WESTERN CONSTRUCTION

JUNE 1951

- Administration ✓
- Design ✓
- Construction ✓
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- Municipal ✓
- Bridge ✓

ANNUAL HIGHWAY ISSUE

Better air compressor performance under ALL operating conditions...

LONGER DRILL LIFE

For longer drill life and more footage drilled at lower cost, use *Texaco Rock Drill Lubricants EP.* These "extreme pressure" lubricants give full protection against wear and rust under severest conditions.

with TEXACO air compressor oils

Whatever your operating conditions or the size or type of your compressors, there is a Texaco air compressor oil *exactly right* to assure trouble-free and economical performance. For example—

★★ If *rust* is your problem, use a Texaco *rust-inhibited* air compressor oil. It will keep your compressors, intercoolers, aftercoolers, lines and receivers free of rust.

★★ If *carbon and gum formations* are causing trouble, use a Texaco *heavy-duty* air compressor oil with special detergent and oxidation-resistant properties. It will keep compressors clean under severest conditions.

★★ If *moisture is condensing* in cylinders and washing off your lubricant, causing excessive wear, a Texaco *compounded* air compressor oil will overcome the difficulty.

★★ If your concern is merely to assure clean operation and reduce wear under *normal conditions,* a Texaco *straight mineral* air compressor oil will do an excellent job.

A Texaco Lubrication Engineer will gladly help you select the right air compressor oil for your requirements. He'll also be glad to tell you how the Texaco Simplified Lubrication Plan enables you to handle all your major lubrication needs *with only six Texaco Lubricants.* Just call the nearest of the more than 2,000 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 . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

A PULLSHOVEL

—not just an attachment!

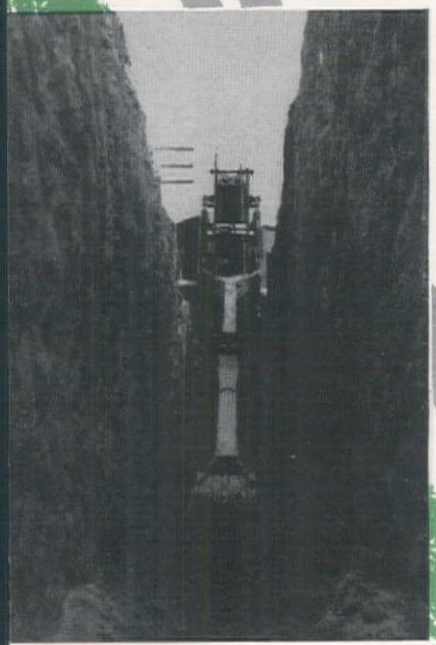
PERFORMANCE in the hands of leading sewer and pipeline contractors has established the Northwest Pullshovel as the standard by which other pullshovels and backhoes are measured. General shapes can be copied, but the tested know-how that delivers performance, reduces upkeep and insures output is beyond copying and results from experience only.

The Northwest Pullshovel is not just an attachment. It represents a group of features so combined that the ensemble represents an overwhelming advantage as excavation and trenching equipment.

The Northwest Pullshovel brings you proved boom design for maximum digging and better dumping ranges. You have the "Feather-Touch" Clutch Control for easier operation, the Cushion Clutch, Uniform Pressure Swing Clutches and a crawler design with demonstrated ability to stand up in the long travel service characteristic of usual pullshovel conditions.

Plan ahead and don't buy a one-purpose trenching machine.

NORTHWEST ENGINEERING COMPANY
135 South LaSalle St., Chicago 3, Ill.



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it's a Leader!

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1234 Sixth Ave., South

WESTERN CONSTRUCTION

Volume 26 **JUNE 1951** Number 6

ANNUAL HIGHWAY ISSUE

ARTICLES

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B.F.Goodrich

Ready for 45 tons on a 60,000-mile trip

MIKE WEATHERBY, shown left above, is supervisor of a man-sized moving job.

As an operator of off-the-road equipment for the Basalt Rock Company, Napa, California, he hauls average gross loads of 45 tons of sand and gravel from the pits to the company's processing plant.

And because the BFG Universal tires on his rig can take it, he moves more materials farther, at less cost to his company.

These big tires have greater bruise resistance — greater ability to absorb and withstand the shocks encountered in drive wheel service under such heavy loads. This is because these BFG tires have the patented *double nylon shock shield* built between the tread and rayon cord body. Yet this added protection (which is exclusive with B. F. Goodrich) is provided at no extra cost to his company.

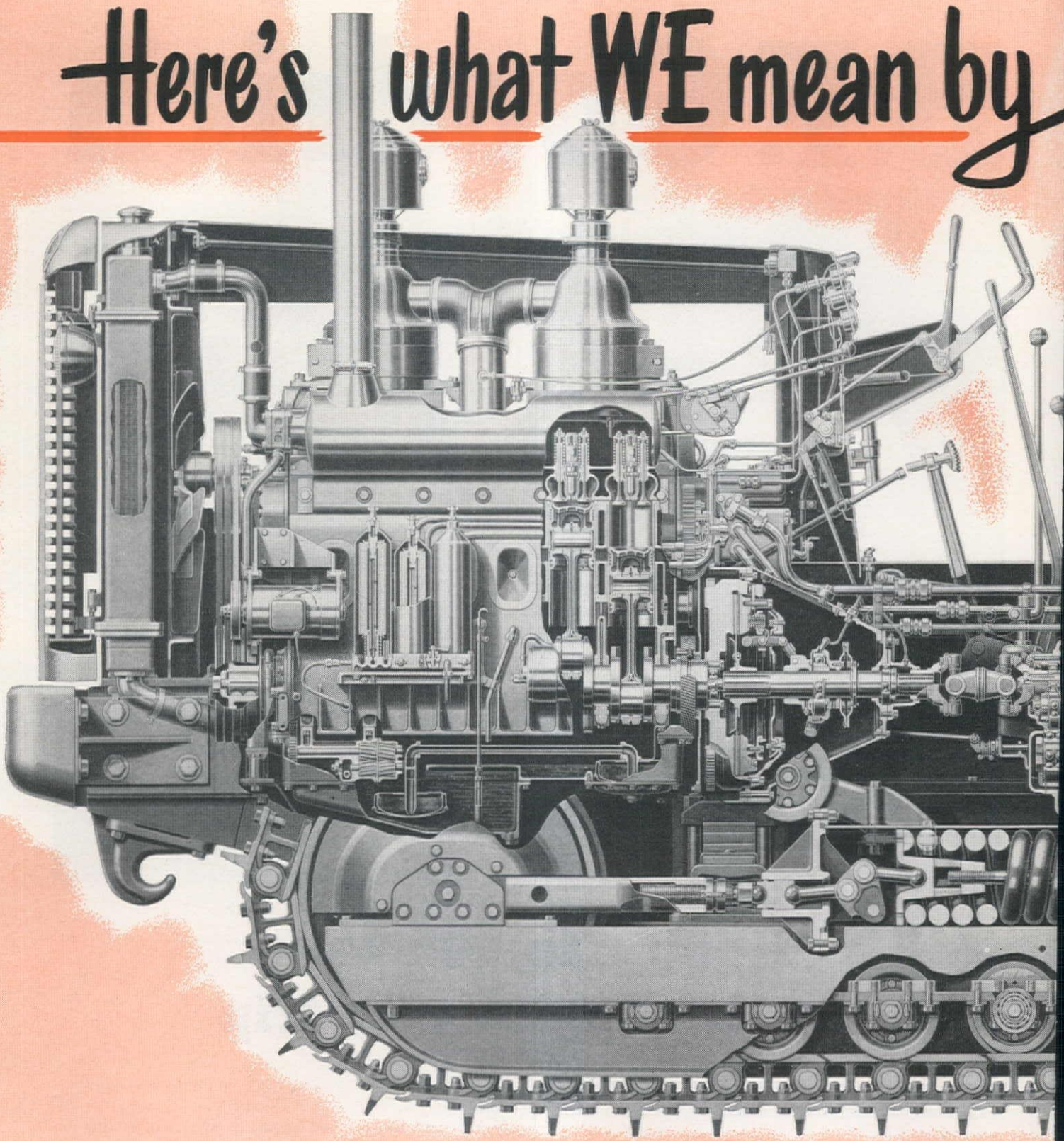
While pulling 90,000 pounds to the plant, Mike's equipment encounters soft, wet dirt and gravel — hard on traction — with an occasional sharp rock thrown in as a surprise package. Yet the special rubber compound built into the husky, wedge-shape tread lugs resists cutting while giving positive two-way traction.

And these tires have been giving an average of 60,000 miles of service!

B. F. Goodrich builds special off-the-road tires for every type of hauling job. See your local B. F. Goodrich dealer. Start now to enjoy the benefits of longer tire life and lower operating overhead. *The B.F.Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER

Here's what WE mean by

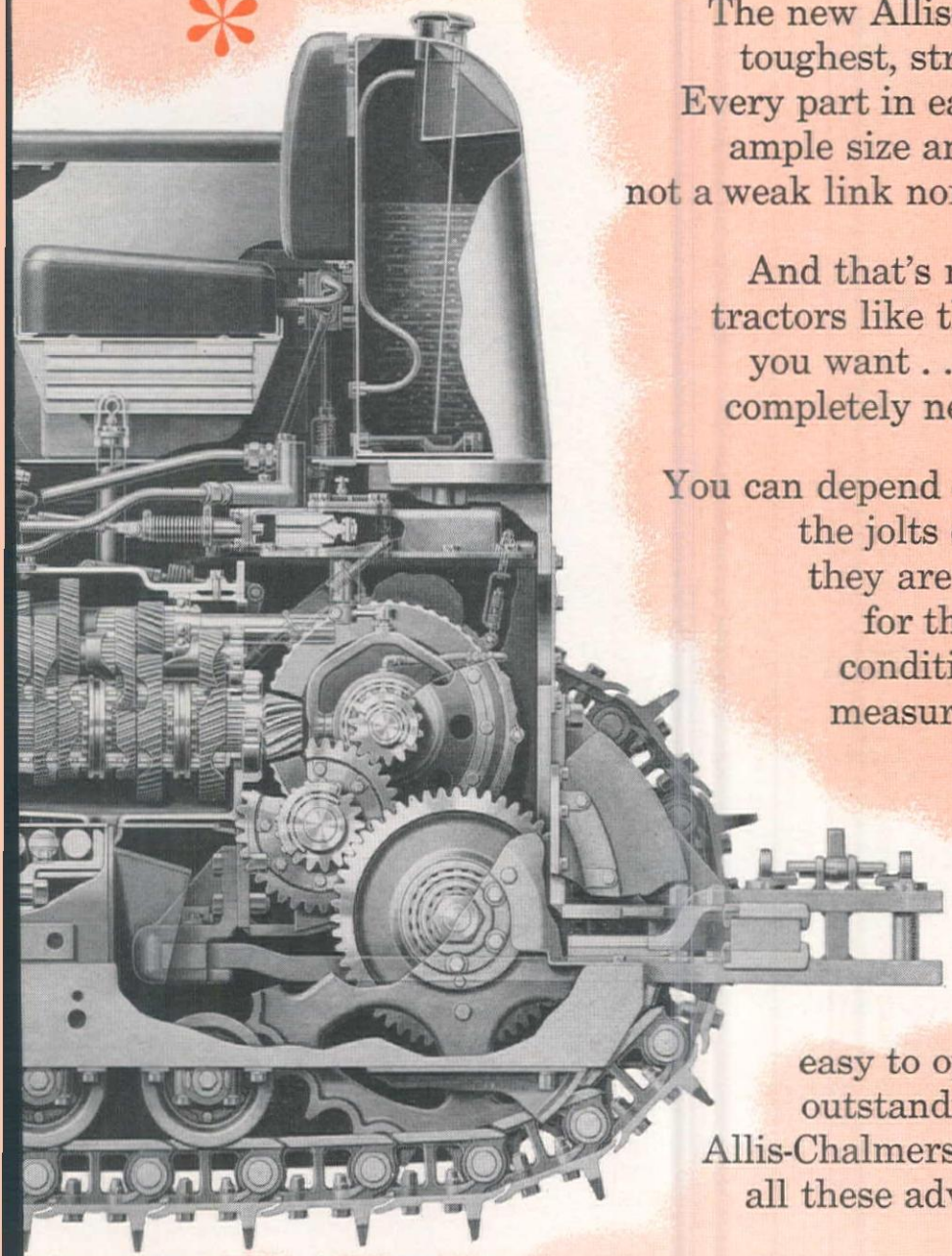


HD-5	HD-9	* HD-15	HD-20
40.26 drawbar hp.	70 drawbar hp.	102 drawbar hp.	Hydraulic Torque Converter Drive
11,250 lb.	18,800 lb.	27,850 lb.	175 net engine hp.
			41,000 lb.

For The Newest, Finest Tractor Line on Earth

see your **ALLIS-CHALMERS** dealer

BUILT TO TAKE IT



The new Allis-Chalmers tractors are the toughest, strongest tractors ever built. Every part in each of the four models has ample size and strength to do its job — not a weak link nor a compromise anywhere.

And that's no accident! To bring you tractors like these . . . with the qualities you want . . . Allis-Chalmers built 'em completely new — from the ground up.

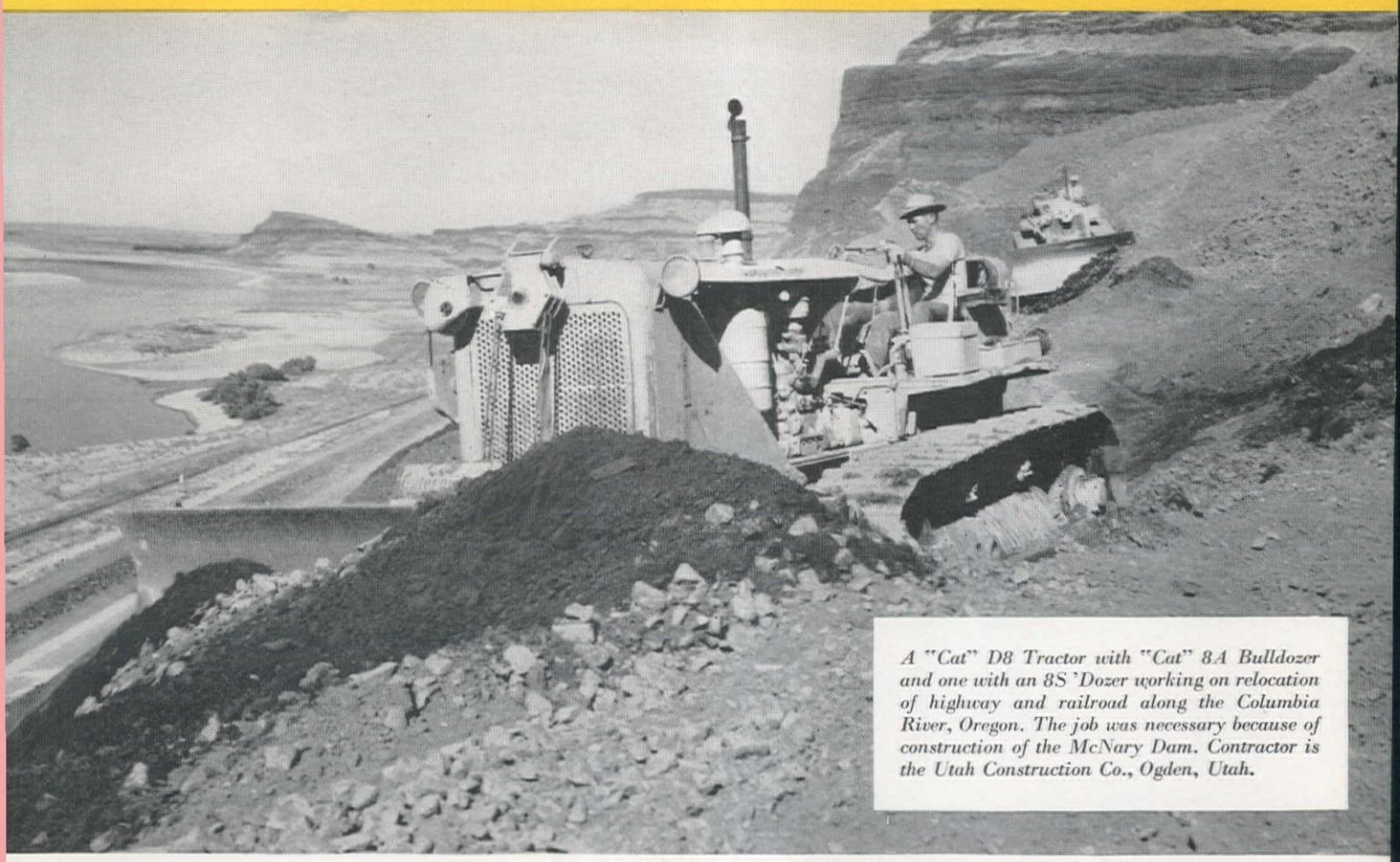
You can depend on them to take the loads, the jolts of today's jobs . . . because they are modern tractors designed for the most grueling operating conditions. They will more than measure up to your expectations!

Here are just a few of the many reasons why this NEWEST, FINEST TRACTOR LINE ON EARTH is *Built To Take It* . . . besides being easy to operate, easy to service and outstanding in performance. Your Allis-Chalmers dealer will gladly explain all these advantages . . . see him NOW.

- All-Steel Welded Construction
- More Power with Bigger Engines — Longer Engine Life
- More Weight, Greater Strength
- Long-Lasting, Large Diameter Clutches
- Extra Heavy Main Frames — No Extra Reinforcement Needed for Front-Mounted Equipment
- Double Reduction, Straddle-Mounted Final Drive Gears with Live Sprocket Shafts and Caged Bearings
- Positive Operating Track Release — Works in Oil on HD-9, HD-15, HD-20
- All New, Specially Designed Track Assembly
- Positive-Seal Truck Wheels, Support Rollers and Idlers — Mounted on Tapered Roller Bearings. 1,000-Hour Lubrication!

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

There's a big



A "Cat" D8 Tractor with "Cat" 8A Bulldozer and one with an 8S 'Dozer working on relocation of highway and railroad along the Columbia River, Oregon. The job was necessary because of construction of the McNary Dam. Contractor is the Utah Construction Co., Ogden, Utah.

IF YOU WANT TO HELP YOUR COUNTRY— AND YOURSELF AT THE SAME TIME— READ EVERY WORD ON THESE TWO PAGES

Keeping equipment *on the job* is of prime importance today—to the nation as well as the contractor. The Military plans to spend 8 to 9 billions on construction in the next 18 months. And a production *backlog* of 52 billions was carried over into 1951 for bridges, roads, earthwork, government work, waterworks and other essential projects.

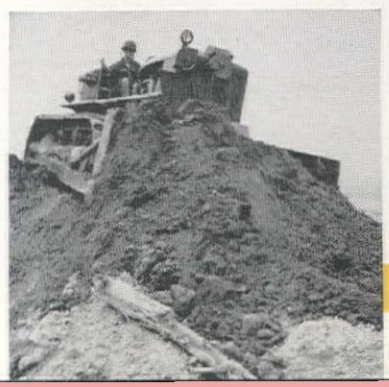
Right now there is a shortage of materials with which to build urgently needed machines and parts. Military and Defense Rated Orders get the nod over unclassified civilian needs. Steel and other materials are in short supply. This means that you—with our help—must get every last machine-power hour out of the equipment and parts you now have.

Down-time will not only weaken the defense effort, it can put the contractor himself in the hole. To get future business, he must get current jobs done without penalty or sacrificing his bond. Down-time means bad distribution of equipment: it means costly damage to equipment forced to do work it's not built to handle.

So to stay in business profitably, and help America arm for defense, do these things now:

1. Use equipment properly. "Cat" machines are built for hard use—not abuse.
2. Give *extra* attention *now* to preventive maintenance (see next page).
3. Have your equipment superintendent plan *ways and means* with your "Caterpillar" dealer. His maintenance responsibility begins where your operators' and mechanics' responsibility ends. He has the skilled servicemen and equipment to rework and rebuild worn parts to keep your machines on the job longer.

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



The last war showed the Military that "Cat" Earthmoving Equipment was as important to defense and offense as tanks. Here Sgt. Robert Chrisman operates a "Cat" D7 Tractor with matching blade on Davison airstrip at Ft. Belvoir, Va.

job ahead!

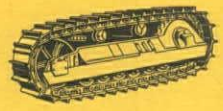
You're the Doctor

Today no owner can afford to think of direct costs alone. Good care of equipment can mean the difference between a producing machine and one laid up for repairs. To see how good care can save many hours of equipment life, reread your Operator's Instruction Book often and follow these suggestions.

• DUST

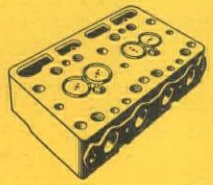
Think of dust as Machine Enemy No. 1. A few grains today—a few more tomorrow—and soon the result adds up to serious wear. Dust or dirt plugged breathers or air cleaners—use of dirty oil containers—loose intake manifolds—loose inspection covers—dirty clutch compartment—failure to wash flywheel clutch compartment—worn seals on crankshaft—defective gaskets—failure to clean oil filter openings . . . these are some of the vulnerable spots.

• TRACK ASSEMBLY



Don't let abusive use or neglect cripple the service life of your track assembly. Track adjustment and lubrication of rollers, carrier rollers and idlers are your job. Before excessive wear occurs on grousers, links, pins, bushings, idlers, rollers and sprockets, call in your "Caterpillar" dealer. He can build up grousers, rollers, idlers and links, and replace sprocket rims and turn pins and bushings so you will have many additional hours of service.

• CYLINDER HEADS



Prevent cracked cylinder heads by avoiding overheating, freezing, scale deposits, filling a hot engine with cold water, pulling heads down too tight, and other poor maintenance practices. Your "Caterpillar" dealer can repair most cracked cylinder heads. He can replace worn valve seats with valve inserts and restore the rocker arm mechanism to serviceable limits. Consult your Operator's Instruction Book for proper cooling system and valve care.

• COOLING

Don't let your engine overheat. Keep the cooling system free of scale, rust and sediment. Use soft or treated water, and when freezing temperatures exist, protect your engine with anti-freeze. Clean the radiator regularly with chemical flushing solutions. Remove foreign matter from the core by brushing or washing. Prevent engine troubles which come with overheating. Consult your Operator's Instruction Book for proper cooling system care.

• LUBRICATION

Careful lubrication practices will add much to your satisfaction through equipment performance, economy and long life. Use *only* recommended lubricants, changing the lubricant at proper intervals. And use *only* "Caterpillar"-proved filter elements. Remove dirt from fittings and clean around the crankcase filler cap before adding oil. A little care saves many hours of engine life. Consult the lubrication chart in your Operator's Instruction Book.

• PISTONS AND LINERS

Almost all the piston wear occurs in the upper ring groove. Your "Caterpillar" dealer can renew your pistons by machining the upper ring groove for a wide ring, many sizes of which are chrome plated. Worn liners can be deglazed and put back to work for many additional hours of service life. Consult your Operator's Instruction Book for information on lubrication and the oil cooling system.

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

NO-TURN SHUTTLE HAUL
FOR FULL OPERATING CYCLE

ON NARROW HAUL ROADS fast-shuttling DUMPTORS® ELIMINATE TURNS . . . . .

This mountain-side construction job shows typical no-turn shuttle hauling. Loaded Dumptor (right) drives off to the fill with body forward, in dump position, while two empty Dumptors return to the shovel in same body position.

At the loading unit, on narrow haul roads, and at the dumping location, Dumptors save turn time, gain haul time. Koehring constant-mesh transmission gives the same 3 fast speeds, forward *and reverse*—lets Dumptors operate with equal ease in either direction. Here's how much no-turn shuttle operation can increase yards per hour for you:

By eliminating only 2 turns on an average 1,000-foot haul, time studies prove that Dumptors can save 30 seconds every round trip — and increase hourly yardage output over 10% per unit. For example: where you would get an average of 13.6 trips per hour with 2-turn operation, Dumptor no-turn shuttle haul will give you 15.4 trips hourly on the same 1,000-foot haul —an increase of 1.8 trips an hour. What's more—fast, easy spotting and 1-second gravity dump help keep Dumptor production high.

Costs stay low, because with gravity dump, there are no complicated, mechanical body hoists to slow up haul cycles — no expensive hoist maintenance or down time to eat into your profits. Dumptors also save on spring maintenance—have just one big, double-coil chassis spring on steering axle, none on the drive axle. Extra-big, shock-absorbing drive tires eliminate need for more.

From every angle—no-turn shuttle hauling, 1-second gravity dump, no body hoist, less spring maintenance—you'll find it pays to use Koehring 6-yard, heavy-duty Dumptors.

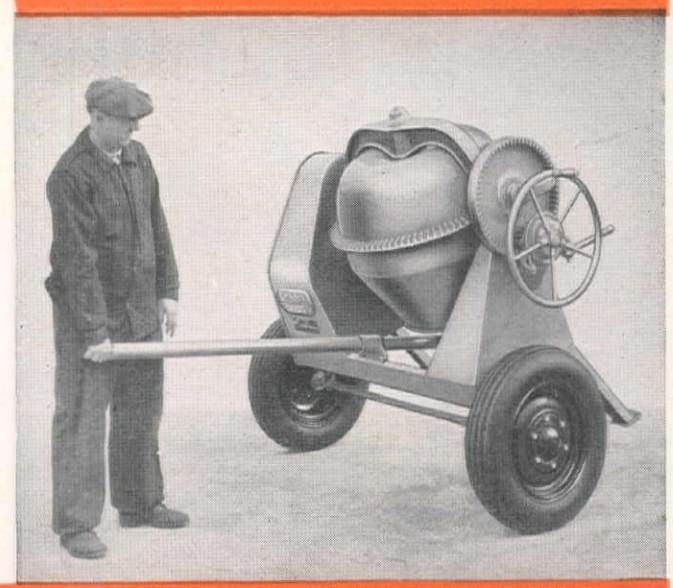
CK113

KOEHRING HEAVY DUTY

SEE YOUR KOEHRING DISTRIBUTOR FOR COMPLETE FACTS

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

KWIK-MIX DANDIES®



3½-S with push-down tow pole . . . is as portable and safe handling as a wheelbarrow . . . gives "curb service" anywhere on your job for mixing top-quality concrete. Balanced light weight makes this 3½-S Dandie easy to handle with tow pole. You push down, instead of lifting up, use your weight, not muscle. When you release tow pole, mixer stands on its legs. Push down too far, and tow pole rests on ground, prevents tip-over. Available with tilting drum, side or end discharge, and non-tilter with end discharge. Other sizes: 6-S, 11-S, 16-S. Also bituminous; tilt, non-tilt plaster-mortar mixers; power wheelbarrow.

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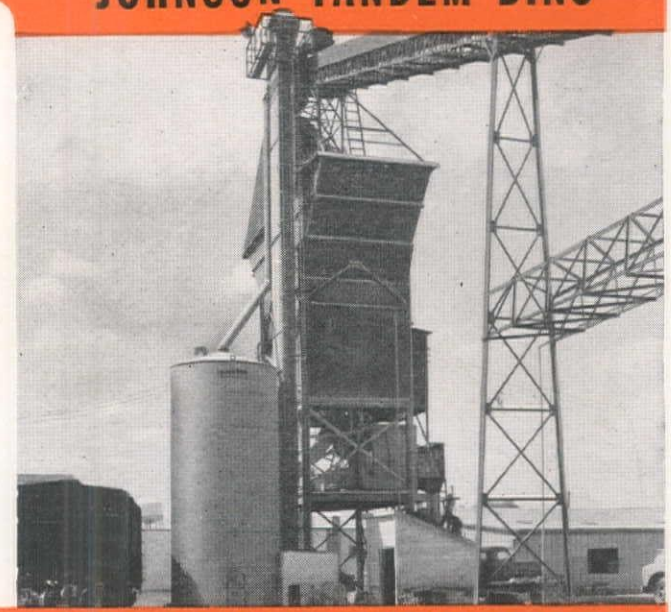
COLUMBIA EQUIPMENT CO. . . . . Boise, Portland
HARRON, RICKARD & McCONE CO. OF SO. CALIF. . . . . Los Angeles
McKELVY MACHINERY CO. . . . . Denver
KIMBALL EQUIPMENT CO. . . . . Salt Lake City
NEIL B. McGINNIS CO. . . . . Phoenix
THE HARRY CORNELIUS CO. . . . . Albuquerque
SAN JOAQUIN TRACTOR CO. . . . . Bakersfield
ENGINEERING SALES SERVICE, INC. . . . . Boise
KOEHRING CO., WEST COAST SALES DIVISION . . . . . Stockton

JOHNSON TANDEM BINS



For transit-mix, central mix . . . or concrete products plants, Johnson All-Welded, Portable Section Aggregate and Cement Tandem Bins available in 7 sizes, 55 to 210 cu. yds., can be arranged for 2, 3 or 4 aggregate compartments. Central cement compartment holds 61 to 185 barrels. Tandem Bins can be furnished with Johnson Concentric Aggregate-Cement Batchers, 2 to 6-yd. sizes, for 2 to 4 sizes of aggregate. Separate cement weigh hopper of Concentric Batcher is suspended on separate scale inside aggregate hopper. Entire unit is quickly dismantled. Ask about Johnson mix plants, buckets, elevators, silos.

AMERICAN MACHINE COMPANY . . . . . Spokane
BOW LAKE EQUIP. CO., INC. . . . . Seattle
CRAMER MACHINERY CO. . . . . Portland
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COAST EQUIPMENT COMPANY . . . . . San Francisco
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PARSONS TRENCHLINERS®

250 digs 3.8 in. to 9 ft. per min. . . . has 30 digging feeds for maximum trenching efficiency on gas lines, sanitary sewers, water systems, cross-country pipelines. This general purpose Trenchliner produces smooth-walled, clean-bottom trenches 16 to 42" wide, up to 12'-6" deep . . . cuts to within 11" of side obstructions. Powershift, arc-type conveyor discharges spoil on either side for loading into trucks . . . maintains constant discharge height, regardless of boom depth. Other 250 features worth checking: arch-type main frame, friction clutch control, self-cleaning crawlers. Also, 4 other Parsons Trenchliner sizes.

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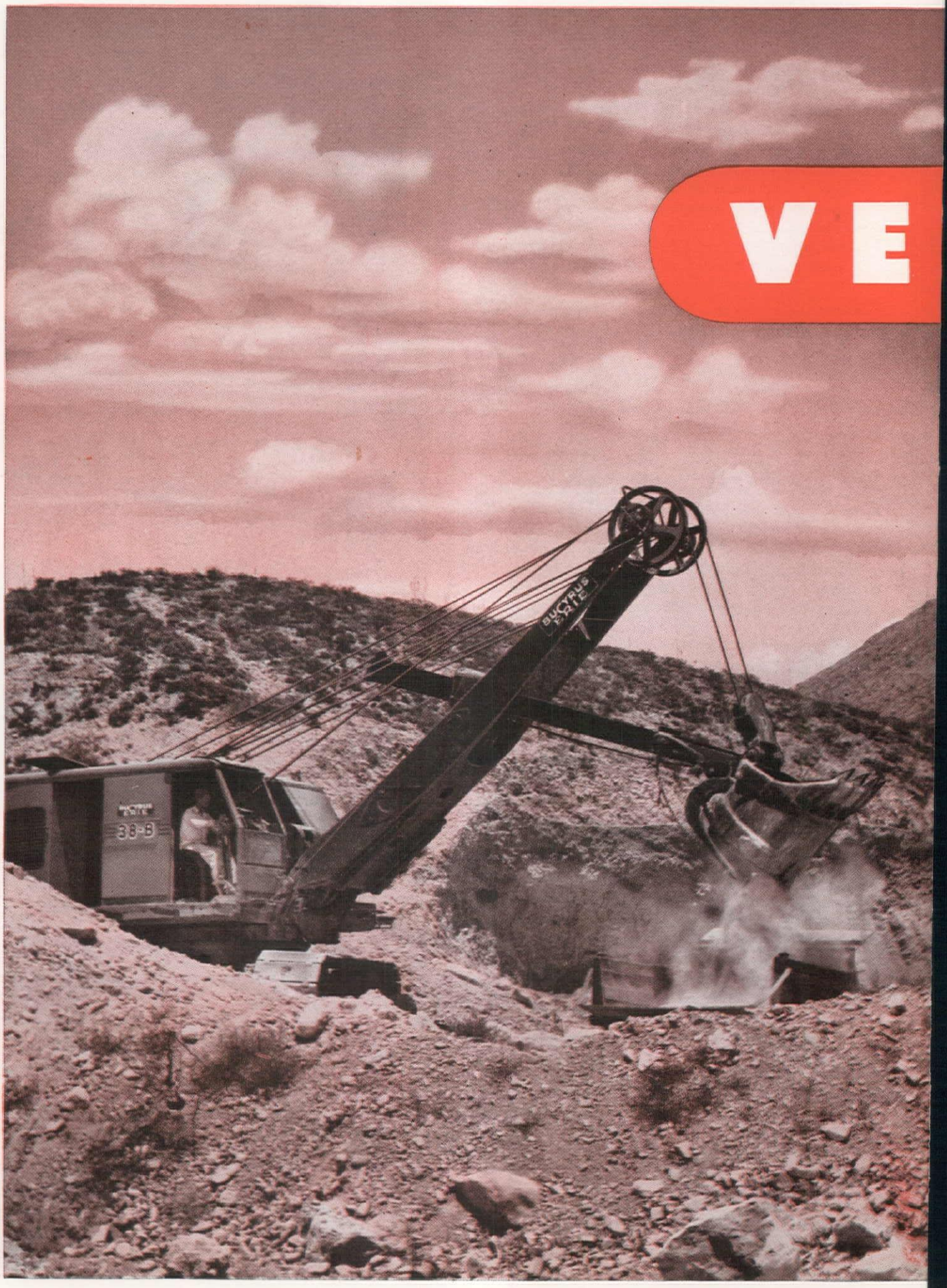
ENGINEERING SALES SERVICE, INC. . . . . Boise
KOEHRING CO., WEST COAST SALES DIVISION . . . . . Stockton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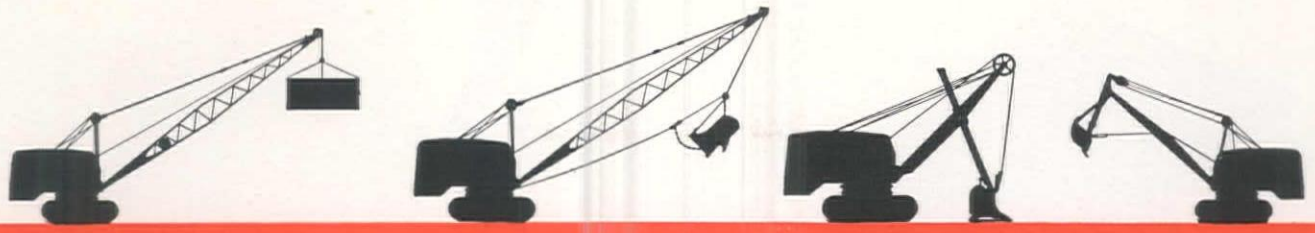
BUCYRUS ERIE
38-B



RSATILITY

Mark of a Preferred Excavator

THE ability to handle dozens of jobs with peak efficiency on each . . . that's one of the marks of a preferred exacavator. And that's one reason why Bucyrus-Eries are favorites of owners and operators the country over.

Take the 1½-yard Bucyrus-Erie 38-B as an example. Its wide-spread mounting and ground gripping treads mean superior stability for fast crane, dragline, shovel or dragshovel service. Its compactly designed, easily accessible main machinery makes conversion simple, facilitates maintenance. Large, high-capacity clutches and brakes meet all demands of excavator and crane service, feature easy-to-make, long-lasting adjustments. "Full-feel" controls mean fast, accurate operation, the operator always in touch with the load.

These and many other features combine to provide the versatility of the 38-B and other machines in Bucyrus-Erie's outstanding ⅜- to 4-cubic yard line of gasoline, diesel and single-motor electric excavators. Top-notch performance with any front-end equipment is one more reason why Bucyrus-Eries are

270E51C

Most Compared . . . Most Preferred

SOUTH MILWAUKEE BUCYRUS ERIE WISCONSIN

SEE YOUR BUCYRUS-ERIE DISTRIBUTOR

BROWNING-FERRIS MACHINERY CO.	*Dallas & Houston*	INTERMOUNTAIN EQUIPMENT CO.	*Boise, Pocatello, Spokane*
CLYDE EQUIPMENT COMPANY	*Portland & Seattle*	THE LANG COMPANY	*Salt Lake City*
THE COLORADO BUILDERS' SUPPLY CO.	*Denver*	THE MERRILL-BROSE COMPANY	*San Francisco*
CONTRACTORS MACHINERY CO.	*San Antonio*	NEVADA EQUIPMENT SERVICE	*Reno*
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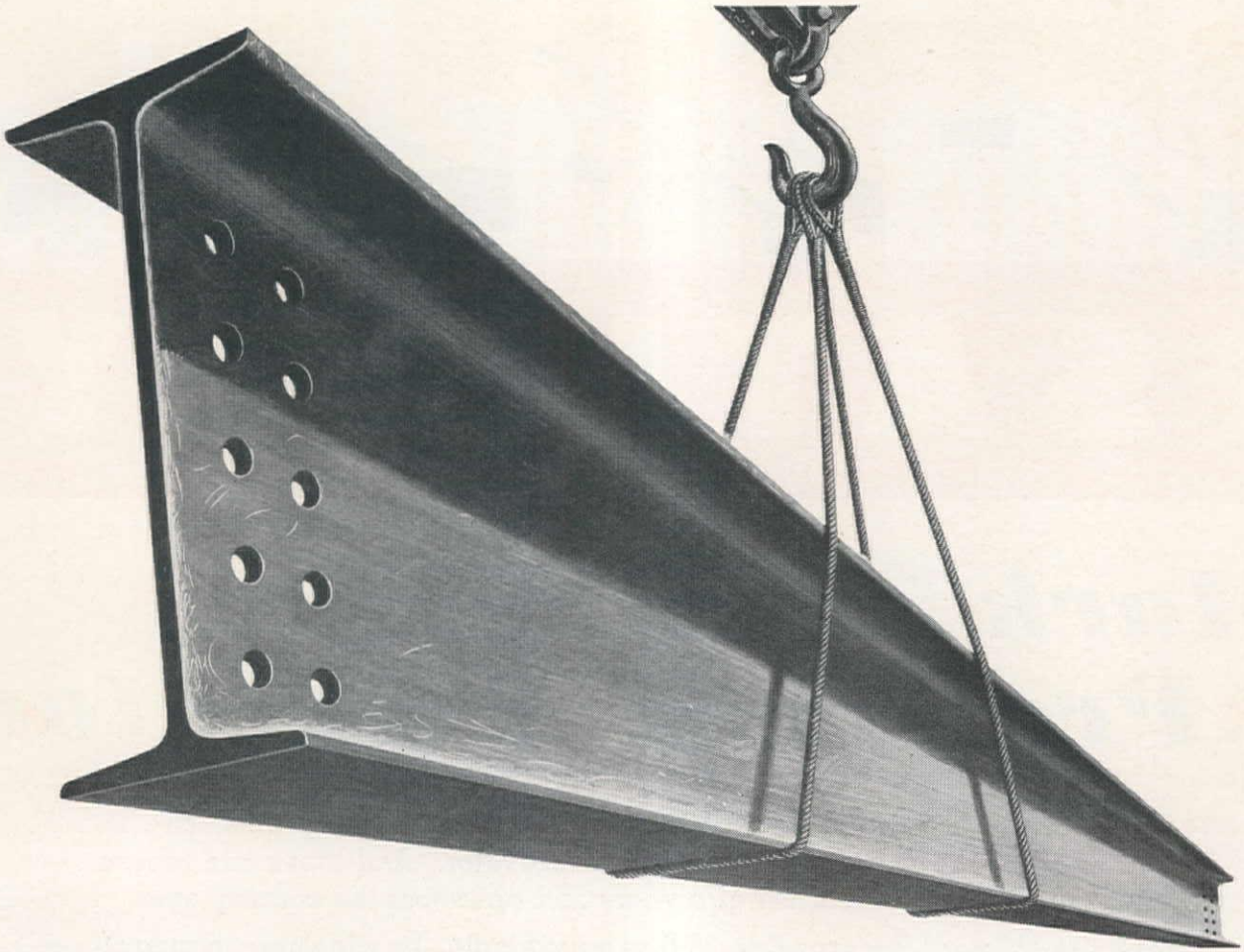
GREAT NORTHERN TOOL & SUPPLY CO.	*Billings*	TRI-STATE EQUIPMENT COMPANY	*El Paso & Odessa*
R. L. HARRISON COMPANY, INC.	*Albuquerque*	WESTMONT TRACTOR & EQUIPMENT CO.	*Missoula & Kalispell*

SHOVELS • DRAGSHOVELS • DRAGLINES • CLAMSHELLS • CRANES



Essential to a $23,900,000,000 program!

Twenty-three billion, nine hundred million dollars —that's the estimated sum which American industry is spending in 1951 to expand plants and equipment for defense.

This program requires an immense amount of steel—*especially for structural shapes.*

While helping to meet these critical defense needs, Kaiser Steel is still supplying a considerable quantity of structural shapes for *non-defense* use.

This is possible because of a consistent expansion program . . . one which will enable Kaiser Steel to produce an estimated 1,380,000 ingot tons in 1951. More than *double* the amount produced in 1944—the peak war year! More evidence that . . .

It's good business to do business with

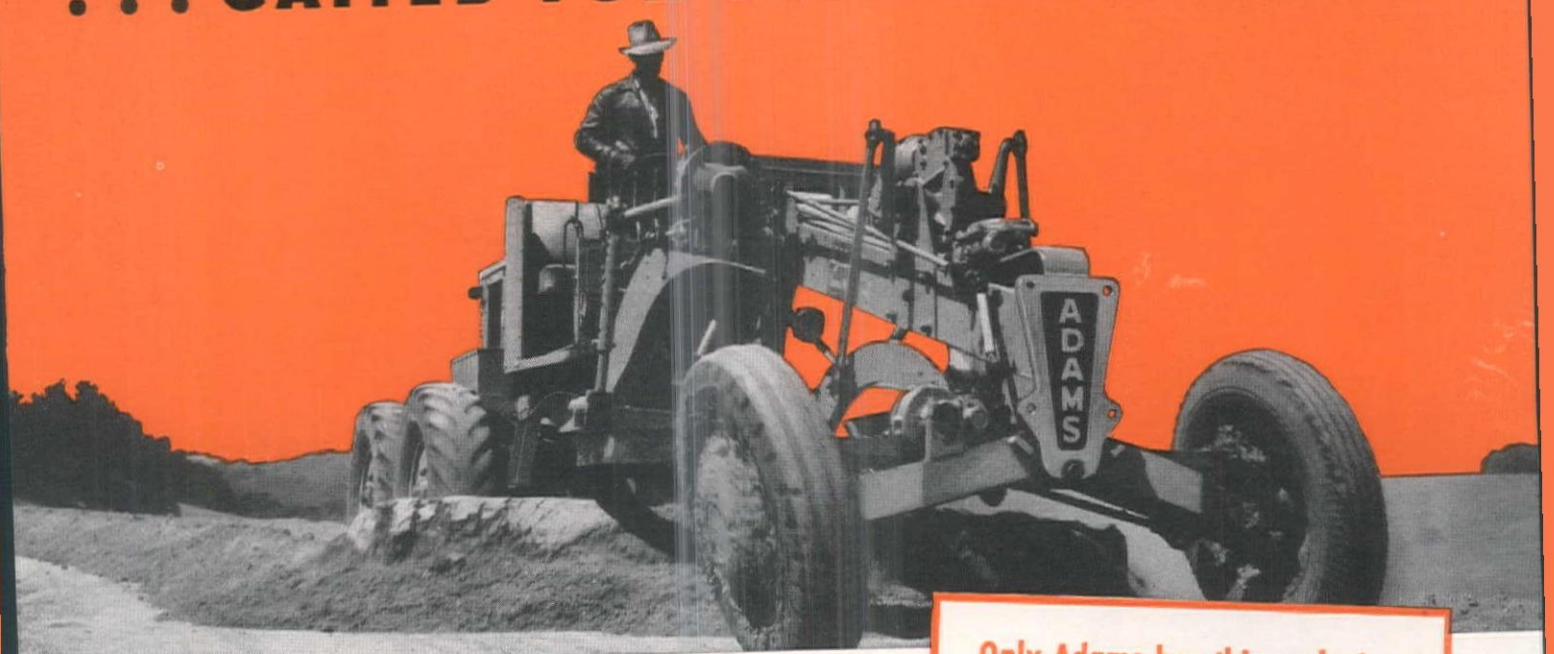
Kaiser Steel

built to serve the West

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

Adams Motor Graders

. . . GAITED FOR TOP PERFORMANCE



8 overlapping forward speeds insure the right working speed for every grading operation . . . Adams Motor Graders give you 2 more forward speeds than several machines of comparable size and power—8 forward speeds instead of 6.

These 2 additional speeds give you an extra working speed and a higher "high"—up to 25 mph. This means greater selectivity of speeds on all types of work—an exactly *right* speed for accomplishing each grader operation at the fastest practical rate . . . plus 30 to 50% faster job-to-job transport.

Let your local Adams dealer show you how 8 forward speeds—and the other big Adams advantages—speed operations, increase efficiency, reduce costs.

Only Adams has this exclusive combination of advantages

- **8 Overlapping Forward Speeds**... Flexible working range speeds work—increases output—provides high transport speeds.
- **Wide Range of Blade Positions**—Without Mechanical Adjustments . . . Saves Time in Adapting Machine to Needed Cuts.
- **Positive-Action Mechanical Controls** . . . Dependable, accurate adjustments—because they're geared . . . Easy, natural steering.
- **Ample Operating Clearances**... Quick, easy adaptation to work . . . Operator comfort, convenience, efficiency.
- **Fast, Easy, Servicing Plus World-Wide Dealer Service** . . . Saves time and money.

See your local Adams dealer

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Bakersfield—Kern County Eqpt. Co., Inc.
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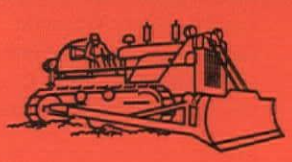
DISTRIBUTORS ALSO IN Seattle and Spokane, Washington . . . Portland, Eugene, Roseburg, Albany and Central Point, Oregon . . . Denver, Colorado . . . Phoenix, Arizona . . . Billings, Great Falls, Missoula and Kalispell, Montana . . . Boise and Pocatello, Idaho . . . Reno and Las Vegas, Nevada . . . Salt Lake City, Utah . . . Albuquerque, New Mexico . . . Fairbanks, Alaska.

"Big Red"

TD 24



How International's "Big Red" Champ outworks the field

When the TD-24 teams up with a loading machine, dirt gets moved from ground to trucks in record time. And the "men who move the earth" are finding this out.

Like the D. W. Winkelman Co., Inc. on a job near Syracuse with a TD-24 loading out 22 pay yards every minute.

"Our TD-24 is the best machine we've ever had," says Superintendent George Cecil. "Pulling the loader, it loads out eleven pay yards every 30 seconds. And it's the only machine we've found that can do a good lugging job with this big loader!"

That's another way of saying International's TD-24 is the most powerful crawler built—the hands-down champ at any job where the pay-off is for more production, stamina and "handle-ability." You can turn with power on both tracks. You can shift "on-the-go." You get going fast, with push-button starting, in any weather.

Look at the record. Ask your friends in the business. Ask your International Industrial Distributor for the low-down on the TD-24. And, times being what they are, ask him about his expert field service and big-time shop facilities for the hard-working years ahead. You'll be a TD-24 man from then on in!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

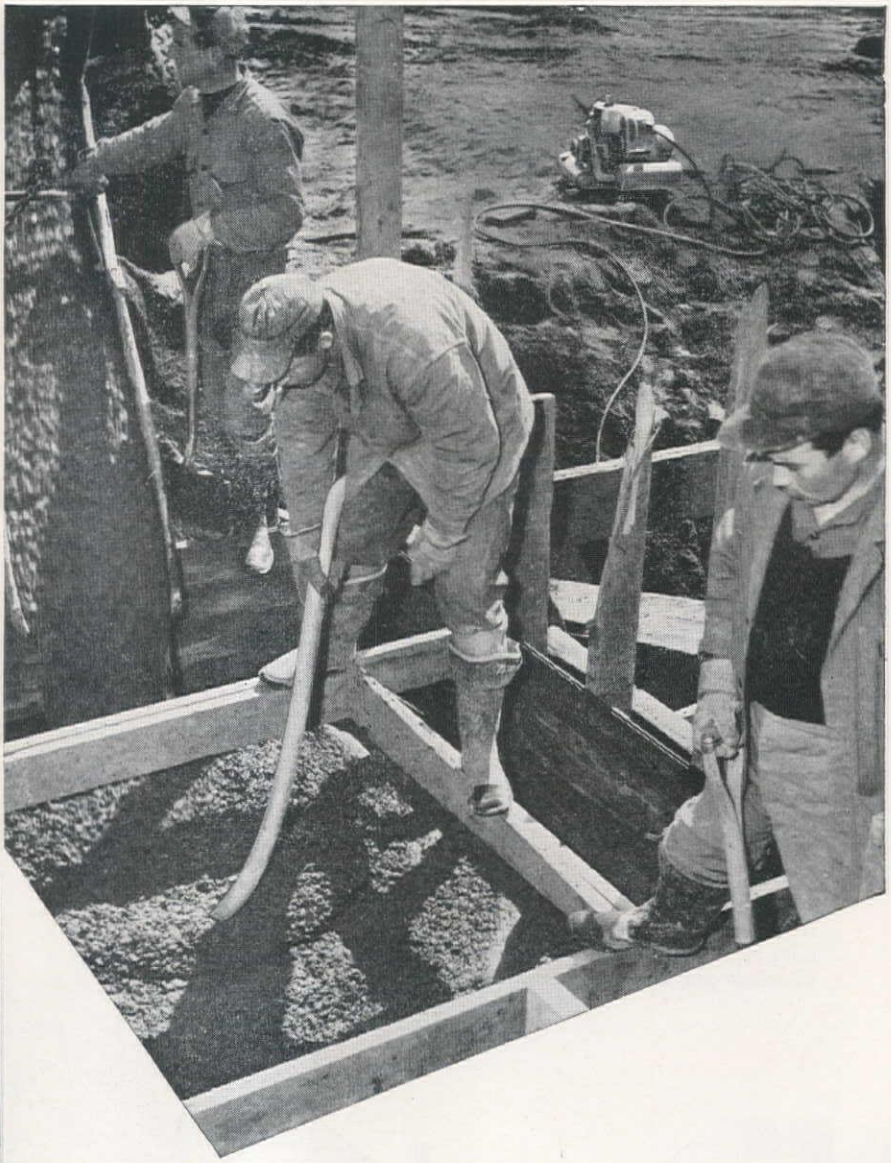
INTERNATIONAL

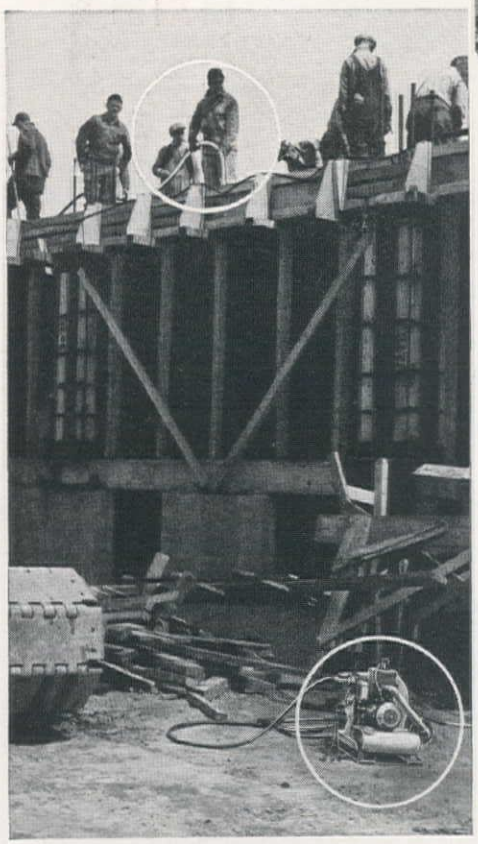
INTERNATIONAL HARVESTER

POWER THAT PAYS

A WINNER FOR WINKELMAN! This big red TD-24 really pays off, loading 22 pay yards a minute for D. W. Winkelman on a job near Syracuse, New York.

One man can use this VIBRATOR anywhere





Homelite Generator on ground powers vibrators on top of forms.

One man with a CP-Homelite unit, placing concrete as fast as it is delivered, does the work of an ordinary three man crew. Place the Homelite Generator in any convenient location—out of the way of the actual pouring operation—and use the CP-Homelite Electric Vibrator anywhere in a radius of 400 feet.

There's no flexible shaft to give trouble. You can bend the tough electric cable—in its neoprene hose handle—around corners or over forms without injuring it. And the extension hose handle permits working 25 feet down in a form. CP-Homelite Hicycle Vibrators run at a constant speed of 10,000 v.p.m., the most suitable frequency for concrete placement and will handle 30 to 40 cubic yards an hour of 2″ slump concrete.

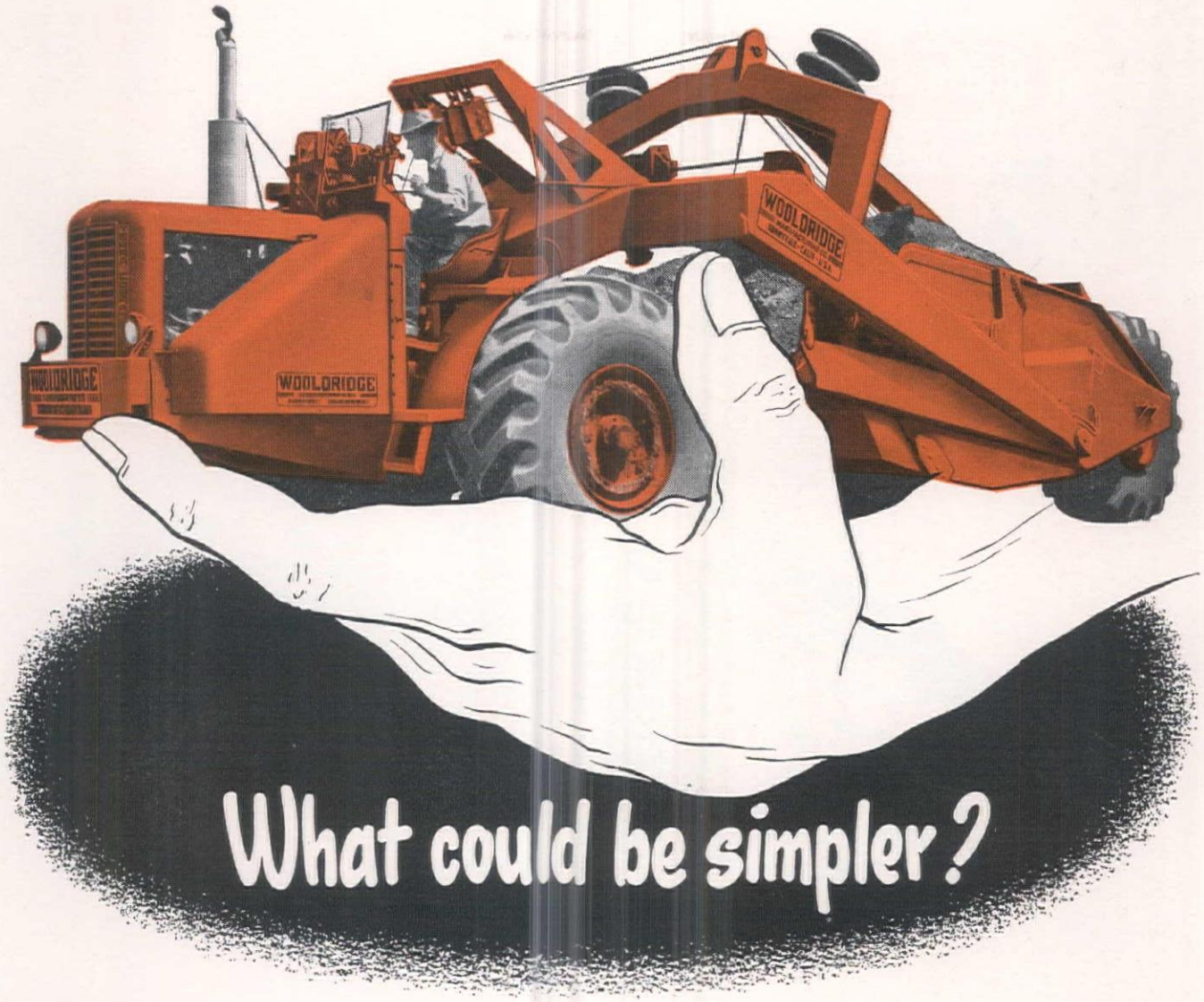
Your Homelite Generator will operate two vibrators and will also power other Hicycle tools, standard Universal Electric tools, and floodlights. Write for full information.

Carryable
Pumps • Generators •
Blowers • Chain Saws
• Paving Breakers

PERFORMANCE · DEPENDABILITY · SERVICE

HOMELITE
CORPORATION

1306 RIVERDALE AVENUE • PORT CHESTER, NEW YORK



What could be simpler?

Operators, service crews, and the owner who pays the bill . . . all know the importance of simplicity. You can't afford to waste time tearing down unrelated parts every time some component needs service. But can a machine with the high production, speed and ruggedness of the Terra Cobra still be so simple? The men out on the job say that Wooldridge Cobras lick every rig in the dirt on this point. Right in the field, they can get at, lubricate, adjust or remove every important component . . . no fussing with unrelated parts. This accessibility applies to the dependable Cummins diesel, rugged clutch and transmission, heavy duty differential, away-from-dirt power control system, simply reeved cables, and all other functional units. Teamed up with extra margins of built-in strength, *simplicity* keeps Cobras on the job for more hours of high-profit production —year in and year out. Have your Wooldridge Distributor go over a Cobra with you from bumper to push button, and you'll see what we mean.

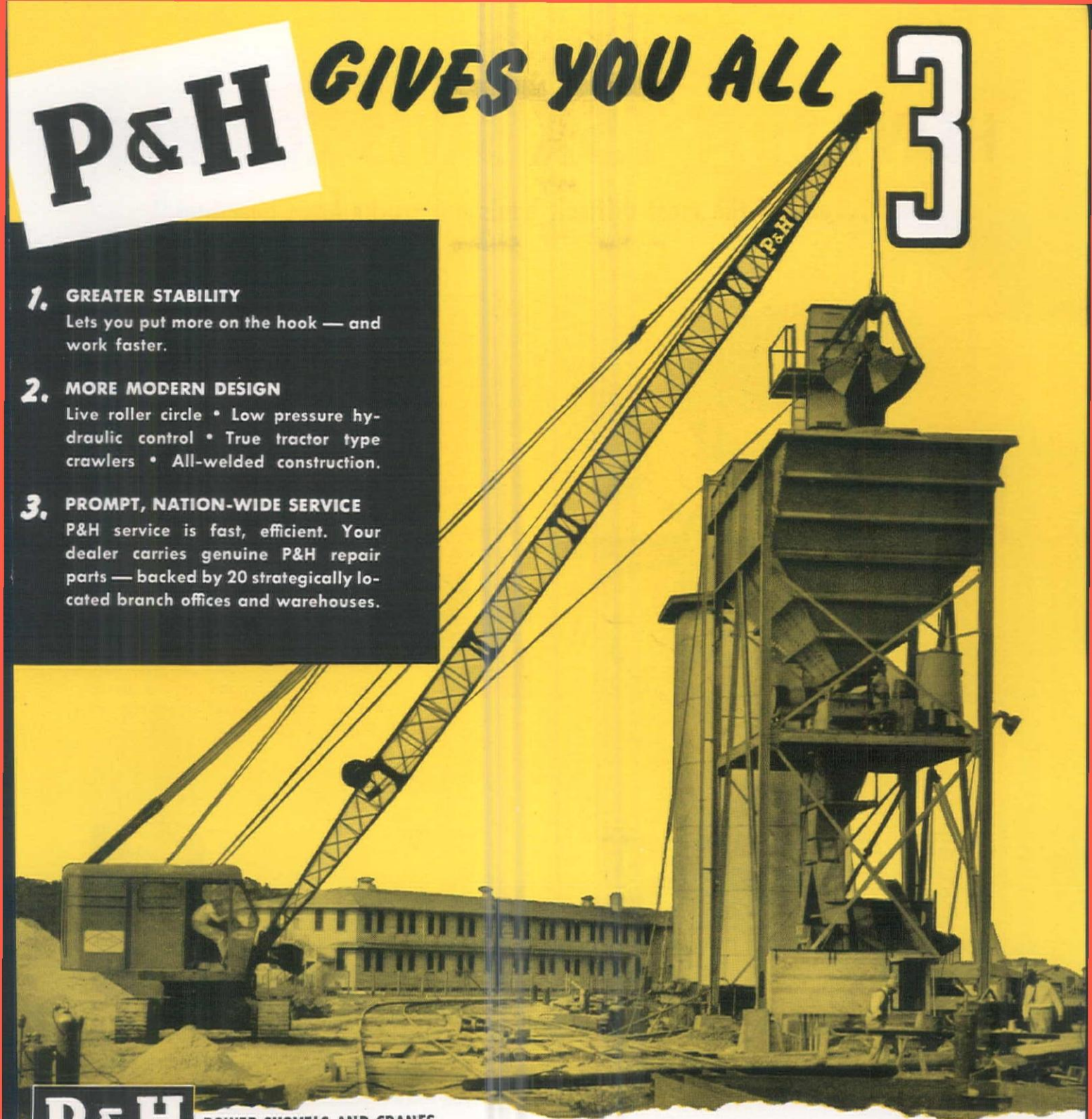
WOOLDRIDGE MANUFACTURING COMPANY

Sunnyvale, Calif. • 5345 N. Winthrop Ave., Chicago 40, Ill.

WOOLDRIDGE

BUILT FOR MORE PRODUCTION PER HOUR—MORE HOURS OF PRODUCTION

P&H GIVES YOU ALL 3



1. GREATER STABILITY
Lets you put more on the hook — and work faster.

2. MORE MODERN DESIGN
Live roller circle • Low pressure hydraulic control • True tractor type crawlers • All-welded construction.

3. PROMPT, NATION-WIDE SERVICE
P&H service is fast, efficient. Your dealer carries genuine P&H repair parts — backed by 20 strategically located branch offices and warehouses.

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HEAVY-DUTY T5X SAVES CONTRACT

on "...one of the most difficult hauls our trucks have ever had."

Prior to using T5X, the A. J. McCosker Company of Berkeley, Calif., was working for the U.S. Navy in the construction of Oak Knoll Hospital in Oakland. Vern DeAgo, superintendent of equipment, recalls: "It was one of the most difficult hauls our trucks have ever had. We had the combination of slow climbing and very fast descent, both hard on motors... We were operating 20 trucks and we had as many as three down per day with bearing failures. The situation became so desperate that we were doubtful that we could fulfill our contract.

"Having heard of T5X, we changed all of our trucks over to it at once. Immediately our bearing failures stopped; we had no troubles with lubrication from then on." Heavy-duty T5X is made by blending a 100% paraffin-base stock with a powerful combination of *fortifying compounds*. This sensational *purple oil* gives outstanding protection and performance in *any* type of internal combustion engine.

Equipment superintendent DeAgo says: "I have been in the construction business for 28 years, and have used nearly all the oils competitive with T5X. I have never found another oil which is so ideal for every phase of heavy construction work. We now operate 120 pieces of equipment, including shovels, compressors, rollers, blades, trucks, tractors, etc. *T5X is in every one of them.*"

The answer to *severe* lubrication problems, T5X cleans as it lubricates, keeps the rings free, retards the formation of harmful carbon and sludge. The unusually high quality of T5X gives you the opportunity for increased engine efficiency, less wear, and lower maintenance and repair costs. *Prove* this for yourself by giving heavy-duty T5X a trial in engines operating under critical conditions.

Contact your local Union Oil Representative for full information on T5X, or write Sales Department, Union Oil Company, Los Angeles 17.

76 UNION OIL COMPANY OF CALIFORNIA

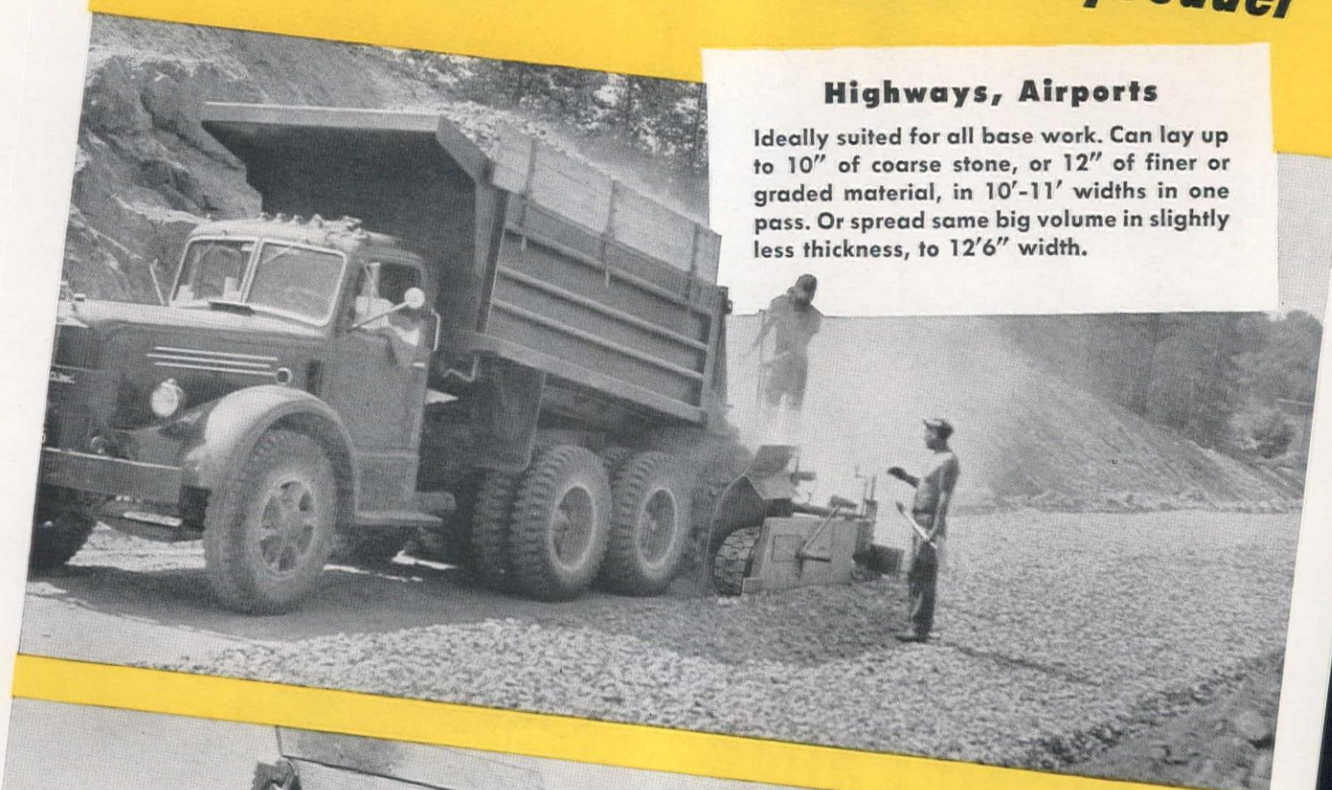
PIONEERING *in Hydraulic* POWER –

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

S. MORGAN SMITH Co.

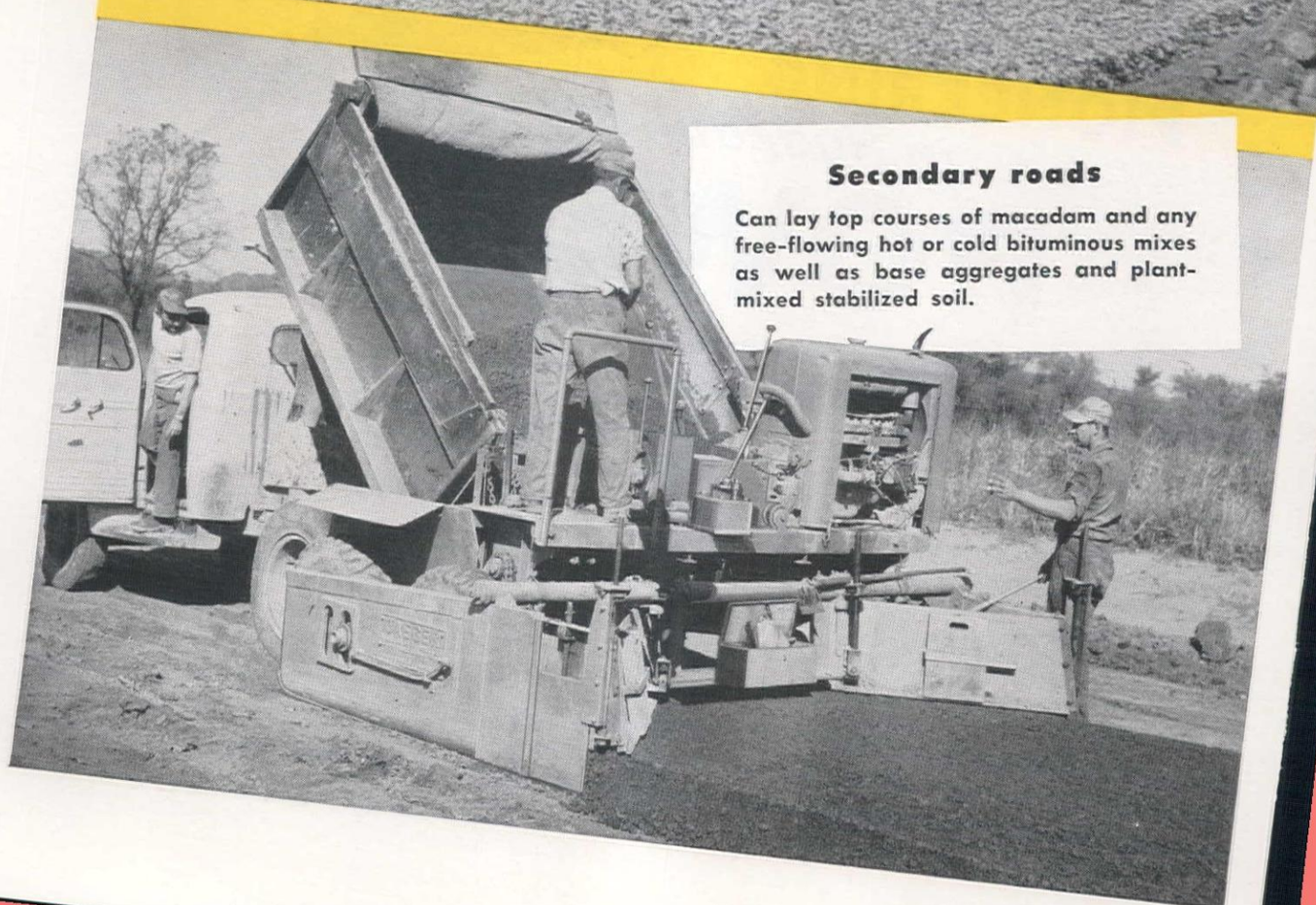
YORK, PENNA. U.S.A.

Today's most useful paving tool... the JAEGER paver-type Aggregate Spreader



Highways, Airports

Ideally suited for all base work. Can lay up to 10" of coarse stone, or 12" of finer or graded material, in 10'-11' widths in one pass. Or spread same big volume in slightly less thickness, to 12'6" width.



Secondary roads

Can lay top courses of macadam and any free-flowing hot or cold bituminous mixes as well as base aggregates and plant-mixed stabilized soil.

Costs ½ the price of bituminous pavers. Accurately lays base and surface aggregates, free-flowing hot or cold bituminous mixes, plant-mixed stabilized soil.

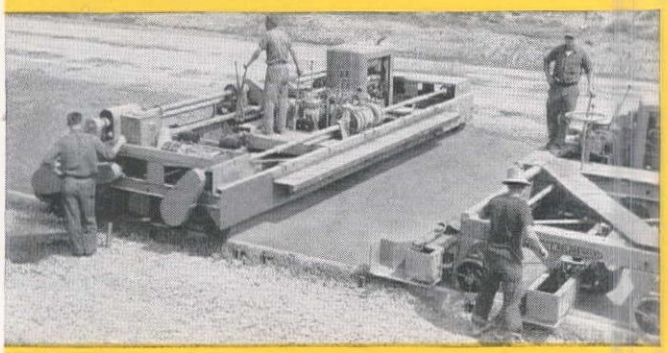
Can lay up to 12″ thickness in widths to 11′; slightly less thicknesses to 12′6″ width. Two spreaders can lay full 25′ width on fast work.

All traction is on the subgrade—No displacement of loose, uncompacted material. Crawler or 4-wheel drive interchangeable to meet any subgrade conditions.

Can lay flush to curbs or headers, blend perfect joints. Two models—to work with any size trucks up to 24-ton semi-trailers.

Small contractors use on parking areas and drives

This simple, low-cost spreader does a beautiful job, fast and with big saving in labor. See your Jaeger distributor.

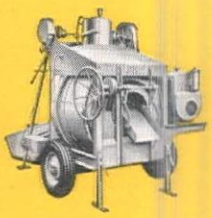


3-Screed "Team" for concrete paving

Jaeger Screw-and-Screed Spreader accurately meters the exact amount of material needed for perfect finishing. No carry-back, no excess or deficiency to delay progress or vary compression. Only one Jaeger Finisher needed, even on high production work. On pitched slab and super-elevated curves Jaeger Diagonal Screed Finisher insures solid placement against the higher form. Screw-and-Screed Spreader also adaptable for high type bituminous pavement.

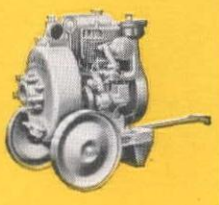
"NEW STANDARD" AIR-PLUS COMPRESSORS

Give you 15% to 25% more air than others, to get more work done with same men and tools. Sizes 75, 125, 185, 250, 365 and 600 cfm.



"SPEEDLINE" CONCRETE, PLASTER, MORTAR MIXERS More batches per hour with fast "Skip Shaker" loaders and thoro-mixing, fastest discharging "Dual Mix" drums. Sizes 3½S to 16S.

"SURE PRIME" DEWATERING AND PRESSURE PUMPS Built oversize for lower speed, longer life operation. 1½" to 10" sizes, capacities to 240,000 gph. Pressure pumps for up to 275 psi.



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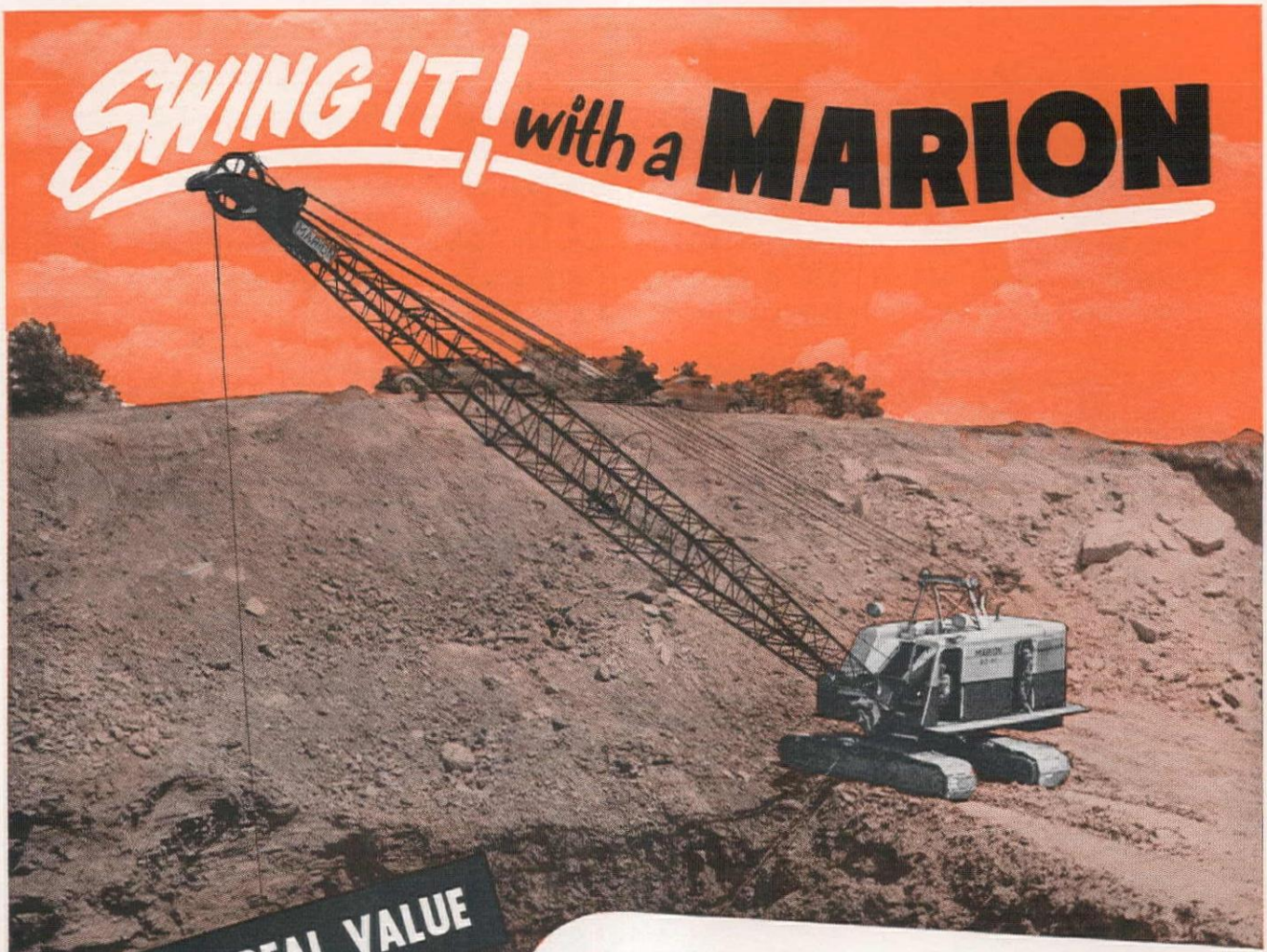

And Get REAL VALUE in DRAGLINES

Want to get more for your dragline dollars?

If so, consider what it takes to make a dragline great.

MARION, in more than 65 years of progress, knows there are no substitutes for experienced design, quality materials and careful workmanship if a dragline is to do its job well and faithfully over the years.

MARION builds draglines to **do a job**—not just to "get by" or to "meet a price." MARION builds a size and type to meet every need.

Let your nearest MARION Sales Representative or Distributor show you how easy it is to own today's outstanding Dragline Value.

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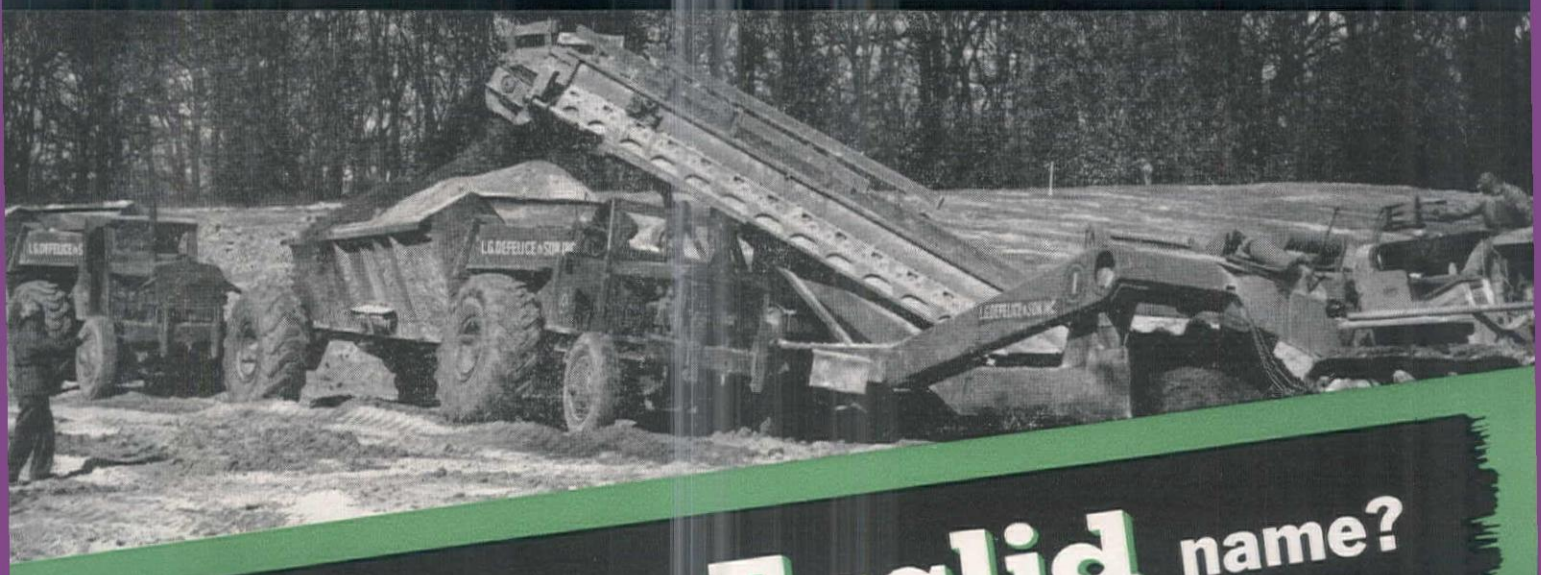
C. H. GRANT COMPANY.....1401 Eastshore Highway, Berkeley 10, California
STAR MACHINERY COMPANY.....E. 415 Sprague Avenue, Spokane 8, Washington
MARION POWER SHOVEL COMPANY.....114 W. Adams Street, Phoenix, Arizona
RASMUSSEN EQUIPMENT & SUPPLY COMPANY.....1960 South Second West, Salt Lake City, Utah



What's behind the Euclid name?

Availability on the Job...

MORE LOADS PER HOUR

•

MORE PROFIT PER LOAD

Simple design and rugged construction of Euclids assure profitable performance year after year on tough jobs. "Eucs" have earned their reputation for job availability — continuous operation, less down time and lower maintenance costs on a wide range of mine, quarry and construction work.

Available, too, are stocks of genuine Euclid replacement parts and efficient service from the world-wide Euclid Distributor organization.

For assistance with your off-the-highway hauling problems and Euclid performance data on work similar to yours, get in touch with your Euclid Distributor . . . or write direct if you prefer.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

CABLE ADDRESS: YUKLID

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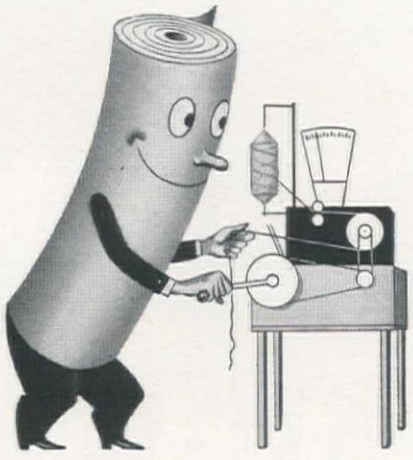
EUCLIDS *Move the Earth*



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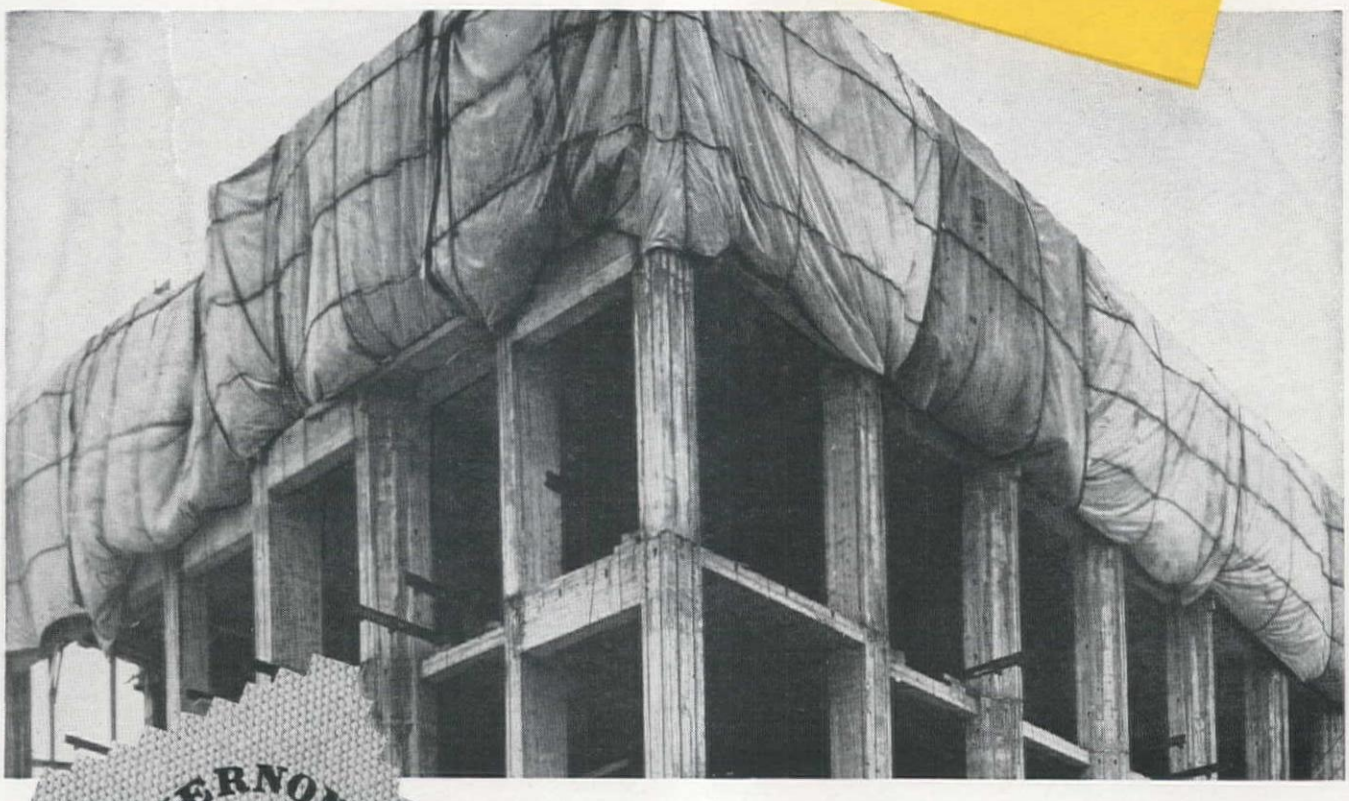
Makes the Big Difference in TARPAULINS



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Gives You Greater Fabric Uniformity

The greater uniformity of Mt. Vernon Extra Duck assures you the two most important qualities you want in tarps—top protection and top wear. You'll find your repair and replacement costs reduced considerably.

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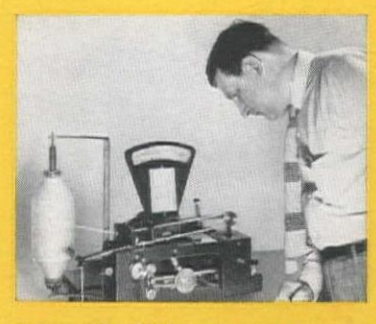


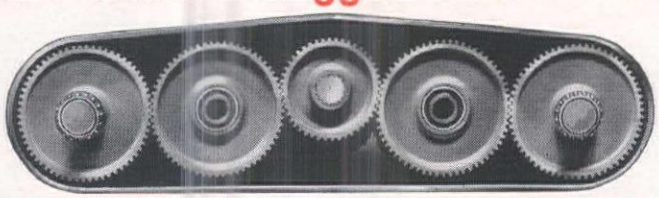
CHECKING COEFFICIENT OF VARIATION And Average Factor Of Quality On Evenness In Roving With Belger Tester. One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products.

GALION MOTOR GRADERS

have ALL-GEAR TANDEM DRIVE

Used successfully for over 20 years

The Most Positive & Rugged Tandem Drive Built



STRONG • STURDY • ADJUSTMENT-FREE

Tandem Drive Gears are in CONSTANT MESH — eliminating breakage of transmission and final drive parts. Gears operate in oil bath.

Automobiles, Trucks and Crawler Tractors are GEAR DRIVEN — Make sure your next Tandem Drive Motor Grader is GEAR DRIVEN.

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ESTABLISHED 1907 **MOTOR GRADERS • ROLLERS**

THE GALION IRON WORKS & MFG. CO., General and Export Offices — Galion, Ohio, U. S. A.
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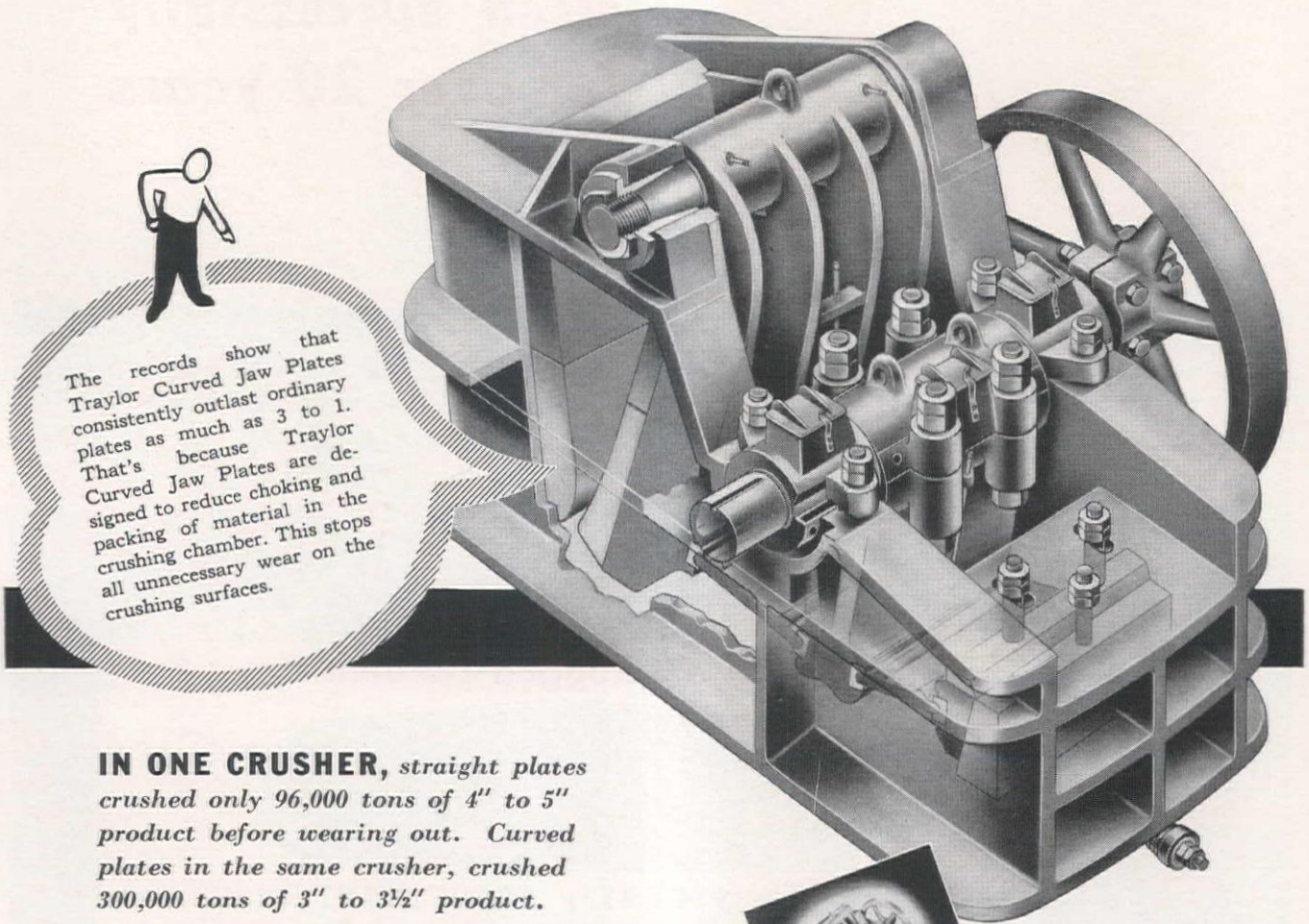
Long Life of Curved Jaw Plates is a bigger reason than ever for buying a Traylor Jaw Crusher



The records show that Traylor Curved Jaw Plates consistently outlast ordinary plates as much as 3 to 1. That's because Traylor Curved Jaw Plates are designed to reduce choking and packing of material in the crushing chamber. This stops all unnecessary wear on the crushing surfaces.

IN ONE CRUSHER, ***straight plates crushed only 96,000 tons of 4" to 5" product before wearing out. Curved plates in the same crusher, crushed 300,000 tons of 3" to 3½" product.***

Keep an eye on the future, when you buy stone crushing machinery today. To insure continuous production, your best bet is to buy equipment that will require a minimum of maintenance and repairs. It may not be easy to get replacement parts when you need them most. Buy a Traylor Jaw Crusher . . . a crusher that has proved its ability to stay on the job 3 times longer between jaw plate replacements. Mail coupon for bulletin on the Traylor H Jaw Crusher today.

MAIL this coupon for complete information

TRAYLOR ENGINEERING & MANUFACTURING CO.
151 MILL ST., ALLENTOWN, PA.

Please send literature as checked

☐ Bulletin 6120 on Traylor Stone Crushing Machinery
☐ Booklet describing Traylor's complete metal-working facilities.

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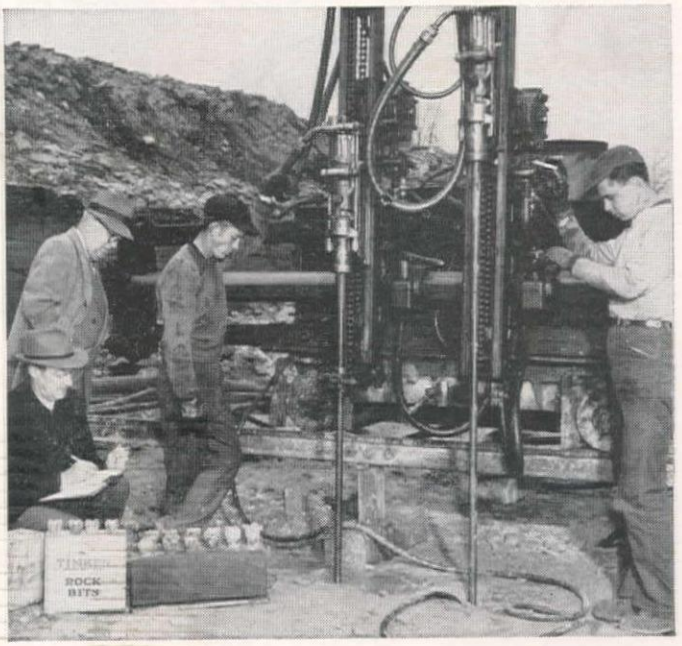
A "TRAYLOR" LEADS TO GREATER PROFITS

Traylor

Rotary Kilns, Coolers and Dryers · Grinding Mills
Jaw, Reduction and Gyratory Crushers · Crushing Rolls

Only the Timken Company offers all 3 rock bit types...



and a complete engineering service

1 MULTI-USE. Basic removable rock bit for 18 years. Gives lowest cost per foot of hole when full increments of the steel can be drilled and when all bits are returned for reconditioning. Low cost.

2 CARBIDE INSERT. For extremely hard and abrasive ground, small holes, extra deep holes. Lets drillers spend more time drilling—less time changing bits. Holes go down faster. Bit reconditioning is simplified.

3 ONE-USE "SPIRALOCK". For use where reconditioning is impractical or undesirable. Offers lowest unit bit cost. New "Spiralock" union holds bit dependably—permits easy removal. Simplifies steel preparation.

The Timken Company's Rock Bit Engineering Service is always ready to help you with your rock bit problem and to help select the right bit for your job. With more than 17 years' experience and *all three* rock bit types to choose from, our Rock Bit Engineering Service can assist you in getting the bit performance you need—whether it's lowest cost per foot of hole, lowest unit bit cost, greatest possible drilling speed, or any other desired advantage.

No other company offers this complete service. Because only the Timken Company makes *all three* rock bit types, our engineers can give you an unbiased recommendation as to the best bit for your job. And no other manufacturer of rock bits has had as much drilling experience in mining, quarrying and construction as the Timken Company. The Timken Roller Bearing Company, Rock Bit Div., Canton 6, O. Cable address: "TIMROSCO".

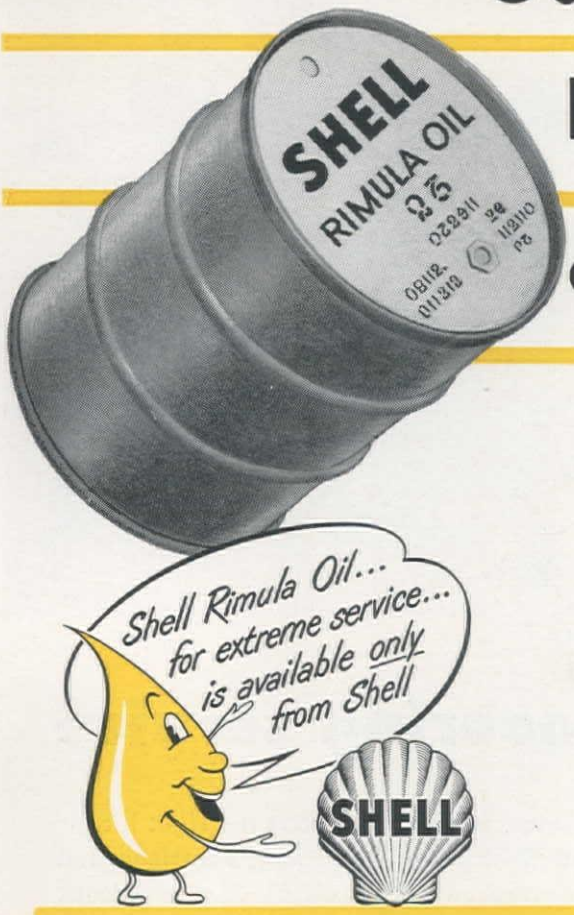
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit
. . . for every job

FREE BOOKLET! A valuable guide for every rock bit buyer. Shows full line of bits with detailed descriptions, recommended uses. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

If you need an extreme-service oil this one can **save you money** by reducing overhaul frequency



Shell Rimula Oil is a *super* heavy duty oil. It counteracts wear under *both* extremes—heavy loads and light loads. And it permits operation *without penalty* on lower-grade fuels.

In certain extreme conditions (see below) that even the best of the regular heavy duty oils couldn't cope with, Shell Rimula Oil cut engine wear rates as much as *90%*.

Results like that mean not only longer and more efficient service from an engine, but also a real money saving due to fewer overhauls. All told, Shell Rimula Oil has saved owners thousands of dollars in operating costs.

Shell Rimula Oil costs more, so there's no point in using it if you're getting satisfactory results from a regular heavy duty oil. But if your overhauls are coming too close together, it will pay you to look into this extreme-service oil. Study the chart below, and talk to your Shell representative.

HOW TO TELL IF YOU NEED SHELL RIMULA OIL

Engines operated under these conditions and lubricated with regular heavy duty oils frequently develop excessive wear and deposits. They must be overhauled often to keep them efficient. They are *expensive* to operate. Shell Rimula Oil was developed to overcome these very conditions—singly or any combination of them. If any of these conditions apply to your operation, better talk to your Shell representative about Shell Rimula Oil. It may save you real money.

DIESEL

EXTREME HEAVY LOAD
particularly on lower grade fuels

For example
TRACTORS IN CONSTANT USE AT PEAK LOAD

LOW JACKET TEMPERATURE
CONSTANT LIGHT LOADS
LOWER GRADE FUELS

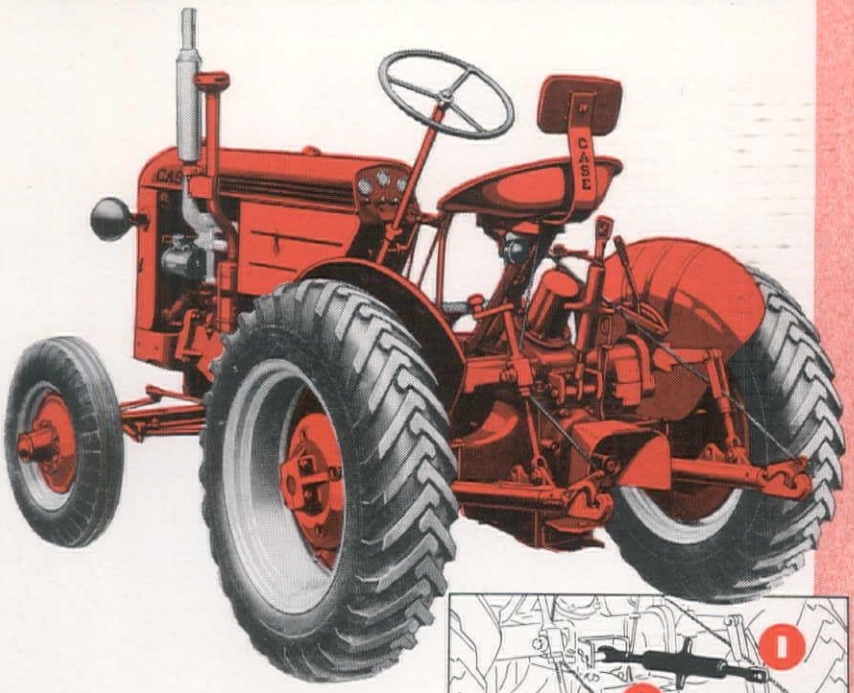
For example
PUMPING ENGINES
MARINE AUXILIARY UNITS
STANDBY ENGINES

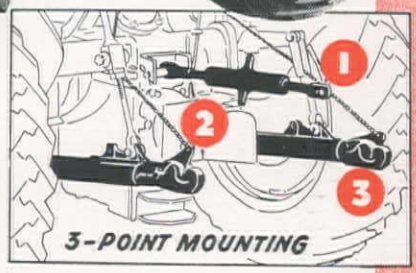
GASOLINE

LOW TEMPERATURE, LIGHT LOAD

For example
DOOR-TO-DOOR DELIVERY SERVICE... OR SIMILAR OPERATION

New FOR CASE "VAI" INDUSTRIAL TRACTOR





EAGLE HITCH FOR LATCH-ON EQUIPMENT

A fast, sure coupling unit for rear-mounted equipment—do ditching, grading, scraping, bulldozing, backfilling, snow handling—dig post holes, remove posts, lift and carry sacks of cement, planks, construction equipment, etc. Many uses on lighter jobs where big, heavy equipment is not needed—also a cost-saver on clean-up and auxiliary work where heavy equipment is on the job.

You can change rear-mounted equipment on the Case "VAI" quicker than you can fill the gas tank. The lifting arms are hydraulic controlled to raise the equipment for quick transport, to lower and hold the equipment at proper working depth. The coupling arms also adjust the tilt and cutting angle of the mounted tools.

The versatility of the Case "VAI" Tractor is matched by its all-around strength and durability—built to take the jars and jolts of contracting and construction work. Get all the facts—send for free literature on the Case "VAI." J. I. Case Co., Racine, Wis.

SEE YOUR CASE INDUSTRIAL DEALER

Superior Equipment Co., Phoenix, Ariz.; Hayward Equipment Co., Los Angeles, Calif.; Growers Equipment Co., Salinas, Calif.; Contractors Machinery Co., San Francisco, Calif.; Lake County Equipment Co., Lakeport, Calif.; E. O. Mitchell, Inc., Bakersfield, Calif.; Liberty Truck & Parts Co., Denver, Colo.; Western Equipment Co., Boise and Idaho Falls, Idaho; Hilton's, Inc., Las Vegas, New Mexico; Electric Tool & Supply Co., San Bernardino, Calif.; Growers Tractor & Impl. Co., Sacramento, Calif.; Farmers Machinery & Supply Co., Reno, Nevada; Foulger Equipment Co., Salt Lake City, Utah; Nelson Equipment Co., Portland, Oregon - Seattle, Wash.; Wortham Machinery Co., Cheyenne, Sheridan and Greybull, Wyoming; Montana Powder & Equipment Co., Helena, Montana.

LESS TIME GETTING READY

MORE TIME ON THE JOB

Changing from one rear-mounted tool to another is quick and easy. Simply remove a pin and touch the hydraulic control. You can even hook to many tools without getting off the tractor seat! Saves hours of get-ready work. The Latch-On tools shown below, and many others, are available.

SCOOP on "VAI" Tractor with Eagle Hitch digs, lifts and carries 10 cu. ft. of material in forward or reverse position. Reinforced cutting edge is replaceable.

BLADE can be tilted or angled to any position from tractor seat for scraping, ditching, grading, bulldozing and backfilling.

POST HOLE DIGGER does the work of eight or ten men. Dig holes for fence posts, tree nursery settings, highway guard-rails, foundation footings and other construction work. Eight auger sizes, 4″ to 24″ diam.

CASE

Barber-Greene

MODEL 543 BUCKET LOADER . . .

450410

SAVES man power-truck time-money

LOADS all free-flowing materials at 3 yrds. per minute

Cost studies prove that nothing can compete with a Bucket Loader in lowest cost loading from stock piles to trucks.

The B-G constant flow principle virtually eliminates the human element — guarantees the same hourly production all day long, whether the operator is fresh or tired out.

The new Barber-Greene Model 543 is the last word in loading economy. Backed by over a billion cubic yards handled by its predecessors, this machine is ready to cut your loading costs.

The new hydraulically controlled trimmer-conveyor combines with time-proved B-G advantages — such as the Spiral Feed, Cleanup Scraper, automatic Overload Release and Floating Boom — to save appreciable manpower on every job. With its 15 m.p.h. road speed, the 543 can get to the job fast and move from pile to pile in a hurry. It is built for high production through years of low-cost service. In addition, it is convertible to a Snow Loader for year-round usefulness.

FOR SALE BY:

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

Save Running Time

Speed is essential if trucks are to make deliveries on time. But speed alone won't do the job. Power is also necessary to prevent delays in getting away under full loads, climbing grades, pulling out of tough spots.

Eaton 2-Speed Axles provide drivers with both speed *and* power. This is made possible by the two gear ratios which Eaton provides for every conventional one. From "low low" to "high high" the Eaton driver can quickly find the most efficient gear ratio to deliver pulling power when needed, speed when desired. The result is faster running time.

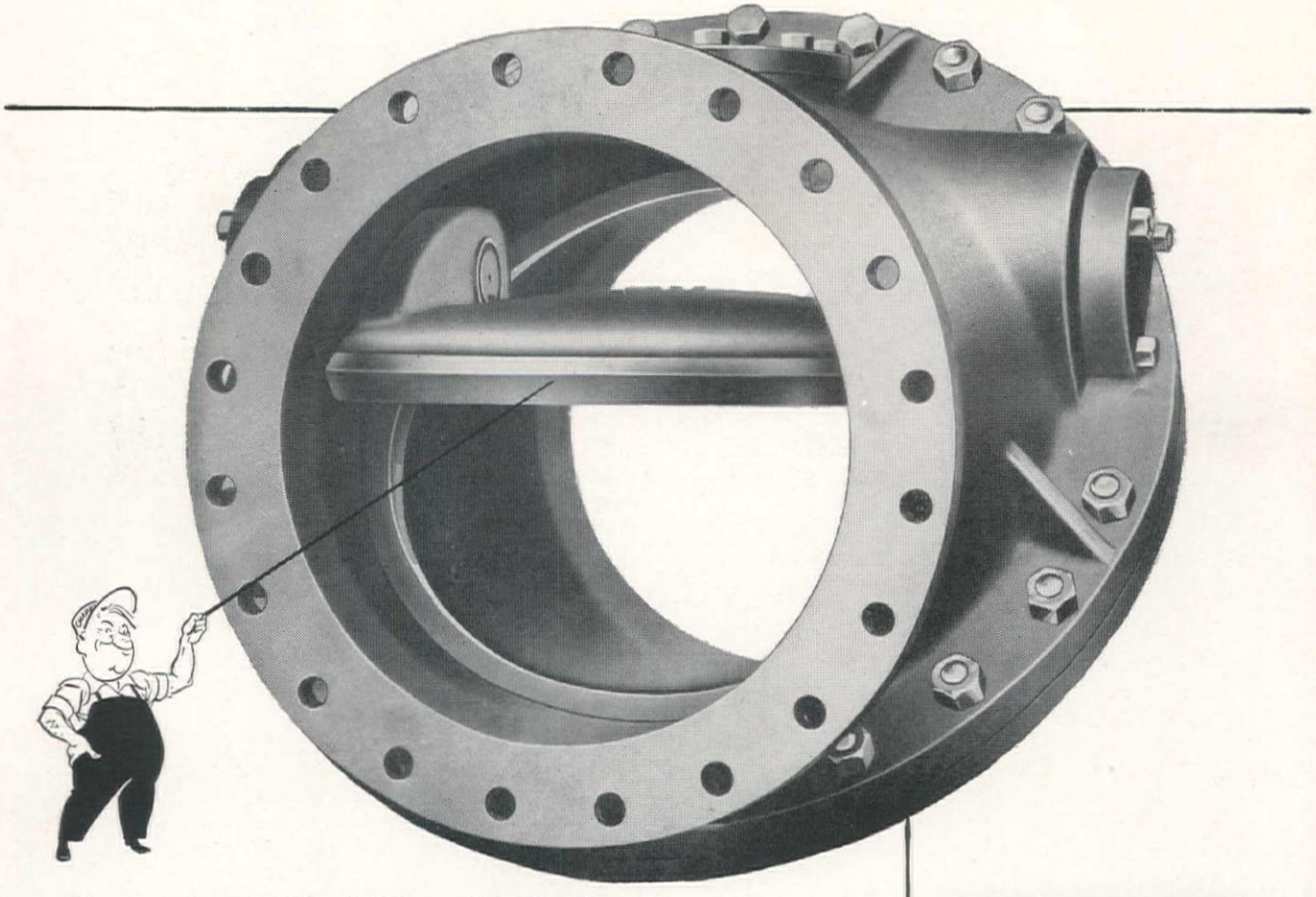
And, exclusive Eaton features assure longer axle life. Your truck dealer will gladly explain Eaton's planetary gearing, positive lubrication, and other outstanding features.

EATON
2-Speed Truck
AXLES

Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

PRODUCTS: SODIUM COOLED, POPPET, AND FREE VALVES • TAPPETS • HYDRAULIC VALVE LIFTERS • VALVE SEAT INSERTS • JET ENGINE PARTS • ROTOR PUMPS • MOTOR TRUCK AXLES • PERMANENT MOLD GRAY IRON CASTINGS • HEATER-DEFROSTER UNITS • SNAP RINGS SPRINGTITES • SPRING WASHERS • COLD DRAWN STEEL • STAMPINGS • LEAF AND COIL SPRINGS • DYNAMATIC DRIVES, BRAKES, DYNAMOMETERS

Stop Expensive Slamming With the Cushioned Closing of CHAPMAN TILTING DISC Check Valves

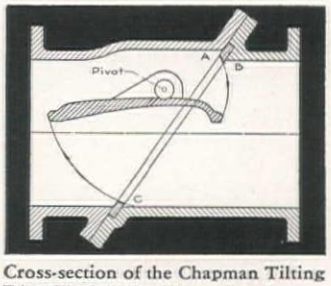


Those words — *cushioned closing* — best describe the action of this unique check valve. The tilting disc works with the stream—opens easily, closes quickly, *yet quietly.* There's no slamming — no resultant destructive stresses on the pipeline.

As a result of this smooth, *cushioned action*, maintenance costs are at a minimum and savings of from 65% to 80% in head losses can be obtained over conventional-type check valves.

Send today for the bulletin describing this unusual valve.

THE CHAPMAN VALVE MFG. CO.
INDIAN ORCHARD, MASSACHUSETTS



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

WIRE ROPE

You'll have fewer shut-downs . . . cut replacement time with Roebling rope

YOU PAY FOR THE BEST when you buy wire rope. And you *get the best* when you buy Roebling Preformed "Blue Center" Steel Wire Rope. "Blue Center" steel is an exclusive Roebling product . . . gives rope the extra toughness that spells long life . . . service economy that really counts. Besides that, Roebling Preformed can be cut without seizing . . . always spools better . . . reduces vibration and whipping . . . doesn't tend to set or kink.

Roebling makes a wide range of wire rope . . . brings you the right construction, grade and size for top performance and economy on each installation. Have your Roebling Field Man help select the *best* rope for your particular requirements. And for maximum savings, get his suggestions on the proper use and maintenance of wire rope. John A. Roebling's Sons Company — San Francisco — Los Angeles — Seattle.

ROEBLING

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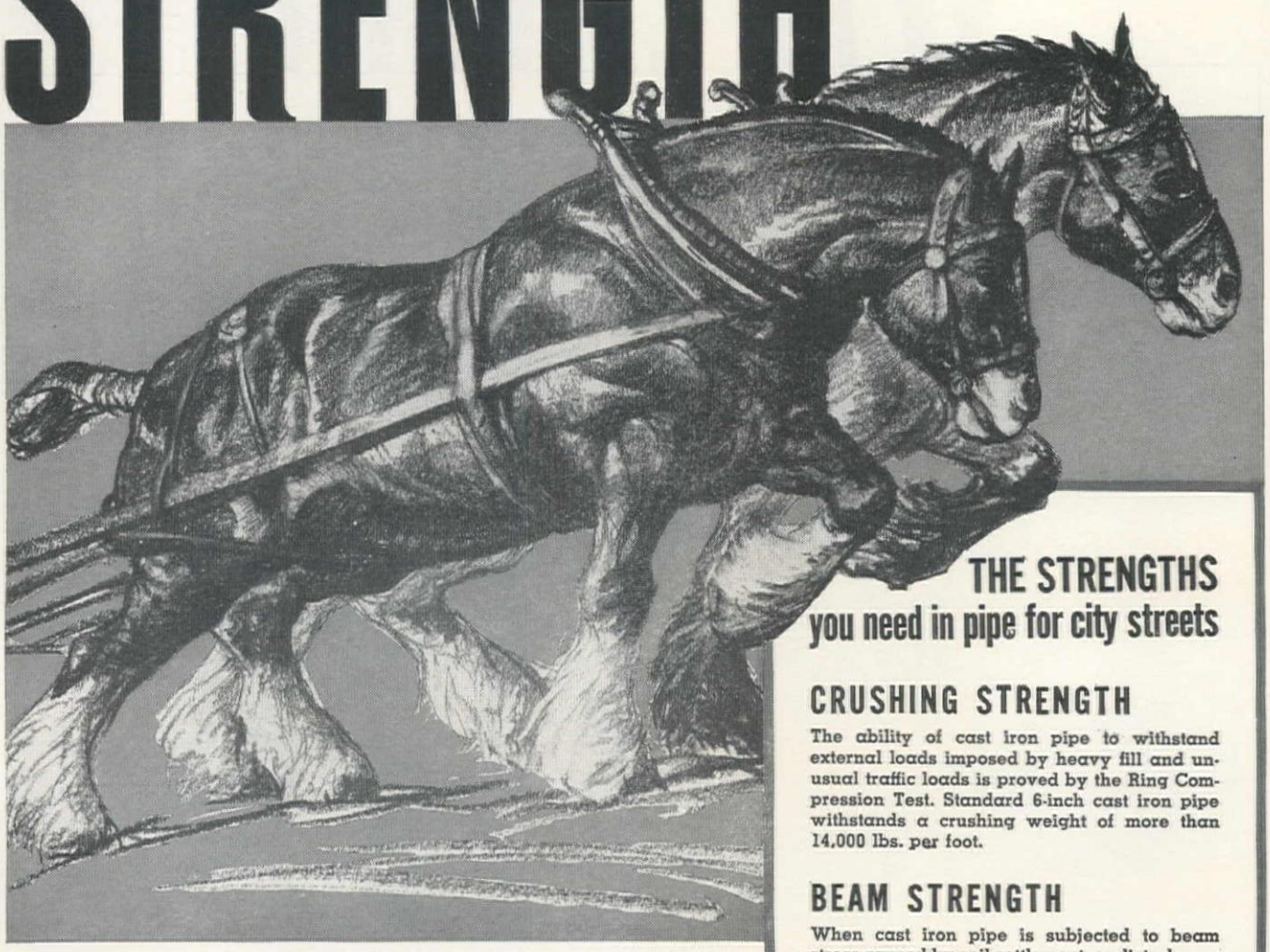
STRENGTH



THE STRENGTHS you need in pipe for city streets

CRUSHING STRENGTH

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

BEAM STRENGTH

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

SHOCK STRENGTH

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

BURSTING STRENGTH

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

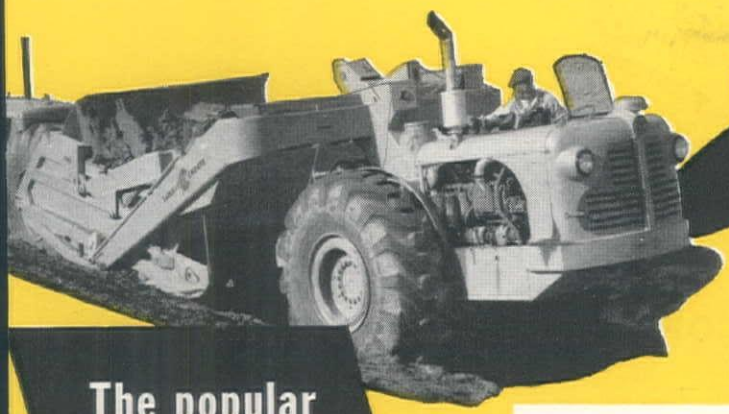
The strengths demanded of pipe to be laid under expensive modern pavements, if costly repairs and replacements are to be avoided, are known strengths—proved by experience and determinable by tests. The four strength factors that pipe must have to withstand beam stresses, external loads, traffic shocks and abnormal working pressures are listed in the box opposite. *No pipe, deficient in any of these strength factors should ever be laid in paved streets of cities, towns or villages!* Cast iron water and gas mains, laid over a century ago, are serving today in the streets of 30 or more cities. These service records prove that cast iron pipe not only resists corrosion but has all the vital strength factors of long life and economy.

CAST IRON

CAST IRON PIPE RESEARCH ASSOCIATION, THOS. F. WOLFE, MANAGING DIRECTOR, 122 SO. MICHIGAN AVE., CHICAGO 3.

CAST IRON PIPE SERVES FOR CENTURIES

The great line of LaPLANT-CHOATE *Earthmovers*



The popular MOTOR SCRAPERS

TS-300 MOTOR SCRAPER
WHEN your job calls for moving big volumes, you can bank on the high production features of the big TS-300 Motor Scraper. Big capacity . . . 14-cu. yds. struck and 17.5-cu. yds. heaped. Speeds in excess of 22 mph. Easy loading and positive forced ejection cut seconds off the operating cycle. Big power . . . with your choice of two Diesel engines—Buda 6-DAS 844 at 280 HP, or Cummins NHS-600 at 275 HP. Investigate *all* the profit-making features of the TS-300 today!

TW-300 MOTOR WAGON
HERE'S a hydraulically controlled bottom dump wagon flexibly joined to the same tractor used on the TS-300 Motor Scraper. 14- to 19-cu. yd. capacity, high speed and rugged power, plus many other money-saving features make this an outstanding unit.

TS-200 MOTOR SCRAPERS
The TS-200 is a 9- to 12-yd. hydraulically controlled earthmover small enough for small yardage jobs, yet with all the capacity, power and speed necessary for high production on your long haul jobs.

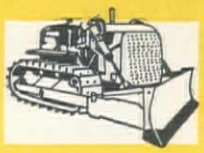
LaPLANT-CHOATE CABLE and HYDRAULIC SCRAPERS

C-314 CABLE SCRAPER
FOR short hauls with track type tractors, you can't beat the performance of C-314 Cable Scrapers. 14-cu. yd. capacity struck, 17.5-cu. yd. heaped. Designed for use with tractors of more than 110 HP. Easily converted for use with T-300 Tractor to become high-speed TS-300 Motor Scraper.

4-YD. HYDRAULIC SCRAPER
FOR smaller jobs with either track type or industrial, rubber-tired tractors. Improved, single-unit hydraulic system provides direct and instantaneous control of bowl and ejector, plus down pressure on the cutting edge when needed. 4-yd. or 2-yd. sizes available.

C-108 and C-106 CABLE SCRAPERS
The C-108 is an 8.4- to 11-cu. yd. scraper for use with tractors of 75 to 110 HP. The C-106 has capacities from 6.1- to 7.5-cu. yds. and is ideal for use with 55 to 75 HP tractors. Both scrapers have the same outstanding performance characteristics as the larger C-314.

There is a size and type of LaPlant-Choate Scraper for every earthmoving job — see your LPC distributor today.



LaPlant-Choate DOZERS
Famous LPC Dozers, both angling and straight blade, are available in hydraulic types in D2, D4, D6, D7 and D8 sizes, or in cable-operated types in D7 and D8 sizes.

LaPlant-Choate RIPPERS
The Model RP-82 heavy-duty three-tooth ripper for use with large size tractors.

LaPlant-Choate TAMPERS
LPC Tampers are available in two popular sizes — the DSR 224 double drum and the TSR 336 full oscillating triple drum.

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Cedar Rapids, Iowa

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JOB-TAILORED Cements

FOR MODERN CONCRETE CONSTRUCTION

STANDARD PORTLAND

MODIFIED PORTLAND

HIGH EARLY

LOW HEAT

SULPHATE RESISTANT

PRONTO

PORTLAND POZZOLAN

BRICK MIX

PLASTIC CEMENT

OIL WELL CEMENT

SPECTROGRAPHIC ANALYZER—analyzes cement samples by vaporizing them in the heat of an electric arc, separating their elements into the colors of the spectrum and photographing results for interpretation.

Concrete used in modern construction practice is no longer an arbitrary mixture of cement, water and aggregates.

Cement content, consistency and proportions of aggregates are carefully computed to obtain the most economical and structurally sound concrete required for the specific project. Many present day projects require special purpose cements; as concrete research has proven that Standard Portland cement does not always make the most durable concrete under certain job conditions.

PERMANENTE JOB TAILORED CEMENTS are manufactured to meet the toughest "specs" in concrete construction! Highly trained chemists, in a plant laboratory equipped with the most up-to-date apparatus available to the industry, exercise close control over the entire manufacturing process. By spectrographic analysis of the finished cement, physical and chemical tests of prepared concrete samples, they are able to predict within extremely close tolerances, the performance of PERMANENTE JOB TAILORED CEMENTS on any given job.

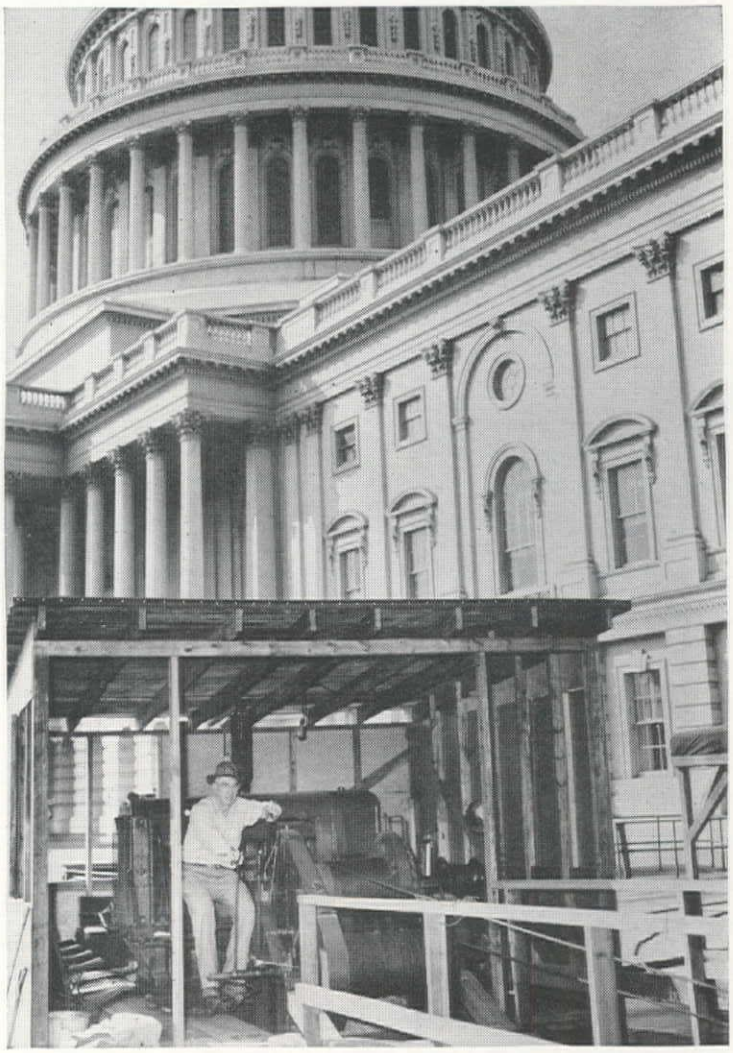
PERMANENTE CEMENT COMPANY

On the job - On time

PERMANENTE, SANTA CLARA, YOSEMITE AND KAISER BRANDS OF PORTLAND CEMENT AND PERMANENTE LIME PRODUCTS

OAKLAND • PORTLAND • SEATTLE
ANCHORAGE • FAIRBANKS • HONOLULU

Fast job on Capitol Hill

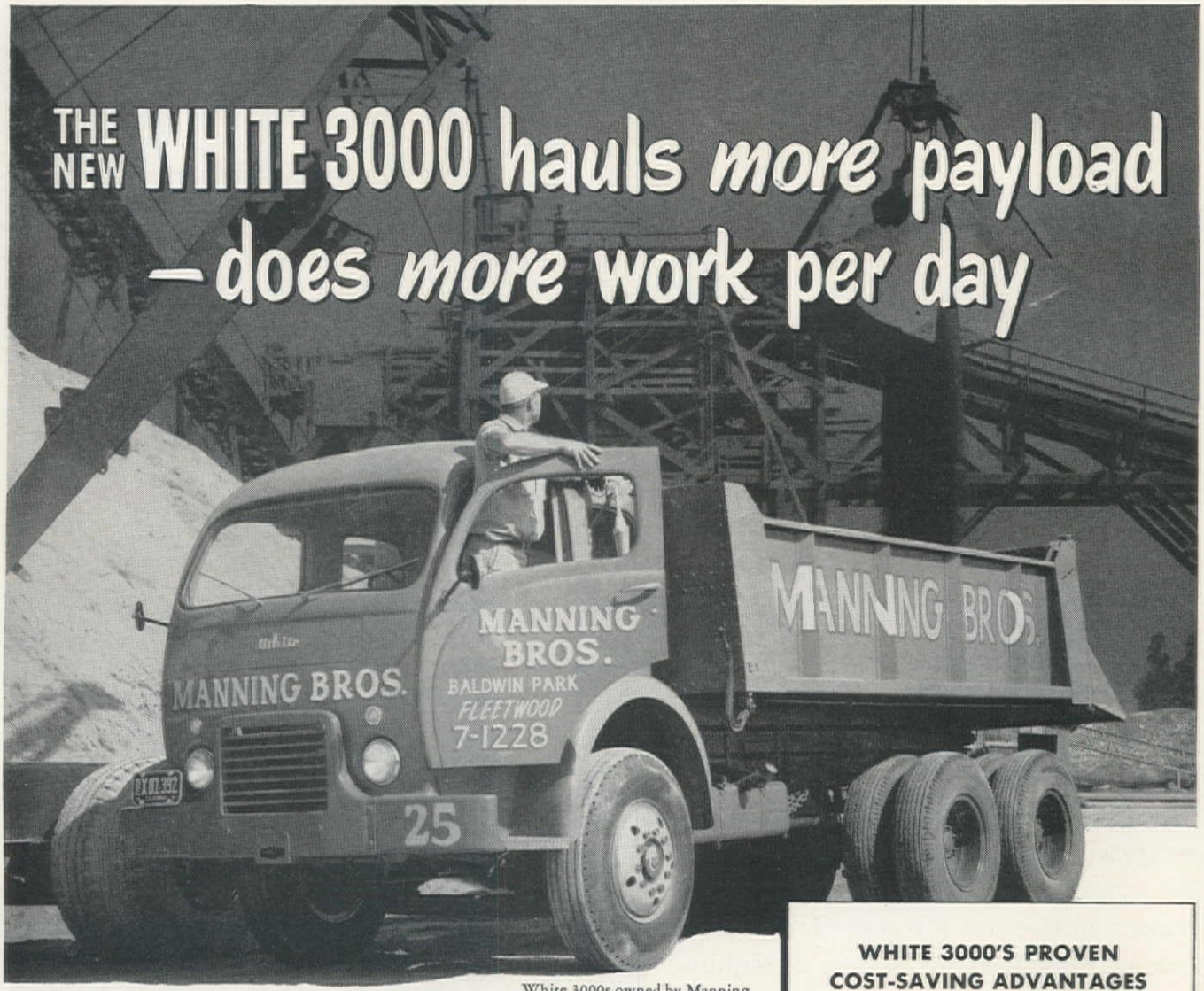


When renovation of the U. S. Senate and House wings of the nation's Capitol was ordered, there were two main conditions attached to the job. First, it must be done with all possible speed. Second, it had to be thoroughly fine work.

Contractor on the job was Consolidated Engineering Company of Baltimore, Md. To insure swift, smooth hoisting of materials, they used two American Model 75 General Purpose Hoists, purchased from General Supply & Equipment Co., Inc. of Baltimore.

Operated by a father and son team—R. G. and C. M. Stevens—these rugged, dependable hoists have carried the work along without a single interruption for service or repairs. One more proof that the more important the job, the greater the need for American Hoists!

THE NEW WHITE 3000 hauls *more* payload —does *more* work per day



White 3000s owned by Manning Bros. carry greater legal payloads thanks to the new White 3000 system of weight distribution.

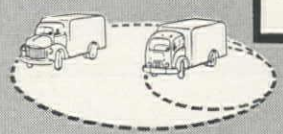
Get the facts of White. Discover the extra capacity and maneuverability of this completely new kind of motor truck. See how it makes more trips per day with greater economy and safety. Watch as the turn of a key tilts the cab—providing complete front-end accessibility for quick, easy maintenance. Learn how you can profit through this *new idea* in transportation. Your local White Representative is ready to prove the earning power of the sensational 3000—in terms of your own business. Call him today.

White EMERGENCY SERVICE CORPS

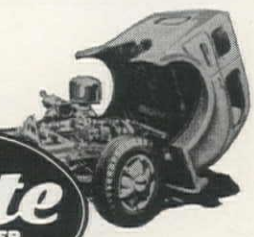
. . . . pledged to keep White trucks and busses operating efficiently during the National Emergency.

WHITE 3000'S PROVEN COST-SAVING ADVANTAGES

1. Saves driver time and energy ...gets more work done.
2. Complete front end accessibility cuts maintenance cost. Makes service easier.
3. New safety features
4. New weight distribution permits longer bodies...more payload.
5. Saves space on the street...in the garage...better maneuverability.



Shorter Turning Radius Saves Maneuvering Time. Better Cab Accessibility Saves Driver Time.



White SUPER POWER 3000

Tips its cab to service

THE WHITE MOTOR COMPANY

CLEVELAND 1, OHIO

Pacific Coast Branches and Dealers in all important cities

FOR MORE THAN FIFTY YEARS THE GREATEST NAME IN TRUCKS

Construction Men LOOK UP TO . . . . .

OWEN
The Universally Popular BUCKETS

A mouthful at every bite"

● Yes, "ON THE JOB" Construction men all over the world are "SOLD" on OWEN BUCKETS for excavating, material handling, dredging, etc. Standardization on OWENS is common practice, but proven wise practice.

If our catalog isn't in your files or on your desk, just drop us a line and we'll dispatch your copy to you promptly.

THE OWEN BUCKET CO.
6060 BREAKWATER AVE. • CLEVELAND 2, OHIO
Branches: New York, Philadelphia, Chicago, Berkeley, Calif.

ROCKMASTER "16" TIMINGS

Rockmaster No.	Avg. Time of Each Delay from Zero (milli-seconds)
0 (zero)	0 (inst.)
1	8
2	25
3	50
4	75
5	100
6	125
7	150
8	175
9	200
10	250
11	300
12	350
13	400
14	450
15	500
16	550

Split . . . a . . . second the ROCKMASTER way

and you get Controlled Blasting

THE ROCKMASTER blasting system offers you a choice of *sixteen* split-second delay detonators. Fit the right ones for your job into the complete system—including the correct explosive, drilling pattern and loading procedure—and you've got the key to a smooth flow of blasting power that can mean true

***controlled* force . . . *controlled* throw . . . *controlled* breakage.**

We help you tailor the system to fit your requirements, often with substantial savings in drilling and dynamite, too.

ROCKMASTER may be the answer to your problems whether you blast coal, rock, ore . . . on the surface or underground. Write for your free copy of the ROCKMASTER "16" booklet that includes diagrams of typical loading in quarries, strip pits, mines, and many types of construction.

ROCKMASTER: Reg. U. S. Pat. Off.

Offices in Principal Cities

ATLAS EXPLOSIVES

"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

SAN FRANCISCO 4, CAL. ATLAS POWDER COMPANY SEATTLE 1, WASH.

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Denver 5, Colorado

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and
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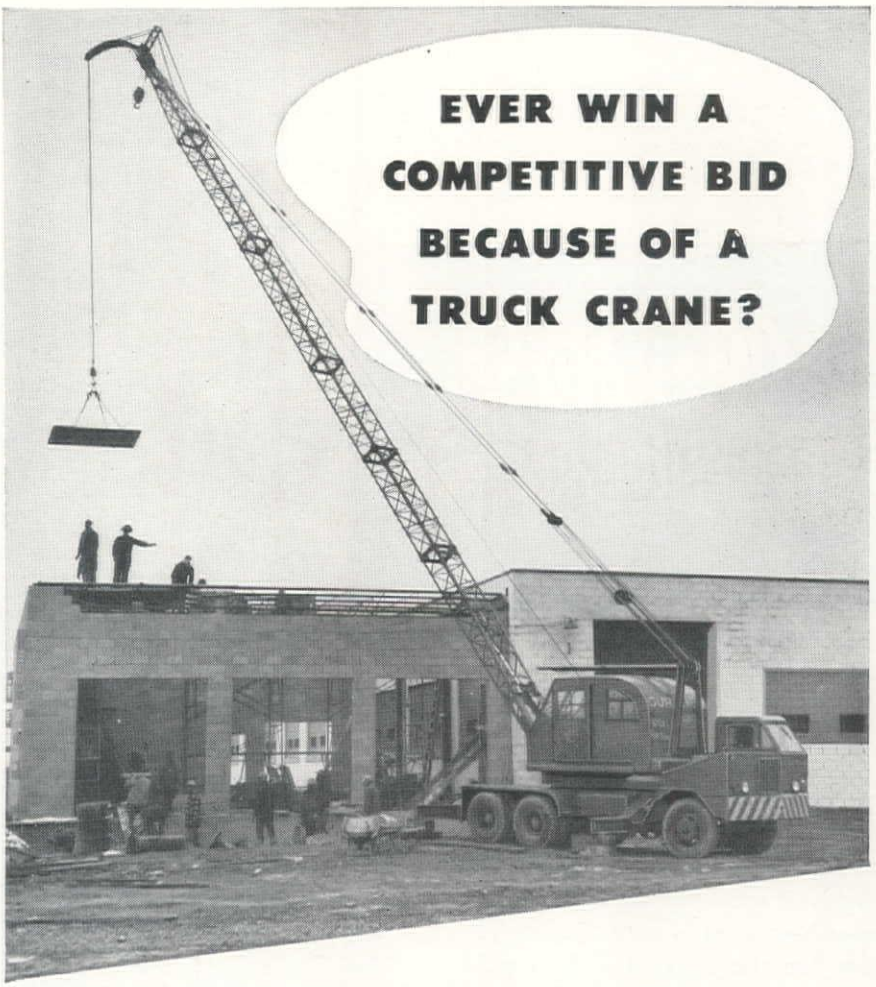
107 N. Main Street
Las Vegas, Nevada

●

NEIL B. McGINNIS CO.
P. O. Box 3615
500 South Central Ave
Phoenix, Arizona

●

SMITH, INC.
1620 First Avenue North
Fargo, North Dakota



Here's one contractor who did! As an example of the advantages inherent in MICHIGAN Truck Cranes, Mr. Gurtzweiler of Henry Gurtzweiler, Inc., Toledo, cited a competitive-bid job.

Other contractors figured on the necessity of using a large crane with long boom to reach from outside a building being erected. Gurtzweiler, taking advantage of his MICHIGAN'S compact size and maneuverability, planned to work from a central point *inside* the building. Result? Henry Gurtzweiler, Inc. got the job . . . another of the many on which the MICHIGAN has given them a competitive advantage.

Moreover, Mr. Gurtzweiler states that although the truck crane is five years old and never has had an idle day, it is still in perfect condition and has had very little maintenance. Why settle for less? Next time you need a truck crane . . . get a MICHIGAN!

MICHIGAN POWER SHOVEL COMPANY
430 Second Street, Benton Harbor, Michigan, U. S. A.

Best Start for foundation cost savings!

Monotube taper-flute steel piles

USING every possible way to save construction materials, time and money is always important. Today it's doubly so. And one of your best ways is with Monotubes. Just see the advantages you gain with these cast-in-place steel piles!

MATERIALS CONSERVED

Monotubes' tapered design and cold-rolled properties not only *save steel,* but also provide unusually high bearing values and exceptional lateral stability. So it's not uncommon to meet load-bearing requirements with less driving . . . or even *fewer* piles. And, because Monotubes are readily extendible on the job, with easy cut-off and simplified weld-splicing, further materials conservation is afforded.

TIME AND MONEY SAVED

You can see how materials are saved —*plus* time and money. And there are *more* economies! Monotubes' taper-flute design results in faster driving. Lighter, standard driving equipment can be used on most jobs. And, Monotubes' light weight makes handling and locating faster and easier.

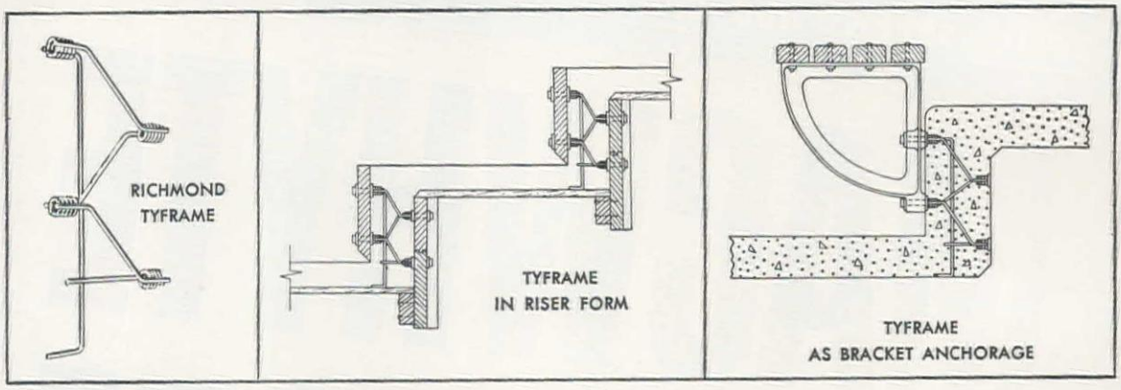
GET COMPLETE INFORMATION

Send for all the interesting facts about Monotubes. Find out how their many advantages can help you save right at the start of your construction projects. For complete data, write The Union Metal Manufacturing Company, Canton 5, O.

UNION METAL

Monotube Foundation Piles

TYFRAMES—A SURE-FIRE SHORT CUT FOR RISER FORMS AND SEAT BRACKET ANCHORAGE



Richmond Tyframes—with Richmond Tyscrus—greatly speed and simplify two important phases of stadium construction.

This truss-like arrangement of wire struts, with a leg at the front face extending down to the soffit, supports the riser form rigidly and in exact position without the use of raking timbers or other external bracing.

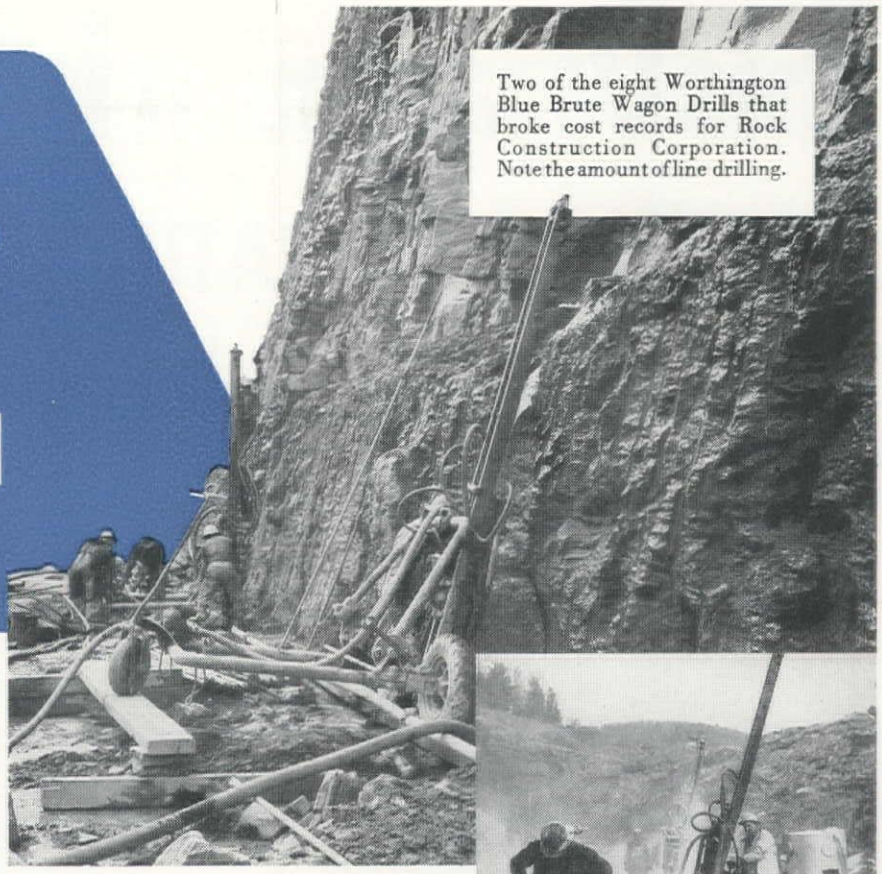
This device is also highly desirable for anchoring seat brackets in poured concrete, as shown—also ideal for hanging steam and water pipes on concrete walls.

Get your "Screwy" or "TY" button — write to A. H. Pilling at Richmond, 816 Liberty Ave., Brooklyn 8, N. Y.

RICHMOND KNOW-HOW—DEPENDABILITY—SERVICE—ESTIMATES & JOB PLANNING

300,000 YARDS

maintenance still too low to be figured



Two of the eight Worthington Blue Brute Wagon Drills that broke cost records for Rock Construction Corporation. Note the amount of line drilling.

President Walt Dunham and Engineer A. Bruce Lattanzi in the company's Downsville Dam office.

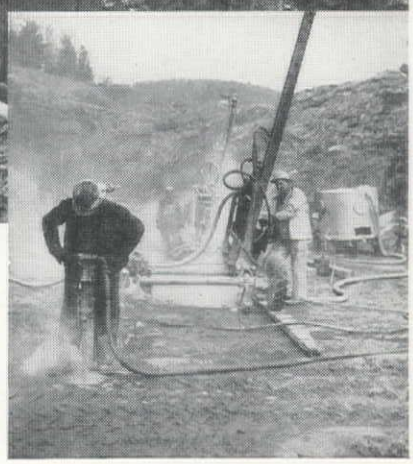
Two 500! Worthington Blue Brute Air Compressors supplying air for drills at the Downsville Dam.

Line drilling in blue stone is child's play to those Worthington Blue Brute Wagon Drills.

Rock Construction Corporation of Kingston, New York, working on the Downsville Dam weir and waste channel, got service out of eight wagon drills that constantly amazed them.

Walt Dunham, president, reported: "We have drilled as much as 700-800 feet per 8-hour day per machine. In 165 working days, the machines put out 300,000 cu yds with so little maintenance it can't be figured in cost per yard."

This job also used a number of Worthington Blue Brute Hand-Held Rock Drills. Says Mr. Dunham: "There has been absolutely no maintenance cost. Our operators like them better than anything they have ever used."



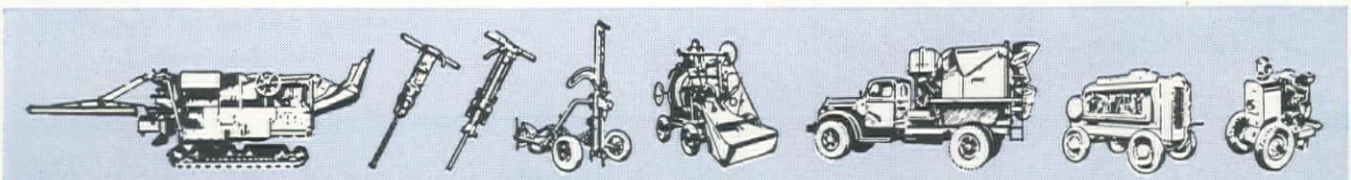
Worthington Blue Brute Rock Drill operating ahead of the wagons collaring hole for laying out line drilling.

Contractors everywhere know that a Worthington Blue Brute team—air compressor and tools—makes mincemeat out of even the toughest jobs. See your nearby Worthington distributor for a demonstration. Worthington Pump and Machinery Corporation, Construction Equipment Division, Dunellen, N. J.

WORTHINGTON

BUY BLUE BRUTES

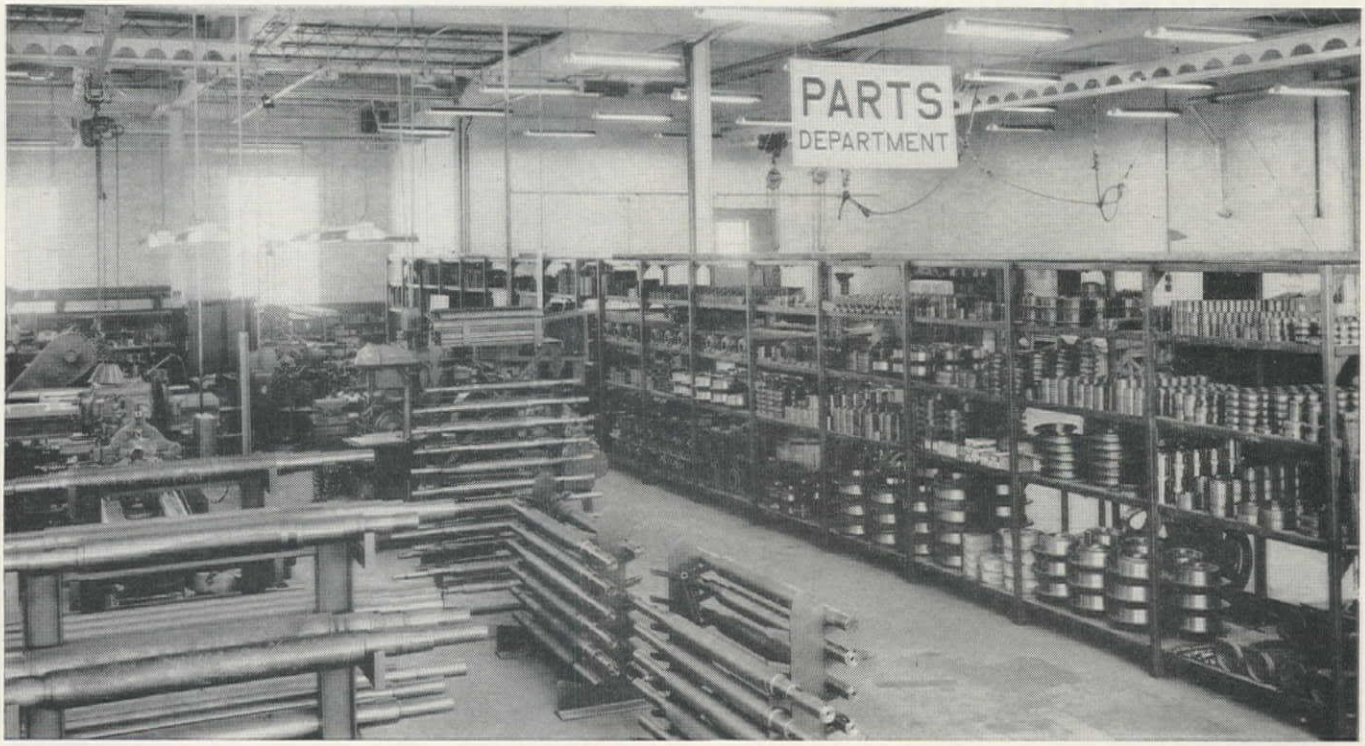
H.1.5



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

This Department Is Never Busy

. . . but SECO VIBRATING SCREENS ARE!



• *Long-Life PERFORMANCE Means Profitable Screening for SECO Users*

If you have Seco vibrating screens on your job . . . it's good to know that you can get *quick service* on any parts replacements you may ever require. That's part of Seco's service policy . . . another of the reasons why you put your confidence in the Seco organization.

. . . BUT HERE'S SOMETHING MORE IMPORTANT!

Seco vibrating screens are *built to endure*. The smooth, balanced performance of patented Seco vibrating screens pays off in long life . . . and a holiday from excessive maintenance worries. *It's a proven fact!* Thousands of busy Seco vibrating screens can't keep our parts department busy. Send for Seco catalog No. 203.

SECO

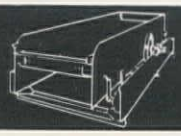
TRUE CIRCULAR ACTION VIBRATING SCREENS

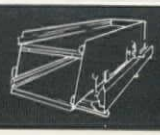
FOR INFORMATION SEE YOUR LOCAL SECO DISTRIBUTOR

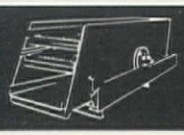
BALZER MACHINERY CO.....Portland, Oregon
ENGINEERING SALES SERVICE, INC.....Boise, Idaho
NATIONAL EQUIPMENT CO.....Salt Lake City, Utah
CHANEY MACHINERY SALES.....San Francisco, Calif.
WESTERN MACHINERY CO.....Spokane, Washington

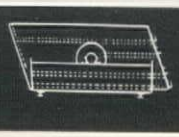
SCREEN EQUIPMENT CO., Inc.
1750 WALDEN AVENUE, BUFFALO 25, N. Y.

One of America's Leading Makers of Vibrating Screens Exclusively


SINGLE DECK


DOUBLE DECK


TRIPLE DECK


THREE AND ONE HALF DECK

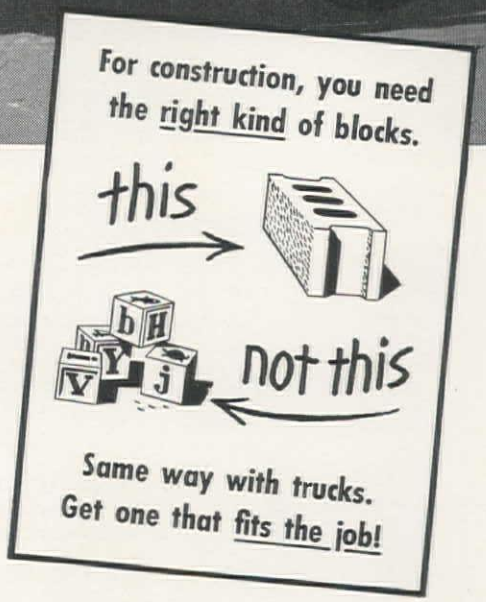
HARNISCHFEGER CORPORATION: MILWAUKEE, Wis., 4490 W. National Avenue
HARNISCHFEGER CORPORATION: SAN FRANCISCO, Calif., 82 Beale Street
***Warehouses Service Stations:* SEATTLE, LOS ANGELES, SAN FRANCISCO**

See your P&H Dealer

EL CENTRO, California.....Purdy & Holmquist, 1275 Main Street
FRESNO, California.....Allied Equipment Company, 1824 Santa Clara Street
LOS ANGELES, California.....Lee & Thatro Equipment Co., Inc., 820 S. Santa Fe Ave.
NAPA, California.....Berglund Tractor & Equipment Co., 1016-18 Soscol Ave.
SACRAMENTO, California.....Sacramento Valley Tractor Co., P. O. Box 1522
SAN DIEGO, California.....Southern Equipment & Supply Co., 2025 South Harbor Drive
EUREKA, California.....Riley & Williams, Inc., Broadway and Clark Streets
BOISE, Idaho.....Olson Manufacturing Company, P. O. Box 1487, 400 Warm Springs
RENO, Nevada.....Mack Truck Sales, 1131 W. 4th Street
PORTLAND 14, Oregon.....Loggers & Contractors Machinery Co., 240 S.E. Clay Street
SALT LAKE CITY, Utah.....Western Machinery Company, 748 West 8th, South
SEATTLE 8, Washington.....Bow Lake Equipment Co., 300 Michigan Avenue
SEATTLE 4 Washington.....Glenn Carrington & Co., 91 Columbia Street
SPOKANE 15, Washington.....F. M. Viles & Co., Inc., N. 1107 Freya

WER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FAB. HOMES

Here's the POWER you want on your job... plus DEPENDABILITY



Whether you're hauling dirt, spreading asphalt, or doing one of many other rugged jobs, you want a truck that fits the job —and provides plenty of low-cost power. Such a truck is a Dodge "*Job-Rated*" truck.

New Dodge "*Job-Rated*" trucks provide more power than before. On 2½-ton models, for instance, Dodge now offers a new 114 hp engine . . . the most powerful Dodge engine ever available in that field. And on high-tonnage models twin carburetion and exhaust system gives you plenty of extra power with extra economy.

And talk about maneuverability! Shorter turning diameters and new worm-and-roller steering gears on many models make the new Dodge "*Job-Rated*" trucks far easier to handle.

If it's dependability you're after, (and who isn't?) you'll go for features like the new Dodge moistureproof ignition and the new high-torque capacity starting motor. They help make starting easier in bad weather.

There's a Dodge "*Job-Rated*" truck to fit your need *exactly*. Get the proof from your nearby Dodge dealer today.

DODGE "Job-Rated" TRUCKS

How Dodge Trucks are "*Job-Rated*" for the Construction Business

A Dodge "*Job-Rated*" truck is engineered *at the factory* to fit a specific job . . . save you money . . . last longer.

Every unit from engine to rear axle is "*Job-Rated*"—factory-engineered to haul a specific load over the roads you travel and at the speeds you require.

Every unit that SUPPORTS the load—frame, axles, springs, wheels, tires, and others—is engineered right to provide the strength and capacity needed.

Every unit that MOVES the load—engine, clutch, transmission, propeller shaft, rear axle, and others—is engineered right to meet a particular operating condition.

"Job-Rated" TRUCKS DO THE MOST FOR YOU

30 POUND
PAVING BREAKER
Model 17

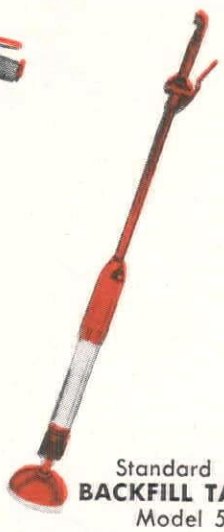
60 POUND
PAVING BREAKER
Model 23

70 POUND
PAVING BREAKER
Model 24

80 POUND
PAVING BREAKER
Model 25

SPIKE DRIVERS
All Sizes

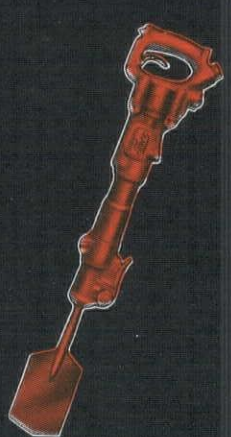
SHEETING DRIVER
Model 25S



Standard Duty
BACKFILL TAMPER
Model 55T

Heavy Duty
BACKFILL TAMPER
Model 66T

Light Weight
CLAY DIGGER
Model 412



Heavy Duty
CLAY DIGGER
Model 18

Light Weight
TRENCH DIGGER
Model 412T

Heavy Duty
TRENCH DIGGER
Model 19

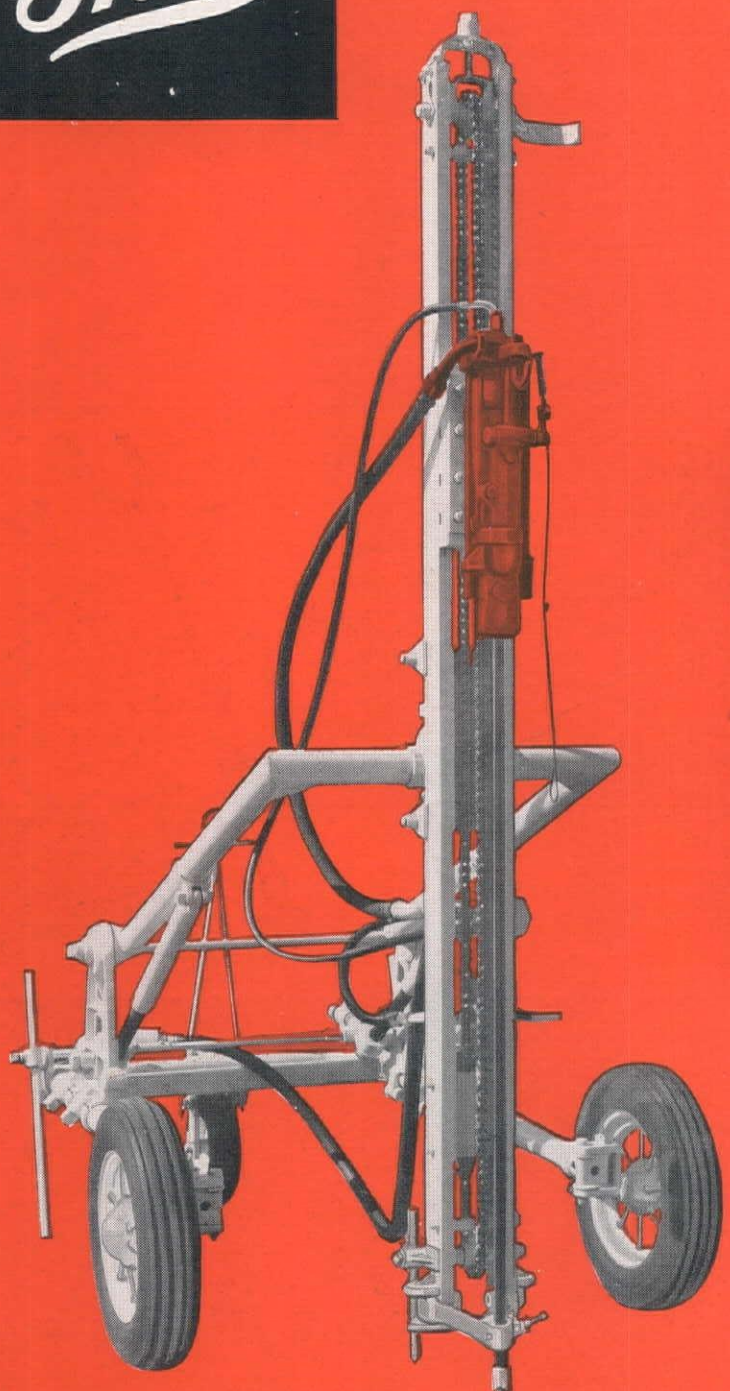
Thor — maker of the famous "25" breaker, champion of the heavy hitters — is *first choice* in construction tools for POWER . . . for a complete line of tools for every job.

Thor

PORTABLE POWER

TOOLS

Thor



SUMP PUMPS
Two Models
Up to 160 Foot Heads

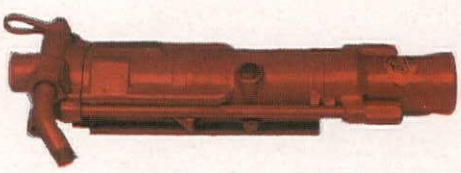
PIN DRIVER
Model 18

30 POUND SINKER
Model 28

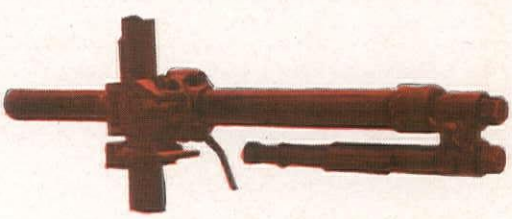
35 POUND SINKER
Two Models

45 POUND SINKER
Model 38

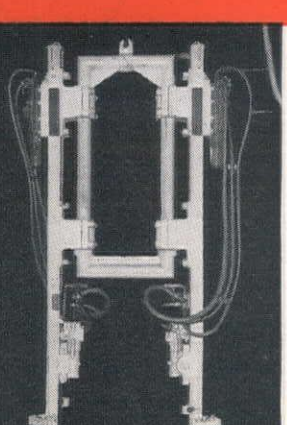
POWER FEED DRIFTER MOUNTING



3″ AND 3½″ DRIFTERS



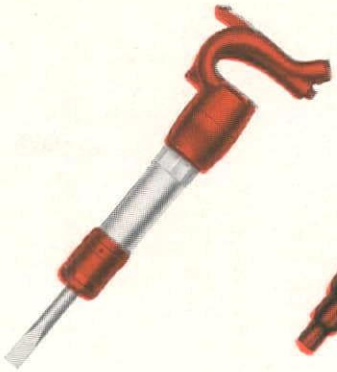
AIR BAR FEED
Converts Drifters and Sinkers to Power Feed Drifting



Here's Thor POWER — in the Thor Model 105 drifter, most powerful rock drill in the Thor line — mounted on a wagon rig that's designed for operation at all angles . . . equipped to feed and return rapidly, or as slow as two inches per minute! Tandem Mast Mounting (left) for pipe line drilling.

PNEUMATIC CONCRETE VIBRATOR
Model 521

CONCRETE GRINDERS
Four Models



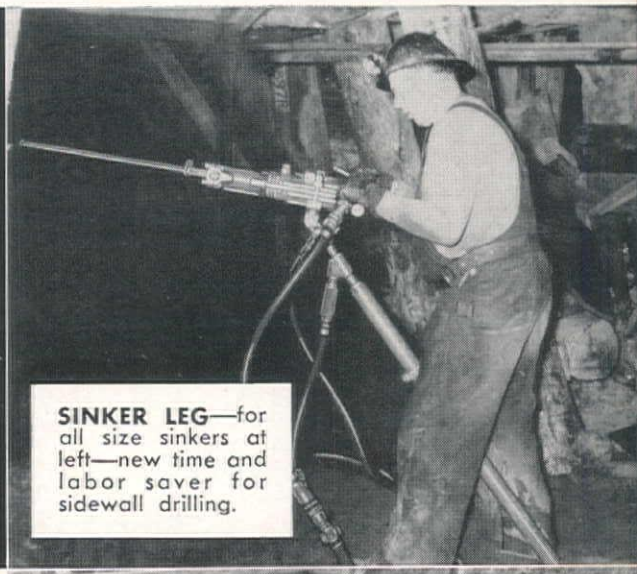
CEMENT CHIPPING HAMMERS
Five Sizes

NAIL DRIVERS
Five Sizes

55 POUND SINKER
Model 72

55 POUND SINKER
Model 75

80 POUND SINKER
Model 85B



SINKER LEG—for all size sinkers at left—new time and labor saver for sidewall drilling.

STOPERS
Six Sizes

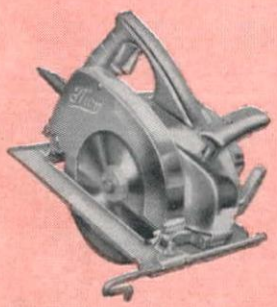
STOPER LEG
Converts Sinkers To Stopers

AIR COLUMNS
For Faster Drifter and Stoper Setups

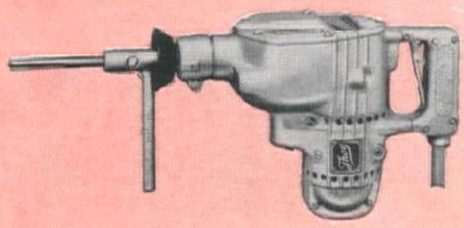
EARTH BORING TOOLS — Thor pneumatic drills for driving augers or "fish tail" bits in laying of gas and water lines, electric conduit and cable under paved roads, alleys, driveways, etc. Also widely used for down-hole drilling of post holes, trenches, etc.

Thor CONTRACTORS TOOLS

ELECTRIC



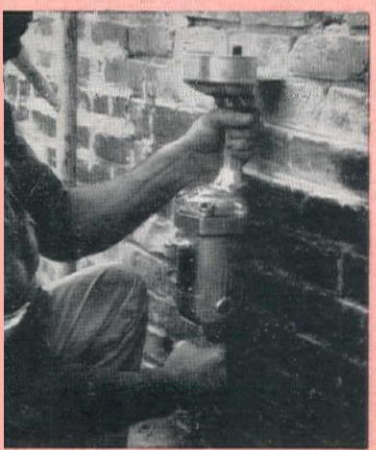
SAWS



HAMMERS

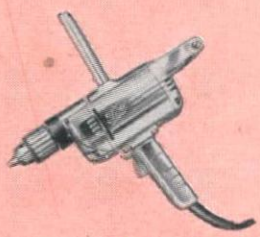
IMPACT WRENCHES

BELT SANDERS



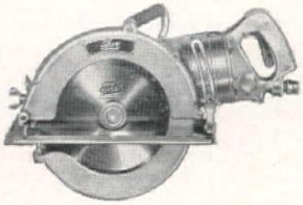
TUCK POINTING GRINDER

GRINDERS AND SANDERS



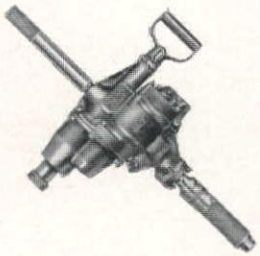
DRILLS AND DRILL STANDS

PNEUMATIC

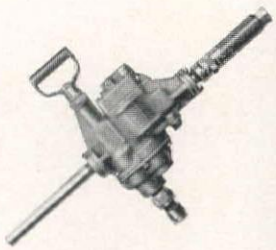


SAWS

IMPACT WRENCHES



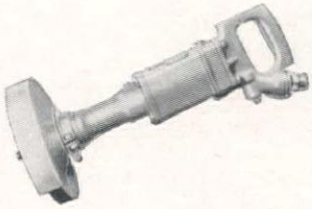
DRILLS



WOOD BORERS

RIVETING HAMMERS

RIVET BUSTERS



GRINDERS

WELD FLUX SCALING HAMMERS

INDEPENDENT PNEUMATIC TOOL COMPANY

AURORA • ILLINOIS

BIRMINGHAM, ALA.
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BUFFALO, N. Y.
CHICAGO, ILL.
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STANDARD ENGINEER'S REPORT

DATA

LUBRICANT RPM Multi-Service Gear Lub.

UNIT Heavy-duty final drive

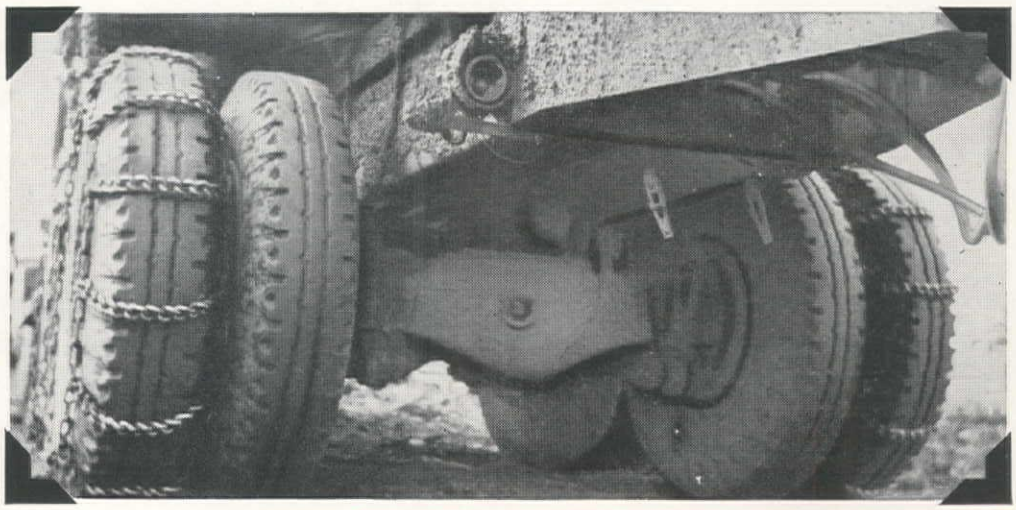
OPERATION Hauling logs from woods to mill

CONDITIONS 5 to 16% soft road grades — grit and extreme temp.

FIRM Camas Lumber Co., Grangeville, Idaho.

Special lubricant stops gear trouble where others failed!

UNTIL RPM MULTI-SERVICE GEAR LUBRICANT was used in this differential, gears and lubricant consistently gave trouble within 200 miles of operation. Three other lubricants failed in temperatures and pressures developed on grades "so tough a jeep can't make them." Gears had to be replaced several times. With RPM Multi-Service Gear Lubricant, the unit now has operated without repair for over a year. It is drained completely and refilled only at intervals of 15,000 miles.



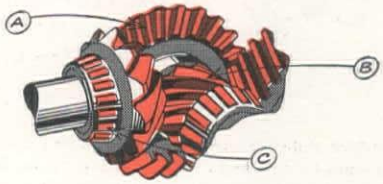
THIRTY TO 40 TON LOADS are usual for the tractor and trailer. About 15 miles of a 25-mile haul is on dirt woods roads where grades are 14 to 16%. They are often deep mud from rain and melting snow. Out of the woods on a surfaced road there are 11 miles of constant 5 to 6% grade where high temperatures are developed in drive gears.

REMARKS: RPM Multi-Service Gear Lubricant will give you longer service from both truck and passenger car gears operating in severe service. It is especially recommended for hypoid gears of all types. It comes in several grades to meet all weather and operating conditions.

RPM

TRADEMARK "RPM" REG. U.S. PAT. OFF.

How RPM Multi-Service Gear Lubricant prevents wear in severe conditions



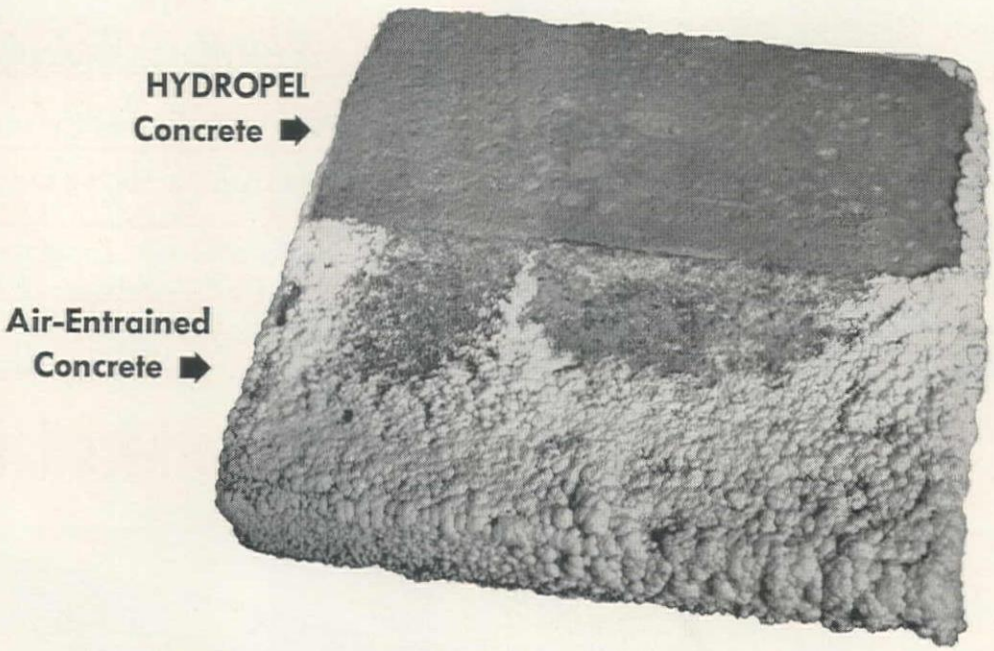
A. Contains a special compound that reacts chemically with metal and forms protective lubricating coating... resists rubbing action of hypoid gear teeth.

B. Withstands extreme pressures and temperatures... highly oxidation resistant. Keeps gears and bearings cool.

C. Inhibitors resist rusting, stop foaming in cases. Lubricates integral bearings and other parts. Will not separate.

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

STANDARD OIL COMPANY OF CALIFORNIA



This block—one-half HYDROPEL Concrete and the other half air-entrained—sat in a shallow layer of saturated salt solution until all liquid evaporated. The solution was sucked through the air-entrained concrete by capillarity, leaving salt crystals on the surface. Note that the HYDROPEL Concrete absorbed almost none of the salt solution—free from destructive salt crystallization.

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HYDROPEL is a unique type of liquid asphalt emulsion, added as the concrete is mixed. It gives you MANY benefits. Why not try HYDROPEL on one of your TOUGH spots? Here are a few of the many problems in concrete that HYDROPEL has solved.

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Case History No. 2

A group of new homes in Lima, Ohio, were built with the first floor well below grade—with walls and floors of concrete. In one house, HYDROPEL Concrete was used as a test. Torrential rains came. Where ordinary concrete was used, the houses had to be pumped out. The "HYDROPEL house" was the only one that stayed dry. Tests of all well-known admixtures proved that HYDROPEL Concrete resists capillary moisture approximately FIVE TIMES better than any other admix.

Case History No. 3

A Connecticut city was plagued with early disintegration of concrete in their curbs, gutters and sidewalks—from freeze-thaw action and de-icing salts. HYDROPEL Concrete was ordered used in all these locations. Inspection, after several years' use, showed the HYDROPEL Concrete to be in perfect condition.

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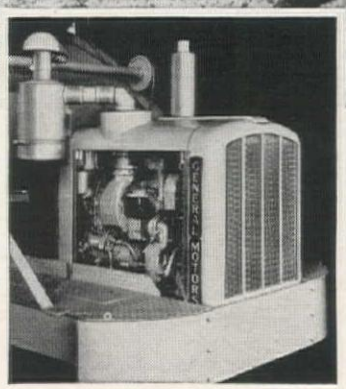

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A $2,000,000 program is now under way in Eureka, California, to improve existing water and sewerage facilities. New and larger mains—three treatment plants—a large reservoir—and a new 500,000-gallon Horton elevated water tank are being built not only with today's municipal requirements in mind, but with an eye towards future growth.

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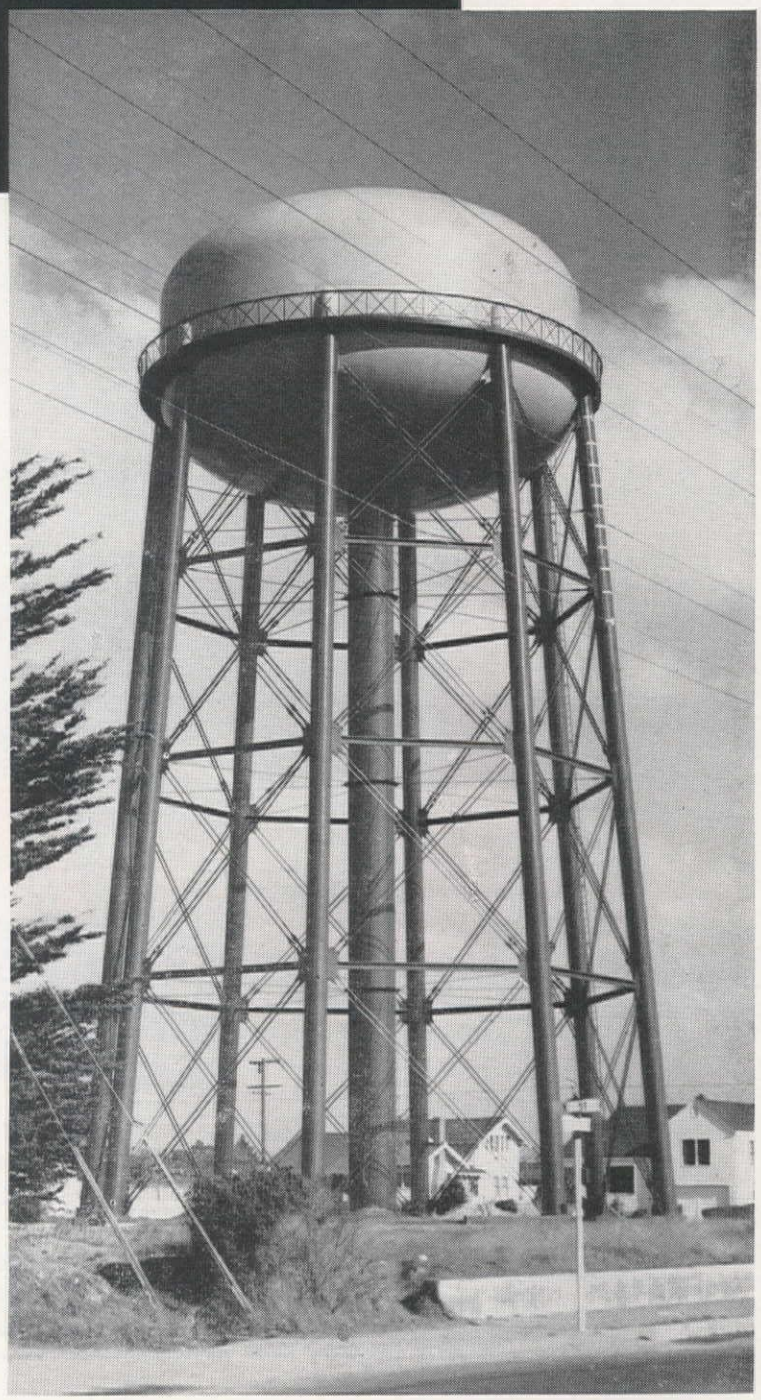
The 500,000-gallon Horton tank recently installed in Eureka, California, is shown at the right. It is 99 feet to bottom.



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WESTERN CONSTRUCTION

June 1951 Vol. 26, No. 6

JAMES I. BALLARD . . . . . Editorial Director
JOHN J. TIMMER . . . . . Managing Editor

Protect Today's Highways But Plan For the Needs of Tomorrow's Vehicles

AS CONTROVERSY increases between trucking interests and highway departments it becomes more and more evident that the basic disagreement is a failure to argue about the same thing. There can be no resolving of a controversy until there is a well defined and common basis for discussion.

Briefly, the automotive and trucking interests—their Western voice is not too unreasonable—demand that highways be built to match possible future developments in heavy vehicle design and manufacture. On the other hand, the nation's highway engineers point to their problem of holding together a weakening system of roads for the greatest public good, in the face of mounting costs and inadequate funds. The problem of designing and building highways adequate for the over-the-road hauling units that could be built tomorrow is one thing, and the accelerating disintegration of the present highways is quite another. There is no common answer to these two different problems. Consider them separately.

There is much precedent to back the position of the truck manufacturers and operators. Their contention that highways have evolved under the pressure of vehicular improvements is true. No highway engineer will disagree with the fact that modern road design, with its features of flatter curves, lower grades, sight distance and width of lane, has resulted from automotive progress. Further, the trucking interests are on sound ground in their contention that American progress is founded on mechanical and industrial development and curtailment is unthinkable, particularly as it relates to the nation's strength and defense. In a word, this side of the unjoined controversy points up the need for highways which are in stride with automotive progress. The position calls for two immediate comments: (1) The talk relates to the roads of tomorrow—not those that exist today and (2) it does not include any tangible plan for paying for these more expensive highways.

These comments, in turn, highlight the position of the highways departments and their unsolved problem. First, they hold a public trust in preserving the investment made over the years by all highway users in the highways *as they exist today*. Second, opposition to increased taxes for highway construction is so vigorous, even to keep present highways up to date, that building more costly roads appears impossible without completely new financing. Highway building technique is such that roads can be built to accommodate any vehicle of the future—for a price. But for those surfaces and structures which have been designed for the loads of today, it is only common sense and in the public interest to place necessary restrictions on their use. If a small proportion of the users find these routes inadequate, the highway engineers still have their responsibility to the many. The contention of trucking interests that highway transport is a cheaper means of moving items of general commerce is possibly valid, but a difficult public benefit on which to levy taxes. It is hard enough to secure even a small increase in assessment directly on the highway user, and any hope of legislative action calling for a general tax to provide highway betterments in the interests of commercial hauling is fantastic. Payment in proportion to direct benefit remains the rule for highway financing.

The issues remain separate. First, the existing roads are a public trust in the hands of the highway departments to be kept in the best possible condition for the traffic of today. On this issue the automotive and trucking interests must yield to rules and regulations based on the best engineering judgment. Second, the future of automotive design assures increasing pressure in regard to advances in size and weight of vehicles, which will bring a new era in highway construction. On this point all elements of automotive production and the commercial users should apply their many abilities in a constructive program for helping highway departments advance plans for securing increased highway funds, if the private and public interests in highways are to advance. These roads of tomorrow can be engineered and built, if they can be financed.

Highway Subjects Have Common Interests

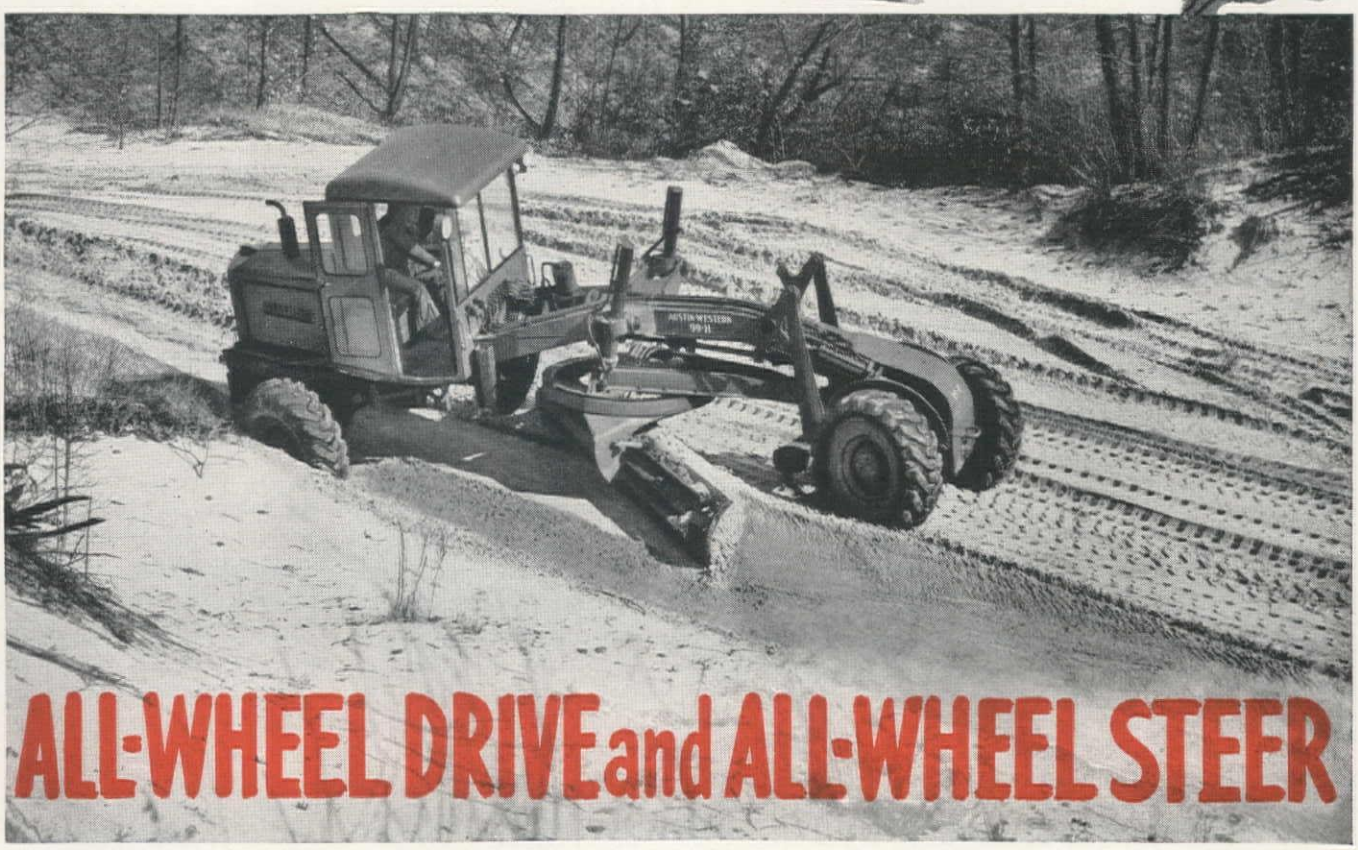
COMMON INTERESTS extend throughout all phases of highway engineering and construction. The counting of traffic, which is normally considered a function of highway administration, is also of direct concern to the maintenance man and the bridge designer. Likewise, the construction procedure developed for a city street may produce an idea that can be translated into a useful application for a primary state highway. Materials of construction are the same for roads built by states, counties or towns.

This issue is devoted to articles within this broad framework of "road building" and each has information of interest to all branches indicated in the check list. However, as a help in pointing out the major features covered in each article the list is repeated and checked.

- Administration . . . . ✓
- Design . . . . . ✓
- Construction . . . . . ✓
- Maintenance . . . . . ✓
- Municipal . . . . . ✓
- Bridge . . . . . ✓

Like "scotch and soda"—

they Go Together



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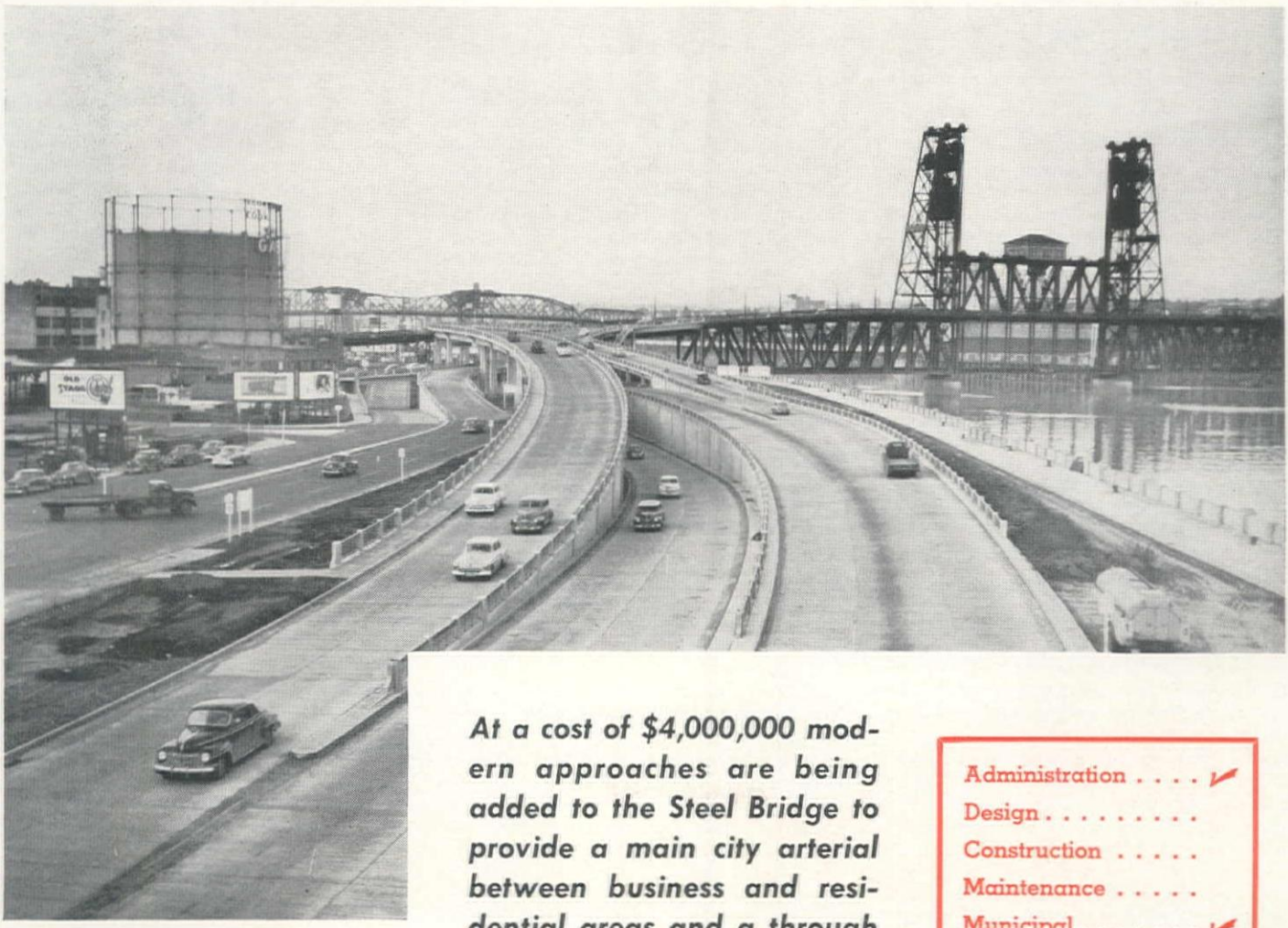
Complex Bridge Project at Portland For Oregon's Major Traffic Problem



At a cost of $4,000,000 modern approaches are being added to the Steel Bridge to provide a main city arterial between business and residential areas and a through route for two important interstate highways

Administration	✓
Design	
Construction	
Maintenance	
Municipal	✓
Bridge	✓

THE LARGEST and most complex municipal traffic and bridge project to be carried out by the Oregon State Highway Department is nearing completion in Portland. Basically, the problem was to find a solution for getting both local and through traffic over the Willamette River with proper regard for the centers of business and residential areas, using an existing bridge to save the cost of another major structure. The solution provides an extensive approach and interchange structure on both ends of the Steel Bridge which was the only crossing not carrying capacity traffic. The new approaches on the west end of the project are complete and in operation. The east approaches will be completed during the current season.

Combined with a smaller project which provides traffic separation on the eastern end of the Broadway approach—next bridge to the north—the program represents a major development in the ultimate solution of the Portland traffic problem. In its final form the combined units of this project, including heavy right-of-way costs, will total more than $4,000,000.

The problem

In total area the city of Portland is almost equally divided by the Willamette River flowing north to a junction with the Columbia. Unfortunately, as far as traffic problems are involved, about 85% to 90% of the business, commercial and industrial section lies on the west side of the river, while possibly 75% of the residential area lies to the east. The local traffic problem within the city is obvious, with its severe morning and evening peaks. Growth of the city and its industries, both during and since the war, have accentuated these problems. Further, the area which will probably provide space for major residential development will continue on the east side of the river.

In addition to this local traffic, with its heavy morning and evening peaks, two major U. S. highway routes traverse the city. U. S. 99W and 99E represent the main Pacific Coast highway with heavy truck and tourist travel, and U. S. 30 is the Columbia River route, the main east-west arterial for the State of Oregon. At present, these two heavily traveled routes intersect within the traffic area of the city and both cross the river at or near the downtown area. Ultimately a complete relocation of the north and south highway (U. S. 99E and 99W) might provide a solution in the

PICTURED ABOVE—

ON THE WEST SIDE of the Willamette River these new approaches to the Steel Bridge will permit an uninterrupted flow of through traffic (north and south) and the heavy daily peak from the business section to the major residential area across the river on the east side. These structures were placed in service last year, and the corresponding approaches on the east side are scheduled for completion late this year.

form of a major by-pass route, but this has not been considered as an immediate solution because of the excessive cost involved.

A further complication in this particular traffic problem was provided by the major railroad routes, with both the north and south main line of the Southern Pacific and the terminal of the Union Pacific crossing the Willamette on a private bridge (Steel Bridge) and entering the Union Station on the west side near the business district.

The present bridges

During the development of the modern city eight bridges have been constructed across the Willamette River. The Sellwood bridge is near the southerly limits of the city and the St. Johns bridge is about 10 miles to the north.

Four of these bridges provide crossings leading directly into the business section (Morrison, Burnside, Steel and Broadway) within a one-mile stretch of the river. Normal traffic growth now fills most of these bridges to capacity during peak hours. They all are 4-lane structures with the exception of the six lanes provided on the Burnside bridge. About the close of the war, the growing pressure of traffic indicated that a solution must be found for the next period of years to provide a means for increasing the capacity of these existing bridges. In addition to the cost, the disadvantage of an additional structure was the fact that these bridges all provide low-level crossings, representing another factor disrupting commercial traffic on the river.

Of these structures, the so-called "Steel Bridge" offered the best opportunity for traffic improvement. This crossing is a privately built and operated railroad bridge completed in 1910. It carries the main line trains of both the Southern Pacific and Union Pacific into the Union Station, as well as providing four lanes of vehicular traffic on its upper deck. In common with the other Portland bridges, it has a lift span to accommodate ship traffic on the river. A unique feature of the Steel Bridge is the double-action of its lift, whereby the lower railroad level can be lifted separately to allow passage of small craft and the total lift, which includes elevating the upper highway deck, needs to be used only occasionally. By generally accepted understanding, the larger ships do not move along the river during the rush traffic hours on the bridges.

Because the approaches to this bridge were the least improved, it carried the smallest vehicular load. As a result, it represented the largest potential capacity for increased traffic if proper approaches could be added.

The solution

Following long study of the problem by the State Highway Department and the City of Portland, the proposed solution provided: (1) leasing of the top deck of the Steel Bridge by the State Highway Department for 30 years to insure the permanence of the plan; (2) the construction of extensive approaches on both ends, including a 3-level interchange on the west side to accommodate an uninterrupted flow of north and south traffic, combined with viaducts to serve the business district without any intersections at grade, and (3) supplemental improvements at the east end of the Broadway Bridge to get the northbound through traffic past this structure without interruption.

West approach structures

The structures forming the west approach on the business district side of the river are completed and in operation. As a result the design and construction of this major portion of the entire project can be outlined.

Ramps were required to handle the eastbound traffic from four approach streets—Harbor Drive and Front running parallel to the river, and Everett and Glisan Streets eastbound from the business district. The through traffic on U. S. 99W uses ramps from Harbor Drive, crossing the river and continuing north.

Each of these on-ramps provides two lanes, which merge into the two lanes eastbound on the bridge. This merging traffic has resulted in a minor problem during rush hours when the peak load from the four lanes representing two ramps has to adjust itself to two lanes on the bridge. Normal traffic volume presents no problem at these points. No precedent was available to determine the length of this merging area and available space was at a minimum. It is possible that longer merging zones might have improved the traffic flow during rush hours.

General arrangement of this series of structures is illustrated by the photograph. A model of this interchange was prepared and used to acquaint civic bodies and laymen with the general arrangements of the project. Incidentally, this program provides the first 3-level grade separation structure in Oregon. All of these several approaches had to climb to the elevation of the upper-deck bridge in a relatively short distance and a maximum grade of 6.5% was adopted in the design.

General design features

The structures comprising the west approach ramps to the Steel Bridge, in general, consist of several series of continuous concrete deck girder spans merging into filled vertical cantilever retaining wall sections at the lower elevations. Although most of the structures were built on curves, by designing the beams and diaphragm beams for equal spacing the engineers made it possible for the contractor to make a multiple reuse of forms. The use of plywood as a form liner was required on all exposed concrete surfaces.

All of the columns for the concrete spans and the bases for the retaining walls were set on footings supported by piling. As the permanent ground water level was approximately 20 ft. below the ground line, composite piling were used consisting of a 50-ft. length of untreated fir piling topped with a metal shell filled with concrete. This type of composite unit is a standard Raymond Concrete Pile Co. piling. The concrete-filled metal shell portion of these composite piling averaged 24 ft. in length. Approximately 85,000 lin. ft. of composite piling were used.

Foundation problems

Since a considerable portion of the area occupied by the new structures was formerly the site for a commercial gas company many interesting but unforeseen conditions were encountered during the excavation operations. At several places old brick walls as much as 5 ft. thick were found a few feet below ground line. At one spot a large masonry pit full of sticky tar residue was uncovered. At another spot a column footing landed near the edge of an old concrete slab, which had been the base of a large stack, and it was necessary to cut through 8 ft. of this old concrete base before piling could be driven for the new footing. A large unfilled concrete basement was found at one location. Traffic had been traveling over the top of this basement for many years without apparent harm. All of these unforeseen underground obstacles tended to provide headaches for the contractor.

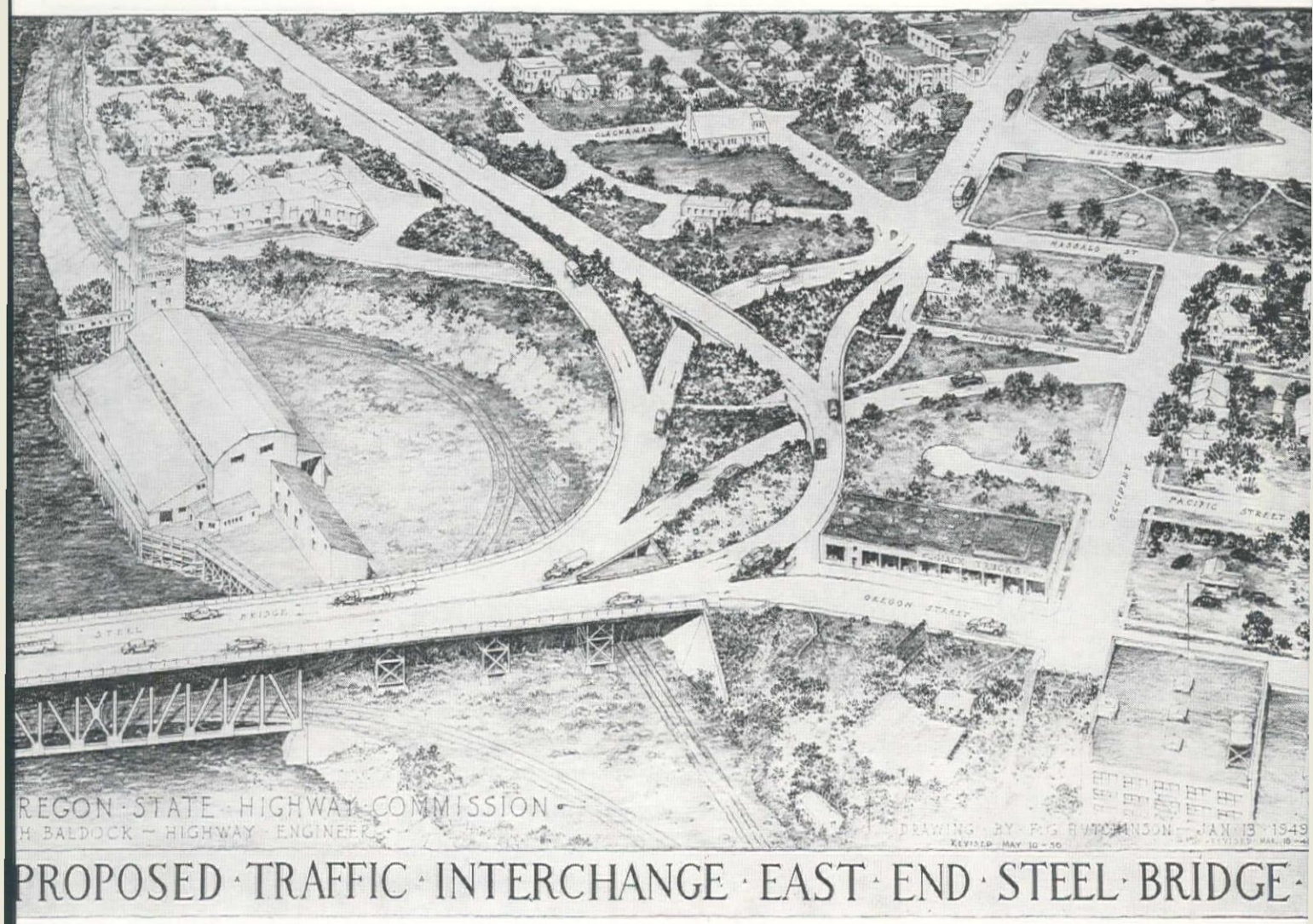
The lowest point in the grade line of one of the southbound roadways is 12.5 ft. above sea level, while the Willamette River only 150 ft. away has been known to reach elev. 30.0. When the river is at an elevation below 9.7 the drainage from all the roadways is taken care of by gravity through the city storm sewer system. When the river is in flood stage the drainage and seepage is carried to a sump and pumphouse. In this pumphouse are two 1,750-gpm. electric pumps which discharge the drainage water into the river. During the year 1949 the river reached a flood stage of 26.0 with the seepage and drainage water being handled very easily by the pumps.

The contractor used crawler cranes for many phases of the work, using them as draglines for excavating, and to lift forms, falsework and reinforcing steel into place. Concrete was lifted in bottom-dump buckets and deposited into hoppers placed on the decks of the various structures. Vibratory screeds were used to aid in the placing of concrete for the decks.

The contract for all of the grading, paving, structures, etc., for the approaches to the west end of the Steel Bridge amounted to $1,300,000 and was performed by the Kuckenberg Construction Co. of Portland. The work was supervised by Lee Gordon assisted by Merle Henderson. Work on the contract was started January 1949 and the approach was opened to traffic on August 11, 1950.

Present work

At the east end of the Steel Bridge another series of structures is now being built to carry the north and southbound traffic to and from Interstate Avenue which leads to Vancouver, Washington. There are also various ramps and roadways to disperse traffic into the east side residential district. One of the structures is a divided structure carrying four lanes of traffic to the Steel Bridge and consists



CURRENT construction is concentrated on these eastern approach structures which will distribute local traffic into the major residential areas. This system of approaches will also handle north and southbound traffic connecting with Interstate Ave. leading to Vancouver, Wash.

of standard concrete deck girder spans totalling about 500 lin. ft. Three other structures carry the main north and south highway over intersecting streets or roadways. The work has required the removal of many houses and business buildings. Contract for the grading, surfacing, pavings, structures, etc., on the section from the Broadway Bridge to the Steel Bridge amounts to $598,000 and is held by C. J. Montag & Sons of Portland, Oregon. The work is actively supervised by C. C. Montag and H. O. Montag assisted by George Marr and L. L. Mace. Work was started on this contract on August 29, 1950 with an estimated completion date of December 31, 1951.

Detour trestle

The section of highway from the east end of the Broadway Bridge north to an intersection with Interstate Avenue at Tillamook Street also required the removal of many houses and buildings. An interesting feature of this contract was the task of carrying the new highway under the east approach to the Broadway Bridge. This approach consisted of a fill between heavy concrete retaining walls. It was not possible to divert traffic during construction of the two-span concrete structure built to replace a portion of the filled approaches, as the Broadway Bridge is a very important east-west arterial carrying approximately 50,000 cars per day. Traffic was handled by building two detour trestles to carry the traffic around each side of the new structure. The limited distance from the portal of the Broadway Bridge to the new undercrossing structure required the use of sharp curves on the trestle but traffic was handled satisfactorily.

Included on the contract was a two-lane concrete viaduct approximately 1,200 ft. long which carries the southbound traffic from Interstate Avenue desiring to cross the Broadway Bridge.

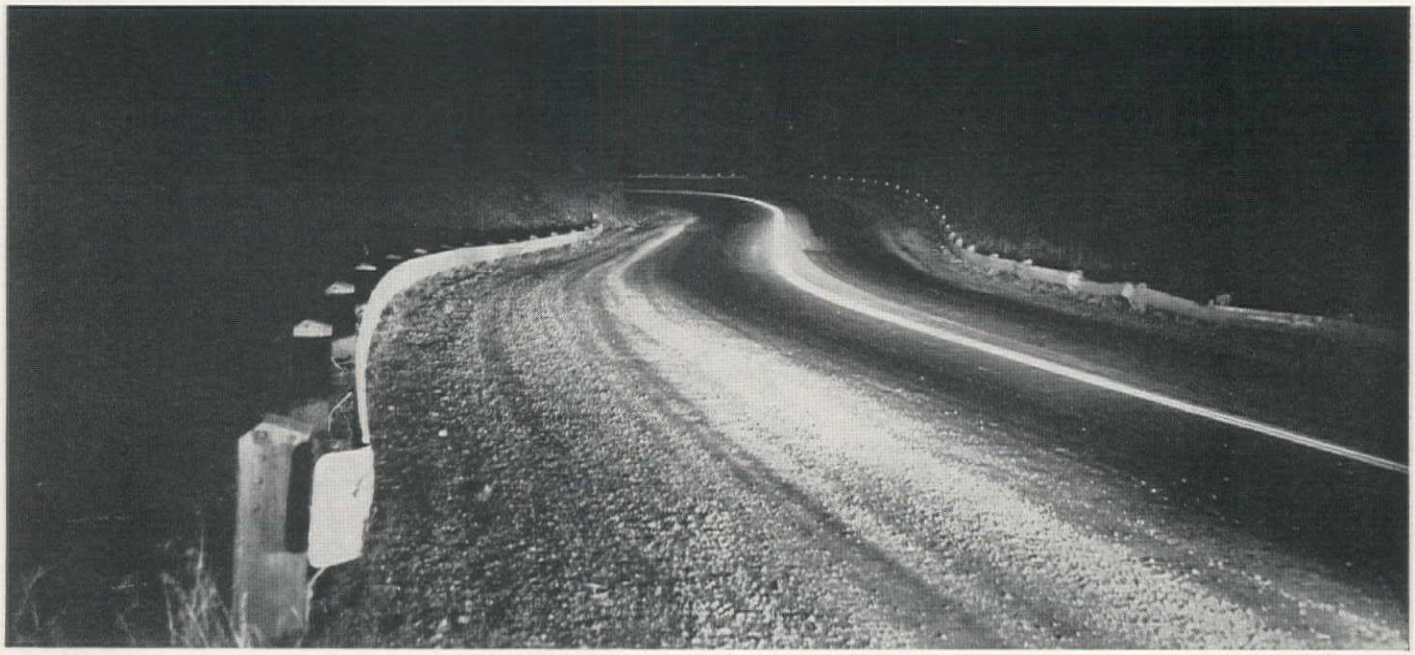
The contract for the grading, paving and structures on the Tillamook Street-Broadway Bridge section is held by C. J. Montag and Sons. The total amount of the contract is $866,000. Work was started September 30, 1949. Since then all structures have been completed and are in use. All work on the contract will be completed September 30, 1951.

A contract was awarded to the General Construction Co. of Portland on January 23, 1951 to redeck the highway deck on the Steel Bridge. The present decking consists of 1-in. asphalt planks on 2 x 12-in. untreated cedar which is supported by 5-in. treated timber planking on treated timber ties. As the treated material is in good condition it was decided to remove the asphalt planking and 2 x 12 cedar planks and replace with treated 2 x 2 lumber. A 1¼-in. wearing surface of asphaltic concrete is to be placed as the final surface. On the lift span the asphaltic concrete wearing surface is to be made of a light weight aggregate to avoid excessive adjustment of the counterweights. This contract amounts to $170,773 and it is expected to be completed by September 30, 1951.

It is estimated that the entire project consisting of the four major contracts will be completed and in use by December 31, 1951.

Personnel

R. H. Baldock is Highway Engineer, Oregon State Highway Department; G. S. Paxson, Bridge Engineer; P. M. Stephenson, Assistant Bridge Engineer; J. T. Skelton, Resident Bridge Engineer for the west end of the Steel Bridge project, steel bridge redecking, and the structures on the Broadway Bridge-Steel Bridge section; Marshall Dresser, Resident Bridge Engineer for the structures on the Tillamook Street-Broadway Bridge section; A. G. Skelton, Division Engineer for the Portland District; and D. J. Barbee, Resident Engineer on grading and paving for the entire project.



Colorado Holds Training Conference to Promote—

Uniform Highway Marking Procedure

- Administration . . . . ✓
- Design . . . . . .
- Construction . . . . .
- Maintenance . . . . . ✓
- Municipal . . . . . .
- Bridge . . . . . .

State-wide uniformity of signing and striping stressed at conference attended by supervisory staffs of engineering, maintenance and traffic divisions and State Highway Patrol — Foremen display equipment and demonstrate techniques of the training program

"UNIFORMITY of operations and procedures in highway marking and signing" were stressed at the Third Annual Training Conference sponsored by the Traffic Division of the Colorado State Highway Department. Carried out under the direction of A. R. Pepper, traffic engineer, the conference was attended by engineers and foremen of the Traffic Divisions, engineers from the District Offices, Maintenance Division superintendents and officers of the Colorado State Patrol. Mark U. Watrous, State Highway Engineer, and James E. Bell, Assistant Highway Engineer of Colorado, both attended sessions of the conference. At the close of the meeting Gilbert R. Carrel of the State Patrol pledged the cooperation of his organization to assist in controlling traffic during signing and marking activities, "particularly where people have been crossing the wet stripes during marking operations."

The meeting was carried out in the form of an informal round-table discussion and most of those attending were veterans in their respective departments and experts in the field of highway traffic control. The meeting was designed to bring these men to date on current practice—both in Colorado and in other states—and to develop uniform procedures in training men to carry out field work in connection with highway marking. Problems of responsibility among foremen were discussed thoroughly, and consideration was given to the need for improving uniformity in procedures throughout the state. Discussions covered training methods, including the operation and installation of traffic signals, speed zoning policy and the use of accident records in connection with accident prevention. It was generally agreed that Colorado's present policy in reference to speed zoning should be studied continually and amended as changing conditions require.

Accident records, it was agreed, should be studied closely by men in the maintenance sections and field inspections of accident sites should be made whenever possible to determine what the Highway Department could have done, or should do, to prevent the accidents or future ones. Corrective measures would include recommendations for improving visibility on curves, installing proper guardrails and possibly widening sections of the road to prevent "repeater" accidents.

PICTURED AT TOP OF PAGE—

REFLECTORIZATION of pavement stripes is accomplished in Colorado by means of spherical glass beads mixed with paint as it is applied by pressure striping equipment. Effectiveness of the beads is shown in this view along highway west of Denver.

Signing and striping foremen put on a display of equipment and brief demonstration of procedure. The purpose of this demonstration was to indicate the techniques of the training program.

At the close of the session, the revised (Mar. 15, 1951) Field Manual of the Traffic Division was released to those in attendance. This manual supersedes the 1950 edition, and describes and illustrates Colorado's practices and policies relating to traffic control. It is to be used extensively in guiding and training all field personnel in the Traffic Division. Contents will be expanded and developed into a more comprehensive manual which will correlate national standards and practices with those relating specifically to Colorado's highway conditions. The manual includes tables and illustrations of approved signs and an outline of basic procedure and specifications for highway striping.

The remainder of this article reviews

the training program and field procedure in connection with the highway striping operations.

Training in highway marking

Field personnel who perform, supervise or administer pavement marking operations must follow the outline provided in the Field Manual for procedural guidance and training. The Traffic Division boasts of the fact that every one of its field men is capable of stepping into the next higher ranking job and perform in a satisfactory manner.

Job instruction follows a topical outline pattern to simplify and highlight the content. Major work operations are broken down to distinct units. These headings, and detailed explanation of coverage, are used for every operation. The general application is presented in this manner:

Performed by: Job performed by whom? Under whose supervision or direction?

Required preliminary information: Background necessary to comprehend and accomplish the job.

Technical references: Sources from which pertinent information may be obtained.

Equipment: Materials and equipment required to perform the job.

Procedure: Step by step instruction highlighting the key points in doing the job.

Training for pavement marking

Operation: Pavement marking.

Job breakdown: Preparation of Striping Log.

Purpose: To chart needed markings and provide instruction for placement of these markings.

Performed by: Sign and Striping Foremen, subject to approval by Maintenance and Division Engineers.

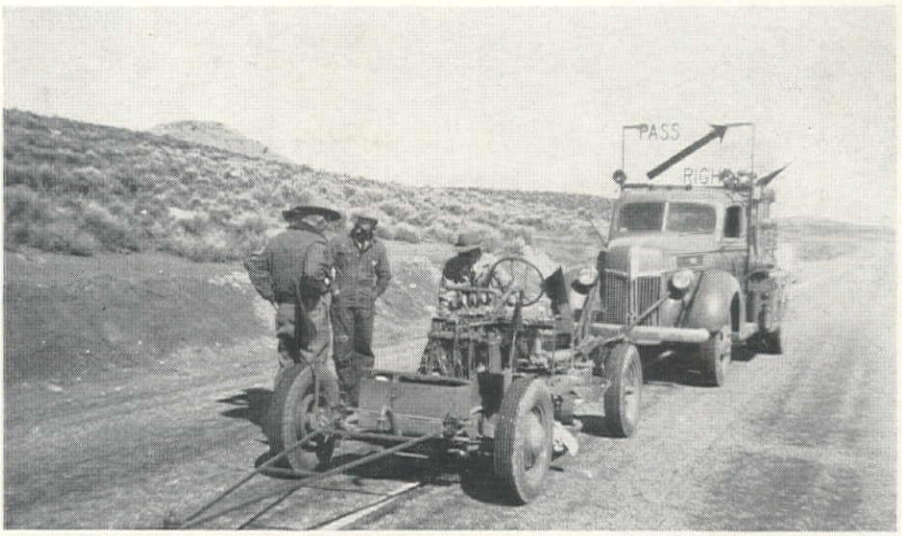
Required preliminary information: Knowledge of striping types and specifications, pavement marking warrants and sight distance computations.

Technical references: Manual on Uniform Traffic Control Devices.

Necessary equipment: S. H. Department vehicle equipped with Survey Speedometer.

Procedure: (Employee is referred to Striping Log.)

1. Begin log at main junction nearest to the striping location. Enter on the heading of the log the route number of the highway to be striped plus the beginning and terminal points of the log.
2. Set Survey Speedometer at "0". Enter junction starting point opposite the "0" reading on line 1 of the log.
3. Make mileage check from the starting point to an intersection convenient to the striping location. Enter on line 2 of the log the mileage reading and place of this intersection.
4. Proceed to the point at which center striping is to begin. Record mileage reading on line 3 plus the instruction to "Start White." Record in "Remarks" column of this same line any conspicuous landmark (such as road sign) which will serve to supplement the indicated speedometer reading reference.
5. Survey all blind curves or other areas of restricted sight distance to determine if no-passing barrier stripes are warranted. An approved method for measuring sight distance is illustrated in the Manual.
6. Clock mileage readings at beginning and terminal points for necessary barrier stripes governing both north and south traffic, and enter these readings. Enter also, as indicated in the sample log, the actual length of barrier stripes in hundredths of a mile. These figures can be converted to units in feet by the use of the chart (shown in the Manual).
7. Enter the type of no-passing stripe to be placed, whether Gap, Point or Lap. The nature of the hazard will determine the particular type used.
8. Enter in the log a description of the curve which warrants the placement of the no-passing restriction, whether a blind vertical curve (BVC) or a blind horizontal curve (BHC).
9. Upon completion of the log, enter the mileage reading at the terminal point of the lay-out and, on the same line, instructions to "END WHITE"—"END LOG."



TOP—Training of striping crews includes instruction for operators and practice with all types of equipment. A new operator is shown receiving a lesson on a "pushmobile."

BOTTOM—Typical striping crew for center marking showing "pushmobile," 5-ton truck mounting compressor, paint tanks and agitator, and rear truck for carrying flags, signs, etc.

Operation of equipment

The "lay-out" trucks in Colorado are especially equipped to place guide markings for center striping operations. These are preliminary markings which serve as reference lines for the proper placement of "T" points in marking the position and limits of adjacent no-passing barrier stripes.

Air pressure for paint application is provided by a Wagner air-brake compressor driven off the truck engine. Mounted within the body of the truck are the receiver tank, one 10-gal. paint tank (DeVilbus), one 5-gal. reducer tank (DeVilbus), an air pressure regulator and the necessary valves, gauges and connecting lines to complete the assembly. Paint is pre-mixed and diluted with an equal amount of thinner from the reducer tank, and is directed under a pressure of about 15 psi. to a flow nozzle mounted beneath the rear end of the truck. This nozzle applies a single and

THE TRAINING SESSION was held on an informal "round-table" basis. This allowed differences of opinion to be recognized, discussed and resolved in a relatively short time.

continuous lay-out line about ½-in. wide.

A vertical sight line on the windshield of the truck used in connection with a multiple pronged fork attachment fastened at the front of the truck enables the driver to steer his course down the center of the roadway by lining up the vertical prongs of the sighting attachment with the shoulder edges of the highway.

A crew of two men is required for this lay-out operation; one man to drive the truck and the other to operate the controls on the lay-out equipment. Red flags are mounted on the extremities of the truck to warn motorists of the road work in progress.

Center striping equipment

Since 1937, the Traffic Division has developed pressure striping equipment to a high degree of effectiveness for Colorado's wide variety of highway terrain. The striping mechanism consists of a 5-ton truck to which is attached a pushcart control unit. A 9-ft. V-shaped pointer and pilot wheel mounted to the frame at the front of the pushcart guides the driver in steering the cart. The overall length of the equipment, from end of the truck to nose of the pushcart, is 44 ft.

Striping appurtenances mounted on the truck bed include a Gardner-Denver compressor with a capacity of 105 cfm., an air receiver, four 60-gal. paint tanks, one 50-gal. paint reducer tank and two 60-gal. bead tanks holding 800 lb. of beads each. The tanks are DeVilbus.

Paint under pressure flows from the truck storage tanks through pipe and flexible hose to 3-in. pipe cylinders on the pushcart which screen foreign matter from the paint before it reaches the guns. On a panel in front of the paint gun operator are all the necessary air pressure regulators, gauges and manual control valves. From these, and by visual observation, the operator can control the type and color combination of stripes placed together with the rate of application. Rate of application can be varied through careful manipulation of air pressure in the paint lines and atomizing units.

Air temperature changes affect the viscosity of certain types of paint, and the nature or roughness of the pavement will often indicate the necessary rate of application. Moreover, the speed at which the cart is pushed will provide additional flexibility. Normally, the paint is forced from the tanks on the truck to the guns on the pushcart under a pressure of 40 psi., while atomizing pressure is maintained at 10 psi. above the required paint pressure.

Reflectorization of pavement stripes is accomplished by means of spherical glass beads forced from the tanks on the truck under a pressure of about 75 psi. to a gravity tank directly in front of the driver on the pushcart from which the beads flow through dispensers onto the wet paint stripes. When necessary, a nominal amount of air pressure can be introduced into the feed tank to expedite the flow of beads.

Approximately 10 gal. of paint are required per mile of broken stripe, and about 5 lb. of beads are consumed per gallon of paint.

A broken stripe attachment developed and constructed by the mechanical shop of the Traffic Division provides for the automatic placement of paint stripes at prescribed intervals for dashed lines. This device is driven by a 20-in. bicycle wheel in contact with a drum on the right wheel of the pushcart. An 8-point sprocket on the shaft of the bicycle wheel connects by chain with a 24-point sprocket attached to the shaft of a cam which in turn operates a three-way roller type Schrader valve to activate the paint guns intermittently.

A minimum crew of four is required for the operation of the entire pavement marking mechanism, one man to drive the truck, one to drive and guide the pushcart, one to operate the paint guns and another to place and pick up striping signs.

Improvement for broken stripes

Recently, a refinement of the broken stripe attachment was developed which permits still more accurate duplication of the skip stripe and facilitates the re-run operation. This revision provided for a tapered drum to replace the present straight 10-in. drum formerly used on the right rear wheel of the pushcart.

In starting the re-run, the bicycle wheel is at the center position on the tapered drum. Then while the equipment is in motion, the spray gun operator shifts the wheel to the right or left of center along the tapered surface to provide the necessary adjustment for a 15-ft. painted segment and a 25-ft. gap. Changing position of the bicycle wheel is accomplished by raising the broken stripe attachment and turning the adjusting bar.

To minimize the necessity of frequent adjustment, air pressure in the two rear tires of the pushmobile checked on trial runs, determines the desired pounds per square inch to assure a 40-ft. cycle (segment plus gap) and that this pressure be maintained thereafter.

As most of the parts are fabricated in the maintenance shops, the cost of this revision was less than $100.00.

Sign installations

Tables and specifications contained in the Field Manual are used as guides for maintenance districts in requisitioning of signs and for technical references for all units of the Traffic Division engaged in regulation, control, fabrication and processing of signs. Specifications for legend, symbol, letter size and series on all signs are also provided for use in connection with sign fabrication.

Signing foremen are taught to use sign logs in charting the requirements of new projects or replacements. Field personnel must have knowledge of highway sign warrants, location and placement, official designations and specifications, types and sizes of sign posts. A State Highway Department vehicle equipped with Survey Speedometer is used to clock the mileage and, as the logging trip is made, notes are entered on forms as the starting point, mileage to required sign installation, wording or symbol, and size and material of post needed. Completed sign log is attached to requisition.

Because erection and placement of signs must be accommodated to highway design and alignment, a degree of latitude is allowed foremen in making standard installations to meet conditions. General procedures of installing signs follow the Manual as to location, proximity of spacing, lateral distance from the roadside, angle of placement and other technical instructions.

In maintaining traffic signs, inspections are made periodically to note the legibility, visibility, effectiveness of installation, and needs for cleaning, replacing or repainting.

Full Pavement for Mountain Roads Has Many Advantages

Administration	
Design	✓
Construction	
Maintenance	✓
Municipal	
Bridge	

Paving the entire road surface from the outer edge of the fill to the toe of the cut slope has been developed by the California Division of Highways and found to provide efficient use of roadbed, safety to the traveling public and ease in maintenance

By F. N. HVEEM
Construction Engineer
and
P. R. WATSON, JR.
California Division of Highways

IN THE MOUNTAINOUS regions of California a number of roads have recently been constructed with a fully paved section, that is, with the entire road surface being made available for traffic from the outer edge of the fill (generally protected with a small dike) to the toe of the cut slopes. The first sections of this type were constructed in 1937, in both District VI and in District I of the California Division of Highways. District I covers an elongated strip along the northwest coast line of California which includes most of the coastal redwood area and is a region of heavy rainfall, often reaching 100 in. per year. This type of paved section is often referred to as the "District I Section," and a typical cross section design for a two-lane highway is shown.

Maximum amount of roadbed

The advantages of this type of section are numerous and the disadvantages few. First, of course, is the question of relative efficiency and utilization of the available roadway. Dr. L. I. Hewes of the U. S. Bureau of Public Roads pointed out a number of years ago that most highway construction in mountainous country involved cutting out very large prisms of material to accommodate a comparatively narrow traveled way. With the increase of traffic and chronic shortage of funds, it appears only logical to provide the greatest usable width for a given quantity of excavation and embankment.

Construction of small dikes of plant-mixed surfacing along the edge of fill sections is primarily intended to protect the fill slopes from erosion caused by water draining from the pavement surface. These dikes also serve to encourage traffic to use a greater width of the traveled way. To an even greater degree the extension of the paved surface across the ditch line to the toe of the cut slopes provides a maximum amount of usable roadbed.

Maintenance needs reduced

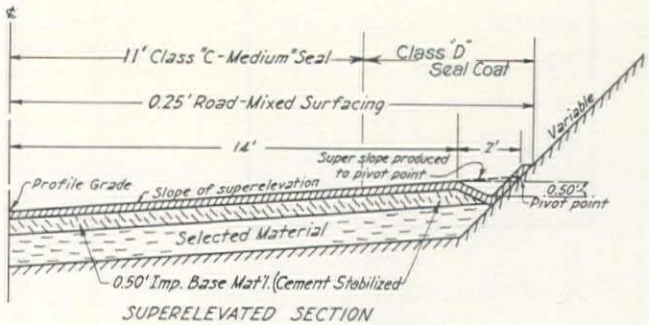
In most cases the paved gutter reduces maintenance by preventing undercutting of the pavement edge and shoulder where considerable water must be carried. This design also makes it easier to remove material that has been washed or raveled down from the adjacent slopes. In certain cases a rounded or semi-circular cross section has been tried but has proved objectionable to the maintenance forces. The most satisfactory type of gutter contour is one on which the bituminous surface can be readily placed and shaped by the operation of a blade or by a simple attachment to a motor patrol. The same ditch contour that is readily constructed in this manner has proved to be the easiest to maintain and keep clean.

The illustration indicates that the base material immediately beneath the bituminous surface has been treated or stabilized with Portland cement. This reflects a definite trend in base construction in California (*Western Construction*, February 1950). However, use of the completely paved section does not preclude the use of any satisfactory type of base material. It may also be noted that the cross section has eliminated the objectionable "trench section" beneath the pavement which many engineers consider to have been responsible for base failures in former years.

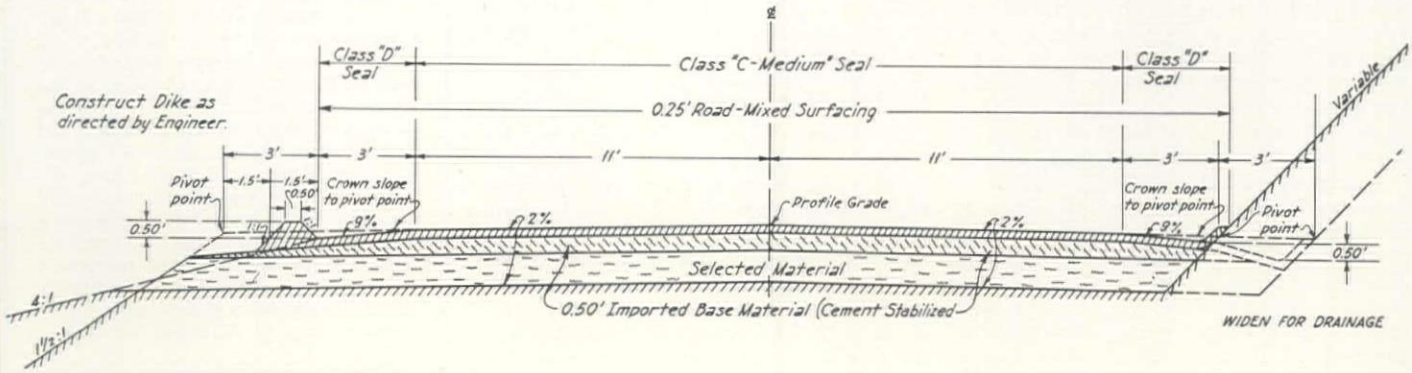
This type of construction does require that close attention be given to underground springs and seepage, and where necessary perforated pipe and pervious drainage courses should be installed.

Summarized: This type of construction appears to represent the most efficient use of the roadbed area and provides increased safety and comfort to the traveling public, and, based on evidence of performance to date, it appears that its use in California is justified and will be continued.

DESIGNED ORIGINALLY to provide for handling drainage down the cut slope in the north coastal region of California, this full-paved section has proved to reduce maintenance and provide the greatest usable width for a given quantity of excavation and embankment.

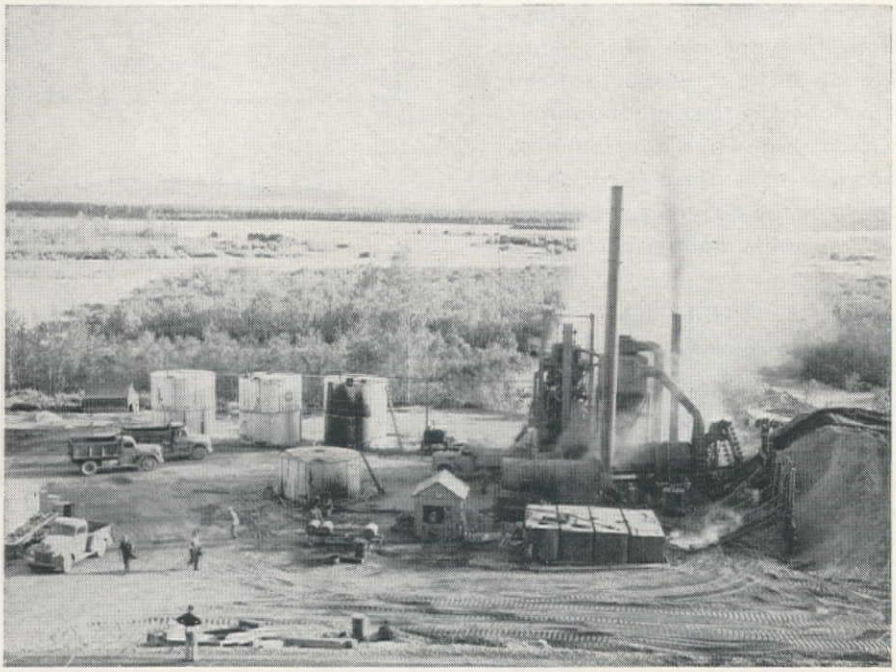


SUPERELEVATED SECTION



WIDEN FOR DRAINAGE

Alaska Road Commission Program to Add 200 Mi. of Paved Roads in 1951



ASPHALT PLANT set up by S. Birch & Sons and Morrison-Knudsen Co., Inc., for a paving contract along the Richardson Highway. Plans have been completed for the remainder of this route.

Third season of accelerated construction will emphasize asphaltic plant-mix surfacing on main routes and some work on pioneer roads to complete about one-half of the authorized program

THE ALASKA Road Commission is completing plans for a third construction season under the accelerated highway program. During the first two seasons, 340 mi. of through roads were reconstructed and paved with asphaltic plant mix and a slightly smaller mileage of pioneer roads have been completed. This year it is planned to add 200 mi. of paved highways, which will complete approximately half of the authorized paving program. Due to curtailment of funds, there will be only minor extensions to pioneer roads already under construction and a modest start will be made on the long awaited Cordova to Richardson Highway route.

Administration	✓
Design	✓
Construction	✓
Maintenance	
Municipal	
Bridge	

The new Seward-Anchorage Highway includes a 58-mi. section of existing Seward-Hope road, and the nearly completed Turnagain Arm road, 60 mi. long. Much of this project lies in the Chugach National Forest, consequently the detailed engineering is being performed by the Bureau of Public Roads with funds supplied by the Interior Department. Along the northerly 12 mi. between Indian and Potter, sections of the road are benched into solid rock occupying the old road bed of the Alaska Railroad. This necessitates construction of a new fill for the railroad along the tide flats at the base of the rock bluff. All engineering work in this section was accomplished by the Alaska Railroad. It will be open for single lane traffic about June 30 and completed to full width by November 1951.

At the Seward end, 58 mi. of the Seward-Hope road will be reconstructed this year to "through road" standards. Paving with hot plant-mix of the entire Seward-Anchorage Highway will be commenced in 1951 and completed late in the following year.

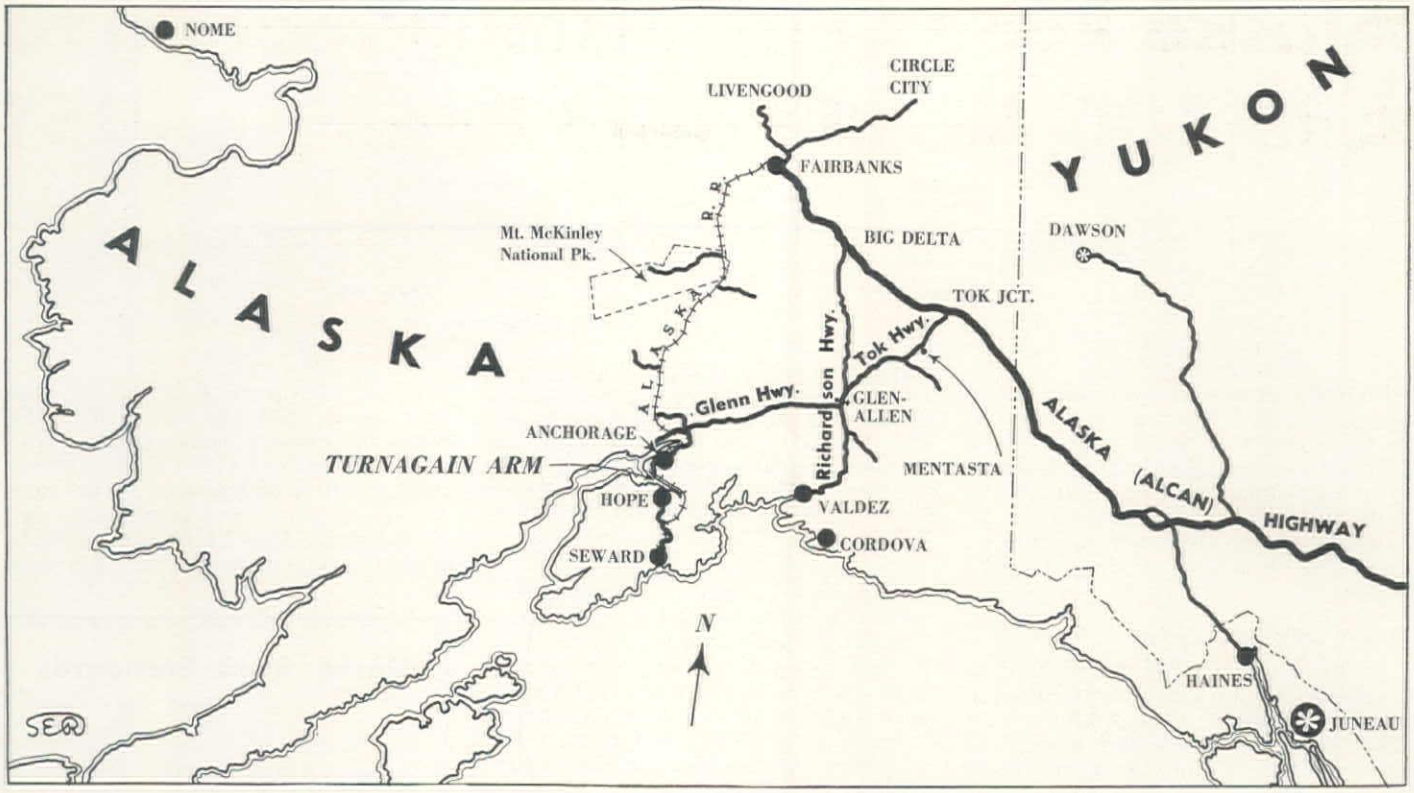
The principal construction problem on the Seward route has been the handling of large quantities of material including much rock excavation. Wet ground and poor drainage have slowed construction along much of the route. Snow slides and steep talus slopes are encountered along the location and numerous bridges are required.

Withstanding heavy loads

The Glenn Highway extends 190 miles from Anchorage to Glennallen Junction by way of Palmer. The southerly portion from Anchorage to Fort Richardson carries dense traffic, over 9,000 cars per day including heavily loaded army trucks and commercial semi-trailers 60 ft. in length. Strict inspection was exercised in the placement of select borrow for this work. The surface consists of a 2-in. plant mix 20 ft. wide placed on 4 in. of crushed base. The completed job has been tested by traffic for one year with minor damage recorded. It is likely that the width of paving will have to be increased in the near future as traffic greatly exceeds estimates and the edges of the pavement are breaking under the action of heavily loaded trucks riding on the narrow shoulder.

From Fort Richardson to Mile 60 above Palmer, moderate traffic has developed, including much local trucking. A portion of this route has been paved for two years and tested under traffic with good results. Generally, the section consists of 1½-in. plant-mix surface course, a 4½-in. crushed base and 12 to 24 in. of select borrow base. In this area frost heaving silts were removed and replaced with clean gravel so that the severe spring breakup recorded in past

FEDERAL agencies responsible for highway construction and improvements in Alaska are the Alaska Road Commission, an agency of the U. S. Department of Interior, and the Bureau of Public Roads, a bureau of the Department of Commerce. Funds for work carried out by the Alaska Road Commission are contained in Department of Interior appropriations, together with Alaska Territorial road funds under a cooperative agreement and funds contributed by private interests for specific road purposes. Generally, the authority of the Alaska Road Commission is limited to those areas outside of National Forests.



IN CASE you're not familiar with places and names in the Territory of Alaska, the map above of the southern portion was prepared by *Western Construction* as a guide. Major highways and terminal cities mentioned in this article are shown.

years is no longer a problem. However, load restrictions will be applied and strictly enforced when any weakness is observed during the thawing period.

The upper Glenn Highway from Mile 60 to Glennallen Junction will be completely paved this year, using the plant-mix surface course described above. Travel along this route is classified as light, under 300 cars per day. However, completion of the paving may see a substantial increase in the travel on this section. Frost heaving silts will be troublesome through much of this area and it is planned to overlay the silt with 20 to 24 in. of gravel. In order to preserve the insulating effect of the moss and brush roots on level or gently rolling terrain, it is planned to avoid stripping or damage to the vegetation. In such places, the gravel overlay will be dumped on the fill and pushed ahead with a bulldozer so that the mat of vegetation remains intact. It is apparent that a stable road can be constructed on frozen ground if the insulating layer is preserved so that the frozen base does not thaw. The solution is to protect and preserve the insulating layer.

Road on rock fill

The Richardson Highway adjacent to Fairbanks and Eielson Field was completed in 1949, using the heavier surface course specified for Anchorage-Fort Richardson. This section of road was placed on a rock fill constructed on the Tanana River marsh lands east of Fairbanks. The new construction has withstood heavy traffic generated by Army needs and commercial hauling. During the winter months of subzero weather, both surfacing and base have contracted, opening large transverse cracks at about 100-ft. intervals along this route. These cracks could be penetrated by a carpenter's folding rule to depths of 2 ft. or more. It was found that such cracks closed during the warmer weather without serious damage to the surface course. In order to prevent gravel from wedging into the cracks, a bituminous fog coat was applied during the first warm days in the spring.

Irregular thaws cause rollers

East of Eielson Field, the Richardson Highway has been completed as far as Big Delta, using a 1½-in. plant mix surface course. Traffic is not heavy over this section, about 500 cars per day, and the new construction has withstood one season's use with only minor damage. Some thawing of the sub-base has occurred at irregular intervals so that long rollers have developed causing an uncomfortable rocking motion to light trucks or passenger cars without snubbers. It is anticipated that these rollers will reduce in number and severity as thawing progresses and settlement of high spots occurs.

From Big Delta to Big Timber Lodge the plans have been completed for most of the route. The northerly half is located in mountainous terrain with gravel or rock base. The construction problems are not difficult except that large quantities of material will have to be moved in order to bench in to rock or talus slopes. Also, numerous gravel out-wash fans must be crossed where swift mountain streams discharge onto the relatively flat valley floor, dumping great quantities of coarse stone. During floods the lateral stream will carry rock in avalanche proportions so that stream channel, bridge and highway are filled and covered with rock.

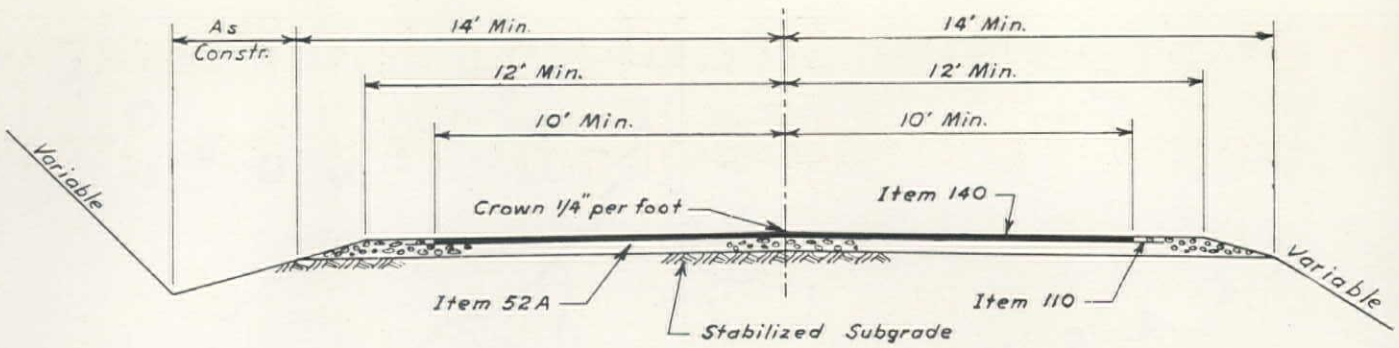
The solution consists of raising the level of road and bridge, and maintenance dredging of the stream after each major flood. The stone is placed on training dikes at either side of the channel to guide flood waters through the bridge opening. The ultimate result of such dredging and training dike construction will be the creation of a debris basin large enough to catch rock slides upstream from the bridge.

The southern half of the Big Delta-Big Timber Lodge section lies in frost

BASE COURSE SPREADER used by Williams Equipment Co. and Reed & Martin, Inc., on the Fairbanks-College paving contract.

heaving silts where heavy overlays of clean gravel will be required. In this section, borrow pits are infrequent and long hauls required so that the cost of road construction is high. It is planned to utilize the light surface course treatment, since traffic is estimated to be under 300 cars per day. Through level to gently rolling terrain, the vegetation will be left undisturbed and covered with gravel fills, as already described for the Glenn Highway, to avoid thawing of the permanently frozen base.

South of Big Timber Lodge, a 50-mi. stretch of road is under construction



TYPICAL SECTION of highway in Alaska has bituminous surfacing for a 2-lane width. Features of design include: Item 52A—gravel or crushed stone base of 4½-in. compacted depth, and shoulders; Item 110—bituminous prime coat, 22-ft. minimum width; Item 140—dense graded plant-mix surfacing of 1½-in. compacted depth topped with seal coat.

with most of the heavy grading completed in 1950. Portions of this route lie in the frost heaving silt terrain. It is planned to overlay with 20 to 24 in. of gravel, finishing off with 1½ in. of hot plant mix on 4½ in. of crushed stone. All paving is scheduled for completion on this strip of highway during the 1951 season.

Heavy rock excavation

At the Valdez end of the Richardson Highway, a 35-mi. section of road is under contract. This includes the Thompson Pass area where heavy rock excavation is required to improve grade and alignment. A rock tunnel job is included in this work. Construction of the tunnel was continued throughout the winter with all excavation completed in March. Lining the portals with concrete and placement of a concrete floor will be undertaken this spring. At the top of the Pass, elev. 3,000 ft., and about 27 mi. from tidewater, a winter maintenance camp has been operated for two successive winters. This operation has been successful in keeping the pass open during the entire winter, combating drifts which accumulated to depths of 40 to 50 ft. Shutdowns of as much as 2 days have occurred during severe storms, but due to relatively mild winters, these shutdowns have been infrequent. Snow removal equipment consists of four 20-yd. Kenworth trucks; two being equipped with railroad size V-plows and two with Bros rotary plows driven by 400-hp. diesel engines. At times when snow depths are excessive, HD-19 bulldozers have been used in advance of the plows for preliminary snow clearance.

In view of heavy cost, the maintenance of this difficult pass was not attempted until 1949 when truck travel supplying the city of Fairbanks and the military installations near by became a dominant factor. During the winter months it is estimated that 60,000 tons of freight moved through the pass bound for the interior.

This freight is in addition to capacity shipments via the Alaska Railroad to the same region. To supplement further the furnishing of construction material and supplies to Fairbanks, it is planned to improve the Haines Cutoff and maintain the Haines Summit during the winter months. It is believed that Haines Summit will be less difficult to maintain due to its sheltered location behind the St. Elias Range and its more gradual approaches, from sea level at Haines to elev. 3,000 ft. at Mile 60. This route will supplement the capacity of existing supply routes, and will serve as a military alternative in event of stoppage of other routes.

COMPLETED paving on the Glenn Highway past the settlement of Glennallen. This portion of the highway was constructed by Babler Brothers and Rogers Construction Co.

Paving of the Alaska Highway has been commenced. The section from Big Delta to Johnson River is under contract to be finished with a light plant mix surface course on prepared gravel base. Much of this ground is unfrozen and well drained. East of Johnson River a 60-mi. strip of highway was paved in 1949 and has withstood light traffic, 500 vehicles per day, with moderate maintenance. The westerly portion of this area between Johnson River and Sears Creek, broke up badly in the spring of 1950 so that it was necessary to close the road to all truck travel for several weeks. Investigation indicated that the specifications had not been rigidly adhered to, and that silt areas remained directly under the crushed base course. Silt will be removed and replaced with select

Concluded on page 157

Alaska Road Standards

	Through Roads	Feeder Roads	Local Roads
R/w Width	300′	200′	100′
Width of Roadbed	28′	24′	20′
Width of Paving	20′	none	none
Clear widths of new bridges	24′	20′	20′
Design load, new bridges	H20	H15	H15
New bridges, vertical clearance	15′	14′	14′
Bridges to remain, clear width	20′	14′	14′
Bridges to remain, safe load, posted, tons	H15	H10	H10

	Through Roads		Feeder Roads		Local Roads	
	min.	desirable	min.	desirable	min.	desirable
Sharpest curve (deg.)						
Flat topog.	11	7	14	7	14	—
Rolling "	18	11	25	11	25	—
Mountainous	36	18	56	18	56	—
Max. Grade (%)						
Flat topog.	5	—	5	—	8	—
Rolling "	7	—	7	—	10	—
Mountainous	9	—	9	—	12	—

	Through Roads		Feeder Roads	
Non-Passing Sight Distance	min.	desirable	min.	desirable
Flat topography	315	415	315	415
Rolling "	240	315	240	315
Mountainous "	165	240	165	240

Wet Weather Problems for Placing Cement-Treated Base in Washington

Plant-mixing the material requires careful planning of time for hauling and placing — Down grades present problems in handling rain water — Batch boxes and plant equipment must be capable of handling fluffy and non-flowing mixture

Administration	
Design	✓
Construction	✓
Maintenance	
Municipal	
Bridge	

By THERON B. STONE
Resident Engineer
Washington Department of Highways

WET WEATHER problems provided an important feature of the cement-treated base project carried out early last winter on the Washington State Highway (No. 14) which forms the north approach route to the Tacoma Narrows Bridge. The job involved the constructing of 6.26 mi. of the cement-treated base, topped with a plant-mix asphalt wearing surface, on the route between Purdy and Pt. Fosdick. In the following review of this project, and its field problems, the term "cement-treated base" is used to distinguish the use of selected pit materials from the road-mixing of the sub-grade material.

Design of base and surface

Design of the 24½-ft. roadway section was based on soil studies of the subgrade, anticipated traffic volume and percentage of trucks and buses. Support values required and matters of traffic flow were left to the design engineers. However, in designing the cement-treated base strength, width and thickness, some consideration had to be given to the construction requirements. A minimum of 600 psi. compressive strength was required for the project. Tests indicated 6% cement with aggregate from the state-owned pit and a moisture content of 7% would give the desired results. This was a little low, so the cement content was increased to 6½% of dry aggregate weight and the moisture to 7½-8%. It was found that probably 8½% moisture content is the top limit to be used under any condition, as the strength falls off rapidly and sticky material results, with which neither man nor machine can cope, and compaction is practically impossible. The aggregate which used 6½% cement and 7½% water contained 25% of 1-in. to ¼-in. material and 75% of ¼-in. to zero, with some small amount of silt.

The roadway design for the project called for a 6-in. thickness and was 24½ ft. wide on top with approximately 1:1 slopes at the sides. The pavement and shoulder slopes were both ¼-in. per foot. This crown is sufficient to provide rapid surface clearance of the water and also gives a little leeway for sub-surface settlement without forming pockets where water would stand. It is thought that no less crown should be advised without the use of side forms or ribbons and templates.

Experience indicates about ¼-in. compaction per inch of depth, as the material swelled during mixing. It is fluffy in texture, which accounts for laying 7½ to 8 in. to obtain 6 in. of compacted depth. In the event a greater depth is required because of relatively poor subgrade, it might be advisable to permit lift construction of 4-in. compacted layers for the total of 8 in., or two 5-in. lifts for a total of 10 in.

Providing the shoulders are to be constructed of a different material, such as screened gravel and selected roadway borrow, they should be previously constructed and compacted. This amounts to trenching in the cement-treated base, providing lateral support for rolling and improved marginal compaction.

The equipment used for preparation of the base material included: a Madsen asphalt plant, complete with two variable speed feeders, dryer, belt elevator and a 3,000-lb. pug mill. In addition, a 500-bbl. bulk cement silo was installed together with all operating controls, batching scales, water pumps, etc.

The street operation was carried on with two Barber-Greene asphalt pavers, a Caterpillar motor patrol, one nine-wheel Bros roller suspended on the circle of a motor patrol, one 3-axle Buffalo-Springfield roller and one 3-wheeled roller (used only occasionally), one sprinkler wagon and one distributor. Personnel requirements were about the same as for laying an asphalt mixture.

Control of the mix

Fortunately for this project, the drier was installed, because for only three periods of a few hours each was it necessary to add water. On several days the stockpile moisture, curiously enough, fell on the mark when the cement was added, and for about half the time the drier and burner were in operation. Small jets were used, as an arbitrary limit of 100 deg. F. was established for aggregate temperature. Later it seemed that the strength fell off above about 115 deg. F.

A study of mixing time in relation to the size of the batch was made by taking numerous samples from batches mixed for different periods and varying batch sizes mixed at the same time. This pug mill would thoroughly mix a batch 5/6 of its rated capacity in 5/8 of the time required to mix a full batch. Reducing the batch size to less than 75% of the rated capacity did not speed up the mixing. Due to the fluffing or swell of the materials dead spots occurred if the mixers were batched to rated capacity.

This project had a very firm subgrade but due to the lateness of the season the top 2 or 3 in. were wet and inclined to be sloppy. In October the contractor began work by placing the shoulder

SPREADING the asphalt finish. Cement-treated base is already laid from shoulder to shoulder.

LAYING the first lift of cement-treated base. Roller closely followed Barber-Greene asphalt paver.

FINISH compaction of cement-treated base was accomplished with a 9-wheel Bros roller suspended on the circle of a motor patrol.

BREAKDOWN compaction was carried out by a 13-ton 3-axle Buffalo-Springfield roller.

materials on the subgrade close to the center-line, then blading and rolling to provide a greater crown and drainage from the center of the road. This proved to be fortunate as later, when the material was cut away to form shoulders just ahead of the base, a firm moist subgrade was exposed. Probably there was a small loss of this shoulder material due to hauling over it, but the procedure was worth while in the interest of the overall project.

Tight surface for base

The finished cement-treated base material should have a sandy tight surface. This was obtained by first rolling with a three-leg roller or tandem, then sprinkling and finishing off with a pneumatic roller with about ⅔ ton per tire. When necessary to do any trimming it was done after initial compaction. As all material cut away is wasted, there can be no cut and fill. Trimming is followed by sprinkling and pneumatic rolling.

The curing seal is applied as it is to regular concrete. However, the use of a curing compound with a wax base would be unsuitable where a bituminous or asphaltic mixture is applied for the wearing surface. Wax and bitumens in combination form a sticky mess which will not stabilize, hence emulsified asphalt is probably the best seal. Since air temperatures approached freezing at the beginning of the project, the seal was changed to MC-2 and applied hot.

The difficulties encountered in constructing the cement-treated base under adverse weather conditions result in several constructive conclusions:

Cement-treated base material should be in place and compacted within two hours including: (1) a maximum of 30 min. from beginning of mix to the time material is spread on subgrade; (2) a maximum of 30 min. from spread to starting compaction; and (3) a maximum of 1 hr. between starting compaction and finish rolling. Actually the schedule of operations limits the distance the material source can be from the most distant part of the job. However, these time limits would usually be more than sufficient.

On a 6½-mile tortuous haul it was comparatively easy to stay within these limits and as the haul shortened, there were times when a 10 to 15 min. delay in dumping the truck load into the spreader provided just enough time to avoid spreading during one of the local squalls prevalent in this vicinity.

INSPECTING the job, from left: D. H. Cadmus of the Bureau of Public Roads; Tryge Hansen, assistant to the resident engineer; Theron B. Stone, resident engineer for the Washington Department of Highways (and author of this article), and in the background, "Dutch" Rohrer, contractor's superintendent.

Ways to combat wet weather

Another problem which is well worth considering is that of laying the treated base downhill when the shoulders are previously constructed and the weather unsettled. As a specific illustration of this problem, work was proceeding up a 2½% grade one day; rain started falling late in the afternoon and everything shut down. By the second morning the water running downhill through the trench for about 24 hr. had run on top, soaked under and through about 50 ft. of base and it could be scuffed out by the soles of light shoes. An important point in laying downhill is to prevent subgrade disturbance by truck tires being braked too hard. These mounds of relatively loose material will not be depressed but paved around by the machine.

Due to the low moisture content the cement batch boxes should be constructed with large doors in the bottom covering most of the pug mill. The sides should have the steepest slope obtainable. Further, due to dust, all measuring devices should be carefully protected. Be sure to use dial scales so that the tare and balance can be easily corrected. In damp weather a large tare can be built up which is not indicated by over-under scales.

Unit bids for the items of cement-treated base were as follows:

(A) Western Asphalt Co., Seattle, Wash. (low bid on project).
(B) Pacific Sand & Gravel Co., Centralia, Wash.
(C) J. D. Shotwell Company, Tacoma, Wash.

		(A)	(B)	(C)
101	ton emuls. asph. seal in place	70.00	55.00	65.00
9,502	bbl. Portland cement in place	4.10	4.80	4.00
26,200	ton mixing and placing cement treated base	2.60	2.30	3.50

(Complete unit bids for project appeared in Western Construction, Dec. 1950, p. 110.)

Personnel

The contractor on the Purdy-Pt. Fosdick job was Washington Asphalt Co. of Seattle. Plant superintendent was Art Johnson and "Dutch" Rohrer was superintendent of road construction.

William A. Bugge is Director of Highways for the State of Washington; Bailey Tremper, Materials Engineer and J. C. Claypool is District Engineer.

Cement-Stabilized Base Course Replaces Untreated Rock—

Street Surfacing Cost Reduced 38%

Modesto stabilizes fine sandy loam of low plasticity instead of excavating sand and replacing with untreated rock for base—Unusual procedure followed of applying asphaltic top course the day following base completion with no allowance for curing period

Administration	
Design	✓
Construction	✓
Maintenance	
Municipal	✓
Bridge	

By FRANK J. ROSSI
City Engineer
and
FRED M. JOHNSON
Assistant City Engineer
Modesto, Calif.

BY USING a cement stabilized base course in place of an untreated rock base the City of Modesto reduced the cost of street surfacing by 38% on several experimental sections laid in residential areas during the last two seasons. This saving is a direct comparison of base course construction, since a 2-in. plant mix asphalt wearing surface was common to both designs. Use of cement stabilization included the rather unusual procedure of applying the asphaltic top course on the following day, reducing the delay and inconvenience to residents and local motorists.

The City of Modesto is fortunate to have most of its streets on soil consisting of fine sandy loam which has no, or very little, plasticity. The subsurface drainage is also very good and water table is 28 to 30 ft. below ground surface. Some years ago, the city started a program of oiling residential streets as a dust palliative and as time went on this developed into a system of oiled streets which are generally referred to as "paved."

These streets have not held up well because the fine sand, with low stability in the first place, requires a large percentage of oil that further reduces its stability. The results are unsatisfactory streets subject to considerable damage by heavy traffic and by surface water left from heavy rains which occur frequently during winter months.

Experiments with stabilization

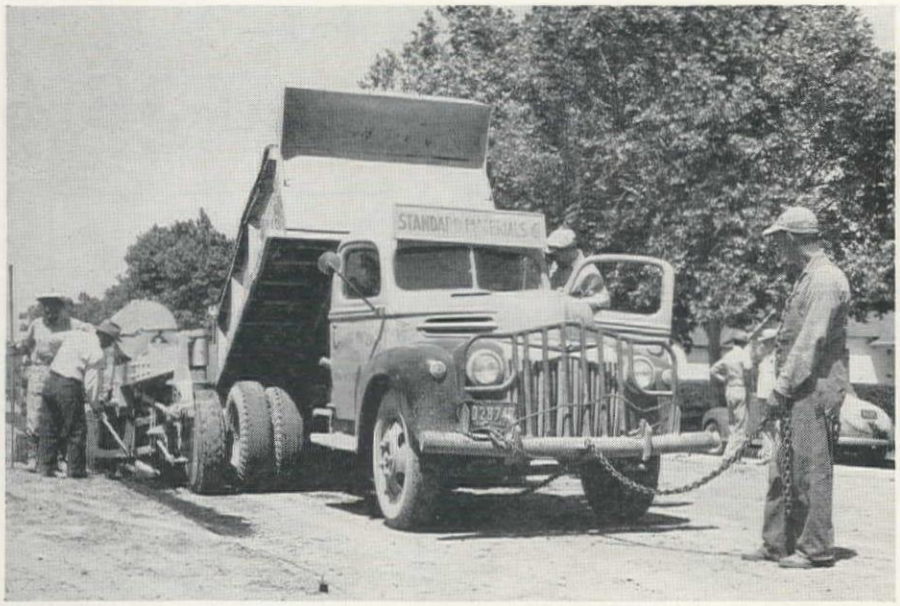
To obtain better stability and permanent improvement of streets of major importance, the city began, and has followed the practice of excavating the sand and placing a 6-in. untreated rock base course and a 2-in. plant mix surface course. Recently, however, to avoid the expense of excavating good material and replacing it with a material that is no better, except for its greater natural stability, the decision was made to experiment with cement stabilization of the sand. The initial experimental section was constructed early in 1950, and consisted of one block approximately 600 ft. in length in a residential district. On this project the center strip 24 ft. in width was improved.

Field procedure

The first operation was to remove the old oil surface and grade the street to the ultimate elevation and cross-section for the top of the base course. The subbase in the area to be stabilized was compacted with a sheepsfoot roller, after which the loosened material was respread over the area and prepared for the addition of Portland cement. In order to insure even distribution of cement, the surface was marked off in sections, approximately 7 x 8 ft. in size and a sack of cement was spread uniformly over each section. The proportion is slightly over 5% cement by volume. The material was then bladed into windrows of a size that could be mixed with a Seaman mixer. The windrows were worked with the blade and mixer until a uniform color indicated an even mixing. Water was added during the last stages of mixing, and in the early stages of compaction.

APPLYING cement on previously loosened and prepared material. To insure an even distribution, the surface is marked off in approximately 7 x 8-ft. sections and a sack of cement spread uniformly over each section.

BASE COURSE material is then bladed into windrows of a size that could be mixed by a Seaman Pulvi-mixer. Windrows are mixed until uniform color indicates an even mixing. Water is added during last stage of mixing.



COMPLETING the same job shown in pictures on preceding page. Base course has received an asphaltic prime coat and has been sanded lightly to prevent pickup by trucks. Next step is to apply as quickly as possible the 1½-in. plant-mix surface course.

A sheepsfoot roller was used in the first stage of compaction to consolidate the bottom portion of the base. When the compaction had reached a stage so that the "feet" penetrated only about 2 in., the sheepsfoot roller was removed and the top was compacted with pneumatic rollers. The surface was finally smoothed with a tandem roller. While rolling was in progress, the blade grader was used to maintain the proper cross-section.

This method follows the conventional procedure on such work. However, on the Modesto job an innovation is the eliminating of the curing period usually allowed before the surface course is applied. The theory behind this procedure is that in placing the surface course before the base has time to set, the heavy equipment will not cause breaking or cracking of the base, but will further compact it. Damage to the base by unauthorized traffic during the curing period is also avoided, and the period of inconvenience to adjoining property owners is greatly reduced.

Prime coat and surfacing

As soon as the surface of the cement stabilized base was sufficiently dry, the asphaltic prime coat was applied and followed as quickly as possible with 1½ in. of plant mix surface course. Cement stabilized base course was spread, the material mixed and compacted, and prime coat was applied in one day's operation and followed the next day by the adding of the plant mix surface course. The street was opened to traffic on the third day.

After the first project was completed, it was found that the procedure presented advantages from the standpoint of cost and service to adjacent property owners as well as motorists. Therefore, it was decided to experiment further and several other sections on other streets in the city were constructed. A total of 147,100 sq. ft. at an average cost of $0.0231 per square foot for the base course were constructed during the 1950 season.

These streets stood up very well during the last winter, which was severe including heavy rains occurring during the period of October to March. At least one of these streets carried an excessive amount of traffic during this time.

At present two projects on our major city streets program are being constructed using this procedure. On these projects, the stabilized base is 6 in. thick and a 2-in. plant mix surface course will be applied. The cement content has been set at 7% for these jobs.

The economy of this type of base treatment, where the soil conditions are favorable, can be illustrated by comparisons of the bids received for similar jobs, except for the base treatment, in 1950 and 1951. On two projects constructed in 1950 with untreated rock base course, the costs per square yard of base were $1.16 and $1.13 respectively. This cost includes the excavation for a depth of 6 in. and the furnishing and placing of the base rock. On two similar projects now under construction, the bid price per square yard of base was $0.44. This price includes furnishing cement and mixing and compacting under the procedure already described. The 2-in. surface course cost $0.72 per sq. yd. in each case. The average square yard of paved area cost $1.865 in 1950, and $1.16 on the 1951 projects. This saving of $0.705 is 38% of the 1950 cost. The question of comparative durability can only be answered after several years' service, but it is felt that where applied to the proper soils this method should give very satisfactory results under medium traffic loads.

The time gained under the procedure which has been adopted removes one of the objections to cement stabilization. The dust nuisance from city streets under construction is very real to adjoining property owners, and anything done to alleviate the condition as quickly as possible is greatly appreciated.

VIEWING surface course being completed: Frank J. Rossi (left) and Fred M. Johnson, co-authors of this article.

Tough Power Line Job Over Continental Divide

ONE OF THE COUNTRY'S toughest power transmission lines, capable of withstanding 60-mph. wind pressures and 20-below-zero temperatures on the 59-mi. route over the Continental Divide between Gunnison and Salida, Colorado, is being constructed by Trans-Electric Co. of Louisville, Kentucky, under a recently-awarded $821,499 contract from the Bureau of Reclamation. Construction of the line as part of Reclamation's future multi-purpose developments in the area will facilitate the delivery of low-cost Colorado-Big Thompson Project electricity to the city of Gunnison, R.E.A. cooperatives and other preference customers in the area through wheeling arrangements with the Public Service Company of Colorado.

The 115-kv. aluminum clad, steel-reinforced conductor cable will traverse some of the most rugged mountain terrain in the United States and much of the construction will be in altitudes in excess of 10,000 ft.

The line, which will begin at a point about 5 mi. west of the city of Salida, is designed for heavy loading conditions of ½-in. of ice and a wind pressure of 8 psf. (equivalent to a 60-mph. gale) at zero temperature, except for the 24-mi. portion of the line above 8,500 ft. over Monarch Pass (11,312 ft. high).

Specifications call for the use of about 1,000 wood poles ranging in length from 50 to 75 ft., to support the aluminum lines, with special bracing provided for the structures erected in the 4-mi. construction area above 10,400 ft.

How Washington Determines Priority For Rebuilding Secondary Highways

A SYSTEM-WIDE survey covering the adequacy of secondary highways in the State of Washington was conducted by the Department of Highways in that state during 1950. This survey followed the general procedure used a year before by the Department in a study of the State primary system. The method of appraisal and rating followed the original procedure prepared and used by the State of Arizona (*Western Construction*, March 1950, page 85).

Details of the Washington Rating Survey and the field procedure used in making this study are reviewed in this article. The results, combined with a proposed procedure to conduct a similar survey on the sufficiency of urban routes, will be an important factor in planning the work of the Washington Department of Highways during the coming period of expansion. W. A. Bugge is Director of Highways and C. K. Glaze is planning engineer in direct charge of the planning program.

The final adjusted score or rating is intended to show the per cent of adequacy or sufficiency of a highway section when compared with a properly constructed replacement.

Field surveys

The field party for the 1950 survey consisted of an engineer from the Bureau of Public Roads, an engineer from the Washington Highway Planning Survey, and as the party traveled from district to district, the district maintenance engineer or his representative. This party, traveling in a bureau vehicle equipped with an odometer recording to hundredths of a mile, rated each Road Life Control Section on the secondary highway system.

The driver of the vehicle acted as observer and gave a running report to the recorder of observed stopping and passing sight distance restrictions and all other pertinent information involving odometer readings. Surface width, shoulder widths, and rideability observations usually were made independently by the recorder. The exact location on the road section of all restricting items and certain cultural features was recorded on a specially designed log sheet.

Assigning ratings

Each control section was given a safety and service rating in the field immediately following the completion of the survey by comparing data recorded on the log form with Washington state design standards.

The maintenance rating was determined by visual inspection during the survey and reflects a maintenance organization's responsibility to keep the highway in a satisfactory state of repair. Points were deducted from a par of 40 for maintenance deficiencies noted on the day of inspection.

The condition rating was determined at the same time in conference with the district representative who furnished information on the adequacy of the road section from the standpoint of subgrade, drainage, sub-base and base, and wearing surface. This rating includes a downgrading for inherent deficiencies due to obsolete construction standards and also deficiencies growing out of inadequate maintenance.

Structural adequacy was determined by deducting the number of points representing permanent deterioration from a par of 40 points. Permanent deterioration was obtained by taking the difference between the ratings for condition, which included maintenance and construction deficiencies and maintenance. This difference in rating represented deterioration beyond the usual scope of maintenance activities and reduced the structural adequacy score by the amount of its severity.

Office procedure

Prior to the time the inspection party began field work all data concerning the construction history of each highway were entered on the Bureau of Public Roads Maintenance Inspection Form —M7. This information was obtained from the Road Life strip maps and other file sources. It included data on surface type and width, the year constructed and the agencies, federal and state, that had participated in construction costs.

This office information was checked in the field during the survey and served along with data compiled on the log form, as a basis for dividing control sections into subsections and also for rating certain elements of sufficiency.

Administration . . . . ✓
Design . . . . . .
Construction . . . . .
Maintenance . . . . . ✓
Municipal . . . . . .
Bridge . . . . . .

As field work was completed the Maintenance Inspection Work Sheets were reviewed in the office for proper subsection breakdown and numerical rating accuracy. Traffic volumes were compiled for each subsection and all data were transferred to the Highway Sufficiency Rating Tabulation Forms and the basic ratings were adjusted by means of a Traffic Volume Adjustment Chart.

1—STRUCTURAL ADEQUACY

a. Surface Maintenance Rating

The numerical surface maintenance rating is the measure of a maintenance organization's fulfillment of its responsibility to preserve and keep the roadway surface as nearly as possible in the original condition as constructed, or subsequently improved, as determined from an evaluation of the extent and importance of needed repairs observed during inspection.

Items of work which may show neglect in surface maintenance include failure to repair holes and breaks; to keep joints and cracks properly filled; to correct sharp sags and heaves; to correct

Washington Highway Sufficiency Rating for the Secondary State Highway System

1—STRUCTURAL ADEQUACY	40 Points
a. Structural Adequacy = 40 minus (Maintenance Rating minus Condition Rating).	
1. Maintenance Rating determined as a measure of the fulfillment of necessary maintenance with a par of 40 points.	
2. Condition is determined by comparing the existing highway section with adequate design standards using a breakdown of structural elements and maximum point values as listed below.	
(a) Subgrade	8 points
(b) Drainage	7 points
(c) Sub-base and Base	15 points
(d) Wearing Surface	10 points
2—SAFETY	30 Points
(a) Shoulder Width	8 points
(b) Surface Width	7 points
(c) Stopping Sight Distance	10 points
(d) Consistency of Alignment	5 points
3—SERVICE	30 Points
(a) Alignment	12 points
(b) Passing Sight Distance	8 points
(c) Surface Width	5 points
(d) Rideability	5 points
TOTAL POSSIBLE SUFFICIENCY RATING	100 Points

pumping slabs; to maintain proper cross section for smooth riding and drainage and to provide a non-skid surface. Work within the scope of reasonable maintenance which has not been performed is reflected in a reduction of the surface maintenance rating from the maximum value of 40 in proportion to the severity of the faulty maintenance performance.

b. Condition Rating

The condition rating of a road section as tabulated in this report is intended to show as closely as possible the structural condition which exists with respect to the design requirements for the particular traffic, climatic and topographical conditions involved.

To arrive at a more accurate appraisal of the condition rating this element was broken down into four sub-elements, with the following weights:

Sub-grade	8 points
Drainage	7 points
Base and sub-base	15 points
Wearing surface	10 points

Evaluation of the various sub-elements involved an appraisal of the following:

Sub-grade: (1) Height of grade line above water level to insure stability and runoff of rain and snow water; (2) stability of local soil under all types of weather, and (3) need for sand cushion or asphaltic membrane on top of sub-grade.

Drainage: (1) Comparison of existing side ditches with required capacity considering grade, cross-sectional area and depth; (2) capacity and location of pipes and culverts with respect to the rapid disposal of runoff; (3) necessity for channel changes or enlargement of existing channels; (4) the need for installation or improvement of erosion control devices; (5) adequate sub-drainage for the control of seepage particularly in frost areas and regions of heavy rainfall, and (6) adequate drainage of pavement surface and base by shoulders constructed of granular material to proper grade.

Base and sub-base: This sub-element is considered to include all aggregate, whether selected material, crushed rock or gravel, between the sub-grade and wearing surface. Evaluation considers: (1) Quality of original material used (clay, silt, or material which slacks); (2) effective thickness as compared to modern standards, and (3) does material extend full width of road bed?

Wearing surface: Evaluation of the existing wearing surface involved only those factors associated with strength and durability. The strength factor was measured by comparing the existing wearing surface thickness with minimum requirements for each design class.

To evaluate surface thickness the existing surface was compared with minimum requirements in the following tabulation:

Design Class	Minimum Surface Thickness
Class II	2½-in. Asphaltic Concrete
Class III	2½-in. Asphaltic Concrete
Class IIIA	2-in. Bituminous Macadam
Class IV	1½-in. Bituminous Macadam
Class V	¾-in. Light Bituminous Surface Treatment

BUGGE

GLAZE

W. A. Bugge is Director of Highways for the State of Washington, and C. K. Glaze is planning engineer in direct charge of the program outlined in this article.

Durability was measured by the surface appearance and the estimated remaining service the present surface might be expected to furnish. In all cases some type of dust free, water impervious surface was considered as a requirement for roads on the state secondary system. Durability was evaluated on the basis of knowledge and experience of the inspecting engineers who considered existing appearance and the remaining life of the wearing surface. Life of surface types varied from 30 years for Portland Cement Concrete Pavement to 15 years for asphaltic concrete and road mixes and 5 years for light bituminous surface treatment.

The final numerical structural adequacy rating for a road section is determined by taking the observed maintenance rating as outlined above, subtracting from it the condition rating to obtain a remainder representative of the permanent deterioration or inadequacy of the roadway surface. The value of this remainder subtracted from the par rating of 40 gives the numerical structural adequacy rating.

On road sections where maintenance and condition ratings are equal no permanent deterioration is indicated and the structural adequacy rating will be 40 regardless of the maintenance and condition rating values.

2—SAFETY

The method of evaluating the safeness of a road section amounts to comparing the design characteristics of the road section under study with the design standards that should be applied to the same section if maximum safety of vehicle operation at the speed selected were to be attained.

This safety rating assumes that the average alert driver can avoid most accidents if the road is wide enough, if it has adequate unrestricted stopping sight distances, and if there are no abrupt changes such as sharp curves between long tangents, narrow bridges in wide road sections, and vertical dips especially on tangents.

A par value of thirty points is assigned to the safety element. In what is considered a descending order of importance, fifteen points are assigned to width, ten points to stopping sight distance, and five points to consistency of alignment.

Width is further sub-divided into eight points for shoulder width and seven points for surface width. The basis for this breakdown is to ensure that shoulder width will be sufficient to provide refuge for vehicles off the travelled surface and that surface width will be sufficient to prevent restriction of opposing traffic streams.

A total of ten points is assigned for a road section with no restrictions to stopping. Points are deducted for each occurrence of horizontal curves, vertical curves or other obstructions where a driver has insufficient distance to make an emergency stop while travelling at the speed selected for rating the road.

The five points assigned to consistency of alignment are reduced by sudden or surprise changes in alignment.

3—SERVICE

The element of "Service" is intended to be a measure of the dispatch and ease with which a given road section can be negotiated. A par value of 30 has been assigned to the service element, which is further subdivided into: (a) alignment; (b) passing sight distance; (c) surface width, and (d) rideability.

Dispatch is considered to be a result of alignment and passing opportunities on most rural roads, with the emphasis on alignment, particularly on lower volume roads. For this reason the total of twenty points assigned to dispatch has been divided into unequal portions of twelve points for alignment and eight points for passing opportunity.

Ease in operation of a motor vehicle is considered to depend upon lane width, regularity of cross-section and surface smoothness, the main factors in the presence or absence of driver tension and fatigue. The total of ten points assigned to "ease" has been divided equally, five points for lane width and five points for the riding quality or the "rideability" of the road.

Adjustment for traffic volume

Basic sufficiency ratings determined by the application of the foregoing methods are adjusted for traffic volume by referring the sum of the total basic rating to the "Traffic Adjustment Chart" to determine the final sufficiency rating. The basic sufficiency rating is a numerical expression of the comparison of each road section with the recommended standards for that section. As the design standards depend primarily upon traffic volume, the basic sufficiency rating recognized somewhat the traffic, or anticipated traffic, on each section.

To attain a relative value for each road section on a system-wide basis, however, it is necessary to employ a correction to the basic score that will reflect the relation of a single road section in terms of traffic service, to the road system of which it is a part.

The traffic volume adjustment provides for reducing the basic ratings on high volume roads and increasing the ratings on low volume roads to obtain comparable values which may then be listed in numerical order for the purpose of analysis. This correction is based on the assumption that important roads need not deviate from standard as far as minor roads to attain an equal position on the priority list.

Development of Program and Procedures for

Maintenance of Wyoming's Highways

When Wyoming began building oiled roads in 1939 maintenance left the days of the old patrol system with the truck-drawn grader to begin the process of mechanization and improved organization which is serving the highway user of today

- Administration . . . . ✓
- Design . . . . . .
- Construction . . . . .
- Maintenance . . . . . ✓
- Municipal . . . . . .
- Bridge . . . . . .

By
W. E. SUTTON
Maintenance and Equipment Engineer
Wyoming Highway Department,
Cheyenne, Wyo.

ADEQUATE and efficient highway maintenance methods are not evolved overnight. They are the result of years of experience and study. A method considered adequate today may be obsolete tomorrow.

The first highway maintenance work in Wyoming undertaken by the state was performed in 1919, at the time that distribution of surplus World War I equipment and supplies was initiated. Maintenance methods were simple and consisted to a large extent of a little shaping up of old trails with horse or tractor-drawn drags and graders. As the automobile became more popular, the demand for all-weather roads increased and the highway department undertook to surface major routes of travel with gravel or shale. To keep these roads in condition, a patrol system of maintenance was inaugurated. This was a very simple system consisting of establishing patrol sections of from 10 to 30 mi. of road. Equipment usually consisted of a horse or truck-drawn grader or drag and a few hand tools.

Maintenance operations and methods were more or less basic and perhaps primitive, especially in comparison with modern standards, until as late as 1930, when it became increasingly evident that traffic-bound gravel or shale surfaces could no longer be adequately maintained under the traffic that had developed.

New methods of maintenance

The Wyoming Highway Department had previously experimented with bituminous material as early as 1924, and in 1929 an extensive program was undertaken to surface all primary roads with bituminous treated gravel. This same year, Wyoming undertook a snow removal program on the more important sections of highway.

The bituminous surfaced road and the newly inaugurated snow removal program required entirely new methods of maintenance. Horse and tractor-drawn graders and drags became obsolete. The patrol system of maintenance was retained for a time, but as motorized equipment was developed and acquired by the highway department, the patrol system of maintenance went by the way, and our present system of gang maintenance was introduced. To this day maintenance methods and equipment are constantly changing and the maintenance man must be ever alert to keep informed on new developments.

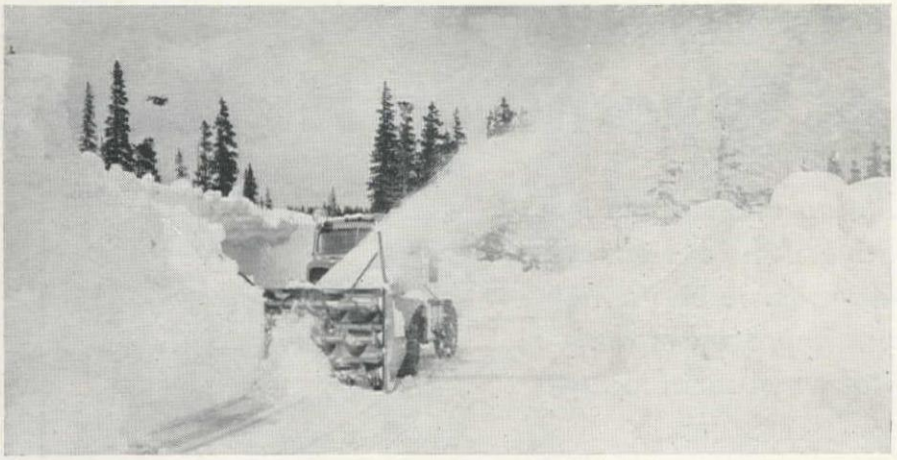
At the present time, Wyoming still has several hundred miles of highway in use that were oil-surfaced about 20 yr. ago. At the time these roads were oiled they were structurally sound enough to sustain the traffic which used them, but today these same roads are being traveled by a volume and weight of traffic far beyond that for which they were built. The inevitable result is the extensive break-up of the road surfaces as well as distortion of the roadbed itself. These roads call for continual major repair work to keep them in travelable condition. Every year it is necessary to completely rebuild short sections in various parts of the state.

It has been the policy of the mainte-

PATCHING with stone chips is still the accepted practice for minor repairs to surface breaks in early spring and later fall months.

AFTER PRIMING with a light coat of MC-1 a windrow of oil-mixed gravel is worked from side to side by motor graders to even up an irregular surface.

STRIPING is part of the responsibility of the maintenance division, along with erection of warning and information signs.



SNOW REMOVAL continues to be an ever expanding feature of maintenance work in Wyoming. Rotary snow plows are located throughout the state at strategic points.

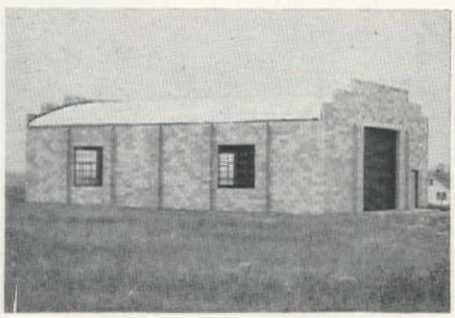
nance division for a number of years to repair or cure a number of so-called "sore" spots each year with the hope that eventually we would gradually reduce the number. But the number seems difficult to cut down. We get consolation from the fact that this phase of our program is making headway, and can point to numerous sections of substantial roadway that used to be bog holes. However, we can look for relief on these old roads only when they are replaced by modern highways designed and constructed to carry the traffic to which they will be subjected.

Proven methods

The general plan of maintenance in Wyoming has not varied materially in the postwar years. The gang method continues to be used, although it has been modified some. The plan is to endeavor to make temporary repairs to early spring breaks that occur on heavily traveled routes, leaving permanent repairs to a time when weather conditions are such that they can be effectively accomplished.

Oil mix mulch is still a tried and proven method. Patching with stone chips has its place and is used some in the early spring and late fall months. Use of machinery is extensive in repairing and rehabilitating roadway surfaces. A few years ago distorted and rough bituminous surfaces were scarified, remixed and relaid to bring them back to a smooth condition. This method was expensive, fairly slow and interfered with traffic flow on heavily traveled roads. Today, the first step is to take out the sags and holes in the road with the use of pre-mixed oiled gravel. This is accomplished by first giving the sags and holes a light prime coat of RC-2. Premixed oiled gravel is then dumped directly on the road, laid in place with a motor grader and thoroughly compacted. This operation brings the road surface back to a semblance of its originally constructed shape.

The entire road surface is then primed with a light coat of MC-1. To complete the job, a light windrow of oil-mixed gravel is hauled on the road and worked from side to side with motor graders until it has been lost in the irregularities in the road surface. After a few days traffic, a seal coat is applied. The final result is a surface as smooth as the original oil mat. If the sags and holes in the surface to be repaired are not too pronounced, the leveling operation may be dispensed with and if necessary, the size of the oil-mixed windrow increased sufficiently to take care of the irregularities in the road surface.



IN AREAS where regular maintenance gangs cannot render adequate service small stations are established with buildings to store equipment.

This method has been in use in Wyoming for several years and is giving gratifying results. The work can be completed quickly, traffic is inconvenienced very little and the finished job gives a stronger and thicker oil mat than that originally constructed. Scarifying and remixing bituminous surfaces still has its place in the Wyoming program. A soft mat that has a tendency to roll, cannot be repaired by adding additional surfacing material. It must be scarified, remixed, and the condition that caused the failure corrected.

About This Article . . .

This review of the general maintenance program carried out by the Wyoming Highway Department was presented by W. E. Sutton at the Twelfth Annual Utah Highway Engineering Conference in Salt Lake City in April. Because it illustrates the planning and procedures for this important field of highway work at the level of the state department it is a valued contribution to the group of articles in this annual issue.—*Editor.*

Bituminous-surfaced roads in Wyoming are in service at elevations ranging from 4,000 to 11,000 ft. above sea level. Temperature and moisture conditions at high elevations are not conducive to good oil work and in some areas of the state it has been found extremely difficult to properly maintain bituminous surfaces. To overcome this, in 1948 the highway department purchased two small portable hot mix plants. These plants proved so valuable that three additional units have since been purchased. The machines turn out a high quality mix and are used from early spring to well into the winter months. Their use has made it possible to improve substantially the quality and quantity of maintenance work performed at high elevations. The use of the hot mix plants is being extended to all areas of the state.

Practically all ordinary maintenance work in Wyoming is performed by state forces. The contract method is used to reconstruct some sections of old highways that are beyond the resources of the maintenance division to repair. This type of reconstruction involves flattening the existing fill slopes, improving drainage facilities, and adding gravel base and new bituminous surface. These projects cannot be classified as maintenance as the reconstructed road bears no resemblance to the original, and is adequate to handle the traffic that will use it. If the projects are large enough to interest contractors, occasionally seal coat work is let to contract. Last season we contracted about 50 mi. of bituminous treatment to level up existing oil mats that had become rough.

Snow removal

Not to be overlooked in the Wyoming maintenance picture is snow removal. Stations are equipped to meet average winter conditions of the area in which the station is located. Under normal conditions, one or two one-way snow plows mounted on 2 to 3-ton trucks will handle a section of road as much as 50 mi. long. Snowfall and wind conditions during a storm are usually never the same over any area. Experienced men know where the trouble spots are likely to develop and concentrate on these. If the storm gets beyond the ability of the men and equipment in the area, additional units are called in from areas that are not being affected. Ordinarily, severe storms that must be combated by the use of heavy equipment cover only two to four counties. To handle this situation, a fleet of large V-type and rotary plows are located at strategic points throughout the state. These heavy units are subject to call to any area where needed.

A modified gang system of maintenance is used in Wyoming, divided into seven maintenance districts, each containing approximately 650 mi. of highway. Each district is in charge of a Maintenance Engineer who reports directly to the Maintenance and Equipment Engineer in Cheyenne. Under the District Maintenance Engineer are crew foremen and section foremen. The crew foreman heads a gang, usually located in the county seat. The size of the gang

Concluded on page 98

Use of basalt rock dust in varied amounts for mineral filler allows change of mix based on type of traffic and weather — Grading control assures that the smallest voids are filled. These are two of the keys to . . .

SURFACE OF PAVING for a residential street shows distinction between base (above dashed line) and top course. This asphalt pavement had been in place two days when picture was taken.

Spokane's Economical Asphalt Paving

By EUGENE H. TUOMY
Asphalt Technician
and ROBERT W. LEACH
Asst. Asphalt Technician
City Engineer's Office
Spokane, Wash.

Administration	
Design	✓
Construction	✓
Maintenance	
Municipal	✓
Bridge	

CONTROL of mineral filler, produced from the crushing of clean basalt rock, is one of the important considerations in the design of asphalt mixes used in the street resurfacing and maintenance operations by the city of Spokane. Because new paving in the city averages 400,000 sq. yd. per year, with corresponding increase in maintenance costs for this ever increasing mileage, the office of the City Engineer gives particular attention to the resurfacing materials and methods to keep these expenditures at a minimum. Design of asphalt mixes, reviewed in this article, is a key to the success of this program.

Filling the smallest voids

The materials used are important. Crushed basalt or ledge rock, of which there is an abundant local supply, is the only aggregate allowed. Preparation of this rock, in turn, yields clean basalt rock dust which is ideal filler for the asphalt mixes used in the Spokane program of street work. A close check is kept on the amount used, and every effort is made to keep it uniform. Many types of mineral filler have been tried, but this rock dust has always been found to be best.

Although the city specifications call for 85-100 penetration asphalt, practice calls for staying near the upper limit or slightly over because it is not so brittle in cold weather. A standardized asphalt concrete paving of 4-in. thickness is used, consisting of 2½-in. base and a 1½-in. surface. Control over the design and mixing of the base is not so rigid. A maximum size aggregate of 1½ in. is used in this. The surface uses a ¾-in. maximum size rock.

When designing a mix for maximum density, it is assumed that the voids left by one size are filled by the next size smaller, and so on until the smallest voids are filled with asphalt mortar. Spokane practice calls for: (1) an increase in the amount of ½-in. rock over the proportion needed for theoretical maximum density and (2) the attaining of a resulting open-textured skid-resistant surface after compaction.

Control in the field

Care must be taken not to overload the mix with ¼-in. material as this works down and the mortar comes up producing a smooth, textureless surface in a short time. Surface mixture design is based on using a maximum of asphalt, staying just below the point where bleeding will occur. Screen tests are made periodically through the day from the hot bin at the plant to determine the percentage of fines, which governs the amount of asphalt used. The asphalt percentage may be altered several times a day, and the percentage of fines is also changed to fit varying field conditions.

Paving during cold weather requires more asphalt and the resulting increase in fines. Paving designed only for light traffic calls for more fines than does paving for heavy traffic. This is done to compensate for the smaller amount of kneading action obtained from light traffic. This kneading action of the pavement during warm weather keeps the aggregate continually moving and works the bitumen to the surface where it is lost by action of the traffic and weather.

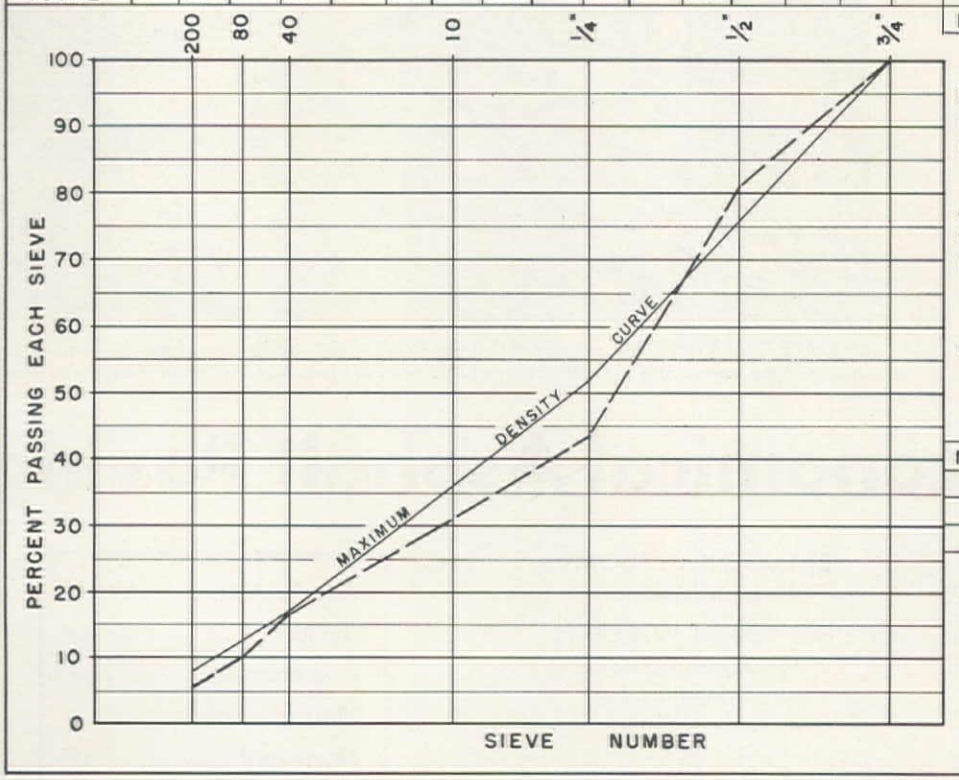
By using a maximum of asphalt, this breakup point in the life of the pavement is delayed as long as possible. Thus, residential streets get more asphalt and more material passing a 200-mesh screen, which means more protection against weathering as well as snow and ice removal. This mineral filler contributes toward an excellent surface, and by varying the percentage used more or less mortar. When the percentage of rock dust is high, the pavement becomes tough and sticky. This is an advantage so long as it doesn't begin to put the other aggregate in suspension. This must be avoided or the interlocking of the sharp rock particles will be lost.

Mixing and placing

As a general rule fines are 31-35% passing a 10-mesh screen, while the asphalt runs between 6.0% and 6.5%. The success of these mixes is largely due to the clean basalt rock dust used and the good control of all phases of the work. Mixing time is varied from the 45 sec. standard if the visual inspection indicates a change is necessary. Tempera-

AGG.		No. 4		No. 3		No. 2		No. 1		SAND		DUST		TOP		BASE		MIX	TOP	BAS	TON
PASS.	RET.	WT.	%	WT.	%	WT.	%	WT.	%	WT.	%	WT.	%	% PASS	% PASS	% PASS	% PASS		LBS	LBS	
1½	1		24													7.0	1000	No 4		556	
1	¾		52													15.1	93.0	No 3	373	423	
¾	½		24		95									19.0	100.0	27.8	77.9	No 2	576	325	
½	¼				5		98		32					37.2	81.0	21.0	50.1	No 1	349	191	
¼	10						2		68					12.8	43.8	7.1	29.1	SAND	452	415	
10	40										59			14.1	31.0	12.9	22.0	DUST	130		
40	80										24		10	6.5	16.9	5.3	9 1	AC.	120	90	
80	200										13		30	5.2	10.4	2.9	3.8	MIXTURE	TONS	SQ. YDS.	YIELD/ TON
200											4		60	5.2	5.2	9	9	SURFACE	215	2,752	12.8
TOTAL			100		100		100		100		100		100								
																		BASE	415	3,237	7.8

DATE April 12, 1951
LOCATION Mt. Pleasant-First Glenwood Park Paving District
Belt Street
Rowan to Wellesley
Inland Asphalt Co.



RECOVERY TEST
INITIAL WT. Recovery test made
FINAL WT. from time to time as
A.C. % a check

TEMPERATURE MIX 300° F
TEMPERATURE A.C. 280° F
PENETRATION 96
WEATHER & TEMP. Clear 63°-71°

CONDITION OF SURFACE
Uniform

SUMMARY FOR PROJECT

MIXTURE	TONS TO DATE	YDS. TO DATE
SURFACE	215	2752
BASE	1,279	10,008

REMARKS: THIS IS A SAMPLE REPORT TAKEN FROM ONE DAYS RUN

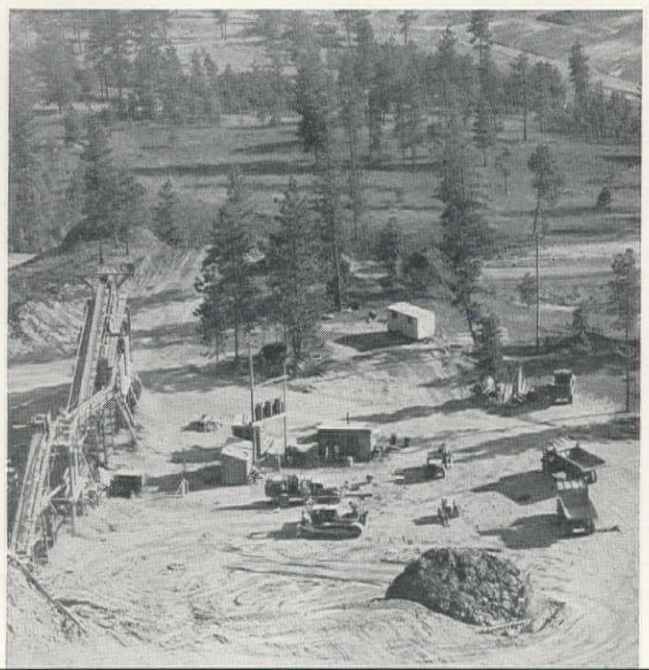
R. W. Leach Inspector
OFFICE OF CITY ENGR. SPOKANE, WASH.

TOP HALF of this chart of daily operations gives the results of the screen analysis of hot bin tests. The graph compares the surface mixture with the maximum density curve. The curve indicates that Spokane's open-type pavement uses plenty of ½-in. aggregate.

ture of the mix is kept as cold as the laying conditions will allow. The substitution of screeds for rakes in hand finishing does a great deal toward improving the surface, since the action of digging up the aggregate is avoided. Good results have been obtained by having the subgrade slightly moistened just prior to laying the paving. All the care in preparing the mix is lost unless it is placed properly on a good base, therefore good field inspection is vital.

Necessary resurfacing work is carried on every year. Usually when the paving reaches the age of 25 years or more it should be resurfaced. The street or the area to be done is thoroughly cleaned and tacked with a medium cut-back asphalt evenly sprayed. Then all holes are patched and a light leveling course is laid. The same mix is used in both surface and leveling courses, except that slightly less asphalt is used in the leveling course.

A large number of the older brick-paved streets in Spokane are rough and out of shape. Also many of these occur on steep grades. Prior to resurfacing this type of street, lateral grooves about 18 in. wide are cut through the brick from curb to curb and about 15 ft. apart. Asphaltic concrete is used to fill these grooves and the resurfacing, even on 12% grades, has shown no sign of slippage.

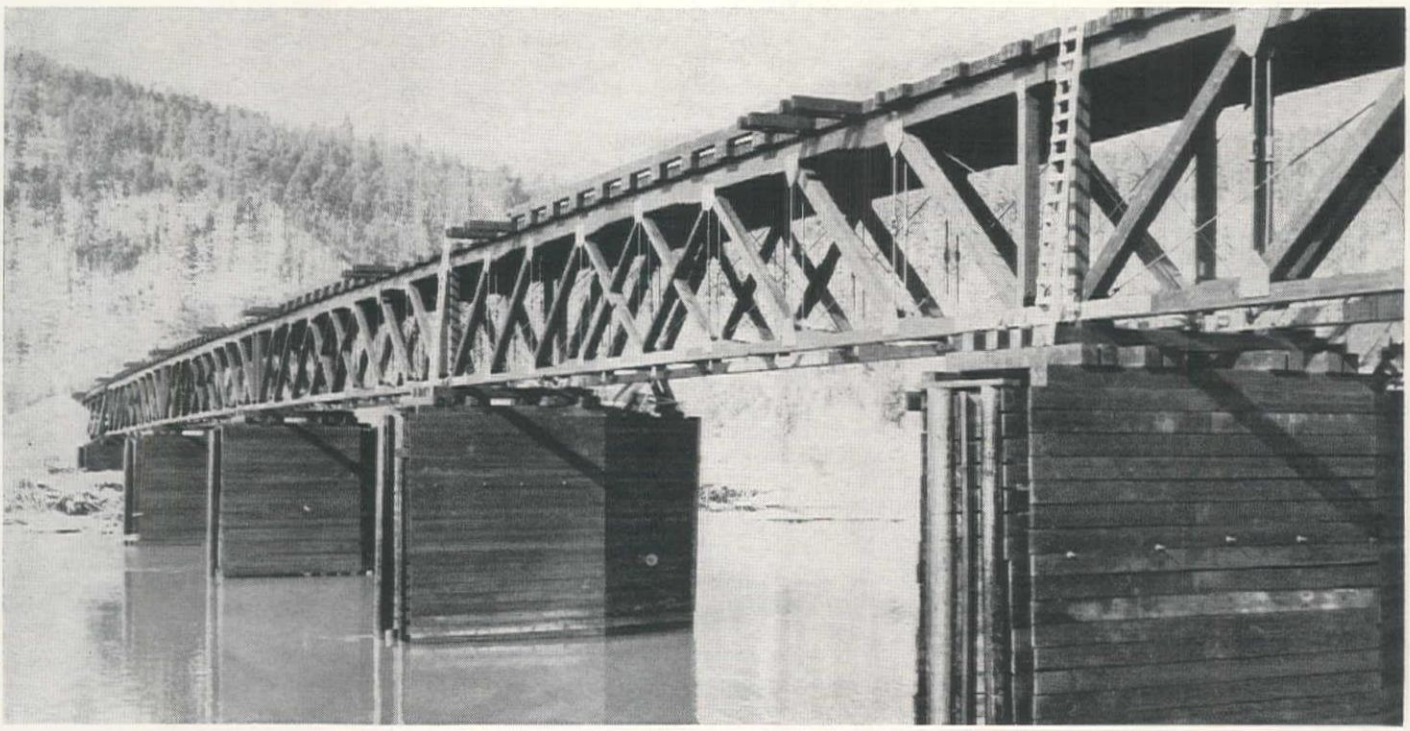


AGGREGATE production plant at Spokane's basalt quarry. Stockpiles of graded materials are in the background. Rock dust from these crushing operations provides the filler material used exclusively for the asphalt paving mixes.

Sand cover replaces tack coat

The problem of resurfacing old and badly shattered sheet asphalt brought forth the experiment of not using a tack coat, but instead a fine sand cover was placed over the entire area. The 1½-in. surface layer has withstood six years of heavy and fast traffic with no cracks in the new surface.

Charles E. Davis is city engineer of Spokane, and A. I. Buchecker is principal assistant.



Treated Timber Bridge in Montana Designed for Loading of 100 Tons

Crossing of Kootenai River to tap large stand of ripe lumber has 100-ft. spans with laminated chords and special welded joint assemblies

Administration	
Design	✓
Construction	✓
Maintenance	
Municipal	
Bridge	✓

DESIGNED FOR LOADS far in excess of those carried by public highway structures, a timber bridge 600 ft. long was built by the J. Neils Lumber Co. of Libby, Montana, to provide access to timber in the Kootenai National Forest. Features of the design, which was prepared by Timber Structures, Inc., include laminated chords with varying sections in the top member, elimination of the usual beam and stringer system in favor of a laminated deck, and special welded joint assemblies.

By
R. F. DeGRACE
Engineer,
Bridge Division,
Timber Structures,
Inc.
Seattle, Wash.

To carry heavy logging loads

The bridge is located near Rexford, in the northwest corner of Montana, where the Kootenai River flows south out of Canada before turning west into Idaho. It will provide access to many millions of board feet of ripe timber which is now ready for harvest in the Kootenai National Forest. The project was carried out following consultation with the U. S. Forest Service, which approved the selection of the treated timber bridge for this site.

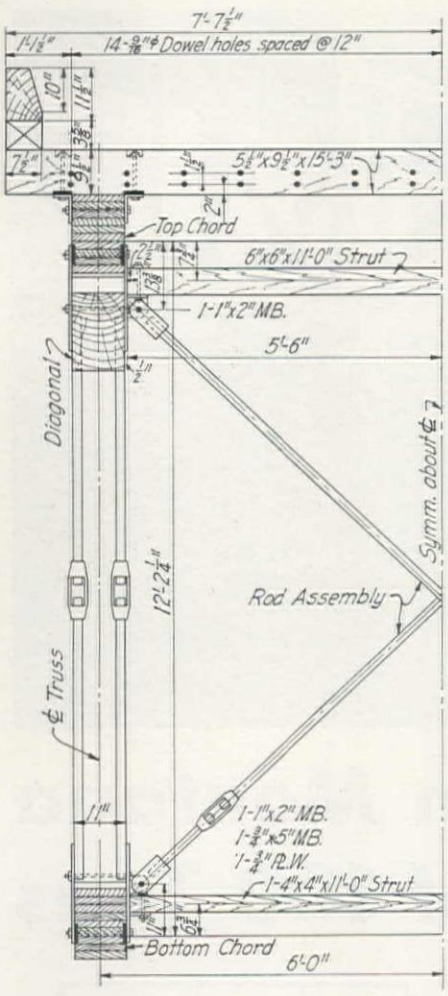
In planning the structure, the J. Neils Lumber Co. looked well toward the future, and laid down a rigid set of requirements. Heavy traffic would be encountered, since off-highway logging trucks with 12-ft. bunks would use the bridge. In addition, 20-yd. dump trucks, machinery trailers carrying large tractors, loading donkeys, power shovels and other heavy equipment would travel the bridge. It was certain that loads would far exceed those on regular public highways. Further, unlimited overhead clearance was also highly desirable, for both log roads and for equipment passage. One side of the bridge should be clear for removal of winter snows. At all times, adequate waterway clearance must be maintained, and provision made for withstanding the pressures of high water and the grinding action of heavy drift during spring floods.

Use of an existing highway bridge nearby was ruled out, because the loads which would be imposed on it were much heavier than it would stand. It did, however, offer easy access to both banks of the channel for construction operations.

Design considerations

Waterway clearance for the new bridge was set at 12 ft. above 1948 high water, which was considered adequate for all foreseeable future floods. The channel of the Kootenai at the bridge site is wide and flat, and grade elevation at the approaches had to be kept as low as possible to avoid long and deep approach fills. Local materials were to be used wherever possible, to avoid excessive hauling costs.

To accommodate all of these important requirements, Timber Structures, Inc. engineers recommended a parallel-chord Howe deck bridge. The most favorable length of span, considering the clearances, grade elevations, and economy involved, was found to be about 100 ft. Five spans were decided upon, each resting upon log crib piers at 100-ft. centers, with 50-ft. trestle approaches at each end. Complete design of the



DETAILS of truss design show laminated timber chords and deck with tie-rod tension members.

structure was then worked out by engineers of Timber Structures and J. Neils Lumber Co. before the construction contract was let.

Entire bridge on vertical curve

To obtain the best compromise between approach grades and necessary waterway clearance over the main channel, the design called for a level center span with a constant 1% grade climbing toward this span from both banks. This design was slightly modified later, the permanent camber for each span being combined with approach grades to put the entire bridge on a 500-ft. vertical curve.

Like most bridges designed primarily for log traffic, a single-lane structure was planned, carrying a roadway of 14-ft. clear width. Trusses were placed at 12-ft. centers, so that the heaviest loads of wide-gauge trucks would be carried directly on them. Eight-panel trusses of 96-ft. clear span were selected with truss height set at 12 ft., center to center of chords.

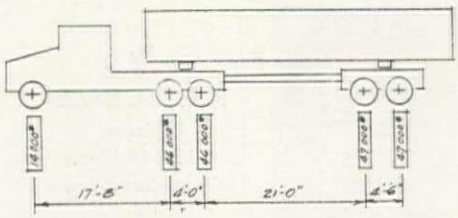
Design of laminated material

Design standards used were from the National Design Specification of the National Lumber Manufacturers' Association, revised 1950, authorized by the U. S. Forest Products Laboratory. Maximum design stresses used for glued laminated material were as follows: Extreme fiber in bending, and tension, 2,150 psi.; compression with grain, 2,300 psi. Sawn material design stresses were: bending and tension with grain, 1,700 psi.; compression with grain, 1,300 psi.

Engineers designed a nail laminated deck, resting directly upon the top chords of the trusses, rather than the more usual floor beam and stringer system. The decking laminations were 2 x 10-in. common structural larch and Douglas fir, laid on edge across the bridge, securely spiked to adjacent laminations, with each lamination toenailed to each top chord. In addition, spiral dowels were driven in prebored holes at 12-in. centers to better distribute wheel loads and to make the deck act as a two-way slab. At panel points, struts of the same depth as the deck laminations were inserted in the decking and firmly bolted to the top chord for anchorage. Thus no nail heads or drift bolts were left exposed to work loose under action of loads, and endanger tires.

Economy of laminated chord

By eliminating floor beams, bending was introduced directly into the top chord members. At first sawn timber chords were considered with an additional vertical strut at mid-panel to reduce bending. This was discarded, however, in favor of a glued-laminated chord system which was designed to resist bending and axial forces combined. The economy of the latter method was made possible by: (1) greater bending strength of glued laminated timbers, (2) the saving in board footage made possible by varying the top chord section throughout its length, according to the varying axial stresses, and (3) the advantage of the properties of a continuous beam in bending.



CRITICAL LOADING used for design of the bridge was a special logging truck with axle loads as shown. Double wheels on rear of truck and trailer are spaced at 14 in., with a spacing of 5 ft., 1 in. between inside set of wheels.

Dense select structural Douglas fir was used in laminating the truss chords, which were bonded by a permanently waterproof phenolic resin glue. Sawn web members were of Dense No. 1 Douglas fir. Top chord net size varied from 11 x 21⅛ in. in the center panels to 11 x 16¼ in. in the end panels. The bottom chord net size varied from 11 x 9¾ in. to 11 x 11⅜ in.

Timber compression diagonals were used with steel tie-rod, tension verticals. An ingenious method of connection between web and chord was utilized to cut down the quantity of steel gussets and connectors. A special welded joint assembly was designed, to carry the stress in the vertical through gusset plates and bearing plates into the diagonal, without passing through the chord and then backtracking into the diagonal, as has been done in timber trusses since the time of their invention by Howe. Thus only the horizontal component of the diagonal stress was carried into the chord, and size and complexity of connections was kept to a minimum. Diagonal rod bracing between trusses was carried at each panel point in the plane of the verticals. All horizontal rod bracing was carried below the deck, in the plane of the top chord, with horizontal struts between truss lower chords.

Treating and truss fabrication

All timber was pressure-treated for permanence. Truss parts were treated with a 50-50 creosote-petroleum mixture to a retention of 8 lb. per cu. ft., at the St. Helens, Ore., plant of Pope and Talbot. Material so treated is usually considered to have a service life of 40 years or more. Lumber for the nail laminated deck was supplied, fabricated for dowels and treated by the J. Neils Lumber Co. at their Libby plant.

All truss fabrication, including holes, daps, and routings for timber connectors, was carried out in the Portland plant of Timber Structures, Inc., before treatment. This assured that adequate penetration of the preservatives would be attained in these places, where it is most essential. Felloe guards and scupper blocks were likewise fully fabricated and then treated before shipping.

To provide a replaceable wearing surface, longitudinal 2 x 4-in. running strips (untreated) were placed to cover the transverse deck laminations, except for a 6-in. width alongside each felloe guard and a 2-ft. center strip. This placement of running strips provides for all types of vehicles from light passenger cars up to heavy logging trucks having a wheel gauge of about 11 ft. Barrel platforms were provided at 50-ft. intervals, the deck laminations being extended for this purpose, to carry 55-gal. water drums and to provide a standing place for pedestrians.

Foundation piers

Foundation piers were rock-filled pile-supported cribs, faced inside and out with 3-in. rough plank to the low water level at the time of construction and reinforced with tie rods. To minimize the hanging up of drift, piers were pointed sharply on the upstream side, and a ¼-in. steel plate nosing was built into the point. Piling for the piers was driven in sequence with the falsework piling, but filling of the crib with quarry-run rock was delayed until the deck erection was completed, for easy access.

Assembly and erection were carried out from the falsework bents which had been placed to carry drivers into position for the piers. Three-pile bents were driven at about 14-ft. centers between piers and capped at the elevation of the lower truss chord. Two drivers were used, a steam hammer working from one end, and a drop-hammer rig operating from the opposite bank of the Kootenai. Average penetration of piling was found

Concluded on page 90

SPANNING 60 ft. between supporting bents of six concrete piles, this small county bridge in Washington has four beams only 9 inches in width. Although the roadway slab poured integrally with the beams was considered adequate for stiffness, header beams were added at mid-point.

Bridge With "Bundled" Reinforcement

SMALL highway bridges are so very numerous that not a great deal of money can well be spent on any one of them. On the other hand where spans of 50 or 60 ft. or more are required, permanent construction is desirable and costs mount up. The small bridge here described was one of three of similar type built under one contract last year on the outskirts of Issaquah, a town 15 mi. east of Seattle, Washington. All three bridges cross Issaquah Creek, a temperamental mountain stream, in about a mile's distance. At times of flood Issaquah Creek runs almost bank full and becomes a vicious thing to deal with. Generally, however, it is a well-behaved small creek.

The contract price for the three bridges (April 1950) was $39,645.28, which included $570 for rock riprap and $450 for removal of old bridges. Of this amount the apportionment to this bridge was $14,066.26; to the largest bridge with a 70-ft. central span and 120-ft. overall length, $16,647.42; to the third and smallest bridge with a 50-ft. span and 70-ft. overall length, $8,931.60.

By
HOMER M. HADLEY
Consulting Engineer
Seattle, Washington

Administration	
Design	✓
Construction	✓
Maintenance	
Municipal	
Bridge	✓

Design features

The accompanying section and beam details show the essential features of the practically common design: (1) beams of constant depth cantilevering over wide cap beams of same depth; (2) cantilever ends carrying short terminal slabs which, at their outer ends, rest on little walls set down into the end fills; and (3) concrete pile bents. All bridges have 22-ft. roadways and 2-ft. wide curbs. At this location, as on the average county road, this width is ample, even generous for traffic. They are designed for H15-44 AASHO loading.

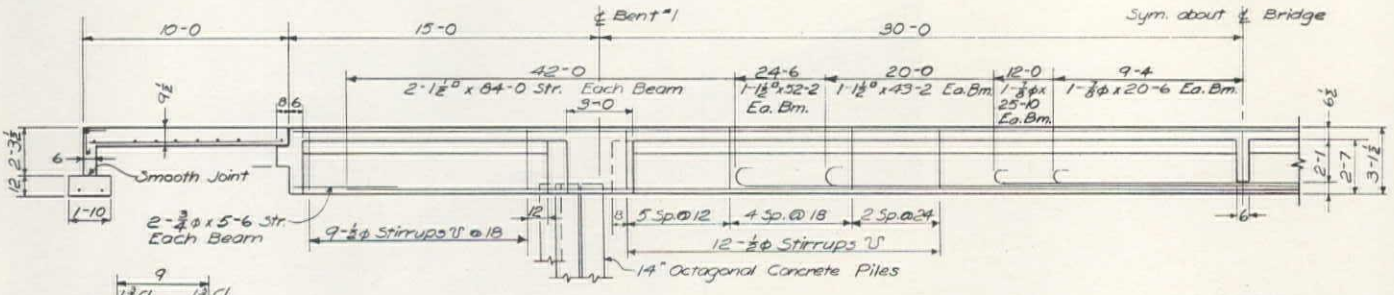
The beam stems are unusually narrow. They are 6 ft., 1 in. o.c., and their breadth is only 9 in. This dimension resulted from the somewhat unconventional and unorthodox "bundling" of the main reinforcement—placing the bars in direct contact with one another vertically and with only a slight gap between them horizontally. There is ample evidence in earlier construction that such spacing can safely be employed and that the fines in the concrete work into the interstitial spaces and completely coat the bars. Particularly is this true when vibrators are used with rich bridge concrete. Needless to say, the elimination of concrete from the beam stems and the elimination of its dead load are advantageous.

With cantilever ends, the longitudinally extending beams are of course in compression in these narrow beam stems at the supports. Consequently the two bottom 1½-in. sq. bars of the "bundle" are extended into the cantilevers as compression reinforcement, and serve most satisfactorily as such. Under standard specifications one quarter of the main span steel must extend to the support anyway, so it might as well be made to work.

The wide cap beams were provided to allow for possible misalignment of the concrete piles, particularly since the bridge is on a 19-deg. skew. There was little need for that precaution however since good alignment was obtained.

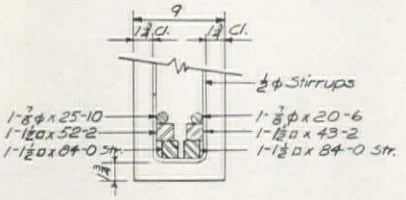
Need for transverse diaphragms?

It is a question with a concrete roadway slab reinforced integrally and poured integrally with the beam stems whether there is a real need for transverse diaphragms or not. Probably the



LONGITUDINAL HALF-SECTION THROUGH ℄ ROADWAY

SCALE: ¼" = 1'-0



SECTION THROUGH BEAM SHOWING BUNDLED BARS

SCALE: 1½" = 1'-0

DESIGN FEATURE is the bunching of reinforcing steel, with direct contact vertically, in the 9-in. beams. With a rich mix and proper vibration the fines work around the bars to completely coat the steel. Two bottom bars are extended into the cantilevers as compression reinforcement.

slab itself would furnish adequate distribution of loads without such beams. However, the conventions were observed and small 6-in. wide header beams set squarely perpendicular to the main beams were provided at midspan. They are staggered and offset from one another in the successive panels as a result of the skew and the desire to locate them at the midspan points of the several bays. They are made 6 in. shallower than the main beams in order to avoid interference between their reinforcement and that of the main beams.

Hand rails of wood

Wooden handrails are employed. Because posts frequently weaken and decay at their tops, due to water standing on their flat top surfaces, these post tops have chamfered edges and are covered with caps of 16-gauge galvanized metal which are nailed into position. Kept painted, such railings have the best possible drainage and air circulation and may be expected to last as long as any wood exposed to the weather. Needless to say they are less expensive than steel railings.

Constant beam depth affords maximum simplicity of forms, carpentry and cost and in the writer's opinion produces a deck of very clean and pleasing appearance.

These bridges were built by King County, Washington, of which D. L. Evans is County Road Engineer. T. N. Buchanan Company, Inc., was the contractor. They were designed by the writer.

Timber Bridge for 100-Ton Loads

. . . Continued from page 88

to be about 15 ft., although only 10 to 12-ft. average penetration had been expected in the planning stage.

Erection procedure

Actual placing of the trusses was done by a 10-ton truck crane. Bottom chords were swung into place on the falsework bents, and the trusses assembled vertically in their final position. The decking was placed on each truss span as construction proceeded, the crane moving ahead over the completed portion to swing out members for the next span. Since chords for the trusses were 50 ft. long, only one splice was needed in each of these members. This made for easy and fast erection, with no decking required on the falsework except that needed for convenience of the erection crew. Erection took place in fairly cold weather, which made handling of the creosoted material particularly easy, since the creosote was too cold to bleed.

Steel joint assemblies were fitted in place against kick pads which had been fabricated as an integral part of the chords. Turnbuckles were used in each rod of the double-rod verticals for take-up, and to equalize tension. Construction was begun the middle of September, 1950, and was completed in about six weeks.

Personnel

General contractors were Roy L. Bair Co. of Spokane. Job Superintendent was I. B. Munson, and Construction Superintendent was William Haworth. Engineer for the U. S. Forest Service was F. L. Nelson, with headquarters in Missoula, Montana. Structural designer was Dick W. Ebeling, assisted by Robert F. Scherzinger. An interested consultant on the Timber Structures staff was Charles Woodworth, assistant Chief Engineer, who is a native of Libby, Mont.

San Diego Has Loan to Build Sutherland Dam

AN INTEREST-FREE advance of $105,000 to assist the City of San Diego in engineering studies and the preparation of design drawings for the completion of an impounding dam on Santa Ysabel Creek in the San Dieguito watershed has been approved by the Housing and Home Finance Agency. The project contemplates construction of the Sutherland Dam, undertaken in 1927 and on which work was stopped the following year, and will cost an estimated $4,498,-200. It also calls for a pipeline to the San Vincente Reservoir Drainage Basin.

The dam will be built about 35 mi. northeast of San Diego. It will have a length of 1,025 ft., will rise 158 ft. above the stream bed to the crest of the spillway gates, and will provide a storage capacity of 36,724 acre-feet.

The population of San Diego, 200,000 in 1940, has approximately doubled. During World War II defense and war-connected activities increased many times and were responsible for the necessity of bringing Colorado River water to this area years ahead of its anticipated schedule.

San Diego authorities say the drought of recent years has caused the depletion of surface water and most of the underground sources of supply in this part of the State, although the Santa Ysabel stream in normal years wastes large quantities of water to the Pacific Ocean. It is the last remaining stream in the area to be developed as a water source.

Present developed water supplies of the City of San Diego have a net safe yield of 31,000,000 gal. a day when the reservoirs are adequately filled. In their present state of depletion the safe yield is less than 10,000,000 gal. The water consumption of the city exceeds 50,000,-000 gal. a day and the balance is made up from Colorado River water.

License to Build Yale Hydro Project Issued Portland Firm

THE FEDERAL Power Commission has ordered issuance of a 50-year license to Pacific Power & Light Company, of Portland, Ore., for the construction and operation of a hydroelectric project on the Lewis River in Clark and Cowlitz counties in Washington.

The project, designated the Yale Hydroelectric Project, will include a dam about 205 ft. high, forming a reservoir extending about 9 mi. up the Lewis River; a separate low earth dam about 1,600 ft. long and 30 ft. high; a powerhouse with an initial installation of two 70,000-hp. turbines connected with two generators each with a capacity of 50,-000 kw., with provision for installation of 2 more units; a substation; and a single 115-kv. primary transmission line approximately 11 mi. long to connect the Yale substation with the company's existing transmission system. Total estimated cost of the ultimate 4-unit installation is $33,350,000.

Thousands of Miles of Penetration Macadam in Oregon Receive

Maintenance With Portable Plants

Extensive volume of patching and resurfacing to meet quality standards carried out with modern asphalt plants of high mobility—Output of 155,000 tons last year cost $8.46 per ton in place

Administration	✓
Design	
Construction	✓
Maintenance	✓
Municipal	
Bridge	

THOUSANDS OF MILES of penetration macadam highway in Oregon have necessitated the development of maintenance units and operations capable of carrying out an extensive volume of work of a quality which is equal to the original surface, and at a reasonable cost. The key to this well established program is the ten portable asphalt plants that are used to carry out these operations on nearly 6,400 mi. of asphaltic type surfacing.

During the last fiscal year these plants turned out 155,000 tons of mixed material for repairing over 2,300 mi. of highway with asphaltic concrete patches or surfaces. The cost is computed at $8.46 per ton in place.

Portable paving plants

One of the key features of these paving plants—both old and new ones—is their extreme portability. Dismantled to provide loads within the limits for maximum weight permitted on highways in the state, the units can be assembled and producing within 2½ hr. after arriving at a new location. When finished they can be dismantled and on the road towards a new location in 1½ hr.

Plans are made early in the season as to where the plant set-ups will be. They are usually located so as to serve an area with a 20-mi. radius. In the event an area of a larger radius is economical the trucks hauling the material from the plant to the application location are equipped with a heavy tarp to retain the heat of the material. Plants remain at a single location anywhere from five to thirty days. On some occasions, due to the relatively short time required to erect and dismantle, the plants may be set up for as little as three days.

The newest portable plant purchased by the state was manufactured by Madsen Iron Works, and contains many improvements over the plants designed and constructed in the state highway shops in 1923. (Features of these plants and the program under which they were used were reviewed in *Western Construction*, August 1939.) On those older type plants the mixing drums were charged with wheelbarrows pushed up a ramp, the aggregate heated in the drum and mixed with the hot oil by the baffles. Subsequent improvement, about 1938-39, brought about the use of a skip to carry aggregates to a hopper on top of the plant. Material was weighed and put in the skip by four men with wheelbarrows.

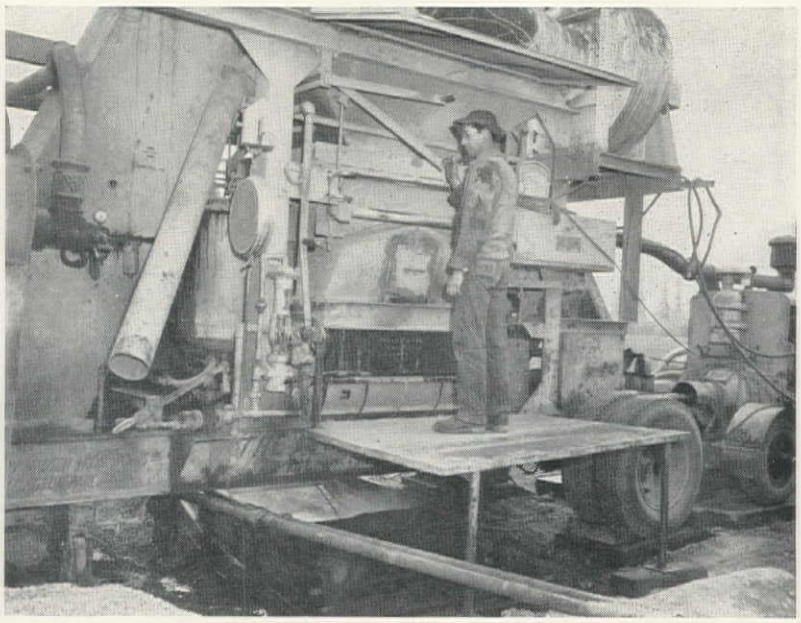
Weighing 34,080 lb., the new plant is 12½ ft. in height (without removable exhaust stack), has a wheelbase of 26 ft., and an overall length, without bunker and power plant of 32 ft., 5 in. Mounted on pneumatic tires it is towed from location to location by a heavy-duty truck. The supplementary equipment, including power plant, kettle, bunker, etc., is towed or carried by the 2-ton trucks used to carry the mixed material from plant to the place of application location.

Arriving at the new location the entire crew aids in setting up the plant. Wheels are set on blocks and a hole, 6 x 8 ft., and 18 in. deep., is dug for the hot material loading skip. Two jacks are set beneath the frame, one on each side, midway between the wheels, to further stabilize the plant.

Handling aggregate

In operation, a Wagner Scoopmobile lifts aggregate from the stockpiles to a double hopper equipped with a grizzly or 2-in. bar screen to reject oversize. The double hopper permits the use of two sizes of aggregates. In the event three sizes are desired in the mix, the loader puts alternate scoops of each of two sizes in one hopper. Aggregate falls from each bin of the hopper through a reciprocating feeder onto two bucket-type elevators. Quantity of the aggregate flowing through the plant is established by adjusting the reciprocating feeders.

From the elevators the aggregates fall into two inclined parallel drums, revolving at 20 rpm., for heating and drying. Each drum is heated by a Hauck low pressure burner. Burners utilize diesel oil from the same tank that supplies the power plant. Air for the burners is delivered at 500 cu. ft. per min. by a Root blower at 8 lb. constant volume. Prior to passing through the blower the



BATCHES of 1,000 lb. (left) at about 275 deg. are lifted by skip which has received a fine spray of diesel oil to prevent sticking. The operator (right) weighs two sizes of heated aggregate and controls the 40 to 45 sec. mixing time.

air is filtered by a unit mounted on top of the power plant. This filter also cleans air for the diesel motor.

Air, steam and particles of sand are drawn from the front, or feeding end of the drums, and pass through a cyclone where the sand is removed before the steam and air pass out through the exhaust stack. About 80% of the sand is saved by the cyclone. This sand, that otherwise would be wasted, is needed to provide a sufficient amount of fine material in the mix. After leaving the cyclone the sand is deposited in one of the two hot-stone elevators that catch the aggregate, heated to 350 deg. F., as it leaves the drums. These elevators raise the material to a pair of storage bins, each equipped with an overflow pipe that runs back to the base of the hot elevator.

Weighing the aggregate

From the storage bunkers, which can accumulate up to 3,000 lb., or three full batches, the heated aggregate drops into the weighing hopper. The weighing of 500 lb. out of each bin completes the batch, which is then dropped into the pug mill. The mill is of special design with an arrangement of spiral paddles which have an egg-beater effect. Asphalt is admitted to the pug mill through a pipe running its full length, having holes spaced every 2 in. for quick distribution. Asphalt is weighed, and introduced at 300 deg. F.

The combination of rapid introduction of hot rock, even distribution of asphalt and special action of the blades makes for a minimum mixing period. The required time is 40 to 45 sec., but an operator reports that a 20-sec. mixing period provides an adequate mix according to appearance.

The mixed material at about 275 deg. F. falls directly to a skip that lifts it up and dumps it in a waiting truck. Prior to dropping the mix the skip is given a very fine spray of diesel oil to prevent the hot material from adhering to its surface. Extreme care is taken in spraying the skip to prevent getting such a quantity as to "cut back" the asphalt.

Supplementing this plant in its operation are: (1) A Caterpillar diesel engine mounted on a separate trailer and connected to the plant by a drive shaft is used to provide operational power for drums, feeder, cyclone, blower, elevators, pug mill and skip. (2) Two 3,000-gal. tanks are hauled as semi-trailers from the source of supply and hold the asphalt at the plant until used; one truck is used for the two tanks, bringing in a full one, leaving it, and returning with the empty tank. (3) A 750-gal. asphalt kettle connected by pipes to both storage tank and feeding tank is attached to the plant and equipped to keep the asphalt circulating through it and the tanks. (4) A 750-gal. tank holds the supply of diesel oil for power plant and burners. Both kettle and diesel tank are trailers and towed by truck when moving to a new location. On the move the skip and bunker are loaded on trucks by the Scoopmobile and unloaded at the new location.

ON THE ROAD the mix is spread and bladed over a tack coat allowing for 1/4-in. compaction for a 1-in. depth of mix and topped with a seal coat.

Two Typical Mixes

Passing	Retained	%
¾"	¼"	30-42
¼"	10 mesh	18-28
10	200 mesh	20-36
200	—	3-5
Asphalt		5-7
	* * *	
½"	¼"	35-45
¼"	10 mesh	33-43
10	200 mesh	12-20
200	—	0-2
Asphalt		4-6
	* * *	

Asphalt is 85-100 penetration, for patching on concrete, or asphaltic concrete pavements, and 121 to 150 penetration on bituminous macadam and oil surfaces.

During the summer when aggregates are normally dry a production of 320 tons in 8 hr. has been attained. On the average the plant produces 300 tons in an 8-hr. day. If aggregates are quite wet when entering the plant production may be as low as 25 tons per hr.

Concluded on page 170

Model Ordinance for Cutting And Backfilling City Streets

City officials of East Bay Metropolitan area draw up model set of specifications to cover the serious municipal problem of trenching through street paving and repairing the cuts

FOLLOWING two years of conferences and discussion, a standardized "model" ordinance regulating the use of streets during work on underground utility facilities has been developed for use by the 11 adjoining municipalities along the eastern shore of San Francisco Bay.

Development of the ordinance and its standardized specifications and permit has been carried out as a major project of the East Bay Chapter of the American Public Works Association. A committee comprised of city engineers, superintendents of streets, and city managers, members of the organization who hold offices in the 11 municipalities, and representatives of the East Bay Municipal Utility District, Pacific Telephone and Telegraph Co., and Pacific Gas and Electric Co., participated in the work of drawing up the model ordinance.

At the April 20 meeting of the East Bay Chapter of the APWA the membership unanimously voted for adoption of the ordinance and recommended that it be accepted and used by the communities concerned.

Heretofore, each of the cities (Oakland, Berkeley, Alameda, Piedmont, Emeryville, El Cerrito, Albany, Hayward, San Leandro, Richmond and Livermore) had separate ordinances governing this type of work. As these cities have common boundaries, underground utility construction, repair and maintenance work often run through more than one city, and in the case of main lines, run through several. The variation in ordinances, permits and backfill and paving requirements, as well as the lack of ordinances in some cases, has provided constant problems to the utility organizations and their contractors executing underground work. In many cases it would be necessary to change operational procedures several times while carrying out a single project.

With the adoption of the standardized ordinance and the specifications it contains, it is believed that greater operational efficiency can be obtained and in some instances a saving in planning and construction will result.

While subject to adjustment to fit the legal language of the separate municipalities, this ordinance formulated by the city officials is as follows: (Sections of a general nature are condensed to conserve space).

"An ordinance regulating the use of public streets and thoroughfares by public utilities for installation, maintenance and repair of underground facilities."

Section 1. Compliance with Ordinance. Work must be done in accordance with provisions of ordinance.

Section 2. Permit Required.

Section 3. Application for Permit. Covers requirements of Superintendents of Streets; furnishing of plans and profiles showing work to be done; method of making application; provisions for emergency street openings; operations on state highways; and notification of police or fire department when necessary for public safety.

Section 4. Form and Conditions of Permit. This section covers the approval of the permit; the time limit of work; that the permit shall be void if work not completed within time specified, or, unless extension of time is given by Superintendents of Streets; for meeting requirements and conditions imposed by State Highway Department if work is done on streets under its jurisdiction; and the keeping of adequate maps and record of underground facilities belonging to the permittee.

Section 5. Revocation of Permit. This provides for permit to be revoked for non-compliance with provisions of ordinance.

Section 6. Notice of Commencement of Work.

Section 7. Prosecution of Work. States that after work is started it shall be diligently and continuously prosecuted until completed and must be completed within time specified, unless for good cause an extension is granted.

Section 8. General Requirements in Performance of Work. "All work shall be performed in a neat and workmanlike manner and so programmed as to cause the minimum of interference with traffic and inconvenience to the public. Free and unobstructed access shall be provided to all mail boxes, fire hydrants, water gates, valves, manholes, drainage structures and/or other public service structures and property as may be required for emergency use. Such public service structures or property shall not be removed or relocated without proper coordination with the properly constituted authorities charged with their control and maintenance. The working area shall be confined so as not to obstruct roadways and walks unnecessarily. Temporary roadways, driveways and walks for vehicles and pedestrians shall be constructed where required. Upon written application, streets, driveways, or areas may be closed for limited periods where, in the opinion of the Superintendent of Streets, the public interests can best be served thereby.

The work shall be coordinated with other agencies or concerns working in the area to the satisfaction of the Superintendent of Streets.

Section 9. Barricades and Warning Signs. During the performance of the work the permittee shall provide and maintain fences, barricades, warning and directional signs, flares, red lights, watchmen and flagmen as may be required by existing laws and regulations and as deemed necessary in the opinion of the Superintendent of Streets, to insure full and complete safety to the general public.

Section 10. Compliance with State Safety Orders and Applicable Laws. Herein is covered obedience to, and enforcement of, existing safety orders, rules and recommendations of State Division of Industrial Safety and local laws, codes and ordinances pertaining to safety.

Section 11. Backfill. All trenches and excavations shall be backfilled in the following manner: the trench or excavation shall

Administration	✓
Design	
Construction	
Maintenance	✓
Municipal	✓
Bridge	

be filled to not less than one (1) foot above the top of the pipe or other utility facility with fine material selected from the excavation, free from stones and lumps and of such character as to be readily compacted around and under the pipe, or with an imported fine granular material. The backfill material shall be thoroughly compacted around the pipe or other utility facility. Above the resultant level of this first operation the trench or excavation shall be backfilled to the subgrade of the pavement type to be replaced. This work shall be done in such a manner as to obtain a relative compaction of the backfill of not less than 90% as determined by the Impact or Field Compaction Test made as specified in Section 6, Article (g), Standard Specifications of the State of California, Department of Public Works, Division of Highways, dated January 1949. If the excavation material will not give the required relative compaction, an imported granular material that will give said relative compaction shall be used. The use of water in this stage of the backfill operation will not be permitted if the soil will not readily drain and/or if the adjacent street may become damaged or the paving is unduly delayed. Excess water must be evaporated before the next layer of earth or paving is placed.

The cushion course of crusher run may be eliminated in unpaved parking strips between the curb and sidewalk. However, the top six (6) inches of backfill in trenches or excavations in unpaved parking strips shall be replaced with original or similar suitable top soil.

Tests for compaction shall be made at the request of the Superintendent of Streets and paid for by the permittee.

Section 12. Pavement. Pavement shall be replaced with a standard type as indicated on the permit.

The edges of all trenches and excavations shall be properly trimmed and squared up, and all loose material shall be removed before pavement is placed.

Temporary surfacing acceptable to the Superintendent of Streets or as indicated in the permit shall be installed on the same or next working day after the backfilling has

Concluded on page 172

Program for Annual Convention of WASHO

Details of 30th annual meeting of Western Association of State Highway Officials to be held in San Francisco June 25 - 28

PROGRAM OF GENERAL AND TECHNICAL SESSIONS

MONDAY JUNE 25

10:00 A.M. General Sessions.
Call to Order.....W. L. ANDERSON
Invocation.
Welcome to the Thirtieth Annual Conference.....G. T. McCOY
Welcome to San Francisco..MAYOR ELMER ROBINSON
Roll Call of States.....J. A. ELLIOTT
President's Annual Address.....W. L. ANDERSON

11:00 A.M. *"Essentiality of Highway Construction to the National Defense Effort"*—R. H. BALDOCK, State Highway Engineer, Oregon.
Group Photograph.

12:15 P.M. Luncheon.

2:00 P.M. Address by THOMAS H. MACDONALD, Commissioner, United States Bureau of Public Roads.

2:40 P.M. Address by H. H. HALE, Secretary, American Association of State Highway Officials.

3:30 P.M. *"Procurement of Essential Materials"* — GEORGE KEATING, Production Engineer, Office of Defense Mobilization.

4:00 P.M. *"How Much of Highway Dollar Is Available for Construction After Right of Way Is Financed"*—FRANK BALFOUR, Chief Right of Way Agent, California.

8:30 P.M. Ice Follies—Winterland.

TUESDAY JUNE 26

9:00 A.M. *"Maryland Test Board"*—FRED BURGGRAF, Associate Director, Highway Research Board.

9:40 A.M. *"Viewpoint of Motor Carriers"*—WADE SHERRARD, General Manager, Motor Truck Association of California.

10:20 A.M. *"Penalties for Overrun in Contract Time"*—W. A. BUGGE, Director of Highways, Washington.

11:00 A.M. *"Contracting in a Period of National Emergency"*—A. N. CARTER, Co-Secretary, Associated General Contractors.

Operations Session—Practical

2:00 P.M. *"Cement Treated Base Construction in California"*—E. WITHYCOMBE, Assistant State Highway Engineer, California, In Charge of Operations.

2:40 P.M. *"Skid Resistance Measurements"*—RALPH MOYER, Research Engineer, Institute of Transportation and Traffic Engineering, University of California.

3:30 P.M. *"Simplification of Grades of Asphalt"*—WALT WINTERS, Chief Engineer, The Asphalt Institute.

4:00 P.M. *"Paints and Protective Coatings"*—BAILEY TREMPER, Materials Engineer, Washington.

Design Session—Theoretical

2:00 P.M. *"Channelization and Intersections"*—EUGENE MAIER, Chairman, Highway Research Board Committee.

2:40 P.M. *"Truck Speeds on Grades"*—WILLIAM E. WILLEY, Engineer of Economics and Statistics, Arizona State Highway Department.

3:20 P.M. *"Triaxial Institute"*—V. A. ENDERSBY, Chairman Triaxial Institute Research Cooperators.

4:00 P.M. *"Analysis of Data on Accident Statistics"*—HARMER DAVIS, Director, Institute of Transportation and Traffic Engineering, University of California.

7:30 P.M. Informal Dinner—Gold Room—Fairmont Hotel.

WEDNESDAY JUNE 27

9:30 A.M. Bus Trip to View Bayshore and Eastshore Freeways with Lunch in Oakland.

THURSDAY JUNE 28

10:00 A.M. General Session—W. L. ANDERSON Presiding.
Reports of Committees.
Report of Secretary-Treasurer.
Election of Officers.
Adjournment.

ENTERTAINMENT FOR THE LADIES

MONDAY AFTERNOON—Tour of Gumps including inspection of the collection of jade and oriental treasures.

MONDAY EVENING—Ice Follies.

TUESDAY MORNING—Cruise around San Francisco Bay, followed by automobile tour of Oakland and lunch at the Claremont Hotel.

TUESDAY EVENING—Informal dinner—Gold Room—Fairmont Hotel.

WEDNESDAY MORNING—Bus trip to Stanford University, with lunch in Palo Alto, and return through Golden Gate Park.

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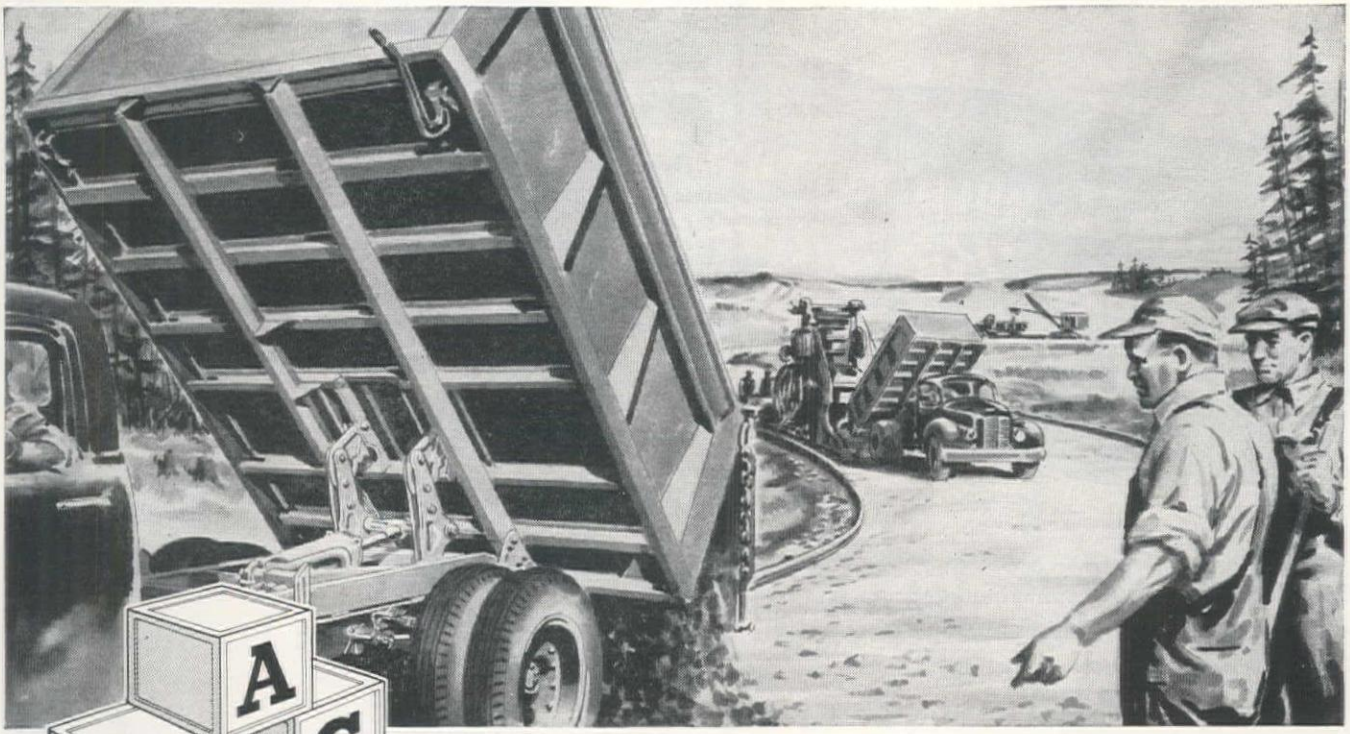
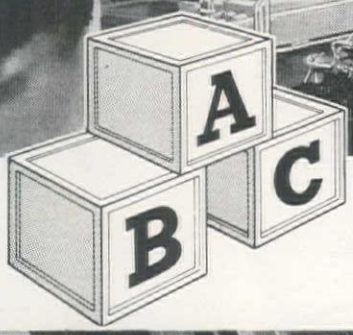
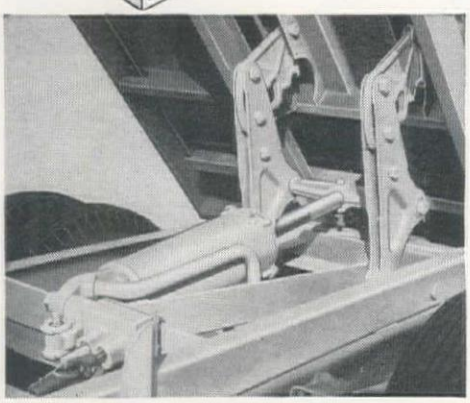




A WINNING COMBINATION on "TOUGH" JOBS!



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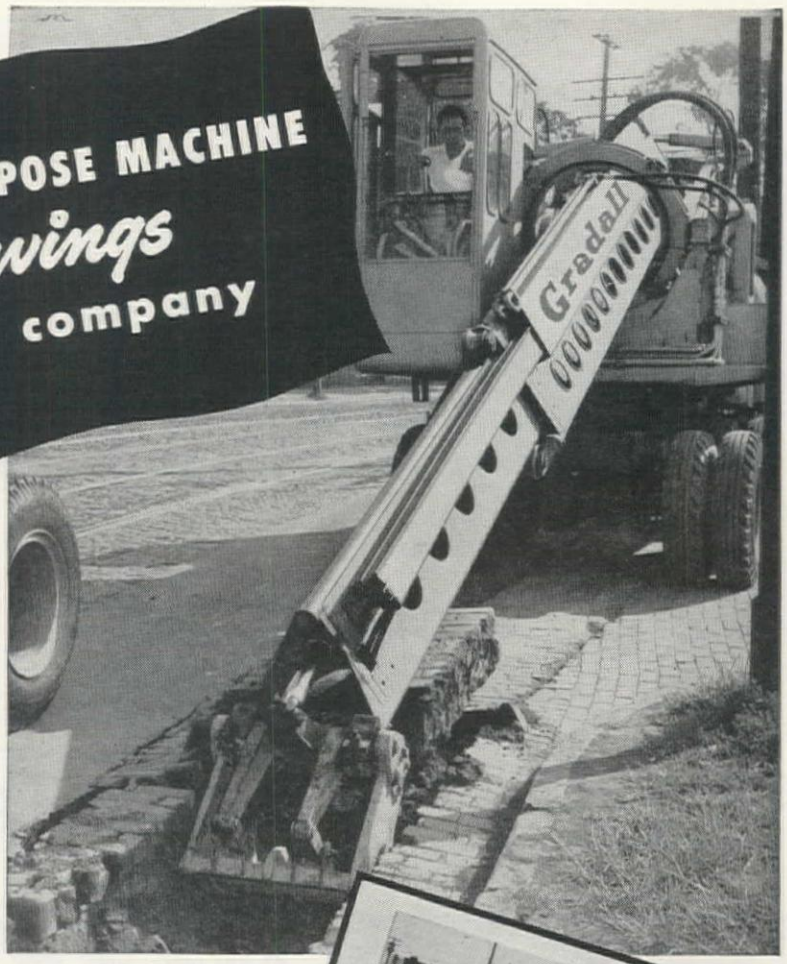

Read how a new mechanization program is saving thousands of dollars for one of the country's largest utility companies.

You will find much valuable information from the experience of this big electric company in developing and adapting mechanized equipment for the kind of jobs regularly faced by construction engineers and contractors. Many different machines are listed along with specific applications. Here's what they say about the Gradall—

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- ". . . with line drill, broach and Gradall machines, we were able to reduce cost of pavement removal about 85%, as compared with the old method using pneumatic jack hammers and hand loading."
- ". . . the same Gradall also makes light work of pile and shore pulling."

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Highway Programs of Western States

A summary of construction planned for 1951

WASHINGTON

The 1951 session of the Washington State Legislature passed a substantial bond issue for expanding highway construction on State Highway Routes 1, 2 and 3. Money from this bond issue would provide for extensive enlargement of the regular state highway construction program for the next several years. At the present time, the constitutionality of the bond issue is being tested in friendly suit and the outcome of this legal action will have an important effect on the present and future highway program of the state.

Aside from the possible construction resulting from the bond issue, a substantial program has been prepared for the fiscal year, which will end March 31, 1952. The over-all figure of this construction program totals an expenditure of approximately $20,000,000.

W. A. Bugge is Director of Highways for the State of Washington.

ARIZONA

Budget making and planning will not be completed until July 1 for the highway construction program of the Arizona Highway Department. Total amount of construction will depend on the carry-over from the 1951 budget.

Tentative plans call for a total construction budget which will be about the same as last year—$24,000,000. This total breaks down into about $6,000,000 of federal aid, $5,000,000 of new state money and about $13,000,000 of carry-over funds.

Of this carry-over, projects which are now under contract represent about $6,000,000 and projects that are contemplated for contract during May, June and July represent a further total of $5,500,000.

R. C. Perkins is state highway engineer of Arizona, and E. V. Miller is assistant deputy state engineer.

COLORADO

Colorado operates on a calendar year and the program for 1951 provides $18,366,758 available for the present season. Of this amount, $8,659,466 is state funds and the remainder, $7,481,000, is federal aid. The federal aid funds are further apportioned as: primary, $3,948,000; secondary, $2,661,000 and urban, $872,000. The total available funds have been allocated by the State Highway Department as follows: primary, $7,920,544; secondary, $5,355,075; urban, $2,612,251 and state, $2,478,888.

These expenditures do not include any funds for the Denver-Boulder Turnpike (*Western Construction*, April 1951, page 67). Money for the turnpike was derived on a $6,300,000 bond issue, most of which has already been obligated to contracts.

Major projects which will be let to contract this year from 1951 funds include additional work on the Denver Valley Highway, for which $2,519,000 is appropriated; paving of the new Denver-Castle Rock Highway on U. S. 85-87, appropriation $1,485,000; a new 2-lane road from Castle Rock to Larkspur, which will make that stretch of U. S. 85-87 a 4-lane highway, $700,000; paving of extension of West 6th Ave., State Highway 182, to the mouth of Clear Creek Canyon and paving a new alternate U. S. 40 in the canyon, $700,000; improvements on U. S. 6 between Denver and Wiggins, $500,000; improvement to U. S. 85 from Greeley south, $650,000, and a new bridge over the Colorado River at Glenwood Springs, $500,000.

Mark U. Watrous is Colorado state highway engineer, Wallis M. Reef is director of public and intergovernmental relations.

OREGON

Highway construction in Oregon for 1951 has been indefinite because of legislation which would authorize the issuance of bonds to expedite an expanding highway improvement program. This bond issue might represent as much as $60,000,000 to be expended in a five-year construction program, with allocation to be made under the direction of the State Highway Commission.

With funds available from assured sources, the 1951 highway construction program in Oregon would include $13,200,000 of work under contract prior to the first of the year; $11,600,000 worth of contracts awarded during the first four months; $3,600,000 to be placed under contract before the end of September. This represents a total of $28,400,000. Of this total, estimates indicate that $18,750,000 will be expended on highway work during the present calendar year.

R. H. Baldock is Oregon state highway engineer.

NEVADA

The construction and maintenance program of Nevada for the calendar year provides a budget figure of $8,300,000. Of this total $6,702,000 will be spent on construction and reconstruction, with $1,496,000 set aside for maintenance work on 3,751 miles of highway. Funds totaling $100,000 have been set aside for snow removal and flood damage.

Placing of this work under contract may be slowed down for two reasons: first, the State Highway Department is again experiencing difficulty in securing qualified engineering personnel in both office and field; second, contractors are already experiencing difficulty in obtaining some critical materials. However, the State Highway Department is making all efforts to get the program under contract without undue delay.

H. D. Mills is chief highway engineer of the Nevada Department of Highways.

IDAHO

An Act of the 1951 Idaho State Legislature established a three-man Board of State Highway Directors. This board will assume control of the State Highway Department and all its functions on July 1. As a result, plans for future highway development in Idaho, including details of the construction program which will be carried out this season, are being left for action by the newly created board.

James Reid is chief engineer of the Idaho Department of Highways.

UTAH

Apportionment of federal aid funds for Utah will provide $2,038,560 of primary funds; $1,346,199 of secondary funds, and $426,384 of urban funds. This represents a total of $3,811,143. The figure is 80% of the federal aid funds which will be apportioned to the state pending final release of the 1950 census figures, which constitute one factor in the allocating of federal aid money.

The State of Utah plans to place under contract during 1951 approximately the following program:

Federal aid primary	$5,000,000	80 mi.
Federal aid secondary	2,500,000	100 mi.
Federal aid urban	1,000,000	5 mi.
State betterments	1,000,000	40 mi.
	$9,500,000	

E. G. Johnson is chief engineer of the Utah Department of Engineering.

NEW MEXICO

About $11,000,000 will be expended by New Mexico during 1951 for highway construction. This represents a decreased program from 1950. Of this $11,000,000, about $5,500,000 will be expended on primary roads, $3,500,000 on secondary, $750,000 for urban construction, and $1,250,000 on the state highway system exclusive of federal aid work.

Expenditures for maintenance will approximate $4,500,000, which is the same as the 1950 expenditure for this type of work. More highway money would be expended for maintenance during the coming season but available

funds made it impossible to increase these expenditures.

National defense efforts may have some effect on construction work for primary routes, particularly where critical materials will be involved. At the present time the State Highway Department plans to award contracts on federal aid roads (primary and secondary) at the rate of about $1,000,000 per month. This was the rate of contract letting which was maintained during 1950.

Construction will result in placing the same general type of roadway surface which has been the New Mexico standard during past years. Practically all of the surfacing will be of the bituminous type, with secondary roads receiving a lower type of treatment and the mileage on the interstate system receiving a plant-mix paving.

B. G. Dwyre is state highway engineer and L. D. Wilson is administration engineer.

CALIFORNIA

A total of $115,500,000 has been allocated for the California State Highway budget of 1951-52. The major construction projects in this program total $71,-108,000. The balance of the funds are allocated for primary engineering, construction engineering, rights-of-way, operation and maintenance at the San Francisco-Oakland Bay Bridge and minor improvements.

Almost $13,000,000 remains in the 1950-51 budget for construction, and projects financed from these carry-over funds will all be under contract prior to June 30.

California law permits the Division of Highways to put construction projects under contract after April 1 for the coming fiscal year. As a result, many projects are already under contract or have been advertised based on the 1951-52 funds.

George T. McCoy is chief engineer of the California Division of Highways.

MONTANA

During 1951 Montana will carry out highway construction projects totaling $11,744,000. In addition to the construction program, maintenance operations which will be let to contract total about $500,000, of which the major item will be about $350,000 let for stock-piling gravel. Total maintenance budget for Montana will exceed $6,000,000.

The construction program for the year includes 49 contracts totaling $8,-164,000 which were awarded last year and on which uncompleted work represents $4,556,000.

The 1951 program has been allocated as follows:

Primary system	$ 7,987,000
Grade separation	836,000
Secondary system	2,676,000
Urban system	245,000
	$11,744,000

Troy Carmichael is chief engineer of the State of Montana Highway Commission.

Wyoming's Highway Maintenance Methods

. . . Continued from page 84

working under the crew foreman is determined by the number of miles of highway assigned to the station; the average is one man for every 23 mi. of road. These crews are made up of permanent employees and work on a monthly salary basis the year round. During busy periods they are augmented by temporary employees paid on an hourly basis. Sufficient equipment to perform any ordinary maintenance work is provided at each of these stations.

Numerous small stations

A few years ago it became apparent that in some sections of the state, certain sections of highway were being neglected because they could not be readily reached by the gang method of maintenance. To overcome this, we have set up a number of small stations with a section foreman in charge of each, assisted by one permanent employee. Men at these stations devote the greater share of their time to surface repair.

As previously mentioned, extensive use is made of machinery in accomplishing maintenance work in Wyoming. Good, modern equipment of the proper type, operated by competent workmen is indispensable if satisfactory work is to be obtained. An otherwise excellent workman may become dissatisfied and incompetent if he is furnished obsolete, broken-down equipment with which to do his job. A continual check is made of all equipment owned by the highway department. When the normal operating life of a piece of equipment has been reached, or if it has become obsolete, it is promptly replaced. This policy permits the maintenance division to use the latest models in all of its equipment and has resulted in much better performance.

Radio system indispensable

Radio plays a major role in the maintenance operations of the highway department. All cars and pickup trucks used by district maintenance engineers and crew foremen are equipped with two-way radios. In addition, a number of snow plow units have radio installations. During the summer months, radio is used for ordering parts and supplies and for general communication between maintenance crews in the field.

The radio system has become almost indispensable to operations during the winter season. Crew foremen use it to direct snow plows to trouble spots, thus enabling a speed-up in service to the highway users. Snow plow crews use the radio to keep informed on conditions throughout their district and are able to transfer equipment quickly from one area to another in emergencies.

There is a growing demand from the public for up-to-date and dependable road and weather information during winter months. Radio is entirely responsible for the prompt information now furnished the public. Twice daily, at 8:00 a. m. and 11:30 a. m., the state network is given over to gathering road and weather information. Each foreman reports to his control station which in turn transmits the information to the master control station at Casper. When all reports are in, the information is rebroadcast to all stations and mobile units in the state. The stations and mobile units record the information on road and weather conditions existing in all areas of the state. This information is given to the local newspapers and broadcasting stations, and is used for answering telephone requests for road and weather conditions. The entire operation of gathering and re-broadcasting road and weather reports consumes about 20 min. of radio time.

Field Problems in Concrete Work Discussed by Experts

HOW CAN CRACKS in flat concrete work be prevented? What are the advantages and disadvantages of using admixtures? Are the standard field tests reliable measures of concrete quality? Practical construction men in the San Francisco Bay Area had the opportunity last month to have these and other questions about field problems in the use of concrete answered by a panel of local authorities.

A similar session on field problems was included as part of the program of the American Concrete Institute national convention, held in San Francisco, Feb. 20-22. Many of the questions, asked of a panel of authorities from all over the country, related to small but annoying problems in concrete construction but resulted in elaborate answers that still left too much of a gap between concrete technology and the actual use of concrete in the field. It was suggested that a later conference be held in the Bay Area wherein more of these practical problems could be discussed and possibly to a greater degree of satisfaction.

This meeting was held the evening of May 4 and was attended by about 250 contractors, engineers and construction men from the Bay Area. The meeting was presented by the University of California Division of Engineering Extension in cooperation with the Central California Chapter of the Associated General Contractors, the Portland Cement Information Bureau and local members of the American Concrete Institute. The discussion was led by the following panel: J. W. Kelly, Professor of Civil Engineering, University of California, chairman; J. E. Jellick, Manager, Portland Cement Information Bureau, San Francisco; W. C. Tait, San Francisco contractor; W. A. Grant, technologist, Readymix Concrete Co., Ltd., San Francisco, and E. L. Howard, Jr., testing engineer, Pacific Coast Aggregates, Inc., San Francisco.

The meeting proved to be more successful than the ACI-sponsored session. No problem seemed too small to merit a thoughtful answer from at least one member of the panel and discussion was spirited. Most of the men who attended the meeting indicated they would be interested in another similar meeting later this summer.

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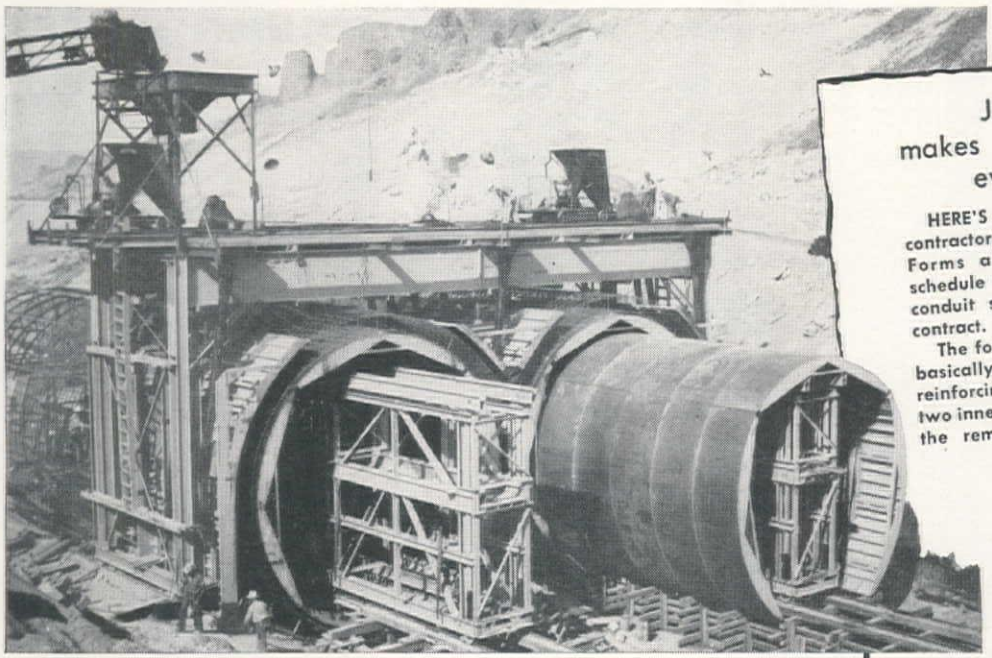

J. A. Terteling makes 25-ft. double pour every other day

HERE'S how J. A. Terteling, Boise contractor, combined Blaw-Knox Steel Forms and a systematic working schedule to make real progress on the conduit section of his Grand Coulee contract.

The form setting procedure consisted basically of first setting the bottom reinforcing steel, then telescoping the two inner barrel forms into place. When the remaining reinforcing steel was placed, the rail-mounted outer form gantry with the outside forms was pulled into place and set for the pour. Sufficient forms were provided to permit concreting a 25-ft. length of double 25-ft. diameter conduit every other day.

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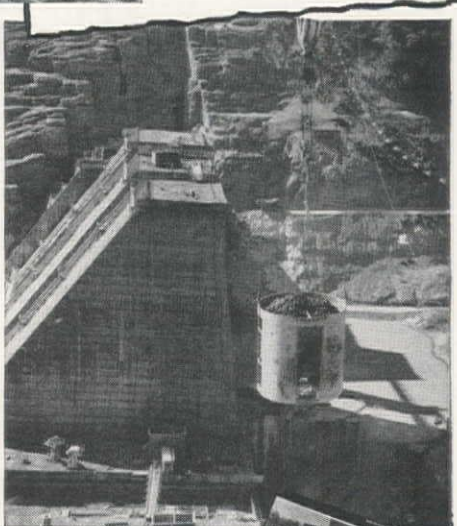

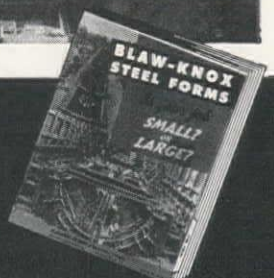

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Fifty Years of Improvement In Concrete Paving Equipment

From wheelbarrow measuring and hand mixing, mechanization has advanced to provide weighed aggregate and bulk cement, dual-drum pavers, machine spreading and finishing

By ARTHUR A. LEVISON
Vice President In Charge of Construction Equipment Dept.
Blaw-Knox Division
Pittsburgh, Pa.

CONCRETE PAVING has advanced by many significant strides since the Foote Company introduced its first mixer in 1896 and took this basic operation off the "hand mixing boards" and put it into a machine. Today the use of diesel driven dual-drum mixers on highway and airport work, when combined with spreaders, vibrators and finishers, is a major factor in the building of the transportation system of the United States. A brief review of the mechanization of concrete highway paving will provide highway engineers with a history of the equipment which has made possible the construction of the roads they plan and design. Another method developed later was to store the materials in stock piles about every 30 ft., moving the mixer by hand from one pile to another, discharging the concrete into wheelbarrows and wheeling it into place.

Concrete Pavers

In 1903 the Foote Catalog stated that the "No. 3 Continuous" weighed 6,000 lb., and could be moved from one pile to another in from 3 to 5 min., adding it was not necessary to have a team for this purpose, as eight to ten men could pull the machine along easily.

Five years after this machine appeared in St. Louis, on towards the close of 1908, the use of mixing boards on street paving work in the United States had almost entirely disappeared. In 1910, Seattle was the first city in the Far West to prohibit the use of continuous mixers on street paving work. In 1914 when World War I was beginning, the day of the continuous mixer on paving work had passed and it was entirely supplanted, first by the side-discharge batch mixer and later by the end-discharge wheel traction paver.

By 1907 Foote had brought out a revolving drum type batch mixer. This was the first of the double cone drums, a design which has been adhered to ever since. This first batch-type machine had a capacity of 14 cu. ft., and was known as a 14S. The first end-discharge model, designated as a model 6A was brought out in 1910 and was designed supposedly for street paving work. Company engineers, in conjunction with the Bryant Paving Co. of Waterloo, Iowa, developed the first full crawler traction paver. This was shipped in April 1919 and was used on an Arkansas road contract where the owner reported that subgrade conditions made the use of a wheel traction paver impossible.

Aggregate Batching Plants

Development of the modern aggregate batching plant was initiated in 1920. Previously, aggregates were placed in piles on the ground around the mixer, shovelled into wheelbarrows, and then dumped into the skip of the mixer. For concrete paving work, the aggregates were deposited on the subgrade in longitudinal windrows, measured in wheelbarrows, and then dumped into the skip. A large number of men were required for handling of the aggregates, and the measuring of aggregates was necessarily crude and inaccurate.

TWIN weighing batchers discharging a double charge of aggregate into the batch truck speed up concrete paving work on highways and airports.

The first batching plants for aggregates utilized volume measurement for both fine and coarse aggregates. Adjustable volume batchers were used in conjunction with overhead storage bins and the batches of aggregates, measured by volume, were dumped into a truck or mixer.

In 1924 it was recognized that the volume measurement of fine aggregates led to inaccuracy because of the bulking of sand. At that time the use of weighing, as a means of proportioning, was experimented with in Iowa on concrete highway paving work, and a few years later, in 1926 and 1927, measuring of aggregates by weighing began to become popular.

While the measuring of coarse aggregates by weight was not essential, it was more convenient and practical to measure both fine and coarse aggregates by weighing. Later came the division of coarse aggregates into multiple sizes in order to better gradation. This led to three compartment and four compartment batching plants which took care of two sizes and three sizes of coarse aggregates, respectively.

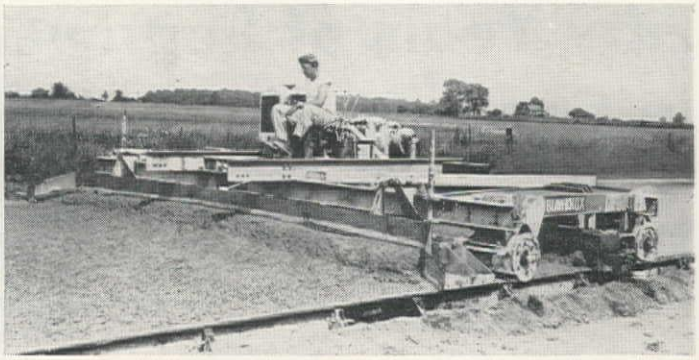
A recent development in batching plants for aggregates is the dual weighing batcher which accommodates two complete batches of aggregates and the two batches are discharged into two-batch trucks simultaneously, thus saving an appreciable amount of truck time.

KEY to modern concrete paving speed and accuracy is the dual-drum paving mixer. Volumetric measuring of aggregate was discarded about 1926 in favor of weighing.

Bulk Cement Plants

The advent of mechanical equipment for handling, storing, and batching bulk cement came in 1930. Up to that time cement had always been handled in bags. A great deal of labor was wasted in opening the bags and emptying them into the batch truck or mixer. In addition, the operation was too slow and there was the attendant disadvantage of loss of cement sacks which worked a financial hardship on the contractor.

At first bulk cement was shipped in boxcars and this required scraper equipment for getting the cement out of the cars. Later hopper bottom cars were de-



HEAVY AND SLOW hand labor has been eliminated by the mechanical spreader (left) followed by the finisher (right). Both machines can be provided with vibrating attachments.

veloped by various railroads and this type of car made it unnecessary for men to get into the car during the unloading of the cement. There was a gradual change and development in bulk cement plant design from boxcars, to hopper-bottom cars, and finally for delivery by truck. Today the design of a bulk cement plant includes a power-operated screw conveyor to move the cement laterally to the foot of a vertical enclosed elevator. The cement is elevated into an overhead storage bin which is leak-proof and weather-tight. Attached to the bottom of the storage bin is the weighing batcher for the cement.

Many designs of bulk cement plants are highly portable for quick erection and minimum loss of time in moving from one site to another. Here again a dual type batcher has been developed within the last two years to permit simultaneous discharging two batches of accurately weighed cement into a batch truck for paving of roads or airports, with appreciable saving in truck time.

Today the use of bulk cement on work of any appreciable size is an economical necessity, taking into account the saving in the cost of cement when purchased in bulk, and the saving in time in the handling and batching of the cement.

Concrete Paving Spreaders

Development of a mechanical concrete paving spreader took place during the construction of the Pennsylvania Turnpike in 1939. This was the first commercial application of a mechanical spreader on a large basis. Previously, the concrete was discharged from the paving machine onto the subgrade, and men with shovels handled the preliminary placing and spreading of the concrete. The finishing machine was utilized as a dual purpose machine: First, as a bulldozer to do heavy-duty spreading of concrete, and second as a finishing machine.

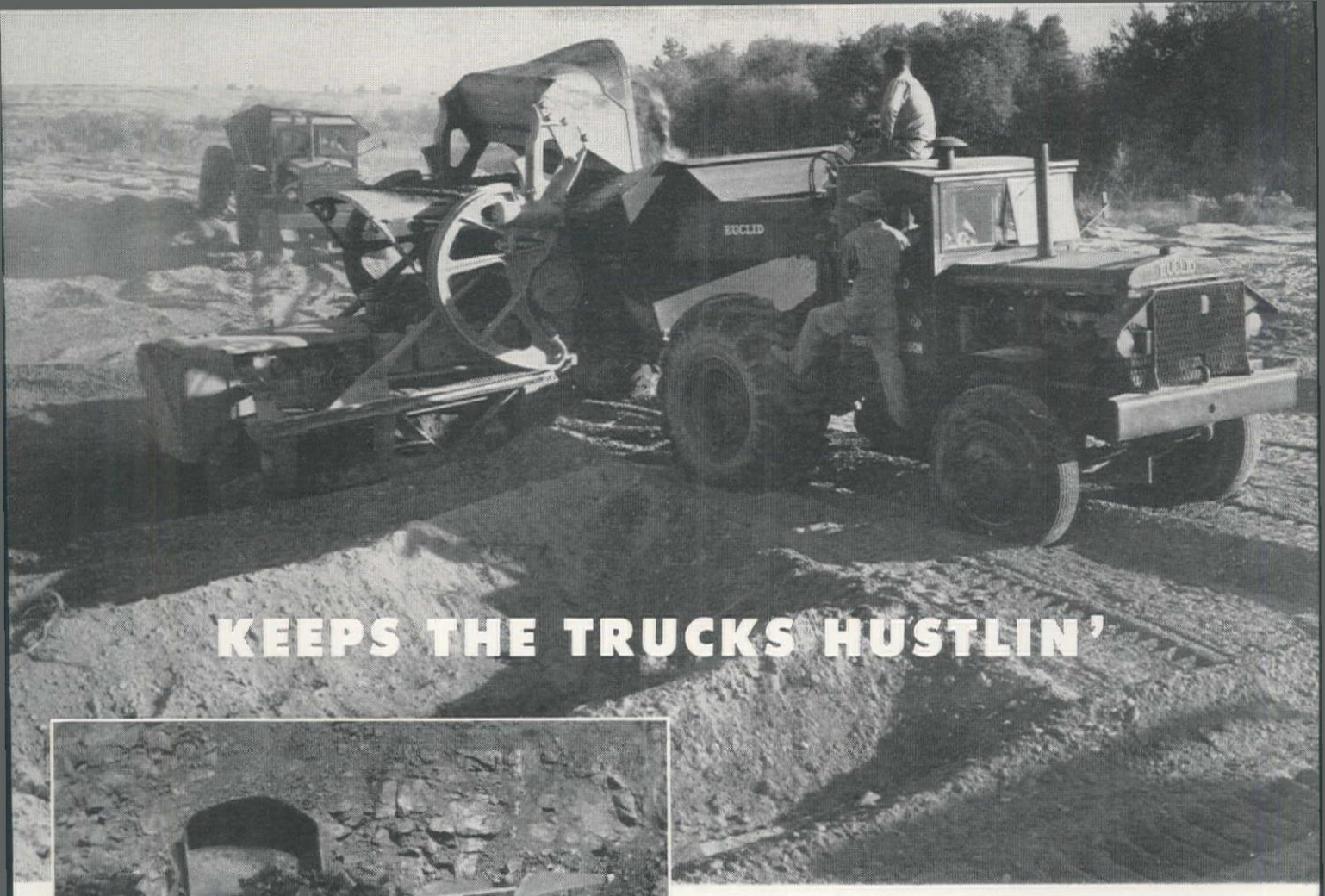
Introduction of the spreader was a long step forward in mechanizing concrete paving operations for roads and airports. It eliminated much hand labor and took away from the finishing machine the bulldozing of concrete for which it was never intended. The mechanical spreader has been a valuable aid in expediting paving construction work.

Along with the paving spreader there has been developed a vibratory attachment (first used in 1932) for the consolidation and compaction of the concrete that has been spread. The vibratory attachment not only consolidates the concrete, but insures absence of honeycomb at the edges of the slab and adjacent transverse and longitudinal joints.

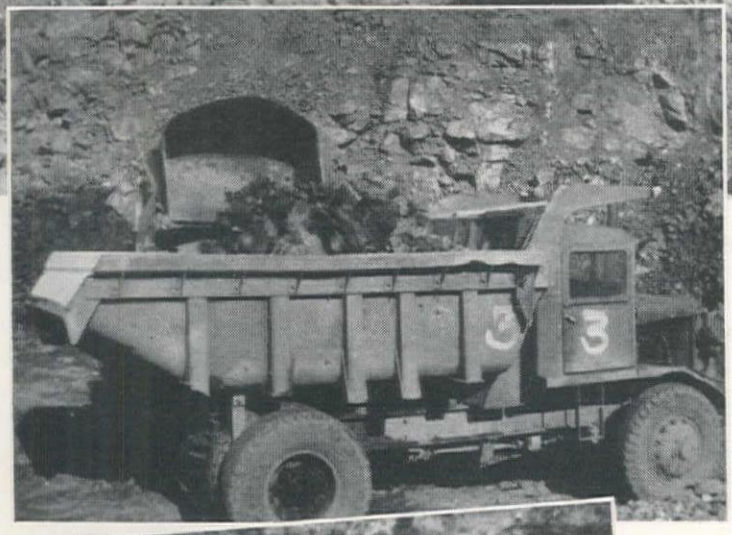
Concrete Finishing Machines

Finishing machines for concrete paving construction began to be used about

Concluded on page 171



KEEPS THE TRUCKS HUSTLIN'



Eimco 104's load the big trucks as well as the small ones. 15 yard "Eucs" like the one illustrated above are loaded full under average rock conditions in 2½ to 3½ minutes.

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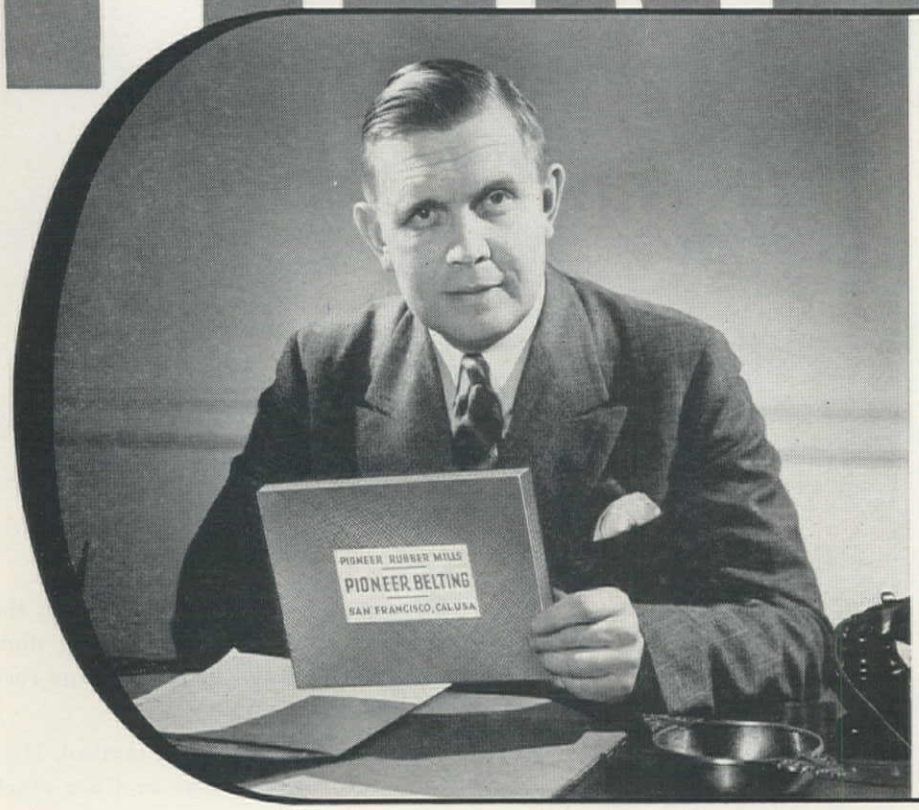

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EQUIPMENT at work building WESTERN HIGHWAYS

8 pages of short stories told with pictures

STRETCHING ROCK SUPPLY

Good rock is scarce in the area of the State of Washington where Kosmos Timber Co. has to obtain material for ballast and topping. The firm uses this Lippmann portable crusher plant with conveyor, 18 x 36 Grizzly King crusher and an apron feeder to stretch the available supply. The plant, which has produced up to 100 cu. yd. per hour, is pulled by a D-7 Caterpillar tractor.

ROAD FILL AT WATER'S EDGE

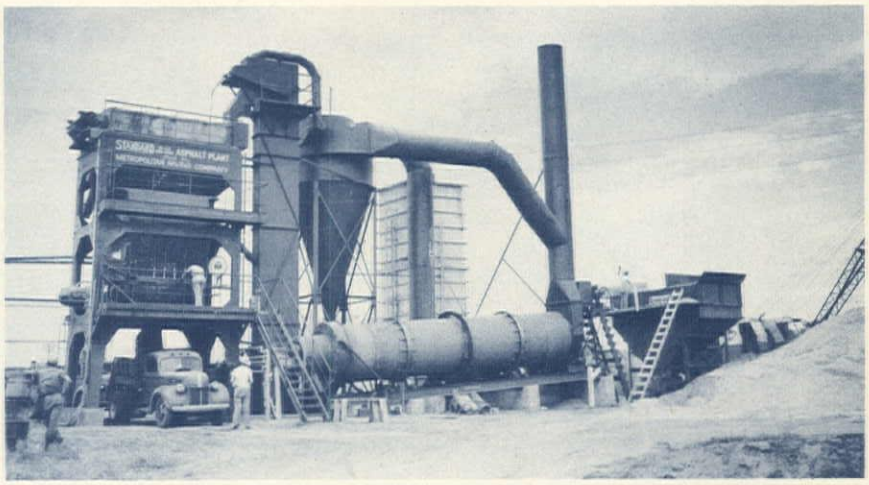
On the Deschutes Basin Project at Olympia, Wash., contractor Thomas Scalzo Co. of Seattle is filling in a road bed along the edge of a lake with 500,000 cu. yd. of varying type sand and gravel with clay. The firm is using C Roadster Tournapulls with E16 Carry-all scrapers on a 6,600-ft. round-trip haul.

ELIMINATING CURVES

To eliminate curves and hills on the Stevens Pass Highway between Monroe and Sultan, Wash., Osberg Construction Co., Seattle, uses six LaPlant-Choate TS300 motor scrapers to load heavy blue glacial till clay. One of the units is shown coming up a 25% grade.

DITCH DIGGING, 1951

Cleaning and regrading ditch in Colorado with an HT4 Traxcavator.



100 TONS PER HOUR OF ASPHALT MIX

Metropolitan Paving Co., Oklahoma City, uses this 4,000-lb. batch capacity Standard Steel Corporation asphalt plant operating on a highway project near Talihina, Okla. The plant has been averaging more than 100 tons per hour since it went into operation a few months ago.

LONG REACH FOR RAILROAD RELOCATION

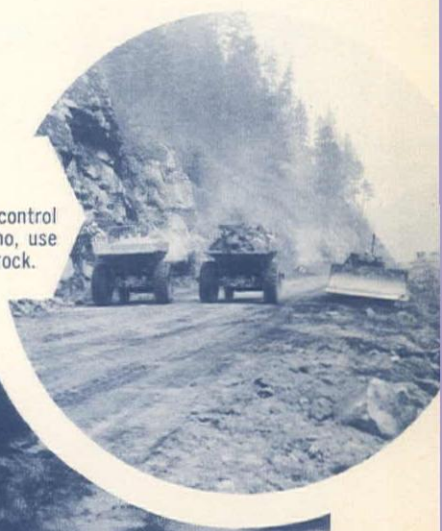
Relocating railroad near Tomar, Wash., Morrison-Knudsen Co., Inc., uses this Manitowac 4500 dragline with 140-ft. boom to load Euclid rear-dumps.

"DEVIL'S SLIDE" PUSHED INTO OCEAN

A spectacular job in recent months has been on "Devil's Slide," 8 mi. north of Half Moon Bay, Calif., along State Highway No. 1. At this point a two-lane blacktop road, completed in 1938 to replace the Pedro Mt. road along a portion of the old Spanish Trail, curves along some 300 ft. above the Pacific Ocean. Over the road, the cliffs tower as high as 600 ft. On January 10, 1951 a huge segment of the hills above the road cut loose following heavy rainfall and three additional slides followed within the next two weeks. For the next three months a fleet of heavy earthmoving equipment worked six days a week to clear an estimated 900,000 cu. yd. of slide material. Machines followed the slope down to the road and the material was pushed over the bank into the ocean. In addition to state equipment, machines of contractors J. O. Archibald, William Frank and Lloyd Rodoni were used on the job.

RIVER ROAD ROCK

Sahler & Sons of Spokane, Wash., working on a 55-mi. flood control project along the Clearwater River highway in central Idaho, use a fleet of Koehring Dumptors (two shown) to haul blasted rock.



SMALL COUNTY CRUSHER

Pima County, Arizona, produces gravel for its county road program with this new Pioneer 17-V Duplex crushing and screening plant. The 17-V is the smallest of the Pioneer bottom-deck feed plants and is designed for smaller construction jobs, maintenance and county work. When this photo was taken, the plant was producing about 60 cu. yd. per hour.

300 TONS OF MINUS ONE-INCH

Morrison-Knudsen Co., Inc., operates this Telsmith 2-unit portable crushing-screening plant near Ontario, Calif., to produce 275-300 tons per hour of minus 1-inch sand and gravel for road building in the area. Primary unit of the plant takes pit run sand and gravel with 15 to 18-in. boulders, with jaw crusher set at about 3 in. Material is then stockpiled and fed into secondary unit, where Gyrasphere crusher takes about 4-in. feed. Finished product goes to concrete and asphalt mixing plants.

TOUGH DRILLING JOB

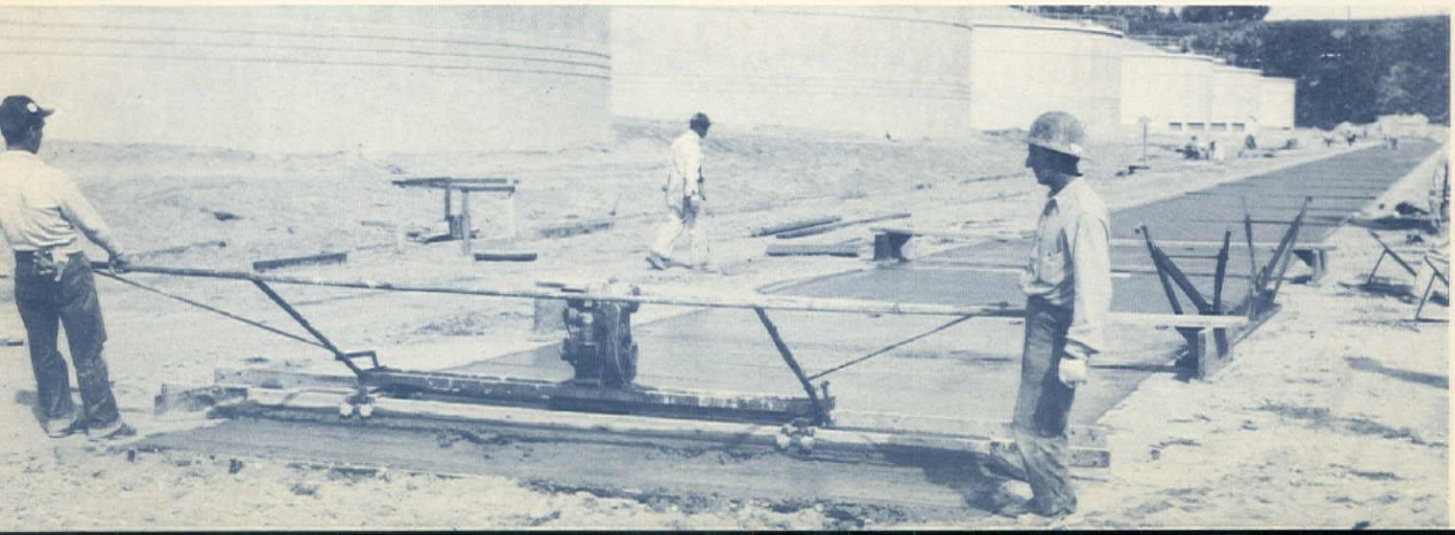
Blasting rock for highway in Washington, Peter Kiewit Sons' Co. gives an Ingersoll-Rand FM-3 wagon drill a good workout. The outfit handles 6-ft. steel changes to drill blasting holes up to 24 ft. deep.

UP-AND-COMING PAVING OUTFIT

Two brothers, Ray and Angelo Bragato, both served with the Army Engineers during the last war. Home from the war, they pooled their experience to form the Bragato Paving Co. at San Mateo, Calif. One of their first large contracts is at San Francisco Airport, enough work to keep most of their equipment busy for half a year. Pictured here is one of their Mack Model A30H trucks equipped with a 3-yd. mixer.

PAVING A MINIATURE CITY

The Hyperion Activated Sludge Plant at Los Angeles is so extensive a project that it requires 95,000 sq. yd. of concrete streets, roadways and parking areas. Problem for the road crews was to be able to change widths, crowns or grades as many as six times a day and to move rapidly from one phase of the job to the next. Joint contractors Peter Kiewit Sons' Co. and Fred J. Early, Jr. Co., Inc., used several Whiteman screeding machines to do the job. Concrete for the 6-in. slab roadways was mixed in a batch plant on the job. Screeding machines rod slabs to required surface shape, compact them and bring moisture to the surface. Powered by a 1½-hp. gasoline engine, the screeding machines are quickly adjustable up to 16 ft.

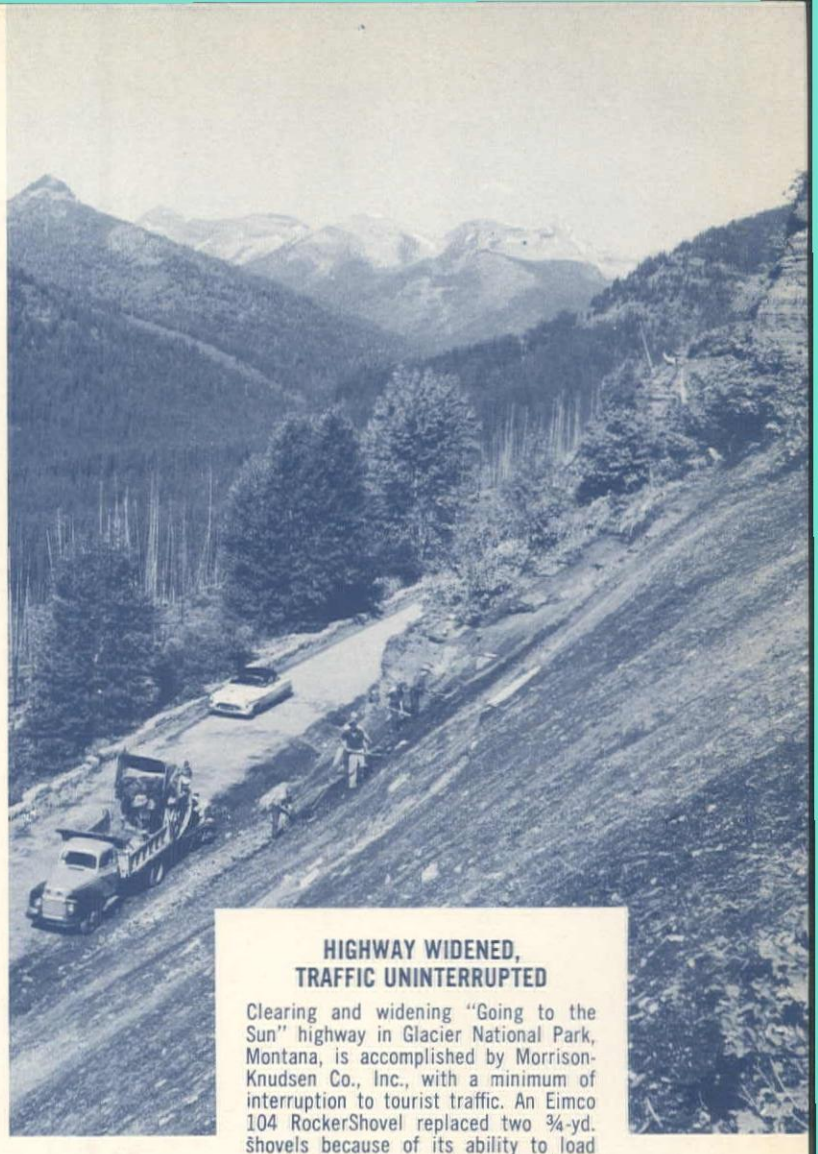


SHOT SHALE LOADED

Link-Belt Speeder LS-90, owned and operated by Henry Shore Co., Littleton, Colo., loads rock with a 1-cu. yd. dipper to improve and partially relocate Colorado State Highway 96 west of Pueblo. Slabs at lower right and back of cab are shot out shale, ready to be loaded.

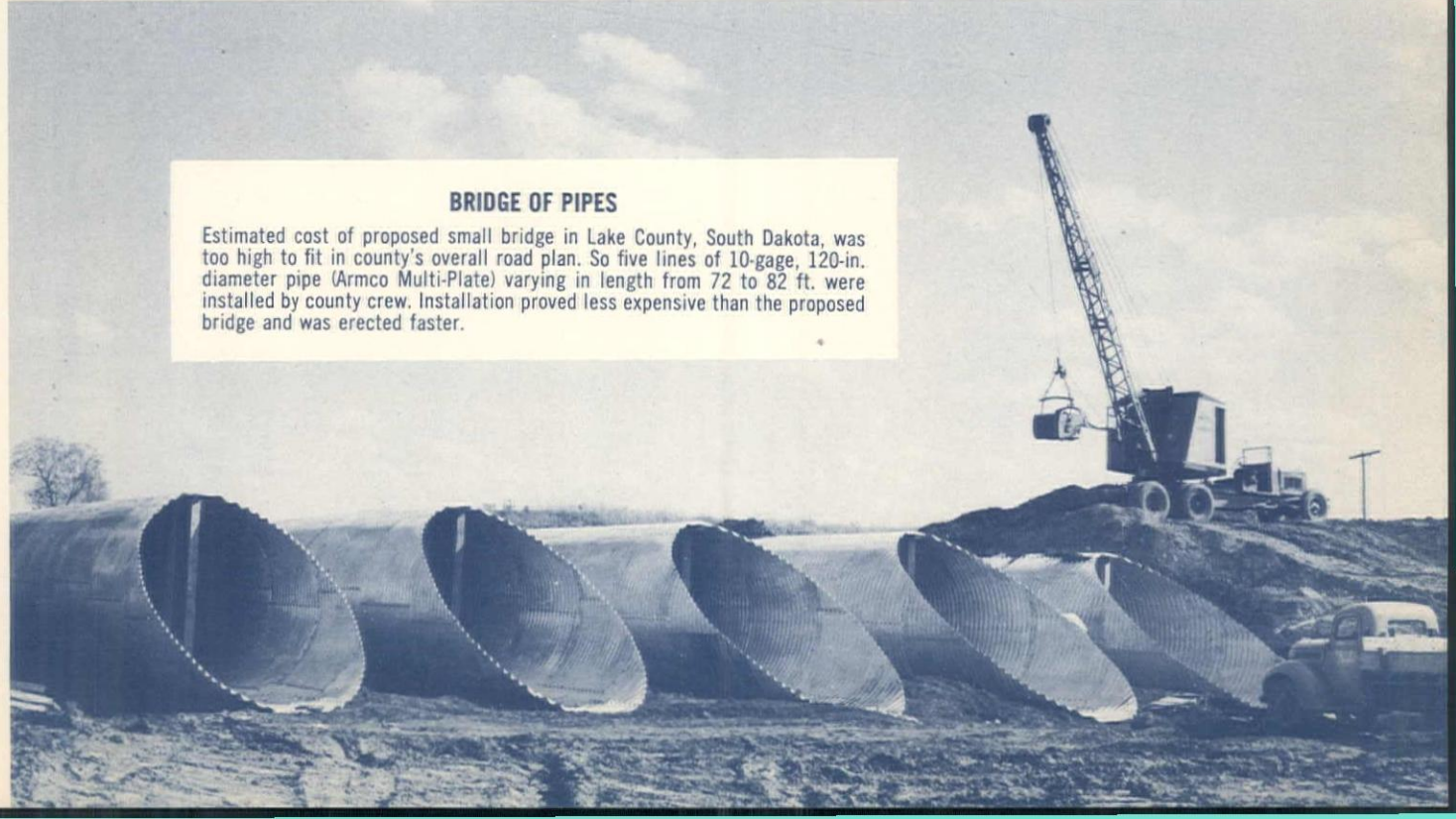
HEAVY DUST ON THE RIO GRANDE

Across the Rio Grande into Mexico, 75 mi. southeast of Laredo, Texas, "Cat" D8 Tractors with No. 80 Scrapers return from fill area in building an access road on Falcon Dam. The road will aid transporting of materials and equipment over a temporary bridge seen in foreground. Lack of rain and heavy dust has scorched the area.



HIGHWAY WIDENED, TRAFFIC UNINTERRUPTED

Clearing and widening "Going to the Sun" highway in Glacier National Park, Montana, is accomplished by Morrison-Knudsen Co., Inc., with a minimum of interruption to tourist traffic. An Eimco 104 RockerShovel replaced two ¾-yd. shovels because of its ability to load effectively in the narrow area available at the toe of the slope and to travel rapidly between loading points. Trucks loaded were F-7 Fords with light gravel boxes. Operators soon learned to protect boxes from injury by putting in a bucket of fines before loading large boulders.



BRIDGE OF PIPES

Estimated cost of proposed small bridge in Lake County, South Dakota, was too high to fit in county's overall road plan. So five lines of 10-gage, 120-in. diameter pipe (Armco Multi-Plate) varying in length from 72 to 82 ft. were installed by county crew. Installation proved less expensive than the proposed bridge and was erected faster.

THE DEVIL'S ROCK PILE

For relocating U. S. Highway 60 in Devil's Canyon east of Superior, Arizona, Fisher Contracting Co. of Phoenix uses a 2½-yd. Northwest shovel to load four 15-ton rear-dump Euclid trucks.

TRAIL-BLAZING LOGGING ROADS

It's rough going for this Allis-Chalmers HD-19 tractor clearing lumber roads in the Northwest. Owner has a fleet of five HD-19's equipped with Carco winches and dozers to arch timber and build logging roads as they are needed.

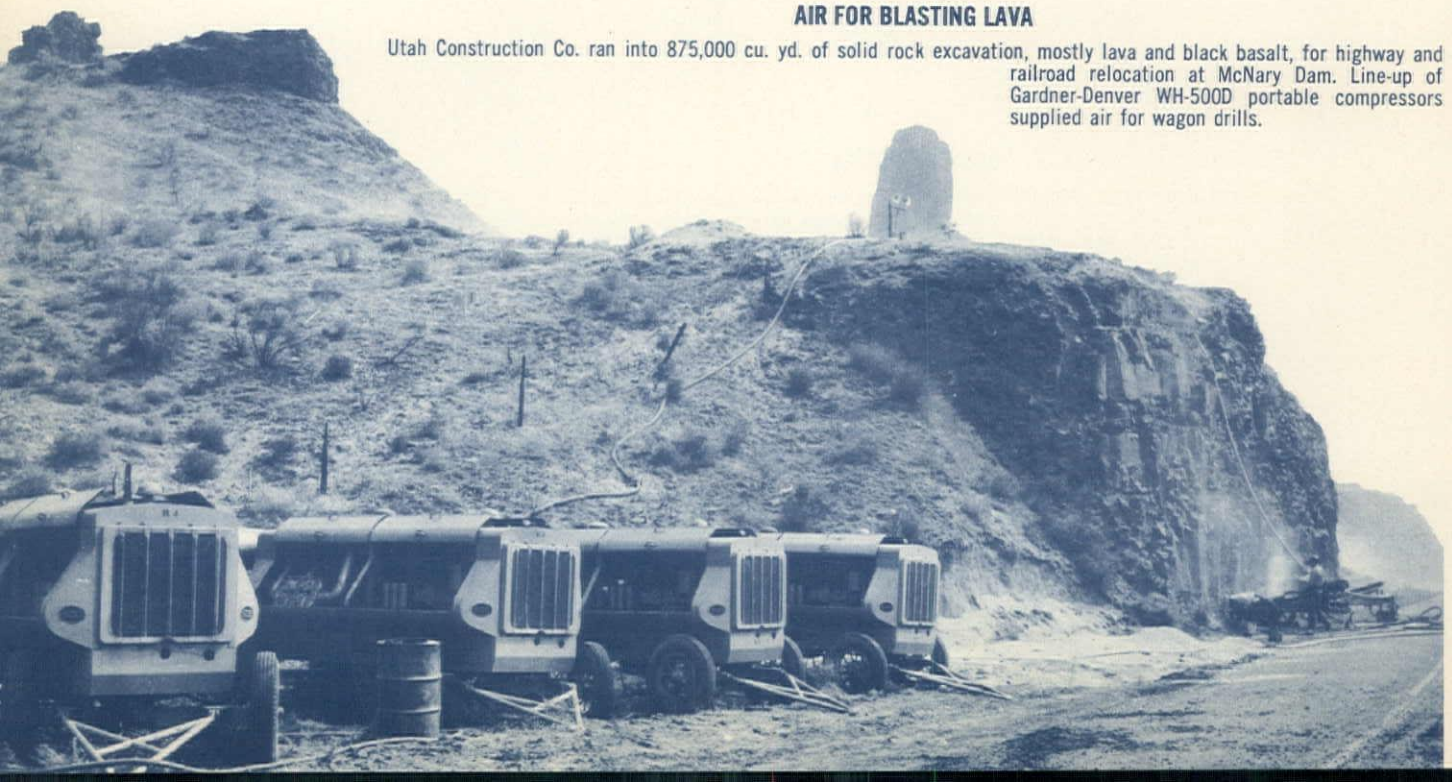
LOADER WITH A REACH

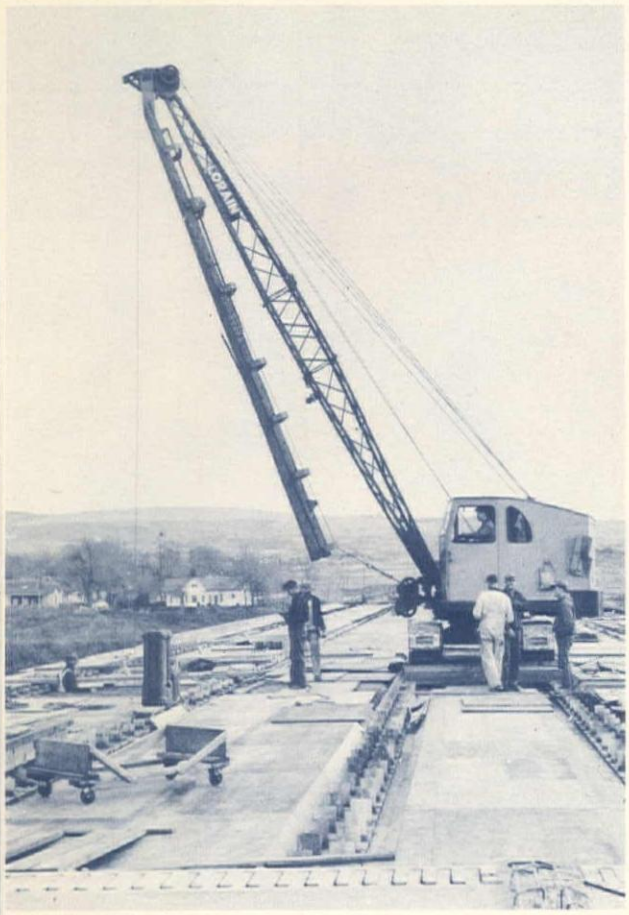
Girl operator looks proud of the reach she gets with this White loader mounted on a Case tractor, owned and operated by the Oregon State highway department. Bucket on White loaders can move forward at top of rise, enabling operator to spot his (or her) discharge without hand spreading.

—Oregon State Highway Commission Photo

AIR FOR BLASTING LAVA

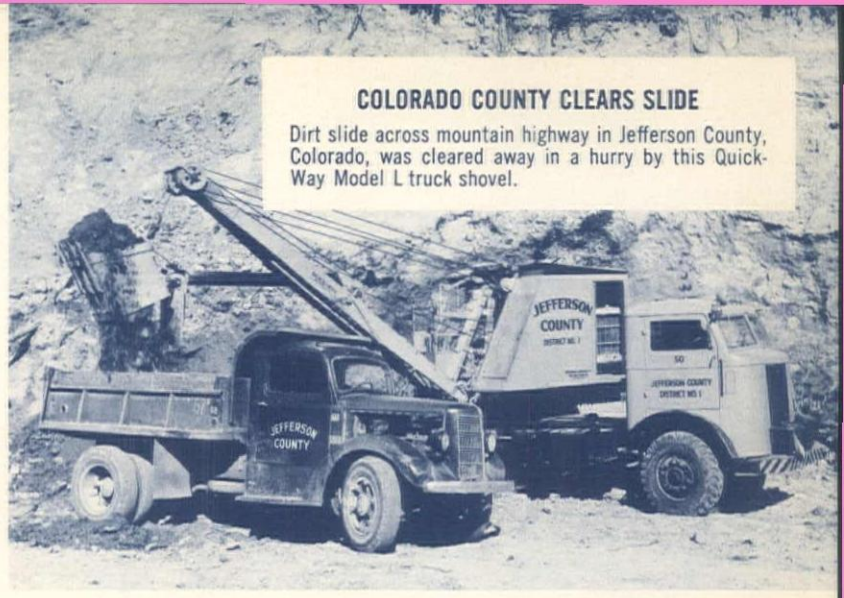
Utah Construction Co. ran into 875,000 cu. yd. of solid rock excavation, mostly lava and black basalt, for highway and railroad relocation at McNary Dam. Line-up of Gardner-Denver WH-500D portable compressors supplied air for wagon drills.





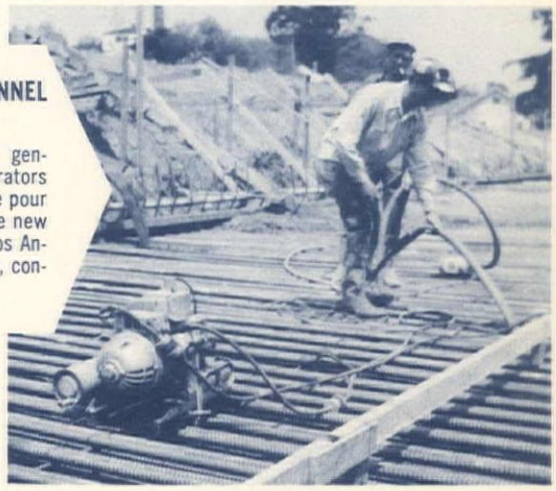
COLORADO COUNTY CLEARS SLIDE

Dirt slide across mountain highway in Jefferson County, Colorado, was cleared away in a hurry by this Quick-Way Model L truck shovel.



SHAKING DOWN TUNNEL FOOTING

A Homelite high-cycle generator powers two vibrators in 1,800-cu. yd. concrete pour for tunnel footing on the new Hollywood Freeway in Los Angeles. Peterson & Baker, contractor.



CRANE DRIVES FALSEWORK PILING

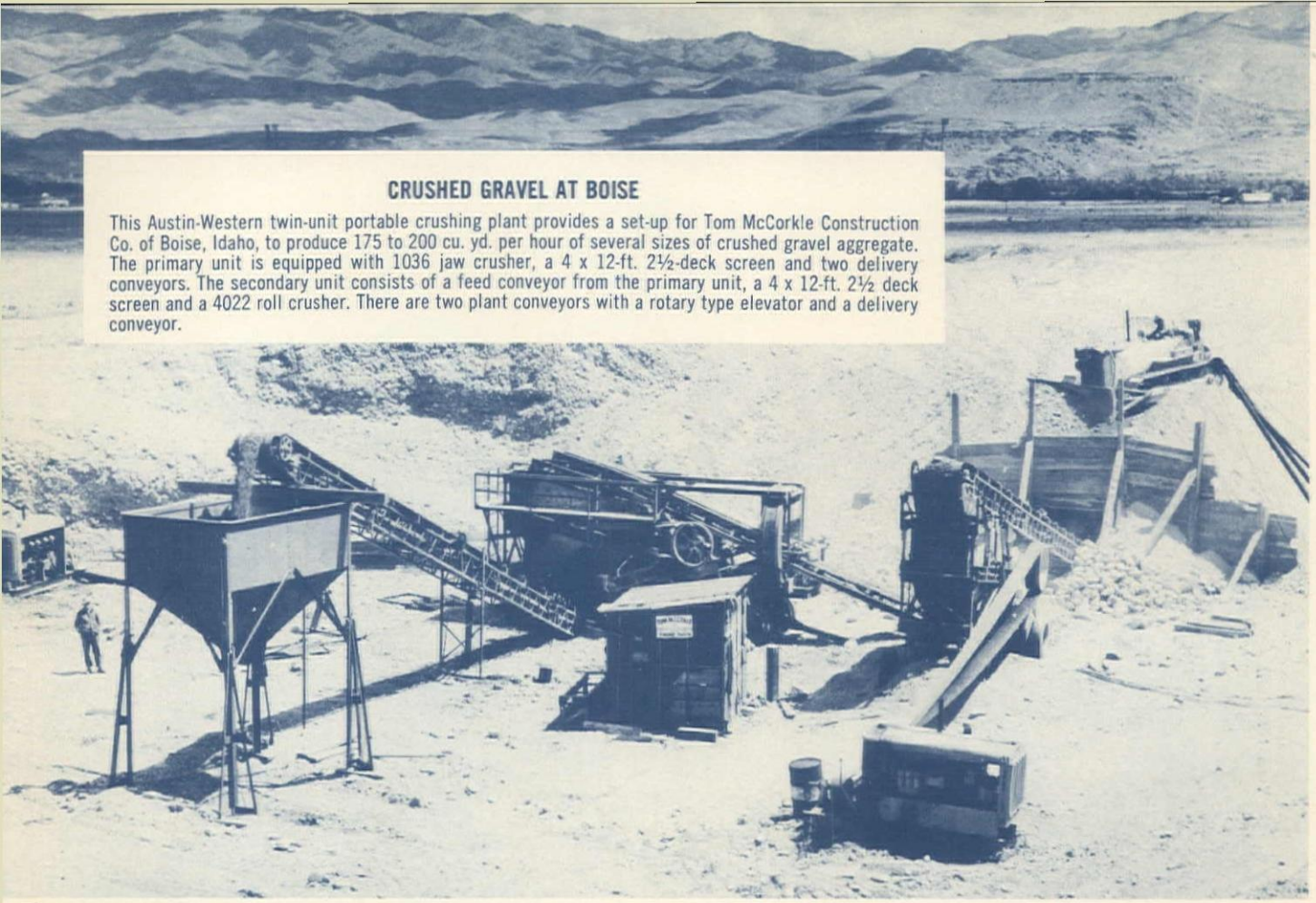
Hansen & Parr, contracting firm of Spokane, Wash., used this Lorain TL-25 crane to drive piling for falsework, set falsework lumber and handle concrete for the new $1,000,000 Clearwater Memorial Bridge at Lewiston, Idaho. In this view the crane is swinging pile driver leads into driving position. The new highway bridge is 1,344 ft. long and 61 ft. wide.

HARVESTING CLAY

At Pacific Coast Aggregates' plant near Livermore, Calif., a Wooldridge Terra Cobra W14 wagon waits for a full load of clay. The wagon has a capacity of 14 cu. yd. struck; 20 cu. yd. heaped.

CRUSHED GRAVEL AT BOISE

This Austin-Western twin-unit portable crushing plant provides a set-up for Tom McCorkle Construction Co. of Boise, Idaho, to produce 175 to 200 cu. yd. per hour of several sizes of crushed gravel aggregate. The primary unit is equipped with 1036 jaw crusher, a 4 x 12-ft. 2½-deck screen and two delivery conveyors. The secondary unit consists of a feed conveyor from the primary unit, a 4 x 12-ft. 2½ deck screen and a 4022 roll crusher. There are two plant conveyors with a rotary type elevator and a delivery conveyor.

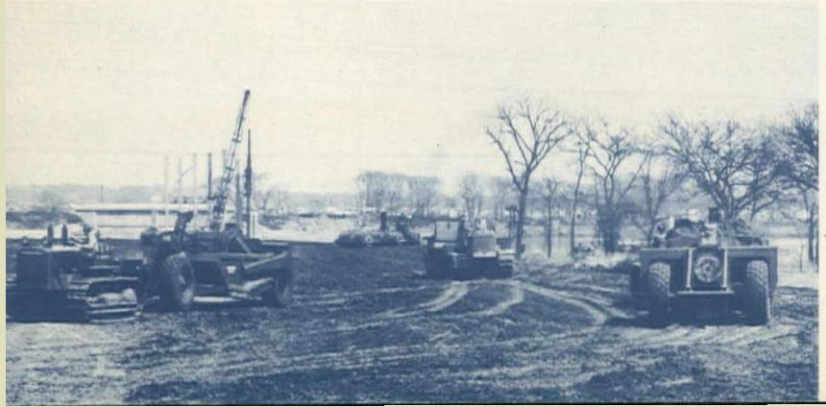


UP-TO-DATE EQUIPMENT AT PHOENIX

One of six new International Model L-160 trucks purchased recently by the City of Phoenix, Ariz., is shown with an IH I-4 wheel tractor and Hough loader taking a load from a patch-material bunker. The 154-in. wheelbase truck is equipped with a 5-yd. dump body and hydraulic hoist. The City of Phoenix operates some 280 pieces of heavy equipment, including graders, heavy-duty and pickup trucks and tractors.

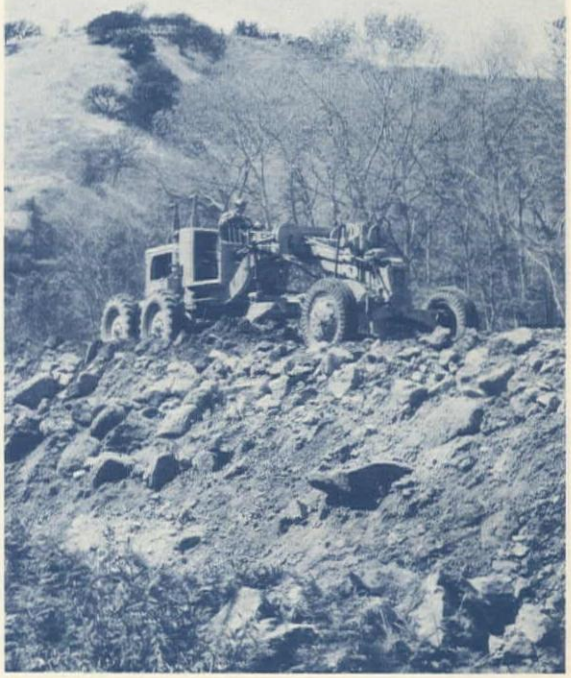
FILLING BRIDGE APPROACH

Three TD-18A International tractor—Bucyrus-Erie S-113 scraper combinations at work on the Tulsa, Okla., bypass route of Highway 66 are shown filling approach area for a bridge over the Arkansas River. Job is now about half completed. "Tex" Baughman Construction Co., contractor.



CUT AND FILL

A total of 350,000 cu. yd. of cut and fill featured construction of a new 4-mi. highway in the Carmel Valley in Monterey County, Calif., by John Mehren, contractor of Campbell, Calif. At the time of this view, 1,500 cu. yd. was being dumped in this fill during each 8-hr. period. A 100-hp. No. 550 Adams motor grader is shown leveling the fill material hauled from cut in background.



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LULL Shoveloader

REACHES FRONT OF LARGE TRUCK BOX—Having the longest reach of any industrial wheel-type tractor loader, the LULL Shoveloader loads to the very front of the truck box from the rear. No special maneuvering is required. No blocking more than one traffic lane. Gives a full truck load every time without pushing dirt forward in box. Loads trucks faster too!

OPERATORS SAY they can really keep trucks moving with a LULL Shoveloader by getting a heaping full bucket every time. No stopping . . . no backing up . . . no lost time. When the forward run has started, pull back both control levers with one hand, and the Shoveloader will automatically tilt the bucket up . . . then start digging. The scooping action of this double control is the most natural digging motion possible. Buckets are filled quickly with one smooth movement. Full buckets mean truck boxes are filled faster. Keep those trucks moving with a LULL Shoveloader!

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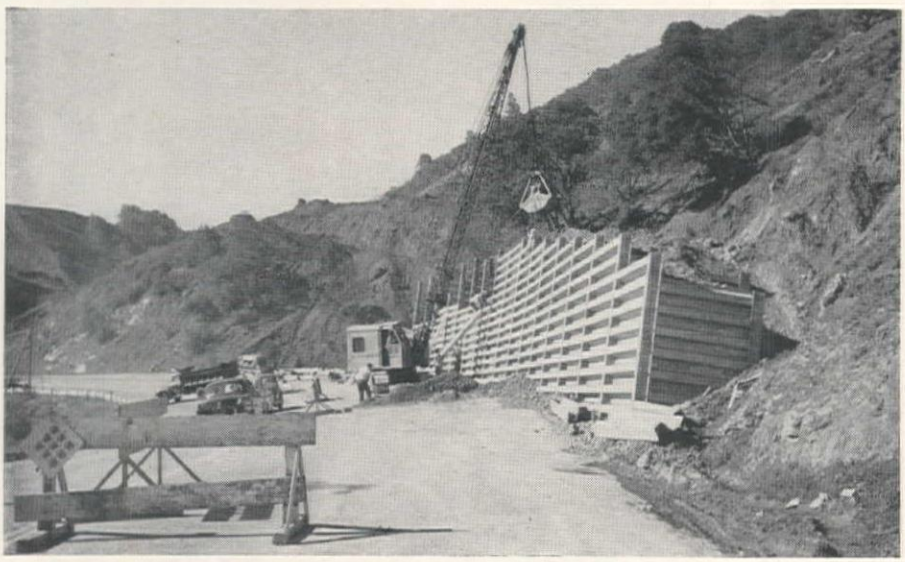
HOW IT WAS DONE . . .

Flexible Metal Structure Solves Bin-type Retaining Wall Problem



RELOCATION of California State Route 17, 2 mi. west of Los Gatos, to make room for the Lexington Dam soon to be constructed across Los Gatos Creek, presented a peculiar bin wall problem to engineers. The new highway fill had to be prevented from encroaching on the old road and traffic had to be maintained on the old road during construction. Complicating the problem, the location is at the base of a water-bearing hillside which, in the past, has required stabilization by means of slant borings and installation of perforated pipe for drainage.

To meet these conditions, the engineers selected the flexible metal structure, Armco bin-type retaining wall. Due to the unstable conditions, it was necessary to remove unsatisfactory material below the base of the wall to a depth of 5 ft. This excavation was then backfilled with select, compacted material capable of supporting the material contained in the metal bin. To prevent water pressure saturating the bin-fill material, a line of six inch perforated metal pipe was laid approximately one foot beneath the base of the rear bin-wall columns. Transverse sand drains were installed at regular intervals. The pipe lay on a sand base and was covered with sand.

The retaining wall is 324 ft. long with an average height of 20 ft.; heights ranged from 10.67 ft. to 24 ft. Batter of wall face is 1:6. The wall, installed on a 526-ft. radius, parallels the center line of the old highway.

Erection was by common labor and uncompacted backfill of damp creek-run gravel was placed by a crane equipped with a clamshell.

Construction was by the Guy F. Atkinson Company with Dick Alexander the superintendent on the job. Resident engineer for Division of Highways was Herbert A. Hart.

Logging Hoist-Tractor Unit Rips Out Street Car Tracks in a Hurry

APTLY ILLUSTRATING the manner in which construction men adapt equipment, designed for other industries, to serve their own needs is the use of a logging hoist to remove street car tracks during current street improvement work in San Francisco.

In addition to the logging hoist the rail removal unit consists of a D-8 Caterpillar Tractor with a D-8N Hyster mounted at the rear; a 1⅜-in. plow steel cable; and a hook and roller, both especially designed for rail pulling. Supplemental equipment includes a Gardner-Denver 125-lb. compressor, air hammer, sledge hammers, crow bars, and cutting torch with its necessary tanks, etc. A war surplus vehicle is used as a pick-up to tow the compressor and carry supplemental equipment. When in operation the vehicle keeps parallel with the tractor and track-mounted logging hoist. The unit, owned by Charles E. Harney Co., San Francisco, is at present being used on a rental basis by the Piombo Construction Co., also of San Francisco.

HOOK with open slot (left) fits over head of rail to lift it at least ½ ft. out of pavement. Hook is then removed and U-shaped roller attached (right). Rail comes out as unit moves forward.

The crew consists of the tractor operator, two workmen to handle the hook and roller and a welder to operate the cutting torch. Another man follows to the rear cleaning the rails, after they have been pulled, at 18-ft. intervals to enable the welder to cut them in sections easily handled.

Before the unit begins work a portable jumbo passes over the track area to drill two lines of holes at 12-in. centers. These rows of holes, parallel with and outside of the tracks, permit easier breaking of the pavement as the rail is pulled. Also, where only the center section of the street, containing the tracks is to be repaved, the holes prevent large pieces of pavement from being pulled out.

In starting the removal operation pavement is broken with the air hammer to expose the rail. If removal starts

on a solid piece of rail, the rail is cut with the torch. If the start is made at a point where the rail ends, such action is not required.

The hook, with an open slot that fits over the head of the rail (see illustration) is slipped over the exposed end. The workmen signal the tractor operator who then winds in cable to lift the end of the rail 6 to 12 in. out of the pavement. In some instances, depending on the condition of the rail, the rail breaks and the operation must be repeated.

The workmen then remove the hook and place the roller under the lifted rail. The roller, about 15 in. long and of 3-in. diameter, is held by a U-shaped frame made from 1½-in. steel bar. The top of the frame is narrowed to fit the cable hook (see illustration). A cross-piece one-half the distance from the bottom of the "U" to the roller provides added strength.

With the roller in position the tractor and hoist move ahead to a point where the cable is at such an angle that as it is drawn in it provides a maximum of horizontal forward motion and a minimum of vertical lift to the roller. The desired lift in the roller is that which only keeps it clear of the ground.

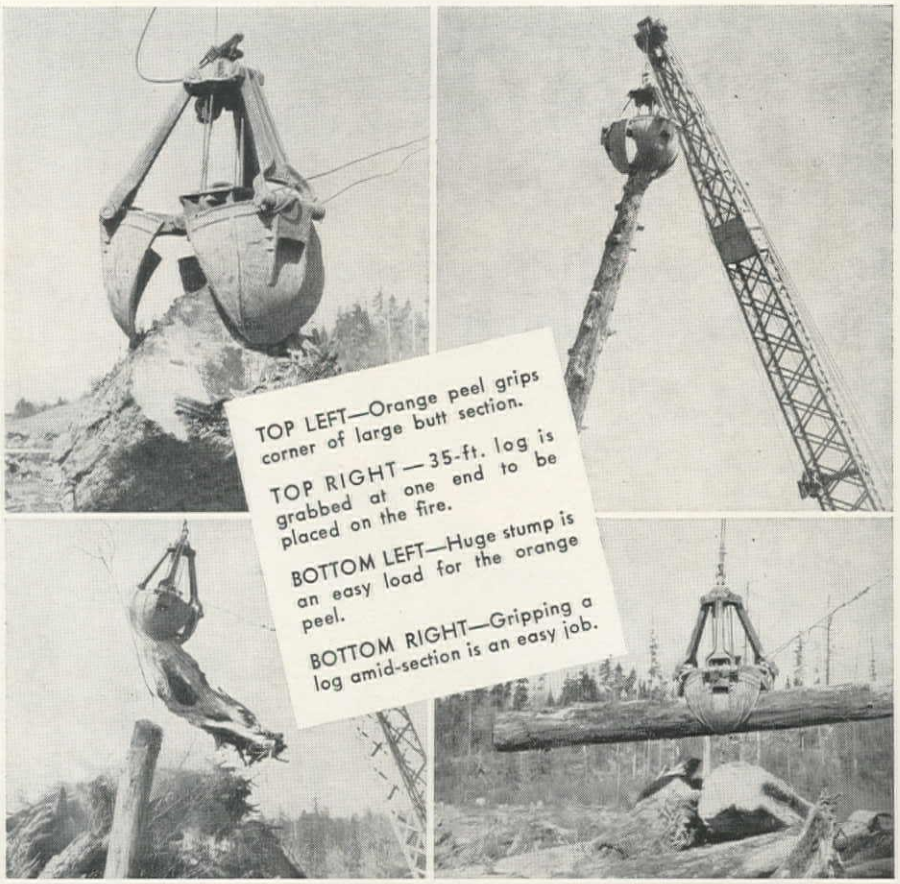
As the cable is wound in and the roller moves ahead the two workmen keep abreast of it, clearing with sledge and bar any pieces of pavement that might get between the U-frame and the rail to jam the roller. Large pieces of pavement that adhere to the rails are also knocked clear by the workmen. As the roller reaches the tie rods during the removal of the first of two rails the welder, also keeping abreast of the roller, cuts the rod with the torch to permit the roller to pass. On the removal of the second of two rails the tie rods offer little or no resistance but bend parallel with the rail in the path of the roller.

When the roller has reached a point where the vertical lifting motion would be greater than the forward motion (almost directly under the hoist), the operation pauses, the tractor and hoist move ahead playing out cable as it moves, and the sequence is repeated.

At times rails come out of the ground at various angles rather than falling straight behind the equipment. At such times, especially when a long length of pulled rail weaves as work progresses, the welder cuts the rail close to the roller.

Operational speed depends largely upon the condition of the rails and the type of original pavement. Working with rails in good condition and removing them from cobble stone or similar pavement offering a small amount of resistance, as much as 5,000 feet of rail has been removed in a working day. However, if the rails are crystallized or highly rusted which causes them to break in very small pieces progress may be as low as 500 ft. per day. Concrete and similar types of hard pavement offer more resistance and consequently slow down production.

The cable, although rated at 64 tons, has been known to break, especially during the removal of rail crossing sections. The D-8N Hyster is capable of exerting a 50,000-lb. line pull.



TOP LEFT—Orange peel grips corner of large butt section.

TOP RIGHT—35-ft. log is grabbed at one end to be placed on the fire.

BOTTOM LEFT—Huge stump is an easy load for the orange peel.

BOTTOM RIGHT—Gripping a log amid-section is an easy job.

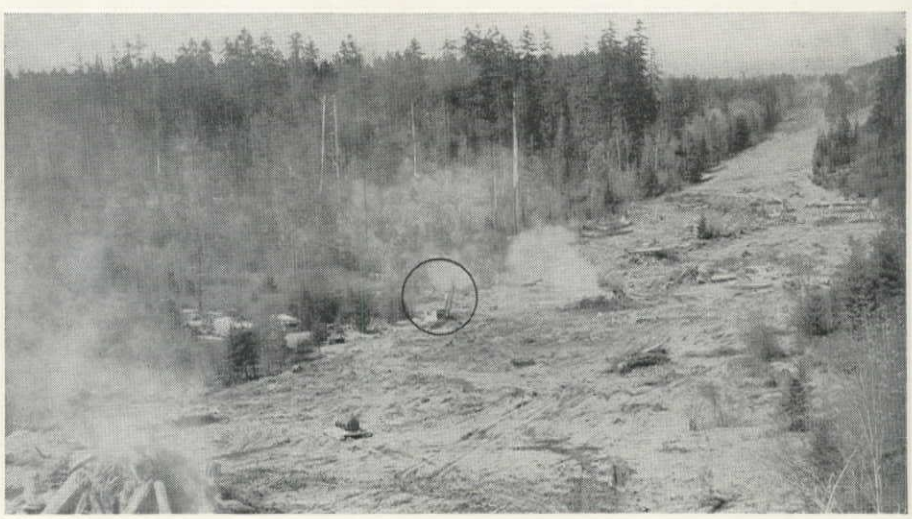
Orange Peel Bucket Comes Ashore to Clear Brush for Road Right-of-Way

FIORITO BROS., Seattle contractor, is using an orange peel bucket in an unusual way for clearing brush on the firm's contract for relocating Highway 99 near Castle Rock, Wash. An ESCO ¾-cu. yd. orange peel bucket originally designed as an under-water rock bucket, is being used to pile stumps, logs and brush in neat piles for burning. Burning is more effective than if a bulldozer had made the piles because the muck and dirt carried along make it difficult to get a free-burning fire.

Each fired pile along the relocation route results in about 25 cu. yd. of ashes, which are scooped up and spread by the orange peel and then turned under by a bulldozer. This eliminates the necessity to beat and box the fire and ashes with the bulldozer and saves much valuable time. The bulldozers bring the brush up to within reach of the crane. A Type 304 Koehring crane handles the orange peel.

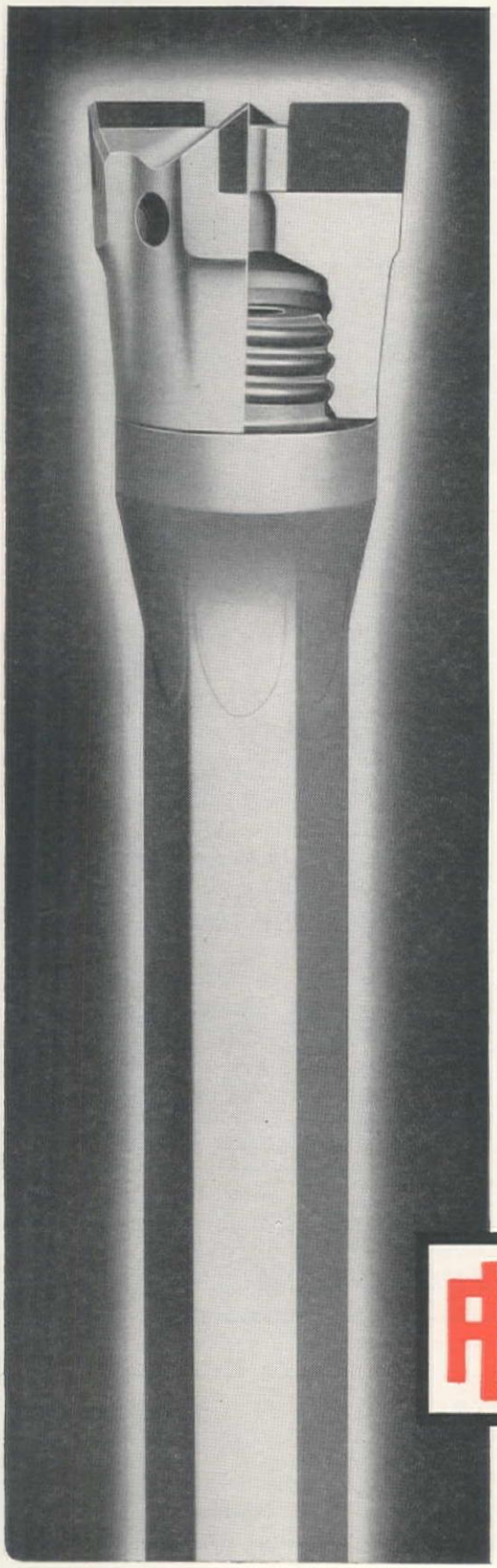
Al DeTore of Fiorito Bros., foreman on the job, is responsible for the unusual application. He says the results are very gratifying since he can work with a small crew at exceptional speed.

FIRED PILES of stumps, logs and brush along the relocation route. The crane (in circle) is moving ahead to build up another pile for burning. Bulldozers feed brush to the crane.



Here's why

CARSET JACKBITS



have changed the entire concept of today's rock drilling costs

Since the advent of the Carset Jackbit, drilling costs can no longer be reckoned *only* in terms of bit cost per foot of hole. For this is only *one of many* items where Carset Jackbits have made possible tremendous over-all savings.

Check the fourteen economies listed below. Note how any one of them by itself makes a significant reduction in the cost of drilling rock. But only when you consider the cumulative effect of all these savings do you get the true picture of Carset economy. It is a picture that has already changed the entire concept of drilling costs — in mines, quarries, tunnels and construction jobs the country over.

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1. Carset Jackbits wear longer
2. Drill faster — 50% or more
3. Boost tonnage 20% or better
4. Consume less drill steel
5. Save up to 30% on dynamite
6. Practically eliminate bit changes
7. Use longer steels
8. Eliminate tapered holes
9. Permit use of lighter drills
10. Reduce air consumption at least 40%
11. Require less shop equipment
12. Reduce maintenance costs 30% or more
13. Drill the hardest rock
14. Finish more rounds per month

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ROCK DRILLS • COMPRESSORS • AIR TOOLS • TURBO-BLOWERS
CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

33% MORE GROUND CONTACT

Single Drive . . .
MORE TRACTION MORE ACTION

And much more satisfaction with the M-B 501 grader. Built into the 501 are the largest grader tires in the business—huge 18:00 x 24 earthmover tires that spread out over 612 square inches to give you flotation for soft going and tremendous traction on *any* surface. Traction unequaled by any other grader in its class—one of the main reasons the 501 will *work* where other graders can not even *travel*.

These large tires provide additional advantages. They roll over irregularities without affecting the blade; they do not sink in and spin as readily as the smaller, narrow tandem drive tires; they roll easier on any surface; all advantages no other grader provides. Get all the facts, and you too will get an M-B 501.

Huge 18:00 x 24 earthmover on the M-B 501 spread out to provide 612 square inches of ground contact for traction.

COMPARE WITH TANDEM DRIVE

The *largest* tandem drive tires in the 50 H.P. class are 12:00 x 24, each tire providing only 116 square inches of ground contact, or a total of 464 square inches. Compare with the 612 square inches above.

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WESTERN MACHINERY CO.	Spokane, Wash., Salt Lake City, Utah, Pocatello, Idaho
T. S. COWGER CO.	Helena, Montana
SAWTOOTH CO.	Boise, Idaho
CLARK COUNTY MERCH. CO.	Las Vegas, Nevada
LIVELY EQUIPMENT CO.	Albuquerque, New Mexico
HOWARD-COOPER CORP.	Portland, Oregon, Seattle, Wash.

Army Has Mobile Unit for Drying Paving Aggregates

AGGREGATES used in black-top paving are now being dried by mobile units. Standard Steel Corporation of Los Angeles has recently been awarded a contract to fabricate a large number of completely portable aggregate dryers for the Armed Forces to speed the work of road and air strip construction in remote areas. This is another striking example of ordinarily fixed operations which have been rendered mobile under the requirements of defense.

Like a giant grasshopper

The complete units, officially designated as "Aggregate Dryers, Semi-trailer Mounted," bear a strong resemblance to giant grasshoppers when set up and ready to operate. A shallow hole is dug to accommodate the foot of the cold elevator, at the feed end of the machine. The aggregates go through the feeder and are raised by the elevator to a hopper above the dryer. From the hopper they are gravity fed into the revolving drum of the dryer heated by the same type fuel which drives the 35-brake-horsepower 1,400-rpm. motor. At the discharge end of the dryer the aggregate is picked up by the discharge elevator, carrying it to the discharge spout. A cyclone separates and returns dust from the hot air discharge.

Pulled behind regular Army truck

For transportation, the main dryer drum, motor and frame, are pulled, as a trailer, behind a regular Army truck. The discharge elevator unit folds over after the spout has been removed. The truck, hauling the main plant trailer also carries the feeder apparatus, duct work and cyclone.

SHALLOW HOLE is dug to accommodate the foot of the cold elevator at the feed end of the machine. Aggregates go through the feeder and are raised by elevator to a hopper above the drier.

The mobile aggregate dryer job is the second contract received by Standard Steel for the defense program. Previously the company built a number of bituminous materials spreaders, mounted on U. S. military trucks, for use in preparation of roads and landing strips.

Roadmixer Attachment Spreads and Compacts Cement-Stabilized Base

WOOD Manufacturing Company has developed a spreading and compacting attachment for the firm's Roadmixers which can be adapted to new units or those already in the field. It operates and functions as an integral part of the road mixing unit.

The spreading and compacting attachment operates as follows. As the machine moves along, the spreader screw conveyor picks up the mixed windrow—splitting it; thus spreading it both to the right and to the left until the full width panel is obtained. The material then passes by a vibratory tube which gives it the initial compaction. Passing beyond this tube the material comes in contact with a vibratory finishing pan which gives further compaction.

The screw conveyor is split in the center and is reversible, thereby enabling the operator to move the mixed material to whatever location he desires. The screw conveyor, vibratory tubes and hydraulic cylinders which control the working position of the finishing pan are all actuated by use of hydraulic motors.

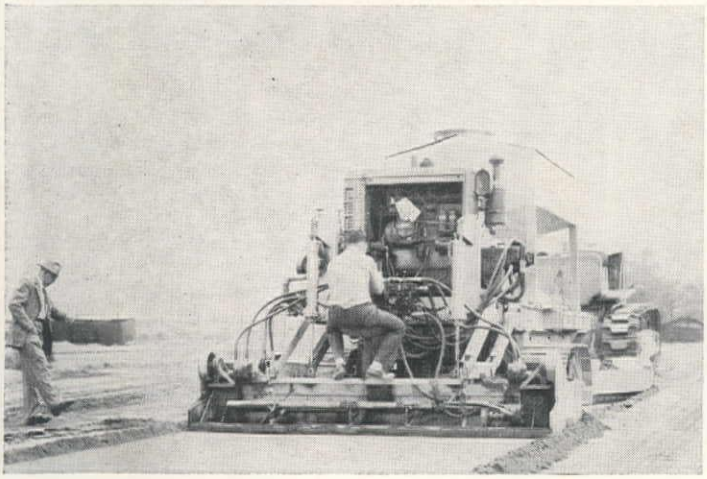
The operator of the vibratory pan is located in a position where he is able to view and operate the spreading mechanism.

The vibratory finishing pan is adjustable—being able to properly spread and compact panels from 10 to 12 ft. in width up to a thickness of 6 to 8 in.

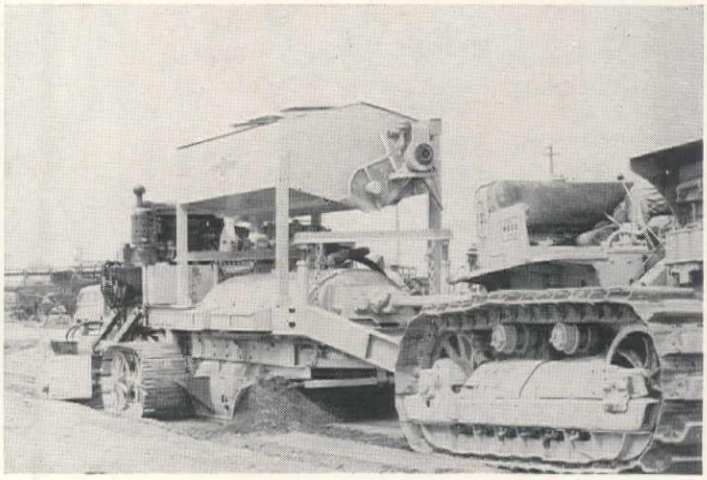
Additional compaction is necessary and this is accomplished by the immediate use of a tandem steel wheel roller, which gives the material its final compaction to meet the specifications. It is to be noted that the steel wheel roller follows directly behind the finishing pan in order that final compaction may be obtained while the material is at optimum moisture content.

The attachment offers these advantages: (1) No motor graders are necessary to spread the material allowing it to dehydrate. (2) No pneumatic tired rollers are necessary to provide initial compaction — the steel wheel rollers travel on the material as it is compacted by the vibratory pan. (3) Greater uniformity in the finished panel is obtained.

WORKING as an integral part of the Roadmixer, the attachment picks up and splits the mixed windrow and passes it through vibratory tube for initial compaction. Steel-wheel roller follows to give final compaction.



MACHINE is shown picking up the material with its wings and operating at depth controlled by gauges located on each wing tip. Unit is equipped with Athey tracks, sometimes necessary for moving over low bearing soils.



CONSTRUCTION DESIGN CHART

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

CXXXII . . . Wind Loads on Flag Poles

THERE ARE some readers who will no doubt smile at even the thought of designing a flag pole. I wonder how many have had occasion to design a flag pole and have discovered the lack of information in engineering literature concerning it. The small flag which may be displayed on special holidays may not warrant more than a guess when it comes to the pole design. When we get into the high sectional steel poles for large flags which will be flown in all weather, strength, stiffness and foundation may be worthy of more than a guess.

On page 172 of the booklet *Construction Design Charts*,[1] a chart was given for determination of the depth of pole settings wherein the bending moment at the ground surface was required among other items of information. In order to solve for the bending moment, the loads and pole dimensions are necessary.

While similar information may be available in other references, I have discovered but one source of information for obtaining the loads on flags. The Bureau of Yards and Docks *Design Manual*[2] gives the following formulas:

Wind pressure on pole

$p = 0.00267\,V^2$

p = pressure, lb. per sq. ft. of projected area of the pole.

V = wind velocity, mph.

Wind load on flag

$R = 0.00\,AV^{1.9}$

R = pull, lb.

A = flag area, sq. ft.

V = wind velocity, mph.

Since the flag is flown from sunrise to sunset at a Naval station, and not just on occasional days, the same reference recommends the use of a wind velocity of 86.2 mph., which is of hurricane intensity. Some locations may warrant an even higher value. As an example, wind velocities of as high as 120 mph. have been recorded at Dutch Harbor, Alaska.

The accompanying chart has been designed to solve, by the use of a single straight line, both of the given equations. I have drawn a solution line on the chart for the assumed conditions:

8 x 12 flag = 96 sq. ft.

Wind velocity = 55 mph.

The wind pressure against the projected area of the pole is read direct, and in this case gives a value of

$p = 8.1$ lb. per sq. ft.

The intersection of the solution line on the central scale gives a value of

$R = 580$ lb.

as the wind load on the flag.

Substituting the assumed values in the two equations, we have

$p = 0.00267\,V^2 = 0.00267 \times 55^2$

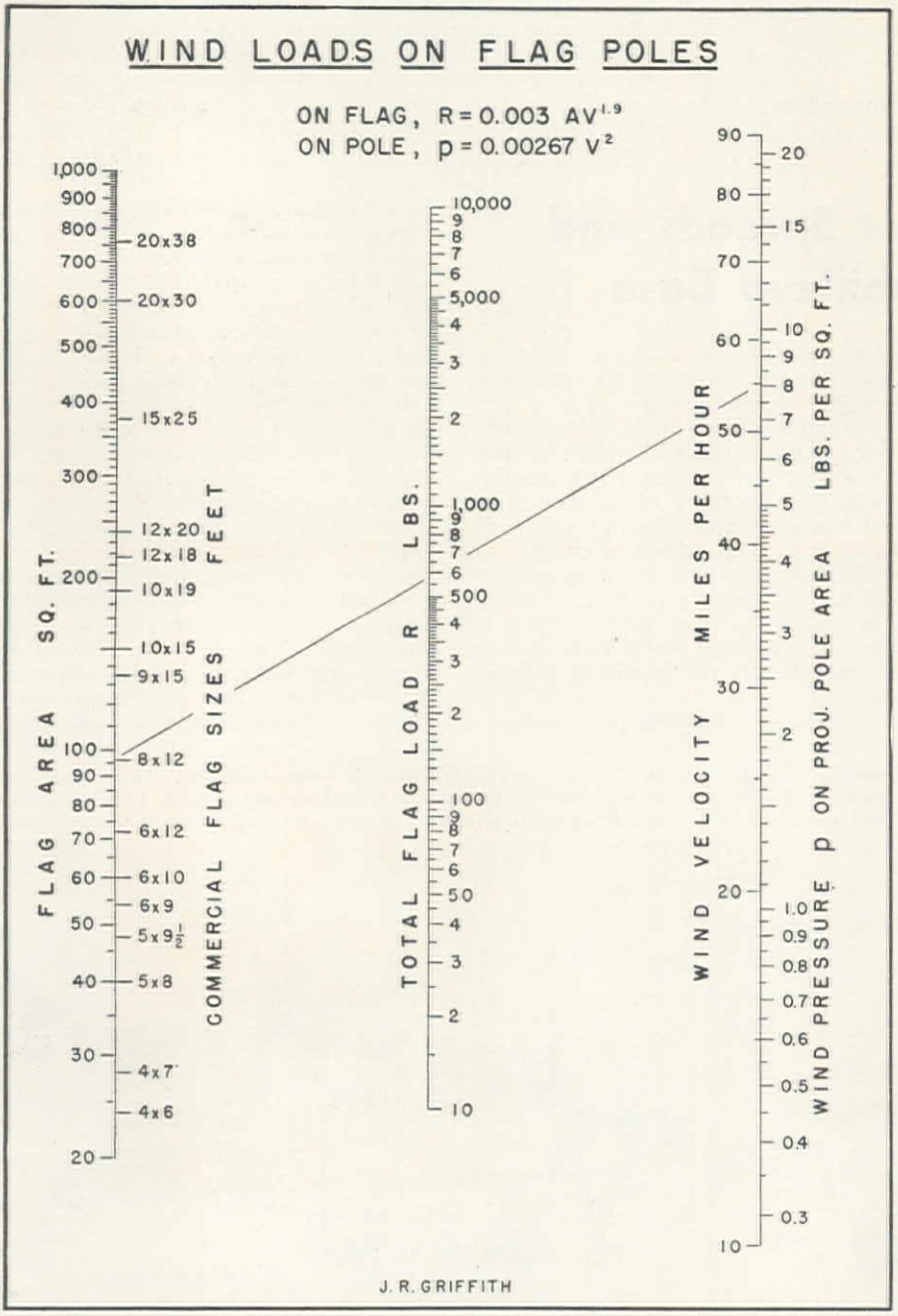
$= 8.07$ psf.

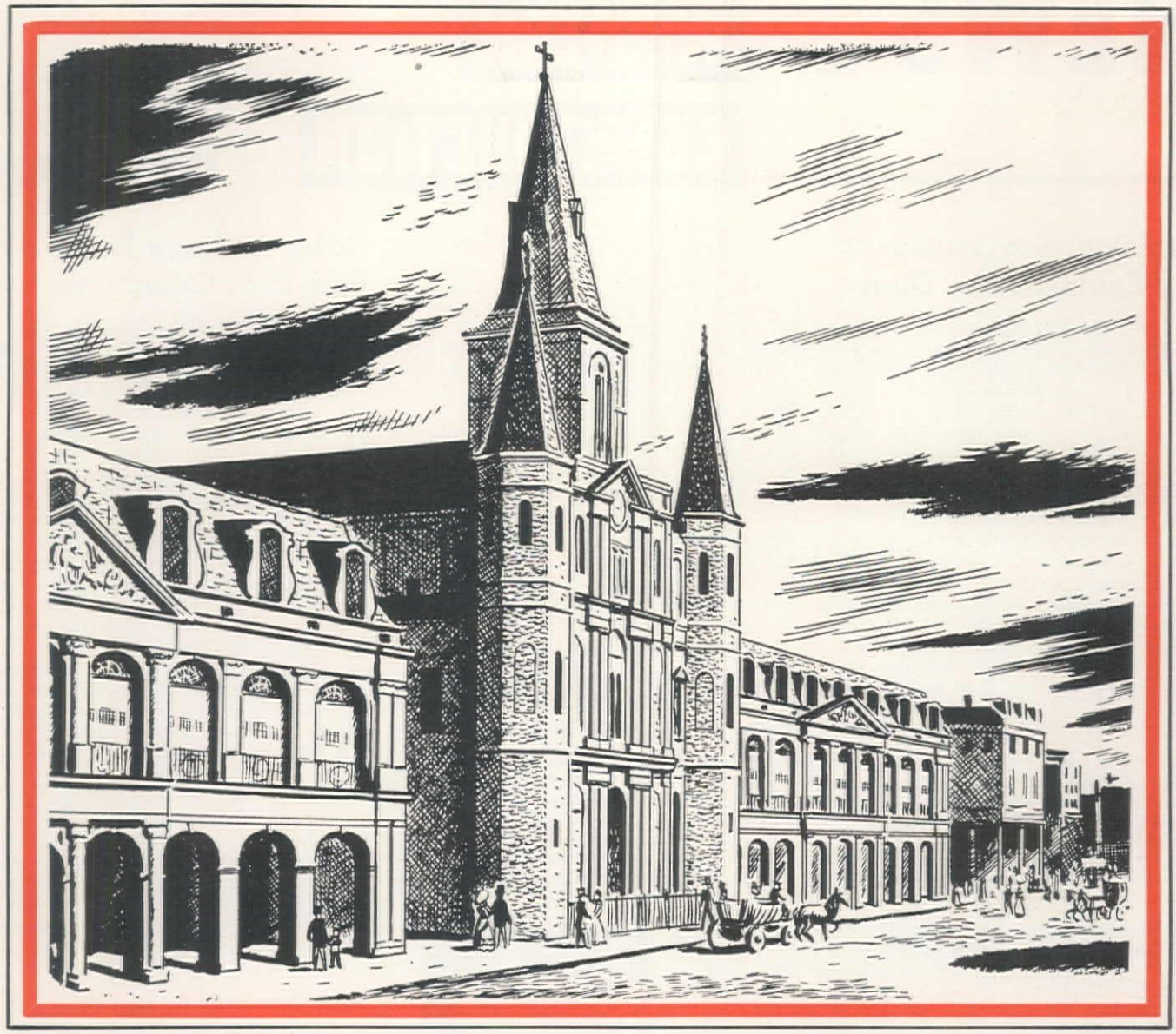
$R = 0.003\,AV^{1.9} = 0.003 \times 96 \times 55^{1.9}$

$= 583.56$ lb.

In the chart referred to, page 172 of the reprint,[1] a flag load was given which does not check with the solution herein presented. In looking back over my records I find that the original chart for pole foundations was prepared in September 1938, and I am unable to recall any explanation for the difference. Perhaps the Bureau of Docks *Design Manual*[2] provided for a revision in the meantime.

[1] Fourth edition, *Western Construction.*
[2] U. S. Navy.





New Orleans' famed Cabildo and Cathedral of St. Louis in the Vieux Carré as seen 100 years ago

New Orleans has a cast iron gas main in service that was installed well over 100 years ago. Vehicular traffic in those times was a far cry from today's giant buses and trailer trucks. The engineering term—*traffic shock*—was then unheard of. There were no sewers, conduits and other underground services to cause soil disturbance. Yet this old cast iron main has had the shock-strength, beam-strength and effective resistance to corrosion to withstand the changes and unforeseen stresses of more than a century. New Orleans' experience is not exceptional. Cast iron water and gas mains, laid over a century ago, are still serving in the streets of more than 30 cities in the United States and Canada.

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NUMBER SIX OF A SERIES

NEWS OF WESTERN CONSTRUCTION

JUNE, 1951

Legislature to Consider Big Feather River Dam

AN INTERIM report on the proposed Feather River project near Oroville, Calif., should reach the California State Legislature before adjournment. Information will be contained in the report which will aid legislators in considering the feasibility of a bill authorizing the project.

Included in the report will be details concerning the nature and extent of the work necessary to make the project a valuable irrigation, power source and flood control program. One of the most important aspects of the proposed plan is the elimination of the high flood potential in the fertile Sacramento Valley. The plan would give protection to about 190,000 ac. of good farm land along the Feather River.

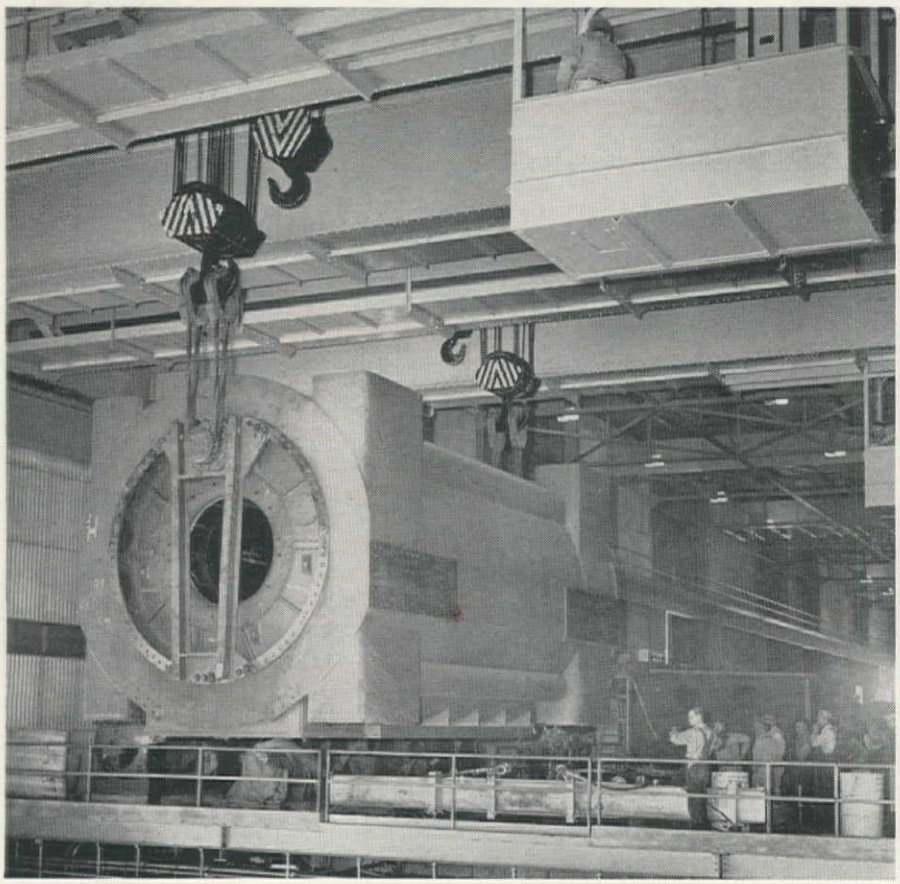
The proposed dam would be located about 5 mi. above Oroville, according to a tentative agreement between the Bureau of Reclamation, Corps of Engineers and State of California. Citizens of the areas involved have displayed great interest and support for the project and have attempted to raise funds for preliminary studies.

If the project were carried out, it is estimated that an additional 2,000,000,000 acre-feet of water would be available for diversion to areas where there is an insufficient supply.

An authorization bill is before the legislature which provides for state construction and operation of the project. Funds would be raised through the issuance of revenue bonds.

187½-TON LIFT FOR STEAM GENERATING PLANT INSTALLATION

SWINGING one of five turbo-generators into place at the new Contra Costa Steam Plant of Pacific Gas and Electric Co. presented the contractor, Bechtel Corp., with a major problem. The installation was accomplished using two of the plant's permanent overhead cranes. Special lifting rigs were bolted to each end of the stator and the travelers of the cranes were temporarily joined by channel iron connectors to work in unison. The cranes lifted the 375,000-lb. load 26 ft. in the air, traveled 325 ft. from the spur track bay to the generator floor, then gently lowered the huge stator into place on its foundations adjoining its tandem compound turbine driver.



Cabinet Gorge Tunnels One-third Completed

THE DIFFICULT task of boring two 1,100-ft. diversion tunnels through solid rock at Cabinet Gorge is one-third completed. Clark Fork River water must be diverted to permit construction of Washington Water Power Company's $40,000,000 Cabinet Gorge Dam and Power Plant. When the river is stopped in its channel by a cofferdam, each of the two 29-ft. diameter tunnels will handle a flow of 30,000 cfs.

Completion of the diversion tunnels is expected about the middle of June, when the flood danger is passed. Underground work on the tunnels was started early in April by Morrison-Knudsen Company, Inc., prime contractor. The tunnels run east and west, parallel to the river, and are about 30 ft. apart. Shift crews working 175 ft. below the surface and about 600 ft. north of the dam site are averaging about 20 ft. a day.

Ten to fourteen holes are drilled for each round and about 450 tons of rock are shot out at each blast. After the diversion tunnels are completed cofferdam construction will begin to block water flow and permit construction of the 170 ft. high dam. About 400 men are already currently on this project.

Baldwin Hills Reservoir Completed and Dedicated

A FOUR-YEAR construction period culminated when the official dedication ceremonies accompanied the first streams of water into the Baldwin Hills Reservoir at Los Angeles, Calif. Speeches by Mayor Fletcher Bowron and members of the Board of Water and Power Commissioners highlighted the ceremonies, which marked another step in the attempts of the area to solve its serious water problem.

The Baldwin Hills Reservoir (*Western Construction*, February 1950—page 61) brings 15 mi. of inlet-outlet pipelines into the service of southern Los Angeles where population increases have presented distribution and pressure problems. The project was begun in January 1947 and over a million cubic yards of earth fill went into the 500-ft. long dam which is 135 ft. high. A 57-in. diameter, 9-mi. long inlet line carries water from Franklin Reservoir in Beverly Hills to the new Baldwin Hills Reservoir. The 66-in. diameter outlet line runs 6½ mi. from the reservoir to the main network distribution system which sends water into the southern areas of Los Angeles.

Record Attendance at California ASCE Meet

WATER AND HIGHWAYS represented two important subjects covered by papers at the Fourth Annual Conference of the four California sections of the American Society of Civil Engineers meeting in Yosemite May 3-5. Another major paper by N. A. Bowers, retired Pacific Coast editor of *Engineering News-Record*, discussed "Engineering Failures," pointing out the value of this type of information as compared to the usual success stories from construction jobs.

Student representatives from eight engineering colleges held their meeting and presented papers in a contest from these student chapters.

The conference was attended by both Gail A. Hathaway, national president of ASCE, and William N. Carey, executive secretary. Attendance at the convention banquet set a new record of 415 for such conferences.

Enough water, if controlled

"We . . . have enough water in California to meet the future needs provided we can afford to control it and convey it where we want to use it." This was one of the important conclusions reached by S. T. Harding, consulting engineer of Berkeley, Calif., in his paper on California water problems. He also said "We have solved the problems of design and construction to an extent that makes it safe to assume that the engineers and contractors can design and build any water project that has the ability to repay its costs." This matter of costs was termed by Harding as "the greatest single problem in the future extension of our water development." He insisted that projects should justify expenditures required to build them. He said that the cost problem will always be with us and will limit extent of developments unless we disregard cost.

"Engineering Failures" was the subject of the talk by Dr. Bowers, who pointed out three reasons that make it worth while to give careful attention to failures: (1) they establish the limits of safe design as nothing else can, (2) knowledge of what will fail and what will not is valuable stock-in-trade for designer and builder and (3) complete data about failures are often hard to get; sometimes are suppressed altogether.

He described "significant failures" as those that resulted in improved design and cited examples surveyed in 40 years of editorial reporting. He described what had been observed after dams had been undermined, had slid out or broken up and some that almost did, but then hung precariously. Summing these up he said the cause of about 80% of dam failures has been over-optimistic assumptions about foundations. Some of the instances cited had never been described in published accounts and he deplored the too-frequent tendency to suppress the facts for the purpose of protecting reputations.

In most engineering design it is necessary for the designer to make assumptions and there is therefore urgent need, he said, to accumulate as broad a background of experience as possible on which to base these assumptions. One of the best ways to do this is to study failures that demonstrate the result of faulty assumptions.

Of the Tacoma Narrows Bridge collapse, from which has sprung a long sequence of research on aerodynamic stability of suspension spans, Dr. Bowers said that knowledge gained from analysis of this failure was so valuable that "if the cause of the accident had remained undiscovered that would have been an engineering calamity greater than the collapse itself."

California Transportation Map Published by BPR

A TRANSPORTATION map for the State of California is now available from the Bureau of Public Roads. The series consists of 21 sheets, each 26 by 36 in. The map shows Federal Aid and State highways, the numbered system of United States highways, and indicates types of surfacing on highways, principal waterways, railroads, and airways. Maps will be sent free of charge to those requesting them from the Department of Commerce, Bureau of Public Roads, Washington, D. C.

May Snow Surveys Produce Few Changes in Run-off Forecasts

FORECASTS on May 1 of 1951 water supplies for Western States promise to depart but little from the April 1 forecasts (*Western Construction*, May 1950—page 76). According to the latest snow survey information released by the Soil Conservation Service and its cooperating agencies, the Northwest may still expect adequate and perhaps excessive run-off in a few localized areas, and the northern tier of intermountain states also will fare very well for water. The southwestern drought was not relieved during April.

Sectional forecasts based on May first snow survey data are summarized in the following paragraphs:

Columbia Basin

Above normal snow pack that existed at the end of March has been considerably reduced, particularly at lower elevations by high April temperatures. These high temperatures have probably been accompanied by high evaporation losses. This, together with abnormally low precipitation during April, will result in run-offs somewhat less than that forecasted April 1. It is estimated that the inflow to Okanogan Lake will be 10% less than that forecast. The amount of reduction in other basins of British Columbia will probably be very small.

The water supply outlook for irrigation and power remains good to excellent throughout the basin.

In general, snow cover throughout Columbia Basin is still above normal, although proportionately lower than on April 1 due to the warm, dry spring prevailing to date. Potential high water on the Kootenai, Methow, and Okanogan rivers was reduced by the high flows during April. However, these rivers may still rise to dangerous levels and precautionary measures should be taken to protect vulnerable areas.

With the exception of Western Montana, valley precipitation throughout the basin was far below normal for April, which reduces the seasonal volumes of water forecast on April 1 by about 6%.

A heavy storm April 28-30 deposited 20 to 40 in. of snow on the higher elevations and 8 to 10 in. of snow at lower elevations in Western Montana. The Flathead River should flow about 150% of average during this season. The Clarks Fork River should flow at least 130% of average. These flows will be less than in either 1950 or 1949. In the Upper Columbia river basin of Montana, water supply for irrigation and power will be sufficient this season for all needs.

Upper Missouri

May 1 snow surveys on the Upper Missouri and Yellowstone rivers in Montana indicate an excellent irrigation water supply for this coming season. The May first snow pack on headwaters of the Yellowstone River is above average and a good water supply is anticipated for the Yellowstone Valley. May-September flow at Corwin Springs should reach 1,770,000 acre-feet or 7% above the 10-year average. Snow pack on the Jefferson is heavier than last year, while on the Madison and Gallatin it is less than last year, but slightly above average.

Snow surveys on the Musselshell and Judith rivers indicate run-off slightly below average in prospect. However, spring and summer precipitation play a very important part in the water supply from these midstate mountain ranges.

May 1 snow surveys on the Wind and Popo Agie river basins indicate a good water supply for those basins for this season. The Wind River above Riverton is likely to produce a record year's run-off. Reservoir storage on Missouri River in Montana is good, along with the storage in Northern Wyoming. Those portions of Eastern Montana not supplied by snow-fed streams are beginning to feel the effects of the deficient precipitation over that section during the winter and spring months. The October-April precipitation over Eastern Montana is 63% of average.

Rocky Mountain States

Colorado water supply outlook has not changed materially since April first. The snow cover on the South Platte remains great. In many cases the snow cover is greater than any since snow surveys began. Areas of heaviest snow cover are on the headwaters of Boulder Creek, Clear Creek and Thompson River. The extreme headwaters of the Arkansas are also very good, but some of the southern tributaries are deficient in snow. The Blue River drainage, tributary to the Colorado, is still unusually high in snow cover. The southern part of the state continues definitely deficient in snow. Stream flow throughout the area is generally below normal due to delayed melt.

Snow cover on the Green River in Wyoming is as great or greater in some cases than last year when it reached record maximum. Precipitation during April was approximately normal in the high watershed of the Snake River in Western Wyoming. No change in the seasonal run-off as forecast on April 1. Good water supplies are forecast for the Jackson, Wyoming, area and adjacent lands below in Idaho.

The water outlook for Rio Grande in New Mexico continues to be critically poor, with practically no snow and well below normal precipitation during April.

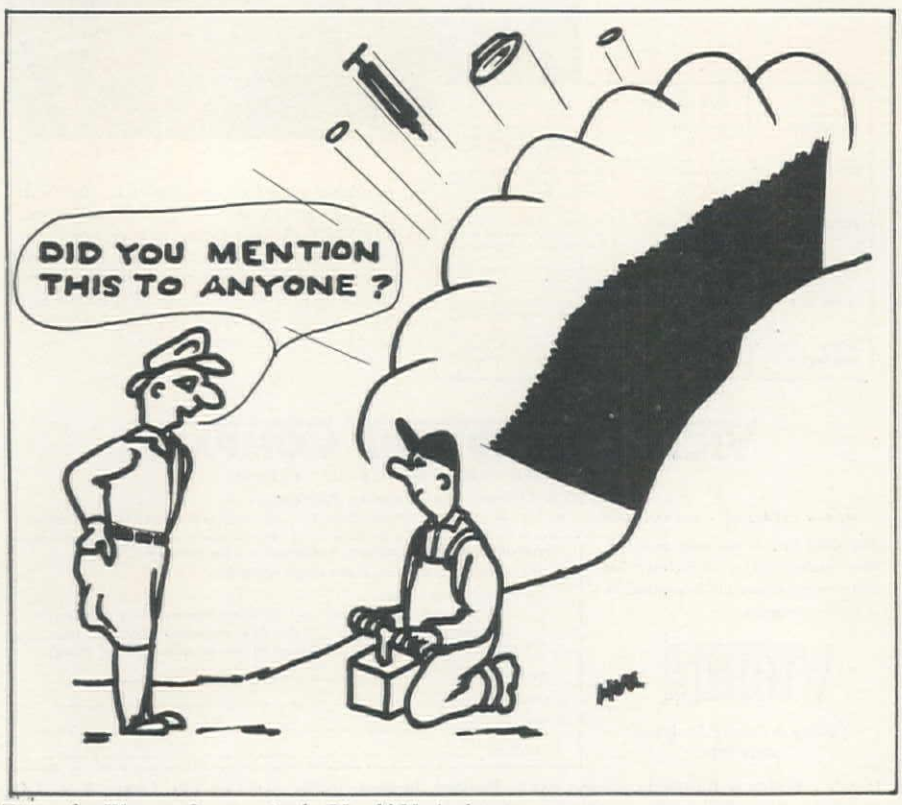
Intermountain States

In general there is no major change in the water supply prospect for Utah. The first half of April was dry with high temperatures which accelerated streamflow. About mid-April, cool temperatures, still continuing, reduced streamflow so that run-off for April has been only normal or below, even in areas where total seasonal run-off is still expected to be considerably above normal. Precipitation for April as a whole was normal or above. Therefore, about the same run-off as forecast a month ago is expected to occur.

May first measurement of key snow courses indicates that very damaging peak flows may still occur in Northern Utah.

Concluded on page 126

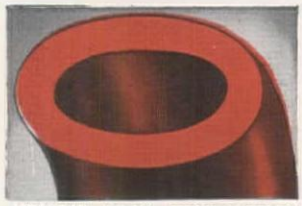
Down-time Dopes . . . . . by Anderson



Drawn for *Western Construction* by Harold V. Anderson

The Stamina Story of ESCO Dragline Buckets

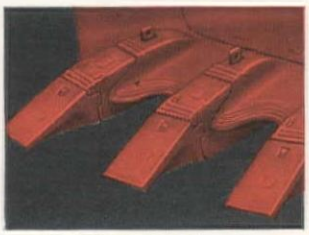
On the hundreds of jobs where *ESCO* buckets are working long after other makes have worn out, the story of *ESCO* stamina is being written every day. But the real inside story is the metallurgy, engineering and craftsmanship that make this endurance possible. Shown here are a few details typical of the rugged construction that means greater production on your jobs.



HOLLOW ARCH CONSTRUCTION eliminates excess weight and increases strength. Used on all *ESCO* buckets over ¾ yard. Cast T section arch used on smaller sizes.

6-YARD *ESCO* HEAVY DUTY (STANDARD) DRAGLINE BUCKET. Other dragline sizes and types, plus full line of dippers, provides a bucket for every digging job.

LONG BOWL **ROPE SOCKET.** Light weight; strong—develops more than 90% of rated cable strength; equal wedging action on all six strands; eliminates crushing and distortion of wire rope.



CLEAN CUTTING LIP decreases digging resistance. Tooth holders cast integrally with cutting lip.

VERTICAL PIN HITCH PLATES. Standard equipment on 5½ yd. sizes or larger. Optional on others.

TRUNNION BRACKETS, links and pins of manganese steel. Alternate holes for adjusting of digging and carrying positions.

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Make, model and boom length of machines used_____

Few Changes in Run-off Forecasts

. . . Continued from page 124

In Southern Utah, high precipitation at the month's end only slightly improved water supply prospects. Streamflow here will still be near a record low. Indicative of Southern Utah is the Beaver River. Only 4 times in the last 38 years has streamflow been as low or lower than it was this April.

The drought in Central and Southern Nevada continues. There has been little improvement during the past month in the outlook for irrigation season water supplies. Above normal mountain snowfall during April has very slightly improved the prospects, but in all areas except for Humboldt Basin snow water conditions on May 1 were far below normal. Cool weather during April, and above normal precipitation in valley areas reduced the April demand for irrigation water. This was helpful in conserving limited stored supplies for use later in the season.

Pacific Coast

Marked lack of rainfall and abnormally heavy snow melt and snow evaporation during April reduced prospective run-off for most of Oregon's streams. However, most of the State can still be confident of good water supplies, although late season deficiencies of water are now expected on many small streams deriving supply from low elevation watersheds. Water stored in reservoirs is 5% above average for May 1, but in a few important reservoirs supplies are below normal.

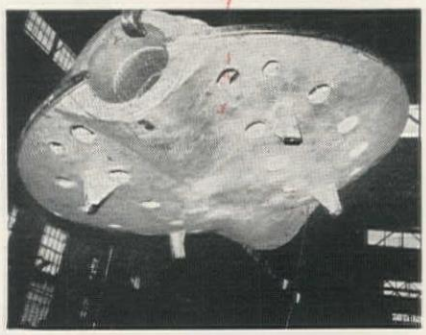
The overall April-July streamflow expectancy for California, as a result of observations of snow courses, precipitation, temperature and antecedent run-off made during April, shows that sufficient irrigation water will be available on the main stem of the Sacramento River; while on all of the rivers to the south, deficiencies will occur. On the Kern and Kaweah, the water deficiencies will be the greatest of record.

Southwest

The water supply outlook for Arizona has not improved since April first. Combined total reservoir storage is 2% less than a month ago, the combined storage being 5% of capacity or 170,000 acre-feet. However, due to general mountain snowfall near the last of April in one large storm, the forecast of February-June inflow to major reservoirs is increased from 140,000 to 150,000 acre-feet.

No change is reported in water allotments for 1951 in Gila and Salt River Projects, nor in the acreage being seeded. Salt and Verde rivers still flow close to their minimum base.

THIS IS NOT A FLYING SAUCER!



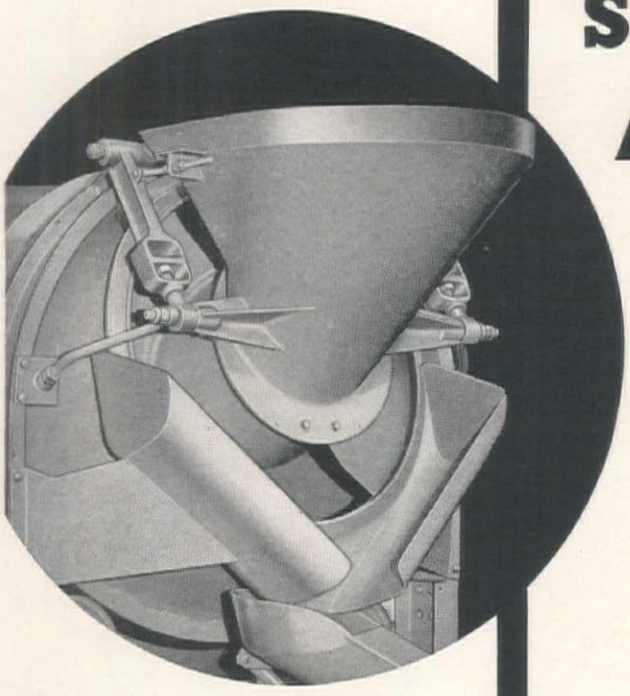
It is a 27,000-lb., 120-in. bronze-rimmed cast-steel leaf for a butterfly valve being manufactured in the Sunnyvale, Calif., plant of Westinghouse Electric Corp. This valve is designed to control the flow of water through a penstock leading to the generator in a southern California hydropower station. Holes shown are on the downstream face of the leaf. The upstream side is solid cast steel. Those "legs" you see are steel supports temporarily welded to the leaf to speed machining and other manufacturing operations.

Rising Reservoir at McNary Causes Some Damage

TROUBLE confronted the Corps of Engineers as spring flow in the Columbia River increased. On the Washington side of McNary Dam, the S. P. & S. R. R. is still operating on the old, low level track going through the dam. With the increased flow the level in the lake above the dam rose, and water seeped through under the railroad track in such a quantity that the drain holes in the downstream moorage wall could not cope with the flow. Water piled up behind the moorage wall and pushed a section out. Damage was estimated at $75,000.

Smile with Smith-Mobile

OH BOY...THAT'S WHAT I CALL UTOPIA IN TRUCK MIXER DESIGN



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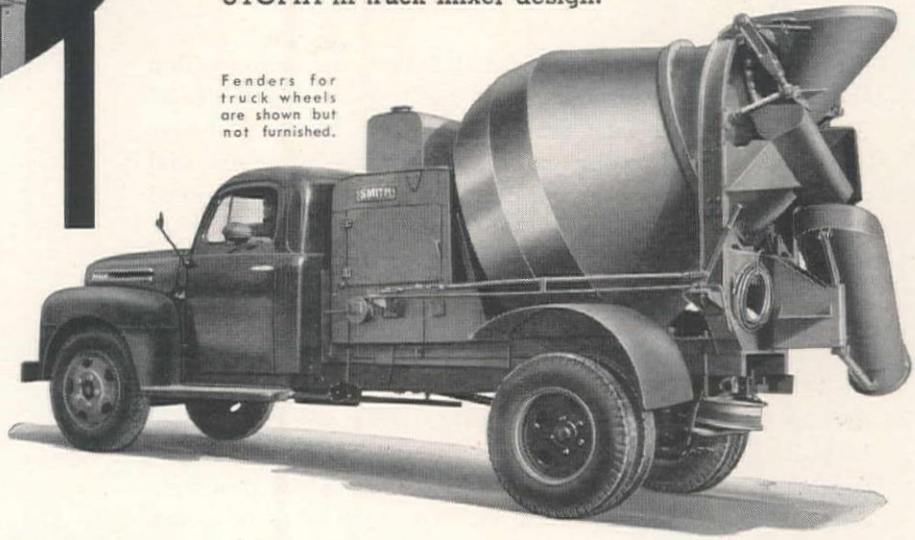

Fenders for truck wheels are shown but not furnished.

Weigh Less! Cost Less!

Smith LOADLIMIT models weigh less and cost less than smaller size standard machines. Yet they haul BIGGER PAYLOADS. Initial investment is less . . . operating costs lower . . . maintenance costs reduced to rock bottom. This adds up to GREATER PROFITS.

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NEWS IN BRIEF

Undersea Subway Would Tap Oil

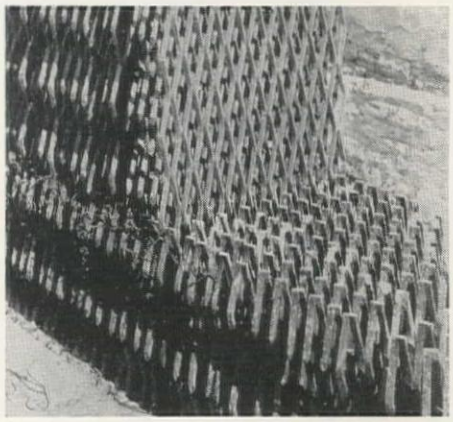
A PROPOSAL to build an undersea subway system in Los Angeles-Long Beach, Calif., harbor and thereby extract the estimated 500,000,000 bbl. of oil resting there, received attention of Southern California.

Knowledge of the oil's existence under the Los Angeles outer harbor area is not a new development, but engineers have long discussed feasible means of extracting the liquid without endangering the shipping in the harbor.

Hillman Hansen, an engineer-geologist, who has devoted ten years of study to the problem of underwater oil drilling, has suggested the subway network. He proposes the sinking of a vertical shaft about 400 ft. below the bottom of the bay. From this depth tunnels would be bored outward to reach the oil deposits. About 50 caissons would be needed to develop the project adequately, and a 100-acre area would be tapped by 20 wells sunken at different angles. Each well would withdraw oil from its own five-acre area.

According to Hansen this plan is more economical than any other so far proposed, and he feels that any opposition to the obtaining of the oil will be waived when defense needs make all known supplies more vital and necessary.

BURGLAR-PROOF REINFORCING



This close-up view of Wheeling Strestcrete reinforcing in a Seattle bank vault shows why it forms an almost impenetrable barrier against drilling, chiseling, burning, etc. Heavy gauge expanded metal sheets, laid parallel to line of possible attack, are made by slitting and stretching ⅜ or 5/16-in. steel sheet into diamond pattern, each 3 in. wide by 8 in. long.

Arkansas River Project Approved

THE OFFICIAL blessing of Secretary of the Interior Oscar L. Chapman has been given to the $150,000,000 reclamation and power project to develop the Arkansas River in southern Colorado. The proposal now goes to the governors of Colorado River basin states for study

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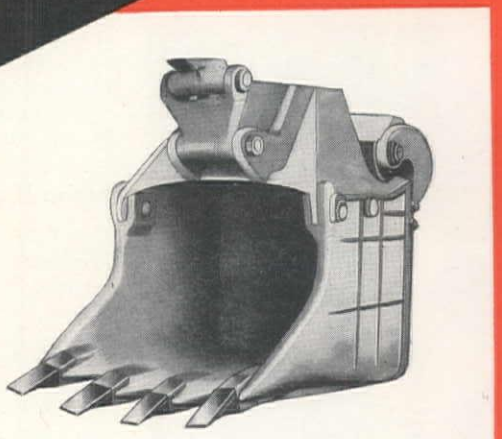

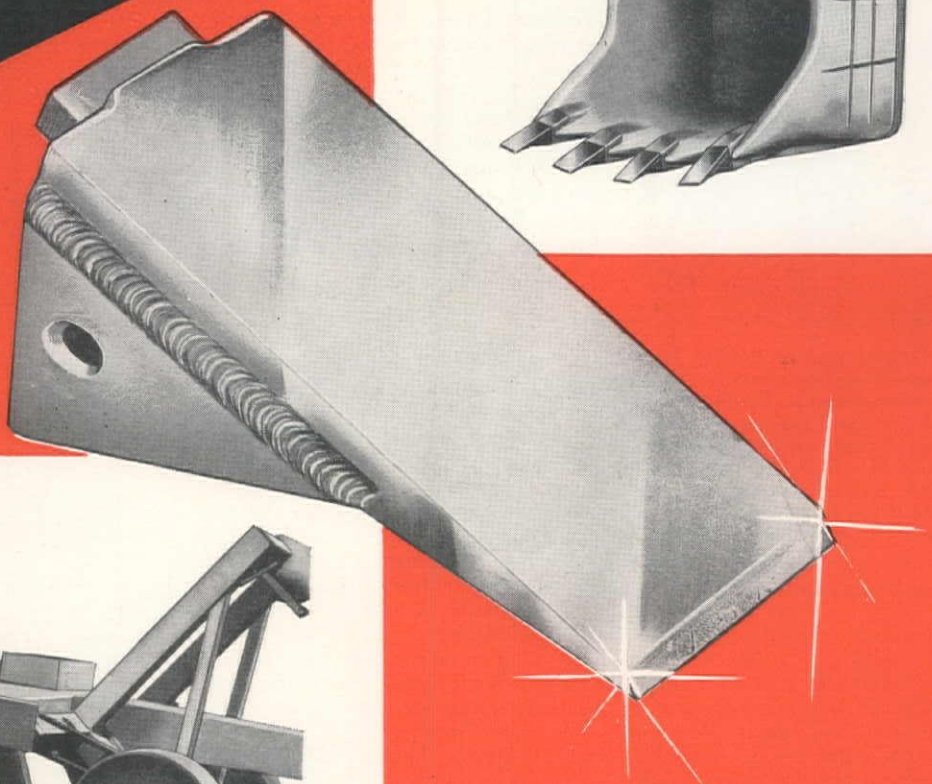

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and consideration. Oklahoma and Kansas will also take part in the study. Ninety days are allotted for the filing of objections and the offering of suggestions, before the measure goes to Congress for approval.

The project would produce a total of 500,000 kv. hours of electric power and would consist of seven dams constructed along the river. When completed the project would be of aid to flood control as well as providing irrigation water.

BIGGEST DIPPER BUCKET?

Probably the largest dipper bucket ever fabricated on the West Coast is this 11-yd. dipper recently completed by Electric Steel Foundry Co. of Portland for use by Western Contracting Corp. on the Missouri Valley project in South Dakota. Girl and Buick have little trouble fitting into the big bucket. The dipper will be used on a Marion Electric 1100-M walking dragline.

Grand Coulee Won't Tell Its Age

GRAND COULEE in Central Washington is still refusing to reveal its age to a group of nationally famous geologists. Even with the help of radioactive atoms, age counts for Niagara Gorge, several thousand miles away, and the counting of layers of hardened clay, no one knows for sure just how old the channel is.

The Bureau of Reclamation sent out the query, as engineers prepare to start the largest pump in the world which will lift eventually about 6% of Columbia River water out of its present bed at Grand Coulee Dam and back into the ice-age channel. Extracted water will be used for irrigation of sage-brush lands about 60 mi. to the south.

Estimating the age of fossils, the path of a glacier and the findings produced by radioactive isotopes failed to produce conclusive results. Experts can not believe that the figure is 11,300 to 11,500 years but one ventured the opinion that the age was something "less than 25,000 to 35,000 years." When the first water is pumped into the Grand Coulee by Bureau engineers, no official figure will be given, but "it's been a long, long time."

Idaho Highway Department Moves

DISTRICT OFFICES of the State Highway Department of Idaho are now located in a new $65,000 two-story building at 24th St. and North & South Highway in Boise. It is not yet known what will be done with the department's old location in the 400 block on 17th St., which housed the offices for over 20 years.

1,055-Ft. Water Drop for Power

A CONTRACT has been awarded by the Bureau of Reclamation to Winston Brothers, Monrovia, Calif., for construction of the Flatiron power plant, pumping plant, and afterbay dam, which will utilize one of the highest water drops on a Bureau project, 1,055 ft. The works are a part of the Colorado-Big Thompson Project and will utilize water diverted from the western to the eastern slope of the Rocky Mountains through the Alva B. Adams tunnel. The East portal of the tunnel through the Continental Divide is at elev. 8,250 ft., and the fall of the water to the mile-high area it ultimately irrigates is utilized in a series of power drops of which the Flatiron is the highest.

Winston Brothers bid $2,240,359.20 for the job. Under the provisions of the contract, the power and pumping plant building, 183 ft. long and 57 ft. wide, must be completed in 515 days and the entire project of building, dam and afterbay, with channels, access roads and other appurtenant features, finished in 745 days.

The Flatiron Dam and Reservoir project is one of three foothills reservoirs which store irrigation water on the Colorado-Big Thompson Project for release during crop seasons. The others, Horsetooth Reservoir and Carter Lake, are in course of construction under the Bureau's multi-purpose water use program.

Operation of the Flatiron installation depends upon the delivery of water diverted from the Big Thompson River and regulated by the Rattlesnake Reservoir discharged through Bald Mountain Pressure Tunnel in a 1,055-ft. drop to the Flatiron plant. After passing through the turbines and pumping unit, the water is delivered into Carter Lake Reservoir.

The project will provide maximum beneficial use of the water for the irrigation of approximately 615,000 acres and the generation of about 177,650 kw. of hydroelectric energy.

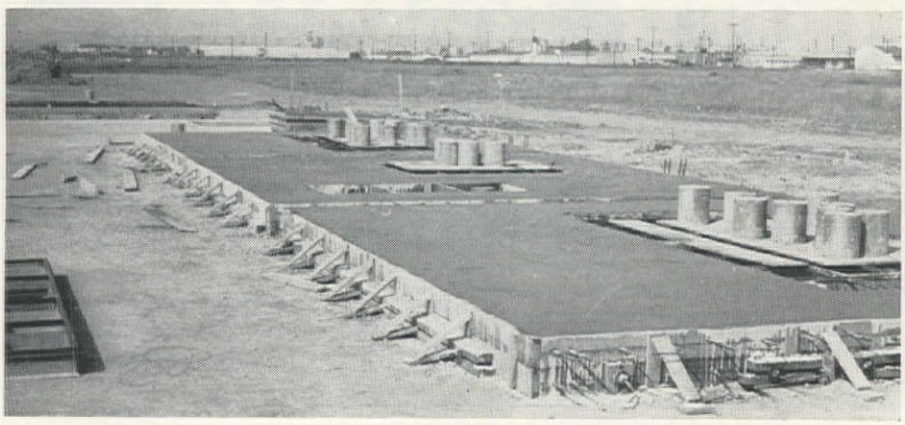
BULLDOZER HELPS LAY PIPE

R. V. Lloyd & Co., Coachella, Calif., is using a Caterpillar D2 bulldozer tractor to assist in several pipelaying operations on a 53-mi. contract. The D2 spots the 12-ft. lengths of 60-in. concrete pipe and is used for backfilling the trench in tight places. In view above, the dozer is placing pipe along the ditch for the crane to lower and place.

Film Tells Story of Colorado River

HOW MAN has corralled the lower Colorado River and its tributaries to make possible the present reclamation developments in southern California, southern Nevada, and Arizona is told in a 27-minute documentary sound motion picture being released by the Boulder City, Nevada, office of the Bureau of Reclamation. Appropriately titled "Corralling the Colorado," the picture is the most comprehensive film history ever produced on reclamation development in the lower river basin. The film is available in 16- and 35-millimeter prints free of charge for noncommercial showings on television stations, in schools and colleges, and before clubs or other interested organizations. Prints may be ordered from the Bureau of Reclamation's offices located in Boulder City, Nev.; Sacramento, Calif.; Salt Lake

TO HOLD STEEL SASH IN PLACE during precasting of tilt-up concrete walls, contractor obtained a stock of 3-gal. ice cream cartons and filled them with concrete. Handles of wire were embedded. Placing these weights over sash area did the job. Contractor was H. C. Smith Co. on construction of the B. F. McDonald plant in L. A.



City, Utah; Boise, Idaho; Billings, Montana; Denver, Colorado, and Amarillo, Texas, from the Chief Engineer's office in Denver, or from the Commissioner's office in Washington, D. C. The borrower will be required to pay shipping costs both ways.

CHUTING CONCRETE AT SALT LAKE

A total of 16,000 cu. yd. of concrete is required for the Bureau of Reclamation's Terminal Reservoir near Salt Lake City. All of the concrete is being handled by two Dumpcretes mounted on Chevrolet trucks. A Noble batch plant with one-yard Koehring mixer is set up on the job to pre-mix all concrete for hauling without agitation in the Dumpcretes. *L. G. "Bud" Waigand* is project manager and *"Tiny" Madsen* is field superintendent for Peter Kiewit Sons' Co. on the job.

Navajos Powwow to Hire Engineer

AT WHAT could be called a "water powwow," the Navajo Tribal Council voted to engage the services of a consulting engineer to partake in studies of the San Juan River water problems.

The Council was told by J. B. Keesee, Window Rock, Ariz., irrigation engineer, that 113,992 acres could be aided by the construction of a gravity irrigation system, and an additional 40,000 acres could receive water with the aid of pumps having a maximum lift of 150 ft.

Estimated cost of the project, according to Keesee, would be about $117,000,000. The proposed dam on this Shiprock project would be erected about 3 mi. downstream from the connecting point of the Pine and San Juan Rivers in New Mexico. A 93-mi. canal would be built to run parallel to the San Juan River on the south side and bring water to a Table Mesa reservoir for storage of about 130,000 gal.

Bid Invitations by the USBR

BID CALLS were extended by the Bureau of Reclamation on several important projects last month. In mid-May invitation for bid went out for the Spillway Stilling Basin completion on the Davis Dam Project, near Kingman, Ariz.

Penstock and conduit construction bids on the Pole Hill and Flatiron section of the Colorado-Big Thompson project were put up for bids in mid-May. Glen Anne Dam on the Cachuma project in California was the subject of bid calls at the end of May, as were the West Canal and Frenchman Hills Wasteway work on the Columbia Basin Project. Eklutna Tunnel and Surge Tank on the Eklutna Project, Alaska, and Exeter distribution system of the Central Valley Project bid calls were advertised in mid-May.

Northwest Power Project Approved

CONSTRUCTION of six 25,000-kilovolt-ampere generating units at Puget Sound Power & Light Company's Rock Island project on the Columbia River in the vicinity of Wenatchee, Wash., has been directed by the Federal Power Commission. The construction, to be carried out by Public Utility District No. 1 of Chelan County, Wash., under a lease agreement with Puget Sound, also includes the raising of the Rock Island dam and the installation of other related hydroelectric facilities. Puget Sound's Rock Island project was completed in its initial stage in 1932, with four generating units having a total capacity of 80,000 kw.

A Good Start at Hungry Horse

THE HUNGRY HORSE Dam construction season got off to a good start in spite of two snow storms during the month of April. A total of 115,640 cu. yd.

of concrete was placed during the month in the huge multiple-purpose dam and power plant rising on the South Fork of Montana's Flathead River. This was 40,000 cu. yd. more than the goal scheduled for the month.

Records were also set by a 24-hour pour of 6,615 yards and an average of 6,365 yards per day for the last 7 days of April. About 1,156,450 cu. yd. are now in place.

High blocks in the dam rose to 254 ft. above bedrock, an increase of 20 ft. during the month. By the end of the construction season the dam will be approximately 400 ft. high according to the schedule. When actually completed it will tower 564 ft., and be the third highest concrete dam in the world.

750-CAR LONG-SPAN GARAGE

Nearly completed framework of the new California State Garage in Sacramento is shown above. The long-span type steel frame building has a minimum of interior columns to allow freer movement of cars. Opposing types of inclines keep outgoing and incoming vehicles from crossing one another. About 1,400 tons of structural steel was fabricated and erected at Bethlehem Pacific's Alameda, Calif., works. The building covers a full one-half city block.

Road Completed to Desert Landmark

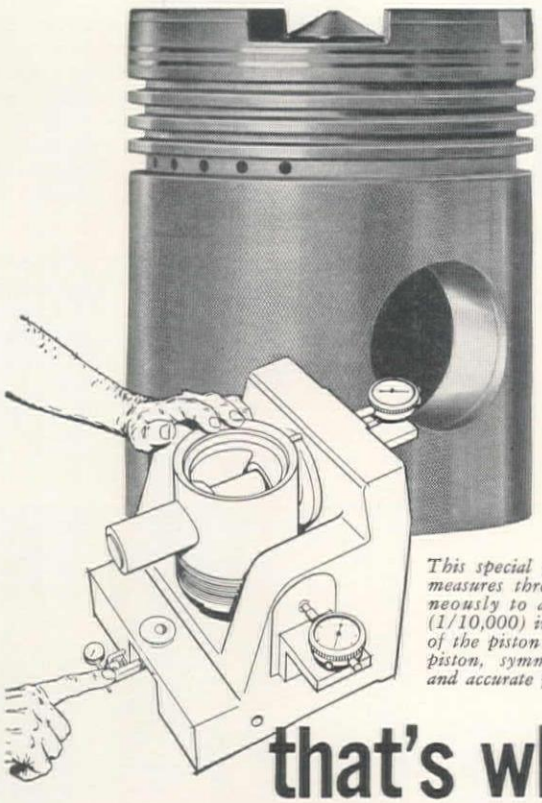
OILING of the Scotty's Castle road in the Death Valley of Nevada was completed in mid-May. Crews laid nearly 2 mi. of road-mixed oil surfacing daily for construction of the realigned road from Highway U. S. 95 to the Nevada-California state line 4½ mi. east of Scotty's Castle. On the Nevada side a total of nearly 22 mi. was built, replacing the old, dusty, washboard, desert road that has existed for many years.

The newly-oiled link in the highway system will make it easier for tourists journeying to the famous desert landmark.

Sewage System Nearly Ready

SCHEDULES indicate that the $23,500,000 East Bay Municipal Utility District sewage disposal system should reach completion late this summer.

The project, which will serve the cities of Albany, Alameda, Emeryville, Oakland, Berkeley and Piedmont, began in 1947 is now about 80% completed. The system will take the sewage of the six East Bay cities, treat it, and dispose of it a mile off-shore in about 40 ft. of water.



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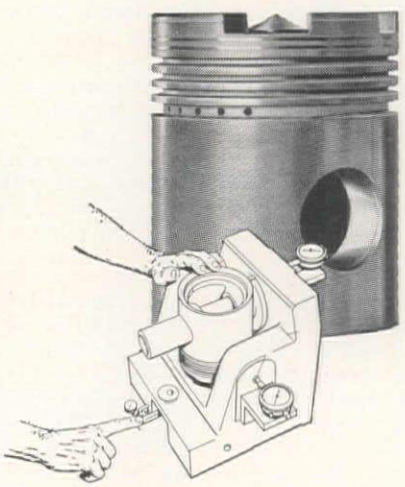

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ENGINEERS ON THE MOVE

Thomas E. Stanton, well known California State Division of Highways engineer, retires May 31 after almost 40 years of service to the State. Stanton will be replaced by **F. N. Hveem,** construction engineer.

* * *

R. E. Edlefsen, engineer with the Idaho State Highway Department, is the new mayor of Boise, Ida.

* * *

Fred H. Simpson, assistant engineer in Seattle, Wash., city engineer's department, retires from his position after almost thirty years of service. During his career Simpson was mainly concerned with the department's construction division work, and supervised many paving projects in the city. Civil defense organizations in Seattle during World War II were his assignment, and at the time of his retirement he was once again engaged in municipal defense planning.

* * *

Carlton S. Proctor is nominated for 1952 president of the American Society of Civil Engineers Board of Direction. The nomination took place at the Houston, Tex., meeting of the society. Proctor, a member of the organization since 1925, has served the society in several important posts, and has been active in the profession for many years. He is at the present time a New York City consultant for a firm which specializes in substructure engineering.

* * *

Clifford R. Salmen becomes acting district engineer for the U. S. Bureau of Roads in Boise, Idaho, replacing **L. R. Huggins,** who retires.

* * *

Major Walter R. LaLonde retired April 1. He has been resident engineer at Cottage Grove Dam, Ore., since its completion. LaLonde will be succeeded by **John W. Wall,** former Bonneville Dam engineer.

* * *

Paul McKay, construction engineer, is now Vancouver, Wash., district state highway engineer. He has been with the department for about 25 years. **William A. Bailey** becomes district construction engineer in the district, and **Robert L. Deever** takes over as maintenance engineer.

* * *

A. G. Keating is the regional production engineer for the San Francisco office of the National Production Authority. He has conducted his own engineering consulting service since the war. Keating formerly headed the War Production Board regional mining division, and was a director of the Northern California cement industry in latter part of the war period. He served with the U. S. Engineers during the construction of army cantonments and installations in Northern California.

* * *

Frank J. Bennett is now construction engineer, powerhouse shift chief, for the U. S. Bureau of Reclamation on the Hungry Horse project in Montana. He was formerly the chief inspector for Kortes Dam, Wyo.

* * *

Colonel J. S. Seybold, Corps of Engineers, goes to Washington, D. C., to assume new duties as assistant chief of engineers for personnel and administration. His position as division engineer, South Pacific Division, will be assumed by **Colonel D. S. Burns,** Corps of Engineers, who has been district engineer of Portland, Ore. Seybold has seen notable advances in the flood control work in

Seybold

Burns

California during his administration, such as construction on Folsom, Farmington, Pine Flat and Isabella dams in the Sacramento-San Joaquin Basin, huge projects to control floods in the Los Angeles area, improvement of the Los Angeles River and tributaries and the starting of the Whittier Narrows Dam.

* * *

Gerard C. Weeshoff, civil engineer, is the new vice president and Southern California manager of A. Teichert & Son, Inc. Weeshoff comes to Los Angeles, Calif., from the main office of A. Teichert & Son, Inc., Sacramento, Calif. He is a graduate of the University of California and has fifteen years' experience in engineering and construction.

* * *

Rudy A. Simonson, 32-year-old Bureau of Reclamation engineering aide at Eleverta, Calif., receives the Department of Interior's gold medal for his heroic actions early last year. Simonson and **Ardis G. Ribbeck,** chief, general engineering section, were lost in a snowstorm while on a reconnaissance trip near Klamath Falls, Ore. Forced to abandon their car, the two wandered in the storm until Ribbeck became too weak to walk. Simonson carried his companion to a shelter and made every effort to revive him, but all efforts failed. He remained with the body until a rescue party arrived four days later. For this deed the young engineering aide receives the highest honor the Department can bestow upon a federal employee.

* * *

David W. Persons, project engineer with the Atomic Energy Commission, is now in Denver, Colo., to direct construction on the $45,000,000 atomic plant 24 miles northwest of Denver. Austin Company, Cleveland, Ohio, prime contractor, sends **W. R. Engstron** to Denver to act as construction project manager.

* * *

L. N. McClellan **(left) receives Gold Medal Award from *John McGowan*, president of the Colorado Engineering Council (see item below).**

L. N. McClellan, chief engineer of the Bureau of Reclamation and director of the branch of design and construction, received the Colorado Engineering Council's Gold Medal. Awarded for distinguished service in the field, the Medal is the highest honor for engineering activities in Colorado.

* * *

Marshall Jones, Bureau of Reclamation engineer, is now district manager for the Bureau's Sacramento Valley district. Jones has wide experience with water conservation methods, especially in the Central Valley Basin. He succeeds **James K. Carr.**

CALENDAR OF MEETINGS

June 8-10—Concrete Products Association of Washington, 22nd annual meeting, at Harrison Hot Springs.

June 10—The President's National Highway Safety Conference, Washington, D. C.

June 13-15—American Society of Civil Engigineers, Summer Convention, at Louisville, Kentucky.

June 25-28 — Western Association of State Highway Officials, 30th annual conference, at Fairmont Hotel, San Francisco.

October 11-13—Structural Engineers Association of California, annual convention, at Yosemite Park, Calif.

October 22-25—American Society of Civil Engineers, Annual Convention, at New York City, N. Y.

October 23-26—California Section, American Water Works Association, annual meeting, at Fairmont Hotel, San Francisco.

DEATHS

Horace W. King, 77, engineer and author, died April 22, in Pasadena, Calif. He was a professor of hydraulic engineering at the University of Michigan from 1912 to 1939 and author of many books in the field of hydraulics. In his long career, King had served with the U. S. Reclamation Service, and on many canal surveys, and he was assistant engineer in charge of the construction of Manila Harbor, P. I.

Fabian S. Miller, 57, city engineer of Palo Alto, Calif., died of a heart ailment May 5 while vacationing in Washington. He had worked for the Oregon State Highway Commission and the Alaskan Railway before entering his municipal post in Palo Alto.

Mark U. Kramer, 65, retired building contractor, died in a Colorado Springs, Colo., hospital of a heart attack.

Anderson L. Burkett, 78, retired building contractor, died April 20 in his Los Angeles, Calif., home.

George R. Nickerson, 75, retired building contractor, died April 26 in Los Angeles, Calif.

Robert B. Wark, 84, retired contractor, died in Seattle, Wash. Wark was one of the founders of the Master Builders.

Ira Davisson, 90, former Tacoma Commissioner of Public Utilities, died suddenly in his home. During his 22 years as a commissioner he contributed much toward the building of the city light system and power projects including direction of construction of Cushman dam.

William F. Henderson, 61, Shelby, Mont., building contractor, died after a long illness April 24 in Toole County Hospital.

John J. Nieto, construction engineer, died in Palm Springs, Calif., early in April.

Lloyd M. Hawkins, 48, vice president of the Hinman Brothers Construction Co., died April 9 in his Boulder, Colorado, home.

Edward D. Pike, 81, building contractor, retired, died April 11 in Phoenix, Ariz.

Harvey A. Klyce, 84, contractor, died April 15 after a long illness. Klyce was well-known in the San Francisco Bay Area as a past president of the Associated General Contractors of San Francisco. He was a resident of Mill Valley, Calif., where he once served as building inspector.

SUPERVISING THE JOBS

C. L. McDonald is superintendent for Macco Corporation and Morrison-Knudsen Company, Inc., on breakwater construction in Crescent City, Calif. **D. O. Fletcher** is general foreman and **Tony Ross** is concrete foreman. This is a Corps of Engineers' project.

* * *

George Easterbrook is the general superintendent for Boen-Sealand Construction Co. on the $4,659,400 construction of 39 eight-family dwelling units at Eielson and Ladd air force bases, Alaska. **Walter Johnson** is superintendent at Ladd. **P. D. Koon** is project engineer along with **Richard Egge. Howard S. Giske,** contractor representative.

* * *

Bridge and irrigation pipe crossing along the Boulder-Denver, Colo., turnpike is being supervised by **Kenneth Mann** and his assistant, **Ralph Cassell.** Peter Kiewit Sons' Co. is the contractor.

* * *

A pair of Eddies, **Eddie Hauser** and **Eddie Jackola,** general superintendent and assistant superintendent respectively, are supervising construction of the $1,500,000 administration building addition on the Westwood campus of the University of California at Los Angeles. **Johnny Ross, C. Yeager** and **Harold Perong** are the foremen for the R. J. Daum Construction Co., Inglewood, Calif.

* * *

Oscar (Bud) Chase is supervising clearing of sections K and L for the Detroit Dam reservoir on the North Santiam River in central Oregon. **A. R. Wager** is office manager on the $172,000 project for contractor Fred Wager & Son, Inc., Auburn, Wash.

* * *

The $3,000,000 school construction in San Jose, Calif., is being supervised by **Willard C. Swenson** and his assistant **C. Anderson** for contractors Williams & Burrows, Inc., and Carl N. Swenson Co., Inc., San Jose.

* * *

Paul Hockensmith is the project manager and **Charles Billings** is general superintendent for Moore & Roberts, Inc., San Francisco, Calif., on the $2,500,000 school construction project in Berkeley. **Gene Campi** is assistant superintendent.

* * *

B. A. "Tex" Taggart is superintendent for Stockton Construction Co., Inc., on construction of the $160,000 Imhoff tank for the City of Merced, Calif. **L. F. Frye** is construction foreman, and **G. E. Winton** is Merced City Engineer.

* * *

***R. H. McAndrew*, left, is BPR engineer, and *R. C. Bassette* is superintendent, on construction of Weiser Bridge in Idaho by J. H. Wise & Son, Boise.**

* * *

Construction of the Republic Supply Co.'s new facilities in San Leandro, Calif., is being supervised by **Roy L. Stout** and his assistant **Del Rea.** Swinerton & Walberg is contractor on this construction which will house warehouse and general office facilities.

* * *

Water main construction in the East San Francisco Bay area cities of Oakland, Richmond, and El Cerrito, Calif., is being supervised by **Harry Nelson** and his assistant, **Tom Wintch. R. H. Brown** is the general foreman for McGuire & Hester on the East Bay Municipal Utility District project.

* * *

Chas. L. Pelham is supervising several jobs in the Southwest for M. J. Brock & Sons, Inc., Los Angeles, Calif., contractor.

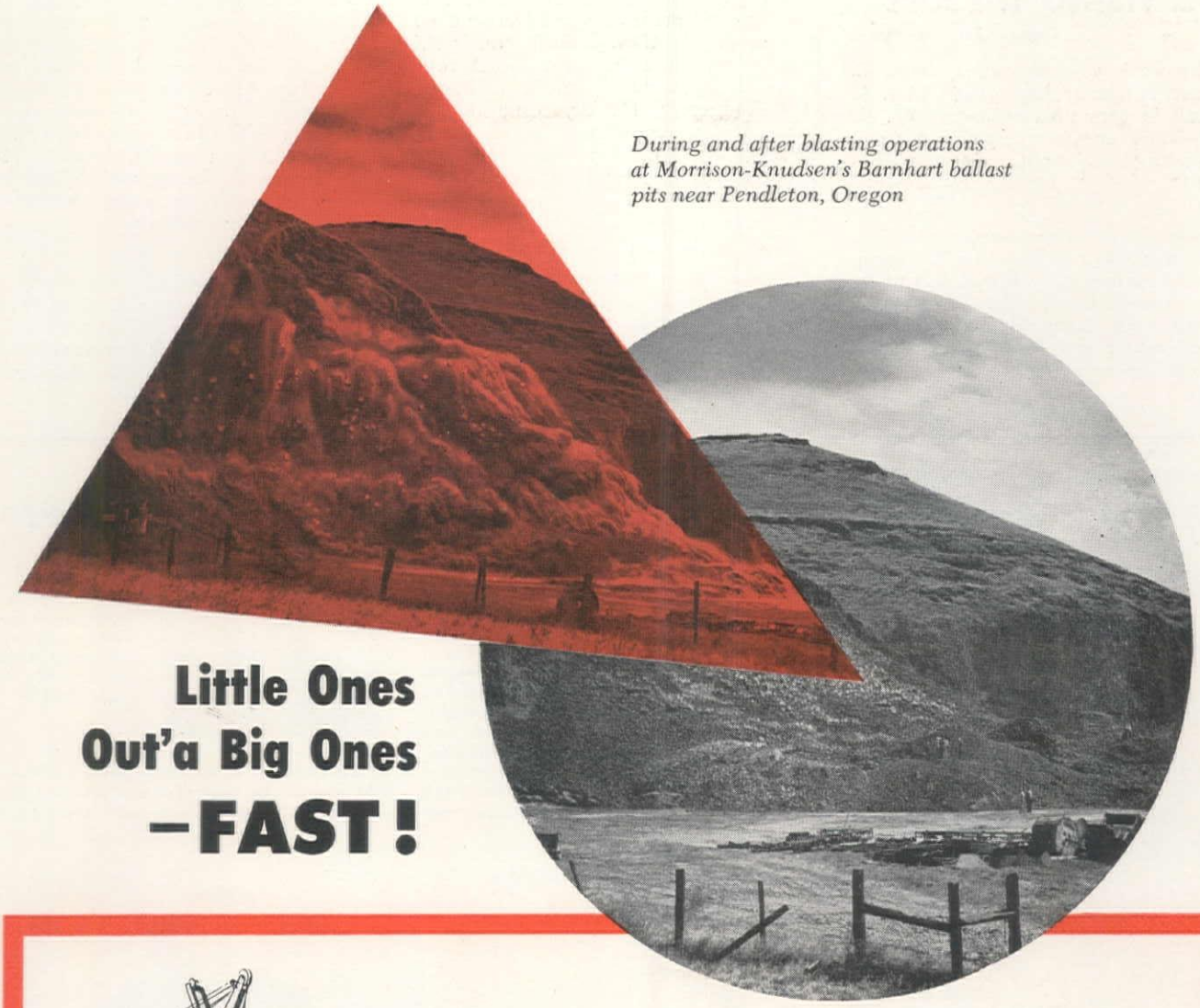
* * *

C. E. Kasler is the project manager and **James Stinson** is the general superintendent for Frederickson & Kasler Co. on the state highway project on Highway 101 south of Camarillo at Thousand Oaks, Calif. **William Loy** is grade superintendent and **Win Ransdell** is master mechanic. **Carl Nelson** is the general foreman and **F. O. Muren** is concrete foreman. **M. H. Whalen** is office manager on the $850,000 project.

* * *

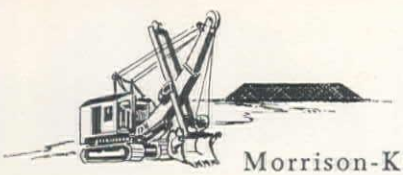
Ross Powerhouse construction for the City of Seattle, Washington, by Guy F. Atkinson Company, Bressi & Bevanda Constructors, Inc., Charles L. Harney, Inc., and A. Teichert & Son, Inc., joint venturers, is being managed by **George W. Wintz. L. L. Sheddy** is his assistant. **Jack Stone** is tunnel superintendent,

Continued on page 138



During and after blasting operations at Morrison-Knudsen's Barnhart ballast pits near Pendleton, Oregon

Little Ones Out'a Big Ones —FAST!



Morrison-Knudsen makes little rocks from big ones with great dispatch at their Barnhart Pit operations near Pendleton, Oregon. The project, started in 1947, crushes screens and cleans rock ballast for Union Pacific Northwest rail lines. Caterpillars, shovels, trucks and the crushing and screening plant have kept up steady production without breakdown or delay since operations began.

According to E. B. Potter, General Superintendent, General Petroleum Corporation has contributed considerably to this record with on-the-job service and dependable lubricants that can take the tough going.

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SUPERVISING THE JOBS

... Continued from page 136

Tom Foran is business manager, **R. E. Ponsford** is purchasing agent and **J. A. Pednealt** is personnel manager. **W. H. Wolff** is chief engineer on the huge project which is to cost approximately $15,000,000.

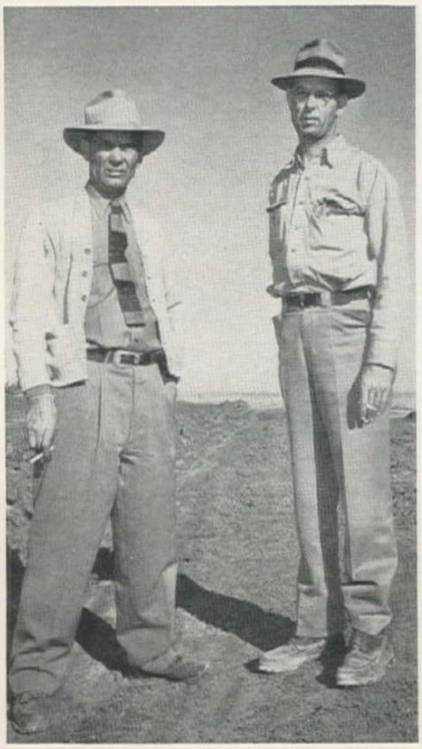
Surfacing and miscellaneous work on the Newcastle-Lusk Road in Wyoming is being supervised by **Floyd A. Collins** for the Summit Construction Co., Rapid City, So. Dak. **Leon Henry** is project superintendent and **Ralph Anderson** is hot plant superintendent on the $320,000 project.

Antioch, Calif., is the site of construction on the Pacific Gas & Electric Co.'s new steam plant. **E. J. Garbarini** is the general superintendent for the Bechtel Corp. **H. B. Burkhammer, R. L. Slater, O. J. Rodgers, S. M. Akyason** and **C. A. Johnson** are superintendents. **P. N. Fletcher** is the civil engineer and **Herb Kirby** is the electrical engineer. **James C. Taylor** is mechanical engineer, **John Levy,** cost engineer, and **H. T. McBride** is office manager on the project.

The concrete steel frame building construction of Superior Concrete Accessories Co. building, San Leandro, Calif., is being supervised by **Lee Kirschner** for The Austin Co.

Martin Green is project manager for the Martin Green Construction Co., Los Angeles, Calif., on the embankment placing work for Lucky Peak Dam near Boise, Ida. **Albert Zaretzka** is the general foreman on this sub-contract job, which involves the movement of 5,250,000 cu. yd. of material. **Charles M. Harold, Gerald C. Lenig** and **Willard E. Parker** are shift foremen. **Russell C. White** is master mechanic.

Tilt-up construction on the $300,000 Tea Garden Products Co. plant in San Leandro, Calif., is being supervised by **A. B. Gonzalves. Jack Kirkman** is carpenter superintendent on the project for The Austin Co.



Five Bonny Dam Record Breakers

HERE are five of the men responsible for the completion of Bonny Dam 2 years ahead of schedule by Utah Construction Co. (*Western Construction*, May, 1951, page 65). Left, *James Fogg*, project manager and *Jess McCreight*, project engineer. Below left, *Clifford L. Mutch*, construction engineer and right, *Morris Droskin*, office engineer and author of last month's article which reviewed construction of the Bureau of Reclamation's dam in Colorado. Utah Construction Co. set new records for USBR projects when more than 1,000,000 cu. yd. of material was excavated each month for four months straight.

***Wayne Byrne*, left, construction engineer at Bonny Dam Sept., 1947 to July, 1949.**

CONTRACTS

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

Alaska

$458,350—**J. J. Badraun,** Girdwood—Low bid for construction of the Chena River and Noyes slough bridges at Fairbanks; by Alaska Road Commission.

$2,093,520—**J. C. Boespflug Construction Co., Peter Kiewit Sons' Co.,** and **Morrison-Knudsen Co., Inc.** (joint venturers), 1912 4th Ave. So., Seattle—Low bid for construction of an addition to the Native Service Hospital, Anchorage, for the quartering of nurses; by Buildings & Utilities Branch of Department of the Interior.

$4,160,002—**Haddock Engineers, Ltd., Tucker McClure, Ben C. Gerwick, Inc.,** and **Swinerton & Walberg** (joint venturers), Anchorage—Low bid for construction of a housing project, waterfront improvements and runway and taxiway work, Kodiak; by the 17th Naval District.

$2,393,001—**Haddock Engineers, Ltd., and Assoc.,** Anchorage—Low bid for the construction of a refrigerated warehouse, Ft. Richardson; by Corps of Engineers.

$3,671,310—**Peter Kiewit Sons' Company,** 1300 Aloha, Seattle—Low bid for the construction of a hangar to be 300 ft. sq., Eielson Air Force Base; by Corps of Engineers.

$5,513,002—**Peter Kiewit Sons' Co.,** 1300 Aloha, Seattle—Low bid for family housing construction at Ladd Air Force Base; by Corps of Engineers.

$1,785,841—**M-B Contracting Co.,** 4108 43rd Ave. N.E., Seattle—Low bid for construction of a station warehouse at Elmendorf Air Force Base; by Corps of Engineers.

$2,709,402—**Patti-MacDonald Construction Co.,** 3829 W. Pine Blvd., St. Louis, Mo.—Low bid for construction of family housing at Ft. Richardson; by Corps of Engineers.

$1,949,002—**Morrison-Knudsen Co., Inc.,** and **Peter Kiewit Sons' Co.** (joint venturers), 603 Hoge Bldg., Seattle—Low bid for miscellaneous facilities construction at Ft. Richardson; by Corps of Engineers.

$5,053,965—**Morrison-Knudsen Co., Inc.,** Boise, Idaho, and **Peter Kiewit Sons' Co.** (joint venturers), Seattle, Wash.—Awarded

contract for military installation construction on St. Lawrence Island; by Corps of Engineers.

$1,478,372—**Nelse Mortensen & Co., Inc.,** 1021 Westlake N., Seattle—Low bid for construction of low-rent housing units, Fairbanks; by Alaska Housing Authority.

$2,907,710—**Valle-Sommers Construction Co.,** Box 4096, Interbay Station, Seattle—Low bid for construction of shop buildings, Ft. Richardson; by Corps of Engineers.

$395,130—**Wiggins Construction Co.** and **Morrison-Knudsen Co., Inc.,** 603 Hoge Bldg., Seattle—Low bid on all three schedules of constructing a 115-kv. transmission line from Eklutna to Palmer; by Bureau of Reclamation.

Arizona

$234,870—**W. J. Henson,** P. O. Box 461, Prescott—Awarded contract for construction on the Topock-Kingman Highway, about 5 mi. southwest of Kingman southerly for a distance of about 10 mi. to be graded and paved; by State Highway Department.

$130,917—**Larsen Contracting Co.,** P. O. Box 1572, Phoenix—Awarded contract for grading, draining and general improvements on about 10 mi. of highway near Chandler; by State Highway Department.

$973,940—**Morrison-Knudsen Co., Inc.,** 411 W. 5th St., Los Angeles, Calif.—Awarded contract for canal lining and related structures for the Wellton Canal, Wellton-Mohawk Division, Gila Project; by Bureau of Reclamation.

$175,520—**J. E. Skousen,** 243 W. 1st Ave., Mesa—Low bid for widening an existing highway north of Alpine and placing base material and bituminous surface treatment; by State Highway Department.

California

$470,992—**Basich Bros. Construction Co., R. L. & N. L. Basich,** 3850 S. San Gabriel Blvd., San Gabriel—Low bid for highway construction in Imperial County between Dixieland and El Centro, about 46 mi. in all to be improved; by State Division of Highways.

$1,049,140—**Basich Bros., R. L. & N. L. Basich,** 3850 S. San Gabriel Blvd., San Gabriel—Low bid for state highway construction between 0.6 mi. west of West Junction with route 187 and 1.2 mi. east of White Water, about 3.9 mi. in length to be graded and surfaced with plant-mix surfacing on cement treated base and 2 reinforced bridges to be constructed in Riverside County; by State Division of Highways.

$933,740—**Bell & Simpson,** 685 Delaware St., Berkeley—Low bid for state highway construction in Kern County between 4.5 mi. N.W. of Isabella Dam to be graded and surfaced and a structural steel bridge to be constructed; by State Division of Highways.

$400,000—**Case-Connolly Co.,** 2051 Del Amo Blvd., Compton—Awarded contract for San Gabriel Dam sluiceway construction; by Los Angeles County Board of Supervisors.

$1,631,050—**Duncanson-Harrelson & Stolte, Inc.,** 8451 San Leandro St., Oakland—Low bid for construction of a bascule type bridge across San Leandro Bay; by State Division of Highways.

$259,850—**Eaton & Smith,** 715 Ocean Ave., San Francisco—Low bid for removal of tracks on Sacramento and Divisadero Sts.; by City and County of San Francisco.

$372,750—**Frederickson & Kasler,** 212 15th St., Sacramento—Low bid for state highway construction in Ventura County from the Santa Clara River bridge through Montalvo, about 1.3 mi. in length to be graded and paved with plant-mix surfacing on cement treated base and an existing pavement; outer highways to be constructed to provide a 4-lane highway; by State Division of Highways.

$513,370—**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland—Awarded contract for grading and surfacing in Monterey County between Chular and Spence underpasses; by State Division of Highways.

$154,170—**J. E. Haddock, Ltd.,** P. O. Box 188E, Pasadena—Low bid for state highway construction on Murphy St., Eastern Ave., and connection with the Ramona Freeway, about ½ mi. in all to be graded with plant-mix surfacing on imported base material,

and a steel beam span bridge for the Pacific Electric Railroad to be constructed; by State Division of Highways.

$1,446,640—**Charles L. Harney, Inc.,** 575 Berry St., San Francisco—Low bid for state highway improvements about 1.3 mi. in length to be graded and paved with Portland cement concrete on cement treated sub-grade and plant-mix surfacing on cement treated base; a grade separation structure and three pedestrian overcrossings, between Army and 17th Sts., San Francisco; by State Division of Highways.

$105,420—**Lee J. Immel,** 3030 San Pablo Ave., San Pablo—Awarded contract for highway improvements on the Eastshore Freeway between Ashby Ave. and El Cerrito overhead, about 2.4 mi. in length to be surfaced with plant-mix surfacing over existing pavement; by State Division of Highways.

$1,357,770—**Peter Kiewit Sons' Co.,** 345 Kieways, Arcadia—Awarded contract for improvement of Rio Hondo channel, about 1.5 river mi. in length, clearing, and water control work to be done; by Corps of Engineers.

$625,660—**Madonna Construction Co.,** P. O. Box 910, San Luis Obispo—Awarded contract for grading and surfacing a portion of highway between Templeton and Paso Robles, San Luis Obispo County; by State Division of Highways.

$104,441—**McGuire & Hester,** 796 - 66th Ave., Oakland—Low bid for pipe sewer construction near Fruitvale Avenue, Oakland; by City of Oakland.

$159,472—**James L. Miller Sons,** Los Angeles—Low bid for highway work on 22.4 mi. to be resurfaced with plant mix surfacing in Riverside County, between Indio and Black Butte; by State Division of Highways.

$180,520—**Oswald Bros. Co.,** 366 E. 58th St., Los Angeles—Low bid for widening existing pavement on Centinela Ave., between Freeman Blvd. and Sepulveda Blvd., about 1.5 mi. in length; by State Division of Highways.

$318,060—**North H. Plunkett and Co.,** 2909 Junipero Ave., Long Beach—Awarded contract for construction of Dominguez channel in the City of Inglewood, and related work; by Los Angeles County Board of Supervisors.

$224,270—**Rice Bros., Inc.,** 8th and Yuba Sts., Marysville—Low bid for highway improvement between Simmerly slough and Butte County line, 8.4 mi. in length; by State Division of Highways.

$364,900—**S. A. E.,** Redwood City—Low bid for state highway construction in San Mateo County, between 0.2 mi. north of Lobitos and 0.3 mi. north of Canada Verde creek, about 3.4 mi. in length to be graded and surfaced with plant-mix surfacing on improved concrete base material; by State Division of Highways.

$199,720—**Wm. A. Smith Contracting Co.,** 108 W. 6th St., Los Angeles—Low bid for repairs to Naval Ordnance Test Station, Inyokern, Kern County; by U. S. Navy.

$130,942—**A. Teichert & Son, Inc.,** 1846 37th St., Sacramento—Low bid for construction of highway between E St. in Woodland and Yolo bypass, about 5.1 mi. in length, border trenches to be excavated, imported base material to be applied and surfaced with plant-mix surfacing; by State Division of Highways.

$155,670—**Tyson & Watters, Inc.,** P. O. Box 1914, Sacramento—Low bid for highway improvements in Modoc County about 12.5 mi. in length to be surfaced with gravel base and road-mix surfacing; by State Division of Highways.

$1,671,170—**United Concrete Pipe Corp.,** P. O. Box 425, Baldwin Park—Awarded contract for Schedule II for construction of earthwork pipe lines and structures, including reservoirs and pumping plants, Friant Kern Canal Distribution System, Central Valley Project; by Bureau of Reclamation.

$361,410—**Warren-Southwest, Inc.,** P. O. Box 419, Torrance—Awarded contract for asphaltic levee facing construction and appurtenant work in the San Gabriel River, Los Angeles County; by Los Angeles County Board of Supervisors.

Colorado

$1,294,700—**Peter Kiewit Sons' Co.,** Omaha National Bank Bldg., Omaha, Neb.—Awarded contract for the construction of Willow Creek Dam; by Bureau of Reclamation.

$2,240,350—**Winston Bros.,** 1530 California St., Monrovia, Calif.—Awarded contract for construction of the Estes Park-Foothills

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Regardless of what size Oliver Industrial Wheel Tractor and Ware Loader you buy . . . "66", "77", "88" . . . you get the identical superior design and performance features in each.

The smaller tractor-loaders are not built down to a price level . . . they are built up to the same quality standards as the larger models.

In the tractors, you get the famous Oliver *plus* power and easy maneuverability that get you in and out of the rough spots . . . *fast!*

In the loaders, you get the same top features in each . . . hydraulically controlled bucket for greater "breaking out" action—full bucket loads . . . hydraulically controlled discharge—easily and gently, fast or slow . . . mid-section pivot of the loader arms for longer reach of dumping position and correct weight distribution on tractor frames . . . simple, rugged design that eliminates unneeded dead weight . . . shock loads absorbed by hydraulic rams for longer tractor and loader life—lower maintenance.

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power aqueduct, west of Loveland, Colorado-Big Thompson project; by Bureau of Reclamation.

Idaho

$244,660—**Aslett Construction Co.,** Twin Falls, Idaho—Awarded contract for bituminous surfacing of the Clearwater highway in Clearwater County, and an existing bridge to be widened; by State Bureau of Highways.

$157,790—**Sather & Sons,** P. O. Box 197, Spokane, Wash.—Low bid for construction of the Coeur d'Alene River bridge on the Enaville-Murray highway; by Bureau of Public Roads.

Montana

$261,500—**C. L. Hubner,** 400 York St., Denver, Colo.—Awarded contract for construction of a 230-kv. transmission line between Hot Springs and Anaconda; by Bonneville Power Administration.

$239,280—**Albert LaLande Co.,** Sidney—Awarded contract for construction of the Great Falls-Armington highway in Cascade County; by State Highway Commission.

$403,325—**Union Construction Co.,** P. O. Box 1261, Missoula—Awarded contract for grading, surfacing, drainage structures, on about 8 mi. of the West Glacier to Glacier Park Station Rd.; by State Highway Commission.

Oregon

$134,400—**Rex C. Ayers,** Portland—Awarded contract for grading and paving on Florence section of Oregon Coast Highway; by State Highway Commission.

$457,400—**Babler Bros. & Rogers Construction Co.,** 4617 S.E. Milwaukie Ave., Portland—Awarded contract for grading and paving on the Tumalo-Bend highway in Deschutes County; by State Highway Commission.

$452,450—**J. C. Compton,** Box 86, McMinnville—Awarded contract for grading and paving on the West Diamond Lake highway in Jackson and Douglas Counties; by State Highway Commission.

$148,002—**General Construction Co.,** P. O. Box 3860, Portland—Low bid for widening Columbia slough bridge on the Pacific Highway; by State Highway Commission.

$177,230—**Floyd Graham Construction Co.,** Portland—Low bid for construction of the Siletz-Logden section of the county road in Lincoln County, including grading and surfacing; by State Highway Commission.

$117,100—**C. R. O'Neil,** Creswell—Awarded contract for grading and surfacing on the Alsea-Deadwood secondary highway; by State Highway Commission.

$356,530—**Power City Electric Co.,** Spokane, Wash.—Awarded contract for the construction of a 45-mi., 230-kv. transmission line between Pendleton and LaGrange; by State Highway Commission.

$193,520—**J. A. Terteling & Sons, Inc.,** P. O. Box 1428, Boise, Idaho—Awarded contract for railroad rehabilitation at Umatilla Ordnance Depot; by Corps of Engineers.

$2,038,702—**Viesko & Post,** P. O. Box 69, Salem—Low bid for the construction of the courthouse in Marion County, to be 4 stories of reinforced concrete construction; by Marion County.

$165,990—**Porter W. Yett,** 6500 N.E. Ainsworth, Portland—Awarded contract for 3.61 mi. of grading and paving on the Rays Ranch-West Union section of the Hillsboro-Cornelius Pass County Road; by State Highway Commission.

Utah

$617,002—**Olof Nelson Construction Co.,** 620 S. Main St., Logan—Low bid for access road construction at Dugway Proving Grounds; by Bureau of Public Roads.

$200,930—**Young & Smith Construction Co.,** 203 Beason Bldg., Salt Lake City—Low bid for construction of the Salina Canyon Summit-Fremont Junction on Sevier County road and 2 concrete bridges; by State Road Commission.

$133,270—**Whiting & Haymond,** 250 W. 2nd St., Springville—Low bid for construction of a selected material base course road,

Escalante-Henriville, Garfield County; by State Road Commission.

Washington

274,590—**J. W. Briggs,** Grandview—Low bid for grading 2.9 mi. of the North Santiam Highway extending east from Detroit; by Bureau of Public Roads.

$230,020—**J. F. Konen Construction Co.,** 522 Park St., Lewiston, Idaho—Awarded contract for draining, grading, and surfacing 6.5 mi. of highway, Rocky Hollow to Field Springs Park, Asotin County; by State Department of Highways.

$398,260—**Lucich Company,** Seattle—Low bid for grading 1.55 mi. of the Heart O' The Hills Highway in Olympic National Park; by Bureau of Public Roads.

$321,040—**Manson Construction & Engineering Co.,** 821 Alaskan Way, Seattle—Awarded contract for the construction of the Portage Canal; by State Department of Highways.

$214,960—**Pacific Sand & Gravel Co.,** P. O. Box 628, Centralia—Awarded contract for the construction of secondary State Highway No. 13-A, Raymond Westerly Federal Aid Project in Pacific County, a net length of 2.522 mi.; by State Department of Highways.

$533,430—**Smith Bros. General Contractors,** Vancouver—Awarded contract for transmission line construction; by Bonneville Power Administration.

$3,490,300—**J. A. Terteling & Sons, Inc.,** P. O. Box 1428, Boise, Idaho—Awarded contract for extension of the East-Low Canal 16.9 mi., Ephrata; by Bureau of Reclamation.

$121,360—**C. V. Wilder Co.,** 2006 State St. Bldg., Bellingham—Low bid for stockpiling crushed stone surfacing and aggregates on the highway, Deming to Shuksan, Whatcom County; by State Department of Highways.

$510,710—**F. E. Wilder,** RFD 6, Olympia—Awarded contract for schedule I transmission line construction; by Bonneville Power Administration.

$5,000,000 approx.—**Howard S. Wright & Co.,** 414 Pontius Ave., Seattle—Awarded contract for general construction of Childrens' Hospital; by Board of Trustees.

Wyoming

$518,900—**Inland Construction Co.,** 3867 Leavenworth St., Omaha, Neb.—Awarded contract for base course surfacing, plant-mix surface course and miscellaneous work on 29.789 mi. of the Newcastle-Lusk Road; by State Highway Commission.

$273,680—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan—Awarded contract for grading, curb and gutter, storm sewer, base course surfacing, plant-mix surface course and miscellaneous work on 1.444 mi. of the Thermopolis streets, Hot Springs County; by State Highway Commission.

$278,410—**N. A. Nelson Construction Co.,** P. O. Box 644, Sheridan—Awarded contract for grading, draining, base course surfacing, oil treatment by the road-mix method, 4 girder spans over the Green River and miscellaneous work on 1.987 mi. of the Granger Junction-Green River road; by State Highway Commission.

$572,400—**Northwestern Engineering Co.,** P. O. Box 567, Denver, Colo.—Awarded contract for crushed gravel base course, plant-mix surfacing and miscellaneous work on 25.205 mi. of the Rawlins-Medicine Bow Road; by State Highway Commission.

$312,910—**Etlin E. Peterson,** 602 W. 15th St., Casper—Awarded contract for construction of a bridge across Green River consisting of 4 cont. deck girder spans, grading, draining, base course surfacing, oil treatment by road-mix method and miscellaneous work on 0.918 mi. of the Green River-Linwood Rd., Sweetwater County; by State Highway Commission.

$403,970—**Schmidt Construction Co.,** P. O. Box 66, Grand Junction, Colo.—Awarded contract for grading, draining, crushed gravel base course and miscellaneous work on 4.827 mi. of the Kemmerer-Big Piney Road; by State Highway Commission.

$323,260—**Summit Construction Co.,** P. O. Box 1609, Rapid City, S. D.—Awarded contract for base course surfacing, plant-mix surface course and miscellaneous work on 11.565 mi. of the Newcastle-Lusk road and 10.154 mi. of the Edgemont connection road; by State Highway Commission.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

New distributors for the *Gar-Bro Manufacturing Company*, 2416 E. 16th St., Los Angeles, Calif., have been added in all parts of the United States. Western distributors include: *Contractors Equipment & Supply Co.*, El Paso, Tex., covering counties adjoining El Paso and Southern counties of New Mexico; *Hall-Perry Machinery Co.*, Butte, Mont., for the state of Montana and ten Northern counties of Wyoming and *A. H. Cox & Co.*, Seattle, Wash., the counties of Okanogan, Grant and Douglas in addition to the Seattle territory.

☆ ☆ ☆

International Harvester Company, Chicago, Ill., announces the letting of most of the major contracts for the construction of a new building which will house a service parts depot and a general sales district office and warehouse in Denver, Colo. Construction will get under way immediately on the $1,500,000 structure. General contractor for the project is *Martinson Construction Company* of Denver. The building is located at 46th and Colorado Blvd.

☆ ☆ ☆

Skilsaw, Inc., is now located in its new building at 2730 S. Broadway, Los Angeles, Calif. The new location features increased floor space totaling more than 6,000

sq. ft. Factory trained service men now number six with FRANK SEIFRES as service manager. Five territory sales engineers covering all of Southern California, Arizona and part of Nevada are now part of the staff. Branch Manager PAUL JONES says this office has the largest stock of parts and accessories of any Skilsaw branch west of Chicago, Ill.

☆ ☆ ☆

Wright Power Saw and Tool Corp., Stratford, Conn., appoints *The Rex Company, Inc.*, 582 Sixth St., San Francisco, Calif., and *Le Roi-Rix Machinery Co.*, 6403 East Slauson Ave., Los Angeles, Calif., as company distributors in California.

☆ ☆ ☆

WILLIAM B. LAWRENCE, formerly *Cummins Engine Company* regional manager for the Rocky Mountain area, leaves his Denver offices to assume new duties as general manager of the Cummins Diesel Sales Corporation with offices in Columbus, Ohio. Cummins also announces the merger of *Cummins Diesel Sales Corporation, Ill.*, and *Cummins Diesel Sales and Service of New York, Inc.*, with the *Cummins Diesel Sales Corporation.*

☆ ☆ ☆

WILLIAM T. PAUL becomes service representative for *Caterpillar Tractor Co.* in the Pacific Northwest. He will headquarter in Portland, Ore.

☆ ☆ ☆

Personnel shifts are announced by *Kaiser Steel Corporation*, Oakland, Calif. H. H. BEYMA is being transferred from the company's headquarters at Oakland, to Seattle, Wash., where he will become sales manager of the Northwest district. J. M. Cos-

GROVE, formerly Northwest sales manager, is transferred to Oakland for special duties in connection with the tinplate program. O. D. HOLE moves from the Los Angeles district office to Oakland as manager of sales of rolled steel products. M. H. HOWARD takes over as manager of by-product sales with offices in Los Angeles.

☆ ☆ ☆

Washington Machinery and Storage Co. of Seattle has been appointed exclusive distributor of *Wooldridge* Earthmoving Equipment for Northwestern Washington, according to an announcement issued by the two firms. JAMES J. HOPE of the Washington organization has been assigned to head up activities in connection with handling of the Wooldridge line. Offering an extensive background of experience in the earthmoving equipment field, Hope is particularly fitted to assume this responsibility, having worked with *Wooldridge Manufacturing Co.* for several years prior to World War II. Since its establishment

***James J. Hope*, who will handle sales of Wooldridge earthmoving equipment for Washington Machinery and Storage Co. (see accompanying item).**

Hope

in 1916, Washington Machinery and Storage Co. has been headed by CHARLES W. THOMPSON, president. JOHN P. STUDEBAKER, vice president, treasurer and general manager, has served the firm continuously for the past 15 years. HIL. BERGLUND, active with the company since 1931, is secretary, production manager and chief engineer. ROBERT W. HANSON is office manager. Wooldridge equipment users are now being offered complete modern shop and field service facilities under the supervision of JACK BLOOMER, shop superintendent. The firm will represent Wooldridge as exclusive distributor in the counties of Chelan, Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston and Whatcom. Sales and service facilities will also be provided for Kittitas and Yakima counties.

☆ ☆ ☆

Pacific Tractor & Equipment Limited, 505 Railway Street, Vancouver, B. C., is appointed exclusive distributor in British Columbia and the Yukon of the *W. A. Riddell Corporation* for Warco motor graders and Hercules road rollers.

☆ ☆ ☆

C. F. HALLADAY serves as chairman of the Advisory Board of the *Associated Equipment Distributors*. Other members of the Board are: A. F. GARLINGHOUSE, *Garlinghouse Bros.*, Los Angeles, Calif.; W. A. DANNER, *Parker-Danner Co.*, Hyde Park, Mass.; G. W. VAN KEPPEL, *The G. W. Van Keppel Co.*, Kansas City, Mo.,

Continued on page 146

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 145

and FRANK MCBATH, *Columbia Equipment Co.*, Portland, Ore. The chairmanship of the Association's Convention Committee goes to S. F. LASKEY, *Northwestern Equipment Co.*, Fargo, North Dakota. P. A. DUFFORD, *Intermountain Equipment Co.*, Boise, Ida., heads the Industry Standards Committee and J. A. BENSON, *Benson Tractor Co.*, Houston, Tex., will chairman the Joint AED-AGC Committee. JACK HATTEN, *Star Machinery Co.*, Seattle, Wash., is co-chairman of the Rental Committee.

☆ ☆ ☆

Cullen

J. P. CULLEN becomes West Coast Manager of the construction equipment department of Blaw-Knox division of the *Blaw-Knox Company*, Pittsburgh, Pa. Cullen headquarters in the Monadnock Building, San Francisco, Calif. He will extend sales and service through established distributors for the complete line of construction machinery.

☆ ☆ ☆

The Trailmobile Company receives a contract from the government for the production of a quantity of specially-designed military type trailers for use in shipyards and army depots on the Pacific Coast. The trailers will be built in the firm's West Coast plant in Berkeley, Calif.

☆ ☆ ☆

DONALD G. MCNABB takes over as service engineer covering the Arizona territory for *Independent Pneumatic Tool Co.*, Aurora, Ill. McNabb will headquarter at 1313 W. San Miguel St., Phoenix, Ariz.

☆ ☆ ☆

HOMER J. ANDERSON is the new general manager of the *Harry Cornelius Co.*, Albuquerque, N. M. Anderson was previously with *Boston Woven Hose & Rubber Co.*, Denver, Colo. He also worked 27 years with *Moore Hardware & Iron Co.*, Denver, Colo.

☆ ☆ ☆

Four important appointments take place in the North Pacific Coast Division of *Fruehauf Trailer Co.* T. O. DAVIS, JR., Oakland, Calif., becomes assistant to the division manager; Z. W. THERRIEN, manager of the Fruehauf-owned sales and service branch at Seattle, Wash., becomes district sales manager of Northwest branches including those at Spokane, Wash., and Portland, Ore.; WILLIAM F. BAILEY, Se-

Continued on page 148

UNIT BID PRICES

Selected Bid Abstracts for Typical Western Projects

Highway and Street . . .

Asphaltic Concrete Pavement

Washington—Walla Walla County—Department of Highways—Morrison & Fisher, Walla Walla, Wash. with a bid of $53,733, was low before the Department of Highways for construction of Primary State Highway No. 3, Walla Walla easterly to be 3.711 mi. in length. Unit bids were as follows:

(1) Morrison & Fisher $53,733
(2) The United Contracting Company $66,318

	(1)	(2)
2,590 ton Class C wearing course in place	8.18	10.20
3,750 ton Class L leveling course in place	8.18	10.00
480 cu. yd. cr. stone surf. top course in place	3.90	5.00

Grading and Bituminous Macadam Surfacing in Oregon

Oregon—Lincoln County—State Highway Department. Durbin Bros., Eugene, with a bid of $240,932, was low before the State Highway Department construction on the Big Creek (Agate Beach-Newport) section on the Oregon Coast Highway. Unit bids were as follows:

(1) Durbin Bros. $240,932
(2) M. L. & C. R. O'Neil 242,974
(3) R. A. Heintz 244,061
(4) K. F. Jacobsen & Co., Inc. 252,556
(5) J. M. Arenz 252,990
(6) Kuckenberg Construction Co. 258,209
— McNutt Bros. 262,474
— Stevenson Construction Co. $264,948
— Heavy Hauling Co. and G. H. Grimstad and T. Vandervelt 282,177
— John Havlik, Jr. 284,532
— C. J. Eldon 298,514
— T. W. Thomas 321,647

	(1)	(2)	(3)	(4)	(5)	(6)
All specified, clearing and grubbing	$8,750	$7,500	$11,000	$12,500	$18,000	$2,500
3,800 cu. yd. structural excav., unclassified	3.75	3.00	4.50	3.00	3.00	3.00
160 cu. yd. trench excav., unclassified	3.75	2.00	2.00	3.00	3.00	1.50
277,000 cu. yd. general excav., unclassified	.28	.29	.28	.33	.28	.305
396,000 yd. sta. short overhaul	.015	.015	.015	.02	.015	.015
1,100 cu. yd. sta. long overhaul	.50	.40	.50	.50	.40	.60
4,800 cu. yd. excav. and placing topsoil	1.25	.50	1.00	.80	1.00	1.50
3,600 yd. mi. truck haul on topsoil	.30	.17	.20	.25	.25	.18
1.10 mi. finishing roadbed and slopes	$1,000	$1,500	750.00	$1,000	$1,000	$1,000
4,900 lin. ft. rounding cutbanks	.15	.15	.15	.20	.20	.20
2,500 lin. ft. 6-in. perf. metal drain pipe, coated	1.70	2.00	1.65	1.50	1.50	1.65
3,200 lin. ft. 8-in. perf. metal drain pipe, coated	2.05	2.50	2.15	2.00	2.00	2.20
180 lin. ft. 12-in. concrete pipe	2.00	3.00	2.20	1.75	1.85	2.50
170 lin. ft. 18-in. concrete pipe	4.00	4.00	3.90	3.60	3.40	4.00
170 lin. ft. 18-in. extra str. conc. pipe	5.00	4.50	4.50	3.75	3.75	4.50
2,400 cu. yd. ¾-in. - 0-in. backfill in drains	4.50	5.50	5.00	4.20	3.00	3.50
790 cu. yd. Class "A" concrete	48.00	52.00	46.50	46.50	62.00	60.00
113,000 lb. metal reinforcement	.11	.105	.11	.11	.115	.12
12,000 cu. yd. crusher-run rock in subbase	2.25	2.25	2.25	2.25	2.25	3.00
1,900 cu. yd. 2-in. - 0-in. rock in base	2.75	2.75	2.75	2.75	2.75	3.00
2,300 cu. yd. ¾-in. - 0-in. rock in base and shoulders	3.00	3.00	3.00	3.00	3.00	3.00
350 M. gal. sprinkling	3.00	3.00	3.00	3.00	3.00	3.00
1.10 mi. preparation of base	500.00	500.00	500.00	500.00	500.00	300.00
1,140 cu. yd. furn. and placing aggregates	4.50	4.50	4.50	4.50	4.50	5.00
22 ton. furn. and placing RC-3 asphalt	44.50	44.50	44.50	44.50	44.50	42.00
80 ton furn. and placing 120-150 asphalt	37.00	37.00	37.00	37.00	37.00	42.00
16 ton furn. and placing RS-1 emulsified asphalt	45.20	45.20	45.20	45.20	45.20	42.00

P.C.C. Pavement on Imported Subbase

California—Monterey—State Division of Highways—Fredrickson & Watson Construction Co., Oakland, Calif., with a bid of $513,377, was low before the State Division of Highways for construction of a state highway between Chular and Spence underpass, about 5.2 mi. to be graded and surfaced with portland cement concrete pavement on imported subbase material with the upper portion cement treated. Unit bids were as follows:

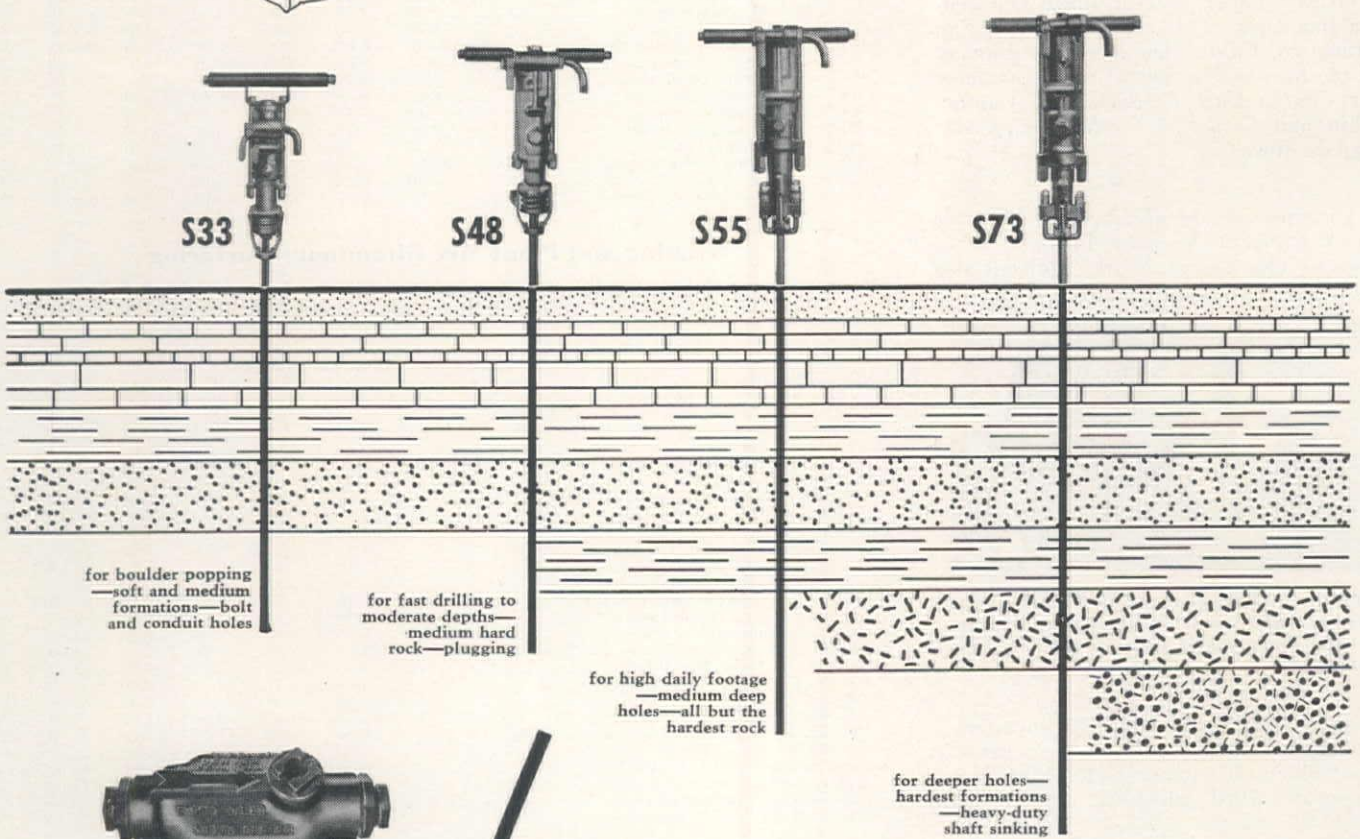
(1) Fredrickson & Watson Construction Co. $513,377
(2) Granite Construction Co. 524,905
(3) Ball & Simpson 528,559
(4) Guy F. Atkinson Co. $533,228
(5) M. J. B. Construction Co. 569,370
(6) Madonna Construction Co. 584,360

	(1)	(2)	(3)	(4)	(5)	(6)
90 cu. yd. removing concrete	11.65	10.00	8.00	4.80	8.00	5.00
275 sta. clearing and grubbing	11.65	50.00	40.00	12.00	30.00	25.00
21,000 cu. yd. roadway excavation	.56	.60	.50	.39	.80	.80
2,050 cu. yd. structure excavation	2.50	4.00	2.50	3.35	3.00	3.00
3,500 cu. yd. ditch and channel excavation	.82	1.00	1.00	.70	.80	1.00
45,000 sq. yd. compact. original ground	.04	.08	.05	.05	.07	.05
151,000 ton imported borrow	.66	.70	.57	.71	.63	.80
14,500 ton imported base material	1.08	1.50	1.20	1.60	1.20	1.30
340,000 sta. yd. overhaul	.005	.01	.01	.007	.01	.01
Lump sum, dev. wat. supp. and furn. wat. equip.	$4,100	$10,000	$7,000	$3,000	$10,000	$15,000
8,000 M. gal. applying water	1.65	1.10	1.45	1.80	1.25	1.60
275 sta. finishing roadway	10.90	15.00	12.00	12.50	12.00	20.00
61,500 ton imported subbase material	.78	.88	.87	.88	.88	.80
70,000 sq. yd. mix. and compact. (cem. tr. subgrade)	.21	.17	.22	.21	.22	.30
3,200 bbl. port. cem. (cem. tr. subgrade)	4.35	3.65	4.30	3.30	4.50	5.00
4 ton liq. asphalt SC-2 (prime coat)	40.00	40.00	39.00	50.00	50.00	50.00
185 ton mineral aggregate (P.M.S.)	7.50	7.00	7.50	7.80	9.70	10.00
10 ton paving asphalt (P.M.S.)	29.00	40.00	7.50	32.00	9.70	20.00
75 ton asphaltic emulsion (cur. seal)	50.00	45.00	50.00	46.50	60.00	40.00
15,950 cu. yd. P.C.C. (pavement)	14.50	13.00	15.00	14.65	16.35	15.00
10,700 ea. pavement tiebolt assemblies	.58	.55	.65	.65	.60	.75
120 cu. yd. Class "A" P.C.C. (structures)	70.00	75.00	60.00	60.00	70.00	80.00
90 ea. right-of-way monuments	5.80	7.00	7.50	6.00	7.00	8.00

(Continued on next page)

any kind of rock costs less to drill with GARDNER-DENVER sinkers

No matter what kind of rock you find underfoot —there's a Gardner-Denver Sinker of the correct weight and power for lower drilling costs. Every model is designed for fast penetration—powerful rotation—clean blowing—easy holding—low air consumption. Bulletin HHD-11 gives all the facts. Send for your copy today.



Drills can't run dry when the LO12 Automatic Oiler guards your air lines. It stops the flow of air when it runs out of oil.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois

Western Branch Offices: Butte, Montana; Denver, Colorado; Los Angeles, Calif.; Salt Lake City, Utah; San Francisco, Calif.; Seattle, Washington; Wallace, Idaho; El Paso, Texas.

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 146

attle, Wash., becomes Northwest district service manager. RALPH HOLMAN, Oakland, Calif., becomes division used trailer manager.

☆ ☆ ☆

Barclay

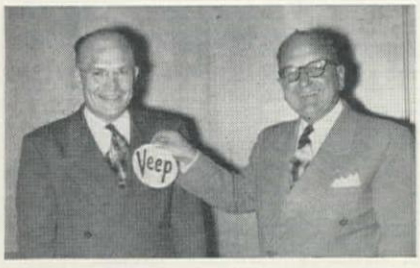
JOHN BARCLAY becomes the general sales manager of *The Heil Co.*, Milwaukee, Wis. He has been with the company for twelve years and was at one time district manager at Seattle, Wash. Barclay replaces WILLIAM E. SIMONS, who has left the firm.

☆ ☆ ☆

GEORGE BROSE, vice president and general manager of *Merrill-Brose Co.*, San Francisco, Calif., announces appointment of the firm as Northern Calif. distributor for *Canton Cast Products Co.*, Canton, Ohio, and *Transport Trailer, Inc.*, Cedar Rapids, Iowa.

☆ ☆ ☆

Vice presidency of *Interstate Tractor and Equipment Company*, Portland, Ore., goes to THOMAS MCNEILL. McNeill also



***Thomas McNeill* receives VEEP badge from *Collis Johnson*, president of Interstate Tractor and Equipment Co. (see item).**

becomes a director of the Northwest machinery firm, a sales and service organization which distributes Caterpillar, John Deere and allied equipment.

☆ ☆ ☆

Neil B. McGinnis Equipment Co., Phoenix, Ariz., now handles the sale and servicing of Dumpcrete bodies in the entire state of Arizona for the Dumpcrete division of *Maxon Construction Company, Inc.*, Dayton, Ohio.

☆ ☆ ☆

The Edward R. Bacon Co. is appointed distributor for *Meili-Blumberg Corp.* Northern California and eastern Nevada will be covered by the firm and all branches will handle the complete line of Meili-Blumberg graders and highway markers.

Continued on page 150

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
1.4 mi. new property fences	$2,565	$2,600	$2,400	$2,500	$2,200	$2,000
0.7 mi. salvag. exist. property fences	$1,225	700.00	900.00	$1,570	800.00	$1,000
1,068 lin. ft. 24-in. R.C.P.	5.35	6.00	6.00	5.85	6.70	8.00
66 lin. ft. 30-in. R.C.P.	6.60	9.00	8.50	7.90	9.50	10.00
378 lin. ft. 36-in. R.C.P.	8.80	11.00	11.00	9.65	12.00	12.00
63 lin. ft. 42-in. R.C.P.	11.75	15.00	14.50	13.85	16.50	20.00
80 lin. ft. 90-in. field assembled plate culv. (512-18)	57.85	50.00	75.00	56.00	72.60	30.00
17,000 lb. bar reinforcing steel	.14	.15	.15	.15	.16	.12

Plant Mixed Bituminous Surfacing in Utah

Utah—Tooele County—State Road Commission. Reynolds Construction Co., Springville, with a bid of $317,151, was low before the State Road Commission for 8.781 mi. of plant mixed bituminous surfaced road on the Low-Knolls project. Unit bids were as follows:

(1) Reynolds Construction Co. $317,151
(2) Olof Nelson Construction Co. 317,716
(3) Carl E. Nelson Co. 361,274
(4) Whiting & Haymond, and Parson & Fife 362,026
(5) W. W. Clyde & Co. $378,668
(6) Strong Company 397,927
(7) Engineer's estimate 355,114

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
34,500 ton plant mixed bitum. surfacing	1.90	1.80	2.35	2.15	2.25	2.36	2.10
407,000 gal. bitum. matl., Type 120-150 Pen.	.11	.115	.11	.11	.11	.12	.11
116,000 gal. bitum. matl., Type MC-1 or MC-2	.12	.12	.12	.12	.125	.13	.12
34,000 gal. bitum. matl., Type RC-4	.12	.13	.12	.19	.135	.13	.12
14,000 gal. bitum. matl., Type RC-2	.12	.12	.12	.10	.135	.13	.12
13,500 gal. bitum. matl., Type SC-3	.12	.12	.11	.11	.11	.12	.12
1,700 ton cover material	3.00	2.50	3.00	3.50	3.00	2.75	2.50
3,000 ton cover material (place in stockpile)	2.00	1.25	2.00	1.75	2.00	2.50	2.00
0.871 mi. scarifying and mixing	$1,000	600.00	$1,000	600.00	700.00	800.00	$1,000
42,500 ton cr. rock or cr. gravel surface crse.	.55	.53	.68	.76	.75	.97	.65
126,000 ton gravel or cr. rock base course	.45	.48	.60	.63	.69	.87	.60
236,000 cu. yd. unclassified excav.	.18	.18	.20	.19	.20	.16	.20
624,000 sta. yd. overhaul, Class "A"	.01	.01	.015	.015	.01	.01	.01
22,000 yd. mi. overhaul, Class "B"	.15	.12	.15	.18	.15	.12	.15
6,200 1,000-gal. watering	2.00	2.50	1.50	2.00	3.00	1.50	3.00
3,700 hr. rolling	5.00	4.00	5.00	4.50	5.00	4.00	4.50
1.098 mi. obliteration of old roads	500.00	300.00	200.00	200.00	300.00	200.00	150.00
81 lin. ft. 18-in. conc. pipe	4.00	4.00	4.00	4.20	4.00	4.00	3.70
930 lin. ft. 24-in. conc. pipe	5.35	5.40	5.00	5.70	5.25	5.00	5.00
66 lin. ft. 30-in. conc. pipe	8.65	8.00	9.00	8.60	8.00	7.75	7.00
3,000 lin. ft. surface ditches	.10	.10	.05	.05	.06	.10	.10
350 cu. yd. excav. for structs.	1.00	.75	2.00	2.00	1.50	1.50	1.50
400 cu. yd. channel excav.	.50	.50	.50	.50	.40	.40	.30
125 acre clearing and grubbing	20.00	50.00	20.00	25.00	15.00	22.50	25.00
28 ea. guide posts	7.00	6.00	7.00	5.00	5.00	6.00	4.00
100 ea. right-of-way markers	6.00	6.00	6.00	5.00	5.00	6.00	5.00

Grading and Plant Mix Bituminous Surfacing

Montana—Deer Lodge & Silver Lake Bow County—State Highway Commission—F & S Contracting Co., Butte, Mont., with a bid of $347,772, was awarded a contract by the State Highway Commission for construction of the Anaconda-East & Butte-West highway to be about 4.328 mi. in length. Unit bids were as follows:

(1) F & S Contracting Co. $347,772
(2) Union Construction Co., Inc. 356,839
(3) Nilson-Smith Construction Co. 362,907
(4) McLaughlin, Inc. $365,954
(5) Charles Shannon Co. 381,078
(6) Inland Construction Co. 392,137

	(1)	(2)	(3)	(4)	(5)	(6)
202,487 cu. yd. uncl. exc. and borrow	.46	.65	.73	.62	.74	.58
943 cu. yd. culvert excavation	2.00	3.00	2.00	3.50	2.00	2.65
25,461 mi.-yd. overhaul	.30	.30	.18	.30	.25	.20
1,288 ton cr. grav. cover material	4.00	5.00	4.50	8.00	5.00	6.00
6,915 ton pl. mix bit. surfacing	7.75	5.00	4.50	6.40	5.50	7.50
23,243 ton Type "A" top coat., ¾-in. grd.	1.70	1.38	1.30	1.40	1.30	1.56
81,082 ton base co. surf. Grade A-2	1.15	1.05	1.10	1.00	1.15	1.20
83,258 gal. SC-6 A.R.O. in pl. mix	.16	.19	.14	.17	.14	.185
36,023 gal. pr. coat oil. MC-1 A.R.O.	.16	.18	.15	.20	.16	.20
25,732 gal. sl. coat oil. RC-4 A.R.O.	.16	.18	.15	.20	.18	.22
90 unit rolling embankment	8.50	8.00	7.00	8.00	8.00	5.00
540 unit rolling surf. courses	8.50	8.00	8.00	8.50	7.00	9.00
3,360 M. gal. water. emb. and surf. course	1.50	2.00	2.00	2.50	2.00	3.50
40 lin. ft. 15-in. R.C.P. culverts	3.00	4.50	3.50	4.00	5.50	6.00
540 lin. ft. 18-in. R.C.P. culverts	4.00	4.70	4.00	5.00	6.50	7.00
670 lin. ft. 24-in. R.C.P. culverts	6.00	6.50	7.00	7.00	8.00	10.00
426 lin. ft. 36-in. R.C.P. culverts	12.50	11.00	12.00	13.00	12.00	15.00
200 lin. ft. 48-in. R.C.P. culverts	20.00	16.00	18.00	20.00	19.00	25.00
84 lin. ft. 60-in. R.C.P. culverts	30.00	24.00	30.00	30.00	28.00	36.00
Lump sum, rem. ex. str. on FI 70(9)	400.00	$1,500	$1,000	$1,000	980.00	$3,000
2 ea. conc. project markers	15.00	25.00	25.00	25.00	25.00	20.00
23 ea. conc. station markers	6.00	8.00	8.00	7.00	8.00	9.00
43 ea. conc. r/w monuments	4.50	5.25	6.00	6.00	5.00	5.50

Grading and Paving with Asphalt Concrete

California—Los Angeles County—State Division of Highways—Webb & White, Los Angeles, Calif., with a bid of $199,646, was low before the State Division of Highways for constructing a city street on the Hill Street relocation between Sunset Boulevard and 200-ft. south of Temple Street, about 0.5 mi. in length to be graded and paved with asphalt concrete. Unit bids were as follows:

(1) Webb & White $199,646
(2) Vido Kavacevich Co. 220,325
(3) J. E. Haddock, Ltd. $255,718
(4) Griffith Co. 264,859

	(1)	(2)	(3)	(4)
2,000 cu. yd. removing concrete	3.50	4.00	5.00	5.50
Lump sum, clearing and grubbing	$3,500	$3,000	$3,000	$10,000
34,500 cu. yd. roadway excavation	.62	.80	1.10	1.00
4,800 cu. yd. structure excavation	.005	.10	.06	.07
4,900 ton imported subbase material	1.10	.65	1.05	1.10
2,400 ton imported base material	1.70	1.75	1.85	2.20
Lump sum, dev. water supp. and furn. water equip.	500.00	400.00	$1,000	$1,300
405 M. gal. applying water	1.50	2.50	1.70	4.00
Lump sum, finishing roadway	500.00	$2,350	350.00	$1,500
13 ton liquid asphalt, SC-2 (prime coat)	35.00	32.00	35.00	27.00

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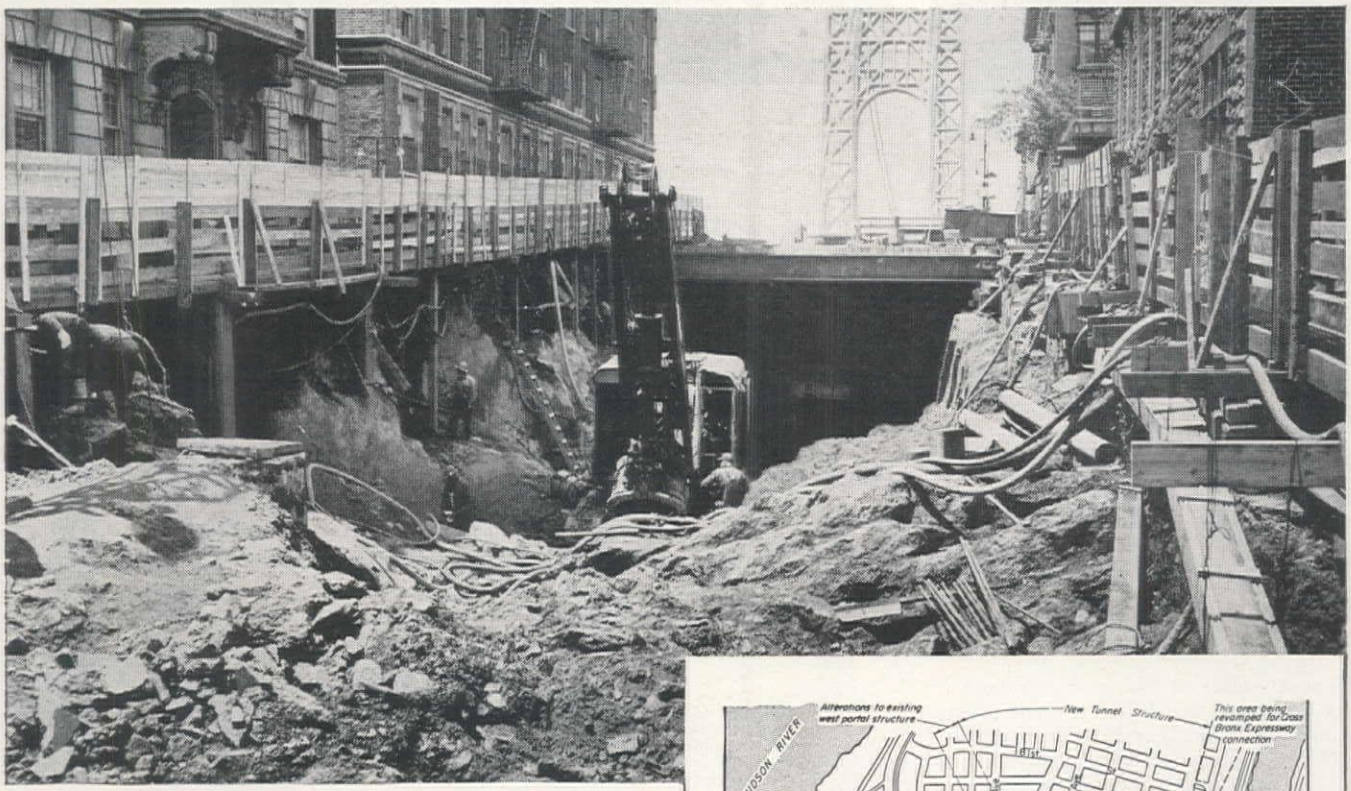
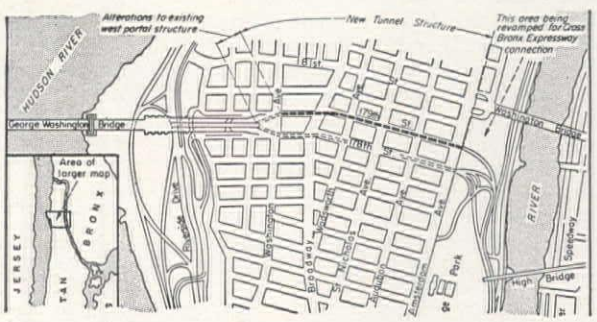
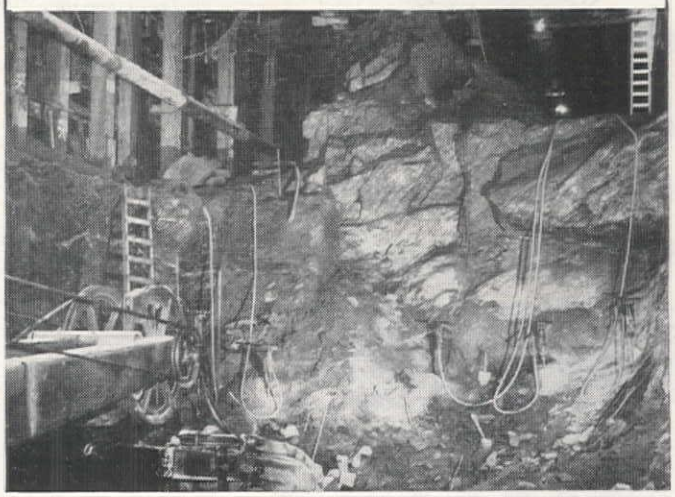


VIEW WEST toward George Washington Bridge shows close quarters in which blasting operations took place.



MAP OF BRIDGE approach gives idea of complicated blasting necessary through crowded residential area.

ROCK FACE of typical cut (below) averaged 30′ depth; 2200′ from west to east across upper Manhattan.



Tricky tunneling in tight quarters

ANOTHER JOB FOR DU PONT EXPLOSIVES

Delicate curb-to-curb blasting beneath busy city streets calls for dependable performance. That's why Poirier and McLane Corporation, New York, general contractors for this Port of New York Authority project, again selected Du Pont Explosives to complete excavation work.

The job was not without difficulties. Confined space —only 60 feet between building lines, extensive underpinning of poorly founded apartment houses and badly folded, seamy Manhattan schist ("the worst kind," in the opinion of men on the job) made the going rough. In addition, it was necessary to line-drill on 3-inch centers along each side to assure clean breakage. It proved another job where always dependable Du Pont explosives enabled engineers to handle the operation smoothly and without a hitch.

Whenever you are planning a job that requires blasting . . . big job or little . . . routine or tricky . . . be sure to consult your Du Pont Explosives representative. He will gladly recommend explosives and supplies most suitable, most dependable and most economical for your job. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

NEWS of MANUFACTURERS

Hercules Powder Company announces the completion of a three-story addition to the main laboratory building at its experiment station near Wilmington, Del., the company's home. The addition provides 26 new laboratory units accommodating 51 chemists and increases the research facilities of the main building by more than 60%.

☆ ☆ ☆

The *Essick Manufacturing Company*, Los Angeles, Calif., producers of air cooling equipment and construction machinery, takes over all of the stock of the *Sterling Machinery Corporation*, Kansas City, Mo., manufacturer of self-priming pumps and mining and contractors hoists. No change is expected in Sterling policy.

☆ ☆ ☆

General offices of *The F. D. Cummer & Sons Company*, builder of asphalt plants, are now located at 1827 E. 18th St., Cleveland, Ohio. Space has been quadrupled to meet the continuing increase in volume of business. The move will provide additional space for the enlarged engineering department as well as warehousing facilities to maintain an adequate inventory to meet the immediate delivery demands for replacement parts for all types of Cummer asphalt

Continued on page 153

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)
90	ton mineral aggregate (P.M.S.)	4.50	6.00	11.00	10.00
5	ton paving asphalt (P.M.S.)	15.00	18.00	11.00	26.00
6	ton asph. emuls. (paint bind. and sl. ct.)	35.00	40.00	50.00	60.00
34	ton sand (seal coat)	5.00	6.00	5.00	5.00
5,100	ton asphalt concrete	4.75	5.00	4.70	5.20
40	cu. yd. Class "B" P.C.C. (pavement)	18.00	20.00	25.00	20.00
1,060	cu. yd. Class "A" P.C.C. (structures)	38.00	42.00	42.00	47.00
10	cu. yd. Class "C" P.C.C. (pipe reinforc.)	22.00	16.00	25.00	20.00
200	lin. ft. rubber waterstops	2.50	2.00	2.20	3.00
548	lin. ft. steel railing (retaining walls)	12.00	12.00	12.00	15.00
221	lin. ft. iron handrail (stairways)	9.20	9.50	9.40	12.00
1,826	lin. ft. metal plate guard railing	4.00	3.50	2.75	3.50
1,280	cu. yd. Class "A" P.C.C. (curbs, gutters, sidewalks)	22.00	24.50	30.00	30.00
145	lin. ft. curb bars	.60	1.00	.75	1.20
160	lin. ft. curb armor	3.00	4.00	3.50	4.00
161	lin. ft. 12-in. R.C.P. (std. strength)	5.00	5.00	4.00	3.50
112	lin. ft. 15-in. R.C.P. (std. strength)	5.50	5.50	4.75	4.00
130,000	lbs. bar reinforcing steel	.095	.10	.10	.12
2,000	lb. miscellaneous iron and steel	.35	.35	.33	.38
13	ea. adjusting manholes to grade	50.00	25.00	25.00	25.00
Lump sum, highway lighting system		$20,000	$19,500	$20,000	$26,000

Bituminous Surface Treatment and Sealcoating

California—San Diego County—State Division of Highways—Cox Bros. Construction Co., Stanton, Calif., with a bid of $134,708, was low before the State Division of Highways for construction of a state highway, portions between Dulzura and Campo, a net length of about 1.1 mi. to be graded and a bituminous surface treatment to be applied. Unit bids were as follows:

(1)	Cox Bros. Construction Co.	$134,708	
(2)	Ralph A. Bell	157,187	
(3)	Morris S. Van Meter	$175,742	
(4)	Norman I. Fadel	176,655	

		(1)	(2)	(3)	(4)
Lump sum, clearing and grubbing		$5,000	$20,000	$3,000	$11,200
57,000	cu. yd. roadway excavation	1.40	1.30	1.80	1.95
1,000	cu. yd. structure excavation	4.00	5.00	5.00	4.00
1,230	cu. yd. ditch and channel excavation	2.25	3.00	5.00	2.00
370,000	sta. yd. overhaul	.015	.015	.02	.02
320	sq. yd. compacting original ground	.12	.12	.20	.10
Lump sum,	dev. water supply and furnish. water equip.	$3,000	$8,000	$3,500	$2,000
1,850	M. gal. applying water	2.50	2.50	2.10	4.00
62	sta. finishing roadway	12.00	25.00	25.00	35.00
160	ton liquid asphalt, SC-3 or 4 (B.S.T.)	25.00	40.00	40.00	25.00
19,500	sq. yd. prep. mix. and shaping surface (B.S.T.)	.14	.40	.60	.20
6	ton asphaltic emulsion (seal coat)	45.00	50.00	70.00	50.00
35	ton sand (seal coat)	12.50	7.00	10.00	10.00
32	cu. yd. Class "A" P.C.C. (structures)	120.00	105 00	100.00	150.00
1,550	lb. bar reinforcing steel	.15	.16	.20	.15
49	ea. right-of-way monuments	7.50	12.00	6.00	7.00
91	ea. installing culv. markers and guide posts	5.50	8.00	3.00	4.00
776	lin. ft. 24-in. C.M.P. (14 gauge)	5.50	5 00	6.88	5.50
176	lin. ft. 36-in. C.M.P. (12 gauge)	10.00	10.00	13.86	10.50
168	lin. ft. 84-in. field assembled plate culv. (310-18)	60.00	50.00	62.18	45.00
5	ea. spillway assemblies	35.00	30.00	35.56	40.00
116	lin. ft. 8-in. C.M.P. down drains	2.00	2.50	2.36	2.50
194	lin. ft. salvag. exist. pipe culverts	1.50	2.50	5.00	2.00

⅝-In. Crushed Gravel in Stockpile

Montana—Gallatin, Park and Meagher Counties—State Highway Commission—R. J. Sundling Construction Co., Livingston, Mont. with a bid of $60,726, was awarded a contract by the Montana State Highway Commission for crushing and stockpiling approximately 57,000 cu. yds. ⅝-in. crushed gravel. Unit bids were as follows:

(1)	R. J. Sundling Construction Co.	$60,726	(5)	Frank W. Thomas	$73,936
(2)	Union Construction Co., Inc.	63,040	(6)	William W. Strever	74,240
(3)	Peter Kiewit Sons' Co.	64,784	—	Stanley H. Arkwright	80,491
(4)	Lou Richardson	73,300	—	Billings Construction Co.	86,010

		(1)	(2)	(3)	(4)	(5)	(6)
57,000	cu. yd. ⅝-in. cr. gravel in stockpiles	.97	1.00	1.02	1.18	1.215	1.17
30,200	mi. yd. haul on stockpiled material	.18	.20	.22	.20	.155	.25

Grading, Drainage and Bituminous Road Mix

Arizona—Mojave County—State Highway Department—W. J. Henson, Prescott, Ariz. with a bid of $234,872, was low before the State Highway Department for construction of the Topock-Kingman highway which extends from a point about 5 mi. southwest of Kingman southerly for a distance of approximately 10 mi., consists of grading, draining, select material, aggregate base and bituminous road mix. Unit bids were as follows:

(1)	W. J. Henson, Contractor	$234,872	(4)	Phoenix-Tempe Stone Co.	$251,003
(2)	Dale F. Payne, Contractor	237,461	(5)	Wallace & Wallace	256,117
(3)	Heuser & Garnett	250,894	(6)	Larsen Contracting Co.	258,157

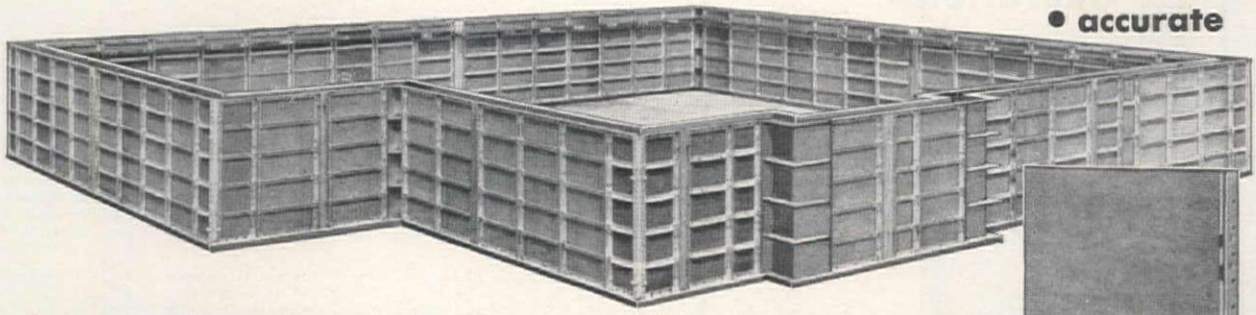
		(1)	(2)	(3)	(4)	(5)	(6)
45,600	cu. yd. roadway excavation	.45	.35	.35	.36	.38	.36
400	cu. yd. drainage excavation	.55	.32	.54	.30	.35	.50
11,600	lin. ft. grader ditches	.05	.05	.05	.04	.05	.07
795	cu. yd. structural excavation	2.00	2.00	2.00	1.50	2.00	3.00
14,700	cu. yd. mi. overhaul	.30	.25	.25	.24	.30	.30
7,500	cu. yd. borrow (CIP)	.48	.35	.47	.30	.30	.40
4,750	M. gal. watering (CIP)	2.75	3.00	3.00	2 85	2.50	2.75
1,700	hr. rolling	5.80	7.00	6.50	6.50	7.00	7.00
74,150	ton select material (CIP)	.50	.40	.40	.60	.58	.60
39,400	ton aggregate base (CIP)	.78	.81	1.05	1.10	1.00	1.00
26,500	ton bitum. mix (Class I-RoadMix) (CIP except cost of liquid asphalt)	1.00	1.23	1.30	1.17	1.20	1.20
502	ton liquid asph. for prime coat (Grade MC-1 or MC-2) (CIP)	32.00	34.00	32.00	32.50	34.00	33.00
892	ton liquid asph. for bitum. mix (Grade MC-2 or MC-3) (CIP)	32.00	33.50	32 00	31.00	32.00	31.00
408	cu. yd. Class A concrete (incl. cement)	38.00	40.00	48.00	38.00	40.00	42.00
49,900	lb. reinf. steel (bars) (CIP)	.11	.12	.13	.11	.13	.12
154	lin. ft. 24-in. corru. met. pipe (CIP except excav.)	5.00	5.00	6.00	4.50	5.50	5.00

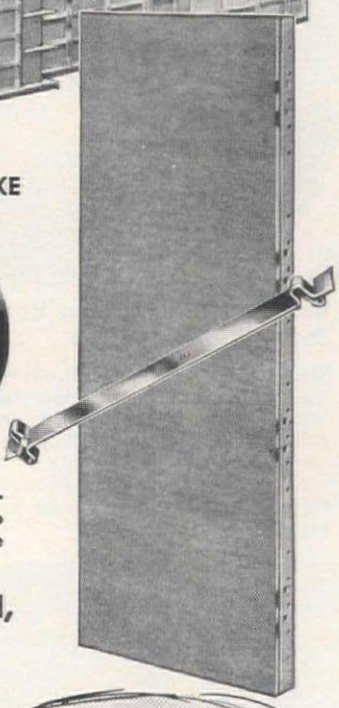
(Continued on next page)

UNI-FORMS take the *Guesswork* out of Forming!

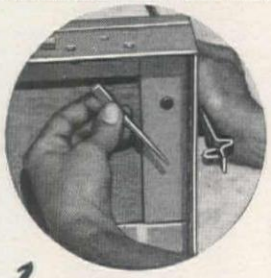
They're

- modern
- easy to use
- automatic
- accurate

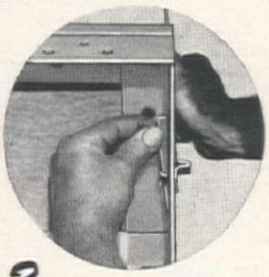




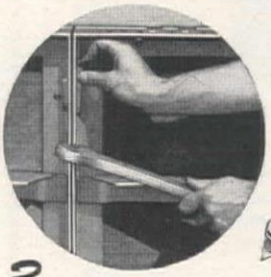
ASSEMBLY OF UNI-FORMS IS FOOLPROOF . . . YOU CAN'T MAKE A MISTAKE



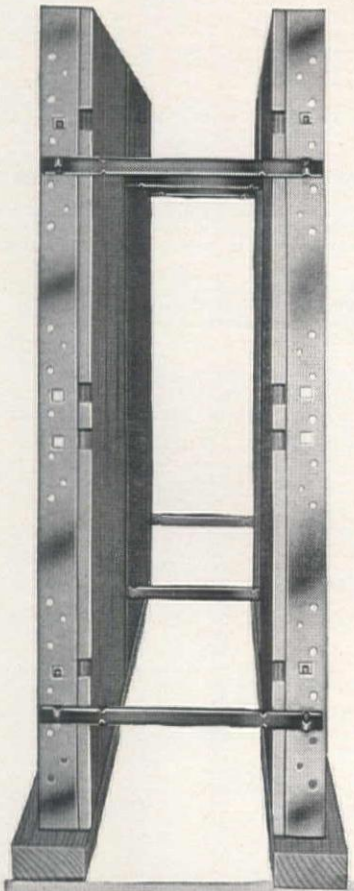
1 The first step in assembly. Put the Uni-Form Tie Loop into the Tie Hole.



2 Drop Tie Key into the Loop. This locks the UNI-FORM and Tie into one integral unit.



3 Bring the next UNI-FORM into position. Drop the second Tie Key into the Loop.



UNI-FORMS Provide Modern, Mechanized, Automatically Accurate Forming

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UNI-FORMS fit the modern building picture . . . they provide speed, quality and lower building costs. Walls, slabs, beams, columns—in fact any concrete, is UNI-FORMABLE.

UNI-FORMS are modular in design . . . 2'0" wide, in varying height up to 10'0". They are symmetrical . . . all sizes will member with one another. Fillers are easily handled with angles punched to match the forms.

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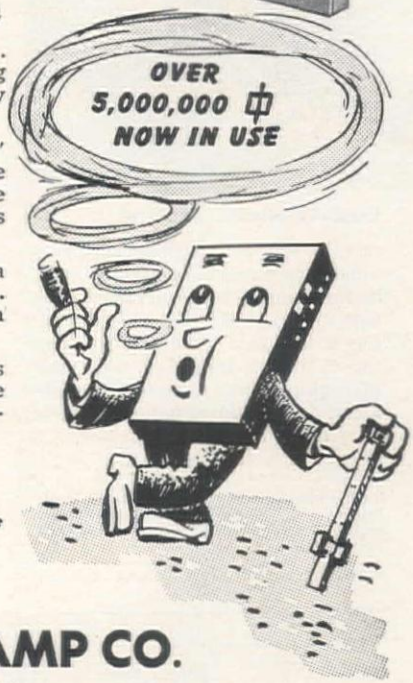
UNI-FORMS are not like ordinary wall forms —they are *permanent* equipment . . . only the plywood is expendable—steel frame is indestructible. Many have seen 20 years of service.

Rent a set of UNI-FORMS with a purchase option. "Try before you buy" is our motto.

Ask for Circular SA-13. It gives full information on the Uni-Form System.



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UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
66 lin. ft. 36-in. corru. met. pipe (CIP except excav.)	9.40	10.00	11.50	8.75	10.00	9.00
92 lin. ft. 42-in. corru. met. pipe (CIP except excav.)	11.00	12.00	14.00	10.25	12.00	10.00
74 lin. ft. 48-in. corru. met. pipe (CIP except excav.)	12.50	13.50	15.50	12.00	14.00	12.00
280 lin. ft. road guard (std. C-7) (CIP)	3.30	3.00	3.00	2.85	3.00	3.00
130 ea. guide posts (std. C-8) (Type B) (CIP)	5.50	6.00	6.00	4.75	6.00	6.00
8 ea. r/w markers (std. C-1) (Type B or C) (CIP)	8.50	9.00	7.00	7.75	8.00	7.00
100,400 lin. ft. line fence (std. C-15 or C-16) (CIP)	.16	.18	.18	.14	.18	.18

Bridge and Grade Separation . . .

Reinforced Concrete T-Beam Bridge

California—Amador County—State Division of Highways—Lefever & Bing, Sacramento, Calif., with a bid of $73,878, was low before the State Division of Highways for construction of a state highway at Dry Creek, about 5 mi. north of Ione, a reinforced concrete T-Beam type of bridge to be constructed, and about 0.5 mi. of approaches to be graded and plant mixed surfacing placed on imported base material. Unit bids were as follows:

(1) Lefever & Bing $73,878
(2) Thomas Construction Co. 74,207
(3) Carey Bros. & Bailey 75,987
(4) B. S. McElderry & Chittenden & Chittenden 87,177
(5) Eugene G. Alves $87,497
(6) O'Connor Bros. 96,572
— Johnson, Drake & Piper, Inc. 97,406

	(1)	(2)	(3)	(4)	(5)	(6)
18 sta. clearing and grubbing	50.00	200.00	50.00	200.00	200.00	40.00
6,200 cu. yd. roadway excavation	1.35	1.75	.90	2.40	1.40	2.95
400 cu. yd. structure excavation	15.00	19.00	7.50	16.00	15.00	10.00
70 cu. yd. ditch and channel excavation	3.00	3.00	5.62	10.00	3.00	5.00
1,600 cu. yd. imported base material	1.50	1.20	1.19	2.10	1.30	2.75
Lump sum, dev. wat. sup. and furn. wat. equip.	$1,000	900.00	850.00	$2,000	$1,640	$1,500
350 M. gal. applying water	3.00	2.00	5.35	2.00	3.14	4.00
18 sta. finishing roadway	20.00	20.00	25.00	20.00	10.00	20.00
11 ton liq. asph. SC-2 (pr. ct. and pen. tr.)	30.00	65.00	56.20	40.00	40.00	47.00
575 ton min. aggr. (P.M.S.)	7.00	7.00	15.00	7.00	7.60	14.00
29 ton liq. asph. SC-4 (P.M.S.)	30.00	7.00	15.00	25.00	25.00	30.00
5 ton asphaltic emulsion (seal coat)	50.00	70.00	75.00	45.00	41.00	60.00
17 ton sand (prime coat)	5.00	7.00	11.87	10.00	7.00	8.75
54 ton screenings (seal coat)	8.00	7.50	13.75	8.00	5.50	10.50
190 lin. ft. corr. met. bridge railing	6.00	6.00	5.00	6.00	8.00	8.00
412 cu. yd. Class "A" P.C.C. (structures)	75.00	65.00	78.75	79.00	88.00	88.90
58,050 lb. bar reinf. steel	.12	.11	.125	.14	.16	.12
14 ea. right-of-way monuments	10.00	10.00	5.60	15.00	5.00	10.00
8 ea. install. culv. markers and sta. markers	10.00	7.00	6.25	10.00	4.50	5.00
12 ea. installing guide posts (reflect.)	10.00	8.00	6.85	10.00	4.00	6.00
2 ea. clearance markers	10.00	10.00	8.75	15.00	5.00	10.00
0.65 mi. new property fence, Type A	$1,600	$2,600	$2,000	$2,000	$3,350	$3,200
0.75 mi. new property fence, Type B	$1,400	$2,300	$1,500	$2,000	$3,000	$2,200
2 ea. drive gates	100.00	75.00	75.00	100.00	150.00	100.00
46 lin. ft. 8-in. C.M.P. downdrains (16 ga.)	3.00	2.50	3.40	2.00	3.00	3.00
148 lin. ft. 18-in. C.M.P. (16 ga.)	4.00	4.50	4.50	4.00	3.00	4.25
3 ea. spillway assemblies	50.00	35.00	37.50	35.00	23.00	40.00
26 lin. ft. salv. exist. pipe culverts	2.00	2.00	2.25	2.00	1.00	3.00
28 cu. yd. light stone riprap	6.00	11.00	45.00	8.00	10.00	35.00
168 lin. ft. metal plate guard railing	5.00	4.00	5.25	5.00	5.00	5.00
Lump sum, remove existing bridge	$4,000	$2,150	$3,450	$2,000	$4,100	$3,000

Approaches and Three Bridges on Colorado Freeway in Pasadena

California—Los Angeles County—State Division of Highways. Guy F. Atkinson Co., Long Beach, with a bid of $3,389,650, was low before the State Division of Highways for construction of three bridges and approaches and alterations for an existing bridge on the Colorado Freeway in Pasadena between San Rafael Ave. and Orange Grove Ave. Unit bids were as follows:

(1) Guy F. Atkinson Co. $3,389,650
(2) United Concrete Pipe Corp., Ralph A. Bell, B. J. Ukropina, T. P. Polich and Steve Kral 3,561,831
(3) Winston Bros. Co. 3,785,536
(4) Peter Kiewit Sons' Co. $3,853,677
(5) Rhodes, Shofner Construction Co., Inc. and Grafe-Callahan Construction Co. 4,299,992

	(1)	(2)	(3)	(4)	(5)
3,300 cu. yd. removing portions exist. struct.	3.00	3.00	2.20	2.75	3.90
Lump sum, removing concrete	$9,291	$60,000	$25,000	$23,174	$40,000
490,000 cu. yd. clearing and grubbing	.46	.60	.70	.57	.90
14,775 cu. yd. roadway excav.	3.00	6.00	5.00	5.00	4.00
8,740 cu. yd. struct. excav. (bridges)	2.50	2.00	2.50	4.00	2.00
16,500 cu. yd. struct. backfill (bridges)	2.50	3.00	2.90	3.80	1.90
47 cu. yd. struct. excav.	3.00	2.00	1.00	4.00	1.10
16,300 sq. yd. ditch and channel excavation	.05	.07	.05	.08	.05
11,000,000 sta. yd. compacting original ground	.004	.005	.003	.004	.005
9,000 sq. yd. overhaul	.20	.12	.08	.10	.13
12,500 sq. yd. preparing slopes (erosion control)	10	.07	.06	.10	.08
Lump sum, cultivating (prep. landscaping)	$4,000	$10,000	$5,000	$2,000	$5,000
20,000 M. gal. dev. wat. supp. & furn. wat. equip.	1.50	1.20	1.70	2.00	1.55
Lump sum, applying water	$2,000	$3,000	$1,500	$3,000	$5,500
14,000 sq. yd. finishing roadway	.35	.20	.26	.45	.22
780 bbl. mixing and compact. (cem. tr. subgrade)	3.40	4.50	4.00	5.00	4.40
32 ton portland cem. (cem. tr. subgrade)	50.00	28.00	40.00	40.00	43.00
29 ton liq. asph., SC-2 (prime coat)	50.00	40.00	50.00	50.00	53.00
8,165 ton asph. emuls. (cur. sl. pt. bind. & sl. ct.)	4.00	4.00	4.20	6.20	4.80
460 ton mineral aggregate (P.M.S.)	22.00	25.00	22.00	20.00	24.00
85 ton paving asphalt (P.M.S.)	6.40	5.00	6.00	12.00	7.40
3,200 lin. ft. sand (seal coat)	1.20	.25	.11	60	.20
165 lin. ft. placing P.M.S. (curbs and gutters)	1.00	2.00	1.00	1.60	1.20
3,200 cu. yd. raised traffic bars	15.00	14.00	16.50	16.00	17.00
2,900 ea. P.C.C. (pavement)	.60	.50	.55	.65	.65
29,800 cu. yd. pav't. tie bolt assemblies	52.00	50.00	61.50	55.00	69.00
5,600 cu. yd. Class "A" P.C.C. (structs.)	80.00	90.00	75.00	100.00	100.00
170 lin. ft. Class "A" P.C.C. (arch ribs)	15.00	12.00	13.00	30.00	11.00
750 lin. ft. ornamental conc. railing	3.00	2.00	2.40	3.00	2.20
3,510 lin. ft. rubber water stops	3.00	3.50	2.60	3.00	3.10
88 ea. furn. steel piling	40.00	50.00	55.00	50.00	39.00

(Continued on next page)

NEWS of MANUFACTURERS

Continued from page 150

plants. Some company assignments are as follows: R. N. BIRDSALL, chief engineer; J. F. VOLNEY, progress engineer and purchasing agent; E. L. FLASCHE, structural engineer and chief draftsman, and J. R. BLACK, assistant to the vice president.

☆ ☆ ☆

Baldwin-Lima-Hamilton Corporation, Eddystone, Pa., announces that the assets and business of *Austin-Western Company*, Aurora, Ill., have become a part of the firm. Austin will continue to serve its customers under its own name.

☆ ☆ ☆

ARTHUR W. PIPENHAGEN, *Harnischfeger Corporation* attorney, becomes president of the National Construction Machinery Credit Group. NORMAN VOELL, *Chain Belt Company*, is elected a member of the executive committee.

☆ ☆ ☆

H. E. BAYER becomes general superintendent of construction for the Chemical Plants division of *Blaw-Knox Construction Company*.

☆ ☆ ☆

Union Wire Rope Corp., Kansas City, Mo., will spend $2,000,000 in expansion of its plant. Part of the space will be for equipment and facilities which will increase the wire mill output by 66%. Five major building projects—plus one which only recently has been completed and occupied will add a total of 109,000 sq. ft. They will give Union Wire Rope more than 500,000 sq. ft. under roof.

☆ ☆ ☆

D. M. STRICKLAND, vice president of *National Clay Pipe Manufacturers, Inc.*, since it was organized, becomes the association's president and general manager. Strickland succeeds W. E. ROBINSON. New vice president of the association is J. J. STEIN, Los Angeles, Calif.

☆ ☆ ☆

Pipe Linings, Inc., a subsidiary of *American Pipe and Construction Co.*, is moving to a new home at 4675 Firestone Blvd., South Gate, Calif.

☆ ☆ ☆

D. B. BAKER, manager of Industrial Power engineering, *International Harvester Company*, retires after 47 years with the firm. Baker led the development of the International TD-24 crawler tractor and aided in crawler tractor and diesel development.

☆ ☆ ☆

F. C. WINTER, manager of stores for *Worthington Pump and Machinery Corporation's* Harrison Works, will add the position of manager of defense procurement to his duties. C. W. CAMP, electrical engineer in Worthington's sales department, becomes assistant corporation manager of defense procurement.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)
10 ea. driving piles	10.00	20.00	22.00	30.00	16.00
5,330,000 lb. pile splices	.11	.11	.105	.12	.11
84,000 lb. bar reinforcing steel	.40	.40	.38	.40	.37
275 lin. ft. miscel. iron and steel	3.00	3.50	4.00	5.00	2.40
1,335 lin. ft. 4-in. steel pipe (10 gauge)	4.00	5.00	5.00	6 00	3.50
2,010 cu. yd. 6-in. steel pipe (10 gauge)	30.00	30.00	33.00	30.00	36.00
1,090 lin. ft. P.C.C. (curbs, gutters and sidewalks)	8 00	7.50	8.00	9.00	8.75
3,140 lin. ft. steel railing	5.50	5.00	5.50	6.50	5.80
Lump sum, steel safety railing	$4,000	$4,000	$4,200	$4,500	$4,500
297 lin. ft. steel stair railing	7.00	7.00	7.00	8.00	7.75
5,000 lin. ft. pipe handrail	1.75	2.25	2.20	2.70	2.80
6 ea. chain link fence	50.00	75.00	65.00	80.00	80.00
4,400 lin. ft. walk gates (chain link fence)	4.50	4.50	4.30	6.00	4.30
12 lin. ft. 18-in. R.C.P.	5 00	6.00	5.00	6.75	5.25
500 lin. ft. 21-in. R.C.P.	6.00	6.25	5.50	8.00	5.80
24 lin. ft. 24-in. R.C.P.	7.00	8.00	6.50	9.00	6.90
20 lin. ft. 48-in. R.C.P.	15.00	15.00	14.00	18.00	16.50
480 lin. ft. 18-in. C.M.P. (16 gauge)	4.00	3.50	3.30	5.70	3.30
240 lin. ft. 21-in. C.M.P. (14 gauge)	5.00	4.50	4.50	7.00	4.50
260 lin. ft. 42-in. C.M.P. (12 gauge)	12.00	10.00	10.00	14.50	10.50
35 lin. ft. pipe shaft manholes	20.00	20.00	14.00	18.00	20.00
1 ea. adjust. manholes to grade (sanitary sewer)	50.00	60.00	25.00	75.00	28.00
Lump sum, engineer's office	$2,000	$5,000	$3,500	$4,500	$6,000
1,050 lin. ft. 8-in. vitrified clay pipe (sanitary sewer)	4 00	3.00	3.60	5.25	6.00
6 ea. brick manholes (sanitary sewer)	200.00	300.00	300.00	300.00	275.00
20 lin. ft. 4-in. cast iron pipe (sanitary sewer)	5.00	2.00	3.00	8.30	7.00
5,500 lin. ft. metal plate guard railing	2 50	3.00	2.80	3.75	3.30
Lump sum, electrical equipment	$9,000	$10,000	$9,000	$9,000	$10,000
810 cu. yd. Cl. "C" P.C.C. (pipe reinf.)	12.00	25.00	17.00	25.00	21.00
260 lin. ft. 1½-in. galv. steel pipe	1.25	1.00	.80	1.20	.90
550 lin. ft. 2-in. galv. steel pipe	1.60	1.50	1.00	1.50	1.15
215 lin. ft. 2½-in. galv. steel pipe	2.00	2.00	1.40	2.00	1.55

Reinforced Concrete Overcrossing on Oregon's Pacific Highway

Oregon—Lane County—State Highway Department. Hamilton & Thomas, Eugene, with a bid of $136,502, was low before the State Highway Department for construction on Goshen Overcrossing section of the Pacific Highway project. Unit bids were as follows:

(1) Hamilton & Thomas $136,502
(2) Birkemeier & Saremal 154,370
(3) Tom Lillebo 157,210
(4) C. J. Eldon 157,785
(5) Lindstrom Bros. $158,160
(6) Valley Construction Company 162,440
(7) Guy F. Atkinson 179,483

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
990 cu. yd. structural excav.	8.50	8.00	12.00	12.00	12.00	7.50	2.65
10 cu. yd. struct. excav. below elev. shown	10.00	10.00	20.00	15.00	20.00	20.00	10.00
1,520 cu. yd. Class "A" conc.	54.50	66.00	65.00	64.25	63.50	71.00	82.50
353,000 lb. metal reinforcement	.1075	.11	.11	.115	.12	.115	.12
600 lin. ft. metal rail	12.00	12.00	12.50	12.50	12.00	10.50	15.00

Dam . . .

Third Step (Completion) Contract for McNary Dam

Oregon—Columbia River—Corps of Engineers—Guy F. Atkinson Co., Ostrander Construction Co., J. A. Jones Construction Co., South San Francisco, Calif., with a bid of $58,416,459, were awarded a contract by the Corps of Engineers for construction of remaining portions of the spillway, powerhouse, abutments and appurtenant structures at McNary Dam, Ore. Unit bids were as follows:

(1) Guy F. Atkinson Co., Ostrander Construction Co., J. A. Jones Construction Co. $58,416,459
(2) Columbia Constructors 61,972,032
(3) Government Estimate 55,058,359

	(1)	(2)	(3)
1 L.S. cofferdam unwatering	$1,200,000	$820,000	$491,494
150,000 cu. yd. removal of cofferdam fill material	1.30	1.60	1.33
1 L.S. removal of closure fill material	$14,000	$8,000	$16,732
11,000 ton removal of steel piling	22.00	49.00	21.02
1 L.S. removal of cofferdam timber cribs	$250,000	$153,000	$110,314
1 L.S. removal of temporary fishway, spillway bay No. 1	$28,000	$15,000	$8,982
1 L.S. removal of temporary fishway, spillway bay No. 13	$85,000	$55,000	$20,283
1 L.S. removal of temporary fishway, Oregon-shore	$16,500	$20,000	$9,531
1 L.S. Removal of temporary fishway, non-overflow section	$3,000	$3,000	$6,660
500,000 cu. yd. excavation, common	.50	.71	.43
250,000 cu. yd. tailrace excavation, unclassified	1.60	1.90	1.45
200,000 cu. yd. excavation, rock	6.25	6.70	3.91
400,000 cu. yd. excavation, rock, in excess of 200,000 cu. yd.	3.00	2.20	3.32
8,000 cu. yd. excavation for fishway approach channels	6.00	11.00	2.37
70,000 sq. yd. foundation cleanup	2.50	6.80	3.50
40,000 lin. ft. drilling EX grout holes	3.00	3.20	2.39
12,000 lin. ft. drilling wagon drill grout holes	.70	2 10	1.61
16,000 lin. ft. drilling NX drain holes	6.00	9.70	4.33
6,000 lin. ft. drilling 3-in. wagon drill drain holes	1.35	3.10	.85
3,000 lin. ft. drilling electrical ground wells and exploratory holes	7.50	11.60	4.02
150 lin. ft. overburden drilling	12.50	17.00	6.99
10,000 bag pressure grouting	2.20	4.50	4.03
40,000 bag pressure grouting 10,000 to 50,000 bags	1.50	4.00	3.04
40,000 bag pressure grouting over 50,000 bags	1.00	3.20	3.04
2,000 ea. minimum payment for pump connection and pressure grouting	5.00	5.00	5.00
1,100,000 bbl. cement	4.00	4.70	4.35
30,000 lb. grout and drain pipe and fittings	.60	80	.34
35 hr. pressure testing exploratory holes	20.00	20.00	39.93
100 bag foundation slurry	8.00	10.00	10.15
300,000 cu. yd. impervious fill	1.00	.80	1.02
40,000 cu. yd. sand filter, Oregon-shore	2.00	2.80	2.99
5,000 cu. yd. sand filter, Washington-shore	4.50	3.20	3.46
30,000 cu. yd. gravel filter, Oregon-shore	2.00	3.30	2.97
55,000 cu. yd. random gravel	.85	.80	1.56
4,000 cu. yd. gravel filter, Washington-shore	4.50	4.00	3.44
42,500 cu. yd. spalls	1 25	2.00	1.24
20,000 cu. yd. selected stone revetment	.90	1.80	1.76

(Continued on next page)

		(1)	(2)	(3)
420,000	cu. yd. rock fill	.65	.56	.71
360,000	cu. yd. random fill	.50	.23	.67
1,000	hr. additional compaction	11.00	14.00	10.74
38,500	cu. yd. sand and gravel filter	2.00	2.80	2.97
170,000	cu. yd. random backfill	.20	.40	.25
45,000	cu. yd. gravel collector	1.65	2.50	2.77
20,000	cu. yd. compacted random backfill	.40	2.00	.30
110	cu. yd. dumped and rearranged riprap	12.00	10.00	3.52
8,000	cu. yd. topsoil	1.20	1.40	1.72
1	L.S. concrete crib retaining wall	$10,000	$5,300	$5,851
1,130	lin. ft. 48-in. diam. perforated C.M.P.	30.00	36.00	32.24
860	lin. ft. 54-in. diam. perforated C.M.P.	37.00	46.00	39.06
1,500	lin. ft. 60-in. diam. C.M.P.	40.00	51.00	46.54
1	ea. manhole installation No. 1	$1,250	$1,300	$1,175
1	ea. manhole installation No. 2	$2,800	$2,800	$2,322
1	ea. manhole installation No. 3	$1,500	$1,400	$1,268
100,000	cu. yd. concrete, mass	20.00	13.50	13.97
90,000	cu. yd. concrete, mass, in excess of 100,000 cu. yd.	15.00	13.50	13.97
20,000	cu. yd. concrete for spillway piers, pier extensions and fishway entrance piers	36.00	30.00	24.66
30,000	cu. yd. concrete for apron	20.00	13.50	15.84
1,500	cu. yd. concrete for service bridges	75.00	60.00	63.92
45,000	cu. yd. structural concrete for fishway and non-overflow dam and miscellaneous structures	55.00	40.00	41.82
200,000	cu. yd. concrete in powerhouse substructure	40.00	32.00	28.11
250,000	cu. yd. concrete in powerhouse substructure in excess of 200,000 cubic yards	25.00	31.00	28.11
62,500	cu. yd. concrete in powerhouse superstructure	60.00	65.00	52.87
7,200	cu. yd. concrete in navigation lock sill	18.00	16.00	13.52
2,250	cu. yd. concrete in blockout for temp. fishladder in non-overflow section	22.50	13.00	10.96
7,850	cu. yd. block-out concrete	100.00	165.00	64.18
40	cu. yd. concrete in separate floor finish and stair topping	150.00	212.00	98.67
6,400	sq. ft. grinding floors in existing powerhouse structure	.80	1.70	.61
190	cu. yd. sawdust concrete	60.00	50.00	14.46
950	lin. ft. precast porous concrete slabs	2.50	1.30	.66
15	cu. yd. concrete for cove base	700.00	370.00	172.41
160	cu. yd. non-shrink grout	60.00	140.00	50.55
73,500,000	lb. steel reinforcement	.14	.14	.146
35,500	lb. copper water stops	1.75	2.00	1.51
16,000	lin. ft. Type "A" rubber water stops	5.00	7.80	6.89
7,700	lin. ft. Type "B" rubber water stops	4.75	4.40	4.30
50,000	lin. ft. drilling and grouting anchor bars	2.00	1.50	1.26
2,900	lin. ft. six-inch corrugated-metal pipe under-drainage system	3.50	3.20	1.62
5,400	lin. ft. eight-inch tile or concrete pipe under-drainage system	2.50	2.50	.81
3,500,000	lb. structural steel in powerhouse roof framing	.22	.23	.258
500,000	lb. structural steel in 230-kv switch structure	.30	.30	.343
1	job vertical lift door	$24,000	$21,000	$17,884
1	job three steel plate water-tight doors and one temporary fishway bulkhead	$22,500	$8,000	$3,709
1	job wire mesh partitions and doors	$1,250	$1,800	676.03
170,000	lb. railings, steel	.65	.70	.48
400	lin. ft. chainlink fence	5.00	4.60	2.77
3,350	lb. railings, aluminum	4.00	10.00	1.93
8,300	lb. safety treads	1.10	1.00	.68
98,000	lb. steel castings	.45	.60	.47
35,000	lb. iron castings	.44	.50	.50
425,000	lb. anchor bolts and inserts	.36	.63	.46
900	lb. expansion bolts	2.50	4.00	4.26
345,000	lb. structural steel in rail bearing plates	.225	.22	.24
665,000	lb. crane rails and railroad rails	.18	.14	.134
72,500	lb. rail splice bars and clips	.20	.30	.354
500	lb. miscellaneous aluminum	7.00	7.00	1.14
1	job aluminum letters	$2,250	$1 500	571.88
5,600,000	lb. structural steel guide and related items for gates, stoplogs, trashracks and latch controls	.39	.65	.50
1,500,000	lb. corrosion-resisting clad steel plate	.61	1.15	.81
290,000	lb. corrosion-resisting steel	2.20	1.74	1.00
30,000	lb. alloy steel forgings, nuts and bolts	.85	1.40	.58
13,000	lb. carbon steel forgings	1.10	1.30	.83
70,000	lb. firebox quality carbon steel plates	.55	.44	.47
100	lb. flax packing rings for penstock expansion joints	3.30	3.00	2.78
400	lb. medium carbon steel bars	1.20	.40	.41
300	lb. low alloy structural steel	1.20	.40	.72
1,300	lb. structural carbon steel, hot dip galvanized	1.00	.40	.45
8,500	lb. sheet steel air duct	1.00	2.20	.95
3,400	lb. sheet aluminum air duct	2.75	3.00	2.30
1	L.S. air diffusers and electric fans	$2,500	$4,000	$1,156
535,000	lb. miscellaneous embedded steel and metal work	.50	.45	.50
700,000	lb. miscellaneous non-embedded steel and metal work	.36	.44	.50
1,000,000	lb. steel grating, tailrace deck	.20	.25	.365
1,750,000	lb. structural steel in service bridges and bridge seats	.24	.28	.303
1,050,000	lb. structural steel in false pier noses and appurtenant stoplogs and guide	.32	.50	.344
1	job piezometer piping in spillway bay 16	$7,000	$13,000	$15,721
1	ea. 72-inch disc arm pivot valve	$36,000	$32,000	$39,003
5	ea. sluice gate, 48-inch by 72-inch valve	$10,500	$9,000	$6,406
580,000	lb. fabricated steel plate pipe and fittings	.55	.52	.29
122,000	lb. galvanized steel pipe	.45	.50	.20
160,000	lb. black steel pipe and fittings	.35	.50	.30
100,000	lb. flanged cast-iron pipe	.33	.40	.28
275,000	lb. cast-iron soil pipe	.40	.40	.173
80,000	lb. cast-iron flanged pipe fittings	.40	.60	.364
400	lb. malleable-iron pipe fittings	.85	.60	.33
2,300	lb. cast-iron screwed pipe fittings	.80	.70	.83
2	ea. gate valve, 6-in. non-rising stem	150.00	200.00	128.00
6	ea. gate valve, 12-in. non-rising stem	750.00	500.00	324.49
16,000	lb. cast-iron soil pipe fittings	.65	.60	.38
500	lb. brass pipe and fittings	1.75	3.20	1.52
275	lb. copper tubing	2.00	3.20	1.89
8,600	lb. floor drains	1.10	.90	1.46
1,600	lb. roof drains	1.10	1.20	1.68
58,000	lb. special cast-iron fittings	.48	.70	.45
200	lin. ft. 5-in. galvanized conduit and fittings	12.00	10.00	4.95
400	lin. ft. 5-in. galvanized conduit and fittings	8.00	8.00	3 89
75,000	lin. ft. fiber or asbestos cement conduit and fittings	.55	1.30	1.95
200	lin. ft. 3½-inch galvanized conduit and fittings	7.00	4.00	3.47
7,100	lin. ft. 3-inch galvanized conduit and fittings	5.50	4.00	3.13
8,600	lin. ft. 2½-inch galvanized conduit and fittings	4.00	4.00	2.35
12,500	lin. ft. 2-inch galvanized conduit and fittings	3.00	3.20	1.63
15,000	lin. ft. 1½-inch galvanized conduit and fittings	2.25	2.30	1.08
45,000	lin. ft. 1¼-inch galvanized conduit and fittings	1.90	2.20	.92
23,000	lin. ft. 1-inch galvanized conduit and fittings	1.60	2.10	.81
56,000	lin. ft. ¾-inch galvanized conduit and fittings	1.50	1.50	.64
2,000	lb. electrical cabinets and special boxes, galvanized sheet steel	1.90	4.00	.62

(Continued on next page)

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)
8,000	lb. special galvanized cast-iron boxes	2.00	5.00	.80
20,000	lb. bare copper ground conductor	1.90	2.25	1.24
72	ea. pier nose lighting fixtures Crouse-Hinds Type RCD-8, form W, with retracting lens, installed, less wiring and lamps	40.00	100.00	44.36
36	ea. sluiceway lighting fixtures, installed, less wiring and lamp	100.00	400.00	150.86
35	ea. recessed incandescent lighting unit, 200 watts or less, with Holophane lens or approved equal, less wiring and lamp	38.00	45.00	35.90
64	4-ft. length fluorescent lighting unit, with lens and wiring to adjacent unit, less lamps	65.00	100.00	38.84
14	6-ft. length fluorescent lighting unit and wiring to adjacent units, less lamps	110.00	130.00	49.75
24	ea. roadway lighting fixture, Crouse-Hinds Type VCD-12, Cat. No. 43125 aluminum and housing and frame installed, less lamps and wiring	135.00	200.00	66.57
42	ea. sidewalk lighting fixture, Crouse-Hinds Cat. No. 42904 or 42912, with aluminum cover installed, less lamps and wiring	15.00	40.00	110.13
9	ea. circuit breaker housing, Crouse-Hinds Cat. No. DVS-536-WT-70-3 installed, less wiring	135.00	200.00	109.06
4,500	sq. ft. hollow tile walls, 6-in.	1.50	2.00	1.08
6,300	sq. ft. hollow tile walls, 4-in.	1.20	1.30	.78
630	sq. yd. suspended plaster ceilings	15.00	12.00	9.36
280	sq. yd. furred plaster walls	16.00	12.00	7.90
850	sq. yd. plaster on tile	8.00	10.00	3.24
370	sq. yd. plaster on concrete	8.00	10.00	5.91
950	sq. ft. suspended acoustical ceilings	3.00	2.00	1.92
1	job quarry tile	$8,000	$15,000	$16,065
1	job ceramic tile	$14,000	$6,000	$13,866
1	job terrazo work, complete	$8,000	$8,000	$8,974
1	job rubber tile floor and base	$7,500	$6,000	$2,516
1	job plastic-type tile floor and base	$1,500	$1,300	620.04
1	job doors	$46,000	$54,000	$18,913
1	job door hardware	$10,000	$6,500	$4,468
1	job windows	$8,000	$3,200	$3,366
1	job glass and glazing	$8,000	$8,000	$4,653
1	job structural glass	$6,000	$4,500	$5,908
1	job glass block	900.00	900.00	$1,386
1	job plumbing fixtures and miscellaneous equipment	$18,000	$20,000	$23,797
1	job toiler enclosures, steel flush type	$4,000	$2,600	$2,161
25	square roof insulation, 2-in. thick	65.00	70.00	70.17
1,200	square room insulation, 1-in. thick	38 00	42.00	30.83
1,225	square built-up roofing	42.00	50.00	24.65
10,000	lb. copper flashing	1.75	1.30	1.23
115,000	cu. yd. embankment for access facilities	.45	.40	.38
9,200	cu. yd. base course	3.50	2.60	3.17
2,150	cu. yd. mineral aggregate	8.00	4.00	3.02
50	ton MC-2 liquid asphalt	40.00	70.00	61.14
270	ton RC-3 liquid asphalt	40.00	60.00	46.73
6,300	lin. ft. beam guardrail	3.50	4.00	4.07
34	lin. ft. 18-in. corrugated metal culvert pipe	15.00	8.00	15.53
8,000	sq. ft. sidewalk	.75	.60	.92
1,700	lin. ft. curb	2.10	4.70	3.83
14,500	lin. ft. tracklaying and ballasting	4.50	4.20	3.41
3,100	lin. ft. timber flangeways	2.25	3.20	3.91
1	job water supply to powerhouse	$35,000	$47,000	$33,460
1	job design, manufacture and install two mechanical traveling water screens and appurtenances, complete	$70,000	$92,000	$99,982
40,000	sq. ft. gratings for diffusion chambers	2.20	1.50	2.04
1	job removal of bulkheads for 1951 flood season	$5,000	600.00	$3,442
1	job install and remove bulkheads for 1952 flood season	$35,000	$32,000	$65,641
1	job install and remove bulkheads for 1953 flood season	$25,000	$48,000	$68,212
1	job bulkheads for doors at elevation 287.0	$3,000	$1,800	$7,370
30	MFBM timber for temporary fishladder	300.00	260.00	226.66
1	L.S. fish viewing windows	$3,000	$4,400	$5,894
1	L.S. fish viewing facilities and miscellaneous work	$5,000	$2,300	$2,664
1	L.S. installation, testing and touchup painting of emergency intake gates	$30,000	$20,000	$6,185
1	L.S. installation, testing, and touchup painting of regular intake gates support beams and lifting beam	$155,164	$350,000	$165,560
350,000	sq. ft. coal tar enamel	.55	.30	.07
1	L.S. erection, testing and painting of two 350-ton indoor bridge cranes	$70,000	$62,000	$108,804
12	ea. installation of pier nose castings for main units	300.00	460.00	336.15
8	ea. installation of embedded turbine parts for main units	$28,000	$48,000	$69,861
2	ea. installation of scroll cases and embedded turbine parts for station service turbines	$3,500	$7,600	$9,561
3	ea. installation of embedded parts for fishway pumps and motors	$4,000	$6,200	$1,749
8	ea. installation of generator foundation bolts	$2,000	$1,100	314.33
1	ea. installation of foundation bolts for rotor erection pedestal floor plate	750.00	$1,100	113.28
1	L.S. installation and touch-up painting of draft tube stop logs	$22,000	$75,000	$20,394
1	L.S. installation and touch-up painting of trash racks	$65,000	$230,000	$17,333
1	L.S. hoisting intake gantry crane to intake deck	$4,000	$19,000	$3,979
1	L.S. furnish basket hoists for temporary fish hoists	$30,000	$16,000	$15,074
1	L.S. install and remove basket hoists for temporary fish hoists	$7,000	$8,000	$2,005
170,000	lb. furnish structural steel for metal work for temporary fish hoists	.20	.18	.36
170,000	lb. install and remove structural steel and metal work for temporary fish hoists	.09	.08	.104
11	MFBM furnish lumber and timber for temporary fish hoists	220.00	130.00	162.45
11	MFBM install and remove lumber and timber for temporary fish hoists	200.00	160.00	417.09
70	cu. yd. furnish, install and remove concrete for temp. fish hoists	65.00	82.00	113.36
1	L.S. furnish pumps for temporary fish hoists	$77,000	$92,000	$76,447
1	L.S. install and remove pumps for temporary fish hoists	$4,000	$3,200	$3,422
1	L.S. furnish air compressors for temporary fish hoists	$3,500	$6,800	$3,606
1	L.S. install and remove air compressors for temporary fish hoists	500.00	$1,600	495.02
36,000	lb. furnish pipe and fittings for temporary fish hoists	.40	.40	.61
36,000	lb. install and remove pipe and fittings for temporary fish hoists	.35	.30	.15
1	L.S. furnish valves for temporary fish hoists	$30,000	$38,000	$46,262
1	L.S. install and remove valves for temporary fish hoists	$5,000	$2,400	$8,223
1	L.S. furnish pneumatic control system for temporary fish hoists	$2,500	$3,200	$2,295
1	L.S. install and remove pneumatic control system for temporary fish hoists	$1,500	$1,200	2,368
1	L.S. furnish and install tainter valve for Oregon-shore intake tower, complete	$21,000	$10,000	$6,656
1	L.S. sanitary sewer system on the Washington shore and water supply system to the bascule bridge guard house, complete	$10,000	$7,200	$4,577
1	L.S. furnish miscellaneous electrical work for temporary fish hoists	$25,000	$20,000	$15,602
1	L.S. install and remove miscellaneous electrical work for temporary fish hoists	$3,000	$10,000	$2,098

Alaska Road Construction

. . . Continued from page 76

gravel base under the present contract.

East of Tok Junction, there remains unpaved 90 mi. of the Alaska Highway which is under investigation at present. Contracts will be let this year for completion by the end of 1953. Much of this route lies in disintegrated granite with a severe shortage of gravel for base fills. However, due to the rolling terrain, it is likely that gravel base can be kept to a minimum without danger of frost boils damaging the finished highway.

The Tok Highway is under reconstruction by Alaska Road Commission forces. The southern half is complete to top of subgrade with a high standard of alignment and grade. This section will be advertised for plant mix surfacing in May 1951, allowing two years for completion. The northern section will be under construction this season, extending from Mile 25 south of Tok to Mile 75. Included in the work is a 9-mi. relocation near the Mentasta summit which will reduce substantially the total length of the Tok road. The southern portion of the highway has proved very difficult reconstruction being located in frost heaving silts. The middle and northern portions are in gravels and rock foundations.

Pioneer road jobs

The principal pioneer road jobs include the Forty Mile Highway extending from Alaska Highway at Tetlin Junction to Eagle on the Yukon River. This road is 160 mi. long, with 105 mi. completed to "feeder road" standards.

Much of the Forty Mile road is at high elevation following ridge locations. Drainage is not a severe problem except for a few locations on north slopes where frozen ground was excavated. At such places on steep side hills, it was necessary to open a high face in frozen ground, which exposed wet silt and lenses of pure ice. Seven major bridges have been provided along this route. The largest of these is the 300-ft. high truss span across the Forty Mile River, a narrow two-lane bridge removed from the Matanuska crossing of the Glenn Highway under the paving program.

The purpose of the Forty Mile Highway is to supply a group of gold mining communities in the Forty Mile region as well as to provide a connection to Eagle and Dawson City, Yukon Territory. Much new country has been opened to prospectors and homesteaders. The connection to Dawson has generated considerable travel between the territories, and it is apparent that easy communication will have an economic and military benefit.

A MAJOR maintenance shop of the Alaska Road Commission is located in Fairbanks.

A survey has been completed in the Fairbanks area for a pioneer road connecting Livengood with Eureka where a small highway now exists. The construction of the Livengood-Eureka road was scheduled for 1951 but has been delayed due to curtailment of funds. Other surveys in the Fairbanks area include a connection from Fairbanks to Nenana and McKinley Park, and a connection from Fairbanks to Chena Hot Springs. The surveys in this region have been supplied by contract flying service out of Fairbanks. Each survey party is equipped with wide track bulldozers for general reconnaissance work, for clearing trail and for towing equipment along the route packed on steel shod wanigan sleds.

Trailers on skids for camps

Recent camps have included skid mounted commercial house trailers in lieu of the canvas tents. This has greatly expedited movement of the crews. Formerly it was necessary for the men to travel long distances from their tent camp to the line each day. Now, with the skid-mounted house trailers, camp is moved almost daily and the men live close to the survey location. In order that contract flyers may land along the line delivering supplies or bringing personnel to the job, it has been the practice to construct rough landing strips, using the light bulldozers supplied for reconnaissance. Naturally level ground covered with light brush can be cleared and shaped for a landing field in about two days time. Ordinarily, the cleared area is about 600 ft. long and 100 ft. wide, sufficient to accommodate a small plane during good flying weather.

Pioneer road construction projects include a major highway from Paxson's on the Richardson Highway to Cantwell on the Alaska Railroad. This construction was undertaken in 1950. Some 50 mi. of new road was constructed working from both ends. Due to curtailment of funds, a minor extension of the work at the Cantwell end only will be undertaken this year. It is hoped to rough out the 25-mi. section connecting Cantwell with McKinley Park Station.

Narrow bridges being replaced

As a part of the reconstruction program, many single lane or narrow two-lane bridges are being replaced with full two-lane steel structures. The new bridges are designed for H-20 loading and are 24 ft. wide from curb to curb. Many temporary wood trestles are being replaced with permanent creosoted timber trestles designed for H-20 loading and full two-lane width. Just outside the city limits at Fairbanks, it is planned to construct three suburban bridges, each 30 ft., curb to curb. Such construction is essential to handling the greatly increased traffic from Fairbanks due to the rapid growth of the city and the military installations.

NEW EQUIPMENT

MORE COMPLETE INFORMATION about any of the new equipment or products briefly described on the following pages may be obtained at no charge. Send your request to Equipment Service, Western Construction, 609 Mission St., San Francisco 5, Calif. For quicker service, designate items by number.

★★

601

Kal-Truk adds dump control to front end-gate

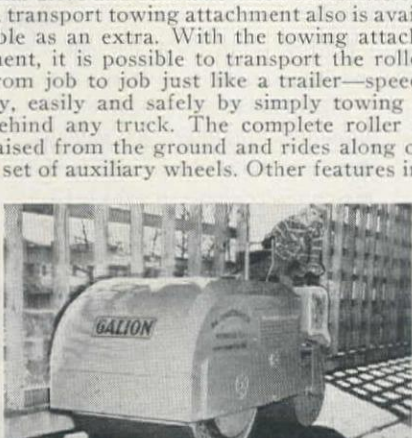
Features claimed: In answer to requests from contractors and industries, Kal-Truk can now be equipped with a dump control on the front end gate. This control door will allow easier pouring into small or narrow openings and is also desirable for discharging partial loads. The dump control is manually operated and may be opened or closed at any time. This new feature can be furnished for installation on trucks already in service.

Manufacturer: Kalamazoo Manufacturing Company, Kalamazoo, Mich.

602

Variable weight tandem roller

Features claimed: The new 3 to 5-ton Galion Variable Weight Tandem Roller has hydraulic steering, rugged spur gear final drive and constant-mesh transmission. A transport towing attachment also is available as an extra. With the towing attachment, it is possible to transport the roller from job to job just like a trailer—speedily, easily and safely by simply towing it behind any truck. The complete roller is raised from the ground and rides along on a set of auxiliary wheels. Other features in-



clude: twin-disc, over-center, forward and reverse clutches; combination service and parking foot brake; compression roll 48-in. in diameter by 42 in. wide and a 2-section steering roll 30 in. in diameter by 40 in. wide—all rolls can be ballasted with water. Rolls are fitted with mats and sprinkler system. Total metal weight of roller is given as 7,650 lb.

Manufacturer: The Galion Iron Works & Mfg. Company, Galion, Ohio.

603

Roadside brush slain by super mowing machine

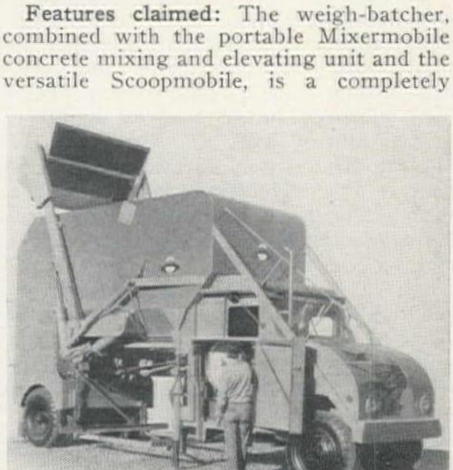
Features claimed: The hydraulically-operated cutting arm of this brush cutting machine levels brush and saplings up to 2½-in. diameter at rate of 1½ to 2 mi. per hour. The cutting bar can operate in 120 deg. of arc horizontally. The single operator replaces a whole crew of men. Speed of operation permits action on about 16 mi. of highway during a day. When the machine is enroute to a new assignment the cutting attachment folds back over the frame and the vehicle proceeds along the highway at a normal rate of speed.

Manufacturer: Hall Machine & Iron Works, Inc., Sedro-Woolley, Wash.

604

Portable unit serves as field concrete mixing plant

Features claimed: The weigh-batcher, combined with the portable Mixermobile concrete mixing and elevating unit and the versatile Scoopmobile, is a completely



portable field concrete mixing plant. A capacity of up to 50 cu. yd. per hour is claimed for the equipment. The unit weigh-batches aggregate on the job, when charged from the Scoopmobile storage piles or directly from dump trucks. Three seven-cubic-yard bins and a two-cubic-yard skip store up to 23 cu. yd. of aggregate. A single operator handles the portable unit which can be set into operation in 15 minutes.

Manufacturer: Mixermobile Manufacturers, 8027 N.E. Killingsworth, Portland, Oregon.

605

Tournadozer gets torque converter, electric control

Features claimed: Super C Tournadozer is now available with torque converter and electric control. The torque converter is a single-stage type, which acts as an automatic hydraulic transmission, combining the advantages of a hydraulic torque converter and a hydraulic coupling. It transmits and selects the proper ratio for delivering power in a steady, even flow to the wheels, and provides a shock load cushion between the engine and the drive wheels which allows the engine to operate at maximum rpm. Lugging of the engine is eliminated. Gears in the constant-mesh, air-actuated Tournamatic transmission are controlled by electro-magnetic valves placed in the air lines going to the clutches which engage the transmission gears. These valves are controlled by 4 push-pull finger tip switches mounted on the dash panel. In addition, electrically-controlled steering is now accomplished by use of a toggle switch mounted on the control panel.

Manufacturer: R. G. LeTourneau, Inc., Peoria, Ill.

606

Improved flow interlock offers finer differential

Features claimed: The new design of this flow interlock, which responds to a flow of water to open or close any electrical contact, includes a finer differential, union fitting at both ends, a bronze piston, reduced size and weight, simpler adjustment and more wiring space. In operation, the device

closes a contact when the flow falls below the preset amount. It acts like a fuse in a circuit which depends upon water cooling for protection. The interlock can be used as a safety device in many applications. One screw adjustment is needed to set the circuit for any flow from ½ gal. to 4 gal. per min. The flow differential between the cut-in and cut-out of the electrical contact is 0.1-gal. maximum. Though the interlock does not control the amount of water flow, this can be accomplished by installing a throttling or regulating valve ahead of the device.

Manufacturer: General Electric Co.'s Control Divisions, Schenectady, N. Y.

607

Non-seize thread compound beats obstinate problem

Features claimed: Seizure of pipe, bolt and stud threads and gasket faces is eliminated by a new metallic compound which combines the advantages of a lubricant and sealer. Led-Plate has effective results when used in temperatures from minus 350 deg. F., to plus 2,900 deg. F., and even higher. Metallic elements, of which over 70% is powdered lead, are held in suspension in hydrocarbons, and the materials will not dry out. The compound can be used for steam, gas, water, air, oil, ammonia and various chemical connections. A sample tube will be sent upon request.

Manufacturer: Armite Laboratories, 6650 Broad St., Los Angeles, Calif.

608

Sensitive control of fluid flow

Features claimed: Designed for more sensitive measurement and control of fluid flows in many industrial processes, this compact and lightweight transmitter has a continuously adjustable range from 0-20 to 0-200 in. of water (differential pressure) and provides this 10-to-1 change of range with no change of parts. Field calibration of any range is possible by the use of scale-type weights which eliminate the need for a water column. The mechanism operates on the pneumatic-balance principle without mercury. It employs an accurate weigh-beam system in which the differential pressure, due to fluid flow at the metering orofice, is continuously balanced by a pneu-

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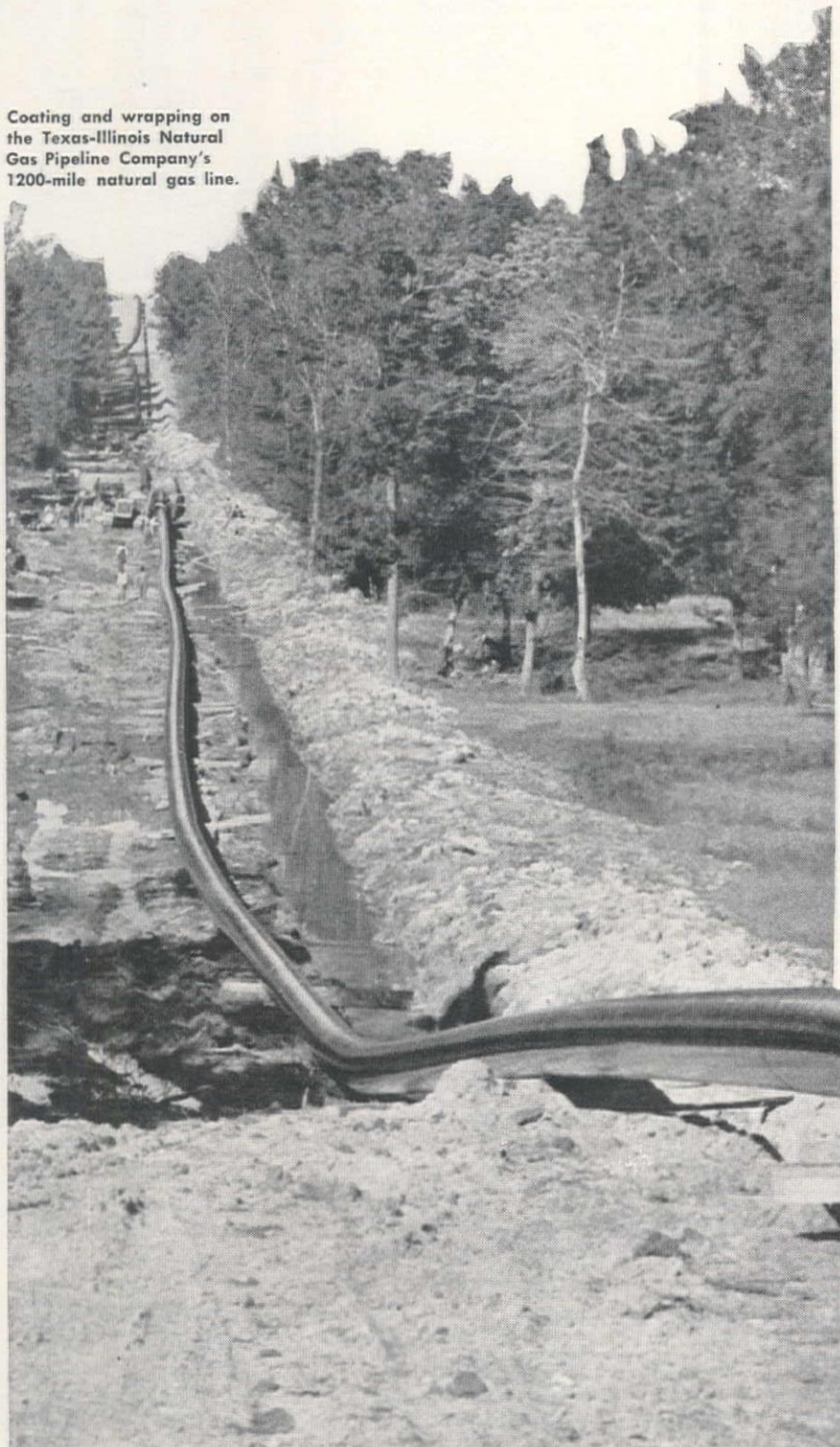

Coating and wrapping on the Texas-Illinois Natural Gas Pipeline Company's 1200-mile natural gas line.

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matic pressure. This pressure becomes a measure of the fluid flow and is connected to a recording or controlling instrument. Extremely fast speed of response to rapid changes in flow is the prime feature claimed for the Differential Converter.

Manufacturer: Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Wayne & Windrim Avenues, Philadelphia 44, Pa.

609

Neoprene can now be applied as a protective coating

Features claimed: Neoprene, the synthetic rubber, can now be applied as an airdry protective coating for maintenance work on structural steel, concrete, wood and exterior surfaces of tanks and equipment. Applicable with brush or spray gun in a single coat of 5-10 mils thickness. Neoprene has resistance to oil, grease and chemicals; resistance to age-cracking by sunlight, weather and ozone. It is resilient, elastic, and has a high order of abrasion resistance.

Manufacturer: E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

610

"Long-Bowl" rope socket will not crush

Features claimed: The manganese steel Long-Bowl rope socket has wedge and socket grooves corresponding to the correct rope diameter, thereby preventing distortion and crushing of rope. Increased wedge angle also guards against damage. Ample clearance between the wedge and socket bowl assures a firm pressure on the rope. Sockets in sizes up to and including 1⅛ in. accommodate two rope sizes using the same wedge. Sizes 1¼-in. to 2⅝-in. use wedges individually varied in eighths of an inch to accommodate specific rope size.

Manufacturer: Electric Steel Foundry Company, 2141 N.W. 25th Ave., Portland, Ore.

611

Speed truck is designed for fast material handling

Features claimed: The Model 2500 speed truck is of rugged construction and capable of carrying a heavy load. High maneuverability is assured by three speeds forward

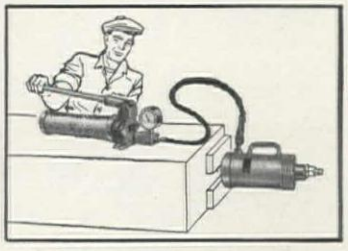
and one reverse. The truck is driven by a 2-cylinder 13-hp., air-cooled Wisconsin engine designed for dependable service and economy. The deck loading area has more than 20 sq. ft., with space beside the driver's seat for long material.

Manufacturer: Kalamazoo Manufacturing Company, Kalamazoo, Mich.

612

"Center-Hole" pullers simplify hard jobs

Features claimed: "Center-Hole" construction in new Simplex Re-Mo-Trol remote control hydraulic rams simplifies many difficult jobs, such as pulling axles, pins and liners, shafts, and prestressing concrete, by eliminating most of the rigging usually needed. Tubular ram construction



allows a center pulling screw or rod to be inserted through the center-hole and secured to the object to be pulled. As the ram plunger extends, the rod is drawn through the ram, which supplies its own back-up. Can also be used with pulling brackets and lateral pull rods, shoring applications, lifting equipment, etc.

Manufacturer: Templeton, Kenly and Company, 1020 S. Central Ave., Chicago, Ill.

613

Building block with effective water resistance

Features claimed: The result of extensive research and tests, Lite-Rock has withstood its first commercial installation successfully. Resistance to the absorption of water made much stronger mortar joints

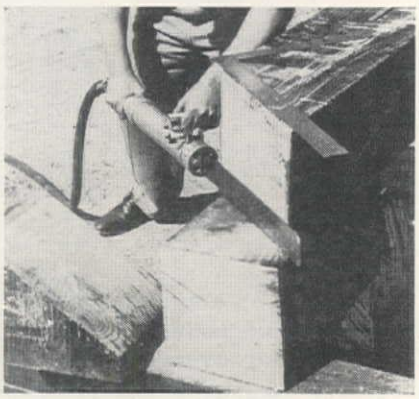
with no evidence of either cracking or crumbling. The new block is manufactured from expanded shale aggregate, and its lower absorption gives a much higher insulation value.

Manufacturer: Empire Building Material Co., Portland, Ore.

614

Precision power saw has new design approach

Features claimed: The Wright Precision Power Saw is a completely new approach to the problems of power sawing ties, timbers and heavy piles in maintenance-of-way work. The saw weighs only 14 lbs. and operates from any track or patrol air compressor of 60 cu. ft. or over. The saw drives twin reciprocating blades over a 4-in. stroke



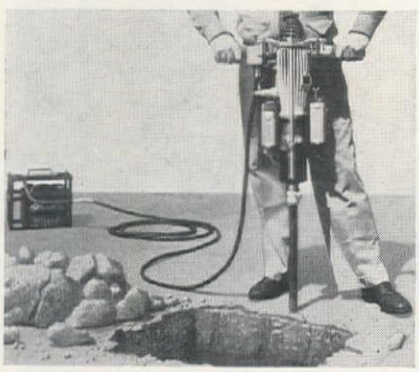
at 1,500 strokes per minute. Because of the dynamic balance derived from the opposed motion of the blades, the saw is definitely free-sawing; there is no thrust or torque during sawing—no kick on completion of cut. There is no limit to the saw's depth of cut, and the width of cut is limited only by the length of the 21-in. blades.

Manufacturer: Wright Power Saw & Tool Corp., 292 Longbrook Ave., Stratford, Conn.

615

Portable gasoline hammers have greater convenience

Features claimed: A new ignition, greater portability, and increased operating convenience, highlight the Portable Gasoline Hammer. Designed for use in the construction field and by municipalities for pavement breaking, rock drilling, spading, and tamping, the new hammers are dis-



tinguished by a simplified arrangement of parts made possible by use of a new and highly compact ignition coil vibrator-condenser assembly which is now located in the right hammer handle. This assembly weighs only a few ounces, and its position in the handle means the length of the high tension lead is reduced from ten feet to about five inches, making better ignition.

The vibrator is a continuous vibrating type which insures a faster initial spark and quick, easy starting under all weather conditions. The hammer requires no auxiliary equipment or power source other than the ignition battery. It is air cooled and gets its power from a single, two-cycle, full-floating piston.

Manufacturer: Barco Manufacturing Co., 1801 W. Winnemac Ave., Chicago, Ill.

616

Tractor, air compressor and backhoe combination

Features claimed: With the addition of this new Backhoe attachment, users will have a tractor, air compressor, and light backhoe combination all in one highly

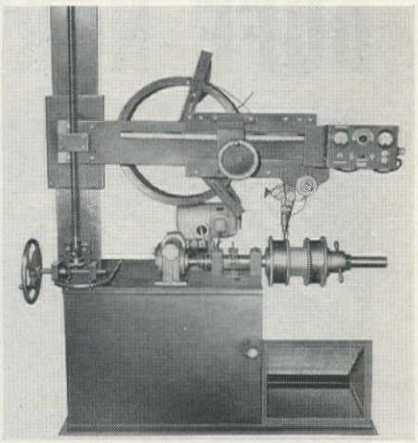
mobile unit. This unit will be of particular value on digging jobs too small to warrant heavy power shovels. With the Tractair's 105-cfm. air compressor capacity, air power for breaking pavement, frost, and later for clay spade work and tamping is readily available. The combination supplies all of the basic equipment needed for most small ditching jobs. The Backhoe attachment is a hydraulic unit, employing 12-in. to 22-in. buckets, digs to a depth of 7 ft., swings 60 deg. to either side of center to dump material and has a positive stop at center to assure straight line digging.

Manufacturer: LeRoi Company, 1706 South 68th St., Milwaukee 14, Wis.

617

Welding equipment to rebuild worn machine parts

Features claimed: Worn tractor idlers and rollers, shovel rollers and shafts, crusher cones, etc., can be rebuilt at a fraction of new part replacement cost by using the proper steel alloy welding rod with this new equipment. The equipment utilizes the submerged arc principle of automatic welding; an alternating current transformer



type welding machine in conjunction with a work positioner capable of handling conical or cylindrical equipment parts which weigh up to 750 lbs. All work is held on centers, which assures a concentric buildup of the worn part.

Manufacturer: Mir-O-Col Alloy Company, 312 North Ave. 21, Los Angeles, Calif.

618

Boom extension increases load travel of utility hoist

Features claimed: This 12-in. boom extension will increase load travel of the Unit Utility Hoist from 77½ to 97½ in. The increase in load movement permits special handling operations such as setting pipe, working in manholes, setting of water hydrants, reaching over obstructions and similar tasks. A new sheave attachment—optional at extra cost—increases load travel an additional 25%. Lifting is done by a wire cable which is secured to a clevis attached to the lower end of the hydraulic cylinder and run through a sheave at the boom end. Special widths of floor frames are also available for applications which require extra clearance.

Manufacturer: Unit Manufacturing Company, 1229 Harmon Place, Minneapolis, Minn.

619

1951 Fruehauf trailers have five major improvements

Features claimed: Fruehauf Stainless Steel Trailers offer the following improvements in the 1951 models: 18-in. spacing of stainless steel cross members; dropping the rear bumper ground clearance to 30 in.;

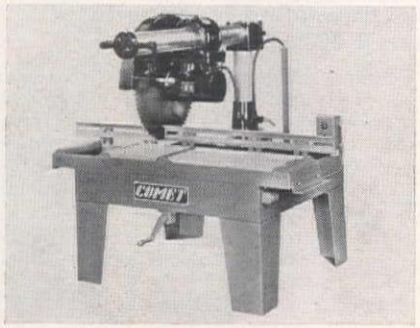
greater landing gear bracing; employment of twin tail and stop lights and use of an improved, self-contained sealed light unit for all clearance lights.

Manufacturer: Fruehauf Trailer Company, Detroit, Mich.

620

Pile and timber saw easy to handle as hand saw

Features claimed: The Comet Timber Cutter was designed primarily for use in mining, bridge building, shipbuilding and other heavy construction work. The saws are available in three sizes with 7½ or 10 hp., 1,800 or 1,200 rpm., 220/440-volt motors that swing blades to 44-in. in diameter. The saw assembly is mounted on a rigid arm of



hardened steel tubing supported by an adjustable steel column. Eight ball bearing rollers allow the saw to move forward and backward on milled tracks in this arm. Adjustment for depth of cut is made through a screw gear raising device, which raises or lowers the column. Adjustment for miter is made by rotating the column to the desired angle.

Manufacturer: Consolidated Machinery & Supply Co., Ltd., 2031 Santa Fe Ave., Los Angeles, Calif.

621

Gasoline-powered concrete cutting saw

Features claimed: The "Creeper Concrete Cutting Saw" is not dependent on any outside source of power. Functions indoors and out and its operation and transportation are a one-man job. Guide rails on the "Creeper" guarantee a smooth edged, straight cut and eliminate cutting blade breakage generally caused by side to side wobble or the application of off center pressure. The unit comes complete with a simple water hose attachment for use with diamond or specially bonded abrasive blades where dust suppression is required. Inexpensive abrasive blades are also available for dry cutting all types of concrete, asphalt or masonry.

Manufacturer: Martin Fireproofing Corp., P. O. Box 27, Kenmore Station, Buffalo 17, New York.

622

New device compiles, plots automatically

Features claimed: The automatic compiling of two measurements and plotting of a curve to show their interrelationship, namely: Y equals f (X), is made possible by a new electronic instrument. The instrument, the Brown ElectroniK function plotter, is said to incorporate two measuring systems, one of which actuates the recorder pen while the other motivates the instrument chart. The chart is driven up and down in response to changes in a second variable. The result is a curve which con-

tinuously evaluates one variable in terms of the other. Measurements over the entire curve are continuous; no interpolation is needed to complete data between points of measurement.

Manufacturer: Minneapolis-Honeywell Regulator Company, Brown Instruments Division, Wayne & Windrim Avenues, Philadelphia, Pa.

623

New "Payloader" with ½-cu. yd. bucket

Features claimed: This new size Payloader tractor-shovel unit, the model HAH, has a ½-cu. yd. bucket, front wheel drive, and a full-reversing transmission giving

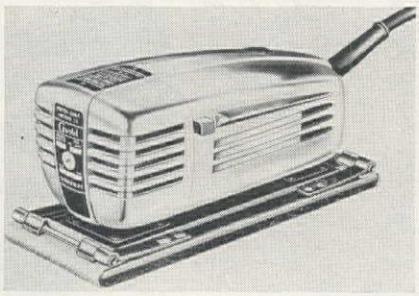
four forward and four corresponding but faster reverse speeds. Speedy and easy forward-to-reverse motion is provided by a separate directional shift independent of the regular gear shift. Top speed forward is 14 mph., and top reverse speed for carrying full loads is 23 mph. The rear wheel steer and compact, short wheelbase design assures utmost maneuverability and short turning radius for a machine of this size. Heavy duty engine is mounted on the rear to provide maximum capacity and stability. Heavy duty, hydraulic service brakes and full operator visibility assure safe and complete control for fast operation.

Manufacturer: The Frank G. Hough Co., 889 Seventh St., Libertyville, Ill.

624

New finishing sander features orbital motion

Features claimed: The new Porter-Cable Guild orbital motion sander is the answer to many finishing problems. Model 105 is



not a vibrator sander, but a powerful, motor-driven machine with two counterbalanced transmissions. In addition to its many woodworking applications, the Guild Sander has industrial applications in sanding metal and enamelled metal surfaces. The abrasive pad of this machine revolves in a 3/16-in. diameter orbit at 5,000 rpm. The compact sander is 9 in. long, 3 in. wide, and 3¾ in. high, weighs 5 lb., and has a removable sanding pad, which uses one-third of a standard 9 in. by 11 in. abrasive sheet.

Manufacturer: Porter-Cable Machine Company, Syracuse 8, N. Y.

625

Conveyor now raises bricks two levels

Features claimed: The Brik-Toter, designed to raise bricks one level, can now be made into a conveyance for raising bricks two levels by use of a simple connector. No sag or deflection results when these two Brik-Toters are bolted together and the two units become a single truss, 40 ft. long. Any of the usual masonry materials can be raised at least 20 ft. from the ground. The connector assembly is sold separately with the necessary bolts. Nuts are pre-welded in all Brik-Toters.

Manufacturer: Mar-Rail Conveyor Co., 560 York Ave., Pawtucket, R. I.

626

Plastic welding cover plate lasts 1,000 hours

Features claimed: Production costs can be cut by this new cover plate which will not warp or crack, is non-pitting, offers crystal clear visibility and has fine optical qualities. Standard size 2 in. by 4¼ in., will fit welding helmets and hand shields. The all-plastic plate will not discolor.

Manufacturer: General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia, Pa.

627

Concrete beam tester with direct reading

Features claimed: A new machine determines, by direct reading, the flexural strength of concrete-beam specimens having a cross section of 6 x 6 in. and sufficient length to permit testing on an 18-in. span.

One division (one one-hundredth of a revolution) on the dial of the gage indicates an applied load of 120 lb., which corresponds to a flexural strength (modulus of rupture) of 10 psi. When the width or depth of the specimen beam varies from the nominal more than 0.05 in., a correction factor must be applied. Correction factors for widths and spans varying from 5.75 to 6.25 in. are given in the instruction manual which is supplied with each machine. The machine has a maximum flexural-strength capacity of 1,250 psi. (15,000-lb. load). This machine is separable into three parts weighing 90, 70, and 35 lb.—a total weight of 195 lb.

Manufacturer: American Instrument Co., Inc., Silver Spring, Md.

628

Tractor-shovel on crawlers has integrated design

Features claimed: This new type tractor-shovel on crawlers is not just a front-end attachment for a conventional crawler tractor. It offers a complete and integrated

design, which means that the engines are mounted at the rear to provide maximum balance and stability. The operator is located high and forward where he has fullest visibility, and there is a special full-reversing transmission that provides 4 forward speeds and 4 corresponding, but faster, reverse speeds. The versatile machine has a bucket capacity of 1 cubic yard. Booms and bucket-dump are each controlled by a pair of hydraulic rams. The horsepower is 67 with either gasoline or diesel engine available.

Manufacturer: Frank G. Hough Co., 707 Seventh Ave., Libertyville, Ill.

629

New jack for spur and switch maintenance

Features claimed: A new Simplex single-acting jack, model 16A, speeds up and simplifies maintenance work on switches and spurs as well as temporary tracks used on construction projects. The jack has the very low minimum toe height of only 1½ in., so it can be placed under the rail without removing ballast. The large forged toe (2½ by 3¼ in.), stabilizes the load. The trip can be operated from either the right or left side. The new jack is 12 in., lift 6 in., and weighs 45 lb., and has a capacity of 15 tons.

Manufacturer: Templeton, Kenly & Company, Chicago, Ill.

630

Reciprocating refrigeration machines as a package

Features claimed: Designed for refrigeration use in the 100 to 150-hp. range are two models of reciprocating refrigeration machines. The machine is furnished as a complete package with compressor, cooler, and condenser, and all inter-connecting

piping, fittings, safety and capacity controls, gauge board, and cooler and condenser stands included. Unusual compactness of assembly reduces pressure loss to a minimum, guarantees better overall performance, and permits a wide range of application where space is critical.

Manufacturer: Carrier Corporation, Syracuse, New York.

631

High capacity conveyor at a low cost

Features claimed: Speed is one of the most important factors offered in the Light Weight Troughed Belt Conveyors of portable design for use in the construction field. Model 666 handles 75 yards of sand or

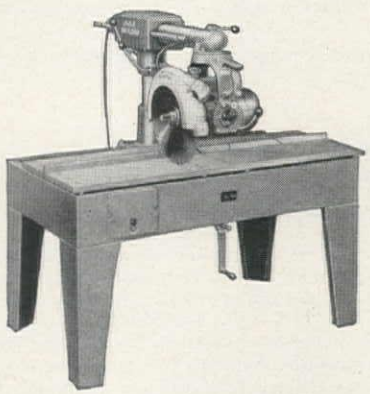
gravel per hour. The rugged machine also handles ore, lime, cinders—virtually every type of material handling job. Standard construction means maintenance-free operation. Standard equipment consists of a twin hydraulic boom hoist, underslung axle, slide trough, and a 14-in., 4-ply belt. Lengths from 14 ft. to 25 ft. are available —additional length upon request.

Manufacturer: The Fairfield Engineering Company, Marion, Ohio.

632

Complete woodworking shop in compact radial saw unit

Features claimed: Available with either manual or magnetic controls, the Skil Radial saw eliminates sawing bottlenecks,



leaving more time for actual sawing. Adjustment handles allow the operator to remain in one place and make all necessary changes and adjustments. Special stops eliminate guesswork, automatically set saw at more common cutting angles.

Manufacturer: Skilsaw Inc., 5033 Elston Ave., Chicago, Ill.

633

Two lubricating systems for Pioneer-Oro feeders

Features claimed: Heavy duty manganese steel pan feeders manufactured by Pioneer Engineering Works now have two lubricating systems available. Both systems

employ the use of tubing to all bearings for distribution of the lubricant. In one system, the tubing is brought out to one side of the feeder, and each bearing is individually lubricated through alemite fittings in which the individual tubes terminate. In the other system the tubing is brought out to one side and all tubes terminate in a central system, whereby all bearings are lubricated simultaneously from a pressure tank. Previously each bearing was equipped with an alemite fitting, requiring separate lubrication at each point. Pioneer-Oro feeders now have the option of three methods of lubrication from which to choose.

Manufacturer: Pioneer Engineering Works, Inc., Minneapolis, Minn.

634

Large guide plates for use on power chain saws

Features claimed: This 12-ft. chain guide plate and cutting chain solves many "big" cutting problems in the Pacific Northwest and West Coast areas. In addition to lumbering operations, the unit can be used in road construction and forest clearance. Two

men operating the unit can cut 12-ft. diameter timber, eliminating the need for large cutting crews working with hand saws, axes or smaller hand saws. The guide plate is interchangeable and can be quickly detached from the power unit when smaller sizes are desired.

Manufacturer: Mall Tool Company, 7725 South Chicago Ave., Chicago, Ill.

635

Preparation fights effects of concrete disintegrators

Features claimed: Excessive water conditions, oils, greases and acids, all active disintegrators of ordinary concrete, cannot easily bite through a minimum one-half inch application of Stonhard Stonpach. The preparation offers high resistance to these conditions and is easily applied when water is added to mix. A flint-hard surface results.

Manufacturer: Stonhard Company, 500 Stonhard Bldg., 1306 Spring Garden St., Philadelphia, Pa.

636

Portable disc sanders are light and compact

Features claimed: Two portable disc sanders which could be of help in certain building operations are now available. Model 460 is a heavy duty sander with 7-in. backing pad; 18 in. in length overall, not including pad, and weighing 14 lbs. Model

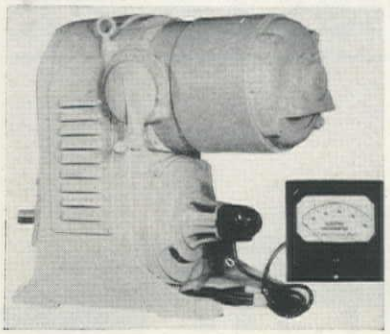
465 is a standard duty sander with 9-in. backing pad, measuring 18 in. without pad and weighing 14¾ lbs. Both models feature cast aluminum frame—light, compact; 3.4-hp. universal type motor, AC or DC, 115 volts standard, 220 volts special; precision-cut gears of finest steel, heat treated and polished for smooth, quiet operation and long life; sealed precision ball bearings throughout and a no-load speed of 4,200 rpm.

Manufacturer: Cummins-Chicago Corporation, 4740 N. Ravenswood Ave., Chicago, Ill.

637

Variable speed electric tachometer

Features claimed: Designed for motor applications that require continuous and accurate speed indication, an electric tachometer arrangement is now available. U. S. Varidrive motors are now available with R-1 tachometer and generator in ratings from ¼ to 50 hp., and speeds from 2 to 10,000 rpm. The sturdily built permanently lubricated, ball bearing type generator is coupled to the U. S. Varidrive and requires no other source of power. The tachometer indicator is entirely enclosed to prevent entrance of dust and other foreign particles, and can be mounted at distances up to 300 ft. from the Varidrive without affecting accuracy. The indicator dial shows operating speed as a per cent of the Varidrive maximum speed. By the use of a percentage indicator, the rate of production of a given machine is instantly available.



Manufacturer: U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif.

638

New truck crane offers strength, versatility

Features claimed: The Hopto TM truck crane has hydraulically-operated power take-off, or independent motor. It features a completely hydraulic hoist, boom and swing and can be mounted on all standard trucks 1½ ton or larger. The weight of the crane is 2,200 lb., and the swing is 180 deg. Capacity of the crane is 1,500 lb. on a 15-ft. radius. Greater capacities are possible with the addition of stabilizers. Lifting height is 23 ft. maximum, and the machine is designed for operation without the use of drums, clutches, brakes, etc.

Manufacturer: The Badger Machine Co., Winona, Minn.

639

Industrial stripers serve in restricted areas

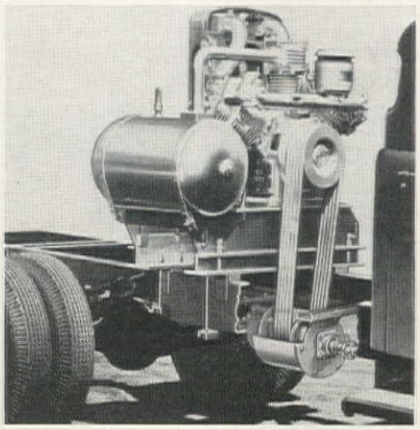
Features claimed: Marking safety lanes, aisles, restricted areas and parking lots can be done quickly and economically with this Model C Industrial Striper. Wheel-mounted for easy one-man operation, the unit works with equal efficiency on any smooth or rough surface, inside or outside. Exclusive "Air Curtain" feature provides a directed flow of exhaust gas against the edges of the spray pattern, assures clean, sharp lines without contacting the surface. Designed to permit striping within an inch or so, of walls, posts and other obstructions, and the stripe width is easily adjustable from 3 to 6 in.

Manufacturer: Kelly-Creswell Company, Xenia, Ohio.

640

Truck-mounted compressor with truck engine drive

Features claimed: For companies whose service and work crews use air tools Model 125 compressor is now available for truck mounting and truck engine drive. Unit mounts on any of five popular makes of 1½ and 2-ton rated trucks, adapts to special



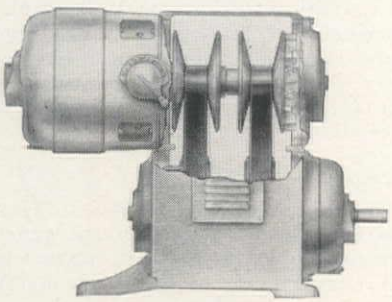
body designs, and derives power from the truck engine through a simple power take-off. First costs are said to be lower because there is no compressor engine and engine cooling system to buy; no engine-to-compressor clutch, trailer unit, fuel tank, battery, or towing hitch. The compressor furnishes 125 cfm. of 100-lb. air. It is capable of driving two heavy duty, or three medium duty, pavement breakers at full 90-pressure at the tools.

Manufacturer: The Jaeger Machine Company, Columbus 16, Ohio.

641

Variable speed motors with effective load distribution

Features claimed: These extra heavy duty motors for variable speed with ratings as high as 50 hp., have dual varibelts to carry the heavy load through the internal



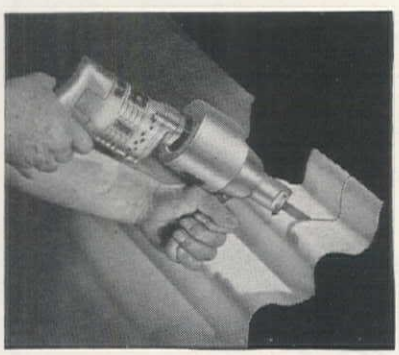
speed changing transmission. A tension control, known as Autotaut, is designed to counterbalance belt load. A calibrated spring is employed to maintain pressure between the two halves of the driven varidiscs and the sides of the belt. Use of dual belts does not affect the ease of changing motor speeds which is accomplished by merely turning a control dial.

Manufacturer: U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif.

642

Power saw attaches to electric or air drills

Features claimed: E-Z Saw easily attaches to electric or air drills, or flexible shaft for power. The unique mechanism of the unit converts the rotary action of the



power unit to a fast, reciprocating motion. By inserting an ordinary hack-saw blade in the holder, a fast power-saw is provided that will quickly cut through all metals including tough stainless steel, Monel and difficult corrugated stock, wood, plastics, composition and other material. Ideal for panel, notching and slotting operations. Can be quickly converted to a power file by simply inserting a machine file in place of cutting blade. Operates with rapid 7/8-in. stroke and is practically vibration free.

Manufacturer: E-Z Way Tool Co., 549 W. Washington St., Chicago, Ill.

Portable Paving Plants In Oregon

. . . Continued from page 92

Maintenance work with material mixed in these plants is carried out on sections of road that are in need of major repair. Operations usually begin in April and run though to the first of October. In the event there is an open fall and still work to be done the operations sometimes extend into November.

Prior to the beginning of the field season the fifteen maintenance superintendents survey their districts and submit reports as to the amount of work needed. The state budget for the work is then made up, based on the conditions of the roads reviewed in these reports and the amount of work required throughout the state.

The amount of material placed on the surface during this maintenance work depends of course on the condition of the road. Generally it is the amount necessary to bring the road up to a level surface. If the base of the road is good then a layer of from ½ to ¾ in. is applied to smooth the road.

At the beginning of maintenance operations on a section of the road the street foreman passes over the area and marks the spots to be patched. If needed, the road is hand broomed, and, if the area to be patched is large and needs brooming, a power broom is used.

A tack coat, of the same asphaltic material as used in the mix, is applied to the area to be patched. A line around the edge of the area is run with a sprinkling can and the remainder of the area sprayed with a power pump.

In the event the patch is small, about 2 or 3 ft. across each way, patching material is cast from the truck by hand, smoothed out with a rake and then rolled. For the larger patches the material is applied from adjustable spreaders mounted at the rear of the dump trucks, bladed with a motor grader and rolled with an 8-ton roller. The roller makes three of four passes over the patch. The rate of compaction allowed is ¼ in. for each 1 in. That is, if the road surface is to be covered with a layer 2 in. deep, then another ½ in., or 2½ in., are spread to take care of the compaction. As the operation proceeds rakers and shovelers keep abreast of the blade spreading the small windrows formed by the edge of the blade and generally smoothing out the material.

After the new surface has been rolled the tack coat crew returns and applies a seal coat, of the same asphaltic material, and spreads ¼-in. minus sand on top of the patch.

It is necessary for the road surface to be dry before the tack coat is applied. In the event rain falls on the tack coat the operation can still be carried out. As a rule a light layer cannot be successfully applied when the area is very wet. If the layer is to be thicker, or the larger amount of material is going to be applied to an oil surface, the rain has little effect as the heat from the new material will draw up the oil in the old surface causing adhesion or tacking.

Equipment for the road crew includes: 8-ton roller, seven 2-ton dump trucks equipped with adjustable spreaders (these trucks are also used to carry or tow equipment when moving), manwagon which also tows trailer carrying roller when moving to new location, one 2-ton flatbed truck for tack coat crew, 500-gal. hot kettle for tack coat crew, and motor grader.

The crew for both plant and road includes: General foreman, street foreman, plant operator, assistant plant operator, mechanic, scoop operator, kettleman, four on tack coat crew, roller operator, blade operator, seven truck drivers, two rakers, two shovelers, two flagmen and one timekeeper.

In addition to the new Madsen plant described in this article the Oregon State Highway Commission has two other Madsen plants, four Gurlinger plants, and three manufactured in the state shops.

Personnel

Operations of the Oregon State Highway Department are under the general direction of R. H. Baldock, state highway engineer. E. A. Collier is maintenance engineer. Foreman of the new Madsen plant is F. A. Starkey, with E. E. "Skinner" Walker as street foreman and Sam Gudmundson as plant operator. Procurement of the plants and equipment for the state highway commission is under the direction of Emil Halleck.

50 Years of Concrete Paving Equipment

. . . Continued from page 102

1920. Prior to that time, concrete for paving work was hand screeded. It was found that this work could be done more rapidly, more efficiently, more accurately and with a superior quality of finish, through the use of a mechanical finishing machine. The screeds of the modern finisher are adjustable for crowning, making it possible to change the crown while the machine is in operation. This is necessary on curves where the crown is eliminated and the surface of the pavement is made flat. The modern finisher can change from standard crown to flat crown when going into a super-elevated curve, and back from flat crown to standard crown, without stopping the operation of the machine. Vibrators can also be mounted on the finishing machine.

Use of over-all vibration of concrete for paving of roads and airports is coming into greater prominence and use. Spreader and finishing machines supplied to the Armed Forces for overseas use during World War II included the vibratory attachment, and most machines for export and use abroad are fitted with the vibratory attachment. In this country the use of over-all vibration for pavement concrete has not been adopted as a general requirement by the state highway departments, nor has it become general practice among contractors.

However, vibration makes it possible for the contractor to handle drier concrete than he could otherwise compact and surface, and at the same time obtain the production in yardage of slab which he requires from his crew.

Ready-mixed Concrete Plants

Due to the rigid enforcement of load limitation laws and regulations in most states, there has been a definite movement toward the design of truck mixers and agitators of substantially less weight (empty) and most manufacturers of truck mixers and agitators are working on the solution of this problem.

The weight reductions required are substantial and the problems for the design of this type of equipment involve the development of a unit of the lightest weight possible yet with strength and years of service built into it.

Latest innovation in the field of concrete paving is a machine developed in Iowa which functions as a combined spreader and finisher, laying a continuous 10-ft. lane of 6-in. concrete without the use of side forms. This slab is unreinforced and is laid at a rate of about 10 ft. per min. Runners along the sides provide forms, and the stiff mix of 2 to 3-in. slump is vibrated as placed. Base course preparation may be of any standard design and concrete may be supplied direct from mixer or by truck-mixer. Experimental sections of pavement were placed last year and the rights for developing commercial models were acquired by Blaw-Knox Co.

Model Specs for Cutting, Backfilling

. . . Continued from page 93

been completed or when directed by the Superintendent of Streets. The time limit for the replacement of temporary with final pavement shall be as indicated.

Section 13. Completion of Work by City. If the work is unduly delayed by the permittee, and if the public interests reasonably so demand, the Superintendent of Streets shall have authority, upon written notice, to complete the work or any portion thereof. The actual cost of such work by the City plus fifteen (15) per cent as an overhead charge shall be charged to and paid for by the permittee.

Section 14. Use of Area by City. At all times during the performance of the work the City shall have the right to use the area occupied by the permittee.

Section 15. Inspection and Inspection Fees. All work done by the permittee shall be inspected by the City and the permittee shall pay the City for such inspection. The inspection fee shall be fixed by the Superintendent of Streets but shall not exceed the sum of $20.00 per eight (8) hour day on days other than Saturdays, Sundays and holidays, and shall not exceed the sum of $40.00 per eight (8) hour day on Saturdays, Sundays and holidays.

Section 16. Notice of Completion. Notice of completion shall be filed with the Superintendent of Streets by the permittee within ten (10) days after completion of the work.

Section 17. Street Maintenance. For a period of two (2) years after the completion of the work the permittee shall exercise reasonable care in inspecting for and immediately repairing and making good any injury or damage to any portion of the street which occurs as a result of work done under the permit, including any and all injury or damage to the street which would not have occurred had such work not been done. By the acceptance of the permit the permittee agrees to comply with the above.

Section 18. Responsibility for Accidents. The permittee shall be responsible for all claims and liabilities for personal injury or property damage arising out of the work herein permitted or arising out of permittee's failure to perform the obligations under the permit with respect to street maintenance. In the event any claim or liability for damages for personal injury or property damage is made against the City, the City Council, the Superintendent of Streets, or any department, officer of employee thereof, the permittee shall and by acceptance of the permit agrees to defend, indemnify and hold them and each of them harmless from such claim.

The unified form for application for permit to excavate in streets developed in conjunction with the ordinance contains such standard items as location of work, purpose, dimensions of trench, depth of conduit below street grade, and commencement and completion of work. Spaces are also provided for such data as name of applicant, etc.

Item six on the form deals with pavement replacement. The types of pavement are listed as A, B, C, D, E, with instructions for the type of pavement to be used to be circled, and further instructions to consult plan for pavement limits if more than one type is to be used.

Below this item the types of pavement are defined as follows:

TYPE A: Class "A" concrete top course having a thickness equal to that of the existing concrete pavement (but not less than 6 in.) extending 3 in. beyond the edge of the trench on each side with a 6-in. crusher run base on a 12-in. cushion course.

TYPE B: 2 in. of plant mix surfacing using 85-120 asphaltic cement on Class "A" concrete slab having a thickness equal to that of the existing concrete pavement (but not less than 6 in.) and extending 3 in. beyond the edge of the trench on each side, on a 12-in. cushion course.

TYPE C: 4 in. of plant mix surfacing using 85-120 asphaltic cement with a 6-in. crusher run base on a 12-in. cushion course.

TYPE D: 2 in. of plant mix surfacing using 85-120 asphaltic cement with a 6-in. crusher run base on a 12-in. cushion course.

TYPE E: A 12-in. cushion course with the top given a treatment of bituminous material.

After the listing of the types of pavement there is a subtitle "Definitions," after which the following appears.

Class "A" concrete, plant mix surfacing and crusher run base shall be equal to that specified in the current Standard Specifications of the Division of Highways of the State of California.

Material for 12-in. cushion course shall have a plasticity index of not more than 6, American Society of State Highway Officials Test T-91-42, and a linear shrinkage of not more than 3%, American Society for Testing Materials Test D 427-39.

NEW LITERATURE

YOU MAY OBTAIN any of the publications reviewed below. Send your request to Western Construction, 609 Mission St., San Francisco 5, Calif. The literature is free, unless otherwise indicated. Please designate the desired items by number.

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643

42-page free booklet on clamshell bucket maintenance

Here is your chance to get 42 pages of practical and useful information on the maintenance and care of clamshell buckets. In this illustrated booklet of up-to-the-minute information on the proper use of clamshell buckets, with a list of common abuses to be avoided, **Blaw-Knox Company,** Pittsburgh, Pa., hasn't missed a thing. For operating men there is a section on bucket lips, which tells why they bow in or bend out, and detailed descriptions for straightening distorted lips. Illustrated instructions on repairing fractures, hard surface cutting edges and rebuilding worn cutting edges are included. "How to reeve the bucket for maximum efficiency" is another subject described in detail and illustrated for easy understanding. Prolonging bucket cable life and diagrammed instruction for the replacement of component parts are fully explained. This booklet is an ounce of prevention that will pay off in trouble-free service and eliminate down-time drag. For your free copy write to **Western Construction,** 609 Mission St., San Francisco 5, Calif.

644

Masonry maintenance, protection

In a fully-illustrated 20-page booklet, **Standard Dry Wall Products, Incorporated,** New Eagle, Pa., offers a complete description of three aids to interior and exterior masonry maintenance and protection. "Waterplug" is a hydraulic cement product which instantly stops water from running through masonry walls and floors. "Thoroseal," when used in conjunction with Waterplug, is a sealer which protects concrete and other masonry surfaces. "Quickseal," which comes in either standard gray or selected colors, is a brush-applied smooth finish. The Thoro System is the name given this treatment and a guide for designers and specification writers is included in the booklet to facilitate using the system against typical masonry flaws. Series of pictures are included to show water seepage problems solved by use of the products.

645

Dealer service

Containing illustrations and information to aid the Caterpillar owner in proper machinery maintenance, a 12-page booklet entitled "Look to Your Caterpillar Dealer for Dependable Service" has been released by **Caterpillar Tractor Co.,** Peoria, Ill.

646

Copper base alloys welding

A reprint, "Aircomatic® Welding of Copper Base Alloys," is offered by **Air Reduction Pacific Company,** New York, N. Y. This is a reprint of an 18-page article, which originally appeared in "The Welding Journal," written by Harold Robinson and John H. Berryman. It encompasses a general in-

vestigation into the weldability of several copper-base alloys with the recently developed inert-gas-shielded-metal-arc welding process. Mechanical properties of a few simple welded joints with a number of electrode-filler metals and several practical applications are included. The article is illustrated with 45 application and specimen photographs and charts. The text is further supplemented with 11 tables of test and specification data.

647

Water treatment unit

The Dorrco Hydro-Treator, a self-contained high-rate water treatment unit for the removal of hardness, turbidity, color and algae from municipal and industrial supplies, is fully described and illustrated in a 32-page, glossy-paper bulletin released by **The Dorr Company, Engineers,** Stamford, Connecticut.

648

Disc sanders described

Full details on two models of portable disc sanders for many practical uses are given in a new catalog of "Power Tools for Industry" just released by **Cummins Portable Tools,** Chicago, Ill. The heavy duty sander with 7-in. backing pad and the standard duty sander with 9-in. backing pad are explained in the catalog.

649

Concrete mixer improvements

A new 16-S Dandie concrete mixer catalog is now available from **Kwik-Mix Company,** Port Washington, Wis. The new bulletin accurately describes and illustrates all recent improvements made on the new three-bag capacity machine. Colors are used in the catalog which explains the improved construction features of the Model 16-S, including all-welded heavy-duty frame construction that resists twisting, coil spring mounting to balance the mixer and cast steel drum heads with machined roller path for smooth, extra life operation. Schematic drawings, listing detailed dimensions of the model are included along with specifications on the extension track and tower loader attachments.

650

Specs and uses of vibrators

Bulletin 511, issued by the **Stow Manufacturing Company,** Binghampton, New York, explains how the Stow line of high efficiency vibrators saves time and money by making possible earlier stripping and removal of forms, elimination of hand puddling and much patching, and earlier finishing of surfaces. Details on the entire line are included in this bulletin, which explains specific uses and specifications for each model. The 8-page bulletin is fully illustrated.

651

Corrosion-resistant fittings

Horace T. Potts Co., Philadelphia, Pa., offers a new 8-page booklet fully describing corrosion-resistant fittings. The booklet shows how light-walled Schedule 5S corrosion-resistant piping reduces the cost of a typical piping layout.

652

Electrical tape uses

More than 30 uses for four "Scotch" brand electrical tapes for construction and maintenance work are described in a new 8-page brochure from **Minnesota Mining and Manufacturing Co.,** St. Paul, Minn. It contains 33 photographs of applications such as the taping of lighting and communication systems, refrigeration equipment, relay cases, frequency changers, connectors, electric motors, bus bars, and others. Properties listed for each tape include color, thickness, tensile strength, elongation, adhesion, fusion, dielectric strength and constant, insulation resistance, power factor, and electrolytic corrosion factor.

653

Welding manual, 3rd edition

"Manual of Welding and Engineering and Design," released by **Eutectic Welding Alloys Corp.,** Flushing, New York, has become so popular that the company has issued a third edition. The latest edition covers additional information. Now included in this 50-page manual are articles on joint preparation by means of electric arc; additional design information; comparative data; new 1951 welding alloy developments; new Chemical Welding aids developed within the past year and many items of new procedural information.

654

Cut highway maintenance costs

"How to Stop Excessive Maintenance at the Source" is an informative bulletin just issued by **Armco Drainage & Metal Products, Inc.,** Middletown, Ohio. The bulletin explains how Armco subdrainage systems get at the cause of maintenance trouble. The systems drain harmful groundwater and keep it out. Light weight perforated pipe especially adapted for highway and railroad loading conditions is described, and other features of the Armco products appear in the illustrated folder.

Space is sold as advertisers' inches. All advertisements in this section are ⅛ in. short of contracted space to allow for borders and composition.

CLASSIFIED SECTION

Rates are $6.50 a column inch. Copy should be sent in by the 10th of preceding month if proofs are required; by the 15th if no proofs are required.

655

29 basic trailer models

In 52 pages of color and illustrated information, **Fruehauf Trailer Co.**, Detroit 32, Mich., offers a thorough representation of its 29 basic trailer models. Specifications and features of three different types of Aerovans, two types of stainless steel trailers, two refrigerator vans, two different corrugated trailer models, and many more models are described in full in the spiral-type, glossy-paper booklet No. 120. More than 300 nominal length variations are shown to be available from the 29 basic models, and standard gasoline tanker bulk capacities range from a minimum of 2,000 gallons to a maximum of 5,000 gallons, while tandem axle tank-trailer capacities on standard models range from 4,000 gallons to 6,500 gallons. Many more questions are answered in this 1951 edition of the Fruehauf's line "Who's who."

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