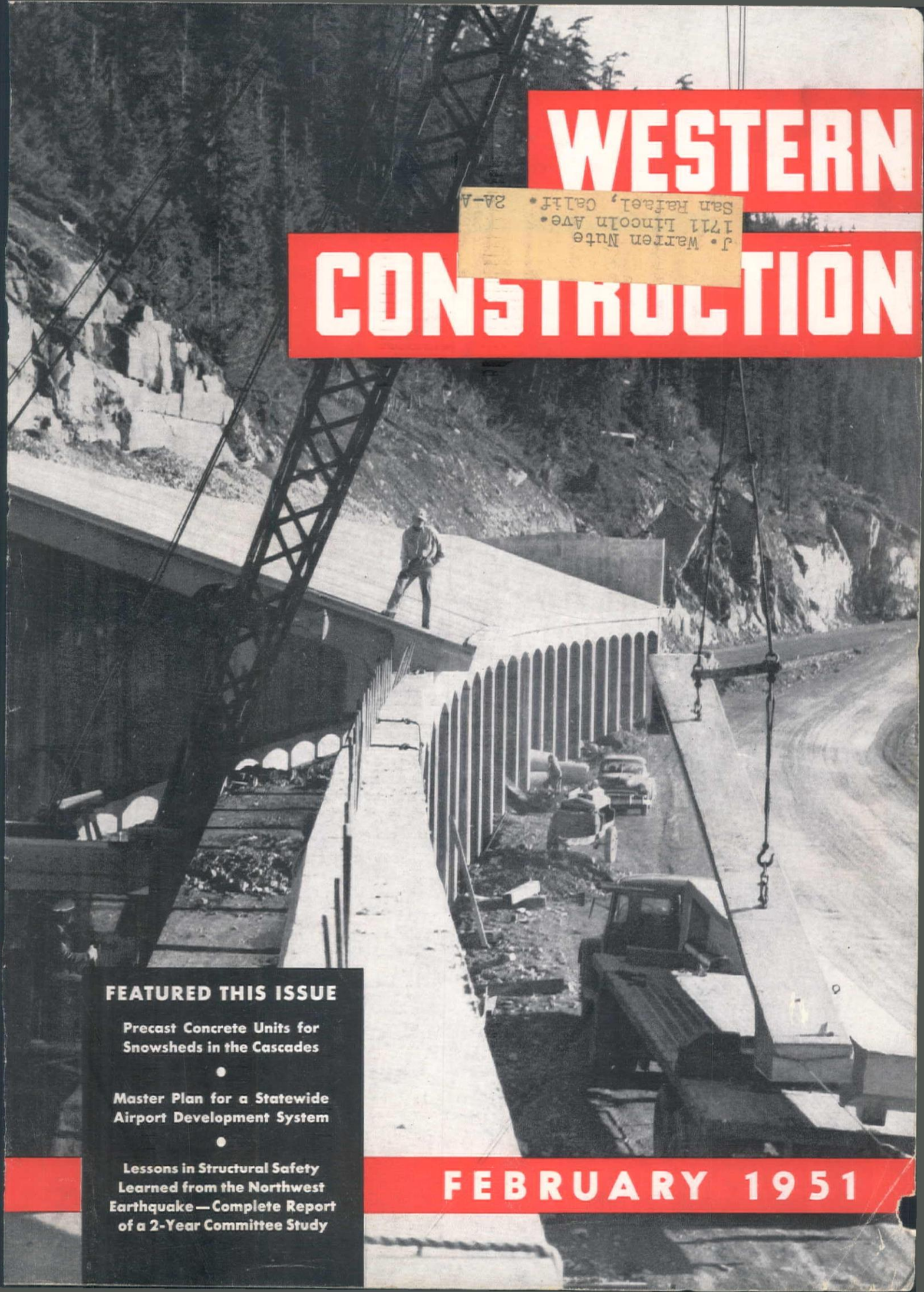
WESTERN CONSTRUCTION



FEATURED THIS ISSUE

Precast Concrete Units for Snowsheds in the Cascades

•

Master Plan for a Statewide Airport Development System

•

Lessons in Structural Safety Learned from the Northwest Earthquake—Complete Report of a 2-Year Committee Study

FEBRUARY 1951

COSTS ARE LESS

Photo courtesy Allis-Chalmers

...when engines are lubricated with TEXACO URSA OIL X★★

Your heavy-duty gasoline and Diesel engines will run better, perform more work, and last longer when they are lubricated with *Texaco Ursa Oil X★★*. Fully detergent and dispersive, *Texaco Ursa Oil X★★* cleans as it lubricates . . . assures lower maintenance costs.

Texaco Ursa Oil X★★ cuts down fuel consumption because it keeps rings free and valves functioning smoothly. Your engines deliver full power. *Texaco Ursa Oil X★★* stands up under heat and pressure . . . assuring maximum protection against wear and corrosion.

Other Texaco Cost-Savers:

1. *Texaco Marfak* — It seals itself in chassis bearings, seals dirt and moisture out . . . outlasts ordinary greases . . . requires fewer applications.

More than 350 million pounds of Texaco Marfak have been sold.

2. *Texaco Marfak Heavy Duty* — Offers full protection and economy in wheel bearings, requires no seasonal change . . . reduces maintenance costs.

3. *Texaco Track Roll Lubricant* — Assures longer service life for crawler track mechanisms . . . reduces wear.

A Texaco Lubrication Engineer will gladly show you the way to greater savings through Texaco's Simplified Lubrication Plan. 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

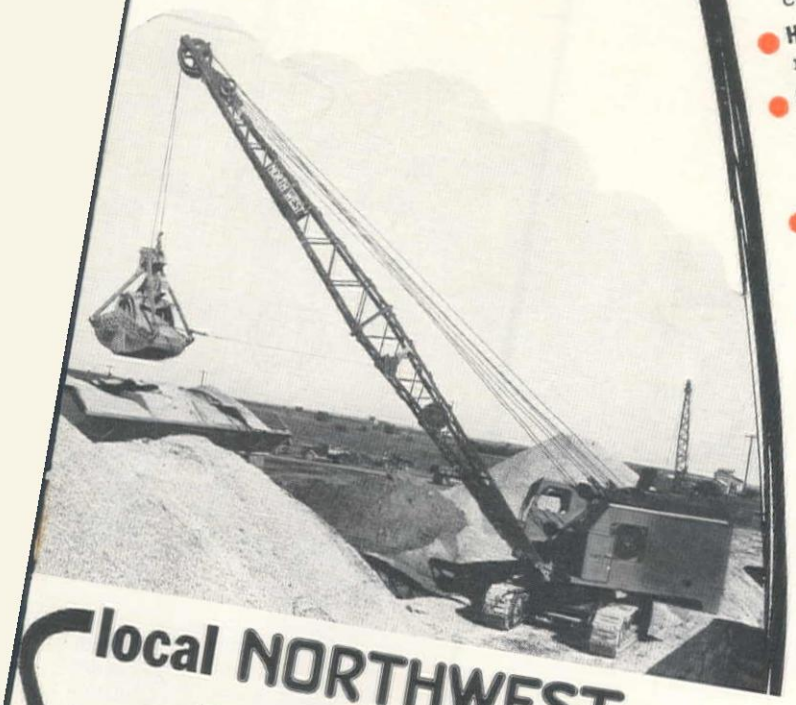
FOR ALL CONTRACTORS' EQUIPMENT

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

BETTER BUY... NORTHWEST!

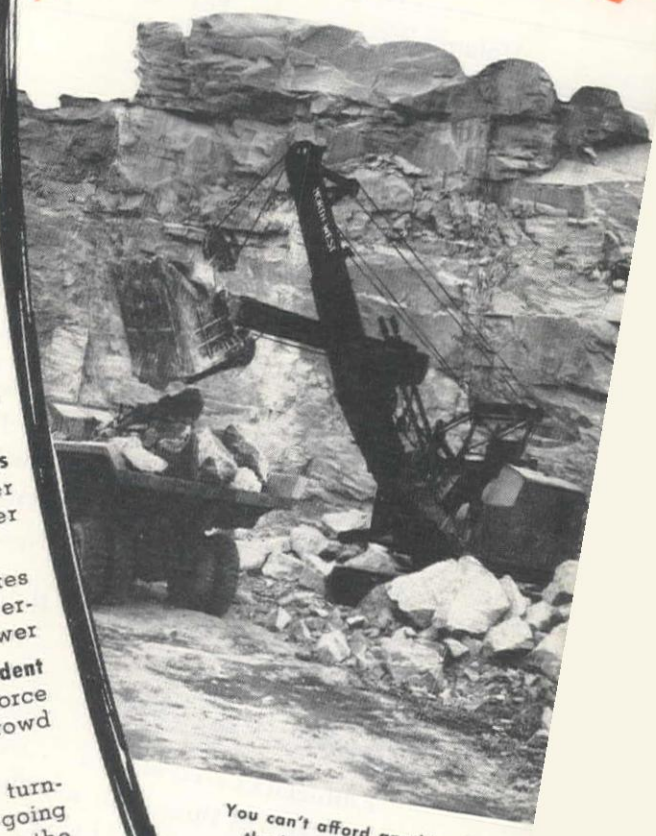
Here is but a part of the list of advantages that Northwest has for you — a list of advantages that puts Northwest far in the lead from the standpoint of low upkeep cost, ease of maintenance and high output.

They deliver the satisfaction that makes the Northwest the best for the heart of the job. Plan now to have one. Let us tell you more about why one out of every three Northwests sold is a repeat order.



- **Simplicity of Design**... Means easy, low-cost maintenance
- **Cast Steel Bases with Cast Steel Machinery Side Frames**... Plenty of strength — maintains shaft alignment
- **Easy Convertibility** ... Makes possible quick machine changes for any class of work
- **Ball or Roller Bearings on All High Speed Shafts**... Minimum loss of power to friction
- **"Feather-Touch" Clutch Control** ...Ease of operation without pumps, valves or tubing. Your Northwest can't be shut down because of control failure
- **Helical Gear Drive**... There is no finer power take off
- **Uniform Pressure Swing Clutches** ... Trouble-free — fewer adjustments — smoother operation
- **Cushion Clutch** ... Eliminates the effect of shock overload to parts under power
- **Northwest Dual Independent Shovel Crowd**... Utilizes force other independent crowd shovels waste
- **Positive Traction** while turning as well as when going straight ahead gives the larger Northwest the ability to travel where other types of crawlers have difficulty.

NORTHWEST ENGINEERING CO.
135 South LaSalle St., Chicago 3, Illinois



You can't afford anything but the best in the heart of the job. Specify a proved Rock Shovel and you'll never have to worry about any kind of digging.

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WESTERN CONSTRUCTION

Volume 26 **FEBRUARY 1951** Number 2

ARTICLES

DEPARTMENTS

FRONT COVER

A PRECAST concrete beam, 40 ft. long, swings up toward its resting place as part of the roof for the 500-ft. long Lake Keechelus snowshed at Washington's Snoqualmie Pass. C. V. Wilder Co. and Gaasland Co., both of Bellingham, Wash., combined to build this and a similar snowshed at a contract cost of $1,015,620. For a review of the project, see page 59.

The Construction and Civil Engineering Publication of the West

★

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B.F.Goodrich

Working on the levee with 33-ton loads —this job calls for Super Traction!

WORKING on a levee enlargement job, the bottom-dump Euclid shown above is being loaded with over fifteen cubic yards of fill dirt from a borrow pit. Add an equipment weight of 35,700 pounds and this king-sized load represents a real traction job. When you consider that the thirty-three tons must be worked over soft, sandy loam—you have a job for super traction!

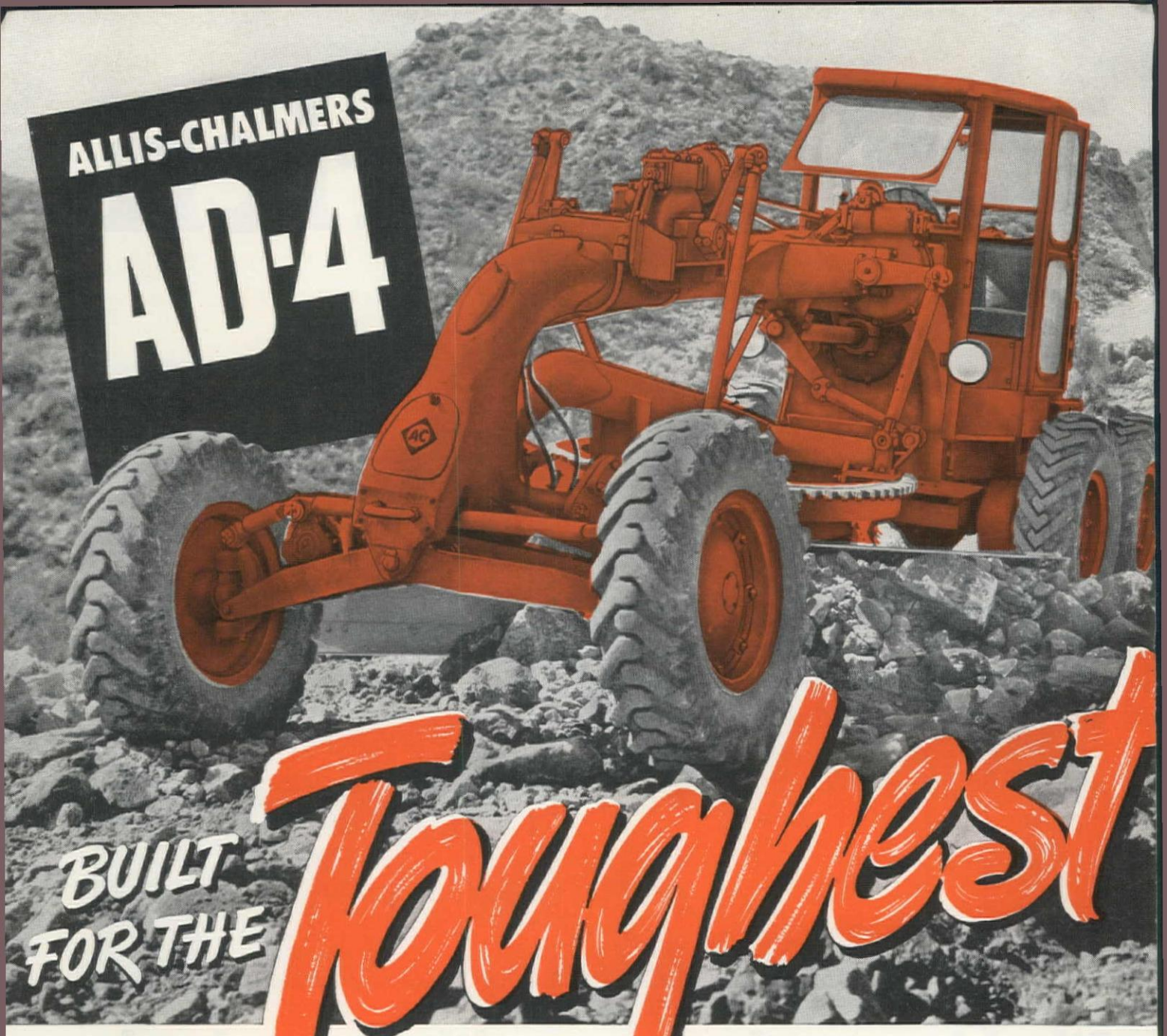
That's where the B.F.Goodrich Super Traction tire takes over. Notice the wide, deep footprint left by these tires—especially designed for jobs where real pulling power is needed in sand, loam, mud and soft dirt. The deep cleats take a big bite, yet this tire is built *wide* to "float" as it rolls. Designed for drive wheels, it serves equally well on free-rolling wheels in *reversed* position. That's the success story of the BFG Super Traction.

In addition to a longer-wearing tread compound, all B.F.Goodrich off-the-road tires offer you the exclusive protection of a *nylon shock shield* (double in the larger sizes). Layers of nylon cord are built into the tire between the tread and the rayon cord body. This shields the backbone of the tire against shocks and costly bruise breaks.

Such patented protection as the nylon shock shield is yours at no extra cost when the B.F.Goodrich brand is on your off-the-road equipment. There's a specially-designed, deep tread for every job.

See your B.F.Goodrich Dealer. Specify BFG tires for your new equipment. Enjoy the longer service and lower operating overhead offered you by *The B.F.Goodrich Company, Akron, Ohio.*

RESEARCH KEEPS B.F.Goodrich FIRST IN RUBBER



A HEAVY-DUTY MOTOR GRADER in every respect — designed and engineered to stand up under any going, to take more punishment, get more work done with less power effort. Some reasons for the AD-4's outstanding performance on every job:

POWERFUL—104 brake hp. . . . General Motors 2-Cycle Diesel Engine . . . dependable, compact, economical, instant starting.

HEAVY— 22,140 lb. effective weight . . . balanced for maximum traction and control.

STRONG—exclusive tubular frame . . . absorbs shocks, protects control rods inside frame.

ACCURATE— blade held firmly on work through direct down pressure . . . smoother cutting.

"ROLL-AWAY" MOLDBOARD — the moldboard that moves material the easiest way . . . by *rolling* it.

TRAVEL SPEEDS smoothly synchronized with operator controls . . . all the needed power applied as required.

HIGH CLEARANCE under circle and axle to handle bigger windrows.

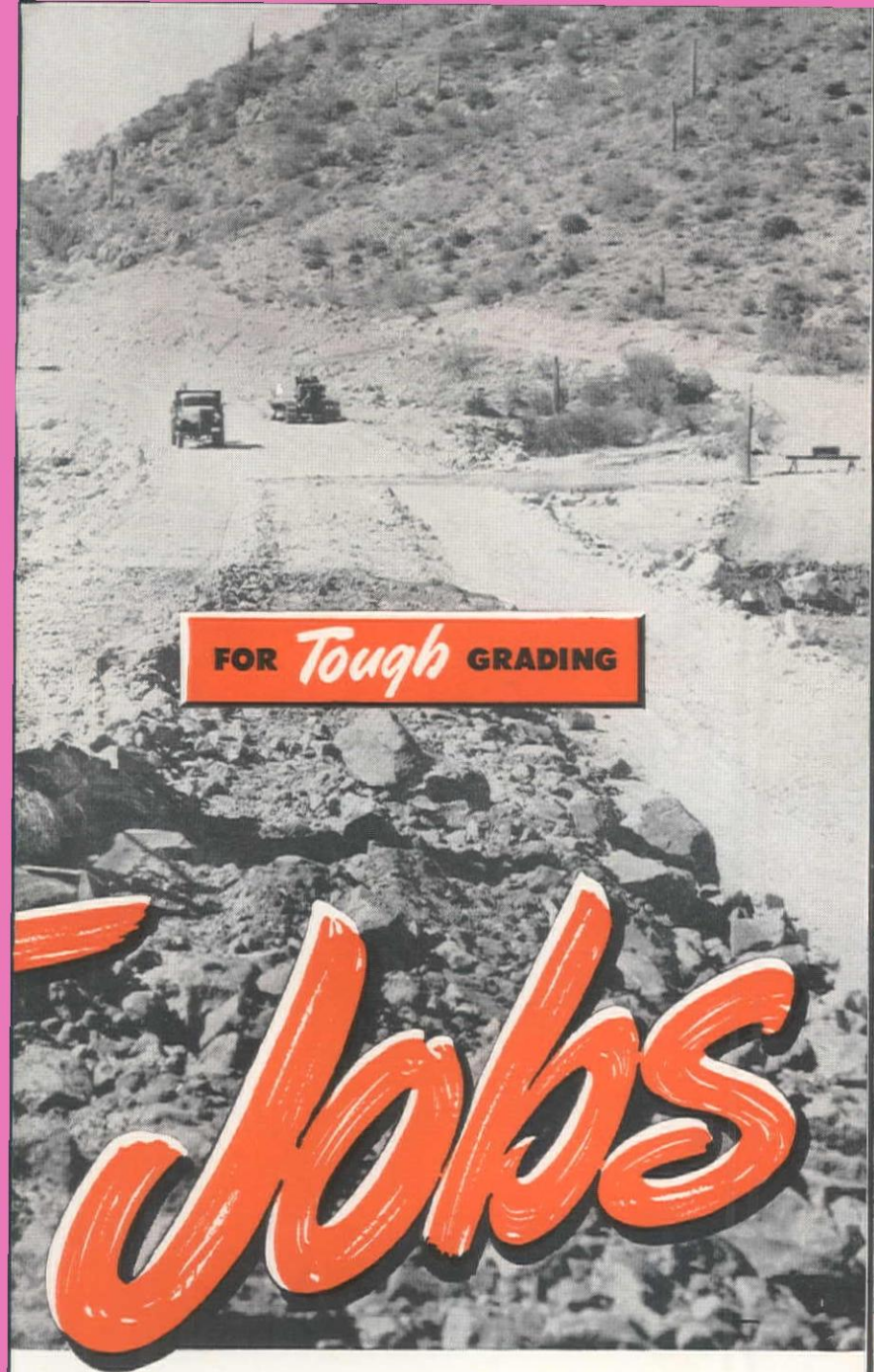
FULL CIRCLE REVOLVING BLADE—swings *ahead* of platform with plenty of end clearance.

FULL RANGE OF BLADE POSITIONS—plus leaning front wheels, for handling all types of grading with ease.

LIQUID-WEIGHTED TIRES ON DRIVING WHEELS puts more weight on the ground — *where it belongs* . . . enables you to work on steeper slopes. Better traction, smoother riding, less tire wear!

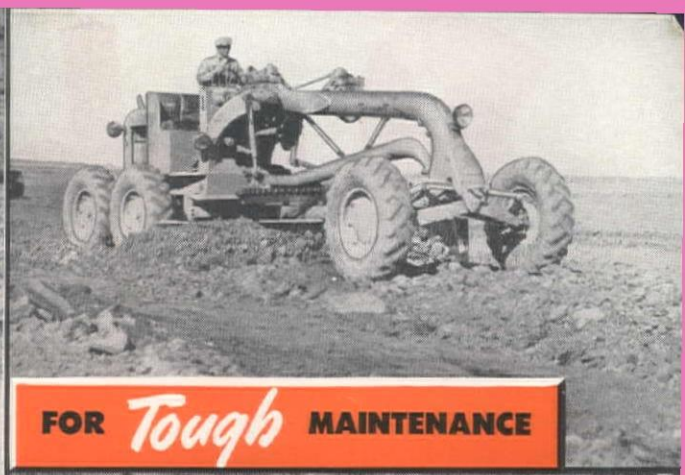
PLUS... easier steering, full visibility, larger clutch, numerous other advantages.

"Seeing Is Believing." **Get the full story from your Allis-Chalmers dealer . . . *NOW!***

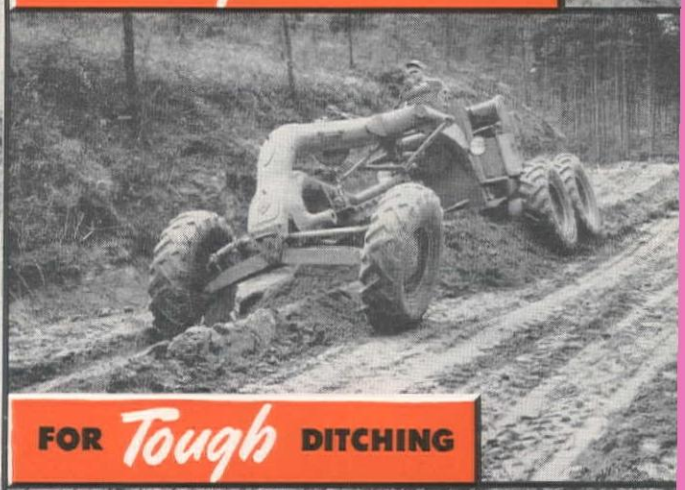


FOR *Tough* GRADING

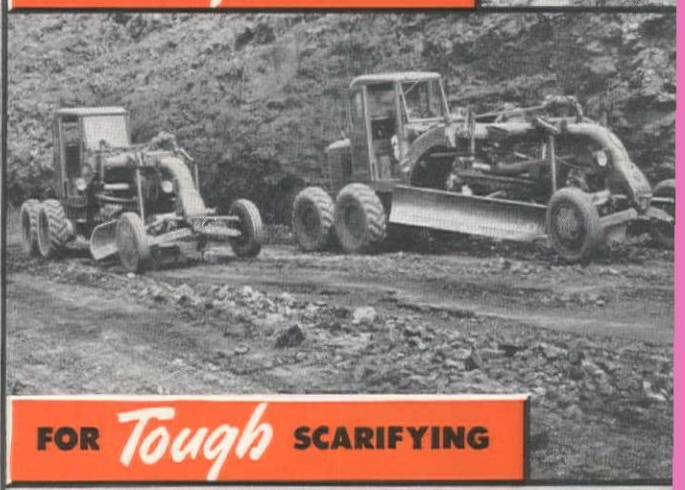
Jobs



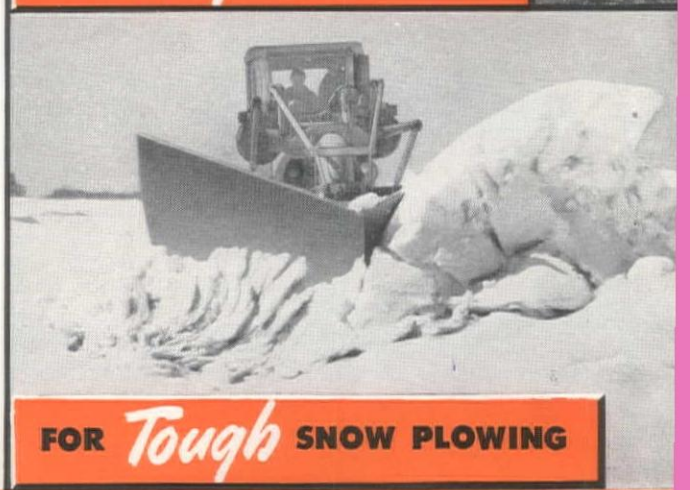
FOR *Tough* MAINTENANCE



FOR *Tough* DITCHING



FOR *Tough* SCARIFYING



FOR *Tough* SNOW PLOWING

CHOOSE THE RIGHT SIZE ALLIS-CHALMERS GRADER TO FIT YOUR NEEDS FROM THIS COMPLETE LINE

Model	Brake Hp.	Engine
AD-4	104	2-Cycle Diesel
AD-3	78	2-Cycle Diesel
BD-3	78	2-Cycle Diesel
BD-2	50.5	2-Cycle Diesel
D	34.7	Gasoline

"Roll-Away" is an Allis-Chalmers trademark.

see your ALLIS-CHALMERS dealer

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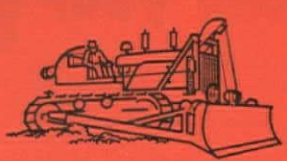
Pushover for

BOWLS OVER BOULDERS—Exclusive International fuel injection system automatically proportions fuel to meet changing load requirements, helps keep TD-24 from bogging down when going is really rough.



the Champ

The champ makes it look easy. The champ has the crowd with him. The champ takes on all comers.

What makes the champ the champ?

In a man it's guts, strength, skill and a fighting heart.

In the TD-24 it's gears, metal and go, translated into irresistible strength, stamina and "handle-ability."

Here are a few things that make the biggest job a pushover for the TD-24.

148 maximum drawbar horsepower—more than any other crawler.

Eight forward speeds, eight reverse.

Speeds up to 7.8 mph in either direction.

Synchromesh transmission—you "shift on-the-go."

Exclusive International push-button, all-weather starting.

Planet Power steering, finger-tip control for pivot turns, feathered turns, turns with power on both tracks plus instant shift up or down one gear without declutching.

Reserve torque to make the TD-24 hang on to overloads and walk away with as much as ten cubic yards on the blade.

The word is out on the "grapevine." At conventions, bid-openings, contract-lettings, contractors are telling each other how the TD-24 does more work with more speed—has more lugging ability—moves more pay-dirt faster than any other crawler on the market.

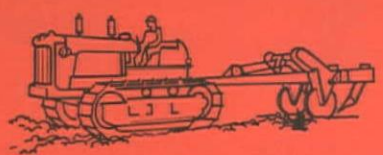
Want more facts . . . more proof? Ask your International Industrial Distributor for the low-down on the TD-24. You'll be a TD-24 man from then on in!

INTERNATIONAL HARVESTER COMPANY
CHICAGO 1, ILLINOIS

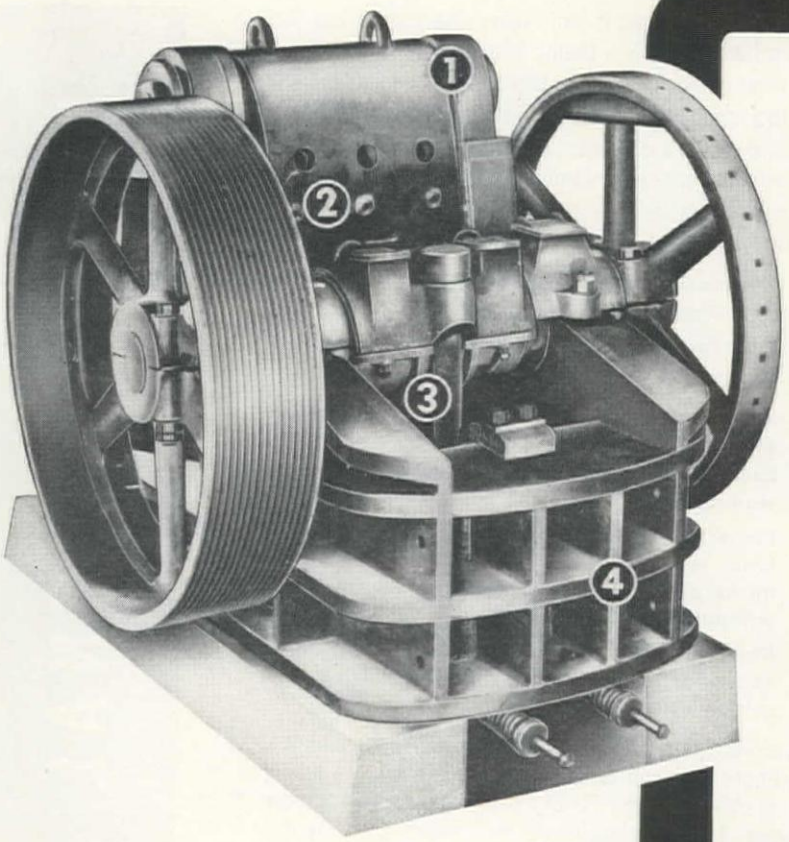
POWER THAT PAYS

INTERNATIONAL

INTERNATIONAL HARVESTER



Four construction features make A Traylor HB Jaw Crusher *best* for on-the-job aggregate production



SWING JAW SHAFT is locked securely in both sides of the frame. Swing jaw works freely with less wear. This patented Traylor construction reinforces frame and reduces maintenance.

CURVED JAW PLATES, outwear conventional straight plates 3 to 1 . . . produce greater tonnages of a finer, more uniform, product with less power.

BULLDOG PITMAN of known strength employs a unique safety device to avoid possibility of serious breakdowns and delays.

REINFORCED, WELDED STEEL PLATE FRAME for exceptional strength without excessive weight. This facilitates transportation, handling and erection.

The Traylor HB Jaw Crusher has established enviable records for economical primary crushing of a wide variety of materials. In its wide range of sizes, up to 56" x 72", you will find a Traylor HB that is ideally suited to your primary crushing requirements. Get complete details on this advanced primary breaker by mailing the coupon today.

MAIL COUPON
For Free HB Jaw Crusher Bulletin

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

Please send me full information that shows how the HB Jaw Crusher can reduce my operating costs.

Name _____

Company _____

Address _____

_____

West Coast Branch: 919 Chester Williams Bldg., Los Angeles, Calif.
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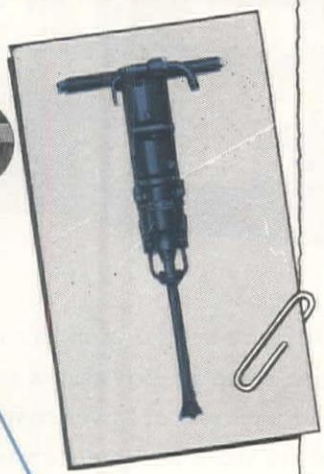
Traylor

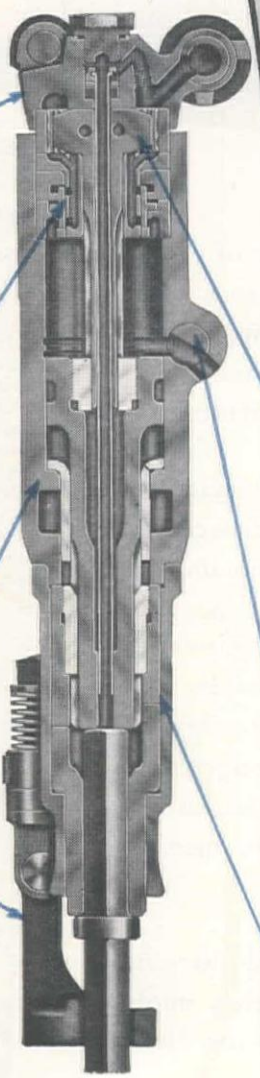
Rotary Kilns, Coolers and Dryers · Grinding Mills
Jaw, Reduction and Gyratory Crushers · Crushing Rolls

A "TRAYLOR" LEADS TO GREATER PROFITS

HERE'S WHAT WE PUT *INTO* A ROCK DRILL

...SO YOU CAN GET MORE *OUT* OF IT!





Combination Backhead for blast rod, air tube or water tube operation greatly reduces cost of change-over parts. Air-operated automatic water valve is optional on same backhead.

Jet Valve is instantaneous, positive-acting, end-seating. Thrown by a jet of air, it provides precise timing. Increased piston hammer velocity results in high drilling speed, low air consumption, strong rotation and easy holding.

Integral Cylinder. All hammer bores are ground in line at one operation, allowing piston hammer to run in true alignment. Replaceable bronze cylinder bushing maintains the front cushion.

Resilient Retainer. Yoke-type, held in replaceable hardened steel bushings and spring-cushioned to dampen vibrations when pulling drill rods. Easily opened and closed, can't wear the chuck housing, and has positive lock-on nuts.

Four-Pawl Rotation. Four reversible pawls give maximum service at four rotation speeds — extra fast, fast, slow, extra slow.

Independent Blow Control changes from drill to blow with ease. Full line pressure available for emergency blowing. Large diameter air tube assures strong, constant blow. Side outlet exhaust is possible with optional blow valve.

Three-Piece Chuck. Chuck, sleeve and nut. Replaceable bronze chuck nut held in a steel sleeve checks piston flute wear.

Worthington BLUE BRUTES *Have Everything You Need For Hard, Fast, Money-Saving Drilling*

With every detail designed to make air do more work, Blue Brute Rock Drills combine the ruggedest construction with the easy handling that goes over big with operators. The WS-55, illustrated, is right for average jobs. For lighter work, use the WS-45 — for heavy duty, the WS-30.

3 More Reasons Why There's More Worth In A BLUE BRUTE!

WB-34 Paving Breaker
Hardest-hitting, easiest handling breaker in the 35-lb. class. Ideal where the operator has to lift the tool frequently in guiding its work.

W-14 Clay Digger
Developed in the field by men with practical experience in clay, and thoroughly proved by long, rigorous job-testing.

W-8 Backfill Tamper
Medium weight, with simple horseshoe valve and ample oil reservoir. A good "walker" that does a finished backfill job, ready for immediate paving.

Immediate deliveries from your nearby Worthington Distributor
See him, or write us direct

BUY WORTHINGTON BLUE BRUTES

Worthington Pump and Machinery Corporation
Construction Equipment Sales Department
Dunellen, New Jersey

Distributors In All Principal Cities

WORTHINGTON

H1-1

Here's the *New*

BIGGER PAYLOADS . . . . . TROUBLE-FREE OPERATION LOWER INVESTMENT . . . . . GREATER PROFITS . . . . . .

LESS DEAD WEIGHT—By careful re-design every bit of excess weight has been eliminated to give you a Hi-Boy that is sturdy and strong and will let you haul bigger payloads at lower cost per yard. You can use a lighter, less expensive truck and reduce your capital investment without sacrificing Hi-Boy quality or performance.

NEW CHAIN DRIVE—Double-strand roller chain automatically compensates for misalignment between drum and drive shaft caused by operation over rough roads. Easy to lubricate and maintain.

NEW TRANSMISSION—This new Blaw-Knox engineered transmission is by far the finest ever put on a truck mixer. It is precision made to automotive tolerances, easy to shift, silent in operation, compact, sturdy and durable. This simple design has a total of only *seven* gears and consists of three self-contained elements that can be separately removed or replaced if adjustment or repair is ever required.

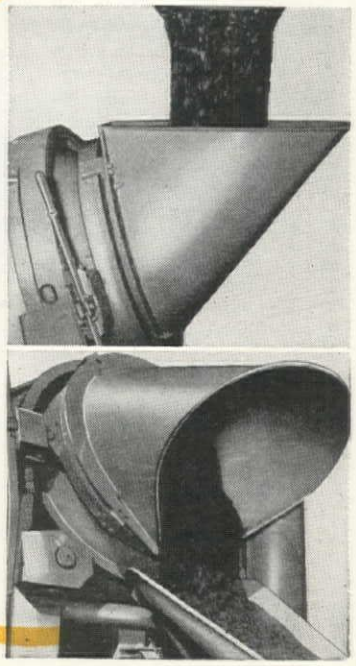
LARGER HOPPER OPENING—You get split-second charging through this new enlarged hopper opening. Completely unobstructed, it permits fast, free flowing of material into the drum.

NEW WATER VALVE—One simple 3-way, non-by-passing piston type valve permits flow of mixing water, flush water or complete cut-off controlled by a single handle. Fast operating handle moves only 6 inches for complete cycle. Valve locks in any position —cannot leak or vibrate out of setting.

the Revolving Hopper with the GUARANTEED SEAL!

The Blaw-Knox Hi-Boy is the only truck mixer with a seal GUARANTEED FOR ONE YEAR! It has the only rear end hopper that operates safely while submerged in concrete! It is the only truck mixer with a Revolving Hopper — the revolutionary feature that ends tail gate trouble *by eliminating the tail gate,* and permits faster charging and discharging of even zero slump concrete.

INSTANT CONTROL—A flick of the lever inverts the hopper for discharging or positions it for charging without any effort on the part of the operator. It's automatic!



A COMPLETE READY-MIX OUTFIT IN ONE PACKAGE from BLAW-KNOX *Material Handling and Storage, Batching Truck Mixers*

BLAW-KNOX

Division of Blaw-Knox Company
Farmers Bank Bldg., Pittsburgh 22, Pa.
New York • Chicago • Philadelphia • Birmingham • Washington • San Francisco

BLAW-KNOX *Hi-Boy*

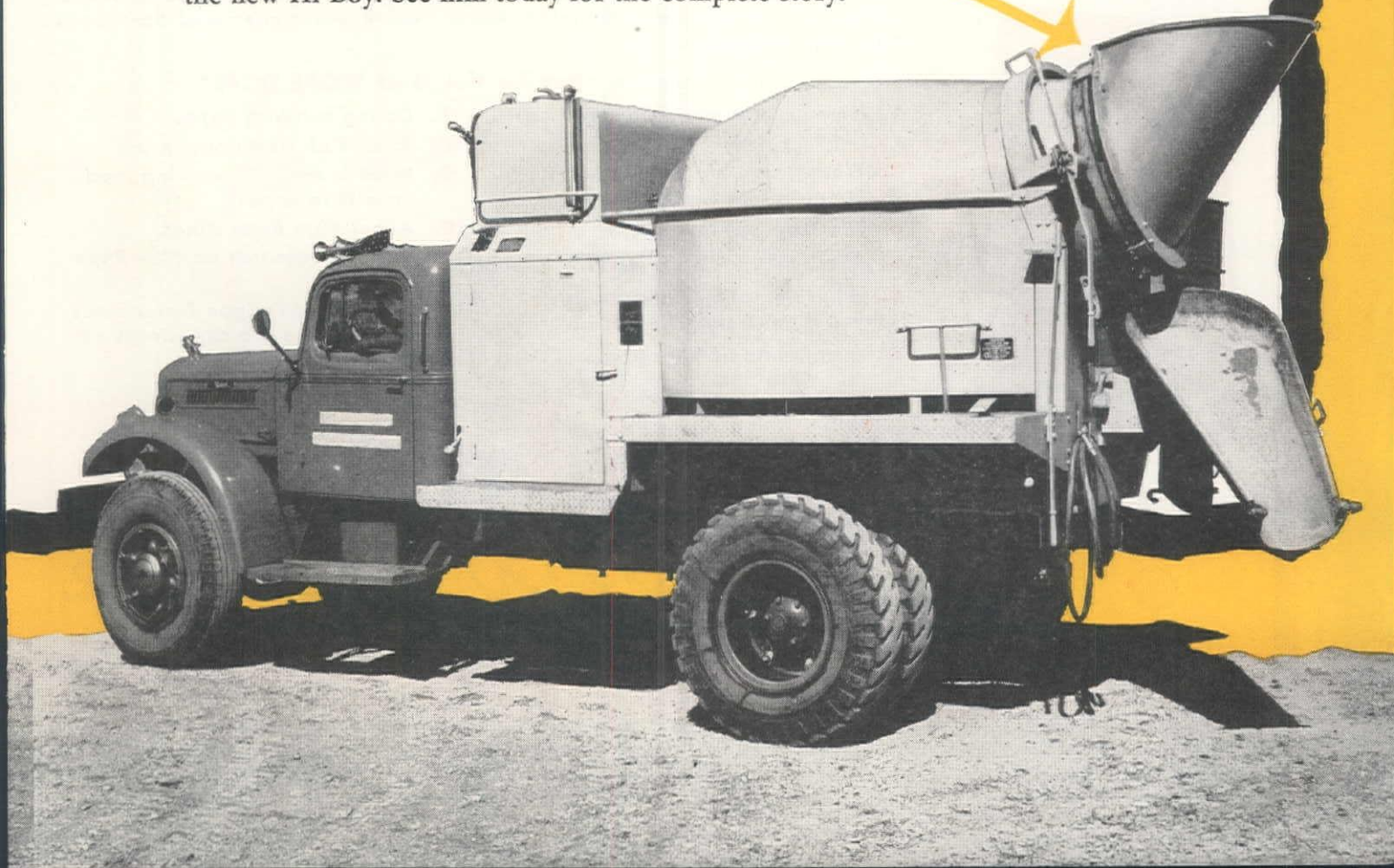
LITE-WEIGHT

TRUKMIXER

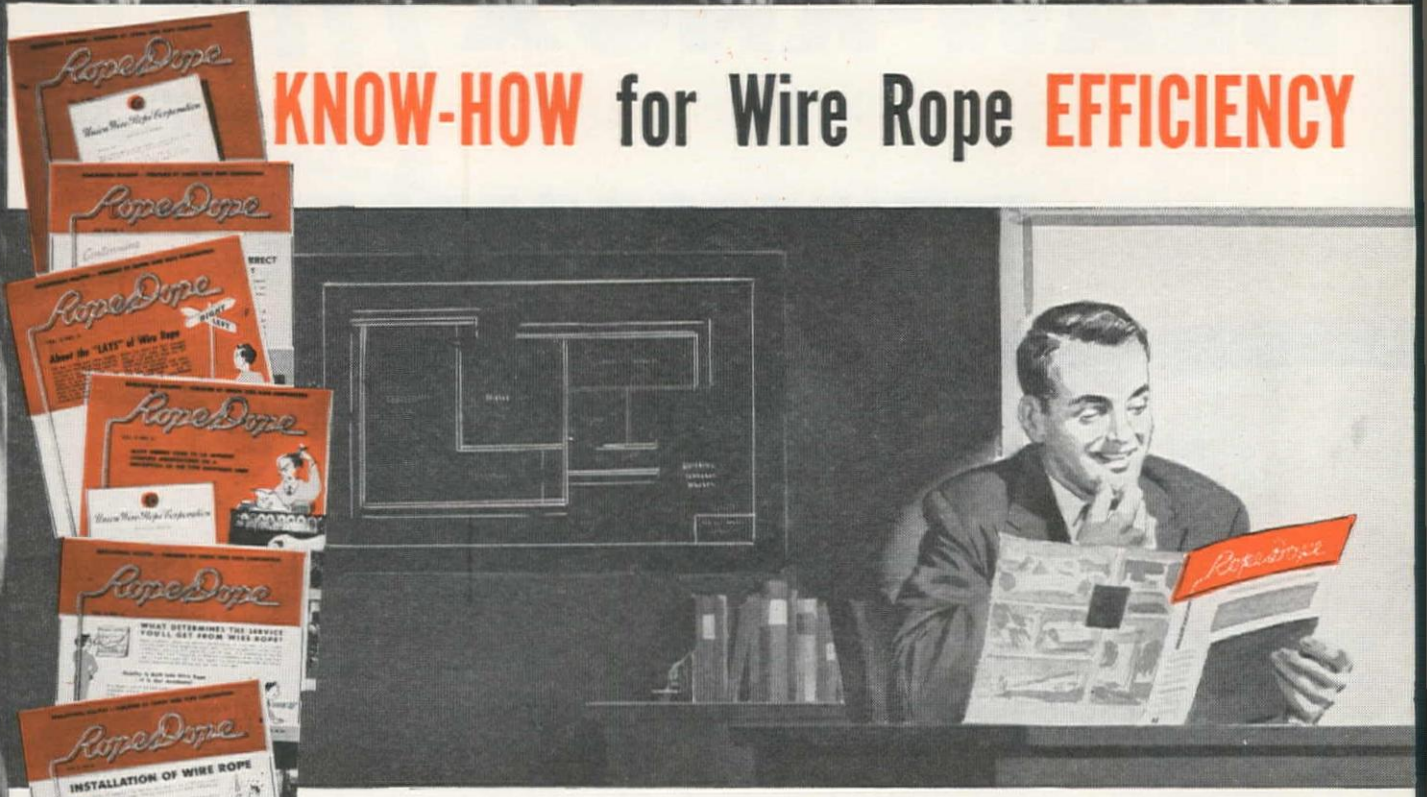
THE New Blaw-Knox Hi-Boy is the lightest weight of all standard complete truck mixers and yet it contains all the high production, low maintenance features of the revolving hopper design. This new truck mixer has been designed to reduce the weight of the 3-yd. model by a *full ton* and the 4½ yd. model by *half a ton* with no sacrifice of rugged Hi-Boy construction.

You Ready-Mix operators know the profit-per-yard advantages of lightweight truck mixer design—you can haul *maximum payloads* with a lower over-all capital investment, less operational cost, and without exceeding legal highway load limits. With the Hi-Boy Trukmixer, you get the fast charging, fast discharging features that speed your operations, plus the *guaranteed* seal that eliminates tail gate troubles and maintenance headaches.

Your nearest Blaw-Knox distributor will describe all the big-profit features of the new Hi-Boy. See him today for the complete story.



KNOW-HOW for Wire Rope EFFICIENCY



RopeDope INFORMATIVE BULLETINS HELP YOU *KNOW HOW* TO GET THE MOST SERVICE FROM WIRE ROPE

Valuable information which will help you select, install, use and care for wire rope to obtain the maximum efficiency on any type of operation is contained in the series of "ROPE DOPE" bulletins issued periodically by Union Wire Rope Corporation. *More than a million copies have already been distributed to wire rope users.* You should be on the list to receive them. If you aren't—send the coupon on the opposite page today!

Here are the titles for Vol. 3 of "ROPE DOPE"

1. *How to Determine the correct Wire Rope for replacement.*
2. *What grade of steel for Safety, Strength and Service?*
3. *The "Lays" of Wire Rope.*
4. *Specifying and ordering Wire Rope.*
5. *What determines the service you'll get from Wire Rope?*
6. *Installation of Wire Rope.*
7. *Caring for Wire Rope.*
8. *Abuses of Wire Rope in use.*
9. *What is the safe working load on a Wire Rope?*
10. *About Wire Rope slings.*
11. *Effect of research on Wire Rope service.*
12. *Accelerated Fatigue Tester measures relative life expectancy of Wire Rope.*

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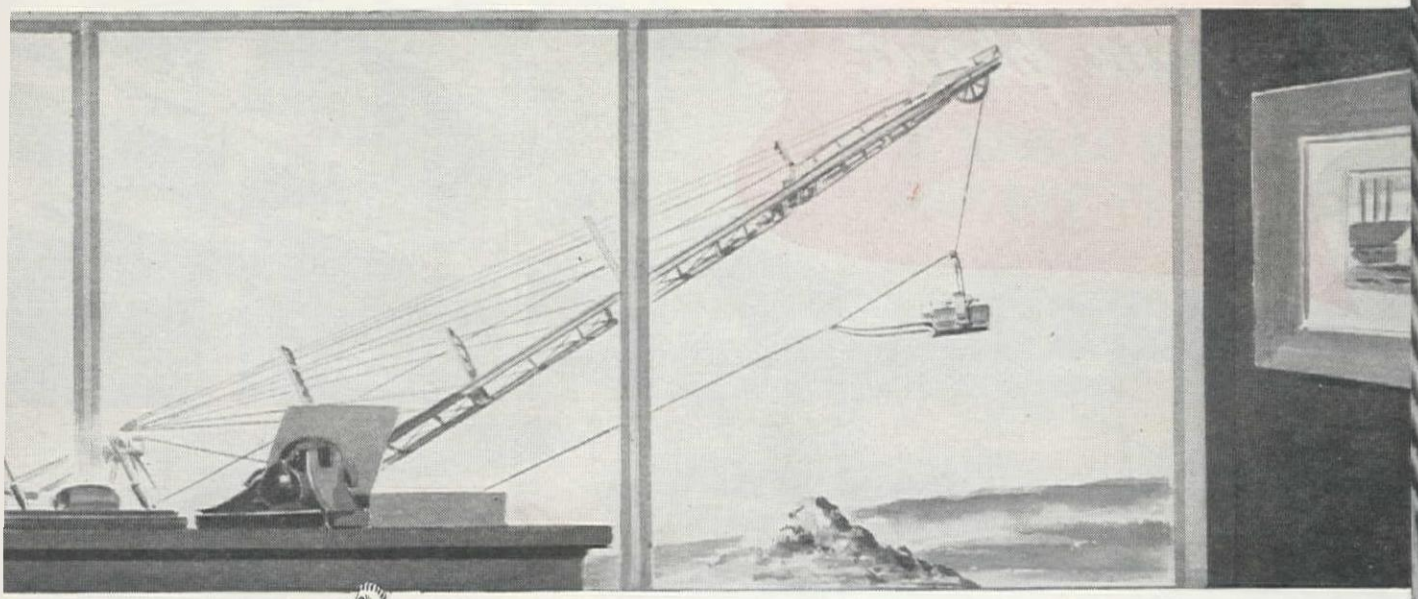
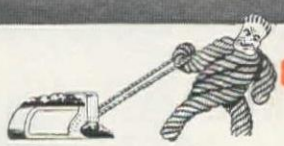
2146 Manchester Ave. Kansas City 3, Mo.

. . . SHOW-HOW for Wire Rope ECONOMY!





Tuffy® SLINGS, DRAGLINES AND SCRAPER ROPES *SHOW HOW* BUILT-IN EXTRA STAMINA MEANS ULTIMATE LOWEST COST!

Count the hours of service and the yards or tons of materials TUFFY special purpose ropes handle for you — the result will show you why TUFFY is the ultimate low cost wire rope for dragline, scraper and sling service. Designed for operations too tough for wire rope not specially constructed for special purposes, TUFFY draglines, and scraper ropes are super-strong, super-flexible and are built to resist the hazards of crushing, abrasion, shock and stresses.

The unique, patented 9-part interlaced wire fabric construction of TUFFY slings (available in 10 factory packaged types) will give you longer service, easier handling, greater flexibility, less damage from kinking and greater stamina.

IT'S EASIER TO ORDER TUFFY ROPES TOO—you can forget about complicated specifications. Just give the diameter, the length and the type TUFFY you need on dragline or scraper, and on slings also the type.

Tuffy CHOKER
Wire rope specially stranded and socketed for extra strength, stamina, flexibility required in logging.

Tuffy SLINGS
An entirely different, patented, interlaced wire fabric construction gives Tuffy Slings extraordinary stamina and flexibility. Factory Fitted.

Tuffy ROTARY LINE
Designed for jackknife and standard rotary rigs, Tuffy Rotary lines are the choice in all well drilling operations for ultimate drilling economy.

Tuffy SCRAPER ROPE
Test Tuffy's ability to handle extra yardage on the toughest scraper jobs. You'll change to Tuffy on your whole fleet!

UNION WIRE ROPE CORPORATION
2146 Manchester Ave. Kansas City 3, Mo.

Please put me on the mailing list for "ROPE DOPE" educational bulletins.

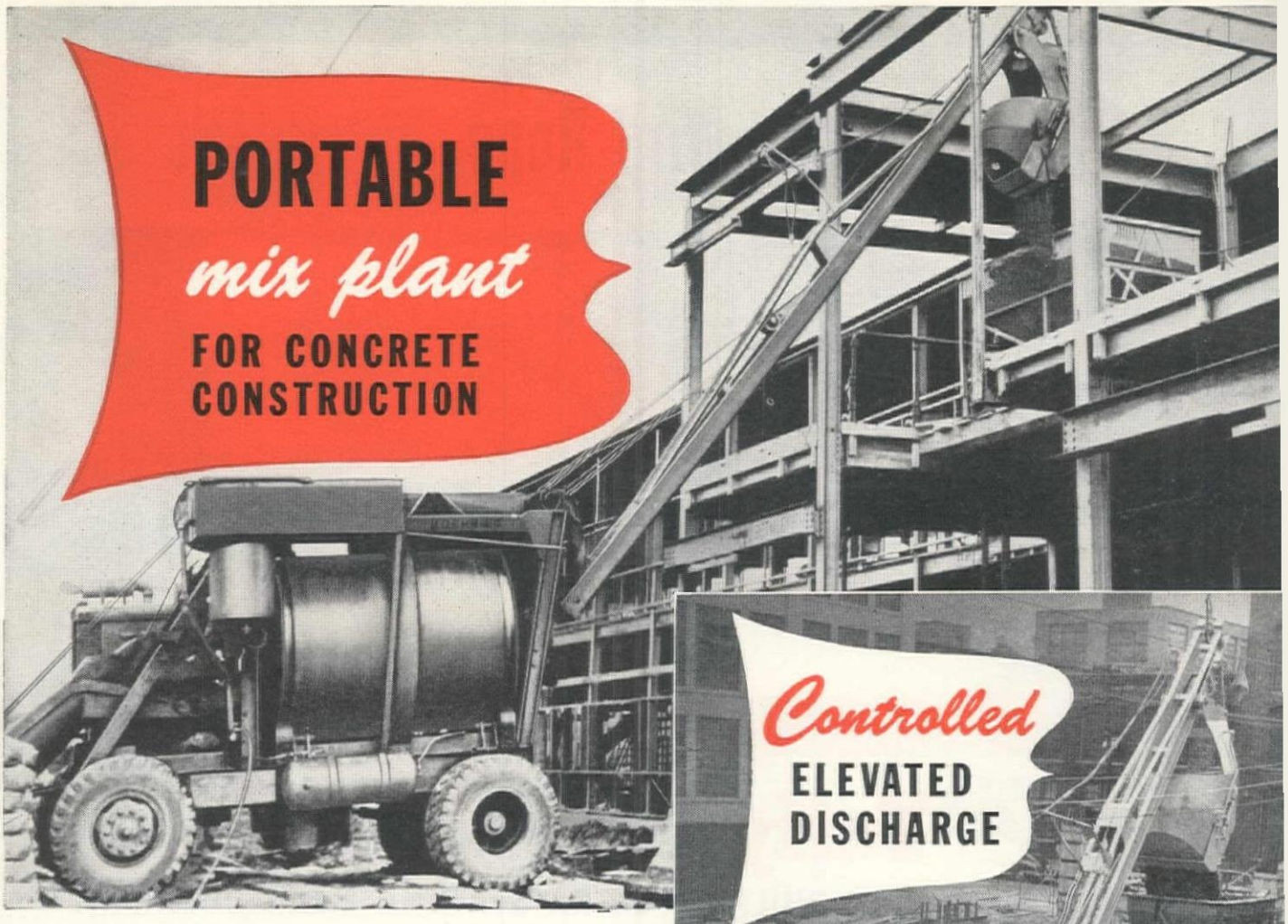
Please send information on:
☐ Tuffy Draglines ☐ Tuffy Scraper Rope ☐ Tuffy Slings

*Firm Name*_____

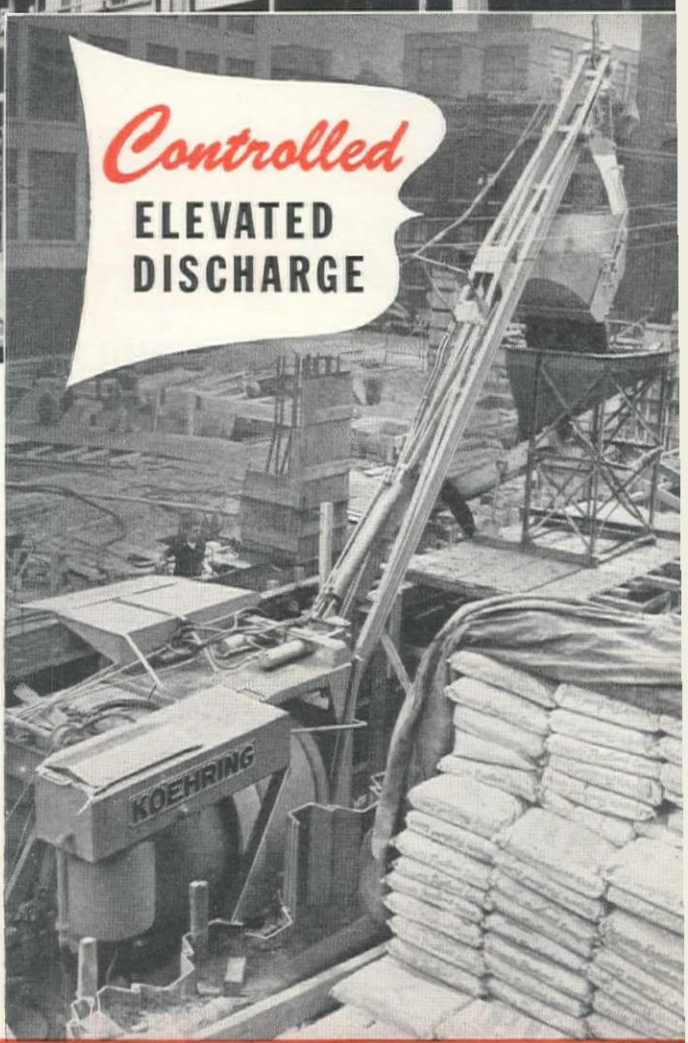
*By*_____

*Address*_____

*City*_____ *Zone*____ *State*_____



PORTABLE *mix plant* FOR CONCRETE CONSTRUCTION



Controlled ELEVATED DISCHARGE

MOBILE, VERSATILE, 16-E *twinbatch*

offers a new low-cost method of producing concrete for floors, foundations, pilings on building construction . . . bridges, aqueducts, tunnels, retaining walls, culverts, streets, highway widening, special batching, etc. Boom elevates 60°, swings in a 160° arc, reaches up and out, bucket discharges controlled batch into overhead forms, hoppers or chutes at a height of 21 feet (higher with special boom). The 16-E mixes and distributes up to 50 cu. yds. per hour, exceeding capacity of larger 27-E single-drum paver. 7-second skip hoist, split-second Autocycle mixing, vertical syphon-type water tank all reduce cycle time and assure maximum-strength concrete. This rubber-tired 16-E *twinbatch* also works over pavement, drives job to job at 6 m.p.h. Ask, too, about Koehring 34-E *twinbatch* for your major paving jobs.

KOEHRING HEAVY DUTY

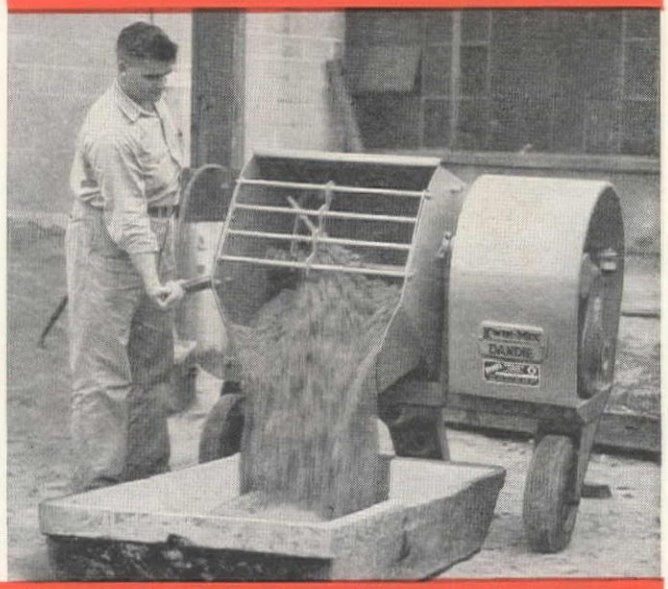
CK 112-SP

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 plaster-mortar MIXERS

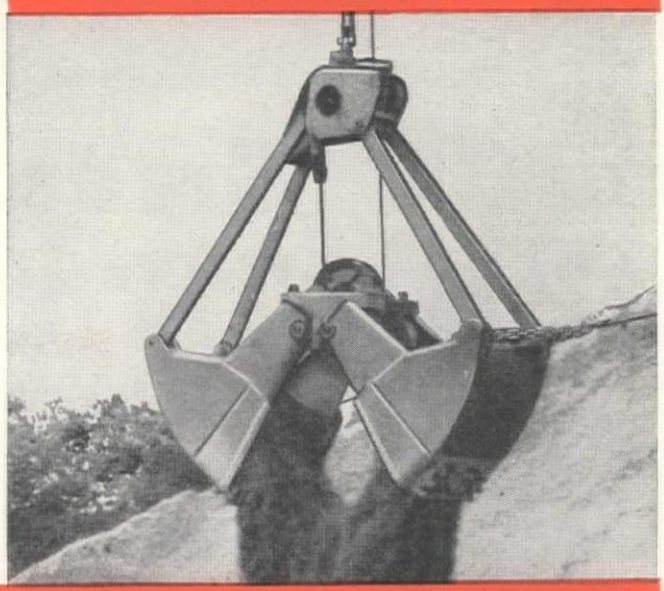
NEW 6-P tilter . . . latest addition to Kwik-Mix plaster-mortar line, has effortless, semi-power tilt for discharge. As loaded drum is released, action of paddle shaft drive starts drum tilt in motion. Drum tilts in opposite direction for quick cleaning. Saw-tooth, non-clogging blades scour drum with each revolution, give thorough, end-to-end mixing, and clean discharge of tilted drum. Grill across top of drum has bag cutter. 60" overall width permits fast towing. Push-down tow pole gives easy spotting. 32" length clears narrow doors. Also: 6-P, 10-P non-tilters, concrete, bituminous mixers, power wheelbarrow.



AMERICAN MACHINE COMPANY.....Spokane
PACIFIC HOIST & DERRICK CO.....Seattle
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 CLAMSHELLS

9 sizes, ⅜ to 2½ yard . . . heavy-duty Johnson Clamshell Buckets are fast-filling, easy-closing, because big, needle-bearing-mounted sheaves reduce friction power loss, deliver full power to cutting lips and teeth. You get capacity load every bite in all materials, because all-welded construction lowers center of gravity, lets bucket dig in straight and deep. Inside and out, these all-welded clams are smooth . . . dig and dump with less resistance. Hard manganese cutting edge, welded to heavy lips, gets tougher with use, assures big-payload performance. Other Johnson products; mix plants, buckets, bins, batchers, silos.



AMERICAN MACHINE COMPANY.....Spokane
BOW LAKE EQUIP. CO., INC.....Seattle
CRAMER MACHINERY CO.....Portland
KEMP YORKE.....Los Angeles
WESTERN MACHINERY CO.....Salt Lake City
NEIL B. McGINNIS CO.....Phoenix
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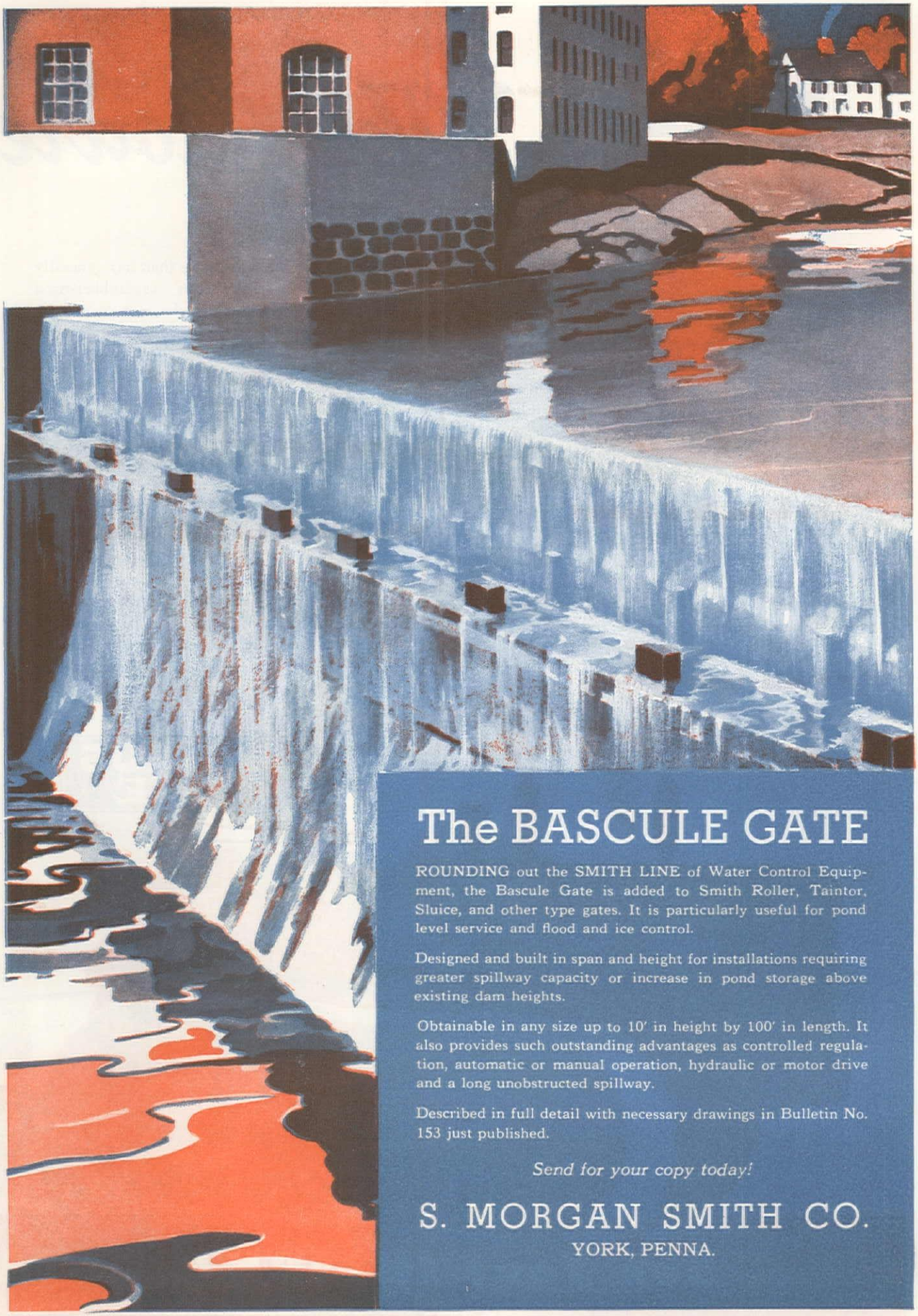
SAN JOAQUIN TRACTOR CO.....Bakersfield
COAST EQUIPMENT COMPANY.....San Francisco
KING AND KRINGEL MACHINERY CORP.....Denver
ENGINEERING SALES SERVICE, INC.....Boise

PARSONS TRENCHLINERS®

1-minute, power-shift conveyor . . . and off-set digging boom let this 221 Trenchliner dodge side obstructions without swerving from grade line. Conveyor shifts completely through machine by power in less than 1 minute. Belt direction is instantly reversible, and its speed is synchronized with bucket line speeds . . . no interruption to Trenchliner production. Off-set digging boom is shiftable across full machine width . . . cuts within 10" of either side . . . digs 16" to 36" wide, 8'-6" deep. All operations are reversible for undercutting sidewalks, sewers, or making vertical set-ins. Check into this 221, or the 4 other Parsons sizes.

AMERICAN MACHINE COMPANY.....Spokane
PACIFIC HOIST & DERRICK CO.....Seattle
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



The BASCULE GATE

ROUNDING out the SMITH LINE of Water Control Equipment, the Bascule Gate is added to Smith Roller, Taintor, Sluice, and other type gates. It is particularly useful for pond level service and flood and ice control.

Designed and built in span and height for installations requiring greater spillway capacity or increase in pond storage above existing dam heights.

Obtainable in any size up to 10′ in height by 100′ in length. It also provides such outstanding advantages as controlled regulation, automatic or manual operation, hydraulic or motor drive and a long unobstructed spillway.

Described in full detail with necessary drawings in Bulletin No. 153 just published.

Send for your copy today!

S. MORGAN SMITH CO.

YORK, PENNA.

Here's Why You're

- **It's matched for championship dirt moving**

  Take the outstanding crawler tractor and hook it up with the outstanding scraper and you get the BIG RED team: International TD-24 tractor and Bucyrus-Erie B-170 (15 yd. struck) or B-250 (22 yd. struck) scraper. No other tractor is bigger, more powerful, easier to handle. The scraper takes full advantage of TD-24 power — loads fast, hauls fast, dumps quick and clean.

- **It's the favorite of operators**

  Operators prefer the BIG RED team because it's bigger and easier to operate, does things no other combination can do. It averages more dirt per trip than any other crawler tractor-scraper outfit, makes one or two extra trips per hour.

- **It makes crawler hauling pay**

  The BIG RED team outperforms rubber-tired outfits on much longer hauls than has generally been accepted. It cuts costs over rubber-tired units because it eliminates the cost of supplementary power for loading and dumping.

- **It works more days per year**

  The BIG RED team comes up with a good day's work every time out, stays on the job under conditions that stop rubber-tired equipment — bad weather, wet fills, wet and slippery haul roads— does away with the cost of maintaining haul roads.

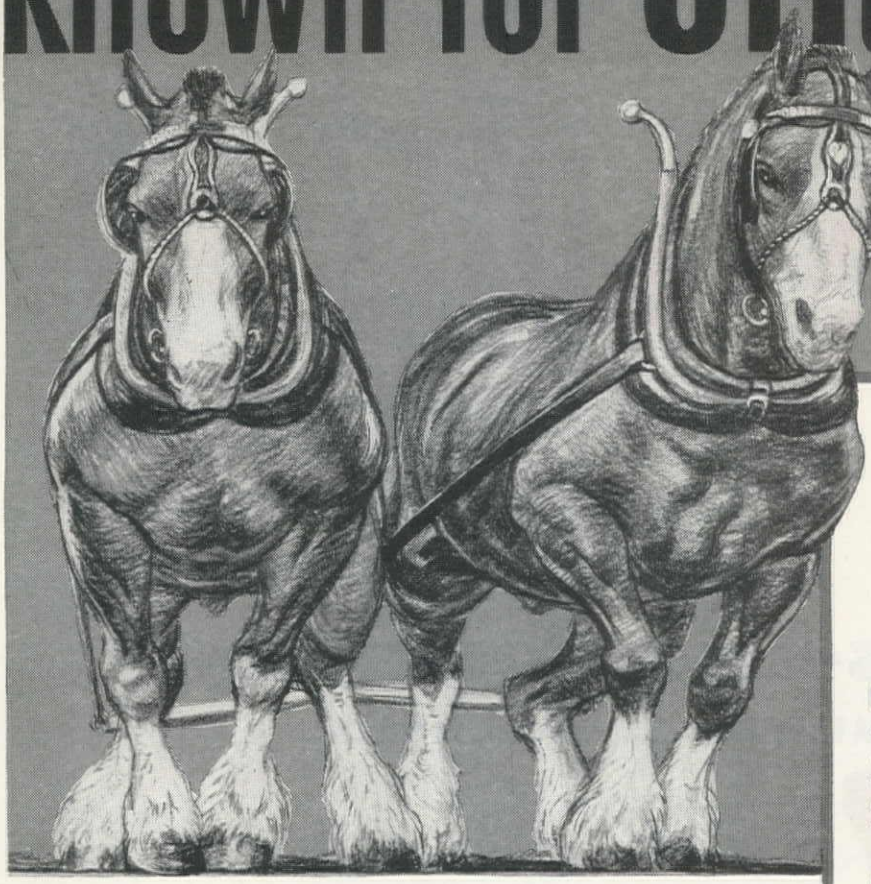
- **It's backed by the best in the business**

  The TD-24 tractor is built by the largest company manufacturing crawler tractors. The B-170 and B-250 scrapers are built by the world's largest and oldest manufacturer of earthmoving equipment. Both tractor and scraper are sold and serviced by International Industrial tractor distributors everywhere. See the one nearest you for full details.

212T50C

See Your INTERNATIONAL

known for STRENGTH



In city streets lay pipe known for STRENGTH

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.

Known strength factors! Proved resistance to corrosion! These are your only safe and sure guides to long life and low maintenance expense of water, gas and sewer mains laid under costly modern pavements. The four strength factors that pipe must have to survive traffic shocks, heavy external loads, beam stresses and severe working pressures are listed in the box opposite. *No pipe that is deficient in any of these strength factors should ever be laid in paved streets of cities, towns and villages.* Cast iron water and gas mains, laid over a century ago, are serving in the streets of 30 or more cities in North America. These attested service records prove that cast iron pipe not only assures you of effective resistance to corrosion but all the strength factors of long life and economy, as well.

CAST IRON

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

CAST IRON PIPE SERVES FOR CENTURIES

Dependable....
PROFITABLE PERFORMANCE

YEAR IN AND YEAR OUT!

Euclids are designed and built for long life and heavy duty service in off-the-highway hauling. Where the going is tough—in open pit mines and quarries . . . and off-the-road construction and industrial work—"Eucs" have earned their reputation for rugged staying power, continuous operation and low cost production.

There are models for your every hauling requirement . . . body designs for every type of material . . . and the speed and capacity to haul bigger loads faster and at lower cost per ton or yard moved.

Euclid owners know that they can depend on prompt, efficient service from a world-wide distributor organization. The services of a hauling equipment specialist and genuine Euclid replacement parts are available to keep operating and maintenance costs at a minimum.

Let your Euclid Distributor provide you with information on the Euclid line of earth moving equipment . . . call or write today.

Rear-Dump "Eucs" have capacities ranging from 10 to 34 tons with diesel engines of 125 to 380 h.p. This 15-ton model, with top extensions, is being loaded on a highway construction job in Massachusetts.

Euclid Scraper picks up a heaped load on an airport job in North Carolina. Capacity is 15.5 cu. yds. struck . . . 275 h.p. diesel engine.

Bottom-Dump Euclids range in capacity from 13 to 25 cu. yds., have diesel engines of 190 to 300 h.p. This "Euc" is hauling approximately 30 cu. yds. at a big earth fill dam in Colorado.

MORE LOADS PER HOUR—
MORE PROFIT PER LOAD

The EUCLID ROAD MACHINERY Co.

CLEVELAND 17, OHIO

CABLE ADDRESS: YUKLID CODE: BENTLEY

EUCLID THE PIONEER

EUCLIDS *Move the Earth*

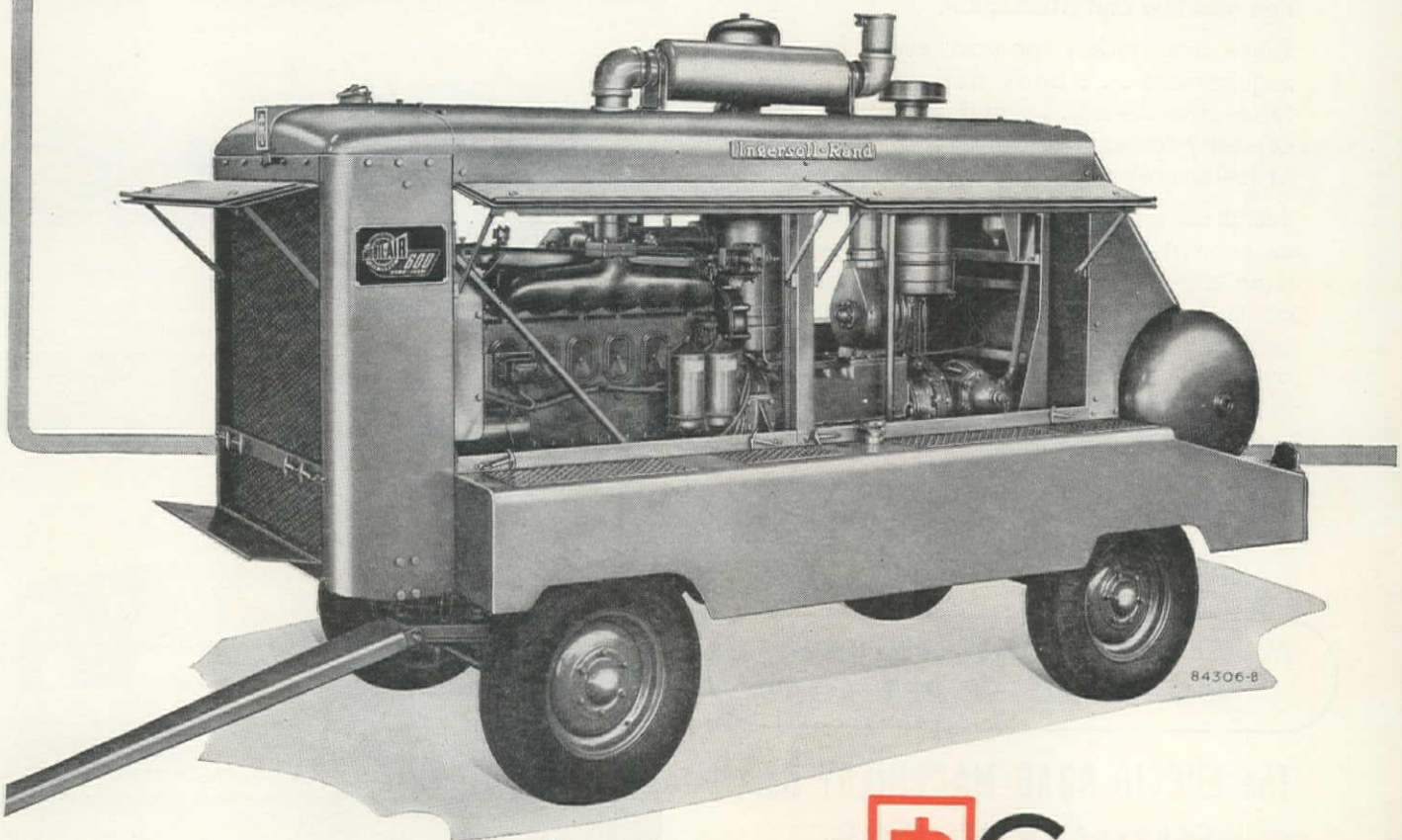
SENSATIO

Ingersoll-Rand

MOBIL-AIR 600

AIR POWER

GYRO-FLOW



An addition to the IR CONTRACTORS' COMBINATION

NAL *New*

600-cfm PORTABLE COMPRESSOR

using a new advanced-design Rotary Compressor

Weighs only 9500 lbs ready to run

Years ahead of any other large capacity portable

- Amazing new GYRO-FLOW compressor . . . two-stage, oil-cooled rotary type without valves . . . without pistons, rings or rods . . . without clutch.
- Never gets hot . . . discharge temperatures less than 200°F under normal operating conditions.
- Matched to powerful, nationally-known General Motors diesel engine . . . takes full advantage of modern speeds.
- I-R AIR-GLIDE Capacity Control . . . the only automatic, step-less regulator that controls the air output smoothly over the full range from 0 to 100% capacity . . . all within a 10-pound pressure range.
- Weighs only 9500 pounds ready to run . . . as much as 20% less than other big-capacity portables.
- **Gets maximum work out of two of the most powerful wagon drills . . . delivers full 600 cfm at 100 psi pressure.**

by **Ingersoll-Rand** . . .

11 BROADWAY, NEW YORK 4, N. Y.

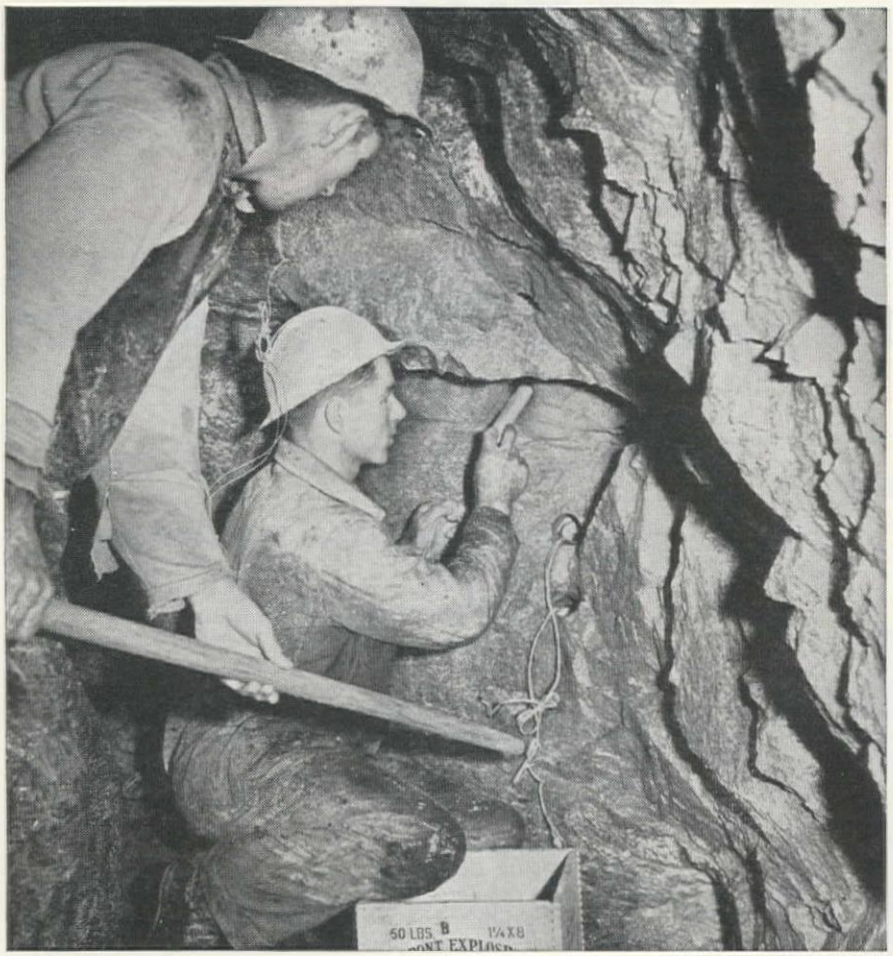
The portable compressor builder that many times before has set new standards

- First Two-Stage Air-Cooled Portable Compressor
- First 500-cfm Portable that was really portable
- First Automatic Speed-Control of Capacity
- First and only MOBIL-AIR.

594-2

Write or call your nearest Ingersoll-Rand representative for the full story.

For your next tunnel job...



be sure to consider DU PONT "GELEX"

It's a high-strength, low-cost explosive that's ideal for blasting tight headings and hard rock

No wonder so many contractors choose "Gelex" for tunnel driving—especially where the going's really rough. This economical, high-strength explosive breaks out hard rock with a maximum of efficiency and economy, even when wet conditions are encountered. It is plastic and cohesive enough for easy tamping and high loading density. It has excellent fumes that permit prompt return of workers to the face after blasts.

The higher stick count of dependable Du Pont "Gelex" grades reduces powder costs...yet excellent fragmentation is obtained in even the tightest headings.

All in all, the economy and dependability of Du Pont "Gelex" is unsurpassed by any other explosives of comparable type! Why not talk to your Du Pont Explosives representative about using "Gelex" on your next tunnel job? See him today—or write: 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*

Send for this booklet about two remarkable new wire ropes....

Roebling's new 6 x 43 and 6 x 49 Wire Ropes break all records on excavating machines

IN THIS NEW BOOKLET you will find a complete list of Roebling wire rope recommendations for top efficiency in every type of excavator service. And two of these ropes, 6 x 43 and 6 x 49 Preformed "Blue Center" Steel with I.W.R.C., are recent Roebling developments of prime importance to all users of medium and large size shovels, draglines and dredges. Their special construction brings unusual abrasion resistance, increased flexibility, and exceptionally high resistance to internal fatigue—a combination that establishes a brand new standard of service life and economy.

These 6 x 43 and 6 x 49 "Blue Center" Steel Wire Ropes are further evidence of Roebling leadership in developing ropes that bring improved performance and savings for users. Mail coupon for copy of "Roebling Wire Rope for Excavators." John A. Roebling's Sons Co. of Calif.—San Francisco—Los Angeles—Seattle.

ROEBLING

Atlanta, 934 Avon Ave. ★ ***Cambridge,*** 31 Carleton St. ★ ***Chicago,*** 5525 W. Roosevelt Rd. ★ ***Cincinnati,*** 3253 Fredonia Ave. ★ ***Cleveland,*** 701 St. Clair Ave., N.E. ★ ***Denver,*** 4801 Jackson St. ★ ***Houston,*** 6216 Navigation Blvd. ★ ***Los Angeles,*** 216 S. Alameda St. ★ ***New York,*** 19 Rector St. ★ ***Odessa, Tex.,*** 1920 E. 2nd St. ★ ***Philadelphia,*** 230 Vine St. ★ ***San Francisco,*** 1740 17th St. ★ ***Seattle,*** 900 1st Ave., S. ★ ***Tulsa,*** 321 N. Cheyenne St.

John A. Roebling's Sons Co. of Calif.
1740 Seventeenth St.,
San Francisco, Calif.

Gentlemen: We are interested in cutting wire rope costs. Kindly send me free copy of "Roebling Wire Rope for Excavators".

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

Company.....

Address.....

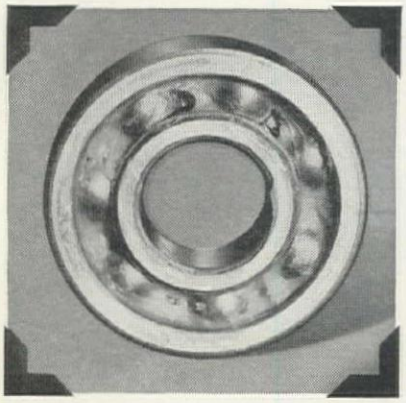
City.....Zone.....State.....

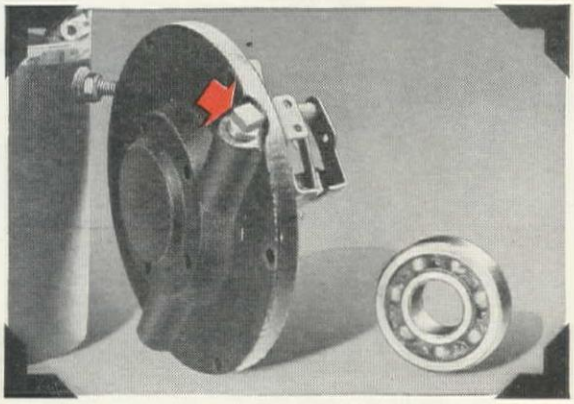
STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	Calol O.H.T. Grease
UNIT	Automotive generator-bearing
LUBRICATOR	Sealed at installation
CONDITIONS	Heavy-duty diesel truck engine
MILEAGE	70,000
FIRM	H. G. Makelim Co., San Francisco–Oakland

Sealed generator bearing still perfect after 70,000 miles!





ONE APPLICATION OF CALOL O.H.T. GREASE, sealed in the bearings when this diesel-engine generator was assembled by H. G. Makelim Co., prevented any bearing wear in 70,000 miles of heavy-duty truck service. Generator was disassembled at this time only because it needed new brushes, and for general inspection. Note a permanent plug replaces usual grease fitting.

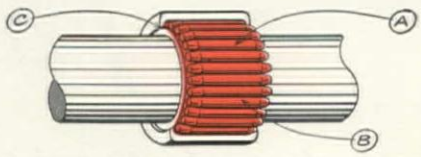
70,000 MILES OF SERVICE did not affect or use up any of the CALOL O.H.T. Grease in the bearings. In special tests, one filling has lubricated bus-generator bearings perfectly for more than 150,000 miles.

"WITH CALOL O.H.T. GREASE SEALED IN BEARINGS, we recommend installing generators without grease fittings," says Frank Balzarini, H. G. Makelim Co. Foreman. "CALOL O.H.T. eliminates need for greasing between overhauls. And eliminating fittings stops over-greasing—a big cause of wear and trouble."

REMARKS: The H. G. Makelim Magneto Repair Company, San Francisco and Oakland, one of the West's oldest automotive-electrical and carburetor repair firms, specializes in servicing equipment in the toughest automotive service—truck, bus and car fleets.

Besides generator bearings in this service, CALOL O.H.T. Grease is recommended for all types of bearings in service under extremely severe operating conditions.

How CALOL O. H. T. Grease protects bearings in severest operating conditions



Used in any type of bearing under any operating condition, high temperature-low speed, high speeds to 10,000 rpm, temperatures from minus 10° F. to 400° F., CALOL O.H.T. Grease will last indefinitely.

A. Contains special oxidation inhibitor—prevents rusting, corrosion, hardening of grease at any time.

B. Resists high temperatures — eliminates coking.

C. Provides excellent seal against water... lubricates efficiently in slight moisture.

CALOL

STANDARD TECHNICAL SERVICE checked this product performance. If you have a lubrication or fuel problem your Standard Fuel and Lubricant Engineer or Representative will give expert help; or write Standard of California, 225 Bush St., San Francisco 20.

STANDARD OIL COMPANY OF CALIFORNIA

Big Producers !

NEW "CAT" DW20 TRACTOR AND W20 WAGON
NEW "CAT" DW21 TRACTOR AND NO. 21 SCRAPER

THESE power twins are the largest earthmovers ever engineered by "Caterpillar." They combine high speeds with high capacities to meet today's demands for increased production for both civilian and military needs. They give construction men the choice of two or four wheels in husky hustlers built to stand up under the toughest going.

For big production on long hauls, you can't beat the 4-wheel "Cat" DW20 with its top speed of 26.6 m.p.h. The DW20 offers two matched trailer units. The W20 Wagon—heaped capacity, 25 cu. yds. And the No. 20 Scraper—heaped capacity, 19½ cu. yds. The DW20 is also available with the No. 20S Bulldozer.

For big production on jobs best suited to 2-wheel rigs, you've got the edge with the "Cat" DW21. Trailing the No. 21 Scraper, which has a heaped capacity of 19½ cu. yds., its top speed is 20 m.p.h.

Both these speedy giants are powered by the new 6-cylinder "Cat" Diesel Engine, producing 225 HP. available at the flywheel. For complete data, see your "Caterpillar" dealer. Under today's conditions, it's a good move to talk over your requirements *now* with him. He's as close as your phone for service or information—call him today!

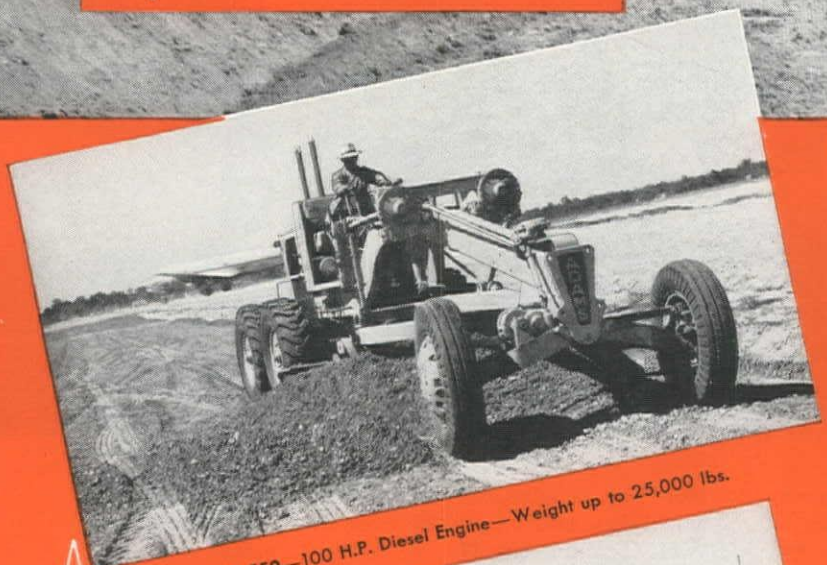
CATERPILLAR, SAN LEANDRO, CALIF.; PEORIA, ILL.

CATERPILLAR
REG. U. S. PAT. OFF.

DIESEL ENGINES · TRACTORS · MOTOR GRADERS
EARTHMOVING EQUIPMENT

5 BIG REASONS

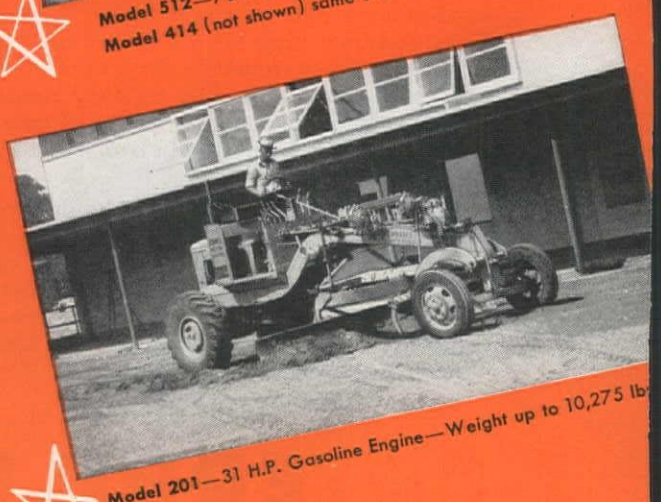
Model 610—100 H.P. Diesel Engine—
Weight up to 27,000 lbs.



Model 550—100 H.P. Diesel Engine—Weight up to 25,000 lbs.

Model 512—76 H.P. Diesel Engine—Weight up to 24,000 lbs.
Model 414 (not shown) same engine—Weight up to 21,800 lbs.

Model 312—70 H.P. Diesel Engine—Weight up to 19,820 lbs.
Model 305 (not shown)—50 H.P. Gas Engine—Wt. up to 19,500 lbs.



Model 201—31 H.P. Gasoline Engine—Weight up to 10,275 lbs.

WHY *Adams Motor Graders are your best buy*

1. **8 Overlapping Forward Speeds . . .** Flexible working range speeds work—increases output—provides high transport speeds.

2. **Wide Range of Blade Positions—Without Mechanical Adjustments . . .** Saves Time in Adapting Machine to Needed Cuts.

3. **Positive-Action Mechanical Controls . . .** Dependable, accurate adjustments—because they're geared . . . Easy, natural steering.

4. **Ample Operating Clearances . . .** Quick, easy adaptation to work . . . Operator comfort, convenience, efficiency.

5. **Fast, Easy, Servicing Plus World-Wide Dealer Service . . .** Saves time and money.

Adams Motor Graders—*and only Adams*—offer owners this important and exclusive combination of advantages.

Each and every one of these advantages is in itself a highly desirable feature . . . and together they combine to give you the fastest, smoothest performing, most flexible and dependable motor graders on the market—*bar none!*

What's more, all Adams Motor Graders—from the very largest machine to the smallest—are of the same tried and proved design—all capable of the same wide range of work, in proportion to their size and power.

Big operator or small—highway official or contractor—you'll find in the *All-Star* Adams Motor Grader team a machine perfectly suited to your requirements and budget . . . a machine with the *right power* and *right capacity* to meet your individual needs exactly.

Ask your local Adams dealer for complete information on these great all-year, all-purpose machines.

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See your local Adams dealer

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Oakland—Bay Cities Equipment, Inc.
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Riverside—Braman-Dickerson Co.
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San Diego—Southern Eqpt. & Supply Co.
San Jose—Valley Equipment Co.
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Santa Rosa—Stevenson Eqpt. Co.
Stockton—Inland Equipment Corp.
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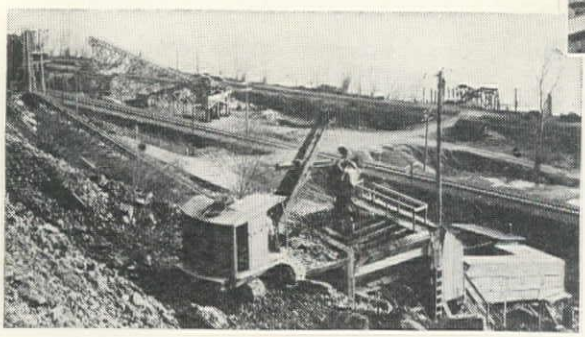
DISTRIBUTORS ALSO IN Seattle and Spokane, Washington . . . Portland, Eugene, Roseburg, Albany, Klamath Falls and Central Point, Oregon . . . Denver, Colorado . . . Phoenix, Arizona . . . Billings, Great Falls, Missoula and Kalispell, Montana . . . Boise and Pocatello, Idaho . . . Reno and Las Vegas, Nevada . . . Salt Lake City, Utah . . . Albuquerque, New Mexico . . . Fairbanks, Alaska.

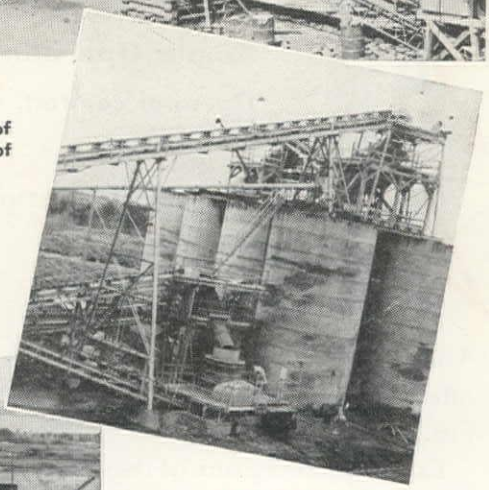
WESTERN OPERATORS use TELSMITH Gyrasphere CRUSHERS

CALIFORNIA
Arrow Rock Co., Roscoe. Two 36″ Gyraspheres handle final reduction.

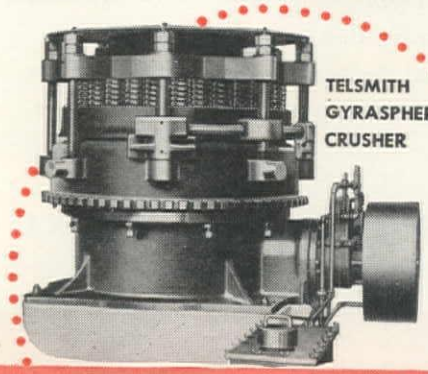


OREGON
Plant at Oregon City of Warren Northwest, Inc., of Portland, Oregon.

WASHINGTON
Crushing-washing plant, Howard Smith, Vancouver.



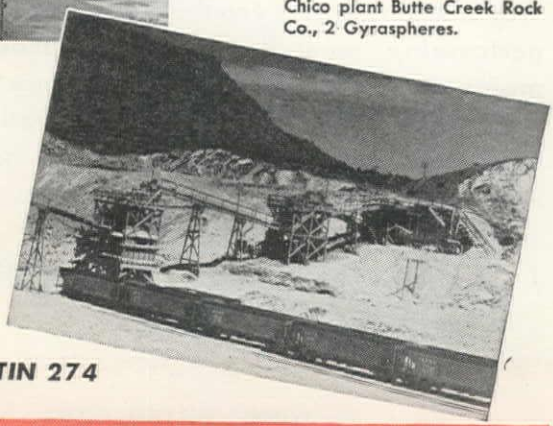
CALIFORNIA
Chico plant Butte Creek Rock Co., 2 Gyraspheres.



TELSMITH GYRASPHERE CRUSHER

MONTANA
Plant of Helena Sand & Gravel Co., Helena.

NEW MEXICO
Sharpe & Fellows Contracting Co. of Los Angeles, quarry plant near Albuquerque.



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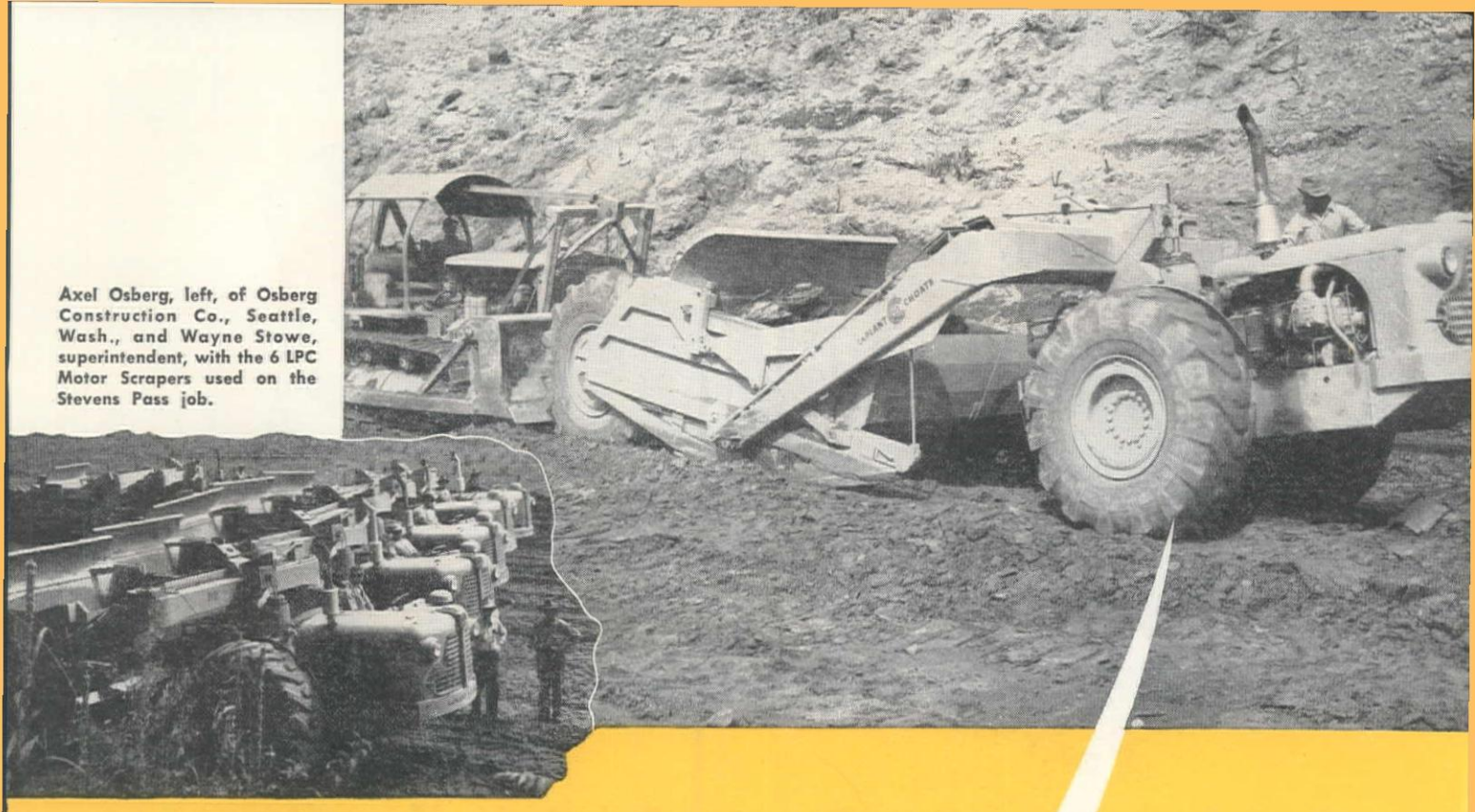
Manufactured by SMITH ENGINEERING WORKS, MILWAUKEE 12, WISCONSIN



Axel Osberg, left, of Osberg Construction Co., Seattle, Wash., and Wayne Stowe, superintendent, with the 6 LPC Motor Scrapers used on the Stevens Pass job.

OSBERG CONSTRUCTION COMPANY *uses*

6 LaPLANT-CHOATE MOTOR SCRAPERS

on tough 500,000 yd. new Washington highway job

There's an LPC MOTOR SCRAPER working near you . . .

Watch its big production features lick the job!

Get in touch with your nearest LPC distributor—he'll be glad to take you out to a practical on-the-job demonstration of what the Motor Scraper can do when it comes to big time earthmoving. He'll explain all the features that make this rig the pace-setter on any job. Call him today for proof.

ON the Washington State Highway job to eliminate a dangerous approach to Stevens Pass, Osberg's six TS-300 Motor Scrapers *averaged a load every 8 minutes* under tough conditions. Approximately 500,000 yards of glacial till ranging from tight coarse gravel to hard almost-shale-like blue clay had to be moved over a plus half mile haul of rough going, with a 25% grade to travel on the return trip. In gravel, the Motor Scrapers were getting 14 yards per trip, while in the clay they were heaped to an average of 18 yards. Main tracks of the Great Northern Railway near the fill, and heavy traffic on an intersecting county road further complicated the job.

Whether your job is difficult or simple, you'll move more dirt per trip and average more trips per hour with the big power, high speed, big capacity Motor Scrapers. LaPlant-Choate Manufacturing Company, Inc., Cedar Rapids, Iowa — LaPlant-Choate Sales and Service, 1022 77th Ave., Oakland, Calif.

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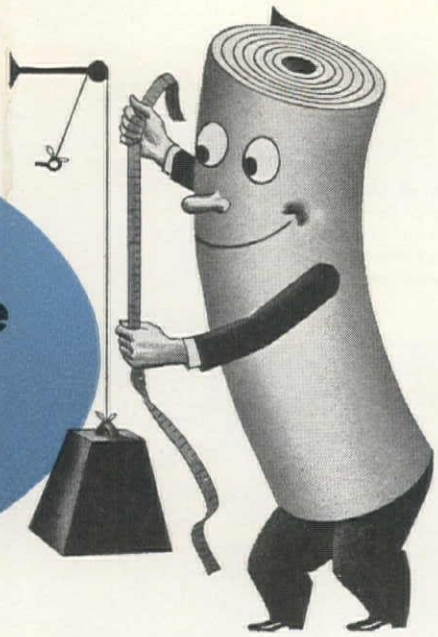

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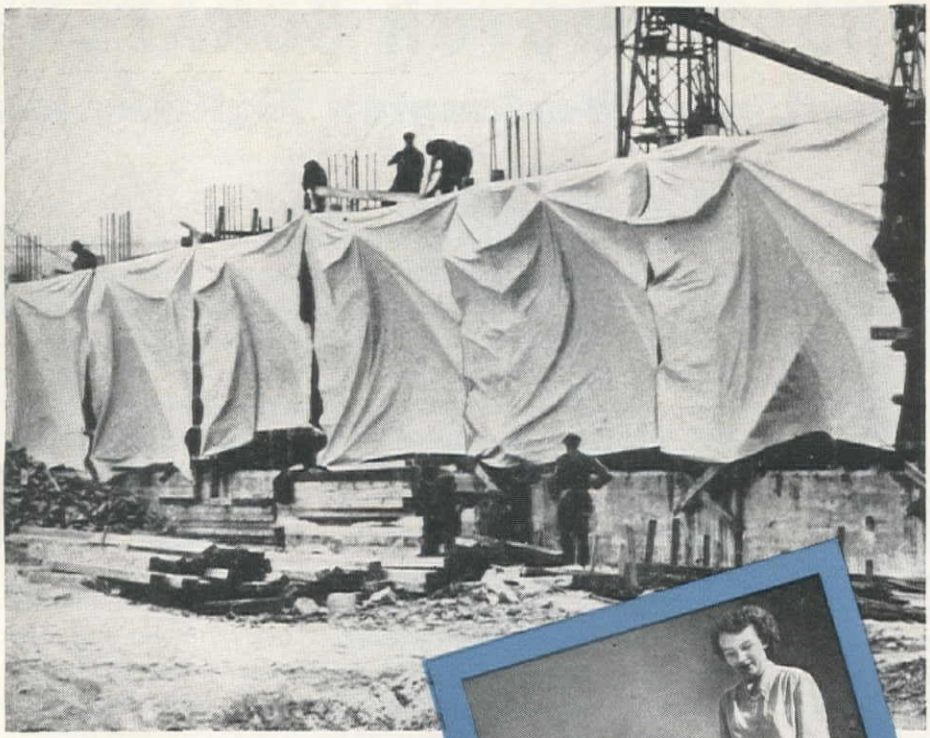

TESTING STRENGTH AND ELONGATION OF YARN WITH MOSCROP TESTER.

This unit automatically tests 6 strands of yarn at one time. One of a series of comprehensive laboratory controls throughout production to assure fabric uniformity in all Mt. Vernon-Woodberry products.

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EATON

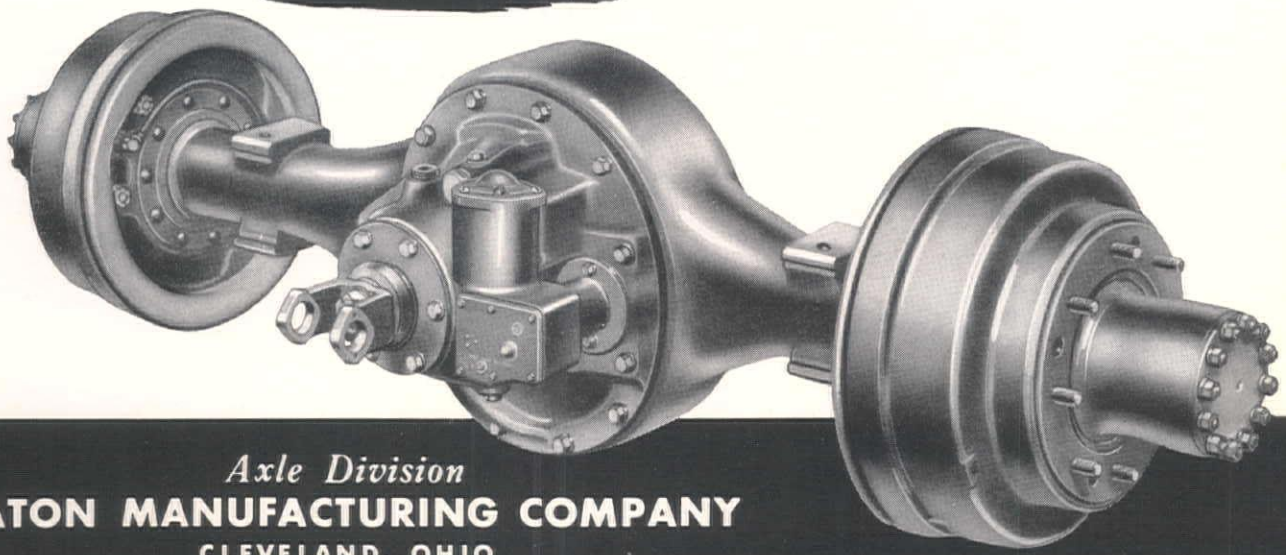
2-Speed Truck

AXLES

Drivers report they are less fatigued after long trips on trucks with Eaton 2-Speed Axles. Eaton equipped trucks are easier to maneuver; quicker on the get-away in traffic; climb hills more smoothly; highball on the open road yet have plenty of power to pull out of tough spots.

These advantages are possible because Eaton 2-Speed Axles give drivers twice the conventional number of gear ratios from which to choose the one best suited for road and load conditions.

Truck owners also are pleased with Eaton 2-Speeds by the saving in maintenance costs, faster schedules, lower cost per mile. Your dealer will be glad to explain how Eaton's planetary gearing, positive lubrication and other exclusive features make Eaton axles last longer.



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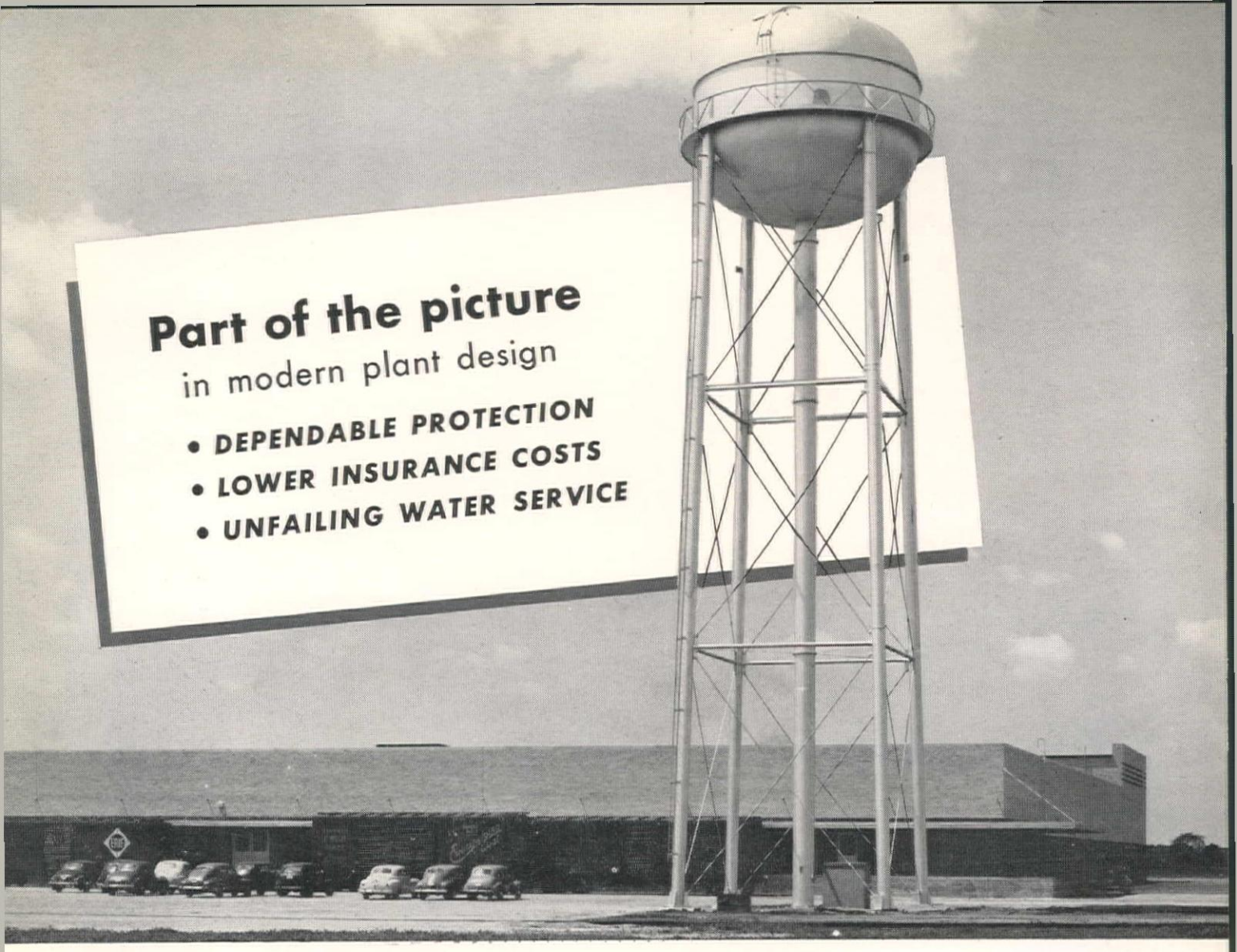
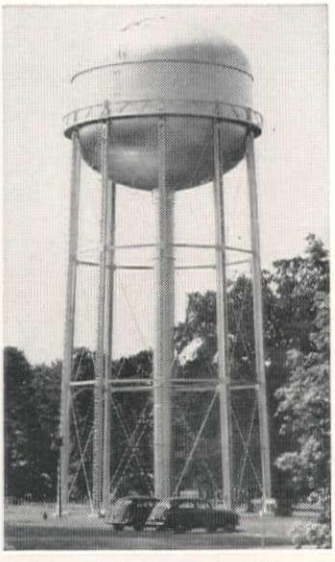


PITTSBURGH • DES MOINES *INDUSTRIAL*



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Choose the Pittsburgh-Des Moines Elevated Steel Tank meeting your precise requirements in type and capacity, and you will enjoy every benefit of safe and certain water supply—at lower cost—*with guaranteed dependability*. Write for our latest "Modern Water Storage" Brochure.

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Sales Offices at:

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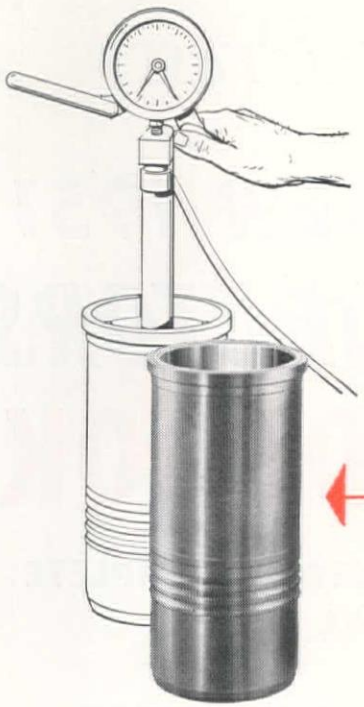
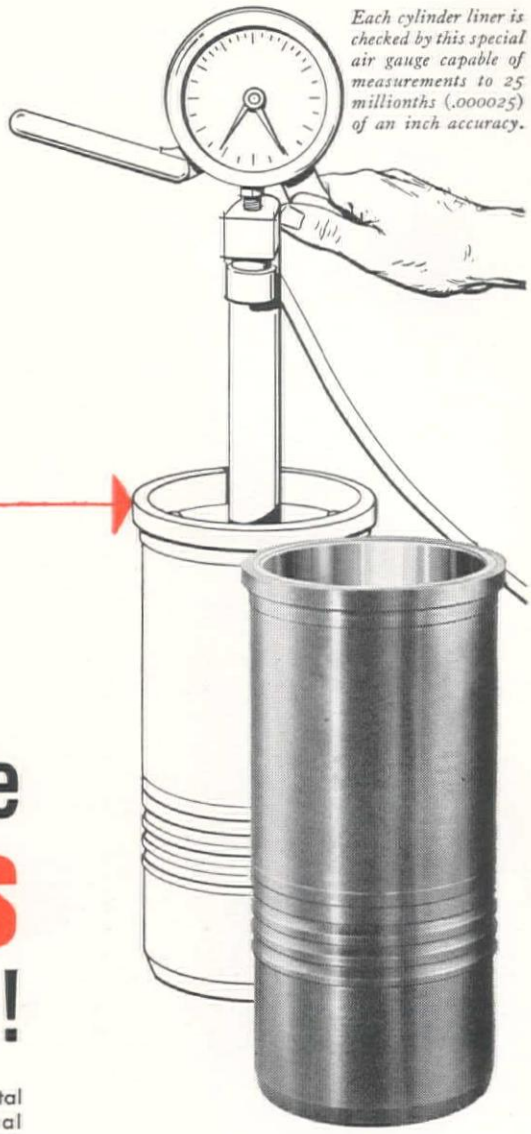


We take twice the care



Each cylinder liner is checked by this special air gauge capable of measurements to 25 millionths (.000025) of an inch accuracy.

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1 Cummins Diesels are built to do the toughest jobs there are . . . year in and year out with minimum repair and attention. This requires rugged parts, precision made to exacting standards. Some parts are manufactured especially for us by carefully selected suppliers. Then, Cummins technical men work almost continually, right in the suppliers' plants, to assure these parts are being made exactly to our specifications. *Each part* must meet these rigid requirements before it leaves the supplier.

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Diesel power by CUMMINS

CUMMINS Dependable DIESEL

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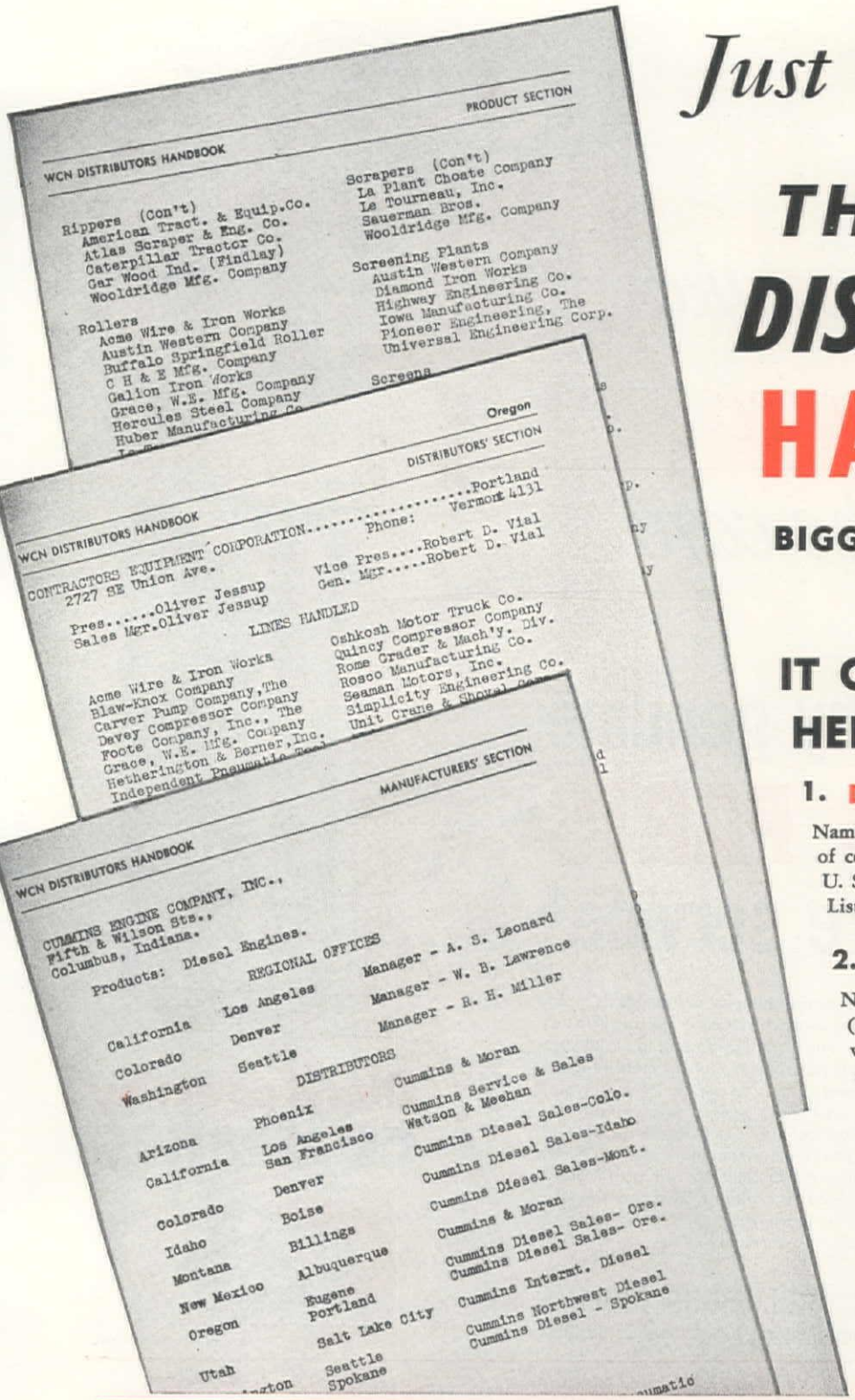

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THE NEW 1951 DISTRIBUTORS HANDBOOK

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IT CONTAINS THESE HELPFUL LISTINGS . . .

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Names, addresses and phone numbers of distributors of construction equipment in the Western half of the U. S., the lines they handle, names of their branches. Listing is alphabetical by states.

2. MANUFACTURERS

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MACK

1st

IN DIESEL TRUCK SALES

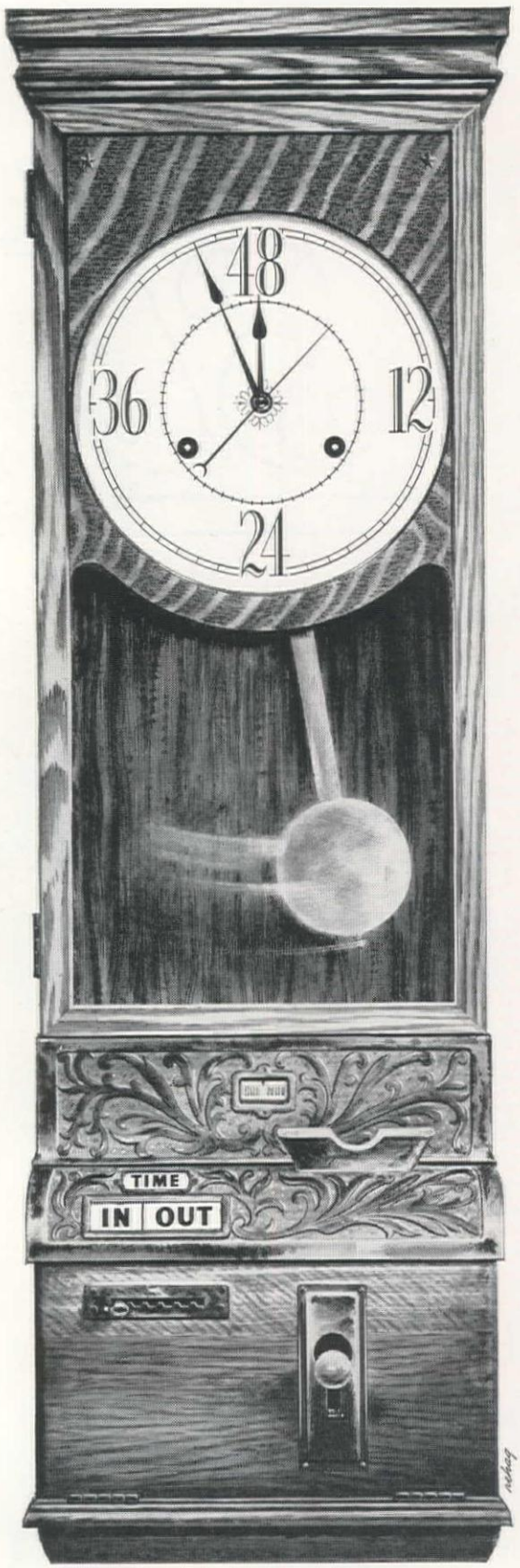
Of all diesel-powered trucks sold during the first nine months of 1950* by 19 different manufacturers—41% were Macks . . . striking evidence of Mack's top-ranking position in diesel truck sales. The country over, more and more truck owners are discovering the advantages of thrifty Mack diesel-powered trucks . . . the big savings they give in more miles per gallon at less cost per gallon. In the face of constantly rising costs, these progressive operators find that it is indeed *profit-wise to dieselize* with Macks.

*Final figures for 1950 not yet available

Be Profit-Wise...Dieselize with Mack TRUCKS

Mack Trucks—Los Angeles • Denver • San Francisco • Seattle • Portland • Salt Lake City • Factory branches and distributors in all principal cities for service and parts.

outlast them all



Too bad it can't be invented!

If someone could invent a day 48 hours long, you can be sure Kaiser Steel would be among the first to adopt it.

But Kaiser Steel *is* working around the 24-hour clock to produce more steel in order to meet pressing Western demands for many products—including structural shapes.

Backing up this work schedule, Kaiser Steel is constantly expanding plant facilities to bring still more steel to the West.

It's good business to do business with

Kaiser Steel

built to serve the West

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

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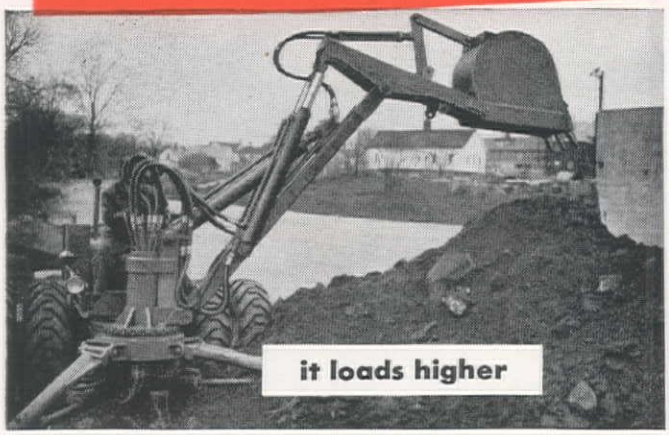
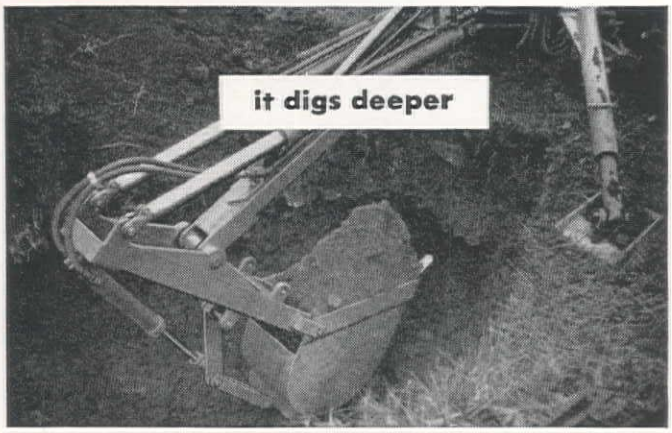
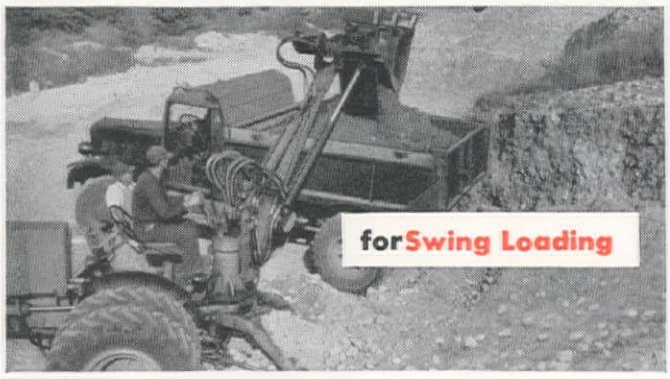
THE OLIVER-WARE Hydro-Trencher

It's Smoother Operating...
No hesitation or "jerks" in the smooth application of hydraulic power. You get smoother, easier handling... more positive control with less operator fatigue.





..and it has a Sensational New "Forced Ejection" Bucket

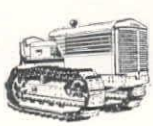


By simply reversing the bucket and dipper stick, you get a swing loader that loads out material faster than you'd believe possible. "Forced ejection" bucket is available as optional equipment. Standard trencher bucket and standard swing loader bucket are available at slightly lower cost. With standard loader bucket, loading height is 12 feet. Loading height with "forced ejection" bucket is 12½ feet.

The "forced ejection" bucket gives you quick, clean, complete discharge of even the stickiest materials. Bucket gate is hydraulically controlled and travels the complete length of the bucket to "force" out all material.

For complete information on this all-hydraulic, tractor-mounted trencher and swing loader, see your Oliver Industrial Distributor.

Have you seen the Oliver color movie, "Task Force on Wheels"? Your Oliver Distributor will be happy to arrange a showing.



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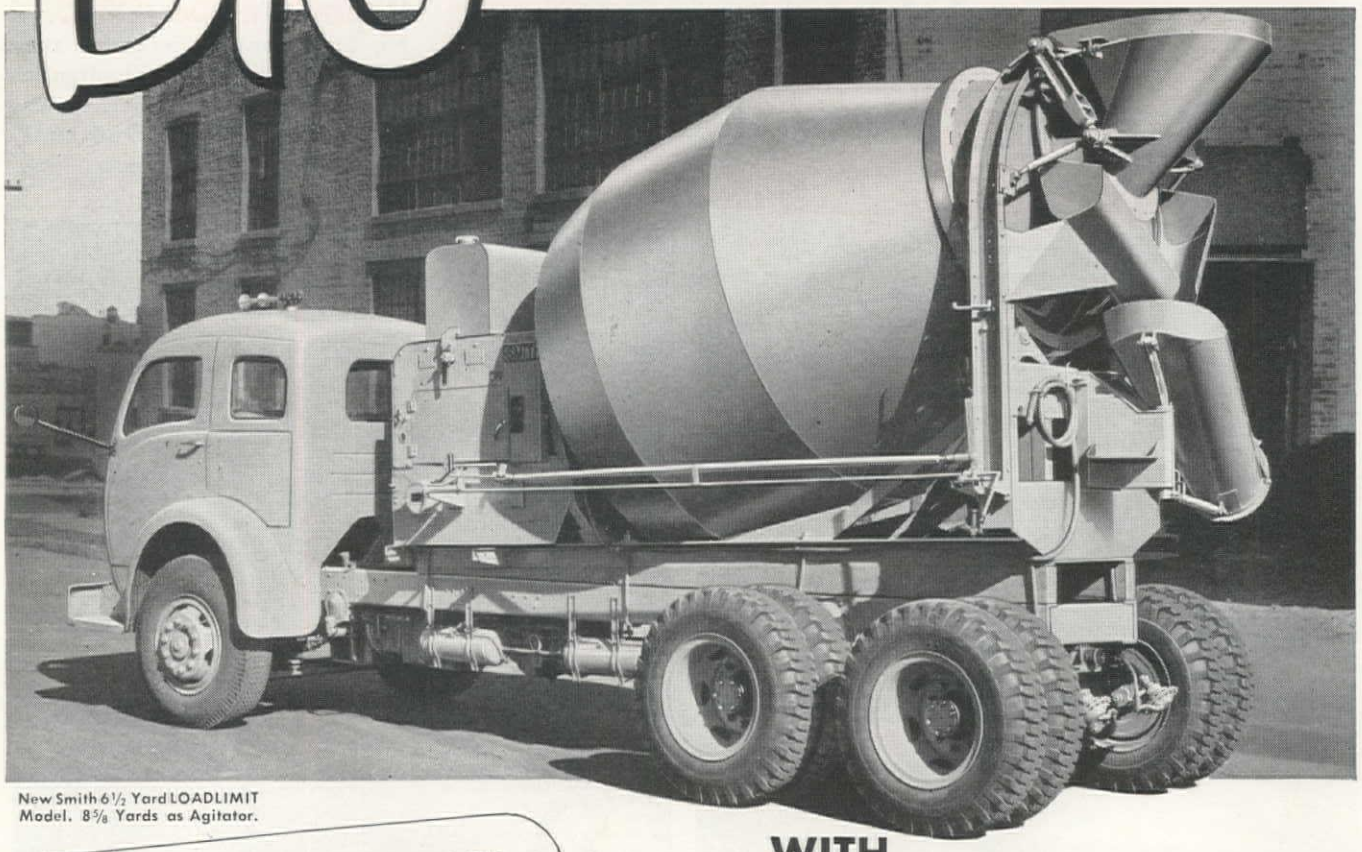
BIG PAY LOADS
that stay within weight limits



New Smith 6½ Yard LOADLIMIT Model. 8⅝ Yards as Agitator.

- ★ Has Approved NRMCA Rating
- ★ Carries Full Rated Load
- ★ Stays Under Highway Weight Limits
- ★ Low Initial Cost
- ★ Low Operating Costs
- ★ Easily Convertible to a Standard Smith-Mobile

WITH SMITH *LOAD LIMIT* MODELS

You can haul BIGGER PAYLOADS at *less cost per yard* with new Smith LOADLIMIT Model Truck Mixers. These dependable machines are the same as standard Smith-Mobiles with a few unnecessary parts removed . . . parts you can readily sacrifice in favor of lighter weight. When the mixer is mounted on the proper truck, the entire unit stays within the weight limitations of most states. The LOADLIMIT models have the well-known Smith-Mobile sturdy construction and performance. Lightweight? Yes — but not too light for tough, everyday service. Available in ALL Truck Mixer sizes . . . 2, 3, 4½, 5½ and 6½ yards. All carry approved NRMCA rating plates. And all can easily be converted to standard Smith-Mobile models. Get the facts! Write for Bulletin No. 247.

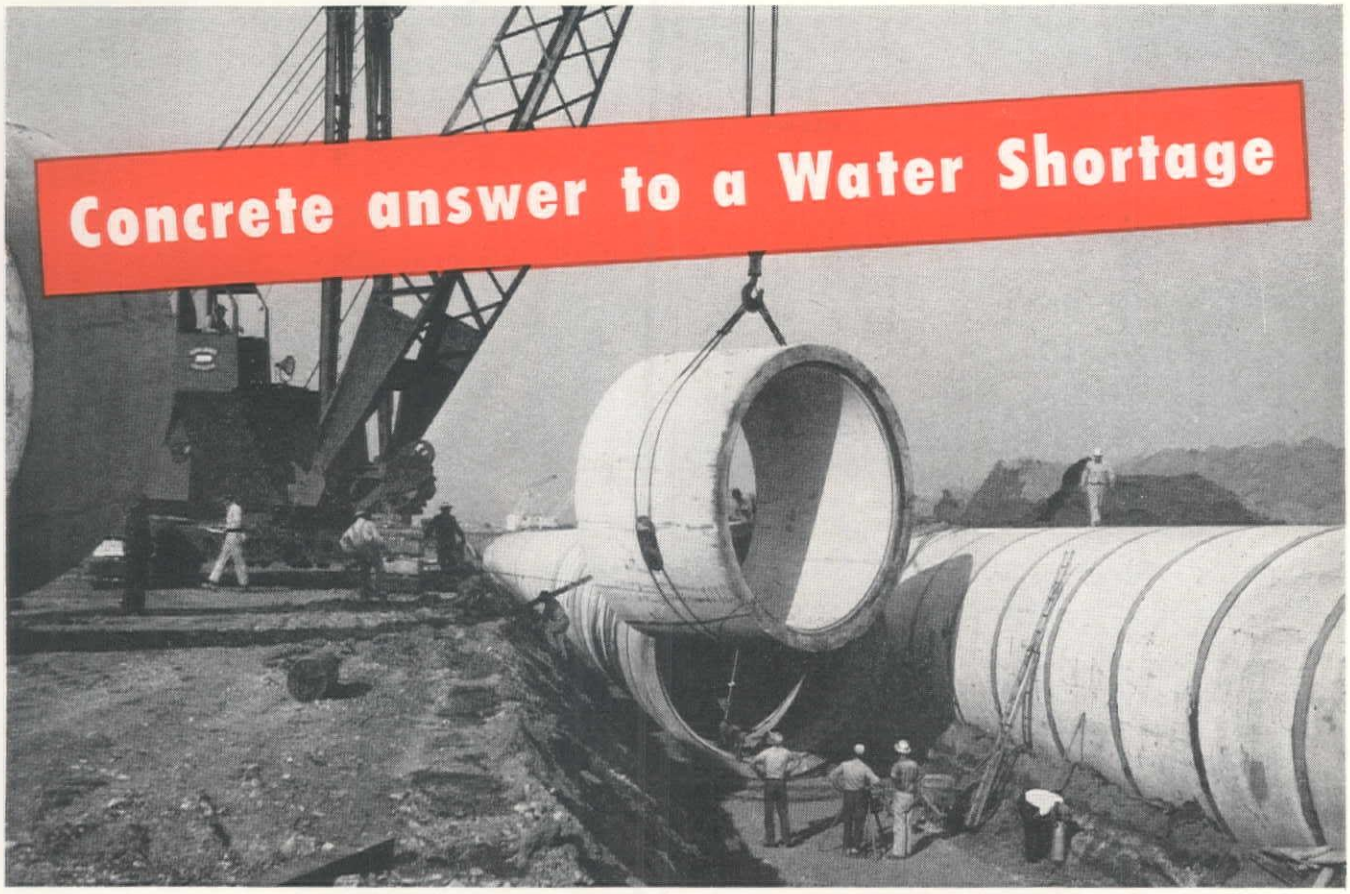
The T. L. SMITH COMPANY
2871 N. 32nd St., Milwaukee 45, Wis., U. S. A.

SMITH MOBILE

For BIGGER and BETTER Concrete Mixers and Truck Mixers Look to SMITH

A 5883-1P

Concrete answer to a Water Shortage



65 ton precast pipe section, 15 foot inside diameter being swung into place by United Concrete Pipe Company on the Delta-Mendota Canal project.

Part of the gigantic Central Valley project, the Delta Mendota Canal was made possible only through the tremendous engineering and performance know-how which the United Concrete Pipe Company displayed in constructing and laying three, 15 foot diameter concrete pipes to carry water 3000 feet into the Canal from the junction of the Sacramento and San Joaquin Rivers.

The 12 foot precast concrete sections of 17½ foot outside diameter are said to be the largest in construction history. In order to provide a firm foundation close to operations for the gargantuan pipe carrier and the 125 ton crane which swung the pipe into place, United's engineers dug individual ditches for each of the 3000 foot pipe lengths. The monstrous equipment employed enabled them to lay up to 27 of the 65 ton sections per day.

Such tremendous projects result from the cooperative efforts of many. In addition to United Concrete Pipe Company, three other contractors — Stolte Inc., Duncanson-Harrelson Co., and Ralph A. Bell, pooled resources and abilities in tackling the huge task.

As is so often the case where the going is tough and equipment performance important, General Petroleum Corporation was on the job, too, providing Mobilgas and Mobilfuel Diesel, air compressor oils, form oils and all types of lubricants and greases — helping the wheels of progress to turn more freely.

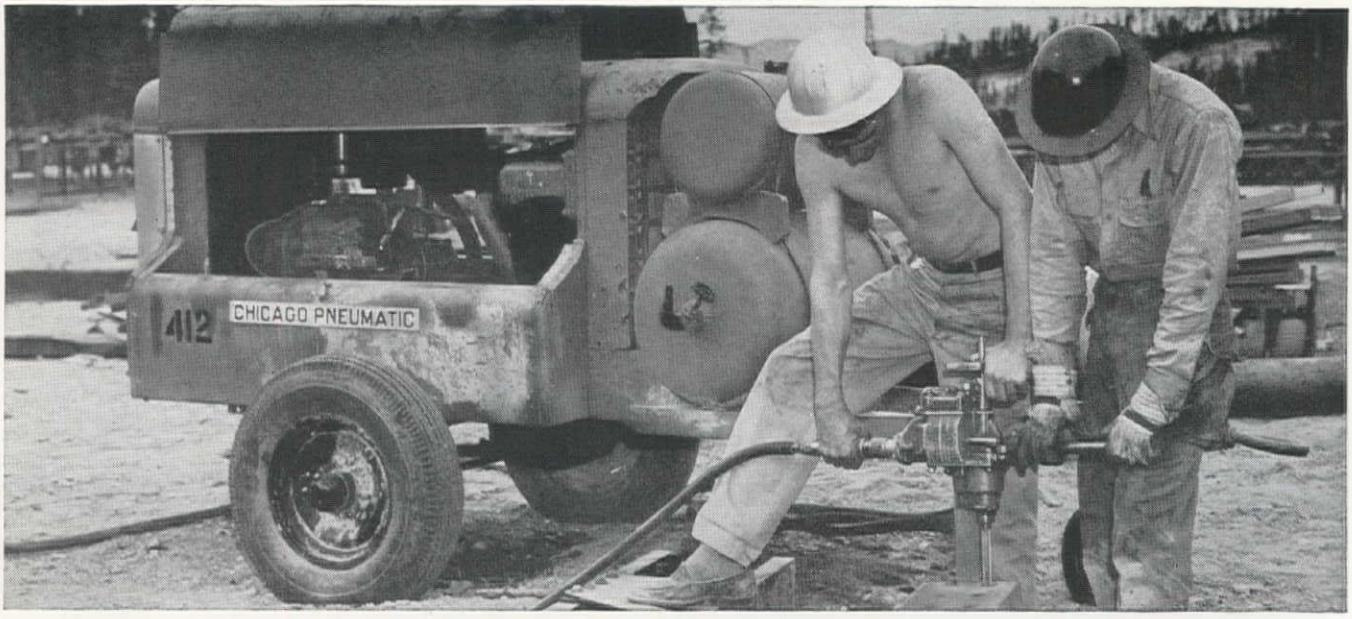
Mobiloil

GENERAL PETROLEUM CORPORATION

— converting nature's gift to better living

Huge pipe carrier converted, under direction of Chief Engineer Kenneth James, from a tank retriever at a cost of $65,000 to handle the tremendous size and weight of largest precast pipe sections.

Steel Cylinder and reinforcing cage for concrete pipe sections on the way to project 28 miles away.

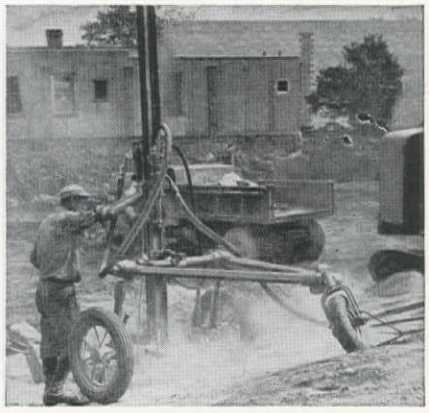


Wherever air is required you can always rely on the dependability, low maintenance and long service of CP PORTABLE COMPRESSORS. The CP Gradual Speed Regulator – adapting engine speed to air demands – minimizes engine wear, gives smoother performance, effects fuel savings ranging from 15% to 35%. CP Portable Compressors are available in gasoline and Diesel driven models from 60 to 600 c.f.m.

for faster schedules use
CP EQUIPMENT

CP PNEUMATIC CORNER DRILLS speed close-quarter drilling and reaming operations. There's a full range of CP drills for every drilling job.

Heavy-duty CP AIR IMPACT WRENCH easily runs nuts up to 1¼" bolt size. The CP line of impact wrenches, with angle heads and accessories, meets all nut and bolt running problems.



The lightweight G-150 WAGON DRILL drills to depth of 20 feet or more, vertically, horizontally, or at any angle—frequently doubling the footage over hand-held methods.

Write for full information on CP Contractors' Equipment

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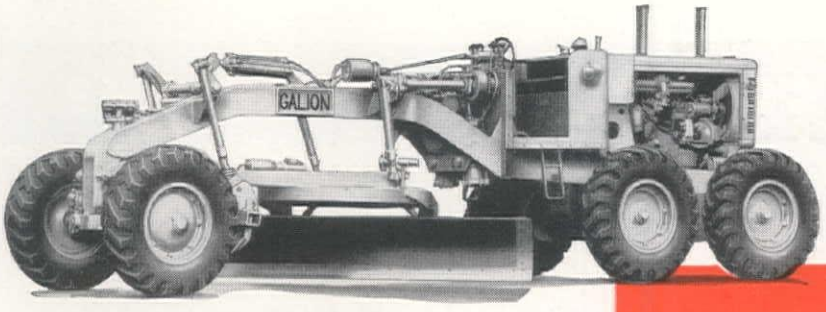
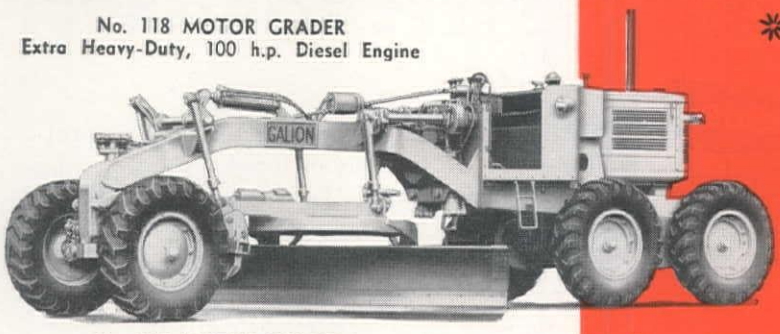
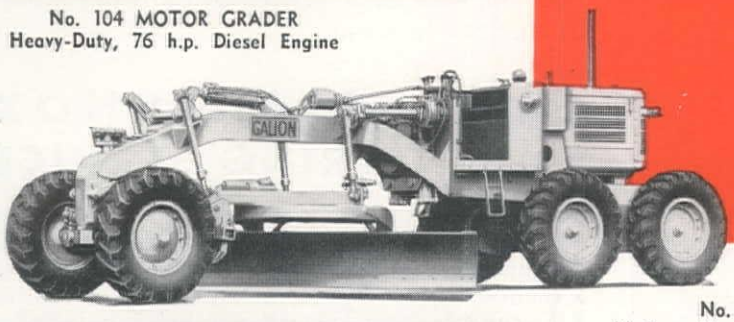
GALION GRADERS



No. 118 MOTOR GRADER
Extra Heavy-Duty, 100 h.p. Diesel Engine



No. 104 MOTOR GRADER
Heavy-Duty, 76 h.p. Diesel Engine



No. 203 MOTOR GRADER
Medium Heavy-Duty, 70 h.p. Diesel Engine

*STANDARD EQUIPMENT includes

Same size tires..... on front and rear. Manual steering with hydraulic booster.

* on Nos. 118, 104, and 203

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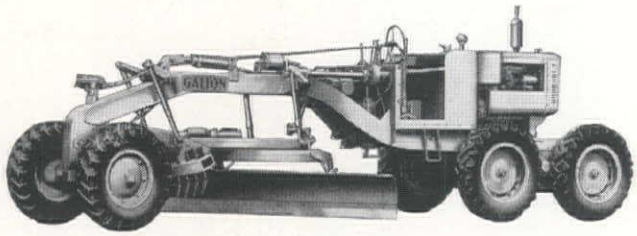
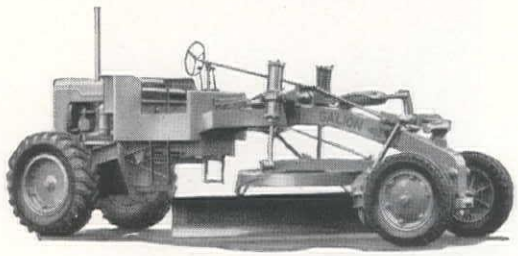


No. 303 MOTOR GRADER
Medium-Duty, 50 h.p. Gasoline or Diesel Engine, Hydraulic Booster Steering and Large Front Tires are available as extra equipment.



No. 402 MOTOR GRADERS
Light-Duty, 31 h.p. Gasoline Engine, Manual Steering.

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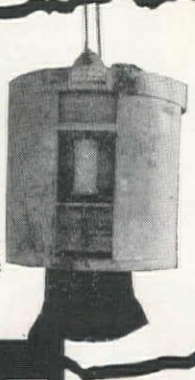
Model CAC Concrete Bucket is specifically designed for low cost handling and placing of harsh, low slump concrete for mass concrete construction projects. Bulletin 2331 gives complete details.



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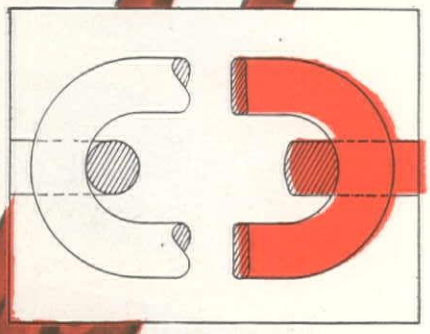
Keep your Dragline Buckets on the job with

ESCO WORK-PROVED REPAIR PARTS

A reserve stock of ESCO repair parts is better than money in the bank. Especially now, when they are becoming hard to obtain, these parts actually are insurance against lost time. Typical of these parts are *ESCO* flat side drag chains, composed of solid links, with extra steel where wear is greatest. They don't have to "take a seat".

Protect yourself now against "down time" for your equipment by anticipating your requirements for the next several months. Your nearest *ESCO* representative will give you details on *ESCO* repair parts; or fill in and mail the coupon for Catalog 108H, which contains the detailed information you need.

With conventional round link chain, contact is at one restricted point only, which wears chain rapidly and reduces strength.



Flat surface of ESCO links distributes wear over maximum area. With wear decreased correspondingly, chain outlasts other types.

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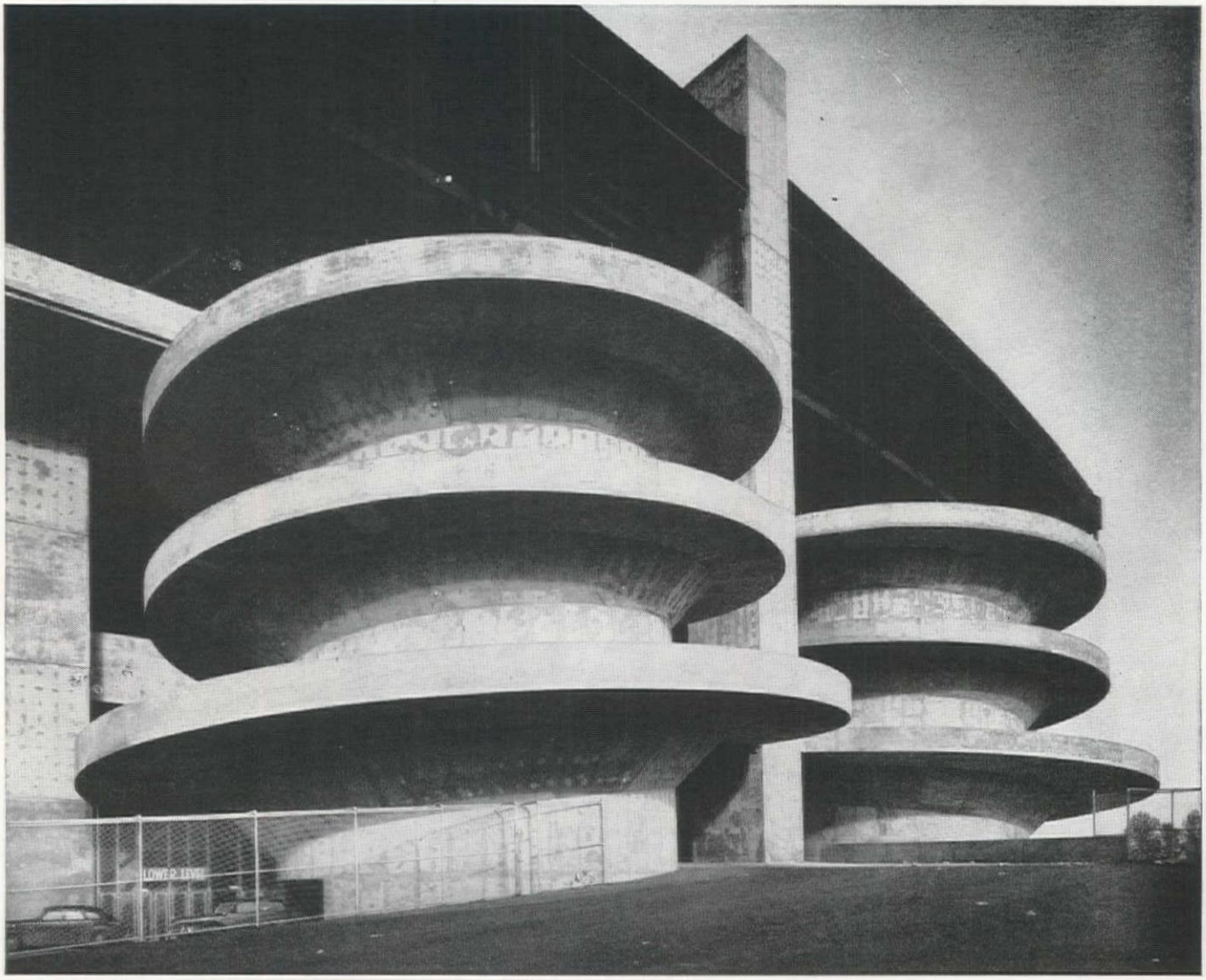


"Simplest Solutions to Special Problems..."

again offered by plywood concrete form panels

THE huge spiral ramps and reinforced concrete supports of the new University of Washington stadium grandstand presented several special form problems: all concrete surfaces were curved; ramp floor-slab thicknesses varied to provide drainage; minimum form costs were required; exposed surfaces had to be smooth, uniform, fin-free.

Douglas fir plywood forms, according to Elmer Strand, partner of Strand & Son, "offered the simplest and least expensive solution. Panels can be reused many times. They're easy to fabricate into cost-cutting built-up sections and easily bent to form curved surfaces."

Another example of this fact: large job or small . . . versatile plywood solves more form problems, more satisfactorily, more often.

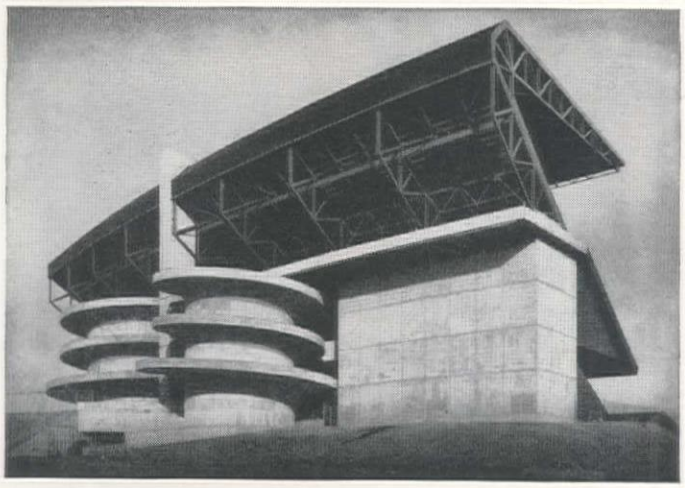
Spectacular is the word for this $1,500,000 addition to the University of Washington football stadium, Seattle. The design was prepared by George W. Stoddard and Associates, Seattle, represented by Francis E. Huggard and architect N. Torbitt. Structural engineer: Sigmund Ivarson. General Contractors: Strang & Son, Seattle; J. H. Wallstrom, superintendent. John Paul Jones was supervising architect for the University, represented by A. O. Whipple. Also representing the university was Charles C. May, superintendent of buildings and grounds.

Douglas Fir

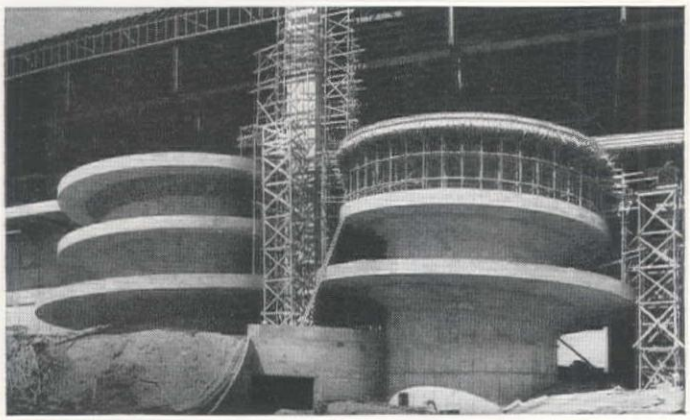
Plywood

AMERICA'S

Plywood Gives Multiple Re-Use, Reduces Labor and Finishing



Twin spiral ramps—shaped like huge gears on 56′ hollow concrete shafts—keep traffic flowing smoothly. On central shafts and the 4′ guard rails, ¼″ plywood served as form liner, with lumber sheathing backed by 2x4 studs, 16″ o.c. and double 2x4 wales, spaced at about two feet. The 4′ wide form sections were bent to required curvature by inserting wooden shims between studs and walers. Sections were stripped, re-erected and bent to next required radius without reconstructing the basic form framework. On the 9″-thick walls of the main support, ¾″ plywood served as combined lining-sheathing. In addition to workability and re-use factors, finishing time and costs were reduced because of the smooth, fin-free surfaces so characteristic of plywood form work.



Large, Light, Strong Real Wood Panels

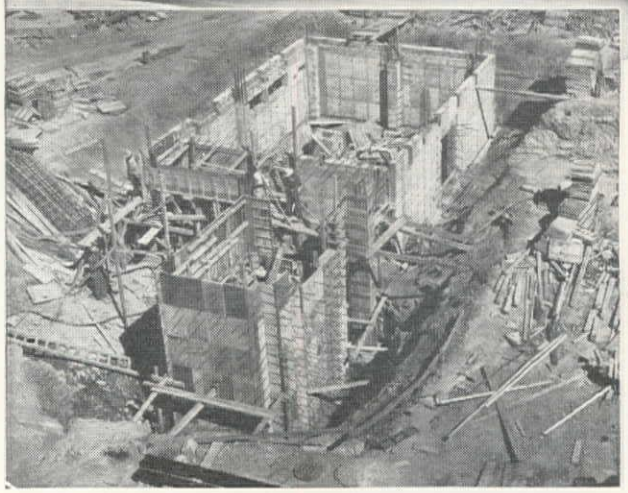
For additional data on Douglas fir plywood for concrete form work, write: Douglas Fir Plywood Association, Tacoma 2, Washington. Of particular interest are two booklets: "Concrete Forms of Douglas Fir Plywood" and "Handling PlyForm".

BUSIEST BUILDING MATERIAL

UNI-FORMS form BIG areas faster...

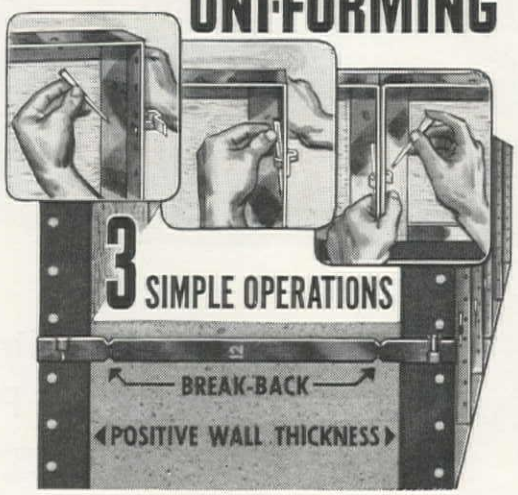
save labor...save materials!

LINED AND BRACED ON 1 SIDE . . . LEAVES UNOBSTRUCTED WORKING AREA ON OTHER SIDE.



VERSATILITY—EVERY CONCEIVABLE WALL DETAIL . . . UNI-FORMED

UNI-FORMING



Faster erection . . . automatically accurate wall widths . . . minimum 1 side alignment and easy adaptability to any forming requirement makes UNI-FORMING the most economical method of forming any type of concrete.

You can form bigger areas, using less man hours and materials with UNI-FORMS . . . steel-framed UNI-FORMS comprise a tight, rigid form that requires no additional structural members.

Let us prove our point. Send a set of plans for an estimate of your UNI-FORMING costs. There is no obligation.

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ALL-AROUND STRENGTH IN CASE INDUSTRIAL TRACTORS

Extra-strong front axles on all Case industrial tractors take in stride the added burdens of front-mounted hydraulic loaders, sweepers, snowplows, scrapers and dozers.

Heavy-duty steering gear corrects for wear by turning worm wheel. Housed in transmission case—assures lubrication with warm oil. Roller bearings, readily adjustable.

● The Case Model "LAI" tractor engine . . . shown in section above . . . has a stroke 30 percent greater than the bore. This, with valve-in-head design, permits the compact compression space that invites smooth, complete combustion . . . consistent fuel economy . . . persistent pulling power down to 40 percent under rated speed. Moderate piston speed and moderate loading of husky bearings on a big 3-bearing shaft help to make the heavy-duty engine that has set a world standard for tractor ENDURANCE.

Similar engine construction in all four sizes . . . plus similar strength and endurance in clutch, transmission and final drive . . . give Case industrial tractors their long-run reliability and economy. J. I. Case Co., Racine, Wis.

Starter and lights are standard equipment at standard price. In completeness of equipment and convenience of operation, as well as quality, Case tractors give extra values.

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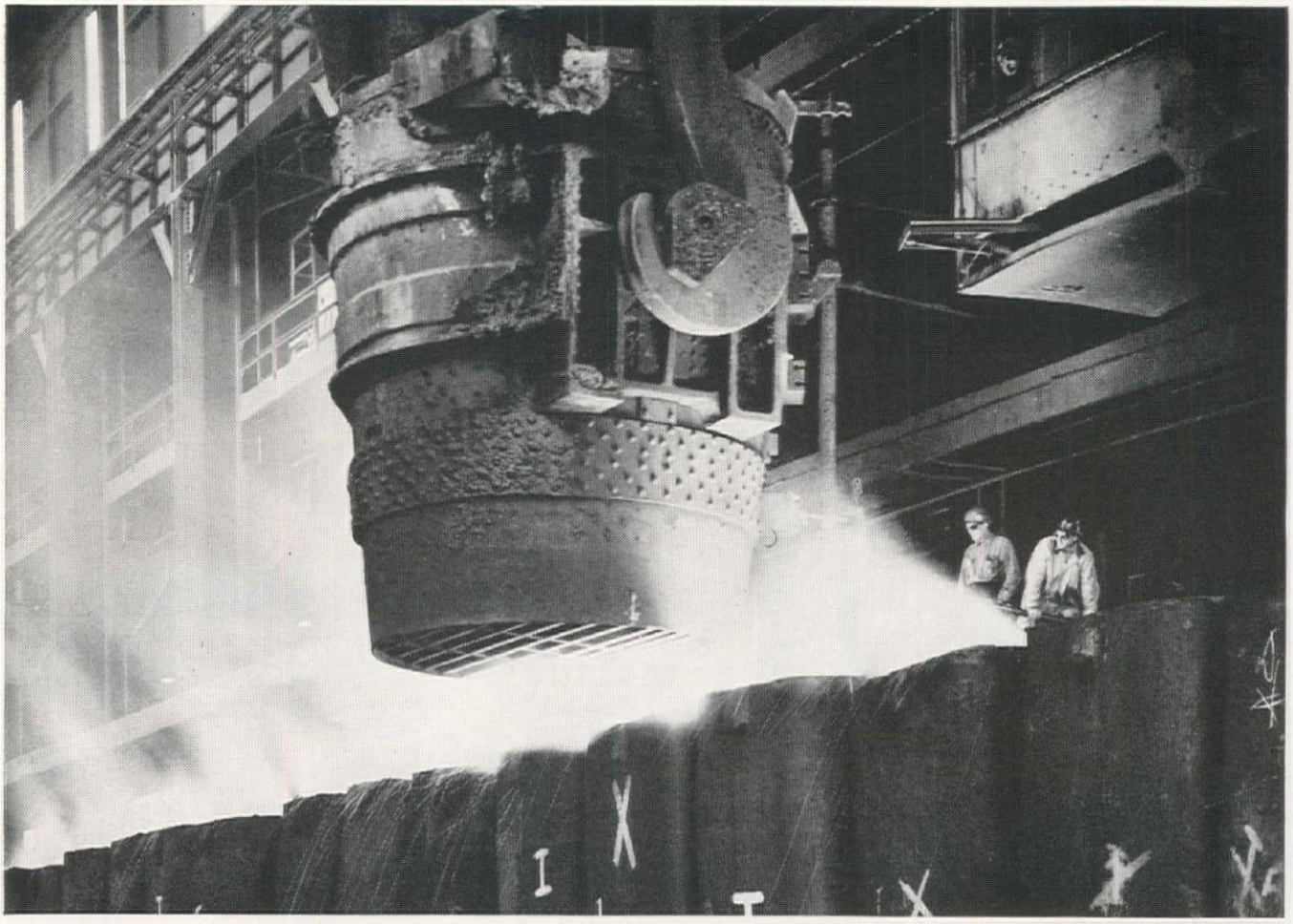


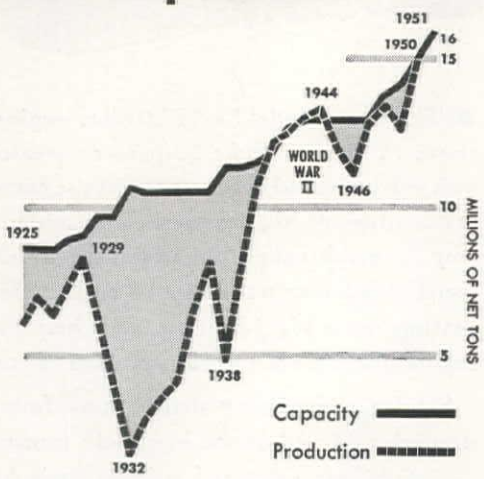
MILLION TONS MORE STEEL

Latest Increase in Bethlehem's Annual Capacity Climaxes 5 Years of Postwar 3,100,000-Ton Expansion

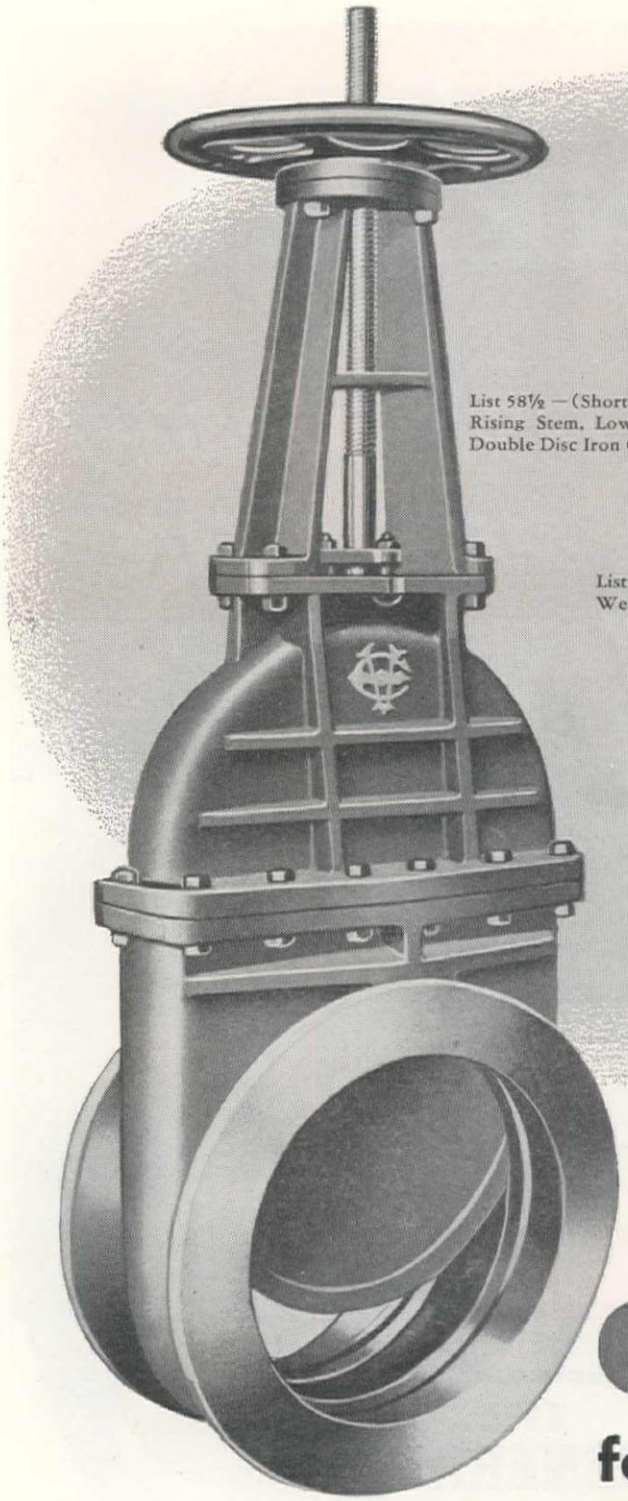
On January 1 of this year Bethlehem's steel making capacity stood at 16 million ingot-tons annually—*an increase of 1 million tons* over a year ago.

Since the war ended we have increased our annual steelmaking capacity *3,100,000 tons, or 24 per cent.*

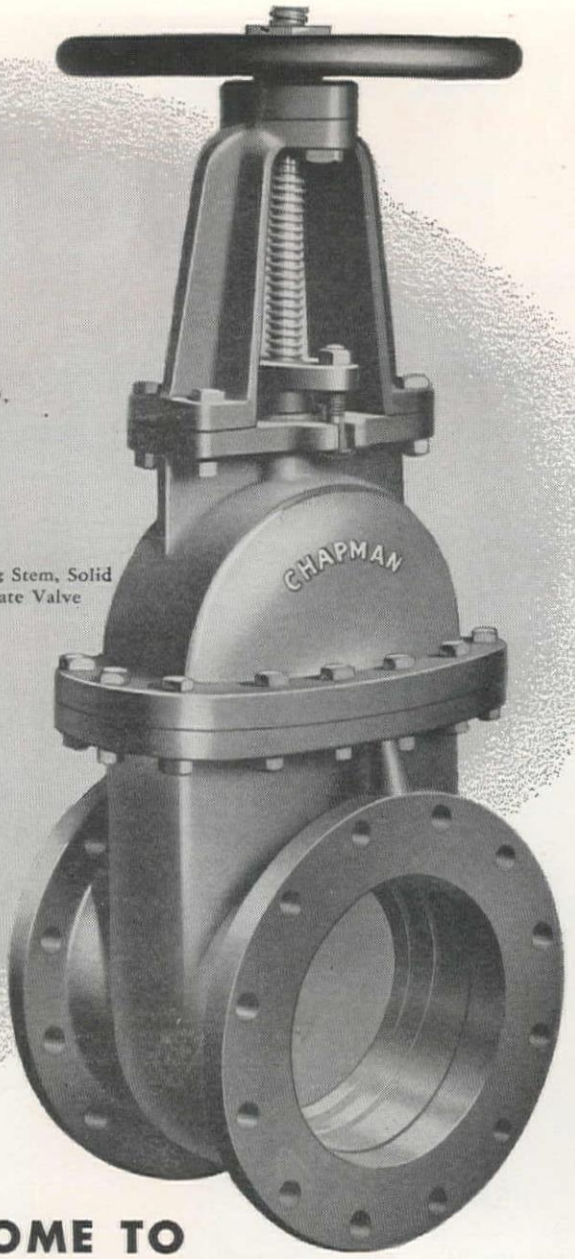
Moreover, as the chart at the right shows, Bethlehem's steel capacity has nearly doubled in 25 years. Additional capacity can and will be created as it is needed.



BETHLEHEM STEEL ★ BETHLEHEM STEEL ★



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



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

COME TO CHAPMAN

for Standard Gate Valves

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

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

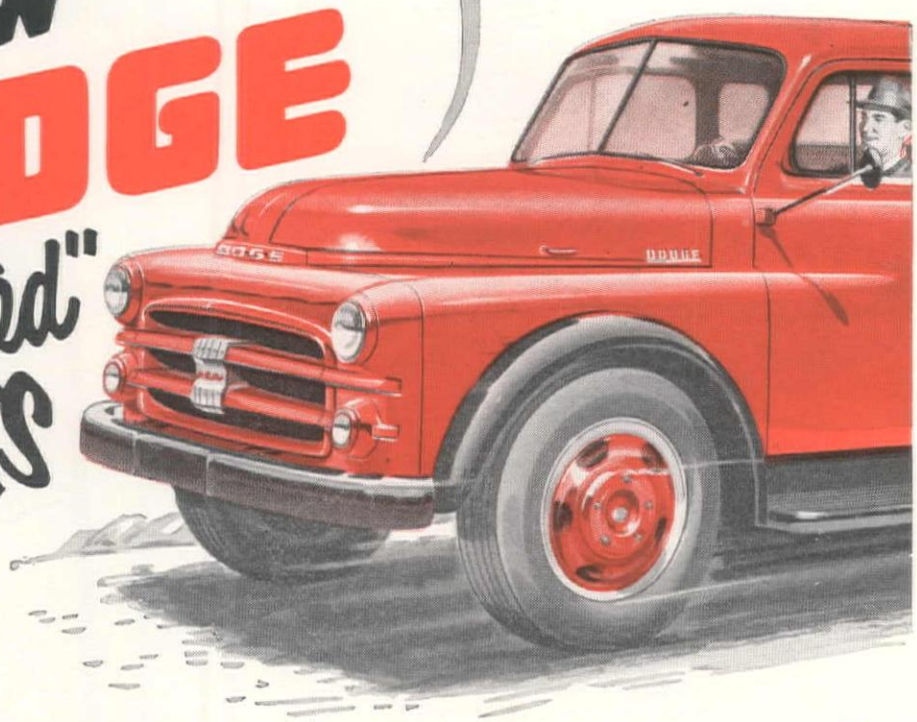
If, however, you need bronze valves — we have them. Just as we have a complete line of steel valves. And valves of many other types such as tilting disc, iron and steel check valves. Whenever special valves for unusual service are required, Chapman engineers will be glad to help you develop them.

The Chapman Valve Manufacturing Company

INDIAN ORCHARD, MASSACHUSETTS

ANNOUNCING!

NEW DODGE "Job-Rated" TRUCKS



The trucks that do the most for you!

NEW Greater Power! Eight engines—with horsepower increases as high as 20%. You'll enjoy the *right power* for your job! *With all their extra value, Dodge "Job-Rated" Trucks are priced with the lowest!*

NEW Easier Handling!
Now, even sharper turning! More comfortable steering angle and easier-operating new worm-and-roller steering gears! You also get such proved features as cross-steering, wide front tread, short wheelbase.

NEW Interiors! Striking new, massive appearance—inside and out! Lower hood line for better visibility. Attractive two-tone cab interiors. New clear-vision instrument panel. New seat comfort.

NEW Extra Quiet Brakes!
Another Dodge "first"! Molded, tapered Cyclebond brake lining. Practically eliminates squeal and grab. Extra-smooth, positive action. Extra-long life. Standard on trucks 1½-ton and up, except air brake models.

ANOTHER DODGE EXCLUSIVE! gyrol fluid drive now available on ½-, ¾-, and 1-ton models.

MORE THAN 50 BRAND-NEW IMPROVEMENTS . . . INCLUDING

- NEW! SMOOTHER RIDE
- NEW! EASIER LOADING
- NEW! EASIER BAD-WEATHER STARTING
- NEW! GREATER ELECTRICAL CAPACITY
- NEW! EASIER-TO-READ INSTRUMENTS
- NEW! BETTER VISIBILITY IN BAD WEATHER
- NEW! MORE EFFICIENT FUEL PUMP

See the NEW **DODGE "Job-Rated" TRUCKS** now on display at your DODGE DEALER'S

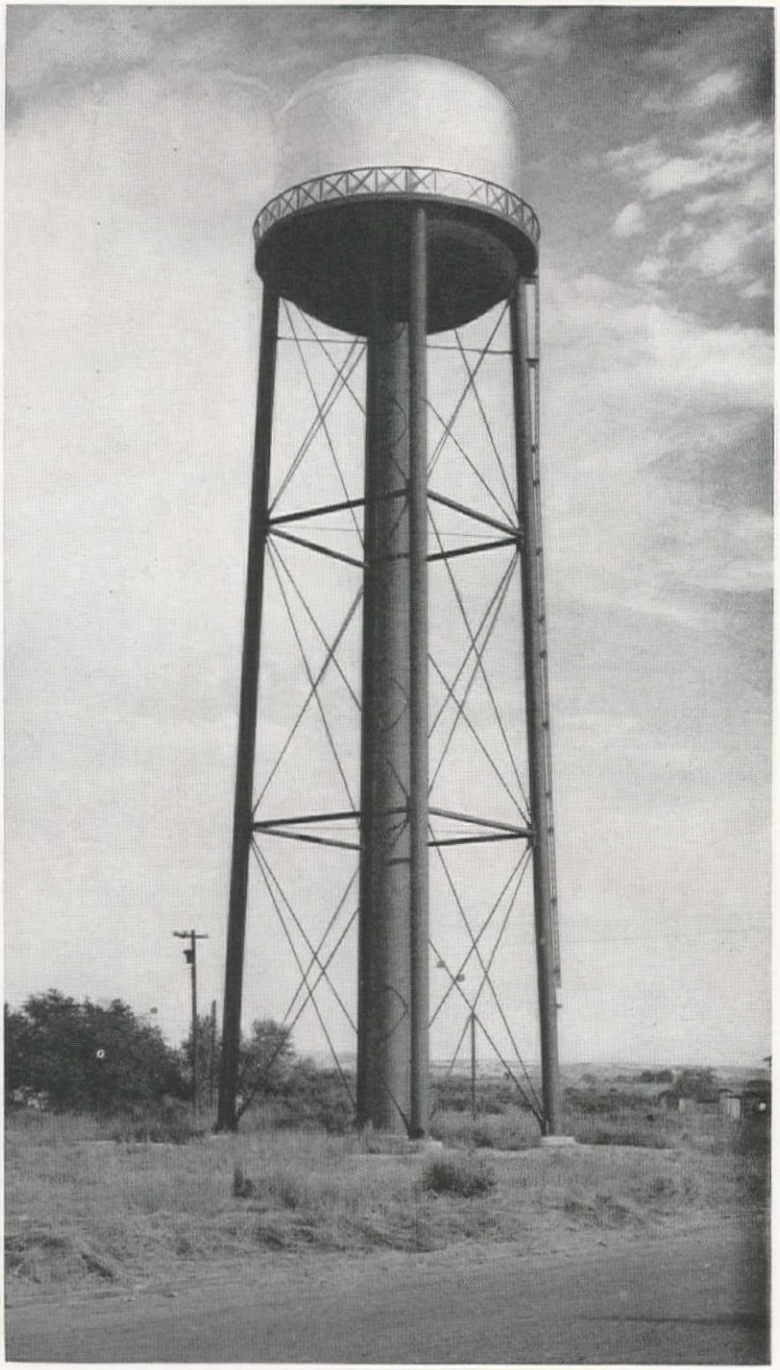
SENTINEL ON THE SNAKE RIVER

"La Maudite—Riviere Enragee" . . . the accursed, the rapid river . . . that's what the French voyageurs used to call it. With good reason too! For hundreds of miles the Snake River twists through granite mountains, desolate prairies, deep gorges . . . sometimes disappearing into underground caverns only to appear again miles downstream. When pioneers and homesteaders found their way to its banks, Fort Boise and Fort Henry were built to provide for their protection. The dreaded river slowly became transformed. As the years went by, what had once been a desolate valley bloomed into rich farm land and growing cities.

And like these old log forts that guarded the people who lived along the winding Snake River, a Horton elevated tank stands like a sentinel in Nyssa, Oregon. For this 100,000-gallon tank provides dependable protection to 751 customers in this growing community . . . protection against interruptions in water service . . . protection against diminishing pressures during peak load periods.

Why don't you take advantage of this protection? Horton welded steel elevated tanks are gracefully designed for long service and lower maintenance costs. Tanks with ellipsoidal bottoms and roofs similar to the Nyssa installation are available in standard capacities from 15,000 to 500,000 gallons.

For complete information, write our nearest office.



Above: Like all Horton municipal installations, this 100,000-gallon ellipsoidal bottom tank is built in accordance with A.W.W.A. specification. It helps supply well water to 8.8 miles of city mains. The minimum pressure in the system is 30 lbs.

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

WESTERN CONSTRUCTION

February 1951 Vol. 26, No. 2

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

A Gas Tax for Airports

HIGHWAY HISTORY records the introduction of a use-tax when the pressure for road expansion exceeded the economic limit of funds from taxes on property. Airport needs have now arrived at this same relative position in regard to financing. According to established practice cities provide these airport facilities as a regular municipal function, but the income from rents and services usually covers only a portion of the costs. This idea of municipal responsibility has developed several fallacies. First, airport costs have increased until cities can no longer afford the tax burden of this service. Further, airports serve the needs of an area much greater than the city, and the outlying districts receive benefits without contributing adequate financial support. Lastly, requirements of air travel or transportation may indicate the need for an airport far removed from a city, as an area with a large but seasonal population.

A fair and equitable solution for the financing of airport projects would be a state tax on aviation fuel. If the use of these funds could be fully protected, as in the case of the highway gas-tax money, there is no reason to believe that serious objections would be raised to such a levy on airplane operations. Obviously, the large interstate air lines would be exempt from any state tax on fuels, but these operators generally carry their share of costs in rentals at the large airports. Local and intrastate air service would represent the proper source for the revenue from fuel, and would secure the major benefits. Today, California has established an authority for studying the need of its accelerating air transport industry. A plan for providing an adequate system of air fields has been formulated, and financing represents a major problem in its balanced development. The parallel of the highway financing and the gas-tax provides the key.

Scholarships by A.G.C.

CLOSER CONTACT between the contractors of Utah and the young civil engineers of the state will be developed as a result of the scholarships recently established by the Intermountain Branch of the A.G.C. The awards made to a junior at both Utah State College and the University of Utah indicate the interest of contractors in encouraging engineering graduates to consider careers in construction. Today the trend in colleges and the industry accelerates in that direction. At present there are relatively few means available by which students can secure an understanding of contracting as a career. As a step in this direction the contractors of Utah have combined a generous act with a means of securing recognition among candidates for future executive positions in the organizations of the A.G.C.

Engineers Who Work for Contractors

CONTRACTORS need engineering talent in their organizations. No longer is it practicable to carry out the complicated operations required on a modern construction job, and meet the demands of technical specifications, with old-fashioned, rule-of-thumb field techniques. Contractors are well aware of this need and progressive organizations are recruiting engineering talent from the civil engineering colleges of the West. These colleges are also aware of this relatively new and expanding field for their graduates.

In California a situation exists which complicates the normal development of this logical concept. The registration law provides that civil engineering graduates during their two-year period of "in-training" must work *"under the direction of a civil engineer legally qualified to practice."* This rigid legal requirement forces a hard decision on any young graduate who may consider getting a job with a contractor. Assuming that the contractor does not have a licensed engineer in his employ, the graduate must view the job possibility with the understanding that he will not qualify for registration. Otherwise, he must first take a job where he will work under a licensed engineer for the required period, then pass his examination, and finally try to get the type of job which was his first choice.

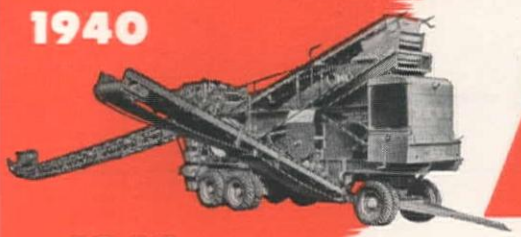
The problem is not simple and there is much diversity of opinion. First, the law includes "supervision of the construction of engineering structures" as part of the definition of civil engineering. Thus, if the present restriction of the act, which requires the period of apprenticeship, were removed it would still be the board's responsibility to determine whether the young engineer had sufficient experience to qualify under this or any other section of the legal definition.

Naturally, private consulting engineers are concerned about the indirect threat of more and more contractors developing engineering staffs. Their position is based on the premise that an engineering license is not necessary for a successful career in contracting, and that if a young engineer wants to be a contractor let him forget about getting a professional license. If the contractor actually needs engineering services let him hire a private consulting engineer for such work. In this point of view the interests of the young graduate deserve some consideration, and he cannot be blamed for wanting to secure a license as the final goal of his years of education and as a security measure if his first choice of jobs is not a success.

The final answer to the complex problem lies behind a profusion of conflicting factors. Those mostly concerned—at least those most interested in modifying the present situation—are the contractors and the young graduates. They must assume the initiative in accomplishing a reconciliation in the present conflict. There is room and need for plenty of sound and objective thinking on this subject from every interest in the construction industry.

1939

1940

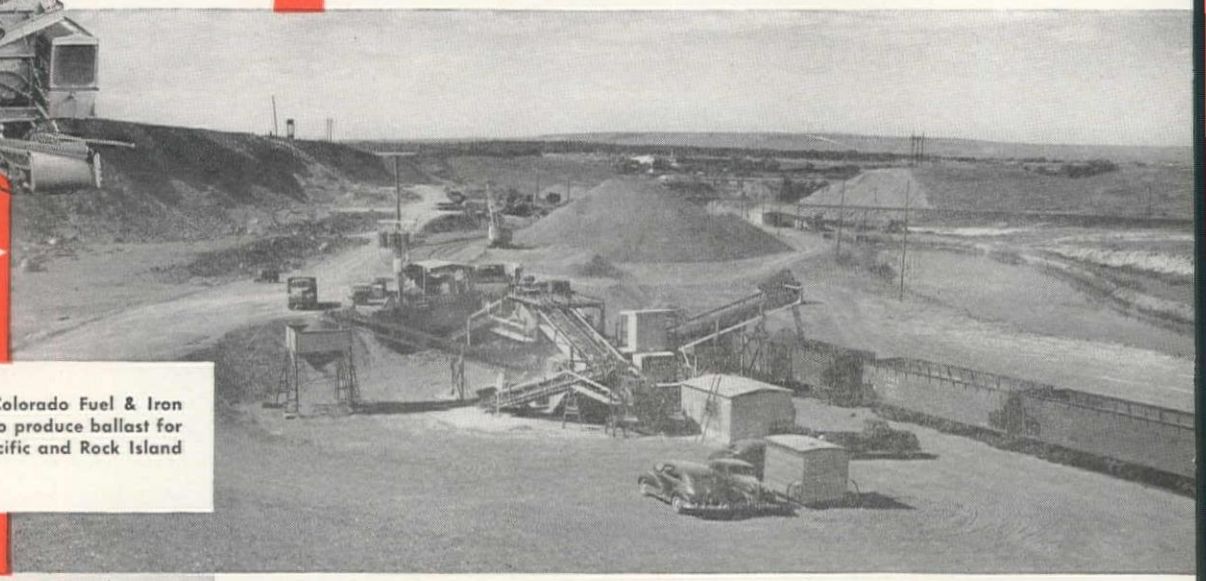


1942

1949→

4 Austin-Western CRUSHING PLANTS

for Arthur & Allen of Pueblo, Colorado



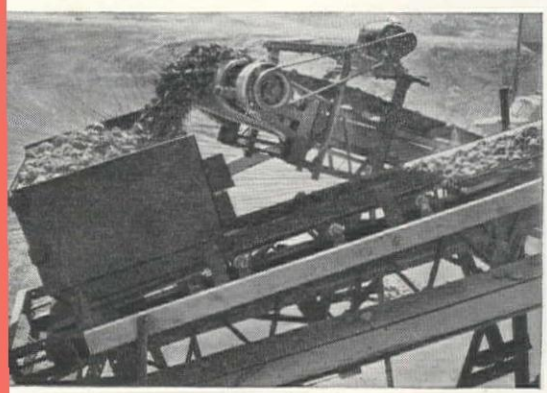
Crushing slag from the Colorado Fuel & Iron Company's Pueblo plant to produce ballast for the Santa Fe, Missouri Pacific and Rock Island Railroads.

The man at the feed conveyor in the foreground is salvaging iron from the slag.

This, the fourth Austin-Western Crushing and Screening Plant purchased by Arthur & Allen over a ten-year period, has an average run of 350 tons per hour and has reached a peak output of 420 tons per hour. The finished product is, in almost all cases, 1½″ minus to ⅜″ plus. The percentage of crush is approximately 60.

Whatever your production requirements, an Austin-Western Plant, designed and tailor-made to meet them, will do the same sort of outstanding job for you. Let's talk it over.

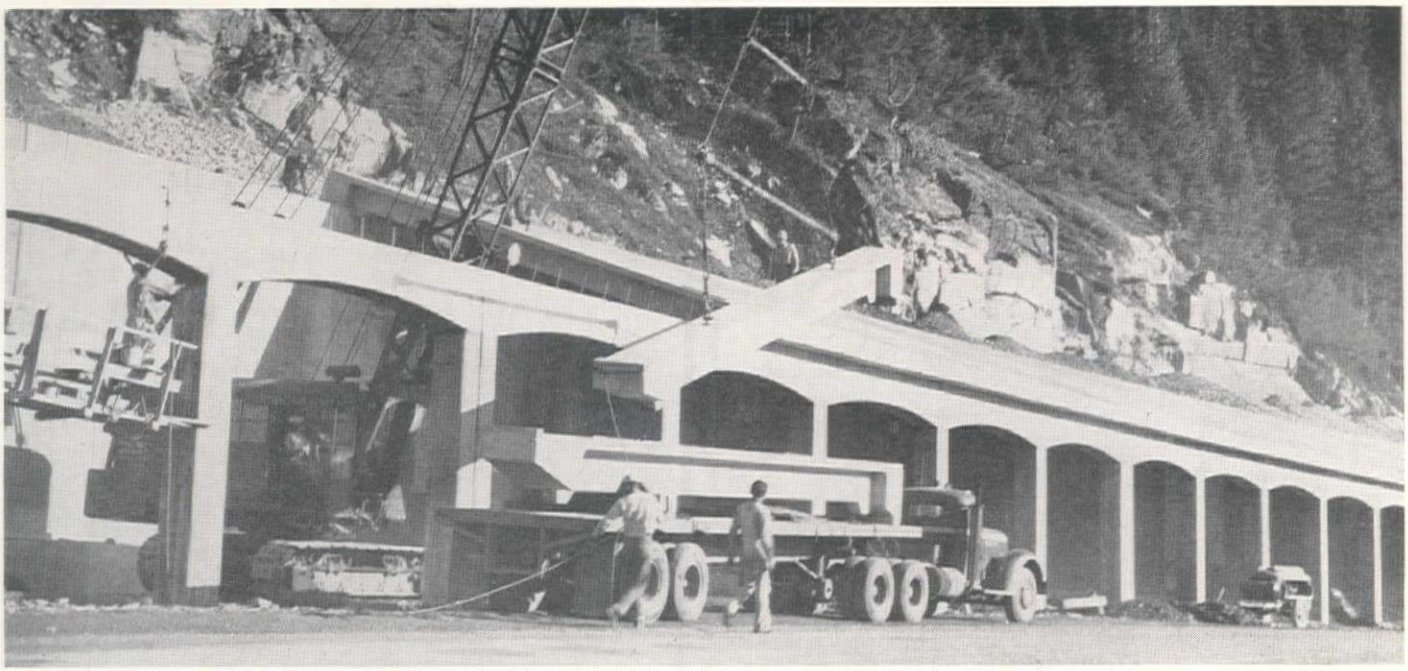
AUSTIN-WESTERN COMPANY, AURORA, ILLINOIS, U.S.A.



These conveyors are carrying the combined output of jaw and roll crushers.

The loading hopper is arranged to accommodate two trucks at one time.

ARIZONA—SHRIVER MACHINERY COMPANY.....*Phoenix*
CALIFORNIA—EDWARD R. BACON COMPANY.....*San Francisco 10*
CALIFORNIA—SMITH BOOTH USHER COMPANY.....*Los Angeles 54*
COLORADO—LIBERTY TRUCKS & PARTS COMPANY.....*Denver 1*
IDAHO—COLUMBIA EQUIPMENT COMPANY.....*Boise*
MONTANA—WESTERN CONSTRUCTION EQUIPMENT CO.....*Billings*
MONTANA—WESTERN CONSTRUCTION EQUIPMENT CO.....*Missoula*
NEVADA—C. D. ROEDER EQUIPMENT COMPANY.....*Reno*
NEW MEXICO—N. C. RIBBLE COMPANY.....*Albuquerque*
OREGON—COLUMBIA EQUIPMENT COMPANY.....*Portland 14*
UTAH—WESTERN MACHINERY COMPANY.....*Salt Lake City 13*
WASHINGTON—COLUMBIA EQUIPMENT COMPANY.....*Seattle*
WYOMING—WILSON EQUIPMENT & SUPPLY COMPANY.....*Cheyenne*



Washington Uses Precast Units for—

Concrete Snowsheds in the Cascades

Sheds 500 and 1,300 ft. long built to shelter two lanes of pass highway often closed by massive snow slides—Tapered T-beams nearly 40 ft. long for sloped roof precast to save construction time during short summer working season

By MARK S. WOODIN
Bridge Construction Engineer
Department of Highways
State of Washington

A RACE against the deepening snow of the winter season in Snoqualmie Pass was won by a narrow margin when the contractor for two concrete snowsheds, being built there for the State of Washington, Department of Highways, placed the last of the backfill against the mountain side and set the final precast roof members. Heavy snow hampered the last operations and the roadway paving had to be deferred until next summer but the sheds are open to traffic and will be of great value in helping to keep the highway open this winter.

Snoqualmie Pass is about 50 mi. southeast of Seattle on Primary State Highway No. 2, which is U. S. Highway No. 10. It is the lowest mountain pass through the Cascade Range and as it carries a large volume of traffic to and from the east to Seattle and the entire Puget Sound area, it is highly important that it be kept open through the winter with a minimum of delays.

Timber shed deteriorates

A short timber shed had long been in service on the east side of the summit near Lake Keechelus, but had reached such an advanced stage of deterioration that further repairs were considered to be impractical. Also, during the bad winter of 1948-1949, the pass was closed repeatedly for long periods by massive snow slides. The worst of these came at a spot slightly west of the summit, known as Airplane Curve, which had no protection whatever. The inconvenience and delays suffered by the traveling public made it apparent that a definite start should be made toward a solution of the problem of keeping winter traffic moving with less danger and expense.

It was decided to rebuild the 500-ft. Lake Keechelus shed and construct a shed 1,300 ft. long at Airplane Curve, using reinforced concrete construction at both places.

It is planned eventually to widen the present highway to four lanes and extend the Airplane Curve shed toward the summit. However, since the winter traffic is so much lighter than in the summer, it was considered that the sheds would only have to be designed to accommodate two traffic lanes.

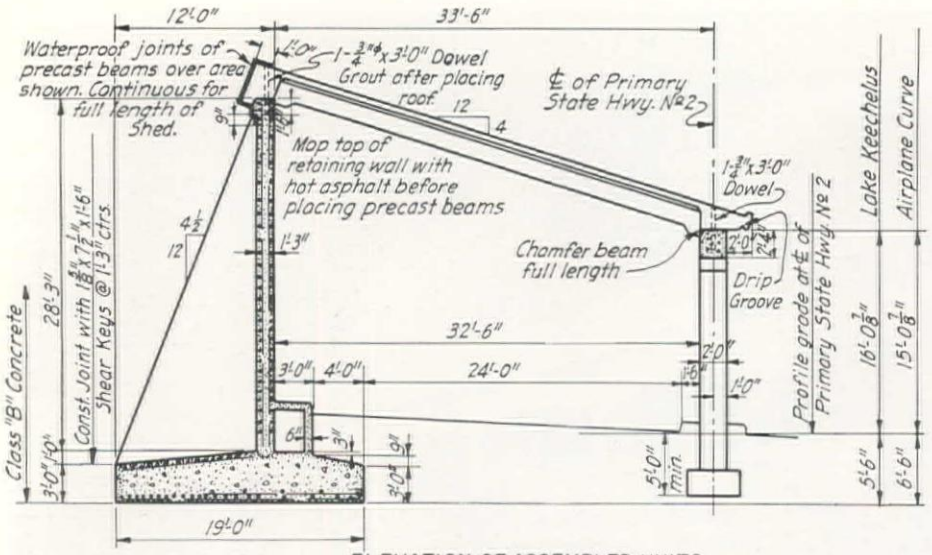
Short season influences design

Another important factor that influenced the design was the extremely short summer season during which construction had to be accomplished. For this reason, plans were sent out to prospective bidders in the fall of 1949 to enable them to make an inspection of the sites before the heavy snow came. Bids on the project were not taken until February 28, 1950, and the contract was executed on March 25, with 240 calendar days allowed for completion. C. V. Wilder and Gaasland Company, Inc., a joint venture of Bellingham, Washington, was awarded the contract on a bid of $1,015,620.55.

Design and forms

The snowsheds have a uniform cross-section consisting of a counterforted retaining wall on the uphill side, 15 in. thick and 28 ft., 3 in. high, a roof of precast I-beams and a series of 20-ft. open bays on the downhill side to support the lower end of the roof beams, which sit on a slope of 4 in 12. The concrete roadway is 28 ft. wide between curbs. The clear span between the inside of the retaining wall and the inside face of the columns on the downhill side is 32 ft., 6 in. The retaining wall footing is 19 ft. wide in rock formations and 23 ft. wide in sand and gravel. Its maximum thickness is 4 ft. The counterforts are 2 ft. thick and spaced on about 10-ft. centers. The open bays on the downhill side consist of a series of columns 2 ft. square on 20-ft. centers, connected by arched beams 2 ft. thick, 3 ft., 4 in. deep over the columns and 2 ft., 4 in. deep at the center of span between columns. Universal Form Clamp Company of Chicago supplied the steel and plywood forms used for the walls, counterforts and columns. Air-entrained concrete was used throughout the structures.

Drainage passes through 12-in. square openings in the retaining wall beside each counterfort. It collects in a duct



ELEVATION OF ASSEMBLED UNITS

2 ft., 6 in. wide and approximately 3 ft. high. The top of the duct forms a safety walk and curb along the uphill side of the roadway. At 100-ft. intervals, 24-in. reinforced concrete culvert pipes lead from the duct under the roadway and discharge on the mountainside.

Precast roof a time-saver

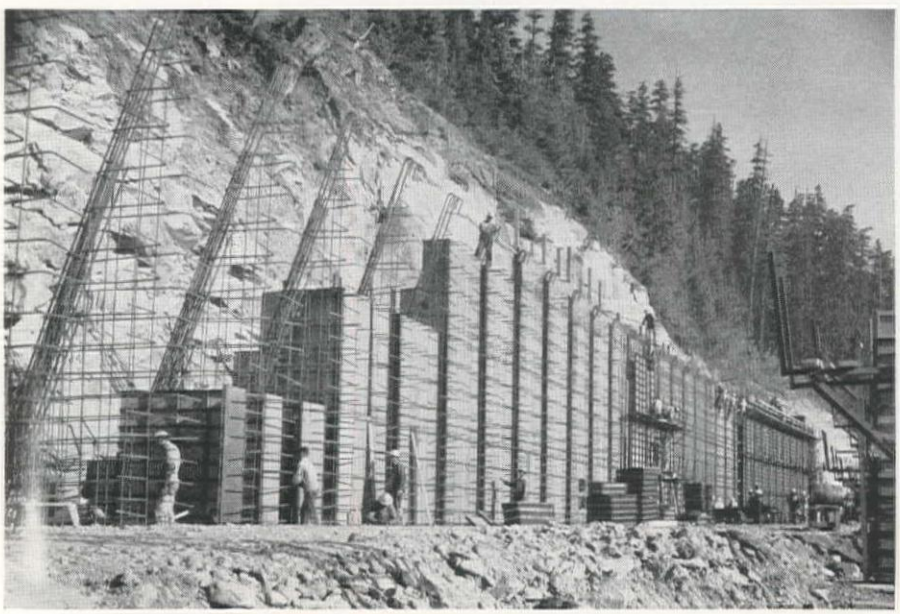
In order to save as much construction time as possible, it was decided to make the roof entirely of precast units which could be set in place as soon as the supporting wall and columns were ready. The typical roof unit, of which a total of 720 were required for the two structures, consisted of a T-beam section having a stem 9 in. thick and 21 in. deep below the flanges. Because both sheds were located on curves, the beam flanges, 5 in. thick, which form the roof, are tapered slightly in width, except for 30 units, which were made a uniform width of 2 ft., 6 in. The roof beams for the Keechelus shed taper from 2 ft., 6½ in. wide at the upper end to 2 ft., 5-5/16 in. at the lower end. The beams at the Airplane Curve shed taper from 2 ft., 6-3/16 in. to 2 ft., 6 in. Both ends of the beams were thickened and recessed to fit over the top of the wall and over the support at the lower end. A tapered hole of 2-in. diameter at the top and 1½-in. diameter at the bottom was formed at each end of the beams to take ¾-in. dowels set in the walls. The tapered holes were filled with grout after the roof was in place.

Ingenious steel forms for beams

The roof beams were made in Seattle at the plant of the Seattle Concrete Pipe Company. Talbot Campbell, president of this organization, devoted a great deal of time and ingenuity to designing the steel forms that were very successfully used in casting the beams. The space allowed between flanges was only ¼ in. Above this open space, a recess was formed, at the bottom of which a piece of asphaltic filler was placed. The recess was then filled with cement grout. Above the grouted recess the opening between flanges was widened to 1 in. and it was originally intended to seal the joint by filling this opening with 61 to 70 penetration asphalt. However, the sealing was not commenced before the snow started in November and it became necessary to defer that part of the work until next spring. It was also decided to substitute Hunts Process Mastic joint filler in place of the asphalt for sealing the joints, as it was adapted to placing in wet weather and also was considered to be more likely to stay in place during the hot summer months. There was considerable discussion during the design stage of this project as to whether the roof beams could be successfully made and placed with the very small tolerances allowed by the ¼-in. space between beams and by the ¾-in. dowels in the 1½-in. holes at the ends of the beams. However, due to the ingenuity and expert workmanship expended on the design and building of the beam forms, together with the skill and exactness with which the field engineers did their work of laying out the structure and setting the dowels, no difficulty was experienced.

The steel forms were made up in four batteries of five forms each. In order to save time, all beams were steam cured. In accordance with the specifications, the forms were allowed to be stripped after forty-eight hours of steam curing, provided a cylinder test indicated that satisfactory strength had been attained. Each beam weighed approximately 9 tons and two beams at a time were hauled from Seattle to the job site on flat bed trucks. After a little practice, a roof unit could be hoisted from the trucks and set in place in about ten minutes.

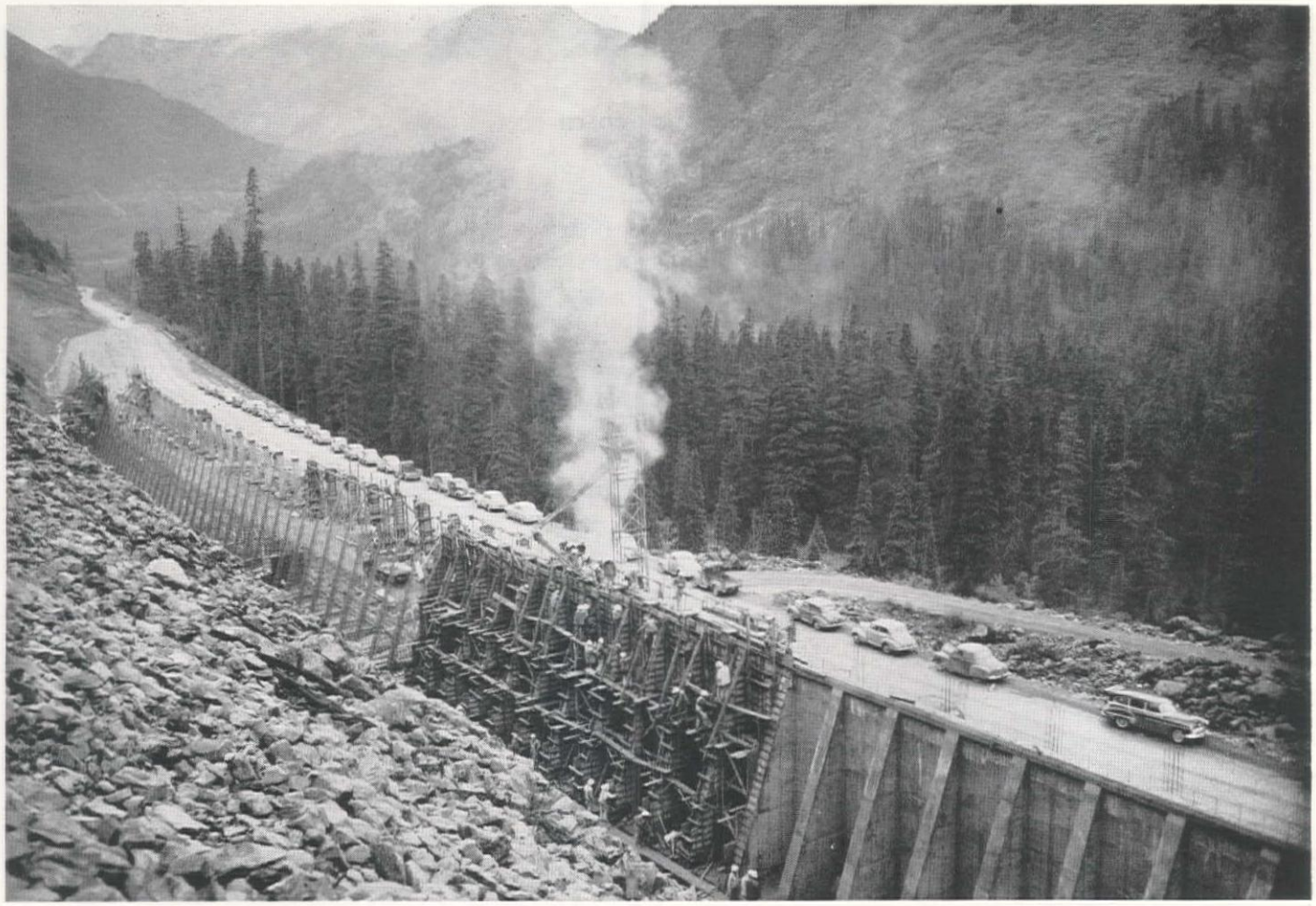
COMBINATION of vertical and horizontal curves presented a forming problem. Three sets of prefabricated steel and plywood forms (Uni-Forms) made a smooth pouring cycle possible.



Excavation starts in deep snow

The principal construction problem encountered on this project was in getting the structure excavation done and before that, in the removal of snow so that the excavation could be started. Considerable delay was experienced at the outset because of the late spring and the very heavy snow that covered the sites of both structures. At Lake Keechelus, it was finally necessary to blast the ice at the edge of the lake so that the huge mass of snow could be pushed into the water with bulldozers. Difficulty was also experienced here in shooting the solid rock which had to be removed. The rock tended to break too large for economical handling and in many cases secondary shooting had to be done. The contract required slightly less than 66,000 cu. yd. of solid rock excavation and it is believed that the considerable difficulties that developed in connection with this phase of the work were primarily responsible for the inability to complete the project before it had to be closed down for the winter.

Excavation was mainly handled by a two-yard Manitowoc shovel, a two-yard Northwest shovel, three Tournarockers, five six-yard trucks and two five-yard Dumptors. The excavated material was used to build up the embankment on the sidehill below the structures to a width sufficient to accommodate two traffic lanes during the shed construction and for future summer time travel.



PLACING CONCRETE in columns and walls proceeded simultaneously for all possible speed during the short working season. This view is at Airplane Curve. A 55-ft. tower lifted mix to hoppers and chutes placed at intervals along the walls.

All aggregates for both structures were produced from the bed of Gold Creek, adjacent to the highway and a short distance west of the Keechelus shed. The sand carried too much organic material and a washing plant had to be established to clean it up before it could be used. Gravel backfill for the Keechelus shed was also obtained from the Gold Creek pit. The material was hauled and dumped into a six-yard skip which was then lifted over the backwall and dumped by a mobile crane operating ahead of the roof emplacement operations between the backwall and the open bays. A total of 13,660 cu. yd. of gravel backfill was thus placed. At the Airplane Curve structure, the backfill was made from the talus slide immediately back of and above the shed backwall. Some difficulty was experienced here in controlling the large boulders in the slide material. A bumper, consisting of a 30-in. log, 50 ft. long, suspended on the retaining wall counterforts and gradually raised as the bulldozer pushed the material into place, helped protect the wall from damage due to rolling rocks.

Concrete placement

Concrete was dumped into a Mixermobile having a 55-ft. tower which was high enough so that placement could be made into hoppers and chutes set at intervals along the walls.

Quantities involved in the project included 3,120 cu. yd. of concrete in precast roof beams, 10,800 cu. yd. of other structural concrete and 1,350 tons of steel reinforcing bars. The 5,205 sq. yd. of 8-in. concrete pavement included in the contract will not be placed until next summer.

Personnel

All the design work and preparation of plans and specifications was done in the Headquarters Office of the State Department of Highways at Olympia, with William A. Bugge, Director of Highways; George Stevens, bridge engineer, in immediate charge of design; T. P. Doyle, district engineer at Yakima and C. E. Chapman, resident engineer, in immediate charge of construction.

For the contractor, E. V. Shields, superintendent, and L. D. McDaniel, field engineer, carried on the work for the Gaasland Company; while Sam Lowry, superintendent for C. V. Wilder, was in charge of the grading work.

BACKFILLING at the Airplane Curve structure was completed while the precast roof beams were being placed. The backfill was made by bulldozing talus slope immediately uphill, with a bumper log suspended on retaining wall counterforts protecting the wall from rolling rocks.

Planning a Statewide Airport System

Believing that the "master plan" approach and adequate engineering studies are needed for coordinated airport development, California has in operation an aviation agency at the state government level — Progress to date can be compared to the pattern of highway development in 1920

By ROBERT L. WEBB, JR.
Supervising Airport Engineer
California Aeronautics Commission
Sacramento, Calif.

THE 1947 California Legislature created the California Aeronautics Commission, empowering and directing it " * * * to encourage, foster, and assist in the development of aeronautics in this State and to encourage the establishment of airports and air navigation facilities * * * ."

In carrying out these legislative directives, the Commission's staff has devoted its time to activities such as surveying, appraising and cataloging all existing airports, furnishing engineering assistance to many political subdivisions within the State, conducting preliminary site selection surveys, and encouraging the development of regional and area airport master plans.

The Commission has engaged in many other activities concerning California's aviation and has devoted considerable time to the collection of basic data which are the essential tools for building its future. Such functions as the compilation of California Aviation Laws and the publishing of an aeronautical chart and airport directory have been among the Commission's early activities. Studies have been conducted and reports presented on the interests of the State in developing perishable agricultural products into air cargo potentials. Since California was the forty-third state to create an aviation agency at the state level, it is apparent that there was considerable "catching up" to do.

An analogy to highway development

The Commission is fully aware of its extensive responsibility in serving California's number two dollar-producing industry. The aircraft manufacturing industry, which is second only to agriculture, has been credited with adding more than a billion dollars annually to California's economy. The aviation manufacturing activity alone employs in excess of one hundred thousand people.

Air transportation, the newest member of the transportation family, is necessarily compared to its predecessors in this group. The analogy of airport development to highway development appears to be quite close as the pattern of airport development stands today approximately where the pattern of highway development stood in 1920. Highways were originally constructed by cities as city streets, then by counties as the need for rapid movement between town and country became evident, and finally by states as a whole, with the national government interesting itself in main trunk routes connecting the major areas of this country. It is proper that the state should develop transportation media to serve the entire State. It is obvious that a part of a highway or an airport system is of no great benefit in itself. Each part or segment is merely a link in the chain and the full economic benefits never will be derived from any transportation system until the system is essentially complete. These principles form the basis for highway development, and airport development can do no better than to borrow this theme.

Some relative advantages

Airport development has one signal advantage over highway development which is exemplified by the fact that one mile of wide highway at San Diego (Lindbergh Field), and another mile of wide highway at Redding (Redding Municipal Airport) can, and does, provide adequate facilities for air transportation between these two points. The tremendous advantage in lower initial cost inherent in air transportation is readily apparent. Airport development is following the same pattern as highway development, as regards the interests of governments in these activities. The Federal Government has long been interested in highway construction through the Bureau of Public Roads, and for a shorter time has been interested in airport development through the Civil Aeronautics Administration and its predecessors. More than $142,000,000 has been expended or authorized by the Federal Government for the development of civil airports in the United States under the Federal Aid Airport Act of 1946. California has received less than her proportionate share as shown by the accompanying comparisons of pertinent aviation statistics.

California lags

The tabulation demonstrates California's interest in aviation, which has produced more than 11% of the nation's planes and pilots from 7% of the nation's population. The table also shows that the State is lagging in civil airports which is comparable to the lag in California's utilization of Federal Airport Funds. This lag in airport development is reflected in the low percentage of approved flight schools.

The several states' roles in airport development have as many variations as there are state aviation agencies. Some states are actively engaged in assisting in the financing and development of a statewide system of airports. Several states own and operate various types of airports. California's role to date, as outlined by the Legislature, has been limited to the coordination of, and assistance to, the present progress of aviation,

About this article—

Airport development stands today where highway development was in 1920. Thirty years ago coordinated systems of highways were being planned and built to serve the needs of entire states, with proper reference to connections which would form a national system of highways. Two factors were important in that stage of highway development: (1) adequate engineering studies and (2) improved finances to build the systems.

Today, airport development has passed beyond the stage of municipal planning, and state-wide programs must provide the unit of engineering design and construction. Financing problems follow and again the similarity to state highway development is indicated and a new source of revenue must be found (see editorial on page 57). This article reviews the state-wide program for coordinated airport development which has been made possible by the establishing of the California Aeronautics Commission. The work of the Commission is reviewed and the program of necessary airport construction is outlined.

For the readers of *Western Construction* this article serves the dual purpose of bringing this new phase of engineering work to date for the other states in the West and by way of indicating the amount and types of construction work which will be the final result of this airport development program.—*Editor.*

Comparisons of Aviation Statistics Show How California Lags

	U. S.	CALIF.	% of U. S.
Population	150,520,000	10,472,348	6.96
Civil Aircraft	92,622	10,594	11.4
Certificated Airmen (commercial and private)	592,761	73,417	11.4
Approved Flight Schools	2,430	198	8.1
Civil Airports (municipal and commercial)	4,785	330	6.9
Total Allocations—Federal Aid Airport Funds to June 30, 1950	$142,597,000	$10,508,767	7.3

and the master planning and encouragement of an integrated state-wide system of permanent airports. Ownership and operation of this system, following the dictum of the Federal Airport Program, would be retained by local political subdivisions wherever possible.

There will be, of course, several localities in California where no local political agency is justified in providing a needed facility. In these cases where the interest of the State is surpassing, it is proper that the State provide financial assistance toward the construction of the facilities that will be of benefit to all of the people of California. Specifically these sites would be provided in mountain passes on heavily traveled air routes for emergency use, and at aeronautically isolated recreation areas such as at Lake Tahoe. Following the instructions of the Legislature, " * * * to encourage the establishment of airports * * * ," and to provide a detailed pattern for their orderly development, the California Aeronautics Commission has deemed it mandatory to provide and maintain a master plan for the establishment of a statewide system of airports. No agency, other than the State, would be in a position to plan and foster such a program to serve the people of California.

A target provided

This plan entitled "California Airport Study" has been recently published by the Commission as a target for the State and its political subdivisions in providing an adequate statewide system of airports. The study's recommendations are not inflexible and it is expected that they will be revised periodically as circumstances dictate. It is believed that unless an orderly plan is established and followed, then the pattern of airport development within the State will be uneconomical, illogical, and inadequate. The airplane recognizes no political boundaries and it is generally believed now, that the county is the smallest political body that should concern itself with any airport development. This trend in thought appears to be following the plan of highway development and will eventually mean that the state is the smallest subdivision to assist in the financing of major airports.

> "Guided by the principles necessary to be considered, and the conditions presented, the Commission has mapped out a statewide system of **airports**, outlined upon the relief map of the State in the office of the Commission. This map, which shows at a glance the topographical features of the State, was secured in the belief that its use would result in a better understanding of the problems which the Commission is expected to solve, point out more clearly the errors incidental to our present system, particularly the defect of faulty location of **airports**, and demonstrate the breadth and scope of the plan recommended. Upon it have been represented all the important **airports** now in existence and the proposed statewide system of **airports**."

The preceding paragraph is a particularly apt briefing of the "California Airport Study" and the basis of the claim for early implementation of its recommendations. These words (substituting "Bureau" for "Commission" and "roads" for "airports") are a verbatim copy from the initial report by State Road Commissioners Irvine, Manson, and Maude submitted to the Governor of California in November 1896.

In 1895, the California State Highway System was started, when by act of the Legislature the Lake Tahoe Wagon Road was acquired by the State Bureau of Highways. This was the humble beginning of a superb 14,000-mi. statewide system of highways that serves every section of the State with paved public thoroughfares. For a section of California that has a population of over 100,000 persons at times, it is eminently proper, and strangely coincidental, that the California Aeronautics Commission should recommend the establishment of an airport at the southern end of Lake Tahoe as the first step in the program to develop a statewide system of airports.

A priority determined

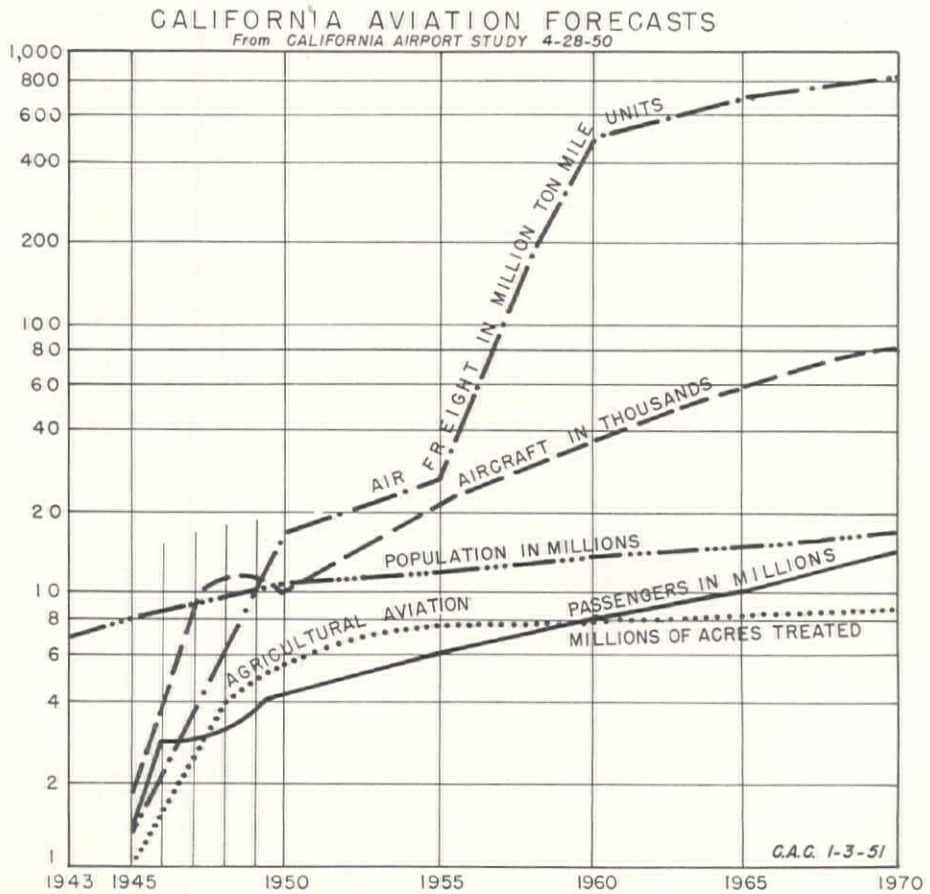
Beginning with the Tahoe airport, and including landing facilities for the new State Fair site, a priority list of construction has been prepared. The five-year program which will fulfill most of California's airport needs, will cost about $14,600,000, of which $7,300,000 may be contributed by the Federal Government under the provisions of the Federal Airport Act of 1946, leaving a state and local share of $7,300,000. This expenditure of state, county and/or city funds for airports appears to be reasonable and equitable when compared to state expenditures for other forms of transportation. Highway capital expenditures by the State alone for construction, reconstruction, and improvements, **less** federal reimbursements for the fiscal year ending June 1949, amounts to $18.05 per year for each licensed motor vehicle operator. This airport program proposes the capital expenditure of $19.89 per licensed pilot per year for a period of five years on the same basis.

An inventory needed

In presenting a plan for airport development, it is proper to begin with an inventory of the aspects of the State that are directly related to aeronautical activity and progress. Those factors that can be directly tied to aviation were selected in this process of studying "end-products" rather than a study of the multitudinous statistics that in summary are recognizable stimuli to aviation's progress. In this study the so-called "end-products" that directly influence aviation have been selected and are as listed below:

Population Land Use	Basic Wealth
Airports Air Passengers Aircraft Agricultural Aviation Air Freight	Total of Aviation Activity
Surface Transportation	For Comparison

The purpose of this inventory is merely to give the facts as they exist and to serve as a point of departure for any



forecast of the future. All of these factors were presented in graphical and pictorial form insofar as possible for reasons of sheer readability and more compelling methods of presentation. The boundless enthusiasm and the unhampered optimism of the West are elements that are most important in this State's progress toward a more prominent place in the Nation, but are impossible to document. However, these qualities are primarily responsible for the large up-turn in the curve projecting these inventory items into the future.

The growth is certain

The forecasts of commercial airline passenger volume, private aircraft registration, air freight and the agricultural usage of aircraft (See chart, preceding page), may appear optimistic but are based on conservative extensions of the curves, representing the progress of these items in the past. The importance of future technological advances in aircraft design, airway and airport operation and the more general acceptance of aviation by a generation that has grown up fondling the model airplane, all have been considered in projecting this present activity into the future. It is proper, as well as necessary, to assume that the general annual improvement in the national standard of living will continue. It is probable that the **rate** of this increase will improve annually. The present trend toward a wider distribution of wealth will increase the number of persons financially able to own aircraft. The movement toward reduced working hours will provide the leisure for more general participation in social and recreational activities involving travel which will increase the utilization of aviation, both commercial and private.

The composition of California presents certain obstacles to over-all studies that are not found in states less diversified in terrain, climate, economy, population distribution, travel habits and general community of interests. For this reason the state has been divided into fourteen "aviation areas." These areas have been selected because they represent distinct units with common interests. In forecasting future aviation activity the end-products required to make suitable recommendations for airport establishment (population, air passenger potential and the expected future registration of private aircraft) have been forecast for 1955 and for 1970 for each of California's fifty-eight counties.

This volume of aviation activity that has been estimated for 1955 naturally leads to certain specific recommendations of airport size and type to serve the various areas throughout the State. Details concerning the airport standards as established by Civil Aeronautics Administration and an estimate of the capacity of each is included in the accompanying box.

Things to consider

In making recommendations for airport locations throughout the State, the most important consideration is the principal justification or the type of air service the recommended facility is intended to provide. Next, the gross area to be served by this facility with its estimated volume of aviation activity, determines the class of airport to be constructed. The established method of airport financing provides for federal participation plus that of a local sponsor. The local sponsor must be a political subdivision or other tax supported body. In each case suggestions have been made as to the political body that should most properly sponsor the project. In cases where cities are already in the airport business, no change was suggested. In most instances of new airport recommendation, the county concerned was suggested as the sponsor. This was done because of the great expansion in cities beyond their limits with the corresponding increase in the population of unincorporated areas which will be served by the airport.

It is believed that the part of airport costs borne by the local sponsor should be spread over the broadest possible tax basis and not confined merely to city limits. In many cases throughout California, cities are now providing airports where the majority of those using the facility are non-residents of the city. Where county interests are secondary in nature, it is suggested that the State participate financially in the sponsorship. At some locations no local sponsor is available and the State must provide local sponsorship.

Estimating costs

In estimating the construction costs, the only items included were those necessary to provide safe and adequate landing areas. These items include: clearing, grading and drainage costs for minimum runways, taxiways and aprons. Suitable bases for appropriate wheel loads are included, and in many cases the construction of surface treatment or light flexible pavement for all weather use is contemplated.

It is believed that no public funds

AIRPORT CAPACITY AND CONSTRUCTION DATA

Class	Based Aircraft Private	Based Aircraft Commercial	Flying Schools	Airline Movements (peak hours) Contact	Airline Movements (peak hours) Instrument
Personal	100[1]	10	1	—	—
Feeder	150[1]	30	2	5[3]	5
Intercontinental	100	100	[2]	120	25

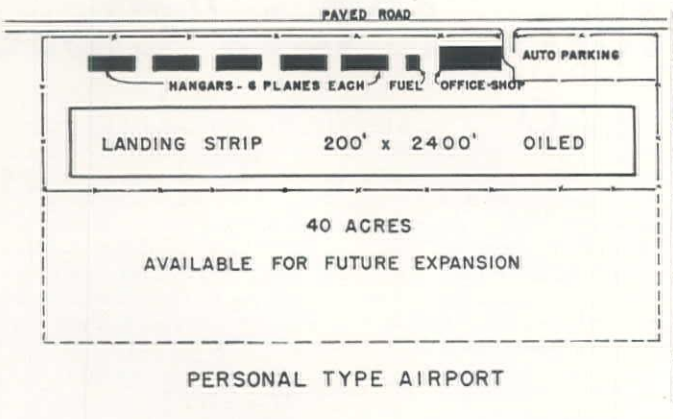
[1] Dual runways will double this capacity.
[2] In general, Class 4 and over airports will be restricted to radio-equipped aircraft operating under Airway Traffic Control and capable of maintaining a minimum speed of 100 miles per hour in the traffic pattern. Training activity will not be feasible.
[3] Feeder lines only.

A. AIRPORT DESIGN STANDARDS

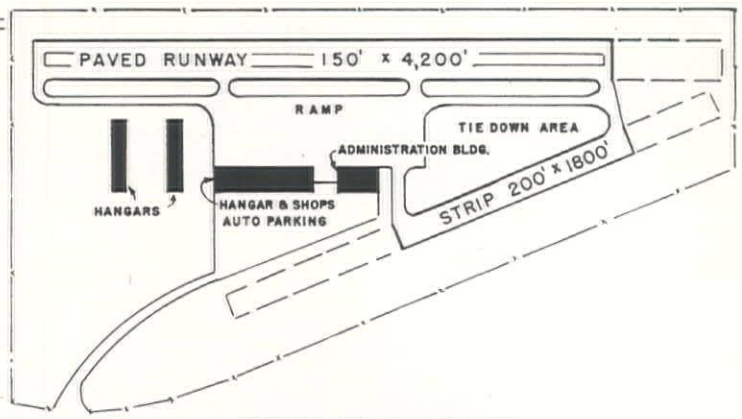
Type of Service	Personal	Feeder	Intercontinental
Length of graded strip	1,700′ to 2,500′	3,201′ to 3,700′	7,201′ to 8,600′
Width of graded strip	200′	300′	500′
Runway width	50′	100′	200′
Taxiway width	20′	40′	100′
Maximum runway grade	3%	1½%	1½%
Max. single wheel load	2,500#	15,000#	100,000#

B. CONSTRUCTION ITEMS (Average conditions)

Clearing and Grubbing	10 acres	20 acres	150 acres
Earth work	20,000 c.y.	40,000 c.y.	6 million c.y.
Drainage	Ditches or 600′ pipe	800′ pipe or drain system	Storm drain system
Fencing	7,000 B/wire	12,000′ B/wire or chain link	30,000′ chain link
Buildings: Administration	1,000 sq. ft.	50,000 sq. ft.	150,000 sq. ft.
Hangars and shops	5,000 sq. ft.	100,000 sq. ft.	500,000 sq. ft.
Tower	No	No	Yes
Utilities	Telephone: Utilities optional	All utilities	All utilities
Tiedown facilities	25	50	100
Airport markers	Segment circle, wind sock	Circle, sock, lights, beacon	Circle, sock, lights, beacon, also landing aids
Pavements	20,000 sq. ft. Turf, dust palliative or surface treatment.	60,000 sq. yd. (a) Asphalt cement. 0-14″ base mat'l., 4″ asphaltic base course, 4″ asphaltic surface course. (b) Portland cement. 4″-12″ aggregate base, 6″-8″ concrete.	600,000 sq. yd. (a) Asphalt cement. 0-48″ base mat'l., 7″ asphaltic base course, 4″ asphaltic surface course. (b) Portland cement. 4″-28″ aggregate base, 12″-18″ concrete.

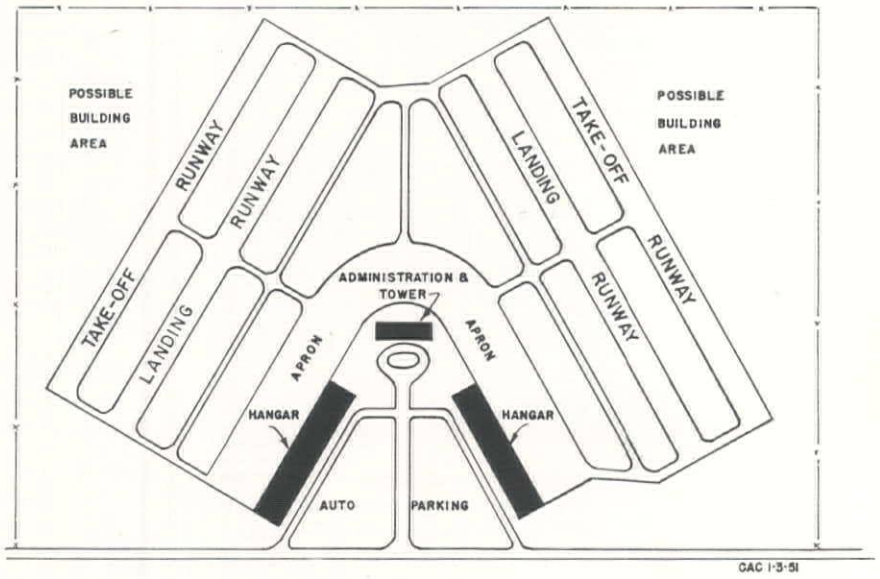


PERSONAL TYPE AIRPORT



FEEDER TYPE AIRPORT

MOST IMPORTANT consideration in making recommendations for airport locations throughout the state is justification of the type of air service the facility is intended to provide. Three types of airports are illustrated by the drawings. A survey and prediction of aircraft expected to be based at a particular location where an airport could serve an allocated area can determine which of the three types should be provided.



INTERCONTINENTAL TYPE AIRPORT

should be expended initially on any items that are not absolutely necessary to provide for the safe operation of aircraft. This policy eliminates administration buildings other than the bare essentials needed; it eliminates all hangar construction and provides the absolute minimum in parking and tie-down areas. It is proper that these refinements should come at a later date as the volume of aviation activity increases. Recommendations include one hundred twenty-three new airports, minor improvements to sixty-two existing airports, and the acquisition of ninety-three others by public agencies to insure their permanency. The total cost of this program is estimated to be slightly under fifteen million dollars and is broken down by item as follows:

Land Acquisition	$ 2,180,000
Land Preparation	4,773,000
Utilities	226,000
Buildings	1,627,000
Surfacing	2,984,000
Lighting	678,000
Miscellaneous	2,162,000
Total	$14,630,000

At the beginning of the second century of its phenomenal growth, it is apparent that California, due to the very progressive nature of its citizens, will continue to develop at a much higher rate than her sister states. To insure order and balance in this rapid growth California must make physical plans on a statewide basis. The State will have 20,000,000 inhabitants at some time in the future. The date of this event is indefinite but its eventual arrival is not questioned. Many millions of dollars will be saved, many months of delay eliminated, and many problems of confusion resolved, by proper and early planning of the physical facilities that are necessary to serve these people. Planning is a continuing process and periodic revisions must be made to conform to changing conditions; the objective is to have a plan to guide the way.

Some broad conclusions

Aviation's part in California's growth is large. The State has accepted the aircraft as an important means of transportation, and as a new tool of agriculture. Airports must be provided on a permanent and equitable basis. Detailed study of the inventory of the State's airports and careful consideration of the specific needs of the various counties and cities, individually and collectively, leads to certain broad conclusions. These are:

An airport is a part of a statewide transportation system and serves all of the people of the State—not just those who live in the immediate vicinity of the terminal.

The "highway system of the air" will not give full service nor show adequate returns until it is completed.

To keep California abreast of national progress a definite, integrated program must be instituted to establish the system.

The problem confronting the people of the State of California at the present time is the establishment of a **system** of airports on a permanent basis in order to realize the full benefit to be derived from aviation.

The terrain will force the use of the airplane for rapid and economic travel in many areas. The distances between the State's major areas of population will demand transportation means faster than can be accomplished on the surface.

Many airports are needed to adequately serve populated areas.

Airports are needed to give access to the many fine existing recreational areas, and to develop others that are not otherwise accessible.

Isolated airports are required to complete the system.

Some airports are needed to save lives.

Action must be initiated at once to avail the State of federal participation in financing the Airport System under the Federal Airport Act of 1946.

Tons of "Tets" Close

BIRD'S-EYE VIEW from Oregon shore as closure operations begin. "Tent village" is tetrahedron storage area. Note head-tower in foreground for 1,400-ft. cableway across the gap to tail-tower on low-water island. Both towers were movable, with about 300-ft. travel, for accurate spotting of dumped "tets".

ON OCTOBER 10, 1950, the first of the concrete tetrahedrons was skidded off the skip and into the 12-foot-per-second current of the Columbia River at the site of the 240-ft. gap in the upper wing of the main second-step cofferdam at McNary Dam, near Umatilla, Oregon.

When the first "tet" plunged into the 60-ft. deep channel, that marked the commencement of a "first" in the engineering field, because never before had an attempt been made to divert a stream of Columbia's volume by the method that was then being used.

Slow-up as sheet-pile cells undercut

Four hundred thirty-seven of the massive "tets" had been skidded into the gap, and 2,300 tons of "B" rock had been dumped in just upstream of them, when there was a temporary postponement in the procedure. One of the steel sheet-pile cells near the Washington State shore was being undercut by the river. There was a sort of secondary, shallower channel on that side, with a low-water island between it and the deep Oregon side channel. The contractor had felt that he could accomplish the Oregon side main gap closure and at the same time go right on with driving and ballasting the last of the sheetpile cells on the Washington side. But after the first drop of "tets" and "B" rock the water humped up about 5 ft. at the gap and this was when the undercutting of the cell on the Washington side occurred. It was then that the contractor halted operations on the closure until he completed the cell-work. This latter was finished on October 30, and closure operations resumed.

Tightening the Columbia's harness

Purpose of the closure was to divert the water toward the Washington side of the river and through the completed bays of the spillway and through the 675-ft. single-lift lock. This lock has a lift of 92 ft., and is the highest single-lift lock in the world.

The barrier of 12-ton "tets" and "B" rock was brought to the surface on November 16 and continued up to elev. 270. It is now leveled off and a temporary roadbed for motor vehicles used on the job now stretches along the top of it. It is planned to construct a cribbing atop this, and to fill it on the downstream side with rubble rock and on the upstream face with fines and impervious material.

Now, the lower wing of the main cofferdam is approximately complete, the 43-acre site for 12 units of the 14-unit

LEFT—100,000 cfs. of the Columbia River flow fights its way through the 240-ft. gap and humps up about 5 ft. as the tetrahedron barrier nearly breaks the surface.

BELOW—When the barrier broke surface on November 16, it marked the success of a "first" in big dam engineering—no other diversion attempt had ever been made by such a method on a stream of the Columbia's volume.

McNary Cofferdam

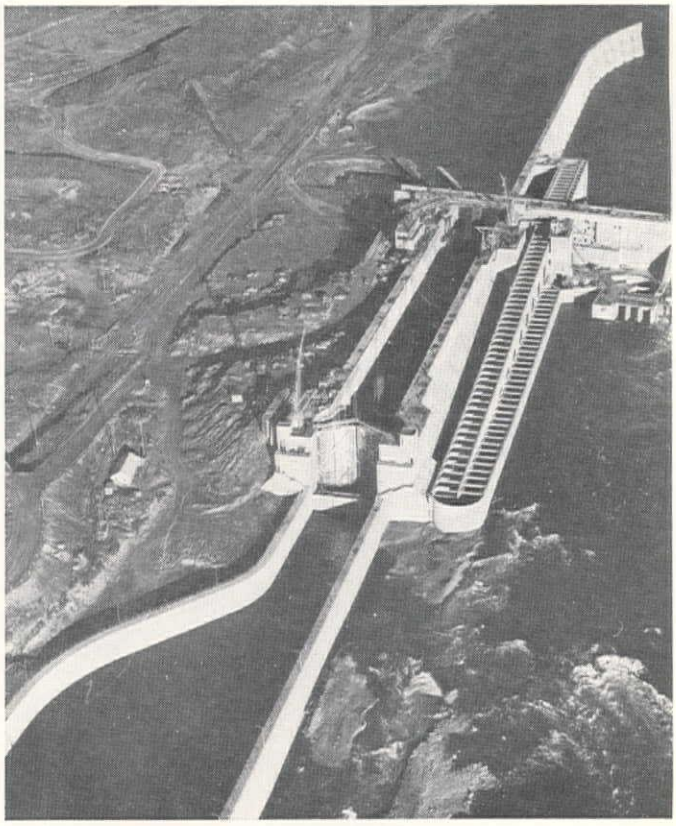
powerhouse inclosed, and unwatering of the area scheduled to commence early in the fall. In addition to the powerhouse units, some 8½ spillway bays will be built in the inclosed area, these to be lined up at the Washington end with the 13½ bays already completed, and at the Oregon end with the 14-unit, 1,422-ft. long powerhouse.

McNary Dam Contractors, Plymouth, Washington, are doing this cofferdam job. Contract was let August 5, 1949, and the amount was $15,835,540.

A million-dollar cofferdam

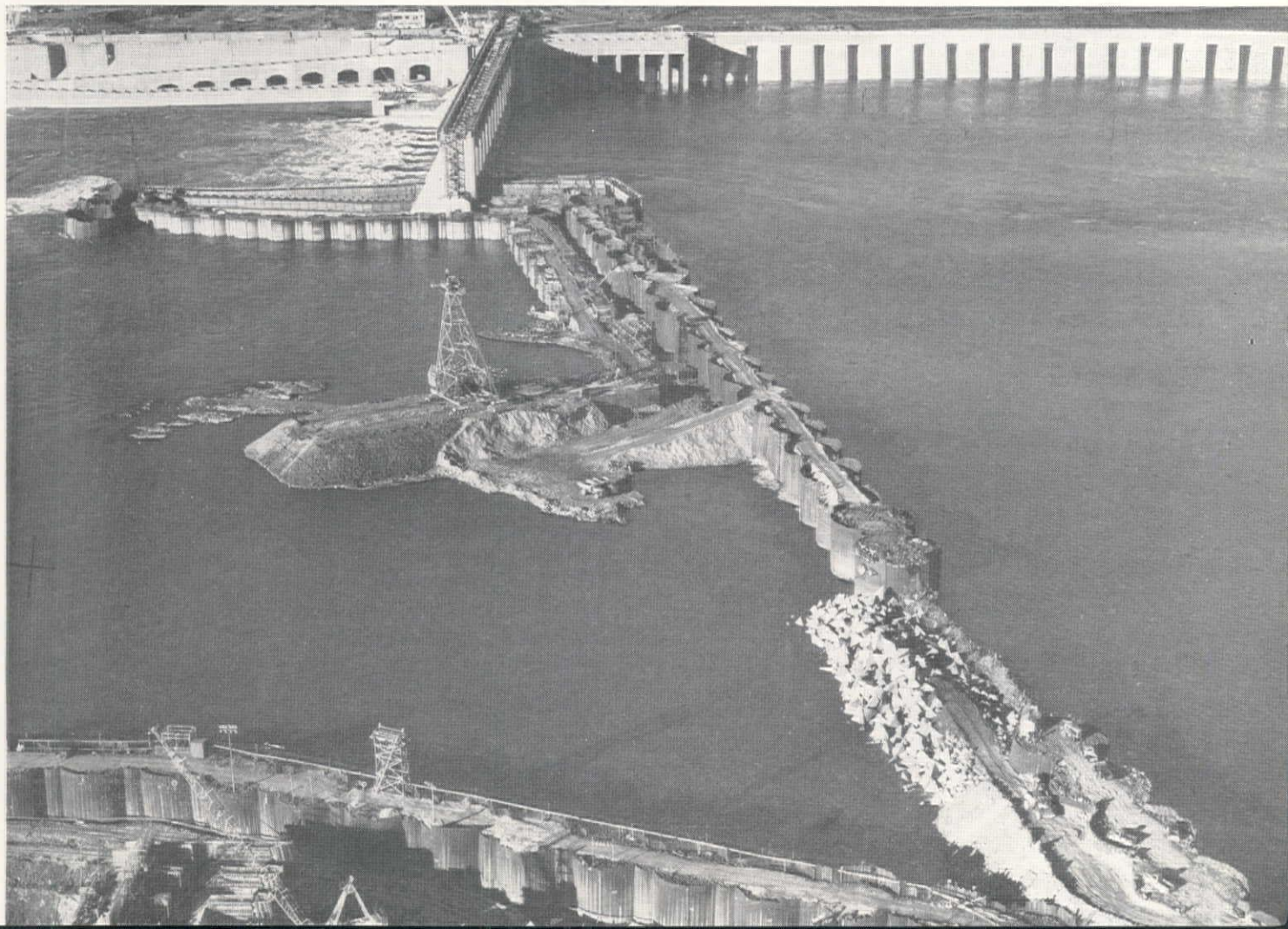
Total cost of the closure of 240-ft. gap was about $980,000. Items figured up in this manner: 3,250 "tets" at $180 each, and 250 "tets" at $135 each. Tets and cable came to $600,000, all placed. "B" and "C" rock came to $200,000. A complete preview of the McNary diversion was presented beginning on page 75 of the October 1950 issue of *Western Construction*.

When completed, multiple-purpose McNary Dam will furnish 980,000 kilowatts of electric power, the first of which will come off the first 2 units in December 1953. Upwards of 250,000,000 lb. of steel of all types will be used in all phases of construction associated with the dam—about enough to build 3 battleships like the big "Mo." Some 1,860,000 cu. yd. of concrete will go into the job. If this amount were stretched out in a cubic-yard line it would be about two-thirds the length of the Great Wall of China. It would be just short of 1,057 mi., or approximately from the damsite to Los Angeles, California.



NAVIGATION LOCK along Washington shore, with 92-ft. lift, is the highest single-lift lock in the world. History was made December 16 when the 600-ton downstream gates swung shut to allow the first craft to pass through. The lock eliminates necessity of running rapids which were the swiftest water between Columbia's mouth and Lewiston, Idaho.

DIVERSION COMPLETED (below), flow of the Columbia is now through spillway bays and navigation lock near Washington shore. Lower wing of cofferdam (being built out of picture at left), will angle to join cells at near end of spillway bays. An area of 43 acres will be inclosed for work on additional spillway bays and the 1,422-ft.-long McNary powerhouse.



Beat Schedules

FM 2-way radio, as a handy tool for coordinating and accelerating construction and maintenance work, can pay for itself in a hurry—Here are some tips on the different types that may be purchased and where they can be used for giving the biggest boost to job efficiency

By DALE SAMUELSON
Technical Information Center
Communications and Electronics Division
Motorola, Inc.
Chicago, Ill.

THE CONTINUAL search for better methods of performing construction jobs embodies the primary desire for attaining a more efficient method of procedure. Efficiency of operation in any business is generally the major factor that determines its continued existence. Use of 2-way radio in dozens of businesses and industries has been found to be a factor that greatly and immediately increases efficiency of operation.

This type of equipment has been used to coordinate and accelerate construction work, public and private, for a number of years. It is also used by state highway departments, utility districts, public utilities, and other groups to coordinate maintenance work on the projects once they are completed.

Why use 2-way radio?

There are many reasons why FM 2-way radio has been adopted by the construction field. Construction work takes the contracting company operations away from the home office, sometimes to out-of-the-way places, and usually far away from telephone communications. This is particularly true of projects in the West where distances between population centers are greater than in most other parts of the country.

The operator of a construction vehicle with 2-way radio usually is never out of touch with the temporary office. If he walks and carries a portable unit he has the same advantage.

In construction work it is often difficult when starting on a job to know what unexpected factors will be encountered and to determine the equipment and supplies that eventually will be needed. Without a rapid means of communications, much time is lost either getting to a phone to call for someone to bring out these requirements, or actually driving a long distance to obtain them.

There are more important reasons why immediate communication facilities are vital. Working with powerful equipment on large construction projects results in increased chances for injuries. This, plus the fact that the operations are often carried out far away from telephone facilities, makes it important that 2-way radio facilities are available.

A time-saver

Of all reasons why radio should be considered as a major means of communications, the saving of time is probably the most important "day-in-day-out" reason. On any job where traveling is involved, that travel time absorbs a large part of the working hours. Anything that will cut down on travel time of trucks and other construction equipment will be an economic advantage that will easily pay for itself, and leave more time to accomplish the important tasks that must be done.

Numerous types of FM 2-way radios may be purchased, but there are general categories into which they may be classified for clarity. These are:

(1) Portable Sets
(2) Mobile Units
(3) Base Stations.

Portable sets

Portable equipment includes such items as pack sets and handset radiophones. These radios usually are light units weighing from 10 to 20 pounds. Motorola's "Handie-Talkie" portable radiophone incorporates the Frenchphone handset. Other manufacturers have somewhat similar sets. Range between two such radios is a mile or more depending on the terrain and up to 60 miles from a unit in an airplane to another ground set. Portables of this type can be purchased with self-contained wet or dry cell battery power packs. In the better units either type of primary power source provides a minimum 8 hours of operating time without recharging or replacing the batteries. In many applications the units are operated only for a few seconds or minutes at a time and therefore can be used for extended periods of time without the necessity of changing or charging batteries.

Pack sets are the larger type of portable unit and have a longer life powerpack. The Motorola unit employs a military palm-type mike and a semi-directional loudspeaker. This type of speaker is particularly valuable when it is desired to talk to a whole crew at one time. The unit can be set on the ground, and incoming messages reach the men without them having to take time out to pick up a receiver to hear. When anyone calls the crew over the 2-way pack set, the receiver audio circuits automatically turn on, and all who are in audible range can hear the message.

Where two or more crews or groups are working on a project, moving from point-to-point where there are no permanent communication channels, 2-way radio is a valuable tool. Time saved in running or driving back and forth to coordinate the crews' activities leaves more time for actual work. Portable radiophones and pack sets are used primarily to coordinate activities within the immediate construction area.

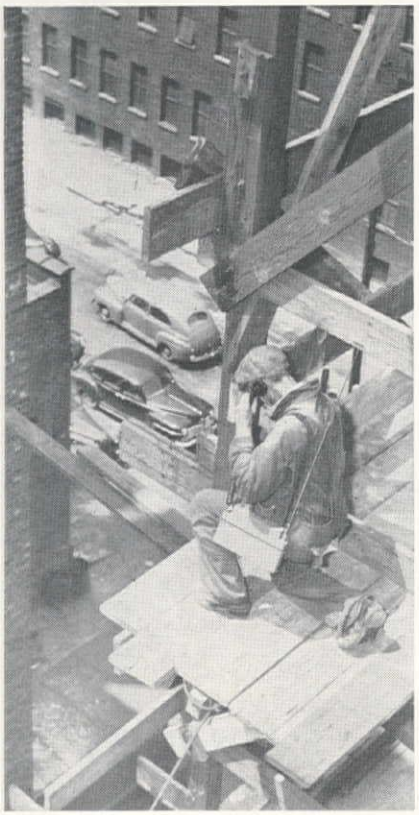
Mobile units

Mobile units are those built for and installed in automobiles, trucks, scrapers, loaders, and any other type of vehicular equipment. The sets operate from the vehicle storage battery and usually have a transmitting power of anywhere from 10 to 60 watts. The higher the power, of course, the greater the range possible. Portable units, also, can be used from vehicles.

Base stations

Base stations are those radio units which are installed permanently at one

by Using 2-Way Radio as a Job Tool



ON BUILDING JOBS, use of portable radiophones makes it possible for workers at different levels to have continuous communication with the superintendent or other workers. Radios for this type of application weigh as little as 10 lb.

point and usually have a specially built, elevated antenna. Because of this relative antenna height they are able to send and receive between mobile and portable sets over far greater ranges than would be possible between two units operating from ground level.

Two-way radio for construction work falls in the Federal Communications Commission category of "industrial" application. Frequencies for these radios are around 160 megacycles, a frequency so high that the radio waves travel essentially in line-of-sight paths. As a result it is important that a central transmitting and receiving station be located on either a high point, or have an antenna high enough to remain in visual distance of the largest area possible.

Some facts on reception

With a 60-watt transmitter as a central station, communications should be possible with a mobile unit 20 or more miles away depending upon intervening terrain.

All reception is dependent on three factors:

(1) Relative antenna height
(2) Receiver sensitivity
(3) Transmitter power.

Receiver sensitivity is essentially equal for mobile, fixed and portable receivers of a given frequency. Transmitter power required is determined by communication engineer's survey tests of the terrain to be covered.

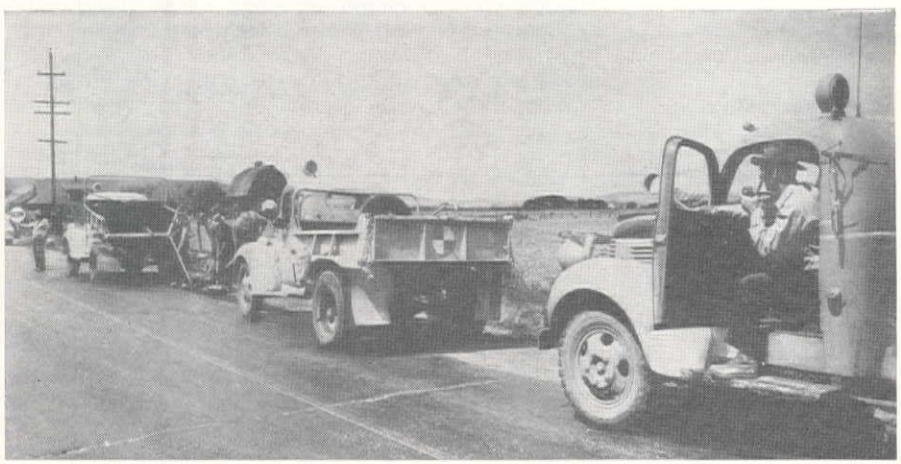
Antenna is important

One of the most important factors is that of antenna height, for antenna height above the surrounding terrain is practically synonomous with transmitter power. As antenna height increases so does the system maximum range. Perhaps one of the best examples of antenna importance is that of the "Handie-Talkie" radiophone mentioned previously. Between two of these units the maximum range over level terrain is probably two miles. Between an airplane and ground, communication distances of 60 and 70 miles have been realized. The airplane altitude tremendously increases the line-of-sight distance necessary in high frequency radio communication systems.

Maintenance costs can be low

When quality 2-way radio equipment is purchased, maintenance costs will be low. No serious trouble should be encountered for many years. Many operators of this type of equipment have found that they can make contracts with nearby communications engineers to maintain the units at a fixed fee which includes costs of parts and services. Most 2-way radio service station operators have many such contracts. With radio equipment costs on a fixed-fee basis, the contractor has a firm basis for further development of his business.

TOP—Section foreman on repair job in Washington communicates with home office to request additional materials, thus saves himself some travel time. BOTTOM—On a road construction project, superintendent has continuous control over his crew and vehicles with a mobile radio system.



1st Installment: Complete Report of a 2-Year Committee Study on—

Lessons in Structural Safety Learned From the 1949 Northwest Earthquake

By HARLAN H. EDWARDS
Chairman, Earthquake Committee
Seattle Section, American Society
of Civil Engineers

ABOUT NOON, Pacific Standard Time April 13, 1949, radio listeners were startled by excited announcements of a violent earthquake in western Washington and Oregon. By declarations of disaster which grew in size with each broadcast the impression was given that the cities of the area were a shambles, though it was far from the truth. However, frantic friends, relatives and others in distant areas who jammed communication lines for days in efforts to reach their loved ones could not know that this Pacific Northwest area was the world's luckiest place that day.

But the Northwest was favored!

Outstanding in natural beauty and moderate in weather, favored as a playground of the nation, the Northwest was unquestionably favored at 11:56 a. m. that April 13 by not only the earthquake but also by the fact that many of the schools were closed "on vacation." Neither scenic beauty nor natural wealth would have availed anything had the shaking continued a little longer, or had there been the strong aftershocks that have characterized most of the severe earthquakes of recent time. Thousands of people who were on the streets at lunch time, that most-feared time for the occurrence of an earthquake, could have been buried under tons of parapet walls, ornamentation and broken building fronts. Thousands of children could have been filing out of the doors of their schools on their way to lunch or play only to be struck down by a hail of lethal masonry, could have been crushed in their rooms by collapsing buildings, or struck down on their playgrounds by falling walls and chimneys.

Yes, luck—if you want to call it that—was with us that day. Or could one call it the "handwriting on the wall?"

In the comparatively small proportion of buildings damaged, shocking conditions of building weakness were disclosed, conditions of inadequacy of design and of almost criminally cheap construction, duplicates of which exist in almost every city and state. Exposed to public gaze were the too-often-unrecognized results of penny-wise and pound-foolish policies which convicted owner, architect and builder alike of neglecting to consider in their structures the effect on human life of natural seismic forces which long since should have ceased to be "acts of God," which have occurred for ages and which may be expected to occur anywhere from time to time just as are heavy winds and floods.

An on-the-spot account of damage

Just before noon on that fateful though fortunate April 13, 1949, I was in a construction shack in Chehalis, Washington, checking over plans for a building being erected. Suddenly I sensed a vibration and heard a dull rumble that was foreign to the hustling and hammering of the job. It was more like a heavy truck approaching rapidly over a rough road.

"Something's not right," I thought, because vibrations of structures usually mean trouble to me. My work is that of a construction supervisor and structural engineer. From years of experience in the West I knew that such sounds and movements were not conducive to the health of structures, and particularly the health of the old brick buildings nearby.

The thought had scarcely flashed through my mind when the old frame shack weaved and shook, creaking in its every joint to the accompaniment of the unearthly rumble and muffled roar of an earthquake. My curiosity getting the better of my training to "stay put" during an earthquake, I dashed out of the door, saw the poles in the alley weave crazily and the taut wires swing in jerky circles like the jump rope of a pair of kids. I heard the rattle and dull roar of the brick walls of the garage across the street falling outward upon the cars parked closely in the lot adjacent. I saw the cloud of dust arise, then settle slowly upon the wreckage of cars that a moment before were the pride and joy of many families. I heard the shouts of excited people, then all was still like the lull after a storm. I wondered what was happening to the noonday crowds in Olympia, Tacoma, Puyallup and Seattle —whether the quake there had continued long enough to cast down upon them the tons of brick, terra cotta, glass and stone that are loosely attached to

How and Why the Seattle Section of ASCE Prepared This Report

ON APRIL 13, 1949, the people of western Washington and Oregon were shown that strong earthquakes could occur in their locality. Property damage as a result of the quake on that date totaled more than $15,000,000 and seven lives were lost. With the quake classified as VII and VIII on the Modified Mercalli scale, major damage resulted in the low, soft land areas extending from Seattle southward to Longview including the cities of Puyallup, Tacoma, Olympia, Centralia and Chehalis. Minor losses were suffered by other communities and outlying areas.

Competent observers in the area agree that had the violent phase of this temblor continued a few seconds longer, or had there been aftershocks of any consequence, the number of people meeting sudden death from buildings collapsing or masonry facings falling would have been appalling. Evidenced by fractures and sometimes-concealed incipient failures, tons of insecure masonry parapet walls, heavy cornices, ornamentation and whole faces of weak buildings would have cascaded down upon the streets giving few in the noon-hour crowds a chance to escape.

Considering the hazards thus made evident, and realizing that engineers are in duty bound as a public service to carefully analyze those conditions and make impartial corrective recommendations, the Pacific Northwest Conference of Earthquake Committees of the American Society of Civil Engineers was formed under the chairmanship of Prof. Alfred L. Miller of the University of Washington. Member committees were set up by actions of the local sections of the Society. Beginning on this page is the complete report of the Earthquake Committee of the Seattle Section, A.S.C.E., the committee being composed of Harlan H. Edwards, author-chairman; Cecil C. Arnold, vice chairman; S. Chas. Dearstyne, Elmer E. Gunnette, Homer M. Hadley, Wm. Enkeboll, Thos. Campbell and Holger Mittet.

Research was made and studies were conducted by the committee into many aspects of the subject earthquake. These included the following:

1. Examination of records of this earthquake and of other earthquakes back as far as recorded.
2. Examination of physical earthquake damage in the several areas and determination of extent and types of damage caused to structures, utilities, equipment and miscellaneous installations.
3. Collection of records, descriptions and photographs from all over the shaken area for study and comparison.
4. Conferences with representatives of bodies experienced with enforcement of measures to prevent earthquake damage, and study of laws and provisions designed to correct present structural inadequacies and to protect against such damage in new construction.
5. Discussion, sifting and weighing of all the information obtained, and developing the final conclusions and recommendations, as submitted in the report.

The complete report of the committee is being presented by *Western Construction* in three installments, beginning with this issue.

A BRIEF OUTLINE of the complete report prepared by the Earthquake Committee, Seattle Section, ASCE, as it will be published in this and the following two issues of *Western Construction* is as follows:

FIRST INSTALLMENT (this issue)—An on-the-spot account of the quake characteristics and damage to various types of structures as background for recommendations to be presented later; a discussion of the effects of this quake as compared to others.

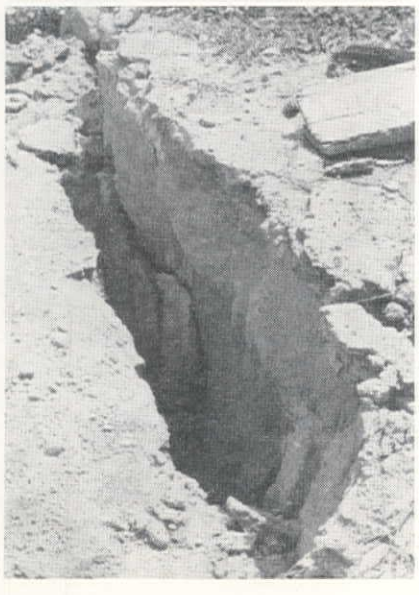
SECOND INSTALLMENT (March issue)—Facts on how new structures can be build and old ones strengthened to become earthquake-resistant, based on analysis of damage by the Northwest quake.

THIRD INSTALLMENT (April issue)—Recommendations for a new approach to the design of structures in areas subject to earthquake hazards; legislation required to achieve the goal of structural safety in the Northwest and elsewhere.

the many buildings that line the streets. Heaven forbid such a disaster!

Mindful of the destructiveness of the aftershocks, if they came, I dashed to my car parked in front of the job, got it away from the old masonry buildings, grabbed my camera and started taking pictures. As usual, the ornate City Hall and Library entrances were blocked by fallen masonry. The structures were racked and broken. From a vantage point a few blocks up the hill I could see that the wood frame residences and similar structures visible from there had fared well so far. Only chimneys were down, but in that respect the damage was almost universal; 1,334 were later counted by the building inspector of that small city. Down the street the Methodist Church tower had broken, partly falling through the roof into the sanctuary and partly, as usual, over the front entrance stairs. Luckily, this was not a church day.

THIS FISSURE and others extended about 100 ft. in an old gravel pit near Centralia. At many locations, consolidation of alluvium by vibratory action of the earthquake freed water retained in spaces between soil particles, causing geysers of mud.



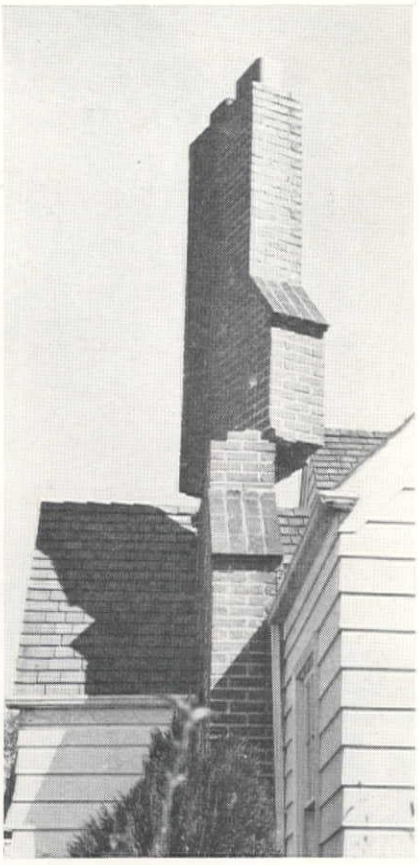
Public buildings damaged, as usual

A block further on, the children of the Junior High School were all out on the lawn. Their building did not seem damaged but on circling to the rear I saw the high brick chimney above the boiler room shattered, with a large chunk on the building side loosened ready to fall into the school. It was a good thing for the kids that the shake didn't last longer. Downtown, a similar chimney did fall from a building, coming to rest in the tangled debris of the display room of a store.

To the south of town several buildings at the State Training School for Boys were badly shattered and partly collapsed, reminding me of the wrecked schools of Long Beach, California, on March 10, 1933. At Castle Rock one of the High School students was struck down by falling brick from above the entrance as he left the school for lunch, while at Longview, on the alluvial plain of the Columbia River, heavy damage had occurred in places. At Centralia, damage similar to that of Chehalis had been suffered, killing one man downtown who was struck by the falling upper walls of a 2-story corner building.

SUBSIDENCE OF FILL brought this old piling to view through asphalt pavement in Olympia. In other areas, piles not driven to refusal dropped out of sight, while some freestanding piles rose.

By this time I had calmed down sufficiently to turn on the radio in the car. Hearing the reports of disaster broadcast, I realized that I had better start for home. As I neared the town of Tenino, north of Centralia, the broadcast told of its shattered buildings and of streets strewn with wreckage, but as I drove through, it was "business as usual." False Alarm! Although real damage had been done in many areas, the radio broadcasts were increasingly excited, exaggerated, and not dependable.



MORE THAN 10,000 unreinforced brick chimneys in the Northwest required repair after the quake. Many just turned on a mortar joint, as at this residence in Kelso, but far too many created hazards by toppling.

It soon became evident that the shock over the whole area had been of a rolling nature which, like the shaking of a bowl of jelly, amplified the movement of structures on the earth's surface, particularly on soft ground. Some damage was done to buildings on firm, compacted gravelly deposits also, but only sufficient to indicate that these areas, too, could be shaken strongly, given the right provocation.

Concealed weaknesses come to view

Outside Olympia at an old 1-story and basement wooden elementary school structure one complete chimney fell away from the building and spread its length over the playground. The top three feet of another chimney crashed through the roof and ceiling to the solid floor beside the blackboard of a classroom. No, there were no casualties, for the children were on vacation.

The School Board had apparently foreseen the need for a better building, because across the street was a new wood-frame-stucco school just ready for occupancy. It showed no damage, for according to qualified observers from California it was of the earthquake-resistant design closely approaching the concept of engineers and architects experienced in areas where earthquakes admittedly occur.

In Olympia another school was nearing completion. An unreinforced ma-

TOP—Poorly anchored brick veneer was knocked off Seattte structure. The obvious lesson here is that building facings must be designed to resist a reasonable amount of horizontal force.

BOTTOM—A man was killed in downtown Centralia by the falling upper walls of this 2-story corner building. Had such damage occurred during the rush noon-hour, more would have died.

sonry partition showed a very distinct crack about 8 ft. long, although green mortar generally concealed this weakness from public view. It was interesting to note that the reported cost for the new, substantially safe elementary school was $10 per sq. ft. of floor area while that of the other, uncertain but ornate school was approximately $15 per sq. ft.

Capitol buildings sitting ducks

Olympia was close to the epicenter of the earthquake and damage was noticeably greater in the larger structures. Buildings of the State Capitol group, typical of many stone-faced masonry structures built throughout the country without regard to seismic shock were materially damaged. The 80-ft. diameter stone-faced reinforced concrete dome of the capitol building erected in 1925 and rising 231 ft. above the entrance terrace showed little damage but that was not so concerning the stone lantern above it. As might be expected in a building of this type built without a continuous frame and having a heavy inverted pendulum forming the dome, large deformations were set up by the earthquake which caused the near-collapse of this lantern as well as typical shear cracks and minor movements in other parts of the structure. Many of the stones of the lantern were separated from the adjoining ones, a few had dropped out and others were hanging loose when the quake stopped.

Other buildings of the capitol group were broken, too. Parapets and cornices were down and many characteristic diagonal cracks were noted in interior partitions and walls. It was particularly evident that the large blocks of stone, wherever they were, had practically no mechanical anchors or ties to each other or to the backing, if any existed. They were just sitting there like ducks on a pond. It was noted and confirmed later, too, that in common with many similar structures of the same or greater age, little mortar existed in many vertical joints and not much more was seen in many of the bed joints.

In Olympia's business district substantial damage was suffered, too, while two tall brick chimneys on the tongue of the harbor alluvial fill were damaged. One broke and fell through the roof of its adjoining boiler plant and killed a man.

Substantiating the severity of the shock which caused all this and other damage in Olympia, authenticated accelerograph records were obtained on instruments of the Coast and Geodetic Survey, located near the State Highway Laboratory on the downtown tideflat fill. These records showed that the force exerted by this quake was more than 4 times the force normally used in designs for complete earthquake reinforcement as done in California where earthquake-resistant design is now standard practice.

Damage at Tacoma

At Tacoma, too, were occurrences of great interest, both on the lowlands and upon the hard gravel of the high land above the business district. To the westward the new Tacoma Narrows Bridge was under construction. A very heavy cast steel saddle which ultimately was to receive one of the great cables supporting the bridge was temporarily resting on wood blocking 3 ft. above the top of the high bridge tower, bolted tight to the tower top plate with four 1-in. vertical rods. During the quake, according to the testimony of men working on the tower, the top moved at least 6 ft. from its position of rest, then snapped back the same or greater distance the other way, breaking the bolts and throwing the casting off. It crashed through a work barge on the water 65 ft. to one side and 507 ft. below.

On the Tacoma lowlands as in Olympia, high factory chimneys broke off, parapet walls fell, and a 75-ft. high brick wall fractured 15 ft. from the top, moved out 5 in., but didn't collapse. On hard ground high above the business district the stone masonry tower of the 60-year-old county courthouse was badly racked by the shocks. It was so fractured in the uppor portion that collapse probably would have been certain had the earth movement continued, according to testimony of the building inspector and consulting structural engineers later on. In contrast, a local senior building group pooh-poohed the danger of collapse and pleaded "don't demolish it—only the cracks need be pointed up. It is a fine example of period architecture and it would be a shame to tear it down." They gave little thought to the fact that structures once cracked and broken remain in that state of suspended destruction until the next quake occurs, then anything could happen. They gave no consideration to the fact that the main structure far below was used by the public, or that it contained the county jail which housed many people against their will, all carrying definite responsibilities for maintaining protection. (Note: the dangerous portion of the tower was later removed.)

Strange things at Puyallup

In nearby Puyallup, strange things had happened. Located on natural alluvium having the ground water level 2 to 3 ft. below the surface, many of the brick buildings (which dated back many years) were damaged. Cornices and

upper walls had collapsed. Low buildings bumped against higher ones having a different rate of motion in the earthquake, breaking the higher walls as they stopped short in their square dancing. Brick moved on brick as much as 3 in. outward at floor and roof levels of some large buildings, leaving the walls precariously near failure. Broken brick lined the wide cracks that were left when street faces of stores stopped on their weaving way to the sidewalk below, lacking the "pushover" of the usual aftershocks.

But this was not all. Throughout the town as least 200 chimneys were rotated up to 45 deg., generally in a clockwise direction with respect to the building, but few fell. Geysers of muddy water rose in many yards to heights as much as 3 ft., forming circular deposits of black, sandy clay while in some basements the surging earth pushed the floors up, crushing the furnaces and piping against the joists above.

Closed to public view and not under jurisdiction of the city building department and code, the unanchored roof and ceiling beams over the stage of the Puyallup High School auditorium slid off their supporting masonry walls and crashed down upon the floor below. Three students who were there when the quake started managed to be clear when the $100,000 crash came.

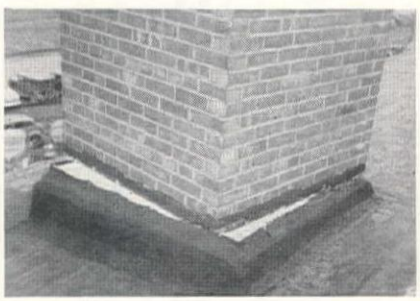
"Almost" at Seattle

Seattle, fortunately, was on the northerly border of the earthquake's strong rumbling and rubbling and except for buildings on soft ground, it suffered comparatively little from the shakeup. Not that the buildings were resistant to earthquakes, I hasten to add (for they were far from it) but because the shaking stopped too soon for damage to develop much beyond the cracking stage. Structures on hard ground were shaken, but not hard enough to hurt much. Masonry partitions were cracked and spalled, plaster fell, terra cotta facings loosened or sheared. On soft ground especially, many old building fronts and parapet walls broke their bonds to the rest of the structure but did not receive impetus enough to crash to the street. With a goodly part of their "earthquake life" gone, they now remain in their weakened condition ready to fall upon the people on the walks, come the next quake. Even without the seismic urge, three or more heavy chunks of masonry have fallen in downtown streets of Seattle in recent months, narrowly missing pedestrians.

Damage on the tide-flat

On the water-saturated, jelly-like tide-flat fill extending from west Seattle to the lower downtown section, however, substantial damage was done. Structures built on piles along the waterfront were whipped violently. A 50,000-gal. wood stave water tank resting on a reinforced concrete platform on 20-ft. high concrete columns above the building had suffered damage to the columns in the 1946 earthquake. Presumably adequately repaired at that time, but still fractured and weakened at the points of greatest stress, in this the succeeding quake it was precipitated to demolition. Its concrete platform crashed down through the concrete roof slab to the floor below breaking refrigeration lines, destroying the building's two elevators and putting the 7-story reinforced concrete refrigeration warehouse out of service for weeks. Cables supporting elevators in other buildings jumped out of their sheaves. A heavy track-mounted electric transformer moved up and off its supports at a substation and landed on the ground 17 in. away. Elsewhere in the area pre-1900 brick walls were collapsed, fractured or bulged and several old downtown buildings south of James Street were so dangerously damaged that they were later condemned and removed.

IN THE CAPITOL DOME at Olympia, erected in 1925, unanchored keystone dropped out and column caps broke away. It takes strong mortar, steel and concrete, besides stone, to make such structures earthquake-resistant.



MANY UNREINFORCED masonry chimneys were fractured and rotated far more than this one, which gave way at the flashing point above the roof. A competent designer could have avoided this weakness.

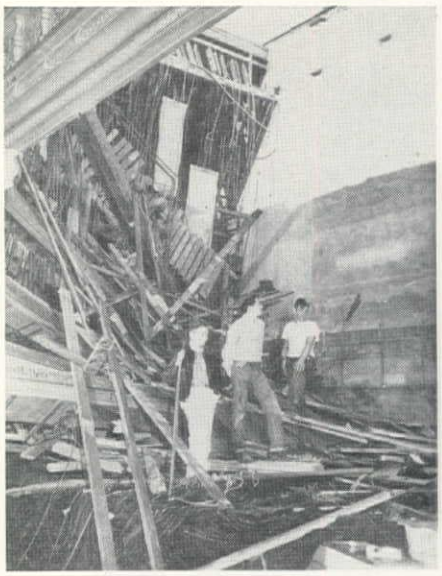
BRICK VENEER failed when improperly anchored to poorly braced frame structure. All structures built of unit material must be thoroughly tied together to move as a whole.

Earthquakes are all different

In clarifying public thinking on the subject of seismic action in relation to people and structures, certain facts stand out. An understanding and appreciation of them will remove the subject from the realm of mysticism to that of ordinary good sense.

1. Earthquakes in themselves are generally not hazardous. They are dangerous largely because we make them so by building structures that are weak in their resistance to seismic forces and hence can be easily shaken apart. They usually come without warning, and ordinarily, destruction occurs within a minute. The violent phase of the April 13 earthquake lasted less than 30 seconds. Longer duration or strong aftershocks would have transformed that moderate quake into a great disaster. Compared with tornadoes, cyclones or the like against which we now design our structures, ordinary earthquakes are mild.

2. No two quakes are alike. They differ in acceleration, rate and kind of motion, and in direction, duration and extent. One cannot know in advance what to expect. Earthquake motion is propagated through and reflected by many different strata from the point of origin miles below the earth's surface. Instead of arriving at the surface in



LEFT—Unanchored roof and ceiling beams over the stage of Puyallup high school auditorium slid off supporting masonry walls and crashed to floor, causing $100,000 damage.

RIGHT—At Castle Rock, a high school student was killed as unanchored gable masonry cascaded to the walk outside the entrance. There could have been more casualties.

waves like the ripples on a lake, they arrive as a complex variety of motions. Some impulses amplify others to create strong motion; others combine to weaken or nullify the shock. These opposing phenomena can occur in close proximity or far apart, depending upon the characteristics of the quake and of the strata through which the impulses pass. In soft ground areas strong motion earthquakes seem sometimes amplified by reflection from enclosing formations like waves are from a wharf or a rocky shore, or are built up over shallow areas like waves are over a reef in high seas.

3. After an earthquake it is surprising to see how many buildings remain unharmed in the midst of wreckage—buildings that are the counterparts of others that have been thoroughly wrecked. However, due to these amplifying and weakening combinations of earthquake forces it is folly for one to assume that one's building is adequately strong to resist earthquakes just because it comes through an earthquake unharmed. Only by careful examination of a building and by a thorough structural analysis of its frame by an engineer or architect skilled in such computation and design can this be determined and the need for strengthening be discovered.

This quake deep underground

Seismologists report that this earthquake originated at a point approximately 30 to 40 miles below the earth's surface and located somewhere within the triangle defined on the surface by the towns of Morton, Little Rock and Toledo, Washington, southeast of Olympia. Its intensity and effect at the surface varied decidedly. As water in a pan is strongly agitated and slopped over the edge by moving the pan with a slow, rocking motion, or is confined with relatively little surface effect by sharp, quick motions, so the soft ground areas were affected differently at different places. Generally speaking, structures on hard ground got off easier. The principal exception noted was along the faults affected by this quake where much more violent motion was seen or made evident by the results on land and buildings near-by.

A rocking and a rotation

Differing from quakes in other areas, this one was reported by many individuals to have a rocking motion; others reported a horizontal and vertical rotational characteristic. As a child moves a jump rope to make it swing in wide circles, so the utility poles in many areas seemed to introduce a vertical rotary movement to the wires held taut between them causing the wires to "wrap" with others nearby. This phenomenon seems to be unique with this quake.

Motion which induced the rotation of brick chimneys as much as 45 deg. on a mortar joint close above a building, (usually at a flashing) was particularly prevalent in areas having water-saturated alluvium soil such as at Puyallup, Harbor Island (Seattle), parts of Centralia, and Kelso, near Longview. The consolidation of the alluvium by the vibratory action of the earthquake freed water which previously had been retained in the spaces between the soil particles. The presence of this released water under the pressure of the surface soil or mat was evidenced by the geysers of water and mud which spurted from the ground reportedly as high as 3 ft., which flowed continuously for as long as 24 hours, and which filled basements in the Sears Roebuck area of 1st Ave. S. in Seattle with sand. During this temporary flotation of the surface areas the horizontal movements of the quake created compression zones in some areas. In parts of Puyallup they were so strong that basement floors were lifted like pistons in a pump as much as 16 in. so that furnaces and pipes were crushed against the joists above and did not recede, while stud or post supports were forced through floors to as much as 8 in. above. These compression areas and adjoining tension areas caused soil movements which pulled apart or broke underground piping or conduit systems.

Visible waves traveling over the earth's surface (often reported but poohpoohed or disbelieved by seismologists at the times of other earthquakes) were seen here and in addition left their imprint on the sands and soils of the soft areas in several locations. On the Tacoma lowlands, definite, though slight parallel ridges about 12 ft. apart were left. In a freshly plowed, disked and leveled field near Kent definite waves with crests about 6 in. high and 30 ft. apart resulted, and on a black-topped road in Pierce County, according to the county engineer, troughs were evident afterward extending diagonally across the pavement for ¼ mile having a crest-to-trough height of 2 to 3 in. In Elma, west of Olympia, the originally-lined-up columns under a light grandstand were observed to "walk" or move up and down during the quake, deforming the structure. The importance of strong struts or solid slabs between footings to assure that the footings will maintain their relative positions in buildings on such material (as required by the earthquake-resistant code) is obvious.

Action like a huge vibrator

Earthquake impulses acted upon the water-saturated alluvium (whether natural or man made) and upon a number of high railroad and highway fills like a vibrator in concrete, causing settlement up to 8 inches in places near and under buildings. At one building in Seattle the ground settled and was washed from under a footing by escaping ground water. At other buildings, particularly back of bulkheads along and in waterfront structures, substantial settlement occurred, breaking water mains and sewers, pulling electric conduit apart as much as a foot, and causing similar damage to other underground structures. Where compaction by vibration of passing trains or trucks had occurred in fills, most of the settlement due to this quake occurred outside the line of influence of such equipment, to cause cracks and depressed areas to appear at the point of change.

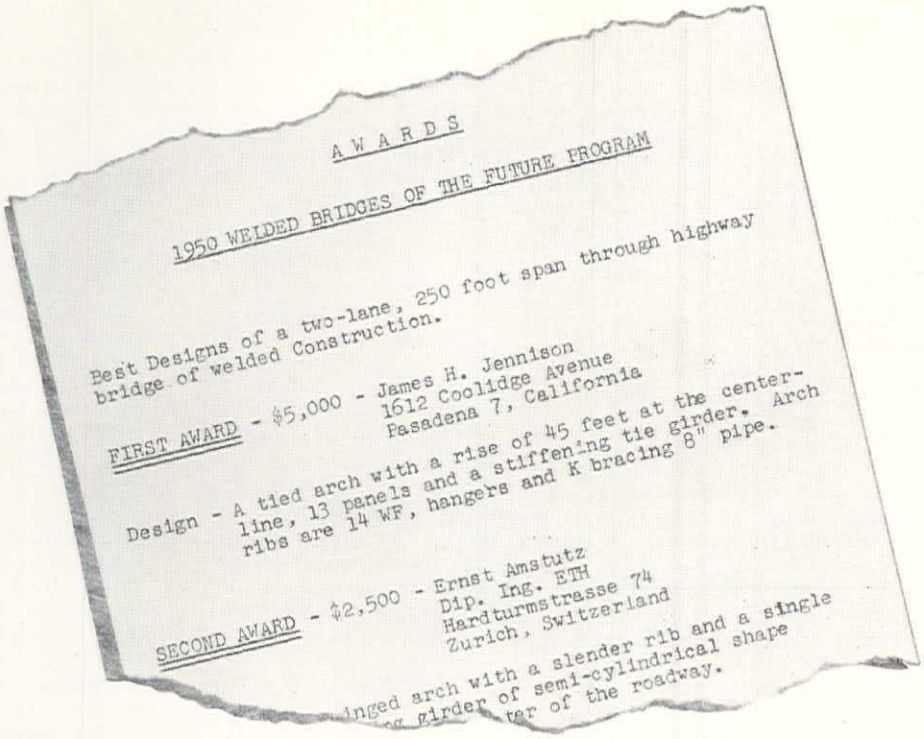
Shocks severe near faults

Insofar as is presently known, practically no permanent horizontal displacement along a fault line occurred, though several opened fissures in soft soil were photographed and several accounts of strong motion near a fault were reported.

A fault known to exist near Chehalis is thought to be responsible for the exceptionally heavy damage to old masonry structures at the Washington State Training School for Boys, where three buildings were so badly shattered that further use or repair was impossible.

Three-part report to be continued next month and concluded in the April issue. For a synopsis of the installments, see box on page 71.

Westerner Wins Welded Bridge Award



AWARDS

1950 WELDED BRIDGES OF THE FUTURE PROGRAM

Best Designs of a two-lane, 250 foot span through highway bridge of welded Construction.

FIRST AWARD - $5,000 - James H. Jennison
1612 Coolidge Avenue
Pasadena 7, California

Design - A tied arch with a rise of 45 feet at the center-line, 13 panels and a stiffening tie girder. Arch ribs are 14 WF, hangers and K bracing 8" pipe.

SECOND AWARD - $2,500 - Ernst Amstutz
Dip. Ing. ETH
Hardturmstrasse 74
Zurich, Switzerland

inged arch with a slender rib and a single girder of semi-cylindrical shape ter of the roadway.

A TIED-ARCH BRIDGE with a stiffening tie girder, designed by James H. Jennison of Pasadena, California, received the First Award of $5,000 in the 1950 Welded Bridges of the Future Award Program sponsored by The James F. Lincoln Arc Welding Foundation. This was a program to stimulate thinking on welded bridge design in order to develop better bridges made at less cost with less steel. The accompanying description is an abstract of the winning design.

THE TIED-ARCH type of bridge with moment rigidity provided in the arch rib is fairly common in riveted steel construction, but rarely has the design of tied-arch bridges provided the major part of the moment rigidity in the tie member. The less common variation of the tied-arch type, which provides virtually all of the moment stiffness in a tie girder at the deck level, was chosen for this welded bridge because it permits better proportions for members, more pleasing appearance, simpler connection details, and greater economy.

A clean appearance and graceful line is achieved by the welded construction of this bridge. Welding is an ideal method of fabrication for a tied-arch bridge with a stiffening tie girder. It permits elimination of gusset plates, clip angles, lacing bars, and other small detail material. The design combines the advantages of beauty, economy, durability, and low maintenance cost.

Details simplify fabrication

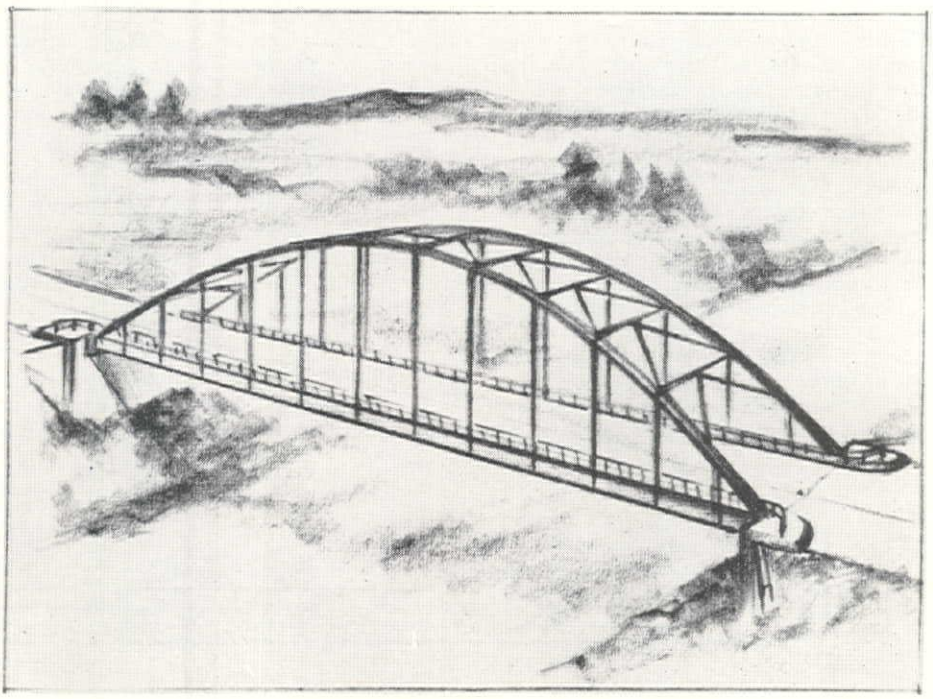
The bridge has a roadway width of 26 ft., and is designed for H-20 highway loading at a basic tensile stress of 18,000 psi. Design specifications are standards of the American Welding Society and American Association of State Highway Officials. The structural design followed conventional methods, but particular attention was paid to the proportion and arrangement of members and to the design of connections. Details were arranged to simplify fabrication and erection. Waste of material has been avoided by selection of efficient sections, and much small detail material has been eliminated. There are no lacing bars, clip angles, or gusset plates.

One of the advantages of welded fabrication is the fact that the completed structure is, in reality, a single piece of material. This integrity of structure is particularly desirable in statically indeterminate structures, because the stresses in such structures depend upon relative deflections of the members. The tied arch in this case was laid out on a parabola with a rise of 45 ft. The panel lengths, 1 at 15 ft., 11 at 20 ft., 1 at 15 ft., were chosen primarily for economy in the floor systems, but the layout is also a good one for the tied-arch design. Estimates were made, through a preliminary design, of dead load and relative stiffness of arch and girder. The final design was computed by a tabular method to obtain summations for influence line values for thrust and total moment. Panel point loads were applied to these influence lines to obtain the design thrust and moment values. The total amount was then distributed between the arch rib and the tie girder in proportion to their effective stiffness using the formula derived by J. M. Garrelts. In this design presented here, from 96 to 97% of the total moment at the several panel points is carried by the tie girder and only 3-4% by the arch rib.

Asymmetrical girder section

The arch rib is made up of a series of chords with the panel points on a parabola. Fourteen WF 167 sections were used with butt welded connections at panel points.

The top flange of the girder was designed to a basic stress of 13,500 psi. because it is necessary to attach hangers to it. The bottom flange was designed to the full basic stress of 18,000 psi., as it has no stress-raising attachments welded to it. The asymmetrical girder section designed to these stresses has the neutral



Winner of Award Has Wide Experience in Both Field and Office

J. H. JENNISON, 39, is the Head of Development Engineering Division, U. S. Naval Ordnance Test Station. He is in charge of development of underwater ordnance, design of equipment and facilities for ordnance testing and operation of the Morris Dam Torpedo Range.

JENNISON

He was employed for 7 years by the Bridge Department of the California Division of Highways, during which period he had a wide experience in design, construction and maintenance of highway bridges of many types. He left the bridge department during World War II to engage in research and development work at California Institute of Technology. This project included design of facilities for testing aircraft torpedoes and was the forerunner of the present Underwater Ordnance Department of the Naval Ordnance Test Station.

In 1947 he received the 2nd Award ($2,000) in the Structural Division of the Lincoln Foundation Design for Progress Program for a paper on the 300-ft. span all-welded movable bridge for the Variable-Angle Launcher. He was Chief Engineer on this project for Naval Ordnance Test Station.

He is a graduate of California Institute of Technology, with a Master of Science Degree in 1936.

He is a member of Tau Beta Pi, Sigma Xi, American Society of Civil Engineers, Structural Association of So. Calif. and is a registered Civil and Structural Engineer, State of California.

axis about 6 in. above the centerline. The welded fabrication of the tie girder makes possible the asymmetrical section and also the required variation in moment of inertia of the section.

No stiffeners in web

The tension stress in the tie girder web increases the stability of the web enough that the ⅜-in. web plate has a factor of safety of 5 against buckling, although no stiffeners are used. At all panel points, the web is stiffened by split pipe sections which transfer the concentrated floor beam loads through the girder to the hangers. Conventional stiffeners are used at the ends of tie girder to transmit loads to the end bearings.

Pipe was chosen for the hangers because of the efficiency of this section in load bearing, maintenance, erection and because of more pleasing appearance.

Pipe for bracing

Pipe is used for lateral bracing because it is an ideal section for such light members where L/r rather than stress governs the size of the section. Welded joints in pipe are usually simple and efficient. Pipe is also suitable for main tension and compression members where suitable connection details can be worked out.

This wa[illegible]ed in reinforced concret[illegible] surface of the deck flush with the lower surface of the top flanges of the floor beams and stringers. The deck is anchored to the curb plate along each edge by shear bars welded to the curb plate.

Three lines of stringers are designed as continuous beams with welded connections to the floor beams. By using 15-ft. end panels and 20-ft. interior panels the same stringer sections can be used throughout.

Steel curbs formed from ⅜-in. plate serve the two functions of curbs and outside stringers. They provide a seat for the outside edge of the deck and are welded to the top flange of the tie girder to transmit longitudinal shear produced by lateral forces. The railing is made from rectangular and square tubing of larger sizes than those currently manufactured.

Savings on steel

The total weight of structural steel, excluding expansion rockers, shoes, and base plates is 364,196 lb. This is 56 lb. per sq. ft., compared to 75 to 90 lb. of structural steel per sq. ft. for bridges of equal span. It is estimated that an equivalent riveted bridge would require 30 to 60% more structural steel than the welded bridge. The price is estimated to $11.50 per sq. ft. for the complete superstructure. The cost of painting will be the only expected maintenance on the bridge and this should be low because of the predominance of large flat surfaces.

The welded tied-arch bridge with a stiffening tie-girder is an excellent choice where esthetic considerations are important. The grace of its lines, proportion of its members, and simplicity of its details combine to make it a beautiful bridge.

L. A. Plans Garage-Bomb Shelter Under Mall at Civic Center

THE LOS ANGELES City Planning Commission has suggested the advisability of having the city construct underground garage facilities beneath the Mall in the downtown Civic Center. This action was occasioned by the results of a staff study of offstreet parking needs in the area. The study revealed that an estimated 18,000 permanent parking spaces would be required for the ultimate Civic Center development. Presently there are but 1,000 permanent spaces and about 5,000 temporary spaces which will disappear when the sites on which they are located will be needed for proposed new structures.

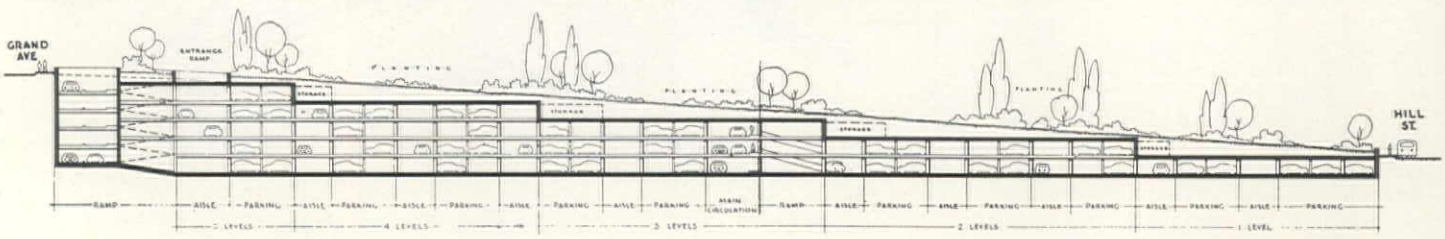
It has long been recognized that some form of multideck parking facilities will be needed, either above or below ground. The Commission believes that the subterranean treatment would be preferable in this instance. A three-fold purpose would be served: first, some 5,600 parking spaces would be made available for citizens transacting business in the Civic Center; second, the ascetic appearance of the area would be enhanced through the development of an attractively landscaped park over the roof of the structure; and, finally, the underground garages could serve as bomb shelters if so required.

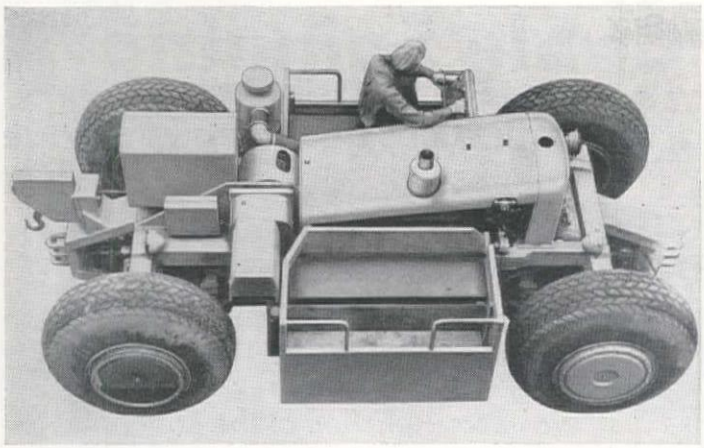
Design and costs

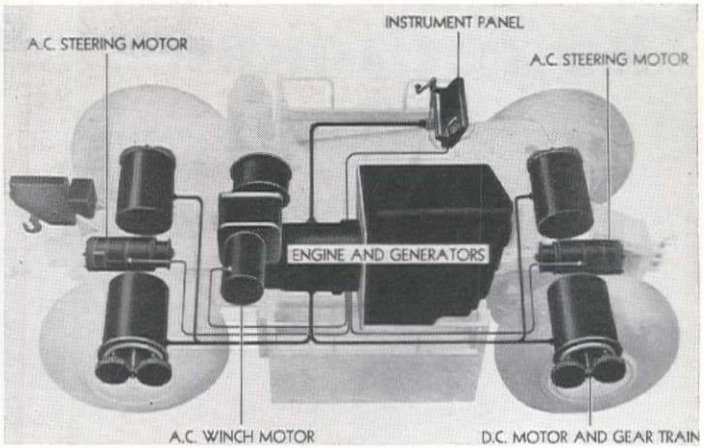
The proposed garages will have 3, 4, and 5 levels in accordance with the slope of the ground. In case of bomb attacks, it is estimated that from 50,000 to 90,000 persons could obtain shelter therein, depending upon the number of automobiles in the garage at the time.

The entrance and exit ramps would be the only visible portions of the structures. Interior ramps would provide safe and efficient access between all floors, and it is planned to have convenient underground access from the garages to the adjacent governmental offices.

The estimated cost of constructing these underground garages is about $10,000,000. Construction will have to await acquisition of the land in the Mall area and the removal of several public and private buildings from the site.







A Look at the First Electric Drive Used on Heavy Earthmoving Equipment

A MACHINE with no clutch, no transmission and no differential, and which incorporates a new method of power transmission as used on heavy construction equipment—that's the new electric-drive Tournatow. Because this is the first machine to put diesel-electric drivers on rubber-tire-mounted heavy equipment, a brief review of its unique features will be of interest to the readers of *Western Construction.*

Self-contained power source

The Tournatow can be compared in action to the battery-powered electric automobile of the early 1900's, with one important exception. Whereas the electric automobile has no self-contained source of electric power, the Tournatow uses its own diesel engine to generate its own power. This power is by a military standard G.M.C. 6-cylinder 2-cycle diesel engine capable of developing 186 hp. at 1,800 rpm.

Two generators, one alternating current and one direct current, are mounted in line with the engine. The DC generator supplies power to each of the four drive wheels. This power is applied indirectly through a potentiometer type rheostat for precision control. The AC generator supplies power to each of the two motors used to steer the front and rear wheels and to the motor operating the large capacity winch on the rear of the unit. This power is controlled by individual switches mounted on the control panel.

Connection between the power plant and the motors . . . drive, steering, and winch . . . is through flexible electric conductors, and the motors are placed at the points of application. Each drive wheel is suspended on ball and socket type bearings with drive motor, reduction gear train, drive gear, and wheel built as a single unit. Tires are 56-in. standard aircraft type.

The steering motors are located at the front and rear of the unit and are individually controlled from the cockpit by means of finger-tip switches. Limit switches automatically cut off the steering motors when the wheels have reached their limit of turn.

The winch is separately controlled by a finger-tip switch on the control panel. The Timken bearing, self-aligning, patented fairlead bracket on the rear of the machine's frame structure permits pulls through an 180-deg. arc, with a maximum side pull of 90 deg. from the axis of the machine. The AC motor and reduction gear box can deliver 30,000-lb. line pull through the ¾-in. cable and line speeds of 60 ft. per min. The automatic brake on the winch motor will hold the load instantly when the operator releases the control switch.

AC for steering and winch

Essentially, the Tournatow's AC electrical system consists of an engine-driven generator which provides current for electric motor operation, AC induction motors located at the various points of a power application, and a system of remote control so that electric motors for steering and winch operation can be operated from a central point; namely, the cockpit. Alternating current was selected for these applications because of its starting, stopping and reversing characteristics.

The LeTourneau alternating current generator is mounted in line with the engine. This three-phase generator is designed and constructed to produce current without the fluctuation and the power loss of the ordinary AC generator.

DC for drive

After reviewing the requirements of drive systems on rubber-tired vehicles, LeTourneau selected DC for the Tournatow as the ideal power because of the excellent starting torque of DC motors and the wide range of speed control possible. An engine-generator set completely detached from the drivers except through flexible conductor cable, and driver wheel units including both the reduction gear train and the DC motor, completely eliminates clutches, transmissions, differentials, braking systems, universal joints, and other mechanical gearing and linkages. Power loss is thereby reduced to line loss between the motor and generator and the loss in the simplified gearing system in the drive wheel. The absence of "steps" or fixed speed ratios in the potentiometer control means that a steady smooth flow of power can be applied while the load is being accelerated. Because there is no mechanical linkage, there are no intervals of clutch operation or reduction in engine speed to change gears.

The DC system consists of an engine driven generator providing current for the motors' operation, 4 DC motors, one in each wheel, and a system of remote control so that the electric motors can be operated from a central point.

The 6-pole DC generator is mounted in-line with the diesel engine directly to the rear of the AC generator. The AC generator (alternator), through step-down transformers and selenium plate rectifiers, provides the generator field excitation through potentiometers. These potentiometers not only control the speed of the DC motors, but also, by the LeTourneau patented method of interconnection, reverse the direction of rotation of the DC motors without the use of circuit breakers in the lines. By this method, it is possible to control the high amperages in the feeder lines by controlling low amperages in the field excitation, keeping high currents completely apart from the controls. The potentiometer varies the field from zero to maximum in either direction, providing an infinite number of speed ratios.

DC for braking

The characteristic regenerative braking effect of the DC motors is used to a great advantage in this application of the DC system. Operating on grades where the tendency of the load is to overspeed the motor in conventional units, the DC motors automatically take on the work of retarding the load. This effect eliminates the necessity for a braking system used during operation. However, since this effect does not exist as long as the motor armature is at rest, a parking brake is built onto the motor to lock the armature when no current is applied to the DC motor. This brake is a multiple-disc, magnet-released, spring-engaged unit, mounted on the rear of the motor frame. As long as current is flowing in the DC system, the magnet is disengaging the brake. When current is cut off, powerful springs engage the brake and lock motor armatures, holding the load in position.

The Techniques of Cable Spinning

As Exemplified at the New Tacoma Narrows Bridge

Cable construction on long span suspension bridges is a complicated process requiring precise coordination of men and heavy machinery—Here is a step-by-step review of how it was accomplished at the only such structure completed in this country during the past ten years

By HAROLD W. HILLS
Resident Engineer
John A. Roebling's Sons Co.

MUCH has been written on the subject of cable construction on long span suspension bridges. This present article does not pretend to cover the entire procedure. It has been some ten years since the last parallel wire suspension bridge was completed in this country and the following report might be of especial interest to those whose construction experience started since the time of erection of the George Washington, Golden Gate, San Francisco Bay and Old Tacoma Narrows Bridges.

The cable construction of these bridges and of the New Tacoma Narrows Bridge and the spinning or erection procedure were much the same. The present cables each consisted of 8,702 parallel #6 Galvanized Bridge Wires, spun in 19 groups or strands of about 460 wires each. Wire strength is in excess of 225,000 psi.

Each strand is in effect an endless skein of wire looping back and forth from anchor to anchor. Actually there are about 788 pieces of wire some 3,500 ft. long in each skein, fastened end to end by overlapping ferrules or nipple splices which are cold pressed onto threaded ends and result in connections of 100% wire strength. Each strand is attached to its separate eyebar anchorage by looping the wires around wheels or strand shoes attached to the eyebars. Proper adjustment of the strand is obtained by varying shims between the first and second eyebars of the chain.

The start of spinning

Prior to the start of spinning of a strand, a guide wire is hung from anchor to anchor. The wire is surveyed to correct elevations before the cable erection starts and is used at the start of each strand. It is fastened to the strand shoes in each anchor and lays in small spinning saddles at each tower. These spinning saddles are so elevated that the guide wire maintains a good working height above the footbridge.

Now, refer to Chart No. 1 which shows the start of spinning of a given strand. Note the tramway drive in the East Anchor, capable of moving the tramway rope at better than 700 ft. per minute.

At the extreme right is the powered unreeling machine. The reel here holds nine tons or 180,000 ft. of wire—already spliced in 3,500-ft. pieces. From the reel the wire runs through the counterweight sheaves, whose function is to absorb momentary differences in relative speed of the tramway and the heavy unreeling machinery. The wire then passes around the tramway spinning wheel "A" and back around the anchor shoe and is dead ended a few feet in front of the shoe. The final wire of the last trip of the strand will later be spliced to this end.

As the wheel proceeds along the walk, it lays down two wires on the footbridge behind it. One, the dead wire to the strand shoe has no motion and is set aside until ready for adjustment. The other wire traveling at better than 1,400 ft. per minute is known as the live wire. It is placed in grooved sheaves along the walk and over the tower known as "live wire sheaves."

Chart No. 2 shows the wheel about 100 ft. past the first tower top, at which location the wire adjusting cycle starts. The wheel, however, does not stop but continues at full speed during all adjustments. The adjusting cycle is started by a man at the tower top who attaches the friction "come-along" grip to the dead wire at the point indicated. He then signals the East Side Span Adjuster to start adjustment of this dead wire. The adjuster has a switch box which operates the "come-along" motor by remote control on the endless line to which the grip is attached. He proceeds to pull the wire free of the footbridge and up until hanging exactly even with the guide wire. He then signals the tower man that the adjustment is complete. The latter then clamps the wire to the tower structure and removes the come-along grip.

SPINNING EQUIPMENT at East Anchorage (below) showing unreeling machine, 10-ton reels and spinning wire counterweight towers. View above shows partially completed cable.

CHART NO. 1—The start of spinning. Reel is loaded with 180,000 ft. of wire spliced in 3,500-ft. pieces. Tramway wheel is ready to begin its round trip to lay "dead" and "live" wires on footbridge.

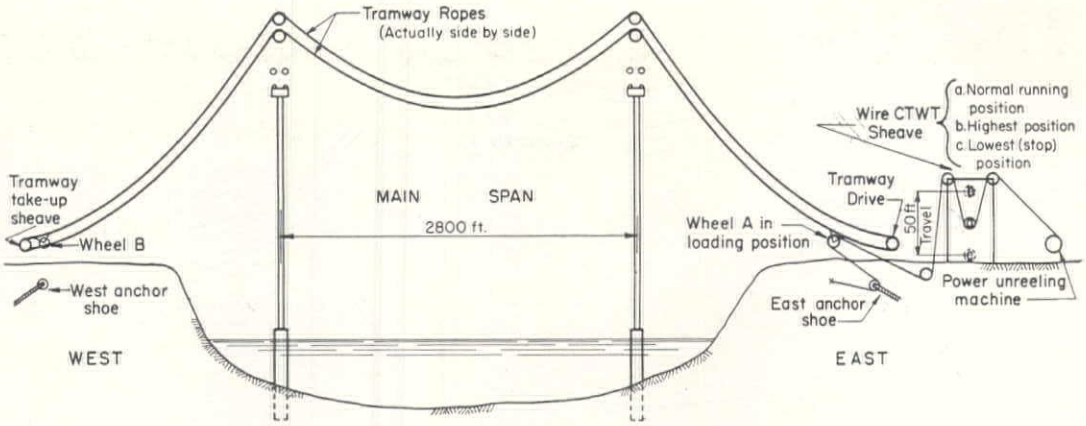
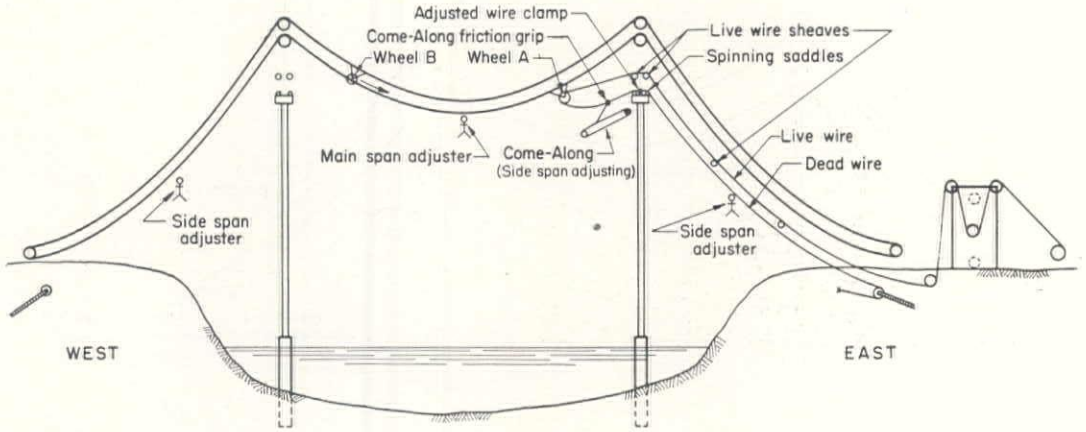


CHART NO. 2—Wheel is about 100 ft. past the first tower top, at which point the wire adjusting cycle starts. "Come along" grip is attached to dead wire to pull it free from footbridge and line it up with guide wire.



He then signals the main span adjuster that the side span adjustment has been completed.

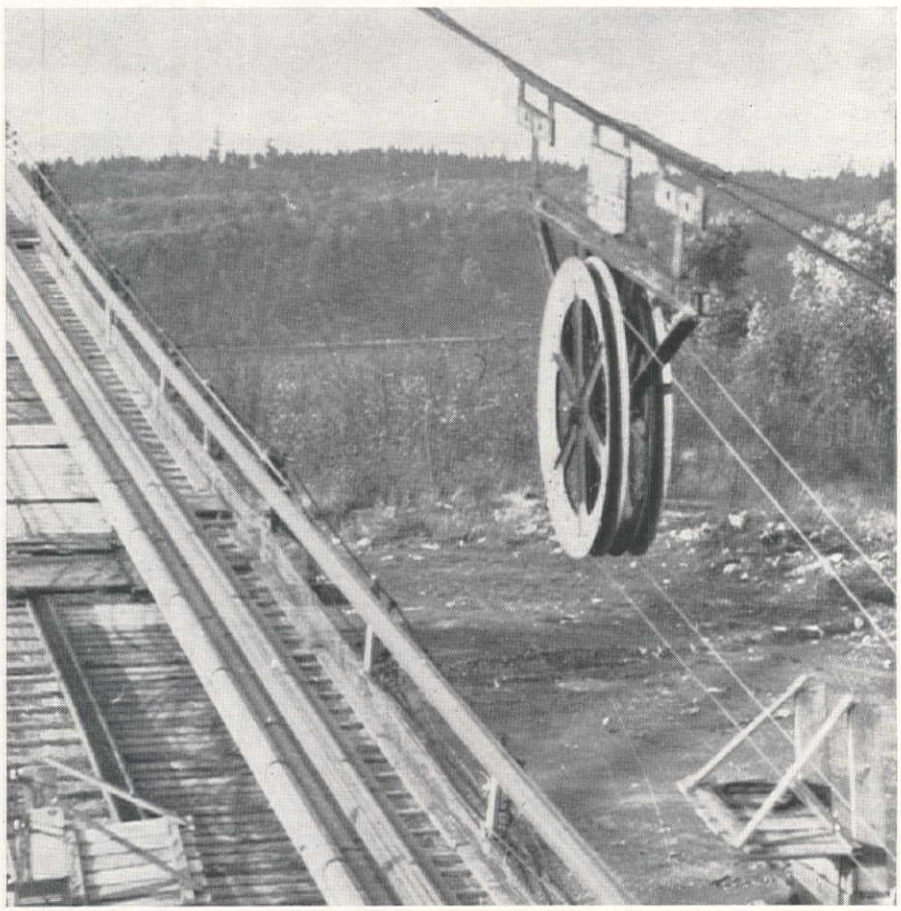
By now the wheel is approaching the second tower. As soon as it passes into the far side span the above adjustment procedure is repeated in the main span, in exactly the same way using the come-along on the far side of the second tower to adjust the main span dead wire.

By then the wheel is close to its far terminus. As it approaches the West Anchor, the tramway slows down and stops with the wheel directly above the far anchor shoe. The loop of wire is quickly removed from the wheel and placed around the shoe.

When the wheel stops, of course, the live wire also comes to rest. From anchor to anchor it is removed from the live wire sheaves. At the towers it is laid alongside the guide and dead wire in the spinning saddles. Along the walk it is set out of the way until ready for adjustment. Meanwhile the "come-along" grip is attached in the West Anchor as shown in Chart No. 3 and adjustment of the West Side Span dead wire proceeds. As soon as this wire is set even with the guide wire, it is clamped at the West Anchor and the grip detached. At the same time a "come-along" grip is attached to the former live wire at the main span side of the tower and the return adjustment is started.

The tramway—in normal operation—is stopped only for a few seconds at the end of the trip. The wheel then proceeds on its return trip—empty at Tacoma, though in the past it has been economically possible to unreel wire from both anchors.

EACH SPINNING WHEEL used at Tacoma was actually two sheaves so that two loops of wire were carried over on each trip and four wires were laid down on the footbridge. Note two strands on the walk in the process of being spun.



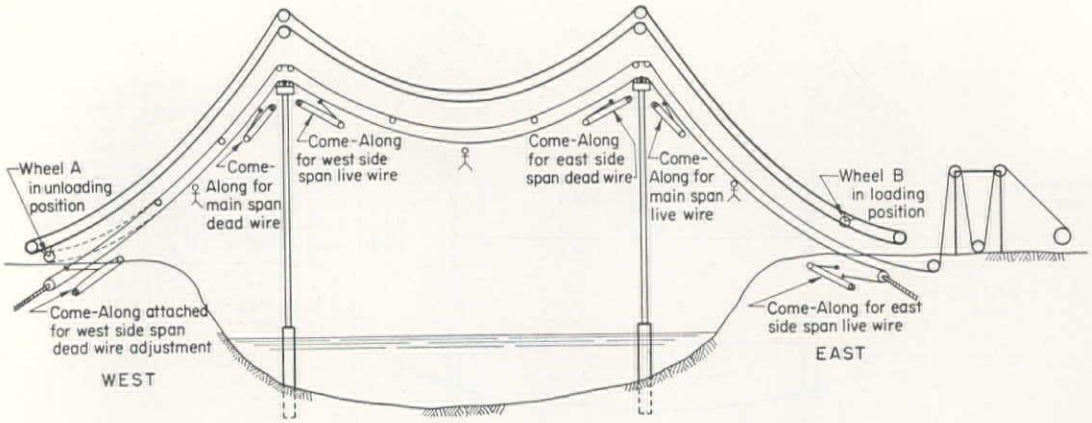


CHART NO. 3—After wheel has reached its terminus at West Anchor, live and dead wires are removed from the wheel and placed around shoe. "Come along" grips are attached to adjust both dead wires and former live wires.

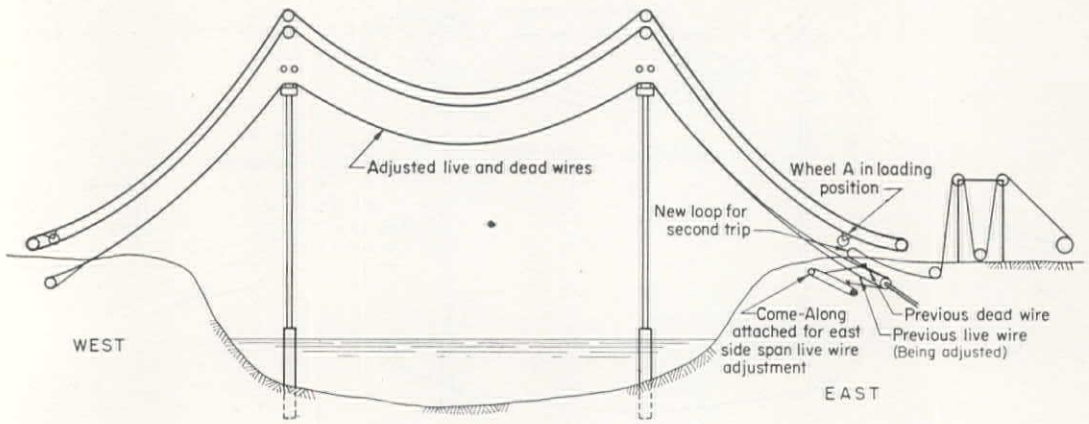


CHART NO. 4—Wheel has returned to East Anchor and live and dead wires are adjusted to line up with guide wire for entire length. Ideal time schedule calls for wheel to arrive at East Anchor at same time adjustment of previous loop is completed.

At full speed the wheel takes about ten minutes to return to the East Anchorage. Adjustment of the live wire back is a race against the wheel.

Slack is pulled ahead of the adjustment and from the main reel through the counterweight tower and the former live wire is pulled down around the East Anchor Shoe and a new bight or loop formed as shown in Chart No. 4. Provided the adjustment beats the spinning wheel back to the East Anchor, this loop will be ready to throw over the wheel as soon as it reaches the anchor. If the adjustment is delayed, the tramway stops until the previous trip adjusting cycle is completed.

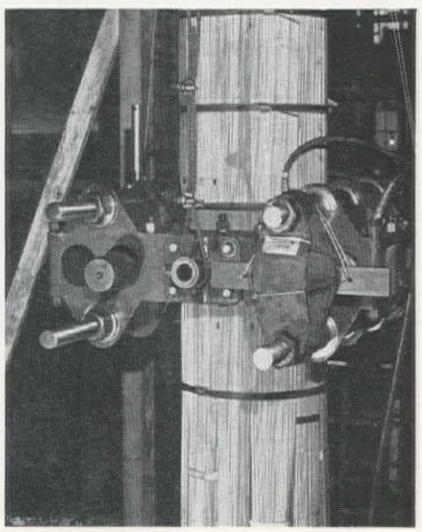
This then is the basic procedure in the spinning operation. Again and again the wheel carries its loop from one anchor to the other until the strand is completed. The guide wire is removed after several trips and set aside to be used again on the next strand.

Two strands at once

Actually, at Tacoma—as indicated on the Charts—two strands were spun at once. Spinning Wheel "A" spun wires for one strand and Spinning Wheel "B" for the other. Also, each spinning wheel was really two sheaves so that two loops or four wires were carried over at once. Thus, there were four unreeling machines and four counterweight sheaves. There were two tramways—one for each cable. The spinning and adjusting of the strands were so balanced as to time and personnel that, while two strands were in process of being spun on one walk, the previous two strands were shaken out, taped up, lifted from spinning saddles and set down into the main saddles and adjusted to exact desired sags by the adjusting crew.

This procedure sounds simple. In practice and design, however, the entire program is exceedingly complex and the necessary equipment, especially the electrical features, very complicated. Some 50 or 60 men, scattered over more than 6,000 ft. of exposed footbridge up to 500 ft. in the air, must work in concerted, intelligent action—day and night, good weather and bad—to maintain any sort of acceptable production. In the foregoing description only a few key men are mentioned. Actually, there are men at frequent intervals handling the wire from end to end of the footbridge. Whole crews are required at towers and anchors to handle the speeding wire, to load and unload the spinning wheel and to operate the adjusting equipment.

GROUPS OF STRANDS, when completed, are squeezed into a tight 20½-in. diam. circle.

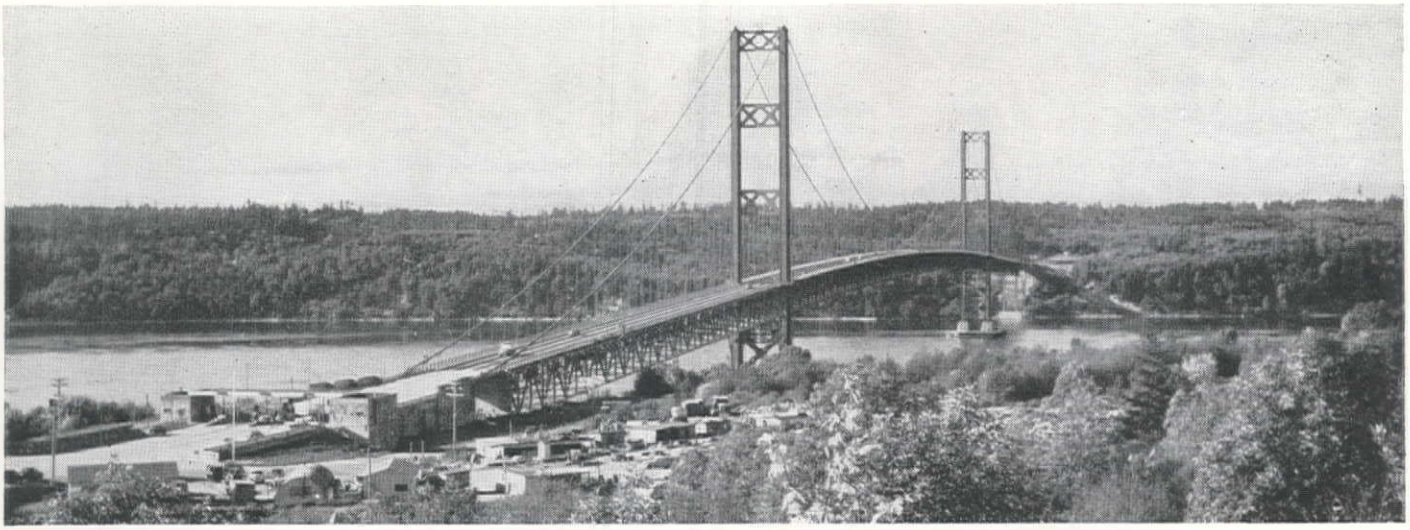


"On their toes"

At the unreeling anchor, tramway drive and unreeling machine operators must be alert and fast in their reactions. Emergency stop signal systems, the adjusting signal lights, telephone and power lines, all add up to a very considerable wiring layout. The whole spinning movement is controlled by a key man known as the Dispatcher, who operates much like the dispatcher on a major railroad line. His quarters are a labyrinth of signal drops, lights, dials, telephones, etc. At his elbow are telephones to all parts of the bridge. At many points along the bridge the tramway may be stopped by pushing a button. This signals the tramway operator, the unreeling machine operator and the dispatcher. By using one of the telephones at his elbow, the dispatcher can immediately ascertain the cause of the stop and instigate the necessary steps to resume operations.

The unreeling machine operators in particular must be "on their toes" at all times. The inertia of the heavy reels and unreeling machine is, of course, very great—especially when the wire is unreeling at 1,400 ft. per minute. Constant vigilance is necessary to keep the telltale counterweight sheaves in the middle of their run by properly conforming the speed of the unreeler to that of the tramway.

When completed, each strand was "shaken out." To pass the rigid inspec-



COMPLETED New Tacoma Narrows Bridge is suspended 221 ft. above sea level by 104,667,656 ft. of wire in two 20½-in. diam. cables. The cables each consist of 8,702 parallel wires spun in 19 strands of about 460 wires each.

tion by State Engineers, all wires had to be within a few inches of the center of the group at mid-spans. To do this across 2,800 ft. of main span is the equivalent of adjusting wires spun over 28 ft. of span to within a little over 1/16-in. elevation.

Adjustment to extreme accuracy

As stated above, completed strands are turned over to a separate crew for adjusting. After the strand has been checked by the State Engineers, it is squeezed into a circle about 5 in. in diameter and fabric bands similar to bicycle tape wrapped about it at some 7-ft. intervals. At the towers and anchors steel wire servings and stainless steel straps hold it in shape. Lifting ropes or grommets, attached at short intervals to a huge curved structural steel beam, are slipped around the strand between the spinning saddles at the towers. The 120-ton hydraulic jacks then lift the strand and set it in the main cable saddles. In the anchor 80-ton jacks, reeved on one side of a two-part line, are used to pull in or slack out the strand as required.

All adjustment of guide wires and completed strands must be done at night, several hours after sunset. For this work all portions of the steel wire in strands previously adjusted and under adjustment must be at exactly the same temperature. Only a few degrees of difference would make the adjustment many inches in error. Actual relative adjustment between the strands in each span is made correct to within less than ⅛ in. in length.

The guide wire and first strand in each cable are set by surveying instruments with lighted targets and using carefully precalculated charts indicating the proper sag readings for varying tower top positions and temperatures. This work in itself could be made the subject of an article as extensive as the present. The final accuracy of line and elevation of the entire future bridge is dependent on this vital survey. Absolute knowledge of the physical characteristics of the wire material, as well as accuracy of field readings, is required so that the unloaded cable will stretch the exact amount and the towers will deflect exactly as predicted as bridge truss and flooring erection proceeds and the dead load brings the finished bridge to its calculated position.

Once these first strands of each cable are set, all other strands in that cable are adjusted by local measurement from top to top of strands at the center of each of the three spans.

Squeezing and wrapping

When completed, the group of strands hangs in a rough hexagonal shape. They are then squeezed into a tight, nearly solid, circle a little over 20 inches in diameter.

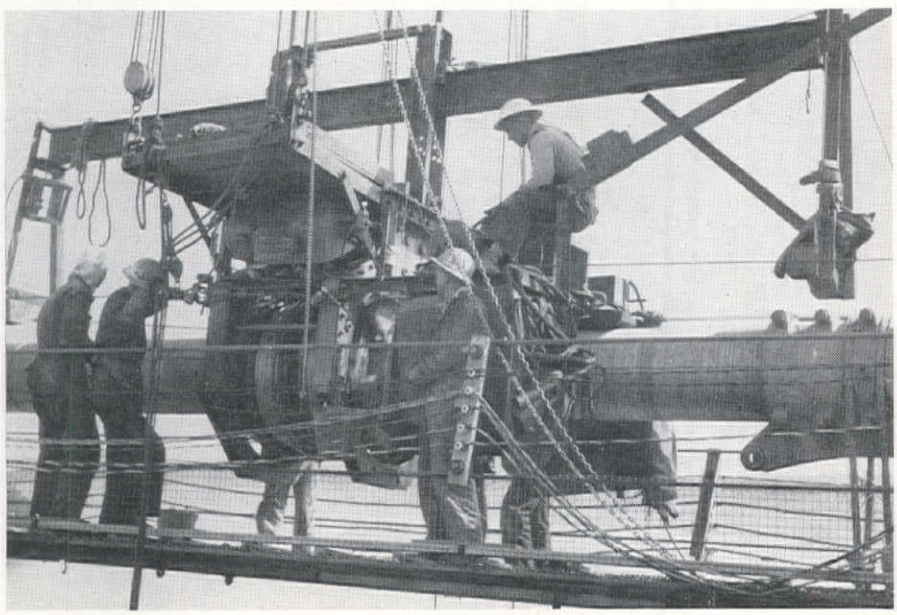
View on page 80 shows machine which does this compacting using hydraulic pressures of 6,000 psi. Squeezes are made at 30-in. intervals and wire servings placed to hold the shape. Cable bands and suspenders are then placed on the cable and the eretcion of the floor system started.

The final operation is to wrap the cable (see illustration). This electronically controlled machine weighing several tons can wrap some 30 ft. of cable in about 20 minutes. Galvanized #9 wire, partly annealed, is placed at such a tension and in such tight contact wire to wire as to produce practically an air tight protection to the nearly indestructible bridge wire underneath. This protection is made even more complete by laying the wire into a coat of red lead paste and finally by three coats of paint on the outside surface.

The cable construction contract for the Tacoma Narrows Bridge was carried out by the John A. Roebling's Sons Company of California with the corporate headquarters in San Francisco. The home office of this firm is at Trenton, New Jersey, where all equipment was designed and manufactured. The field operations were under the direction of Robert J. Cole, Erection Manager. F. M. Meyerend was Field Plant Engineer.

At the home office of John A. Roebling's Sons Company, C. C. Sutherland is Chief Engineer and Blair Birdsall is Assistant Chief Engineer of the Bridge Division.

FINAL OPERATION is to wrap the cable with wire. This is done with an electronically-controlled machine weighing several tons that can wrap some 30 ft. of cable in about 20 minutes.



HOW IT WAS DONE . . .

Cableway System Designed to Speed Shasta Dam Spillway Apron Repairs

A UNIQUE feature in overflow spillway design at the Bureau of Reclamation's Shasta Dam will make major repairs to the spillway apron an easy matter if they ever become necessary. The device consists of a cableway spanning the downstream end of the Shasta spillway apron, for the purpose of installing and removing a large steel cofferdam between spillway training walls.

Use of a cofferdam provides relatively easy inspection and repair of the spillway apron. At some large overflow spillway dams, cofferdam installation and spillway apron repair have proved to be expensive and time-consuming affairs. At Grand Coulee, for instance, it was necessary to lower huge caissons into the stilling basin to correct erosion damage from the tremendous force of falling Columbia River water.

Shasta is the only large Reclamation dam in the West having provision for easy installation of a temporary and removable cofferdam. Although to date there has been only one spillway overflow, and that of a test nature, it is probable that a considerable amount of water will spill during extremely wet years. Hence, provision was made for easy inspection and repair of the spillway apron against erosion action.

Under the cableway and cofferdam system, the cofferdam sections are lowered into place from the 1,380-ft. cableway, and then the stilling basin can be pumped dry for inspection and repairs.

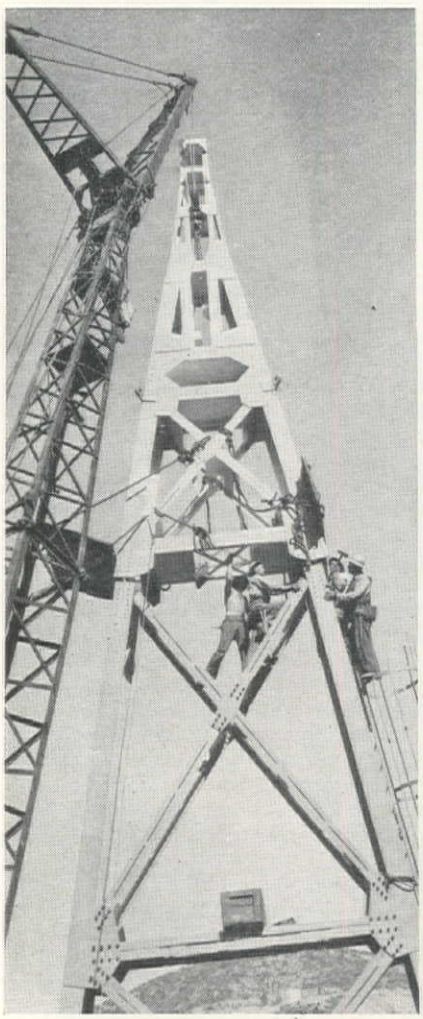
Shasta's cableway, the main track cable of which is 3 inches in diameter, was erected by John C. Gist of Sacramento, Calif., at a cost of $48,220. The cofferdam consists of 1,000 tons of structural steel, to be assembled into large trestle bents and bulkhead panels, and then placed in the lower end of the spillway. There is a distance of 225 ft. from the loading dock at the head tower, from which the cofferdam parts are lifted from trucks, to the bottom of the spillway. From the center line of the 80-ft. loading dock to the west side of the spillway is 800 ft. This is approximately the longest haul necessary on the 30-ton capacity spillway.

The three-inch, main track cable is 1,668 ft. long and weighs approximately 24 tons. It is of locked coil construction, manufactured by the American Steel and Wire Company of Trenton, New Jersey. The hauling cable is of 1⅛-in. diameter. Maximum deflection of the main track is 88 ft.

Erection of the head "A" frame tower, which is 130 ft., 2 in. high, was accomplished by use of a 2½-yd. Lima dragline with a 90-ft. boom and a 20-ft. attached jib. The tail tower height is 60 ft., 2 in., and is located on the west bank of the river, its footing 126 ft. below the head tower footing.

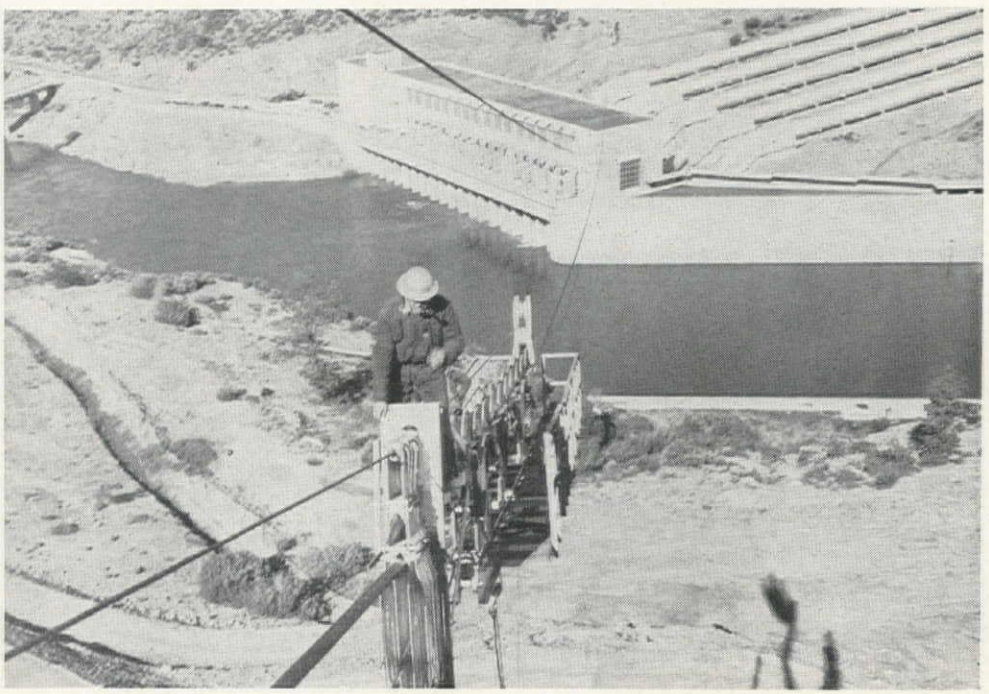
Installation of the cable was done by a step-up method, beginning with a ½-in. manila pilot rope, attached to a ½-in. wire rope, and then the 1¼-in. wire rope messenger line over which the 3-in. main track cable was hauled. It is anchored securely at each end to concrete anchors weighing 330 tons each, extending through the main "A"-frame tower for 200 ft. and the tail tower for 92 ft.

The hoist house is located directly behind the head tower, with 150-hp. motor-powered hoisting machinery. Regenerative braking is employed, the current produced in braking being fed to a series of resistors instead of returned to the lines. The load line drums are gear-connected through friction clutches to the in-haul, out-haul drum for synchronizing purposes.



LEFT—Putting the finishing touches on the "A" frame head tower.

BELOW—Taking a carriage ride high above the stilling basin of the Shasta Dam spillway during a test run. The cableway enables easy installation and removal of steel cofferdams at the downstream end of the stilling basin during any necessary repair operation.



New Additive Increases Battery Life Expectancy

A BATTERY ADDITIVE which doubles the life expectancy of storage batteries resulting in a savings of 50% of the annual expenditures, according to customers, is now receiving national recognition. *Newsweek* (December 11, 1950) devotes much space to Battery AD-X2, product of Pioneers, Inc., 2411 Grove St., Oakland, Calif. Meanwhile, expansion of this baby firm, only three and a half years old, in order to greatly increase production has been announced.

AD-X2 is a unique product. Neither its inventor nor the scientist who advised him have been able to explain why it works, but such accounts as Kellogg Express & Draying, Dinwiddie Construction Co., California Highway Patrol, and Consolidated Air Lines are enthusiastic. R. B. Lohry, engineer in charge of the City of Oakland electrical department's radio division says Pioneer's product has extended by at least 250% the life of batteries used to power police- and fire-department radio equipment.

The product and the firm are the material representation of one man's idea. Jess M. Ritchie, founder of Pioneers, Inc., is a general engineering contractor who became interested in the sulfation problem in lead-acid batteries while working as general superintendent of construction for the Drake-Utah-Grove operations in the Philippine Islands. He returned to Oakland in 1946 determined to do something to increase the useful life expectancy of storage batteries.

For technical advice, he turned to Dr. Merle Randall, then Professor Emeritus of the University of California. Under the chemist's direction, Ritchie started compounding and testing chemicals that might help remove the sulfate from the plates without destroying the plates themselves.

In September 1947 an apparently-successful compound was discovered. Pioneers, Inc. was formed and the product as it is now being marketed was completed February 2, 1948. So far as is known, it is the only successful chemical change in the lead-acid battery since that type of battery was conceived by Dr. Plante in the nineteenth century. It has found a world wide market, and is now being distributed in Oakland, Los Angeles, Martinez, Fresno, Stockton, Sacramento and Aptos, Calif.; Phoenix, Ariz.; Alberta, Canada, and Panama.

We can't tell you how or why AD-X2 works, because the formula is a secret which Ritchie has memorized. However, it is said to contain Epsom salts and sodium sulfate.

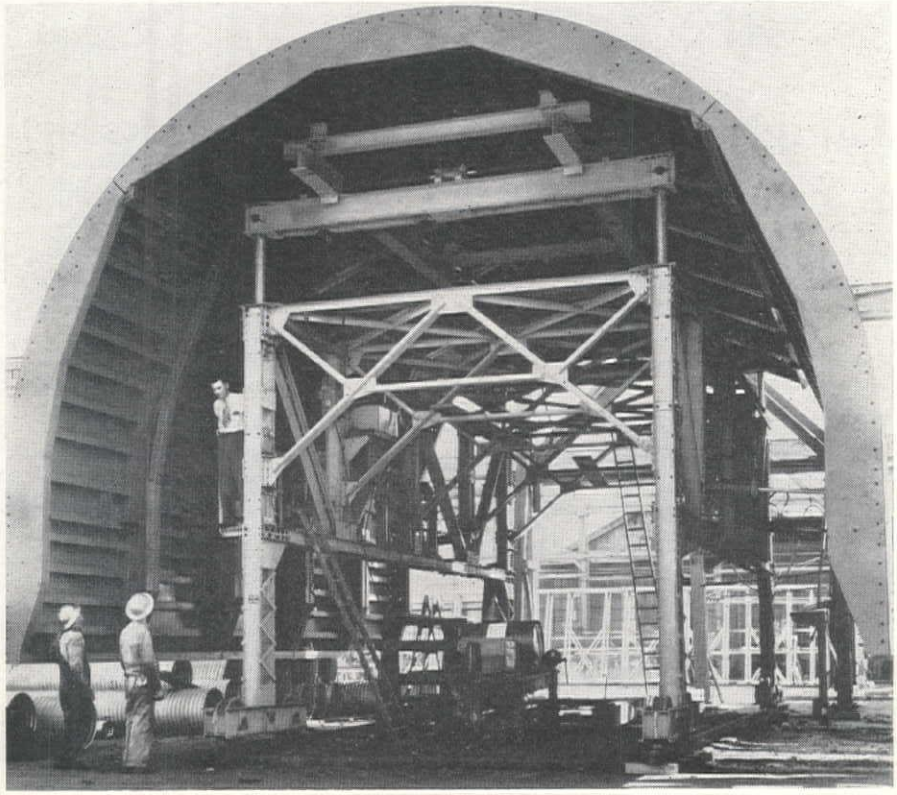
In addition to selling Battery AD-X2 for $3.00 per individual package which contains enough to treat an automobile battery, Ritchie has a staff which buys junk batteries, repairs them, gives them some AD-X2, and sells them for a fraction of the price of a new battery.

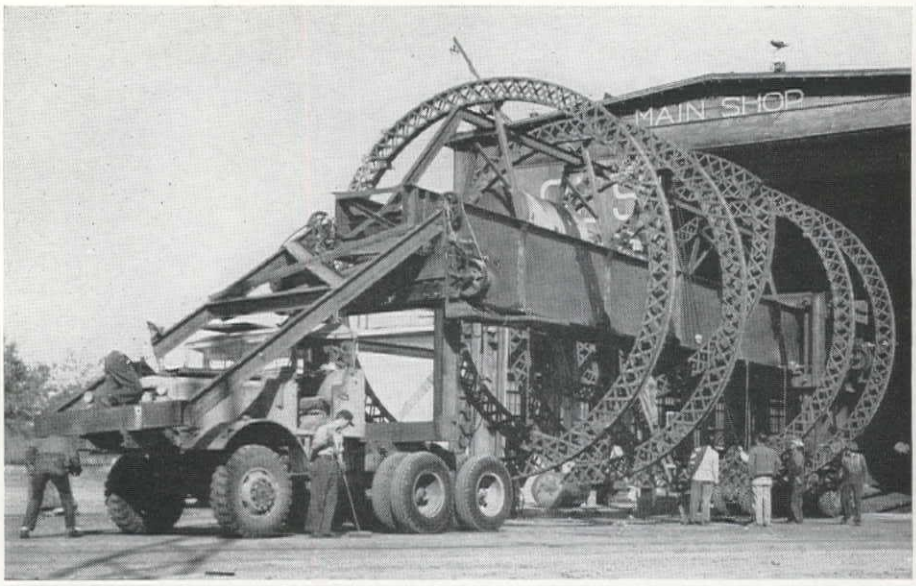
Executive vice-president of Pioneers, Inc., is W. M. Hager, a graduate of the engineering school of Princeton and former procurement director for the Drake-Utah-Grove operation. During World War II, he was assistant manager of one of the largest construction syndicates ever brought together, the Pacific Naval Air Base Contractors. S. Archie Schlater who has been connected with several nationally known battery concerns is plant superintendent, and Fred D. Knight is sales manager for the young firm.

DISCUSSING new battery additive, left to right: Dr. Frederick G. Sawyer, Stanford Research Institute; George A. W. Boehm, Science Editor, Newsweek, and Jess M. Ritchie, President, Pioneers, Inc. See story at left.

Telescopic Steel Forms for Broadway Tunnel Concrete

SAN FRANCISCO'S Broadway Tunnel project will use two telescopic steel tunnel forms for pouring and setting concrete. Shown below, the forms weigh 45 tons and are 44 feet long by 28½ feet wide. The two forms and the hydraulically operated traveler (shown inside form) were fabricated at the Vernon, Calif., plant of Consolidated Western Steel Corp., for the general contractor, Morrison-Knudsen Company, Inc. Concrete is poured through ports in the forms. While concrete is setting around one form the traveler moves the second into position for the next pour. Each of the twin tunnel bores is 1,632 feet long.





"Old Highpockets" Totes Tunnel Liners

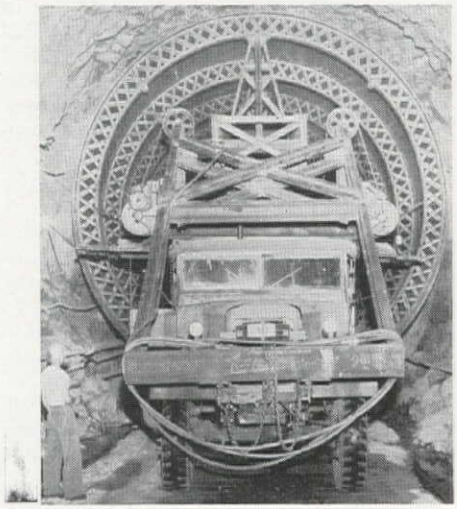
COMPLETION in early January of the Lucky Peak Dam tunnel liner has been accomplished by Olson Manufacturing Company, Boise, Idaho, steel fabricators, according to H. J. Agee, vice president and general manager of the Idaho firm.

Olson's part of the Lucky Peak job involved approximately two and a quarter million pounds of steel. The 1,138-ft. tunnel was lined with plate from the Geneva Steel Plant which was fabricated at the "Olson City" factory and hauled approximately 8 mi. to the dam site.

Individual sections were 23 ft. in diameter, 40 ft. long and formed of ½-in. and ¾-in. plate with T-stiffener rings to give added strength. Olson's sub-contract called for fabrication, transporting and welding in place in the tunnel preparatory to the concrete pour. Prime contractor on the Corps of Engineers project is Macco-Puget Sound.

A distinctive feature of the tunnel liner job is the mammoth trailer which Olson engineers designed for handling the huge pipe sections. Dubbed "Old Highpockets" the trailer is built around a Mack 6 x 6 tractor unit with a Larison compensating axle under the bogie.

A 66-ft. double beam section carries a series of expanding lattice rings to hold the pipe in position. Accurate placement of the load in the tunnel was achieved through four trailer-mounted cable winches air-powered with a 60-ft. compressor. Air-powered steering on the bogie permits maneuverability and gives the impression of a gigantic hook and ladder truck. After the pipe was set in concrete, the removable lattice rings were collapsed and taken back to the factory for another section.



"OLD HIGHPOCKETS" ready to back into liner section (above left). With folding rings expanded, section is "loaded" (above right) and ready for trip to tunnel site. At right, close cooperation between drivers in cab and rear bogie needed to prevent binding while section is installed.

Liquid Spreaders Set on GI Trucks

COMPLETION of the first unit of a contract to manufacture liquid bituminous material spreaders to be mounted on United States Government trucks for Armed Forces use has been announced by Standard Steel Corporation, Los Angeles fabricators of heavy special machinery.

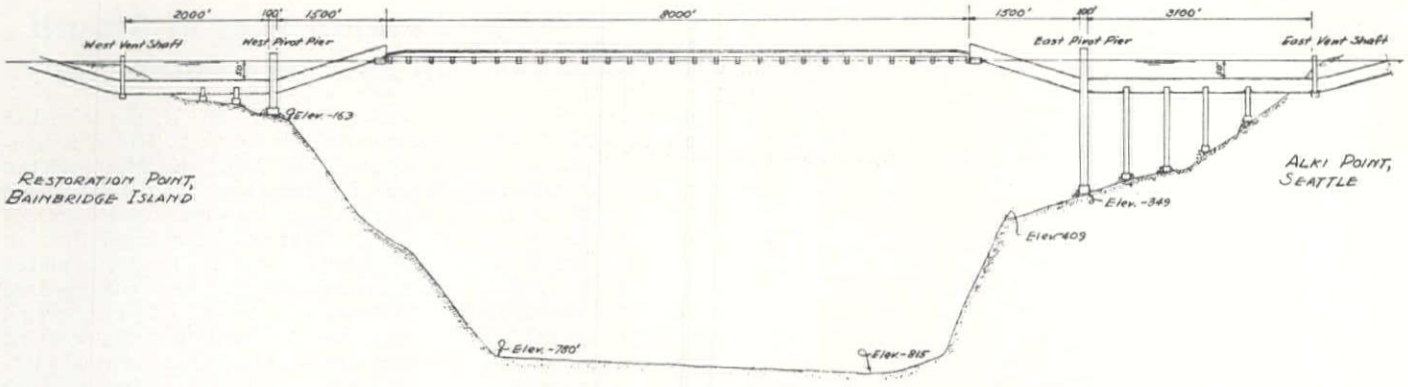
The spreaders are being made according to joint Army and Navy specifications and are designed to be employed for spreading many different kinds of bitumious substances, from road oils to heavier asphalts, in constructing roads and airport landing strips. They provide completely self-contained, mobile units which operate on easily obtainable fuels and are capable of going anywhere the trucks can be driven.

Robert S. Burns, left, president of Standard Steel Corp., and M. B. Preeman, center, vice president and general manager of Road Machinery Division, inspect first mounted spreader.

The spreader assembly consists essentially of an 800-gal. capacity tank to hold the liquid to be spread; a diesel fuel burner to heat the liquid; an asphalt pump and blower operated by an independent gasoline engine; and a spray bar made up of 2-ft. sections so that it can be extended to any desired width up to 24 ft.

The machine is capable of delivering from 1/10 of a gallon to 3 gallons of liquid per sq. yd. A pump tachometer indicates the delivery of the pump in gallons per minute and total distance traveled. All controls are within easy reach of the operator's platform which is located on the left side at the rear of the vehicle.

The complete unit, including the truck, weighs 24,000 lb., and the spreader assembly alone weighs 8,000 lb.



Combination of Submerged Tunnels and Pontoons Would Provide—

A Practical Bridging of Puget Sound

THERE IS pressing need for a bridge across Puget Sound from Seattle to replace costly ferry service, but the problems of extreme water depth and navigation requirements rule out any conventional design. Two proposals have been made: (1) a floating tunnel, anchored against buoyancy; (2) a pontoon bridge to Vashon Island combined with a high-level suspension span to the Kitsap County mainland. The writer discards both plans as impractical and proposes instead a crossing from Alki Point to Restoration Point with submerged tunnels at each end, an anchored pontoon section in the center.

THE GREAT sweeping arc of Puget Sound extending from the Straits of Juan de Fuca to Olympia and beyond is characterized by waters of extreme depth. In the vicinity of Seattle there are three narrow points—and therefore bridge sites—where the width is only about 3 miles. However the maximum depths of water at these narrowest points are respectively as follows: West Point at Fort Lawton to Skiff Point on Bainbridge Island, 850 ft., Alki Point to Restoration Point on Bainbridge Island, 815 ft., and Brace Point just outside the southwest city limits of Seattle to Dolphin Point on Vashon Island, 650 ft. With such water depths to contend with —they prevail for approximately half or more of the total distance—the construction of any conventional type of bridge supported on fixed piers is wholly impossible.

Two previous proposals

For the past several years there has, however, been considerable talk and discussion of a bridge across Puget Sound at Seattle. Two definite proposals have been advanced by the Toll Bridge Authority engineers. One of these is for a floating tunnel, anchored down against buoyancy, which would adapt equally well to any of the three sites. The second proposal applies to the Vashon Island route only and is for a pontoon bridge across East Passage on the east side of that island and for a high-level suspension bridge across Colvos Passage on the west side of the island. The pontoon bridge would substantially shut off the east passage to all large vessels although it has been proposed that a 400-ft. moveable section would be provided in it. The west side passage would have a high-level bridge with a main span of approximately 3,000 ft. Inasmuch as the east passage is now used by the great majority of large ships going to Tacoma it appears very unlikely that a permit for such a pontoon bridge would be issued by the Army Engineers. The writer cannot, of course, do more than make a prediction based upon the department's past

By
HOMER M. HADLEY
Consulting Engineer
Seattle, Washington

actions and policy. It can be stated, however, that that policy has always been one of giving priority to shipping and recognizing established navigational rights. For this reason the writer ventures to predict that this proposed construction will not be sanctioned if application is made for it.

As for the floating tunnel it likewise appears impractical because of the difficulties and hazards of construction and the further hazard connected with its insurance. Should anything ever happen that would lead to rupturing the shell of such a tunnel and flooding its interior, all support would be lost from end to end and it would fall to the bottom of the Sound in one complete, overwhelming, catastrophic ruin. The loss would be 100% from shore to shore. No insurance man likes 100% losses.

The writer proposes a bridge from Alki Point in Seattle to Restoration Point on Bainbridge Island of the following type: approximately 3,000 ft. of tunnel section supported on piers on the Alki Point side and 2,000 ft. of similar tunnel construction on the Restoration Point side; from the tunnel sections, 1,500-ft. transition sections supported at the tunnel ends on large pivot piers, with buoyant support at water level at their opposite ends; and between these transition sections about 8,000 ft. of anchored pontoon bridge with deck approximately 30 ft. above water surface. The supporting pontoons would be approximately 300 ft. on centers and set transversely to the roadway and the deck structure, of cellular, reinforced concrete, box girder type, would span between them.

Advantages of the new plan

This particular location, Alki Point to Restoration Point, has three outstanding advantages over any other location. First and foremost it lies closest to a straight line between the center of Seattle and the center of Bremerton. Its route is 5 miles shorter to Bremerton than the Vashon Island route and shows practically the same saving over the West Point-Skiff Point route. Secondly, this is the one place in the entire length of Puget Sound where solid rock occurs on both sides of the Sound. Thirdly, this is the sole and only place in the vicinity of Seattle where shipping, wherever bound, naturally tends to hold to the inshore ends of the bridge. Any vessels moving between Seattle and Tacoma naturally hold close to Alki Point. Any ships passing Seattle and going directly to or from Tacoma likewise tend to hold close to Alki Point since this Point, projecting far out as it does, lies on the straightest course there is up and down Sound. Ships to and from Bremerton must turn sharply at Restoration Point and tend therefore to hold to this point. Ships travelling through Colvos Passage on the west side of Vashon Island and

going to Seattle naturally hold close to Alki Point or if going up-Sound naturally hold close to Restoration Point. Similarly if going to Shilshole Bay in the Ballard district of Seattle from Colvos Passage they naturally hold quite close to Restoration Point. Therefore this location is a particularly favored one and is best suited of any to the accommodation of shipping and to the proposed construction.

From Restoration Point a road on easy grades would lead across the southern end of Bainbridge Island to Crystal Springs on the west side. There a second bridge is required, about a mile long, to cross to Illahee on the mainland from which point one road would lead southerly to Bremerton, a second one northerly to the Hood Canal ferry. This Crystal Springs-Illahee location has the shallowest water on the west side of Bainbridge Island and is by far the best bridge site there is.

Pier construction

Returning to Puget Sound, for the construction of piers to give definite and positive support to the tunnel sections, it is proposed that the rock base be cleaned off and that heavy rock fills be made and leveled at the several sites. The pier bases themselves would be constructed on land and launched. Then upon them the pier shafts would be built, employing the familiar slip-form construction used in building grain bins and elevators. As each shaft grew in height water would be gradually admitted to its pier base and as the shaft lengthened the pier would be settled deeper and deeper in the water. When completed the piers would be floated into exact position and settled onto the rock bases. Then additional rock would be piled around them to hold them definitely in true position. Following this the tunnel sections would be floated into place and settled in the final position on top of the pier shafts. Adjoining sections would then be interconnected. The pontoon construction needs no explanation. In view of the far more severe exposure to wind and wave, the Lake Washington type of structure can scarcely be regarded as suitable here and the type previously outlined would be substituted, permitting the free passage of waves beneath the deck and only interfering with them at the supporting pontoons.

Placing transition sections

The most difficult construction feature unquestionably will be the placement of the 1,500-ft. transition sections which at their lower ends have hinged supports upon the pivot piers at the level of the tunnels. It appears that joints of spherical ball-and-socket type, the ball placed upon the pier and the socket attached to the underside of the transition section, would readily yield the comparatively slight movements required and that treated rubber yokes or collars, encircling the transition sections and attached to the piers, would provide watertight joints. While extreme tidal movements of 19 ft. are possible at the upper end of the transition section, the actual angular change with a 1,500-ft. radius is but slight and not more than a few inches of angular movement would be required at the pivot pier ends.

Ventilation would be provided at the pivot piers and at the vent shafts at the inshore ends of the ship channel sections. From these points the tunnels would rise through solid rock to the atmosphere of the outer world.

While this proposed project is of major scale and size there is nothing essentially difficult about it. Handling the great transition sections which are longer than the Queen Elizabeth and weigh as much or more, is the greatest problem. At an early stage the writer thought of spiral ramps in large terminal piers to rise from tunnel level to the upper level and thence by truss spans to the pontoons. Such construction, however, is most unsatisfactory from the point of view of traffic movement and would prove far more disappointing than the Lake Washington ship channel opening has. The straight, direct alignment and easy grades which the transition sections afford practically requires that they be employed.

There can be no question that there is a great and crying need for an improved connection between Seattle, the west side of the Sound and the entire Olympic Peninsula area. Therefore, this bridge is proposed as a practical means of achieving that end and as indeed the only practical means of accomplishing it.

Seventh Year of Drouth In Southern California

EXAMINATION of U. S. Weather Bureau records by C. C. Elder, hydrographic engineer for the Metropolitan Water District, reveals that Southern California is now in its seventh year of the most severe and longest drouth on record for the area. The accumulated rainfall deficit in the Los Angeles area from March 5, 1944, to December 31, 1950, is 35.97 inches. This never-received rain amounts to the area's normal rainfall for a period of two years and four months.

Chairman Joseph Jensen of the Metropolitan District's Board of Directors has pointed out that a number of Southern California cities would be faced with a disastrous water shortage caused by this lack of rain if it were not for the Colorado River water made available by the Metropolitan aqueduct.

The Great Drouth started in March of 1944. During each of the six "weather years" since that time there has been less than the normal rainfall of 15.23 inches. 1950-51 holds slim prospects of being a non-drouth year, as the rainfall in the Los Angeles area during the last six months of 1950 amounted to only 1.71 inch.

Several of the 32 cities of the Metropolitan Water District are completely dependent on Colorado River water.

Intermountain AGC Makes First Scholarship Awards

THE FIRST awards of $250 scholarships to a deserving engineering student at both the University of Utah and the Utah State Agricultural College have been made by the Intermountain Branch of the Associated General Contractors. The award program was initiated early in 1950 and the AGC chapter made the first funds available for the 1950-51 school year. The awards go to deserving Junior civil engineering students, taking into consideration scholarship and the need of the individual, as well as aptitude for engineering and construction.

At the Utah State Agricultural College, the scholarship award went to Ronald D. Blotter (see cut). A Junior from Logan, he plans to secure a degree in highway engineering. Blotter, who is married, has an outstanding grade point average of 2.63, and is very active in extra-curricular affairs.

The University of Utah award was made to William H. Borton, who is also married and has an excellent scholastic record. Borton's home is in Pocatello, Idaho, where he is employed by the city engineer during summer vacations.

Intermountain AGC committees to assist in selection of the students were: at Utah State Agricultural College, Carl Nelson and John Mickelson; at the University of Utah, Ellis W. Barker and Wilford W. Clyde.

AGC STUDENT AWARD at Utah State Agricultural College goes to Ronald D. Blotter of Logan, Utah. Carl E. Nelson, former president of the Intermountain Chapter, makes the presentation. Looking on are Dean Jerald E. Christiansen, left, and John H. Mickelson, Logan contractor.

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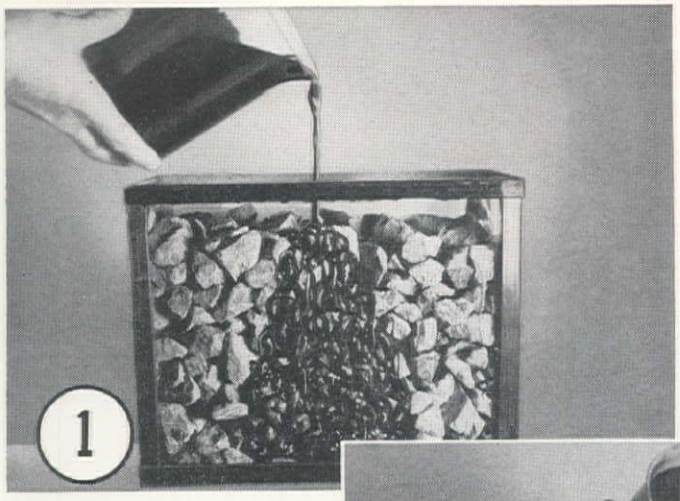

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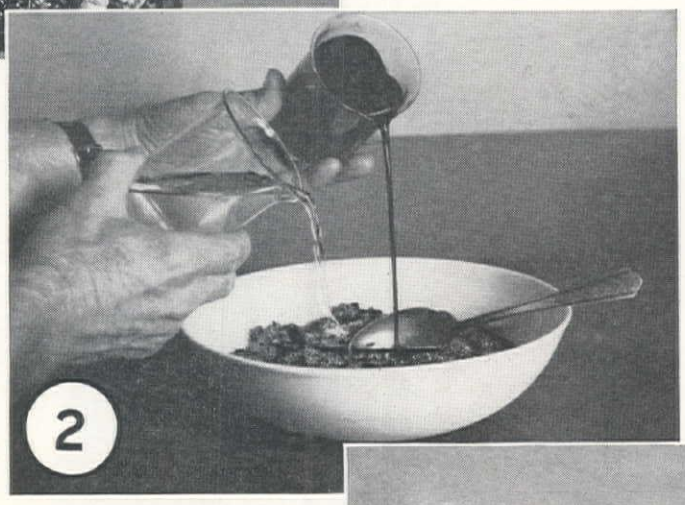

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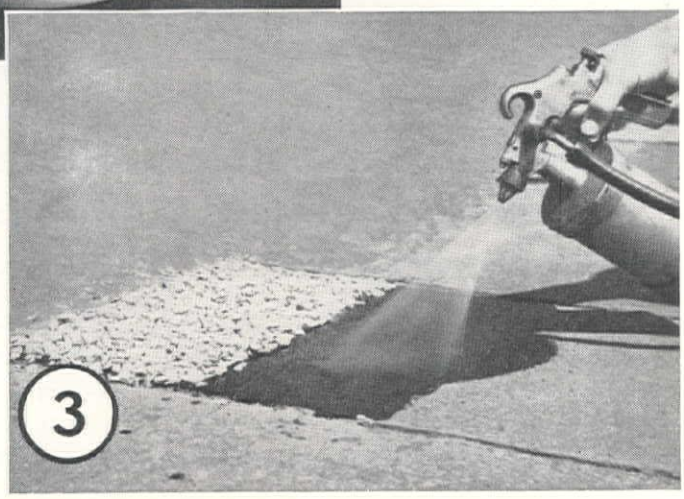

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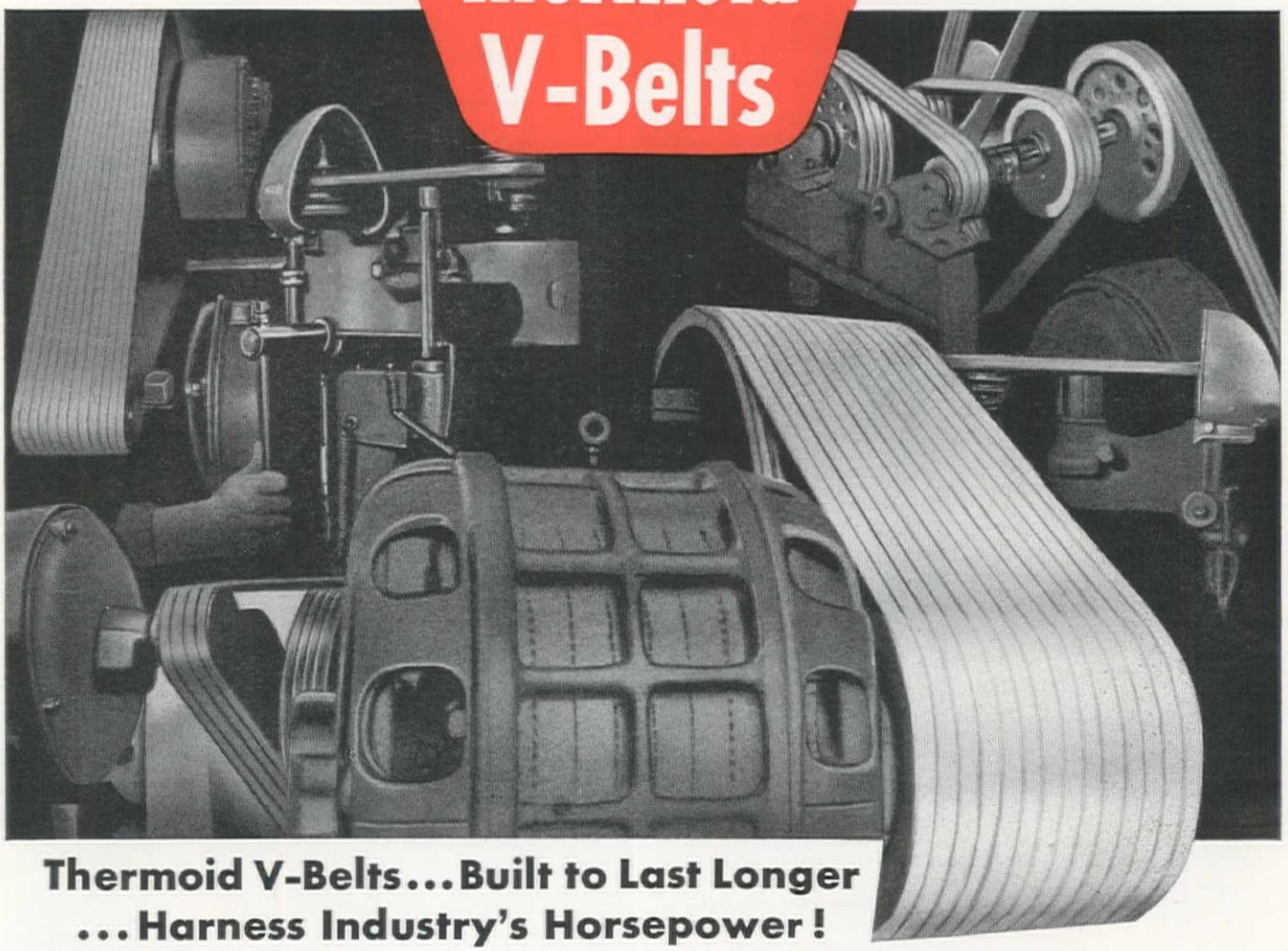

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CONSTRUCTION DESIGN CHART

CXXVIII . . . Minimum Percentage of Spiral Reinforcement

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

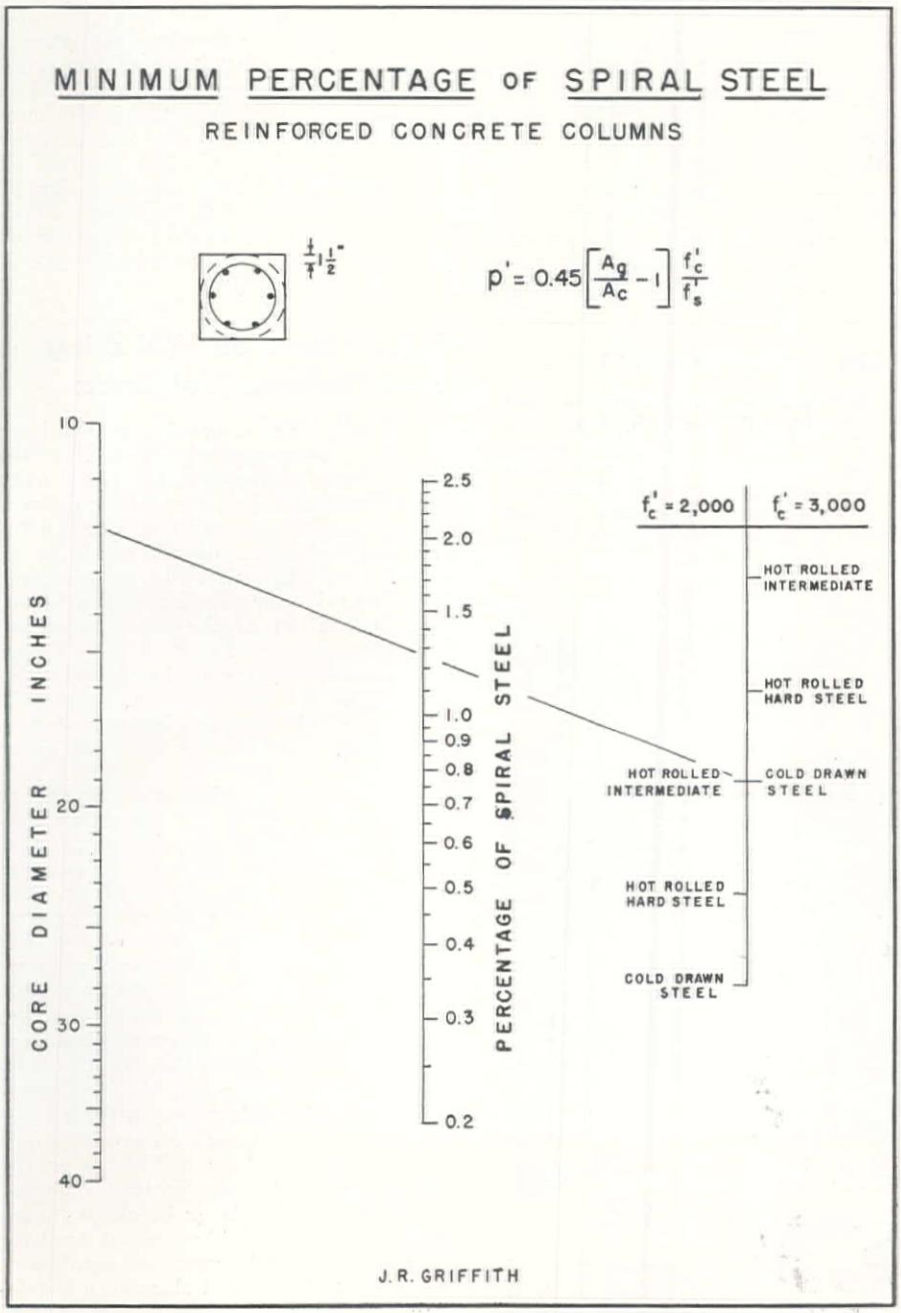
A CHART was previously published on page 56 of the booklet *Construction Design Charts*[1] for determination of the "pitch" of column spirals when the percentage of such spirals was given. In the writeup given therein, mention was made to the method specified by the ACI Building Code[2] for determination of the minimum spiral reinforcement. Since this same method is to be found in most city building codes, and is a rather tedious method, a chart for such solutions will probably be welcome.

The conventional expression for the minimum percentage of column spiral reinforcement is

$$p' = 0.45 \left[\frac{A_g}{A_c} - 1 \right] \frac{f'_c}{f'_s}$$

in which

p' = minimum ratio of volume of spiral reinforcement to the volume of concrete core,
A_g = gross area of the column
A_c = area of the core
f'_c = ultimate strength of concrete
f'_s = useful limit of stress in spiral reinforcement
40,000 psi. for hot rolled rods of intermediate grade
50,000 psi. for hot rolled rods of hard grade
60,000 psi. for cold drawn steel wire.



The diameter of the column has been taken as 3 in. more than the core, on the accompanying chart, for computing the gross area of the column. This allows for 1½ in. of protective covering outside the column reinforcement. Graduations have been provided on the chart for the three grades of spiral reinforcement steel in combination with either 2,000- or 3,000-lb. concrete.

The chart is solved by a single straight line intersecting all three scales. A solution line has been drawn on the chart for the following assumed conditions:

Core diameter = 12 in.
(Area = 113.1 sq. in.)
Column diameter = 12 + 3 = 15 in.
(Area = 176.7 sq. in.)
f'_c = 2,000 psi.
f'_s = 40,000 psi.
(Hot rolled intermediate steel)

By substitution in the formula we would have

$$p' = 0.45 \left[\frac{A_g}{A_c} - 1 \right] \frac{f'_c}{f'_s}$$

$$= 0.45 \left[\frac{176.7}{113.1} - 1 \right] \frac{2{,}000}{40{,}000}$$

$$= 0.45 \, [1.56 - 1] \, 0.05 = 0.0126$$

In terms of percentage, we would then have a value of 1.26%, which checks the solution indicated on the chart.

On the right hand scale of the chart, it will be noted that hot rolled intermediate steel used in conjunction with 2,000-lb. concrete gives results identical to those when cold drawn steel is used with 3,000-lb. concrete. The marks on the right hand scale are but plottings of the ratio $\frac{f'_c}{f'_s}$.

In the first instance we would have

$$\frac{f'_c}{f'_s} = \frac{2{,}000}{40{,}000} = 0.05,$$

whereas in the second instance

$$\frac{f'_c}{f'_s} = \frac{3{,}000}{60{,}000} = 0.05.$$

[1] Fourth edition, *Western Construction.*
[2] *Building Regulations for Reinforced Concrete*, American Concrete Institute.

NEWS OF WESTERN CONSTRUCTION FEBRUARY 1951

Bid Opening Set For Ross Dam Powerhouse

MULTI-MILLION dollar contract proposals for construction of the powerhouse, tunnel and appurtenances at Ross Dam on the Skagit River will be received by the Seattle Board of Public Works until February 21. The proposed contract will cover construction of the powerhouse on the left bank of Diablo reservoir just below the dam, construction of powerhouse appurtenant works, installation of plate-steel penstock liners, alterations to existing power-tunnel intake structures, and installation of spillway gates.

The reinforced-concrete and steel-frame powerhouse will be approximately 307 ft. long and 76 ft. wide and 64 ft. high. More than 7,500,000 lb. of reinforcing steel and steel plate liners will be placed in the powerhouse and tunnel. Structural steel to be used will total over 3,000,000 lb., and placing of penstock plate steel lining will involve approximately 3,855,000 lb.

The powerhouse will provide for ultimate installation of four 100,000-kva. hydroelectric generators, three of which are already on order.

Utah Looks for New Revenue to Finance 15-Yr. Road Program

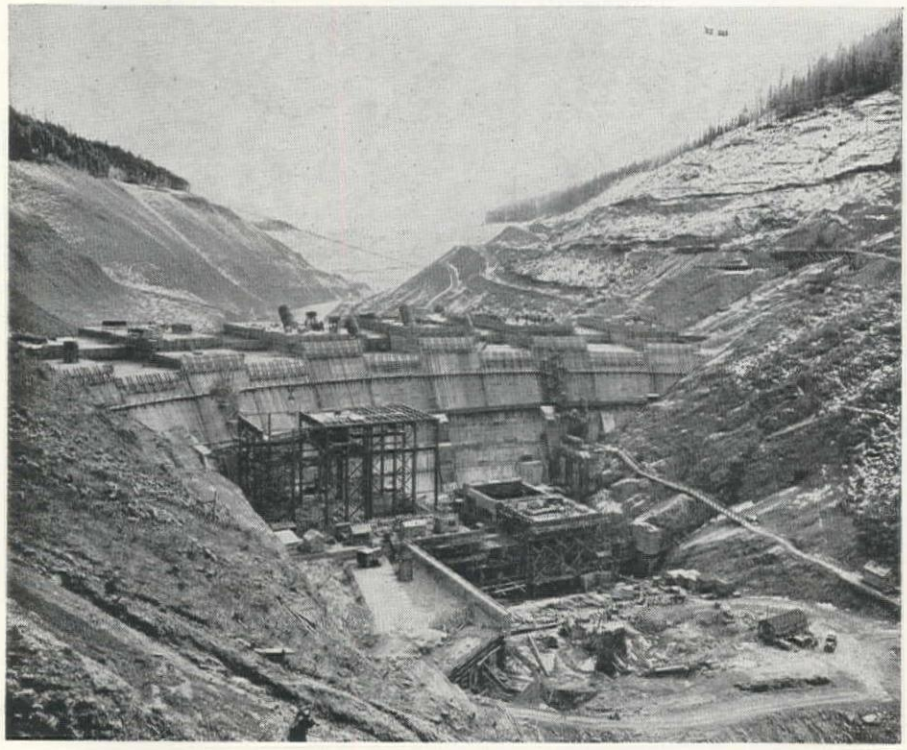
BASIC ELEMENTS of a 15-year-plan that would see a total of $225,000,000 spent for improved travel arteries in Utah have been agreed upon by the Utah legislative council on roads. $15,000,000 would be spent each of the 15 years for the work. Gasoline taxes would be hiked 2 cents per gallon and license fees on heavy vehicles increased on a pro-rated schedule on highway use. In approving the highway program, the Council pointed out that everything was dependent upon the two revenue raising measures.

Meanwhile, Utah will embark on a record federal aid program of highway construction totaling $6,102,000 during the fiscal year beginning July 1, but the sum falls short of what is needed. D. H. Whittenburg, state road commission chairman, notes that the 28 projects programmed were chosen from some $15,000,000 of "necessary emergency construction."

The approved federal aid program is divided into $3,770,000 for primary roads and $2,332,000 for secondary roads. Most expensive project planned is the construction of 3.6 mi. of road between Price and Helper, Carbon County, on U. S. 50-6. This will require an estimated expenditure of $550,000. Closely following in expense is an 8.6-mi. project on U. S. 91 in Iron County, which will cost an estimated $512,000.

TIGHT SCHEDULE CALLS FOR NEW HUNGRY HORSE RECORDS IN '51

RECORDS SET during 1950, when more than 1,000,000 cu. yd. of concrete were placed for Hungry Horse Dam in northwestern Montana, will have to be broken in 1951 to keep pace with the tight schedule planned by the Bureau of Reclamation. The 1951 schedule calls for General-Shea-Morrison, prime contractor for the dam and power plant, to place an additional 1,200,000 cu. yd. First power production is expected in October of 1952. View below shows the big dam as it looks today, about 50% completed to 235 ft. above bedrock. Erection of structural steel framework for the powerhouse is continuing through the winter.



Interconnection Will Bring BPA Power to California

AS A MEANS of providing additional electric power urgently needed for the defense production program, the Bureau of Reclamation has approved construction of an interconnection between the Bonneville Power Administration, in the vicinity of Klamath Falls, Oregon, and the Central Valley Project in California.

Construction of the interconnection was recommended by the Defense Power Administration late in December after study and review by it, the Bonneville Power Administration, Bureau of Reclamation and the Federal Power Commission.

The interconnection will permit the transmission south of otherwise unusable waste hydroelectric energy from the Pacific Northwest to California during seasonal high-water and off-peak periods on the Columbia River System, and the transmission north of power from California to the Pacific Northwest in low-water periods on the Columbia River System. In such periods, steam power generated in Central California may be transmitted to the Northwest by displacement of Central Valley Project power which might flow southward.

Water power which otherwise might go to waste will be utilized over the interconnection, thus affecting large fuel economies and a large block of power will be made available without need for new or additional generation equipment which may be needed elsewhere for defense production.

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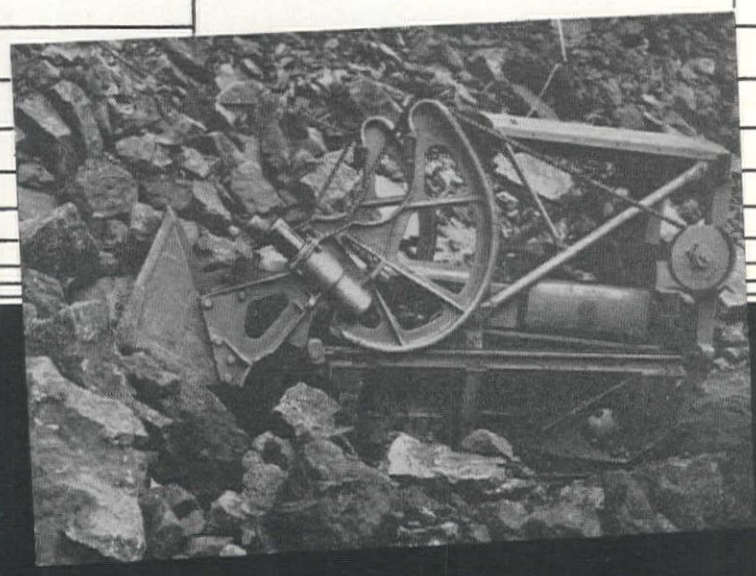

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Sharing Costs Could Provide More Rail-Highway Crossings

MANY rail-highway crossings could be made safer if railroad, highway, county and city officials cooperated more closely in determining the fair proportion of costs that should be paid by each, according to Walker Paul, assistant to chief engineer of the Southern Pacific Company, in a recent address before the legal affairs committee of the American Association of State Highway Officials.

The committee was reminded that the Federal Highway Act of 1944 set up a formula under which total contribution by the railroads in such projects is limited to 10%. Local highway departments, however, usually try to divide costs on a 50-50 basis and ask the railroad to assume subsequent maintenance expense of signals, even though major portion of such maintenance may be caused by automobiles or trucks running into the signals, he declared.

Paul also asserted that ability of a railroad to pay part of the costs of highway crossing elimination or improved protection is based solely on what it earns from the transportation business, more and more of which business is being taken from it by highway vehicles. The increased need for protection, due to increased number of highway vehicles, raises the ability as well as the obligation of public bodies to pay a greater part of the cost, because each vehicle contributes gasoline and other taxes, he declared.

It is evident, he said, that the private motorists and other taxpayers pay part of the costs of highways to support the truck business. The railroads must maintain their rail facilities at their own expense and also pay heavy taxes, and they have lost a large amount of their less-than-carload freight business and through-haul business on high revenue type freight to the trucks, he maintained.

Before any highway department draws plans for a rail-crossing or separation project it should bring the railroad in as a fully informed partner, Paul suggested. "Fundamentally we are all working for stockholders, the railroads directly and the highway departments indirectly being responsible to the taxpayers. It is incumbent upon both railroads and highway departments to conserve the stockholders' finances and to construct and maintain railroads and highways in the most efficient manner."

As illustration of how serious the grade crossing problem has become he explained that California alone has approximately 9,800 public road crossings, and more than 4,000 other private road crossings. Obviously it would be impossible for the few railroads in California to bear a substantial part of the costs of improving protection at all these crossings, he said. "We feel a more liberal division of expense on the part of the highways, counties and cities should be made, thus permitting of improved protection on a greater number of crossings."

Employment Boom Due at McNary

Jobs for 1,250 more workers are expected in 1951 on the McNary dam project. This increase will bring the number of persons at work on the $50,000,000 project to 3,350.

Colorado Timber Roads, $8,000,000

U. S. Forest Service has completed tentative plans to spend eight million dollars building 550 miles of timber roads in Colorado in 1951 to step up defense lumber production by 160%.

FUTURE CHEYENNE HOME OF WYOMING'S STATE HIGHWAY DEPARTMENT

RIEDESEL AND LOWE Construction Co., Cody, Wyo., is scheduled to complete the $1,200,000 steel and limestone state office building at Cheyenne in mid-July. The Wyoming State Highway Department will occupy the second and third floors and have a test lab in the basement. The Wyoming game and fish, health, and welfare departments and state museum will also occupy a portion of the structure. The interior features movable partitions to allow efficient utilization of floor space.

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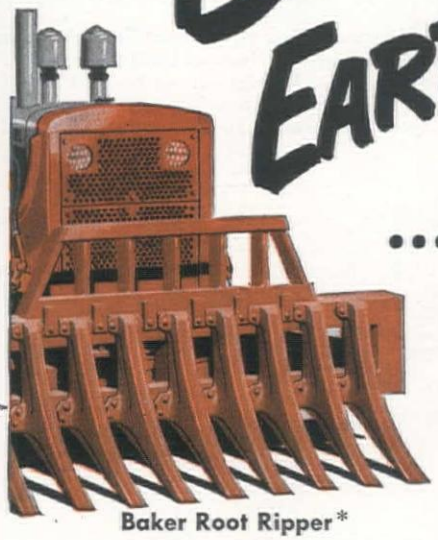

Baker Root Ripper*

Power...Weight...Balance...

There's one sure way to make these advantages on your new and more powerful Allis-Chalmers Tractor *pay double* on earth-moving jobs.

And that is to specify Baker Bulldozers, Gradebuilders and Root Rippers—for *exclusive* Baker features enable you to use far more of the *tractor power for PUSH.*

Positive down-pressure, for example. Twin hydraulic cylinders exert an equalized *straight-from-the-shoulder* pressure that forces the blade down until virtually the entire weight of the tractor rests on the cutting edge.

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For further information, ask your nearest Baker Allis-Chalmers dealer for a copy of the new catalog, Bulletin No. 894 . . . or write direct to: THE BAKER MANUFACTURING COMPANY Springfield, Illinois.

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Northland Machinery Company
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Dielschneider Equipment Oregon, Ltd.
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Farm & Industrial Equipment Co.
Eugene, Oregon

West-Hitchcock Corporation
Klamath Falls, Oregon

Oregon Tractor Company
LeGrande, Oregon

Tractor Sales & Service, Inc.
Medford, Oregon

Umatilla Tractor Company
Pendleton, Oregon

Wood Tractor Company
Portland, Oregon

•

Cate Equipment Company, Inc.
Salt Lake City, Utah

•

A. H. Cox & Company
Seattle, Washington
Wenatchee, Washington
Tacoma, Washington

Northern Harris
Walla Walla, Washington

Yukon Equipment, Inc.
Seattle, Washington

American Machine Co.
Spokane, Washington

•

Studer Tractor & Equipment Co.
Casper, Wyoming

Edward P. Cliff, regional forester, said that funds are not yet approved by Congress but the program is expected to be approved in a move to meet heavy military needs. The plans call for "access roads" into 46 now inaccessible timber regions in all eleven national forests in Colorado. The roads would be from three to twenty-one miles long.

Langlie Opposes Bonds for Highways

Governor Arthur B. Langlie, Washington, has voiced disapproval of a proposed $65,000,000 bond issue for construction of four special highway projects on the grounds that the state is already carrying too many bonds and that construction companies in the state are reaching the limit of the amount of work they can handle. The proposed bond issue would finance remaining reconstruction of P. S. H. 1, truck passing lanes over Snoqualmie Pass, highways and farm-to-market roads in the Columbia Basin, and another Columbia River bridge between Pasco and Kennewick.

FPC Approves Cabinet Gorge Dam

The Federal Power Commission has approved an application by the Washington Water Power Co. for permission to build the proposed $40,000,000 Cabinet Gorge Dam and power plant in Bonner County, Idaho, according to Kinsey M. Robinson, president of the power firm. Work will begin immediately on a power line from Clark Fork, Idaho, to the dam site, and it is planned that the four-generator 200,000-kv. plant will produce power from its first generator by November 1952.

Colorado-Big Thompson Milestone

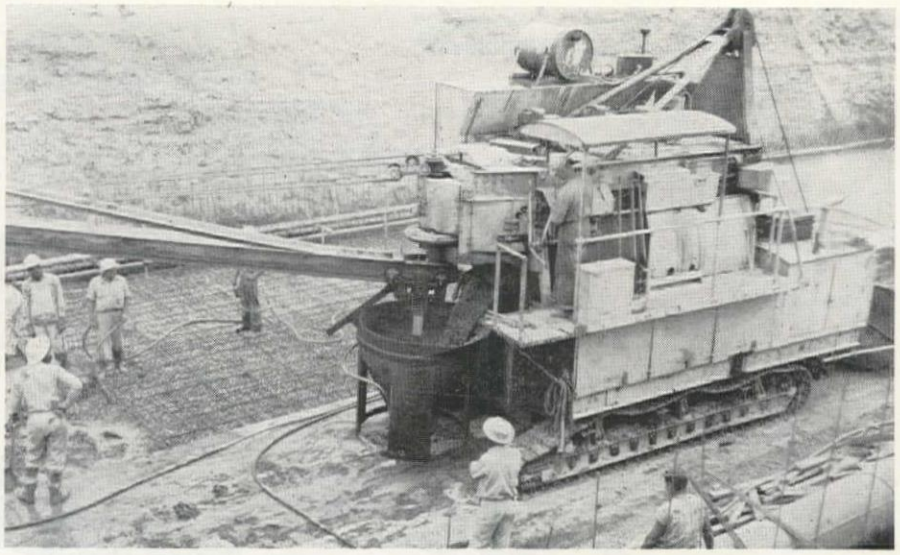
Water which will be available for the 1951 irrigation season has started flowing into Horsetooth reservoir, Colorado, for storage, marking another milestone in the Colorado-Big Thompson project. James H. Knights, manager of the South Platte district of the Bureau of Reclamation, said 20 second-feet of water was released from Lake Estes January 8, for the reservoir.

Coulee Sets Power Record

The greatest generation of hydroelectric current from one place in the world was reached at Grand Coulee Dam on January 8, when an instantaneous peak of 1,937,000 kw. was reached. On the same day an hourly record for power production was set.

One Billion Bond Issue for Roads

The California legislature has been asked to sanction a $1,000,000,000 State super-highway program which would convert all major California State highways into four-lane arteries, and a 2 cents per gallon increase in the gas tax to pay for it. The program was submitted by Senator Randolph Collier, chairman of the interim committee on highways and the standing committee on transportation. If it goes on the ballot, the proposal will include a bond issue, the gas tax hike, and the specific highways to be improved or reconstructed. Collier previewed his proposal in the June 1950 issue of *Western Construction*, page 81.



INGENUITY COMBINES EQUIPMENT FOR POURING CHANNEL LINING

P & J ARTUKOVICH used ingenuity in combining equipment for mixing and accurately placing concrete on walls and bottom of the channel lining for the U. S. Engineers' Compton Creek project in Los Angeles. A single-drum Foote Paver was combined with a 1-cu. yd. Gar-Bro bucket and elephant trunk attachment. A bail on the bucket provides for boom angle adjustment and a special top extension increases the bucket capacity to 36 cu. ft.

Wenatchee to Host USBR Conference

Wenatchee, Wash., will become Reclamation Capital of the nation for a week next summer when Bureau of Reclamation officials from Washington, D. C., and 17 Western states gather there for the organization's annual programming conference. This will be the first time the session has been held in the Pacific Northwest. Purpose of the annual conference is to chart the bureau's program for the coming 12 months in accordance with the intent of Congress and moneys made available by Congress.

CALENDAR OF MEETINGS

Feb. 13—Tacoma Chapter of A.G.C., at Winthrop Hotel, Tacoma.

Feb. 14-16—Fourth Northwest Conference on Road Building. More Hall, University of Washington, Seattle, Wash.

Feb. 20-22—American Concrete Institute, annual national convention, at St. Francis Hotel, San Francisco.

Feb. 21-23—American Society of Civil Engineers, Winter Convention, at Rice Hotel, Houston, Texas.

Feb. 26-March 1—Associated General Contractors, annual national convention, at Statler Hotel, Boston, Mass.

Feb. 28-March 1—American Concrete Pressure Pipe Association, 2nd annual convention, at Waldorf-Astoria Hotel, New York City.

March 1-3—American Concrete Pipe Association, 43rd annual convention, at Waldorf-Astoria Hotel, New York City.

March 12-14—American Road Builders' Association, annual meeting, at Schroeder Hotel, Milwaukee, Wis.

April 2-4—Twelfth Annual Highway Engineering Conference, at Salt Lake City, Utah. Sponsored by the Dept. of Civil Engineering, University of Utah. Exhibit of equipment and materials in connection with the conference. Contact A. Diefendorf, Head, Dept. of Civil Engineering, 102 Civil Engineering Bldg., University of Utah, Salt Lake City 1.

May 3-5—California Sections of American Society of Civil Engineers, annual joint conference, at Ahwahnee in Yosemite National Park, Calif.

June 13-15—American Society of Civil Engineers, Summer Convention, at Louisville, Kentucky.

Davis Power Plant Goes to Work

Pressing a key in Washington, D. C., Secretary of the Interior Oscar L. Chapman placed in operation January 5 the first of five 45,000-kw. generators at the Bureau of Reclamation's Davis power plant on the Colorado River between Nevada and Arizona. The power plant, which will be generating to its full installed capacity of 225,000 kw. next summer when all units are in operation, is the fourth largest hydroelectric power plant of the bureau. Davis Dam itself, an earth and rock fill structure 138 ft. high and 1,600 ft. long, was constructed by Utah Construction Co. of San Francisco. It is the last of the major reclamation dams that are to be built below Hoover Dam.

Eklutna Work Bidding Begins

Bidding opened in January for erection of a 55- by 142-ft. steel-frame warehouse, and construction of residences, streets and utilities at the Eklutna government camp in Alaska. The work, 15 mi. south of Palmer and 30 mi. northeast of Anchorage, is in connection with a $20,000,000 Bureau of Reclamation project for building a 22,000-ft. tunnel to divert the flow of water from Eklutna Creek to a power plant to be built north of the present Eklutna power plant.

President OK's Canadian River Bill

President Truman's signature on a bill authorizing construction by the Bureau of Reclamation of the Canadian River

project, in northwest Texas, opens the way for eleven cities to obtain additional water supplies. The project, as planned, will consist of a dam and reservoir on the Canadian River about 45 miles northeast of Amarillo and approximately a mile upstream from Sanford, together with the necessary aqueducts, pumping plants, and irrigation facilities. Total cost of the project is estimated at about $85 million. Actual construction of the project cannot begin until a compact between New Mexico, Texas and Oklahoma concerning water division has been ratified and funds specifically appropriated by Congress.

Alaskan Way Viaduct Progress

Washington state highway department awards a $3,691,400 contract to Morrison-Knudsen Co., Inc., and Rumsey & Co., jointly, on their low bid for construction of the Pike to King St. second section of the Alaskan Way viaduct in Seattle. The winning bid was $45,828 below the second-low proposal. Construction of the double-deck second section of the viaduct will require approximately 18 months to complete.

$9,399,900 for Alaska Steam Plant

Patti-MacDonald Construction Co., bidding $9,399,900, is low on a contract for construction of a central heating and power plant at Fort Richardson, Alaska. The basic proposal was for an eight-boiler and five-turbine combination. The basic structure includes a 102- by 193-ft. boiler building, 66- by 153-ft. turbine building, and a 99- by 273-ft. coal building. The building will be steel frame, with insulated metal panels and steel sash.

Northwest Dams Needed for Power

Funds totaling $30,000,000 for initial work on the Hells Canyon, Ice Harbor and The Dalles dams are included in the fiscal 1952 budget submitted to Congress by President Truman. The proposal calls for $8,000,000 for Hells Canyon, $4,000,000 for Ice Harbor, and $18,000,000 for The Dalles project. All three are designed to step up production of hydroelectric energy for the defense program.

Security on Reclamation Projects

Public access to Bureau of Reclamation dams, power plants, electrical switch yards, irrigation pumping plants, and other installations has been restricted pursuant to the President's proclamation of a national emergency. The restrictions cover and control access to all installations, buildings and areas of construction activity which are considered to be of critical importance. The regulations do not now deny access to vista houses and points not involving close proximity to vital equipment.

Albeni Falls Project Advances

Bids on a contract for second-stage construction of Albeni Falls Dam on the Pend Oreille River west of Priest River, Idaho, have been invited by the Seattle district, Corps of Engineers. Prospective

date for opening proposals is March 1. The work includes foundation preparation for and construction of the spillway dam, furnishing and installing spillway gates and a 200-kw. standby generating unit, and construction of upstream and downstream cofferdams to inclose the powerhouse area. Macco Corporation, Paramount, Calif., has been awarded a $519,500 contract on its low bid for initial construction work at Albeni Falls.

Close Bidding on Columbia Bridge

Guy F. Atkinson Co., Portland, is apparent low bidder at $1,988,572 in close bidding on a contract for construction of a bridge across the Columbia River at Covington Point near The Dalles, Ore., according to Wasco County Judge W. R. Webber. The structure is of conventional steel cantilever design, 2,700 ft. long including approaches of plate girder spans, and a clear span 576 ft. long over the river. Complete details are given in the December 1950 issue of *Western Construction*.

Correction—It's M & K Corp.

An error occurred on page 75 of the January 1951 *Western Construction* in the listing of contractors for San Francisco's North Point Sewage Treatment Plant. "Morrison-Knudsen Corp." was incorrectly substituted for M & K Corp. Our apologies are due M & K Corp. for the slip-up. The correct listing of members of the joint-venture for the $8,289,000 initial major contract at the plant is as follows: M & K Corp.; Stolte, Inc.; Fred J. Early, Jr., Co., Inc.; and Haas and Rothschild. An article describing operations of the joint-venture appeared on page 74 of the November 1949 *Western Construction*.

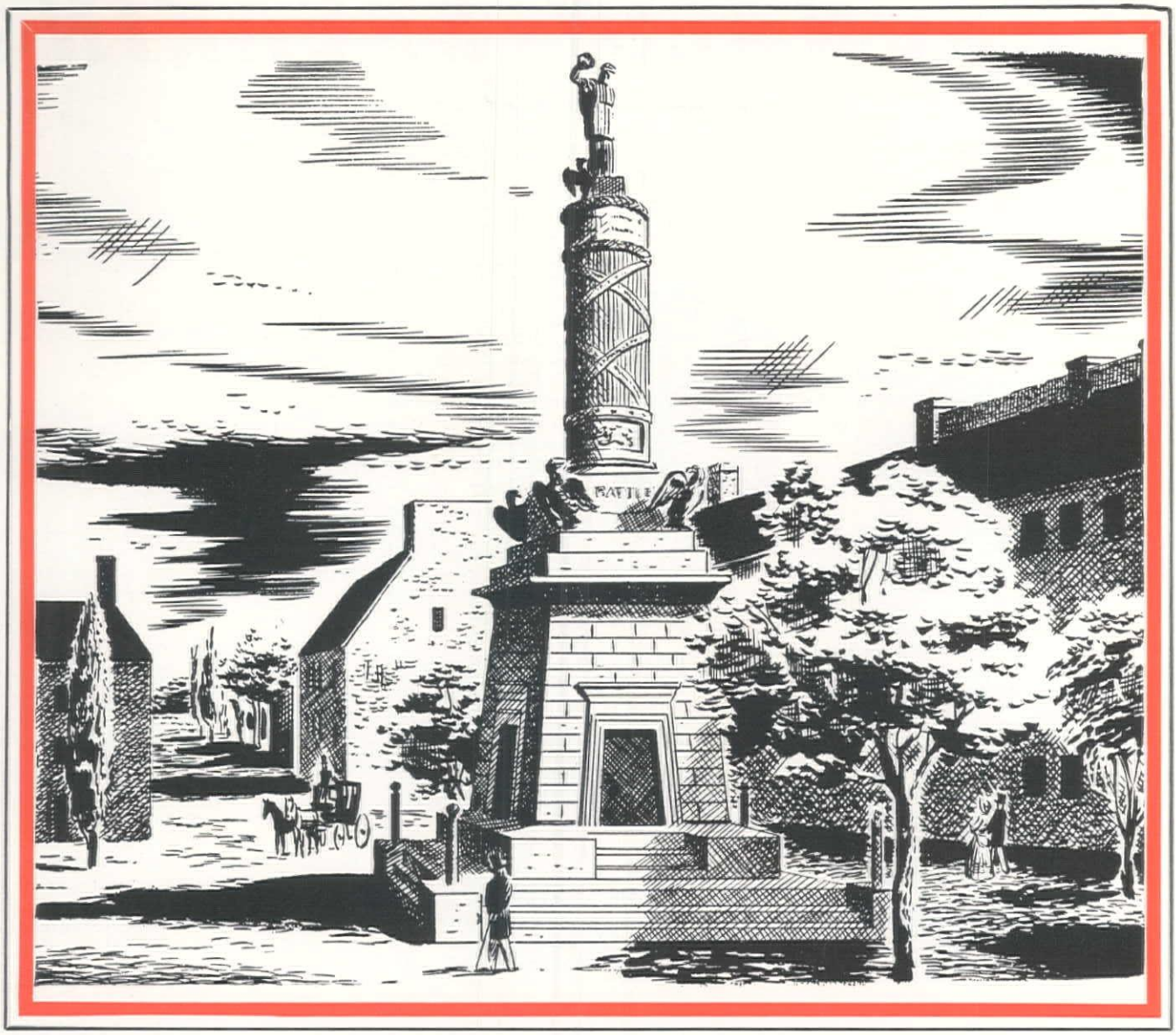
California Civil Engineers Schedule Annual Conference

THE FOUR California sections of the American Society of Civil Engineers have scheduled their annual conference for May 3-5 in Yosemite National Park.

The conference will open Thursday evening, May 3rd, with a session on Yosemite lore lead by one of the park officials. Friday is set aside for technical and business sessions, with a banquet scheduled Friday evening. A student chapter conference will follow on May 5.

Included on the technical program are speakers of authority on Western engineering matters. These include Neil Petree, chairman of the Highway Committee for the California State Chamber of Commerce; S. T. Harding, Berkeley Consulting Engineer and National Director for ASCE; and Dr. N. A. Bowers, Pacific Coast Editor of Engineering News-Record for 36 years.

Convention headquarters will be the Ahwahnee. Quarters will also be available at Yosemite Lodge and Camp Curry. Interested ASCE members from outside of California are also cordially invited to attend. Reservations may be made by writing the Yosemite Park and Curry Co., Yosemite National Park, Calif.



Baltimore's Battle Monument to her heroic dead in the War of 1812, as it looked 100 years ago.

Baltimore, Maryland has cast iron water and gas mains in service that were installed more than a century ago. In addition, there are more than 28 other cast iron water or gas mains with known records of continuous service for more than 100 years in the older cities of the United States and Canada. Such service records prove that cast iron pipe not only resists corrosion effectively, but is endowed with all the strength factors that pipe laid under city streets must have to meet the stresses imposed by modern conditions of traffic and underground services.

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PERSONALLY SPEAKING

Allen D. Christensen has been named to the newly-created post of executive vice-president and general manager of Utah Construction Company of Ogden, San Francisco, and Salt Lake City. As general manager, he will assume some of the activities of **L. S. Corey,** who remains as president of the company. Christensen, a graduate of the University of Utah and of Stanford, was vice-president in charge of construction.

* * *

Noyes H. Roach, construction engineer, assumes a partnership and the title of executive vice-president in the general contracting firm of MacIsaac, Menke & Roach, Inc., formerly known as MacMen, Inc., of Los Angeles.

* * *

Ralph P. Johnson, of the engineering and construction staff at Los Alamos, will be manager of the Atomic Energy Commission's Las Vegas field office. Construction work at the new atomic testing ground in Nevada is being done by **Robert E. McKee,** general contractor, of Los Angeles and El Paso.

* * *

Ansbert G. Skina, well-known Idaho consulting electrical engineer who rebuilt the dismantled West Berlin power plant during the American airlift into Germany, receives appointment as chief of the construction expediting branch of the defense power administration. A graduate of the University of Idaho, Skina was associated with the Bunker Hill & Sullvan Mining and Concentrating Company of Kellogg, Idaho, for seven years. After five years of combined army and military government service in Europe, he joined the defense power administration in September 1950 and assisted in the preliminary steps of organizing the agency.

* * *

Nielsen

E. G. Nielsen, regional planning engineer since 1945, has been appointed assistant director of the Bureau of Reclamation's Region 3, which embraces Southern California and the lower Colorado River watershed, covering most of Arizona and parts of Nevada, Utah and New Mexico. Nielsen, who has been with the bureau since 1934, succeeds **L. R. Douglass** who is now director of power, Boulder Canyon project, filling a vacancy created by the death of **C. P. Christensen.**

* * *

William F. Faustman, associate highway engineer in the construction department of the California Division of Highways, retired January 1, 1951, after 39 years of service with the state.

* * *

The Alaska Road Commission has appointed **Kenneth F. Goodson** district engineer at Fairbanks replacing **Frank Nash** who retired. Goodson has been with the commission since March 1949. Prior to that he worked with the Arizona Highway Department, W. A. Bechtel Co., S. Birch and Sons, and in the general building contract business in Oakland, Calif.

* * *

Cecil E. Rhodes is now special projects district engineer of the Asphalt Institute, with offices in the Cobb-Stebbins Building, Denver. He succeeds **Walter F. Winters,** recently promoted to the post of chief engineer.

* * *

Ernest C. Bechly, senior staff member of the Lewis County, Wash., county engineering staff, has retired after 47 years of service.

* * *

N. Owen Jones, state highway commissioner of North Dakota since 1945, resigned his post December 31. It is announced he will join the staff of the Northwest Equipment Co. at Fargo.

* * *

Clark G. Dillon, formerly civil engineer with the Bureau of Reclamation at Kortes Dam, Wyo., is now assistant manager of the Broronson Lumber Co., Clarendon Hills, Ill.

* * *

J. E. Amundson, president of Amundson Construction Co., Ltd., Vancouver, B. C., is the new president of the Vancouver General Contractors Association. He succeeds **L. G. Murray.** Other officers for the new term are **A. J. Hutchinson,** 1st vice-president, and **W. D. Lee,** 2nd vice-president.

* * *

Rodney C. Richardson, Sacramento, succeeds **W. H. Hamblin** as assistant to the director of public works for the State of California. Hamblin has been called back into service with the Navy, and Richardson will serve until his return.

* * *

Clare W. Hendee became regional forester of California region, U. S. Forest Service, on January 1, 1951, with headquarters in San Francisco. He and his rangers administer 18 national forests comprising over 19 million acres.

* * *

S. D. Waldorf, who has served as Gallatin county surveyor for 25 years, was appointed city engineer of Bozeman, Mont., in December and began his duties January 8.

* * *

Lieutenant Colonel **Edward G. Herb,** Omaha, Neb., has been assigned as district engineer of the Tulsa District, Corps of Engineers, Tulsa, Oklahoma, and assumed his duties as of December 1950. Colonel Herb was assistant district engineer of the Portland, Oregon, office of the Corps of Engineers before the war. In 1939 he was assigned area engineer for the Willamette River project at Eugene.

Reinhold Succeeds Needles as Road Builders' President

Paul B. Reinhold, president and treasurer of Atlas Equipment Corporation, Pittsburgh, is 1951 president of the American Road Builders' Association, succeeding **Col. E. R. Needles,** New York consulting engineer. Prior to his elevation to the presidency, Reinhold was first vice-president of the association, oldest national good roads organization in the country, and has headed and served on many of its important committees. In Pittsburgh, he heads that city's Chamber of Commerce Committee on Highways and Bridges. A 1913 graduate of Lehigh, he was affiliated with the Crucible Steel Company of America, Pittsburgh, for ten years. During World War I he worked under direct supervision of the War Industries Board. In 1923 he entered private business, forming Reinhold & Company, Inc., in Pittsburgh. This firm marketed crushed stone and limestone products and specialized in their use in highway and public works construction. In November of 1935 he formed the Atlas Equipment Corporation, which specializes in the marketing of industrial and road building machinery and equipment. Among many activities, Reinhold is a director of the Fort Pitt Bridge Works, Pittsburgh; president of Pittsburgh Opera, Inc.; and a director in the Pittsburgh Motor Club. Nominees for vice-president include: **Charles M. Noble,** chief engineer, New Jersey Turnpike Authority, Trenton, N. J.; **Charles W. Smith,** president, Smith Engineering & Construction Co., Pensacola, Fla.; **W. A. Roberts,** executive vice president, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; **A. Diefendorf,** head, Department of Civil Engineering, University of Utah, Salt Lake City, Utah.

Reinhold

OBITUARIES . . .

Fred G. Healy, former New Mexico state highway engineer, died recently at Albuquerque. Healy joined the New Mexico highway department in 1921 becoming progressively project, location, and construction engineer. In 1940 he was named assistant state highway engineer, and from 1944 to 1946 served as state highway engineer.

* * *

Donald Steel, 67, construction mining engineer and geologist, died at his home in Palo Alto, Calif., January 10, after a long illness.

* * *

Carl L. Schmidt, 87, retired Salt Lake City contractor, died January 13 of a cerebral hemorrhage. Born in Berlin, Germany, he was a former resident of Stockton, Calif., and a veteran of the Alaska gold rush.

* * *

H. A. "Jack" Lilla, 47, Hayward, Calif., contractor, was killed January 1 in an airplane crash southeast of San Jose. Lilla was a director of the Associated Homebuilders of the Greater Eastbay.

* * *

Walter Gordon Clark, 74, internationally known engineer, died Dec. 17 at his home in Los Angeles. Born in Salt Lake City, he was active on many Western projects, including laying submarine defenses in San Francisco Bay during the Spanish-American War and serving as engineer for Colorado River projects. He also checked figures and designs of Panama Canal dams. He is credited with invention of the pulmotor.

* * *

Davis

Charles Alfred Davis, 68, nationally known chief of Denver's multi-million dollar sewage and sanitation department, died January 6 after a short illness. Davis first went to work for the City of Denver in 1904 as a city engineer. In 1913 he became head of the sanitation department and has had constant supervision of Denver's sewage operation since that time.

* * *

C. K. Sprinkling, 54, died recently at his home in Oakland, Calif. He had been a general contractor in the Oakland district for 20 years, and was a member of the Emeryville Industries and the Oakland Builders Exchange.

* * *

John Kent Davis, 56, Reclamation Bureau inspector-engineer, died after a heart attack at Hungry Horse, Dec. 26. Davis was one of the first Reclamation Bureau officials at the Hungry Horse dam site, and was formerly a Colorado contractor.

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10. Are the hoist, crowd and swing speeds in proper balance for maximum production?
11. Compare weights and ballast.
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SUPERVISING THE JOBS

N. J. Witt is supervising a $385,574 highway job in San Bernardino for K. B. Nicholas, Ontario, Calif. The job consists of highway improvements at 5th and "I" Streets, including a structural steel railroad overhead and approach.

Supervising a $120,420 project for Morrison-Knudsen Co., Boise, Idaho, reconstructing .701 mi. of Capitol Boulevard, in Boise, are **P. H. Prewitt,** highway division manager, **James N. Warner,** general superintendent, and **George Nowland,** street superintendent.

S. B. Wood is job superintendent and **Bob Nutt** is foreman for Clyde W. Wood & Sons, North Hollywood, Calif., on a $369,668 contract for highway improvements between Wildwood Glen and Decanso Junction in San Diego County.

Carl Rice is job superintendent for two highway construction jobs for Winston Bros. Co., Monrovia, Calif. One is a $1,112,920 contract for paving, grading and structures on the Santa Ana Freeway, Los Angeles; the other is a $956,067 contract for five overcrossings and two pedestrian undercrossings on the Harbor Freeway, also in Los Angeles.

Supervising work on a $126,069 contract for grading and surfacing the Cedar Pass to Pinnacles highway, in Colorado, for Summit Construction Co., Rapid City, South Dakota, are **Sidney Thorson,** grading superintendent, and **Ralph Anderson,** surfacing superintendent.

Gale Lefler and **Harold Gall** are supervising construction of 35 eight-family buildings at Fort Richardson, Alaska, for Patti-MacDonald Construction Co., St. Louis, Mo. Other key men on the $3,699,900 contract are **Bob Landau,** engineer, and **S. Patti,** foreman.

Vincent Minice, Jr., is job superintendent for Valley Construction Co., Spokane, Wash., on its $440,003 contract for constructing Section E of the Spokane sewage disposal system. **Frank N. Bill** is foreman, **Frank Coluccio** is job foreman, and **Emry Tomlenson** is carpenter superintendent on the project.

Gordon Pollock is project manager for George Pollock Co., Sacramento, on a $644,190 job for the Bureau of Reclamation. **J. Hamilton Higday** is general superintendent and **Art Root,** excavation superintendent, on the job which consists of completing a 24-inch pipe turnout on the Delta Cross Channel, Central Valley Project, near Walnut Grove, Calif. **Gus Windberg** is project engineer and **Charles Lewis,** field engineer, for George Pollock Co.

***William J. Kennish,* left, is superintendent and *Russell Ball* is master mechanic for Morrison-Knudsen Co., Inc., headquartering at Kennewick, Wash., for a railroad relocation project on the north side of the Columbia River near McNary Dam. The relocation is necessary because the old railroad will be inundated by water of the McNary Dam reservoir.**

Britt Pugh, Ukiah, Calif., is job superintendent for Nevada Constructors, Inc., Reno, on a $127,068 contract for highway improvements on the Carmel Valley road in Monterey County, Calif.

***K. C. Dack,* principal in K. C. Dack Construction Co., Milton, Ore. has his equipment working on a rock dike near Milton.**

Working on the $1,358,006 job for constructing Section B-1 of the Seward to Anchorage highway for Max J. Kuney Co., Spokane, are **W. R. Wiginton,** job superintendent, **Vincent Abbott** and **Rudolph Antovich,** foremen, and **S. M. Erickson,** timekeeper.

Glenn C. Johnson is project manager and **Lloyd Miller** is office manager for Morrison-Knudsen Co., Boise, Idaho, for construction of the $18,500,000 C. J. Strike dam and power plant on the Snake River near Mountain Home, Idaho. **William A. Abrahamson** is project engineer.

John V. Leone is job superintendent, and **George J. Gahm,** assistant superintendent, for Domenic Leone Construction Co., Trinidad, Colo., on a $134,545 highway construction job. The work consists of 1.37 miles of grading and structures on State Highway 10 between Durango and Hesperus in Colorado.

A. B. Galbraith is job superintendent, and **P. E. Anderson,** assistant superintendent, for O. E. Anderson, San Jose, Calif., on a $1,386,029 job for construction of a technical high school in San Jose.

H. L. Wheat is job superintendent for H. L. Royden, Phoenix, Ariz., on a $308,846 contract for constructing a portion of the Topock to Kingman highway in Arizona.

John B. Robison, a partner in R & M Construction Co., Central Point, Ore., is supervising a $130,041 highway construction job for the company. The work consists of construction of structures and approaches on the Holland Loop highway in Josephine County, Ore.

R. C. Speaks, formerly superintendent for Hazard Construction Co. and Hodges & Kahn of San Diego, is now a grading contractor in San Diego. **Boss McCary** is his superintendent on four subdivision projects under way.

Kenneth Sivey is job superintendent for Western Construction Co., Lovell, Wyo., on a $266,104 contract for constructing the War Memorial Hospital at Powell, Wyo. **R. E. Smithson** is general superintendent, **Joe L. Earl,** concrete superintendent, and **Robert E. Werhli,** job engineer on the project.

Oscar Kringlen is general superintendent and **Nils Oberg,** assistant superintendent, for Oberg Bros. on a $1,600,000 construction job on the Sepulveda Boulevard Subway between Century and Imperial Blvds. in Los Angeles.

***Paul C. Guinn,* left, is superintendent and *Ross H. Eddington* is assistant of tunnel works on the Lucky Peak Dam project near Boise, Idaho. Joint-venture outfit doing the job includes Morrison-Knudsen Co., Inc., J. A. Terteling & Sons, Inc., Macco, and Puget Sound Construction Co.**

57-Mi. Transit Mix Haul For Arizona Bridge Job

WHAT IS BELIEVED to be the longest transit-mix concrete haul for a monolithic pour yet made in Arizona was accomplished recently by the Fisher Contracting Co., Phoenix. Two pours, of 600 cu. yd. each, were made for the main cable anchors of the recently-completed natural gas pipeline suspension bridge across the Gila River at Gillespie Dam. The mix was transported a distance of 57 mi., making it the largest commercial monolithic pour in Arizona to be transported this distance. The pour was satisfactory in every way.

All concrete aggregates for the job were manufactured at the Superior Sand and Gravel Co. plant, Phoenix, an enterprise of the contractor. The firm's entire fleet of 22 transit-mix trucks (Rex, Smith, and Jaeger mixers mounted on Diamond, Auto Car, International, and GMC diesels) was used to expedite the record pour, meanwhile maintaining a complete schedule of commercial city deliveries.

The drivers were called in beginning 1:00 a. m. the day of the pour. Two reported at 1:00 a. m. to load aggregate, cement, and water, and an additional two reported at 15-minute intervals thereafter. Consistent dispatching of the trucks avoided traffic jams at the discharge end of the haul and resulted in no delays en route. Only light traffic was encountered for the 10-mi. portion of the route in town, and the remainder was on open highway. Regular equipment and drivers were used, and no changes in daily plant operation were made.

No water was added to the mix until the trucks were three miles from the job. The entire fleet made one round trip to the job, averaging about 3 hr. per truck, and then returned to begin regular deliveries at 6:00 a. m. Again at 2:00 p. m. the trucks were dispatched to the bridge to make four trips each during the following 12-hr. period. The drivers worked a staggered shift.

Augmenting the transit-mix pour at the jobsite, a Johnson 1½-cu. yd. batcher was kept batching between 6:00 a. m. and 2:00 p. m., into three of the mixer trucks for the monolithic pour, while the other 19 trucks were making city deliveries. Carl Jacobson, superintendent, was in charge of timing for the entire operation. Trucks were dispatched in pairs every 10 to 15 minutes. This was found to be fast enough, and no attempt was made to increase speed at this part of the cycle. The pour on the second cable anchor was much the same as for the first, requiring the same amount of time. No changes were made in operations for the second anchor pour. During the entire 25-hr. operation, only two loads were lost due to breakdowns on the long haul.

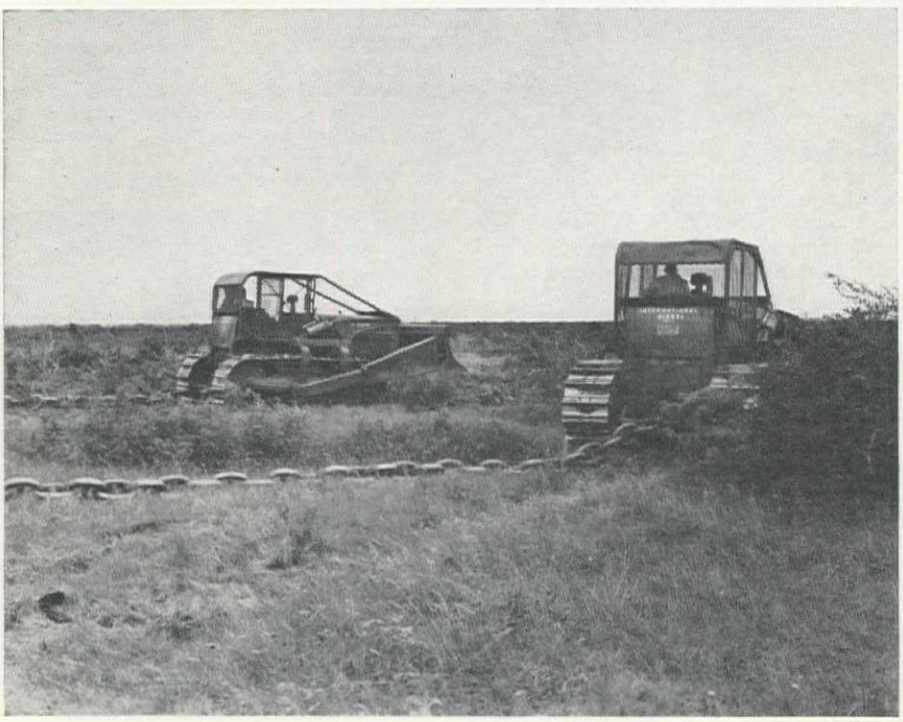
The bridge is being built for the El Paso Natural Gas Co. to carry a 30-in. natural gas pipeline across the Gila River as part of the system which includes the Super Inch line from west Texas to the San Francisco Bay Area. Its location is about 20 mi. from Gila Bend. The bridge has a main span length of 1,080 ft., with two side spans of 540 ft., and the distance between main cable anchors is 2,685 ft. One of the main tower foundations consists of two steel caissons, 11 ft. in diam., partly filled with concrete and resting upon steel bearing piles driven to bedrock. The other main pier foundation consists principally of two cofferdams with an inside diameter of 12 ft., 8 in. of sheet steel piling, and also partly filled with concrete. Working under compressed air was not required during caisson construction.

The only alternative procedure to the record transit-mix haul would have been to establish a batcher or paver at the job. The contractor, when asked about the record haul, said "This was only another unusually large job that we could handle in stride, and it amounted only to a long day for all concerned." D. W. Fisher is president, and John F. Fisher is vice-president of the construction firm. Warren Hunter is chief engineer, and Carl Jacobson is superintendent.

Structural steel for the bridge is being fabricated and erected by the Allison Steel Mfg. Co., Phoenix.

TRACTORS PULL BATTLESHIP ANCHOR CHAIN TO CLEAR HEAVY BRUSH

TWO International TD-24's with a 262-ft., 25,100-lb. battleship anchor chain following in a big loop behind them move across a Texas cattle ranch as part of a program to restore pasture lands which have become infested with noxious weed trees, brush and the widespread mesquite. Each link of the chain is 13 in. long, is of 3¼-in. stock, and weighs 99¾ lb. The two 148-hp. diesel crawler tractors push and bulldoze their way through heavy thickets and provide a steady pull on each end of the heavy chain to cause brush and trees up to 22 inches in diameter to be uprooted. Chasing frantic rabbits, skunks and other animals (even rattlesnakes!) before it the rig can cover 400 acres per day.



Eugene Asks FPC Permit for McKenzie River Development

THE CITY of Eugene, Ore., by and through the Eugene Water & Electric Board, has applied to the Federal Power Commission for a preliminary permit for a hydroelectric development on the McKenzie River in Linn and Lane Counties, Oregon.

The proposed development would include five powerhouses having an aggregate installed capacity of 161,000 hp. Power to be generated at the development would be used to meet present and anticipated demands on the City's existing distribution system, the application states.

Included in the plans are control works for the regulation of Fish Lake and Clear Lake, with a conduit from Clear Lake to a powerhouse below Middle Falls, with an installed capacity of about 20,000 hp. A diversion dam and reservoir would be located at Beaver Marsh, with a conduit leading to a powerhouse, with installed capacity of about 50,000 hp., near the mouth of Kink Creek. A reservoir would be created at the confluence of Smith River by a dam about 150 ft. high. A powerhouse of installed capacity of about 25,000 hp. would be located at that site.

Another 150-ft. high dam, with a powerhouse of installed capacity of 30,000 hp., would create a reservoir near the confluence of Deer Creek. A dam located about ½ mi. below the mouth of Frissell Creek would create a reservoir extending upstream to Deer Creek, and a 2-mi. long conduit would lead to a powerhouse, of about 36,000 hp. installed capacity, located about one mile below Belknap Springs.

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Here is another impressive example of how PIONEER RUBBER MILLS, for the past sixty-three years, has been developing all types of industrial rubber goods to give you *better* and *longer* service. Call any of the distributors listed below for Pioneer belting, hose, packing and other products. They are *especially built* for long life.

*This hose is known as PIONEER **"PYLON"** spray hose. It has a single Nylon braid, and oil and chemical resisting synthetic rubber tube and cover. **"PYLON"** spray hose is made in all usual sizes.

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Contracts . . .

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

Alaska

$9,540,765—**Anderson Construction Co. and Benson Montin, Inc.** (as joint venturers), Mercer Island, Seattle, Wash.—Contract for construction of one 500-man and six 200-man barracks at Ladd air force base, and nine 200-man barracks at Eielson air force base; by Corps of Engineers.

$343,329—**J. C. Boespflug and S. Birch & Son,** 1914 South 4th Ave., Seattle, Wash.—Low bid for construction of a complete bulk liquid fuel system at Elmendorf air force base; by Corps of Engineers.

$113,113—**Morrison-Knudsen Co., Inc.,** 603 Hoge Bldg., Seattle, Wash.—Contract for installation of radiant heating for buildings at Eielson air force base; by Corps of Engineers.

$7,902,772—**Morrison-Knudsen Co., Inc., and Peter Kiewit Sons' Co.,** 1300 Aloha St., Seattle, Wash.—Low bid for construction of the central heating and power plant at Eielson air force base; by Corps of Engineers.

$3,582,782—**Morrison-Knudsen Co., Inc., and Peter Kiewit Sons' Co.,** 1300 Aloha St., Seattle, Wash.—Contract for construction of two 200 by 1,000-ft. permanent storage warehouses in general depot area, Fort Richardson; by Corps of Engineers.

$9,399,900—**Patti-MacDonald Construction Co.,** Anchorage—Low bid for construction of central heating and power plant, Fort Richardson; by Corps of Engineers.

$287,000—**Sealand Construction Co.,** Seattle, Wash.—Contract for construction of a railroad bridge over 20-Mile River at Portage; by Alaska Railroad.

Arizona

$118,618—**Arizona Sand & Rock Co.,** P. O. Box 596, Phoenix—Contract for improvement of Osborn Road in Phoenix, from Central to 19th Ave.; by City.

$983,689—**T.G.K. Construction Co.,** Phoenix—Contract for construction of municipal library in Phoenix Civic Center, at Central Ave. and McDowell Rd.; by City.

$378,748—**Vinnell Co., Inc.,** 1145 Westminister Ave., Alhambra, Calif.—Low bid for grading and construction of bridge on Salt River Valley highway, Tonto National Forest, in Gila County; by U. S. Bureau of Public Roads.

California

$498,340—**Artukovich Bros., Inc.,** 16200 S. Atlantic Ave., Paramount—Contract for construction of main trunk line and outfall sewer at Chester Ave., Planz Rd., Terrace Way, Richland and 1st Sts., in Bakersfield; by City.

$116,045—**P. & J. Artukovich, Inc.,** 13305 S. San Pedro St., Los Angeles—Contract for construction of intercepting sanitary sewer mains and appurtenant work in "G" St., 28th St., and 13th St., in San Bernardino; by City.

$1,524,626—**Guy F. Atkinson Co.,** 22233 S. Santa Fe Ave., Los Angeles—Contract for construction of the Anaheim St. bridge over the Los Angeles County flood control channel; by Long Beach Harbor Department.

$272,599—**Barrett & Hilp,** 918 Harrison St., San Francisco—Contract for construction of sewers in Martinez; by Sanitary Board.

$4,400,000—**Bechtel Corporation,** 3780 Wilshire Blvd., Los Angeles—Contract for erecting an electrical sub-station to be known as Cutler Sub-Station, at Norwalk; by Southern California Edison Co.

$155,960—**Cox Brothers Construction Co.,** P. O. Box 36, Stanton—Contract for 3.7 miles of widening and surfacing on highway between Sea Scout base and south city limits of Newport Beach, Orange County; by State Division of Highways.

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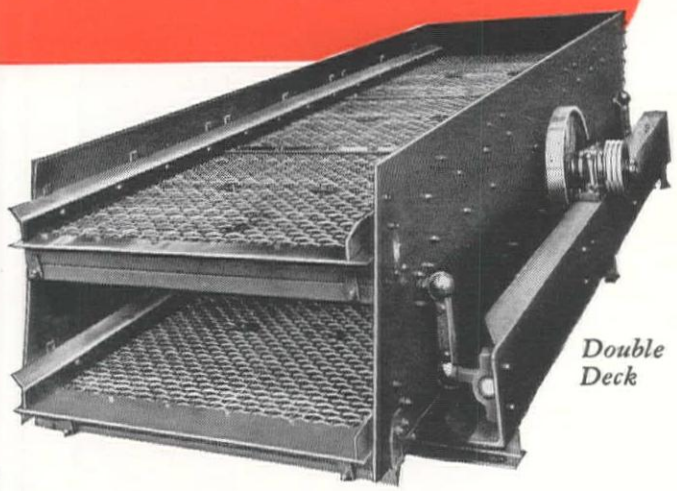
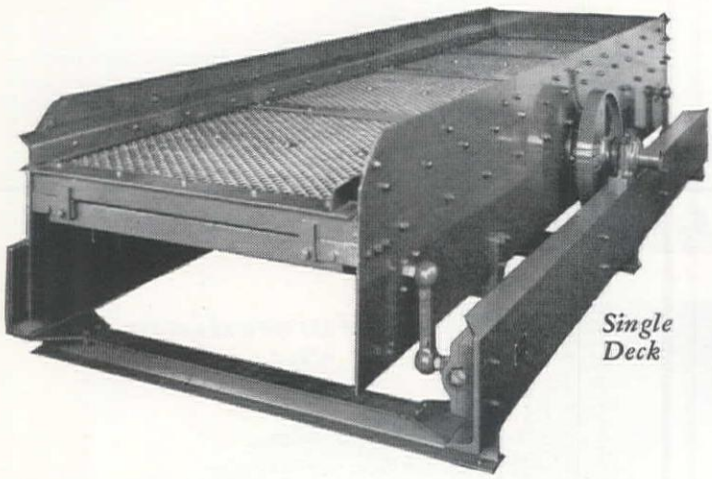
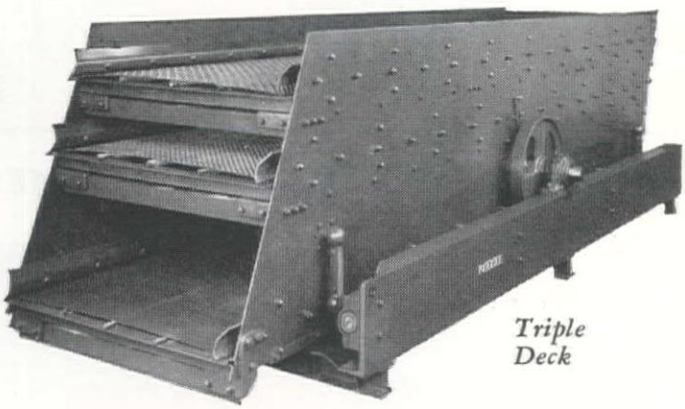


Double Deck



Single Deck



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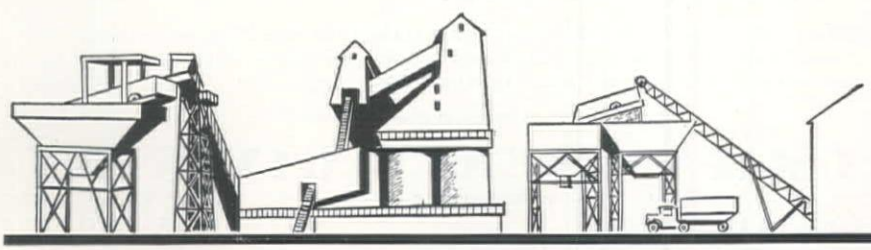

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N. E. OTTERSON CO.....San Francisco, California

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$1,800,000—**Dinwiddie Construction Co.,** 210 Crocker Bldg., San Francisco—Contract for construction of a new wing and remodeling of existing building at Children's Hospital, 3700 California St., San Francisco.

$627,825—**Eichleay Corporation,** Monadnock Bldg., San Francisco—Low bid for construction of one 20-ft. dia. and one 24-ft. dia. flow diversion valve for the 8-ft. supersonic wind tunnel at Moffett Field; by National Advisory Committee for Aeronautics.

$372,786—**Claude Fisher Co., Ltd.,** 2455 E. 55th St., Los Angeles—Contract for improvement of La Cienega Blvd. and Stocker St., near Inglewood; by County.

$782,676—**Fredrickson Bros.,** 1259 Sixty-fifth St., Emeryville—Contract for highway construction consisting of 1.7 miles of grading and surfacing in Solano County, between Alamo Creek and Utalis Creek; by State Division of Highways.

$5,040,402—**General Electric Co.,** 1853 Folsom, San Francisco—Low bid for installation of electric drive system for 8-ft. supersonic wind tunnel at Moffett Field; by National Advisory Committee for Aeronautics.

$116,715—**Glanville and Shallock,** 2618 Niles St., Bakersfield—Low bid for construction of sewage treatment plant in Tuolumne City; by City.

$1,019,935—**Granite Construction Co.,** Box 900, Watsonville—Contract for construction of concrete lining, roof and control works at Sutro reservoir, San Francisco; by City and County.

$1,032,455—**Granite Construction Co.,** Box 900, Watsonville—Contract for highway construction in Marin County near Ignacio consisting of 5.5 miles to be graded and surfaced, construction and repair of bridges; by State Division of Highways.

$144,372—**Granite Construction Co.,** Box 900, Watsonville—Contract for construction of sewer and water project at Portola State Park, San Mateo County.

$660,552—**Griffith Co.,** 1060 S. Broadway, Los Angeles—Contract for grading and surfacing and five bridges in Tulare County between 1 mile north of Goshen and Traver; by State Division of Highways.

$100,700—**Haddock Engineers Ltd.,** Box 390, Montebello—Contract for water softener installation at Naval Ordnance Test Station, Inyokern; by U. S. Navy.

$348,038—**Chas. L. Harney, Inc.,** 575 Berry St., San Francisco—Low bid for 3.2 miles of highway construction on Bayshore highway between south city limits of San Francisco and north city limits of South San Francisco; by State Division of Highways.

$520,735—**R. V. Lloyd & Co.,** Box 391, Coachella—Contract for construction of earthwork, pipe lines and structures for the Coachella Valley distribution system, Boulder Canyon Project, located near Mecca; by Bureau of Reclamation.

$449,326—**E. E. Lowell,** Box 148, Vallejo—Contract for construction of sanitary sewers in Antioch; by City.

$678,464—**MacDonald & Kruse, Inc.,** 816 S. Allen, Glendale—Low bid for construction of Compton Creek flood control improvement, Lanzit Ave. to Main St., located 4 miles northwest of Compton; by Corps of Engineers.

$1,515,600—**Parker, Steffens and Pearce,** 135 S. Park St., San Francisco—Contract for construction of a six-story, reinforced concrete building at 7th and 8th Sts., Sacramento, to house the Department of Education and Department of Finance offices; by Department of Public Works.

$135,000—**E. H. Peterson & Son,** 5691 San Pablo Dam Road, Richmond—Low bid for construction of a new transit shed at the Ninth Ave. terminal, Port of Oakland; by Oakland Board of Port Commissioners.

$286,090—**George W. Peterson and Jack W. Baker** (as joint venturers), 6314 Santa Monica Blvd., Los Angeles—Low bid for construction of reinforced concrete bridge on Hollywood Freeway at Holly Drive, in Los Angeles; by State Division of Highways.

$105,205—**H. H. Peterson,** 3340 W. Washington, San Diego—Contract for construction of a sewer system in the San Ysidro sanitation district, San Diego County; by County Board of Supervisors.

$644,190—**George Pollock Co.,** Box 903, Sacramento—Contract for completion of the 24-in. pipe turnout of the Delta Cross Channel, Central Valley Project, situated in the vicinity of Walnut Grove; by Bureau of Reclamation.

$668,269—**Steve P. Rados,** 2975 San Fernando Rd., Los Angeles—Contract for construction of earthwork, pipe lines and structures of the Friant-Kern Canal, Central Valley Project, located in the vicinity of Strathmore; by Bureau of Reclamation.

$1,479,512—**Stanton-Reed Co.,** 816 W. 5th St., Los Angeles—Contract for construction of Chaffey Union High School in Fontana; by High School District.

$2,881,500—**Carl N. Swenson and Williams & Burrows** (as joint venturers), 10 California Dr., Burlingame—Contract for construction of low rent housing project in Sacramento, consisting of 62 frame buildings comprising a total of 400 housing units and one administration building; by City Housing Authority.

$1,600,000—**Swinerton & Walberg,** 225 Bush St., San Francisco—Contract for construction of a 3-story and basement reinforced concrete and steel building at 870 Market St., San Francisco; by F. W. Woolworth Co.

$242,145—**Valley Paving & Construction Co.,** Box 6, Pismo Beach—Contract for grading and surfacing 3.2 miles of highway between San Julian Ranch and Ytias Creek, Santa Barbara County; by State Division of Highways.

$2,713,030—**Westinghouse Electric Corp.,** Pittsburgh, Pa.—Contract for fabrication and installation of three 54,000-kw. hydroelectric generators in the Folsom power plant on the American River; by Bureau of Reclamation.

Colorado

$315,191—**Gardner Construction Co.,** Box 360, Glenwood Springs—Contract for grading, structures and surfacing 2.8 miles on State Highway 4 in Mesa County; by State Highway Department.

$138,939—**Lindstrom & Williams,** 935 Colorado Blvd., Denver—Contract for widening a bridge on State Highway 1, beginning north of Federal Heights and extending north to the Boulder and Weld County Ditch; by State Highway Department.

$696,014—**J. H. & N. M. Monaghan & Associated Cos.,** Derby—Contract for highway construction on 6.6 miles of the Denver to Boulder Turnpike, beginning at south line of Boulder County and extending to Federal Blvd., Denver; by State Highway Department.

$239,269—**Paul G. Van Sickle Corp.,** 442 Broadway, Denver—Contract for construction of earthwork, concrete, canal lining and structures on Poudre supply canal of Colorado-Big Thompson Project. Located near Fort Collins; by Bureau of Reclamation.

Idaho

$213,107—**F. R. Hewett Co.,** Box 46, Parkwater, Wash.—Contract for surfacing 21.8 miles of Coeur d'Alene Valley highway in Benewah and Kootenai Counties; by Bureau of Highways.

$272,868—**F. R. Hewett Co.,** Box 46, Parkwater, Wash.—Contract for construction on 3.8 miles of Palouse highway in Benewah and Kootenai Counties; by Bureau of Highways.

$519,500—**Macco Corporation,** 14409 S. Paramount Blvd., Paramount, Calif.—Contract for initial rock excavation and construction of cofferdams for Albeni Falls dam near Priest River; by Corps of Engineers.

$488,740—**Marshall, Haas & Royce,** Belmont, Calif.—Contract for highway construction on U. S. Highway 10, in Kootenai County; by State Bureau of Highways.

$374,094—**Mountain States Construction Co. and Statewide Plumbing Co.,** Pocatello—Contract for construction of sewer lines for Nampa improvement district No. 40; by City.

$247,879—**Western Construction Co.,** Box 628, Pocatello—Contract for construction on 13.4 miles of Gooding to Fairfield highway in Gooding County; by State Bureau of Highways.

Montana

$1,231,162—**Darnell & Askevold Construction Co.,** Missoula—Low bid for construction of the 82-mile 115-kv. transmission line from Canyon Ferry Dam to Great Falls; by Bureau of Reclamation.

Nevada

$155,889—**Silver State Construction Co.,** Fallon—Contract for construction of a portion of the secondary highway system in White Pine County, from Cleve Creek to Piermont Creek; by State Department of Highways.

New Mexico

$232,397—**Floyd Haake,** 1201 Sierra Vista, Santa Fe—Contract for highway construction on State Highway 47 between Belen and La Joya; by State Highway Department.

$1,079,700—**Robert E. McKee, Inc.,** Box 1706, Santa Fe—Contract for construction of laboratory facilities at Los Alamos, consisting of a building with 32,000 sq. ft. floor area, and including furnishing and installing equipment; by Atomic Energy Commission.

$624,419—**Reynolds Electrical & Engineering Co.,** 718 N. Piedras St., El Paso, Texas—Contract for construction of 80-mile Socorro to Albuquerque 115-kv. transmission line; by Bureau of Reclamation.

$135,357—**Skousen-Hise Contracting Co.,** 207 Springer Bldg., Albuquerque—Contract for misc. construction on State Highway 360 northeast of Carlsbad; by State Highway Department.

$458,909—**Henry Thygesen & Co.,** Box 876, Albuquerque—Contract for misc. construction on U. S. Highway 66 from Gallup east, in McKinley County; by State Highway Department.

Oregon

$1,988,572—**Guy F. Atkinson Co.,** 806 Cascade Bldg., Portland—Low bid for construction of a cantilever-type bridge across the Columbia River at Covington Point near The Dalles; by Wasco County.

$223,480—**Guy F. Atkinson Co. d.b.a. Willamette Iron & Steel Co.,** 806 Cascade Bldg., Portland—Low bid for 4 Walker free discharge valves for Lookout Point Dam reservoir; by Corps of Engineers.

$853,190—**Baldwin-Lima-Hamilton Corp.,** Philadelphia, Pa.—Contract for pumps and motors and installation of fish collection system for McNary Dam on the Columbia River near Umatilla; by Corps of Engineers.

$509,302—**Berke Brothers,** 7923 N.E. Halsey St., Portland—Contract for grading and topping 17.1 miles of the Wilson Creek to Boardman section of the Columbia River Highway; by State Highway Commission.

$677,600—**Lee Hoffman,** 535 S.E. Water St., Portland—Contract for fabrication and erection of the superstructure for a steel truss and girder span railroad bridge at the upper crossing of the Middle Fork, Willamette River, Lane County; by Corps of Engineers.

$586,110—**P. S. Lord,** 4507 S.E. Milwaukee Ave., Portland—Contract for construction of the East Glisan to Greeley unit of the sewage treatment program in Portland; by City.

$118,000—**Packard Pipe & Pump Co.,** Vancouver, Wash.—Low bid for construction of the Alder St. and Albina St. sewage pumping stations in Portland; by City.

$163,339—**Urban Plumbing & Heating Co.,** Portland—Contract for construction of a sewage disposal plant in Hermiston; by City.

$172,200—**Fred Wager & Son, Inc.,** Box 514, Auburn, Wash.—Low bid for clearing areas "K" and "L" in the Detroit Dam Reservoir on the North Santiam River; by Corps of Engineers.

Utah

$110,738—**LeGrand Johnson,** 595 East 1st St., Logan—Contract for highway construction and a 20-ft. bridge between Tabiona and Fruitland in Duchesne County; by State Road Commission.

$119,494—**Wheelwright Construction Co.,** 2300 East Ave., Ogden—Contract for construction of the concrete Price River Bridge on U. S. Highway 6 and 50 in Carbon County; by State Road Commission.

Washington

$3,298,700—**L. E. Baldwin,** Seattle—Contract for construction of 300 housing units at Richland; by Atomic Energy Commission.

$4,432,053—**Bethlehem Pacific Coast Steel Corp.,** Box 3494, Rincon Annex Station, San Francisco—Contract for furnishing tower and foundation steel for the Big Eddy to Troutdale and Olympia to Covington 230-kv. transmission lines; by Bonneville Power Administration.

$2,000,000—**George H. Buckler,** 4235 S.E. 17th Ave., Portland, Ore.—Contract for construction of a chemical manufacturing plant for Electro-Chemical Co., Buffalo, N. Y. on a 44-acre site on the Columbia River, Vancouver; by Electro-Chemical Co.

$1,500,000—**Henry George & Sons,** Hutton Bldg., Spokane—Contract for construction of 1,200,000-bushel grain elevator at Kennewick; by North Pacific Grain Growers, Inc.

$292,775—**Goodfellow Bros.,** Wenatchee—Low bid for paving 1.3 miles of four-lane highway between Grand Coulee and Coulee Dam; by Bureau of Reclamation.

$2,473,000—**L. H. Hoffman,** 715 S.W. Columbia St., Portland, Ore.—Low bid for construction of Hot Semiworks buildings at Richland, including 8 buildings, underground concrete crib and underground steel tank; by General Electric Co.

$616,160—**Minnis & Shilling,** Rt. 5, Eugene, Ore.—Low bid for construction of extensions to the Wapato irrigation project; by Bureau of Indian Affairs.

$1,088,605—**Morrison-Knudsen Co., Inc., and City Electric & Fixture Co.** (as joint bidders), Seattle—Low bid on items 1 and 2 for construction of steel towers on Wheeler and Blue Mountains at the naval communications station near Arlington; by 13th Naval District.

$3,691,400—**Morrison-Knudsen Co., Inc., and Rumsey & Co.,** Seattle—Contract for construction of the Pike to King St. second section of the Alaskan Way viaduct in Seattle; by State Department of Highways.

$124,890—**R. L. Moss & Co.,** Box 37, Zenith—Low bid for construction of sewer project in east Vancouver; by City.

$2,175,315—**United Concrete Pipe Corp. and Ralph A. Bell,** Box 425, Baldwin Park, Calif.—Contract for construction of the Frenchman Hills tunnel south of Quincy on the Columbia Basin's west canal; by Bureau of Reclamation.

$313,890—**Donald L. Williams Co.,** Seattle—Low bid for construction of office and service buildings at Winchester, Moses Lake, Mesa and Warden in Columbia River Basin Project; by Bureau of Reclamation.

$322,588—**Woodworth & Co.,** 1200 East D St., Tacoma—Contract for extension of the north-south runway at McChord air force base; by Corps of Engineers.

Wyoming

$340,702—**Forgey Construction Co.,** No. 6 Townsend Bldg., Casper—Low bid for grading, draining, surfacing and misc. work on 6 miles of Midwest to Casper road; by State Highway Commission.

$269,329—**Etlin E. Peterson,** 602 E. 15th St., Casper—Low bid for construction of culverts and bridges over Salt Creek and misc. work on 11 miles of the Midwest to Casper road; by State Highway Commission.

$300,775—**Taggart Construction Co.,** Box 560, Cody—Low bid for grading and surfacing on 5 miles of the Midwest to Casper road; by State Highway Commission.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

PARKER E. WICKWIRE, former assistant manager of the Oakland branch of *J. I. Case Co.*, is transferred to take over the management of the company's Portland branch. He has been succeeded by HARLAND L. HANSON.

☆ ☆ ☆

CHEHAK

Link-Belt Speeder Corporation announces the appointment of N. V. (NORB) CHEHAK as district representative for Washington, Oregon, Idaho, Montana, British Columbia and Alberta. Chehak has been located at the factory in Cedar Rapids, Iowa, in the sales promotion department. He will make his headquarters in Portland, Ore.

☆ ☆ ☆

DEAN DE GRAFFENREID is the newly-appointed district sales engineer for the Tulsa, Oklahoma, office of *Byron Jackson Co.*, according to LYNN SAWYER, general manager of the pump division and vice-president of the company. De Graffenreid, a graduate engineer, has been with Byron Jackson Co. since 1947.

☆ ☆ ☆

I. G. ZUMWALT, SR., 78, president of *I. G. Zumwalt Co.*, Colusa, Calif., died December 11 at his home following a year's illness. Zumwalt had been associated as a dealer with *Caterpillar Tractor Co.*, and C. L. Best Gas Traction Co., a predecessor company, since 1917.

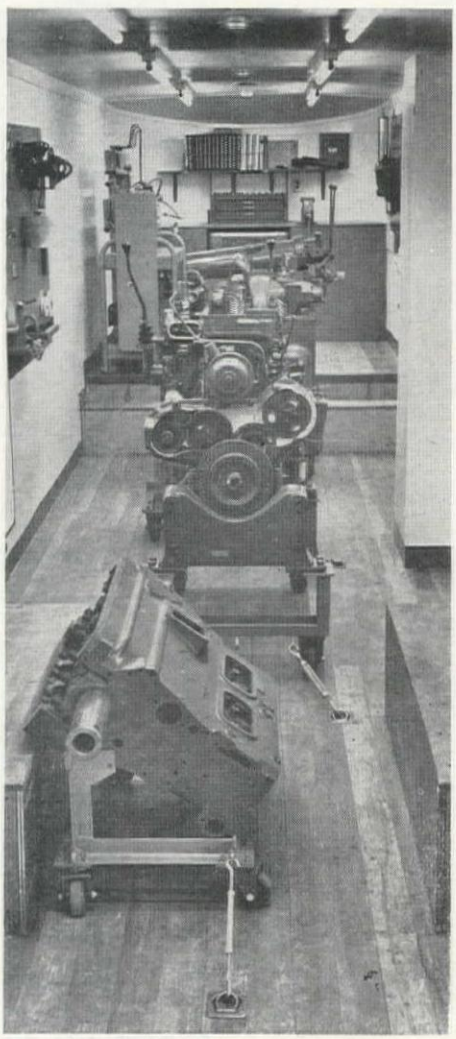
☆ ☆ ☆

Thirteen *Caterpillar* distributors are represented in the Northwest Caterpillar Parts Managers' Association, which has been formed for the purpose of achieving improved methods of doing the job for customer, manufacturer and distributor. J. E. ROLLINS of *Finning Tractor & Equipment Co., Inc.*, Vancouver, is president of the organization and LEE DENTEN, *Bunting Tractor Co., Inc.*, Boise, is secretary-treasurer.

☆ ☆ ☆

Republic Supply Company of California is newly-appointed California distributor of the complete line of the *Taylor Forge & Pipe Works*, and Taylor Forge products will be available from Republic's 17 stores located throughout the state. Taylor's sales service staff has also been increased in California and includes WILLIAM B. GRAGG and FRANK MERKEL in the San Francisco Bay area; L. D. HALL, P. S. HOFFMAN and D. E. WASH in the Southern California region. TOM LINGLE is Pacific Coast Manager for the company.

☆ ☆ ☆



INTERIOR VIEW of one of the two 32-ft. trailers which bring the latest service and maintenance information on International Harvester industrial power products to the company's district office and distributor service personnel throughout the West. Two instructors man each of the units.

☆ ☆ ☆

Mid-January saw the grand opening of a National Asphalt Research Center at the Franklin Institute Laboratories for Research and Development, in Philadelphia. According to DR. HENRY B. ALLEN, executive vice president of the Institute, the new center will be set up on a nation-wide scale, with sponsoring companies representing oil, roofing, molded products, linoleum, sealing compounds and allied industries. Its basic purpose will be to further the development of a scientific technology which will permit the formulation of better asphalts for specific purposes and the development of new applications for asphalts. At a low individual cost, the sponsoring companies will share the benefits of continued research as well as the solution of specific problems.

☆ ☆ ☆

STUART E. YEATON, general product manager of the Electrical Wire Division of *John A. Roebling's Sons Co.*, Trenton, N. J., announces the appointment of two new sales executives. HOWARD E. MALONEY, who started as a salesman in the company's Seattle office, is now manager of sales. FRANK T. CRAVEN, a member of the electrical staff since 1936, appointed assistant manager of sales.

☆ ☆ ☆

The appointment of WATSON N. HAARBAUER as San Francisco assistant district manager of the *United States Steel Supply Co.*, a U. S. Steel subsidiary, has been announced by FRANK B. STEWART, district manager.

☆ ☆ ☆

Newlin Machinery Corp., 641 Southwest Blvd., Kansas City, Kan., has been appointed exclusive distributor for *Wooldridge Manufacturing Co.* for the state of Kansas and the western half of Missouri. Established 23 years ago, Newlin offers complete modern shop facilities and a large staff of trained service men.

☆ ☆ ☆

KEMP YORKE has been appointed by the *C. S. Johnson Co.* of Champaign, Ill., to handle sales of Johnson concrete batching and cement handling equipment in Southern California. He will maintain an office in Los Angeles.

☆ ☆ ☆

ROBERT L. (BOB) HERNON is now with the *Kimball Equipment Co.*, 222 W. 17th South, Salt Lake City, Utah. Hernon has been an equipment salesman in the Salt Lake area for the past two years.

☆ ☆ ☆

AL SMITH, president of *Heil Equipment Co.* of San Francisco recently visited the Heil factory in Milwaukee, Wis.

☆ ☆ ☆

WILHITE

CHARLES J. WILHITE, who started with Cummins in 1939, has been promoted to Acting Northwest Regional Manager of *Cummins Engine Company, Inc.*, of Columbus, Ind. His headquarters will be 809-810 Security Bldg., Seattle, Wash. RALPH J. SHIELDS has been appointed to Wilhite's previous position of Northwest regional service representative.

J. K. Wheeler Machinery Company moved into its new $80,000 plant at 1485 South Second West Street, Salt Lake City on January 2, according to an announcement by J. K. WHEELER, president and general manager. The main new building provides 6,000 sq. ft. of floor space, including areas for sales, parts, office, and machine display. The new facilities also include a steel structure, 40 by 40 ft., for displaying larger pieces of equipment. The company's repair and rebuilding plant, which has been at the site for some time, covers an area of 4,800 sq. ft. J. K. Wheeler Machinery Company's sales territory includes Utah, eastern Idaho and western Wyoming.

J. K. WHEELER
president and general manager of the J. K. Wheeler Machinery Company, Salt Lake City.

☆ ☆ ☆

J. J. THOMPSON is newly-named manager of the Sales Personnel and Training Division of *Worthington Pump and Machinery Corp.* at Harrison, N. J., according to an announcement by W. H. FELDMANN, vice-president in charge of sales. Thompson was assistant manager of Worthington's Cincinnati office.

☆ ☆ ☆

SWAN

ROBERT SWAN has recently been appointed resident industrial sales engineer for *Aero-Coupling Corp.*, subsidiary of the *Aeroquip Corp.* With headquarters in Berkeley, he will handle sales and service for Northern California and Nevada.

☆ ☆ ☆

Goodman Manufacturing Co. announces the following changes in sales administration personnel: MORRIS F. CUNNINGHAM, formerly vice president and sales manager, has been elected vice president in charge of sales succeeding the late A. C. GREEN; WILLIAM T. FERGUSON, former assistant sales manager, has become sales manager; CEDRIC E. MCWHORTER, formerly district manager at Denver, has been named mining engineer. Headquarters for all three will be the company's main office in Chicago. Taking over as new district manager in Denver, is L. W. HALL.

☆ ☆ ☆

On December 4, the assets and business of *Lima-Hamilton Corp.* became a part of the *Baldwin Locomotive Works* of Eddystone, Pa., which under the name of *Baldwin-Lima-Hamilton Corp.*, will hereafter carry on all the activities formerly conducted by both companies. Heading Baldwin are MARVIN W. SMITH, president, and GEORGE A. RENTSCHLER, chairman of the board.

☆ ☆ ☆

Pacific Car and Foundry Co. has razed and rebuilt half of its steel fabricating shop at the Renton, Wash., plant. The new structure, which is all steel frame with corrugated steel sides, covers 14,000 sq. ft. of the steel shop and will house part of the assembly line for 1,400 refrigerator cars and 200 freight cars now on order. A welding shop addition to the building will facilitate manufacture of sub-assemblies and special Carco welding.

☆ ☆ ☆

Foulger Equipment Co. of Salt Lake City celebrated completion of its new quarters by holding open house on December 16. In charge of the enlarged facilities for display and service is C. F. PAYNE, who has been named service manager of the firm. BERT FOULGER, president, announces the following additions to the company's lines: *Smith Engineering Works* — crushers, screens and gravel plants; *J. I. Case Manufacturing Co.*—four models of industrial rubber-tired tractors; and *Manitowoc Engineering Works*—1 to 5½-yd. power shovels.

PAYNE

☆ ☆ ☆

JOHN G. SEILER, executive vice president and general sales manager of *Tube Turns, Inc.*, of Louisville, Ky., announces the appointment of the *Bethlehem Supply*

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 111

Co., Tulsa, Okla., and the *Bethlehem Supply Co. of California*, Los Angeles, as distributors of Tube-Turn welding fittings and flanges. Tube Turns, Inc., is the nation's oldest and largest manufacturer of seamless welded fittings for industrial piping.

☆ ☆ ☆

The *Industrial Equipment Co.*, Los Angeles, is appointed Southern California distributor for Worthington Pump & Machinery Co., Ransome Machinery Co., Pettibone-Mulliken Corp., Haiss Manufacturing Co., Eagle Iron Works, and Electro Alarm Co.

☆ ☆ ☆

Oshkosh Motor Truck Co. appoints *Lee & Thatro Equipment Co.*, Los Angeles, Southern California distributor.

☆ ☆ ☆

Fruehauf Trailer Co. names new division managers to direct Western sales activities. E. C. HENNING, Oakland, Calif., will head Fruehauf branches at Seattle and Spokane, Wash., Portland Ore., Sacramento, Oakland and San Francisco, Calif. Division manager in the Rocky Mountain area is EARL E.

HENNING

TICE

WRIGHT

WRIGHT, formerly manager of Fruehauf's Denver branch. Branches in this area are located at Denver; Billings, Mont.; Boise, Idaho; Salt Lake City, Utah; Albuquerque, New Mexico, and El Paso, Texas. A. V. TICE, Los Angeles, whose division includes branches at Fresno, Los Angeles, and San Diego, Calif., and Phoenix, Ariz., most recently has served as Phoenix branch manager.

☆ ☆ ☆

Recently appointed distributor in Washington and Idaho for the *Koehring Co.* of Milwaukee, the *American Machine Co.* of Spokane will handle the complete Koehring line of heavy-duty construction equip-

Continued on page 114

UNIT BID SUMMARY

Tunnel . . .

Excavation and Steel and Concrete Lining for Irrigation Tunnel on Columbia Basin Project

Washington—Grant County—Bureau of Reclamation. United Concrete Pipe Corp. and Ralph A. Bell, Baldwin Park, Calif., with a bid of $2,175,315, was low before the Bureau of Reclamation for construction of the West Canal-Frenchmen Hills Tunnel in the Columbia Basin project. The length of the tunnel will be approximately 1.77 miles. The principal components of the work to be performed include the following: (a) Canal excavation for the inlet and outlet channels. (b) Excavation of the tunnel. (c) Concrete lining of the tunnel. (d) Concrete portal transitions. Unit bids were submitted as follows:

(1)	United Concrete Pipe Corp. & Ralph A. Bell	$2,175,315	
(2)	Peter Kiewit Sons' Co.	2,227,605	
(3)	Bates and Rogers Construction Corp.	2,476,373	
(4)	Morrison-Knudsen Co.	2,493,925	
(5)	Gibbons & Reed Co.	2,533,315	
—	T. E. Connolly, Inc.	2,585,700	
—	General Construction Co.	2,636,195	
—	Stolte Inc. & Fred J. Early Jr. Co.	$2,648,485	
—	G. L. Tarlton Contracting Co.	2,655,621	
—	J. C. Boespflug Construction Co.	2,765,983	
—	Kuckenberg Construction Co.	2,990,190	
—	Walsh Construction Co.	3,069,920	
—	Guy F. Atkinson Co.	3,088,715	
—	Macco Corporation	3,175,475	
(6)	Engineer's Estimate	2,381,844	

	(1)	(2)	(3)	(4)	(5)	(6)
160,300 cu. yd. excav., common, for canal	.50	.40	.28	.25	1.05	.18
7,100 cu. yd. excav., rock, for canal	3.00	2.50	1.52	1.40	1.40	1.25
77,100 cu. yd. excav., all classes, in tunnel	16.80	18.25	17.35	17.50	18.00	18.00
100 cu. yd. excav., all classes, for tunnel enlargement	30.00	26.00	17.35	25.00	50.00	30.00
500 cu. yd. backfill	1.00	1.50	1.15	1.50	1.25	1.00
400 cu. yd. compacting backfill	4.00	1.75	2.25	1.75	4.00	2.50
220 sq. yd. dry-rock paving	4.00	7.00	4.75	6.60	13.00	6.00
708,000 lb. furn. and instal. perm. structural-steel tunnel supports	.14	.13	.147	.18	.17	.18
255 M.B.M. furn. and erect. perm. timbering in tun.	200.00	200.00	240.00	500.00	300.00	250.00
5,600 lin. ft. furn. and instal. tunnel roof support bolts	2.00	3.00	1.65	2.00	1.50	3.50
900 lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	2.00	1.25	1.60	1.50	.75	1.25
900 lin. ft. drilling grout holes	2.50	1.75	1.60	1.90	.75	2.00
900 lb. furn. and placing grout pipes and connections	1.50	.50	1.45	.80	.90	1.00
9,000 cu. ft. pressure grouting	2.00	1.75	1.45	3.00	2.35	2.50
360 cu. yd. conc. in portal structs. and transitions	57.00	54.00	115.00	85.00	68.00	65.00
20,250 cu. yd. conc. in tunnel lining	20.00	16.50	33.85	28.75	24.70	26.00
62,000 lb. furn. and placing reinf. bars	.12	.12	.12	.15	.14	.14
30,900 bbl. furnishing and handling cement	5.00	6.25	4.92	5.50	6.30	5.00
50 sq. ft. furn. and placing elastic filler	2.50	1.50	6.00	1.00	2.00	2.00
500 lb. furn. and installing weep pipe in tunnel lining	.60	.25	.75	50	1.00	.40

Excavation and Reinforced Concrete Lining for Bald Mountain Pressure Tunnel on Colorado-Big Thompson Project

Colorado—Larimer County—Bureau of Reclamation. Winston Bros. Company, Monrovia, Calif., was low bidder and awarded contract at $1,691,262 for construction of the Bald Mountain Pressure Tunnel and access roads, Estes Park-Foothills power aqueduct, Colorado-Big Thompson Project. Work to be performed consists of the following: (a) Excavation for approximately 1.3 miles of tunnel. (b) Excavation for approximately 80 feet of 50-ft. diameter surge tank. (c) Open-cut excavation for channel, trashrack structure, transition, and cut and cover section at the inlet portal; open-cut excavation at the outlet portal for tunnel access; and open-cut excavation for the surge tank above elevation 6604. (d) Excavation and earthwork for the Linger and East Portal access roads. (e) Lining of the tunnel and surge tank with reinforced concrete. (f) Concrete construction of structures, including the trashrack, transition, and cut and cover section at the inlet portal; and the surge tank roof. (g) Installation of structural steel, vent screens, vent pipe, and ladder for the surge tank; trashracks and metalwork for the trashrack structure; and valve and piping for the tunnel sump drain. (h) Construction and installation of corrugated-metal pipe culverts, cattle guards, gates and cable guard fence for the Linger and East Portal access roads. Unit bids were as follows:

(1)	Winston Bros. Company	$1,691,262	
(2)	Peter Kiewit Sons' Co.	1,743,988	
(3)	United Concrete Pipe Corp. & Ralph A. Bell	1,851,923	
(4)	Macco Corporation	1,948,850	
(5)	Rhoades-Shofner Construction Co.	$2,009,301	
—	G. L. Tarlton Contracting Co.	2,136,049	
—	Wunderlich Contracting Co.	2,188,812	
—	Lowdermilk Bros.	2,389,552	
(6)	Engineer's Estimate	1,876,296	

	(1)	(2)	(3)	(4)	(5)	(6)
80,000 cu. yd. excav., all classes, in open cut	1.25	1.50	.90	1.50	1.08	1.10
33,400 cu. yd. excav., all classes, in tunnel	19.00	20.00	26.00	20.50	18.80	28.00
100 cu. yd. excav., all classes, for tunnel enlargement	25.00	30.00	40.00	35.00	30.68	28.00
6,800 cu. yd. excav., all classes, for surge tank and 60-ft. tunnel section	13.00	21.00	5.50	10.00	24.15	33.65
685,000 lb. furn. and install. perm. steel tunnel supports	.18	.13	.18	.20	.265	.18
245 M.B.M. furn. and erect. perm. timb'g in tunnel	200.00	190.00	200.00	410.00	326.80	200.00
150 lin. ft. furn. and laying 8-in. diam. sewer pipe with cemented jts.	1.00	5.00	3.00	3.00	1.50	1.20
600 lin. ft. drilling feeler or pilot holes ahead of tunnel excav.	1.00	2.25	2.50	1.30	1.97	.40
600 lin. ft. drilling grout holes thru conc. lining	1.00	1.50	2.50	3.50	3.88	1.10
600 lb. furn. and placing grout pipe and connections	1.00	.50	3.00	1.25	1.41	1.00
6,500 cu. ft. pressure grouting	2.00	2.00	2.00	3.00	2.73	1.75
14,400 cu. yd. excav., all classes, for roadway	1.25	1.70	.65	1.80	1.04	1.25
100 cu. yd. excav., all classes, for road structs.	5.00	6.00	6.50	6.00	5.22	5.00
800 cu. yd. selected roadway borrow	1.00	1.00	.65	3.50	.52	1.50
1,125 cu. yd. selected roadway surfacing	1.60	4.00	1.00	1.00	1.00	3.00
12,500 sta. cu. yd. overhaul	.03	.03	.05	.01	.096	.05
1,235 cu. yd. backfill	1.00	1.00	.65	.80	.50	1.00
235 cu. yd. compacting backfill	4.00	4.00	4.00	4.60	7.00	4.00
540 cu. yd. riprap 24-in. thick	3.00	6.50	4.00	6.50	2.50	6.00
500 cu. yd. concrete in structs.	60.00	40.00	50.00	100.00	53.56	43.00
9,900 cu. yd. concrete in tunnel lining	27.00	27.00	30.00	33.00	45.41	29.50
960 cu. yd. conc. in lining of surge tank and 60-ft. tunnel section	45.00	44.00	40.00	70.00	51.45	42.00
17,000 bbl. furn. and handling cement	5.00	5.00	5.50	6.00	5.78	7.50
1,458,000 lb. furn. and placing reinf. bars	.14	.12	.13	.14	.12	.12
42 lin. ft. furn. and laying 24-in. diam. corrugated-metal pipe	5.00	7.50	5.00	5.00	6.00	5.50
78 lin. ft. furn. and laying 30-in. diam. corrugated-metal pipe	6.50	8.50	8.00	6.50	7.00	6.75
138 lin. ft. furn. and laying 36-in. diam. corrugated metal pipe	10.00	12.00	10.00	10.00	9.20	10.00

(Continued on next page)

SEE YOUR

MICHIGAN

DISTRIBUTOR

STEFFECK EQUIPMENT CO., INC.
P. O. Box 584
Helena, Montana

●

MODERN MACHINERY CO., INC.
P. O. Box 2152
Spokane 2, Washington

●

WESTERN EQUIPMENT CO.
2244 N.W. Savier St.
Portland 10, Oregon
also
1360 West First Ave.
Eugene, Oregon

●

SPEARS-WELLS MACHINERY CO.
1832 West Ninth St.
Oakland 7, California

●

SMITH BOOTH USHER COMPANY
2001 Santa Fe Ave.
Los Angeles, California

●

THE SAWTOOTH CO.
715 Grove Street
Boise, Idaho

●

HEINER EQUIPMENT & SUPPLY CO.
501 West 7th South
Salt Lake City 4, Utah
also
3301 Walnut St.
Denver 5, Colorado

●

WILSON EQUIPMENT CO.
P. O. Box 218
Cheyenne, Wyoming

●

MICHIGAN SALES & SERVICE CO.
1506 Fifteenth Avenue West
Seattle 99, Washington

●

CONTRACTORS' EQUIP. & SUPPLY CO.
P. O. Box 456
Albuquerque, New Mexico
and
P. O. Box 2039, El Paso Texas

●

JAMES CASHMAN
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

Trouble-Free PERFORMANCE

"It's the only machine we've had for any length of time that has had no major repairs." That's what William Wylie, equipment foreman, says about the MICHIGAN ½ yd. Crawler Excavator owned by A. G. Woods Company, Windsor, Connecticut. Yes . . . it's quite a record for an excavator that has been *"worked hard," 10 to 14 hours a day for a year and a half.*

At Woody Crest Housing Development in West Hartford, Connecticut, the MICHIGAN digs service, sewer, water and drainage ditches . . . excavates for septic tanks and basements . . . loads trucks. Digging 450 feet of trench and laying the eight inch pipe is an average day's work.

Service records like this are typical for MICHIGAN Excavator-Cranes. Why settle for less? When *you* need an excavator-crane . . . investigate MICHIGAN . . . you'll agree it's *your best buy!* Write, wire or phone for complete details.

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

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Continued from page 112

ment along with products of the three Koehring subsidiaries, *C. S. Johnson, Kwik-Mix* and *Parsons* companies. American, with PETER A. BRIGGS, president, HENRY A. BRIGGS, vice president, and F. H. ETTER, secretary and sales manager, succeeds Western Machinery Co. as the Koehring representative for the area.

☆ ☆ ☆

Cooper-Bessemer Corporation, builders of diesel engines, gas engines and compressors, appoints WALTER H. KRAEMER to its field sales and service office in San Francisco.

WATTS

☆ ☆ ☆

L. A. WATTS has been appointed assistant general sales manager of the *Wickwire Spencer Steel Division* of the *Colorado Fuel and Iron Corp.* Watts has been with the company since 1938.

☆ ☆ ☆

K. W. WELLS, formerly of Shaw Sales & Service Co., Los Angeles, is now sales engineer for *Western Machinery Co.,* Phoenix, Ariz. DONALD D. ALLEN, formerly of Western Machinery, is now in the purchasing department of Grand Central Aircraft at Tucson, Ariz.

☆ ☆ ☆

Three West Coast Koehring distributor salesmen attended the recent *Koehring Products* school in Milwaukee, Wis. They

At the Koehring Products School, left to right: BYRON WALKER, Koehring Co. district representative; J. W. AMES, J. W. SAVAGE and QUINT SHILEY.

are: JAMES W. AMES, Pacific Hoist & Derrick Co., Seattle, Wash.; JAMES W. SAVAGE, and QUINT SHILEY, Harron, Rickard & McCone Co., Los Angeles, Calif.

☆ ☆ ☆

Barber-Greene Company has moved offices from 1142 Howard St., San Francisco, to 318 S. "B" St., San Mateo. The phone number of the new office is Diamond 3-5828. E. L. BENSON is area sales manager and HARRY JACKSON is area service manager for Barber-Greene.

120 lin. ft. furn. and laying 50-in. by 31-in. diam. corrugated-metal pipe arch	15.00	14.00	13.00	13.00	11.20	12.00
1 gate furn. and installing barbed-wire fence gate	25.00	16.00	30.00	50.00	31.00	20.00
1 gate furn. and install. double steel-frame fence gate	150.00	65.00	130.00	200.00	119.00	75.00
2 cattleguards furn. and constr. cattle guards for East Portal access road	$1,500	$4,560	900.00	$2,300	$1,565	$1,500
1,100 lin. ft. furn. and constr. cable guardrail	4.00	4.00	3.50	4.00	2.90	3.00
64 posts furn. and erect. guard posts	10.00	7.50	6.50	12.50	9.50	6.00
1 cattle guard furn. and constr. cattle guards for Linger access road	$1,500	$1,104	400.00	900.00	758.00	600.00
41,000 lb. installing miscl. metalwork	.10	.18	.05	.10	.091	.20
4,500 lb. furn. and installing miscl. metalwork	.50	.28	.65	.36	.76	.55
18,300 lb. furn. and erecting structural steel	.20	.23	.25	.28	.25	.18

Sewerage . . .

Concrete, Cement-Asbestos and Vitrified Clay Sewer Pipe for System at Ketchikan, Alaska

Alaska—Ketchikan—Alaska Public Works. Morrison-Knudsen Co. was low bidder before Alaska Public Works for construction of streets and sewers in Ketchikan. Unit prices by the three bidders identified as follows:

(1) Morrison-Knudsen Co. (2) L. E. Baldwin, Inc. (3) Keil & Peterman.

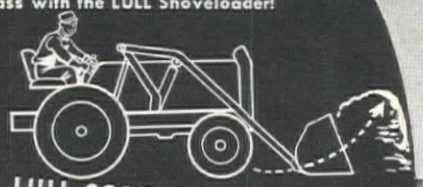
	(1)	(2)	(3)
BASIC BID "A"—SANITARY SEWERS			
50 cu. yd. extra excavation	5.40	15.00	14.80
1,933 cu. yd. rock excavation	12.00	30.00	33.30
1,900 cu. yd. select backfill	3.60	5.00	13.00
1,000 cu. yd. select backfill for bedding	7.00	8.00	17.76
20 ea. manholes, Type "A", Standard	480.00	480.00	370.00
8 lin. ft. extra depth manhole, Type "A"	135.00	105.00	44.50
5 ea. shallow manhole, Type "B"	385.00	500.00	370.00
1 lin. ft. extra depth shallow manhole	90.00	105.00	44.50
1 ea. drop manhole	600.00	600.00	592.00
3 ea. existing manhole, connection	125.00	240.00	74.00
6 ea. clean outs, 6-in. soil pipe	56.00	44.00	82.00
1 ea. clean outs, 8-in. soil pipe	70.00	48.00	100.00
548 lin. ft. C. I. soil pipe, 6-in.	9.45	13.00	15.90
426 lin. ft. C. I. soil pipe, 8-in.	11.50	16.00	19.55
13 ea. 6-in. on 6-in. C.I. S.P. "Y"	15.50	21.84	23.70
8 ea. 6-in. on 8-in. C.I. S.P. "Y"	18.00	45.00	32.60
1 ea. 8-in. to 6-in. C.I. S.P. reducer	10.50	25.00	26.60
1 ea. 6-in. C.I. S.P. ⅛ bend	11.50	15.00	16.30
10 cu. yd. concrete pipe anchors	150.00	100.00	300.00
ALTERNATE 1—CONCRETE SEWER PIPE			
2,558 lin. ft. 6-in. pipe service connections	7.25	8.40	4.42
185 lin. ft. 8-in. pipe service connections	8.00	10.10	5.26
4,170 lin. ft. 8-in. pipe, main sewers	8.00	8.50	4.26
802 lin. ft. 12-in. pipe, main sewers	9.35	10.35	6.50
119 ea. 6-in. on 8-in. wye	14.90	8.25	30.25
22 ea. 6-in. on 12-in. wye	20.00	17.00	38.50
8 ea. 8-in. on 12-in. wye	24.00	17.00	39.50
63 ea. 6-in - 45° ells	11.00	4.40	5.35
63 ea. 6-in. - 22½° ells	11.00	4.40	6.80
4 ea. 8-in - 45° ells	14.00	7.70	10.00
4 ea. 8-in. - 22½° ells	14.00	7.70	10.65
5 ea. 8-in. - clean outs	40.00	53.00	74.00
ALTERNATE II—CEMENT-ASBESTOS SEWER PIPE			
2,558 lin. ft. 6-in. pipe service connections	8.00	8.85	4.71
185 lin. ft. 8-in. pipe service connections	9.00	11.00	5.63
4,170 lin. ft. 8-in. pipe, sewers	9.00	9.90	4.63
802 lin. ft. 12-in. pipe, sewers	11.00	11.90	6.51
119 ea. 6-in on 8-in. C.I. wye	18.10	73.00	30.25
22 ea. 6-in. on 12-in. C.I. wye	22.50	106.50	38.50
8 ea. 8-in. on 12-in. C.I. wye	28.00	106.50	39.50
63 ea. 6-in. 45° ells	15.30	24.25	5.35
63 ea. 6-in. 22½° ells	15.30	24.25	6.80
4 ea. 6-in. - 45° ells	19.50	33.00	10.00
4 ea. 8-in. - 22½° ells	19.50	33.00	10.65
5 ea. 8-in. clean outs	42.00	52.00	74.00
ALTERNATE III—GLAZED VIT. CLAY SEWER PIPE			
2,558 lin. ft. 6-in. pipe service connections	7.50	8.50	4.70
185 lin. ft. 8-in. pipe service connections	8.35	10.20	5.78
4,170 lin. ft. 8-in. pipe sewers	8.35	8.50	4.78
802 lin. ft. 12-in. sewers	11.00	10.40	7.52
119 ea. 6-in. on 8-in. wye	15.30	9.50	31.72
22 ea. 6-in. on 12-in. wye	19.50	18.00	27.31
8 ea. 8-in. on 12-in. wye	21.00	18.00	28.42
63 ea. 6-in. - 45° ells	11.00	4.50	5.64
63 ea. 6-in. - 22½° ells	11.00	4.50	5.64
4 ea. 8-in. - 45° ells	15.00	8.15	11.30
4 ea. 8-in. - 22½° ells	15.00	8.15	11.30
5 ea. 8-in. clean outs	42.00	55.00	74.00
BASIC BID "B"—STORM WATER SEWERS			
10 cu. yd. extra excavation	5.45	15.00	14.80
850 cu. yd. rock excavation	12.00	30.00	22.20
200 cu. yd. select backfill for bedding	8.35	8.00	14.80
300 cu. yd. select backfill	3.60	5.00	10.40
7 ea. manhole, Type "A", standard	480.00	480.00	370.00
8 lin. ft. extra depth manholes, Type "A"	135.00	105.00	44.40
17 ea. manhole, Type "B", shallow	385.00	500.00	370.00
1 lin. ft. extra depth shallow manhole	90.00	105.00	44.40
6 ea. Type "B" manhole, catch basin	370.00	500.00	355.00
28 ea. storm water inlets	115.00	246.00	148.00
1 ea. long pattern inlet	150.00	259.00	89.00
6 ea. small area drain casting	21.00	35.00	37.00
10 ea. existing inlet conversion	125.00	300.00	44.40
1 ea. special inlet manhole "X-X"	735.00	750.00	740.00
1 ea. special inlet manhole "Y-Y"	850.00	800.00	740.00
3 ea. special inlet manhole "Z-Z"	430.00	490.00	444.00
ALTERNATE IV—CONCRETE SEWER PIPE			
100 lin. ft. 4-in. sewer pipe	6.70	8.00	1.54
2,870 lin. ft. 8-in. sewer pipe	8.00	8 80	3.34
154 lin. ft. 10-in. sewer pipe	8.75	9.60	3.88

(Continued on next page)

Operators get...

heaping buckets every time with the LULL Shoveloader

Natural SCOOPING ACTION assures a heaping full bucket in one pass with the LULL Shoveloader!



LULL SCOOPING ACTION eliminates costly stop-and-go bucket loading.

The hydraulically controlled bucket of the LULL Shoveloader scoops instead of pushes the earth into the bucket, so it naturally moves more earth in less time.

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!

MORE PROFITS? SURE! With heaping full buckets and faster loading, you move more earth in less time and at less cost. Make your next loader a LULL Shoveloader!

Get LULL SHOVELOADER FACTS today. MAIL THIS COUPON NOW!

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2 • • • •

LULL Manufacturing Company
3612 East 44th Street Minn. 6, Minn.

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

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

NEWS of MANUFACTURERS

RALPH K. GOTTSHALL, assistant general manager of the Explosives Department, has been appointed assistant to the president, *Atlas Powder Co.*, Wilmington, Del. D. J. C. COPPS, formerly manager of the Joplin district sales office, will replace Gottshall as assistant general manager of the Explosives Department.

☆ ☆ ☆

RALPH J. CORDINER, *General Electric* president, announces the appointments of JOHN W. BELANGER of Schenectady, N.Y., and NICHOLAS M. DUCHEMIN of Lynn Field, Mass., as general managers of the company's Large Apparatus Divisions and Small Apparatus Divisions respectively. ROBERT L. GIBSON of Pittsfield, Mass., has been named general manager of the company's Chemical Department.

☆ ☆ ☆

Three new vice-presidents have been elected by the *Fruehauf Trailer Co.*, Detroit, Mich. Named were: E. S. QUARNGESSER, Baltimore, Md., vice-president in charge of the eastern sales division; W. W. SIEGRIST, Detroit, vice-president in charge of truck body division; and HARRY R. BADGER, Detroit, vice-president in charge of scheduling.

☆ ☆ ☆

F. L. YETTER has been appointed senior vice-president of *C. H. Wheeler Manufacturing Co.* Yetter rejoins the company after a twenty-month period during which he served as director of foreign affairs for the Kuljian Corp.

☆ ☆ ☆

E. R. "ED" GALVIN has been appointed merchandise manager at the Harvey, Ill., home office of the *Buda Co.*, manufacturer of diesel and gasoline engines and other products widely used in the construction industry. Galvin has long been a prominent figure in construction circles, having served successively as general sales manager of Caterpillar Tractor Co., R. G. LeTourneau, Inc., and LaPlant-Choate Manufacturing Co.

☆ ☆ ☆

Promotion of CLYDE C. WILLIAMS to the post of general manager of the Marine and Industrial Engine Division of *Chrysler Corp.*, has been announced by R. T. KELLER, president of the division. Williams, who had been Marine Engine Division manager since April of 1946, joined Chrysler in 1928 and has held a variety of increasingly important posts with the corporation since. E. E. TRITTSCHUH will be manager of the Marine Engine Division, the post left vacant by advancement of Williams.

☆ ☆ ☆

The Four Wheel Drive Auto Co., Clintonville, Wis., announces the appointment of WILLIAM HANSON as manager of a newly-created Market Development and Research department. The new department

Continued on page 118

448 lin. ft. 15-in. sewer pipe	11.00	11.40	7.77
753 lin. ft. 24-in. sewer pipe	18.00	17.75	15.91
3 ea. 8-in. on 8-in. concrete wye	20.00	8.15	15.50
1 ea. 8-in. on 15-in. concrete wye	25.00	38.60	32.50
6 ea. 4-in. - 90° ells	9.00	4.00	6.42
ALTERNATE V—CEMENT-ASBESTOS CL. 1 SEWER PIPE			
100 lin. ft. 4-in. sewer pipe, Class 1	7.40	8.45	1.92
2,870 lin. ft. 8-in. sewer pipe, Class 1	9.00	9.85	3.85
154 lin. ft. 10-in. sewer pipe, Class 1	10.25	10.80	4.37
448 lin. ft. 16-in. sewer pipe, Class 1	13.80	12.30	7.86
753 lin. ft. 24-in. sewer pipe, Class 2	21.00	23.00	16.55
3 ea. 8-in. on 8-in. C.I. wye	19.50	73.00	15.40
1 ea. 8-in. on 15-in. C.I. wye	32.00	346.00	32.50
6 ea. 4-in. - 90° ells	9.75	24.00	6.42
ALTERNATE VI—CORRUGATED METAL PIPE			
100 lin. ft. 4-in. sewer pipe	8.40	8.90	1.54
2,870 lin. ft. 8-in. sewer pipe	9.75	10.10	3.34
154 lin. ft. 10-in. sewer pipe	10.80	11.00	3.88
448 lin. ft. 15-in. sewer pipe	13.00	13.35	7.77
753 lin. ft. 24-in. sewer pipe	17.60	21.00	15.91
3 ea. 8-in. on 8-in. wye	30.00	18.65	15.50
1 ea. 8-in. on 15-in. wye	35.00	45.00	32.50
6 ea. 4-in. - 90° ells	14.00	10.65	6.42
BASIC BID "C"—STREET PAVING			
200 cu. yd. extra excavation	5.40	13.00	10.40
1,290 cu. yd. rock excavation below paving	8.70	30.00	29.60
660 cu. yd. rock excavation on above paving	8.70	19.00	17.75
1,700 cu. yd. select backfill for bedding	8.35	8.00	10.40
3,024 cu. yd. select backfill	3.60	5.00	7.66
4,200 sq. yd. remove existing paving, etc.	1.25	5.25	1.48
7,100 lin. ft. 6-in. x 18-in. concrete curb	3.35	3.50	6.00
15,240 sq. yd. concrete paving	14.00	15.50	15.50
1,050 lb. ¾-in. steel bars—sleeves	.24	.25	.44
1,340 sq. yd. 4-in. concrete sidewalk	10.00	8.00	10.40
608 sq. yd. 5-in. concrete sidewalk	11.50	9.00	11.84
120 sq. yd. concrete driveway returns	12.60	10.00	14.80
800 lin. ft. hand rail, pipe	8.30	2.50	7.40
15 cu. yd. retaining wall, concrete	124.00	110.00	185.00
30 cu. yd. rubble masonry	85.00	60.00	222.00
5 cu. yd. plain Class "A" concrete	103.00	70.00	148.00

Waterway Improvement . . .

Construction and Repair of Pile Dike and Revetment

Washington—Cowlitz County—Corps of Engineers. Willamette Tug & Barge Co., Portland, Ore., with a total bid of $74,131, was low before the Corps of Engineers for constructing a pile dike and revetment and repair of an existing pile dike and revetment along the Columbia River at Kalama Port Dock. Unit bids were submitted as follows:

(1) Willamette Tug & Barge Co.	$74,131	(5) H. D. Haley & Sons	$83,479
(2) General Construction Co.	77,393	— Portland Tug & Barge Co.	90,265
(3) Stoen Landscape & Construction Co.	78,178	— Miller & Strong, Inc.	99,788
(4) S. D. Spencer & Son	82,703	(6) Contracting Officer's Estimate	77,067

CONSTRUCTION OF PILE DIKE	(1)	(2)	(3)	(4)	(5)	(6)
7,960 lin. ft. new piling, in place	1.20	1.14	1.56	1.75	1.45	1.16
2,090 lin. ft. install used piling	.50	.55	.75	1.25	.80	.68
8 M.F.B.M. timber, in place	150.00	250.00	275.00	175.00	200.00	230.00
4,000 lb. hardware, in place	.40	.25	.28	.40	.40	.31
4,200 cu. yd. stone, in place	3.75	4.15	3.68	3.75	3.50	4.10
1,290 cu. yd. dumped stone revetment	3.50	4.20	3.68	3.50	3.50	4.10
REPAIR OF EXISTING PILE DIKE AND REVETMENT AND CONST. NEW REVETMENT						
1,800 lin. ft. new piling, in place	1.20	1.12	1.70	1.75	1.45	1.32
1.2 M.F.B.M. timber, in place	150.00	334.00	275.00	175.00	200.00	230.00
700 lb. hardware, in place	.40	.25	.28	.40	.40	.31
20 ea. pile shoes, in place	4.00	5.00	10.45	15.00	10.00	5.15
8,400 cu. yd. embankment from borrow	1.29	1.00	1.20	1.60	2.25	1.00
7,110 cu. yd. dumped stone revetment	3.75	4.20	3.68	3.50	3.50	4.10
210 cu. yd. quarry waste blanket	1.29	1.75	3.00	3.00	3.50	1.43

Irrigation . . .

Reinforced Concrete Pipe for All-American Canal Laterals

California—Coachella Valley—Bureau of Reclamation. R. V. Lloyd & Co. of Coachella, with a bid of $520,735, was low before the Bureau of Reclamation for construction of earthwork, pipe lines and structures on laterals and sublaterals of the All American Canal system, Coachella Valley distribution system, Boulder Canyon Project. Unit bids were as follows:

(1) R. V. Lloyd & Co.	$520,735	(5) V.C.K. Construction Co.	$588,755
(2) Pipeline Construction Co. of Riverside	544,145	— P. & J. Artukovich, Inc.	622,933
(3) Milosevich & Zarubica Construction Co. and Vido Kovacevich	548,987	— R. A. Wattson Co.	668,051
(4) Steve P. Rados, Inc.	578,689	— Thomson Plumbing & Heating Co.	709,883
		(6) Engineer's Estimate	625,159

	(1)	(2)	(3)	(4)	(5)	(6)
88,300 cu. yd. excav. for pipe trenches	.31	.25	.36	.37	.52	.40
6,300 cu. yd. excav. for structs.	.80	.80	.90	.85	.95	1.25
88,300 cu. yd. backfill in pipe trenches	.20	.20	.25	.16	.18	.30
6,300 cu. yd. backfill around structs.	.41	.39	.14	.32	.25	.60
200 cu. yd. excav., loading, hauling, and placing consolidation matl. from borrow area	1.15	1.20	1.35	2.60	2.00	1.75
3,500 cu. yd. puddling backfill	1.15	1.00	1.15	1.10	.85	1.00
500 cu. yd. consolidating backfill	1.72	1.50	1.75	1.75	1.00	1.75
415 cu. yd. reinf. conc. in structs.	80.00	75.00	85.00	77.00	65.00	80.00
100 cu. yd. plain concrete	40.00	33.00	32.50	33.50	30.00	35.00
770 bbl. furn. and handling cement	4.15	4.28	4.50	4.75	3.90	4.75
30 cu. yd. furn. and installing baffle plank in pipe stands	100.00	80.00	105.00	100.00	95.00	100.00
90 unit furn. and install. valve boxes and covers for 8-in. gate valves	7.50	7.50	9.00	12.50	8.50	8.00

(Continued on next page)

More miles of road at lowest cost per mile makes this husky Model 501 the decided choice of contractors and public bodies, who have taken the time to check up and compare.

It will be your decision too, for this No. 501 gives you tremendous ground gripping traction on its huge 18:00x26 tires, tremendous blade pressure for tough going, plenty of weight on front and rear, plenty of over-all weight for rugged strength and long life.

It has all the important basic features of the highest price machine, yet none of the seldom used extras which add to the original cost of a grader. It will handle rough grading, fine grading, maintaining and ditching — and do the job to anyone's satisfaction, at the lowest obtainable cost.

Before you invest in any grader it will pay you to investigate the M-B line, and the various attachments which make it an all around, year around performer. Send for literature today!

traction

Huge, low pressure, 10 ply 18:00 x 26 tires provide 613.6 square inches of ground contact.

weight

17,180 lbs. of rugged strength. Heavy front (4,970 lbs.) and rear (12,120 lbs.) provide stability and traction under all conditions.

blade pressure

8,040 lbs. of pressure on the blade produces full loads and positive action in tough going.

power

51 H.P. Gasoline or Diesel, heavy duty engines that are built for road work. Simple, trouble-free, economical.

MEILI-BLUMBERG CORPORATION

1633 WISCONSIN STREET • NEW HOLSTEIN, WISCONSIN

COAST EQUIPMENT CO.....San Francisco, Calif.	CLARK COUNTY MER. CO.....Las Vegas, Nevada
CASEY METCALF MACH. CO.....Los Angeles, Calif.	NEVADA EQUIPMENT SERVICE.....Reno, Nevada
CONSTRUCTORS EQUIPMENT CO...Denver, Colorado	KIMBALL EQUIPMENT CO.....Salt Lake City, Utah
SAWTOOTH CO.....Boise, Idaho, Twin Falls, Idaho	HOWARD-COOPER CORP.....Seattle, Washington

HOWARD-COOPER CORP., Portland, Roseburg, Central Pt., Eugene, Albany, Oregon.

NEWS of MANUFACTURERS

Continued from page 116

has been organized to secure contracts for the manufacture of component parts and assemblies for non-competitive companies, and to find new products that can be manufactured and merchandised by Four Wheel Drive.

☆ ☆ ☆

Scheduled for completion early in 1951 is the new Engineering Services building under construction at the site of *Eutectic Welding Alloys Corporation's* new plant in Flushing, Long Island. The additional laboratory facilities in the new building will provide further space for the company's continuous welding development research and experimental analysis and testing on welding problems of the 78,000 U. S. plants which use Eutectic alloys and fluxes.

☆ ☆ ☆

International Harvester appoints W. W. BLACK chief engineer of the field engineering section in the industrial government products group. Black will direct and coordinate all the activities related to training operators and servicemen for specialized government vehicles produced by the industrial power division. F. J. SCHRECK will take Black's place as general supervisor of the industrial service section.

☆ ☆ ☆

GAIL E. SPAIN, vice president of *Caterpillar Tractor Co.*, announces a voluntary allocation program designed to distribute equitably during 1951 the heavy machinery manufactured by the company. The system, which evolved from experience gained during World War II and the years following, has already been accepted by Caterpillar dealers as the best mode of distribution under present market conditions.

☆ ☆ ☆

SMITH W. STOREY, president of the *General Portland Cement Co.* and the *Consolidated Cement Corp.* of Chicago, was elected chairman of the board of directors of the Portland Cement Association at the annual meeting in Chicago in November. He succeeds WALTER C. RUSSELL, president of *Peerless Cement Corp.*, Detroit, who has served as chairman of the board for the past two years.

☆ ☆ ☆

HARRY G. MORROW, former sales manager for welded products for Spang-Chalfant Division of National Supply Co., is a new vice president of *L. B. Foster Co.*, supplier of railroad trackage, steel sheet piling and pipe. His headquarters will be at the company's main office in Pittsburgh.

☆ ☆ ☆

Purchase of the *R-S Products Corp.* of Philadelphia by *S. Morgan Smith Co.* of York, Pa., was announced recently by BEAUCHAMP E. SMITH, president. The Philadelphia concern is a leader in the

Continued on page 120

5	unit furn. and install. valve boxes and covers for 12-in. gate valves	8.65	10.00	10.00	14.00	11.00	12.00
55,600	lb. furn. and placing reinf. bars in structs	.14	.14	.14	.15	.09	.15
40	units furn. matls. and const. asbestos-cem. pipe vents 10 ft. or less in height	23.00	20.00	22.50	22.00	33.00	20.00
7	units furn. matl. and const. asbestos-cem. pipe vents betw. 10 and 15 ft. in height	34.50	30.00	29.00	34.00	35.00	35.00
1	unit furn. matl. and const. asbestos-cem. pipe vents more than 15 ft. in height	57.50	40.00	55.00	68.00	55.00	70.00
280	lin. ft. furn. and laying 10-in. diam. std. conc. irriga. pipe	.74	.85	.86	.85	.86	.85
62,460	lin. ft. furn. and laying 12-in. diam. std. conc. irriga. pipe	.90	.85	.90	.95	.96	1.05
14,440	lin. ft. furn. and laying 14-in. diam. std. conc. irriga. pipe	1.10	1.00	1.04	1.15	1.24	1.25
12,970	lin. ft. furn. and laying 16-in. diam. std. conc. irriga. pipe	1.35	1.20	1.26	1.35	1.48	1.65
17,270	lin. ft. furn. and laying 18-in. diam. 25-ft. head reinf. conc. pipe	2.40	3.20	2.85	3.40	3.00	3.25
22,230	lin. ft. furn. and laying 20-in. diam. 25-ft. head reinf. conc. pipe	2.75	3.28	3.70	3.83	3.52	3.75
17,430	lin. ft. furn. and laying 21-in. diam. 25-ft. head reinf. conc. pipe	3.10	3.40	3.70	3.83	3.62	3.85
18,780	lin. ft. furn. and laying 24-in. diam. 25-ft. head reinf. conc. pipe	3.80	3.98	3.82	4.32	4.28	4.55
5,340	lin. ft. furn. and laying 27-in. diam. 25-ft. head reinf. conc. pipe	4.40	5.00	4.52	4.83	5.83	5.25
3,510	lin. ft. furn. and laying 30-in. diam. 25-ft. head reinf. conc. pipe	5.50	5.66	5.23	5.70	6.45	5.95
70	lin. ft. furn. and laying 42-in. diam. 25-ft. head reinf. conc. pipe	8.75	8.75	8.24	8.90	11.39	9.40
380	lin. ft. furn. and erect. 12-in. diam. conc. irriga. pipe vert.	1.84	.90	1.85	2.10	2.00	1.65
35	lin. ft. furn. and erect. 12-in. diam. 25-ft head reinf. conc. pipe vertically	2.75	2.80	2.85	4.90	3.30	2.85
24	lin. ft. furn. and erect. 30-in. diam. 25-ft. head reinf. conc. pipe vertically	8.20	9.50	6.91	7.60	10.00	8.05
600	lin. ft. furn. and erect. 36-in. diam. 25-ft. head reinf. conc. pipe vertically	10.35	12.10	8.75	9.00	11.95	10.00
320	lin. ft. furn. and erect. 42-in. diam. 25-ft. head reinf. conc. pipe vertically	12.00	13.65	11.00	10.40	14.25	12.35
120	lin. ft. furn. and erecting 48-in. diam. reinf. conc. pipe vert.	14.00	20.00	12.98	11.90	16.90	14.75
70	lin. ft. furn. and erecting 54-in. diam. reinf. conc. pipe vert.	16.00	25.03	14.03	14.30	20.60	17.15
80	lin. ft. furn. and erecting 60-in. diam. reinf. conc. pipe vert.	18.00	26.00	18.43	16.40	23.70	20.00
10	lin. ft. furn. and erecting 66-in. diam. reinf. conc. pipe vert.	20.00	40.00	22.10	19.50	26.00	23.00
30	lin. ft. furn. and erecting 72-in. diam. reinf. conc. pipe vert.	25.00	42.00	24.78	25.00	30.00	26.50
30	lin. ft. furn. and lay. 12-in. diam. std. str. conc. culv. pipe	2.90	2.16	3.57	2.20	2.80	2.50
60	lin. ft. furn. and lay. 15-in. diam. std. str. conc. culv. pipe	3.60	2.80	3.83	2.75	3.25	3.00
84	lin. ft. furn. and lay. 18-in. diam. std. str. conc. culv. pipe	4.50	4.00	4.68	3.40	3.85	3.60
24	lin. ft. furn. and lay. 21-in. diam. std. str. conc. culv. pipe	5.25	4.50	5.48	4.00	4.35	4.40
60	lin. ft. furn. and lay. 24-in. diam. std. str. conc. culv. pipe	6.30	5.00	6.37	4.65	5.20	5.10
72	lin. ft. furn. and lay. 30-in. diam. std. str. conc. culv. pipe	7.50	6.80	7.66	6.00	6.80	6.80
36	lin. ft. furn. and jacking 18-in. diam. std. str. conc. culv. pipe under Highway No. 111	40.00	32.00	17.74	23.00	25.00	40.00
36	lin. ft. furn. and jacking 21-in. diam. std. str. conc. culv. pipe under Highway No. 111	45.00	35.00	21.68	24.00	26.00	46.00
108	lin. ft. furn. and jacking 30-in. diam. std. str. conc. culv. pipe under Highway No. 111	55.00	43.00	24.52	30.00	30.00	55.00
250	lin. ft. furn. and laying or jacking 30-in. diam. extra str. conc. culv. pipe under So. Pac. Railroad tracks	52.00	43.00	34.25	25.00	35.00	20.00
28	bends fabricating bends in 10-in. diam. irrigation pipe	3.45	4.50	4.95	8.85	6.00	7.50
1	bend fabricating bend in 12-in. diam. irrigation pipe	4.00	8.00	4.95	8.85	8.00	9.00
16	bends fabricating bends in 14-in. diam. irrigation pipe	4.60	8.50	6.75	11.10	9.00	10.50
4	bends fabricating bends in 18-in. diam. 25-ft. head reinf. concrete pipe	13.80	8.75	10.00	17.25	18.00	18.00
4	bends fabricating bends in 20-in. diam. 25-ft. head reinf. concrete pipe	16.00	9.00	18.00	17.25	19.00	20.00
1	bend fabricating bends in 21-in. diam. 25-ft. head reinf. concrete pipe	17.00	12.00	18.00	17.25	19.50	21.00
4	bends fabricating bends in 24-in. diam. 25-ft. head reinf. concrete pipe	19.50	16.00	20.00	21.70	24.00	24.00
1	bend fabricating bends in 27-in. diam. 25-ft. head reinf. concrete pipe	23.00	22.00	21.00	21.70	26.00	27.00
5	bends fabricating bends in 30-in. diam. 25-ft. head reinf. concrete pipe	28.75	27.50	28.00	24.25	28.00	30.00
2	bends fabricating bends in 42-in. diam. 25-ft. head reinf. concrete pipe	40.00	42.00	35.00	24.25	45.00	42.00
29	tees fabricating 12- by 12- by 12-in. tees in irrigation pipe	4.60	6.00	8.40	8.85	8.00	9.00
5	tees fabricating 14- by 14- by 12-in. tees in irrigation pipe	4.60	7.00	9.75	8.85	8.50	9.90
7	tees fabricating 16- by 16- by 12-in. tees in irrigation pipe	4.60	7.00	10.00	8.85	9.00	11.70
1	tee fabricating 18- by 18- by 12-in. tee in 25-ft. head reinf. concrete pipe	17.00	9.00	24.00	10.85	18.00	16.80
1	tee fabricating 20- by 20- by 12-in. tee in 25-ft. head reinf. concrete pipe	17.00	9.00	25.00	10.85	20.00	18.00
1	tee fabricating 21- by 21- by 12-in. tee in 25-ft. head reinf. concrete pipe	17.00	10.00	25.00	10.85	20.50	22.80
2	tees fabricating 24- by 24- by 12-in. tees in 25-ft. head reinf. concrete pipe	23.00	20.00	27.75	13.10	25.00	24.00
1	tee fabricating 30- by 30- by 12-in. tee in 25-ft. head reinf. concrete pipe	29.00	26.00	27.75	13.10	30.00	26.40
17	tapers furn. and laying 10- by 12-in. irrigation pipe tapers	5.75	6.00	10.00	2.80	9.00	7.65
74	tapers furn. and laying 12- by 14-in. irrigation pipe tapers	6.90	7.00	11.50	3.15	10.00	9.00
8	tapers furn. and laying 12- by 16-in. irrigation pipe tapers	7.50	9.00	12.25	3.20	10.50	13.65
5	tapers furn. and laying 14- by 16-in. irrigation pipe tapers	7.50	12.00	12.75	3.80	14.00	10.75
1	taper furn. and lay. 12- by 18-in. 25-ft. head reinf. conc. pipe taper	11.50	11.00	22.00	3.60	16.00	18.85
2	tapers furn. and lay. 14- by 18-in. 25-ft. head reinf. conc. pipe tapers	11.50	11.00	23.00	3.90	17.00	15.50
5	tapers furn. and lay. 16- by 18-in. 25-ft. head reinf. conc. pipe tapers	12.00	14.00	25.00	5.70	18.00	12.50
5	tapers furn. and lay. 16- by 20-in. 25-ft. head reinf. conc. pipe tapers	13.20	17.00	26.00	6.05	20.00	17.95
3	tapers furn. and lay. 18- by 20-in. 25-ft. head reinf. conc. pipe tapers	13.80	18.00	27.00	10.35	23.00	18.75
8	tapers furn. and lay. 18- by 24-in. 25-ft. head reinf. conc. pipe tapers	16.50	20.00	28.00	10.35	30.00	31.00
3	tapers furn. and lay. 20- by 24-in. 25-ft. head reinf. conc. pipe tapers	16.50	18.00	29.00	11.65	31.00	27.00
29	tapers furn. and lay. 21- by 24-in. 25-ft. head reinf. conc. pipe tapers	16.50	20.00	29.00	11.65	32.00	24.60
32	tapers furn. and lay. 24- by 30-in. 25-ft. head reinf. conc. pipe tapers	25.00	28.00	30.00	13.80	35.00	39.75
6	tapers furn. and lay. 27- by 30-in. 25-ft. head reinf. conc. pipe tapers	27.50	28.00	32.00	15.75	36.50	31.80
9	tapers furn. and lay. 30- by 36-in. 25-ft. head reinf. conc. pipe tapers	27.50	35.50	34.00	18.10	42.00	49.00
8	tapers furn. and lay. 36- by 42-in. 25-ft. head reinf. conc. pipe tapers	30.00	38.00	41.00	52.25	50.00	59.00
2	tapers furn. and lay. 42- by 48-in. 25-ft. head reinf. conc. pipe tapers	36.00	39.00	45.00	40.30	55.00	70.00

(Continued on next page)

1 CRAWLER TYPE

- Available in capacities up to 120 Tons
- Travel speed up to 1 M.P.H.
- Requires one operator
- All major operations controlled by air (excluding Type 34)
- Steers from the cab

2 WHEEL TYPE

- Types 34 and 604 available with wheel mounting.
- One engine powers all operations, including travel
- One operator controls all operations from cab
- Rotating assemblies have same basic features as corresponding crawler machines

3 TRUCK TYPE

- Mounted on 10-wheel truck carrier
- Powered by two engines
- Requires two operators
- Can travel up to 31 M.P.H.
- Available only with Type 34 rotating assembly

3 Ways to faster-more efficient Crane Service

LIMA Shovels, Cranes and Draglines are built in the following capacities—Shovels ¾ to 6 yards, cranes to 110 tons and draglines, variable. Rubber-mounted Truck Cranes in 20 and 35 ton capacities.

CRANES—Crawler mounted - truck mounted - wheel mounted - Baldwin-Lima-Hamilton builds them all and in sizes that will best meet your requirements. When mounted on rubber they are available in capacities up to 35 tons. They will go anywhere you can drive a truck and at speeds up to 31 M. P. H.

For work where mobility is not an important factor, LIMA crawler mounted cranes can be furnished in capacities up to 120 tons. To increase their range of usefulness a variety of attachments are available: shovel, dragline, clamshell, pullshovel and pile driver. Each attachment is interchangeable. For faster, more efficient crane service buy the crane that is first in quality—first in safety and reliability—BUY LIMA.

LIMA EQUIPMENT SOLD AND SERVICED BY: **Our Seattle Office:** 1932 First Ave. So., Seattle 4, Wash. **Our San Francisco Office:** 1232 Hearst Bldg., San Francisco 3, Calif.
SALES AGENTS: Cascade Industrial Supply, 515 Market St., Klamath Falls, Ore.; **Contractors' Equipment & Supply Co.,** P. O. Box 456, Albuquerque, N. M.; **Feenaughty Machinery Co.,** 112 S.E. Belmont St., Portland 14, Ore.; **Feenaughty Machinery Co.,** 600 Front St., Boise, Ida.; **H. H. Nielsen Company,** 216 Paxton Ave., Salt Lake City, Utah; **Garfield and Company,** 1232 Hearst Bldg., San Francisco 3, Calif.; **Jameson Engineering Sales,** 573 Dexter Horton Bldg., Seattle, Wash.; **Modern Machinery Co., Inc.,** 4412 Trent Ave., Spokane 2, Wash.; **Smith Booth Usher Co.,** 2001 Santa Fe Ave., Los Angeles 54, Calif.; **Tulsa Equipment Co., Inc.,** 1804 North Lewis St., Tulsa, Oklahoma.

BALDWIN-LIMA-HAMILTON CORPORATION
LIMA-HAMILTON DIVISION
LIMA, OHIO, U. S. A.

LIMA
CRANES • • • SHOVELS • • • DRAGLINES

NEWS of MANUFACTURERS

Continued from page 118

fields of special valve and industrial heat treating furnace production. The present management of R-S Products will be retained in the Smith subsidiary.

☆ ☆ ☆

The *Dallett Co.* of Philadelphia, which was purchased in 1947 by the *Reed Roller Bit Co.*, has been moved to the Cleco Division plant in Houston, Texas, where production of Dallett tools and accessories is now in progress. The combined facilities of the company in Houston cover 42½ acres of land and make use of over 1,000 modern machine tools.

☆ ☆ ☆

The recent purchase of *Johnson Engineering and Sales Corp.* of Rockford, Ill., by the *Porter-Cable Machine Co.* of Syracuse, N. Y., will extend the parent company's line of electric tools to provide a complete selection of portable woodworking machines. All production facilities of Johnson Corp. are being moved to Syracuse under the direction of LLOYD B. BENHAM, vice president and factory manager of Porter-Cable.

☆ ☆ ☆

JOHN SPENCER LITTLEFORD, founder of *Littleford Bros., Inc.*, of Cincinnati, died on November 12 at his home in Fort Thomas, Ky. He was 94 years old. His firm, which has been directed by his sons since he and his brother retired about 20 years ago, is now one of the largest road equipment and steel fabricating plants in the Middle West.

☆ ☆ ☆

WILBUR E. COMBS is the recently-appointed product manager for the L. H. Gilmer division of *United States Rubber Co.* With headquarters in Tacony, Philadelphia, Combs will be responsible for sales of V-belts, shock pads, flat transmission belts, etc.

☆ ☆ ☆

Appointment of WALTER KENNEDY as chief engineer of *United States Plywood's* Technical Division was announced recently. Kennedy will make his headquarters at the Palmer, Mass., office where research and development of Honeycomb and other company products are being expanded.

☆ ☆ ☆

WALTER G. STROMQUIST, 52, vice-president and general sales manager for *Masonite Corporation*, died of a heart attack January 1. He joined Masonite in 1937 as assistant sales manager, and became vice-president and general sales manager in 1947.

☆ ☆ ☆

Fruehauf Trailer Co. announces the election of two vice presidents. L. C. ALLMAN has become executive vice president after

Continued on page 122

2	tapers furn. and lay 48- by 54-in. 25-ft. head reinf. conc. pipe tapers	40.00	48.00	50.00	70.25	59.00	80.00
2	tapers furn. and lay. 54- by 60-in. 25-ft. head reinf. conc. pipe tapers	50.00	52.00	58.00	81.40	65.00	92.00
31	joints install type "A" expansion jts. in 12-in. diam std. concrete irrigation pipe	3.00	7.50	10.00	4.65	10.00	18.00
8	joints install. type "A" expansion jts. in 14-in. diam std. concrete irrigation pipe	3.00	8.50	12.00	4.75	11.00	21.00
7	joints instal. type "A" expansion jts. in 16-in. diam. std. concrete irrigation pipe	3.00	9.50	13.00	6.65	11.50	24.00
31	joints instal. type "B" expansion jts. in 12-in. diam. std. concrete irrigation pipe	3.00	7.50	10.00	2.00	8.00	12.00
8	joints instal. type "B" expansion jts. in 14-in. diam. std. concrete irrigation pipe	3.00	8.00	12.00	2.00	9.00	14.00
7	joints instal. type "B" expansion jts. in 16-in. diam. std. concrete irrigation pipe	3.00	10.00	13.00	2.85	9.50	16.00
31	joints instal. type "C" expansion jts. in 12-in. diam. std. concrete irrigation pipe	3.00	7.00	15.00	3.55	10.00	18.00
8	joints instal. type "C" expansion jts. in 14-in. diam. std. concrete irrigation pipe	3.00	8.00	17.00	3.70	11.00	21.00
7	joints instal. type "C" expansion jts. in 16-in. diam. std. concrete irrigation pipe	3.00	9.00	18.00	4.95	11.50	24.00
1	unit 10-in. diam. collared contraction jt. at struct.	10.00	16.00	17.00	9.60	10.00	10.00
9	units 12-in. diam. collared contraction jts. at structs.	10.00	16.00	17.00	9.65	12.00	12.00
3	units 14-in. diam. collared contraction jts. at structs.	12.00	16.00	17.00	10.00	12.50	14.00
1	unit 16-in. diam. collared contraction jt. at struct.	15.00	16.00	18.00	10.05	13.50	16.00
6	units 18-in. diam. collared contraction jts. at structs.	15.00	16.00	19.00	13.35	16.00	18.00
6	units 20-in. diam. collared contraction jts. at structs.	16.00	17.50	20.00	13.75	18.00	20.00
2	units 21-in. diam. collared contraction jts. at structs.	18.00	20.00	20.00	14.60	18.50	21.00
4	units 24-in. diam. collared contraction jts. at structs.	20.00	21.00	22.00	21.55	21.00	24.00
1	unit 27-in. diam. collared contraction jt. at struct.	20.00	23.00	24.25	22.85	25.00	27.00
4	units 30-in. diam. collared contraction jts. at structs.	25.00	27.00	26.50	24.25	28.00	30.00
1	unit 36-in. diam. collared contraction jt. at struct.	30.00	30.00	30.00	26.60	35.00	36.00
2	units 42-in. diam. collared contraction jts. at structs.	35.00	34.00	35.00	30.10	46.00	42.00
1	unit 60-in. diam. collared contraction jt. at struct.	50.00	51.00	50.00	47.00	75.00	60.00
9	units 12-in. diam. flexible conn. and contr. jts. at structs.	10.00	7.50	17.00	8.35	12.00	24.00
4	units 15-in. diam. flexible conn. and contr. jts. at structs.	15.00	8.50	17.00	9.85	14.00	30.00
6	units 18-in. diam. flexible conn. and contr. jts. at structs.	15.00	9.00	19.00	12.85	18.50	36.00
8	units 21-in. diam. flexible conn. and contr. jts. at structs.	18.00	12.00	20.00	12.85	20.00	42.00
4	units 24-in. diam. flexible conn. and contr. jts. at structs.	20.00	13.00	22.00	13.00	24.00	48.00
1	unit 27-in. diam. flexible conn. and contr. jt. at struct.	20.00	14.00	24.25	13.65	27.50	54.00
4	units 30-in. diam. flexible conn. and contr. jts. at structs.	25.00	17.50	26.50	19.00	30.00	60.00
1	unit 36-in. diam. flexible conn. and contr. jt. at struct.	30.00	19.00	30.00	19.35	38.00	72.00
2	units 42-in. diam. flexible conn. and contr. jts. at structs.	35.00	23.00	35.00	22.65	46.00	84.00
1	unit 60-in. diam. flexible conn. and contr. jt. at struct.	50.00	32.00	50.00	27.70	75.00	120.00
14	units installing 10-in. diam. line meter tubes and heads	23.00	23.00	22.00	10.65	18.00	20.00
7	units installing 14-in. diam. line meter tubes and heads	23.00	25.00	26.00	11.20	28.00	26.00
1	unit installing 18-in. diam. line meter tube and head	28.75	38.00	38.00	16.00	35.00	32.00
2	units installing 20-in. diam. line meter tubes and heads	28.75	42.00	42.00	16.00	40.00	35.00
1	unit installing 24-in. diam. line meter tube and head	31.50	43.00	44.00	19.20	49.00	41.00
2	units installing 30-in. diam. line meter tubes and heads	34.50	48.00	48.00	26.70	60.00	50.00
1	unit installing 42-in. diam line meter tube and head	50.00	54.00	55.00	27.75	85.00	68.00
1,700	lb. installing gates and gate hoists	.25	.22	.21	.40	.25	.25
90	valves installing 8-in. diam. gate valve with bellmouth	11.50	10.00	10.00	9.35	12.00	15.00
5	valves installing 12-in. diam. hub-end gate valves	17.25	15.00	14.00	17.70	15.00	20.00
650	lb. furn. and installing miscel. metalwork	.50	1.95	.45	.45	.40	.50

Earthwork and Concrete Lining on Columbia Basin Main Canal

Washington—Columbia Basin Project—Bureau of Reclamation. J. A. Terteling and Sons, Inc., Boise, Idaho, was low bidder for earthwork and concrete lining of the Main Canal, Columbia Basin Project, stations 255 to 326. Unit bids were as follows:

(1) J. A. Terteling and Sons, Inc. $1,043,274
(2) Morrison-Knudsen Co., Inc. 1,047,440
(3) Winston Brothers Co. 1,285,880
(4) Peter Kiewit Sons' Co. $1,344,628
(5) Western Contracting Corp. 1,656,576
(6) Engineer's estimate 1,002,869

		(1)	(2)	(3)	(4)	(5)	(6)
606,000	cu. yd. excavation for canal	1.05	1.02	1.30	1.26	1.17	.95
145,000	cu. yd. excavation from borrow pits	.30	.28	.40	.49	.26	.40
58,000	mi. cu. yd. overhaul	.38	.30	.25	.40	.54	.30
110,000	cu. yd. compacting embankments	.175	.25	.35	.50	.16	.30
69,500	sq. yd. preparing rock foundation for conc. lining	1.11	1.10	1.30	1.50	3.60	1.25
7,700	sq. yd. trimming earth foundtns. for conc. lining	.59	1.10	1.30	1.50	1.40	.60
11,520	cu. yd. conc. in unreinf. conc. canal lining	12.00	14.50	17.00	20.00	42.00	12.00
17,300	bbl. furn. and handling cement	5.85	5.10	4.90	4.60	6.50	5.00
1,150	cu. yd. furn. and placing rock fill	.73	3.00	5.00	5.00	3.00	2.00
360	lb. furn. and placing ladder rungs	.59	.50	1.00	.80	.60	.65

Bridge and Grade Separation . . .

Superstructure for Steel Truss and Girder Span Railroad Bridge

Oregon—Lane County—Corp of Engineers. Lee Hoffman, Portland, with a bid of $677,600, was low before the Corps of Engineers for fabrication and erection of the superstructure for a steel truss and girder span railroad bridge at the upper crossing of the Middle Fork, Willamette river. Unit bids were submitted as follows:

(1) Lee Hoffman $677,600
(2) Consolidated Western Steel Corp. 746,900
(3) Contracting Officer's Estimate $642,810

		(1)	(2)	(3)
2,800,000	lb. structural steel, in place	.2395	.265	.2287
700	cu. yd. rock fill matl. for protection at base of falsework piers and bents	10.00	7.00	3.50

Reinforced Concrete Bridge

California—Kings County—Division of Highways. Charles S. Moore and Robert R. Murdock, Oakland, with a bid of $67,255, were low before the state Division of Highways for constructing a reinforced concrete bridge across Kings River about eight miles north of Hanford. Unit bids were submitted as follows:

(1) Charles S. Moore and Robert R. Murdock $67,255
(2) Thomas Construction Co. 68,191
(3) Tomblin Co. 69,894
(4) Anderson Co. 71,125
(5) E. G. Perham $72,524
— E. H. Peterson & Son 77,222
— J. E. Haddock, Ltd. 77,532
— Trewhitt-Shields & Fisher 79,524
— G. M. Carr & Bati Rocca 83,201

		(1)	(2)	(3)	(4)	(5)
Lump sum,	remove existing bridge	$2,500	$5,800	$3,400	$4.500	$4,000
560	cu. yd. Cl. "A" P.C.C.	45.00	42.00	44.00	48.00	52.00
9,240	lb. misc. steel	.35	.39	.32	.30	.35

(Continued on next page)

Made to get the mix where the profits start

You can't make money on a batch of ready-mix concrete unless it reaches the job in good shape.

That's why *more and more* operators have International Trucks working for them. They know they can depend on Internationals to come through even when the going is toughest. More miles of trouble-free performance with Internationals on the job mean better service, more profit. Here's why:

Heavy-duty engineered stamina

Every new International Truck is heavy-duty engineered for extra toughness.

This means that extra stamina is built into every truck part. You can depend on trouble-free performance and longer truck life. It's the big reason why Internationals have been first in heavy-duty truck sales for 18 straight years. But that's not all . . .

You get a new kind of comfort

Drivers helped design the new easy-riding Comfo-Vision Cab and you'll be glad they did.

You get more head room, leg room, and foot room in the easy-riding, "roomiest cab on the road." You get road-commanding, full-front visibility through the one-piece, curved Sweepsight windshield. You get a fully adjustable seat with "posturized" cushions.

And when you slip behind the wheel, you'll find a new ease of handling. Super-steering and Super-maneuverability give you more positive control from a more comfortable position and enable you to turn in the shortest *practical* circles.

See for yourself NOW

The world's most complete line of trucks offers you the right model for your job. Ask your nearest International Truck Dealer or Branch for information.

International Harvester Builds
McCormick Farm Equipment and Farmall Tractors
Motor Trucks . . . Industrial Power
Refrigerators and Freezers

Heavy-Duty Engineered

INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY CHICAGO

NEWS of MANUFACTURERS

Continued from page 120

having served for over 10 years as vice president of the organization. C. L. SCHNEIDER has been named vice president in charge of sales, with headquarters at the company's main office in Detroit.

☆ ☆ ☆

JAMES R. HITT becomes manager of the factory branch of the *Trailmobile Company* in Newark, N. J. He was sales representative for the company in the Chicago area.

☆ ☆ ☆

A. E. MCINTYRE has been elected president, and WALTER TAYLOR vice-president of *Malsbary Manufacturing Co.*, 845 Ninety-second Ave., Oakland, Calif., steam cleaning equipment manufacturers. McIntyre has served as general manager since 1949, and Taylor is Malsbary plant manager.

☆ ☆ ☆

A subsidiary of *Pullman Incorporated*, the *Pullman-Standard Car Manufacturing Co.*, entered the tractor allied equipment field on December 29, 1950. Pullman-Standard purchased the entire tractor allied equipment business of *Isaacson Iron Works*, with plants in Seattle, Wash., and Rockford, Ill.

3,960 lin. ft. furn. conc. piling	3.75	4.30	3.50	3.75	3.50
88 ea. driving conc. piles	105.00	71.50	137.00	90.00	80.00
96,000 lb. bar reinf. steel	.10	.095	.10	.105	.12
746 lin. ft. corr. metal bridge railing	3.50	3.75	4.50	5.50	5.00
2 ea. clearance markers	10.00	15.00	12.00	10.00	10.00

Five Reinforced Concrete Grade Separation Bridges on Harbor Freeway in Los Angeles

California—Los Angeles County—State. Winston Bros. Co., Monrovia, with a low bid of $956,067, was awarded a contract by the California Division of Highways for construction of five reinforced concrete bridges for overcrossings and two pedestrian undercrossings, and grading and surfacing of various adjacent roadways and streets on the Harbor Freeway at 5th and 6th Sts., Los Angeles. Unit Bids were as follows:

(1) Winston Bros.	$ 956,067	— Guy F. Atkinson	$1,086,821
(2) Webb & White	999,940	— W. J. Disteli & R. J. Daum Construction Co.	1,097,168
(3) Granite Construction Co.	1,003,838	— United Concrete Pipe Corp & Ralph A. Bell	1,105,030
(4) Charles MacClosky Co. & C. G. Willis & Sons	1,038,350	— Carlo Bongiovanni	1,133,425
(5) J. E. Haddock, Ltd.	1,051,065		
— MacDonald & Kruse	1,070,459		

	(1)	(2)	(3)	(4)	(5)
4,700 cu. yd. removing concrete	2.30	3.00	1.75	3.00	4.00
Lump sum, clearing and grubbing	$5,000	$10,000	$2,000	$7,400	$10,000
190,000 cu. yd. roadway excav.	.62	.70	.60	.74	.78
16,700 cu. yd. struct. excav. (bridges)	1.00	2.00	2.00	2.25	2.15
14,700 cu. yd. struct. backfill (bridges)	1.85	2.00	2.00	1.60	2.00
4,330 cu. yd. struct. excav.	2.80	3.00	3.00	3.00	2.30
250 cu. yd. ditch and channel excav.	1.00	1.00	2.00	2.00	1.00
4,800 ton I. B. M.	1.85	1.50	1.25	2.20	2.00
Lump sum, dev. water supply and furn. watering equip.	450.00	$1,000	750.00	75.00	$1,500
800 M. gal. applying water	1.50	1.50	1.50	2.00	1.50
Lump sum, finishing roadway	900.00	$1,000	$1,400	$1,000	350.00
500 ton mineral aggregate (P.M.S.)	4.00	4.50	3.50	5.00	6.25
28 ton paving asphalt (P.M.S.)	15.00	4.50	15.00	20.00	6.25
13 ton liquid asphalt SC-2 (pr. ct.)	24.00	30.00	30.00	50.00	35.00
6 ton asphalt emuls. (sl. ct. and pt. brd.)	40.00	40.00	40.00	60.00	50.00
60 ton sand (sl. ct.)	5.20	3.00	4.00	10.00	4.70
4,650 ton asph. conc.	4.60	4.50	4.50	5.00	4.40
55 cu. yd. P.C.C. (pavement)	18.00	16.00	20.00	24.00	18.50
10,030 cu. yd. Cl. "A" P.C.C. (struct.)	42.00	42.00	46.00	45.00	46.00
1,440 lin. ft. rubber waterstops	2.00	2.50	3.00	4.00	2.10
500 cu. yd. P.C.C. (curbs, gutters and sidewalks)	30.00	30.00	22.00	30.00	28.00
2,029,000 lb. bar reinf. steel	.095	.09	.09	.09	.09
35,040 lb. misc. iron and steel	.33	.33	.30	.35	.34
360 lin. ft. metal stair treads	2.00	2.00	3.00	3.00	2.00
3,543 lin. ft. steel bridge railing	6.25	7.00	8.00	7.00	6.50
330 lin. ft. steel skid rail	6.25	7.25	8.00	7.00	7.00
425 lin. ft. ornamental iron railing	16.00	17.00	16.00	18.00	16.00
185 lin. ft. stair railing (pedestrian undercross.)	6.00	6.00	6.00	6.00	5.80
160 lin. ft. timber guard railing	2.80	2.50	2.00	4.00	1.70
325 lin. ft. portable timber guard rail	2.80	3.50	3.00	4.00	3.30
2,300 lin. ft. chain link fence	2.30	2.20	2.25	2.00	2.40
430 lin. ft. remov. and reconstruct. chain link fence	.40	1.00	.50	1.00	1.10
430 lin. ft. removing and salv. chain link fence	.90	.40	1.00	.40	.40
2 ea. drive gates	70.00	125.00	75.00	150.00	110.00
22 lin. ft. 4-in. cast iron pipe	2.20	3.00	2.00	10.00	3.00
252 lin. ft. 4-in. asbestos-cement drain pipe	1.30	2.00	2.50	2.00	2.50
52 lin. ft. 16-in. welded steel pipe (16 ga.)	2.00	10.00	4.00	8.00	4.00
70 lin. ft. 6-in. vitrified clay sewer pipe (std. str.)	7.50	7.50	5.00	4.50	12.00
640 lin. ft. 8-in. vitrified clay sewer pipe (extra str.)	8.00	12.00	5.00	5.50	6.70
5 ea. manholes (sanitary sewer)	550.00	500.00	300.00	250.00	450.00
1 ea. drop manhole (sanitary sewer)	550.00	500.00	450.00	300.00	600.00
3 ea. house sewer connection caps	17.00	40.00	20.00	10.00	25.00
3 ea. adjust. manholes to grade (sanitary sewer)	27.00	80.00	15.00	25.00	30.00
70 lin. ft. 8-in. non-reinf. conc. drain. pipe	1.40	6.00	1.00	6.00	1.30
580 lin. ft. 12-in. R.C.P.	3.20	7.00	6.00	6.00	3.00
380 lin. ft. 15-in. R.C.P.	4.10	8.00	10.00	6.00	3.80
10 lin. ft. 18-in. R.C.P.	5.00	9.00	6.00	7.00	4.50
260 lin. ft. 24-in. R.C.P.	7.00	10.00	10.00	8.00	6.00
144 lin. ft. 33-in. R.C.P.	12.00	15.00	20.00	17.00	10.00
40 lin. ft. pipe shaft manholes (storm drain)	14.00	15.00	20.00	15.00	15.00
330 sq. yd. membrane waterproofing	2.60	3.00	2.00	5.00	2.60
Lump sum, wash. equip. (pedestrian undercross.)	360.00	750.00	$1,000	800.00	650.00
Lump sum, electrical equipment	$27,000	$26,292	$30,000	$27,335	$28,000

Highway and Street . . .

Bituminous Surfacing and Stabilization

Colorado—Larimer and Grand Counties—Bureau of Public Roads. Northwestern Engineering Co., Denver, with a bid of $489,955, was low before the Bureau of Public Roads for bituminous surfacing and stabilization of Trail Ridge Road, Colo. Unit bids were as follows:

(1) Northwestern Engineering Co.	$489,955	(5) Western Pavement Construction Co.	$508,115
(2) Brown Construction Co.	493,424	— Lowdermilk Bros.	532,395
(3) Inland Construction Co.	494,355	— Peter Kiewit Sons' Co.	549,950
(4) Colorado Construction, Inc.	499,210	(6) Engineer's Estimate	395,075

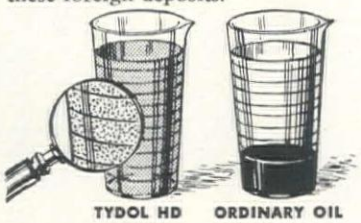
	(1)	(2)	(3)	(4)	(5)	(6)
50,000 cu. yd. unclassified excavation	1.25	1.50	.83	1.50	2.60	1.00
2,200 cu. yd. unclass. excav. for structs.	5.00	4.00	4.50	6.00	4.00	4.00
260,000 sta. yd. overhaul (1,000-ft. free haul)	.03	.02	.015	.03	.02	.02
900 unit watering of embankment, Item 29	2.00	1.00	2.00	2.00	2.00	2.00
1,000 unit watering of base course, Item 52A	2.00	1.00	2.00	2.00	2.00	2.00
250 hr. rolling of embankment, Item 29	10.00	10.00	11.00	10.00	14.00	6.00
270 hr. rolling of base course, Item 52A	10.00	7.00	11.00	10.00	8.00	7.00
14,000 ton selected borrow for subgrade	2.00	1.50	2.75	2.00	1.70	1.50
33,200 ton cr. grav. or cr. st. base crse, Cl. 1, grading C	2.40	2.50	2.91	2.20	2.10	2.25
97,000 gal. M.C. cutback asph., grade 0 or 1, for pr. coat	.25	.20	.23	.25	.15	.18
1,700 ton cover aggre. for Type 3 seal ct., grading B	7.50	10.00	10.00	7.00	6.00	6.00
58,000 gal. R.C. cutback asph., grade 2, 3, or 4, for seal coat	.25	.22	.26	.20	.20	.18
18,000 ton (Cl. F pavement, Type F-1) plant mixture, grading B	6.25	8.00	5.95	7.00	6.00	5.40
870 ton asph., grade 200-300, for Type F-1	40.00	30.00	43.75	35.00	35.00	35.00
8 cu. yd. concrete, Class A	100.00	100.00	120.00	100.00	60.00	100.00
2,500 lb. reinforcing steel	.25	.20	.30	.22	.17	.14
18,000 lb. structural steel—furn. fabr. and erect.	.40	.20	.30	.37	.25	.30

(Continued on next page)

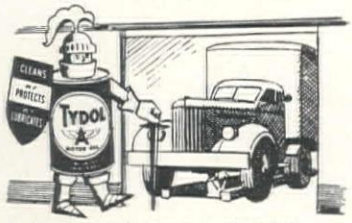
HERE'S ROAD-TEST PROOF! After 31,000 miles of rugged light truck duty, the piston at left—lubricated with engine-cleaning Tydol HD—is free from sludge, varnish, carbon and corrosion. The badly-fouled piston at right—lubricated with a well-known competitive oil—was tested under identical conditions.

HERE'S WHY TYDOL HD KEEPS ENGINES SO CLEAN

1. Rich in potent detergent additives, Tydol HD quickly loosens sludge (gum, varnish, carbon) from moving parts . . . actively disperses these foreign deposits.



2. Tydol HD holds sludge particles harmlessly in suspension where they cannot cause wear. With ordinary oils, sludge settles onto valves and pistons; soon hardens.



3. When Tydol HD is drained, out goes sludge, too . . . because it's suspended in the oil. Valves, pistons and rings stay free and clean because Tydol HD gets rid of sludge that other oils can't budge.

TYDOL HD DRIVES ENGINE SLUDGE OUT

Cuts Repair Costs!

Power goes up . . . repair costs go down when you safeguard your engines with Heavy Duty Tydols. These amazing HD oils *keep engines cleaner* than any other oil; protect better against wear! Try them. See for yourself how every quart . . . every drop *cleans* as it *protects* as it *lubricates;* gets *three* jobs done—*not* just one!

3 GREAT TYDOLS TO CHOOSE FROM

TYDOL HD—Heavy Duty oil for high-speed gasoline, butane, diesel-fueled engines in automobiles, busses, trucks, tractors and stationary units under normal conditions. SAE grades 10, 20, 30, 40, 50. Sold in cans and drums.

TYDOL HD S-1—Higher detergency level than Tydol HD. For every type of engine subjected to frequent and continued over-loading. For engines in delivery service making many stops and starts. SAE grades 20, 30, 40. In drums.

TYDOL HD S-2—Highest detergency level of the HD series. For high performance super-charged engines using all types of diesel fuels, under the most extreme operating conditions. SAE grade 30. Sold in drums.

Rely on your Associated Representative for expert help on any lubrication problem.

© TWA CO.

TYDOL HD
Compounded Motor Oil

TIDE WATER ASSOCIATED OIL COMPANY

For the best in basketball sportcasts, Play Ball with Associated!

210 cu. yd. cement rubble masonry	50.00	50.00	80.00	75.00	30.00	50.00
120 lin. ft. 12-in. C.G.S.M. culvert pipe	4.00	3.00	4.00	4.00	4.00	2.50
130 lin. ft. 24-in. C.G.S.M. culvert pipe	7.00	6.00	8.00	7.00	7.00	6.00
100 cu. yd. hand-laid rock embankment	15.00	30.00	31.00	25.00	12.00	6.00
700 sq. ft. metal cribbing	7.00	4.00	10.00	6.00	6.00	6.00
6,000 lin. ft. 8-in. perf. C.G.S.M.P. underdrain	6.00	6.00	6.25	6.00	7.00	4.00
70 sq. yd. grouted rubble gutter	10.00	10.00	12.00	10.00	4.00	6.00
80 ea. timber guide posts with warning reflectors (treated)	6.00	10.00	7.50	6.00	6.00	6.00
40,000 sq. ft. cutting, lifting, and placing sod	.30	.20	.31	.20	.25	.15
300 lin. ft. stone barriers	4.00	5.00	3.60	2.00	2.00	2.00
2,670 lin. ft. walls	4.00	.20	1.00	2.00	4.00	1.50

Grading, Draining and Crushed Gravel Base Course

Wyoming—Goshen County—State. Hopkins & McPherson, Inc., Laramie, Wyo., was low bidder and awarded the contract for grading, draining, base course surfacing, and misc. structures on 11 mi. of the Huntley-Table Mountain Road. Unit bids were as follows:

(1) Hopkins & McPherson, Inc. $231,473
(2) Read Construction Co. 266,409
(3) Northwestern Engineering Co. 278,492
(4) Big Horn Construction Co. 289,950
(5) J. H. and N. M. Monaghan & Associates $291,411
(6) Inland Construction Co. 292,415

	(1)	(2)	(3)	(4)	(5)	(6)
242,000 cu. yd. excavation	.17	.18	.24	.25	.285	.26
54,000 cu. yd. excavation (selected embankment)	.33	.35	.32	.45	.32	.35
234,000 cu. yd. sta. overhaul	.01	.01	.01	.01	.01	.01
251,000 cu. yd. mi. yard mile haul	.10	.14	.12	.12	.09	.13
3,300 M. gal. watering (emb.)	1.30	1.50	1.50	1.00	1.25	1.30
470 hr. sheepsfoot roller operation	9.00	10.00	10.00	8.00	10.00	10.50
200 hr. pneumatic tired roller operation	4.00	6.00	7.00	5.00	6.50	6.00
180 hr. smooth steel roller operation	6.00	6.00	7.00	8.00	7.00	8.00
58 lin. ft. 12-in. C.M.P.	2.50	2.50	2.50	2.50	2.65	2.40
2,810 lin. ft. 18-in. C.M.P.	3.10	4.00	3.25	4.00	3.50	3.20
508 lin. ft. 24-in. C.M.P.	4.75	6.00	4.50	6.00	4.90	5.00
266 lin. ft. 36-in. C.M.P.	8.50	10.00	7.75	10.00	8.75	10.00
64 lin. ft. 42-in. C.M.P.	12.00	13.00	12.00	12.00	11.65	13.00
60 lin. ft. 48-in. C.M.P.	13.00	15.00	14.00	16.00	13.95	17.00
180 lin. ft. 60-in. C.M.P.	16.00	21.00	18.00	21.00	18.00	21.00
460 lin. ft. 22-in. x 13-in. C.M.P. arch culvert	3.60	4.00	4.00	5.00	4.30	4.00
28 lin. ft. 29-in. x 18-in. C.M.P. arch culvert	4.50	5.00	4.50	10.00	5.20	5.00
60 lin. ft. 36-in. x 22-in. C.M.P. arch culvert	6.00	7.00	6.50	7.00	7.50	7.30
142 lin. ft. 50-in. x 31-in. C.M.P. arch culvert	12.00	13.00	10.50	12.00	12.25	13.00
62 lin. ft. 58-in. x 36-in. C.M.P. arch culvert	13.50	15.00	14.00	15.00	16.50	16.00
178 lin. ft. 65-in. x 40-in. C.M.P. arch culvert	18.00	19.00	18.00	20.00	20.00	20.00
220 lin. ft. 12-in. std. R.C.P.	2.80	3.00	4.00	3.00	3.20	2.50
150.5 lin. ft. 18-in. siphon R.C.P.	8.00	7.00	8.00	8.00	9.30	6.70
102 lin. ft. 24-in. std. R.C.P.	6.50	6.00	8.00	7.00	6.70	5.70
136 lin. ft. 30-in. std. R.C.P.	8.80	9.00	10.00	10.00	9.95	8.80
72 lin. ft. 36-in. std. R.C.P.	12.00	12.00	12.00	12.00	12.80	11.30
146 lin. ft. 8-in. welded steel pipe	2.00	2.50	4.00	3.00	3.85	3.80
30 lin. ft. 14-in. welded steel pipe	4.00	5.00	5.00	6.00	4.95	5.20
154 lin. ft. relaying pipe	1.00	2.00	2.00	2.00	2.50	1.30
750 cu. yd. excav. for pipe culverts	1.50	2.50	2.00	2.00	2.00	3.00
970 cu. yd. structure excav.	2.00	3.50	3.00	3.00	2.25	3.30
2,000 cu. yd. special backfill	.80	1.70	2.00	2.00	2.00	2.00
815 sq. yd. stabilized sand cement paving	3.50	3.30	5.00	4.00	5.00	5.00
260 cu. yd. Class 1 rip-rap	12.00	16.00	10.00	15.00	10.00	14.00
80.5 cu. yd. Class C concrete	52.00	65.00	45.00	55.00	52.00	80.00
314.9 cu. yd. Class B concrete	45.00	46.00	50.00	45.00	52.00	46.00
31,810 lb. reinforcing steel	.12	.13	.13	.12	.115	.155
610 lb. structural steel	.30	.50	.50	.35	.60	.26
1,862 lin. ft. treated timber piling	2.50	2.35	2.50	2.00	2.80	2.50
56.415 M.B.M. treated timber	260.00	300.00	300.00	275.00	300.00	350.00
425 lin. ft. metal plate guard rail	3.00	3.50	3.50	3.00	3.00	2.80
1 ea. test pile	150.00	200.00	200.00	250.00	200.00	200.00
540 hr. mechanical tamping	5.00	6.00	6.00	8.00	5.50	8.00
Lump sum, removing and resetting flume	100.00	150.00	150.00	400.00	75.00	250.00
Lump sum, removing existing structures	600.00	600.00	$2,500	$1,000	$4,800	$2,300
22,700 ton crushed gravel base crse. (1-in. max.)	.55	.61	.70	.90	1.00	.80
331,000 ton mile haul of surfacing matl.	.06	.065	.07	.07	.07	.065
3,400 cu. yd. binder	.60	.70	1.00	.90	.75	.40
4,200 cu. yd. mi. haul of binder	.20	.20	.20	.20	.10	.20
520 M. gal. watering (base)	1.30	2.00	2.00	1.00	1.50	1.30
220 hr. roller operation	4.00	6.00	7.00	6.00	7.00	6.50
39,000 lin. ft. std. r/w fence	.14	.16	.17	.16	.18	.13
5,800 lin. ft. Type A r/w fence	.22	.21	.30	.22	.28	.21
95 ea. brace panels	8.00	9.00	12.00	11.00	8.50	10.00
115 ea. end panels	10.00	11.00	10.00	14.00	11.50	13.00
65 ea. r/w markers	7.00	6.00	10.00	10.00	10.00	13.00
1 ea. R. C. project markers	30.00	35.00	25.00	25.00	30.00	25.00
0.3 mi. detour obliteration	50.00	300.00	300.00	500.00	500.00	250.00
1 ea. cattleguard (prefabricated)	250.00	200.00	200.00	250.00	500.00	220.00
1 ea. prov. and maint. field test. lab. bldg.	400.00	250.00	250.00	400.00	500.00	200.00

Grading, Drainage, Asphaltic Concrete Paving and Reinforced Concrete Bridges

Oregon—Douglas County—State. Roy L. Houck & Son, Salem, with a low bid of $440,230, was awarded a contract by the Oregon State Highway Department for grading, paving and structures on the Canyonville section of the Pacific highway. Unit bids were as follows:

(1) Roy L. Houck & Son $440,230
(2) R. A. Heintz Construction Co. 449,096
(3) McNutt Bros. 507,596
(4) Vernie Jarl 511,994
(5) Halvorson Construction Co. 521,733
— Berke Bros. 534,423
— Kuckenberg Construction Co. $538,465
— E. L. Gates & Co. 541,548
— Leonard & Slate, Oregon Ltd. 550,767
— J. N. & M. J. Conley 576,679
— Nat McDougall Co. 623,737
— C. J. Montag & Sons 763,169

	(1)	(2)	(3)	(4)	(5)
18 acre clearing and cleaning-up, Sta. 65+00 to 93+50	300.00	500.00	625.00	500.00	500.00
7 acre grubbing, Sta. 65+00 to 93+50	250.00	450.00	300.00	400.00	400.00
1 acre extra clearing	350.00	500.00	$1,000	500.00	400.00
1 acre extra grubbing	250.00	500.00	500.00	400.00	400 00
100 sq. ft. felling danger trees	5.00	5.00	5.00	5.00	8.00
1,200 cu. yd. structural excav., unclassified	3.00	4.00	5.00	4.00	3.00
180 cu. yd. trench excav., unclassified	2.50	1.50	3.00	3.00	3.00
112,000 cu. yd. general excav., location "A", unclassified	.25	.28	.35	.30	.30
220,000 cu. yd. general excav., location "B", unclassified	.701	.85	.70	.85	.84
807,000 yd. sta. short overhaul	.01	.01	.015	.015	.02
21,000 cu. yd. sta. long overhaul	.40	.40	.50	.40	.45
1.85 mile finishing roadbed and slopes	500.00	500.00	$1,000	$1,000	600.00

(Continued on next page)

7,900 lin. ft. rounding cutbanks	.15	15.00	.20	.10	.20
4,100 cu. yd. excavating and placing topsoil	.50	1.00	2.00	1.00	2.00
8 acre preparing soil and seeding	50.00	200.00	75.00	100.00	100.00
200 lb. grass seed, chewing fescue	.77	1.00	.75	1.00	1.00
200 lb. grass seed, common rye	.11	.20	.12	50	.50
80 lb. grass seed, alta fescue	.50	.75	.75	1.00	1.00
40 cwt. inorganic fertilizer	3.50	4.00	6.00	3.90	7.00
230 lin. ft. 18-in. extra str. corru. metal pipe, protected invert	4.80	4.84	5.70	4.00	4.75
80 lin. ft. 6-in. metal drain pipe, coated	1.50	1.70	1.80	2.00	2.00
440 lin. ft. 6-in. perf. metal drain pipe, coated	1.55	1.75	1.85	2.00	2.00
150 lin. ft. 8-in. metal drain pipe, coated	1.95	2.10	2.55	2.00	2.50
1,200 lin. ft. 18-in. concrete pipe	3.45	3.60	3.65	4.00	4.50
530 lin. ft. 24-in. concrete pipe	4.85	4.85	5.20	6.00	6.00
170 lin. ft. 30-in. concrete pipe	5.60	6.20	7.10	8.00	6.50
110 lin. ft. 36-in. concrete pipe	9.20	9.25	9.85	10.00	10.00
240 lin. ft. 8-in. sewer pipe	1.00	.90	1.15	2.00	1.25
90 cu. yd. ¾-in. - 0 backfill in drains	3.00	5.50	6.00	5.00	6.00
1 only Type "B" special manhole	500.00	225.00	300.00	300.00	382.00
6 only concrete catch basins	55.00	75.00	105.00	50.00	147.00
1 only special concrete catch basin	100.00	85.00	90.00	75.00	259.00
550 cu. yd. excavation for bridges	3.00	5.00	5.00	6.00	7.00
10 cu. yd. excav. below eleva. shown	20.00	15.00	10.00	10.00	10.00
75 cu. yd. Cl. "A" conc. for miscl. structs.	50.00	65.00	75.00	56.00	62.00
640 cu. yd. Cl. "A" conc. for bridges	55.00	62.00	60.00	57.50	65.00
9,500 lb. metal reinf. for miscl. structs.	.105	.11	.14	.135	.12
160,000 lb. metal reinf. for bridges	.105	.11	.12	.125	.12
400 lin. ft. handrail	10.00	12.00	12.00	13.00	9.00
1 only 30-in. drain gate	200.00	200.00	200.00	200.00	250.00
18 cu. yd. concrete curbs	40.00	50.00	60.00	60.00	65.00
280 cu. yd. concrete median strip	35.00	50.00	60.00	43.00	45.00
2 only recesses for traffic control markers	5.00	50.00	5.00	25.00	6.00
60 only concrete sight posts	12.00	11.00	11.50	10.00	10.00
6,600 cu. yd. additional ¾-in. - 0 gravel in key course	2.35	2.30	1.90	2.30	2.40
10,200 cu. yd. ¾-in. - 0 gravel in leveling course and shoulders	2.35	2.30	2.85	2.30	2.40
1,200 M. gal. sprinkling	2.50	2.00	2.00	2.00	2.00
1.85 mi. preparation of base	300.00	275.00	200.00	275.00	300.00
550 cu. yd. ¾-in. - 0 gravel in binder course	4.00	3.50	3.65	3.60	4.50
90 ton furn. and placing RC-3 asphalt	40.00	50.00	50.00	50.00	50.00
10,300 ton Class "B" asphaltic concrete	7.00	6.85	6.75	6.85	7.00
50 ton RS-1 emulsified asphalt	42.00	51.00	50.00	51.00	60.00
300 cu. yd. aggregate in seal coat	4.00	4.50	3.65	3.60	5.50
240 lin. ft. asphaltic conc. traffic markers	1.00	1.00	1.00	2.00	2.00
1,410 cu. yd. 1¼-in. - ¾-in. cr. gravel in stockpile	1.60	1.60	3.30	2.30	1.65
1,060 cu. yd. ¾-in. - ½-in. cr. gravel in stockpile	1.60	1.60	3.30	2.30	1.65
2,780 cu. yd. ½-in. - ¼-in. cr. gravel in stockpile	1.60	1.60	3.30	2.30	1.65
650 cu. yd. ¼-in. No. 10 cr. gravel in stockpile	1.60	1.60	3.30	2.30	2.25
18,400 yd. mi. hauling cr. gravel, pile measure	.12	.15	.20	.12	.15

Widening and Paving Bayshore Highway South of San Francisco

California—San Mateo County—State. Chas. L. Harney, Inc., San Francisco, with a bid of $348,038, was low before the State Division of Highways for widening and paving 3.2 miles of Bayshore highway between the south city limits of San Francisco and the north city limits of South San Francisco. Unit bids were as follows.

(1) Chas. L. Harney, Inc. $348,038
(2) Morrison-Knudsen Co. 369,180
(3) Eaton & Smith $405,164
(4) Guy F. Atkinson 419,112

	(1)	(2)	(3)	(4)
150 cu. yd. removing conc.	10.00	23.50	20.00	12.00
770 lin. ft. remov. raised traffic bars	.40	.25	1.25	1.20
58 ea. remov. and salv. Type "A" luminaries	3.60	8.00	4.50	3.65
31 ea. remov. and salv. Type "B" luminaries	3.60	6.00	4.50	3.65
71 ea. remov. and salv. met. luminarie std. and pipe mast arms	18.00	30.00	22.00	18.25
18,000 sq. ft. remov. traffic stripe	.30	.22	.15	.50
171 sta. clearing and grubbing	45.00	22.00	100.00	15.00
33,000 cu. yd. roadway excav.	.90	1.43	1.40	2.50
450 cu. yd. struct. excav.	4.20	3.10	10.00	3.00
230 cu. yd. ditch and channel excav.	3.40	2.50	1.75	2.40
400,000 sta. yd. overhaul	.008	.01	.015	.01
38,700 sq. yd. compacting orig. ground	.05	.10	.06	.06
42,000 ton imported borrow	1.10	.60	.85	1.00
Lump sum, dev. water supply and furn. watering equip.	$1,300	$7,000	$15,000	$3,000
3,850 M. gal. applying water	2.80	1.50	2.00	1.80
171 sta. finishing roadway	18.50	25.00	20.00	9.15
14,000 ton mineral aggregate (C.T.B.)	3.00	3.40	3.50	3.30
3,650 bbl. Portland cement (C.T B.)	3.00	3.50	4.00	4.40
25,000 ton C.R.B.	2.80	2.85	3.00	3.20
30 ton liq. asph. SC-1 (pr. ct. and pen. tr.)	38.00	32.00	30.00	36.50
62 ton asph. emuls. (cur. sl., pt. bdr. and sl. ct.)	48.00	34.50	50.00	42.50
600 ton screenings (sl. ct.)	5.80	4.00	5.00	6.25
52 ton liq. asph. SC-6 (sl. ct.)	36.00	32.00	30.00	36.50
155 ton sand (sl. ct.)	4.40	5.00	5.00	6.00
7,200 ton min. aggr. (P.M.S.)	5.40	6.27	5.00	6.50
370 ton paving asph. (P.M.S.)	26.00	25.60	23.00	26.25
5,850 lin. ft. placing P.M.S. dikes	.21	.50	.20	.20
1,950 lin. ft. raised traffic bars	1.50	1.60	1.00	1.50
160 cu. yd. Class "A" P.C.C. (struct.)	53.00	92.50	100.00	62.25
26 cu. yd. Class "B" P.C.C. (curbs)	43.00	49.50	55.00	62.50
4,400 lin. ft. metal plate guard railing	3.50	3.75	4.00	3.00
90 ea. instal. met. culv. mkr. and guide posts	5.20	5.00	6.00	4.80
3 ea. horiz. refl. units	9.30	12.40	15.00	6.70
350 lin. ft. new prop. fence	.66	1.24	.50	.45
60 lin. ft. 18-in. C.M.P. (16 ga.)	3.90	3.85	5.00	3.50
260 lin. ft. 8-in. C.M.P. downdrains (16 ga.)	2.10	1.87	2.50	1.90
12 ea. spillway assemblies	36.00	44.00	40.00	35.00
265 lin. ft. salv. and relay. exist. C.M.P. downdrains	1.20	1.87	3.00	.90
6 ea. salv. and relay. exist. spillway assemblies	31.00	19.00	20.00	18.25
9,000 lb. bar reinf. steel	.13	.15	.15	.15
2,850 lb. misc. iron and steel	.36	.37	.50	.45
3 ea. adjusting manholes to grade	120.00	154.00	60.00	30.00
Lump sum, revising traffic signal system and hwy. lighting	$5,900	$6,000	$10,000	$5,800
BIN TYPE RETAINING WALLS				
13 ea. 6½-in. x 9¾-in. x 8-ft. columns (8 ga.)	26.00	24.00	22.00	22.50
5 ea. 6½-in. x 9¾-in. x 9.33-ft. columns (8 ga.)	30.00	29.00	30.00	26.00
13 ea. 6½-in. x 9¾-in. x 10.67-ft. columns (8 ga.)	34.00	32.00	30.00	30.00
5 ea. 6½-in. x 9¾-in. x 12-ft. columns (8 ga.)	38.00	37.50	35.00	33.50
36 ea. 48 6⅛-in. x 8⅞-in. column caps (12 ga.)	1.10	1.00	3.00	1.00
36 ea. 49 16-in. x 22-in. base plates (1 ga.)	6.80	6.60	7.00	6.20
18 ea. 50 6-in. x 15¼-in. x 7.4-ft. bottom spacers (16 ga.)	9.00	8.50	8.00	8.00
95 ea. 51 6-in. x 19½-in. x 7.4-ft. spacers (16 ga.)	11.00	10.00	10.00	9.75
238 ea. 52 8-in. x 16-in. x 9.5-ft. stringers (16 ga.)	20.00	18.50	17.00	17.45
34 ea. 53 2¼-in. x 3⅜-in. x 9.5-ft. stringer stiffeners (8 ga.)	6.00	5.50	7.00	5.20
1,200 ton 54 filter material	2.80	3.50	4.00	3.15

NEW EQUIPMENT

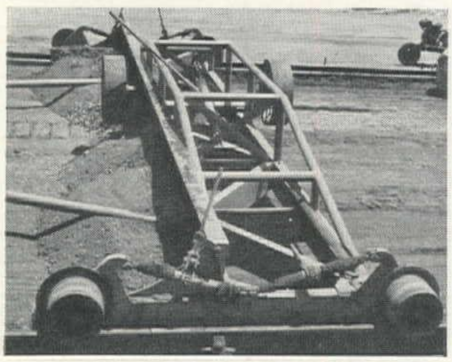
MORE COMPLETE INFORMATION about any of the new equipment or products briefly described on the following pages may be obtained at no charge. Send your request to Equipment Service, Western Construction, 609 Mission St., San Francisco 5, Calif. For quicker service, designate items by number.

★★

201

Sub-grade Planer For Deep, Wide Cuts

Features claimed: This Ferguson sub-grade planer will cut an accurate sub-grade for concrete paving up to 25 feet wide and



from 6 to 14 inches in depth. Designed to answer the demand for a heavy duty, rigid machine which will not deflect under extreme loads, it is especially suitable for airport work. Its 10,000-lb. weight and sturdy construction make it possible to carry excess dirt forward to where needed. Pull bars attach the planer to tractor and a removable tongue is provided for trailing.

Manufacturer: Shovel Supply Co., P. O. Box 1369, Dallas 1, Tex.

202

Apron Feeder Made of Cast Manganese Steel

Features claimed: The apron width of the heavy service Manganese Feeder is 4 ft., available in various lengths. The pans, rollers, sprockets, and bushings are of cast austenitic manganese steel. The frame is made of heavy structural beams. The feeder can be operated with direct motor drive or from auxiliary equipment, with roller chain or belt.

Manufacturer: Lippman Engineering Works, Milwaukee 14, Wisc.

203

Ford Motor Company Introduces 180 Truck Models

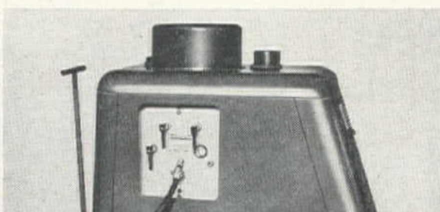
Features claimed: New features include automatic Power Pilot carburetion-ignition control to meter and fire the correct amount of fuel at the right instant under varying loads without spark knock. The rear window is enlarged to more than 3½ ft. for full vision. Performance of the F-1 light duty truck has been improved by changing the rear axle ratio from 3.73:1 to 3.92:1. The F-1 transmission has been redesigned for heavier loads, and has constant mesh helical gears with synchronizers in second and third speeds. Improvements are noted on the braking force distribution, clutch disk, and front bumper. Cast spoke wheels with demountable rims are standard on F-7 and F-8 models, but steel disk wheels are still available. Engines have been improved with chrome top piston rings, heat expansion-control pistons, and higher high-lift camshafts. Exhaust valve stems have been nitrided to help prevent sticking. A new "5-Star Extra" cab is optional equipment on the 1951 fleet. It is sound proofed with undercoating on the floor, spray-on material on the doors and back panel and with roof insulation of 1½-in. glass wool padding covered with acoustic board.

Manufacturer: Ford Division, Ford Motor Company, Dearborn, Michigan.

204

High Pressure Oil-Fired Steam Cleaner and Flusher

Features claimed: Model JO Hypressure Jenny features an oil-fired, electric motor driven steam cleaner which operates at 80



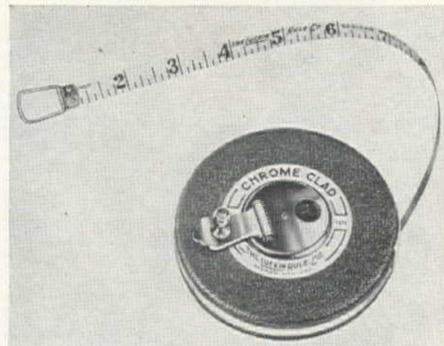
to 120 psi., with 90 gal. per hr. capacity. It is recommended for all extra-heavy-duty removal of grease and dirt, and is a cleaner that reverse flushes complete cooling systems, including radiator, engine block and water-type heaters, in one operation. It is especially useful to operators of car, truck, or bus fleets, since the price of this multi-purpose unit is less than the costs of separate steam cleaner and cooling system flushers.

Manufacturer: Hypressure Jenny Division, Homestead Valve Mfg. Co., P. O. Box 843, Coraopolis, Pa.

206

Durability and Beauty Combined In "Leader" Steel Tapes

Features claimed: A steel tape with a maroon-colored Vinylite covered case that resists water and will not stain or scuff is



available in 25-, 50-, 75-, and 100-ft. lengths. The case has a roller type throat, flat stainless steel edge band that is flush inset and attractive name plate. Nickel plated winding mechanism has folding flush handle opened by push pin. The chrome-clad line is corrosion resistant, will not chip or crack.

Manufacturer: Lufkin Rule Co., Saginaw, Mich.

207

Mechanical Remote Control For the Sterling "Speed-Trol"

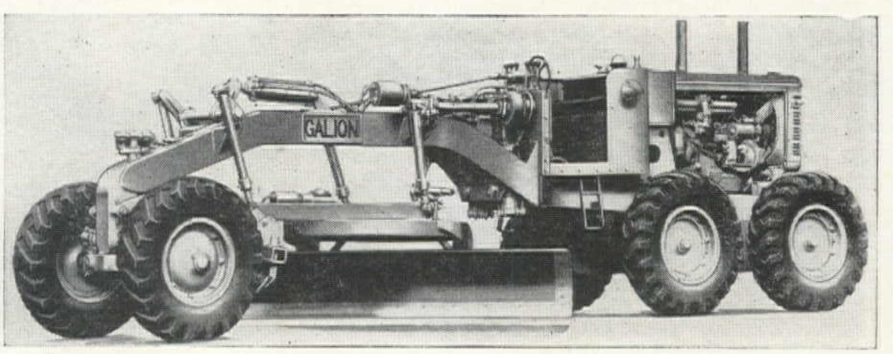
Features claimed: A new remote control unit has been designed so that the operator will always have the handwheel control at his fingertips, thus giving greater usage of the variable speeds and a steady flow of power at any selected speed. Produced for Sterling speed-trol electric power drives,

205

Heavy Duty Motor Grader With Fast Reverse Speed

Features claimed: The Galion model 118 motor grader is of the extra heavy duty class, and features a greatly improved transmission of the constant mesh type. It has six overlapping forward speeds from 1.3 to 22.6 mph., and two reverse speeds, including an exceptionally high reverse speed of 10.5 mph. available. Only one lever is used for gear shifting. Other features include a 100-hp. diesel engine, all-gear 4-wheel tandem drive, full hydraulic control, rugged box-type single member frame.

Manufacturer: The Galion Iron Works and Mfg. Co., Galion, Ohio.



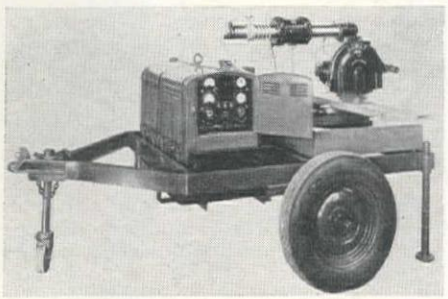
it can be adapted to any speed-trol now in use. The remote control is available with extended flexible cable, extended rod with universal joint, right angle bevel gear with extended rod, chain and sprocket, or a combination of any of the above.

Manufacturer: Sterling Electric Motors, Inc., Los Angeles 22, Calif.

208

Trailer-mounted Radial Power Saw And Generator Combination

Features claimed: The saw, in this new portable combination, is a 3 hp., 3 phase, 240 volt Comet Clipper that cuts stock 16 in.



wide up to 4⅜ in. thick. A four cylinder gasoline engine drives the generator which delivers 5 kilowatts of power. This provides ample power for the saw and for six single phase 120 volt power outlets for portable electric tools. Saw, generator and motor are all mounted on an all steel, two wheel trailer.

Manufacturer: Consolidated Machinery & Supply Co., Los Angeles 21, Calif.

209

Small and Compact 200-Amp. Transformer Welder

Features claimed: The MCX has a full 200-amp., 50% duty cycle, NEMA rating, with three current ranges selected by insulated tapered plug connectors and hand crank adjustments giving infinite currents in each range. The welding unit uses an automatic hot start control with a hermetically sealed gas filled, time delay relay magnetic switch that has no open contact.

Manufacturer: Air Reduction Co., New York, N. Y.

210

Outdoor Service Equipment For Temporary Circuits

Features claimed: Magnetic circuit breakers as well as receptacles are available in one compact enclosure for jobs where portable tools are used. Temporary circuits for such apparatus as drills, sanders, compressors, pumps, saws, motors, etc., are estab-

lished by merely plugging in the equipment to the convenience outlets. The receptacles are already wired-in, so that the only connections necessary are those directly to the line. This equipment is available with one to four fully magnetic breakers in combination with one or two receptacles. Ratings are supplied in any combination up to 50 amps. each.

Manufacturer: Heinemann Electric Co., Trenton, N. J.

211

Rotary Snow Plow Attachment For Allis-Chalmers Graders

Features claimed: The Sno-Flyr rotary plow, mounted on your Allis-Chalmers motor grader, provides efficient snow removal and saves the cost of extra equipment for carrying the plow. The snow plow cleans close to the ground, snow streams are individually controlled from the cab, and the unit has full 360 deg. revolving chutes allowing complete casting control in any direction. Mounted on the grader, the combination makes a completely cab-controlled snow plowing operation, giving

easy maneuverability of plow and grader. When summer comes, the auxiliary engines that were used to power the plow are available for other jobs such as motor grader replacements, power for generators, air compressors, hoists, etc.

Manufacturer: Wm. Bros Boiler and Manufacturing Co., Minneapolis, Minn.

212

Grinder for Circular Saw Uses Owner's Saw Table

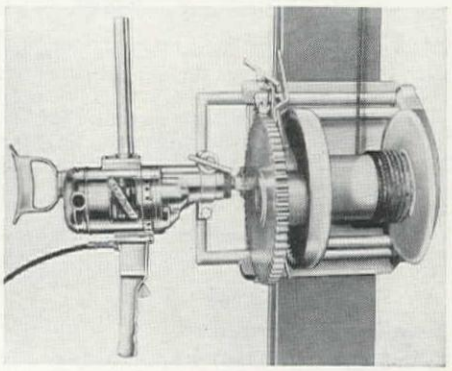
Features claimed: The "Tru-Circle" saw sharpener has been designed to fit all known saw tables. The extremely simple jig will gum, joint, and sharpen combination, crosscut, rip, or novelty blades from 6 to 10 in. in diameter. The jig can also be used for touching up the raker teeth of combination blades.

Manufacturer: A. D. McBurney, Los Angeles 13, Calif.

213

Portable Drill One Minute, Power Hoist the Next

Features claimed: SKIL 1-in. drill combined with American Handiwinch makes a complete power hoist unit in a few minutes



by means of a simple adapter kit. The drill can be taken out of the hoist bracket and is then ready for all drilling jobs. Combined with the Handiwinch, it has a hoisting capacity of 1,000 lb. at 10 fpm.

Manufacturer: SKILSAW, Inc., 5033 Elston Ave., Chicago, Ill.

214

Concrete Spreader With Three Functions

Features claimed: Pictured here is one of Jaeger Machine Company's new screw-screed concrete spreaders. Available in two models (10 to 15-ft. width and 20 to 25-ft. width) the new machine combines a transverse, 12 in. oscillating screed with the Jaeger remixing-compacting screw

spreader. It performs the triple function of spreading, initial strikeoff, and precision metering of concrete for the following finisher. Some of the advantages are: remixing and compacting of concrete on the subgrade by the spreading screw eliminates honeycombing and segregation; spreads stiffest mixtures and biggest piles uni-

formly from form to form; strikeoff plate, immediately behind the screw, makes initial strikeoff to approximate grade line, then the 12 in. oscillating screed makes precision strikeoff and meters exactly the right amount of material to the following finisher; and costly carryback by shovelers is eliminated.

Manufacturer: Jaeger Machine Co., Columbus 16, Ohio.

215

A Waterproofing Liquid That Seals Out Moisture

Features claimed: Lipton All-Seal is a penetrating clear liquid compound that solves the problem of waterproofing concrete, brick, plaster, stone, cement, tile, natural woods, and other building materials. It will cover from 200 to 350 sq. ft. per gallon, and may be applied by brush or low pressure garden type spray. The cost of waterproofing is from $4.95 to $5.25 per gallon.

Manufacturer: Leo Lipton Enterprises, Los Angeles 49, Calif.

216

Adjustable Stop Gauge Boosts Power Saw Production

Features claimed: Designed to put power cut-off sawing on a mass production basis, the Comet Adjustable Stop Gauge makes it possible to set several predetermined lengths at one time for extremely accurate cut-off. All stop blocks have 4 sq. in. of gripping surface and can be pre-set at any position without using a wrench. Additional stops can be added at any time without disturbing other stops already positioned on the bar.

Manufacturer: Consolidated Machinery and Supply Co., Ltd., Los Angeles 21, Calif.

217

"Bob-Cat" Electric Cable Hoists Are Small but Mighty

Features claimed: A heavy-duty electric cable hoist, manufactured in ½, 1, 1½, 2, 3, and 5-ton capacities, will be marketed

under the trade name, "Bob-Cat." An outstanding feature is total enclosure of the motor within the cable drum. This reduces over-all dimensions and affords substantial weight savings. Due to the enclosed hoist design, motors are protected against mois-

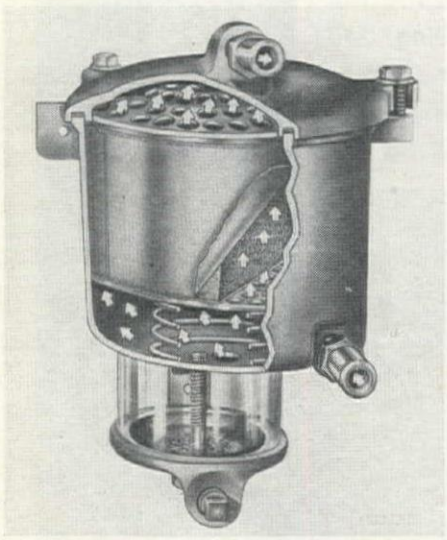
ture, splashing liquids, weather, dust and corrosive atmosphere. Hoists are powered by high torque Ohio motors specially manufactured for use with Bob-Cat units.

Manufacturer: Cleveland Chain & Manufacturing Co., Broadway and Henry Sts., Cleveland 5, Ohio.

218

Cooling System Filter Eliminates Overheating Troubles

Features claimed: An electro-chemically activated cooling system filter cuts down



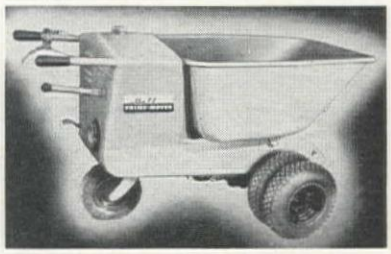
engine breakdown expense and lost time due to overheating troubles in liquid-cooled gasoline or diesel internal combustion engines. The cut-away view of the Perry cooling system filter shows its simplicity and the ease with which replacements can be made. The coolant flows through electro-chemically activated filter element. Perforated corrosion-resistor plates above and below filter element absorb electrolytic action and prevent corrosion. Harmful residue is deposited in visible sump at bottom of filter unit. The unit is available for capacities from 6 to 30 gallons.

Manufacturer: Spark-O-Liner Corp., Minneapolis, Minn.

219

Compact Powered Wheelbarrow Has Capacity of 1,500 lb.

Features claimed: New features, including forward direct drive with half speed reverse under power, dependable 5 hp. Wisconsin engine, constant mesh transmission, and conveniently placed operator's controls, have been added to the Prime-Mover



powered wheelbarrow. The engine and gasoline tank are located in enclosed panel on top and at rear of chassis—away from floor dirt. Capacity of the wheelbarrow has been increased to 1,500 pounds, bucket or platform load. The popular turning radius of 33 in. has been maintained. The unit is 33½ in. wide, permitting easy access through doorways and on elevators.

Manufacturer: Prime-Mover Co., Muscatine, Iowa.

220

Portable Lighting System Uses Compressed Air

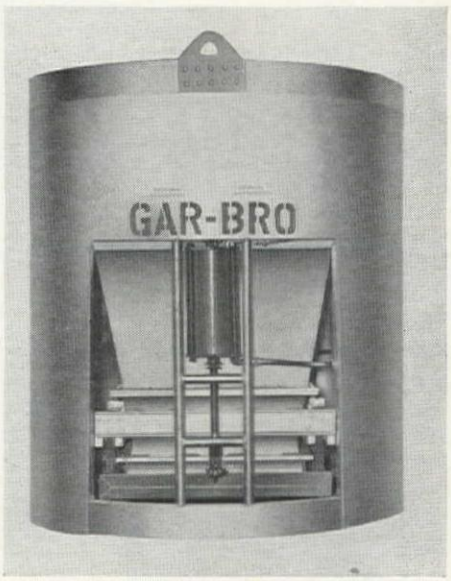
Features claimed: A low-voltage portable lighting system for mining and construction work was recently announced. Named the Joy-Lite, the unit develops an output of 250 to 280 watts, with air consumption not exceeding 25 cfm. For protection from dirt and dripping water, the generator is mounted in a steel box equipped with a carrying handle for easy portability. Lamps have tripod swivel bases which can be used as column clamps, and hooks which serve as hangers. The unit weighs 48 lb.

Manufacturer: Joy Manufacturing Co., Pittsburgh, Pa.

221

Air-Operated Concrete Bucket With Double Clamshell Gates

Features claimed: This is a concrete bucket with a high pressure air supply tank and control valves as an integral part of the equipment. Featured on the air-oper-



ated Model A bucket are pull-chain controlled valves that eliminate the necessity of hose, connectors, and air supply at the dumping location. Double clamshell gates are grout tight and non-clogging, and have center discharge and straight down dump. Any portion up to a full load may be released. The bucket may be operated by remote control if desired. All sizes of Model A Gar-Bro buckets including the dual-4, 2-compartment buckets, can now be equipped with high pressure air tanks and controls.

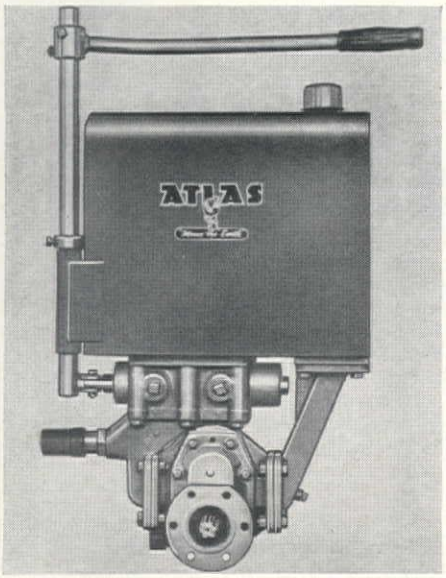
Manufacturer: Gar-Bro Mfg. Co., 2416 E. 16th St., Los Angeles.

222

Packaged Hydraulic Control Unit for Tractors

Features claimed: This complete package unit includes pump, valves, tank, adaptor mountings, drive connections, and all parts ready for installation. Built in two sizes with single, dual, or triple controls, this hydraulic control unit operates at pressures ranging up to 700 psi. Operating

speed ranges up to 1,500 rpm. Adaptor mountings permit operation from power take-off at the rear or from crankshaft at the front of the tractor. Either 4 or 8-gal. tanks can be supplied. Right or left rotation



is optional and either one can be converted in a few minutes. Four-way open center piston-type valves are stocked for dual and triple controls. A pre-set pressure relief valve is a part of each unit.

Manufacturer: Atlas Scraper & Engineering Co., Bell, Calif.

223

Bulldozers and Root Rippers For Allis-Chalmers' HD-9 and HD-15

Features claimed: Bulldozers, grade-builders and root rippers, both engine-mounted hydraulic and cable operated models, are now available for the new models HD-9 and HD-15 Allis-Chalmers tractors. The outstanding design feature of this Baker equipment is achievement of fingertip control gained through short linkage between the blade control lever and hydraulic control valve. This short linkage reduces working and wearing parts, so that the operator can feel any change in blade position and maintain full positive control with greater ease.

Manufacturer: Baker Manufacturing Co., Springfield, Ill.

224

"Airfuge" Takes Impurities Out of Compressed Air

Features claimed: A complete line of separators for cleaning compressed air by means of centrifugal force has been established under the name Swartwout Airfuge. The separator is available in 7 inlet and outlet tapping sizes, from ½ to 2½ in. The Airfuge removes 99% or more of all impurities from compressed air without pressure drop. Moisture, oil, scale, and other solids in the air are whirled outward to the walls of the unit where they drain down to the trap section. A float-operated trap automatically releases accumulated liquids as they rise to a level above that necessary to effect a seal. Drain valve outlet is tapered to prevent stoppage by particles of scale.

Manufacturer: The Swartwout Co., Bulletin S-13, 18511 Euclid Ave., Cleveland 12, Ohio.

225

Powerful Air-cooled Diesels Available from Britain

Features claimed: Lister-Blackstone, Inc. will market and service in this country a single cylinder and a two cylinder air-cooled diesel engine made by Armstrong-Siddeley, manufacturers of the "Sapphire" turbo-jet aircraft engine. The arrangement will make available to American diesel power users two English-made engines, the single cylinder model developing 8 hp. at 1,500 rpm., and two cylinder model developing 20 hp. at 1,800 rpm. The Armstrong-Siddeley diesels are particularly well suited to generator service developing from 3 to 10 kw. Both models are also used in powering farm machinery, pumps of all types, brick crushers, compressors, cement mixers, saw mills, etc.

Distributor: Lister-Blackstone, Inc., 420 Lexington Ave., New York 17, N. Y.

226

Concrete Mixer Improved In Design and Performance

Features claimed: Improvements have been made in a heavy-duty type concrete mixer by the Kwik-Mix Company. In construction features, the new 3-bag mixer is designed with heavier frame sections, coil spring mounting and cast steel drum heads having machined roller paths. Drum roller shafts revolve on larger, internal double

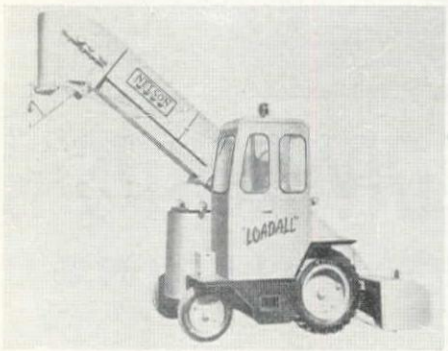
row, self-aligning ball bearings mounted in pillow boxes attached to heavy trusses welded to the frame. In addition, the 27-hp. gasoline engine comes equipped with a clutch and a spring loaded hoist clutch is kept in constant engagement. Other major changes include an improved water valve and lever arrangement and a positive Batchmeter actuating mechanism.

Manufacturer: Kwik-Mix Co., Port Washington, Wis.

227

An All-purpose Loader Designed for Small Contractors

Features claimed: An all-purpose loader, known as the Loadall, specifically designed for the smaller municipality or contractor,



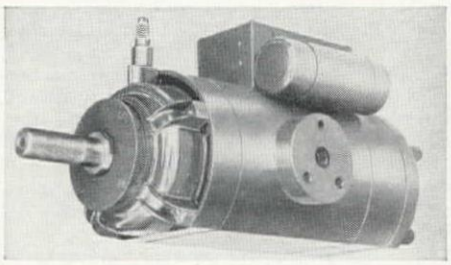
will handle snow, sand, gravel, coal, cinders, humus, leaves, salt, etc., without belt changes or use of special attachments. The Loadall travels under its own power at road speeds up to 10 mph. with working speeds up to 6½ mph. Loads heavy materials at from 1¾ to 2¼ cu. yd. per minute, snow at from 6 to 8 cu. yd. per minute.

Manufacturer: N. P. Nelson Iron Works, Inc., Clifton, N. J.

228

Saw Motor Allows Full Use Of Blade Cutting Depth

Features claimed: A new direct-drive saw motor, the Lo-Dead Rise, increases the saw blade's cutting potential. Previously, the



housing of direct drive radial arm saw motors did not permit the full utilization of the cutting depth of saw blades. The new motor increases the cutting depth by 41%. The motor has a high grade steel shaft that has been ground to close tolerances to permit accurate work.

Manufacturer: DeWalt Inc., Lancaster, Pa.

229

Torch and Automatic Drive For Argon Metal Arc Welding

Features claimed: A new hand torch and automatic wire drive unit for argon metal arc welding increases the speed possible with hand welding equipment. The consumable electrode serves as the filler metal. Welding rod is fed from a coil into an argon-protected atmosphere at a steady predetermined rate. The unit, which consists of an argon metal arc hand-welding torch and the rod feed unit, is particularly adaptable for welding aluminum in ranges of thickness from ⅛ to 1½ inches.

Manufacturer: Linde Air Products Company, 30 East 42nd St., New York 17, N. Y.

230

Remote Control for Variable Speed Electric Power Drives

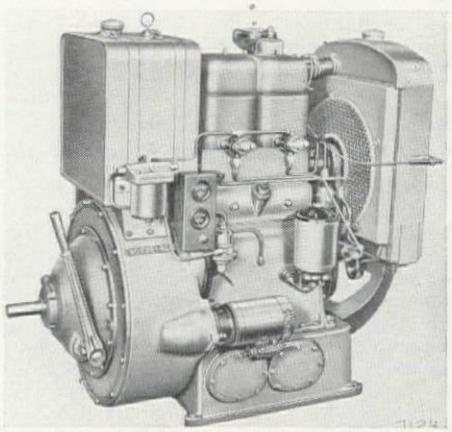
Features claimed: The electric remote control for Sterling Speed-Trol (variable speed) electric power drives is a package unit design to be mounted on any size drive in the field or at the factory. The unit includes a mounting bracket, reversing motor, chain and sprockets, friction clutch, chain guard, and remote "fast-slow" station. Available in ½ to 25 hp. sizes.

Manufacturer: Sterling Electric Motors, Inc., Los Angeles 22, Calif.

231

Two-Cylinder Diesel Engine Rated at 20 to 30 Horsepower

Features claimed: Known as the 4FS2, this engine is rated from 20 to 30 horsepower within an operating speed range of 1,200 to 1,800 rpm., has a 4½-in. bore and



5¼-in. stroke. It is an extra heavy duty, vertical, four-cycle, mechanical injection diesel engine built as a complete, self-contained unit. The 4FS2 is offered as an electrical generating set, pumping unit, and with clutch or stub shaft power take-off for direct connection or belt drive. It is also available for marine auxiliary application.

Manufacturer: Nordberg Manufacturing Co., Milwaukee 7, Wis.

232

Automatic Rewind Steel Tape Saves Steps and Time

Features claimed: A 50-ft. steel tape rule which rewinds automatically, the first of such length to require neither hand rewind crank nor reel, is offered to builders and tradesmen. Since it can be manipulated in one hand, and its end-loop can be freed from hook or a half-driven finishing nail by a simple flip of the case at full tape extension, builders can now measure in a single step any distance normally encountered in construction. Called the Master Longboy 050, the rule has an easily replaceable tape.

Manufacturer: Master Rule Mfg. Co., Inc., Middletown, N. Y.

233

"Hi-Boy" Truck Mixer Loses Weight, Gains on Performance

Features claimed: The new model Hi-Boy Trukmixer has lost a full ton in the 3 cu. yd. model and a half ton in the 4½ cu. yd. model without sacrificing any of the ruggedness required in truck mixer construction. New features that eliminate excess weight and improve performance are a 3-way, non-bypassing piston type

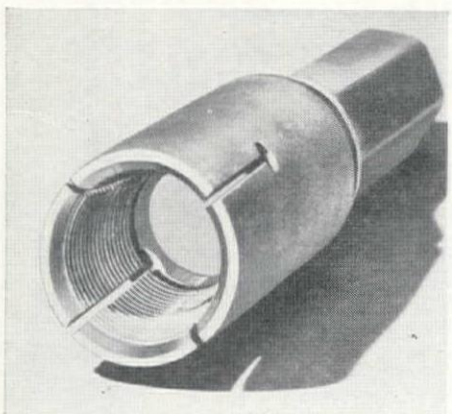
water valve that makes possible a greatly simplified piping system; a double-strand roller chain drive which automatically compensates for misalignment between drum and drive shaft caused by operation over rough roads; and a compact and simplified transmission.

Manufacturer: Blaw-Knox Company, Pittsburgh, Pa.

234

"Hole-Saver" Reclaims Lost Bits And Drill Steel Broken Off

Features claimed: The Rock-Bit Hole-Saver is used to reclaim lost bits and drill steel broken off in the hole so as to save redrilling the hole. Attached to a threaded steel in place of a bit, its left hand, tapered threads cut in the metal of the broken rod and remove it quickly and without jamming. The tool is threaded for Timken H or D; Rock Bit R-1 or R-2 steel to fit the following size steels: (a) ⅞-in. Hex., ⅞-in. O.D.; 1-in. Hex., 1-in. O.D., 1⅛-in. Rd.; (b) 1¼-in. Rd. and 1⅜-in. Rd.



Manufacturer: Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Pa.

235

Tilting Mixer for Conversions to Central Mixing

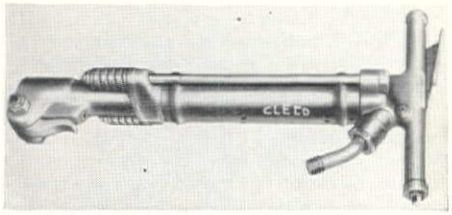
Features claimed: The Supremix Mixer is an integral part of plant structure, eliminating elevated foundations or separate mixer platforms. Lower location in the structure saves head room, making it outstanding for new plants and those converting from dry batching to central mixing. The Supremix plant is of versatile design, allowing for two lines of traffic, one for central mixing, and one for dry batching, using the same scale and batching facilities.

Manufacturer: Supremix, Inc., Adrian, Michigan.

236

Paving Breaker Light Enough For Overhead Use by One Man

Features claimed: Cleco RC-50 paving breaker weighs only 50 pounds, but has heavy power. It is especially suitable for brick work, asphalt cutting, and shop maintenance work. It incorporates the Reed-Cleco valve which gives full control on both power and return strokes, assuring hard, uniform blows, fast action, minimum recoil, no short-stroking and low air consumption. Wear-resistant alloys, automatic



lubrication and heavy-duty construction assure long life and low maintenance costs.

Manufacturer: Cleco Div., Reed Roller Bit Co., 5125 Clinton Drive, Houston 20, Texas.

NEW BOOKS . . .

PROCEEDINGS OF THE SECOND CALIFORNIA INSTITUTE ON STREET AND HIGHWAY PROBLEMS—Published by the Institute of Transportation and Traffic Engineering, University of California, Berkeley, Calif. 168 pages, 6 x 9. Price $1.00.

This illustrated, paper bound volume presents the papers and discussions of the conference on street and highway problems arranged under five headings: general, urban, county, traffic, and construction and maintenance. Of interest are such papers as "Numerical Rating of County Roads—Arizona Method," by William E. Willey, Engineer of Economics and Statistics, Arizona State Highway Department; "Off-Street Parking," by M. S. Irvine, City Engineer, Riverside, Calif.; and "One-Way Street System for Sacramento," by D. Jackson Faustman, Traffic Engineer, City of Sacramento, Calif.

UNDERPINNING: ITS PRACTICE AND APPLICATION — By Edmund Astley Prentis and Lazarus White. Published by Columbia University Press, 2960 Broadway, New York 27, N. Y. 374 pages, 6 x 9. Price $10.00.

This second edition of an authoritative technical description of underpinning methods and applications for foundation construction has been extensively revised and contains much new material. The authors, engineers and contractors with many years' experience in the design and installation of underpinning, write for the profession, and describe in detail actual cases of every type of underpinning. The volume also contains an introductory treatise on soil mechanics, nearly 200 photographs and drawings, and appendices which include, among other information, specifications, legal aspects of underpinning and foundation work, and a glossary of terms.

COFFERDAMS — By Lazarus White and Edmund Astley Prentis. Published by Columbia University Press, 2960 Broadway, New York 27, N. Y. 311 pages, 6 x 9. Price $10.00.

The enlarged second edition of *Cofferdams* makes readily accessible the essentials of scientific cofferdam design and construction in concise and practical form. Presentation is made of theoretical considerations of hydrodynamics of seepage forces, stream erosion, and lateral earth pressures for cofferdams on land and in water. Actual design and construction features are presented by detailed case studies of cofferdams which have come directly under the authors' supervision. Construction equipment, pumping stations, sheet-piling of wood and steel, bracing systems, excavation methods are among the features described. An effort has been made to present actual cases of pitfalls and failures as well as successes in cofferdam design.

FOUNDATIONS OF STRUCTURES —By Clarence W. Dunham. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 679 pages, 6 x 9. Price $7.50.

This text discusses in considerable detail the planning and dimensioning of foundations for structures. It shows how to obtain and interpret data regarding soils, how to plan the support of a structure upon them, and how to devise means for the construction of that foundation. A wide variety of foundation problems are illustrated in this book aimed specifically at developing in the reader the ability to plan and design safe and practical sub-structures by the use of sound engineering judgment. Special features include an extensive treatment of bridge piers and bridge abutments, to show what foundations look like, what problems are generally involved, and how the structures may be constructed; and a full discussion of foundations that are subjected to vertical and horizontal forces and to overturning moments.

THE DESIGN OF FLEXIBLE AND RIGID PAVEMENTS — By Robert Horonjeff and John Hugh Jones. Published by University of California Press, Berkeley, Calif. 94 pp., 8 x 11. Price $2.50.

This manual explains the principles pertaining to the planning and design of flexible and rigid pavements. Design methods discussed are—the California bearing ratio method, the Canadian method, the Civil Aeronautics Administration method, the Kansas highway commission method, the California stabilometer method, design of rigid pavements, and additional methods of flexible pavement design. Many charts and illustrations are used to clarify the text. The design of rigid pavements is based on analysis developed by Dean Westergaard and the work of Dr. Pickett of Kansas State College and G. K. Ray of the Portland Cement Asssociation. Information included in the syllabus has been gathered from many sources; the bulk of material being obtained from publications of the Highway Research Board and the Portland Cement Association.

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.

★★★★★★★★★★★★★★★★★★★★★★★★★★

237

62-page Free Booklet On Aggregate Production

Yours for the asking is **Pioneer Engineering Works'** new tenth edition of "Facts and Figures," the popular vest pocket-size booklet of handy information on crushing, screening, washing, materials handling and aggregates. The 62 pages of the booklet contain tables on stage of reduction and capacities of crushers, capacities of screens, how to select conveyors and feeders. Horsepowers required to operate various types of equipment are given, and there are tables showing how to select drives. Of particular interest will be found the charts showing the percentage of each size of stone in the product of a crusher, whether it be in open or closed circuit. Tables on electric power have been added, as have useful tables for the bituminous contractor. In addition, there are included numerous tables of miscellaneous information on weights, measures, conversion factors, trigonometric functions, square and cube roots, etc. Contractors, aggregates producers, engineers, college instructors and engineering students will find the booklet most helpful in solving problems common to the construction industry. For your free copy write to **Western Construction,** 609 Mission St., San Francisco 5, Calif.

238

Universal Joint Application

An extensive list of uses and applications of universal joints and a catalog of Curtis universal joints has been published by the **Curtis Universal Joint Co.,** Springfield, Mass. Included in the catalog is the new "Lo Friction" joint, developed for industrial applications where the joint friction heat or Kinetic energy must be dissipated rapidly.

239

Enclosed Electric Motors

An illustrated 4-page folder introduces a new development in totally enclosed, nonventilated, squirrel cage, induction motors. The bulletin which contains descriptive pictures of mechanical construction, convenient lubrication, etc., is available from the manufacturer, **Fairbanks-Morse & Co.,** 600 S. Michigan Ave., Chicago 5, Ill.

240

Concrete Forms

The Uni-form system of concrete forming is described in a folder issued by **Universal Form Clamp Co.,** 1238 N. Kostner Ave., Chicago 51, Ill. The simplicity and accuracy of the system in corners, closures, battered walls, circular walls, culverts and tunnels are illustrated.

241

Major Dam Projects

An illustrated book, published by **American Hoist & Derrick Co.,** St. Paul 1, Minn.,

should have unusual interest for contractors, engineers and construction men. Its pages contain dramatic pictures of the nation's greatest dam jobs—Garrison, Friant, Grand Coulee, Bull Shoals, and others—and the use of American Revolver Cranes on these big construction jobs.

242

Metal Lath and Lighting

The attractively illustrated quarterly issue of the Metal Lath News features some fifty excellent pictures illustrating varied examples of striking and effective lighting in retail establishments, hotels, churches, commercial structures, clubs and apartments. The beauty of metal lath and plaster construction and its utility in lighting installation is demonstrated. Copies of this 16-page magazine are available from **Metal Lath Manufacturers Association,** 636 Engineers Bldg., Cleveland 14, Ohio.

243

Clamshell Buckets

A bulletin descriptive of Haiss clamshell buckets has been issued by **George Haiss Mfg. Co.,** 141 Park Ave., New York 51, N. Y. Buckets designed for excavation, trenching and rehandling are illustrated and capacities and dimensions given. Special construction features, including the heavy duty head frame, wedge-lock dead ending and sta-in-line variable reeving are pictured.

244

Portable Conveyor

An 8-page bulletin available from **Barber-Greene Co.,** Aurora Ill., describes the versatile, light-weight, Barber-Greene portable belt conveyor. Illustrated, through sketches, are the various applications of stockpiling, reclaiming, car unloading, and handling of wet concrete, bagged or packaged materials. Photographs of machine design features, as well as scenes of the conveyor in various field applications, are included.

245

Gas and Electric Vibrators

Stow Manufacturing Co., 57 Shear St., Binghamton, N. Y., has released a bulletin on gas and electric vibrators and screeds. The bulletin details the advantages of vibration in concrete work and recommends specific types of gas or electric vibrators for specific jobs. For the contractor working on large highways, for example, the bulletin recommends a 4½ hp. gasoline vibrator with V-belt drive automatic clutch, and full turn swivel base. Vibration screeds that save as much as $800 per mile in construction of roadway slabs and other large surfaces are also recommended.

246

Hard Surfacing Manganese

"Hard Surfacing Manganese Steel" is the title of a 4-page bulletin just released by **Rankin Manufacturing Co.,** 3072 West Pico Blvd., Los Angeles 6, Calif. The article outlines applications, precautions and suggestions on proper procedures for facing manganese steel. It is stated that where precautions as outlined have been observed, manganese has been successfully hard-surfaced.

247

Saving Steel With Lumber

Recent curbs on the civilian use of steel make "Typical Designs of Timber Structures," a 116-page book, valuable in preparing various building designs for the defense program. During World War II

the first edition of this book was used by the armed forces throughout the world. The new edition will be sent free to Army and Navy architects, engineers and draftsmen by writing **Timber Engineering Co.**, 1319 Eighteenth St., N.W., Washington 6, D. C.

248

Lifting the Big Trees

A 12-page, 2-color bulletin on the application of Lorain shovels and cranes to the logging, pulpwood and lumber industries has just been published by the **Thew Shovel Co.**, Lorain, Ohio. Giant log loaders and models of all capacities, both on crawlers and rubber tires, are shown at work solving forest problems in this bulletin which consists entirely of job stories and photographs.

249

Conveyor and Elevator Belting

Thermoid Co., Trenton, N. J., has published a 16-page informational bulletin covering all types of conveyor and elevator belting. It contains a discussion of each of the various types of belting and suggestions for their application; and is complete with all the tables, charts, and formulae necessary for the selection of the right type of belt for the application.

250

Long-Reach Crane

The Manitowoc model 3900 long-reach crane and dragline is described in a 12-page catalog released by the **Manitowoc Engineering Works**, Manitowoc, Wis. The machine is rated as a 3-cu. yd. dragline, with lift capacities of 60 tons at 12-ft. radius, and 30 tons at 30-ft. radius. The bulletin lists complete working ranges and capacity tables, and explains how the added capacity claimed at long radii is obtained. Pictures and text illustrate features and machinery details, with gear diagrams and photos of optional equipment available for special jobs. A half page of diagrams and photos shows how the crane can be loaded and unloaded for rail shipment by handling its own components; and two full pages illustrate job applications.

251

Photomicrographs

A new release of photomicrographs has just been published by **Eutectic Welding Alloys Corp.**, New York, to show welding engineers and operators exactly how and why Eutectic Low Temperature Welding Alloys make it possible to avoid the distortion, stress, warpage, and embrittlement that conventional high-heat rods invite.

252

Mobile Crane

Within 24 pages and with 74 illustrations **Bay City Shovels, Inc.**, Bay City, Mich., gives the reader a complete picture of the powerful machinery assembly of the Bay City CraneMobile, followed by details of the gantry, and pin-connected boom and jib.

253

Corrugated Steel Sheeting

How to use lightweight corrugated steel sheeting to effectively control movement of soil or water is described in a 10-page illustrated booklet published by **Armco Drainage & Metal Products, Inc.**, Middletown, Ohio. Entitled "Armco Steel Sheeting for Trenches, Cofferdams, Cutoff Walls, Shore Protection," it points out where Armco interlocking and flange type sheeting can be used to advantage. Photographic case-histories show that corrugated sheeting has ample strength, is fast driving and results in lower costs. Also included in the booklet—data on driving and properties of both types of Armco sheeting as well as a method of figuring sizes and spacing of wales and struts.

254

Caterpillar Hydraulic Bulldozers

The complete line of Caterpillar hydraulic straight and angling blade bulldozers is featured in a broadside available from **Caterpillar Tractor Co.**, Peoria 8, Ill. The advantages of hydraulic jack, hydraulic control, and hydraulic bulldozer are illustrated by diagrams, and specifications are given for all Caterpillar hydraulic bulldozers.

255

Non-Destructive Metal Testing

An illustrated bulletin fully describing Dy-Chek, the dye penetrant method of metal inspection, and showing how this chemical process simplifies non-destructive testing, is available from **Dy-Chek Co.**, 1515 E. Broadway, Hawthorne, Calif. Dip, brush and spray methods are explained, and varied applications in factories and in the fields are discussed.

256

Armed Forces Recreational Building

Architects, engineers and builders in charge of construction for the armed services will find valuable information and suggestions in "Timber for Recreational Buildings," a booklet published by the

Timber Engineering Co., 1319 Eighteenth St., N.W., Washington 6, D. C. Anticipating a boom in the building of service recreational projects, this 24-page booklet portrays the wide variety of design that can be achieved in recreational construction by timber. The booklet has a photographic gallery of gymnasiums, arenas, field houses, drill halls, bleachers, community buildings, playhouses, etc.

257

Safety Belts

A 4-page bulletin, published by **Mine Safety Appliance Co.**, Pittsburgh 8, Pa., describes the complete line of M.S.A. safety belts. Body type belts, harness type belts, bridge and structural steel workers' belts, linemen's belts, petroleum workers' belts and miscellaneous safety belts of both leather and webbing material are described. In addition, accessory equipment for safety on the job is illustrated.

258

Woodworking Equipment

A folder featuring new uses of the DeWalt "Power Shop," a radial arm saw specially designed for small woodworking shops, has been published by **DeWalt Inc.**, Lancaster, Pa. Attention is called in the folder to the fact that a jigsaw, lathe, and belt sander can now be used with DeWalt home workshop models, thus creating a one machine woodworking shop.

259

Welding Fluxes

Complete details of an expanded line of welding fluxes, known as "Lo-Cost Flotectic Fluxes," has been released by **Eutectic Welding Alloys Corp.**, 40 Worth St., New York 13, N. Y. This line, developed to meet the increasing demand for more efficient chemical aids to welding, reduces surface tension and makes way for better welds. Data on application ranges, suggested metals use, governmental specifications and other helpful information appear in the bulletin.

260

Uses for Light-weight Pipe

A bulletin showing typical applications of Naylor light-weight pipe in the construction, dredging, materials handling, mining, oil, paper mill, power plant, and sewage disposal fields has been released by the **Naylor Pipe Co.**, 1230 East 92nd St., Chicago 19, Ill. The bulletin includes data on fittings, flanges, connections, and pipe specifications from 4 in. to 30 in. in diameter.

261

Conveyor and Elevator Belts

Featuring illustrations which show in detail all major parts used in construction of its line of conveyor and elevator belts, the **B. F. Goodrich Co.**, 5400 E. Olympic Blvd., Los Angeles 22, Calif., has issued a new 26-page catalog on the subject. The publication describes all belt features, explains why increased service life is made possible, and tells the function which each part of the belt performs. Also included is significant data on each belt in the company's line.

262

Welding Patent Classification

Over 12,000 patents on arc welding equipment and the use of arc welding in machinery, structures and other types of metal fabrication have now been classified and indexed in the A. F. Davis Welding Library of Ohio State University. The system of classification and index permits the location of any patent in a matter of minutes. To provide to industrial organizations an efficient, quick method of locating patents relating to welding and its use, Ohio State University is making available a bulletin entitled "Patent Classification in the A. F. Davis Welding Library." The bulletin is available on request and gives the outline of the patent classification index, explaining the operation and use of the system.

263

Valves Actuating Cylinders

A line of valves for actuating air or hydraulic cylinders is introduced by **Ledeen Manufacturing Co.**, Los Angeles, Calif., in a bulletin showing circuit diagrams and operation detail, dimensions, weights, and descriptions of the 14 models available. The valves embody the rotating disc construction and are made for hand operation, foot operation, and finger or solenoid operation.

264

Flat Belting

The **Thermoid Co.**, Trenton, N. J., has available a concise 8-page technical bulletin on flat transmission belting as an aid to plant engineers and operating personnel in selecting the right transmission belt to meet their individual problems. The bulletin contains complete formulae, charts, and tables for the proper selection of transmission belting.

265

Diesel Dope

A new 28-page booklet entitled "Ten Questions to Ask a Diesel Engine Salesman" is being offered by the **Murphy Diesel Company**, Milwaukee 14, Wisc. The booklet asks and answers ten questions pertaining to diesel engine design and gives full mechanical details on the Murphy Diesel line of engines.

266

Off-Highway Rear Dump Truck

The Euclid Road Machinery Company, Cleveland, Ohio, has released a catalog folder on the Model UD Rear-Dump Euclid. This unit is powered by a 125-hp. diesel engine and has a payload capacity of 20,000 lb. It is the smallest off-highway hauling unit built by Euclid; others range in size to 40-ton payload capacity. Illustrations and specification data are included in the catalog.

267

Versatile Power Shovel

Publication of a 2-color, 12-page booklet on the Marion type 111-M machine has been announced by the **Marion Power Shovel Co.**, Marion, Ohio. The booklet gives a complete design and performance story on the 111-M. This machine, equipped with diesel power, electric swing and Marion air control, is available for service as a shovel, dragline, clamshell, crane, or long range shovel.

268

Corrosion Prevention

Corrosion resistance superior to conventional zinc coatings with cost savings is claimed for Zincilate, the one-coat, self-protecting, anti-corrosion coating described in an 8-page illustrated bulletin, available from **Industrial Metal Protectives, Inc.**, 315 Montgomery St., San Francisco 4, Calif. The bulletin presents case histories on outstanding companies and typical applications showing Zincilate's resistance to severe abrasive and corrosive conditions, data on

surface preparation and methods of application, and an offer of providing process engineers to investigate corrosion problems and supervise application.

269

Single-drum Hoists

The complete line of Joy single-drum, multi-purpose hoists for mines, construction jobs, oil fields, and industrial plants is described in a 16-page bulletin released by **Joy Manufacturing Co.**, Oliver Bldg., Pittsburgh, Pa. The bulletin contains complete descriptions and specifications for hoists with capacities from 500 to 3,500 lb., and driven by turbinair, pistonair, electric, or gasoline engines. A handy chart simplifies the choice of any hoist to fill a particular need.

270

Paint Developments

A 20-page booklet, "This Is DuPont—The Story of 'Duco' Finishes," is designed to provide a pictorial record of the history of "Duco" and the impact it has had on the American scene. Available from **E. I. DuPont de Nemours & Co.**, Wilmington, Del., the booklet features developments in automotive paints by contrasting 1920 paint on a 1950 car and the new "Duco" on a 1926 model. The interesting story of the development of modern finishes is told by illustrations.

271

Tubular Hoist Towers

A 6-page bulletin, "Gold Medal Hoist Towers," issued by **Patent Scaffolding Co.**, Long Island City, N. Y., reveals new developments in hoist tower design and construction. Use of tubular steel components, it is claimed, contribute to safety, efficiency, economy, appearance and low-cost service. Dimensions, specifications and diagrams for both light and heavy towers are included. Sketches and photographs illustrate actual applications.

272

Equipment Enamel

The **Wilbur & Williams Co.**, Boston 15, Mass., has available the first color chip card, using actual paint instead of ink on the chips, and therefore showing the paint gloss, of their Totrust Enamel line of rust-inhibiting enamel. Available upon request, the card gives the complete range of the enamel which has been on the market for about 20 years and now matches almost 30 equipment manufacturers' original colors.

273

Types of Concrete Piles

An 8-page bulletin entitled "Concrete Piles and Caissons" has been issued by **Western Foundation Corp.**, 2 Park Ave., New York 16, N. Y. The feature of the bulletin is a suggested standard specification for cast-in-place concrete piles. Described and illustrated are Western's button bottom piles which have been driven to depths of over 100 ft.; pedestrial piles, designed for improving the soil's bearing value; composite piles which are combinations of thin-shell-encased concrete with lower section of wood or concrete-filled pipe; and the compressed concrete piles which require no steel.

274

Snow Plow Controls

Monarch Road Machinery Co., Grand Rapids, Mich., has available leaflets describing its complete line of clutch operated power hydraulic snow plow controls. The controls are simple to install, and are merely clamped on the generator. The units operate on ordinary lubricating oil, easily obtainable.

275

Utilization of Douglas Fir

"Where to Use Douglas Fir Lumber," a two-color booklet featuring "the world's most versatile wood," has been published by the **West Coast Lumbermen's Association**, 1410 S.W. Morrison St., Portland 5, Ore. This attractive 16-page publication will be useful reference material because it covers the properties, characteristics and grades of Douglas fir; gives recommended grades for interior and exterior uses and points out the hundreds of uses of this dependable softwood.

INDEX TO ADVERTISERS
★ IN THIS ISSUE ★