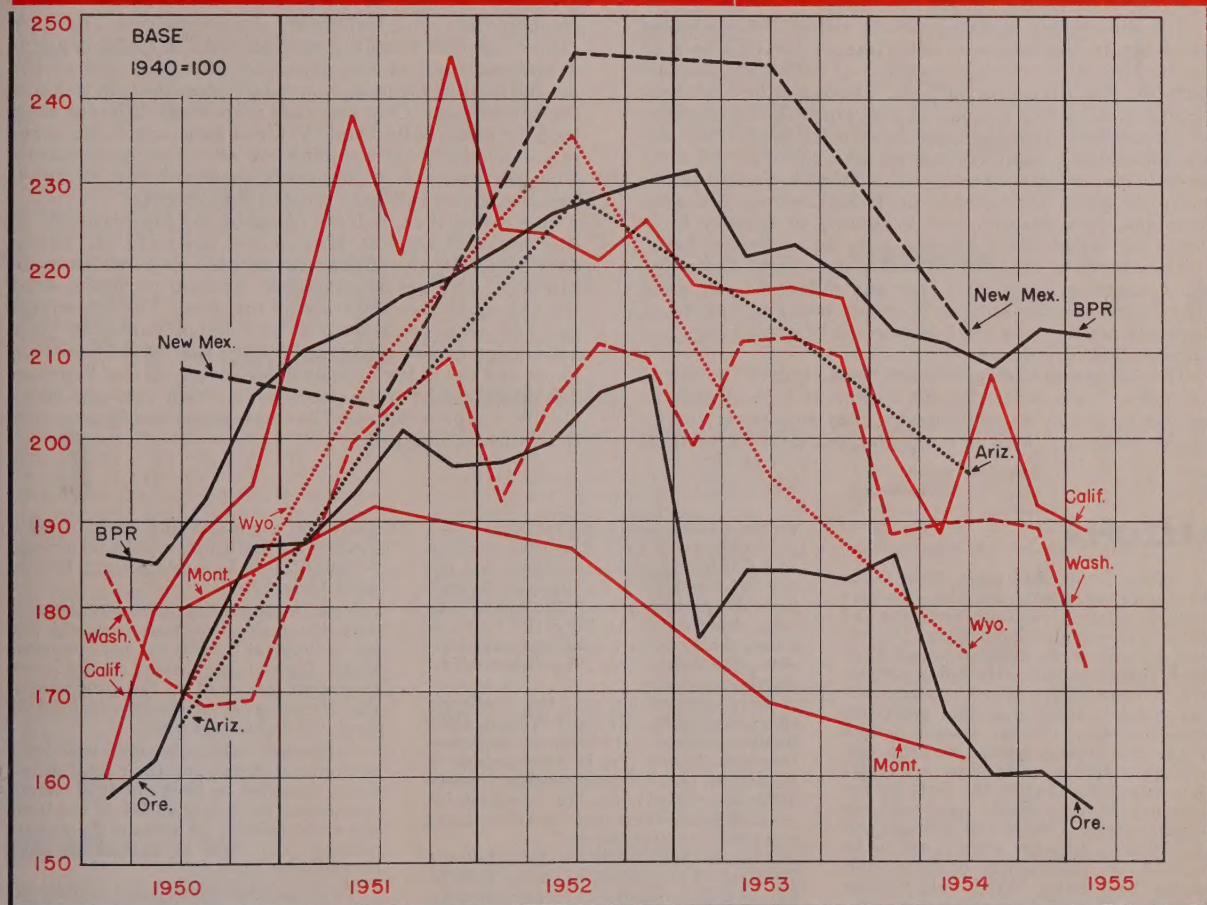


JULY 1955



What's in a highway cost index?

HOW IS THE OTHER GUY DOING? That's the main question answered by the chart of state highway cost indexes shown here. How the other guy is doing it—that is, how he derives his index—is presented in accompanying discussions.

But it's difficult to draw general substantive conclusions for the whole West, just from the bare figures. If there's anything consistent about this region, it's the variety! From one end to the other are vast differences in geographic characteristics. And these in turn affect state highway department work load, conditions of contractor competition, average standard of highway constructed, and construction logistics.

Population, vehicle mileage, and road mileage are all tied together—hence the difference in work load between, say, California and Montana. California thereby has the statistical basis for a more sensitive and accurate cost index curve. A look at the chart, however, shows that the justifiable frequency of plotting values does not necessarily mean a smooth curve.

Competition doesn't have to follow the population pattern. But a high general level of business and industrial activity, characteristic of Western metropolitan centers,

does foster greater competition. Cities are especially apt to show it these days, when either too little work or too much competition in his own line will cause a contractor to crowd into another.

Standards of highway vary with traffic need. And the difference isn't only in quantity of materials involved. The lesser road utilizes lesser cost materials in many respects. Thus the rural states will build their cost indexes on a different range of materials prices.

Construction logistics are a subtle influence. The state whose highway routes are well-defined and well-populated, whether by topographic or economic cause, has lesser problems of access to construction areas. With sources of materials, labor, supplies, and transportation close at hand, a project—and therefore an index of its cost—carries less overhead in logistical charges.

Then there's the matter of terrain type. The differences are obvious as between Nevada and Washington, or Colorado and Arizona. But even these states have regions of similarity at their nearest (or common) points. It should be noted that differences in terrain are quite haphazardly present, being of course functions of political boundary location, and having no basis in the criteria

of engineering design, construction method, or cost analysis!

So, if you're in New Mexico, you'll likely find that the Oregon curve, of itself, is merely an interesting curiosity. Its main significance for you will lie in the reasoning behind it. And, considering the reasoning behind all the indexes, the West is different "from itself" in still another way. The degree of detail and attention to statistical techniques for interpretation varies all over the lot. You can take your choice among the states.

The differences in detail chiefly reflect the resources available to the highway departments for this sort of work. They also reflect something of each department's purpose. But even this purpose, whether it be historical record or an active attempt at cost control, is a function of resources, because it depends on work load. If the department has a relatively low volume, there isn't a sufficient basis for detailed analysis. Neither is there a possibility of great savings. A quick look shows Arizona, Montana, New Mexico, and Wyoming to compile their costs, and figure their indexes, only on an annual basis.

Elsewhere, in the Pacific Coast states and Colorado, more exacting work goes into the index. At the same time these are the busiest Western states in degree of highway activity; so there is more to be gained from interpretation of indexes.

This brings up the question of "cost control" by use of an index. It's a contradictory notion, at best. A look at an index, and at its components, may suggest trying to avoid designing with a particular material or method

that is presently high priced. On the other hand, assuming that each project is subjected to economic analysis at the planning stage, its later construction and inclusion in an index will tend to control that index.

For the most part, cost control isn't possible from the data directly used in preparing an index. There are too few items used—from 6 to 24 in Western states, with varying weights assigned.

If there is to be true cost control resulting from interpretation of highway department cost records, it must come by the use of techniques of cost analysis. These are rather different from the methods used in building an index alone. And, as was discussed editorially last month for the state of Oregon, it is of considerable help to know the actual costs. Cost units are very likely different from bidding price units. And they are most apt to be accurately available—if available at all—from contractors. The alternative is to duplicate their methods of book-keeping with a full-time crew of timekeepers.

In a sense, then, indexes based on bid prices cannot be used for cost control, because bid units are the wrong parameter. In this light, the records discussed and illustrated here serve principally historic purposes, even for the most thorough states involved. The advantage for you who work with a cost index comes in your knowledge of non-numerical factors that affect your own index and the index of your neighboring states. And they are probably the only states with which you can beneficially compare figures. On these pages the figures only illustrate techniques.

ARIZONA

George Lang, Arizona's state highway engineer, points out that contract volume doesn't warrant an index of costs to be computed quarterly. The annual figures, when charted as we have done alongside quarterly index curves, give a remarkably smooth curve, but one which is thereby neither more nor less accurate. Closer spaced points might conceivably define maxima and minima within shorter time intervals; they might also distort the facts by the influence of some single large and unusual contract. Comparing Arizona too closely with a bigger state is apt to be a case of comparing oranges and apples. Says Lang, "With only a three to five million dollar volume in contracts per quarter, a quarterly index fluctuates more readily depending on the location of a few major jobs and the type of terrain encountered."

Arizona's index is computed on eight construction items:

ITEM	UNIT	WEIGHT
Roadway excav.	cu. yd.	23%
Borrow	ton	6
Aggregate base	ton	19
Bit. plant-mix	ton	10
Liquid asphalt	ton	10
Struct. concrete	ton	17
Bar reinf. steel	lb.	9
24-in. C.M.P.	lin. ft.	6

Non-numerical factors recognized in the judgment of Arizona engineers include volume of federal construction in the state, location of project (near railroad?), and type of terrain. The latter is particularly worth noting, as Lang mentioned, because 23% of the index is based on excavation.

CALIFORNIA

California's index, oftentimes more "jumpy" than any of the others, re-

turned to that form last year after a surprisingly stable 1953. The 1953 stability had California engineers' hopes up; but the 1954 and 1955 fluctuations haven't been disappointing since their trend has been downward. At 189.3 the index is about the same as a year ago, and considerably below the 1953 "plateau" of 217.6.

Keen competition gets the credit for this showing, but Richard Wilson, California assistant state highway engineer, is wary: "... a rise in price trends is imminent, as it does not appear reasonable that price trimming to offset increased labor rates and materials costs can continue indefinitely."

Also to be noted is the fact that the Division of Highways in recent months has let a high number of large contracts. Aside from competitive aspects, this fact alone permits very favorable unit prices, which have acted to hold the index down.

Within the index, four items showed slight increases in the 1st quarter 1955, three dropped slightly. No values have recently been computed for the eighth item. Here are all of them, together with their current prices:

ITEM	UNIT	PRICE
Roadway excav.	cu. yd.	\$ 0.39
Crusher run base	ton	1.69 ¹
Plant-mix surf.	ton	4.55
Asph. conc. pave.	ton	7.00 ²
PCC pavement	cu. yd.	13.44
PCC structures	cu. yd.	40.66
Bar reinf. steel	lb.	0.095
Structural steel	lb.	0.140

¹Since 1953, untreated rock base.

²Latest value, 3rd quarter 1954.

COLORADO

Here is a state which has just entered the index business. Colorado's first purpose in devising an index last year was to enable updating of cost estimates

made for a needs study back in 1949. Feeling the BPR index to be inaccurate for application to a single state, here is what Colorado did:

First, a composite mile was defined, with the realization that it would not be a "typical" mile in any physical sense. Instead, it contains all bid items of importance, and in the proportions that they appear in the state's total of work for an average year.

Colorado's composite mile was built on contract items, and their total quantities, recorded in 1949 and 1950. Items accounting for less than 1% of the total were eliminated; 24 remained, encompassing over 90% of annual contract construction cost.

To proportion these items and arrive at the quantity of each to be included in a composite mile, the period 1949-53, inclusive, was used. Here are the items and quantities that resulted:

ITEM	UNIT	QUANTITY
Grading and stabilization		
Unclass. excav.	cu. yd.	10,630
Struct. excav.	cu. yd.	109
Struct. backfill	cu. yd.	116
Rolling	hr.	88
Wetting	M. gal.	351
Sta. yd. overhaul	sta. yd.	64,112
Yd. mi. overhaul	yd. mi.	6,055
Ton mi. overhaul	ton mi.	12,188
Sub-base	ton	2,998 ¹
Surfacing		
Cr. rock surf.	ton	1,976
Asphalt	ton	17
Liquid asphalt	gal.	10,252
Road-mix process	sq. yd.	4,659
Stone screenings	ton	70
Plant-mix surf.	ton	279
Conc. pavement	sq. yd.	449
Structures		
Bridge timber	M. fbm.	1
Concrete	cu. yd.	36
Reinf. steel	lb.	4,107
Struct. steel	lb.	7,114

R.C.P.	lin. ft.	162
C.M.P.	lin. ft.	109 ²
B.W. fence	lin. ft.	1,286
Sewer pipe	lin. ft.	17

¹All, whether bid as sub-base or select borrow.

²Quantity given is for all diameters, and cost used to develop composite is average per ft. of all pipe used.

Multiplying the average cost for each of these units in a given year by the quantity shown above produces a composite mile cost for that year. With 1949 as the base year, Colorado has determined index values for each subsequent year through 1953, and for each quarter year since then. It has not been feasible to convert these values to a 1940 base; therefore they do not appear on the accompanying graph. Instead, here is a tabulation of Colorado's composite mile cost experience, on the 1949 base:

1949—100.0	1954, 1st qtr.—82.5
1950— 83.3	2nd qtr.—78.7
1951— 90.8	3rd qtr.—86.0
1952—101.9	4th qtr.—85.4
1953— 88.9	av. —84.5
	1955, 1st qtr.—78.3

Occasionally there is no use of some bid item during an index period. Still, a value must be assigned to permit computing the index. In this case, the last recorded composite mile cost for the particular item is adjusted by means of an average index. This average index is computed from current index values for all other items in the same group (grading, surfacing, or structures). These current index values for separate items are not figured against the 1949 base. They are cumulative, so to speak, being based on each previous index period.

Colorado has checked this adjustment method, using the single item (concrete pavement) which showed the greatest fluctuation during the 1949-53 period. The error introduced in the composite mile index was less than 5%.

IDAHO

Idaho's first published index information comes from C. P. Humphrey, engineer of costs and estimates. This index uses just 9 bid items, yet these cover between 75% and 90% of total contract cost. No composite mile has been determined. The average unit prices for each item have been figured for whatever quantity was involved in the index period.

The study was carried back to 1950, in order to catch the effects of the Korea war. Without a reference point in 1940, it hasn't been possible to plot Idaho's index on these pages. A single equation is afforded by Humphrey's remark that "the Idaho cost index for the 1st quarter of 1955 is 104.6, while that of California for the same period, reduced to a base of 1950=100, is 104.5, which is close enough as to similarity to rest one's case upon."

The discouraging aspects of cost index comparisons can equally well be illustrated, however, by "backing up" just one quarter. California's index for the 4th quarter 1954 was slightly higher (about 1½%), while Idaho's was 70% lower!

Here are the components of the Idaho index, together with their average prices for the 1st quarter 1955:

UNIT	PRICE
Unclass. excav. cu. yd.	\$ 0.333
Sprinkling water M. gal.	1.33
Rolling hr.	4.76
Crushed base ton	0.932
Asphalt gal.	0.163
Road-mix surf. mi.	2,686.12
Plant-mix surf. ton	3.85
Class A conc. cu. yd.	72.25
Reinf. steel lb.	0.1413

And here is how Idaho's index has fluctuated over the past four years:

1950—100.0	1954, 1st qtr.—110.2
1951—110.2	2nd qtr.—107.5
1952— 97.0	3rd qtr.— 92.8
1953—114.2	4th qtr.— 73.2
	av. —95.9

According to Humphrey, the performance of Idaho's index reflects an increase in bidders for 5.4 per job in 1950 to 6.8 in 1954. It also shows, in its latest figures, that "when contractors have exhausted their ability and opportunity to absorb high labor and materials costs, they must adjust their bid prices upward, or go out of business."

MONTANA

Never published before, Montana's index has been built on an average unit contract price summary compiled annually by the highway department. The base is a combination of the years 1940 and 1941—justified by the slight difference in price levels at that time, and also by the greater quantities available from two years of record. Fifteen items were used:

Unclass. excavation and borrow	Type B crushed rock surfacing
Overhaul	Plant-mix surfacing
Rolling	Road-mix surfacing
Watering	All bitum. materials
Select borrow base aggregate	Corrug. metal pipe
Type A crushed rock surfacing	Reinf. conc. pipe
	Struct. concrete
	Reinforcing steel
	Struct. steel

Among individual items, Montana's administrative engineer, Fred Quinnell, Jr., comments on three. Average unit prices in 1954 were below 1940 levels for watering and plant-mix surfacing. Unclassified excavation and borrow moved from a base level of \$0.19 per cu. yd. to a high of \$0.358 in 1950 and 1951, and has now dropped to \$0.211—indicating a net increase of 11.1%.

In the case of plant-mix, greater tonnage offered for contract in Montana, the improvement of finishing machines, and the introduction of mixing plants having greater production all contributed to its slight net decline over the 15-year period.

NEW MEXICO

The base for this index is the 4-year period 1938-41, having an average value of 100.05. The 1940 figure alone is 101.2. For purposes of the chart on page 21, the latter figure was changed to 100, the remaining three years of the base period were proportioned accordingly, and a new base period value of 98.9 was derived. This permitted adjusting subsequent annual figures to new—and only slightly different—values. This adjustment was performed by the Western Construction staff.

New Mexico uses seven individual contract items, placed in three weighted categories. Here they are:

GRADE AND DRAINAGE (42%)
Unclassified excavation
24-in. corrug. metal pipe
SURFACING AND BASE (38%)
Base course
Asphaltic road oil
MAJOR STRUCTURES (20%)
Class A concrete
Reinforcing steel
Structure excavation

The values are computed annually, for the reason common to the less active states. On a quarterly basis, says H. S. Wiley, planning director, values "may be greatly influenced by only one big job that may not necessarily be indicative of a trend."

OREGON

From its peculiarly thorough records of cost, Oregon builds an index composed of six general classifications. Here they are, together with their 1st quarter 1955 values (based on 1940=100):

CLASSIFICATION	INDEX
Grading	146.0
Crushed rock surfacing	123.4
Bit. macadam surfacing	176.3
Asphaltic conc. pavement	102.6
PCC pavement	240.8
Conc. bridges and structures	269.1

Index performance by individual classifications has varied during the past year. (The overall index is down for the usual reason, competition, which has thus far offset labor cost increases.) PCC pavement has risen a little, concrete structures has gone down a little. Grading has dropped materially, from 163.5 a year ago, because of several projects that were easier to excavate than the average for the entire state.

Crushed rock prices bounced both ways—down when many crushing contractors were short of work, up when several contracts came along, and down again (in a single quarter from 142.6 to 123.4) when specifications were changed and one large project was bid at a very low figure. The spec change was from graded crushed rock base to crusher run base.

The foregoing analyses, by Oscar Cutler, Oregon's chief cost analyst, are particularly interesting in that they show how non-numerical factors can affect anyone's index. Arizona and Montana are not alone in worrying what one odd job can do to index accuracy; discussion and explanation are vitally necessary to interpretation of any record.

WASHINGTON

The "composite year" technique is used here. That is to say, average quantities of selected items for a year's contract volume are the basis. Here's how it works:

A base period of 4 years, 1946-49 inclusive, was used, and the average annual quantity of 11 items was determined. Using the 1940 weighted average unit price for each of these items, extensions were computed and added

(Continued on page 90)

Small crane erects 7-story building



ERECTING HEAVY structural steel on the 7th floor was handled by this Dodge powerwagon having a 20-ft. A-frame on front and a Tirfor Griphoist to allow booming up and down. Beginning with the 4th floor erection, the truck was raised from floor to floor through the elevator shaft.



IN RENO, NEVADA, where everything is unusual, this building expansion by Harolds Club fitted in with the spirit by having steel erected and concrete poured floor at a time.

STRUCTURAL STEEL was erected for one story and the pouring of concrete in the walls and floor followed immediately. This may seem like an odd way to put up a 7-story building—but there was a good reason for it. In addition, it brought about one of the most interesting methods of steel erection yet used in the West.

Harolds Club in Reno (a widely advertised establishment) has just finished a large expansion of their facilities. One of the things desired by the Club was to utilize each floor of the new building just as soon as possible. This meant that instead of erecting all of the steel for 7 stories first, and then following up with the concrete—the two would go up nearly at the same time. Harolds Club became their own general contractor with the steel contractor being the Martin Iron Works of Reno, Nev. The building was designed by Ferris & Erskine, architects of Reno, and the structural engineer was H. E. Engle of San Francisco, Calif.

Size of the problem

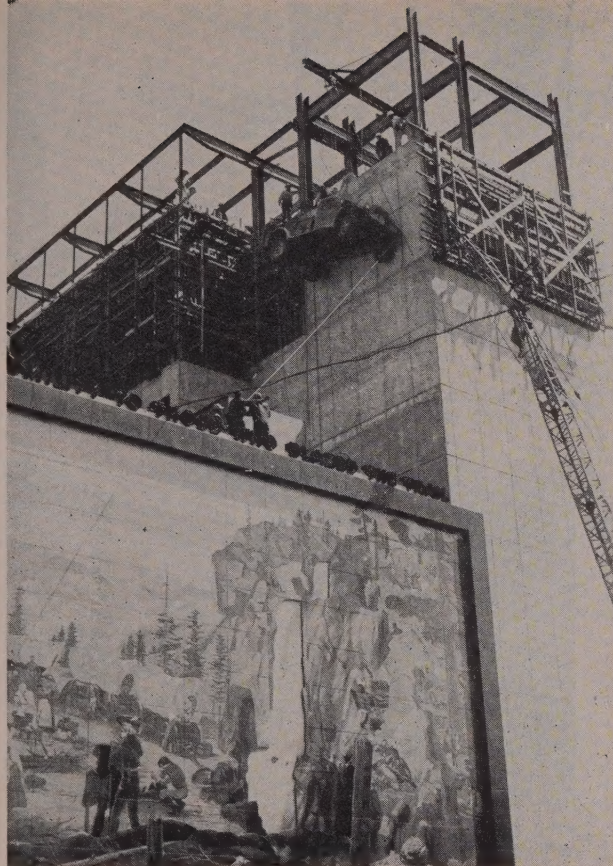
Building dimensions are 26 x 140 ft. from the basement to the 4th floor and 36 x 140 ft. from the 5th floor up—the extra 10 ft. from the 5th floor up being a cantilever projection on the north side. Floor-to-floor height is 15 ft. 2 in. Overall height is about 120 ft. There are two principal rows of columns lengthwise of the building at 12-ft. centers.

Erection of the heavy structural steel for the first four floors was all done with a Link Belt truck crane equipped with a 60-ft. boom and 30-ft. jib. Columns were heavy 14-in. wide-flange, some of them weighing 233 lb. per ft., and girders were 21- to 24-in. wide-flange up to 26 ft. long, (the width of the building). Column lengths were 30 ft. for two stories, with the basement columns being 37 ft. 6 in. long. Due to the cantilever of the building above the 4th floor, the supporting beams had to be 36 ft. long, allowing a 10-ft. overhang to the north side of the building. The most severe structural problem was posed by the fact that the building was broadside to prevailing winds.

Raising crane floor to floor

Beginning at the 4th floor, the tricky erection began. A Dodge powerwagon was lifted to this level by the truck crane. It had a 20-ft. A-frame boom on the front. A power winch on its front end did the hoisting, while a cable from the top of the A-frame to the rear of the truck allowed booming up and down.

Structural members were lifted to the 4th floor and then erected by the Dodge truck. Since high early



FIRST STEP in lowering the Dodge truck from the 7th floor was rolling it out into space and setting it on the first handy roof.



SECOND STEP required this Link Belt truck crane with 60-ft. boom to then pick it up and further lower it to street level.

strength concrete was used on the floor slabs, only four days were needed after the pour before the truck could be placed on the slab and then allowed to run around where necessary.

After concrete had been poured in the 4th to 5th floor walls and the 5th floor—the powerwagon was taken up to the next floor level (the 5th floor) through the elevator shaft. This shaft was next to the street and columns above the 4th floor level had been set by the truck crane from the street with its 90-ft. boom. Electric winches mounted on temporary beams over the elevator shaft raised the truck to the new level.

This process was repeated for the 6th and 7th floors. That is, the truck crane raised major structural steel parts to the floor level being worked on, the Dodge truck erected them, concrete was poured, and then the truck would be taken up the elevator shaft one more floor. By the time work was under way on the 7th floor, the 3rd floor had already been finished and in use by Harolds Club.

For the 7th floor to roof erection (one story) heavy structural steel had been lifted to the 6th floor level prior to pouring of the concrete walls at that level. These members were

then taken up through the elevator shaft. This seemed the easiest way since the boom of the truck crane on the street could not reach to the 7th floor level.

A hoisting tower in the alley at the rear of the building was used for bringing up concrete. Also, a short Chicago boom attached to the tower allowed lifting of lighter steel members to the various floor levels.

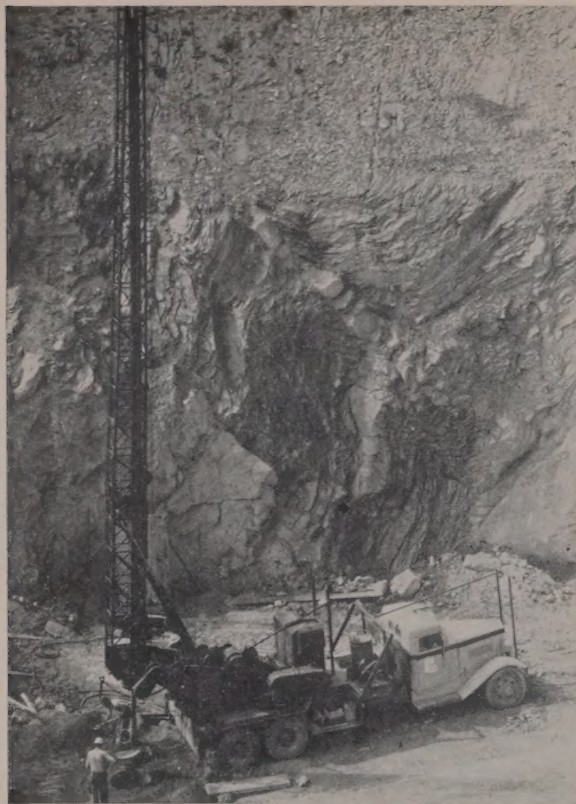


TIRFOR GRIPHOIST jacks ordinary wire rope in either direction and came in handy for booming the A-frame up and down for setting steel in cramped quarters.

An interesting feature of the Dodge truck was the use of a Tirfor Griphoist that controlled the booming up and down of the A-frame of the Dodge truck. This device has the wire rope cable pass through it and will jack the rope in either direction. A manually worked lever arm attached to it allows rapid adjustment of the boom height even while under heavy load. It serves and acts much as a come-along jack with the advantage of using ordinary wire rope.

After erection of all structural steel, a steel beam with a 10-ft. overhang on the north side of the building was temporarily installed directly under the roof beams, and a trolley attached to it. The Dodge powerwagon was then lifted off the 7th floor level, rolled out into space and with the help of the Link Belt crane lowered to the existing roof of the original Harolds Club, from which it was picked up and lowered to the street.

For Martin Iron Works, Martin G. Schwamb is owner and took an active interest in the erection. Cyril Wagner was steel erection foreman. The 500 odd tons of steel were completely fabricated at the Martin Iron Works shop under the supervision of T. K. Meredith, office engineer, and William Granata, plant manager.



P & Z RIG drills holes 50 ft. deep in the soft sandstone at Santa Felicia Dam for five cast-in-place piles to support spillway.



AUGER DRILLED 3-ft. diameter holes at 20 ft. per day rate. The rig, largest in the West, is capable of drilling 8-ft. diameter holes.



HIGH-STRENGTH tremie concrete was poured in each of the bell-bottomed holes with casing being pulled as concrete was brought up.

West's largest auger bites sandstone

By NEVILLE S. LONG

Construction Engineer

United Water Conservation District

USE OF A LARGE-SIZE earth auger owned by the P & Z Co. of San Francisco proved to be a successful and relatively economical method of drilling 36-in. diameter holes in the sandstone foundation of the spillway at Santa Felicia Dam. Presently under construction by the United Water Conservation District on Piru Creek in Ventura County, Calif., the dam is a combination rolled earth-and-gravel structure with a concrete-lined chute spillway on the right abutment.

The foundation of the dam and spillway consists of interbedded sandstone shales with the sandstone ranging in hardness all the way from little more than a consolidated sand to strata of hard, well-cemented sandstone. However, the vast majority of the sandstone encountered in the foundation is relatively soft.

The holes served as forms for five 50-ft. deep cast-in-place, bell-bottom, reinforced concrete piles to support the discharge end of the spillway. The spillway, which is designed for a maximum discharge of 105,000 cfs., is 104 ft. 7 in. wide at the discharge end and has a 20-ft. cantilever section ex-

tending downstream from the support piles. The piles are designed to add safety to the structure in the event that a large discharge from the spillway tends to erode the foundation beneath the lower end of the spillway. They are capable of supporting the entire load of the last 40 ft. of the spillway channel, running full.

Blasting at only one location

When the P & Z Co.'s rig was set up over the first hole, there was some question of how successful it would prove to be. However, after drilling about 20 ft. of hole in the first full working shift, it was evident that the application of this rig to this type of work was a success. The rig is capable of drilling 8-ft. diameter holes. Drilling of the pile holes proceeded smoothly from east to west until the work was started on the westernmost hole where, at a depth of about 20 ft., a very hard sandstone strata was encountered in which the rig could make no headway at all.

Work proceeded by hand on this hole until permission for light blasting was obtained. Because of the importance of not shattering the surrounding foundation, blasting was limited to the use of one-third to

one-half a stick of dynamite placed in holes not over 2 ft. deep. Use of these light charges in the hard sandstone—about 8 ft. in depth—successfully pierced it and the rest of the hole was drilled without further difficulty.

Belling of the bottom of the holes was done by hand by the use of jackhammers, and since the rock was relatively soft, no difficulty in this work was encountered.

Cost of drilling the holes and belling the bottoms amounted to about \$86 per ft. with cost of the completed piles about \$125. These costs are exclusive of all engineering costs incurred by the District.

Santa Felicia Dam is being built under a prime contract held by D & H Construction Co., Macco Corp., and M. H. Hasler Construction Co. and for whom George J. Renauld is project manager. V. C. Cook handled the drilling operation for P & Z Co. Marvin Burrow was foreman for subcontractor on the steel, Fontana Steel Co. James Sipe was concrete superintendent.

For the United Water Conservation District, W. F. Gentry was field engineer, and the author construction engineer—both being in direct charge of the work.

What conditions and methods are best in the West for— Producing low-cost road aggregates

By PAT THOMSON

County Engineer
Douglas County, Washington

THE MANUFACTURE and stockpiling of crushed aggregate prior to use appears to be a construction process peculiar to the Western states. This is probably true for three main reasons.

First, size, for Western counties are large, with huge road systems requiring several crusher setups to provide aggregate within cost range hauling distances. Eastern counties, however, are small, containing many commercial operators, with crushed material available upon demand. Some eastern counties dredge material directly from the rivers. In some, crushed limestone used for blast furnace flux, or air cooled blast furnace slag is readily available.

Secondly, the ready availability of pit sites, both quarry and gravel, coupled with the constant attempt to better aggregate price per ton or yard, leads to off-season crushing contracts, compelling stockpiling. Some eastern counties, as indicated by information received from engineers, do not have pitsites. All material is shipped in commercially as used.

Lastly, because of the distances between Western metropolitan centers, stationary commercial producers cannot provide the aggregate where needed. The construction of roads through isolated mountain passes, or across vast desert regions, has fostered its own peculiar type of contracting industry. For Western crushing construction has become a personalized field, breeding a new group of specialized contracting men. It has also introduced an engineering and inspection field peculiar to Western county highway departments.

There were certain factors pertaining to this crushing industry that we wished to clarify, both from the standpoint of the contracting agency and the contractor. Thus, we surveyed by questionnaire, an equal number of both groups. The results were somewhat surprising to me, and perhaps to you. For the wide expected variance of opinion did not appear. What did appear, however, was some total excellent suggestions on handling aggregate crushing projects.

1. Do you feel that statewide standard specifications provide the best possible bidding measure. Why? Why not?

2. Would individual specifications for each pit to provide the best possible from that pit mean cheaper rock prices? Why? Why not?



ROAD CONSTRUCTION in isolated areas calls for portable plants such as contractor Frank Baulne's outfit producing 2,200 tons per shift in the Moses Coulee area of Douglas County. Another important factor for low-cost aggregates is awarding stockpile contracts in off-season.

Answers here were multiple in opinion and crossed over, so the two will be resolved simultaneously. The opinion variance here was very definitely split along topographic, and consequently along source of supply, lines. Those counties having an abundance of good pitsites, both natural gravel and quarry, seemed to favor a strict adherence to a standard statewide specification code. Their theory advanced in support of this premise is that a uniform standard gives the contractor a uniform bidding measure. As a result, the contractor supposedly knows what he and all other bidders are faced with, and can therefore bid his lowest competitive price.

Supporting this theory, one group of contractors felt that standard specifications and their detailed interpretations have become a matter of engineering custom and habit. Therefore, the subsequent analysis and cost estimating of a project is simplified for the contractor, with beneficial prices resulting. This group feels that should a pit not meet standard specifications, it would be best to provide another.

The second opinion fell naturally into the areas topographically situated where the character of the pits made it impossible to manufacture specification aggregate without excessive reject. These areas, through laboratory tests of the pit material and intended aggregate usage, determine individual pit specifications. Both contractors and contracting agencies agree that if such specifications are designed with an eye to maximum production, least price will be influenced.

A fast growing group, receiving favorable contractor attention cost-wise, are the progressive experimenters. These engineers believe that standard specifications have a place

in specific projects; i.e., bituminous surfacing. They are also of the opinion that a lot of their roads will never be anything but gravel surfaced—getting the farmer out of the mud. In such instances, what they want on the road is rock. The necessary setting-up fines can be obtained from the ditch. For such roads, specification rock has proven an undue expense. Consequently, these engineers call for crusher run from gravel pits, and never squeeze for fines on a quarry setup. This, in the contractor's mind, appears to offset the multiple setups, and some fabulous prices have resulted, with one receiving a low of 45c per ton.

3. Do you have any suggestions, from your viewpoint, on handling or setting up projects to induce better prices?

Both the contractors and the engineers answered this is a similar vein. It was felt that any contracting agency, state, county, or city, must preplan its crushing projects thoroughly and definitely. Smooth construction projects are always planned sufficiently far in advance that all major changes can be accomplished before the project is under way.

Most any large crushing project will have a certain number of headaches, but good planning will eliminate or ease most of them. This planning means breaking your projects down into their several parts, judiciously analyzing the work to be done, clarifying and simplifying the specifications to the nth degree, and finally carrying the project through on completion schedule.

The similarity of opinions is denoted by the following quotes. Howard Taylor, Okanogan County Engineer, has this to say, "There is no doubt a lot of work to be done in



WESTERN CRUSHING is a rugged industry. Here is a Cat D8 with U-dozer working a quarry near Coulee City, Wash. This is typical of the shot rock pits in central Washington.



FEW FINES were required for the 1-in. minus crusher-run rock being placed upon this Douglas County haul road. Binder material came from the roadside. Road will not be surfaced in foreseeable future.

planning crushing projects to make them more economical for the county and the contractor. We have a lot of need for small stockpiles widely spaced and, as you know, these are extremely expensive. If by proper planning these stockpiles can be grouped and let in off-peak season, I believe we would benefit greatly."

Richard Hewett, partner, F. R. Hewett Co., Spokane, Wash., expresses himself thusly, "Insofar as it is possible, funds and requirements should be so budgeted as to make each project large enough to keep plant erection and mobilization charges at a minimum per unit of production."

The general consensus approved a hard-headed common sense pre-planning of both the contractor and contracting agency's responsibility.

4. What is the contractor's responsibility in a crushing project?

Both parties again agree that it is the contractor's responsibility to supply specification aggregate within the allotted completion time of the contract. This should be done in an honest, straightforward manner reflecting credit upon the industry and leaving no taint of suspicion so that contracting agencies feel they must "clamp down," so to speak.

The contractor should enter upon the project with sufficient men and equipment to meet the required priority scheduling of the component stockpiles. The project should be started early enough that there is a flexibility of time should an unaccountable situation arise, during the course of the project. Should some condition prevent moving in upon the project promptly, the contracting agency should be notified immediately, so that a revised scheduling of minimum effect can be worked out. Wholehearted cooperation throughout the project makes for better public relations and more contracting.

5. What do you feel is the state or county responsibility in a crushing project?

The county, state, or city responsibility boiled down to getting the best aggregate in the least time at the most essential cost possible. The suggestions on how to attain this seemed to be best satisfied by following the old writing rule of what, where, when, how, and who.

Any crushing project must necessarily start with a definite statement of what is to be produced. For modern specification writing brooks no generalities. The old "Stick me a pile of rock out yonder," accompanied by a vague wave of the hand, is the reason that lawyers have thrived. Specifications must particularize the amount, type, and character of aggregate demanded at each pitsite. Any alternate specification provision must be clearly delineated. For specifications providing adequate information induce lower costs since the contractor does not have to bid "by the seat of his pants." Finally all specifications must be rigidly enforced in fairness to all competing bidders.

The where is all important. Unless clearly denoted otherwise, the contracting agency must supply the site, necessary right of way, stockpile sites, and any other matter that would clarify the crushing location.

Is there sufficient raw material in the pit to furnish the amount of aggregate desired? Material sources must be thoroughly investigated by drill testing or other methods. Aside from the embarrassment, nothing is more costly on a crushing project than a half-mile move to complete a set-up.

Do you know the raw material will grade to the aggregate specified? Some pits just won't make it within a reasonable amount of contractor's labor and expenditures. A change of specs in midstream, with screens installed, can be a costly maneuver.

Any opportunity for negotiation in the middle of a project means someone is going to pay.

Most Western contracts are multiple choice setups. The priority scheduling of each stockpile must be clearly defined. Should the sequence of projects range, as in Douglas County, through 3,500 ft. of elevation, consideration must be given to the season of the year and subsequent weather conditions. The contractor must be made aware of other projects dependent upon his. Also, the other construction projects, if any, that might possibly interfere with or impede his progress. Finally, is the order of projects such that they can be accomplished for your need without pushing the contractor into overtime or double shifting?

If these suggestions are followed by the contracting agency, both contractors and engineers agree that better prices will result.

6. What do you predict for the future of Western crushing?

All replies were highly and decidedly optimistic. With more and more roads to be built, more and more aggregate will be needed. Two definite predictions were featured.

With the increase in size and number of Western metropolitan areas, stationary commercial plants will increase. Counties should commence to purchase all available quarry and gravel sites to protect their interests and price strata. It was recommended that this procedure be started immediately before the private concerns entered the field.

Because of the continued multiple set-up contract, the day of the large crusher is ended. Crushing plants will be smaller and more fully portable. Plants will also be more advanced, producing greater quantity with fewer men and less equipment.

Where do you fit into these opinions?

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utilizes tractor and pusher power at maximum efficiency. The result: bigger loads and faster loading times. Feature after feature, many of them described briefly here, add up to a new profit-making potential for users. Get the full facts from your Caterpillar Dealer.

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**NEW DW20-DW21
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HOW LOWBOWL DESIGN PAYS OFF IN BIGGER, FASTER PAYLOADS



New No. 470 Scraper with **LOWBOWL** design

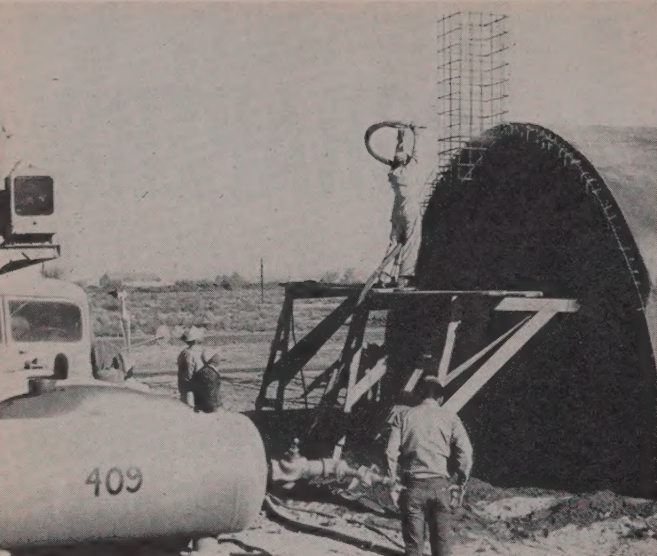
Both scrapers were loaded with the same material obtained under identical conditions. Result: in the No. 470 a net load weighing 5000 pounds greater than the load in the No. 21—a profitable margin for **LOWBOWL** design!

Both No. 470 and No. 456 feature this new concept. The bowl has been widened and lengthened, yet bowl depth has been lowered. Horsepower is utilized more efficiently. Material is loaded with less resistance clear out to the end of the loading cycle. Result: faster loading for **LOWBOWL** design!

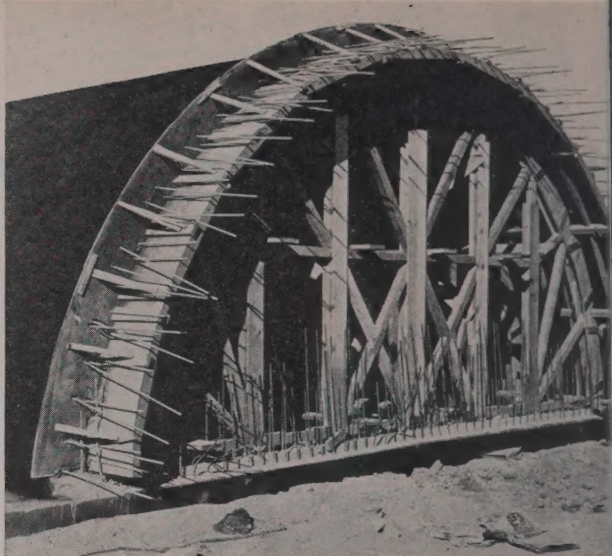


Sideboarded No. 21 Scraper

ANOTHER EXAMPLE OF CATERPILLAR LEADERSHIP IN ACTION



CONCRETE SPRAYED on rear and barrel of the igloo by the Gunitite process meant forms need be built for the inside surfaces only.



HEAVY FORMWORK supports the inner barrel-type forms. Concrete has already been placed over forms and built-up roofing applied.

Ammo igloos get heavy Gunitite cover

BUILDING HEAVILY reinforced concrete ammunition storage igloos of the barrel-type design proved to be cheaper when done by the Gunitite process—as compared to pouring concrete—for the Vinson Construction Co. of Phoenix. Five of the igloos were required at Luke Air Force Base, and Vinson got the contract under the Gunitite alternate for \$98,000.

The structures measure 81 ft. long by 26½ ft. wide. Concrete floor slabs and footings were placed on a select material base. The concrete barrel has a 9-in. thickness at the crown and increases in thickness to 15 in. at the spring line. To provide further blast resistance, the barrel is covered

with 4 ft. of dirt at the crown which tapers off on a 2:1 slope.

Another interesting construction feature is that all of the reinforcing steel bars are welded together. Steel in the barrel connects to footing dowels which in turn are connected to a grounding cable completely encircling the structure. Reason for this is to prevent the accumulation of a static charge of electricity that could conceivably set off a blast.

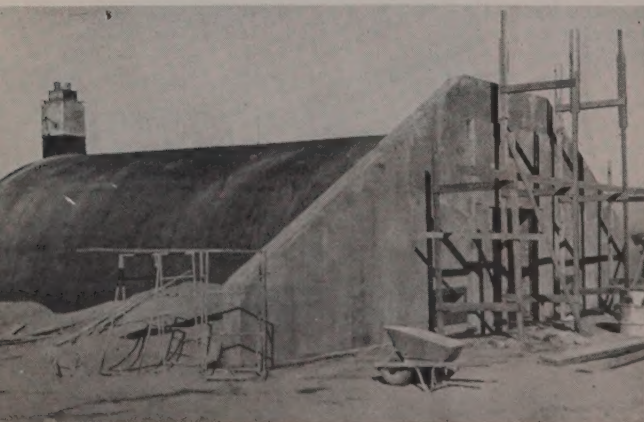
Watertightness is ensured by the application of a built-up roof over the Gunitite, and before putting on the dirt cover. A number of layers of asphalt impregnated paper are hot mopped on. After the dirt fill is in place, an asphalt seal coat is sprayed

on the dirt to prevent erosion. This is readily seen in the lower right photo.

Advantage to the Vinson firm in using the Gunitite process was that no outer formwork was needed. The conventional concrete pouring method requires forms at least to mid-height before the slope of the barrel flattens out enough for the concrete to stay in place without running.

Brigadier General T. C. Rogers is commander of Luke AFB. Design work and contracting for the construction was accomplished by the Los Angeles District Corps of Engineers. Monitoring the work came under the AF Installations Representative Office in San Francisco.

RETAINING WALL front of the ammunition igloo has been completed and structure is ready for earth backfill.



COMPLETED STRUCTURE has 4-ft. thick dirt fill over the crown section tapering off on three sides on a 2:1 slope.



Easy way to handle rigid frames

IT DOESN'T TAKE LONG to put up a building when the details of design and construction are well thought out in advance. This was certainly the case for the erection of precast concrete rigid frames as one part of the construction of the First Methodist Church at Sunnyvale, Calif.

Five frames were required for the structure, each frame spanning a 44-ft. out-to-out distance and spaced at 14-ft. centers. Height of the vertical legs was about 17 ft. with $2\frac{1}{2}$:12 slopes for the beam part of the frame. Thickness of each frame was 1 ft. while the depth at various points varied from about 1 ft. 4 in. at the base and one-quarter points—to over 2 ft. at the haunches and crown.

Other features of the building included 6x10 timber roof purlins at 7-ft. centers with 2x6 tongue and groove exposed sheathing over. Stud walls between frames were diagonally sheathed and plastered.

Forming the frames

Gunnar Carlson of Carlson Construction Co. (this was his first building contract since starting business in California) went about the forming for the frames in a methodical manner. A light casting pad on the ground was necessary for the first frame and then the next four were economically aligned and cast on top of the first one. Aside from the first frame, forms used for the second frame—overlapping the first—were reused for the remaining three.

To make sure that each frame could be lifted free at erection time, Techcote AntiBond 200 bond breaker was applied between layers. Easily stripped Richmond Tyscrus held the forms together.

Low lifting stresses

It took only two days for the forming, placing of reinforcing steel, and pouring of each frame. Imbedded items included Richmond inserts for the four pickup points, bolts to hold clip angles for the roof purlins, and steel base plates. Design strength of the concrete was 3,000 psi., but 2,000 psi. was sufficient for lifting purposes. Lifting stresses were low as compared to what final stresses would be when the frames were in place and fully loaded. Concrete was delivered by transit-mix truck.

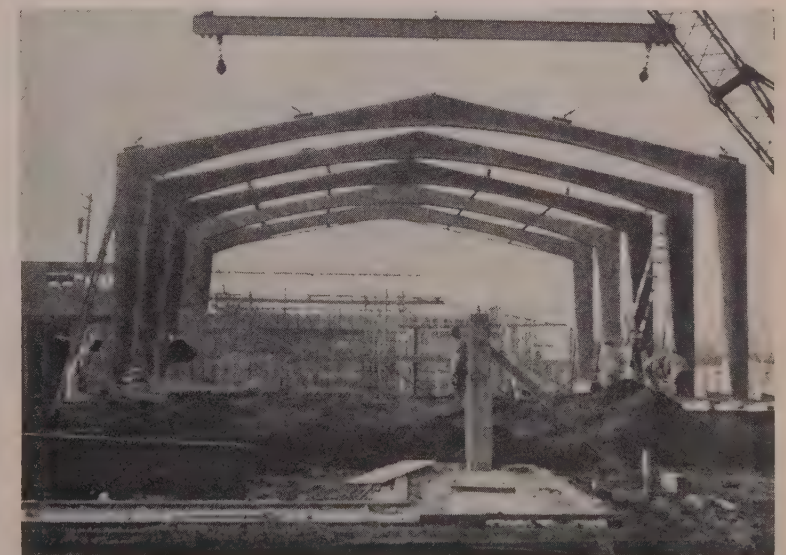
In order to shorten the time before erection could begin, high early strength concrete was used in the last poured frame—the top one of the



FIVE RIGID FRAMES, with a span of 44 ft. each, were cast one on top of the other using Techcote Antibond 200 applied between layers. Kickers against base of frames made pickup by crane foolproof.



LINK BELT CRANE with 55-ft. boom had a long reach from paved road to place the frames. Recent rains made the center area of the structure muddy and unstable for lifting the 10-ton weights involved.



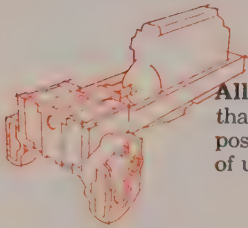
AT A COST of only \$400 each, all five frames are up with operations already begun on erecting the roof purlins. Casting pad in the foreground was used for forming the first frame.

Allis-Chalmers presents the new

ANOTHER BIG STEP AHEAD IN LOW-COST DIRT MOVING

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Allis-Chalmers advanced basic design . . . tested and proved
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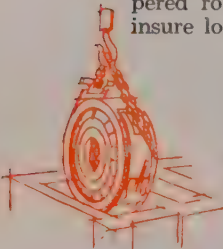


All-Steel Box-A Main Frame that soaks up shock loads, makes possible the service simplicity of unit construction.

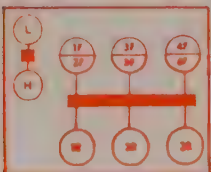
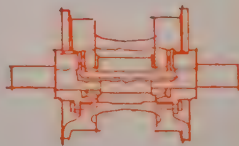
Exclusive One-Piece Steering Clutch and Final Drive Housing with all final drive gears straddle-mounted on tapered roller bearings to insure long life.



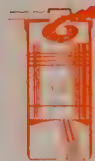
Unit Construction lets you remove engine, master clutch, transmission, steering clutches and final drives without disturbing adjacent parts.



1,000-Hour Lubrication Intervals for roller bearing truck wheels, idlers and support rollers . . . makes production time out of service time.



Dual-Range Constant-Mesh Transmission lets you go from any forward speed to any reverse speed by shifting only one lever. Eliminates double shifting! That means faster work cycles . . . more production!



New Allis-Chalmers Diesel Engine with "follow-through" combustion and tornado turbulence . . . for smooth engine performance, cleaner combustion, extra long engine life.



New Wrap-Around Radiator Guard used as dozer lift frame to simplify design, reduce cost of bulldozer; guard tilts forward for easy service.



New Master Clutch with Ceramic Lining sets new standards of clutch life . . . with fewer adjustments required.



New Operator Convenience including roomy, flat platform . . . foam rubber seat . . . 24-volt direct electric starting . . . 60-gal. fuel tank.



Tough New Track — New design, through-hardened with extra toughness for long life even in severe abrasive conditions.

PLUS . . . new, all-weather cooling; independent radiator-core mounting; new strength and capacity in final drive gears, shafts and bearings.

**NEW STANDARDS OF PERFORMANCE AND
LONG LIFE ON A WIDE RANGE OF JOBS**

You owe it to yourself to investigate the performance advantages of the HD-11 . . . newest addition to the Allis-Chalmers leadership line. See your nearby Allis-Chalmers dealer now.

HD-11

90 net engine hp

75 drawbar hp

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six speeds forward to 5.7 mph

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SOUTHERN CALIFORNIA
San Joaquin Tractor Co.—Bakersfield
Shaw Sales & Service Co.—
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IDAHO
Southern Idaho Equipment Co.—Idaho Falls and Boise

MONTANA
Mountain Tractor Company—Missoula
Richland Machinery Company—Sidney
Seitz Machinery Company, Inc.—
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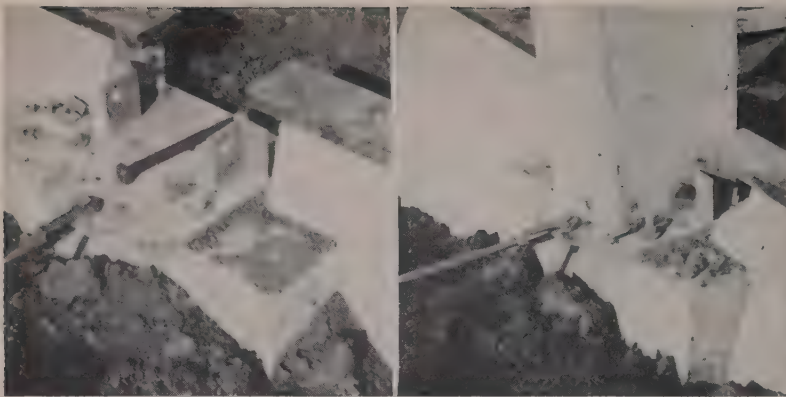
NEVADA
A-D Machinery Company, Inc.—Elko
Moore Equipment Company, Inc.—Reno

OREGON
Pape Brothers—Eugene, Roseburg and North Bend
Hauptert Tractor Company—Medford
Wood Tractor Company—Portland

UTAH
Cate Equipment Company, Inc.—Salt Lake City

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

WYOMING
Studer Tractor & Equipment Company—Casper



SIMPLE BASE CONNECTION allowed a bolt to be slipped through two lugs of the leveling plate and through the leg of the frame. Permanent connection will result from welding base plate to leveling plate. Tie rod extending to the left from leveling plate connects to opposite member, will be embedded in concrete.

stack. Eight days curing was then allowed before beginning lifting operations.

A Link Belt 25-ton truck crane with 55-ft. boom did all of the erection work, and did it smoothly. Wood kickers placed against the butt of the frames kept them from sliding as the tops were lifted. A steady lifting strain was sufficient to break the bond between successive frames as they were erected—with the exception of one time when feather wedges had to help the situation along.

Erected in spite of rain

It had been planned to have the erection crane walk each unit into the center of the building where the 10-ton weight of each frame would have been no handling problem for a 25-ton rig that didn't have to boom out very far. However, the muddy condition of the center of the structure from recent rains called for a change in the approach.

A concrete paved road paralleling one side of the building offered the only stable footing for the crane, even though it meant booming out about 30 ft. to place each frame. With care exercised in blocking the crane,

all five frames were erected without incident.

Two simple connections were all that had to be made to hold each frame securely in place as it was erected. One of these was the placing of two adjustable pipe shores that remained in place until wall and roof sheathing was constructed. The other was the slipping of pins through the base of each leg of the frame. Each pin passed through holes in the leveling plate on the footing until the plates imbedded in the bottom of the frame legs could be welded to the leveling plates.

Under adverse weather conditions which necessitated slower and more careful erection methods—still—all frames were in place at the end of one day's operation. Total cost for each frame in place (including forming, concrete, and erection) was only \$400.

Architect, engineers

Architect for the church was Carlton A. Steiner of Berkeley. Consulting engineers Wildman & Morris of San Francisco did the structural design and determination of the basic method of erection of the frames.

Look up when working near overhead lines

A CAMPAIGN to reduce accidental contacts with overhead power lines by farm and industrial equipment was announced jointly by Pacific Gas and Electric Company and the California Division of Industrial Safety.

Aimed at the elimination of carelessness which causes deaths and injuries in California annually, the campaign will be carried to employer and employee organizations, home owners and other groups, by representatives of the State and the PG&E.

Three illustrated pamphlets emphasize the importance of the need to "look up" near power lines. One of them points out that power lines are just as safe as trains, boats, ladders,

matches, and other common items—if you are careful. Distribution of the pamphlets has been started.

The California Penal Code makes it a misdemeanor to allow any machinery, equipment, building, or other object within 6 ft. of a high voltage overhead conductor. The code also requires cranes, power shovels, drilling rigs, hay loaders, and similar apparatus to carry a durable sign with large letters reading, "Unlawful to operate this equipment within 6 ft. of high voltage lines." The Division of Industrial Safety has been bringing violators into court.

The six principal causes of deaths and injuries are portable irrigation

pipes, hay derricks, nut harvesting poles, well-drilling rigs, cranes, and the installation of TV antennas. Other causes include construction scaffolding, spray rigs, kites, and model airplanes.

The failure to "look up" before moving objects near power lines was given as the prime reason for such accidents.

A field manual for up-to-date reference on concrete inspection

AN EXTREMELY VALUABLE book that everyone should have who has anything to do with concrete has just been published by the American Concrete Institute. Entitled "ACI Manual of Concrete Inspection," its contents provide up-to-date information for both the field and office man. As stated in the foreword of the book, "... this manual ... describes methods of inspecting concrete construction which are generally accepted as good practice. The manual is intended as a supplement to the specifications and as a guide in matters not covered by the specifications."

Three notable policies were established by the committee preparing the manual: (1) the text tells why as well as how; (2) the text is readable and brief; (3) the manual interprets the policies set forth by authorized bodies—does not try to establish them. Numerous references are included for those seeking more information.

Price of the book is \$2.50 and it can be obtained from the American Concrete Institute, 18263 W. McNichols Rd., Detroit, Mich.

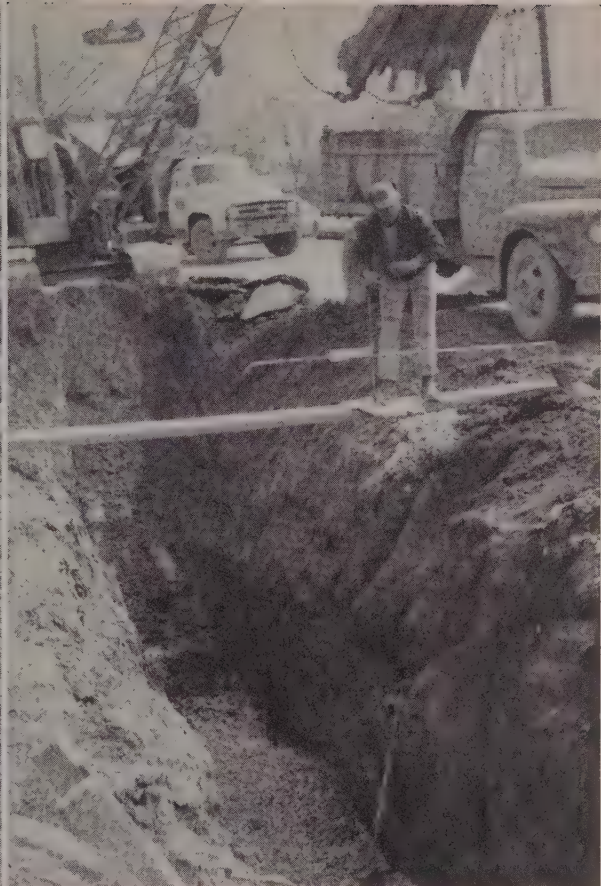
Steel structures painting manual

THE SECOND of two volumes of the "Steel Structures Painting Manual" has been published by the Steel Structures Painting Council, 4400 Fifth Ave., Pittsburgh 13, Pa. The new volume, called "Systems and Specifications" has been prepared with the assistance of several hundred technical consultants. It contains specific recommendations on painting a tremendous variety of steel structures and surfaces in various exposures and it is extensively indexed.

In addition to guides and indexes of recommended painting schemes, the book includes complete specifications for surface preparation, pretreatment, paint application, paints, and paint systems. "Systems and Specifications" consists of 300 pages case bound in leatherette with hard covers. Copies may be ordered from the Council at a cost of \$6.00 each, postage paid.



HILTON & CARR Construction Co. used a $\frac{1}{2}$ -yd. Unit backhoe with sufficient room in the street to dump material. Grade for concrete sewer pipe set by ordinary grade rod. Pumps were required to keep bottom of trench dry with gravel backfill placed for pipe bedding.



PAUL VUKICH Construction Co. had to use different methods. Because of narrow street, this Northwest 25 dragline with $\frac{3}{8}$ -yd. bucket dumped material into Ford trucks for disposal. Firm used a Gradeliner for setting pipe grade. Gravel for pipe bedding was used here, too.

Many methods for 179 miles of sewer

Near Salt Lake City, one of the largest sanitary sewer projects in the West is underway. Efficient methods by the contractors are cutting the schedule in half.

WHAT WAS SUPPOSED to be a 2-yr. long period of sewer construction is going to be accomplished 9 months ahead of schedule for the Salt Lake City Suburban Sanitary District No. 1. With one contractor having got construction under way last summer on a treatment plant and five other contractors starting about the same time on the trunks, mains, and service lines—the work has rapidly progressed to where the project will be nearly complete this fall. Bids were opened in June 1954, with about 2 yr. allowed for most of the contracts.

The area in which sewers are being installed covers about 11,000 ac., almost one-half the size of Salt Lake City as a comparison. It is located just south and east of the city. With-

in this area are 129 mi. of trunks and mains, and 47 mi. of service lines—for a grand total of 175 mi. The planning for this tremendous project has been capably designed and supervised by the Salt Lake City engineering firm of Caldwell, Richards & Sorensen.

The entire project, which will cost a total of about \$8,000,000, was broken into 7 basic units for bidding by the contractors. It consists of a treatment plant, a contract for the trunk outfall lines, and five areas of roughly equal size for the installation of collection and service lines. Typical unit prices for the successful bidders are given in a separate tabulation with this article.

Tolboe & Harlin of Salt Lake City received a \$954,130 contract for the

treatment plant construction with 520 calendar days for completion. Complete treatment of the incoming raw sewage is afforded with the effluent being chlorinated before disposition into a nearby river.

What the contractors had to do

Paul Vukich Construction Co. and MGR Construction Co. of El Monte, Calif., received a \$637,529 award for the trunk lines radiating out from the treatment plant. Because all of the other contracts would tie into these trunk lines, only 120 working days were allowed for this construction. About 44,000 ft. of reinforced concrete pipe from 18- to 42-in. diameter and 12,000 ft. of 4-in. service lines made up this contract.

Statewide Plumbing & Heating Co. of Murray, Utah, received a \$1,020,869 award for 140,000 ft. of 8- to 12-in. diameter mains and 58,000 ft. of 4-in. service connections, with 2 yr. for completion. Schmidt Construction Co. of Grand Junction, Colo.,



was successful bidder on two contracts totaling \$1,623,882 that involved 339,689 ft. of 8- to 18-in. mains, 133,000 ft. of 4-in. services, and 2 yr. for completion.

Kloepfer Construction Co. of Logan had a \$524,275 contract for 96,000 ft. of 8- to 12-in. mains and 29,000 ft. of 4-in. service connections, with 2 yr. for completion. Hilton & Carr Construction Co. of Ogden has the last contract, \$281,859, for 57,000 ft. of 8- to 15-in. mains and 12,000 ft. of 4-in. service connections, with 400 calendar days for completion.

Variable ground conditions

Just about every type of ground was encountered by the contractors putting in the sewers. Ground conditions ranged from dry gravel, dirt, sand, and clay in the higher areas—to places where the ground water caused extensive sloughing of these same materials.

Average depth of trenching was 9 to 12 ft.—this depth being necessary to allow connections to the basements of houses. Depths up to 20 ft. were sometimes necessary. Because of the number of varying cut depths and ground conditions, there were just as many methods being used by the different contractors. Where the bottom of trenches was muddy, a gravel bottom was required and used uniformly by all contractors. Gravel specified and used was plus $1\frac{1}{2}$ in. and minus $2\frac{1}{2}$ in. Besides giving good support to the pipe in unstable ground, this gravel bed also allowed pumping to lower the watertable sufficiently to pour hot joints on vitrified clay pipe in the dry.

High quality pipe

Pipe specified for the project was either vitrified clay for under 15 in. in diameter or reinforced concrete

LEFT—It was rough going for the Kloepfer Construction Co. here in a clay soil with a high watertable. Bucyrus-Erie $\frac{1}{2}$ -yd. backhoe worked just ahead of pipelaying crew.

CENTER—Maze of underground utilities was often encountered. At this location Hilton & Carr had a $\frac{3}{8}$ -yd. Badger backhoe carefully working in unison with the men in the trench.

RIGHT—Gravel bedding for sewer pipe was extensively required. Methods used for placing it varied from using job-made buckets, as above, to dumping directly in trench by front-end loaders.

for over 15 in. The concrete pipe is of the dense-spun type and is fitted with rubber-gasketed bell and spigot joints. Pipe life should be at least 50 to 100 yr.

At one time this spring there were no less than 28 separate operations going on where trench was being dug and pipe installed. In the following account, several of these operations will be discussed and illustrate just about most of the conditions that were encountered on the whole project.

Hilton & Carr's operations

A typical trench dug by Hilton & Carr was parallel to a concrete paved street with the trench located as close as possible to the edge of the pavement without there being danger of street cave-in. Depth of the trench was about 12 ft. and dug by a $\frac{1}{2}$ -yd. Unit backhoe. Gravelly dirt with the watertable present in the lower 2 or 3 ft. required them to dig a trench about 10 ft. wide.

It should be mentioned, and it applies to all contracts, payment for trench excavation was by the cubic yard, but only for the dirt involved 18 in. wider than the pipe up to 18-in. diameter and 24 in. wider than the pipe for sizes over 18 in. In the case above, there was considerable over-

excavation—typical for most of the trench dug by all contractors.

Gravel for pipe bedding was delivered by dump truck and placed in the trench by a contractor-made long, shallow bucket. Cables from the bucket were attached to the backhoe for lifting and dumping.

Backfilling with an International TD 18 dozer followed closely behind pipe setting. This held bank cave-in to a minimum and kept the adjacent street as clear as possible from excavated material.

Reasons for the extensive use of backhoes by this contractor and others rather than trenching machines were twofold: opening up a wider ditch because of water problems, and better control of ditching where there were numerous underground crossing utilities. Hilton & Carr had a $\frac{3}{8}$ -yd. Badger backhoe at another location. As illustrated on these pages at this location, a maze of other utilities required extreme care.

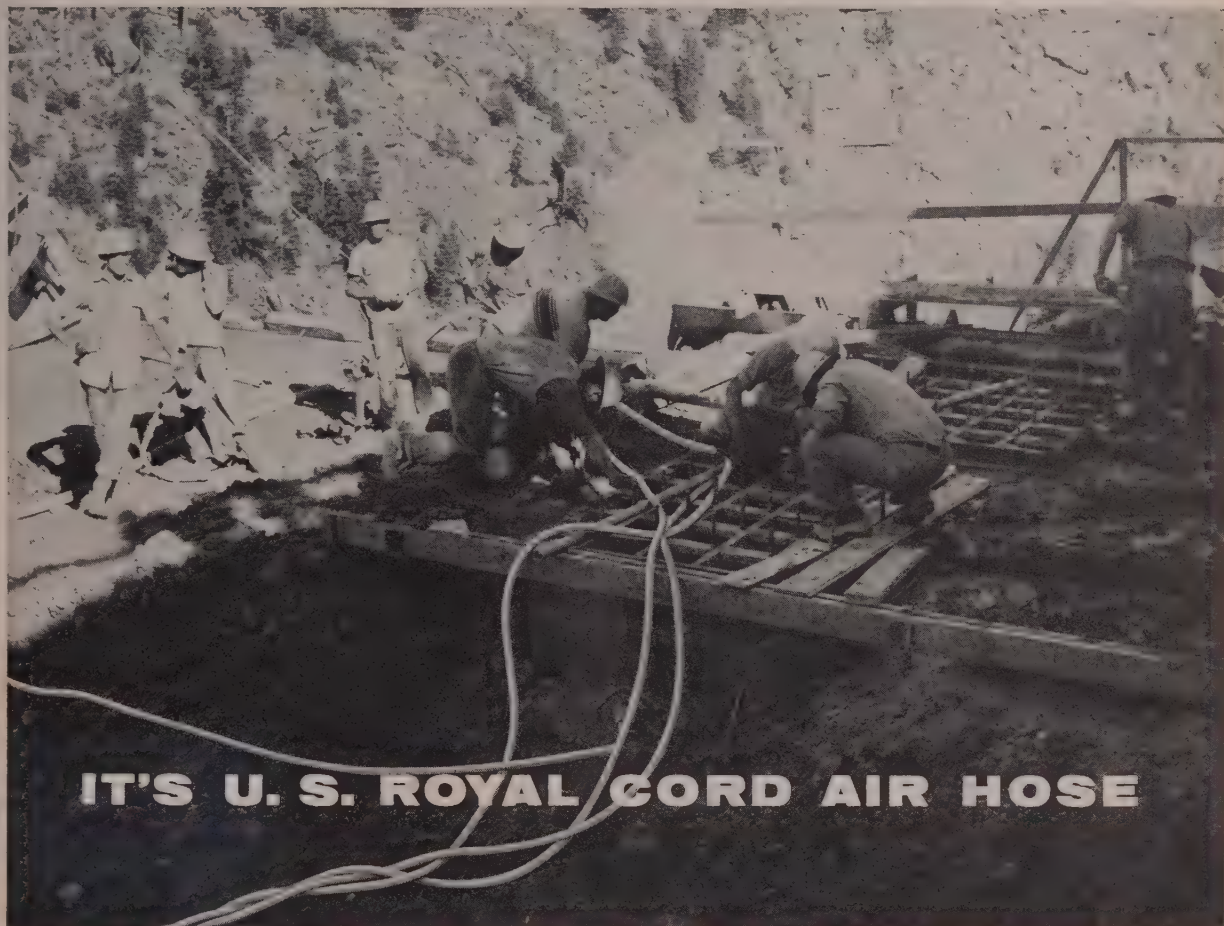
Hilton & Carr made a pipe frame with sheet metal sides that was used occasionally in caving ground. The frame was pulled along the trench bottom and offered protection to the workmen. About 3 ft. wide, 6 ft. high, and 8 ft. long, it allowed ample working room for setting small diameter sewer pipe.

Narrow streets for Vukich

Vukich's contract called for installation of the larger sized pipe—up to 42-in. diameter—and they had equipment to match. A typical operation for them on a narrow street where not much operating room was available went like this.

A Northwest 25 with $\frac{3}{8}$ -yd. drag-line bucket dug the trench. There being no room on the road for excavated material, it was loaded into Ford trucks and removed. Haul dis-

At the Denver water dam one hose takes the place of many...



The immense water-supply dam just completed for the city of Denver, Colorado, required over 8,000 feet of air hose in its construction.

The experienced contractor who handled the job picked U. S. Royal Cord Air Hose for several hard-boiled reasons:

- (1) U. S. Royal Cord Air Hose not only handles air—but also *water—and water under the extreme pressures required in washdown*. He used the hose on vibrators to consolidate the concrete—he used it as part of cooling lines on face of dam—on pneumatic tools, on sump pumps and sludge pumps, rock drills, chipping hammers, air wrenches.
- (2) The contractor found there was no need to go easy on

U. S. Royal Cord. *No need for cribbing, no time wasted by workers in selecting or storing away special hose for special jobs. No money tied up in stocking specialized hose.*

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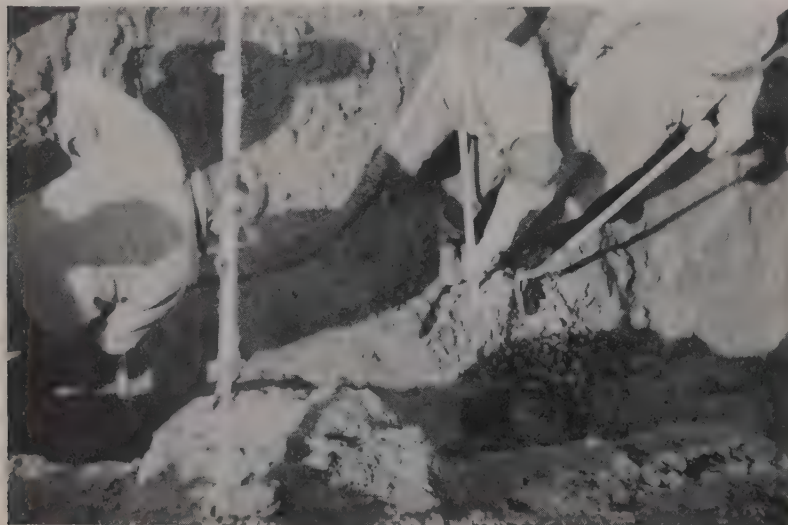
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MGR CONSTRUCTION CO. made good time with cuts to 20 ft. with this Parsons 310 trencher where ground conditions allowed. P&H truck crane handled pipe sections, and Allis-Chalmers HD-5 placed gravel pipe bedding.



TWO GORMAN-RUPP pumps did excellent work in handling soupy, muddy water for Kloepper here. Trench was never opened up for more than a few feet as placing each pipe section was a major project.



"CHUCK" KELLEY is resident engineer for this \$8,000,000 project. In the background are digester tanks built for cold weather conditions at the treatment plant being constructed by Tolboe & Harlin. Walls of tanks will have insulating mats attached to them and then have dirt backfill to the top.

tance was really held to a minimum—only 200 ft. The first 200 ft. of ditch excavation had been stockpiled. From then on the trenching and backfilling was a continuous operation with 200 ft. or less of ditch open.

Grade and line in the bottom of the trench was set by a method common in Southern California—where the Vukich firm headquarters and one that is quick and accurate. Their Gradeliner, in fact the first one ever manufactured, was set up opposite a grade stake. If the trench was large, a plank laid across it supported the instrument. A plumb bob, tape and leveling device are all incorporated parts of this instrument.

Other equipment in use by Vukich at this one location included an International TD 9 front end loader for placing gravel bedding for pipe, an Ottawa Hydra-Hammer for pavement breaking, a Cat D4 bulldozer for backfilling, and a Novo 3-in. pump for dewatering.

MGR dug deep

Trenching to a 20-ft. depth was about the maximum that the MGR Construction Co. encountered in their part of the large trunk outfall line installation. Where the ground would stand vertical cuts, and where the watertable was below the bottom of the ditch, a Parsons 310 trencher made good time. Bracing and trench jacks were required in the 2-ft. wide trench as a safety precaution against cave-ins.

A P&H truck crane was used for placing heavy sections of reinforced concrete pipe. An Allis-Chalmers HB 5 Scooploader handled backfill operations, while a Jaeger 2-in. pump handled dewatering problems.

Kloepper had mud

Messy is the word for one section that Kloepper had. Down the middle of a new subdivision street—and nothing but mud. Using a 1½-yd. Bucyrus-Erie 22B backhoe, the trench was opened up only a few feet ahead of the pipelaying crew. Trench widths varied up to 15 ft.—which didn't leave much room for the excavated material.

Gravel bedding for the pipe was the only way that the pipe could ever have been laid under such conditions. The two Gorman-Rupp 3-in. pumps kept the water level down below pipe grade—so that one pipe section at a time could be laid. An International TD 18 bulldozer handled backfilling.

In another case Kloepper had a ½-yd. Bucyrus-Erie 22B working in a gravelly-dirt area where progress was rapid with the watertable well down. A Cat D8 handled backfilling here.

Well planned field work

Caldwell, Richards & Sorenson set up a large field office to handle and coordinate the work of the contractors. One of the principal func-



A typical mountain lake where periodic restocking with fingerlings from the fish hatcheries insures fine sport fishing year after year.

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New concrete fingerling ponds at Bonneville Hatchery for handling accelerated fish program.



Fingerlings being removed from Hatchery ponds for restocking the lakes and streams of Oregon.

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ence and nature: Strength for the tank walls, to hold the millions of gallons of water needed to contain the fry; easy cleaning and maintenance, without the use of paint or other preservatives; smooth, non-toxic surfaces to protect the delicate fingerlings from injury; permanence—the first installation is the last!

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MOST MANHOLES were constructed using metal forms inside and outside. Ease of stripping entire outside form is evidenced here.



THIS PIPEFRAME box with heavy sheet metal sides was used occasionally by Hilton & Carr to protect workmen while laying pipe in caving ground. Dimensions are about 3x8 ft. by 6 ft. tall.

tions handled from there was the staking out of the lines in advance of construction. Location and depth of the lines was substantially the same for the contractors during actual installation as when they had bid on the contracts, but corrected to make sure that all houses could tie into the mains.

To accomplish this surveyors made a plot plan of each house in the area (about 11,000) and determined the depth of the basement and the location of the sewer outlet. Based on this information the final gradient and depth of the sewer could be determined with accuracy.

Severe winter problems

A late fall in 1954 enabled all contractors to work at a fast pace late in the year. But then—an unusually cold winter in Salt Lake City set in with temperatures going down to minus 15 deg. F. This brought about some tough working problems.

UNIT PRICES SUBMITTED BY THE SUCCESSFUL CONTRACTORS IN THEIR AREA OF THE PROJECT

Contractor and area	Item	Quantity	Unit price
Statewide-A	Main sewer line excavation, per cu. yd.	93,500	\$2.50
Schmidt-B	" " " " " " " "	163,500	0.75
Schmidt-C	" " " " " " " "	119,500	0.75
Kloepfer-D	" " " " " " " "	82,800	2.00
Hilton & Carr-E	" " " " " " " "	45,000	2.15
Vukich & MGR-F	" " " " " " " "	66,500	1.35
Statewide-A	Service line excavation, per cu. yd.	29,500	\$2.50
Schmidt-B	" " " " " " " "	56,000	0.50
Schmidt-C	" " " " " " " "	30,100	0.50
Kloepfer-D	" " " " " " " "	20,000	2.00
Hilton & Carr-E	" " " " " " " "	8,000	2.50
Vukich & MGR-F	" " " " " " " "	7,200	0.75
Statewide-A	4-in. vitrified clay pipe, per ft.	57,750	\$2.20
Schmidt-B	" " " " " " " "	88,600	1.90
Schmidt-C	" " " " " " " "	44,150	1.90
Kloepfer-D	" " " " " " " "	28,920	1.55
Hilton & Carr-E	" " " " " " " "	12,000	1.05
Vukich & MGR-F	" " " " " " " "	12,200	2.63
Statewide-A	8-in. vitrified clay pipe, per ft.	89,600	\$2.75
Schmidt-B	" " " " " " " "	159,500	1.84
Schmidt-C	" " " " " " " "	101,480	2.05
Kloepfer-D	" " " " " " " "	80,000	1.55
Hilton & Carr-E	" " " " " " " "	31,000	1.41
Vukich & MGR-F	42-in. reinforced concrete, per ft.	3,200	16.45
	18-in. " " " " " "	12,300	6.70
Statewide-A	Excavate, fill in unstable ground, per cu. yd.	10,800	\$5.00
Schmidt-B	" " " " " " " "	500	6.00
Schmidt-C	" " " " " " " "	4,600	6.00
Kloepfer-D	" " " " " " " "	1,500	5.00
Hilton & Carr-E	" " " " " " " "	1,000	5.00
Vukich & MGR-F	" " " " " " " "	3,597	3.00
Statewide-A	4-ft. manholes, 10 ft. deep, each	8	\$231.00
Schmidt-B	" " " " " " " "	136	190.00
Schmidt-C	" " " " " " " "	95	200.00
Kloepfer-D	" " " " " " " "	59	230.00
Hilton & Carr-E	" " " " " " " "	33	235.00
Vukich & MGR-F	" " " " " " " "	7	275.00

Frost reached a depth of 42 in. at many locations and was more than the biggest backhoes in use could open up. Gibbons & Reed Co. of Salt Lake, normally road builders, came to the rescue of the contractors with a single tooth ripper pulled by two Cat D8s. Working on a rental basis, they moved from area to area loosening up the surface for backhoe or trenching operations.

Clay soils jetted

Another general problem, common to all contractors, was that of backfilling the trenches to suitable compaction. Special care was taken on the first 6-in. cover over the top of the pipe, and the remainder usually bulldozed in and water jetted, using a water truck with a 30-ft. hose. Even clay soils settled well under this treatment.

Some uncompacted trenches were caught in the first winter freezeup. Then, in the spring of the year, they really settled. There was some inconvenience to residents of the area, but nothing that wasn't typical of a spring thaw anywhere in northern country.

Radio control over the spread-out operations was used by the three

largest contractors—Schmidt, Statewide, and Kloepfer. When something requires attention right away, such a communication system can save a lot of money and headaches.

Although maps were available prior to the beginning of work that located most of the existing utilities in the various areas—exact location was oftentimes difficult. The contractors and the engineers used electronic pipe finders for location of iron and steel pipe lines. Thus the field location was determined so as to give a minimum of interference with existing utilities.

Key men

For the engineering firm of Caldwell, Richards & Sorensen, Alton H. Sorensen was project engineer. Field personnel include Charles R. Kelley, resident engineer; Ivan Haslam, office engineer; and the following chiefs of party—Marty Roark, Earl Torgersen, Howard Nicholson.

Key men for the various contractors were as follows: Kloepfer—Eldon Kloepfer; Statewide—Ken Balus; Schmidt—Jack Cook; Hilton & Carr—Jack Hilton; Vukich—Paul Vukich; MGR—Roy Pizula; Tolboe & Harlin—Bill Harlin.

Freeway design and safety problems

By J. C. YOUNG

Engineer of Design
California Division of Highways

FEW PEOPLE will question the fact that freeways are safer and provide greater mobility for traffic than ordinary streets or highways. Experience in California shows that considering all types of accidents the number per unit of travel on freeways is approximately one-half the number per unit of travel on conventional facilities.

On the basis of traffic fatalities, the margin in favor of freeways is even greater. The number of fatalities per unit of travel on freeways is less than one-fourth the rate on other type highways. This, despite the fact that freeways carry heavy volumes of traffic at relatively high speeds. Accident records on similar facilities throughout the United States show the same relative advantage in favor of freeways.

The reason for this superiority of freeways over conventional highways, accident-wise, is not difficult to determine if the various features of freeway design are carefully analyzed. It was this careful analysis of accident statistics and design features to eliminate certain types of accidents that led to the present design standards for freeways.

Accident elimination—what kind?

Traffic accidents may be classified in many ways but for the purpose of this analysis only the following general classifications will be discussed:

1. Accidents involving pedestrians.
2. Head-on collisions between two vehicles.
3. Right angle or intersection



EARLY FREEWAY design for on and off ramps had lane at right for autos to use before making turn. Drivers didn't behave as figured and stayed in the main lane before turning with the result that rear-end collisions were frequent.

type accidents involving two or more vehicles.

4. Single-car accidents.
5. Accidents due to differential speed, frequently called rear-end or overtaking accidents.

In order to prevent pedestrian type accidents, the obvious solution is to prohibit pedestrians from using the freeway. This is done by providing pedestrian overpasses or underpasses and fencing the entire freeway. None of these features is unique to freeways, since they have been constructed on many conventional roads and streets and, likewise, pedestrians have been fenced off from portions of conventional facilities. The only difference in the case

of freeways is that in all cases use by pedestrians is discouraged, thereby almost entirely eliminating pedestrian accidents on freeways.

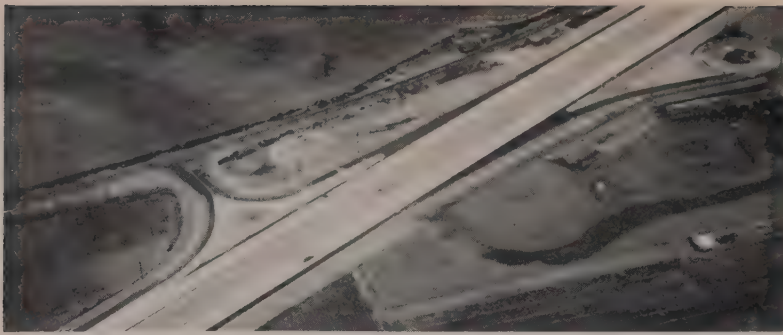
The head-on type of collision, although fortunately not high in point of numbers on conventional highways, is nevertheless frequently severe and spectacular when it does occur. Placing a dividing strip between opposing lanes of traffic, or in more common terms, constructing a divided highway, is the obvious preventive measure and has been adopted as a part of freeway design. Again, freeways are not the only type highways which are divided as there are many such highways throughout the country which are not classed as freeways and they, too, are relatively safe as regards head-on type collisions. But on the freeway, the dividing strip plus prohibition of pedestrians eliminates two distinct classes of accidents.

Conventional highway problem

Intersection type accidents, or right angle collisions, are the largest single group on conventional highways, and, in addition, they are frequently serious, resulting in numerous fatalities. The only sure cure against intersecting type accidents is to eliminate the intersection. This is done by closing some intersecting roads and providing grade separations, which means that vehicle paths cross each other at different elevations where intersecting roads can not be closed. This simple but relatively expensive expedient is, of course, not confined to freeways, as grade separations have been constructed on conventional streets and highways in many locations. How-



MODERN FREEWAY has full speed take-offs and merging lanes that have successfully done away with the rear-end collision type of accident. More time has been spent in developing freeway connection designs than all other design features combined.



FREEWAYS CAN CARRY just as much traffic 20 yr. from now if strip development is prohibited. Control of access to the freeway, properly designed, is the key to their remaining as such.

ever, it is again to be noted that in the case of the freeways, grade separations are an integral part of the design, and the safety thus engendered is added to the safety provided by the elimination of pedestrians and use of a dividing strip.

With a few minor exceptions, the only accidents that occur on freeways fall roughly into two classifications of single-car or rear-end collisions.

The single-car accident may take many different forms and for this reason does not readily lend itself to elimination by engineering measures. A single car accident is generally due to the driver losing control of his vehicle because if he were in control the accident would not occur. This lack of control is frequently due to the driver overdriving his ability or reactions and many drunken drivers are involved in this type of disaster. The only thing the engineer can do is to design the freeway with gentle curvature and good visibility ahead at all points so that it is difficult for even the reckless driver to get into trouble. These high standards of alignment and sight distance are incorporated in freeways as well as many other modern highways.

Most serious—rear-end collisions

Putting together the design features so far discussed, we have produced a relatively safe facility capable of handling large volumes of traffic safely and rapidly; however, up to this point we have overlooked one very important feature and that is how to get the traffic which wishes to use the freeway, on and off. Any time that a vehicle leaves or enters the stream of traffic on a conventional highway facility, there is a hazard introduced, due in a large measure to the slowing down of a vehicle to make a sharp turn out of the traffic stream or the entering of a slow moving vehicle into the traffic stream after having made a right-angled turn on to the facility. Both of these movements are conducive to rear-end collisions. This, then, has always been a major problem in freeway design because it is a type of hazard that can be minimized by proper design but can not be en-

tirely eliminated. There is little doubt but that more time has been spent in developing designs of connections to freeways than to any other single design feature, or possibly more than has been devoted to all of the other design features combined.

Motorists don't behave

Early attempts to remove the hazard of slowing down on the freeway consisted of constructing an additional lane of pavement parallel to and adjacent to the right hand edge of the normal pavement lanes. The theory was that when a motorist desired to leave the freeway he would pull off on this auxiliary deceleration lane in advance of the turn-off and slow down before reaching the turn-off without interference with the through traffic on the main freeway lanes. Unfortunately, careful study of traffic behavior showed that the actual path of the vehicle was not as anticipated. Most of the motorists still slowed down in the main travel lanes and left these lanes only slightly in advance of the turn-off, completely ignoring the lane which had been provided for deceleration purposes. This led to the present design of freeway take-offs, which might be called a full speed take-off, where the vehicle can turn directly into the off-ramp at his driving speed on the freeway and then decelerate on the ramp itself in advance of its connection to the city street.

Similarly, early attempts to provide an acceleration lane at entrance ramps were not too successful. It was found that unless the shape of the entrance was such as to encourage the driver to accelerate in the auxiliary lane, many drivers chose to enter the main traffic lanes close to the turn-on and in some cases if there was not a gap in traffic they would come to a complete stop and wait for such a gap. Also, these early acceleration lanes were based on the theory that all that was necessary was for the vehicle to accelerate from its speed on the connecting street to a speed about seven-tenths the design speed of the freeway.

Many of the early acceleration lanes were completely curbed and

when the driver reached the end of the auxiliary lane he was physically forced onto the main travel lanes whether there was a gap in traffic or not. Two important features of ramp design were later evolved. First, the ramp was so shaped that the vehicle was brought to a position practically parallel to the freeway lanes by means of curbs or other barriers so that he was naturally traveling in the acceleration lane in a direction parallel to the main line of traffic.

This brought out the concept that this problem was not strictly a matter of acceleration but involved merging as well. Acceleration lanes even came to be known as merging lanes. Their length was increased, depending upon the volume of traffic on the main line, which also indicates the frequency and length of gaps in traffic. Special precautions were taken even beyond the end of the merging lane and physical barriers such as bridge rails or curbs were omitted so that if the entering vehicle could not find a gap in traffic, he could still proceed on the shoulder without any particular hazard to himself or other traffic.

Modern freeway almost foolproof

With these improvements in on- and off-ramp design, we now have a facility which will carry large volumes of traffic safely and rapidly and from which traffic can turn off or enter with a minimum of friction and hazard. In other words, the freeway designer eliminated the most frequent cause of rear-end collisions, which was differential speed at entrances and exits.

We have discussed the major design features of freeways which were the outgrowth of efforts to minimize the five classes of accidents previously listed. However, there is one feature, not previously mentioned, which is probably the most important of all and that is the taking of access rights. While the restriction of access eliminates strip development along the roadside with its consequent side friction and confusion of movements and in this way reduces hazard, this feature has another very important function, which is the preservation of the investment in the highway facility.

What about the future?

In other words, as long as strip development along the roadside is prohibited, any given freeway will be capable of carrying as much traffic 20 or 40 yr. hence as it is capable of carrying on the day it is opened. No doubt it is this feature of preventing obsolescence of the facility more than anything else that encouraged the highway designer to expend such a vast amount of effort in refining the various features of design to provide the excellent over-all facility that is known as a freeway.

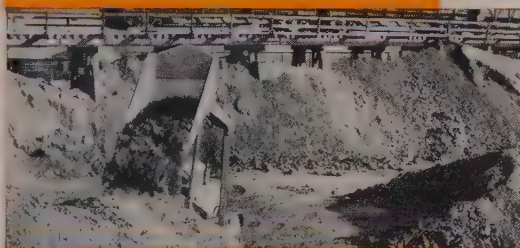
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Model 6-C Austin loads blended clay from stockpile into haulage truck at Denver Sewer Pipe & Clay Company, Denver. Loader is also used to blend various grades of raw clay and to stockpile mixtures, ready for crushing.



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REPORTS from the COURTS

By HOWARD S. BURNSIDE, Attorney and Registered Engineer

No compensation for extra work

The plaintiff was the successful bidder for a sewer construction job. The bid contained the usual provisions about having examined the location and being familiar with the specifications and local conditions. The specifications allowed the City to make alterations in the work with provisions for adjusting cost; and provided "No extra work shall be performed or change be made except upon written orders from the Engineer pursuant to authorization by the City Council stating that the extra work or change is authorized and no claim for an addition to the contract sum shall be valid unless so ordered." The contract made the contractor responsible for all loss or damage arising out of the nature of the work, from the action of the elements, from any unforeseen difficulties or obstructions which may be encountered, and responsible for completing the work according to the specifications and the requirements of the Engineer under them.

In a word, this is a "miracle" contract. It is a miracle if all conditions are met and the contractor still shows a profit on completion. However, these provisions or their equivalent are commonly found in contracts for public works. Any contractor unfamiliar with them should proceed cautiously because the contract can be applied strictly, and the courts will confirm it.

As the work progressed there were deviations from the plans and difficulties were encountered because of the location of underground lines incorrectly shown in the plans. Also, the contractor was required to do several things not shown in the plans. A dispute arose as to the amount due and the contractor brought suit. The court found that the items questioned were not beyond the requirements of the contract, that the contractor had relied on his own examination of the site of the work and not on the plans, and that the contractor had "assumed all responsibility for errors and omissions in the plans, etc."

Thus the contractor received no extra compensation for digging ditches deeper although the City Engineer ordered him to do so; or for doing various other things. In

the final analysis the court said, "If (the contractor) intended to seek compensation for any extra work or change, he should have proceeded to get the necessary authorization in accordance with the provisions of the contract. The purpose of such provisions is clearly to permit the City Council to have control over the project and its cost, as otherwise a municipality which had voted a certain amount for a public improvement might find itself obliged to pay an amount greatly in excess of the contemplated cost of the improvement."

As long as contracts are interpreted according to the plain meaning of the words used, one can expect the same result; and with sound public policy behind it as noted by the court. But it is fundamentally wrong to permit the City Engineer to order changes which the contractor must follow as a practical matter and then refuse to reimburse him because the City Council has not acted. It is also wrong to require a contractor to acknowledge his viewing of the site for an underground job and then later say he relied on his inspection rather than faulty plans furnished to him to show underground locations. This is a trap pure and simple. It is not legally wrong, as the case demonstrates, but only because the contract made the contractor responsible for anything and everything. One way these inequities can be corrected is through realistic bid conditions, specifications and contracts.

Imagine the City Council meeting to approve extra work every time a contractor encounters unexpected underground conditions. Or perhaps he should close down his trenching operation at, say, 10:30 a.m. when he strikes an unknown sewer or water line to await "a written order from the Engineer pursuant to authorization by the City Council." These are the only alternatives on many such contracts. The sensible solution is to continue work and hope to get paid later. Abstracts of the testimony in the present case suggest this as a common course followed.

"Q. Did you ever get any authority in writing from the engineer? A. We have the cut sheets.

"Q. Aside from that? A. No, that is right.

"Q. Did you ever get any author-

ization by the city council? A. I have never had authorization from a city council, in this particular job, or any other job.

"Q. . . . why is it you waited until after the job was completed before calling attention to the extra compensation? A. We expected the engineer to make the proper adjustments on his own.

"Q. But you knew the provisions of the contract . . . ? A. That is true.

"Q. . . . why . . . did you not insist upon some sort of written authorization? A. We felt we had it in our cut sheets; that is all we have on many a job. You follow this and complete the job and then proper adjustments are made; that is the usual procedure. Any where fairness is manifested by parties concerned, there is no difficulty."

The fact that fairness is manifested by negotiation at the conclusion of the job is probably the only reason rigid public works contracts persist; but this is no excuse for such unworkable, impossible and unfair conditions. They scare off legitimate competition, and are traps for the unwary contractor used to working where "fairness is manifested," in the drafting of the contract as well as its ultimate application.

The driving necessity to get jobs and keep men and equipment at work is a dominant factor in causing a contractor to accept severe terms. Where a one-sided contract is forced upon him, bit by bit, through bid conditions and specifications which are finally incorporated into the contract by reference, there results a sort of twentieth century tyranny. Those responsible for administering work should provide for reasonable, workable procedures on such things as extra work, changes, unforeseen latent or underground conditions, termination before completion, etc. It can be done and should be done.

1. *Bares v. City of Portola*, 124 C.A. 2d 819.

Notes

Uncertainty as to the fact of damage is fatal to an action for breach of contract, but equal certainty as to amount of damage is not required.

"An innocent party damaged by the acts of a contract violator will not be denied recovery simply because precise proof of the amount of damage is not available. The law only requires that some reasonable basis of computation be used, and will allow damages so computed even if the result reached is only an approximation."

The measure of damages for failure of subcontractor to furnish specified quantity of specially designed concrete is the difference between the contract price and what the principal contractor had to pay.

Allen v. Gardner 126 C.A. 2d 335.

ARIZONA

A 6x7-FT. TEST BORE should be under construction soon through Mule Mountain between Tombstone and Bisbee. This test tunnel will determine the feasibility and practicality of a large permanent traffic tunnel which would eliminate a mountainous stretch of Highway 80. Length of the tunnel is 1,830 ft.

BIGGEST PROBLEM for the Arizona Joint Legislative Highways Study Committee for the next 2 yr. will be that of highway financing. Although the State was able to take in stride the increase of \$3,000,000 in federal funds (increased from \$7,000,000 to \$10,000,000), current Congressional proposals could provide the State with as much as \$19,000,000.

RECENT MAJOR CONTRACT AWARDS and low bids in Arizona include a low bid of \$126,805 sub-

mitted by **Martin Construction Co.** of Tucson for 2.8 mi. of grading, draining, and surfacing on the Nogales-Tombstone highway. **Paul I. Nelson** of Lemon Grove, Calif., submitted a low bid of \$487,909 for 4.2 mi. of grading and surfacing in Gila and Apache National Park. **Tiffany Construction Co.** of Phoenix submitted a low bid of \$255,110 for 7.3 mi. of grading and surfacing of a new alignment of US 80 beginning 57 mi. east of Yuma.

CALIFORNIA

BUILDING CONSTRUCTION to the tune of \$18,529,243 has been approved by the state assembly ways and means committee for the State Department of Mental Hygiene. Included in the construction program is \$5,340,000 for a wing to the new medical center of the University of California at Los Angeles. Other large construction projects would be

carried out at the Patton and Agnews state hospitals.

AFTER THE THIRD TRY at bids, the Tri-Dam project will soon be under way. Twice previously bids have been rejected for various reasons. This time (May 23) there were two acceptable bids very close in amount. **Macco Corporation**; **Peter Kiewit Sons' Co.**; **Stolte, Inc.**; and **Morrison-Knudsen Co., Inc.**, were awarded the contract for \$31,200,000. Another joint venture of the **Arundel Corp.**; **L. E. Dixon**; and the **Guy F. Atkinson Co.** submitted a bid which was only \$17,000 higher.

Interesting features of the contract are that \$1,000,000 is available over and above the bid price to cover contingencies. Also, if the project is finished before planned completion date of December 15, 1958, all power revenues derived between actual completion and planned completion dates will go to the contractor. This could be as much as \$2,000,000 if the contract is finished 1 yr. early.

The project consists of two dams with their power plants and a tunnel and located on the Stanislaus River in Tuolumne and Calaveras counties, Calif.

AN UNUSUALLY LARGE covered reservoir is under construction for the East Bay Municipal Utility District (East San Francisco Bay Area). It is an excavated-type storage basin that requires the removal of 300,000 cu. yd. to form an oval 1,000 ft. long, 400 ft. wide, and 40 ft. deep. Bottom and inside slopes of the reservoir will be covered with a concrete lining and the roof of the reservoir will have lightweight concrete slabs.

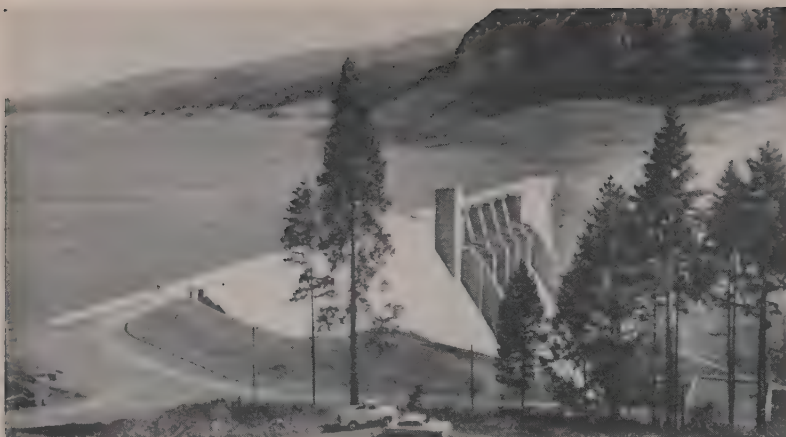
VARYING COASTAL CONDITIONS require different types of outfall sewer construction. Last year, **Western Construction** covered a project at Santa Cruz, Calif., where the first use of **Prepakt concrete** was made to embed a reinforced concrete line in a trench. **Fred D. Bowlus** of Whittier, Calif., was consulting civil engineer. On his latest project at Port Hueneme, conditions are such that the outfall will be of mechanical joint cast iron pipe supported on steel piles and cradles in a trench. A contract award for this project was to have been made late in June.

THE YUBA MANUFACTURING plant at Benicia is building the world's largest and most powerful



PRODUCING POWER BEFORE COMPLETION

At **Folsom Dam**, a key project of the Corps of Engineers on the American River 30 mi. east of Sacramento, the reservoir level is already at the spillway crest elevation—about 300 ft. above the base. Three 56-ft. high radial gates, some of the largest ever constructed, were fabricated and installed by **U. S. Steel's Consolidated Western Steel Division**. The remaining five gates will be installed later this year. The second of three 60,000-kva. generating units was expected to be in operation by July 15, with the final unit to start around the middle of October. General contractors are **Merriitt, Chapman, and Scott Corp.** of New York, and **Savin Construction Corp.** of Connecticut.



WILLAMETTE VALLEY PROJECT DEDICATED

On June 25, these two dams marked the completion of another Corps of Engineers multi-purpose project. The upper photo shows Lookout Point Dam, a combined concrete and earthfill structure. Height of the concrete gravity section is 258 ft. Over 838,000 cu. yd. of concrete were required there, and 8,250,000 cu. yd. of embankment were required in the wings. In the lower photo is Dexter Dam, a reregulating unit located 2½ mi. downstream from Lookout Point. Height of the dam is 90 ft. It has seven 44-x 35-ft. gates.

sand dredge for Utah Construction Co. To be completed in September, the dredge will move 36,000,000 cu. yd. of fill required for a residential development on the east shore of San Francisco Bay.

A 22-STORY new headquarters office building is to be constructed by Crown Zellerbach Corp. in downtown San Francisco beginning next year. The building will accommodate 2,000 people and house 200 cars in an underground garage.

THE RECENT PASSAGE of two bond propositions totaling \$14,150,000 in Sonoma County means that the Coyote Dam water project on the Russian River may soon be under way. With appropriation of the federal government's share, already authorized in 1950, the flood control and water supply distribution system can begin. The dam will be an earth structure with rock facing 160 ft. high, 2,800 ft. long, and 30 ft. wide at the crest. The dam's reservoir capacity of 122,500 ac. ft. will insure a steady water supply, badly needed, for downstream communities.

IT IS UNUSUAL when you hear of a tunnel being demolished in the same manner as that of a building. In Los Angeles, an expanding civic center required the leveling of a hill pierced by a 45-yr.-old brick and concrete tunnel. Ordinary rock and dirt excavation means were used until all that was left was the original tunnel lining. For this purpose a big steel ball, said to be the largest of its type ever cast in one piece, was swung by a crane. The crown of the tunnel was knocked out and this caused the two sides to cave in together.

ONE OF THE LARGER sewer projects of the West got under way with the \$1,359,000 award to three engineering firms for surveys, engineering studies, and designs for the \$40,000,000 improvement to the Hyperion sewage disposal plant and system in Los Angeles. The three engineering firms are Koebig & Koebig, Holmes and Narver, Inc., and Daniel, Mann, Johnson & Mendenhall. The first step, to take about 10 months, will be the design of an \$18,000,000 trunk line to run from near Culver City to the Hyperion plant.

Another 8 months will be needed for \$20,000,000 worth of modifications to the Hyperion plant itself.

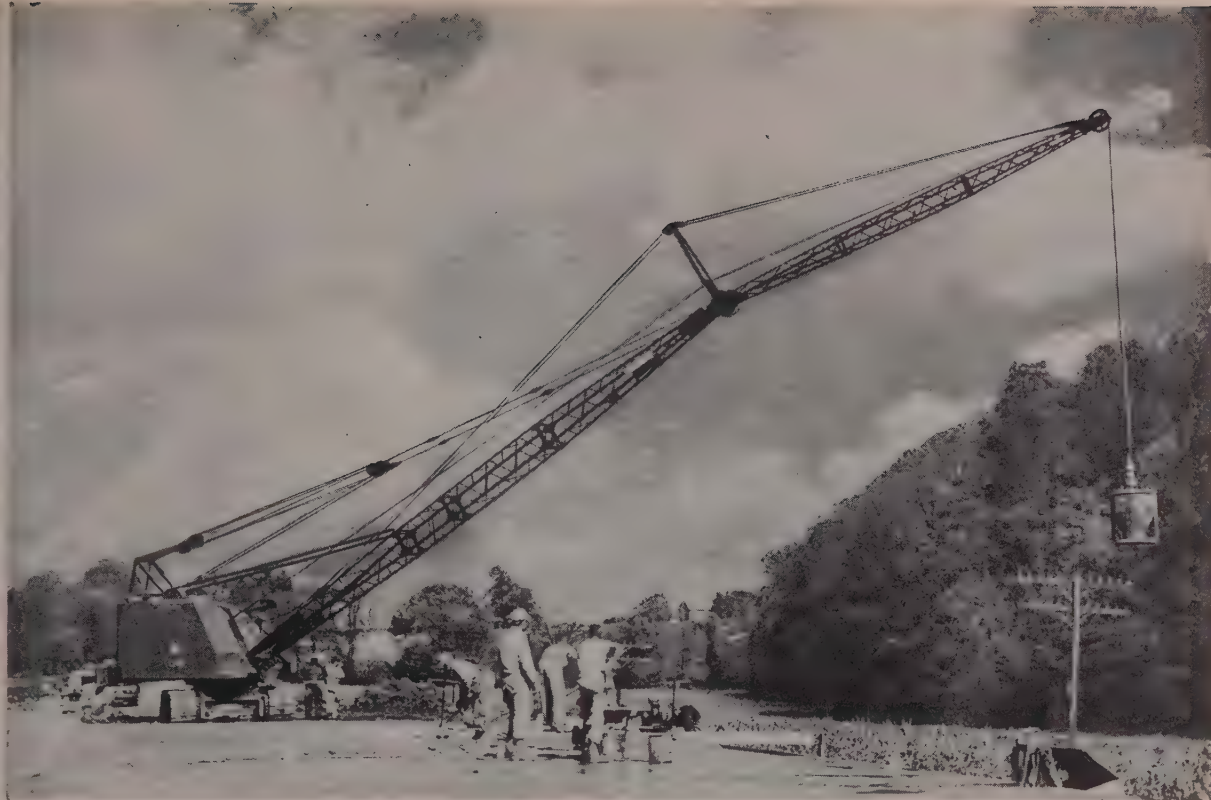
RECENT MAJOR CONTRACT AWARDS and low bids in California include a low bid of \$234,401 submitted by Asta Construction Co. of Rio Vista for 10.4 mi. of surfacing on US 99 in Yolo County. Gordon H. Ball of Danville submitted a low bid of \$1,521,676 for 5.8 mi. of grading and paving and construction of 5 bridges in Tulare County. N. L. Bosich of Garvey submitted a low bid of \$368,828 for 17 mi. of grading and surfacing in Los Angeles County. Economy Builders of San Carlos received a \$1,500,000 award for construction of a 75-home subdivision near San Carlos. W. H. Darrough & Sons of Yuba City submitted a low bid of \$205,668 for 2.8 mi. of grading and surfacing in Butte County.

Granite Construction Co. of Watsonville submitted a low bid of \$367,269 for construction of a concrete bridge and approaches in Mendocino County. Griffith Co. of Los Angeles submitted a low bid of \$209,683 for 47 mi. of surfacing at various locations in Tulare County. Harms Bros. of Sacramento submitted a low bid of \$368,157 for 1.5 mi. of grading and surfacing near Placerville. Theo. G. Meyer & Sons of San Francisco received a \$4,680,353 award for construction of a 14-story reinforced-concrete medical-science building for the University of California in San Francisco.

O. K. Mittry & Sons of Gardena submitted a low bid of \$287,912 for 1.9 mi. of grading and surfacing in Tuolumne County. Morrison-Knudsen Co., Inc., and R. A. Westbrook of Los Angeles received a 4,746,411 award for construction of a runway extension at March Air Force Base. Pyramid Construction Co. of Reno submitted a low bid of \$222,762 for 8.1 mi. of grading and surfacing in Mono County. Rothschild, Raffin & Weirick of San Francisco submitted a low bid of \$824,258 for construction of the spillway and outlet works at Cherry Valley Dam. J. A. Thompson, J. A. Thompson & Son, and J. A. Thompson & Son, Inc., of Inglewood submitted a low bid of \$1,103,171 for 3.5 mi. of grading and paving and construction of a bridge in Riverside County. J. H. Trisdale, Inc., of Redding submitted a low bid of \$474,360 for earthwork and structures on the Corning Canal of the Central Valley Project.

COLORADO

TWO LARGE HOUSING projects are scheduled for the Denver area. One is a \$20,000,000 subdivision to include 1,200 homes, shopping center, and theater with construction to start in about 2 months on this 1,000-



FAR REACHING, NEW LS-88 uses jib to spot concrete bucket on road job. Patented high gantry is raised and lowered under power, one of many optional extras.

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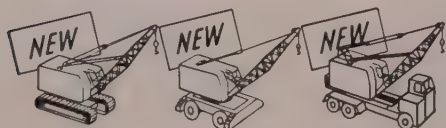
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Toronto, Ontario

ac. site. Developers are the United Construction Co. of Stockton, Kansas. The other is a \$5,000,000, 530-home development just south of Thornton. Developers are the City View Heights Co.

FOR THE COMING YEAR, Colorado has scheduled thirteen 4-lane highway projects covering 68 mi. Total cost of the road projects will be \$12,700,000.

STREET PAVING is big business in Denver where 20 mi. of it is to be done this summer at a cost of almost \$1,500,000.

THE POSSIBILITY of a tunnel through the Continental Divide in Colorado continues to make news. There are several "ifs" attached to the matter, however. If an extension of the Interstate Highway System would include such a tunnel, and if a suitable tunnel site can be found (several have been investigated) maybe it will be built. As one step in the right direction toward financing of the project, the Colorado Legislature recently authorized a \$16,000,000 bond issue for this purpose.

ACCORDING TO John C. Kreiling of the Colorado State Highway Department and as reported by the Arizona "Spotlight" the new miles of highway built since World War II in the United States could not even park the new cars produced since then—more miles of cars have been built, bumper to bumper, since the War, than miles of road.

RECENT MAJOR CONTRACT AWARDS and low bids in Colorado include a low bid of \$939,000 submitted by **A. S. Horner Construction Co.** of Denver for construction of a tunnel in Mesa Verde National Park, Montezuma County. **Lowdermilk Bros.** of Denver received a \$219,290 award for 1.9 mi. of grading, structures, and surfacing on state highway 6 in Delta County. **Pioneer Construction Co.** of Pueblo received a \$484,977 award for 8.9 mi. of grading and structures on state highway 4, in Lincoln County.

IDAHO

KAISER ENGINEERS of Oakland, Calif., recently began design work on an Engineering Test Reactor for the Atomic Energy Commission, the reactor to be constructed at a cost of \$10,000,000 to \$15,000,000 at the National Reactor Testing Station in Idaho.

UNDER THE GORE BILL for new highway construction, recently passed by the U.S. Senate, the State of Idaho would spend \$125,000,000 over the next 5-yr. period. Idaho would have to raise \$9,400,000 for

primary, secondary, and urban roads, and \$78,200,000 for the interstate highway network.

RECENT MAJOR CONTRACT AWARDS and low bids in Idaho include a \$92,221 award to **Western Construction Co.** of Pocatello for 5.5 mi. of surfacing in Bingham County. **Winn & Co.** of Buhl submitted a low bid of \$97,791 for 3.4 mi. of construction and 6.3 mi. of surfacing in Gem County.

MONTANA

THE WASHINGTON WATER POWER CO. is finally to start construction this July on the \$79,500,000 Noxon Rapids Dam in eastern Montana after recent approval by the Federal Power Commission. The project, located on the Clark Fork River will include the construction of a 190-ft. high concrete and earth-fill dam extending nearly a mile across the river, building of a power house, and relocation of Northern Pacific Railroad tracks.

MANY BIDS have been opened in the last month and a half for the construction of a major Air Force base at Glasgow. To be constructed there are a water and sewer system, paved roads and electrical distribution system, airfield paving, runway, hangars, jet fuel storage tanks, and airmen's dormitories. This defense work is under the administration of the Walla Walla District, Corps of Engineers. As a separate phase of the development at Glasgow, the Montana Power Company is constructing a 21-mi., 69,000-volt transmission line there. Swain and Morris is the contracting firm handling this work.

RECENT MAJOR CONTRACT AWARDS and low bids in Montana include a \$291,789 award to **Stanley H. Arkwright, Inc.,** of Cody, Wyo., for 6.4 mi. of grading, draining, and gravel surfacing in Jefferson County. **S. Birch & Sons Construction Co.** of Great Falls received two awards: one of \$101,339 for 62.4 mi. of seal coating on the Crow Agency-Broadus highway in Big Horn and Rosebud counties, and another of \$112,327 for 10.4 mi. of surfacing in Broadwater and Meagher counties. **N. A. Nelson Construction Co.** of Sheridan, Wyo., received a \$131,371 award for construction of a bridge over St. Mary River in Glacier County.

NEVADA

A \$3,651,000 **CONTRACT** was awarded to **C. H. Leavell and Utah Construction Co.** for major construction at Fallon's Naval Auxiliary Air Station. Included in the contract is

a 1,000 man mess hall, operations building and control tower, 50,000 sq. yd. of aircraft parking space, a steel and concrete hangar, dormitories, and utilities. Conversion of the base from an auxiliary status to a permanent installation is the reason for this work. Stead Air Force Base, just north of Reno, is also the scene of a big expansion program. Several new buildings are currently under way. This base, similar to the situation at Fallon, has been designated a permanent installation and changed in classification from Strategic Air Command to a crew-training Air Force installation.

RECENT MAJOR CONTRACT

AWARDS and low bids in Nevada include a \$647,045 award to **George E. Miller** of Reno for 1 mi. of grading and surfacing in Sparks.

NEW MEXICO

THE UNIVERSITY of New Mexico will be adding a new \$1,500,000 gymnasium. The architects Meem and Holien should have the plans ready for bidding in early October.

SIXTEEN FEET is being added to the height of the Alamogordo Dam by the Liston Clark Co. of Kansas City and under the jurisdiction of the



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Bureau of Reclamation. The added height of the dam will not increase the reservoir capacity but is further insurance against high peak flood flows of the Pecos River.

RECENT MAJOR CONTRACT AWARDS and low bids in New Mexico include a \$435,311 award to **Brown Contracting Co.** of Albuquerque for 16.6 mi. of grading and surfacing in Bernalillo and Sandoval counties. **Sheldon G. Hatch** of Taylor, Ariz., submitted a low bid of \$136,200 for 8.5 mi. of grading and surfacing in Apache National Forest. **List & Clark Construction Co.** of Carlsbad submitted a low bid of \$598,617 for enlargement of the Alamogordo Dam on the Carlsbad Project. **Lowdermilk Bros.** of Espanola, N. Mex., received a \$315,000 award for 20.9 mi. of grading and surfacing in Apache National Forest.

OREGON

THE FIRST OF THREE generators at Albeni Falls dam on the Pend Oreille River north of Spokane is now on the power lines. The second generating unit will go on the lines July 1, and the third about September 1.

A FEASIBILITY REPORT has just been recently completed by

Tudor Engineering Co. of San Francisco on a bridge near Astoria that would span the Columbia River. Cost of the project would be \$25,000,000. The entire bridge would be 4 1/3 mi. from West Astoria to Point Ellice, Wash. It would have 330 piers with the longest span 1,073 ft. and having a vertical clearance of 183 ft. above mean tide. At the present time the cost of the bridge is more than can be financed by local interests and it is not on either the federal or state lists for construction.

A 3-YR. PRELIMINARY permit has been issued to Pacific Northwest Power Co. by the Federal Power Commission for proposed developments at Mountain Sheep and Pleasant Valley. The developments are on the Snake River in Idaho County, Ida., and Wallowa County, Ore. The preliminary permit does not authorize construction but gives the company priority while making surveys and investigations.

OREGON HIGHWAY construction suffered a severe setback because of unusually wet weather during April and May. If good weather prevails during July and August, it may be possible to catch up. However, August of last year was a very bad month.

THREE HUNDRED miles of natural gas pipeline, part of the 1,600-mi.

long project between the San Juan Basin of New Mexico and the State of Washington, should be under way this month. Ray Fish of the Pacific Northwest Pipeline said the line is expected to be finished before next winter. The entire 1,600-mi. long line will be in operation by July 1956.

THE WOODROW WILSON High School at Hillsdale is being constructed by the Lift Slab process. Much of the structure is three stories high and marks a major use of this new building process in Oregon.

RECENT MAJOR CONTRACT AWARDS and low bids in Oregon include a low bid of \$139,796 submitted by **Allum Brothers** of Eugene for grading and surfacing in Multnomah County. **Herbert Bros.** of Estacada submitted a low bid of \$163,484 for grading and surfacing in Multnomah County. **Inland Construction Co.** of Milwaukie submitted a low bid of \$125,694 for construction of a R.R. overcrossing in Clackamas County. **Tom Lillebo** of Reedsport submitted a low bid of \$159,950 for construction of the Applegate River bridge in Josephine County.

UTAH

PACIFIC NORTHWEST Pipeline Co. has awarded the first eight contracts for construction of the natural gas pipeline that will initially extend almost 1,500 mi. from the San Juan Basin of New Mexico to the Pacific Northwest. Fish Northwest Constructors, Inc., with headquarters in Salt Lake City, is doing the design work. The first contracts awarded cover 387 mi. of 26-in. and 268 mi. of 22-in. steel pipe line. This takes in the portion of the line from Ignacio, Colo., to Burley, Idaho. Contracts were awarded to River Construction Corp., Ft. Worth, Texas, to lay pipe from Ignacio to Moab, Utah; R. H. Fulton & Co., Lubbock, Texas, from Moab to Jensen, Utah; Associated Pipeline Contractors, Inc., Houston, Texas, from Jensen to a point southwest of Green River, Wyoming; A. J. Curtis Construction Co., Casper, Wyoming, from southwest of Green River to Sage, Wyoming; B. & M. Construction Corp., Oklahoma City, Okla., from Sage to Lava Hot Springs, Idaho; Midwestern Construction, Inc., Tulsa, Okla., from Lava Hot Springs to a point east of Burley, Idaho.

RECENT MAJOR CONTRACT AWARDS and low bids in Utah include a low bid of \$204,809 submitted by **Gibbons & Reed** of Salt Lake City for 2.8 mi. of grading and surfacing in Weber County. **Peter Kiewit Sons' Co.** of Denver submitted a low bid of \$3,458,285 for construction of a runway at Hill Air Force Base.

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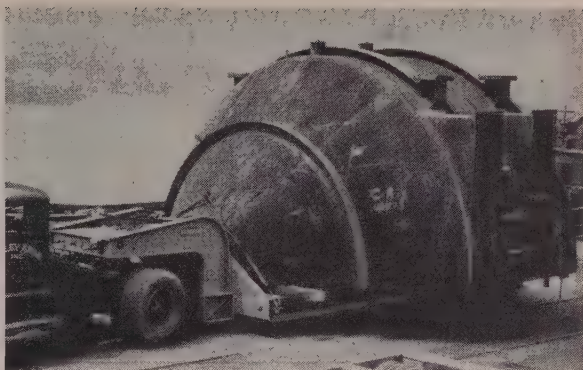
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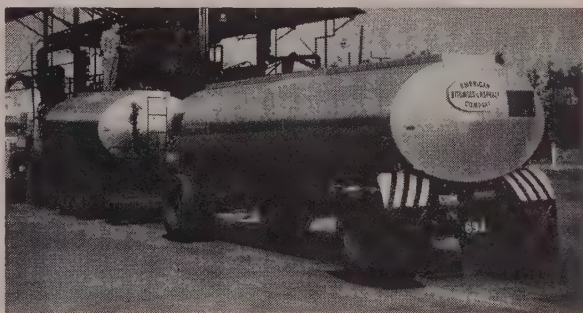
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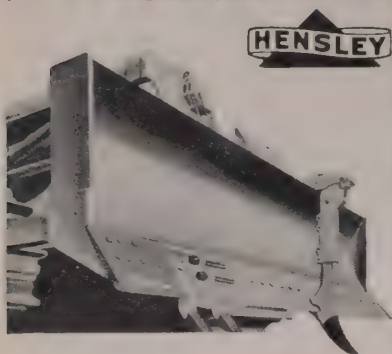
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Western Traction Co., Sacramento
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Joe Smith Machinery, Denver
Johnson-Tudor Co., Denver

IDAHO:

Engineering Sales Service, Boise

MONTANA:

Treasure State Equipment, Kalispell and Missoula
Westate Machinery, Billings

NEVADA:

Elko Blacksmith Shop, Elko
Pioneer Equipment, Reno

NEW MEXICO:

Lively Equipment Co., Albuquerque

OREGON:

Cal.-Ore. Machinery, Medford
Western Equipment Co., Eugene and Portland

TEXAS:

Deal's Machine Shop, Lubbock
Hi-Way Machinery, Dallas and San Antonio
Lively Equipment Co., El Paso

UTAH:

J. T. Holland Co., Salt Lake City

WASHINGTON:

Pacific Holst & Derrick Co., Puyallup and Seattle
Western Machinery Co., Spokane

WYOMING:

Kereml Tractor & Equip. Co., Cheyenne and Casper

WASHINGTON

IN THE PRESENT DAY rural expansion of large cities, Spokane is no exception. The city has been expanding northward with \$10,000,000 in new homes now planned. One of the major bottlenecks has been development of an adequate sewage and water system to serve the area. With most of the homes to be sold under FHA or Veterans Administration financing, both federal and county specifications for utilities must be met.

A BLUEPRINT for a growing diversified economy that will benefit every community of the Puget Sound-Cascade region was provided recently in a comprehensive program for electric power development prepared by Jack D. Stevens, consulting engineer. This report was prepared for the Puget Sound Utilities Council.

Action is already under way on a number of the recommendations of the Stevens report. Discussions with government officials of the United States and Canada are looking to construction of the proposed \$250,000 Mica Creek Dam on the Upper Columbia River in British Columbia. Preliminary permits or licenses have been received from the Federal Power Commission on seven proposed hydroelectric projects, and engineering investigations are under way on six others.

Largest is the 585,000-kw. Rocky Beach project on the Columbia just above Wenatchee. It also may be the first built under council-federal partnership—Chelan P.U.D. holding a preliminary permit for the dam. President Eisenhower's budget contained \$2,000,000 initial appropriation under the expectation the government will pay for the cost of non-power features. Seattle City Light is exploring the development of a 265,000-kw. dam at Boundary on the Pend Oreille River. Tacoma City Light proposes Cowlitz River projects at Moss Rock and Mayfield.

Snohomish P. U. D. is studying four projects, two on the Sultan River, to yield 110,800 kw. Chelan P. U. D. is investigating projects for 110,000 kw. at Chiwawa and Leavenworth, in addition to Rocky Beach. Including the Mica Creek study, these council proposals total 2.8 million kilowatts of added capacity for this region.

WORK BEING DONE for the Tacoma Department of Public Utilities includes several large contracts. A \$499,039 contract was awarded to Buchanan, Sather and DeRyche for installation of the fourth generating unit at Ross powerhouse. Several minor projects are included in that bid. \$136,150 is to be spent also at Ross to groud the access tunnel and

cross tunnel leading to the dam, to regROUT a portion of the foundation, and to inspect the spillway surfaces and make necessary repairs. At Gorge Powerhouse, \$1,254,000 is to be spent in preparing the four generating units for high-head operation. Construction of Gorge High Dam will increase the head (the height the water will drop) at Gorge from 294 to 382 ft. On the dam construction, the contractors still have only one shift working.

COUNTY-LEVEL highway construction can be sizable in some states. Spokane County will spend \$22,000,000 in the next 2 yr. if the State Highway Department's plan for modernization is carried through.

THE PACIFIC Sand and Gravel Co. is seeking to lower the lake level of Plummer Lake, near Centralia, by 10 ft. Purpose of this is to lower the lake enough so that material can be excavated from its banks for use as fill on the new Pacific Highway route. A pump capable of handling 8,000,000 gal. a day is being used—it is hoped that it can keep the lake level down 10 ft.

RECENT MAJOR CONTRACT AWARDS and low bids in Washington include a \$260,368 award to A. J. Cheff Construction Co. of Seattle for construction of an undercrossing in Thurston County. **Columbia Asphalt Paving Co.** of Yakima received a \$245,005 award for 3.6 mi. of grading and surfacing in Quincy, Grant County.

J. N. Conley of Portland received a \$228,962 award for 1.4 mi. of roadwork on state highway 8 in Skamania County.

Peter Kiewit Sons' Co. of Long view received a \$510,475 award for 3.9 mi. of grading and surfacing state highway 12 in Wahkiakum County. **MacDonald Building Co.** of Tacoma received a \$1,684,202 award for construction of temporary barracks and mess halls at Fort Lewis. **Murphy Bros., Inc.**, of Spokane submitted a low bid of \$319,717 for earthwork, canal lining, and structures on the Kennewick division of the Yakima Project.

WYOMING

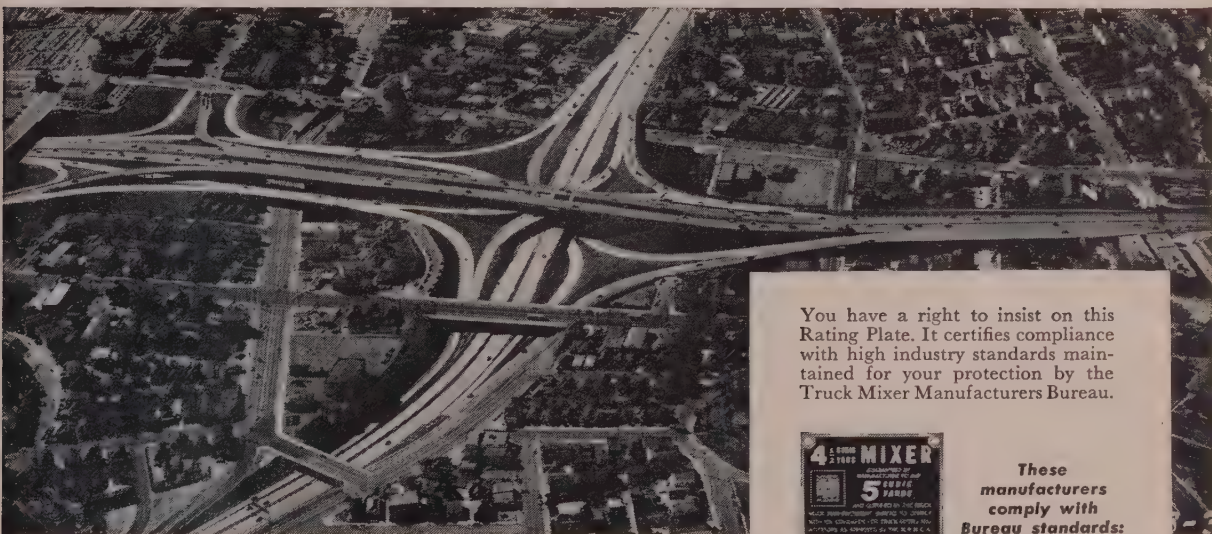
A ROAD PROJECT should be getting under way the first of this month to provide a truck route through east Cheyenne and out of the city limits to make a junction with Highway 30. The project will be handled by the state highway department with the city participating in the cost. Truck traffic from some of the major streets in the city will use the new route and relieve some present traffic congestion.

See the complete Hensley line at your nearby Hensley dealer!

Hensley
EQUIPMENT COMPANY, INC.
800 PERALTA AVENUE • SAN LEANDRO, CALIFORNIA



COMPLEX TO LOOK AT, BUT SIMPLE TO DRIVE: Four traffic levels in a single bridge structure makes a lot of sense to Los Angeles motorists. It enables the traffic of two crossing Freeways to interchange with a simple turn in the desired direction and provides a right-hand take-off and junction, and minimum travel distance, at all times. California Division of Highways Official Photos.



You have a right to insist on this Rating Plate. It certifies compliance with high industry standards maintained for your protection by the Truck Mixer Manufacturers Bureau.



**These
manufacturers
comply with
Bureau standards:**

mixed in transit . . .

Because mobile truck mixers travel nimbly where it is not practical for other equipment to operate, ready mixed concrete has long been the preferred material for building and paving concrete highway "structures." Modern highways, turnpikes and expressways, with their entries, exits, grade separations and interchanges, have so increased this use that ARBA estimates show ten new truck mixers are now needed, to pour structures, for every new spreader and finishing machine required to finish pavement slab.

Highway standards are high standards. State Highway Departments, in increasing numbers, specify that ready mixed concrete be processed in truck mixers of proper design, capacity, mixing speed and water control accuracy, as certified by Bureau Rating Plate.

BLAW-KNOX EQUIPMENT DIVISION
Pittsburgh, Pa.

CHAIN BELT COMPANY
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Los Angeles, Calif.

CONCRETE TRANSPORT MIXER CO.
St. Louis, Mo.

CONSTRUCTION MACHINERY CO.
Waterloo, Iowa

IMPERIAL CONSTRUCTION EQUIPMENT CO.
Melrose Park, Ill.

THE JAEGER MACHINE COMPANY
Columbus, Ohio

THE T. L. SMITH COMPANY
Milwaukee, Wis.

WILLARD CONCRETE MACHINERY CO., LTD.
Lynwood, Calif.

WORTHINGTON CORPORATION
Plainfield, N. J.

Unique Prefab Form System Speeds Sewage Plant "Y" Wall Construction



MECHANIZED FORMING with new "Y" wall trusses and UNI-FORM Panels speeds construction, saves labor and material

Field reports on a new system for forming "Y" walls in aeration tanks and settling basins indicate very satisfactory operation and important labor and material saving advantages for the system.

Developed by the Universal Form Clamp Co., Chicago, the new system is said to completely eliminate the many problems and difficulties encountered by contractors in forming this special type of wall in sewage disposal plant construction.

Specially designed trusses, which can be made to handle any type, height, shape or wall thickness, are used in conjunction with standard UNI-FORM Concrete Forms to form the "Y" wall. Assembly of the truss and UNI-FORM Panels into a complete form, ready to receive concrete is a fast, mechanical operation. Positive internal spreading and accurate wall thicknesses are assured by the use of Universal Spir-oloc Cone Nut Assemblies.

Features incorporated in the design and operation of the Universal "Y" wall form-



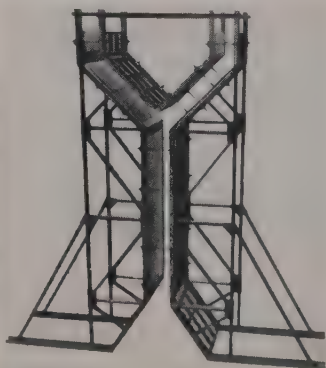
STRIPPED WALLS are clean and accurate. The system eliminates the necessity of additional lumber or tying devices for the alignment and bracing of the unit.

Erection, stripping and movement of the form can be handled either as individual

pieces or as a large unit. Both methods have been very successfully used on recent projects.

Because standard UNI-FORM panels are used to form a large percentage of the "Y" wall contact area, it is possible to strip all UNI-FORM panels within a very short time after the actual pouring of concrete, leaving the trusses in place to provide the necessary support for the required period of time.

In this way, faster forming cycles, using minimum UNI-FORM equipment are pos-



ASSEMBLED SECTION of "Y" wall truss with UNI-FORM Panels

sible, resulting in lower labor and material costs. UNI-FORM Panels are rented or sold, or rented with an option to purchase.

For complete details on Universal "Y" wall forms and UNI-FORM Panels, Write:

K. C. CONSTRUCTION SUPPLY CO.
Denver, Colorado

UNIVERSAL FORM CLAMP CO.
San Leandro and Los Angeles, Calif.

Here and There

THE BIG ALUMINUM PLANT at Kitimat continues to expand. Basic construction on this project was covered by **Western Construction** in 1954. The powerhouse at Kemano, B. C., which supplies electricity to Kitimat, now has three generating units, each with a capacity of 150,000 hp. A fourth generating unit of the same capacity is now being built. Initial aluminum production of the plant last August was 91,500 tons a year and will eventually rise to 550,000 tons of the primary metal yearly.

THE U.S. SENATE has approved a bill sponsored by Senator Albert Gore authorizing a 300% increase in federal funds for a national road-building program. It provides for \$18,000,000,000 to be spent in the next 5 yr. A breakdown of this amount is as follows for the various types of roads: The federal government and the states would each put up \$4,500,000,000 on a 50-50 basis for primary, secondary, and urban roads; on the interstate system the federal government would put up 90% of the funds against 10% of state matching funds, this amounting to \$7,750,000,000 for the government and \$861,000,000 for the states.

Adoption of this bill means President Eisenhower's 10-yr. road plan has been decisively rejected by the Senate.

HELLS CANYON DAM on the Snake River, bordering on the states of Idaho and Oregon, is still a controversial subject. At the present time here are the developments. Federal Power Commission Examiner William J. Costello recently recommended in an initial decision that Idaho Power Co. be given a license for one dam instead of the three for which they are applying—the three dams being Brownlee (approved by FPC), Ox Bow, and Hells Canyon. However, it is not expected that the Federal Power Commission will make a decision on whether to approve or disapprove the application for three dams for several months yet.

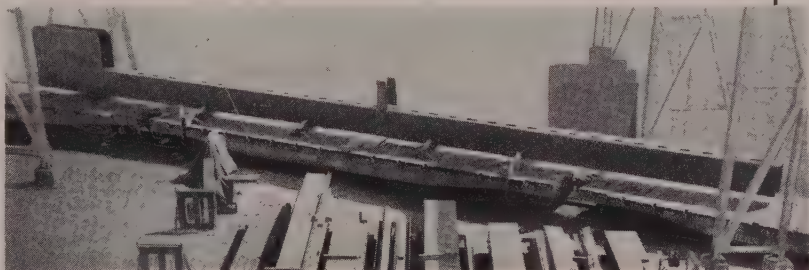
In the meantime, the U. S. Senate Interior Reclamation Subcommittee is scheduled to take a vote on the high Hells Canyon Dam. The House Interior Reclamation Subcommittee is scheduled to start hearings about now on a bill to authorize the Federal Hells Canyon Dam.

HIGHWAYS AREN'T the only field for big construction in the coming years. The U. S. Department of Commerce has stated that state and local governments should build \$200,000,000,000 worth of new schools, hospitals, and other public works during the next 10 yr.

Want to see what **YUBA** can fabricate for YOU?



Yuba designed this screen for long life and minimum maintenance. Inner screen of $\frac{3}{8}$ " U.S. Abrasion Resisting Steel has holes drilled to prevent clogging. Inner and outer screens easy to renew. Can be completely lubricated from outside.



This bottom chord for Richmond-San Rafael bridge is 94' long, weighs 48 tons. Fabricated by Yuba from steel supplied by Judson Pacific Murphy.

Here are two big samples . . . This jacketed screen, 35' long and 8' in diameter, now washes and screens three sizes of sand simultaneously for Morrison-Knudsen at Table Rock Dam site in Missouri. Right, one of 96 chord and truss members fabricated by Yuba for Richmond-San Rafael bridge builders, Judson Pacific Murphy-Kiewit.

One or many, large or small . . . Whether it's a single machine like the Morrison-Knudsen aggregate screen, or a production run, Yuba is equipped to design and build to fit your needs and your time schedule. It doesn't have to be big either—we forge, fabricate, and machine both large and small parts to close tolerances.

Facilities at our Benicia plant—handy to deep water, railroad or truck shipment—include:

ENGINEERING AND DESIGNING • STRUCTURAL STEEL FABRICATING
HEAVY & LIGHT MACHINING • WELDING • FORGING • HEAT TREATING
PATTERN MAKING • EXPORT PACKING AND SHIPPING

*Send us your drawings and specifications for estimates.
No obligation. Wire, write, or telephone EXbrook 2-0274.*

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Room 653, 351 California St., San Francisco 4, California, U. S. A.

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YUBA builds-to-order such things as:

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Bridge & structural members
Water & fuel tanks
Mineral jigs
Placer & hydraulic dredges
Perforated screen plates
Revolving screens
Expansion joints
Hot-blast & stack valves
Pneumatic & hydraulic control equipment

91



ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

ALASKA'S HUB—Booming Anchorage has nearly 50% of the estimated labor force in Alaska, a recent Territorial Employment Service survey shows. Right now the Anchorage area boasts a total labor force of more than 21,000. The Fairbanks labor force is estimated at about 12,000. Juneau, the Territory's capital, has an estimated labor force of 5,900. Anchorage still has about 2,000 persons seeking jobs and Fairbanks has more than 800 jobseekers.

NEW AIR FORCE STATIONS—The Air Force in Alaska is adding two more completely military installations to the chain of seven Air Force stations on which construction is scheduled to start this summer. These stations are located at isolated points strung across the Territory. Total costs of the nine projects will run around \$25,000,000 according to the Alaska District Engineers.

WAGE TALKS—Negotiations between the Alaska Chapter of the Associated General Contractors and the Alaska Council of Carpenters were

scheduled to resume June 20. The carpenters are the last basic trade to conclude a 1955 wage contract in Alaska. All other crafts have agreed to a ten cent an hour across-the-board wage increase. The carpenters are expected to negotiate in terms of working conditions and increased fringe benefits rather than increased wages. They are, of course, entitled to the ten cent an hour increase offered other crafts under the provisions of their present contract.

TROOP LABOR—Alaska Unions and contractors are up in arms again with regard to the problem of military competition with civilian labor on Alaska construction projects. Such competition has been denounced by the Anchorage Central Labor Council and also the Associated General Contractors. In a wire of protest sent by the Central Labor Council to the Territorial Commissioner of Labor, Henry Benson, the council declares that the military plans to use troop labor on at least four construction projects. The projects are at Sparravohn, Naknek, Galena, and Indian Mountain accord-

ing to the labor organization. Work involved includes construction of roads, power lines, buildings, and general construction.

CONSTRUCTION NEWS CAPSULES—Reginald Whitman, the new general manager of the Alaska Railroad has predicted the possibility of reduced freight rates on the railroad. Such a reduction would materially cut the cost of Alaska construction by slashing the transportation charges each project must contend with... A \$525,000 school is being planned in the Turnagain-By-The-Sea suburb of Anchorage with completion scheduled by the fall of 1956... Construction in Alaska's oil exploratory work is involving sizable sums. Typical is the \$100,000 invested by the Aledo Oil Company of Fort Worth, Texas, in the Alaska Oil and Gas Development 128 mi. north of Anchorage... The City of Anchorage is in the midst of a 54-block paving program; the completion is set for this summer... An electrical heating system is being laid on a section of one street as an experiment to determine whether it can keep ice and snow off that section. If successful, the system will be used on many of the hills, of Anchorage that make driving hazardous in the winter... Work has begun on the extension of the North Douglas Road near Juneau.

DO YOUR BLASTING HOOK UPS DEMAND:

Maximum Safety—?
Freedom From Electrical Hazards;
Electrical Storms—?
Simplicity of Hook Up—?
Assurance Every Hole Is Fired—?
Lowest Overall Costs—?

THEN YOU'LL FIND PRIMACORD* IS THE
ANSWER ON YOUR OPERATIONS. ASK YOUR
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*4 types available:
PLAIN, REINFORCED,
WIREBOUND, PLASTIC.



COAST MANUFACTURING & SUPPLY CO.
LIVERMORE, CALIFORNIA

Easy... to handle
to drive
to locate ...
and they're
permanent!

The New
Copperweld Non-Rusting
SURVEY
MARKERS

A thick copper covering prevents corrosion, while the steel core provides strength and rigidity for easy driving. The Copperweld Moltan-Welding process makes the two metals inseparable.

*Trade Mark

At little cost, Copperweld* Survey Markers protect the investment of the original survey. They can't rust or rot, and they're simple to install—won't splinter or break. The bronze head can be readily center punched for precise reference. Want more details on this economical method for identifying survey points permanently? Write for Bulletin No. 144.

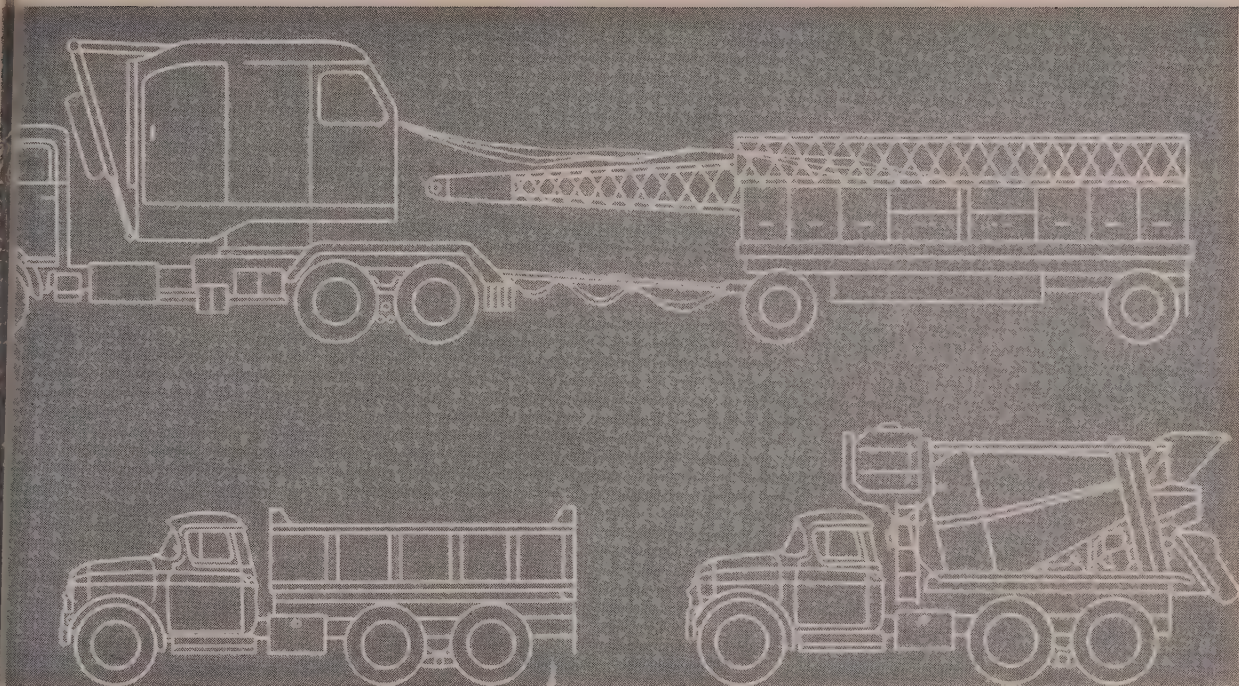
Standard length is 3 feet—other sizes made to order. Packed 10 markers to a carton.

COPPERWELD STEEL COMPANY
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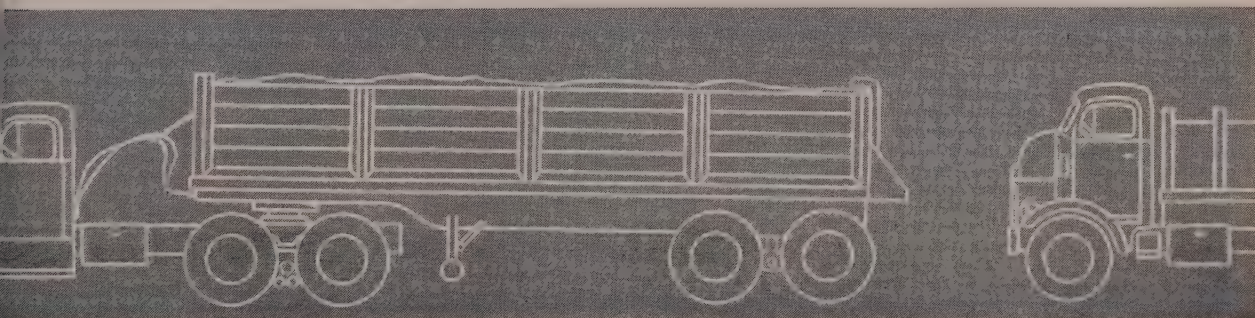


No MATTER what you haul—or where you haul it—you'll find a new GMC Blue Chip tandem-axle model engineered to handle bigger loads—faster—with lower running costs—less time out for repairs—greater driver comfort—in more safety—over a longer truck-life—than ever before. For proof, see your GMC dealer *now!*

You can cash in on Blue Chip tandem-axle advantages . . .

- in 19 models from 28,000 to 59,000 GVW
40,000 to 90,000 GCW
- with a choice of gasoline and Diesel power—155 to 230 h. p., including new 175-h.p. V8.
- with a wide selection of wheelbases from 146 to 224 inches.
- with up to 11% greater frame ruggedness—plus full-length frame reinforcements available as a factory-installed option.
- with time-saving, money-saving, truck-saving Hydra-Matic in 9 models throughout the range.
- with improved turning ability for close-quarter maneuvering and work in traffic.

GMC TRUCK & COACH—A *General Motors Division*



ENGINEERS on the move

Bernard G. Brady, assistant chief of the supply and procurement division of the North Pacific Division of the Corps of Engineers in Portland, has been transferred to California to become chief of the management branch of the Corps at Sacramento. Brady started his service with the Army Engineers at Fort Peck, Mont., in 1934 during construction of Fort Peck Dam. He has been attached to the North Pacific Division for the past nine years.

* * *

Kenneth M. Christinson, engineering division, recently returned from a two-year tour of duty, specializing in air field paving at Casa Blanca, and has been assigned director of the Division laboratory at Troutdale, near Portland.

* * *

Robert E. Loudon was recently assigned project engineer of the Lower Los Angeles River Unit 4 of the Los Angeles District of the Corps of Engineers. At the same time **Leonard G. Hogue** became project engineer of Unit 5. Both men are located at Long Beach.

* * *

J. Y. Long Co. Engineers, engineering firm with headquarters in Oakland, Calif., announces the moving of their offices to their own build-

ing located at Ninth and Oak Sts. The firm practices the broad field of civil engineering, including planning and design of buildings, bridges, subdivisions, streets, drainage and sewage projects.

* * *

L. A. Hostetter announces the opening of his engineering office at 2321 Twenty-first St., Sacramento, Calif. With a varied background in engineering, Hostetter spent over

**L. A.
Hostetter**



seven years as special projects engineer and irrigation consultant with International Engineering Co., Inc., San Francisco.

* * *

William H. Wisely took office May 2 as executive secretary of the American Society of Civil Engineers. He succeeds **Col. William N. Carey**, who held the post for ten years.



NEW IRRIGATION SYSTEM for two districts near Coeur d'Alene, Idaho, is examined by (l. to r.) **Dean J. Mutch** and **Percy H. Pharr, Jr.**, construction engineers for the Bureau of Reclamation, and **Oscar Smith**, assistant superintendent of Intermountain Company, which is installing the system under the Bureau's supervision.

Design for Lift Slab

AN EXCELLENT reference, the Lift Slab Engineering Manual, is now available for architects and engineers. Technical information has been organized for instant reference in both general form and in practical examples that have proven successful.

There appears to be no limit to what can be accomplished with this new building method. Seven-story buildings, slabs lifted on 36 columns simultaneously, loads per column of 150,000 lb., spans of 30 to 68 ft. depending upon the slab design—all this bears out the versatility of the method.

Copies of the manual are registered and available only to architects and structural engineers at \$5.00 per copy. Write to **United States Lift Slab Corp.**, Perry Brooks Building, Austin, Texas.

Lawrence Moon and **Raymond Reed** of the bridge division of the Washington State Department of Highways recently resigned to take employment with a private engineering concern.

* * *

Jay Rassler, a registered civil engineer in the State of California, who has worked with many major engineering firms in the Los Angeles area, was recently elected vice president of **Karl F. Tuttle Co.** Headquarters of this engineering and surveying company are located at Arcadia, with branch offices in Los Angeles, San Diego, San Francisco, and Alaska.

* * *

H. W. Johansen was recently appointed as district engineer of the Fairbanks District of the Alaska Road Commission.

* * *

Reports from the hydroelectric design branch, North Pacific Division, Corps of Engineers, Portland, contain the following notes about its engineering personnel. **Karl J. Drus** has retired after 22 years' service. **Dock A. Brown**, electrical engineer, has transferred to the engineering division of the Seattle District, and **William Farrow**, structural engineer, has gone to the Middle East District and is now stationed in Tripoli. **Robert G. Fischer**, mechanical engineer, has resigned to accept a position with the Bechtel Corporation in Los Angeles.

* * *

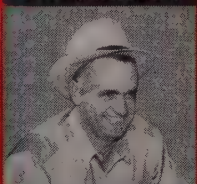
Colonel William F. Cassidy, as of June 1, took over the responsibilities of the Division Engineer of the South Pacific Division, Corps of Engineers, at San Francisco, replacing



Master Mech. Olyn Saine



G. P. Rep. Jack Hanafin



Super. Harold McNees

Four interchange bridges, three highway undercrossings and a pedestrian walkway — latest links in the vast Southern California freeway network — are now being completed by Freeway Constructors of San Gabriel, Calif.

All work is proceeding without interference to the 80,000 vehicles which pass daily on the busy Santa Ana Freeway, one mile east of Los Angeles city limits.

Superintendent Harold McNees and master mechanic Olyn Saine credit much of their firm's success in meeting the rugged schedules to the General Petroleum products and service which have kept their equipment operating at top speed.



GENERAL PETROLEUM CORPORATION

Colonel Paul D. Berrigan who becomes North Central Division Engineer at Chicago effective July 1.

* * *

Lt. Col. Vernon T. Loesing, CE, recently took over as new resident engineer for Ladd and Eielson Air Force Bases, replacing Lt. Col. J. K. Addison who was reassigned to Fort Sam Houston, Texas, after his 3-



Addison

Loesing

year tour with the Alaska District. Colonel Loesing was assigned to the Alaska District last July, first as assistant to the resident engineer at Elmendorf and at Fort Richardson, and later as project officer over construction at Eielson.

* * *

The builders of most of the heavy engineered construction projects in the West—dams, bridges, aqueducts, stadiums, etc.; Shasta, Hoover and Grand Coulee dams, etc.—are forming an organization called the Beavers. Included in the group also will be companies which are supply organizations (materials, engineering, etc.), publishers, legislators, and others who have shown their belief and faith in the competitive contract system. One of the final organizational meetings took place in Los Angeles, April 29. The Beavers plan



LT. COL. J. R. McCAMMON, executive officer of San Francisco District, Corps of Engineers. Colonel McCammon has been directing the functions of his office since coming to San Francisco in March of this year from Germany, where he was chief of repairs and utilities, Western Area Command, U.S.A.

struction Co., has been selected as first president of the Beavers. Other officers named by the founders are: L. E. Dixon, senior vice president; George H. Atkinson, junior vice president; J. C. Maguire, secretary-treasurer; J. P. Shirley, Jr., assistant secretary-treasurer; and James L. Lovell, ambassador of good will. The first board of directors includes, in addition to Johnson, Dixon, Atkinson and Maguire: Herman Brown, Allen D. Christensen, S. M. Griffith, S. E. Hunkin, Algot F. Johnson, Henry J. Kaiser, E. L. Kier, Peter Kiewit, John MacLeod, A. B. McEachern, Harry W. Morrison, F. W. Parrott and Jim Yates.

* * *

Glenn E. King, secretary of the Arizona State Highway Commission, resigned July 1 to become executive secretary of the Arizona Chapter of Associated General Contractors. The Commission has appointed James Herron of Pinal County to fill the vacancy left by King's departure.

* * *

In accordance with the policy of the Bureau of Reclamation in Region 3 at Boulder City, Nev., of rotating key personnel between regional and project offices, the following changes are announced. Acting regional engineer H. W. Van Loo goes to Yuma as projects manager, succeeding Murray J. Miller who moves to Boulder City as regional engineer. Miller fills the vacancy made by the recent appointment of J. P. Jones as regional director.

* * *

Luther E. Cliffe, an employee of the Bureau of Reclamation since 1933 who worked continuously (except for 4 years military duty) on the Columbia Basin Project until September 1947 when transferred to the Bureau's office in Washington, D. C., resigned in April to accept a position

as an assistant resident engineer with the Power Authority of the State of New York.

* * *

O. J. Porter & Co. and L. C. Urquhart, who have been associated since Jan. 1, 1953, with B. E. Beavin, Sr., under the name of Porter, Urquhart & Beavin, henceforth will continue their consulting engineering business under the name of Porter, Urquhart, McCreary & O'Brien. Bruce D. McCreary will continue as partner in charge of the San Francisco and Sacramento offices, and Kenneth H. O'Brien will remain in the same capacity in the Los Angeles office. Bernard M. Gordon recently joined the staff as head of the West Coast foundation engineering division office. Beavin has opened a separate consulting engineering office in Baltimore and will be associated with the above firm in the East on joint ventures or as consultant.

* * *

Holmes & Narver, Inc., Los Angeles engineers and constructors, have received a special award from **Factory Management and Maintenance** magazine for their work in connection with a multi-million dollar brewery recently constructed in Van Nuys, Calif. Holmes & Narver designed, engineered, and inspected construction for the owner, Anheuser-Busch, who shares the honor of this award.

DEATHS

Henry O. Stevens died April 27 at Garrison, N. Dak. He was senior member of Stevens Bros., Contractors. His career was a varied one, with activities in irrigation, highway, public works, etc., extending from the East to the West Coast.

* * *

Herbert E. Weyler, former California state registrar of contractors, 1943-1945, died May 22 at Santa Barbara. At one time he served as mayor of that city.

* * *

Mason H. Roberts, 66, chief of the utility section, division of engineering, Corps of Engineers, died at Sacramento, Calif., May 2, of a heart attack.

* * *

Michael D. Pobor, 35, a civil engineer employee with the California Division of Highways, was killed recently when his car was struck by a switch engine at a railway crossing in Sacramento.

* * *

Frank A. Backman, 53, assistant to the vice president and general manager of Kaiser Engineers, died May 12 in Oakland, Calif. Prior to his work with Kaiser, he was with the Los Angeles Bureau of Water & Power.



Johnson

Maguire

to hold an annual conclave in different Western cities (the first probably at Los Angeles) at which time awards will be made to individuals and firms for special achievements or for bringing credit to the industry. Membership will be confined to qualifying firms and individuals in the area west of the Mississippi including Alaska.

William A. Johnson, chairman of the board of American Pipe & Con-

THE DEW line will round out a triple radar fence protecting the continent. The Mid-Canada Line and Pinetree Line of radar stations are part of the over-all plan.



was named prime contractor for the DEW line construction. Subcontractors include Puget Sound Bridge and Dredging Company and Johnson, Drake and Piper, Inc., both of Seattle; the Northern Construction Company and J. W. Stewart, Ltd., of Vancouver; and Foundation Company of Canada, Ltd., of Montreal.

Backbone of each of the spreads is Caterpillar* Arctic-proof equipment. It has proved itself building Thule Air Base in Greenland. It has hauled supplies for the Naval Petroleum Exploration Program at Point Barrow. For decades it has served the commercial needs of industry of the north in mining, construction, pulp and similar operations.

To get the job done it was natural for DEW line subcontractors to rely on their fleets of D4s, D6s, D8s, No. 12 Motor Graders, Traxcavators*, Cat Scrapers and Electric Sets.

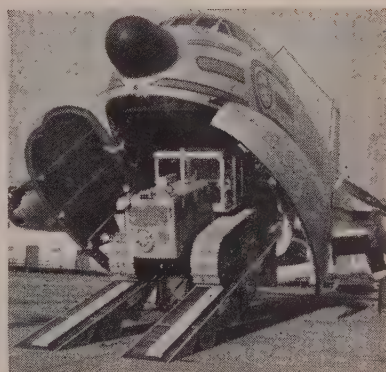
Cat trains moved above the Arctic Circle making landing strips and blazing new snow roads through the

meager stands of hoar-frosted vegetation which reacted like glass when snapped by bulldozers. Other Cat units followed, flown into the landing strips in the Air Force's big airlift, "Operation Big Haul."

Altogether 6600 tons of tractors, buildings and other heavy equipment were brought in by the Tactical Air Command's 18th Air Force. At the airstrips, construction crews put together hundreds of small prefabricated buildings and bolted them to rounded timbers which served as sled runners. Trains of them were towed by Caterpillar track-type Tractors to various Arctic sites.

All big yellow machines have been winterized to withstand temperatures as low as 70 below. The foresight has paid off. On February 15, nine D8s, all equipped with Caterpillar's new oil clutches, were at a point where the mercury dropped to an all-time low of 76 below! *No trouble was reported!*

A few refinements have been added,



A D8 is pulled aboard a Globemaster as part of the DEW line airlift at an Alaskan base. Tractors made up a good part of the 6600 tons of cargo which the Air Force flew to advance bases.

such as escape hatches for operators of tractors in the event they drop through the ice.

Today, north of the Arctic Circle, the painstaking research which goes into all Caterpillar equipment is paying off. For on this vital project . . . on this toughest of all proving grounds . . . only the most dependable equipment can be trusted. Once again the choice has been Caterpillar.

CATERPILLAR TRACTOR CO., SAN LEANDRO, CALIF.; PEORIA, ILL., U. S. A.

*Cat, Caterpillar and Traxcavator are registered trademarks—®

SUPERVISING the jobs

Allan Chertkow, Southern California general superintendent for H. K. Ferguson Co., is in overall charge of construction of a research laboratory, library, etc. at Anaheim for the Richfield Oil Co. Other important contractor personnel on this \$2,500,000 project are Harry Craft, project superintendent; George Burrows, field engineer, William Gardner, assistant superintendent, and N. W. Erwin, chief accountant. Started in February, construction is expected to be completed in November.

E. B. Potter, project manager; W. M. "Bill" Anderson, general superintendent, and George Schneider, project engineer, head the construction personnel of Morrison-Knudsen Co., Inc., which is doing some railroad relocation work at Dallesport, Wash., for the Corps of Engineers. Mark Harris is in charge of the job office and D. V. "Tod" Sloan is doing the purchasing. Other important workers on this \$2,400,000 contract are Walt Forslund, master mechanic; Joe Childers, drill superin-

tendent, and the following foremen: Everett Metzker, labor; Grant Peacock, grade; Walter Stills, powder; Harry Weaver, grade, and Virgil Norwood, shop. Started in February this year, the job will probably be ready for the Corps in late 1956.

* * *

Oliver Braaten is general superintendent for Henry Hagman, contractor on construction of several bridges near Spokane, Wash., for the Department of Highways. Carpenter foremen are Bob Kirk and Bill Jent. Others among the foremen are Walt Wilson, ironworker; Carl Moerike, cement finisher; Theron Johnson, pile-driver; Clair Martin, structural, and Roy Widmark, labor. This job has been going on since October 1954 and will soon be finished.

* * *

Jack Feuerstein is superintending for Walker Boudwin Construction Co. erection of a \$443,000 store structure, part of an 11-unit business development at Reno, Nev.

* * *

Lonnie Lawler, superintendent, and Bob Carlson, project engineer, are top men for Peter Kiewit Sons' Co. on this firm's contract on the Colorado Freeway through Eagle Rock, Los Angeles, Calif., now in the last stages of completion. Others among the key personnel are Sam Eldridge, cement foreman; Zelmo Mullican, bridge foreman; "Sailor" Hamby, master mechanic; Vern L. Hunsaker, crane operator. Sam Dulberg is engineer for the State bridge department.

* * *

John Patterson, superintendent for Peter Kiewit Sons' Co., is in charge of a recent award in the amount of \$510,475 for 3.9 mi. of grading and surfacing, Primary State Highway 12, Skamokawa to Elokomin River, Wahkiakum County, Wash. Started May 24, the job will probably run 210 days.

* * *

O. P. Pope is project manager, and D. J. Westbrook is general superintendent for Morrison-Knudsen and R. A. Westbrook, the combination which is constructing a runway extension at March AFB, Calif. Another important man on this \$4,746,411 job is the project engineer, Frank Scully. Office manager is Tom Hopper. Dallas Matthews is in the master mechanic spot. A 430-day job, work got under way May 2.

* * *

George B. Schetky, supervisor; Edgar A. Norton, electrical engineer; and Robert E. Phillips, mechanical foreman, are directing the work of Western Electrical Construction Co. covering the \$158,000 completion of Chandler power and pumping plants and appurtenant works, a part of the Kennewick Division of the Yakima Project, Wash. Job has been going since May 23 and includes the installation of non-

Down-time By Domagalski



Western Construction

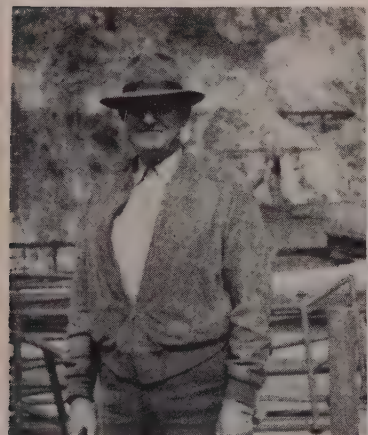


Piedmont

Birch



Smith



Mercer



Maguire

Jones

Hankins



Rice

Morrison-Knudsen men at Box Canyon Dam

Among those in for the finish of Box Canyon Dam, the \$10,000,000 hydro project on the Pend Oreille in northeast Washington which Morrison-Knudsen Co., Inc., has been building since April 1954, are the following key men under the direction of Simon Piedmont, project manager, and Fred A. Reif, project engineer.

Frank B. Morrison, business manager; William R. Green, warehouse

and purchasing agent; Charles Faris, office engineer; Floyd Mercer, field electrical engineer. Superintendents: William A. Denton, graveyard; Odus J. Hankins, rigging; Clarence L. Harmon, plant and equipment; Harry E. Smith, electrical; Denver C. Thomas, swing; Leonard L. Birch, concrete. Foremen: Larry G. Jones, general carpenter; William L. Gibson, truck; Charles W. Kevis, John D. Pickett,

and Meredith Williams, electrical; Claude Burton, cement finisher; Kenneth L. Wilmoth, shop; Delbert C. Curtis and James T. O'Kins, mechanical; Arthur Horton, reinforcing steel; Ralph T. Fralick and Allan O. Mason, rigger; Augustus T. Maguire, labor. Ernest R. Rice is safety engineer.

Constructed for P.U.D. No. 1 of Pend Oreille County, M-K has nearly completed the job.

embedded turbine parts, pumps, electrical switchgear, and miscellaneous work which is expected to take 400 working days.

* * *

Joe Mancebo, assisted by R. B. Kurtz, master mechanic; Claude Smalley, general foreman; and "Cy" Robie, timekeeper, is superintending 7.2 mi. of surfacing for Fredrickson & Watson Construction Co., a \$105,-305 contract lying between Lanes Valley road and Manton in Tehama County, Calif.

George Borovich is superintending a \$126,874 job for Thomas Construction Co. Located about 0.3 mi. south of Millville in Shasta County, Calif., construction consists of a steel girder and concrete deck bridge and grading and surfacing of 0.2 mi. of roadway. Fred Hunsaker is concrete superintendent. Started April 11, the job is scheduled for completion about the end of August.

* * *

F. M. Cochrane is project manager on construction of two pumping

plant additions at the Hanford Works, Richland, Wash., a \$1,392,-985 undertaking which will take about 440 days to complete. Construction has been going on since May 2.

* * *

Roger A. Wilson, grading superintendent, and C. A. Gustin, crushing superintendent, are F. R. Hewett Co.'s chief men on 8.0 mi. of grading and surfacing on State Highway 7-C, Taunton to Potholes East Canal, Adams County, Wash.



Heckart

Money



Barker

The Dalles Powerhouse Constructors are still going strong

Allen R. Bacon, project manager; John D. Heckart, general superintendent; and William B. Money, assistant superintendent, head the construction force at work on the first stage—16 units powerhouse, at The Dalles Dam, a \$29,800,000 project of the Portland District, Corps of Engineers. Among the top engineering personnel are Bill Davis, project engineer; Floyd Mahoney, field engineer, and his assistant, D. A. Kelley; M. L. Frederick, office engineer. Also Howard Latham, safety engineer; George Carlson, office manager; Henry Duguay, in charge of the warehouse; and Larry Barnes, schedule engineer. Other important men employed on the project by The Dalles Powerhouse Constructors, joint venture firm, which started work on this phase of the job in June 1953 are: Superintendents — Jack Douglas, swing shift; Otto Hanssen, graveyard; Sid Stewart, carpenter; Joe Heckart, carpenter-shop; Herbert "Dutch" Peters, labor; Sam Simon, rigger; Gil Doby, concrete; also Al Petersen, Harley Stevens, V. W. Dollarhide, carpenter walkers; "Whitey" Sherman, concrete walker; Duane Westberg, Lou Lloyd, Joe Spencer, labor walkers, and "Chuck" Barker, expeditor.

Among the foremen are: Carpenter—E. Peterson, R. Fournier, H.



Peters

Petersen

Stewart

Barnes

Ross, V. Herbert, A. Sanders, D. Thames, L. Thomas, J. Hammons, B. Hawkins, H. Schull, M. Bunning, H. Cox, E. Neimi, P. Stevens, J. Jobe, T. Peck, H. Green, R. Wylie, J. Sauls, J. Bryson, R. Emerson and C. Clifton. Cement finisher—H. Cox, M. Jones, Z. Hendricks and H. Benson. Ironworker—O. Melton, J. Vivant, L. Bard, E. Hamm, J. Hansen, G. Roskowsky, L. Heath, O. Ballheim, G. Cavis, J. Robinson, J. Duval and H. Danneman. Batch plant—G. Larson and O. Hill. Mechanic—J. MacDonald, F. Straight, N. Mills and R. Kopp. Labor—E. Hunt, W. Myers, R. Miller, D. Morris, W. Whetsler, J. Nesbitt, W. Graham, W. Beebe, H. Anderson, H. Frey, N. Litchfield, R. Day, J. Fox, W. Hildreth, R. Lansing, and J. Carrico. Power—P. Darby, H. Stevens, J. Fehr, L. Turner, E. Beimer, O. Ely and L. Orcutt.

A \$9,500,000 subcontract at The Dalles project is being handled by the joint-venture of The Steel Construction Co. of Oregon and Rutherford & Skoubye. This covers furnishing, fabricating, and placing rein-

forcing steel for the powerhouse, fish-ladders, and navigation locks. Among the general foremen and walkers are: George Thompson, yard; Elwood Collins, Johnnie Osburn, Scotty Davies, Carl Palmer, Richard Potts and Les Ellis. Steel foremen—"Hank" Ronfield, "Chuck" Nickolauson, Harry Miller, Marvin Schaad, James Herrell, Norman Gale, Ralph Viertel, Ramon Funston, Lester A. Jones, Melvin Dunlap, William Suddeth, Milton E. Thurman, Kenneth Vandergriff, Walter W. Funston, Forrest Pulliam, Emmett McKenzie, Robert Eller, Jr., Robert Doolittle, Charles B. Sisson, Robert L. Ellis, James Soursley, Wilson Vinson, Charles A. Forford, William T. Kelvin, Merle Davis, Earl C. Vaughn, Mervyn L. Russell, John L. Bowman, Mose Taylor, Richard Barrickman, James L. Grant, Clarence G. Turner, Clair E. Morrison and Samuel Reynolds. This portion of the project by Steel Construction and Rutherford & Skoubye got under way in August 1951 and contractors expect to complete the job by the end of next year.

John Allum and **Bill Allum**, partners in the contracting firm of Allum Brothers, are currently supervising a \$139,796 contract recently awarded them for grading and surfacing a section of the East Burnside road in Multnomah County, Ore., a 150-day job which got started May 5. Two other important men on the work are **Gordon Bunker**, engineer, and **Cecil Baird**, supervisor.

* * *

Sam Bergstrom is superintending for **K. L. Goulter & Son** a 2.3-mi. grading and surfacing job in Snohomish County, Wash. Located in the vicinity of Everett, the job has been going since May 16 and is expected to take 250 days for construction. **Floyd W. Hoskins** is general foreman; **Earl Chandlee**, shop foreman; and **Roy C. Johnson**, office manager.

* * *

Bill Rudolph is superintending for **Big Horn Construction Co.**'s \$328,961 contract for surfacing, sand-gravel seal coat, and other work on 26 mi. of the Gillette-Broadus road, near Gillette, Campbell County, Wyo. **Clyde May** is crushing foreman on this 100-day job which started May 25.

* * *

John Chappell, superintendent, and **William Dodd**, engineer, are in charge of a \$552,900 job of Macri-Montgomery Construction Co. in Alaska. Macri-Montgomery were awarded this contract March 31. It covers construction of a theater building and advance underseas weapons shop at the Naval base at Kodiak and will require 275 days for completion.

* * *

L. H. Weber will act as his own superintendent on a recent award to this contractor for earthwork and structures, relocation of Wyoming State Highways US 26 and US 89, Palisades Project, Idaho. An estimated 90-day job, Weber was expecting to move in on the site about June 1.

* * *

T. A. Close, with the assistance of **Ed Grevesen**, equipment operator, and **Francis Rook**, carpenter foreman, is superintending a \$131,371 contract awarded **N. A. Nelson Construction Co.** for erection of steel and concrete bridge on the Kiowa Junction-Babb highway in Glacier County, Mont. Construction is expected to be completed by the end of July.

* * *

Wallace H. Litchfield, president and manager, and **Larry E. Johnson**, vice president, are directing a recent \$283,400 award to the combination **Puget Construction Co.** and **Wallace H. Litchfield**, for construction of a 2-story reinforced concrete office building and 1-story reinforced concrete trades building for the Washington State Highway Commission.



Sipes

Stalsberg

Curtis

Burbank

Darwin Lind, project manager, and **Glenn Toy**, project engineer, head the job of personnel of **Morrison-Knudsen Co.** which has the paving at Fairchild AFB, Spokane, Wash, a Corps of Engineers project costing \$4,700,000. Superintending the batch plant is **L. F. "Bill" Porter**; the excavating, **Herb Kenyon**; the paving, **Hank Meiner**. **Floyd Williams** is master mechanic. Office engineer is **Gordon Robinson**.

D-H Paving Co. is furnishing asphaltic concrete under a sub-contract, and has **Ken Madison** in the

superintending spot. **Robert L. Donkel** is handling the office work. **Robert H. Newell** is foreman, plant.

A subcontract for furnishing of aggregate went to **Curtis Construction Co.**, with **Rex Stuart** as project manager; **Fred D. Curtis**, superintendent, assisted by **Bill Sipes**. **"Bud" Burbank** is master mechanic and **"Red" Stalsberg** is crusher foreman on this portion of the project.

Contractor started work on this airport paving job in May and expects to hand it over to the Engineers in September 1956.

District, a 315-day job which has been going since May 9.

* * *

Jim Rinaudo, superintendent for **Claude C. Wood Co.**, is supervising a \$214,792 award for grading and surfacing in San Joaquin County, Calif. Construction consists of a 4.3-mi. stretch between 1.2 mi. east of Clements and the Calaveras county line. **Jack Corbett** is grading superintendent for contractor **C. V. Kenworthy**; and **Horace Bell** is paving superintendent for **Wood**.

* * *

A. N. Regalia, manager of highway constructions of the **Baldwin Contracting Co., Inc.**, has over-all direction of a \$154,909 contract in Sutter County, Calif. Located at three different spots near Yuba City and Oroville, there are 9.6 mi. to be surfaced and job is expected to take 90 days. General superintendent on the work is **A. J. Vercruyssen**; project superintendent is **C. W. Covington**.

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.

Fred Howell, 31, was killed when the tractor he was driving skidded on an icy road and flipped over, near Kamiah, Ida.

Edward F. Gillen, 42, bulldozer operator, was killed recently near Ralston, Wyo. The victim apparently went too close to the edge of a ravine and the machine toppled over, rolling down a 100-ft. embankment.

Everett Artz, Yuma, Ariz., a construction worker on the new Arizona Public Service Co. substation, was injured in a recent accident when his safety belt slipped. He was being lifted down from a scaffold by means of a crane hook inserted in his safety belt when the belt slipped, injuring his back.

Bill Oliver, 24, of Casper, Wyo., was killed instantly when the dragline boom he was operating came in contact with a 3,200-volt line. The accident occurred on a bridge construction just west of Torrington.

D. H. Line, 51, Umatilla, Ore., a painting contractor, was drowned when he leaped into the Columbia River in an attempt to save a workman who lost his balance while painting the new Umatilla bridge. The workman, **Reuben Wagner**, was later picked up by a boat.



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LIMA is proud to be able to offer the fast-moving, fast-working BADGER as part of the standard LIMA line of quality-built machines. This highly portable, hard-working, ruggedly built 1/2 yard shovel is easily convertible for use as a trench hoe, clamshell, dragline, pile-driver, crane or skimmer. Available with gasoline, Diesel or electric power, the BADGER has proved on the toughest jobs that it's the fastest, most dependable shovel in its class.

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| 4. No tail swing. | 8. Easily portable. |
| | 9. Easily convertible. |

It will pay you to find out how the BADGER can benefit your own operation. Contact your nearby BADGER distributor, or write today to Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

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BADGER Shovel Conversion



BADGER Dragline Conversion



Above

BADGER Crane Conversion

Below

BADGER Trench Hoe Conversion



TRICKS of the TRADES

Portable hydraulic punch wins award

THREE WINNERS and an honorable mention winner in the annual employee best suggestion competition, sponsored by the Salt River Project, were announced recently. The competition covered the year 1954.

Top prize of \$75.00 was divided when William Gallman of Tempe, and Robert Turner of Phoenix, were awarded first place for their suggestion of purchasing or making a portable hydraulic punch for punching Weltrus beams. An investigation was made by officials of the company and an attempt was made to purchase a portable hydraulic punch. One company offered to build this punch on a special order for about \$800.

Immediate practical use

At this time, the Power District was busily engaged in the construction of substations and the repairing of river hydro units in addition to normal maintenance work. The lack of this portable punch upset the work schedule. The punch was designed and fabricated in the Power District's machine shop at a cost of about \$200. When placed into operation it helped to meet the urgent work schedule and



TOP WINNERS were Robert Turner (left) of Phoenix and William Gallman of Tempe and are shown here demonstrating the portable hydraulic punch idea that won them first place.

Metallizing reinforcing rods cuts concrete slab thickness

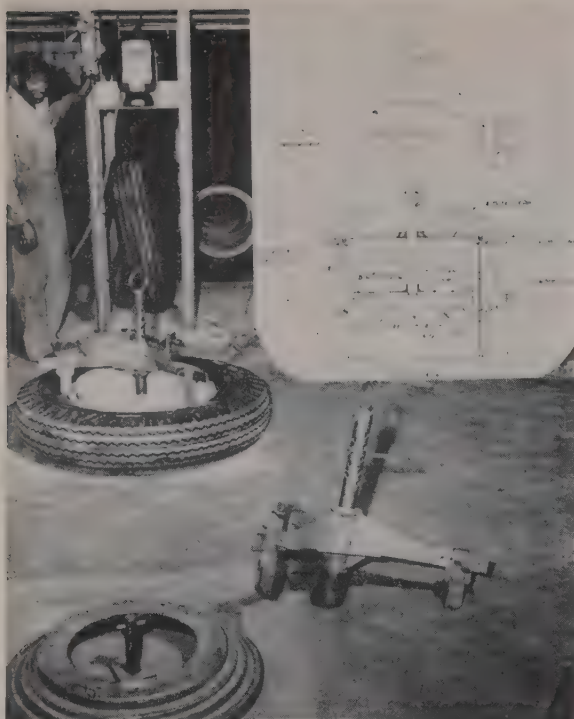
THE DESIGNERS AND BUILDER of the beautiful Mormon Temple, recently erected at Santa Monica, Calif., were faced with a series of problems not unique in a building of this type. The goals were to reduce the weight, cost, and construction time with no consequent weakening or ultimate possible defacing of the structure. During the course of the investigations it was decided to make use of modern metallizing. Here is the story as given by the Metallizing Engineering Co., Inc., Westbury, N. Y.

There are only two ways to prevent cracking or spalling of reinforced concrete. One of these is to apply a sufficient thickness of concrete over beams or rods so that moisture cannot seep through and rust them. Obviously this is costly and results in unduly heavy construction. The other is to coat the steel itself with some rust proof metal such as zinc. The latter method was used with metal spraying as the means of application.

The actual work was quite simple and involved only two steps. The fabricated steel was sandblasted with a good angular abrasive. This removed scale, dirt, and provided sufficient roughness for proper bonding of the metal. No other preparation was needed. Next the operator, as shown in photograph, applied .005 in. of pure zinc. The steel was ready to use "as sprayed."

Approximately 100,000 lb. of beams and rods were metallized and used in the solid and honeycomb tilt-up concrete slabs. By doing this the engineers were able to reduce the total slab thickness by 2 in. If the steel had not been protected against corrosion it would have been necessary to have 1 in. more concrete on each side of the reinforcing beams. The actual work was done by the Crankshaft Grind & Metallizing Co. of Salt Lake City, Utah.





Easy-to-operate tire mouter

A PNEUMATIC TIRE mouter designed by Autocar engineers almost 2 yr. ago proved such a time-and-labor saver for the builder of heavy-duty trucks and tractors, that about a year ago Autocar offered to supply plans for the device free to the industry.

In the month that followed, more than 700 requests for the plans were received at Autocar and numerous reports of appreciation came in from companies which followed the specifications contained in Autocar reprints.

Now the wheel—or perhaps the tire—has turned around again. Autocar in moving from its old plant in Ardmore to its new quarters in Exton, Pa., as the Autocar Division of The White Motor Co., has built into the new plant equipment not one, but two of the devices. Just to make the circle a little more complete, Autocar repeats its offer to supply plans for the device free to fleet owners and truck operators.

Mounting rims and tires for the big, heavy-duty Autocars had been a weighty job, taking the time and work of two or three men. With the new pneumatic tire and rim mounting machine designed by Autocar plant engineer, one man does the job easily, quickly, safely, and economically. And it is done without the risk of damage to the tire or rim which exists with other methods.

Set over an 18-in. pit, 24 in. in diameter, is a stepped-down, circular casting which can hold wheels or demountable rims 20, 22, or 24 in. in diameter. The bottom of this casting is at floor level.

Fastened on a plate in the pit below the floor level are a pair of Bendix-Westinghouse air-brake cylinders, 6 in. in diameter, with a $2\frac{3}{4}$ -in. stroke and a capacity of 1,500 to 2,000 lb. per sq. in. Both brake cylinder arms are fastened to an 11-in. cross-piece of $\frac{1}{2}$ -in. steel. A 2-in. steel spindle rod attached to the center of the cross-piece rises through the center of the stepped-down casting to about 5 in. above the floor. A $\frac{5}{8}$ -in. cross-rod is mounted through the top of this spindle.

In mounting a tire, the operator first places a rim base on the stepped-down casting. Next, he drops the tire on the rim base, slips the side ring on after and positions the locking ring.

Then he lowers a three-armed spider, hooks it on to the spindle rod which comes up through the center from the pit and locks the two with a quarter turn. The three spider arms notch on to the side ring and, as the operator turns on the compressed air, force it and the bead of the tire down past the locking-ring seat on the rim. With a sharp tap of a hammer, the operator seats the locking ring.

The spider is released and the tire is then placed in Autocar's new safety tire stall and inflated with anywhere from 72 to 100 lb. of air pressure.

Autocar's engineering department figures that this is one case in which going into the hole has made money. It has resulted in quicker, easier, safer work and an improved operation at lower cost.

Jiffy Jacks easily adapted to any job



WHEN THE C. F. Bolster Co., plastering contractors of Los Angeles, took on the job of plastering the Broadway Department Store in west Anaheim, California, their major task involved the plastering of three ceilings, each of which covered an area of 10,000 sq. yd.

More than 650 pairs of Jiffy Jacks were used on the mammoth scaffold job involved. According to foreman Jim Baker, speed was a "must" both in applying the plaster and moving the scaffolding. Journeymen first applied a thin scratch coat to metal lath. Then, with the new Karelius Sand Hog, they shot on a $\frac{3}{4}$ -in. thickness of sand plaster.

By leaving the trestles intact, and removing only the 2x4 legs of the jacks, the scaffolding was easily moved from one floor to the next. "Jiffy Jacks are the best scaffolding we have ever used," said foreman Baker. "They are adaptable to any job."

Superior Jiffy Jacks are manufactured in the West by Superior Scaffold Co. of Culver City.



**ROAD
LIFE
UP**

*Why More
Freeway Engineers
Are Specifying*
**SOIL-CEMENT BASE
STABILIZATION**

The cost of constructing and maintaining today's modern freeways must and can be kept down! They must be designed to take a heavy beating from traffic!

That's why more and more engineers are specifying soil-cement base stabilization. The result: tougher roads are being built and taxpayers' dollars are going farther.

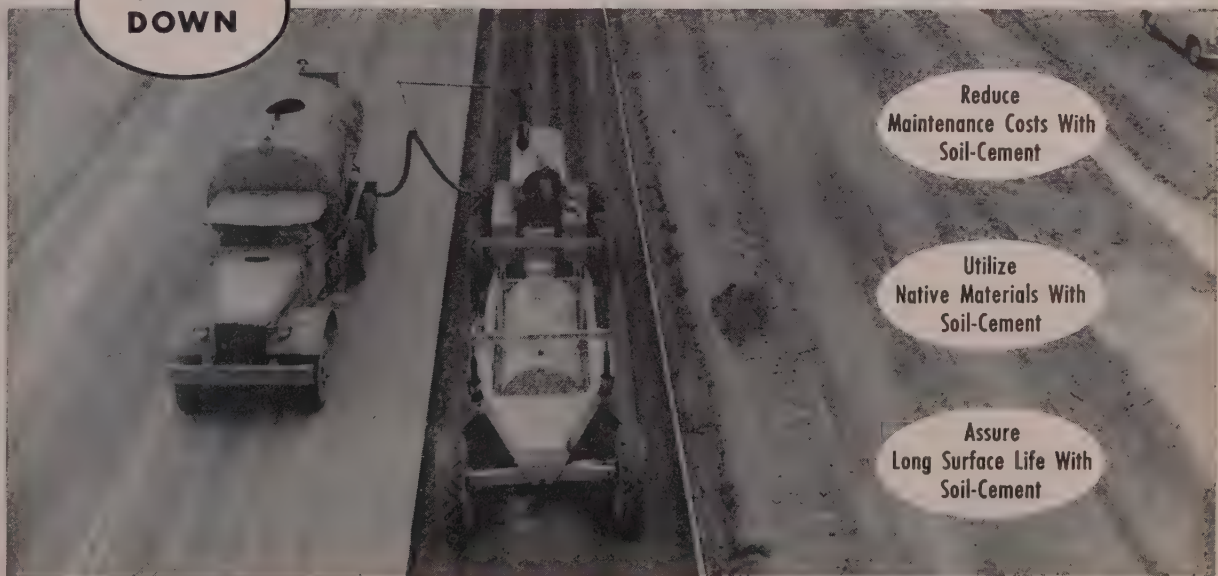
With soil-cement base stabilization, the base course can be made stronger—and often at a lower initial cost, since native minerals can be used.

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Let us send you case histories that demonstrate the advantages of specifying soil-cement base stabilization.

**COSTS
DOWN**

Most Soil-Cement Is Mixed With Pettibone Wood Mixers



**Reduce
Maintenance Costs With
Soil-Cement**

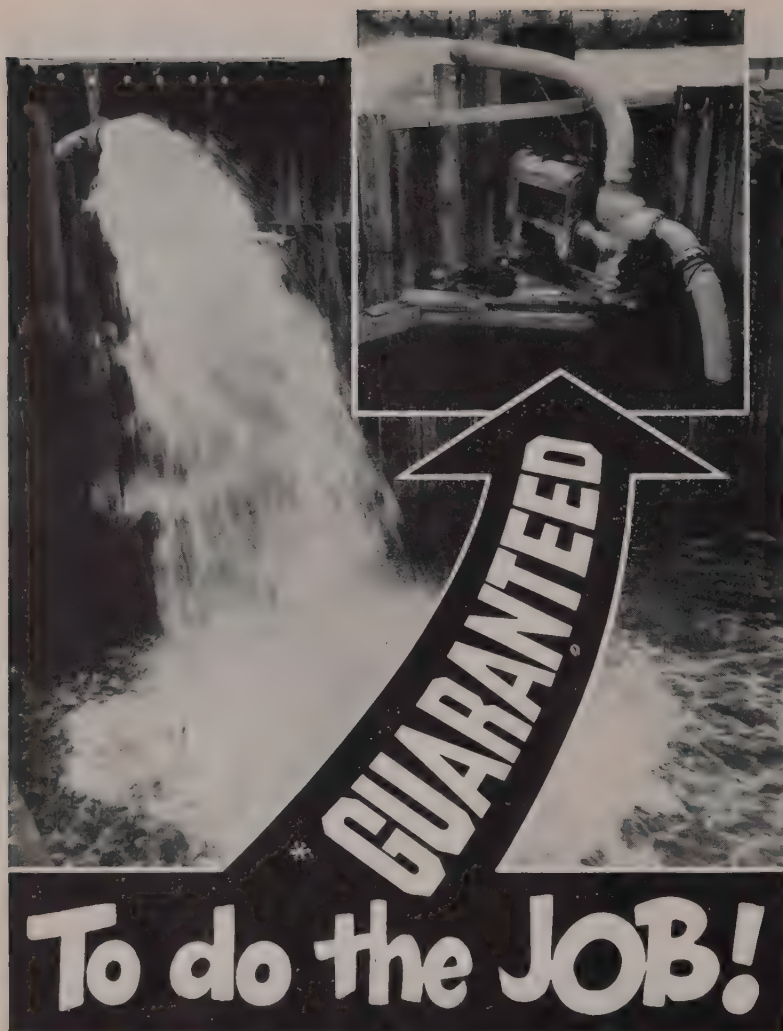
**Utilize
Native Materials With
Soil-Cement**

**Assure
Long Surface Life With
Soil-Cement**

The Model 42 Pettibone Wood, Single-Pass, Self-Propelled Road-mixer, shown here in actual construction work on the freeway pictured above, produces 250 tons per hour of uniformly mixed windrows up to 6 cu. ft. ready for spreading. Tandem drive assures positive traction. Also available is the Single-Pass Model 54, which is tractor drawn and powered, with capacities up to 350 tons per hour.

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Dependable pumps are of vital importance, working side by side with the men, shift after shift, day in, day out.

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HIGHWAY INDEX

(Continued from page 23)

together. The resulting total cost is Washington's index base. For subsequent years, the current average unit price for each item has been applied to the same quantities, and new extensions and a new total cost derived. The ratio of this total cost to the 1940 cost is the index. Here are the items, their units, and base quantities:

ITEM	UNIT	QUANTITY
Common excav.	cu. yd.	2,068,000
Unclass. excav.	cu. yd.	2,386,000
Rock excav.	cu. yd.	513,000
Ballast	cu. yd.	333,000
Cr. rock base	cu. yd.	135,000
Cr. rock surf.	cu. yd.	235,000
Asphaltic conc.	ton	99,000
8-in. PCC pave.	sq. yd.	82,000
Class A conc.	cu. yd.	14,000
Reinf. steel	lb.	4,278,000
Struct. steel	lb.	4,000,000

WYOMING

W. A. Gallup, planning engineer for the Wyoming Highway Department, lays heavy emphasis on non-numerical factors that can affect the index in Wyoming:

"Competition: Very good since 1946. Over 100 contractors prequalified to bid. The last 2 or 3 years the department has received an average of about 8 bids per project.

"Weather: The working season, particularly for oiling work, is comparatively short, being from about the middle of June to the middle of September. Winter conditions in most parts of the state are severe and nearly all jobs that cannot be completed are suspended and carried over.

"Transportation costs: These are an important item since steel, culvert pipe, timber, etc., must be shipped long distances for some projects."

The index computed in Wyoming is built from six items which represent about 60% of the money spent each year. To arrive at an index value, the current average unit price for each item is first tabulated as a percentage of the 1940 unit price. These percentages are then converted to individual index values according to a weighting schedule; the total of the values is the composite index. Here are the items, their 1954 prices, their weights, and their 1954 weighted index values: (For 1940, weight and weighted index values are synonymous.)

ITEM	PRICE	WEIGHT	INDEX
	1954		1954
Common excav.	\$ 0.226	39	71
Base gravel	0.777	29	34
Oil	0.109	9	15
Class A conc.	51.93	11	31
Struct. steel	0.128	6	11
Tr. tim. pile	2.731	6	13
		100	175

NEVADA and UTAH

Nevada has only its normal contract records for studies as required. Utah compiles annual total quantities and average bid prices for 180 odd bid items.

POSITIVE EJECTION WITH A 140,000-LB. PUSH!



C & D MOVALL dumps rock, mud, gumbo, frozen ore fast and clean, spreads fill like a scraper

QUICK & CLEAN...Caterpillar DW21 powered MOVALL dumps mucky mud and rock mixture whistle-clean in 12 to 14 seconds on Geo. M. Brewster & Son's New York Thruway job, near West Nyack, New York.

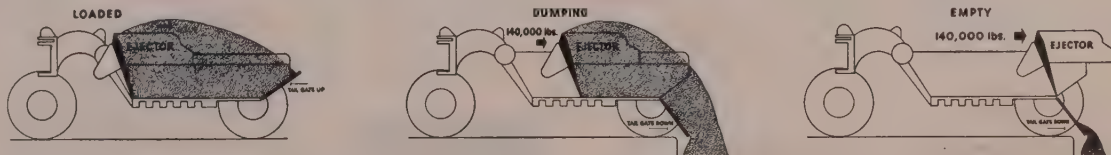
C & D MOVALL's "scraper-in-reverse" design puts a 140,000-pound push behind the ejector for unloading. This gives you positive ejection and controlled dump or spread for handling any material you can load with shovel, dragline or belt loader. MOVALL can place the load where and how you want it...over the edge of a fill, spread in even lifts of any desired depth, or into hoppers at a controlled rate. The 140,000-pound push scrapes the bowl whistle-clean, even in mud, gumbo, or frozen ore.

3 BIG ADVANTAGES

The MOVALL offers you the widest work range of any hauling unit available today, enables you to:

- (1) "tool up" for more types of work for less money;
- (2) keep your MOVALLS busy on jobs where special-purpose hauling units stand idle;
- (3) use same Cat DW20 or DW21 prime movers for both scraper and top-loading jobs.

C & D MOVALLS are available for Cat DW20 and DW21 tractors; handle 31-ton, 25 cu. yds. (heaped) loads of any material you can top load. They cost no more than comparable-size limited use wagons; they pay off on many more types of work. See your Caterpillar - C & D dealer, or wire us now about a MOVALL demonstration on your job. C & D MANUFACTURING COMPANY, Perkins (suburb of Sacramento), California; phone Hillcrest 5-8592.



HOW IT WORKS

Movall uses standard cable scraper power control. To dump, operator releases backhaul 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.

TOOLS of the TRADES

Use the addresses listed for further information on any of these items

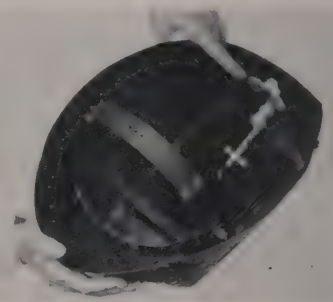
WATER REPELLENT work shoes that resist absorption of chemicals and filth are now being manufactured by **Red Wing Shoe Co.**, Redwing, Minn. The new line of shoes, Sylflex, is being offered in two styles: 6-in. and 8-in. The tanned leather is very resistant to water but when it does get wet it can be dried quickly near heat without harming the shoe. The waterproofing has been accomplished without sealing the pores which permit air to reach the

foot. The leather is soft and pliable but does not shrink.

THE FULL LINE of Skullgard protective helmets is described in recently published 16-page brochure. Given is information on the importance of head protection, descriptions of all models of Skullgards and their applications, and data on the design, manufacture, and testing of hats made of glass fibre and aluminum. Copies of the bulletin, No.

06003, may be obtained from **Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.

A WELDING HELMET is now available that frees both hands for welding at all times by permitting the operator to raise or lower the welding lens with a slight pressure of the chin. The chin pad requires only a ¼-in. movement to



drop the welding lens, giving complete visibility through the clear inside safety glass and filter lens which protect the welder's eyes. Removal of the pressure returns the lens to welding position. The helmet is adjustable and weighs no more than conventional models. **Caruthers & Fernandez, Inc.**, New Products Division, 1501 Colorado, Santa Monica, Calif.

HEAVY DEPOSITS of grease and oil on machinery can be softened and loosened with a new aerosol spray, then flushed clean with water. The spray contains no acids or alkali which might harm metal surfaces and can be used as a cleaner on painted surfaces, clothing, and upholstery. Application is from a push-button sprayer. It can be used on cleaning windows, materials handling equipment, and oil or grease spillage on concrete. Write to **Montgomery Chemical Co.**, Jenkintown, Pa., and ask about "Swish" aerosol degreaser.

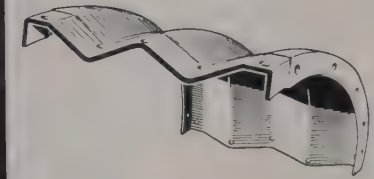
PEG-RACK CONVEYOR has been developed by **Rack Engineering Co.**, 222 Sixth St., Connellsville, Pa., for the handling of bulky or hard-to-stack items. The rack rolls on two rigid and two swivel casters. The rack is adjustable on 3-in. centers for the pegs and 6-in. centers for the uprights. The standard size is 24- x 60-in. base, with 60-in. high uprights, but will be built to individual specifications. Capacities range from 1,000 to 3,000 lb.

A JACKSTAND built for heavy lifting will fit and lift the drawbar of any industrial or construction equipment. Two tons can be lifted without slip-page. The jackstand is produced by **Knight Manufacturing Co.**, Brodhead, Wis.

TWO NEW FITTINGS and hose kits have been announced by **Aeroquip Corp.**, Jackson, Mich. The kits feature a hinged top, removable tray, ruler, and fitting identification chart. Kit 5143 contains 71 ¼-in. fittings and 24 ft. of ¼-in. hose on a revolving reel. Kit 5144 contains an assortment of 93 fittings and two spools holding 24-ft. coils of ¼- and ⅝-in. hose. Both kits are designed for use by large automotive maintenance departments.

STRONG, LIGHTWEIGHT ARMCO LINER PLATE

Saves
Tunneling Time
and Money



What does the "two-flange" design of Armco Liner Plate mean to you? In your tunneling jobs it can save time, reduce handling and help make your low bids profitable. Here's why.

On a pound-for-pound basis, it is the strongest liner plate structure made. The deep corrugations extend through the longitudinal joints to pro-

vide continuous circumferential strength. Adjacent rings are joined at the flanges along both sides. With this special design you buy, handle and install less metal to do a specific tunneling job.

Write us for details. Your crews need no special training or equipment to do a fast, efficient tunneling job.

ARMCO DRAINAGE & METAL PRODUCTS, INC.

Berkeley • Los Angeles • Seattle • Spokane
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ARMCO LINER PLATES



NEW EQUIPMENT

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

New line of cable-operated scrapers

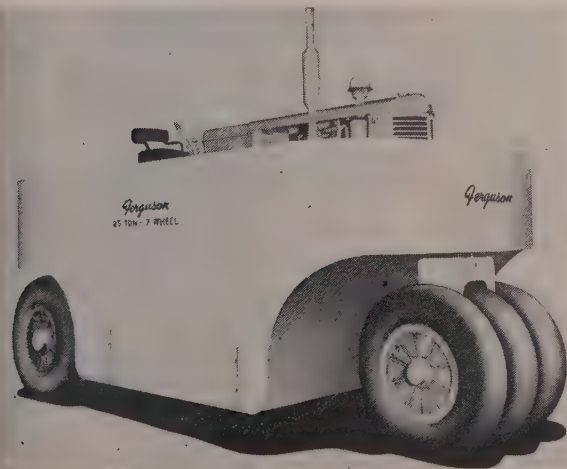
Now on the market is a complete line of four-wheeled, cable-operated scrapers designed for use with M-R-S tractors. With heaped capacities ranging from 10.5 to 32.5 cu. yd., the units employ a hydraulic weight transfer system which shifts scraper weight forward to the tractor drive wheels when extra traction is needed. New



features include large low pressure tires for greater flotation, simple cable reeving, and full power forward ejection. The new line is a joint product of Wooldridge Mfg. Division, Continental Copper & Steel Industries, Inc., of Sunnyvale, Cal., and the M-R-S Manufacturing Co., of Flora, Miss.

Self-propelled, rubber-tired roller

A new self-propelled, rubber-tired roller weighing 25 tons when fully ballasted with sand, is now on the market. It is provided with six speeds forward and six in reverse and operates equally well in either direction, eliminating the need of turning. Large diameter tires, for light draft



and high rolling speed, are arranged to conform to U. S. Corps of Engineers' specifications. Pressures up to 795 lb. per in. of tire width may be obtained. Steering is hydraulic. The manufacturer is Shovel Supply Co., 4900 Hines Blvd., Dallas, Texas.

New model crawler by Caterpillar

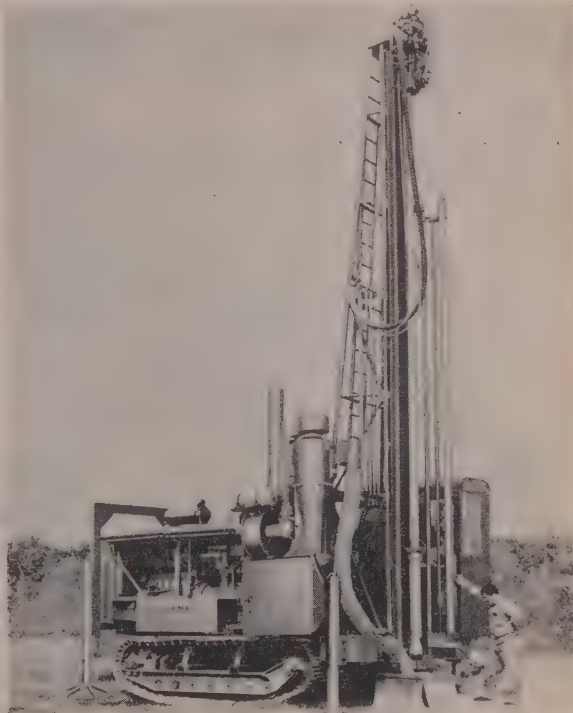
Caterpillar Tractor Co., Peoria, Ill., is now making a new D7 crawler and two new models of the D8. Increased horsepower highlights the new D7. It now has 128 hp. at 1,200 rpm. compared to the 108 hp. at 1,000 rpm. of the previous model. Drawbar pull has increased from 25,200

lb. to 28,700 lb. Another feature is an engine balancer which reduces vibration and permits the 4-cylinder engine to operate with the same smoothness as a 6-cylinder engine.

The two D8 models have different drives—a torque converter (Series D) and a direct drive (Series E). Both models have improved operator comfort and are easier to service. The operating weight of the Series D is 41,265 lb. and the Series E, 40,430 lb. Ground clearance on both has increased from 10½ in. to 13 in.

Blast hole driller

The Triple Duty Drillmaster is a self-contained drilling unit designed to speed up the drilling of rock and provide a range of hole sizes and drilling depths. The first of three possible combinations can be used for deep blast holes up to 6 in. in diameter. In combination two a heavy



hammer drill is used for 4¼-in. holes—and in combination three it can be used for rotary holes up to 6¼ in. in diameter. Additional information can be obtained by writing to Ingersoll-Rand Co., 11 Broadway, New York 4, New York, and requesting Form 4164.

New model Hopto digger

A ½-yd. Hopto digger with a 360-deg. swing has been announced by Badger Machine Co., Winona, Minn. The completely hydraulic "360" has an extension arrangement which permits straight-sided vertical digging. It digs to a depth of 17 ft. with a surface reach of 24 ft. The backhoe loading height is 12 ft. on a 16½-ft. radius with a shovel bucket loading height of 14 ft.

Shovel-crane adapter

A new loading attachment is now available for underground mining and general bulk materials handling. Called the Excaloder, it adapts the Link-Belt Speeder LS-98 shovel-crane for horizontal, straight-line loading operations. It is interchangeable with the shovel, hoe,



dragline, clamshell, or crane attachments for the LS-98. Maximum dumping height, with stick extended at 45 deg., is 16 ft. 11 in. The bucket will close automatically when dumping lever is released or it can be held in open position for grading by toggling control lever in fully open position. **Link-Belt Speeder Corp.**, Cedar Rapids, Iowa.

Ladder-type Trenchliner

A ladder-type Trenchliner has been developed by **Parsons Co.**, of Newton, Iowa. A low center of gravity and

low ground bearing pressure are features of the design. The machine, designated Model 155, produces from 5.8 in. to 12.75 lin. ft. of trench per min. in a range of 30 speed selections by lever control. A higher range of 30 speeds, up to 25 lin. ft. per min. is possible by a sprocket change. The boom hoist is hydraulically actuated. Literature is available.

Prime-Mover powered wheelbarrow

A new Prime-Mover powered wheelbarrow has been announced by the **Prime-Mover Co.**, Muscatine, Iowa.



The unit hauls $\frac{3}{4}$ ton on a chassis 64 in. long and 31½ in. wide. It is easily converted from dump bucket to flatbed for handling solid materials. Two sizes of flatbeds are available.

DIRECT WAY TO



**Ask Your Nearest
Dealer About
Darex AEA:**

Pacific Coast Aggregates, San Francisco;
Blue Diamond Corporation, Los Angeles; Utah Lumber Co., Salt Lake City; C. E. Mitchum, Albuquerque, New Mexico; Baker-Thomas Lime & Cement Co., Phoenix; Ray Corson Machinery Co., Denver; Mason's Supply Co., Portland; Miller-Richardson, Helena; Hawaii Builders Supply Co., Honolulu.

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Darex AEA is the world's most widely used brand of air entraining agent . . . specifically formulated . . . carefully compounded. Concrete made with Darex AEA places easier, finishes faster, has finer texture, is more durable. And, of course, lower cost concrete.

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A **BARGAIN**

THAT BY-PASSES THE DISTRIBUTOR IS NO BARGAIN AT ALL!

In these times of mounting production costs, many purchasers of industrial supplies and materials are beginning to look upon their distributors as an extra expense. At first blush, it might *seem* cheaper to buy direct from the maker.

Actually, the distributor helps *both* the buyer and manufacturer save money. Like this:

He saves the buyer warehousing, handling and storage details, paperwork, provides an immediate single source of supply for thousands of items that industry needs, often in a hurry.

He saves the manufacturer the cost

of heavy inventory maintenance in all parts of the country, the expense of an army of salesmen, a fleet of trains and trucks, and a staff of credit and collection experts. In a sense, your distributor represents a cooperative distribution facility that you share with all other firms in your area.

Next time you're tempted to get a direct quotation from the manufacturer, whether on a big or small item, figure out *all* the costs—not just the first cost—and you'll find you gain much more, yet in the long run pay no more, by utilizing the services of your distributor.

WICKWIRE ROPE



3151

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

Lightweight core-drilling machine

A portable core-drilling machine with detachable bits has been developed by **Demo Tool Corp.**, 8735 Melrose Ave., Los Angeles, Calif. It weighs 50 lb. and drills self-cleaning holes from 1/2 in. to 6 in. in diameter



through all materials including reinforced concrete without changing bits. The carbide-tipped bit strikes 8,400 blows per min. while rotating at 350 rpm. The machine is powered by a portable generator of 1,700 watts. It features a water and air swivel that distributes lubricants through the entire length of the core tubes.

Power steering for Ford & Ferguson

Power steering can be installed on any Ford, Ferguson, or Ford-Ferguson tractor without disturbing or discarding any of the regular steering mechanisms. The new power steering device delivers 1,500-lb. pressure and cuts down on wear on the steering gear. It absorbs shock and assures immediate steering response in an emergency. A 4-page bulletin gives full information. **Leland T. McGee Mfg. Co., Inc.**, 410 Dixon Ave., Compton, Calif.

Cold flow press for wire rope

Solid fusion of fittings to wire rope in up to 30 sec. is possible with a new



cold flow press. The press is made by **The Skookum Co., Inc.**, 8504 N. Crawford St., Portland, Ore. Use of the press forms a grip that is beyond

the breaking point of the wire rope. The press is operated by one hydraulic lever. It weighs 3 tons, is 56 in. high and 28 in. wide. Literature is available.

Sectional steel scaffold

A sectional steel frame that was designed for economy and safety has been announced by **The Patent Scaffolding Co., Inc.**, 38-21 12th St., Long Island City, N. Y. It features a built-in ladder and can be used for a rolling scaffold for maintenance and repairs. The frame comes in five sizes, from 3 ft. to 6 ft. 6 in. Bulletin PSS-36 gives full details.

This item is dynamite

Hercules Powder Co., Inc., Wilmington 99, Del., now has available small diameter cartridges in lengths up to 24 in. These sizes make possible more uniform fragmentation through the discharge of a continuous column of explosive, saving time and labor in loading blast holes.

Trailer-mounted lights

A trailer-mounted lighting unit has been released by **United States Motors Corp.**, Oshkosh, Wis. A 10-kw. U. S. engine generator supplies the power. Six 1,500-watt lights with full



swivel and vertical adjustment supply the broadest illumination possible for general construction work. Lights may be controlled individually and power outlets are provided. A wide variety of engine and generator sizes are available on special order.

Wire rope line extended

Broderick & Bascom Rope Co., 4203 Union Blvd., St. Louis 15, Mo., has added a new grade of wire rope to its line. It has an independent wire rope core. The manufacturer recommends it for drag lines, shovel hoist ropes, arch lines, scraper and dozer ropes, or any operation where strength greater than the company's standard grades is required.

One man loads this trailer

A new trailer which can be loaded or unloaded by one man, without skids, has been announced by **LaCrosse Trailer Corp.**, LaCrosse, Wis. The main advantage of the unit is



that the only mechanical connection between gooseneck and trailer is a standard inverted fifth wheel in the base of the gooseneck, which attaches to a standard spring loaded king pin on the front of the trailer platform. This provides a hook-up which is easy to align. Capacity is 33 tons. Literature is available.

Hydraulic hoister

Now available is the **Econmobile**, which can hydraulically lift 2,500 lb. 17 ft. high. Equipped with an auxiliary tower it will reach 22 ft. Many attachments make this a versatile piece of equipment—aggregate bucket, cement bucket, chain boom fork, and a work platform. For details write **American Road Equipment Co.**, Omaha, Neb.

Refin offers its largest pipe

A 12-in. diameter rigid polyester resin, fibre-glass reinforced pipe, the largest ever produced, is now available. Unlike steel pipe, Refin pipe resists corrosion and has a smooth, seamless interior. It is easy to handle, inexpensive to install, and does not



suffer from chemical attack and rust. Bursting strength is near 800 psi. For details contact **Louis Potomac, Refin Industries**, 5730 Kearny Villa Rd., San Diego 11, Calif.

Here's a vibrator for \$190

A new 2-hp. vibrator which weighs 38 lb. is now available. With attachments it can be used for surfacing

pumping, and drilling. The cost is \$190, including the engine mounted on a round base, 12 ft. of 7/10-in. diam. shafting, and the 2½-in. diam. by 14-in. long vibrator head. **Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.**

Semi-automatic hard-facing

A line of tubular fabricated wires designed for open arc application through standard semi-automatic welders has been announced by



Stoody Company, Whittier, Calif. No flux is required. Seven to 15 lb. of hard metal per hr. can be deposited. The normal 10% loss for stub ends is eliminated. The wires are bare and there is no slag removal problem.

Abrasive discs

DuraCut disc-wheels are a new abrasive product being manufactured by **Bay State Abrasive Products Co., Westboro, Mass.** The discs are made in 7-in. and 9-in. diameters, with a depressed center. The wheels are designed to be used on a right angle head portable grinder, and can be applied to work either flat or at a slight angle.

Brunner & Lay Rok-Bits

Rok-Bits in 3½-, 4-, and 4½-in. gauge sizes, to fit on 1½- and 2-in. drill rods are being produced by **Brunner & Lay, Inc., 9300 King St., Franklin Park, Ill.** The bits are designed to fit directly on the steel of two machines, eliminating the use of adapters. Send for descriptive Bulletin B-1.

Conveyor belt

A new conveyor belt reinforced with a synthetic fabric can be spliced in the field without special equipment. A 6-ply belt 30 in. wide could carry 400 tons per hr. The belt is manufactured in various widths up to 72 in. and in thicknesses up to 15 plies. **Hewitt-Robins, Inc., Stamford, Conn.**

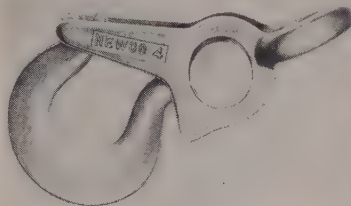
600-gph. steam cleaner

A 600-gal. per hr. cleaning and 500-gal. per hr. high pressure rinse machine is now available. The cleaning solution can be delivered through one, two, three, or four nozzles. The

machine is designed to be operated at 400- and 200-gal. per hr. speeds with proportionate savings in fuel, power, and water. Two models are available, gas or oil fired. **Clayton Mfg. Co., El Monte, Calif.**

Newco safety hook

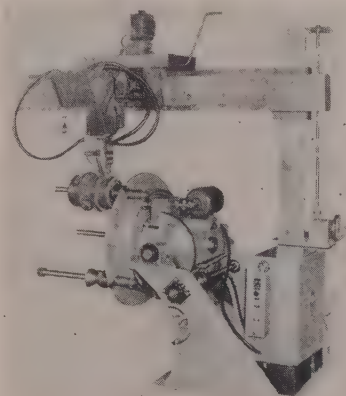
A load cannot be lifted without the gate or yoke of this safety hook automatically locking. To open, the hook must be manually pressed against a compression spring. The design al-



lows full throat opening and keeps the hook from catching on projections or ledges. Literature is available. **Newman Manufacturing Sales Corp., P. O. Box 5939, Kansas City 11, Mo.**

Roller and idler rebuilder

Herrick Mfg. Corp., 2000 Center St., Cleveland 13, Ohio, is manufacturing a machine to automatically rebuild idlers and rollers. For welding rollers, four spindles are provided,



equally spaced on the outer edge of the turntable. As the worktable turns a spindle is engaged at each 90 deg. A 1,000-lb. load may be rotated when the table is tilted at 90 deg. The machine is 8 ft. 4 in. high and weighs 2,000 lb.

Convertible trowel

A troweling machine that converts to 26-, 36-, or 45-in. capacity is now being marketed by **Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.** It is powered by either a pneumatic or electric motor. The safety throttle control eliminates stalling; when the handle is released the ring stops and the engine idles. An eye for lifting is provided. Both edges of the shoes and blades can be used. A



gasoline engine unit with 36-in. capacity sells for \$375.

¾-yd. scraper

A ¾-yd scraper is now being built by **McGee Manufacturing Co., 410 Dixon Ave., Compton, Calif.,** for use with the 600, 800, and NAA series



Ford tractors. The machine can be used as a scarifier, scarifier and scraper, floater and finisher, and a backfiller. The machine is 66 in. wide and weighs 610 lb. Literature is available.

Gurley transit

The optical plummet has been adapted to the American transit by **W. & L. E. Gurley, Engineering Instrument Division, Troy, N. Y.** This



principle permits the instrument to be leveled and centered by looking through a small telescope which is focused on the stake tack. The transit uses a tripod with fixed-length legs 54 in. long. The transit weighs 15 lb. Ask for Bulletin OP-57.

Rotary pump

Now available is a utility pump which develops 350 psi. It is adapted

to mounting on a pick-up or light truck. Where permanent installation is desired it can be mounted under the truck body. Literature is available. **Watson Company**, 1316 67th St., Emeryville, Calif.

Portable concrete finisher

This concrete finisher is fitted with balanced, retractable wheels for portability. It is available in a choice of



three ring sizes, 29, 36, and 48 in. in diameter. The free-floating drive base gives good pitch adjustments for both floating and finishing trowels. The manufacturer is **Champion Mfg. Co.**, 2028 Washington Ave., St. Louis 3, Mo.

3-in. "Mud 'n Sludge" pump

Barnes Mfg. Co., Mansfield, Ohio, has marketed a 3-in. diaphragm pump called the "Mud 'n Sludge." It is designed for such jobs as septic tank cleaning, mud handling, catch basin, trap and pit cleaning. The pump,



known in sophisticated circles as the BC-302, weighs 235 lb. and can be handled by two men. Specifications show a 3-in. suction and discharge, a capacity of 3,600 gal. per hr. at a 10-ft. head, and a maximum suction lift and discharge head of 25 ft.

Loader for small crawlers

A loader is now on the market for John Deere and other small crawler tractors. It has an all-welded box girder frame and double-acting hydraulic cylinders. The 1-ton bucket

will dump up to 9 ft. For additional information write to **Shawnee Mfg. Co.**, 1947 N. Topeka, Topeka, Kansas.

End section for corrugated metal

A new design for an end section for corrugated metal structures involves the use of two side lugs and a length of galvanized rod threaded on each end. It is an alternate type of connection for use in 30- and 36-in. diameter



pipe, and pipe-arches from 18 in. to 11 in. to 58 x 36 in. inclusive. The unit price installed is less, due to lower material and labor costs and elimination of the connecting band. For more information write to **Products Information Service, Armco Drainage & Metal Products, Inc.**, Middletown, Ohio.

Roller frame for Cat D4

A new 5-roller, oscillating-type, track roller frame is now available as an attachment for the Caterpillar D4 tractor. A tractor equipped with a 5-roller track frame requires a 34 section track included on the standard 4-roller machine. Light roller guards are available as attachments for use with the 5-roller frame. Also available are a new tool bar and tool bar bulldozer arrangements. For details write **Caterpillar Tractor Co.**, San Leandro, Calif.

Caterpillar pipelayer

Caterpillar, with four other pipelayers on the market, is testing another one, the 583, designed from the



ground up as a pipelayer. It has a lifting capacity of 130,000 lb. and a 21-in. ground clearance. The pipelayer drive is completely independent of the tractor master clutch and the torque converter. The machine

weighs 39 tons and is referred to by the manufacturer as the most efficient pipelayer ever built. Write **Caterpillar Tractor Co.**, San Leandro, Calif.

Flexible conveyor hose

A flexible metal hose, especially designed for use in conveying materials having abrasive and corrosive characteristics, is furnished with .012-in. stainless steel strip liner, unless a carbon liner is specified. Full details may be had by writing to **A. M. Younger, Universal Metal Hose Co.**, 2137 S. Kedzie Ave., Chicago 23, Ill.

International Harvester additions

Six truck models, the R-1700 series, powered by a valve-in head 140-hp. gasoline engine have been introduced by **International Harvester Co.**, 180 N. Michigan Ave., Chicago 1, Ill. The new models range in weight from 16,000 to 20,000 lb. Also in production are 13 six-wheel, motor-truck models with weights going from 33,000 lb. to 41,000 lb. Two new engines have also been added. The Black Diamond 264 delivers 140 hp. and the Royal Red Diamond 501 develops 212 hp.

Versatile electric wrench

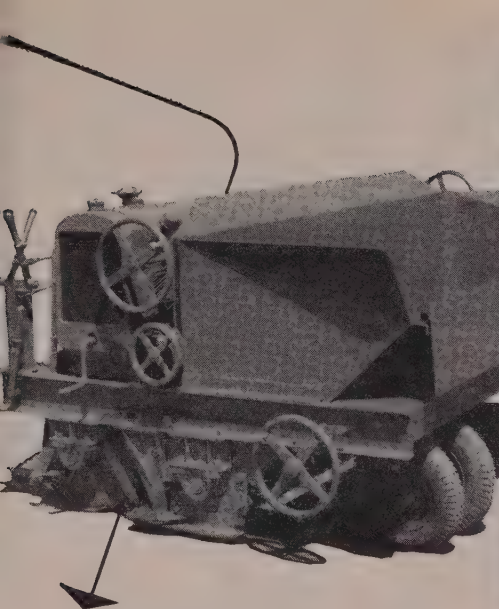
More than 26 attachments can be used with the W-120 electric wrench fitting it for such uses as brushing, sanding, reaming, tapping, removing



nuts and bolts, sawing and drilling. It has an AC-DC 25- to 60-cycle motor. The price is \$110. Write to **Mall Tool Co.**, 7725 S. Chicago Ave., Chicago 19, Ill.

Traffic line printer

Traffic and safety lines can now be printed on road surfaces with a sled-type roller made by **Line Marker Division of Universal Yonkers Corp.**, 30 Woodworth Ave., Yonkers, N. Y. The machines come in five models ranging in paint capacity from 3 to



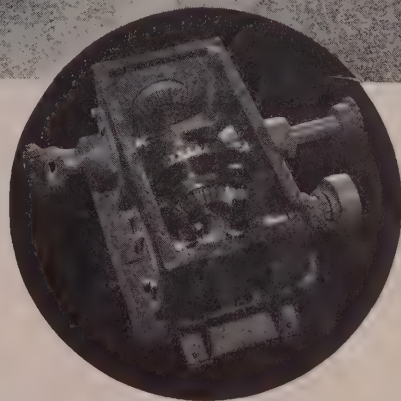
TOW TYPE

NO OTHER BITUMINOUS PAVER BUILT LIKE THIS!

IF you are figuring on the smaller asphalt jobs—those alley jobs, driveways, parking lots, tennis courts, playgrounds—here's the machine for you.

The Adnun Jr. is a far advance over the ordinary wheel mounted hopper.

Here is a machine that will give you many years of service. Look at the rugged frame! Every bearing is an anti-friction bearing! Oscillating Screed is cut from the plate. Hopper is heavy gauge steel. Engine power moves empty paver and saves truck time ordinarily wasted on relocation. Dual Controls make operation easy from either side. Such a unit means lower cost operation, fewer repair bills and a better job.



Above is gear case on the Adnun Jr. Gears have cut teeth and shafts run on anti-friction bearings all in an oil bath. This is typical of the high type design of the Adnun. It costs more to build but it pays out in less trouble on the job.



No other Black Top Paver gives you the wide range of service that is possible with the Adnun Sr. It lays any type of asphaltic mix, hot or cold. No other paver can lay as narrow a course and no paver lays anything wider. It is quickly equipped as a stone spreader and with Continuous Course Correction and the Fluid Level it lays to an accuracy unequalled by any other machine on the market.

ADNUN JR

MODEL 8

BLACK TOP PAVER

BLAW-KNOX COMPANY

CONSTRUCTION EQUIPMENT DIVISION

1940 State Street
Nunda, New York

BLAW-KNOX

10 gal. It is gravity fed and has no power unit. It can be used on black top, macadam, concrete, asphalt, or wood.

Straddle carrier dumper

A hydraulically operated straddle dump device is available for use with the 20,000-lb. capacity carrier manufactured by **Clark Equipment Co.**, Benton Harbor, Mich. Through its use, box-like containers for bulk ma-



terials can be picked up, transported, and dumped in a one-man operation. The device is U-shaped with the cross bar acting as the lifting device. Arms of the device are raised by two hydraulic chain hoists to a maximum 11½ ft. Load capacity is 16,000 lb.

Try these in mud or sand

Tracks like these can be used when trucks, cranes, or tractors are con-



fronted with mud, snow, or sand. They fit most tires and are easy to mount, giving up to 500% greater flotation. Available in 15- or 18-in. sizes from **P & G Supply Co.**, 1604 S. W. 10th Ave., Portland, Ore.

Small electric plants

A new line of small, engine-driven, electric-generating plants ranging in size from 500 to 2,500 watts has been announced by **D. W. Onan & Sons, Inc.**, Minneapolis 14, Minn. The sets are air-cooled and use less than 0.35 gal. per kw. hr. at full rated load. Optional accessories include a carrying frame, two-wheeled dolly, and a recoil rope starter. Literature is available.

4-in. diaphragm pump

A new 4-in. diaphragm pump combines two single units to double the conventional pumping capacity. The

same ratings applied to the single valve types carry over to the new line of double pumps which now deliver up to 12,000 gal. per hr., at 10-ft. suction lift. For complete details write for bulletin 55DP from **Rice Pump & Machine Co.**, Belgium, Wis.

Heavy equipment trailer

A new trailer for the transportation of construction equipment is the **Talbert trailer** which permits quick interchange of decks of various



lengths for greater load flexibility. In the photograph the units are attached to a 13-ft. deck with telescopic side extensions. For details write **Talbert Construction Equipment Co.**, 7950 W. 47th St., Lyons, Ill.

Imported transits

Two imported transits, built to American specifications, are now available from **Umeco Optical Division**, 465 California St., San Francisco 4, Calif. The 13½-lb. instrument has a 26-power telescope 9½ in. long. Horizontal circle is 5½ in. in diameter with verniers reading to 20 sec. The 9-lb. instrument has a 5-in. hori-

SUPERIOR CARPULLERS and BARGE MOVING WINCHES

CAPSTAN TYPE • DRUM TYPE • SPECIAL TYPES

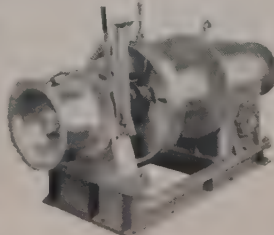


Model SC Superior
Capstan Carpuller



Model EP Drum
Type Carpuller

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.



30 H.P. Electric Mooring Winch

Write for Bulletins and Catalogs

SUPERIOR-LIDGERWOOD-MUNDY CORPORATION

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

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

BUY BARNES PUMPS

**Barnes Self-Priming Centrifugals Give You
More Pump, More Profit, Three Ways**

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- 3 **SIMPLE FIELD SERVICING** — direct flow suction, non-clogging trash type impeller, self-lubricating Super-Seal for quick, economical field servicing!

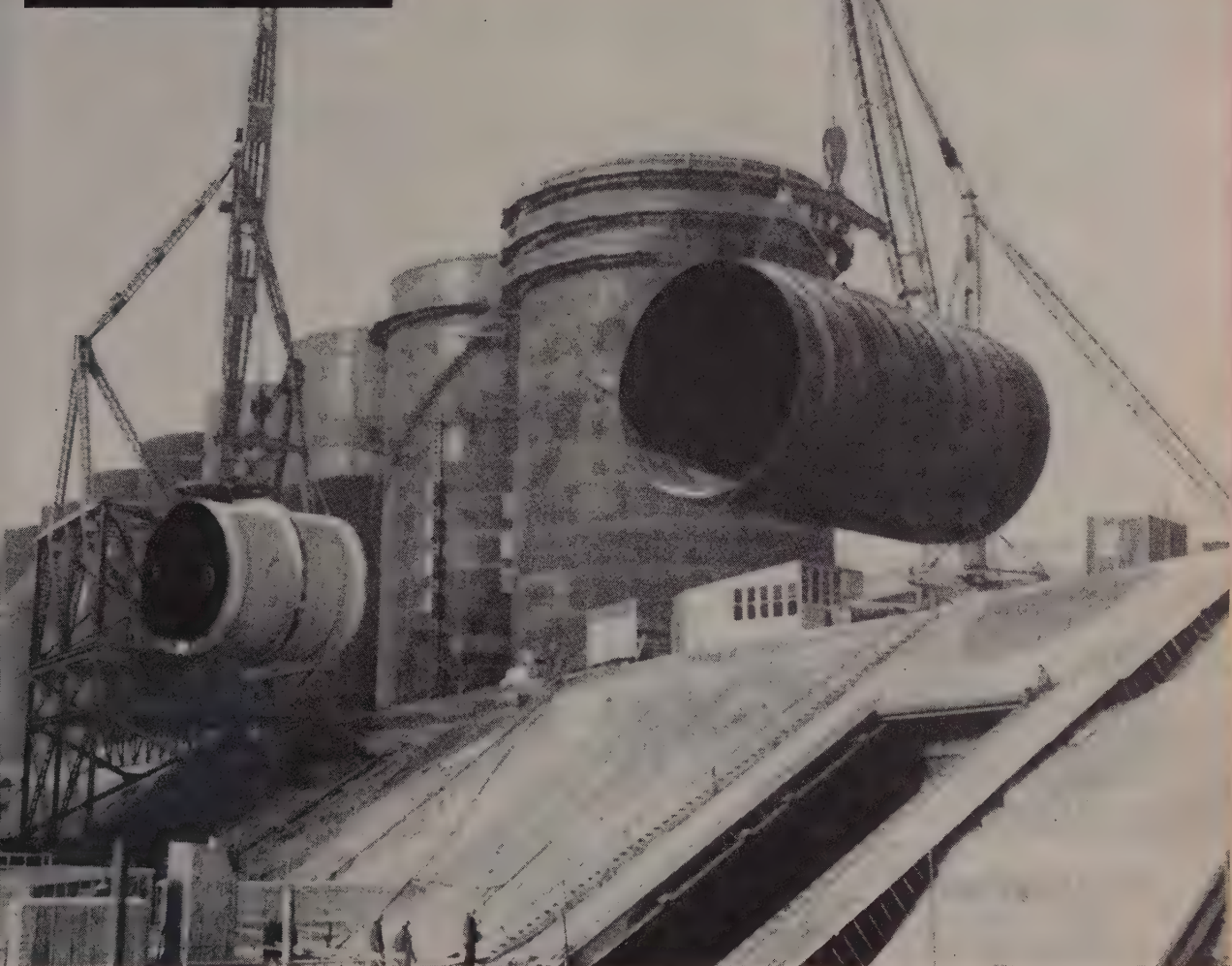
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MANSFIELD, OHIO
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Buy the best . . .
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See your **BARNES DEALER** or write for Catalog S2

Barnes Manufacturing Co., Oakland, California; Central Equipment Co., Berkeley, California; The C. H. Jones Equipment Co., Salt Lake City, Utah; Larson Equipment Co., Los Angeles, California; The Rix Company, Inc., San Francisco, California; Lowry Equipment Co., Redding, California; Universal Equipment Co., Seattle, Wash.

STEEL**PLATEWORK**by **PITTSBURGH DES MOINES**

Progress Report—from **FORT RANDALL**

Our multi-million-dollar project for the Corps of Engineers at Fort Randall Dam is concerned with steel. Here in South Dakota where the Missouri is being harnessed, we are building 8 steel surge tanks 59' diameter by 100' high; 8 steel penstocks 22' diameter by 700' long; an outlet pipe 22' diameter by 700' long, and related work. The picture shows the surge tanks, 95% complete, and in foreground the last 50-ton penstock can being lowered into Tunnel 10. The traveler crane is about to place a 30-ton can with ring girder into Tunnel 8. ● The craftsmanship is typically Pittsburgh-Des Moines. You can count on it for your forthcoming job—may we submit quotations?



PITTSBURGH-DES MOINES STEEL CO.

Plants at **PITTSBURGH, DES MOINES** and **SANTA CLARA**

Sales Offices at:

PITTSBURGH (25).....3420 Neville Island	DES MOINES (8).....921 Tuttle Street
NEWARK (2).....219 Industrial Office Bldg.	DALLAS (1).....1225 Praetorian Building
CHICAGO (3).....1224 First Nat'l Bank Bldg.	SEATTLE528 Lane Street
LOS ANGELES (48).....6399 Wilshire Blvd.	SANTA CLARA, CAL.627 Alvise Road

zontal circle and a 4½-in. vertical circle, both having vernier readings to 1 min. The telescope is 9 in. long with a 23-power magnification. The price is \$350.

14.6-hp. concrete saw

Chief among the features of the concrete saw now being manufactured by Champion Mfg. Co., 2028



Washington Ave., St. Louis 3, Mo., is the 14.6-hp. gasoline engine, easily accessible for maintenance. The welded steel construction of the ma-

chine has its weight distributed over four rubber tire wheels. Even three-wheel contact holds the blade in the cut. Standard equipment includes a water hose and apron and a belt guard.

Fuller transmission

A 9-speed transmission shifted with a single lever has been announced by the Fuller Mfg. Co. of Kalamazoo, Mich. The transmission, Model R-1150, is designed for trucks up to 300 hp., developing up to 800 ft. lb. of torque. Literature is available.

Hold-Kontrol valve

A hydraulic valve is now on the market which can be used for either single- or double-acting operation. A 360-deg. swivel handle can be set in any position. The valve can be made to hold in operating position until returned to neutral by pressure-operated detent. It has ¾-in. inlet and outlet ports, ½-in. cylinder ports. Char-Lynn Co., 2843 26th Ave. So., Minneapolis 6, Minn.

Rotating fairlead

A rotating fairlead for use on Bucyrus-Erie 22-B draglines is now available. With suitable bracket and anchor pin the fairlead can be used to replace the old style hinge type fairlead. It assumes the plane in which the rope bends over the sheave. Rollers are not required on this new



style frame. The guide plates are reversible to give double wearing life. Literature is available. Bucyrus-Erie Co., South Milwaukee, Wis.

Equipment briefs . . .

DIRECT ELECTRIC starting is now available on the Cat D2 crawler, the DW20, and DW21 wheel tractors, and the 212 motor grader. The system has two 12-volt batteries and is designed for use in moderate climates. Caterpillar Tractor Co., San Leandro, Calif.

TRIPLE GROUSER shoes are now standard equipment on both the No. 6 and HT4 Caterpillar Traxcavators. These shoes have three full width, low profile grousers 11/16 in. high. Caterpillar Tractor Co., Peoria 8, Ill.

DISC-TYPE IDLERS have become standard equipment on Caterpillar D6 tractors and No. 6 Traxcavators. The sides of the new idlers prevent brush and rocks from becoming entangled in the idler. Caterpillar Tractor Co., Peoria 8, Ill.

A TWO-POSITION, light material bucket with a 3-cu. yd. capacity is now available as an attachment for the No. 6 Traxcavator, according to Caterpillar Tractor Co., Peoria 8, Ill. The bucket is designed to handle aggregate weighing 2,000 lb. per cu. yd., or less.

A REDESIGNED 3½-cu. ft. plaster-mortar mixer is now built by the Kwik-Mix Co., Port Washington, Wis. Improvements affect both the design and the performance of the unit. Literature is available.

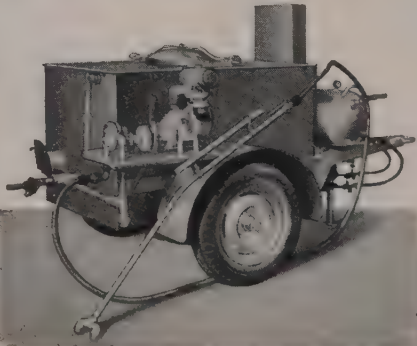
AIR OUTPUT of the Le Roi Tractair has been increased from 105 to 125 cfm. The Tractair, a combination wheel tractor and air compressor, still sells for \$3,688 FOB factory. Le Roi Division, Westinghouse Air Brake Co., Milwaukee 14, Wis.

SCHILD BANTAM CO., of Waverly, Ia., has announced improvements on its line of ¾-yd., 5- and 6-ton trucks and crawler-mounted crane-excavators. One of the new features is a change from 4 to 6 cylinders. There has been no price increase. Literature is available.

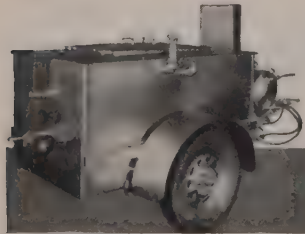
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MATERIALS**



Capacities from 80 to 325 gallons. All equipped with *exclusive* FIRE PROOF TOP (hinged tops available for roofing use). Operator and equipment are *protected* from flash fires. Complete line of accessories optional. Choice of kerosene and propane burners.



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Ward Leonard Electric
Excavators Offer . . .**

LOW COST DIGGING FOR BIG YARDAGE JOBS



Large construction projects, like the multi-million yard Fort Randall Dam, profit greatly from the big-output capacity of Bucyrus-Erie Ward Leonard electric excavators. These machines help bring down the cost-per-ton of dirt moved to real profit-making levels.

New front-end design adds strength while reducing power-wasting deadweight. Heavy-duty construction from treads to boom point keeps maintenance costs low and adds many years to machine life. Ward Leonard control results in extra fast acceleration and deceleration. There's extra torque and plenty of usable power when needed most.

When you bid jobs involving big yardages, protect your profit margin with a Bucyrus-Erie Ward Leonard electric excavator. Three models to choose from — the 4½-yd. 110-B, the 6-yd. 150-B, and the 8-yd. 190-B.

49L55

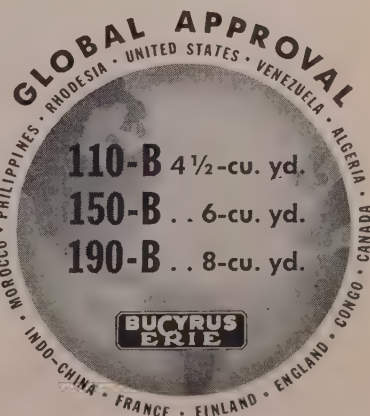
This Bucyrus-Erie 150-B was used in digging an approach channel to the downstream portion of the Fort Randall Dam spillway. Earlier, the electric shovel worked on the construction of haul roads and ramps leading to the excavating area.

**BUCYRUS
ERIE**

South Milwaukee
Wisconsin

1880 **75** 1955

YEARS OF SERVICE
to Men Who
Shape the Earth



News of DISTRIBUTORS

Frank Gaus adds technical asst.

Frank D. Gaus Co., Long Beach, Calif., announces the addition of Wayne N. Cardott as technical representative on matters of concrete



Wayne N.
Cardott

construction as applied to the products of Serviced Products Corp. and Dewey and Almy Co. Cardott's headquarters will be at Burlingame, Calif., P. O. Box 224.

Aeroquip distributor

Aero-Coupling Corp., Southern California, announces the appointment of Los Angeles Rubber & Asbestos Co. as distributor of Aeroquip hose lines and couplings in the Southern California area.

Northwest appointment

Appointment of Star Machinery Co., Seattle, Wash., as a distributor for the combined lines of Marion-Osgood-General equipment covering the state of Washington, parts of Idaho, Montana, and Alaska, is announced.

Gradall service in Arizona

Gradall Division of The Warner & Swasey Co. recently announced the appointment of State Tractor & Equipment Co., Phoenix, as distributor for the state of Arizona. C. R. Templeton, industrial sales

manager, heads the Gradall operation of the Arizona distributor.

Huber-Warco distributors

Huber-Warco Co. announces the appointment of Sawtooth Company, Boise, Ida.; Caird Engineering Works, Helena, Mont., and The O. S. Stapley Co., Phoenix, Ariz., to distribute its complete line of rollers and graders in their respective territories.

Manitou Equipment, new account

Manitou Equipment Co., Portland, Ore., recently acquired the distributorship of Unit cranes, shovels, draglines, etc.

Promotions at Cummins Engine

Promotion of Loyd E. Williams to manager-distribution, Cummins Engine Co., Inc., Columbus, Ind., is announced. Williams had been Rocky

Lloyd E.
Williams



Mountain regional manager for Cummins, in Denver, Colo., since March 1950. In his new position he will be in charge of the firm's 12 regional offices, handling domestic distributor activities.

IH Wyoming distributor

Keremi Tractor & Equipment Co., Cheyenne, has been appointed IH Industrial Power distributor in the

state of Wyoming for the full line of International Harvester Co. A complete stock of replacement parts is maintained at Cheyenne and at the Keremi branch in Casper.

D'Arcy represents Clark Equipment

Nicholas A. D'Arcy, Jr., Huntington Park, Calif., has been appointed factory representative for Clark Equipment Co.'s automotive divi-



Nicholas A.
D'Arcy, Jr.

sion. He will handle the Clark line in San Luis Obispo, Kings, Tulare, and Inyo counties in Southern California, in Arizona, and in Clark County, Nev. Assisting D'Arcy are George Riley and John Eber.

Alex Ainlay moves to Calif.

A. E. Ainlay, district representative for Pettibone-Mulliken Corp. at Denver, Colo., is moving to California and will locate in the vicinity of Sacramento. He will work with Pettibone-Mulliken, Pettibone Wood, Universal Engineering Corp., and Haiss Mfg. Co. in Northern California, Nevada, western Idaho, Oregon, Washington, and British Columbia.

Homelite personnel changes

Ralph Evans of the Homelite Corporation of San Francisco has been transferred to Los Angeles as new district manager there, succeeding Clyde Southwick, who resigned to become associated with his own company, Kwik Manufacturing Co., Inc. Evans has been with Homelite ten years, first as a salesman, then branch manager at Sacramento, and later as branch manager and assistant to Robert C. Glidden, district manager at San Francisco.

Keremi represents Hensley line

Hensley Equipment Co., Oakland, Calif., recently appointed Keremi Tractor & Equipment Co., at both Cheyenne and at Casper, Wyo., to handle the Hensley equipment in their respective areas.

Worthington appoints distributor

Worthington Corporation's portable compressor and contractors' tool division announces the signing of a new distributor agreement with Dove Creek Equipment & Supply Co., Dove Creek, Colo. The new distributor will handle Worthington's complete line of portable compressors and contractors' tools and will serve counties in Arizona, Colorado, and New Mexico.



NEWLY ESTABLISHED BRANCH of H. W. Moore Equipment Co. at Grand Junction, Colo. Located at 2335 Grand Ave., the property covers four acres. All lines handled at Denver headquarters are now available here. Cecil Terrel, branch manager, has a large stock of parts and equipment on hand.

MANUFACTURERS



A. G. STREBLOW (left), president of Basalt Rock Co., and **Jack L. Ashby**, vice president and general manager of Kaiser Steel Corp., during inspection of the Napa, Calif., facilities of the Steel Division of Basalt Rock Co., which Kaiser Steel will purchase. Largest pipe fabricator in the West, the Basalt Steel Division includes two modern plants at Napa and Fontana.

Garlinghouse takes on Viking

Garlinghouse Brothers, Los Angeles, recently took on the Viking Manufacturing Co. line of concrete conveyors.

Raymond official retires

Rear Admiral Kirby Smith, CEC, USN. (Ret.), vice president and director of Raymond Concrete Pile Co., recently retired as vice president of domestic sales. Donald W. Moss succeeds him.

Blaw-Knox ups two

Robert A. Troman has been promoted to sales manager of the tower department, Equipment Division of Blaw-Knox Co., replacing A. H. Jackson, who has been promoted to manager of engineering and development.

U. S. Steel new operation

Shipment of the first commercial order for a new product—cold expanded seamless pipe—is now being made from the Lorain Works of U. S. Steel Corp.'s National Tube Division. Operation of the new expansion unit at Lorain is the first of its kind in the pipe-making industry. The equipment is designed to expand pipe in the size range of 16-in. to 26-in. outside diameter.

Gerwick retains prestressed firm

Announcement was recently made by Robert H. Singer, representative for the precast and prestressed manufacturing division of Ben C. Gerwick,

Inc., San Francisco, that T. Y. Lin & Associates have been engaged as technical consultants on the manufacture, design, and use of prestressed concrete building and related members.

U. S. Rubber sales

Two sales appointments are announced in truck tire department of United States Rubber Co. by H. C. Oliver, sales manager of the U. S. Tires Division. H. W. Dodenhoff has been made manager of truck tire sales; J. F. Arthur becomes manager of fleet sales. Dodenhoff, with U. S. Rubber since 1948, was most recently a merchandising specialist. Arthur was formerly truck tire sales manager, and previously had been a district manager in Seattle and San Francisco.

Bucyrus-Erie ups Goree

According to recent announcement, Edwin T. Goree has been appointed assistant sales manager, excavator distributors, for Bucyrus-Erie Co. Goree will assist R. C. Adams.

Cummins Engine promotes Every

Recently appointed to the position of assistant general sales manager of Cummins Engine Co., is Paul J. Every. Before joining Cummins in 1947, Every was sales manager of

For your concrete forming needs...

EFCO "LIFETIME" STEEL FORMS

available on a **PURCHASE BASIS**

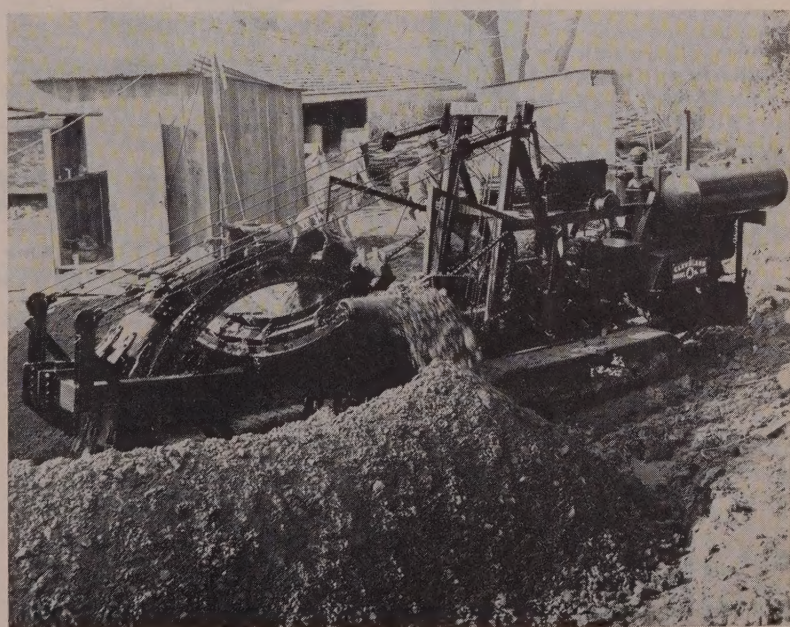


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(advertisement)



STORM DRAIN TRENCH, 5½ feet deep by 22 inches wide, at El Rancho Verdi, Hayward, Calif. was dug by this Cleveland in a right-of-way so narrow it allowed barely enough room to unload the trencher. The outstanding maneuverability of the compact Cleveland trencher was a most important factor on this job, according to owner L. C. Jensen of Castro Valley, Calif. To dig *more trench . . . in more places . . . at less cost* get the facts on Cleveland trenchers from your local distributor or write: **THE CLEVELAND TRENCHER CO., 20100 St. Clair Ave., Cleveland 17, Ohio.**

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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.

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Planning and Project Engineers—Flood Control. Salary July 1, \$507 with periodic increases to \$616. Preliminary studies and design of flood control construction. Write County Civil Service, 236 Third Street, San Bernardino, California.

Engineers—Foremen—Office Men

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

Geo. E. Deatherage & Son
CONSTRUCTION CONSULTANTS
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PORTABLE PRE-FABRICATED BRIDGES

Bailey Steel Panel-Truss Type
Either Permanent or Temporary
for

• Remote rural roads • Oil, mine & timber access • Emergency detours • Construction by-passes • Park roads • Forest roads • Foreign development.

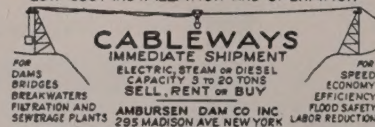
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BAILEY BRIDGE EQUIPMENT CO.
1343 Chorro St., San Luis Obispo, Calif.

FOR SALE

One Model 36 Woods Road Mixer like new. Used only 225 hrs. For information, write to Doug-Lynn Co., 1638 Main St., Walnut Creek, California or call Yellowstone 4-5759.

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IMMEDIATE SHIPMENT
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SELL, RENT OR BUY
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NEAR BREWSTER, WASHINGTON

Shipped New — Used Only One Job

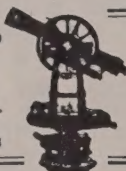
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Length	Pcs.	Pcs.	Pcs.
72-65 ft.	105	100	2
65-60 ft.	210	50	9
60-50 ft.	210	5	18
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Also quantify 35 ft. and shorter—Quick Shipment Regardless of job, location. Write, Wire or Phone.

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LB FOSTER Co.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
HOUSTON 2 • LOS ANGELES 5

the heavy equipment division of Baldwin Locomotive Works.

R. W. Robinson named sales mgr.

Roger W. Robinson has been appointed sales manager for Clark Equipment Co.'s transmission division, making his headquarters at the plant at Jackson, Mich.

Wallis joins Schield Bantam

Schild Bantam Co. announces the appointment of Buel M. Wallis as general sales manager. Wallis formerly was general sales manager of the Adams Division of LeTourneau-Westinghouse Co.

Broderick & Bascom elects prexy

Joseph H. Bascom, executive vice president and treasurer of Broderick & Bascom, was recently elected president of the firm.

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WESTERN CONSTRUCTION, 609 Mission St., San Francisco 5, Calif.

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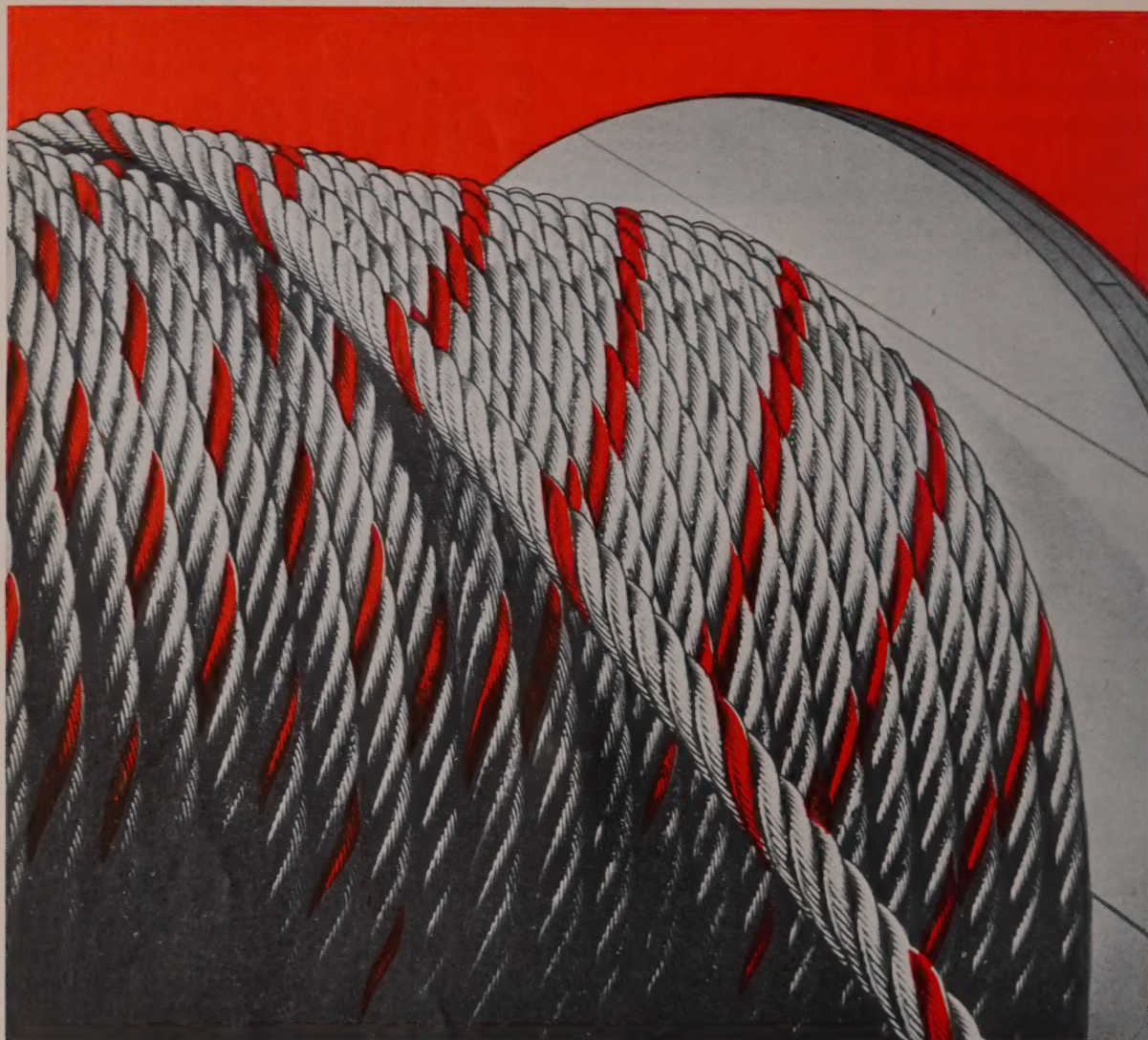
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