VESTERN CONSTRUCTION

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DECEMBER 1952

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WESTERN CONSTRUCTION

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FRONT COVER

COMMON EXCAVATION from Palisades dam site has been stockpiled for later use on embankment. Shoveled out of stockpile, it has been run over 5-in. grizzly shown here for separation into Zone 2 and Zone 3 material. Full story of 1952 progress by Palisades Contractors is on pp. 59-63 of this issue.

USBR photo by Phil Merritt.

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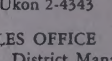

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WESTERN CONSTRUCTION

Health-and-welfare problems have arrived

Contractors of the West face serious and complex problems with the positive trend toward health-and-welfare programs for construction labor. The national trend has already been established in other industries and the gradual extension into the construction field seems inevitable, regardless of the change in political climate. Whether the addition of such a fringe benefit is a logical part of steadily advancing wage rates may now be considered a rather academic question and not worth time for discussion.

This is not theory, but fact. The first health-and-welfare program has already been established in the Northwest, with funds accumulating and machinery for disbursements set up. Further, in Northern California a comprehensive study of such a program is under way by the AGC as part of the current labor contract.

To illustrate some of the peculiar problems involved, consider a health-and-welfare program for labor in an Eastern coal mining community, as compared to one for construction operations in the West. A coal mine is permanent and so is much of the labor force. These employees reside in the local town, have done so for years, their families and their needs are generally well known both to management and labor officials alike. No confusion in state laws exists. The just and equitable administration of a fund under these conditions is relatively simple.

Now, turn to the construction industry in the West as the extreme opposite. Each contractor's job is a completely individual set-up as to location, type of work, labor force, local laws, area of labor agreement and the relations with a different contracting agency. Types of labor may vary as the job progresses, involving heavy equipment at an early stage, and form-work and concrete a few months later. Labor turnover is seasonal and if the job extends more than one year the force may be completely new. Families are equally mobile, often living in towns far from the job site. The house trailer, which has become the symbol of the skilled construction worker of the West, illustrates the problem of administration.

The source of the funds and the manner of accumulating are probably the simplest part of starting a welfare program, even though they may provide the toughest nut for negotiating. Related to the accumulating of a fund is the question of grouping several crafts together. While this will be favored by contractors, labor officials will want separate funds for each union, which is another preliminary hurdle of some magnitude. Other problems among the seemingly endless number for any welfare plan involve the impact of state laws as contractors move from job to job, the use of funds in one bargaining area for a man moving in from another, setting up the trustees for the fund and the selection of the actual administrator, not to mention the proper time interval to be established between the start of the fund and the initial disbursements.

For the contractors of the West the trend toward health-and-welfare programs is one that needs serious study. A double responsibility rests on these contractors: (1) they must use their business knowledge and ability to see that such programs are established on sound principles, and (2) they must see that their employees, who are members of the unions, get fair and equitable treatment in the subsequent administration. Contact and understanding established during past years with labor officials will now prove of new importance. Only through an understanding of both management and labor problems can solutions be reached that will allow the construction industry to move forward in its essential and expanding service to the West.

Prestressed concrete units for sale

On the structural horizon appears the idea of prestressed concrete units manufactured and sold in standard sizes. Although the rate of progress in this development may be uncertain, recent advances place it in the practical stage. Use of precast concrete units has evolved from the original building-blocks of a generation ago to the wall-sized slabs of today. Attempts have been made to produce structural elements for merchandising with guaranteed strengths and other characteristics. Such enterprises always have faced the major hurdle of size and weight per unit, not to mention the engineer's need for uniform quality. Transportation costs and problems were factors in limiting the selling area for the commerical plant. And although the large, modern casting plant might be acceptable to the designer in regard to the quality of its products, its area for sales was limited. On the other hand, the small-town type of plant might be in the right sales area but would not have the quality control that made the product acceptable. Thus, one way or another the idea lagged.

The first part of the problem is nearing solution, as the quality of output from smaller plants has improved. Better equipment in the smaller capacities, and more trained concrete technicians have provided this answer. There remained the matter of weight and size of the resulting units. Now, the principle of prestressing, or post-tensioning, is the answer to this difficulty. If the application of prestressing can produce a fifty per cent reduction in the size and weight of concrete structural units the radius of economic selling will be extended in proportion. Further, quantity output always brings further reduction in costs. Structural engineers, and their architectural associates can well watch this development as one of today's most important phases of concrete design and construction.

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Austin-Western and Snow Master—this is combination to break the clutch of winter—to k city streets and country highways clear.

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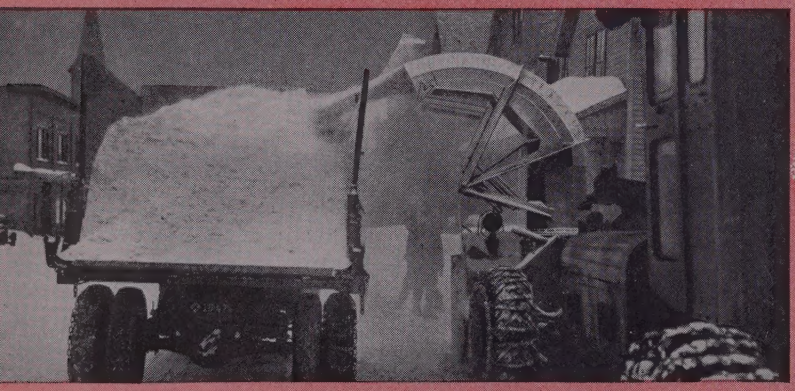
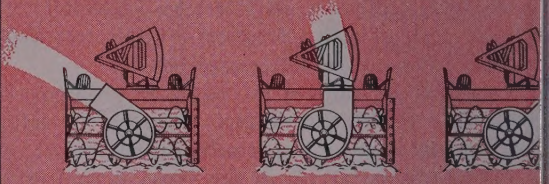
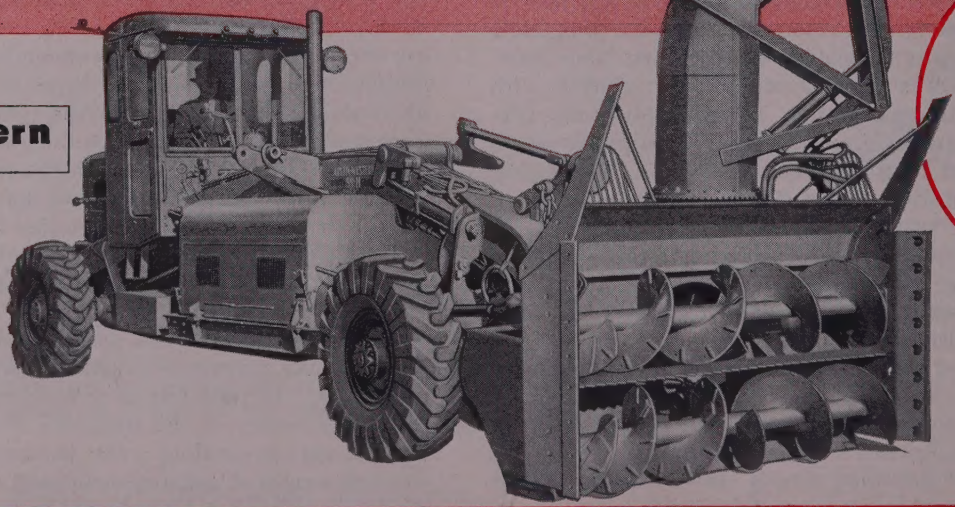




Effortless, hydraulic power makes all adjustments instantly—t blower housing for direct casting to either side, or through

ompletely directional control, with "wrist action" chute, makes it easy to load trucks om any angle. When casting, the telescopic chute puts the snow precisely where it's anted. No broken windows. . . no clogged driveways.



The engine which drives the Snow Master is mounted beneath the arch of the grader frame . . . when summer comes can be quickly and easily removed as a unit and replaced by circle and blade.

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WESTERN CONSTRUCTION

DECEMBER 1952

FIRST SEASON AT PALISADES

In eastern Idaho the record earthfill dam being built by the Bureau of Reclamation is ahead of schedule—Snake River channel change offsets diversion tunnel delays—Contractor places 5% of embankment this season, having planned on only stripping and excavation—Wide open site allows fast hauls by big equipment spread

UPSTREAM CUTOFF excavation was complicated by a "glory hole" that tied up a dragline for an extra month while embankment placement was carried out on both sides.

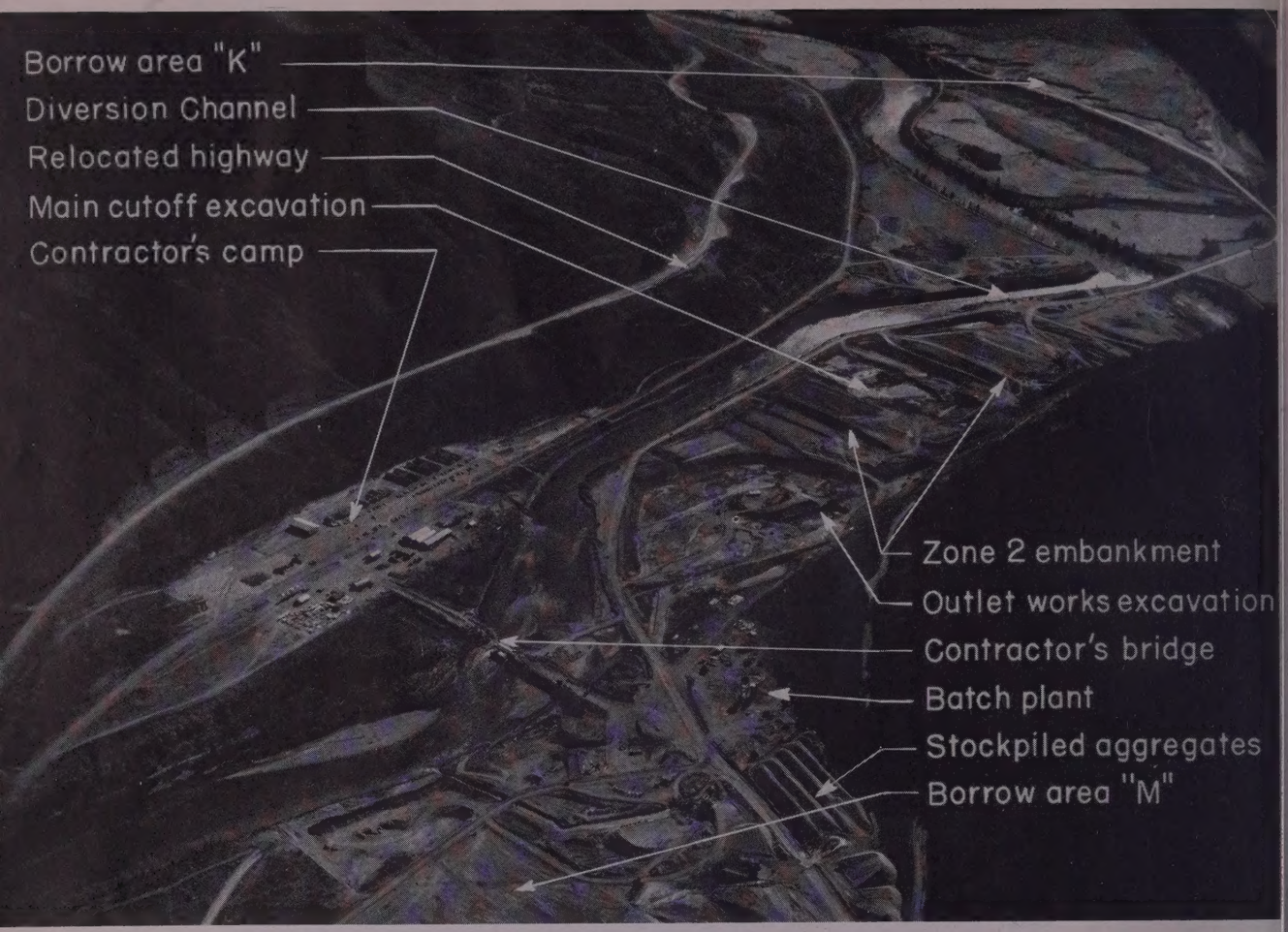
GOOD LUCK on the weather helped Palisades Contractors make unprecedented progress during the first season of work on the prime contract for construction of Palisades Dam in Idaho. Mid-October saw the first cold snap hit the big Bureau of Reclamation project on the south fork of the Snake, and by then nearly 650,000 cu. yd. of embankment had been placed. The contractor's original plans had included only stripping and foundation excavation in 1952.

Palisades Dam is the main item in a $76,000,000 project for control and utilization of Snake River waters. The dam itself is the biggest earthfill structure yet attempted by the Bureau. It is being built on a $29,180,000 contract held by a joint venture of J. A. Jones Construction Co. of Charlotte, N. C., and Seattle, and Chas. H. Tompkins Co. of Washington, D. C. Rising 250 ft. from the river channel to a crest at el. 5,630, the dam spans 2,200 ft. between abutments at that elevation. Together with a maximum base thickness of 2,100 ft., these dimensions provide an index to the 13,800,000-cu. yd. total bulk of the structure. Other specifications of the dam and a general description of the project were reviewed in *Western Construction* for May 1952, pp. 86-87.

Good borrow

Weather wasn't the only feature contributing to the 1952 progress. Of perhaps more overall importance was the presence of excellent embankment material close at hand. The principal source tapped was borrow area "K," a 250-acre bench of alluvium at the mouth of Bear Creek, a Snake River tributary on the left a scant 1¼ mi. upstream from the axis of the dam. Cleared earlier in the season, with cleared and stripped material easily shoved downhill and over the edge of the bench beside the river channel, this area was a perfect supply for Zone 1 embankment—impervious material placed and tamped for the central core of the dam, its upstream cutoff and blanket.

Altogether, 5,000,000 cu. yd. will be needed for Zone 1 and, to get it, other borrow areas will have to be opened up downstream later. During the recent



LOOKING UPSTREAM late in October, this air view shows all features of the project but the tunnels which are hidden by Calamity Point (right). The Snake River is shown flowing in an excavated channel which has allowed major operations to move ahead before the diversion tunnels are completed.

season, however, area "K" sufficed, being excavated for some 475,000 of its 3,540,000-cu. yd. potential. Moisture conditions in the pit varied from place to place and from time to time, but the contractor was able to pick and choose his cuts to keep a steady movement of dirt going—dirt that hit within the allowable range in moisture content and needed no further processing.

Two shovels (5½- and 3½-yd.) and a dragline (4½-yd.) were able to work against cut banks that allowed maximum hourly output. By digging "pockets" in the bank, they were able to load out the hauling equipment on either side with a minimum of lateral swing or vertical lift. The haul to the dam was downhill all the way. For these reasons, daily production was about 20,000 cu. yd. of Zone 1 material. This was done in two shifts totaling 19½ hr.

Trouble at the start

Naturally all this didn't come about in a day. It was preceded (and accompanied) by 1,250,000 cu. yd. of stripping and excavation and by a river channel change that meant moving another 250,000 cu. yd.

Palisades Contractors bid low last April and moved onto the job late in May, expecting to do some excavation this year on the flood plain between the river channel and the left abutment. Next season, with the diversion tunnels in the left abutment complete, it was planned to get the river out of the way more or less permanently so that the full width of the dam site would be clear for work. However, an obstacle developed.

The tunnel contract had been let last fall to J. A. Terteling & Sons of Boise. This early work represented part of the $2,000,000 "shoestring" on which the project began. Plans were for the Terteling contract to be done this year. The prime contractor would take over for tunnel completion—some open-cut work downstream and tunnel lining.

Early diversion

But the steel shortage plagued Terteling, who wasn't even able to set portals until June of this year. As a result, the tunnels won't be ready for Palisades Contractors to take over until next year. To keep the tunnel delay from affecting the rest of the job, the prime contractor elected to move the river this year, handling it somewhat as was done at Lucky Peak Dam.

In its natural state, the Snake lives up to its name at Palisades. It flows in a relatively narrow channel along the side of the canyon above the dam site, but at Calamity Point, the massive andesite intrusion that juts into the canyon to form the left abutment, the river is turned nearly 180 degrees to the right. It crosses the canyon about on the axis of the upstream cutoff and flows thence on the right side of the canyon.

Digging the channel

Moving in four tractor-scraper combinations, the contractor started on July 1 to excavate a diversion that would isolate the natural jog. Commencing about ¼ mi. upstream, the new channel would shift the river at a somewhat lesser angle.

After the flood plain gravels had been stripped, a 5½-yd. shovel and a 6½-yd. dragline moved in to finish the 250,000-yd. job, cutting the plug at the upstream end of the diversion on August 16. An added feature of this trick was that it effectively put borrow area "K" on the same side of the river as the portion of the dam site that was dried up. Actually, the haul road traverses the cofferdam erected to turn the river into its new channel.

The diversion will carry 30,000 cfs. which is very likely enough capacity to handle the river next spring, and certainly enough thereafter. For the tunnels should be ready next winter. They will also pass 30,000 cfs., and with 5 ft of freeboard on the cofferdam that will

an the entire site to el. 5,425. Thus, mmencing in 1954, the dam site can be veloped to its full width. The unusual version tunnel capacity permitting this sults from the eventual function of the version tunnels. They will be the power d outlet tunnels on the completed oject.

rogress this year

As summarized earlier, there was a t of excavation done during 1952. In e site itself, 1,000,000 cu. yd. of mate- al were moved out, much of it stock- led downstream for later use. Strip- ng in borrow areas "K" and "M" ac- counted for another 200,000 cu. yd. Rock excavation from the left abutment and the powerhouse vicinity came to 50,000 cu. yd. Finally, tunnel excavation on the separate Terteling contract was esti- mated at 40,000 cu. yd. It is mentioned here principally because it formed a source of a portion of the embankment placed.

Embankment in place totals 430,000 cu. yd. of Zone 1 material, placed at least to el. 5,407.5 wherever the site had been stripped. Progress figures for mate- rial placed in other zones are: 70,000 cu. yd. in Zone 2, 70,000 cu. yd. in Zone 3, and 80,000 cu. yd. in Zone 4.

The material in Zones 2 and 3 came entirely from common excavation. The major portion of this went first into stockpile and was shoveled out as needed. Passed over a 5-in. grizzly, it was split, the scalpings going into Zone 3 and the passing material into Zone 2. The remaining embankment placed in these two zones came directly from ex- cavation without processing.

Zone 4 material placed in 1952 came from rock excavation at the left abut- ment, powerhouse, and outlet works, and from the tunnels being driven under the Terteling contract.

Next year, Zones 2 and 3 will be sup-

DIVERSION TUNNELS OF 26-FT. DIAMETER WILL SERVE POWER PLANT

THE TWO diversion tunnels for Palisades Dam construction pierce Calamity Point, the left abutment, at el. 5,375, about the level of the river channel. Eventually to serve as power and outlet tunnels, they are, respec- tively, 1,210 and 1,550 ft. long, lying on parallel alignments 125 ft. apart, center to center. They are being driven by J. A. Terteling & Sons of Boise, largely on a separate contract for $1,242,700. Terteling has subcon- tracted completion of the tunnels from Palisades Contractors.

As pictured and noted in *Western Construction* news item last October (page 112), they are being blasted through andesite in 12-lin. ft. maxi- mum rounds, achieving a 31-ft. circu- lar section that will be concrete lined to 26 ft. During the month of Septem- ber bad ground slowed the miners to 4-ft. rounds, but in October they had moved up again to 8-ft. rounds and were nearing rock that would permit maximum progress. Total advance at each heading by mid-October was about 700 ft.

Drilling procedure

For drilling the tunnel faces, an alternating schedule has been adopted so that a single drill jumbo can be used. This three-deck affair is rubber- mounted on a Kenworth frame and is hauled by a D-8 Cat into first one tunnel and then the other. It mounts 15 Joy jibs with Thor drills. Drill steel is 1¼-in., with disposable bitts. About 90 to 100 holes are drilled for each round and loaded with 100 sticks of du Pont gelatin 60% powder and 1,000 sticks of du Pont Gelex 45% powder, fused with 6- to 12-ms. de- lays.

Three shifts of miners are pushing the work, and a complete cycle takes about 12 hr. Good rock breakage has been the rule, speeding operations of the Koehring electric shovel that is mucking the rock out into 4 Koehring Dumptors.

The tunnels are fully supported with 10-in. steel I-beam sets placed at 4-ft. centers. Steel lagging has been extensively used. At present the tun- nels are not being taken to full sec- tion, in order to permit easier opera- tion of equipment. Excavation of the invert, 6 ft. at the deepest, will follow holing through.

DRILLS are mounted on a truck frame moved by tractor. This outfit alternates in the two tunnels on a schedule that gives a complete round every 12 hours.

Spillway tunnel

In addition to completion of these tunnels, Terteling's subcontract in- cludes driving the spillway tunnel, on which no start has yet been made, and also the inclined shafts that will be added to power and outlet tunnels.

The spillway tunnel will be located even farther into Calamity Point, and will be 1,850 ft. long, finished to 28-ft. diameter. Its upstream invert will be at el. 5,570. Dropping 168 ft. through an inclined shaft in the first 312 lin. ft., the tunnel will be heavily reinforced. The bore will then proceed for over 1,500 ft. as an unreinforced concrete- lined section. An 80-ft. length will en- compass the transition to reinforced design again, and the final 50 ft. will be a pressure conduit constructed in the open and then backfilled.

Inclined shafts for the other two tunnels will be opened from el. 5,452 in the abutment, where sliding gates will be located behind trashracks built into the abutment to the full height of the dam. The original portals and first 123 ft. of the tunnels will then be plugged with concrete.

Elevation and use

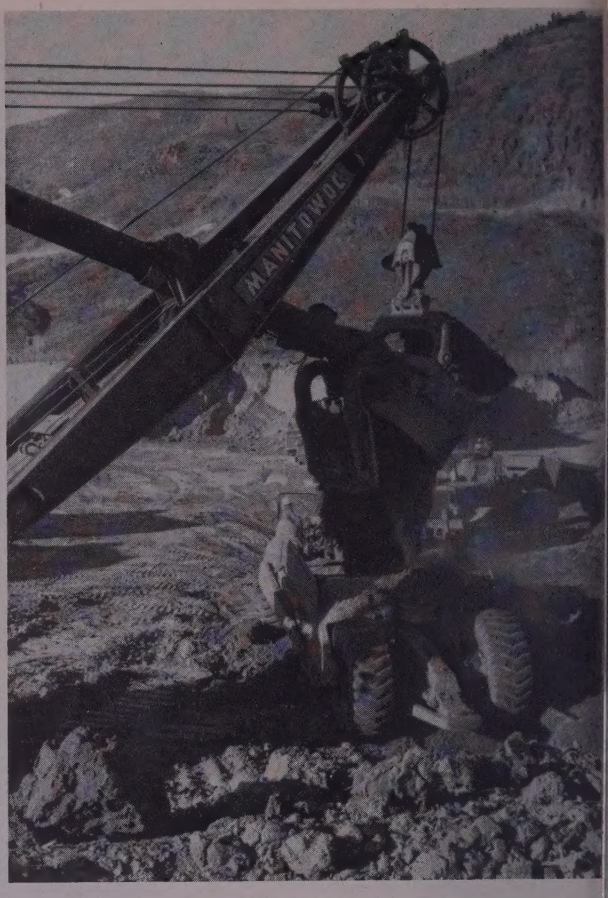
Dowstream invert of all three tun- nels will be at el. 5,370. Maximum tail- water elevation will be 5,386 ft. Draft tube invert below the powerhouse, to be built at the toe of the dam, will be el. 5,350. The outlet works will be built so that effluent from both tun- nels can be wasted, or power tunnel effluent put to work through four 30,000-kva. turbo-generators.

The unavoidable delay to the Ter- teling contract has caused a "housing problem." Expecting originally to be finished before the prime contract was under way, Terteling set up his com- plete camp close by the tunnel por- tals, actually in the forthcoming dam site.

Now, with the prime contract ahead of schedule, the tunnel contractor has almost lost his camp! Only the change house, compressor house, and office remain, clinging against Calam- ity Point while the main dam con- struction proceeds virtually on all sides.

The tunnel work by Terteling is being supervised by E. C. "Red" Williams, project superintendent. Heading up the three shifts are Jim Harding, C. L. Pulley, and Chuck Eaton. Bud Kimes is the contractor's engineer, and Rudy Hardin the office manager.

COMMON EXCAVATION out of stockpile was first run over a 5-in. grizzly, during this season, to secure material for Zone 2 (passing) and Zone 3 (scalped). Borrow pit yardage next year won't need this treatment.



LOADING carrying scrapers with a shovel is unusual but wa done during October as the contractor probed borrow area "K" for material of proper moisture content.

plied directly from borrow area "M," adjacent to the downstream toe on the left bank flood plain. Investigation has shown that cuts to about 8-ft. depth will produce Zone 2. Deeper cuts will give Zone 3.

Zone 4 next year, as it was in large part in 1952, will come from rock excavation, both by the prime and tunnel contractors.

Moisture and compaction

Zone 2 material in 1952 was generally too dry when placed, probably because it had been handled in and out of stockpile, as well as run over a grizzly. To dampen it properly a 5,500-gal. water tank built as a semi-trailer was brought on the job, hauled by a Caterpillar DW-21 tractor. The embankment layers were then each thoroughly blended to their full depth by several passes of a gang disc. The disc was also used occasionally to aerate material that had been too damp in its natural state.

The Zone 1 material generally was "just right." However, this is not indicative that the same conditions will prevail during remaining seasons. The contractor is prepared to irrigate his borrow areas next year as may become necessary.

Compaction was handled by 12 passes of sheepsfoot rollers. Specifications call for 95% of maximum density at optimum moisture. Five rollers were used on Zone 1, the most extensive embankment in area, and one roller on Zone 2.

Glory hole

Excavation of any dam site always seems to turn up at least one unexpected feature. At Palisades in 1952 it was a "glory hole" about 70 ft. deep, located right at the old river jog hard against Calamity Point. Generally, the site is underlain in the river and on the right by sandstone—actually a very compact formation of gravel and claye sand. However, the andesite of Calamit Point makes contact with this materia where the river scoured against th point. There, ages past, the river erode away the sandstone faster than the an desite. The result was a localized area o scour and gouging in which detrital ma terial churned to create the 70-ft. de pression.

Subsequently filled up with river grav els as the Snake advanced to geologi maturity, this hole was hidden, to be

EQUIPMENT AT PALISADES DAM

- 1 5½-yd. Manitowoc 4500 shovel
- 1 6½-yd. Manitowoc 4500 dragline
- 1 60-ton Manitowoc 3500 crane
- 1 2½-yd. Bucyrus-Erie 54-B shovel
- 1 2½-yd. Bucyrus-Erie 54-B dragline
- 1 4½-yd. Marion 1100 dragline
- 1 3½-yd. P&H 1055 shovel
- 1 25-ton P&H 255 truck crane
- 1 ¾-yd. Insley backhoe
- 1 1½-yd. Hough Payloader
- 5 25-yd. Euclid bottom-dump wagons
- 20 17-yd. Euclid bottom-dump wagons
- 10 15-yd. Euclid end-dump wagons
- 4 9-yd. Euclid end-dump wagons
- 4 Caterpillar DW-21 tractor-scrapers
- 14 Allis-Chalmers HD-20 tractors
- 1 Allis-Chalmers HD-9 tractor
- 1 Allis-Chalmers HD-5 tractor
- 2 Caterpillar DW-10 tractors
- 6 40,000-lb. McCoy sheepsfoot rollers
- 1 40,000-lb. McCoy smooth roller
- 4 Allis-Chalmers AD-40 graders
- 1 5,500-gal. water tank semi-trailer
- 1 5,000-gal. water tank semi-trailer
- 6 600-cfm. Ingersoll-Rand Gyroflow compressors, portable
- 1 105-cfm. Ingersoll-Rand Gyroflow compressor, portable
- 3 600-cfm. Gardner-Denver electric compressors, stationary
- 5 Joy wagon drills
- 2 Gardner-Denver wagon drills
- 2 Joy wagon jackhammers
- 2 Ingersoll-Rand wagon jackhammers
- 2 Truck-mounted grease outfits.

ANOTHER PANORAMA shows extent of embankment operations in October. Zone 1 embankment in cutoff and blanket on left, Zone 2 on each side of cutoff. Tunnel portals are around point to left of tunnel contractor's buildings at base of point.

ome a perverse fascination for the con-actors and engineers building Palisades am. Alongside it, excavation for the pstream cutoff was completed in Sep-mber, at least over as far as the new ver channel. But in the glory hole it-lf a 4½-yd. dragline worked on until ctober 14, finally cleaning everything t so that Zone 1 material might be placed. Bottom of this hole is at el. 5,329, while the remainder of the upstream cut-off carries down only to el. 5,368. With the old riverbed at el. 5,375, incidentally, there was very little stripping generally necessary in this area.

During the winter that has now hit the job, tunnel work will continue. Some material will be placed in Zone 4 of the dam. This is the biggest stuff and isn't susceptible to freezing. Concurrently, rock excavation will be carried on in the left abutment and powerhouse areas.

DIRT YARDAGE AT PALISADES DAM

BORROW PITS

(Measured in excavation)

Area	Contents	To place in
K	3,540,000 cu. yd.	Zone 1
L	600,000	Zone 1
	617,680	Zone 2
	68,630	Blanket
M	2,700,000	Zone 2
	3,515,520	Zone 3
	218,570	Zone 4
	126,270	Blanket
N	2,000,000	Zone 1
Site	1,110,550	Zone 2
	409,000	Zone 3
	405,000	Zone 4
	34,360	Blanket
	170,000	Riprap
	15,515,580 cu. yd. (plus additional Zone 4, blanket, and riprap from tunnel excavation)	

DAM

(Measured in embankment)

Zone	Total yardage	Comes from	1952 progress
1	5,000,000 cu. yd.	K, L, N	430,000 cu. yd.
2	3,770,000	L, M, Site	70,000
3	3,570,000	M, Site	70,000
4	880,000	M, Site, Tunnel	80,000
Blanket	310,000	L, M, Site, Tunnel	——
Riprap	270,000	Site, Tunnel	——
	13,800,000 cu. yd.		650,000 cu. yd.

PERSONNEL

Bureau of Reclamation

Palisades Dam is a project of Region 1 of the Bureau of Reclamation, headquartered at Boise. Louis B. Ackerman is construction engineer for the Bureau at Palisades. I. D. Jerman is field engineer on appurtenant construction within the reservoir. This later work includes relocation of 20 mi. of State Highway 26, and construction of 30 mi. of Forest Service road to maintain access in side canyons formerly served by a shorter, low-level road in the reservoir area. H. P. "Pat" O'Donnell is field engineeer on the dam and power plant, and M. W. Archibald is chief of the earthwork branch. G. A. Swanson is office engineer.

Contractor

For Palisades Contractors, A. L. Pauls is project manager and Paul H. Swanson is assistant project manager. W. H. "Bill" Kennish is general superintendent. Frank J. Kish is project engineer.

Shift superintendents are H. W. Taylor and G. M. Bierhaus. James Brown is master mechanic. Richard Fegert is rock superintendent, and M. C. "Charlie" Silva is concrete and carpentry superintendent. W. E. "Bill" Wayne is mechanical and electrical superintendent, and E. A. "Slim" Bray is batch plant superintendent. N. M. Campbell is business manager.

Population growth outmodes open drains and requires . . .

$1,000,000 worth of storm drain work for Denver

Program for this year exceeds 30,000 lin. ft. of concrete drains in newly built areas —Backhoes and beefed-up trencher speed progress of work by Latimer Construction Co. and Birchby & Nauman, Inc.

DENVER is about to solve the case of the missing storm sewers—using engineers instead of detectives.

The need for the missing storm sewers crept up subtly on the rapidly growing, mile-high city. Fifteen years ago WPA crews built riprap-lined storm drain ditches out through open country. Almost before anyone realized what had happened, these open areas built up. Last year, for example, over 7,000 new dwellings were built in the Denver city limits. The additional roofed and paved areas upped storm runoff, and suddenly the older protective works were outmoded and inadequate.

Denver is spending well over $1,000,000 in 1952 to add new sections to its storm-sewer system, picking the most critical areas for the work. The outlay for storm sewers is as significant and sizeable an item in Denver's public works budget as sewage handling, street improvement, and the maintenance of parks.

In several respects, Denver's perpetual case of missing storm sewers is well justified. Until a tract is fairly well developed, no need for a storm sewer system exists, because storm water will either soak in or flow down natural watercourses which are then adequate. When a tract is built up, however, the need for storm runoff conduits begins to be felt, and of course the more the upper ends of a watershed are built up with paved areas, the more critical the runoff problem becomes farther down.

Thus it has been Denver's policy to plan storm sewers as soon as the need is fairly critical. Two methods are generally used: (1) an Improvement District or petition basis is used, and (2) a direct contract basis between a subdivider and a private contractor is sometimes employed.

Under the Improvement District system, which is the more prevalent of the two, a group of property owners join together to form an Improvement District. After indicating their wish to have protective storm works constructed, they are assessed for the work. A 12-year amortization scheme covers all costs of construction, engineering, interest, and collections. The system has worked well in practice, and current work is being repaid in this manner.

Denver always tries to keep its improvement works on a sound basis to minimize injunctions and other court action. As a result, bonds for these improvements are very much in demand. The city has never yet failed to sell its bonds quickly.

Engineering problems

Many engineering and construction problems have been whipped to add to the system, which is now 325 mi. long. One big line was cut through a high saddle dividing the Platte River watershed from the Sand Creek watershed, because of the desirability of dumping into Sand Creek. The construction of Williams Fork Dam and a long water tunnel is still recent enough to be remembered, and it was one of the biggest and toughest done yet by the City. Almost all the storm sewers have to be laid down natural watercourses, whic makes for a wet ditch in 90% of th cases.

Storm sewer projects are currentl under way in east, northeast and soutl west Denver, but possibly the most diff cult of the lot is a 10,000-ft. job in th Hale Parkway vicinity. Latimer Co struction Co. of Denver has the $900,0 contract for its construction, and is b ing aided by the subcontracting firm Birchby & Nauman, Inc., which is i stalling all lines under 48-in. diameter

The scope of the Denver program ca be visualized in the following tabulatic of the linear feet of various sizes of pi being laid:

Diameter	Lin. Ft.	Type Pipe
78-in.	2,701	Reinforced concre
72-in.	742	" "
66-in.	385	" "
60-in.	374	" "
54-in.	1,790	" "
48-in.	1,188	" "
42-in.	7,245	" "
39-in.	1,496	" "
36-in.	679	" "
33-in.	563	" "
30-in.	1,056	" "
27-in.	1,933	" "
24-in.	1,293	" "
21-in.	1,716	Plain concrete sew
18-in.	290	" " "
15-in.	300	" " "
12-in.	7,882	" " "

In addition to these items of pipe, t work also includes such items as standard strength 24-in. culverts, standard strength 21's, 238 No. 13 inle and 68 manholes.

IFTING PIN inserted through formed hole and ocked with a steel key inside the pipe makes a uick hook-up for handling pipe sections by back-oe. Five-ft. length of 78-in. weighs 4½ tons.

Latimer uses backhoes

The portion of the project being done by Latimer calls for trenches averaging 5 ft. deep, and wide enough to accommodate pipe up to 6½ ft. in diameter. Much of the pipe is being laid under old storm channels built back in the '30's by the WPA, and the demolition of this old masonry is a natural job for a backhoe. The principal backhoe which is used 00% for digging pipe trench carries a -yd. bucket. Another similar machine is being used partly for trenching, but its principal job calls for clamshell digging round structures. It is also used, with a 00-lb. concrete weight, for backfill amping.

Since much of the pipeline runs down he middle of a divided parkway, the contractor had to get rid of most of the dirt as soon as possible. The better material is being saved, and is used for backfill after the pipe sections are in place.

During excavation, ground water and normal flow in the old storm channels s handled by a system of centrifugal pumps, which either put it back in the ditch farther down or dump to the nearby gutters. Wherever possible, however, he finished storm sewer is being used.

The pipe is being manufactured by Lock Joint Pipe Co. at its Denver plant. It is trucked out to the job on large semi-trailers, and in the case of the 78-in. line, four 5-ft. sections make a load. Each of Lock Joint's delivery tractors is equipped with a power winch which permits the drivers to unload pipe without any help from a crane or other workman. He simply hooks the cable into the lifting hole of the last section, releases the blocking, tilts the trailer, applies a brake lightly to the winch, and drives the tractor away. The pipe sections roll off gently down a small ramp to the ground. They are then blocked, and the driver is ready to return for another load. Excellent deliveries have maintained a supply of pipe sections ahead of the normal 50-ft. daily progress by the backhoe.

The pipe sections are being laid on an average gradient of .35%. The trench is being cut a foot low to allow for a cradle of rounded stream gravel from the Platte River to be shaped to support the pipe sections. Trucked to the job from Herbertson Rock Co.'s commercial plant, the material is being clammed into the ditch or, in some cases, dumped in by a labor crew. It furnishes support for the pipe and acts as a French drain after installation.

Joints pulled up

The pipe joints are fitted up, pulled tight by a small ratchet, and are then mortared on the outside by a mixture of 1 part of cement to 2½ parts of sand. Immediately after this material sets up, backfill is applied to the spring line and tamped by pneumatic guns. Special care is always taken with any backfill which will be underneath a paved street. The initial backfill is done carefully, subsequent material is selected and placed with the aid of the concrete block tamper on the crane and, as a final precaution, the top part of the fill is placed in 6-in. lifts, smoothed out by the small dozers, and tamped by a Hydra-Hammer.

Progress has generally been good, considering the ground water and ever-present utilities crossings. Fortunately, with the exception of one small portion, there will be no rock to drill and shoot anywhere in the project. The material is mostly sandy clay, with some deposits of caliche.

Final mortaring of the joints on the inside is held up until all the backfill is in. This operation completes the line prior to its final inspection and acceptance by the City.

Good progress by subcontractor

Birchby & Nauman's subcontract work is generally located in much more open and unsettled sections than the prime contract. In some of the terrain where equipment can get up and go, progress as high as 400 ft. a day (8 hr.) is being made, thanks to a shop change made on a conventional digging ditcher.

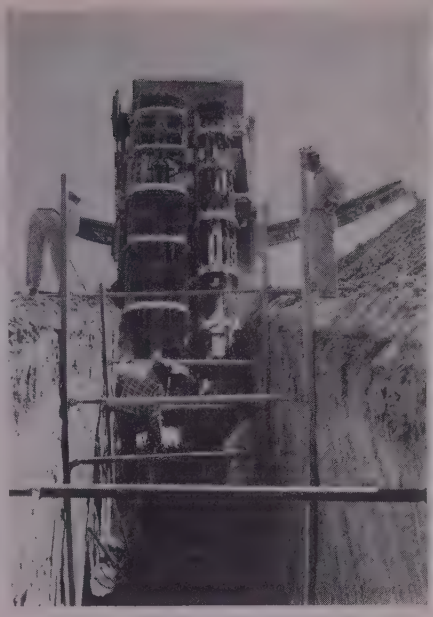
Equipment List

Latimer Construction Co.

1 Northwest Model 4 (clam, backhoe, tamping)
1 Northwest Model 4 (backhoe)
2 Jaeger 4-in. pumps
4 Rex 4-in. pumps
2 Gardner-Denver 365-cfm. compressors
4 Gardner-Denver pneumatic tampers
2 Caterpillar D-4 tractors and dozers (backfill)
1 Caterpillar No. 12 motor grader
1 Bucyrus-Erie Hydrocrane
1 Bucyrus-Erie 10-B clam
1 Ottawa Hydra-Hammer

Birchby & Nauman, Inc.

1 Parsons Model 310 Trenchliner
1 Quick-Way truck crane (pipe placing)
1 Caterpillar D-4 and dozer
1 Caterpillar D-2 and dozer
750 Duff-Norton trench jacks



BIGGER BITES result from extended ladder and second set of buckets on this trencher. Now it digs a trench over 5 ft. wide and puts out 125 cu. yd. per hr.

The Parsons 310 Trenchliner used by the subcontractor for all ditch excavation ordinarily comes equipped with a set of digging buckets 36 in. wide. The ladder was widened and lengthened to allow digging up to 17 ft., the maximum on the project, and an additional string of 24-in. buckets was installed. To get rid of the enormous amount of extra material the machine would dig, the cross conveyor was lengthened 3 ft., and its driving sprocket was speeded up about 90%. The machine was digging a 3-ft. ditch 10 ft. deep in hard caliche-bound clay when this magazine visited the work, and it was putting out 125 cu. yd. of dirt per hr.

Wherever the ditch needs it, jacks and timbering are used to brace temporarily. A small truck crane with a conventional pipe lifting bar is used to place the pipe sections, and mortaring is similar to that on the bigger job. Backfill is shoved in on the subcontract job by a small dozer, and since most of this work is in an unpopulated and unpaved location, no backfill tamping is necessary. Operations are moving as rapidly as possible, after a flurry of labor trouble, to get the job finished ahead of winter.

Personnel

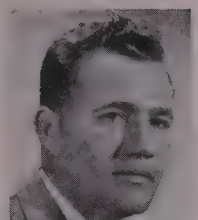
All of Denver's engineering and public works program is under the supervision of Mayor Quigg Newton. Terry J. Owens is City Engineer, and T. P. Campbell is Manager of Improvements and Parks, under which department the storm sewers are built.

Latimer Construction Co. has assigned E. S. Stewart as field superintendent of its work, and Carmen Romola is in charge for Birchby and Nauman.

Prestressed tilt-up walls for earthquake resistance

Post-tensioning places 60 psi. of compression in warehouse walls to secure structural integrity — Process has tangible advantage of reducing reinforcing steel and tends to lessen shrinkage cracks

By
F. THOMAS COLLINS
Consulting Engineer
San Gabriel, Calif.



TO PROVIDE structural integrity to a tilt-up building for resisting earthquake forces and to reduce objectionable cracking (unsightly, but not serious) a system of post-tensioning was introduced in a warehouse built for the Fernando Cannery Co. in San Fernando, Calif. The introduction of compression in the top of each of the four walls has been accomplished by the following sequence of operations: (1) casting conduits in the precast wall slabs, (2) continuing these openings through the cast-in-place columns, (3) pulling through the bundles of wires to be used in stressing, (4) placing these wires in tension designed to provide a compression of 60 psi. in the wall slabs and (5) anchoring the wires and grouting the conduits full.

Reduction in steel

The initial tangible advantage of this design innovation was the permission of the municipal building department to reduce the size of the reinforcing bars in a wall slab. Another immediate effect was to eliminate some curing cracks in the slabs, much to the satisfaction of the owner. An ultimate advantage should be the complete elimination of any cracks caused during the concrete gaining ultimate strength.

The initial structural advantage was the provision of a pretensioned bond beam at the periphery of the roof diaphragm, that would always keep the horizontal joint of the wall under compression, during all normally expected lateral forces from seismic or wind origin. The recent earthquake in Bakersfield has shown that a built-in tension force at this region of the wall will greatly reduce minor damage from the walls tending to open at the vertical joint from the diaphragm "cap action."

Panels tied together

The integrity of a precast structure depends a great deal upon how well it is tied together. There is no better way to tie the blocks together than to string them on a high strength prestress wire cable. This application, tried here for the first time, illustrates how simple and easy it is to get a really well tied together structure. For all precast buildings, with concrete roof slabs and concrete beams and girders, this system of tying the individual elements together has even a greater application, and the Freyssinet system of prestressing offers an excellent method for doing this economically. Now it is possible to make beam-to-girder connections, by holding one member against the other, and the net effect will be true continuity of structure.

The structure

The building itself is not unusual and can be described briefly as a typical single-story warehouse. It is similar t many others which can be considered rather standard design in the Los An geles area, including a floor slab cast o the ground, tilt-up wall panels cast wit window and door openings, cast-in-plac columns between panels and a timbe roof truss. In plan, the structure is 75 100 ft., and has no interior columns. Th sides consist of five 20-ft. wall slabs while the ends have three 25-ft. slabs.

Column footings in the walls are of th simple spread type of unreinforced con crete, 6½ ft. long in the line of the wal 4½ ft. wide and 1 ft., 10 in. thick. Dowel are provided for connecting with th cast-in-place column. The floor slab wa cast on the ground and is 5 in. thick, o 2,500-lb. concrete. The floor is stoppe 2 ft. from the wall line all around th structure.

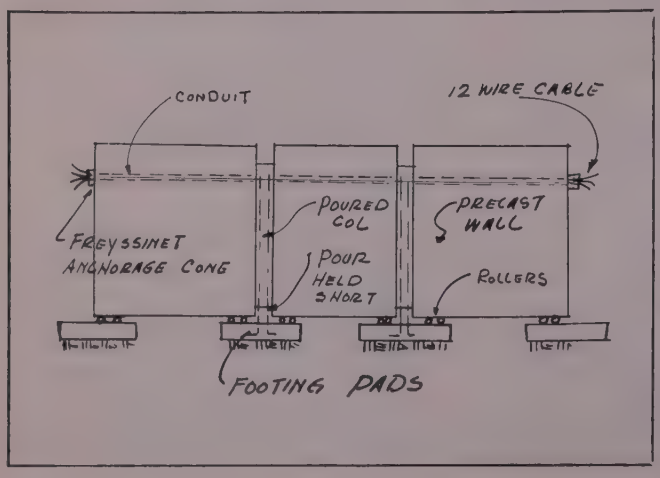
Wall slabs were cast on the floo These panels include the window open ings and two large doors on opposit sides of the building, 16 x 14 ft. in siz to permit trucks to enter the warehouse When cured the slabs were lifted int position by usual methods and secure by a 45-deg. pipe brace attached to a anchor cast in the floor.

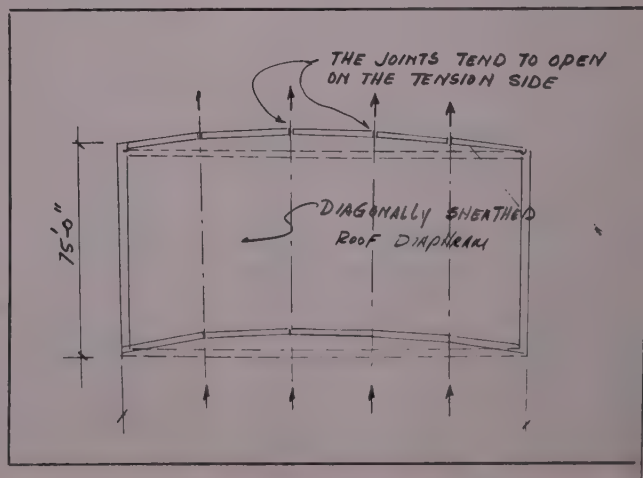
The timber roof trusses span the 75-f width of the building and rest on the to of the cast-in-place column. The struc ture is completed with 1-in. wood sheath ing on 2 x 10-in. purlins in hangers at tached to the top chord of the trusses Details of this construction are shown i the attached sketches.

Plan for post tension

A rather common complaint of owner having this type of structure is the ten dency for shrinkage cracks to develop It is possible to convince owners tha such cracks are superficial and do not i any way impair the structural stabilit of the building, but the reflection on th engineer, the contractor, and even th material, remains. This problem is common subject of discussion for struc tural engineers dealing with this type o building and led to the consideration o methods for elimination of such wal cracks, particularly adjacent to open ings, combined with additional advan tages.

The solution to the problem, which i





SKETCHES showing: (1) method (left) of introducing wire near the top of the precast walls to tie the slabs together and (2) the tendency of the unrestrained joints to open up (right) when the structure is subjected to a lateral force.

being tried in this building for the first time, is the placing of the walls in compression after they have been lifted into position and fixed between the cast-in-place columns.

The original plan for this post-tensioning program was to introduce wires near the tops and the bottoms of the wall slabs. This original plan was modified in the present situation because the truck doors reduced the area of wall slabs above the footings to the point where the compression did not seem feasible.

In addition to the elimination of the cracking the effect of tying the four walls together at the corners was used in the design for taking care of the lateral (earthquake) loads required. The sketch shows how the precast walls of an ordinary building tend to open on the tension side of the diaphragm. The prestressing of the walls on this "cap" area will keep the walls together.

As a result of this induced compression in the wall slabs, the building inspection department of San Fernando permitted the reduction in the normal reinforcing steel from 5/8-in. rd. at 16 in., to 3/8-in. rd. at 16 in. This was a tangible cost reduction, saving approximately 3,150 lb. of steel for the job.

Provisions for tensioning

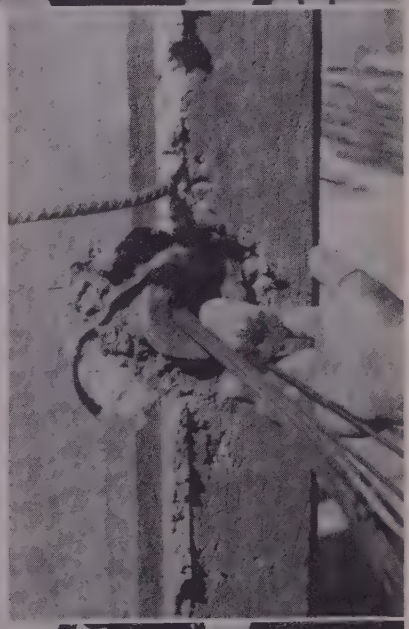
To provide for the induced compression in the walls, a 1½-in. diameter conduit was introduced in the forms for the wall slab. This pipe conduit was located in the center of the slab thickness and 3 ft. down from the top. If the original plan had been put into effect, a similar opening would have been introduced near the bottom of these wall slabs.

After the walls had been cast and placed in position, flexible metal tubing was used to extend the conduits across the space to be filled by the cast-in-place columns. These sections of conduit were held with tape at the joints where they connected with the conduits in the slabs. This arrangement provided a continuous opening on all four walls, extending in each case from corner to corner of the building.

Rollers under slab

To provide for the necessary movement between the base of the slabs and the concrete footings on which the slabs rested, simple roller nests were introduced under each slab. These units consisted of two steel plates to provide bearing and two sections of ½-in. round steel bars for rollers. These units were not pre-assembled, but were merely placed by hand when the slabs were put in position. With the slabs in place on the rollers, the columns were formed, the steel cages placed and the columns poured. As soon as this column concrete had reached proper strength it was possible to carry out the plan for tensioning the wires. Following the pushing of a pilot wire through, a bundle of 12 wires was pulled through the conduits. These wires are of high tensile strength with a yield point of 175,000 psi., and are .196 in. in diameter. The stressing of these wires was carried out by using the Freyssinet

JACKING EQUIPMENT in position for applying a 135,000 psi. tension in the wires which extend through the entire length of the 100-ft. wall.



ANCHORING of the group of wires is accomplished by inserting the fluted cone in the socket with the wires arranged around the cone.

JACKING HEAD fastened to the group of wires which will be anchored by a similar plug when proper tension is secured. Note the group of wires at upper right coming from the conduit in the other wall.

method and equipment. Briefly, an anchor is provided at one end by using a fluted cone and socket (see illustration) into which the wires clamp themselves as the pull is introduced. At the other end a special hydraulic jacking device is fastened to the entire group of wires and the tension applied. When the tension has reached the required amount, a similar cone insertion is made to maintain this tension. In the present case four pulls were required, one for each wall.

60 psi. in the wall

The design requirement was to stress the wires up to 135,000 psi., which would introduce a compression of 60 psi. in the concrete near the top of the wall. Naturally, this compression decreases toward the bottom of the wall and the openings provide some interruption in the stress distribution.

TO EXTEND the conduits through the cast-in-place columns, the method was to use flexible hose taped to the ends of the pipes cast in the panels.

The last step consists of grouting the conduits containing the tensioned wires. Final concreting includes the completion of the columns and the dry packing of the small space between the wall slabs and the footings.

In general, this procedure for tensioning was carried out without serious field problems by a small crew. Naturally it was the initial effort to do such work and subsequent jobs could be carried out much more efficiently. In general, it would appear that about 16 man-hr. of time would be required for such tensioning operations for the four walls of a building.

Personnel

The structure was designed by the writer and construction was carried out by Precast Structural Builders, Inc., under his immediate supervision. The work of prestressing, which followed the recommendations of the Freyssinet Company, Inc., were supervised by James R. Libby, West Coast representative. The building is owned by the Fernando Cannery Co. of San Fernando, Calif.

Practical ideas from the field on dismantling concrete piers

Use of half-round steel and wedges in drilled holes was quick method in breaking up temporary piers cast to support turbine units during installation

By H. B. McDERMID
Retired Construction Engineer

A LARGE hydroelectric powerhouse job included placing 15 low-head Francis hydraulic turbines whose physical dimensions were so large that it was deemed advisable to cast the scroll cases in concrete, as well as the draft tubes, which measured 25 x 40 ft. across the axes of their oval discharge openings into the tailrace. To hold the cast iron upper stay rings of the turbines in place while the scroll cases were being formed and poured, eight concrete piers were cast in place for each unit. These were each a yard square in horizontal cross section and were poured to a height about 1 ft. below the stay rings they were to support. The rings were then blocked up with steel wedges and shims to their exact height. This method was employed not only to permit exact location of the stay rings, but also to give sufficient clearance for dismantling the temporary piers after their usefulness was over.

But, after the steel wedges under the first stay ring were removed, the piers were found to be too clumsy and also too heavy to handle in one piece with the crane then serving the job. So it was decided to break the 12-ft. high piers into two pieces for easier handling.

A Burley rock drill was set up to drill a 3-in. horizontal hole midway of the pier side, one to each side of pier. Then the crew appeared with 3-in. half-round steel and placed two in each hole, their flat sides together, with a heavy wedge between the flat sides. These wedges were set in all four holes so that wedge pressures would be exerted to force the upper and lower halves of the pier apart, splitting it in two along the center lines of the four holes.

The men used only an 8-lb. sledge to tighten the wedges, not attempting to do all the job with one set of wedges, but driving one moderately and then moving on around the pier. In an astonishingly short time the pier popped in two and was ready for the rigging crew to drag out. The pieces were subsequently used to test the stability of the upper ring of the turbine by double-loading it and reading the deflection after 24 hr.—some 300 tons of load. Those concrete blocks came in mighty handy for that purpose and were used all the way down the powerhouse, a quarter-mile long.

This method of breaking up concrete has many times proven valuable to the author in other localities. There comes to mind the cleaning out of some concrete foundations in the shop of a big construction job. Only three men were left to finish the work, the boss and two workmen.

One morning the boss decided to get at dismantling two concrete foundations that had held the main air compressor and its driving motor. The first was a U-shaped affair about 6 ft. each way and 30 in. square in vertical section all around the U. The motor foundation was about 30 in. square and 1 ft. high. Both pieces were strong, well-hardened concrete.

The boss determined that here was a place to use his wedge technique and, after giving his men their instructions, went to order his half-round shims and wedges from a blacksmith shop. When he returned to the job with his tools, he found that the men had pulled what they evidently thought was a fast one, tacking the small block with their concrete points and wedges and leaving the one ten times as big for the boss.

He paid no attention but started drilling holes at the grade line all around the big U-block, as well as some intended to split the block into three pieces. By the time the wedges and shims arrived, the men were openly curious, wondering why the boss had drilled all the holes. When he placed the wedges and shims and commenced driving them with his sledge, their amusement knew no bounds. The boss wasn't too certain his sizes were right for the job attempted, but he paid no attention to the ridicule. In 10 min. after tightening the first wedge, he had all the concrete burst loose from the ground and broken into three movable pieces. Also he had gotten the toe of a track jack under the end of one piece and had it chained up to the "cannon wagon" ready for the dump.

Shortly afterwards one of the men meekly came to his elbow and asked, "Boss, if you're through with those wedges, could we borrow them?" Their own small piece, after several hours of work, looked only as if someone had mistreated the corners a little. Those two men were as meek as could be throughout the remainder of the job which didn't displease their boss any after the cocky ridicule of his wedge idea. Proportioned right, he knew that the idea always works and can be a real time saver in the right application.

Central Valley is sinking, says USBR report

A GRADUAL SINKING of California's Central Valley has been reported by the Bureau of Reclamation. Internal weakness probably has been caused by an excess pumping of ground water and possibly by the recent earthquakes. A 250-square mile section has been sinking as much as one to eight feet since 1920. Extensive surveys will be conducted in order to determine the exact extent of the land subsidence.

Culverts replace log bridges on national forest roads

Elimination of maintenance problems is the goal of five culvert installations in Lassen National Forest during 1952—Entire program carried out by three-man crew—average labor cost per installation is $900

By H. R. WILLIAMS
Forest Engineer
Lassen National Forest

MAINTENANCE of old log bridges in national forests has long been a problem of the Forest Service. During recent years a continuing program of replacement has been carried out, using either culverts or permanent bridge structures. The following article describes work done during the 1952 season in Lassen National Forest, California, where five culvert installations were completed.

Funds for the recent work were made available in 1951 and, at that time, five structures were selected for replacement, on Goodrich, North Digger, South Digger, Colby, and Bailey creeks. Lengths of the existing log bridges varied from 16 to 24 ft.

Pipe culvert sizes

The most economical and physically possible new installation for each site was determined to be multi-plate pipe arch culvert. The sizes necessary, depending in each case upon area of tributary watershed, were as follows:

Goodrich Creek	93 x 64 in. by 36 ft.
North Digger Creek	107 x 72 in. by 34 ft.
South Digger Creek	142 x 90 in. by 38 ft.
Colby Creek	142 x 90 in. by 36 ft.
Bailey Creek	159 x 96 in. by 38 ft.

Contracts for the culvert material were awarded late in 1951 to Armco Drainage & Metal Products, Inc., on a bid of $8,352, and delivery was taken at Susanville, Calif., in March of this year. Work, however, was delayed by heavy snows, and the project was not commenced until the latter part of April, about three weeks later than usual.

The culvert sites were tackled singly by a three-man crew, an equipment operator acting as foreman and assisted by a pair of laborers. Equipment consisted of a Caterpillar D-7 tractor with bulldozer, a stake truck fitted with a hand-operated boom for handling materials, and a trailer house.

Work sequence

The work at each site included the following steps: (1) construction of detour where necessary; (2) assembly of multi-plate; (3) removal of log bridge; (4) preparation of stream bed; (5) lowering assembled culvert into place; (6) backfill; and (7) construction of roadway approach fills. Sufficient headroom was a factor in each installation. Even with the final selection of pipe arches, it was necessary to raise the roadway from 1 to 4 ft. in each instance.

Work on Goodrich Creek, where the smallest culvert was placed, began on April 28 and was finished on May 13. The complete job required 12 working days, or 36 man-days, plus two days of supervision by the road foreman of the forest. Total cost on Goodrich Creek for labor, material, equipment, and supplies was $1,679.

A continuing "late spring" prevented access to any of the remaining sites until May 23, when the crew began hauling materials to the North Digger Creek culvert site. This job was finished on June 16, in 16 working days, at a total cost of $3,050.

Installation in 10 days

The South Digger Creek job began the following day, close by its predecessor. Only 10 days were required this time, as the crew was by now quite adept at assembling the multi-plate, as well as at performing preliminary work with the least difficulty. Total cost on this culvert came to $1,793.

Other work engaged the culvert crew during early July, but the fourth structure, on Colby Creek, was begun July 16. Only 13 working days were required to complete the installation despite the fact that the crew was called away several times for fire fighting. Such interruption is expected in their work but, luckily in 1952, the fires were minor and little loss of production resulted on the culvert work. The cost of the Colby Creek culvert was $2,660.

The fifth culvert, on Bailey Creek, had not been completed when this review was prepared. However, it is estimated that the cost will be about $3,300. Thus, five bridges are replaced with culverts at a total cost of about $12,800. With culvert materials alone accounting for $8,350 of this total, it is apparent that the part-time supervision of one man and the active work of three others, together with some consumable materials and depreciation, come to $4,450, or a little less than $900 per structure.

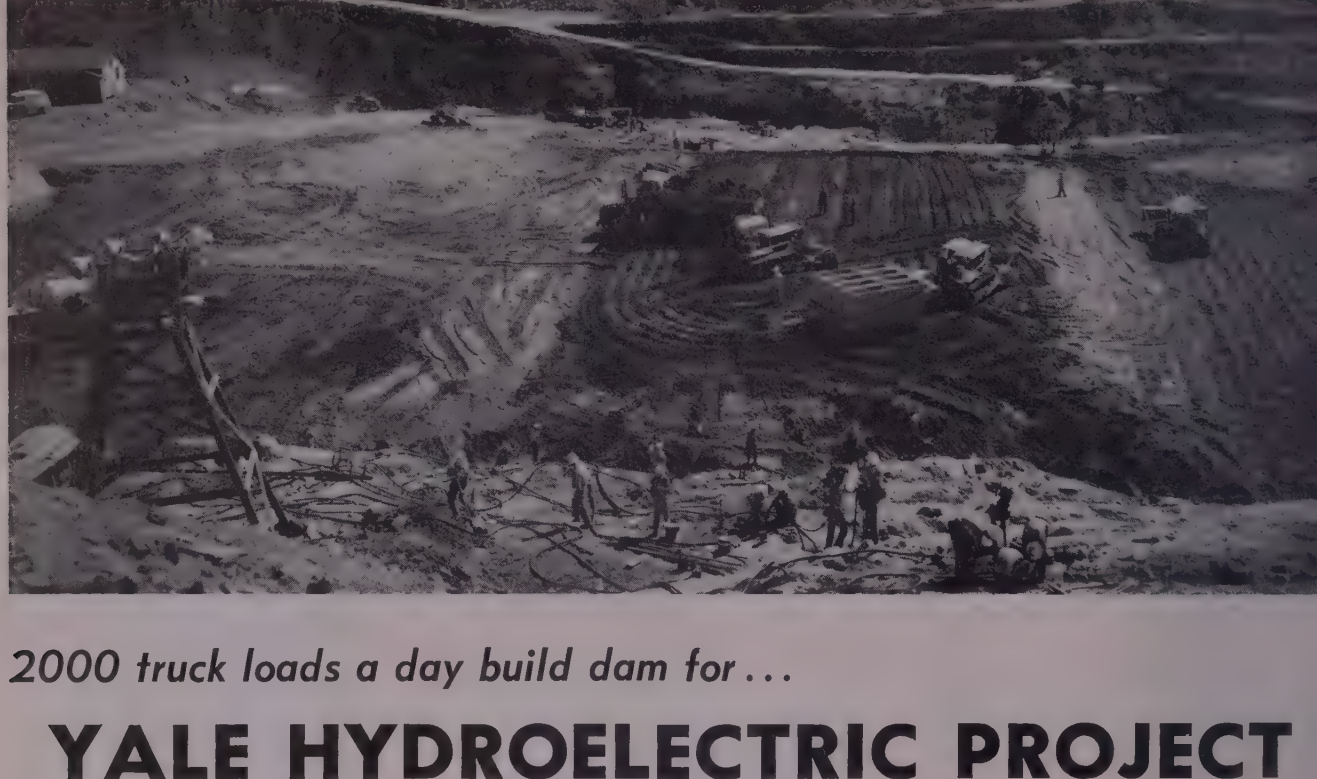
Personnel

The improvement program is under the direction of V. A. Parker, Forest Supervisor. This material was assembled by the acting supervisor, H. R. Williams. Delbert Ward is the road foreman in Lassen National Forest, and Leonard "Dutch" Filter is working foreman on the culvert project.

TYPICAL LOG BRIDGE in Lassen National Forest. Maintenance of these old bridges has long been a Forest Service headache.

NEW CULVERT, a multi-plate arch, is now in place at same site of bridge shown at left. Installation of culvert cost $2,660, took 13 working days.

U. S. Forest Service photos

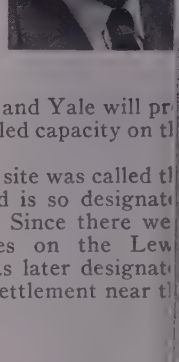


2000 truck loads a day build dam for . . .

YALE HYDROELECTRIC PROJECT

Second project in the development program on the Lewis River built by Pacific Power & Light Co. will produce 108,000 kw. — Morrison-Knudsen masses equipment to move unusual volcanic fill material through months of tough weather

By
E. ROBERT DE LUCCIA
Vice President and Chief Engineer
Pacific Power & Light Company



RACING against an almost impossible time schedule, the Pacific Power & Light Company's 108,000-kw. Yale Hydroelectric Project on the Lewis River in southwestern Washington is nearing completion. The project, which is the second of a series planned for the Lewis River, is located in the upper end of the reservoir of the company's Merwin Project that is the first of the series. Provision is made for two additional units at Yale, each of 54,000-kw. capacity, to be installed whenever additional storage is provided in the upper river, or when peak load conditions are such as to make their installation justifiable.

Consideration of developmental possibilities for the Lewis River extends back for over thirty years. In 1931 the Merwin Project, 12 mi. downstream from the Yale site, was completed with one 50,000-kw. unit installed. In 1949 a second 50,000-kw. unit was put in and provision remains for the installation of two more similar sized units. Upstream from Yale, foundation explorations are under way at two other possible dam sites. Construction of projects at these sites together with completion of installations at Merwin and Yale will provide 501,000 kw. installed capacity on the Lewis River.

Originally the Yale site was called the Basket Ferry site and is so designated on early study maps. Since there were several basket ferries on the Lewis River, the project was later designated as Yale after a little settlement near the site.

The drainage area

The Lewis River is typical of streams west of the Cascade Range. Such streams are very important factors with respect to a balanced hydroelectric power supply in the Northwest. They usually run full and in flood during the late fall, winter, and early spring months; whereas the Columbia has its low water period during the winter with high flows in the late spring and summer. Thus, the western streams supplement the Columbia with its low winter water flows and its high summer flows. These streams are close to the heavy markets for electric power; and the development of sites on such streams permits a greater portion of the power generated to be delivered

Merwin Dam was Ariel when built in 1931

REFERENCE in this article to the Merwin project downstream from Yale Dam indicates it was built in 1931. At that time, it was called the Ariel Hydroelectric Project. A comprehensive (6-page) article was published in *Western Construction*, Oct. 10, 1931, reviewing both design and construction operations. The project was designed by Electric Bond & Share Co., and construction was carried out by the Phoenix Utility Co., with H. F. Lincoln, project manager, and R. C. Booth, construction engineer.

In May 1948 the dam and project was officially named the Merwin Project in honor of L. T. Merwin, vice president and general manager of the Northwestern Electric Co., predecessor to Pacific Power and Light Co.—*Editor.*

to the markets, since transmission lines are much shorter and losses correspondingly much lower.

The drainage area above the project is about 600 sq. mi., and the rainfall is extremely heavy. At the head of the Yale Reservoir, for example, the annual rainfall is about 120 in., and up at the sources of the Lewis River it is about 170 in. Runoff is extremely rapid and floods occur practically without warning.

The dam site

Geologic considerations are, of course, extremely important in the selection of a dam site and in the ultimate choice of type of design. At Yale dam site the Lewis River flows in a canyon, the southerly wall of which rises precipitously from the water. On the north side, there is a sharp slope up to the base of an abrupt rock cliff which rises about 100 ft. above the channel. This canyon is from 160 to 200 ft. deep, with a width averaging about 400 ft., for a distance of several hundred feet up and down stream within the dam site area. From the top of this canyon, the land rises gradually at the north, across a well-defined but narrow terrace bench, to the summit of a rock ridge about 1,100 ft. distant from the river. The opposite, or southerly side, is a steep rock face about 400 ft. from the water's edge forming a steep wall.

The river channel is generally of gravel, sand, and boulders 20 to 50 ft. in depth over the underlying rock. The occasional gravel bars are shifted by the flood waters more or less from year to year.

Surface features are due first to glacial erosion of upturned layers of hard and soft volcanic rocks; second, to partial obscuring of these erosional features by the spreading out of gravel and sand, clays, and boulders in holes and along the sides and in the bottoms of the canyons by the action of the glacial ice, by the heavy flows of water that resulted when the ice melted, and by the streams of the more recent times. Rock formations which underlie the area are prevailingly of volcanic origin and range from continuous sheets of solid hard lavas to cellular and slaggy pebbly mixtures, cinders, ash, conglomerates, and tuffs.

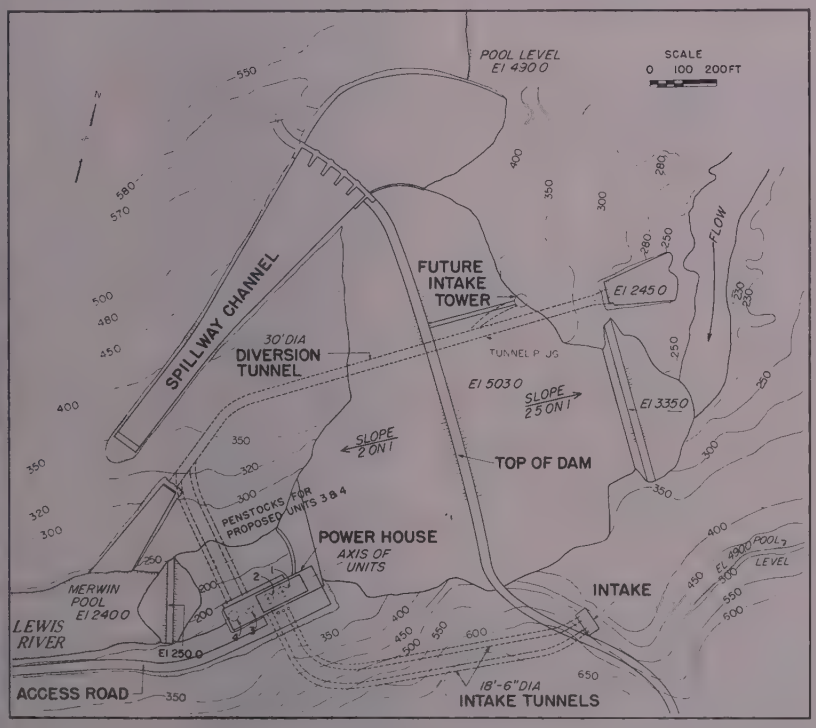
Types of dams considered

The types of dam considered for the Yale Project ranged from a concrete arch, such as at Merwin, on through several designs to the type finally selected. A careful study was made of the possibilities of using a concrete arch-type dam, but it was concluded such a dam at Yale would be expensive in view of foundation conditions. Studies of a concrete gravity type dam confirmed findings of Government engineers in a preliminary report made in 1948 that a concrete masonry dam would also be very expensive. This report indicated that a project employing a concrete dam of 80,000-kw. installed capacity and with provision for a future 40,000-kw. unit would run about $60,000,000.

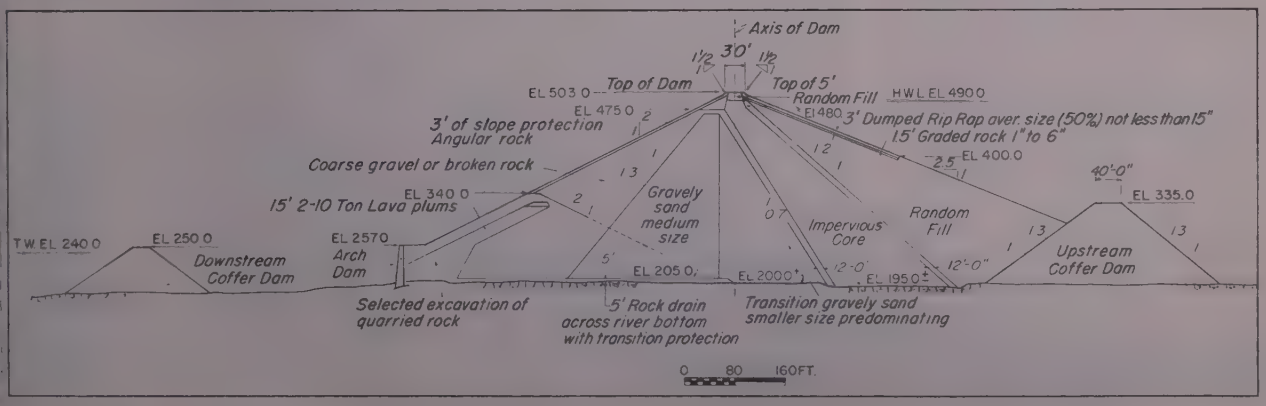
The possibility existed of constructing the dam as a rock-fill structure taking advantage of the high rock bluff on the south, or left abutment. Test quarrying of this material revealed that the rock would break into very small pieces; and to obtain the rock selection required, nearly three times the amount of material required in the dam might have to be handled.

Available in the valley close to the dam site in large amounts were sand and gravel materials with gravels, or cobbles, up to the size of a man's head and larger. Available also were silts suitable for impervious core, and it was decided to construct the project of these materials at an estimated cost of about half the cost of a gravity concrete masonry dam and about 20% less than a rock-fill structure.

Tremendous rainfall, often more than 1 in. per day, would ordinarily preclude construction of an earthfill dam in the rainy season. However, it was essential that construction be completed in No-



PLAN of dam and power features, showing location of the diversion system and the tunnels to deliver water to the plant. Note that the supply for the two future units will be brought across the river from the diversion tunnel.



MAXIMUM SECTION of Yale Dam indicating the sloping core, the upstream cofferdam which was incorporated in the final structure and the concrete arch at the downstream toe.

START—In July 1951 the site showed fast work in clearing and stripping to bedrock over much of the dam area. The diversion tunnel extends under the far bank of the Lewis River, with Mt. St. Helens in the distance.

vember 1952 as part of the defense program. In fact, the Defense Electric Power Administration rated this project as one of the eight most critical projects and gave it extremely high priority ratings with respect to procurement of materials and equipment. Thus, materials or methods had to be found or devised which would permit construction of an earthfill dam under the severe weather conditions indicated. The silt just mentioned was found to be practically hopeless for use in wet weather unless pre-dried. Many different schemes were considered, from erecting a tent over the valley to passing the material on a belt to infra-red drying ovens; but all would have been very expensive.

Heavy emphasis was placed on exploration and search for material which might replace this silt or might be blended with the silt to assist in placing the material without detracting from its impermeable qualities. Shortly before the rains began, a material was discovered in large quantities, about a mile from the site, graded from a very fine pumice-like powder on up to a 1-in. gravel. This material was tested in several laboratories as well as at the job site, and was found to have a remarkably high degree of impermeability. Also, it had dry unit weights approaching that of sand and gravel; and being primarily granular, had a very high shearing value. Not only was it highly impermeable, but it could also add to the strength of the dam itself.

The geologists reason that this material had been formed in nature by means of a great torrent of water mixing the ingredients perfectly; and then finally, the torrents subsiding suddenly pushing the material out in the form of a vast mud wave. Since the material seemed to have been formed by a torrent as a conglomerate mixture and because of its impervious qualities, it was named "impervious torrential conglomerate." It proved useful not only as an impervious material in the dam, but also for road surfacing.

Start of construction

Field work began in March 1951 when access roads were constructed into the project, and the field office, camp, warehouse, and other necessary supporting features were commenced. Only a limited amount of work could be done initially pending necessary clearance from interested government agencies. On April 24, 1951, the Federal Power Commission adopted an order issuing a license, and in June the project was designated as a defense plant by the Defense Production Administration which granted a certificate for accelerated amortization.

Morrison-Knudsen Company, Inc., the principal contractor, was then given the full-speed ahead signal. Meanwhile, Ebasco Services Incorporated, as agents for Pacific Power & Light Company, organized and set up the office and field forces in cooperation with the Pacific's engineers necessary to accomplish design and engineering and to supervise construction.

The camp provided accommodations for 400 men, and several privately owned camps were established in the vicinity. These and the fact that the project is located less than 40 mi. from Vancouver, Wash., were sufficient for a peak of over 1,700 men at the high point of construction effort. The early construction of the six permanent operators' quarters and six temporary individual houses for supervisory personnel proved to be a wise move.

Diversion and unwatering

Unwatering was accomplished by means of a diversion tunnel and cofferdams. The diversion tunnel is 30 ft. in diameter, of horseshoe section, and 1,500 ft. long. Included in the upper headworks of the tunnel is a by-pass valve to pass water around the gates after the diversion tunnel had been closed to fill the reservoir. Construction of the tunnel was commenced in May 1951 and completed late in September. On September 29 the upper cofferdam was closed by dumping large rocks into the channel diverting water through the tunnel. This upper cofferdam eventually reached the unusual height of 130 ft. With the extremely heavy rains and possibilities of flash floods, it was deemed necessary to protect against all floods except the maximum flood of record which had been caused by heavy rain and the failing of an upstream underground lake.

As part of the flood protection feature, the downstream toe of the dam contained very heavy rock kept piled a few feet higher than the main dam during the flood season. Thus, if the cofferdam were overtopped the heavy water flow would be taken on this rock toe and a stilling pond formed on the dam itself with the hope that this would not cause too much unraveling. Despite the highest early season flood on record when 21 in. of rain fell in October just after the cofferdam had been commenced, no overtopping occurred. At one time, on the basis of the feeling that additional protection should be provided, the cofferdam was raised 20 ft., and a few days later a very high flood raised the upper pool 11 ft. higher than the cofferdam would have been had it not been raised.

The lower cofferdam, as well as the upper, were both constructed of sand and gravel and heavy rock with impervious silt blankets and offered no particular problem. Careful preparation was made for the construction of the cofferdams by cleaning both abutments and dredging the river channel. While some leakage occurred, it was not burdensome. As the fill for the dam rose an 8-ft. diameter corrugated pipe was used as a sump with sections added progressively to handle cofferdam leakage and construction water waste.

The diversion tunnel was driven from both ends, in hard rock, employing generally standard driving methods. Timber supports had to be used in about two-thirds of the tunnel. The tunnel is concrete lined throughout.

Excavation

While the diversion tunnel was being driven, excavation for the dam was begun on the north. The material was cast into the cofferdams, or wasted. During excavation operations on the north bank a huge block of rock averaging 70 to 8[illegible] ft. high and nearly 100 ft. long suddenly slipped several inches, and had to be removed.

On the south bank a considerable amount of talus, which at first was thought to be suitable foundation material, had to be removed under extremely difficult conditions. As pointed out earlier, underlying the hard block

MAJOR EQUIPMENT

Compressor plant

1 Chicago-Pneumatic, 800 cfm.
3 Gardner-Denver, 680 cfm.
6 Gardner-Denver, 570 cfm.
20 portable, 500-cfm., Ingersoll-Rand, Gardner-Denver and Chicago-Pneumatic
25 Ingersoll-Rand backfill tampers
5 Gardner-Denver grout pumps
27 Jackhammer drills—Ingersoll-Rand and Gardner-Denver
33 Wagon drills, Ingersoll-Rand, Gardner-Denver and Chicago-Pneumatic

Concrete

1 Noble batching plant, 100-ton with two 4-cu. yd. mixers
6 Mack Dumpcrete trucks, 4-yd.
3 Rex double Pumpcrete machines
1 Rex 34-cf. concrete paver
20 Concrete vibrators: Mall, Jackson, Syntron electric, and 9 Chicago-Pneumatic air

Diversion tunnel and Penstock tunnels

2 Conway mucking machines
3 Goodman locomotives
2 GE locomotives
1 Atlas locomotive
24 Muck cars
70 Drifters: Ingersoll-Rand, Gardner-Denver and Chicago-Pneumatic
1 Special fitted D8 Caterpillar tractor mucker with electric motor

Excavation (Also used in pits)

1 Manitowoc 5-yd. dragline
3 Northwest 80-D shovels
1 Bucyrus-Erie 120-B 5-cu. yd. electric
2-3 D8 Caterpillar tractors
4 scrapers: Wooldridge and LaPlant-Choate

Borrow pits

1 Manitowoc 5-yd.
1 Bucyrus-Erie 5-yd. electric
2-3 Northwest 80-D (shovel or dragline)
1 Bucyrus-Erie 2½-yd. shovel
1 ¾-cu. yd. Koehring shovel-dragline
Up to 6 D-8 Caterpillar tractors

Hauling

28 Euclid end-dump trucks, 17-yd.
24 Euclid end-dump trucks, 10-yd.
14 Euclid end-dump trucks, 25-yd.
6 Euclid bottom-dump trucks, 13-yd. (used only a short time)
Spreading on the fill was done by up to 12 D-8 Caterpillar tractors.
Southwest 50-ton pneumatic roller was used to compact core.
1 13-wheel wobble-wheel roller, Williams

Miscellaneous

43 Service trucks and pickups: Ford, Chevrolet, International, Willys, Dodge and FWD
2 Lorains: 1 Moto-crane; 1 truck crane
46 Pumps: Johnson, Bingham, Peerless, Jaeger, Byron-Jackson
19 Welding machines: Hobart portables, General Electric, and Lincoln
20 Koehler light plants, 1½ to 7½ kw.
2 Caterpillar No. 12 motor patrols
1 Melbray portable steam cleaner
22 Flat-bed trucks of various types
1 4,500-gallon tank with Euclid tractor

AFTER 15 MONTHS—In spite of the long season of heavy rains, by September 1952 the rolled earthfill was completed, rising 323 ft. above bedrock and 1500 ft. long at the crest. The curved concrete toe wall is 80 ft. high and keeps the fill from extending into the powerhouse discharge.

andesite and basalt was a layer of much softer material. As this was excavated, the columnar crystals which formed the rock mass would break and slide into the excavation in amounts of from 5,000 to 10,000 cu. yd. This situation together with the fact that it was necessary to excavate the talus nearly to original river level, in what turned out to be a second canyon, while rain was falling frequently more than an inch a day produced a very trying period and tested the tempers and abilities of the construction and engineering forces to the utmost.

Dam design

The dam has a downstream slope of 2 to 1, and the slope of the upstream side is 2.5 to 1. The impervious core is of the sloping type with upstream slope 1.2 to 1 and downstream 0.7 to 1. The sloping core was originally chosen when it appeared that silt would be used which, due to excess moisture, would be compacted to a different degree from the sand and gravel shells. It was feared that this might cause a differential settlement where the core might settle more than the shells and result in the possibility of piping with leakage through the impervious zone. When the impervious conglomerate was substituted for the silt, excavation for the dam and treatment under the core had already progressed to a point where a vertical type core could not be considered.

On each side of the core is a 12-ft. thick filter zone of pure fine sand to prevent bleeding of the fine materials out of the core. Upstream from the sand zone is a pit run sand and gravel protected by heavy rock riprap. Downstream from the sand filter the fill is graduated from fine to coarse sand verging into sand and gravel and washed gravel and then into a heavy rock toe. The downstream slope of the dam is finished with quarry run rock.

All material was placed by end dump trucks except for minor amounts in which bottom dump trucks were used. It was found, generally, that bottom dump trucks could not negotiate the steep gradients surrounding the project.

Borrow pits for the sand and gravel were located on the right bank upstream from the dam and generally at, or slightly above, the level of the river. The longest haul was about 5 mi. round trip. After vegetation and top soil were removed in the borrow pits to expose the sand and gravel beds, power shovels were used to load the trucks. The shovels removed material down to river level for pit run material. For the downstream zones of the dam, where clean gravel was desired, draglines were used to remove material below water line, automatically providing washed gravel. Sand was found in zones within the borrow pits and was used without processing.

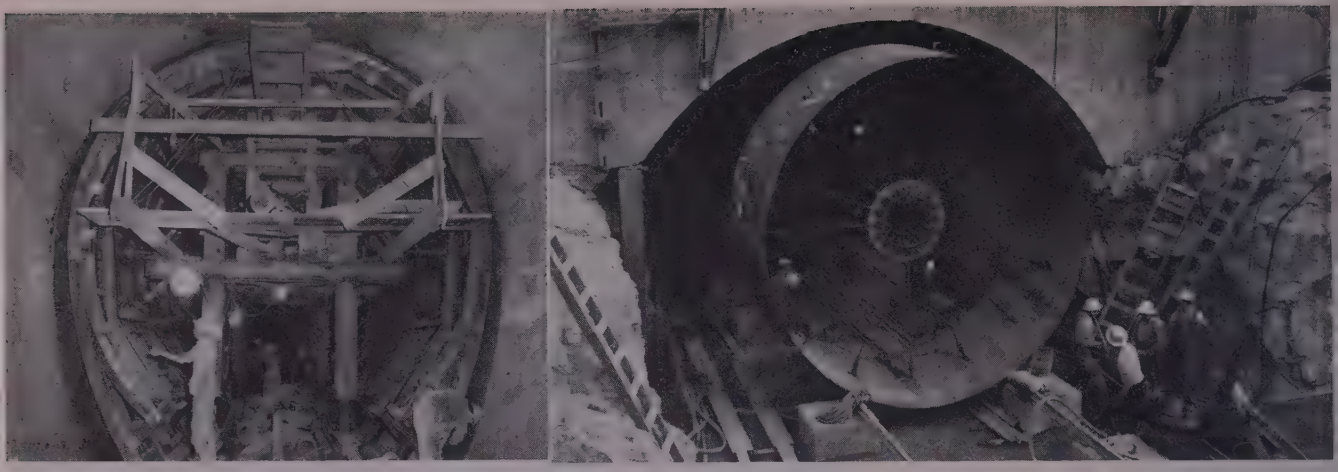
The borrow pit for the impervious torrential conglomerate was located at a higher elevation on the right bank about a mile downstream from the dam.

Amounts of fill

The following amounts of fill (in cubic yards) were placed in the main dam:

Slope protection	97,400
Crest roadbed and finish	4,000
Angular lava-rock toe	211,600
Crushed rock drain	7,107
Random fill	3,034,000
Sand filter	187,700
Impervious core material	659,000
Total	4,200,807

The dam is 323 ft. high above lowest point in the foundation, 1,500 ft. long



DIVERSION TUNNEL was 1500 ft. long of horseshoe section driven through hard rock and concrete lined. Form built by Chicago Bridge & Iron Co. (left) was used for lining. The penstock pipe installed in the intake tunnels was welded into sections at the lower portal (right) and pulled into position.

and nearly 1,600 ft. thick at the base including the upstream cofferdam.

Placement of fill in the canyon began about the middle of October 1951, and the dam was practically completed by July 4, 1952, despite the very heavy rainfalls experienced in the region. The job was on a 24-hr. schedule six days per week. The record day's placement was 40,312 cu. yd. on June 17, 1952. This averages one truck dumping every 34 seconds!

Before placing the core, holes were drilled up to 100 ft. deep below the river bed into solid rock and thoroughly grouted under pressures up to 100 psi. Following this operation, fine impervious silt 4 to 5 ft. thick was hand tamped on the clean rock surface to insure intimate contact between the impervious fill material and the rock surface. The impervious conglomerate was placed in layers together with the accompanying zones of sand, sand and gravel, and rock.

Downstream from the core on the rock foundation and connecting with the core, a rock drain, extending practically the width of the river channel and about 15 ft. deep composed of rocks 3 to 8 in. in size, was laid to insure base drainage from under the downstream part of the structure.

To place the powerhouse upstream as far as possible, a curved concrete toe wall about 80 ft. high was constructed against the downstream toe of the dam. However, this wall has no structural relationship with the dam. Its use permitted shortening the power tunnels by 100 ft.

In placing the fill, even though it was raining, hose jets were applied, averaging 3 gal. of water to each yard of sand and gravel, and 5 gal. of water to each yard of rock. Sand and gravel and the rock were compacted by the passing of the trucks and bulldozers which spread the material in about 12-in. layers. The core was placed in from 8- to 12-in. layers, depending upon the weather, and compacted with a rubber-tired roller, in addition to the passing of bulldozers and truck equipment.

One further matter concerning the dam should be mentioned. Before the finding of sufficient amounts of impervious conglomerate, and in order to keep the silt borrow pits as dry as possible, the borrow area was coated with asphalt after stripping of growth and topsoil. An area of 25 ac. lying on a steep hillside was graded to provide a smooth surface and given one shot of penetration asphalt. A standard type of oil distributor mounted on a truck was dragged up the slope by a winch on a tractor.

Saddle dam

In addition to the main dam a secondary dam or dike was constructed across a low-lying saddle just north of the main dam. This structure is a rolled earthfill with impervious core of silt and was constructed in the dry weather during July and August 1951. It is 1,600 ft. long, 40 ft. high and 200 ft. wide at the base. The upstream slope is protected with a heavy rock blanket; the downstream slope has been planted in low bush Scotch broom.

Spillway

The spillway is a concrete channel 1,090 ft. long containing five 40-ft. wide, 30-ft. high tainter gates operated by electric hoists. The spillway channel is excavated through rock and has a capacity of 174,000 cfs.—about twice the highest recorded flood. This channel does not extend all the way to the river downstream from the dam, but is brought through the bedrock well below the dam. It is anticipated that the passing of water over the rock will absorb considerable energy and thus prevent, or greatly reduce, any possible scour of the river bank opposite the lower end of the spillway.

Powerhouse

The powerhouse is located in the upper end of the reservoir formed by the Merwin Dam downstream. Turbines are set with the center lines at the normal elevation of the downstream pool and hence are provided with compressed air hook-up in order that the tail water can be depressed when the runners are to be examined or operated as condensers. Superstructure is of the semioutdoor type with only sufficient structure to provide a working bay and to protect the generators up to the top of the generator structure. Over each unit is a generator cover suitably waterproofed where it joins the roof. Horizontal hatch doors are provided over the working bay. The outdoor powerhouse crane of 250-ton capacity straddles the powerhouse.

Foundation excavation was begun in October and less than 500 cu. yd. of rock had to be removed. Concrete placing was started in October. The powerhouse, now nearing completion, is expected to be ready for operation with the first unit early in November 1952. The second 54,000-kw. unit is to go into operation in December 1952, to complete the initial operation.

Turbines are of the Francis type manufactured by S. Morgan Smith. Generators are furnished by General Electric and the stators were shop stacked and wound in four sections, The turbines are 70,000-hp. rated capacity, each under a net effective head of 224 ft. and for operation at a speed of 150 rpm. The head on the turbines will vary from 190 to 272 ft. Generators are rated at 54,000 kw., 0.9 power factor, 60,000 kva., 13,800 volts and are the vertical shaft type with direct connected 250-v. shunt wound main exciter and 250-v. compound wound pilot exciter. Both generators are paralleled on a 13.8-kv. bus through oil circuit breakers. The two units are stepped up through a single bank of three single phase 46,000-kva., 13.2 to 115-kv. forced-air oil cooled transformers.

The plant will be operated as a semi-automatic station controlled from the Merwin plant downstream. It is planned to have only one operator-oiler on duty at Yale each shift. This operator will put the Yale units on the line manually after which the Merwin operator through supervisory equipment and a microwave communication system will take over control of machine loading.

Power tunnels

Two power tunnels, each 18½ ft. in diameter and averaging 1,100 ft. long

were driven for units 1 and 2 in the left abutment. Provision was made to use the diversion tunnel for future units 3 and 4. At that time, it is contemplated the penstock from the diversion tunnel will cross the tailrace to the left bank, or a powerhouse for these two units will be built just below the dam on the right bank close enough to the present powerhouse to use the same crane.

For this future work a concrete circular caisson 76 ft. in diameter and 55 ft. high was constructed above and to one side of the diversion tunnel. It is planned in the future to lower the reservoir to the minimum operating level (3 ft. below the top of the caisson) and then construct the headworks and make the necessary connection to the diversion tunnel. A bad fault zone, which developed landward of the two power tunnels for units 1 and 2, made hazardous the driving of additional tunnels in the left abutment; this resulted in the decision to use the diversion tunnel.

PROGRESS in placing earthfill reached a maximum on June 17, 1952 when the crews and equipment of Morrison-Knudsen put in 40,312 cu. yd. (24 hours) or at a rate of a truck dumping every 34 sec. around the clock.

Power tunnels

The power tunnels, with invert at elevation 400 at the intake works, proceed level until the transition from the square gate section to the designed horseshoe section is passed. They then dip down on a 9% grade, intersecting in easy curves a 55% grade, to drop 125 ft. into the horizontal section of tunnel on level with the scroll cases at the powerhouse. The lower hundred feet of each tunnel into the powerhouse is lined with 1-in. steel plate with welded joints since the rock is not considered strong enough at the edge of the excavation. These penstocks are 16 ft. in diameter.

After the tunnel lining was completed, a comprehensive and careful grouting program was followed. Holes were drilled 10 to 20 ft. through the lining into the rock at 20-ft. intervals and grout pumped to refusal.

Drilling of the upper part of the tunnels was done from truck-mounted jumbos. Due to the 9% grade, it was not possible to use regular muckers. Consequently, the contractor fitted an overhead dumping bucket onto a D-8 Cat and substituted an electric motor for the usual power plant. A cable was unreeled behind to supply electric power. A curved chute extended completely over the tractor (see illustration) and dipped down over the front. A truck was let down on a cable and a scoop-shovel mounted on trunnion arms lifted the material up and backward over the equipment.

The 55-deg. sections were first opened up by drilling a 6 by 8-ft. pilot drift from the bottom to the top. Then the tunnel section was widened beginning at the top and moving down. The upper end of the tunnel was than drilled to meet the top of the steep slope section. The steep slope section and the lower end of the tunnels required very heavy timbering due to faulty rock. By drilling horizontal holes 100 ft. deep in the crown of the upper tunnel section and grouting before advancing the face, it was possible to get along without timbering.

Fish provision

No provision had to be made for handling fish since at the Merwin project, built over twenty years ago, special provision was made to carry the fish around the 200-ft. high Merwin Dam. These fish facilities consist of a channel, or runway, leading to a steel tank. At intervals the tank is raised by means of a special hoist and placed on a truck with special facilities for pumping air through the tank while the fish are in transit. The fish are carried to hatcheries on the Lewis River or to other river basins or dumped back into the river above the project. When Merwin was built, the company constructed a hatchery, purchased necessary transportation equipment; and in addition, pays a fixed amount of money each year for the maintenance and operation of the hatchery. The program, in cooperation with the State of Washington, has been in successful operation for over twenty years. Minimum discharges of water are released from Merwin reservoir and the storage is sufficient so that there is no special requirement for water release from the Yale reservoir.

Construction power

Construction power for the project was obtained from Merwin over what will be the project transmission line. This line is about 12 mi. long on wood poles of H-frame type construction. It terminates in the Merwin switchyard on two 115-kv. buses through two 1,200-ampere, 3,500,000-kva. oil circuit breakers. From one bus, normal power flow for Yale generation will be over a 16-mi. 115-kv. transmission line to a point near Kalama, Washington, where the line ties into the Northwest Power Pool through the facilities of the Bonneville Power Administration. The other 115-kv. bus in the Merwin switchyard will normally tie the Merwin plant to the company's transmission line to Portland. These two 115-kv. buses will usually be operated independently of each other but they can be tied together through oil circuit breakers in case of line outage, plant failure or at times of limited generating capacity at Merwin and Yale plants.

The project is notable for the speed with which it has been constructed; the fact that a major earth dam was successfully completed in a winter season of unusually heavy rains; and the use of an unusually high cofferdam to minimize interference from floods and the special provision in the construction of the dam to handle floods should they occur. Nearly $5,000,000 worth of construction equipment was massed at the site. The construction of heavy rock and gravel fill roads enables truck movement in the heaviest type of weather without bogging down.

Personnel

For the Pacific Power & Light Company, E. Robert de Luccia is vice president and chief engineer, J. B. McKamey is project manager for Ebasco Services Incorporated (Agent for P. P. & L.), Frank L. Beadle is assistant to the project manager, G. M. Henderson is resident engineer and Allen B. Raby is construction accountant.

C. E. Roberts, field engineer; F. W. Yarbrough, soils engineer; D. L. Houghton, concrete engineer; W. N. Laval, field geologist; R. P. O'Reilly, office engineer, and H. P. Robertson, cost engineer, make up the other supervisory personnel of Ebasco Services Incorporated on the job.

George E. "Ed" Murphey is project manager for Morrison-Knudsen Company, Inc. Among the supervisory and administrative personnel for the contractor are: Owen J. Daly, general superintendent; John A. Byer, project engineer; O. Sims and P. L. Geiger, assistant general superintendents; Carl Hersloff, tunnel superintendent; Charles Silva, carpentry and concrete superintendent; J. A. Moren, master mechanic; J. S. Lusk, excavation superintendent; Gordon Phillips, rigging superintendent; E. E. Eaton, concrete superintendent, and C. T. McBride, administrative superintendent.

Powder-actuated fasteners speed house frame pre-assembly

By JIM WARN
Construction Superintendent
Barrett & Hilp
San Francisco, Calif.

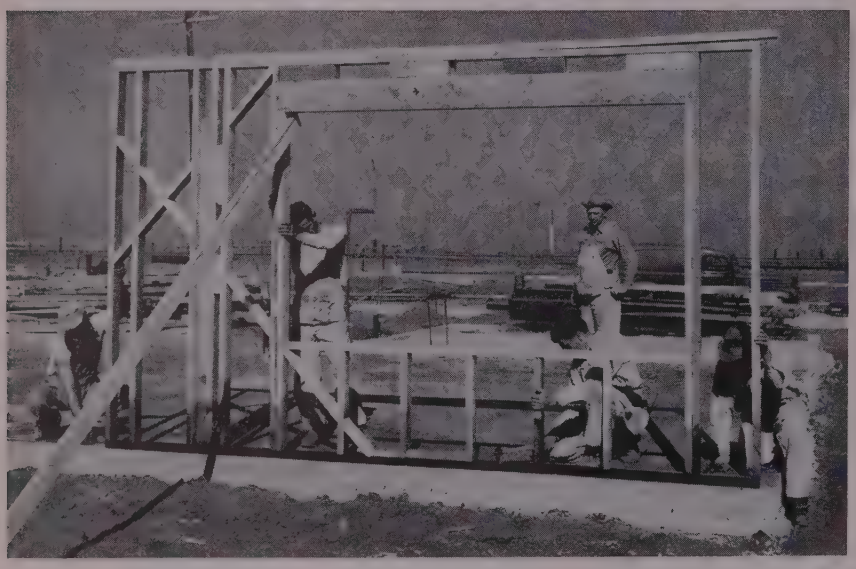
BANG-UP JOB is performed at tract, where frames are set and secured by powder-driven studs. Detail shown includes completed stud assembly at far right, driven through 18-gauge steel that acts as washer. Acceptability of method depends a lot on operator's ability.

IN MY 20 YEARS with Barrett & Hilp, a constant aim has been to develop construction methods that would cut costs but stay in line on quality. Our present housing job at University Village on the San Francisco peninsula is based on pre-assembly of frames to do this.

One obstable to the most efficient frame construction has been the need for setting mudsills ahead of time, fitting them to preset foundation bolts.

A solution to the problem seemed to be the use of power-actuated fasteners. The Veterans Administration and the FHA both had approved the use of Ramset fasteners elsewhere in the country.

We picked a "pilot house" in the tract before going into full-scale operations, and asked A. W. Russell, chief building inspector of San Mateo County, and H P. Tarratt, his assistant, to examine the proposed method, along with ourselves and representatives of Elder & Co., distributor of Ramset fasteners. Our plan was to use a No. 3478 Ramset fastener driven through an 18-gauge steel disc that would act as a washer. Together with the field demonstration, he had the results of pull-out tests by the Underwriters Laboratories and lateral-thrust tests by Abbott A. Hanks, Inc.



A FEW TAPS with a hammer line up the rigid wall section on the slab. There are no joists to plumb, as the treated sill has been installed at a central yard. Doors can be sawn out later.

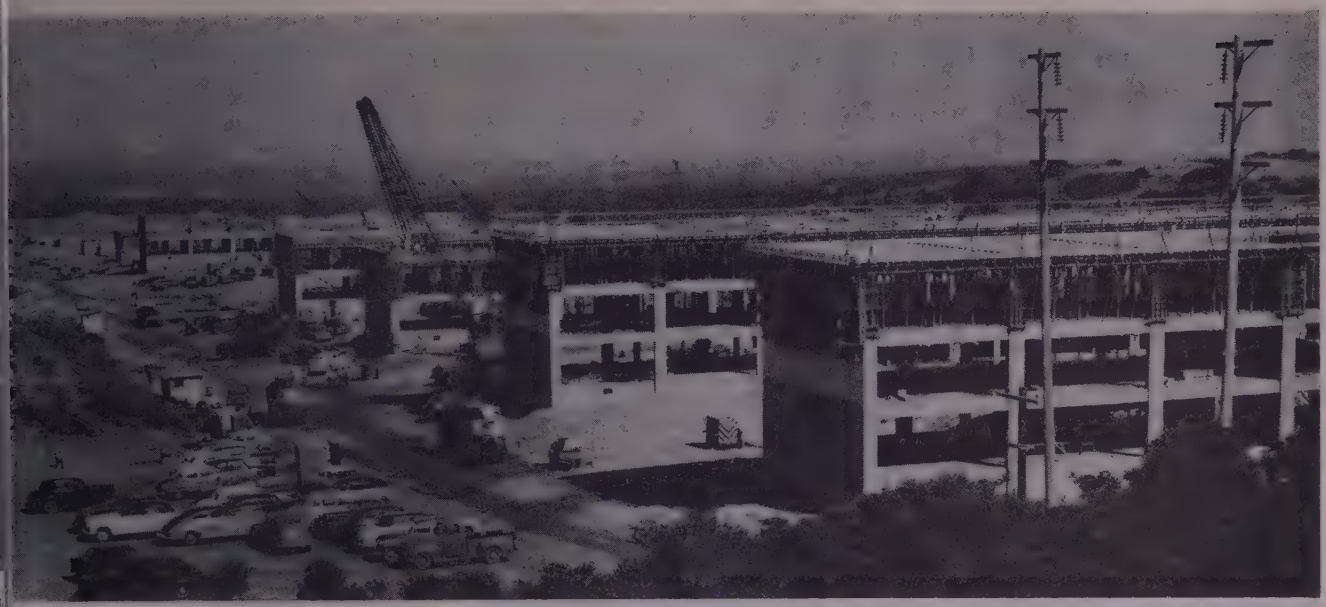
On the basis of these tests, Russell approved our use of Ramset No. 347 fasteners on 4-ft. centers as an improved alternate to standard foundation bolts on 6-ft. centers, so long as all openings and corners of the sill plate and interior partitions were secured and attention given to the proper curing of the foundation.

Since we did this "pioneering" in San Mateo County, we understand that approval has been given elsewhere to the method, providing that the control conditions which we established and followed are observed in all cases.

All in all, this single improvement in method constitutes a significant step in increasing our house production.

Downtime memo: 'Chute the works

TODAY'S FASTEST WAY to get parts from the factory to the point of breakdown is by air. Cargo-dropping parachutes are coming into increasing use for this specific purpose. Construction crews, such as this one, can ill afford to have expensive equipment standing idle for days—when they can put it back on wheels in a matter of hours. Wheel bearings, in this case, were the midget parts that stopped the earth-moving goliath. One quick phone order, some fast action by the distributor, a chartered airplane trip, and the equipment was rolling again in less time than it would have taken a letter to go from the job to the company's home office.



Assembly-line concrete barracks

Stair-stepped structures reflect scheduling planned to permit job repetition and materials re-use—Fast work results on $12,000,000 job for building 31 barracks in close order drill at Fort Ord

"WE FIND that it takes about three repetitions for our crews o reach their best efficiency." Observa- ions like this, made at the 25% point in rogress on a $12,000,000 job, are among he factors that will determine the de- ree of success to be attained by J. N. Jack" McPhee in superintending con- truction of 31 permanent barracks at ort Ord, California. The buildings are ll alike, except for the addition of boiler ooms in eight, and they are going up in ssembly-line fashion, with the various rews detailed to specific tasks. "Just ke in an automobile plant," says Mc-Phee, "except that we bring the men to the work."

OLUMN CONCRETE precedes rest of deck, ith two cranes making quick work of handling uckets to the scattered pour spots.

Del E. Webb Construction Co. of Phoenix, Arizona, and Los Angeles got the barracks job last January on a bid of $12,614,832, although government change orders have made for a succession of revised totals. The work was specified with two acceptable alternates involved: a contractor might bid on a 100% reinforced concrete design, or one incorporating concrete block filler walls in a reinforced concrete frame. The Webb bid was based on the frame-and-filler-wall alternate.

Among items subject to change orders has been the number and size of buildings themselves. At present—and it appears that the point is final—there are 31 buildings arrayed in two parallel lines, 16 in an east row extending south to north, and 15 in the parallel west row. They are grouped characteristically in fours, except for a cluster of three at the northwest corner of the project site.

Each building is T-shaped, the stem being devoted to living facilities, and the crossbar to individual kitchen and messing facilities. The barracks proper are 39 ft., 6 in. wide, and 265 ft., 8 in. long in an east-west direction. The mess wing is 58 ft., 4 in. wide and 121 ft., 10 in. long. The dormitory area is three floors high, while the attached mess wing consists of a basement and one floor. Excavation beneath this area of each building for steam and plumbing lines also provides a partial basement for equipment and food storage.

Altogether, the job presents an unusual opportunity for application of assembly-line procedures to heavy construction. Many military base housing projects have been handled by Webb men in the past, but largely these were of wood, and this semi-permanent construction was an application of housing tract methods.

The construction at Fort Ord, as at most other U. S. military bases these days, is intended not only to serve current needs of an expanded military where World War II structures no longer are serviceable, but also to be the basis of an integrated plan for permanent construction at major establishments.

Complex job planning

Working in reinforced concrete, though, whether with one building or 100, requires engineering in every construction detail. Instead of (or in addition to) light scaffolding, there must be heavy forms. Instead of precast footing piers, there must be considerable excavation for poured-in-place spread footings.

The relatively greater complexity of each construction detail in these permanent buildings requires greater time and more engineering for each operation. There is great variation, for instance, imposed by specifications for the time

DOWN TO EARTH. Three structures at left are pictured on the same day at respective degrees of progress. Ideally, the barracks follow each other at 7-day intervals. Concrete work shown here calls for greater time. Note completed interior backfill in middle picture.

that must elapse before form stripping. As a result, carpenter crews move straight through a group of buildings or through the entire project in performance of their work. But concrete crews skip around. They tackle the larger pours on a schedule drafted a week in advance, and smaller pours are sandwiched daily into available time on the schedule. Weather conditions, of course, can work a rapid change in the pour schedule, for a threat of rain can cause cancellation of the pouring of a final slab.

Clearing and grading

Site clearing and grading started in February, soon after the contract was signed, and has regulated other work schedules. As it progressed it was followed speedily by excavation of building sites, forming and pouring of footings, and then the work of erecting the buildings.

Grading was completed in late October, and consisted of moving about 600,000 cu. yd. of cut and fill with tractor-scraper combinations. In the original grading 6 in. of the top soil was removed and stockpiled off the building sites to be replaced for planting after buildings are erected. Following the site clearing, grading and compaction has kept pace, with 50-ton rubber-tired compactors doing the work. Excavation for buildings was scheduled for completion the last week in November; pouring of footings for the last barracks early in December.

Specifications call for 95% compaction under actual building sites and 90% elsewhere. There is little moisture content in the sandy soil over most of the site, and additional water was delivered t the site and sprinkled by tank trucks t gain the specified moisture content i compaction.

Although there is little significar variation between buildings, there ar differences between floors or ends of th same building. Height of the first floo elevation from spread column footing varies with each building due to slop of the site. Excavation for footings an for basements averages 4,000 cu. yd. a each structure. Exterior walls vary fro 8 to 10 in. in thickness, and with the foo ings in place one pour brings exterio walls up to the first-floor level. Interio columns, varying up to a 24-in. squar section, are poured to the same level.

Concrete requirements

Specifications call for 1-ft. lifts i the concrete pour, meaning essentiall that concrete shall not be poured fro one location and permitted to slum along the forms an excessive distanc Instead, the pour point shall move a the concrete is placed, so that the poure section rises somewhat uniformly in 1-f increments.

Forms may be stripped when a sampl of the concrete shows a compressiv strength of 2,000 psi., or after 7 days. Th contractor has found that the concret develops its strength well ahead of re quirements. Specified for a 28-da strength of 2,500 psi., it has often bee tested at 4,000 psi. The mix employs maximum aggregate size of ¾ in. Max mum allowable slump is 4 in., and i floor slabs it has been held as low as 2 in

Before forming proceeds to uppe floors, backfilling is accomplished aroun wall and column footings, except i areas which call for basements. Here th floors are graded and prepared for pour ing, and basement concrete work is fin ished. Backfilling around exterior sur faces is preceded by coating of the con crete as protection against moisture.

First floors are formed by steel pa forms to give a 2½-in. deck and 9½-in joists at 20-in. centers. The floor-to-floo height from basement to first floor is 1 ft., 4 in.; in the boiler room 18 ft., 6 in.

With forming of columns, beams, an partitions rising above the first floor, th barracks begin to make use of opera tions that will repeat on floors above Floor-to-floor height between remainin floors in each building is uniformly 10 ft 5½ in. The extreme end of each building opposite the mess wing, is sectioned of with removable partitions into room 11½ x 15½ ft. The center of each build ing has concrete-block partitions to form rooms for non-commissioned officers commanding officer, lounge and lava tories. The section next to the mess hal is for classrooms. Each building wil house 225 men.

UP IN THE AIR. Again, three different barracks illustrate points of progress in construction. Steel pan forms receive first floor pour, which retains protective paper covering in second picture as column steel is moved in. Final panel shows second floor forming.

The roof, like the floors, is formed on steel pans. It consists of 2½ in. of structural concrete followed by 4 in. of lightweight concrete. A uniform slope results with the thickness varying from 6 in. at the center to 2 in. at the outside.

Between concrete frame members, filler walls are being built of concrete masonry units. These carry up to windowsill height. Remainder of the wall is glazed, fitted with Truscon steel casements. Filler-walls are 8 in. thick, reinforced both horizontally and vertically. Vertical rods are grouted into the block cores at 16-in. centers.

Total concrete in each buildng comes to about 2,400 cu. yd. Some 29,000 concrete blocks go into the filler-walls of each structure.

An operational sequence and staggering of progress was devised to get "roofs" or upper floors in place faster and permit other trades to proceed with their installations simultaneously with actual construction of floors above. It also allows better spacing of steel deliveries, a prime consideration in time of steel scarcities.

Form panels of ⅝-in. plywood are being used on the job. Forms for the many spandrels and interior beams are moved intact. Where schedules make it logical to move forms from one building to another, this is done. But where they are used on the next higher floor of the same building, they are simply moved upward intact.

Speed and economy in this repetitive job also have been helped by the use of steel shores, portable steel scaffolding, column jacks, special steel pan forms, etc. Steel shores have saved many man hours in their extensive use for support of beam and spandrel forms, and for support of steel pan-and-joist forms. The shores need be set once only, and all subsequent uses require only a "verifier" adjustment for fit into position. They can be handled and installed by one man, with no necessity for aid in setting wedges.

Steel pan forms have been furnished and detailed in long lengths to fit the job. The long sections, in pairs, span each bay between floor beams. Most beams, and their supporting column centers, are 24 ft. between centers. Where the pan forms abut they lie on temporary timber beams supported by adjustable shores.

Work crew organization

Personnel organization has to be of a high order to maintain control of the work scheduling. To do this, the job personnel are assigned to small crews, usually of about 10 men. Each crew is supervised by a foreman, and over these foremen is a general foreman. By late October the total working force was approximately 650 men, and this was expected to increase to about 750 men at the height of construction early in 1953.

In the matter of one crew continuing on the same type of work day after day, McPhee realized that repetition to achieve familiarity with the job would improve performance. Yet he found that the third repetition generally brought the maximum efficiency to be gained. Beyond that point the time factor for a particular job was fairly well nailed down, barring inordinate turnover in the crew personnel.

Ready-mix concrete for the barracks work is being supplied on subcontract by Granite Constructors of Watsonville, Calif. On the job for Webb, it is placed with two 1½-yd. and one ¾-yd. buckets handled by a Bucyrus-Erie, an Osgood Mobilcrane, and a General Truck crane.

Besides its original barracks construction contract, the Webb company in subsequent bidding won a $2,000,000 contract for construction of warehouses, a stockade and guardhouse at Fort Ord. Most recently there has been added a $2,100,000 contract for utilities.

The San Francisco District, Corps of Engineers, is directing the Fort Ord construction program, with Col. R. Warren Heilig as resident engineer.

J. N. McPhee is superintendent for Del E. Webb Construction Co., assisted by Gilbert A. Murray. W. A. Warriner is job office manager, and W. W. Clark is job engineer. A. H. "Andy" Shearer is general carpenter foreman, and Clyde "Whitey" Maslen is general labor foreman.

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Vital link in construction of Portland's sewerage improvement program is the laying of 30- and 42-in. cast iron pipe under the Willamette River—Sections more than 90 ft. long were joined by flexible couplings and laid in an excavated trench

Submarine sewer job at Portland

A MAJOR ADVANCE in construction of the Portland Sewage Disposal Project in Oregon has been marked recently by construction of the Willamette River Unit of the project. The river unit involves the installation of two cast iron force mains under the Willamette River from a pumping station at the west end of the Burnside Bridge to a connection with an east side interceptor sewer at N.E. Occident Ave. and Irving St. The work has been done on a $683,000 contract held jointly by State Construction Co. of Seattle and Walter McCray of Mercer Island, Washington.

Crossing on a skew

The Ankeny pumping station, westerly terminus of the contract, lies to the south of the Burnside Bridge. The first 150 ft. of both 30- and 42-in. pipes is on shore, but thereafter the lines drop into the river directly in front of the sea wall constructed along the Willamette River bank. Paralleling the shore for some 500 ft., the lines then turn to the northeast, crossing the main river channel on a skew alignment totaling about 1,200 ft. The pipe is laid in river bottom trench in this reach. Toward the east end of the job, the lines on shore are joined to a monolithic concrete structure passing under railroad tracks. This 175-ft. length completes linkage with the 96-in. interceptor sewer which was constructed last season.

100-ton floating crane

Submarine trench excavation commenced late last June along the foot of the west seawall. The bottom material being very soft and unstable throughout this 500-ft. length, bents of 2 piles each were placed to support each 16-ft. pipe joint. Some deflection of the seawall itself was noted during the nearby trenching operations, so quick pipe laying was followed immediately by backfilling with river run gravel. Minor cracking in the pavement behind the seawall was the only effect of this work, with no siignificant damage to the wall itself or its stability.

Alignment dictated

Pipe used for this portion of the job, as for the river crossing itself, was laid by a 100-ton floating crane. The pipe was trucked to the site, and assembled there on a barge, six 16-ft. joints comprising one laying length.

Lowered to the prepared trench and pile bents, the pipe was joined under direction of divers. Actual fine maneuvering was handled topside by taglines controlled by divers' instructions. Doublex-Simplex lock joint pipe was used for the crossing, with bolted connections made up underwater by pneumatic impact wrenches in the hands of divers.

The trench for the river crossing was excavated wide enough for both pipes and about 9 ft. below the natural river bed. This excavation, incidentally, carried with it the removal of two sunken scows that lay directly on the trench alignment.

The river bottom contour in this reach is rather irregular. As a matter of fact, the final course of the pipe, first paralleling the seawall before turning across the channel toward its destination, was dictated by the presence of rough riverbed topography along a more direct alignment. In order to avoid possible scour effects responsible for this condition the dog-leg was specified.

The pipe, as laid, negotiates four or five rather abrupt changes in grade, its trench lying as much as 60 ft. below the surface in one place. Therefore, ball and socket double hubs were installed by the contractor between laying lengths for ease in laying and joining the pipe in the river crossing.

Under railroad tracks

Final step in the work consisted of forming and pouring the concrete conduit passing beneath railroad tracks on the river's east shore. Railroad bridge crews installed temporary girders to carry their tracks, and the contractor was able to excavate. The material there is a very hard cemented gravel that had to be loosened first by pneumatic breakers before it could be removed by a backhoe. Portions of the pipe trench itself short of this concrete structure have had to be blasted.

Personnel

The project was designed by the consulting firms of Stevens & Thompson and J. C. Cunningham & Associates. The work of these engineers also has included design of the 13,200-ft. Grand Avenue interceptor sewer, tunneling for which was reviewed briefly in *Western Construction* for September 1951, pp. 90-91.

The work is under the direction of L. G. Apperson, city engineer. D. E. Currin is field engineer for the city, and furnished material for this article. The contractor is represented by Ed Hart and Walter McCray, the latter providing diving services on the project.

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WESTERN CONSTRUCTION NEWS

DECEMBER 1952

Bids this month for new S. F. Bay crossing

CONSTRUCTION BIDS are scheduled to be opened late this month for the Richmond-San Rafael bridge crossing of San Francisco Bay. Legal obstacles from interests opposing the project may interfere as indicated in the November issue (p. 82).

The State Toll Bridge Authority authorized on November 7 the sale of revenue bonds to finance the project. Design and construction of the $65,000,000 program are under the direction of Norman C. Raab.

Opposition to the plan for a high level steel bridge which will ultimately provide two decks for six lanes of traffic comes from interests favoring a solid fill barrier at or near the site. This barrier would also serve to store fresh water and control the intrusion of salt water into upper San Francisco Bay. The building of the high level bridge might delay or eliminate the construction of the barrier, according to these interests. Indications at this writing are that a suit would attempt to block bridge construction.

DON'T OVERLOOK . . .

. . . THE 1952 ANNUAL INDEX, which begins on page 137 of this issue. All of the editorial features published in the twelve issues of WESTERN CONSTRUCTION during 1952 are indexed for easy reference. Also, unit bid abstracts are indexed by location and type of construction involved.

Concrete supply set for Hanford atomic plant

HENLY Construction Co., Boise, will build and operate a $637,500 concrete mixer for the Atomic Energy Commission in its further expansion at Hanford. The plant will produce approximately 100,000 to 300,000 cu. yd. of concrete during a three-year period beginning in November. Henly will supply his own means to furnish about 150,000 cu. yd. of aggregate, also.

STEEL ARCH BRIDGE GOES UP NORTH OF ANCHORAGE

NEW HIGHWAY BRIDGE over Eklutna River about 60 mi. north of Anchorage in Alaska is shown under construction by Munter Construction Co. of Seattle, Wash. Shown here is a 15-ton Lorain Moto-Crane used by the firm. With 60-ft. boom and 10-ft. extension, the machine erected the 1970 ft. steel arch span and 50-ft. and 40-ft. I-beams for the approaches. Entire job consisted of moving one existing arch span upstream and placing the new center arch span as shown. The concrete deck of the bridge is 60 ft. above the river bed.

More power from P. G. & E. steam plant

THE NETWORK of electric lines supplying power to Northern and Central California farms, factories and homes got a 117,500-kw. jolt of new energy on November 11. The source was a massive generating unit which went into service for the first time at Pacific Gas and Electric Company's $80,000,000 Moss Landing Steam Plant on Monterey Bay. A second new unit of equal size, the plant's fifth and last, is scheduled for completion in another month.

Construction of the Moss Landing plant has been in progress continuously since ground was broken in September 1948. Power from the first unit to be completed surged over the transmission lines in April, 1950. Work on the last two units now being completed began in the fall of 1950.

With all five generating units in service Moss Landing will reach its designed capacity of 575,000 kw., making it the biggest steam-electric plant in the West.

Before the rising demand for electricity catches up with the new supply at Moss Landing, PG&E will have increased its capacity still further. Moss Landing will be "biggest in the West" only until next spring, when two more generating units being added to the original three at Contra Costa Steam Plant near Antioch are scheduled for service.

Even these two 575,000-kw. twin plants will yield place, however, to the 600,000-kw. Pittsburg Steam Plant, now rising. The first two of its four generators are scheduled for service late in 1953 and the next two early in 1954.

Columbia River toll bridge would replace two ferries

A PROPOSAL was recently submitted to the Corps of Engineers to OK a $4,132,000 toll span crossing the Columbia River, three miles downstream from McNary Dam. The proposed bridge would be financed by revenue bonds, to be handled by Tudor Engineering Co., San Francisco, and Colpitts, New York, the same firms which handled funds for The Dalles bridge. They are at present negotiating to buy two ferries now operating at the bridge site. The new bridge, consisting of two 600-ft. spans, would be paid for by tolls. Estimates are that annual maintenance costs would be $13,600 and operating costs $39,000.

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Tunnel contract awarded on Sly Park Project

A CONTRACT for construction of Camp Creek Tunnel near Camino, El Dorado County, Calif., as part of the Sly Park Unit of the Central Valley Project, has been awarded to the G. L. Tarlton Contracting Co., of St. Louis, Mo., on a low bid of $412,655. It is the first contract to be awarded on the Sly Park Unit project, one of the ten "new construction starts" authorized by Congress for inclusion in the Federal Reclamation program during the national emergency. An initial appropriation of $1,250,000 for the Unit was made in the last session.

The tunnel, with a capacity flow of 500 cfs., will carry Camp Creek water to the upstream end of Sly Park Reservoir, which will be constructed to hold 41,000 acre-feet of water, some of which will be used for irrigation, industrial, municipal and domestic use in Placerville, Camino, and other communities in the area.

The 2,900-ft. long, concrete lined tunnel, 7 ft. in diameter, must be completed within 330 days after notice to proceed, the contract stipulates.

Construction contracts for other major features in the Sly Park Unit program are expected to be awarded during the coming fall and winter, with tentative schedules calling for completion of the project in 1955.

Other major features of the plan include:

Dam and reservoir on Sly Park Creek at the lower end of Sly Park Valley, a rolled earth-fill structure 175 ft. high and 850 ft. long, with a water storage capacity of 41,000 acre-feet.

A 10-ft. diversion dam on Camp Creek to divert water into the Camp Creek Tunnel.

Sly Park-Camino Conduit, starting at the main dam at Sly Park Reservoir and extending 7.4 mi. to Camino, would consist of 7 mi. of concrete or steel pipe and one tunnel 2,220 ft. long.

The estimated total capital cost of Sly Park Unit is $7,030,000.

Good safety record at Albeni Falls Dam

CONSTRUCTION ACCIDENTS at Albeni Falls Dam, Wash., have been remarkably few, reports James F. Grafton, resident engineer for the Corps of Engineers. Only two of the 13 accidents resulting in loss of working hours have occurred since the beginning of this year. The worst accident was a finger amputation. Contractors at the dam site have been striving to keep the safety record as high as possible, but one time last winter disaster was averted only through quick action on part of one man who caught the tumbling body of a co-worker six feet after he was hurled from an ice scaffold toward the rocks 120 ft. below. The rate of lost time accidents stands at only .05% of man hours on the job.

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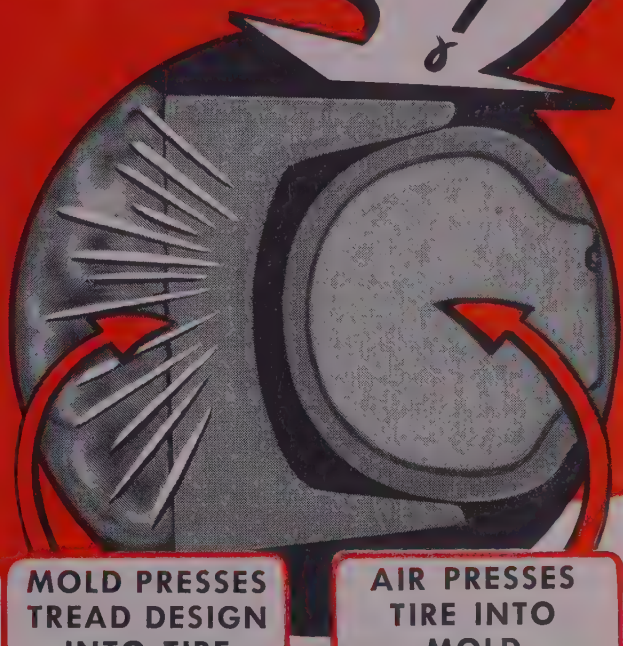
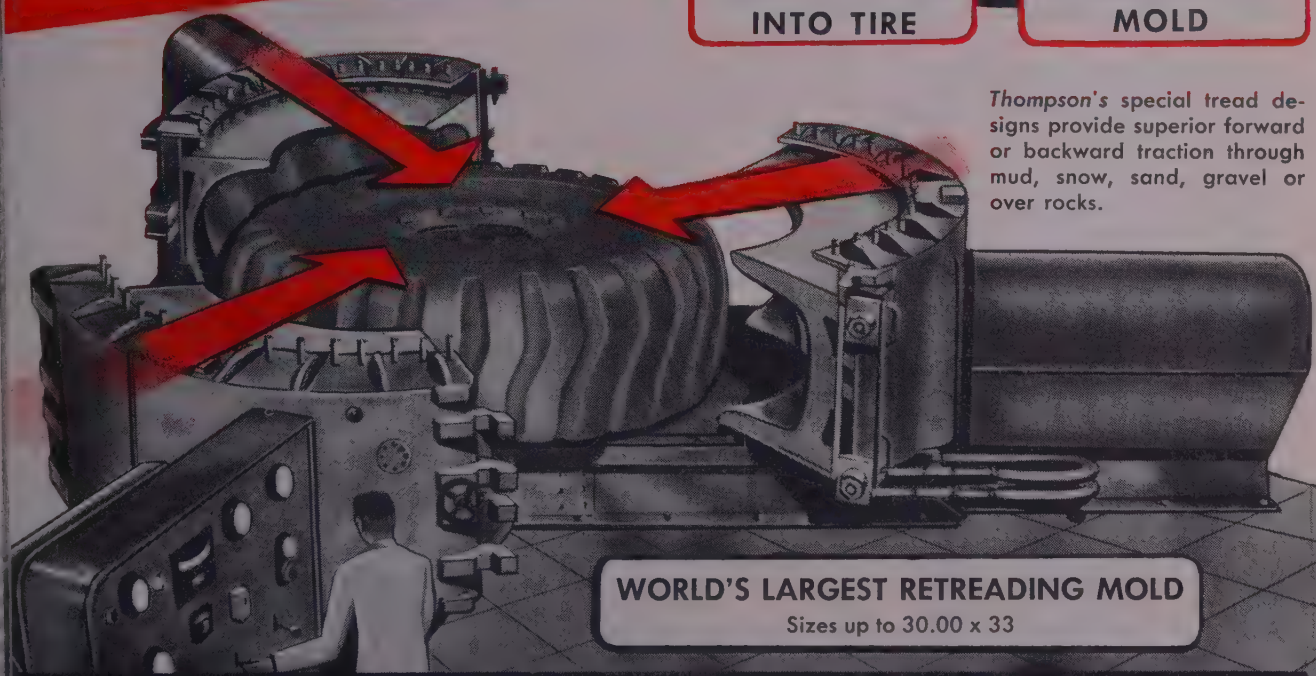


MOLD PRESSES TREAD DESIGN INTO TIRE

AIR PRESSES TIRE INTO MOLD



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AGC conference discusses labor, welfare benefits

CONTINUING their occasional meetings for the informal discussion of common problems, the managers, secretaries and representatives of the Chapters of the Associated General Contractors from the eleven Western states met in San Francisco October 27. This Western Chapters Conference was presided over by J. A. Thompson, national director from Los Angeles, with W. Don Shaw, manager of the Southern California Chapter, acting as secretary.

Health and welfare benefits

The morning session was devoted exclusively to current labor problems, with special reference to impending requests for the establishment of health and welfare benefits. The representatives from the Northwest indicated that the last raise in wages negotiated with the teamsters' union had included the establishment of a fund to be paid out of the wage increase for such benefits. The fund is to be controlled by representatives of both the contractors and the union.

The Northern California Chapter and the Central California Chapter reported through Harold Ringrose that the subject of health and welfare benefits was actively discussed in their latest negotiations with several of the craft unions and the result was an agreement that representatives of the AGC chapters would embark on a comprehensive study of the subject during the current contract period. Such a study has been undertaken.

The afternoon session was devoted to the discussion of several subjects of importance to all of the Western chapters. These included matters of government control over materials, the renegotiation of contracts by the federal government, matters of equipment rental with option to purchase, and the problems of subcontractors and bid depositories.

Jim Marshall, assistant managing director of AGC, was present at the conference and presented the national picture on these various points of discussion.

Some of the recommendations authorized at the close of the conference were:

The Conference lends its complete support to the national association's position with regard to opposing bid depositories, listing of subcontractors and bid segregation, and further in its full support to the policy contained in its recent publication, "Just and Harmonious Relationships in the Construction Industry."

The Conference supports in its entirety the resolution adopted by the U. S. Chamber of Commerce, namely, recommending the immediate relaxation of controls on all types of construction materials by the National Production Authority and further, that such controls be completely abolished as of January 1, 1953.

The Conference also expressed appreciation to H. B. Simpson of "Project —Adequate Roads" for attending the conference and went on record supporting "PAR," recommending that all chapter members add their support to the aims and objectives of "PAR."

More conferences planned

Considerable discussion was given to the subject of continuing the Western Chapters Conference both as to location and type of meeting. Expressions indicated that these conferences were serving a useful purpose and should be continued, since they enabled the chapter officers to discuss in an informal manner common problems of interest to AGC throughout the West. Interchange of ideas was believed to be useful for all chapters as the representatives returned and reported to their local groups. The informality of the meetings was considered particularly helpful and any action taken at the conference was definitely to be expressed as a recommendation to be reported back to the chapters in the West.

AT A RECEPTION in honor of A. S. Horner, AGC National President, and H. E. Foreman, AGC Managing Director, held in San Francisco in October, are, from left: *A. S. Horner, Frank F. Burrows*, President, Central California Chapter of AGC, and *Harold O. Parish*, President, Northern California Chapter.

Bechtel will engineer big Northwest refinery

BECHTEL Corporation has been awarded a contract to engineer, design and construct a $35,000,000 Northwest oil refinery. The structure will be built for General Petroleum Corporation near Ferndale, Wash., on a 850-acre site. Bechtel Corporation will employ about 1,500 people during the two-year period of work on the refinery.

This contractor was locked out of his own house!

TELLING IT to the judge in San Rafael, Calif., recently were an embarassed contractor, who built a house on the wrong lot, and the irate matron whose lot is no longer vacant.

The matter became a court affair when the lady had the locks changed on the un-ordered residence and claimed it for her own. The contractor protested.

Judge N. Charles Brusatori solved the problem by ordering sale of house and lot. Mrs. Noreen Outsen, lot owner, was to receive $2,000 for her lot. Contractor, Gaither and Boe, would collect the rest.

USBR asks bids on major projects

BID INVITATIONS were issued by the Bureau of Reclamation for several important projects during the month of November.

Calls for Kirwin Dam, part of the Missouri River Basin Project, were issued in late November. This earthfill dam on the north fork of the Solomon River near Kirwin, Phillips County, Kansas, will consist of excavation for structures, completion of excavation for foundation of the dam, completion of the dam embankment, and construction of concrete structures. The dam will be about 105 ft. high and 12,600 ft. long. Concrete construction will include a 400-ft. wide spillway with chute and stilling basin, and 8,180,000 cu. yd. of the total 9,500,000 cu. yd. embankment.

November 26 was the date for calls on Camp Creek Diversion Dam, Central Valley Project, about 2 mi. east of Sly Park, Calif. The structure will be a concrete overflow weir about 44 ft. long and 10 ft. high built on a rock foundation. The headworks, requiring a 7- by 7-ft. radial gate is part of this contract.

North Branch Dam, for which calls were issued November 28, will be located on Picacho Arroyo, about five mi. northwest of Las Cruces, N. Mex. This will be an earthfill detention structure about 1,600 ft. long and 42 ft. high, with 160,000 cu. yd. embankment required. North Branch Dam will be part of the Rio Grande Project.

Bids were issued in mid-November for Courtland Canal and detention dams, Missouri River Basin Project, located near Superior, Neb. The 2.4 mi. of 685-cfs. capacity canal to be constructed include nine embankment sections which are to serve also as detention dams, and 423,000 cu. yd. excavation.

Calls for Unit 3 of Mohawk Lateral Distribution System, Gila Project, were also issued in mid-November. Work is located near Wellton, Ariz., and will include about 29 mi. of unreinforced concrete lined laterals and sublaterals of 90 to 15 cfs. capacity, and construction of 13.8 mi. of protective dikes and chanels. Total excavation will be about 1,201,000 cu. yd.

Chandler Power Canal, Yakima Project, located about 9 mi. from Prosser, Wash., was subject of a bid call in early November. The 8-mi., 1,500 cfs. capacity canal is to be constructed from Prosser power plant to Chandler power plant.

Bids were issued in late November for East Low Canal, Columbia Basin Project, near Warden, Wash. This 34-mi. reach of unlined canal will vary in capacity from 1,490 cfs. to 550 cfs., and in base width from 22 to 20 ft. About 3,700,000 cu. yd. common excavation is required.

Bids will be issued at an unannounced date within the next month for Sly Park Dam, Central Valley Project. The work will involve construction of an earth- and rock-fill dam about 750 ft. long and 175 ft. high, with an outlet works conduit and ungated spillway, and construction of a saddle dam about 700 ft. long and 100 ft. high.

Nevada contractor a friend of the handicapped

IN RECOGNITION of its noteworthy achievement in hiring handicapped and disabled veterans, Isbell Construction Co., Reno, was given an award by the American Legion during the national Hire the Handicapped Week. The award was occasioned on October 10 by ceremonies at radio station KOH, and actor Edward Arnold made the presentation for American Legion headquarters. Isbell Construction Co. has an average of 598 employees of which 53% are veterans, and 10% are handicapped veterans.

Euclid service training school

Special week-long factory training courses in servicing Euclid earthmoving equipment are being conducted from November to early spring by Euclid Road Machinery Co., Cleveland. Four beginning and four advanced courses are offered. The school is open to representatives of equipment distributors, customers and others.

. of E. changes specs on irport pavement types

S A RESULT of long consideration nd study of aircraft take-off, landing, nd taxiway facilities at military bases, ne office of the Chief of Engineers has ade certain revisions in its policy for lecting pavement types. The general roblem of runway paving has grown in roportion to the weights of aircraft deloped for both civil and military use. ut the most recent and alarming agravation of the problem has resulted om wide use of jet aircraft.

Now the Chief of Engineers has desigated certain paved airport areas for oncrete pavement only. The "lowest rst cost" criteria no longer apply in ese instances. The designation of soalled rigid pavement is made not for easons of better structural value, but r the reason of its greater resistance to ne corrosive effects of jet afterburner eat and fuel spillage. Pertinent portions f the directive follow:

"Provision for selecting pavement pe on basis of first cost and without ualification as to areas are rescinded as ey apply to 25-yr. life ZI [Zone of nterior] stations. Following Air Force riteria for airfield pavements are estabshed for FY 53 [Fiscal Year 1953] proram:

"a. Selected areas on permanent ZI asis are designated for pavement with ortland cement concrete as follows: 1) Hangar and dock access; (2) maintnance aprons; (3) following aprons; 4) parking aprons; (5) stub parking ; (6) wash racks; (7) calibration platorms; (8) runway ends (1,000 ft.); (9) armup pads.

"b. Following areas on permanent ZI asis may be paved with either asphaltic oncrete or Portland cement concrete on asis of lowest first cost: (1) runways except 1,000 ft. on ends); (2) taxiways; 3) alert taxiways.

"c. All pavement areas on semi-perianent ZI basis may be paved with ther asphaltic concrete or Portland ceent concrete on basis of lowest first ost."

iscussions of the problem

Efforts to study the problem have een widespread, and many aspects have een aired in various conferences. mong these was the symposium held st April at Port Hueneme, Calif. Sponored by the Naval Civil Engineering esearch and Evaluation Laboratory here, the meeting was well attended by ngineers throughout the West. The roblems were outlined, and aircraft perational specifications which must be onsidered in the solution were preinted. Economic considerations also ntered the discussion, particularly as ey are reflected in the life of various avement types. The manner in which ich pavements are "written off" as a roject is planned was another economic spect. Essentials of this symposium ere reviewed in *Western Construction* r June 1952, pp. 111-112.

Hydro power plans added for Toketee Project

THE CALIFORNIA Oregon Power Company, of Medford, Oregon, has filed an application with the Federal Power Commission requesting an amendment of its license for the Toketee Project on the North Umpqua River in Oregon to include two additional hydroelectric developments.

The two proposed additional developments, to be located on North Umpqua River in Douglas County, Oregon, would be designated Lemolo No. 1 and Lemolo No. 2. Total estimated cost of the construction is $19,916,700.

Details of the plans

Lemolo No. 1 would include a diversion dam, about a mile downstream from the mouth of Lake Creek, with an overall crest length of 885 ft., and a maximum height of 120 ft. The reservoir would have an area of 415 acres. An open conduit would extend from the dam to the forebay, with a steel penstock extending on to the powerhouse, which would contain a 40,000-hp. turbine connected to a 29,000-kw. outdoor-type generator. The development also would include an outdoor substation, and a 132-kv. single circuit transmission line about 13 mi. long.

The other proposed development, Lemolo No. 2, would include a diversion dam 195 ft. long and 25 ft. high, located about 500 ft. downstream from the mouth of Warm Springs Creek and Lemolo No. 1 powerhouse. The development also would include an open conduit; a steel penstock; a powerhouse containing a 46,000-hp. turbine connected to a 33,000-kw. outdoor-type generator; an outdoor substation; and a short transmission line.

Colorado Contractors Assn. sponsors scholarships

COLORADO Contractors Association Inc., awarded four Colorado engineering students each with a $250 scholarship. The awards were presented at the organization's meeting in October at the Shirley-Savoy Hotel, Denver. The winners, all juniors, are Addison F. Smith 26, and James M. Coffey, 22, students at the University of Colorado, and James M. Bell, 19, and Gerald B. McRae, 20 both of Colorado A. & M. College.

Colorado highway contracts will top $25,000,000

BY THE END of September more than 663.9 mi. and $15,000,000 in road work contracts had been placed by the Colorado Highway Department. A total of 110 contracts were awarded but the department has 41 more to advertise and hopes to let by the end of the year. These projects are estimated to cost more than $10,500,000 and will cover 237.5 mi.

Job accidents take their toll

ACCIDENTAL DEATHS and serious injuries on the West's construction jobs are reported each month in the interest of promoting safety on-the-job.

NEAR MISSOULA, Mont., Sam Boyovick, tractor operator, was crushed to death when his tractor turned over on a steep slope. Boyovick was helping to tighten wires on a Bonneville Power Administration transmission line between Hot Springs and Anaconda. Riding with Boyovick was Henry Inman, who was operating the tractor's winch. Inman was thrown clear when the tractor struck a large rock which both men failed to see.

Near Farmington, Utah, Virgil Swift, 35, construction worker for Macco Construction, Fairmount, Calif., on an oil pipeline from Wyoming to Utah, was killed instantly when a timber flipped by a large rolling pipe struck him on the jaw. Swift had helped other workers to prepare a length of pipe, resting on 4 x 6 timbers, for dropping into an adjacent trench. As the pipe rolled into the trench, the timber was catapulted into Swift's face.

At Ellensburg, Wash., Robert Dunnington, part-owner of the Ellensburg Cement Products Co., received fa head injuries when he was throv against a wall by a sand conveyor be

Near Chandler, Ariz., James Hunt worker on a highway construction j for Arizona Sand and Rock Co., w killed when he was struck by a hou moving rig. The rig was being driven a speed of about 18 mph. past the stret of highway under construction. Oth workers nearby shouted to Hunter move out of the way of the rig as it a proached. He was struck in the back a corner of the house.

At Ely, Nevada, Brose Wilkinson, e ployee of Utah Construction Co., w injured fatally when he was crushed b neath a house which was being mov The house was one of many being mov to a new townsite. It had been jacked and supported to allow workmen work under the floor. Apparently, und pinning gave way and Wilkinson w pinned beneath the house by a cent beam.

At Lehi, Utah, LouGene O. Peters of Lehi was buried and killed in a lar slide while he was working with his tra tor at the open face of a clay pit.

No Federal objections to Feather River Project

THE DEPARTMENT of the Inter has notified the FPC that it has no o jection and has acted to clear the app cation of the Water Project Author of the State of California to constru the Feather River Reclamation Proje

Acting Secretary of the Interior V non D. Northrop observed in a letter the Federal Power Commission that t water and power potential of the Feath River and other principal streams in t Central Valley must be developed unc an orderly, continuing program in futu years to meet the expanding needs California's growing population.

"The complete utilization of the resources," Secretary Northrop said, an enormous undertaking which will quire the full support and cooperation all who are interested in comprehens water resource development includi Federal, State, and local agencies. T State, by its application to the Fede Power Commission, has indicated readiness to undertake this importa phase of the comprehensive develo ment. It is our view that the State shou not be denied the opportunity to ta this step."

The Feather River project works, a cording to the State application, wou consist of the Oroville Dam across t Feather River about 5.5 mi. above t town of Oroville. This dam would approximately 710 ft. high above t stream bed and, with the aid of t smaller earth-fill dams, would confin reservoir having 3,500,000 acre-feet c pacity. An afterbay dam would be bu downstream to a height of appro mately 75 ft. above stream bed and t hydroelectric power plants at the da would have a total installed capacity 465,000 kw.

LETTERS

erious self-analysis for alaried civil engineers

ditor, *Western Construction:*

Pride in his work and thrill of accomplishment may help to compensate he civil engineer for mediocre salary ut when he finds that men on the contractor's per hour pay roll, working without any responsibility, receive more pay han the salaried engineer, he realizes hat there is something fundamentally rong with his social or professional atus.

Your editorial in the October issue on The public votes on engineering probms" clearly states why the salaried civil ngineer should make a serious selfnalysis of his position.

In line with the above thoughts, more an a year ago, I decided to leave wenty-four years of State service on upervision of Dams as to safety, when certain not entirely satisfactory job ad been resolved. I have resigned my osition as Principal Engineer and have pened an office at 905 46th St., Sacraento, for consulting services on degn and construction of dams.

I am a "charter" subscriber to *Westn Construction.*

W. H. HOLMES
Civil Engineer
Sacramento, Calif.

he people should decide

litor, *Western Construction:*

Your October editorial, "The public tes on engineering problems," implies at the voters are not called upon for gal or medical decisions. However, it not uncommon for public health questns to be put to a vote, the most recent ample being fluoridation of public ter supplies. The initiative and refendum give the voters opportunity to cide all manner of legal questions.

Being unfamiliar with the question to ich the editorial refers I can only surse that in addition to the technical oblem the vote might be affected by e desirability of the immediate project, e continuing usefulness of the model connection with future projects, ether San Francisco citizens should ar the whole cost, etc.

We are proud of our profession, but do not claim omniscience. While the mocratic process is imperfect it is the st safeguard against bureaucracy and mplete dictatorship. I believe the engier's obligation is to explain the necesy for what he proposes. Let the people informed, and then let them vote.

HOWARD B. STANLEY
Portland, Oregon

CALENDAR OF MEETINGS

December 20—Nevada Chapter, AGC, annual meeting, at Reno.

1953

January 8—San Diego Chapter, AGC, annual meeting, at El Cortez Hotel, San Diego.

January 9-10—Intermountain Branch, AGC, annual meeting, at Hotel Utah, Salt Lake City.

January 9-10—Montana Contractors' Association, AGC, annual meeting, at Finlen Hotel, Butte (date and location tentative).

January 12—Portland Chapter, AGC, annual meeting, at Multnomah Hotel, Portland.

January 14 — Southern California Chapter, AGC, annual meeting, at Statler Hotel, Los Angeles (date tentative).

January 16—Mountain Pacific Chapter, AGC, annual meeting, at Benjamin Franklin Hotel, Seattle.

January 19—Alaska Chapter, AGC, annual meeting, at New Washington Hotel, Anchorage (date tentative).

January 30—Idaho Branch, AGC, annual meeting, at Hotel Boise, Boise.

January 30-31—Colorado Contractors Association, AGC, annual convention, at Shirley-Savoy Hotel, Denver.

February 1-4 — Mason Contractors Association of America, Inc., national convention and show at Sherman Hotel, Chicago.

February 5 — Wyoming Section ASCE, annual meeting, at Connor Hotel, Laramie.

February 9 — Colorado Section, ASCE, annual meeting for installation of officers.

February 10—Tacoma Chapter, AGC, annual meeting at Tacoma.

February 25-28—American Concrete Pipe Association, annual convention at Baker Hotel, Dallas.

March—Arizona Chapter, AGC, annual meeting, at Westward Ho Hotel, Phoenix.

March 3-6 — American Society of Civil Engineers, national convention, at Fairmont Hotel, San Francisco.

March 23-28 — Associated General Contractors, 34th annual convention, at Miami, Florida.

September 14-16 — Associated General Contractors, mid-year board meeting, at Edgewater Beach Hotel, Chicago.

1954

March 1-4—Associated General Contractors, 35th annual convention, at Statler Hotel, Los Angeles.

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18 yard capacity 225 HP engine

With speed ranges never before available in 2-wheel-tractor-propelled scrapers, the new Terra Cobra 142 offers speeds to 35 MPH plus more gradability. Stabilized 90° steer, higher clearance and lower center of gravity give greater maneuverability in tight places and rough ground. Simple finger-touch remote controls, good visibility, and latest foam rubber cushioned seat increase operator efficiency and comfort. Big low pressure tires combine high flotation and carrying capacity. Extra ruggedness keeps 'em rolling. Simplicity reduces servicing. Let your Wooldridge Distributor show you today why the new more versatile Terra Cobra 142 can handle more jobs per year—earn more profits per job.

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Terra Cobra Wagon

Power Control Units

Scrapers

Rippers

Bulldozers

ENGINEERS ON THE MOVE

L. A. Elsener, manager of the Chicago Bridge & Iron Co.'s San Francisco office, has been elected a vice president of the company. The company's Western operations include a new modern fabricating plant at Salt Lake City, a construction headquarters at Torrance, Calif., and contracting offices at San Francisco, Los Angeles and Seattle.

L. A. Elsener

Elsener has been associated with the Chicago Bridge & Iron Co. since 1922, immediately following his graduation from Purdue University. He was a contracting engineer in the company's San Francisco office from 1923 to 1928 and has been manager of the office since that time. He is a past president of both the San Francisco Engineer's Club and the San Francisco Section of the American Society of Civil Engineers.

Legal controversy over a proposed $8,308,000 sanitation program for Orange County, Calif., was climaxed by the resignation of **Raymond R. Ribal,** chief engineer and general manager of the Orange County Sanitation Districts. Ribal's resignation was precipitated by the decision of officials to modify the program because of increased cost and place supervision in the hands of the consulting engineers who are designing the sewer works. His resignation was effective October 31.

Charles S. Hale, one of the Bureau of Reclamation's outstanding construction engineers and a Reclamation employee for 24 years, resigned as project engineer on the second barrel of the San Diego aqueduct to become general manager and chief engineer of the Coachella Valley County Water District. Hale's return to Coachella Valley will be a homecoming, because the Coachella distribution system was a project built under his immediate supervision. He left the valley last August to take over construction of the San Diego aqueduct's second barrel.

Builders Quantity Survey, Spokane, is a new service for builders in the Inland Empire area. **Gilbert V. Johnson** and **Edward M. Watson** are the men who have undertaken this work to provide contractors and builders with estimates of the amount of each material needed to complete a job. Both have had many years of experience in the architectural and construction industries. Johnson believes that this new firm may be the only quantity survey office in the area.

James Paul, for the past six years operator of Paul Construction Co., has joined the Del E. Webb Construction Co. as head of a new separate department. This department will undertake only the planning and building of residential and commercial developments. Paul will incorporate his own staff into the Webb organization.

Maurice L. Dickinson, formerly chief construction engineer of Hetch Hetchy Water Supply for the Public Utilities Commission of San Francisco, is now chief hydraulic engineer for Bechtel Corporation at offices located at 4620 Seville Ave., Los Angeles 36, Calif.

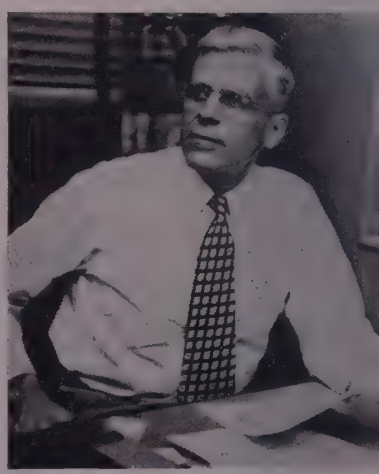
Now that work is terminating on Hungry Horse Dam, Bureau of Reclamation personnel are gradually leaving the area for employment on other Bureau projects. Engineers on the move include: **Tom Wilson,** who is going to Chief Joseph Dam, and **Elmer Taft** and **Clifford Beck,** who are going to Eklutna Project, Alaska. **Paul Nickerson** and **Robert Brust** have headed toward Bureau regional offices in Boise, **Bob Manthey** to Great Falls, and **Norman Head** to Townsend, Mont. **William Chatfield's** transfer will locate him in the Columbia River Basin.

William J. Campion, formerly assistant highway engineer for the California Division of Highways, is now associate highway engineer for the Sacramento County Engineering Department.

The BPR has appointed **Albert C. Spann** to fill the position of district engineer in Wyoming, a vacancy resulting from the recent retirement of **John D. Slye.** Spann's work has been primarily on national park and forest roads Utah, where he was district engineer the BPR office at Ogden. His new he quarters will be in Cheyenne.

After spending some time this y in Burma and three months in Brit Columbia, **Frederick W. Clayton** is n in Bakersfield, Calif., as chief engin of the building department.

Peter Kiewit, well-known president Peter Kiewit Sons' Co. and its vario affiliates, has been named non-meml winner of The Moles Award for 19 Two awards for outstanding achie ment in construction, one to a meml and the other to a non-member, given annually by The Moles, a N York society of men engaged in co



Peter Kiewit

struction of tunnels, subways, foun tions and other heavy constructi Probably the most notable Kiewit co tract is for the Atomic Energy Comm sion's new $1.2 billion plant in Oh awarded this summer. The other, me ber-winner, is **Edward P. Palmer** New York.

Frank Goodman, formerly city en neer of Winslow, Ariz., now has t same position in Holbrook. He was one time Arizona State Highway En neer, and is an honorary life member the Arizona ASCE.

R. H. Corey, consulting engineer, recently retired. Corey, whose offi were located in Portland for 22 yea has most recently been working in t field of municipal water and sewa works in Oregon and Washington. practice is being taken over by Clark Groff, whose offices are in Salem.

The Valle-Sommers Construction announces that **Paul Fredrickson** is n in charge of industrial relations. For t last four years Fredrickson was mana of the Mountain-Pacific Chapter, A sociated General Contractors of Am ica. Before the war he served as c superintendent of buildings in Seatt

GENERALS

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At Less COST!

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DEATHS

Ellis W. Barker, 52, contractor a engineer, died Oct. 11 in Salt Lake Ci Barker was past president of the Ut Society of Professional Engineers, t Utah Chapter of the Associated Gene Contractors, and national director of t AGC.

* * *

Clement T. Wiskocil, 63, with the Ci Engineering Department at the U versity of California for 38 years, di Oct. 31. He was a past president of bo the San Francisco Section, ASCE, a Structural Engineers' Association Northern California.

* * *

John H. Sutthoff, 85, engineer w developed the open deck bridge flo died Oct. 28 in Sausalito, Calif.

* * *

Thomas Irving, 88, retired constru tion engineer in the Seattle building d partment, died Oct. 26 in Seattle.

* * *

Frank O. V. Carter, field engineer f James I. Barnes Construction Co. at L Angeles, died recently.

* * *

Royal Upson St. John, civil enginee died recently in Oakland. He was charge of construction of the San Fra cisco airport and later became its ma ager.

* * *

Clifford H. Stone, 64, director of t Colorado Water Conservation Boar died suddenly in New Orleans on Oct ber 22. The widely-known authority water conservation had left Colorado t day before to attend a meeting of t Arkansas-White-Red Basins Interage cy Committee. Judge Stone was a lea ing figure in the struggle between t upper and lower basin states for Col rado River water.

* * *

Harold St. John, 48, superintendent the California Division of Highways Susanville, Calif., died Oct. 24 in Susa ville.

* * *

F. A. (Andy) Latham, 52, reside superintendent at Boulder City for t Department of Water and Power of t City of Los Angeles, died Oct. 29 Boulder City, Nev.

* * *

Carl S. Replogle, 64, civil engine died Nov. 1 in Piedmont, Calif. He w for many years a design engineer f Judson Pacific Steel Co.

* * *

Milton Leroy Herzog, 46, buildi contractor of Seattle, died of a hea attack November 3 while on a huntin trip. He had been in the building bus ness for 10 years, and was a partner the firm of Herzog & Skaggs.

SUPERVISING THE JOBS

Hilde Construction Co., Inc., has **Milo ack,** grading superintendent, and **Fay amsey,** crushing superintendent, at ork grading, graveling and draining 5.1 i. in Montana.

* * *

A. W. Stolzenburg is superintending nstruction on 11 mi. of Montana's rcle-Sidney road for Albert LaLonde o.

* * *

A joint venture of Williams & Bur-ws and Carl N. Swenson Co., Inc., is e construction of new buildings for e Sonoma State Home, in California. **illard Swenson** is superintendent and rry Dawson is his assistant.

* * *

At work on the Pacific Highway in regon are **L. H. Becker** and **R. E. eath.** The contractor is Acme Con-uction Co.

* * *

Lease & Leigland and M-B Contract-g Co. are putting in a $731,000 sewer stem and pumping station at Fort chardson, Alaska. **Dave Stewart** is perintendent; **Vic Raney,** foreman; **J. Reilly,** engineer; **F. F. Root,** master chanic; **Jim Marchetti,** office man-er.

* * *

Russell Wise is general superintend-t for 1.5 mi. of highway work on the tskirts of Yuma, Ariz. Heuser & Gar-tt, contractor, also has **Don White** in ey position.

* * *

Tanner Bros. has **Arthur Rogers** head-g 4.5 mi. of construction on the Ge-nimo-Solomensville highway in Ari-na. **E. O. Olson** is concrete foreman.

* * *

Mark Hentis is overseeing construc-n of the structural steel superstruc-e of Hell Canyon Bridge, Ariz. Dail nstruction Co. has the $176,515 con-ct.

* * *

Elvin Hunt is superintending con-uction of sewers at Menlo Park, lif., for Kevry Construction Co.

* * *

The Owl Truck & Construction Co. s been awarded a $684,480 contract for aring, stripping and grouting the erry Dam site in California. The perintendent for this job will be easily membered—he is **Fred L. Cherry.** Of-e manager is **H. G. LaGrange.**

* * *

Doing bridge work at Salem, Ore., is **ester F. Briggs,** superintendent for tt McDougall Co. Assisting him are **R. Newman** and **O. H. Femrite.** The former is carpenter foreman and the latter is pile driver foreman.

* * *

Thomas S. Miller is superintending road work in Oregon for Natt McDougal Co. The two grade foremen are **A. H. Gard** and **Floyd L. Dickeson.** Master mechanic is **R. E. Haskins.**

* * *

Kansas City Bridge Co. is doing reconstruction work on the Northern Pacific Railroad's Columbia River crossing at Pasco, Wash. **S. A. Yerby** is project manager for the $4,500,000 job which is expected to be completed by June 1954. **Lou Grieble** and **A. R. Hutchings** are general superintendents. Air superintendents are **Joe Gunther** and **Charles Shorey,** and **J. S. Burk** is master mechanic. **S. S. Smith** is general carpenter foreman, assisted by **Melvin Mahaffey** and **Paul Wilkins.** Pile driver foremen are **Martin Bishop, D. T. Miller, A. C. Miller, Bud Cole, Frank Accanero** and **Vern Kinney.** Other foremen are **Jimmy Norman,** welding; **Jim Tyson,** labor, and **Dick Shafhauser,** iron workers. **Paul Black** is the job engineer; **Ronnie Ingram** is office manager, and timekeeper is **Edith Yerby.**

* * *

I. L. Allen is superintendent for construction of a sewage treatment plant for Kennewick, Wash. W. B. Edmiston & Sons, Inc., has the contract.

* * *

A million dollar job for the Atomic Energy Commission is the construction of buildings and warehouses in Washington. Sound Construction & Engineering Co. has the contract. **Floyd Garrett** is superintendent, assisted by **R. H. Baugh. Curt Beery** is carpenter foreman and **Vern Herdy** is labor foreman. The other two foremen are **Frank Pompa,** cement finishing, and **Lee McIntosh,** iron worker. **Harry Simmonds** is project engineer.

* * *

George M. Heald, Jr. is supervising nine miles of road improvement work in Wyoming for Heald & Christler, Inc. His assistant is **Elmer J. Christler,** and **Jack Coleman** is shifter.

* * *

A. L. Acton, superintendent, and **George Monighan,** timekeeper, are Taggert Construction Co. men doing grading, graveling, oiling and draining in Stillwater County, Mont.

* * *

Jarvis, Cascade and Austin have a $1,917,000 joint contract to build 13 piers for the Pasco-Kennewick Bridge over the Columbia River. **Paul Jarvis** is project manager, and **Web Shaddy** does the superintending. Foremen on piers are **Bill George** and **Paul Higdon. Lyal Nugent** is concrete foreman, **Wes Mays** is carpenter foreman, **Dean David** is office manager and **Dick White** is chief electrician.

* * *

C. D. Pruitt is heading the Pruitt Construction & Equipment Co.'s job to put up 227 frame and stucco dwellings in Whittier, Calif. His assistant is **M. Klinefelter.**

* * *

C. A. Larsen has the contract for construction of the high school in Linda Vista, Calif. **W. George Wilson** is superintendent and **Leslie Lawrence** is job foreman.

COMMENTING on work problems at Palisades Dam are USBR men *R. W. Taylor* (left), inspector, and *M. W. Archibald,* chief of the earthwork branch (See article on pp. 59-63).

* * *

Larry Mahan is superintending the S. Birch & Sons Construction Co.'s contract for 8½ mi. of road work in Montana. **Guy Haney** and **Jim Egan** are foremen, and **Dave Wingfield** is office manager.

* * *

Walter B. Johnson is superintendent for Boen-Sealand Constructors' $2,466,-320 award for 16 eight-family quarters and utilities at Eielson Air Force Base, Alaska. **Floyd Hardenbrook** is assistant superintendent and **Fred Pankratz** is heavy equipment superintendent.

* * *

The State of California is building California Medical Facilities, a hospital for the care of prisoners. Johnson, Drake & Piper, Inc., is constructing the main institutional group of buildings at a cost of about $4,500,000. **George Knenkel** is general superintendent on the job. Concrete superintendent is **Clarence Bond.** General carpenter foreman is **Don Adams,** assisted by **Gordon Lindsey** and **John Boykin.** The field engineer is **Robert S. Rathbone,** and **Richard D. Feeley** is office manager. The State has appointed **Nick G. Gatoura** in-

spector for Division of Architecture, and **Robert E. Tabacchi,** mechanical inspector. Johnson-Pacific Murphy, which has the steel contract, has **Henry Gamblin** superintending.

* * *

J. A. Bryant, contractor, has **W. P. Dockery** supervising construction of a $500,000 gym for Armijo Union High School, Fairfield, Calif. **Alden Luntey** and **F. Lerseth** are carpenter foremen. Labor foreman is **W. Glover,** and **E. Clark** is office manager.

* * *

J. G. Brown is superintending for Fred J. Early, Jr. Co.'s contract to improve the sewage treatment in Pittsburg, Calif. Foremen are **Harold Pate** for carpentry and **Ray Terherst** for labor. Office manager is **W. R. Olsen. J. B. Eckerson** is representing the engineering firm of Clyde C. Kennedy.

* * *

Detroit Dam (*Western Construction*—October 1950, pp. 65-68) and Big Cliff Dam, under construction on the North Santiam River near Mill City, Ore., are multimillion-dollar projects undertaken by Consolidated Builders, Inc. *Western Construction* now has a current and comprehensive list of supervisors for these two dams which are being built for the Corps of Engineers. **Russell A. Hoffman** is both general manager and general superintendent, and **Bert W. Provost** is construction superintendent. **Ralph V. Winchell** is master mechanic; **Warren R. Varcoe,** shop foreman; **Vincent A Palmer,** office engineer; **William F Tickle,** personnel manager; **Ernest W Bauer,** office manager; **Roy R. Bates** safety superintendent; **Donald R. Bengston,** field engineer; **Kenneth I. Crosier** manager of insurance and safety, and **Kenneth A. Nielson** is purchasing agent.

Superintendents and supervisors are as follows: **Joseph W. McNealy,** carpenter; **George W. Humphrey,** rigging and cableways; **Floyd C. Jones,** electrical; **Ray E. Walker,** material and warehouse; **Kenneth J. Siler,** pipe shop; **Eddie N. Carpenter,** aggregate plant and crushers; **Lee R. Pinkston,** quarry; **Carl J. Watt,** carpenter shop; **Marshall N Aust,** stripping supervisor, and **Gilbert E. McCarty,** imbedded metals supervisor.

Walkers are: **Nathan M. Bond,** cement finishing; **Harry A. Dyhrman** concrete; **Arthur F. Findley, Leon H Murphy** and **Robert V. Sweitzer,** carpenter; **Clyde T. Wells,** reinforcing iron, and **Otto G. Winnett,** pipe shop.

The carpenter foremen are: **William M. Clark, William Defoe, Byron E Hawkins, Alvin O. McMillen, Arthur W Mollet, Robert C. Morris, Lawrence A Smith, Dell B. Wagner** and **Warren D Williams. Ronald S. Gurr, Elvin A Nearhood** and **Kenneth C. Wenner** are cement finishing foremen. Electrical foremen are: **James H. Armstrong Richard J. Chalupa, Lewis W. Cooper Zene W. Crowe, Jesse Fallen, Floyd Johnson** and **Milo F. Thompson. James D. Adams, Henry Danneman, Lawrence P. Mullins** and **William M. Suddeth** are iron worker foremen. Foremen over the labor crews are: **Claude F. Cawrse James F. Fehr, Walter L. Graves, Walter D. Guier, Rudolph G. Herlofsen Lauren B. Hurd, Virgil C. Jackson, Wallace D. Mattson, Alton A. Schmidt, Edward M. Sellers** and **John D. Toothman** Mechanical foremen are **Ronald V Clemens, Martin J. Diesburg** and **Arthur I. McGrandle,** and the two mixing plant foremen are **Frank K. Hamby** and **Thomas M. Wood.** The foremen for transportation and warehouse are **Joseph E. Lalack, Willis S. Sischo** and **Jack D. Colburn.** Pipefitting foremen are **Walter S. Barr, Jr., James J. Race, Fred C. Reick, George V. Van Agtmael** and **Albert A. Wabs. Melvin T. Foster Thomas Johnson** and **Luster B. Voshell Sr.,** machinist foremen, complete the list of personnel at Detroit and Big Cliff Dams.

* * *

The area superintendent for Sully-Miller Contracting Co.'s job to do grading and surfacing on the Pacific Coast highway in Southern California is **P. J. Luce.** Job superintendent is **E. L. Whit**

* * *

Rosendahl Corporation reports two jobs in California. One, construction of 12 miles of gas transmission main for Pacific Gas & Electric Co., is headed by **Harry Pharis,** project manager; **Russ Hansen,** superintendent, and **Phil Greenwood,** office manager. The other current project is installation of equipment and process piping for Flintkote Co.'s new

paper plant at San Leandro. **Milt Watt** is project superintendent; **John Huffman,** millwright superintendent; **Percy Wilder,** pipe fitter foreman; **Al Hunt,** rigging foreman; **Clen Lafrenz,** project engineer, and **Jim Turner,** office manager.

* * *

Cleo Walling is heading 6.1 mi. of highway construction in Montana for Walling Construction Co.

* * *

Constructing a $1,205,730 administration building for the Tacoma Dept. of Public Utilities is the Roy T. Earley Co., which had **Elmer L. Visser** as superintendent. **Bob Henry** is Visser's assistant, **Ed Hagen** is carpenter foreman, **Dick Crowe** is detailer, **Jack Dulin** is reinforcing foreman and **Leo St. Peter** is labor foreman.

* * *

A joint venture of Ed Keeble and Dan Caputo is the Twelfth St. Dam Project, Oakland. **George Gosich** is superintending for Ed Keeble, with **Tony Shiano** his foreman, and **Jim McMullen,** grade foreman. Dan Caputo has **Tony Caputo** superintending. Caputo's foremen are **Jim Andrade, Fred Hudson** and **M. Toaka.**

* * *

George Moore is superintendent for Howard J. White, Inc., on a building construction job in Palo Alto, Calif. Foremen are **Harley Shull** and **Dick Boyce.**

* * *

The Los Gatos, Calif. sewerage project undertaken by Parrish, Inc. (formerly D. A. Parrish & Sons, Inc.), is headed by **Rue Parrish,** project manager. The job superintendent is **Joe White,** and **Bob Venemann** is office superintendent.

* * *

L. O. (Larry) Grossnickle is superintending work on two closely-connected jobs for Guy F. Atkinson Co., on the Marysville, Wash., overpass and the other the Ebbey Slough bridge. Also superintending are **Harold Percival,** carpenter, and **Whitey Berg,** pile driver. **Ben Veenhuizen** is master mechanic, office manager is **George Hornung,** and **Carl Hannan** and **Harry Joy** are labor foremen. Other foremen are **Al Knapp,** pile driver; **Jim Smith, Al Linscheid** and **Charles Saar,** carpentry, and **Carl E. Stole,** cement finishing. Subcontractor Raymond Concrete Pile has **Bob Mathor** superintending. Pile driving foremen are **R. A. Coty** and **Coy Campton.** Another subcontractor on this job is Sampson Steel Co. **A. L. "Andy" Anderson** is the Sampson superintendent.

* * *

A cluster of jobs in Alpine County, Calif., has occupied resident engineer **Frank Lucas,** California Division of Highways (District 10) during the past season. Relocation of 1.5 mi. of State Highway 88 near Woodfords is being done by Harms Bros. of Sacramento at a cost of $280,000. Grading and bridge construction on State Highways 88 and

4, also near Woodfords, has been under contract to Eaton & Smith of San Francisco for $275,000.

Assisting Lucas on the relocation job are **E. A. Huun** and **Wilson Schutte,** the latter a representative of the State bridge department for construction of a 56-ft. span that is included in the work. **Dave Otis** is superintending the work, and **Roy Ziegler** is concrete foreman.

John Canfield is Lucas' assistant on the Eaton & Smith work, which includes short reaches of grading at four spots, construction of a bridge, and reconstruction of another. Wilson Schutte is on hand for the bridge work here too. **Robert Trask** is superintending the work for Eaton & Smith.

Subcontractor for structures on both contracts is Minton & Kubon of Oakland. **Bob Minton** is superintendent.

* * *

Ross Powerhouse, a large scale project along the Skagit River in Washington, is well under way (*Western Construction*—October 1952, pp. 72-76). The contractor is Ross Powerhouse Contractors, a joint venture of Guy F. Atkinson Co., Bressi & Bevanda, A. Teichert & Son Co., and Charles L. Harney. A complete list of personnel heading this $15,000,000 construction work for Seattle City Light is as follows: **George W. Wintz** is project manager, assisted by **Lewis L. Sheddy.** General superintendent is **Forrest H. Jones; William H. Wolff,** chief engineer; **Harold Lundberg,** master mechanic; **Ernest M. Bernhagen,** electric superintendent; **Arthur Cody,** rigging superintendent; **V. Joseph Davis,** intake superintendent; **Leo P. Jennett,** transportation superintendent, and **Roy Swanson, W. K. Kemp** and **Byron Spears** are reinforcing steel superintendents. **Fritz Fjeldheim** is the powerhouse superintendent. **William A. Roark,** formerly powerhouse walker, has been transferred to another job with the company.

Thomas F. Foran is business manager; **Gerald E. Snider,** office manager; **Joseph K. Scharf,** paymaster-personnel manager; **R. E. Ponsford,** purchasing agent; **John L. Ziemer,** warehouse chief; **G. M. McClung,** camp manager; **B. P. Burt,** safety engineer, and **David Belcher** and **Alec P. Ketchen,** field engineers.

General carpenter superintendent is **Otto Hanssen,** assisted by **O. J. Robbins** and bifurcation superintendent is **Stanley V. Jones, L. M. Larsen, R. J. Jones, J. G. McManus** and **R. M. Roark** are general carpenter foremen. Tunnel walkers are **J. M. Hartman, G. W. Brown** and **J. C. Verner.** Tunnel shifters are **Sam B. Molan, Riley A. Long, J. C. Purcell, H. H. Severe, G. G. Fleury** and **C. A. Chambers.**

The foremen are as follows: **W. C. Scott, Max Bingham, H. P. Brockway** and **F. T. Arling,** rigger foremen; **J. L. Woodin,** pipe foreman; **John Sandy** and **R. S. Kolemain,** cement finishing foremen, and **R. D. Sauer** and **R. O. Washke** electrical foremen. The carpenter foremen: **J. S. Parker, D. S. Schieck, H. A. Vitt, H. H. Heaster, V. L. Shanks, O. L. Charbonneau, L. R. Gales, G. C. Harner, A. E. Howard, Jack Maki, H. L. Ness** and **L. Wagner.** Tunnel foremen: **R. G. Thompson, J. V. Vodopich, T. Rich, F. W. Nolte, D. F. Purcell, R. M. Hinegardner** and **L. J. Follansbee. O. L. Strausbaugh** and **F. R. Barr** are mechanical foremen. Labor foremen: **E. Heggie, H. T. Peterson, Max Balich, A. Bond, J. D. Bilson, C. C. Phillips** and **R. A. Sisk.** Reinforcing steel foremen complete the list of men at work on Ross Powerhouse: **C. R. Topness, E. R. Mahus, B. B. Chaffin, J. F. Warmouth, H. Belders, N. R. Glaser** and **R. H. Burus.**

Penstock and turbine installation and powerhouse piping for Ross Dam are being handled by Marine & Industrial Supply Co., Inc. **Brinton Sprague** is project manager for this phase of the Skagit Project, and **James H. Boney** is general superintendent. The engineering **Lorne Garden.** Assistant superintendents are: **H. M. Boney,** penstocks; **L. Robinson** and **K. W. Carroll,** turbine and **R. J. Young,** spillway and intake gates. **E. H. Bunn** is piping foreman and **R. Shepherd** is mechanical engineer.

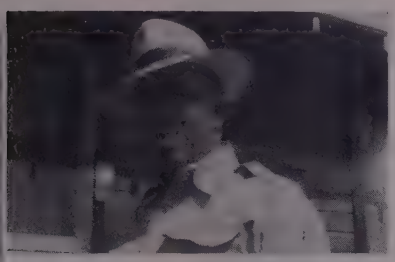
* * *

Louis C. Dunn, Inc., and Carrico & Gautier have a contract to construct two warehouses at Benicia Arsenal, Benicia, Calif. Project manager on the $3,500,000 job is **George Herrero,** assisted by **Al**

argaehr, superintendent, George Pet-rson, carpenter foreman, Lon Jenkins, oncrete foreman, and Bill Bostwick, of-ce manager. Engineer is William C. forth.

* * *

Ralph Hoffman is general superin-endent for all work for Ralph Larsen Son, Inc., San Francisco. Larsen is urrently putting up an addition to the all of Records, Martinez, Calif. Bill oss is job superintendent and Harold riedman is carpenter foreman.



FAMILIAR FACES at Nimbus Dam and Powerhouse are *A. T. Evans*, project manager (above), and (below) *R. M. Hayden* (left) and *Glenn McAfee*, superintendents. See November issue for a complete list of supervisors.

Lonnie Miller is Walter G. Meyers & on's superintendent for construction of e $1,500,000 Pasco, Wash., senior high hool. Inspector is A. F. Raber. Les oaht and Jerry Havercroft are car-nter foremen, and Ed O'Bannon is bor foreman. This new school building as been designed by Wulff, Bishop & itter, architects.

* * *

Jack Walcher is superintending cais-n foundation work on the State Dept. Public Health Building, Berkeley, alif., for E. B. Payne Construction Co. oward Cuthbert is carpenter foreman nd Terry Frampton is timekeeper.

* * *

Miscellaneous Travis Air Base con-ruction is a $7,000,000 undertaking of e Del E. Webb Construction Co. The rge California project is being super-sed by R. G. Fleming, assisted by A. aRue. F. P. Kuentz is job engineer, hn Meeker is office engineer and L. ave Saunders is field engineer. The neral carpenter foreman is Clyde W. dams, who has five assistants, Jack ilders, J. D. Dunn, T. C. Jeffords, arvey Cates and Leonard Scott. The bor superintendent is B. B. (Blackie) hnson, and labor foremen are Jack

Continued on page 117

CONTRACTS

A Summary of Bids and Award[s] For Major Projects in the Wes[t]

Alaska

$2,515,225—**Kuney-Johnson Co.,** 235 9th Ave. No., Seattl[e] Award for five dormitories and a mess-and-administration bld[g.] Eielson Air Force Base; by C. of E.

$1,191,000—**Manson-Osberg Co.,** 1132 N. 128th, Seattle—L[ow] bid for 4,500-ft. pressure tunnel with arch, clearing for a pensto[ck] line, a feeder line, wharf and barge grid, Beaver Falls Proje[ct;] by Ketchikan Public Utilities.

$4,591,075—**Northern Ready-Mix, Inc.,** and **Nelse Mortensen C[o.] Inc.,** Fairbanks—Low bid for furnishing 135,000 cu. yd. of w[et] mixed conc., aggregates and grout, Ladd and Eielson Air Fo[rce] Bases; by C. of E.

Arizona

$313,785—**Emil H. Krall,** 1825 N. 11th Ave., Phoenix—Awa[rd] for presedimentation basin and raw water pumping station Squaw Creek; by City of Phoenix.

$482,975—**Fisher Contracting Co.,** P. O. Box 4035, Phoenix Award for Verde filter plant additions; by City of Phoenix.

$205,810—**Larsen Contracting Co.,** P. O. Box 1790, Pheonix Low bid for 7.2 mi. of grading, Payson-Colcord Mountain Tonto National Forest, Gila County; by BPR.

$1,318,474—**Morrison-Knudsen Co., Inc.,** 411 W. 5th St., L[os] Angeles, Calif.—Low bid for earthwork, conc. lining and stru[c]tures, Wellton Canal, Gila Project; by USBR.

$274,692—**Lyle Price,** P. O. Box 548, Flagstaff—Low bid 6 mi. of grading and crushed rock base course, Clifton-Alpine Apache National Forest, Greenlee County; by BPR.

$1,272,840—**T. K. G. Construction Co., Inc.,** 802 Security Bld[g.,] Phoenix—Low bid for Squaw Peak filter plant; by City Phoenix.

$482,975—**T. K. G. Construction Co., Inc.,** 802 Security Bld[g.,] Phoenix—Award for Squaw Peak reservoir; by City of Phoen[ix.]

$421,185—**Wallace and Wallace,** P. O. Box 470, Phoenix—Awa[rd] for 5⅓ mi. of rebuilding and paving over a new alignme[nt,] Ehrenberg-Wickenburg hwy.; by St. Hwy. Dept.

California

$671,380—**P. & J. Artukovich, Inc.,** and **M. Miller Co.,** 13305 S[.] San Pedro St., Los Angeles—Low bid for steel siphon and stru[c]tures, second pipe line, San Luis Rey River crossing, San Die[go] Project; by USBR.

$201,165—**Charles L. Burch & Sons,** 2419 N. Chico St., El Mon[te] —Low bid for sanitary sewers in Tyler Ave., El Monte, Los A[n]geles; by Los Angeles County.

$732,384—**Eaton & Smith,** 1215 Michigan St., San Francisco Award for 6 mi. of grading and plant-mixed surf. on ceme[nt] treated base, and reinf. conc. slab and girder bridge across M Creek, Fresno County; by Div. of Hwys.

$161,384—**Norman I. Fadel,** 7101 Radford Ave., No. Hollywo[od] —Award for 1.6 mi. grading and road-mixed surf., and rei[nf.] conc. bridge across Black Rascal Creek, Santa Fe Drive, Merc[ed] County; by Div. of Hwys.

$339,743—**Griffith Co.,** 1060 Broadway, Los Angeles—Award 2.9 mi. of grading and plant-mixed surf. on cement treated ba[se]

weetwater Valley rd. betw. Highland Ave. and Bonita Bridge, an Diego County; by Div. of Hwys.

,603,000—**B. C. Hamann** and **Riha Construction Co.,** 4859 El ajon Blvd., San Diego—Award for Mission Bay Senior High chool; by San Diego Board of Education.

568,200—**C. V. Kenworthy,** 2037 E. Harding Way, Stockton—ward for 2.6 mi. of road construction, Berry Summit east ward Willow Creek, Six Rivers National Forest, Humboldt ounty; by BPR.

529,715—**Kenworthy & Patterson,** 1505 W. Walnut St., Stockn—Low bid for clearing, grading, etc. of 4.29 mi., Six Rivers ational Forest, Humboldt County; by BPR.

206,630—**Matich Bros.** and **Matich Bros. Paving Co.,** P. O. Box 0, Colton—Award for 4 mi. of grading and plant-mixed surf., lhambra St. to Palm Ave., betw. State 26 and Base Line, San ernardino County; by Div. of Hwys.

324,629—**Matich Bros.** and **Matich Bros. Paving Co.,** Box 390, olton—Award for 5.2 mi. of grading, widening, and plant-mixed rf., Yucaipa Blvd., Yucaipa, San Bernardino County; by Div. Hwys.

3,143,695—**Morrison Knudsen** and **R. A. Westbrook,** 411 W. 5th t., Los Angeles—Low bid for Garvey Reservoir for Colorado iver Aqueduct Distr. System, Monterey Park, Los Angeles; y Metropolitan Water Dist. of Southern Calif.

318,770—**H. Earl Parker Co.,** 12th and F Sts., Marysville—Low d for repairing 10 mi. of the Sacramento River levee betw. acramento and Freeport; by C. of E.

297,800—**Pipeline Construction Co. of Riverside,** 2931 Main St., iverside—Award for pump sump and South Perris Valley supy line, Hemet; by Eastern Muni. Water Dist.

221,362—**M. J. Ruddy & Son,** 922 J St., Modesto—Award for idening and plant-mixed surf. on untreated rock base, 5 mi. nr. alley Springs, Calaveras County; by Div. of Hwys.

339,300—**San Francisco Bridge Co.,** 140 Montgomery St., San rancisco—Low bid for seawall and dredge, extend runway 3-31 at U. S. Naval Air Station, Alameda; by U. S. Navy.

97,950—**Stephens Trucking Co.,** French Camp—Award for 3.6 i. of grading and surf., Byron Hwy., Contra Costa County; by iv. of Hwys.

412,655—**G. L. Tarlton Contracting Co.,** 5505 Dale Ave., St. ouis, Mo.—Award for constructing Camp Creek Tunnel with a ft. diameter horseshoe-shaped tunnel, Central Valley Project; y USBR.

243,255—**J. A. Thompson & Son,** P. O. Box 518, Inglewood—ward for reinf. conc. bridge on Placentia-Yorba Road, Orange ounty; by Div. of Hwys.

,723,840—**Ford J. Twaits Co.,** 449 S. Beaudry St., Los Angeles Low bid for police department rehabilitation center in Boquet anyon, Saugus, Los Angeles; by City.

388,580—**Ukropina, Polich & Kral,** 8425 E. Clarence, San abriel—Award for two reinf. conc. bridges and approaches ossing S. P. tracks and San Gabriel River about 2.5 mi. west Whittier, Los Angeles County; by Div. of Hwys.

2,559,019—**Ukropina, Polich & Kral,** 8425 E. Clarence, San abriel—Award for 3.8 mi. of grading, PCC surf. on cementeated subgrade, 5 bridges and a retaining wall, Los Angeles iver Freeway betw. 223rd St. and South Junction of Atlantic ve., Los Angeles County; by Div. of Hwys.

728,140—**Ukropina, Polich & Kral,** 8425 E. Clarence, San Gariel—Award for 1.4 mi. of roadbed for a four-lane divided hwy., lvas Bridge to North Sacramento Freeway, and four reinf. nc. bridges; by Div. of Hwys.

522,815—**R. A. Wattson Co.,** Box 747, North Hollywood—Low d for earthwork, pipe lines and structures, Glen Anne Laterals, oleta Distr. System, Cachuma Project; by USBR.

olorado

64,775—**Colorado Constructors, Inc.,** 725 W. 39th Ave., Denr—Low bid for uranium access rd., 33 mi. of grading, strucres and surf. betw. Nicholas Wash and junction with State 145 San Miguel and Montrose counties; by St. Hwy. Dept.

$151,434—**James B. Kenney, Inc.,** 3233 Osage St., Denver—Award for prestressed concrete water storage tank, Loveland; by City.

$171,636—**Peter Kiewit Sons' Co.,** Box 8787, University Park Sta., Denver—Low bid for 5.5 mi. of grading, structures and stabilization, st. hwys. 145 and 108 west of Telluride, San Miguel County; by St. Hwy. Dept.

$546,971—**Lowdermilk Bros.,** P. O. Box 4150, Denver—Low bid for 1.75 mi., Boulder-Idaho Springs Rt., Roosevelt National Forest, Boulder County; by BPR.

$225,490—**M. J. Sears,** 509 15th St., Denver—Low bid for 7 mi. of grading, structures and surf., State 135 betw. Gunnison and Crested Butte; by St. Hwy. Dept.

Idaho

$139,390—**Clifton & Applegate,** Box 1473, Spokane—Award for grading 3.1 mi. of forest road betw. Enaville and Murray, Shoshone County; by BPR.

$488,400—**Peter Kiewit Sons' Co.,** P. O. Box 875, Sheridan, Wyo.—Award for 7.24 mi. of forest rd. grading, Yellowstone Park hwy., Fremont County; by BPR.

$110,595—**Morrison-Knudsen Co., Inc.,** 319 Broadway, Boise—Low bid for alteration and reconstruction of parts of Arrowrock Dam; by USBR.

$492,097—**Duffy Reed Construction Co.,** Box 1092, Twin Falls—Award for plant mixed bit. surf. and a conc. and steel underpass, 4.7 mi. in Twin Falls County, Idaho, and .6 mi. in Elko County, Nev.; by St. Dept. of Hwys.

Montana

$261,640—**C. B. Lauch Construction Co.,** Box 2559, Boise, Idaho—Award for sewage system and treatment plant, Hamilton; by City.

$140,440—**Barry O'Leary, Inc.,** 215 N. 16th St., Billings—Award for sanitary sewers, sewer lines and manholes, Billings; by City.

Nevada

$383,980—**Lembke-Clough and King Co.,** 1927 Fremont St., L Vegas—Award for work at Nevada proving grounds; by AE

$237,770—**Silver State Construction Co.,** Fallon—Award for portion of st. hwy. system, 14 mi. south of Denio to Denio, Hu boldt County; by St. Dept. of Hwys.

New Mexico

$246,485—**J. H. Ryan & Son,** P. O. Box 513, Albuquerque Award for substucture across Rio Grande River in Albuquerqu by St. Hwy. Dept.

$243,418—**Skousen Construction Co.,** 201 Springer Bldg., Alb querque—Award for 4.1 mi., San Lorenzo-Dwyer rd., Gra County; by St. Hwy. Dept.

$157,643—**Skousen Construction Co.,** 201 Springer Bldg., Alb querque—Award for 8.7 mi. of grading and drainage, Ojo Feli Ocate rd., Mora County; by St. Hwy. Dept.

Oregon

$197,841—**E. L. Gates & Co., Inc.,** 444 Center St., Salem—Lo bid for 8 mi. of road and a timber bridge, Rock Creek-Grav Creek rd., Suislaw National Forest; by BPR.

$314,868—**C. J. Eldon,** 3101 N. Columbia Blvd., Portland—Awa for grading 6.3 mi. of forest road and construction of a timb bridge, Clackamas River area; by BPR.

$247,236.37—**R. C. Hughes,** 4020 Latawah St., Spokane—Awa for 117.3 mi. power transmission and distr. lines, Wheeler a Grant counties; by Columbia Power Cooperative.

$2,987,374—**Morrison-Knudsen Co., Inc., Macco Corporation a Peter Kiewit Sons' Co.,** P. O. Box 450, Boise—Low bid for hydr electric powerhouse and appurtenances, Lookout Point Proje Middle Fork of Willamette River, 23 mi. from Eugene, La County; by C. of E.

$426,425—**Fred H. Slate Co.** and **E. C. Hall Co.,** 7805 S.W. 40

ve., Portland—Low bid for 4.6 mi. of grading, Willamette Hwy., Willamette National Forest, Lane County; by BPR.

outh Dakota

,761,120—**Adler Construction Co.,** P. O. Box 595, Home State ank Bldg., Loveland, Colo.—Low bid for construction of Pac- la Dam near Rapid City; by USBR.

tah

62,332—**W. W. Clyde & Co.,** Springville—Award for road con- ruction, Blanding to San Juan River; by St. Rd. Comm.

87,568—**Germer, Abbott & Waldron,** Tremonton—Award for 3 mi., road mixed bit. surf. rd., Park Valley to Rosette, Box lder County; by St. Rd. Comm.

78,279—**Peter Kiewit Sons' Co.,** Box 8787, University Park a., Denver—Low bid for 6.4 mi., Vernal-Manila rt., Ashley ational Forest, Uintah & Daggett counties; by BPR.

,804,330—**Rocky Mountain Contractors, Inc.,** 3150 Highland r., Salt Lake City—Low bid for basement and foundation, ashington Terrace Non-Profit Housing Corp., Ogden.

,066,810—**Stolte & Sweeney,** Salt Lake City—Low bid for wer collection system, Murray; by City.

,486,615—**Utah Construction Co.,** 57 E. 4th So., Salt Lake ty—Low bid for Gateway tunnel, Weber Basin Project; by SBR.

95,218—**Whiting and Haymond,** 250 W. 2nd No., Springville— ward for road construction, Blanding to Hite, San Juan County; St. Road Comm.

ashington

,960,000—**J. C. Boespflug Construction Co.,** 1912 Fourth Ave. Seattle—Low bid for 7-story addition and alterations, Harbor- ew County Hospital bldg., Seattle; by King County.

,254,725—**Cascade Constructors,** 1731 S St., Sacramento, Calif. Low bid for Schedule A, main equipment installation and ne operation services, McNary Dam; by C. of E.

50,610—**Curtis Gravel Co.,** P. O. Box 106, Spokane—Award clearing, draining, grading, bit. surf. and a reinf. conc. girder dge, 5.5 mi., P. S. H. No. 3, Spokane County; by St. Hwy. mm.

37,200—**General Construction Co.,** P. O. Box 3244, Seattle— w bid for 570 lin. ft. of sheet steel pile bulkhead, naval and rine corps reserve training center, Lake Union, Seattle; by S. Navy.

76,235—**Goodfellow Bros., Inc.,** Box 1337, Wenatchee—Low for grading, Stevens Pass hwy., 4.15 mi.; by BPR.

57,914—**Hall-Atwater Co.,** 605 13th Ave., Seattle—Award for rt Lewis ordnance area; by C. of E.

57,500—**Henly Construction Co.,** Boise—Award for Hanford nc. mixing plant operation; by AEC.

53,000—**Lockyear & White, Inc.,** P. O. Box 687, Longview— ard for grading, surf. and steel girder undercrossing, .96 mi. Trinidad, Grant and Douglas counties; by St. Hwy. Dept.

913,080—**Manson Construction & Engineering Co.,** 821 Alas- n Way, Seattle—Award for Snohomish River bridge on P. S. No. 1 betw. Everett and Marysville; by St. Hwy. Comm.

57,000—**Schutt Construction Co.,** Genoa, Wis.—Award for Nary reservoir clearing and fence building; by C. of E.

yoming

59,778—**Heald & Christler, Inc.,** Cody—Award for grading, ining, etc., on 8.75 mi. of Bates Creek-Medicine Bow rd., ltrona County; by St. Hwy. Dept.

17,438—**Woodward Construction Co.,** Box 1046, Rock Springs ward for 5.75 mi. of grading and surf., Smiths Fork rd., ncoln County; by St. Hwy. Dept.

UNIT BID PRICES

Selected bid abstracts for Western projects

Bridge and Grade Separation

Bullards Ferry steel bridge in Oregon

Oregon—Coos County—State. Carl M. Halvorson, Inc., Portland, submitted the low bid of $639,993 for construction of the Bullards Ferry Bridge over the Coquille River. Unit bid prices were as follows:

(1) Carl M. Halvorson $639,993.00
(2) C. J. Eldon 655,929.00
(3) Tom Lillebo 657,665.00
(4) Hamilton & Thomas $683,220
(5) General Construction Co. 738,718
(6) Guy F. Atkinson 742,563

	(1)	(2)	(3)	(4)	(5)	(
All specified, clearing and grubbing	$5,000	$8,550	$5,000	$7,000	$17,500	$15,
20 cu. yd. structural excav., unclass.	5.00	4.00	2.50	5.00	3.00	
90 cu. yd. trench excav., unclass.	2.00	3.00	2.50	5.00	3.00	
64,000 cu. yd. general excav., unclass.	.48	.58	.38	.60	.48	
286,000 yd. sta. short overhaul	.01	.02	.01	.02	.015	
2,800 cu. yd. sta. long overhaul	.75	1.00	.50	.50	.40	
2,500 cu. yd. rock slope protection	4.00	4.60	4.00	5.00	3.50	
0.49 mi. finishing roadbed and slopes	$1,000	$1,000	$1,000	$1,000	$1,000	$2,
50 lin. ft. 12-in. concrete pipe	4.00	2.00	2.00	2.00	2.25	
50 lin. ft. 18-in. concrete pipe	5.00	4.00	3.50	4.00	3.50	
3,800 cu. yd. selected roadbed topping	.60	1.00	.90	1.00	.70	
6,700 yd. mi. hauling roadbed topping	.15	.20	.25	.25	.20	3
80 M. gal. sprinkling	5.00	3.00	3.00	3.00	3.00	
All required, shoring, cribbing, etc.	$98,000	$73,000	$105,000	$100,000	$120,000	$130,
1,800 cu. yd. excav. for structure	5.00	10.00	8.00	8.00	4.00	
10 cu. yd. excav. below elev. shown	25.00	20.00	15.00	10.00	10.00	3
1,500 lin. ft. furnish treated piling	1.80	1.70	2.00	2.00	1.80	
6,500 lin. ft. furnish untreated piling	.70	.80	.80	.72	1.55	
36 only drive composite piles	100.00	72.50	80.00	80.00	96.00	11
256 only drive pier piles	40.00	39.00	40.00	35.00	45.00	3
4 M-FBM treated lumber in place	400.00	400.00	400.00	400.00	500.00	30
5,530 cu. yd. seal concrete	57.00	40.00	44.00	40.00	46.00	4
1,300 cu. yd. Class "A" concrete	57.00	61.00	75.00	68.00	75.00	7
230,000 lbs. metal reinforcement	.12	.11	.12	.12	.115	
435,000 lbs. structural low alloy steel	.245	.251	.242	.25	.27	
2,300 sq. ft. filled steel grid decking	4.00	4.60	4.00	5.25	5.20	
All required, machinery	$42,833	$56,000	$49,000	$50,000	$58,500	$57,
All required, electrical equipment	$39,000	$41,000	$40,000	$40,000	$40,000	$41,

Structural steel for Oregon's Wilsonville Bridge

Oregon—Clackamas County—State. Bethlehem Pacific Coast Corporation, Seattle, submitted a low of $462,872 for furnishing structural steel construction of the Wilsonville Bridge on the West Portla Hubbard highway. Unit bid prices were as follows:

(1) Bethlehem Pacific Coast Corporation $462,872
(2) General Construction Co. 487,200
(3) Judson-Pacific Murphy Corporation.. 488,092
(4) American Br. Div., U. S. Steel Corporation $504,

	(1)	(2)	(3)	(
1,800,000 lb. structural loy allow	.2088	.2175	.2189	.2
440,000 lb. structural carbon steel	.1978	.2175	.2138	.2

Dam

Concrete spillway dam at The Dalles Dam site

Washington and Oregon—The Dalles Dam site—C. of E. Guy F. Atkinson Co. and Ostrander Const tion Co., South San Francisco, submitted the low bid of $14,437,978 for construction of concrete spill dam, including tainter gates and excavation for the tailrace and approach channel at The Dalles Dam site the Columbia River. Unit bid prices were as follows:

(1) Guy F. Atkinson Co. and Ostrander Construction Co. $14,437,97
(2) S. A. Healy Co. 14,888,60
(3) Morrison-Knudsen Co., Inc. and Peter Kiewit Sons' Co. 14,990,58
(4) The Arundel Corporation, L. E. Dixon Co., The Hunkin-Conkey Construction Co. and The American Pipe and Construction Co. 16,508,07
— Consolidated Builders 16,666,66
— J. A. Jones Construction Co. 16,788,46
— Grafe-Callahan Construction Co., Floyd Shofner, D. G. Gordon, and Gunther & Shirley Co. 17,959,62
(5) Contracting Officer's Estimate 14,707,92

	(1)	(2)	(3)	(4)
650,000 cu. yd. excav., for dam and stilling basin, uncl.	3.35	2.25	1.95	2.86
1,512,000 cu. yd. excav. in tailrace and approach chan., uncl.	1.40	1.75	1.40	2.86
46,000 sq. yd. final foundation cleanup	5.30	5.50	6.00	4.50
3,300 sq. ft. line drilling	2.00	1.85	1.30	1.50
17,100 cu yd. filter matl., in pl. (gov't des'g'n cofferdams)	2.25	3.00	2.00	4.50
17,100 cu. yd. rock spalls, in pl. (gov't des'g'n cofferdams)	1.10	1.65	1.95	2.20
17,300 cu. yd. transit'n zone matl., in pl. (gov't des'g'n cofferdams)	1.30	2.00	.60	2.75
21,000 cu. yd. fill in cofferdam cells, in pl. (gov't des'g'n cofferdams)	1.25	.90	.85	1.00

(Continued on next page)

		(1)	(2)	(3)	(4)	(5)
2,200	cu. yd. dumped stone revetment, in pl., (gov't des'g'n cofferdams)	2.50	1.00	1.80	2.00	1.00
100	cu. yd. sand and cement in burlap bags, in place	180.00	100.00	98.00	100.00	98.00
900	ton gov't furn. sheet piling, in pl. (gov't des'g'n cofferdams)	80.00	60.00	98.00	90 00	99.50
345,000	bbl. cement, portland	3.00	4.50	4.95	4.50	4.57
200,000	cu. yd. conc., mass in dam	12.50	11.00	11.80	11.50	9.95
69,000	cu. yd. conc., in stilling basin	15.00	12.00	13.30	14.00	12.63
54,000	cu. yd. conc., in piers	18.20	25.00	24.00	17,50	20.58
8,000	cu. yd. conc., structural	18.20	60.00	93.40	47.00	85.50
72,000	lin. ft. drilling for and grouting anchor bars	1.40	2.00	1.45	1.50	1.52
12,700	lin. ft. 12-in. diam. half-round drain tile, in place	4.00	1.00	4.30	1.40	2 20
028,000	lb. steel reinforcement, in place	.115	.10	.107	.11	.116
2,600	lin. ft. 12-in. water stop, in place	3.75	5.50	4.80	3.10	6.00
610	lin. ft. 9-in. water stop, in place	3.00	5.00	4.60	4.20	4.40
667,500	lb. spillway tainter gate, in place	.33	.29	.32	.25	.35
327,600	lb. tainter gate miscl. matl., in place	.35	.34	.332	.35	.48
23	ea. tainter gate operating machinery, in place	$20,000	$25,500	$27,000	$27,500	$33,980
1	job sump pumps, in place	$5,000	$4,500	$4,360	$3,000	$2,350
73,200	lb. steel pipe, valves and fittings, in place	.60	.70	.55	.50	.45
508,000	lb. structural steel for stoplog guides, in place	.28	.30	.2905	.25	.46
18,800	lb. structural steel, in place	.60	1.00	.63	.40	.36
10,100	lb. corrosion-resisting steel, in place	1.00	.83	.9493	1.05	1.10
47,300	lb. corrosion-resisting clad steel plate, in place	1.10	1.20	1.078	.90	.76
226,000	lb. miscellaneous metal, in place	.50	.45	.33	.40	.41
153,300	lb. steel rails, in place	.30	.17	.217	.165	.19
18,250	lb. handrailing, in place	.70	.90	.82	.70	.72
7,000	lb. cast iron pipe and fittings, in place	.72	.32	.42	.60	.47
9,000	lin. ft. ¾-in. galv. conduit and fittings, in place	1.90	1.15	1.36	1.20	1.32
10,500	lin. ft. 1-in. galv. conduit and fittings, in place	2.20	1.40	1.65	1.50	1.42
4,000	lin. ft. 1¼-in. galv. conduit and fittings, in place	2.50	1.90	1.92	2.50	1.68
1,700	lin. ft. 1½-in. galv. conduit and fittings, in place	2.70	2.25	2.80	3.50	2.07
650	lin. ft. 2-in. galv. conduit and fittings, in place	3.20	2.75	3.30	4.10	3.00
7,500	lin. ft. three cond. cable No. 4, 600 v., in pl.	3.60	2.25	1.85	1.50	.77
1,500	lin. ft. three cond. cable No. 19/25, 1000 v., in pl.	1.00	.85	.85	.60	.74
50,000	lin. ft. single cond. wire No. 12 AWG, 600 v., in pl.	.11	.17	.10	.15	.15
23,000	lin. ft. single cond. wire No. 10 AWG, 600 v., in pl.	.15	.22	.13	.20	.18
1,000	lin. ft. single cond. wire No. 6, 600 v., in place	.25	.45	.24	.30	.34
100	lin. ft. single cond. wire No. 2, 600 v., in place	1.10	.55	.42	.50	.61
10,000	lin. ft. single cond. cable 19/25, 1000 v., in place	.17	.45	.12	.20	.19
1,000	lin. ft. single cond. cable 19/22, 1000 v., in place	.17	.45	.16	.20	.21
4,000	lb. bare copper ground cond., in place	2.10	1.75	2.30	2.10	1.44
1,000	6½ sect. cable trays, single pan, straight or corner section, in place	48.00	27.50	40.40	40.00	31.60
1,400	lb. cast metal junct. box, watertight, in place	2.75	2.25	.88	2.00	2.52
14	ea. receptacles—3 pole, 4 wire, 30 amp., 480 volt, vaportight, in place	100.00	5.50	36.50	35.00	49.20
160	ea. receptables—2 pole, 3 wire, 125 volt, 15 amp. with screw cap—vaportight, in place	33.00	5.50	10.65	15.00	20.90
60	ea. wall switch, single pole, 10 amp., vaportight, with cover, in place	20.00	5.50	5.50	15.00	16.40
88	ea. lighting fixture, 100 watt, Type A, in place	20.00	12.00	20.00	18.00	16.30
4	ea. lighting fixture, 200 watt, Type C, in place	52.00	12.00	23.00	22.00	41.20
69	ea. lighting fixture, 100 watt, Type D, in place	42.00	12.00	21.00	20.00	25.70
96	ea. lighting fixture, 100 watt, Type E, in place	43.00	12.00	21.00	20.00	24.80
71	ea. lighting fixture, 100 watt, Type F, in place	85.00	12.00	63.00	50.00	55.20
23	ea. lighting fixture, 100 watt, Type G, in place	45.00	12.00	41.00	30.00	33.70
70	ea. lighting fixture, 100 watt, Type H, in place	50.00	12.00	71.00	15.00	22.10
4	ea. lighting fixture, 25 watt, flush mounted, Type J, in place	25.00	22.00	29.00	20.00	33.70
21	ea. lighting fixture, 150 watt, Type K, in place	20.00	12.00	20.00	25.00	22.50
2	ea. lighting fixture, 100 watt, Type L, in place	20.00	12.00	20.00	25.00	28.50
12	ea. lighting fixture, 150 watt, Type 6, in place	35.00	12.00	28.50	30.00	42.90
3	ea. lighting fixture, 100 watt, Type P, in place	18.00	12.00	16.00	15.00	15.30
2	ea. outdoor lighting fixt., 200 watt, Type Q, in pl.	60.00	12.00	27.50	40.00	33.00
2	ea. germicidal fixture, 15 watt, Type S, in place	45.00	12.00	35.00	45.00	58.00
4	ea. transformer, dry type, 15 KVA, single phase, 480 to 120/240 volt, in place	375.00	225.00	305.00	350.00	598.50
2	ea. transformer, dry plate, 5 KVA, single phase, 480 to 120/240 volt, in place	160.00	200.00	169.00	175.00	347.50
11	ea. magnetic contractor 2 pole, NEMA size 1, in place	130.00	170.00	135.00	90.00	72.80
2	ea. transfer switch, 60 amp., 575 volts, 3 pole, double throw, in place	175.00	170.00	90.00	140.00	250.00
18	ea. pushbutton switch, momentary contact, 2 button, in place	10.00	12.00	30.00	25.00	34.20
2	ea. lighting panelboard, 8 circuit, 3 PSN, 120/240 volts, NEMA type IV, in place	400.00	170.00	190.00	250.00	322.50
6	ea. safety switch, 2 pole, 575 volts, Type A, unfused, in place	150.00	90.00	100.00	120.00	146.80
4	ea. lighting panelboard, 20 circuit, 3 PSN, 120/240 volts, NEMA Type IV, in place	600.00	225.00	407.00	490.00	693.00
1	ea. lighting panelboard, 24 circuit, 3 PSN, 120/240 volt, NEMA Type I, in place	500.00	275.00	407.00	300.00	387.00
1	ea. heating panelboard, 6-2P circuits, 3 PSN 120/240 volt, NEMA Type I, in place	300.00	275.00	320.00	250.00	236.00
90	ea. gantry rail bonds, in place	5.00	17.00	6.00	7.00	3.10
24	ea. gate seal heaters, in place	600.00	$1,375	750.00	750.00	715.00
7	ea. elect. heater, glass panel type, 1000 watt, 240 volt, in place	110.00	30.00	86.00	100.00	120.90
3	ea. elect. heater, glass panel type, 650 watt, 240 volt, in place	90.00	30.00	74.00	100.00	108.00
1	ea. elect. heater, fan type, 15 K.W., 480 volt, 3-phase, in place	350.00	115.00	330.00	260.00	313.00
1	ea. exhaust fan, 700 C.F.M., ⅜-in. static pressure, in place	125 00	30.00	100.00	400.00	368.00
1	ea. exhaust fan, 100 C.F.M., ⅛-in. static pressure, in place	60.00	55.00	72.00	50.00	135.00
5	ea. thermostat, 230 volt, 30 A., in place	30.00	17.00	32.00	30.00	33.80
1	job highway overpass	$28,000	$32,000	$19,570	$25,000	$27,760
10,000	ac. ft. pumping (gov't designed cofferdams)	1.50	3.10	12 25	3.00	9.45
00,000	lb. stoplogs	.30	.32	.287	.30	.33
1	job spillway stoplog lifting beam	$7,000	$7,500	$8,400	$10,000	$7,350
1	job removal of cofferdam fill matl. (gov't designed cofferdams)	$100,000	$157,720	$139,700	$100,000	$218,460
1,525	pile removal and reconditioning of steel piling (gov't designed cofferdams)	16.00	22.50	20.00	10.00	13.10
2,500	lb. copper tubing and fittings in place	2.20	1.30	1.35	3.50	2.30
1	job miscl. architectural features to complete south abutment in place	$20,000	$7,500	$20,818	$16,500	$17,900
1	lump sum, alternated designed cofferdams (total of prices bid for Items No. 5, 6, 7, 8, 9, 11, 83, 86, and 87)	.....	.....	.....	.....	.....

(Continued on next page)

UNIT BID PRICES . . . CONTINUED

Excavation for dam embankment foundation

Montana—Missouri River Basin Project—USBR. O'Neill Construction Co., Havre, Montana, with a l of $42,145, was low before the Bureau of Reclamation for earthwork and excavation for the Missouri Div sion Dam foundation, Missouri Diversion Unit, Missouri-Souris Division. Unit bids were submitted as f lows:

(1) O'Neill Construction Co.	$42,145	(5) Holzworth Construction Co.	$68,6
(2) McLaughlin, Inc.	50,160	— S. Birch & Sons' Construction Co.	68,9
(3) Gibson & Sons	64,435	— Morrison-Knudsen Co., Inc.	71,4
(4) Hilde Construction Co.	67,215	(6) Engineers' estimate	92,6

	(1)	(2)	(3)	(4)	(5)	(
30,500 cu. yd. excav., stripping under blanketed area upstream from dam	.19	.19	.23	.37	.26	
95,500 cu. yd. excav. for dam emb. fndtn. 0 to 2 ft. deep	.20	.19	.24	.34	.26	
138,000 cu. yd. excav. for dam emb. fndtn., over 2 ft. deep	.125	.19	.25	.17	.26	

Building

Mounded concrete igloos at Air Force base

Idaho—Mountain Home Air Force Base—C. of E. Roy L. Bair & Co., Spokane, Wash., submitted low l of $42,696.50 for construction of mounded concrete igloos at Mountain Home Air Force Base. Unit bid pri were as follows:

(1) Roy L. Bair & Co.	$42,696.50	(3) Phil McInnis & Henry George & Sons	$52,650
(2) Babbitt Construction Co., Inc.	48,290.00	(4) Government estimate	49,375

	(1)	(2)	(3)	(4
1,300 cu. yd. excav., unclassified	4.90	6.60	3.50	1
2 ea. igloo superstructure	$11,872	$ 15,305	$18,160	$21,
130 cu. yd. concrete in substructure	75.25	50.00	66.00	29
10,000 lb. reinforcing steel in substructure	.20	.22	.16	
400 lin. ft. pipe drain	2.00	1.00	4.00	1

Waterway

Dredging in Coos Bay, Oregon

Oregon—Coos Bay—Corps of Engineers. Pacific Dredging Co., Paramount, Calif., submitted the low l of $204,890 to the Portland District, Corps of Engineers for maintenance and improvement of existing Riv and Harbor Works, Coos Bay. Unit prices were as follows:

(1) Pacific Dredging Co.	$204,890	(3) Contracting officer's estimate	$193,9
(2) Manson Construction & Engineering Co. and Osberg Construction Co.	278,850		

	(1)	(2)	(3
798,000 cu. yd. dredging to depth of 30 feet at mean lower low water and disposal of material	0.2388	0.325	0.2
120,000 cu. yd. dredging and disposal of material in over-depth	0.1194	0.1625	0.1

Channelization of the Rio Grande

New Mexico—Middle Rio Grande Project—USBR. List & Clark Construction Co., Kansas City, M was low bidder at $713,012 for channelization of the Rio Grande near San Marcial to create a fish and wi life refuge. Unit bids were submitted as follows:

(1) List & Clark Construction Co.	$713,012	— Guy F. Atkinson Co.	$1,054,9
(2) McGinnes Bros., Inc.	792,329	— Isbell Construction Co.	1,058,
(3) Morrison-Knudsen Co., Inc.	811,191	— Platte Valley Construction Co.	1,060,
(4) Marshall, Haas & Royce	882,429	— Grafe-Callahan Construction Co.	1,384,4
(5) T. G. Rivers	922,247	(6) Engineers' estimate	868,

	(1)	(2)	(3)	(4)	(5)	(
2,550 acre clearing	80.00	92.00	60.00	90.00	110.00	100
520,500 cu. yd. excavation for channel	.15	.17	.22	.17	.16	
683,500 cu. yd. excavation for drainage channels	.15	.17	.22	.17	.16	
36,000 cu. yd. excavation for cut-off trenches	.15	.17	.22	.25	.16	
17,100 cu. yd. excavation for pilot channels	.15	.17	.40	.25	.16	
648,000 cu. yd. excav. from borrow for emb. adj. to chans.	.15	.17	.22	.20	.20	
24,700 cu. yd. excav. from borrow for San Marcial training levee and acces road	.15	.17	.22	.25	.30	
10,500 cu. yd. excav. from borrow for Tiffany access rd.	.15	.40	.40	.25	.30	
12,900 cu. yd. excav. from borrow for heading dike	.15	.17	.22	.25	.20	
3,370 cu. yd. excavation for structures	3.00	1.00	1.20	10.00	8.00	1
1,700 cu. yd. backfill	1.00	1.00	1.00	2.50	1.30	1
1,700 cu. yd. compacting backfill	3.00	2.00	4.00	2.50	3.00	2
625 cu. yd. 36-in. riprap	6.00	6.00	4.40	10.00	4.50	5
3,360 cu. yd. 24-in. riprap	6.00	6.00	4.35	8.00	4.00	5
7,900 cu. yd. 16-in. riprap	6.00	6.00	4.35	6.00	4.00	6
3,950 cu. yd. 8-in. gravel bedding under riprap	3.00	5.00	3.00	5.00	4.50	4
2,000 cu. yd. 12-in. gravel bedding under riprap	3.00	5.00	3.00	5.00	4.50	4
275 cu. yd. concrete in structures	60.00	80.00	72.00	100.00	135.00	80
413 bbl. furn. and handling cement	6.00	6.00	7.00	8.00	7.00	6
43,000 lb. furn. and placing reinf. bars	.16	.12	.20	.20	.20	
110 sq. ft. furn. and placing ½-in. elastic filler matl. in joints	3.00	2.00	3.30	3.00	2.00	2
45 lin. ft. placing 9-in. rubber water stops in joints	2.00	2.00	1.00	5.00	4.00	2
475 lin. ft. furn. and laying 72-in. corr. metal pipe	30.00	32.00	35.00	35.00	44.00	31
150 lin. ft. laying 72-in. corugated-metal pipe	7.00	11.00	4.00	10.00	15.00	10
110 lin. ft. excav. of tunnel and furn. and installing tunnel liner plates through railroad emb.	150.00	115.00	156.00	150.00	200.00	90

(Continued on page 116)

USBR publishes report on Heart Butte Dam

PUBLICATION of a technical record of the design and construction of Heart Butte Dam, a North Dakota feature of the Missouri River Basin Project, has been announced by the Bureau of Reclamation. The summary report is the first in a new series of this type to be issued by the Bureau on its major structures.

The 93-page illustrated volume includes 10 chapters discussing materials investigations, design, contracts, concrete production and control, construction, costs, and related data. Ten appendices tabulate various types of field and laboratory tests, costs, settlement readings; these also list drawings and reports concerning the design and construction of the structure.

Heart Butte is a rolled-earth fill dam on the Heart Butte River, 14 mi. south of Glen Ullin, North Dakota. Construction began in March 1948 and was completed the following year. Crest length of the dam is 1,850 ft., and it rises 125 ft. above stream bed. The earth embankment contains 1,140,000 cu. yd. of earth material. Water releases are controlled by a morning-glory spillway and two 4- by 5-ft. pressure slide gates on the outlet tube.

The technical record may be purchased for $1.20 from the Bureau of Reclamation, Publications Unit, Building 53, Denver Federal Center, Denver, Colorado. Check or money order payable to the Treasurer of the United States should accompany each order.

ASTM symposium on consolidation problems

A SYMPOSIUM issued by the American Society for Testing Materials through the work of its Committee D-18 on Soils for Engineering Purposes serves three important functions—first, it illustrates the wide range, variety, and character of consolidation problems encountered in soil and foundation work; second, it presents the different approaches and consolidation testing techniques used in the analyses of these problems; and third, it advances the knowledge and understanding of the nature of consolidation phenomena.

Following an introduction (by Donald M. Burmister, professor of civil engineering, Columbia University, New York, N. Y.; chairman, Subcommittee R-5 on Structural Properties of Soils, of Committee D-18 on Soils for Engineering Purposes) which explains some of the peculiar problems in this field of soils testing, there is a "Report of Consolidation Tests with Peat" by James B. Thompson and L. A. Palmer; and then a paper on "Consolidation and Related Properties of Loessial Soils" by W. G. Holtz and H. J. Gibbs.

Copies of this 116-page book can be obtained from headquarters of the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa., at $1.75 each in heavy paper cover.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
450 cu. ft. grouting behind tunnel liner plates	5.00	5.00	2.50	10.00	5.00	4.00
28,850 lb. furn. and installing slide gates and gate hoists	.39	.50	.80	1.00	.70	.70
1,800 lb. furn. and installing miscl. metalwork	.50	.50	1.05	1.00	.90	.65
3 M.B.M. furn. and erecting timber in bridges	400.00	400.00	450.00	400.00	700.00	400.00
35 M.B.M. furn. and erecting untr. timber in bridges	370.00	350.00	420.00	350.00	625.00	350.00
1,222 lin. ft. furn. and driving treated-timber piles	4.00	3.00	4.50	5.00	10.00	3.50
23 cattle guards furn. and install. cattle guards	800.00	850.00	$1,200	500.00	$1,500	$1,300

Streets and Highways

Storm drain along highway

California—Yolo County—State. McGuire and Hester, Oakland, submitted the low bid of $32,826 to the State Division of Highways for construction of about 0.6 mi. of storm drain between 2 mi. east of Yolo Causeway and Merkley Avenue, Yolo County. Unit prices were as follows:

(1) McGuire and Hester $32,826
(2) L. G. Lentz 35,805
(3) Lefever & Bing 38,199
(4) B. J. Ukropina, T. P. Polich, Steve Kral $40,894
(5) A. Teichert & Son, Inc. 51,394

	(1)	(2)	(3)	(4)	(5)
2 cu. yd. removing conc.	18.00	10.00	50.00	20.00	21.50
4,650 cu. yd. structure excav.	2.20	3.50	3.80	3.60	5.50
Lump sum, dev. wat. sup. and furn. wat. equip	625.00	300.00	500.00	320.00	130.00
65 M. gal. applying water	4.00	3.00	6.00	5.00	3.50
3 ton liq. asph. SC-2 (pen. tr. and pr. ct.)	40.00	50.00	50.00	65.00	60.00
12 ton sand	20.00	5.00	12.00	10.00	6.00
78 ton P.M.S.	20.00	10.00	20.00	13.00	15.00
6 cu. yd. Class "A" P.C.C. (struct.)	125.00	100.00	125.00	125.00	175.00
4 cu. yd. broken conc. riprap	25.00	20.00	100.00	32.00	60.00
1,480 lin. ft. 18-in. R.C.P.	4.25	4.27	4.00	5.50	5.50
1,340 lin. ft. 21-in. R.C.P.	5.00	4.90	4.50	6.00	6.50
270 lin. ft. 12-in. C.M.P. (16 ga.)	4.00	3.50	3.00	4.50	4.00
50 lin. ft. 18-in. C.M.P. (16 ga.)	5.00	4.50	5.00	5.80	4.50
85 lin. ft. 18-in. C.M.P. (16 ga.) (jacked into place)	40.00	20.00	15.00	19.00	40.00
600 lb. bar reinf. steel	.25	.15	.50	.25	.17
3 ea. new manholes	200.00	350.00	400.00	450.00	200.00
5 ea. frames and covers for drop inlets	87.00	90.00	150.00	90.00	90.00

PCC paving on cement-treated subgrade

California—Los Angeles County—State. J. E. Haddock, Ltd., Pasadena, with a bid of $1,919,792, was low bidder before the California Division of Highways for 1.1 mi. of grading and paving with Portland cement concrete pavement on cement-treated subgrade, 19 retaining walls and a pedestrian undercrossing on Harbor Freeway between Olympic Blvd. and Second St. Unit bids were submitted as follows:

(1) I. E. Haddock, Ltd. $1,919,792
(2) Webb & White and W. J. Distelli 1,987,337
(3) Ukropina-Polich-Kral 2,124,473
(4) Griffith Company $2,216,896
(5) Bressi and Bevanda Constructors 2,279,793

	(1)	(2)	(3)	(4)	(5)
1,900 cu. yd. removing concrete	3.50	3.50	6.00	4.00	6.00
Lump sum, clearing and grubbing	$25,000	$45,000	$55,000	$26,000	$25,000
600,000 cu. yd. roadway excav.	.56	.55	.56	.60	.60
43,400 cu. yd. structure excav.	2.00	2.25	2.50	2.50	2.75
29,500,000 sta. yd. overhaul	.003	.0033	.004	.005	.005
82,000 sq. yd. compacting original ground	.05	.05	.05	.05	.05
20,000 ton imported subbase material	1.75	1.65	2.00	1.95	2.00
36,000 ton imported pervious subbase matl.	1.90	1.85	2.00	2.25	2.50
61,000 ton I.B.M.	2.00	1.90	2.00	2.25	2.25
53,000 sq. yd. cultivating (prep. landscaping)	.06	.10	.12	.09	.10
Lump sum, dev. wat. sup. and furn. wat. equip.	$16,000	$10,000	$20,000	$9,500	$25,000
27,000 M. gal. applying water	1.40	1.50	1.00	1.90	1.25
Lump sum, finishing roadway	$2,500	$3,000	$3,500	$6,000	$10,000
107,000 sq. yd. mix. and compact. (cem. treat. subgrade & C.T.B.)	.28	.24	.25	.39	.34
7,100 bbl. Port. cem. (cem. treat. subgrade & C.T.B.)	3.50	3.70	4.25	4.20	4.00
135 ton asph. emuls. (cur. sl., pt. bd. & sl. ct.)	43.00	44.00	65.00	58.00	55.00
22 ton liquid asphalt, SC-2 (pr. ct.)	30.00	25.00	52.00	30.00	45.00
3,000 ton mineral aggregate (P.M.S.)	5.70	6.00	6.00	5.50	6.50
155 ton paving asphalt (P.M.S.)	5.70	6.00	6.00	5.50	6.50
2,100 lin. ft. placing curbs (P.M.S.)	.25	.50	.25	1.20	.50
8,400 ton asphalt concrete	5.00	5.50	6.00	5.00	6.50
16,500 cu. yd. Class "B" P.C.C. (pavement and base)	13.00	13.50	15.00	15.00	15.00
13,000 ea. pavement tie bolt assemblies	.60	.60	.60	.70	.60
8,550 cu. yd. Class "A" P.C.C. (structures)	42.00	45.50	45.00	43.00	50.00
2,270 lin. ft. rubber water stops	1.70	2.00	2.00	2.50	3.00
128 sq. yd. membrane waterproofing	3.00	3.00	3.25	4.00	3.50
4,200 cu. yd. Class "B" P.C.C. (curbs, gutters, and sidewalks)	26.00	29.00	30.00	30.00	30.00
225 lin. ft. curb bars	.75	.80	1.75	.90	1.25
150 lin. ft. curb armor	3.40	5.00	5.00	5.00	5.00
815,000 lb. bar reinforcing steel	.095	.0935	.10	.015	.10
50,000 lb. misc. iron and steel	.30	.30	.35	.34	.50
4,653 lin. ft. steel skid railing	6.50	6.25	7.00	7.30	7.00
291 lin. ft. exterior steel handrailing	8.30	7.50	8.50	9.00	8.50
298 lin. ft. wall steel handrailing	3.10	3.00	3.00	3.20	3.00
8,500 lin. ft. metal plate guard railing	2.70	3.30	4.00	3.25	4.00
210 lin. ft. portable timber guard rail	3.00	3.30	3.50	3.75	3.50
210 lin. ft. 48-in. chain link fence	1.60	1.40	1.40	1.45	1.35
8,700 lin. ft. 72-in. chain link fence	2.25	2.00	2.00	2.10	2.00
28 ea. walk gates	75.00	60.00	67.00	70.00	65.00
3,800 lin. ft. salvaging exist. chain link fence	.60	.30	.30	.30	.26
3,800 lin. ft. reconstr. salvaged chain link fence	.60	.50	.50	.50	.50
90 lin. ft. 12-in. R.C.P. (std. str.)	3.50	3.50	3.80	5.10	3.50
3,800 lin. ft. 15-in. R.C.P. (std. str.)	4.10	4.00	4.50	6.50	4.00
1,750 lin. ft. 18-in. R.C.P. (std. str.)	5.20	5.00	5.60	7.30	5.00
540 lin. ft. 21-in. R.C.P. (std. str.)	6.20	6.00	6.00	12.20	6.00
1,050 lin. ft. 24-in. R.C.P. (std. str.)	6.90	6.60	6.70	14.50	7.00
120 lin. ft. 30-in. R.C.P. (std. str.)	9.30	8.80	9.00	13.50	9.00
710 lin. ft. 33-in. R.C.P. (std. str.)	10.50	10.00	9.75	14.50	10.50

(Continued on page 118)

SUPERVISING THE JOBS...

... Continued from page 107

Wilce and **Joe Munoz. P. D. Clothier,** office manager, **L. Kracht,** cost accountant, and **M. D. Redick,** timekeeper, round out the list of Webb employees. The Corps of Engineers is represented by **Art F. Kull,** project manager, and **Stewart Bonnemort,** Kull's assistant.

Work on the second barrel of the San Diego aqueduct is now under way. Johnson Western Constructors has **Roy Richards** supervising its $3,192,825 award. Engineer is **Garland Gray, Fred McKinley** is superintendent of excavation and **Oscar Goddart** is superintendent of drilling and shooting. **Andy Carter** does the timekeeping.

The $2,800,000 West Contra Costa Hospital is being built by Parker, Steffens & Pearce. The contractor has named **William Holgers,** superintendent; **Howard Hill,** carpenter foreman; **Al Adams,** labor foreman; and **V. Povoroff,** engineer. The California hospital district is represented on the job by **Mike W. Fulton.**

The Austin Co. is putting up the American Insurance Co.'s building in Menlo Park, Calif. The $500,000 job is supervised by **Frank F. Lindahl. Hank Lampi** and **David Poole** are foremen for carpentry and labor, respectively. **James Simcox** is office manager.

Another highway contract reported from Montana is one superintended by **Watt White** for Ed Tangmo, contractor. Assisting are **Bill Roberts, C. W. Phelps, Howard Smith, Harold Walker, F. A. Broke** and **Jerry Edge.**

J. H. Beaver is project manager for L. H. Hoffman, who is putting up the $20,000,000 Kraft Pulp Mill for Weyerhaeuser Timber Co., Pulp Division. **Dave Doering,** general superintendent for all Hoffman work, is also heading the job with Beaver. Craft superintendents for Hoffman are **Millard Gee,** structural steel and rigging; **Earl Jacobsen,** reinforcing steel; **Andrew Johnson,** carpentry; **F. C. Brown,** field engineer; **Harrison Bailey,** Brown's assistant; **A. G. Hunt,** millwright, and office manager **Robert E. Millar.** Area general foremen are **Rennie Nason** and **C. I. Stufflebeam.**

Representatives of the subcontractors are as follows: Mechanical Constructors Co., piping subcontractor, has **R. S. Bonn,** general superintendent, and **Jim Harding,** job superintendent. **Ray Sullivan** is superintendent for Electrical Construction Co. Consolidated Western Steel Co., which is responsible for tank fabrication and erection, has **C. V. Swanson,** general superintendent.

Weyerhaeuser's representatives are: **G. F. Alcorn,** project engineer; **Bill Conns,** assistant project engineer; **Boley Thomas,** field engineer, and **Charles Saunders** and **Rusty Inkster** do the accounting and purchasing, respectively, for this large building project located in Everett, Wash.

A railroad overhead and roadway is going up in Garnet, Calif. **R. L. Basich** is heading the work for Basich Bros. Construction Co. **K. K. Jacobson** and **John Hasich** are assisting.

W. F. Gunnison has **George Baba** supervising construction of Third Street Baptist Church in San Francisco.

The University of California at Berkeley is erecting a new home economics building. Parker, Steffens & Pearce has **Norman Thorsell** superintending the job. The two foremen are **Frank Trinca,** carpenter, and **Joe Soares,** labor.

On the job constructing a state employment building in San Francisco, is **Howard Severance,** superintendent for Barrett & Hilp. **Bryant Sterling** is carpenter foreman and **Nick Ferris** is labor foreman. Office manager is **James Whitson.**

M. B. McGowan, Inc., has **F. J. Burrows** in charge of all its operations in the San Francisco area. This firm has two current pile driving operations in the vicinity. **Hugh Erwin** is superintendent for a job in San Rafael and **M. M. Phail** is superintendent on construction of a school building in San Jose.

UNIT BID PRICES ... CONTINUED

	(1)	(2)	(3)	(4)	(5)
130 lin. ft. 36-in. R.C.P. (std. str.)	11.90	11.50	11.00	38.00	12.00
18 lin. ft. 42-in. R.C.P. (std. str.)	15.00	15.50	18.00	19.50	15.00
160 lin. ft. 66-in. R.C.P. (std. str.)	26.00	26.00	30.00	30.00	30.00
45 cu. yd. Class "C" P.C.C. (pipe reinf.)	25.00	23.00	35.00	40.00	25.00
9,700 lin. ft. 6-in. P.M.P. underdrains	1.25	1.20	1.50	1.60	1.50
2,400 cu. yd. filter material	6.00	3.30	4.70	6.25	6.50
5 ea. spillway assemblies	30.00	30.00	35.00	30.00	30.00
220 lin. ft. 6-in. C.M.P. downdrains (18 ga.)	1.30	1.70	1.50	1.60	2.00
44 lin. ft. 4-in. asbestos cement drain pipe	2.50	1.75	2.00	6.00	4.00
61 lin. ft. 6-in. asbestos cement drain pipe	3.40	2.25	2.30	8.50	5.00
38 lin. ft. 4-in. cast iron pipe	2.00	2.00	3.30	7.50	6.00
74 lin. ft. 6-in. cast iron pipe	3.00	3.00	4.00	10.00	7.00
650 lin. ft. 1½-in. galvanized steel pipe	1.00	1.00	1.75	1.50	2.00
1,300 lin. ft. 2-in. galvanized steel pipe	1.20	1.25	1.65	1.60	2.00
750 lin. ft. 2½-in. galvanized steel pipe	2.00	1.60	2.00	2.10	2.50
2,700 lin. ft. 6-in. welded steel pipe	1.50	1.70	1.90	1.80	2.50
Lump sum, washing equipment	300.00	450.00	236.00	500.00	$1,000
Lump sum, drainage pumping equipment	500.00	500.00	700.00	750.00	$1,500
Lump sum, lighting equipment	$7,000	$6,750	$8,000	$7,700	$7,000

National Forest road in Colorado

Colorado—Douglas County—BPR. Platt Rogers, Inc., Pueblo, submitted the low bid of $267,842 to the Bureau of Public Roads, for construction of a roadway 26 ft. wide and 4.5 mi. long in Pike National Forest, Douglas County. Unit prices were as follows:

(1)	Platt Rogers, Inc.	$267,842	
(2)	Brown Construction Co.	269,775	
(3)	Henry Shore	279,808	
(4)	Colorado Constructors, Inc.	285,553	
(5)	C. L. Huber Co.	295,518	
—	Lowdermilk Bros.	$301,674	
—	Schmidt Construction Co.	306,703	
—	K. S. Mittry Construction Co.	327,684	
(6)	Engineer's estimate	269,301	

	(1)	(2)	(3)	(4)	(5)	(6)
Contingent sum, miscl. force account work	500.00	500.00	500.00	500.00	500.00	500.00
18 acres clearing and grubbing	300.00	700.00	800.00	300.00	500.00	300.00
136,000 cu. yd. unclassified excav.	1.12	1.05	1.10	1.20	1.20	1.00
1,950 cu. yd. unclassified excav. for structs.	3.00	7.00	5.00	5.00	5.00	4.00
36,000 cu. yd. unclassified excav. for borrow, Case 1	.40	.50	.40	.40	.60	.60
120,000 sta. yd. overhaul (1,000 feet free haul)	.03	.01	.03	.03	.04	.03
1,100 cu. yd. mi. special overhaul of borrow (1,000 ft. free haul)	.30	.15	.30	.50	.30	.30
Contingent sum, obliteration of old roadways	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000
4.540 mi. finishing earth graded roads	500.00	$1,000	500.00	400.00	600.00	$1,000
1,600 units watering of embankment	2.00	1.00	1.00	1.00	1.25	2.00

(Continued on page 120)

Committee to study municipal construction

MATTERS in municipal constructio of mutual interest to general contractor and the American Public Works Assoc ation will be studied by a national join committee newly established by the a sociation and The Associated Gener Contractors of America.

The committee will consider questior submitted to it by municipal and ger eral contractors, public works officia and others. The invitation to set up th committee was extended by AGC Pres dent Arthur S. Horner, of Denver, an accepted by Allan H. Rogers, of Ne York, president of APWA.

Co-chairmen of the committee ap pointed by the presidents of their respec tive associations are: George R. Thomp son, City Engineer, Detroit, for APWA and C. R. Ralph, Kaw Paving Co., Inc Topeka, Kan., for AGC.

Soil surveying covered by ASTM publication

A 226-PAGE SYMPOSIUM on surfac and subsurface reconnaissance has bee published by the American Society fo Testing Materials. Purpose of the sym posium, sponsored by ASTM Committe D-18 on Soils for Engineering Purpose is to assemble authoritative informatio on techniques that have been applie to this type of reconnaissance on soils i widely varying fields and to examin these techniques for their limitation a well as application.

Following an introduction by G. W McAlpin, Director, Bureau of Soil Me chanics, New York Department of Pub lic Works, Albany, N. Y., and L. E Gregg, Assistant Director of Research Kentucky Department of Highways Lexington, Ky., there are fifteen tech nical papers and two panel discussion in which several engineers participated

The papers relate to the geologic in terpretation of land forms and underly ing deposits, the pedologic interpreta tions, airphoto interpretation and geo physical methods.

Subjects covered in this symposium include the following: Interpreting geo logic maps; reconnaissance in the plain area; foundation exploration in arctic preparing county soil maps; the engi neer and pedology; aerial photograph and preliminary soil surveys; a critica panel review of air photo analysis; earth resistivity tests; electrical resistivity method; measurements of weathered mantle rock; earth resistivity method in subsurface explorations; seismic meth ods and foundation exploration; seis mology applied to shallow zone re search; resistivity reconnaissance and panel discussion on geophysical meth ods.

Copies of this book can be obtained from headquarters of the American Society for Testing Materials, 1916 Race St., Philadephia 3, Pa., at $3.00 each in heavy paper cover.

NEW BOOKS

STREAMLINED SPECIFICATIONS STANDARDS, Volume 1—Architectural (in three pads)—Small

Ben John Small has prepared a long-overdue aid to architects and engineers who have been troubled with the techniques of writing clear, well-defined specification standards. Streamlined specification standards have proved to be the most workable and comprehensible. Small's work is not only a comprehensive reference but a working manuscript which may be edited without destroying continuity or form. The pads are in standard size 8½ x 11 pages, double-spaced and printed only on one side. Individual leaves may be removed for rearrangement, corrections or filing. This first volume is divided into three pads covering architectural specification: Pad 1—Contractual, Site Work, Structural; Pad 2—Masonry, Weather Protection, Metal Work; Pad 3—Finishing. The work eventually will consist of three volumes. The second will be mechanical and electrical, the third will be equipment of buildings. Published by Reinhold Publishing Corporation, New York. 980 pages in three pads, 8½ x 11. Priced at $20.00.

A COMPLETE LIST of reviews in the "New Book" section during 1952 will be found in the annual index, pp. 137-142.

ADVANCED STRENGTH OF MATERIALS—Don Hartog

This book picks up the subject of strength of materials where it is left after the familiar first-term engineering course. It is aimed at "bridging the gap between" the strength of materials and the theory of elasticity. The material, complete with proofs and derivations for every proposition, is presented clearly and extremely well from the reader's point of view. Naturally, the material included is not for the beginner since certain knowledge of the subject is presumed. But for those who have had the base, the next step is well presented here. For reference purposes a splendid index is contained. Published by McGraw-Hill Book Co., New York. 380 pages. 6¼ x 9¼. Priced at $8.50.

Books reviewed in this section are made available by J. W. Stacey, Inc., retailers of technical books (stores at San Francisco and Denver). You may obtain a copy of any book reviewed this month by sending an order to J. W. Stacey, Inc., c/o Western Construction, 609 Mission St., San Francisco 5, California. C.O.D. orders will be accepted.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
Lump sum, providing and maintain'g water plant or plants	200.00	$1,000	$1,000	500.00	$1,000	$1,000
790 hr. rolling of embankment	10.00	7.00	12.50	12.00	10.00	8.00
378 cu. yd. conc. Cl. "A" (air-entrained conc., low-alkali cement)	80.00	65.00	75.00	70.00	75.00	80.00
39,200 lb. reinforcing steel	.16	.11	.125	.15	.14	.16
5 m.ft.b.m. untreated timber	300.00	300.00	300.00	300.00	300.00	300.00
102 cu. yd. cement rubble masonry	64.00	70.00	100.00	90.00	75.00	60.00
1,892 lin. ft. 24-in. C.G.S.M. culvert pipe	5.50	7.00	5.50	6.50	6.00	8.00
230 lin. ft. 30-in. C.G.S.M. culvert pipe	7.50	9.00	7.00	7.50	7.00	10.00
244 lin. ft. 36-in. C.G.S.M. culvert pipe	10.00	11.00	10.50	11.00	11.00	12.00
130 lin. ft. 48-in. C.G.S.M. culvert pipe	13.50	20.00	15.50	15.00	15.00	17.00
2,000 sq. ft. log cribbing	2.00	1.50	2.00	3.00	2.50	2.50
7 ea. conc. maintenance marker posts	16.00	10.00	10.00	20.00	20.00	15.00
10,600 lin. ft. barbed wire fence, Type 1	.24	.25	.25	.30	.25	.30
1 ea. gate (12-ft.)	50.00	50.00	40.00	60.00	40.00	40.00
180 ea. timber guide posts with warning reflects. (tr.)	5.00	5.00	6.00	5.00	5.00	6.00
600 lin. ft. metal plate guardrail	4.00	4.00	3.50	3.00	4.00	4.00

Miscellaneous

Lighting for the Alaskan Way Viaduct

Washington—King County—State. Northwest Engineering Electric Co., Seattle, submitted the low bid of $148,534 to the State Department of Highways for construction of lighting for the Alaskan Way Viaduct, Schedule E, Primary State Highway No. 1 (Alternate), Seattle. Unit prices were as follows:

(1) Northwest Engineering Electric Co...$148,534
(2) Donald W. Close Co. 149,500
(3) Holert Electric, Inc. $150,203
(4) Van S. McKenny Co., Inc. 164,755

	(1)	(2)	(3)	(4)
8 only steel poles mounting Type "A" incl. conc. base	250.00	229.00	251.00	213.00
1 only steel pole mounting Type "A" without conc. base	219.30	199.00	185.00	197.00
38 only steel poles mounting Type "B"	154.00	161.00	122.00	145.00
48 only steel poles mounting Type "C"	140.00	144.00	120.00	130.00
5 only steel poles mounting Type "D"	160.00	161.00	139.00	152.00
1 only 9-ft. steel pole incl. conc. base	146.56	101.00	165.00	110.00
1 only installing steel transit pole	161.33	163.00	154.00	167.00
28 only 6-ft. brackets	20.61	18.00	20.00	19.00
4 only 6-ft. brackets mounted on viaduct	21.62	16.00	26.00	23.00
76 only 4-ft. brackets	18.50	15.00	16.00	17.40
108 only mercury vapor luminaire assembly on bracket	112.00	127.00	116.00	133.55
77 only fluorescent luminaire lower deck unit assemb.	322.13	325.00	304.00	318.60
44 only mercury vapor luminaire lower roadway unit assemb.	120.26	129.00	137.00	143.00
2 only street lighting handholes	118.11	145.00	168.00	137.00
52 only handholes on viaduct	64.70	69.00	71.00	76.00
10 only 4 circuit watertight distribution boxes	81.06	83.00	87.00	89.00
1 only 6 circuit watertight distribution box	88.00	99.00	98.00	94.00
2 only 10 circuit watertight distribution boxes	110.00	218.00	110.00	115.00
21 only pull boxes	12.96	23.00	26.00	18.55
6,600 lin. ft. 2-in. conduit	1.55	1.26	1.44	1.37
19,400 lin. ft. 1¼-in. conduit	1.10	1.10	1.18	1.40
3,300 lin. ft. 1-in. conduit	.90	.80	1.00	1.35
5,000 lin. ft. ¾-in. conduit	.76	.52	.58	1.00
13,600 lin. ft. #6 stranded 1 cond. neo. cov. 5,000 volt cable	.52	.45	.55	.56
5,800 lin. ft. #4 stranded 3 cond. neo. cov. 600 volt cable	.67	.75	.70	.74
1,500 lin. ft. #4 stranded 2 cond. neo. cov. 600 volt cable	.49	.38	.48	.73
2,500 lin. ft. furn. #4 stranded 1 cond. weatherproof wire	.10	.09	.09	.09
11,000 lin. ft. #6 stranded 3 cond. neo. cov. 600 volt cable	.517	.54	.56	.56
2,200 lin. ft. #6 stranded 2 cond. neo. cov. 600 volt cable	.385	.36	.51	.50
1,200 lin. ft. furn. #6 stranded 1 cond. neo. cov. 600 volt cable	.134	.13	.14	.30
250 lin. ft. #8 stranded 3 cond. neo. cov. 600 volt cable	.41	.43	.65	.57
300 lin. ft. #8 stranded 2 cond. neo. cov. 600 volt cable	.31	.28	.50	.44
4,000 lin. ft. #10 stranded 2 cond. neo. cov. 600 volt cable	.225	.19	.19	.24
1 only wiring existing terminal nosing lights	141.80	140.00	40.00	137.00
3 only wiring existing twin danger lights	214.00	116.00	40.00	125.00
13 only installing transformers and oil fuse cut-outs	63.50	53.00	58.00	98.00
Lump sum, sign post complete with 1 sign incl. conc. base	$1,500	$1,705	$2,042	$1,810
Lump sum, sign post complete with 2 signs incl. conc. base	$2,615	$1,665	$1,880	$2,327
Lump sum, sign post complete with three signs	$2,207	$2,240	$2,620	$3,239
Lump sum, sign bridge at sta. 3+55 complete with signs	$6,137	$7,200	$6,764	$7,422
Lump sum, sign bridge at sta. 48+85.22 complete with signs including concrete footings	$7,281	$8,270	$8,265	$8,282
300 lin. ft. timber piling creosote treated	4.20	6.30	4.60	7.00
3,400 lin. ft. 4-pair telephone cable 19 gauge	.30	.51	.58	.21
14 only telephones	120.00	117.00	111.00	116.00

NEW LITERATURE

1201

Hot oil heater described

Hopkins Volcanic Specialties has i sued a booklet on its hot oil heate which is capable of burning any gra fuel oil or natural gas. Recommend uses for the burner are heating asphal waxes, chemicals, plastics and simil installations where the required te perature is between 212 deg. and 4 deg. F.

1202

Motor grader data available

An attractive catalog (No. 375) on i model 118 extra heavy-duty mot grader has been issued by **Galion Ir Works & Mfg. Co.** Numerous cut-aw drawings show detailed views of co struction and operating features, such the advanced hydraulic control syste six-speed constant mesh transmissi and the combination manual and h draulic booster steering. Complete spe fication table is given.

1203

Booklet on crushing, screening and washing plants

Of interest to quarry, mine and ceme plant operators is this 16-page catalog **Pioneer Engineering Works'** units f stationary crushing, screening a washing plants. Descriptions and speci cations are given for the compan crushers, feeders, conveyors, vibrati screens, revolving screens, scrubbe dehydrators, bins and related units. D tail drawings show eight models of st tionary primary units for gravel quarry installation.

1204

New bituminous paver described

A paver, capable of almost insta width adjustment from 9 ft. to 12½ while the machine is in motion, is d scribed in a bulletin on its model BF by **Pioneer Engineering Works.** Oth features of the machine illustrated a the tiltable screeds which enable hi frequency compaction, and matching d vice which provides automatic matchi of adjacent course, gutter or curb.

1205

STORAGE TANKS—Chicago Brid & Iron Co. has an 8-page booklet (F) the advantages of storing highly volat liquids and gases in Hortonspher under pressure. Tables of sizes are i cluded for both the liquid storage tan with capacity ranges from 1,000 to 3 000 bbls., and for gas storage units f operating pressures of 30 to 150 lb. p sq. in.

1206

DIESEL TRACTOR—Sheppard D sels stress the 75% fuel costs savings their diesel power industrial tractors the booklet on the SDI-3 model. Illu trations show model at work with L shoveloader, Hopto digger and spec purpose units for mines, quarries a railroads.

NEW LITERATURE

1207

ips for maintaining npaved roads

Helpful advice on maintenance of unaved roads is contained in a 36-page ooklet by **Calcium Chloride Institute.** he advantages and use of calcium loride and procedure for spring, sumer and fall maintenance work are listed. pecification charts show requirements r stabilized wearing courses; tons rusher-run stone per mile; volume of ne mile pavement, and weights of road uilding materials.

1208

low to order wire rope

This fact-packed 64-page handbook elps wire rope users become more exert wire rope buyers. Offered by **A. eschen & Sons Rope Co.,** the book R-51) contains descriptions and illusations of wire rope construction, workg load information and safety factors.

1209

New steel company will specialize in prestressed concrete tensioning units

Free booklet explains

FORMATION of the **Stressteel Corporation** to produce the only large diameter, high strength steel tensioning units for the prestressing of concrete is announced with the publication of the "Stressteel Manual," a comprehensive handbook describing the new material and its use. Stressteel tensioning units, consisting of bars ½ to 1⅛ in. in diameter and up to 80 ft. long, together with their end anchorages, were developed in England. Stressteel Corporation has been established by a group of American and Canadian businessmen to manufacture and sell the units in North America. The manual, available free to our readers, covers the new product under the following headings: Advantages, applications, design data, materials, specifications, construction procedures, procedures in pictures and order requirements.

1210

teel H-pile catalog offered

An illustrated, thoroughly documented 102-page catalog (No. 223) on -piles is being offered by **Bethlehem teel Co.** In addition to a general dission of the characteristics of H-piles nd their driving methods in various soil types, over fifty pages of engineer drawings and data are shown for various projects throughout the country. Tables given include comparison of pile driving formulas with actual test data; charts for solving Boston pile driving formula and maximum bearing capacities of rock and soil based on the New York building code.

1211

Wood preserving

Why creosote is still the best wood preservator is answered in a booklet by **Koppers Co.** Charts show preservative value of creosote compounds and distillation range of various creosote properties.

1212

Lubricating your machinery

Euclid Road Machinery Co. has a comprehensive booklet on lubricating procedures, presenting helpful details for their own models as well as a general discussion of the subject. Characteristics of lubricants, their properties and tests, reasons for oil and lubricant change, proper lubrication intervals and recommended application methods are explained.

1213

Cutting down carburetor troubles

Complicated problems with carburetors are neither complicated nor problems according to a booklet published by **Pennsylvania Refining Co.** Written for the man who isn't an expert mechanic, the booklet describes the various carburetor parts, common troubles and how to correct them. Cleaning the carburetor, source of most trouble, is done in 20 minutes without disassembling it with the method described.

1214

Saving insulation time and money

Eliminating the expense of costly heating equipment, the Laykold asphaltic products for insulation purposes are described in this booklet by **American Bitumuls & Asphalt Co.** Recommendations for use, and instructions for applying insulation adhesive, cement and weather coat given.

1215

Sand pump bulletin available

Reliable, efficient handling of heavy density material is described in bulletin P-15-L-1 on sand pumps by **Western Machinery Co.** Blueprint drawing shows design and operation of pump, and tables show capacity horsepower and rpm. at

various discharge heads, friction water in pipes and specific gravity pulp materials.

1216

Getting acquainted with Worthington

An easy introduction into the field pumps, compressors and fifteen oth Worthington products is offered **Worthington Corp.** Copy and drawin by cartoonist Don Herold takes t products one by one and tells you wh they do and how they work.

1217

Tractors "ride the rails"

Applications of tractors for mec anized off-track maintenance work railroads is the subject of a booklet **Caterpillar Tractor Co.** Maintenan techniques used by railroads across t country and illustrations show the wo done by tractors equipped with bu dozers, scrapers, front-end loads a crane attachments.

1218

Government standards listed

A data book, combining for the fi time in a single publication Fede specifications for service weight, extr heavy cast iron soil pipe and fittings, h been published by the **Cast Iron S Pipe Institute.** The booklet covers formation necessary in laying out so waste and vent systems in accordan with government standards.

1219

Fork truck operator manual

In the interest of safe and efficient truck operation, **Hyster Co.** has ma available a comprehensive manual t training lift truck operators. Combini the cartoon technique with detail manual approach, the book contai operational, preventive maintenan safety and basic materials handling formation. Illustrations include typi patterns for loading pallets, basic m neuvers and stacking procedure.

1220

Rough terrain doesn't mean rough steering

Air operated, the **Air-O-Matic Pow Steer Corp.'s** booster for commercial a heavy duty vehicles, is described in bulletin issued by the manufacturer. D signed to lick the problem of hard ste ing on construction jobs where t ground is soft or sandy, the booster illustrated installed on a truck, mot crane drag link and moto-crane arm e tension.

1221

What is Kaisaloy steel?

Kaiser Steel Corp. makes available 16-page booklet on Kaisaloy, low all steel designed for high structural e ciency with minimum of weight. Prop ties and characteristics of the steel a explained and illustrations show conve tional applications where greater lo capacity is desired without increase weight.

Literature briefs . . .

1222

TRUCK TIRES—If you want outstanding mileage and top performance from your truck tires, you should read what users of Atlas truck tires have done for others. **Standard Oil of California** has published statements of satisfied users with a few of the reasons why.

1223

BULLDOZER—**Caterpillar Tractor Co.** has a new booklet (30504) on its line of bulldozers. Examples of the application of cable and hydraulically controlled blades, straight, angling and U-shaped are pictured on actual jobs.

1224

JACKBIT WALL CHARTS—Four large, easily read charts for your bit shop wall or bulletin board are available from **Ingersoll-Rand.** Simple, illustrated directions for grinding Carset jackbits, threading jackrods, uses of jackbits and rolling the undercut.

1225

SASH MAINTENANCE — Trouble-free sash maintenance is subject of bulletin released by **Tremco Manufacturing Co.** Discusses weatherproofing; glazing; caulking and methods of painting.

1226

SUPER COMPACTOR—Ruggedly designed roller, utilizing principle of high intensity mass loading to obtain maximum density in base for highway construction is described and illustrated in this bulletin offered by **Super-Compactors, Inc.** Operating specifications given for single and double unit.

1227

SANITARY FILL — 32-page booklet for engineers or municipal officials on economical landfill is offered by **Drott Manufacturing Corp.** Also available from the same company are job stories on its skid-shovel, bullclam and other equipment.

1228

BITUMINOUS MAINTENANCE UNIT—**Rosco Manufacturing Co.** has issued a data sheet (555B) on its bituminous model for secondary construction work. Specifications and standard equipment listed.

1229

ROOTER—Literature on **Esco Electric Steel Foundry's** Buck Forte Rooter designed to root and doze on same pass. Said to cost 75% less than conventional types, rooter enables a 50% increase in yardage.

1230

CONCRETE ACCESSORIES — **Universal Form Clamp Co.** is offering a catalog 902 containing specifications for placing accessories.

1231

CRUSHER—Outstanding for its heavier design and longer crushing stroke, the Telsmith Gyrasphere crusher is described in a bulletin offered by **Smith Engineering Works.**

1232

ARCAIR TORCH—How to gouge and cut all metals with only carbon arc and compressed air is described in a new bulletin on the Arcair Torch available from **Arcair Co.** Literature illustrates typical applications.

1233

CONCRETING TIPS—Bulletin K-37 from **The Heltzel Steel Form & Iron Co.** describes plants and engineering service for central mix, transit mix and concrete products operations.

1234

STEEL SCAFFOLDING—Divided into three sections—maintenance scaffolding, sectional steel scaffolding and allied equipment, this broadside folder illustrates in detail the complete line of Waco steel scaffolding equipment manufactured by **Wilson-Albrecht Co., Inc.** Applications and specifications together with special "package" units for specific types of jobs are discussed.

1235

TORQUE TRANSMISSION — Performance and application data on the new Fuller 4-FS-1440 transmission for use with truck-type torque converters will be furnished by **Fuller Manufacturing Co.** The unit, capable of developing up to 400 hp., makes new load and road performance possible in heavy duty service.

1236

SAND DRAINS — Information on a new development of **McKiernan-Terry Corp.** for dehydrating marshy ground which provides permanent soil stabilization. Bulletin from company describes the operation.

1237

RATCHET LEVER HOIST—**Coffing Hoist Co.** will send you a bulletin fully explaining its new ratchet lever hoist which operates in any one of six positions for ease of handling in close quarters.

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NEW EQUIPMENT

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1238

M-310 has improved dump truck design

The M-310 dump truck features important innovations and improvements in dump truck design, giving greater payload capacity and easy maneuverability. Its truck and chassis has been built with an eye for exclusive dump service. Greater advantage has been taken of the load-carrying ability of the front axle by shifting a portion of the payload weight to the front, thus increasing the total legal payload capacity, which is 15 tons net in many states. A rugged, heavy-duty front axle has been provided to absorb this greater weight. The chassis is built of high quality steel members, braced to support a maximum load. All component parts of engine, steering mechanism, axles, transmissions and drive units are built for rugged service, are easily maintained and readily replaced. The single passenger cab provides an unobstructed view.

The truck has a Ford 317 V-8 Overhead Valve, 155-hp. engine and full air brakes. It is equipped with a hydraulically powered telescopic hoist. Safe, simple, and reliable in operation, the hydraulic principle eliminates heavy mechanical levers, arms, cams, and other parts subject to wear and failure. The manufacturer is **Cook Bros. Equipment Co.**

1239

New size Universal rock plant

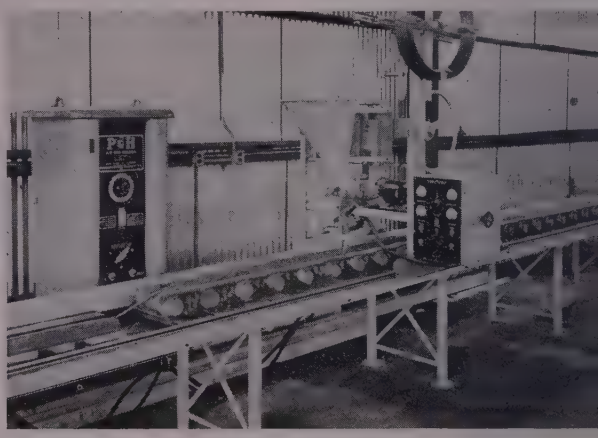
Universal Engineering Corporation announces a new addition to their 293QH Series Limerock plants. Designed for 100% crushing, this new plant features an 18-in. x 30-in.

roller bearing jaw crusher, an 18-in. x 31-in. hammer mill, and a 4-ft. x 10-ft. three-deck gyrating screen with ball tray. Special by-passes are built in to give product control making it possible to produce aglime, road rock and chips simultaneously, aglime and chips, aglime and road rock, or all aglime. The Universal 293QH Limerock plants are now available in balanced combinations with 18-in. x 24-in., 18-in. x 30-in., and 20-in. x 36-in. jaw crushers, 18-in. x 31-in., and 26-in. x 36-in. hammer mills, and 4-ft. x 10-ft., and 4-ft. x 12-ft. screens.

1240

Automatic welder-positioner speeds track rail rebuilding

An automatic welder-positioner for crawler track rail rebuilding and other longitudinal welding is now in production at **Dean Weld Machine, Inc.** Chief advantage of this machine



is the elimination of tedious disassembling for rail rebuilding; the 40-ft. positioner bed will accommodate a full-length track with or without pads and grousers attached. The typical 76-link track can be rebuilt in only eight hours with one operator, including set-up and finishing time.

Low heat required reduces distortion so that track pins may be turned after welding. Automatic controls break and re-start the arc at each link joint so that build-up material does not fill the rail joints; thus cutting or grinding after welding is virtually eliminated.

The machine handles other longitudinal welding or build-up on any sections which can be positioned in the 40-ft. 28-in. welding bed. Extra 10-ft. bed extensions are available. The unit is shipped complete with bed, carriage, welding head, 500-ampere transformer and all controls and cables.

1241

P & H's latest "baby" is a giant dragline

Field test operations have been acclaimed by witnesses of **Harnischfeger Corporation's** new model 1855, reportedly the largest dragline ever mounted on a single pair of crawler frames. The giant has a working weight of 600,000 lb., and can handle an 8-cu. yd. bucket with a 120-ft. boom or a 7-cu. yd. bucket with a 150-ft. boom. Its maximum height is 32 ft., with the cab top slightly more than 19½ ft. above the ground. Hoist line speed is 246 ft. per min., and digging line speed is 199 ft. per min. Hoist line pull is 75,600 lb., and digging line pull is 93,500 lb. It is powered by an 8-cylinder Cooper-Bessemer FV8 diesel engine. Four separate Magne

torque units control every motion, digging, hoisting, swinging and even propelling. The electro-magnetic controls eliminate friction clutches entirely, transmitting power with-

out mechanical linkage or wear. The resulting ease and smoothness of operation means an absence of shock loads and an increase in daily output.

1242

Sierra loader cuts earthmoving costs

The Sierra loader, built by **C & D Manufacturing Co.**, plus a single Caterpillar D318 tractor and operator, is an efficient, rugged earthmoving team. This loader is maneuvered by fingertip dual power control. Its short turning radius (about the same as tractor-scraper combination) makes the Sierra useful in short or circular pits. The 27-ft. conveyor is quickly raised or lowered, and has a belt protected by non-cutting side guards and underside scrapers.

Excellent visibility enables the operator to maintain exactly the right height. The Sierra is equipped with a fast-cutting 42-in. disc plow. Plow and conveyor are mounted on the same hinged beam, providing 6-ton down pressure on plow and keeping spacing constant regardless of digging depth.

1243

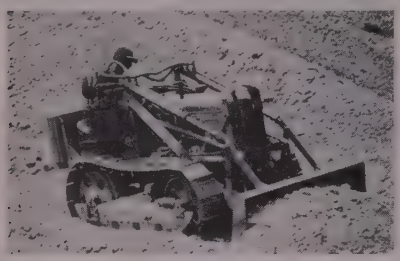
Loading ramp is economical and it installs in 5 minutes

The portability and deck adjustment features of this Illo loading ramp mean that your costs go down while efficiency goes up. Standby time is eliminated. One man can drive forklift right onto the truck and load and unload. Safety is accomplished by the fact that the ramp floats with truck body to provide a safe and firm surface. Unit also provides extra dock space when deck is locked into position. **John B. Illo Engineering Co.** is the manufacturer. Available in manual and electrically powered models.

1244

Small Oliver crawler tractor adaptable for many uses

Oliver Corporation describes its Model "OC-3" as "The Tractor of a Thousand Uses." Matched equipment



makes it adaptable for dozing, trailbuilding, front end loading, sidewalk snowplowing, and many other useful tasks. The tractor weighs less than 3,600 lb., but it is rated at 21.85 drawbar hp., and 26.36 belt hp.

1245

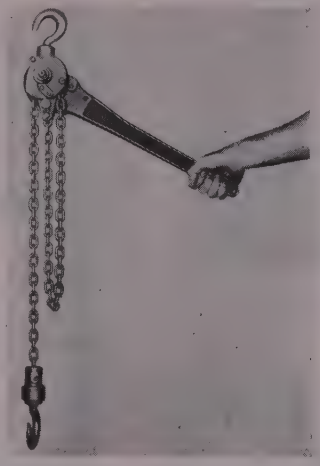
Direct drive hydraulic torque converter for heavy trucks

A new direct drive hydraulic torque converter for trucks carrying loads up to 30 tons has been developed by Twin Disc Clutch Co. This converter eliminates 99 per cent of forward shifting in off-highway operation. The action is aided by use of special hot-oil resistant seals made of Hycar 4021 (polyacrylic) rubber developed by the B. F. Goodrich Chemical Co.

1246

Ratchet-lever hoist is flexible and easy to service

Changes have been made in the Model R coil-chain ratchet-lever hoist now be-



ing manufactured by Coffing Hoist Co. It retains the Coffing unique ratchet and pawl operating principle but uses coil instead of roller chain, permitting it to swing or wrap easily in any directio The handle operates in any positio solving the difficulties of cramped spac Safety stops prevent the handle fro spinning, and it can be operated wi either partial or full strokes. The easi disassembled unit is available in 1,50 and 3,000-lb. capacities. Moreover, overloaded, the handle will bend, th giving the operator warning to avoid accident.

1247

Double-jawed crusher

The double-jawed El-Jay Gyraja crusher is now available in two siz

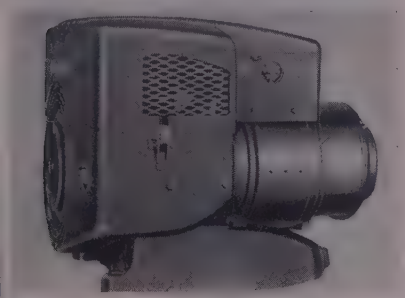
after several years of testing. The tw crushing chambers are formed by oscillating jaw working between two st tionary jaws. The two chambers ha

ndependent adjustment so that any per-centage of fines may be obtained without reducing the maximum desired size of product. All crushing stresses are in a line and are divided between the bearings so no bearing carries more than half the crushing load. Available from **El Jay Manufacturing Co.** in two sizes, the 18-in. crusher weighs 5,400 lb., and the 42-in. crusher weighs 25,000 lb. The large size will crush 175 tons per hour; the smaller 41 tons per hour. The manufacturer claims that the machine will handle very muddy rock without clogging.

1248

Small generating plant packs 3,500-watt wallop

D. W. Onan & Sons, Inc., announces a new 3,500-watt AC electric generating plant (Model 305CK) to meet the demand for higher capacity in small-sized electric plants. Tests prove that it can safely draw up to 4,000 watts of power



at intervals for two-hour periods. The 115-volt, 60-cycle unit is powered by the Onan "CK," a two-cylinder, 4-cycle, air-cooled gasoline engine, which delivers its full rated load with fuel consumption of only 0.68 gallons per hour. Model 305CK is available either in manual or remote starting units.

1249

Large new 4-wheel drive tractor on the market

The Model TM "Payloader" tractor is a large rubber-tired machine recommended for heavy-duty drawbar and pushing work, both on and off pavement. It makes a flexible, efficient railroad car

switcher and spotter for industrial plants and yards, and can pull or push 8 to 10 loaded cars. The "Payloader" is available with a 106-hp. gasoline engine or a 90-hp. diesel engine. It weighs 25,000 lb., and develops up to 16,000 lb. and 14,000 lb. drawbar pull, with gasoline and diesel engine respectively. Manufactured by **Frank G. Hough Co.**

1250

Automatic hardfacing process

A need for improved methods in depositing tungsten carbide hardfacing material on tool joints for well digging rigs has encouraged AIRCO'S development of an Automatic Heliweld Hardfacing Unit. The new product uses the

standard Automatic Heliweld Head and a unit for feeding bulk tungsten carbide. In operation, the arc melts the base metal, producing an elongated pool. The tungsten carbide particles are poured into the pool behind the arc. The rate of tungsten carbide feed is electrically controlled. The manufacturer claims tests have shown that the abrasion resistance of deposits made by this process is considerably greater than that attainable with other arc methods.

1251

New stand-by electric plant

A compact electric generating plant engineered primarily for emergency stand-by service is now on the market. It has a 10-kw. capacity, available with electric starting or controls which automatically start the plant the instant regular power fails. The four-cylinder air cooled engine does not require attention, reducing maintenance needs to a minimum. The plant can be furnished for single phase or three-phase service, at either standard or special voltages. It provides an ideal combination of low initial and minimum operating expense. Manufactured by **Universal Motor Co.**

1252

Oliver's three-in-one combination is a versatile unit

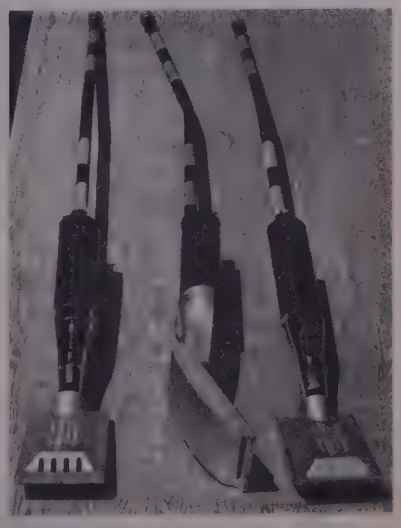
A combination loader-dozer-crane means reduced costs for loading and dozing. **The Oliver Corporation** announces its Strait-Line loader, which, mounted on an Oliver Industrial Wheel Tractor, digs at either end, swings its

load overhead, and loads in front. The manufacturer claims that the rear-carried bucket load multiplies traction and makes steering easier. The tractor will doze at the push of a lever, and carrying a loaded bucket in the rear gives added traction, making wheel tractor dozing very effective. The loader bucket may be removed from the Strait-Line unit and replaced with a crane which can operate at either end of the tractor.

1253

A self-heating iron for asphalt wrinkles

The Surfa-Slick Self-Heating Asphalt Smoothing Iron is a 40-lb. gasoline-operated instrument resembling the household vacuum cleaner (see cut). The



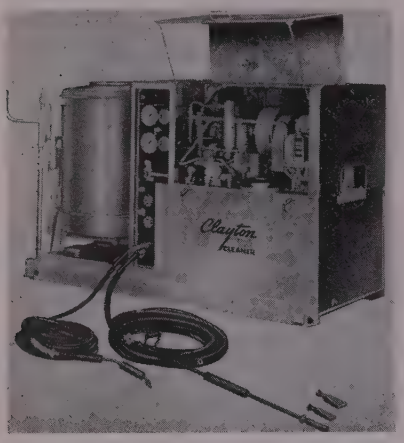
iron will heat up in 10 min., will stay hot all day long, and handle remains cold while iron is hot. No time need be wasted building and attending fires. It is simply

operated, and although lightweight, it has a rugged constitution. Available at **Camm Manufacturing.**

1254

Steam cleaner for big-time operations

Clayton Manufacturing Co. announces that its BOE-600S Clayton Kerrick Steam Cleaner, originally designed for the Armed Services, is now available in



a "civilian" model. The machine is for extra heavy-duty use and large-scale operations. It can discharge up to 540 gal. per hr. of pressure detergent spray, and the same amount of hot or cold pressure rinse simultaneously.

The steam cleaner is equipped with a 60-gal. detergent concentrate tank and a 40-gal. fuel tank, guns, hoses and cable. It will operate for 4 hours continuously at maximum load and much longer at lesser loads without reloading. The equipment operates on 220-volt, 60-cycle, single phase current. Weight, with storage tanks empty, is 2,000 lb.

1255

For testing electric circuits, sparkplugs

A safe test-light is available for testing electrical circuits to 600 volts, sparkplugs, motors, fuses, etc. The new pocket-size Test-Glo has resistors behind each test-prod which reduces voltage in leads. The enclosed neon test lamp is at the front end of the prod handle, always in line of vision. Heavily insulated, the 24-in. leads have 10,000-volt wire. Handles are long and thin for deep probing. The entire unit is cement-sealed and moisture proof. Manufactured by **Ideal Industries, Inc.**

1256

A hoister for heavyweights

Roll-O-Hoist Model "K" is a heavy-duty material elevator with a special "walk-through" feature for handling concrete buggies. Its capacity is rated at 1,200 lb., accommodating a standard two-wheel concrete buggy, or it can be furnished with a tip-over bucket for handling ¼ yd. of concrete. The adjus able cross braces permit a 6-ft., "wal through" opening to enable workmen roll buggies directly through the ho frame.

The hoist has remote control mec anism, safety devices to prevent disast from over-traveling or cable-break, a it may be erected easily and quick Basic height is 32 ft., additional heig obtained by 10-ft. extensions. The Mo "K" is a useful hoist for handling vario building and roofing materials. Manufa tured by **Stampco Products.**

1257

Changes on Wood P-600 Prepariz

Wood Manufacturing Co., manufa turer of mix-in-place roadbuildi equipment, announces modifications its P-600 Preparizer. Power has been i creased 55 hp. by replacing the form engine by an International Harvest UD24, 180-hp. diesel. Drive-on paddl replace the slow old method of bolti paddles to the rotor shaft.

In one operation this new model sca fies and pulverizes old asphalt mats f complete re-use. The manufactur claims that it can reprocess any asph material that can be scarified by a mot grader. Its capacity is up to 1,500 sq. per hr. An attachment can be obtair to convert the machine into a s blender.

1258

Reversible pump is easily installed

A centrifugal pump which opera with equal efficiency when rotated either direction is now on the mar

It was designed primarily for circulating cooling water in air compressors, diesel and gasoline engines, and other water-cooled machines. It may be easily installed in any position on a machine, and is suitable for heads up to 50 ft. and capacities up to 67 gpm. It has been successfully installed on either side of the same machine without turning the pump around when moving it from one side to the other. Called the Model CAY, it is manufactured by the **Gardner-Denver Co.**

1259

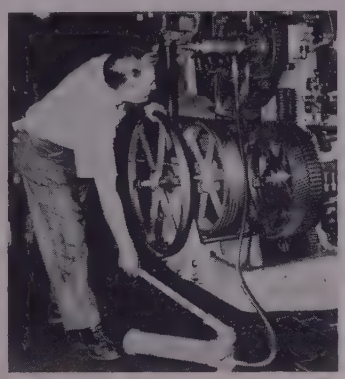
Street sweeping is a science

Engineering development hasn't forgotten mechanization of as common-place an occupation as street sweeping. Model 53M Engine-Driven Pull-Type Sweeper has been designed by **Meili-Blumberg Corporation.** The new road sweeper, powered by a Wisconsin VE4 engine with built-in heavy duty clutch, has a 30-in. diameter 96-in. brush which is quickly set at a 30-degree angle to sweep a 78-in. path either to the right or to the left.

1260

Hydraulic ram simplifies concrete prestressing

The Simplex Re-Mo-Trol, manufactured by **Templeton, Kenly & Co.,** is a remote controlled hydraulic puller which has been found to speed and simplify tensioning of prestressing rods and cables in many prestressed concrete applications. A hole passing through the center of the ram plunger makes it possible to pass the prestressing rods through the ram, enabling a straight-line, torque-free pull. The illustration shows two Re-Mo-Trol Rams connected to a single pump for equal, simultaneous



tensioning of rods on either side of a concrete block member. The ram is connected by a flexible, high-pressure hose to the pump, which may be located six or more feet away.

1261

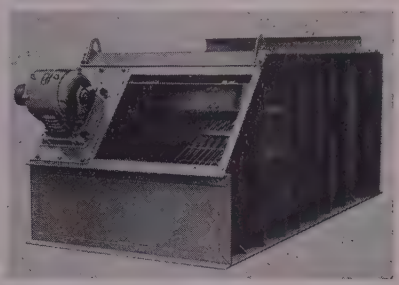
Five new sizes of Le Roi compressors

In order to better fit air compressors to the requirements of commonly used air tool combinations, **Le Roi Co.** has introduced five new sizes of portable air compressors. The new capacities are 85 cfm., 125 cfm., 185 cfm., 250 cfm., and 365 cfm.

1262

This grizzly does energetic scalping

The "Symons" type K-RG Vibrating Rod Grizzly is a heavy-duty unit designed to scalp in excess of 400 tons of material per hour. It is suited for service following most sizes of primary crushers and for use ahead of secondary crushers. The new grizzly serves primarily as a single cut scalping unit but it can accomplish a limited number of separations.



The screening surface is 50 in. wide and 8 ft. long. Spring steel rods are easily replaceable. The power mechanism is basically the same used on other "Symons" vibrating screens. Manufacturer is **Nordberg Manufacturing Co.**

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

Osgood-General opens new coast branch

Osgood Co. and General Excavator Co. announce the opening of their new and larger sales and service branch for the West Coast, located in South San Francisco, Calif. The company's expanded facilities will carry its cranes and shovels of the latest design, plus ample parts stocks for owners and distributors.

Cleaver-Brooks appoints Western Traction Co.

Cleaver-Brooks Co., Milwaukee, has appointed Western Traction Co., San Francisco, as northern California distributor for its road machinery division. The new distributor has three branch offices: Contractors Equipment and Supply Co., Fresno; George M. Philpott Co., Sacramento, and W. E. Pierce Co., Eureka. Western Traction Co. will stock all parts and provide complete service on every item in the Cleaver-Brooks road machinery line, including mobile, portable and stationary steam boilers, tank-car heaters, bituminous boosters, "Peak-Temp" oil boosters, "Deuce" tank-car heaters and pumping boosters.

NEW HEADQUARTERS for Schuler & James, Inc. of Los Angeles are pictured above at 5107-5109 Anaheim-Telegraph Rd. Schuler & James specializes in industrial parts for trucks, tractors, and marine engines and contractor supplies. Eight well-trained men cover sales territory under supervision of *William Hargrove*, general sales manager. Other officers are: *John G. Baehr*, president, *C. W. Johnson* and *Hugh A. Hall*, vice presidents, *William Wendell*, treasurer, *David O'Bryan*, secretary, and *Robert Rasmussen*, general manager. This expanding 15-year old concern has branch offices in San Francisco and Phoenix.

Shepherd promotions

Shepherd Tractor & Equipment Co., Los Angeles distributor for Caterpillar and John Deere, announces several executive promotions. Don C. Montgomery now is assistant general manager, Richard E. Miner will now serve as general office manager, Ray T. Smith, former manager of Shepherd's Lancaster and Castaic Junction outlets, is now the general farm sales manager for the entir organization, and Thurman "Mike Michael has been appointed farm sales man working out of the Los Angele store. Grover Stetler is now Lancaste branch manager, and Cliff Large take over the management at Castaic Junc tion.

"Cat" sends Pertz to Calif.

Caterpillar Tractor Co. announces tha Harry C. Pertz is now assistant servic manager of its western division, wit headquarters in San Leandro, Cali Pertz has been with the concern sinc 1948, and until his present appointmer he was assistant service manager fc Caterpillar's eastern division.

Aero-Coupling Corp. appointment

Aero-Coupling Corp. has appointe Bearing & Transmission Products c Eureka, Calif., as stocking distributc of Aeroquip's complete industrial lin Bearing & Transmission Products, mar aged by J. H. Jacobs, will serve the nort coastal area with Aeroquip's reusab hose fittings, hose, and self-sealin couplings.

Bill Johnson now with Armco

William A. "Bill" Johnson began Arm co's two-month indoctrination cours at Berkeley in September, and now a sists Vic Householder in representin Armco in Arizona. Johnson formerl was with Salt River Valley Water User Association.

ew Schramm facilities in L. A.

The Los Angeles factory branch of chramm, Inc., now has larger headuarters at 846 E. 6th St., Los Angeles, handle increasing business in the tertory. The new warehouse will carry a

mplete stock of machines and pneuatic tools. Karl Burlie directs the chramm branch and Charles "Chuck" ill heads the service department.

. S. Johnson Co. distributor

Cook Bros. Equipment Co., Los Anles, is the new distributor serving Arina for C. S. Johnson Co., a subsidiary f Koehring Co., Milwaukee. Cook Bros. ill handle the complete line of Johnson ncrete batching and cement handling uipment, including concrete and clamell buckets.

ew sales specialist for Skil Corp.

Interest in radial Skil saws has been great that Skil Corp. has found it ecessary to add a "specialist" to the aff. Norman Thole, formerly with aven Saw & Tool Co., has been sected to assist regular sales personnel Pacific Coast branches in answering e many inquiries about their product.

Associated Equipment Distributors hold regional conferences throughout the West

REGIONAL MEETINGS of the Associated Equipment Distributors covering the entire West (Regions 11, 12, 14) were held at three locations during October. Members of Region 12 met in Seattle, with L. E. Jones presiding, on October 23-25. Region 11 held its conference in Santa Barbara October 19-21, with Beal Shaw presiding. Region 14 met at Colorado Springs October 23-25, with Director Frank Skidmore in charge.

National president of AED, Harry Hush, attended both the Santa Barbara and Seattle sessions, while Jack Randle, field secretary, attended the meetings in Santa Barbara and Colorado Springs.

In Seattle, the members of Region 12 held their annual meeting, attended by representatives from Washington, Oregon, Idaho, and Montana. The Director of Region 12, L. E. Jones of Hall-Perry Machinery Co., Butte, Montana, welcomed the delegates and guests. The problem of equipment rental, with or without the option to buy, held an important part in the program, with the initial presentation made by Phil Dufford of Intermountain Equipment Co. of Boise. A morning panel was devoted to the subject of "Company Car Ownership vs. Fleet Rental or Mileage Basis." The usual social activities completed the program. Jack Hatten of the Star Machinery Co., Seattle, was general chairman in charge of the conference.

Members of Region 11 and guests met in Santa Barbara October 19-21 for an initial day of golf followed by two days of important business sessions. Director Beal Shaw, Shaw Sales & Service Co., Los Angeles, presided over the opening session. This session was devoted to subjects of general interest to AED and AGC. The contractors' point of view was presented by H. O. Parish, president of Northern California Chapter of AGC, and "What the Contractor Needs from AED" by J. A. Thompson, national director of AGC from Los Angeles. The subject of financing equipment purchases and current trends was reviewed by E. H. Thrower, vice president of C.I.T. Corp., San Francisco.

On the second day talks were given on various subjects, including: the necessary teamwork between distributors and manufacturers, the problems of inventory, the logical advertising program for a member of AED, and the importance of local AED activity. The AED group insurance program, which was recently instituted, was discussed by Jack Randle, field secretary, and national affairs of the Association were brought before the members by Harry Hush, national president. The afternoon session on the second day was a closed meeting for a thorough discussion of strictly AED matters.

In Colorado Springs, on October 24-25, a conference was held with general participation of Regions 10 and 14. Re-

REGION 11 meeting (top) was held at Santa Barbara and Region 12 (bottom) met at Seattle. Both conferences were attended by *Harry Hush* of New York, national president of AED.

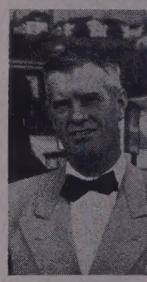
gion 14 includes the Western states of Colorado, New Mexico, Utah, Wyoming and the El Paso area of Texas. The opening session was presided over by Frank Skidmore, director of Region 14 and general manager of Contractors Equipment & Supply Co., Albuquerque, New Mexico. An important speaker at the opening session was R. L. Arnold of Salt Lake City, who is the immediate past national president of AED. Jack Randle reviewed work of the Association in Washington, D. C. and at the national level. Problems of equipment financing represented a major feature of the program, with a talk by J. A. Turiff of C.I.T. Corp. A particularly active discussion followed a talk by Morris Adelstein, president of Northwest Engineering Co., on the subject "Contractor-Distributor Relationship."

The second day started with regional breakfasts which included a business meeting for each of the two regions. The rest of the day was devoted to panel discussions of distributor problems, with special emphasis on sales. Director Skidmore wound up the business sessions with a talk on "AED in the Future." Leigh Jones, Western Machinery Co., Denver, was general chairman for the convention.

Goodall expansion

Goodall Rubber Co. has two new offices serving the Northwest, offering improved facilities in Seattle and Portland for Goodall industrial rubber and allied products. Staffing the Seattle branch are: Joe H. Moss, Northwest manager; Lloyd Lorentzen, general office manager; LaVerne Schurman, secretary and clerk; Otto Borth, warehouseman, and two salesmen, Hugh Degler and Bill Riek. At the Portland branch are Jink Williams, manager, and salesmen Orel Davidson and Ben Parks.

GOODALL RUBBER CO.'s new Seattle branch is headquartered in this attractive brick-and-glass building at 2751 Fourth Ave. S., Seattle. 5,000 sq. ft. is provided for warehouse, sales and office.



JOE H. MOSS, Northwest Manager for Goodall Rubber Co.

acwhyte Co. visitors

Two officials of the Macwhyte Co. sited the Pacific Coast in October in der to inspect company facilities and hold sales conferences with local rep- sentatives in Seattle, Portland, San rancisco and Los Angeles. Visitors ere F. D. Holden, assistant general sales manager, and J. H. Werner, manager of the order and service department of the Macwhyte Co. head office in Kenosha, Wis.

Euclid appoints new Washington distributor

Euclid Road Machinery Co. announces the appointment of Philpott Equipment Co. of Seattle as distributor for its earthmoving equipment in the western half of Washington and Alaska. J. G. Woodford manages Philpott's Washington and Alaska operations. Ward Meyers is parts manager and Frank Godfrey is service manager. The Alaska branches at Anchorage and Fairbanks are managed by Carl Lottsfeldt and Warren Sullivan.

Caterpillar sales rep

Special representative for Caterpillar Tractor Co.'s Western sales division is Russell H. Johnson, with headquarters in the San Leandro, Calif., office.

International Harvester acquires Frank G. Hough Co.

International Harvester Co. acquires the stock of Frank G. Hough Co. of Libertyville, Ill., manufacturer of the well-known "Payloader," effective November 1. The Hough Co. will be operated as a wholly owned subsidiary with no immediate changes in organization anticipated, according to John L. McCaffrey, president of International Harvester.

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6—Sullivan (Joy) Wagon Drills—Light Weight Models

1—Chicago Pneumatic Diamond Drill, Size 5E Model CP5—w/J3068 Feed Screw

6—Gardner-Denver Drills—Models S45 and S55

6—Ingersoll-Rand Jackhammers —Models JB4 and J50

6—Pavement Breakers—Miscellaneous makes and models

4—Gar-Bro Dumpcrete Bodies (4 cu. yd.)

1—Pump-crete Machine Rex 8" Elec. Driven w/approx. 500 ft. pumpcrete pipe and fittings

2—Boilers, 2000 gal. cap., hot water pressure 40# complete w/fire bowls

1—#36 Kennedy Van Saun Gearless Gyratory Crusher complete w/200 HP Elect. Motor and Controllers

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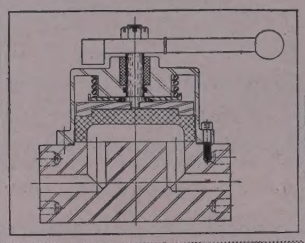

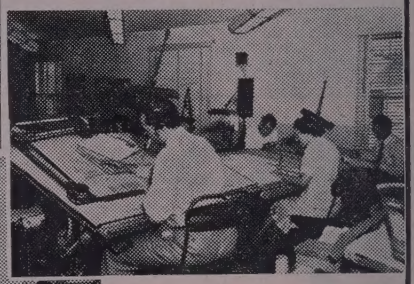

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