Reynolds Construction Co. 151,649
(7) Engineer's estimate 124,301

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
113,000	gal. bituminous material, type SC-3	.13	.14	.12	.125	.12	.14	.11
22,000	gal. bituminous material, type RC-4	.17	.155	.14	.16	.14	.16	.15
5.723	mi. scarifying & mixing	600.00	650.00	600.00	600.00	700.00	600.00	700.00
1,100	ton cover material	3.00	3.00	3.00	3.50	3.50	3.00	2.50
5,000	ton cover material (place in stockpile)	2.00	1.60	2.00	2.00	2.00	2.50	2.00
30,000	ton cr. rk. or cr. gravel surf. course	.60	.66	.70	.69	.70	.65	.65
10,000	ton crushed rk. or cr. grav. surf. crse. (place in stockpile)	.50	.50	.50	.48	.55	.50	.50
22,000	cu. yd. selected material base course	.53	.57	.52	.65	.95	.75	.45
63,500	cu. yd. unclassified excavation	.20	.22	.24	.21	.22	.25	.20
51,000	sta. yd. overhaul, class "A"	.015	.015	.02	.015	.015	.02	.015
200	yd. mi. overhaul, class "B"	.25	.20	.30	.20	.20	.25	.15
2,000	1,000 gal. watering	1.50	1.25	2.00	1.50	1.50	2.00	2.00
1,300	hr. rolling	4.00	5.00	4.00	5.00	4.50	5.00	4.50
260	lin. ft. 15-in. C.G.M. pipe	2.70	2.63	2.50	2.60	2.50	2.70	2.58
110	lin. ft. C.G.M. pipe	3.00	3.10	3.00	3.10	3.10	3.00	3.00
1,012	lin. ft. 24-in. C.G.M. pipe	4.50	4.50	4.00	4.25	4.80	4.60	4.70
180	lin. ft. 30-in. C.G.M. pipe	5.80	5.25	5.00	5.50	6.40	6.20	5.90
50	lin. ft. 36-in. C.G.M. pipe	9.00	8.50	8.00	8.00	9.50	9.00	9.50
104	lin. ft. 48-in. C.G.M. pipe	12.50	12.00	11.00	11.00	12.60	15.00	12.00
66	lin. ft. 72-in. C.G.M. pipe (beveled ends)	25.00	25.00	22.00	21.00	29.60	25.00	26.00
72	lin. ft. 84-in. C.G.M. pipe (beveled ends)	34.00	34.50	31.00	32.00	40.00	35.00	35.00
92	lin. ft. C.M. pipe arches 22-in. x 13-in.	4.00	3.25	3.00	3.75	3.35	3.50	3.25
160	lin. ft. C.M. pipe arches 29-in. x 18-in.	6.00	4.60	4.25	5.00	5.10	5.00	4.85
72	lin. ft. C.M. pipe arches 65-in. x 40-in.	20.00	16.00	16.00	14.00	14.70	16.00	14.00
203	cu. yd. concrete, class "A"	70.00	70.00	75.00	67.50	65.00	75.00	55.00
32,314	lb. reinforcing steel	.12	.13	.14	.135	.125	.15	.11
1,700	cu. yd. excavation for structures	2.00	1.00	2.00	2.50	1.50	2.00	1.50
1,600	cu. yd. channel excavation	.50	.40	.40	.55	.50	1.00	.35
105	cu. yd. loose rip rap	4.00	5.00	10.00	15.00	7.00	20.00	3.00
31	ea., guide posts	5.00	5.00	6.00	5.00	5.00	7.00	5.00
1	ea., removal of existing structure	$2,000	500.00	500.00	750.00	700.00	$1,500	500.00
74	ea., right of way markers	5.00	6.00	3.00	5.00	5.00	6.00	5.00
2	ea., F.A.P. markers	20.00	20.00	20.00	25.00	25.00	20.00	20.00

Bituminous Surfacing on Cement-Treated Base

Washington—Pierce County—State. Western Asphalt Co., Seattle, with a low bid of $278,371, was awarded a contract by the Department of Highways for paving with light bituminous surface treatment, Method A, and bituminous surface treatment, plant mix Type F, on cement-treated base, between Purdy and Point Fosdick Road, Pierce County. Unit bids were as follows:

(1) Western Asphalt Co. $278,371
(2) Pacific Sand & Gravel Co. 311,678
(3) J. D. Shotwell Co. 348,960

		(1)	(2)	(3)
1,140	cu. yd. unclassified excavation, including haul	$2.00	$1.00	$1.50
110	cu. yd. common trench excavation, including haul	1.50	2.50	3.00
1,230	cu. yd. structure excavation	.75	3.50	3.00
1,850	M gal. water in place	.50	2.40	3.00
680	cu. yd. gravel backfill for drains in place	4.00	4.50	3.00
1,290	tons selected roadway borrow in place	1.25	1.25	2.50
5,690	tons one course screen. gravel surf. in place	1.75	2.75	2.50
17,750	tons one course screen. gravel surf. in pl. fr. stockpile	1.45	1.60	1.75
10,840	tons crush. stone surf. mod. base crs. in pl. fr. stockpile	1.45	1.80	1.50
560	cu. yd. top soil in place	2.00	3.50	1.50
	LIGHT BITUMINOUS SURFACE TREATMENT METHOD A			
63	mi. preparation, construction, finishing	200.00	250.00	450.00
229	tons asphalt cement MC-3 in place, at	35.50	38.00	42.50
2,600	cu. yd. placing crush. cover stone from stockpile	1.40	1.75	1.50
	BITUMINOUS SURFACE TREATMENT "PLANT MIX" TYPE F			
683	tons asphalt cement 201-300 penetration-plt. mix in plant	26.50	30.00	30.00
13,676	tons mixing and placing bit. mixture	3.00	3.00	4.00
	CEMENT TREATED BASE			
101	tons emuls. asph. penetration typ. (cur. seal) in pl	70.00	55.00	65.00
9,502	bbl. Portland cement in place	4.10	4.80	4.00
26,200	tons mixing and plac. cement treated base	2.60	2.30	3.50
	OTHER ITEMS			
138	sq. yd. cement conc. pave. std. 14-day mix 8" sec. in pl	4.00	6.00	6.00
213	sq. yd. cement conc. pave. std. 3-day mix 8" sec. in pl	5.00	7.50	6.50
138	sq. yd. concrete placed as extra thickness	2.50	3.40	5.00

Continued on next page

Small-town Sewerage

Continued from page 108

ducing the low bid price to $110,943. With extras, the final contract price was $118,034.

Quantities indicated on finally prepared plans and unit bid prices were:

6,206 ft. of 6-in. vitrified clay sewer pipe	$3.04 per lin. ft.
3,340 ft. of 8-in. vitrified clay sewer pipe	3.98 per lin. ft.
36 manholes	127.00 ea.
646 ft. 4-in. B&S cast-iron force main	3.05 per lin. ft.
1,153 ft. 6-in. B&S cast-iron force main	3.90 per lin. ft.
1,065 ft. of 6-inch cast-iron mech. joint pipe	5.35 per lin. ft.
2,674 ft. of 8-in. cast-iron mech. joint pipe	6.20 per lin. ft.
5 sewage pumping plants	....
1 primary sewage treatment plant design population 1,500	....

Construction of the beach lines, although possible only at medium and low tide, was accomplished without undue difficulty. Attempt to remove the old pipe using a small crawler tractor was unsuccessful as the treads ground themselves into the soft beach material. A long cable operated by winch-truck on the street several hundred feet above the beach proved quite satisfactory. Trenching was attempted with a Fordson excavator on the beach but with little success as the trench caved in between tides. Most of the trenching was done by hand. A most useful piece of equipment was an LCVP Navy landing barge 36 ft. long with a 20-ft. well operated by a 225-hp. Gray diesel engine. This was used in transporting mobile equipment to and from the beach, delivering pipe, and standing by with air compressor and similar equipment. Concrete encasement and anchor blocks for pipe were poured from ready-mix trucks on the street above through portable chute and wheelbarrow along the beach.

The initial bid price for the work would have represented an expenditure of $465 per capita for a population of 700. This greatly exceeded the current cost for similar facilities in other communities but may be accounted for by the large percentage of work which had to be performed on an exposed, narrow beach submerged at every tide. The contract price for the work finally performed was $170 per capita. Although not providing sewage treatment facilities, it is believed that this expenditure was reasonable for the works obtained, considering current high prices for labor and materials, difficult terrain, and abnormal pumping requirements.

Plans and specifications were prepared by the writer, who also supervised the construction work as city engineer, with Ralph B. Robinson and Fred C. Evans as inspectors. Lloyd E. Allen was assistant engineer in preliminary investigations, design, and initial plans. The general contractor was Macnsons Contracting Engineers, with Jerald McClenahan as superintendent, and John L. Rumsey, engineer.

13,200	lbs. pavement reinforcement Type No. 2 in place	.15	.15	.15
21,052	lin. ft. asphaltic concrete dyke in place	.30	.72	.60
371	lin. ft. asphaltic concrete gutter in place	1.00	1.00	.75
2,767	lin. ft. Type A precast white reflect. curb in place	1.80	2.40	2.20
791	lin. ft. Type C precast white reflect. curb in place	2.25	2.75	3.00
2	only, precast white reflect. traffic buttons in pl.	5.00	2.25	25.00
2	only, illuminated terminal nosing Type No. 1 in pl.	75.00	30.00	50.00
2	only, illuminated terminal nosing Type No. 2 in pl.	75.00	42.00	50.00
100	lin. ft. galvanized conduit pipe ¾" diam. in place	.75	1.25	.50
850	lin. ft. perforated corr. metal drain pipe 8" diam. in pl.	2.10	2.40	1.60
30	lin. ft. plain conc. culv. pipe 12" diameter in place	2.00	2.40	2.00
50	lin. ft. plain corr. metal culv. pipe #16 ga. 8" diam. in pl.	2.00	2.40	1.60
2,395	lin. ft. bit. coat. corr. metal culv. pipe #16 ga. Type #2 8" diam. in pl.	2.10	2.40	1.70
1	only, catch basin in place	100.00	90.00	250.00
57	only, special conc. inlet with C. I. Frame and Grate in pl.	50.00	48.00	50.00
114	cu. yd. hand placed riprap in place	10.00	12.00	40.00
12	only, monument case and cover in place	45.00	30.00	22.50
1,020	cu. yd. crushed cover stone in place from stockpile	1.50	1.50	2.00

Heavy Grading and Drainage Over New Alignment

Arizona—Pinal County—State. Fisher Contracting Co., Phoenix, with a bid of $284,448, was low before the Arizona State Highway Department for grading and draining the roadway over a new alignment, beginning about 2 mi. northeast of Superior on the Superior-Miami highway and extending easterly for a distance of approximately one-half mile, Pinal County, Arizona. Unit bids were as follows:

(1) Fisher Contracting Co. $284,448
(2) Arizona Sand & Rock Co. 306,877
(3) Orr & Orr Construction Co. 322,591

		(1)	(2)	(3)
136,550	cu. yd. roadway excavation	1.76	1.92	2.00
10,950	cu. yd. overbreakage	1.32	1.44	1.50
5,400	cu. yd. slides	.88	.96	1.00
8,800	cu. yd. drainage excavation	1.70	1.67	2.00
165	cu. yd. structural excavation	6.80	5.00	6.00
3,900	cu. yd. mi. overhaul	.50	.40	.60
7	cu. yd. class A concrete (including cement)	88.00	100.00	80.00
380	lb. reinforcing steel (bars) (CIP)	.16	.30	.20
246	lin. ft. 30-in. bituminous coated corrugated metal pipe (CIP except excav.)	8.00	9.00	10.00
140	lin. ft. 60-in. bituminous coated corr. met. pipe (CIP except excav.)	26.50	26.00	26.00

Railroad . . .

Constructing Ballast, Ties and Rails for Railroad Relocation

Oregon—Lane County—Corps of Engineers. Utah Construction Co., Richmond, Calif., with a bid of $199,463, was low before the Corps of Engineers for furnishing ballast, ties, rail and appurtenances and constructing track for Southern Pacific Co. Project begins about 12 mi. upstream from Lowell, Ore., on existing Southern Pacific Co. railroad. The bid was rejected and the job will be readvertised. Unit bids were as follows:

(1) Utah Construction Co. ..... $199,463 (2) Engineer's estimate $120,450

		(1)	(2)
5,500	cu. yd., Ballast material, in place	8.04	4.20
4,700	lin. track ft., Track laying, new 132-lb. rail	19.20	12.28
2,500	lin. track ft., Track laying, shoofly track, used 131- or 132-lb. gov. furnished rail	7.10	4.37
1,420	lin. track ft., Track laying, shoofly track, used 110-lb. government-furnished rail	6.90	4.21
1	ea., No. 12 Turnout, 132-lb., new, shoofly to main line, in place	$6,730	$4,154
1	ea., Derail switch, 132-lb., new, in place	$1,375	614.00
3	ea., Track car turnout, complete, in place	200.00	101.00
10,000	cu. yd., Removal of slides	1.25	.72
1,000	cu. yd., Excavation and embankment	1.25	.56
7,500	cu. yd., Roadbed topping material	2.00	1.32

NEW BOOKS . . .

IRRIGATION PRINCIPLES AND PRACTICES—By Orson W. Israelson, Ph. D. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 404 pages, 6 x 9. Price $6.00.

This is the second edition of a text on the fundamental aspects of irrigation principles and practices. It reflects the progress made in the field since 1932 when the first edition was published. Special attention is given to the efficient conveyance of water and its application to and storage in soils and regions. The author introduces much information that is important in the economic use of water in irrigation, and in the perpetuation of arid-region agriculture. Features of this second edition are the following: Flow of water in soils is simplified by the introduction of certain clarifying assumptions, the addition of hydraulic terms, and the use of sketches and numerical examples. New material on drainage emphasizes the necessity for and the methods of draining irrigated lands. The consumptive use of water is discussed, the discussion including information on the intelligent allotment of water to different areas, based on modern research. Israelson is professor of irrigation and drainage at the Utah State Agricultural College.

* * *

STRUCTURAL THEORY—By Hale Sutherland and Harry Lake Bowman. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 400 pages, 6 x 9. Price $5.00.

This is the fourth edition of a volume that is concerned primarily with the study of structural stress analysis. Revisions from previous volumes reflect contemporary trends in engineering instruction. In addition much material has been re-written for simplification and clarification. Major revisions occur with slope and deflection, and rigid frames. Three additions have been made: (1) solutions of compound trusses, (2) a brief explanation of the fixed points in continuous beams, and (3) an extensive consideration of members of varying moment of inertia supplementing the

treatment of moment distribution. The book should be useful as a reference in connection with a graduate course in stress analysis.

* * *

GEOLOGY AND FOUNDATION TREATMENT ON THE TENNESSEE VALLEY AUTHORITY PROJECTS—Published by the Tennessee Valley Authority, Knoxville, Tennessee. 548 pages, 6 x 9. Price $2.00.

This is the second of a series of special reports being prepared to cover certain phases of engineering and construction work common to all projects designed and constructed by TVA. The book discussed the general geology of the Tennessee Valley area and the integration of the work of engineers and engineering geologists. It presents in detail the choice of dam site, geology of the site, and remedial measures in treatment of foundations for dams and appurtenant structures throughout the valley.

* * *

HOUSE CONSTRUCTION COSTS—By G. Underwood. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 18, N. Y. 315 pages, 6 x 9. Price $4.50.

This is probably the only book devoted exclusively to house construction costs. The author has attempted to provide contractors, carpenters and the home builder with all necessary information for making intelligent cost estimates on each division of house construction, whatever materials costs and wage rates may be in his district. A special table is provided giving the correct proportions of labor and material costs as a quick method for determining the unit cost of homes in all price ranges. The book contains many illustrations of structural details and detailed descriptions of building operations. Underwood kept cost records for all the jobs he worked on for the past 35 years in preparation for this book.

* * *

THE WATER SEEKERS—By Remi A. Nadeau. Published by Doubleday & Company, Inc., Garden City, New York. 300 pages, 6 x 8. Price $3.00.

The battle of Southern California to satisfy its growing pains with an adequate water supply makes a fascinating story. Other books have been written telling the story, but none have attained the objectivity that Nadeau has achieved in this book. He begins the story when the Southwest was still mostly desert and traces the story up to present day, with liberal and anecdotal treatment of controversy, famous personalities, and engineering and construction problems and struggles. Winning of the Owens River water supply for the Los Angeles area is described with careful attention given to the viewpoints of the Owens Valley settlers and to Los Angeles officials. The story of William Mulholland and the Los Angeles Department of Water also is featured. A careful look is taken at the present Arizona-California controversy over waters of the Colorado River.

NEW EQUIPMENT

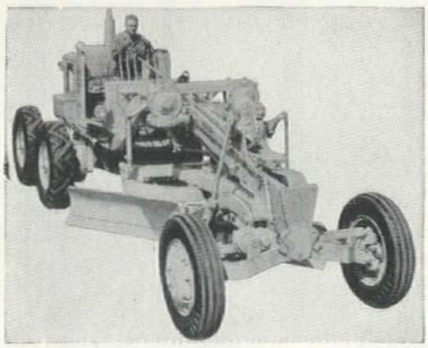
MORE COMPLETE INFORMATION about any of the new equipment or products briefly described on the following pages may be obtained at no charge. Send your request to Equipment Service, Western Construction, 609 Mission St., San Francisco 5, Calif. For quicker service, designate items by number.

★★

1201

Diesel Motor Grader for Ditch, Bank and Surface Work

Features claimed: The No. 312 motor grader is powered by a 70-hp. International diesel engine and weighs from 18,285 to 19,800 lb., depending upon equipment. With



over 12,800 lb. on the rear wheels ample traction is provided to take full advantage of the 70-hp. engine. Model features: Tandem drive, full-floating rear axle, 8 overlapping forward speeds, faster mechanically operated controls, 12-ft. blade and high-arch front axle.

Manufacturer: J. D. Adams Manufacturing Co., Indianapolis, Ind.

1202

Wetting Agent Gives Greater Strength to Concrete

Features claimed: This liquid wetting agent, when added to the mix in small amounts, results in denser, stronger and more uniform concrete blocks and bricks. The chemical permits the use of less water by increasing its efficiency, thus producing a so-called dry concrete of greater strength. Plasticity required for proper molding is improved. Agent results in cleaner equipment, lighter colored products and better dispersion of cement. Called Santomerse S, it is available in 250- and 450-lb. containers.

Manufacturer: Monsanto Chemical Co., St. Louis 4, Mo.

1203

Slide Rule Calculator Computes Metal Requirements

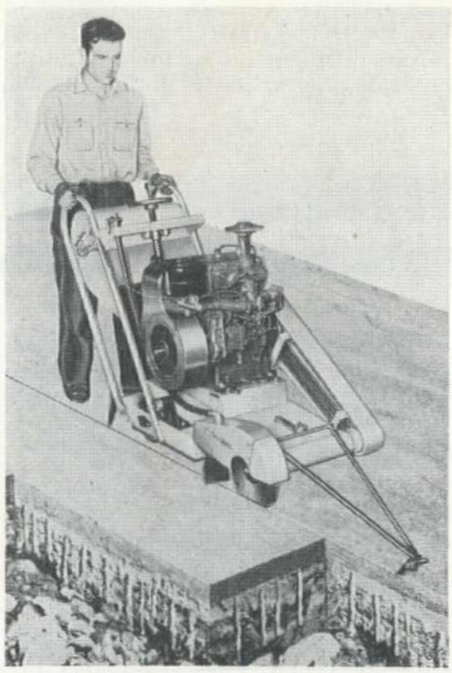
Features claimed: Metal rod and flat stock requirements can be determined directly from blue prints or a sample piece of metal with a new slide rule-type calculator. With a single setting, rod stock diameters ⅛ to 3 in. made of bronze, brass, steel, and aluminum in square, hexagonal and round shapes may be calculated. Flat stock .003 to 3 in. thick in any length or width, are also provided for. The slide is set with the correct rod size of flat stock thickness on a line with the type and shape of metal being figured. Pounds of stock required per thousand pieces for the length of piece needed may then be read directly from the rule. Priced at $9.50.

Manufacturer: H. R. Potter Co., Box 318, Montclair, N. J.

1204

Portable Concrete Saw for Deep Cuts with No Blade Binding

Features claimed: Two gasoline-powered Clippers, model C-75 with 7½-hp. engine, and the C-130 with a 13-hp., 2-cylinder engine, each counter balanced for good turnability, are designed specifically for concrete contractors, utility companies, street repair departments, and pavement and highway work. Models C-15 and C-20 with electric motors are produced specifically



for plumbers, electrical contractors, and building maintenance departments. The model CHD makes it possible for present owners of Clipper Model HD8s to convert their masonry saws for concrete sawings. The cutting speed is from 12 fpm. in asphalt, and up to 5 fpm. at 1 in. deep in limestone concrete. The maximum depth of cut is 6½ in.

Manufacturer: Clipper Manufacturing Co., 2800 Warwick, Kansas City 8, Mo.

1205

Lighter Air Compressor Makes Moving a Cinch

Features claimed: Improved 105-cu. ft. portable air compressor is lighter, lower and more maneuverable. Improvements include: new zero pressure retractable third wheel; new underslung spring mounted undercarriage with heavy-duty commercial 15-in. trailer tires; a simple, retractable support leg; new style unit core radiator with pressure cap to prevent boiling and better operation of engine at higher temperatures and altitudes; carburetor with fixed jets for better economy, and relocation of instrument panel and battery box to give unrestricted full length tool boxes.

Manufacturer: Worthington Pump & Machinery Corp., Construction Equipment Division, Holyoke, Mass.

1206

Speed and Flexibility Combined in Hydraulic Chain Saw

Features claimed: The lightweight, low-cost hydraulically-operated chain saw operates from the power take-off of a tractor, jeep, truck, or stationary engine. Long flexible hose allows the operator to work at a considerable radius from the power source for maximum portability. The saw can be operated in any position or angle. There are only two moving parts in the motor, and two in the pump.

Manufacturer: Von Ruden Manufacturing Co., Claremont, Minn.

1207

Tail Gate Loader Built Especially for Pickup Trucks

Features claimed: Called the Stratton Hydro-Loader, Model TG, this new equipment can lift loads up to 650 lb. from ground to truck level in less than a minute. It is manually operated, hydraulically powered, and is easy to install.

Manufacturer: Stratton Equipment Co., Cleveland, Ohio.

1208

Electric Power Drives of the Single Phase Capacitor Type

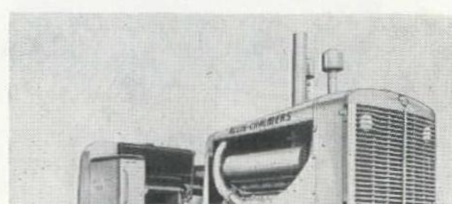
Features claimed: The single phase motors are available in ratings from ½ to 3 hp., and provide infinite speed variation in practically any given range desired, either 2:1, 3:1, or 4:1 speed variations, with 18 different maximum speeds from 2,000 to 52 rpm. Each selected speed is steady and will not vary under fluctuating load conditions.

Manufacturer: Sterling Electric Motors, Inc., Los Angeles 22, Calif.

1209

No Maintenance Problem With This Tractor

Features claimed: A torque-converter-equipped tractor, the HD-20, with a 660-



cu. in. engine, has plenty of power to provide longer life, less maintenance and in-

creased production. A three-stage hydraulic torque converter eliminates most gear shifting and keeps the tractor working smoothly at higher average speeds. Operating adjustments, maintenance points and major assemblies are so located and designed that the care, maintenance and repair of the tractor can be accomplished with least possible effort and loss of time. Simple unit construction allows removal or replacement of major assemblies without disturbing adjacent parts. Positive-seal, grease packed truck wheels, idlers and support rollers are serviced at the factory and thereafter require greasing attention only once every 1,000 hours.

Manufacturer: Allis-Chalmers Mfg. Co., Tractor Div., Milwaukee 1, Wis.

1210

Free "Bar Card" Shows Details of Steel Reinforcing Bars

Features claimed: A "bar card," covering latest ASTM Specification A-305 reinforcing bars, has just been released and is

CONCRETE REINFORCING STEEL INSTITUTE
38 SOUTH DEARBORN STREET, CHICAGO 3, ILLINOIS

STANDARD A305 REINFORCING BARS

BAR SIZES		WEIGHT	NOMINAL DIMENSIONS — ROUND SECTIONS		
OLD (INCHES)	NEW (NUMBERS)	POUNDS PER FOOT	DIAMETER INCHES	CROSS SECTIONAL AREA SQ. INCHES	PERIMETER INCHES
¼	2	.167	.250	.05	.786
⅜	3	.376	.375	.11	1.178
½	4	.668	.500	.20	1.571
⅝	5	1.043	.625	.31	1.963
¾	6	1.502	.750	.44	2.356
⅞	7	2.044	.875	.60	2.749
1	8	2.670	1.000	.79	3.142
1⅛	9	3.400	1.128	1 00	3.544
1¼	10	4.303	1.270	1.27	3.990
1¼	11	5.313	1.410	1.56	4.430

offered free of charge by the manufacturer. Card serves as a ready reference chart of weights (lb. per ft.) and nominal dimensions (diameter, cross-sectional area, and perimeter) for the standard sizes of steel reinforcing bar from ¼ in. through 1¼ in. Bar sizes are listed in both the old system (inches) and in the new (numbered) system. Standard ASTM designation numbers for reinforcing bars are listed on the back. Dimensions of card, 8½ x 11 in.

Manufacturer: Concrete Reinforcing Steel Institute, 38 S. Dearborn St., Chicago 3, Ill.

1211

Kick Taken Out of Pneumatic Super Hammer

Features claimed: This exceptionally powerful air tool, the Appton Super Hammer, competently handles drilling, chipping, trimming, riveting, sealing, and scaling. Hammer measures 9½ in. overall, and has a 1-in. diam. piston. Unique no-trigger

construction means that the hammer operates when pressed into contact with the work, stops when withdrawn. Recoil or kick has been eliminated. Force of blow is adjustable; it adjusts from a light tap for delicate work, to full power for heavy applications. Tool uses very little air, and operates on pressures from 30 to 100 lb., as necessary.

Manufacturer: Burgess Thomas Co., Dept. R, Box 287, Bloomfield, N. J.

1212

Portable FM Radiotelephone for Two-way Field Communication

Features claimed: The "Littlefone" is a complete portable 2-way radio station in one compact unit, ready for instant voice communication. It is powered by self-contained storage batteries which may be recharged from 6-volt car battery or 115-volt power. The Littlefone comes in hand-carry and back-pack types. Squelch circuits are available on all models. Dry battery operation is optional. All models comply with FCC regulations.

Manufacturer: Doolittle Radio, Inc., 7421 S. Loomis Blvd., Chicago 36, Ill.

1213

Time-saving Slide Rule for Concrete Beam and Slab Design

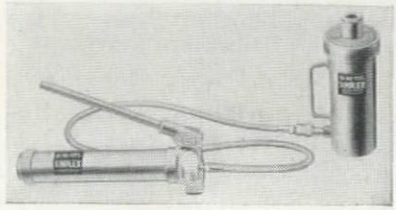
Features claimed: This pocket-sized plastic slide rule, 7 by 2¼ in., offers to structural engineers an accurate and time saving method of designing reinforced concrete beams and slabs. By setting the graduated slide on the known quantities, such as moment and shear, the required beam size, steel area, stirrups, unit shear, bond, K value, and others, are indicated for complete beam design. This slide rule eliminates practically all need for formulas, tables, charts, or multiplying slide rule, and

is applicable for all values of design stresses and assures a solution without error. The price, $2.50, includes instruction sheet.

Manufacturer: Seymour Lester, 7906 Santa Monica Blvd., Hollywood 46, Calif.

1214
Remote Control Feature on Hydraulic Rams and Pumps

Features claimed: Re-mo-trol units operate where limited space or other difficulties make use of self-contained jacks impos-



sible. This unit enables operator to lift, pull or push from a distance and in any direction—up, down, sideways, or at an angle. A center hole tubular ram, such as are found on units of 30-ton capacity or greater, enables use of the Re-mo-trol as a puller. A rod or bolt inserted through the ram and secured over the ram head can be pulled through the ram as it extends. Available in seven models, including a telescoping ram, ranging from 10- to 100-ton capacities. The pumps operate at a maximum of 10,000 psi., with overload safety protection.

Manufacturer: Templeton, Kenly & Co., 1022 S. Central Ave., Chicago 44, Ill.

1215
"Hammer Knife Mower" for the "Mighty Mouse" Tractor

Features claimed: The mower, for use with the Mead "Mighty Mouse" tractor, uses a design of hinged knives whirling

with centrifugal force from a center shaft to give long cutting life at small upkeep. New knives can be replaced in a few minutes at negligible cost. The mower is available in a 4-ft. width, and is separately powered by a 5-hp. engine.

Manufacturer: Mead Specialties Co., Dept. HKM-61, 4114 No. Knox Ave., Chicago 41, Ill.

1216
Non-clogging, No-drip Asphalt Spray Bar

Features claimed: The spray bar, known as the Bros Spraymatic, is specially built for dependable handling of heavy bitumen material with full circulating, 3-section uniform distribution. It has been designed to eliminate leaky valves, fat and lean streaks, and clogged orifices. Circulation is guided

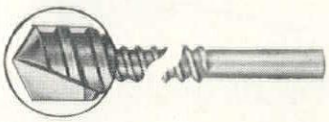
by a center partition extending the length of the bar. Other features include non-clogging, self-screening nozzles, and ring packed, non-leaking 45 deg. swing joints. A built in, self-cleaning disc-type shut-off valve is located right at the fan slots, eliminating danger of clogged or frozen orifices. The nozzle spring operating the disc also serves as a strainer, and nozzle valves have tapered seats to provide sharp material cut-off.

Manufacturer: Wm. Bros Boiler and Manufacturing Co., Minneapolis, Minn.

1217

All Dust Removed by Carbide Tipped Masonry Drill Bit

Features claimed: Cyclo-Twist positively removes all dust as it drills. Two exclusive features make this possible. Two spiral low angle flutes are turned in the steel drill body; the diameter of the body is the same



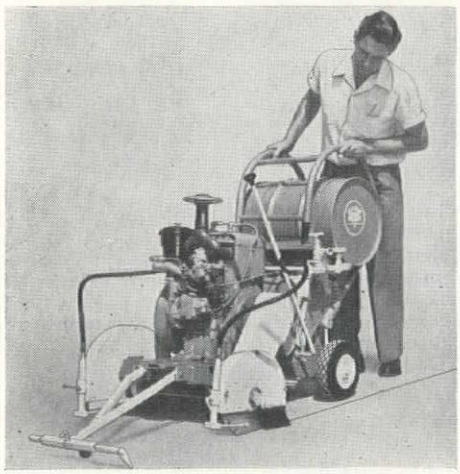
as the diameter of the hole to be drilled. Thus, maximum steel support is given to the carbide tip. The built-in flutes enable the drill to remove all dust from the hole being drilled. Removal of dust insures uniform drilling rate; lower temperatures mean carbide stays sharper longer. Therefore, many more holes can be drilled than with any other carbide-tipped masonry drill. Sizes from 3/16 in. to 1 in., up to 36 in. in length.

Manufacturer: New England Carbide Tool Co., 60 Brookline St., Cambridge 39, Mass.

1218

Concrete Cutter Insures Maximum Diamond Wheel Life

Features claimed: Power has been substantially increased on the Model 250 heavy-duty concrete cutter. The original 10-hp. engine has been replaced by a 13.5-hp., air-cooled, 2-cylinder, 4-cycle Wisconsin Model TF. No more variations in wheel speed, regardless of load and depth of cut, with this increase in power. A hose connection permits a positive water feed to



the blade from external sources. For cutting the blade is gradually eased into the concrete at a controlled rate of speed by means of a hydraulic retardant which eliminates sudden shock and possible diamond wheel damage. Rear tires are now pneumatic, converting the machine to self-trail-

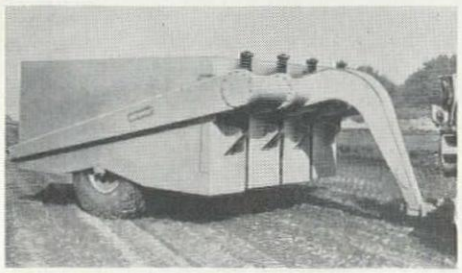
ing. The removable tongue attaches to a standard trailer hitch on car or truck.

Manufacturer: Felker Manufacturing Co., 1128 Border St., Torrance, Calif.

1219

One Wheel, One Tire on Each Unit of Flexible Compactor

Features claimed: This more flexible compaction roller consists of a series of weight-box units, each equipped with a wheel and tire. These units are filled with wet or dry sand, earth, steel scrap or other materials. As compaction roller is towed over the bumpy surface of earthfills, the units oscillate up and down and provide a constant and unchanging compaction



weight on each tire. Thus, there is no bridging or sudden shifting of combined weight on any one or two wheels. A sectionalized tubular yoke permits use of any number from three to six of the weight-box units. By the same means, the unit can be dismantled for easy shipment. Compaction loads range up to 15 tons per tire.

Manufacturer: Southwest Welding & Manufacturing Co., Alhambra, Calif.

1220

Hi-speed Trailer with Emphasis on Impact Resistance

Features claimed: The PD-20 trailer, designed for use with the Caterpillar DW20 diesel tractor, is of all-welded high strength steel construction throughout. Design is a semi-bathtub type with modified tapered sides and one low side for easier loading and dumping. Can be equipped to dump to right or left side. Overall length of tractor and trailer is 42 ft. ⅝ in. Width 12 ft. 2½ in., and the height 9 ft. 6 in. Trailer has a

wheelbase of 24 in. and a tread of 102 in. Clearance under frame of 24⅞ in. is sufficient to clear unusual road obstacles. Bottom of wagon is of double plate steel with oak fillers designed to absorb shock of heavy shovel loading. Shock absorbers are rubber body pads similar to those used on PD-10Q.

Manufacturer: Athey Products Corp., 5631 W. 65th St., Chicago 38, Ill.

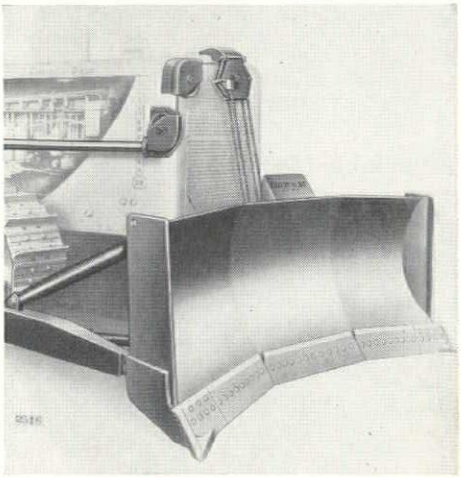
1221

U-Shaped Bulldozer

Manufacturer: Caterpillar Tractor Co., San Leandro, Calif.

Equipment: Unit designed to permit long-haul pushing of loose material with minimum end spillage.

Features claimed: Model 8U is designed



for universal use in all earthmoving applications with the Caterpillar diesel D8 track-type tractor. An excellent tool for stockpiling, handling large-capacity loads, and allowing good maneuverability. Does smooth finishing, quick backfilling, pioneering and side hill work. A convenient tool for felling trees.

1222

Plastic Pipe

Manufacturer: Carlon Products Corp., Cleveland, O.

Equipment: Plastic pipe which is furnished in threaded sections together with molded plastic fittings.

Features claimed: Plastic fittings facilitate installation of standard or intricate systems for handling fluids or gasses. Car-

lon TL can be threaded and cut in the conventional manner with standard pipe-fitting tools, and because of the pliability of the plastic from which this pipe is extruded, fit-up is faster. Threaded, leak-proof joints are assured. Pipe furnished in 20-ft. lengths and incorporates standard International Pipe Threads.

1223

Clamp Hanger

Manufacturer: United Industries, Madison, Wis.

Equipment: Two-piece hanger that can be assembled and installed on a standard pre-cast concrete joist in a few seconds.

Features claimed: Loadgrip Clamp Hanger offers a solution to the problem of

attaching piping, conduit, ducts, furring strips, and other suspended fixtures to the under side of pre-cast concrete joists. No special tools needed for installation. Hanger grips the joist more firmly with every added pound of load. Can be installed or removed by hand in seconds.

1224

Digger and Loader

Manufacturer: Pippin Construction Equipment, Inc., White River Junction, Vt.

Equipment: A combination digger and loader attachment for Ford and Ferguson and other tractors.

Features claimed: Model EX-100 is tractor-powered and hydraulically-operated. It

digs, shovels, and loads quickly, efficiently, and economically. It digs and shovels to a full 7-ft. depth; back hoes by reversing the regular shovel; digs plumb trenches on side hills up to 15-deg. grades; back hoes and front hoes a 22-in. wide trench; elevates the shovel bucket 10 ft. above grade and swings its load laterally in a 110-deg. arc.

1225

Hard-Facing Alloys

Manufacturer: Eutectic Welding Alloys Corp., New York.

Equipment: Addition to line of Eutechrom line of hard-facing alloys.

Features claimed: The following electrodes and gas rods for the overlaying of various steels will be available: for water hardening steel: 6WH (electrode), 5WH FC (gas). For air hardening steel: 6AH (electrode), 5AH FC (gas). For oil hardening steel: 60H (electrode), 50H FC (gas). For high speed steel: 6HSS (electrode), 5HSS FC (gas). For hot working tools, dies: 6HW (electrode), 5HW FC (gas).

1226

Steam Cleaner

Manufacturer: Malsbary Manufacturing Co., Oakland, Calif.

Equipment: Cleaner using higher pressures to speed up steam cleaning and cut labor costs.

Features claimed: Practical operating pressures of the Model 250 cleaner can go as high as 250 lb., whereas 90 lb. has been considered the practical limit on steam vapor type cleaners. Features include: automatic thermostat, safety valve, swivel type gun, compact control and instrument panel, and steam valve for solution stirring. Simple control adjustment provides five distinct cleaning actions—steam cleaning, high pressure hot or cold water, and low pressure wet steam and warm water.

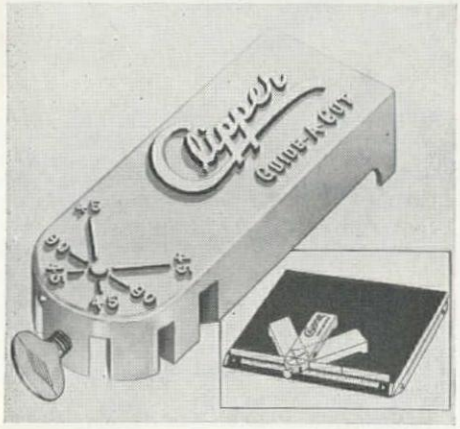
1227

Adjustable Measuring Guide

Equipment: Guide for making angle cuts on masonry materials simply and easily.

Manufacturer: Clipper Manufacturing Co., Kansas City, Mo.

Features claimed: Guide-A-Cut permits one to make angle cuts (45 deg. and 90 deg.) with ease on any masonry material. Adaptable to any Clipper masonry saw conveyor



cart. Eliminates need for tacking material guide strips on the conveyor cart or use of a special cart. Holds material firmly to eliminate slipping (the cause of most blade breakage). Priced at $3.75.

NEW LITERATURE

YOU MAY OBTAIN any of the publications reviewed below. Send your request to Western Construction, 609 Mission St., San Francisco 5, Calif. The literature is free, unless otherwise indicated. Please designate the desired items by number.
****

1228

Bearing Lubrication

Interesting studies in bearing lubrication for electrical motors are presented in Bulletin 1579 entitled "Lubriflush," issued by **U. S. Electrical Motors, Inc.,** 200 E. Slauson Ave., Los Angeles 54, Calif. It graphically shows comparative amounts of lubricant in different designs of bearings and how bearings are subject to air circulation. Application of U. S. Motors' Lubriflush principle is presented, showing how bearings can be lubricated for life and also can be purged of old lubricant and renewed without disturbing the bearing housing.

1229

Porous Media

Fifty-six pages of illustrated data on porous media for filtration and diffusion are available in an engineering bulletin published by **The Carborundum Co.,** Refractories Division, Perth Amboy, N. J. It is a complete reference covering all filtration and diffusion applications for ceramically bonded media. Numerous charts, tables and illustrations supplement the technical information that deals with uses, design, installation, operation, and specifications.

1230

Asbestos Yarning Rope

A color folder entitled "Asbestos Yarning Rope" explains the use of this inorganic rope for yarning bell and spigot lines in water lines. Published by **Johns-Manville,** 22 East 40th St., New York 16, N. Y., the folder lists advantages, recommended methods of application, and different types available. One page is devoted to tables showing standard sizes, feet per pound and packaging of the material, as well as data for determining the size and amount of rope needed for any number of joints in pipe sizes from 4 through 60 in.

1231

Road and Street Machinery

A 20-pg., handsomely bound catalog offering the company's line of machinery for construction and maintenance of roads and streets has been issued by **White Manufacturing Co.,** Elkhart, Ind. Catalog No. 32-D describes portable and stationary asphalt plants, concrete vibrators, asphalt and tar heating kettles, front end loaders for wheel type tractors, tool and surface heaters, and kerosene torches.

1232

Dirt and Scum Remover

A 12-pg., two-color bulletin describes the Dorrco Vacuator in detail, including photographs, drawings, capacities and design data. The Vacuator is a compact, high capacity unit utilizing the principle of controlled vacuum flotation to remove solids, grit and scum from sewage and industrial wastes, and manufactured by **The Dorr Co.,** Barry Place, Stamford, Conn. Three

pages of bulletin are devoted to operating results from practice, and cover plant descriptions, flowsheets and Vacuator and plant removals.

1233

Cargo Trucks

A bulletin descriptive of its new line of Fageol Super Freighter large payload capacity cargo trucks has been issued by **Twin Coach Co.**, Kent, Ohio. Bulletin L-3447 contains a complete description of Super Freighters with detailed specifications. Comparative figures are presented to show how Super Freighters transport more payload than other trucks or tractor-trailer combinations.

1234

Controlled Combustion Engines

A 16-pg. two-color catalog describing its DA Dyna-Swirl diesel engines especially designed for all types of heavy-duty trucks has been published by **The Buda Co.**, Harvey, Ill. Included are detailed specifications of the various features of the new DA engines including a full explanation of the Dyna-Swirl controlled combustion system which improves the operation of the engine by providing approximately 15% more horsepower and 15% higher usable torque. Four pages are devoted to pictures and stories about installations of these engines in actual trucks.

1235

Garrison Dam Film

"The Garrison Story" is a documentary film featuring Garrison Dam, one of the largest earthmoving projects ever undertaken, and its part in the overall development of the Missouri River Valley. It shows various construction phases plus glimpses into the Missouri Valley of tomorrow and other interesting highlights of the huge project. This 20-min., full-color, 16-mm. sound film is available to contractors, industrialists, engineering and civic organizations, schools and universities. Correspondence relative to "The Garrison Story" should be directed to the Sales Development Dept., **The Euclid Road Machinery Co.**, Cleveland 17, Ohio.

1236

Lubricating Systems

The latest in heavy-duty lubricating systems for construction equipment is shown in a catalog issued by **Lincoln Engineering Co.**, St. Louis 20, Mo. Designed especially for contractors, the catalog gives complete specifications for each system illustrated.

1237

Overhead and Front-end Shovel

The Lodover, a new 1-yd. combination overhead and front-end shovel for International Harvester tractors, is fully described in an 8-pg. illustrated catalog published by **Service Supply Corp.**, Manufacturing Division, Philadelphia 32, Pa. The Lodover substantially increases loading production, because turns are eliminated. On many jobs, overhead loading steps up output as much as 50%.

1238

Right Angle Motoreducer

Falk Corp., Milwaukee 8, Wis., has released a bulletin illustrating and describing its new all-steel right angle Motoreducer which combines the advantages of its standard Motoreducer with the adaptable right angle head. Can be used for either

horizontal or vertical applications and is available with output shaft single or double ended. Engineering Bulletin 3110 provides selection information, dimensions, rating tables and service factors.

1239

Determine Concrete Slump

Several data sheets have been made available by **Supremix, Inc.,** 401 Grace St., Adrian, Mich., describing its central mixing plant and its tilting mixer equipped with Plastograph. The Plastograph is a device built into the mixer to measure with accuracy the consistency or slump of concrete during the mixing cycle.

1240

Care of "Cat" Equipment

"Service Reporter" is the title of a new **Caterpillar Tractor Co.** publication which contains helpful hints and basic information on how to keep equipment in good working condition. To be issued four times per year in October, January, April, and July, the publication is compiled and edited by Vic Woodling, supervisor of dealer service publications and service staff. Available through Caterpillar dealers.

1241

Military and Civilian Construction

Of prime interest to those in charge of military construction, as well as to architects, engineers and contractors, will be the pictorial bulletin, "Timber for Military, Commercial and Industrial Buildings," published by **Timber Engineering Co.,** 1319 Eighteenth St., N.W., Washington 6, D. C. It presents advanced uses to which the Teco connector system of timber construction, using the wedge-fitted split-ring connectors and Trip-L-Grip framing anchors, have been put in many types of buildings. Booklet also treats glued-laminated timber construction and the gracefully decorative lamella construction.

1242

Lubrication Practices

Covering its full line of Lubriko Greases for anti-friction bearings, this useful folder published by **Master Lubricants Co.,** 962 Fourth St., Los Angeles, Calif., gives use and application data for 25 different densities. Densities range from liquid greases to heavy cup lubricants. Especially valuable for maintenance men and mechanical engineers, the folder gives facts on lubrication maintenance and selection of a lubricant.

1243

Portable Steam Boilers

Wm. Bros Boiler & Mfg. Co., 1057 Tenth Ave., S.E., Minneapolis 14, Minn., has recently published a folder describing its line of portable steam boilers. They are widely used for heating tank cars of asphalts, oils, tars, pitches; for pile driving by steam hammer; for heating storage tank coils; for heating and thawing catch basins; heating and sterilizing refrigerator cars.

1244

Fiberglas Articles

Publication of the third edition of the Fiberglas Bibliography, a volume of annotated references to selected articles which have appeared in the nation's press, has been announced by the Public Relations Director, **Owens-Corning Fiberglas Corp.,** Toledo, O. The bibliography is of 88 pages and contains indexes of publications cited, authors and applications and uses. It is available to engineers, technologists, research investigators, and college and university students.

1245

Proper Use of Slings

An illustrated, pocket size card gives tips on proper care and use of slings for safe handling. Card was created as a service to safety men for promotion of greater safety in their plants. Written for superintendents, safety directors, riggers, crane followers, floormen, and maintenance men. Card No. 50-38 is issued by **Macwhyte Co.,** Sling Dept., Kenosha, Wis.

1246

The D7 Inside and Out

A 32-pg. booklet on the D7 tractor has been issued by **Caterpillar Tractor Co.,** Peoria 8, Ill. Practically every part of this model tractor is described, and complete specifications are shown.

1247

Trussed Rafters

A brochure entitled "Wood Frame Teco Trussed Rafters" will be of interest and immediate value to architects, engineers and contractors in all parts of the country, and to those responsible for military construction. The subject is set forth in text, pictures and diagrams together with detailed descriptions of latest approved methods of applying the Teco wedge-fitted split-ring connectors and Trip-L-Grip framing anchors. Brochure has been made available by **Timber Engineering Co.,** 1319 Eighteenth St., N.W., Washington 6, D. C.

1248

DUMP WAGON AND SCRAPER—**The Heil Co.**, Milwaukee, has issued a full color brochure with an original Kodachrome cover on its 2C800 Heiliner. Featured are job pictures, cutaways, and specifications of the Heiliner with its interchangeable scraper and bottom dump wagon. Highlighting the presentation is information on the patented Hydro-Steer and Super-Axle, and on the Cummins 200-hp. diesel engine which powers the unit.

1249

FORK LIFT TRUCKS—This catalog size, 2-color bulletin prepared by **Mobilift Corp.**, Portland, Ore., is now available for firms and individuals interested in fork lift trucks. Bulletin illustrates two new 2,000-lb. capacity Lev-R-Matic Drive fork lift trucks, and gives specifications and many features of both models. Model E is an improved, more functional stand-up type and the ER is an entirely new sit-down type.

Space is sold as advertisers' inches. All advertisements in this section are ⅛ in. short of contracted space to allow for borders and composition.

CLASSIFIED SECTION

Rates are $6.50 a column inch. Copy should be sent in by the 10th of preceding month if proofs are required; by the 15th if no proofs are required.

NOTICE

The Board of Supervisors of the County of El Dorado will accept applications for the position of Road Commissioner and County Engineer, such applications to be filed with the County Clerk, County of El Dorado, Courthouse, Placerville, as soon as possible.

Experience in administration, practical road building and road maintenance, engineering, and bridge designing should be included in the application.

Personal interviews will be arranged by
ARTHUR J. KOLETZKE, Clerk

FOR SALE

15" x 28" Pacific Jaw Crusher with 75 h.p., 440 V., 3 phase 60 cycle slip ring motor and controls. Extra jaws. Excellent condition. $3850.00 F.O.B. location.

STANDARD MACHINERY CO.
450 Bayshore Blvd. San Francisco 24, Calif.
Telephone ATwater 2-2883

DAM CONSTRUCTION SUPERINTENDENT AND TUNNEL CONSTRUCTION MAN FOR SERVICE IN INDIA

The Government of Punjab (India) desires to engage on contract for about five years the services of a construction superintendent to take charge of the construction of a 680 foot high straight gravity dam and large size tunnels together with power houses. It is also interested in the services of a construction superintendent-in-charge for tunnel work. Applicants must have served for long periods in responsible capacities on the construction of dams and have been in overall charge of the construction of at least one high concrete dam. The tunnel man must have similar experience with respect to tunnels. Apply by mail in duplicate, to the Director, India Supply Mission, 635 F Street, N. W., Washington 4, D. C. giving full details of qualifications and experience stating minimum terms of salary acceptable. Furnished quarters fitted with electricity and water supply available in the Project Township.

DISTRICT SALES MANAGER

West Coast territory. Salary, commission, expenses, car furnished. Excellent opportunity to represent well-known, growing power shovel manufacturer. Construction machinery and engineering background desirable.

Send personal history, sales experience and include photo, if available. Prompt interview will be arranged. Write TODAY!

Box 1077, Western Construction
609 Mission St., San Francisco 5, Calif.

RILEY & WILLIAMS, INC.

Eureka, Calif. Phone 4386
Crescent City, Calif. Phone 2371

LINES WE HANDLE:
ROEBLING WIRE ROPE
McCULLOCH POWER SAW
SKOOKUM BLOCKS AND RIGGING
ESCO RIGGING TOOLS
MONARCH FORGE AND MACHINE WORKS
GEARMATIC TRANSMISSIONS
P & H SHOVEL
CHICAGO PNEUMATIC CO.
PACIFIC POWDER
PORTALOY CONVEYOR CHAIN
SPEAR & JACKSON SAWS

La Plant-Choate TS300 Motor Scraper SN208, new Aug., 1949. Big Tires. A1 shape.
Allis-Chalmers HD19 with Gar Wood Tiltdozer and PCU, new July, 1949, 2000 hours, like new in every respect.
2 Caterpillar DW10 Tractors and Scrapers. New Oct., 1947, 3500 hours. Completely overhauled.

ENGLAND & ROTH CONSTRUCTION CO.
Contact J. R. England, 2859-W. Rapid City, So. Dak.

FOR SALE

1—Hyster D8 TOWING WINCH complete with power take-off shaft and controls.

1—New unused Blaw-Knox Model XC form riding CONCRETE FINISHER, with Concrete Vibrator, Transportation Wheels and Adjustable Screed. Machine completely set up and ready for operation.

CONTRACTORS MACHINERY CO.
1401 Illinois Street, San Francisco 7, Calif.
Mission 7-0588

Lorain Crawler Crane:

Year: 1950
Model: KL-50
Serial: 20569
Boom: Fifty Feet (50')
Fairlead, Tagline
Crawlers: 30" Wide—14' Long
Independent Boom Hoist
Picking Capacity: 40,000 lb. at 10' radius
200 Working hrs. on above machine
Located in our yard at
Minneapolis, Minnesota
Selling Price: F.O.B. Loaded on Cars, Minneapolis—$26,500.00

P. & H. Truck Crane:

Year: 1947
Model: 150
Capacity: Ten Ton (10)
Boom: Fifty Feet (50')
Engine: Six Cylinder Buda
Air Brakes, Fairlead,
Tires: 10.00 x 20
Selling Price for the above Machine: $14,500.00
These Cranes have been used for Steel Erection Mostly

Truck Crane Service Co.
215 Second Street S. E.
Minneapolis 14, Minnesota

CRANES

LORAIN 820 crawler. Shovel & Drag. Cat. D13000, 2 yd. $1000 in new spare parts.
LORAIN 41, ¾ yd. crawler. Crane, clam, drag, hoe. Cat. diesel.
BAY CITY 45, ¾ yd.. crawler, crane, drag.

SHOVEL FRONTS

Northwest 25	Lorain 820
Northwest 6	Lorain 79
Northwest 80D	Lorain 75B
Bucy-Erie 54B	Lorain TL backhoe

ROLLER

HUBER 8-10 ton tandem. Buda diesel. Electric start.

TRACTORS

TD-14 International
TD-9 International
D-8 w/Dozer & G-W scraper, 12-14 yd.
RD-7 with dozer.

ENGINES FOR EUCS

7—Buda 6DC-844 diesels, Euclid engine replacement units. Special low prices.

COAST EQUIPMENT CO.
944 Bryant St. San Francisco
MArket 1-5740

FOR SALE

4½-yd. Jaeger mtd. on 10-wheel Intl.
4-yd. Challenger Mixer mtd. on 10-wheel GMC.
1—10-wheel GMC 6-yd. dump mtd. on army truck.
1947 Ford 4-yd. rated 2-ton truck.
3 mos. old semi-dump with Cook Bros. Trailer mtd. on GMC truck chassis.
Allis-Chalmers small patrol grader.
3 x 12 Symons double-deck screen.
1 Cedar Rapids roller bearing jaw crusher.
Conveyors and parts.
Electric gear-head and low speed motors.
3 Compartment aggregate bunkers.
Automatic and Electric switches.
Mechanical 3-ft. finishing machine.
Miscellaneous tools and equipment.

The above equipment has been slightly used and in good condition—but Uncle Sam beckons.

MR. ROBLES
524 No. Vanderhurst King City, California
Telephone 465

NEW LOW RATES FOR CLASSIFIED ADVERTISING!
1 time ..... $6.50 a column inch
6 times ..... 6.35 a column inch
12 times ..... 6.20 a column inch
Send copy to: Copy Service Department
WESTERN CONSTRUCTION
609 Mission Street San Francisco 5, California

Materials For Sale . . .
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Imports from Spain, also quantities spot deliveries
WEST COAST TRADERS CO.
564 Commercial Street San Francisco, Calif.
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