WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

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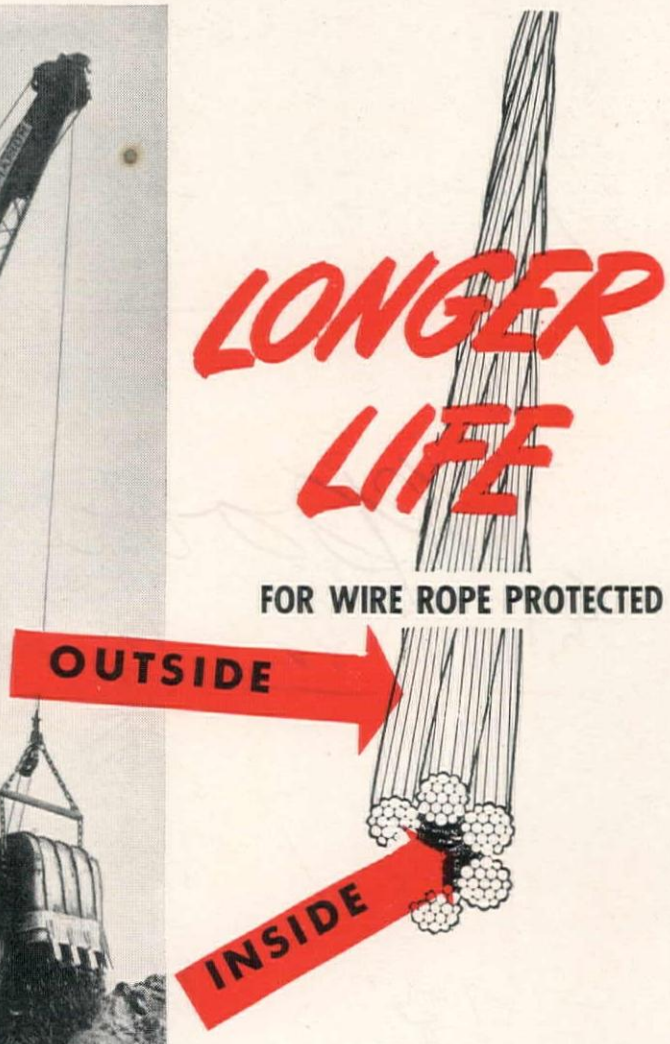
Idaho Power Co. Hydro Expansion
Wind Tunnel Tests Tacoma Bridge
Stream Runoff Forecast for 1946
Sacramento ASCE Railroad Report
Fog Dispersal Systems Studied
Steel Frame Erected in 17 Days

WINTER SCENE at Anderson Ranch Dam, Bureau of Reclamation structure in Idaho. Main earthfill embankment is at right, and frozen lake at lower left. Trashrack placement continued during the winter, in order to be ready for an estimated 80,000 ac. ft. of storage this spring. Embankment is about 65 per cent completed, will resume with good weather.



LONGER LIFE

FOR WIRE ROPE PROTECTED



YOUR wire rope will stay stronger longer — give you many extra months of efficient service — if you protect it with *Texaco Crater*. That's because *Crater* provides thoroughly effective lubrication both *inside and out*. It penetrates to the very core and prevents rotting — greatly reduces friction and wear resulting from rapid flexing.

You can depend on *Texaco Crater* to retain all its protective qualities under the most adverse operating conditions. It resists the corrosive effects of the weather. It has been the standby of experienced operators the world over for more than 30 years.

Texaco Crater is also an extremely effective lubricant for open gears. It cushions heavy loads and shocks, quiets noise, materially reduces wear.

For Texaco Products and Lubrication Engineering Service, call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT STARRING JAMES MELTON WITH HIS GUEST, ED WYNN — CBS



HERE'S where those Northwest Rock Shovel advantages pay out. Compare the action of a Northwest in rugged going like this with other machines. Note how cleanly the dipper fills—no stuttering, no teasing to get a load—the Northwest Dual Independent Crowd that utilizes force other shovels waste cuts into the bank cleanly for a full dipper and a quick pass to the truck. That's what assures output.

Add to this the Cushion Clutch, the "Feather-Touch" Clutch Control, Uniform Pressure Swing Clutches and other Northwest advantages and you see why the Northwest has such a reputation for handling rock. Remember, if you have a real Rock Shovel you never have to worry about output in any kind of digging.

NORTHWEST ENGINEERING COMPANY
1736 Steger Bldg., 28 E. Jackson Blvd.
Chicago 4, Illinois

INDEPENDENT CROWD plus AUTOMATIC CROWD
FOR GREATER DIGGING POWER
The DUAL CROWD

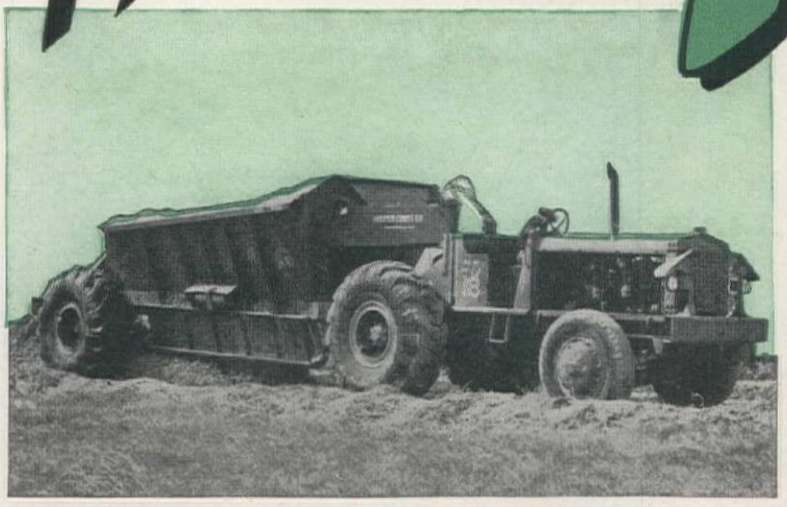
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WILSON EQUIPMENT & SUPPLY CO., 902 West 22nd St., Cheyenne, Wyoming

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NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

FAST...CLEAN EUCLID DUMPING *Cuts Costs*



● Fast, non-stop dumping and accurate spotting on the fill are time-saving and cost-cutting features of Bottom-Dump Euclids.

The large, full length and width trailer doors open instantly by gravity — they are unlocked by operation of an air valve on the steering column. Smooth, steep hopper sides of the Bottom-Dump Euclid shed the load quickly and cleanly. Adjustment of the door opening permits dumping the load in long windrows or large heaps on the fill, depending on the job requirements.

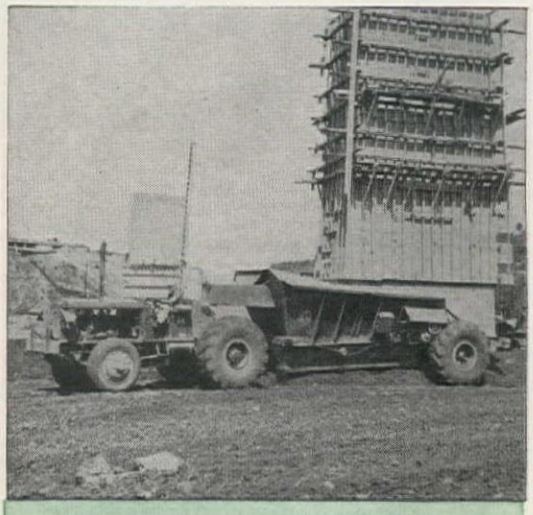
Doors are closed by engaging a driving wheel with the left trailer tire which winds the door cable on a drum of the control assembly. In a short travel distance the doors are fully closed and locked in position — driving wheel of the door control is then automatically disengaged from the tire.

The simple but rugged construction of the famous Euclid door control . . . its reliable performance and long life . . . is typical of Euclid features that result in lower hauling costs for leading contractors and industrial owners. Your Euclid distributor will be glad to provide facts and figures on what Euclids can do for you.

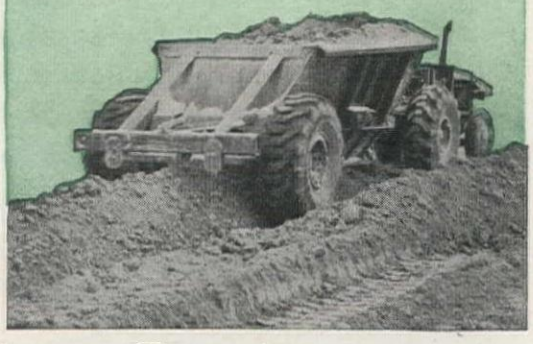
BOTTOM-DUMP EUCLIDS. Capacities of 20 to 32 tons — 13 to 42.9 cu. yds., struck . . . loaded speeds from 26 to 34.4 m.p.h. . . . powered by 150 to 275 h.p. Diesel engines.

REAR-DUMP EUCLIDS. Capacities of 15 to 22 tons — 9.2 to 20.7 cu. yds., struck . . . loaded top speeds of 22 to 38 m.p.h. . . . powered by 150 to 275 h.p. Diesel engines.

The EUCLID ROAD MACHINERY Co.
CLEVELAND 17, OHIO



The big, sturdy hopper of the Bottom-Dump Euclid is wedge-shaped to place a large part of the payload on the drive wheels for proper weight distribution and improved traction. The shallow load over the trailer wheels is discharged first, thus maintaining maximum traction on drive wheels until the complete load is discharged from the hopper.





Brown, Fraser & Co., Ltd., Vancouver; A. H. Cox & Co., Seattle; Hall-Perry Machinery Co., Butte; Intermountain Equipment Co., Boise and Spokane; The Lang Co., Salt Lake City; Lively Equipment Co., Albuquerque; Constructors Equipment Co., Denver. Factory Branch: 3710 San Pablo Avenue, Emeryville, California.

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

Covering the Western Half of the National Construction Field

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J. M. SERVER, JR.
Editor

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LONG TRUCK LIFE
LOW OPERATING COST



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2. Accept the recommendation you get. Here's why: The International Truck Line is complete. It includes a truck of the right type and carrying capacity for every job. International Branches and Dealers can recommend the right trucks without prejudice.

3. Set up a program of regular International service. The work is done by skilled mechanics, using special International equipment and factory-standard International parts. The service is supplied by International Dealers everywhere and by the nation's largest company-owned truck-service organization—International Branches.

Today's International Trucks are the best ever built. They represent more than 40 years of truck engineering and manufacturing experience. This engineering and manufacturing has long been so outstanding that in the last 15 years more heavy-duty Internationals have been purchased for commercial use than any other make.

So buy International—service International—and don't "under truck." That's the specification for long truck life and low operating cost.

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International Truck Branches located at San Diego, Los Angeles, West Los Angeles, Glendale, Fresno, Sacramento, Oakland, San Francisco, Portland, Tacoma, Seattle, Spokane, Salt Lake City, Denver, Cheyenne, Billings, and Great Falls.

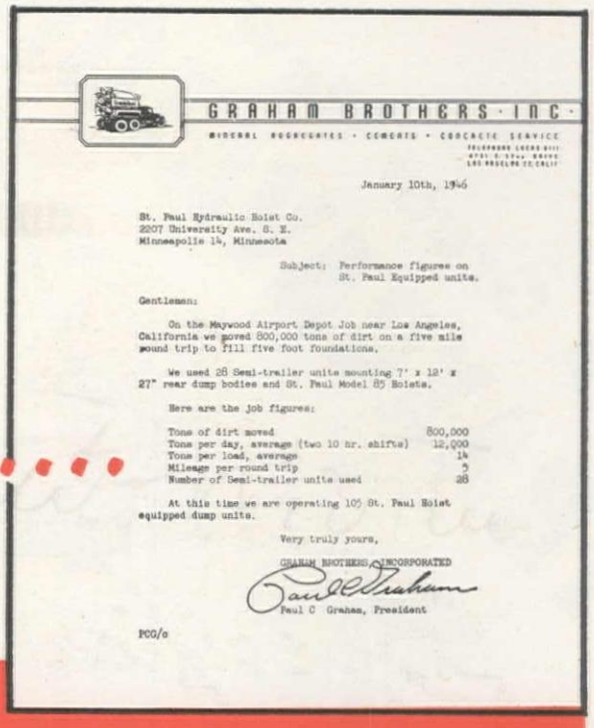
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INTERNATIONAL

INTERNATIONAL *Trucks*

How to keep dirt moving 2½ miles at 600 tons per hour!

Tons of dirt moved	800,000
Tons per day, average (two 10 hr. shifts)	12,000
Tons per load, average	14
Mileage per round trip	5
Number of Semi-trailer units used	28



GRAHAM BROTHERS · INC ·

MINERAL AGGREGATES · CEMENTS · CONCRETE SERVICE

January 10th, 1946

St. Paul Hydraulic Hoist Co.
2207 University Ave. S. E.
Minneapolis 14, Minnesota

Subject: Performance figures on St. Paul Equipped units.

Gentlemen:

On the Maywood Airport Depot Job near Los Angeles, California we moved 800,000 tons of dirt on a five mile round trip to fill five foot foundations.

We used 28 Semi-trailer units mounting 7' x 12' x 27" rear dump bodies and St. Paul Model 85 Hoists.

Here are the job figures:

Tons of dirt moved	800,000
Tons per day, average (two 10 hr. shifts)	12,000
Tons per load, average	14
Mileage per round trip	5
Number of Semi-trailer units used	28

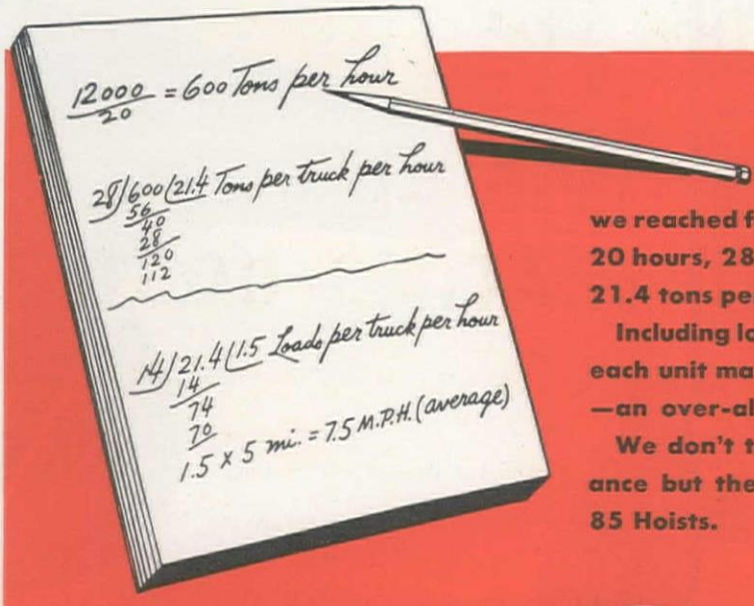
At this time we are operating 105 St. Paul Hoist equipped dump units.

Very truly yours,

GRAHAM BROTHERS INCORPORATED

Paul C Graham, President

PCG/o



When the above letter came in, we reached for a scratch pad, quick! 12000 tons daily, 20 hours, 28 units . . . meant that each unit delivered 21.4 tons per hour on a 2½ mile haul.

Including loading, dumping and all other stops, then, each unit made 1½ round trips of 5 miles every hour —an over-all average speed of 7.5 m.p.h.

We don't take all the credit for this fine performance but the units *are* equipped with St.Paul Model 85 Hoists.

ST. PAUL HOIST

2207 University Ave. S. E.

HYDRAULIC COMPANY

Minneapolis 14, Minnesota

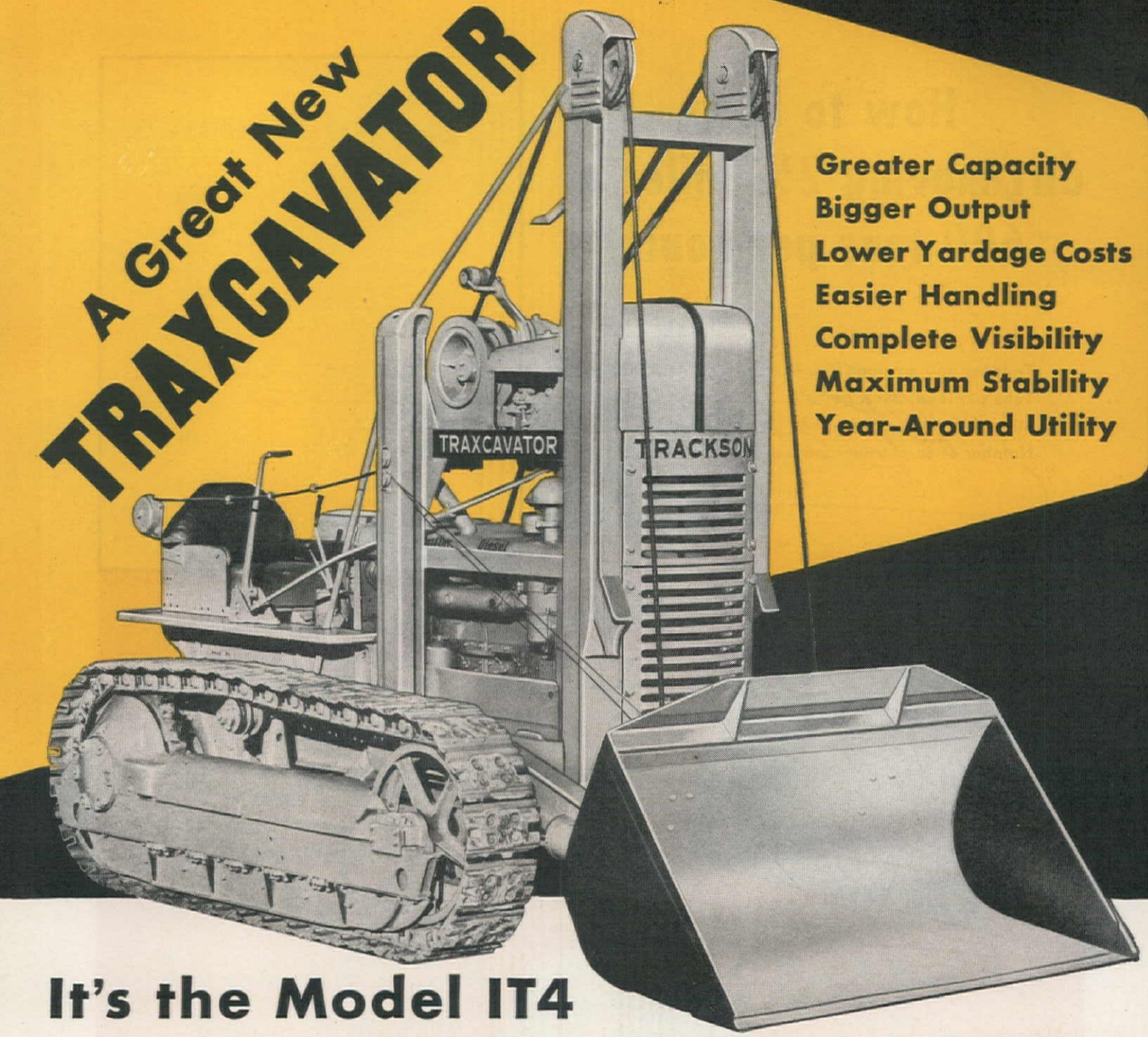


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A Great New TRAXCAVATOR

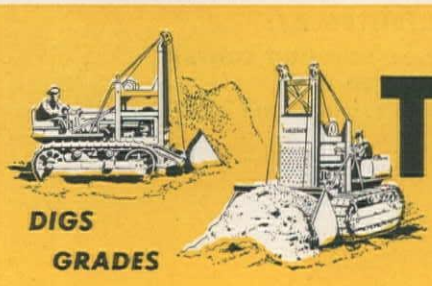
Greater Capacity
Bigger Output
Lower Yardage Costs
Easier Handling
Complete Visibility
Maximum Stability
Year-Around Utility



It's the Model IT4

A great new TRAXCAVATOR is here, with all the basic advantages that have made TRAXCAVATORS the standard of comparison the world over, plus many features that insure easier handling, bigger output and lower yardage costs. Thoroughly field tested under severest conditions, the IT4 is the most rugged and productive tractor shovel of its size ever offered. It will excavate and dig big yardages at low cost in toughest soils, load trucks and trailers, transport and load all kinds of bulk materials and also ditch, cast, carry, spread, strip, bulldoze, backfill, level, landscape, terrace, trench, remove snow and do a host of other earth-moving and material-handling jobs. This versatility means year around usefulness and profit. The big one-cubic yard bucket is wider than the tractor tracks which permits excavating and grading close to and alongside walls and curbs and easy maintenance of grades. The IT4 and "Caterpillar" D4 tractor on which it mounts are engineered as a unit to match the full capacity of each other and are sold and serviced by the same dealers. Get the facts on this modern, new TRAXCAVATOR from your TRACKSON-"Caterpillar" dealer or write direct.

TRACKSON COMPANY, Dept. WC-56, Milwaukee 1, Wis.

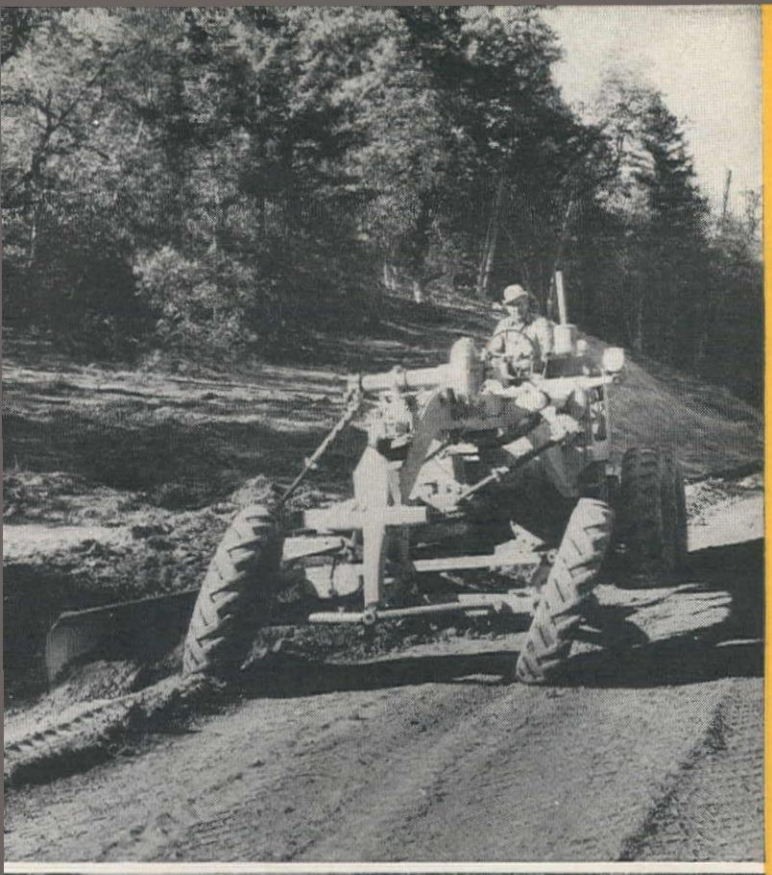


TRAXCAVATOR

REG. U. S. PAT. OFF.

THE ORIGINAL TRACTOR EXCAVATOR







USERS write the BEST ADS

"We have always considered 'Caterpillar'-made products tops"*

—Thomas H. Schaefer, Supt.
McNutt Bros., Eugene, Oregon.

CATERPILLAR TRACTOR CO., San Leandro, Calif.; Peoria, Ill.

CATERPILLAR

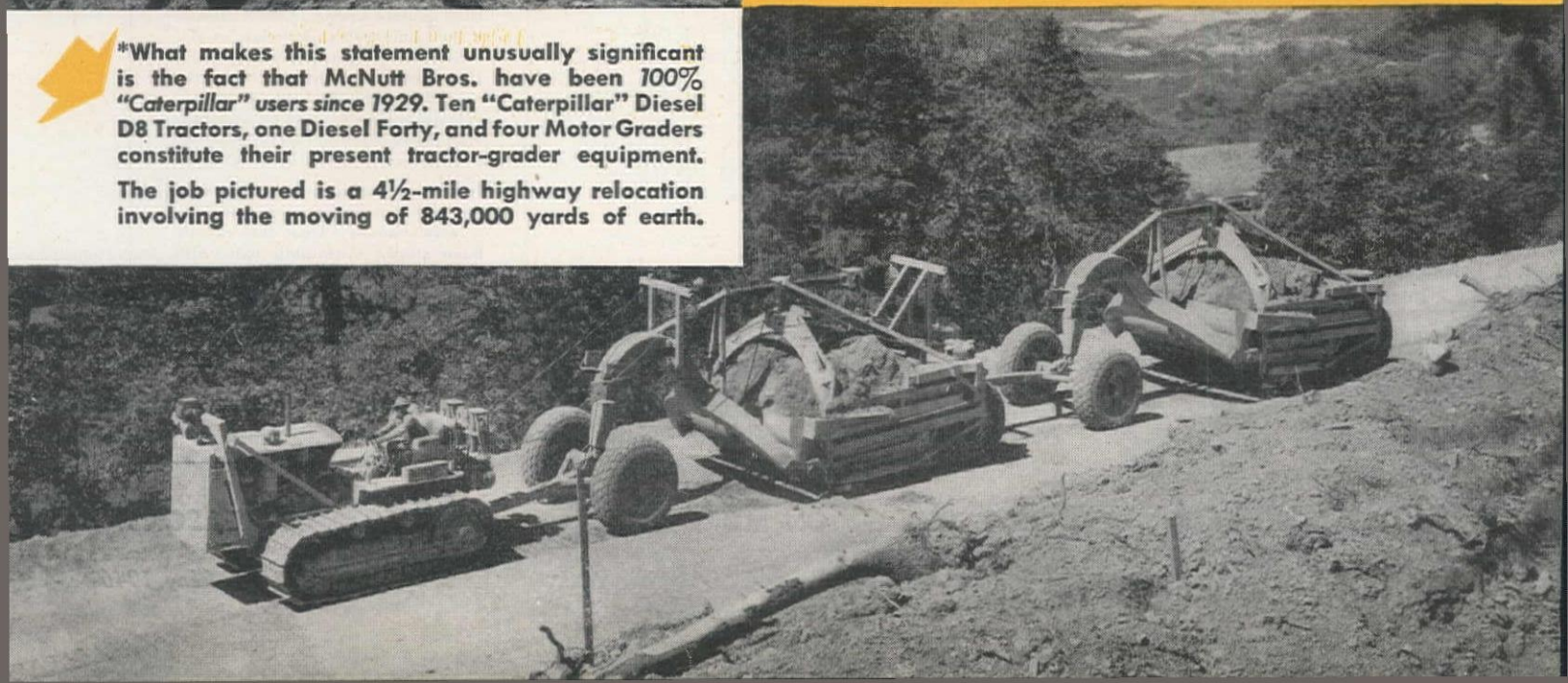
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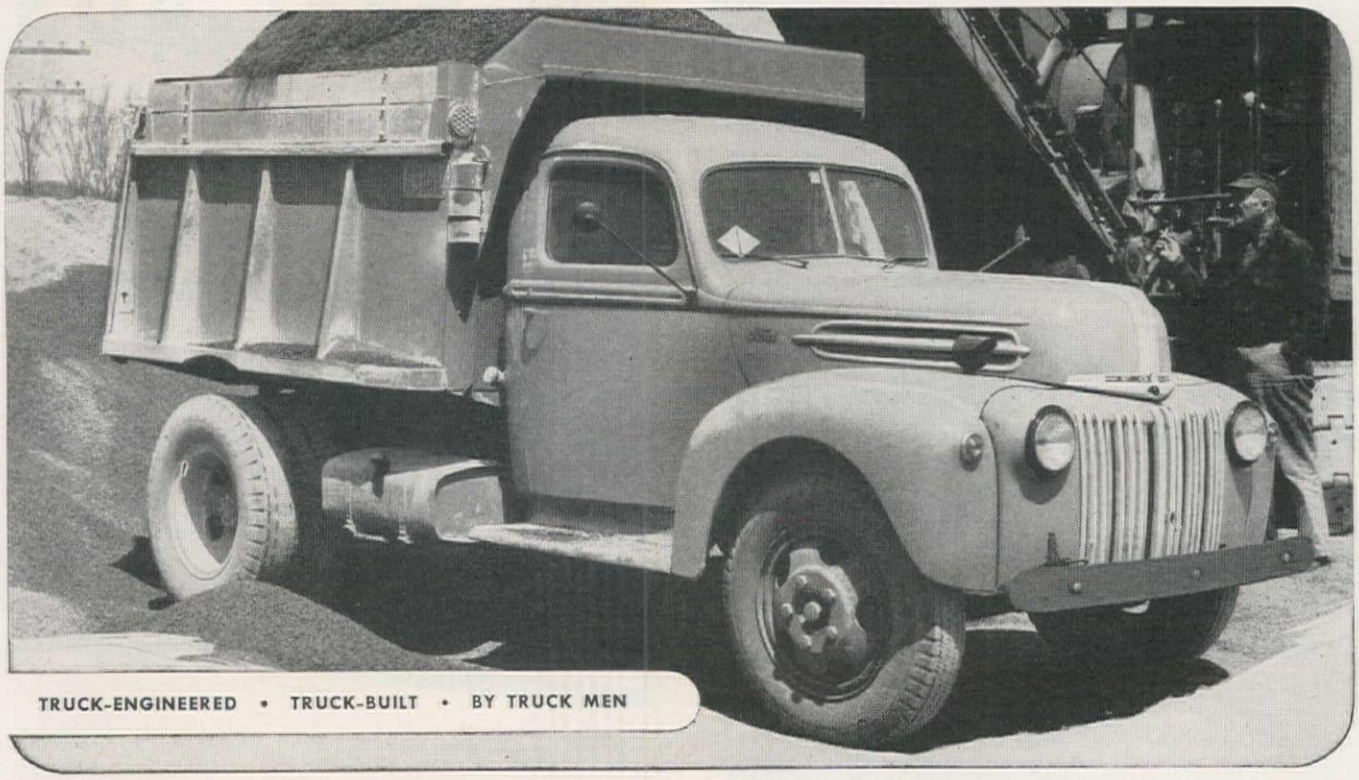
ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

*What makes this statement unusually significant is the fact that McNutt Bros. have been *100% "Caterpillar" users since 1929*. Ten "Caterpillar" Diesel D8 Tractors, one Diesel Forty, and four Motor Graders constitute their present tractor-grader equipment.

The job pictured is a 4½-mile highway relocation involving the moving of 843,000 yards of earth.



Better Trucks for YOUR Business!



TRUCK-ENGINEERED • TRUCK-BUILT • BY TRUCK MEN

"FORD TRUCKS HAVE BEEN MY CHOICE SINCE 1931"

"This will give you an idea of what this 1942 Ford is doing," wrote Operator A. W. Avery, of Utica, New York, some months ago. *"Although you rate it at 1½ tons, I often carry much greater loads with this 5-yard body with side-boards. This has been its daily job in all kinds of weather!*

"I've used Fords since 1931—that's many years of satisfied service. I feel I've been lucky in having a Ford through these years."

Emergency pressures, which have been on the building trades, have made overloading almost a national custom. No truck engineer likes to see overloading, of course. But it has certainly proved one big fact for thousands of Ford Truck operators: Ford Truck endurance is a tremendous asset when the going gets really tough. Then Ford axle and clutch engineering prove their soundness; Ford frame strength and spring capacity prove their extra value; and Ford power speeds jobs to a finish.

There's a new Ford dump truck chassis in production now. Heard about it? Ask your Ford Dealer.

Ford

FORD ADVANCED ENGINEERING!

THE FAMOUS V-8 ENGINE, for toughest service, now 100 HP, with NEW steel-cored Silvaloy rod bearings for trebled endurance • NEW Flightlight aluminum alloy 4-ring pistons for added oil economy • Tougher, rust-proofed valve springs • NEW moisture-sealed distributor • NEW coolant-saving radiator closure • Auto-balanced carburetion for still more thrifty power • Servicing simplified still further. And the rugged, thrifty 90 HP Ford six-cylinder engine, for stop-and-go jobs, with many important advancements, available in all except C.O.E. chassis.

Ford Truck rear axles—world-famous for load-lugging—provide generous reserve capacity • Light duty chassis have sturdy ¾-floating axle with triple-roller-bearing, straddle-mounted pinion; full-floating axles in all other chassis • 2-speed axle at extra cost in heavy duty units • Improved 4-speed transmission at extra cost in light duty chassis, standard in all others.

FORD TRUCKS

MORE FORD TRUCKS ON THE ROAD • ON MORE JOBS • FOR MORE GOOD REASONS

P&H TRUCK CRANES



Here's High Speed Travel ...and Greater Work Capacity



- There's no compromise between mobility and work-ability on P&H truck cranes. With their *dual power* you have no half-way measures.

YOU TRAVEL with an engine that's *built for travel*, geared for it! Across town or across state, you can drive at regular traffic speeds.

YOU WORK with another engine *designed* for that job. It's the right power for unhampered *load handling ability*—greatest possible capacity.

Whether it's crane, dragline, shovel or other work, P&H's *dual powered* units enable you to handle a wider range of work and to do it faster, at lowest cost. Write for literature.

"Size for size, no P&H truck crane has ever been out-lifted."

P&H *Added Values*

- *Hydraulic control*—a new peak in operating ease and safety.
- *Greater stability*—with exclusive torsion bar-mounted front axles and lower center of gravity.
- *Independent Planetary boom hoist*—raises or lowers boom smoothly, with or without load.
- *Planetary load lowering*—permits "inching" of loads, accurately.
- *All-welded construction*—greater strength. Weave-proof frame eliminates sway at boom point.

P&H REMOTE CONTROL AVAILABLE

With this unit you can control all carrier movements (including the horn) by electric push button from operator's position inside crane cab.

HARNISCHFEGER CORPORATION

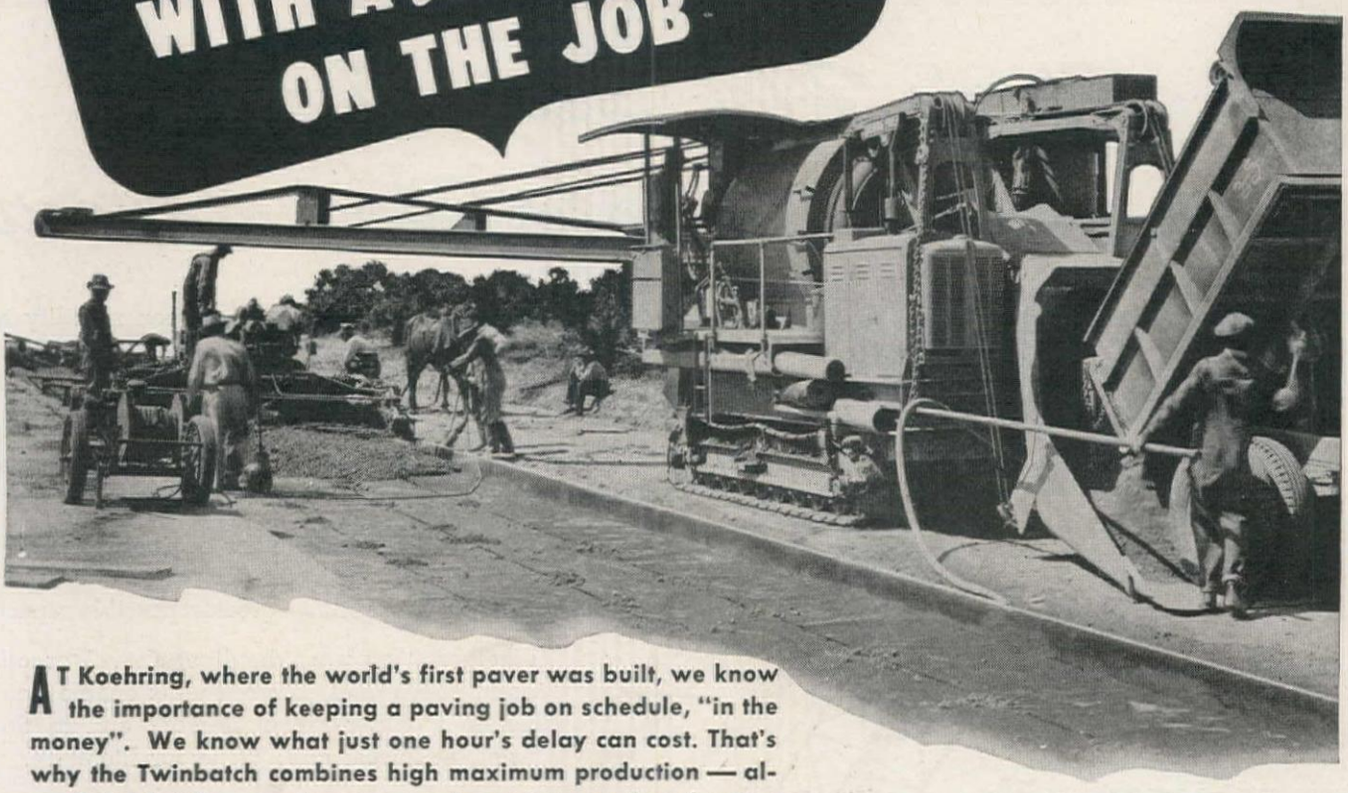
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NEW ROUTES COME THRU ON SCHEDULE WITH A *twinbatch* ON THE JOB



AT Koehring, where the world's first paver was built, we know the importance of keeping a paving job on schedule, "in the money". We know what just one hour's delay can cost. That's why the Twinbatch combines high maximum production — almost 90 batches per hour, enough concrete to lay down a 1,000 foot slab, 20 feet wide, in four hours — with exceptional Heavy-Duty strength.

HEAVY-DUTY PAVER

Because it's built right for on schedule service, the Twinbatch is a Heavy-Duty machine. Every detail tells a Heavy-Duty story: 16-inch 78-lb. steel I beams make up the main frame. The heavy two-compartment drum has extra alloy liners. Drum roller paths are the heaviest and thickest of any paver.

CONTINUOUS EFFICIENT SERVICE

Because maximum efficiency is safe-guarded by Heavy-Duty construction, high production continues uninterrupted. Unfailing, the Twinbatch sets an efficient, money-making pace for the crew. At the customary 60-batches-an-hour clip, the Twinbatch works smoothly, effortlessly . . . easy on the operator, easy on the crew. When rains cause delays, its top output of 86.7 batches per hour gets the job back on schedule — fast.

KOEHRING

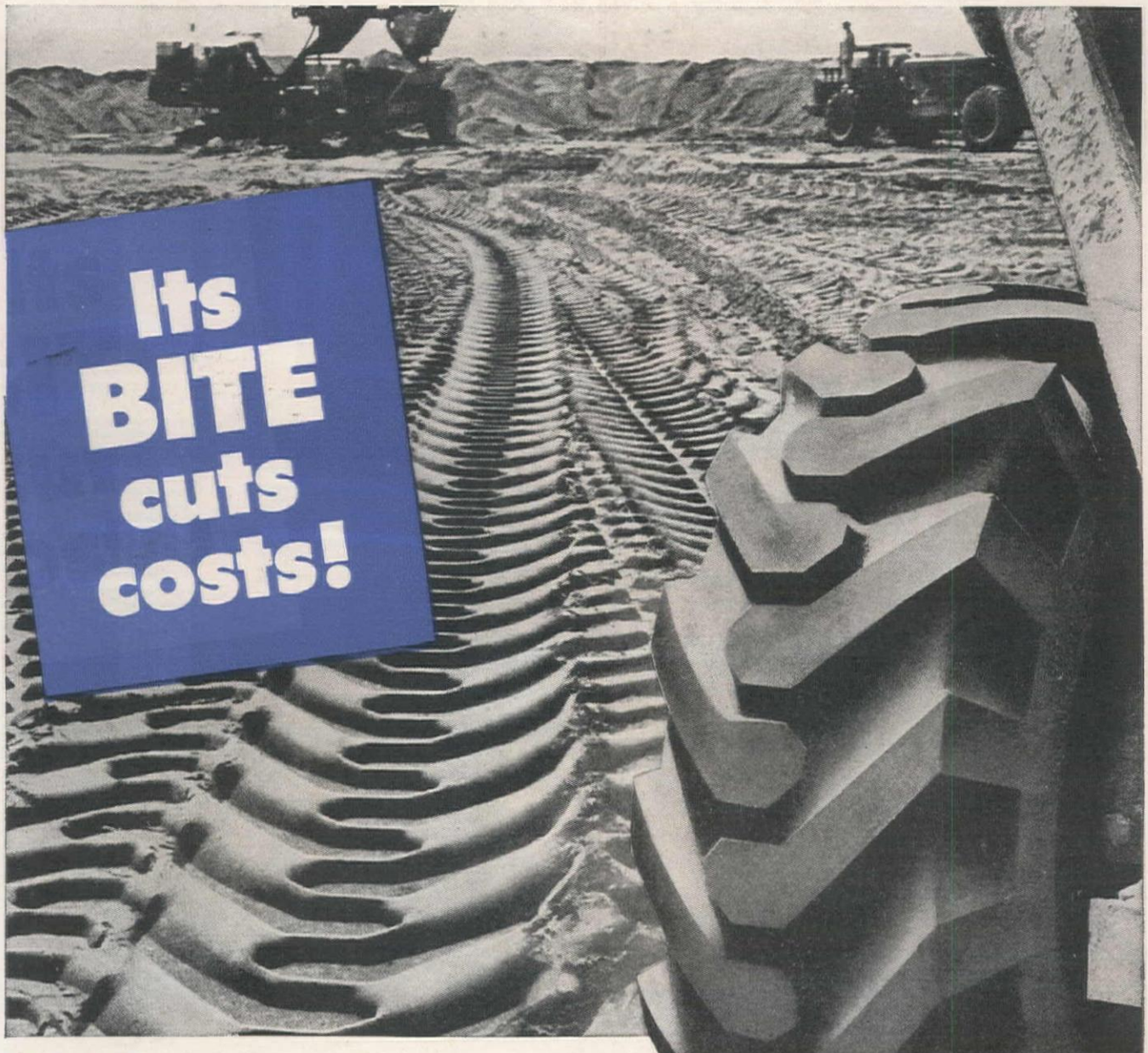
34-E *twinbatch*

PAVER

TWO COMPARTMENT DRUM

KOEHRING COMPANY • *Milwaukee 10, Wisconsin*

PACIFIC HOIST & DERRICK CO. . . . Seattle, Washington
WESTERN MACHINERY CO. . . . . Spokane, Washington
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HARRON, RICKARD & McCONE CO. OF SOUTHERN CALIFORNIA . . . Los Angeles
KOEHRING COMPANY WEST COAST PARTS WAREHOUSE . Sacramento, California



Patterned by Sure-Grip Earth Movers working on New York's $200,000,000 Idlewild Airport job.

HERE you see the tread marks of a work champion — Goodyear's Sure-Grip Earth Mover. It hauls big yardages faster — delivers lower costs on big jobs everywhere. That's because its *open center* self-cleaning tread keeps those husky lug bars *completely separate* — enables *each* one to bite in sharp, clean, deep — take a full-depth, full-length grip with minimum slip — pull sure and steady in *any* going. That's the big reason why Goodyear's Sure-Grip is tops with cost-wise contractors everywhere — and one reason why *"more yards are moved on Goodyear off-the-road tires than on any other kind."*

Sure-Grip—T.M. The Goodyear Tire & Rubber Company

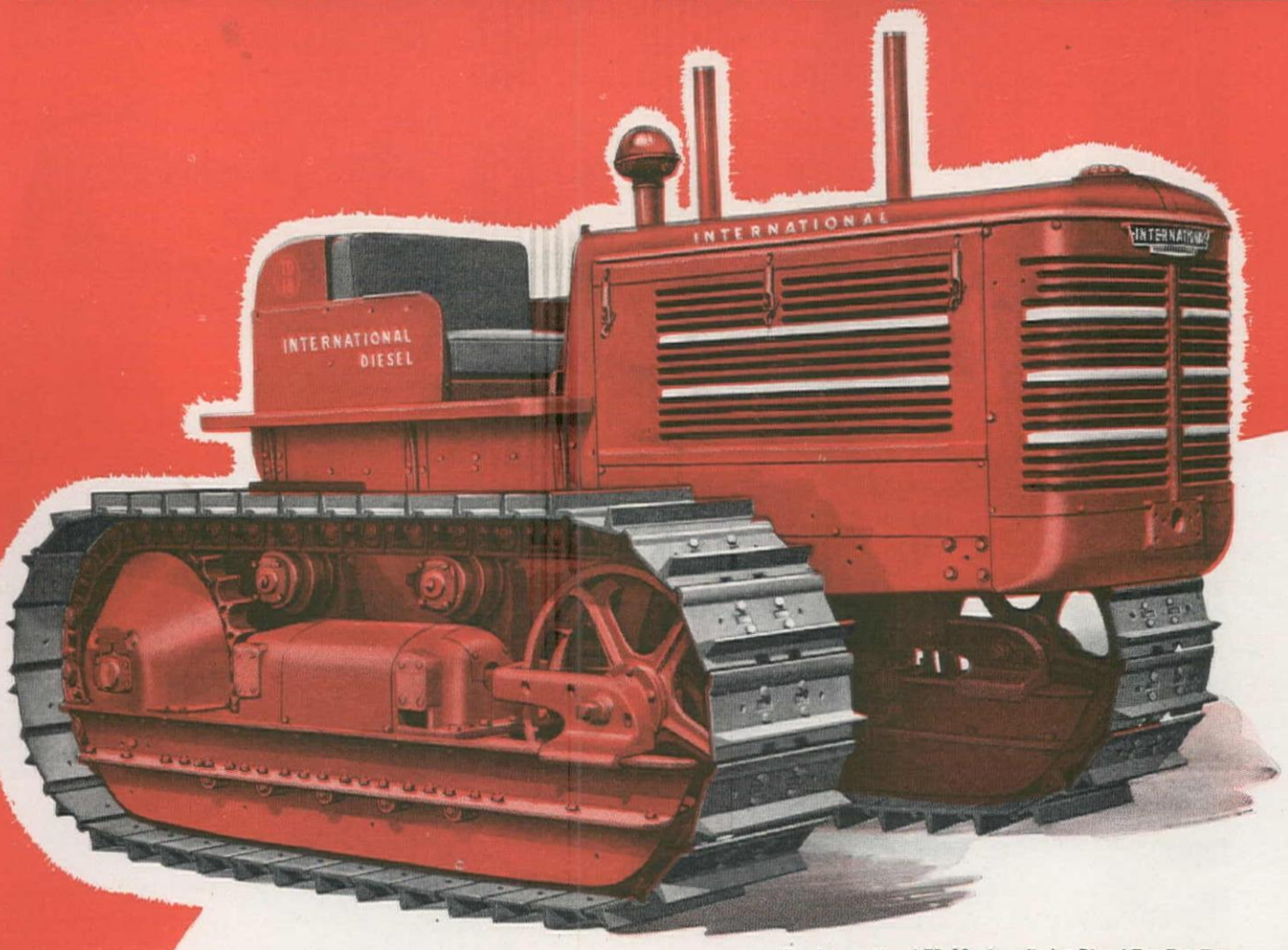
BUY and SPECIFY
GOODYEAR
—it pays!

GOODYEAR

THE GREATEST NAME IN RUBBER

The Best Combination-

INTERNATIONAL



The International TD-18, six-cylinder Diesel TracTracTor. This power-packed crawler will take all the punishment your toughest jobs can give it! Low cost for fuel—minimum maintenance—ruggedness that assures long-lived service in powering the construction jobs of today and tomorrow—backed by International Harvester's world-wide service organization.



TracTracTors AND *the Finest* OF MATCHED EQUIPMENT

ONE outstanding advantage in buying International Tractors for any power application is the excellence of perfectly matched equipment available for use with them. Through International Industrial Power distributors you have available the 'dozer blades and other earth-moving tools that are best adapted to construction operations at your locations.

Thus, you have the best combination for profitable operations: (1) the unbeatable operating economy of power-packed International Crawlers and (2) the finest of time-tested and job-proved equipment, matched in work capacity to the horsepower of International Tractors.

Consider the many superior features of International TracTracTors, such as:

- Instant-starting, *full Diesel* engines with advanced design fuel injection that assures complete fuel combustion—
- Ball-bearing and roller-bearing power transmissions that deliver maximum engine horsepower to the tracks—
- Accessible and replaceable clutches, brakes, transmission and other assemblies—

Then you know that International Tractors plus the finest of matched equipment makes the best combination for greater profits through peak performance.

See your International Industrial Power Distributor for all the facts about International Tractors, Power Units and matched equipment now available. There's a size and type of International Tractor exactly suited to your operations.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue **Chicago 1, Illinois**

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BROWN MOTORS, Reno, Nevada

BROWN TRACTOR COMPANY, Fresno, Madera, Reedley, Cal.

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SUTTON-MORF TRACTOR CO., Sacramento, California

THOMPSON-SAGA, INC., Stockton, California

VALLEY EQUIPMENT CO., San Jose and San Francisco, Cal.

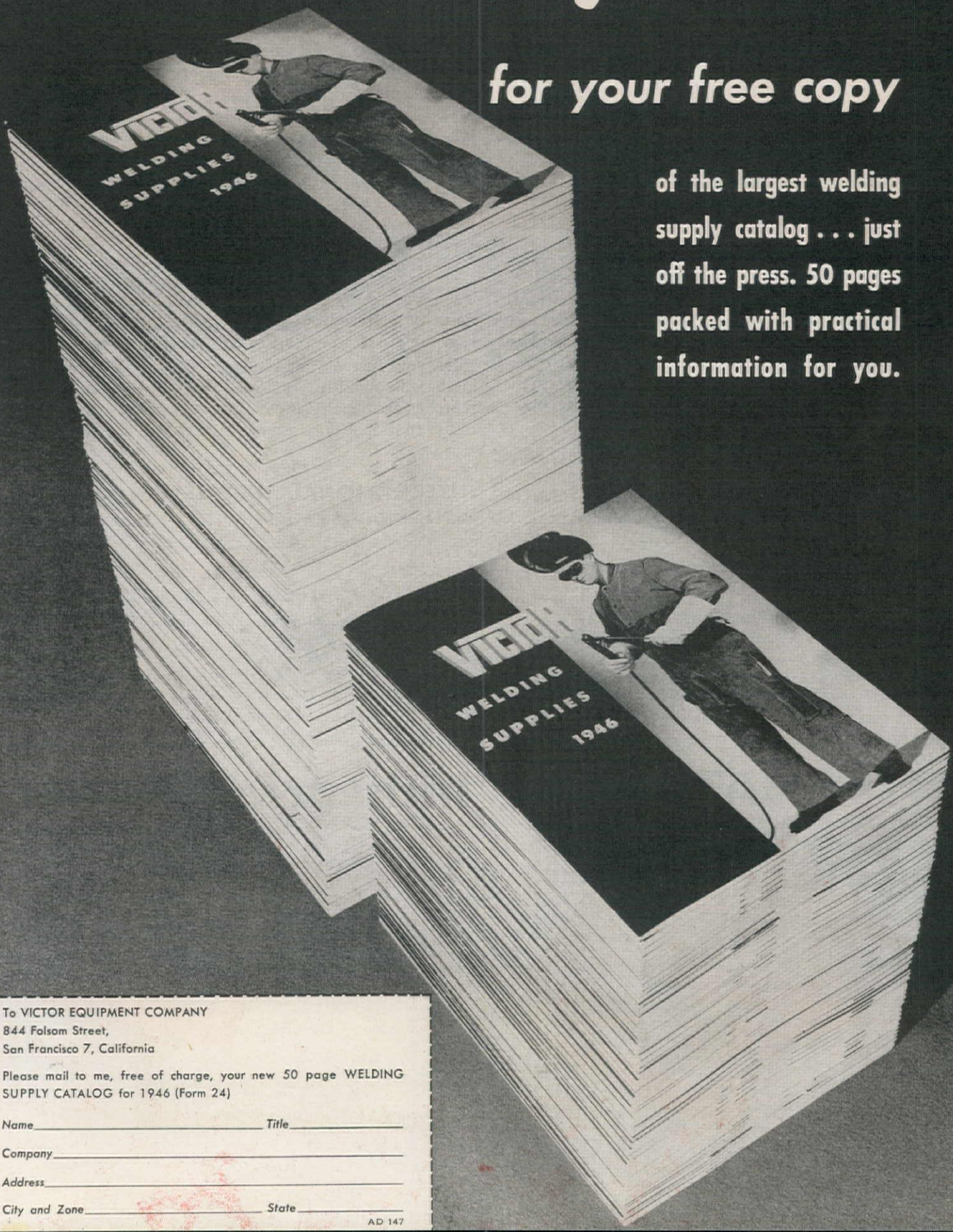
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Please mail to me, free of charge, your new 50 page WELDING SUPPLY CATALOG for 1946 (Form 24)

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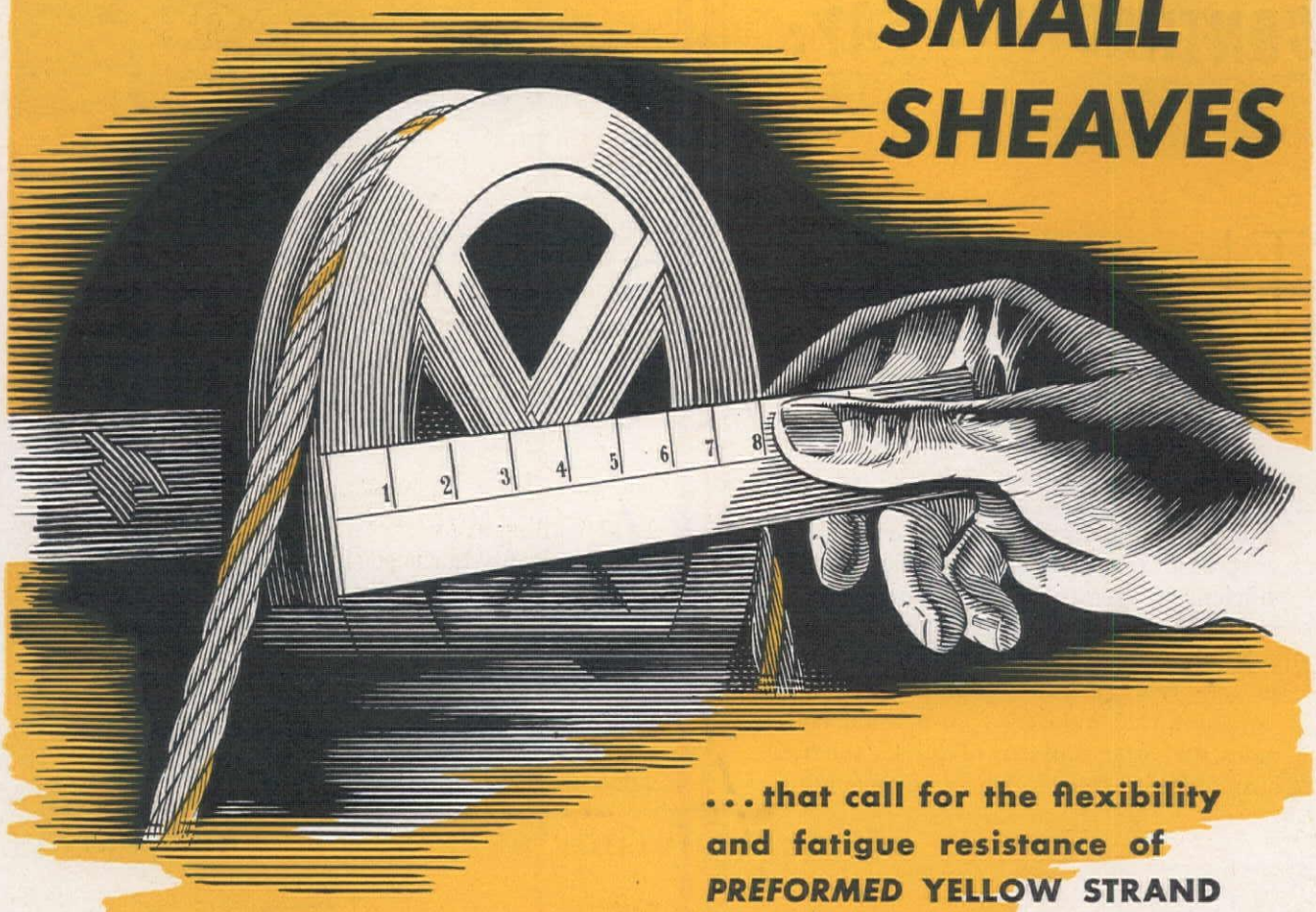
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AD 147

We still have with us . . .

SMALL SHEAVES



. . . that call for the flexibility and fatigue resistance of *PREFORMED* YELLOW STRAND

In a lot of equipment lines, old and new models will have one feature alike: small sheaves—perhaps accompanied by small drums. Either is tough on wire rope. Both should remind you to *minimize* their fatiguing effect by using *Preformed* Yellow Strand.

While reasonable bending is expected of unpreformed rope, severe bending tends to break down the steel itself. High speeds, heavy loads and reverse bends all hasten a premature end.

The *flexibility* of *Preformed* Yellow Strand enables it to hold its own *longer* against fatigue. Its wires and strands can concentrate on the *external* bending job, because *internal* stresses have been virtually neutralized during manufacture. Instead of having been forcibly twisted into place, the parts have been preshaped to the spiral curvature they keep in the finished rope.

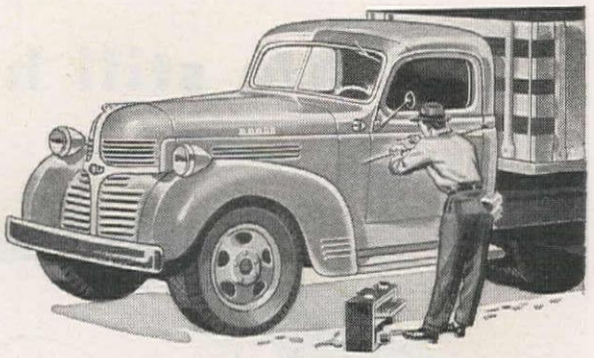
Along with greater endurance, smooth-running *Preformed* Yellow Strand offers faster installation . . . higher kink-resistance . . . increased protection for workmen.

Specify *Preformed* Yellow Strand by name. Get all you should in wire rope performance and economy. Broderick & Bascom Rope Co., St. Louis 15, Mo. *Branches:* SEATTLE, Portland, New York, Chicago, Houston. *Factories:* SEATTLE, St. Louis, Peoria.

HAND BOOK FREE: "Industrial Wire Ropes" contains useful facts, tables, pictures. Write for your copy.

BRODERICK & BASCOM
Yellow Strand
***PREFORMED* WIRE ROPE**

CONTRACTORS SAY:



"There is no substitute for *Job-Rated* economy"

You—like thousands of other contractors—*know* that when trucks *fit your job*, they perform more efficiently, operate more economically, and last longer. . . . You know that you get better and more economical performance when the engine in your truck is "sized" for your loads. And you know that when the transmission, clutch, axles, and other units are of exactly the right size for the truck's job—you get *better* hauling at *lower* cost. . . . Dodge *Job-Rated* trucks fit your needs in many ways. They're engineered specifically for rugged, day-in-and-day-out service. Bodies are big and strong, and drivers like their comfort. . . . If you struggled through the war *without* the economy and dependability of trucks that fit your job—talk to Dodge owners, then to a Dodge dealer. NOW is a good time to switch to Dodge *Job-Rated* trucks.

DODGE / DIVISION OF CHRYSLER CORPORATION



DODGE *Job-Rated* TRUCKS

FIT THE JOB ... LAST LONGER

LISTEN TO THE MUSIC OF ANDRE KOSTELANETZ, WITH FAMOUS GUEST STARS, THURSDAYS, C.B.S., 9 P.M., E.T.



Why buy an obsolete compressor when you can get a JAEGER?



Sizes 60 to 500 ft., gas, diesel, electric.

With their giant "ultra-lapped" valves, slower piston speeds, bigger air receivers, interchangeable precision parts, full force feed lubrication and latest type Continental, International and Caterpillar engines, Jaeger "AIR PLUS" Compressors are delivering cooler air for less cost in fuel and upkeep than any compressor you've ever owned. Ask for Catalog JC-5.



JAEGER PAVING TEAM

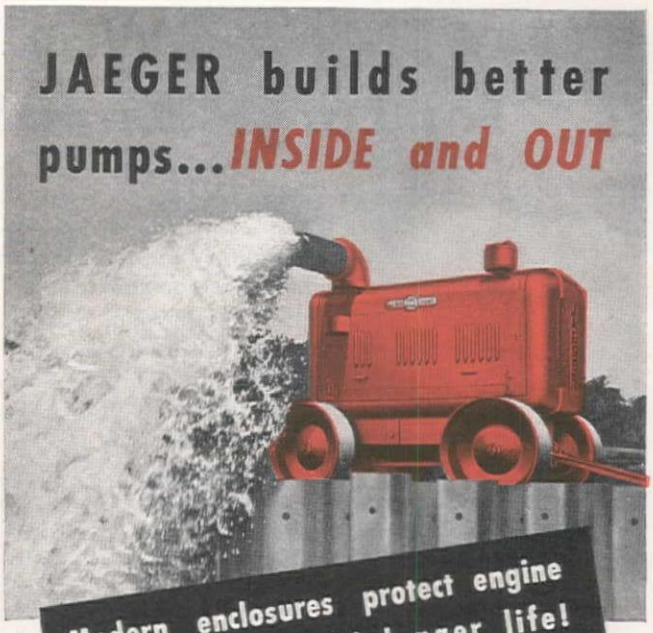
for Faster Paving (Over 300 Lin. Ft. per Hour of 25 Ft. Slab When Working Behind Two 34 E Dual Drum Pavers),

for Greater Density and Uniformity of Slab, Due to Re-Mixing Action of Jaeger Spreading Screw,

for Precision Smoothness of Riding Surface,

for Lower Costs thru High Production, Small Crews and Cutting of Final Finishing Time.

JAEGER builds better pumps...INSIDE and OUT



Modern enclosures protect engine efficiency . . . add longer life!

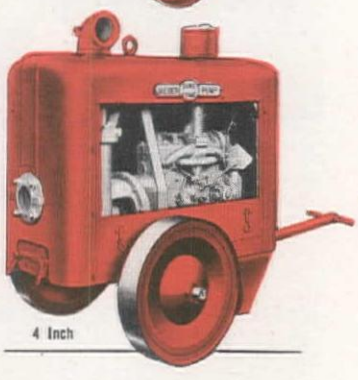
Experienced contractors buy far more Jaeger "Sure Primes" than any other make of pump. They know that all "Sure Prime" pumps are better engineered, conservatively rated, powered with high grade engines and enclosed in modern housings that keep those engines dry, clean, quick-starting and smooth running for extra thousands of hours of low cost service.

Protected Yet Accessible

Instant opening side panels admit to all operating controls. Enclosures are also designed to lift off or swing open for complete access when desired. One of many exclusive Jaeger advantages.



2 Inch



4 Inch



Capacities 3000 to 240,000 g.p.h.

Only Jaeger Offers All These Features:

- Inherent priming action plus "jet" priming —fastest and doubly sure.
- "Lubri-Seal," accessible for inspection.
- Self-cleaning shells . . . Replaceable liners or seal rings.
- Pumps individually tested and certified.

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Why You Need B-G Finishers For Large-Area Surfacing

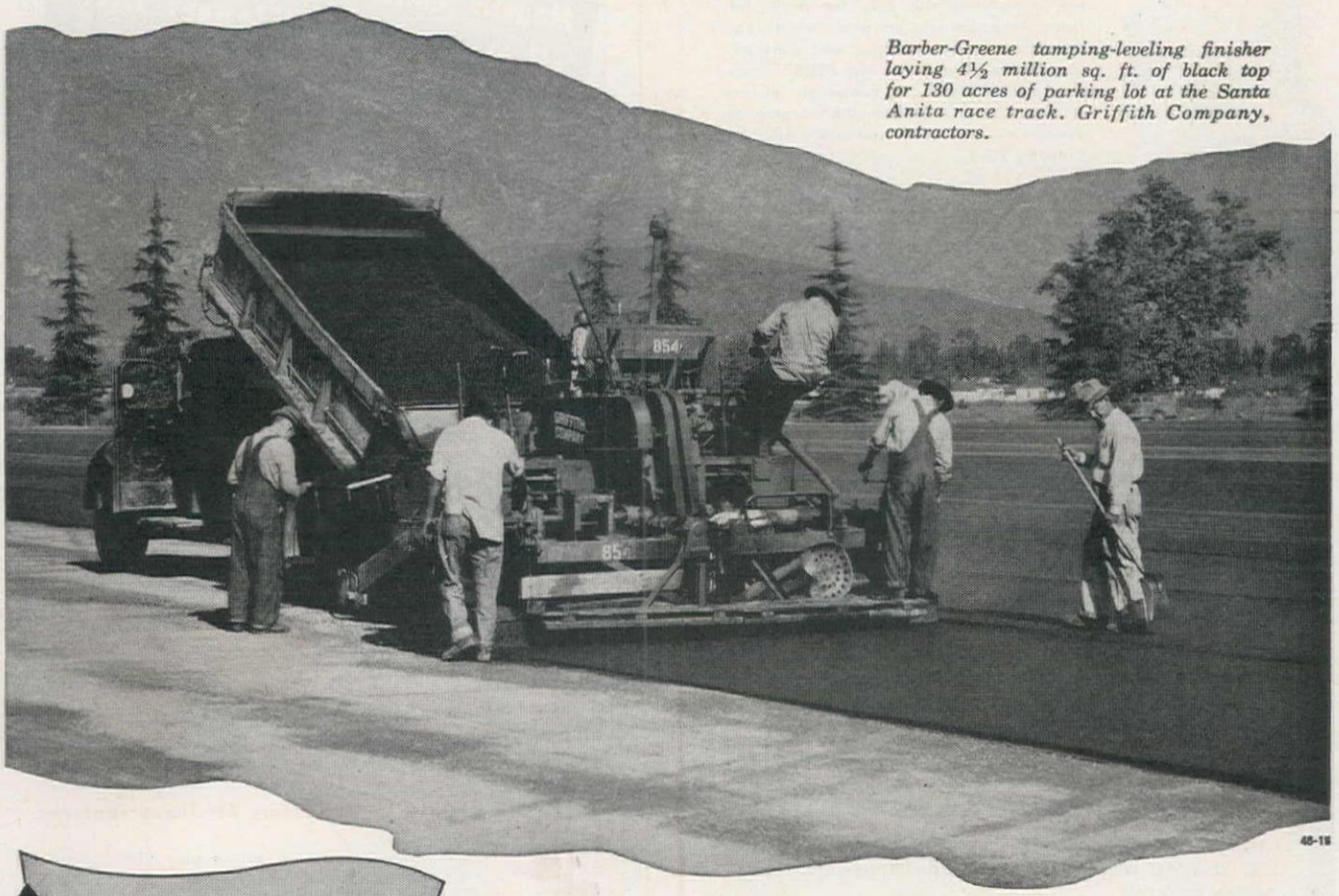
• An important requirement for large area surfacing—such as airport runways, super highways, parking lots, playgrounds, etc.—is that there be *no ridges or breaks in the entire surface area.* With so many of these jobs coming up now and in the near future, B-G Finishers are even more important to you.

These Tamping-Leveling finishers match the joints evenly—they compact and tamp each succeeding strip firmly in place against the previous one.

Because of this even compaction across the full width of the mat (including the joint) you get a ridge-free continuous surface area. There is the same density across the joint that there is in the rest of the strip.

The B-G Tamping-Leveler finisher will lay any mix, hot or cold, loosely graded or sheet asphalt—and up to 6 inches thick. Also, it gives you a mat of uniform density and a smooth level surface over an irregular sub-base.

Your Barber-Greene representative has catalogs on Barber-Greene asphalt equipment and data on its performance on jobs like yours. Barber-Greene Company, Aurora, Illinois.



Barber-Greene tamping-leveling finisher laying 4½ million sq. ft. of black top for 130 acres of parking lot at the Santa Anita race track. Griffith Company, contractors.

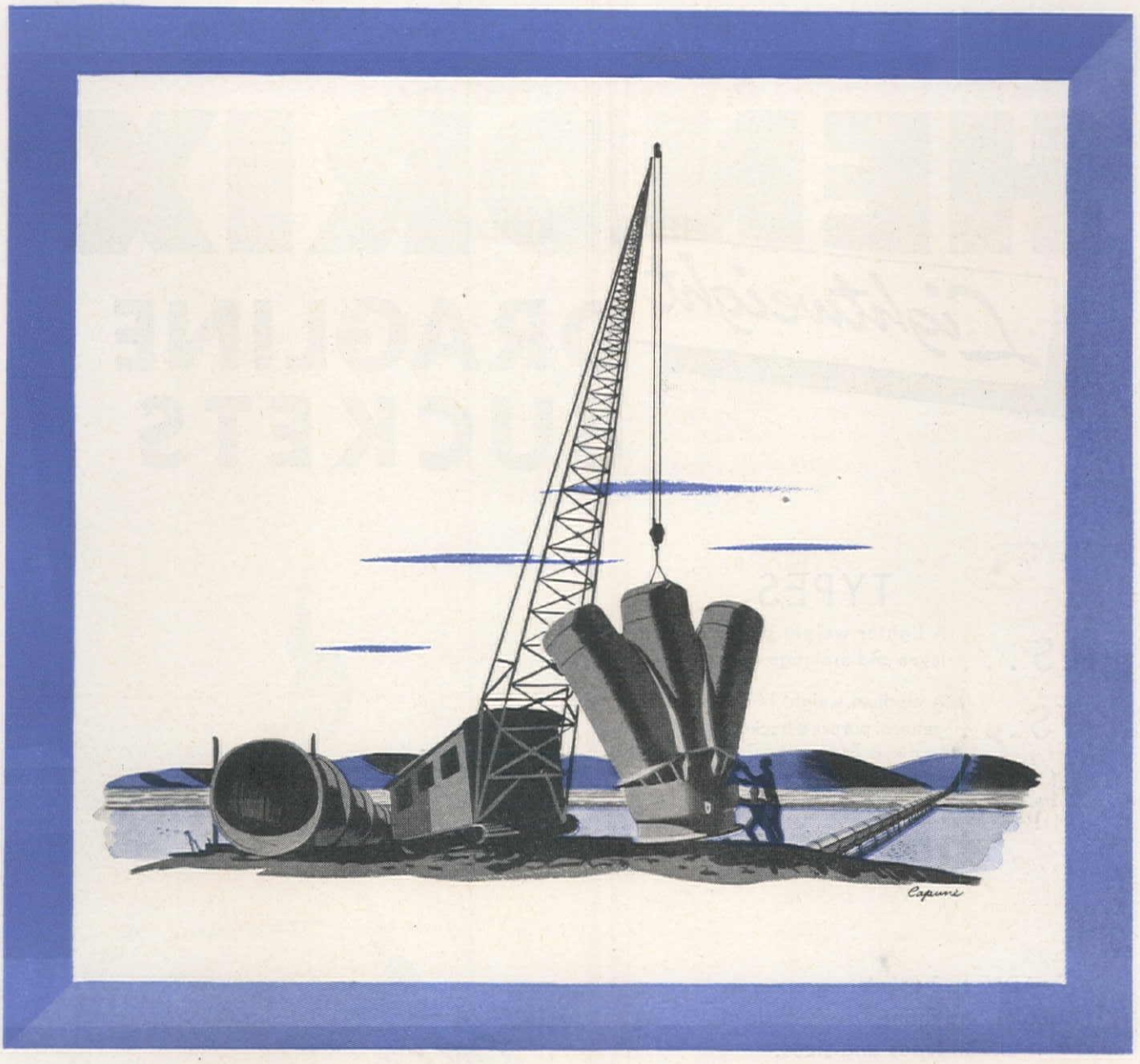
48-18

B-G Barber-Greene CONSTANT FLOW EQUIPMENT



LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES

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PIPELINES OF STEEL

With its purchase of Western Pipe & Steel Company, Consolidated Steel Corporation is better equipped than ever to fill your needs for steel pipe as well as other forms of fabrication and erection.

If your current or future plans call for precision craftsmanship in steel, Consolidated's versatile engineering experience and expanded facilities stand ready to carry out your orders *immediately*.



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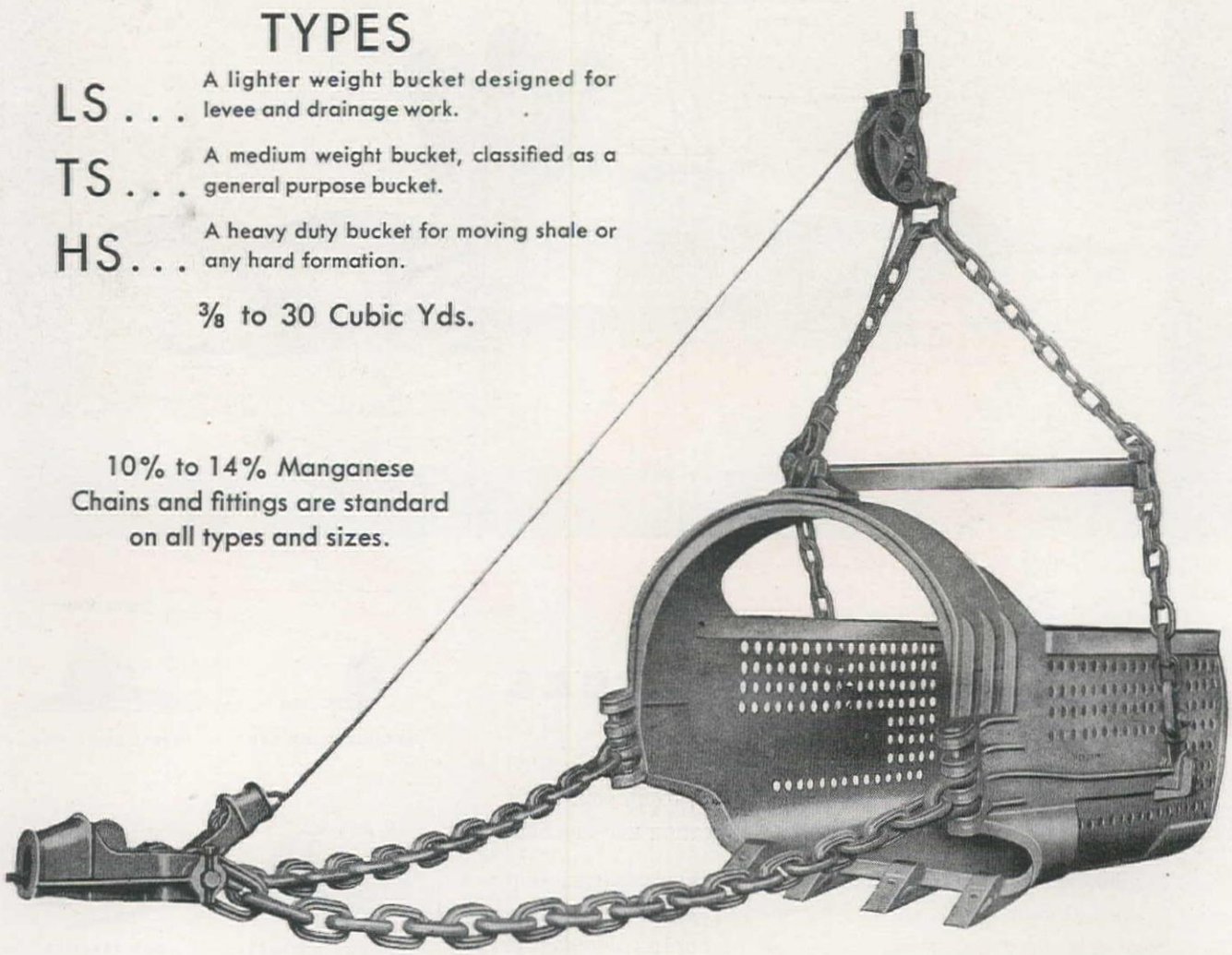
LS . . . A lighter weight bucket designed for levee and drainage work.

TS . . . A medium weight bucket, classified as a general purpose bucket.

HS . . . A heavy duty bucket for moving shale or any hard formation.

⅜ to 30 Cubic Yds.

10% to 14% Manganese
Chains and fittings are standard
on all types and sizes.



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BUDA DIESEL

one-sixty-one

. . . reliable power at 1/3 the cost!



BUDA One-Sixty-One Diesel Model 6-DC-844

the engines that Experience Built...

TAKING time out to figure operating costs of their new BUDA DIESEL powered shovel, a large midwest operator was more than satisfied to find that the new machine not only out-performed other units, but operated at "one-third the cost of steam."

Service records of BUDA DIESEL powered construction, quarry and mining equipment all over the country are proving every day that these modern "ONE-SIXTY-ONE" SERIES engines are tops for economy and dependability.

Be sure your new equipment is BUDA powered.

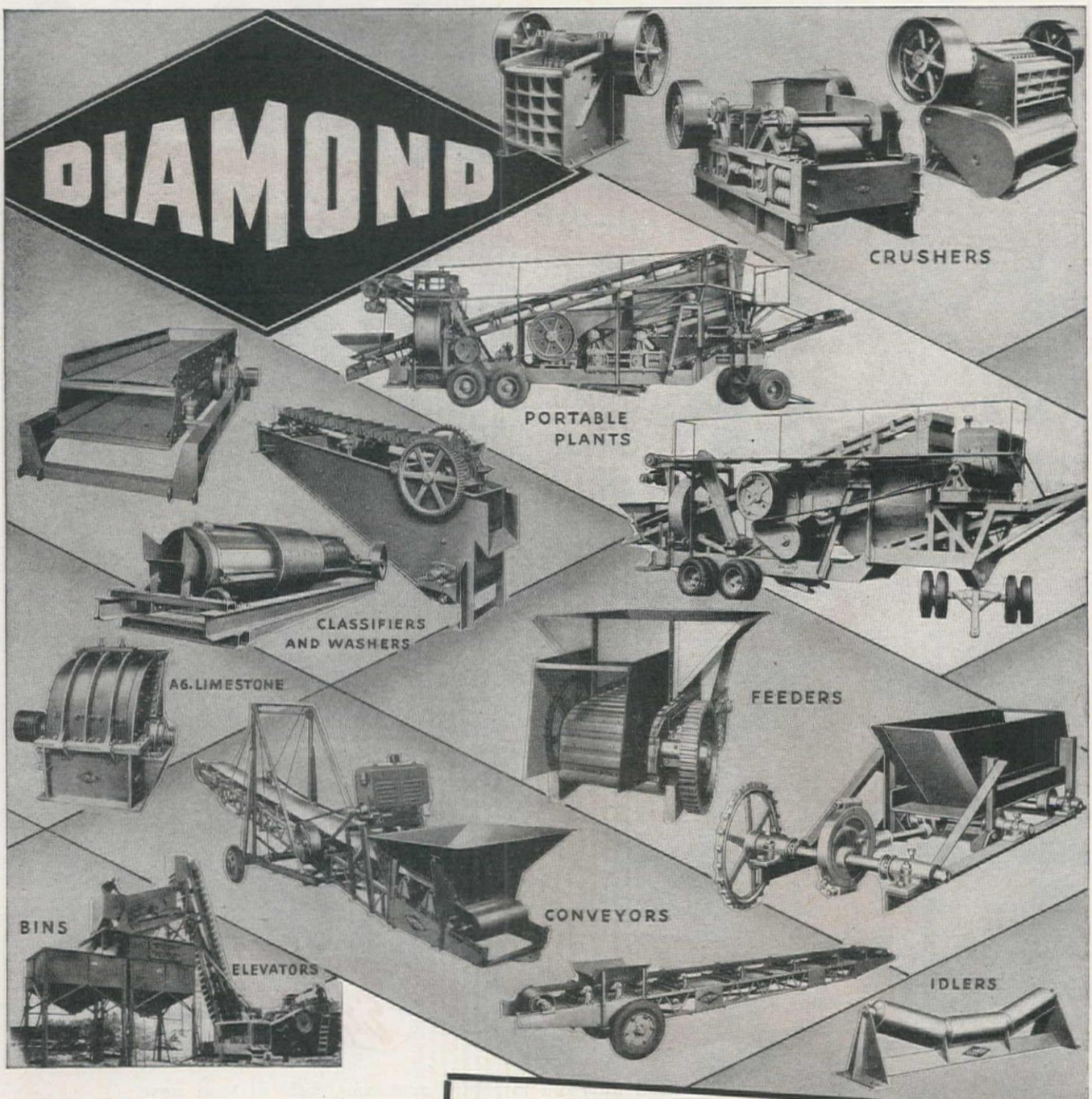


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BUDA

15424 Commercial Avenue
HARVEY (Chicago Suburb) ILLINOIS

THERE'S NOTHING TOUGHER THAN A "DIAMOND"



The proven ruggedness of DIAMOND equipment is your key to profits on the job. The slogan at the top of this ad—"There's nothing tougher than a DIAMOND"—was suggested to us—and that's exactly the way hundreds of DIAMOND users feel. For a banner year in 1946—see your DIAMOND dealer or write us.

DIAMOND DEALERS

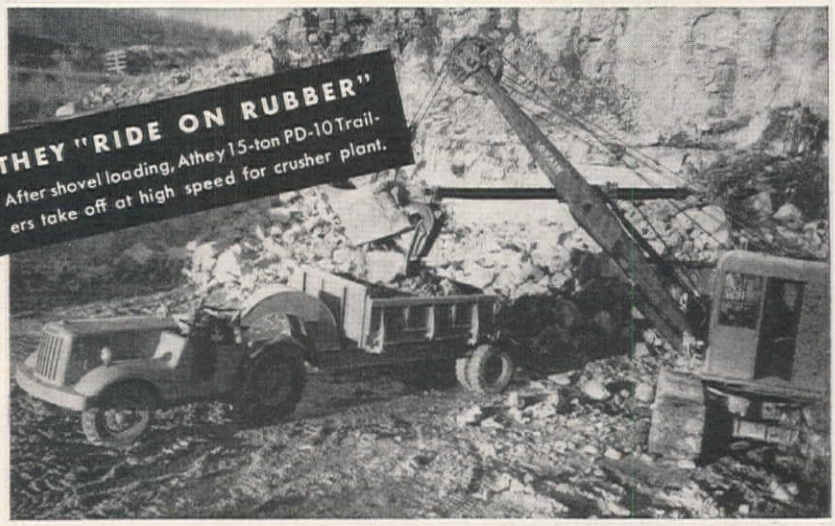
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DIAMOND IRON WORKS, INC. and the **MAHR MANUFACTURING CO. DIVISION**
1818 **SECOND STREET NORTH** **MINNEAPOLIS 11, MINN.**

2 Reasons why . . .

ATHEY PD-10 TRAILERS WORK HERE!

1 THEY "RIDE ON RUBBER"
After shovel loading, Athey 15-ton PD-10 Trailers take off at high speed for crusher plant.



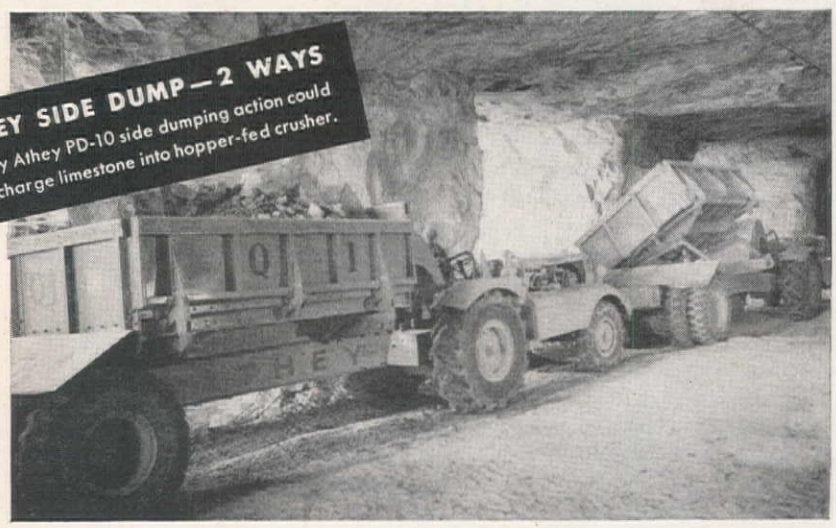
Here's another job — the Peerless Lime Company of Ste. Genevieve, Mo. — where operating features of the new Athey PD-10 Trailer were the perfect answer to a tough job condition.

Operations at the huge quarry called for loading trailers both on the surface and in an underground "cave" cut in solid limestone. Haul distances to the crusher called for high-speed travel so that crushing plant would operate at maximum capacity. The new Athey PD-10 Trailer, powered by "Caterpillar" DW 10 rubber-tired Tractor, gave haul speeds up to 18 m.p.h. to speed delivery of material.

Unloading at crusher plant demanded a side-dump trailer due to location of hopper at mouth of cave and the design of the crusher setup. Athey PD-10 Trailer 2-way side dumping action again was the fast, low-cost answer for this material handling job.

ATHEY PRODUCTS CORPORATION • CHICAGO, ILL.

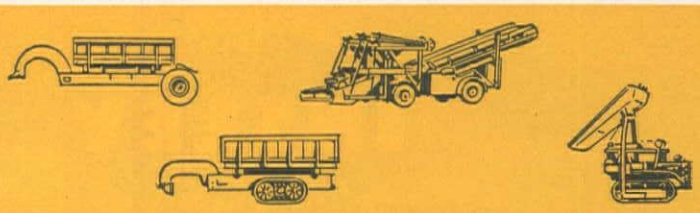
2 THEY SIDE DUMP — 2 WAYS
Only Athey PD-10 side dumping action could discharge limestone into hopper-fed crusher.



For big capacity, fast travel and more output — plus the versatile unloading of 2-way side dump — ask your Athey-"Caterpillar" Dealer for facts about the new PD-10 Trailer . . . powered by the famous "Caterpillar" DW-10 Tractor. He will gladly assist you in the selection and application of the right combination for lowest cost operation.

Athey APCOR Products

Athey



DEPENDABLE LOADING AND HAULING EQUIPMENT

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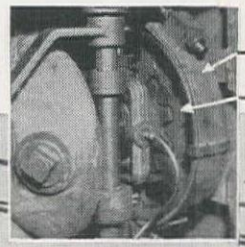
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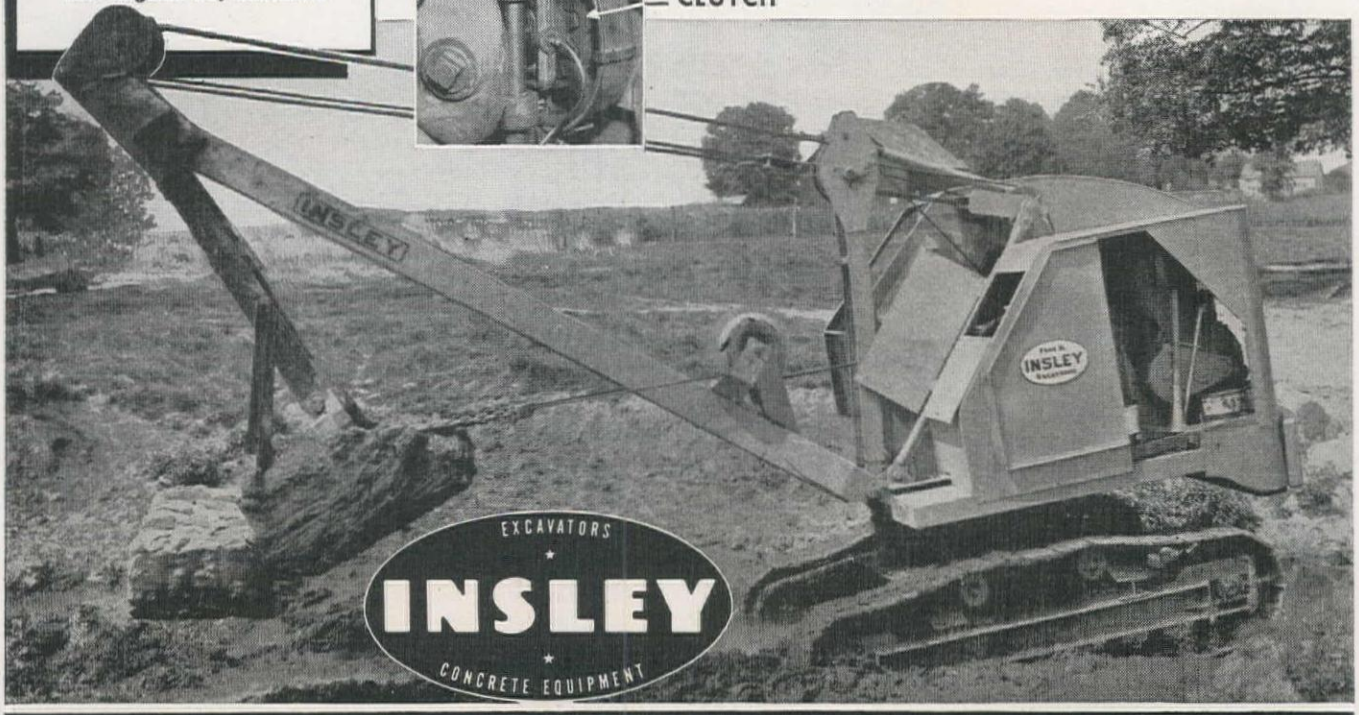
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Los Angeles 22, California

Easier to Maneuver

Here's one reason why the Insley Excavator works fast and sure over any terrain—no matter how rough, tough, or soft the going may be: On turns you not only can de-clutch the pivot crawler . . . you can brake it, too. That means more complete control—faster, easier maneuvering into position. This, plus Insley's self-cleaning crawlers—extra wide, extra long at no extra cost—assure a surefootedness that saves time in tight spots and tough going.

These refinements are but a few of the proved Insley features which mean low-cost yardage for you. See your Insley dealer today for full details on the Insley Excavator—⅜ or ½-yd. Five interchangeable attachments—shovel, crane, hoe clamshell or dragline. Gasoline, diesel or electric power.

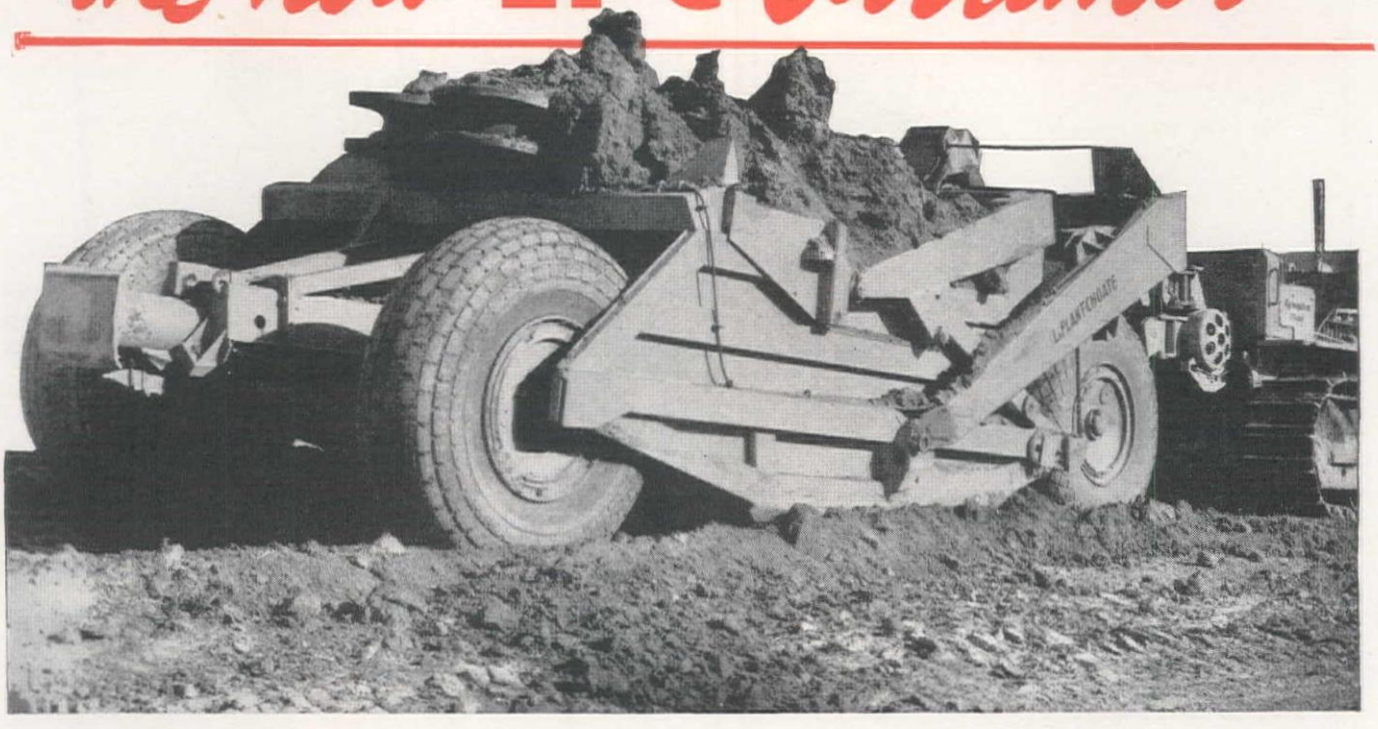


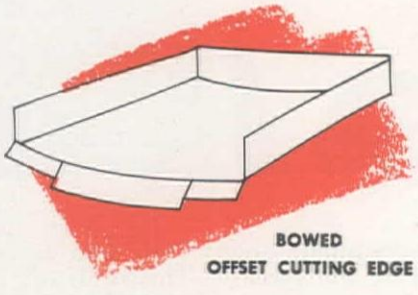


INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

bigger pay loads are a cinch with . . .

the new LPC Carrimor*





BOWED
OFFSET CUTTING EDGE



EXCLUSIVE
"FOUNTAIN ACTION"

Yes, Sir! You get bigger "pay loads" every time with an LPC "Carrimor". Moreover, you get them faster and with less power! Here's why: The "floating" front apron provides a generous initial opening for loading, without any movement of the tail gate. The bowed offset cutting edge gives you instant penetration in all kinds of material. The earth "fountains" up toward the center of the bowl until a full heaped load is obtained. Even in very loose material you can get full loads with amazing ease because LPC's exclusive, eccentric hoist sheaves produce a greatly accelerated downward throw in favor of the cutting edge, creating a "pumping" action that forces the load up into the bowl.

In addition to these features there are dozens of others that will cut minutes off your loading, hauling and dumping time while adding yardage to your pay loads. Compare the new LPC "Carrimors" with any other scraper you've ever used and you'll see why so many agree on LPC for lowest possible cost per yard. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; Oakland, Calif.

*Trade Mark Registered

LaPLANT-CHOATE

Engineered Earthmoving

Lowest Possible Cost per yard

You can
LAY WATER PIPE FASTER
when it's easy-to-handle Transite



KEEPING UP with the trenching machine is common practice when the pipe being installed is Transite!

Crews can unload and install this easy-to-handle, asbestos-cement pipe quickly . . . lay all but the larger sizes without mechanical handling equipment. The Simplex Coupling cuts assembly time . . . assures tight, yet flexible joints.

And in addition, Transite delivers these *long-term* advantages:

No tuberculation. Made of asbestos and cement, its initial high flow rate (C=140) is unaffected by tuberculation. Users never have to contend with excessive pumping costs resulting from this costly form of internal corrosion.

High corrosion resistance—outside, as well as inside and all the way through! Thousands of Transite Pipe installations—many in highly aggressive soils—testify to its exceptional resistance to soil corrosion.

Low maintenance. Transite's tight joints, high uniform strength, great durability and proved corrosion resistance all add up to low maintenance. Over the years, Transite Pipe has established an enviable record for economy in water distribution and supply lines throughout the country.

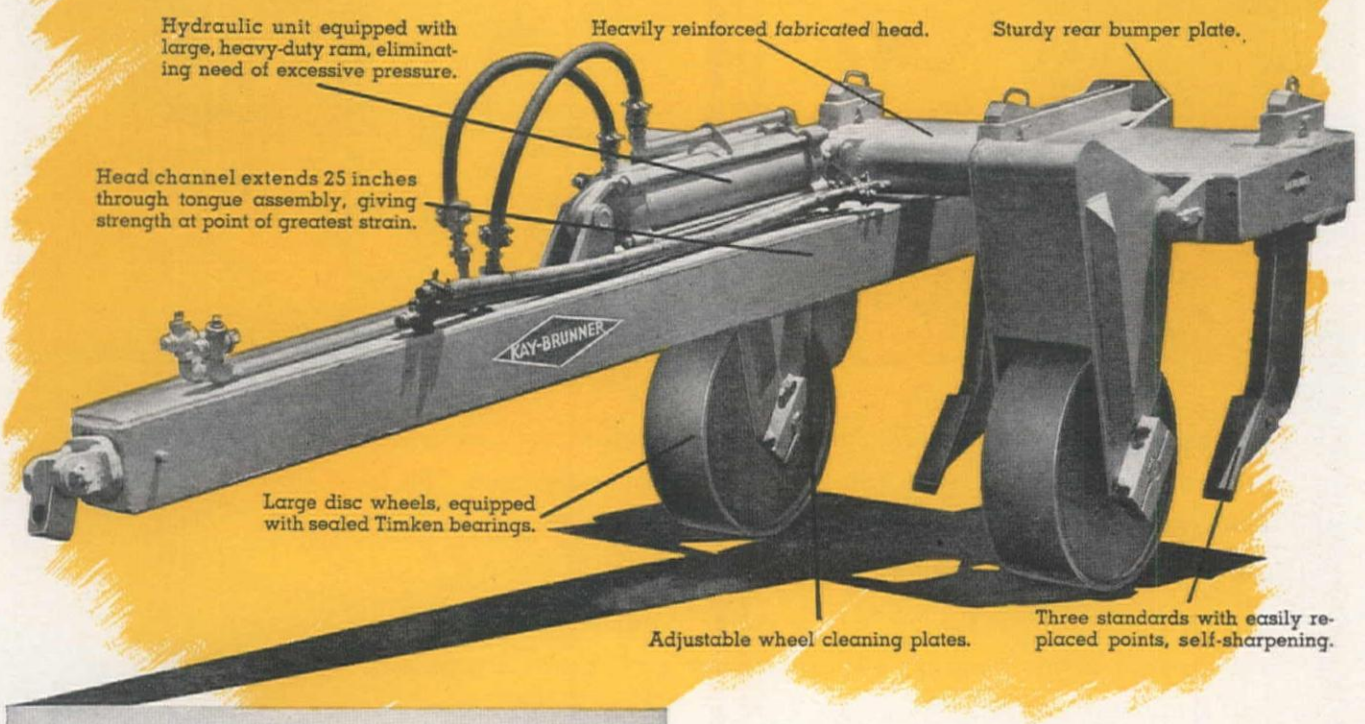
For complete information, write for brochure TR-11A. Johns-Manville, Box 290, New York 16, New York.

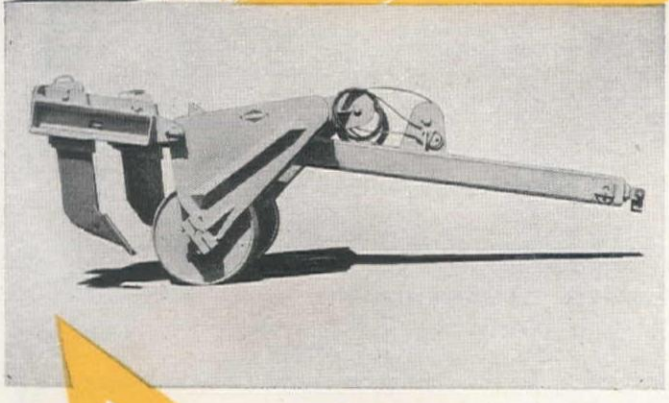
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville
TRANSITE PRESSURE PIPE
An Asbestos Product

Announcing a new and complete line of hydraulic and cable controlled

KAY-BRUNNER RIPPERS





There's a size to match your tractor in this great new line of Kay-Brunner rippers, and extra heavy construction to meet the toughest jobs. You can put full reliance in their rugged strength, for Kay-Brunner has had 22 years experience in building all kinds of dirt moving equipment to meet Western conditions. Either cable or hydraulic control, and weights range from 5,000 to 10,000 pounds.

For complete details and specifications, see your nearest Caterpillar dealer or write.

KB RIPPERS

KAY-BRUNNER STEEL PRODUCTS, INC.
2721 ELM STREET, LOS ANGELES 41, CALIFORNIA

BULLDOZERS ★ TRAILBUILDERS ★ CARRYING SCRAPERS ★ POWER CONTROL UNITS ★ TAMPING ROLLERS ★ BACKFILLERS

TRAILMOBILE

DUMP TRAILERS



For the transportation of bulk construction materials, such as sand, gravel, crushed rock, and for the hauling of excavated "fill," TRAILMOBILE Dump Trailers fill the needs for large capacity, sturdy construction, and easy pulling.

TRAILMOBILE Dump Trailers are popular among road builders, among contractors building airports, revetments, dams, irrigation and drainage projects. They like them in the oil fields for their ability to haul big loads over poor roads. In the mining industry, they are used to haul ore from mines to mills, and concentrates from mills to smelters or railheads.

If your problem is hauling big tonnage—far—fast—economically—investigate TRAILMOBILE DUMPS.

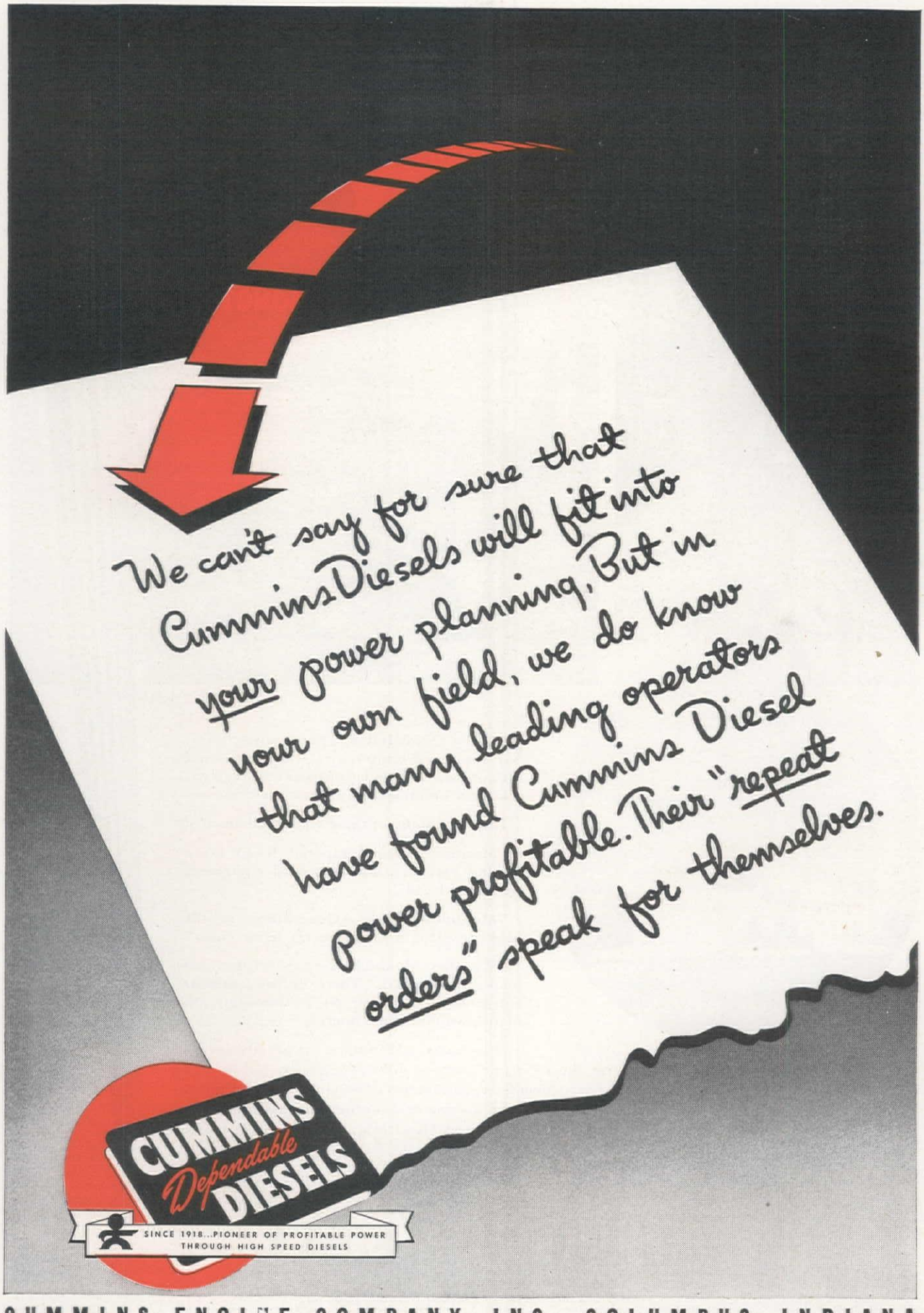
THE TRAILMOBILE COMPANY • BERKELEY, CALIFORNIA

★

The TRAILMOBILE Dump Trailer shown above is owned and operated by John Pedro of Lovelock, Nevada.

TRAILMOBILE

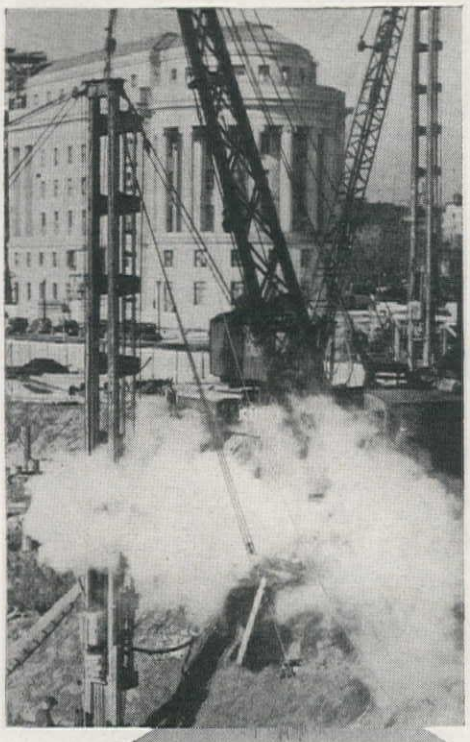
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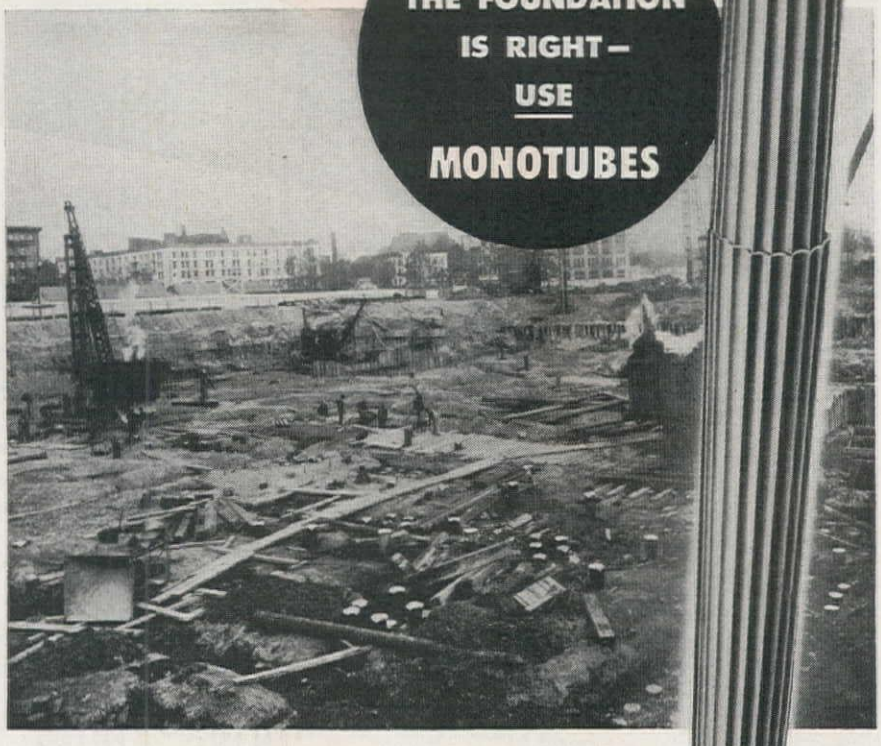


CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

Putting up a Big Job?

BE SURE THE FOUNDATION IS RIGHT— USE MONOTUBES







COST-CONSCIOUS, profit-wise engineers and contractors who have used Monotube *steel* foundation piles base their enthusiastic endorsement on past performance.

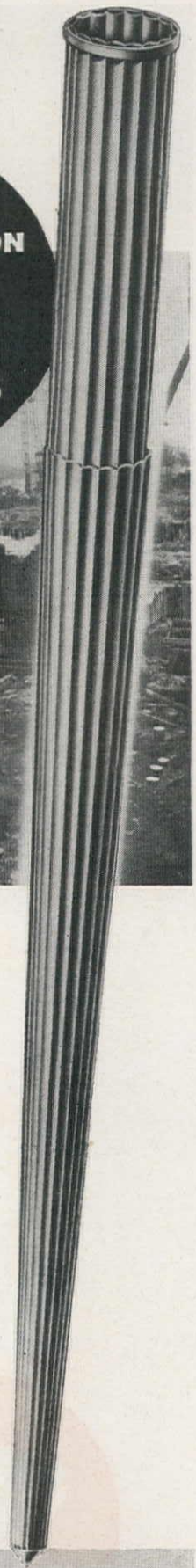
Here are some of their typical comments:

"Monotube's fluted, tapered design made driving easy . . . with standard equipment we had at hand."

"Monotube's easy extendibility, in the field, saved us time and extra labor costs."

"We like Monotube's speedy top-to-toe inspection feature. Their hollow, tubular construction lets us do a thorough job before we pour the concrete."

Why not turn Monotube's many advantages to your benefit on the next construction job? They're available in a gauge, size and taper to meet the requirements of varying soil conditions. For additional information and competent engineering assistance on jobs, large or small, write The Union Metal Mfg. Co., Canton 5, Ohio.



UNION METAL

Monotube Tapered Piles

DUST F.O.B. YOUR ENGINE



Nature delivers dust—at a rate of up to 4 tons per square mile in 24 hours —to make "sandpaper" in your engine oil

That 4-ton figure is a city dust-fall measurement. Imagine what it can be outside the area of pavements, with working equipment churning up its own clouds of those abrasive particles!

Add the contamination of unburned gasoline from over-choking or faulty automatic chokes...the condensation of water ... and the washing-down of worn particles from the engine itself. That's why engine oil must be changed regularly.

Next time you change oil, put new Golden Shell into the crankcase. It contains a new oxidation inhibitor that gives it high resistance to oxidation—the forerunner of sludge. Because sludge gums up oil lines, a sludge-free crankcase will mean better lubrication . . . longer engine life.

And without sludge to clog it, your oil filter will be able to trap more of those abrasive dust particles in the 8000 gallons of air your engine "inhales" for each gallon of gasoline it burns. So specify new Golden Shell with oxidation inhibitor.

WITH OXIDATION INHIBITOR

Golden Shell

SHELL

MOTOR OIL ... 25¢ PER QUART *TAX EXTRA*



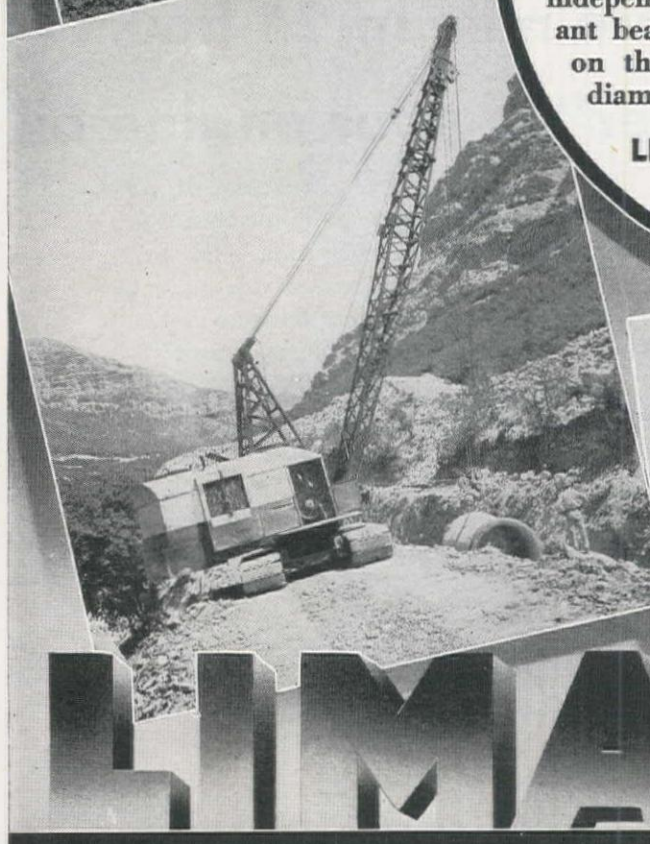


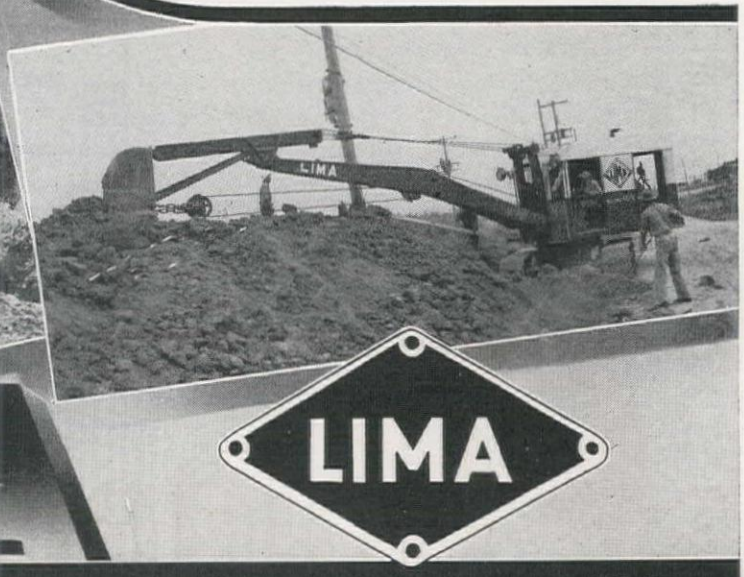
LIMA shovels, cranes, draglines, clamshells and pull-shovels are built to match the job. They are easily converted in the field, from one combination to another without a lot of extra work. This advantage makes it possible to handle many different kinds of excavating and crane work with one machine. You simply change front end equipment to match the job to be done. When you make your next equipment purchase, consider the wide range of application afforded by LIMA and assure yourself of the greater profits that come with an all-purpose machine. Other LIMA advantages are: independent clutches, anti-friction bearings at every important bearing point, fast, mobile crawlers, and air control on the larger types. A LIMA is identified by the diamond on the cab, an emblem of quality for 75 years.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division — **LIMA, OHIO**

NEW YORK, N. Y. · NEWARK, N. J. · ST. LOUIS, MO. · MINNEAPOLIS, MINN. · DALLAS, TEXAS · MEMPHIS, TENN. · SEATTLE, WASH. · SPOKANE, WASH. · LOS ANGELES, CALIF. · SAN FRANCISCO, CALIF. · PORTLAND, OREGON

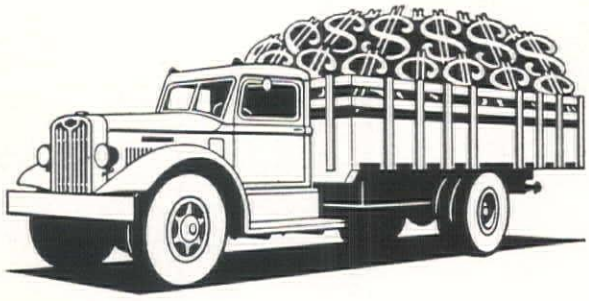




LIMA

SHOVELS ¾ YARD TO 5 YARDS · **DRAGLINES – VARIABLE** · **CRANES 13 TONS TO 100 TONS**

1932 First Avenue South, Seattle 4, Washington; Garfield & Company, 1232 Hearst Bldg., 5 Third St., San Francisco 3, California; Smith Booth Usher Co., P. O. Box 3578 Terminal Annex, Los Angeles 54, California; Held-McCoy Machinery Co., 3201 Brighton Blvd., Denver, Colorado; Smith Booth Usher Co., 1756 Grand Ave., Phoenix, Arizona; Contractors' Equipment & Supply Co., Springer Bldg., P. O. Box 456, Albuquerque, New Mexico; Mode · Machinery Co., Inc., N. 2417 Division St., Spokane, Washington; Jameson Engineering Sales, Fairbanks, Alaska.



PAYLOAD

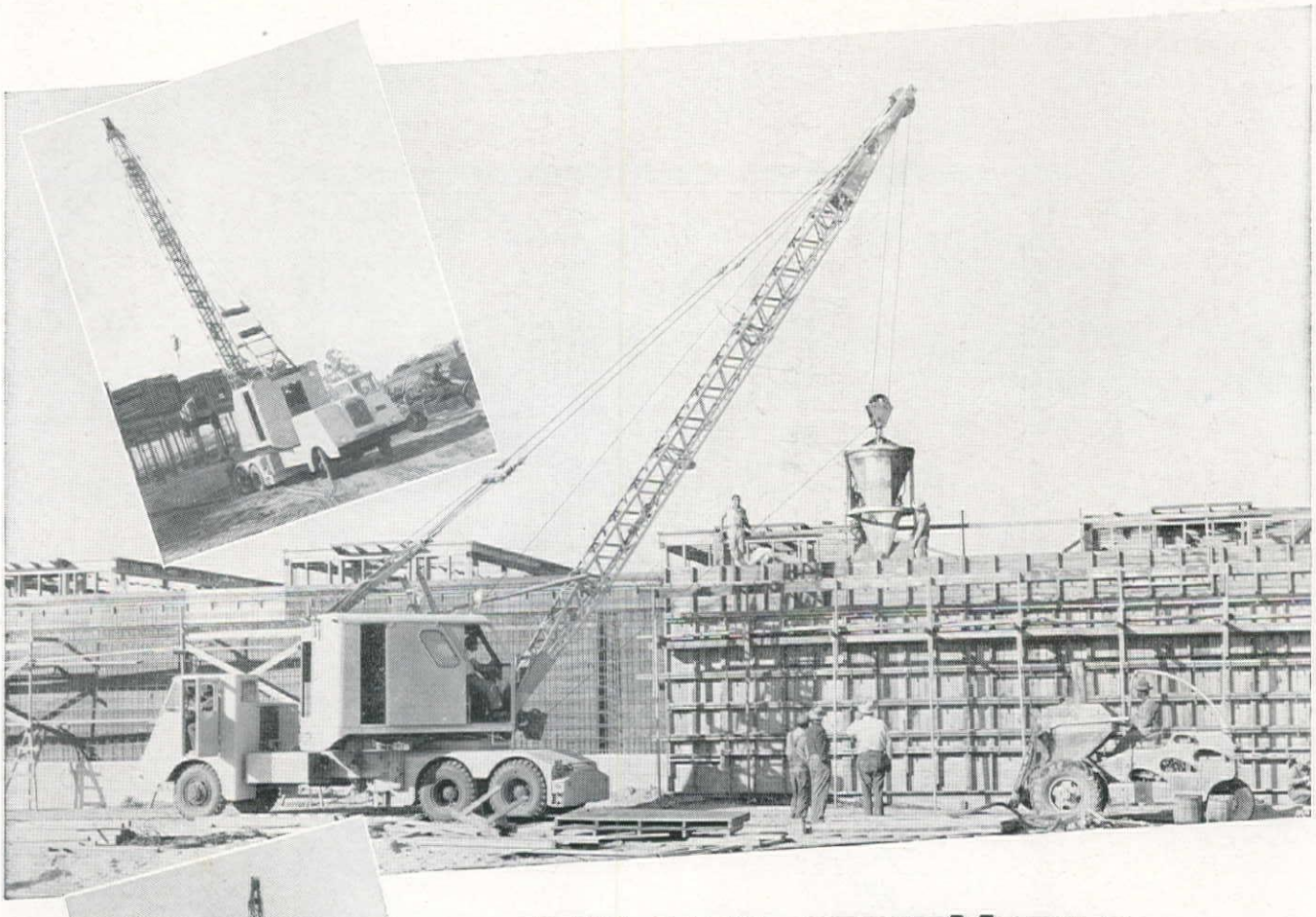
Autocar Trucks are superbly engineered. Their precision-built quality makes them leaders in the heavy-duty field. But the cost-wise buyer looks for more than workmanship and quality. He is concerned especially with payload, because it's the cargo carried that makes hauling profitable. Here Autocar is preeminent, for these great trucks return mile after mile of cost-cutting performance with heavy, dead-weight loads.

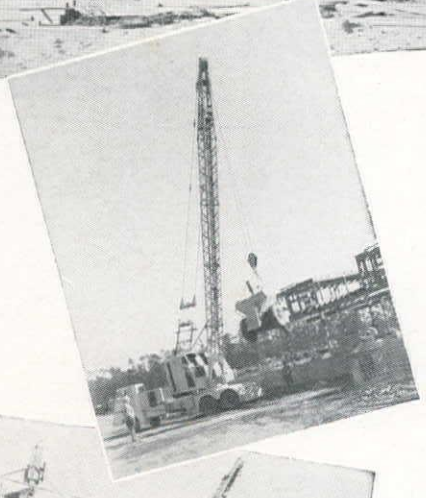
AUTOCAR TRUCKS

FOR HEAVY DUTY

SOLD AND SERVICED BY POINTER-WILLAMETTE
IN OREGON, WASHINGTON, AND MONTANA

HEADQUARTERS: 238 N. E. OREGON ST., PORTLAND 14





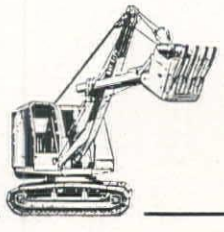


BAY CITY CRANEMOBILE

Gets No Rest on Big Project

The versatile performance of this 20-ton BAY CITY CraneMobile working for Robt. E. McKee, general contractor of Los Angeles and El Paso erecting a five-million dollar federal building on the Pacific Coast, is an on-the-job testimonial to the flexibility and dependability of this modern machine. Swinging a one-yard bucket at the end of a 50-ft. boom to place concrete precisely where it is needed is only one of the many jobs performed swiftly and easily. When elevators of the batching plant broke down, the CraneMobile hoisted material into hoppers until repairs were made. It has been lifting compressors, small trucks, and other construction equipment in and out of the partially-completed structure—digging excavations, hoisting reinforcing steel, moving concrete forms, etc. On any job a CraneMobile is in constant demand for these and many other jobs where heavy materials must be moved quickly and surely to keep construction going ahead at a profit-making pace. For complete information see your nearest BAY CITY dealer or write today to BAY CITY SHOVELS, INC., Bay City, Michigan.

BAY CITY



SHOVELS • DRAGLINES
CRANES • HOES • CLAMSHELLS

SEE YOUR NEAREST DEALER for Bay City excavating and material handling equipment in sizes from ⅜ to 1¼ yards having crane rating up to 20 tons. Both crawler and pneumatic tire mounting.

DRILL ROCK quicker, cheaper



with TIMKEN *Rock Bits*

Acclaimed by construction contractors and metal mine operators as the greatest rock drilling tool ever developed. An outstanding achievement of engineering experience; metallurgical knowledge; and steel making know-how; a highly specialized product manufactured in a completely-equipped modern plant where nothing else is made.

When we say that you can put down more holes in less time at lower cost with Timken Bits we are merely summarizing the experience of hundreds of contractors and mine operators who have standardized on these bits after proving their merits.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS

If you still are using conventional steels you don't know what you're losing; swing to Timken Bits and begin saving. Write for name of nearest Authorized Distributor. Look for the trade-mark "TIMKEN" on every bit you buy.

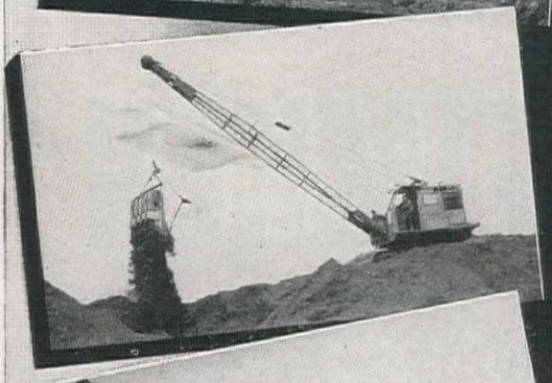
THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

Swing's the thing



IN A DRAGLINE

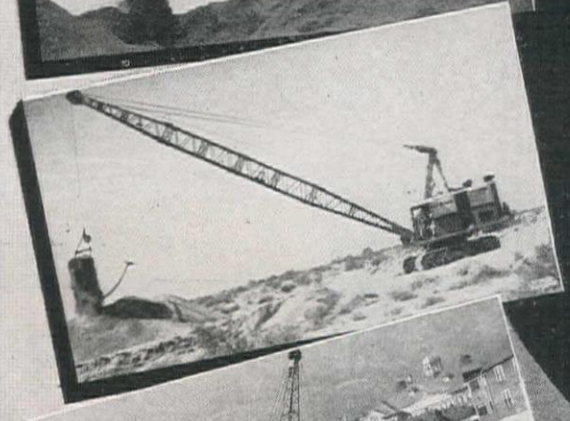
MARIONS



swing far . . . swing wide . . . but most important SWING SMOOTHLY.

The smooth swing cycle of a MARION DRAGLINE adds extra yardage to every shift.

There is a MARION dragline to fit your job.



MARION
POWER SHOVEL COMPANY

MARION, OHIO, U. S. A.

¾ cu. yd. to 40 cu. yds.

Offices and Warehouses in principal cities



ASK YOUR MARION DISTRIBUTOR TO HELP YOU SOLVE YOUR MATERIAL HANDLING PROBLEM. HIS EXPERIENCE IS INVALUABLE TO YOU

MARION DISTRIBUTORS

Edward R. Daley, Marion Power Shovel Company, 571 Howard St., San Francisco 5, Calif.; Joseph O. Reed, Marion Power Shovel Company, 2504 N.E. Hoyt St., Portland 12, Ore.; Star Machinery Co., 1741 First Ave., South, Seattle 4, Wash.; Shaw Sales & Service Co., 5100 Anaheim Telegraph Road, Los Angeles, Calif.; H. H. Nielson, 541 W. 2nd South St., Salt Lake City, Utah; Guntert & Zimmerman, P. O. Box 1688, Banner Island, Stockton, Calif.

NOTE: MARION POWER SHOVEL COMPANY — FORMERLY THE MARION STEAM SHOVEL COMPANY — ESTABLISHED SINCE 1884



MOTOR Snuggles Up TO COMPRESSOR

...AND A BIG JOB GETS *all the air it needs*

This story concerns an air compressor used indoors. It tells how a G-E motor enabled the compressor to fit into a very tight space. But it applies equally well to users of air compressors on outdoor construction jobs where portability and ease of handling are important.

Back in 1943, engineers of an eastern industrial concern found that unless they could increase their compressed-air capacity quickly, vital war production was going to fall behind schedule. The problem was—where to put an extra air compressor in a plant already jam-packed with machinery.

There was just one empty corner about 10 by 12 feet in area. A compact high-speed air compressor might be squeezed in. But that left no room for a belt- or shaft-connected drive-motor. The answer was a motor that could be mounted right on the compressor—an unusally compact, close-coupled synchronous motor.

Today, both the compressor and its G-E motor can boast of a perfect three-year performance record, and the combination is still going strong. It has never failed to meet a sudden increase in compressed air demand, and has operated throughout every night shift with no more maintenance than routine inspection and lubrication.

Close-coupled for Economy

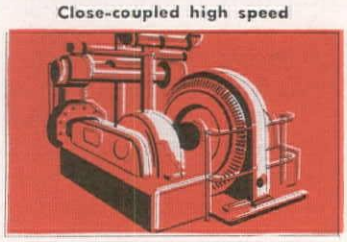
G-E close-coupled synchronous motors have won wide acceptance among compressor users in the construction field. Because the rotors are precision fitted directly to the compressor crankshaft, these motors need no outboard bearing or separate foundation. The motor air gap is uniformly and permanently maintained. Installation is simple, too—it is easy to align the motor flange with the compressor frame.

Whether you make compressors or use them, you will be interested in the design and maintenance savings made possible with compact G-E synchronous motors. Write or phone your nearest G-E office. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

G-E SYNCHRONOUS MOTORS FOR COMPRESSORS



Close-coupled high speed



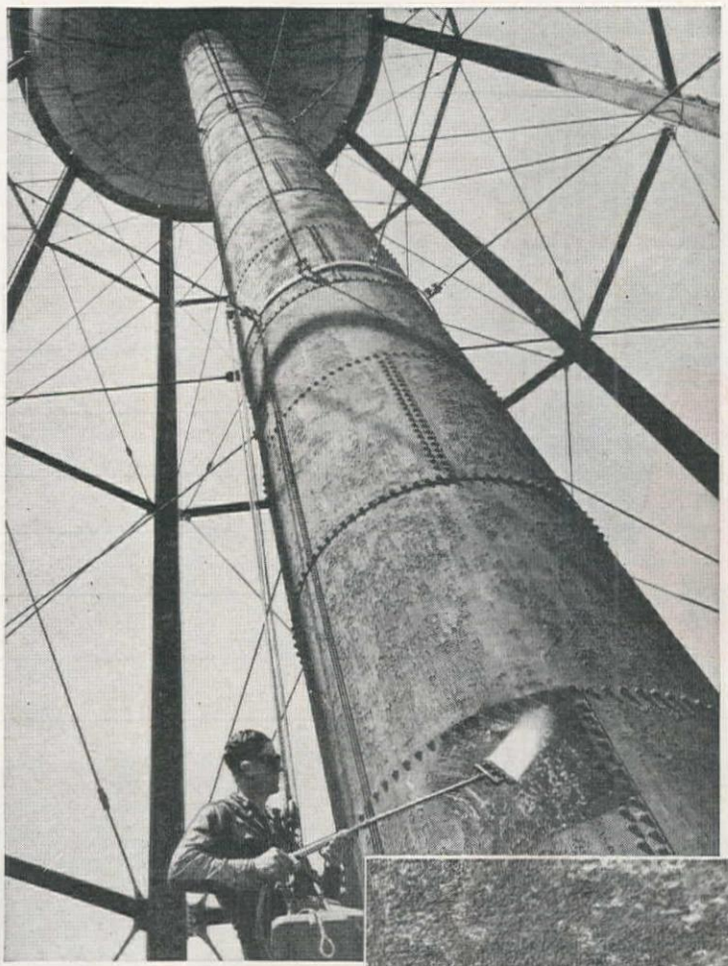
Direct-connected low speed



Belt-connected Tri-Clad

GENERAL ELECTRIC

750-272-8030



Start of flame-cleaning operation on water tower structure

It's Flame Cleaning

the fast, economical method for Preparing Steel for Painting



BEFORE — *Close-up view shows conditions of paint-lift heavy rust and scale that were met.*



AFTER — *The finished job after flame cleaning. A smooth, clean, dry surface ready for a lasting coat of paint.*

QUICKLY, easily and safely applied, the Airco flame cleaning process provides a clean, warm and dry surface conducive to a lasting paint job. The oxyacetylene flame cockles old paint, loosens rust and drives off hidden moisture . . . gives longer paint life to all kinds of steel structures.

In planning new steel structures exposed to weather, prepare before you paint for economical maintenance. Flame clean all steel parts before applying the prime coat of protection. This method loosens the semi-tenacious mill scale. No dirt or moisture left to start corrosion. Reduces future maintenance costs to absolute minimum and gives longer life to the paint job.

For further details write for folder ADG-1066B—"Flame Cleaning and Dehydrating Old Steel Structures," and folder ADG-1067A—"Flame Cleaning and Dehydrating New Steel Structures." Address: Air Reduction, General Offices: 60 East 42nd Street, New York 17, N.Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

ADVANTAGES OF OXYACETYLENE FLAME CLEANING

1. Provides a clean, warm and dry surface conducive to a lasting paint job.

2. Easily used inside the shop or in the field because of the extreme portability of the apparatus.

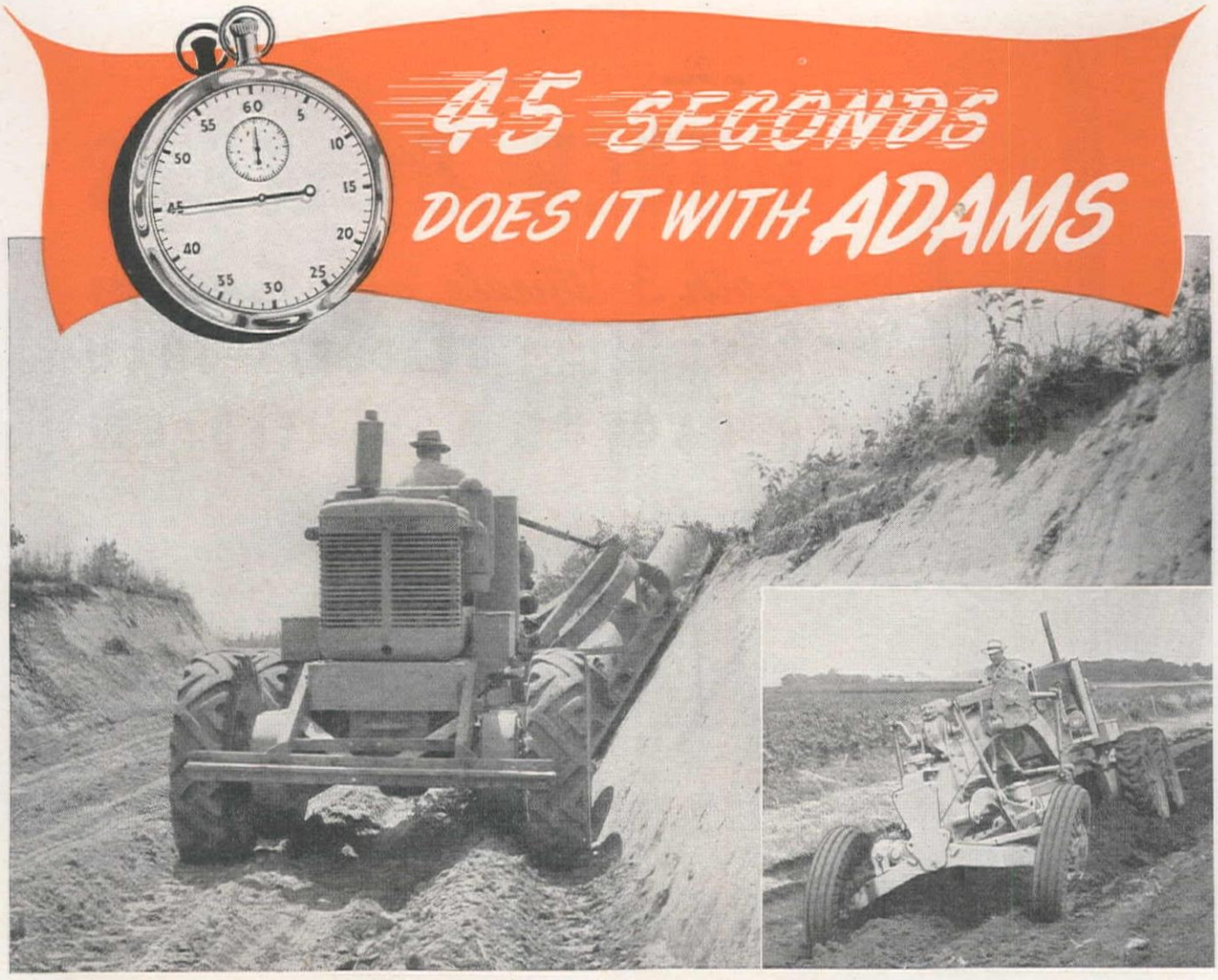
3. No special technical skill required.

4. Saves time and money in steel structure preparation.

AIR REDUCTION WCN
60 East 42nd Street
New York 17, N. Y.
Please send me a copy of folder checked.
☐ *ADG-1066B—"Flame Cleaning and Dehydrating Old Steel Structures"*
☐ *ADG-1067A—"Flame Cleaning and Dehydrating New Steel Structures"*
Name_____
Firm_____
Address_____
City_____ Zone_____ State_____

AIRCO **AIR REDUCTION**
Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories



From Ditch Cuts To Bank Cuts Without Mechanical Adjustments

★ **It's a fact!** With Adams Motor Graders you shift from ditch-cutting to bank-cutting positions (or vice versa) *in just 45 seconds—with blade centered on circle—without changing "average" setting of telescopic blade lift links.*

The importance of this advanced Adams feature can hardly be exaggerated. It means that positive power-operated blade controls accurately place the blade in virtually any desired position—*without stopping grader—without operator leaving his seat.* This spells *faster operation—better work—more work per day.*

Model for model, Adams are the world's most versatile and useful motor graders—designed and built to do all types of grading just a little faster, easier and better than any others. That's why, wherever speed, power, efficiency and economy are premium factors, you'll find Adams Motor Graders the outstanding favorites.

For complete facts on all models, see your local Adams dealer, or write company direct.

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, IND.

LOCAL *Adams* DEALERS

CALIFORNIA—Western Factory Branch
J. D. ADAMS MANUFACTURING CO.
230 7th Street, San Francisco 3
Adams Distributors at: San Francisco, Los Angeles, Sacramento, Redding, Riverside, San Jose, Fresno, Stockton, Salinas, Santa Rosa, Modesto, Visalia, Merced, Bakersfield, Santa Maria and San Diego

ALASKA—Glenn Carrington & Co., Fairbanks
ARIZONA—O. S. Stapley Company, Phoenix
COLORADO—McKelvy Machinery Co., Denver
IDAHO—Intermountain Equipment Co., Boise, Pocatello
MONTANA—Industrial Equip. Co., Billings, Missoula
NEVADA—Brown Motors, Reno

NEW MEXICO—Hardin & Coggins, Albuquerque
OREGON—Howard-Cooper Corp., Portland, Eugene
UTAH—The Lang Company, Salt Lake City
WASHINGTON—Howard-Cooper Corp., Seattle
Intermountain Equipment Co., Spokane
WYOMING—Industrial Equip. Co., Billings, Mont.
The Lang Company, Salt Lake City, Utah



Yes Sir! "More features than a cactus has needles", well describes the many advantages of the Huber Rollers. Your nearest Huber Dealer will gladly furnish you with information about these features.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

LEE & THATRO EQUIPMENT CO.
Los Angeles, Calif.

THE O. S. STAPLEY CO.
Phoenix, Arizona

EDWARD F. HALE CO.
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THE MINE & SMELTER SUPPLY CO.
Denver, Colorado

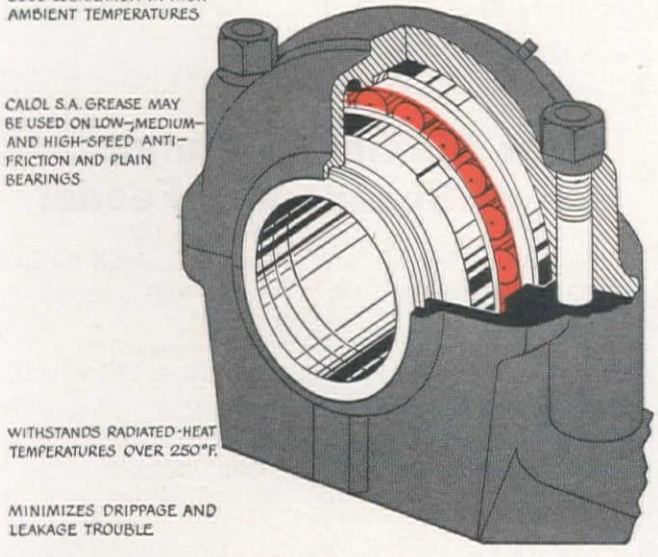
CONTRACTORS' EQUIPMENT & SUPPLY CO.
Albuquerque, New Mexico

FEENAUGHTY MACHINERY CO.
Portland, Ore. • Boise, Idaho
Seattle, Wash. • Spokane, Wash.

THE C. H. JONES EQUIPMENT CO.
Salt Lake City, Utah

STANDARD ENGINEERS NOTEBOOK





New grease lubricates in extra hot conditions

Developed especially for bearings that must operate in radiated heat, new Calol S. A. (sodium aluminum) Grease has proved satisfactory in temperatures over 250° F. It has been tested by many operators on working machines in the field. In addition, it was given a series of tests in the Navy Ball Bearing Machine, operated at 10,000 rpm, with bearing temperatures maintained at a high degree.

Calol S. A. Grease is made from a special type base and selected oils that give it high heat-resistant qualities. In use, these qualities assure minimum drippage or leakage from bearings.

Although Calol S. A. Grease is ideal in a multiplicity of services, it is specifically adapted to the lubrication of low, medium and high speed anti-friction bearings used in all types of machines.

Made in three grades, 00, 0, and 1, by Standard of California, Calol S. A. Grease is available in 35-, 108- and 420-pound containers.

Tailored gasoline ups engine efficiency

Many operators get the maximum return from their gasoline dollar by using Chevron Supreme Gasoline. That's because it's made for today's engines, allows them to produce full power without waste.

Chevron Supreme Gasoline is the highway version of Chevron Aviation Gasoline. Unusual blending agents, developed during the war for this famous warplane fuel, also go into Chevron Supreme Gasoline. They assure uniform, smooth burning in combustion chambers and eliminate pinging and knocking.

The distillation range of Chevron Supreme Gasoline is such that its volatility is completely controlled. It starts engines easily and quickly, warms them up promptly and lets them instantly respond on a pull. Its endpoint is high enough to give full power and low enough to prohibit waste of fuel.

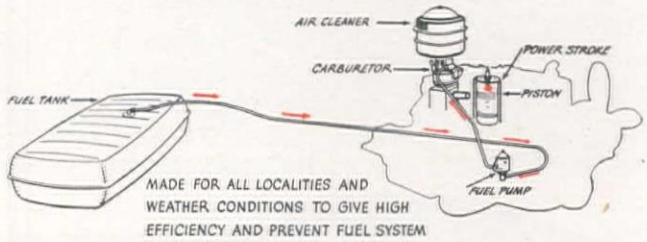
Chevron Supreme Gasoline is available at Standard of California plants, Chevron Gas Stations, Garages and Standard Stations throughout the West.

THIS SHOWS HOW CHEVRON SUPREME GASOLINE ACTS IN A COMBUSTION CHAMBER..... BURNS SMOOTHLY AND EVENLY, GIVES FULL POWER WITHOUT WASTE.



VIEWS THROUGH A GLASS HEAD ENGINE

CHEVRON SUPREME GASOLINE CONTAINS SPECIAL BLENDING AGENTS THAT CONTROL ITS VOLATILITY, STOP PINGING OR KNOCKING



MADE FOR ALL LOCALITIES AND WEATHER CONDITIONS TO GIVE HIGH EFFICIENCY AND PREVENT FUEL SYSTEM VAPOR LOCK

CHEVRON SUPREME GASOLINE IS A HIGHWAY VERSION OF CHEVRON AVIATION GASOLINE, SPECIALLY TAILORED FOR AUTOMOTIVE ENGINES

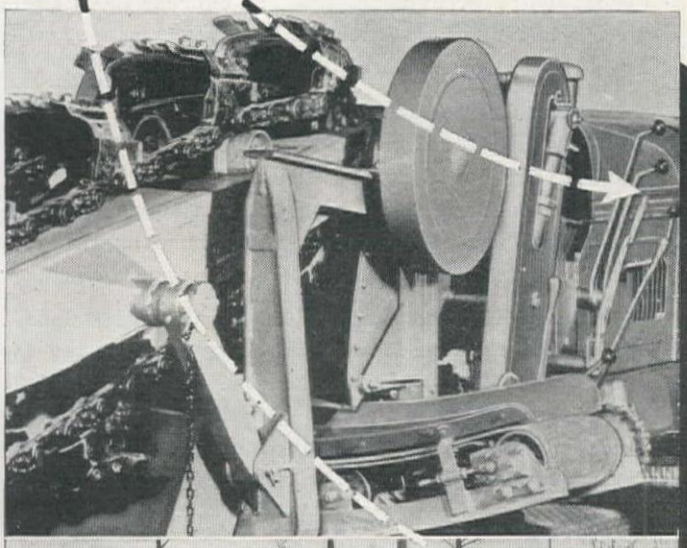
Standard Fuel and Lubricant Engineers are always at your service. They'll gladly give you expert service—make your maintenance job easier. Call your local Standard Representative or write Standard of California, 225 Bush St., San Francisco 20, California.

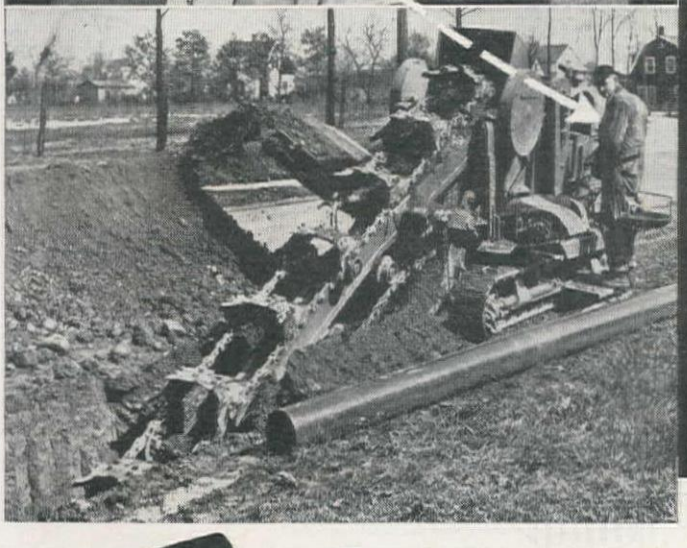
FOR EVERY JOB A **STANDARD OF CALIFORNIA** TEST-PROVED PRODUCT

simplicity

OF CONTROL —

Yet Maximum Range of Speeds and Feeds!





The Buckeye Model "410" Trencher is noted for its simple controls, yet it offers the operator:

All obtained by shifting easy-to-operate automotive type levers.

- 36 CUTTING FEEDS (.46 to 38 feet per minute)
- 6 TRAVEL SPEEDS—5 FORWARD, 1 REVERSE (.336, .59, 1.14, 2.05 and 2.67 M.P.H.)
- 4 BUCKET LINE SPEEDS (31.54, 106, and 189 feet per minute)

Check the many other features that make this outstanding trencher so popular with:

GENERAL CONTRACTORS—ROAD BUILDERS
UTILITIES—MUNICIPALITIES

COMPACT, MINIMUM WEIGHT, WITH BIG TRENCHER STAMINA. Width (exclusive of shiftable conveyor) only 4'9". Height only 6'10". Bearing Pressure only 6 lbs. per sq. in. Superior design, expert workmanship and quality construction throughout.

VERSATILE PERFORMANCE.
- Can turn in its own length.
- Digs trench from 18" to 24" wide.
- Digs trench up to 6' deep (7'6" optional).

Get complete specifications on Buckeye Model "410" Trenchers from your nearest Buckeye Dealer, or send for Bulletin No. 45, before you figure your next trenching contract.

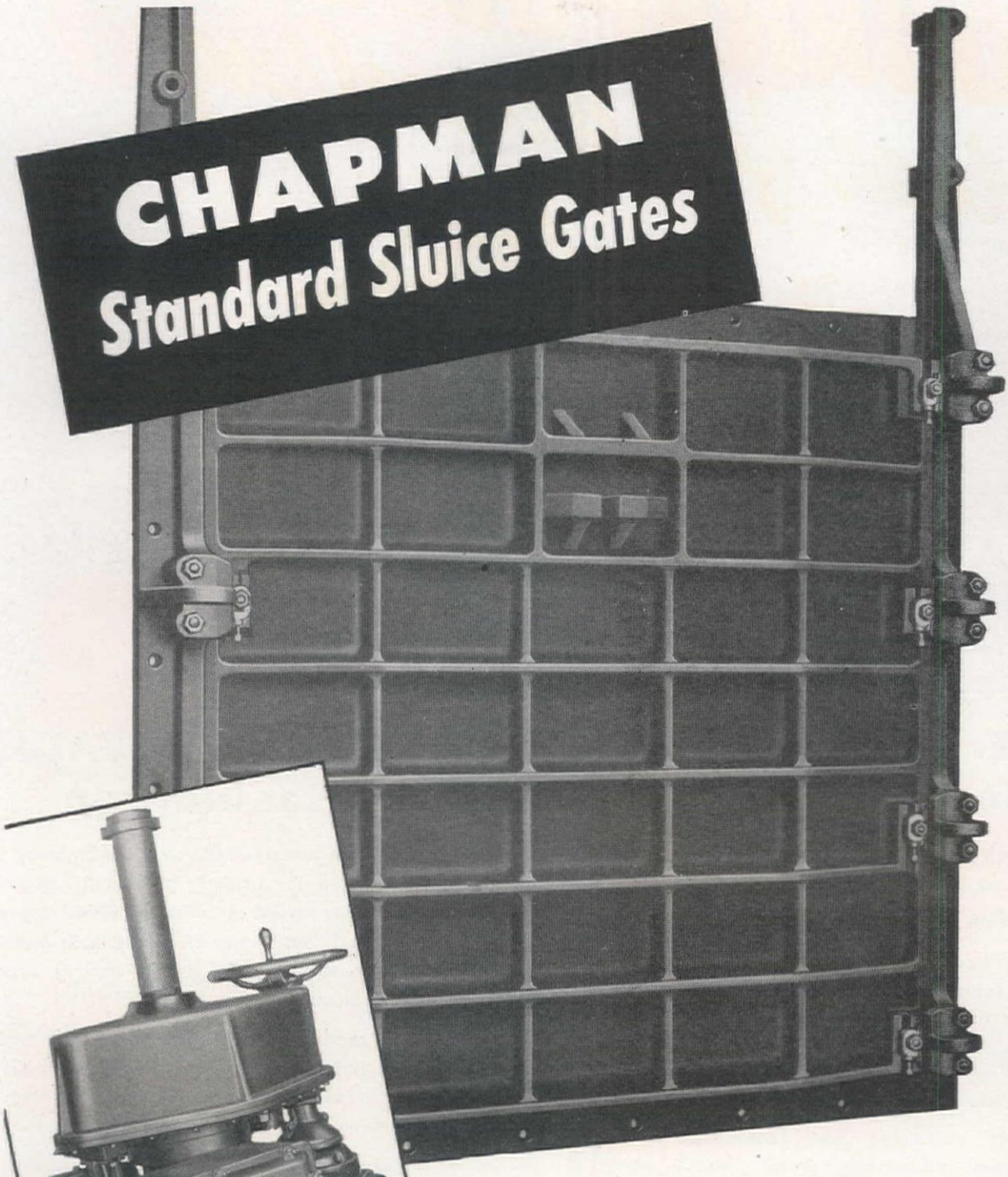
THERE'S A COST-CUTTING BUCKEYE TRENCHER FOR EVERY TRENCHING NEED.

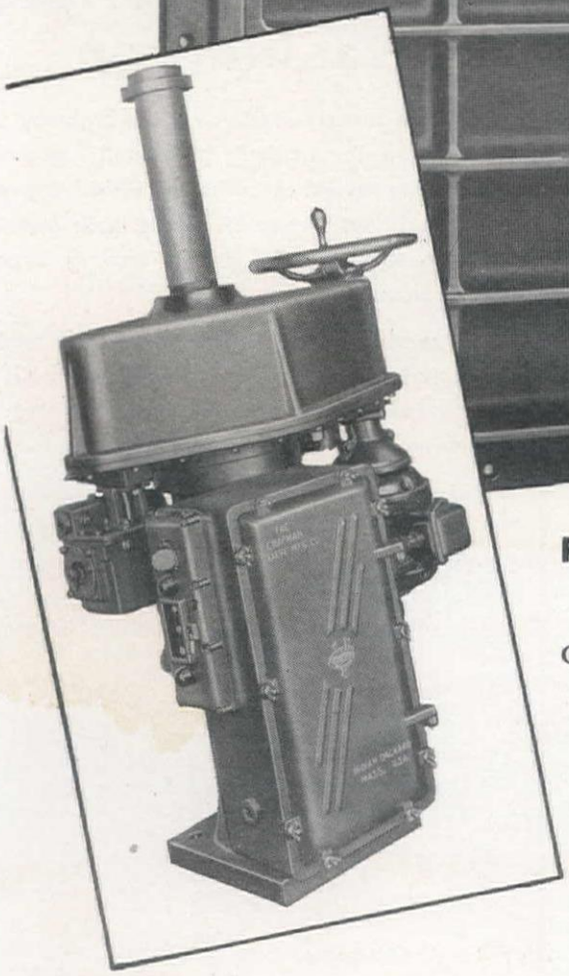
BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO

built by **Buckeye**

CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

CHAPMAN
Standard Sluice Gates





Reliable Construction...Reliable Operation

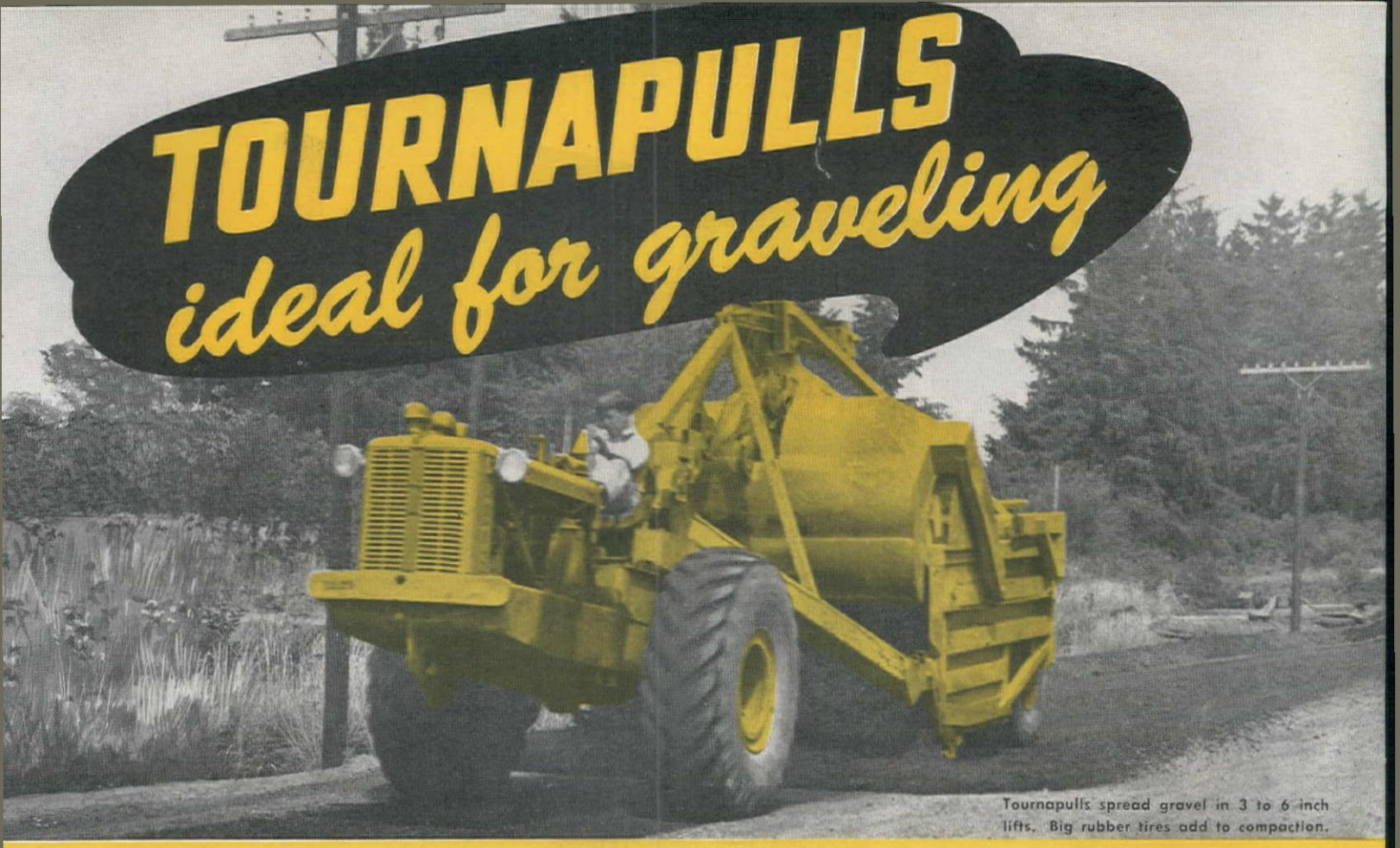
Many so-called Special Sluice Gates are available in Chapman's standard patterns. You can usually find just what you want in the Chapman line, but if not, our engineers will gladly work with you on your problem.

Sluice Gates may be operated by hand, by hydraulic cylinder or electrically, through the Chapman Motor Operated Floor Stand shown at left. Completely enclosed in weather-proof housing, this stand is delivered wired and ready to install. Handwheel is provided for emergency operation in case of power failure. Let Chapman engineers help on your Sluice Gate problems.

The Chapman Valve Mfg. Company

INDIAN ORCHARD, MASS.

TOURNAPULLS ideal for graveling



Tournapulls spread gravel in 3 to 6 inch lifts. Big rubber tires add to compaction.

HANDLE HAULS up to 3 MILES . . SURFACING Aberdeen-Westport road in Washington

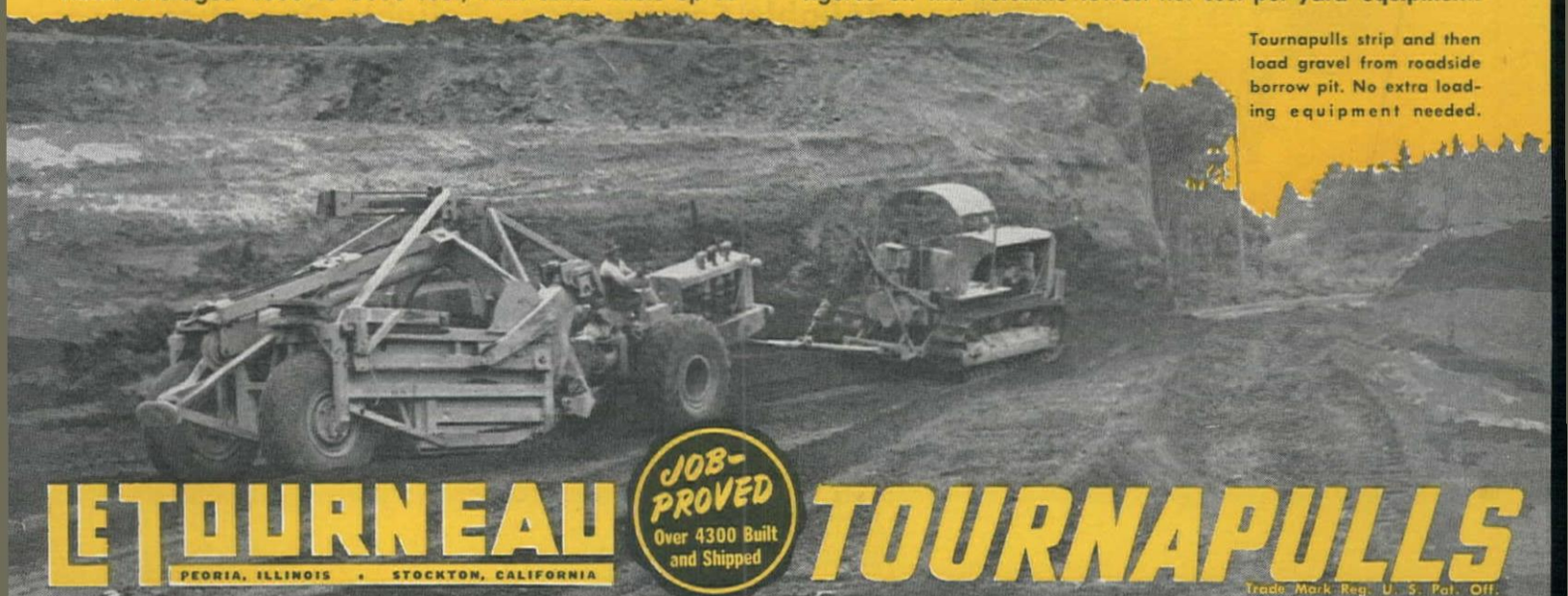
Big-tired, high-speed Tournapulls load, haul, spread and compact pit-run gravel ... maintain traffic flow without interference

On 104,000 cubic yard job along Grays Harbor, south of Aberdeen, Sound Engineering & Construction Co. used three Tournapulls. They found them especially valuable to meet their problems in relocating and surfacing this secondary highway, some of it across soft mud tideland flats which were under water daily at high tide.

In gravel surfacing operations, their Tournapulls worked roadside pits, loaded, hauled and spread gravel in place. Hauls averaged 4000 to 5000 feet, with some hauls up to three miles, and were largely made over the highway which had to be kept open for traffic. Tournapulls spread the gravel in thin accurate layers. Because these rigs' big rubber tires compacted the layers in normal travel back and forth, it was possible to keep regular traffic moving over the newly surfaced grades.

Ability to surface roads fast and at low cost with a minimum of equipment is but one of many ways Tournapulls can profitably solve your construction, road-building, and maintenance problems.

See your LeTourneau Distributor today for job-proved facts and figures on this versatile lowest-net-cost-per-yard equipment.



Tournapulls strip and then load gravel from roadside borrow pit. No extra loading equipment needed.

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED
Over 4300 Built and Shipped

TOURNAPULLS
Trade Mark Reg. U. S. Pat. Off.

FOR LOWEST NET COST PER YARD

C48

FWD THE *One* TRUCK FOR *Many* JOBS

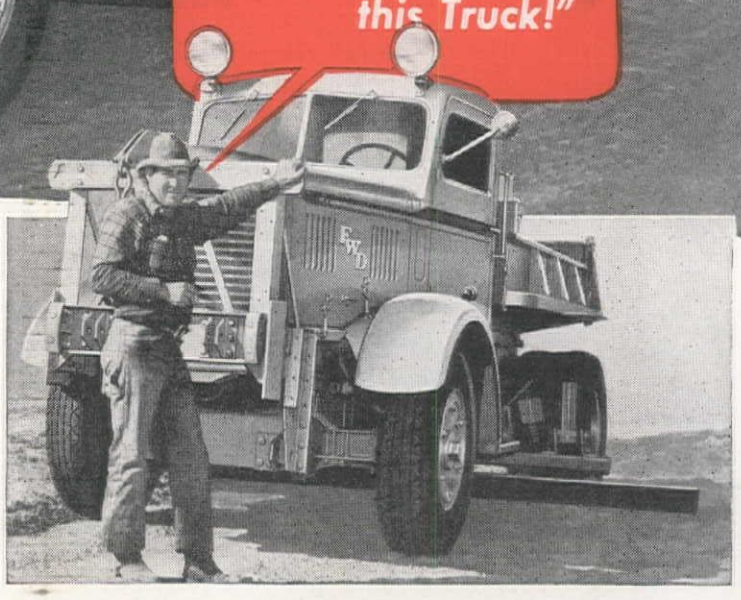


SPRING • SUMMER • FALL and WINTER

Wherever highway construction and maintenance men operate, the outstanding ability of FWD trucks with under-body blade equipment is well known and valued. On their blading ability alone, FWDs rate as first choice for highway duty . . . but the same truck that does this work so well does scores of other highway jobs equally well, throughout all seasons of the year.

Back of FWD superior performance is the experienced, specialized FWD engineering that provides the highest development of the true four-wheel-drive principle with center differential . . . engineering that equalizes power and load distribution, puts driving power and traction on all wheels, divides working-strains over two driving axles . . . engineering that gives FWDs the power, ruggedness, dependability and economy that makes these all-purpose trucks the first choice of highway authorities.

See your FWD dealer, or write for information on FWD trucks now ready to go to work for you.



There was genuine pride in the voice of driver Bob McBride as he told the FWD photographer "I sure do like that truck!" It's the newest and biggest of the Logan County, Colorado, Highway Department's fleet. For 15 years Logan County has used every one of its FWDs to do many jobs, from grading and weed removal to heavy snow clearing.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis., U.S.A.

Canadian Factory: KITCHENER, ONTARIO

FWD Distributors: ARIZONA—Arizona-Cedar Rapids Co., 401 N. First St., Phoenix; CALIFORNIA—The Four Wheel Drive Auto Co., 1339 Santa Fe Ave., Los Angeles 21, and FWD Pacific Co., 469 Bryant St., San Francisco 7; COLORADO—Liberty Trucks & Parts Co., P. O. Box 1889, Denver 1; IDAHO—Intermountain Equipment Company, Broadway at Myrtle St., Boise; MONTANA—Steffeck Equipment Co., 11 E. Cutler St., Helena; NEVADA—Allied Equipment Co., Reno; NEW MEXICO—The Myers Company, Las Cruces; OKLAHOMA—Halliburton Oil Well Cementing Co., P. O. Drawer 471, Duncan; OREGON—Feenaughty Machinery Co., 112 S.E. Belmont St., Portland 14; UTAH—Cate Equipment Co., 49 E. 9th So., Salt Lake City; WASHINGTON—Feenaughty Machinery Co., 1028 6th Ave., So. Seattle 2, Glenn Carrington & Co., 91 Columbia St., Seattle, and Feenaughty Machinery Co., 715 N. Division St., Spokane; WYOMING—Wortham Machinery Co., 517 W. 17th St., Cheyenne; ALASKA—Glenn Carrington & Co., Nome, Fairbanks, Anchorage.

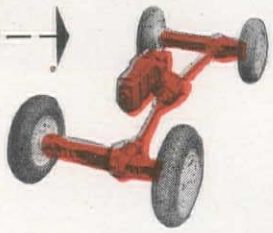
FWD TRUCKS

THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

FOUR-WHEEL-DRIVE

A "plus" that pays in many ways

"MORE POWER ON MORE WHEELS"



You get all 3—

POWER

75 Diesel horsepower — more than enough for the toughest kind of work. 2-cycle engine efficiency and economy!

TRACTION

21,500 lbs. total weight...with 15,660 lbs. concentrated on the four rear Tandem wheels, that drive together . . . as a unit!

CLEARANCE

22-inch front axle clearance allows material to flow freely to moldboard — no hanging-up on windrow, no wasting h.p. pushing a dead load.

Plus a full range of blade positions and leaning front wheels to handle all types of grading with ease.

Plus simplified operation — easier steering and control, electric instruments, electric brakes, full operator comfort.

Plus a larger capacity, longer life, easier-to-operate clutch . . . gears that automatically lock in place . . . a tubular frame that resists all twists and strains.

Together these Model A-D features mean more work done, more accurately, at lower cost...a better job on every job!



THE A-D MAKES EVERY PASS COUNT ON *EVERY* JOB!..

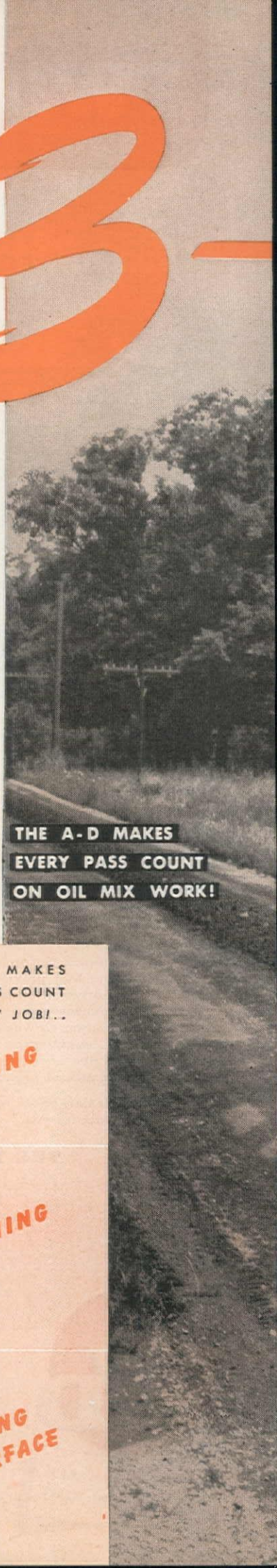
SLOPING



DITCHING

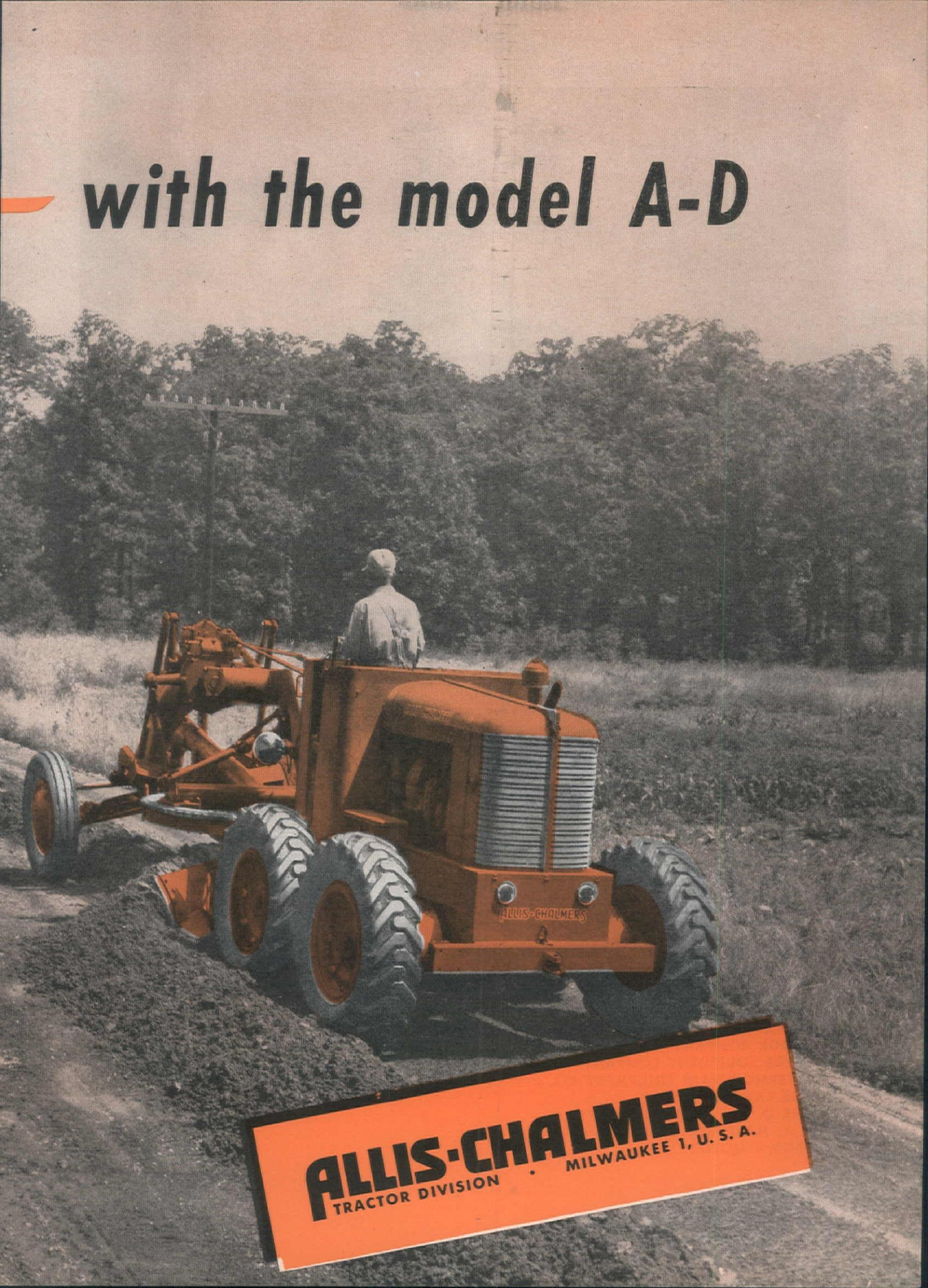


GRADING SURFACE

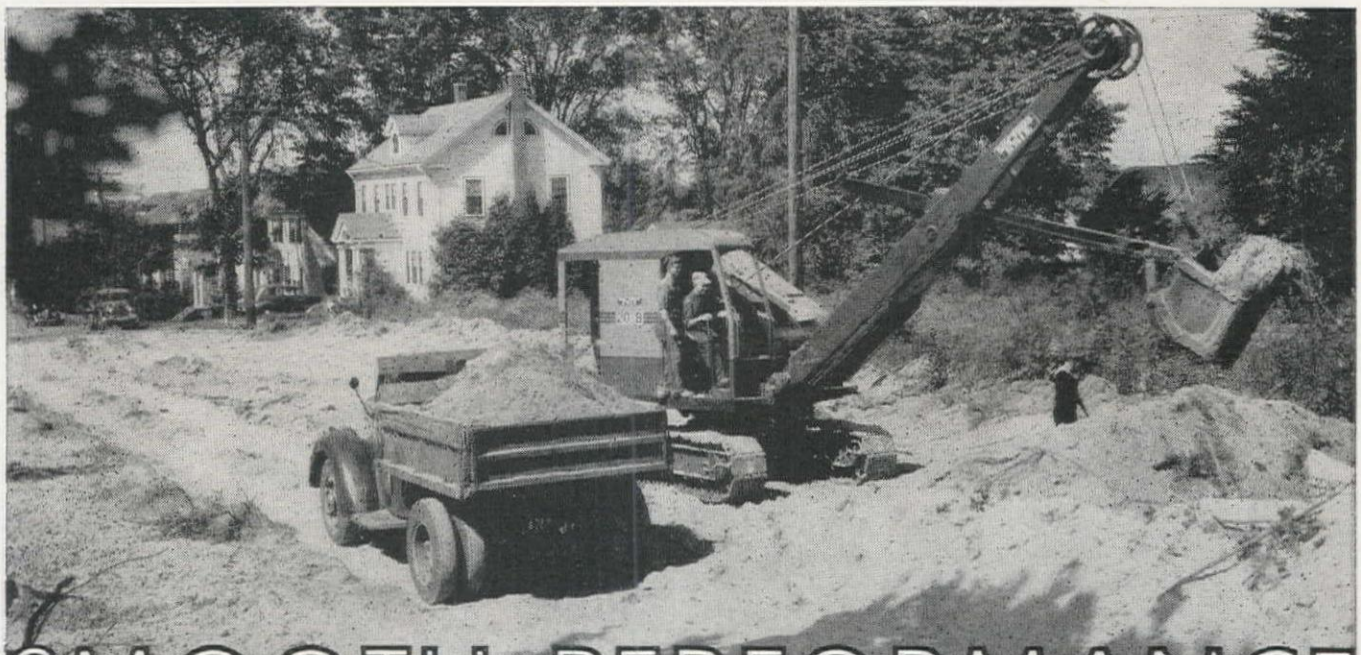


THE A-D MAKES EVERY PASS COUNT ON OIL MIX WORK!

with the model A-D



ALLIS-CHALMERS
TRACTOR DIVISION · MILWAUKEE 1, U. S. A.



SMOOTH PERFORMANCE

--- Easy on the Operator
--- Easy on the Machine

The quiet, easily controlled, coordinated performance of Bucyrus-Erie excavators results in greater output because it means less operator fatigue, less wear on the machine itself. The operator, working with easily manipulated responsive controls, finds it easy to keep a Bucyrus-Erie working at top speed without becoming excessively fatigued . . . without experiencing the end-of-shift slow downs that cut output. Smooth performance means more consistently efficient machine effort, too. It means that the operator gets full use of engine power all through the shift because losses due to friction and vibration are tremendously reduced. It means that maintenance requirements are lower because it indicates accurately machined close-fitting parts held in lasting alignment and operating with the smoothness that cuts wear to a minimum. Yes, quiet coordinated performance is a big reason why Bucyrus-Eries consistently outproduce other machines. Check with men who have operated Bucyrus-Eries, or watch one at work yourself. You'll be convinced that Bucyrus-Eries are your best bet for big output. BUCYRUS-ERIE COMPANY, South Milwaukee, Wisconsin.

51E45

BUCYRUS ERIE

Fully Convertible — 3/8 to 2 1/2 Cu. Yards

SHOVELS, CLAMSHELLS, CRANES, DRAGLINES, DRAGSHOVELS

SEE YOUR BUCYRUS ERIE DISTRIBUTOR

EXC-2

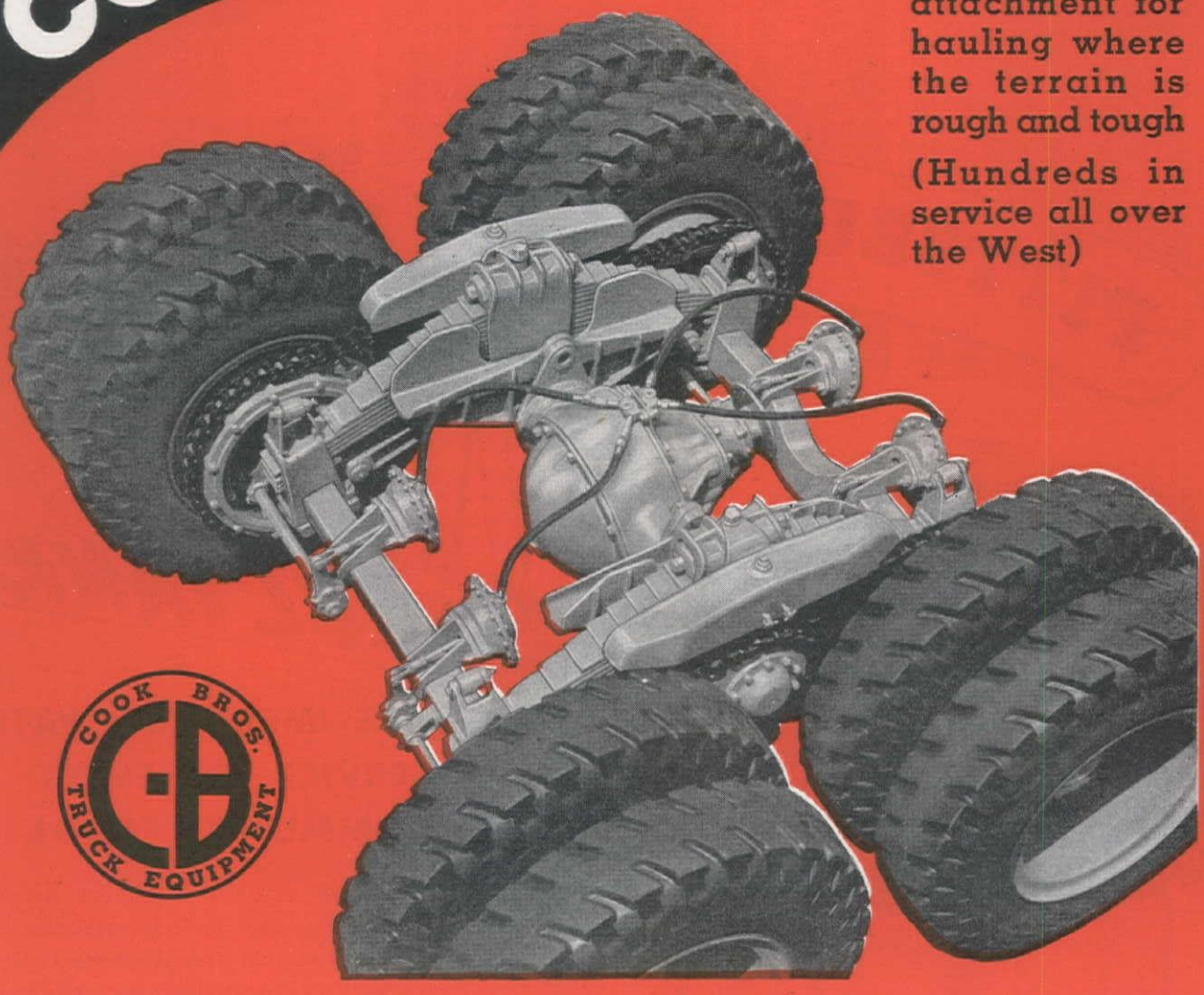
SOULÉ EQUIPMENT COMPANY	Oakland — Sacramento
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Shovels • Dragshovels • Draglines • Clamshells • Cranes • 3/8 to 2½-yd.

COOK BROS. BOGIE

A great truck attachment for hauling where the terrain is rough and tough

(Hundreds in service all over the West)



COOK BROS. TRUCK EQUIPMENT

A RUGGED UNIT — SIZES UP TO 16 TONS

Hauling jobs including: Ready-mix concrete, logs and lumber products, sand and gravel, mobile cranes and shovels, oil field supplies and equipment, etc., all require tough, dependable truck equipment — Here is where Cook Bros. Chain Drive has proven to be highly efficient with its added traction, flexibility and power — Installed on your truck will provide years of satisfactory performance—A profitable investment for the truck operator. For full information see your nearest distributor: L. H. Pierce Auto Service, 1306 S. E. Ninth Ave., Portland, Ore.; Cook Bros. Equipment Distributors, 416 E. Eighth St., Oakland, Calif.

COOK BROS. (C. B. Equipment Co., Div.)
1800 Pasadena Avenue, Los Angeles, Calif.

For HEAVY DUTY HAULING



PITTSBURGH · DES MOINES

ELEVATED STEEL TANKS



ASSURE IMPROVED WATER SERVICE FOR EVERY COMMUNITY NEED!

Fundamental to modern municipal progress is better water service for the consumer—expressed in the desirable forms of constant supply, uniform pressures around the clock, dependable fire protection, ample reserves for emergencies. Elevated water storage in Pittsburgh-Des Moines Steel Tanks provides these benefits at low cost—originally, and during their many years of useful life. Write for the complete story of Modern Water Storage in our illustrated new brochure: we'll send your copy promptly!



PITTSBURGH · DES MOINES STEEL CO.

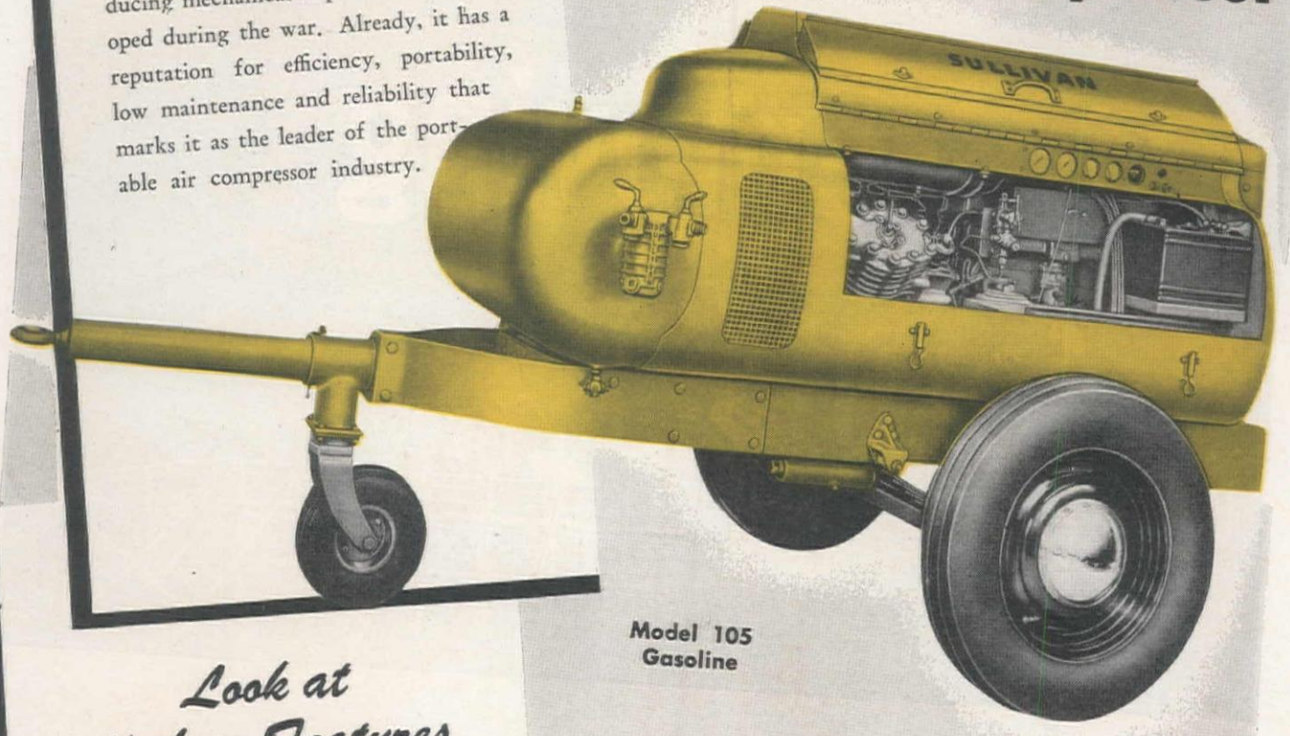
SAN FRANCISCO, CALIF., 627 RIALTO BUILDING—DES MOINES, IOWA, 921 TUTTLE STREET
SEATTLE, WASH., 1128 EIGHTH AVE., SOUTH

DALLAS, 1225 PRAETORIAN BUILDING . . CHICAGO, 1224 FIRST NATIONAL BANK BUILDING
PITTSBURGH, 3420 NEVILLE ISLAND . . . . . NEW YORK, ROOM 919, 270 BROADWAY

PACE SETTER for the portable air compressor industry

The new Sullivan Series 80 is the first portable air compressor to incorporate the NEW materials and efficiency-producing mechanical improvements developed during the war. Already, it has a reputation for efficiency, portability, low maintenance and reliability that marks it as the leader of the portable air compressor industry.

the New SULLIVAN Series 80 Portable Air Compressor



Model 105
Gasoline

Look at all these Features

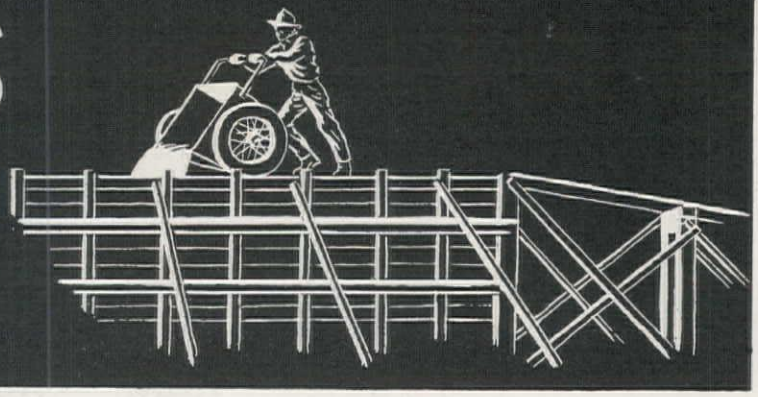
Matched engine • Direct-concentric valves • Two-stage compression • "Econo-Miser" control • Improved air cooling • Drop center axle • "Flexi-plane" drawbar • Single throw crankshaft • Oversize bearing surfaces • Cross-flow intercooler • Full Force-feed lubrication • "Cascade" oil cooling • Electric starters • "Bulkhead" body construction • Slow piston speeds • Lightweight pistons • Oil bath air cleaners • Oversize air receiver.

Here's the portable compressor you've been waiting for! It has every desirable feature that you are familiar with in a Sullivan portable, plus a lot of new ones that will make you agree that the new Series 80 is the finest portable on the market. You have never seen so much air-power, efficiency, portability, low maintenance and reliability packed so efficiently in so little space. The new Sullivan Series 80 is offered with gasoline or diesel engines and in many different sizes and mountings. See your nearest Sullivan distributor or branch office for all the details or send for Bulletin A-55. Sullivan Machinery Company, Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

SULLIVAN

THE WORLD'S MOST MODERN PORTABLE - COMPRESSED - AIR PLANT

saves labor in removing forms



Associated's Cycol Form Oil

This outstanding petroleum product makes form removal easy by forming a protective film between wood and concrete. (Cycol *Compounded* Form Oil is available for metal forms, and is equally efficient.)

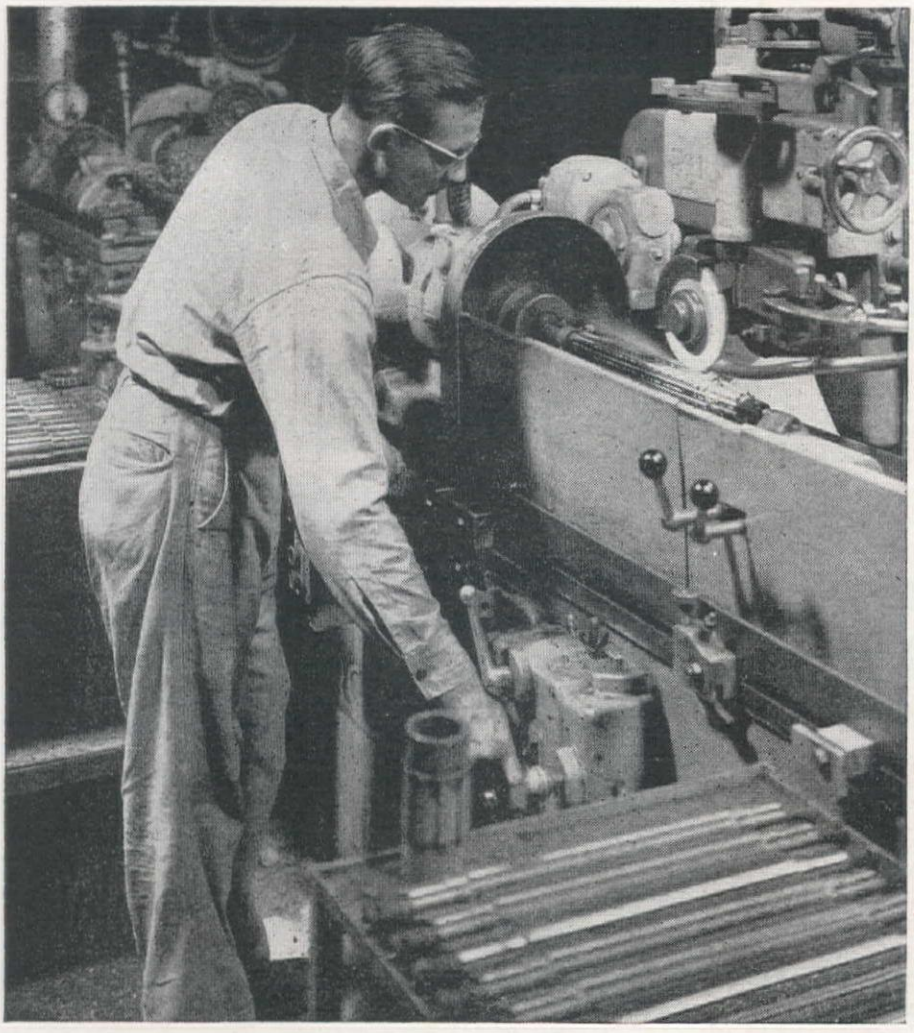
• • •

Regardless of the job involved, Cycol Form Oil will save you labor, time, and money. And give you better finish. If you are not now using it, order a trial lot of Cycol Form Oil from your nearby Associated Representative. Watch it work, time your labor, and do your own proving. A phone call's all it takes.

Tell Your Associated Dealer You Want a Credit Card

Correct Lubrication is Machinery's Most Vital Need

TIDE WATER ASSOCIATED OIL COMPANY





Grinding splines of transmission shaft to .001 tolerances in the Oliver "Cletrac" Plant.

We're not tolerant of tolerances!

In fact, we're very exacting! For example, all splines of transmission shafts on Oliver "Cletrac" crawler tractors are ground to a tolerance of .001—insuring true running and easy shifting of gears.

These close tolerances—the precision fits so necessary for smooth, quiet operation—are a primary essential of every operation in the Oliver "Cletrac" plant. And those tolerances are carefully checked by the most modern testing devices to guarantee the maintenance of the outstanding quality that characterizes every Oliver "Cletrac" tractor.

Materials, design and workmanship are all based on one standard—the built-in quality that assures years of dependable, economical service.

Maintenance of that standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors—for your every need.

CLETRAC

a product of

THE OLIVER CORPORATION Cletrac

The OLIVER Corporation

State of Arizona: Choguill Tractor Co., Phoenix. *State of California:* Tractor Service Company, Inc., Chico; Gustafson Tractor Co., Eureka; Mechanical Farm Equipment Dist., Inc., San Jose; Comber & Mindach, Modesto; Nelson Equipment Co., Los Angeles; Tractor & Equipment Co., San Leandro; Flood Euipment Co., Sacramento; W. J. Yandle, Santa Rosa; Hamsher Tractor Co., Stockton. *State of Washington:* Burrows Motor Company, Yakima; Inland Truck & Diesel Company, Spokane; Pacific Hoist & Derrick Co., Seattle; Melcher-Ray Machinery Co., 202 East Alder Street, Walla Walla; Coleman-Jones Equipment Co., Chehalis. *State of Oregon:* Loggers & Contractors Machinery Co., Portland and Eugene. *State of Idaho:* Idaho Cletrac Sales Co., Lewiston; The Sawtooth Company, Boise. *Western Montana:* Western Construction Equipment Company, Billings and Missoula. *Nevada:* B&M Tractor & Equipment Corp., 1420 S. Virginia St., Reno. *British Columbia:* Pacific Tractor & Equipment, Ltd., Vancouver.

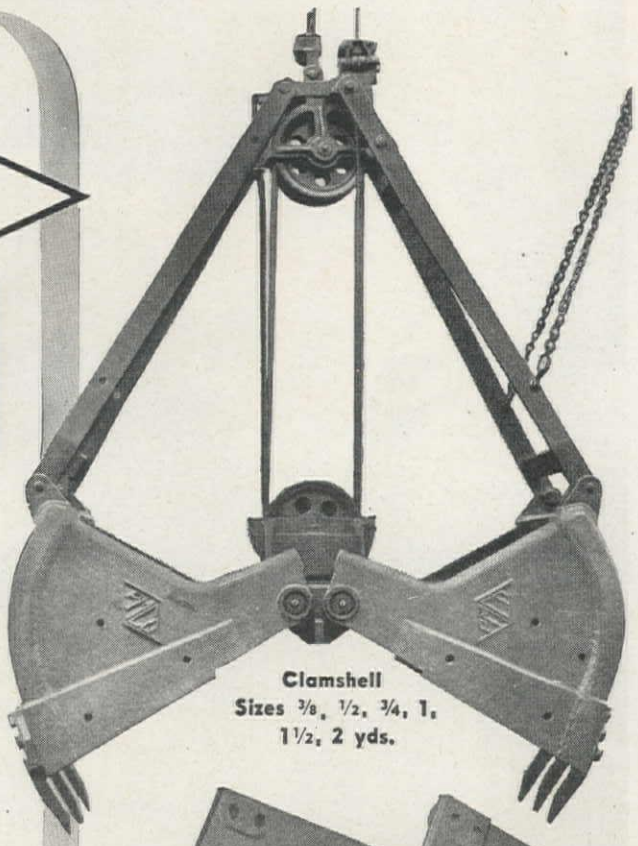
PMCO

America's Most Complete Line of Material Handling Buckets

All purpose-

- **SHOVEL**
- **PULLSHOVEL**
- **DRAGLINE**
- **CLAMSHELL**

● FRONTS, BOTTOMS, SCOOPS and TEETH are 14% manganese steel developing tensile strength up to 120,000 p.s.i. This high percentage manganese steel gives tough, rugged strength for hard service and allows wide set corner teeth for easy entrance in digging. Volume production methods enable us to build a better bucket with amazing economies in manufacturing.



Clamshell
Sizes 3/8, 1/2, 3/4, 1, 1 1/2, 2 yds.

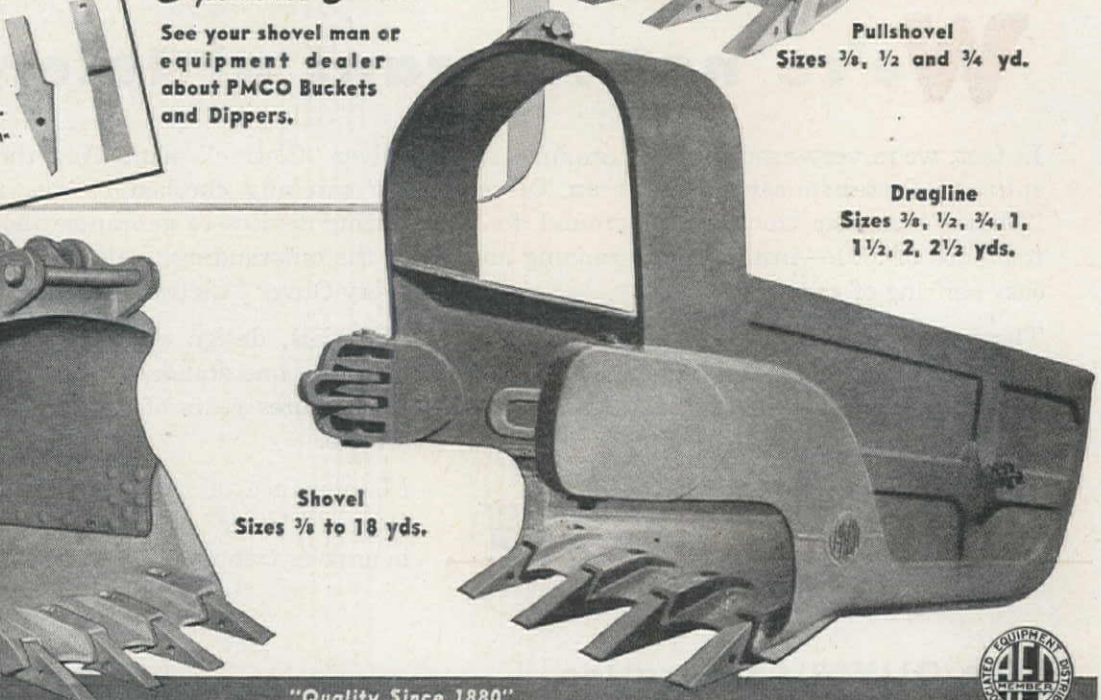


Pullshovel
Sizes 3/8, 1/2 and 3/4 yd.

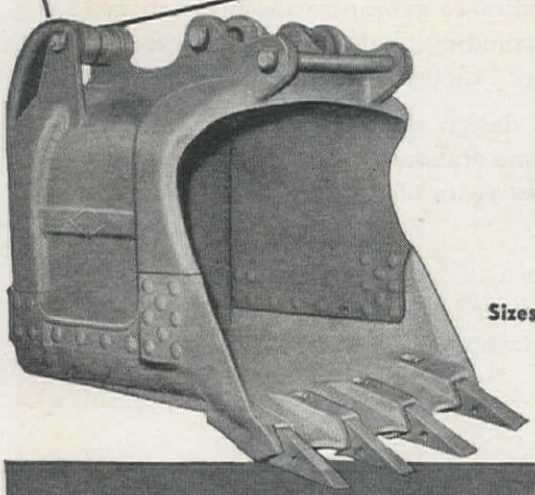
Experience Counts

See your shovel man or equipment dealer about PMCO Buckets and Dippers.

On the 1/2 yd. and 3/4 yd. Shovel, Pullshovel, and Dragline Buckets, all teeth are interchangeable — a great advantage to operators.



Dragline
Sizes 3/8, 1/2, 3/4, 1, 1 1/2, 2, 2 1/2 yds.



Shovel
Sizes 3/8 to 18 yds.

"Quality Since 1880"

PETTIBONE MULLIKEN CORP. CHICAGO 51, U. S. A.

WE OPERATE THE LARGEST AND MOST COMPLETE MANGANESE STEEL FOUNDRY IN THE UNITED STATES.

GENERAL ELECTRIC

Announces . . .

NEW

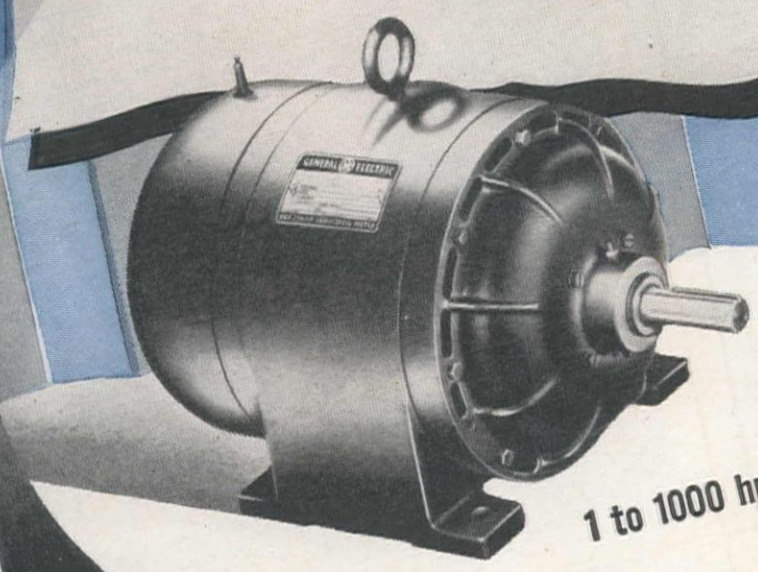
Totally Enclosed TRI-CLAD MOTORS

In 1940, G.E. introduced the Tri-Clad open motor—with emphasis on the feature that industry wanted most in a motor, *protection.* Since then, more Tri-Clads have gone into service than any other integral-horsepower motor.

Today, we are ready with a new line of Tri-Clad motors—*totally enclosed, fan-cooled motors*—built on Tri-Clad design principles in both standard and explosion-proof types.

We believe that these are industry's most dependable motors. They are designed specifically for use in many adverse atmospheres—in iron dust, outdoors, in hazardous areas, and chemical atmospheres. Their scope of application is as wide as the field of industrial motor use. Safeguarded against most sources of motor damage, their longer life and lower maintenance will make them economical motors for use on almost every job. *General Electric Company, Schenectady, N. Y.*

750-260-8030



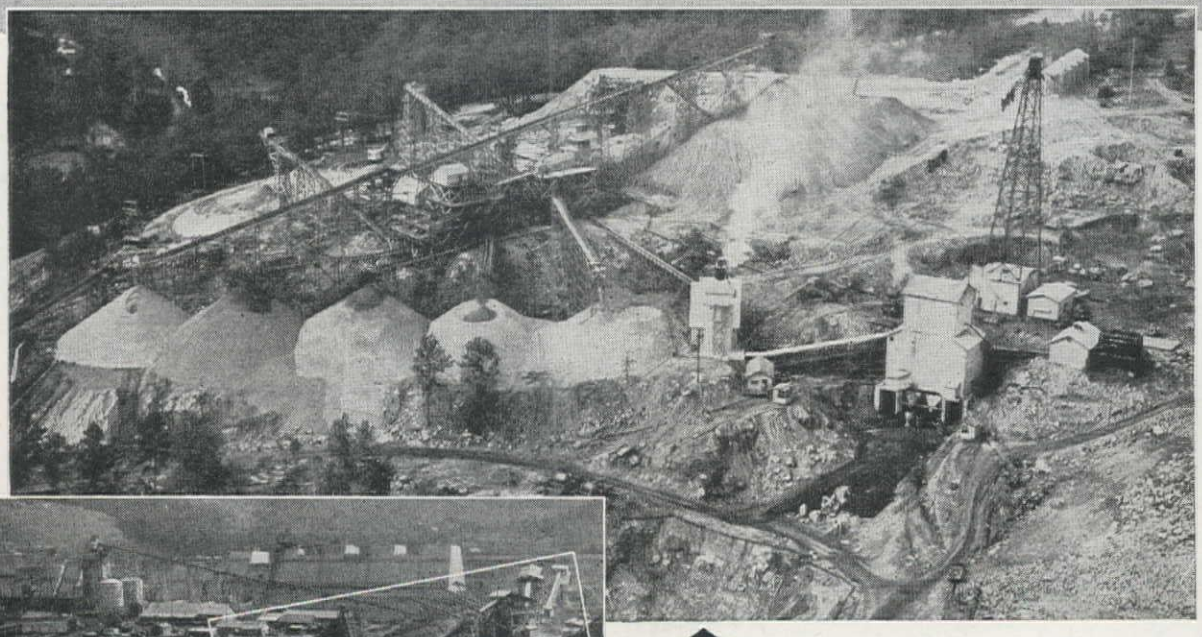
1 to 1000 hp

COMPLETE ENCLOSURE FOR PROTECTION AGAINST DIRT, DUST, AND WEATHER

For large construction projects

TELSMITH

COMPLETE PLANTS





1,500,000 cu. yds. of aggregate for Norfork Dam.

1,500,000 tons of aggregate for Center Hill Dam.

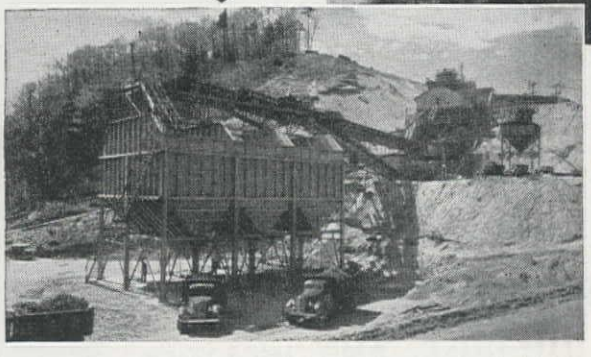
West Mountain Plant serves many Pennsylvania projects.

1,000,000 yds. of aggregate for Delaware Aqueduct.



● When it's a big job and urgent — there's usually a Telsmith sand and gravel or rock crushing plant. A complete plant, soundly designed by Telsmith engineers—with accurately balanced Telsmith-built machinery . . . completely adequate as to crushing, screening, classifying capacity . . . fast and flexible in operation . . . entirely dependable as to product quantity, quality and sizing. For reasons *why*—get Bulletin EP-30.

MP-4





Large projects in New England are served by this Telsmith plant.

SMITH ENGINEERING WORKS, 4010 N. HOLTON STREET, MILWAUKEE 12, WISCONSIN

Mines Engineering & Equipment Company, 369 Pine St., San Francisco 4—811 W. 7th St., Los Angeles 14

Clyde Equipment Co. Portland 9, Ore. | Clyde Equipment Co. Seattle 4, Wash. | General Machinery Co. Spokane 1, Wash. | Gordon Russell, Ltd. Vancouver, B.C. | Contractors' Eqpt. & Supply Co. Albuquerque, N. M. — El Paso, Tex.

WATER — WON THE WEST!



LOCK JOINT CONCRETE CYLINDER PIPE (48" diameter) for the 70-mile San Diego Aqueduct... ready for delivery and installation. Manufactured at the San Diego Plant of the AMERICAN PIPE AND CONSTRUCTION CO.

AMERICAN PIPE & CONSTRUCTION CO. manufactures and installs:

LOCK JOINT CONCRETE CYLINDER PIPE

PRESTRESSED LOCK JOINT CONCRETE CYLINDER PIPE

AMERICAN CONCRETE CYLINDER PIPE

HUME CENTRIFUGAL CONCRETE PRESSURE PIPE

Concrete Pipe for storm sewers, sanitary sewers, culverts, highway drainage and other uses.

Offices and Plants at Portland, Oregon Oakland, San Diego and Los Angeles, California

Water — traveling hundreds of miles through pipe lines, canals and conduits, finally swept aside the dead hand of drought barring westward expansion from the days of the early Dons! Millions of gallons of water are now delivered daily to western cities, ranches and rapidly growing western industries through permanent REINFORCED CONCRETE PRESSURE PIPELINES!

For 50 years CONCRETE PIPE in water supply lines has formed important links in the great, permanent water arteries that have finally won the west. Today REINFORCED CONCRETE PRESSURE PIPE in Main Water Supply Lines — under construction and in the design stage — provides dependable service in slaking the thirst of a still growing Western Industrial and Agricultural Empire!

Free from wall-thinning corrosion, tuberculation or electrolytic action, REINFORCED CONCRETE PRESSURE PIPE is truly PERMANENT! Literature and information concerning its many uses in Main Water Supply Lines, Force Mains, Storm and Sanitary Sewers, Culverts and Highway Drainage are available from

American Pipe and Construction Co., P.O. Box 3428, Terminal Annex, Los Angeles 54, Calif.

AMERICAN
PIPE & CONSTRUCTION CO.

LONG-LASTING WATER SUPPLY LINES



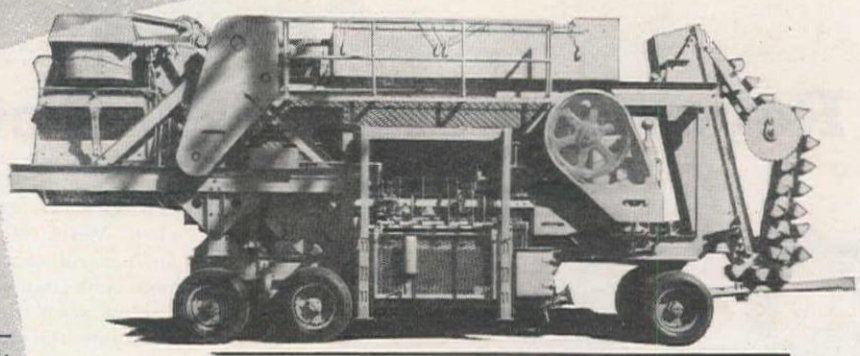
WAREHOUSED FOR WEST BY George M. Philpott Co., San Francisco, Calif. DISTRIBUTED BY: Glenn Carrington Co., Seattle, Wash. (For Interior Alaska); Alaska-Pacific Supply Co., Seattle, Wash. (For Alaska Coastal Regions); General Machinery Co., Spokane, Wash.; Clyde Equipment Co., Portland, Oregon, and Seattle, Wash.; Montana Powder and Equipment Co., Helena, Mont.; Nickerson Machinery Co., Salt Lake City, Utah; Le Roi-Rix Machinery Co., Los Angeles, Calif.; Burdick & Burdick, El Paso, Texas.

THE MODEL

FIRST in Portability
FASTEST Set-up
FINEST Mixes

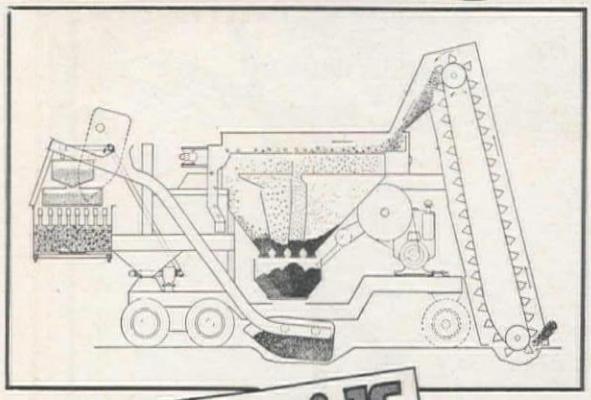
A SUPER-PORTABLE BATCH TYPE ASPHALT PLANT

—THE MODEL F



● Yes, sir—here it is—the Model F—a 2500-lb. batch type portable asphalt plant that you can set up and get into operation in a matter of minutes. The only part that has to be raised is the folding elevator. Twin-shaft, 2500-lb. capacity pug mill, 36"x10' triple-deck horizontal Cedarapids Symons screen, 4-compartment (6 batch) hopper, 25 cu. ft. batcher, 2500-lb. springless dial scale, 25 cu. ft. skip hopper, and steam-jacketed pump are in place at all times. Ground level charging hopper assures quick, easy loading. Pug mill discharges directly into trucks thereby eliminating troublesome delivery conveyor belts. Operator's platform on the ground level makes possible one-man control of all operations. Offered with a choice of gas, diesel or electric power, with or without a drier for hot or cold mixes.

The Model F is the ideal plant for paving contractors, counties, and state highway departments. It grades the aggregate, weighs the material, mixes it to suit specifications, does it better and satisfies the most rigid inspection. Get the details today.



Cedarapids

Built by IOWA

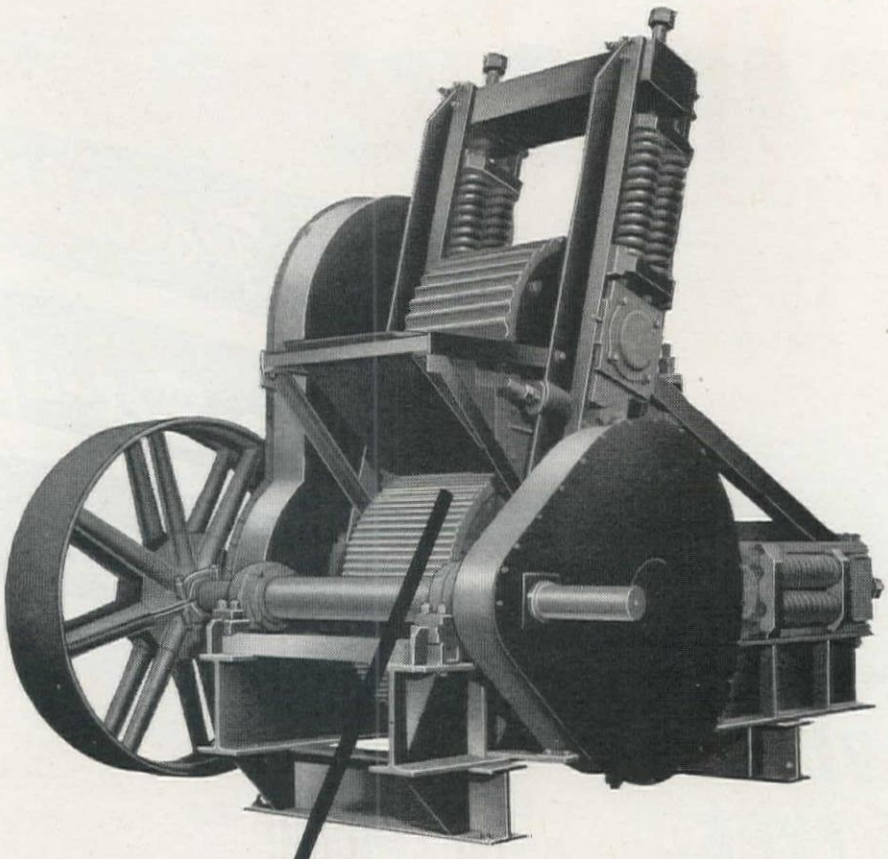
IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U. S. A.

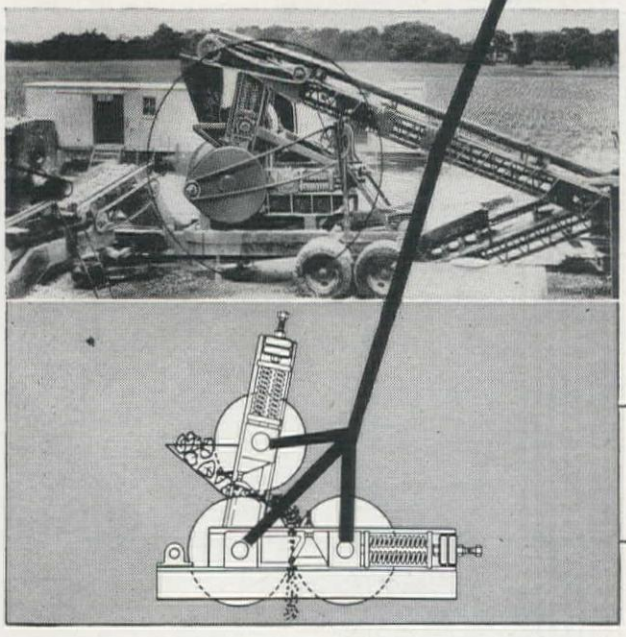
THE IOWA LINE

of Material Handling Equipment is Distributed by

HOWARD-COOPER CORP., Seattle, Washington, and Portland, Eugene and Medford, Oregon; HALL-PERRY MACHINERY CO., Butte, Great Falls, Missoula, and Billings, Montana; INTERMOUNTAIN EQUIPMENT CO., Boise and Pocatello, Idaho, and Spokane, Washington; WORTHAM MACHINERY CO., Cheyenne, Wyoming; KIMBALL EQUIPMENT CO., Salt Lake City, Utah; BROWN-BEVIS EQUIPMENT CO., Los Angeles, California; H. W. MOORE EQUIPMENT CO., Denver, Colorado; EDWARD F. HALE CO., Hayward, California; ARIZONA-CEDAR RAPIDS CO., Phoenix, Arizona; R. L. HARRISON CO., INC., Albuquerque, New Mexico; SIERRA MACHINERY CO., Reno, Nevada.



Revolutionary 2 in 1 Action...



THERE'S NOT an idle square inch on a roll crusher shell. With 100% of the shell surface a working surface, roll crushers have a larger capacity for fine materials than any other type of crusher.

Now, with the addition of a third roll, PIONEER combines the functions of 2 crushers in 1, greatly *increasing the stage of reduction*. The Triple Roll Crusher saves on original cost, operating expense, weight, space, and extra elevators and conveyors.

The two bottom rolls are 40" x 22" and the top roll is 34" x 22". The third roll assembly can be shipped complete with all attachments to those having a PIONEER 40" x 22" double roll crusher.

We'll be glad to give you full details on this new PIONEER Crusher with revolutionary 2 in 1 action.

"It's the best secondary crusher made," says Norman Roverud of Spring Grove, Minnesota. ***Revolutionary 2 in 1 action.*** Material first passes between the floating top roll and the driving roll. Then, without elevators or conveyors, it passes between the driving roll and horizontal floating roll.

PIONEER ENGINEERING WORKS, INC.
1515 CENTRAL AVE. • MINNEAPOLIS 13, MINNESOTA

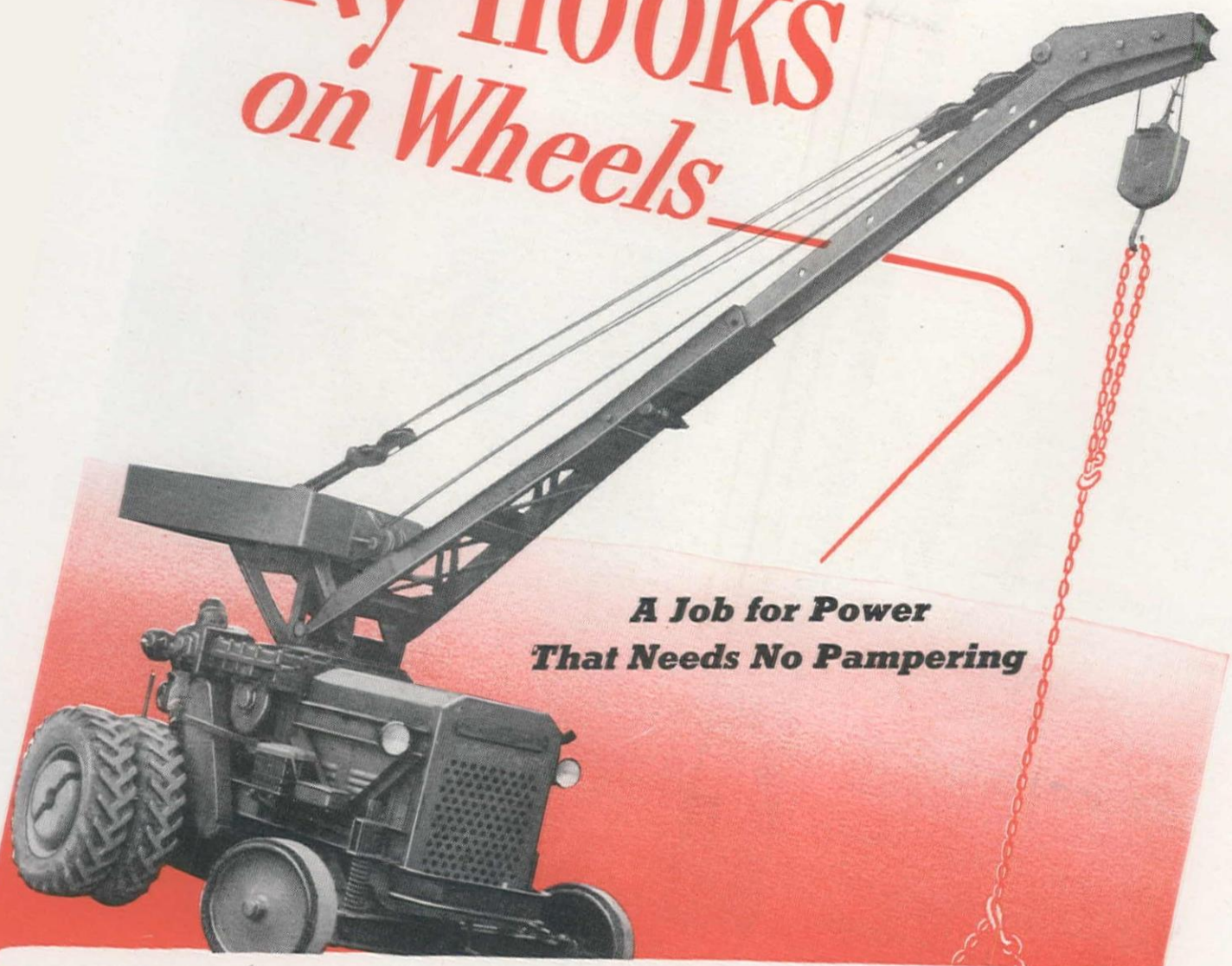
Engineers and Manufacturers of Quarry—Gravel and Mining Machinery

PLAN WITH

Pioneer

ENGINEERING WORKS

Sky-Hooks on Wheels



A Job for Power That Needs No Pampering

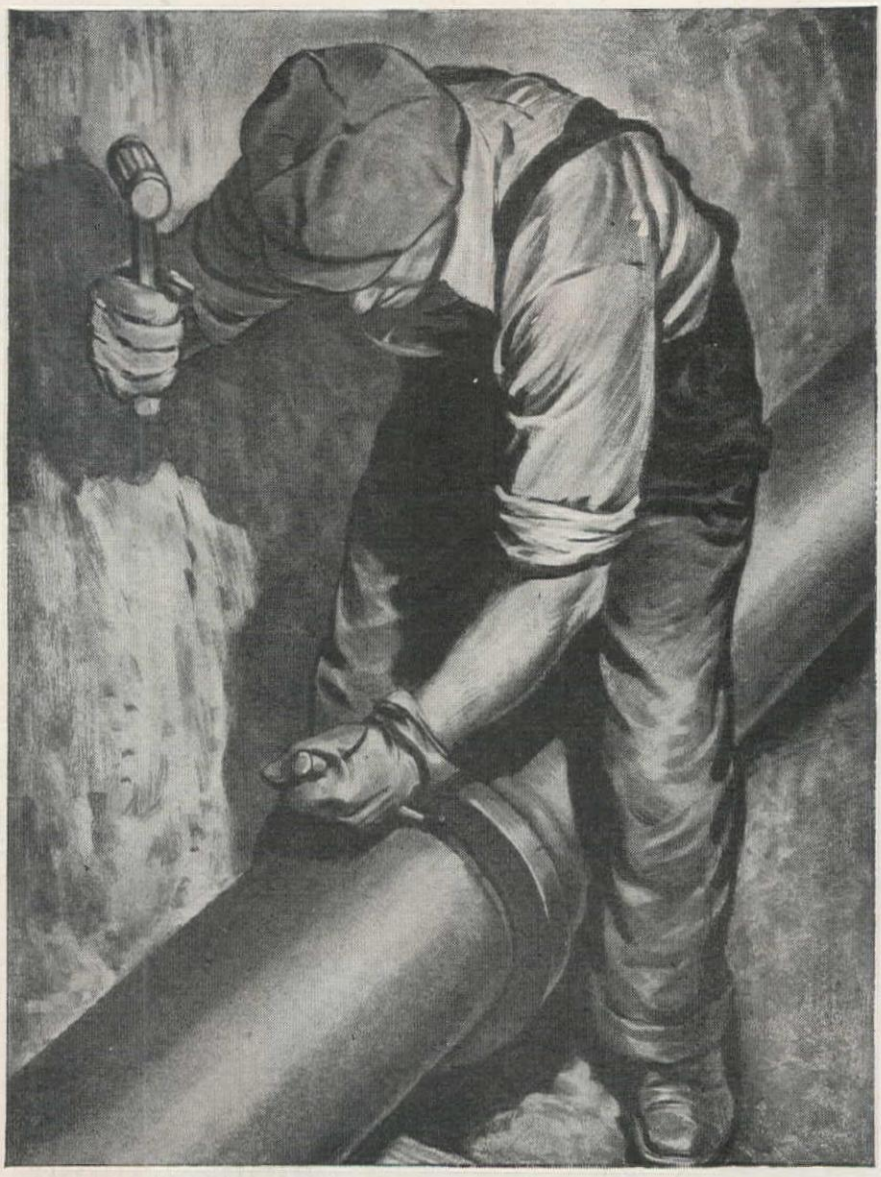
CASE

In Business to Serve You. Your Case industrial distributor is located and equipped to supply complete service not only on Case tractors and engine units, but on related equipment. His lines are chosen and his personnel is trained with your local conditions and requirements in mind. Take advantage of his varied experience in tractor power and equipment applications.

Almost as handy as the mythical sky-hook . . . and a lot more substantial . . . is a Case "LAI" Industrial Tractor with full-circle slewing crane. It lifts loads up to 8,000 pounds, reaches out for lighter loads up to 20 feet, according to length of boom used. It works with double or single line to suit the loading, can be furnished with double drum for clamshell operation. It needs no track, not even a road, to hustle from job to job.

This is but one of various sizes, types and makes of cranes engineered for use with Case industrial tractors. The extra strength and stability of Case tractors make them ideal not only for cranes but for all manner of mounted equipment, including loaders, winches, scrapers and bulldozers, street and sidewalk snow-plows, rotary sweepers, highway and airport mowers. The "lugging" ability of Case engines, whereby they pull as much at half speed as normal speed, gives flexibility for gentle handling of heavy loads.

Four basic sizes of Case industrial tractors, with varied wheel and tire equipment for all tractive conditions, cover a weight range from 2500 to more than 10,000 pounds. For full information call the distributor who maintains service in your area. J. I. Case Co., Oakland, Los Angeles



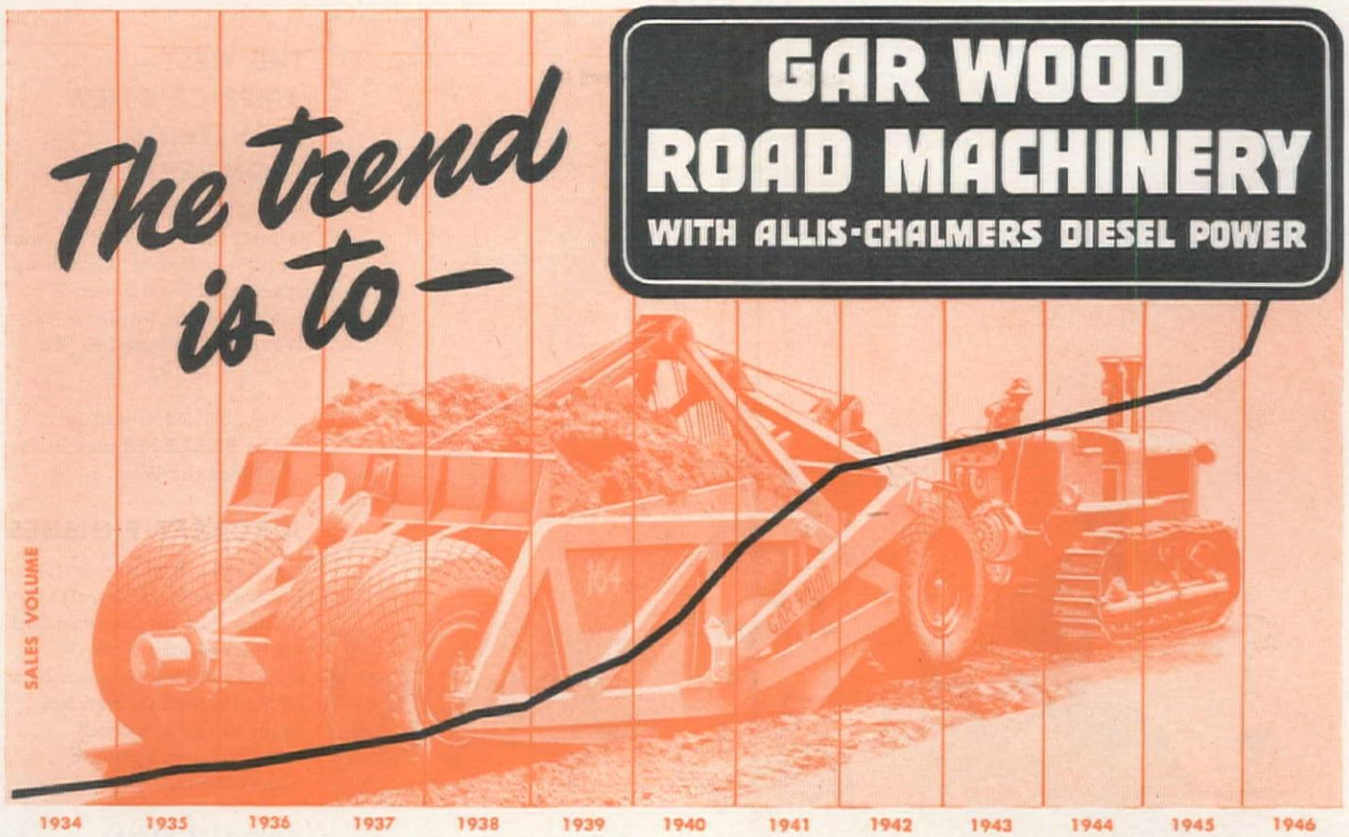
A well-calked joint—a level trench without humps or hollows—a tamped backfill in all but sandy soils: these are simple fundamentals of good practise in laying cast iron pipe. Observe them and you give the pipe full opportunity to deliver the centuries of useful life built into it at the foundry. For, cast iron pipe, like all materials of construction, must be properly installed if it is to give maximum service with minimum maintenance cost. Our new 16 mm. sound motion picture, "Installing Cast Iron Pipe" is available, on loan, without charge, to water and sewage works officials, engineering schools and organizations. Address Dept. H. Cast Iron Pipe Research Association, T. F. Wolfe, Engineer, 122 S. Michigan Ave., Chicago 3.

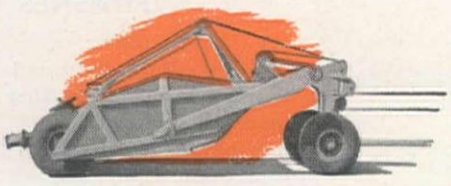
CAST IRON PIPE

SERVES FOR CENTURIES

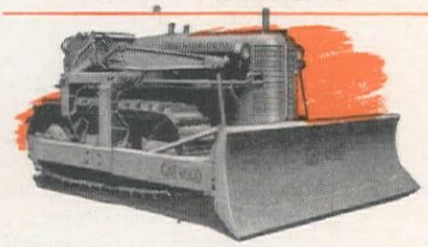
GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

The trend is to—





4-WHEEL CABLE SCRAPERS
Capacities: 11-15-20-25 cu. yds.



HYDRAULIC DOZECASTERS with angling blades, for all Allis-Chalmers Tractors



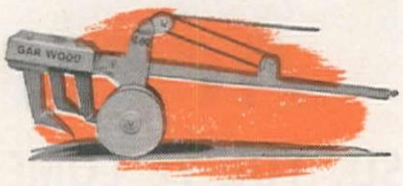
CABLE DOZE-CASTERS with angling blades, for Allis-Chalmers HD-10, HD-14 and HD-14C Tractors

On every kind of earth moving job, throughout the world, Gar Wood Road Machinery has made good, setting new high standards of performance and workmanship.

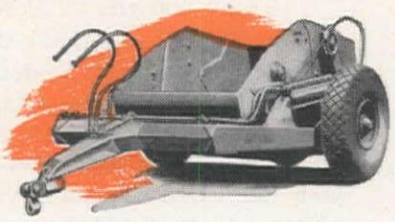
As a result, the demand for this equipment has steadily grown over a period of many years (see chart above) until now it has reached the proportions of a world-wide trend.

Here is a sound reason for specifying Gar Wood earth moving units. "Nothing succeeds like success."

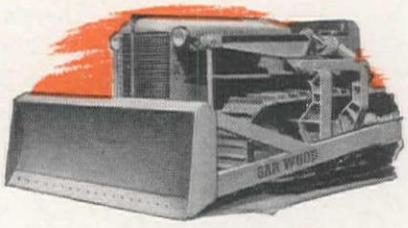
Contact your Allis-Chalmers dealer. Let him point out the superior features of Gar Wood Road Machinery and show you actual job performance in your territory with many satisfied users.



HEAVY DUTY RIPPERS
Cable and hydraulically operated



2-WHEEL HYDRAULIC SCRAPERS
Capacities: 3-5-6-8 cu. yds.

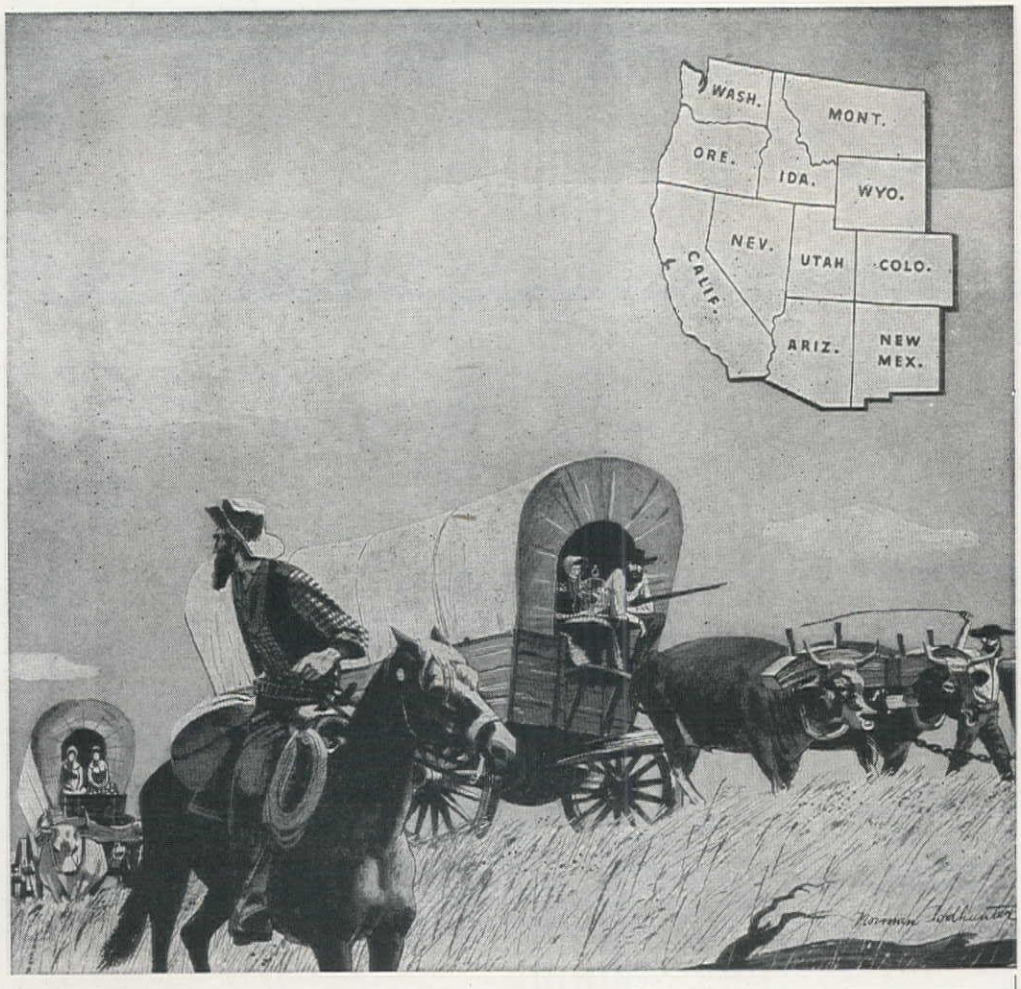


HYDRAULIC BULLDOZERS with fixed blades, for all Allis-Chalmers Tractors.

GW ROAD MACHINERY
is Sold Through
ALLIS-CHALMERS
Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE: HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS



SO, YOU'VE COME WEST?

WELCOME FROM A PIONEER!

Yes, it *was* the "wild and woolly West" when Fuller started in '49. But, today it's the awake and working West. Bigger, better equipped, production-proved and keenly conscious of mammoth markets across the Pacific.

So, welcome, new industries—each of you—from a '49er! No matter what your job, FULLER can serve you. We've solved knotty industrial paint problems for half a century. We're still doing it, for small shops, for large plants. If you've a new problem, we can solve that, too.

But—there's a better way than reading this to find out. Have us show you! That's the practical action FULLER technicians like to give to industrial customers.

W. P. Fuller & Co. factories at San Francisco, Los Angeles, Portland; Branches and Warehouses in principal Western cities.

"Specialized finishes"

FULLER INDUSTRIAL PAINTS

THE WEST—AMERICA'S NEW INDUSTRIAL FRONTIER!

FULLER—West's oldest, largest, most relied upon paint maker—welcomes the *pioneer spirit* again so evident. We banked on the future in '49. We're still enthused in '46.

* *

Below, briefed, a partial roll of FULLER'S part in the growth of the West.

AIRCRAFT FINISHES

Air-minded from the first, Fuller developed aircraft finishes that became standard for the industry, helped mightily during the war. Now all Fuller Aircraft Finishes again available to both commercial and private plane owners.

PRODUCTION FINISHES

Wood, metal, plastic, or whatever—Fuller Industrial Finishes do a dual job. They meet exacting production demands; make sales department happy, too. Mr. Production Manager, Mr. Sales Manager—ask us!

MAINTENANCE FINISHES

Paints protect, preserve. Wide acceptance proves ours ace high. We go further—know the psychology of color. Fuller Color Engineering is a valuable management aid to reduce workers' strain, assure safety, increase output. Costs nothing to find out!

MARINE FINISHES

Fuller Marine Finishes have a long record of paying out in service under the toughest possible exposure. That's why so many ship operators specify Fuller, from bridge to bottom. Interested in pay-out service? Fullerize!

All You Need is a LICENSE TAG—



—to Haul on the Highway with MISSISSIPPI WAGONS!

* * *

Yes—and Mississippi Wagons are the ONLY hauling units of their type on which a license tag can be used!

Four-axle construction, made possible by the weight-transfer feature found exclusively on Mississippi Wagons, is the reason for their ability to operate efficiently, legally, and economically both ON and OFF the highway.

Four axles not only provide maximum flotation over soft ground on construction work, but serve to reduce axle-loadings for road and street travel. As a result, the Mississippi Wagon is the only bottom-dump hauling unit powered by a heavy industrial tractor that can haul payloads of 27,000 pounds on highways without exceeding the 18,000-pound axle-loading limit set by most states.

With all-round performance like this available, why make or carry a double investment in hauling equipment? Let a single investment in MISSISSIPPI WAGONS put you in a position to handle both construction and long-haul jobs . . . at costs that will enable you to meet and beat tough competition in the big days ahead.

COMPARE THESE FIGURES WITH YOUR PRESENT COSTS FOR HIGHWAY HAULING!

Following are the approximate costs per ton-mile for hauling with Mississippi Wagons:

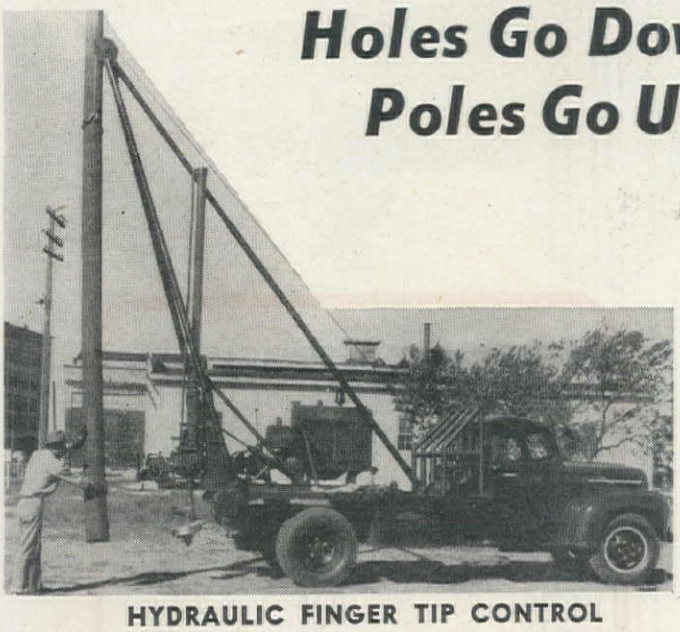
LENGTH OF HAUL ONE WAY	TONS A DAY PER WAGON	COST PER TON-MILE
5 miles	202	3.5¢
10 "	115	3.1¢
15 "	81	2.9¢
50 "	27	2.6¢

The figures are based on a 10-hour day, an average speed of 20 m.p.h., payloads of 27,000 pounds, 10 minutes loading and dumping time per trip, and a total daily cost of $35.00 per Wagon, covering fuel, lubricants, driver's wage (average), reserves for depreciation, repair parts and labor, tire wear over abrasive concrete roads, insurance, social security, and miscellaneous expense.

M-R-S MANUFACTURING COMPANY, Jackson, Mississippi

MISSISSIPPI WAGON *The World's Most Modern Hauling Unit*

JAQUES
HYDRAULIC EARTH BORING MACHINE

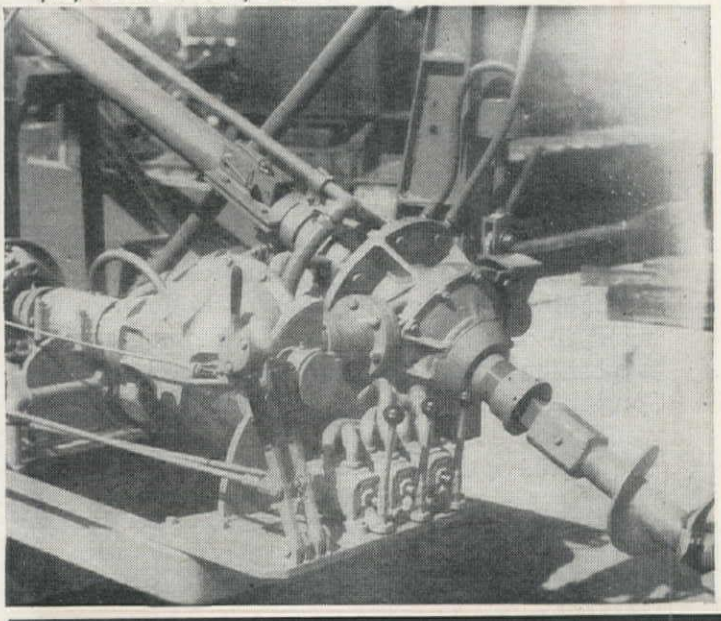


Holes Go Down Quicker, Poles Go Up Faster With a Jaques

1. All plumbing is hydraulic controlled, enabling faster transportation from hole to hole as machine can be instantly lowered to traveling postion.
2. Faster drilling, as the hydraulic feed maintains a constant pressure on the bit—the texture of soil controls the rate of digging.
3. Hydraulic pressure on bit transmits less shock to machine while digging in rock.
4. Operator fatigue reduced to a minimum.
5. Anchor holes are easily drilled at any angle.

HYDRAULIC FINGER TIP CONTROL

Reduces operator fatigue. One man easily operates this machine as all controls are conveniently located. Peak operating speeds easily mantained hour after hour with this simple, trouble-free hydraulic control.



SPECIFICATIONS

Motor—Int. Model U4—with electric starter. **Construction**—Unit mounted on steel-I-beam skids (easily attached to or removed from truck). **Drive**—Mechanical—four forward speeds and one reverse. **Feed**—Hydraulic. **Lift**—Hydraulic. **Leveling**—Hydraulic. **Hole Size**—Up to and including 24 inches (larger diameter on special order). **Depth of Hole**—8 to 9 feet with standard machine (greater depth on special order). **Weight**—3400 pounds. **Width**—4 feet, 3 inches; **Length**—10 feet.

Immediate Delivery on Standard Models

for Further Information Write or Wire



JAQUES POWER SAW CO.
DENISON, TEXAS

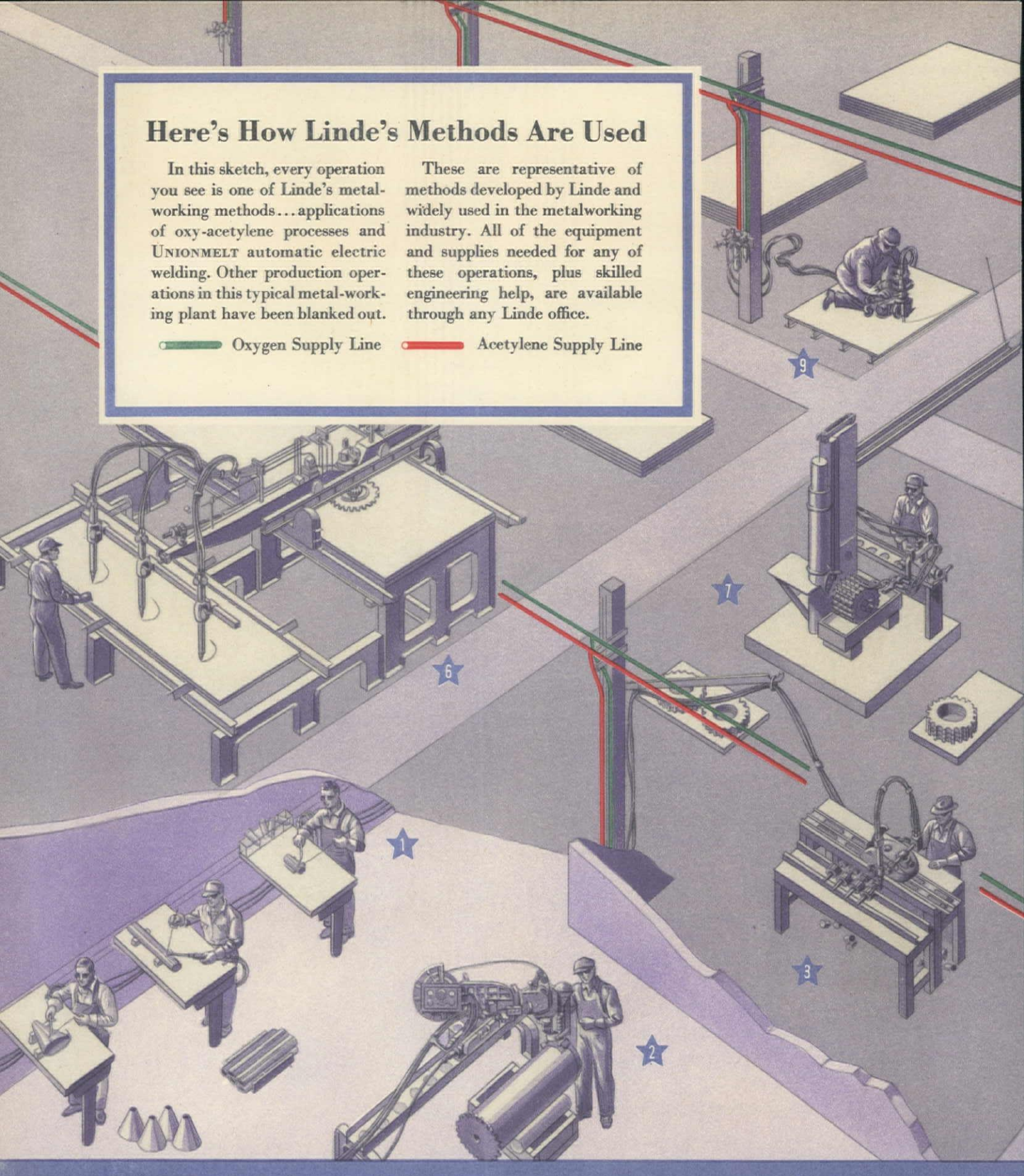
REPORT No. 7 *on the use of Linde Methods in mass production . . .*



In METAL-WORKING PLANTS LINDE METHODS are Important in Many Steps of Manufacture

A continuous succession of Linde developments for oxy-acetylene flame-joining, cutting, forming, and treating metals has changed fabrication methods so much that in many metalworking plants oxygen and acetylene are now made as readily available as water and electric power. Equipment can be connected to the supply line anywhere by means of convenient outlets, such as you see above.

In the sketch that you will see as you turn this page, are shown some of the many uses of the intensely hot oxy-acetylene flame in the production line. One of these—marked 8—is a relatively new one.



Here's How Linde's Methods Are Used

In this sketch, every operation you see is one of Linde's metal-working methods... applications of oxy-acetylene processes and UNIONMELT automatic electric welding. Other production operations in this typical metal-working plant have been blanked out.

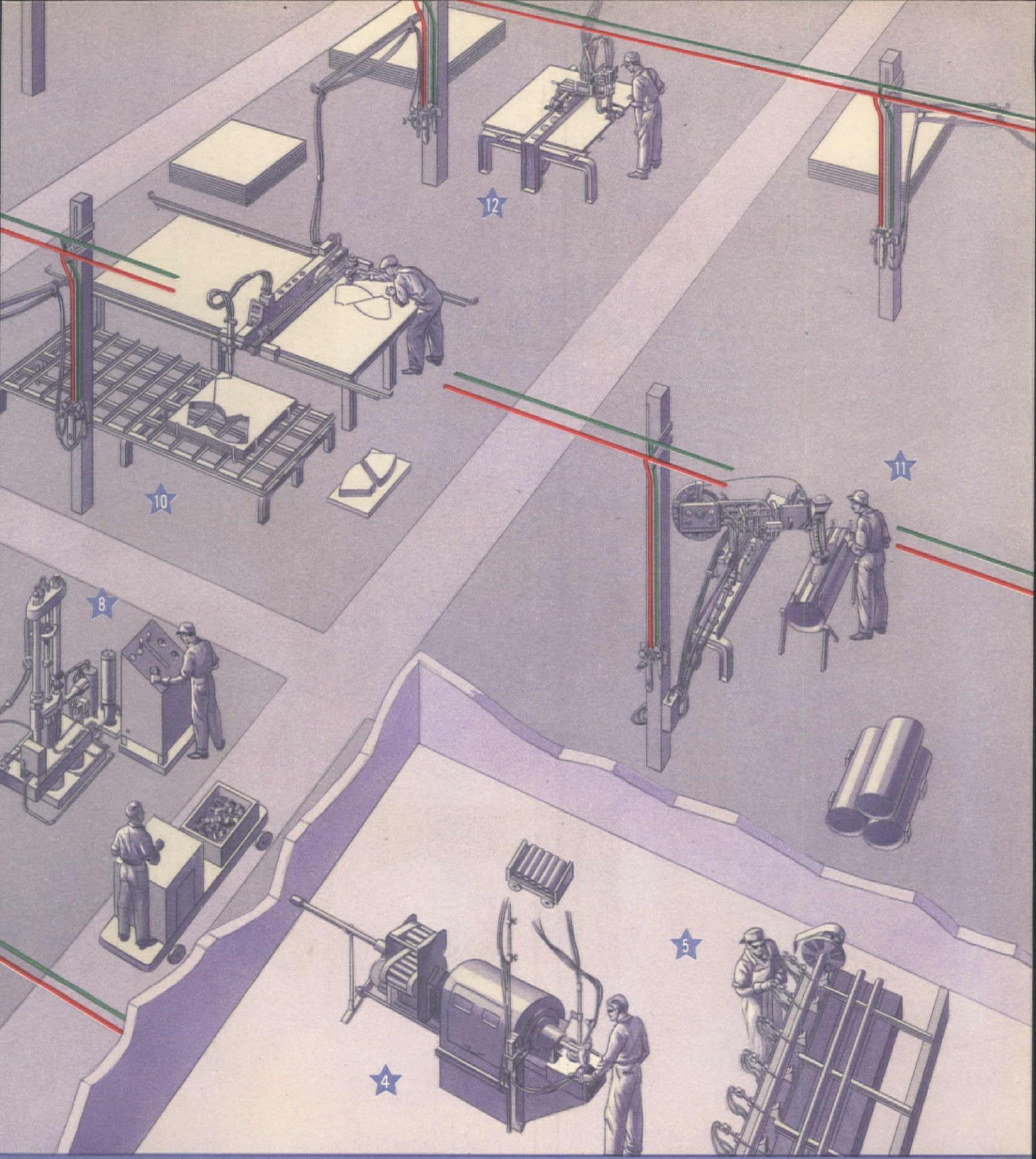
These are representative of methods developed by Linde and widely used in the metalworking industry. All of the equipment and supplies needed for any of these operations, plus skilled engineering help, are available through any Linde office.

Oxygen Supply Line

Acetylene Supply Line

Methods developed by THE LINDE AIR PRODUCTS COMPANY

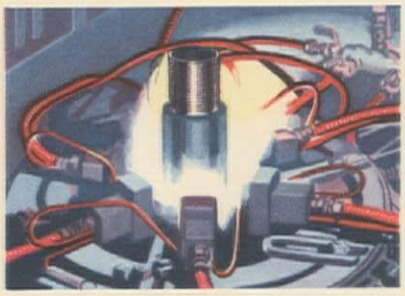
1. Manual welding of small assemblies.
2. UNIONMELT welding of sprockets to drum ends.
3. Flame-cutting risers from cast gear blanks.
4. Flame-spinning of tubing to form end closures.
5. Flame-cutting tubing ready for spinning.
6. Shape-cutting three sprockets simultaneously.



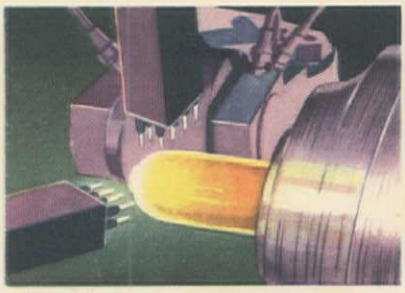
Simplify the Production of Metal Products of Many Kinds

7. Flame-hardening to lengthen sprocket life.
8. Pressure-welding bearing sections to shaft.
9. Cutting drum heads with a portable flame machine.
10. Flame-cutting parts from stacked plate.
11. Welding the seam by the UNIONMELT electric process.
12. Flame-planing plate edges to be welded.

WHAT LINDE FLAME METHODS WILL DO



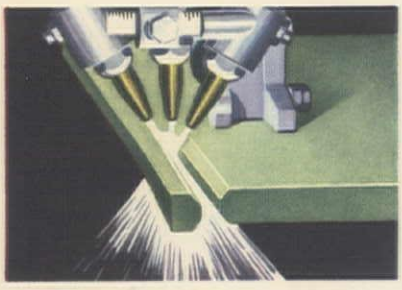
A hard, wear-resistant case can be given to local surfaces of hardenable steel by oxy-acetylene flames followed by a water quench. Chemical composition of the metal and toughness of the core are not affected.



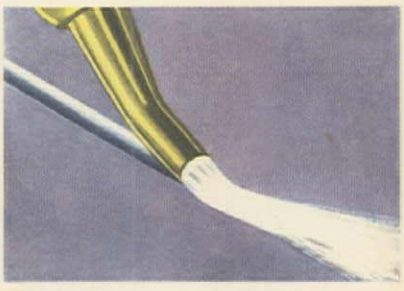
End-forming of tubular products, for completely or partially closing the ends, or for reducing diameters at any point, can be done without interruption by applying oxy-acetylene flames to rapidly spinning tubes.



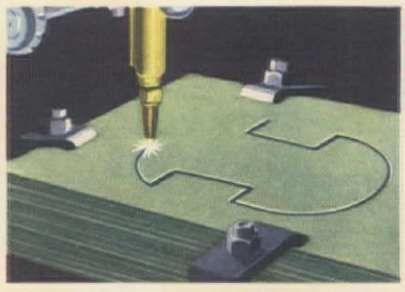
Smooth - sweep bends in pipe of almost any diameter and at any angle can be made without thinning the pipe walls or impeding flow, by applying the intense, fully controlled heat of oxy-acetylene flames.



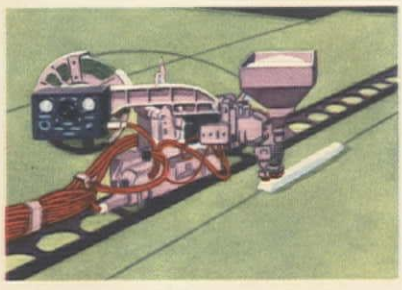
Preparing plate edges with flame-cutting equipment speeds trimming and beveling of plate preparatory to welded fabrication. Cuts in several planes can be made simultaneously, accurately, and at low cost and power consumption.



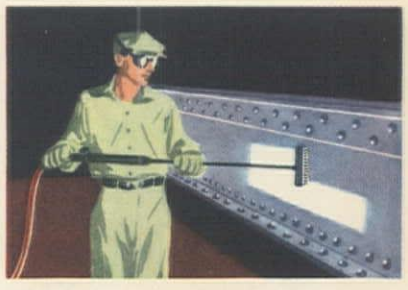
Grooving of metal surfaces, the preparation of plate edges for welded fabrication, the removal of temporary welds, and the preparation of cracks in castings for repair by welding are done easily with oxy-acetylene flame-gouging.



Parts of any size, shape, or thickness can be fashioned from stock steel plate quickly and accurately with flame-cutting machines. Flame-cut edges are smooth...frequently require no machining.



Automatic electric welding by the UNIONMELT process makes high-quality welds in steel of any thickness at speeds up to 20 times faster than other methods of welding with rods.



Oxy-acetylene flames remove scale, rust, grease, corrosive salts, and moisture from surfaces of steel prior to painting. Paint goes on faster, bonds tighter, lasts longer.



Pressure plus heat from oxy-acetylene flames applied simultaneously, quickly joins plate, pipe, shafting, railroad rails, and metal sections of the same or different metallurgical characteristics.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 E. 42nd St., New York 17, N. Y. UCC **Offices in Other Principal Cities**

In Canada: Dominion Oxygen Company, Limited, Toronto

The words "Linde" and "Unionmelt" are trade-marks of Union Carbide and Carbon Corporation or its units.

Other reports on the use of Linde methods in SHIPBUILDING, in STEELMAKING, METAL-FABRICATING, PIPE, PRODUCTION AND FABRICATION OF STEEL, and UNIONMELT WELDING will be sent on request.

EXTRA WALLOP *for Faster* { BREAKING / SHEETING DRIVING / SPIKE DRIVING

with Thor

PAVING BREAKERS



YOU CAN USE the extra power of Thor Paving Breakers to do many *different* jobs. As hard-hitting demolition tools they break concrete, rock and ice; cut asphalt; tamp dirt; dig clay and hard pan. Used with Sheeting Driver attachment, they quickly drive wood or steel sheeting as thick as 3 inches. Another simple change of the front head and they become heavy-duty Spike Drivers.

EXTRA POWER Speeds the Work

On *every* job, Thor Breakers are bonus makers. Thor's exclusive short-travel, tubular valve gets more work from *all* the air to drive a reversible, block-type piston in harder blows. Air cushioning of the piston in the cylinder—plus perfect timing and balance—provide smooth operation for easy handling. Air vents in the sturdy back head keep the handle remarkably cool. Rugged construction means long-life and low maintenance cost. You can get these benefits on your own jobs now . . . ask your nearby Thor distributor.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Blvd., Chicago 6, Illinois

Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS



Precisionbilt, like a diamond cutting machine, J&L Permaset Pre-formed Wire Rope will give you increased rope life. Just as diamond cutting is done by highly skilled men of long experience, J&L Wire Rope is made by men who have for years produced the best in wire rope.

The long service of J&L Wire Rope on any job reflects the quality of the steel from which it is made—J&L Controlled Quality Steel.

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

GILMORE WIRE ROPE DIVISION

PITTSBURGH 30, PENNSYLVANIA

J&L *Precisionbilt* PERMASET PRE-FORMED WIRE ROPE

BETTER BUILT FOR BEST PERFORMANCE



One way side dump Body with dual telescopic Hoist. Automatic downfold side.



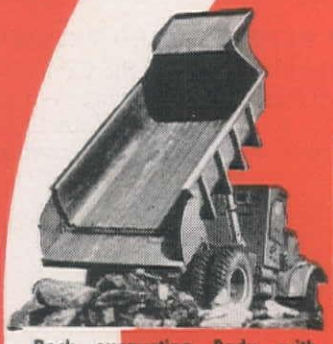
Type Q12 Body with Model T440 dual telescopic Hoist. Capacity 16 cu. yds.



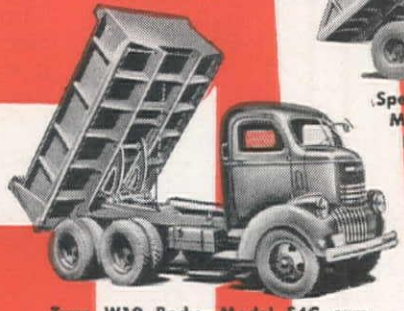
Type X-112 Extra heavy duty Body with automatic downfold tailgate.



Type X-112 Extra heavy duty Body, scoop end, with Model T-4440 Hoist. Capacity 19 cu. yds



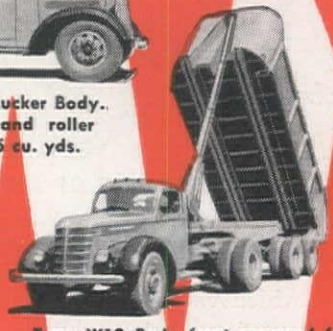
Rock excavating Body with downfolding gate.



Type W12 Body—Model F4C cam and roller Hoist. Capacity 6 cu. yds.



Special scoop end mucker Body. Model F8B cam and roller Hoist. Capacity 5 cu. yds.



Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.



Telescopic boom Crane. Radius 8 to 20 feet.



Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.



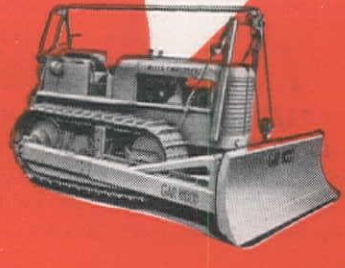
Bulldozer and rear mounted Winch.



Type W12 Body and single telescopic Hoist. Double acting tail-gate Capacity 4 cu. yds.



West Coast Special W-12 Body. Model F8C cam and roller Hoist. Capacity 10 cu. yds.



Cable Dozecaster with angling blade.

TRADE MARK

GW TRADE MARK

GAR WOOD INDUSTRIES, INC.

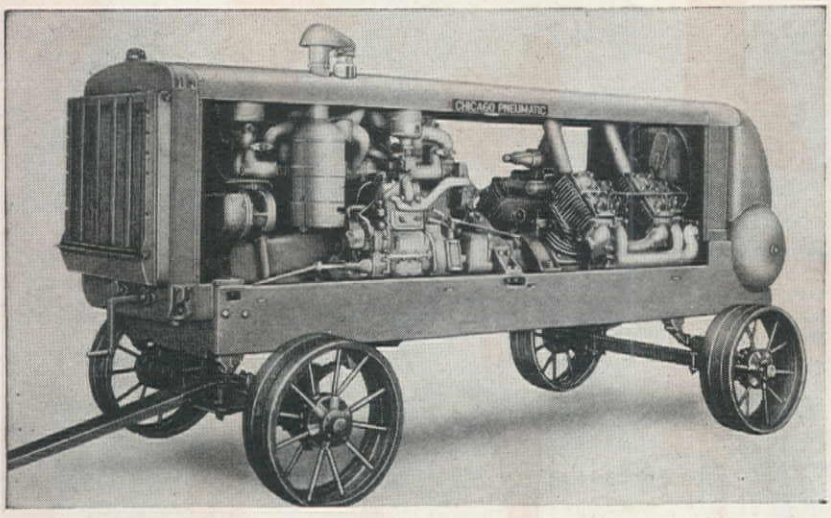
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EQUIPMENT HELPS CONTRACTORS TO KEEP JOBS

moving on schedule!



500 CUBIC FEET OF AIR ON WHEELS

That's what is available with the Model 500 CP Diesel-driven Portable Compressor. Fuel is saved, maintenance reduced, by the *Gradual Speed Regulator*, which varies the engine speed in proportion to the demand for air. Other Chicago Pneumatic gasoline-driven and Diesel-driven portable models range from 60 to 315 c.f.m., actual capacity.



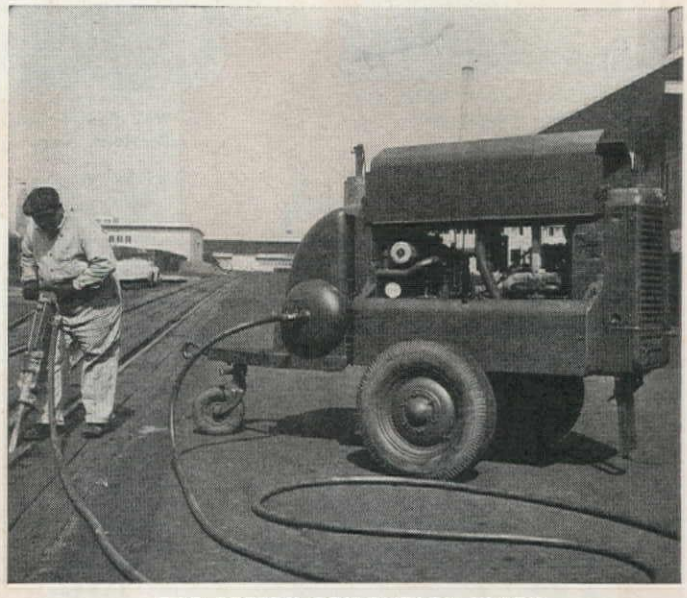
CP SUMP PUMP NEEDS NO PRIMING

Turn on the air and lower the CP Portable Sump Pump into the water — and it starts to work at once. Watertight casing; muck cannot get into motor.



4 FEET A MINUTE THROUGH GRAVEL

That's easy with the CP-116 Sheeting Driver, which does as much work as ten men with mauls. As there is no "brooming", sheeting can be used repeatedly. Has only one moving part, hence maintenance is low.



FOR SPEEDY DEMOLITION WORK

Operating without kick-back, CP-117 Demolition Tool is recommended for use on hard cement and hard-to-extremely-hard materials. Economical in air consumption and low in maintenance. Shown is a CP Model 60 Compressor.

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Peterbilts help build Moffett Field

Wherever big construction jobs are done in the West, there you will usually find ***Peterbilt*** dual drives. It may be the building of a dam or reservoir, road construction, irrigation projects, revetments and other dirt moving jobs.

Here you see the job which a fleet of ***Peterbilts*** is doing for Heidlebaugh & Wagner of San Pedro in the building of the Navy's Moffett Field at Sunnyvale, California. When you see these big ***Peterbilt Dumps*** swing into position, and the hydraulic hoist raises the body into dumping position, you know that big yardage is being moved . . . quickly and economically.

If you are running a parcel delivery service, you wouldn't be interested in ***Peterbilts*** . . . but if you are contracting excavations and fills, or hauling crushed rock or hot mix, you will go for ***Peterbilts.***



Peterbilt Motors Company

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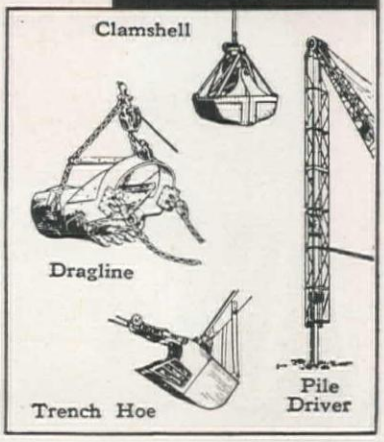
LINK-BELT SPEEDER'S *Convertibility* PAYS OFF



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ONE MACHINE PERFORMS ALL OPERATIONS!

You can do more work, more KINDS of work, more of the time, with a Link-Belt Speeder "shovel-crane" because it is quickly, easily convertible to any earth moving or handling operation.

Look at the variety of jobs illustrated here, all connected with road building — all done with the same standard Link-Belt Speeder, with interchangeable front end attachments.

No wonder contractors, highway departments, municipalities are considering a LINK-BELT SPEEDER in their future plans.

For Prompt, Efficient, Convenient Sales and Service:
There is a Link-Belt Speeder Distributor Located Near You

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LINK-BELT SPEEDER

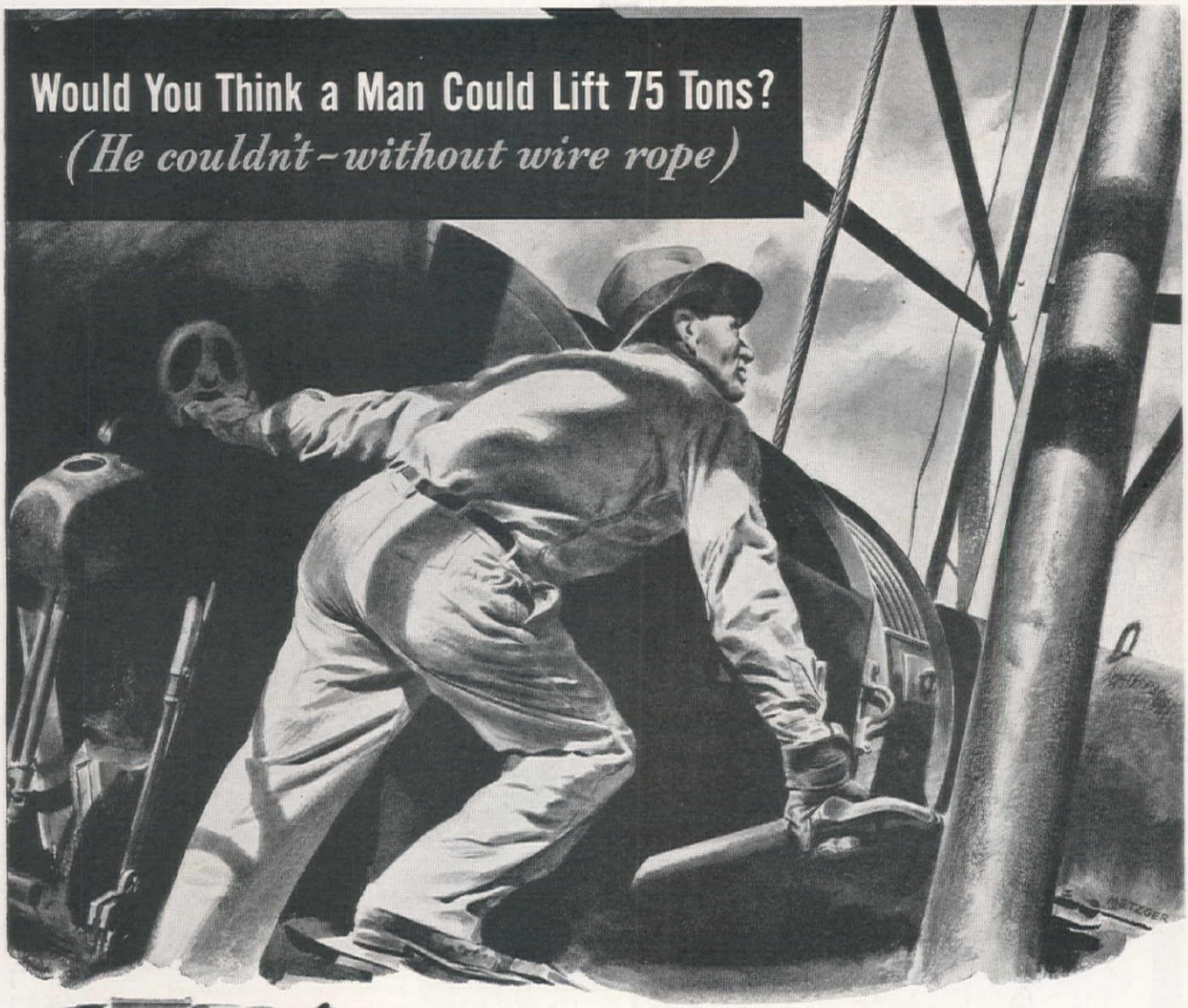
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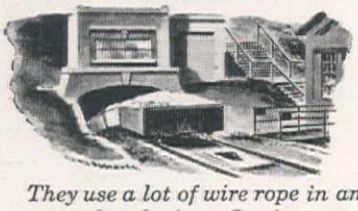
LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

★ *Let's keep America* ★ **AHEAD** ★
ON GOOD ROADS!

Would You Think a Man Could Lift 75 Tons?

(He couldn't—without wire rope)





They use a lot of wire rope in and around coal mines. One important ground use is for car spotters and retarders. Preformed wire rope is easier and safer to handle.

He's lifting 15,000 feet of heavy steel drill pipe—no wonder he keeps his eye on the wire rope. Running at high speeds, wire rope tends to whip and pile up on the drum. This crushes rope and forces early shutdowns for replacement. Operators prefer Preformed wire rope because it resists whipping, spools evenly and reduces shutdown frequencies.



Power shovels scoop up earth and rock with giant bites. The wire rope makes it look easy. Being more flexible, Preformed wire rope runs over small sheaves with minimum wear.



Modern machines almost invariably are equipped with Preformed wire rope. Preformed is flexible and limber. It is tractable and free from internal tension. It handles easier, so operators like to work with it, and it lasts longer so the front office likes to order it.

ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

HANDLES EASIER - LASTS LONGER



SURPLUS HOBART ARC WELDERS

200, 300 AND 400 AMPERE RATINGS

Three million dollars worth of surplus Hobart Arc Welders *must* be sold between May 15th and June 15th. Most of this equipment is of the MG type but some quantity is available in gasoline driven units. Arrangements may be made to inspect the offered items. Largest inventories are located at Boston, Detroit, Cleveland, Chicago, Atlanta, Kansas City, Richmond and Philadelphia—but information on availability, condition and location may be obtained at any of the War Assets Administration Regional Offices listed below. The equipment will be sold on a "where is, as is" basis . . . used or unused . . . and priced accordingly. For full information contact the nearest office listed below or check and mail this coupon.

ALSO MANY OTHER TYPES OF WELDING AND FLAME CUTTING EQUIPMENT

LINCOLN

Hundreds of Lincoln Arc Welders in the popular 300-400 Ampere size are also available; some gasoline engine driven.

WESTINGHOUSE

Flexarc equipment for production or construction operations is available in smaller quantity. Also other standard makes and ratings.

RESISTANCE WELDERS

Spot Welders located in Philadelphia, Detroit, Chicago, Los Angeles, Cleveland and Kansas City; *Seam Welders* in Cleveland, Chicago, Detroit, Birmingham, Boston and Philadelphia. Also *Flash Welders.*

WELD POSITIONERS

In standard sizes and types, are located in Detroit, Boston, Chicago and New York.

FLAME CUTTERS

Save production time and money with portable or stationary, single or multiple torch flame cutting machines. All types of gas cutting equipment available for quick sale.



VETERANS OF WORLD WAR II—To help you in purchasing surplus materials, a veterans' unit has been established in each War Assets Administration Regional Office.

FREE SALE FACTS

To War Assets Administration:
Please send me information prior to your sale on the availability, condition and location of Hobart Arc Welders of the following

types:..... and ratings:.....

.....

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I am also interested in:—

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- ☐ WESTINGHOUSE ARC WELDERS
- ☐ .....ARC WELDERS (other)
- ☐ SPOT, SEAM, FLASH WELDERS
- ☐ WELD POSITIONERS
- ☐ FLAME CUTTERS

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Firm.....

Address.....

City..... State..... 176-2

All items subject to prior sale

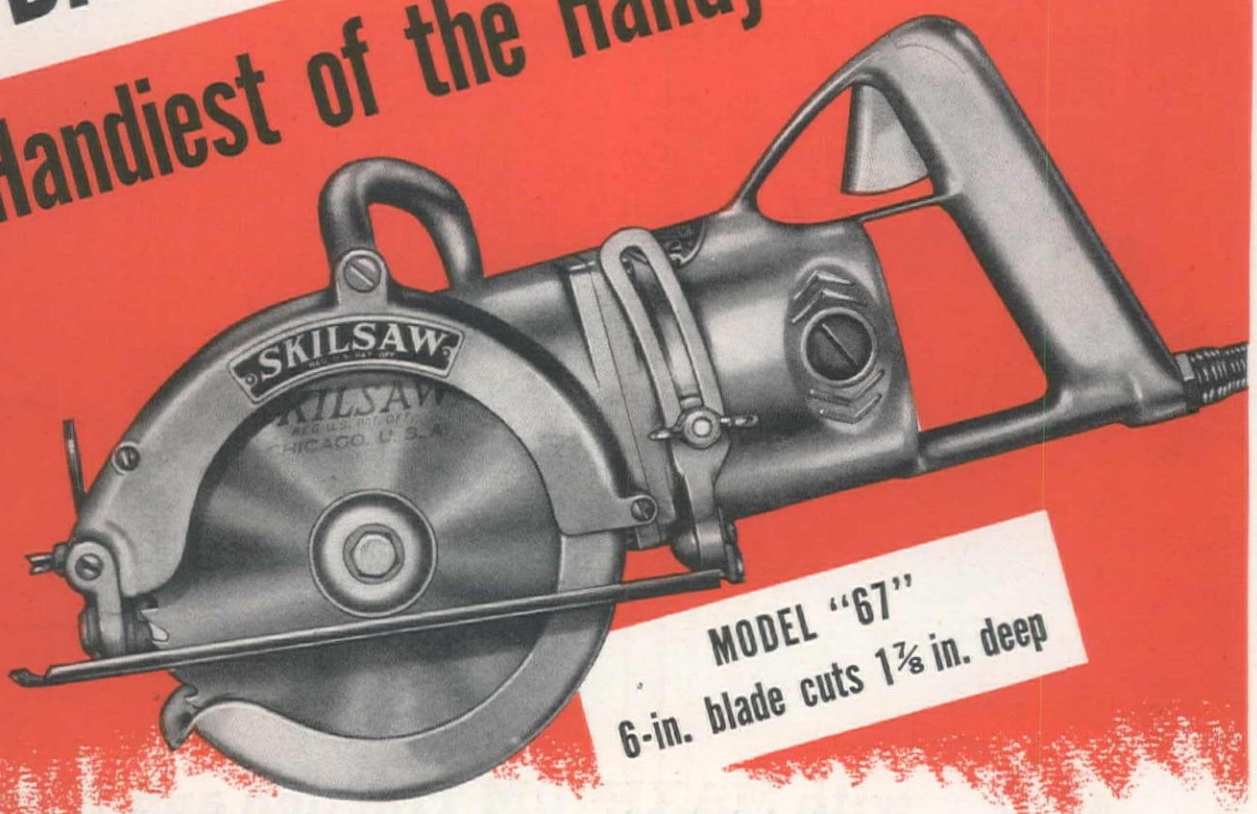
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MODEL "67"
6-in. blade cuts 1⅞ in. deep

• A real companion for your larger SKILSAWS . . . you'll want Model "67" for cutting sheathing, roofing, sub-flooring . . . to use on ladders, scaffolding, platforms. Only 15½ inches long . . . only 11½ pounds in weight . . . packed with the heavy duty power and stamina that have made SKILSAWS the first choice of builders everywhere for a quarter century. Like all SKILSAWS, Model "67" speeds your work and cuts your costs. Call your distributor today for a demonstration!

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GEARED TO THE EARTH —FOR FASTER LOADING



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WOOLDRIDGE
EARTHMOVING EQUIPMENT
Includes



★ **SCRAPERS**
Tractor-drawn for handling heaping yardages from 6 to 28 cu. yards.



★ **POWER CONTROL UNITS**
Single and multiple drum with universal or roller fairleads.



★ **BULLDOZERS**
Tough and rugged design for standard makes of tractors.



★ **TRAILBUILDERS**
Adjustable angle-blades for standard tractor mounting.



★ **RIPPERS**
Available in light, medium and heavy duty models with two sizes to each model.

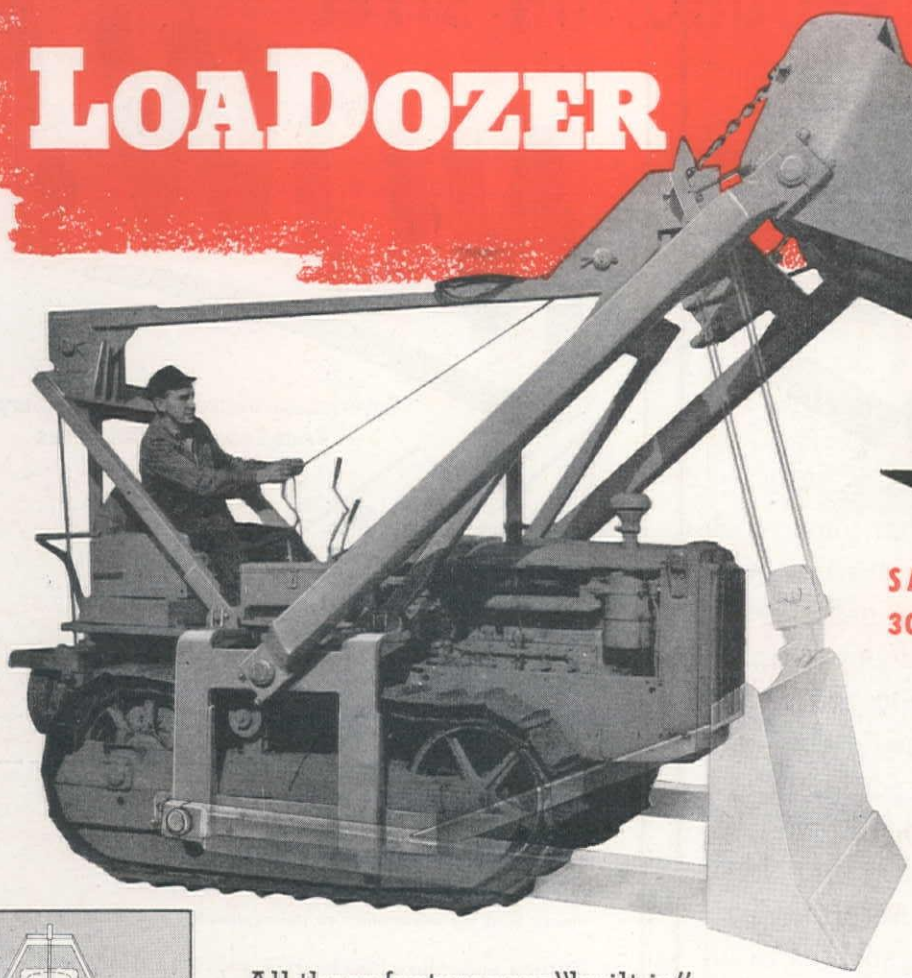
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TERRA COBRA
High-Speed Self-Propelled EARTHMOVERS

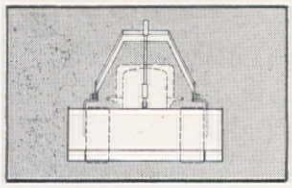
NOW-THE SOUTHWEST LOADOZER

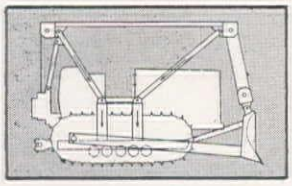


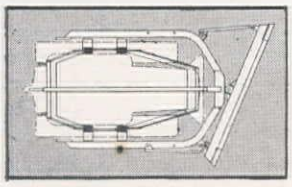
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SAVES ONE TRACTOR
30 MINUTE CHANGE-OVER
EASY OPERATION

Balance
Economy
Ruggedness
Speed
Versatility







"Over Center Track Mounted" design gives perfect balance

ANOTHER EXAMPLE OF *Southwest's* LEADERSHIP

All these features are "built-in" qualities of the new SOUTHWEST "LOADOZER"—Extra values that mean greater efficiency and economy in Loader and Bulldozer operations. Remember—you SAVE ONE TRACTOR—it takes only 30 MINUTES TO CHANGE OVER this combination Loader-Bulldozer unit.

- Built for all four makes of track type tractors.
- See your equipment dealer about the complete line of SOUTHWEST CONSTRUCTION EQUIPMENT.
- For complete specifications on this Loader-Bulldozer combination unit—WRITE FOR BULLETIN CM-11.

CONSTRUCTION MACHINERY DIVISION

Southwest Welding & Manufacturing Co.

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Government-owned High Quality Surplus Priced For Substitute Uses

If you need fabricating bar alloy stock now and are willing to adapt top quality material priced at or near carbon steel prices—here is real opportunity. Over 25,000 tons of hot rolled and 25,000 tons of cold finished carbon and alloy steel bars are ready for immediate shipment to you. The stock is available in standard sizes, shapes, but is of above average grades. Accordingly it has been priced at levels such as to insure its quick employment to meet America's postwar needs. For details on F.O.B. locations, sizes, quantities and shipping arrangements contact your nearest W. A. A. Regional Office below . . . or clip and mail this coupon.

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To War Assets Administration:

Please send me information on the availability and pricing of the following:

Carbon and Alloy Billets, Blooms, Slabs, Rods, etc. ☐
H. R. & C. F. Alloy Sheets, Strips and Plates ☐
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Mechanical Tubing, Carbon and Alloy ☐

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FIRM.....

ADDRESS.....

CITY.....STATE.....

157-5

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WATER
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handling costs cut with

Crackerjack HOSE

To get a true picture of CRACKERJACK hose economy, look at both maintenance and long life. When CRACKERJACK is still in good condition—both *inside* and *out*—long after ordinary hose has been retired, only half the story has been told. The other half is CRACKERJACK'S ability to stay on the job, preventing costly shut-downs and confusion while hose breaks are cut out, couplings installed, and hose rejoined. In every length of CRACKERJACK hose, the tube, carcass and cover are balanced and tailor-made for each job. It's built for today's high pressure tools, abrasive materials, and high-ball schedules.



CRACKERJACK **AIR DRILL** HOSE



CRACKERJACK **WATER** HOSE



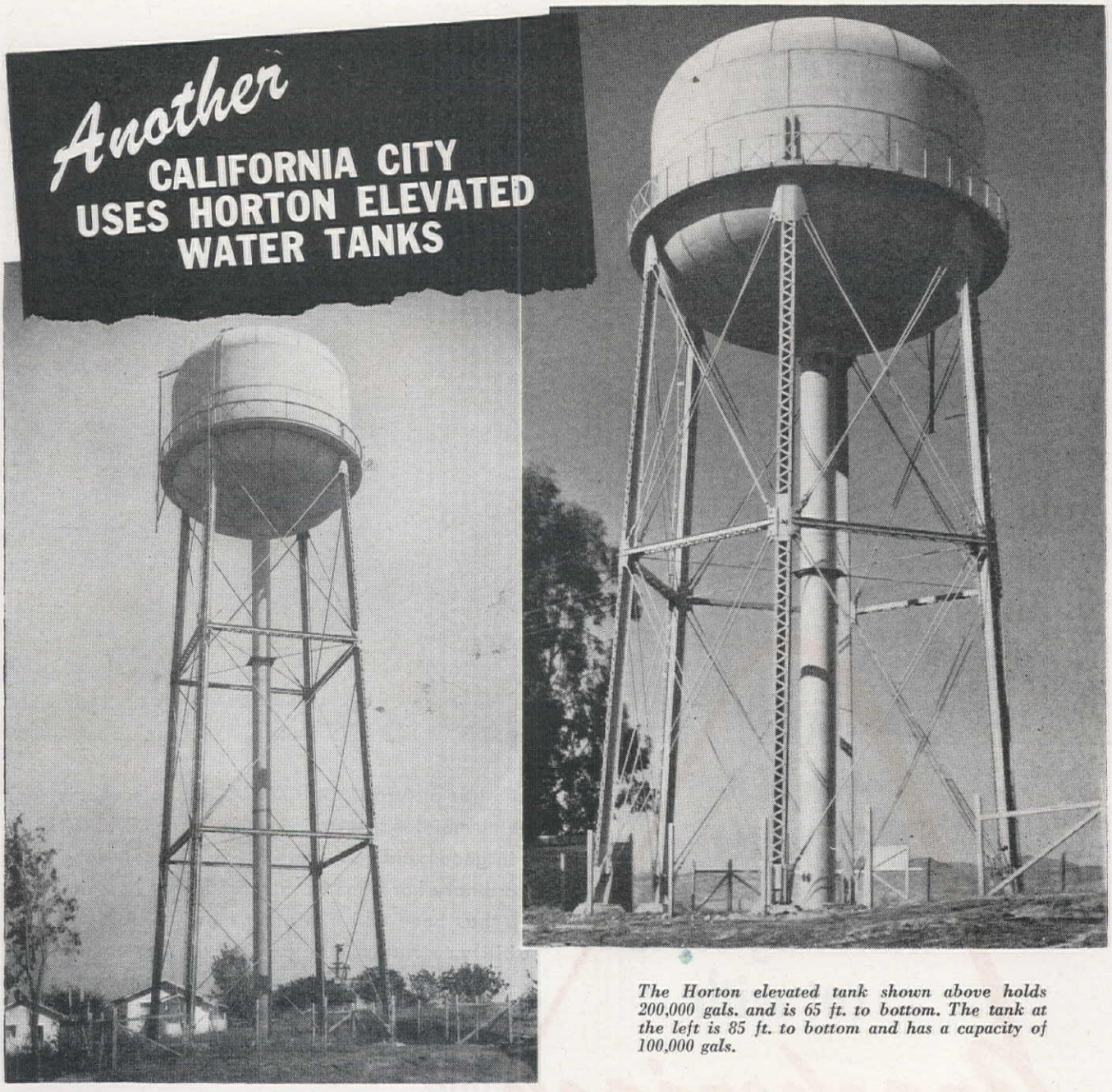
CRACKERJACK **GUNITE** HOSE

The AMERICAN RUBBER Mfg. Co.

OAKLAND, CALIFORNIA

MANUFACTURERS OF RUBBER PRODUCTS FOR INDUSTRY

Another CALIFORNIA CITY USES HORTON ELEVATED WATER TANKS



The Horton elevated tank shown above holds 200,000 gals. and is 65 ft. to bottom. The tank at the left is 85 ft. to bottom and has a capacity of 100,000 gals.

VALLEJO now adds its name to the growing list of California cities which have erected Horton elevated water storage tanks to provide gravity pressure in their water distribution systems.

A gravity water supply is hard to beat . . . it has many advantages. Municipalities that pump their water direct from the source often subject the pumping apparatus to severe strain during peak demand periods. This shortens the life of the pumps and, in addition, pressures in the outlying sections are not always adequate.

Elevated water storage provides for pumping during off-peak periods, a practice which generally lowers pumping costs and adds life to pumping equipment. Elevated water storage also provides an adequate reserve of water immediately available for fire protection.

We design, fabricate and erect Horton elevated water tanks in a complete range of standard sizes as well as in special designs to meet requirements. Standard designs include ellipsoidal-bottom tanks with ellipsoidal roofs, Waterspheres, and in the larger sizes, radial-cone bottom tanks with cone, dome or ellipsoidal roofs.

Write our nearest office for quotations on Horton elevated storage tanks for municipal or industrial service.

CHICAGO BRIDGE & IRON COMPANY

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***Plants at* BIRMINGHAM, CHICAGO, and GREENVILLE, PENNSYLVANIA**

WESTERN CONSTRUCTION NEWS
WITH WHICH IS CONSOLIDATED WESTERN HIGHWAYS BUILDER

May, 1946 Vol. 21, No. 5

J. M. SERVER, JR. . . . . Editor
D. F. STEVENS . . . . . Associate Editor
ARNOLD KRUCKMAN . . . . Washington Editor
A. H. GRAHAM . . . . . Field Editor

Saving Tax Money—II

LAST MONTH this page spoke of the waste of tax money inherent in the operation of numerous small county governments in areas which geographically and otherwise might logically be considered similar. We promised to point out other ways to save some of the taxpayer's dollars.

This editor has just returned from a tour over four Western states. To avoid any embarrassment to anyone, let's not name them, but he found in all, and in one particularly, a political situation that is disgraceful to the state, degrading to the state employees, and wasteful in the extreme of the taxpayer's money.

This is a state which has no Civil Service system for selecting and protecting employees. Having worked under Civil Service in the past, this editor knows it is not wholly effective, and has some undesirable and wasteful features, but it is so far superior to the patronage system used by the state under discussion that there can be no real comparison.

The State Highway Engineer is of course changed with every change of administration, and should he evidence any individuality or independent thought, he is of course changed **during** the administration. Thus he is obliged to spend a very great proportion of the time for which he is paid by the citizens, in building and maintaining "political fences." Efficiency in highway administration is obviously an impossibility. Furthermore, and this is said as a general statement, without personal reference to the present occupant, it is rarely possible to secure the services of an engineer of high quality to work under such conditions.

But this is not the end, of course. Every department head and subordinate under the Chief Engineer is subject to removal at every change of Chief. It is naturally impossible for these employees to concentrate wholly on the public's business, and at each change it is necessary to "break in" the new man or men, with consequent delay and expense. Of course, each employee, of whatever grade, is obliged to contribute his two per cent to the political campaign funds.

The politics situation is so bad that the highway engineer dare not inform the public of his advance planning of specific projects, lest pressure groups descend like hordes of gnats on the Governor, and force abandonment of needed projects. A certain project currently being discussed is of primary importance to traffic safety and movement in that state, yet such a strong pressure group is threatening and may ultimately cause its abandonment, because of purely local jealousies.

What we have said about the State Highway Department applies equally to every branch of government in that state. We just happened to have closer contact with the Highway Department.

The cities of the state are in equally deplorable condition, perhaps even worse. A city school superintendent didn't agree with someone who was someone, so his contract wasn't renewed; the school kids went out on strike—pressure groups start young there. A new majority of City Commissioners was elected in one city; the old Commission, as its last official act, reduced city water rates (note that they didn't do it while they were in charge of the spending!)—the first official act of the new Commission was to restore the old rates; with a new clique in control, every appointed city official is quaking in his boots.

Amazingly enough, these government bodies, infested as they are with political lice, do get a few things done, and, still more amazingly, done well. But to suppose that they are accomplishing to the maximum of their capabilities, or that the taxpayer is geting his money's worth from this sort of a set-up, is to strain one's credulity.

We didn't talk to a single person in that state, not one, including many of the office holders themselves, who liked or believed in the system. But not one had any suggestion to remedy it, or had any apparent interest in doing anything about it.

The name of the state was not mentioned, though some may recognize it, because an identical situation prevails in a majority of the Western states. If the taxpayer likes it, we suppose it's OK. But we don't think he likes it, and we urge formation of committees in such states, which will direct hard and sincere efforts toward the introduction of sound, efficient, technical operation of government at all levels.

New Highway Engineer

MARK U. WATROUS has been named State Highway Engineer of Colorado, after a long and bitter fight through the Civil Service Commission and the several state courts. Following the death of C. D. Vail, former Engineer, a civil service examination gave Mr. Watrous, by aid of veterans' preferment, first position on the eligible list, over Arthur F. Hewitt, formerly Vail's assistant and, after the latter's death, Acting Highway Engineer.

We're glad the contest is settled, and a permanent appointment made. We're glad, too, that the charges of possible unfairness in the examinations were sifted by the courts. Had the charges been sustained, it would have been a severe blow to the Civil Service system, concerning which we have had something to say above.

We're sorry Mr. Hewitt lost out, for he has always been a warm friend of this magazine and its editors, and it was just our personal hope that he'd receive the appointment. We, of course, took no sides in the contest. However, after careful investigation, the courts decided that Mr. Watrous was the best qualified for the position, and we congratulate him and wish him every possible success. We also know him to be a fine gentleman and capable engineer, and he may look for fullest cooperation from *Western Construction News*.

Change in Staff

WESTERN CONSTRUCTION NEWS is happy to welcome back to its editorial staff Capt. Dudley F. Stevens, who left the position of Editor to enter the armed forces in March, 1943. He returns with the title of Associate Editor and will spend most of his time outside the San Francisco office in direct contact with engineers and contractors, the men who **make** the construction news of the West. With the return of this experienced and capable editor, readers will be assured of continued and even more complete, timely and thorough news coverage of engineering construction throughout the West.

We regret to announce at the same time that T. Douglas Overton has resigned as Managing Editor, to accept an important position with the Nevada Bureau of Mines in Reno. No replacement has yet been made in this post.

● **Gross Weight**

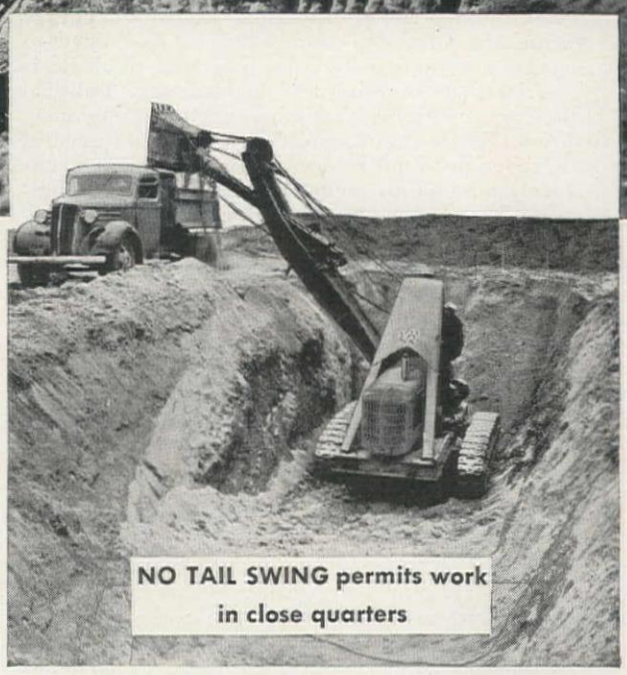
● **Dipper Capacity**

BY ANY YARDSTICK

● **First Cost**

● **Operating Cost**





. . . the ¾ Swing Badger, with its low center of gravity (for digging power), and lighter swinging weight (for more swings per minute), moves *more material, faster* and *cheaper.*

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MONTANA—WESTERN CONSTRUCTION EQUIPMENT COMPANY . Billings
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UTAH—WESTERN MACHINERY COMPANY . . . . Salt Lake City 13
WASHINGTON—COLUMBIA EQUIPMENT COMPANY . . . . Seattle
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WESTERN CONSTRUCTION NEWS
MAY • 1946

Idaho Power Output Enlarged

Hydroelectric development by Idaho Power Co. in Hagerman Valley will increase output by 16,500 kilowatts—Flow of Snake River reduced to almost nothing by irrigation diversion, but power potential restored by flow from springs — Design of project unique in combining spillway with tailrace canal of powerhouse

By HENRY L. SENGER
Chief Engineer
Idaho Power Company
Boise, Idaho

INTERESTING DESIGN and construction features are embodied in the second 16,500-kw. hydroelectric development under construction by Idaho Power Company at Upper Salmon Falls on Snake River, located about 3 mi. south of Hagerman in south central Idaho. The Upper Salmon Falls are located in a steep gradient section of the river. The average drop for a 35-mi. section upstream is 18 ft. per mi. and for a like distance downstream, 11 ft. per mi. The site as originally planned included two developments in tandem within the 1½-mi. stretch of river comprising the Upper Salmon Falls. The regulating dam originally constructed is located across the river at the head of the falls and the initial plant, completed in 1937, at the foot of the falls.

These plants are run-of-river firm power plants with no possibility for storage. Due largely to river regulation of ample water supply combined with an unanticipated recovery of head in the tailrace, there has resulted an excess of head for the original plant, a very unusual accomplishment. The 2,300-ft. long extension of the tailrace for the new plant will recapture 2 ft. of the excess head for the new development.

The river will be directed to the new canal intake and thus diverted to a canal ¾ mi. long which is enlarged at its lower end into an open penstock section connecting with the power house. From the power house a tailrace trench 2,300 ft. long, excavated in the stream bed will carry the water to the headrace canal for the lower plant. This is the seventh hydroelectric development of the Idaho Power Co. on Snake River.

INTAKE CANAL for the new powerhouse unit looking downstream, at conclusion of excavation and just before pouring of concrete lining. Rock is a hard basaltic lava.

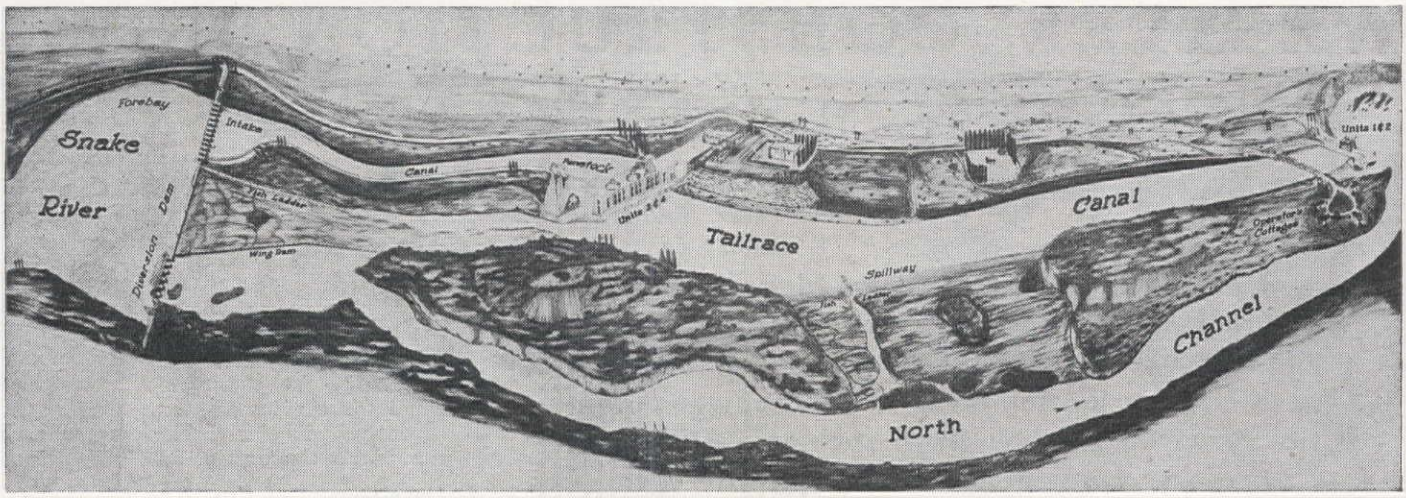


Development of site

During the 20-year period, 1907-1927, the State of Idaho enjoyed a period of great agricultural expansion and during this period many storage reservoirs were built, several of which on the Snake, Boise and Payette rivers and the Wood River are of large capacity. The largest of these, the American Falls reservoir, on Snake River, has a capacity of 1,700,000 ac. ft. of water.

This expansion in agriculture with its allied industries and a growing population placed an ever-increasing responsibility upon the several companies then serving the isolated sections of the territory with electricity and later upon the Idaho Power Co., which was organized through consolidation in 1916 of these predecessor companies.

During the period 1927-1946, the continuing rapid expansion of agriculture necessitated the building of additional irrigation reservoirs to provide supplemental water for existing projects and the additional water needed for irriga-



tion of new lands—Anderson Ranch reservoir on Boise River, 500,000 ac. ft., and Cascade reservoir on Payette River, 700,000 ac. ft., both under construction, together with the Palisades reservoir on upper Snake River, 1,300,000 ac. ft., now in the pre-construction stage.

Reduction in flow

The Snake River is becoming a highly regulated stream. As a result the characteristics of power sites below American Falls and below Milner Dam are gradually undergoing a change. Sites formerly suitable for the development of firm power are passing through a transitional phase approaching seasonal power, as the power water supply becomes more dependent upon the times and amounts of release required for irrigation use. For example, the development originally contemplated at American Falls east side plant anticipated the production of firm power, but due to reservoir control the output at American Falls is now largely dependent upon the use of water as released for irrigation purposes and consequently the output varies seasonally from near zero to its maximum capacity of 27,000 kw. quite in conformity with these irrigation releases.

Milner Dam on Snake River is located about 50 mi. below the American Falls reservoir. The combined developed storage above Milner Dam is about 3,000,000 ac. ft. At Milner Dam final diversion of nearly all storage water in Snake River is made into the Twin Falls, Gooding and North Side irrigation canals, having a combined capacity of about 8,000 sec. ft. and regulation has been such as to practically eliminate any flow below this point. As a result, the river immediately below Milner Dam for the summer months of the year is virtually dry, the measured flow being as low as 6 sec. ft. With the completion of the Palisades reservoir and increasing regulation for irrigation use the minimum release of water below Milner may be extended in the future over a greater part of the time.

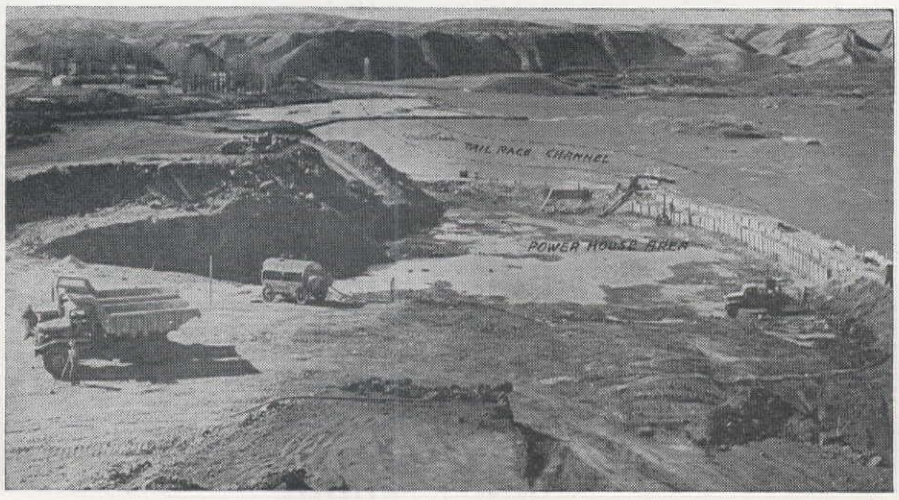
SYSTEMATIC PLAN of development, Upper Salmon River project of Idaho Power Co. Units 3 and 4 are being built.

Immediately below Milner Dam the Snake River plunges into a canyon and emerges again onto the valley lands some 200 mi. downstream. At a point about 60 mi. below Milner Dam the river drops steeply in a series of cascades a mile and a half long to form the so-called Upper Salmon Falls. The measured drop is 85 ft.

One of the remarkable features of Snake River canyon is the abundance of large volume springs which pour out from its northern rock wall, especially in the portion of its course 40 mi. above and 10 mi. below Upper Salmon Falls. The aggregate volume of these springs, combined with irrigation return flow, amounts to about 7,000 sec. ft. of water. Perhaps the largest and finest known cataracts formed by springs occur in the vicinity of Thousand Springs about 5 mi. above Upper Salmon. The Malad Alcove about 10 mi. below Upper Salmon Falls produces more than 1,100 sec. ft. of spring water.

The original plant, Units 1 and 2, at Upper Salmon, with capacity of 18,000 kw., was completed in 1937. This included the building of a low hydraulic concrete regulating dam, 1,617 ft. long, at the head of the falls and immediately above Dolman Island, which serves to divert water to the south channel and thence to the power house. This dam includes, (1) a flood control section with six 15 x 30-ft. taintor gates; (2) a central flashboard section; (3) an intake section for the south channel; and (4) a low concrete spur dam with flashboards extending from the south end of the taintor gate section to the head of Dolman Island. This separates the north and south channels and diverts flood waters to the north channel away from the power canal. The flashboards are supported by 3-in. pipes set in the concrete base. At the lower end of Dolman

POWERHOUSE SITE unwatered behind cofferdam. Existing plants are located to left of water tank. The tailrace channel was made by extending a riverbed crevice with a trench 15½ ft. wide and 2,300 ft. long, as shown by dotted lines on photo.



Island a low concrete gravity dam, 1,445 ft. long, across the south channel diverts the water into a canal with a capacity of 6,500 sec. ft. to the existing power plant.

New development

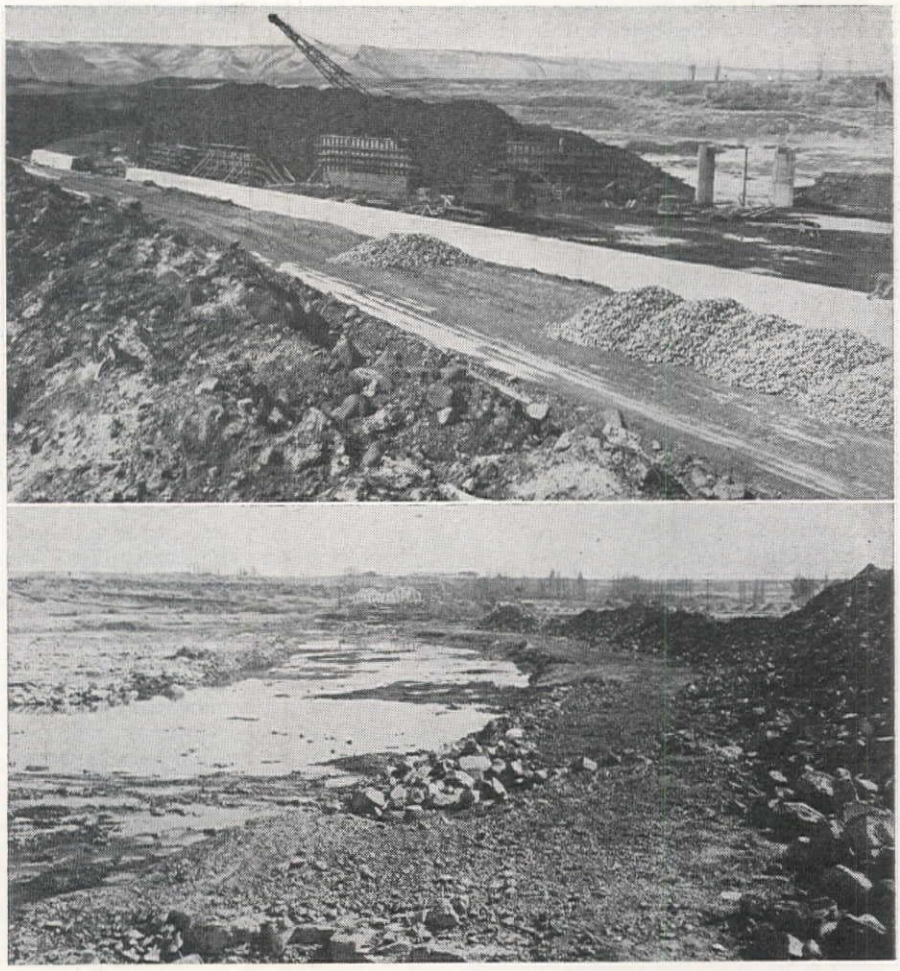
Plans made for the 1937 development included the interposition of a new plant between the regulating dam and the power house. The water is first to be used in the new plant and passed on from its tailrace directly to the headrace channel of the existing plant. The effective head of the existing plant is 44 ft. Of the remaining head, 35½ ft. will be used in the new plant. The new development includes a forebay, canal intake, canal, open penstock section, power house, and a long tailrace connecting with the headwater channel to the lower plant. Cofferdams with an aggregate length of 4,500 ft., in water varying in depth from 4 to 15 ft., are required to unwater the site during construction. Water in an amount of 6,500 sec. ft. must be passed continuously for operation of the existing plant. A temporary channel extension of the canal will permit the removal of the stream flow in the south channel during the period of concrete placement in draft tube pits and tailrace excavation contiguous to the power house. The development entails the excavation of 250,000 cu. yd. of rock and 100,000 cu. yd. of earth, and placement of 50,000 cu. yd. of concrete.

Forebay

Above the regulating dam a submerged V-shaped flat layer of rock with its base against the mid-section of the dam and its point 1,200 ft. upstream apportions the water flow largely to the north or flood channel of the river. Water entering the south channel must flow over this submerged weir from north to south and then turn abruptly into the canal intake. To augment the flow in the south channel a trench 3½ ft. deep, 100 ft. wide and 1,200 ft. long is excavated in the rock stream bed to induce a flow of 2,500 sec. ft. around the submerged weir and improve the distribution of water through the canal intake. River trash will be permitted to pass to the power house and from there be removed with a mechanical power rake.

Canal intake

The canal intake section of the regulating dam is 456 ft. long and comprises 10 open bays 39 ft. wide through which water may pass at a depth of 10 to 12 ft. The water is contained in the intake with concrete gravity walls varying in height from 18 to 22 ft. In the north or river side section of the wall, one 20 x 18-gate opening is provided to facilitate the unwatering of the canal when an inspection of canal and penstock is to be made. An inspection of the canal is anticipated only at infrequent intervals and provisions for unwatering consist of hand placing of stop logs in the openings for the canal intake and by-passing the resulting leakage water through the gate opening to the river.



CANAL CONSTRUCTION on the Hagerman Valley job. Top, intake to the diversion canal during construction, showing buttresses for the gate opening in the north wall. This opening is for draining the canal and forebay when lining and penstocks are to be inspected. Bottom, a natural submerged rock weir upstream from canal forebay made necessary excavation of a trench in streambed 100 ft. wide and 3½ ft. deep.

Water entering the intake is directed to a funnel-shaped enlargement of the canal, 300 ft. wide at its entrance, and converging in a distance of 500 ft. to a bottom width of 63 ft., joining with the canal. The depth of channel entry is increased as it approaches the canal.

Canal

The canal is excavated in lava rock. It will be lined with concrete, minimum thickness, 6 in. Its finished dimension is 63 ft. wide at bottom, with ¼ to 1 side slopes and 72 ft. wide at the water line. The depth of water is 18 ft., gradient 1/10 of a foot in 1,000 ft., velocity 5.41 ft. per sec. The canal proper is 2,000 ft. long with a capacity of 6,500 sec. ft. The concrete canal wall on the river side is designed as a spillway for practically its entire length. The purpose of this is to dissipate the wave caused by the hydraulic bore when the plant is suddenly shut down.

Power house forebay

The power house forebay is an enlargement from canal dimension through a distance of 600 ft. to an inside width of 110 ft. at its junction with the power house. The bottom is sloped downward near the power house where the trash racks are installed. The water depth at this point is 34.6 ft. In the river side wall at a location approximately 130 ft. above the power house, two vertical steel reject gates, each 18 x 20 ft. in dimension are placed having free discharge to the river. The two gates have a capacity of 6,500 sec. ft. and are raised in 4 min.

The gates are so connected as to raise automatically when a sudden change in water elevation occurs in the penstock. Such rise occurs when the plant is suddenly shut down for extraneous reasons and the resulting hydraulic bore moves up the canal. The reject gates are designed for quick opening so as to re-establish the uniformity of water flow quickly to the lower plant. Protection against freezing of the reject gates consists of circulating the warmer spring water through openings near the contact between gate seals and guides. The flow is divided into two directions to provide the maximum of heat at all locations around the gates. A 4 x 6-ft. sluice gate is mounted in a trench across the bottom of the penstock below the reject gates to entrain all remaining water when the canal and penstock are readied for inspection.

After completion of the concrete walls in the canal intake and power house penstock, grouting of the foundation

rock will be extended where needed. The rock is stratified hard basalt. Holes 20 ft. deep at 10 ft. intervals will be sunk to facilitate the grouting operations.

Tailrace

At the base of the upper falls and about 1,000 ft. below the diversion dam a crevice which extends below the location of the new power house, is cut into the rock river bed. At the power house it is about 100 ft. wide and 40 ft. deep. The tailrace for the power plant is cut into this crevice which is then extended downstream 2,300 ft. by a channel 100 ft. wide and 15.5 ft. deep cut in bedrock. The tailrace channel is enlarged at its lower end to conform with the level of river bed rock at that place. Water level at the end of the tailrace channel coincides with the headwater level at the upper end of the dug canal leading to the existing plant.

Extending from the upper end of the crevice a fish ladder will be built up the rapids for a distance of 1,000 ft. to the diversion dam. The structure will be of concrete on rock foundation and have an inside dimension of 4 ft. The ladder will provide 36 pools separated with concrete partitions so that the jump between pools is about 12 in.

Power house features

The reinforced concrete power house structure is located at the end of the open penstock or enlarged end of the canal and built integrally with the lower penstock walls and reject gate spillway. The outdoor type generators are not housed in a building but are located on a deck 30 ft. above tailwater and at the station yard level. The south wall rises 13 ft. above the outdoor generator deck and connects to either end of the penstock terminal walls to form the forebay of the power house. A 4-motor outdoor traveling gantry crane designed for a 75-ton load on the main hook and 20 tons on the auxiliary hook, is arranged for traveling over the generator deck. One cranerail is located on top of the south wall and the other is supported on the downstream edge of the generator deck. Crane girders extend beyond the upper short leg to allow the carriage to be moved upstream a sufficient distance to handle the intake gate. The crane is also equipped with a jib crane and a 15-ton capacity hoist, extending downstream from the lower leg for handling of the draft tube gates.

Details and substructure

The draft tubes, which have a maximum depth of 25 ft. below tailwater, are separated by a 24-ft. central bearing wall in which is located a 10-ft. square pump sump extending 6 ft. below the draft tubes. The draft tubes can be drained into the sump through a 15-in. drain line laid under the concrete floor of the tubes. Weep holes in the draft tube floors relieve excessive uplift pressure. Each opening into the tailrace is 18 ft. 3 in. wide by 15 ft. 3 in. high. The setting of the water wheels relative to the tailwater level is high enough so that inspection of the runner can be made. Two draft tube gates are provided for unwatering and inspection of the draft tubes, and are stored in space below the jib crane along the north power house wall. The intakes opening to the scroll cases through the south wall are 22 ft. high by 20 ft. 6 in. wide. A heavy structural steel intake gate is provided and when not in use is stored in a pit located in the top of the south wall.

The trash racks in front of the scroll case openings are 110 ft. wide by 40 ft. deep and are to be made up in panels.

These panels, which slide in structural steel guides, are made of 2-in. galvanized extra heavy pipe spaced at 6-in. centers and welded to a steel frame. Trash is hauled up the racks by means of a mechanical rake and deposited in a trench in the intake operating floor. Water for carrying away the trash is admitted to the trash trench through a tunnel and sluice gate in the west penstock wall. The trash is deposited in a collecting basin on the east side of the station and burned after drying. Disposal of trash at the new plant will practically eliminate the necessity for trash raking at the lower plant.

Formwork

Concrete forms for the gravity walls in the canal intake and penstock are prefabricated. Forms for both draft tubes and scroll cases are being built on a large platform where templates for all intricate sections are laid out to actual size; this provided a ready means of checking all design dimensions. From these templates, ribs for supporting the form sheathing were built. All forms are to be built and completely assembled on the platform in bolted sections so that they can be easily taken apart and hauled to the erection site and there reassembled. After completion the forms will be treated with linseed oil and then taken apart and stored. Forms are so constructed in advance and in proper sequence before the power house excavation is completed.

Forms will be supported on concrete piers carefully built to line and grade. In the case of the large draft tube forms, after the sections are lowered by derricks and bolted together on the supporting piers, final adjustment can be readily made by use of wedges, jacks and derrick. This plan of form building in advance of erecting massive walls and power house may, it is anticipated, contribute in a large measure to a rapid construction schedule.

Power house arrangement

The design of the power house is nearing completion and includes a 13 x 100-ft. operating room, located on the downstream side and below the generator deck, for housing the switchboard, low tension oil switch, cubicles, governors, oil pressure receivers, control battery, and local service switchboard. At either end of the operating room a tunnel connects with the generator pits, which provide access to the tops of the turbines, governor servo-motors, turbine gate operating equipment, and turbine guide bearings. Below the operating room is the pump room for location of governor oil pumps and sump tank, air compressors and receivers, service water pumps, sump pumps, and air washer. Access to the scroll cases, draft tubes and pump sumps is made from the pump room.

Domestic water supply and cooling water is piped from a spring through 12,000 ft. of 10-in. spiral welded pipe dipped in tar. About 750 gal. per min. of spring water is so provided.

There will be two main generating units, each consisting of a vertical shaft turbine directly connected to a vertical



INTAKE OF CANAL during construction, as seen from diversion dam. Concrete gravity walls are about 20 ft. high. The funnel-shaped intake is 300 ft. wide at opening, and converges to 63-ft. width in 500 ft. Powerhouse forebay is enlargement of canal at its lower end to 110 ft. wide.

water-wheel outdoor generator. The turbines are Baldwin vertical fixed blade propeller type runners, wicket gate turbines each having a rated capacity of 11,500 hp.; speed, 112.5 r.p.m.; net effective head, 35.5 ft. The weight of each turbine and rotor completely assembled on the shaft is about 440,000 lb. The turbines are set in concrete scroll cases. The Woodward governors are of the oil pressure actuator type having a capacity of 90,000 ft. lb. They are designed to operate the gates over the full range in three seconds and are sensitive to a speed variation of ¼ of 1 per cent.

The generators are General Electric totally enclosed vertical water-wheel generators for outdoor service with direct connected 125-volt main and pilot exciters and rated at 9,000 kva., 9,000 kw., 1.0 power factor, 3 phase, 60 cycle, and 6,900 volts. The generators are self-ventilating, the air being recirculated through a completely closed duct system located on opposite sides of the units. Cooling water for the ventilating duct can be supplied from three sources: the forebay, service water pumps, or from the spring water supply. The thrust bearings are water-cooled spring type bearings carrying a load of about 220 tons including that of the hydraulic thrust.

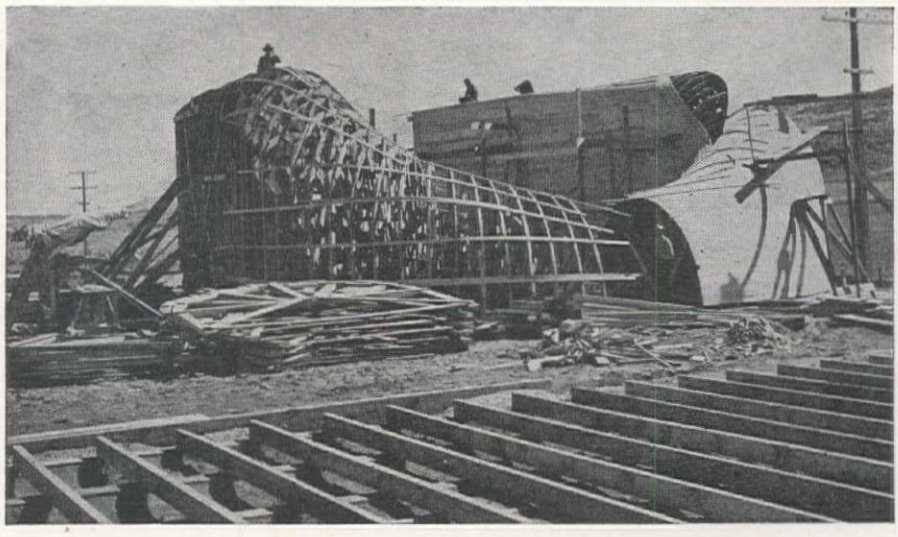
Appurtenant features

The 138-kv. outdoor substation is located in a yard 150 ft. wide by 220 ft. long at the south of the power house. A track leads from each transformer foundation to the gantry crane for moving the transformers under the crane. Galvanized steel structures support the transformers and the 138,000-volt air break switches and the 138,000-volt bus is supported on Lally columns. There are two Allis-Chalmers 9,000 kva. 138,000/6,600-volt outdoor type self-cooled transformers. A 138-kv. transmission line about 120 mi. long will connect the new Upper Salmon Falls development with the existing plant at Upper Salmon, the Lower Salmon plant, and the substations at Boise and Emmett, Ida., forming a loop with the existing transmission system.

The structures of this line are two-pole, H-frame type constructed of 60-ft. poles with standard spacing of 600 ft. Two 2¾ x 9½ in. x 28-ft. crossarms bolted to either side of the poles support the stranded copper cable with strings of 8 suspension insulators.

The construction is being done by contract, including the transmission line. Morrison-Knudsen Company, Inc., Boise, Ida., are the contractors. R. H. Shoemaker, general superintendent, and L. E. Steelman, construction superintendent, represent the contractor. Excavation of the canal was started in Oct., 1945. It is anticipated the first unit may be placed in operation during Nov., 1946.

The staff of the Idaho Power Co. is headed by H. L. Senger, in charge of the power plant development, and C. O. Crane, the transmission line construction.



DRAFT TUBE forms for the powerhouse are fabricated and completely assembled on a platform outside the powerhouse in bolted sections. After assembly and careful checking of dimensions, they are taken apart, hauled to erection site and there reassembled. Form shown here is cut in half by a vertical line through the center.

Construction Materials Gain In Latest Production Report

IMPROVEMENT in production of major construction materials was noted in January, following a general downward trend at the close of 1945, according to the latest report on construction and construction materials, prepared by the Construction Division, Department of Commerce.

Construction costs and prices of construction materials continued to rise in December, with prices of materials reaching their highest level in 25 years, the report states.

Pointing out that December production declines were in general in line with normal seasonal trends, due in part to the Christmas holidays, the report summarized the supply situation for construction materials and components at the beginning of 1946. Data for key materials follow:

Steel: January production was curtailed by the strike and showed only about 60 per cent of capacity as compared with 75 per cent in December and 79 per cent in November. Sheet and strip are the tightest of all steel shapes and are expected to continue in short supply through the first half of 1946.

Lumber: December production declined to the lowest monthly level in ten years. In millwork, unfilled orders far exceed production which is hampered by shortages of manpower and materials. Softwood plywood continues in short supply, chiefly because of log shortages. Hardwood flooring production is retarded by shortages of dry lumber and lack of experienced labor. Unfilled orders in producers' hands equal 6 to 10 months' output at the present rate.

Clay Products: All clay products except hollow facing tile showed production losses in December, in contrast with sharp gains in the two previous months. For most clay products, demand continues heavy. Brick (common and face) demand represents about 3½ months' production at the present rate. Total 1945 shipments of 2.4 billion brick represented an 18 per cent increase over 1944 shipments. Stocks at the close of 1945 were at an all-time low, only 15 per cent of normal. Structural clay tile stocks have declined progressively since 1941 to a low of 12 per cent of normal. Clay sewer pipe production and shipments continued to decline. Stocks at the end of 1945 were 60 per cent lower than at the end of 1944 and 97 per cent lower than at the end of 1943.

Portland Cement: December, 1945, production was about 32 per cent greater than that for December, 1944, and output in 1946 is expected to amount to from 140 to 145 million barrels. December, 1945, production exceeded shipments, resulting in a substantial increase in stocks.

Cast Iron Soil Pipe: January production rose sharply to approximately 26,500 tons from December output of 21,971 tons. Demand represents 12 months' production at the current rate. Output is affected by shortage of pig iron.

Concrete Building Blocks: Unfilled orders amount to more than double the current production rate. Inventories at the end of 1945 were only 50 per cent of normal. If sufficient manpower is available 1946 requirements can be met.

Metal Building Products: Volume of production is contingent upon available steel inventories. No steel windows are in stock. Production is limited to inventories of basic shapes. Nails are in very short supply, with no improvement expected until the second quarter of 1946.

Model Tests of Tacoma Bridge

Wind tunnel tests on models of both old and new designs of Tacoma Narrows suspension span indicate causes of original collapse, and convince engineers of soundness of the proposed new structure — Damping mechanisms, truss girders, slotted floor, added width, and higher towers, among changes from original design

A MILESTONE in bridge building was passed last month with approval of plans for the world's first aerodynamically-tested bridge. The Washington Toll Bridge Authority put its stamp of approval on designs for the new Tacoma Narrows bridge, the result of over four years of structural studies involving original research and laboratory experimentation. It is expected that construction bids will be called for by midsummer and that the new structure to link Tacoma and Bremerton will be thrown open to public travel sometime around January, 1948. It will draw attention and close observation from bridge builders all around the world.

It was a stormy day, November 7, 1940, that the original Narrows bridge collapsed, just four months and six days after it was opened to traffic. A steady 45-m.p.h. gale howled across Puget Sound. The bridge began to rise in waves as it had done before, having already earned the name of "Galloping Gertie," but this time the waves were larger, with vertical displacements of up to five feet. Just before the end the pavement was heaving in nine waves, going up and down 37 times a minute. The final crackup came when the center diagonal stays broke and a twisting motion developed. When the storm subsided approximately 90 per cent of the central span suspended structure had fallen into the water and the side spans had sagged about 70 ft. at their centers. The main cables and towers still remained standing but were so badly damaged by the violent distortions to which they had been subjected as to be rendered useless. No damage was done to the piers.

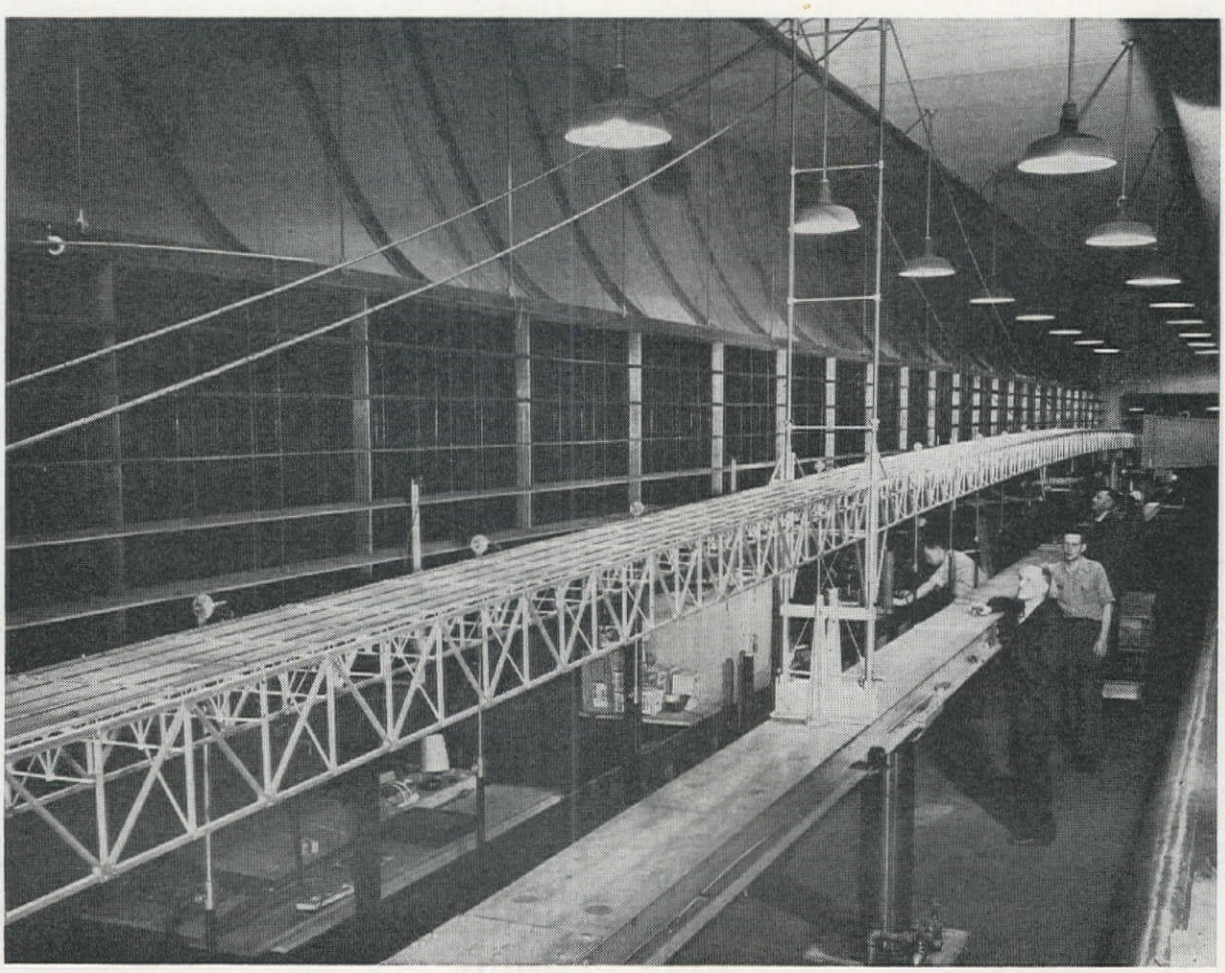
Engineers were surprised and dismayed. Why had the bridge failed? It had been built by a reputable construction firm from traditional suspension bridge designs. Suspension bridges everywhere immediately became objects of apprehension and close scrutiny.

ONE HUNDRED FOOT scale model of new Tacoma Narrows bridge has withstood wind tunnel gales equivalent to 118 mph. Prof. F. B. Farquharson, director of experiments shown examining model bridge. Note the slotted deck and truss girders.

Why did it fail?

From the very beginning, the Tacoma Narrows bridge had not acted right in the wind. Soon after the stiffening girders and floor steel were erected, vertical vibrations of considerable amplitude were observed in the structure at very low wind velocities. Several remedial devices were proposed. After the roadway was completed the amplitudes became larger running as great as 40 or 50 in. under certain wind conditions. Worried engineers immediately began model studies at the University of Washington. Material for a corrective scheme was ordered but the bridge collapsed before delivery was even made.

The insurance report read: "The failure of the structure was due to a combination of causes. Of these, particularly important, were the flexibility of the stiffening girders and the small tor-



sional resistance of the bridge. Resonant vibrations were set up by the wind." The Washington Toll Bridge Authority, however, had to know a lot more than this before it undertook to build a new structure to replace the old one. An engineering consulting board was set up consisting of Charles E. Andrew, of Tacoma, chairman; John I. Parcel, St. Louis, Mo.; Glenn B. Woodruff, San Francisco, Calif.; and Theodore von Karman, Pasadena, Calif., aerodynamicist. A specially built wind tunnel was constructed in the Engineering Experiment Station at the University of Washington to make aerodynamic studies of designs developed by the designing engineers. This work was carried on under the supervision of Prof. F. B. Farquharson, director of the station.

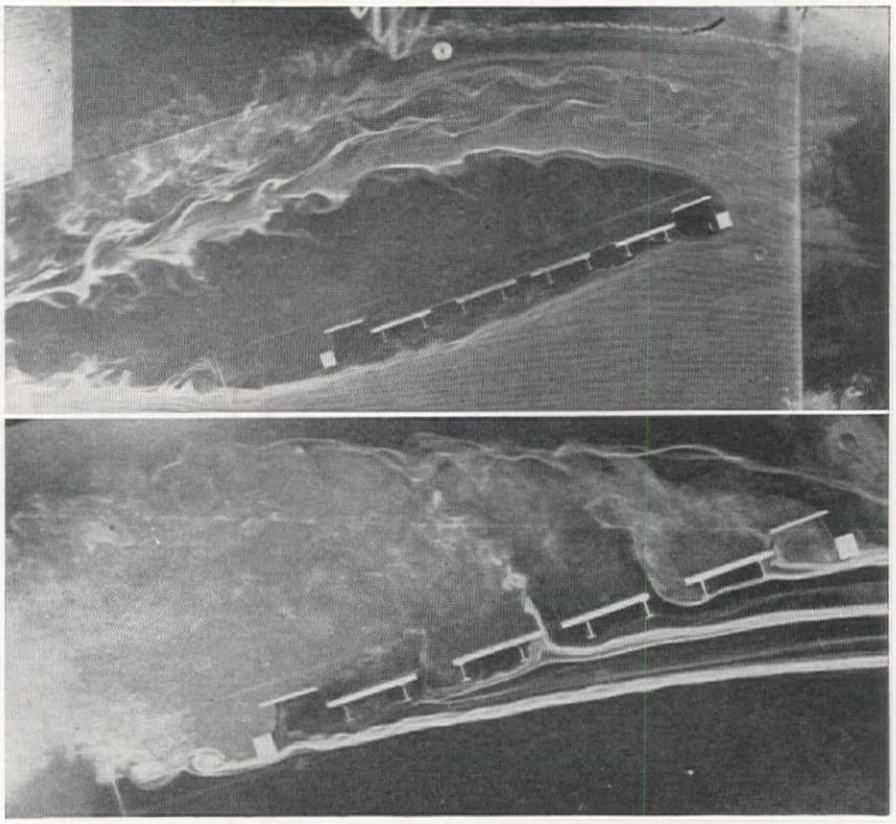
For four years, research of a completely unique nature in bridge building was carried on. The experimenters had no precedent for their studies. They were pioneering in a new field. Because the results would be important to bridge builders all over the nation, the federal Public Roads Administration participated in up to 60 per cent of the wind tunnel and model costs, which will total almost $100,000.

Last month the voluminous report was completed and laid before the governor. It included the results of extensive studies as to the reasons for failure of the old bridge, and a design for the new bridge which the engineers say will stand firmly in gales of up to 118 m.p.h., the limit of the wind tunnel.

Model research

To carry out the studies of various designs, a wind tunnel was built with a throat 4 ft. high and 100 ft. long. Ten big propellers created a scaled wind velocity equivalent to 118 m.p.h. in the prototype and with a variable vertical angle of attack up to 15 deg. The bridge models themselves were constructed to scale structurally, mechanically and aerodynamically. They were approximately 100 ft. long, one-fiftieth the size of their prototypes. Altogether two full models were built, an exact model of the original bridge, which was almost blown down again in a test, a preliminary design model of the proposed bridge, and several sectional models to test deck types. These are the first and only three-dimensional models of a bridge that have even been made in true scale. The engineers were apprehensive at first as to whether they could safely make accurate deductions as to bridge reactions by the use of scale models. For this reason a complete model of the original bridge was built first. Careful records of the old bridge's oscillations had been kept along with wind measurements right up until the day of its collapse. When the scale model reacted in the same manner engineers knew they could safely pursue their testing of new design types, with assurance that the prototypes would react in substantially the same manner.

The engineers have come to the conclusion that the collapse of the original bridge afforded emphatic proof that **"henceforth designers of suspension bridges must consider not only static forces, including wind, but also the possibility of vibrations of objectionable amplitudes resulting from aerodynamic forces."**



ACTION OF AIR attacking the bridge structure is studied by blowing smoke over bridge sections. A stream of air is shown directed at an angle upward against a typical floor section; at top, solid floor receives positive action upward and negative pressure above; below, wind passes easily and neutrally through slot openings in the deck. Picture below is an eddy behind the solid girders of the original bridge.

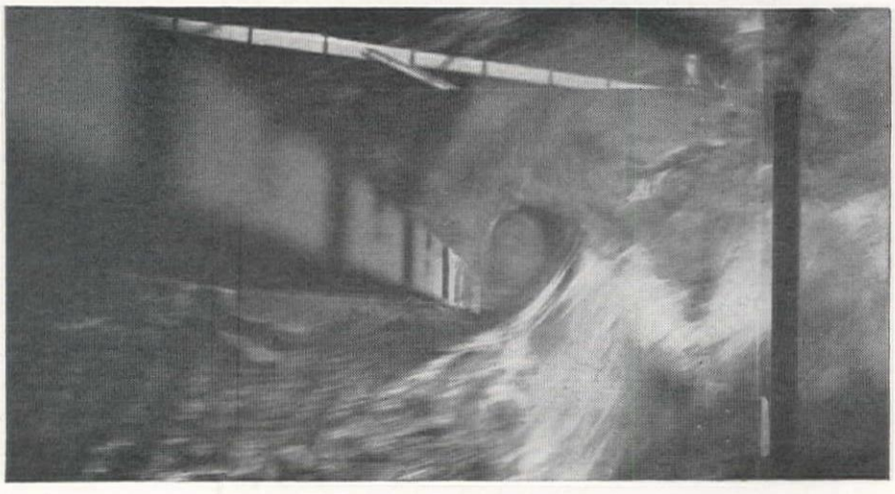
All suspension bridges, according to the engineers, are subject to varying degrees of motion when subjected to wind. The problem was to limit these motions to negligible amounts under any velocity or angle of wind which might occur at the bridge site.

Damping the vibrations

In making their studies the engineers carefully recorded the various types of oscillations and vibrations which might lead a bridge to disaster. These findings will be of considerable importance to future bridge builders.

One of the most important features of any bridge is its "damping" ability or ability to absorb shock. Damping forces are those forces arising from internal or external friction which tend to bring a vibrating body to rest. Previously they had been studied very little by bridge engineers and then only in connection with the matter of impact in railway bridges. This ability to dissipate energy within the structure may result from any of the following causes:

1. Internal friction within the steel (hysterisis) when subjected to alternating stresses.
2. Similar effects in the concrete slab



provided the concrete is stressed during the vibrations.

3. Friction at the bearings and other points of sliding and, possibly, by slippage between cable wires.

4. Viscous damping applied externally to the structure by energy absorbing devices, etc.

5. Air damping, i.e., resistance by friction during motion of the vibrating body through the air. The forces acting from the air in wind-off condition always represents damping additional to the structural damping. Under wind, energy may be transferred from the air to the structure or from the structure to the air. In the first case one has negative and in the second case positive air damping which is to be deducted from or added to the structural damping.

The greatest source of damping ordinary trussed bridges, according to the engineers, is friction in the bearings. As the span increases, this effect decreases.

Not all vibrations are damped, however. In a uniform wind stream undamped vibration is only possible if a certain amount of energy is transferred from the wind to the structure which more than balances the energy dissipation by structural damping. Consequently, in all cases in which, in a uniform wind stream, oscillations with constant or increased amplitudes are observed, the existence of negative air damping has to be inferred. Such oscillations are termed "self-excited."

Catastrophic motion

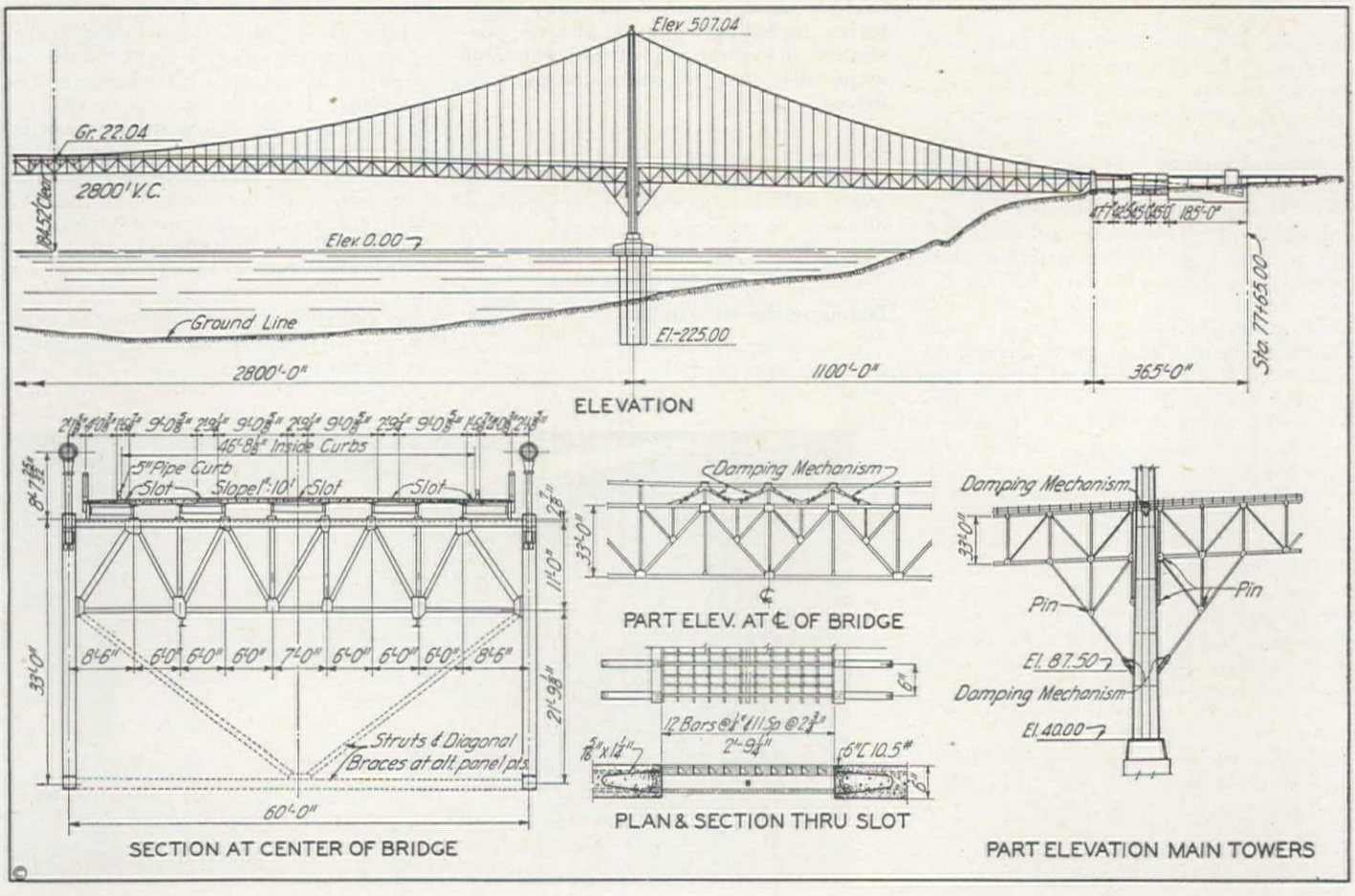
From tests on the models engineers are convinced that the Tacoma bridge was destroyed by what they call "catastrophic torsional oscillations." This is a twisting form of self-excited motion which starts at a certain "critical velocity" of the wind. If this velocity is increased beyond the critical value the amplitude increases rapidly. The oscillations become more and more violent without a sign of reaching maximum peak. No sign was found that the oscillations would moderate or disappear at some higher velocity. It is called "catastrophic" since it is bound to lead to the destruction of the structure.

For a structure of this same shape, the critical velocity is proportional to the width of the structure and the frequency of vibration. Increased damping might delay the development of such self-excited oscillations and raise somewhat the critical velocity, but would not serve to keep the bridge from ultimate collapse.

In all cases of self-excited oscillations the forces which maintain the motion are created by the motion of the structure itself. In the case of catastrophic torsional oscillations this is shown by the fact that a shedding of vortices can be observed with a frequency equal to the frequency of oscillation of the bridge, whereas in the case of a stationary structure exposed to the wind, the frequency increases proportionately to the wind velocity. It was found experimentally that a decrease in the ratio between the girder height and the width of the roadbed increased the critical velocity very essentially.

Another type of oscillation is what engineers call the "catastrophic coupled oscillations." This is similar to the flutter of a flat plate or a streamlined airfoil, although the forces producing the self-excited motion may have different laws due to the different shape of the structure. Bending and twisting occur simultaneously with a common frequency. If the two oscillations are in the same phase, the structure appears to swing around a point off the plane of symmetry, mostly removed upstream from center. However, in general, the two motions have different phases so that the center of vibration appears to be floating.

This type of oscillation was observed on the model of the first new preliminary design tested in the wind tunnel. It had a truss-girder type cross-section with a solid deck. Observations on this model revealed that the critical velocity increases essentially if the ratio between the torsional frequency and the bend frequency is increased. Whereas in the case of catastrophic torsional oscillations the critical velocity is proportional to the torsional frequency, in the case of coupled oscillations it increases faster than the torsional frequency. Therefore, if such coupled oscillations can be expected, it is advisable to increase the torsional frequency of the structure relative to the bending frequency.



ENGINEER'S DRAWINGS of Tacoma Narrows suspension bridge span as now designed for early construction, and various sectional elements, showing damping mechanism and slots.

Restricted oscillations

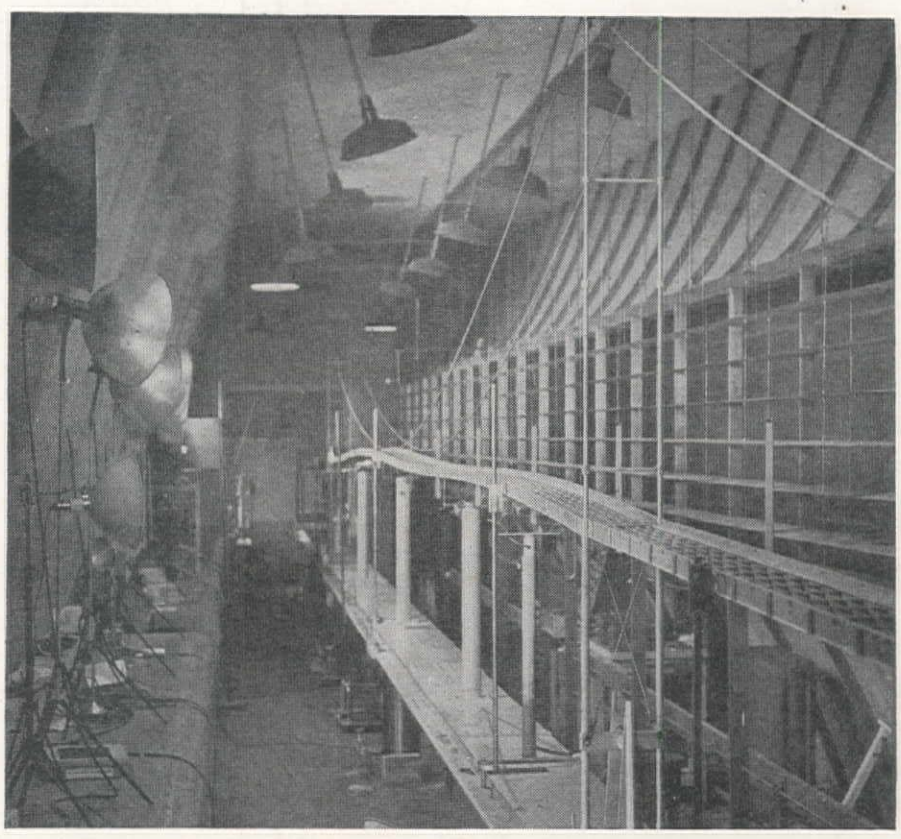
There is still another type of oscillation which is called "restricted." These oscillations develop at certain wind velocities and disappear at a higher velocity. These were observed on the Tacoma bridge before its collapse and have also been observed on many other bridges of this type. They have small amplitudes and are not dangerous to the structure but have an annoying and possibly detrimental effect on traffic. Motorists get a "seasick" feeling. These oscillations depend definitely on shape characteristics of the structure. The forces exciting the oscillations are also in this case produced and maintained by the presence and the motion of the structure. In the case of the plate girder type of section it was found that at the wind velocities at which such restricted oscillations appear, the vortex frequency produced by the structure at rest is a certain multiple of the frequency of oscillation of the bridge. This indicates a sort of resonance between the aerodynamic forces produced by the eddies and the bridge.

Restricted instability usually occurs at such low velocities that an increase of the frequencies of oscillation of the bridge by increased stiffness cannot always remedy the situation. This fact was one of the main reasons for substituting an open girder type of cross section for one with full plate girder. Increasing the damping by artificial means like shock absorbers is a very efficient method to suppress restricted instability. Complete elimination of any restricted instability may be almost impossible for a structure having so many modes of oscillation as a suspension bridge. In fact such oscillations with small amplitudes are found in many mechanical devices including automobiles, railway cars and airplanes. The main point is to make sure that the amplitudes will not reach noticeable and annoying magnitudes.

Both stiffness and weight were found to be important considerations in the design of a suspension bridge. With increased stiffness the time required to build up to the "steady state" is increased. To the extent that increased stiffness is obtained by increasing the moment of inertia of the stiffening truss, the stresses in the steel during vibrations are increased and greater damping occurs. The effect of weight is quite similar. Since the energy in the vibrating structure varies directly with the weight, the time to reach the steady state is increased. Moreover, it is probable that the increased weight will be so placed that it will participate in the stresses resulting from vibration and thereby contribute somewhat to the damping. However, the engineers concur that weight not essential to the structure is very expensive and should be kept as low as possible.

New bridge design

Armed with their wind tunnel findings the engineers undertook to prepare designs for a new bridge. Insofar as possible, use will be made of the remaining installations of the old bridge. The existing piers, anchorages and west approach, with some alterations, will be used. In the former bridge the weight of the superstructure constituted only slightly more than 11 per cent of the maximum load on the foundation. The new superstructure, together with the weight of concrete added to the pier tops, constitutes a total increase in foundation load of approximately 6 per cent. The most severe loading considered possible results in a unit pressure of approximately 13 tons per sq. ft. on the piers. This is less than one ton per square foot more than in the former bridge and is considered quite safe.



MODEL OF ORIGINAL Tacoma Narrows span in the wind tunnel, showing distortion exactly similar to that in the prototype just prior to its destruction in 1940. Technicians at the wind tunnel precisely reproduced and studied destructive conditions.

In the former bridge the towers were built with battered legs 50 ft. apart at the bottom and 39 ft. apart at the top. The new towers will have vertical legs, 60 ft. apart. Thus it is only necessary to remove the existing concrete pedestals at the pier tops and reconstruct them 60 ft. apart for the wider tower. Fortunately the 60 ft. width actually gives a better distribution of load on the pier than before and it is unnecessary to disturb the main body of the piers. The new pedestals will be built 40 ft. above the water level instead of 23 ft. as in the old bridge, in order to raise the bases of the steel towers above salt water spray during storms.

The old anchorages will be used but their weight increased. The horizontal pull from the cables in the former bridge on the anchorages was approximately 29,200,000 lb. for the maximum condition. In the new design this pull is increased to 36,600,000 lb., an increase of 25.4 per cent, thus heavier anchorages are necessary and 5,000 cu. yd. of concrete will be added to each end. They will also be widened to take care of the increased distance between cables.

The west approach suffered only minor damages. An investigation of the design of this portion of the bridge revealed that with the substitution of lightweight concrete for the standard concrete in the original structure, this approach, with some modifications, would safely carry a four-lane roadway.

Design changes

Many other differences are immediately apparent in the new designs. In the first place the new bridge will be bigger and heavier than its predecessor although the length 5,979 ft., will be the same. Instead of a two-lane, this will be a four-lane structure. This will provide greater mass and inertia, but most of all it was considered virtually a necessity in view of the tremendous growth that has occurred in the Tacoma-Bremerton area during the war.

The distance between cables is increased from 39 to 60 ft. and the roadway width from 26 ft. to 46 ft. 8½ in. The new towers will also soar upwards to 502 ft. instead of 425 ft. in the old bridge, to allow for the increased cable sag caused by the greater weight. The new cables will be 20⅛ in. in diameter instead of 17¼ in. in the former crossing. During the failure of the original bridge, the towers were subjected to stresses far in excess of those contemplated in the original design. While they

were damaged to an extent that rendered them unfit for further use, the fact that they did not collapse was considered by the engineers as testimony enough of the reserve strength in this cellular type of construction. Consequently the same general type will be used in the redesign.

The next most obvious difference is the openness in the type of construction. Instead of the old 8-ft. solid girder supporting the main deck, which girders get considerable blame for the collapse, the new bridge will have a 33-ft. open-type truss. The trussed girder will present less of an obstruction to the air and will also break up air currents. Open trussed floor beams are used. Stiffness is increased by use of a double-lateral bracing system. The distance center to center of trusses is 60 ft. or 1/47th of the center span, the same ratio used for the Golden Gate Bridge. The depth of the trusses, 33 ft., is 1/85th of the center span as compared with 1/168th for the Golden Gate bridge.

Slotted roadway

Motorists will immediately notice the slotted roadway design. The first preliminary design of the new bridge was built with a solid roadway. Tests on this model demonstrated that it was stable in a horizontal windstream for all velocities within the capacity of the wind tunnel up to the equivalent of 118 m.p.h. on the prototype. However, with the windstream inclined upward at an angle of two degrees or more, catastrophic torsional vibrations developed at a critical velocity of 78 m.p.h. While this was considerably above the point at which the original bridge failed, it was still considered unsatisfactory. Violent storms do occur at the site in which the wind blows in a cross direction toward the high bluffs along the westerly shore. In passing these bluffs, the windstream may well be deflected upward as much as six to eight degrees.

As a result of these tests engineers immediately went to work on sectional models to eliminate this weakness. Catastrophic instability of this type can be avoided in two ways, by increasing the torsional stiffness of the structure or by appropriate choice cross section. A total of 76 sections were investigated in order to arrive at the new design.

The cross-section adopted unites both possible cures. First, the double lateral system increases the torsional stiffness of the suspended body. Secondly, the aerodynamic action of the longitudinal slots in the roadway tends to eliminate the forces causing catastrophic oscillations. These slots are continuous longitudinal strips of open steel grating 2 ft. 9½ in. wide running between each of the four road lanes.

Not so apparent to the eye, but quite important, is a shock absorber system for the bridge. This is the result of research into "damping" qualities of the bridge design. Those external energy absorbing devices will be located at the centerline of the bridge where the cables come down to the roadway and at each tower. They are hydraulic cylinders similar to huge jacks, or the recoil system of a battleship's guns. These absorbers will permit slow motion, such as that caused from expansion of live load deflection of the bridge, but rapid motions such as oscillations, are resisted.

Rope stay investigation

When wind tunnel research was undertaken on the bridge, engineers had an opportunity to test various proposals that had already been made for increasing the stability of the existing bridge. When bridges similar to the Narrows span developed objectionable vibrations, efforts were made to add to their stability by using various arrangements of wire rope stays. In the Tacoma bridge diagonal ties were added at the center of the bridge. Hold-down ties had been installed in the east side span and were being installed in the west side span at the time of the failure.

According to the engineers many proposals have since been put forward, some of them going to the extent of completely eliminating stiffening trusses and depending upon stays for all the stiffening required. All types of stays were studied and the engineers arrived at the following conclusion:

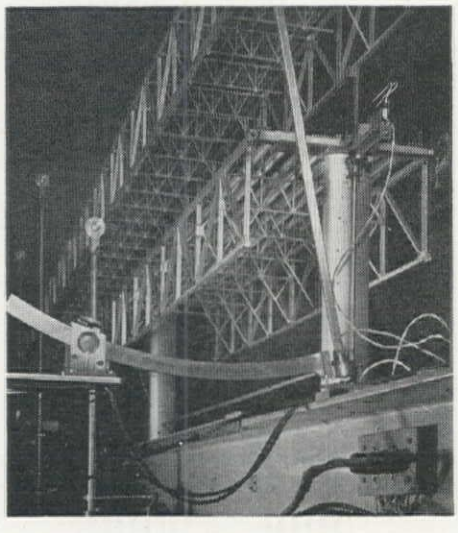
"To be effective these stays must be installed with high initial tension. Under certain conditions of live load and temperature high stresses develop. The result is that stay ropes stretch, requiring constant maintenance to keep them tight. In the original Tacoma bridge, the stresses in the center ties probably reached the point of failure. No arrangement was found that did not appear hazardous. Therefore no rigid stays are included in the recommended design. They are employed with energy-absorbing devices but are arranged so that no excessive stresses can be developed thereby."

Financing

The original Tacoma Narrows bridge was constructed at a total cost of $6,618,138.53. The estimated cost of construction, including engineering and contingencies, for the new bridge is $7,560,000. For estimating the total amount of the bond issue, interest during construction and incidental financing expense must be added, bringing the estimated amount of the bond issue to $8,500,000. The value of the two main piers, which will be used, is estimated at approximately $2,500,000.

The cost of operation of the bridge, maintenance and insurance is estimated at between $55,000 and $60,000 a year, depending upon the insurance rate. Estimates of traffic indicate revenues at present ferry toll rates considerably in excess of the debt service. It is anticipated, therefore, that it will be possible to effect a reduction in toll schedules to about one-half of present rates (about 70¢ per vehicle).

CALIBRATED MECHANISM for determining minute deflections of bridge model during wind tunnel tests. In foreground is sectional model, also used in various tests.



Yellowstone Offices Located at Miles City

TO EXPEDITE preconstruction work in connection with the third unit of the Buffalo Rapids project, Bureau of Reclamation headquarters are being established in Miles City, Mont.

Office space has been secured in the Arnold Block in Miles City for workers engaged in bringing this unit of the authorized Yellowstone River Pumping units to the stage where construction can be initiated.

Two survey parties of four men each, several engineers for office studies, and a small clerical force will comprise the initial group. Work will be carried on under the direction of Carl Myers, in charge of preconstruction work in connection with Yellowstone River Basin Units.

The third unit of the Buffalo Rapids project consists of three units—Sadie Flat, Haley and Marsh. Work will first be centered on the Sadie Flat Unit where field parties will stake out canals and laterals, building sites for pumping plants and pipe lines. Structures such as bridges, canal turn-outs, substations and transmission lines will be located.

The Sadie Flat Unit, north of the Yellowstone River approximately 10 mi. west of Miles City, contains 7,100 ac. Two pumping plants will be required. Two pumping plants will also be required for the irrigation of lands in the Haley Unit, north of the Yellowstone River three miles east of Terry. Three pumping plants will be needed for the irrigation of the 3,240 ac. in the Marsh Unit on the south side of the Yellowstone River, approximately 10 mi. downstream from Fallon.

The Yellowstone River Pumping Units, of which the Third Division of the Buffalo Rapids is one unit, are a part of the initial phase of the Missouri Basin project, authorized in the Flood Control Act of 1944. These units, 25 in number, are located along the Yellowstone River extending from east of Livingston to just over the Montana-North Dakota line. Three of the units are located between Livingston and Billings; the remaining 22 east of Billings. The 25 units will bring under irrigation a total of 95,300 ac. of new land.

Davis Dam Construction Inaugurated

TONS OF EARTH and rock were blasted from a hill by 24,000 lb. of dynamite Apr. 19 as construction of Davis Dam was officially begun by the Utah Construction Co. of San Francisco, contractor.

The explosion was part of an informal ceremony attended by press and radio representatives, engineers and contractors' men, which marked the opening of the Bureau of Reclamation's $47,000,000 project in Pyramid Canyon on the Colorado River some 67 mi. downstream from Boulder Dam. The first blast was on a hill which is being cut down to form the diversion channel. When completed, the channel will carry the flow of the river around the dam site on the Arizona side of the river while the dam is under construction. When the dam is finished, the channel will be a permanent feature of the power plant, forebay and spillway and for non-power water releases.

The ceremony began with a press and radio conference in Kingman, Ariz., was followed by a noon luncheon at the dam site given by the Utah Construction Co., and was concluded with speeches and the explosion.

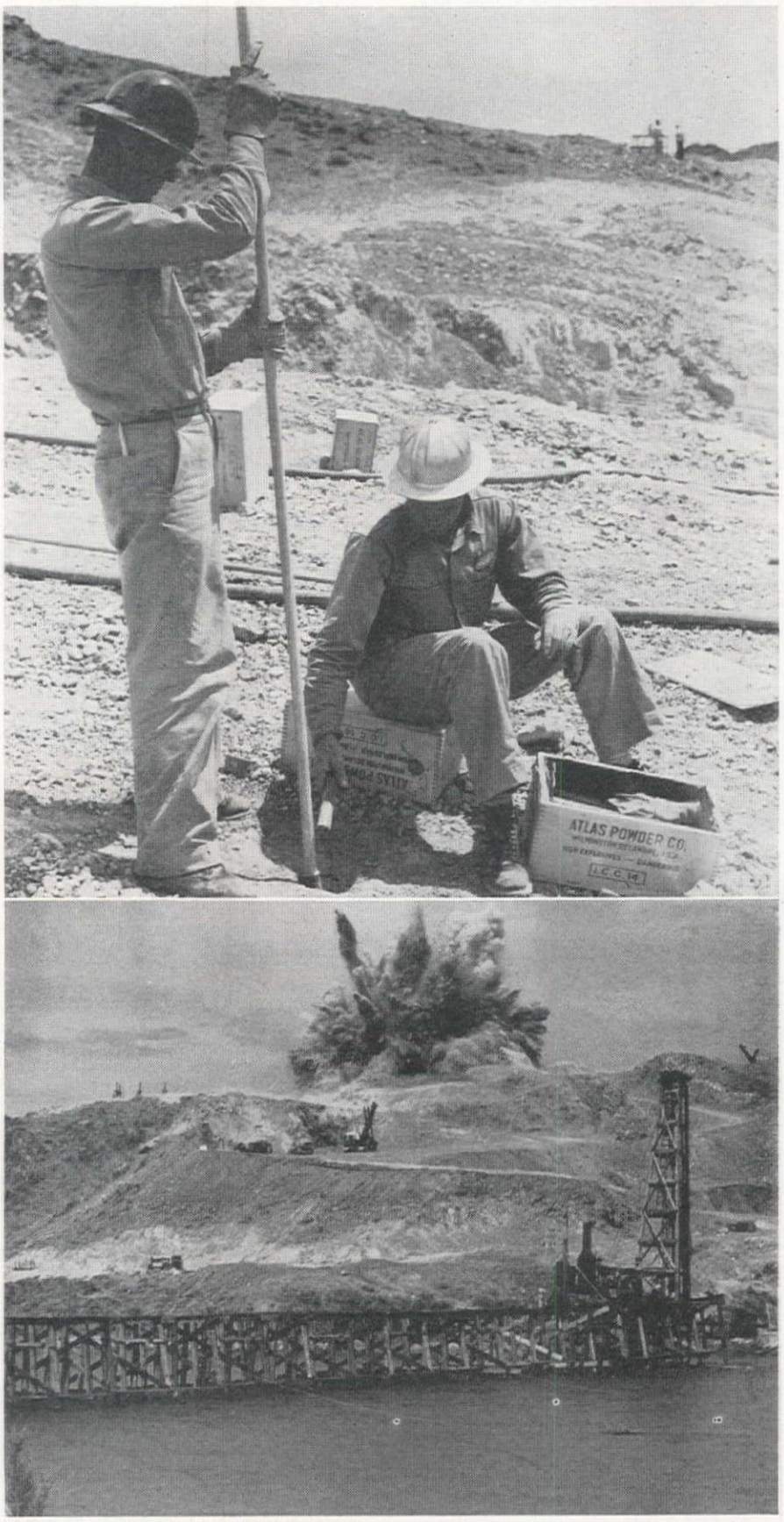
Davis Dam will be an earth and rockfill structure 138 ft. above the river bed, impounding some 1,940,000 ac. ft. of water. The power plant will have a generating capacity of 225,000 kw. and will add from three-quarters to a billion kw.-hr. of electrical energy annually to that now being generated by Boulder and Parker dams.

Primary purposes of the project are to re-regulate water releases from Boulder Dam according to downstream irrigation requirements, to generate hydroelectric energy, and to help meet provisions of the U. S.-Mexican treaty which divides waters of the Colorado, Tijuana and Rio Grande rivers between the two countries.

From Washington, D. C., Commissioner of Reclamation Michael W. Straus wired, "This day is the culmination of 24 years of planning—24 years that have brought forth Imperial, Boulder, Parker, Headgate and Laguna dams, and the All-American Canal—24 years that have seen the unruly Colorado River tamed and put to work. Davis Dam is but another step in planned resource development of the West. Thence has sprung power for wartime and now for peacetime industry, water for fertile lands in California and Arizona that without it would be hopeless desert. Growth of cities and business has followed inexorably.

"I wish the contractor and all others concerned in building this dam Godspeed that its facilities will be available as soon as humanly possible."

The $21,462,505 construction contract was awarded to Utah Construction Co. and associates on Jan. 19. Construction is also under way on the Government camp near the dam site.



UTAH CONSTRUCTION CO. workers pack dynamite in drill holes atop Pyramid Hill for the first blast, to inaugurate construction at Davis Dam, top. Below, earth and rock shoot skyward in first blast. Diversion channel will pass through the hill.

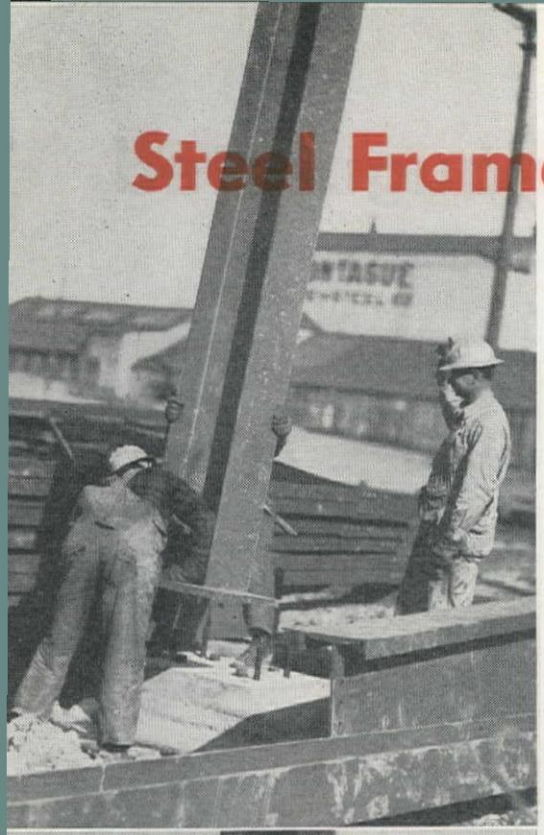
Steel Frame Erected in Record Time

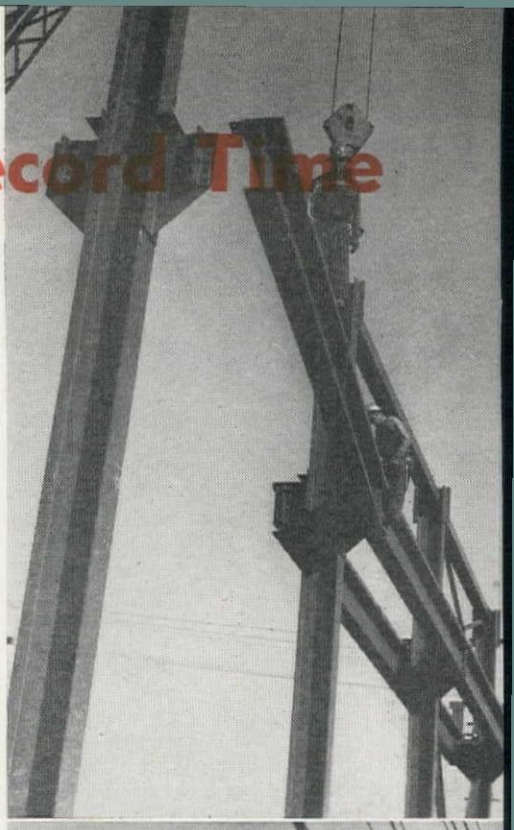
Four-acre warehouse, built entirely of steel, delayed in early stages of construction by heavy rain, but erection schedule was balanced by efforts of steel men, who raised entire framework in seventeen days —Building consists of five bays, each 86 ft. wide and 375 ft. long—Columns to support traveling cranes in each bay

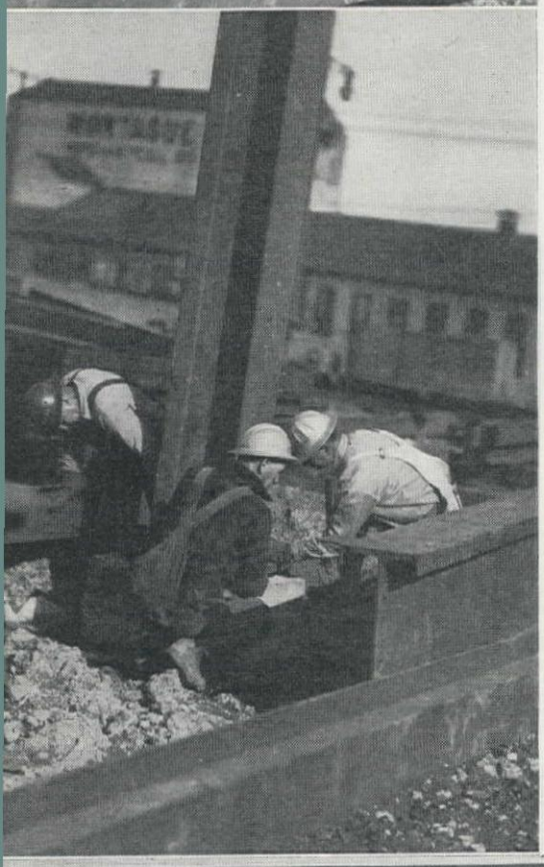
By RAYMOND GAUTHIER
District Engineer
Fabricated Steel Construction Division
Bethlehem Pacific Coast Steel Corp.
San Francisco, California

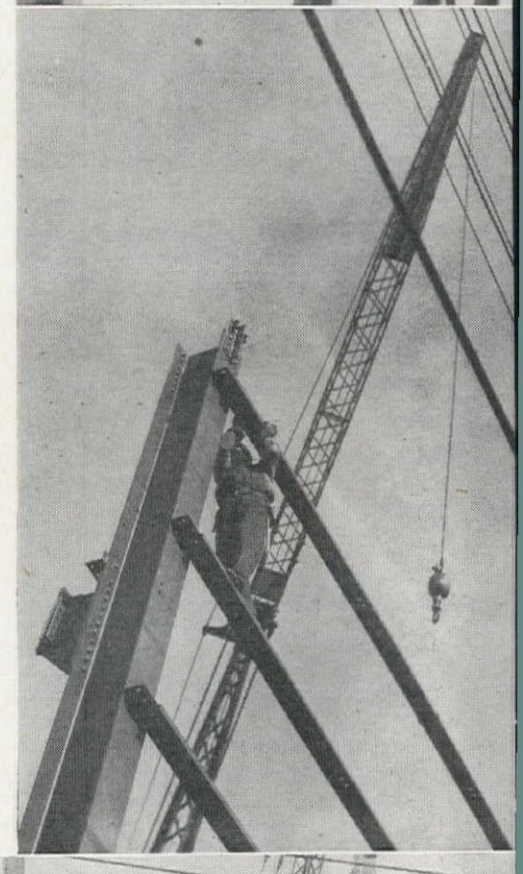
IN SPITE OF heavy rains which put construction schedules far behind in their initial stages, the four acre mill depot now nearing completion at Third and Mariposa streets in San Francisco will be ready for occupancy in May of this year as planned. The steel framed structure is being built for Bethlehem Pacific Coast Steel Corporation by that company's Fabricated Steel Construction Division. The new building will make it possible to stock all the Bethlehem steel products heretofore warehoused in various private buildings located in the city, thus consolidating stocks for improved deliveries to Bay Area industries.

It was not until January 17 that the steel erectors were able to start their work. With construction then several weeks behind schedule, the steel work-













ERECTION SEQUENCES during raising of the steel warehouse. Upper left pictures show crane placing column of steel on concrete footing and workmen bolting it to anchor bolts; top right, placing a crane girder in one of the bays; center right, attaching girts to column; bottom left, double spur tracks entering north end of building; bottom right, mobile crane was used extensively in erecting steel assemblies; building 50 per cent complete here.

ers put on a show seldom seen in building construction of this type by erecting all the steel framing in only seventeen working days. This put the job back on schedule.

Construction started

On Oct. 1, 1945, the ground was broken for construction. Due to the topography of the site, it was necessary to move approximately 12,000 cu. yd. of material. The cut was in the southwest corner and the remaining area was filled with the material from the cut. The filled area was laid in 8- to 10-in. courses, wetted, and thoroughly compacted with a sheepsfoot roller.

Around the outside of the area, a concrete retaining wall was constructed on the original ground to retain the fill and to serve as a foundation for the exterior steel columns of the building. Interior column foundations are spread footings, approximately five feet square, placed directly on top of the compacted fill. Some of the interior footings, however, rest on the natural ground.

Due to unprecedented rains during the month of December, the contractor was seriously hampered in completing foundations and walls, delaying completion of these features until January, 1946.



TRUSSES WERE RIVETED on the ground before erection at the Bethlehem mill. Fink-type trusses were riveted throughout. Steel erection took only seventeen days.

Superstructure

The superstructure consists of a steel frame, forming a structure of five 85 ft., 9 in. wide aisles each 375 ft. in length. Longitudinal spacing of columns is 23 ft. 5¼ in. Each aisle is to be equipped with a 10-ton crane of 82 ft. 4-in. span and crane runway beams are bracketed from the columns. All columns, interior and exterior, are 16-in. WF 88 lb. sections and are considered pin ended at top and bottom. Roof trusses are of the Fink type. Lateral loads are carried to the end walls of the building by a horizontal truss system in the plane of the bottom chord, this truss system extending the whole width of the building. The steel superstructure is riveted throughout, except for bolting of girts and purlins.

The 175,000 sq. ft. of roofing consists of 22-gauge corrugated, felt-protected steel. Corrugated sheets of 24-gauge were used for siding construction. Corrugated wire glass is being used for skylights, and all steel sash in exterior walls has been galvanized and given two coats of paint before erection.

Roof drainage is provided by twenty-four 6-in. downspouts which feed into four sewer lines. Sewer lines are of 6-, 8- and 10-in. cast iron pipe.

For better appearance on street fronts, concrete retaining walls have been hidden by a brick veneer and the brickwork extended 5 ft. above the finish floor line.

RAYMOND GAUTHIER, district engineer for the fabricated steel construction division, Bethlehem Pacific Coast Steel Corp., directs mill construction.



Contractors

The general contractor for grading, foundations, brickwork and sewer lines was Carrico and Gautier of San Francisco.

The 1,250 tons of structural steel required for the superstructure was fabricated at the Alameda Works of the Bethlehem Pacific Coast Steel Corporation, and erected by the Erection Department of the Fabricated Steel Construction Division of the same company.

Engineering work for the job was divided as follows: foundation explorations, Dames and Moore, San Francisco; foundation design, Hall & Pregnoff, San Francisco; and superstructure design, Engineering Dept., Fabricated Steel Construction Division, Bethlehem Pacific Coast Steel Corporation, San Francisco.

Bonneville Administration Requests Sixteen Million Construction Fund

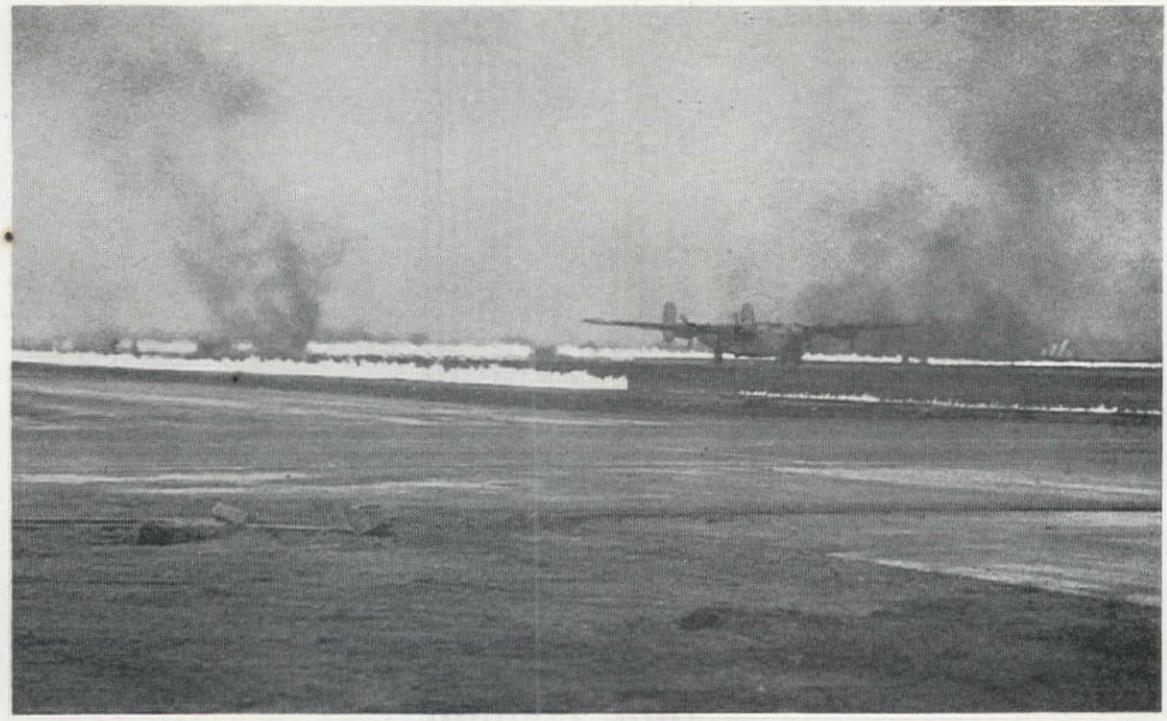
INCLUDED in the national budget requests for the 1947 fiscal year is a total of $16,973,069 for construction on the system of Bonneville Power Administration in the Pacific Northwest.

Of Bonneville's total 1947 construction budget only $6,445,019 is being requested for new projects. The balance of $10,528,050 is needed to carry forward projects previously approved by Congress.

Major new projects for which funds have been requested with approval of the Bureau of the Budget include a 230,000-volt line from the proposed Detroit dam, which has been authorized by Congress, to Chemawa, near Salem, Ore., $1,182,000; a 230,000-volt line from the proposed Hungry Horse dam on the Flathead River in Montana to Kerr dam, $900,000; additions to Bonneville's Spokane substation, $217,000; and a 115,000-volt line from Olympia to Cosmopolis, Wash., $430,000.

The Detroit-Chemawa and the Hungry Horse-Kerr dam lines will supply power for construction of the Detroit and Hungry Horse dams and eventually will integrate the power output of the two projects with Bonneville's main 230-kv. network.

A total of $2,500,000 is being requested for construction of miscellaneous feeder line extensions.



Navy PB4Y2 lands at the Naval Air Station in Arcata, Calif., during a dense fog, using one of the FIDO burner installations. Fog is dispersed to a height of about 300 ft. Pilot enters the cleared area on beam, has adequate visibility for landing.

FIDO—Airport Fog Cleared

Air Station at Arcata, Calif., to continue fog dispersal studies as joint Army-Navy-Civil project—Thermal systems seem most effective and were used during war, but sonic and other plans also being tested — Low cost installation for commercial use is goal of investigators

By DALE H. HUTCHISON
U. S. Naval Auxiliary Air Station
Arcata, California

FOG, A METEOROLOGICAL phenomenon which has been a source of much publicity to San Francisco and London, has finally succumbed to the ingenuity of man. FIDO, a creation born during the labors of war, has given man a certain amount of control over the weather. Prior to the entry of the United States into the conflict, Great Britain found that the exigencies of war necessitated a device which would enable bombing missions to take off and land in thick weather. The job was given to the Petroleum Warfare Department of Great Britain, who pioneered the development of FIDO (Fog, Intensive Dispersal Of).

It has recently been announced that the Naval Auxiliary Air Station at Arcata, Calif., where the Navy's research program on FIDO has been conducted, will be operated by a joint Army-Navy-Civil Agency upon the station's discontinuance; it is to be operated as an experimental station to do all types of research on the various aids to low visibility landings. The location was chosen by the Navy in December of 1944 because of its high incidence of fog. The station is an ideal site, as it is situated on a bluff which rises abruptly 200 ft. above the surf. The warm, moist air from the semi-permanent eastern Pacific cell of high pressure becomes fog laden as it moves eastward over the cold California current, and this fog pours over the bluff onto the airfield like a thick, viscous mass. The station has the added advantage of having no hazards, either natural or artificial, in the vicinity of the field, which allows for excellent blind flying operations.

First FIDO installation

FIDO was first used by the U. S. when the Seabees started building a FIDO installation on Amchitka in the Aleutians in Apr. 1944. Lack of fog was never one of the problems in the Aleutians. The actual building and installation of the system was something to be considered. Small lakes had to be filled in; bulldozers, which had all but disappeared in the tundra and muskeg, had to be lifted out; supports for the burners had to be found. All in all, it was a construction problem which tested even the ingenuity of the Seabees.

Finally, the system was installed, had been tested several times, and those who had scoffed and scorned the project became converts. On July 25, 1944, just prior to dawn, the burners were ignited and the fog lifted from the zero-zero conditions so that the sky became visible. A Navy PBY-5A took off and disappeared in the fog. The plane then made a normal instrument approach and broke into the clear at 150 ft. over the end of the runway. After this successful take-off and landing, an Army C-47 made two take-offs and landings with FIDO. Again in August of the same year, when President Roosevelt was visiting the Aleutian area, all stations with patrol planes were fog bound; FIDO was lighted and six PBY-5A's took off to fly an anti-submarine patrol.

The success of the Amchitka installation indicated a need for additional experimental work with emphasis on efficiency and economy. A Landing Aids Experimental program was established, sponsored by the Landing Aids Section, Maintenance Division, Bureau of Aeronautics, and under the direction of Commander J. P. Lunger and Commander R.

L. Champion. The war was still in progress at this time, and the immediate goal was the development of equipment suitable for use in the islands north of Japan for aircraft operations from that area. After the pressure of war was removed, the experimental work was continued, and it has been closely observed by the flying interests of the U. S., Canada and England. In addition to the work of the Navy, several large universities have made contributions to the program through National Defense Research contracts.

The fog removal problem

The problem of dispersing fog is primarily one of removing fog particles from the air throughout a limited area. With the new developments of radio glide and localizer beams that line the plane up with the runway, FIDO needs only to give a ceiling of 300 ft., and a plane coming in on the beam can make a contact landing after it arrives over the end of the runway. The thermal method of dispersing fog is one of releasing heat into the atmosphere by the combustion of fuel. This method has been more successful in dispersing fog than others.

The principle involved in removing the fog particles by the thermal method is quite simple. The temperature in the lower layers of the atmosphere is sufficiently raised so that the fog particles evaporate and become water vapor. The removal of fog particles from the air increases the ceiling and the visibility sufficiently so that a landing may be effected.

The quantity of heat necessary to evaporate the free water from the atmosphere is dependent upon three things. These three factors are so interrelated that it is inadvisable to go into their relative importance; but rather, it is sufficient to recognize them and be aware of the contributions of each to the problem of evaporating the fog. One factor to consider is the size of the fog particle. The shape of the particle is spherical, but there is a large variation in size, which causes corresponding variation in the vapor pressure of the particle. Another item influencing the vapor pressure of the fog particle is the impurities in the particle itself. These impurities cause a reduction in the vapor pressure. The vapor pressure is directly related to the amount of heat necessary to vaporize each particle, and thereby influences the heat necessary to clear the field.

Another factor of importance is the number of fog particles per unit volume of air, or the amount of free water in the air. It is axiomatic that the heat necessary to evaporate the water is directly related to the quantity of free water in the air, and it has been found that there is a large variation in the water content of different fogs. The amount of free water varies from about 0.5 grams per kilogram of air to as much as 4.0 or 5.0 grams per kilogram.

The third factor involved in determining the heat requirements is the transfer of the air mass. The transfer of air mass is related directly to the velocity of the wind and its direction in relation to the area being cleared. There are two factors to consider in relation to the effects of the wind upon the problem of clearing fog. One is the actual air mass transfer which adds new fog particles to the area being cleared, and necessitates the continual release of heat in order to keep these particles removed. The other factor is the mechanical effect which the wind has upon the thermal current set up by the burners. The mechanical effect of the wind causes the thermal currents to drift to the leeward; thus the clearing is effected away from the runway. The problem of the wind in relation to the burners is one that must be considered with advection fog only. Radiation fog is never accompanied by wind, or if it is, the fog soon dissipates, and there is no fog to remove.

Test installations at Arcata

Numerous thermal systems are installed at Arcata. Prior to the present time, the British have done most of the development work on FIDO, and in order to have a yardstick to measure the effectiveness of the developments, it was thought advisable to install their best systems.

At present, the thermal installations include the Slot Burner, which has been installed at Heathrow, a commercial field near London; a Hades-Rapex installation, which up to the present had the highest thermal output of any of the burners; non-glare burners designed by the Army Air Forces and the British; and the newest installation, a High Pressure system which burns a low grade fuel by atomizing the fuel.

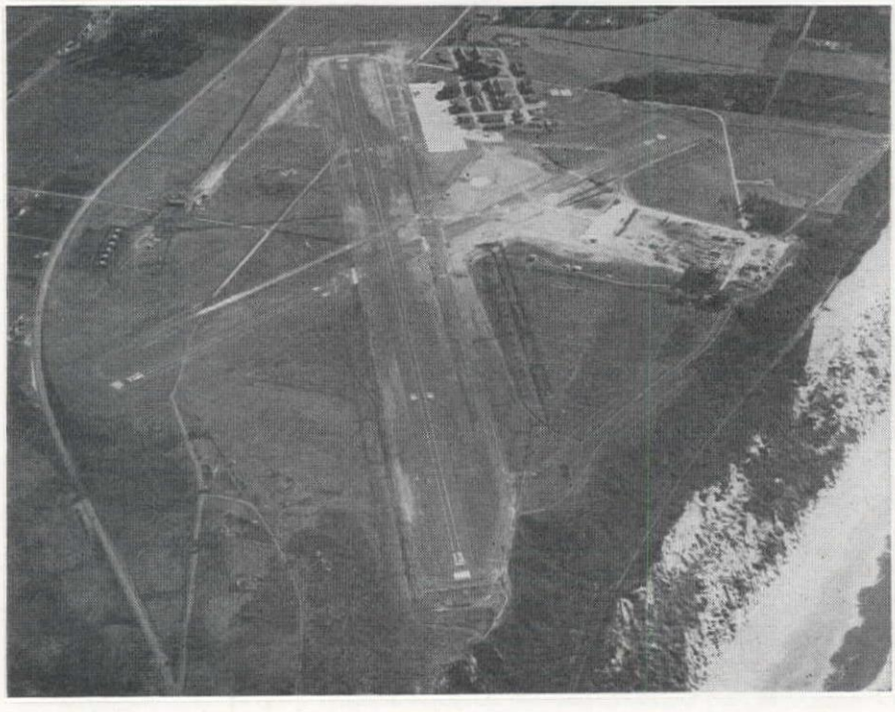
All of the systems have been set up so that one operator can control them from the control tower by pressing a few buttons. This operation system allows control of the amount of fuel fed to the system, and allows ignition of the system from the same control panel. The control tower is also equipped with an amplifier so that directions may be given to various men about the field. A number of the key men have walkie-talkies so that contact is maintained with all hands at all times.

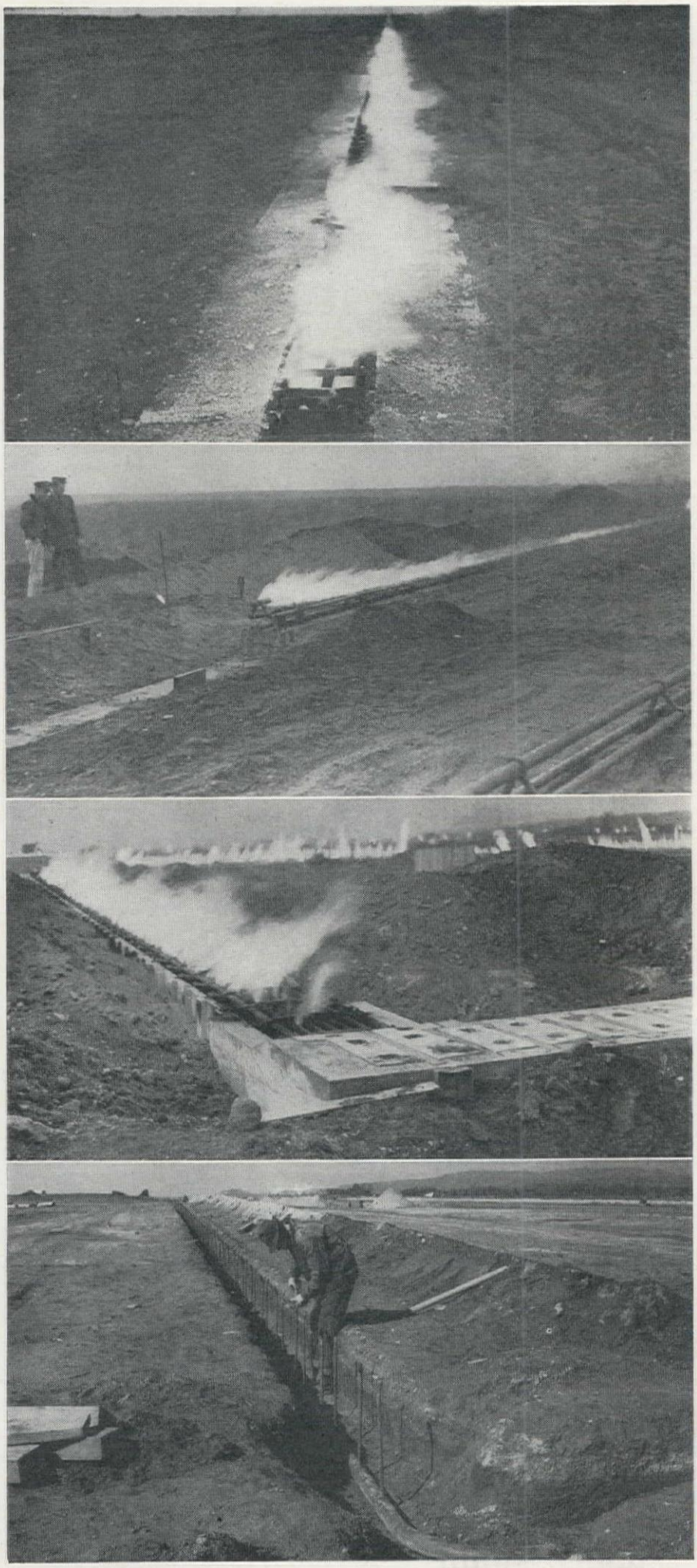
While the systems are in operation, aerologists are busy collecting aerological data. During each burn, information is obtained about the size of the particles, the amount of free water per unit volume of air, the air temperature, dewpoint, wind velocity and direction. At regular intervals before, during, and after the burning operation, the ceiling and visibilities are taken in the area being cleared, and at a distance of one-half mile from the burning operation where the fog pours over the cliff from the sea. These observations are later checked, because it must be known just exactly how much clearing is being accomplished by FIDO. In addition to the above observations, the temperature is taken at 100-ft. intervals up to 300 ft. directly above the area being cleared. Results have indicated that the temperature at 300 ft. has risen as much as 6 deg. F.

Burner types

The Slot (USN MK-5) burner consists of two 1-in. pipes, one a few inches above the other. The upper pipe acts as a vaporizer chamber because the gasoline feeds into the top pipe, and then at the end of the section it makes a U-turn into the bottom pipe. The lower pipe is the burner, and has holes drilled on six-inch centers through which the gasoline feeds and burns. The burning of the

LANDING AIDS Experiment Station is located on Navy field at Arcata, Calif., a location especially suited for studying fog. It is atop 200-ft. bluffs rising out of the ocean. Heavy fog rolls over field almost daily, but no other obstacles exist.





bottom pipe furnishes sufficient heat to vaporize the gasoline in the top pipe, which in turn feeds gasoline vapor into the burner pipe; this vapor burns with a clear, smokeless flame. The gasoline is fed into the system at a pressure of about 15 to 20 lb. per sq. in., and the vaporization process increases the pressure of the vapor so that the system will burn with a flame four to five feet high. The burner unit is placed in a cast-iron trough that is laid flush with the ground. The burner is fabricated in 110-ft. sections, so that the installation may be any length desired. The system is operated from the control tower by electric valves; it has a hot wire ignition system which ignites it initially, and the flame reproduces itself after it has once been ignited.

The Hades-Rapex (USN MK-3) burner differs from the other systems in that the gasoline is vaporized in one area rather than along the burner, and vapor is fed to the burner pipe from a collecting pot. The vaporizer, which furnishes the vapor for the burner, is composed of sixteen 2-in. pipes 120 ft. long. In the bottom of the vaporizer is a 3-in. burner pipe with holes on 6-in. centers. This burner pipe in the bottom of the vaporizer furnishes the necessary heat to vaporize the fuel for the rest of the line. After the fuel is vaporized, the sixteen 2-in. lines empty into a large catch pot which feeds the remainder of the burner lines. The burner line is composed of an 8-in. line for two-thirds of its length, and it then reduces to a 6-in. line for the remainder of the distance. A vaporizer 120 ft. long can furnish sufficient vapor for 1,000 to 1,500 ft. of burner line. The burner line is drilled with holes on 6-in. centers; every 15 ft. there is a stabilizer jet which consists of two holes twice the diameter of the burner holes. The stabilizer jets are to keep the vapor from surging in the line. This system is ignited with a hot wire coil that is controlled from the panel in the control tower, the same as is the flow of fuel to the vaporizer. Gasoline is fed into the vaporizer at about 10 lb. per sq. in., and this supplies sufficient pressure when vaporized to feed the entire length of line. The pressure is sufficient to feed a flame about 5 ft. in height. This system furnishes more heat per linear foot than the other systems operating on gasoline.

The Haigill (USN MK I & MK II) system was installed in the Aleutians, and was one of the first systems developed by the British. The burner is composed of three pipes fabricated in 60-ft. sections. The two bottom pipes, which compose the burner, are 1¼ in. in diameter, and are spaced 7 in. apart. The holes in the burner pipes are placed on 6-in. centers. The third pipe is placed

FIRING SYSTEMS of various types being tested at Arcata. Top, a slot burner line. Second, a line of Haigill burners; this system was used in the Aleutians during the war. Third, Hades system, vaporizer in foreground, burner line in background. Bottom, high pressure Diesel burner line; this is the newest installation at field.

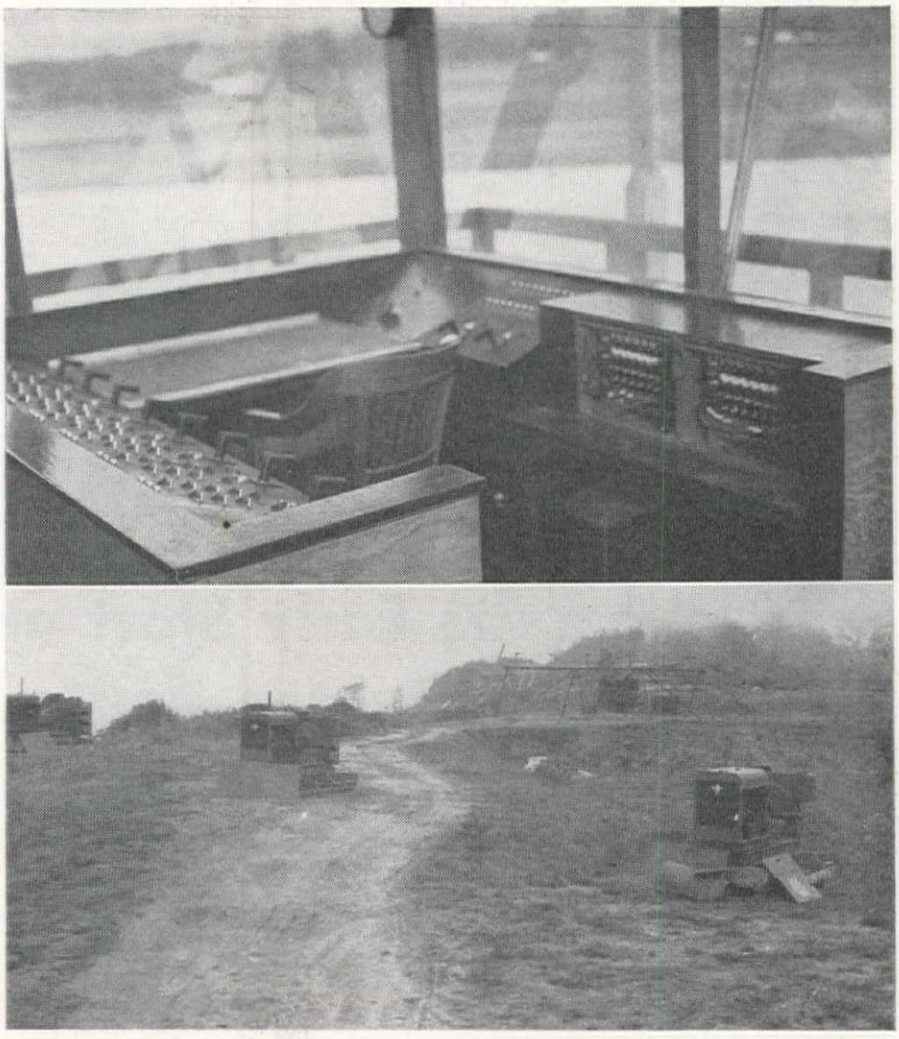
midway between the two burner pipes and 6 in. above them. This third pipe comprises the vaporizing chamber, and is heated by the two burner pipes. There are two designs of this burner, both operating on the same principle. At the present time, the burners are ignited by a torch pot placed under one end. The burners are fed gasoline at about 15 to 20 lb. per sq. in. This feed pressure allows the burners to burn with a flame about 4 ft. in height.

There are two types of non-glare burners: AAF (USN MK VII) and PWD (USN MK VI). The primary purpose of these burners is as a guide and marker for the runway approaches. The secondary purpose of the burners is to furnish heat to insure the fog being entirely removed from the approach zones. The differences between the burners are small, and it is not practical to discuss the individual burners here; but suffice it to say that the burners operate on a principle similar to the Haigill in that the burner pipes below heat the vaporizing chamber or pipe some few inches above the burner. It is also important to point out that the burners are so constructed that the flame from the burner does not glare and blind the pilot on his approach to the field. These burners are ignited with a torchpot at this time, and the gasoline is fed into them at about 15 lb. per sq. in.

Newest development

The most recent installation is a High Pressure system, designed by the Babcock-Wilcox Company; it was constructed to burn a low grade fuel, and thus reduce the cost of clearing fog. The fuel is atomized through a specially designed nozzle at 1,500 lb. pressure. These nozzles are arranged in two manners, one being a triad head with three nozzles, and the other with single nozzles. The system is designed to generate as much as twice the amount of heat as is obtained by other systems. The Diesel burners will be ignited by a system of Calrod ignitors, or improved type of hot wire ignitor. The system will be controlled entirely from the operations tower. The high pressure burner has the advantage of burning with a luminous flame, which gives a large amount of radiant heat in addition to the heat obtained from the fuel combustion. Some burners have also been installed as marker burners along the side of the runway in order to evaluate their effectiveness in comparison with various airport lighting methods. Another advantage of the high pressure system is that the system can be lit off immediately after it is turned on, while the other systems need a three to five minute preheating period in order to vaporize the fuel before it begins to operate efficiently.

The fuel is furnished to the various high pressure lines at a pressure of 1,500 lb. per sq. in. by a nine stage centrifugal pump, which has a capacity of 850 gal. per min. and is driven by an 800-hp. electric motor. The pump is designed for pumping fuel other than Diesel.



"FIDO" BURNER control panel in the interior of the control tower, top, provides operator with complete regulation of fog-dispersal equipment on the field. Below, sirens are placed at windward end of runway to disperse fog by the sonic method.

The pump house also has twelve advanced base type pumps. Eight of these pumps are used to furnish gasoline to the various gasoline systems, and the other four are used to furnish Diesel fuel to the Diesel pump. These pumps are driven by gasoline motors and furnish 250 gal. per min. at about 125 lb. pressures per sq. in.

The Navy uses two main types of fuel in their fog dispersal systems. One is a commercial 60-octane non-leaded gasoline, and the other is commercial No. 3 Diesel fuel. Both fuels have proved satisfactory; however, experimentation must be done on the use of different types of fuel in different systems.

Sonic fog dispersal

Some research has been done on the sonic method of fog dispersing. This field is fertile for additional research work, and it is expected that it will be continued. At the present, there are twelve Chrysler Victory Bell Sirens at the windward end of the runway, which are set at an angle of 60 deg. to the runway, and parallel with the ground. These sirens have developed as much as 140 decibels at 400 ft. The sound wave which the siren creates is 440 cycles, and the sirens operate at 3,000 rpm.

The basic principle upon which the sirens operate is quite as simple as the operating principle of the other systems. The sound waves cause the fog particles to move in cycles which vary with the size of the particle. This motion brings about the collision of the particles which causes them to grow. This process repeats itself until such time as the particle becomes so heavy that it can no longer remain in suspension and precipitates out. The mechanical removal of these fog drops brings about an increase in visibility.

The work thus far indicates that planes can be landed at a cost of $100 to $200 per plane. However, with proper operation of the control tower at a busy air terminal, the cost of landings per plane could be reduced. One of the aims of the project is to make the operation so economical and so safe that it will be widely used by both commercial and military aviation interests.

Future planning for FIDO

The plans for the future of FIDO indicate work on a wind curtain installation. When the wind is blowing at right angles to the runway, it causes the clearance to drift away from the runway, resulting in a great dissipation of heat,

and reducing the clearance that should be obtained from the systems. The wind curtain is to be a curtain of air which is projected upward parallel to the runway and at right angles to the prevailing wind. This curtain forms a barrier to the wind, creating an eddy over the runway and maintaining the heat over the runway itself; thus the clearing will be effected where it is required.

Quite similar to the wind curtain is a water screen experiment which will be tried in the near future. The plan is to project a curtain of water approximately 100 ft. into the air. This curtain of water will cause the fog particles to coalesce with the water particles and all will fall to the ground. The curtain is to be installed on the side of the runway nearest the prevailing wind, and in this way will remove the fog particles before they reach the runway, reducing the amount of heat necessary to clear the fog.

The future plans of FIDO necessitate research work on the use of desiccants to dispel fog. A certain amount of work has been done in other places on the use of this method to get rid of fog, but the work needs to be checked and verified, and other types of desiccants must be tried.

With the continued operation of the experimental station by joint Army-Navy-Civil Agencies, there will be experimental work in progress on various other types of low visibility approach gear, including high intensity, airfield lighting, approach lighting, and electronics. The possibilities are unlimited; the centralization of research as carried on at Arcata should bring about a tremendous advancement in the expanding field of aviation.

Seattle Expects Early Start on $3,450,000 Elevated Route

By AL JACOBSON
Seattle, Washington

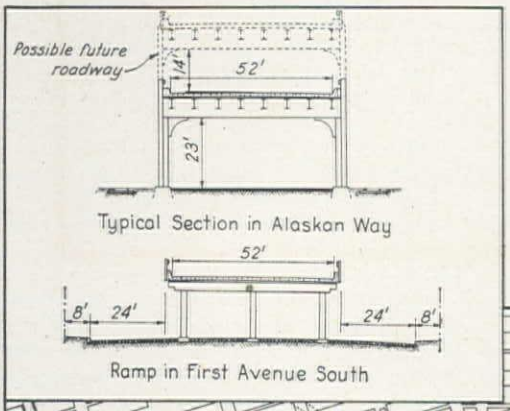
A 20 PER CENT INCREASE in downtown traffic, together with anticipated new cars soon to be released to the public, are responsible for an anticipated early start of construction work on Seattle's proposed $3,450,000, four-lane Alaskan Way elevated roadway that will greatly relieve congestion.

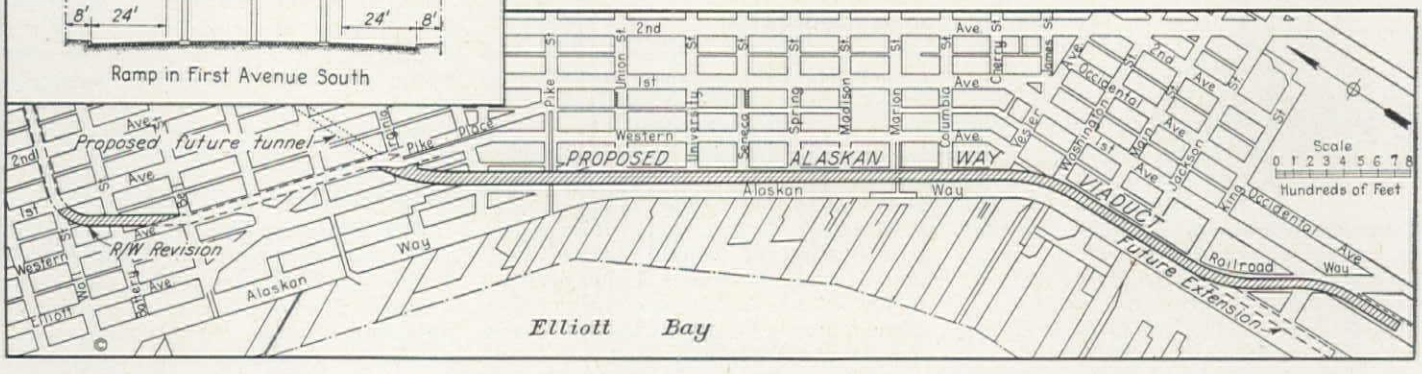
The new project will provide a direct route for north-south traffic on U. S. Highway 99, enabling it to go around the central business district. Its southern terminus will be on First Avenue South near Connecticut Street and the route will follow Railroad Way into Alaskan Way and along the east side of Alaskan Way to Virginia Street where it will connect with Western Avenue. A new diagonal roadway will run from Western Avenue and Bell Street to First and Wall Streets, and traffic will use Wall Street which flows into Aurora Avenue or U. S. Highway 99 to the north.

The viaduct, which is expected to require two years for completion, will be a freeway type structure, without ingress or egress. It will permit traffic from Highway 99 and the southern industrial district to move quickly and easily to the northern section of the city. While the project has as yet not been fully designed, it is expected to be of structural steel with a reinforced concrete roadway having a clearance of 23 ft. and the design will make it possible to add an upper deck, if future conditions warrant it.

The design work will be done by the city engineering department in collaboration with the State Highway Department. All work will be under the direction of City Engineer C. L. Wartelle. Acquisition of right-of-way and completion of design will probably delay the start of actual construction for about one year.

According to C. G. Will, principal assistant city engineer, the city has applied to the federal government, through the highway department, for financial aid under the Highway Act of 1944. The balance of the cost will be provided by the city of Seattle either from its own funds or from state moneys appropriated by the last legislature and ear-marked for allocation to cities on a population basis. The federal grant is expected to be $1,500,000. It has already been announced that federal funds totaling $1,900,000 will be available for use in the city limits.





Fish Authorities Urge Delay in Dam Building

DELAY IN CONSTRUCTION of McNary Dam on the Columbia River, for which Congress included $2,600,000 in the recent appropriations bill, was urged by the U. S. Fish and Wildlife Service in order to give time for fisheries technicians to complete studies on the effect of the dam on salmon runs.

J. T. Barnaby, North Pacific fisheries investigation chief, reported that it is possible there may be loss of fish due to their failure to ascend successfully the fishways at McNary Dam, and reviewed escapement of salmon over Bonneville Dam to illustrate his point.

"There is some mortality incurred in getting adult fish past Bonneville Dam. Dead adult salmon are found throughout the season along the shores of the river below the dam," he said, presuming that many of the salmon died from injuries sustained before finding the fishways.

"While salmon do ascend the Bonneville fishways in a satisfactory manner and climb a height of approximately 60 ft., there is no assurance that they would, after making that passage and traveling 150 mi. farther upstream, including passing Celilo Falls, be able to ascend a similar, but 50 per cent higher, fishway at McNary Dam," Barnaby stated, adding that there would probably be a moderate mortality of salmon.

He was more alarmed at the building of a whole series of dams, of which McNary was a first unit, believing that the losses incurred during the passage of fish upstream and downstream over the dams, plus the reduction of spawning and rearing areas and a general change in environmental conditions would be so serious as to make continued propagation in the headwater tributaries virtually impossible.

Runoff Forecast—
1946 Water Supply in Western States



WORKERS OF THE SOIL Conservation Service ski across country on their annual quest of snow measurements preparatory to publishing the 1946 stream runoff forecast. They carry specially calibrated equipment to compute the density of the snow at carefully selected locations on each watershed for which runoff predictions are to be made.

Mountain and Pacific States may expect runoff this year to equal or exceed long-term average, but southern drainage basins will receive sub-normal supplies, becoming increasingly severe moving toward Arizona, Southern California, Southern Utah and New Mexico — Storage will ease the situation

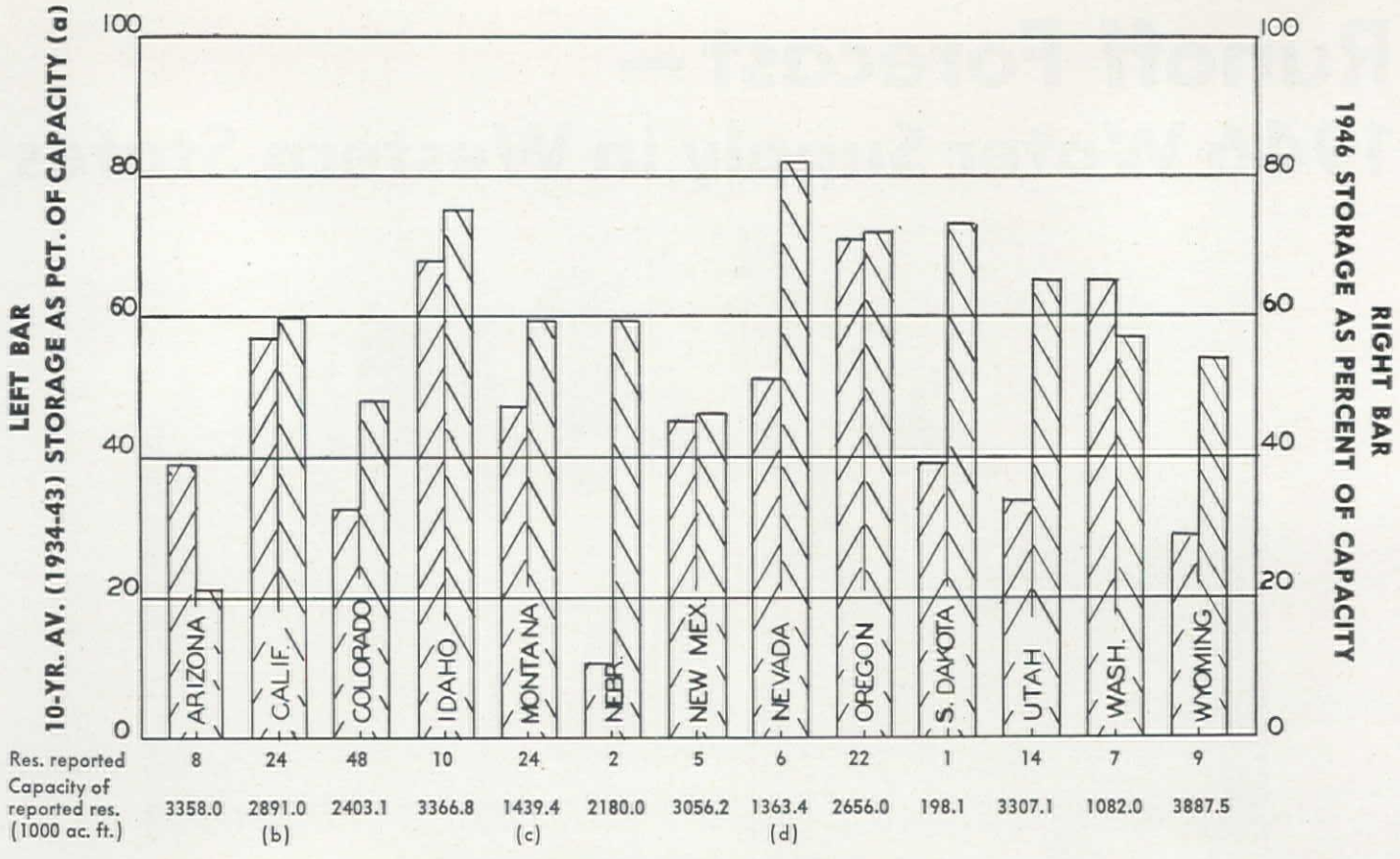
A THOUSAND YOUNG MEN went into western mountains early in April for final seasonal measurements of the snow. Two weeks later the results of their surveys, analyzed by officials of the Soil Conservation Service and cooperating Federal and State Agencies, disclosed the runoff that is to be expected from the snow melt during the coming spring and summer months.

A summary of the forecasts is presented at the conclusion of this article. This summary, State by State, follows the order of the report published in the May, 1945, issue of *Western Construction News*.

The over-all 1946 outlook, as announced by the snow-survey authorities, is for runoff generally equalling or exceeding the long-term average in the northern half of the Mountain and Pacific States, but for sub-normal supplies in the southern drainage basins. In portions of the Columbia River basin, runoff may be as much as 200 per cent of normal, a potential flood menace being indicated along both sides of the Cascade Mountains and the lower reaches of Kootenai River. The decline from North to South is progressively emphatic, however, and New Mexico, southern Utah, Arizona, and southern California will experience shortages of severe proportions. The deficiencies will be somewhat eased by carry-over storage, which, with careful use, may be enough to meet 1946 requirements of most areas having storage rights. However, storage in Arizona reservoirs is far below total reservoir capacity and substantially below the long-term spring average.

Snow survey forecasting

Forecasts of seasonal water supplies had been considered feasible by Western engineers and meteorologists long before a successful procedure for making them was devised. Snow depths by snow-stake readings were ascertained for years throughout the mountain regions before it was realized that the density of the snow might vary fully 100 per cent and that these depth measurements might be misleading to that extent. Many kinds of gages for catching snow as it fell were tried, but none has yet been devised which will make a true



RESERVOIR STORAGE AS OF APRIL 1, 1946*

*Not all reservoirs in all states are reported, but enough are reported to provide a reliable index of each state's storage supply. (a) Most state averages for reported reservoirs are for full 10-year period but in a few cases reservoirs having less than 10-year records are included. (b) Does not include Narrows (Yuba River), Friant or Shasta Reservoirs. April 1, 1946, storage in these three reservoirs combined is 3,536,000 acre-feet, which is 84 per cent of their capacity. (c) Does not include Fort Peck reservoir (capacity 19,000,000 acre-feet); April 1, 1946, storage 12,890,000 acre-feet. (d) Does not include Lake Mead (capacity 31,140,000 acre-feet); April 1, 1946, storage 20,983,000 acre-feet.

catch of snow under most natural conditions. However, a satisfactory way to measure the water potentialities of snow was finally found. By this method, the weight of a core of the snow of known diameter and length drawn vertically from the snow cover is determined. The density of the snow can be computed from these measurements or by the specially calibrated equipment which is now generally used, the equivalent water depth of the snow being indicated by the weight of the snow core.

The snow survey procedure now prescribed for water supply forecasting consists of ascertaining the average water content of the snow-cover each year at a few carefully selected locations on each watershed for which run-off predictions are to be made. The number and locations of measuring stations in each watershed are intended to be such that all major storm effects will be registered in their snow cover. They are all located above the zone of winter melting and usually at the highest elevation that can be reached by the snow surveyors during the winter. Selected spots where the snow neither drifts nor is blown away by the wind are required. At each location a line, termed a snow course, is established and snow cores, usually numbering about 20, are obtained at designated points along this course. From these samples the average water content of the snow is ascertained. Depending upon locality and year, the measurements upon which the principal forecasts are based are made on or about March 1 or April 1, annually.

The winter of 1945-46 marked the eleventh year that snow surveys have been extended to all the major watersheds of the West. This program began with the action of Congress in assigning the responsibility of extending and coordinating snow surveying to the Division of Irrigation, Soil Conservation Service, U. S. Department of Agriculture. Since then there has been made available to localities which lie remote from their sources of water the information upon which to base plans for using or handling the water from melting snow. Through radio broadcasts and bulletins issued monthly from January to May the inhabitants of such areas as lower Rio Grande Valley, Texas, Imperial Valley of California, and the lower Columbia River country, learn about the snow conditions in far-off Colorado, Wyoming, Montana, or Canada.

The snow survey leaders are looking to the time when the field work can be accomplished without the hardship and uncertainty that attends it today. Some of the various types of snowplanes, snowmobiles or power toboggans now being tested will eventually eliminate much of the difficulties of snow surveying.

While absolute accuracy is not expected from forecasts based on the snow surveys, those made in recent years have closely approximated actual runoff. An example is afforded by the 1945 forecasts for the Mountain States, where estimates for 15 major drainage basins indicated 99 per cent of a 10-year average runoff; the runoff actually measured turned out to be 97 per cent.

The following paragraphs summarize the prospects for 1946 runoff and storage, both as related to 10-year or other long-term averages. The storage percentages represent major reservoirs for which 10-year averages are available, and are in terms of storage capacities.

Arizona: Runoff is expected to be low, ranging from about 40 per cent on the Gila River to about 50 per cent on the Salt, Little Colorado, and Verde rivers. Reservoir storage is very low, with 8 important reservoirs showing about 55 per cent of their long-term average storage and only 21 per cent of capacity. Storage in Lake Mead is 20,983,000 ac. ft.; capacity, 31,142,000 ac. ft.

California: The State-wide prospect is satisfactory, though better in the northern drainage basins than in the South. Snow pack tributary to the Sacramento is slightly above normal, but the excess is not enough to cause floods unless heavy rains should occur during the melting season. San Joaquin watershed snow pack is a little below average, but will supply enough water for normal needs. It is doubtful whether snow water will reach Tulare Lake through the Kern, Kings or Kaweah drainage.

In reservoirs of the Sierra, stored water is more than the long-term average. In twenty-seven reservoirs having a capacity of 7,086,000 ac. ft., 5,271,000 ac. ft. is already in storage. With normal operation all reservoirs should fill before melting ends. As of Apr. 1, storage in twenty-four reservoirs was already 105 per cent of the 10-year average.

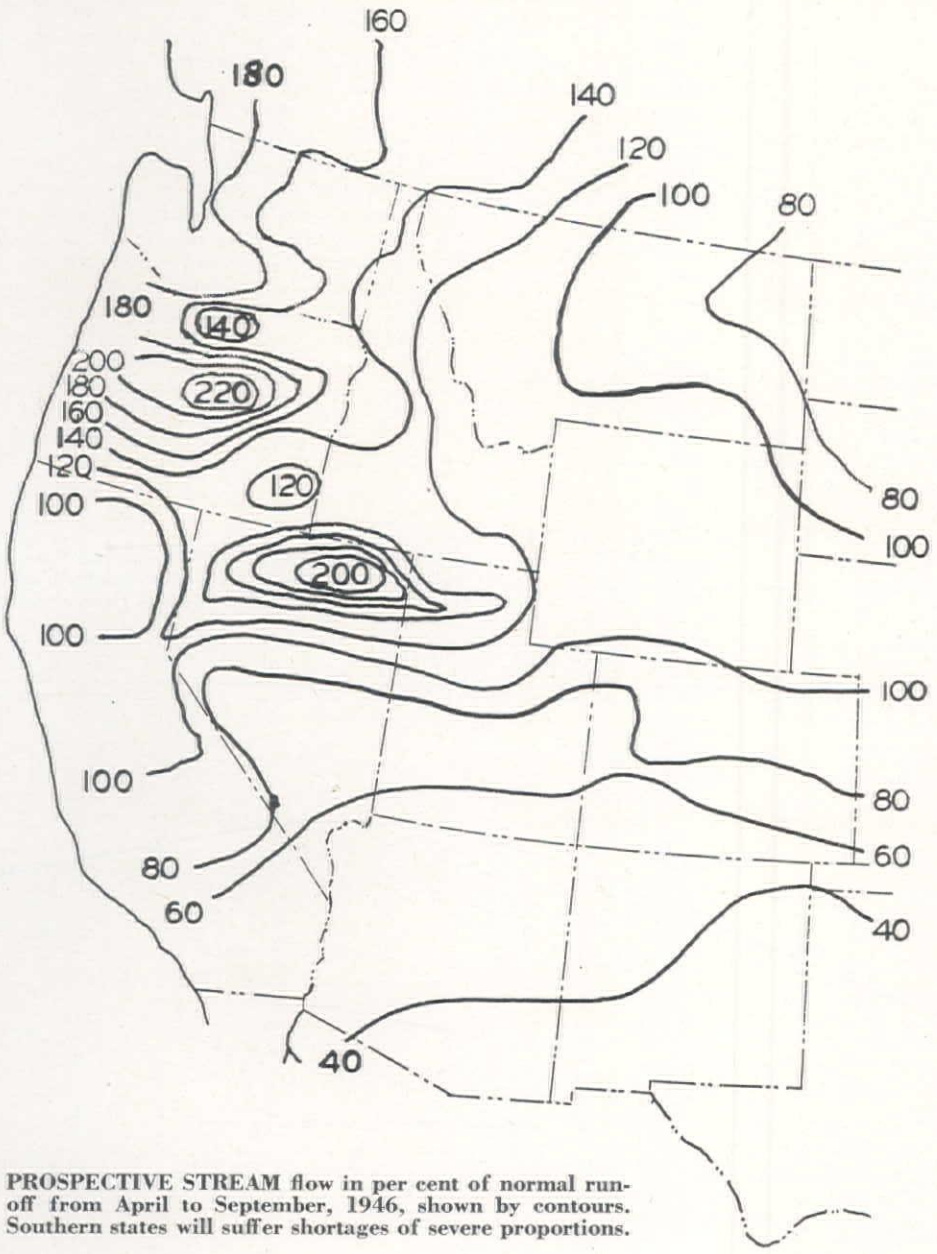
Snowpack as of Apr. 1, in per cent of normal, ranged as follows: Upper Sacramento - McLeod - Pit, 100; Feather, 95; Yuba, 115; American, 107; Mokelumne, 105; Stanislaus, 101; Tuolumne, 98; Merced, 97; Upper San Joaquin, 92; Kings, 88; Kaweah, 87; Kern, 80.

Colorado: Outlook is for more or less normal runoff in the northern part of the State, but less favorable in southern Colorado. Percentages of normal range as follows: Poudre, 100; South Platte, 90; Yampa, 100; White, 75; Upper Colorado, 85; Gunnison, 60; Dolores, 50; Animas, 50; Rio Grande, 50; Arkansas, 75; Purgatoire, 60. The 10-year average for Apr. 1 storage, representing 48 reservoirs, is 32.3 per cent of capacity, but the corresponding 1946 figure is 47.9 per cent.

Idaho: In the Snake River basin supplies are expected to be abundant but without much danger of flood. Moderately high water is looked for in the area drained by the Boise, Payette, Weiser, Malheur, and Burnt rivers. Flow is expected to range, in per cent of long-time normal, as follows: Clearwater, 119; Salmon, 119; Snake, at Moran, Wyo., 104, at Heise, Ida., 100, at Weiser, Ida., 124; Big Lost, 101; Big Wood, 112; Boise, 139; Payette, 126; Weiser, 179; Kootenai, 134; Spokane, 145. Ten major reservoirs show 75 per cent of capacity this year against a 10-year average of 68 per cent on Apr. 1.

Montana: Runoff in prospect both east and west of the Continental Divide averages close to normal, as follows: Milk, 85; Marias, 100; Missouri, 100; Musselshell, 90; Jefferson, 110; Madison, 110; Gallatin, 100; Yellowstone, 110; Tongue, 110; Clark Fork, 107. Twenty-four reservoirs which normally are 47.9 per cent full at this season, show 59.3 per cent.

Nevada: Prospective runoff varies in per cent of normal, as follows: Upper Humboldt, 200; Lower Humboldt, 160; Eastern Nevada streams, 70; Southeastern Nevada, 60; Truckee, 100; Walker, 70; Carson, 70. Storage in six major reservoirs is 82 per cent of capacity, as against a corresponding normal of 51 per cent.



PROSPECTIVE STREAM flow in per cent of normal runoff from April to September, 1946, shown by contours. Southern states will suffer shortages of severe proportions.

New Mexico: Runoff is expected to be substantially below normal, as follows: San Juan, 50; Chama, 50; Canadian, 40; Pecos, 40. Five major reservoirs show 46.4 per cent of capacity, as against a normal of 45.3 per cent.

Oregon: Streamflow for the April-September period will furnish from good to abundant supplies, prospective average being 143 per cent of normal with a range from 115 to 238 per cent. Twenty-two reservoirs with total capacity of 2,656,090 ac. ft. are 72 per cent full as against an average filling on Apr. 1 of 71 per cent.

Utah: Storage of water in snow varies widely. In the northern part of the State it is considerable above normal, but southern and eastern sections are deficient. Supplies will vary from 148 per cent of long-term average on the Blacksmith Fork River to 55 per cent on the Sevier. Hold-over storage is at a high point and storage rights will experience no shortage. All reservoirs will fill except Utah, Bear, and Strawberry lakes. Utah and Bear are higher than at any other time in the past 10 years, and all three will have available more than enough water to meet irrigation demands.

Washington: Unusually high river stages can be expected throughout the Columbia basin. Potential flood hazard exists in some areas along both east and west slopes of the Cascades and along the lower reaches of Kootenai River. Estimated flows: Columbia (at The Dalles) 116 per cent of normal; Chelan, at Stehekin, 124, at Lucerne, 143; Okanogan, 137; Methow, 140; Wenatchee, 137; Yakima, 183. Reservoirs with capacities totaling 1,082,000 ac. ft. are 57 per cent full as against a normal of 65 per cent.

Wyoming: All principal streams are expected to carry more than normal runoff, as follows: Shoshone, 105; Greybull, 110; Bighorn, 110; Powder, 110; Green, 115; Sweetwater, 110; North Platte, 100; Laramie, 100. Belle Fourche River will carry only 80 per cent, but Belle Fourche reservoir (in South Dakota) is 73 per cent full as against a long-term normal of 39.2 per cent. Nine Wyoming reservoirs, normally 29.1 per cent full, now show 54.3 per cent.

British Columbia: Through the cooperation of the Department of Lands, Province of British Columbia, the Soil Conservation Service is able to report the following prospects for the Columbia basin in British Columbia: Runoff will be substantially above normal in percentages as follows: Kootenai at Wardner, 138; at Columbia confluence, 149; Elk, 149; Columbia at Trail, 161; Okanogan, 166. Storage reservoirs are full or nearly so. Soil is moist and not frozen below the snow, which will have a tendency to increase flood potentials.

Railroad Problem—
Western Pacific Bisects Sacramento

A. S. C. E. committee studies engineering and economic problems of city bisection at grade by railroad's main line — Suggests remedies, giving probable cost of each, and presents its recommendation

THE SACRAMENTO SECTION of the American Society of Civil Engineers, at their meeting of Oct. 31, 1944, appointed a special committee on the "Western Pacific Problem," authorized to study engineering and economic phases of the problem presented by the bisection of the city of Sacramento at grade by the main line of the Western Pacific Railroad.

Scope and findings

The committee organized itself into sub-committees, each to report at weekly meetings of the whole committee on particular assignments fitted to the experience or special field of the sub-committee. Thus advice was had on each item of the problem from those best qualified to give it, but the conclusions expressed are the consensus of the whole committee.

Investigations were begun without preconceived ideas as to the solution and with a determination to examine thoroughly all proposals which had ever been suggested or which might develop during the study.

The committee found that solutions could not ignore the future disposition of trackage other than the WPRR main line, so the scope was extended to include all conflicts between rail and street networks in the city. For solutions, it has weighed the advantages and disadvantages of all proposals for relocation, combination, grade separation and crossing protection. For proposals which were found practical, costs were estimated for comparison with appraisals of benefits and for comparison of alternative schemes.

Particularly, consideration was given to proposals for relocation along three different routes, for depressing or elevating the main line and for otherwise separating, protecting or vacating the undesirable grade crossings. Some of these were found feasible, but only one combination satisfied all physical, economic and safety requirements.

The committee recommends this combination, the "Limited Separation Plan," the six important elements of which may be briefed as follows:

1. WPRR main line kept in present location.
2. Underpasses for arterial streets.
3. Protection or vacation of other grade crossings.
4. Rectification of railroad grades.
5. Removal of all trackage from city streets.
6. Stage construction.

General situation

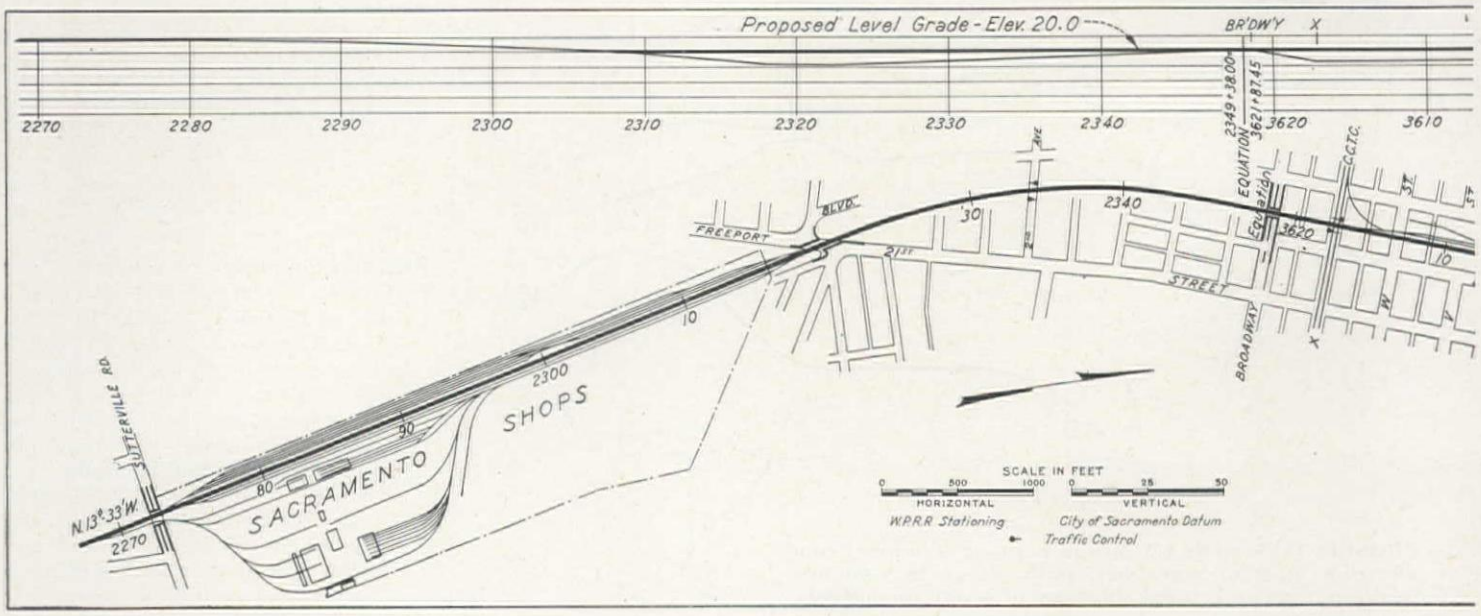
The city of Sacramento, located on the flood plain at the confluence of the Sacramento and American rivers, has grown outward so as to leave its commercial district at the confluence in its northwest quarter. The other three quarters are predominantly residential. It differs from most cities then, in two important respects: the topography is flat and the center of trade is in one corner.

Industry flanks the two rivers, served once by river boats alone and later by railroads terminating at the waterfront. As other railroads entered the city, industry developed in parallel strips.

Interconnecting the trade center, the industrial strips and the residential quarters is an outmoded pattern of streets. They form an unyielding grid in and around the trade center, from which similar grids have been appended along the old radial post roads. To expedite traffic from these radials to and into the grid, some relief has been obtained by designating certain streets as arterials, but without providing the requisite width to assure continuous flow at optimum speeds.

Consequently, a large proportion of the vehicular traffic continues to follow non-arterials for cross-town trips. Nearly every street in the grid is an important thoroughfare for regular traffic. This feature plays an important part in any proposal to eliminate delay where the grid is bisected by the railroad. The trend is toward greater congestion. Residential expansion to the east and southeast is swelling the flow of traffic over the WPRR main line, in spite of decentralization of shopping areas. Industrial

DRAWING BELOW shows route the Western Pacific Railroad takes through California's capitol city of Sacramento. Heavy lines



development along the railroad continues steadily.

The railroad complication

The main line of the Western Pacific, an important interstate and transcontinental link, bisects the city of Sacramento from north to south on a direct alignment. Such a location was a noteworthy engineering achievement because of obstacles in the path of the infant railroad. History shows that it was a popular location. The present unpopularity is not a consequence of location alone, but of complications which were foreseen and supposedly provided for in the franchise.

This franchise gave the city the right to require separation of any grade crossing on a divide-the-cost basis. It also stated that the main line grade was the railroad's option, with the provision that after ten years (from 1907) the city could move for determination of an ultimate grade.

Without implying that the city should have acted, it is pointed out that the rights to require grade separations and to determine ultimate grades have not been exercised, and that such inaction is also a factor in present complications.

In addition to the Western Pacific tracks, the period since granting of the original franchise has seen construction of a whole network of tracks along or crossing city streets at grade. These include the Northern Electric Co. and the Central California Traction Co.

These electric lines are part and parcel of the Western Pacific Problem, not only because the Western Pacific owns the Sacramento Northern (successor to the Northern Electric) and an undivided third of the Traction line, but because of the locations of the intersections at which freight cars are interchanged from one line to another.

Industry, restricted by zoning, has located in ribbon developments along the Western Pacific's main line and industrial spur, but has not been permitted along the electric lines in the city streets. This industry is light, so far, and flanked on each side with respectable residence districts. Although the hazard is always present, these residential districts have not degraded to slums; there is no "wrong side of the track." Real value of such property is another complication.

Of great importance is the situation of the railroad's yards, icing plant and main shops alongside the main line just inside the south limits of the city. Not only was this location popular, but the site was a public gift on condition that the shops be built and maintained there. This plant has become an important unit of the city's industry. Any relocation of the main line away from the plant will impair its utility to the railroad and risk removal of the industry.

Since 1910, numerous investigations have been made of the Western Pacific Problem, and reports rendered. One report, made in 1941 by the California Railroad Commission, was so thorough and proposed such logical corrections that the committee anticipated like conclusions unless signified changes had occured since 1941 in the interrelations of city to railroad.

The committee did find significant changes. It seems pertinent, therefore, to summarize the problem in two parts, separating these changes from the situation described in the latest report. They have been tabulated as follows:

Situation in May 1941

Some of the 24 street grade crossings "protected" by wigwags.

Traffic hazard nominal at all crossings.

Traffic delay moderate at 20 and serious at 4 crossings.

Some complaint of depreciation of abutting property.

Some complaint of train noise as a nuisance.

Trains restricted to 15 m.p.h. for 3 mi.

Relocation judged barely possible but uneconomic.

Elevating railroad judged desirable but uneconomic.

Automatic gates and signals at all grade crossings recommended as the best plan within the means of the city and railroad.

Public apathy toward gate protection.

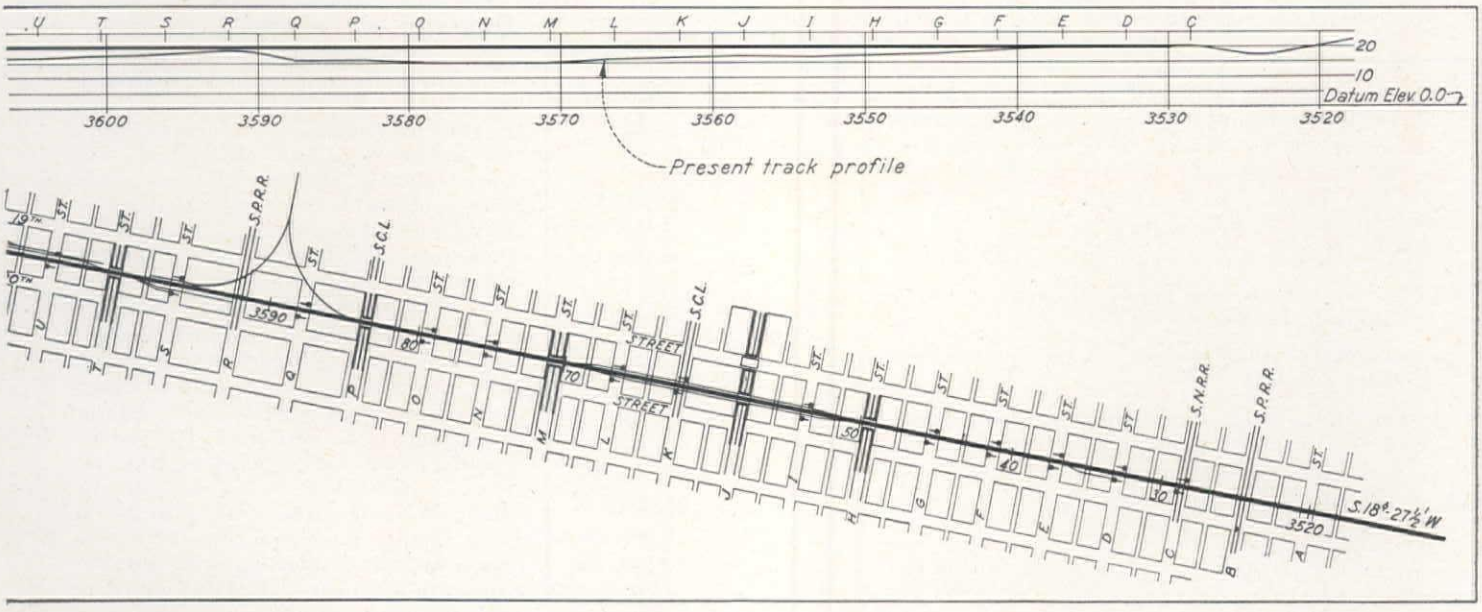
Changes since 1941 (partly due to war)

Rail traffic much heavier; passenger trains longer, freight trains longer and more frequent.

Expectation that rail traffic will not return to pre-war levels because of permanent population increases, agricultural expansion in the central

IN RECENT ISSUES, *Western Construction News* **has discussed various phases of the subject, "Publicity for Engineers." There are numerous ways to enforce the attention of the community to the activities of the profession or its individual members. But the method that will be greeted with the most interest, and engender the greatest respect for the technical man is the sincere, community-spirited performance of some real service for the people by the societies or the individual engineer.**

The Sacramento Section of the American Society of Civil Engineers, in a spirit of completely unselfish service to the city, spent 18 months in a thorough study of "The Western Pacific Problem," caused by the bi-section of the beautiful city by this railroad, considered several alternate solutions and finally has presented its recommendations. A condensation of the report is published here, both because of its engineering interest, and as an outstanding example of what the technical societies can do to improve the standing of the engineer in the community.



indicate the proposed grade separations and small symbols indicate gate installations. Existing and new profiles at top.

valleys and new processing plants in Sacramento.

Diesel power increasing on WPRR and SNRR.

Vehicular movement reduced in car-crossings but increased in passenger-crossings, during wartime dependence on public carriers; currently there is a return toward pre-war distribution and probability of greater volume.

Traffic delay now serious at 7 grade crossings, due to concentration of public carriers and some changes in arterial system.

Longer trains standing at the depot now block 3 streets at once, increasing length of detour.

More and longer trains approaching the yards has increased duration and frequency of delay at Broadway.

Industry along the WPRR main line is gaining steadily.

Prosperity of railroad and community has improved the ability (and probably the will) to purchase remedies.

Heavier rail traffic, prosperity and new elements of competition for WPRR and Southern Pacific has eliminated any likelihood of relocation by joint operation of SP track.

The railroad has expanded its shop and yard plants and added an office building in the depot block.

Increase of home-to-job distance is fostering demands for highspeed arterials.

Proposed remedies

In attempting to find such a solution, the committee has determined feasibility, effectiveness and cost of the proposals listed below. With each proposal is shown an approximate cost for rough comparison, based on 1945 prices. It being beyond the scope of the committee to determine such things as water table and rights of way accurately or to anticipate, for example, widths of underpasses to be adopted by the city, the costs were expressed as minimum and maximum limits between which the actual cost would probably be included. The costs shown in the following list are medians of the limiting costs.

	Median Cost
Relocation of the main line and shops of the Western Pacific RR (including capitalized rentals for joint operation, but excluding losses or removal costs sustained by industries and connecting railroads serviced by the existing location):	
a. To the east via Brighton	$4,700,000
b. To the west via Yolo County	4,100,000
c. Via alley between Front and Second	4,500,000
Protection of existing grade crossings at 24 street intersections (alleys to be closed)	150,000
Relocation of the passenger depot (not adjusted for exchange value of land)	100,000
Elimination of all grade crossings on the existing line (but the first two plans do not maintain all streets as thoroughfares):	
a. By depressing the railroad	10,000,000
b. By elevating the railroad	6,000,000
c. By depressing all streets	9,000,000
d. By depressing 8 streets and closing 19	3,500,000

Relocation not justified

Certain factors in relocation are so important that they may be listed as requirements. Briefly, they are:

a. New alignment so chosen that a similar problem will not develop on a new barrier.

b. Length of new line and operating time should not be increased without compensation.

c. Connections for freight interchange with other railroads should be equivalent to existing facilities.

d. On-line industry should be relocated on the new line or compensated.

e. Yards, shops and icing facilities must be joined effectively to the new line to prevent abandonment of this important local industry.

f. Territorial and operating advantages of competing railroads must not be upset.

g. Right of way must be acquired shrewdly to secure the new line at reasonable cost and obtain a fair price for the abandoned strip.

The first factor demands that the relocated line follow an existing barrier, such as the S.P.'s Stockton line on the east or the river boundary of the city on the west. Either location is physically possible, affecting 9 to 13 mi. of existing line and adding from one to three miles of distance. Because of increased speed, operating time over the main line would actually be reduced, so that the second factor can be satisfied.

However, the other five factors are so complicating that the committee eliminated relocation as impractical without estimating cost of all these contingencies. Obstacles to relocation have been gaining in number and permanence until it is certain the cost to all parties involved might even exceed the cost of separating all the intersecting city streets along the existing location. It cannot be done by state construction (although the committee did not agree that this was an obstacle).

Protection of existing grade crossings

Having determined that the solution lay along the existing line, consideration was given next to the recommendation made in 1941 that the 24 grade crossings be protected. Neither the public nor the railroad is satisfied with the wigwag signals now installed at some of the crossings. The railroad is still restricted to a speed of 15 m.p.h. There being no barrier, drivers are tempted to race the crawling trains to the crossing. The wigwags are activated by switching operations, so that drivers often find the warning just another call of "Wolf, Wolf!!" This fosters contempt and neglect for the warning.

For today's traffic habits, protection must include three elements—a physical barrier, a sound warning and floodlighting, each fully automatic. Such combinations are common in the East; where installed, trains are allowed to pass at high speed.

In Sacramento, modern protection would be a one-sided remedy. There would be little gain in safety, because the crossing-accident record is almost negligible. Trains could be accelerated to operational limits, eliminating all delay now endured by the railroad. But passenger trains would not be accelerated near the depot, so that there would be little reduction of vehicular delay at the H, I, J, K, L and Capitol crossings. Freight trains running in and out of the yards would cause the usual delays at the X, Broadway, 2nd, 21st and Sutterville crossings. With regular make-up, northbound freights would not be able to improve much on present speeds within the city.

Gate protection would increase vehicular delays due to switching operations, because gates cannot be passed like wigwags. Automatic crossing gates will not be satisfactory at crossings within warning distance of switching operations.

The committee is certain that the public would condemn such a solution as a backward step for the benefit of the railroad alone. As an independent solution, the proposal was eliminated. However, favor will be expressed for the protection of minor crossings in combination with the separation of others.

Depressed railroad plan

Next to relocation, the most desirable plan from many viewpoints is to hide the railroad by depressing it in a subway. Consideration was given to both a cut-and-cover tunnel subway and to an open subway. The tunnel subway had been proposed with the idea that a freeway or parkway could be developed on the cover slab. This was eliminated for the present as an expensive sequel to a first-stage open subway.

Grades of the 24 streets to be bridged over the subway could be raised only a few feet without interference at intersections with 20th Street and without impairing sight distance. To provide standard railroad clearances, the rail grade would be 5 ft. below sea level. Industrial sidings would have to be on long ramps or in spur tunnels or subways at sub-basement level. Ramped connections to the Q-R-Alley industrial

spur would close some streets in that area.

The cost is excessive. Estimates range from $8,500,000 to $11,000,000, depending upon location of the water table (not known to the committee) and practicability of lowering it temporarily or permanently by pumping. Since even the minimum estimate is beyond that of other remedies, the proposal was discarded.

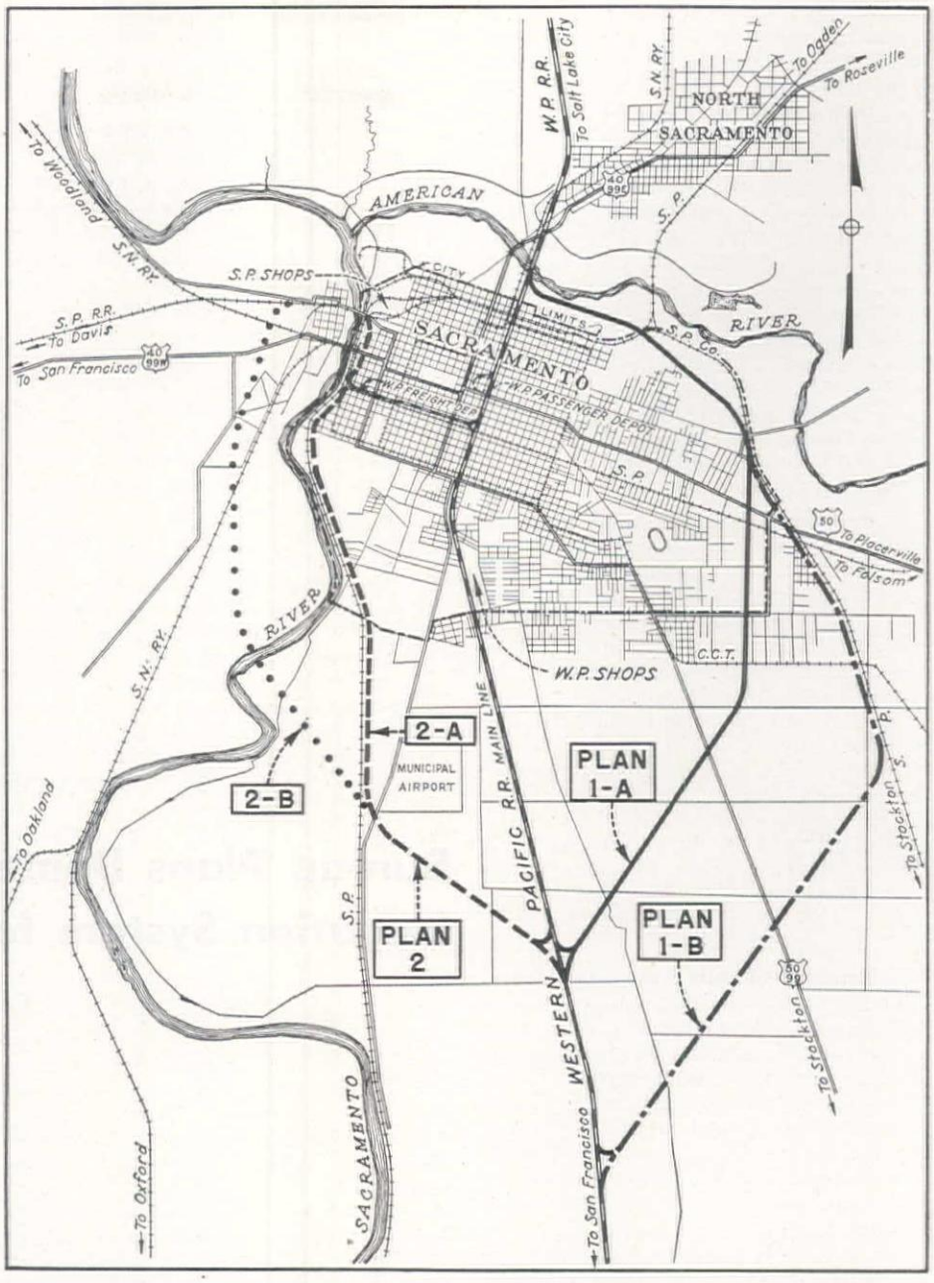
Elevated railroad plan

Instead of depressing the tracks 22 ft. in a subway, they could be elevated 12 ft. on an embankment or viaduct. The lesser grade change is explained in part by clearance regulations, being 14 ft. for highways and 22 ft. for railways. Also, for the highway bridge over a subway, a 5-ft. hump would impair sight distance, but a highway underpass can dip much more than that amount.

Industrial sidings could be regraded without much difficulty, but the connections between P and S streets to the industrial spur and to the S. P.'s R Street line do not permit much change of grade at R Street. Hence there would be two viaducts, one north and the other south of R Street, with ramps down to, or nearly to, existing grade at that point. Freight trains northbound from the yards would have to fight two inclines, canceling the benefit from removal of speed restrictions.

Noise is a potent factor. If the track were elevated on a trestle viaduct, the structure would be a sounding board, and noise would be carried in nuisance volume for as much as half a mile. Even if elevated on an embankment, objection will be made by property owners living within several blocks of the line. As a partial offset, there would be an end to noise generated at rail crosses at C, J, K, P and X streets.

The committee agreed that the elevated plan was still a possible solution and one that might prove advantageous to the city if it pursued its rights aggressively without regard for comparison of total cost to total benefit. This comparison being very unfavorable, the committee cannot recommend the plan.



MAP OF SACRAMENTO and surrounding area is overlaid with drawings of suggested remedies for "Western Pacific Problem" presented by engineer's committee.

Depot relocation plan

The most aggravating delays are caused by the blocking of J, K and sometimes I streets by passenger trains stopping at the depot. These stops are commonly for 10 minutes and occasionally for 15 minutes. Automobiles can detour, except when they cannot turn around in a traffic jam.

It has been suggested that the depot be moved to V Street, on land now owned by the railroad. Since U Street is not open to traffic and V Street is unpaved, delay would be limited to occasional blocking of W Street.

The idea has many advantages: low cost, relief from the most objectionable delays, relocation of depot near the center of population, access to without blocking the arterial network.

The committee believes the depot can be relocated for $100,000, that the plan is not a sufficient solution, but that it has advantages worth considering for a stop-gap solution or as part of a comprehensive plan.

Limited separation plan

By the process of elimination, the committee was led to a limited separation plan. In general terms, it is a plan to separate the more important crossings and to protect or close the others. This permits some choice in streets to be separated and streets to be closed and in the order of construction. These choices will be affected by trends of traffic and substitution of buses for street cars.

A fairly definite plan has been developed. Six essential items were briefed in the findings; with more detail, these items are:

1. **Acceptance of present location as final.** As long as proposals for relocation are encouraged, there will be reluctance on the part of railroad and city to spend any considerable sum for the relief of any part of the problem. Without waiting for expiration of existing franchises, the city may negotiate for extensions; perpetuation of location would be a factor of great importance in the negotiations.

2. **Underpasses for arterial streets.** At present the railroad is obligated to share in the cost of separations at 24 street and 23 alley crossings upon demand of the city. Since the whole obligation is uneconomic, there will be resistance to any partial demand. The obligation should be reduced to an indisputable and economic program, say at the following arterial crossings: H, J, Capitol, P, T, Broadway, 21st and Sutterville. For the first six, the obligation of the railroad is presumed to remain at half the cost, since right-of-way consideration is involved. For 21st and Sutter-

ville, there is no franchise obligation at present, so participation by the railroad would be determined by the Railroad Commission.

3. **Protection or vacation of other crossings.** In order to permit high-speed passage of trains, all non-arterial crossings must be fully protected or closed. Development of the ribbon area between 19th and 20th streets by light industry suggests that all alleys and R and U streets be vacated and reverted to abutting owners by city action. Ten or 12 other crossings, and particularly those adjacent to underpasses, might be closed and barricaded. The other 4 or 6 grade crossings left open and unseparated should be so effectively protected that trains could operate without speed restrictions.

4. **Rectification of rail grades.** A more uniform grade should be substituted for the "roller-coaster" that the WPRR built "temporarily" in 1907. It should be noted that the present railroad grade rises and falls about as follows: El. 17 under the B Street levee, El. 20 at D, 15 at N, 19 at R, 17 at W, 20 at Broadway, 16 at 21st and 24 at Sutterville. Hence, paradoxically, a train climbs 11 ft. northbound and 18 ft. southbound through the city. The total both ways could be reduced from 29 to 7 by establishing grade at El. 20 from C Street to the yards. This grade will reduce the cost of five of the suggested underpasses without creating blind spots at unseparated crossings.

5. **Removal of rails from city streets.** A policy of conversion from street cars to buses already announced by Sacramento City Lines will effect the removal of rails from J, K and P streets. Franchises for the rails on Alhambra, C and X streets should not be renewed. Necessity for these rails is largely for freight interchange, which can be effected by more suitable routes than the circuits through the city.

The line in R Street is not limited by franchise. In effect, R Street is not a city street and the city might profit by disposing of the public's interest. In any case, it is not proposed that rails be removed from this one street, because of the extent of industry served.

6. **Stage construction.** Although the success of the Limited Separation Plan as a solution of the Western Pacific Problem depends upon its adoption in toto and upon commitments to obtain all items ultimately, it lends itself admirably to stage construction, one unit at a time as finances permit. This cannot be said of the relocation plans, nor of the depressed railroad plan; even the elevated railroad plan cannot economically be divided into more than two major units.

The committee prefers not to recommend an order for the construction of the several units, except to point out that the Sutterville crossing should be last.

Benefits and cost of limited separation plan

This 6-point coordinated plan would end all reasonable complaints of delay. Rail traffic would move without speed restrictions; the level grade would help freight trains pick up speed for the northbound pull over the American River and to maintain speed for the southbound pull into the yards.

As for vehicular traffic, practically all could be routed through the underpasses without detour or delay. Drivers on urgent missions would avoid the grade crossings. The underpasses would define the arterial system and foster its rational development.

Noise would be reduced. Although trains would move faster, tracks would be smoother after elimination of five crosses and several switches. With promise of Diesel or turbine power and more streamlining, trains of the future will be comparatively quiet.

Cost of the plan (exclusive of removal of rails from city streets, but inclusive of damage to property along the underpasses) has been estimated as between $2,500,000 and $4,000,000, depending upon the degrees of safety and convenience to be built into the structure. The lower figure would provide a central underpass with two 15-ft. lanes and full clearance, flanked on each side with service roads and walks for the abutting property. The higher figure would provide a divided 4-lane highway through the underpass and service roads on land to be acquired.

Recommendations

The committee recommends adoption of the Limited Separation Plan in its general terms and urges careful consideration of detailed suggestions. Such details as appear in this report were presented to demonstrate practicability of the general plan, but no recommendation is made thereon.

No recommendation is made on the proposal for relocating the depot, except that it does not conflict with the recommended plan and will provide a large measure of relief pending construction by states of the full program.

The report is signed by F. W. Panhorst, State Bridge Engineer and newly-elected national director of the American Society of Civil Engineers, chairman of the committee, and by C. A. Ecklund, Stewart Mitchell, R. Robinson Rowe, Fred J. Grumm, A. G. Mott, Norwood Silsbee, Carl M. Hoskinson, Geo. G. Pollock, Jas. G. Standley, Jr., Carl Maughmer, Norman C. Raab, Edwin F. Sullivan, Gilbert F. Mellin, Henry M. Rich, members.

Bureau Plans Domestic Water Supply, Irrigation System for Idaho Region

A STABLE, EFFICIENT irrigation system and a safe domestic water supply has been planned for the Lewiston Orchards area, near Lewiston, Ida., according to a Bureau of Reclamation report on the project.

In announcing the plan, R. J. Newell, Northwest regional director of the Bureau of Reclamation, said the report would now be transmitted to the Governor of Idaho and to the Secretary of War for comment in accordance with the Flood Control Act of 1944. Following that it will be submitted to Congress and authorization sought for early construction of the project.

The million-dollar development calls for reconstruction of an old, wood pipe irrigation and domestic water system, now deteriorated beyond repair and inadequate for present needs, and the construction of needed additions to the system. Estimated costs, based upon 1940 prices, would be $997,000.

Irrigation features of the project would benefit 3,778 ac. of land. Distribution of water to the lands in the district is now subject to prolonged and frequent interruptions and to excessive losses due to failures in the system. In addition, the proposed development would provide a safe, approved domestic water supply for the present 736 users and have adequate capacity to serve an ultimate population of 4,000. The present domestic water, given a class 3 rating by the Idaho Department of Health, is delivered through the same system as the irrigation water.

The proposed project involves the replacement of the entire wooden flume distribution system with a welded steel pipe system for the irrigation works and an independent domestic water supply system consisting of a treating plant, clear water reservoir and distribution lines of Transite pipe.

Works proposed for construction in addition to the distribution system are an earth- and rock-fill dam to replace a timber crib structure, on Webb Creek, 11,016 ft. of 36-in. steel pipe to replace wooden flumes on Webb and Sweetwater Creeks, and 745 ft. of 27-in. precast concrete pipe, with concrete intake and outlet works, to replace a combination chute and siphon on Sweetwater Creek. The dam will have a maximum height of 35 ft., a crest length of 115 ft. and a spillway with a capacity of 2,200 sec. ft.

Buffalo Bill Honored

BUFFALO BILL DAM and Reservoir in Park Co., Wyo., received their name officially last month when President Harry Truman signed legislation changing the name of Shoshone Dam and Reservoir.

Sen. Robertson, author of the resolution making the change, and Sen. O'Mahoney, both of Wyoming, were present at the signing, and Sen. Robertson received the pen used in signing the legislation from the President.

This is the 100th anniversary year of Buffalo Bill, who was born William Frederick Cody.

HOW IT WAS DONE

JOB AND SHOP TIPS FROM THE FIELD EDITOR'S NOTEBOOK

Macco Co. Machine Excavates, Trims Canal in One Run

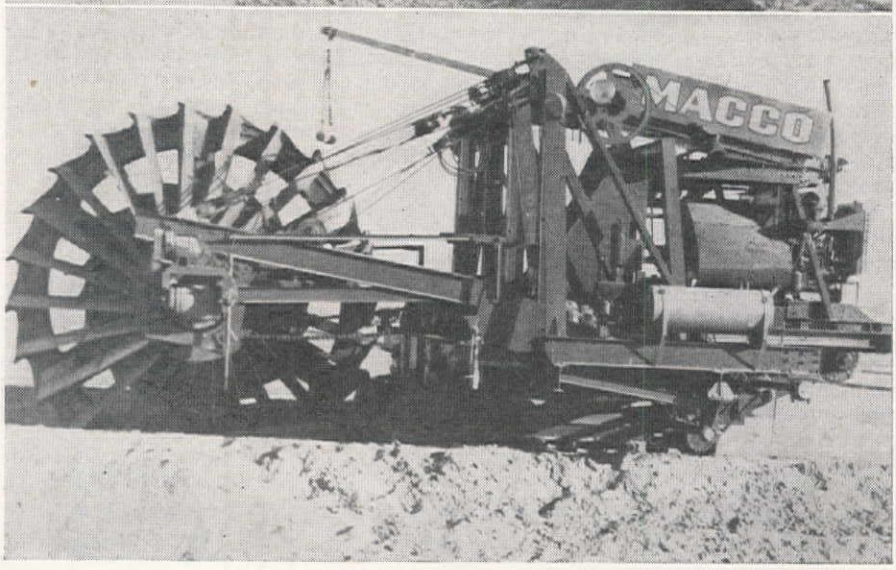
LATERAL CANALS on the Yuma Mesa Division of the Gila Project in Arizona are completely excavated and neatly trimmed all in one operation by a rig that Macco Construction Co. of Clearwater, Calif., has developed.

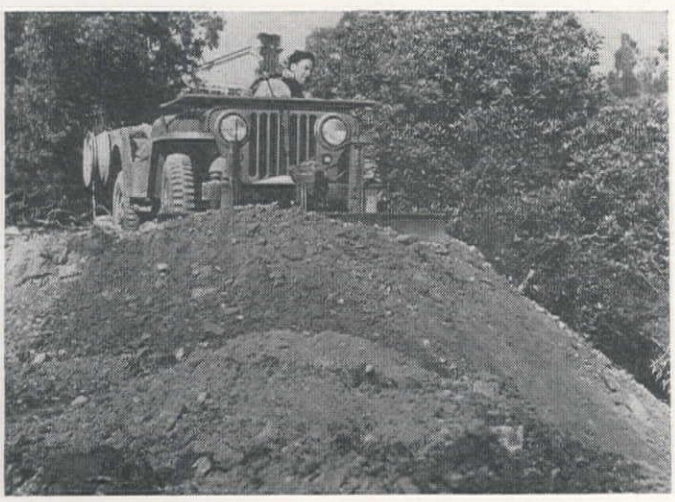
Hanging from an adjustable frame carried on a crawler-mounted bed, a double conical drum digs the canal with edges that conform to the outlines of the canal prism. A head-on view of this cutting drum is shown at top. A big engine provides the power for propulsion and excavating and a gas-driven generator furnishes current for electric lights and motor-operated belts that discharge the spoil from the interior of the drum to either side of the rig. At lower right is a side view of the machine—its main power plant at far right, and the side discharge belts leading from the center of the cutting drum, at left.

Near Yuma, operators moved the rig over previously-compacted embankments, and in one pass left bottoms and sides of the cuts ready for Gunite lining. The depth of a cut can be varied up to 5 ft., with a corresponding variation in top width up to 15 ft., by means of the cable-controlled adjustable frame. The big propelling engine is in the exact middle of the front end of the main frame. A small engine to its right drives the electric generator, and crawlers are independently driven for steering.

The Bureau of Reclamation awarded the contract for lining the lateral canals with Gunite last November to Macco for $146,860.







LOS ANGELES CONTRACTOR USES JEEP IN BUILDING

Destined to play its part in the nation's housing program, this Jeep is shown performing as a combination bulldozer and grader on terrain marked by steep grades and sharp angles, which requires an unusual amount of earth moving for the little four-wheel-drive vehicle. Contractor Rodney Walker of Los Angeles, Calif., is using the Jeep on construction of his own home, and after the grading is finished, will use it as a light truck to haul supplies and equipment, and for other building purposes. A number of Jeeps are being sold as war surplus, and the Willys-Overland Motors Co. is turning out new machines for civilian use.

NEWS OF WESTERN CONSTRUCTION

MAY, 1946

Water Exchange Program Outlined for Central Utah

CLIMAXING YEARS of study, survey and research, a comprehensive $300,000,000 project to provide additional water and power for Utah's most heavily-populated sections has been drawn by the Bureau of Reclamation's Region Four headquarters and has been transmitted to Washington.

To be known as the Central Utah project, the proposed reclamation-power project involves construction of a 6,500,000-ac. ft. reservoir in western Colorado, enlargement of the Strawberry Reservoir in Utah, 450 mi. of aqueduct, including more than 100 mi. of tunnel, and 380,000 kw. of electric power capacity. The $300,000,000 cost estimate is based on 1940 prices.

For years Utah water engineers and Bureau of Reclamation officials have studied ways and means of getting water from the Green River, a Colorado River tributary, to central Utah. At one time the possibility of pumping the water over the mountains was considered, but the power cost was prohibitive. Tunneling through the mountains was then considered, but again the cost appeared prohibitive.

Basis of the new project, which has been stamped "feasible" by the regional Reclamation office, is an exchange of water betwen reclamation areas. Water from the Green River would be given to water users in the Utah Uintah Basin in return for Uintah water which would be diverted westward at an 8,000-ft. elevation, thus eliminating the need for pumping.

Key storage reservoir of the project would be the Echo Park dam on the Green River just east of the Colorado-Utah border. The reservoir would be of 6,500,000-ac. ft. capacity, of which only approximately 300,000 ac. ft. would be used in connection with the Utah project. It is estimated that the dam would provide 145,000 kw. of power capacity.

Approximately one-fifth of the power output would be utilized to provide a 130-ft. pumping lift which would allow the 300,000 ac. ft. to flow by gravity into the Uintah Basin in eastern Utah. This Echo Park water would be diverted through an aqueduct from the reservoir to a water storage area at Starvation site, near Duchesne. The aqueduct would be approximately 132 mi. long, including 18 tunnel sections totaling 31 mi.

With this water having been assured for the Uintah Basin, water previously used by the basin would be made available for central Utah. To obtain this water without pumping, an aqueduct, mostly tunnels, would be run along the south slope of the Uintah Mountains at an elevation of 8,000 ft., picking up water from tributaries of the Green and Duchesne rivers and diverting it westward to Strawberry Reservoir.

The aqueduct from the Uintah Mountains to the Strawberry Reservoir would be approximately 100 mi. long, 90 mi. of which would be tunnels constructed in 19 sections, the longest not over 10 mi. The aqueduct would be progressively larger as it crossed more streams, with a capacity of 2,500 to 3,000 sec. ft. by the time it reached Strawberry Reservoir.

To provide storage space for the water, Strawberry Reservoir, which now holds 265,000 ac. ft., would be enlarged up to 2,000,000 ac. ft. by constructing an earth-fill dam 300 ft. high and 1,500 ft. long at Soldier Creek on Strawberry River ten miles downstream from the present reservoir. Water from the reservoir would be diverted through another line about 20 mi. to the Spanish Fork River where it would divide, one canal running to Provo and the other running 66 mi. to the Sevier Bridge reservoir. From there, a gravity canal 97 mi. long would run southward to Kanosh, supplying water to 74,000 new acres and supplemental water to 20,000 ac.

It is estimated that 15 per cent of the repayment costs could be borne by wa-

EARTHWORK UNDERWAY ON MEXICO EARTHFILL DAM

SANALONA DAM on the Tamazula River near Culiacan, Mexico, is under construction by Morrison-Knudsen de Mexico, S. A. American earth moving equipment on the job include the Bucyrus and Euclid shown below. The dam will be 2,600 ft. long, 220 ft. high, and will contain about 5,000,000 cu. yd. of fill. J. D. McCLARY is general superintendent for the contractor; J. GUERRERO ALCOCER is project manager.



ter users, leaving 85 per cent to be repaid from power sales, reclamation officials said.

Major points of power production would be at Echo Park and at four points on Diamond Creek between Strawberry Reservoir and the mouth of Spanish Fork canyon. Smaller power plants would be located at the Sevier Bridge reservoir and at points along the aqueducts where power might be needed for pumping. The Central Utah project would tie in with proposed Bear River development in northern Utah inasmuch as it would allow water now used by the Utah Power Co. to be diverted, with the power thus lost being replaced by power developed at the new project.

First Bids Opened on Willamette Valley Dam

ARMY ENGINEERS opened bids at Portland on May 14 for a million-dollar contract in connection with Dorena dam on the Row river in Lane County, Oregon—one of the seven proposed dams in the Willamette valley flood control project.

Two of the seven dams — Cottage Grove and Fern Ridge, also in Lane County — are already in place. Preliminary work was started on Dorena dam prior to the war, under contract to E. C. Hall and McNutt Brothers, Eugene, but the contract was cancelled and the work halted.

In announcing the pending contract, Colonel O. E. Walsh, District engineer, pointed out that it was the first major construction project to go out for bids in the Porttland District since the war.

The contract will involve relocation of the Oregon, Pacific and Eastern railroad, market road No. 30 and the Cottage Grove municipal water supply line leading from a reservoir in the vicinity of Dorena. It will also include construction of a county road on the left bank of the stream and construction of borrow area drainage facilities. The building of one highway bridge and two railroad spans is included in the relocation work.

Walter A. Schwarz, resident engineer in Eugene, will be in charge of the work at the dam site. A contract for erecting an engineers' office building and constructing access roads was awarded Apr. 1 to Tauf Charneski, Leaburg, and this contract is now under way. The completed cost of Dorena dam is estimated at from $5,000,000 to $6,000,000.

John Savage Reports on Palestine Hydro Plant

JOHN LUCIAN SAVAGE, internationally-famous engineer, who designed Grand Coulee and Boulder dams, and more recently blueprinted the Yangtze Gorge Project for China, appeared last month before the Anglo-American Commission in Jerusalem, to outline technical plans for water-resource development for the Holy Land based on a report which he prepared last year. On loan to the State Department, as a specialist under their Cultural Cooperation Program, the former chief designing engineer for the Bureau of Reclamation spent 14 months in the Far East in 1944-45.

In addition to special studies of irrigation and hydroelectric power development projects which he made in China, India and Afghanistan, Savage spent several weeks in Palestine, where he examined sites proposed for irrigation and hydroelectric development by the Commission on Palestine Surveys. James Buchanan Hays, chief engineer for the commission, had spent about two years in studying and mapping the projects prior to Savage's visit.

Savage was asked to discuss the Palestine projects at the first meeting of the Anglo-American Committee of Inquiry held in Washington, Jan. 12, and he has now been requested to attend the Jerusalem hearings to present further views on the engineering phases of water-resources development in the Holy Land.

He returned to Denver in April to continue work as consulting engineer to the government of China on the Yangtze Gorge and tributary projects.



SEATTLE ENGINEER WINS AWARD

COL. CONRAD P. HARDY, district engineer of the Seattle District, U. S. Army Engineers, receives the Legion of Merit medal from COL. THERON D. WEAVER for supervising the military construction program and supply assignments of the Seattle area from Dec. 1943 to Dec. 1945. Under Colonel Hardy's supervision a $200,000 construction program covered Montana, north Idaho and most of Washington. He directed military design and supply for Alaska, supervised manufacture of war lumber items, and administered special supply assignments including reclamation of engineer equipment returned from use overseas.

Accident Records Improved in 1945

APPROXIMATELY two million workers were disabled during 1945 as a result of work injuries, Acting Commissioner of Labor Statistics A. F. Hinrichs reported in summarizing preliminary estimates prepared by the Bureau of Labor Statistics. The injury total is about 10 per cent below that of 1944, which was the first year to show a reduction in work injuries after a constant upward trend since 1938.

"The total actual time loss caused by disabling work injuries during 1945 is estimated at about 41¼ million employee-days. This is about 2¼ million days less than the corresponding estimate for 1944, a very gratifying gain. In part, this was due to a decrease in employment and in part to a definite improvement in the injury experience of a number of major industry groups, most notably in manufacturing. But, even so, this time loss represents the equivalent of full-time employment for an entire year of 137,000 workers.

"This figure makes no allowance for the more serious effects of deaths and permanent impairments. If the standard allowances are made for these disabilities, the total economic time loss reaches 218 million days, or the equivalent of full-time annual employment of 725,000 employees.

"The 1945 injury count indicates that about 16,000 workers were killed at their jobs and that another 84,500 were permanently impaired. Of these, 1,800 were estimated to be so seriously injured as to be unfit for any future industrial employment. The main bulk of the 1945 injuries, as is always the case, consisted of temporary disabilities. There were about 1,900,000 of these injuries.

"The most notable decrease in the number of work injuries was experienced by the manufacturing group. With about 200,000 fewer injuries than in 1944, the decrease amounted to 27 per cent, only partly due to the employment decline of about 12 per cent. In mining and quarrying, government and miscellaneous non-manufacturing industries, injuries decreased by 10 per cent.

"Other major industry groups, however, showed increases. Greater activity in construction led to a 12 per cent increase in injuries. Public utilities, wholesale and retail trade, railroad and the miscellaneous transportation industries increased by smaller amounts."

Estimated Number of Disabling Injuries During 1945, by Industry Group

Industry Group	All disabilities	Fatalities	Permanent-total disabilities	Permanent-partial disabilities	Temporary-total disabilities
Totals	2,002,800	16,000	1,800	82,700	1,902,300
Agriculture	305,600	4,500	400	15,300	285,400
Mining and quarrying	82,100	1,500	200	3,600	76,800
Construction	112,200	1,700	100	3,400	107,000
Manufacturing	574,600	2,700	300	25,300	546,300
Public utilities	20,300	400	5	600	19,300
Trade	296,000	800	100	7,100	288,000
Railroads	94,100	1,100	400	6,500	86,100
Miscellaneous transportation	139,900	1,000	100	4,200	134,600
Services, government, and miscellaneous industries	378,000	2,300	200	16,700	358,800

Muskrat Trap Rights to Pay Part of Water Costs

COSTS OF WATER to farmers in the Truckee-Carson Irrigation District of Nevada have been reduced $2,932.39 by revenue received from lease of muskrat trapping rights on Newlands Project lands near Fallon, Nev.

The district received this revenue, a minor portion of its income, from two lessees, Herman Johnson and Harold Peer, during the trapping season from Nov. 15, 1945, to March 15, 1946. Johnson paid the district $681.40, 40 per cent of his total selling price of $1,703.50 for 782 muskrats. Peer paid $2,250.99, 42 per cent of the $5,359.50 he grossed on the sale of 2,385 muskrats.

The Truckee-Carson Irrigation District got jurisdiction of this land in 1926 when it took over operation and maintenance of the Newlands project, constructed by the Bureau of Reclamation.

Canadian Road May Traverse Flat Land in U. S. Territory

CONSTRUCTION OF a road through United States territory, about 40 mi. long and running into the U. S. to a maximum depth of five miles from the Canadian border, is being pushed by Associated Boards of Trade of Southeastern British Columbia. The purpose of the road is to eliminate the two 5,000-ft. summits on the Southern Transprovincial Highway between Rossland and Cascade.

The present road over the summits has, during the war years, been closed to traffic during the major part of each year, owing to deep snow and washouts on the gravel road. And driving over the route at any time of the year is not pleasant, owing to the many hairpin turns necessitated by the steep climbs up the mountain sides.

The proposed road will be routed on relatively flat ground and runs through Colville National Forest in Washington. The present dirt road is in good condition.

Swinging off on the Rossland side from Paterson, the road will follow Sheep Creek for a short distance. It will then swing southward, past Elbow Lake, and westward to Box Canyon, passing Box Lake and Summit Lake en route. The road will enter Canada again at Laurier.

OBITUARIES . . .

Richard H. Dearborn, 72, dean emeritus of the school of engineering at Oregon State College, died recently in Providence hospital. Dearborn pioneered the electrical engineering department at the University of Oregon in 1901, and became head of that department at Oregon State in 1914. He authored a number of technical articles, and was affiliated with the American Institute of Electrical Engineers, Northwest Electric Light and Power Assoc., Society for Promotion of Engineering Education, and the Thomas A. Edison Memorial Foundation Commission.

Lt. Col. James B. L. Macdonald, well-known in railway and engineering construction circles, died at his Vancouver, British Columbia home. For 12 years prior to his death he was in the Department of Public Works in the Fraser River canyon section. Previously he was superintendent of construction on the Grand Trunk Railway from Hazelton to Prince Rupert for the firm of Foley Bros., Welch & Stewart.

* * *

Claude W. Sopp, assistant city engineer and chief of the Pasadena, Calif., municipal water department, died March 31, following a three months' illness. Sopp did work in planning and construction of the Morris Dam in San Gabriel Canyon, had been associated with the Southern California Edison Co., with the U. S. Geological Survey, and was vice president of the Los Angeles section of the American Society of Civil Engineers.

* * *

Harvey A. Gibson, 37, rigging crew member at Anderson Ranch Dam in southern Idaho, died in a Boise hospital March 23 of injuries suffered when he was struck by two cables after a boom collapsed during the movement of heavy equipment. Nick Nixon was injured at the same time and has recovered.

* * *

Barnard Ransome, 72, construction engineer and president of the Ransome Co. of Emeryville, Calif., died April 23 at his Diablo home following a week's illness. Ransome was active in helping to rebuild San Francisco after the 1906 fire and earthquake.

* * *

John Chambers, 82, early-day contractor of Great Falls, Mont., died April 21. Chambers came to Great Falls as an employee with a construction crew when the first rails were laid to the city. Later he helped build the first wagon bridge over the Missouri, and still later built the first school in the city.

* * *

Merrill R. Deakin, 58, Denver contractor, died April 1 after a heart attack. After serving in World War I Deakin began to work as a contractor on Colorado road projects. He was a member of the Colorado Contractors Association.

* * *

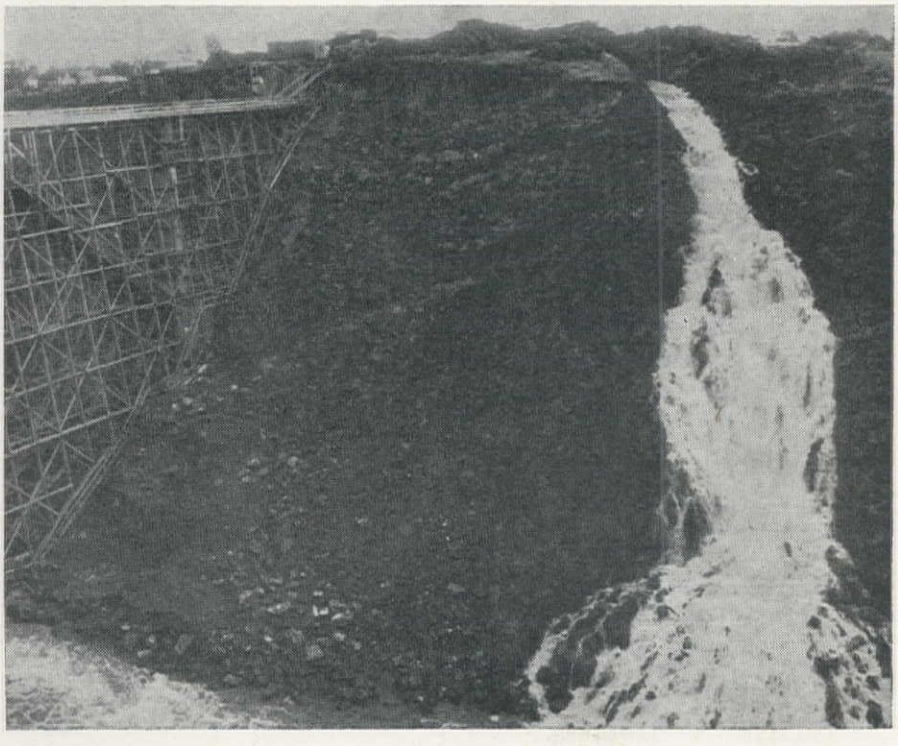
George R. LeBaron, 65, right-of-way and claims agent for the Metropolitan Water District of Southern California, died March 31 in Los Angeles. LeBaron obtained the right of way for the 410-mi. Colorado River aqueduct.

* * *

Thomas F. Ingram, 69, building contractor of Los Angeles, died March 30 at his home.

WATERS OF DESCHUTES AND CROOKED RIVERS JOINED BY PROJECT

WHILE TESTING the new canal which will convey 1,000 sec. ft. of irrigation water from the Deschutes River in Oregon to 50,000 ac. of land in the Bureau of Reclamation's Deschutes project, the water was discharged through a temporary outlet into the Crooked River. An imposing concrete flume, shown under construction by McLaughlin Construction Co., will eventually carry the water across the latter stream.



WASHINGTON NEWS
. . . for the Construction West

By ARNOLD KRUCKMAN

WASHINGTON, D. C.—The law Congress made intends "that the portion of appropriations or allocations invested in the power features of (irrigation) projects shall be fully amortized and repaid within 50 years with interest at the rate of 3 per cent per annum." This is the sense of Section 9(a) of the Reclamation Act of 1939. The Solicitor of the Department of the Interior disagreed with Congress. He formally promulgated an opinion which interpreted the sense of Congress to be that commercial power rates shall be fixed to return each year sufficient to repay: (1) operation and maintenance, and reserves for replacement as long as there is a power plant; (2) three per cent of commercial power investment, but no return of principal, no time limit fixed within which the commercial power investment must be repaid, presumably the useful life of the property; (3) and that the intent is to apply the annual return from the three per cent of the commercial power investment to liquidate the excess irrigation costs, over and above those charged against the irrigator, rather than payment of the interest charges invested in commercial power. The Solicitor holds no amortization is required of the principal invested in power.

The law as remade by the Solicitor aroused Congress. Discussion on the floor of the House on Nov. 29, last year, elicited these sentiments from members of the Sub-Committee on Appropriations for the Interior: "I am for reasserting in the Appropriation Bill the actual basic law," declared Congressman Jones of Arkansas. "It is not an issue of writing new legislation in the bill. The point at issue is that portion of the appropriations or allocations invested in power features of such projects shall be fully amortized and paid in 50 years, with interest at 3 per cent. That is basic law."

Congressman Norrell of Arkansas said: "As a member of this committee, I concur in the position taken by the gentleman. The Department should comply with the organic reclamation law and not depart therefrom because of some erroneous opinion. I hope that between now and next Spring that matter will be remedied, either by the legislative committee or the Department of the Interior."

Congressman Jones added: "As far as I am concerned, I do not intend to vote for any more reclamation appropriations as long as the Department of the Interior distorts the law by curbstone legal opinions. I have been very liberal in voting for such appropriations, but I shall not vote for another one until the Department of the Interior observes the law."

1947 Reclamation budget

The decision of the Appropriations Committee on the budget for reclamation for 1946-1947 was due to be reported to the House in March. The report was delayed in expectation of a settlement of the controversy. The President, and Bureau of the Budget, recommended an appropriation of $165,000,000 for the reclamation program, one of the largest ever contemplated. Congress, generally, was predisposed to be liberal because a number of essential projects had necessarily been postponed during the war. The feeling was strengthened by the exemption of the construction of dams, irrigation projects, utility services, and similar undertakings closely allied to reclamation in the West, from the drastic restrictions of the building order recently promulgated by CPA.

The word has come from the Hill that the Appropriations Committee will make its report to the House soon. The absence of any decision about the conflict with the Department of the Interior brings via the grapevine the information that the Reclamation budget will be cut absolutely to the bone. In effect, it is expected new projects will, mainly, be denied; apparently the $165,000,000 program will be cut to less than $80,000,000, possibly below $70,000,000. It is true this will reflect solely the sentiment of the House Committee. Those interested in the Reclamation budget unquestionably will appeal to the Senate Committee to reinstate some of the deleted appropriations. Whether or not it will be possible to spur the necessary enthusiasm in the Senate, and whether or not the Senate can persuade the House to accept reinstated items, is a problem only the eventual results can demonstrate.

The issue between an administrative department and the Congress has never before been joined in such a pitched contest. In effect, if not in precise words, the Department of the Interior insists that it has the power and the authority to apply the law made by Congress as the Department sees fit. Congress, in theory, and in fact, makes the law which the people, who pay the taxes and who are the United States—the ultimate government—demand. The Department, in effect, feels it is empowered to define what the people mean, as their wishes are expressed in the law made by Congress. Many sincere and earnest public officials are convinced the hydra-headed public—which provides the taxes—has the average mentality of a child of 7. During the war a very eminent career official proclaimed this judgment as the precipitate of long experience. It is natural that from this state of mind would stem the conviction that the people must have paternal guidance.

Who is the government?

Not only the West, and its pressing Reclamation program, but the policy of the Government of the United States is involved in the decision the Irrigation and Reclamation Committee of the House makes in its report on H. R. 5124, introduced by Congressman Robinson of Utah. The bill itself, which unequivocally reiterates the 50 years' amortization and 3 per cent annual interest exaction incorporated in the Reclamation Act of 1939, is less important than the discussion which it has launched before the Committee, and the spirit of those who participate in the discussion. The current Commissioner of Reclamation, Mike Straus, on April 4, made a statement to the Committee which, in spirit and words, is an epitomization of the attitude of the administrative departments to the Congress. Roughly, the Congress is the board of directors of the business known as the United States. The departments are the agencies employed by the board of directors to effectuate its purposes.

In the statement prepared by Straus, an employee of Congress, he says: **"The Bureau is opposed** to the attachment to the Robinson bill of any riders having to do with the charges for the sale of Boulder Canyon power, etc." Later he stated: **"The Bureau and the Department will, I feel sure, not oppose consideration by this Committee** of a reduction in the interest rate pertaining to the Boulder Canyon project." In another part of his statement he served notice on Congress that "if the Bureau's position is rejected, there will be fewer feasible new irrigation projects in the West." In discussing a certain phrase used in drafting H. R. 5124, Straus graciously says: "I would be perfectly happy to have that phrase eliminated." The element which irks the Congressmen is the attitude of a sovereign condescending authority. It sounds like the dictum handed down from Mt. Sinai.

The Straus statement is extremely adroit, and tends to make the Western water users wonder if it is true "low-cost water and low-cost power are inseparably linked" by the perpetual subsidy for power from the annual 3 per cent to be paid upon money invested in the power features of irrigation projects, and which are not to be repaid. Floyd O. Hagie, of the National Reclamation Association, told the Committee the plan suggested by Straus would throw the burden of repaying the interest upon all the taxpayers of the nation, who thus would subsidize the projects, by establishing a national subsidy to power rates in the West. "If the Solicitor's opinion is applied on the Grand Coulee project," declared Hagie, "the subsidy to power on that project alone would amount to over $70,000,000 during the next 50 years."

Straus implied the law now requires that the interest revenues be applied to amortize irrigation costs. Challenging the claim, Hagie brought out an interesting situation: "The Solicitor's interpretation, though rendered in 1944, has

never been put into effect definitely on any project. However, the Department (of the Interior) is playing with the idea on the Grand Coulee project, where, under Executive Order No. 8526, they are keeping two sets of books, one set in accordance with the Solicitor's opinion, and one set in accordance with the original intent of Congress under the 1939 Act; they are waiting the decision of this Committee to determine which way to jump."

The Central Valley

There are those here who see in letters recently written by the President to leaders Sen. Alben Barkley and Congressman John McCormack, the persuasive literary skill of Reclamation Commissioner Straus. The letters, a series of two or three, deal with the conflicting duties of the Reclamation Bureau and the Army Engineers. H. R. 5400 apparently precipitated this instance, which may become an incident, because, over his own signature, the President urged upon the leaders of the Democratic Party in Congress that the activities of the Army Engineers in connection with the Kings and Kern River projects, should give way to the Bureau of Reclamation. There are substantial items in H. R. 5400, assigned to the Army Engineers, which the President, like Commissioner Straus, thinks should be deleted.

If the projects are developed under the supervision of the Army Engineers, the fruit of the works would be available to some of the great land holdings in the vicinity of Bakersfield; and the service of the water would presumably have no strings tied to it. The President apparently was sold the idea because he makes clear in his letters that he is convinced the projects should be assigned to the Bureau of Reclamation for the reason that the work done under the Bureau supervision would be a reimbursable charge upon the landowners for the stored water. The proposal has been in suspension for several months, waiting upon the opinion of the Governor of California. There is every indication that the Bureau of Reclamation, with the aid of the President, intends to make an issue of this problem concerning the Pine Flat and the Isabella dams. The so-called Presidential letters have not yet been published by the Congressional leaders.

Downey explodes

The debate obviously ties in with the protracted controversy over the question whether new farm lands under Reclamation irrigation projects must be restricted to 160-ac.-per-person ownership; reverberations here indicate that considerable stormy political water is ahead, so far as this question is concerned. Sen. Sheridan Downey, somewhat like the apocryphal Nero Wolfe, seldom goes visiting. But the other day he, and Congressman Alfred J. Elliott, of Tulare County, in the heart of the Central Valley, called upon the new Secretary of the Interior, Julius Albert Krug. Sec. Krug apparently thought it would be pleasant for Commissioner Straus to participate in the visit. There is no doubt that Downey was pleased to find the Commissioner present.

The Senator seldom explodes; but it is reported on this occasion he minced no words in telling Straus that he considered him responsible for the unhappy situation in California, which concerns the 160-ac. restriction controversy; and, in simple California argot, let him know what he thought about the meddling which had precipitated an extremely thorny political imbroglio. They say the Secretary also was very peevish, leaving no doubt in the Senator's mind that the Secretary hitherto had misunderstood the situation, and had had an entirely different conception of the situation. The Commissioner is said to have said very little. There are circumstances when words are useless.

All this, and the recent outspoken comments about the Commissioner by various engineers, and different engineer groups, must be distressing to Straus. The engineers make no secret of the idea that they think it would be wisdom for the Secretary to find a new head for the Reclamation Bureau. It is reported the thought prevails even among engineers in the Reclamation service. It is not clear what the Secretary thinks. The general impression is that he will go slowly, and will take his time in finding new people. Those who know him best appear to think it will be six months or a year before any radical changes are made.

LATE WIRE

E. F. SCATTERGOOD, of Los Angeles Department of Water and Power, is here negotiating re-adjustment of entire Colorado River Compact to meet Southern California's need for more water, according to reliable sources. He already is fighting project on Gila River and projects in Texas, and apparently intends to fight all plans for new projects on Colorado River tributaries. There are more projects than water in Colorado tributaries, and program patently requires adjudication of water claims old and new. Mexican Water Treaty allocations apparently will be involved. Congress will not support any more projects in basin until states settle division of water. Scattergood has spent considerable time to enlist sympathetic support of Reclamation Bureau and Interior Secretary. He is reported campaigning to align other states and that a greater interstate fight is in prospect than that over original compact.

Roughly, 1,200 compliance agents are in field for CPA checking lumber and other building materials black markets. Compulsory allocations officially discounted but actually expected. Off record, CPA intimates Building Order tougher to operate than anticipated. Present low of 25 billion board feet of lumber annually will rise to 35 billion by end of year unless more strikes interfere. Upwards of 1,200 strikes are now formally certified immediately ahead and more coming by Fall. This second wave, in substantial industries, programmed to be followed by a third late in summer extending through to winter, settling jurisdictional fights between unions.

Floyd O. Hagie, secretary of National Reclamation Association, has resigned, effective June 1, to become secretary-manager of Seattle Chamber of Commerce. . . . The Federal Airport Bill is before President for signature, probably will be signed by time this appears.

The drive against Reclamation Commissioner Straus by engineers on his own staff, plus organized engineers, has reached such proportions that committees of engineers will lay formal protests before Interior Secretary. Krug apparently must fire Straus, or Straus must undertake wholesale firing of engineers in field. Director of Budget in writing protested Straus' support of policy to abandon 50-year amortization plan.

Columbia Valley Authority

The Columbia Valley Authority bill is scheduled for hearings before the Senate Commerce Committee late in June. The Committee is headed by Sen. Bailey of North Carolina; it includes such conspicuous patriots as Sen. Bilbo of Mississippi, and Sen. O'Daniel of Texas. Sen. Vandenberg of Michigan and Knowland of California are members.

The bill introduced by Sen. Mitchell of Washington will be considered. Two days have been allotted to the proponents, and two days to the opponents. This is the tip-off that hearings, as presently planned, will be perfunctory. They tell us here that Mitchell will have a tough fight for re-election; and that the hearings are designed chiefly to give him campaign material. As Washington sees it now, the CVA has no immediate hope of realization; especially since the senior Senator, Warren G. Magnuson, thinks it is a mistake to press it now. There has been overwhelming opposition from the farmers, water users, and business men of Washington State.

The housing program

Wyatt, Bowles, the Congress, and the contractors and material producers, and, finally, the prefabricated houses manufacturers, plus an assorted lot of participants, are the factors which still make the proposed housing adventure a big interrogation point. Bowles is considered the real brains and brawn behind the drive, and Wyatt the selling showman. The opinion here is that the whole program may still, conceivably, be knocked galley west, if Congress does not enact the proper law. At present, Wyatt is the czar of housing, with

powers to grab anything anywhere to make the program work. He can make prices, and he can push aside the CPA. It remains to be seen if the prospective law will perpetuate his powers. The impression here is, in the final showdown, Wyatt will be boss of CPA, and that Bowles will be boss of Wyatt.

If things don't go into a stall, it is expected the home construction will be under three billion dollars by the end of 1946; industrial construction is estimated at not more than $825,000,000; commercial construction, under $600,000,000. Here, in the East, the contractors are going along with the jobs that were underway, and do not expect to even make much effort to do anything until July or August. If the Department of Interior experts do not interfere, it is expected the West may have a real boom in the types of heavy construction that are exempt. Prefabs are regarded as the possible exception to the general paralysis. If they can get materials and capital, overcome consumer and union resistance, and secure a breakdown of building codes restrictions, it is calculated the 70-odd prefab factories may conceivably produce the 850,000 structures within the two years Wyatt has programmed. The word in the Capital is that very little substantial construction has stopped; and apparently many builders and contractors either do not know, or do not wish to know, that the law or order is yet completely in operation.

Utah Builders, Labor Start Meeting Series

UTAH BUILDING CONTRACTORS and American Federation of Labor building trades representatives met at Pleasant Grove, Utah, last month to discuss building problems in the intermountain area and draw up resolutions.

The meeting was the first of a proposed series for the purpose of discussing ways and means of common understanding of problems facing contractors and building trades leaders, and for setting up some bases for maintaining harmonious relations between the groups.

Prominent representatives present were: T. C. Jacobsen, president, and Allan Mecham, manager and labor relations counsel of Intermountain Branch of A.G.C.; Mark B. Garff, chairman of the labor committee of Salt Lake City; W. W. Clyde, chairman of the highway committee; John McKean, president of the Utah State AFL building trades council; R. S. Roberts, secretary and treasurer of the building trades council; Irvin J. Cary, AFL organizer; C. R. Van Winkle, operating engineers; Spencer Madsen, carpenters; Roy Larsen, laborers; E. O. Moe, plumbers, and L. F. Anderson, electricians.

Resolutions were passed urging more cooperation between contractors and labor, proposing abolishment of the "force account" method of constructing public works, favoring stabilization of building costs, and opposing freezing of materials for use only in homes.



SNOW SURVEY WINTER SHELTER SOIL CONSERVATION Service surveyors enter deep snow entrance tower, called "Santa Claus" chimney, to subterranean instrument shelter at Crater Lake, Ore., experimental plot. See story of water runoffs on page 107.

Canada Gets Alaska Highway, Defense Projects from U. S.

A CEREMONY was held at Whitehorse, Yukon Territory, April 3, to mark the taking over by Canada from the United States of the Alaska Highway, the airfields on the Northwest Staging Route, the telephone system from Edmonton to the Alaska border, and other defense projects in the Northwest. The terms on which these projects are being turned over were settled in each case by agreement, already published, between the two governments.

Because the development of the projects being transferred to Canadian responsibility has taken place under the auspices of the Permanent Joint Board on Defense, the two governments sent their respective chairmen to represent them on this occasion. The Chairman of the Canadian Section is Gen. A. G. L. McNaughton and the Chairman of the United States Section is The Hon. Fiorella LaGuardia. Other civilian and military representatives of both Canada and the United States also were present.

Power Firm Will Reconstruct Flowline Pipe in Rush Job

RECONSTRUCTION OF eight-tenths of a mile of 11-ft. wood stave flowline pipe serving the Grace, Ida., plant of the Utah Power and Light Co. at an estimated cost of $235,000 will be undertaken in May, according to J. L. Jameson, who will be in charge of construction for the power company.

The project, one of several planned for this season by the company, will be a "rush job" and will be completed within a month, since three 11,000-kw. generating units will be out of service while the work is in progress.

Originally built in 1913, the line extends from the Grace Dam 4.36 mi. down to a large surge tank atop a hill, from where the water plunges 524 ft. into the Grace generating station. Approximately 2,000 ft. of the old line were rebuilt in 1937 and another 5,000-ft. section was rebuilt two years later. The flowline has a capacity of 1,020 sec. ft.

Seven carloads of steel saddles, to replace the present concrete ones, which have deteriorated, have been ordered. About 300 men will be employed on the project.

The Editor's Mail...

Riverside, Calif.

Editor,
Western Construction News
Dear Sir:

I am a boomer, consequently I have worked in many sections of this country. Incidentally, I have been in every state in the Union with the exception of seven. For example, I have been in every town in North Dakota, with one exception; and almost every town in both Oklahoma and Kansas.

My home has wheels under it, therefore my wife and I always have a shelter, a bed, and food whenever available.

On one trip we drove 3,050 mi. Were your space sufficient I would send you a description of the most interesting incidents. Briefly, we started from the Clinton, Tenn., project, home of the atomic bomb, drove to Florida, thence to Santa Ana, Calif. The Navy paid me $102 for expenses incident to the trip.

I make a close study of the craftsmen, particularly the carpenters, who represent different localities.

As to production, the southern carpenters accomplish the least. They are never in a hurry, always have time to relate an anecdote and play pranks, to the discomfiture of others. For example, one mischievous carpenter, while standing upon a roof, threw a five-gallon bucket full of water upon me. The impact staggered me. Once, while I was sleeping soundly, some of them tied me to the floor, then poured ice-cold water under me. I did not keenly appreciate that.

Some of them can not distinguish between eighths, quarters and halves on a rule but refer to them as long or short marks.

The Chicago carpenters are both skillful and rapid, but not much given to levity.

The Iowa and Kansas carpenters are serious fellows, yet friendly.

The Nevada carpenter is sociable, reasonably energetic, but less capable than some others. At heart he is a gold miner.

The California carpenters represent everything, both skillful and awkward, both energetic and lazy.

The Oakies and Arkies have me nonplussed.

Yes, it is very interesting to study craftsmen who represent various localities.

Yours truly,
GEORGE E. DAWSON

Western Construction Aided By FWA Loans for Planning

INCLUDED AMONG recent loans from the Federal Works Agency for planning future construction, are the following to Western municipalities and other engineering agencies. These are made available through the Bureau of Community Facilities, and are to be repaid, without interest, when construction is begun.

Alaska

Anchorage received an advance of $30,375 to prepare plans and specifications for a steam-electric power plant, transmission lines, and a steam heat distribution system, which is estimated to cost a total of $1,537,185.

Juneau was granted $4,950 for planning recreational facilities which will cost $200,000, and Seward received two awards: $2,900 to plan conversion of an old USO building, the work to cost $58,000, and $2,000 to plan a grade school which will cost $62,000.

Arizona

Arizona State College, Tempe, received $8,400 to finance planning of a science building, estimated to cost $262,600; Coconino County School District, $3,780 for schools at Flagstaff, which will cost $108,000; Coolidge, $1,000 for a library to cost $20,000; and Somerton, $4,750 to plan sanitary sewer projects which will cost $110,842.

California

California projects allocated planning money follow, listed in the following order: City — planning funds — project —estimated cost.

Alameda School Districts, $19,500, high school wing addition, $350,000; Capistrano High School District, $1,000, athletic field, $22,500; Fremont School District, five advances totaling $14,500, high school facilities at Sunnyvale, totaling in cost $336,900; Jefferson School District, $4,500, school at Clovis, $94,500; Lindsay School District, $7,541, elementary school at Lindsay, $143,443.

Live Oak High School District, three advances totaling $17,800, high school facilities at Morgan Hill, $327,800; Los Angeles, five advances adding up to $23,400, sanitary sewer extensions, $537,000; Los Angeles County, $45,000, jail and appurtenances at Castaic Junction, $985,000; Los Gatos, $9,000, street work, $168,000; Lynwood, two advances totaling $5,500, reservoir and swimming pool, $203,500; and Modesto High School District, $25,000, new high school, $750,000.

Marin County Sanitary District, $6,600, sewage treatment plant at Corte Madera, $131,000; Mokelumne Hill Sanitary District, $1,500, sanitary sewer system, $38,240; Monterey High School District, $24,000, high school additions, $435,500; North Sacramento, $7,375, sanitary sewer extensions, $154,503; Novato Sanitary District, $4,500, sanitary sewer system in Novato, $166,000; and Oceanside, $3,640, trunk sewer and laterals, $105,000.

San Bernardino School District has three advances: $2,600 for a new unit at Muscoy, $58,160, $3,265 for an addition in San Bernardino, $72,124 and $2,445 for another San Bernardino unit, $54,268; San Bernardino High School District was granted $7,470 to plan a new building costing $166,752; Santa Barbara was allotted $5,400 to design a garbage incinerator which will cost $194,400.

Colorado

Mesa County Junior College District received $6,750 to plan a women's dormitory at Grand Junction, to cost $180,000. Other advances were: Mesa County School District, $5,000, elementary school at Grand Junction, $133,216; Canon City, $6,000, interceptor sewers and treatment plant, $214,957; and Otero County School District, $4,780, school addition at La Junta, $192,490.

Idaho

Alameda was allotted two advances, $600 to plan waterworks estimated to cost $20,000, and $1,200 to design sanitary sewer extensions which will cost $40,000. Other Idaho planning projects and the amounts they received, follow: Boise, $15,000, sewage treatment plant and sewer extensions, $600,000; Dayton School District, $16,000, high school facilities, $422,550; Jerome and Lincoln County Joint School District, $8,000, high school facilities at Jerome, $237,000; Latah County School District, $2,750, elementary school addition at Moscow, $65,270; Orofino, $3,600, water system improvements, $65,000; Salmon, $4,000, sewer system extensions, $123,000, also $2,700 for street improvements, $88,000; University of Idaho, $7,140, home economics building at Moscow, $256,900; and Wendell, $1,700, street improvements, $50,000.

Montana

Belt School District was granted $11,226 to plan a high school and a grade school at Belt, estimated to cost $332,264. Other Montana awards follow: Drummond, $3,500, waterworks system, $60,000; Dutton, $3,150, sanitary sewer system and treatment plant, $72,040; Power School District, $6,500, addition to high school at Power, $144,400; and White Sulphur Springs, $2,500, water reservoir and mains, $68,200.

Nevada

Caliente received two advances totaling $3,960 to plan a swimming pool and bath house, total cost $75,000. Additional Nevada advances: Caliente School District, $4,500, school additions at Caliente, $81,500; Carson School District, two advances totaling $9,870, two grade schools in Carson City, total cost $223,500; Churchill County Board of Education, $10,000, school additions at Fallon, $223,500; and Fallon School District, $5,600, school additions and a new school at Fallon, $132,560.

New Mexico

Dexter was advanced $2,250 for plan preparation for extensions to the water system, estimated to cost $50,000; Socorro received $5,700 to plan a clorinating plant and water line extensions, estimated to cost $137,350, and also $1,700 to design sewerage additions which will cost $46,390; and the State Department of Public Welfare was allotted $7,400 to design a 50-bed tuberculosis hospital at Socorro, estimated to cost $200,000.

Oklahoma

Elk City Board of Education received $796 to plan remodeling of a gymnasium to cost $21,219; Guymon was advanced $4,000 to plan sewer extensions, estimated to cost $103,000; and Mountain View was granted $1,750 for water supply improvements to cost $48,900.

Oregon

Ashland School District received $10,500 for planning a grade school estimated to cost $300,000. Other Oregon awards were: Beaverton, $10,550, complete sanitary and storm drain systems, $232,625; Coos County School District, $4,087, grade school at North Bend, $107,000, and $7,336, high school at North Bend, $196,000; Harney County School District, $6,000, grade school facilities at Burns, $207,000; Hood River County, $5,760, alterations to Hood River High School, $170,600; and Lake Grove School District, $2,250, elementary school addition, $69,000.

Utah

Centerville was granted an allotment of $2,500 to plan a $77,000 sanitary sewer system; and Murray School District received $1,916 to design a high school shop costing $55,120.

Davis County School District was granted $16,702 to plan a junior high school at Bountiful, estimated to cost $471,600, and other Utah advances were: Elwood, $3,000, water distribution system, $90,000; Heber City, $670, water system improvements, $23,300; Price, $3,477, sewage treatment plant, $98,490; and the state government, $17,024, new state office building at Salt Lake City, $1,252,500.

Wyoming

Converse County School District received $3,600 to plan a gymnasium at Douglas estimated to cost $83,100, and Laramie County was granted $2,700 for planning a public library at Cheyenne, to cost $80,200.

Hawaii

Honolulu Board of Water Supply was granted an advance of $46,000, to design buildings estimated to cost $1,260,000.

Vast Irrigation and Power Project Recommended for Boise-Payette Area

A COMPREHENSIVE REPORT outlining the Bureau of Reclamation's plan for the development of the initial 230,000-ac. unit of the 400,000-ac. Mountain Home Project, near Boise, Ida., and containing a recommendation that construction be authorized by Congress and undertaken at an early date, has been transmitted to Governor Arnold Williams of Idaho.

The proposed project involves the importation of surplus Payette River water into the Boise Valley and the use of the Boise River water released by this importation into the Mountain Home area. The multiple-purpose project, in addition to providing irrigation service, will have a capacity to produce 165,000 kw. of hydroelectric energy to meet growing power needs in southern Idaho, and will eliminate almost all flood damage in the Payette Valley.

The cost of the development is estimated at $94,693,000, on the basis of 1940 prices. The entire investment, except a $674,000 allocation to flood control, is to be repaid to the Federal Treasury. Power revenues will return a major share of the construction costs — approximately 84 per cent, or $81,139,000—this comprising all of the costs allocable to power, plus $62,736,000, or 83 per cent, of the cost of bringing water to the land. Water users will be asked to repay approximately $12,880,000.

The report states that construction of the Payette Unit, as the initial block of 230,000 ac. is called, will create 3,000 new irrigated farms and thereby increase the rural and town population of the project area and vicinity by an estimated 40,000.

The new power plants proposed will supply approximately 700,000,000 kw. hr. of hydroelectric energy annually. In southern Idaho the existing power generating facilities and those now under construction are estimated to be inadequate to supply the normal power demands contemplated after 1948.

The 700,000-ac. ft. Cascade Reservoir, near Cascade, Ida,, already authorized, will be used to store and regulate the flow of the north fork of the Payette River. These waters will be diverted downstream into the contemplated 1,330,000-ac. ft. Garden Valley Reservoir, near Banks, by use of four structures: first, Smiths Ferry Diversion Dam, 14 mi. north of Banks (a concrete, gravity structure about 36 ft. high); second, Smiths Ferry-Scriver Creek tunnel (4.6 mi. long and 12 ft. in diameter); third, 6,900-ac. ft. Scriver Creek Reservoir (impounded by a dam approximately 152 ft. high); and, fourth, Scriver Creek Reservoir tunnel outlet (a mile long and 14 ft. in diameter).

Water from the north fork, as well as the south fork, of the Payette River will be regulated by Garden Valley Reservoir, from where it can be released into either of two channels: first, down the Payette River for private lands and the existing Payette Division of the Boise Project and, second, to the 54-mi. long Payette-Boise Aqueduct of the Mountain Home Project (which will run from near Banks, past Horseshoe Bend, to a point 5 mi. northeast of Eagle) for delivery into a canal running to the existing Boise Project Diversion Dam on the Boise River, near Boise.

Waters of the Boise River will be delivered to the Monutain Home area in two ways: first, from the south fork of the Boise River below 500,000-ac. ft. Anderson Ranch Reservoir through Long Tom tunnel (7.2 mi. long and 23 ft. in diameter) to Long Tom Creek in the project area, about 9 mi. north of the community of Mountain Home; and, second, from the Boise River at a point below the 286,500-ac. ft. Arrowrock Reservoir and above the Boise Project Diversion Dam by means of a pumping plant, approximately 1,100 cu. ft. per sec. in capacity, and a tunnel. The pump lift would be about 285 ft.

Two of the project's three power plants will be located on Scriver Creek, north of Banks, to utilize the more than 1,100-ft. difference in elevation between the north fork of the Payette River at Smiths Ferry and the Garden Valley Reservoir. The upper plant will be situated at the confluence of West Scriver Creek and Scriver Creek proper, and have a capacity of 30,000 kw. and a head of 390 ft. The lower plant, having a capacity of 90,000 kw. and a head of 770 ft., will be constructed on Scriver Creek at the high water line of Garden Valley Reservoir. The third power plant, of 45,000 kw., will be located at Garden Valley Dam.

Auto Traffic Expected To Exceed Prewar Totals

RURAL HIGHWAY traffic during the coming summer will approach and may possibly exceed prewar levels, according to the Public Roads Administration. Last October the traffic counts of state highway departments showed a marked upswing. In the following months traffic continued its sharp rise above that in the same months of the war years. In January traffic outside of cities reached an all-time peak for that month, exceeding the 1941 figure by 6.9 per cent.

The January increase over 1941 traffic was most marked in the Rocky Mountain and Pacific Coast States, amounting to 24 per cent. In the central region it was 3.2 per cent above the 1941 figure, while the New England and North Atlantic states were still 1.6 per cent below the prewar figure.

The increase in travel over that of 1941 was almost entirely on the main highways but there was a small increase on the local roads. At the beginning of the year there were approximately 4,000,000 fewer passenger cars than in 1941. However, many drivers were finding less difficulty in obtaining repairs and the tire situation was improving.

During the summer months there is expected to be increased use of cars now in service and traffic will be swelled in proportion to the new cars placed in use.

Construction to Start on Missouri Basin Project

THE STAGE was set for construction of the first South Dakota unit of the huge Missouri Basin reclamation program when a call for bids for the erection of Angostura dam, on the Cheyenne River, was announced by the Chief Engineer's office of the Bureau of Reclamation.

Bids will be opened at the Bureau's office in Hot Springs, S. D., May 22.

Angostura Dam, about nine miles south of Hot Springs in Fall River county, will create a reservoir with a capacity of 200,000 ac. ft. of water for irrigation, silt control, and recreational purposes. The structure will be a concrete gravity type dam with a height of 150 ft. above the river bed, and a crest length of approximately 1,600 ft. A quarter million cubic yards of concrete will be required for construction of the dam which is expected to get under way this summer. Completion is anticipated by late 1949.

The beginning of construction to harness the rivers of the Missouri Basin, one of the biggest engineering jobs of all time, signals the inauguration of a long-range program to banish major droughts and devastating floods which, in past years, have wrought havoc in the valley. The basin-wide plan to develop land, water, mineral, and power resources, is expected to reverse the downward trend of population, increase land values, and create approximately 53,000 new farms in nine Great Plains states.

Nevada Engineers Ask Survey Control Net for the State

ESTABLISHMENT of a net of control points for local surveys in the Reno and Las Vegas, Nev., areas under a proposed U. S. Coast and Geodetic Survey program was urged by the Reno Engineers' Club in a letter sent to the Nevada congressional delegation.

The control net proposed by the Coast and Geodetic Survey, which makes the most accurate control surveys known, would allow local engineers to use a system of land description by coordinates. Such a system was authorized by the 1945 Nevada legislature as an alternate to the present method of townsite descriptions. The engineers wrote their legislators that extension of the control survey to establish a number of convenient triangulation stations in the Nevada areas would reduce the cost of making local surveys, and would increase the accuracy of such surveys.

The Coast and Geodetic Survey program was requested of the federal agency by the Nevada state planning board and the Nevada mapping commission.

PERSONALLY SPEAKING

Mark U. Watrous, Pueblo, Colo., engineer, is the permanent state highway engineer of his state, the Colorado supreme court ruled recently. His position was claimed by acting highway engineer **Arthur Hewitt** who challenged the result of a civil service examination in which Watrous passed with the highest grade. Hewitt contended the examination should have been promotional instead of open, but the court held that the character of the examination was entirely within the discretion of the commission.

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Jesse R. Hall, supervisor and administrator of Stanislaus National Forest, Calif., has just retired from the U. S. Forest Service after more than 37 years as a federal forester, all of them in California. In 1908 Hall was assigned to the Plumas National Forest; later he served on the staff of the Klamath National Forest and then as supervisor of Los Padres and Shasta National Forests. His successor is Supervisor **Allen F. Miller** from the Texas National Forest. Miller spent seven years in the Rocky Mountains and then was assigned administrative and supervisory posts in the north central and New England states.

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Visiting engineers from three foreign countries are inspecting Bureau of Reclamation structures in New Mexico, Arizona, California and other western states. **L. E. Orduz,** professor of hydraulic engineering at the University of Bogota, Colombia; **Thor G. Brantzaeg,** designing and construction engineer with the Norwegian Hydro-Electrical Nitrogen Production Co. of Oslo, Norway; and **Arturo Carvajal,** irrigation engineer, Chile, are making the trip.

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Fred P. Howard, formerly with the Soil Conservation Service of the Department of Agriculture, was recently named unit supervisor of the Owl Creek unit of the Missouri Basin Project. The Owl Creek unit, northwest of Thermopolis, Wyo., is one of 11 units where preconstruction work has been centered. From 1942 to 1945, Howard was district conservationist at Cedar City, Utah.

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Comdr. Jesse H. Kopp of the Naval civil engineer corps, is now on terminal leave and has joined the Clarke-Halawa Co. of Honolulu as manager of their paving department. Commander Kopp was formerly with Griffith Co. of Los Angeles, and served in the Normandy and Okinawa campaigns.

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W. C. Hill, civil engineer and land surveyor formerly of Minnesota, fills the new position of state airport engineer of Oregon, and will act as general engineer assistant to Leo G. Devaney, director of the State Board of Aeronautics. During the war, Hill had airport engineering experience in Minnesota, Washington and Oregon, both as a civilian engineer and a Navy officer.

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Capt. George F. Hopkins, chief of the operations division of the Seattle District, U. S. Army Engineers, was recently discharged at Fort Lewis and returned to the same duties as a civilian. Hopkins joined the Seattle District as a civilian engineer in 1930, after serving as a land surveyor and logging engineer for Washington and California firms.

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R. J. Walter received the position of construction engineer on the Balmorhea Project in Reeves Co., Texas, from the Bureau of Reclamation. He will superintend construction of irrigation facilities to provide additional water to the Reeves Co. Water Improvement District No. 1. Walter has been with the Bureau 10 years and before that worked with the Middle Rio Grande Conservancy District and the Rio Grande Canalization Project.

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J. C. Gearhart and **H. L. Thompson** have been included in the consulting engineering firm of Stevens & Koon of Portland, Ore. Gearhart has been with the firm since 1936 and recently returned from Naval service, and Thompson was formerly on the civil engineering faculty at Northwestern Technological Institute. The firm will continue with its original name. It specializes in hydraulic and sanitary engineering.

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G. H. Bingham, irrigation expert since 1935 with the Montana state extension service, has been appointed an irrigation specialist on the Missouri Basin Project development staff. Montana State College is cooperating with the Bureau of Reclamation on the project, and Bingham will serve in a liaison capacity between the Bureau and the college in developing plans.

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MAJ. EDGAR L. GRIDER, construction engineer who worked on Pine Canyon and Coulee Dams, is now stationed in Korea with military government forces as executive officer of the 40th Co. with headquarters in Seoul. Prior to entering the Army in 1943, Major Grider was site superintendent on construction of the Roosevelt Naval Base at Terminal Island.



O. G. Johnson, Joe K. Hicks and **W. M. Howard,** CAA airport engineers, have been detailed to prepare recommendations concerning the disposal of surplus military airport properties. Hicks and Howard are stationed at Santa Monica, Calif., covering southern California, southern Nevada, Arizona and Utah; and Johnson is in San Francisco taking care of northern California and northern Nevada.

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Harlan H. Edwards, civil engineer, is now associated with the architectural firm of Bebb & Jones, Seattle, Wash., and will have charge of field supervision of construction, specifications and materials development. From 1943 to 1946, Edwards was technical editor of Pacific Builder and Engineer, and from 1941 to 1943 was assistant chief engineer of Siems Drake Puget Sound, builders of the $150,000,000 naval bases at Sitka, Kodiak and Dutch Harbor, Alaska.

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John Sawyer of the Macco Construction Co., Clearwater, Calif., has been placed in charge of all field construction work for the company. Sawyer was in charge of excavation of foundations at Boulder Dam and also worked at San Gabriel and Parker dams. At the opening of the war he went to Puerto Rico on construction work, and also spent two years in the Aleutian Islands.

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E. Sandquist is in Denver, Colo., with the Federal Works Agency, Bureau of Community Facilities, Division 9, as assistant division engineer on the advance planning program which is concerned with the disposition of federally constructed projects built under the Lanham Act. Sandquist was formerly division administrative officer in the bureau's Division 7 in Berkeley, Calif.

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Charles H. Carter is back with the Bureau of Reclamation after serving as a major in the capacity of post engineer at the Quartermaster Depot in Tracy, Calif. Carter is now chief of the design section in the Bureau's regional office at Salt Lake City, Utah. From 1937 to 1942 he was an office engineer on Utah construction projects with the Bureau.

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T. R. Heikes, superintendent of the American Falls power plant of the Idaho Power Co., has been transferred to Boise to supervise power plant operation and maintenance. **L. E. Garlinghouse,** formerly superintendent at the Swan Falls plant, succeeds Heikes at American Falls.

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Col. E. H. Marks has just assumed command of the newly-formed South Pacific Division, U. S. Engineers, with headquarters in San Francisco, Calif. This new division comprises the San Francisco, Sacramento and Los Angeles areas. **Brig. Gen. Philip G. Bruton,** who was division engineer for the past year, retired Mar. 11.

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S/Sgt. Frank F. Zielinski arrived back from Okinawa where he served with the 935th engineering aviation regiment, and has returned to his old post as airport en-

gineer with the Civil Aeronautics Administration at Santa Monica, Calif. Zielinski was at one time with the Isbell Construction Co. of Reno, Nev.

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Donald McMurray has been promoted district construction engineer of the Washington State Highway Department with headquarters at Olympia. McMurray had been resident engineer for the department at Port Angeles and was succeeded in that position by **Edward R. Smith** of Hoquiam.

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Col. Henry Berbert, San Francisco, Calif., civil engineer, is the new engineer supply officer at the Schenectady, N. Y., Army Service Forces depot. In the Army since 1917, Colonel Berbert formed, trained and commanded the 335th Engineer General Service Regiment which he led in campaigns of Africa, Corsica, France and Germany.

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Joe Littlefield, recently discharged from the service, is now resident engineer for the city of Elko, Nev. In his new job, Littlefield will work four days for the city and the remainder of the week with **William Settlemeyer,** county surveyor.

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Two new British Columbian construction companies have been formed in Victoria. **Nicholas Williamson, James William Thorpe, Murray Cartlidge** and **Lloyd Skogman** have become partners in the Garnett Construction Co. The Barson Construction & Decorating Co. is composed of **Harold E. Sanderson** and **Christopher J. Barners.**

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Col. Frank E. S. Pou, who used to be with **Gen. Claire Chenault** in the CBI theater, has been transferred from the Civil Aeronautics Administration's Mississippi River commission to the Airports Branch at Santa Monica, Calif., where he will help prepare CAA recommendations on the disposal of surplus military airport properties.

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M. M. Bolton recently transferred from the office of the service command engineer at Fort Douglas, Utah, where he was chief of the road runway, railroad section, to the Oakland Army Base, Camp Knight, Calif., where he is now chief of the engineering branch of the post engineers.

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J. P. McElroy is the new president of the Engineers Club of Fresno, Calif. Other recently elected officers are **H. M. Patton,** vice president; **R. E. Dunkle,** secretary-treasurer, and **J. C. Heaslet, W. F. Kaiser, W. L. Scott, C. F. Waite** and **J. P. Price,** directors.

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Albert Molenaar has been named extension engineer in irrigation for Washington State College. From 1944 to 1946 Molenaar was project engineer for the U. S. Department of Agriculture on the Post Falls irrigation project at Coeur d'Alene, Ida.

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J. J. Hedderman is the engineer in supervision of the Durango, Colo., field office of the Bureau of Reclamation which is launching intensive field surveys of water and power development possibilities in the San Juan and Dolores River Basins. He is also in charge of the colonies of workers at Naturita, Colo., and Chama, N. M., which will engage in the surveys.

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O. L. LeFever has been appointed chief engineer of Northwestern Electric Co., Vancouver, Wash., to supervise engineering studies and decisions involved in the large volume of construction and system improvement planned for the future.

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LLOYD B. HUGHES

Lloyd B. Hughes, recently discharged from the Navy after serving as assistant director in the transportation and shipping section, staff of the Western Sea Frontier, has joined the Port of Oakland as an assistant to the port manager, **A. H. Abel.** Before the war, Hughes was assistant general traffic manager for Montgomery Ward & Co. in Oakland, Calif., and was active on the Pacific Transportation Advisory Board.

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Roy L. Gardner, a former major in the Army Engineers, has returned to the Seattle, Wash., firm of Gardner, Gardner & Hitchings, Inc., civil engineers, after spending five years in the service.

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Larry Fisher owns the new L. T. Fisher Construction Co. of Del Mar, Calif., and is building a $300,000 hotel there at present. Fisher was formerly general superintendent for P.N.A.B. on the island of Oahu, T. H.

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L. E. Hough, until recently maintenance engineer at the Navy's blimp base at Tillamook, Ore., is now city engineer of Ontario, Ore. He formerly held the same position in Fairbanks, Alaska, and several other Pacific Coast cities.

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The Great Falls Contractors Association was organized recently in the Montana city, with **Robert F. Pappin** as president, **C. E. Beaulaurier** as vice president and **Gordon C. Gens** as secretary-treasurer.

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C. T. Leeds of Leeds, Hill & Jewitt of Los Angeles, and **F. G. White,** chief engineer of the Board of State Harbor Commissioners in San Francisco, were appointed members of a committee on construction and operation of ports, harbors and necessary structures, formed by the American Society of Civil Engineers recently.

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Palmer B. DeLong is engineer in charge of the accelerated planning program to develop water resources in western Wyoming, with headquarters in Kemmerer, a Bureau of Reclamation field office.

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Calgary, Alberta, has two new contracting firms, the G. & S. Construction Co., and the Foothills Excavating & Concrete Contractors.

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Clark M. Davis, engineer, and **William I. Williams,** architect, have formed Williams-Davis and Associates and are located on the site of the construction firm of the late H. F. Miller in Bremerton, Wash.

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Ed. H. Honnen, a Seabee commander in the ETO and Southwest Pacific during the war, has returned to his duties as president and general manager of the Ed. H. Honnen Construction Co. of Colorado Springs, Colo.

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Kenneth Young, formerly a regional consultant with the War Production Board, has succeeded **Augustus Slater** as industrial engineer for the Los Angeles Chamber of Commerce.

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Don Akins has been appointed city engineer of Ellensburg, Wash., on a temporary basis until the city is able to secure a permanent successor to F. L. Breckon, who resigned April 1.

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The Morrison Engineeing Co. of Helena, Mont., was recently incorporated by **John H. Morrison, Joseph Maierle** and **E. G. Toomey,** all of Helena.

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L. A. McKenzie has established a general contracting business at Kelowna, British Columbia.

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John H. Bjork is an engineer on construction of Davis Dam on the Colorado River for the Bureau of Reclamation.

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W. E. Orr, Jr., has been taken into full partnership in the old Phoenix, Ariz., construction company of W. E. Orr, Contractor, making the firm Orr & Orr Construction Co.

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Ens. Gilbert Edwards has replaced **Lt. Comm. Morris Lustbader** as resident officer in charge of construction at the Alameda N.A.S., California.

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Frank M. Stocking has joined the Washington State Highway Department as chief right-of-way agent, succeeding **Earl Dickinson** who resigned to enter private business.

* * *

William B. Bateman, who served with the Army in Australia, has opened a construction contracting firm in Pasadena, Calif.

* * *

E. S. Barnhill has been appointed city engineer of St. Anthony, Ida.

SUPERVISING THE JOBS

H. E. Williams is project manager for the Utah Construction Co. of San Francisco on the $21,462,505 Davis Dam in Pyramid Canyon, Ariz. General superintendent on the project is **T. H. Terry,** field engineer is **W. T. Lloyd,** office manager is **T. G. Richards,** and office engineer is **E. G. Johnson.** Other key men in the Utah crew are **H. Thiessen,** master mechanic; **C. Crockett,** carpenter superintendent; **J. Lloyd,** excavation superintendent; **H. Mulhern,** electrical superintendent, and **P. Schneider,** in charge of erection and pile driving.

* * *

H. M. Vincent is in Los Angeles with contractor Paul W. Trousdale as project manager of a $3,400,000 housing project at La Brea Ave. and Coliseum St. There will be 340 units in the project and **J. H. McMullen** is general superintendent of their construction. Resident engineer is **Phil Oppenheimer,** carpenter foreman is **Ben Shaefer** and concrete foreman is **L. W. Nelson.** Vincent, Oppenheimer, Shaefer and Nelson hold the same positions on another 144-unit housing project Trousdale is building on Fairoaks Blvd. in Pasadena, on which **Harold Phillips** is general superintendent. **Ellery Colbert** is the contractor's superintendent on the 166-unit housing development under construction at Sepulveda Blvd. and Oxnard, where **George Scott** is carpenter foreman; and **Wally Fish** is superintendent of the $4,500,000 project at Hynes where **Don Botsford** is the carpenter foreman.

* * *

Ted Y. Johnston is general superintendent for Marshall S. Hanrahan of Redwood City, Calif., on state highway work at Fresno. **Sam Ball** is job superintendent, **Ken Cornell** is in charge of paving, **E. A. Jensen** is in charge of structures, **H. G. Filson** is in charge of concrete batching and asphalt plant, **Tom Cowan** is grade foreman, **Jim Crawford** is office manager, **Jack Sprague** is engineer and **John Fay** is master mechanic.

* * *

Homer Henson has the position of job superintendent on the $750,000 project of moving 500 dormitories and erecting Quonset huts throughout the state of Arizona. Del E. Webb Construction Co. of Phoenix holds the F.P.H.A. contract for Arizona. Chief of operations is **J. O. Martin,** and office manager and purchasing agent is **E. C. Warmbrodt.**

* * *

Frank Wood, member of the Clyde Wood, Inc., contracting firm, is personally supervising construction of the All American Canal check job. **Elmo Schuetz** is superintendent; **Joe Denker,** carpenter foreman; **Bill Schurmeister,** labor foreman, and **Clarence E. Hughes,** engineer.

* * *

V. O. Crockett has the job superintendent spot on the $94,687 sanitary sewer and street resurfacing job in the Teesdale Ave. and Valley Spring Lane sewer district of Los Angeles, Calif. The contract is held by R. A. Wattson Co. of North Hollywood, and **Carl Beaver** is master mechanic and **C. F. Sponenburgh** is job office manager.

* * *

Bill McCray, associated with Los Angeles' Griffith Co., is superintending construction of state highway work 10 mi. west of Colton, Calif., a $1,300,000 job. **"Nels" Nelson** is resident engineer; **Joe Porcher,** project manager; **R. T. Pickett, Bob Richardson, M. L. Sheeran** and **G. R. Thiemann,** grade foremen; **Tooney Gibson,** master mechanic, and **Jake Coffey,** truck foreman.

* * *

W. B. Walker is managing construction of Oregon's Albany-Toledo 115-kv. wood pole transmission line through Linn and Lincoln Counties. **George E. Berry** is supervising engineer for H. H. Walker of Los Angeles, Calif., who holds the contract, and **Donald Hazen** is electrical foreman.

* * *

Victor Hokason and **H. W. Eliason** are job and general superintendents on 3.1 mi. of road work from Placerville to Lake Tahoe through El Dorado National Forest. H. Earl Parker of Marysville, Calif., has the $470,032 contract, and **Doug Jordan** is office manager and purchasing agent.

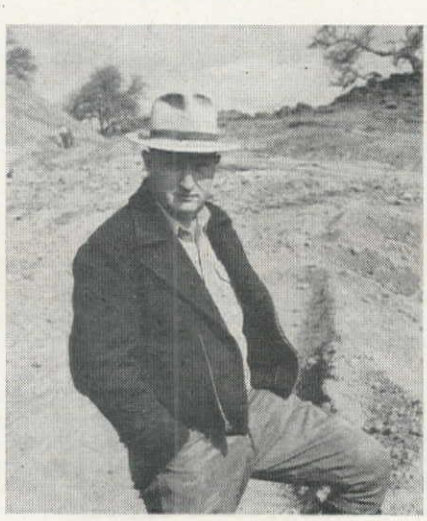
* * *

Gus Merrill is in Los Angeles with the L. E. Dixon Co. on construction of a Sears Roebuck building, as project manager. Resident engineer for the structure, located at 5820 S. Vermont Ave., is Stiles & Clements; general superintendent is **S. D. Fraser,** and carpenter superintendent is **Dean A. Thie.**

* * *

J. A. Sheldon is superintendent on the highway job Harms Bros. Construction Co. is doing near Arbuckle, Calif. Assistant superintendent there is **R. B. Zeigler** and foreman is **L. D. Dotta.**

J. A. SHELDON



R. J. Jenks is at the Boulder Dam project in Nevada as project manager for Guy F. Atkinson. It is the only drill and broach job west of the Mississippi and resident engineer there is **E. C. Christianson** of the Bureau of Reclamation. **Ralph Hawkins** is assistant general superintendent, and other key men of the Atkinson crew are **C. E. Ferguson, P. C. Johnson, Jack Sinfield, Bill Rives, Walt Wickland** and **C. D. Greenwood.**

* * *

Ed Skuls is project manager on Guy F. Atkinson's Sacramento, Calif., 4½-mi. freeway project of funneling traffic around N. Sacramento to outlying districts. **Herb Booth** and **Jack Smith** are project and office engineers, respectively, and other leaders in the Atkinson gang are **Frank Ryan, Charlie Harris, L. C. Fassett, Tom Foran** and **Frank Shipman.**

* * *

Norman F. Barber is superintendent on the intermediate air terminal buildings J. I. Barnes Construction Co. of Santa Monica, Calif., is erecting at the Los Angeles airport for the city and all major airlines. Assistant superintendent is **William E. Palmer,** office manager is **W. M. Flinders** and carpenter foreman is **George Howse.**

* * *

Chester H. Nixon is with Atherton Construction Co. in Seattle, Wash., as job superintendent on a $125,000 hotel going up at Appleyard for Great Northern Railway. **Don F. Micklethwaite** is general superintendent, **Gordon Pappin** is supervising the engineering and **James B. Lewis** is purchasing agent.

* * *

Ben Johnson, who spent the past 15 years in highway construction work, is general superintendent for MacIsaac & Menke of Los Angeles on the 30-unit housing project for veterans going up at Brooklyn and N. Roden Aves. in Los Angeles. Carpenter foreman there is **Art Milius,** and timekeeper is **H. V. Tunstall.**

* * *

William Bushelle is at Terminal Island, Calif., with the Guy F. Atkinson Co. as project manager for the dock being built for Hughes Aircraft. **John Stearns** is resident engineer, **Jack Murphy** is excavation superintendent, **Ray Helm** is carpenter superintendent and **Miles Newton** is project engineer. The dock will probably be finished by June 1, 1946, in time for the launching of the giant "Mars."

* * *

T. F. Flint is general superintendent of construction at a spa health resort being built for more than a million dollars three mi. south of Las Vegas, Nev., on U. S. Highway 91. The resort will include 199 rooms, casino, dining room, and main entrance building, with 19 units in all.

* * *

W. E. Bradbury is at San Francisco's Naval Shipyard at Hunters Point as superintendent for James I. Barnes Construction Co. of San Francisco on the $2,290,000 superstructure for a two-story shop building being completed. **Ray Anderson** is his assistant, and **J. B. Allen** is purchasing agent.

* * *

Steve Miller has the supervising position with Stolte, Inc., of Oakland, Calif., on the $2,000,000 housing project being built west of Belmont in San Mateo Co. There will



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be 200 $10,000 homes. **Chuck Carlin** is office manager, **H. Gumpertz** is utility superintendent and **James Butler** is grading superintendent.

* * *

Walt Sides is general superintendent on two bridges under construction at Mossdale, Calif., between Stockton and Tracy. Stockton Construction Co. has the contract, and **Chris Reid** is their engineer. **A. L. Fitzsimmons, B. A. Starlin** and **M. Hicks** are foremen.

* * *

James Milone, of Burrows & Milone, Tacoma, Wash., is acting as job superintendent on the $37,000 water system improvements under construction in four Tacoma improvement districts. **John Seifert** is foreman on the job.

* * *

Caesar Denarde is job superintendent for Craftbilt Homes, Inc., of San Francisco on the erection of 500 two- and three-bedroom homes in N. Sacramento, Calif. **R. Mullins** and **R. Rutter** are other key men on the project.

* * *

John Yasich is supervising dredging and the construction of a jetty at Moss Landing Harbor, Calif., for the San Francisco Bridge Co. Costing $267,968, the project's dredge captain is **J. R. Francis** and dredge chief engineer is **Frank Lampson.**

* * *

T. L. Quarles is project superintendent on the truck service garage going up in Fresno, Calif., for $100,000. Foremen for contractor Taylor & Wheeler are **Clarence Wood, S. L. Aubalaugh** and **Clinton Sinclair.**

* * *

Don Ross is job superintendent, and **Ed Frost** is his assistant, on the Rector Dam being built at Napa, Calif., by Parker & Ball. Resident engineer on the dam is **M. P. Thiebaud.**

* * *

Ed Nehr is supervising construction of the telephone building that Lawrence Construction Co. of Sacramento, Calif., is building at 2216 Stockton Blvd., Sacramento. **Jerry Chernoff** is office manager of the $77,845 job.

* * *

William O. Osborne is with the Wm. P. Neil Co., Ltd. of Los Angeles as job superintendent on the Boyle Midway Co. building in Los Angeles, where **H. W. Baker** is carpenter foreman and **Bob R. Downey** is steel foreman.

* * *

Jack Burchett is general superintendent for Silver & Martin on the New Mexico State highway job north of Santa Fe on U. S. 284-64. The project calls for 7¼ mi. of select bar surface at Pojoaque junction. **Jeff Goff** is office manager.

* * *

Jim Sheeks is superintendent of construction on a $100,000 garage being built at 801 E. Main St. in Alhambra, Calif., by contractor Z. B. Barker of Pasadena.

* * *

Ted Beebe is job superintendent for H. Mayson of Los Angeles on the $1,132,476 reinforced concrete ward buildings for disturbed females and infirm females at the Stockton, Calif., State Hospital.



OTTO PARLIER

Otto Parlier is supervising improvements on the Los Angeles River from N. Broadway to Alhambra Ave. for contractor E. B. Bishop of Orland, Calif., who received a $759,614 contract for the job. **H. B. Clemens** is field office manager, **G. D. Myers** is engineer, **S. C. Rodgers** is assistant superintendent, and **L. D. Gomez, H. F. Duncan, G. R. Gay** and **H. C. Fewell** are foremen.

* * *

Paul B. Tichenor, project manager for T-S Construction Engineers, Inc., of Los Angeles, Calif., is now at work on a steel frame department store building at Wilshire and Fairfax, Los Angeles, and is assisted by **W. T. Miller,** general superintendent; **Harry G. Felber,** engineer; **Joe Collins,** carpenter foreman, and **L. M. Morton,** labor foreman.

* * *

Stewart Allen is job superintendent on the new I. Magnin Co. building going up at Beverly Hills, Calif. William Simpson Construction Co. has the contract and carpenter foreman is **Jess Parker,** labor foreman is **Jack Barry** and engineer on the project is **Don Williams.**

* * *

Stanley Carlson is in Benicia, Calif., with Parish Bros. on Central Valley Project levee work. **Ole Nagel, Fred Andeasson** and **Dave Sills** are foremen there.

* * *

Ralph J. Hoffman is job superintendent on the construction of a sewer collecting system, pumping station and treatment plant being built for $669,038 by Bechtel Brothers McCone Co. in Oildale, Calif. Office manager is **H. F. King.**

* * *

Foster Manning is superintendent on the $398,813 grain elevator Henry George & Sons of Spokane, Wash., are building in Worden, Ore. **D. G. Carlos** is assistant superintendent there, and the youngest member of the firm. **Lloyd George** is also on the job.

* * *

Al J. Hume of Vallejo, Calif., is general foreman on the $240,000 shopping center R. A. Walsh of Vallejo is building at Appian Way and Maloney Ave., El Sobrante. Building foreman is **Louis H. Redenbaugh.**

* * *

Earl Pursel is superintendent for Macco Construction Co., Clearwater, Calif., on the $599,122 structural steel overhead crossing to go over the Union Pacific tracks on the Terminal Island Freeway in Los Angeles.

* * *

B. Williams has the top superintendent position with Morrison-Knudsen Co. of Boise, Ida., on the $4,688,000 Kortes Dam and power plant 62 mi. southwest of Casper, Wyo., on the N. Platte River.

* * *

Henry V. Dale is at Crescent City, Calif., supervising construction of an inner breakwater for the harbor. Basalt Rock Co., Inc., of Napa has the $206,250 contract.

* * *

F. Ames, of the Del E. Webb Construction Co. of Phoenix, Ariz., is job superintendent on the $225,000, two-story and basement store building at First and Adams Sts. in Phoenix. **J. O. Martin** is chief of operations and **H. G. Winston** is purchasing agent.

* * *

Paul B. Young is managing work Haddock-Engineers, Ltd., is doing at the Naval Ordnance Test Station, Inyokern, Calif. **Jess Gilbreath** is general superintendent of heavy construction, **Tom Peterman** is general superintendent of building construction, and **C. P. Collins** is field engineer.

* * *

H. M. Mason, general superintendent for the Ross B. Hammond Construction Co. of Portland, Ore., is in charge of the construction of an insurance building going up at N.E. 18th Ave. and Sandy Blvd. in Portland.

* * *

R. S. Brabrook, after working abroad for several years, is now associated with The Austin Co. of Los Angeles as general superintendent on construction of buildings at Mines Field on Century Blvd., Los Angeles.

* * *

Frank Pennell is superintendent for Ensor H. Buell, contractor on an automotive specialties sales building being constructed on University Ave., Berkeley, Calif.

* * *

Ken Lynch and **Elmo Klinkenbeard** are in charge of constructing the new highway route from Woodland to Martins Bluff in Cowlitz Co., Wash. The contract is held by Peter Kiewit Sons Co. of Seattle.

* * *

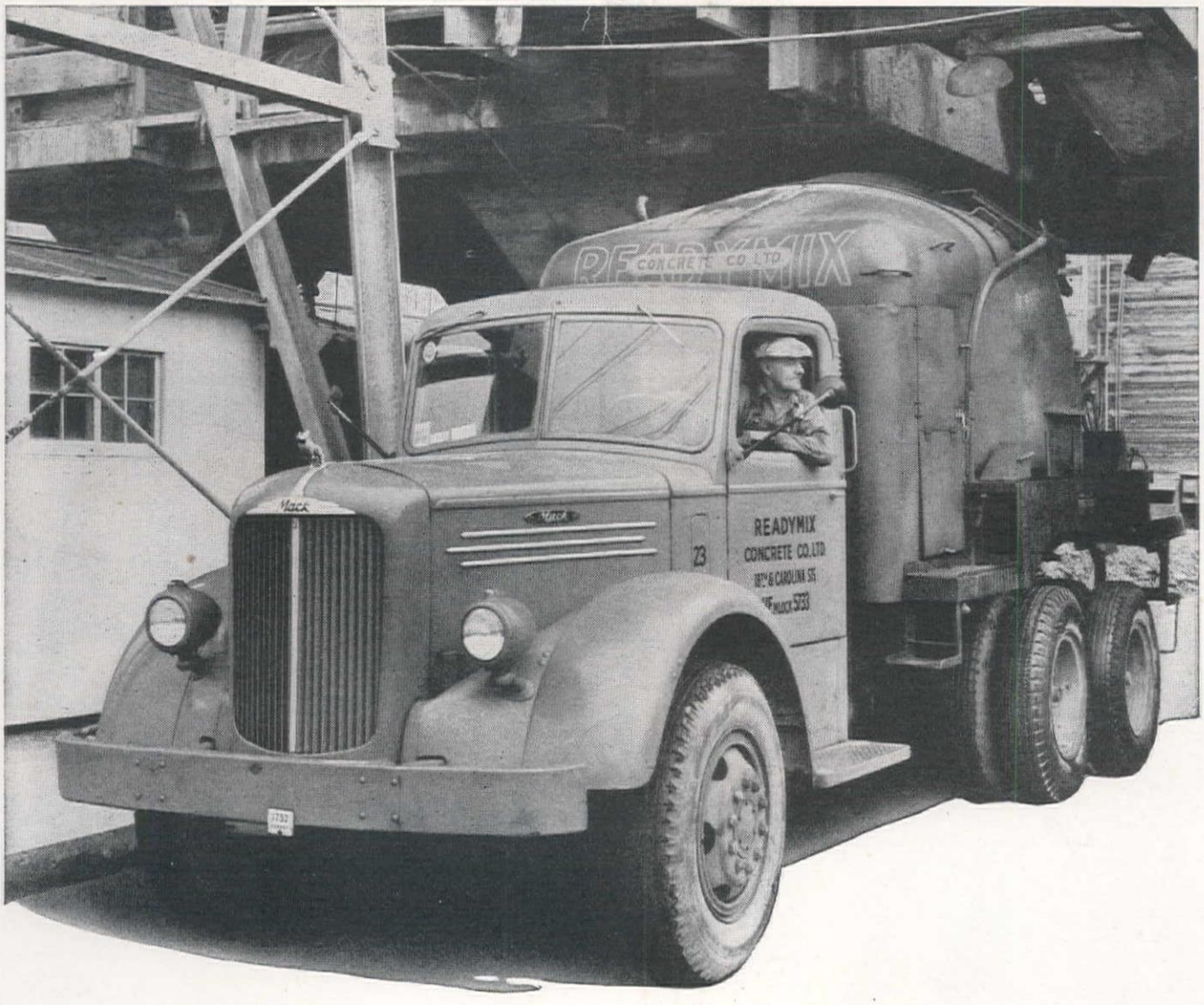
H. W. Armstrong is carpenter foreman on the Redondo Beach pavilion "Boyd" and "Puss" Muncy of Los Angeles are building. Other key men with Muncy Brothers are **G. K. Fletcher** and **C. W. Lewis.**

* * *

R. J. Lugo, formerly key man on numerous southwest projects and recently discharged from the Seabees, is now foreman with Fisher Contracting Co. of Phoenix, Ariz., on the Highway 66 cutoff at Flagstaff.

* * *

H. C. Wehlast is resident engineer for Los Angeles' Griffith Co. on the $700,000



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building Janss Investment Corp. will lease to Sears Roebuck & Co. in Santa Monica, Calif. **J. Heppenstal** is project manager, **Leonard Berglund** is general superintendent, and foremen are **T. W. Oglesby, Rush N. Hill** and **Al Simmons.**

* * *

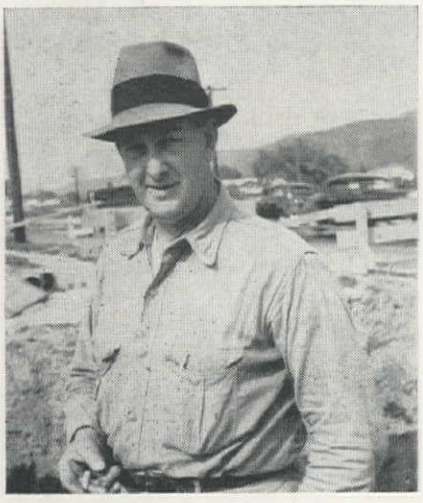
Floyd Rupp has the superintendency of the factory and office building MacIsaac & Menke of Los Angeles are building in that city at 127 N. San Vicente. **Harry Hall** is carpenter foreman on the job, and **L. W. Martin** is labor foreman.

* * *

H. J. Shields is supervising construction of the $150,000 42-unit motor hotel he is building for Pueblo Courts, Inc., at 1750 Colorado St. in the Eagle Rock section of Los Angeles, Calif. His foreman is **Leonard Revis.**

* * *

G. K. Thatcher is general superintendent for Byerts & Dunn of Los Angeles, Calif., on the $134,269 reinforced concrete overcrossing on the Hollywood Parkway at Benton Way, Los Angeles. **R. K. Byerts** is job superintendent on the project.



GEORGE K. THATCHER

* * *

Ralph Steele is general superintendent for Robert McCarthy Co. of San Francisco on Federal Public Housing Authority projects in Tulare Co. and in Fresno, Calif.

* * *

Al Grimel and **S. Daniels** are grade foremen on the D. D. Skousen road job near Albuquerque, N. Mex. **Kenneth Savage** is master mechanic and **T. B. Brown** is engineer for the construction.

* * *

Fred Anderson is in Delano, Calif., with Trewhitt, Shields and Fisher of Fresno, supervising construction of a $150,000 reinforced concrete theater building.

* * *

George Bogorich is master mechanic for E. B. Bishop on the granite plant going up at Orland, Calif. Bogorich was formerly shop foreman at Shasta Dam throughout its construction.

* * *

Wayne Shields acted as general superintendent on the warehouse he contracted to build in Eugene, Ore. Carpenter foreman was **E. R. Stevenson** and steel superintendent was **Glenn Stevens.**

UNIT BID SUMMARY

Highway and Street...

Oregon—Marion County—State—Surf.

Kuckenberg Construction Co., Portland, bidding $387,929, was low in bidding before the Oregon Highway Department, Salem, on grading and bituminous surfacing on 3.5 mi. of the Gates-Niagara section of the North Santiam secondary highway, and furnishing 3,000 cu. yd. of rock in stockpiles. Unit bids follow:

(1) Kuckenberg Construction Co. $387,929
(2) Berke Bros. 415,520
(3) K. L. Goulter & Co. 418,475
(4) E. C. Hall Co. $439,828
(5) Sound Construction & Engineering Co. 513,697

	(1)	(2)	(3)	(4)	(5)
All specified clearing and grubbing	$35,000	$30,000	$20,000	$30,000	$36,500
700 cu. yd. structural excav., unclassified	5.00	5.00	5.00	5.00	10.00
800 cu. yd. trench excav., unclassified	4.00	3.00	2.00	2.50	1.25
368,000 cu. yd. general excav., unclassified	.48	.54	.58	.60	.80
900,000 yd. sta. short overhaul	.02	.01	.015	.01	.02
6,600 cu. yd. sta. long overhaul	.50	.40	.50	.50	.35
11,500 lin. ft. rounding cutbanks	.15	.15	.15	.20	.15
3.53 miles finishing roadbed and slopes	350.00	300.00	$1,000	500.00	700.00
90 lin. ft. 12-in. perf. conc. pipe	2.00	2.00	1.35	2.00	1.50
330 lin. ft. 12-in. conc. pipe	2.00	2.00	1.30	2.00	1.50
540 lin. ft. 18-in. conc. pipe	3.00	2.50	2.50	3.10	2.80
1,050 lin. ft. 24-in. conc. pipe	3.75	4.00	3.50	4.50	4.50
180 lin. ft. 36-in. conc. pipe	7.00	7.00	7.00	8.50	8.65
110 lin. ft. 48-in. conc. pipe	11.00	12.00	12.00	15.00	14.00
44 lin. ft. salvaging culvert pipe	3.00	4.00	2.00	2.00	1.00
10 cu. yd. rock or gravel backfill drains	5.00	5.00	5.00	5.00	4.00
490 cu. yd. Class "A" conc.	50.00	50.00	50.00	50.00	50.00
79,000 lbs. metal reinf.	.07	.08	.08	.08	.10
26,500 cu. yd. 3-in. - 0-in. materials in base	2.30	2.58	2.50	2.65	2.25
7,500 cu. yd. 1-in. - 0-in. materials in base and shoulders	2.30	2.58	2.50	2.65	2.35
850 M. gals. sprinkling	2.50	2.00	2.00	2.00	2.00
1,000 cu. yd. ¾-in. - ½-in. cr. rock in stockpile	2.30	2.60	2.50	2.65	1.95
1,000 cu. yd. ½-in. - ¼-in. cr. rock in stockpile	2.30	2.60	2.50	2.65	1.95
1,000 cu. yd. ¼-in. - 0-in. cr. rock in stockpile	2.30	2.60	2.50	2.65	1.95
8,000 yd. mi. hauling cr. rock	.15	.15	.15	.15	.15
3.53 miles preparation of base	200.00	300.00	200.00	150.00	400.00
3,740 cu. yd. furnishing and placing aggr.	3.50	3.15	3.50	4.15	3.15
48 tons furnishing and placing RC-3 or Emuls. Asph.	31.00	30.00	33.00	32.00	35.00
242 tons furnishing and placing 121-150 asph.	.....	30.00	33.00	.....	35.00
290 tons furnishing and placing RT-8 tar	26.00	.....	.....	25.00	.....

California—Los Angeles County—State—Grade and Pave

Macco Construction Co., Clearwater, offered the low bid of $1,141,080 to the California Division of Highways, Sacramento, for the construction of 2.1 mi. of Long Beach-Terminal Island Freeway between Henry Ford Ave. and Willow St., the street to be regraded and paved with asphaltic concrete. A summary of the unit bids received follows:

(A) Macco Construction Co. $1,141,080
(B) James I. Barnes Const. Co. 1,218,496
(C) Griffith Co. 1,241,804
(D) Warren Southwest, Inc. 1,278,986
(E) Peter Kiewit Sons' Co. 1,392,829
(F) J. E. Haddock, Ltd. $1,412,079
(G) Guy F. Atkinson Co. 1,436,000
(H) Basich Bros. Const. Co. 1,493,476
(I) Clyde W. Wood, Inc. 1,592,457

(1) 1,200 cu. yd. removing concrete.
(2) 58 acres, clearing and grubbing.
(3) 14,500 cu. yd. roadway excavation.
(4) 23,500 cu. yd. structure excavation.
(5) 4,700 cu. yd. ditch and channel excavation.
(6) 144,000 lin. ft. vertical holes (sand drains).
(7) 16,500 tons sand backfill (sand drains).
(8) 680,000 tons imported borrow.
(9) 72,000 tons imported subgrade material.
(10) 125,500 sq. yd. preparing Cl. "C" subgrade.
(11) Lump sum, dev. water supply and furn. wat'g equipment.
(12) 7,200 M. gal. applying water.
(13) Lump sum, finishing roadway.
(14) 290 tons, liq. asph. RC-2 (B.S.T.)
(15) 24,000 sq. yd. prep., mixing and shaping surf. (B.S.T.)
(16) 2 tons liq. asph. SC-2 (prime coat).
(17) 540 tons plantmixed surfacing.
(18) 50,500 tons asphalt concrete.
(19) 132 tons asph. emulsion (curing seal and seal coat).
(20) 330 cu. yd. P.C.C. pavement base.
(21) 720 cu. yd. P.C.C. structures.
(22) 315 tons gravel backfill (ret. wall foundtns.)
(23) 400 lin. ft. rubber water stops.
(24) 30 sq. yd. membrane waterproofing.
(25) 410 cu. yd. Class "C" P.C.C. (pipe reinf.).
(26) 2,800 cu .yd. P.C.C. curbs and gutters.
(27) 34,500 lin. ft. chain link fence.
(28) 15 ea., walk gates.
(29) 1,420 lin. ft. 18-in. R.C.P. (std. str.)
(30) 2,500 lin. ft. 24-in. R.C.P. (std. str.)
(31) 1,320 lin. ft. 30-in. R.C.P. (std. str.)
(32) 390 lin. ft. 36-in. R.C.P. (std. str.)
(33) 90 lin. ft. 48-in. R.C.P. (std. str.)
(34) 180 lin. ft. 54-in. R.C.P. (std. str.)
(35) 1,960 lin. ft. 66-in. R.C.P. (std. str.)
(36) 5 lin. ft. pipe shaft manholes.
(37) 680 lin. ft. 12-in. plain conc. pipe.
(38) 1,980 lin. ft. 15-in. plain conc. pipe.
(39) 90 lin. ft. 6-in. steel pipe conduit.
(40) 3 each, adjusting manholes to grade.
(41) 50,000 lbs. bar reinf. steel.
(42) 35,000 lbs. misc. iron and steel.
(43) 145,000 ea., mesembryanthemum edule cut'gs
(44) Lump sum, electrical equipment.
(45) Lump sum, pump house & pumping equip.

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
(1)	3.00	4.00	4.50	3.00	4.20	4.85	2.50	6.50	3.00
(2)	50.00	50.00	150.00	35.00	85.00	66.00	40.00	75.00	100.00
(3)	.70	.50	.50	.40	.35	.70	.60	.45	.50
(4)	2.00	2.30	3.15	1.20	2.50	5.15	2.00	2.50	4.50
(5)	.70	1.20	.65	.60	1.75	.75	1.50	1.10	1.00
(6)	.80	.85	.95	1.00	.80	.64	1.50	.90	.75
(7)	2.00	1.50	2.20	2.25	1.85	3.50	3.00	2.00	2.90
(8)	.42	.55	.48	.465	.70	.66	.63	.70	.78
(9)	1.60	1.87	2.00	2.25	1.80	1.87	2.00	2.00	1.96
(10)	.10	.10	.11	.20	.10	.09	.10	.10	.10
(11)	$3,000	$3,000	$3,500	$1,200	$15,900	$16,000	$5,000	$7,450	$2,000
(12)	1.50	1.85	1.60	1.65	1.80	1.60	1.50	2.60	1.00
(13)	$2,500	$2,000	$1,500	$1,850	$2,500	$4,500	$4,000	$6,500	$4,500

(14)	15.00	15.00	19.00	15.40	19.00	12.25	16.00	17.50	16.00
(15)	.15	.15	.10	.15	.14	.14	.10	.10	.15
(16)	50.00	20.00	30.00	30.00	30.00	27.50	35.00	130.00	50.00
(17)	5.50	3.25	4.50	6.50	5.25	4.50	4.25	6.50	5.00
(18)	3.80	3.75	4.00	4.55	3.90	4.35	4.50	5.50	4.60
(19)	25.00	17.50	22.00	21.00	25.00	21.50	25.00	22.00	30.00
(20)	12.00	13.00	12.40	14.75	18.50	18.00	13.00	12.00	15.00
(21)	30.00	30.00	40.00	46.25	54.00	40.00	55.00	75.00	65.00
(22)	2.00	1.80	2.90	3.50	3.00	3.60	2.60	2.50	3.50
(23)	2.00	2.00	2.25	2.50	2.50	1.30	2.00	4.00	2.00
(24)	3.00	3.00	3.25	2.50	3.50	2.20	2.00	3.25	5.00
(25)	20.00	18.00	25.00	19.00	20.00	17.00	16.00	9.75	70.00
(26)	24.00	26.00	22.50	27.25	31.00	22.85	22.00	21.00	25.00
(27)	1.30	1.25	1.50	1.45	1.50	1.40	1.25	1.50	1.35
(28)	50.00	50.00	50.00	50.00	50.00	52.00	50.00	50.00	45.00
(29)	4.00	3.50	3.25	4.25	4.00	3.60	3.00	3.25	4.00
(30)	5.00	4.50	4.20	5.30	5.00	4.50	4.00	4.20	7.00
(31)	11.00	6.00	5.70	7.20	6.40	6.00	5.50	5.75	9.00
(32)	14.00	8.50	7.50	9.00	8.00	7.95	7.50	7.75	9.50
(33)	18.00	10.50	11.00	12.50	12.00	11.80	10.00	12.00	17.00
(34)	23.00	12.00	13.00	14.75	15.00	14.10	12.50	13.50	19.00
(35)	30.00	20.00	16.00	23.50	20.00	18.30	16.00	17.00	30.00
(36)	15.00	50.00	11.00	16.30	16.00	9.25	25.00	13.50	23.00
(37)	3.50	2.00	1.20	2.50	2.20	1.36	1.25	1.30	3.00
(38)	4.50	2.30	1.50	2.85	2.50	1.75	1.50	1.70	4.00
(39)	2.00	6.00	2.30	3.70	3.00	1.10	6.00	3.00	3.50
(40)	125.00	100.00	30.00	10.50	100.00	30.00	30.00	25.00	60.00
(41)	.06	.06	.09	.075	.08	.078	.07	.09	.10
(42)	.20	.15	.16	.12	.12	.17	.25	.20	.30
(43)	.03	.03	.04	.05	.04	.032	.035	.06	.08
(44)	$8,000	$9,000	$9,000	$5,035	$10,000	$13,400	$12,000	$14,000	$12,000
(45)	$5,000	$6,000	$4,400	$7,625	$5,200	$3,300	$7,266	$14,000	$12,500

Arizona—Coconino County—State—Pave

Fisher Contracting Co., Phoenix, submitted the low bid of $448,211 to the Arizona State Highway Commission, Phoenix, for grading, draining and placing aggregate base and Portland cement concrete pavement on 4 mi. of the Flagstaff-Winslow highway, extending easterly from a point 3 mi. east of Flagstaff. Particularly interesting was the close grouping of seven bidders, varying only $40,000. Unit bids follow.

(1) Fisher Contracting Co. $448,211
(2) Wallace & Wallace 449,795
(3) Bowen, McLaughlin & Lynch 452,352
(4) Packard Contracting Co. 460,449
(5) Western Construction Co. $463,266
(6) Arizona Sand & Rock Co. 469,655
(7) W. E. Orr 489,773

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
129,670	cu. yd. roadway excav. (unclass.)	.96	.90	1.10	1.04	1.22	1.20	1.15
1,000	cu. yd. overbreakage	.72	.675	.825	.78	.915	.90	.8625
1,000	cu. yd. slides	.48	.45	.55	.52	.61	.60	.575
2,415	cu. yd. drainage excav. (unclass.)	1.00	1.00	1.10	.84	1.25	.78	1.10
1,300	lin. ft. grader ditches	.07	.08	.05	.08	.12	.16	.15
255	cu. yd. structural excav. (unclass.)	2.25	3.00	2.20	2.50	2.64	2.73	4.00
150,308	sta. yd. overhaul	.02	.02	.02	.015	.015	.02	.02
6,935	cu. yd. mi. haul	.36	.40	.30	.20	.30	.40	.30
1,000	ton imported borrow	.65	.90	.75	.50	.70	.55	.60
38,900	ton aggregate base	.96	1.10	.90	.90	.91	.88	1.05
6,600	cu. yd. stripping pits	.25	.30	.30	.20	.22	.36	.35
6,560	M. gal. sprinkling	3.50	2.25	3.40	2.50	3.30	1.85	2.00
2,330	hr. rolling	6.25	5.00	5.00	5.75	5.30	4.50	5.00
54,405	sq. yd. concrete pavement	3.38	3.65	3.40	3.75	3.15	3.65	3.96
86	cu. yd. Class "A" conc. (incl. cement)	45.50	40.00	38.00	40.00	39.00	34.20	40.00
6,372	lb. reinf. steel (bars)	.08	.10	.08	.08	.08	.08	.10
340	lin. ft. 18-in. C.M.P. (except excav.)	2.60	3.30	2.20	2.30	3.70	2.72	2.30
394	lin. ft. 24-in. C.M.P. (except excav)	3.90	4.30	3.30	3.60	5.20	4.00	3.55
204	lin. ft. 30-in. C.M.P. (except excav.)	4.88	5.00	4.20	4.40	6.20	4.75	4.29
124	lin. ft. 36-in. C.M.P. (except excav.)	7.80	7.50	6.50	7.00	8.75	6.92	6.40
322	lin. ft. 42-in. C.M.P. (except excav.)	9.36	10.00	7.70	8.00	9.80	8.40	7.50
3	ea. cattle guards (2 unit)	457.00	500.00	420.00	335.00	400.00	403.00	450.00
4,940	lin. ft. reconstructing fence	.12	.10	.15	.17	.12	.12	.10
1	ea. resetting steel gate	26.00	20.00	20.00	20.00	22.00	26.00	25.00
3,840	lin. ft. road guard	2.50	2.50	1.90	1.50	2.00	1.89	1.50
118	ea. guide posts	3.90	4.00	5.00	5.00	5.00	3.90	5.50
33	ea. r/w markers (Type "E")	6.00	5.00	6.30	6.00	5.00	6.87	5.00
4,994	ton mineral aggregate	1.20	1.25	.95	1.05	1.28	1.03	.95
525	ton road oil (SC-4) (for roadmix)	25.50	26.00	25.00	28.00	26.00	24.00	26.60
3.9	mi. processing roadmix	845.00	500.00	500.00	750.00	$1,200	780.00	$1,000
453	ton screenings	7.80	8.00	2.50	6.50	5.00	4.50	5.00
61	ton emuls. asph. (Cl. "A") (for seal coat)	35.10	31.00	35.00	32.00	34.00	32.50	34.00
591	sq. yd. placing intersections	.85	1.00	.25	1.00	1.00	1.00	1.00

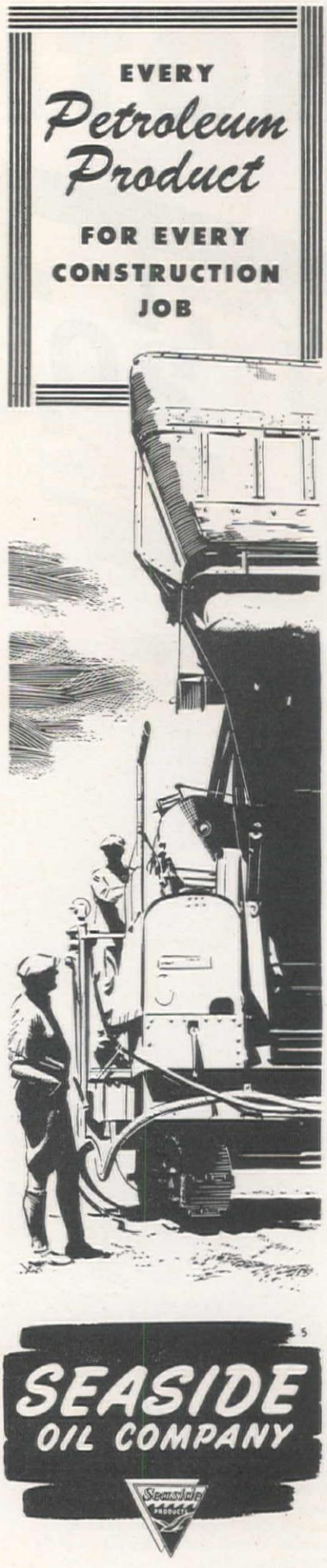
New Mexico—Colfax County—State—Street Improvement

Frank M. Kenney, Denver, Colorado, was awarded the contract on the lowest bid of $208,577 by the Highway Department, Santa Fe, for the construction and installation of street improvement in the city of Raton, SR-72. Summary of the work and unit bids received follows:

(1) Frank M. Kenney $208,577
(2) Northwestern Engineering Co. 251,349
(3) Lowdermilk Bros. 257,623
(4) Henry Thygesen & Co. $272,559
(5) J. H. Ryan 273,623
(6) E. M. Silver 290,343

		(1)	(2)	(3)	(4)	(5)	(6)
25,000	cu. yd. excavation (unclassified)	.85	.70	1.35	1.25	1.00	2.10
60,000	sta. yd. overhaul	.023	.025	.02	.04	.02	.05
15,000	¼ mi. yd. haul	.10	.05	.10	.10	.05	.10
70	cu. yd. two course surfacing	4.00	5.65	5.00	3.50	4.00	3.00
11,319	sq. yd. Portland cement conc. pave	3.24	3.90	4.00	3.00	4.00	3.00
3,021	lin. ft. longitudinal metal center joint	.35	.18	.50	.50	.20	.20
37,706	lb. wire fabric reinf.	.075	.083	.10	.18	.10	.10
409.7	cu. yd. conc. curb and gutter	24.00	32.00	30.00	40.00	25.00	40.00
922.9	cu. yd. Class "A" conc.	31.50	40.25	35.00	45.00	40.00	44.00
50.0	cu. yd. Class "C" conc.	31.50	40.25	50.00	34.00	30.00	20.00
179,164	lb. reinforcing steel	.0675	.074	.10	.10	.08	.09
218,323	lb. structural steel	.0975	.12	.10	.12	.12	.12
630	lin. ft. std. str. conc. pipe, 24-in. diam.	4.85	10.00	5.00	10.00	9.00	6.00

(Continued on page 134)



NOTHING LIKE I

Thew 20 Lora



Moto Shovel

The new Lorain TL-20 on popular 6x6 Moto-Crane mounting . . . shown with Shovel Boom. Complete boom interchangeability is yours on the TL-20.



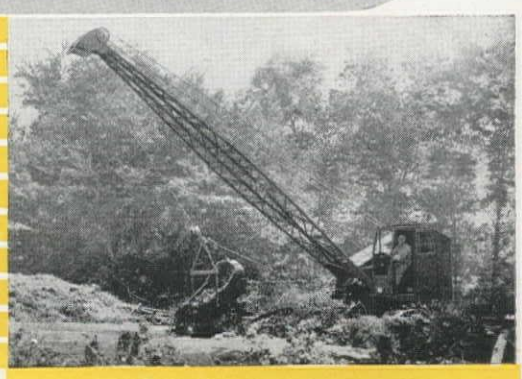
As a Crawler Shovel

Chain drive crawler . . . two travel speeds in *both* directions . . . horizontal propelling shaft and steering mechanism one complete "unit assembly," easily removable . . . propelling mechanism enclosed and runs in oil . . . all welded shovel boom, one piece stick . . . electric dipper trip.



As a Moto-Crane

The new TL-20 is available as a highly mobile, 2-engine Moto-Crane, with travel speeds up to 33 m.p.h. . . . mounted on special "shovel-crane" chassis frame . . . built in 6 and 4 wheel units as 6x6, 6x4, and 4x4 drives . . . double reduction gear driven axles . . . 5 interchangeable booms.



As Dragline, Clamshell, Crane

Equally efficient on rubber-tire or crawler mountings. All-welded crane boom with all-purpose boom head and flanged bolted connections. Draglines use patented "cable-miser" fairlead. Clamshells equipped with electric tagline. Cranes have "Steel Erectors Precision Boom Hoist."

THE NEW TL-20 IS AVAILABLE WITH 5 INTERCHANGEABLE BOOMS AND CHOICE OF 10

T Ever Before!



THE NEW THEW-LORAIN TL-20

The new Thew-Lorain TL-20 is the greatest advance in the shovel-crane field in years. It's entirely new in ideas . . . new in design . . . new in performance . . . It brings you job profit advantages and opportunities never before offered in the ½-yard class.

There's a revolutionary, new turntable design featuring "Unit Assembly." Each major component—the clutch shaft, engine and accessories, hoist shaft, cab, is complete in itself and can be removed and replaced as a complete unit.

There's a startling, new clutch shaft assembly . . . five identical shoe-type clutches, all mounted in one "Unit Assembly," to control all machine operations. All clutches are interchangeable.

You buy no "extras" in the TL-20. It is a "Complete Package." All essential and desirable accessories—such as starter, generator, lights, etc. . . . are built into the standard unit.

Sixteen outstanding design features of the new TL-20 are listed briefly below. You must completely investigate this revolutionary new design in order to appreciate it fully. It's truly a "post-war" shovel-crane for "post-war" conditions. Learn why there is "nothing like it" on the market today. See your Thew-Lorain Distributor now . . . you are going to want a new Lorain TL-20!

THE THEW SHOVEL CO., LORAIN, OHIO

Thew TL 20 Lorain

OUTSTANDING DESIGN FEATURES

1. A COMPLETE PACKAGE
2. NEW UNIT ASSEMBLY
3. 5 IDENTICAL CLUTCHES
4. ANTI-FRICTION BEARINGS
5. OIL-ENCLOSED CUT GEARS
6. INTERCHANGEABLE PARTS
7. ONE-PIECE ALL-WELDED BED
8. HOOK ROLLERS
9. 2 SPEED CRAWLER
10. DROP FORGED CRAWLER TREADS
11. POSITIVE CRAWLER TRAVEL LOCK
12. "FULL CIRCLE" CRAWLER STEERING
13. CHOICE OF 9 RUBBER-TIRE MOUNTINGS
14. POSITIVE, INDEPENDENT CABLE SHOVEL CROWD
15. ALL-PURPOSE CRANE BOOM
16. GOOSE-NECK HOE BOOM



As a Self-Propelled Unit

The popular single-engine, one-man controlled unit, with all controls for travel and operating located in operator's cab . . . effortless air power steering . . . 4 speeds in both directions up to 7 m.p.h. . . . double reduction gear driven axles . . . built in 6 and 4 wheel units as 6x4, 4x4 and 4x2 drives.

MOUNTINGS TO FIT YOUR JOB



SEE YOUR THEW-LORAIN DISTRIBUTOR

Get a copy of the new TL-20 Bulletin and further facts from your nearest THEW-LORAIN Distributor listed below.

Le Roi-Rix Machinery Co., Los Angeles 11
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Liberty Trucks & Parts Co., Denver 1
Coast Equipment Company, San Francisco 1
A. H. Cox & Co., Seattle 4, Washington
Bunting Tractor Co., Inc., Boise, Twin Falls, Gooding, Fairfield, and Burley, Idaho; LaGrande, Oregon
Connelly Machinery Company, Billings and Great Falls, Montana
Sanford Tractor & Equipment Co., Reno, Nevada
The Mountain Tractor Co., Missoula, Montana
The Tractor & Equipment Co., Sidney, Montana
P. L. Crooks & Co., Portland 10, Oregon
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Wortham Machinery Co., Cheyenne, Wyoming
Branches: Sheridan, Greybull and Casper



BLADE EDGES
GUARANTEED SPLIT-PROOF

INGERSOLL SHOVELS
"The Borg-Warner Line"

SMITH BOOTH USHER COMPANY, *Distributor*
Los Angeles, Calif. Phoenix, Ariz.
Factory Representative:
John F. Kegley & Son, Los Angeles, Calif.



we **ARE** *Screen Proud!*

We are proud of the fine performance of Pacific Wire Screen and for its trustworthy, careful workmanship, exact sizing and long service to the gravel producing industry. Specially tempered for hardness and low maintenance cost.

Made complete for Cylinders, Shakers, Cones, Vibrators. Be specific—say Pacific 4-S to your dealer.

PACIFIC WIRE WORKS CO.
KARL H. KAYE, President
Factory and Warehouse
4515-29 6th AVE. SO., SEATTLE 8, WASH.
Established 1891

4-S SUPER STRENGTH SPRING STEEL

30	lin. ft. corr. galv. metal culv. pipe, 8-in. diam.	1.40	2.50	2.00	1.50	1.50	2.00
250	lin. ft. corr. galv. metal culv. pipe, 8-in. diam.	1.60	2.25	3.00	1.75	1.50	2.00
25	sq. yd. conc. blanket, bank protec., 6-in. thick	4.00	5.00	5.00	6.00	4.00	6.00
2	ea. project markers, Type II	40.00	25.00	25.00	60.00	50.00	20.00
860	cu. yd. removing existing pavements	3.25	5.75	5.00	4.00	20.00	5.00
204.8	cu. yd. concrete sidewalk	22.00	33.00	30.00	30.00	22.00	27.00
305	sq. yd. membrane waterproofing	3.50	2.00	1.50	3.00	5.00	3.00
39	sq. yd. asphalt plank 1¼-in. thick	9.00	9.55	7.20	10.00	5.00	10.00
153	sq. yd. damproofing	1.50	1.45	2.00	2.00	3.00	1.00
298	cu. yd. sand fill	3.50	5.65	2.00	5.00	4.00	5.00
225	cu. yd. screened gravel fill	3.50	5.65	3.00	5.00	4.00	5.00
395	lin. ft. vitr. clay sewer pipe, 4-in. diam.	.75	1.35	1.00	1.00	1.00	1.00
25	lin. ft. vitr. clay sewer pipe, 6-in. diam.	.80	1.65	1.00	1.50	2.00	1.80
240	lin. ft. vitr. clay sewer pipe, 8-in. diam.	1.00	1.85	1.50	1.80	2.50	2.10
380	lin. ft. vitr. clay sewer pipe, 10-in. diam.	1.20	2.10	2.00	2.00	2.50	2.40
421	lin. ft. vitr. clay sewer pipe, 12-in. diam.	1.50	2.30	2.50	2.50	3.00	2.50
606	cu. yd. railroad structure conc.	31.50	42.00	35.00	38.00	40.00	50.00
171	lin. ft. steel handrail	9.00	11.40	10.00	12.00	10.00	6.00
87	lin. ft. pipe handrail	3.00	2.90	5.00	3.00	4.00	4.00
503	lin. ft. removing sewer pipe	1.00	1.70	2.00	1.00	2.00	1.00
1,100	lb. corr. galv. metal sheets	.15	.15	.20	.30	.50	.20
19	lin. ft. cast iron pipe, 8-in. diam.	4.00	2.75	4.00	3.00	4.00	5.00
80	M. sq. ft. grass seeding	40.00	5.00	25.00	50.00	100.00	80.00
185	lin. ft. copper water tube, ½-in. diam.	.54	.55	.70	.50	.35	.20
820	lin. ft. copper water tube, ¾-in. diam.	.60	.70	.85	.60	.75	.30
860	lin. ft. copper water tube, 1-in. diam.	.66	.80	1.00	1.00	1.00	.40
3	ea. brass stops for ½-in. tubes	3.00	2.60	3.00	1.00	3.00	5.00
3	ea. brass stops for ¾-in. tubes	3.40	4.15	4.00	1.00	4.00	5.00
6	ea. brass stops for 1-in. tubes	4.00	6.00	4.50	1.00	5.00	5.00
98	ea. sprinkler heads	2.00	2.80	5.00	1.50	1.00	2.00
13	ea. service boxes	4.00	3.75	10.00	5.00	10.00	5.00
100	M. gal. watering	2.00	1.60	3.00	3.50	3.00	5.00
65	hour rolling	6.00	5.60	7.50	6.00	10.00	10.00
8	ea. Juniper, Japonica Sylvestris	15.00	9.50	20.00	20.00	15.00	12.50
78	ea. Juniper, Chenensis Pfitzeriana.	15.00	10.50	20.00	15.00	15.00	12.50
21	ea. Juniper, Virginiana Cannarti	20.00	15.80	20.00	20.00	15.00	12.50
22	ea. Juniper, Virginiana Pyranidaformia	20.00	14.35	20.00	20.00	15.00	12.50
14	ea. pit lighting fixtures "C"	22.50	64.00	30.00	30.00	20.00	20.00
12	ea. wall lighting fixtures "B"	30.00	70.00	50.00	35.00	20.00	20.00
3	ea. light standard fixtures "F"	250.00	431.00	300.00	275.00	250.00	20.00
1	ea. light standard fixtures "E"	225.00	481.25	300.00	300.00	250.00	20.00
2	ea. light standard fixtures "A"	250.00	456.25	300.00	300.00	250.00	50.00
2	ea. light standard fixtures "D"	250.00	456.25	300.00	300.00	250.00	50.00
1	ea. light standard fixtures "K"	250.00	468.18	300.00	300.00	250.00	50.00
1	ea. light standard fixtures "L"	320.00	870.00	350.00	300.00	250.00	75.00
1	ea. panel board complete	150.00	281.25	200.00	150.00	250.00	350.00
7	ea. junction boxes, 7-in. x 6-in. x 5-in.	5.00	31.75	25.00	25.00	10.00	10.00
563	lin. ft. galv. elec. conduit, ¾-in. diam.	.30	.32	.75	.60	.30	.08
338	lin. ft. galv. elec. conduit, 1-in. diam.	.35	.45	.80	1.00	.40	.11
220	lin. ft. galv. elec. conduit, 1¼-in. diam.	.42	.55	1.00	1.00	.50	.15
555	lin. ft. galv. elec. conduit, 1½-in. diam.	.50	.70	1.00	1.50	.75	.17
234	lin. ft. galv. elec. conduit, 2-in. diam.	.70	.80	1.25	1.75	1.00	.25
575	lin. ft. two conductor No. 12 braid cable	.20	.38	.30	.40	.50	.22
318	lin. ft. two conductor No. 12 Type "AF" cable	.23	.45	.40	.55	.50	.25
133	lin. ft. two conductor No. 12 lead sheathed cable	.27	.55	.40	.35	1.00	.40
170	lin. ft. two conductor No. 10 lead sheathed cable	.30	.50	.40	.35	1.00	.50
262	lin. ft. two conductor No. 8 lead sheathed cable	.33	.55	.45	.50	1.00	.55
82	lin. ft. three conductor No. 8 lead sheathed cable	.48	.75	1.00	.80	1.00	.55
142	lin. ft. two conductor No. 6 lead sheathed cable	.45	.80	1.00	.80	1.00	.60
82	lin. ft. two conductor No. 4 lead sheathed cable	.52	.90	1.00	.80	1.00	1.00
561	lin. ft. three conductor No. 4 lead sheathed cable	.75	1.10	1.10	1.00	1.00	2.00
236	lin. ft. three conductor No. 0 lead sheathed cable	1.65	1.60	2.00	1.50	1.00	3.00

California—San Bernardino County—State—Pave

Griffith Co., Los Angeles, submitted the low bid of $1,386,770 to the California Division of Highways, Sacramento, for grading and paving with Portland cement concrete a stretch of highway 9.8 mi. in length between Colton and Mulberry St. The contract was awarded to the low bidder. One of the outstanding features was the large proportion of overhaul on the job. The following unit bids were submitted:

(A)	Griffith Co.	$1,386,770	
(B)	Matich Bros. & R. S. Crow	1,403,866	
(C)	H. E. Parker & N. M. Ball Sons	1,432,751	
(D)	J. E. Haddock, Ltd.	1,452,538	
(E)	Basich Bros. Construction Co.	1,477,221	
(F)	Peter Kiewit Sons Co.	1,483,792	
(G)	Guy F. Atkinson Co.	1,545,455	
(H)	E. W. Elliott Construction Co.	1,549,834	
(I)	Rhoades Bros. & Shofner	$1,568,119	
(J)	Mittry Brothers	1,569,666	
(K)	H. H. Everist, Sr.	1,649,344	
(L)	Warren Southwest, Inc.	1,651,974	
(M)	Bressi Bevanda Constructors	1,668,772	
(N)	Morrison-Knudsen Co., Inc.	1,744,739	
(O)	Vinnell & Co.	3,793,708	

(1) 650 cu. yd. removing concrete.
(2) 518 sta. clearing and grubbing.
(3) 4,600 ea. removing trees and stumps.
(4) 802,000 cu. yd. roadway excavation.
(5) 12,000 cu. yd. structure excavation.
(6) 4,600 cu. yd. structure backfill.
(7) 450 cu. yd. ditch and channel excavation.
(8) 88,000,000 sta. yd. overhaul.
(9) 53,000 sq. yd. preparing slopes (slope erosion prot'n.)
(10) 85 tons straw (slope erosion protection)
(11) Lump sum, develop water and furnish equipt.
(12) 22,500 M. gal. apply water.
(13) 518 sta. finishing roadway.
(14) 270,500 sq. yd. subgrade treatment.
(15) 2,000 tons liquid asphalt RC-2 or RC-3 (sub'g tr.)
(16) 27,500 tons mineral aggregate (P.M.S.)
(17) 1,300 tons paving asphalt (P.M.S.)
(18) 0.6 tons asphaltic paint binder.
(19) 360 lin. ft. raised bars (P.M.S.)
(20) 62,000 cu. yd. Cl. "B" P.C.C. (pavement)
(21) 41,500 ea. tie bolt assemblies
(22) 1,905 cu. yd. Cl. "A" P.C.C. (structs.)
(23) 80 lin. ft. rubber water stops.
(24) 180,000 lbs. furnish bar reinf. steel
(25) 180,000 lbs. placing bar reinf. steel.
(26) 186,000 lbs. furnishing struct. steel.
(27) 186,000 lbs. erecting struct. steel.
(28) 390 lin. ft. steel railing.
(29) 522 cu. yd. Cl. "A" P.C.C. (curbs, gutters, S.W.).
(30) 181 ea. monuments.
(31) 2,980 lin. ft. laminated guard rail.
(32) 276 ea. culvert markers.
(33) 90 ea. guide posts.
(34) 17.6 mi. new property fence.
(35) 0.54 mi. chain link fence.
(36) 27 ea. street closure fence units.
(37) 1,050 lin. ft. 30-in. std. str. R.C.P.
(38) 304 lin. ft. 8-in. C.M.P. (16 ga.)
(39) 182 lin. ft. 18-in. C.M.P. (16 ga.)
(40) 7,000 lin. ft. 24-in. C.M.P. (14 ga.)
(41) 4,100 lin. ft. removing exist. irrig. pipe lines.
(42) 840 lin. ft. 12-in. welded steel pipe (siphons).
(43) 170 lin. ft. 16-in. welded steel pipe (siphons).

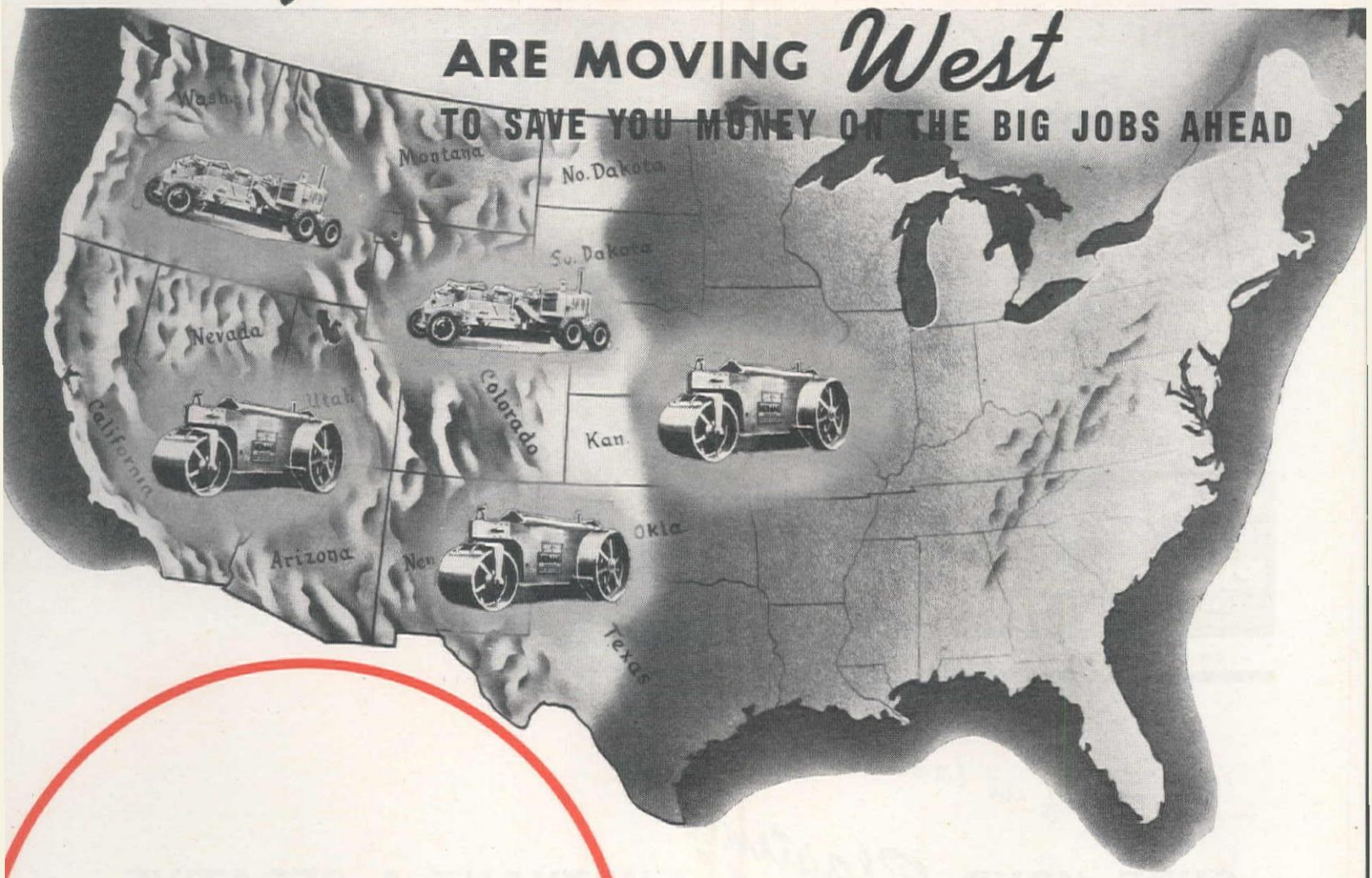
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
(1)	4.00	4.00	3.00	2.35	5.00	5.00	2.50	10.00	3.50	4.50
(2)	6.00	20.00	15.00	24.30	10.00	29.00	10.00	28.00	25.00	35.00
(3)	3.40	2.50	6.50	3.60	5.00	7.60	2.50	6.00	4.50	10.00

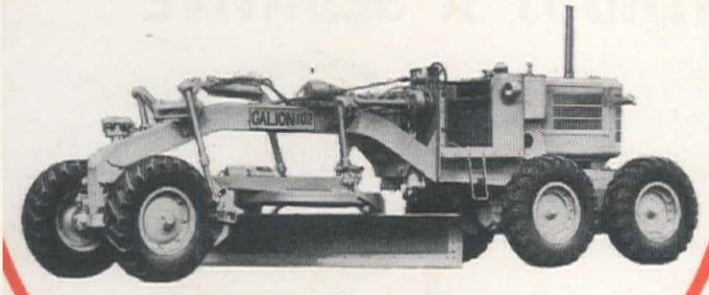
(Continued on next page)

New Powerful GALIONS

ARE MOVING *West*

TO SAVE YOU MONEY ON THE BIG JOBS AHEAD





GALION 102

See this new GALION 102

Engineered for heavy duty building and maintaining hard-used Western roads and airports. Ask about the new features that reduce operating costs.

YOUR WESTERN DISTRIBUTOR can tell you more about these NEW HIGH-POWERED GALIONS

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BROWN-BEVIS EQUIPMENT CO.	Phoenix, Arizona
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NELSON EQUIPMENT CO.	Seattle, Washington
F. RONSTADT HARDWARE CO.	Tucson, Arizona
BROWN-BEVIS EQUIPMENT CO.	Los Angeles, California
NELSON EQUIPMENT CO.	Boise, Idaho
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GENERAL EQUIPMENT CO.	Reno, Nevada
NELSON EQUIPMENT CO.	Spokane, Washington
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ROLLERS AND MOTOR GRADERS

The **GALION IRON WORKS & MFG. CO.**
GALION OHIO

PIPE for Every PURPOSE

Whether it's a Giant Corrugated Culvert or the simplest of water systems—there's a Beall pipe to fit the job. You'll find that engineers and contractors specify Beall pipe because they have learned to depend on its uniform quality.

Beall Industrial pipe ranges from 4" to 84" diameter and it includes pipe for every purpose.

MUNICIPAL WATER SYSTEMS
DRAINAGE SYSTEMS
ROAD CULVERTS
PUMPING PLANTS
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IRRIGATION SYSTEMS

BEALL
PIPE & TANK CORP.
1945 NORTH COLUMBIA BOULEVARD
PORTLAND, OREGON

Offices in: SEATTLE, SPOKANE, BOISE

(4)	.32	.315	.37	.33	.25	.431	.41	.28	.38	.24
(5)	1.50	.90	1.65	2.60	2.50	1.50	1.20	2.50	1.50	2.00
(6)	1.10	.50	2.50	2.15	1.50	1.00	1.90	3.00	1.00	1.50
(7)	.90	1.00	1.60	1.65	1.50	1.00	1.90	1.00	1.00	2.00
(8)	.0015	.002	.0015	.0013	.002	.0006	.0022	.0025	.0025	.0025
(9)	.08	.10	.05	.065	.10	.13	.10	.15	.05	.20
(10)	48.00	65.00	45.00	51.00	75.00	48.50	50.00	50.00	50.00	65.00
(11)	$7,500	$10,000	$9,000	$11,600	$5,000	$4,500	$3,500	$10,000	$3,000	$12,000
(12)	1.30	1.50	1.40	1.30	1.90	1.60	1.50	1.50	1.85	1.50
(13)	3.00	20.00	10.00	15.00	15.00	7.00	10.00	12.00	13.00	15.00
(14)	.16	.19	.17	.14	.15	.21	.15	.16	.18	.15
(15)	15.00	14.00	14.50	14.80	14.00	16.00	12.25	14.00	15.90	16.50
(16)	2.62	2.75	1.90	2.60	2.50	3.00	2.75	3.30	3.25	3.25
(17)	14.00	14.00	13.00	13.60	13.50	15.70	11.50	15.00	13.50	15.50
(18)	110.00	100.00	100.00	127.00	125.00	42.00	100.00	85.00	100.00	200.00
(19)	.90	1.00	.60	.80	.75	.80	1.00	1.00	.90	1.00
(20)	9.00	8.40	8.65	9.10	9.50	8.90	9.05	9.00	8.50	9.40
(21)	.50	.45	.53	.58	.58	.50	.55	.60	.50	.58
(22)	31.00	30.00	35.00	38.10	42.00	35.00	40.00	39.00	30.00	36.00
(23)	2.50	1.00	2.00	1.25	2.00	2.40	2.50	2.00	2.00	2.50
(24)	.044	.04	.05	.05	.046	.044	.04	.04	.04	.045
(25)	.024	.025	.02	.022	.03	.024	.02	.025	.02	.02
(26)	.065	.0063	.065	.072	.07	.08	.06	.06	.08	.085
(27)	.024	.025	.015	.025	.027	.01	.03	.03	.0175	.025
(28)	5.25	6.00	5.50	5.65	5.50	5.40	5.00	7.00	8.00	7.00
(29)	21.00	24.00	26.00	22.25	24.50	40.00	34.00	26.00	30.00	36.00
(30)	5.00	4.00	4.00	6.35	5.00	4.80	3.50	5.00	3.75	4.50
(31)	1.80	2.00	2.30	2.50	2.10	2.25	2.10	2.20	2.00	2.50
(32)	3.25	4.00	4.00	3.80	5.00	2.90	3.50	4.00	3.75	4.50
(33)	3.50	4.00	4.00	3.20	5.00	2.90	3.00	4.00	3.75	5.00
(34)	880.00	$1,000	950.00	$1,590	$1,050	$1,100	800.00	950.00	750.00	$1,050
(35)	$7,000	$6,500	$6,300	$8,900	$7,000	$7,250	$6,200	$6,500	$10,000	$6,600
(36)	175.00	175.00	200.00	180.00	175.00	180.00	160.00	200.00	240.00	175.00
(37)	5.20	5.25	5.30	5.65	5.50	5.08	5.20	5.25	5.00	5.50
(38)	1.10	1.50	1.60	1.15	1.40	1.34	1.10	1.55	1.25	1.35
(39)	2.00	2.25	2.50	1.50	2.20	2.25	2.10	2.50	2.50	2.60
(40)	3.00	3.00	3.10	3.05	3.15	3.37	3.00	4.25	3.00	3.50
(41)	.50	.50	.60	.65	.60	.27	.70	2.00	1.00	1.00
(42)	2.15	6.00	2.10	3.35	2.15	2.70	3.00	5.30	2.80	3.50
(43)	2.80	6.50	2.85	4.80	3.00	3.60	4.00	6.50	3.75	5.00

Arizona—Cochise County—State—Grade and Surface

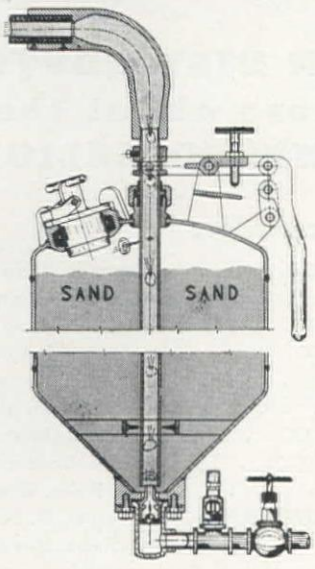
Packard Contractors Co., Phoenix, submitted the low bid of $394,932 to the Highway Department, Phoenix, for the construction of 4 mi. of grading, draining, base material and roadmix bituminous surfacing on the Benson-Douglas Highway. Bids were received from the following:

(A)	Packard Contr. Co.	$394,932	
(B)	L. M. White Contr. Co.	406,945	
(C)	Tanner Construction Co.	409,212	
(D)	Wallace & Wallace, Gen. Contrs.	413,279	
(E)	P.D.O.C., Gen. Contrs.	422,578	
(F)	Edw. VanDoorn, Contr.	$424,521	
(G)	Bowen & McLaughlin	431,985	
(H)	I. G. Beall, Contr.	441,160	
(I)	Fisher Contracting Co.	453,723	
(J)	Tiffany Const. Co.	493,644	

(Continued on next page)

Relief at last!

CURE YOUR *Blasting Headaches* WITHOUT A SEDATIVE



CLEANING PROBLEMS and EXCESSIVE CLEANING COSTS ARE HEADACHES

Relieve them by using a ***SANSTORM*** Sandblasting Machine of a size to meet your blasting requirements

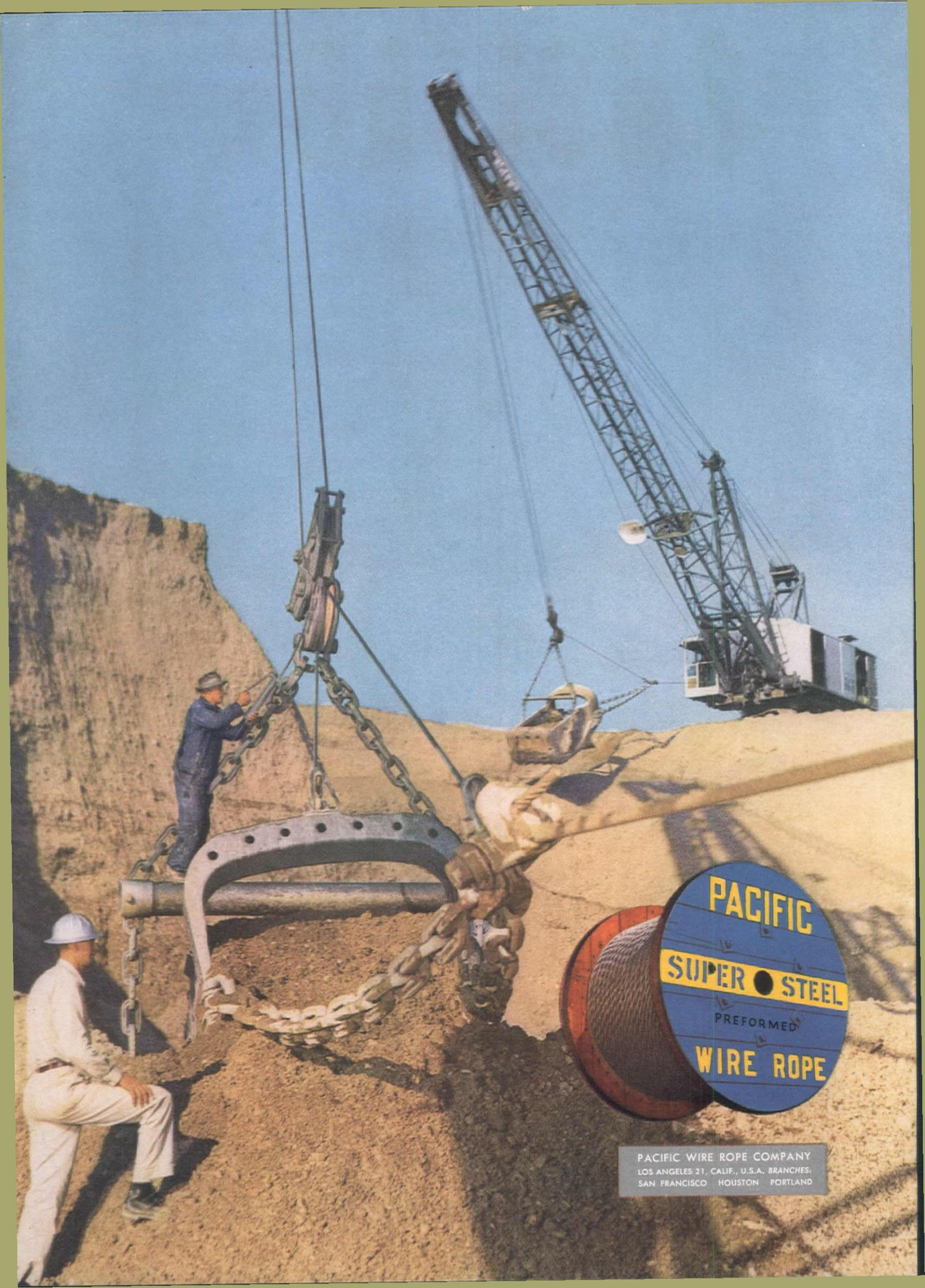


The easily operated ***SANSTORM*** Machine is designed so **It Will Not Plug** or **Clog**—yet give **Constant Abrasive Discharge** and by a simple adjustment provide **Clean Air Blast** for **Dusting** the finished work.

Just a note will bring our folder explaining other outstanding features.

Manufactured by
SANSTORM MANUFACTURING CO.
Santa Clara & H Streets
Fresno, California

Distributed by
SANSTORM SALES COMPANY
P. O. Box 1173
Fresno, California

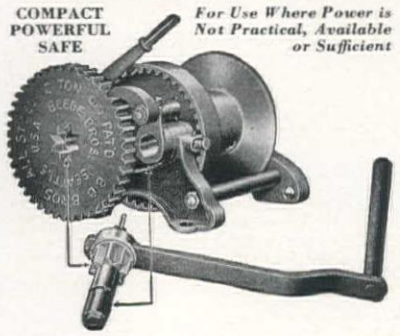


PACIFIC WIRE ROPE COMPANY
LOS ANGELES 21, CALIF., U.S.A. BRANCHES:
SAN FRANCISCO HOUSTON PORTLAND

BEEBE BROS.
ALL STEEL HAND HOIST
SEATTLE, U.S.A.

COMPACT
POWERFUL
SAFE

For Use Where Power is Not Practical, Available or Sufficient



"The strongest geared power for its weight in the world"

Three sizes: 2-, 5- and 15-ton. Capacity comparison figuring ½" flexible plow steel cable.

2-ton "Lightweight"	75 ft.
5-ton "General-Utility"	250 ft.
15-ton Triple-Geared "Special"	1200 ft.

With patented instant gear change and positive internal brake that never fails, and will lock and hold load until released.

Ratios	Weight	Price
2-ton 4 & 22 to 1	60 lb.	$ 50
5-ton 4 & 24 to 1	110 lb.	$ 75
15-ton 4, 19 & 109 to 1	680 lb.	$250

ALL MODELS priced f.o.b. Seattle. 5-ton size can also be furnished with special 16" or 24" wide drum in place of standard drum 8" wide. Scatter them around the job to suit, one or 100, distributing the load "evenly." Place assembled pipelines, caissons, trusses, girders, or what have you. Just be sure of your **rigging** and **anchorage.** Manpower never grew that could break a Beebe Hoist on a fair pull—a 5-ton General Utility withstood a mechanical pull of 41,000 lbs. on official test, breaking a ¾" plow steel cable with Hoist remaining intact.

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BEEBE BROS.

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The VIBRATORS workmen like to use



PERFECT BALANCE makes Viber Vibrators so easy to handle that better workmanship results—and faster work schedules may be maintained. VIBERS give you a constant, smooth speed of 9,500 RPMs IN CONCRETE—the highest ever offered. Vibers are flexible, yet rugged, and all elements are interchangeable, including electric, pneumatic and gasoline motors.

THE VIBER COMPANY
726 So. Flower St., Burbank, Calif.

VIBER
HI-SPEED CONCRETE VIBRATORS



ORIGINATORS OF
INTERNAL CONCRETE VIBRATION!

(1) 152,381 cu. yd. roadway excav. (unclass).
(2) 3,500 cu. yd. overbreakage.
(3) 2,500 cu. yd. slides.
(4) 14,014 cu. yd. drainage excav. (unclass.).
(5) 1,920 lin. ft. grader ditches.
(6) 350 lin. ft. crown ditches.
(7) 4,297 cu. yd. struct. excav. (unclass.).
(8) 181,784 sta. yd. overhaul.
(9) 21,447 cu. yd. mi. haul.
(10) 43,623 tons imported borrow (CIP).
(11) 38,295 tons select material (CIP).
(12) 15,060 tons aggregate base (CIP).
(13) 8,003 M. gal. sprinkling (CIP).
(14) 2,229 hr. rolling.
(15) 392 hr. mechanical tamping.
(16) 285 lin. ft. concr. separating strip (CIP).
(17) 1,619 cu. yd. class A concr. (incl. cement).
(18) 193 cu. yd. class D concr. (and cement).
(19) 179,700 lbs. reinf. steel (bars) (CIP).
(20) 690 lin. ft. 18-in. bit. coated CMP (CIP except elevation).
(21) 698 lin. ft. 24-in. bit. coated CMP (CIP except elevation).
(22) 722 lin. ft. 30-in. bit. coated CMP (CIP except elevation).
(23) 402 lin. ft. 36-in. bit. coated CMP (CIP except elevation).
(24) 490 lin. ft. 42-in. bit. coated CMP (CIP except elevation).
(25) 80 lin. ft. 48-in. bit. coated CMP (CIP except elevation).
(26) 885 cu. yd. plain riprap (CIP).
(27) 14 cu. yd. grouted riprap (CIP).
(28) 1,440 lin. ft. fence cable (¾-in. rope) (CIP).
(29) 27 ea. guard fence posts (CIP).
(30) 1,550 lin. ft. reconstr. fence (CIP).
(31) 2,850 lin. ft. road guard (CIP).
(32) 125 lin. ft. rail bank protection (Type B) (CIP).
(33) 161 ea. guide posts (CIP).
(34) 62 ea. r/w markers (type D or E) (CIP).
(35) 5,808 lin. ft. comb. curb and gutter (CIP).
(36) 4,425 sq. ft. cover sidewalk (CIP).
(37) 5 ea. stand. catch basins (A-27) (CIP).
(38) 12,802 tons roadmix (CIP except liq. asph.).
(39) 935 tons road oil (8C-4) for roadmix) (CIP).
(40) 932 lin. ft. placing bitum. mix curb.
(41) 1,278 tons screenings (CIP).
(42) 172 tons emul. asph. (Cl. A) (for seal coats) (CIP).
(43) lump sum pipe handrail (on mile Pass Gulch Bridge) (CIP).
(44) 355 lin. ft. reconstr. steel fence (on new and raised retaining wall).
(45) 50 cu. yd. removal of concr. retaining wall.
(46) 840 lin. ft. removal of concr. sidewalk and comb. curb and gutter.
(47) 8,660 sq. yd. removal of concr. pavement.
(48) Lump sum removal of concr. bridge (Rt. of Sta. 74 and 60).

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
(1)	.80	.50	.80	.80	.86	.86	.80	.90	.90	1.20
(2)	.60	.375	.60	.60	.645	.645	.60	.675	.675	.90
(3)	.40	.25	.40	.40	43	.43	.40	.45	.45	.60
(4)	.65	1.50	.55	.55	.42	.40	.40	1.00	.70	.70
(5)	.10	.20	.10	.10	.15	.07	.12	.15	.12	.08
(6)	.50	.30	.20	.20	.60	.34	.50	.15	.22	.62
(7)	2.60	2.87	2.50	2.50	2.25	2.00	2.50	2.00	2.00	3.00
(8)	.015	.02	.02	.02	.02	.015	.02	.02	.02	.02
(9)	.22	.25	.30	.30	.35	.34	.30	.35	.37	.25
(10)	.50	.50	.65	.65	.45	.46	.44	.45	.55	.65
(11)	.50	.50	.65	.65	.52	.55	.52	.75	.60	.65
(12)	.88	1.00	.95	.95	1.00	1.00	1.05	1.00	.90	.90
(13)	1.50	1.75	1.60	1.60	2.50	1.55	2.75	1.50	2.75	1.50
(14)	5.00	6.25	5.00	5.00	5.50	5.00	6.00	5.00	6.00	6.00
(15)	2.50	7.50	3.00	3.00	3.00	5.50	3.00	4.00	1.70	3.00
(16)	1.60	2.25	2.00	2.00	3.00	1.35	4.00	10.00	4.25	1.50
(17)	30.00	32.50	32.00	32.00	29.00	32.00	32.25	30.00	36.00	30.00
(18)	30.00	37.50	34.00	34.00	37.00	35.00	40.00	30.00	37.00	34.00
(19)	.08	.09	.08	.08	.075	.075	.09	.08	.08	.07
(20)	2.30	3.10	2.50	2.50	2.30	3.05	2.20	3.00	2.72	2.50
(21)	3.60	4.75	3.75	3.75	3.60	4.20	3.50	4.50	4.05	3.50
(22)	4.50	5.75	4.75	4.75	4.45	5.00	4.25	5.00	5.15	4.80
(23)	7.00	8.60	7.00	7.00	6.90	7.50	5.50	7.00	8.10	8.00
(24)	8.00	10.30	9.00	9.00	8.20	9.00	7.85	8.50	10.00	9.00
(25)	10.00	13.25	10.00	10.00	9.35	10.00	8.85	10.00	12.50	11.00
(26)	5.00	5.00	4.00	5.00	6.00	6.75	6.00	4.00	6.50	4.00
(27)	10.00	8.00	10.00	10.00	30.00	13.50	25.00	10.00	15.00	10.00
(28)	.50	.25	.60	.60	1.00	.60	.50	1.50	.50	1.10
(29)	5.00	6.00	4.50	4.50	5.00	3.50	5.00	3.50	2.25	4.50
(30)	.17	.15	.15	.10	.20	.34	.12	.25	.12	.20
(31)	1.75	2.00	1.80	2.00	1.15	2.00	1.50	2.00	2.50	1.60
(32)	5.40	6.00	6.00	5.00	5.00	2.70	5.00	5.50	6.00	5.00
(33)	5.00	6.00	4.80	4.50	5.00	2.00	5.00	5.00	3.85	6.00
(34)	5.00	6.00	4.80	5.00	6.00	5.50	5.75	6.00	6.00	6.00
(35)	2.00	2.50	1.70	1.75	3.00	1.70	3.20	3.00	1.35	2.10
(36)	.25	.30	.35	.25	.40	.34	.42	.35	.35	.30
(37)	25.00	100.00	200.00	75.00	200.00	135.00	175.00	75.00	140.00	60.00
(38)	1.30	2.00	1.60	1.20	1.60	2.10	1.65	1.50	1.25	1.80
(39)	22.00	30.00	25.00	26.00	23.00	27.00	24.00	22.00	27.65	27.00
(40)	.50	1.00	1.00	.40	.50	.70	.35	.30	.20	.70
(41)	4.00	5.00	4.50	4.00	4.50	4.25	5.00	5.00	4.00	6.00
(42)	28.00	40.00	30.00	31.00	26.00	30.00	28.00	23.60	33.60	34.00
(43)	300.00	30.00	250.00	100.00	100.00	135.00	100.00	200.00	40.00	400.00
(44)	3.00	1.00	.75	1.00	1.00	.34	1.00	2.00	1.00	3.00
(45)	4.00	3.50	8.00	4.00	5.00	13.50	5.50	6.00	15.00	5.00
(46)	.20	1.00	.70	.20	1.00	.34	.90	.70	.25	.10
(47)	.50	.50	1.00	.15	.25	.34	.75	.50	.75	.60
(48)	500.00	250.00	750.00	400.00	425.00	550.00	500.00	300.00	$1,000	$1,000

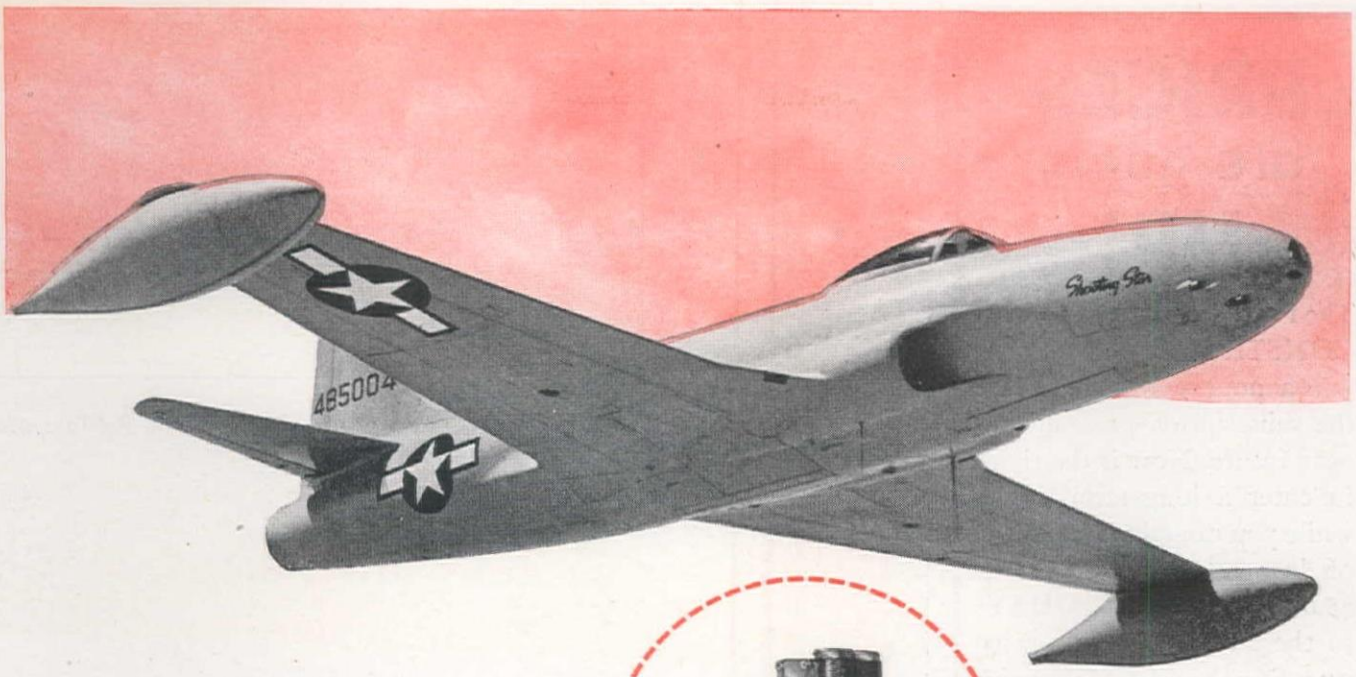
Washington—Franklin County—State—Surf.

Carbon Bros., Spokane, was low bidder with an offer of $233,276, on grading, surfacing and stockpiling aggregates on 10.5 mi. of State Highway 11, between Sagemoor and Connell, and was awarded the contract. The unit bid follows.

(1) Carbon Bros.	$233,276	(5) F. R. Hewett Co.	$281,261
(2) Roy L. Bair & Co.	243,778	(6) Fiorito Bros.	299,844
(3) Max J. Kuney Co.	251,151	(7) N. Fiorito Co.	326,821
(4) Peter Kiewit Sons' Co.	258,787	(8) J. A. Terteling Sons, Inc.	353,195

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
75,190 cu. yd. com. excav., 600-ft. haul	.24	.40	.39	.30	.33	.50	.50	.64
11,700 cu. yd. rock excav., 600-ft. haul	.95	1.60	.69	.79	1.40	2.00	1.60	2.22
320 cu. yd. trench excav., 600-ft. haul	.70	1.50	1.25	2.50	1.50	1.00	3.50	1.50
56,620 cu. yd. stas. overhaul on above	.015	.01	.01	.02	.02	.02	.02	.015
193.20 M. cu. yd. stas. overhaul on above	6.00	7.00	5.00	3.00	10.00	5.00	5.00	6.00
360 cu. yd. struct. excav.	1.75	1.50	2.00	3.50	2.00	1.25	3.50	2.00
9,360 lin. ft. slope treatment	.10	.15	.10	.15	.10	.15	.15	.15
555.8 stas. (100-ft.) finishing roadway	9.00	8.00	5.00	15.00	10.00	15.00	15.00	12.50
500 cu. yd. grav. slope protect.	1.10	1.50	3.50	3.00	1.40	2.00	1.75	4.00
79,810 cu. yd. ballast in place	1.60	1.50	1.50	1.81	1.80	1.82	1.90	2.12
22,480 cu. yd. crush. stone surf. top course	1.60	1.64	2.10	1.90	2.45	1.95	2.85	2.59
6,030 M. gals. water	1.50	3.00	3.80	2.40	3.00	4.00	3.50	3.00
3,660 cu. yd. cr. cover stone in stockpile	1.25	1.20	2.00	1.00	1.40	1.30	2.30	2.46
1,000 cu. yd. waste scr. in stkpile	.25	.25	.25	.25	.25	.25	.25	.25

(Continued on next page)





PIERCE GOVERNORS

The P-80 Shooting Star Made A Great Record
(COAST TO COAST- 4:13:26)

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1,040 cu. yd. crse. crsh. scrs. ⅝-in. to ¼-in. in stockpile	1.50	1.30	2.00	1.50	1.80	1.50	2.30	2.70
420 cu. yd. fine crsh. scrs. ¼-in. to 0-in. in stockpile	1.50	1.30	2.00	1.50	1.80	1.50	2.30	2.70
5.50 cu. yd. conc. Class C	50.00	45.00	50.00	60.00	60.00	75.00	100.00	67.50
243 lbs. steel reinf. bars	.18	.15	.20	.10	.10	.25	.20	.15
2 only, reinf. conc. fed. aid markers	10.00	10.00	15.00	10.00	10.00	15.00	25.00	10.00
34 only, reinf. conc. r/w markers	3.50	3.00	3.50	3.30	4.00	2.00	5.00	6.00
213.8 stas. (100 ft.) remov. existing oiled surf.	58.00	7.00	8.00	7.00	3.00	10.00	15.00	15.00
2 only remov. existing conc. headers	10.00	8.00	20.00	7.00	5.00	25.00	30.00	15.00
96 lin. ft. pl. conc. or V.C. culv. pipe, 12-in. diam.	1.50	1.70	2.50	1.50	1.70	1.50	2.00	2.11
372 lin. ft. pl. conc. or V.C. culv. pipe, 18-in. diam.	2.50	2.85	3.75	2.60	3.00	2.50	3.00	3.65
363 lin. ft. std. reinf. conc. culv. pipe, 18-in. diam.	3.00	3.00	4.00	3.10	3.70	2.75	3.25	3.87

Power . . .

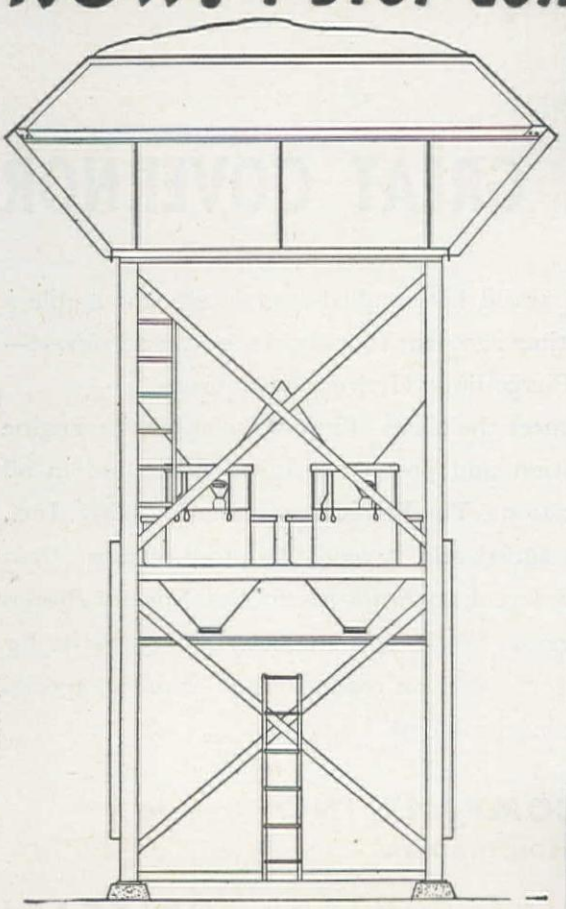
California—Butte, Yuba, Sacramento Counties—Bureau of Reclamation Transmission Line

H. H. Walker, Inc., Los Angeles, submitted the low bid of $281,760 to the Bureau of Reclamation, Denver, Colo., for the construction of 56 miles of 230 kv. transmission line from Oroville to Sacramento, for the Kennett Division, Central Valley Project. The following is a summary of the unit bids received on Specification No. 1152:

(1) H. H. Walker, Inc. $281,760
(2) Underground Construction Co. 426,883
(3) Stolte, Inc. 487,616
(4) Electric Construction Co. $496,780
(5) Abbett Electric Co. 565,222

	(1)	(2)	(3)	(4)	(5)
Lump sum, clear land and right of way	$17,820	$32,243	$35,000	$25,000	$54,000
3,000 cu. yd. common excav. foundations	3.25	4.65	7.50	13.00	10.00
600 cu. yd. rock excavation, foundations	6.00	4.65	15.00	17.00	64.00
1,800 cu. yd. place conc., tower foundations	28.50	45.00	62.50	63.00	65.00
240,000 lb. furn., fab. and place reinf. steel in tower foundations	.10	.12	.07	.16	.09
75,000 lb. pl. steel stubs, tower foundations	.06	.07	.015	.20	.09
4,500,000 lb. erect towers, complete	.019	.027	.0375	.0325	.05
56 mi. string 3-phase circuit, conductor	888.00	$1,500	$1,769	$1,300	880.00
858 ea. assemb. and attach suspension-insulator assemblies with 16 insulator units (single)	3.20	10.00	13.34	5.00	10.00
36 ea., assemb. and attach suspension-insulator assemblies with 16 insulator units (double)	9.85	20.00	26.64	15.00	15.00
60 ea., assemb. and attach double string tension-insulator assemb. with 17 insulator units	15.75	25.00	26.62	100.00	17.00
56 mi. string two ½-in. galv. steel overhead ground wires	555.00	800.00	121.00	400.00	211.20
350 ea., place fence-ground posts and grounding fences	1.25	5.00	6.00	10.00	3.50

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CONSTRUCTION SUMMARY

The following pages contain the most complete available tabulation of construction contracts awarded in the eleven western states during the past month. Except for certain instances, contracts amounting to less than $10,000 are not listed. Space is not available to list more than a small proportion of the proposed projects. For your convenience, all items are prepared in an identical manner to provide the following information: County of job location (capital letters); name and address of contractor (bold face); bid price; brief description of work; awarding agency; and approximate date of award. More detailed information on many of these projects is often available, and will gladly be furnished upon your request to the Editor, WESTERN CONSTRUCTION NEWS, 503 Market Street, San Francisco.

CONTRACTS AWARDED

Large Western Projects...

A. D. Knowles Construction Co., Portland, Ore., will build a 3,000-unit housing project costing from $25,000,000 to $30,000,000 in Astoria, Ore. The project will include 1,500 individual homes in the $6,000-$10,000 range, 1,500 other homes consisting mainly of duplexes and apartments, a $200,000, two-story motel, and a large garage and shopping center at 19th and Commercial Sts.

Case American Construction Co. of San Diego, Calif., and **Concrete Ship Constructors** of National City have a joint contract of $1,900,000 for extending Pier 6 and constructing Pier 8 at the San Diego Naval Repair Base.

M. H. Golden Construction Co. of San Diego will build four new piers at the San Diego Naval Repair Base for $1,892,000; **Ofcco Construction Co.** of Long Beach has a $1,000,000 contract to install water, steam and air services at the four new piers, and **Fishback & Moore, Inc.** of San Diego will install electrical services at new San Diego piers.

Pacific Coast Construction Co., San Francisco, Calif., is building 700 two-story homes plus a complete business district north of Lake Merced in San Francisco. The project will cost $10,000,000.

Holland Page of Austin, Tex., was awarded $1,807,665 by the El Paso Co. Water Control & Improvement District No. 1 to construct water and sewer lines, wells and an elevated tank at Ysleta.

F. R. McAbee, Seattle, Wash., has been contracted by Alderbrook Development Co., Inc., of Seattle to build 300-400 residences that will sell for $7,000-$10,000. The addition will go up on W. 100th and 110th Sts., 3rd and 12th Aves. N.W., in Seattle.

Earl W. Heple, San Jose, Calif., will receive $1,250,000 from Guy Standifer of San Francisco and Jack Rainer of New York City, owners of Tanforan Race Track at San Bruno, Calif., for modernizing and enlarging the track and facilities.

Missouri Valley Constructors, Inc. of Leavenworth, Kan., and **Winston Brothers** of Minneapolis, Minn., have received a $1,303,168 contract for building a construction bridge at the Garrison, N. Dak., dam site, from the U. S. Engineers office at Omaha, Neb.

S. J. Groves & Son of Minneapolis, Minn., will grade and surface 13.5 mi. of east access road to the Garrison, N. Dak., dam site, for $1,163,030.

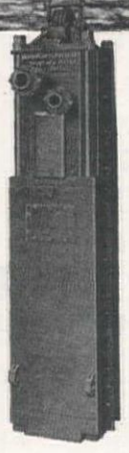
J. K. Thomas and **Beyer Construction Co.**, Los Angeles, Calif., have a contract from Mitchell Land & Improvement Co. of Long Beach to build a 95-unit apartment building for $1,500,000 at Atlantic Ave. and Ocean Blvd., Long Beach.

Lowdermilk Bros., Denver, Colo., has the Bureau of Reclamation contract of $1,864,822 for excavation and lining with concrete Ram's Horn and Prospect Mountain tunnels of the Colorado-BigThompson Project near Estes Park, Colo. The two tunnels will connect the eastern portal of Adams tunnel with Mary's Lake and Estes power plants.

J. D. O'Connor Construction Co. of San Francisco, Calif., will construct 181 five- and six-room frame and stucco houses near Alum Rock Ave., San Jose, for Paul Wilmore of Connecticut. The homes will sell at about $9,500 each.



Two-mile highway bridge across the Potomac River at Ludlow Ferry, Md.



The erection of this great bridge by Merritt-Chapman & Scott Corp. over the Potomac river required the driving of extra long piles through dense, sandy clay under water.

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Coastwise Construction Co., Palo Alto, Calif., is building two housing projects for itself in Palo Alto. One, costing $3,000,000, will have 400 homes on Willow Glen, Pine and Jonathan Aves., Malone Rd. and Guadalupe Creek; the other, costing $1,500,000, will consist of 126 farm type houses in the Garland and Price tracts at Oregon and Middlefield Rd.

Granby Constructors of Denver, Colo., has just received a $5,988,969 contract for 288 ft. high Granby Dam on the Colorado River, 6 mi. N.E. of Granby, Colo., from the Bureau of Reclamation.

Macco Construction Co. of Oakland, Calif., and **Morrison-Knudsen Co., Inc.**, of San Francisco were awarded a contract of $4,107,731 from the San Francisco Public Utilities Commission for airport extension, including fill, pavement and related construction at the city's airport.

Stolte, Inc., Oakland, Calif., will receive $2,000,000 from Sedric Cunningham of San Carlos to construct 200 homes on the site of the former Belle Monti golf course west of Belmont in San Mateo Co.

Basich Bros. Construction Co. and **Basich Bros.**, Alhambra, Calif., will grade and surface 4.1 mi. of highway near Mission Valley limits of San Diego. The State Division of Highways awarded the $1,098,840 contract.

Peter Kiewit Sons Co., San Francisco, Calif., was awarded $1,904,500 by the Bureau of Yards & Docks to construct a six-story concrete and steel shop building, including paving, track work and elevators at the Hunters Point Naval Repair Base in San Francisco. Kiewit Co. also has another contract from the Bureau of Reclamation for earthwork, canal lining and structures on the Friant-Kern Canal of the Central Valley Project. The latest contract is for $1,598,856.

Morrison-Knudsen Co. of Boise, Ida., will build Kortes Dam and power plant for the Bureau of Reclamation's Missouri Basin Project on the North Platte River in Wyoming. The Kortes unit will cost $4,688,000.

H. B. Zachry Co., San Antonio, Tex., has a U. S. Engineer contract for $2,775,006 for building Addicks Dam, an earthfill structure about 11 mi. long, to control flood waters in upper Buffalo Bayou basin, which supplies Houston, Tex.

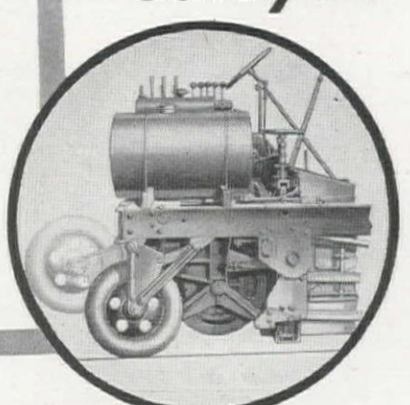


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James I. Barnes Construction Co., San Francisco, Calif., will complete a two-story shop building and miscellaneous work at the San Francisco Naval Shipyard for $2,290,000.

Highway and Street...

Arizona

SANTA CRUZ CO.—**L. M. White Construction Co.**, Box 2350, St. Mary's Rd., Tucson—$574,447 for Nogales-Tombstone Hwy. F-27, from Sonoita NE. 13 mi. to Cochise Co. line—by State Highway Commission, Phoenix. 4-10

California

ALAMEDA CO.—**Gallagher & Burk**, 900 73rd Ave., Oakland—$10,564 for .17 mi. access road to Army Air Force Intrasite Depot, Webster St., Oakland—by Public Roads Administration, San Francisco. 4-3

CONTRA COSTA CO.—**Lee J. Immel**, Box 65, Sta. A, Berkeley—$76,297 for 10.1 mi. widening shoulders and surf. and widening a bridge on portions of hwy. betw. Pittsburg and 4 mi. E. of Brentwood—by Division of Highways, Sacramento. 4-26

KERN CO.—**Griffith Co.**, 1060 S. Broadway, Los Angeles—$416,170 for 1.9 mi. grade. and paving betw. Brundage Lane and 24th St., Bakersfield—by Division of Highways, Sacramento. 4-26

KERN CO.—**Oilfields Trucking Co.** and **Phoenix Construction Co.**, Box 751, Bakersfield—$22,351 for 4.7 mi. shoulder widening and rock surf. betw. Lost Hill and Wasco—by Division of Highways, Sacramento. 4-9

LOS ANGELES CO.—**Griffith Co.**, 1060 S. Broadway, Los Angeles—$128,126 for 1.1 mi. grade. and paving on Rosemead Blvd. betw. Huntington Blvd. and Colorado St.—by Division of Highways, Sacramento. 4-1

LOS ANGELES CO.—**Griffith Co.**, 1060 S. Broadway, Los Angeles—$32,801 for resurf. of Atchison St. and 20 other sts., Pasadena—by City Council, Pasadena. 4-19

LOS ANGELES CO.—**Macco Construction Co.**, 815 Paramount Blvd., Clearwater—$1,141,080 for 2.1 mi. grade. and paving on Terminal Island Freeway betw. Henry Ford Ave. and Willow St., Long Beach and Los Angeles—by Division of Highways, Sacramento. 4-22

MONTEREY CO.—**Granite Construction Co.**, Box 900, Watsonville—$227,373 for 1.9 mi. grade., paving and surf. shoulders betw. 2 mi. S. of Salinas and Salinas—by Division of Highways, Sacramento. 3-29

SACRAMENTO CO.—**A. Teichert & Son, Inc.**, Box 1113, Sacramento—$103,660 for improvement of streets, blvds., drives, courts and easements in Wright & Kimbrough Arden Park Vista, Units Nos. 2 and 3, Sacramento—by Sacramento County Board of Supervisors, Sacramento. 4-23

SAN DIEGO CO.—**Basich Bros. Construction Co.** and **Basich Bros.**, Box 151, Alhambra—$1,098,840 for 4.1 mi. grade. and surf. betw. .4 mi. S. of Mission Valley limits of San Diego and San Diego—by Division of Highways, Sacramento. 4-26

SHASTA CO.—**W. C. Railing**, 27 Lowell St., Redwood City—$55,482 for 9.7 mi. surf. betw. 4.5 mi. E. of Ingot and Montgomery Creek—by Division of Highways, Sacramento. 4-29

SISKIYOU CO.—**Clements & Co.**, Box 277, Hayward—$168,879 for 13.3 mi. surf. betw. Yreka and Camp Lowe—by Division of Highways, Sacramento. 3-29

SISKIYOU CO.—**Clements & Co.**, Box 277, Hayward—$23,928 for 7.8 mi. of surf. betw. Shasta River and Gazelle—by Division of Highways, Sacramento. 4-22

SISKIYOU CO.—**Clements & Co.** and **Milo A. Brown**, Box 277, Hayward—$166,885 for 20 mi. surf. betw. Weed and Yreka—by Division of Highways, Sacramento. 4-4

SISKIYOU CO.—**Morgan Construction Co.**, Pleasanton—$36,937 for 31.7 mi. seal coat betw. Cougar and Dorris—by Division of Highways, Sacramento. 4-24

TEHAMA CO.—**Oilfields Trucking Co.** and **Phoenix Construction Co.**, Box 751, Bakersfield—$508,837 for 7.1 mi. grade. and surf., betw. 6 mi. N. of Red Bluff and Shasta Co. line—by Division of Highways, Sacramento. 4-3

Colorado

EL PASO AND FREMONT COS.—**C. L. Hubner**, 4000 York St., Denver—$90,072 for gravel surf. 3.5 mi. of state hwy. 115



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CRAMER MACHINERY CO. ..... Portland, Oregon
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INTERMOUNTAIN EQUIPMENT CO. ..... Boise, Idaho
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STEFFECK EQUIPMENT CO. ..... Helena, Montana
WORTHAM MACHINERY CO., Cheyenne, Sheridan & Greybull, Wyo.
CAPITOL TRACTOR & EQUIPMENT CO., North Sacramento, California
SPEARS-WELLS MACHINERY CO., INC. ..... Oakland, California
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STATE TRACTOR & EQUIPMENT CO. ..... Phoenix, Arizona



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Michigan 2207	SUtter 7944	Phone 3-8021	Elliott 7043

Mills—Trenton, N. J., established 1870

betw. Colorado Springs and Canon City—by State Highway Department, Denver. 4-3

GRAND CO.—**Domenic Leone**, Trinidad—$84,211 for gravel resurf. of 9.2 mi. of SH 2, betw. Tabernash and Granby—by State Highway Department, Denver. 4-5

LOGAN AND WELD COS.—**C. L. Hubner**, 4000 York St., Denver—$137,748 for gravel surf. of 5.8 mi. of state hwy. 14 betw. Sterling and Stoneham—by State Highway Department, Denver. 4-3

Montana

CASCADE CO.—**S. Birch & Sons Construction Co.**, 314 Ford Bldg., Great Falls—$169,368 for grade., drainage, surf. oiling 7.1 mi. of Ulm-Gore Hill section of Ulm-Great Falls Rd., U. S. 91—by State Highway Commission, Helena. 4-24

SWEET GRASS CO.—**Big Horn Construction Co.**, Sheridan, Wyo.—$174,565 for grade., drainage, surf. on 8.1 mi. of Big Timber-Harlowton Rd.—by State Highway Commission, Helena. 4-24

YELLOWSTONE CO.—**Big Horn Construction Co.**, Sheridan, Wyo.—$89,826 for partial grade., drainage, surf. on 8.9 mi. of Broadview South section of Billings-Broadview Rd.—by State Highway Commission, Helena. 4-24

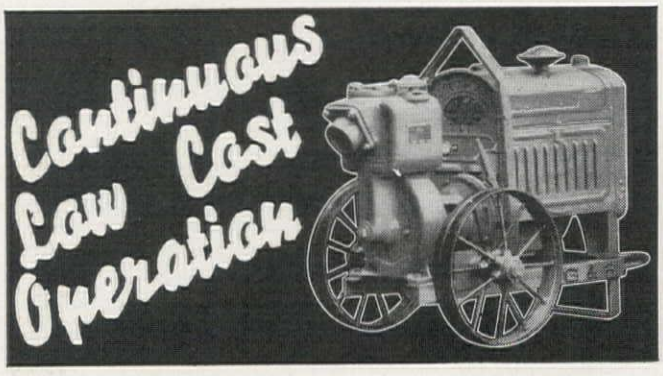
Nevada

HUMBOLDT CO.—**The Silver State Construction Co.**, S. Main St., Fallon—$172,566 for 14.9 mi. of state hwy. from junction with U. S. 95, 31 mi. N. of Winnemucca, to Sod House, Rt. 8A, Sec. A—by Department of Highways, Carson City. 4-15

LYON CO.—**Dodge Construction, Inc.**, N. Main St., Fallon—$222,550 for portion of state hwy. system from Dalzell Canyon to junction with State Rt. No. 3 near Central with spur connection to Wellington, Rt. 22, Sec. A—by Department of Highways, Carson City. 4-15

North Dakota

McLEAN CO.—**S. J. Groves & Son**, 509 Wesley Temple Bldg., Minneapolis, Minn.—$1,163,030 for grade. and surf. 13.5 mi. of



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east access road to Garrison dam site—by U. S. Engineers, Omaha, Neb. 4-15

Oregon

KLAMATH CO. — **Warren-Northwest Co., Inc.,** Box 5071, Portland—$361,800 for grade. and paving 1.8 mi. of Klamath Falls-United States reclamation service canal section of Klamath Falls-Lakeview hwy.—by State Highway Commission, Salem. 4-18

Texas

ANDREWS AND YOAKUM COS. — **Public Construction Co.,** Box 380, Denton — $63,652 for 30.5 mi. surf.—by State Highway Department, Austin. 4-4

BELL AND McLENNAN COS.—**Wallace & Bowden,** 5513½ E. Grand Ave., Dallas—$40,185 for 20 mi. asph. underseal on U. S. 81—by State Highway Department, Austin. 4-1

BROWN CO.—**Holland Page,** Box 1181, Austin—$46,538 for 10 mi. grade., structs., etc.—by State Highway Department, Austin. 4-4

CARSON CO.—**John F. Buckner,** Box 76, Cleburne—$32,867 for 5.6 mi. grade., structs., etc.—by State Highway Department, Austin. 4-4

DALLAS CO.—**Austin Road Co.,** 1000 Singleton Rd., Austin —$88,350 for 1.2 mi. grade., culverts on Hwy. Loop 12—by State Highway Department, Austin. 4-4

DALLAS CO.—**O'Neal Construction Co.,** 901 S. Austin St., Dallas—$23,445 for paving alleys, Dallas—by City Council, Dallas. 4-1

DALLAS CO.—**O'Neal Construction Co.,** 901 S. Austin St., Dallas — $15,532 for extending Lemmon Ave. around Love Field, Dallas—by City Council, Dallas. 4-1

DALLAS CO.—**Texas Bitulithic Co.,** Box 5297, Dallas—$13,-520 for resurf. Houston St. viaduct, Dallas—by State Highway Department, Austin. 4-1

DALLAS CO.—**R. L. Wallace,** 911 Cordova St., Dallas—$19,-702 for paving alleys, Dallas—by City Council, Dallas. 4-1

DENTON AND DALLAS COS.—**Wallace & Bowden,** 5513½ E. Grand Ave., Dallas—$17,200 for 8.9 mi. asph. conc. pavement on Hwy. 114—by State Highway Department, Austin. 4-1

ERATH CO.—**A. L. Bucy,** 804 I Ave., Brownwood—$40,757 for constr. of 39 mi. asph. conc. and seal coat on four hwys.—by State Highway Department, Austin. 4-26

FALLS CO.—**H. E. Williams,** Box 235, Austin—$344,556 for 5.9 mi. re-grade., extending structs. and pavement on Hwy. 6 —by State Highway Department, Austin. 4-23

FISHER CO.—**Hugh McMillan,** Box 1227, El Paso—$119,651 for 7.9 mi. grade., structs. on Hwy. 70—by State Highway Department, Austin. 4-4

HALE CO.—**Ernest Loyd,** Box 1077, Fort Worth—$73,853 for 12.9 mi. foundation course and surf.—by State Highway Department, Austin. 4-4

HIDALGO CO.—**Kelly Construction Co.,** 2215 Belknap, San Antonio—$211,166 for paving in Alamo Heights—by City Council, Alamo Heights. 4-11

HOCKELEY CO.—**Ted B. Smith,** Box 298, Midland—$61,115 for 6.5 mi. base from Sundown E. to State Hwy. 51, Levelland —by State Highway Department, Austin. 4-1

JACK CO.—**Gaylord Construction Co.,** 806 Bodgett St., Houston—$31,788 for 35.2 mi. of seal coat and leveling on Hwy. 24—by State Highway Department, Austin. 4-26

JEFF DAVIS CO.—**Uvalde Construction Co.,** 2400 Uvalde St., Dallas—$155,085 for base and surf. on Hwys. 118 and 166—by State Highway Department, Austin. 4-23

KINNEY CO.—**Ernest Loyd,** Box 1077, Fort Worth—$54,303 for 11.3 mi. grade., structs., etc. on Hwy. FM 334—by State Highway Department, Austin. 4-4

MEDINA CO.—**McKenzie Construction Co.,** Transit Tower, San Antonio—$203,798 for 50 mi. additional topping and 7 mi. street work, Hondo—by Medina Co. Judge, Hondo 4-4

PARKER CO.—**Public Construction Co.,** Box 380, Denton—$30,513 for 13.6 mi. paving on Hwy. 80—by State Highway Department, Austin. 4-4

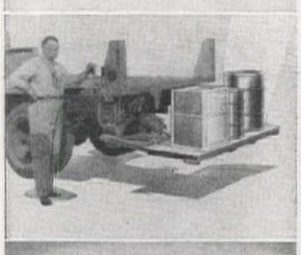
RANDALL CO.—**Austin Road Co.,** 100 Singleton Rd., Dallas, and **Bell & Braden,** Herring Hotel, Amarillo—$540,663 for 14.2

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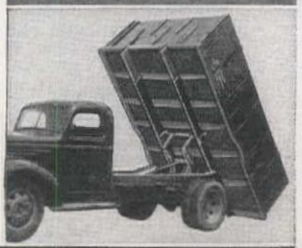
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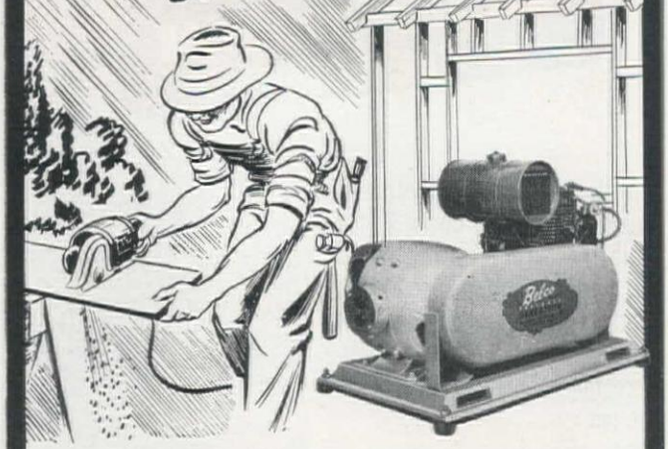
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mi. conc. pavement widening and asph. conc. pavement on Hwys. 60 and 87—by State Highway Department, Austin. 4-17

TARRANT, PARKER AND JOHNSON COS.—**Brown & Root,** Box 3, Houston—$438,877 for 13.6 mi. of grade., structs., etc.—by State Highway Department, Austin. 4-4

WISE CO.—**Public Construction Co.,** Box 380, Denton—$26,302 for 5.5 mi. asph. conc. leveling on U. S. 81—by State Highway Department, Austin. 4-4

Utah

SALT LAKE CO.—**W. W. Clyde & Co.,** Springville—$227,229 for surf. FAS No. 228-A from Copperton to Magna—by State Road Commission, Salt Lake City. 3-30

SALT LAKE CO.—**Olof Nelson,** Box 413, Logan—$239,044 for 2½ in. plant-mixed bitu. surf. road, 21st St., betw. Salt Lake and Magna—by State Road Commission, Salt Lake City. 4-19

Washington

BENTON CO.—**Standard Asphalt Co., Inc.,** Spokane—$33,365 for surf. on certain Benton Co. roads—by County Engineer, Benton City. 4-17

COWLITZ CO.—**K. L. Goulter & Co.,** 3419 16th Ave. W., Seattle—$363,711 for constr. of Pacific hwy. from Rocky Point to Ostrander—by Department of Highways, Olympia. 4-18

KING CO.—**Northwest Construction Co.,** 3950 6th Ave. NW., Seattle—$105,733 for paving 14th Ave. S. on Beacon Hill; and $15,815 for paving Snoqualmie St., Seattle—by Board of Public Works, Seattle. 3-29

PIERCE CO.—**A. P. & E. Co.,** Tacoma—$120,713 for asph. conc. pavement and shoulders on 3.9 mi. of primary state hwy. No. 1, King Co. line to Puyallup River bridge—by Department of Highways, Olympia. 4-3

SNOHOMISH CO.—**Harrison Bros.,** 225 Wakefield Dr., Tacoma—$253,958 for grade. 4.3 mi. primary state hwy. No. 15, Cavalero's Corner to Snohomish—by Department of Highways, Olympia. 4-3

SPOKANE CO.—**Sather & Son,** 1003 21st Ave., Spokane—

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3425 STONE WAY — SEATTLE 3, WASH.

$142,255 for grade. and asph. conc. pavement on 6.4 mi. of primary state hwy. No. 2, Stevens Creek to Galena—by Department of Highways, Olympia. 4-3

Bridge & Grade Separation...

Arizona

COCONINO CO.—**Kansas City Bridge Co.,** 215 Pershing Rd., Kansas City—constr. of double track, two-hinged, steel arch over Canyon Diablo, midway betw. Flagstaff and Winslow—by the Santa Fe Railway, Los Angeles. 4-23

California

CONTRA COSTA CO.—**Case Construction Co.,** Box 416, Alameda—$326,987 for 1,000-ft. causeway of creosoted piles at Richmond terminal extending into San Francisco Bay from Castro Point; and complete ferry slip—by Richmond-San Rafael Ferry Transportation Co., Richmond. 4-26

LOS ANGELES CO.—**Barnes Construction Co.,** 1119 Montana Ave., Santa Monica—$87,433 .7 mi. grade. and paving and four bridges on Pacific Coast hwy. betw. Dominguez Channel and San Gabriel Ave., Los Angeles and Long Beach—by Department of Public Works, Sacramento. 4-26

LOS ANGELES CO.—**Contracting Engineers Co.,** 2310½ W. Vernon Ave., Los Angeles—$127,632 for two overhead crossings and retaining walls, Santa Ana Parkway over Ramona Parkway Ramp 4, Los Angeles—by Department of Public Works, Sacramento. 4-1

LOS ANGELES CO.—**E. W. Elliott,** 1200 California St., San Francisco—$849,357 for struct. steel overhead crossing on Terminal Island Freeway over Union Pacific, Southern Pacific and Pacific Electric tracks, Anaheim St., Los Angeles—by Department of Public Works, Sacramento. 4-22

LOS ANGELES CO.—**Macco Construction Co.,** 815 Paramount Blvd., Clearwater—$599,122 for struct. steel overhead crossing on Terminal Island Freeway over Union Pacific tracks, Los Angeles—by Department of Public Works, Sacramento. 4-22

LOS ANGELES CO.—**Oberg Bros.,** 401 W. Redondo Blvd., Inglewood—$264,297 for struct. steel overhead crossing with graded apprs., Anaheim St. appr. road to Terminal Island Freeway, Nicholson Ave., Los Angeles—by Department of Public Works, Sacramento. 4-26

MENDOCINO CO.—**Fred Fredenburg,** 1717 Garibaldi Ave., Temple City—$40,069 for reinf. conc. slab bridge on conc. pile bents and .12 mi. grade. and surf. apprs., Dooley Creek, 1 mi. E. of Hopland—by Department of Public Works, Sacramento. 4-26

MERCED CO.—**Gunnar Corp.,** 5575 Valley Blvd., Los Angeles—$415,297 for 3.8 mi. grade. and paving and constr. of four bridges, betw. Black Rascal Canal and Buhach Sta.—by Dept. of Public Works, Sacramento. 4-11

SAN BERNARDINO CO.—**Matich Bros.,** Box 390, Colton—$478,204 for 5.7 mi. grade. and paving and constr. of reinf. conc. bridge betw. Vineyard Ave. and Etiwanda Ave.—by Division of Highways, Sacramento. 4-2

SAN DIEGO CO.—**Oberg & Cook,** 2106 W. 93rd St., Los Angeles—$87,433 for two bridges and apprs. across Samagatuma Creek and Descanso Creek, near Descanso—by Division of Highways, Sacramento. 4-26

SAN DIEGO CO.—**O'Rourke & Parker,** 2779 Jackson Ave., Garvey—$39,344 for reinf. conc. slab bridges across Matagual Valley Creek, Canada Verde Creek and Acorn Creek, betw. 2 and 17 mi. N. of Morettis—by Department of Public Works, Sacramento. 4-4

SAN DIEGO CO.—**Spencer Webb,** 1111 N. Sycamore, Los Angeles—$167,316 for two steel girder bridges about 17 mi. E. of Oceanside across San Luis Rey River and Keys Canyon Creek—by Department of Public Works, Sacramento. 4-29

SANTA CLARA CO.—**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland—$379,442 for separation and apprs., grade. and surf., Bayshore Freeway, Santa Clara St., San Jose—by Department of Public Works, Sacramento. 4-4

Idaho

GOODING CO.—**Morrison-Knudsen Co., Inc.,** Box 450, Boise—$691,904 for 15.6 mi. roadbed, drainage structs., 119 ft. conc.

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arch bridge on North Side hwy. between Bliss and Wendell—by Bureau of Highways, Boise. 4-20

Montana

SWEET GRASS CO.—**W. P. Roscoe Co.,** Box 633, Billings—$62,122 for 184-ft. steel and conc. bridge and 216 lin. ft. timber structs. on Big Timber-Harlowton Rd.—by State Highway Commission, Helena. 4-24

North Dakota

McLEAN CO.—**Missouri Valley Constructors, Inc.,** Leavenworth, Kan., and **Winston Brothers,** 1470 Northwestern Bank Bldg., Minneapolis, Minn.—$1,303,168 for construction bridge at Garrison dam site—by U. S. Engineers, Omaha, Neb. 4-28

Oregon

JEFFERSON CO.—**Sleeper & Keyes,** 434 Portland Ave., Bend—$24,718 for hwy. crossing, sta. 2718 plus 78, N. unit main canal; sta. 39 plus 17.7, lateral M-48; sta. 30 plus 51.23, lateral M-51, Deschutes Project, near Metolius—by Bureau of Reclamation, Bend. 4-19

WASHINGTON CO.—**A. D. Ford & Son,** Portland—$15,007 for road grade separation on Sunset hwy., near North Plains—by State Highway Commission, Salem. 4-23

WASHINGTON CO.—**A. D. Ford & Son,** Portland—$74,000 for Vadis overcrossing over tracks of S. P. & S. RR. on Sunset hwy., near North Plains—by State Highway Commission, Salem. 4-23

Washington

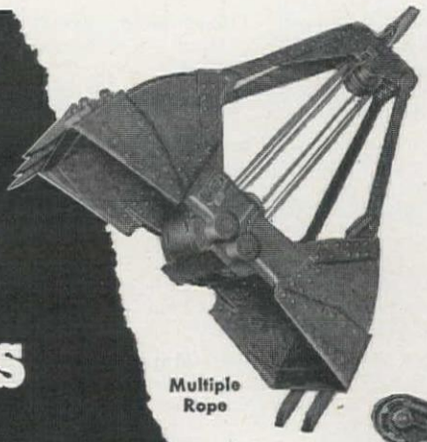
KING CO.—**Beal & Roberts,** 730 Republic Bldg., Seattle—$94,652 for one reinf. conc. T-beam bridge and two reinf. conc. pile and flat slab bridges and grade. on secondary state hwy. No. 15-B—by Department of Highways, Olympia. 4-3

KING CO.—**Everett McKellar,** Cashmere—$44,279 for reinf. conc. T-beam bridge over Pacific Coast RR. Co. tracks and retaining walls on .25 mi. of State Hwy. No. 5, Maple Valley vicinity—by Department of Highways, Olympia. 4-5

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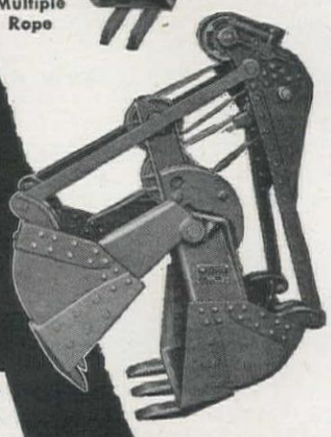
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Airport . . .

California

LOS ANGELES CO.—**N. M. Ball Sons,** 649 S. Olive St., Los Angeles—$96,125 for surf. runway and installing electric ducts, Buffalo Springs Airport, Santa Catalina Island—by Santa Catalina Island Co., Los Angeles. 4-2

SAN FRANCISCO CO.—**Macco Construction Co.,** Freight and Ferry Sts., Oakland, and **Morrison-Knudsen Co., Inc.,** 111 Sutter St., San Francisco—$4,107,731 for airport extension, fill, pavement and related constr., San Francisco Airport—by Public Utilities Commission, San Francisco. 4-24

Utah

WASHINGTON CO.—**W. W. Clyde & Co.,** N. Main St., Springfield—$107,069 for improvements at intermediate landing field, St. George—by Civil Aeronautics Administration, Santa Monica, Calif. 4-19

Water Supply . . .

California

LOS ANGELES CO.—**Tom L. Gogo,** 10024 S. Figueroa St., Los Angeles—$57,832 for 5,330 lin. ft. of 20-in. water main in Harbor Ave., 10th St. and 9th St., Long Beach—by Long Beach Water Department, Long Beach. 4-5

SAN MATEO CO.—**Pacific Pipe Line Construction Co.,** 2128 San Pablo Ave., El Cerrito—$14,334 for water mains, Edgemar area, Sharp Park—by North Coast County Water District, Sharp Park. 4-9

Oregon

WASHINGTON CO.—**P. S. Lord & Co.,** 4507 SE. Milwaukie, Portland—$324,470 for 10.5 mi. 18-in. pipeline, Hillsboro—by Hillsboro Utilities Commission, Hillsboro. 4-29

Texas

ANDREWS CO.—**Cullum & Hodgson,** Great National Life Bldg., Dallas—$160,000 for water supply system, including high service pump bldgs., etc., Andrews—by Board of Education, Andrews. 4-17

DALLAS CO.—**E. L. Dalton & Co.,** 403 Great National Life Bldg., Dallas—$24,408 for water main, Lake Park Estates, Dallas—by City Council, Dallas. 4-22

DALLAS CO.—**E. E. Farrow Construction Co.,** 6109 Forest Park Rd., Dallas—$29,289 for water mains and sanitary sewers, Belmar Addition, Dallas—by City Council, Dallas. 4-22

DALLAS CO.—**F. S. Oldt Construction Co.,** 403 S. Haskell, Dallas—$43,345 for water mains, NW. Dallas, Preston Rd. area, and Bluffview Estates—by City Council, Dallas. 4-11

DALLAS CO.—**O. J. Parrott Construction Co.,** Tower Petroleum Bldg., Dallas—$29,188 for water mains and sanitary sewers, North Ridge Estates, Dallas—by City Council, Dallas. 4-22

DALLAS CO.—**O. J. Parrott,** Tower Petroleum Bldg., Dallas—$31,379 for water main in E. and S. Dallas and Oak Cliff—by City Council, Dallas. 4-11

DALLAS CO.—**E. H. Reeder Construction Co.,** Box 5650, Dallas—$32,216 for water mains and sanitary sewers, parts of Dallas—by City Council, Dallas. 4-22

DALLAS CO.—**Ben Sira & Co.,** 3901 Elm St., Dallas—$34,059 for water mains and sanitary sewers, Greenway Terrace Addition No. 2, Dallas—by City Council, Dallas. 4-22

DALLAS CO.—**Ben Sira & Co.,** 3901 Elm St., Dallas—$18,286 for water mains and sanitary sewers, Cherrywood and Preston Square Additions, Dallas—by City Council, Dallas. 4-22

EL PASO CO.—**Holland Page,** Box 1181, Austin—$1,807,665 for water and sewer lines, wells and elevated tank, Ysleta—by El Paso Co. Water Control and Improvement District No. 1. 4-23

JIM WELLS CO.—**Layne-Texas Co.,** 3901 Elm St., Houston—$21,616 for water well and pump, Alice—by City Council, Alice. 4-11

Utah

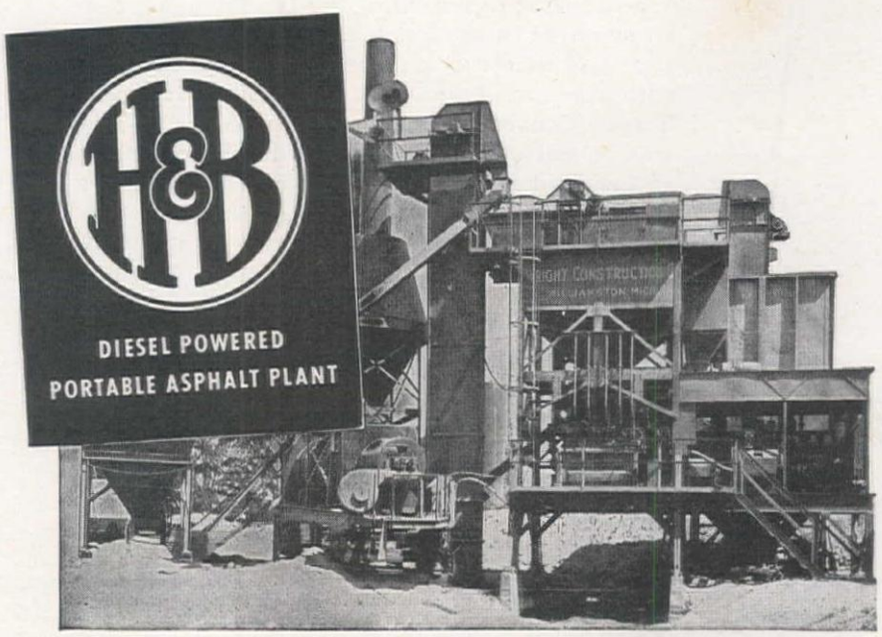
WEBER CO.—**Clarence Waterfall,** Ogden—$3,764 for 1,207 lin. ft. of pipeline on Madison Ave. betw. 38th and 40th Sts., Ogden—by City Council, Ogden. 4-13

Sewerage . . .

Arizona

MARICOPA CO.—**H. L. Royden,** 2211 W. Jackson, Phoenix—$134,541 for sewage collection system and sewage treat. plant, Buckeye—by City Council, Buckeye. 4-19

MARICOPA CO.—**H. L. Royden,** 2211



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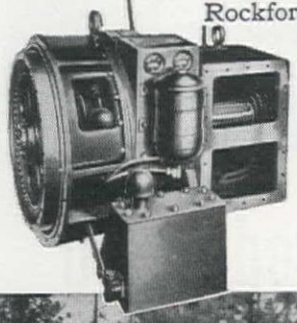
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Hydraulic Drives

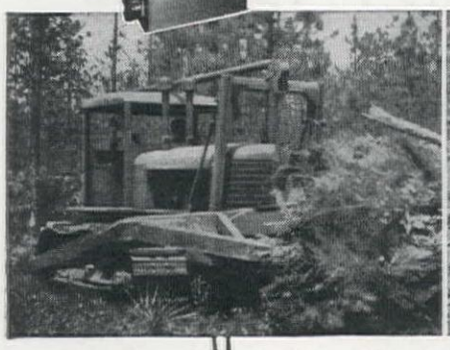
assure smooth, flexible power

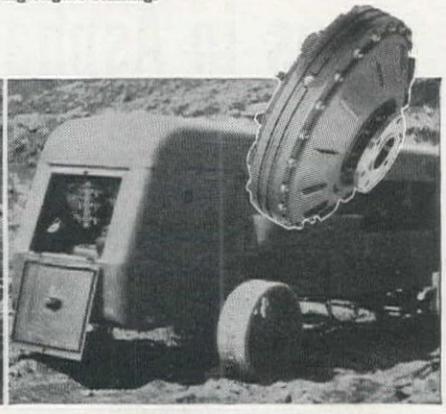
When dozing out stumps, the tractor hits an obstruction at high speeds and all working parts receive a solid shock. These shocks are cushioned with the installation of a Twin Disc Hydraulic Torque Converter,* such as in the Allis-Chalmers tractor pictured below. The hydraulic drive provides a fluid cushion which protects the entire tractor against destructive shocks. At the same time, the torque converter's "five-to-one" torque multiplication means steadily increasing push at reduced tractor speeds. The torque converter also provides the tractor with the equal of an *unlimited* set of gear ratios within a fixed speed range . . . automatically adjusted to give the most efficient power application at all times. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

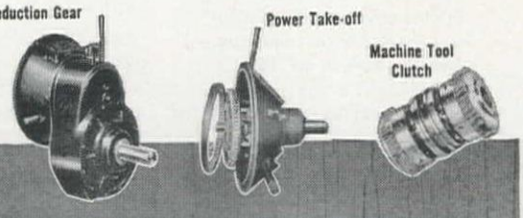


**Lysholm-Smith type*

On a compressor, smoothness and flexibility are assured by a hydraulic coupling. Here, the engine operates at a governed speed but the coupling between the engine and compressor unit is subject to considerable variations in torque transmitted. In compressors, such as the portable Gardner-Denver unit shown here, the Twin Disc Hydraulic Coupling has the distinct advantage of absorbing peak loads, isolating torsional variations and preventing engine stalling.







ARMY E NAVY

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U. S. PAT. OFF.

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

W. Jackson, Phoenix—$10,712 for sanitary sewers in parts of Encanto Vista and in 7th and Windsor Aves., Phoenix—by City Council, Phoenix. 4-5

California

ALAMEDA CO.—**Gallagher & Burk,** 900 73rd Ave., Oakland—$49,508 for culvert with appurtenances, in portions of E St. and right-of-way betw. SW. end of 100th Ave. and Western Pacific RR. Co. right-of-way, Oakland—by City Council, Oakland. 4-15

LOS ANGELES CO.—**Bebek & Brkich,** 238 W. Florence Ave., Los Angeles—$5,472 for sanitary sewer line in 154th St. from Western Ave. to Denver, Gardena—by City Council, Gardena. 4-19

LOS ANGELES CO.—**Bolton Engineering & Construction Co.,** 10722 Ashton Ave., Los Angeles—$11,990 for installation of sewers for housing of juveniles, Sheriff's Training Center, Los Angeles—by Board of Supervisors, Los Angeles. 3-29

LOS ANGELES CO.—**P. S. Tomich,** 501 S. Del Mar Ave., San Gabriel—$63,746 for sanitary sewer lines in Chandler Blvd. and Radford Ave. district of San Fernando Valley—by Board of Public Works, Los Angeles. 4-14

MARIN CO.—**McGuire & Hester,** 796 66th Ave., Oakland—$174,212 for sanitary sewer system, Mill Valley—by City Council, Mill Valley. 4-5

ORANGE CO.—**G. E. Kerns,** 5574 Atlantic Ave., Long Beach—$108,360 for reinf. conc. sludge digestion tank, 75 ft. dia. and 28 ft. sidewall ht., near Huntington Beach, and reinf. conc. booster pumping plant, 600 sq. ft. area, ¼ mi. E. of Bushard St., Santa Ana—by City Council, Santa Ana. 4-19

SAN FRANCISCO CO.—**M. J. Lynch,** 2251 Revere Ave., San Francisco—$107,932 for Pine St. sewer from Van Ness Ave. to Divisadero St., San Francisco—by Department of Public Works, San Francisco. 4-4

Texas

DALLAS CO.—**E. H. Reeder Construction Co.,** Box 5650, Dallas—$21,043 for water mains and sanitary sewers, Crest Haven Place Addition, Dallas—by City Council, Dallas. 4-22

LLANO CO.—**Roy M. Mitchell,** Box 1154, Shreveport, La.—$166,251 for water works improvements and sanitary sewer system, Llano—by City Council, Llano. 3-28

MIDLAND CO.—**Hayner & Burn,** Las Cruces, N. Mex.—$77,239 for sanitary sewer extensions, Midland—by City Council, Midland. 4-1

TARRANT CO.—**F. S. Oldt Co.,** 403 S. Haskell, Dallas—$36,250 for 12-in., 10-in. and 8-in. sewer mains, W. of Bellaire Addition, and 8-in. and 6-in. additions and laterals in West Cliff Addition, and three creek crossings, Fort Worth—by City Council, Fort Worth. 4-1

TARRANT CO.—**Southwest Concrete Co.,** W. T. Waggoner Bldg., Fort Worth—$60,292 for storm sewers on Boyd St., Fort Worth—by City Council, Fort Worth. 4-10

TARRANT CO.—**Southwest Concrete Co.,** W. T. Waggoner Bldg., Fort Worth—$17,338 for 2,700 ft. of 6-in. and 8-in. sanitary sewer lines, Crestwood Addition, Fort Worth—by City Council, Fort Worth. 4-10

Washington

SKAGIT CO.—**Thorburn & Logozo,** 4608 36th St. SW., Seattle—$210,669 for sanitary sewer and treat. plant, Burlington—by City Council, Burlington. 4-12

Waterway . . .

California

DEL NORTE CO. — **Basalt Rock Co., Inc.,** 900 8th St., Napa—$206,250 for constr. of inner breakwater at Crescent City harbor—by U. S. Engineer Office, San Francisco. 4-24

LOS ANGELES CO.—**E. B. Bishop,** Box 325, Orland—$759,614 for Los Angeles River improvements, N. Broadway to Alhambra Ave., Los Angeles—by U. S. Engineer Office, Los Angeles. 4-10

MONTEREY CO.—**C. Dudley De Velbiss Co.,** Eastshore and Huntington Ave., Richmond—constr. of levees for purpose of impounding spoils from dredging operations, Moss Landing—by Moss Landing Harbor District, Castroville. 4-15

MONTEREY CO.—**San Francisco Bridge Co.,** 503 Market St., San Francisco—$267,968 for dredging and jetty constr., Moss Landing Harbor—by U. S. Engineer Office, San Francisco. 4-4

SAN DIEGO CO.—**Case American Construction Co.,** San Diego, and **Concrete Ship Constructor Co.,** National City—$1,900,000 for extension of Pier 6 and constr. of Pier 8, Naval Repair Base, San Diego—by Bureau of Yards and Docks, Washington, D. C. 4-8

SAN DIEGO CO.—**Case American Construction Co.,** San Diego—$475,000 for dredging at Naval Repair Base, San Diego—by Bureau of Yards and Docks, Washington, D. C. 4-8

SAN DIEGO CO.—**Fishback & Moore, Inc.,** San Diego—$1,500,000 for installation of electrical services at new piers, Naval Repair Base, San Diego—by Bureau of Yards and Docks, Washington, D. C. 4-8

SAN DIEGO CO.—**M. H. Golden Construction Co.,** 3485 Noell St., San Diego—$1,892,000 for four new piers, Naval Repair Base, San Diego—by Bureau of Yards and Docks, Washington, D. C. 4-8

SAN DIEGO CO.—**The Newport Dredging Co.,** 631 31st St., Newport Beach—$89,089 for dredging approx. 500,000 cu. yds. of material from floor of Mission Bay, foot of Ventura Place, San Diego—by City Council, San Diego. 4-15

SAN DIEGO CO.—**Ofcco Construction Co.,** 2650 Cherry Ave., Long Beach—$1,000,000 for installation of water, steam and air services at four new piers, Naval Repair Base, San Diego—by Bureau of Yards and Docks, Washington, D. C. 4-8

YOLO CO.—**American Dredging Co.,** 1419 Broadway, Oakland—$38,600 for levee reinforcement at Bryte's Bend, Sacramento River—by U. S. Engineer Office, Sacramento. 4-15

YOLO CO.—**A Teichert & Son, Inc.,** Box 1113, Sacramento—$36,804 for levee construction and pumping plant, Bryte's Bend, W. Levee, Sacramento River—by U. S. Engineer Office, Sacramento. 4-22

Washington

KITSAP CO.—**The General Construction Co.,** 3840 Iowa St., Seattle—$733,100 for dredging for facilities for inactive vessels, Bremerton Navy Yard—by Puget Sound Navy Yard, Bremerton. 4-29

Pacific Ocean Area

PACIFIC OCEAN AREA—**Pollock-Stockton Shipbuilding Co.,** Stockton, Calif.—negotiated contract for inactivation of drydocks, Pacific Ocean area—by Bureau of Yards and Docks, Washington, D. C. 4-2

Dam . . .

California

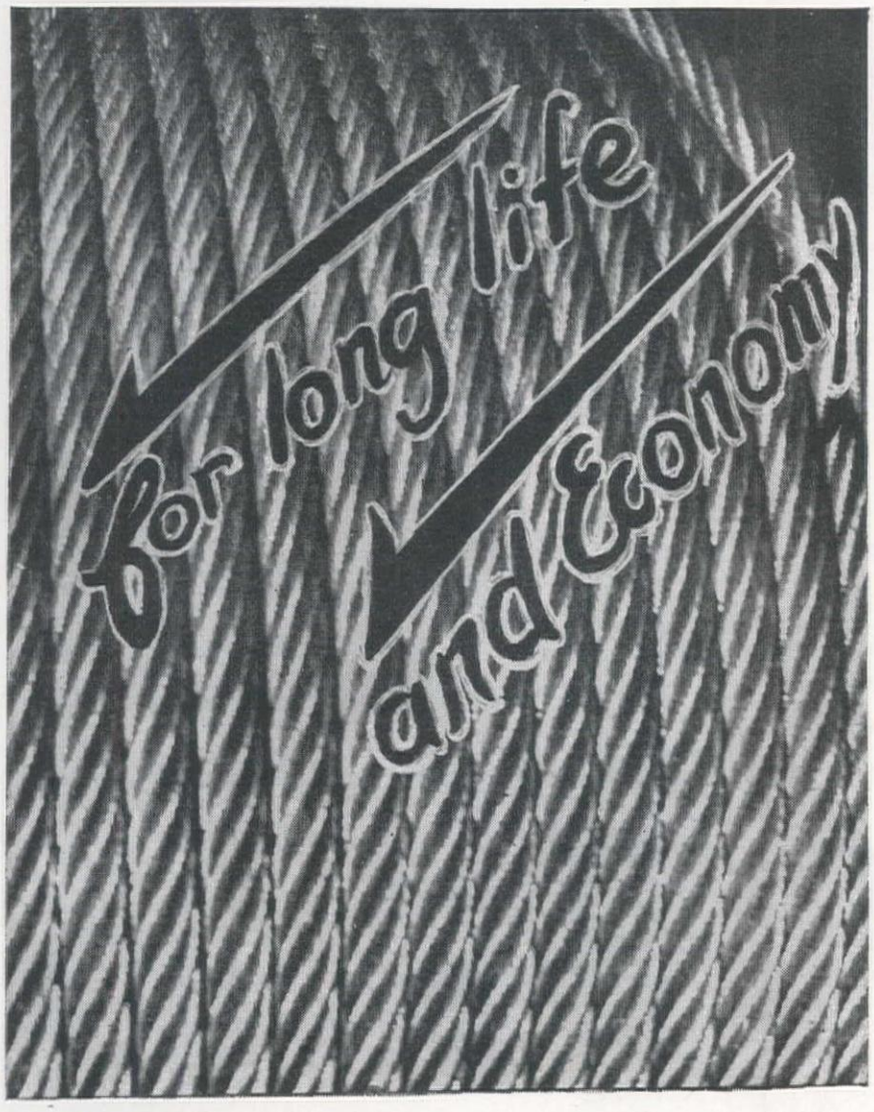
SAN DIEGO CO.—**Macco Construction Co.,** 815 Paramount Blvd., Clearwater—$92,270 for earth dam, earth-lined reservoir and pipeline, S. Encinitas Creek—by San Dieguito Irrigation District, Encinitas. 4-19

Colorado

GRAND CO.—**Granby Constructors,** Denver—$5,988,969 for Granby Dam, 288 ft. high, rock and earth fill constr., 6 mi. N.E. of Granby, on Colorado River—by Bureau of Reclamation, Denver.

Texas

HARRIS CO.—**H. B. Zachry Co.,** Box 596, San Antonio—$2,775,006 for Addicks Dam, earthfill struct. about 11 mi. long to



"The Double Blue Line"

A Pacific Coast Product

WIRE ROPE MFG. & EQUIPMENT CO.

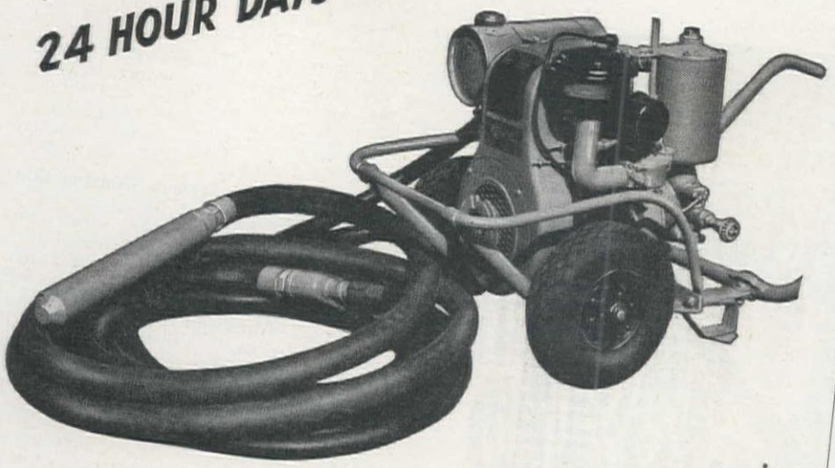
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SAN FRANCISCO PORTLAND LOS ANGELES



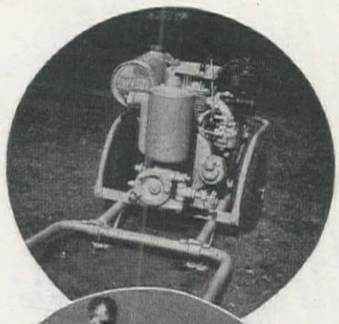
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Vibrator head driven by hydraulic motor. Standard head 2¾" x 21". Vibratory frequency instantly adjustable from 3000 to 7000 V.P.M. All moving parts submerged in oil. Rugged, neoprene lined hose 34 feet long. Husky Wisconsin engine. Wheelbarrow mounting balanced for light lift, with drop handles for easy hose manipulation. Grinding and drilling attachments available. See it at your JACKSON distributor or write for further details. Other JACKSON models to ideally suit every concrete vibratory requirement.





ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

control flood waters in upper Buffalo Bayou basin, Houston—by U. S. Engineer Office, Galveston. 4-19

Wyoming

NATRONA CO.—**Morrison-Knudsen Co.,** Box 450, Boise, Ida.—$4,688,000 for Kortes Dam and power plant, Kortes Unit, Missouri Basin Project, N. Platte River, 62 mi. SW. of Casper—by Bureau of Reclamation, Washington, D. C. 4-19

Irrigation . . .

California

CONTRA COSTA CO.—**Parish Bros.,** Box 6, Benicia—$568,974 for earthwork, canal lining and structs., Contra Costa Canal, Sta. 2321 plus 25 to end, and Mountain View Reservoir, Delta Division, Central Valley Project, about 1 mi. E. to 3½ mi. SE. of Martinez—by Bureau of Reclamation, Denver, Colo. 4-23

FRESNO CO.—**Peter Kiewit Sons Co.,** 442 Post St., San Francisco—$1,598,856 for earthwork, canal lining and structs., sta 1144 to sta. 1591 plus 66.15, Friant-Kern Canal, Friant Division, 18 mi. E. of Fresno, Central Valley Project—by Bureau of Reclamation, Washington, D. C. 4-12

NEVADA CO.—**Elmer J. Warner,** 1103 Sycamore St., Stockton—$38,150 for D-S canal extension, clearing and earthwork, 3 mi. E. of Grass Valley—by Nevada Irrigation District, Grass Valley. 4-11

Colorado

BENT CO.—**Grosshans and Petersen,** Marysville, Kan.—$459,476 for Fort Lyon protective works, near Las Animas—by U. S. District Engineer, Albuquerque, N. Mex. 4-23

Oklahoma

JACKSON CO.—**James & Phelps Construction Co.,** Oklahoma City—$154,915 for 15 mi. of lateral and sub-laterals, 3-mi. pipeline, etc., Altus Project, near Blair—by Bureau of Reclamation, Washington, D. C. 4-23

JACKSON CO.—**Stebbins Construction Co.,** Box 1498, Tulsa—$185,712 for 11.5 mi. West Canal: culverts, siphons, bridges, etc., Altus Project, N. and W. of Blair—by Bureau of Reclamation, Washington, D. C. 4-23

Wyoming

PARK CO.—**Wyoming Construction Co.,** 162-A N. 3rd St., Laramie—$90,042, Schedule 1; and **Otis Williams & Co.,** Helena, Mont.—$124,393, Schedules 2 and 3, earthwork and structs., Heart Mountain Canal, Shoshone Project, 4 to 17 mi. N. of Cody—by Bureau of Reclamation, Cody. 4-25

Tunnel . . .

Colorado

LARIMER CO.—**Lowdermilk Bros.,** 140 S. Elati St., Denver—$1,864,822 for excavation and conc. lining, Rams Horn and Prospect Mountain tunnels, to connect eastern portal of Adams tunnel with Marys Lake and Estes power plants, Colorado-Big Thompson Project, 1 mi. S. to 4 mi. SW. of Estes Park—by Bureau of Reclamation, Denver. 4-2

Power . . .

California

SACRAMENTO CO.—**H. H. Walker, Inc.**, 1816 S. Grand Ave., Los Angeles—$281,760 for 23-kv. transmission line from Oroville to Sacramento—by Bureau of Reclamation, Denver, Colo. 4-23

Oregon

HOOD RIVER CO.—**O. A. Snyder,** Tillamook—constr. of first 5 mi. of 120-mi. transmission lines in Hood River Valley—by Hood River Electric Cooperative, Hood River. 4-10

Texas

COOKE CO.—**J. & J. Construction Co.,** Oklahoma City, Okla.—109 mi. of rural electric lines, Muenster—by Cooke Co. Electric Cooperative, Muenster. 4-9

Washington

GRANT CO.—**Electric Construction Co.,** 1650 Center St., Tacoma—$225,178 for 210 mi. rural electric lines to serve 185 members—by Public Utility District No. 2 of Grant Co., Soap Lake. 3-15

YAKIMA CO.—**Pacific Power & Light Co.,** Yakima—$100,000 for installation of more than 960 lights in business and residential districts, Yakima—by City Council, Yakima. 4-2

Canada

BRITISH COLUMBIA—**Western Bridge Co.,** Vancouver—more than $700,000 for 660 steel transmission towers to carry power from B. C. Electric Bridge River power development to lower mainland area—by B. C. Electric Co., Vancouver. 4-6

Building . . .

Arizona

COCONINO CO.—**Del E. Webb Construction Co.,** Box 4066, Phoenix—$54,072 for 36 family dwelling units, Flagstaff—by Federal Public Housing Authority, San Francisco. 4-3

MARICOPA CO.—**Del E. Webb Construction Co.,** Box 4066, Phoenix—proceed order for $189,252 worth of FPHA houses: 126 family dwelling units, throughout county—by Federal Public Housing Authority, San Francisco. 4-9

MARICOPA CO.—**P. W. Womack Construction Co.,** Box 2414, Phoenix—$100,000 for shopping center bldg., Camelback Rd. and Central Ave., Phoenix—by William J. Wasson and M. J. Makaus, Phoenix. 3-29

PIMA CO.—**Bailey & McCoy,** 1130 Lowell Ave., Tucson—$50,000 for one-story reinf. brick store bldg., E. Broadway, Tucson—by C. H. Abbott, Tucson. 3-29

PIMA CO.—**Samuel E. Gercke,** 2802 E. 6th St., Tucson—$60,000 for two-story convent bldg., N. Norris Ave. and E. Adams St., Tucson—by SS. Peter and Paul Catholic Church, Tucson. 4-5

PIMA CO.—**Del E. Webb Construction Co.,** Box 4066, Phoenix—proceed order for $108,144 FPHA housing project: 72 family dwelling units, Tucson—by Federal Public Housing Authority, San Francisco. 4-9

PIMA CO.—**Del E. Webb Construction Co.,** Box 4066, Phoenix—$250,520 for 124

GREAT STRENGTH



LITTLE WEIGHT

There is no excess weight in Calco Spiral Welded Pipe. Electric fusion-welded seams, as strong as the metal they join, add nothing to the weight or bulk of the pipe—there are no laps to cause interior projections and lessen flow capacity.

Spiral welded construction has been proven to impart great resistance to both column and internal stresses; the pipe deflects slightly under external loads without cracking or breaking.

This combination of strength and lightness makes long-lasting Calco Spiral Welded Pipe easy to install. Transportation and handling costs are low. Joining of the long sections—up to forty feet—is accomplished quickly, resulting in the laying of large footages per day. And once in the ground, Calco Spiral Welded Pipe is good for many years of service.

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CALIFORNIA CORRUGATED CULVERT CO.
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ARMCO DRAINAGE & METAL PRODUCTS, Inc., *Hardesty Division*
Plants now operating: DENVER; SALT LAKE CITY; BOISE, TWIN FALLS, CALDWELL, JEROME, IDAHO; ONTARIO, NESSA, OREGON

WASHINGTON CULVERT & PIPE CO.
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OREGON CULVERT AND PIPE COMPANY
2321 S. E. GLADSTONE STREET, PORTLAND 2

family dwelling units, Tucson—by Federal Public Housing Authority, San Francisco. 4-3

YUMA CO.—**Schumaker & Evans Construction Co.,** 4007 W. 6th St., Los Angeles—$72,096 for 48 family dwelling units, Yuma—by Federal Public Housing Authority, San Francisco. 4-3

California

ALAMEDA CO.—**Parker, Steffens & Pearce,** 135 S. Park, San Francisco—$800,000 for six-story office bldg., 1977 Center St., Berkeley—by State Farm Mutual Auto Insurance Co., Bloomington, Ill. 4-3

ALAMEDA CO.—**John F. Tulloch,** 3428 Ettie St., Oakland—$75,000 for reinf. conc. plant addition, 20th and Grove Sts., Oakland—by Holt Manufacturing Co., Oakland. 4-17

CONTRA COSTA CO.—**M. & K. Corp.,** 200 Financial Center Bldg., San Francisco—$696,000 for office and laboratory bldg. and industrial relations bldg., Richmond—by Standard Oil Co. of California, San Francisco. 4-17

CONTRA COSTA CO.—**Jos. H. Siino,** 1020 Beacon St., Pittsburg—$150,000 for four-story apartment bldg., adjacent to new Enea Dairy at Central and Railroad Aves., Pittsburg—by self. 4-26

CONTRA COSTA CO—**Stolte, Inc.,** 8451 San Leandro St., Oakland—$56,000 for two-story and basement store bldg., betw. Railroad Ave. and Cumberland St., Pittsburg—by Sal R. Russo, Pittsburg. 4-1

CONTRA COSTA CO.—**R. A. Walsh,** 918-A Marin St., Vallejo—$240,000 for shopping center: market, drug store, hardware store, beauty parlor, barber shop, drive-in garage, etc., Appian Way and Maloney Ave., San Pablo—by Ray Vogel, San Pablo. 4-5

FRESNO CO.—**Fisher & McNulty,** Matteo Bldg., Fresno—$250,000 for three-story, reinf. conc. and struc. steel raisin packing plant, G and Tulare St., Fresno—by California Packing Corp., Fresno. 4-5

FRESNO CO.—**W. H. Irwin,** 274 N. Fulton, Fresno—$66,500 for addition to manufacturing plant, 2900 Hamilton Ave., Fresno—by Sun Maid Raisin Growers Co., Fresno. 4-29

FRESNO CO.—**Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$190,800 proceed order for 100 family dwelling units, Fresno—by Federal Public Housing Authority, San Francisco. 4-18

FRESNO CO.—**Midstate Construction Co.,** 1299 Bush St., San Francisco—$100,000 for interior and exterior remodeling of store bldg., 1152 Fulton St., Fresno. 4-4

FRESNO CO.—**Trewhitt, Shields & Fisher,** Pacific Southwest Bldg., Fresno—$75,000 for conc. and brick store bldg., Olive and Wilson Aves., Fresno—by Marks Furniture Mart, Fresno. 4-11

KERN CO.—**O. D. Williams,** 506 G St., Bakersfield—$136,000 for two-story and part basement bldg., 1101 20th St., Bakersfield—by Pacific Telephone & Telegraph Co., Bakersfield. 4-5

LOS ANGELES CO.—**Aldon Construction Co.,** 6233 Wilshire Blvd., Los Angeles—$121,750 for five frame and stucco apartment bldgs., Barrington Ave., W. Los Angeles—by Timely Builders, Los Angeles. 4-5

LOS ANGELES CO.—**The Austin Co.,** 777 E. Washington Blvd., Los Angeles—$100,000 for addition to processing bldg., 1017 N. Las Palmas Ave., Los Angeles—by Eastman Kodak Co., Los Angeles. 4-5

LOS ANGELES CO.—**Paul M. Baer & Son,** 2400 Hyperion Ave., Los Angeles—$68,600 for 20-family bungalow court, Stagg St., N. Hollywood—by Charles W. Brenaham, Van Nuys. 4-5

LOS ANGELES CO.—**Morris Bear,** 1255 S. Orange Grove Ave., Los Angeles—$250,000 for 50 five-room houses, Sharp, Morehart, Remick and Cranford Aves., Van Nuys—by self. 3-29

LOS ANGELES CO.—**Contracting Engineers,** 2310½ W. Vernon Ave., Los Angeles—$78,000 for two-story factory bldg., 3681 7th Ave., Los Angeles—by L. Witcower, Los Angeles. 4-19

LOS ANGELES CO.—**Irving P. Crowell,** 8301 Hindry St., Los Angeles—$63,000 for two factory bldgs., 2102 and 2202 Broadway, Los Angeles—by Dan Gertsman, Los Angeles. 3-29

LOS ANGELES CO.—**Irving P. Crowell,** 8301 Hindry St., Los Angeles—$62,000 for shop and factory bldg., 2043-2119 Colorado St., Santa Monica—by Jonas Bienenfeld, Los Angeles. 4-5

You Can't beat All-Wheel-Drive



For All-Around, All-Weather Service

Marmon-Herrington *All-Wheel-Drive* Trucks are designed to do a superlative job for you—on all kinds of work—on the highway or off. Unsurpassed for fast, efficient highway service, they have the live power and traction in *all wheels* to move maximum loads in going that makes conventional-drive trucks sit down and quit—through deepest mud, sand and snow, up steepest hills and mountain grades.

For 1946 Marmon-Herrington offers two new, importantly improved Heavy-Duty *All-Wheel-Drive* Trucks—with super power, traction and efficiency for all-around, all-weather service—under all operating conditions. Especially recommended for—Road Building and Maintenance—Snow Removal—Oil Field Operations—Public Utility Work—Logging, Mining, etc.

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CONSTRUCTION PLANT AND EQUIPMENT FROM SHASTA DAM, CALIFORNIA

AVAILABLE FOR SALE **IMMEDIATE DELIVERY**

CABLEWAYS AND HOISTS

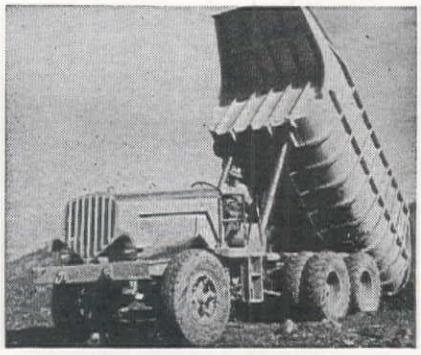
3—Lidgerwood, 3-drum electric hoists with 500 h.p. G. E. motors. Ward Leonard control, complete with controls and all electric equipment.
2—Lidgerwood, 3-drum electric hoists with 500 h.p. Westinghouse motors complete with controls and all electrical apparatus.
5—Cableway towers, structural steel, 3—125 ft.; 1—75 ft. and 1—45 ft., complete with travel mechanism.
6—Complete sets of carriages, main and auxiliary, fall and dump blocks, fall rope carriers, buttons, takeup bars and takeup sheaves.
1—American pillar crane. Cap. 5 T. at 48½ ft. and 15 T. at 25 ft. radius.
1—Colby elevator hoist, double drum, 75 h.p., equipped with brakes and emergency equipment, including one hoist cage. 15 ton capacity.
12,000 lin. ft. of used 3" dia. locked coil cable in length from 500 to 2600 lin. ft.
Misc. lot of sheaves, jewels, blocks, etc.

CEMENT PLANT

1—Dual No. 265 Fuller Fluxo cement pump, duplex type complete with gravity feed and automatic control equipment. 400 bbls. per hr. capacity. Pumping distance 3300 ft.
1—Fuller-Kinyon pump—type "D," 125 h.p., complete with air hose power control cable, control cabinet.
1—C-200 Fuller single stage rotary compressor Westinghouse motor 100 h.p.

CONVEYORS

66—Motor operated gates for sand and gravel up to 6" cobbles with 1-h.p. Allis-Chalmers gear motor.
2—Complete sets, including 42" tandem drive pulleys, 42" head pulleys, 36" tail pulleys.
3—150 h.p. Westinghouse gear motors, 144 r.p.m., 2300 volts, 3-phase, 60 cycle.
1—Airplane tripper for 36" belt with two 17' wing belts, capacity 1,000 T. per hour, complete with pulleys, drives and gear motors.



12—White Dump Trucks Model 1580-691, 24 cu. yd. capacity in good condition.

DRILLING EQUIPMENT

2—Mod. 315 I-R portable compressors, gas driven.
5—I-R paving breakers.
8—I-R drifters DA35.
1—I-R-54 drill sharpener.
10—I-R jackhammers.

TANKS AND RECEIVERS

10—8 cu. yd. steel hoppers, including gates and air rams.
2—Water filters.
2—Wallace & Tiernan chlorinators.
1—9500 bbl. all welded water tank, 48' dia., 30' high.
1—5400 bbl. all welded water tank, 36' dia., 30' high.
1—200 bbl. steel water tank.
10—Sandblast tanks 24" x 96" with hoppers and fittings.
10—Lubricator tanks 14" x 30"; 24" x 48"; and 24" x 60".

PUMPS

3—Bingham type SVD submersible pumps.
1—Byron-Jackson 150 h.p. 10 in. deep well.
2—Byron-Jackson 200 h.p., 5 K-H type 8Q1 deep well turbine pumps.
10—I-R No. 25 sump pumps.

MIXING PLANTS

1—3000 cy. bin with 5 compartments for aggregates, 2 compartments cement, incl. turnhead, gates.
1—Complete set C. S. Johnson fully automatic batching equipment for 5 aggregates, cement and water for 4 cy. batchers.
5—4 cy. Koehring concentric zone mixers, including batchmeters, timers, consistency meters.

MISCELLANEOUS

1—P.A.X. automatic telephone switchboard with 76 phones.
Pole line hardware.
Floodlites—500 to 1500 w.
1—1¼ cu. yd. heavy duty clamshell bucket.
12—Muck skips, 7—14 cu. yds.
50—Chicago pneumatic concrete vibrators, Nos. 417, 518 and 519.
Several sizes of monkey wrenches, wood borers, chipping and riveting guns.
New and used rubber hose, ¾" to 4".

MACHINERY AND SUPPLIES

1—125 kw. motor generator set, 275 volts D.C.
Complete stock of warehouse supplies.
Complete line of transformers and electric motors.

ALL ITEMS SUBJECT TO PRIOR SALE

PACIFIC CONSTRUCTORS, INC.

GENERAL CONTRACTORS—BOX 898, REDDING, CALIFORNIA **Phone 512 and 1779 REDDING**

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

A MOUTHFUL at EVERY BITE

This is not only the claim of OWEN, the name symbolic of the highest grade Excavating and Handling Buckets for years. — Operators everywhere, "on and off" the job, volunteer this testimony.



And — there's a reason. Owen-engineered buckets incorporate special features which have been continually improved.



THE OWEN BUCKET CO., LTD.
BERKELEY, CALIFORNIA

and MORE BITES PER DAY

DEALERS: LOS ANGELES, SPOKANE, SEATTLE, PORTLAND, SALT LAKE CITY, HONOLULU

LOS ANGELES CO.—**J. L. Dandy & Co.,** 4316 Lankershim Blvd., N. Hollywood—$78,000 for 20 homes, Aztec and Beaver Sts., Los Angeles—by self. 4-19

LOS ANGELES CO.—**L. E. Dixon Co.,** 609 S. Grand Ave., Los Angeles—$300,000 for additions to club house and grandstand at horse racing plant, 1050 S. Prairie Ave., Inglewood—by Hollywood Turf Club, Inglewood. 3-29

LOS ANGELES CO.—**Edward M. Dunn,** 10924 Barman Ave., Culver City—$60,000 for frame and stucco motor court, Ventura Blvd., Van Nuys—by self. 4-19

LOS ANGELES CO.—**Jack Ewins,** 10377 W. Olympic Blvd., W. Los Angeles—$66,300 for 18-family frame and stucco bungalow court, 5906 Cahuenga Blvd., Van Nuys—by self. 4-19

LOS ANGELES CO.—**Sam Fink,** 443 S. La Cienega Blvd., Beverly Hills—$100,000 for two- and part three-story bldg., 332 N. Rodeo Dr., Beverly Hills—by H. Scheff, Los Angeles. 3-29

LOS ANGELES CO.—**Frederick Fischer,** 8521 Lincoln Blvd., Venice—$195,000 for 25 six-room houses, 80th and 81st Sts., Venice—by Loyola Village Construction Co., Venice. 4-5

LOS ANGELES CO.—**Fred Hack,** 3337 Sunset Blvd., Los Angeles—$100,000 for conc. block store and roller skating rink, 4815-45 Hollywood Blvd., Los Angeles—by J. Petos, Los Angeles. 4-19

LOS ANGELES CO.—**Haddock-Engineers, Ltd.,** 129 W. 2nd St., Los Angeles—$237,000 for additional stories to administration and central office bldg., 1314 7th St., Santa Monica—by Associated Telephone Co., Los Angeles. 4-11

LOS ANGELES CO.—**H. F. Hendrickson,** 2811 Clearwater St., Los Angeles—$100,000 for sanitarium, 4770 Griffin Ave., Los Angeles—by Southern California Foundation, Inc., Beverly Hills. 4-5

LOS ANGELES CO.—**Jackson Bros.,** 3475 W. 8th St., Los Angeles—$70,000 for two-story brick and conc. medical office bldg., 1015 Gayley Ave., W. Los Angeles—by Westwood Village Medical Arts Bldg., Inc., Los Angeles. 3-29

LOS ANGELES CO.—**John Keith Construction Co.,** 3917 Wilshire Blvd., Los Angeles—$118,400 for apartment hotel bldgs., 7762-70 Hollywood Blvd., Los Angeles—by L. B. Turk and John Keith, Los Angeles. 4-19

LOS ANGELES CO.—**Kemp Bros.,** 8750 Mettler St., Los Angeles—$80,000 for reinf. conc. warehouse and office bldg., 5806 S. Main St., Los Angeles—by Boris Laviletes and J. Schneiderman, Los Angeles. 4-19

LOS ANGELES CO.—**William C. McDean,** 1740 Walnut Ave., Long Beach—$70,000 for two-story motel bldg., 1610 Pacific Ave., Long Beach—by Mrs. Bernice Carlton, Long Beach. 4-5

LOS ANGELES CO.—**McNeil Construction Co.,** 5860 Avalon Blvd., Los Angeles—$200,000 for reconditioning of Mira Mar Hotel, Santa Monica—by Hull Hotels, Inc., Los Angeles. 3-29

LOS ANGELES CO.—**Meyer-Nash Corp.,** 1414 Hollywood Way, Burbank—$300,000 for 44 six-room dwellings, Lilienthal and De Haviland Aves., Venice—by self. 4-19

LOS ANGELES CO.—**H. S. Morgan,** 5060 Bakman Ave., N. Hollywood—$127,000 for six apartment bldgs., Sherbourne Dr. and Guthrie Ave., Los Angeles—by H. Martin Ward, Los Angeles. 4-5

LOS ANGELES CO.—**Myers Bros.,** 3407 San Fernando Rd., Los Angeles—$210,000 for two-story mortuary bldg., S. Vermont Ave., Los Angeles—by Maj. H. McKinley, Los Angeles. 4-5

LOS ANGELES CO.—**C. L. Peck,** 354 S. Spring St., Los Angeles—$60,000 for one-story reinf. conc. department store bldg., Colorado Blvd. and Los Robles, Pasadena—by Broadway Department Store Los Angeles. 3-29

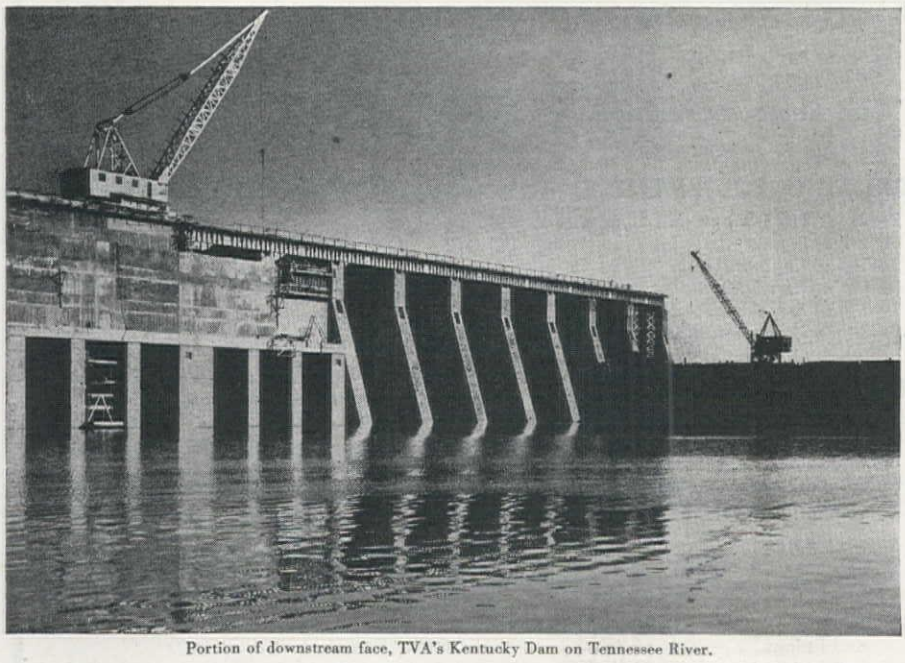
LOS ANGELES CO.—**C. L. Peck,** 354 S. Spring St., Los Angeles—$60,000 for service bldg., 1617 S. Hope St., Los Angeles—by Electric Equipment Co., Los Angeles. 4-19

LOS ANGELES CO.—**C. L. Peck,** 354 S. Spring St., Los Angeles—$150,000 for one-story and basement garage sales bldg., Swall Dr. and Wilshire Blvd., Beverly Hills—by Beverly Hills Ford Co. 3-29

LOS ANGELES CO.—**Pruitt Construction and Equipment Co.,** 8617 4th Ave., Inglewood—$494,000 for 95 frame and stucco houses, S. Western Ave., 205th St., 209th St., S. Denker Ave., Torrance Blvd. and 208th St., San Pedro—by Safeway Construction Co., Los Angeles. 4-19

LOS ANGELES CO.—**Albert Rothenberg,** 2162 Talmadge St., Los Angeles—$123,000 for three 20-room hotel bldgs., 649 S. Detroit St., 329 S. Cochran Ave. and 649 S. Hauser Blvd., Los Angeles—by self. 4-19

LOS ANGELES CO.—**J. B. Rowley,** 1842 Thurman Ave., Los Angeles—$129,600 for six apartment bldgs. and six garages with



Portion of downstream face, TVA's Kentucky Dam on Tennessee River.

FIR-TEX

ABSORPTIVE FORM LINER

Produces Smoother, Harder Concrete on KENTUCKY TVA DAM

FIR-TEX Absorptive Concrete Form Liner is a highly absorptive felted board, with a chemically treated surface which resists bonding. The mechanical vibration of concrete increases the tendency of air and water bubbles to float to the surface and to the face of the mass. When a non-absorptive form liner is employed, these bubbles have no avenue of escape and consequently remain to become voids in the face of the concrete.

The action of the Fir-Tex Liner is like that of a vacuum cleaner. It absorbs all excess air and water adjacent to surface. The removal of bubbles permits the cement to flow into those spaces so that this surface sets solidly into a smooth attractively textured mass of extreme density and resistance to moisture. This structural change in the concrete extends to a depth of about 1¼ inches from the face. Not only has the structure been given architectural beauty, but its weather resistance has been so greatly increased that eminent engineers have referred to its surface as "case hardened."

FIR-TEX INSULATING BOARD CO.

Porter Building, Portland 4, Oregon

two apartments each, Oak St., Santa Monica—by Gus Fallis, Los Angeles. 4-19

LOS ANGELES CO. — **Shumaker & Evans Construction Co.,** 4007 W. 6th St., Los Angeles—$73,598 proceed order for 49 family dwelling units, Pasadena—by Federal Public Housing Authority, San Francisco. 4-23

LOS ANGELES CO. — **Simpson Construction Co.,** 816 W. 5th St., Los Angeles—$500,000 for one-and part four-story masonry industrial bldg., Foothill Blvd. and Eaton Wash, Pasadena—by Allied Products, Inc., New York. 4-19

LOS ANGELES CO.—**Substantial Homes, Ltd.,** 1750 N. Serrano Ave., Los Angeles—$96,000 for 64-room frame and stucco hotel Bldg., 1008-12 S. Westmoreland Ave., Los Angeles—by George Miller & Son, Los Angeles. 4-19

LOS ANGELES CO.—**Substantial Homes, Ltd.,** 1750 N. Serrano Ave., Los Angeles—$134,100 for 15 six-room, frame and stucco dwellings, S. Cochran Ave., Los Angeles—by self. 3-29

LOS ANGELES CO.—**J. K. Thomas** and **Beyer Construction Co.,** 611 Chamber of Commerce Bldg., Los Angeles—$1,500,000 for 95-unit apartment bldg., Atlantic Ave. and Ocean Blvd., Long Beach—by Mitchell Land and Improvement Co., Long Beach. 3-29

LOS ANGELES CO.—**P. J. Walker Co.,** 3900 Whiteside Ave., Los Angeles—$700,000 for four-story reinf. conc. and terra cotta telephone bldg., 434 S. Grand Ave., Los Angeles—by Southern California Telephone Co., Los Angeles. 4-18

LOS ANGELES CO.—**Western Defense Housing Co.,** 1041 E. Green St., Pasadena—$4,500,000 for all-rental housing project for 1,000 families in apartments: 500 single, 500 double apartments, 62-ac. site, Avalon Blvd. and 234th St., Wilmington—by Avalon Village Co., Wilmington. 4-2

MADERA CO. — **Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$93,492 proceed order for 49 family dwelling units, Madera Co.—by Federal Public Housing Authority, San Francisco. 4-23

MARIN CO.—**A. Von Rotz,** 23 Brookside Dr., San Anselmo—constr. of eventual 93 5-room, $10,000, frame and stucco houses, Forbes Estate, San Anselmo—by James & David Leach, San Anselmo. 4-11

MARIN CO.—**Kenneth Smitten,** 564 Market St., and **M. J. King, Inc.,** 231 Franklin St., San Francisco—40-home subdivision, $7,500 each, Santa Venicia, Venicia Harbor, San Rafael—by selves. 4-23

MONTEREY CO.—**Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$62,400 proceed order for 32 family dwelling units, Salinas—by Federal Public Housing Authority, San Francisco. 4-16

MONTEREY CO.—**Refrigeration Engineering, Inc.,** 6107 S. Central Ave., Los Angeles—constr. of six separate one-story frame and stucco office bldgs., 101 Highway, S. Salinas — by Shippers' Development, Inc., S. Salinas. 4-23

ORANGE CO.—**George W. Carter,** 128 N. Orlando Ave., Los Angeles—$70,000 for one-story office and garage bldg., Chester Ave. and Minnie St., Santa Ana—by self, to lease to Southern California Telephone Co., Los Angeles. 4-19

RIVERSIDE CO.—**A. Farnell Blair,** 7052 Santa Monica Blvd., Los Angeles—$76,540, Home Gardens School, Brotherton and Grant St., Corona—by Corona School District, Corona. 3-29

RIVERSIDE CO.—**Daley Bros.,** 426 Bryant St., San Francisco — $75,100 proceed order for 50 family dwelling units, Blythe—by Federal Public Housing Authority, San Francisco. 4-23

RIVERSIDE CO.—**Eric W. Emtman,** 3825 Vine St., Redlands—$200,000 for steel frame and reinf. conc. warehouse bldg., 2727 Kansas Ave., Riverside—by Paul Lewis, Riverside. 4-22

RIVERSIDE CO.—**Hodges Construction Co.,** Corona—$104,000 for plant addition for pectin production, Corona—by Exchange Lemon Products Co., Corona. 4-8

RIVERSIDE CO.—**Waale Camplan Co.** and **Smith, Inc.,** 920 Palm Canyon Dr., Palm Springs — $149,766 for one-story conc. addition to S. unit of high school, Palm Springs — by Palm Springs Union High School District, Riverside Co. 4-11

SACRAMENTO CO. — **The Austin Co.,** 618 Grand Ave., Oakland—$1,000,000 for canning plant: eight bldgs. of reinf. conc., brick and struct. steel, Franklin Blvd. and 42nd Ave., Sacramento—by Campbell Soup Co., Camden, N. J. 4-10

SACRAMENTO CO.—**Craftbilt Homes, Inc.,** 1445 Bush St., San Francisco—500 two-and three-bedroom homes, N. Sacramento—by self. 4-9

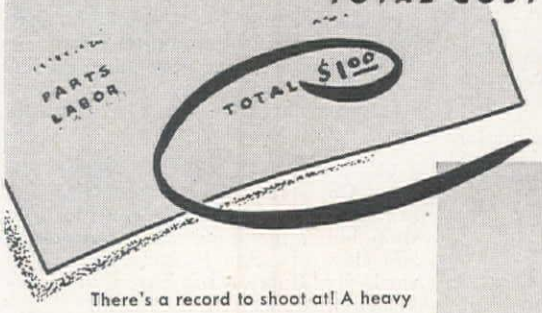
SACRAMENTO CO. — **James Jansen,** 1923 Stockton Blvd., Sacramento — 50 frame, stucco and wood shingle houses to sell from $7,600 to $9,000 each, Fifth Ave. tract, Sacramento—by self. 4-29

98% OF ALL THE GENERALS EVER BUILT ARE STILL IN ACTIVE SERVICE!

22,000 HOURS OF OPERATION---

TOTAL COST OF REPAIRS

$1.00



There's a record to shoot at! A heavy duty ¾-yard GENERAL, owned by Mr. J. R. Savage, prominent Ohio construction man, operated an average of 20 hours a day for 3½ years, working alternately as pull shovel, clamshell, dragline and crane, and during that time the total cost of repairs to the unit was exactly ONE DOLLAR! That's keeping service costs at rock bottom!

And don't forget, this amazing record was compiled on all types of work . . . Mr. Savage keeps his equipment busy on every kind of job. This GENERAL took all the jobs, even the toughest ones, in stride. Right now, this unit is busy on a $750,000 project Mr. Savage has started for the Wheeling Steel Corporation.

Low-cost, efficient performance like this means lower bids, more work, greater profit. The record proves that General-built equipment will deliver cost-cutting performance, time and again. Remember, 98% OF ALL THE GENERALS EVER BUILT ARE STILL IN ACTIVE SERVICE. That's a factor worth considering when you're planning to purchase new equipment. Better get complete details on the new line of GENERALS soon to be available . . . it's the first step to greater profits!



THE OSGOOD COMPANY
SHOVELS, DRAGLINES CRANES
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CRANES, DRAGLINES AND SHOVELS
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General Machinery Co., Spokane, Wash.; Wood Tractor Co., Portland, Ore.; M. M. McDowell & Sons, Seattle, Wash.; Power Equipment Co., Denver, Colo.; Hyman-Michaels Co., Los Angeles-San Francisco.

SACRAMENTO CO.—**S. H. Oser,** 2217 10th Ave., Sacramento—$70,000 for modern frame and stucco truck sta., Stockton Blvd. and Fruitridge Rd., Sacramento—by Tide Water Associated Oil Co., Sacramento. 4-11

SAN BERNARDINO CO.—**Clifford C. Bong,** 6 N. 1st St., Arcadia—$111,315 for additional storage facilities, Marine Corps Depot of Supplies, Barstow—by Bureau of Yards and Docks, Washington, D. C. 4-22

SAN BERNARDINO CO.—**McNeil Construction Co.,** 5860 Avalon Blvd., Los Angeles—$150,000 for reconditioning of Arrowhead Hotel, Arrowhead Springs — by Hull Hotels, Inc., Los Angeles. 3-29

SAN BERNARDINO CO.—**R. & W. Construction Co.,** 2264 E. Las Tunas Dr., Temple City—96 six-room houses, San Bernardino—by self. 4-19

SAN BERNARDINO CO.—**C. T. & W. P. Stover,** 116 N. Alexander Ave., Claremont — $100,000 for addition to factory bldg., 234 E. Main St., Ontario—by General Electric Co., Los Angeles. 3-29

SAN DIEGO CO. — **George W. Carter,** 128 N. Orlando Ave., Los Angeles—$70,000 for one-story office and garage bldg., Riley and Congress Sts., San Diego—by self, to lease to Southern California Telephone Co., San Diego. 4-19

SAN DIEGO CO.—**Tavares Construction Co., Inc.,** 19th St., National City, and **H. H. Johnson,** 624 Spreckels Bldg., San Diego—$97,967 for three-story office bldg., 841 9th Ave., San Diego—by Land Title Insurance Co., San Diego. 3-29

SAN FRANCISCO CO.—**Adam Arras & Son.,** 116 New Montgomery St., San Francisco—$80,691 for additions and alterations to provide office space for San Francisco Naval Base, Embarcadero, San Francisco —by Board of State Harbor Commissioners, San Francisco. 4-12

SAN FRANCISCO CO.—**James I. Barnes Construction Co.,** 941 Russ Bldg., San Francisco—$2,290,000 for superstructure for completion of two-story shop bldg., shipfitters' and boilermakers' shop, etc., San Francisco Naval Shipyard — by Bureau of Yards and Docks, Washington, D. C. 3-29

SAN FRANCISCO CO.—**Barrett & Hilp,** Industrial and Barneveld Aves., San Francisco—$450,000 for bldgs. 3 and 4, Industrial, Bayshore and Oakdale Aves, San Francisco — by Apparel City, Inc., San Francisco. 4-25

SAN FRANCISCO CO.—**Harney, Haas & Rothschild,** Oakdale and Barneveld Aves., San Francisco—$450,000 for bldgs. 1A, 1B and 2, Industrial, Bayshore and Oakdale Aves., San Francisco — by Apparel City, Inc., San Francisco. 4-25

SAN FRANCISCO CO.—**Charles Jones,** 666 Mission St., San Francisco — $85,000 for alterations to ground floor of Sutter Hotel, convert four stores and portion of lobby into men's store, Kearny St., San Francisco—by Hirsch & Price, San Francisco. 4-18

SAN FRANCISCO CO.—**Peter Kiewit Sons Co.,** 442 Post St., San Francisco—$1,904,500 for six-story conc. and steel shop bldg., including paving, track work and elevators, San Francisco Naval Shipyard—by Bureau of Yards and Docks, Washington, D. C. 4-16

YOU PROFIT with 3 WAYS

WYCO

CONCRETE FLEXIBLE SHAFT DRIVE VIBRATORS

SAVE LABOR—SAVE MATERIAL
CUT PLACEMENT COSTS 50%

Stronger, denser high quality concrete obtained. Honeycombing, air bubbles and scaly surfaces eliminated. Best tool ever devised for vibration of mass concrete of low water cement ratios.

Preferred by contractors everywhere for high efficiency and low maintenance costs.



WYCO Gasoline Power Vibrators

Gasoline Vibrators mounted on wheelbarrow or stationary swivel base. Standard air-cooled engine. Ball-bearing jack shaft with twin V-belts. Equipped with WYCO Patented Jack Shaft completely disengages engine. No. GV902A shown. 3 H.P. **$330**



Gasoline or Electric Motor Drive

WYCO features: Hardened spud vibrator head completely sealed—nose hard alloy steel—cast steel rotor—2 Norma Hoffman roller bearings, 1 ball thrust bearing, for dependable rotor action in severest conditions—greatest amplitude of vibration for size of vibrator load.

Available with interchangeable tools for grinding, surfacing, drilling, wire brushing, sawing, etc.

Electric Motor Drive WYCO Vibrators

3 types: 2 for AC, single or 3-phase constant speed, direct or jack shaft step-up type. For both AC and DC a Universal Motor is supplied.

WRITE FOR CATALOG AND FULL DETAILS



WYZENBEEK & STAFF, Inc. 856 W. HUBBARD ST. CHICAGO 22, ILLINOIS

SAN FRANCISCO CO.—**M. & K. Corp.,** 200 Financial Center Bldg., San Francisco —$96,800 for constr. and alteration of two-story frame bldg. to industrial shop, San Francisco Naval Shipyard—by Bureau of Yards and Docks, Washington, D. C. 4-8

SAN FRANCISCO CO.—**A. T. Morris & Sons,** 5400 Fulton St., San Francisco—$150,000 for two struct. steel frame and corrugated steel factory bldgs., 2765 16th St., San Francisco—by Reliance Trailer & Truck Co., San Francisco. 4-5

SAN FRANCISCO CO. — **Pacific Coast Construction Co.,** 1500 Judah St., San Francisco — $10,000,000 for 700 two-story residences and complete business district N. of Lake Merced, San Francisco — by self. 4-19

SAN JOAQUIN CO. — **C. E. Kennedy,** 305 E. Weber Ave., Stockton—$100,000 for two-story reinf. conc. steel frame abattoir bldg., Sacramento Rd., Stockton—by Salcedo Packing Co., Stockton. 4-16

SAN MATEO CO.—**Barrett & Hilp,** 918 Harrison St., San Francisco—$100,000 for four-story conc. store bldg., Second Ave., San Mateo—by Drs. Gerald I. and John Snell, San Mateo. 4-17

SAN MATEO CO.—**Dinwiddie Construction Co.,** Crocker Bldg., San Francisco—$200,000 for reinf. conc. telephone exchange bldg., San Mateo Ave., San Bruno —by Pacific Telephone and Telegraph Co., San Francisco. 3-29

SAN MATEO CO.—**C. F. Parker,** 1644 Monterey Blvd., San Francisco—$115,000 for administration wing, cafeteria and multi-use rooms, and grading and paving of play area, Laurel School, Laurel Creek, San Mateo—by San Mateo Elementary School District, San Mateo. 4-25

SAN MATEO CO.—**Stolte, Inc.,** 8451 San Leandro St., Oakland—$2,000,000 for 200 homes, $10,000 each, site of former Belle Monti golf course W. of Belmont—by Sedric Cunningham, San Carlos. 4-3

SAN MATEO CO.—**G. W. Williams Co.,** 10 California Dr., Burlingame—$150,000 each for three three-story apartment bldgs., Oak Grove and Floribunda Aves., Burlingame—by H. H. Lauder, Burlingame. 4-29

SANTA CLARA CO.—**Coastwise Construction Co.,** 2499 Middlefield Rd., Palo Alto—$3,000,000 for 400 homes on Willow Glen, Pine and Jonathan Aves., Malone Rd. and Guadalupe Creek, Palo Alto—by self. 4-19

SANTA CLARA CO. — **Coastwise Construction Co.,** 2499 Middlefield Rd., Palo Alto—$1,500,000 for 126 farm-type frame and stucco houses, Garland Tract and Price Tract, Oregon and Middlefield Rd., Palo Alto—by self. 4-8

SANTA CLARA CO. — **Earl W. Heple,** 494 Delmas Ave., San Jose—constr. of 500 two- and three-bedroom houses to cost $8,000-$10,000 each, S. side of Tully Rd., E. of Franklin School, Northern Rd. and Willow Glen Way, and off Minnesota Ave. near Willow St., San Jose—by Graham Moulton, San Jose. 4-16

SANTA CLARA CO.—**Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$190,800 for 100 family dwelling units, San Jose—by Federal Public Housing Authority, San Francisco. 4-3

SANTA CLARA CO. — **J. D. O'Connor Construction Co.,** 391 Sutter St., San Francisco—const. of 181 five- and six-room frame and stucco houses to sell at approx. $9,500 each, Alum Rock Ave., San Jose—by Paul Wilmore. 4-15

SANTA CLARA CO.—**W. W. Williamson Co.,** 320 Market St., San Francisco—$120,000 for one-story frame cold storage bldg., 480 Lincoln Ave., San Jose—by Low Temperature Co., San Francisco. 4-19

SISKIYOU CO. — **Stephen Joyce,** 1531 Francisco St., San Francisco — $90,000-$100,000 for motel: 47 bedroom units, 37 garages, 300 N. Main St., Yreka—by self. 4-1

SONOMA CO.—**Marin Capital Co.,** Sycamore and Highway, Mill Valley—$500,000 for 60 $7,000 homes, Washington, Vallejo, Madison and Payran Sts., Petaluma—by self. 4-5

STANISLAUS CO.—**S. C. Giles & Co.,** 319 Elks' Bldg., Stockton—$105,000 for frame and corrugated iron warehouse, Modesto—by San Joaquin Valley Walnut Growers' Assoc., Linden. 4-19

STANISLAUS CO.—**S. C. Giles Co.,** 319 Elks' Bldg., Stockton—$100,000 for one-story reinf. conc. struct. steel quick freezing plant with frame office bldg., Modesto —by Pacific Grape Products Co., Modesto. 4-24

STANISLAUS CO.—**MacDonald, Young & Nelson,** 127 Montgomery St., San Francisco—$500,000 for two-story, mezzanine and basement department store bldg., 11th and J Sts., Modesto—by Graeme MacDonald, San Francisco. 3-29

STANISLAUS CO. — **Wieland Bros.,** 919½ Eye St., Modesto—$300,000 for macaroni factory, candy factory and finished product warehouse, Beard industrial tract, Modesto—by Grocers' Packing Co., Modesto. 4-11

SUTTER CO.—**McCoy & Butler,** 1128 F St., Marysville—$270,000 for reinf. conc. cold storage plant bldg., betw. Reeves Ave. and Bridge St. on Sacramento Northern tracks, Yuba City—by Yuba City Refrigerating Co., Yuba City. 4-19

TULARE CO.—**Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$156,456 proceed order for 82 family dwelling units, Tulare Co.—by Federal Public Housing Authority, San Francisco. 4-23

TUOLUMNE CO.—**Robt. McCarthy Co.,** 1050 Kirkham St., San Francisco—$114,152 proceed order for 76 family dwelling units, Stanislaus—by Federal Public Housing Authority, San Francisco. 4-19

Nevada

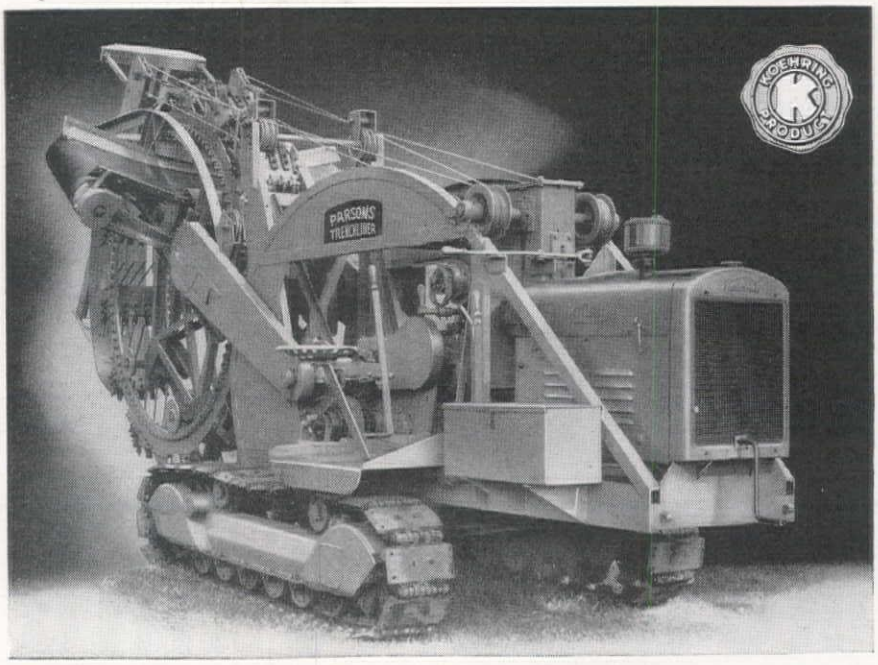
MINERAL CO. — **Johnson, Drake & Piper, Inc.,** 1736 Franklin St., Oakland—$252,340 for six inert storehouses, N.A.D., Hawthorne — by Bureau of Yards and Docks, Washington, D. C. 4-5

ORMSBY CO.—**M. & K. Corp.,** 200 Financial Center Bldg., San Francisco—$72,096 proceed order for 48 family dwelling units, Carson City—by Federal Public Housing Authority, San Francisco. 4-17

WASHOE CO. — **M. & K. Corp.,** 200 Financial Center Bldg., San Francisco—$150,384 proceed order for constr. of 102 family dwelling units, Reno—by Federal Public Housing Authority, San Francisco. 4-12

Oregon

CLATSOP CO. — **A. D. Knowles Construction Co.,** Portland — $25,000,000 to $30,000,000 for 3,000-unit housing project: 1,500 individual homes, $6,000-$10,000, 500-ac. development; 1,500 homes, incl. duplexes and apartments, scattered sites; and $200,000, two-story motel, large garage and



200 PARSONS WHEEL TRENCHLINER

DIRECT, SIMPLE POWER FLOW

Power goes to work fast on the Parsons 200 Trenchliner, flows in a direct line, without detours. You get maximum production per hour, because more power is delivered to the wheel.

ENCLOSED GEARS

All the gears that activate the operation of the Parsons 200 Trenchliner require lubrication only once a season because they are enclosed in oil-tight gear cases. Gears are cut from the solid; alloy steel shafts are mounted in anti-friction bearings.

PIVOTAL WHEEL MOUNTING

New pivotal wheel mounting, exclusive on the Parsons 200 Trenchliner, eliminates dirt catching slide tracks, simplifies fine grading in pipeline and drainage operations. Wheel drive chains stay tight in any wheel position.

2-POINT WHEEL BOTTOM SUPPORT

Wheel is supported at four points, but most firmly on the bottom where digging pressure is greatest. Two double-wheeled adjustable dollies are spaced close together to prevent frame distortion.

PARSONS COMPANY
KOEHRING SUBSIDIARY NEWTON, IOWA
TRENCHING EQUIPMENT
PARSONS

shopping center, 19th and Commercial, Astoria—by Pickett & Zimmer, Portland. 4-16

CROOK AND UMATILLA COS.—**Oregon Construction & Engineering Co.,** Eugene and Portland — $160,000 for two feed mills: one at Prineville—by Crook Co. Cooperative; and one at Hermiston—by Farmers' Bureau Cooperative. 4-19

MARION CO. — **McCormack Construction Co.,** Pendleton—$145,367 for dormitory annex to nurses' homes, Pendleton—by Eastern Oregon State Hospital, Pendleton. 4-20

MARION CO.—**Ed. R. Viesko,** 1440 S. 13th St., Salem — $100,000 for addition to paper plant, Front and "D" St., Salem—by Western Paper Converting Co., Salem.

MULTNOMAH CO. — **Bingham Construction Co.,** 317 Builders Exchange Bldg., Portland—$200,000 for factory bldg., 540 N.E. 19th, Portland—by Jantzen Knitting Mills, Portland. 4-8

Texas

BEXAR CO.—**H. J. Von Rosenberg,** 401 American Hospital and Life Bldg., San Antonio—$500,000 for three-story and basement addition to Romana Plaza, San Antonio—by Sears, Roebuck & Co., San Antonio. 3-26

DALLAS CO.—**Robert E. McKee,** Box 2848, Dallas—three-story and basement, brick and reinf. conc. bldg., Ross, Henderson and Greenville Aves., Dallas—by Sears, Roebuck & Co., Dallas. 3-26

DALLAS CO.—**Homer A. Parks Construction Co.,** 222 Construction Bldg., Dallas—$241,000 for brick, conc. and steel school bldg., Grand Prairie — by Grand Prairie Board of Education. 4-24

DALLAS CO.—**A. J. Rife Construction Co.,** 2808 Inwood Rd., Dallas — $356,603 for school bldg., 20 class rooms, auditorium and cafeteria, Greenway Park and Inwood Rd., Dallas—by Board of Education, Dallas. 4-12

DALLAS CO.—**Watson Construction Co.,** 1927 Akard St., Dallas—$128,000 for remodeling Shumond retail store, 1513 Main St., Dallas—by I. C. Shumond, Dallas. 4-1

LUBBOCK CO.—**T. C. Bateson Construction Co.,** 622 Irwin-Keasler Bldg., Dallas — $2,400,000 for two dormitories, Lubbock—by Texas Technological College, Lubbock. 4-16

NUECES CO.—**Ben Davis,** 3246 Huisache St,. Corpus Christi—$375,000 for church and educational bldg., Furman Ave., Carancahua St. and Tancahua St., Corpus Christi—by Park Ave. Baptist Church Congregation, Corpus Christi. 4-2

TARRANT CO.—**Cain & Cain,** 406 Majestic Bldg., Fort Worth — $100,000 for three-story department store bldg., 502 Houston St., Fort Worth—by Monnig Department Store, Fort Worth. 4-9

TARRANT CO.—**W. N. McCarstain,** 4129 Curgos, Fort Worth—$157,500 for six-room houses, Westridge and Locke Sts., Fort Worth—by self. 3-27

TAYLOR CO.—**Rose Construction Co.,** 1117 Walnut St., Abilene—$240,000 for three-story dormitory, Abilene—by Hardin-Simmons University, Abilene. 4-17

Utah

SALT LAKE CO. — **Jacobsen Construction Co.,** 724 S. 3rd, East, Salt Lake City—$150,000 for bldg., 21st S. and 2nd W. Sts., Salt Lake City—by Bennett Glass & Paint Co., Salt Lake City. 4-6

SALT LAKE CO.—**M. & K. Corp.,** 200 Financial Center Bldg., San Francisco, Calif.—proceed order for $430,875 FPHA housing project: 225 family dwelling units, Salt Lake City—by Federal Public Housing Authority, San Francisco. 4-9

SALT LAKE CO.—**M. & K. Corp.,** 200 Financial Center Bldg., San Francisco—$375,628 proceed order for 254 family dwelling units, Salt Lake City—by Federal Public Housing Authority, San Francisco. 4-17

Washington

KING CO.—**J. C. Boespflug Construction Co.,** Securities Bldg., Seattle — machine shop, warehouse and office bldgs., Sixth Ave. S. and Hinds St., Seattle—by Link-Belt Co., Seattle. 3-28

KING CO.—**Paul N. Carlson,** 1308 Madison St., Seattle—$150,000 for two-story and basement medical center, 1318 Madison St., Seattle—by self. 4-23

KING CO.—**General Construction Co.,** 3840 Iowa St., Seattle—$775,000 for brick and steel one-story motor parts depot, 4th Ave. S. near Spokane St., Seattle—by Ford Motor Co., Seattle. 4-3

KING CO.—**A. D. Johns,** 4128 California Ave., Seattle—100 homes at $6,000-$7,500, betw. Fifth and Tenth Aves. N.E. and E. 155th and 165th Sts., Seattle—by self. 3-29

KING CO.—**F. R. McAbee,** 921 Elliott Ave. W., Seattle—constr. of 300-400 residence addition, homes to sell for $7,000-$10,000, betw. W. 100th and 110th Sts. and Third and 12th Aves. N.W., Seattle—by Alderbrook Development Co., Inc., Seattle. 4-3

NOW WRECKING

14 Ship Building Ways, Docks, Etc. At Cal-Ship Yards—Terminal Island

LOS ANGELES

25,000,000 BOARD FEET LUMBER

Structural Framing Timbers and Planks Suitable for Bridging, Warehouses, Mines, Buildings, etc. 2x6, 3x6, 3x8, 4x6, 4x8, 4x12, 6x12, 8x12, 10x12, 12x12, 14x14, etc. Lengths up to 40 Ft.

50,000 PIECES PILING

30 to 60' Long, Treated and Untreated

1400 TONS RAILROAD TRACKS

25 MILES PIPE — ALL SIZES AND KINDS

100 TONS ELECTRIC WIRE, CABLE AND BUS BARS

All Materials are the Finest Grades — Less Than 4 Years Old

EVERYTHING GOES!

OUR TIME IS LIMITED! PHONE—WRITE OR CALL

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Wrecking & Salvage Co.

AND

MAURICE KATLEMAN

General Wrecking Contractors

1831 Pasadena Avenue Los Angeles (31) CApitol 1-1129

SEE SALESMAN AT JOB OFFICE: CAL-SHIP YARDS—GATE 3 TERMINAL ISLAND—WILMINGTON

Telephones: NE. 6-1861, Ext. 99, TERMINAL 23755

KING CO.—**O. E. Turnquist Construction Co.**, Orpheum Bldg., Seattle—$86,170 for auto freight depot, 2100 Alaskan Way, Seattle—by Seattle Auto Freight Depot, Seattle. 4-23

MASON CO. — **Industrial Engineers & Contractors,** 711 Middle Waterway, Tacoma—$941,000 for three-story wall board plant, Shelton—by Simpson Logging Co., Shelton. 4-23

WHATCOM CO.—**Roy T. Earley Construction Co.**, Tacoma—$100,000 for two-story frame, cork-insulated freeze plant and receiving dock, Bellingham—by North Pacific Frozen Products Co., Seattle. 3-26

Territories

HAWAII—**Pacific Construction Co., Ltd.,** 1192 Wainanu, Honolulu—$576,500 for 300 family dwelling units, Honolulu—by Federal Public Housing Authority, San Francisco. 4-5

Miscellaneous . . .

California

LOS ANGELES CO. — **Wm. A. Smith Contr. Co.,** 514 Central Bldg., Los Angeles —$145,000 for 15,000 ft. of spur track connecting Union Pacific RR. tracks with Douglas Aircraft factory, Long Beach—by Kaiser, Frazer Corp., Long Beach. 4-19

SAN MATEO CO.—**Earl W. Heple,** 494 Delmas Ave., San Jose — $1,250,000 for modernizing and enlarging Tanforan Race Track, San Bruno—by Guy M. Standifer, San Francisco, and Jack Rainer, New York City. 4-29

TRADE WINDS

News of Men Who Sell to the Construction West

CALIFORNIA

C. T. Spivey has been appointed assistant director of industrial relations of COLUMBIA STEEL CO., San Francisco, Calif., according to recent announcement by **William A. Ross,** president. Spivey, who has been associated with United States Steel Corp. since 1937, has served in numerous capacities of industrial relations work for the steel corporation. He started as an industrial engineer for Columbia Steel at the Pittsburg works. In 1940 he returned to the West to direct the company's industrial relations activities in the state of Utah, and in 1943 was transferred to the Government-owned Geneva Steel Works, returning to Columbia Steel Co. in 1945.

☆ ☆ ☆

Ross L. Mahon is the new Pacific Coast representative of S. MORGAN SMITH CO., of York, Pa., large manufacturers of turbines and valves. His territory covers the entire West Coast, and his headquarters are located at No. 1 Montgomery St., San Francisco. Mahon has recently returned to civilian life, having served as a colonel with the U. S. Corps of Engineers.

☆ ☆ ☆

After ten years of service with CATERPILLAR TRACTOR CO., of San Leandro, Calif., and Peoria, Ill., **J. W. Muller** has left to become associated with the Johnson Tractor Co., Caterpillar distributor at Riverside, Calif. Recently transferring from the Eastern Sales Division to California is **Gordon J. Fowler.** In his new post, Fowler will serve the following distributors: Budd & Quinn, Fresno; The Cousins Tractor Co., Hanford; Halton Tractor Co., Merced; Holt Bros., Stockton; Treanor Equipment Co., Visalia; and Valley Tractor & Equipment Co., Modesto.

☆ ☆ ☆

CALVIN D. WOOD, ADVERTISING, announces the opening of new offices at 617 Montgomery St., in San Francisco, Calif.

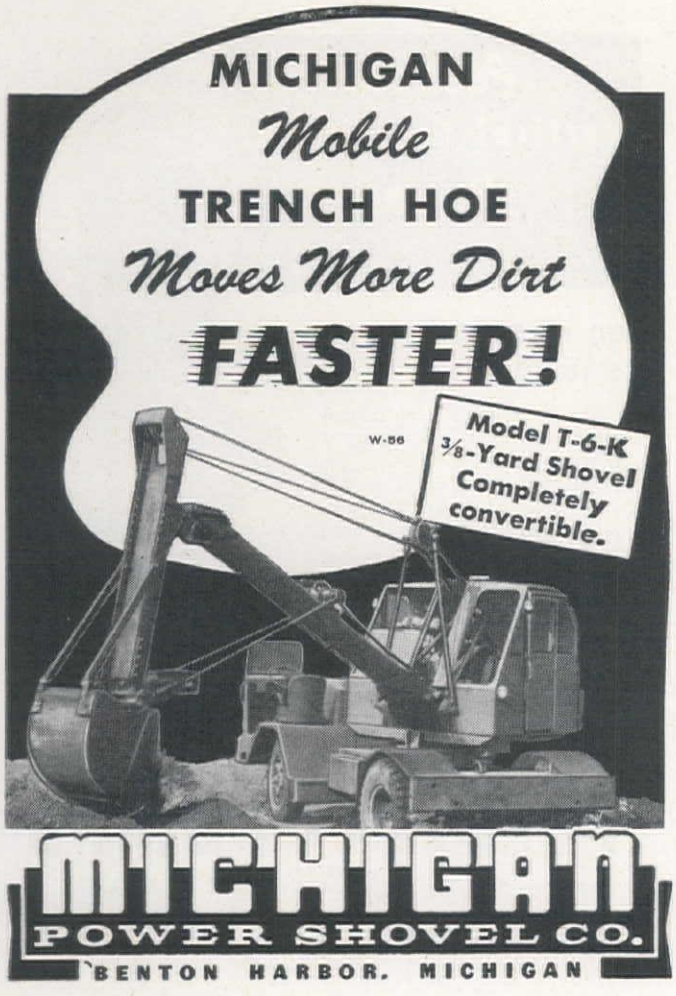
☆ ☆ ☆

To accommodate the increased activities of its postwar program, office space is being doubled at the Niles, Calif., headquarters of the KRAFTILE COMPANY, it was announced recently by **C. W. Kraft,** president of the building materials manufacturing and distributing firm.

☆ ☆ ☆

INTERMOUNTAIN

H. S. Eberling, district sales representative of CATERPILLAR TRACTOR CO.'s Eastern Sales Division, has been transferred to the Western Division. He will make his headquarters at Salt Lake



GIVE EQUIPMENT LONGER LIFE
HARD SURFACE WITH
P&H "ABRASOCOTE"



Now! Two brand-new P&H electrodes to give you *longer* lasting surfaces—*less* maintenance costs. Use Abrasocote on parts requiring high resistance to impact and abrasion—and double their lives.

"Abrasocote" is available in two types — Nos. 10 and 20 — to give you the surface hardness jobs require. Easy to use, they operate equally well on AC or DC. Take advantage of their important time, money, machinery saving benefits. Get information from your P&H representative or write us.

"ABRASOCOTE 10"
Harder than No. 20, it's for parts subject to rolling or sliding abrasion, batter and impact. Applications include tractor treads, drive sprockets, cams, crusher hammer, etc. Rockwell C hardness 35-40.

"ABRASOCOTE 20"
For high resistance to impact, heat, corrosion, abrasion. Deposit work hardens under impact. Use on high carbon manganese cast steels. Rockwell C hardness 25-35

P&H also makes other electrodes in all types and sizes — AC or DC — for welding all steels and for building up and hard surfacing.

P&H WELDING ELECTRODES
HARNISCHFEGER CORPORATION

General Offices:
4490 W. National Ave.
Milwaukee 14, Wis.

City, Utah, and serve three distributors: Bunting Tractor Co., Inc., Boise, Idaho; Pioneer Machinery Co., Idaho Falls, Idaho; and Robison Machinery Co., Salt Lake City; as well as Utah and Idaho agricultural dealers. Eberling has been with Caterpillar since 1933, and recently was discharged from the Army where he served as a captain.

☆ ☆ ☆

WORTHINGTON PUMP AND MACHINERY CORP., with general offices in Harrison, N. J., announces the following appointments: **P. A. Alers** becomes manager of the El Paso, Tex., office. He has been with Worthington since 1933. **Andrew S. Ormsby,** formerly in charge of industrial relations of the Bendix Aviation Co., is assigned to the post of director of industrial relations for Worthington.

☆ ☆ ☆

PACIFIC NORTHWEST

William H. Griffith, Jr., has become associated with the PACIFIC WIRE WORKS CO. of Seattle, as sales manager, according to a recent announcement by **Karl H. Kaye,** president. At one time he was located in Oakland, Calif., in the wire cloth business, going from there to Los Angeles and finally transferring to Seattle. He is a Navy veteran of World War II, having been released from service late in 1945.

☆ ☆ ☆

LINK-BELT COMPANY, nationally known manufacturers of chain, power transmission and conveying machinery, announces the building of a new plant at 6th Ave. S. and Hinds St. in Seattle, replacing the company's present plant at 820 First Ave. S. The general contract has been awarded to J. C. Boespflug Construction Co. of that city. This expansion is with the view of better serving Link-Belt's customers in northern Idaho, western Montana, Oregon, Washington and Alaska. **Ralph S. Drury,** vice president, Pacfiic Division, and **Fred A. Koeph,** district manager, direct the company's activities in the Pacific Northwest area.

☆ ☆ ☆

John C. Emery has been appointed as northwest regional manager for the Thermo-Aire Division (formerly the Heating and Ventilating Div.) of EVANS PRODUCTS CO. of Detroit, Mich., with offices in Portland. Emery's territory will include Oregon, Washington, Idaho, Montana and British Columbia. At the same time **A. R. Lintern,** manager of the Division, announced the appointment of the following distributors in the Northwest: Northwest Thermo-Control Fan, Seattle; Lyman Agencies, Vancouver, B. C., and Potter-Webster Co., Portland. The Division manufactures truck and bus heating and ventilating equipment.

☆ ☆ ☆

AMONG THE MANUFACTURERS

E. R. Galvin assumed his new duties as executive vice president, general sales manager and member of the board of directors of LA PLANTE-CHOATE MANUFACTURING CO., INC., Cedar Rapids, Iowa, one of the nation's leading manufacturers of bulldozers, scrapers and other earth-moving equipment. **S. L. Myers** becomes vice president and export sales manager, and **Jay M. Fetters** assumes the management of foreign development.

Galvin is recognized as one of the top sales executives in the entire construction equipment industry. He was formerly president of Tyson Bearing Corporation of Massillon, Ohio, and prior to that was sales manager of R. G. LeTourneau, Inc. He also served with the Caterpillar Tractor Co., Cleveland Tractor Co. and E. I. Du Pont de Nemours & Co., in similar capacities.

☆ ☆ ☆

THERMOID COMPANY, Trenton, N. J., announces the appointment of **H. C. Anderson** as Director of Research. Anderson has had wide experience in research, engineering and in managerial capacities, having been formerly associated with The Flintkote Co., Chrysler Corp. and Ford Motor Co. This experience in research and development in the industrial and automotive fields qualifies him to play an important part in the future plans of Thermoid.

☆ ☆ ☆

R. C. Owens has returned to his position as secretary of THE OSGOOD COMPANY and THE GENERAL EXCAVATOR COMPANY, both of Marion, Ohio, after having served nearly three years with the U. S. Navy, in which he held the rank of lieutenant. Owens will be actively interested in the promotion of the future development of both Osgood and General. Both companies have already announced several new and improved models.

☆ ☆ ☆

Net earnings of DRESSER INDUSTRIES, INC. and subsidiaries for 1945 totaled $1,921,628, according to the company's annual report. Net sales were $80,544,911, as compared to $54,995,408 for the preceding year. The backlog of business at the end of the year was $25,500,000. Fourteen companies are now members of the Dresser group.

UNIT 514 SPEEDS UP THE JOB!

Compact, ½ yard excavator. Exclusive UNIT features include: FULL VISION CAB . . . Finger-tip controls . . . Automatic foolproof traction brakes . . . Drop-forged alloy steel gears . . . One-piece cast gear cast. Convertible to all attachments.

½ YD.



UNIT 514 — ½ Yard Shovel

UNIT 514
5 Ton Crane



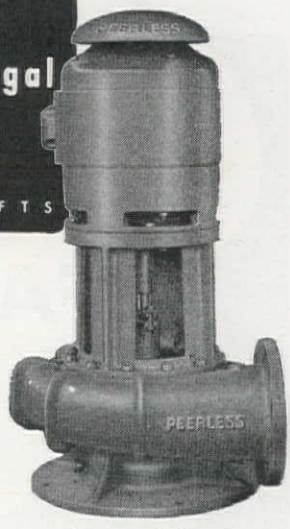
UNIT 514
½ Yard Trenchoe

UNIT CRANE & SHOVEL CORP., 6421 West Burnham Street Milwaukee 14, Wis., U.S.A

CONTACT FACTORY DIRECT
FOR PRICE AND DELIVERY

A 4908-¼R

Peerless
Vertical Centrifugal
Pumps
FOR SHALLOW LIFTS



Close-Coupled Type

100 to 5000 g. p. m.
15 to 100 foot head

• Peerless Vertical Centrifugal Pumps are intended for general pumping purposes. • They are built in both the Close-Coupled and Submerged types. The Submerged type is furnished with either top or bottom suction. Direct connected electric motor, steam turbine or engine drive, either direct or through right angle gear. • These pumps are successfully applied to sumps or drainage or wherever it is necessary to move large quantities of water at comparatively low lift. • Installation space is reduced to a minimum, of paramount importance in industrial installations . . . Extremely economical to operate.

217 WEST JULIAN STREET, SAN JOSE 5, CALIFORNIA

PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corp.



FACTORIES
LOS ANGELES 31, CALIFORNIA
301 West Avenue Twenty-six
QUINCY, ILL. • CANTON 6, OHIO

RHEEM MANUFACTURING CO. is forming a new company to be known as RHEEM de MEXICO, S. A,. and has started construction of a factory near Mexico City. Fifty-one per cent of the stock will be held by Mexican interests, and Rheem will hold the remaining stock. In addition to heaters especially designed for Mexican and South American markets, the new company will manufacture the usual line of steel containers.

☆ ☆ ☆

R. G. LeTOURNEAU, INC., has announced the appointment of **Oscar W. Nelson** as vice president and general manager of the Peoria plant. He was formerly with the Curtiss Wright Corp. as general



manager of their Beaver, Pa., plant. In his new position he will have responsibility over all Peoria operations, his duties including those formerly handled by **Denn M. Burgess,** who recently resigned.

☆ ☆ ☆

The new Conservation Bureau established by the PORTLAND CEMENT ASSOCIATION, Chicago, Ill., is headed by **Ezra C. Wenger,** who has been regional highway engineer for the Association in six midwestern states for the past eleven years. The purpose of the Conservation Bureau is to correlate technical information and assist users of concrete in the fields of water supply, sewage disposal, flood control, irrigation, reclamation and all similar activities.

☆ ☆ ☆

Joseph F. Heil was elected president of THE HEIL COMPANY, Milwaukee, Wis., at the annual meeting of the Board of Directors in March. **Julius P. Heil,** founder of the company and president since its inception, will continue actively in the business as director and treasurer. Young Heil came to the company in 1923, and after eight years of progressive training in practically every phase of the business, he was made vice president, which position he held until his elevation to the presidency.

☆ ☆ ☆

THE EUCLID ROAD MACHINERY CO. of Cleveland, Ohio, announces three recent additions to its organization: **H. W. Hiscox** has been appointed sales representative for Virginia and West Virginia; **George M. Perry** has joined the Export Department as assistant to **P. H. Malenchini,** manager of the department; **Thomas A. Cantrell** has been placed in charge of field engineering, in which capacity he will study Euclid equipment in the field and will prepare data on operation and costs for use by Euclid distributors and owners.

☆ ☆ ☆

CECO STEEL PRODUCTS CORP. has transferred its general offices from Omaha, Neb., to its manufacturing division plant in Chicago. The plant, located at 5701 W. 26th St., is being enlarged now by over fifty per cent. This plant is one of fourteen owned by the organization, and manufactures windows, doors, screens, joists, steel forms and other metal building products.

☆ ☆ ☆

Stewart S. Cort, for the past year with the Tin Plate Sales Department of Bethlehem Steel Co. in Bethlehem, Pa., has returned to the Pacific Coast to take over as manager of the Sheet and Tin Plate Sales Department of the BETHLEHEM PACIFIC COAST STEEL CORP. Cort joined the company in 1937 and two years later became supervisor of commercial research for Bethlehem's Pacific Coast Steel operations, and prior to going to Pennsylvania was Manager of Scheduling for Bethlehem's West Coast mills.

☆ ☆ ☆

The annual report of **Robert P. Page, Jr.,** president of THE AUTOCAR COMPANY, Ardmore, Pa., reveals that sales for the year 1945 amounted to $49,199,013, compared with $59,852,068 in 1944. Profit for 1945 was $801,167 after provision for sundry taxes. This is equivalent to $1.52 per share on the common stock after meeting all requirements of the preferred. In 1944, the corresponding earning was equivalent to $2.98 per share of common stock. During 1945 sales to commercial customers amounted to $20,129,047 and in 1944 such sales totaled $11,780,282.



The wise truck owner doesn't overlook the cost of service and maintenance on integral sub-assemblies when he figures the *overall cost* of operating his truck. You can make sure of minimum cost and maximum wear-life—quick, easy maintenance and less-frequent repairs—if you make Fuller your choice of transmissions. Fuller Transmissions are built to provide trouble-free service throughout a truck lifetime. The smooth operation and quiet-running of Fuller Transmissions during their entire work-life is proof of that fact! That's why so many "cost-conscious" operators are specifying Fuller for their new trucks.

FULLER MANUFACTURING COMPANY, TRANSMISSION DIVISION
KALAMAZOO 13F, MICHIGAN
Unit Drop Forge Division, Milwaukee 1, Wisconsin

Fuller TRANSMISSIONS

NEW EQUIPMENT

MORE COMPLETE information on any of the new products or equipment briefly described on these pages may be had by sending your request to the Advertising Manager, Western Construction News, 503 Market Street, San Francisco 5, California.

Smallest Diesel Engine

Manufacturer: R. H. Sheppard Co., Hanover, Pa.

Equipment: 3¾ hp. Diesel engine.

Features claimed: A new Diesel engine unique, not only by being the smallest ever built for commercial use, but also because it is the only stationary Diesel that is air cooled. Over-all dimensions of the engine are: 28½ in. high, 20¾ in. wide, 22½ in. long with crank removed. It is a single cylinder, 4 cycle Diesel, developing 3¾ hp. at 1,800 rpm. It has a 3 in. bore and 4 in. stroke. Piston displacement is 28 cu. in. The fuel tank holds but 9/10 of a gal., fuel consumption being ½ lb. per brake hp.hr. Air cooling is accomplished by a fan-driven stream of fresh air over many cooling fins.

Mobile Crane

Manufacturer: Hughes-Keenan Company, Mansfield, O.

Equipment: Ten ton roustabout crane.

Features claimed: A mobile, tractor mounted, full-swing boom crane capable of handling a load of 10 tons at a radius of 9 ft. This model MC-8 can be obtained with standard strength booms either 15 or 30 ft. in length. All gears and clutches run in oil, fully enclosed. Boom swing and hoist and load hoist are all independent actions, with separate controls and automatic brakes. The new unit is ideal for loading equipment around the yard or for stacking heavy, bulky objects.

Plastic Metal Coatings

Manufacturer: American Pipe & Construction Co., Los Angeles.

Equipment: Metal surface preparations.

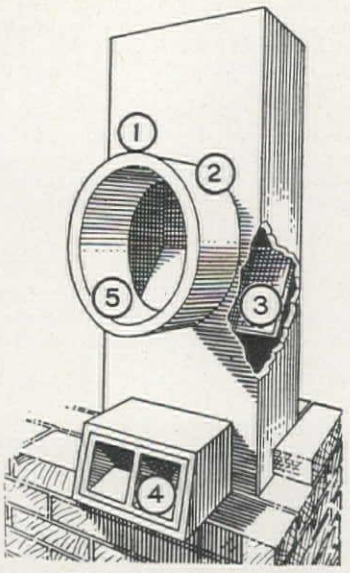
Features claimed: Two new Amercoat plastic coatings, No. 59, for zinc, is a treatment for galvanized metal surfaces prior to application of a protective coating, and No. 60 is a surface preparation for copper and brass. These solutions are suitable for use where shot or sandblasting is impracticable and give excellent adhesion between the metal and the subsequent protective coating.

Standardized Cylinders

Manufacturer: Engineering Products Company, Los Angeles, Calif.

Equipment: Air and hydraulic cylinders.

Features claimed: For the first time in the history of cylinder construction, a standardized cylinder has been produced for operation by air, oil, or water, which lends itself to almost universal mounting applications. At the same time, the cylinder is completely standardized, is manufactured in quantities, and is available in an assortment of diameters, and stroke lengths that meet practically all requirements.



NEW SAFETY FLUE

Safety Flue

Manufacturer: New Castle Refractories, Newcastle, Pa.

Equipment: Refractory safety flue.

Features claimed: A single refractory casting providing a flue entrance, a flue liner, a baffle plate and a clean-out opening combined in one unit, eliminates the weakest point in chimney construction, namely the multiple joints, cracks and patches. Sparks, flames and fumes cannot escape at the joint where the furnace flue enters the chimney. A plug type closure of the clean-out opening is also made of refractory.

ETNYRE
"Black-Topper"
BITUMINOUS DISTRIBUTORS



SEE YOUR ETNYRE DEALER . . .

ALLIED EQUIPMENT CO. Reno, Nevada
KIMBALL EQUIPMENT CO. Salt Lake City, Utah
PAUL FITZGERALD Denver, Colorado
NEIL B. McGINNIS CO. Phoenix, Arizona
R. L. HARRISON CO. Albuquerque, New Mexico
STUDER TRACTOR & EQUIP. CO. Casper, Wyoming
HOWARD COOPER CORP. Seattle & Spokane, Wash.; Portland, Ore.
THE CROOK CO. Los Angeles, California
INTERMOUNTAIN EQUIPMENT CO. Boise, Idaho
A. L. YOUNG MACHINERY CO. San Francisco, California

E. D. ETNYRE & CO., Oregon, Illinois

PUNCH-LOK
Hose Clamps and Fittings



Today's Best Bet!

FOR YOUR PRODUCTION AND MAINTENANCE OPERATIONS

For descriptive catalog and name of nearest distributor, write Harry M. Thomas, Pacific Coast Representative, Dept. B, 1554 Oakland Ave., Piedmont 11, Calif.

PUNCH-LOK COMPANY
321 No. Justine Street, Chicago 7, Illinois

eliminating hinges. The safety flue is designed to receive flue pipes of 7, 8, 9 and 10 in. diameters.

Wire Rope Clamp

Manufacturer: Nunn Manufacturing Co., Evanston, Ill.

Equipment: An enclosed, streamlined tubular cable clamp.

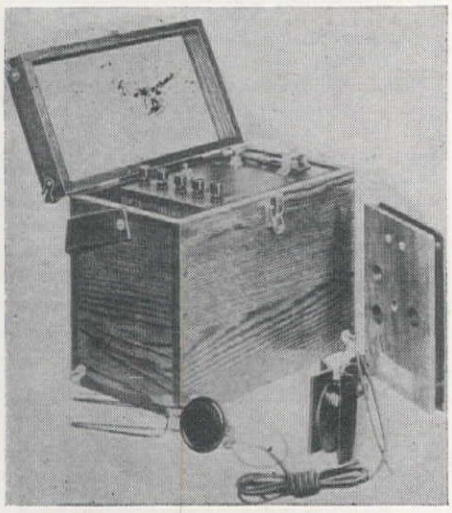
Features claimed: The "Cabl-ox" is an obstruction-free wire rope clamp incorporating a sound wedging principle in a tubular casing with pressure applied to squeeze the cable between two tapered and grooved members by tightening a threaded bushing. The new wedging action is soundly engineered and will hold loads in excess to the tensile strength of the rope used. The units are fabricated of alloy steel cadmium plated for weather protection. It is made in all standard sizes from 1/16 to ¾ in. Every industrial user of wire rope will be interested in the absolute security, speed of assembly and economy in use which is possible with this new clamp.

Cable Locator

Manufacturer: W. C. Dillon & Co., Inc., Chicago, Ill.

Equipment: Stewart cable tester and locator combined.

Features claimed: A ruggedly built, easily portable and compactly cased instrument for locating shorts, crosses, grounds and wet spots in underground cables, it



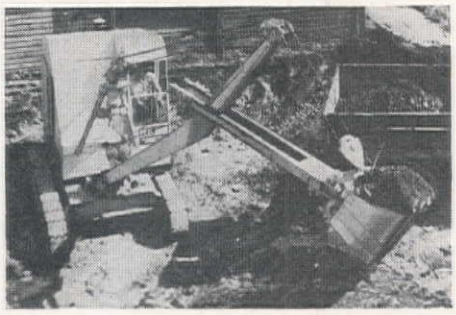
tells in a simple operation just where cables or pipes are buried and how deep. It is especially valuable for checking depth of cable at river crossings and determines when a service pipe is below frost or water line in lowering and regrading thoroughfares. It is especially useful in re-charting towns or districts where underground records have been lost or were never made. It is suitable for use by industrial companies, public utilities, light and power organizations, city engineers, forestry services and many others.

Junior Excavator

Manufacturer: Byers Machine Company, Ravenna, Ohio.

Equipment: Light weight, portable ⅜ cu. yd. shovel.

Features claimed: A light, fast excavator, known as the Byers Junior, has partial swing operating advantages, because it weighs not more than 8¾ tons complete. It has unusual portability and mobility features of interest to smaller contractors, county engineers and road supervisors. The shovel is powered with a 37.5 hp. industrial type motor, providing ample power



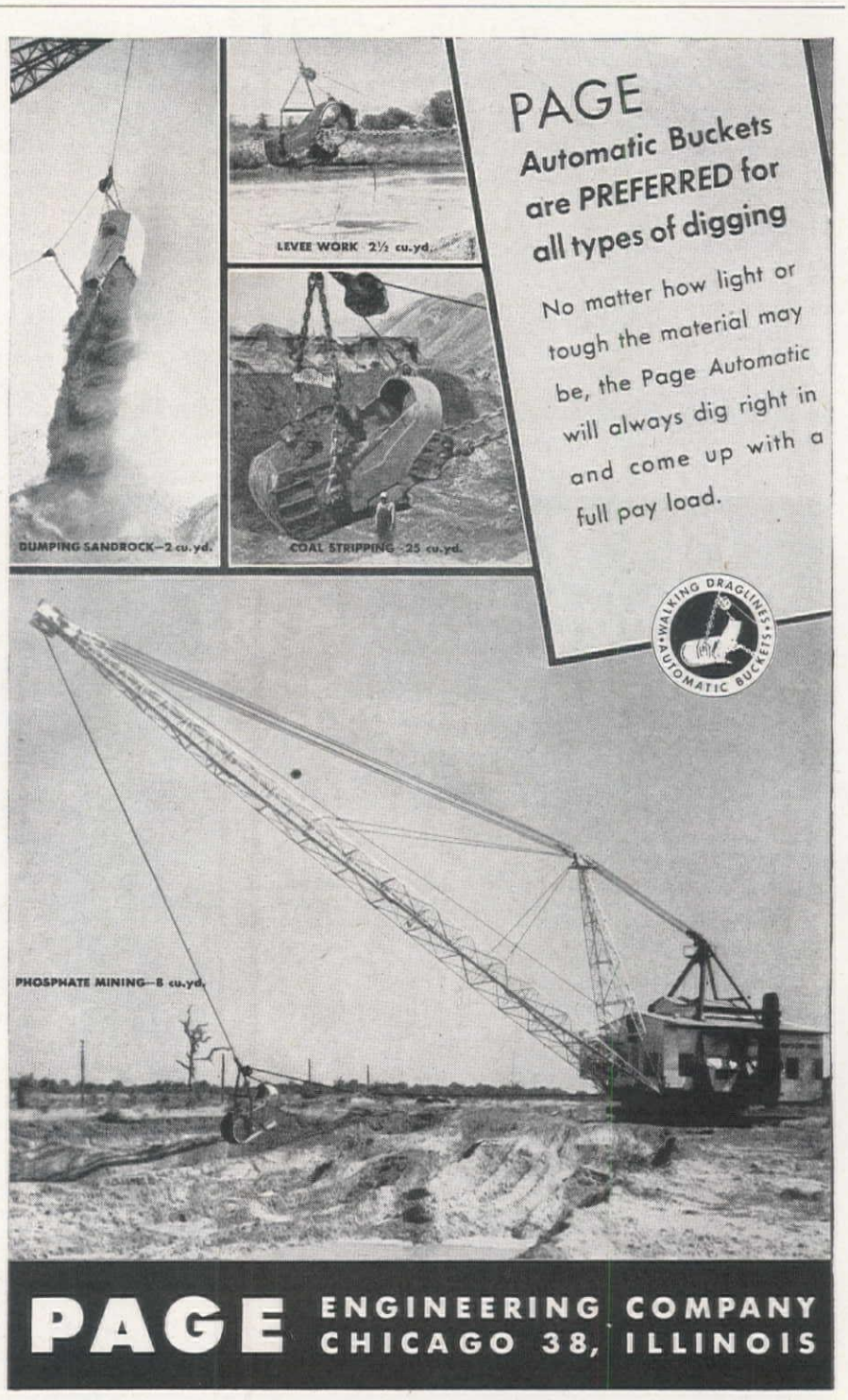
to force the ⅜-cu. yd. dipper through hard digging. The operator and all working machinery are located on the non-weaving 14-in. deep structural main frame and do not swing with the boom. Because gears, clutches, drums and shafting are set low on the main frame, an unusually low center of gravity results, and increased resistance against tipping is assured when excavator is working on sloping ground or employed as a crane to lift heavy loads.

Wingdozer

Manufacturer: Electric Steel Foundry, Portland, Ore.

Equipment: Track maintenance aid—"Wingdozer."

Features claimed: A new Esco track walking wingdozer consists of a crawler tractor with special track pads having a flange running fore and aft similar to a railway car wheel flange. This enables the tractor to operate on a track like any other piece of rolling stock, but with



one principal difference, its ability to maneuver on and off track unaided. An adjustable front outrigger, equipped with small flanged wheel, prevents the side stresses of the attached wingdozer from thrusting the tractor from the rails. In this manner ballast can be spread and the existing road bed shaped up and reconditioned.

Independent Power Supply for Paver

Manufacturer: D. W. Onan & Sons, Minneapolis, Minn.

Equipment: Model W3S Onan 3,000-watt power plant.

Features claimed: Mounted on the cross members of a Blaw-Knox Paving Spreader, the power unit furnishes lights and power to operate the ½-hp. motors which drive the four vibrators mounted on the spreader. The independent power plant is driven by a 6.5-hp. two-cylinder, water-cooled gasoline engine direct-connected to the 115 volt, 60 cycle, single-phase alternator.

Self-sealing Hose

Manufacturer: Goodyear Tire & Rubber Co., Akron, Ohio.

Equipment: Rugged air hose.

Features claimed: Development of bullet-sealing fuel hose during the war is included in a new cord air hose just released. Cover, carcass and tube are bonded together with much greater adhesion strength than previously obtainable. The result is a lighter hose with thinner wall gauge, but greater ruggedness, flexibility and length of life. It is oil resistant, non-porous and seamless. A new super-strong, cabled cotton yarn is used in the fabric.



Earth-moving Scrapers

Manufacturer: Caterpillar Tractor Co., Peoria, Ill.

Equipment: A new line of scrapers matched to Diesel Cats.

Features claimed: The new scrapers designated as Nos. 80, 70, and 60 have respective struck measures of 13.8, 8.7, and 6.0 cu. yd. They have been designed to match the capacity to the power of Caterpillar Diesel tractors. The new scrapers are open-bowl design for greater stability, visibility and access for shovel or dragline loading. They have a high apron lift to clear the stickiest materials, a clean, positive ejection and long cable life assured by correct reeving, and over-sized precision-grooved sheaves.

Portable Heater

Manufacturer: Surface Combustion Corp., Toledo, Ohio.

Equipment: Janitrol portable heater.

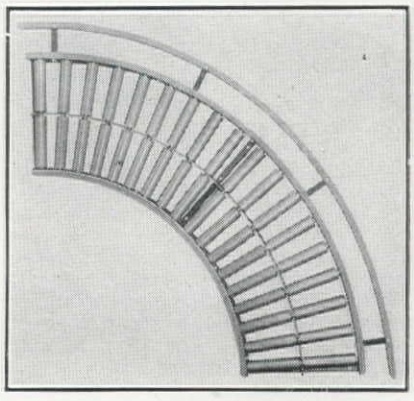
Features claimed: A portable heater designed for use in the construction industry to facilitate the drying of plaster and painted surfaces, the Janitrol is especially useful. In a recent field test during cold, damp weather the heater raised the temperature of a building under construction from zero to 80 deg. With the aid of this new portable heater the contractor finished plastering and had it thoroughly dried out within 2½ days. The portable unit is designed to burn gasoline, kerosene, or light fuel oil. Liquid fuel is introduced into the cylindrical combustion chamber through a spray nozzle. A fan driven by a gasoline engine, or electric motor if desired, supplies the heater with combustion and ventilating air. The heater can be used for removing frost from bricks, thawing out sand and gravel and preventing freshly poured concrete from freezing.

Gravity Roller Conveyor

Manufacturer: Lyon Metal Products, Inc., Aurora, Ill.

Equipment: "Packaged" conveyor units.

Features claimed: Gravity roller conveyors in several sizes: three straight sections, each 10 ft. long and in widths of 12, 18 and 24 in.; three 90 deg. curved sections in the three widths; and two trestles 18 and 24 in. wide. Each item is a complete unit packaged for sale. These conveyors are good for safe loads up to 200 lb. Rollers are fitted with ballbearings and mounted on full-length shafts. Rollers are spaced on 4 in. centers so that practically all packages are supported on a minimum of three rollers



and by setting the rollers above the level of the side rails, packages wider than the conveyor itself can be moved.

Welding Electrode

Manufacturer: Air Reduction Sales Company, New York City, N. Y.

Equipment: All-purpose mild steel electrode.

Features claimed: A new Airco No. 312 mild steel electrode has been designed primarily to prevent underbead cracking in the welding of hardenable steels.



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WASHINGTON OFFICE: 405 E. Pike Street, Seattle

LITERATURE FROM MANUFACTURERS . . .

Copies of the bulletins and catalogs mentioned in this column may be had by addressing a request to the *Western Construction News*, 503 Market Street, San Francisco, California.

E. I. Du Pont de Nemours & Co., Wilmington, Del.—The company explains its World War II record in a 64-page booklet, which is a good reference addition to a library. It covers Du Pont's activities from the atomic energy program to a statement of its earnings.

Pittsburgh Plate Glass Co., Pittsburgh, Pa.—Beautiful full-color photographs, as well as black and whites, make this company's booklet on the use of glass in homes a very attractive and informative source for all house builders.

Armco Drainage & Metal Products, Inc., Middletown, O.—"Mistakes in Drainage... and What Makes a Subdrain" is the title of a new, authoritative work on road drainage, by H. E. Cotton, drainage engineer for the Armco firm. Since free water trapped in the subgrade is an evidence of poor drainage, which leads to excessive maintenance and premature failure, most engineers will be interested in learning the latest about what makes a proper subdrain.

J. D. Adams Manufacturing Co., Indianapolis, Ind.—Model No. 512 motor grader is the subject of the new catalog published by Adams on its first post-war motor grader. Incorporating many new features in design, No. 512 is the product of over five years of intensive research and experimental work and has been "job tested" on every type of road building work. The high-arch front axle and full-floating rear axle are featured.

Chain Belt Co., Milwaukee, Wis.—The complete line of Rex sanitation and liquid clarification equipment is presented in a 44-page book, profusely illustrated with pictures, drawings and diagrams. Rex products shown include conveyor sludge collectors and Tow-Bro sludge removers, grit collectors and washers, thickeners, skimmers, filters, rapid mixers, water-oil separators and water screens.

Victor Equipment Co., San Francisco, Calif.—An unusual 50-page booklet dramatizes the intricate welding industry with clarity and skill. The uses of flame are depicted from the practices of the Stone Age down to the huge machines that cut and join metals today.

C. E. Phillips & Co., Inc., Detroit, Mich.—"Welding and Brazing of Copper and Copper Alloys" is the title of a handbook of procedures and materials published in three principal sections. The first part is devoted to definitions of materials and processes, plus tables. The second section discusses each of the common copper alloys, and the third section includes welding and brazing materials, and plan of treating each.

The Texas Co., New York, N. Y.—"Construction Machinery" is the title of the Lubrication Magazine recently distributed by the firm. Charts, photos and text tell which lubrication should be used for each type of machinery. Line drawings illustrate the more intricate parts of machinery.

Johns-Manville Corp., New York, N. Y. Two brochures, "Products for the Sewage Works Industry" and "Products for the Water Works Industry," each with more than 100 photographs of actual installations of Johns-Manville asbestos products, and each with a catalog with further information on the products, have been published for distribution.

Ideal Industries, Inc., Sycamore, Ill.—Rounding out the Ideal line of solderless wire connectors, solder lugs and solderless lugs, the company has developed a line of split bolt connectors and service entrance connectors. Complete information on them can be obtained from the price sheet with specifications.

The Euclid Road Machinery Co., Cleveland, O.—Two new catalog folders on Euclid models are off the press. Form No. 101 features Model F 15-ton rear-dump for off-highway hauling of earth, rock, ore and heavy excavation, and with a capacity of 9.7 cu. yds. The 13 cu. yd. bottom-dump is covered in Form No. 201 which is designed for big jobs and has a payload capacity of 40,000 lbs.

Buda Co., Harvey, Ill.—This firm has recently published a catalog featuring its new line of "One-Sixty-One" series Diesel engines for automotive, industrial and marine service, including pressure lubrication data, engine data and other descriptive information.

Westinghouse Electric Corp., San Francisco, Calif.—A colorful, attractively illustrated booklet is Westinghouse's annual "Engineering Highlights," which features the company's engineering developments considered most important. Articles included in the 1946 publication include: "Electronics," "New Materials," "Generation and Distribution of Power," "Gas Turbines and Jet Propulsion," "Aids to Victory" and "Use of Electric Power."

The Heil Co., Milwaukee, Wis.—Four new bulletins on Heil bodies and hoists are now available. They are: BH-4534 on heavy duty dump bodies and twin cylinder hydraulic telescopic hoists, BH-4550 on twin arm hoists for heavy duty trucks, BH-4533 on twin arm hoists and bodies for 1½ to 2½ ton trucks, and BH-4549 on platform conversion hoists. Thirty different improvements in design and construction of arm-type hydraulic hoists have been made over pre-war models.

Gardner-Denver Co., Denver, Colo. — A smart looking blue, yellow, black, grey and white booklet recently published by this old firm is designed to present the background of the compressed air machinery company, the manufacturing, the distribution of its products to world markets, and its contribution to World War II. A list of its products and branch offices throughout the world is also given.

Metal & Thermit Corp., New York, N. Y.—"Murex Electrodes" is the title of this firm's new booklet on underwater cutting and welding. It describes the arc-oxygen process for cutting steel under water and cutting cast iron and high alloy steels in the open air, and gives considerable working data and procedure information. Also covered are Murex electrodes for welding and for cutting light gauge materials under water; and instructions for their use are given.

National Cylinder Gas Co., Chicago, Ill.—The Technical Service Department of the company has just issued a circular covering the "how to" on cutting cast iron with oxy-acetylene flame. Also included is a discussion of proper types of equipment, preheating conditions, cutting positions,

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Sika Chemical Corp., Passaic, N. J.—An 8-page illustrated pamphlet describes the benefits and action of Plastiment, "the concrete desifier," which is recommended by the manufacturer for use in concrete to improve its characteristics in such vital respects as watertightness and surface hardness. Magnified views of concrete with and without Plastiment present proof of its improvement values.

Victor Equipment Co., San Francisco, Calif.—This western company has just released a new 50-page welding supply catalog for the Pacific Coast. Claimed to be the most comprehensive supply catalog ever printed, it covers a large assortment of every type of supply required for gas or electric welding and flame cutting. Photographs and drawings are ample throughout the book.

Oakite Products, Inc., New York, N. Y.—Construction engineers, superintendents, foremen and others responsible for maintenance cleaning of machinery and equipment will be interested in a booklet on steam detergent cleaning put out by this firm. Emphasis is placed on steam detergent cleaning as a simple, fast method for safely removing grease, oil, dirt, sand and other deposits from all types of equipment.

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