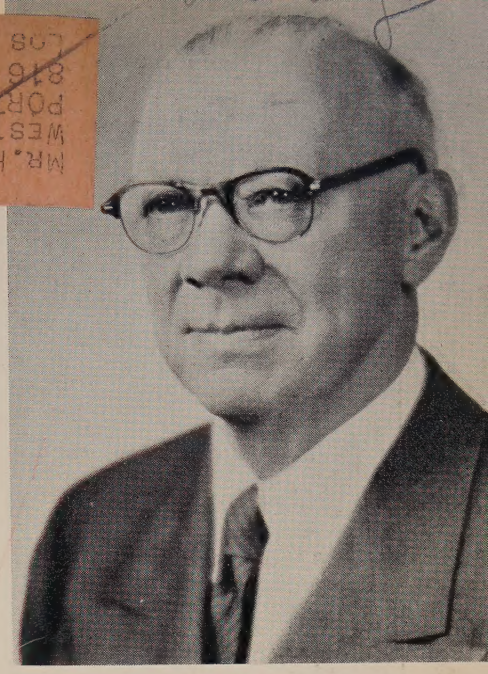
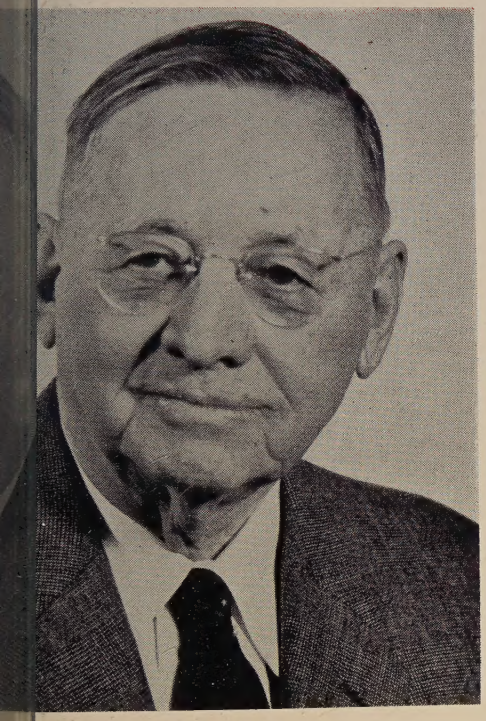
ESTERN
ONSTRUCTION



JOHNSON



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FEBRUARY 1960

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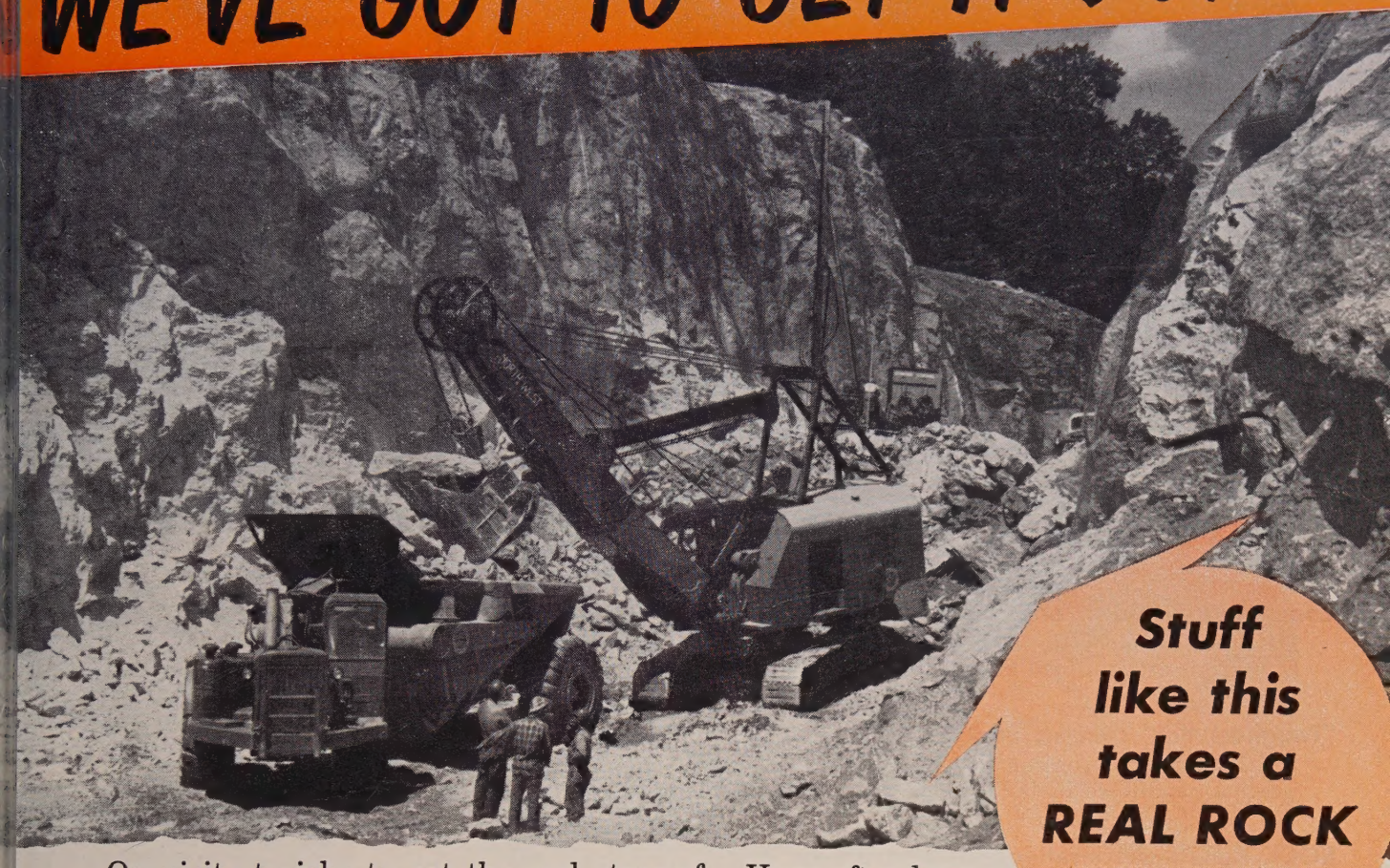
THE GENERAL TIRE & RUBBER CO. Akron, O.

'WE'VE GOT TO GET IT DONE!



Stuff like this takes a REAL ROCK SHOVEL!

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WESTERN CONSTRUCTION

KING PUBLICATIONS

FEBRUARY
1960
Vol. 35 No. 2

CONTENTS

COVER—Three of the men honored by the Beavers, Western construction organization at their annual dinner in Los Angeles last month are shown on our cover. For details see page 60.

Published monthly by
KING PUBLICATIONS
609 Mission Street
San Francisco 5, California
Phone: YUkon 2-4343

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★

Subscription $10.00 per year, $12.50 foreign, single copy $1.00. Cost per single copy of Construction Equipment Directory, published each January, is $5.00. Every regular qualified recipient of Western Construction receives a copy of the Construction Equipment Directory bound in the January issue.

Accepted as Controlled Circulation, publication at Portland, Oregon. Postmaster: Please send Notice 3579 to Western Construction, 609 Mission Street, San Francisco 5, California.

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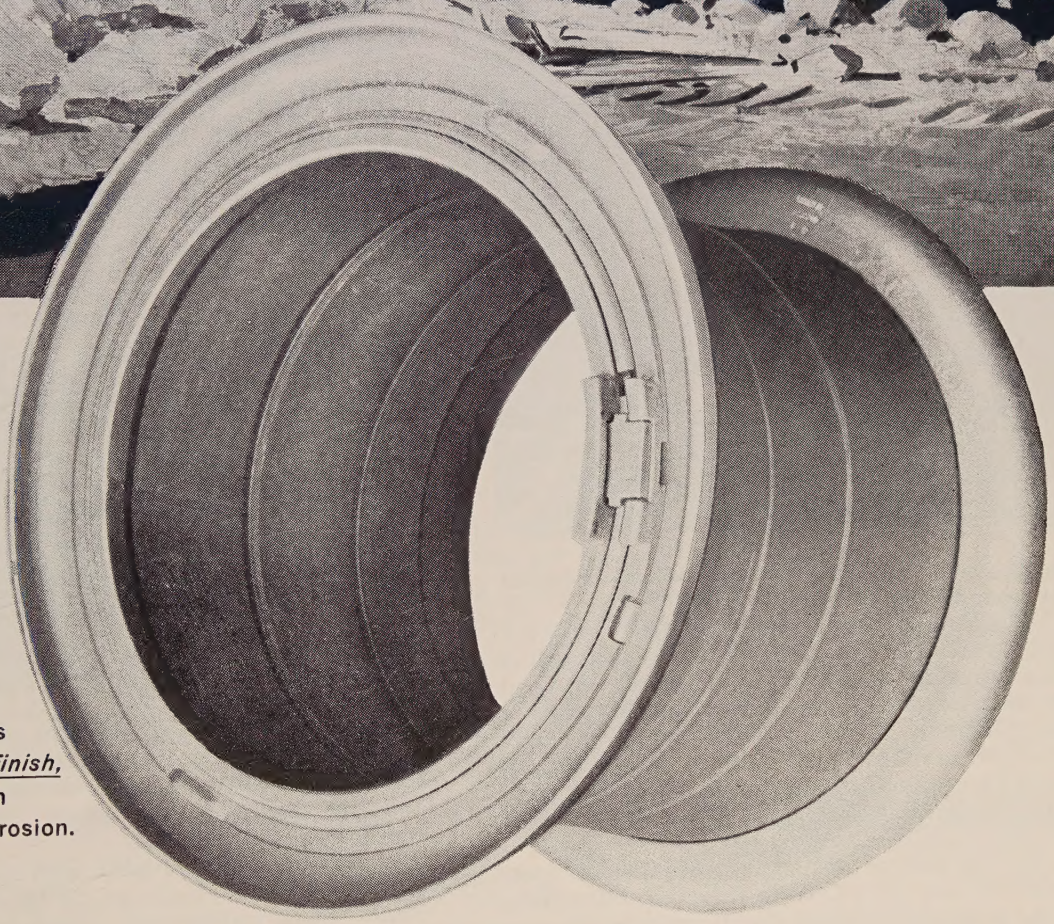

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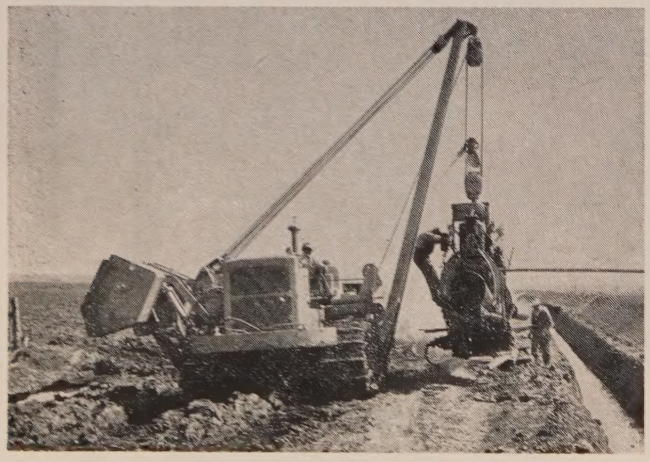
NEW EQUIPMENT

Obtain more information on these new developments in construction equipment by writing the corresponding numbers on reply postcard.

Pipelayer with improved power control

A power shift transmission, featuring an exclusive new concept in the transmittal of pipelayer power, is now available on the Caterpillar No. 583 Pipelayer. It provides instantaneous, one-lever control of gear shifting without interruption of power and momentum. It is built to withstand the demanding conditions of pipelayer service.

In addition, by a unique utilization of planetary gear versatility—introduced to the industry on these machines—pipelayer performance is provided which combines the best features of both direct drive and torque converter power trains. Heart of the new power-tailoring arrangements is a planetary gear set, driven integrally by the engine flywheel, which transmits 1/3 of the engine torque directly to the transmission input shaft, and the remainder through the torque converter.



Horsepower of the No. 583 Pipelayer has been increased from 225 to 235.

On the operator's deck, one speed-range selection lever now takes the place of the three levers which formerly controlled gear selection, flywheel clutch operation and forward-reverse movement. In terms of operator efficiency, this means: reduced shifting time, effortless and simplified gear changes. Only a fraction of a second is required to actuate the power shift transmission, as against a shift time often up to several seconds for standard transmissions.

Shifting ease insures the matching of pipelayer speed and power to the terrain. With finger-tip selection of gears, the powershift transmission permits rapid movement on the pipeline right-of-way.

In the dope and wrap operation, for example, the pipelayer can instantly match its speed to the wrapping unit even under adverse conditions such as uncertain underfooting or grade changes. In the lowering-in operation, the reduced shifting time insures rapid movement in changing machine positions, increasing laying efficiency.

By directing a portion of engine torque straight to the transmission input shaft, it provides higher overall efficiency than a standard torque converter drive and retains the solid feel of direct drive machines.

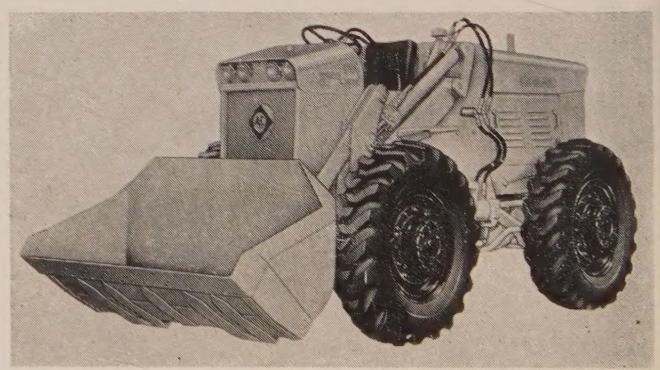
The remainder of the engine power is directed through the torque converter, allowing the tractor to automatically adjust travel speed to load, as on normal torque converter drive pipelayers.

The No. 583 power shift Pipelayer has a three-speed forward, three-speed reverse, planetary transmission. It consists of five in-line gear trains, each with a separate clutch. Two of the planetary trains are directional; three constitute the low, intermediate and high gear ranges. ***. . . Write No. 150***

Two transmission types on one loader

Two types of transmission available with a single model front-end wheel loader have been announced by **Allis-Chalmers Mfg. Co.** Model TL-14 TractoLoader is now available with either the Allison transmission, or the new, economical Tractomatic power reversing transmission.

The four-speed Tractomatic transmission reduces initial capital outlay for a wheel loader without sacrificing essential advantages. On the Tractomatic transmission, a single hydraulically operated steering column lever controls both forward and reverse movement without clutching, shifting gears, or stopping the machine.



The Tractomatic transmission provides maximum efficiency for almost all TractoLoader applications. The manufacturer recommends the Allison transmission specifically for operations involving relatively long travel haul distances.

Model TL-14 is available with either an 86-hp. 6-cylinder gasoline engine or 83-hp. diesel engine. No matter which transmission option is selected, the machine is equipped with an automatic clutch cut-off, which has the effect of placing the transmission in neutral and thereby diverting full engine power to the hydraulic system at a touch of the brake pedal. This clutch cut-off can be disconnected, when loading on a down-grade or dozing over a bank, by flipping a lever in the operator's compartment. ***. . . Write No. 151***

(Turn to page 127 for more New Equipment. New Literature can be found on page 122.)

'KOLMAN Conveyor-Screen Plant Increased our Production 65% on Sticky Crushing Job'

Hopkins Construction Ltd. Thanks a Kolman for Preventing Operating Loss

Hopkins Construction Ltd., Lacombe, Alberta, began a crushing job near Edmonton this spring on which they were required to produce about 40,000 tons of ¾" gravel. This was to be taken from a stockpile of pit run gravel. Their examination of the material indicated an average crush which they thought could be completed without difficulty.

"But when work commenced," said C. D. Marble, "we encountered about a foot beneath the surface exceptionally sticky fines which cut our production to not more than 50%. Regardless of what adjustments we made in our equipment we could effect no improvement. The gummy fines adhered to anything they touched. For a time it looked like a pretty dismal proposition.

"We solved the problem by introducing a Kolman 50'x36" conveyor with vibrating screen. It succeeded in separating the sticky fines from the rock which was passed directly to the crusher and also fed the fines back to the conveyor belt in a manner which resulted in good blending. Our production increased about 65% immediately. As a result the job was completed in good time, where otherwise it would have lasted considerably longer and resulted in an operating loss to ourselves."

Hopkins Construction Ltd. is just one of hundreds of contractors who are discovering Kolman has the combination for low-cost, high production screening and loading. Many have used set-ups similar to that pictured here to speed up their production by preliminary screening ahead of the crusher.

Extra heavy construction permits the Model 101 to handle heavy loads at constant rates without fear of excessive expense or breakdown time loss. It's a brute for production — the 36" is capable of loading over 800 tons per hour!

50-ft. Kolman Model 101 with 36" belt shown separating fines on Hopkins Construction Ltd. job near Edmonton, Alta. Equipped with Model SB-80 Kolman single-deck screen and feeder-trap combination.

The Kolman Model 101 is available in belt widths from 18" to 42" and up to 60-ft. lengths on portable plants. It's capable of carrying either a single, double or triple-deck vibrating screen without additional support, and can be equipped with a dozer trap, casting hopper, feeder-trap, or feeder-hopper. Adaptable to any type of feeding — dozer, dragline, shovel, front-end loader and others. Best of all, the Kolman 101 costs less than comparable heavy-duty conveyors. Better check into it now!

See Your Nearest Dealer

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NEW MEXICO
ALBUQUERQUE—Construction Machinery Co.

OREGON
PORTLAND—Balzer Machinery Co.

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SEATTLE—Sahlberg Equip., Inc.
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The WEST from WASHINGTON

By E. E. HALMOS, JR., Washington, D. C.

Although it still appears unlikely that any major aid-to-education legislation will get through this session of Congress, the Administration seems to be pushing hard to make a record of its concern over the shortage of educational facilities.

The construction needs of the Western states for educational purposes figure heavily in this campaign. Despite the fact that one of the states—California—leads all others in bond-issue approvals for school construction, the classroom shortages of the 15 states that Washington now considers "western" (including Alaska, Hawaii and Oklahoma) still total an estimated 19,640—more than a seventh of the total national need.

Principal reason that Washington takes a dim view of any major school aid prospects this session is the fact that such a program will inevitably raise the specter of racial integration. And Southern members of Congress are bitterly opposed to any law that would force further, or faster, integration in their home districts. So it's obvious that party leadership will try to soft-pedal school aid this session, to avoid divisive political battles. Or, if something does get to the floor, it'll be swamped in impassioned oratory and won't get far.

(This problem, incidentally, is equally present with relation to housing legislation that's still pending, after a Presidential veto last session.)

However, three major bills are still pending in Congress, and there'll be some effort to bring them to the floor. One, an Administrative measure, would provide $100 million of federal money over a 25-year period; a bill by Montana's Senator Murray would spend $11.5 billion over four years; another by Michigan's McNamara calls for a $2 billion, two-year program.

Backing up the general cry for help, the Department of Health, Education and Welfare has released a year-end report indicating that the national classroom shortage in the Fall of 1959 was 132,400 units. Breakdowns by states give these totals for Western states:

Arizona, 1,676; California, 4,600; Colorado, 1,125; Idaho, 761; Montana, 572; Nevada, 269; New Mexico, 1,078; Oregon, 694; Texas, 4,557; Utah, 925; Washington, 2,272; Wyoming, 102; Alaska, 293; Hawaii, 474. It is interesting that the greater part of this need is to accommodate excess enrollment in eight of the states—Arizona, Colorado, Nevada, Oregon, Texas, Utah, Wyoming and Alaska. In the others, the greater need is for replacement of existing unsatisfactory facilities.

Despite evidence of strong voter support for school construction bond issues, HEW said state education authorities estimated that classroom construction will drop behind 1959 this year, by about 10.4%, unless further help is held out by the Federal government.

* * *

When you get into the area of local financing for school construction, Western states show up remarkably well.

Overall, in the first 11 months of 1959, voters in 48 states approved bond issues totalling $1.2 billion. That's under the 1958 total of $1.4 billion, but shows a jump of 30% over 1957. HEW points out that since bond proposals are presented to voters in greater numbers in election years (such as 1958) the 1957-59 comparison is a fair one.

The Western states are the strongest in this picture. HEW's survey indicated that in the period 1953-1959, 55.9% of all bond issues were concentrated in seven states—two of which were California and Texas. In fact, two states—California and New York—accounted for 27.6% of all school bond sales in that period.

The Investment Bankers Association, in an analysis of the 1958 bond record, fills in some details: From 1947 to 1957, nine states had a population growth rate of more than 30%. Included were California, Arizona, Nevada, New Mexico, Colorado, Oregon and Utah (California's population alone went up 40%). With only 15% of the nation's population, these states (plus Delaware and Florida) accounted for more than 21% of school bond sales.

In detail, here's how the Western states did, according to IBA figures, in 1958 school bond sales: Arizona, $26.4 million; California, $1.1 billion; Colorado, $73 million; Idaho, $11 million; Montana, $18 million; Nevada, $17.5 million; New Mexico, $21.5 million; Oregon, $55.1 million; Texas, $364.2 million; Utah, $25.6 million; Washington, $105.7 million; Wyoming, $7.6 million.

And IBA foresaw continued strong support of such bond issues through 1960.

All of which adds up to good construction prospects in educational construction in the West, almost regardless of new Federal legislation.

* * *

And, speaking of prospects for business in 1960, you have to conclude that construction business will remain good, probably rise—barring a major and long-lasting strike in a basic industry.

You've already been swamped in the flood of statistical predictions and analyses that flow out of Washington and other cities about this time of year. For construction, the net seems to be an increase in total volume for 1960—despite predictions from several sources that housing will be the "sick man" this year. (That's a point of view of course. New housing starts for 1959 are now generally pegged at 1,350,000. The most pessimistic of the forecasts figure a drop to about 1,200,000 for 1960—entirely ascribed to tight credit. And there's some evidence that demand for more expensive homes, with more bathrooms, fancier kitchens, etc., may offset the drop, from a dollar standpoint, at least).

Overall, though, most statisticians look for a general rise in volume (not counting maintenance and repair) of up to $2 billion, with the heaviest emphasis on industrial construction—one economist has predicted that private industry will spend as much as $3.5 bililon for new plant and equipment.

Other factors are evident to support these forecasts. For instance, if you dig deep enough into the mammoth budget statement that the President sent to Congress in mid-January, you'll find something like $7 billion tucked into various places for construction work. The demand for school space, discussed above, is another factor, as are continuing programs (even if not increased) for stream pollution control, housing, health facilities of many kinds, and defense.

And then, too, you must repeat

"CLASH-BOX" robbing your CASH-BOX?

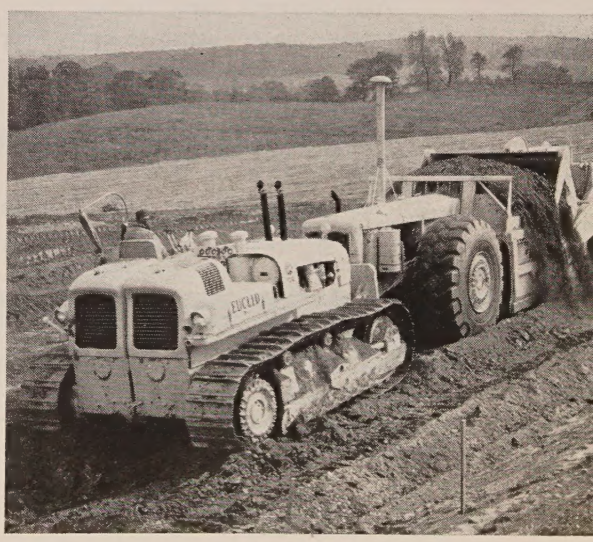
Crawlers without full-power shift are obsolete . . . and costly!

If your crawlers have master clutches and manual shift transmissions—"clash-boxes" as they're commonly called—you may be passing up profits that should be yours.

With proven Torqmatic Drive in the Model C-6 and the TC-12, Euclid Crawlers provide full-power shift and instant reverse. There's no loss of power or momentum when changing from one speed range to another . . . no delay for clutching and shifting . . . and with a flick of the wrist you change travel direction fast. It's a dependable power train, too . . . proved in thousands of "Euc" earthmovers on every kind of job.

Have your dealer show you how Euclid Crawlers have more productive capacity on any tractor work . . . dozing, ripping, push loading big scrapers, or towing heavy loads. The seconds they save on every work cycle can add up to more cash in your cash box!

EUCLID Division of General Motors, Cleveland 17, Ohio
Plants at Cleveland and Hudson, Ohio and Lanarkshire, Scotland.



Proven Torqmatic Drive provides smooth steady flow of power . . . full-power shift . . . instant reverse . . . easy operation. For push loading scrapers the fast maneuverability of "Euc" crawlers cuts scraper cycle time and steps up production . . . changes from one speed range to another, and from forward to reverse and back again, are made under full power . . . there's no clutching.

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GM GENERAL MOTORS EUCLID

EUCLID EQUIPMENT

FOR MOVING EARTH, ROCK, COAL AND ORE

that this is a political year. Congress can do much to increase Federal spending for construction.

* * *

A big imponderable for construction industry statisticians has always been the amount of money spent and materials and labor used in maintenance and repair work. AGC, for instance, estimates that it will total $20 billion in 1960, other sources are more conservative.

The reason, of course, is that much of this work is too small to appear in any regular statistics—an increasing volume of it falls into the "do it yourself" category, in which Western residents have long been pioneers.

This year, the Census Bureau (which, as you know, took over some of the functions of the Bureau of Labor Statistics in this field) will make a try to pin this work down. It has prepared lengthy questionnaires for householders and other property owners, in an attempt to find a basis. Results won't be available until the end of the year, if then.

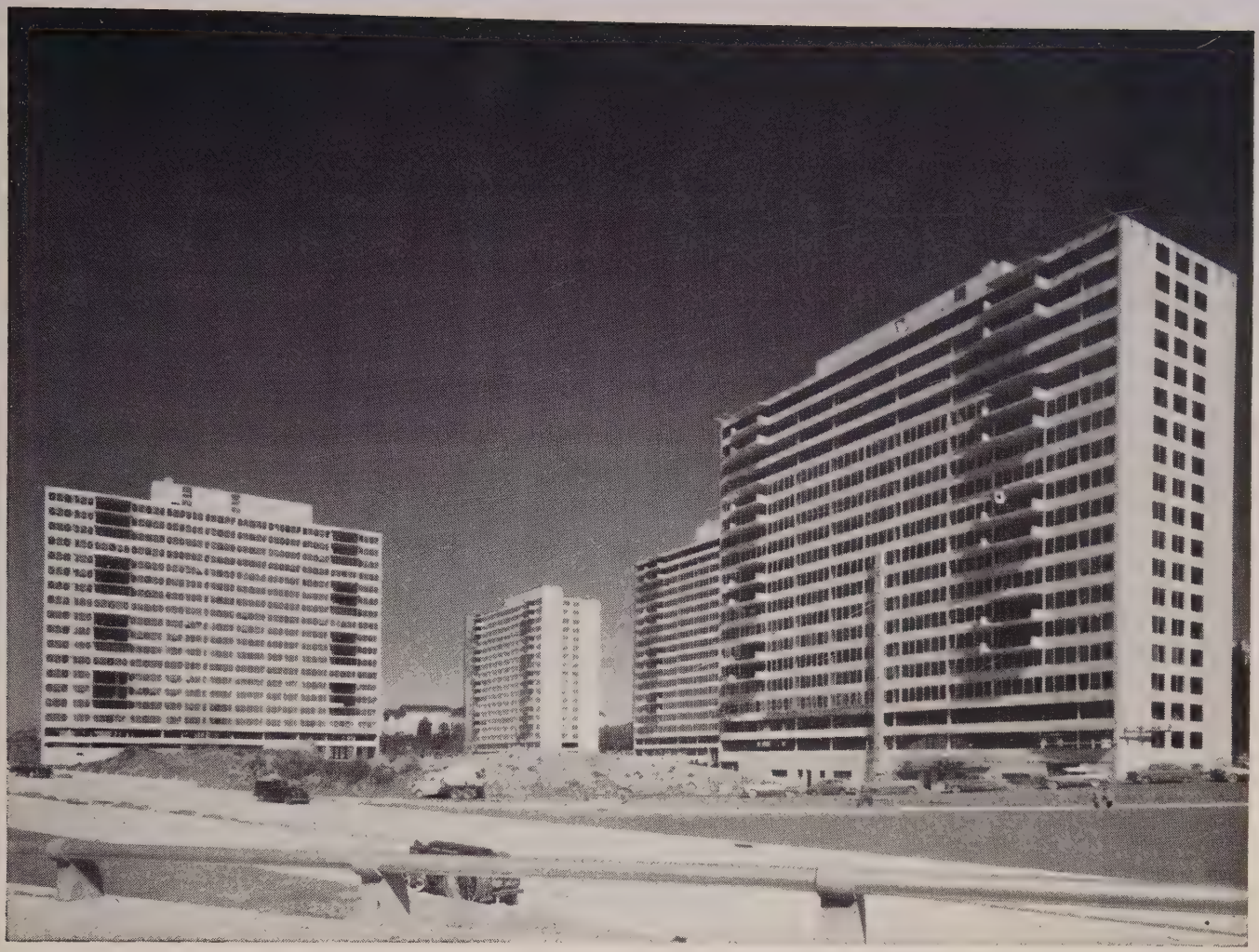
Census, by the way, will make a second series of aerial reconnaissances this spring, to see if it can relate photography with its figures on new housing and new construction starts. One series was flown last fall, is still being evaluated. Objective is to bring the data more nearly up to date, get more complete coverage than is possible by normal reporting methods.

* * *

New Federal buildings for San Francisco and Los Angeles are in the cards for funding by Congress this year—but they're not the start of any large program. They are, in fact, leftovers out of some 96 projects authorized in 1954, which the General Services Administration wants to get under way this year. (There are a total of 20 such "leftovers"—all completely planned, and all but two with sites already acquired) ready for funding now.

GSA will also ask Congress for planning and site survey money for a number of new structures, above the 20 mentioned, but doesn't expect to get funds for more than a few (and the agency figures it takes about three years from granting of such initial money to awarding of construction contracts).

There is, however, a possibility that Congress may do a bit better on this front than in previous years.



Ultimate strength design used in Philadelphia's newest housing project!

Modern application of this tested principle provides short cuts in planning . . . brings substantial savings in time and materials.

The 18-story Park Towne Place apartments are the largest urban renewal development in the U.S.—and Philadelphia's tallest reinforced concrete structures!

Here was an ideal opportunity for engineers to demonstrate the value of the *ultimate strength method* for designing concrete.

The engineers used *ultimate strength design* because they believed this procedure to be more consistent with actual structural behavior and more realistic in relation to encountered loads, resulting in uniform safety factors—neither over- nor under-designed.

The design of the columns on this project demonstrated dramatically the economy of materials achieved by using *ultimate strength design*. Engineers everywhere are finding *ultimate strength design* is quick and easy when they use procedures, data and design aids now available.

Parke Towne Place Apartments. Architects: John Hans Graham & Associates, Washington, D.C.; Milton Schwartz, AIA, Philadelphia. Structural Engineers: Dorfman & Bloom, Philadelphia. General Contractors: Parkway Triangle Construction Co., Philadelphia.

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A national organization to improve and extend the uses of concrete

FOR STRUCTURES... MODERN **concrete**

. . . for more details, write No. 13 on Reader Service Postcard

Under terms of legislation passed last session, public buildings now need only to be approved by the public works committees of the two houses (not by the full houses), then GSA can ask direct funds, without regard to the budget.

* * *

You may have noted a change in handling the budget this year—in the matter of quite a bit of comment on what it may contain prior to the delivery of the President's actual message.

Contents of the budget itself are probably the most carefully guarded secret in Washington—which is not, ordinarily, much of a place to keep secrets. That wasn't changed this year, but there were a lot of "trial balloon" statements on it by high officials.

* * *

Briefs — Contractors in the District of Columbia are backing new proposals that would apply a 2% use tax on construction equipment to "outside" firms bringing in equipment from other areas—if the contractor's home state doesn't already make such a levy. Some 23 states have such taxes. . . . John A. Volpe, former interim Federal Highway Administrator, defends state highway officials from what he calls "unfair innuendos" of "politicians" who are critical of Interstate highway progress. Said Volpe: Officials have been performing near miracles since 1956, shouldn't be criticized for delays that are basically Congress' fault. . . . Federal Housing Administration, rounding out 25 years of operation, now has total assets exceeding $1 billion, has handled over $45 billion of home and project mortgage insurance, nearly $12 billion of property improvement loan insurance. . . . Bureau of Reclamation has signed contracts with Shasta County and the State of California to permit start of a $7.3 million highway relocation program connected with the proposed Whiskeytown Dam and reservoir of the Trinity project. . . . There's been no official word, but other government construction agencies are watching the Corps of Engineers' much-argued ruling requiring that contractors purchase half-scale plans for new projects, then purchase full-scale plans at 59 cents a sheet. . . . FBI has been called into discussions with the Labor department, with an eye toward FBI help in investigating labor corruption under new laws.

WESTERN CONSTRUCTION

A Flaw in the Public Works System

WITH all of its merits there is a flaw in the well established practice of bidding on public works projects. A bid figure represents the offer of a contractor to carry out the proposed construction work, and it also represents the cost of preparing the bid. This is a proper charge and a necessary part of the system of competitive bidding. Should a dozen contractors bid the job it is obvious that the cost involved in preparing an estimate must be multiplied by twelve.

Losing bidders must absorb these costs and introduce them into their cost of doing business. They will appear indirectly in subsequent bid prices, if the contractor is to remain in business. Over any period of time these multiple bidding costs will be reflected in the price paid for carrying out public construction projects. Sharp pencils may provide an excellent figure for the award of an individual contract, but behind the scenes are costs for many unsuccessful estimates.

This situation does not dull the merits of the contract system. Freedom to bid competitively and to award contracts to the lowest qualified bidder remains the keystone of the construction industry. Its advantages over any form of force account operations need not be enumerated and these comments do not subtract from our support of the contract system.

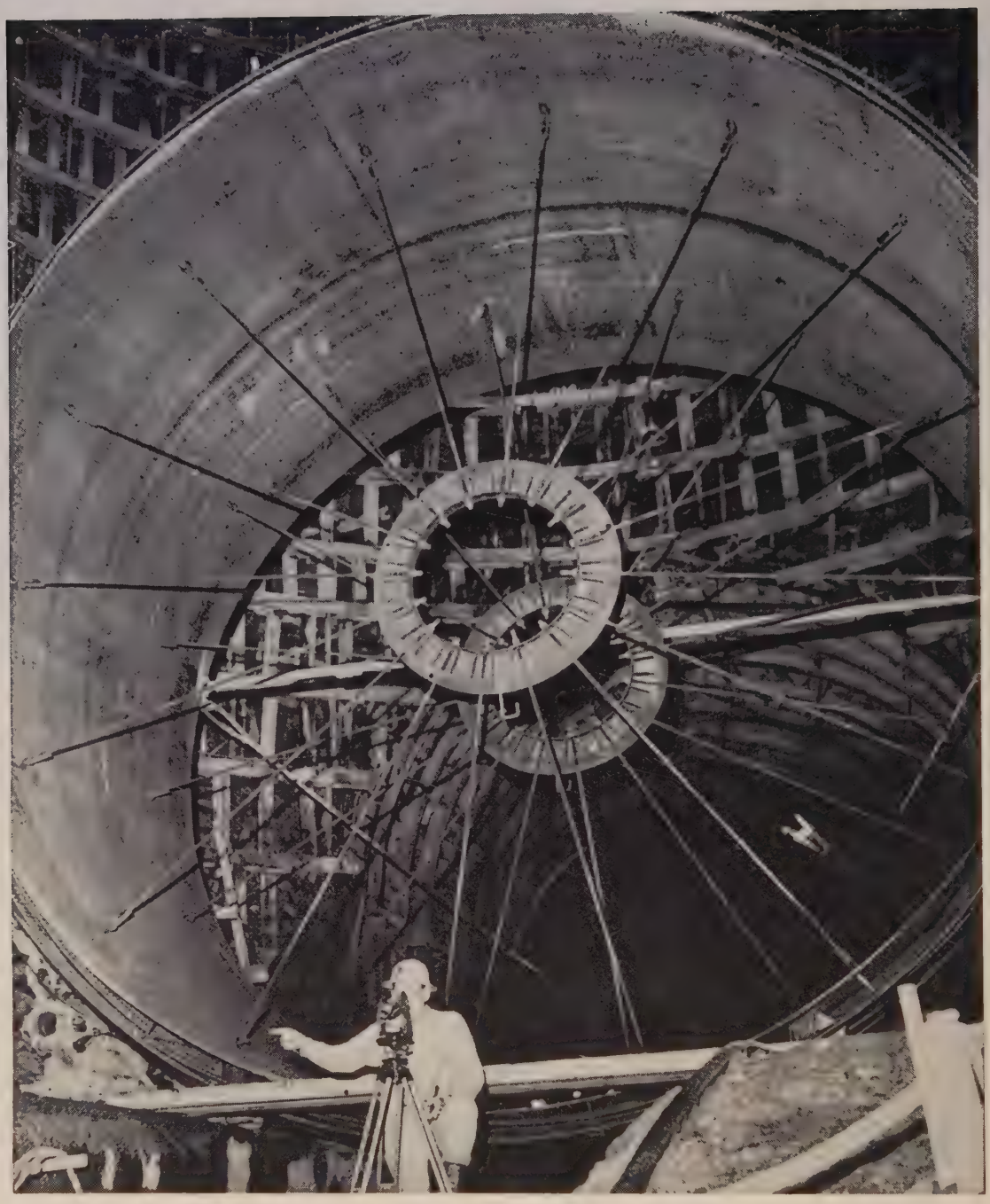
However, it is worthwhile to explore any possibility for minimizing the duplication of time and cost for preparing proposals. Naturally, such bidding elements as planning a system of attack, developing a method of work, programming the required equipment fleet and manpower must be handled by each contractor. These are the factors where individual ingenuity and skill are important. But there are certain aspects in the preliminary stages of any bid preparation where work is repeated and paralleled by every bidder. The take-off of quantities, pricing and many other operations represent multiple time and cost to secure the same quantities and figures.

Engineers in public agencies express concern over the obvious costs sustained by a bidder who is second or third low for a number of jobs. They also have a deeper concern over the fact that all of such work must ultimately be reflected in the cost of these public projects.

Contractors are naturally individualistic. They contend that their particular bidding system must be carried out from beginning to end by their own estimators. However, it would seem that some of the initial work might be done by a single individual or organization with results made available to all bidders who would pay their share for such information.

Plans and specifications on engineering projects get increasingly more complex which adds further to the cost of bidding. A more skilled group of estimators is required and their work becomes more extensive. As these bidding costs rise, and sooner or later enter into the cost of public construction, it would appear that some effort would be justified in a new approach to using a common source of preliminary information for all bidders.

Jim Ballard



25-foot diameter section of Swift Dam tunnel liner inside 55-foot diameter surge chamber.

Delivers the "PAY LOAD" at Swift Dam

Fifteen and a half million cubic yards of rock and compacted earth, holding back a 740,000 acre foot reservoir, are the biggest ingredients of the Pacific Power & Light Company's recently completed Swift Dam on the Lewis River in Washington. But the "pay load" conveyor of this man-made mountain is the 1,575-foot, steel-lined power tunnel which carries water under high pressure into three 13-foot diameter penstocks for the 68,000 kilowatt generators.

The plate steel lining of the power tunnel, the penstocks, and the 55-foot diameter surge chamber were all fabricated by American Pipe and Construction Co. at an "on the job-site" assembly plant. American's steel plate products, engineering, fabrication and erection abilities were proved once again at Swift Dam.

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KING PUBLICATION

WESTERN CONSTRUCTION

FEBRUARY, 1960

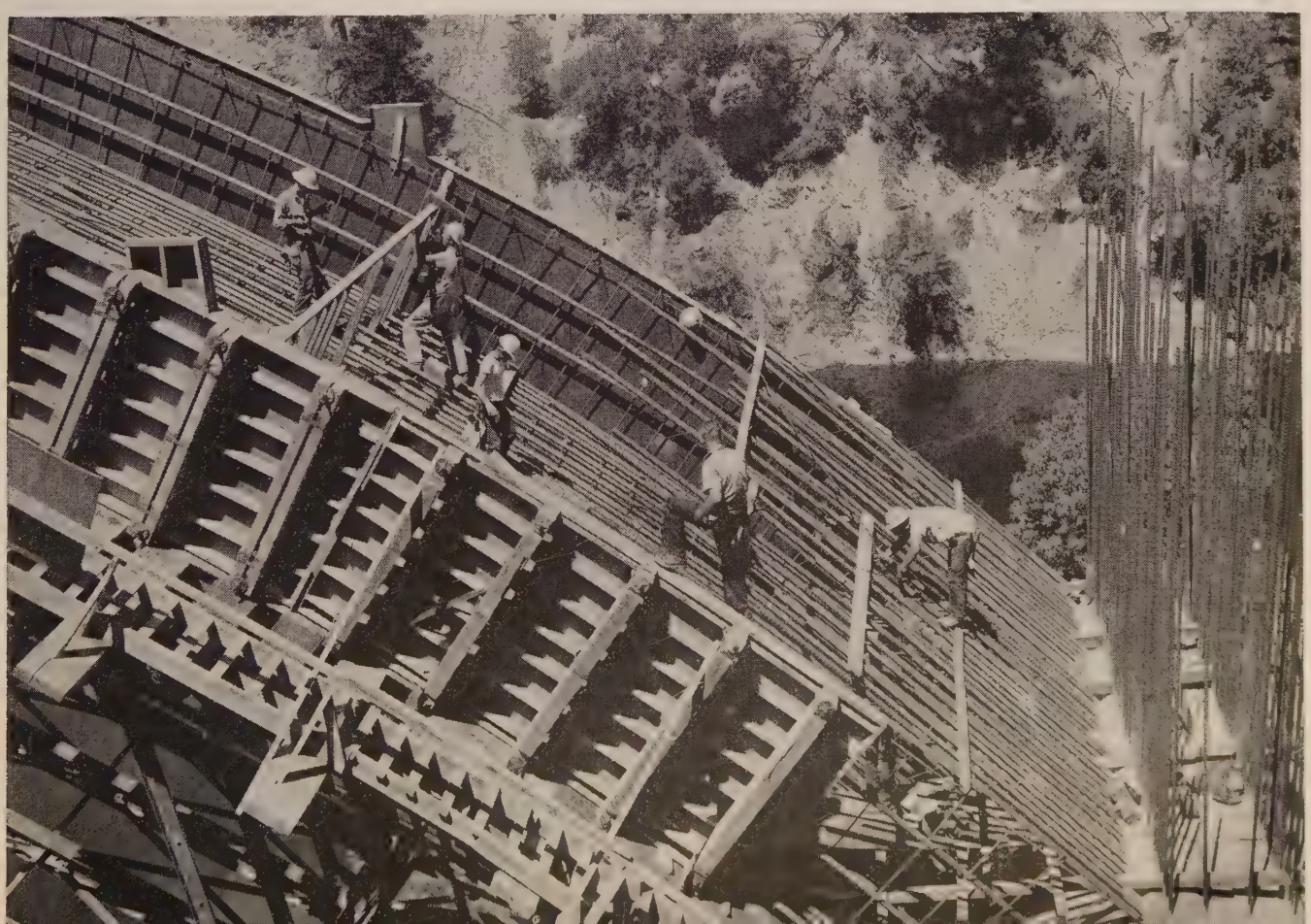
Concreting a 308-ft. arch bridge

A feature of railroad relocation for the Oroville Dam Project is a notable structure being built by the California Department of Water Resources. Details are presented on concrete mix, forms, and reinforcing splicing.

By J. G. SELF
Resident Engineer
Department of Water Resources
State of California

A SPECTACULAR concrete arch bridge over the North Fork of the Feather River is a major feature of the relocation work required for the Oroville Dam Project to be constructed by the California Department of Water Resources. Upon completion of the relocation work, which includes 23 mi. of track, 5 tunnels and 3 major bridges, this concrete arch will become part of the Western Pacific Railroad mainline Feather River Route. The contractor building the bridge is Pacific Bridge Co. A feature article in the April 1959 issue of *Western Construction* described the general features of the bridge and the falsework, as well as the project as a whole.

The main concrete arch is 308 ft. long, and has a rise of 155 ft.; is 5 ft. thick and 20 ft. wide at the crown and 8 ft. thick, and 30 ft. 10 in. wide at the skew back; it contains a volume of 2,300 cu. yd., which weighs approximately 5,000 tons. The bridge is reinforced con-



EAST ARCH leaving Pier 4 with steel setters preparing to start placement of extrados rebars. End of the pour is indicated by the frame being set for the bulkhead.

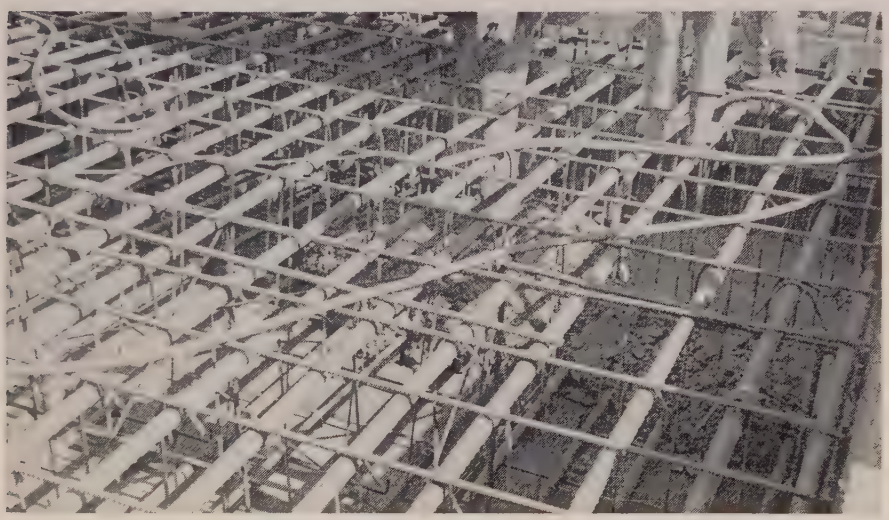
crete throughout, the only exposed metal being the handrails. It is 1,010 ft. long, including 6 minor piers and the 3 main arches.

Aggregate source and quality

Aggregates were produced in a temporary plant located about 6 mi. south of Oroville in the dredger tailings area and operated by B. C. Richter Co. of Oroville. The stockpiled aggregates are delivered by truck, and the California Transport Service Co. along with Pacific Bridge Co. has done most of the hauling. Sand was secured from the same source for a few months, but this source was changed to a pit on Dry Creek about 6 mi. north of Oroville. The Dry Creek sand particles are more rounded and use of this sand increased workability and decreased water requirement. However, both sands met the specification requirements as processed and both made acceptable concrete.

A close check was kept of gradation, cleanliness, etc., by State inspectors, and good, uniform aggregate was produced. However, a bulldozer was used to stock-pile coarse aggregates after manufacture, and considerable dirt and rock dust was developed in much of it. As a result it was necessary to rewash the gravel before use.

The contractor chose to wash the aggregates during finish screening over the batch plant bins. For some of the aggregates, prewetting was necessary in order to get good washing. The prewetting operation also helped to meet cooling requirements during hot weather since the specifications require that the concrete temperature, as placed in the forms, should not exceed 90 deg. This requirement has been largely met by sprinkling the aggregate piles and shading the sand. During a few of the hottest days, extra cooling was provided by the addition of ice as the truck mixers were charged.



CONCRETE is going into place near the crown of an arch. The layers of #18 intrados and extrados bars are obvious, with the #6 tie bars and the #5 hair-pin ties. The finished arch is 20 ft. wide and 5 ft. thick at the crown.

POUR NO. 6 going into the main arch (left) near the crown. Placements were made in pairs to keep the arch in balance. Top-forms in 3-ft. panels were used in pouring the arches, except near the crown. The timber tower under the arch was used in erecting and removal of the steel arch centering. Center arch completed (right) with truss in position for the third arch.

Washing problems

The main objection to washing at the batching plant has been a fluctuating water content in the aggregate as batched. This caused problems in mixing water control and has undoubtedly added to the difficulty of maintaining a uniform slump.

Cement is supplied in bulk by Permanente Cement Co. and delivered by truck. The batch plant is a 3-yd. capacity Noble Batchmobile with semi-automatic batching controls, 600-bbl. capacity cement bin, 3 aggregate bins and 1 sand bin.

Stockpiles are supplied by bottom-dump truck dropping aggregates and sand into a hopper feeding a movable 64-ft. belt running on a track with push button control to change the location of the belt discharge into the 3 aggregate piles and the sand pile. Material from the stockpiles is then picked up by a 2-yd. Michigan front-end loader and dumped into another hopper discharging onto a 126-ft. belt feeding the batch plant.

This material, other than the sand, drops onto a horizontal vibrating screen mounted above the batch plant before going into the batch plant bins. Another 59-ft. belt picks up the dry batched discharge and elevates it over the truck loading area. An air entraining agent "Protex" and a water reducing retarder "Plastiment" are added during the batching operation. Water is metered directly into the 6-yd. Challenge truck mixers by an automatic meter valve arrangement.

The batch plant is located about ½ mi. from the bridge site and mixing in the trucks takes place during transportation. However, the minimum 80 revolutions normally required are not always completed upon arrival at the bridge site. Both 1 and 2-cu. yd. buckets

RESIDENT ENGINEER Jim Self (left) and Pat Sullivan, inspector for the Western Pacific Co.

CONCRETE PLANT on the sandbar about .5 mi. upstream from the bridge site. The Noble batch plant is supplied with 3 sizes of aggregate and sand.

have been used to place concrete in the forms. Various sized cranes have been used including a Manitowac 3900 and a P&H 10-55 both equipped with 130-ft. booms and 30-ft. jibs, a 255A P&H and a P&H 35-ton Model 555 with 120-ft. boom and 20-ft. jib.

Placing the concrete

During tremie placements in the two main piers in the river, 10 and 12-in. pipes with various sized hoppers were used. Slump of the tremie concrete was maintained at a 7-in. average. For these two main piers, the cofferdams were constructed of steel Z piles with the inner face on the neat lines. Concrete was placed directly against the piles with the volume outside the neat lines considered as overage for the contractor's convenience. During tremie placements, pumping down of the water inside the cofferdam was allowed only to the point that the head inside was always greater than the outside head.

During placement in the forms, especially the arches, the concrete was dumped directly from the buckets into the forms whenever possible. Sections of 12-in. flexible tubing with hoppers were used when needed to get the concrete to the position required or to prevent segregation due to dropping through or onto reinforcing bars or tie rods.

Slump of concrete as placed has been less than 3-in. average as measured by standard slump cone. Air powered 2½-in. and 3-in. Chicago Pneumatic vibrators and 2½-in., 220-volt Hi-cycle electric vibrators have been used with most success.

Electric powered 110-volt vibrators have tended to heat up and then freeze. Vibration of newly placed concrete with penetration into the previous layer has been effective in obtaining a high quality of workmanship.

Bar welding and placing

The welding and placing of the No. 18 reinforcing bars in the arches was of particular interest. The arches taper both in the thickness and width away from the skew back.

A cage of No. 18 bars was placed throughout the curvature of the arch, properly spaced across the intrados and extrados faces and sides with a required distance from the forms of 3 in. for protective concrete cover. These bars were butt-welded from 24-ft. to 80-ft. lengths to form continuous bars over 400 ft. long, using the Thermit process of welding.

Up to 154-ft. lengths were welded upon the level work trestle deck, and later picked up by two cranes using double pick-points, rigged with pulleys to keep the load on all four points. This worked very well with no particular trouble of any kind developing, such as bends in the bars or damage to the welds.

This was undoubtedly due, at least in part, to good planning and excellent operation of the cranes. It was a novel sight to watch 1 ton of 154-ft. long wiggling and twisting bars, which resembled spaghetti from a distance, rise up and go into position. There are 46 bars full length (almost 400 ft.) in the main arch and 56 noncontinuous bars of various lengths.

The Thermit welding process required cutting and trimming the ends of the bars to a neat finish, spacing with a ⅜-in. gap between bars, preheating the bars to 400 deg., placing a sand resin mold into position, luting with sand, pouring in the Thermit welding compound and starter powder, igniting, and cleanup after cooling. The temperature of the burning Thermit was approximately 5,000 deg., but the actual burning process was over in a matter of seconds. The resin in the sand mold then burned out, permitting the weld to be cleaned and completed in ½ hr. or less. This process considerably reduced the time required to weld this size of bar as compared to butt welding with the shielded arc welding process.

The ductility of these welds is less than that obtained by shielded arc welds, but the general results have been excellent with the weld strength exceeding the bar strength in most cases as indicated by pull tests of specimens. Quality control is maintained by visual inspection, radiographs of selected bars using a radioactive Cesium pill and pull tests of sample specimens. Minor defects are repaired by the shielded arc welding process. This same procedure is being used on the No. 18

to No. 11 bars in the pylons and on the bars in spandrel walls.

Forms and forming

A wide variety of forms were employed using plywood sheathing in most cases. However, in the case of the two main piers, the steel Z piles were used as forms, and the top of the arch was formed with 2-in. T & G. In the spandrel wall lifts, the forms were built to withstand a 20-ft. head of concrete.

When placing the pylons, the forms were designed and built for a 5-ft. head, which controlled the rate of placement. Later, additional studding was added to the forms to remove deflection of the plywood between studs. A careful system of pulling the bottom of the forms in tight for each lift was worked out to prevent bulging and mortar leakage, with good results.

Of particular interest are the arch forms for the soffit. Stringers were made of 8 x 20-in. timbers cut on the job to the correct radius and supported at 4-ft. centers by the steel arch trusses. Then, 4 x 6-in. planks were placed on the stringers, which in turn were topped with ⅝-in. plywood. For the side forms, double 4 x 12's, 4 x 8's and 2 x 10's were used for the wales (radial) and 2 x 6's on 1-ft. centers for studs (circumferential) and finished with ⅝-in. plywood.

Soffit forms and side forms were made up in panels on the sand bar work site about ½ mi. upstream from the bridge, trucked to the bridge and erected by crane.

The reinforcing steel was then placed after the soffit and side forms were in place. Top forms were made up in panels 3 ft. wide, and are put in place during the placement in sequence. Falsework for the arches consists of eight 2-hinged steel arches spaced 4 ft. apart, spanning 281 ft. and rising 127 ft. at the crown. These arches were designed and fabricated by Herrick Iron Works, Hayward, Calif. Considerable detail was given on this portion of the work in the April issue article.

Concrete in the arches is designated as Class A concrete with 4,000 psi. compressive strength at 28 days and a W/C ratio by weight of 0.50 maximum. All other concrete, except tremie concrete in the two main piers, is Class B with 3,000 psi. required strength and W/C ratio of 0.60 maximum. Cement content has been 5.5 sacks per yd. for the arches except for two placements where 5.75 sacks were used. Strengths at 28 days have been well above the specification requirements. Most of the Class B concrete has been placed with a cement content of 4.25 sacks per yd.

A water reducing retarder, Plastiment, produced by Sika Chemical Co., and an air entraining agent, Protex, a product of the Autoline Chemical Co., have been added to the concrete. The desired air content is 2.5% and the amount of water reducer retarder has varied depending upon the cement content and concrete temperature. Maximum amount of Plastiment used was 4 ounces per sack of cement, and the minimum was 1.5 ounces per sack of cement. The amount used depended mostly upon the maximum temperature, but also on increases in allowable maximum slump of the concrete.

The slump limit was originally 3 in. but this was raised to a firm 5 in. on the condition that extra water reducer was added to compensate for the higher allowable slump. This made it possible to operate at an average of 3 in. with a good margin of safety in case extra water or air got into the mix. This has worked out quite well considering the fluctuating water content in the aggregate, and an occasional malfunction of the air entraining dispenser. The only time when a definite problem developed was when the mix was run at an average slump too near the maximum, and a slight increase in air or water would cause excess slump.

The contractor has had no trouble in placing concrete with a 3-in. slump and has very often placed concrete with 1 to 1½-in. instead of taking time to add water and remix. At these lower slump ranges, the discharge from the trucks became quite slow and difficult and an increased amount of vibration became necessary, but excellent results were obtained.

The maximum size of aggregate specified is 2½ in. with general size classifications of 2½ in., 1¼ in. and ⅝ in. Maximum sand size is 3/16 in.

A continuing problem throughout the job has been segregation of aggregates at both the beginning and the end of discharge from the truck mixers. In order to insure a uniform concrete, it has been necessary for the contractor to mark and identify a bucket with excess rocks and then to spread the excess rocks by hand if necessary; or in case of placements in thinner walls, to discard the concrete with excessive segregation altogether.

Access and work space is limited, calling for considerable ingenuity in laying out the work. Since most operations require the almost constant use of one of the big cranes, careful scheduling of this equipment was necessary. In general, the job has gone very well and a beautiful and distinguished bridge has taken form.

Personnel

Walter G. Schulz is Chief Engineer for the Division of Design and Construction, State Department of Water Resources; in charge of Feather River area work is Charles V. Heikka. Samuel S. Dulberg is senior bridge engineer. Resident engineer is James G. Self, assisted by Edgar Johnson. Concrete engineer for the Department is Lewis H. Tuthill.

For Pacific Bridge Co., Merrill Bird is project engineer, John Dean is assistant project manager and acting manager. J. Duane Naillon, chief engineer of Herrick Iron Works, designed the falsework.

The bridge designers are Woodruff and Sampson, consulting engineers, of San Francisco.

End of an era

TWENTY-NINE years of Federal control over Boulder City, Nevada, ended January 4, when the Bureau of Reclamation turned over this Hoover Dam community to an incorporated citizenry for self-government under the laws of Nevada.

The city, which was construction headquarters during the early thirties for Hoover Dam, key unit of the Boulder Canyon Project, is being transferred under provisions of the Boulder City Act of 1958. The legislation, resulting from several years of studies and effort, authorized the Bureau of Reclamation to dispose of those properties in the community not required for continuing Federal activities and permitted the citizens to establish self-government responsive to local and State statutes.

The Bureau of Reclamation has transferred ownership of 33 sq. mi., to the new incorporated city. Total property valued by the Federal Housing Administration at $2,393,900, is included in this area.

A SCOUT ARMORY is being built here at the Eskimo village of Wales with Russian Big Diomede Island and American Little Diomede Island, the site of another armory, standing out offshore in Bering Strait. The headlands of Siberia loom 56 mi. away in the right background.

"Toughest yet" contract in Alaska

Manson-Osberg Co. of Seattle has been confronted with severest site and weather conditions in building 48 armories for the famous Alaskan Scouts of the National Guard in isolated Eskimo villages.

CONTRACTORS bidding on Alaskan construction have become accustomed to a wide variety of diversified projects. But here comes along a contract that out-Alaskas all previous projects for unique conditions and unusual specifications — the Manson-Osberg National Guard Armories job.

When contractors of the "South 48," anxious to get in on Alaskan construction, looked at the armory plans and specifications, many rolled them up, pitched the bundle into File Thirteen, and emphatically instructed their estimators to unplug their calculators — this Operation Eskimoland was too risky a contract for newcomer cheechakos. Key men of companies specializing in 49th State work shook their heads in doubt. The bidding documents of the U. S. Army Engineer District, Alaska, Corps of Engineers, Anchorage, Alaska called for the building of 48 pre-fabricated armories for the Alaska National Guard Scouts. These Scouts form that colorful, strategic organization which served gladly as expendable World War II watchdogs to report by radio the expected Japanese beach-head landings along Alaska's many miled, unprotected Bering Sea coastline during the early dark days of the conflict. This thin, olive-drab Eskimo line of defense was our plane watchers and reporters before the DEW-Line radar screen and the White Alice tropospheric-scatter communications network went into operation.

A whistle of amazement

Contractors whistled in amazement when they looked over the site location plans and traced the armory villages on the map. The construction was located mainly in coastal Eskimo villages strung for thousands of country miles along the northern shores. A few of the sites are scattered up rivers such as the Kuskokwim, the Kobuk, and the mighty Yukon. A majority of the armory locations are in the real bush at minute villages where hardhatted construction men have never left boot tracks.

When contractors were thinking about bidding this unique construction contract, they had to have a large detail map of Alaska to locate the sites and plan their logistics. From southern Bering Sea waters near the beginning of the Aleutian Island Chain to the Arctic Ocean, and from a distance of 35 mi. to the Russian mainland to nearly the same distance from Canada, the spread of the construction was fantastic. Most of the prospective bidders were amazed at the location plans, but there was more to come as they dug into the contract details.

Specifications really specified

The detail specifications floored them all as these usually cut-and-dried requirements nearly always have followed a traditional pattern. In fact, field construction men and engineers are prone to

COMPLETED National Guard Armory at Shaktoolik will also be used as a community center for dances and town council meetings as well as a military facility. The building is 20 x 60 ft. of insulated metal on timber foundations. It has a heater and a 5-kw. engine-generator set.

complain bitterly at times about boiler-plate specifications and cry in their beer that specs should be more custom-built for each job. They have been heard to mutter moodily that if you would take the scissors and paste pots away from design sections, specifications could not be turned out.

Well, they could not complain very much about these armory contract specifications — they were tailor-made for each site and tried to give the bidders as much information as possible so that they would not have to necessarily visit all the locations in order to make a bid. For the outstanding custom-made plans and specifications, complimentary sacks of smoked salmon are due the Planning and Design sections of the U. S. Army Engineer District, Alaska, which ramrodded the design and later the far-flung construction inspection for the Alaska National Guard.

To give a brief sample of the tailored specifications, the following extracts provide an idea of the detailed information:

"TRANSPORTATION: (a) Daily air flights are available from Seattle to Anchorage and Fairbanks. Daily air flights are available from Anchorage and Fairbanks. Scheduled air flights are available from Anchorage and Fairbanks to Scout Battalion Headquarters at Bethel and Nome. Chartered and regular airflights may be arranged from Bethel and Nome to the village sites. (b) Sea transportation is on a regular schedule to many of the sites. The sites located in isolated areas will require special arrangements."

"COMMUNICATION SERVICE: (a) The contractor shall be responsible for his own communication requirements. (b) Limited facilities for communication exist at most sites. The Bureau of Indian Affairs maintains a scheduled contact system with the village school teachers. Alaska National Guard Scout personnel maintain a contact scheduled by dry-cell radio sets. (c) Sites To Scout Headquarters Radio Service: The Scout Headquarters of Bethel and Nome have a daily radio contact service set up with each village site. The contractor may obtain these contact schedules by writing to the Office of the Adjutant General, P. O. Box 2421, Juneau, Alaska, or directly to Scout Battalion Headquarters in Bethel and Nome."

The physical conditions, so important to good bidding, were listed in detail, site by site. Information on the majority of the locations ran like this:

"QUINHAGAK: (a) Location: The village is located at the mouth of Kinektok River on the westerly coastline of Kuskokwim Bay, approximately 75 mi. south of Bethel. (b) Landing Facilities: Elevation of the beach above water level is approximately 15 ft.; the distance of the site from the beach is approximately 500 ft. No known trucks or mechanical equipment are available. The chief means of transportation is by boats equipped with outboard motors owned by the local populace. (c) Site Characteristics: The site is nearly level, high and dry, no brush, grass, or timber. (d) Living accommodations shall be the responsibility of the contractor. It is doubtful that accommodations are available in the village, however, it is possible the contractor may make arrangements with the school teacher for one or two people."

In working up the complex contract and the bidding documents several alternate bid items were provided on prefabrication, transportation, and erection of the buildings in various groupings as funds were limited and it was hard to estimate accurately the fair and reasonable cost of such a far-flung construction spread. If worse came to worst, the thinking was that a contract could be let to have the successful contractor prefab the buildings and ship them to the sites. Then the local National Guardsmen at each village would erect the armories on their own. But none of these option alternates had to be picked up as a contractor, very experienced in all types of construction in the isolated Alaskan bush, submitted a low bid for the whole package that was well within the funds limitations.

ESKIMO Guardsmen, hired by the contractor, install insulation in pre-fabricated structure at Kipnuk.

Bidder, and the job to be done

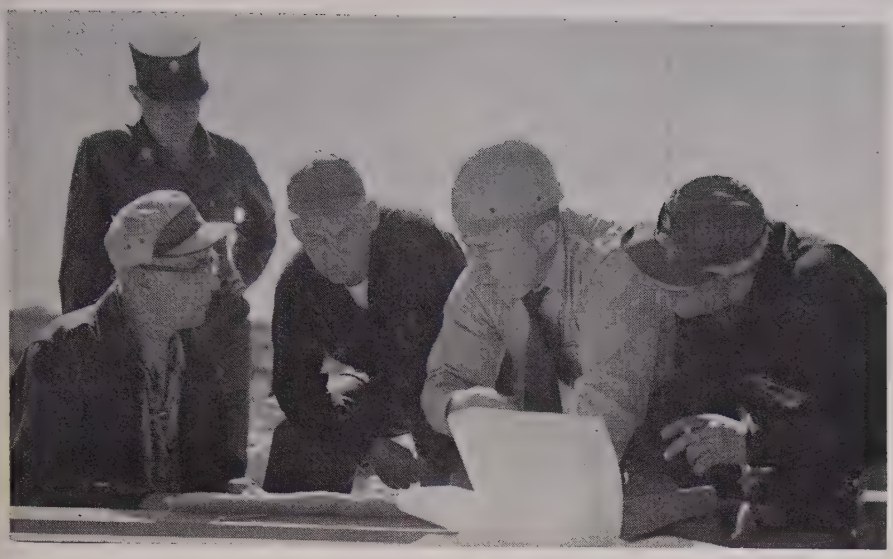
Manson-Osberg Co., Seattle, Wash., bid $1,050,600 for the total job. Completion dates were liberal as the contract called for completion of 46 structures by November 1960, and the two remaining sea-bound, storm-swept armories on King and Little Diomede Islands by June 1961.

The design called for 20x60 ft. insulated metal buildings on 8-in. wood timber foundations with two 70,000-BTU heaters and one 5-kw. engine-generator in each structure. There were six types of armories with specifications varying as to structural requirements at each site for different wind and snow loads. The majority were designed to withstand a 30-lb. wind load and a 40-lb. snow load, but structural criteria at the worst weather sites increased the wind requirement to 40 lb. Due to the rocky terrain, the armories at King and Little Diomede Islands necessitated special foundations to fit the rough hillsides and anchors and cable tie-downs to resist wind and earth slides. The very windy sites at Point Hope, Wainwright, and Barter Island required turn-buckle and cable tie-downs to resist a 40-lb. wind load.

The successful bidder subcontracted to the Ramstad Construction Co. of Anchorage, Alaska, the erection of 19 armories along the stormy Bering Sea. With headquarters established at centrally located Hooper Bay, Ramstad kicked off the construction program July 17, 1959, with the erection of the armory at Unalakleet.

Manson-Osberg set up their first headquarters at Bethel, and their first construction was initiated at Kwethluk August 3. In November, the prime contractor subbed the two armories at Dillingham and its 80-mi. neighbor, Togiak, to a combine of Morris Wilson, Kenneth Oldham and Fred Frakes, a noted Alaskan bush pilot.

The shipping of the pre-fabricated buildings from Seattle to the scattered locations presented a jigsaw puzzle. Alaska steamship lines transported the knocked-down armories to the villages that were on their regular port of call and stockpiled others at key centrally-located sea and river ports. A Ramstad



PLANS for an armory are given a pre-construction once-over at the Kwethluk job site by: (l. to r.) George "Stan" Herning, Corps of Engineers inspector; Major Orris Haynie, Corps resident engineer; Stanley Losey, Manson-Osberg superintendent; Bernard Sturgulewski, Corps project engineer; and John Kortlever, Manson-Osberg superintendent.

EARL TINKEY, veteran construction inspector who is a 30-year-plus man with the Corps.

barge, the boat North Star of the Native Indian Service, and lightering services where available were utilized to land the materials on the beach shingles. When available, tram lines, hoists, and trucks at a very few locatoins were used by the National Guard Scouts, hired by the contractors, to horse the building components to the construction sites. But at most of the villages, the guardsmen moved the pre-fabbed parts by hand and on their sturdy backs.

These armory buildings have a civilian angle as they will be utilized as community centers for dances and get-togethers, emergency housing for stranded travelers and weathered-in pilots and passengers.

Planning, and weather problems

The contractors used a planned chain of operations to erect the buildings. As a rule, two foremen would fly by charter plane into a site, recruit local labor as available, and start erection. With the building well under way, the spare foreman would journey to another site where he would meet a new foreman flown in from their centrally located construction base. After breaking in the new supervisor, the lead foreman would then fly to another village to initiate the operations again. It had been planned to utilize at least two shifts to take advantage of the nightless working season, but at the majority of the sites only one shift of from 6 to 8 native workers could be hired as most of the able-bodied men were away from the villages at their summer fishing camps.

Wild weather confronted the builders and handicapped transportation and construction. A few typical extracts from the daily reports of George "Stan" Herning, Corps of Engineers' inspector on the Kuskowim spread out of Bethel will give you a brief blue-print of the conditions that had to be overcome:

"July 20, 1959. The weather since Friday has been very bad with low overcast, rain, and strong wind. From Friday noon to this morning, the movements of planes were practically at a halt. The Northern Consolidated Airlines plane from Anchorage was unable to land here at Bethel. The National Guard plane went to another village Saturday and damaged a float and is now being repaired. Sunday, Duffield, the contractor's expediter, and I went up to Akiak in his boat, a 2 hour ride, and watched the unloading of the armory materials there. At Akiak and Tulusak most of the villagers are down river at the fish camps at the present time. There is one villager left behind at each village to keep watch on the armory materials. The mosquitos are out in swarms to greet you."

"August 8. Kwethluk: Flew by charter to Kwethluk to check on armory erection. Then to Quinhagak where boat was unloading armory on the river bank. The bank was so soft and muddy that the boat's Cat and trailer could not be used. The natives will hand carry the materials some 900 feet to the building site later."

"August 11. Kwethluk: Only 4 natives working today; others fishing. One foreman sick today with flu. Sunny and warm for a change, but with 40 mile wind blowing and air full of sand. Small planes grounded."

"August 17. Bethel: Weather very bad here today, especially down river at Kipnuk. Fog, fine rain. Kwethluk raining, but no fog. I will move to either Kipnuk or Cherofnak and work out of there, weather permitting. Only one mail plane a week to these villages. Ten minutes by air between these villages but 6 hours by boat."

"August 22. Kipnuk: Only 4 natives working at Kipnuk and 7 at Chefornak. Whipping rain and terrific wind at Kipnuk this a.m. Unable to place any roof or wall sheets."

"August 24. Bethel: Weather bound and closed in today, no ceiling or visibility. All local planes grounded. NCA jet flight to Bethel had to go on to McGrath, unable to land here. I am unable to get to jobs. Talked to foremen at 5:30 p.m. on Bureau Indian Affairs school radio. This terrible weather slowing up work."

"August 26. Bethel: Still weather bound. Fog, rain, and high wind. No plane movement. NCA mail plane had to return to Anchorage unable to land here. Could not contact crews at Kipnuk or Chefornak this evening due to static."

The contractor's men and the government inspectors covered the jobs by the seat of their pants and a handful of charter plane tickets as best they could. Sometimes they stayed in a larger village which had a small bush hotel and commuted to the job locations by boat and by charter plane. Other times they camped at the construction sites, which had no lodging accommodations, and bunked in abandoned native fishing camp tents, empty houses, and school teacher buildings. Anything available was greatly appreciated. They often cooked with a can-opener and ate out of tin cans from the village store. Sleeping bags, emergency rations, and cooking gear were as standard construction equipment as their rain pants and parkas.

By December 1959, the construction of the 48 armories was 80% complete; 21 structures had been finished and turned over to the National Guard Scouts, and 22 were erected, enclosed, and shut

(Continued on page 58)

ROCK BOLTS—
Applications in construction

PART 2

THE USE of rock bolts to support or consolidate the surface of vertical or steeply pitching walls both underground and in surface applications has been growing rapidly. When bolts are used in such cases, they are installed normal to the wall surface and they have been effective in constraining and slowing down the vertical movement of the wall. In addition, and particularly where used with chain link fabric, they have proven very valuable in preventing the scaling off of small rocks and slabs with protection of anyone working or traveling below.

Since, on a large wall, the slabs or blocks which might break off may be quite thick, longer bolts are used for this application than are generally used in tunnelling. Hence, bolts up to 30 ft. long of the wedge and slot type have been used for this purpose. In addition, for permanency and maximum anchorage, such bolts may be grouted or cemented in place.

Contrary to applications in a tunnel or arched roof where the load on the rock bolt will primarily be in tension, in wall support, the bolt may have to withstand severe stresses in shear. Since the sheer strength of steel is considered to be only one-half the tensile strength, the bolts may have to be placed on close centers if they are to withstand a predominately shearing load.

> Last month, in Part 1 of this article, the authors reviewed the principles of rock bolting and presented detailed information on tunnel installations in the West, and a large underground power installation. In Part 2, they describe the use of rock walls for rock walls and outline available figures on costs.

Swift Creek Dam—An outstanding example of the use of rock bolts and chain link fabric in the support of vertical walls is shown on the next page. It is the forebay channel which will funnel water from the reservoir behind the Swift Creek Dam to the 32-ft. diameter, 1,575-ft. long power tunnel. This channel is 725 ft. long, 200 ft. deep and 50 ft. wide. Both walls are covered with a protective blanket of 2-in. opening x 6 gage galvanized chain link fabric totaling 70 ac.

The metallic fabric was purchased in rolls 12 ft. wide and 50 ft. long. At the erection site, four rolls were laced end to end and then one end of each 200-ft. length of fabric was hoisted to the top of the channel by special crane. There it was laced with 12-gage steel wire to ¾-in. galvanized wire rope strung horizontally across the face of the channel and secured to 1-in. wedge-type rock bolts. In the process, the rolls were anchored in such a manner as to overlap each other 8 in. and the edges were joined with hog rings.

To give the fabric extra support, ⅜-in. wire rope was fastened vertically to the mesh, from the top of the channel down, and secured to rock bolts spaced 20 ft. apart.

Howard A. Hanson Dam—The rock bolt-chain link fabric combination is being used in the cuts leading to and above the tunnel portals for this project being constructed by Kaiser-Raymond on the Green River in Washington for the Corps of Engineers.

The slopes to be supported varied from ¼-to-1 to ½-to-1 and are composed of rock interspersed with clay seams and containing considerable ground water. Special drilling techniques and modification of the standard 1-in. wedge type bolt enabled 1,056 bolts up to 40 ft. long and averaging over 20 ft. in length to be anchored successfully. These bolts were then grouted in place, stabilizing the slopes permanently. Bolts were also used to support a protective blanket of 2-in. opening x 6 gage chain link fabric. Hence, double support of the slopes was attained: first, stabilization of the slope itself and secondly, of preventing any small rocks or slabs from scaling off and injuring any men, or damaging any equipment which might be working in the cut below.

Glen Canyon Dam—In addition to their use in the various tunnels

INITIAL FACE of a diversion tunnel at Glen Canyon Dam project showing the rock bolts and plate washers used to support the arch of the roof and the brow profile of the portal.

By HOWARD K. SCHMUCK
Assistant Manager
and
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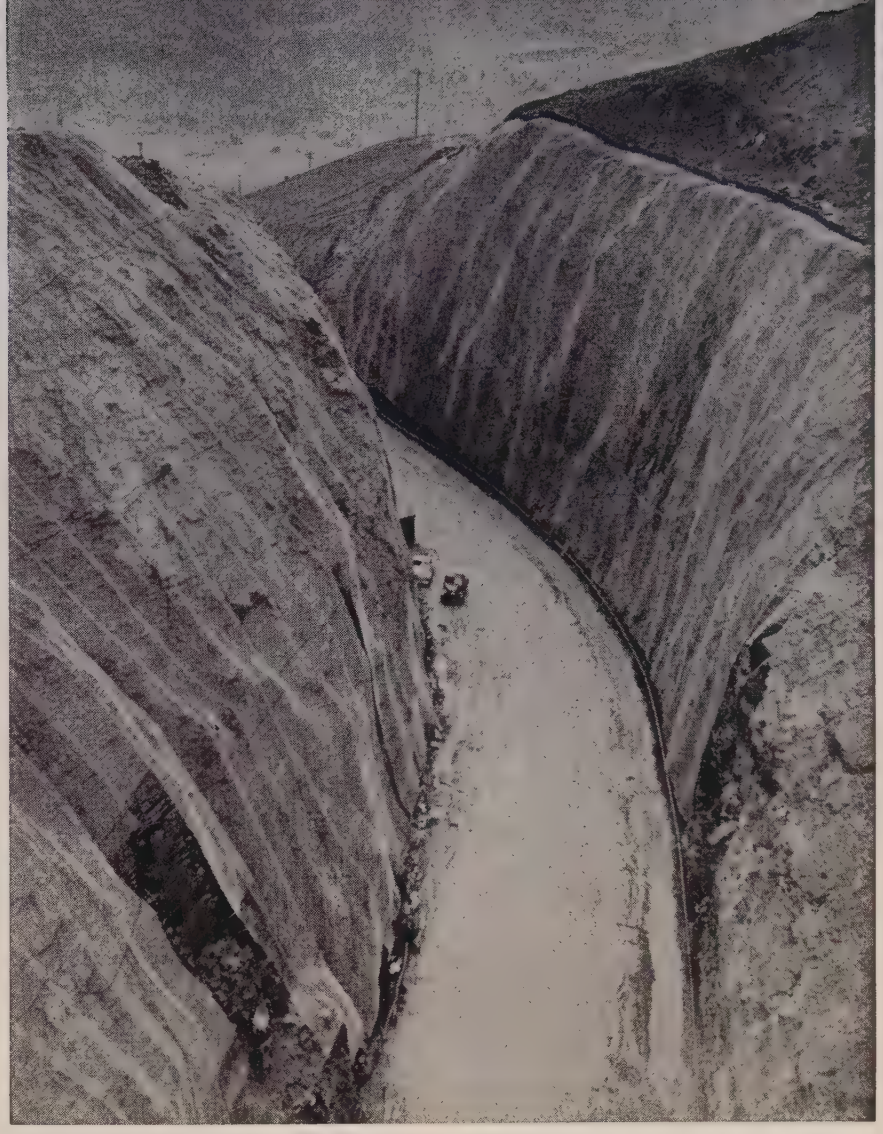
Product Engineer
Mining Supply Sales
Colorado Fuel and Iron Corporation
Denver, Colorado

of the Glen Canyon Project, rock bolts were also used extensively to support vertical walls above the tunnel portals. In this case, rock bolts and plate washers alone provide sufficient support and protection without the necessity of using chain link fabric.

The initial face of the north portal of the left diversion tunnel has expansion type rock bolts and steel plate washers used to support both the arch of the roof and to maintain the brow profile of the opening (see illustration).

Some other specific applications for rock bolts in stabilizing walls or stopes have been made at:

- Folsom Dam in California where 1½-in. slot and wedge type bolts 14 ft. long were spaced on 5-ft. centers to stabilize a rock face 30 ft. high.
- Monticello Dam in California where 1-in. slot and wedge type bolts 6, 9 and 12 ft. long were used in two areas to stabilize rock faces above a road and a tunnel portal.
- Union Pacific Railroad where both 1¼ and 1½-in. slot and wedge type bolts and ¾-in. expansion type bolts, without fabric, were used to stabilize the faces of two deep cuts on their Cheyenne-Dale line located in Wyoming.
- Mayfield Dam in Washington where 1½-in. slot and wedge type bolts up to 30 ft. long were used to stabilize the cliff face above the damsite on the Cowlitz River.
- Pomme de Terre Damsite in Missouri where rock bolting was used to hold slabby and jointed rock in the walls of the approach and outlet channels.



ABOUT 70 ac. of chain link fabric are used to support these rock walls of the forebay channel at Swift Creek Dam. Lengths of fabric were unrolled from the top of the 200-ft. high walls, with an 8-in. overlap. The fabric was secured by rock bolts spaced 20 ft. apart.

Cost information

The actual costs of rock bolting on construction projects appear almost impossible to obtain. Some of the few costs that have been obtained have shown the installed prices charged for an installed rock bolt to be 4 to 9 times the cost of the materials involved. From costs obtained in underground mining, we feel that these are too high and reflect other costs not directly associated with the cost of the bolting itself.

Judged on mining practices under similar conditions to tunneling, the installed cost of a rock bolt in any pattern of systematic bolting should run somewhere between two and three times the cost of the rock bolting materials involved. A 6-ft. x 1 in. slot and wedge type bolt with 8 x 8 x ⅜-in. plate will cost about $1.86 plus 0.51 or $2.37. The labor cost of installing this bolt should not exceed $3.50 (on a pattern system) giving a total direct cost of $5.87. Of course, to this must be added many indirect costs such as overhead, freight, material handling, supervision, etc., which vary infinitely from job to job.

To give an idea of the cost of bolting materials, the approximate mill prices of some of the items most commonly used in construction are:

6-ft. x 1-in. slot and wedge bolt, complete with ⅞-in. wedge and 1-in. heavy hex nut	each	$1.86
8-ft. x 1-in. ditto above	each	2.28
6-ft. x ¾-in. expansion type bolt, complete with expansion shell	each	1.20
8-ft. x ¾-in. ditto above	each	1.46
6 x 6 x ⅜-in. square steel plate washer	each	0.29
8 x 8 x ⅜-in. square steel plate washer	each	0.51
2-in. x 6 gage metallic fabric	per sq. ft.	0.15
2-in. x 9 gage metallic fabric	per sq. ft.	0.10

The problem of estimating rock bolting costs for construction projects is complicated by the fact that prices are usually called for on a per lineal foot of bolt or on a per

ESTIMATED INSTALLED PRICES OF ROCK BOLTS

Combination	Bolt with anchor device	Plate	Est. labor	Total cost per unit	Direct cost linear foot of bolt	Pound of steel
6'x1" slotted bolt with 8"x8"x⅜" sq. washer	$1.86	$0.51	$3.50	$5.87	$0.94½	$0.82½
6'x¾" expansion bolt with 8"x8"x⅜" sq. washer	1.20	0.51	3.50	5.21	0.87	0.43
8'x1" slotted bolt with 6"x6"x⅜" sq. washer	2.28	0.29	4.50	7.07	0.88½	0.32
8"x¾" expansion bolt with 6"x6"x⅜"	1.46	0.29	4.50	6.25	0.78	0.43

pound basis whereas, regardless of length, the same amount of threading, slotting or heading must be done—whether a 2-ft. bolt or a 20-ft. bolt. In addition, the cost of anchoring device, bearing plate and other accessories is the same for any length of bolt. The type of bolt used also gives a wide variation in comparing prices.

On the accompanying table, we have compared the estimated installed prices on a unit, per linear foot and per pound basis for four bolt-accessory combinations. These are entirely hypothetical since actual cost or bid price data is not available except in generalities.

To these prices, of course, must be added the burden of other costs such as freight from the mill, storage, transportation to the working face, etc. These we anticipate will vary widely between contractors and different jobs. However, assuming that 50% is added for these costs, we would have per linear foot costs ranging from $1.17 to $1.42 and per pound prices from 43¢ to 64¢. It appears that the price per linear foot gives a more accurate estimate than does the per pound price and also one more in line with what has been bidding practice to date. Fortunately, most recent specifications have called for prices on a linear foot of installed bolt basis.

Variety of uses

It is almost impossible to determine the number and length of bolts that will be required in any opening until some actual experience is obtained in its excavation. One of the major advantages of rock bolting is its flexibility to meet a wide variety of conditions. For example, rock bolts may be used individually to hold up a slab here and there, two or three may be used to neutralize a small tension zone at the top of an arch, or a ring of 10 to 20 or more may be used entirely around an opening depending on the conditions encountered. In view of this, we feel that installed unit costs for varying combinations quoted separately form a more accurate way of bidding on this method of ground support.

Conclusion

In tunnelling and other underground excavations in which the construction industry may be involved, the use of rock bolts for permanent or temporary support gives these major advantages:

a. Great reduction in the amount of steel, and in some cases timber, which would otherwise be used in sets or ribs.

b. Reduction in necessary overbreakage to accommodate steel or timber sets, should these have been used.

c. Reduction in amount of concrete needed for lining because there is no need to excavate oversize.

d. Reduction in original steel support costs, handling and storage costs, and ventilation costs.

e. Support of openings which are too large or high to support by other means.

To illustrate the above, in a tunnel project in which rock bolts were used to support 57.7% of a total of 113,036 feet of bore, approximate material weights and man-hours required to install respective types of roof support in typical 100-ft. tunnel sections were as follows:

	Rock Bolts and Accessory Materials	Rib-Type Steel Sets With Lagging
Material weight (lb.)	5,000	34,500
Man-hours for installation	112	125
Per Cent of installation completed during drilling cycle	100	25

In this case, the typical rock bolt set consisted of two 1-in. wedge and slot type bolts, 6 ft. long, supporting a 6-in.x8.2-lb.x5-ft. long channel.

For wall and slope support and protection, the rock bolt-plate washer or rock bolt-metallic fabric combination fills a need for which there has been little answer except costly benching or cutting back the slope to make it less steep. Recent progress and applications indicate that this idea is today taking hold rapidly.

Definitely, no claims are made that rock bolts together with their various combinations of accessories can solve all problems of underground support. It has been said, however, that wherever a satisfactory anchor of a rock bolt can be obtained, they can be used to support the opening successfully if the proper pattern, type of bolt, bearing and lagging is used. As more experience is gained with their usage in construction projects, their field of application will grow rapidly. This same pattern of progress has been shown first in coal mining and then metal mining so that today in only about 12 years, rock bolting in mines has grown from a curiosity to an accepted method of underground support that consumes over 3,000,000 individual bolts per month.

In this Western Region it appears that the multiplying need for water makes it certain that ever-increasing tunnelling projects will be driven by all levels of government from water districts to the Federal. Further, we believe we can anticipate great quantities of underground construction for storage and defense purposes. These should be the type of excavations which will give ideal conditions for rock bolting.

Interest in rock bolting for construction projects is high and growing. The contractors who take a realistic and progressive attitude toward this method of ground support will find it an excellent tool and a means to better efficiency, safety and ultimate profit.

PAVING SPREAD rounds curve in new roadway. String includes two Koehring 34E pavers, a Blaw-Knox spreader, Jaeger finisher and Lewis leveling float. Dark strip is seal coat over 4-in. lift of CTS placed inside headers. Batch trucks have 2-mi. run from plant.

"Olympic" paving team wins winter race

Six miles of full-width concrete paving placed by A. Teichert & Son, Inc., at average speed of 2,800 ft. per day on Highway 40 project in the Sierra Nevada.

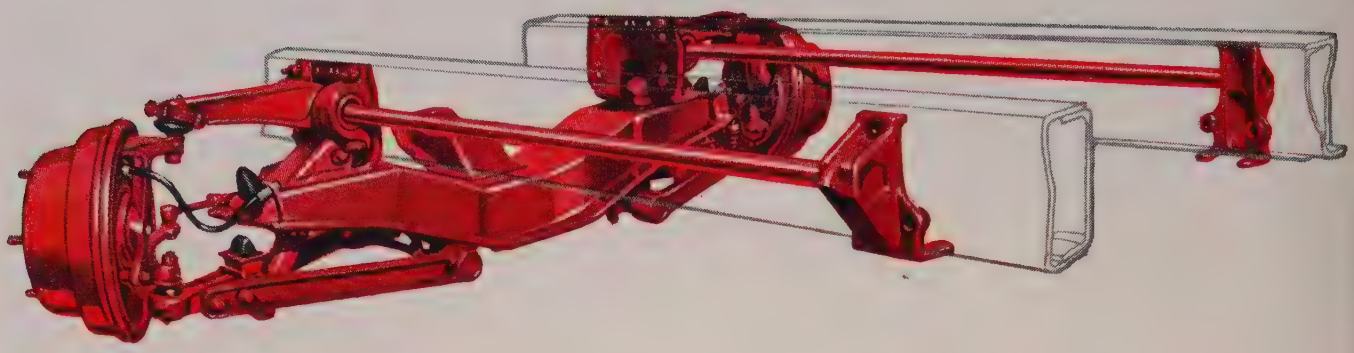
PROJECT manager Wil Staring, left, and Bob Brock, general superintendent, stand on new grade, which overlooks batch plant. Old road will be rebuilt.

IF the forthcoming Winter Olympic Games included an event for high speed paving a logical U. S. entry might be A. Teichert & Son, Inc. The construction firm recently completed 6 mi. of full-width paving on a new section of U. S. 40, near Emigrant Gap on the way to the Olympic site at Squaw Valley. Teichert Company's "time" for the course was an average 2,800 ft. per day established by a carefully coordinated paving train. Crews finished well ahead of snow and freezing weather.

High speed features were evident at virtually every phase of the surfacing job beginning with placement of untreated base material by standard haul rigs without use of spreader boxes. Cement treated sub-grade was "ready mixed" at the contractors' aggregate plant and placed between preset header boards in a 4-in. lift with a modified asphalt paver. Headers themselves were pre-assembled into 20-ft. lengths moved and placed by utility cranes.

The paving was done under a $4,787,742 contract awarded by the California Division of Highways for construction of 7.8 mi. of 4-lane highway between Baxter and Emigrant Gap on the western slope of the Sierras. The job involved construction of a completely new road bed to carry two lanes as well as straightening and rebuilding the existing crooked 2-lane mountain road.

Contractor's forces, headed by Wil Staring, project manager, moved on the job in April 1959.



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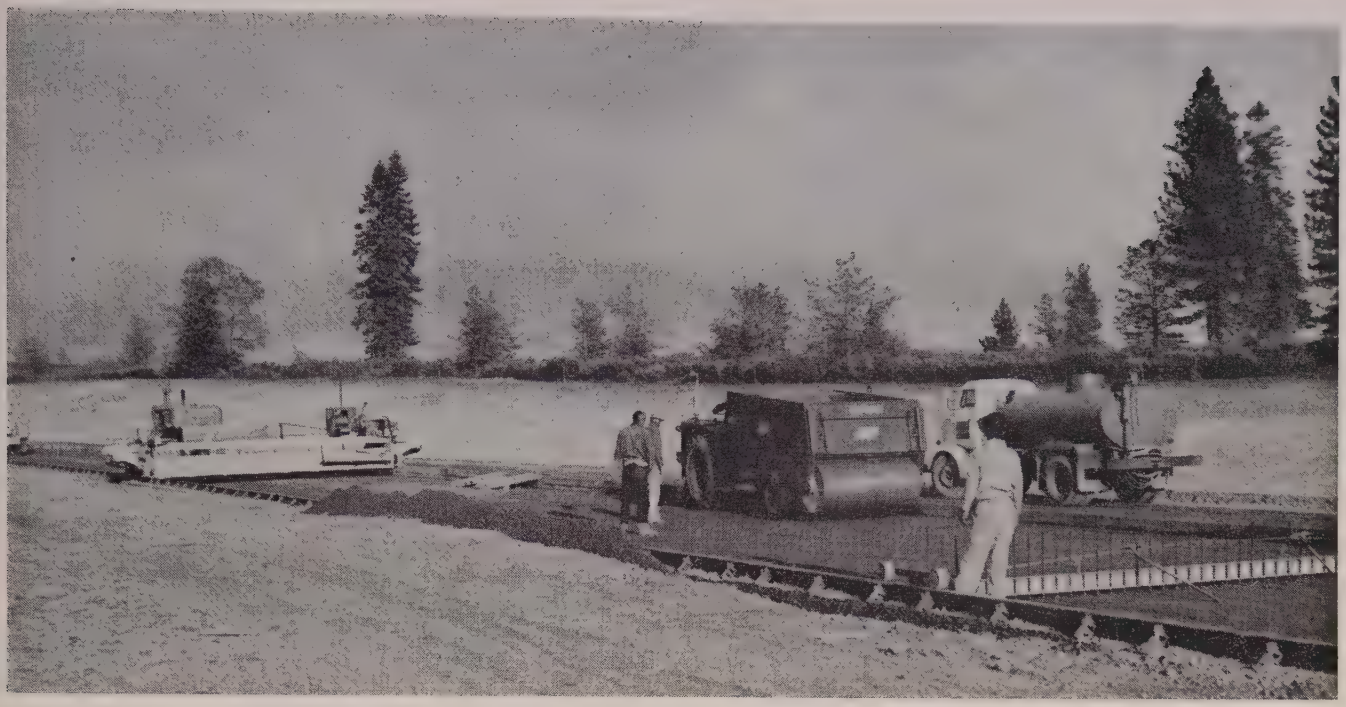

LEADING the paving train is the CTS spread. Material is placed in 6-in. lift, trimmed, and compacted to 4-in. inside raised headers.

Compactor uses pneumatic tires and steel roll. Cement treated subgrade is delivered in end-dump trucks and spread by asphalt spreader.

and by early October they were ready to pave. Prior to the actual construction operations, however, Staring and Robert Brock, project superintendent, spent more than a month studying the site. Among other things they were searching for a water supply, and a source of aggregate closer than the State suggested pit some 15 mi. from the job.

They found their gravel deposit on a knoll which formed the highest part of the job at the easterly end of the project. The hilltop, part of an old glacial moraine, was composed of gravel and rock of usable quality and quantity for all requirements except concrete aggregate.

Water source was found a few hundred yards away in the form of a shallow reservoir originally used by the nearby railroad and supplied by a gravity pipeline from the river several miles away. The contractor leased the reservoir and repaired the pipeline, installing an 8-in. pipe over part of the distance.

With water and gravel sources assured the contractor began operations on the new road which runs for about 6 mi. This road is one long, relatively uniform, grade. The contractor divided the job into two sections working the top section ahead of the lower part. This was done for two reasons: first because the upper area dries out early in the spring, and second because it is subject to snow and cold weather earlier in the fall.

The concrete batch plant was set up at the midway point dividing the two sections. Here a huge level bench was developed between the existing roadway on one side and the new grade running across the mountain side on the other. Grading operations were completed on the top section in late summer and that portion of the job was turned over to a 4-stage integrated paving train.

Imported base material

Leading the train was the string of bottom-dump, truck trailer gravel trucks used to place a 12-in. lift of imported sub-base material. Making the haul from the gravel pit at the top of the job the trucks placed the gravel mixture on the fly. Material was deposited in broad flat windrows without use of spreader boxes. Uniformity was maintained by regulating width of hopper door openings and speed of the trucks. A fleet of 25 bottom-dumps was used in the opening stage. This number diminished to six as the train moved closer to the plant. The 1SM used was 2½ in.-minus with less than 5% passing a No. 200 screen and 25 to 65% passing a No. 4 screen. Material was placed on the full width of the roadway in a 1-ft. layer, and spread to grade by motor patrols and compacted with steel rollers.

At this point, concrete paving superintendent Ken Cornell took over the subsequent operations, using a crew fresh and well organized from paving 83,000 cu. yd. on the same highway between Roseville and Newcastle.

As the ISM crew advanced a highway division survey crew staked the roadway. On their heels came the header crew placing and staking steel header boards in 20-ft. sections. These sections were prefabricated by bolting two 10-ft. steel header boards to a pre-drilled 20-ft. timber 4 in. thick. This was done to increase the height of the header boards by 4 in. to allow for placement of cement treated base inside the forms.

Bolting of two forms to one timber was done for more efficient handling, since the weight of a 10-ft. section of header plus timber would prove too heavy for handling without equipment. The 20-ft. sections gave the added advantage of reducing the number of joints subject to movement under the weight of the finishing equipment.

Headers were set 24 ft. apart to allow paving of two normal 12-ft. lanes in one operation. Use of 20,000 lin. ft. of forms gave a minimum of three days' production, allowing sufficient working room for setting and aligning headers, placing and compacting CTS, and for the paving string itself. The forms were in continuous use, being plucked off the finished end, loaded on trucks and reset at the head end.

Cement treated subgrade was premixed at the gravel plant and delivered to the job in end-dump trucks. These discharged into an Adnun asphalt spreader which had

STAKES are pulled with this hydraulic rig powered by small gas engine. Fork hooks around end of stake, and cylinder pulls against frame.

STEEL tie bars are imbedded with this reel. Bar set in notches of projecting arms is carried around steel and deposited below saw depth.

been modified by removing the auger to spread a 6-in. loose lift between the header boards. The lift was compacted to a 4-in. layer with a 3 wheel roller and new Seaman-Gunnison DuoPacker combination steel roll, pneumatic tire compactor. The unit which can apply either or both methods of compaction at once is powered by an International Harvester 2-wheel tractor. Precise operation of the spread and compacting units was required to obtain a uniform lift from one side to the other without knocking the header boards out of line. When compaction was completed the CTS was seal-coated with MC2 applied by boot truck and the roadway was ready for concrete paving.

The paving train was made up of two Koehring dual drum, 34E pavers, a Blaw-Knox spreader followed by Jaeger finisher and a Lewis leveling float. The pavers were fed by a string of 4-compartment batch trucks which shuttled between the batch plant and the paving string. The trucks moved back and forth on the right side of the roadway using the comparatively narrow shoulder. This required some intricate maneuvering to keep two streams of traffic going and turn the rigs around without hitting the headers. Water wagons which tended the pavers were spotted on the opposite side of the roadway to provide more traffic room on the paver side.

On 24-ft. width concrete paving, California Highway Division requires placement of short steel tie bars across the center line and buried beneath the depth of the saw cut. These rods were inserted in the fresh concrete by a pair of revolving notched discs which were partially submerged. Rods were placed at the notches of the wheels by an operator, carried around into the concrete, and disengaged at the bottom of the wheel's revolution.

The leveler made two passes over the fresh concrete to bring it to acceptable smoothness. This was a make or break operation as far as acceptance of the completed road is concerned and the operator was well aware of the limitations. A sign wired to the side of the machine read, "6.99 or grind." referring to the allowable error of 7 in. per mile set forth in California highway specs. In operation the cumulative error was well below the maximum tolerance.

Headers from the previous day's pour were pulled for immediate reuse. Pins were pulled with a power tool developed by the contractor, and headers were loaded on flatrack trucks by means of an Austin-Western crane with a telescoping boom which reached both headers from one side of the slab. At the placing end, the headers were strung from the trucks with beds partially raised, and later set by a Hendy crane operating between header lines.

Batch trucks supplying the pavers were operated on sub-contract by Giboney & Heilman. Sand and gravel was delivered to the general contractor's batch plant from the

UTILITY crane loads headers on flat rack for transport to front of job. Each unit made up of 2 steel headers bolted to 20-ft. timber for additional height to accommodate sub base.

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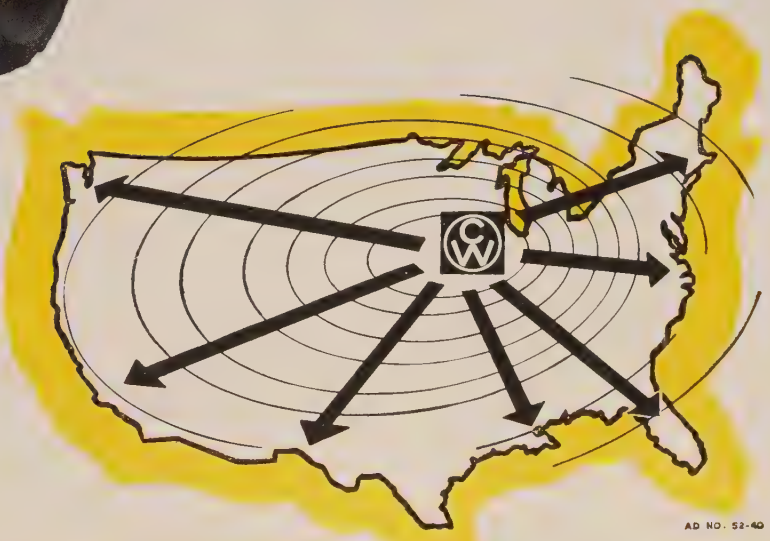

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Bear River plant of R. J. Miles by Hess-Mace Trucking Co., and cement was delivered from Calaveras Co. plant at San Andreas by Winkler Bros.

These materials were batched in a Johnson 4-bin batch plant of 300-cu. yd. per hr. capacity located near the mid-point of the job. Aggregates were elevated by conveyors, and cement was stored in silos with 1,200-bbl. capacity. Daily handle was about 3,000 tons of aggregate and 2,500 bbl. of cement for the 6-sack mix used on this paving job.

The lower 3½ mi. of concrete paving was laid on a uniform 5% upgrade, and in this area the design called for a third 12-ft. lane of concrete paving to be used as a truck lane. Super-elevation of this lane varied from 1½% to a maximum of 3%, compared with the maximum of 8% used on the other two lanes. Paving of this 12-ft. lane was done after the 24-ft. paving had cured alongside, using conventional highway paving equipment and one paver instead of two.

All paving operations were completed by late October, and the plant, equipment and crew moved immediately to their third job of the season on U.S. 40, this one between Sacramento and Davis.

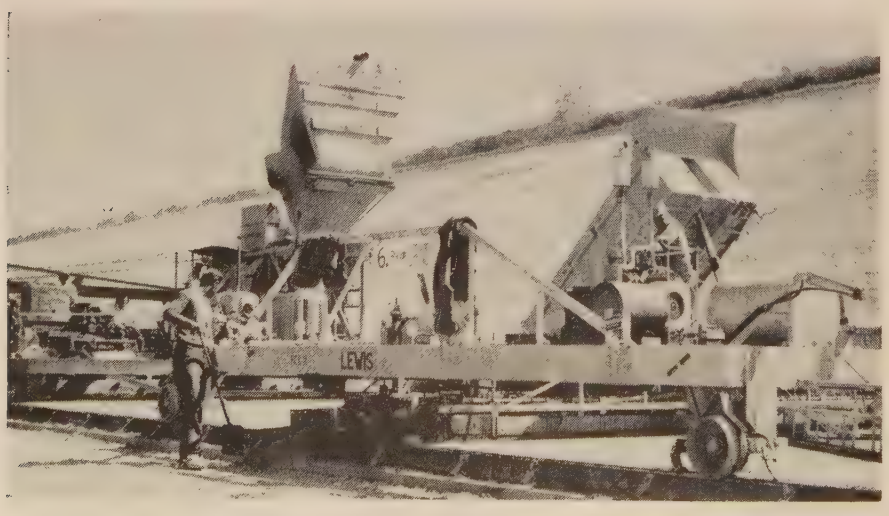
The balance of imported sub-base material and untreated base were next brought in and laid alongside the completed concrete slab, then shaped for temporary shoulders. By Thanksgiving, the new section was opened up for 2-way traffic, allowing the contractor to do roadway excavation on the westbound roadway, which followed substantially the line and grade of the existing road. The portion of that grading which could be done without disturbing the existing pavement was completed during December, a month which stayed remarkably dry. On the last day of the year, westbound traffic was put back on the existing road as a 1-way road, and eastbound traffic continued to use the new lanes, also as a 1-way road. Thus the State and the travelling public will have the unexpected benefit of 6 mi. of freeway-type pavement during this winter.

CEMENT treated sub-grade was pre-mixed in this continuous type plant. Cement stored in hopper at left, and aggregate drawn from bank behind bulkhead. Trucks were loaded from belt.

Plant operations

The aggregates plant operated on six 12-hr. days, turning out imported sub-base material and untreated base. Feeding required two 80D Northwest shovels with DW21 Athey end-dumps and Euclid end-dumps. Plant components included a Universal wobble feeder, a Pioneer 42x48 jaw crusher, 5½- and 4-ft. Symons Nordberg cone crushers, El Jay screens and log washers, and a Wemco screw. Conveyors and stackers were designed and built by the contractors' own forces, who also designed and assembled the plant components.

Cement treated sub-grade material was prepared in a special automatic, continuous type plant. Mixing was done in a pug-mill into which conveyors with automatic regulating devices metered aggregate, cement, and water. The mixed material was conveyed directly to trucks for delivery to the paving train.



SIGN on leveller reads "6.99 or grind," referring to California specs which permit error in smoothness of 7-in. per mile. Smoothness of job was well within tolerance.

Early drainage problems

Ground water in cuts and fills continually plagued the contractor, and compaction to 90% relative density required extensive aeration and frequent moving from one area to another to allow for drying of the soil. Subdrainage of all cuts was done under contract items calling for placing of 8-in. perforated corrugated metal pipe in filter material in a trench at the right shoulder line. Water in the form of springs encountered in the cuts had to be handled by the contractor progressively as the cut was brought to grade. Unplanned subdrainage was found to be necessary beneath practically all fills as well, and an extra 10,000 ft. of PMP had

BASE MATERIAL pit and processing plant located just off road at highest point on job. End-dumps, top, deliver material from pit to conveyor system for processing and stockpiling. Bottom-dump trailer rig in foreground is used to spread base material on grade.

to be installed under very adverse situations of terrain and ground conditions. Delay was minimized on these operations because the State's resident engineer gave immediate authorization on the spot to handle each drainage problem.

At one location on the project the PG&E ditch carrying 25 sec. ft. of drinking water crossed the existing highway twice and ran alongside it for half a mile. The contract called for extending a box culvert, constructing and protecting multiplate culverts and channel changes with rip-rap, and installing 1,900 ft. of 48-in. reinforced concrete pipe to carry this water, all without getting the water muddy. This major diversion problem was handled by intercepting the water course above its first road crossing, carrying it in open ditch and in two 24-in. corrugated metal pipes on the sidehill above the working area to a point below the outfall structure of the new 48-in. RCP.

At sidehill locations where steepness made construction of pipe pads impractical, cross-drains were installed through the completed embankment at a —2% cross-fall to the outside of the embankment. The CMP was bent accordion-fashion at that point by using two large oxy-acetylene torches to heat the metal, and the cross-drains ran down the outside of the embankment to natural ground. Bends were painted with zinc compound to restore rust protection damaged by heating.

Personnel

For California Division of Highways, Edwin Whitnack is resident engineer and Eric Hansen is assistant resident. For the contractor, Wil Staring is project manager; Robert Brock, general superintendent; Warren Shields, excavation superintendent; Kenneth Cornell, paving superintendent; S. N. Cottrell, project engineer; Ivan Anderson, office manager; Oliver Warren, cost engineer; and Les Abshear, master mechanic.

Alaska Armories

(Continued from page 39)

down for the winter to be completed during the summer of 1960. Five were not started due to transportation difficulties.

Personnel

The following men directed the unusual armory projects for the contractors: Manson-Osberg Co. had Clyde Hovik, Alaska general manager; Ted Duffield, expediter; Superintendents Dick Simons, Roy Hovik, Stanley Losey, and John Kortlever; Foremen Ray McClune, Delbert Ray, and William Leshe.

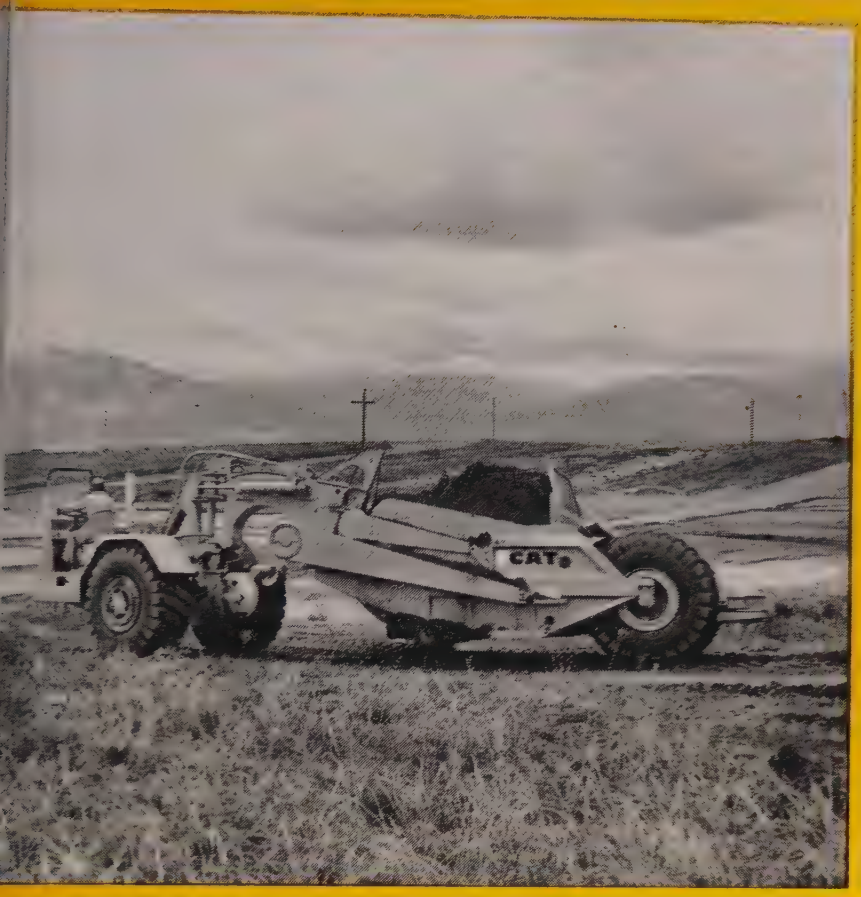
Ramstad Construction Co. had Allan MacLean, superintendent; Assistant Superintendents Horace Kelsey, Donald Clay, Hugh McArdle, Oscar Clay, and George Huiatt.

Ed Bratton and Morris Wilson supervised the construction of the two armories for Frakes, Wilson, and Oldham.

The U. S. Army Engineer District, Alaska, Anchorage, Alaska, had the following personnel involved in design, administration, and inspection of the armory construction for the Alaska National Guard: Col. W. C. Gribble, District Engineer; Lt. Col. R. A. Brandt, Assistant District Engineer for Operations; Warren George, Chief, Engineering Division; John England, Chief, Construction Division; Gus Steinwandel, Supervision and Inspection Branch; Major Orris Haynie, Resident Engineer; Ed Smith, Assistant Resident Engineer; Bernard Sturgulewski, Project Engineer; and Jim Wardlaw, Office Engineer. Special mention is deserved by the hardy field inspectors: George "Stan" Herning, who has lived and worked in Alaska most of his life; Leo Ocean Smith, an eight-year veteran of Alaskan Corps construction; and Earl Tinkey, who has worked in Alaska since 1947 for the Corps; and by Henry Cate, Planning Branch, Engineering Division, who did such an outstanding job in siting and acquiring data for the unique plans and specifications.

Major Robert D. Ellis, Commanding Officer of the 2nd Scout Battalion at Bethel, and Capt. James E. O'Rourke, 1st Battalion Commander at Nome, represented the Alaska National Guard and helped to a great extent in the construction program.

JOB REPORT ON TWO CAT NO. 619 TRACTORS WITH MATCHING NO. 442 LOWBOWL SCRAPERS...



Good maneuverability, power and acceleration!

Hauling, as well as dumping close and maneuvering in tight quarters, the No. 619-No. 442 is proving its worth on the Park Hill Subdivision, Colorado Springs, Colorado. Typical performance pushloaded by a D8: On a 3700-foot round-trip haul, the No. 619-No. 442 averages 3.38-minute cycles and handles 15 to 16 bank yards per load for production of 220 bank yards an hour.

Alexander Construction Company is using two Caterpillar No. 619-No. 442 rigs for dirt work on the Park Hill Subdivision, Colorado Springs, Colorado. The project, which covers 340 undeveloped acres, will one day have 1282 homes. About 2,000,000 cubic yards of damp sandy loam are involved in the section where the machines are now shaping land, and the job calls for a great deal of close dumping and maneuvering in tight quarters. Operator Clarence B. Kusma sums up the No. 619s' performance this way: "They handle good. Turn short. Have well-located controls. Get up to 5th gear in about 1000 feet on the flat."

On this project, as on other projects, the No. 619-No. 442 is living up to its advance notices as an excellent "all job" rig. Here are some reasons why. Its Turbocharged Cat Engine provides 225 HP and high torque rise, ideal for lugging under load and for fast acceleration. Its LOWBOWL Scraper handles 14 cu. yd. struck, 18 cu. yd. heaped. It has 30 MPH usable operating speed, plus ground-hugging roadability never before found in a two-wheel tractor of comparable size. New 2-jack hydraulic steering makes it extremely easy to maneuver, yet retains that important "feel of the road" touch. And advance design permits full 90° turns and a turning diameter of 30 feet.

Get the full facts about the "all job" No. 619-No. 442 from your Caterpillar Dealer. Compare it with any two-wheel tractor of similar size for money-making performance. Ask for a demonstration—see for yourself how you can make use of its versatility to step up production on your job!

Caterpillar Tractor Co., General Offices. Peoria. Ill., U.S.A.

CATERPILLAR

NO. 619-NO. 442 FOR "ALL JOB" VERSATILITY

Golden Beavers awarded to six outstanding men of construction industry

MORE than 1,200 members of the Beavers, an organization of men and companies in the heavy engineering construction industry, met at the Statler-Hilton Hotel in Los Angeles last month for their Fifth Annual Meeting. Highlight of the meeting was the Awards Dinner at which six members received Golden Beaver Awards for 1960.

Principal speaker was Dr. William Pickering, Director of the Jet Propulsion Laboratory, Pasadena, Calif. R. W. Rasey, president of the Beavers, and also president of Winston Brothers Construction Co. of Minneapolis, presided at the meeting.

1960 Awardees

Management:
Algot F. Johnson, Al Johnson Construction Co.;
Walter Scott, Peter Kiewit Sons' Co.;
Supervision:
Victor G. Hindmarsh, Bechtel Corporation;
Engineering:
W. J. Leen, U.S. Army Corps of Engineers;
Supply:
Tim J. Riley, Ingersoll-Rand Co.,
and Special:
Raymond A. Wheeler, Lt. General, U. S. Army (ret.).

Following are brief biographies of the six outstanding men of the heavy construction industry given recognition by the Beavers:

Algot F. Johnson

As an individual Algot F. Johnson has always maintained an abiding interest in the welfare of his fellow man. As a leader in the construction industry he has shown great imagination and tenacity of purpose. His utilization of these qualities has brought him recognition from the University of Minnesota and the King of Sweden, as well as leadership of the successful company that bears his name.

Johnson was born on a farm in Minnesota in 1884, the son of Swedish immigrants, and worked in the U. S. Mail service to finance his way through the University of Minnesota, School of Mines.

After entering the construction field he moved rapidly through the positions of engineer, foreman and superintendent. After World War I he organized the firm of Johnson, Drake and Piper, a firm that is now international in its scope under the direction of the remaining partner George Drake.

In 1927 Johnson formed his own company, the Al Johnson Construction Co. This company has specialized in engineering structures and dredging work over most of the North American continent and in many foreign countries.

The same zeal and enthusiasm he brought to his life work in the construction industry, has brought him equal recognition and success in civic affairs and functions. His efforts in behalf of the University of Minnesota and in the promotion of cultural and educational relationships with Sweden have earned him the Outstanding Achievement Award for 1955 from the University of Minnesota, and the rank of Commander of the Royal Order of Vasa presented by the King of Sweden. As present chairman of the board of the Al Johnson Construction Co. he is instrumental in the making of major policies for his company as well as maintaining an interest in the many dam and dredging contracts held by his company. He is equally active in the civic affairs of his community with a special interest in a citizen's scholarship committee. The regard with which Algot F. Johnson is held by his own organization is shared by the entire construction industry. The Beavers are privileged to honor this man.

Walter Scott

Walter Scott worked as a carpenter on the foundation of the Nebraska State Capitol. Some years later, when the Capitol Tower was built he was in charge of the project for Peter Kiewit and Sons. This growth has marked Walter Scott's climb in his chosen career, from doing odd jobs for his contractor father to his present position as Vice President, Peter Kiewit Sons' Co.

Walter Scott was born in Nebraska in 1896. After his return from World War I service he entered the University of Nebraska and was graduated in 1923 with a degree in Civil Engineering. In 1926 he became associated with the Kiewit Company as an engineer, estimator and construction superintendent and during the early thirties played an important role in the growing firm.

With the beginning of World War II, his field of operations expanded as the firm assumed responsibili-

(Continued on page 62)

ENGINEER'S FIELD REPORT

PRODUCT: RPM MULTI-SERVICE GEAR LUBRICANT

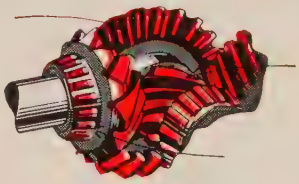
FIRM: YAKIMA CEMENT PRODUCTS CO. Yakima, Washington

No scoring or pitting of differential gears in 6 years

In Six Years of using RPM Multi-Service Gear Lubricant, not one differential in the entire 20-truck fleet of Yakima Cement Products Co. has shown any scoring or pitting of gear teeth. Despite grueling service delivering ready-mix concrete and other building materials to off-highway construction sites, lubricant has never failed to do its job. Firm's six-wheel-drive trucks supply sand, gravel, ready-mix concrete, and fabricated concrete products to projects within 100 miles of Yakima, Washington.

Ready-Mix Truck like rest of firm's vehicles, is rebuilt Army surplus 2½-3 ton International. "In the fleet of 21 six-wheel-drive trucks, we have never had a transmission or differential failure due to lubrication, despite our severe operating conditions since we started using RPM Multi-Service Gear Lubricant," says firm's chief mechanic, Art Weber. This lubricant is also used in all mixer drive gear boxes.

Why RPM Multi-Service Gear Lubricant prevents wear



- Special compound forms protective lubricating coating on gears by chemical reaction with metal...resists rubbing action of hypoid gear teeth.
- Withstands extreme temperatures and pressures...highly oxidation resistant...keeps bearings and gears cool.
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Walter Scott

(Continued from page 60)

ties for urgently needed military construction. Projects ranged from Fort Lewis 41st Division Cantonment near Tacoma, Washington, to the Glenn L. Martin plant, runways and hangars.

Since 1946, his staff has successfully bid and built, or participated in such projects as the Friant-Kern Canal in California; underground installations at Albuquerque; the Portland sewage tunnels; the Eklutna Tunnel in Alaska; Bull Shoals Dam in Arkansas; Fort Gibson in Oklahoma, the Hyperion Outfall in Los Angeles; various St. Lawrence seaways projects; the Niagara Power Development and others.

Scotty's warm personality and understanding have earned him respect and friendship throughout the construction industry.

For these qualities and for his well earned reputation as one of the most astute and capable engineers and estimators in the construction industry, the Beavers are honored to make this award.

•

Victor G. Hindmarsh

The accomplishments of Victor G. Hindmarsh are not confined to the concrete and steel of rail lines, dams, tunnels, bridges and industrial developments although certainly there are scores of these. His real accomplishment is the development of untold numbers of young construction men he has helped along the way.

He was born in Hastings, Minnesota, in 1880, educated in Minneapolis, and began his construction career with the Southern Pacific railroad in 1900.

Before and during the First World War he spent four years in shipbuilding, then returned to construct bridges, dams, and tunnels with Grant Smith and Co., with General Construction Co., and with Bennett and White of Calgary.

In 1931 Mr. Hindmarsh joined J. H. Pomeroy and Co. bidding and building jobs for them up and down the Pacific Coast.

Later during the 1930's he was loaned to the Bechtel Corporation as top man for a critical project. When it was completed Pomeroy graciously consented to a permanent "loan" and Victor G. Hindmarsh was with the Bechtels to stay.

By 1937 he was in charge of oil refinery construction, starting at Standard Oil Co. of California's Richmond Refinery with a hydrogenation plant.

In 1945 he was elected vice president and director. In 1951 he was named senior vice president.

In the latter capacity he had chief responsibility for one of the biggest and most complex overseas jobs of that time, the 120,000-barrel Aden Refinery for British Petroleum Co. Ltd., involving activity on three continents and a work force of 15,000 recruited in 17 countries. This refinery was completed in 21 months, well ahead of schedule.

Victor Hindmarsh is a builder, not just of work projects, but of younger men who will build the even larger projects of tomorrow. For his own accomplishments and for those of the men he has inspired and trained, the Beavers present this tribute.

•

W. J. Leen

W. J. "Bill" Leen is the type of construction man who has made the Corps of Engineers one of the most respected agencies of our government. As chief of the Construction Division of the Los Angeles District of the Corps of Engineers, he is known throughout the West as an able leader and a top flight engineer.

Born at Iola, Kansas, in 1902, he was graduated from Oklahoma A & M College in 1928. After graduation he went to work in the Kansas City District of the Corps. From that time he has steadily progressed through numerous engineering positions to become one of the top civilian engineers in the Federal Government.

Leen has been employed by the Corps of Engineers for over 30 years. Since 1935 he has made his headquarters in Los Angeles.

During World War II, he was commissioned in the Corps of Engineers and was Commander of Engineer Detachment "A" which rehabilitated the Port of La Havre, France. Later he was assigned as the Commanding Officer of the 1314th General Service Regiment which saw duty in both Europe and the Pacific.

During Leen's assignment as Construction Chief, the Los Angeles District has made an enviable record of construction. The Los Angeles-Long Beach Breakwater and the Playa del Rey Small Craft Harbor now under construction are typical examples of River and Harbor projects built under his supervision. Flood control construction performed by the District has included numerous reservoirs and channels in the Los Angeles County Drainage Area as well as in Orange County, California, Nevada, and Arizona. Military construction supervised by Mr. Leen has included every type of construction from minor building alterations for the Organized Reserve to the most involved missile launching facilities. It can safely be said that facilities at every Army and Air Force installation in the southland reflect the exceptional

construction management abilities displayed by this dedicated Federal employee.

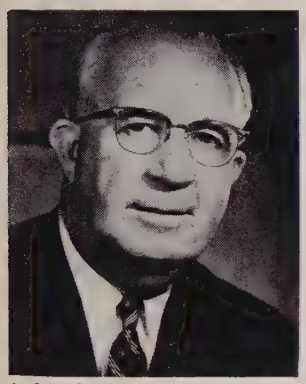
The Beavers are proud to honor him.

•

Tim J. Riley

Tim J. Riley grew up loving machinery the way some boys grow up loving baseball. As he grew older his total devotion to mechanics was gradually concentrated upon the construction industry, until today he is recognized as an authority on construction equipment.

Riley was born in Butte, Montana, in January 1900, and spent his boyhood watching the activity in the shops of Butte's copper mines.



In 1916 he went to work for the Anaconda Co. and completed a machinists apprenticeship in 1921. During that time he also completed high school and a night school business course at the local business college.

In 1925 he became machinist foreman for the Anaconda Co. on general assignment at several of their mines. In 1929 he joined the Ingersoll-Rand Co., an association which has proven mutually satisfactory since.

For the past 30 years he has served the I-R sales organization in Butte, New York City, Salt Lake City and finally to his present position in San Francisco as special representative of the New York general sales department, assisting the firm's seven Western branches on sales and design of construction equipment. He was I-R representative at Kerr Dam, Grand Coulee and many other dam, tunnel and highway projects.

During these years of contact with the construction industry it has become recognized that not only does Tim have a keen understanding of the problems of the builders he serves, but also that his knowledge of machinery and equipment is unsurpassed. Even more to his credit, builders from coast to coast accept his word as a binding commitment.

Tim J. Riley is typical of those devoted men who serve the construction industry in the role of supplier. For his years of service to the industry and for the credit he has brought to that industry, the Beavers are privileged to honor him.

•

General Raymond A. Wheeler

General Raymond A. Wheeler is one of that rare breed of men who has combined a military and an engineering career to the honor of each. General Wheeler was graduated from the United States Military Academy at West Point, the Engineer School of the United States Army, the Command and General Staff College and the National War College.

His overseas war service ranged from the expedition to Vera Cruz, through France, Germany and Italy in World War I, to the Persian Gulf area, China-Burma-India and Southeast Asia in World War II. At the end of World War II he was serving as commanding general of the India-Burma theater and as deputy supreme Allied Commander of the Southeast Asia command. At the end of his active duty he was serving as Chief of Engineers, U. S. Army.

He has been awarded the Distinguished Service Medal with three Oak Leaf Clusters, the Silver Star, the Legion of Merit, and the Air Medal. He also received awards from several foreign countries, including honorary knighthoods from two of them.

When he retired from the U. S. Army with the rank of Lt. General he was appointed Engineering Advisor by the International Bank for Reconstruction and Development, where he organized an engineering staff and a technical operations department. His special assignments included the Indus Basin waters discussions between India and Pakistan for which the World Bank is lending its good offices seeking a solution of the dispute, and to a cooperative study with the Suez Canal authority for planning improvements of the Canal to meet increased traffic requirements.

He was loaned by the World Bank to the United Nations for the clearance of the Suez Canal at the end of 1956, and again for the survey of the Mekong River in Indo-China at the end of 1957.

He is an honorary member of the American Institute of Architects and received a non-member award from the Moles in 1948. In 1958 he received the Hoover award for engineering.

It is only fitting that the Beavers now climax this most distinguished career with their own Beaver award.

•

Beavers organized in 1955

The Beavers, an informal organization of individuals and firms representing the heavy construction industry, was founded in 1955 under Wm. A. Johnson, chairman of American Pipe & Construction Co., who became its first president.

At the initial awards dinner, held in Los Angeles in January 1956, Johnson outlined the group's general objectives: "The construction fraternity includes men who in many cases have devoted a lifetime to that industry. It is felt that deserved recognition should be given to the principals, but generous recognition likewise should be given to other individuals who have been an essential and important part of the construction team and who have contributed generously to the success and honor of the industry."

In line with this policy, the organization has each year presented "Golden Beaver" statuettes to construction men in recognition of distinguished service.

More data on rubberized asphalt

Editor:

The April 1959, issue of *Western Construction* contained an article entitled "Rubberized Asphalt for Seal Coats," which was based on a report prepared by the Natural Rubber Bureau Road Research Laboratory for the Colorado Department of Highways and other interested parties. The July issue included further information on this experiment in the form of a letter from J. R. Benson.

In October we conducted an inspection of the various test sections in this experiment to determine their condition after 14 months of service. We would like to report our findings and also to correct some impressions that may have been gained from the previous references to this experiment.

It has been reported that the application of the cutback with natural rubber was, in part, poor due to high viscosity. Actually, of the three separate sections with this material, only a portion of the third (and last section placed) shows evidence of unsatisfactory placement. While this one section must be rated as decidedly inferior, the other two sections with natural rubber were in excellent condition — equal or superior to any of the other sections.

The sections with the other types of rubber (butadiene-styrene and neoprene), while generally in very good condition, showed some variations in appearance. Three of the six sections were excellent, while the other three had local areas of bleeding and blackening in the traffic lanes. Some of these defects may be attributable to construction factors, but the fact that they apparently have not been observed previously would indicate that traffic and weather are responsible.

The three control sections without rubber were generally inferior to the sections with rubber, the difference being manifest in the marked blackening in the wheel paths which, according to Benson, appeared shortly after construction. This blackening, although unsightly, does not appear to have progressed to the point where it would be considered detrimental from the standpoint of performance.

As a matter of record, it should be emphasized that this was the first time that natural rubber latex had been used in the Benson rubberizing process. Preliminary laboratory investigations and pilot runs had indicated that a suitable blend was attainable. However, the subsequent production run did not result in a blend with all of the characteristics of a well-dispersed rubber, and some gelling and separation occurred. Before this condition had been detected, another carload of rubberized cutback had been prepared by the same process for a similar experiment in South Dakota.

While this material also showed some separation, a homogeneous condition was restored by heating and circulating in the tank car. The application was entirely satisfactory and, when examined after over a year of service, the performance was judged to be excellent. In the past three years alone, natural rubber latex has been used in more than a dozen other experimental surface treatment projects without any difficulty such as encountered in Colorado.

The final evaluation of the relative merit of various types of rubber will require longer periods of service for both the Colorado and South Dakota experiments. It is hoped that additional planned and controlled experiments may be arranged so as to obtain further comparisons. In the meantime, it should be noted that the benefits of rubberized asphalts over untreated asphalts are often significant in the very early periods of service.

One advantage that has been observed is the superior retention of aggregate when the fresh surface is first subjected to traffic. In this critical period, when the asphalt is relatively tender, it is highly desirable to have a binder that develops holding power quickly so as to reduce whipoff and the blackening which follows. Rubber seems to help.

James M. Rice, Director
Road Research Laboratory
Natural Rubber Bureau

WALKING WITH A RING HANGING FROM ITS BOOM

Construction of the second power plant of the Fort Peck Dam in Montana is currently under way for the Corps of Engineers. A Manitowoc crane owned by Chicago Bridge & Iron Co., is shown lifting a 17½-ton ring of steel tunnel liner. It will walk the liner approximately 200 ft. to buildings where an automatic welding process will connect the rings. Completion date is scheduled for February 1961.

New steels are born at Armco

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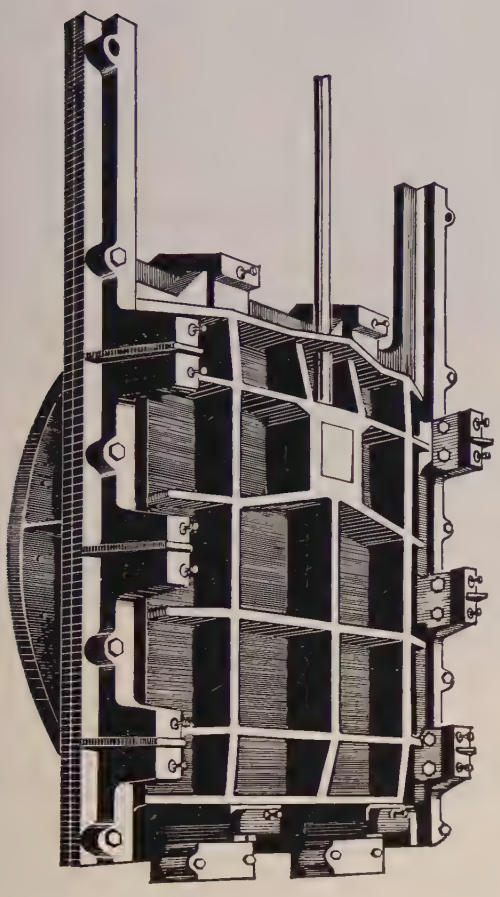

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1. NEW TRUSS built in upright position by railroad bridge crew is 247 ft. long, 40 ft. high and weighs 250 tons. Special trucks and outrigger beams hold it upright for moving.

2. (Top Right) START of quarter-mile trip to bridge. Outrigger skids ride on special rails built over the main line. Truss must be in place and rails cleared in 4 hours.

Building a bridge around a bridge

3. LOCOMOTIVE crane tows truss slowly out over the ancient bridge 110 ft. above Snake River. Erection of falsework to remove link and pin for testing would cost half as much as entire new bridge built for $500,000.

Union Pacific replaces a key main-line structure at American Falls, Idaho, without disrupting service by placing new 250-ton trusses on either side of existing 1901 bridge.

4. TWO PAIRS of 150-ft. steel poles with steel headframes were supplied by Pacific Crane & Rigging Co. Div. of Macco Corp., Paramount, Calif., for lifting the trusses. Two load blocks were hooked into lifting lugs at each end of the truss, taking the load to permit removal of outriggers and running gear. Blocks on one side were slacked to drift truss to edge of bridge.

5. CRANES with booms at wide angle pull truss outward for final lowering into position. Crane and drum hoists were coordinated by Jim Curran, UP bridge engineer with mike in center of bridge. Job was done in 8 deg. weather.

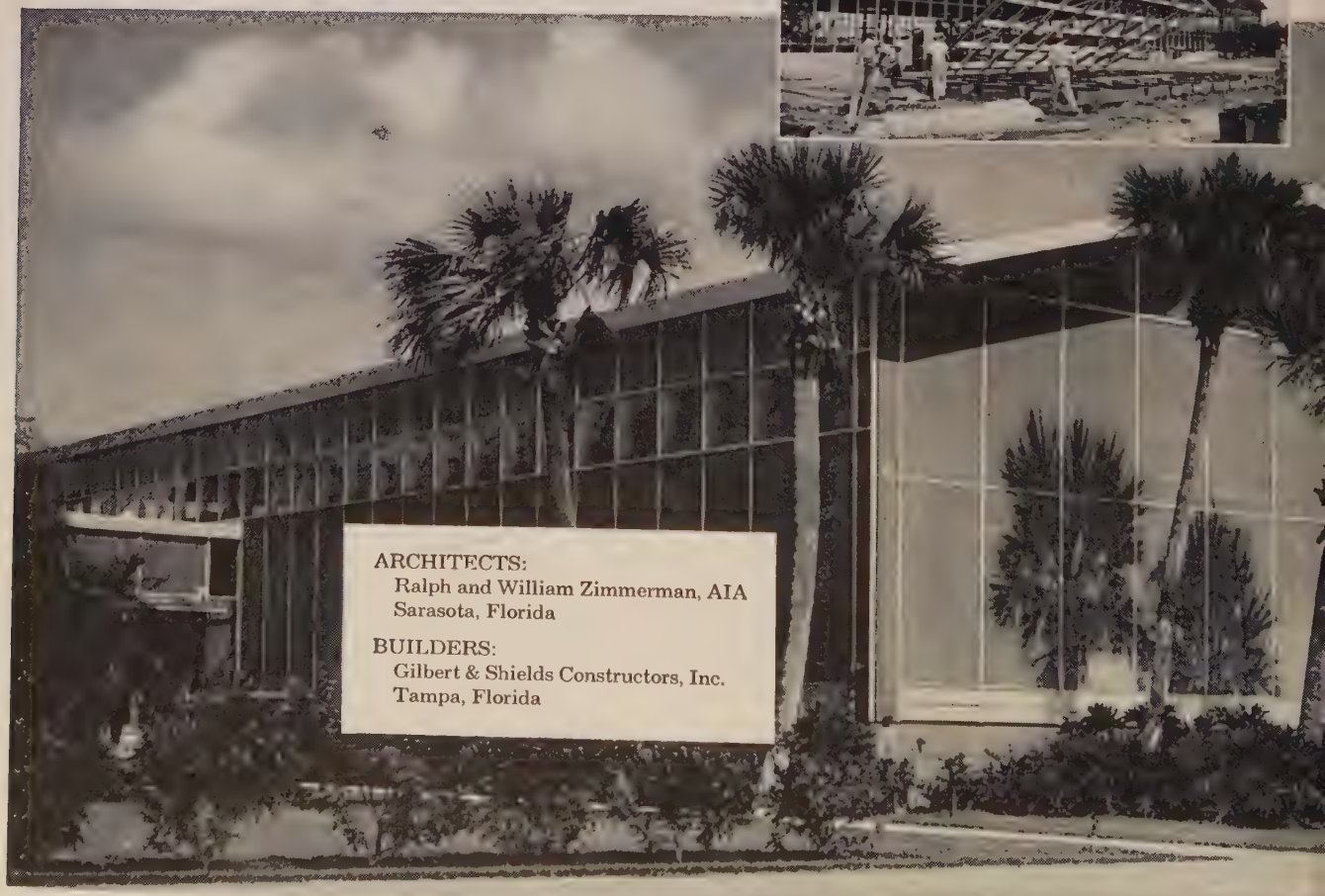
6. CREW grins after completing lowering on schedule. Big blocks in background use 17 parts of 7/8-in. steel cable. Louis Stec, left, was project supervisor for Pacific Crane who planned operation. Steel supplied by Paxton & Verling Steel Co.

Fir plywood component
versatile nev

Giant prefabricated 4 x 48 foot fir plywood girders were crane-lifted into position atop supporting columns.

Stressed skin fir plywood roof panels were used in pairs to form peaked roofs over 40 foot bays.

Sidewall framing was tilted into position, covered with high density overlaid Exterior fir plywood siding.



ARCHITECTS:
Ralph and William Zimmerman, AIA
Sarasota, Florida

BUILDERS:
Gilbert & Shields Constructors, Inc.
Tampa, Florida

nake possible
ow-cost building techniques

...in 50,890 sq. ft. converting plant for International Paper Co.

One of the largest all-plywood and wood structures built since World War II, this Auburndale, Florida, plant of International Paper Company's Container Division demonstrates the outstanding technological advantage of modern plywood construction. Major key to building economies was the use of prefabricated fir plywood components.

BOX BEAMS, prefabricated of fir plywood, were one time- and money-saver. The beams, strong as steel and far lighter, have webs of 1-inch fir plywood and flanges and stiffeners of 2 x 12's. They were 4′x48′, and had a clear span of 40′ to support the series of eight 48-foot peaked roof bays.

STRESSED SKIN ROOF PANELS, prefabbed with plywood, were lightweight and easy to install. Each pair of panels spans 40′ to form the peaked roof over each bay. Top skin is ⅜″ fir plywood, bottom ¼″, glued and nailed to 2 x 8 framing.

EXTERIOR WALLS are ¾″ high-density overlaid fir plywood which requires no finish and is expected to be maintenance-free for the life of the building. The entire structure was completed in 154 working days. Structural members, including the fir plywood box beams, columns and girders, went up in 10 days. Stressed skin roof panels took 10 days; the siding went on in 5.

FOR INFORMATION on fir plywood component construction or other data, write
DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON
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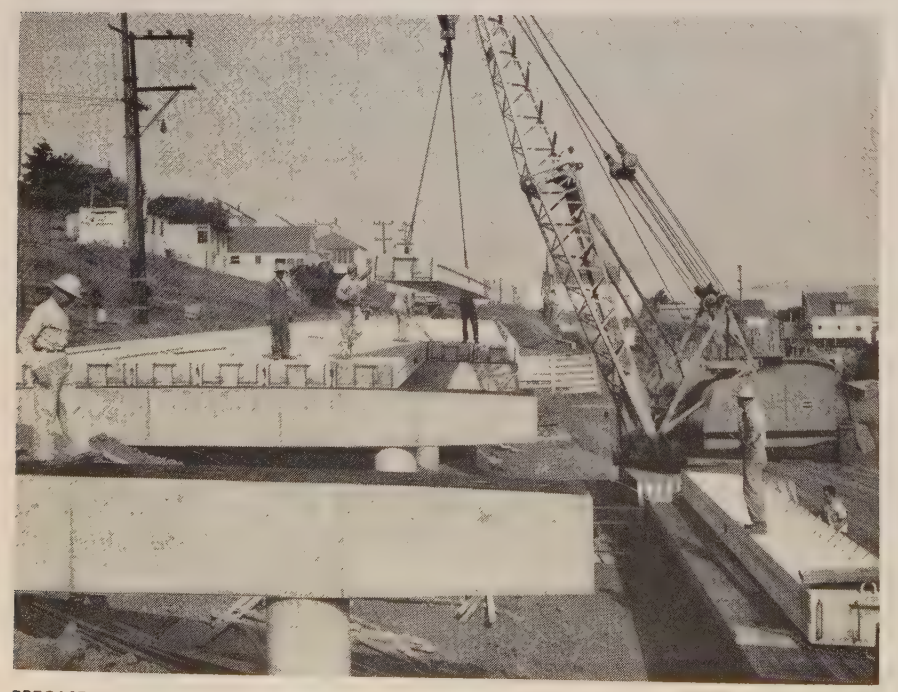
COMPOSITE photograph of Candlestick Park, showing stadium under construction and part of the 60-acre parking lot which will hold 8,200 cars and 300 buses. Concrete rim around top of the stadium is a boomerang to protect both spectators and players.

Solving traffic problems at Giants' new stadium

More than 45,000 people will converge on Candlestick Park, all of them travelling on rubber tires. To prevent a monumental traffic jam, San Francisco's Department of Public Works created a network of streets cutting through steep hills and filling acres of bay mud.

By ALFRED GOLDBERG
Street Reconstruction Engineer
Bureau of Engineering
Department of Public Works
City and County of San Francisco



PRECAST post-tensioned beams placed in Ingerson Avenue Viaduct. Beams were produced in a casting yard near the stadium. Capped concrete piles were drilled and cast in place.

IN APRIL 1960 the San Francisco Giants will open their season in the newest and most modern plant in major league baseball—Candlestick Park.

The new stadium incorporates several "firsts" in its design. It will be the first major baseball stadium to provide radiant heating, to be built completely of reinforced concrete, and to have a specially designed system of access roads for the motorist and mass transit.

The stadium will seat 45,000, including about 2,500 in temporary center field bleachers. Seats are mounted on precast, prestressed slabs resting on cast-in-place grade beams. The upper deck is supported on massive post-tensioned beams. The wind baffles, consisting of precast boomerang shaped beams closed by precast panels, will protect the spectators and players alike from the prevailing winds. The exterior columns are inverted Vees and carry their load to diagonal struts and ultimately to caissons imbedded in rock. The Vee shape was adopted for architectural pur-

poses and, together with the boomerang wind baffle, will give the stadium a unique and most attractive appearance.

Candlestick Park is located in the most southeasterly corner of San Francisco and adjacent to San Francisco Bay.

The stadium was constructed in solid rock and the parking lot constructed by using the material excavated for the stadium and filling in the surrounding shoreline. The access roads enclose the parking area and are likewise mainly on filled land.

The access roads and sewers project required solution of several major engineering problems in the traffic, highway, construction, hydraulic, sewage and structural fields. There was little time to spare. The project started in August 1957, and was completed 26 months later, in October 1959.

The location of Candlestick Park Stadium presented a series of conditions not previously encountered in any major league baseball park.

Californians are probably the most car-conscious citizens in the country. Almost all mass transit runs on tires. Subways, trains and streetcars are either nonexistent or carry only a small fraction of the traffic load.

The stadium site has no access by the city's streetcar lines, private railroad, or other off-the-pavement mass-transit mode. It was, therefore, a foregone conclusion that the entire attendance to a stadium event had to come on tires over city streets and access roads.

The size of the parking lot was set at approximately 60 acres; it is at the moment the only closeby parking facility.

After consultation with all bus and taxi operators, the traffic load assignment for pregame approach to the park was as follows:

	Vehicles
Passenger Cars	8,200
Municipal Buses	100
Charter Buses	300
Taxicabs	400
Total Design Provision	9,000

	People
At 3 passengers per car	24,600
At 70 passengers per bus	7,000
At 50 passengers per bus	15,000
At 3 passengers per taxi	1,200
	47,800

These figures are based on a capacity attendance and provide a 5% margin over the stadium capacity of approximately 45,000. The parking lot was laid out to accommodate 8,200 passenger cars and 300 charter buses. The Municipal buses and the taxis would unload their passengers directly in front of the main entrance to the stadium using the Jamestown-Ingerson Service Road and then leave the area for storage during game time. After the game they will return and load in the same area.

The basic traffic criteria adopted for the access road design are:

a) Maximum attendance, weekday afternoon game.

b) Game completed and traffic entering street and freeway system at 4:00 p.m.-5:00 p.m. period (normal peak hour.)

c) Lane capacity 600 cars per hour at control points.

Street requirements

The location of the site required the construction of all but one of the roads shown in the aerial photo. At the start of design only Gilman Avenue was a paved street near the stadium site. A network of roads that could be constructed rapidly and could disperse traffic to available streets and freeway facilities was, therefore, needed. The shape of the parking lot and its location out in San Francisco Bay indicated that a circumferential roadway around the lot was required initially. The fill for this roadway would come from the construction of an extension of Jamestown Avenue, south of the stadium, which would require over 1,500,000 cu. yd. of excavation, mostly in rock.

Connecting this circumferential roadway to the street and freeway system would be done by constructing Harney Way along the shoreline to the south ultimately reaching the Bay Shore Freeway south of the San Francisco-San Mateo County Line. This roadway would also connect, via existing streets, to the old Bay Shore Boulevard. To the north new roadways would be constructed along Fitch Street and Carroll Avenue, using fill from the Jamestown cut. Lastly, Ingerson

AERIAL VIEW of Candlestick Point showing new road system constructed by the City to serve the baseball stadium. Some streets reserved for taxis and buses. Parking area is 60 acres.

Avenue would be extended into the area.

The lanes provided by the various facilities are as follows:

Circumferential Roadway—
- Gilman Avenue Extension, 5-12-ft. lanes
- Hunters Point Service Road, 6-12-ft. lanes
- Jamestown Avenue—east of Harney Way, 6-12-ft. lanes
- Jamestown Avenue—west of Harney Way, 3-12-ft. lanes plus 2-12-ft. lanes for mass transit
- Harney Way, 3-12-ft. lanes
- Ingerson Avenue, 3-12-ft. lanes
- Fitch Street, Carroll Avenue, 4-12-ft. lanes

The assignment of traffic in pregame operation would result in the following number of inbound lanes:
- Gilman Avenue—west of Fitch. 2-12-ft. lanes
- Fitch-Carroll, 3-12-ft. lanes
- Jamestown—west of Harney, 3-12-ft. lanes plus 2-12 ft. lanes mass transit
- Harney Way, 3-12-ft. lanes
- Total inbound, 11-12-ft. lanes plus 2 mass transit

By using reversible one-way streets, together with off-center lane designations, the post-game distribution is the same as above. The mass transit buses and taxis will use the loop consisting of Jamestown Avenue, Stadium Service Road, and Ingerson Avenue for entering and exiting. Ingerson Avenue is reserved exclusively for bus and taxi use.

Sewer and drainage

The entire parking lot, over 60 acres, has been sloped to drain to the peripheral roadways and the removal of the storm water, therefore, became an access road problem. Originally the sewer system planned for the project would provide for removal of all sewage and storm water by connection to the City sewer system with temporary diversion structures for storm overflow. As a result of settlement recordings of the fill placed for the Hunters Point access road, it was decided to postpone permanent sewer construction therein until the fill stabilizes. A major consideration for the design of the sewer system was the pattern necessary for the ultimate development of the entire area north and east of the stadium site. This area has been designated for reclamation for use as an industrial area with rail and highway facilities. The main sewer constructed for the stadium was in Gilman Avenue Extension and Fitch Street. It consisted of reinforced concrete sewer on piling, most of which exceeded 100 ft. in length. Size of the sewer varied from 18-in. to 81-in. diameter.

STEEL bin wall forms retaining wall along Ingerson Avenue. Wall has maximum height of 25 ft.; was constructed without mishap in dry year.

Roadway structures

The construction of the new roads for the extension of Ingerson Avenue to the stadium and McKinley Avenue to Harney Way required three structures, a viaduct and retaining wall for Ingerson Avenue, and an overpass for McKinley Avenue.

Ingerson Avenue was a known slide area with a history of slippage. It was assigned the important duty of providing a separate road system for the bus and taxi traffic. In order to assure continuous use of this roadway a 248-ft. precast, prestressed concrete viaduct on drilled-in, cast-in-place, bell-end, reinforced concrete piles was constructed to span the slide zone. Piles were battered and designed to carry the horizontal thrust of the sliding material.

The headwalls for the viaduct, as well as a retaining wall required elsewhere on Ingerson Avenue, were constructed as a galvanized steel bin wall. Maximum height of the bin walls is 25 ft. Construction of bin walls and viaduct proceeded without mishap during one of the driest years in city history.

The main contract, of the eighteen access road contracts that constituted the City's work for the new stadium, was the excavation of the Jamestown Avenue Extension. This consisted of cutting into the existing Bay View Park to construct a 100-ft. right-of-way and an adjacent 25 ft. easement for a future haul road for the reclamation district. Maximum depth of cut was 200 ft. Total material removed exceeded 1,500,000 cu. yd.

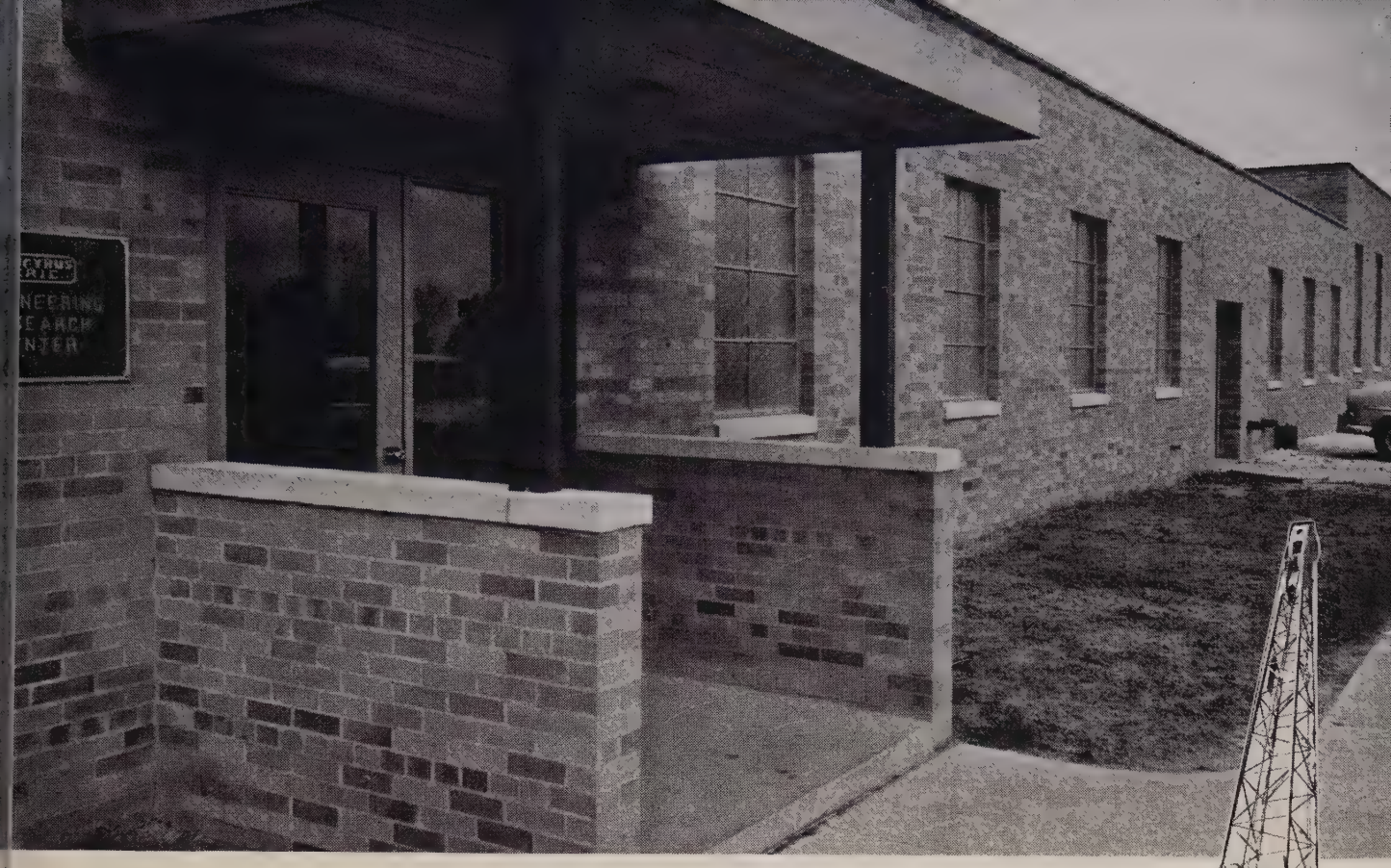
Initially, the contractor employed 13 scrapers with six D-8 or D-9's, as pushers and for ripping, to remove the overburden. Scraper operations ceased halfway through the job after rock was reached, whereupon blasting was employed. The City supervised blasting operations to minimize nuisance and damage.

The contractor used a 6-yd. electric shovel for the most part to remove the blasted material. Dozers pushed some of the broken material into hoppers for loading directly into trucks. Seven 20-cu. yd. Euclids were used at this stage.

All material removed from the cut was end-dumped to construct the roads around the parking area. The bay in this location had about 19 ft. of water overlying up to 60 ft. of bay mud, an organic clay-like material that weighs about 50 lb. per cu. ft.

Initially, full displacement of the soft mud was attempted but when fill depths of over 55 ft. were encountered, other methods had to be employed.

The parking lot contractor had used the full displacement method which would cause shear failures in the underlying mud and tilt up the mud on the bay side. He would continue to load the edge, pushing it down and creating another shear failure and so on to the end of the job. This required a considerable



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To find out what machines will do, it is necessary to find out what they won't do! Bucyrus-Erie engineers working on booms, for example, literally cover a boom with strain gauges — fine wire sections so delicate many are broken in ordinary handling — to find out exactly where the strains occur and how severe they are. They lift weights so far beyond capacity booms are forced to buckle. They tug away at the boom with tractors to check side loading factors of safety. Finally the material will stand no more.

At this point the engineers know where to start over again, what changes will give you a boom in which each element adequately complements all other elements, what strengthening is needed to keep the machine working steadily, safely for maximum profit.

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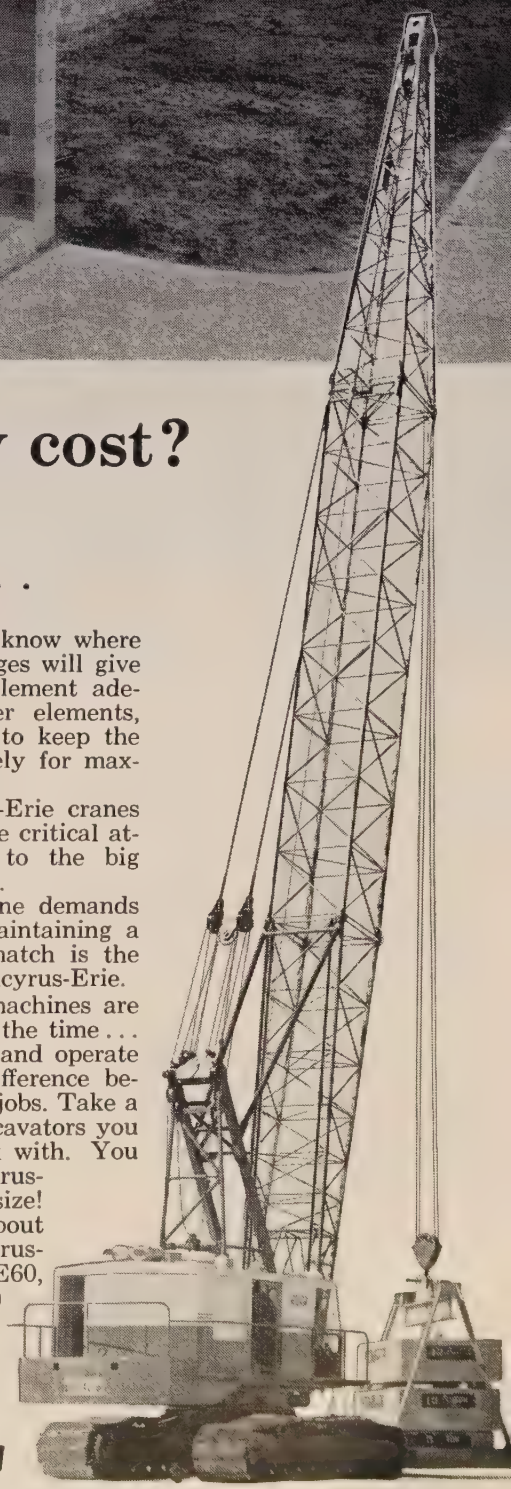

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quantity of fill material. When the Hunters Point service road fill operation indicated that this shear failure was starting in the roadway and causing excessive quantities of fill to be required, the City called in its soil consultants and an alternative method was evolved.

The method used was to place a layer of fill to a minimum thickness (about 4-8 ft.) that would sustain the haul vehicles. No fill was to be stockpiled. If shearing occurred no fill was to be placed to "level" up the area, but rather fill was to be placed as far ahead of the shear as possible. After the entire roadway area was covered with the minimum fill, an equal blanket of material was to be placed a minimum of 50 ft. on the bay side of the right-of-way. Successive lifts of 2 ft. in depth were to be placed until grade was reached. The resultant fill averaged 12 to 15 ft. in depth. Additional width of bayside blanket was placed to assure stability. Subsidence readings taken over the past year indicate no differential settlement nor is the vertical movement, as the underlying mud compresses, excessive. Lateral movements, though not large, indicate that sewer construction on piling should be delayed for the time being.

BIN and conveyor used to load out broken rock after drilling and shooting on the 1,500,000-cu. yd. Jamestown Cut. About half the cut required blasting.

Jamestown shear-out

In February 1959 following a very low tide, a section of Jamestown Avenue Extension midway between Harney Way and Hunters Point service road sheared and dropped 10 ft. vertically. This area had been placed by the full displacement method although all the mud had not been displaced. Subsidence points were set for recording future movements. The entire immediate area was unloaded to a depth of 6 ft. and all excess material so removed was placed as a bayside blanket. Additional material was placed as a blanket 100 ft. in width, 8 ft. thick for the full length of the shear failure. Records indicated the control of the movement. Upon reaching a steady vertical settlement with small horizontal movements, the roadway area was returned to grade.

Freeway cloverleaf

The last fill operation consisted of a single cloverleaf intersection with the Bay Shore Freeway. The freeway at this point had been constructed by the State Division of Highways, which utilized every available means to achieve full displacement of the mud. The cloverleaf had a maximum width of 200 ft. on the bayside of the freeway fill. After placement of 40,000 cu. yds. of material, it became apparent that considerable shearing was going to occur. In order not to use excessively large amounts of fill, it was decided to construct the fill by using the Hunters Point method of thin fill over roadway and protective blanket and then raising only the roadway to grade in successive 2-ft. lifts. All other areas, that is those between the access roadway and the freeway, were not to be filled at all.

This method succeeded except for a 500-ft. long section that continued to shear daily. It was observed that the shearing in the failed section was moving laterally great distances and no assurance could be made as to its ceasing before the project deadline. In conjunction with the soil consultants it was decided to blanket the bayside to a 200-ft. width with 8 ft. thick material, remove all excessive interior weight, and surcharge the extreme edge of the blanket with 3 ft. of fill. Shear failures diminished with each of the remedial steps. Upon their completion, the roadway was ready for final grading.

The 18 contracts for the construction of the access roads and sewers constituted the largest number of contracts let by the Department of Public Works, for one particular project. The contracts consisted of sidewalk narrowings to provide additional roadway width, new street constructions, the Ingerson Viaduct, Jamestown Cut, sewers and pavement constructions on access roads developed from the excavated cut materials, and street lighting contracts. In addition, street and traffic signs were installed throughout the area by the California State Automobile Association, on contract from the City.

Within two months after start of design all utility companies were advised of the scope of the project and meetings were held giving them the details of each phase as then available. Constant liaison was maintained during design and construction so that interferences were minimized and utility construction work dovetailed into line with City contract work.

Personnel

The work undertaken to construct the access road system came under the direction of the Department of Public Works—Reuben H. Owens, Director. The design work was by the Bureau of Engineering, headed by Clifford J. Geertz, City Engineer. Coordinating Engineer for the City was Alfred Goldberg.

TO GIVE CONTRACTORS what they need *when* they need it, B.F.Goodrich built a warehouse near the Niagara project. A complete line of B.F.Goodrich tires is stored, ready for every emergency. At the B.F.Goodrich Tire Service Building on the job site, a crew of trained tire maintenance men works in shifts, 'round the clock.

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B.F.Goodrich conveyor belts will carry materials for 1,300,000 cubic yards of concrete, total required for the entire generating plant. And helping to keep the whole project humming are special B.F.Goodrich maintenance and service facilities—all part of the new B.F.Goodrich Unified Contractor Program.

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WESTERN CONSTRUCTION NEWS ®

Corp of Engineers contracts total $155,000,000 in N.W.

THE construction program of the U.S. Army Engineer District, Walla Walla, Corps of Engineers, for the current fiscal year ending this June 30 is one of the largest in the history of the District, Colonel Paul H. Symbol, District Engineer, revealed in a summarization of the Corps operations for the remainder of the fiscal year. During this period bids will be, have been invited, or have been awarded on construction contracts totaling more than $155,000,000. Some of the contracts will continue into future years.

On January 1, contracts had been let on 22 military projects estimated to cost in excess of $44,000,000 and on 32 civil projects estimated at over $43,000,000. During the last half of the fiscal year, January to June, it is contemplated 23 military contracts will be awarded with an estimated value of some $48,000,000 and 25 civil works contracts will total approximately $19,000,000.

The entire construction program for the District for the current fiscal year is summarized as Washington, 48 contracts totaling $100,700,000; Oregon, 14 contracts totaling $1,100,000; Idaho, 27 contracts totaling $48,900,000; Montana, 12 contracts totaling $4,200,000, and Wyoming one contract totaling $400,000.

Two Titan bases

The military construction work involves building a Titan Intercontinental Ballistic Missile Base at both Larson and Mountain Home Air Force bases in Washington and Idaho. Each Titan base will represent expenditures of approximately $40,000,000 when completed. Besides the launching facilities, other items to be constructed at ICBM bases include runways, blast deflectors, roads, dormitories and water supply systems. The contract has been awarded for the Larson missile work and the Mountain Home construction project is expected to be awarded early in 1960. Bids will also be received on two Army missile projects at Hanford and Mountain Home, which will represent a total of approximately $4,000,000.

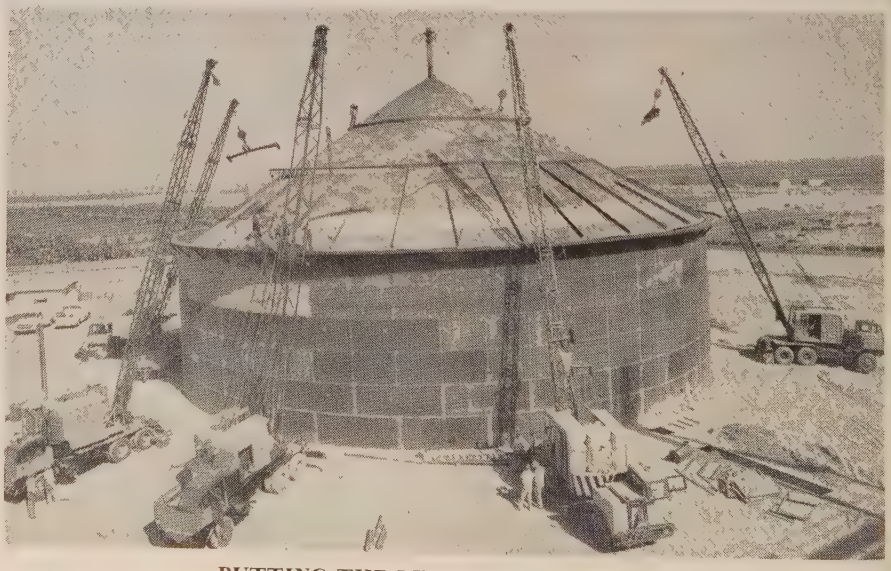
Civil works

Relative to the civil works activities, John Day Lock and Dam on the Columbia River represents the largest active contract awarded during the fiscal year. At John Day, the Washington shore first step cofferdam is essentially completed. Rough excavation for the navigation lock and dam abutment has been completed and excavation for the spillway portion of the dam is about 25% completed. Funds of $19,500,000 which were allowed for the fiscal year work at John Day is ample to maintain the project on schedule. The contract for the north shore construction work at John Day includes the north shore abutment, fish ladder, nonoverflow section, navigation lock and 19 of the 20 spillway bays and amounts to $32,381,096. Award was made to Montag, Halvorson, McLaughlin and Associates in late 1959.

At Ice Harbor Lock and Dam, 9 mi. up from the mouth of the Snake River, funds of $27,950,000 have been allotted for the fiscal year ending this June. These funds will keep the project on schedule, allowing retention of the November 1961 date for raising of the Ice Harbor pool, and December 1961 for the first power on the line.

Construction will also continue on the remaining spillway bays, nonoverflow section, navigation lock and north shore fish facilities. This north shore work at Ice Harbor should reach the halfway completion mark by the last of June. On the south shore of Ice Harbor, construction work will continue on the powerhouse, involving the installation of turbines, generators, and miscellaneous power plant equipment, bringing this work to an approximate 80% completion stage by close of the fiscal year.

Advanced planning work involving some $1,326,000 in funds is being utilized this year for continued engineering studies on various other multi-purpose river projects. Thirty-five miles above Ice Harbor Dam is Lower Monumental Lock



PUTTING THE LID ON A 126-FT. TANK

Surrounding a 126-ft. diameter tank at a feed lot near Kerman, Calif., these six Lorain Moto-Cranes are putting on the 60-ton steel-plate roof. The tank is 30 ft. high and 60-ft. booms were used.

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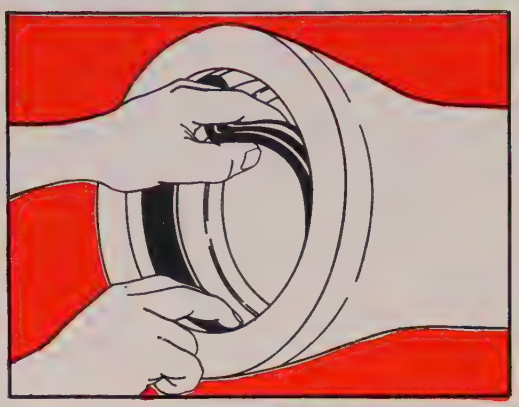
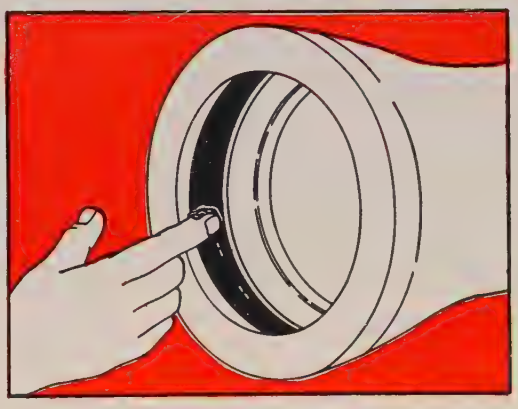
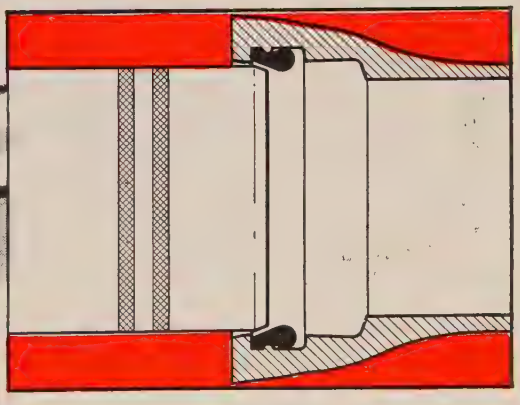


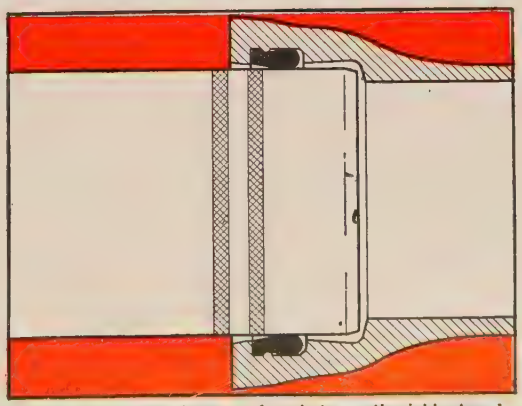
Insert gasket with groove over bead in gasket seat



Wipe a film of special lubricant over inside of gasket



Insert plain end of pipe until it contacts gasket



Force plain end to bottom of socket . . . the job's done!

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HAWAII Report

By ALAN GOODFADER, Honolulu

NEW RECORD—Bids let in Hawaii hit a record $180,000,000 in 1959 and will go to $200,000,000 in 1960 unless there is all-out war, Clarence L. Hodge, manager of the General Contractors Association of Hawaii, estimates. His estimate shows a $5,00,000 gain over bids let in the record 1958 year. About 95% of the construction was on Oahu. "However," Hodge said, "With the advent of statehood, the tourist boom and increasing population and scarcity of land, neighbor island construction activity has already started to boom. It should continue to move forward at a brisk pace."

THE KICKOFF – Two projects were kicked off at year's end to provide a massive injection for the construction boom. Bids were opened on terminal buiidings for Honolulu's jet age airport. Robert E. McKee, General Contractor, Inc., and Nordic Construction, Ltd., a joint venture, turned in the apparent low lump sum bid of $6,372,200. The contract will be the largest ever granted by the State Department of Public Works. The buildings will be in a crescent dominated by an 11-story structure topped by a control cab. The second project is construction of a 690-ft. drawbridge over Honolulu harbor's second entrance. Hawaiian Dredging & Construction Co. and J. H. Pomeroy Construction Co.'s $1,269,000 bid won the U. S. Engineers contract. The concrete and steel bridge will be the first of its kind here—a double leaf bascule. Pacific Concrete & Rock Co. recently completed a 2,500-cu. ft. pour of concrete for the first underwater foundation of the bridge. It was the largest underwater concrete pouring here since World War II. General contractor for the substructure is Alton J. Phillips Co. of Seattle.

NEW ROADS—The State has announced that it hopes to make the paving of approach roads for Honolulu's Wilson Tunnel through the Koolau Mountains its first highway project of 1960. As 1959 ended, the State Highway Department had highway construction costing $11,621,539 under way. The approach road contracts will be for 2.4 mi.

MORE FEDERAL FUNDS?—U. S. Sen. Oren E. Long has said he feels Hawaii has a chance of getting up to $47,000,000 in back Federal defense highway act payments. He feels sure the State will get at least part of the aid it missed as a territory. Precedent for the retroactive payments was set in 1932 when Hawaii was given back-payments for some of the money it missed when the first Federal highway aid bill was passed by Congress in 1916, Long said.

STRIKE SETTLED – Maui's 4½-month construction strike ended when contractors and the AFL-CIO Building and Construction Trades Council signed an agreement. The strike involved about 160 skilled workers at its start, but many of them moved to other islands during its duration. The end of the strike came when the union filed a letter with the Honolulu office of the National Labor Relations Board disclaiming interest in present Maui construction workers, the NLRB allowed the union to withdraw unfair labor practices charges against contractors, and the contractors withdrew their petition for an NLRB election involving 21 workers hired after the start of the strike.

MISSILE CONTRACT – The Navy has announced the award of a $393,670 contract to Hawaiian Dredging-Contractors Corp. for construction work on a missile impact area facility at Midway Island. It will construct "buildings with interior and exterior work."

IMPRESSIVE FIGURES – Meanwhile, the construction boom continues. Construction in November here was worth $18,500,000, compared to $7,500,000 in November, 1958. The big leap was in private construction contract awards, at $9,600,000 compared to $1,300,000 for the same month a year before. The Bank of Hawaii, in its year-

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Take the controls of a new Oliver Trans-O-Matic OC-96 Loader —and "let the tractor do the talking!"

Power shifting plus power steering (with three types of turns) makes the startling difference! The OC-96 is *so easy* to operate, it simply cannot be compared with older designs on this count—*or any other!*

You sit in a spacious, foam-rubber seat (offset for ideal visibility)...have full-freedom leg room in the wide, flush-deck compartment.

As for the controls, they're practically "in your lap." Levers for *power* steering, *power* reverse and *power* shift are placed directly ahead of the seat. Your arms are in "resting" position all the time. To brake or foot-steer, pedals do the job just as effortlessly.

Easy operation, indeed! The *easiest* you ever had—plus.

NEW! 3 types of power turns—The only crawler its size giving you counter-rotation turns for about-faces in the tractor's own length—also spot turns and gradual turns.

NEW! Power shifting—Shift from forward to reverse instantly, on the go. No clutching, no gear-clashing with Oliver's all-hydraulic Trans-O-Matic transmission. Four speeds in high or low range—forward to 6.05 m.p.h., backward to 8.07 m.p.h.

NEW! Torque converter—The OC-96 has heaviest-duty torque converter (not automotive kind)—delivering full engine power for digging and crowding in fastest non-stalling operation. Advanced 62 gross h.p. diesel.

NEW 1-yd. loader design—See how the OC-96 is an *integral* tractor-loader minus high, hung-on parts and cross members. Loader side pedestals are actually part of the tractor for low profile, high stability, finest visibility and safety. Fast breakout, greatest dumping reach. No other its size has such rapid work cycle—is so rapid-reversing.

"Easy operation? Man, this OC-96 is the easiest I've ever seen!" "There has never been a crawler-loader like it for speedy, easy handling," says Lee Bruce of L. H. Bruce and Son, Middleton, Wisconsin.

On this big grading and loading assignment for a University of Wisconsin 2½-million-dollar student housing project, the OC-96 hustled the entire job. Six-yard trucks were put on a 2½-minute loading cycle. Counter-rotation turns cut time and working distance, permitted trucks to be spotted closer.

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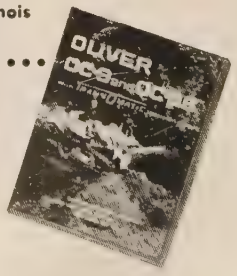

NEW CATALOG—"must" reading for cost- and comfort-conscious tractor users.

end review of the State's economy, says construction and tourism were "areas of exceptional growth" that led Hawaii to its greatest advance in the history of the islands. An all-time high in new apartment house and shopping center building was among outstanding features during the year, the bank said. It foresees a gradual tapering off in luxury housing construction with continued development of medium and low-cost housing. Commercial and industrial construction, estimated a $31,600,000 in 1959, has the highest growth rate of any section of the construction industry, the bank says. It notes that a mass movement to suburbs coupled with rapid population growth here has stimulated construction of new schools and highways. It expects public buildings to add substantially to the volume of construction.

NAVY AWARDS—The Navy has announced the award of three contracts to Honolulu firms. Capitol Builders received a $28,850 contract for repairs to the Kaneohe Marine Air Station brig, J. W. Podmore & Sons received a $10,851 contract for a radar test facility, and Pacific Drilling Co., Ltd., received a $6,400 contract to seal and repair artesian wells at a number of Oahu locations.

LOW BIDDERS—Following are some low bids announced here recently. Wahiawa Machine Shop, $458,841, construction of Iroquois Point Elementary School at Pearl Harbor . . . J. M. Tanaka and Construction Equipment Co. jointly, $49,018, construction of Palolo Stream wall at St. Louis High School . . . Hawaiian Bitumuls & Paving Co., $77,208, and Nanakuli Paving and Rock Co., $38,369, low bidders on two Honolulu street reconditioning jobs . . . Abe Contracting Co., $15,038 on conversion of cafeteria into classrooms at Waialua Elementary School, and $28,500, alterations to cottages at Wahiawa Intermediate School . . . M. Kaneko Contracting Co., $18,830, construction of covered walks at Pearl City Intermediate School.

NEIGHBOR ISLAND RESORTS—Plans also have been announced for resorts on the Islands of Hawaii and Molokai. The Watumull Investment Co., a local firm, has disclosed the purchase of 2,100 acres on Hawaii for a resort hotel and residential development that will include a 100-room hotel and an 18-hole golf course.

HANDLE THE TOUGHEST PUMPING JOBS WITH EASE!

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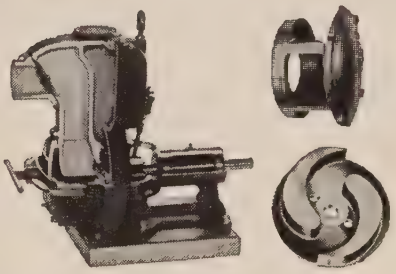
EXTRA HEAVY DUTY
Pumps for Contractors

Completion dates . . . equipment failure . . . bad weather . . . water problems . . . headaches that harass as you push to get the job done. You just can't afford to have trouble.

Dependability takes on its full meaning when these rugged Gorman-Rupp Pumps are on the job. Simple design, rugged construction—and the performance, even under brutal treatment, is completely reliable. You know you can keep the toughest jobs going with these extra heavy duty units.

See these pumps at your Gorman-Rupp Distributor. They're built to serve you for years.



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160 GPM MODEL 12B2	350 GPM MODEL 13A2	600 GPM MODEL 14A2	1400 GPM MODEL 16A2
			

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ALASKA Newsletter

By CLIFFORD S. CERNICK, Fairbanks

SHOW'S ON ROAD – The 1960 construction show is on the road. Though there's not too much evidence of it if you were to walk—in 30 below zero weather—down the main street of Fairbanks, the machinery is definitely in motion; though they're not visible to the naked eye, the cogs are turning. Contractors are all set to bid on a jumbo-size aggregation of projects. Architects in Alaska have never been busier—and a number of them are burning a great deal of midnight oil to keep up with the pace. Municipalities and both state and federal agencies have expanded programs which will soon get under way. In local union halls, you could swing a cat in every direction and not run the risk of hitting anyone—but union officials are getting set for the rush which isn't far off. After a two-week holiday, about 50 employes of the Baker & Ford Co., one of the prime contractors at Clear, have returned to the job. As soon as it's warm enough to pour concrete—a matter of only a few weeks now, hiring will begin in earnest at Clear. So, though things are quiet on the surface, one has only to dig a little deeper to prove that the '60 construction show is moving forward—fast!

IT'S A ROAD SHOW – I'm convinced that one of the firm anchors insuring the stability of the 1960 construction season is the mammoth—by Alaskan standards—road construction program being scheduled for this year. A man who knows virtually every inch of roads in the 49th State – and one who has a key position in Alaska's road-planning hierarchy – had some interesting comments about one segment of the 1960 program. That man, Woodrow Johansen, division engineer for the Bureau of Public Roads, gave a "shotgun estimate" of the work to be done around Fairbanks. This, he says, will run to around $13,000,000 for Interior Alaska, which is about one-third the total sum projected for spending throughout Alaska—$40 to $42 million. A breakdown moneywise of the various projects will not be available until all plans and designs are completed, Johansen said. Many of the northern contracts will not be let until late summer. By that time, incidentally, the state will have jurisdiction over the work. One of the major projects scheduled is the Nenana to Clear road – a distance of 17 miles. A road already extends from Fairbanks to the mining community of Nenana. The planners are all set to launch an Alaskan road program the like of which the people of Alaska have never seen . . . and it's mighty good news for the construction industry.

PERSONNEL SQUEEZE – The Alaska Department of Public Works' division of highways faces a tough personnel situation when it takes over control of Alaska's highway work from the federal Bureau of Public Roads on July 1, 1960. The latter agency has been responsible for the bulk of the highway work in Alaska and over the years has built up an efficient organization. The state must start virtually from scratch. The Division of Highways now assumes the Bureau of Public Roads' tasks (for the most part) without having access to its personnel, many of whom will not wish to make the switch to state operation. After the changeover, the Bureau's main responsibilities will lie in approving surveys and designs and providing general supervision on all Alaska Division of Highways activity where federal aid to highway funds are concerned. The Bureau also will retain the responsibility for planning and construction of Forest Highway and National Park Roads. Recently, the Division of Highways publicized job opportunities existing within the expanded organization and appealed to Bureau of Public Roads personnel to transfer to the state agency and remain in Alaska. Four of the more important jobs which are vacant are engineer of construction, engineer of maintenance, bridge design engineer and road design engineer.

FEES FOR JOBS – A number of Alaska contractors and unions alike are becoming increasingly concerned over reports that New York employment agencies are charging exhorbitant fees to secure construction jobs in Alaska. In most cases, such jobs when available, can be obtained without the payment of any fee whatsoever. Bob Dixon, business agent for the Teamsters Local in Fairbanks, said it was his understanding that a number of men hired for Alaska jobs had paid from $700 to $900 to get this work. Dixon—and others who are critical of the job fee procedure—said he had no quarrel with the practice of hiring workers from the outside when they are unavailable here, but feels there is no justification for the high fees they are required to pay.

TRIP TO CITY HALL—In Alaska's cities and towns, the men at city hall are the kingpins so far as major urban construction projects are concerned. I talked to the Fairbanks city manager, Clifford Nordby, concerning the city's plans for this coming season. He tells me that the big item on the Fairbanks schedule this year is a $1,200,000 sewage treatment plant. The Federal Department of Health, Education and Welfare has allocated $250,000 to the city for the project. An additional $950,000 will come from municipal bonds authorized early last year.. Meanwhile, plans are going ahead for an extension to the city's water system in the area on the south border of Fairbanks. The cost of this will be about $656,000. A total of about $1 million will be spent on a storm sewer system. This sizable program for Fairbanks represents only a fraction of the large amount of work slated by the City of Anchorage. When the municipal programs for all of Alaska's cities for 1960 are totalled, the size of Alaska's municipal construction endeavor is impressive.

NEW CONTRACT REGULATIONS – Commissioner Richard A. Downing of the Department of Public Works has issued a notice to contractors and others desiring to bid on and perform work on public projects contracted for the State of Alaska. The new regulations include a requirement for furnishing a financial and experience statement "to help protect the state against irresponsible bidders and those who might inadvertently over-extend themselves financially." Those interested in obtaining the forms should write to Downing at Juneau.

SPECIAL REPORT TO CATERPILLAR OWNERS:

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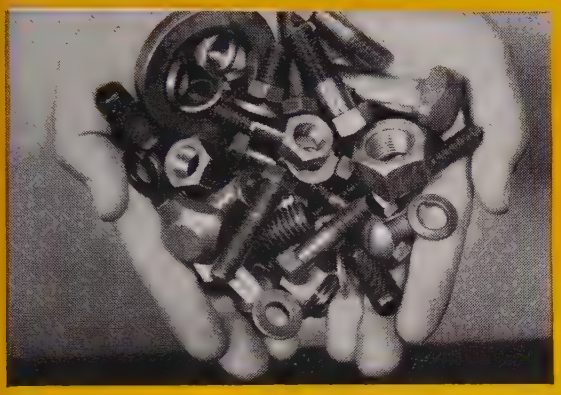
CAT ALL-PURPOSE BOLTS AND NUTS ARE STRONGER... HOLD LONGER...GRIP BETTER

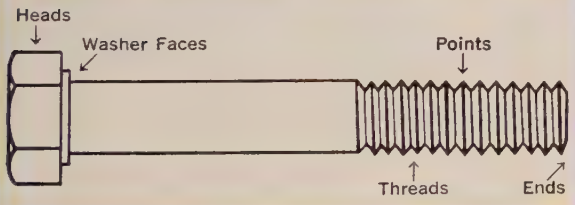


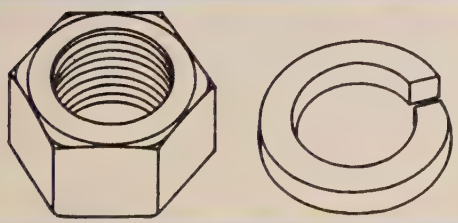
Ever twist a head off a bolt because it wasn't *strong* enough . . . or scrape your knuckle when your wrench "rounded off" the head because it wasn't *hard* enough? It's not likely to happen if you use Cat all-purpose bolts and nuts. They're highest quality in every way. For example, Cat bolts exceed Grade 6 in all requirements as rated by the Society of Automotive Engineers. Grade 5 is the average rating of bolts used in other earthmoving equipment.

WHAT GRADE OF BOLTS DO YOU USE?

Here's what's normally stocked at . . .	Hardware Stores, Automotive Outlets	Industrial Supply Houses, Other Mfr. Outlets	Special Order Only	Caterpillar Dealers
SAE	Grade 0-3	Grade 5	Grade 6	Exceeds Grade 6
Minimum Tensile Strength (Breaking point)	55,000-110,000 PSI	105,000-120,000 PSI	133,000-140,000 PSI	142,000 PSI
Hardness Rockwell Rating	RC 0-28	RC 19-32	RC 28-36	RC 30-38

If you need tougher, stronger hardware—get Cat all-purpose bolts and nuts. You can count on them to do a better job longer because they're stronger and harder than others.





HERE ARE OTHER CAT BOLT BONUSES YOU GET. *Heads* are higher and full size—easy to get wrenches on. *Flats* are hard and parallel—corners don't round off, are easy to grip. *Threads* are rounded at the roots and free from laps and burrs. *Points* are smooth and uniform. *Ends* are precisely rounded or chamfered—cross-threading doesn't occur. *Washer faces* are flat and have uniform thicknesses. *Heads and threads* are concentric to shaft—heads and nuts fit flush.

NUTS AND LOCK WASHERS are matched to every size bolt to give complete top-quality fasteners, too. Nut threads resist stripping. Corners do not round. Clean, smooth-fitting threads make installation fast and easy. Lock washers have smooth surfaces for maximum wear and strength.

When you need the best bolts and nuts to keep your machinery and other equipment together, see your Caterpillar Dealer. He has a large selection.

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Low bids and contract awards

ALASKA

Morrison-Knudsen Co., Inc. of Seattle, Wash. received a $968,000 contract for construction of facilities for the U.S. Air Force Base at Northeast Cape. Work will consist of recreation building, an operations building, covered walkway; inside utilities, a gravel surface road and grading work. **Ghemm Co., Inc.** of Fairbanks received a $141,601 contract for construction of a radar tower for the U.S. Air Force Station at Murphy Dome. Work consists of erecting tower, installation of outside utilities, excavation, backfill, roadwork and grading. A $150,425 contract was received by **Alcan Pacific Co.** of Anchorage for construction of radar tower, earthwork, power plant work, installation of outside utilities, roadwork and grading, for U.S. Air Force at Bethel. **Fairbanks Builders, Inc.** of Fairbanks submitted a low bid of $146,300 for construction of radar tower and related work at Campion Station for U.S. Air Force. **Lent's, Inc.** of Anchorage submitted a low bid of $165,600 for modification work at U.S. Army Nike sites in the Anchorage and Fairbanks areas. **Green Construction Co.,** Seattle, Wash., submitted a low bid of $489,328 for grading and paving 1.8 mi. in Sitka.

ARIZONA

Peter Kiewit Sons' Co., Arcadia, Calif. submitted a low bid of $2,183,553 for earthwork, concrete lining and structures, Wellton-Mohawk main conveyance channel, Wellton-Mohawk Division of the Gila Project. A low bid of $287,636 was submitted by **W. J. Henson, Contractor** of Prescott for 1 mi. of grading, surfacing and sealcoating on the Globe-Show Low highway in Gila County. **Western Constructors, Inc.** of Phoenix submitted 2 low bids for roadwork in Cochise and Maricopa counties: a low bid of $253,087 for construction of one bridge, grading and surfacing approaches on the Benson-Douglas highway in Cochise County, and $192,154 for construction of one underpass structure in city of Phoenix, Maricopa County. **Mohamed Earthmoving Contractors** of Phoenix submitted a low bid of $119.725 for grading, surfacing and related work near Tempe in Maricopa County.

CALIFORNIA

Fredericksen & Kasler of Sacramento received a $5,755,891 contract for 7.7 mi. of 4-lane freeway and construction of 12 structures west of Corona in Riverside County. **Williams & Burrows Contractors, Inc.** of Belmont submitted a low bid of $2,278,882 for the modernization of Central Reservoir at MacArthur Blvd. in Oakland. A $1,795,176 contract was received by **Gordon H. Ball and Gordon H. Ball, Inc.** of Danville, to convert 6.4 mi. of U.S. Highway 99 from expressway to full freeway, north of Tulare to the Visalia Airport Interchange, Tulare County. **Fredrickson & Watson Construction Co.**, Oakland, received 2 contracts for roadwork in Solano and Marin counties: $1,697,777 for grading and surfacing to construct 2.9 mi of 4-lane freeway near Vallejo, on the Vallejo-Benicia highway in Solano County, and $1,024,444 for construction of interchange, frontage roads and connections on U.S. 101 in and near San Rafael in Marin County. **Morrison-Knudsen Corp. Inc.,** San Francisco, submitted a low bid of $1,148,000 for construction of a library building addition at San Jose State College, Santa Clara County. **Madonna Construction Co.** of San Luis Obispo received a $1,481,509 contract for construction of 2.3 mi. of 4-lane freeway on U.S. Highway 101 through Pismo Beach in San Luis Obispo County. The contract includes traffic separation bridges and interchange facilities. **Cen-Vi-Ro Pipe Corp.** of Shafter received a $1,208,662 contract for the construction of major features of an irrigation distribution system for the Tea Pot Dome Water District of the Central Valley Project. **Leo F. Piazza Paving Co.,** San Jose, received a $369,573 contract for construction of one bridge, grading and surfacing approaches near the south city limit of San Jose in Santa Clara County. A $180,636 contract was received by **Thomas Construction Co.** of Fresno for widening, grading and paving on 1.2 mi. in city and county of Fresno. **L. B. Wells Construction Co.,** Visalia, received a $150,248 contract to reconstruct and widen 2.9 mi. south of Visalia in Tulare County.

COLORADO

A. S. Horner Construction Co., Inc., Denver, submitted a low bid of $585,594 for construction of the final portion of the Southside Canal of the Collbran Project in west-central Colo. A low bid of $411,711 was submitted by **Northwestern Engineering Co.,** Denver, for structures, grading and surfacing on 4.2 mi. beginning at Dolores-Montezuma County line extending northwest to State Highway 10, Dolores County. A low bid of $344,445 was submitted by **James B. Kenney, Inc.** of Denver for bridge widening and viaduct construction in city of Colorado Springs, El Paso County. **Peter Kiewit Sons' Co.,** Denver, submitted a low bid of $268,843 for grading, structures and asphalt surfacing on 1.5 mi. on the Hampden Franklin highway in Arapahoe and Denver counties. **Pioneer Construction Co.,** Pueblo, submitted a low bid of $175,851 for grading, stabilizing, structures and surfacing on 2.3 mi. in and near Rocky Ford, Otero County.

IDAHO

Robert V. Burggraf Co., Idaho Falls, received a $80,812 contract for Site B, access roads for Titan missile bases near Mountain Home Air Force Base. **Jensen-Rasmussen & Co.,** Sunnyside, and **B-E-C-K Constructors** of Seattle, Wash. in a joint contract received a $787,163 contract for construction of pump house for Nuclear Processing Reactor Project at Hanford Works Kaiser Engineers, prime contractor.

MONTANA

Hosier Engineering Co., Columbus, Ohio, submitted a low bid of $3,080,053 to the U.S. Bureau of Reclamation for stringing conductors and overhead ground wires on the Fort Peck-Bismarck 230-kv. power line project in Montana and North Dakota.

NEVADA

Wells Cargo, Inc. of Las Vegas received a $286,730 contract for construction of a portion of the state highway system near the Oregon-Nevada state line in Humboldt County. A $139,067 contract was received by **Nacon Company, Inc.** of Las Vegas for construction of a por-

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Take it from owners who know what the Massey-Ferguson 204 Industrial Tractor CAN DO!

This amazing 40-h. p. unit has Instant Reverse and torque converter. It lets you change direction of travel instantly and smoothly with a touch of your toe... and without shifting gears or clutching. It has one pedal for forward... another for reverse with acceleration built in each pedal. Provides four speeds — equal in each direction — so you never have to slow down when backing out of congested areas. It also shortens cycle time between load and dump. A third pedal lets you increase rpm when not in motion to speed up loading.

There is no question that this is the greatest time-saving, fuel-economizing, and most maneuverable tractor in its class. It's ideal for land development, landscaping, backfilling, loading, or any one of a hundred different lifting and maintenance jobs a contractor has.

A full range of attachments is available for the Massey-Ferguson 204 including the famous Massey-Ferguson Loader and Backhoe combination which is power-matched to the tractor. The loader has numerous attachments — such as dozer blades, crane, lift forks, and a variety of buckets to provide low-cost, on-the-job-versatility.

The popular Massey-Ferguson 220 Backhoe is the ultimate in its field. It is equipped with the rotary boom swing cylinder pioneered by Massey-Ferguson that provides 200 degrees continuous operating arc. Hydra-slide positioning lets you shift the entire digging assembly, mast, seat, and controls left or right to dig flush alongside buildings, fences, or walls. In any digging or dumping position, the operator stays directly in line with the bucket for unequalled visibility.

Other attachments for the 204 include the M-F Scarifier-Scraper — four tools in one, and the Multi-purpose Blade. Massey-Ferguson can equip you to do a better job with more profit!

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San Diego
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Santa Rosa
Guanella Tractor Company

Visalia
Mid-Valley Equipment

IN NEVADA

Smith
Wines Brothers Equipment Company, Inc.

IN TEXAS

El Paso
The Myers Company

tion of state highway, east of Lida in Esmeralda County.

NEW MEXICO

C. R. Davis Contracting Co. of Albuquerque submitted a low bid of $866,855 for grading, surfacing and structures on 1.3 mi. in Bernalillo County. A low bid of $790,052 was submitted by **J. W. Jones Construction Co.,** Albuquerque, for grading, surfacing, and related work in Bernalillo County. **Jack Adams Construction Co.,** Santa Fe, submitted two low bids for roadwork in Rio Arriba and Curry counties: $498,345 for 10.9 mi. of grading, surfacing, structures, and related work in Rio Arriba County, and $98,370 for 8 mi. of grading and surfacing on 108 Texico-north in Curry County. **Floyd Haake** of Santa Fe submitted two low bids for roadwork in San Miguel and Guadalupe counties: $240,570 for 5.4 mi. of grading and surfacing in San Miguel County, and $97,853 for 2.8 mi. of grading, surfacing and structure on Anton Chico-Pecos River section in Guadalupe County.

OREGON

Roy L. Houck Sons' Corp., Salem, submitted a low bid of $1,083,148 for grading, paving, and signing on the Linn County line-McKenzie River section on Pacific Highway in Lane County. A low bid of $623,333 was submitted by **Pacific Concrete Co.** and **Otis P. Jordan, Jr.,** Portland, for construction of Rogue River bridge on Pacific Highway in Jackson County. **Dorman Construction Co.,** Vancouver, Wash., submitted a low bid of $480,154 for grading, surfacing, and signing on the Multnomah Falls-Dodson section of the Columbia River highway in Multnomah County. **C. R. O'Neil** of Creswell submitted a low bid of $478,031 for grading and paving on the South Unit, Grass Valley-Kent section on the Sherman highway in Sherman County. **Warren Northwest, Inc.** of Portland submitted a low bid of $345,305 for grading and paving on the Camp Adair-Lewisburg section of the Pacific Highway-west in Benton County. **A. R. Sime & Glen A. Pegram** of Kennewick, Wash., submitted a low bid of $210,929 for earthwork and structures, Talent Division, Oregon Rogue River Basin Project. **Sig Andersson** of Coos Bay submitted a low bid of $165,070 for construction of one bridge on the S.P.R.R., New Pacific Highway in Lane County. A low bid of $101,851 was submitted by **Calkins Crushing Co.,** Oceanlake, for grading and oiling on the Cedar Creek-Chitwood Creek section of the Siletz highway in Lincoln County. **Ausland Construction Co.,** Grants Pass, submitted a low bid of $95,585 for bridge construction, Beacon Drive overcrossing, Pacific Highway in Josephine County.

UTAH

Saunders Construction Co., Ogden, received a $1,745,988 contract for construction of Highland Junior High School in city of Ogden. **Weyher Construction Co.** of Salt Lake City received a $158,843 contract for concrete and steel structure in Davis County.

WASHINGTON

MacRae Bros. Construction Co., Seattle, received a $2,330,334 contract for construction of three bridges on the Seattle Freeway, State Highway 1 in King County. **Lewis Hopkins Co.** of Pasco submitted a low bid of $667,358 for earthwork, concrete lining and structures, Block 88, West Canal Laterals, Columbia Basin Project. **Max J. Kuney Co.** of Spokane received a $294,004 contract for grading, surfacing and related work, Rocky Reach to Orondo in Douglas County. **Northwest Construction, Inc.,** Seattle, received a $248,377 contract for grading, draining, surfacing and signing on State Highway 1 in King County. **C. E. O'Neil Inc.** of Ellensburg received a $287,484 contract for 2.1 mi. of grading and surfacing, Twin W. Orchard to McLean Orchard in Douglas County. **Henry Hagman** of Spokane received a $278,652 contract for 1.1 mi. of grading, surfacing, and construction of Kettle River bridge in Ferry County. **L. W. Vail Co., Inc.,** Pasco, received a $218,990 contract for 2.3 mi. of grading, surfacing and draining, Gibbon to Kiona, Benton County. A $210,545 contract was received by **De Atley Paving & Crushing, Inc.** of Yakima for grading, surfacing and structures in Yakima County. **Materne Bros. Co.** of Spokane received a $138,444 contract for 13 mi. of grading and surfacing defense access roads, Fairchild Air Force Base, Spokane County. A $107,561 contract was received by **Calabrese & Sons** of Mercer Island for 1.8 mi. of grading and surfacing in Benton County. **Swanson & Youngdale Construction Co.** of Minneapolis, Minn. submitted a low bid of $1,148,263 for constructing a missile-assemble building addition at Fairchild Air Force Base near Spokane. **Frank Coluccio Construction Co., Inc.** Seattle, received a $1,326,680 contract for construction of the 36- and 42-in. water supply main on the east side of Lake Washington to provide water to the city of Kirkland. **H. Halvorson, Inc.** of Yardley submitted a low bid of $837,980 for microwave facilities in connection with the Atlas intercontinental-ballistic-missile installations in the Fairchild Air Force Base area.

WYOMING

Martin K. Eby Construction Co., Inc. of Wichita, Kan., submitted a low bid of $22,143,981 for construction of an Atlas missile launching facility near Warren Air Force Base, Cheyenne.

Test holes drilled for Bay tunnel

PRELIMINARY work on the world's longest underwater transit tube has begun in San Francisco Bay.

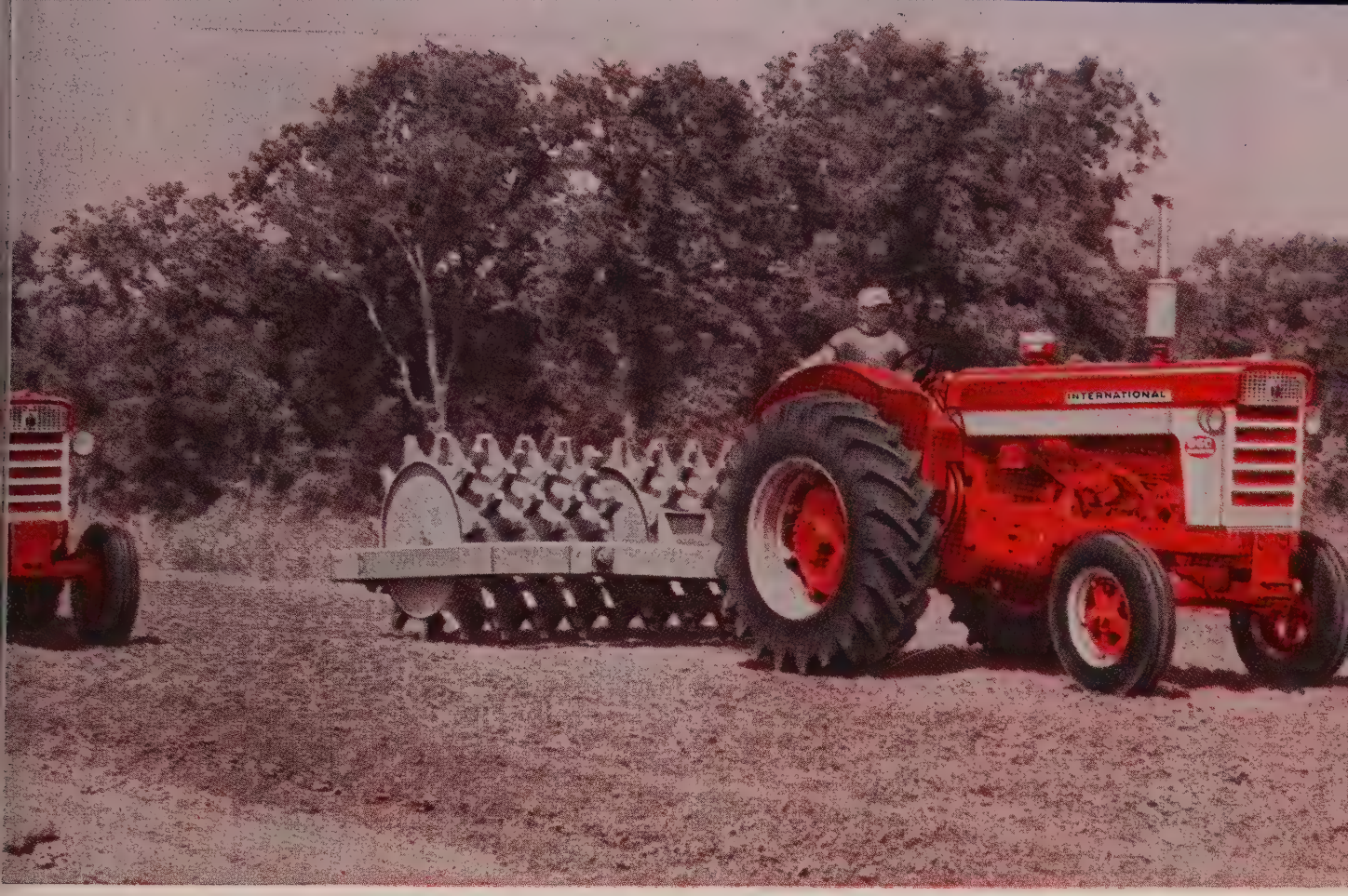
Using a floating barge, test holes are being drilled to obtain soil samples and other information from the bottom of the bay along the tube alignment.

The information is needed to design the $84,000,000 underwater structure, a 4-mi. link in the new rail rapid transit system now being engineered for the Bay Area. The tube, when constructed, will carry commuters across the bay between San Francisco and Oakland in 11½ min. in electric-powered trains. Previous engineering studies have shown that construction of the tube is feasible.

The initial drilling project, costing some $125,000, also includes the installation of special "seismic geophones" at various locations along the tube alignment. They will pick up and transmit earthquake vibrations from the submerged mud and rock to recorders in San Francisco.

The seismic information will be monitored over a period of two years, or until after actual construction of the tube is begun.

The consulting engineers for the five-county Bay Area Rapid Transit District retained Ben C. Gerwick Inc. of San Francisco to carry out the drilling project. A total of ten holes are being drilled on

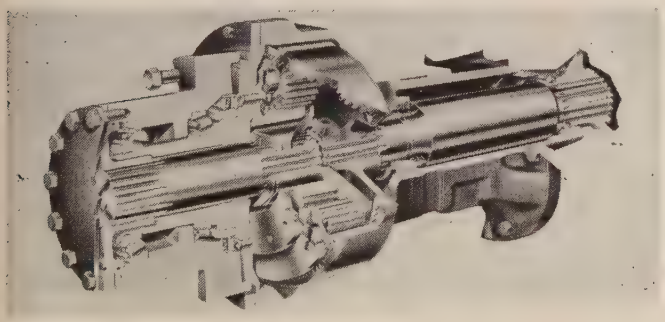


It's a real lugger!

...new International® 660 Diesel

Put the 660's 74 drawbar hp* to work and free your big earthmoving tractors for larger, more profitable assignments! The new, direct-start, smooth-running six-cylinder Diesel delivers *more than 11,000 pounds of pull*, with adequate weight for traction.

Over 4½ tons of built-in brawn give the 660 the stamina for continuous heavy-duty operation. Yet, with power steering, operators handle this giant tractor with single-handed ease. Equipped with optional Torque Amplifier drive, the powerful 660 provides 10 speeds forward, 1.5 to 16.5 mph. In any gear, a touch on the TA foot control lets the operator boost pull-power up to 45%, *on-the-go*, without shifting...Also available with Multi-Range, 6-cylinder gasoline or LPG engine.



First new big tractor drive in 10 years!

A new and exclusive planetary gear system makes the final speed reduction at the wheel hub . . . axles are completely free-floating. Thus, tractor weight, shock loads from uneven terrain, and heavy drawbar pulls are carried by the hefty final drive housings, *not on the axles.*

Take a good look at your equipment fleet and add up the number of jobs you could handle more economically with the International 660's rubber-tired speed and lower operating costs. Then, visit your International Harvester dealer, headquarters for the construction industry's most complete line of tractors . . . six power sizes on wheels, 13.4 to 95 maximum flywheel hp*. Ask for a demonstration of the tractor to match your needs.

**Corrected to standard sea level conditions.*

See your INTERNATIONAL HARVESTER dealer

International Harvester Products *pay for themselves in use*—Farm Tractors and Equipment . . . Twine . . . Industrial Tractors . . . Motor Trucks . . . Construction Equipment—General Office, Chicago 1, Illinois.

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the proposed tube alignment from the Oakland Mole to the vicinity of the San Francisco Ferry Building.

Six of the holes will be utilized for soil analysis and four will be used in the seismic tests. The underwater geophones will be installed at three levels in the submerged mud and rock — some as low as 250 ft. below the surface of the Bay.

First underground missile base

CONSTRUCTION of this country's first underground missile launching base will require some 66,000 tons of steel products, according to the American Iron and Steel Institute. Lowery Air Force Base will consist of six subterranean complexes or sites strategically scattered on about 875 ac. of open land near Denver. Key to each complex will be three steel and concrete silos, 40 ft. in diameter and more than 150 ft. deep, each of which will house a ready-to-fire Titan ICBM. The silos will be sealed over with heavy steel doors which will keep the complex "presumably" safe from everything but a direct atomic hit.

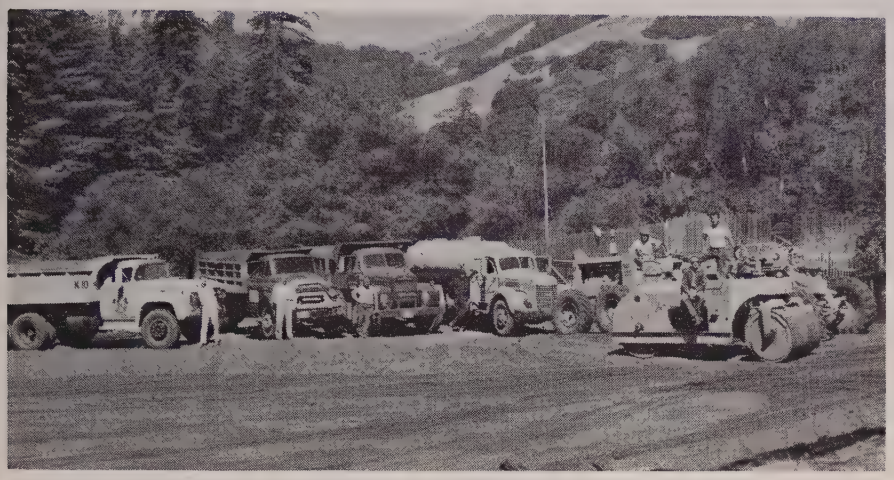
According to the base's primary contractor, the 66,000 tons of steel products to be used in the construction of the six complexes will include 28,000 tons of reinforcing steel, 12,000 tons of structural shapes and plates, 10,000 tons of corrugated steel tunnel liner, 10,000 tons of steel pipe, and 6,000 tons of other steel products.

Contract awarded on flip of coin

IT required a coin toss to determine the low bidder on a project for 1.3 mi. of chain link fencing on a state highway in San Luis Obispo County. When all nine bids submitted for the job had been opened and double checked, California Division of Highways engineers reported that Anchor Post Products, Inc., and the San Jose Steel Co., Inc., had submitted identical low bids of $18,237.40. The remaining seven bids ranged from $18,917.90 to $22,184.30.

With Office Engineer H. C. McCarty supervising, the two firms broke the tie in the time-honored manner. Anchor Fence Post of Sacramento won the toss. The project provides for fencing on U. S. Highway 101.

ENGINEERS and CONTRACTORS



CONTRACTORS BUILD GIRL SCOUT CAMP ROAD

Member firms of Engineering & Grading Contractors Assn. in the San Mateo, Calif., area donated materials, equipment and labor to grade and pave a half-mile road connecting the Woodhaven Girl Scout Camp with a nearby highway. Working on weekends during the past summer, contractors completed the project in about six weeks. Shown above is a typical Saturday morning spread. From left, 10-wheeler supplied by Kuna Paving Co., San Mateo, *Dave McIntosh,* driver; 10-wheeler by L. C. Smith, San Mateo; 10-wheeler by C. J. Wood, Redwood City, *Manuel L. Puerta,* driver; water wagon by Piombo Construction Co., San Carlos, *L. A. Pruett,* driver; blade by J. O. Archibald, Redwood City, *Keith Hamilton, operator;* roller by C. J. Wood, *Ray Hernandez,* operator (standing). *Ken McMillan,* EGCA secretary, is seated on roller. Other contributing firms not shown include Bragato Paving Co., Arthur "Buzz" Haskins, Fisk, Firenze & McLean, B. Fontana, Bahr & Ledoyan, Freeman Paving Co., Blomquist Oil Co., and Skyline Materials Co.

The Woodhaven road is one of a series of civic projects undertaken by the contractors organization in a continuing community service program.

Raymond C. Kelly has been appointed executive secretary of the Consulting Engineers Association of California, President **John A. Blume** announces from the association's headquarters at 9 First St., San Francisco. Kelly has many years of nationwide experience in engineering construction and in association management.

* * *

Edward W. Blackmer, engineer with the California Division of Highways at Sacramento, has been appointed to the American Bitumuls and Asphalt Company Fellowship in Transportation Engineering at the University of California. He will undertake research in the field of bituminous materials under direction of **Prof. Carl Monismith** of the Department of Civil Engineering.

* * *

Joseph A. Love, who is retiring from Pacific Gas and Electric Co. the end of the year, will be succeeded as manager of the Gas Construction Department by **M. H. "Hap" Chandler.** Chandler started with PG&E in 1940 and has held various engineering assignments with the utility company in San Francisco.

* * *

B. J. Greulich, structural engineer, has become a partner in the firm of Hugh B. Brewster, Structural Engineer, with offices in Fresno, Calif. For the past twenty years Greulich has been employed by Midstate Construction Co. as an engineer and construction estimator for all types of construction.

* * *

Some major changes in its staff and district engineer personnel were recently announced by the State Road Commission of Utah. **Erin H. Leonard,** district engineer at American Fork, has been named assistant state maintenance engineer with headquarters at Salt Lake City. He replaces **M. R. Fenn** who has been made assistant construction engineer. The new district engineer for District 6 at American Fork is **Jim West,** who has been District Engineer of No. 4. **Joseph Q. Adair** from the Construction Department replaces West.

* * *

Several reassignments of resident engineers for the Utah State Road Commission are reported. **J. Rex Sutherland** has charge of 1.5 mi. of surfacing near Holladay. W. W. & W. B. Gardner is doing the work. **Robert Wheadon** is resident on highway construction near Kanab where Whiting & Haymond has a 175-day contract for surfacing and construction of a 158-ft. long concrete and steel bridge. **William J. Pratt** is in charge of a 3.7-mi. surfacing project near Payson. Contractor here is W. W. Clyde & Co. **Ben Lee** is resident for project on State Road 64 near St. George

CALENDAR

Feb. 4-6—Engineering and Grading Contractors Association, annual convention, Sheraton-Palace Hotel, San Francisco, Calif.

Feb. 15-19—National Sand & Gravel Association, convention and equipment exposition, Conrad Hilton Hotel, Chicago, Ill.

Mar. 1-3—School of Engineering of College of the Pacific, annual highway conference, Stockton, Calif.

Mar. 3-4 — University of Colorado, annual highway engineering conference, Boulder, Colo.

Mar. 7-11 — American Society of Civil Engineers, national convention, Jung Hotel, New Orleans, La.

Mar. 21-24 — The Associated General Contractors of America, annual convention, San Francisco, Calif.

Mar. 23-25 — Northwest Highway Engineering Conference, (Northwest Conference on Road Building and the Northwest Traffic Engineering Conference) Oregon State College, Corvallis, Ore.

June 19-24—Western Association of State Highway Officials, annual conference, Multnomah Hotel, Portland, Ore.

where a concrete and steel structure is being constructed and a road-mix bituminous surfacing laid by Wheelwright Construction Co. **Carl M. Fonnesbeck** has been assigned to a 7.5-mi. roadway to be graded and drained between Brigham City and Honeyville. Fife Construction Co. is performing the work.

* * *

Robert W. Shaffer, civil and structural engineer associated with major public works projects throughout the West for 16 years, has joined Wilsey and Ham Engineers and Planners in the firm's Los Angeles offices, according to announcement by **Lee E. Ham**, president.

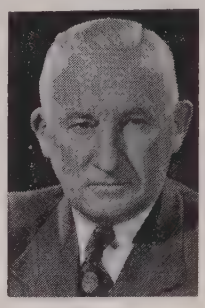
* * *

The Austin Company has appointed **Frank Roodman,** as assistant manager of this engineering and construction firm's 5-state Western district. Announcement comes from **J. H. McVey,** vice president and manager of the company's Western district with headquarters in Los Angeles and a branch office in San Francisco. Roodman, with 23 years' service with Austin, has been engineering co-ordinator for missile projects at the general offices in Cleveland.

* * *

John F. Bonner has been elected vice president of Pacific Gas and Electric Co. in charge of engineering. He succeeds **Walter Dreyer,** who is retiring following a distinguished 43-year career with the company. During his long engineering career Dreyer contributed in large measure to the building of numerous hydroelectric plants located in the Sierra Nevada and to the many large steam-electric plants of the Pacific Coast. He will continue to serve PG&E as a consultant on pending major projects.

Bonner



Dreyer

Bonner, who has been Dreyer's assistant since 1955, is the son of **Frank E. Bonner,** well known consulting engineering specialist on hydroelectric power projects in the West. Like both Dreyer his father, Bonner is a civil engineer. Following receipt of his degree from the University of California in 1937, he joined PG&E as an assistant hydrographer. After five years service in World War II, he returned to PG&E, where he has since been closely concerned with hydroelectric developments on the major watersheds of Northern and Central California.

Also announced is the election of **E. Howard Fisher** as vice president in charge of gas operations. He has been general superintendent of pipeline operations since 1954 and now succeeds the late **Philip E. Beckman** who died last November.

* * *

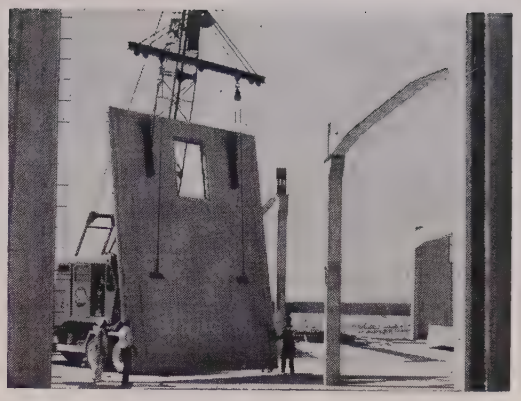
J. C. Womack, who was appointed California state highway engineer following the death in December of **J. W. Vickrey,** makes appointments to some important posts. **J. P. Murphy** has been promoted from assistant state highway engineer—administration to deputy state highway engineer. Filling Murphy's former post as of Feb. 1 is **Lyman R. Gillis** who has been district engineer in charge of planning in District VII, Los Angeles, for the past four years. **George A. Hill** is successor to Gillis in this district. Hill has been chief assistant to the engineer of design at the Sacramento headquarters office.

J. C. Womack

* * *

Announcement is made of the appointment of **Edwin Becker,** recently appointed county engineer for Jefferson County, Wash., to the additional position of city engineer of Port Townsend. He succeeds **Ronald Wilder** in the dual position. Wilder recently resigned to accept an appointment as Thurston County engineer.

WAREHOUSE DANIEL CONSTRUCTION CO. PHOTO



SUPERIOR Stress Equalizers, Pick-Up Inserts, and Lifting Angles were used on this panel.

DANIEL CONSTRUCTION CO. PHOTO

ADJUSTABLE BRACES used for quick and easy alignment of panels

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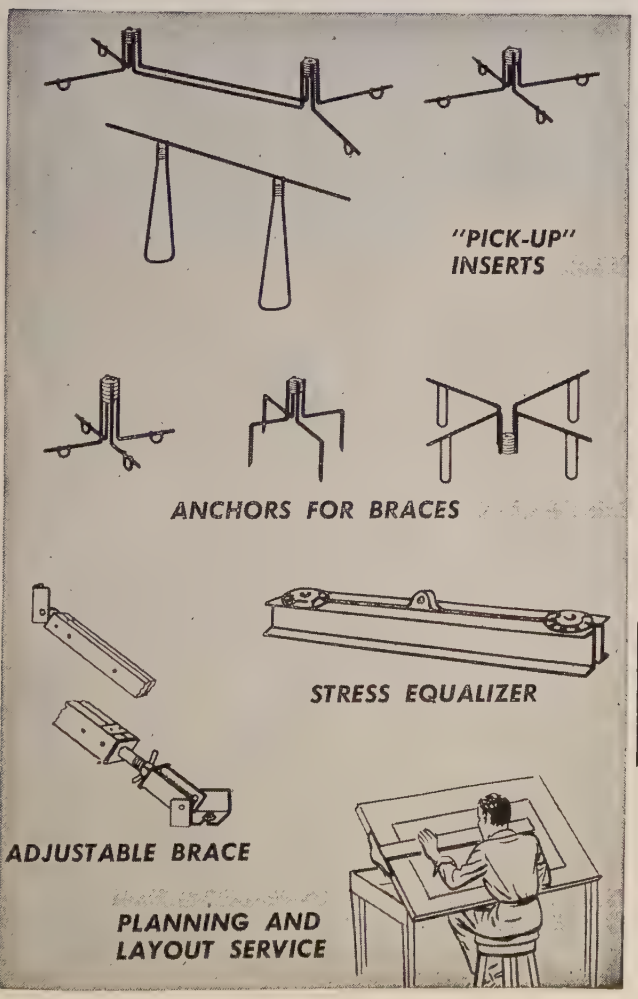
FROM ORIGINAL LAYOUTS TO FINAL POSITIONING



In addition to tilt-up accessories which have been used and proven on thousands of conventional as well as unusual projects in this field, SUPERIOR also provides the *system* for the entire job, from original planning and layouts, to the final positioning of the precast panels.

As the pioneer in this field, SUPERIOR has recently developed a special Stress Equalizer for reducing lifting stress in tilt-up panels of over 20 ft. high. It offers two advantages: (1) Less concrete reinforcing steel is required for stresses which occur at time of lift; (2) Permits use of simplified crane rigging.

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. . . for more details, write No. 43 on Reader Service Postcard

SUPERVISING the jobs

Vern Mulherron, project superintendent for Mardian Construction Co., is in charge of construction on the Coolidge-Mesa highway, Ariz., consisting of grading, surfacing, and 4 pile-bent bridges with concrete decks.

According to **Dan Mardian,** vice president of the contracting company, work started here in mid December, and will probably end in March. Bid was $163,617.

* * *

Walter Gott is superintendent on O. D. Cowart Construction Co.'s recent award at $131,297 for highway construction on State 290 in Sandoval County, N. Mex. Contract covers 2-lane, grade, drain, base course, 1-course surface treatment and miscellaneous work on a 2.4-mi. stretch. **Tex Raley** is the grade foreman; **Fred Roeder,** timekeeper; and **Carl Scott,** mechanic. Under way since the first of December, the job is expected to be finished about April 1.

* * *

C. R. Jurgensen is the superintendent on another highway job which recently went to O. D. Cowart Construction Co., this one on a low bid of $442,451. Here **G. C. "Pete" Muller** is master mechanic, and **William R. Howard,** timekeeper. The job is 4 mi. of 4-lane, grade, drain, base course, concrete curb and gutter plant-mix surface and related work in Lea County, N. Mex. Job will be finished about May 1.

* * *

Lindsey "Tex" Henry, superintendent for C. H. Elle Construction Co., is in charge of a $379,437 project of grading and surfacing on 4.6 mi. of the Elk City highway in Idaho County, Idaho. Started in December, the job will run through June.

* * *

M. E. Schlichter, project superintendent, and **Ward O. Amsbury,** project engineer, are key men on $585,000 contract for schedules 1 and 3, earthwork and structures, southside canal, Collbran Project, which was awarded recently to A. S. Horner Construction Co. **Paul Gosch** is timekeeper. According to Horner, work will start in March, earmarked for conclusion in October.

* * *

Dick Geary, superintendent, **Parker Selby,** job office manager, **Don Pallet,** job engineer, **Bud Real,** substructure superintendent, and **Norm Westling,** superstructure superintendent, are the five top men employed by Peter Kiewit Sons' Co. on 2 structures—Judkins Point overcrossing, and Willamette River bridge, on the Pacific and McKenzie highways in Lane County, Ore. Work on the $2,138,285 project started in December.

* * *

Jack Husman and **Harold Husman** of the contracting firm of Husman Brothers, Inc., are acting as general superintendents, and are being aided by **Hogler Johnson** and **Bill Rathburn,** structures superintendents, and **Bill Mackey,** grading superintendent, on grading and light bridge construction on 3.7 mi. of divided highway, Sheridan-Marginal road in Sheridan County, Wyo. **Don Berg** is contractor's estimator on the $414,226 contract.

Ralph E. Stevens is supervising construction of Sundance TM Site 201, Operation Area, in the city of Sundance, Wyo., a $1,634,762 recent award to Purvis Construction Co. Work started early in October, and according to **James P. Purvis,** contractor, it will be finished in late fall.

LET US HEAR FROM YOU

At regular intervals, readers of WESTERN CONSTRUCTION receive a letter asking them to list their current address and job title on a form and return it to our San Francisco office.

When yours comes, please fill it out and send it back as soon as you can. It doesn't cost a cent—we pay the postage—and nobody will try to sell you anything. In fact, just the reverse.

By returning the form, you will continue to receive WESTERN CONSTRUCTION each month absolutely free, provided you are in the heavy construction industry in the 13 Western states.

Why do we do this? Well, we have more than 18,000 names on our circulation list, and we have to keep this list up to date. Each month, a lot of people change jobs, move, retire or leave the industry. We can't keep up with these changes unless you help us.

Second, we want to make sure we cover the heavy construction industry: engineers, contractors, street and highway department personnel, concrete and aggregate producers, field superintendents, etc.

And finally, we want to make sure you want to get the magazine—that it is useful to you in your business. Therefore, periodically we ask each reader to return the brief form completed as indicated. When the form is not returned we have no choice. We stop sending the magazine.

So when your letter comes, please send back the form and you will continue to receive WESTERN CONSTRUCTION.

Let us hear from you!

Thanks—The Editors

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Batch-Type Asphalt Plants

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(40 to 70 T. P. H.)

Mobile 40
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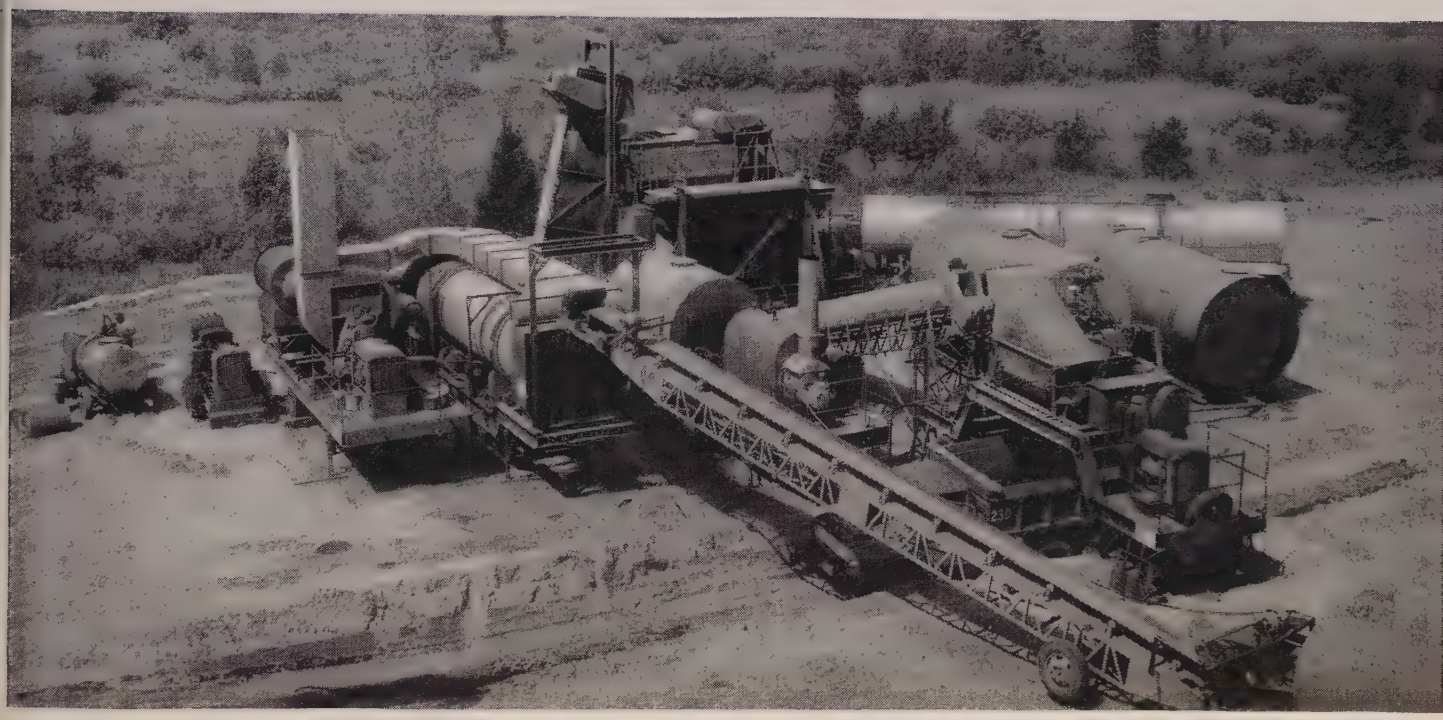

Owners Say: *"We can move, set up, and be running again in 3 days — instead of a week"*

● H & B Mobile Plant owners have found that the time they save in moving, setting up and in mixing enables them to get substantially more production, and thus pay for their plant in a much shorter time.

These plants are completely wheel mounted, and can be ready to move in a matter of minutes. No crane is necessary for erection or dismantling. Flexible hose and plug type electric connections between permanent piping on the various units make possible quick connections in the field.

As one owner says: "With our other plants it takes a full week to move and set up again. With our H & B Mobile Plant we can move, set up and be running again in 3 days." In other words, 3 days that would otherwise be spent in moving can now be used for production.

Another Mobile Plant owner says: "We have cut moving costs by approximately 70%—and increased our production by approximately the same —70%."

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What are qualities of a good superintendent?

Here are some of the answers from veteran L. T. Grider, based on supervising the construction of 23 dams in this Western region:

LOOKING BACK over the years and a long acquaintance with construction firms and their superintendents, I believe that the qualifications that make a good superintendent are born in the man rather than coming from "book learning." At least, the only proper teacher is the one who teaches in the hard school of experience.

I like to think of a superintendent as a coach and his crew as the team. At least, this should be the attitude of the young man as he begins to take over supervisory duties. Just like a coach, a superintendent is required to be "the boss" on occasion, but normally should be working with and for the team.

One good reason for thinking of a superintendent as a coach is the fact that both of them have an important responsibility to put the right man in the right place at the right time. Not only does this make for better team play and results, but it is also better and easier on the individual members of the team.

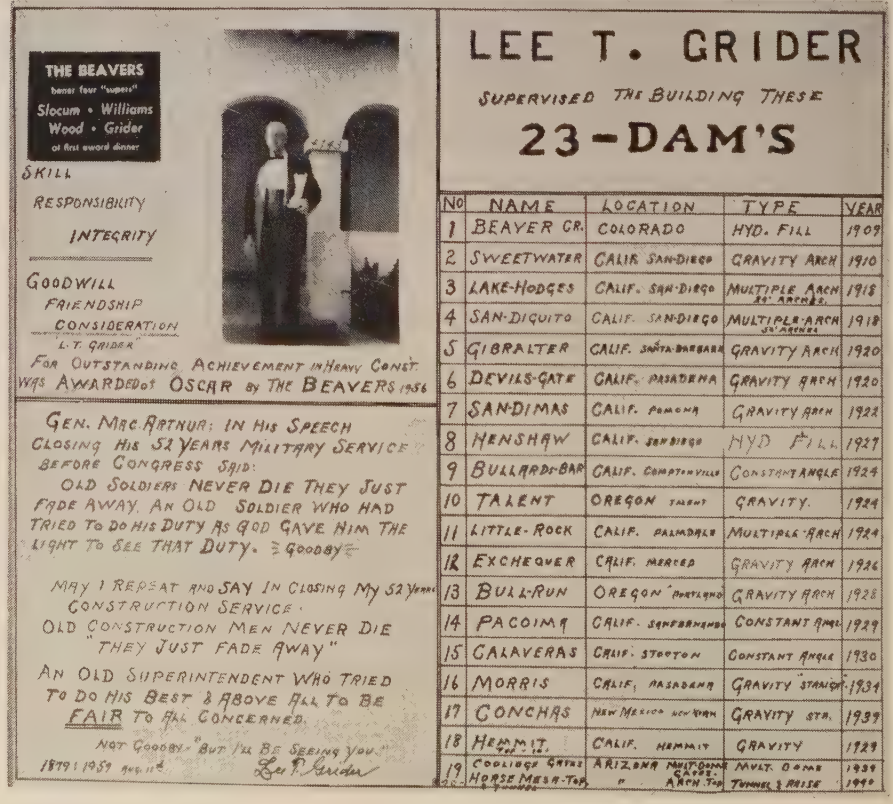
Carrying the parallel a little further, the coach must keep in mind that his job is to win games, and the superintendent must get the job carried out on time and with economy. In both cases circumstances require occasional toughness, even to the point of being considered hard to work for—and I have been called that. However, it is important to never let members of the team or the crew go home with a feeling they have been mistreated. At the end of every session the crew and the individual members should leave the practice field or the day's work with a desire to return next day ready to give a good performance and to possibly offer a suggestion or idea of value.

Using another comparison, construction work is not like the Army where the officer must take men who are sent to him and who must stay whether they like the job or not. This creates quite a different atmosphere. On a construction job —at least in the old days—the superintendent could fire a man, or the man could put down his shovel and walk off the job, with no "by your leave." However, the similarity between Army and construction is that the officer or the superintendent must be a born leader to succeed and rise in the ranks of supervision. Just as all West Point graduates do not become four-star generals, neither do many graduate engineers become good construction superintendents. This leads me back to my original idea that the best superintendents are born with the proper qualifications and are lucky enough to get in with a good company and improve themselves with varied and valuable experience.

As a veteran superintendent I would like to say something for the benefit of the young or would-be contractor. Bid your jobs based on the most economical plan you can develop for carrying out the work. Never bid a job based on what other contractors have bid to do similar work. Other contractors are using their ingenuity and the brains of their staff to plan an economic attack, so that you must have ideas that are better or a plan of attack that will cost less money. Sometimes contractors are inclined to try out new and glamorous ideas. Such methods may be successful on the unusual job that presents peculiar conditions, but on the average job it is good management and day to day control that cuts the pennies off the bid figure for a yard of dirt or concrete. Remember the old-timers had plenty of tricks up their sleeve when it came to bidding and bid figures so that your own cost records are more valuable than a study of bids presented on other jobs.

Another good rule is never to take a job just to keep busy, or as they used to say in years gone by, just to make mule feed.

There came a time about 25 years ago when jobs got so large and required so much capital that contractors joined together in groups of two to ten for bidding. This situation was particularly tough on the superintendents in such a group. Only one could be the top man when the job was secured and many others who had been bosses on their own job had to become assistants. This was tough all around, since having this type of staff put pressure on the top superintendent, and he had a team that was good, but sometimes hard to manage. However, this plan of bidding developed better prices for construction work, for the benefit of the public, and also put more brains together into methods of attack. As more groups were formed



LEE T. GRIDER

SUPERVISED THE BUILDING THESE

23-DAM'S

No	NAME	LOCATION	TYPE	YEAR
1	BEAVER CR.	COLORADO	HYD. FILL	1909
2	SWEETWATER	CALIF. SAN-DIEGO	GRAVITY ARCH	1910
3	LAKE-HODGES	CALIF. SAN-DIEGO	MULTIPLE ARCH 24 ARCHES	1918
4	SAN-DIGUITO	CALIF. SAN-DIEGO	MULTIPLE-ARCH 30 ARCHES	1918
5	GIBRALTER	CALIF. SANTA-BARBARA	GRAVITY ARCH	1920
6	DEVILS-GATE	CALIF. PASADENA	GRAVITY ARCH	1920
7	SAN-DIMAS	CALIF. POMONA	GRAVITY ARCH	1922
8	HENSHAW	CALIF. SAN-DIEGO	HYD FILL	1927
9	BULLARD-BAR	CALIF. COMPTONVILLE	CONSTANT ANGLE	1924
10	TALENT	OREGON TALENT	GRAVITY.	1924
11	LITTLE-ROCK	CALIF. PALMDALE	MULTIPLE-ARCH	1924
12	EXCHEQUER	CALIF. MERCED	GRAVITY ARCH	1926
13	BULL-RUN	OREGON PORTLAND	GRAVITY ARCH	1928
14	PACOIMA	CALIF. SAN-BERNARDINO	CONSTANT ANG.	1929
15	CALAVERAS	CALIF. STOCKTON	CONSTANT ANGLE	1930
16	MORRIS	CALIF. PASADENA	GRAVITY STATION	1931
17	CONCHAS	NEW MEXICO NEW MEX.	GRAVITY STA.	1939
18	HEMMIT	CALIF. HEMMIT	GRAVITY	1929
19	COOLIDGE DAM HORSE MESA DAM	ARIZONA MULTI-DOME ARCH DAM	MULT. DOME TUNNEL & RAISE	1939 1940

for bidding it brought back further competition which helped the situation among the qualified superintendents.

In closing these ideas and the suggestions I am passing along to the younger generation I would like to place the strongest emphasis on the word "FAIR." I think being fair to all concerned is the most important thing, not only in construction but in everything we do.

I am sure that everyone who served on the teams with Lee Grider on the projects listed in his summary might like to drop a note and tell the "old superintendent" some of the things that have gone on since they played the last game together and remember some of the incidents of that game. Address Lee T. Grider, 4143 Chase Avenue, Los Angeles 66, Calif.

C. E. White, Jr., project manager, **Art Snider,** superintendent, and **Jim Randall,** project engineer, head the list of Lembke Company's personnel building the Washoe County jail at Reno, Nev. Construction started in December, earmarked for next December completion. Lembke's bid was $1,054,574.

* * *

James Abshire, superintendent, assisted by **Alvin "Whitey" Trout,** grade foreman, and **Lyle Call,** labor foreman, is in charge of a $324,078 grading and drainage contract on 3.2 mi. of highway west of Saguache, Colo. Gardner Construction Co. is doing the work, which started in December, with July the estimated completion date.

* * *

Joe Hanus, superintendent for Green Construction Co., has charge of grading and drainage on 5.5 mi. of road in Juneau, Alaska, a $262,430 award. **J. C. "Jack" Jones** is office manager. He reports the work has been under way since Dec. 1 and will be finished the end of July.

* * *

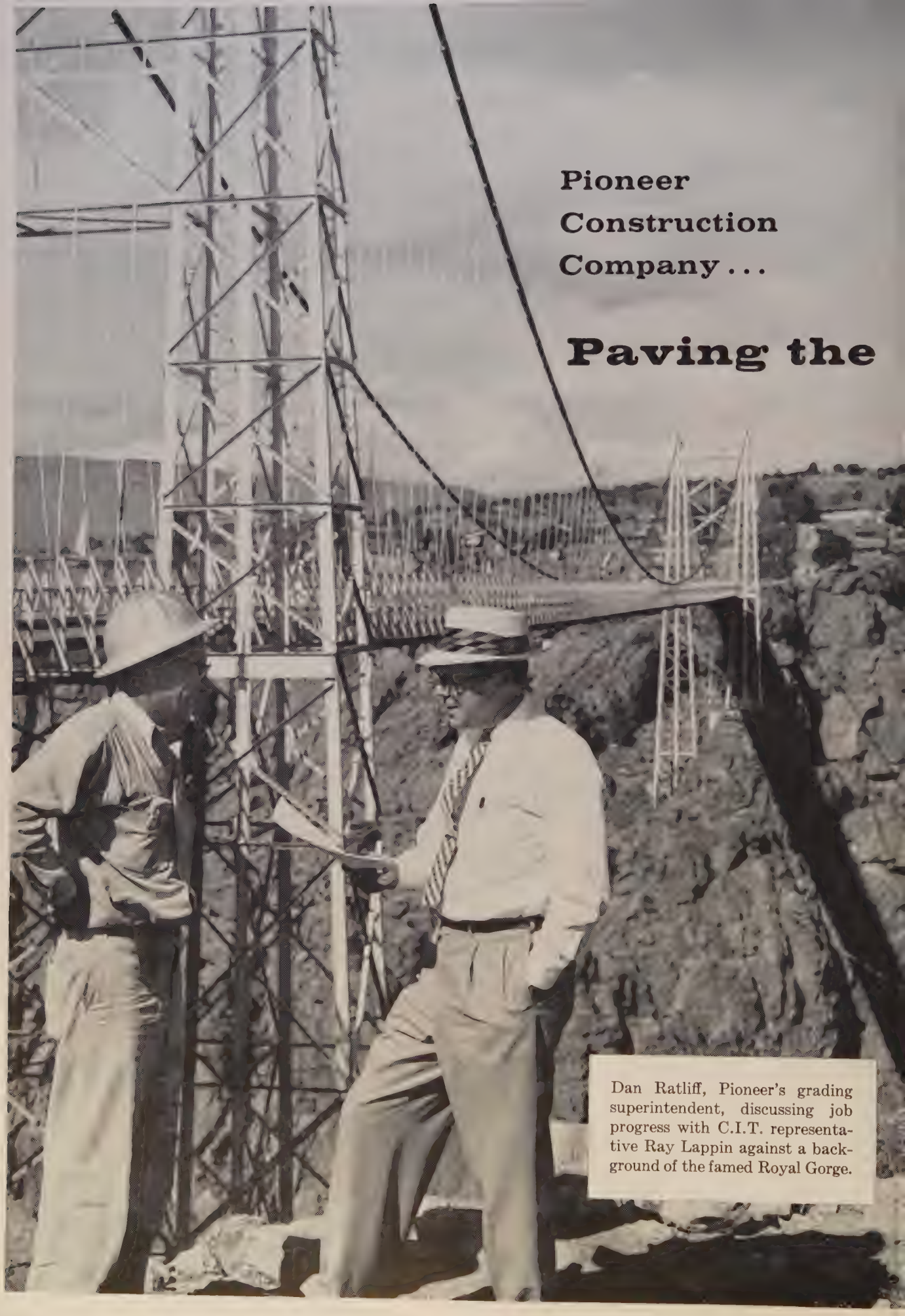
Melvin A. Johnson, grade superintendent, and **W. Jay Grant,** crushing superintendent, head the job personnel working for Grant Construction Co. on grading and surfacing, Craigmont—Culdesac on U.S. 95 and Winchester connection in Lewis County, Idaho. Assisting as foremen on the $612,589 job are **Norm F. Meyers,** grade, and **Pearl Crable,** crushing. Under way since November, work is expected to be finished in September.

* * *

David Weisz, general superintendent, has charge of A-I Paving Co.'s $399,691 contract for grading and surfacing in the city of Walnut, and in the City of Industry, Los Angeles County, Calif. **Ralph C. Daly** is engineer. Other key men are **Fred Weisz** and **J. L. McGeorge,** foremen, and **Maurice D. Mewes,** mechanic. Scheduled to be finished in July, work started in January.

* * *

James Wright is project superintendent for Morrison-Knudsen Co., Inc., the successful bidder at $638,177 for grading, surfacing, drainage structures and underpasses in Washington County, Idaho. Office manager is **John L. Eliopulos.** Work started in November, earmarked for completion Sept. 1.



Pioneer Construction Company . . .

Paving the

Dan Ratliff, Pioneer's grading superintendent, discussing job progress with C.I.T. representative Ray Lappin against a background of the famed Royal Gorge.

Way to Royal Gorge

C.I.T. Is On the Job, Too

Breath-taking! Beautiful! Exclamations like these are repeated again and again by thousands of motorists every year as they view the Royal Gorge of Colorado. What has this to do with road building? A lot!

Motorists now have a smooth, fast, modern approach to the world's highest suspension bridge over the turbulent Arkansas River. Last fall, Pioneer Construction completed a road building project, linking the access road to the bridge over the gorge and Intercontinental Highway 50. A 4.7-mile stretch, the job included a four-way interchange, plus construction of culverts, boxes and asphalt surfacing. During construction, traffic had to flow freely in either direction—tourists and all.

To fill, blast, grade and construct, it takes a lot of heavy equipment and working capital. According to Clarence Brown, President of Pioneer: "We feel that C.I.T. has proven to be completely flexible in arranging long-term plans designed to meet particular construction requirements. We measure C.I.T.'s value to our important operations by this yardstick of flexibility."

How Job-Engineered Finance Plans Help Contractors

Payd Plan equipment financing terms to 6 years with payment schedules related to depreciation, or equal monthly payments over 36 months, or skip-payment plans are just a few of the helpful financing tools offered by C.I.T. Corporation.

In addition to equipment purchase financing, C.I.T. can help improve contractors' bid and bond capacity, meet current operating expenses or other business needs by arranging capital loans. C.I.T. representatives know how to lay out "job-engineered" finance plans, carefully devised to fit the needs. Why not call or write today. No obligation, of course.

Pioneer's Bucyrus-Erie 3 cubic yard shovel—the first of its kind in Colorado—loads a dump truck to keep the job moving on its 150-day schedule.

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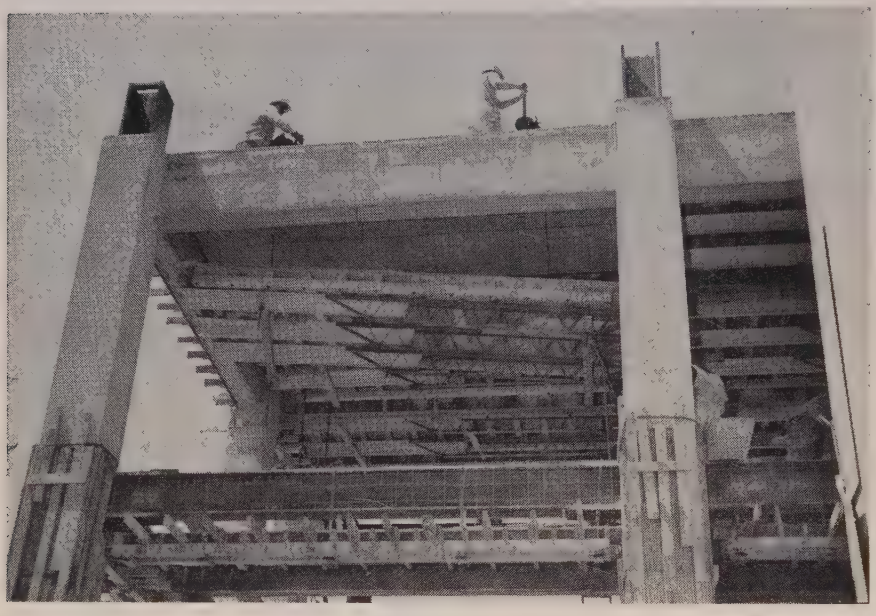
CONSTRUCTION BRIEFS



HAND WINCHES used to lower assembled floor form to next level for re-use. Note cables piercing completed slab. Form tilted to clear flanges.

Floors built from top down

PLACING concrete floors from the top down in a 3-story Seattle building enabled the W. G. Clark Construction Co. to re-use the same assembled forms for each level.

The project, the Dr. Samuels Institute Building, called for placing reinforced concrete floors on a steel frame. The contractor started forming the top floor first, and when the forms were ready for stripping he lowered them to the next level using cables which pierced the completed floor.

In each 10x18-ft. bay, three Acrow horizontal spans were placed on 4 x 4's resting on bottom flanges of the I-beams with wedges in between. Decking was made of 4 x 4 timbers and plywood panels bolted together to form a rigid unit. This was used to place a concrete slab floor 4½ in. thick.

Before lowering each bay, wedges and supporting timbers were taken out. Horizontal shores were shortened slightly and the entire form was tipped to clear the flanges. Subsequently the whole system was lowered to the next floor.

Contractor's personnel included Don Clark, owner; J. E. Ferguson, project manager; Charles Rosenhan, general superintendent; and John Powell, job superintendent. Shoring was supplied by the Van Daal Co.

Mobile unit weighs, loads aggregate

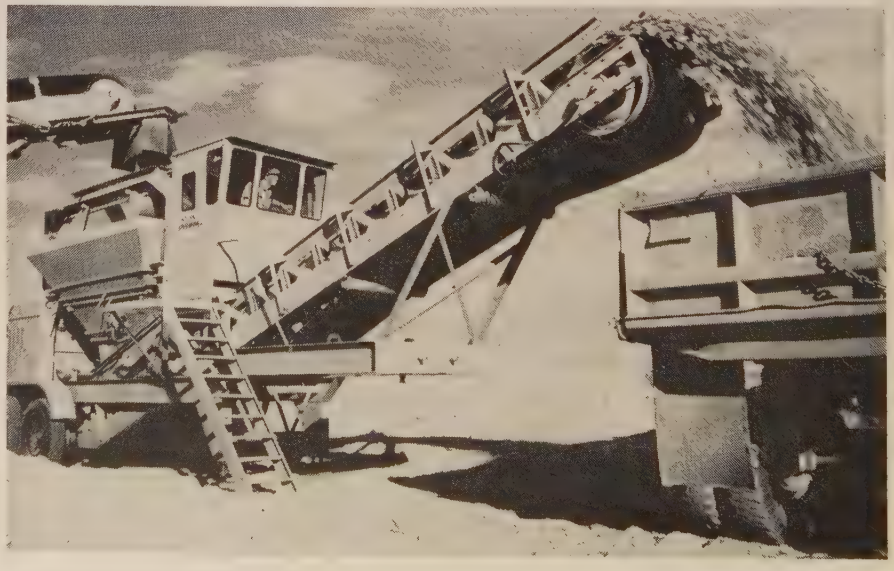
A NEW mobile bulk material weigher capable of spewing six tons of gravel from hopper to truck in 30 seconds is helping contractors speed America's Interstate Highway program in the West. It is the "Schrock Speed-Weigh," developed by the Western Conveyor Co. of Boise, Idaho.

The unit has eliminated costly truck tie-up time at loading and weighing points on a Morrison-Knudsen interstate highway project at Morgan, Utah, according to Clay Miller, plant superintendent for the construction firm.

The unit was developed to automatically weigh and load rock, gravel, coal, iron ore and other aggregates in a continuous operation. Hoppers and gates use T-1, low carbon steel for reduced weight and greater strength.

In a normal operating cycle, material is conveyed by a charging conveyor through a surge hopper into the weighing bin until the preselected weight has been attained.

The surge hopper gates then close and the weighed material is discharged to the hauling unit by the loading conveyor. When the scale equipment indicates that all material has been discharged, the weigh hopper gates close, the surge gates open and the cycle repeats it-



ELECTRONIC scale-loader handles a 6-ton batch in 30 seconds. Unit developed by Idaho firm uses "load-cells" instead of levers to determine weight.

DAYBROOK Aluminum DUMP TRAINS

. . reduce OPERATING EXPENSES 11.5%

"On regularly scheduled runs from Pigeon, Michigan, to points all over the state, our two new Daybrook aluminum dump trains have earned a savings of 11.5% of operating expenses"—says trucker, Clarence E. Yenglin.

These are the factors that made the operating savings a reality . . . INCREASED LEGAL PAY-LOADS, due to "load-rated" design of the aluminum bodies, and EXCELLENT AXLE WEIGHT DISTRIBUTION. Also, the weight advantage of the aluminum bodies brings the Yenglin Company an annual savings of $125.00 per license, per unit, each year!

"Extra Profits" will more than pay for the larger initial investment in the Daybrook aluminum bodies. Contact your Daybrook distributor, today! Let him tell you more about the many Daybrook design and engineering features of bodies and hoists that offer like savings on all hauling and construction operations.

Daybrook—manufacturer of quality hydraulic truck equipment for the construction industry—

DUMP BODIES *(aluminum and steel)* • **HOISTS** *(telescopic and underbody)*
POWER GATE® (hydraulic tail gate) • **POWER LOADER** (truck-mounted crane)

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. . . for more details, write No. 47 on Reader Service Postcard

Completely portable Lima A-W crushing installation has primary 20 by 36-in. jaw crusher, Model 101-CE secondary plant and 7-yd. surge bin. Delivers exceptionally high production for Maymead Lime Co. in Tennessee.

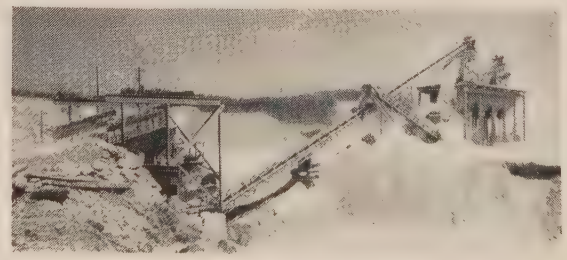
How Lima Austin-Westerns BEAT RISING COSTS!

Higher output, lower maintenance. These two cost reducers are characteristic of Lima Austin-Western Crushing, Screening and Washing equipment.

Advanced engineering design assures top operating efficiency for years—free of maintenance problems and costly downtime. Improved manufacturing processes and extensive use of anti-friction bearings and heat-treated alloy steels also add to the dependability of this rugged, precision-built machinery.

Lima A-W offers a complete crushing, screening and washing line including jaw and roll crushers, matching screens, conveyors and bins. Stop increasing costs; learn how Lima Austin-Western meets your exact needs for low-cost, accurately sized specification materials. See your nearby distributor or write to Baldwin-Lima-Hamilton Corporation, Construction Equipment Division, Lima, Ohio.

Lima Austin-Westerns available for stationary or portable installation.



Edward R. Bacon Company, San Francisco, California; **Columbia Equipment Company,** Portland, Oregon, Seattle, Washington, Spokane, Washington; **N. C. Ribble Company,** Albuquerque, New Mexico; **Western Machinery Company,** Salt Lake City, Utah, Idaho Falls, Idaho, San Francisco, California; **Keremi Tractor & Equipment Company,** Cheyenne, Wyoming, Casper, Wyoming; **A. H. Cox & Company,** Seattle 4, Washington; **Inland Diesel & Machinery Co.,** Spokane, Washington; **Engineering Sales Service, Inc.,** Boise, Idaho; **Macdonald Equipment Company,** Denver, Colorado; **Graid Equipment Company,** Reno, Nevada; **Western Machinery Company,** Phoenix, Arizona, Tucson, Arizona; **Seitz Machinery Company, Inc.,** Billings, Montana, Great Falls, Montana; **Smith Booth Usher Company,** Los Angeles 54, California

LIMA AUSTIN-WESTERN Crushing, Screening and Washing Equipment
BALDWIN · LIMA · HAMILTON
CONSTRUCTION EQUIPMENT DIVISION · LIMA, OHIO
608

. . . for more details, write No. 48 on Reader Service Postcard

self. The complete cycle for a 6-ton batch is run in 30 seconds.

The unit employs an electronic load-cell device which weighs only the material itself. Guaranteed accuracy is one half of one per cent. In tests conducted by the State of Idaho Highway Department over a week's period of operation the unit tested weighed within one tenth of one per cent accuracy.

Although the load-cell method of weighing has been proven in stationary installations all over the world, the "Schrock Speed-Weigh" is the first mobile load-weigher to employ this type of equipment.

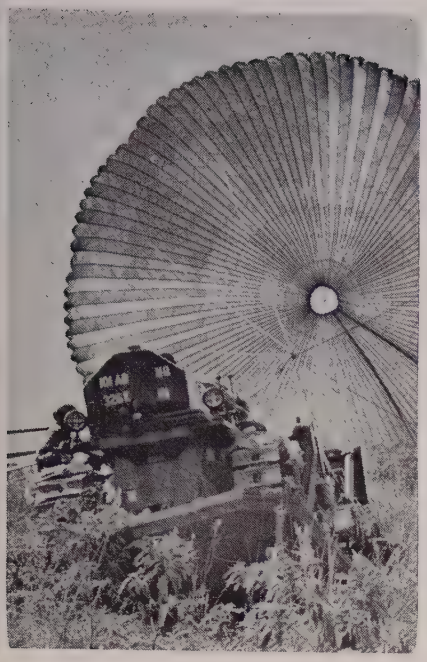
Electronic weighing components developed by Streeter Amet transcribe a printed record, in duplicate, of each batch weight, each truck number and the total number of batches. The cab is air-conditioned for the operator's comfort and to protect electronic equipment.

Equipped with rubber tires, air brakes, mud flaps and stop light, the 30,000-lb. unit can be safely hauled at 50 mph. on good surfaced roads.

. . . Write No. 152

TRINITY DAM GATE SHAFT

The tower emerging from the hill above is the vertical gate shaft at Trinity Dam in Northern California. The gate shaft is being constructed with a circular slip form designed and built by Trinity Dam Contractors. At the top of the form is a central hopper into which concrete is placed by a guy derrick. A revolving distributor swinging beneath the hopper spouts the concrete into the walls of the shaft. The tower of the shaft is 20 ft. in diameter and will reach a height of 100 ft.



Just drop in—

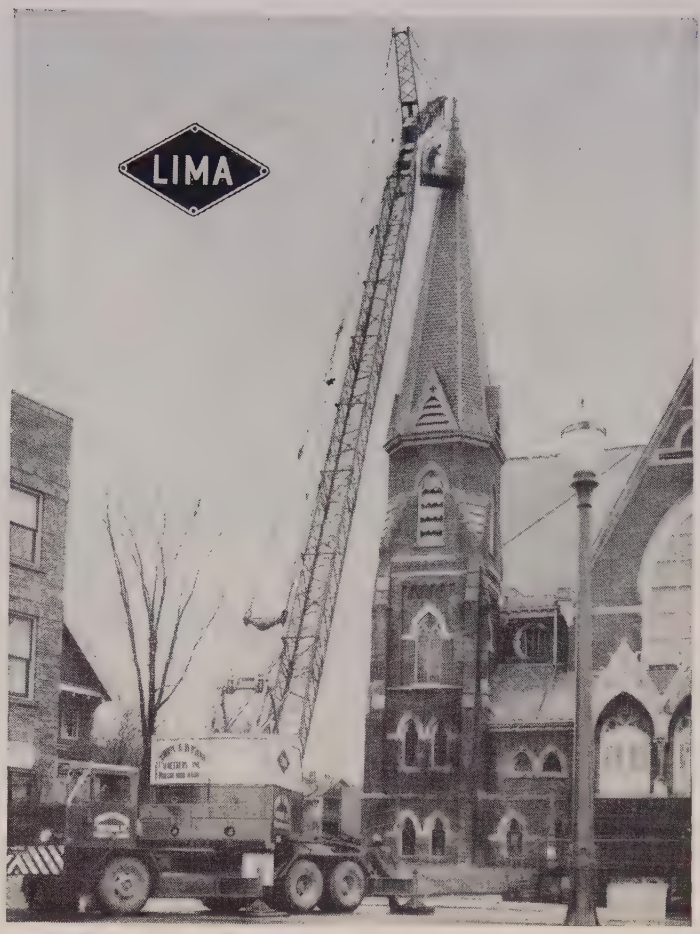
No highway permit needed

POSSIBILITIES of rapid development of construction sites not readily accessible from the ground were recently demonstrated when an equipment spread worth several million dollars was parachuted into a remote area by an airborne Army Engineer unit. The drop was made by 43 giant cargo planes. Within 48 hours, the Army unit had built a 2,000-ft. long, 50-ft. wide dirt surfaced runway capable of handling high performance assault-type cargo aircraft. About 40,000 cu. yd. of dirt were involved.

None of the equipment "dropped" into the job was severely damaged. All was de-rigged and working within 45 minutes after hitting the ground.

Equipment in the first drop included five Caterpillar airborne D6 tractors, one Cat No. 212 motor grader and several 2½-ton trucks, as well as jeeps and ¾-ton trucks. Subsequent equipment drops included two additional No. 212 motor graders, six Hough rubber tired front-end loaders and more trucks.

The major items of machinery, termed "monster loads" by the Army, weighed as much as 21,000 lb. each when packed for the airdrop. They were lowered to the ground by six, 100-ft. diameter parachutes each. In operating condition, the D6 tractor (modified) weighs approximately 15,975 lb.



Workmen in personnel cage suspended from jib of 130-ft. boom rig line around Jamestown, N. Y., church steeple in preparation for demolition. Crane is a Lima 44-T.

Morris & Reimann Wreckers:

Well pleased with LIMA 44-T

"We've been in the wrecking business 28 years and our 2 year old Lima 44-T is perhaps the best mobile crane we've ever owned!" That's what wreckers Orville Morris and Nelson Reimann, Amherst, N. Y., have to say about their truck-mounted 30-ton Lima crane.

Travels city streets

"It's a fast and powerful rig. We once dismantled a 140-ft stack in only 45 minutes with a wrecking ball attached to the Lima. It's a good traveler, too. Moves about on city streets from job to job with speed and ease.

"Lima's many special features result in important dollar savings. Maintenance costs and downtime have been very low . . . distributor service excellent.

"We are very well pleased with our truck-mounted Lima."

Undivided responsibility

The 44-T is a versatile 30-ton crane or a 1-yd. shovel. It can also be used with interchangeable dragline or clamshell attachments. The heavy duty 10-wheel carrier (6 x 4 or 6 x 6) is designed and built by Lima . . . giving you the benefit of the undivided responsibility of only one manufacturer. Two engines; choice of power.

Lima Truck-Mounted Cranes are available in capacities up to 75 tons, shovels to 1¼ yd. There's a Lima type and size to add profit on your job. Get all the facts. See your nearby LIMA distributor or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.

Our Seattle Office—1932 First Avenue South, Seattle 4, Washington; **Our La Mirada Office**—14120 E. Rosecrans Ave., La Mirada, California; **Feenaughty Machinery Co.**, 112 S. E. Belmont Street, Portland 14, Oregon; **Modern Machinery Co.**, 4412 Trent Avenue, Spokane 10, Washington; **N. C. Ribble Co.**, 1304 North Fourth Street, Albuquerque, New Mexico; **Bay Cities Equipment, Inc.**, 2792 Cypress Street, Oakland 7, California; **Bay Cities Equipment, Inc.**, 1178 West San Carlos Street, San Jose, California; **Evans Engine & Equipment Company**, 4300 - 11th Avenue, Northwest, Seattle, Washington; **Smith Booth Usher Company**, 2200 S. San Gabriel River Parkway, Los Angeles 54, California; **Evans Engine & Equipment Co., Inc.**, Post Road—Box 894, Anchorage, Alaska; **Faris-Moritz Equipment Co.**, 5790 Colorado Blvd., Denver, Colorado; **Shasta Truck & Equipment Sales**, South 99 Highway, Redding, California; **Reno Equipment Sales Company**, 1510 West Fourth Street, Reno, Nevada; **Western Machinery Company**, 820 North 17th Avenue, Phoenix, Arizona; **Western Machinery Company**, 1111 West St. Mary's Road, Tucson, Arizona; **Western Machinery Company**, 2300 South Main Street, Salt Lake City 15, Utah; **Western Machinery Company**, P. O. Box 197, 590 West 19th Street, Idaho Falls, Idaho

LIMA Construction Equipment Division, Lima, Ohio
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. . . for more details, write No. 49 on Reader Service Postcard

MASTER MECHANIC

Winter starting tips for diesel engines

Trojan Division
The Yale & Towne Manufacturing Co.

THE DIESEL engine has no spark plugs so it relies on high compression to heat air in the cylinder enough to burn the fuel injected into it. When the engine is cold the metal parts rapidly absorb the heat in the cylinder and thus prevent ignition. This happens every cold day so that the engine needs help to get started.

Assuming the starter is turning the engine at normal starting speed, there are two ways to get proper starting conditions: One, heat the air introduced into the cylinders; the other, help out with a fuel that burns at a lower temperature than diesel fuel.

Glow plug

In some open chamber diesels, such as Cummins, a glow plug is mounted in the intake manifold. When fuel is sprayed onto this glowing element a small fire is kindled in the intake manifold and this heated air is drawn into the cylinder giving enough boost to start the engine in most instances.

Engines with a precombustion chamber design usually mount the glow plug in this small precombustion chamber so that ignition begins in a fractional part of compressed air in each cylinder where fuel is injected. *Usually failure in starting with glow plugs comes because the operator is too impatient to allow the plug to heat fully before he begins cranking.*

Fast fuels

Ether and ether-base fluids are fuels with a lower flash point, or temperature, at which they begin to burn. This method is better liked because it gives instantaneous results. Ether fluids are high energy fuels and if used carelessly or too freely can cause serious mechanical engine damage because of abnormal compression pressures.

In an engine with a glow plug in the intake manifold NEVER use ether and the glow plug at the same time. A nasty backfire or perhaps even more serious damage could result.

Ether starting fluids are available in gelatin capsules, pressure capsules and aerosol-type pressure cans. Each form has its particular hardware to direct the fuel to the engine intake manifold. All of them work effectively — choose the one best suited to your needs. Both types of capsules are a "one shot proposition" while the aerosol can provides a more generous supply. Warm aerosol cans and capsules vaporize more quickly so keeping the ether indoors until ready for use is to your advantage.

Thick oil

Very cold weather causes crankcase oil to become very thick. Obviously it is difficult for the oil pump to circulate thickened oil so that the initial start starves cylinder walls and bearings of oil for a short time. It is especially important to avoid speeding the engine during this critical period. There are multiple viscosity oils on the present market which are thinner when they are cold. These oils have a low viscosity oil base with certain resins added and thicken as they warm up. Diesel engine makers have been reluctant to approve their use, therefore always follow your engine maker's oil recommendation. If it is practical at the end of the working day to drain the oil from your engine while it is warm, it can be warmed in the morning and added just before cranking the engine, with good results.

Battery load

Most automotive type diesels have an electric cranking motor as a utility starter. Since accessory loads vary so widely, the choice of batteries has always been the result of experience. Under normal conditions most batteries are adequate, but cold weather causes frequent failures. Generally speaking, more and larger plates mean a greater reserve of cranking power. If your battery is in good condition but fails to start your engine by not lasting long enough, a larger battery will crank your engine longer. Price, physical size and weight are all good indications of battery size.

Gasoline starting engines give unlimited cranking duration once started.

Air starters are excellent since they usually give higher cranking speed but a regular mobile compressor unit is usually needed to supply enough air.

If a shed is available to shelter your equipment use it to your advantage. Fully enclosed sheds can be heated enough to be of real benefit in starting the engine since the air, crankcase oil and coolant all get the benefit of the warmth. In some cases cylinder head bolts may be replaced with special bolts having built-in electrical heating units. These heaters help by giving warmth to the coolant in the engine water jacket and usually require only house current electricity which may be available in your shed.

After your diesel engine is started and running smoothly it will warm up to its most efficient operating temperature more quickly if it is run through its ordinary work cycle at a moderate pace. A good rule is to let the engine temperature come up to nearly normal before demanding full engine power.

The key to a smooth functioning diesel engine in cold weather is a thorough knowledge of the starting procedure rules — and following these rules every working day.

Welding rod booklet

Welding rod comparison charts, listing products of 78 companies are contained in a 48-page booklet published by the American Welding Society. Fifteen AWS - ASTM specifications are involved and brands as well as manufacturers' names are contained in two indexes.

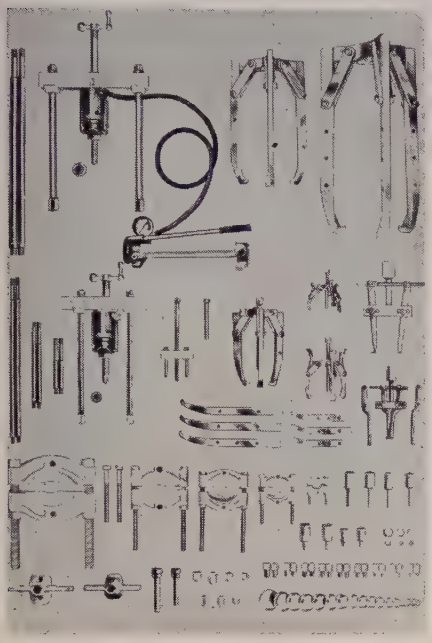
The current booklet, Filler Metal Comparison Charts, is the second edition prepared by the society. With the aid of the charts, it is possible to see at a glance the classification of any filler metal, irrespective of the brand name or number.

Price of the booklet is $2.50. Copies may be obtained from the American Welding Society, 33 West 39th St., New York City 18.

Hydraulic pullers for gear removal

A NEW SET of hydraulically operated maintenance tools for servicing industrial crawler tractors and earth-moving equipment is announced by **Owatonna Tool Co.**

This OTC maintenance set, No. Y-1750, includes pullers, attach-



ments and adapters to fit all types of equipment, plus 17 ½ and 50 ton OTC Power-Twin hydraulic units which can be used on other hydraulic equipment as well.

Any maintenance operation requiring the removal and installation of gears, bearings, sheaves, pulleys, bearing cups, shafts, sleeves, couplings and other tightly fitted parts can be accomplished quickly.

. . . Write No. 153

Modern blast cleaning machines

A guide to pressure type abrasive blast cleaning operations and a catalog of machines and accessories has been released by the **Sanstorm Mfg. Co.** Catalog 594 contains information on open and closed top pressure type sandblast machines; nozzles used in various operations; data tables on ratios of nozzle bore sizes to compressor capacities; and operator accessories. It also includes data on Sanstorm's high velocity blast nozzle which multiplies the surface area coverage that can be cleaned compared to ordinary nozzles and without equipment or abrasive alterations. For further information, write on company letterhead to: Sanstorm Mfg. Co., Dept. WC-1, P.O. Box 1173, Fresno, Calif.

NEW LITERATURE

To obtain free copies of literature described in this section, write the corresponding numbers on reply postcard.

Prestressed concrete projects

The unlimited applications for prestressed concrete are the subject of a 20-page publication, Bulletin MBR-P-13, recently issued by **Master Builders Co.** Studies of 16 outstanding prestressed concrete projects are covered; photographs and job stories cite the role of Pozzolith in achieving the high concrete qualities required for prestressed work. A prestressed lift-slab, 120-ft. long prestressed bridge girders, and a 2,000,000-gal. prestressed water tank are some of the projects covered. Both pretensioned and post-tensioned projects are featured.

. . . *Write No. 154*

Controlled area heating

A 4-page folder titled, "Spots That Heat—A new Concept in Radiant Heating," provides three simple charts which detail the types of heaters required, capacities, coverage, mechanical specifications, shipping weights, plus all other physical features of radiant heaters used in heating difficult indoor and outdoor areas. **Apextro Products Co.'s** leaflet describes their quartz infratube heaters which have proven efficient and low-cost as auxiliary heating, particularly for unusual or hard-to-reach areas.

. . . *Write No. 155*

Timber construction

Use of laminated wooden beams and heavy timber decking is described in a 24-page catalog titled "Engineering in Wood—1960" issued by **Timber Structures, Inc.** The catalog is illustrated with application photographs of the various timber structural components and contains detail drawings, tables of dimensions and sectional properties, together with specifications and other information. Examples of glued laminated domes also are shown. . . . *Write No. 156*

Pump for trench work

A new 2-in. "skwee-gee" diaphragm pump is included in the CMC diaphragm pump line described in a 4-page brochure published by **Construction Machinery Co.** Recommended for drying out trenches and ditches, the 2-in. pump unit model FD-L2 is powered by either gas or electric motor. The folder provides performance data and specifications on the 2-in. and 3-in. diaphragm pumps as well as data on 3-in. and 4-in. ball valve and flap valve types.

. . . *Write No. 157*

Small plant sewage treatment

An 8-page, 2-color bulletin titled "Small Plant Sewage Treatment" has been issued by **Dorr-Oliver, Inc.** It describes the design operation and advantages of four equipment units which provide both clarification and sludge digestion in a single tank and are adapted to small scale operation. The four units discussed are the: Clarigester; Degritting Clarigester; Duo-Clarigester; and the CompleTreator. Complete description of the four units along with drawings, recommended uses, and installation photographs are included.

. . . *Write No. 158*

Steel liner plates

Technical information on steel liner plates for excavation support in tunnel and shaft construction is contained in a 20-page bulletin published by **Commercial Shearing & Stamping Co.** Numerous illustrated examples of specific applications of commercial liner plates in soft ground tunneling are featured in the booklet which provides engineering properties of the plates and includes tables of suggested thickness of plates for a variety of uses. Also included are specifications, installation procedures and tunneling methods. . . *Write No. 159*

Domes for concrete grids

One-piece steel domes used for forming the voids in concerte grid construction are described in a 4-page circular issued by **Grid Flat Slab Corp.** The folder presents concise descriptions of the grid system, the steel grid domes, form work and utility layouts as well as comprehensive safe load tables and typical layouts of ceilings and floors utilizing grid system construction. The 2-ft. modular steel dome, together with necessary accessories, is supplied under a package lease arrangement by the company.

. . . *Write No. 160*

Heavy-duty conveyor

Additional conveyor capacities through use of heavy-duty belting and 45-deg. troughing idlers is outlined in a brochure issued by **Manhattan Rubber Divn., Raybestos-Manhattan, Inc.** Included are descriptions of the construction of Ray-Man belting which permits use of steeper idler angles and thus provides additional carrying capacity. . . . *Write No. 161*

Air entrainment meter

A precision type of air entrainment meter used in testing and designing concrete mixes is the subject of a new 6-page bulletin issued by **Soiltest, Inc.** The bulletin contains complete operating instructions and illustrations of the meter to enable the operator to obtain precise determinations of the air entrained in concrete. The readings are made direct and the entire test can be conducted quickly and easily by an engineer or technician. Bulletin also contains information on maintenance and recalibration of the unit. . . . *Write No. 162*

Heavy-duty steam cleaner

A new 600-gal. per hour steam cleaner introduced by **Aeroil Products Co.,** is described in a 6-page brochure. The model Cl-600 is designed for heavy-duty use and features a down draft burner and 15,000-volt transformer to provide constant ignition. It is provided with a chemical by-pass system which enables cleaning chemicals to by-pass the heating coil and permits use of less expensive compounds while preventing coil clogging problems. Two cleaning guns and one rinse gun are provided as standard equipment.

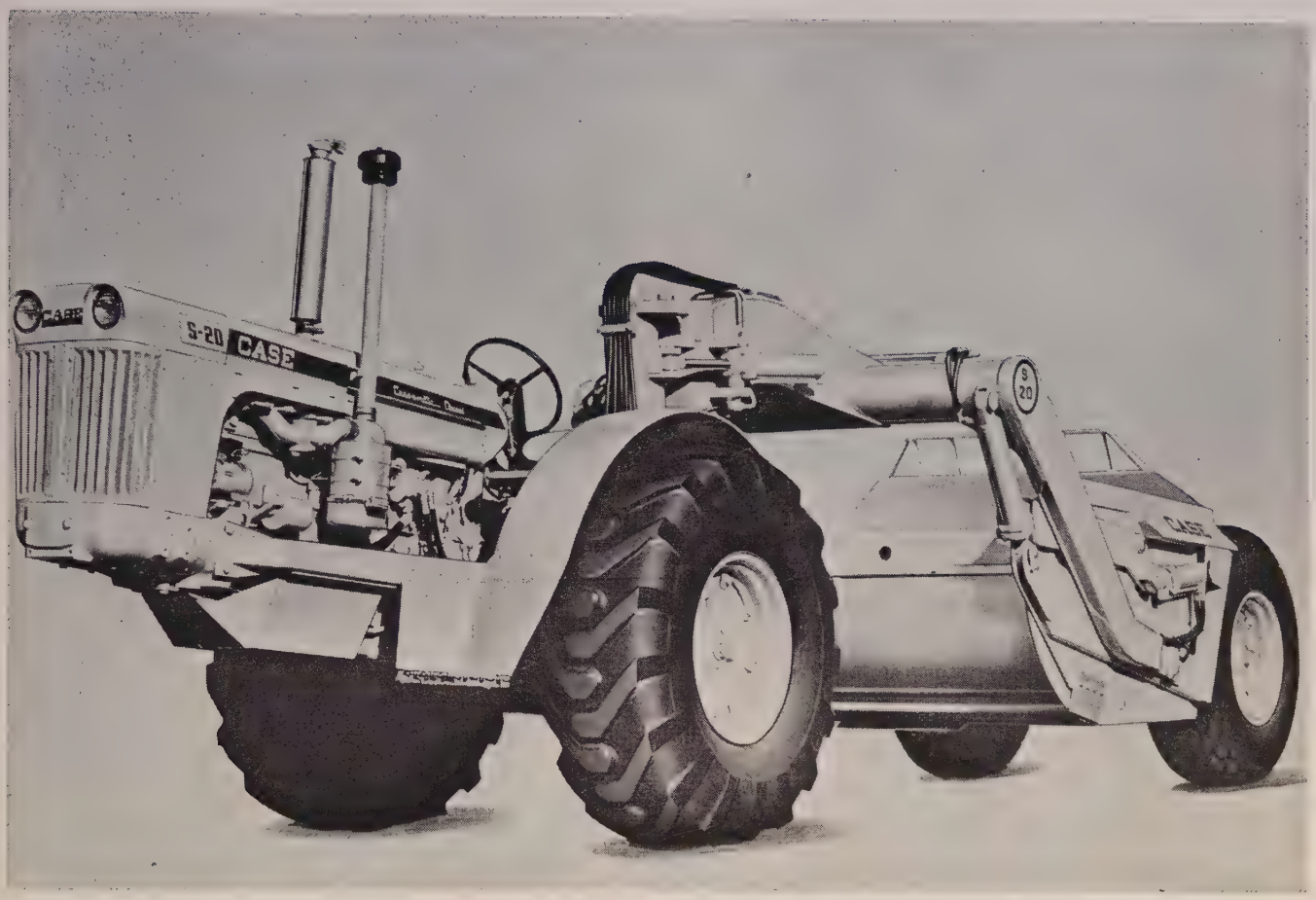
. . . *Write No. 163*

Bin level switches

Comprehensive technical and engineering data on "Tellevel" bin level control switches are contained in Bulletin 159 offered by **Stephens-Adamson Manufacturing Co.** Included are specifications, diagrams and illustrations of normal-duty, explosion-proof and heavy-duty Tellevels. . . . *Write No. 164*

NEW EQUIPMENT

Obtain more information on these new developments in construction equipment by writing the corresponding numbers on reply postcard.



Case introduces small scraper line

J. I. Case Co. last month unveiled the S-20, a 6½-yd. hydraulic scraper powered by an 80-hp., 2-wheeled prime mover. The unit is the first in a line of earthmovers ranging up to 18-yd. capacity which the company plans to introduce. Scraper bowl is 84 in. wide, with reversible 3-piece cutting edge. Center portion of cutting edge can be adjusted for extra digging penetration in hard ground, or for fine grading. Single piece tail gate and bowl bottom is hinged at lip for roll-out ejection, accomplished with a relatively short-stroke hydraulic cylinder.

Scraper is self-loading to struck capacity in most soil conditions, but also has a big push block for push-loading. The two-wheeled prime mover is adapted from a Case wheel tractor, has an 80-hp. diesel engine and torque converter transmission with 8 forward speeds. Torque converter can be locked out on the go for fast travel speeds. Hydraulic steering provides full 90-deg. turns.

A feature of the small scraper is its mobility. It needs no breakdown for highway travel since it is less than 8 ft. wide, and has a maximum axle-loading of 18,000 lb. The S-20 is priced at about $12,500.

. . . Write No. 165

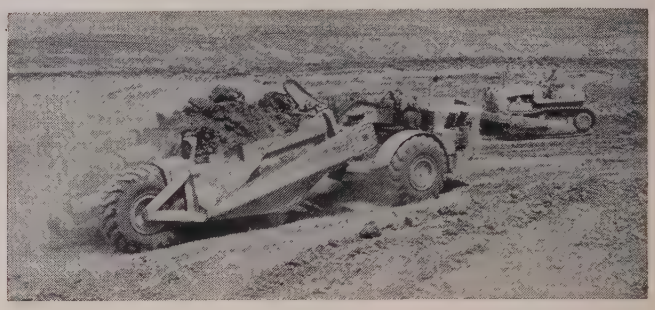
New conveyor for tunnel rock

Skid-mounted idlers which can be strung together like beads to support a conveyor belt of virtually any desired length are features of a new extendable mine conveyor, announced by **Hewitt-Robins, Inc.** The new unit is comprised of a belt which runs on idlers, mounted on sled-like skids, spaced at 5-ft. intervals and held in alignment by wire ropes. An electro-hydraulic crawler tractor is attached to each end of the conveyor exerting constant tension on the belt to keep it taut. As many as 200 idler skids can be put together to make a unit 1,000 ft. long. A traveling tripper permits variation in the distance from the conveyor loading point to discharge. Material can be handled at a rate of 400 tons per hour for 70 hours or more without moving the equipment. When the rock face has advanced beyond conveyor system's limit the tractors tow the entire unit in long sections to a new work area. Tractor is equipped with hydraulic jack so that it can be positioned under the tripper, lifting it off the ground and carrying it to the new work area.

. . . Write No. 166

Curtiss-Wright scrapers show excellent performance on Interstate job test

A group of five CW-226 scrapers hauled payloads ranging from 12 to 18% above their rated 26-yd. capacity with cycle times below those of smaller competitive makes according to a job study reported by **Curtiss-Wright Corp.** The project was an Interstate highway construction job involving movement of 1,200,000 cu. yd. of dirt. Material included silty loam,

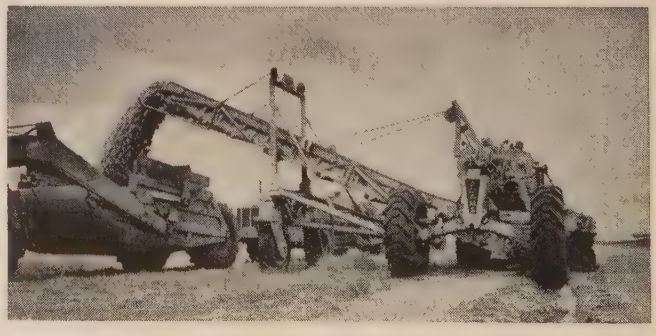


clay loam and blasted slate rock. Working in clay loam the CW-226's moved an average 30.62 yd. per trip. One wet load weighed 97,150 lb. calculated at 32.28 cu. yd. Average load was 118% of full capacity. In moist, silty clay, the units had a 29.83-cu. yd. average which is 112% of capacity. Largest load recorded was 91,000 lb. or 30.33 cu. yd. Moving shot and ripped slate rock the scrapers averaged 25.23 cu. yd. or 97% of capacity. The 4-wheel CW-226 self-propelled scrapers are powered by a GM turbo charged diesel rated at 360 hp. It employs an Allison torque converter and Allison 4-speed transmission. It includes "Roto-Gear" hydraulic gear steering. Bowl has a struck capacity of 26 cu. yd. and a rated payload of 78,000 lb. It employs cable operated roll-out ejection. Entire unit is 46 ft. long, 12 ft. wide and has a total weight of 85,500 lb. All major components are readily accessible for field servicing.

. . . Write No. 167

Belt loader attachment for large motor graders

A belt loader attachment with a dumping height of 15½ ft. for use with large motor graders of LeTourneau-Westinghouse and Caterpillar lines has been developed by **Jebco, Inc.** The belt is supported from a frame riding on two tandem wheels attached with out-



riggers to the side of the grader. The frame supports most of the unit's weight so that the normal balance of the grader is not disrupted. Height of the belt can be raised or lowered by cables operated from the grader.

. . . Write No. 168

Smallest engine supercharger features simplicity of design

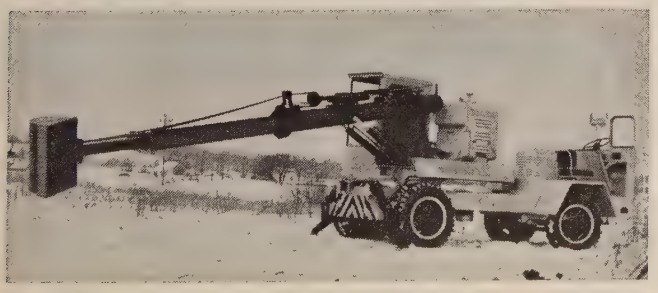
Only 17 parts and a total weight of 24 lb. make up the AiResearch TO603 turbocharger the smallest such unit in production. Developed by **Air Research, Industrial Division of the Garrett Corp.,** and International Harvester Co., the turbocharger is used on International Harvester's DT282 engine which powers the Model TD-9 tractor. Power output is increased 23%. The turbo charging unit which makes use of exhaust gases to increase intake air pressure is of

vaneless design which provides a flow range enabling the engine manufacturer to cover a broad engine operating range at high efficiency. It is air cooled and does not add to the cooling load of the engine nor does it require any water plumbing.

. . . Write No. 169

Excavator features hydraulic digging boom and rotating bucket

A new Model BR-5 HydraXcavator carrier-mounted hydraulic excavating machine has been introduced by **Davis Engineering, Inc.** Carrier of the new unit has a close coupled chassis with driver position located over the left front wheel housing. It is powered by a Continental 226 engine that provides a road speed of 40



mph. Full swing on the upper mechanism enables the unit to load out from any position. Carrier can be maneuvered from the upper mechanism cab through use of a hydraulic motor and drive. Standard attachment of the unit is the new HydraScope with a 20-ft. boom and 7-ft. telescoping action. The end of the attachment may be rotated 90 deg. either side of center to permit dressing of slopes, etc. All operations are hydraulically controlled. *. . . Write No. 170*

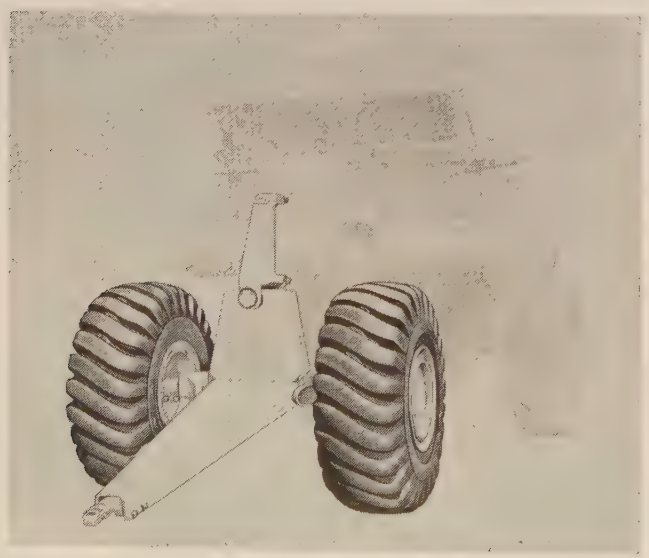
Loader attachment for Cat graders

A 1-yd. shovel-loader attachment for Caterpillar motor graders has been introduced by **Martin Co.** Called "Graderloader," it mounts on the front of the grader allowing full vision operation during loading or dumping. Once the mountings are added to the grader the loading unit can easily be installed or removed in minutes. Using existing connection points the Graderloader quickly attaches to the top and forward scarifier mounts. Two bolts and a transverse pin secure the unit to the grader frame without interfering with scarifier or other grader operations. The loader has a reach height of 11 ft. Its 2-lever, hydraulic control valve installs at the side of the grader control panel providing one-hand operation of the attachment. Reverse acting hydraulic cylinders provide 18,849.6 lb. of lift, suitable for handling culverts and other heavy objects. A Vickers hydraulic pump mounts at the rear of the grader engine crank shaft.

. . . Write No. 171

Front wheel dollies for Athey trailers

Front wheel dolly units which will permit Athey rubber-tired trailers to be towed by crawler tractors have been introduced by **Athey Products Corp.** The front running gear unit is composed of a drawbar, axle member and one of three hitch members. The hitch member is matched and designed to the desired scraper or trailer. Cable shearing to match crawler tractors and cable control units is available as is an air brake system if brakes are necessary for the trailer unit. The dolly utilizes the hydraulic pump packages presently furnished with the new Athey trailers. Pumps for older equipment also are available. The dolly forms a connecting link between the crawler tractor and the rubber-tired trail unit. It enables a crawler tractor to substitute for the normal rubber-tired prime mover, it pemits operation in foul weather or sloppy footing. The dolly also can be used for tandem operation of more than one scraper or trailer.



. . . Write No. 172

Big shovel crane offers diesel or electric power

Numerous equipment power and base options are available on the new Lima type 1800 and 1800-SC shovel cranes, introduced by **Lima, Construction Equipment Division, Baldwin-Lima-Hamilton Corp.** As a standard shovel the type 1800 is equipped with a 35-ft. boom, 26-ft. 10-in. dipper handle and 5-cu. yd. dipper. As a coal loading shovel it is equipped with a 7- or 8-cu. yd. dipper, and as a crane it has a lifting capacity of 112 tons. The type 1800-SC is a 140-ton capacity crane with ground gripping stability. Extra long crane booms with jibs are available for high lift work. Both 1800 and 1800-SC are air operated rigs. Both are in the big-time producer class, yet the design permits knock-down for job-to-job transportation. The crawler base is available in two widths, standard for the type 1800 and extra wide for 1800-SC. Each base is of one-piece cast steel construction, bored and bushed for the two through axles and horizontal propel shaft. Both models are available with diesel or electric power with torque converter drive. Literature available.

. . . Write No. 173

New rig drives wellpoints

A "sliding weight" holepuncher which successfully installs wellpoints in hard to penetrate soils is announced by **Griffin Wellpoint Corp.** The holepuncher uses a combination of jet water and impact blows to penetrate the soil. The long slender tube is hoisted into position with a crane and driven about a foot into the ground. A heavy cylindrical weight which fits around the shank at the upper end is raised and allowed to drop against a striker plate. The weight of the holepuncher itself which ranges from 1½ to 2 tons plus the impact of the sliding weight which weighs an additional ton combined with the force and sluicing action of the jetting water to drive the shank into tough soil.

. . . Write No. 174

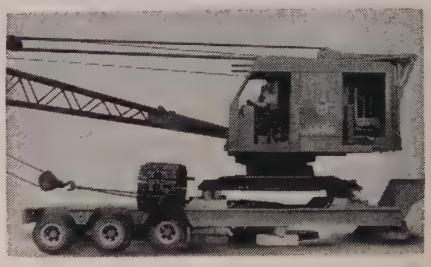
Try surveying by radio

Ever think of using a radio in your surveying operations? The advantages are (1) voice communications between surveyors eliminates the need for hand signals which are not always sufficient; (2) longer legs of surveying are possible; (3) communications are possible with headquarters within range and with other crews working in the area. The perfect unit to use for such an application is **Motorola's** Handie-Talkie 2-way unit which provides protection from interference. The transmitters in the system generate an inaudible coded tone which is transmitted along with the voice message. This tone is detected by a relay in the receivers. Incoming messages are blocked from the receivers audio circuit unless the coded tone is present. Consequently messages from other systems on the channel are normally not heard. The compact transistorized Handie-Talkie portable radiophones are available in low- and high-powered versions both at 25-50 MC and 144-174 MC frequency bands. The equipment can be operated from long lived dry cell or rechargeable nickel cadmium interchangeable power-pack battery. The units vary in weight from 7 to 18 lb. depending on the power of the unit and the type of its battery supply.

. . . Write No. 175

Crawler strips in 2 hours for highway traveling

A 40-ton crawler tractor crane that lifts and walks with more than its own weight is now offered by **Link-Belt Speeder Corp.** For fast job-to-job transport, it can be stripped down to an 8-ft. over-all width and about 32,000 lb. With a crawler base that is 15 ft. long and 14 ft. wide, with 42-in. shoes, the new LS-108 has a spread eagle stance that gives it exceptional stability. Unassisted, it will pick and handle 160 ft. of the optional tubular boom and gib. Also the LS-108 offers as standard equipment power hydraulic controls, 2-speed travel in either direction with hydraulic power steering, independent rapid boom hoist with power up-and-down and a hydraulic



control swing brake. Optionals include such benefits as reversing clutches for either or both main drums, third drum, powered gantry for removable counterweight, engines with torque converters and elevated cab. . . . *Write No. 176*

Lightweight manual hoist

A 1½-ton capacity power-pull manual hoist weighing only 7½ lb. is now being produced by **American Gage & Mfg. Co.** The new model with 3/16-in. preformed aircraft cable enables one man to lift more than 3,000 lb. and is stressed for a 50% overload.

Cable can be removed and replaced in the field, using only a hex socket wrench to remove a set screw. All stress points are high tensile strength manganese bronze. Frames are steel. Cable is attached with a new swaged sleeve and tapered 9/32-in. hole. Among the applications of the hoist unit are setting forms, hoisting work platforms, suppporting water lines or underground cable during excavating, bracing temporary structures, lifting, lowering or moving equipment. . . . *Write No. 177*

Lightweight hoist line

A new series of 5 lightweight lever hoists is announced by **Coffing Hoist Division of Duff-Norton Co.** Ranging from 3.4-ton to 6-ton capacities the hoists feature a brake chamber neoprene-sealed against water, oil, chemicals and dirt. Overload protection is embodied in the safety handle which bends to indicate an over capacity load before the chain breaks or hooks open. The Sealed Ratchet MA Series hoists have aluminum alloy frames for easy transport. The load hook is supported on ball bearings that swivel freely for easier load handling. Chain is welded alloy steel, heat treated and plated for maximum wear. . . . *Write No. 178*

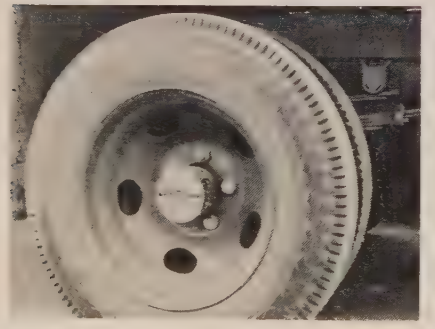
Large impact wrench

An impact wrench with 1¼-in. capacity and weighing only 21 lb. is announced by **Gardner-Denver Co.** The 18B-9 wrench is the largest of a series manufactured by the

firm. It is 13¾ in. long, excluding square drive. The fast starting air motor cannot burn out from overloading and the operator experiences no sudden stall shock when a bolt is seated. Spline drive and a complete line of accessory equipment are available. . . . ***Write No. 179***

Back-up warning alarm

A back-up warning bell for trucks called Warn-A-Larm has been marketed by **Warn Sales Co.** The alarm is a 6-in. diameter bell of chrome plated steel which fits on the hub of a rear truck wheel. Striker devices fitted in sockets around the hub bang the bell 4



times with each revolution of the wheel in reverse. Strikers are made of brass bar stock and are encased in a nylon molded cage. When the wheel travels forward, strikers are held in their slots; when the wheel is reversed they slip out of the sockets as each one reaches the apex of the revolution, and drop through a channel to strike the rim of the bell. Bronze springs at the end of the channels bounce the strikers back from the bell instantly for resonance. Units include brackets and stainless steel band stock for mounting. Can be mounted on either wheel. . . ***Write No. 180***

Lorain 40-ton crawler crane

Lorain model 56, a 40-ton crane in the 1¼-yd. class mounted on a carrier base is announced by the **Thew Shovel Co.** The crawler is

14 ft. long and 13 ft. wide with turntable connected by Lorain's Shear-Ball connection. This is the same single-race ball-bearing on which the company recently announced an unprecendented 10-year warranty. The machine will handle up to 110 ft. of boom. It is equipped with the patented square-tubular-chord boom which combines the high strength with light weight. Air power is used for both crane and crawler control. The engine is equipped with torque converter. Anti-friction bearings are used in such places as the travel shaft, hoist and swing drums. The travel mechanism is completely enclosed by a gear case cover which allows the unit to run in a constant oil bath. Rear counterweight is easily detached for highway transport. . . . ***Write No. 181***

Caterpillar eliminates the gear shift lever

The SynchroTouch Transmission Control announced earlier this year by **Caterpillar Tractor Co.** for both DW 21 and DW 20 tractors not only replaces the gear-shift

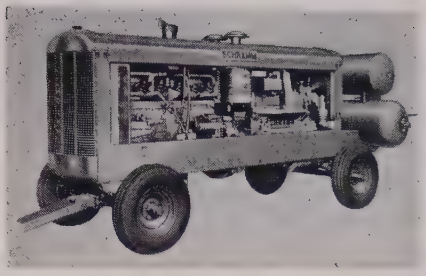
lever with an easily turned dial, it also permits operators to more easily and accurately match engine torque speed ratios to load demands. In addition to permitting

maximum machine performance, operator fatigue over a complete shift is considerably lessened. The unit is an optional item for both the DW 20 and DW 21 tractors. Basic transmission of the tractors is not changed.

The only alteration that takes place when the unit is installed is in the shifter shafts, forks, shaft brackets, transmission cover and the shifting linkage. The shifter shafts are replaced by pistons housed in hydraulic cylinders. Hydraulic pressure is supplied by a vane-type pump mounted at the rear of the engine and driven off the timing gear train. The hydraulic system is electrically controlled by the operator through the selector switch. . . . *Write No. 182*

High altitude compressor

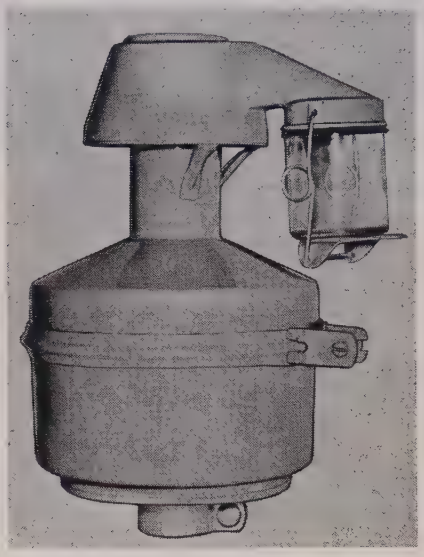
Full 600 cfm. at 100 psi. is delivered at altitudes up to 10,000 ft. by the new model 600 TC compressor announced by **Schramm, Inc.** The new Schramm unistage portable compressor is powered by a turbo-charged International diesel engine with a low 1,200-rpm. operating speed; the unit incorporates a single liquid cooling system which circulates through engine and compressor. Its standard equipment includes electric starter with 12-volt battery and generator, lubricating oil filters on both engine and compressor.



. . . *Write No. 183*

2-stage air cleaner attachment

A 2-stage air cleaner attachment employing both centrifugal force and filtering action is now available as an attachment working ahead of the standard oil bath cleaner. The unit called the "Filtrator" is manufactured by **Harco Manufacturing Co.** The accessory is made in sizes to fit engines on standard industrial and construction equipment. It attaches to the present air intake to remove virtually all impurities before the air reaches the oil bath air cleaner. In operation, a pre-cleaner removes more than 90% of all foreign material through centrifugal air currents depositing dust in a vacuum jar, which is easily removed and emptied by means of a quick-release clamp. Air is then passed through a sealed micronic filter which collects the remainder of the dust particles. The filtrator has no moving parts. Loosening of one wing nut permits disassembly for removal of disposable element.



. . . *Write No. 184*

News of DISTRIBUTORS

Former Columbia man joins Air-Mac

Norman Creitz, formerly with Columbia Equipment Co., Portland, Ore., has joined the Air-Mac sales force in the construction equipment division at Portland.

Western Machinery adds Cleveland Trencher line

Western Machinery Co., Phoenix, Ariz., has taken on the construction equipment line manufactured by The Cleveland Trencher Co., Cleveland, Ohio.

Changes in key personnel

Studer Tractor & Equipment Co. announces the recent resignation of Louis J. "Lou" Yakse, sales representative. As of this date, no replacement has been made. Announced also is that Robert R. Studer has joined the company as secretary-treasurer, replacing Gordon P. Studer who moved up to executive vice president. Robert will be sales representative for the Basin area of northwestern Wyoming in addition to his other duties. The Studer headquarters in Casper recently added some improvements in the way of additional sales offices, increased parts storage area, new parking area addition, etc.

Bill Durand joins Sahlberg

William E. Durand has joined Sahlberg Equipment, Inc., as sales engineer covering Kitsap, Thurston, Lewis and the harbor counties in Washington. Durand had been in the construction business on his own prior to joining Sahlberg.

Distributor news from Central California

Don Graham, industrial sales engineer with Allied Equipment Co., Fresno, Calif., has resigned to accept a position as sales manager with Copper State Equipment Co. in Phoenix, Ariz. Bob Jockers, formerly in tractor sales with Budd & Quinn, Fresno, replaces Graham. With the installation of a modern-equipped track parts rebuilding station at Fresno, and the addition of a Dynamometer and hydraulic track press, Allied can now rebuild track rollers, idlers and links, with resulting savings in parts costs to owners of International and other makes of crawler tractors in the Central Valley area of California.

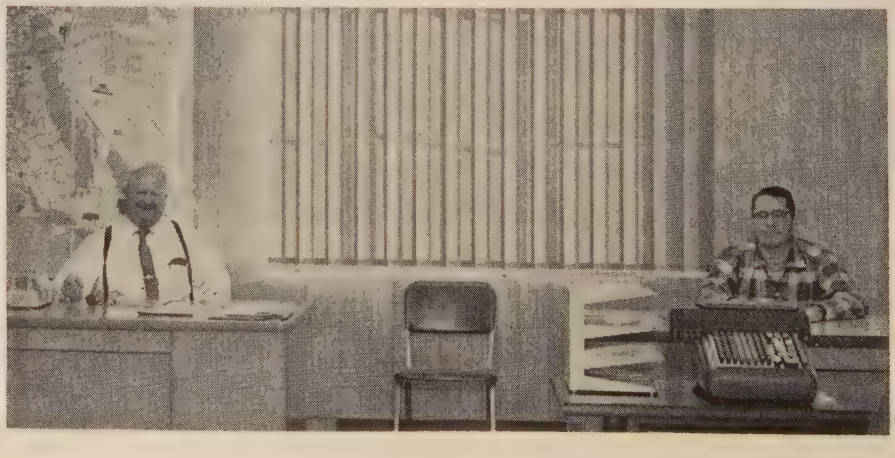
District managers and their territories

Operating out of the Santa Ana branch office of Machinery Supply, Inc., of Stockton, Richard N. Turner, Southern California district manager, covers San Luis Obispo, Kern and Inyo counties and all the area south to the Mexican border. Turner was formerly employed by Crook Company in Los Angeles, and prior to that by LeTourneau-Westinghouse Co. out of Peoria. Covering all of Northern and Central California is John C. Burke, district manager. Before joining Machinery Supply, Inc., Burke was with West Coast Engine & Equipment Co. at San Jose.

Min-A-Con promotes Tetmeyer

Len W. Beck, Sr., president of Min-A-Con Equipment Co. and The Diesel Service Co., Phoenix, Ariz. announces the promotion of Francis E. Tetmeyer to secretary and treasurer of both firms. Before

RECENTLY completed office of Coan-McIntosh, Inc., 720 Arthur St., Albany, Calif. Adjoining this structure will be the shop facilities now under construction. The distributorship, headed by *George R. McIntosh*, president, and *T. L. Coan*, secretary-treasurer, specializes in rentals and sales to the construction industry of complete line of compaction equipment, including Vibro-Plus Products, Inc., and the Wacker Corporation. A branch office is maintained in Sacramento, at 8350 Jackson Road.



joining these companies in 1958 he was with Rafter Engineering Co.

New Braun plant has up-to-date service system

The recently completed plant of Robert H. Braun Co. at Pico Rivera, Calif., is hailed by the company as the largest material handling distributor facility in the West. It occupies a 3-ac. area, has 32,000 sq. ft. of space, a third of which is devoted to offices and showrooms, and the remainder to warehousing and parts, and to repair and maintenance shops. The new facility will employ a conveyor system to expedite parts service, thereby cutting down waiting-time for drop-in customers and expediting movement of equipment being overhauled.

Wemco appoints distributor

Lively Equipment Co. of Albuquerque has been appointed to cover all of New Mexico except those counties along the Arizona and Texas borders for the Wemco line of aggregate processing equipment.

Takes on major accounts

Announcement is made by Diesel Construction Equipment Co., San Diego, Calif., of its appointment as exclusive franchise dealer for Fruehauf Trailer Co. in San Diego County, and for Mack Trucks in San Diego and Imperial counties.

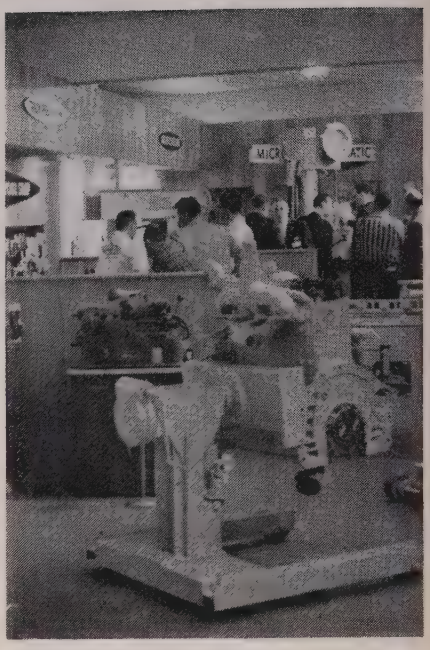
Denver Air Machinery new Kwik-Mix distributor

Denver Air Machinery Co., Denver, Colo., has been appointed distributor for the complete line of equipment manufactured by Kwik-Mix Co., including mixers, Moto-Bug material handlers, and Hi-Lifter 4-wheel drive fork trucks. The assigned territory includes the section of Colorado east of the Continental Divide, and Albany and Laramie counties. E. F. White is president of the company, and J. R. Lenz, vice president in charge of sales.

Inland Service & Supply sold

Announcement is made by Inland Service and Supply Co. and Inland Rentals, Inc., Las Vegas, Nev., of change in ownership. As of Jan. 1, C. K. and M. C. Christensen sold their capital stock to S. Grant Stewart and Walter H. Bell. Stewart will serve both organizations as president and general manager.

IN THE DRIVER'S SEAT of the new Case scraper is Marc B. Rojtman, dynamic president of the company, flanked by Ted A. Haller, vice-president for engineering.



DEALERS inspect shop equipment and tools available through Case dealer program.

Case launches new line of road building equipment

J. I. Case Company last month drew a bead on the light and medium sized construction equipment market, and unveiled some of its ammunition at a lavish "World Premiere" of 1960 equipment in Bal Harbour (Miami) Fla.

The company launched its drive in the road-building field with a 6½-yd. hydraulic scraper, smallest of a line that will extend to 18 yd., and announced plans to build motor graders, shovel-cranes and off-highway trucks in the future.

The announcement highlighted the annual dealer sales meeting in Miami attended by more than 7,000 people, all guests of the Case Co., including dealers and their wives, company personnel and guests. Flown to Florida in groups of 500, the visiting dealers were treated to a 5-day VIP vacation, studded with cocktail parties, floor shows, swimming and sight-seeing.

Star of the show was Case's energetic president, Marc B. Rojtman, the rotund dynamo who in the past three years has spent $28,000,000 on product development, raised industrial (construction equipment) sales more than 600%, and more than doubled the firm's 1956 volume of $87,000,000.

During 1959, Rojtman reported, Case sales topped $200,000,000 including $62,500,000 in industrial sales, and, he inferred, dealers ain't seen nothing yet. Rojtman forecast that the industrial line would outstrip farm sales in the next few years to account for 55 to 65% of the firm's volume.

Backing up this growth forecast the company unwrapped a multi-stage program embodying:

Product Development—Backbone of the company's current line is a light wheel tractor series with backhoe-loader attachment, which alone accounted for $35,000,000 of the company's 1959 industrial sales.

A diesel crawler tractor series includes 60, 80 and 100-hp. models. These units can be rigged as loaders and/or bulldozers, and feature constant-mesh transmission, full hydraulic controls extending to angling of the dozer blade. Tractors were shown with a wide variety of attachments such as brush rakes, log tongs, rippers and several sizes of buckets and blades. A wheel-loader line with 4-wheel drive, starts with the 15-cu. ft. capacity W-3, available with backhoe and other tools, and runs to the current W-12 of 2 yd. capacity. Soon to come, W-15 at 3 yd. capacity.

Introduced at the show was the S-20 scraper (see New Equipment) a 6½-yd. self-propelled unit to be followed by others ranging up to 18 yd.

Significantly, the first scraper is a small one, and Rojtman says he does not intend to compete in the big leagues of heavy-duty equipment. His target is the small and intermediate field-cleanup and utility jobs on big jobs, the full spread on small contracts, subdivision work and industrial excavation.

Dealer Assistance—To strengthen its 300 industrial dealers Case offers a liberal building program, with a uniform layout covering show room, exterior display, warehouse office and service shop. New buildings will have a pylon and panel sign insignia, which ultimately will identify all Case outlets. Dealers are offered two models of transport trucks equipped with tilt bed or tilt trailer and rigged for complete equipment field service, for demonstration, pickup and delivery. All manner of shop tools ranging from hand tools to automatic welding equipment are offered at cost and pushed heavily by Case service men who want well-equipped dealer shops. Service merchandise even includes a Case-designed record system for shop inventory which will fit any size operation. A mechanic training program progresses from correspondence courses through slide films, mobile school truck, to two-week formal course (stressing management) at the home office.

This is the last of the "World Premiers" which opened 3 years ago in Phoenix. Next year dealers

will be invited to Paris, where Case is building a new plant, but the company will pick up the tab only for those dealers who show a big increase over 1959 volume.

Several Western dealers and salesmen won awards at the meeting. Heading the list was the eagle award, for doubling previous year's business, which went to Schuman Carriage Co., Ltd., Honolulu, Hawaii, owned by G. E. "Dutch" Schuman.

Individual salesmen winning 150M sales volume awards were: Claude Pryor, Kawana Equipt. Sales, Santa Rosa, Calif.; R. W. Greider, Contractors Machinery Co., San Francisco; Burl Schweikart and Bill Hoy, Orange County Tractor Co., Anaheim, Calif.; Ray Gilmore, Gilmore & Wilcox, Southgate, Calif.; Paul Tomothy and Willard Stoffel, K.C.Y. Tractor Co., El Cajon, Calif.; and Stanley Lindo, Schuman Carriage Co., Ltd., Honolulu, Hawaii.

Portland branch winners included Joe Cooley and Carl Halverson, Midway Machinery and Supply, Eugene, Ore.; Joe Crooks and Roger Smith (double), Willamette Equipt., Portland; Al Floyd, Western Tractor, Seattle; Jack Stevens (double) Tool Crib Sales, Seattle; John Graham, Graham Implement Co., Chehalis, Wash.; Don Morrison, Tractor Center, Salt Lake City; and Roger Chesrown, Clearwater Tractor, Lewiston, Idaho.

MANUFACTURERS

Union Wire Rope promotion

Announcement is made by Union Wire Rope Corp., Kansas City, Mo., of the promotion of D. E. Bedford. Formerly district manager at the Portland, Ore., branch, Bedford has been made regional manager for the states of Washington, Oregon, California, Arizona, Nevada, western Montana, and most of Idaho. His headquarters will be in San Francisco. Dom A. Villanueva, for-

D. E. Bedford

merly sales representative in Oregon and Idaho, has been appointed branch manager, and will continue to travel Washington, Oregon, and the western portions of Montana and Idaho. Richard K. Erickson, formerly southeastern representative, has been transferred to Los Angeles.

Western regional manager

Otto R. Brown has been named Western regional manager of the explosives and mining chemicals department of American Cyanamid Co., Salt Lake City, Utah. He has been with Cyanamid since 1935.

George Jennings moves up

George C. Jennings has been named wire rope sales manager of The Colorado Fuel & Iron Corp. He was formerly CF&I's New York district sales manager.

Gebhard Jaeger dies

Gebhard Jaeger, 85, founder and honorary chairman of the board of Jaeger Machine Co., Columbus, Ohio, died at his home in Hollywood, Fla. Jaeger organized the machine company in 1906 to manufacture concrete mixers and machinery.

Top level engineering appointments announced

Two important engineering appointments are announced by Charles F. Hill, general manager of Massey-Ferguson Industrial Division, Wichita, Kans. Henry J. Thomas, Milwaukee, who has had wide experience in earth-moving and construction equipment design, is named chief engineer. J. I. Michaels, Wichita, has been named consulting engineer, as an assistant to Thomas.

Delcour becomes Denver district manager

William T. Delcour has been named manager of Goodyear Tire & Rubber Co.'s industrial products district office at Denver, Colo., replacing J. L. Reid, who has resigned. Delcour has been a member of Goodyear's organization since 1948.

West Coast producers join forces

Two leading West Coast producers of pressure-treated forest products have joined forces with the acquisition by J. H. Baxter & Co., San Francisco, of part ownership in West Coast Wood Preserving Co. of Seattle, Wash. In making the announcement, Walter L. Wyckoff, co-owner and president of the new company, stated the firm will now be known as Baxter-Wyckoff Co., with offices remaining at 411 Seneca Bldg., Seattle.

Porter elected chairman of K&M

The election of Robert R. Porter as chairman of the board of Keasby & Mattison Co., Ambler, Pa., manufacturer of construction and industrial materials, is announced. In addition to his new duties, Porter will continue to serve as company president.

Sales territory open

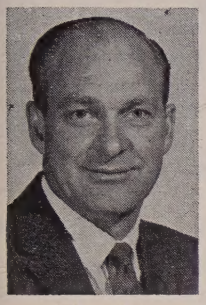
A large Eastern equipment manufacturer announces the need for representatives to sell a popular line of building construction equipment to distributors in nine Western states. Men interested in supplementing their construction equipment accounts may address Box 10, *Western Construction*, 609 Mission St., San Francisco 5, Calif. Inquiries confidential.

W. B. Litle resigns from Bucyrus-Erie Co.

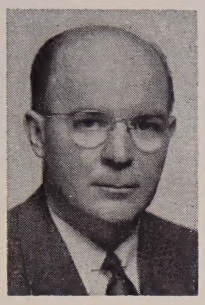
W. B. Litle has resigned as chairman of the board of directors of Bucyrus-Erie Co. He had been associated with the company for 32 years, primarily in executive capacities. His resignation is due to continuing ill health.

Atlas Copco names district mgr.

Promotion of John R. Thornton from its Salt Lake City staff to California district manager, in charge of construction and mining sales, is announced by Atlas Copco Pacific, Inc. Thornton joined Copco in 1954 and for the past year has been its resident sales engineer on the Arch Dam project in Utah. Rock drills, drill steels and bits, air compressors, and related equipment are the principal Copco products.



Thornton



McCall

J. D. McCall becomes Columbia-Geneva head

Appointment of J. D. McCall as president of Columbia-Geneva Steel Division of United States Steel Corp., with headquarters in San Francisco, was recently announced. He succeeds Leslie B. Worthington who was elected president of U. S. Steel. A native Californian, McCall started his business career in Oakland and joined Columbia Steel Co. in 1936 as an engineer and statistician. At the time of his appointment to the top position he was vice president —operations of Columbia-Geneva, a post to which he was appointed in 1957. Prior to that, he had served as the Division's general manager of operations.

Asphalt Institute elects officers

Eugene M. Stone, president of the Empire Petroleum Co., Denver, Colo., was recently elected chairman of the board of The Asphalt Institute, College Park, Md., succeeding Don L. Nielsen of Union Oil Co. of California. Western regional vice presidents elected are C. W. Turner, American Bitumuls & Asphalt Co., San Francisco, and Charles P. Taylor, Wilshire Oil Co. of California, Los Angeles.

Sika sees greater use of plastics in construction

Engineers from as far away as Japan and Venezuela gathered for the 1959 Sika School on Concrete Technology. Dr. E. Schmid, president of Sika Chemical Corp., addressed the group and noted the continual growth of plastics in the concrete industry. In its eighth year, the school covers such subjects as Sika epoxy resins, details of designing construction joints, theory and practice of coatings and membranes, and admixtures for concrete.

CLASSIFIED

Space is sold as advertisers inches. All advertisements in this section are ⅛ in. short of contracted space to allow for borders and composition.

CONTRACTOR WANTED

To mine and deliver iron ore on board car. Sizable open pit operation. Write Box 2A, WESTERN CONSTRUCTION, 609 Mission Street, San Francisco 5, Calif.

Rates are $15.50 a column inch. Copy should be sent in by the 15th of month preceding publication date.

"Chuck" Ewing becomes branch manager

A change in management at Goodall Rubber Co.'s Denver branch is announced. Burford Peck, who had been manager for the past four years, has voluntarily left the Goodall organization, and G. R. "Chuck" Ewing has been promoted to manager. His experience in both sales and management well qualify him for the managerial duties, according to announcement from P. E. Moss, Northwest Regional Manager, Salt Lake City, Utah.

Sales appointment by Worthington

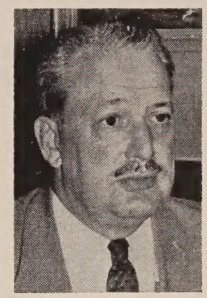
Graham Ross has been appointed manager of sales of Worthington Corporation's Plainfield, N. J., Division. Ross will be responsible for sales of all equipment made at the Plainfield plant, where Worthington manufactures truck mixers, pavers and allied construction equipment. Ross succeeds Paul Galton who left Worthington to join the newly-formed Ransome Company.

Executive promotions announced

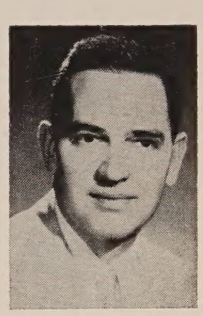
Three executive appointments in Bethlehem Steel Co.'s sales department and a retirement are announced by J. V. Honeycutt, vice president in charge of sales. W. J. Stephens, currently an assistant general manager of sales, becomes assistant vice president. D. C. Roscoe, also now an assistant general manager of sales, becomes general manager of sales succeeding K. L. Griffith, who is retiring following 40 years' service with the steel company. S. S. Cort, general manager of sales for the Pacific Coast Division, becomes an assistant general manager of sales. Cort will return to the Bethlehem office after twenty years of service in the Pacific Coast Division where since 1954 he served as chief sales executive.

Eimco promotes two

Announced by Joseph Rosenblatt, president of The Eimco Corporation, are two top management appointments. Wayne L. Dowdey has been named general sales manager for the corporation. He formerly managed Eimco's Southern district. Paul O. Richter, company vice president, has been appointed general manager of the Filter Division. Richter will move from Illinois to take up residence in Salt Lake City, where Eimco's head offices are located.



Richter



Dowdey

Euclid marks special occasion

Euclid's training department recently passed a milestone in its program of training customer personnel at the Cleveland factory. Members of two recent classes included the one-thousandth Euclid dealer serviceman and the one-thousandth Euclid customer. During the past ten years over 6,000 men have completed courses on various types of Euclid.

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