

SEPTEMBER 1955



IT'S A BIG equipment operation in the impervious zone 1 borrow pit of heavy clay. Here a Euclid sidecutter elevating loader is being pulled

by an HD 21 (foreground) and a TD 24. Hauling to the damsite are 25-cu.yd. Euclid bottom dumps, 17 of them in all.

WANSHIP DAM: A test ground for heavy equipment

New tractors, special borrow pit conditions, a short season—these facts make this earthfill dam in Utah one of the more interesting projects in the West today.

HERE IS A PROJECT where the contractor, Utah Construction Co., has purchased or leased several new makes of tractors and is keeping accurate cost records to determine just what can be expected in efficiency and performance from each. All types of material—from heavy clay to dense rock are being handled—to provide good test conditions. Just what each of them is doing will be described in this article in conjunction with a description of particular phases of work that goes into constructing the dam.

Wanship Dam, being built at a cost of \$2,423,004, is part of the Bureau of Reclamation's Weber Basin Development located about 40 mi. east of Salt Lake City. Its prime purpose will be to store water for

irrigation districts near Ogden—but a small 1,400-kw. power plant is also to be constructed. Further downstream an extensive diversion dam, canal, tunnel, and distribution system are in various stages of construction.

The dam, shown in cross-section elsewhere on these pages, has a 2,010-ft. crest length and 156-ft. maximum height. Three zones of material are required, an impervious clay core, a gravel blanket upstream and downstream, and heavy rock in the downstream toe. There is a concrete lined spillway 75 ft. wide in the east abutment and also in the same abutment, the 12-ft. diameter diversion tunnel and outlet works.

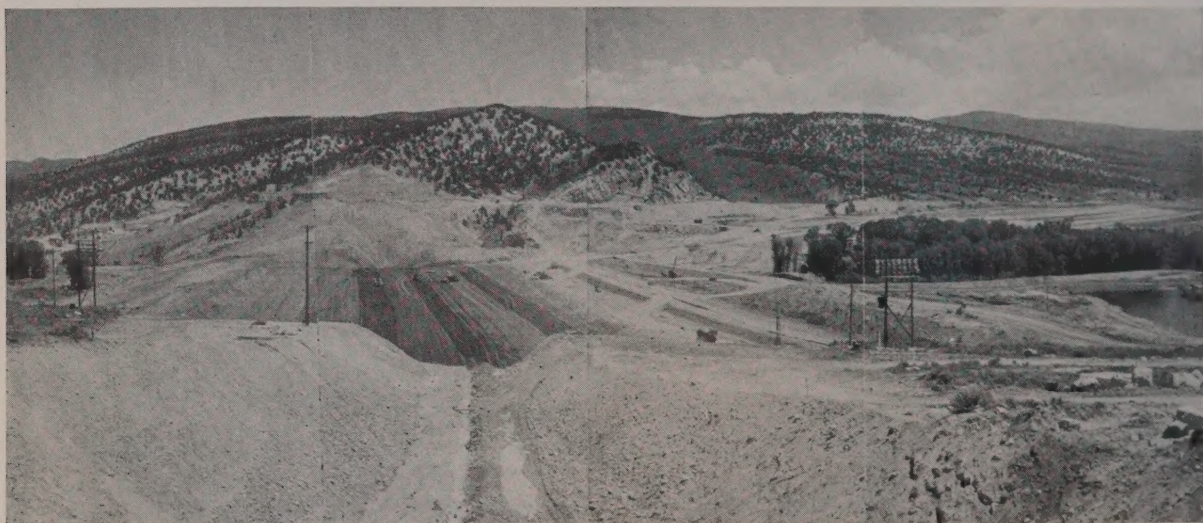
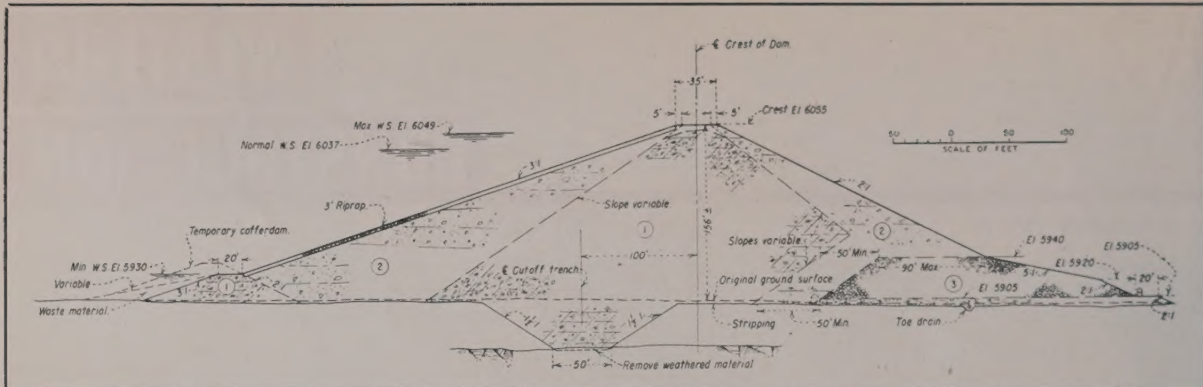
Contract award was made to Utah Construction Co. in June of last year with 1,000 calendar days allowed for

completion. Before winter had set in the damsite and borrow area had been cleared and stripped, access roads established, and the diversion tunnel well under way. The latter, 867 ft. long, was finished and lined during the winter months. It is of interest that a gate chamber is installed near mid length with an 85-in. diameter steel outlet pipe installed within the 12-ft. diameter tunnel and running from the gate to the downstream portal and a control house.

Zone requirements differ

The construction operations on each zone of the dam require different types of construction equipment. At present, about one-fifth of zone 1 and 2 materials have been placed and nearly all of zone 3. Work is proceeding on a two-shift basis with the possibility that the dam may be completed this year, one year ahead of schedule.

Considering the zone 1 impervious section, requirements are that it be



LOOKING AT THE EAST ABUTMENT down the centerline of the dam. Equipment is actively placing the zone 1 impervious core in the center with material being hauled from upstream to the right. Zone 2 blanket

material comes from excavation carried on near pond to the right. Access roads on the far hill lead to the overflow spillway where formwork for the wing walls is being constructed.

placed in 6-in. layers and at as near optimum moisture content as possible. This optimum is about 17% with the Bureau having it placed at $\frac{1}{2}$ to 2% less than this. Just upstream from the dam and on the east bank is a large deposit of suitable clay and silt materials. Haul length will vary from a few hundred feet to about $\frac{1}{2}$ mi. Maximum size material allowed here is 5 in.

At the pit, the material is generally too dry and has required watering. A Rainmaker system of pipes and sprinklers has been installed and handled much as a farmer would his alfalfa. To make sure that the water penetrates the dirt uniformly, it is first ripped and broken up to a 2-ft. depth.

Big borrow pit show

For excavating a Euclid sidescutter elevating loader is used that cuts a 5-ft. vertical slice each pass. It requires two tractors to pull it, an HD 21 and a TD-24. Usually, two of the same make are used. Excavation is laid out so that long passes with the sidescutter are possible and a uniform 5-ft. depth is removed over the

entire area before going down one more level. Hauling to the dam from the pit are Euclid bottom dumps, each taking 25 cu. yd. at a time. There are 17 of them on the job with a lesser number actually hauling because of routine repairs and maintenance.

After leveling, the layer is sprinkled by a 7,000-gal. Euclid water truck if further moisture is required and it is then disced and harrowed for uniform moisture distribution. On this operation is one of the new Eimco 105's on a rental basis from the manufacturing company. It is also one of the first being used in heavy construction work other than in the mining field. Following this step comes the sheepfoot parade for compaction. Each dual roller has had its weight boosted to 20 tons—this giving a 4,000-lb. weight per 3-in. diameter tamping foot. By having the rollers operate in line on each pass over the length of the dam, it is a simple matter to keep track of the number of passes made.

Typical Bureau specifications are that 12 passes of the rollers will be made over each 6-in. layer and that

is the actual field case. More or less passes can be required dependent on how many are required to reach the specified density at optimum moisture based upon the modified Proctor test. An adjustment in the unit price of \$.0035 per cu. yd. is made for each pass more or less than 12.

Torque converters are best

The consistency of the impervious section of the dam at optimum moisture is such that it is heavy going for the equipment. It is here that real power is needed, such as on the sheepfoot operation. Tractors such as a Caterpillar D8, Allis-Chalmers HD 19 or 21, and the International TD 24 could handle this phase. Turning in this material also brought out the advantage of the models equipped with torque converters—which was true for the HD 19, HD 21, and TD 24—full power is retained in both tracks. The smaller Eimco 105 pulling an attached McCoy light ripper bar through the heavy clay brought out the same turning advantage with full power in both tracks.

In the contractor's daily reports on equipment usage, the actual and

pected number of hours of operation each piece works is noted. Comments on differences between the figures such as delays, or type of pair, are noted and give a valuable performance record on each type of equipment.

For the cut-off trench, especially, and to a lesser extent in other places where the earthfill contacts the bedrock, the Bureau has required a very clean rock and shale surface before placement of any material. This was found practical by the contractor to use hand brooms.

For compaction of the impervious zone material in areas that were not accessible to the sheepsfoot tampers, the contractor used hand-operated or pneumatic tampers and Chicago Pneumatic 3-leg pneumatic tampers. This material was placed in 6-in. layers similar to the main section.

Rapid density determinations

Density tests performed by the Bureau were being taken with the new Watts Densometer—developed by Herbert Humphres of the Washington Highway Department. This apparatus expands an oil-filled rubber balloon into a small excavated hole and allows direct volume readings. With experience a soils crew can rapidly determine the density in place to keep up with the fast moving earthfill placing operation.

Suitable zone 2 material is found directly upstream from the dam in the river channel. One of the biggest draglines to be found in the area, a Marion 151M with a 90-ft boom, is used to load the belly dumps. About four or five swings with the 8-cu. yd. bucket is sufficient to fill one of the 25-cu. yd. units. With a shorter hauling distance and faster loading, the zone 2 filling operation proceeds at a much faster rate than that of the impervious fill.

Zone 2 compaction

This zone 2 material is free draining, sand, gravel, and cobbles with a maximum size of 12 in. It is dumped and bulldozer spread into a 12-in. layer. Compaction as required by the specifications is set at 4 complete coverage passes of the tracks of a 40,000-lb. tractor. The contractor is using an HD 21 to accomplish this. No special problems have been encountered in reaching desired results.

The zone 3 toe rock with a limitation on size of 1 cu. yd. was mostly obtained from miscellaneous rock excavation required on the job such as for the spillway and access roads. It was placed from end dump trucks and leveled out into 3-ft. layers by bulldozers.

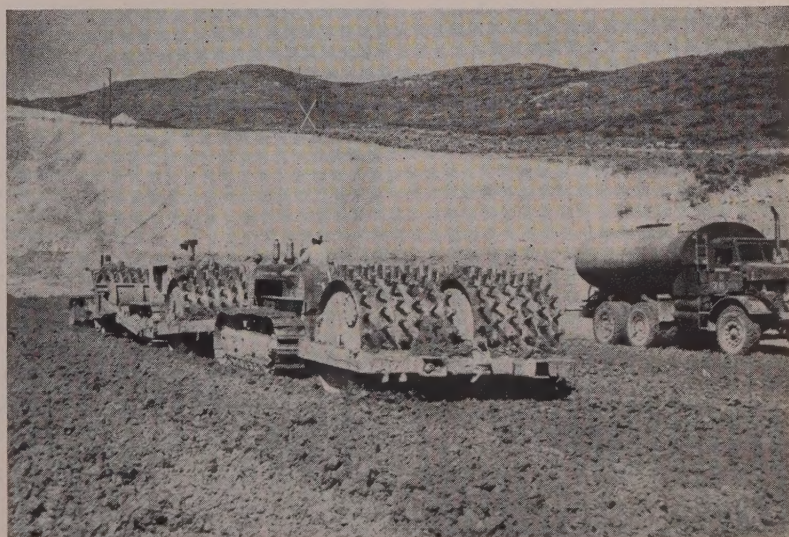
Grouting operations on the curtain wall across the axis of the dam were completed during July of this year. Maximum depths required



LOOSE SANDSTONE and dirt is dozed down the 42 % spillway slope by a Cat D8. At the bottom a Northwest 80D loads it into Eucs for placement as the zone 3 toe rock of the dam.



EVEN SPACING of windrows, spread by the bottom-dumps across the full length of the dam, gives a consistent 6-in. layer when spread out by the dozer. Going is boggy at 17 % moisture.



TWELVE SHEEPSFOOT passes are required over each 6-in. lift of clay. Operation in line helps keep the tally straight. Here's a Cat D8, HD 21, and a TD 24 in one line pulling McCoy rollers.



23-FT. HIGH wing walls are formed using Universal Uni-Form panel sections and pipe-frame scaffolding for fast erection.

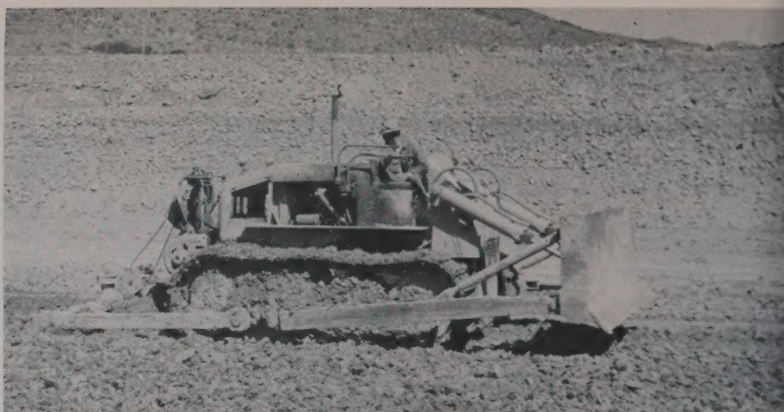
were about 110 ft. The grout mix varied from 1 part cement to 5 parts water in the tighter formations to 1 part cement to 1 part water in the loose formations. Standard grout pressures in per square inch of 50 psi. plus the depth of the hole in feet were sufficient. The outlet works tunnel and gate chamber were grouted earlier in the construction of the dam.

Unique tunnel plugging

Prior to earthfill operations, there existed in both the east and the west abutments of the damsite three old exploratory mining tunnels that had to be sealed off. The method selected by the contractor was to drill down vertically from over the tunnels and to pour a slurry mix into them—somewhat like a grouting operation. A big Joy Champion rotary drill was used that put down a 7 $\frac{3}{8}$ -in. diameter hole. The slurry was 10% cement, 30% clay, and 60% sand.

The overflow spillway required considerable blasting to clear a 75-ft. wide path nearly 800 ft. long. Most of the rock was sandstone and shale with some layers of coal. Bottom of the drilled holes was held to about 4 ft. above final subgrade level. This 4-ft. depth of remaining material prevented air slacking of any shale formation until its final removal shortly before concrete placement and also it served as a safety factor against early blast shattering of the foundation rock.

Two-thirds of the spillway is on a 42% slope that was blasted in sections of about 100 vertical holes each with hole spacing being on 8-ft. centers each way. Atlas Flodyn powder



NEW EIMCO 105 shown here is one of the first to be used in the West in heavy construction. It is pulling a light ripper to give uniform moisture distribution. Note the amount of heavy clay sticking to the treads—it takes power to get through it.

was used, set off by No. 3 Geladyn detonators and Rockmaster caps. Two Ingersoll-Rand wagon drills did all of the work and were supplied air by an I-R 615 rotary compressor that gave excellent service. Joe Roach, drill foreman, got good results using $\frac{1}{2}$ lb. or less of powder per cu. yd. of rock blasted.

After the slope blasting a Cat D8 dozer was used to push blasted rock to the foot of the slope for loading by a Northwest 80D shovel into trucks. Further tailrace excavation below the spillway was performed by a Northwest 80D dragline.

Graded riprap to be placed 3 ft. thick on the upstream slope of the dam embankment, and on the outlet works and spillway approaches and outlet channels, will be obtained from a hard well-cemented sandstone formation about 5 mi. upstream from the dam. The Joy Champion drill will be used here with the large bore holes to be put down on 20- to 30-ft. centers. Past experience with this rig has shown that it can drill at a rate of 50 ft. an hour in a 5 hardness sandstone—a rate that will make short work of the 76,000 cu. yd. of riprap operation.

Forming wing walls

Wing walls at the upper end of the spillway are 23 ft. high for a 200-ft. distance and about 12 in. thick. Formwork for these high walls—to be reused on the lower walls on the slope of the spillway—is the Universal Uni-form. Mostly 2x6-ft. panels were used, placed with the long dimension horizontal. They went up rapidly with the aid of Beatty Safeway scaffolding. It is interesting to note that this work is far from being a reinforced building project—but the same construction methods pay off. The full 23-ft. height of the wall will be poured at one time.

Concrete placement will be by two methods for the spillway. From the batch plant, which is located only 300 ft. away from the base of the

spillway, trucks will transport 1-cu. yd. Gar-Bro buckets to the top of the spillway where a crane will further handle them for wall pours. On the sloping downhill floor, it is anticipated at this time that a vibrating screed will be pulled up the slope with concrete delivered by a Pumpcrete machine, the same one used for lining the outlet tunnel.

The concrete plant is a Noble with a Ransom 1-cu. yd. dual-drum mixer and an 80-ton cement silo. Four hoppers are required, holding aggregate sizes of sand, - $\frac{3}{4}$ in., -1 $\frac{1}{2}$ in., and -3 in. Aggregate is trucked in from a commercial producer. From the bins where the trucked aggregate is stockpiled, it is further moved as needed to the plant's hoppers by an elevating conveyor loaded by a front-end loader.

One of the central points for any large earthmoving operation is the maintenance and repair shop—and the one to be found here can handle nearly all breakdowns encountered. The basic shop is a 40x100-ft. Vinell building which allows getting a lot of equipment inside during the winter months or when it is raining hard. A TD 14 equipped with a front-end boom capable of swinging 90 deg. left or right of center and able to lift 2 tons is the jack-of-all-trades piece of equipment that can run into the shop to lift heavy parts, or equally well run out into the field for repair work there. Tire changing, engine replacement, truck frame straightening are all in a day's work for master mechanic Monty Schoenfeld and his men.

Another of the major day-to-day problems is building up and hard-surfacing such items as the sheep-foot tampers and the shovel and dragline teeth and buckets. Where more than one layer has to be built up, the firm has been using Ranite BX hardsurfacing rod with good results.

Key personnel on this project are given in the Supervising section of this issue.

BLASTING: An interesting business

Gibson & Roberts are drill and shoot specialists of the Pacific Northwest. Here is a factual account about how they shoot some tough types of rock, and how they have managed to keep themselves a growing firm.

By **PAT THOMSON**
County Engineer
Douglas County, Washington

NO ONE KNOWS exactly when the Chinese first discovered gunpowder. But its rediscovery in 1320 A.D. changed the entire course of history. For its use led directly to the invention of other stronger explosives. And of these, dynamite has been exceedingly effective in the construction world of today.

Lack of the original simple invention would have precluded the existence of such a firm as Gibson & Roberts of Spokane. Bill Roberts and Frank Gibson met in 1936, working in the same mine. Later, they were partners driving drifts in another mine. Both graduated from Mining Engineering at the University of Washington, Bill in 1938, Frank in 1939. The two formed a partnership in October of 1946, and then incorporated in April of 1954.

The small beginning

The company's first project was blasting some 30,000 cu. yd. of blue basalt for the C. & E. Construction Co. of Yakima. For this work, they rented a 315 compressor and wagon drill. The two were well acquainted with drilling from their previous

mining experience but not so well versed in powder work. The E. of C. & E., George Ensminger, showed them the intricacies of springing holes and the company was under way.

Now—bigger projects

Most of the company's work has been in blasting quarries for the various crushing organizations in the Pacific Northwest. However, they are willing to work anywhere, anytime. Since the spring of 1953, the company has branched into tunnel work ranging in cross-section from 8 x 8 ft. to 38 x 38 ft. They have driven the diversion tunnel for the Pend Oreille River at Box Canyon Dam, the Heart of the Hills tunnel at Olympic National Park for the Bureau of Public Roads, and a railroad tunnel 1,900 ft. long on one of the new taconite projects on the Minnesota Iron Range. Presently, they are driving a diversion drainage tunnel for the mill on the same project. Continued success is apparent from the following news clipping from the June 25, *Spokesman Review* paper of Spokane, Wash.:

"Gibson & Roberts, of Yardley, yesterday was awarded a \$600,000 contract to drive the power and diversion tunnel for the Mayfield

dam on the Cowlitz river near Chehalis, Wash.

"W. J. Roberts said the contract was awarded by the Arundel Corporation and the L. E. Dixon Co., San Gabriel, Calif., project construction firms. Roberts said work will start September 1 with completion scheduled in about a year."

How to place an estimate

Quarry blasting is contracted on a price of so much per cubic yard of crushed aggregate produced by the plant. On a price of 14-15c per crushed yard, the company furnishes labor, equipment, and insurance, but not the explosives. It is extremely difficult to give any guarantee of fragmentation. With new areas and new quarries, possible fragmentation is largely "guesstimation." Basalt is particularly difficult to work with as the character of the rock will vary greatly even within the same pit. Interior clay stratification often causes drilling troubles. In shooting eight different quarries in Douglas County, only one turned up with rock larger than melon size. And these quarries varied from the porous igneous basalt almost spongy in shock absorption to the fire-glazed blue basalt that drills like steel and shatters like glass. Experience is necessary in any area and its rock formation if degree of fragmentation is to be readily estimated.

Pit layout important

In quarry shooting, the pit layout depends upon the crusher man's positioning of the jaw and general plant location. If the crushing superintendent feeds with a dozer, shooting is done to give a gentle downhill push. If a shovel is to be used for feeding, a flat floor must be the result. At the same time full cognizance must be taken of all nearby buildings, transmission or toll utility lines, or any other object subject to blast damage. Insurance premiums are high enough these days. And crushing outfits take a dim view of the bad public relations resulting from a spread blast.

In quarry shooting, the holes are drilled on a square grid pattern of 10 to 15 ft. Part of the pattern spacing distance is dependent upon the type of springing conditions to be encountered. The most economical hole depths vary from 16 to 24 ft., giving from 80 to 200 cu. yd. of solid material, which, in basalt, will swell approximately 30%.

Springing a big shot

The firm generally initiates their springing with a special gelatin 40% stick powder. The powder is dense, has a high velocity, and cracks a



HERE IS ONE of the large drill jumbos and a loading platform used by Gibson & Roberts working in a heading of the Heart of the Hills tunnel, Olympic National Park, Wash.



PARTNERS W. J. Roberts (left) and Frank Gibson have seen their firm steadily grow since they first started in 1946.

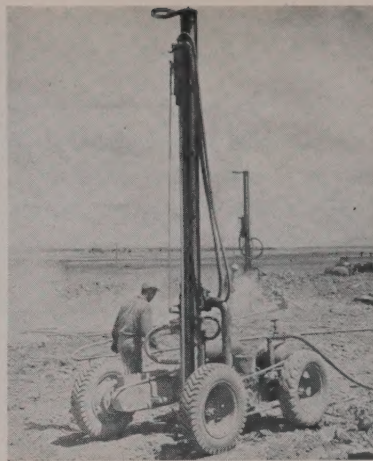
good pocket. When the pocket cavity is large enough to contain 25 lb. of powder, springing is completed with free-flowing 40% bag powder. Generally, the final springing shot lifts the rock a little. The rock doesn't settle back to its original firm and undisturbed position. Therefore, this creates a large void volume at the bottom of the hole. This, in turn, is the ideal blast load position since the object is to lift, heave, and turn the rock without throw.

What kind of cap

In quarry shooting, it is preferred to use instantaneous caps. This gives a greater movement of rock per pound of powder. However, in some instances, such as one Douglas County pit where the back pit line was only 8 ft. from a lush wheat field, there is a problem. A fist sized rock going through the knives of a self-propelled combine has a way of turning a peace-loving farmer into one hell of a rough customer. Here, overbreak and throwing were both problems. In such cases, millisecond delay caps are used to prevent sharp shock and back break. On a total 17,000-ton shot, less than 10 min. cleared away all scattered rock debris, leaving not only a happy farmer but a well satisfied county engineer. Millisecond delay caps have also proven very successful and valuable for moving a shot close to the crusher if the unit is in place, or for applying reverse English to hold a shot upon a steep hillside.

Variable lb. per cu.yd.

In some locations, it is difficult to spring holes large enough to hold 120 lb. of powder. And on others it is relatively simple to spring large enough to hold 200 lb. If it is planned to load the shot at 0.90 lb. of powder per cu. yd., the average spring pocket should hold 1.10 lb. of powder per cu. yd. Then if some pockets are a bit small the deficiency



A SELF-PROPELLED wagon drill developed by the firm is shown here working on a quarry of Pacific Sand & Gravel Co. near Spokane.

can be made up in neighboring holes. Most portable crushing units are now fed with either a U-dozer or a small shovel, so that the quarry must be well churned by the blast to allow easy handling. On grading projects, where large shovels are used, the rock can be shot much lighter. As a rough rule of thumb, Gibson & Roberts load 1 lb. of 60% powder per cu. yd. of solid rock. Their lightest shot was loaded .65 lb. per yard, and their toughest at 1.2 lb. which, even then, didn't produce a satisfactory break.

For major equipment, the firm now owns four 600 rotary compressors, three self-propelled wagon drills, several conventional drills, one small and one large drill jumbo for tunnels of various sizes, two Koering Dumpsters, a 3/4-yard electric shovel for large tunnels, an Eimco 105 for medium size tunnels, a model 21 Eimco for small headings, two 25-hp. fans for ventilation, a 4-ton locomotive, water trucks, pumps, a 60-kw. generator, a TD18 for plowing snow and leveling dumps, six flatbed trucks and a tilt-top trailer.

Keeping track of maintenance

With equipment widely scattered, proper lubrication and preventive maintenance was a problem. As a gentle reminder to operators, the firm placed a small steel box on each unit of equipment. This box contains the service card record for each equipment item as to proper time for hourly, daily, or weekly service. Thus, no operator can plead ignorance of service requirements, for he must fill out the service card record every specified time unit. When a card is full, it is signed and mailed to the home office. This successfully forestalls a shirking of lubrication duties.

The firm has had no serious accidents, for they rigidly follow the Safety Code of the Department of Labor and Industries. Primary con-

siderations are to have the bore of the hole sufficiently large enough to prevent undue ramming of stick springing powder, and not to load spring pocket too soon as the heat may propagate a premature blast and to thoroughly test all circuit at a safe distance. Twice, during winter slack periods, the entire crew has been put through the Red Cross first aid course.

The best project

The company feels one of their best projects was blasting the rock for Marshall, Haas, and Royce west of Blue Creek bridge on Coeur d'Alene Lake's north shore. With a 12-man crew and three wagon drills the firm blasted 125,000 cu. yd. of solid rock per month. The total project consisted of 500,000 yards with 90% being moved in less than four months. It was a good project because the weather was good, the rock was good drilling, the haul was short, and there was a good cooperation in the planning of work between the prime contractor and the company. Bill Roberts said, "We took this one cheap, but the costs were cheaper and that is what counts."

The toughest project

One of their toughest jobs was shooting the grade for R. A. Heintz of Portland, Ore., on the Pullman West project. A new motel, a cafe and several houses near the cut necessitated loading light and firing with delay caps one at a time to keep shock down. This was not entirely successful for water in the rock allowed the shock wave to travel propagating neighboring holes. As the cut deepened, several active septic tank lines were cut. Blow piping spring holes became a very unsanitary operation.

What's in the future

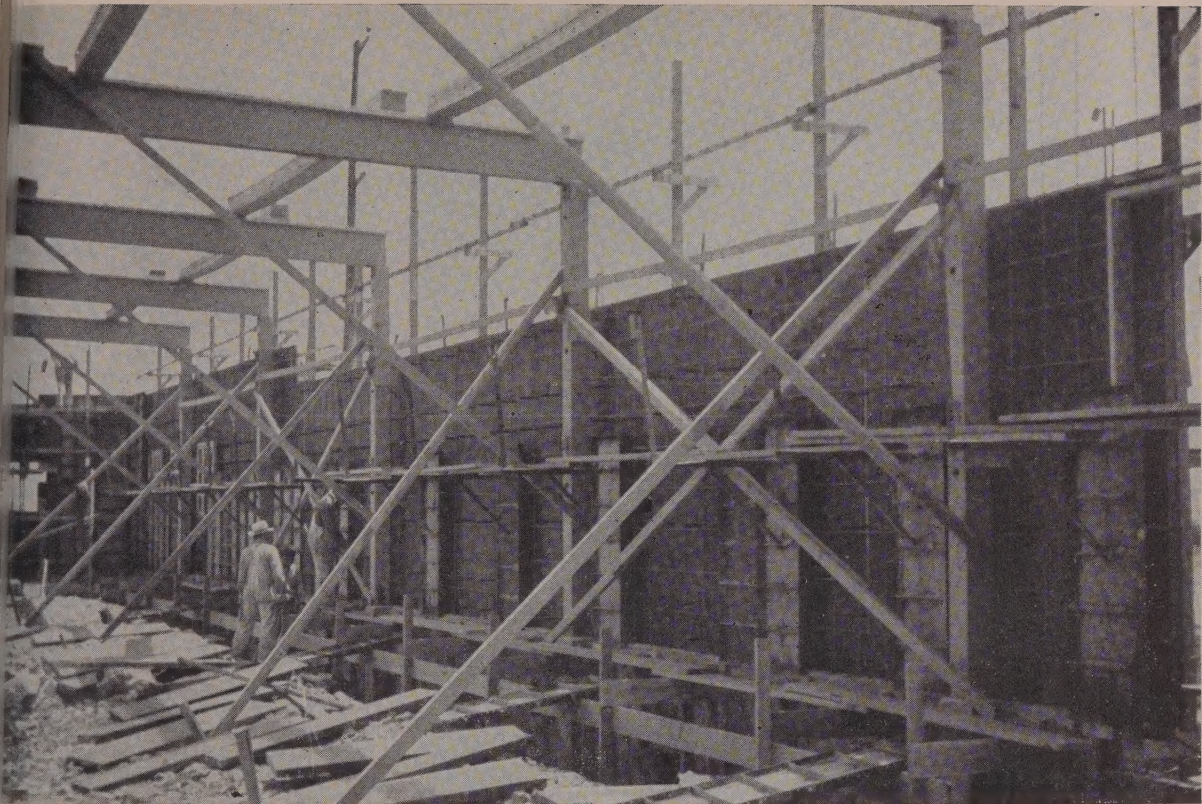
Bill Roberts feels that the blasting industry will grow faster than other heavy construction. Traffic requirements demand wider subgrades and better alignment, rock or not, with heavier ballasting. Speaking of the future, he says, "The drilling of rock is in a state of flux at present with all types of equipment being sold, percussion drills which are identical with the 1915 models, churn drills, rotary drills, and fusion piercing. I think that with perfection of drill steel, carbide tipped bits, and better methods of hole cleaning that we will see a big changeover to true rotary type drills in the next 10 years. For 20-ft. lifts in diced basalt there is nothing at present that beats springing wagon drill holes. In soft formations, tunnels are being driven now with mechanical moles and with the perfection of carbide tipped cutting heads, better methods of bonding the carbides, etc., it appears that that should work in all types of rock."

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OUTSIDE UNI-FORM wall forms 10 ft. high, made up of 6-ft. and 4-ft. components, were put up first, followed by reinforcing steel. A few

interior panels held up wale brackets so that iron workers could work higher up. Crew now puts in remainder of inside forms.

Concrete forms go fast with prefab panels

COMPETITION IS KEEN in the small building field and a contractor has to know how to keep costs down if he is to survive. The Armstrong Cork Co. warehouse being constructed in San Bruno, Calif., is a good example of how one contractor, the Van Bokkelen-Cole Co., goes about doing the concrete work efficiently.

Building characteristics

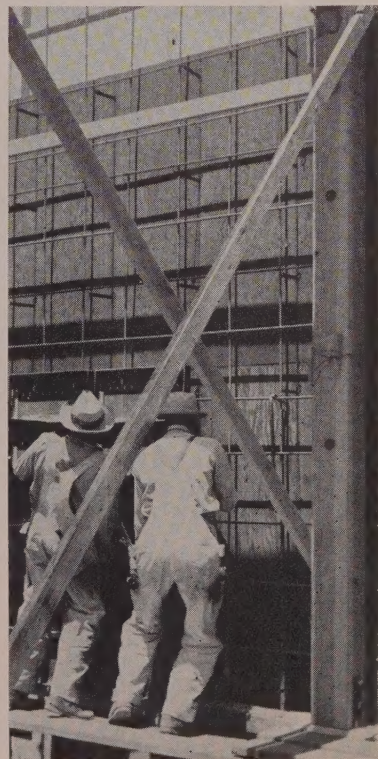
The building covers a 72x140-ft. area. A continuous concrete 9-in. thick footing wall rests on the natural subgrade and rises to finished floor grade. Exterior walls are 6-in. concrete with a height of 14 to 16 ft., at some places, the extra 2-ft. height being due to a parapet wall. The roof is supported on 16-in. wide-flange steel beams which span one-half the building width of 36 ft. Beam spacing is 20 ft. center to center. At the exterior walls the beams rest on 8x8 timber posts 14 ft. tall and down the center of the building on pipe columns. Roof pur-

lins are 2x10 lumber. Each 8x8 post is anchored to the concrete wall by three anchor bolts imbedded in the concrete and passing through the post.

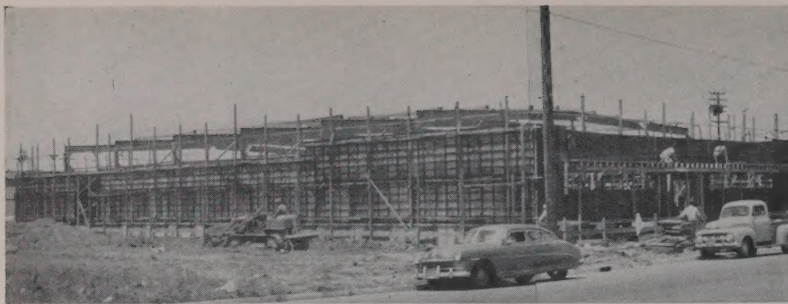
Sequence of construction

Key feature of the concrete framework is the use of Universal Uni-Form panels. These are used in predominantly 2x6-ft. and 2x4-ft. sizes. In the sequence of operations the 4-ft. high foundation wall was formed and poured first. Upon stripping forms there, the next step was the erection of the 8x8 posts, pipe columns, steel beam, and placing the stacks of 2x10 purlins—all this done by a crane operating from outside the building area.

For the main concrete work on the walls, the exterior forms were erected first—a 6-ft. high form first, followed by a 4-ft. high form. The situation here is that the full wall height will be made in two concrete pours of about 10 ft. and 6 ft. in the order of pouring. For the upper or



TWO MEN can easily handle the 2x6-ft. panels. Metal strap ties are easily pinned to the forms to provide tight connections.



WAREHOUSE WILL have been completed from start to finish in a little over two months time. Putting up walls first with inside fill and concrete floor slab later frees subcontractors.



BLOCKOUTS for windows, doors, canopies are no problem to construct with basic panel sizes. Filler panels can be easily made to fill in gaps and connected to the others.

second pour the lower 6-ft. high form will be stripped and placed upon the upper 4-ft. high form. Altogether about 8,000 sq. ft. of forms are being rented.

Five carpenters were able to place the entire exterior perimeter set of forms 10 ft. high in a matter of four days. This amounts to better than 4,000 sq. ft. of form area including

the extra work of blockouts for one large rear door, and for windows and a door at the front of the building.

With the exterior forms in place the iron workers could then place reinforcing steel to the 6-ft. high level above the foundation wall. At this time intermittent interior 6-ft. high panels were placed and tied to the outside wall forms. Upon these

were erected wale brackets, furnished by Universal, and upon which a platform was erected so that the iron workers could place more reinforcing steel. No special scaffolding is ever required.

Little bracing needed

Wales and strongbacks to hold the Uni-Form panels were few in number. Wales consisted of 2x4's placed horizontally at about 6-ft. intervals at the panel joints and the strongbacks were placed vertically at about 10-ft. intervals. The nature of the panels themselves is such that when they are locked together there is considerable rigidity in a wall section.

Alignment

Since the 8x8 posts are knee-braced to the steel beam plates upon which the purlins rest, the roof structure has rigidity and the wall forms at the posts can be firmly anchored to them at that point. In the intermediate 20-ft. gaps between posts, braces will be extended from the wall forms to the roof purlins—of which the first 10 or so nearest the walls will have been placed for this purpose. The net result of all this is that the wall forms can be accurately and quickly aligned with a minimum of trouble and with no ground to wall kickers required whatsoever.

Concrete will be poured for the first lift using a Scoopmobile. Concrete in the second lift will be placed by crane and bucket. Carpenters at both of these times will then be free to work on the roofing.

Advantages

The walls and most of the roof of this building will be finished before anything is done on the interior slab floor. Earth and sand fill operations to bring up the subgrade can be carried on through the rear large entrance door. One of the principal advantages in constructing the building in this manner is that only the general contractor's own men have been involved in the structure at this point—the subcontractors only to the extent of the small number of embedded items in the walls. A building interior for the future concrete floor is presented that is fully protected from the weather elements. This method of construction offers a lot of competition to tilt-up wall construction and can probably beat 30 days off a schedule for that type of construction for a building this size.

The Van Bokkelen-Cole Co. was the first contractor in the San Francisco Bay Area to use the Universal framework panels when they became available about 6 years ago. They have constructed many warehouses and buildings using them.

B. K. Burton is general superintendent for the firm and C. B. Anderson is job foreman.

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Progress in engineering materials marks design for— Second bridge at Carquinez Strait

**Modern concreting methods for
heaper substructure—High-yield strength**

**steel for lighter truss members—Welding
and bolting for better connections**

By **CLAUDE H. DARBY**

Senior Bridge Engineer
California Division of Highways

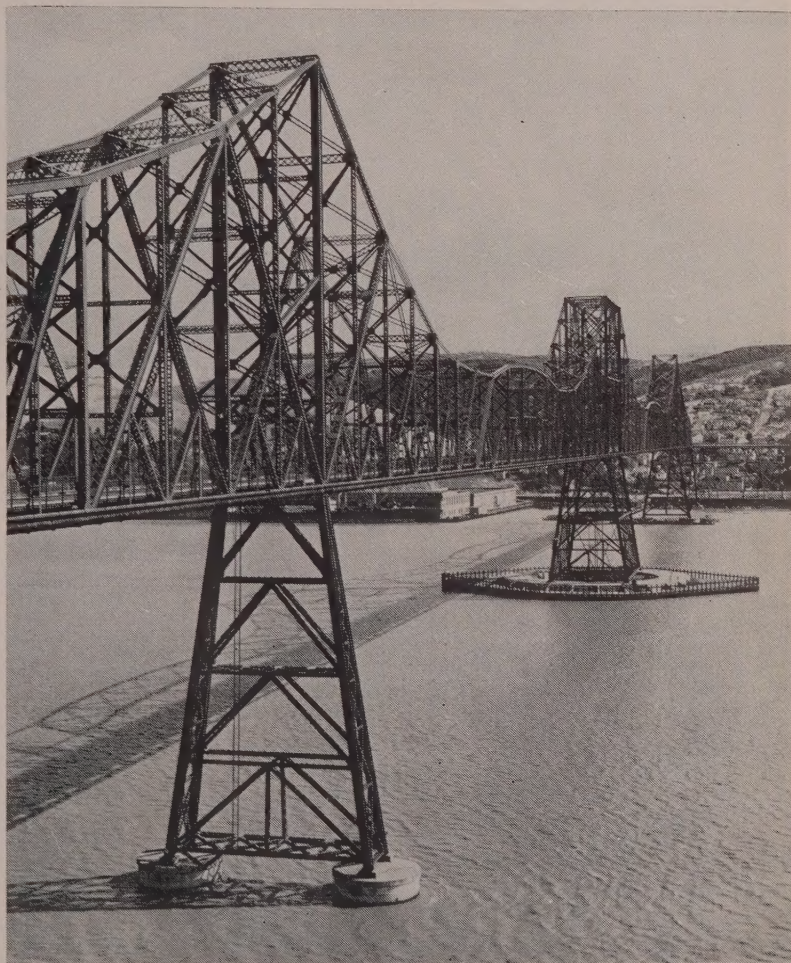
DESIGN OF A BRIDGE paralleling a similar structure designed 30 years ago affords graphic comparison of the changes made possible by new processes in manufacturing, fabrication, and construction. Carquinez Strait Bridge, northeast of San Francisco Bay, was completed by the American Toll-Bridge Co. 27 years ago. Traffic studies of main highway routes from San Francisco Bay cities now indicate the ultimate need for an 8-lane freeway across the strait. The present 3-lane bridge is to be widened and a new bridge built parallel to it.

In laying out the parallel bridge, the advisability of maintaining reasonable similarity of appearance between two adjacent structures determined the type of structure. The parallel bridge, therefore, could be assumed to be a twin structure, possibly to be built from the original plans with revisions only for increased width and loads. Technological progress in fabrication, construction methods and materials has been so great that the present economical design is far from this twin bridge arrangement. This article reviews the principal contrasting features of old and new designs: (1) caissons, (2) main pier fender, (3) structural design for high-yield-strength steel and welded fabrication, (4) high strength bolts, and (5) battledeck floor with asphalt-latex wearing surface.

Deep bedrock

Piers 2, 3A, and 3B (for old and new bridges) are adjacent to the deep navigation channel and require caissons. Pier 2 is nearest the north shore of the strait. Piers 3A and 3B underlie the mid-channel tower. Water depths vary from 80 to 110 ft. Bedrock composed of stratified sandy shale, hard clay, and sandstone is overlain by gravel, sand, and mud. The gravel and sand strata are about 20 ft. thick and the overlying mud varies from 20 to 35 ft. thick.

For the existing bridge separate caissons were used at each of the six separate pier legs. The caissons were timber and concrete, 40 ft. square and 110 ft. high, and contained four 8x8-ft. open wells. These wells were enclosed by double walls of timber and the space between filled with concrete. The upper 35 ft. of each pier shaft, a circular concrete sec-



TWO 1,100-ft. cantilever spans flanked by 500-ft. anchor spans, plus curved trestle at south end, identify present bridge. Central tower is 150 ft. high. Main pier fender design is uneconomical today. (This one, added in 1928, replaced four World War I surplus ships anchored around pier!)

tion 34 ft. in diameter, was constructed inside a cofferdam extending above the top of the caisson.

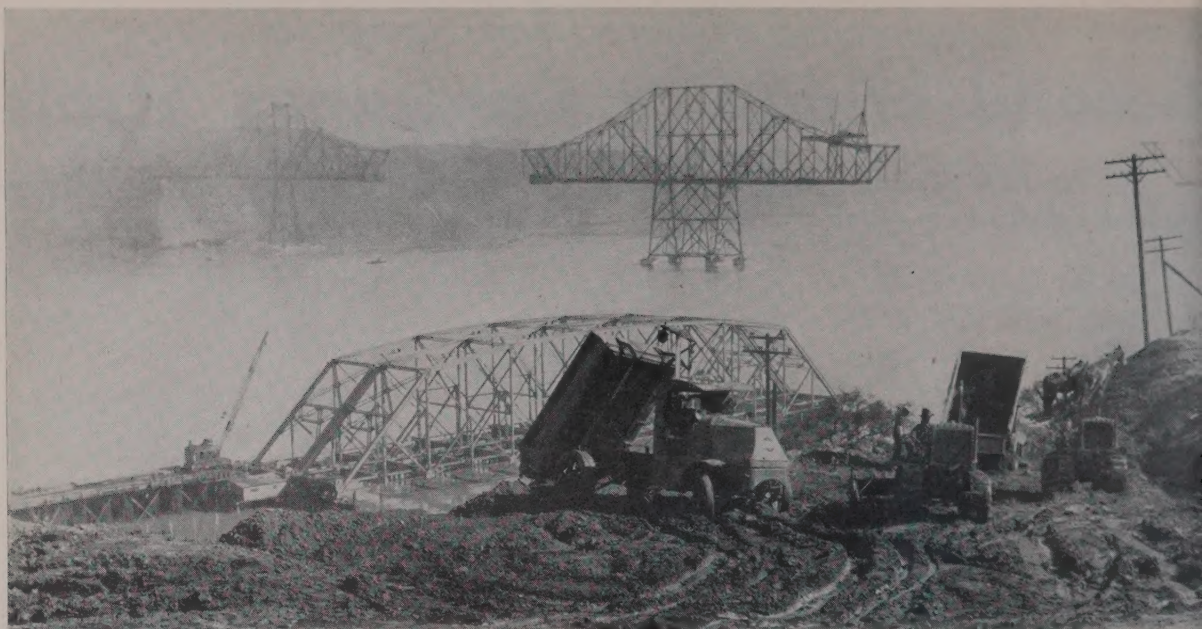
The new design contemplates three large caissons, one for each pier, giving greater stability. The caisson walls are to be of reinforced concrete. The caissons will be 53 ft. wide, 102 ft. long, and about 150 ft. high. Details are similar to those of caissons used for the East Bay portion of the San Francisco-Oakland Bay Bridge and for the Tacoma Narrows Bridge.

Fender problem licked

The depth of water around piers 3A and 3B presents a difficult and unusual situation for design of fend-

ers. The existing fender is a concrete frame supported on 85-ft. precast concrete piles which were driven into a fill made of small rock. The fill extends from el. -85 to el. -60, and required 200,000 tons of rock. The work cost \$680,000 in 1928. The cost of extending this fender, in kind, to protect the new bridge is estimated at \$2,000,000 at the present time. With the continued settlement of the rock fill there is some doubt about the permanence of this type of fender.

A more economical fender has been developed to reduce the cost of the deep rock fill. The estimated cost of this fender is less than \$500,000. The design requires only a thin layer of rock to eliminate scour below the



ERECTION BY COUNTERWEIGHT was feature of original construction. Main spans were built near shore and floated out for big lift. This

picture, like new bridge design, points up improvements in construction methods and materials, as well as hauling equipment.

present streambed due to local turbulence around the piers.

Steel pipe piles 24 in. in diameter and 140 ft. long will be used for the substructure of this fender. These piles will be driven several feet into bedrock and will not be affected by erosion or settling of the rock fill. A sufficient number of battered piles are provided to serve as anchors when placing the caissons should the contractor elect to construct the fenders prior to the caissons and use the permanent structure as a work platform.

The fender superstructure is a sand-ballasted concrete box designed to withstand the impact of a large ship. The superstructure required for the assumed horizontal loads has sufficient strength to carry the loads and forces of the usual temporary guide frames and work platforms necessary for anchoring and constructing caissons.

Same outline—new members

The truss design was definitely influenced by the existing bridge. Heights, panel lengths, and location of members are practically identical to the existing structure. The only change in outline is the use of parallel chord trusses in the suspended spans. The makeup of members and the connections, however, is distinctly modern. The laced and battened members of the existing bridge have been abandoned in favor of H and box sections in order to reduce maintenance painting costs. Also, the fabrication of these sections has been simplified by welding. Sway bracing members have been reduced in number and made of heavier components. A fairly new

steel with a very high yield point and especially designed for welding may be used in a bridge structure for the first time on this project, although a good many thousand tons have been used industrially since World War II.

High yield-strength steel

Present plans call for three types of steel in the trusses of the new structure. There will be approximately 1,300 tons of carbon steel, ASTM specification A-7; 6,300 tons of low alloy steel, ASTM specification A-242; and 2,000 tons of high-yield-strength steel.

In studies for the use of high-yield-strength steel, the proposed working stress for direct tension and bending is 45,000 psi. Allowable working stresses for compression members have been established by secant formulas. For comparison, maximum values are 15,000 psi. for carbon steel, 18,000 psi. for low alloy steel, and 35,500 psi. for high-yield-strength steel.

Deflection a problem

Deflection stresses (secondary stresses) become major factors in stress analyses of bridges of this length. At first the designers were concerned with keeping strain and deflection as low as possible. The resultant members, however, became so stiff that in some cases the computed secondary stress exceeded direct stress.

The deflection of L30 (free end of cantilever arm) was about 20 in. for the truss with all members made of carbon and low alloy steels. Computations for deflection using high-yield-strength steel members adjacent to the piers, showed an increase

of 30% in the total deflection at L30.

Members critically affected by deflection stresses, however, were greatly improved in their reaction to deflection. In the lower chord the moment of inertia was reduced 65%. In this less rigid member the bending stress was reduced from 19,200 psi. to 2,900 psi. The effect of the bending stress was further decreased by the high allowable working stress for direct compression, so that the ratio of secondary stress to principal stress was reduced from 110% to less than 10%.

Only two sectional types

The conventional design of heavy truss members has been based on riveted construction. Components have been limited to thickness which can readily be fabricated by shearing to size and punching and reaming of rivet holes. The heavier chords of the present bridge are composed of 14 components—8 web plates, 4 angles, and 2 cover plates.

In studies of built-up members the cost of stitch riveting 3 and 4 plates together to make up web plates appeared unwarranted with modern methods available. There is sufficient precedent using heavy plates and welding the flanges or cover plates to the web plates to assure satisfactory results on a structure of this size.

The number of sectional types can be reduced to two—H-sections for tension members and box sections for compression members. In these sections the two vertical plates comprise the major area of the member, and they are connected directly to the gusset plates, leaving very small increments of stress to be transmitted to the horizontal or trans-

“...it pays to buy the finest”

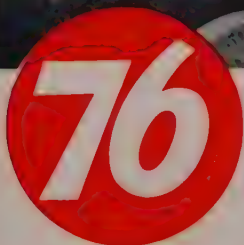
“About five years ago a Union Oil Company representative recommended T5X motor oil and UNOBA *multi-purpose* grease for our equipment, and we agreed to try them on certain of our machines.

“After thorough testing of these products in a few pieces of our equipment we were more than gratified with the results. Engine performance improved and oil drain intervals were extended by using T5X. Costly lubrication errors became a thing of the past with *multi-purpose* UNOBA. In fact we've never had a part failure where this lubricant was used.

“We've standardized on Union lubricants for our more than 50 pieces of equipment. We endorse them without reservation to operators of gasoline or diesel-powered heavy-duty equipment that is subject to hard usage. We've found it pays to buy *the finest*.”

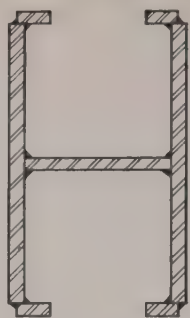
From everywhere come reports like this one of the American Construction Co., Inc., of Hartford, Conn. There's a Union Oil representative near you. Call him and have him show you how Union Oil Company products can save you time and money...no matter what lubricants you're using now.

Joe Wilkovich, superintendent, and James R. Mancini, vice-president in charge of operations, American Construction Co., excavating contractor for the Connecticut General Insurance Building at Bloomfield, Connecticut



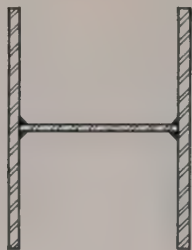
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LOW ALLOY STEEL A 242

2 RS 42 X 2 1/4
1 R 22 X 1 3/4
4 RS 5 X 2
AREA = 268.5 in.², WT. = 915 #/ft.
MEMBER U16-U18



CARILLOY T-1 STEEL

2 RS 36 X 1 3/4
1 R 23 1/2 X 1
AREA = 149.5 in.²
WT. = 508 #/ft.
MEMBER U16-U18

COMPARATIVE SECTIONS show what can be done with new steel—Carilloy T-1, for example. Carbon and low-alloy steels force design to excessive plate widths and thicknesses, require reinforced H-sections to resist dead load bending.

verse member. The larger bottom chord members have been reduced from 14 components varying from 3/4 in. to 1 in. in thickness to 5 components varying from 3/4 in. to 1 1/2 in. in thickness.

Welds replace stitch rivets

More than 1,000 stitch rivets requiring over 3,600 punched and reamed holes in each of these members have been replaced with 340 ft. of 5/16-in. automatic fillet welds.

H-sections are connected with 4 continuous fillet welds. Simple box sections are also connected with 4 fillet welds, while a reinforced box section (having an intermediate plate at the center) require 8 welds. Sections are designed so that all welds can be made automatically and the member positioned for maximum efficiency in welding.

The length of many members is greater than plates available in the widths and thickness required. Full-strength butt welds will be permissible in the makeup of these members. The splices will be staggered, and in tension members the short end sections may be of thicker material to compensate for loss of section due to rivet holes.

Edges of plates will be sheared or flame cut for better workmanship in welding the box sections. While the stress transferred from the webs to the perforated cover plates is small, and only nominal welding is required, it is deemed advisable to maintain the highest standards of fabrication in all components.

Rivets or bolts

Three methods were investigated for end connections for main members: riveting, high tensile bolting, and welding. The size of members and use of cantilever method of erection were reasons for rejection of welded connections. The proposed low alloy steel chord sections were

48 in. deep, 56 in. long, and weighed up to 25 tons each. (At this stage, studies did not include use of high-yield-strength steel.) No simple method of placing and holding these members in place for welding connections during erection was presented by our studies.

For some time observation and research have cast doubt over accepted methods of computing riveted connections and the actual condition of the rivet in the rivet hole. While the average engineer would admit that field rivets were not always tight, and the rivet hole might not be filled, there was little question in his mind concerning shop rivets. They were always assumed as having full bearing and shear strength.

Reasons for bolt usage

Some renovation jobs have been rather disillusioning about full bearing of rivets, and the more acceptable theory at present is that friction is the holding force in all riveted joints as well as in bolted joints. The fatigue strength of high strength bolts has been found superior to rivets. The designers, therefore, prefer the high strength bolt connections for this and several other reasons.

Among these reasons, all of them vital to erection efficiency, are the following: (1) Calibrated impact wrenches are now available which measure the tension in each bolt as it is tightened. (2) After all of the bolts are placed, those first tightened may be re-worked to compensate for any loosening effect. (3) Bolting requires only 2 men in a crew, and they can be trained in a very short time. (4) Inept workmanship results in either loose bolts which can be corrected, or over-tightened bolts which are not detrimental. (5) Inspection is positive.

Some question has been raised concerning slipping of bolted joints, based on the occurrence of unfilled

holes. This again implies that rivet holes are filled and do not slip, which is questionable. The designers have, however, taken this argument into consideration and computed the deflection due to slippage of joints. Assuming 25% of possible total slippage, the deflection due to slipping is only 10% of elastic deflection. Use of high-yield-strength steel has made this small deflection stress of little effect.

Final design problem

The economy of high tensile bolts in relation to rivets has not been definitely determined at this time. The factors favorable to bolts are shorter training of workmen, small loss of materials due to poor workmanship, the use of permanent connectors for erection bolts, size of bolting crews, and lesser skill required. These factors will have to be weighed against the increased first cost of the bolts over rivets.

A final major design problem deals directly with the existing Carquinez Strait Bridge and its modification to provide 4 traffic lanes. Renovation of the bridge to provide these lanes of H15-S12 loading, can be accomplished by replacing the existing concrete roadway slab and walks with a lightweight steel floor. This light battled steel floor and a thin wearing surface of latex-asphalt emulsion and 1/4-in. screenings has been described in recent publications (*Western Construction*—November 1953, p. 59).

Lightweight steel floor

Briefly, this assembly is an all-welded steel floor with vertical plates placed diagonally between the wide flange stringers to reinforce the floor plate against flexure. The conventional 3/4-in. battled steel plate is reduced to 7/16-in. thickness, with an average reduction in total steel weight of 20 lb. per sq. ft. The non-skid wearing surface weighs about 2 lb. per sq. ft. However, an allowance of 6 lb. per sq. ft. has been used in all designs to care for any accumulation of material due to resurfacing.

The resultant panel load for the entire floor system is 16% to 25% greater than for open grid decks, only 72% to 80% of the weight of filled grid decks, and 70% of the weight of a deck system with a lightweight concrete slab.

The writer and a small group of designers have made the studies and preliminary designs for this project since 1948. Most of the work has been under the direction of Stewart Mitchell, planning engineer, bridges, and A. L. Elliott, principal bridge engineer.

I. O. Jahlstrom, operations engineer, bridges, has given valuable advice on foundation design. F. W. Panhorst, assistant state highway engineer, bridges, is actively in charge of the bridge design. G. T. McCoy is state highway engineer.

Television goes underwater to check bottom for The Dalles Dam closure design

By R. J. POPE

Chief, Soils Engineering Section
Portland District
Corps of Engineers

UNDERWATER TELEVISION has been successfully employed by the Portland District, Corps of Engineers, to examine the riverbed of the Columbia River and obtain information for design of the rockfill closure dam for The Dalles Project. An especially valuable feature of its use was that everything the camera surveyed was observed by the design engineers and could be recorded for reference by photographing the screen.

What the closure dam is

The river closure for The Dalles Project will be made by constructing a rockfill dam in a deep narrow channel which is the restricted outlet below "Big Eddy." This channel, about 600 ft. wide and 140 ft. deep below normal river surface, has been cut in a faulted area of the Columbia River basalt flows. The channel was partially filled in 1952 and 1953 by placing approximately 1,000,000 cu. yd. of rock obtained from excavation for the powerhouse. Completion of the closure by the addition of more dumped rockfill will be accomplished during low water flow of 100,000 to 200,000 cfs. in November and December of 1956. This will divert the river flow through the eight units of the powerhouse that are planned for future expansion and will not be incorporated into the finished dam by increasing the height of the rockfill and placing gravel and sand blankets on the upstream face.

Further information needed

The first examination of the river bottom in the closure area was made in 1945 by divers who reported that the riverbed was exposed bedrock with a smooth scoured surface. The preliminary design for the closure dam was based on this information, but more complete information was required for final design because the foundation area will not be exposed by dewatering during construction. It was also realized that changes may have occurred since the original examination due to changes in flow conditions caused by the rockfill placed in 1951 and 1952. An attempt to obtain additional information with a diver in November 1954, was unsuccessful because the current in the area to be explored prevented the diver from reaching bottom.

Television development

The use of underwater television was then considered. It was learned that Harold Maiken of Commercial Divers, Incorporated, a Portland,



Corps of Engineers photos

TELEVISION CAMERA in waterproof case is mounted in tripod frame with 10 sealed-beam lights. Tail fin keeps it from twisting on way down until camera rests about 2 ft. above bottom.



140 FT. DOWN this is what the camera records on the monitor screen on board the barge. Coarse gravel pictured here is about one-third actual size. Numbered photographs are taken for future study.

Ore., diving firm, had been assembling underwater television equipment for use in his commercial diving work. Using the latest developments in industrial television apparatus, experience gained from devel-

opment of underwater photography apparatus, and considerable ingenuity, Maiken assembled an underwater television chain which was first demonstrated in an examination of erosion damage to concrete in the spill-



PORTABLE TV RECEIVER used as monitor had a camera located in front of it to make permanent record. An observer watching screen would direct operating personnel over an intercom system.

way at Grand Coulee Dam in December of 1954. The camera was carried by a diver in this demonstration. The Corps of Engineers cooperated in planning and building a tripod frame for the camera and in developing methods of remote operation from the surface for use in swift currents and the television chain was used to obtain the desired information at The Dalles Project in January 1955.

"TV Eye"

Basically the underwater television chain consisted of RCA's industrial "TV Eye" coupled to a standard make portable television receiver with a 14-in. screen. The camera was equipped with a wide angle lens as used on 16-mm. home motion picture cameras which are of the same approximate outside dimensions. Closed circuit connection between the camera and monitor set was by means of 300 ft. of 24-wire control cable incased in a waterproof rubber hose. Power for the TV units and lights was provided by a portable light plant with a small voltage regulator to maintain constant voltage for the electronic equipment.

Special frame

The tripod frame served to hold the camera steady at a fixed distance from the subject, provided a mounting for the underwater lights and protected the camera from damage. A fin attached to the tripod prevented twisting while the camera was off the bottom. Of the various types of lights tried, best results were obtained by using ten 150-watt sealed beam outdoor floodlight bulbs mounted five on either side of the camera and about

18 in. above the subject. These bulbs withstood pressure from depths up to about 160 ft.

A 40x80-ft. drill barge was used as a base of operations for these explorations although a smaller barge would have been adequate. It was especially suited for close maneuvering in difficult water by use of winches which handled a bowline to an anchor upstream and breastlines to shore from each corner of the barge. This method of operation not only held the barge steady, but also facilitated quick moves to any desired position. Occasionally it was necessary to relocate one of the shore anchors to reach a desired location, but this operation seldom took over 10 min. The barge positions were located by sextant observations of range markers plotted with a 3-armed protractor.

Steady picture

After the barge was in position, a 500-lb. anchor was lowered to the river bottom from the stern. The anchor line was held taut and as near vertical as the current would permit. The camera, fastened to the anchor line with guide rings, was then lowered by means of an air winch. As the camera was lowered, the connecting cables were lashed to guide rings which slid on the anchor line. A steady picture was obtained with the camera tripod resting on bottom. This picture was observed in the cabin and record pictures were taken with a still camera at most locations.

The television camera was then raised slightly off the bottom and allowed to swing and drift in the current to cover as much area as possible. The anchor was also lifted a

few feet and relowered to bring a new area into view. This procedure was repeated three or four times at each location. These movements were directed by the observer in the cabin over an intercom system to the operating personnel at the stern of the barge. Eighty-one locations at depths ranging from 35 to 140 ft. were examined in four days after the usual difficulties of a new operation had been worked out.

Vital information obtained

Considerable vital and previously unknown information was obtained by use of the underwater television camera. It was learned that approximately one-third of the foundation was covered by sand or gravel, and boulder deposits were found in other areas. Each of these materials requires separate treatment in the design of the dam. The different materials could be easily identified on the television screen by the engineers responsible for design. Although considerable detail is lost in the still photograph and reproduction, the illustration clearly shows the nature of a typical gravel deposit as viewed on the television monitor.

The Corps of Engineers plans to re-examine the foundation area during the annual flood stage of the river. The underwater television camera is expected to be useful in observing underwater work during construction and in examining underwater structures of many kinds.

Water turbidity a problem

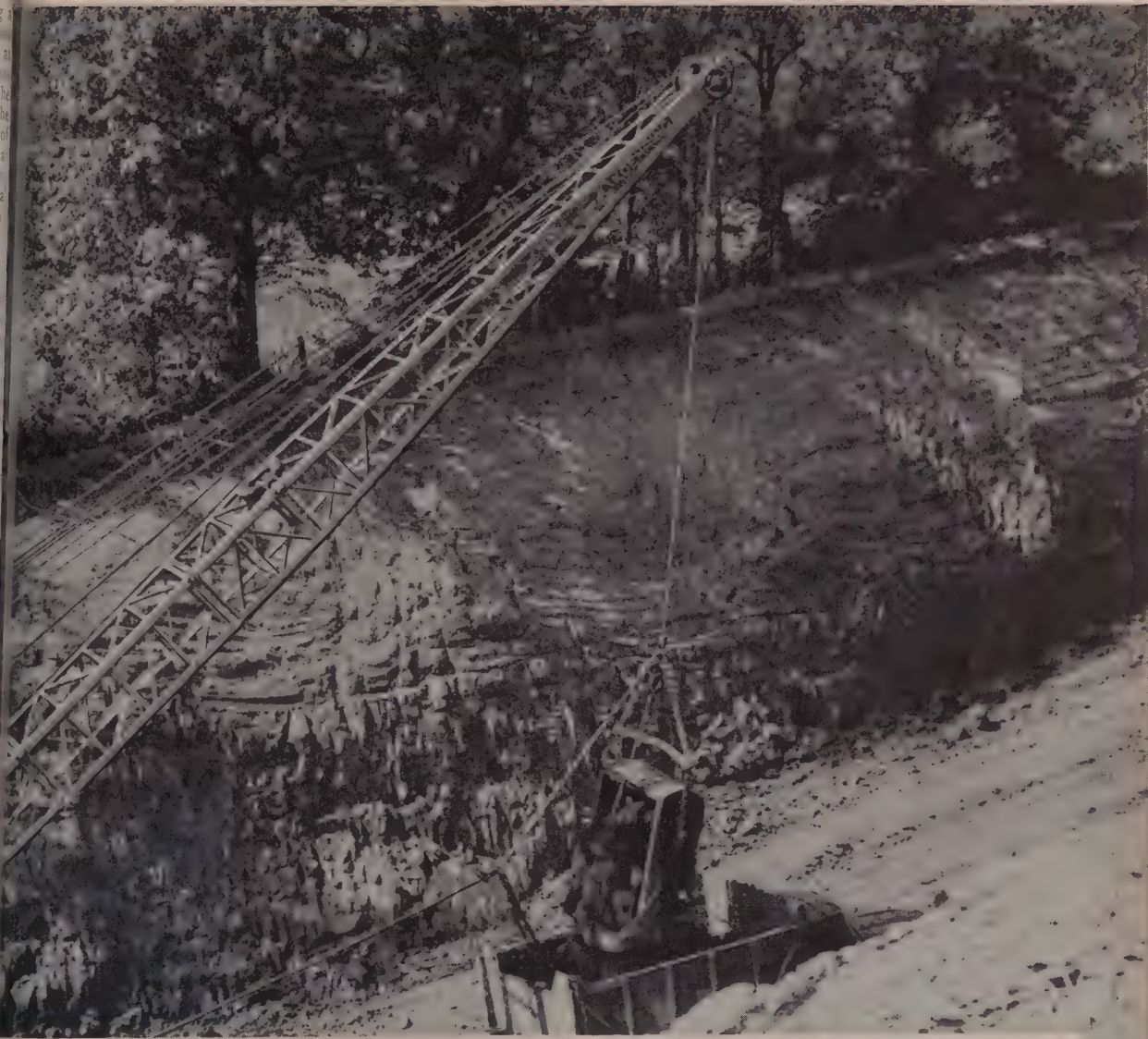
The maneuverability required for successful operation of underwater television by surface control was adequately solved for this job by simple methods. Control would be easier in quiet water and could be made more versatile provided the expense of more elaborate equipment were justified. Limited visibility due to turbidity of the water is a serious obstacle. The Columbia River was not clear at the time of use, and it was necessary to place the camera within about 2 ft. of the subject for a satisfactory view. This gave a viewing area of about 1 sq. ft. A clear water container to displace the turbid water in front of the lens is being developed to overcome this difficulty and make the camera usable in more turbid water. Other improvements developed since the first operation include remote control of light intensity, better scale markings, and taking record photographs with a motion picture camera to give a better impression of being present.

It can't be beat

The venture, which originated as a last resort after failure to obtain information by conventional methods, developed into a successful operation and proved to be a faster, cheaper, and better method of underwater exploration.

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KOEHRING MODEL	SIZE DIPPER	KOEHRING LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load)		PRICE PER POUND OF LIFT CAPACITY*
205 CRAWLER	½-Yd.	20,000 lbs.	30-foot boom at 10-ft. radius	?
205 ON RUBBER	½-Yd.	30,000 lbs.	25-foot boom at 12-ft. radius	?
304 CRAWLER	¾-Yd.	27,800 lbs.	35-foot boom at 12-ft. radius	?
304 ON RUBBER	¾-Yd.	50,000 lbs.	30-foot boom at 10-ft. radius	?
405 CRAWLER	1-Yd.	40,000 lbs.	40-foot boom at 12-ft. radius	?
605 CRAWLER	1½-Yds.	72,300 lbs.	50-foot boom at 12-ft. radius	?
1005 CRAWLER	2½-Yds.	159,000 lbs.	50-foot boom at 12-ft. radius	?

*Figures available on request—ask your Koehring distributor for them.

K529R

New machine casts continuous 48-in. diameter concrete pipe in place

By **ERNEST C. FORTIER**
Consulting Engineer
Fresno, California

SEVERAL HUNDRED MILES of cast-in-place pipe have been installed in the San Joaquin Valley of California in the past 30 yr., but it is only recently that such pipe could be installed completely and continuously in one operation without the customary horizontal joints of the two-stage process. The new pipe is in effect a machine-made pipe, cast-in-place. In the past 5 yr. during the development period, some 150,000 ft. of No-Joint pipe in sizes ranging from 24 to 48 in. have been installed successfully in Northern and Central California. Production has been purposely curtailed to perfect mechanical details and to insure a quality product.

In the project illustrated here the South San Joaquin Irrigation District, the City of Manteca, and the adjacent landowners entered into an agreement for the construction of 582 ft. of 48-in. poured-in-place concrete pipe to replace a portion of an open ditch. The cooperating parties shared equally in the cost. The District assumed responsibility for all engineering work, supervision, and inspection.

Contract was awarded to Cecil Sand & Gravel Co. and forms and a machine for casting the pipe were made available to the District by the No-Joint Pipe Co. of Yuba City, Calif. Although the Manteca job was the first 48-in. installation—and using a new machine—no mechanical difficulties were encountered. It afforded a smoother operation than the smaller 24-in. size. Keeping the machine fed with transit-mix concrete at the rate of a yard every 5 min. presented the only real problem in stoppages.

The line is now in successful operation without any leaks. Glen R. Simpson, assistant superintendent with the District, has stated these facts about the operation: It is the best cast-in-place pipe that he has seen in 3 yr. of experience, the concrete was uniform in thickness and quality, the method of weigh-batching into transit-mix trucks assured control of the concrete as it was mixed and placed, and that form scars were less in magnitude than with other methods where bed-boards roughen the invert.

Ross Cecil, the contractor, was in charge of the job. Also participating in the construction was Elmer Tunsen who developed the No-Joint method.



1 THE SEMI-CIRCULAR BOTTOM of the trench acts as an outside form for the bottom half of the pipe. The shield in front is attached to the hopper and traveling pipe form. A 2-cycle engine is attached to the front end which actuates the winch and oil pump to supply the vibrator. The winch is equipped with a variable speed transmission to accommodate the optimum travel rate for the various pipe sizes. Travel speed varies from 60 ft. per hr. for 48-in. pipe to 120 ft. per hr. for 24-in. pipe. Four-foot long aluminum forms which support the upper half of the pipe after it is placed are seen on the bank. Excavation was performed by Floyd Butcher of Modesto who has developed a fleet of wheel-type excavators for this specific purpose.



2 CONCRETE FLOWS into the hopper of the machine from a transit-mix truck. The spade-shaped tools on each side of the hopper are moved up and down by a geared mechanism actuated by a gasoline engine which is mounted on the hopper. This device moves the concrete into the annular space provided for the pipe shell and a vibrator attached to the bottom of the machine compacts the concrete in the pipe shell and solidly anchors it in the surrounding soil.

in.



3 CURVES CAN BE ACCOMMODATED by this process, slight here, but up to a 50-ft. radius has been handled for 24-in. pipe. Aluminum forms on the right bank and wooden spreaders on the left bank are ready for use. In the 48-in. pipe four spreaders were used per form.

Three to four men, exclusive of the concrete delivery crew, can handle the entire operation. Former open lateral at this location was a maintenance problem and dangerous for children. This project at Manteca, Calif., was 582 ft. long and the first of this size anywhere.



4 INSIDE FORMS SUPPORT about two-thirds of the inside circumference, supported by the wooden spreaders. The forms are hooked together. This is the way things look at the end of day's pour—the following morning the spreaders are removed, the forms slid around on the bottom, rehooked, and pulled out as a train with a cable attached to a truck. They are then unhooked, lifted out of the trench, oiled, and placed on end on the trench bank. Note that about two-thirds of the outside circumference of the pipe is supported by undisturbed earth—also, the extra thickness of concrete at the spring line of the arch forming the top portion of the pipe.



5 A RELATIVELY SMOOTH interior surface results from the use of this method. Metal form marks are clearly evident.

CARBIDE INSERT? or MULTI-USE?



LOCATION: Cleveland Dam Project, Capilano River, Vancouver, B. C.
DRILLING CONDITIONS: Granodiorite.

TIMKEN[®] carbide insert bits chosen in competitive tests for Cleveland Dam

TO insure the best bit performance on the Cleveland Dam Project, Capilano River, Vancouver, B.C., the contractor chose his bits through competitive tests. Several other makes of rock bits were tested, but Timken[®] carbide insert bits won out. They were used from the start of the job to the finish.

Timken carbide insert bits are most economical for constant-gauge holes, small-diameter blast holes and very deep holes. And they're your best bet for highest speed through hard and abrasive ground such as the very hard Granodiorite encountered on the Cleveland Dam job.

For drilling in ordinary ground, Timken multi-use bits are more economical. With correct and controlled reconditioning, you get the lowest cost per foot of hole when full increments of steel can be drilled.

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Sharp tunneling practice for White Point outfall

Lessons in "tunnel housekeeping," special support for heavy ground, and a unique cherry picker are the high spots of this 8,400-ft. project in soft rock.

FIVE YEARS' WORK and there's still 7,000 ft. to go! That's how it is with the Los Angeles County Sanitation Districts, double-barreling their White Point outfall sewer. All in all, it's a 5-mi. tunnel—but it's been purposely planned for stage construction from the upstream end, and temporary cross connections to the existing line have upped the outfall capacity periodically as the work has advanced. Tunnel crews are now on the last leg, boring in from the White Point portal, bent on holing through in 1956.

Outside the tunnel itself, the rest of the job is a study in size—the size and scope of work necessary to sewer a growing Western phenomenon like the Los Angeles metropolitan area. For something on that, see the box elsewhere on these pages.

What's doing, and what's ahead

Now, about this current tunnel work: Sanitation Districts crews are punching a 15-ft. horseshoe bore "uphill" through soft rock. By the end of July they had made some 700-odd feet, against a total for this leg of 8,400 ft. The goal is a bulkhead in the tunnel 550 ft. below the surface of the coastal hills. There's an airshaft there, and a cross connection in the existing 8-ft. tunnel. The new bore was completed to that point in March 1954 and has been in service since then.

When Western Construction looked in on the work, progress was mighty good, a shade under 3 rounds per shift. That's about 14 ft. But Harry Panaccione, the superintendent, knows about the heavy ground encountered on the other end. And also he has records from the 8-ft. tunnel driving back in 1936-37. So he's counting on an overall average for the job of about 10 ft. per shift. That would wind up the work in 70 weeks, somewhere around the end of 1956.

Because of ground conditions, there are two designs for lining in this tunnel, and the excavated section changes to match them. The standard lining is 14 in. thick at the arch, 17 in. in the invert. Excavation for this section is based on an arch section with a 7-ft. 4-in. radius outside the steel ribs. It's another 8 ft. 4 in. from spring line to foot blocks,

giving 14 ft. 8 in. of width and 15 ft. 8 in. of height. Near the portal and in heavy ground when the tunnel pierces it, the concrete will be 22 in. thick across the arch, 26 in. in the invert. The nominal tunnel dimensions include an 8-ft. arch radius, with 9 ft. from springline foot blocks. This section is about 16x17 ft.

The "tunnel housekeeping" trick works especially well in the heavy section. Here, to get arch action between foot blocks, curved spreaders are used. This means an extra 18 in. or so of excavation. It also means an inconvenience in laying track—or it would without the French drain that is placed. The drain consists of 10-in. corrugated and perforated pipe, with 6 in. of rock cover. And it really speeds the work later on.

Here's what you gain

Track laying is easier, as noted. Also, the mucker does a complete job the first time around. There's no cleanup later on, caused by muck getting trampled and soaked and turned into mud. Any fine material that does accumulate gets washed down through the rock and into the drain. But there isn't much standing water in the first place, and that's another advantage. Seepage (up to 100 gpm.) and drill water run off into the drain right now.

The trick might not be worth while in hard rock, but in ground like this, solid and coherent when dry, swelling and slick and muddy when wet, it's a good thing. Panaccione carries the drain idea right on into his standard section, in fact. He figures it's well worth the 15,000 yd. of drain rock involved, and the extra excavation.

Steel and squeeze blocks

Beating the heavy ground is another story. In a sense, the whole tunnel is in tricky ground. The Districts figure that there'll be about 1,000 ft. of "redriving" to do before this 8,400-ft. length is done. (At the other end 2,400 ft. had to be done over.) Sometimes the support distorts. Sometimes it buckles. Sometimes the whole set just moves over, without changing shape at all. But in every case it has to be removed, some rocks taken out, and the section supported and blocked all over again.



FULL SUPPORT frames crew in soft shale. The ground is strongly deformed, with thin beds of siltstone, limestone, and sandstone.

Support designs for the heavy section now have a specific compensating feature that may cut down on the redriving. First, the steel itself. Specified in the other leg as 8-in. 24-lb. wide flange members at about 4 ft., it didn't hold. Closer spacing didn't help. Finally the Districts called for doubled-up I-sections. Two 4x10-in., 25.4-lb. pieces are welded together, creating a box section with flanges. After installation, if necessary, the box can be drilled and pumped full of grout for added stiffness.

Another feature of the support is based on a finding that the squeezing action of the ground seems to have limits. That is, it moves a certain amount and then quits. (In an extreme case, two hours of pressure completely folded one side of the arch support in the other leg of the tunnel. Miners fought the situation with 12x12 stulls and caps. But the squeezing stopped before any load ever came on the timbers.)

To beat the squeeze, special blocks are installed along with the other support. A 6x8x8-in. block goes at the crown, like a "dutchman," between the two halves of the arch steel. Then, 3x8x4-in. squeeze blocks are placed between the arch steel and all crown bars. This way, there can be pressure enough to crush a lot of wood before the steel itself is moved or subjected to damaging forces.



PORTAL is framed to carry project road overhead. At left is simple retaining wall, while crib at right holds 200 yd. of drain rock for easy chuting to mine cars below.



HEADING is a cloud of dust when miners dump drain rock below newly laid track. In 5 min. grade will be firmly established and crew will begin setting arch support.

So much for housekeeping and special support. The novel cherry picker developed by the Sanitation Districts people is a story all to itself. For that, remember to look at "Tricks of the Trades," page 99 this month.

Watching the miners complete a round reveals the smooth operation. It should be. Many of the men have worked together for a long time. Let's watch things after the last muck car has left the heading and just as the mucker moves back.

Loose rock has long since been barred down. With all machinery out of the way and a clear chance to work, a couple of miners swing picks to notch out for foot blocks. Art Bauer, the shifter, is away from the heading setting up a couple of pairs of "cross hairs"—two plumb lines from the crown, and two lines stretched across the tunnel a set distance above foot block elevation. A quick look at a target rod shows one side already on the money, the other still needing some pick work.

Drainage and track

One man picks away at the end of the track, uncovering the plug of the last length of French drain. He clears it, and then smooths out a trench leading forward to the tunnel face. Two men bring up a length of corrugated; they jam it into place—with a little persuasion by maul on a bent edge—and set the new plug.

Track comes next. (Every other round, that is. They lay 10-ft. sections.) Ties rest on the foot blocks, the rails are jockeyed into approximate position and a spreader put across the extreme end. Then they make up to the old rail, Art Bauer

takes another sight for center, and the spikes begin to sink under a rain of sledge blows. A short miner works fastest. Maybe it's because he doesn't have so far to swing the sledge. But he sure leans into his work, and he shows a lot of practice. First on one side, then on the other—driving spikes on both sides of the rail, and never hitting the rail itself.

Meantime, the motorman has been busy. The mucker is off on a siding, the muck cars are out at the portal being pulled up the 20% ramp by a 25-hp. car puller. (This is an outfall, the invert 14 ft. below sea level at the portal.) Now the locomotive comes forward with a hopper car full of drain rock and two pieces of arch steel on top. First the steel is shucked off, one to each side. But the new tracks still sag under the load until the gates are tripped, the rock dumped, and the car pulled back. As the dust clears, the miners step in with shovels and rods to distribute and tamp the rock. Bauer has to take another sight on the track. It's a little low now, and some plain and fancy prying, plus a little more tamping, is needed to get it on grade and firmly set.

Steel and timber

Now it's time to set steel, and here comes the drill jumbo, clear forward on the new track right up to the face. Muscle moves the arch steel forward, and sets one end on the foot blocks. More muscle walks the steel up and swings it in against the jumbo. Hold there, now, while a couple of men get to topside to take it the rest of the way.

Up she goes, one piece at a time.

It makes up just right, naturally. Now a bolt and some collar bracing will hold it temporarily, while Bauer makes another check for alignment. This time he sights right along the steel already in place. And he yells to shove the new set back a bit on one side. So!

Meanwhile, the jumbo wings have been swung up and secured, and collar braces and ties, wedges and blocking are being passed topside. Wrenches and sledges appear again, and that's all there is to it. There's a good bull gang on this job. Every brace and tie is there, and nothing has to be cut special. The planning is good, and the energy is there to match.

Air and water

The right top crew is ready to go first, and the air and water connections have been hooked up none too soon. Some of the miners huddle with their chuck tenders and yell instructions for spotting holes. Not the right top crew. They have it all set up for hand signals. The air motor and safety ratchet on the Joy boom chatters and the boom comes up. More of the same and it swings to the right. 'Hold her there!

The miner maneuvers his 1½-in. steel into the chuck of a Joy T300 and gives it a half turn. The steel centralizer swings up and closed. Two quick motions turn on the water and open the throttle. Then a fast but steady hand on the feed. And in a cloud of spray and spalling rock the Timken drill bit bites its way into the face.

Stop and go

This is a trim hole, high up in the arch. Collaring is fast, feed is steady. Suddenly the hole plugs and water streams out around the chuck. The hand on the feed turns, then jumps to the throttle and throws it clear over to blow the hole. A new cloud of air and water signals success, and the miner's hand as quickly opens the throttle and starts the feed once again.

Time for a change. Reverse the feed. Twist the short change loose, yank it out and drop it on the jumbo deck. The chuck tender automatically swings the boom away from the hole to make room for the next change. This time it's a 7-ft. rod. This miner hasn't bothered to shut off the water. He squints and takes a shower as he slides the steel into the hole, then watches the boom come back on line. The steel drops into the chuck and the spray water ceases with the half turn that locks the change.

Once again the throttle is opened and the feed knob is adjusted. Slowly the drill moves forward. No plugging this time. Just watch her go, until the machine runs out its feed and the hole is done. Now for a time- and labor-saving trick.

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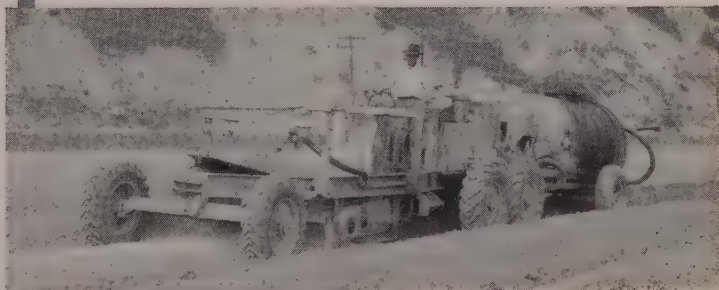
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This miner doesn't take the steel from the hole. He uncouples it, racks his drill back in its shell, and signals his chuck tender to drop the boom to the next spot. After that it's the same as before, except for one thing. When he's ready for that long change again, he doesn't have to look around for it. And he doesn't

have to stoop down and pick it up. It's right by his shoulder, ready to slide out and drop down just a foot or two, for placing in the new hole.

With this kind of performance, drilling a round goes fast. There are 16 trim holes around the arch, all looking straight ahead or slightly out. Across the invert are 5 lifters.

The whole project --- five miles and five years

The White Point outfall system sewers the whole east side of Los Angeles County, right over to the Orange County line. It takes in foothill towns to the north like Sierra Madre and Pasadena. It takes in Los Angeles proper clear south to Long Beach (included), and west to the beach cities of Hermosa and Redondo. It serves towns that are actually closest to the controversial Hyperion plant that takes the rest of the metropolitan area sewage.

For the past 18 yr. the main stem of the outfall has been an 8-ft. tunnel going about 6 mi. (including 1,500 ft. of cut-and-cover conduit) to the sea at White Point. Offshore lies a 60-in concrete pipe outfall.

Capacity of the system was increased first in 1947 by a higher surge tower at the treatment plant and a 72-in. offshore outfall line. This permitted working under greater heads. Since then, capacity has again been increased three times, in July 1949, in December 1950 and in March 1954. Each time the device was to cross-connect the advancing new outfall to the old one.

More than a tunnel

What's the new outfall consist of? First, there is 5,000 ft. of 12-ft. diameter concrete pipe laid in a trench. Then there is 3,500 ft. of 12-ft. lined tunnel, driven from the end of the trench, and cross-connected.

After that the miners jumped ahead 5,700 ft., revamped a 14-ft. shaft 165 ft. deep, and worked back to meet the first leg. This done, the project had advanced 14,200 ft. and a second cross connection was effected. (The first cross connection was now plugged.) Then, from the same shaft, the work moved downstream 8,400 ft. to a third cross connection.

Both the latter cross connections are still open. When the new outfall is complete, they'll be closed by valves and bulkheads, but not plugged. This way it will always be possible to isolate sections of either tunnel for maintenance.

On the shore at White Point, a manifold and valve station will be built. It will have "plumbing" to cross-connect both tunnels and the three ocean outfalls, plus extra gear to serve future construction of tunnels or outfalls.

From the beach stretches 1,000 ft. of timber pile trestle, and this is the scope of the single contract on the whole project. Healy-Tibbitts is doing it—blasting trench and laying 24-ft. joints of reinforced concrete pipe, then placing tremie concrete backfill enough to cover the pipe to a depth of 1 ft.

Beyond this contract the Districts have finished excavation for the rest of the line—600 ft. of trench about 12 ft. deep, 1,600 ft. more of lesser depth. Beyond this point the pipe will rest on the natural bottom, in depths from 75 to 215 ft. Backfill in the shallow trench will be of 1½-in. rock, "humped" to effect full coverage at first, tapering to spring line. At Station 79+82 will be located a wye, and from this point two lengths of 60-in. pipe will continue on out another 1,208 ft. Terminal stationing on each wye is 91+90. All the pipe beyond the wye is diffuser pipe—a 7½-in. hole in each joint.

48-ft. laying lengths

The costliest thing in work of this type is diver time. Close to shore they can stay down as long as necessary. And the pipe is laid one joint at a time. But in the deep water a dive may cost up to \$250, and a man can work less than an hour. So the Districts make up two joints at a time, rig a strongback, and lay the outfall in 48-ft. lengths. The pipe has slip joints, with a cast iron male portion making up to a rubber gasket and a lead seal.

Reason for the extraordinary length of this ocean outfall—nearly 9,200 ft.—is to get down to suitable depth. Distance from shore is not the whole answer to satisfactory sewage dispersion.

The measure of the project is its increased capacity. The existing tunnel alone, with its 60-in. pipe off shore, was good for about 70 mgd. Adding the 72-in. pipe in 1947 brought this up to 120 mgd. Cross-connections made during the present work have moved the figure to 150 mgd., to 210 mgd., and to 220 mgd. at present. (The last increase was small, being offset by head loss when 2,000 ft. more length was completed on the 72-in. ocean pipeline in December 1953.) The completed project will be good for about 400 mgd.

A horseshoe pattern of 8 relieves goes straight in. And the pattern is completed by 4 cut holes in a square: they look in and almost come together at full depth.

Shoot and muck

Now it's lights out on the jumbo, and cigarettes are stomped out as the miners go to work with powder. It's Trojan powder, 40%, loaded about two sticks to the hole. Some take more, and about 100 sticks are used. This comes to around 30 lb. Figuring against 40 cu. yd. per round, it gives a powder factor of about 0.75 lb. per yd.

After loading and shooting, the miners don't wait long for smoke. It's a good-sized tunnel section, and the fans are efficient. The crew comes forward as soon as the jumbo can be sidetracked and replaced by a Conway mucker. Breakage is good, and the round is loaded out swiftly—three trains totaling 16 4-yd. cars.

The mucker works under a temporary staging at first, with the miners up above driving crown bars ahead, cantilevering them from the last arch ribs. The shale drills and shoots well, but it will not stand long without full support.

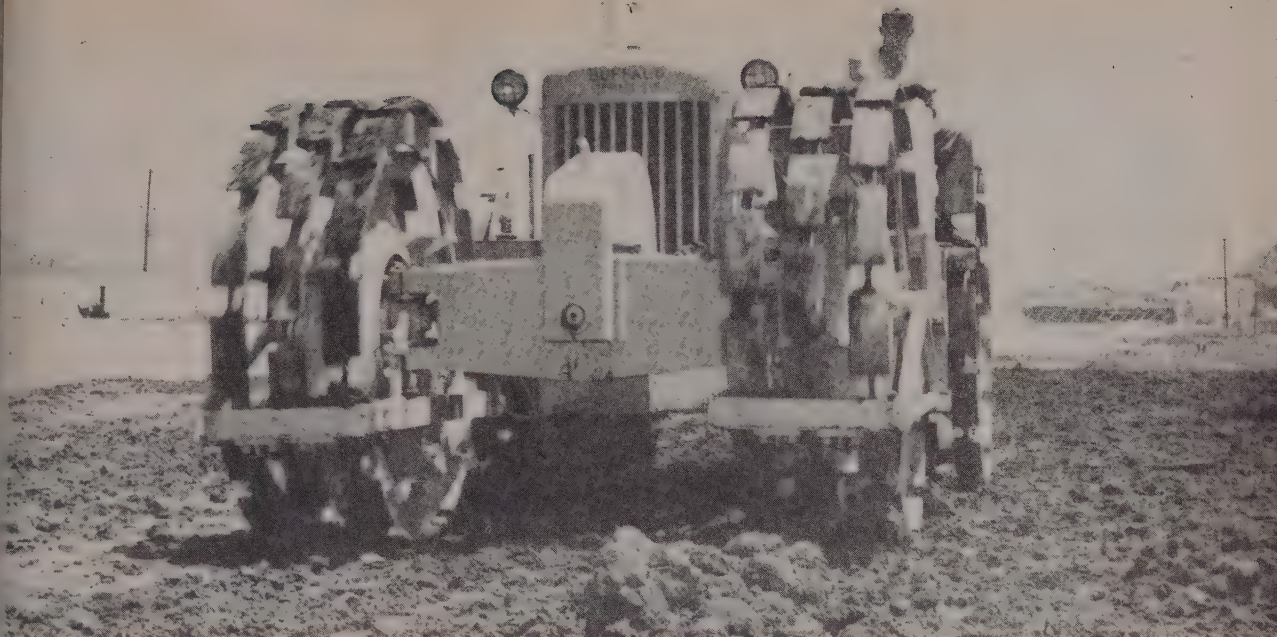
To clean the invert over beside the foot blocks, the crew jams a piece of rail under the dipper hinge. This keeps it from dropping below horizontal, and now it's a first-class scraper, right at grade. Then, to dig out the French drain, they pull this steel and a few more passes finish the job entirely, drain area and all.

Men and jobs

That's all there is to it. The day crew does this three times a shift, give or take a little delay, and the swing crew picks it up without a hitch. Typical cycle time for a round is like this: drilling, 45 min.; loading, 15 min.; smoke, 5 min.; crown bars, 15 min.; mucking, 45 min.; track, 15 min. (average per round); support, 15 min. The total is about 2½ hr.

The whole tunnel operation is a credit to the gang that bosses it. Art Bauer is the day shifter, Jack Cisco is on swing. Harry Panacione, with 25 years of soft rock work behind him, is tunnel superintendent. Forest Bigum is master mechanic, and Ralph Christian is drill doctor. Electrical and carpenter foremen are Jess Butler and Herb Maydew.

The whole show, including offshore outfall construction, is under the direction of Lester Haug, engineer and construction superintendent for the Sanitation Districts. Don Schmid is field engineer. Superintendent on offshore work by the Districts is Dan Boom. At the top of the heap is A M Rawn, chief engineer for the County Sanitation Districts of Los Angeles County.



Kompactor: New wrinkle in rolling

THE CONTRACTOR SAYS, "It does the work." The operator allows that it's the easiest thing yet for rolling embankments. It's Buffalo-Springfield's new K-45, the Kompactor. The one we're talking about belongs to Fredrickson & Watson, and they're using it on freeway embankments in Richmond, Calif., north and east of the San Francisco-Oakland Bay Bridge.

To start with, the Kompactor just doesn't look like a big roller. Actually, it weighs 32,000 lb. But as it rolls down the fill, its big, exposed wheels and underbody clearance give it more the look of an out-sized farm tractor. The wheels themselves are the feature. Instead of smooth steel tires, they're fitted with many rectangular steel pads. Segmented wheels, they're called, and that's the source of the roller performance. According to Buffalo-Springfield, the result is interrupted pressure—almost all of it vertical—that gets away from displacement of compacted material and "bulldozing" of loose material ahead of the wheel.

It has big feet

Front and back wheels are the same diameter, but the rear wheels are wider and have one more row of pads. All the pads are 5½ in. wide and 1¾ in. thick. Pads on the rear wheels are longer, 13¾ in. vs. 11¾ in. The sizing and spacing is arranged so that there will always be portions of two front pads and three rear pads, of each wheel, on the ground. This distribution means a compacting force of 580 lb. per lin. in. of tread, which

puts the Kompactor in the big roller class.

Long runs and steady production are where the Kompactor shows the most promise. Fredrickson & Watson had their roller on a run about 2,000 yd. long one day in June. The rising embankment was being built 28 yd. at a crack by big bottom-dump sets of doubles spilling on the run. And a D8 with a dozer blade was spreading the material into lifts of specification depth. The Kompactor easily kept up with this team, by itself. With another Cat to spread, it can keep up with 500 cu. yd. per hr.

All this performance comes in a package 8 ft. 9½ in. wide, 20 ft. 10 in. long, and 6 ft. 8 in. high (not counting the exhaust stack!). The wheel

base is 13 ft. 11 in., the turning radius 29 ft. 6½ in. between outside tracks. Effective rolling width of the Kompactor is 5 ft. 3½ in.

Power is provided by a 110-hp. diesel, and a torque converter makes operation a snap. Forward, reverse, and a selection of speed ranges—that's all there is except for throttle, brake, and steering wheel. You have your choice of speeds from 1 to 5 mph., in either forward or reverse.

From all the nice things that have been said about the Kompactor, you might think it was the only roller in the business today. But this isn't so easily said. And for the reasoning here we get back to the dirty business of dirt itself. Embankment material is variable, even with the best con-



SLIM SCRIBNER has worked on every kind of rig, but this is almost vacation!



SCRIBNER'S VIEW shows the husky details of "interrupted pressure" pads on K-45.

Relative compaction by California Impact Test

No. passes	Kompactor				Southwest			
	Rel. comp., top 8 in.		Rel. comp., 18-in. depth		Rel. comp., top 8 in.		Rel. comp., 18-in. depth	
2	85	Avg.	94	Avg.	89	Avg.	96	Avg.
	91		94		84		93	
	89		92		88		89	
4	95	Avg.	94	Avg.	86	Avg.	93	Avg.
	89		90		87		95	
	83		90		85		87	
6	91	Avg.	91	Avg.	86	Avg.	91	Avg.
	89		88		84		94	
	96		87		85		83	



SHEAR CRACKING was curse of comparative rolling program. This happened along edge of test embankment, indicating vertical boundary and possible lateral movement.

trols, and there are times when any roller has to put in a lot of hours to get results. Then, when you go to checking comparative performances directly, putting one machine against another, you create a need for even more controls.

Roller vs. roller

As an example, consider the tests conducted by California's Division of Highways on the Fredrickson & Watson job in June. The job was already using a familiar and reliable machine, a 50-ton Southwest pneumatic. Test rolling was set up, in the words of the highway engineers, "solely to determine the relative effect of the new Kompactor without regard to the attainment of any specific degree of compaction."

The reasoning here was imposed by physical conditions of the test area. After all, only limited control could be exercised on a construction project without inconvenience and delay to the contractor. In addition, the soil was somewhat variable. Generally, it was composed of 50% to 60% silt, with the remaining 40% divided between sand and clay. However, even in the small area involved in the tests, silt content varied from 41% to 67%, sand from 17% to 39%, and clay from 15% to 38%.

The moisture content was the native amount in the excavation at the time, and it ranged from 14% to 17%, which was close to the test optimum, but probably somewhat

dry for the compacters in use. Thirty-six relative compaction tests resulted from the comparative rolling program. Here's how the work was set up and carried out:

Two parallel strips of embankment were established side by side, one for rolling by the Kompactor, the other for the Southwest. Totaling 300 ft. in length, each strip was subdivided into three 100-ft. sections. Then, each lift in each section was compacted by 2, 4, and 6 passes of the roller assigned. The embankment was brought up in 8-in. lifts to a height of about 3 ft. above original ground. Afterward, six tests were made in each section—three in the top 8 in. and three at a depth of about 18 in. (to determine compaction in the zone 15 to 21 in. down).

Unfortunately, two unexpected conditions were observed during the tests. And study of the accompanying table of test results shows that these conditions had their influence—so much that no clear-cut relationships can be established. The difficulties were (1) effect of hauling equipment and (2) shear failures in the embankment due to inadequate lateral support.

Fredrickson & Watson were importing their embankment material in big, 28-yd. bottom-dumps, driving through the test strips from the 2-pass section toward the 4- and 6-pass sections. Sometimes the dirt arched in the truck and trailer bodies, requiring several runs to shake a load

loose. These occasions resulted in variable and indeterminate amounts of compactive effort, most of it on the 2-pass sections.

Shear failures resulted from the way the two rollers were operated. That is, they worked in the same strip for each layer, and as the height of fill increased, the outside slope was formed by blading loose material over the shoulder. The result was a vertical boundary in the compacted material. Although the relative compaction tests were made in the central portion of each section where no cracking was discernible, the compaction may have been affected by the yielding along the outer edge.

Equal results

Now, what do the test results show? First, in the upper lift, increased passes by the Kompactor moved the average compaction from 88% up to 92%. For the Southwest, the effect was to drop the compaction from 93% to 89%. Tests at 18-in. depth showed decreasing values for both machines, as the number of passes increased. Here, according to A. W. Root of the Division of Highways' Materials & Research Department, is the effect of shearing caused by lack of lateral support.

Root goes on to remark: "We have no explanation for the disparity between the results of the three tests in each subsection. The differences were noticeable when the test holes were excavated, even though the holes were only 10 ft. apart, the moisture contents similar, and the coverages by the compactors uniform."

All in all, however, the rolling showed the new Kompactor to be an adequate performer. And the contractor's decision to include one in his spread bolsters that conclusion. Says the Division of Highways with natural and proper conservatism: "The effect of the Kompactor compared favorably with the Southwest unit. It is evident that either roller is capable of producing the required density where soil and moisture are uniform and controlled. The design of each compactor required two trips past a given point to roll out the space between wheels for a solid coverage of the ground surface. The standard specification control of not less than 90% compaction has not been altered to permit use of the Kompactor."

Personnel

Site of the roller tests was a section of the Eastshore Freeway. The resident engineer for District IV is M. O. Clemens. Contractor cooperation was administered by K. E. Poss, superintendent for Fredrickson & Watson. Testing was done by the foundation section of the Materials & Research Department, with W. S. Maxwell in charge, and under the general jurisdiction of A. W. Root.

Now they're JETTING relief wells

The Corps of Engineers has tried it, and specs this month may have a jet alternate for over 75 wells at Whittier Narrows Dam.



WATER DOES THE WORK, while Raymond crew under drill foreman Emil Geist takes a break. A 25-ton Bay City handled the leads and the pipe. River water was pumped at 500 gpm.

SIX EXPERIMENTAL relief wells jetted in place below Whittier Narrows Dam in July this year may put a new twist on an old business. The most startling thing is speed—four jetted wells per day with one rig, against only one drilled well in the same time.

The Los Angeles District of the Corps of Engineers has sponsored the work, and with considerable potential savings involved. Depending on the investigation results, between 75 and 100 more relief wells may be jetted in place all along the 15,000-ft. downstream toe of Whittier Narrows Dam on the San Gabriel River. Bids for the work will be taken in October, and specs out this month will tell if the jetting alternate has gotten a favorable nod from the Corps.

Questions about jetting

According to Jack Rolston, soils engineer, the test installations were made to answer several questions. The first, of course, is the most obvious. Can you jet a well? After that, are the results satisfactory? For one thing, a jetted well winds up with a smaller volume of gravel pack than usual, so there is some reason to think performance would differ from a drilled well. After development of the test wells, pumping tests will determine yield and coefficients of permeability of surrounding gravels. And, assuming success, these coefficients will also determine the spacing of final installations. That's why the contract quantity may be as few as 75 or as many as 100 wells.

Another question, not directly related to the jet technique except in

the case of small diameter wells, has to do with riser pipe materials. The experiments used 6-in. I.D. plastic (polystyrene) pipe. The Corps is also considering Transite and Orangeberg pipe on this project.

The test work included two 14-in. wells, one 10-in., one 8-in., and two 6-in. An extra 8-in. well was added alongside a 14-in. at the close of the job. Raymond Concrete Pile Co. did the work on a competitive contract basis. The basic techniques for the different sizes were as follows:

Packing procedure

For 10- and 14-in. wells (casing diameter), the casing was put down to full depth (between 50 and 65 ft.) by jetting. Then the jet pipe was replaced by the permanent riser, and packing begun. Gravel was placed first, and the casing withdrawn simultaneously—but with caution to keep the bottom of the casing below the surface of the gravel. When 19 ft. of gravel was in place, 2 ft. of sand filter was added, and earth from there on up. (Gravel depth was determined by the length of perforated riser installed, specified as 15 ft.)

For the 8-in. well, procedures began the same way, but no packing was used. The casing was removed as soon as the riser was in place. The 6-in. wells varied in one further way. The riser pipe served as its own casing for the 6-in. wells, being jetted down with the 3½-in. jet pipe inside it. Final installations of 6- and 8-in. wells were identical—riser in place with no gravel pack.

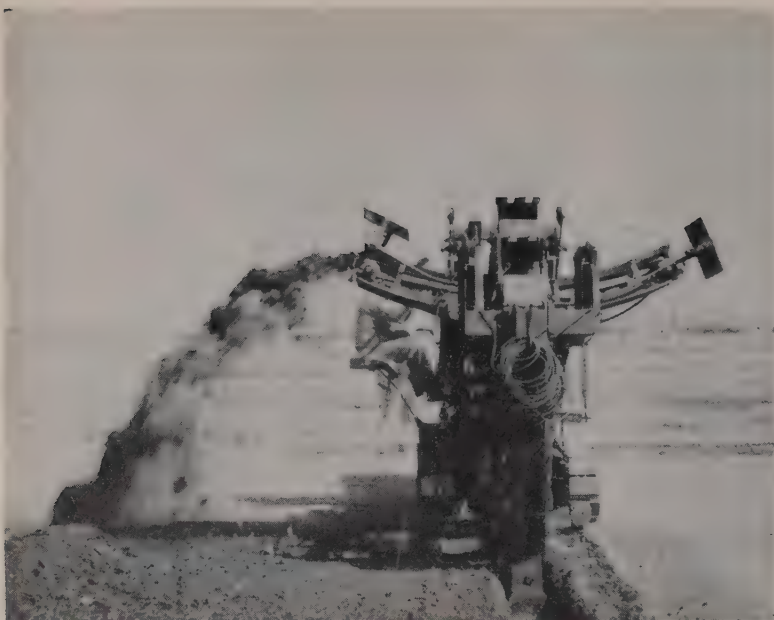
Trial and error showed one thing: the jet has to be inside the casing or riser as it goes down. On the first 14-in. installation, an attempt was made to jet a large hole part way without any casing. The ground stood satisfactorily to a depth of 25 ft., but a greatly oversized hole was produced. Then, when the casing was placed and jetted with the jet pipe outside the casing, a lot of large cobbles and rock sank to the bottom and formed a "nest" of rock. This rock pocket was too solid to jet and limited the well depth to only 40 ft.

Another reason for the trouble on this first installation was the loss of head due to jetted waters rising outside the casing (as well as inside) in an irregular, rough "conduit", the hole itself. Jetting inside the casing restricted the water in the casing itself, in the smooth annular space between the casing and the jet pipe. Better jet pressures were maintained this way and jetted material came to the top more efficiently.

Conclusions

The conclusion on procedure was the same for all well and casing sizes, and was equally successful for all: "Collar" the hole by quickly jetting a pilot hole the full depth, then set the casing (or riser), put the jet inside it, and sink the installation.

Special observation of the 6-in. wells had to do with the suitability of plastic riser pipe, which doubled as casing in the jetting process. Would it crush, would it be damaged at the lower end, would it suffer in handling



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J. C. BOWLES & SON, contractors in Whittier, California—using Cleveland trenchers exclusively—have dug footings for 51,570 homes throughout the Los Angeles area during the past 5 years. Bowles says that “no other machine will do this work so cheap and so fast and give you such a clean finished job.” He has purchased seven Clevelands since 1950.

The Cleveland Model 95 shown above is cutting footings trenches on a 250 home project in Lakewood City, California. One of the four Clevelands Bowles is currently operating, this fast-moving trencher completes 20 footings per day. Each footing in this group requires over 300 feet of trench, 13 inches wide by 12 inches deep.

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control account for the overwhelming popularity of these machines on all types of trenching work . . . house services, gas and water mains, cable and conduit trenching, farm drainage and irrigation work, highway widening and drainage, and oil and gas pipelines.

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CLEVELAND



BIG ONES jetted up show what the method can do when casing channels the flow.

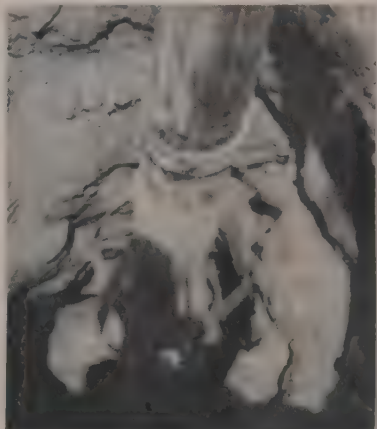
around the job? The answer on all counts appeared to be no—the pipe was satisfactory.

Properties of plastic

The plastic used was a product of Carlon Products Corp. of Cleveland. Designated “LS,” it is a 6-in. nominal diameter pipe, furnished here in 20-ft. lengths. Actual diameters are 6.625 in. O.D. and 6.065 in. I.D. (wall thickness of 0.56 in.). The pipe weighs 2.857 lb. per lin. ft. “sleeved” (with couplings). Its stated properties include withstanding a maximum pressure of 105 psi. at 73.4 deg. F. Catalogue price was \$529.11 per 100 ft. (For comparison, wood stave riser pipe would run about \$400, but was inapplicable here because of fluctuating water table levels.)

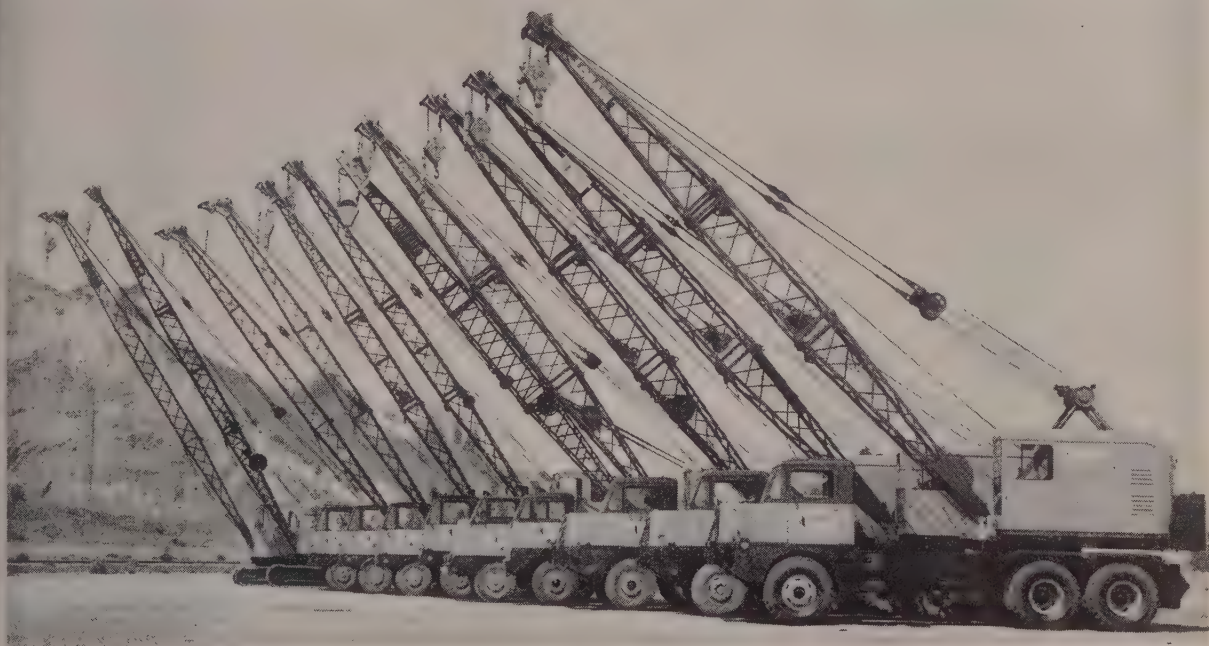
Personnel

The jetting method was suggested by Jack Rolston, who went ahead to plan and supervise the test program. The work was under the general jurisdiction of Claude Fetzner, chief of the design section, foundation, and materials branch, Los Angeles District. Wayne Rickerd assisted Rolston on field work.



“SPIDER” centers riser in gravel, but tends to rise when casing is pulled.

10 LORAINS *all in a row . . . for* ROSENDAHL CORP., Richmond, Calif.



This big crane line-up is the Lorain fleet owned by Rosendahl Corp. of Richmond, Calif. Reading from left to right, here are the star performers on their Lorain team . . . Lorain-25; Lorain-50; Lorain-20 Moto-Crane; Lorain-20 Moto-Crane; Lorain MC-254; Lorain MC-254W; (next—a stranger); Lorain MC-424; Lorain MC-504; Lorain MC-504 . . . and a Lorain MC-524. Since the photo, Rosendahl Corp. have added a 25-ton MC-425 Moto-Crane to this impressive fleet.

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Safety program at Garrison Dam paid dividends

PROGRESS has exceeded all work schedules on the spillway for the mammoth Garrison Dam in North Dakota, yet safety has dominated this job since construction began in 1952. The low accident rate on the project won the builder, Garrison Spillway Constructors, the first place plaque awarded in May 1954, by the AGC for top safety honors in the Heavy Construction Division, Group A.

The spillway is part of the largest earth-filled dam embankment in the world. Crossing the Missouri River,

the Garrison Dam is $2\frac{1}{2}$ mi. long, 2,600 ft. wide at its base, and 60 ft. wide at its peak. The spillway is designed to serve as a safety valve, should the run-off from the water sheds in upper North Dakota and Montana converge too rapidly on the dam.

By the time the spillway is completed in August 1955, it will embody 282,000 cu. yd. of concrete and 12,000 tons of reinforcing steel and miscellaneous metals. Each of its 28 gates weighs 50 tons and is 40 ft. wide and 29 ft. high.

About 520 men work on the spillway project and their welfare on the job is the intimate concern of Albert E. Nollet, safety engineer for the contractor. Nollet hovers like a guardian angel over every employee from the moment he is hired. The new employee is added to the payroll only after passing a physical examination, and is given personal indoctrination in safety before starting his first duties. This includes detailed instructions in the use of extensive safety equipment provided for workers, most of which was supplied by Mine Safety Appliances Co.

Supervisors and foremen wear Skullgard protective helmets, and all workmen are protected by MSA aluminum "T" hats.

Goggles are available to all personnel and Dustfoe respirators guard the lungs of cement and bulk plant handlers and operators.

Safety rules enforced

Like any other successful safety program, Nollet's is a dynamic one based not only on rules but also on the enforcement of the rules; not only on equipment but also on the use of equipment. Well aware of the continuing need of "selling" safety, Nollet says: "A safety engineer should spend considerable time on the work in direct contact with the men and supervisory personnel, always promoting amicable relations and avoiding criticisms as much as possible. The main thing is to keep safety uppermost in the minds of the workers by being seen among them. It is my opinion there is no substitute for direct amicable contact..."

On the spillway job, every foreman and supervisor is responsible for accident and fire prevention in his own group. This responsibility is spelled out in a detailed memorandum issued by J. M. Kellog, project manager.

Top men meet weekly

In order to keep the program alive and vigorous, Nollet conducts a safety meeting every Tuesday morning with the project manager, project superintendent, chief engineer, office manager, warehouse superintendent, personnel manager, all superintendents, and all key foremen. Minutes of such meetings are later mimeographed and distributed to all foremen and supervisors.

A general safety meeting of all employees is held every other Monday, and special group meetings are arranged when they are considered necessary.

The safety program on the spillway work was coordinated with that for the entire dam project which was under the direction of C. C. Rusconi, safety director for the Corps of Engineers. The prize-winning safety record on the spillway showed an accident frequency rating of only 3.89 and severity rating of .14 with 770,928.5 man-hours of exposure.

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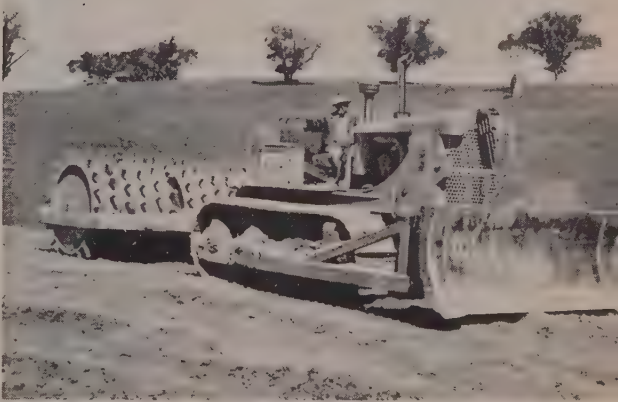
Big dirt mover on the new Kenwood Plaza Shopping Center, Kenwood, Ohio (Cincinnati suburb), is this 44,000-lb HD-21. The contractor, John R. Jurgensen Company, will move an estimated 250,000 yd before the job is finished.

Pulling, pushing and dozing, two HD-21's owned by Ransome Company, Emeryville, Calif., are busy on the 4.4-mile, all-new Ygnacio Valley Road extension job in Contra Costa County, Calif.

Push-loading scrapers is another of many uses for the HD-21. The torque converter drive automatically selects the speed and power necessary to help scrapers pick up a full load. Contractors Machinery Company, subsidiary of Grannis and Sloan, Fayetteville, N. C., is using this HD-21 for extending aircraft runways at Pope Field, Ft. Bragg, N. C.

Dozing hard sandstone in stripping and building access roads keeps two HD-21's busy at the Peerless Mine of Coal River Mining Company, Hookersville, W. Va. The HD-21's are working 16 hours a day, 7 days a week, moving up to 1,500 yd of material like this in each 8-hour shift.

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OREGON
Dielschneider Tractor Company—The Dalles
Haupt Tractor Company—Medford
Wood Tractor Company—Portland

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Cate Equipment Company, Inc.—Salt Lake City

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A. H. Cox & Company—Seattle, Tacoma
American Machine Company—Spokane
Mid-State Equipment Company—Wenatchee

WYOMING
Studer Tractor & Equipment Company—Casper

REPORTS from the COURTS

By HOWARD S. BURNSIDE, Attorney and Registered Engineer

Termination provisions omitted from contract

A guide to terminating a professional service or construction contract before completion of work is usually desirable, particularly in contracts which include engineering or architectural services as part of a program. However, termination provisions are usually given little attention and often omitted completely.

Since the owner is the person desiring the finished job and is ultimately responsible for all contract costs, he would like to retain the right to stop the work at any time. Cost estimates upon completion of engineering may be beyond the budget, changed conditions may require curtailment of the program, or other factors may enter the picture. However, the contractor or engineer has scheduled his work load anticipating a job of a scope described in the contract. If he gives the owner the right to terminate, he is entitled to reimbursement for loss, inconvenience, shutdown expense, etc. A reasonable basis can usually be established in private contracts. Contracts with public agencies are more rigid and subject to less negotiations. There is no fixed formula.

Termination provisions in a joint venture contract are probably rather rare. Ordinarily several contractors simply join forces and anticipate sharing of profit or loss depending on financial and operational contributions. But when an owner of land and a contractor engage in a joint venture for development work and speculation, the desirability of termination provisions is more apparent.

In *Adler v. Campbell*¹ a contractor agreed with an owner to build structures on the owner's property for income producing development through sale, rental or otherwise. Several parcels of land were involved. Before the contractor commenced work, the owner sold most of the property for personal reasons including his change of heart on going further with the contractor.

The contractor brought an action on the joint venture agreement asking dissolution of the joint venture, an accounting of the profits on the land sold and for a declaration of the rights and duties of the parties. (Note: The contractor did not contribute any money toward the pur-

chase of land and his only interest derived from the joint venture agreement for development.)

The trial court decided the case against the contractor. The joint venture contract was interpreted to mean that the contractor had no interest in the lots unless buildings were actually constructed, and that the owner was free to sell them meanwhile. The contractor appealed in vain. The appellate court said "The contract is entirely silent with respect to what should happen in the event no such building operations should be carried on." Since the contract was silent, the trial court admitted other evidence as to the parties' intentions that apparently favored the owner's position.

This disappointment, one trial and an appeal, would all have been avoided by anticipating a failure of the purpose of the contract and setting forth in the document a simple guide to termination of the relation before completion.

1. *Adler v. Campbell*, 126 C.A. 2d 421.

Liability arising out of careless soil tests

The plaintiffs had contracted to buy land and build if soil tests revealed no substantial fill at the site. The defendant was engaged as an expert to make soil tests and reported a fill of 12-16 in. One of defendant's employees, however, had noted evidence of fill 4-5 ft. deep in several of the test holes but said nothing. Relying on the report, the plaintiffs purchased the land and commenced construction. Actually there was 3-6 ft. of fill and the foundation had to be constructed much deeper than originally planned.

Plaintiffs brought action to recover the increased cost of the foundation on three theories of recovery: (1) breach of warranty, (2) deceit, and (3) negligence. In reversing a judgment for plaintiffs the Supreme Court of California said: "The evidence . . . does not justify the imposition of the strict liability of a warranty . . . The amount of his fee and the fact he was paid by the hour also indicate he was selling service and not insurance. Thus the general rule is applicable that those who sell their services for the guidance of others in their economic, financial and personal affairs are not liable in the ab-

sence of negligence or intentional misconduct."¹

As to the other theories of recovery the court continued: "Defendant's intent to induce plaintiffs to alter their position can be inferred . . . (his) statement was erroneous . . . (he) negligently performed the fill test (and) his statement was therefore made without reasonable ground for believing it to be true and plaintiffs justifiably relied on his statement . . ." The causes of action for deceit and negligence were supported by the evidence.

The judgment was reversed by the court, however, because the increased cost of the foundation was not a proper measure of the plaintiffs' damage. In this case the proper measure of damages was the difference in the value of the land, before construction was commenced, between what the plaintiffs bought and what they thought they had bought.

1. *Gagne v. Bertran* 43 Cal. 2d 481.

Plaintiff wins, then loses more

Plaintiff machine works contracted to produce tank heads and certain dies for the defendant, a manufacturing firm. The defendant furnished steel for the heads but the contract was silent as to who would get the scrap steel or "clippings" from the work which amounted to slightly more than 100 tons. Shortly after the first purchase order, the defendant telephoned and requested the scrap but the plaintiff claimed the right to keep it and the defendant said nothing more. Also, the defendant after receiving the dies had to spend additional sums to make them operate properly.

Thereafter the defendant failed to pay \$886.91, the balance due on the account, and suit was filed for recovery of this amount. Defendant cross-complained asking damages for the scrap steel that the plaintiff sold and for the cost of making the dies operable. The court gave the plaintiff judgment for \$886.91; and gave the defendant a judgment on his cross-complaint in the sum of \$2,304.28 for the scrap steel which was determined to belong to him and \$1,601.76 expended in making the dies operable.

The judgment was affirmed on appeal¹.

The defendant might or might not have tried to recover the amounts which he recovered on his cross-complaint in the absence of the plaintiff's suit. This is unknown. But such a result as this points up the importance of forecasting possible adverse results and evaluating the adversary's strength. A full disclosure of all the bad aspects of your case to your representative is just as important as an account of the favorable items.

1. *Orange County Mach. Wks. v. Republic Heater Corp.*, 277 P. 2d 461.

ARIZONA

THE ARIZONA HIGHWAY COMMISSION plans to expand the practice of engaging the aid of private engineers in order to expedite the many highway projects scheduled throughout the state. The first such action was recently taken when engineers Ralph Hoffman and Lloyd W. Miller were retained to prepare plans for rebuilding the bridge over the Gila River near Florence.

CONGRESS in the recent session approved \$25,000 for use by the Army Corps of Engineers for a flood control survey and navigation study on the Gila River below Painted Rock

RECENT MAJOR CONTRACT AWARDS and low bids in Arizona include a \$157,750 low bid by **Fisher Contracting Co.** of Phoenix for construction of an overpass 1½ mi. west of Ashfork on US 66 in Yavapai County.

Martin Construction Co. of Tucson submitted a low bid of \$546,930 for 6 mi. of grading and surfacing on the Tucson-Benson highway and construction of a 3-span overpass 31 mi. southeast of Tucson. **Lyle Price** of Flagstaff submitted a \$199,949 low bid for construction of a new overpass and approaches parallel to an existing overpass on US 66 east of Seligman. **Vega Engineering & Grading Co.** of Berkeley, Calif., submitted a low bid of \$1,519,646 for earthwork, concrete lining, and structures of Texas Hill canal and distribution system, Welton-Mohawk division of the Gila Project.

CALIFORNIA

ONE OF THE HIGHEST rockfill dams in the world is under way with the award of a contract to Morrison-Knudsen Co., Inc., Walsh Construction Co., and B. Perini & Sons. The dam is being built for the Pacific Gas

& Electric Co. on the Kings River about 85 mi. east of Fresno. Height of the dam will be 250 ft. with a crest length of 3,350 ft. About 3,680,000 cu. yd. of rock will be required with the upstream face of the dam to be concreted. Wishon Dam is the first of two dams the company will build on the river in connection with the development of 274,000 kw. of electric generating capacity at a cost of \$80,000,000.

THE LARGEST SINGLE HIGHWAY contract ever awarded in Northern California recently went to the firm of Grove, Shepherd, Wilson & Kruege at \$5,878,249 for construction of an 8-lane freeway between 10th Street and the San Francisco-Oakland Bay Bridge distribution structure as an additional unit of the East Shore Freeway in Oakland.

THE BIG MARINA project at Long Beach is about 30% complete now. Connolly-Pacific Co. are contractors for the dredging work and have moved about 1,200,000 cu. yd. of sand from the harbor area.

TEMPERATURES OF 113 DEG. and high pressure water flows slow down the concrete lining work on the Bureau of Reclamation's Tecolote tunnel located near Santa Barbara. Since last March, about 4,000 ft. have been lined with almost 15,000 ft. still to go. Only recently a week's work was represented by only 142 ft. of lining. It is hoped the project can be completed by the first of the year.

CONSTRUCTION OF the Los Angeles Department of Water & Power's Pleasant Valley Dam has been started under a \$452,125 contract awarded to the Seeger & Higday Construction Co. Location of the dam is about 10 mi. north of Bishop, Calif., where it will be built across the Owens River about 2½ mi. downstream from the existing control Gorge plant. When complete, the compacted earthfill dam will have a height of 87 ft. above stream bed, a crest length of 530 ft., and will be about 500 ft. thick at the base. There will be 437,000 cu. yd. of material in the embankment with completion scheduled for December of this year. Total cost will be \$3,000,000.

RECENT MAJOR CONTRACT AWARDS and low bids in California include a \$237,295 low bid by **Ace Excavators** of San Leandro for grading and surfacing 9.5 mi. in Glenn



TRIMMING THE SLOPE AT SANTA FELICIA DAM

Here's a new Allis-Chalmers HD21 working on a mighty steep slope. The bank is too steep for the tractor to climb, so the operator goes up the road, swings around and backs down with the dozer blade dragging to smooth the embankment fill. This dam, located on Piru Creek near Ventura, Calif., will contain 4,000,000 cu. yd. of earth fill and will rise 200 ft. above the streambed. As a flood control and reservoir storage unit, it will have a capacity of 100,000 ac.ft.

County. **Guy F. Atkinson Co.** of Long Beach submitted a low bid of \$4,086,411 for grading and surfacing with concrete pavement of 1.8 mi. and construction of 20 major structures on the Harbor Freeway between 92nd St. and Gage Ave. **N. L. Basich** of Garvey submitted a \$279,700 low bid for grading and surfacing of 22.6 mi. and construction of two reinforced concrete bridges near Coyote Wells underpass in Imperial County.

Clements Construction Co. and **Ronald D. Coats** of Centerville submitted a \$469,529 low bid for 5.6 mi. of grading and surfacing and construction of a reinforced concrete girder bridge between Fort Jones and Moffett Creek in Siskiyou County. **Daley Corp.** of San Diego submitted a low bid of \$768,038 for construction of four bridges, and grading and surfacing of 7.8 mi. between Coronado Heights and R. H. Dana Place in San Diego County. **Granite Construction Co.** of Watsonville submitted a \$962,632 low bid for 1.6 mi. of grading and surfacing and construction of three reinforced concrete bridges and one pedestrian overcrossing between route 5 and Mission St. in Santa Cruz County.

Harms Bros. of Sacramento submitted a \$150,863 low bid for 2.9 mi. to be graded in El Dorado County; a \$164,381 low bid for surfacing and construction of concrete culvert in Glenn County; a low bid of \$552,712 for 21.7 mi. of grading and surfacing on route 23 and route 58 in Kern County. **Charles L. Harney** of San Francisco submitted a \$322,850 low bid for 0.9 mi. of grading and surfacing, construction of pedestrian undercrossing, installation of illumination and modification of traffic signal system at south city limits of San Francisco. **W. F. Maxwell Co.** and **Hermreck & Easter** of Los Angeles submitted a low bid of \$1,736,751 for 2.4 mi. of grading and paving, grading and surfacing ramps and frontage roads, and construction of 8 bridges in San Bernardino County.

COLORADO

PORTIONS OF THE Denver-Boulder Turnpike are being given an asphaltic concrete overlay. On four of the bridges and at other places where mud jacking has been repeatedly used to raise the grade of the concrete pavement to a uniform level are the principal places for the operation. Repeated mud jacking in the past has cracked several of the road slab sections. Thickness of the new surfacing will be 2½ in.

IT WAS HOPED in Denver during August that a \$75,000,000 special water bond issue would enable the city to step up its rate of construc-

tion on one of the world's longest tunnels—the 23-mi. long Montezuma or Blue River tunnel. This tunnel pierces the Continental Divide and will serve as a transmountain carrier for water from the Blue River near Dillon to the north fork of the South Platte near Grant. A crew working only one shift a day has been working since 1946 proceeding at the rate of about 6 ft. a day on the 11x11-ft. bore. About \$1,000,000 has been spent to date with \$37,000,000 more needed to complete the tunnel. Several additional headings would be started if the bond issue passes and completion would be scheduled for 1960. Only 2 mi. from the eastern Grant end has been completed so far.

DENVER'S \$11,000,000 Mile High center is now structurally complete, more than a month ahead of schedule. Contractor on this Webb & Knapp project is the George A. Fuller Construction Co. The structure is one of Denver's tallest at 23 stories.

RECENT MAJOR CONTRACT AWARDS and low bids in Colorado include \$138,617 low bid by **F. H. Linneman, Inc.**, of Denver, for earthwork and structures for the South Platte Supply Canal-Firestone Siphon of the Colorado-Big Thompson Project.

IDAHO

RECENT APPROVAL of the Bureau of Reclamation's 1955-56 program by Congress includes these new starts: to continue construction of the Palisades Dam, power plant, switch yard, and transmission lines, \$8,780,000; to continue construction on the Minadoka north side pumping project, \$2,200,000; to start construction on irrigation facilities in Michaud Flats, \$520,000.

THE STATE OF IDAHO has plans on the drawing boards for \$3,000,000 worth of building projects. The largest unit will be a \$1,300,000 library for the University of Idaho at Moscow which is expected to begin this fall. Bids will probably be called in September or October on a \$1,000,000 industrial administration building to be located at Boise.

RECENT MAJOR CONTRACT AWARDS and low bids in Idaho include a \$108,490 award to **Fife Construction Co.** of Heyburn for 5 mi. of constructing roadway and surfacing on the Carmen Creek Road in Lemhi County. **Inland Asphalt Co.** of Spokane received a \$165,753 award for surfacing 4.9 mi. of US 10 between Willow Creek and Lookout Pass in Shoshone County. **Western**

Construction Co. of Pocatello received a \$117,891 award for constructing roadway and surfacing 1.1 mi. of the Rexburg Westerly Road and 4.1 mi. of the Lyman-Sunnydell Road in Madison County.

MONTANA

THE BUREAU OF RECLAMATION'S work schedule for 1955-56 includes these items in Montana: Fort Peck, \$348,000; Helena Valley Unit of the Missouri Basin, \$3,000,000; Lower Marias Unit of the Missouri Basin, \$3,675,000; the Yellowstone Unit of the Missouri Basin, \$4,000,000.

THE EBASCO ENGINEERING CO. is handling the work for the new Noxon Rapids Dam near Thompson Falls in the northwestern part of Montana. Work should now be getting under way on clearing of the right-of-way.

RECENT MAJOR CONTRACT AWARDS and low bids in Montana include a \$179,072 award to **Billings Construction Co.** of Billings for grading and surfacing 9.8 mi. on the Plevna North Highway in Fallon County. **S. Birch & Sons Construction Co.** of Great Falls received a \$454,229 award for 3.9 mi. of grading and gravel surface on the Great Falls Road in Cascade County. **James Crick & Sons** of Spokane, Wash., received a \$386,646 award for grading and surfacing 6 mi. on the Butte West and Dillon-Butte Highway in Silver Bow County.

Mooney Construction Co. of Billings received a \$1,380,000 award for construction of a junior high school in Butte. **Naranche & Konda** of Butte received a \$178,951 award for grading and gravel surfacing 5.2 mi. of the Wisdom-Divide Road in Beaverhead County.

NEVADA

THE SUM OF \$25,000 was appropriated for the Army Corps of Engineers for the fiscal year 1956 for further flood control surveys on the Las Vegas Wash. The survey will determine what is necessary to prevent the city of Henderson from being subjected to further flash floods. Floods of this nature have caused recent severe damage to Las Vegas and Henderson.

STEAD AIR FORCE BASE in Reno is going to get a face lifting. The work to be performed and for which bids are to be opened this month include a technical training building, a non-commissioned offi-

The Engineer's Field Report

CASE HISTORY

RPM Automotive Grease
PRODUCT

Camillo Corporation
FIRM *Monrovia, Calif.*

Wheel bearings in "perfect" condition on trucks hauling 28-ton loads up 10% grade



This is one of six rebuilt Macks owned and operated by Mr. A. A. Camillo, Monrovia, California. The trucks are used to haul sand and rock from pit to bunkers where it is made into ready-mix concrete. Each truck carries 20-yard loads (about 28-30 tons) up a 10% grade and averages 50 loads per day. All six trucks use RPM Automotive Grease to lubricate chassis and wheel bearings. Since using this grease the company reports inspections showed all wheel bearings in perfect condition with no sign of wear—not a single bearing replaced during this time.

FREE BOOKLET. giving complete information on RPM Automotive Grease, will be sent on request to Standard Oil Company of California, 225 Bush St., San Francisco, California.



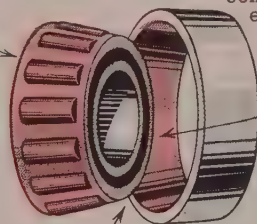
TRADEMARK "RPM" REG. U. S. PAT. OFF.

FOR MORE INFORMATION about this or other petroleum products, or the name of your nearest distributor, write or call any of the companies listed below.

Why RPM Automotive Grease protects bearings under all conditions

sticks to all bearing surfaces...feeds slowly and evenly

stays on, maintains proper consistency even in freezing cold or extreme heat



provides a tough lubrication film that protects against heavy pounding and overload pressures

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

DON'T SHOOT... use this powerful new ROCK-BUSTING TEAM



Rock Ripper ON THE New Cat D8

Lick hard-to-load materials with the most powerful and effective ripping team available today — the ATECO Rock Ripper on a new CAT D8. It's a perfectly-matched combination that puts every ounce of the new D8's tremendous drawbar pull to work shattering hard rock, shale, cemented gravel and other hard materials into easy-loading condition. There's no faster, more economical way to reduce loading time, boost payloads or save wear and tear on your scrapers!

Works wherever your tractor can go

Compact tractor mounting of the ATECO Rock Ripper lets you rip in corners, turn short in narrow cuts. Swivel-mounted standards pivot on turns for effortless steering.

Exclusive rock-shattering action

Special curved standards with replaceable rock-splitting points produce an underground "quivering" action that really shatters rock to easy-loading fragments. Makes an economical scraper job out of many tough rock conditions you'd expect to "shoot" and shovel-load!

Available now for Cat D6, D7, D8; New D8 and D9 tractors

Job-proved, heavy duty construction; rips to 24" depth with 9" head frame clearance. Ideal for ripper-dozer combination; ripper balances dozer weight for increased traction, easier handling. Tractor drawbar takes the pull—no strain on tractor case. Why let hard-to-load materials cut production on your job? Call your Caterpillar distributor now for an ATECO Rock Ripper demonstration!



Speeds tree felling, too. Root knives replace regular ripper standards. Will cut roots 10" to 12" in diameter, down to 30" below surface. Cuts supporting roots so trees can be dozed over in 5 minutes or less.

31

AMERICAN TRACTOR EQUIPMENT CORPORATION

Designers and manufacturers
since 1920

Mack Woodruffe
PRESIDENT

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Oakland 3, California

BULLDOZERS • ROADBUILDERS • RIPPERS • SCRAPERS • LOADERS

cers' club, a swimming pool, and modernizing airmen's dormitories.

RECENT MAJOR CONTRACT AWARDS and low bids in Nevada include an \$846,774 award to Dodge Construction, Inc., of Fallon for construction of a portion of the state highway system from Winnemucca to 21 mi. north in Humboldt County. Hoops Construction Co. of Twin Falls, Idaho, received a \$158,358 award for 18 mi. of grading and surfacing near Mountain City in Elko County. Hoops Construction Co. of Twin Falls received a \$94,766 award for grading and surfacing 4.2 mi. near Wells in Elko County.

NEW MEXICO

ALBUQUERQUE HAS a new \$10,000,000 housing development planned to be started very soon. About 540 acres will be developed with 900 to 1,100 homes to be constructed there. This will be the second largest housing development in the area.

THE ARMY CORPS OF ENGINEERS has been granted funds by the recent Congress of \$10,900 for flood control studies on the Spring River and \$15,000 for the Pecos River at Carlsbad. These amounts will enable the studies to be completed so that possibly they may be authorized at the next session of Congress.

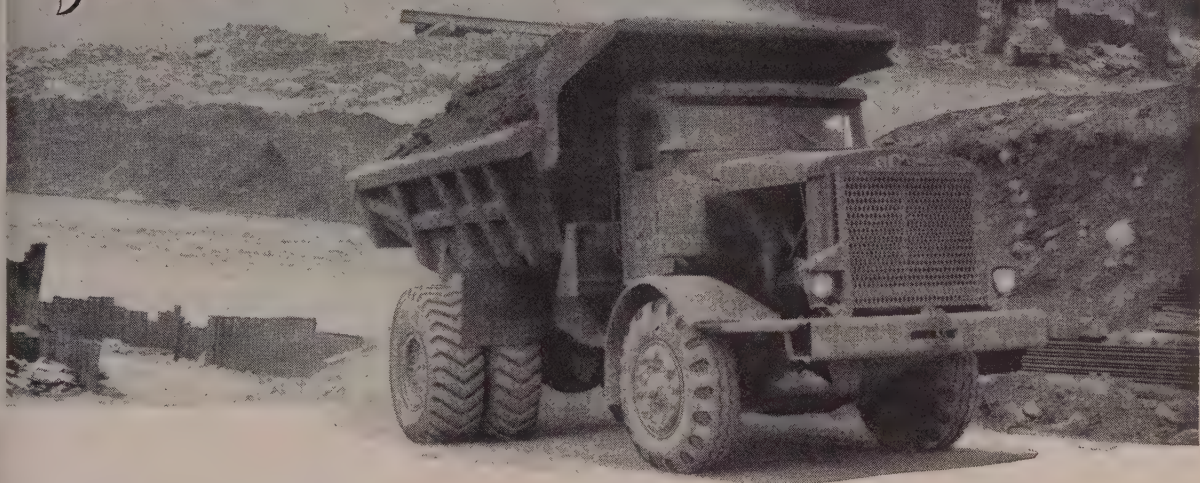
AT SANTA FE the state prison project valued at \$7,000,000 is more than half finished. It is being built by the Robert E. McKee firm and is expected to be finished early next year.

RECENT MAJOR CONTRACT AWARDS and low bids in New Mexico include a \$127,000 award to Jack Adams of Los Alamos for 9.1 mi. of grading and surfacing on state route 256 in Eddy County. Armstrong & Armstrong of Roswell received a \$148,686 award for grading and surfacing 3.8 mi. of US 66 in Guadalupe County. Brown Contracting Co. of Albuquerque received a \$624,446 award for grading and surfacing 15.7 mi. of US 66 in Bernalillo County. Brown Contracting Co. of Albuquerque received a \$300,263 award for 1.6 mi. of grading and surfacing on North Fourth Street in Bernalillo County. O. D. Cowart of Albuquerque received a \$184,857 award for grading and surfacing 31.2 mi. of the Ojo Feliz-LaCueva Road in Mora County.

OREGON

THE \$1,806,000 FOR NEW and additional construction at Portland Air Base was recently approved by Con-

Firestone NYLON TIRES



Cut Downtime. . . . **on the St. Lawrence Seaway**

INITIAL excavation for the Long Sault Dam on the St. Lawrence Seaway is right on schedule. On this project, as on all the excavation projects of the St. Lawrence Seaway, Firestone Nylon Tires are eliminating big downtime losses, giving more retreads and keeping tire costs at a minimum.

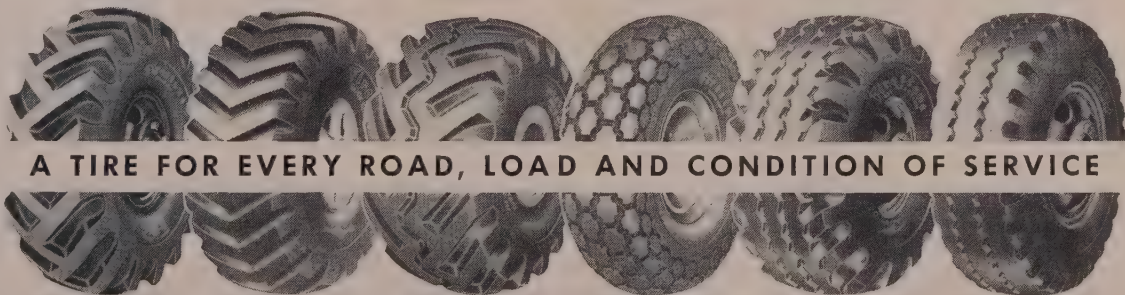
You can cut your costs with Firestone Nylon Tires because they are specifically engineered for the job. The treads give more traction and they are extra tough to resist cutting. Double-thick sidewalls

give added protection against cuts and snags.

The new Firestone Safety-Tensioned Gum-Dipped* nylon cord body insures longer tire life and more retreads. The Firestone Safety-Tensioned Gum-Dipped* nylon body gives the greatest protection against impact breaks . . . flex breaks . . . heat failures . . . and water damage.

Let your Firestone Dealer or Store show you how Firestone Nylon Off-The-Highway Tires will cut your downtime and increase your profits.

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



A TIRE FOR EVERY ROAD, LOAD AND CONDITION OF SERVICE

GROUND GRIP • ROCK GRIP • GG WIDE BASE • ALL NON-SKID • ALL TRACTION • RIB EXCAVATOR

When you buy new equipment or replacement tires, specify Firestone

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SEATTLE CITY LIGHT'S GORGE HIGH DAM UNDER WAY

The right bank of the Skagit River below the Gorge Diversion is being cleared and excavated in preparation for construction of the 285-ft. high concrete Gorge High Dam. Large boulders are being drilled and shot on the left. Contractors are Merritt-Chapman & Scott Corp. of New York and the Savin Corp. of East Hartford, Conn.

gress. The project includes a hangar for the repair and maintenance of Air Force Reserve airplanes; an operational parking apron for 16 planes; a bulk supply warehouse; a technical training building. A settlement has yet to be reached between the government and the Port of Portland on a new lease on the landing area of the airport. The amount mentioned above is in addition to \$2,500,000 appropriated in 1951 for construction of hangars, taxiways, ramps, and other projects for the Air Defense Command and which is still a dormant fund.

THE BONNEVILLE POWER ADMINISTRATION has been allotted \$1,033,000 during the new fiscal year for construction of a 240,000-volt line to be built from the Bonneville's Evaline substation 21 mi. to Mayfield. This is where the city of Tacoma is launching a \$35,000,000 hydroelectric development. An Olympia contractor, F. E. Wilder, is the contractor for clearing the right-of-way and building access roads for this transmission line which is to be put into operation in October of next year.

RECENT MAJOR CONTRACT AWARDS and low bids in Oregon include a low bid of \$108,655 by Nielsen & Smith Construction Co. of Twin Falls for construction of a bridge on the Old Oregon Trail Highway in Malheur County. C. R. O'Neil of Creswell submitted a \$278,899 low bid for grading and surfacing on the Louse Creek-Grants Pass section of the Pacific Highway in Josephine County. Parker-Schram Co. of Portland received a \$499,533

award for paving on the Pacific Highway in Lane County. Rogers Construction Co. of Portland submitted a low bid of \$450,665 for grading and paving on The Dalles-California Highway in Klamath County. Porter W. Yett of Portland submitted a \$596,233 low bid for grading and paving on the Tualatin Valley Highway in Washington County.

UTAH

OF THE MONEY APPROPRIATED by Congress for the Bureau of Reclamation in Utah for the coming fiscal year, the lion's share of \$10,895,000 is to be spent on the Weber Basin project. The money will provide funds for continuation of work on the Gateway canal and tunnel, Wanship Dam, enlargement of Pineview Dam, and construction of the Weber and Davis aqueducts. Construction also will be started this year on the Stoddard diversion works and the first portion of the drainage system.

RECENT MAJOR CONTRACT AWARDS and low bids in Utah include a \$119,000 low bid submitted by W. W. Clyde & Co. of Springville for 2.1 mi. of grading and surfacing the Ephraim-Orangeville Route in Emery County. A. S. Horner Construction Co. of Denver, Colo., submitted a \$495,917 low bid for construction work on the Stoddard Diversion Dam and Gateway Canal of the Weber Basin Project. Olof Nelson Construction Co. of Logan sub-

mitted a low bid of \$549,411 for grading and surfacing 3.2 mi. of state route 24 in Emery County.

Peter Kiewit Sons' Co., of Denver, Colo., submitted a \$1,353,466 low bid for 3.6 mi. of grading and surfacing in Salt Lake County. **Strong Co.** of Springville submitted a low bid of \$223,000 for 4.9 mi. of grading and surfacing the Vernal-Manila Route in Uintah County. **J. M. Sumsion** of Springville submitted a \$437,187 low bid for construction of a bituminous surfaced road in Emery County. **Utah Construction Co.** of Salt Lake submitted a low bid of \$1,372,766 for Pineview Dam enlargement and highway relocation on the Weber Basin Project. **L. A. Young Construction Co.** of Richfield received a \$156,000 award for grading and surfacing 9.8 mi. of the Panguitch-Panguitch Lake Route in Garfield Co.

WASHINGTON

AN ADDITIONAL APPROPRIATION of \$1,000,000 for the Ice Harbor Dam on the lower Snake River just east of Pasco will permit the Army Corps of Engineers to complete design plans of the structure, acquire real estate, build access roads, and start the cofferdam on the south side of the river. Start of this construction means the end of a 10-yr. fight to get the \$142,000,000 power and navigation dam under construction.

It is the lower of four dams planned to be constructed on the Lower Snake River within the state of Washington. It will create a lake about 40 mi. long and provide a navigation lock 100 ft. high, 10 ft. higher than McNary lock which is now considered the highest single lift lock in the world. This project would be under the Army Corps of Engineers Administration.

PROJECTS SCHEDULED by the Bureau of Reclamation during the coming fiscal year as approved by Congress include the following: for the Foster Creek division of the Chief Joseph project, \$631,000; for the Columbia Basin (which would include The Dalles), \$12,500,000; for the Kennewick division of the Yakima project, \$3,000,000; for the Roza division of the Yakima project, \$475,000.

THE PORTLAND AND WALLA WALLA districts of the Army Corps of Engineers have been reformed to place the John Day damsite within the latter district. The engineers have now recommended on the design of the dam that its height be reduced about 30 ft. This new report results in lowering the normal operating pull level to 262 ft. from 292 ft. as originally planned. The new report will be



TRENCHING 7 MILES of Indianola Avenue, a heavily traveled thoroughfare in Columbus, Ohio, called for a fast-moving job. The first step in opening the ditch was to

line-cut and break a 7" course of paving brick topped with asphalt. Two 80 lb. breakers, powered by a Jaeger "125" Roto Air-Plus, were used for this work.

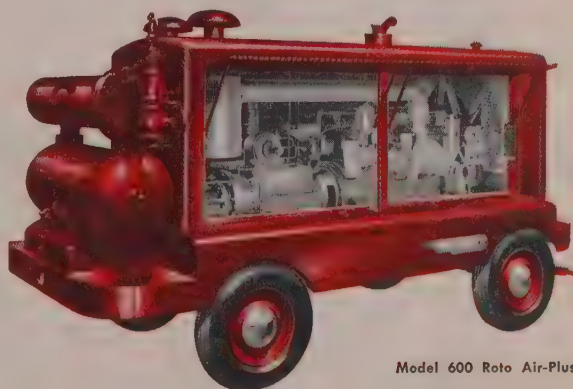
How Jaeger "125" Rotary speeds street work

On the above job, the instant-acting control of the Jaeger rotary, enabling it to maintain 100 lbs. minimum pressure under all air demands up to 125 cfm, made it possible to run two 80 lb. breakers at full efficiency, cutting and breaking an average of 400 linear ft. of 3 ft. wide trench (1200 sq. ft.) each 8 hours.

Because the higher efficiency of the Jaeger Roto enables it to operate at more economical engine speeds, fuel consumption on this job averaged only 1½ gallons an hour.

For big work, equally high efficiency is offered in the Jaeger Model 600 rotary. Jaeger reciprocating type compressors also continue to be available in all Jaeger "new standard" ratings with the exception of the 600 cfm size. For full information and comparative prices, see your Jaeger distributor — or send for Catalogs JC and JCR5.

For big work, Jaeger offers the Roto "600", illustrated below. It is the first fully efficient 600 cfm rotary compressor.



Model 600 Roto Air-Plus

Sold and Serviced by:

EDWARD R. BACON CO.....San Francisco 10
NELSON EQUIPMENT CO.....Portland 14
WESTERN MACHINERY CO.....Salt Lake City, Denver 4, Spokane 2
SHRIVER MACHINERY CO.....Phoenix
J. D. COGGINS & CO.....Albuquerque

SMITH BOOTH USHER CO.....Los Angeles 54
A. H. COX & CO.....Seattle 4 and Tacoma
THE SAWTOOTH CO.....Boise and Twin Falls, Idaho
TRACTOR & EQUIPMENT CO.....Sidney, Miles City, Glasgow
CENTRAL MACHINERY CO.....Great Falls and Havre
WORTHAM MACHINERY CO.....Cheyenne, Wyo.

SERVICISED PRODUCTS for CONCRETE STRUCTURES

Dams and Floodwalls, Sewage Treatment
and Water Filtration Plants

In general these products are specially designed for structures which control or contain water. Preformed joint fillers used in conjunction with rubber waterstop fill and seal expansion or construction joints so effectively that considerable hydrostatic pressure on one surface of the structure is not allowed to come through the joint.

EXPANSION JOINT FILLERS



CORK Premolded Joint Filler has a high recovery factor (95%) after compression — is non-extruding and inconspicuous in mass concrete structures. Keeps the joint filled at all times.



SELF-EXPANDING CORK is specially treated to expand to 150% of original thickness to insure positive joint filling where concrete shrinkage problems are present. Non-extruding . . . and resilient.



SPONGE RUBBER CEMENTONE Gray color blends with concrete. Fully resilient, non-extruding. Uniform thickness and density. Supplied in various degrees of compressibility to meet your requirements.

RUBBER WATERSTOP

Servicised Waterstop is flexible and elastic, with a very high tensile strength — easy to install and once in place withstands contraction, expansion and shearing movement to insure a positive permanent water-tight seal against hydrostatic water pressure.

Two types — Flat Dumbbell and Hollow Bulb. Both types meet all standard engineering specifications. Waterstop also available in fabricated ell's and tee's.



Flat Dumbbell Type



Hollow Bulb Type

NEW! SPLIT DUMBBELL TYPE



Servicised Split Type Waterstop spread open and nailed to inside of bulkhead. This eliminates slotting — saves time and labor.



Saves time, labor — eliminates split bulkheading. One half of waterstop width is split to permit fastening to bulkhead to form a "T" (see illustration). After pour, bulkhead is stripped, and divided section joined by stapling or with rubber cement. Also lower cost field splicing using Servicised Union.

MOLDED PARA-PLASTIC



Sealing at footing.

Bituminous rubber seals keyed contraction or construction joints, in vertical walls. Applied by heating surface. Adheres to concrete to form resilient, moisture-tight seal.

PARA-LATERAL STRIP

For sealing exterior vertical construction or expansion joints in walls, tunnels, foundations, etc., where joints must be protected against seepage from backfill.



Premolded Material

Write for catalog describing the complete Servicised line and the special brochure on Rubber Waterstop. Sent without obligation.

SEE YOUR SERVICISED DISTRIBUTOR

Charles R. Watts & Co., Seattle 7, Washington
Pacific Building Materials Co., Portland 12, Oregon
Utah Lumber Co., Salt Lake City 10, Utah
K. C. Construction Supply Co., Inc., Denver, Colo.
Santa Fe Builders Supply Co., Albuquerque, N. M.

Santa Fe Builders Supply Co.
Rhodes & Jamieson, Ltd.
F. Geremia & Son
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Santa Fe, N. M.
Oakland 4, Calif.
Sacramento, Calif.
Buena Park, Calif.

submitted to the Secretary of the Army and finally to Congress for approval—it will considerably reduce the cost of the dam now authorized.

A \$1,000,000 HOSPITAL addition is planned for St. Luke's General Hospital in Bellingham. The new steel and concrete building will replace the present frame structure built in 1926.

AS OF THE FIRST OF AUGUST construction of the city of Tacoma's Mayfield Dam was still being held up by a court order instituted by the state fish and game departments on the grounds that the structure would violate the state's fish sanctuary act. There was a possibility that the case might have to go as high as the state supreme court for settlement.

RECENT MAJOR CONTRACT AWARDS and low bids in Washington include a \$162,728 award to Associated Sand & Gravel Co. of Everett for 8.7 mi. of grading and surfacing state route 1 between Blanchard and Bellingham in Skagit and Whatcom counties. Goodfellow Brothers, Inc., of Wenatchee received a \$111,183 award for grading and surfacing 1.5 mi. of state route 10 in Chelan County. J. F. Konen Construction Co. of Lewiston received a \$143,511 award for 3.9 mi. of grading and surfacing on state route 3 in Asotin County.

Lockyear & White of Longview received a \$105,458 award for construction of the Elokomin River Bridge in Wahkiakum County.

C. E. O'Neal of Ellensburg received a \$248,766 award for 9 mi. of grading and surfacing on state route 10 in Okanogan County. Sather & Sons of Yardley received a \$224,897 award for construction of 0.7 mi. of state route 3 in Pullman. Thos. Scalzo Co. of Seattle received a \$353,812 award for grading and surfacing 3.8 mi. of state route 14 in Pierce and Kitsap counties. Washington Asphalt Co. of Seattle received a \$122,035 award for 11.1 mi. of grading and surfacing state route 2 in Kittitas County.

WYOMING

THE FAIRVIEW DEVELOPMENT Co., Inc., of Cheyenne is planning to build a \$1,250,000 shopping center in east Cheyenne. New stores and a 350-car parking area are to be constructed within the next 15 to 18 months.

IN THE PUBLIC WORKS appropriation bill approved by President Eisenhower more than \$13,000,000 is available for Wyoming water development projects. The amount includes \$900,000 for start of the Old Creek project in Hot Springs County; \$8,120,000 for the Glendo



Model 8-C Austin Overshot Loader loading rock in Colorado quarry.

Load 12 cubic yards per minute with an Austin Overshot Loader

Austin Overshot Loaders move material overhead, from loading point to haulage units, in one fast, straight-line movement. Because they waste no time twisting or turning, Austins complete each loading cycle in just 20 seconds—make 3 full cycles every working minute!

A Model 8-C Austin Loader, mounted on a Caterpillar D8 Tractor, moves 4 cubic yards of material every cycle—12 cubic yards each minute!

Cut costs . . . boost your production . . . use Austins to load trucks, wagons, railcars—to mix or stockpile—to excavate. Or, use Austin job-tested attachments on your Loader to bulldoze, screen raw materials, or load logs and other items.

Austin Overshot Loaders are now available in five models, for installation on Caterpillar D2, D4, D6, D7 and D8 Tractors. Bucket capacities from 1 to 4 cubic yards.

AA-1405

AUSTIN DIVISION

Central Ohio Steel Products Company
Galion, Ohio • Denver, Colorado

*Ask your Caterpillar-Austin Dealer
for a demonstration*



To help you hole-thru faster...

COMMERCIAL liner plates speed up mining in soft ground tunneling

Working many feet underground in the heading of a soft ground tunnel, this crew is unconcerned about the possible danger which could result from a cave-in. By installing the COMMERCIAL steel liner plate system of ground support, the contractor of this job is providing the best safety insurance for his men as well as assurance for himself that his job can be completed on schedule.

When you realize that the COMMERCIAL plates have continuous inward flanges with all four corners solid, it is easy to understand why they are so strong and will support such heavy loads. No one wants to take a chance of losing a heading because of inadequate ground support. A lost heading, like a lost week-end, costs money and takes time to recover from.

Look how close to pay line these "sand hogs" mine. Just a few more spadefuls of dirt need to be removed before one of them will slap the next plate into place while the other will

slip seven bolts thru matching holes in the flanges and quickly tighten up the nuts with a rachet. Bolt in one hand, nut in the other, two inside vertical flanges between with matching holes—everything out in the open—what could be quicker or more simple?

As all flange joints are butt to butt and plates are curved to the exact required radius, there's no over-mining beyond pay line to cause voids behind the plates. Thus ground ravelling is minimized and reduction of the amount of grouting behind the steel lining, if any, becomes a very substantial cost-saving item.

Our experience, from many years work with engineers and contractors who have successfully used the COMMERCIAL liner plate system in hundreds of different soft ground tunnels, can be a great help to give you the footage and safety needed to complete your tunnel on schedule. There will be no obligation.

project; \$1,340,000 for Hanover Bluff; \$800,000 for Eden; \$750,000 for Kendrick; \$300,000 for Riverton; \$300,000 for Shoshone.

RECENT MAJOR CONTRACT AWARDS and low bids in Wyoming include a \$377,946 award to Colorado Construction, Inc., of Denver for grading, draining, surfacing, one culvert, one overhead structure, and miscellaneous work on 6.9 mi. of the Laramie-Ft. Collins road in Albany County. Gibbons & Reed Co. of Salt Lake City submitted a \$228,000 low bid for 17.7 of grading and surfacing on the Heback Canyon and Snake River Canyon Route in Lincoln and Teton counties. Inland Construction Co. of Omaha received a \$330,465 award for grading, draining, surfacing, construction of one bridge, and miscellaneous work on 4.9 mi. of the Worland-Thermopolis road in Washakie County.

Jones, Hinckley & Jones, Inc., of Powell received a \$351,779 award for grading, draining, surfacing, construction of three continuous reinforced concrete slab spans over Alkali draw and three continuous girder spans over Potato Draw and miscellaneous work on 6.7 mi. of the Greyhull-Shell road in Big Horn County.

Here and There

NOTHING WAS DONE by Congress in the closing days of its session on two major construction items. The bill before Congress which would have authorized the \$760,000,000 Upper Colorado Basin project affecting the states of Arizona, Colorado, Utah, New Mexico, and Wyoming was shelved. The other major subject on which nothing was done was the approval of any kind of a program for more than the current rate of road building. Both President Eisenhower's plan to set up a new government corporation to sell 30-yr. bonds and the Gore proposal for an extension of the present federal aid program were rejected.

ALASKA

RECENT MAJOR CONTRACT AWARDS and low bids in Alaska include a \$1,346,602 award to B-E-C-K Constructors, Inc., of Seattle for construction and rehabilitation of utilidors at Eielson AFB. Fairbanks Building Contractors of Fairbanks submitted a low bid of \$550,000 for troop facilities at Ladd AFB. J. A. Jones Construction Co. of Seattle submitted a \$3,968,430 low bid for construction of complete military installation for U. S. Air Force on Sitkinak Island.

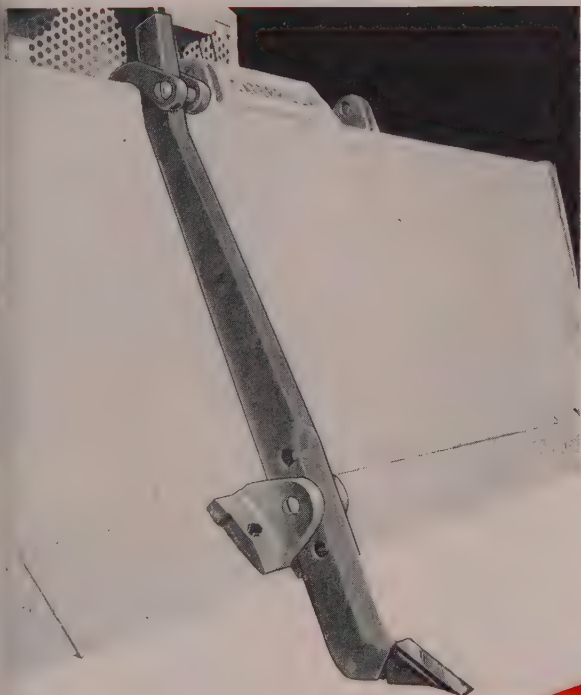
COMMERCIAL
PRODUCTS PREPARED BY CUSTOMER REQUEST

THE COMMERCIAL SHEARING AND STAMPING COMPANY
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Teeth that really dig



RAPID RIPPER

FOR ALL MAKES OF BULLDOZERS

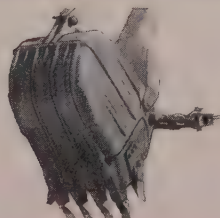
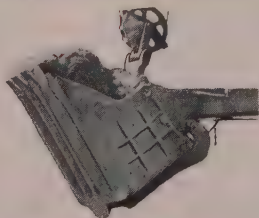
- **Narrow sharp replaceable point penetrates in hard, compact ground**
- **Lightweight — easy to handle**



BULLDOZER CORNER ADAPTERS

- **INCREASES EFFICIENCY OF BULLDOZER**
- **MORE MATERIAL MOVED WITH LESS POWER**
- **POINT PILOTS AHEAD OF BLADE, REDUCES WEAR ON BLADE**
- **CORNER POINTS STAY SHARP. ELIMINATES ROUND CORNERS**

TEETH FOR ALL TYPES OF EXCAVATING EQUIPMENT



H&L

TOOTH COMPANY

1540 SOUTH GREENWOOD AVE. MONTEBELLO, CALIF.

ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

HIGHWAY TO ARCTIC—One of the really historic sagas of modern transportation against great odds is Alaska Freight Lines' unprecedented winter "highway to the Arctic," used to supply Distant Early Warning Line radar construction sites in the north. New concept in Arctic supply of construction sites emerged from the operation. Thirty-two diesel truck-trailers and a giant specially-constructed "Snowtrain" plied the route successfully during the bitterest months of the winter. More than 500 tons of freight moved over the winter road bulldozed out of the tundra ice and snow. A construction supply operation of such scope in the trackless Arctic had been considered impossible.

MIDNIGHT SUN CONSTRUCTION—Success of the highway to the Arctic is due principally to careful planning and use of natural advantages such as the fact that biting Arctic cold has frozen rivers, lakes, and open tundra to pavement hardness. A little bulldozing, a little scraping, a little compaction and the job was done. Arctic experts including Indian guides laid out the route for the highway. A road-building crawler train with construction equipment and sled-mounted housing for workers blazed the 25-ft. wide, 400-mi. long road through.

PIPELINE TESTING—A Sept. '1 completion date, including final testing of the Haines-to-Fairbanks pipeline, is hoped for by the Alaska District Corps of Engineers. Final tying-in for building utilities, electrical and general clean-up now under way. Line will be operated for one month to check efficiency before contractor turns it over to the military.

EMPLOYMENT PICTURE—Construction employment in Alaska is now at its yearly peak. A few shortages are now developing—principally in highly skilled categories, including engineers, Alaska's fishing, mining, and logging industries have taken up much of the slack in jobless rolls. Even so, several hundred men are still unemployed in Anchorage.

JOB REPORT—Summarized, this is the employment picture now at key points in the territory . . . **ANCHORAGE**—needed here are stenographers, registered nurses, graduate engineers, and social workers; in oversupply are laborers, truck drivers, sales clerks, waitresses, office clerks, cooks, and carpenters . . . **FAIRBANKS**—needed are draftsmen, engineers, construction inspectors, auto body repairmen, and medical technicians; seeking work are laborers,

truck drivers, carpenters, plumbers, sales clerks, and office workers . . . **KETCHIKAN**—experienced loggers are needed; unemployed are office workers, domestic workers, and laborers . . . **PETERSBURG**—Needed are barbers, chokermen, bull cooks, and cannery workers; fishing has absorbed virtually all who want to work.

POWER LIMELIGHT—Power construction in Alaska is rapidly coming into its own. Initial impetus was given to western Alaska's power development planning by construction of Eklutna hydroelectric project. Since then, planners have been busy blueprinting several new projects. Included are Cooper and Crescent Lake power dams on Kenai peninsula. Susitna River dam is in long-range planning status. Chugach Electric Association, a cooperative, now has a steam plant in operation in Anchorage. City of Anchorage has its own power setup. Matanuska valley, portions of Cook Inlet area and Kenai peninsula are being considered for appraisal as potential industrial sites. Geological Survey has completed study of four prospective power sites on the Kenai peninsula near Seward: Grant, Ptarmigan, Cooper and Crescent Lakes.

NO ALASKA CONTRACTOR should be without U. S. Geological Survey maps on Alaska. These are considered outstanding from standpoint of accuracy, information on terrain, and transportation data . . . New maps and reports are now out on the Koyukuk basin and Shaktolik river areas. Report consists of a geological map, structure sections, and descriptions of rock units.

FOCAL POINT of Anchorage area construction is at Fort Richardson this season. Work is going ahead on more than \$3,000,000 in new projects . . . Airport construction work is progressing at the Bethel field . . . Central Construction Co. has begun work on resurfacing of the Juneau municipal airport.

PERMANENT PIPELINE JOBS—Twenty-eight permanent jobs are now open for qualified persons interested in accepting employment on the Haines-to-Fairbanks pipeline. Applications should go to territorial employment office at Juneau. Jobs open include civil engineer, safety engineer, safety inspector, chief station engineer, pipeline maintenance general foreman, operating engineer, and plumber. Also needed are four petroleum pipeline dispatchers, six station operator maintenance men, two

pumpmen, two diesel mechanics, two maintenance mechanics, two electricians, and two oil field welders. Most jobs require 2- to 5-yr. experience. Work is under civil service and employees will be stationed at Haines and other points along the pipeline route.

LABOR SCENE—In general, construction in Alaska has been plagued with less labor strife this season than for several years past. Only flaw in harmonious labor picture this season is threatened walkout of plumbers in the Anchorage area. Plumbers are the only building trades craft in Alaska without a working agreement for the current construction season. All others have signed 1- or 2-yr. contracts. So far, there has been no strike vote on the part of Anchorage plumbers, but many plumbers have "informally" walked off jobs their union has placed in the "unfair" category. Plumbers are asking wage increase of 40 cents per hr. with double time for all time over 40 hr. per week. This would increase rate for plumbers to \$4.65 per hr. With travelling allowances, new rate desired by plumbers would give them a Saturday pay of \$9.82 per hr. Plumbers have rejected a 20-cent per hr. increase.

CONSTRUCTION NEWS CAPSULES . . . Railroad tunnel to Whittier being reconstructed following \$30,000 blaze believed caused by spark from diesel engine passing through snowshed of 13,090-ft. tunnel . . . Water drill rig in Anchorage recently struck a gusher of artesian water, with rate of flow up to 250 gpm. Well was to serve an apartment house; drillers say it could supply entire suburb . . . Plumbers are first union in Alaska to seek guaranteed annual wage. Plumbers union spokesman declared worker would take cut in hourly scale if assured of annual minimum . . . Alaska Public Works has signed a \$536,000 contract with city of Anchorage for rehabilitation of water mains; city will pay half . . . Anchorage slum-clearance program has hit a snag; city officials can't find owner of five condemned buildings . . . District Engineer has announced that \$45,000,000 in new projects at 63 Army and Air Force sites in Alaska are now being planned; construction on these projects will begin between August of 1955 and February of 1956 . . . Residents of Bristol Bay protested that contractors were carrying out military work projects in their area without making provision for hiring of some residents; it's reported the contractor involved modified his personnel program by hiring some residents of Bristol Bay area . . . Valuation of Alaska property for 1954 amounted to \$44,000,000 in 30 Alaska cities, an increase of 24% over 1953 . . . Wrangle is seeking a power permit for hydroelectric project on Kunk Creek in Tongass National Forest.

ENGINEERS on the move

T. M. Garrett, for the past 15 years manager of the contractors section of E. I. du Pont de Nemours & Co. at Wilmington, Del., recently retired after more than 35 years of service with the company. **James H. McGrath** succeeds him as manager.

David L. Narver, Jr., was recently appointed to the position of project manager by Hyperion Engineers, the joint venture firm organized to design and engineer expansion of Hyperion sewage treatment and disposal facilities. Narver is secretary of Holmes & Narver, Inc., sponsor of the joint venture firm in the \$40,700,000 sewer project west of Los Angeles.

TWENTY-SIX HUNDRED of the more common geologic terms used by geologists, engineers, and professional men in allied fields, are clearly and concisely defined in the "Glossary of Selected Geologic Terms with special reference to their use in engineering," by Wm. Lee Stokes and D. J. Varnes. Published as Volume 16 of the Proceedings of the Colorado Scientific Society, prices are \$3.50 cloth bound and \$2.75 paper bound. Send order and check to **Treasurer, Colorado Scientific Society**, Box 688, Denver, Colo.

Announcement of a newly organized engineering firm was recently made. Located at Seattle, Wash., the new firm is a joint venture of five groups of engineers, together with independent associates, and is operating under the name of Gellert, Griffin, Carey & Associates, with **N. Henry Gellert** as executive partner. In addition to Gellert, the key men behind the new engineering concern are **DeWitt Griffin**, **James W. Carey**, **Harrison W. Kramer** and **Wayne Harrigan**.

William D. Hosmer has left the Alaska District, Corps of Engineers, after five years of service. Locating in Alaska in 1947, Hosmer was stationed at Kodiak with constructors and engineers for the Navy before joining the Corps in 1950, where he has served in varying assignments in the engineering division.

Ken R. White, civil and structural engineer, recently moved his office to 1565 Marion, Denver, Colo.

William H. Ellison announces formation of a partnership with **George A. Sedgwick**. The new consulting structural engineering firm will be known as Ellison, Sedgwick and Associates, located at 1045 Sansome St., San Francisco.

Jack Kardell, city engineer of Tulelake, Calif., for the past two years, recently resigned to accept a position with Pomeroy and Bechtel, Western contractors with construction projects in the Philippine Islands.

John Work, a well known and long time employee of W. C. Kruger and Associates, architects of Santa Fe, New Mex., recently retired from the construction industry after more than 50 years of service.

Norman G. Wallace, chief reconnaissance engineer with the Arizona Highway Department, recently retired from state service after 23 years in highway work. Prior to joining the department in 1932, Wallace was construction engineer with the Southern Pacific R.R. in Mexico, and later served with the Bureau of Public Roads in Alaska.

William L. Hall, transportation economist in the division office of the Bureau of Public Roads, Portland, Ore., resigned July 1 to accept the position of executive director of the Montana Legislative Interim Committee Highway Needs Study. Another man who recently left the Portland office is **Joe Lissner**, assistant in the federal-aid branch, who retired July 31 after over 36 years of continuous government service.

David H. Meldrum, head of the overseas section of the military planning branch of the North Pacific Division of the Corps of Engineers, has been transferred to an 18-month assignment in the Mediterranean division, making his headquarters in Nouasseur, French Morocco. Another recent traveler from the Division was **Andrew Saltwick** who journeyed to Korea to carry out an assignment by the Chief of Engineers calling for expert consulting services in connection with Inchon Harbor. Saltwick is coordinator of all hopper

dredge operations for the North and South Pacific divisions.

Col. Robert N. Swartz of the Los Angeles District Office of the Corps of Engineers at Los Angeles was recently assigned as assistant district engineer. **Lt. Col. Charles A. Carroll** was assigned to Swartz' former post of executive officer.

R. M. Parsons of the Idaho State Department of Highways was recently appointed district engineer of District 4 at Lewiston, and **J. A. Phelps** of District 5 at Coeur d'Alene.

Lamar Floyd of the New Mexico State Highway Department has been made director of the personnel section. Floyd has been with the department for over 15 years, most recently as safety director, and is quite familiar with the problems of the engineer. One of his principal duties now is to develop cooperative programs with colleges and universities to produce more engineers, as well as to develop training programs within the department.

William A. Bissonnette is currently employed at Mayfield Dam, a concrete structure being built by Tacoma City Light as a part of the Cowlitz Project in Washington. Bis-



William A. Bissonnette

sonette was previously employed on Coulee, Shasta, and Keswick dams of USBR and McNary Dam of C. of E. and has also worked on dam construction for Brown & Root, contractors.

Earl W. Hampton of the California State Division of Architecture was recently appointed assistant state architect, administrative. He has been acting in this capacity since the retirement of his predecessor, **W. K. Daniels, Sr.** last January.

Carleton Pierson, supervising contract and building specifications writer with the California Division of Architecture, recently retired after more than 43 years continuous service with this division.

The report on the comprehensive investigations of the water and land resources of the Arkansas, White, and Red River Basins has gone to each Federal agency and State involved for comments. **Dr. Walter L.**

Huber, consulting engineer from San Francisco, Calif., served as adviser to the President of the United States concerning this matter.

There have been several moves recently among the engineers of the Portland District, Corps of Engineers. Col. James U. Moorhead, District Engineer, leaves early in September for the Far East Command with headquarters in Tokyo, Japan. Col. Jackson Graham takes his place at Portland. Lt. Col. Francis G. McBride recently came from a 3-year assignment at The Hague, Holland, to serve as executive officer, succeeding Col. David S. Parker who has

been named assistant district engineer.

Glen C. Blegen, former powerhouse superintendent at Bonneville Dam, has been named project engineer for The Dalles Dam project. Harold N. Walker, chief of the design branch, engineering division, was granted a year's leave to accept an appointment in New Delhi, India. Lewis E. Knerr will fill his post while he is absent.

A picked group of men have been selected to head construction of a network of U. S. Air Force installations at remote northern sites where

the Alaska District Corps of Engineers is supervising more than \$22,000,000 in construction contracts. The new project engineers include: At Galena, Noren V. Anderson; Bethel, Harold D. DeWitt; Chiniak, Donald MacKinnon; Fort Yukon, Frederick W. Burns; Homer, Harry E. Jones; King Salmon (Naknek), George W. Avery; Kotzebue, Harry Knudsen; Middleton Island, Bernard Sturgulewski, Jr.; Unalakleet, Joseph F. MacIsaac.

John F. Bonner, civil engineer and member of ASCE, was recently appointed assistant to the vice president and chief engineer of the Pacific Gas & Electric Co., Walter Dreyer.

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DEATHS

James R. Griffith, 61, former dean of engineering at the University of Portland and professor of structural engineering at Oregon State College from 1929 to 1940, died July 18 at a Portland hospital after five weeks' illness. At the time of his death he was on the faculties of Washington State



James R. Griffith

College and the Armour Institute of Technology, Chicago, and was a design engineer for the Atomic Energy Commission's Hanford works. Professor Griffith was a frequent contributor of engineering articles to technical publications. He was the author of "Construction Design Charts" which appeared in *Western Construction* for a number of years and were later widely circulated in book form.

CALENDAR

- Sept. 8-10—Western Association of State Highway Officials, 34th annual conference, Jackson Lake Lodge, Wyo.
- Sept. 12-14—American Road Builders' Association, 3rd national conference of County Highway Engineers and Officials, Greystone Hotel, Gatlinburg, Tenn.
- Oct. 6-8—Structural Engineers Association of California, 24th annual convention, Yosemite Valley, Calif.
- Jan. 11-14, 1956—American Road Builders' Association, 54th annual convention, Miami Beach, Fla.

SUPERVISING the jobs

Clarence Fratzke is superintending the construction of an administration building located in Oakland, Calif., for John E. Branagh & Son, which is doing the work at a cost of \$761,293. Under construction since March, completion is set for April of next year.

Frank and Manuel Souza, partners in the firm of Oakland Sewer Construction Co., are acting as foremen on their own recent award for installation of sewers in portions of Fairway Ave. and Sequoyah Road in Oakland, Calif.

Carl W. Boulden is general superintendent for A. S. Horner Construction Co. on a \$73,000 award for three bridges on Highway 87 north of Sheridan, Wyo. **Dick Hoyer** is office manager. Resident engineer is **Harold Saffell**, assisted by **Willie Ball**. Among the foremen are **Jacob Neumiller**, pipe; **Frank Wood**, carpenter, and **Wade Hunt**, concrete.

Bernard H. Prentiss is supervising the construction of the Lewis & Clark Junior High School at Billings,

Mont., a \$1,368,800 contract being executed by Lowe Construction Co. Assisting as foremen are **Vernon Moore** and **John Mohland**, carpenter; **Al Meyer**, labor, and **Bob Heiberg**, steel.

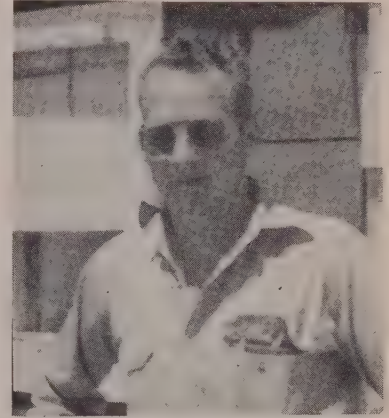
Oscar Kringlen, superintendent, **William J. Thomas**, assistant superintendent, and **Roy V. Silver**, office manager, are top personnel for Oberg Bros., contractor on the nearly completed widening of Aliso Street across the Los Angeles River and Aliso Street (freeway) involving erection of an 80-ft. prestressed girder. This is a \$2,000,000 project. State resident bridge engineer is **W. B. James**. **Leo Trombatore** is the district state representative of the California Division of Highways.

Max Sandri is superintendent for Vinnell Co., Inc., on a storm drain job at Long Beach, Calif.

Victor Weidmer, general superintendent, and **Lee Kirschner**, assistant superintendent, head the construction force working for Ukropina-Polich-Kral on construction of a

bridge over Dog Creek, 28 mi. north of Redding, Calif. UPK received this contract from the State at approximately \$750,000. The bridge, which has been under construction since August 1954, is expected to be finished this coming December.

L. W. Vail is in over-all charge of construction of 15.2 mi. of State Highway 9, between Kooskia Bridge and Syringa Creek in Idaho County, Idaho. He is a partner in the firm of L. W. Vail Co. which received the contract for this work at \$190,495. Supervising the job is **V. S. Pearce**, who expects to finish about Oct. 1.



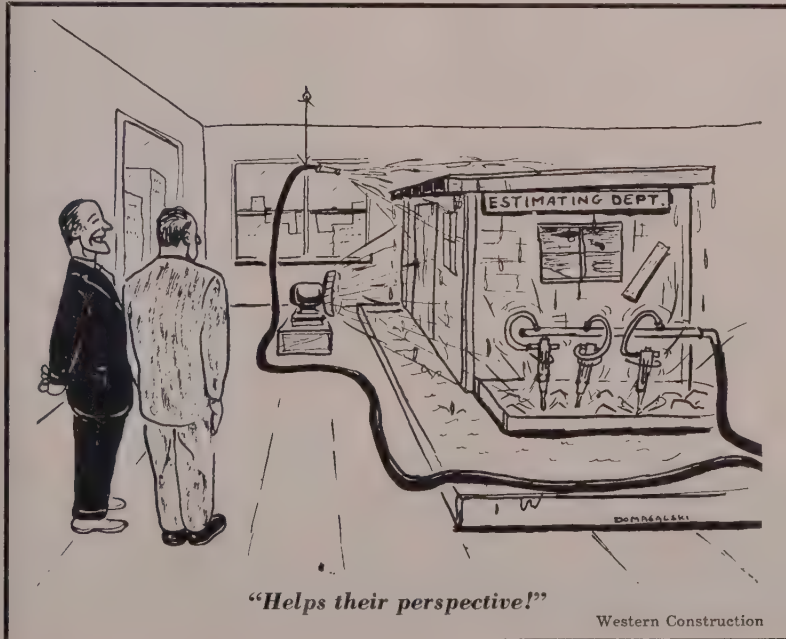
A \$750,000, 4-story, brick and structural concrete office building is under construction at Casper, Wyo. Superintendent **K. K. Rowe** is in charge of the work for the contractor, **Riedel-Lowe Co.**, Cheyenne.

Jack H. Guthrie is general superintendent for Pacific Bridge Co. which holds the contract at \$752,000 for rebuilding jetty at Yaquina Bay and Harbor at Newport, Ore., for the Corps of Engineers. Assisting as foreman is **Les Canady**. **R. Wigle** is mechanic on heavy machines, and **Lewis C. Peck** is welder. Rock up to 20 tons is hauled 17 mi. by truck to the site and dumped directly on the jetty. The job got under way in mid-March and is scheduled for completion the middle of September next year.

Jim Talley is superintendent for C. R. Park, contractor who is putting up a building at Long Beach, Calif., for **Bekins Van & Storage Co.** Foremen are **Jim Jastey**, carpenter, and **Fred Diaz**, labor.

Paul Tate is subcontractor on excavating for **Raymond Concrete Pile Co.** who are driving 185 piles. **Harry Luthin** is general superintendent; **Jim Barry**, job superintendent; **Floyd Williamson**, foreman, and **Emmett McMurray**, operating engineer. Among the crew are **Paul Williamson**, **Hubert Williamson**, **Robert Hamon**, **Joe Mora** and **Roy McGill**.

Down-time By Domagalski



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Ertz Getrum Hinkley



Lewis Anderson Davies Jones
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The Western Construction camera at Glasgow Air Force Base

R. J. O'Meara, general superintendent for Northwestern Engineering Co., is in charge of construction at the Glasgow AFB at Glasgow, Mont., a \$3,186,000 undertaking of the Corps of Engineers. "Wally" Marquardt is job engineer, and Howard Hart is in charge of the office. Other key men are Floyd Breamer, pipe superintendent, and Vince Norskog, carpenter superintendent; Cecil Rahn, crusher foreman; Kenny Tollefson, pipeline foreman; Marion Webb, warehouseman, and John Grayson, master mechanic.

Grading and surfacing is subcontracted to Harris Construction Co.,

a five-month job which started July 1. Kenneth Harris of the contracting firm is acting as project manager, while Warren Walsh is general superintendent. Harold Getrum is master mechanic. Others among the construction crew are Ed Ertz and Fred Hinkley, oilers; Bob Janssen, truck driver, and the following operators: James Gillick, scraper; Maurice Wortman, patrol; Arnold Lewis and John Anderson, Euc; Levi Davies, tractor, and Blaine Jones, scraper. Four of the first 14 TS18 Euclid 2-motor scrapers in the U. S. are being used by Harris on this job. (Western Contracting Corp. of

Sioux City, Iowa, has the other 10 on a turnpike job in Indiana.) Eucs are of 300 hp. in front motor; 195 in rear, with 33.5x33, 32-ply tires.

Service Electric Co., Inc., is another subcontractor on this project; Jim Donaldson superintending. Streets and access roads are subcontracted to A. & W. Construction Co. R. C. Arnold, president of the firm, is acting as project manager, and Paul C. Arnold is supervising the job.

Morrison & Maierle are consulting engineers for the entire project which has been going since mid-June and will probably run through 1956. Darrel Manning is representative.

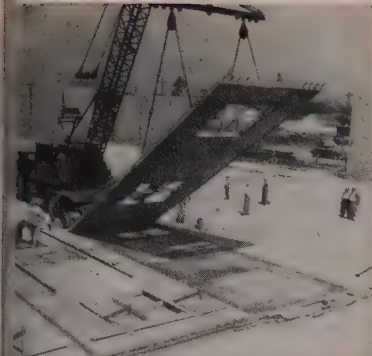
Keith J. "Mickey" Erickson is supervising a 2.9-mi. grading and surfacing job on State Highway 14, Holman Road to Bethel in Kitsap County, Wash. Arthur Hanson is clearing foreman, and Martin J. Diesburg is master mechanic. Erickson Paving Co. was awarded this contract on a low bid of \$299,075. Job got under way in April and will soon be finished.

Vern Mulherron, project superintendent for Mardian Construction Co., is in charge of grading and draining and construction of two railroad underpass structures, an overpass, and installation of three drainage pumps on the Phoenix-Prescott highway at Santa Fe railway and Black Canyon highway crossing, in Arizona. Job started April 22 and will probably end January, 1956.

William P. Butler is supervising the work of reconstructing the central wharf at Pier 20, East Waterway Terminal, for the Port of Seattle, Wash. Others among the key men are Frank L. Hook, foreman, and "Hank" Clark, pile-driver foreman. Butler Construction & Engineering Co. won the contract at a cost of \$473,355, started work April 17, and expects to be finished this year.

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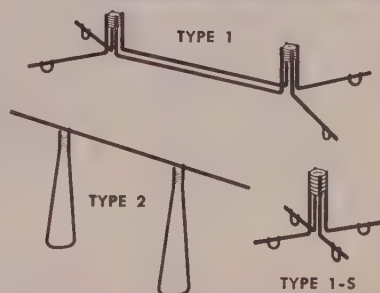
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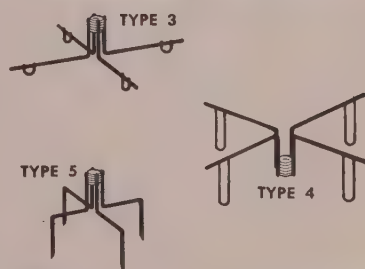
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The Western Construction camera with Morrison-Knudsen in Wyoming

R. E. Denham, project manager; Cecil F. Amick, general superintendent, and Kensul Shotwell, assistant superintendent, are the top supervisors for Morrison Knudsen Co., Inc., on a railroad relocation in Wyoming. This is an 8½-mi. line change for the Union Pacific, Moyer Junction to Fossil, in the vicinity of Kemmerer. The office is managed by T. F. Cushing, assisted by H. L. Phillips and Kaiji Okano.

Others among the key personnel on this project, now about completed, are: Superintendents—Dean Rule, shovel; M. L. McCrady, cat. Foremen—Lloyd Rule, Reed Harris, and John Gracik, shovel; T. O. Pulliam and Bob Zeller, cat; John Scheuffele, pipe; George Colton, grade. Ferd Puls is master mechanic. C. C. Ray is heavy duty mechanic.

Track extensions and signal mounds from Granger, Wyo., to Pocatello, Idaho, are in charge of Max Marshall, superintendent, assisted by Vernon Lindenmuth, foreman.

M.-K. started work here Mar. 28.

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For top loading performance, the plant is equipped with KOLMAN's Portable Feeder Trap Combination. The trap is designed to facilitate loading with bulldozer and various other means. The reciprocating plate feeder is built into the trap, so both are an integral part of the conveyor and completely portable. In addition, Wing Walls extend from the sides of the trap to prevent material from working in around the conveyor tail section.

The complete plant is fully portable with no disassembly whatever. The vibrating screen folds under the end of the conveyor for towing without removing any of the drive assembly.

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Broadway and 19th Sts.
SANTA ROSA—Empire Farm Equipment Co.,
1470 Santa Rosa Ave.

IDAHO

BOISE—The Sawtooth Company, 1115 Grove St.

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ELKO—A-D Machinery Co., 251 West Commercial St.

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PORTLAND—Western Equipment Co., 2244 N.W. Savier St.
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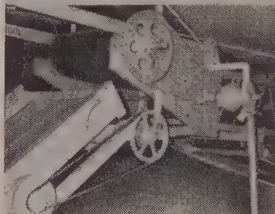
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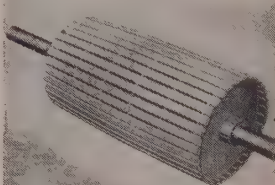
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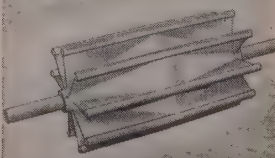
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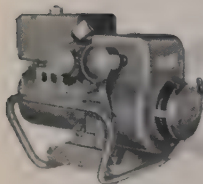
That power-packed Onan Model 205AJ on the construction site above, delivers 2,500 watts of A.C. power, enough to operate several electrical tools or floodlights simultaneously. Powered by an Onan 4-cycle gasoline engine, it has all the 4-cycle advantages of quick starting, long life and easy maintenance, yet it weighs only 154 pounds, and costs less per watt of output than any electric plant in its size range.

This model and others in the new AJ and AK series, ranging in size from 500 to 2,500 watts, are all lighter in weight, more compact, and lower in cost than previous models. They are completely Onan built . . . powered by new, modern, short-stroke, single-cylinder Onan gasoline engines, direct-connected to Onan drip-proof all-weather generators.

Equipped with carrying frame or two-wheel, rubber tired dolly, these new electric plants can be taken anywhere . . . moved around easily on the job. Get all the facts on these new electric plants from your Onan distributor.

NEW POWER-PACKED MODELS

500 to 2,500 watts



AJ A.C. MODELS
1,000 and 2,500 watts,
115 or 230 volts.

AK A.C. MODELS
500 and 750 watts, 115
or 230 volts.



Electric Plants for every need—500 to 50,000 watts

Write for Special Folder!

D. W. ONAN & SONS INC.

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W. L. Vawter, who has been superintending a 3-mi. stretch of grading and surfacing south of Inspiration Point and Julian in San Diego County, Calif., expects to have the job finished about Oct. 1. Ray Reed Co. and Conrad Construction Co., Inc., is doing the work at contract price of \$232,087.

* * *

Tom Stewart of the firm of Stewart & Hitchcock, contractors, recently directed the construction for his firm of a portion of state highway in White Pine Co., Nev., on which Max Riggs was superintendent and Al Henderson, grade superintendent. Contract price, \$169,234.

* * *

Carl Henderson, carpenter superintendent, assisted by Ernest Tigner, labor foreman, and John Hamelan, rock foreman, is in charge of a job for Paul Jarvis, Inc., covering dam alterations and Chandler Canal enlargement, Kennewick Division, Yakima Project, Wash. This award went to Jarvis at \$420,612. Starting date, June 1; closing date, Feb. 15, 1956.

* * *

W. A. Sisson is supervising construction of storage igloos at Mountain Home AFB, Idaho, for J. H. Wise & Sons. Project engineer on this \$658,230 construction is Irving H. Coles. Milo B. Lamb is assisting as foreman. Started in April, work is expected to be finished by the end of this year.

* * *

Harry Woods, superintendent, is chief man for Northwestern Engineering Co. on 5.4 mi. of highway grading and surfacing in Douglas County, Colo. Other key contractor men on this \$533,300 project are Lester Kelley, crushing-aggregate superintendent; Samuel G. Carlson, fine-grading and form setting foreman; Donald Finch, paver foreman. Stanford M. Adelstein is office engineer. Work will soon be completed.

* * *

Cliff Schultz, paving superintendent; Cecil Green, crusher superintendent, and Sam Parker, asphalt plant superintendent, have been working on a job in Washington for S & F Construction Co. A \$133,939 award, work was for 2.6 mi. of grading and surfacing on Fender Road to Wild Rose Road in Spokane.

* * *

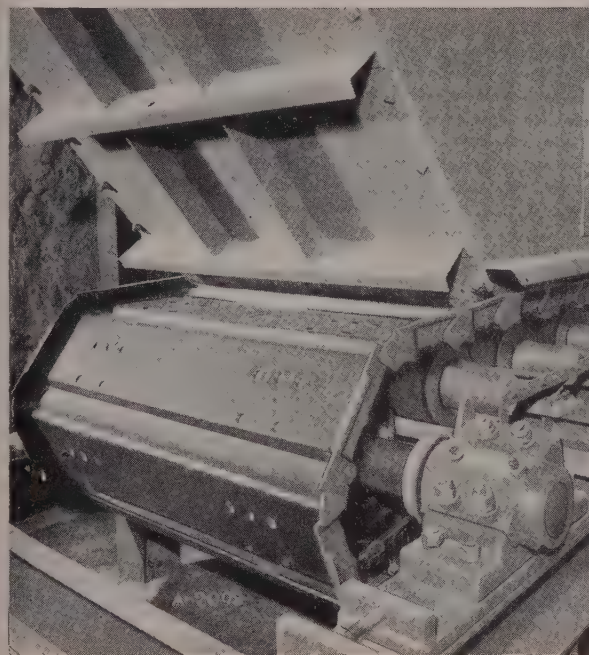
Ed Kivimen is foreman on grading and surfacing 9.1 mi. of highway section Hilger-Winifred-Big Sandy, Big Sandy south, Chouteau County, Mont. John Nykalaya is assisting as mechanic. S. Birch & Sons Construction Co. is the contractor who secured the job at a low bid of \$157,618.

* * *

Earlon Fisher, superintendent, is currently directing a \$189,595 contract for Inland Construction Co. Work consists of 10 mi. of grading

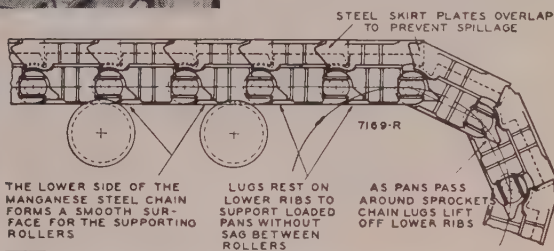


S-A "AMSCO" MANGANESE FEEDERS



"AMSCO" Feeders withstand the punishing impact and abrasion of ore loads—often falling many feet—through multi-million ton service. One unit logged over 26-million tons in a seven year period, another has handled 65-million tons in 23 years . . . typical examples of outstanding service in both long life and tonnage.

This "AMSCO" secondary feeder discharges to belt conveyor. An S-A Tel-level control automatically stops the feeder if there is a choke-up.



Elevation of S-A "AMSCO" pans and chain showing knee-action lugs at joints. Lugs permit chain to bend freely around sprockets but prevent sagging between track-rollers, even under load. Bottom of chain forms a smooth surface for the track-rollers.

No Matter How Brutal the Beating, They Come Back for More...MUCH LONGER

Because all wearing parts are made of MANGANESE, the toughest steel known to man

Thousands of tons of ore and rock crash down every day . . . and these smashing, loading impacts continue year after year . . . yet S-A "AMSCO" Feeders unfailingly handle high tonnages from car dumps, primary crushers and loading pockets—feeding to or from scalping screens — meeting every application where feeders must absorb heaviest abrasive punishment . . . with practically no maintenance.

Nothing but Manganese steel will withstand these repeated, punishing impacts, this constant abrasive action . . . that's why in S-A "AMSCO" Feeders,

pans, chains, pins, bushings, track roller, sprocket — in fact *all components subject to wear* — are made of manganese steel . . . and actually become tougher and more abrasion-resistant with repeated shocks.

S-A "AMSCO" Feeders are individually engineered to provide lowest cost-per-ton handling for heaviest-duty applications. Tremendous in size and capacity, they have a life expectancy rated in millions of tons — as proved by their record in mines since 1924.

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The Western Construction camera at Wanship Dam in Utah

G. Glen Gage, project manager; John "Harry" Williams, superintendent, and John D. Davenport, project engineer, make up Utah Construction Co.'s personnel at the USBR Wanship Dam project at Wanship, Utah. In the office, headed by C. J. Getz, are Earl L. Hadley, Charles W. Graves, C. C. Bonner, and Scipio Kenner. Assistant superintendents are C. A. Banks, Ned McColley, Vern Jeffries. Mont Schoenfeld is master mechanic, with H. E. McNally doing the traveling. Another superintendent is Clarence U. Shafer, carpenter. Among those key men who are serving as foremen are: Grade and shovel

—Bob Stewart, Tony Zakotnik, Ed Colebrook, Paul Davis, Lorin Haycock, Frank Bleazard, Vance Affleck, Albert Banks, and Frank George. Shop—Jack Skinner, Russell C. Mitten, Mike Angus, Don Roberts. Carpenter—Fred Vranes, Fay H. Peterson. Labor—Errol "Bill" Bailey, D. H. Rae, Owen Kester, R. C. Hall. Drill — Joseph Roach (general). Warehouse—Albert Zemanek. John M. Rapp is party chief.

Reinforcing steel is subcontracted to Charles B. Jarman Co., with K. E. Francom supervising the work. Bailey, Inc., supplies the tire service, with Harold Becker, foreman.

The Bureau of Reclamation has an active training program going on for civil engineering college students on this project for the summer. There are a total of 37 Bureau personnel on the job, of which 13 are students, all of whom are doing an excellent job. Key personnel are E. O. Larsen, region 4 director; C. H. Carter, assistant regional director; Clinton D. Woods, project manager; A. H. Peterson, resident engineer; E. H. Jeffries, chief inspector; J. R. Henchcliff, general engineer; A. W. Timmins, chief embankment inspector; J. W. Kimbal, chief grout and concrete inspector.

and surfacing of the Brandenburg-Garland-Miles City highway in Custer County, Mont. Henry Dinal is mechanic on this project.

Melvin A. Johnson, grading superintendent, and W. Jay Grant, crusher superintendent, have been in charge of a \$136,638 grading and surfacing job for Grant Construction Co. in Kootenai County, Idaho. Work is just about completed.

"Tommy" Byrne, superintendent, is putting on the finishing touches to 4 mi. of grading and surfacing, and a

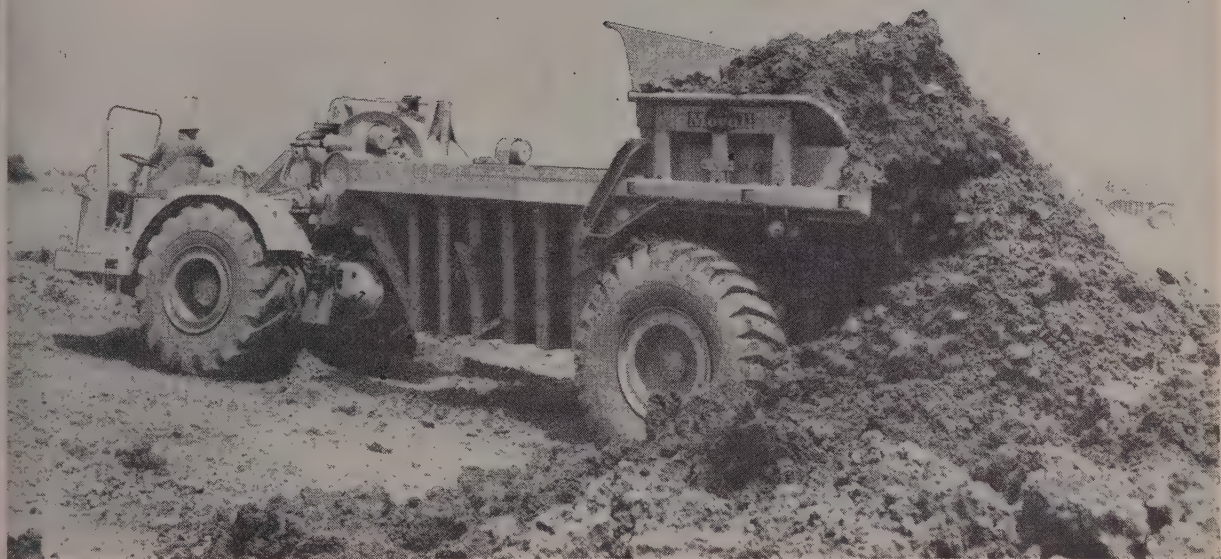
bridge, on the Salt River Valley-Hardt Creek highway in Maricopa County, Ariz., for T. C. Holmes, contractor on the \$134,287 award.

W. B. McMakin, vice president and general manager of L. C. Smith Co., is executing a \$779,137 award which recently went to his firm for grading and paving 0.8 mi. and a concrete and steel bridge in the vicinity of Willow Road in San Mateo County, Calif. George S. Warren is superintendent. The following foremen are assisting: Charles Jolley, equipment; Lee Dunn, pipe, and Charles Bonat, car-

penter. Contractor started work April 28 this year and expects to have the job finished by mid-March, 1956.

James Rinaudo is project manager, and H. M. "Mac" McHugh is superintendent for Claude C. Wood Co., which is finishing work on 4.3 mi. of grading and surfacing in San Joaquin County, Calif., between 1.2 mi. east of Clements and the Calaveras County line. Working as foreman on this \$214,792 award is John Campbell.

Art Gohde, job superintendent for W. R. Cahoon Construction Co., is



Dutcher Construction teams C & D Movalls with Caterpillar DW21's to dump gluey marine clay quickly and cleanly on St. Lawrence Seaway.

MOVALL'S POSITIVE EJECTION SCRAPES OUT GLUE-LIKE CLAY ON SEAWAY JOB

MORE LIKE GLUE THAN CLAY—that's how observers described the sticky, blue marine clay on Dutcher Construction Company's Grasse River Locks project near Massena, N. Y. Gravity alone couldn't discharge this sticky clay from bottom-dump and tilting end-dump wagons. It came out of scrapers in big lumps which blocked the scraper wheels.

After considering all types and makes of hauling units, Don Dutcher put nine C & D Movalls, powered by Caterpillar DW21's on the job. Here's what he says of his choice:

"I selected Movalls for my job on the St. Lawrence Seaway because I figured the positive ejection features would handle the sticky material here better than any other hauling unit. The MOVALLS will also handle rock and any other type of material

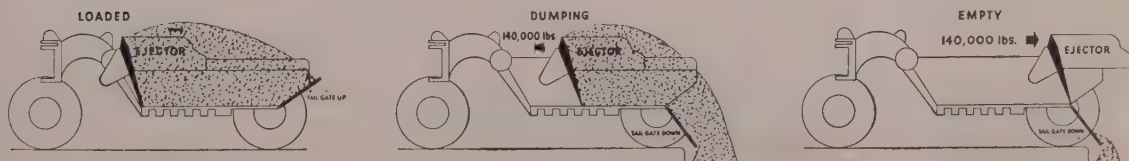
I'll have to haul. I like the easy interchangeability from Movall to scraper use. The Movalls are doing a wonderful job, and I am very happy with them."

DOZER-LIKE EJECTOR with 140,000-lb. push wipes the Movall body clean every trip (no build up as with gravity dump); handles any material you can top load, enables you to control dump and spread, when needed.

BUY AND TRY FROM CATERPILLAR DISTRIBUTORS—C & D Movalls of 31 tons, 25 heaped yards capacity are available NOW for DW20's, DW21's; also 22 tons, 16 heaped yard Movalls for DW15's. Ask your reliable Caterpillar-C & D dealer to demonstrate on your job, or write direct to C & D Manufacturing Company, Perkins (suburb of Sacramento), California. Phone Hillcrest 5-8592.

6

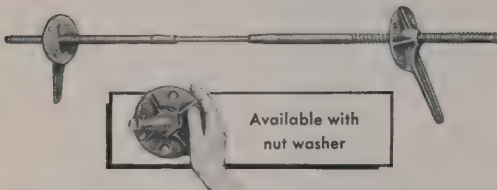
HOW IT WORKS—Movall uses standard cable scraper power control. To dump, operator releases back-haul drum to drop tailgate, engages ejector drum. Eight-part ejector line gives 140,000 lb. push to boost load out fast and clean. Operator has complete control of discharge, controls spread depth by varying travel speed. After dumping, backhaul line closes tailgate and rolls ejector to loading position.



UNIVERSAL FORM TIES

a
*Complete Line
From 1 Source*

SPIROLOC Form Ties



Available with
nut washer

SPIROLOC Cone Nut Assembly



The most positive internal spreader and form tie

**Faster Erection . . .
Positive Holding . . .
Easier Stripping**

- Greater tie strength for heavy construction
- Fewer ties per sq. ft. of form area. **LOWER MATERIAL AND LABOR COSTS**
- Positive breakbacks
- Permanent, reusable equipment
- **RENTED . . . SOLD**

Positive Spreader Ties for all types of Concrete Construction

TWISTYES

SNAP TIES



Combination wedge and bearing plate . . . easy application . . . won't twist or fall off — ample take-up.



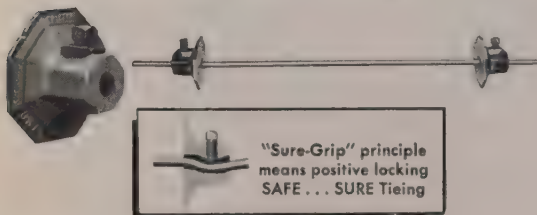
- Low cost ties for job-built or prefabricated forms
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- Accurate breakbacks . . . minimum plug required
- Choice of Spreader Washer . . . 7/8" flat is standard
- Rugged Twistye and Snap Tie Clamps have extra bearing surface . . . additional safety factor

Curved ends speed installation and stripping . . . long slope wedge for ample take-up. Extra nail holes permit nailing clamp in any position.



FORM CLAMPS

The Most Versatile Tie . . . At the Lowest Cost



"Sure-Grip" principle means positive locking
SAFE . . . SURE Tying

- 2 Form clamps and a mild steel rod make a tie to handle any condition
- Wide clamp base gives more bearing on waler . . . won't "bite" at maximum loads
- Notched base permits nailing to waler

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directing construction of the Unit A pumping plant at the north side division of the Minidoka Project of the USBR near Rupert, Idaho. Cahoon won the award at \$373,194, started work the middle of May and expects it will take 630 days to finish the job.

* * *

N. S. McHarg, general superintendent, has the help of the following superintendents in the construction of a portion of state highway in Clark County, Nev., from Boulder City to 5 mi. easterly. L. G. Wilder, construction; William Hartman, Jr., hot plant, and Ray Brown, shop. This work is being done by Wells Cargo, Inc., at a cost of \$253,577.

* * *

Lee T. Dulin is superintending the construction of the Spokane River bridge on Harvard Road in Spokane County, Wash. Louis Elterich Co., the contractor, started work June 17 and expects to have it complete in 240 working days. Cost of job, \$146,853.

* * *

R. N. Moseman is superintending a \$1,103,629 award to C. K. Moseman for 2.7 mi. of grading and surfacing, construction of a steel bridge and revision to existing bridge in King City, Calif., between Canal St. and 1.8 mi. north of Salinas River. Henry DeSantos is general foreman, and Robert Frost is carpenter foreman. Job started in May and will probably close September, 1956.

* * *

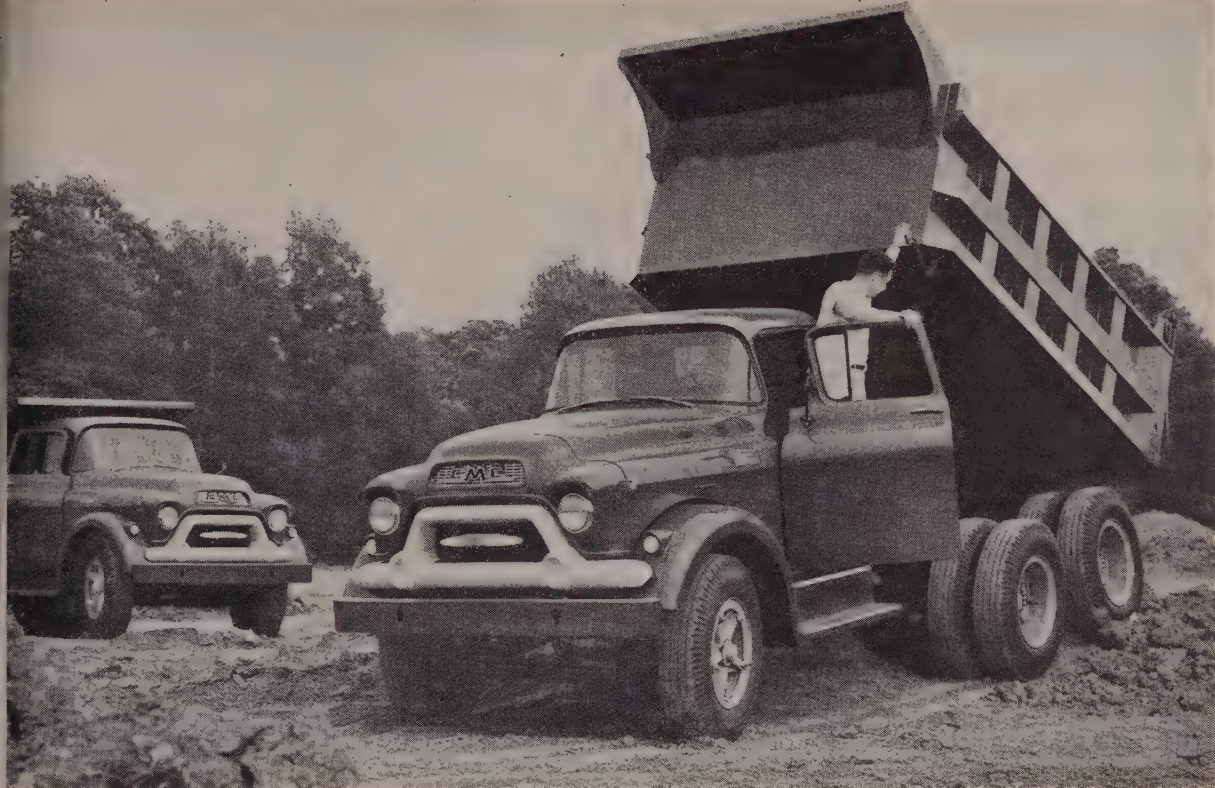
Frank C. Crilly, project manager for McGillivray Construction Co., has been in charge of a \$361,730 job in Sacramento County, Calif., situated between 18 mi. south of Florin Road and Jansen Drive and consisting of 3.9 mi. of widening and surfacing and construction of 7 bridges. This work is expected to be complete September 15.

* * *

E. M. Tidmore, superintendent, assisted by Glen Wells, master mechanic, and Frank Powell, foreman, has been on a job since April 15 for Flickinger Brothers, which won the award at \$347,799 for grading and draining 7 mi. of U. S. Route 80, 18 mi. southwest of Buckeye on the Phoenix-Yuma highway in Arizona. Job will soon be finished.

* * *

Dave Christian, construction superintendent for Stewart & Nuss, Inc., is in charge of two recent awards to this contractor in Tulare County, Calif. One is a road job north of Deer Creek and Linda Vista Ave., a \$455,537 contract for 7.7 mi. of paving, which started Aug. 1, and will probably run for 120 days. Foremen here are John Scales, grading; Pete Hamby, paving, and Al Steitz, plant. K. Keck is maintenance superintendent. The other contract, \$172,107, is for 5.9 mi. of grading and surfacing on Road 192, between 48 Ave. and 96 Ave., west of Terra Bella. A 95-day



GMC'S NEW BLUE CHIP MODEL MW620-42 (at right) gets the power to hustle extra-hefty loads over tough terrain from a rugged 190-h.p. truck engine. Twin Hydra-Matic Drive eliminates shifting effort—protects engine, axle and drive-line. The MW620 has a new

34,000 lb. capacity tandem axle—is rated for 42,000 GVW-65,000 GCW work. The GMC M500 awaiting its turn at left is a two-axle model powered by a 155-h.p. engine that's teamed with 8-speed Hydra-Matic. It's rated at 24,000 GVW.

They've got the bigger "muscles" a construction hauler needs

THEY'RE even brawnier than they look — the 19 rugged new tandem-axle jobs spanning the 28,000 GVW-90,000 GCW range in GMC's great new Blue Chip line.

Their frames, for example, are of a unique new design that builds in super-stamina. If your operation is unusually severe, full-length reinforcements* can be installed right at the factory. There are new extra-capacity axles—front and rear.

And the big choice of power plants—gasoline or Diesel—155 to 230 h.p.—can swing a lot more work with their high torque output—do it faster and with less strain. When time and tonnage are closing in on you their reserve power makes the big difference.

Bigger Clutches, Too

New 2-plate 14-inch clutches give you up to 76% greater working surface—prolonging clutch-life and making shifting easier. Or you can eliminate all clutch-and-shift work

—and all clutch repairs as well—with any of the 9 new Hydra-Matic models.

In all 19, you can have Safety Power Steering* to help drivers with the tough going. And every one of them has the kind of rims-to-roof ruggedness that makes down-times fewer and farther between—truck-life longer and more profitable.

In this big range of models, there's sure to be one made to order for your job. Check on it at your GMC dealer's today!

**Optional at extra cost*

See GM Diesels at work at the

General Motors Powerama

Lake Shore Drive, next to Soldier Field, Chicago

August 31 through September 25

GMC TRUCK & COACH — A General Motors Division

"OUR ERIE STRAYER BUCKET IS THE MOST VERSATILE TOOL WE OWN"

• States Edward J. Petrillo, President, Edward J. Petrillo, Inc.



On the job photo shows an ERIE bucket's no-slip grip on concrete pipe being moved at Edward J. Petrillo, Inc. on the New York Thruway.

The change-over from clamshell bucket to grappling hook costs time and money—to say nothing of the extra man needed to work the hook. That's where an ERIE bucket's versatility pays extra dividends.

Like Mr. Petrillo, many satisfied owners use their ERIE not just to dig and load sand and gravel, but to move boulders, sewer pipe, steel girders, concrete slabs, logs, and old lumber.

An ERIE Strayer bucket is nimble, too. Its great power is perfectly balanced and easily controlled. Operators appreciate this feature—especially when digging in corners, along edges or loading hoppers in tight quarters.

These better buckets provide these "wanted" features:

1. Top closing power from block and tackle, plus lever arm construction, plus precision balancing.
2. Manganese steel teeth and high carbon steel lips that bite up full payloads of even toughest clay and gumbo.
3. Rigid, one-piece, welded head that shrugs off bumps and jars. No shimmy. No wobble.
4. Two-line, continuous reeving. Adds up to 50% to cable life. Less down-time for reeving.
5. Low head room for fast work in tight quarters; low center of gravity for easy positioning.

For catalogs, write Dept. WC 95 Cable Address: EXIMPORT



ERIE STRAYER CO.

3795 GEIST ROAD • ERIE, PENNSYLVANIA

job, work started here July 25. Buford Helling is grading foreman on this stretch of highway, and Hamby, Steitz, and Keck are in their respective positions.

* * *

R. J. Scalzo, partner in the firm of Thomas Scalzo Co. which was recently awarded a contract at a cost of \$353,812 for work in Pierce and Kitsap counties, Wash., is directing the job. P. Raghianti is superintendent; R. Curtin is master mechanic and H. Heinbigner is oiler. Work was scheduled to start Aug. 1 and consists of 3.8 mi. of grading and surfacing on Primary State Highway 14, Purdy to Holman Road. Grading is to be completed by use of Tournapulls, scrapers and dozers; channel changes with draglines. About 270 days are required to finish the job.

* * *

Charles Greenameyer, superintendent, and Gene Collier, field engineer, are top men on a \$824,258 contract held by Rothschild-Raffin & Weirick for construction of spillway and outlet works on the Cherry Valley Project in connection with the Hetch Hetchy water supply for the City and County of San Francisco. Work has been going since May 1955.

SAFETY

Job accidents take their toll

THESE were the accidents that resulted in death or serious injury on the West's construction jobs during the last reported month.

Paul L. Bringhurst, 44, tractor operator in the employ of Gibbons & Reed Construction Co. at its gravel pit at Salt Lake City, Utah, was buried in 5 ft. of soil when the top of a 70-ft. embankment fell on him. He was dead when brought out a half hour later by volunteer workers who had dug frantically to rescue him.

* * *

Ernest B. Bodle, 57, and Loren J. Restad, 28, were injured when a scaffold broke, throwing them 25 ft. to the ground. The men were employed on construction of a new seminary building being erected in Denver, Colo.

* * *

Edgar L. Coburn, 63, employee of the city of Visalia, Calif., while operating a grader towed by a tractor, was seriously hurt in a collision with a freight train. Barney T. Bailey, on the tractor, jumped when it was severed from the grader and he saw the crash was inevitable. The tractor caused considerable property damage as it crashed through the street before being brought to a stop.

TRICKS of the TRADES



Sky hooks in a tunnel

HERE'S THE QUICKEST thing yet in the way of cherry pickers. It was dreamed up by people of the Los Angeles County Sanitation Districts, and they're making good use of it in their White Point outfall tunnel (page 47 of this month).

To start with, this device is good only on tunnels 15 ft. high, or better. All it does is pick up and set down. Rigging it to permit setting a car off to one side would complicate the thing, and you'd do better with something else.

The advantage of this set-up is speed when it comes to moving forward each day. The whole works can be disconnected, taken ahead,

and put back to work by a couple of men in about 15 to 20 min. This indicates pretty simple connections and equally simple operation, so let's have a look.

As the picture shows, the picker consists of two identical cylinders, pistons, and sets of rigging. The only thing they share is an air line. But even that has a manifold and leads to separate air controls. (You need two men for hooking on the mine cars anyway.)

The bottom of each cylinder is fitted for pin connection to a special bracket that clamps on a steel rib just above the foot block. That's the only essential connection. Other-

wise, a light chain at the top of the cylinder merely keeps it from falling away from the side of the tunnel.

Rigging is as shown: a wire rope dead-ended by clamps on the steel passes through a pair of snatch blocks and, between them, through a block on the end of the cylinder piston rod. The snatch blocks are secured to brackets that clamp on the arch steel.

The live end of the rope is fitted with a hook. And that's all. You bring the piston down, and the hook goes up. Extend the piston, and the hook comes down. The only tricky part is adjusting the length of wire rope so that when the hook is down it will just barely make up to a car coupling. Because the track level varies a little bit from place to place, this means the cable clamps get set differently at each location.

All you need is a wrench . . .

Now, about moving it. The secret here is in having two sets of clamp brackets for the cylinder, and for the snatch blocks. The extra set is installed at the new location.

Then the mine locomotive pulls alongside a cylinder and the hook secured somewhere on the motor. Taking a little strain with the piston pulls the cylinder off its hold-down bracket and makes pin removal easy. Now the cylinder is hanging from its own rigging. Retract the piston some more and the cylinder goes up. The miners swing it in against the locomotive and lower away.

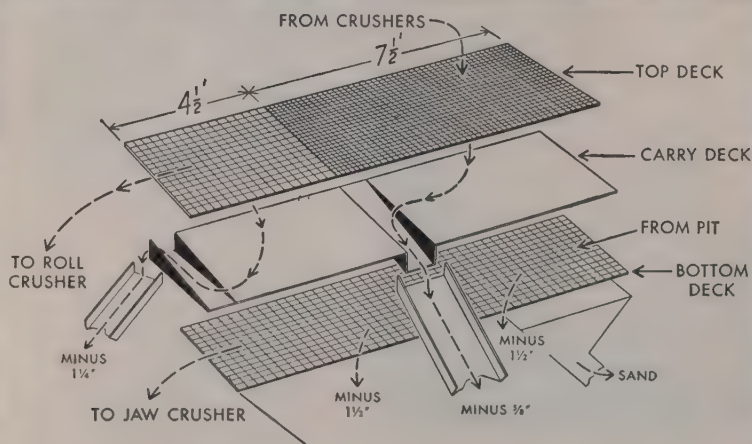
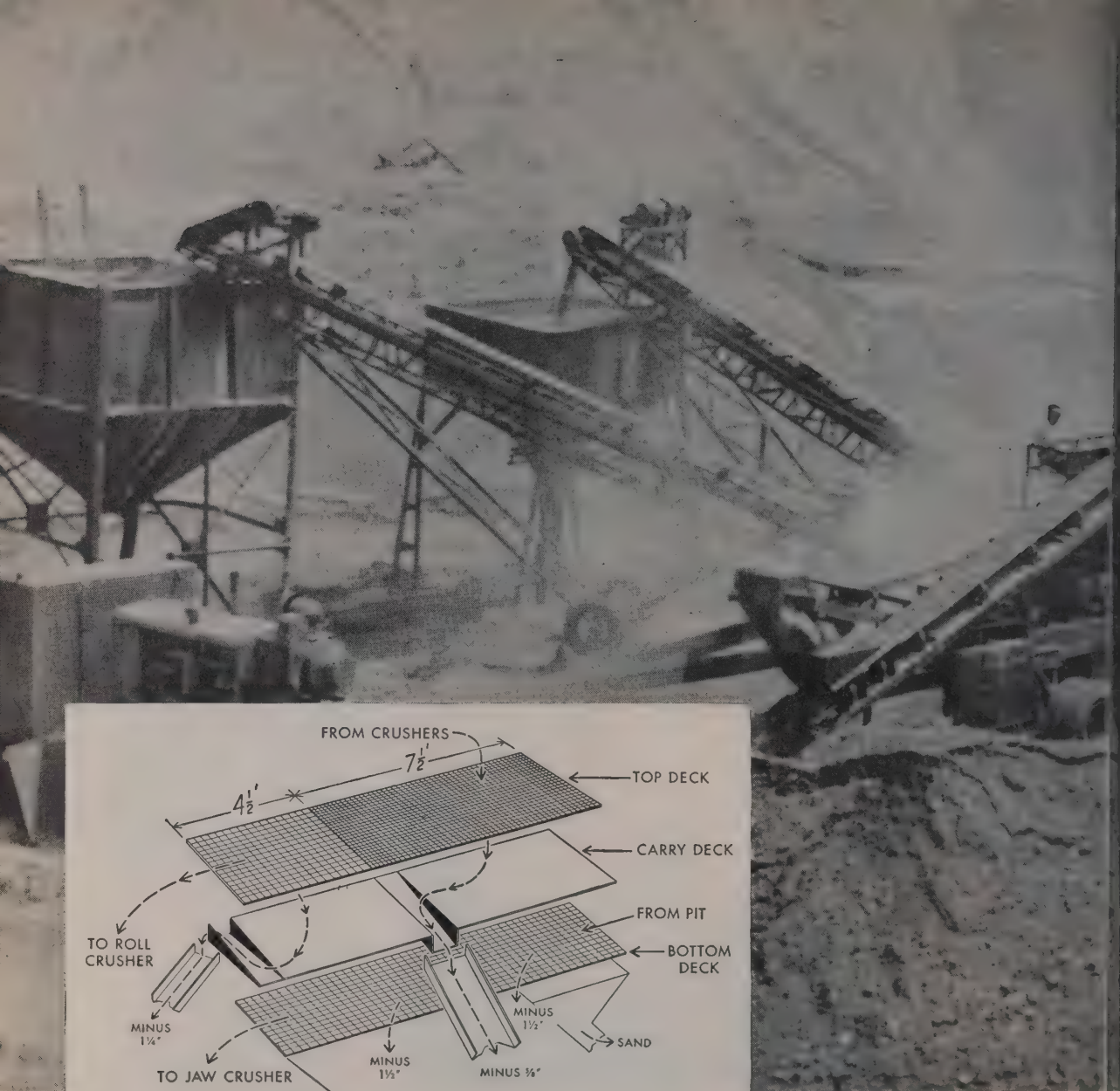
You know those "ears" on a locomotive, used for lifting out the battery case? Well, this cylinder has a female bracket to match. And when the cylinder is lowered again it hangs right on the side of the locomotive. After that it's a simple matter to disconnect the air, unpin the snatch blocks, let go the cable clamp, and move on.

Then everything is done all over again, only backwards. Rig the snatch blocks and clamps. Hook up the cylinder air. Pick up the cylinder. Guide it down to its new base. Jam in the base plate pin. The cherry picker is in business again.

Build one yourself

Of course, this has to be done for both cylinders. And there are minor adjustments in the cable clamps to match the height of car couplings, but that goes fast. It'll soon go faster. The tunnel shifter is going to put a length of chain and a hook on the dead end of the cable. Then he can make adjustments in length, link by link, and not have to fool with cable clamps.

Vital statistics: piston diameter, 11 in.; rod diameter, 2 7/16 in.; piston stroke, 4 ft. (moves the hook 8 ft.); wire rope diameter, 3/4 in.; air pressure, 100 psi.; weight of empty mine car, 6,500 lb.



Duplex plant produces for three jobs at same time

SIMULTANEOUSLY TURNS OUT TWO SIZES OF FRACTURED STONE TOGETHER WITH CONCRETE AGGREGATES OR ROAD GRAVEL

If you are a contractor or gravel producer you'd probably be satisfied if your portable plant could produce 100% crushed material meeting a given set of specifications... and you'd probably feel that the plant would be doing all you had the right to expect of it.

To produce this 100% fractured material with an ordinary duplex plant you'd most likely have to use an auxiliary screening unit ahead of your duplex so all your material fed to it would be crushed.

But Fred Ward isn't so easily satis-

fied. In a pit near Detroit, Michigan, he's turning out two different sizes of fractured rock to meet the rigid specifications of the State Highway Department. In addition, he's producing road gravel.

... and at times, he's producing all 3 products simultaneously... with one portable plant!

State specifies fractured rock

Michigan, like so many other states, is recapping a considerable mileage of old pavements with asphalt materials. The State Highway Department

requires that these materials contain 100% fractured particles in order to give the asphalt mat a definite stability.

According to present state specifications, the base course must be rolled to a 1 1/2" mat and must contain minus 1 1/4" products with 0-10% passing a #4 mesh (Spec. 9AA).

5/8" minus rock for top mat

The top mat must also be made up of 100% fractured material, all over passing 5/8", with 0-10% passing #10 mesh (Spec. 25A).

And to further complicate matters, Ward had to meet these specifications from materials retained on

NEW EQUIPMENT

For your convenience in obtaining more information quickly, the manufacturer's address is provided with each review.

New shovel-crane by Schield Bantam

A self-propelled $\frac{3}{8}$ -cu. yd., 6-ton shovel-crane for materials handling has been announced by **Schild Bantam Co.**, Waverly, Iowa. The machine, CR-35, has a 12,000-lb. lifting capacity and an outside turning radius of $19\frac{1}{2}$ ft. (This is the shortest self-propelled turning radius in the shovel-crane industry.) Two-speed independent travel



allows the operator to work the upper deck machinery and travel at the same time. The steering mechanism and brakes are controlled hydraulically, while the travel mechanism and upper machinery operate on mechanical control principles. The complete unit, including counterweight, outriggers, and 25-ft. crane attachment carries a list price of \$11,500.00 f.o.b. factory. Complete specifications are available.

Let's get some ripping done

Model RXH-3 ripper has special application in big earth moving jobs as well as for breaking up heavy overburden and mining ores. The complete unit weighs 25,000 lb., and is built to work with large crawler tractors. Depth control provides for ripping at depths of 36,



42, and 48 in. A long center standard is available to give a penetration of 60 in. The regular standards have removable hard-faced points for maximum resistance to wear. **Southwest Welding and Mfg. Co.**, 3201 W. Mission Road, Alhambra, Calif.

Badger adds to ditcher line

The **Badger Machine Co.**, of Winona, Minn., has announced the addition of the Model 75 front end loader to its line of ditching and trenching equipment. The ma-



chine has a loading height of 8 ft. with a 153-deg. bucket tilt. The Model 75 can also be used for backfilling. The loader is shown on a Minneapolis Moline R.T.I. tractor equipped with a Model 80 Hopto Digger.

New Payloader is largest of line

The third, and largest, of the 4-wheel-drive tractor-shovels has been added to the Payloader line. Designated model HO, the unit has a capacity of 2 cu. yd. The clutch pedal has been eliminated and all shifts through all speed



ranges in both directions can be made without slowing down. Emphasis has been given to driver comfort. An exterior outlet for hydraulic use with auxiliary equipment has been provided. Full details are available. **Frank G. Hough Co.**, 707 Seventh St., Libertyville, Ill.



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Wax Base — Non-Wax Base

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COMPANY

INCORPORATED

820 W. Manchester Avenue, Inglewood, California

New attachment for Homelite chain saws

An attachment that converts the Homelite Model 17 chain saw into a brush cutter is now on the market. A flexible shaft delivers 3.5 brake hp. to a 10-in. circular blade. Hanger and handle bars are adjustable while a



harness evenly distributes the weight of the unit on both shoulders. A diaphragm type carburetor permits cutting in any position. The 5-ft. arm makes it easy to reach under low branches or up to overhanging limbs. Further literature is available. **Homelite Corp.**, Port Chester, N. Y.

Plywood panels without frames

Plywood panel forms without metal or wooden frames have been placed on the market by **Superior Concrete Accessories, Inc.**, 4110 Wrightwood Ave., Chicago 39, Ill. Made of 1½-in. plywood and reinforced with sections of ½-in. plywood, the forms weigh less than 5 lb. per sq. ft. The panels are 24 in. wide and 4 ft. 6 in. or 8 ft. long. A single clamp—the only working part required—draws the panels together tightly and locks them, secures the snap tie, lines up panel faces, and provides a wedge for liners if necessary. Special corner angles are available.

Rubber-tired 165-hp. dozer

The first rubber-tired dozer powered by a turbocharged diesel engine has been introduced by **Construction Machinery Division, Clark Equipment Co.**, Benton Harbor,



Mich. It has a road speed of 27 mph., 4-wheel drive, and rear wheel steering. The 2¾-yd. bowl, raised and lowered by two double-acting cylinders, is tipped back and forth by a 6-in. cylinder. Both ends of the blade are fitted with vertical cutting edges. Weight is 27,000 lb.



P&H Model 655-B; 1 1/2-yd. capacity. P&H builds the world's most complete line of Power Cranes and Shovels.



...20 YEARS AHEAD with welded construction!

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ve you a new and better kind of power shovel — *com-*
ly welded of rolled alloy steels!

ity successful years in the field have proved beyond all
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limination of dead weight. Today's P&H machines give
aster cycles, still more dependable service — still lower
age costs. Behind today's machines is P&H's long ex-
nce in welded design and construction — still 20 years

ahead of the field.

All-welded construction is only one of many major improve-
ments originated by P&H. There are others that will earn you
more money than is possible with older style machines you
may now be using. Get the facts from your nearest P&H
dealer. P&H Pacific Division, Harnischfeger Corporation:
2400 East Imperial Highway, Los Angeles 59, Calif.; 100
Bush St., San Francisco, Calif.; 2909 First Ave., South,
Seattle, Wash.; 1108-15th St., Denver, Colorado.

HARNISCHFEGER

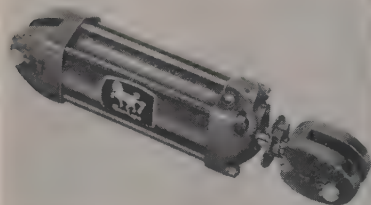
PHOENIX, Arizona.....Arizona Equipment Sales, Inc., 2812 Grand Ave.
CRESCENT CITY, California.....Riley Logging Supply Co., Highway "Y"
EL CENTRO, California.....Purdy-Holmquist Co., 1275 Main Street
ESCONDIDO, California.....Southern Equipment & Supply Co., 301 W. Grand
EUREKA, California.....Riley Logging Supply Co., 1034 Broadway St.
LOS ANGELES 22, Calif.....Shaw Sales & Service Company, 5100 Telegraph Rd.
OAKLAND, California.....Cook Bros. Equipment Co., 416 East Eighth St.
SACRAMENTO, California.....Sacramento Valley Tractor Co., 1901 Broadway
SALINAS, California.....Farmers Mercantile Company, 15 W. Alisal Street
SAN DIEGO 13, Calif.....Southern Equipment & Supply Co., 2025 E. Harbor Dr.
SANTA MARIA, California.....Hanson Equipment Company, Main St. at Blosser Rd.

FRESNO, California.....Allied Equipment Co., 1824 Santa Clara Street
DENVER, Colorado.....Liberty Trucks & Parts Co., 690 Lincoln Street
BOISE, Idaho.....Starline Equipment Co., 503 South 16th St.
ALBUQUERQUE, New Mexico.....Leonard Motor Company, 1211 North 4th Street
RENO, Nevada.....Pioneer Equipment of Nevada, 525 Kietzke Lane
EUGENE, Ore.....Loggers & Contractors Machinery Co., 540 Filmore St.
PORTLAND 14, Oregon.....Loggers & Contractors Machinery Co., 240 S.E. Clay St.
SALT LAKE CITY 13, Utah.....Western Machinery Company, 2300 S. Main St.
SEATTLE 8, Washington.....Bow Lake Equipment Co., Inc., 300 Michigan Ave.
SEATTLE 4, Washington.....Glenn Carrington & Co., 91 Columbia St.
SPOKANE 1, Washington.....Construction Equipment Company, E. 3823 Trent Ave.

HARNISCHFEGER CORPORATION—Pacific Division: LOS ANGELES 59, Calif., 2400 East Imperial Highway. Branch Offices: SAN FRANCISCO, Calif., 100 Bush St.
DENVER, Colorado, Rm. 415, Central Bank Bldg., 1108 15th Street. SEATTLE 4, Washington, 2909 First Avenue, South. LOS ANGELES 59, California, 2400 East Im-
perial Highway.

Adjustable hydraulic ram

The Strokontrol ram has an easily adjusted hydraulic depth stop. The cylinder has a 3½-in. bore and is



available in stroke lengths up to 16 in. It is designed for operating pressures

up to 1,200 psi. and meets S.A.E. and A.S.A.E. specifications. **Char-Lynn Co.**, 2843 26th Ave. So., Minneapolis 6, Minn.

"Quick-change" goosenecks

Interchangeable yoke sections to fit Caterpillar DW20 and DW21, and similar prime movers are a new feature of C & D Movall power ejection and dump wagons. Changeover from scrapers to Movalls or vice versa can be made by two mechanics in 4 to 8 hr. in the field. No modifications or extra assemblies are required. The same basic Movall can be used with any prime mover with sufficient horsepower and double-drum cable control merely by installing the



proper gooseneck. Literature is available. **C & D Manufacturing Co.**, Perkins, Calif.

Easyarc electrode

The Easyarc LH 7-16 electrode deposits 60% more metal than conventional low hydrogen electrodes, according to the manufacturer. The electrode has a powdered iron coating which melts and becomes part of the weld. Literature is available. **Air Reduction Pacific Co.**, 220 Bush St., San Francisco, Calif.

New crawler by International

Power in the new International Harvester diesel crawler has been increased to 103 hp. The drawbar pull is 24,300 lb. at rated speed of 1,450 rpm. The crawler, TD-18A, has 6 forward



and 2 reverse speeds, ranging from 1.6 up to 5.5 mph. The track frames on the new model have been made 300% stronger. The new track frames beef up the 3-point track suspension system. Weight is 25,000 lb. **International Harvester Co.**, 180 No. Michigan Ave., Chicago 1.

Alloy fluxes—agglomerated

A line of agglomerated fluxes for automatic submerged arc welding of low alloy steels has been introduced. The fluxes can be used with a mild steel electrode and will produce a low alloy deposit which can be readily varied to meet specific requirements. The basic fluxes are stocked, and after the job analysis determines the weld deposit requirements, a flux can be created without delay to meet the specific requirements. **Lincoln Electric Co.**, 22801 St. Clair Ave., Cleveland 17, Ohio.



LOW COST PORTABLE HEAT saves time and money for contractors

For only a few cents an hour in fuel, you can dry plaster, fast, even on cold or humid days; pour and cure concrete safely at any temperature and keep men working, inside or out, in freezing weather. That saves hours of time... and time means money.

Your Master Heater rolls into place, starts at the flip of a switch. You don't need a vent. Three models put out 100,000; 160,000 or 400,000 BTU's per hour; burn inexpensive kerosene or fuel oil.

The low price is repaid time after time in hours saved and workmen working.

Write for full information or see your Master distributor.

MASTER VIBRATOR COMPANY
345 Stanley Ave., Dayton 1, Ohio

MASTER



Owned by George M. Brewster and Son, Inc.—this new Lorain 85, with a 2½-yd. dipper and a 26-ft. boom, is working on the New York Thruway, where contract called for 2½-million yards of grading on a 4.7 mile stretch near Nyack.

New Lorain 85 drives through fluid for maximum economy and efficiency

The new Lorain 85, recently introduced by the Thew Shovel Co., Lorain, Ohio—features a Twin Disc Fluid Power Take-Off to provide maximum economy and efficiency. The fluid drive unit provides a "cushion" that eliminates shock loads—protecting *both* driving and driven equipment. It prolongs the life of cables and reduces fuel consumption and maintenance costs.

The Lorain 85, shown above, is the *seventy-seventh* Lorain to be purchased through the years by George

M. Brewster and Son, Inc., Bogota, N. J. It is one of four new "85's" just added to this well known contractor's fleet. This might be interpreted as a vote of confidence in Thew-Lorain—and in their *standard* component parts.

The Twin Disc fluid PTO has been time and job proved on other Lorain models for many years. In fact, Thew-Lorain pioneered the application of fluid power take-offs on power shovels . . . and Twin Disc Fluid Power Take-Offs are *standard* in *all* Thew-

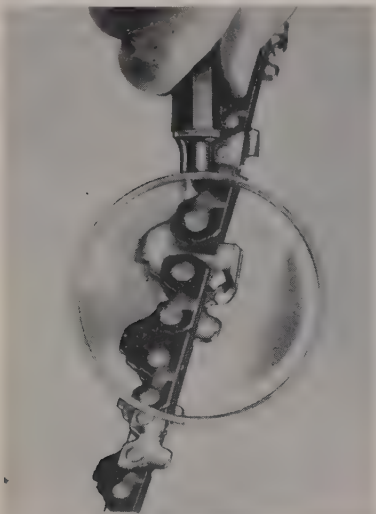
Lorain crawler-mounted units in the heavy-duty ¾-yd. and the 1, 2, 2½-yd. classes. Let Twin Disc power linkage specialists help solve *your* particular problem! Twin Disc Clutch Company, Racine, Wisconsin, Hydraulic Division, Rockford, Illinois.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division) Rockford, Illinois
Branches: 2950 Leonis Blvd., Los Angeles 58, Calif. • 820 1st Ave. S., Seattle 4, Wash.

Planer has double teeth

A saw chain now being produced by **Mall Tool Co.**, 7725 S. Chicago Ave., Chicago 19, Ill., features double cutting teeth which increase cut-

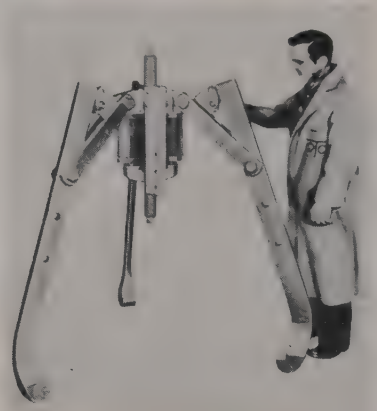


ting-power. The cutters are supported front and back to give strength and prevent the chain from whipping in the cut. The depth gauge, rounded for fast plunge cutting, cannot catch in wood. Friction heating and clogging is minimized by the dumping action of the double

cutters. Prices range from \$12.75 for 12-in. capacity to \$55.20 for a 78-in. capacity.

100 tons of puller

Owatonna Tool Co., 389 N. Cedar St., Owatonna, Minn., has developed a 100-ton hydraulic industrial puller. The triple grip puller was designed



to handle the big pulling jobs in heavy equipment maintenance shops. A 36-in. adjusting screw provides quick adjustment to the work and permits utilization of the full 5-in. ram piston travel. Prices and details will be sent by the manufacturer.

Oil cooled air compressor

A two-stage oil cooled rotary compressor in 125- and 600-cfm. sizes has been announced by **Jaeger Machine Co.**, 550 W. Spring St., Columbus 16, Ohio. A minimum pressure of 100 lb. can be constantly maintained over the entire operating range. In cold weather oil is automatically bypassed to the cylinders to protect against dry starts.

Portable tank trailer

For continuous operation on road-mix jobs, **Pettibone Wood Mfg. Co.**, Box 620, 6900 Tujunga Ave., North Hollywood, Calif., announces the



Model 2500 portable tank trailer. It carries road oil, emulsions, and other binder fluids. A supply tank attached to the mixer permits the transfer of binders from supply truck without interrupting the operation of the mixer unit. Specifications are available.

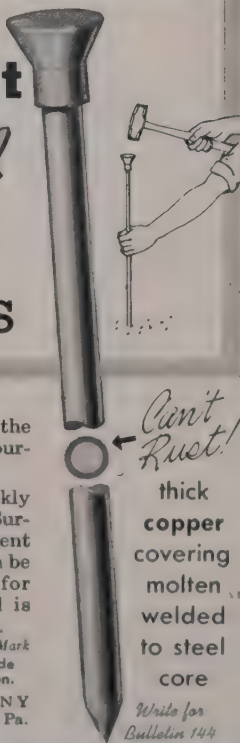
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MARKERS**



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SUPERIOR CARPULLERS and BARGE MOVING WINCHES

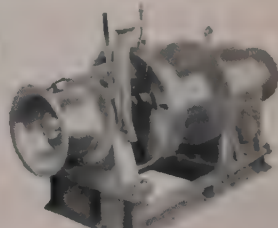
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Model SC Superior
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30 H.P. Electric Mooring Winch

Meeting any requirements of speed, space and capacity in Carpullers and Barge Moving Winches has been a specialty of ours for many years. When planning to improve the handling of barges and railroad cars, remember our long experience in the design and manufacture of this equipment is at your disposal.

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Main Office and Works: SUPERIOR, WISCONSIN, U.S.A.

New York Office, 7 Day Street, New York 7, N. Y.

Portable sandblaster

A portable sandblaster has been added to the line of Safetee Products Co., 173 14th St., San Francisco, Calif. It features the Cyclone blast



gun coupled to a 100-lb. capacity abrasive hopper mounted on a detachable two-wheel carriage for extreme portability. Just right for a job where the machine has to be moved frequently.

Engine runs year serviceless

A new engine has been designed to run continuously for a year without service. The 20 brake-hp., 2-cylinder engine is being manufactured by Minneapolis-Moline Co., Box 1050, Minneapolis 1, Minn. A new cooling system eliminates water pump, pulleys, fan, fan belt, and radiator hoses. Water is circulated through a cast-aluminum cooling unit built into the flywheel. Present models use natural gas fuel.

200-hp. engine

Model 590, a 200-hp. engine which weighs less than 1,300 lb., has been introduced by Hall-Scott Motors Co., Berkeley, Calif. The power-weight ratio is less than 6 lb. per hp. The new engines are available for gasoline, liquid petroleum gas, or natural fuels. Optional equipment includes radiators, hoods, and power take-off.

Diesel torque-converters

A line of diesel torque converter power units has been announced by P & H Diesel Engine Division, Harnischfeger Corp., Crystal Lake, Ill. The unit is complete with its own fluid cooler. Various types of clutch arrangements may be had. A tail-shaft governor is available to control the output shaft speed. The unit is offered for the company's complete line of diesels.

Equipment briefs...

THE OIL CLUTCH that has been used in Caterpillar crawlers is to be included in the No. 12 motor grader as standard equipment. The clutch can be used up to 1,500 hr. without adjustment. Caterpillar Tractor Co., Peoria 8, Ill.

ADAPTATION of the Shawnee Scout Model 70 ditcher for installation on TerraTrac 300, 400, and 500 crawlers has been announced by Shawnee Mfg. Co., Inc., 1947 N. Topeka, Topeka, Kan. Literature is available.

A HOT LUGGER, which will give roofers a convenient way to transfer hot liquid from a pumping system's roof stand or from a hoisting bucket to a feltlayer, has been announced by Aeroil Products Co., Inc., Dept. B, 69 Wesley St., South Hackensack, N. J. It weighs 105 lb. and has a capacity of 30 gal.

MULLER MACHINERY CO., Inc., Metuchen, N. J., has improved its 4-cu. ft. plaster and mortar mixer. The electric motors are now mounted on a hinged base, the same as the gasoline drive, so that the paddle shaft may be "declutched" without stopping the motor.

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Use this nation-wide form rental and supervisory service for your concrete forming needs. Saves time, labor, material. For complete details...

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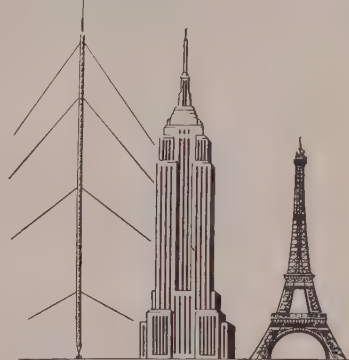
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WELDED DESIGN SPEEDS CONSTRUCTION OF WORLD'S TALLEST TOWER

A COMBINATION of efficient structural design and high speed manual shop welding is responsible for low cost of construction on this 660 ton, 1572-foot television tower. Built for Station KWTW, Oklahoma City, it is believed to be the tallest man-made structure on the face of the earth.



Fifty sections 30 feet long are stacked up to form the complete tower. Each section is straight sided with 12 foot face and three vertical legs forming the triangular section. The legs are tied together by horizontal girts of steel angles and diagonal bracing of steel rounds bolted to drilled gusset or wing plates which in turn are welded to leg members.

All structural members are machined and welded in fast down hand position with Lincoln Jetweld, iron powder electrodes using Lincoln AC welders. After galvanizing and painting, they are shipped knocked down, field assembled on the ground and then erected in the air.

Designers and fabricators, Dresser-Ideco Company, Columbus, Ohio. Erection sub-contractors, Mizell Construction Company, Ganado, Texas.



Welding wing plate to solid round tower leg with Lincoln Jetweld and Lincoln AC welders.

BENEFITS FROM WELDED DESIGN are available in Lincoln Studies in Structural Arc Welding. Available by request. Write

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News of DISTRIBUTORS

Graco adds Galion line

Graco, distributor, with headquarters at Stockton, Calif., has added Galion rollers and graders to the many lines already handled.

Lee Denton joins Starline

Lee Denton, formerly associated with Caterpillar service and parts, recently joined the Starline Equipment Co., Boise, Idaho, as salesman for west and northern Idaho.

AED joint regional meeting, Oct. 6-8

A joint fall meeting of Region 11 and Region 14 of Associated Equipment Distributors will be held at the Hotel Riviera in Las Vegas, Nev., Oct. 6-8. The AED Executive Committee will also hold its fall meeting at Las Vegas on Oct. 5-6. Reservation requests should be made through the AED Convention Committee: For Region 11, in care of Beal Shaw, 5100 Anaheim-Telegraph Road, Los Angeles, Calif., and for Region 14, in care of Walter W. Kershaw, 245 West South Temple, Salt Lake City, Utah.

Lang Co. modernizes shop

The Lang Company, Inc., Salt Lake City, Utah, is completing extensive modernization of its service shop facilities, including enlarged quarters for the service department, headed by George Wood, manager. New shop equipment being installed assures the quickest and most economical service work, and includes a dynamometer (the only one in this

area), a large, fully automatic track press, a complete electrical laboratory, a Magnaflux, and other equipment, according to reports from this distributor.

New branch manager

C. Scott Hoepfner has been named branch manager of Peerless Pump Division, Food Machinery & Chem-



C. Scott
Hoepfner

ical Corp., and now heads the new factory sales office recently opened at 461 Market St., San Francisco.

Roberts succeeds Fox

James C. Roberts is named contracting manager in charge of the San Francisco district office of the American Bridge Division, U. S. Steel Corp. He succeeds J. R. Fox who retires after almost 46 years with the corporation.

Huber-Warco names rep

Huber-Warco Co. announces the appointment of Foulger Equipment Co., Salt Lake City, Utah, as a distributor of its complete line of tandem rollers, 3-wheel rollers, and graders.

New salesman for three lines

West Coast Engine & Equipment Co. in recent months has taken on the selling of Gruendler rock crush-

SURPLUS "CAT" NEW ROLLER SHELLS D4

4F5321—single flange—(list \$23.54) our price \$15.00

4F5320—double flange—(list \$27.70) our price \$18.00

25% with order—F.O.B. our yard—Subject to prior sale.

LARGE STOCK OF NEW PARTS FOR CONSTRUCTION
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& SONS, INC.

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ers, Kohlman conveyors and screens, and Ingram rollers. George McIntosh who joined the company in June is in charge of sales on these three lines. McIntosh was previously sales manager for Bay Cities Equipment.

New dealer for Adams Division

Loggers & Contractors Machinery Co., Portland, Ore., recently added to its lines the Adams grader through LeTourneau-Westinghouse Co.

Seattle firm adds to sales force

A. R. Cornford and William N. Barclay recently joined Pacific Hoist & Derrick Co., Seattle, Wash., as salesmen.

Changes at N. C. Ribble

Among recent changes at N. C. Ribble Co., distributor of Albuquerque, New Mex., are the addition of four new salesmen: Richard Blattman, R. E. Kuehne, Jack Kelly, and Ralph Calvani. In addition, Palmer Ickes is in the parts department.



FERGUSON & BLAKEMORE Machinery Co., Oakland, Calif., has been named distributor in 39 counties of Northern and Central California for the complete line of LeTourneau-Westinghouse Co. equipment, including motor graders and Traveloaders manufactured by its Adams Division. **E. M. Ferguson**, who at one time was Western area sales manager for LeTourneau-Westinghouse, and **John Blakemore**, a veteran equipment man, head the newly organized distributorship. Shown here, l. to r. **Fran Duke**, Western sales manager for LeTourneau-Westinghouse, and Ferguson; standing: **Lee Jorgenson**, LeTourneau-Westinghouse district sales representative, and **Blakemore**.

Welding Service adds, subtracts

Several new lines were recently acquired by Welding Service Sales, Inc., San Francisco, Calif. Among them: John Tillman Co., Stultz-Sickles, Adams Welding Products Co., Standard Foundry, Contour Sales Corp., Indiana Oxygen Co., Haynes Stellite Co., and "Cam-Lok" manufactured by the Division of Em-

JACKSON MULTIPLE COMPACTOR



FAST, COMPLETE COMPACTION OF 12" MACADAM BASE COURSES

Specified density of base courses of rock, slag, soil-bound macadam, gravel and sand up to 12" thick is achieved in jig-time with the JACKSON MULTIPLE VIBRATORY COMPACTOR. Frequently no more than one pass is required. Likewise, one pass suffices to solidly fill all voids from top to bottom when sufficient dry fines have been spread. With a standard width of 13', 3", working speeds up to 60 FPM and reverse travel of 5½ MPH, this machine offers single course compaction at its best — tremendous opportunity for time-and-money savings.

GRANULAR SOIL SUB-BASES — PAVEMENT WIDENING

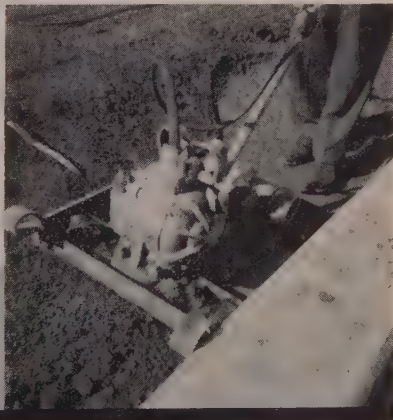
It is equally advantageous in compacting granular soil sub-bases. And by towing the compacting units in tandem at the side of the tractor, any granular material used in flexible base course widening can be compacted to specified density in one pass.

LARGE AREA FILLS: Nothing approaches the efficiency and convenience

of this machine in compacting granular soil fills such as bridge approaches, sub-bases for large concrete floors, parking lots, etc. It quickly achieves desired density and individual units may be sub-contracted and even fitted with operating handles to suit every condition and to get into the really tight places. Interchangeable bases 12" to 26" in width, are available.

IN TRENCHES — CLOSE TO FOOTINGS, ETC.

The manually-guided, self-propelling JACKSON COMPACTOR (similar to one of the compacting units used in the MULTIPLE, fitted with operating handle) has proved exceedingly successful on thousands of granular soil compaction jobs and is widely used for bituminous pavement patching. Operated from a Jackson Power Plant on auto trailer having quick pick-up device for loading and carrying Compactor.



See your
JACKSON DISTRIBUTORS
or write us for complete information.

JACKSON
VIBRATORS, INC.
LUDINGTON, MICHIGAN

pire Products, Inc., Welding Service no longer represents Leader Automatic Welding Co. nor Reid-Avery Co.

Personnel changes at Studer

Tom Duncan, formerly with Studer Tractor & Equipment Co., Casper, Wyo., has accepted a position with Natrona County as superintendent of the county road program. Having spent most of his life in the construction business, he is well qualified for the post. Other recent changes among the personnel are the addition



Harold B. Morrison

of Harold B. Morrison and Albert Hilliard, and the departure of John Cross. Morrison has joined the sales staff and is assigned the northeast part of the state. He was formerly with the Tubular Service Corp. in Salt Lake City. Albert L. "Shorty" Hilliard is representing Studer in the southern part, making Cheyenne his

headquarters. He comes from Boise, Idaho, where he was manager for Western Machinery Co. Cross, service manager for the past five years, was hit by the uranium bug and is with Lost Creek Uranium Co., Rawlins, Wyo., as maintenance superintendent.

Western Machinery appointments

Les Hall has been appointed parts manager at Western Machinery Co., Phoenix, Ariz., with Tom Reilly taking over the rental department.

McCoy Co. names new branch mgr.

McCoy Company, Denver, Colo., Caterpillar and Thew distributor for the state of Colorado, announces the appointment of Dick Tremaine as manager of its Sterling branch. He joined the McCoy organization about five years ago, working up through various assignments, with considerable experience in sales at the Grand Junction branch before coming to Sterling.

Southwest expansion

Equipment Sales Co. of Phoenix, Ariz., reports they have taken on the "Plaster Master" line manufactured by Santa Anita Manufacturing Co. of Los Angeles. This distributor recently opened a new repair shop in Albuquerque, New Mex., located at 4121 Edith St., N. E. J. O. Richardson is service manager.

MANUFACTURERS

Sauerman enlarges facilities

Sauerman Bros., Inc., has moved its general offices to 620 S. 28th Ave., Bellwood, Ill. The new office building is adjacent to the plant and provides enlarged facilities for all departments.

Atlas helps blasting efficiency

Atlas Powder Co. has introduced a new 3-D, sequence camera specially designed to study the action of ex-



plosives at work on actual jobs. Atlas technicians are using the new camera to examine blasting theories and methods, and expect it to contribute even more to explosives technology than its predecessor, the "machine gun" camera.

Jaeger promotions

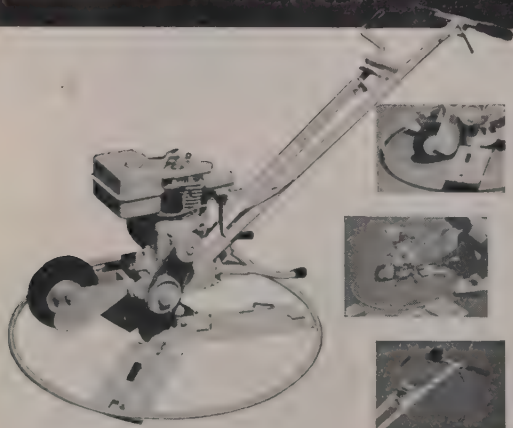
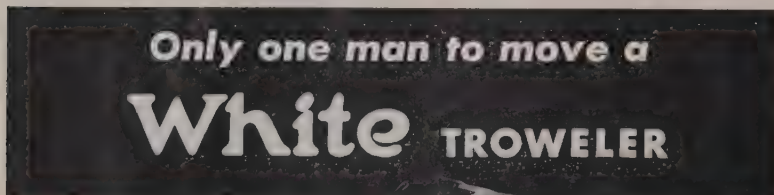
Promotion of A. C. (Andy) Thomas from truck mixer division sales manager to assistant general sales manager of The Jaeger Machine Co. is announced. Thomas has been associated with sales promotion and sales at Jaeger since 1940 and has directed truck mixer sales since 1948. In this latter capacity he is being succeeded by Emil L. Baugh, who for the past 10 years has been southeastern district sales representative.

A-C appointment

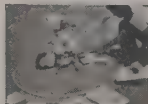
Arthur E. Thode has been appointed industrial advertising manager for the Tractor Division, Allis Chalmers Manufacturing Co. He started with the company in 1929, advancing through various departments of the division. Thode gained practical sales field experience with an A-C dealer and later in the manufacturing department of A-C. Most recently he has been supervisor of industrial sales literature.

Open for business

The American Culvert Co. has begun gun operations at its Oakland, Calif.



Retractable wheel, up to trowel, down to move.



Remove blades and ring in seconds... for cleaning, changing blades, or moving through doorways.



Adjust blade pitch during rotation from handle. Safety throttle control stops rotation if operator lets go handle.

PORTABILITY, patented, exclusive! PERFORMANCE, unbeatable! PRICE, comparable to trowelers without these features! Model T-1, 36" diameter, Patent No. 2,621,568.

White MANUFACTURING COMPANY

ELKHART 15, INDIANA

ant located at 751 Embarcadero, one 6. Officers of the new corporation include William J. Bardin, president; Norris H. Wiggins, vice president of sales; and Henry V. Dabadie, vice president of production. The company, an independently owned Western fabricator of corrugated metal pipe to serve the highway and drainage markets in Northern California, has initial production facilities for up to 150 tons per month of circular galvanized corrugated culvert in diameters from 8 in. to 96 in.



"URANIUM AGE"

The highest speed diamond drill rig available is the claim that Gunderson-Taylor Machinery Co. makes for their new Model GT-200 rig. Features that aid this outfit to compete in the highly competitive state of exploratory uranium drilling on the Colorado Plateau are a 30-min. set-up and drill time and corresponding tear-down time. Tower is built for 20-ft. "pulls" with a separate power for diamond drill and water pump.

Pohndorf made v.p., sales

Ernest L. Mathy, chairman of the board of directors, National Welding Equipment Co., San Francisco, Calif., recently announced the election of Henry L. Pohndorf as vice president in charge of sales. A veteran in the welding industry, Pohndorf has been chief engineer for the company, and recently general sales manager. Simultaneously, the appointment of William G. Norman as chief engineer was announced. Richard K. Brown was elected treasurer, and Lois J. Currier, assistant treasurer.

New prexy of Cleveland Formgrader

Glen Mooney has been appointed president of the Cleveland Formgrader Co., Avon, Ohio, paving equipment manufacturer. Mooney comes directly from Truscon Laboratories where he was general sales manager.

Pettibone Mulliken elects new v.p.

Herbert J. Knudten, president of Universal Engineering Co., has been elected vice president of the concern's parent company, Pettibone

Mulliken Corp. Knudten will maintain residence at Cedar Rapids, Iowa, and continue his present capacity at Universal.

Roesch heads White Autocar

Karl A. Roesch, director of service of the Autocar Division of The White Motor Co., was recently appointed general manager of the division, succeeding Edward F. Coogan who retires after 31 years of continuous service with Autocar.

Milo Smith retires

Milo E. Smith retired from Chicago Bridge & Iron Co. on July 1. Smith joined the advertising department of the company July 1, 1923, and served as advertising manager from 1926 to mid-1954. He has been active in the Chicago Industrial Advertisers Assn. for 30 years, serving as president in 1934-1935, and was elected a life member last year. He was also active in the National Industrial Advertisers Assn.

Felderman heads sales

Joy Manufacturing Co. has appointed L. G. Felderman as sales manager, rock mechanization, with headquarters at the company's plant at Franklin, Pa. He was formerly manager, sales engineering, for all Franklin products. In his new position, Felderman will specialize on trackless mining products for hard rock and tunnel applications.

Plenty of LIFT!
with
MONARCH POWER HYDRAULICS
for Snow Plows and Road Machinery

The HEP "Dynamight"
ELECTRIC POWER CONTROL

FOR NEW OR EXISTING EQUIPMENT

FITS ALL TRUCKS — is FAST and EASY to Install

Available for 6 or 12 Volt Systems

1000 lbs. pressure
1 gal. per minute volume

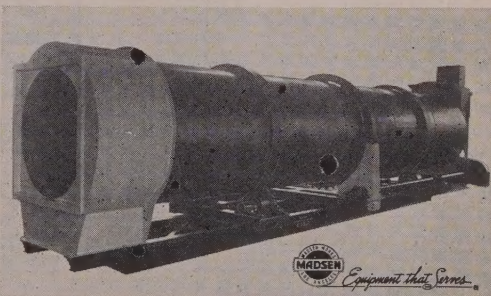
Fan Belt Models Also Available.

MONARCH ROAD MACHINERY CO.
1331 MICHIGAN ST. N.E.
GRAND RAPIDS 3, MICH.

PUT THE HEAT ON

AGGREGATE DRYING

YOU GET MAXIMUM HEATING at minimum fuel costs per ton of material dried when you use **MADSEN Aggregate Dryers**. These outstanding dryers set the pace for high daily production and trouble-free performance. **MADSEN** advantages include a unique cold end cowl design with externally replaceable bottom liners. And, the interior spiral flights and lifters in **MADSEN Dryers** provide the logical pattern for most efficient heating. Check the **MADSEN** plus-values below and ask your **MADSEN Distributor** for the complete story.



MADSEN AGGREGATE DRYERS

PLUS VALUES

YOU GET IN A MADSEN DRYER

- Fully enclosed cast steel cut tooth gears for both dryer speed reduction and cold elevator drive.
- **MADSEN**-pioneered girth sprocket drive or girth gear for long-lived power application to the shell proper.
- Choice of power . . . electric motor or engine — low-pressure air-oil, steam-oil or gas fired.
- Massive tire, trunnion and bearing assemblies . . . and free-flow stack outlet and feed chute combination.



MADSEN WORKS

CONSTRUCTION EQUIPMENT DIVISION

Baldwin-Lima-Hamilton Corporation

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Construction Equipment Division

CLASSIFIED

Rates are \$8.50 a column inch. Copy should be sent in by the 15th of preceding month if proofs are required by the 20th if no proofs are required.

NOTICE TO BIDDERS

WESLEY E. SEALE DAM PROJECT NEAR CORPUS CHRISTI, TEXAS

Sealed bids, in duplicate, will be received by the Lower Nueces River Water Supply District, at 211 Weber Building, Corpus Christi, Texas, until 1:30 P.M., C.S.T., Tuesday, October 11, 1955, and all bids will be publicly opened and read at 2:00 P.M., on that date, at the Corpus Christi Chamber of Commerce Office, 1201 N. Shoreline Drive, Corpus Christi, Texas, for constructing the

WESLEY E. SEALE DAM PROJECT ON THE NUECES RIVER. FIVE MILES SOUTH OF MATHIS, TEXAS

The project consists of two Ambursen type reinforced concrete slab-and-buttress spillways 60 feet high, approximately 1346 feet and 1560 feet long, respectively; three sections of rolled fill dam approximately 2200 feet, 500 feet, and 400 feet long, respectively; an outlet structure and appurtenant works; and a field office building. The following approximate quantities are required for the principal items:

Stripping	75,000 cu. yds.
Core Trench Excavation ..	46,000 cu. yds.
General Excavation	146,000 cu. yds.
Trenching and Finishing	
Excavation	30,000 cu. yds.
Backfill	14,000 cu. yds.
Embankments, Rolled Fill.	787,000 cu. yds.
Embankments, Unclassified	110,000 cu. yds.
Topsoil	4,000 cu. yds.
Reinforced Concrete in	
Foundation Floors, Mats,	
and Paving	40,000 cu. yds.
Reinforced Concrete in	
Buttresses, Piers, Deck	
Slabs, Abutments, and	
Structures	47,000 cu. yds.
Gravel Fill	31,000 cu. yds.
Riprap	26,000 cu. yds.
Rockfill	2,000 cu. yds.
Road Surfacing	12,000 sq. yds.
Steel Sheet Piling	5,650 tons
Reinforcing Steel	5,910 tons
Automatic Steel Crest	
Gates 9'x37'	60 gates
Intake Tower, Complete	
with Valve and Sluice	
Gates	1 complete
Field Office Building	
26'x50'x28'	1 complete

The plans, specifications, and bidding documents may be secured from the office of the General Manager, Lower Nueces River Water Supply District, 211 Weber Building, Corpus Christi, Texas; or from Reagan & McCaughan, 320 Wilson Building, Corpus Christi, Texas; or from Ambursen Engineering Corporation, 295 Madison Avenue, New York 17; or 603 Rosalie Avenue, Houston 6, Texas. A deposit of \$100.00 is required for each set of plans and specifications. Upon return of plans and specifications in good condition within fifteen days after date of bidding to the Lower Nueces River Water Supply District, 211 Weber Building, Corpus Christi, Texas, the full deposit will be refunded to bona fide bidders and 50% to non-bidders.

Bids must be made on the standard proposal form, in duplicate, and must be accompanied by a bid security in a total amount not less than 5% of the total maximum bid price. Of this bid security, it is mandatory under the Texas laws governing the District that a sum equalling not less than 1% of the total amount of the bid must be in the form of a certified check payable to the order of the Lower Nueces River Water Supply District. The remainder of the security may be in the form of a certified check or, at the option of the bid-

der, a bidder's bond. The District reserves the right to reject any and all bids, or to accept any bid deemed advantageous to it.

No bidder may withdraw his bid within 45 days after the opening thereof.

The successful bidder will be required to be bonded to the District in a sum equal to 100% of the amount of his proposal.

The bidder is hereby notified that the specifications contain the general prevailing wage scale and the Contractor shall not pay less than the wage rates so shown.

Dated this 2nd day of August, 1955.

LOWER NUECES RIVER WATER SUPPLY DISTRICT

GUY I. WARREN
President
CHARLES GALLAND
Secretary

FOR RENT

RENT STEEL PILING

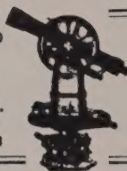
Get the exact lengths and sections you need from Foster—all standard makes, delivered on time—and at Foster's standard low rental rates. Also Rental Pile Hammers & Extractors.

LB FOSTER Co.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
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SOLD RENTED REPAIRED

Transits • Levels
Steel Tapes • Compasses

Portland Instrument Co.
334 S.W. 5th nr. Stark
PORTLAND 4, ORE., AT 3598



LOW COST INSTALLATION AND OPERATION

FOR
DAMS
BRIDGES
BREAKWATERS
FERTILIZATION AND
SEWERAGE PLANTS

CABLEWAYS
IMMEDIATE SHIPMENT
ELECTRIC, STEAM OR DIESEL
CAPACITY 3 TO 20 TONS
SELL, RENT OR BUY

FOR
SPEED
ECONOMY
EFFICIENCY
FLOOD SAFETY
LABOR REDUCTION

AMBURSEN DAM CO INC
295 MADISON AVE NEW YORK

MEN WANTED

GRADUATE ENGINEER

(Mechanical Preferred)

Experienced in design and manufacture of Batch Type Bituminous Plants. New department being created—excellent opportunity for advancement with leading heavy equipment manufacturer. Salary commensurate with qualifications. Also Engineers experienced in crushing, screening, conveying and bituminous equipment. All replies kept confidential. Send full details of personal and experience record with first letter.

Write to Box 9-B, c/o Western Construction, 609 Mission St., San Francisco, Calif.

Engineers — Foremen — Office Men

Learn latest methods to organize and run work. Prepare for the top jobs. Send postal card for details.

Geo. E. Deatherage & Son

CONSTRUCTION CONSULTANTS
P. O. Box 921 Lake Worth, Florida

WANTED — Experienced sand and gravel man. Must be able to set up plant and produce sand and screened and crushed gravel from river deposit. Work in Northwest. Give full particulars.

Write to Box 9-A,
Western Construction
609 Mission St., San Francisco 5, Calif.

FOR SALE

FOR SALE

STEEL SHEET PILING—WASHINGTON

255 tons 40-66 ft.—Carnegie MP-101
45 tons 45° Y pcs.—Carnegie MP-102
Immediate shipment near Brewster, Wash.

MISSISSIPPI VALLEY EQUIPMENT CO.

511 Locust, St. Louis 1, Missouri
Chestnut 1-4474

FOR SALE

440—14"x14"x10' Steel Concrete Paving forms manufactured by Blaw-Knox Co. These forms were used on one job and are in good condition.

CHEFF BROS. & SANDKAY, INC.
Box 938, Ephrata, Wash., Phone Skyline 4-3571

Want Ad Order Blank

Please run my ad 12, 6, 1 time (circle which) according to rates at top of page. Make ad 1, 2, 3 columns wide (circle which) by inches (specify, one to 10) deep.

Signed

Address

City State

Send ad to Classified Dept.,
WESTERN CONSTRUCTION, 609 Mission St., San Francisco 5, Calif.

Contractors' engineers and \$ \$

It's been said before, but will bear repeating: When a young engineer starts to work for a contractor he must never allow the dollar sign to get out of his sight.

Of course engineering educators keep reminding students that tradition demands their accomplishing for one dollar what any fool can do for two. But this idea never quite takes hold in engineering practice as it does in contracting. If the young engineer works for a governmental agency or a private organization his approach to the cost factor is always guided by the knowledge that conservative design never gets him into trouble with his superiors and that money always seems to be adequate. With rare exceptions engineering planning is open-ended on financial considerations.

Not so when the contractor becomes his boss and is committed to a figure that marks the line between profit or loss. Every thought and action revolves about COSTS. His first job may relate to keeping cost records, providing information for checking the good health or poor health of the job, but recognition will come to him by cutting costs, not keeping track of them. Knowledge secured by maintaining these records can be the starting point for new ideas to cut a cost corner on the next job. In fact, the tempo of inventiveness must be as fast as competition is sharp. It is the essential of contracting survival. If he challenges each phase of the job with "Could I think of a way to do that at lower cost on our next job?" the young engineer will find himself a welcome and appreciated member of the organization.

Some helpful suggestions and counsel are provided in this issue by a well qualified construction engineer of long and varied experience. The article will help to focus the young engineer's attention on the value of shrinking the cost-dollar. Nothing will help a construction career more.

Teach field men about dirt

Dirt—or call it earth—has become an important modern construction material, manufactured on the job by the contractor. No longer is it dumped into dams, fills, or embankments. Today, pit materials are examined by microscope, the dirt is taken apart and put through all kinds of fancy tests and the proper amount of moisture is determined to secure the compacted density the engineer will demand. The process is getting almost as complicated as designing concrete.

Having made all of these studies and fixed the mix, the laboratory is ready to turn the job over to the contractor's crew in the field. Here the units of measure are truck-loads and the laboratory tamping-tool becomes a sheepfoot roller. Water, which the lab man specifies to perhaps $\frac{1}{2}\%$, is put on by tank-truck. From the test sample to 1,000,000 yd. of dirt is a big jump. Are the men who manufacture this million cubic yards of engineered construction material properly informed?

Does the "super," the boss in the pit, the foremen on the fill, even the operators know what they are required to do, and why? If the specs talk about "% of maximum density" to be secured, or the bids require a fixed number of roller passes with adjustments for more or less, then the whole field crew ought to know the simple rules of producing the finished material, and the reasons.

Too many resident engineers have to contend with stubborn resistance in securing the required accuracy in field operations demanded by specs. They have the final responsibility in trying to achieve laboratory standards when the measuring unit is a belly-dump load. One solution is to load the job with inspectors who run around telling everybody, "No, that doesn't meet specifications." It might be smarter engineering to spend the same amount of time, and money, starting the contractor's supervisory staff off with some simple instructions covering: (1) the raw material, (2) the methods required in handling and processing, and (3) the results to be obtained. In every case the explanation of "why" is most important. A few talks by a practical-minded expert in soil engineering might be the answer.

Of course, it is easy to say that the people who most needed the instruction would not attend. But the contractor could take care of that, if he were convinced such instruction would make the job run smoother and faster. Even without required attendance there is always the super who wants to get out on his own, the foreman who wants to be super, and even the type of operator who is eager to learn enough to be the foreman on the fill. These are the men who would make willing students. What they learned would help solve the field control problems on the earthfill jobs of today and tomorrow. Both contractor and supervising engineer would benefit.

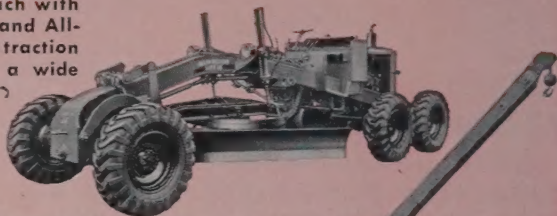
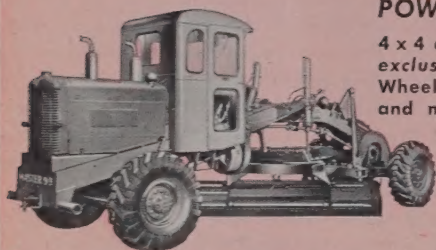
AUSTIN- WESTERN

CONSTRUCTION
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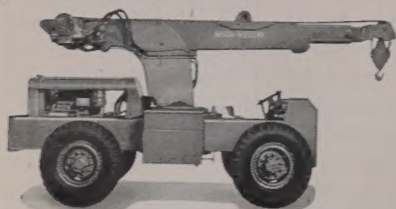
POWER GRADERS

4 x 4 and 6 x 6 models, each with exclusive All-Wheel Drive and All-Wheel Steer for maximum traction and maneuverability, plus a wide assortment of time-saving, money-making attachments.



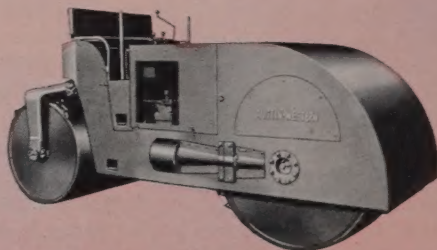
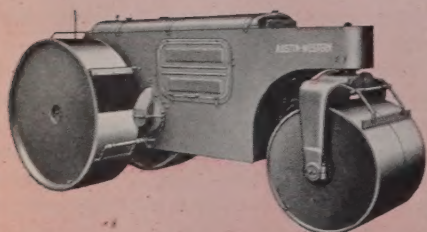
HYDRAULIC CRANES

Self-propelled and truck-mounted models. The telescopic boom raises and lowers, rotates 360° and handles a wide variety of jobs with superb precision.



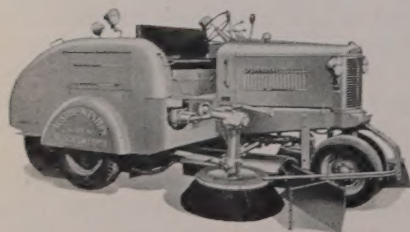
ROAD ROLLERS

3-wheeled and tandem models . . . variable weight . . . gas or diesel engines. Torque Converter Drive is smooth powerful and flexible.



MODEL "40" SWEEPER

Single or double gutter broom . . . front steer for safety and maneuverability . . . rear dump for convenience . . . broom sweeps directly into hopper for efficiency and economy.



Your nearby distributor will gladly furnish special catalogs on any or all Austin-Western products.

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