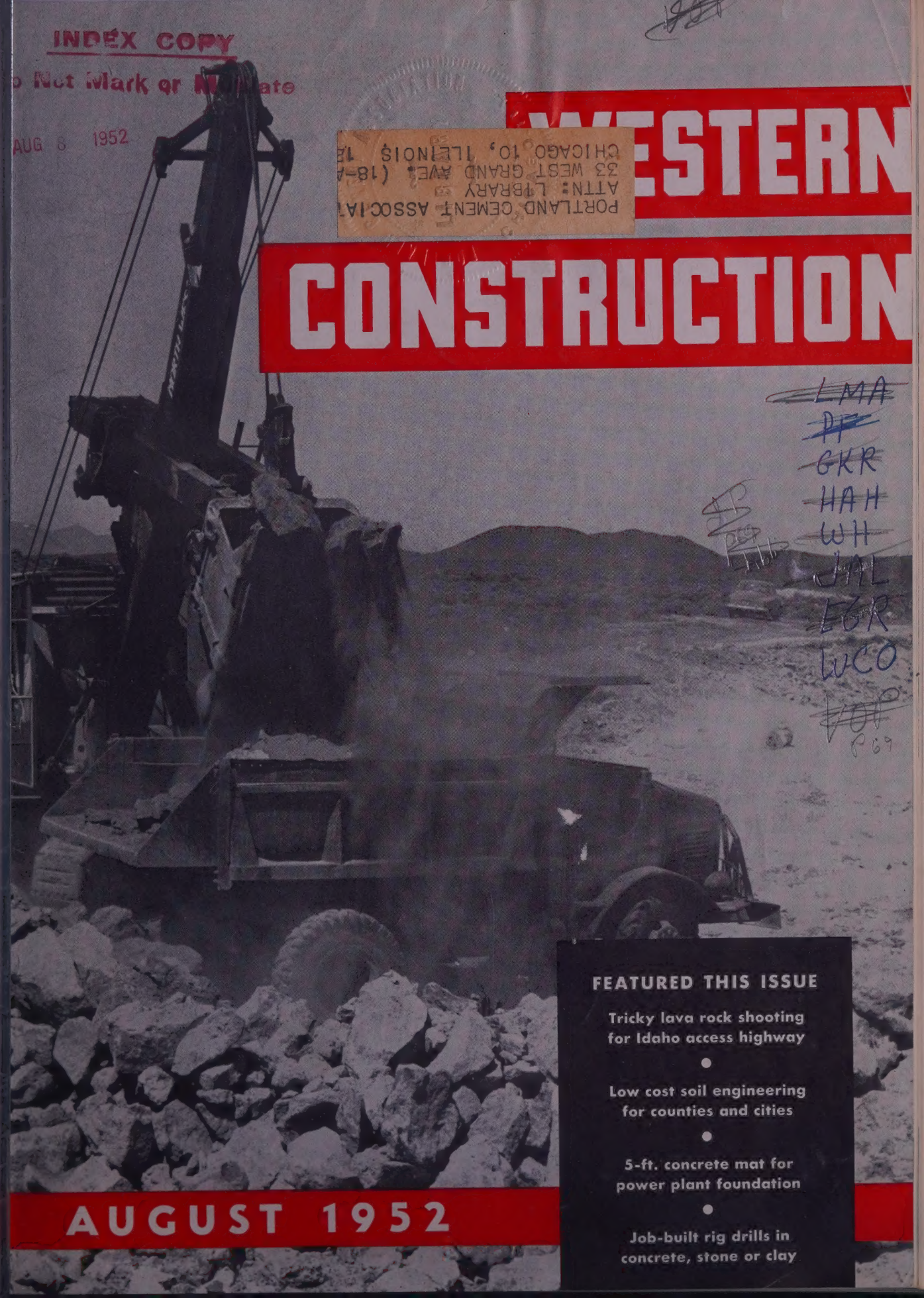
WESTERN CONSTRUCTION



FEATURED THIS ISSUE

Tricky lava rock shooting for Idaho access highway

•

Low cost soil engineering for counties and cities

•

5-ft. concrete mat for power plant foundation

•

Job-built rig drills in concrete, stone or clay

AUGUST 1952

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WESTERN CONSTRUCTION

Volume 27 **AUGUST 1952** Number 8

ARTICLES

DEPARTMENTS

FRONT COVER

SOME OF THE TRICKIEST lava rock shooting a contractor could desire is taking place on construction of an access road to the atomic plant at Arco, Idaho. Rock from cut sections is all being used for fill. Cover shows a Northwest 6 loading rock at one of the cuts. Complete story starts on p. 59.

The Construction and Civil Engineering Publication of the West

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WESTERN CONSTRUCTION

August 1952 Vol. 27, No. 8

Contractors can never forget P. R.

With few exceptions, contractors depend solely on the pending of public funds for their business. Although the xpenditure of such funds may be said to be under the ontrol and supervision of engineering administrators, the ublic knows that the money is paid out to contractors for arrying out assigned units of work. This system is only as ermanent as the confidence of the public in the method nd its efficient results. Today the system is generally ac-epted. However, it is not enough to rest on this acceptance; he work to keep the public informed on the advantages of he method is never ending.

One important phase of this continuing recognition pro-ram is proper contact with engineering agencies, admin-strative officials and legislative bodies at federal, state and ocal levels. This work is generally assigned to, and carried ut successfully by association offices. The larger and more ifficult problem of contact with the general public seldom eceives the consideration it deserves. Direct contact is next o impossible and the logical connecting link must be de-eloped through local daily newspapers.

Based on this sound approach, the Colorado Contractors ssociation has carried out a program designed to improve ublic relations at the grassroot level by developing a "better press" for work carried out on the state highway ystem. One of the features of the program was the distri-ution of a carefully prepared booklet which told news-aper editors and reporters in easily-understood terms bout the advantages of the contract system, the part con-ractors play in the state highway program, the rudiments f competitive bidding and contract awarding, and some-hing of the field problems with reference to inconvenienc-ng the public in delays and detours. The booklet went so ar as to present a group of pictures illustrating the more ommon types of contractors' equipment and explained heir features and use. Thus, reporters were encouraged, by eeling more familiar with the subject, to visit highway obs in the local area. For the first time, perhaps, the local aper had a true understanding of highway construction rocedure and felt inclined to report on current projects. n turn, this meant that the public reached by that local ewspaper received more and better information on work arried out by local contractors and others doing jobs in he area. The reaction could not be other than favorable.

Contractors in other states of the West would do well to tudy this program of the Colorado contractors. Although he public relation problems in other states may require nother approach, the basic need for improving contact alls for continual thought and effort.

"My design couldn't be built"

The ultimate example of designing-for-design's-sake might be the reported remark of the young engineer who reveled in the dubious distinction of being so successful that he designed something that couldn't be built. As ridiculous as this example may be, it emphasizes a fundamental problem. Young engineers must be constantly admonished that design is only the first step in the final objective of construction—a finished project at minimum cost.

The basic problem stems from the fact that engineering colleges produce designers and not constructors. They have made recent efforts to correct this unbalance in technical education—the need had long been recognized—but the fact remains that most civil engineering graduates think in terms of design. Admitting construction is a practical art and can be learned only in the field through actual experience, college courses in design should lay a firm foundation of straight thinking. The embryo designer should be reminded that all results dictated by mathematics must also stand the final test of practical field considerations—that columns for a reinforced concrete building can sometimes be carried up in constant section at a net saving in form work, or that steel members of one size can be repeated at the expense of a few extra pounds of steel to simplify fabrication. The student designer, according to the professor, has his hands full assimilating the technical problems, *but* he can be told and retold that someone must find a way to translate his design into actuality, or his efforts will be only the expression of theory.

Large engineering organizations have realized this problem for years and have taken the logical step of transferring young engineers from field to office, and the reverse, in an effort to balance the in-training period. Growth of the idea indicates its soundness. It must be expanded to reach all who go from college graduation to the drafting board. The problem represents a fruitful place for expanding cooperation between the Western chapters of the AGC and the sections of the ASCE.

Horse sense for a sewer

A childish face peering up through the grating of a storm sewer in a small California city provided the evidence that an adequate guard had not been installed over the outlet. In fact, it developed that the larger diameter sections of the drain were routes for frequent scooter excursions and explorations. This is but another instance of the need for more horse sense in design. Probably the storm drain system had been carefully and exactly designed. But an outlet guard was omitted either in the interest of cutting costs, or through sheer oversight. The former could be classed as an engineer practicing false economy, and the latter would represent a designer who lacked the practical touch.

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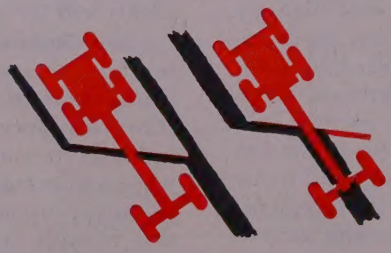

On the ordinary motor grader, the operator has two alternatives; split the windrow and move less material, or straddle the windrow and not move it the full distance. Each of these procedures slows down the job.

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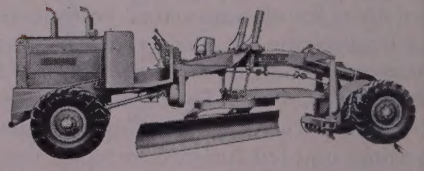

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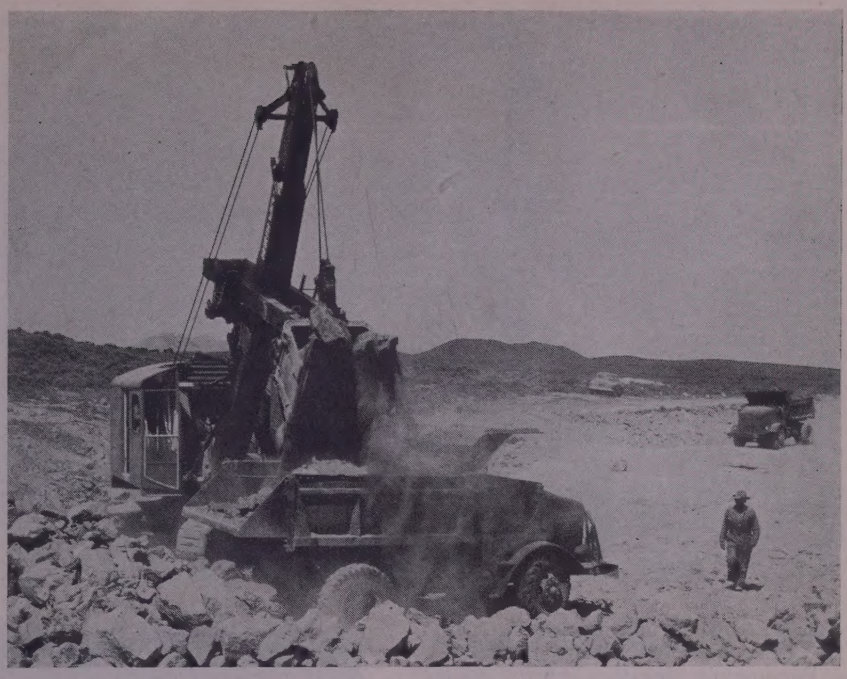
hallow shooting with unpredict-ble results in hard, abrasive rock s the tough feature of a 10½-mi. rading project for an access road o the atomic center at Arco, Idaho - Broken rock is hauled from cut ections (right) to fill locations — lere's how the men of LeGrand ohnson, Utah contractor, are do-ing the tricky job



Blasting a road through lava rock

"IF I EVER get another 15-foot bank ahead of this shovel, I'll be scared o death it'll cave in on me. All I've done or a month is chase lava rock with a 4½-yard dipper."

Merlin Hurst, shovelrunner on a Northwest Model 6, was expressing in concise words one of the odd features of a 10.5-mi. highway his company, LeGrand Johnson of Logan, Utah, has under construction for the Idaho Bureau of Highways. Some of the trickiest lava rock shooting which Hurst and many of the other key men have seen stands in the way of the new highway between Blackfoot and the Government's atomic center at Arco, Idaho.

Whiting and Haymond, of Springville, Utah, know what the problems are, for this company is just finishing another 10-mi. section of the 35-mi. highway. Shallow shooting in hard, abrasive, porous lava rock is a feature of the grading job. LeGrand Johnson's project calls for grading and the establishment of a satisfactory subgrade. Sub-base and pavement will be let later under other contracts. A $220,000 contract with the Idaho Bureau of Highways covers the construction work currently under way by Johnson's men and equipment.

Better access needed

The work is a part of the general highway improvement in this area during the past 2 years, to furnish better transportation facilities between Idaho Falls and Blackfoot and the atomic center at Arco. The old road from Blackfoot, U. S. 20, is so badly beaten that plans are under way to abandon it after contractors finish the new route. Johnson started the project April 20, and in spite of lava rock and lava dust, expects to finish by September 15.

Plans call for a 42-ft. wide subgrade, with 4:1 slopes in earth sections. To aid in snow removal, the cut slopes in rock are being flattened to 1½:1. Pavement later on will be 34 ft. wide. Alignment is generally straight, except where sweeping curves have been interposed to miss tough lava buttes sticking up out of the back Idaho desert country. The project is at an elevation of about 4,800 ft. above sea level.

Specifications call for all broken lava rock in the cut sections to be used in the fills, at specific locations. To meet this requirement, it is necessary to open up the entire 10.5 mi. before finished grade can be made, since all rock fills must be topped with earth. Compaction requirements in the powdery, fine lava soil call for 95% of optimum Modified AASHO methods. The optimum moisture content of this soil is between 16 and 18%.

Grading hinges on rock work

Less than 3 mi. of the 10.5-mi. project is all in dirt, with clear sailing for the excavation equipment. The remainder is a combination of jagged lava rock, solid rock, and combinations of earth and rock. In the latter locations the tractor equipment is working the dirt out almost to rock, after which the powder crew takes over.

Equipment selected for earthmoving includes several of the "old reliables"; three LeTourneau FP Carryalls of 18-yard capacity, pulled by D8's and an International TD-24. A new D8 is assigned as a pusher. A double set of Southwest and LeTourneau sheepsfoot rollers, with a Caterpillar D6, is on compaction. Water is such a problem that there is a 4-mi. dead haul from a 300-ft. well. Two tankers are being used. One is a Diamond T mounted 3,000-gal. unit; the other a 4,000-gal. unit on an International K-11 semi.

Scrapers for long hauls

The average dirt haul is 800 ft., but some of the hauls are up to 1,300 ft. The company has used the scrapers profitably even on this longer haul by making sure, with its pusher, that heaping loads are taken up each pass. Cuts are Figure 8'd, digging at the crossover point and dumping alternately on both sides of the point where the machines are loaded.

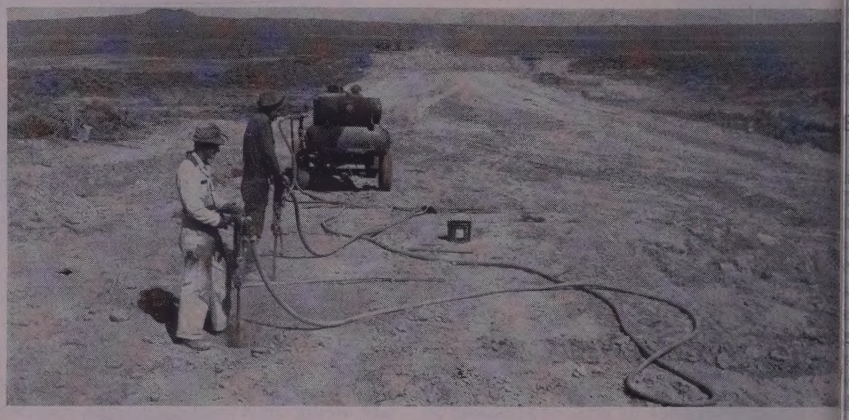
The dirt, too, is tricky. "It's dead; inert," Superintendent Bob Cruxton said. "It isn't wet, but it will stick in the bowl of a scraper. Put a motor grader to cutting slopes, and the dirt won't scour clean. It just sticks. It's tough to move. You've got to move every pound of the stuff, because it won't roll."

There is no set pattern to the earth portion of the job. Cuts and fills which can be completed in their entirety are being worked that way. But all too often the dirt work depends on finding a rock fill to cover, or a place to put dirt. There are 130,000 cu. yd. of common and 60,000 cu. yd. of borrow excavation, so by shifting the borrow locations around, better hauling distances have been arranged.

Although the highway crosses a high desert, about one mile of 18- to 36-in. concrete pipe drains are being laid in the contract. Supply and installation of these pipe sections, which of coure pre-

LEFT—Wagon drills set up a hole pattern of a uniform 5 ft. Despite abrasive seamed rock, each of three drills on the job is averaging up to 750 ft. of hole each 8-hr. shift.

BELOW—Small jackhammer spread is accounting for quite a bit of light shooting on the job. Broken rock often had to be shot secondarily after more jackhammer drilling.



cedes earthwork, is being subcontracted by Clark Concrete Co. of Idaho Falls.

Fortunately, due to a normal winter and a few spring showers, the dirt has some moisture naturally, and only about 4½% was being added when the job was visited. Good moisture testing facilities are available, and field technicians are working closely with the equipment spread to put 16½% moisture in the material just before it is rolled. When this moisture is in the material and distributed, 6 passes of the double sheepsfoot will develop the required 95% density, even though this is a tough earth specification. In fact, many densities around 97, 98, and even 100% have been noted, especially where fills were compacted additionally by the passage of loaded Carryalls.

Rock work

Of all the problems, however, rock excavation is the worst. And there are 55,000 cu. yd. in the job classified as rock. It is a black, porous, typical lava flow formation, seamed with clay streaks, pockets, and all kinds of tricky fissures. When powdermen pull a shot—and they are experienced powdermen—they never know for sure whether the rock will heap up in the center of the cut or whether the force of the powder will escape off to one side beyond the slope line.

Two drilling crews are being used: a shallow depth gang with 3 jackhammers, and a wagon-drill crew for deeper work. Many of the cuts are 1, 2, and 3 ft. deep. Some are as deep as 17 ft. Many are in the 8-ft. class.

For wagon drill work, three Worthington machines are being used with a 500-cfm. Chicago Pneumatic and a 315 Gardner-Denver for power. Timken steel, with Liddicoat throwaway bits, is being used. The hole pattern is a uniform 5 ft., bottoming after two or three bit changes with a 2-in. diameter. The formation is abrasive and full of seams, but each of the drills is making from 500 to 750 ft. of hole every 8-hr. shift. Springing is out of the question, because the

FAR LEFT—Superintendent Bob Cruxton studies how best to work out a pocket of broken rock.

LEFT—D. E. (Red) Packer (left), powderman, talks it over early in the morning with Cliff Anderson, excavation foreman.

SCRAPERS are being used profitably on hauls of from 800 to 1,300 ft., by making sure, with pushers, that heaping loads are taken up with each pass. Double set of sheepsfoot rollers can be seen in the background.

ock is too full of seams and clay. It is aded on the heavy side: 1½ to 2 lb. to e cubic yard, with Atlas Amodyn 2H r Illinois Powertol B, both 65% stick owder.

lasting techniques

An excellent system of delays has been sed with success even in this formation. wo or three center rows along the ighway centerline are loaded with in- antaneous exploders. Then Minimax o. 1, 2, 3 and 4 delays are used on either de out toward the slope lines. Powder placed to the slope line, and 3 ft. below rade in the roadway section. When a ot is pulled, with the aid of a 110-220 olt generating machine, the effect of the elay system is to throw the material to a high, broken pile in the center of e roadway, where the shovel will have better bank to work on. Even so, some f the shallow cuts leave something to be esired from a loading standpoint.

Jackhammer work is done according o the same general system, with hole enters a foot closer. A 315-cfm. chramm portable compressor furnishes e air for this operation.

Broken rock often has to be shot secndarily, after more jackhammer drilling y the three Thor 50-lb. machines, beause of bad seams which run explosive rces off to one side. When the material has been reduced small enough to be handled by the 1½-yard Esco dipper on the Model 6 Northwest shovel, it is loaded out to a fleet of four 8-yard International K-11 dump trucks, which take it to the designated points in the fill. A D8 and dozer helps to bed the broken material at the base of the fills, and there have even been cases where the roadway had to be excavated an extra foot or so to make room for the big material.

About 1,600 cu. yd. of broken rock is being handled each day by the shovel, and the scrapers are moving about 5,000 cu. yd. a shift. The drilling had to go on a 2-shift, 6-day basis to stay ahead.

Equipment upkeep

Field maintenance for equipment is provided, and there is a small field shop to take care of minor repairs. And maintenance is a problem, too. The soil is so fine, for example, that about 80% will pass a No. 200 sieve. When the wind blows, conditions get so dusty that air filters sometimes have to be cleaned at 5-hr. intervals. Oil filters and oil are changed at 120 hours; oftener if the weather gets dusty. Manufacturer's specifications for lubricants and service are being followed closely to make the equipment last.

Extensive hardfacing on the shovel dipper and teeth has become necessary. Stoody self-hardening rod, and some tube borium, is being used successfully. What Cruxton has seen the lava rock do to the shovel dipper, however, has made him watch his scraper fleet like a hawk to make sure the operators stop short of this material.

Although the job is a grading assignment without the usual production of crushed sub-base and surfacing, it is one of the toughest and most interesting in southeastern Idaho. "It's a great feeling," said Superintendent Cruxton, "to get that rock all shot and placed, the dirt in, and see our grader out there shaving final grade to the blue tops.

Personnel

Men on the job for LeGrand Johnson include Cruxton and Hurst, previously mentioned; Rock Excavation Foreman Cliff Anderson, and Grade Foreman Doc Hodges. State operations are being supervised by E. F. Budge, Resident Engineer, with C. A. Kelly as District Engineer at Pocatello, and E. V. Miller in over-all charge as State Highway Engineer.

Federal aid to highways hits an all-time high

EDERAL AID to highways amounting to $1,385,000,000 for the fiscal years f 1954-55 hit an all-time high in the bill igned in June by President Truman. ongress had passed the measure in the ace of Administration demands for a utback. Regular authorizations for state articipation total $575,000,000 annually ncluding, for the first time, $25,000,000 or the interstate highway system.

Other major authorizations include: 50,000,000 for defense access roads and $10,000,000 emergency fund. In addion, miscellaneous authorizations for orest development and other public land roads total $77,500,000 annually.

Lieut. Gen. Eugene Reybold, executive vice president of the American Road Builders' Association, said that he received the announcement with mixed feelings. "Of course I am glad to see Federal aid for highways increased instead of reduced. Furthermore, I am glad that a step has been taken to provide for the development of the important interstate system. The $25,000,000 authorized is sadly inadequate, but it gives recognition to a critical problem."

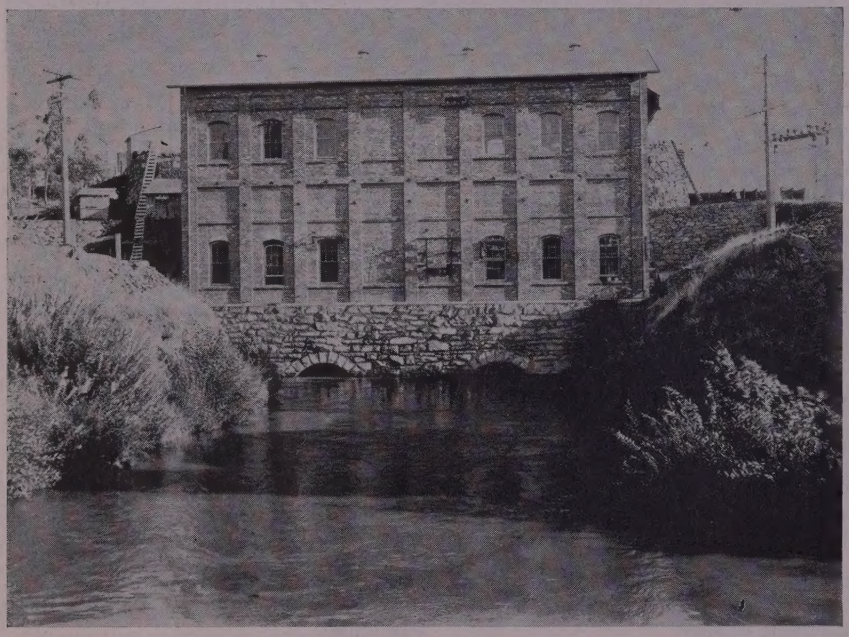
Gen. Reybold in his testimony before both the Senate and House hearings on the highway bills had pointed out that deficiencies on the interstate system alone exceed $11,000,000,000 and the total needed improvement on the entire federal aid system had been established at upwards of $32,000,000,000.

He stressed the point that the seriousness of the highway situation indicated the need for the establishment of a definite long-range plan of rehabilitation. He suggested that a 10-yr. program, approximating a total annual expenditure of $3,000,000,000, would constitute a reasonable and realistic approach to the problem. Based on the present 50-50 matching basis, this would call for a yearly outlay of $1,500,000,000 in federal funds.

Shut-down and dismantling for historic hydro plants

P. G. & E. power pacesetters of yesteryear

THE OBITUARIES of two California pioneers were recorded recently with the shutting down of one Pacific Gas & Electric Co. powerhouse in the course of new dam construction and the sale of another for dismantling. Isolated from its American River water source by destruction of its diversion dam is Folsom powerhouse, located 22 mi. northeast of Sacramento, Calif. The other plant, Electra on the Mokelumne River, is being razed subsequent to its replacement by a new plant two years ago.



ABOVE—Folsom's wheels ceased turning in July when its diversion dam came into the path of American River channel excavation for the Corps of Engineers Folsom Project.

BELOW—The new Electra plant, a sleek installation with five times the output of its historic predecessor, has been in operation for two years on the Mokelumne River.

Folsom powerhouse, built in 1895, has been in operation for 57 years, the oldest plant in the P. G. & E. system. When electricity was first transmitted at 11,000 volts from Folsom to Sacramento, the state capital was referred to as "the first American city to demonstrate the practicability of long-distance transmission of high voltage." The 3,200-kw. plant was shut down in July after Merritt-Chapman Scott Corp. and The Savin Construction Corp., prime contractor for the Corps of Engineers multi-purpose Folsom Dam and reservoir, received authorization to proceed with tailrace channel excavation in the vicinity.

Electra powerhouse, one of the earliest hydroelectric installations, figured a half century ago in a dramatic race between rival utilities to be first to carry electricity from the Sierra to the sea. Such a feat of transmission was unheard of at the time.

San Francisco's first hydroelectric power was generated at Electra, which was completed on May 6, 1902 after four years of construction. Industrial and financial leaders of the city had watched with keen interest while Prince Andre Poniatowski, a member of the Polish royal family, and his Standard Electric Co. competed with John Martin and Eugene de Sabla of the Bay Counties Power Co. for the distinction of being first to reach the Bay Area with transmission lines from their mountain plants. Prince Poniatowski, a brother-in-law of W. F. Crocker, San Francisco banker, had linked old mining ditches of the Mother Lode into a water system to drive the generators of his company's Electra plant. In fact, many of the old ditches and flumes built for use in hydraulic mining days are still in service bringing water to P. G. & E. dams and powerhouses.

Martin and de Sabla won the transmission race by bringing power 142 mi. to Oakland from their Colgate powerhouse on the South Yuba River. But Poniatowski's transmission line, coming up the peninsula, was first to enter San Francisco. Power reached the city on November 3, 1902.

P. G. & E. the final winner

Both plants were incorporated in the Pacific Gas & Electric Co. system when that company was organized in 1905. Colgate powerhouse was damaged by fire in 1946 and was razed and replaced by the present plant in 1949. Old Electra was taken out of service in 1949 after P. G. & E. completed the greatly enlarged modern Electra plant nearby.

The New Electra, with a capacity of 92,000 kw., is nearly five times larger than the old plant, rated at 20,250 kw. Old Electra was in continuous operation for 46 years. It is being razed by Western Steel Cutting, Inc., and Economy Pipe & Supply Co. of Los Angeles—and the machinery may yet generate power in some less-developed nation.

Low cost soil engineering for county and city highway programs

Here is a plan whereby local organizations can economically utilize the principles of soil mechanics — Charts furnish quick reference for estimating engineering properties of classified soil — Success of method in the State of Washington discussed

By

HERBERT W. HUMPHRES

District Soils Engineer
Washington Department of Highways
(Co-recipient of Dr. L. I. Hewes Award for 1952)

THE DEVELOPMENT and maintenance of the proper complete testing facilities and the competent highly trained staff of specialists required by modern-day soil engineering departments entails considerable cost. State highway departments throughout the nation have found, however, that this cost is justified; in fact, it is not a "cost," but rather a "savings"! There is only one reason that the application of the principles of soil mechanics to road building problems has become an important part of the highway program; that is because it has been more than able to pay its own way. By proper use of soil information, road builders are able to minimize the effect of the two most detrimental elements of engineering. These are over-designing, which causes needless waste, and under-designing, which causes excessive maintenance and premature reconstruction.

The problems of sub-organizations

State highway departments, with their high budgets and large construction programs, have had little difficulty in financing soil investigation work, but for county and city organizations, it has been a different story. With limited "dollars per mile" to spend and with minimum-sized staffs to carry on the work, it is very difficult for these organizations to expand their functions. It is rather ironical that those departments that would probably gain the greatest benefit from soil studies should be in such a position.

The need for and the importance of a soil program in county highway construction was very aptly covered by Olaf Stokstad of Michigan in his paper 1) presented at the Road Builders Conference in Seattle in 1949. The following quotation from his paper is particularly impressive: "There is no question but what the expensive job should have a soil survey, but it is the low-cost secondary project which offers the greatest challenge to the soil engineer. In this field, because of large mileages and limited funds, it is mandatory that the road builder take advantage of every local resource or favorable condition, and that designs are just adequate to perform the service required."

In the State of Washington, the seriousness of this situation was recognized, and the responsible officials in the Highway Department were highly receptive to suggestions that something be done to relieve the problem. After thoroughly studying the needs and the available facilities in this area, a tentative plan for aid to the counties and cities was evolved. The plan was initiated in February 1950, with the presentation of a paper by the writer at the annual Road Builders' Conference in Seattle. The following extract from the paper outlines the proposal made at that time.

Details of the plan

"I wish to submit a plan for consideration of both cities and counties as a practical means of getting started in a comprehensive soil program. I do not have the authority to commit the state to any course of action, but I do believe that this plan lies well within the limits of possible cooperation.

"In this plan the role of the state would be primarily that of furnishing advisory supervision and technical aid. The District Soil Engineer is available to the counties in his district for limited, but believed adequate, time for help on principal projects. The loan of special equipment or use of district laboratories for identification and classification tests is feasible. The Materials Laboratory at Olympia is available for performing the necessary soil tests. The only limitation on these services is that they do not interfere with the execution of work on state projects.

"The principal suggestion to the counties and cities under this plan is that at least one man be made available part time for soil investigation. This man should be trained to identify and classify soils properly and be capable of performing routine classification and identification tests. If a trained man cannot be hired, a man from the existing force could be trained either by arranging for a short, concentrated course at the University, or by attaching him to the state soil department for a short time. The latter suggestion has the advantage of familiarizing the county or city representative with the individual requirements of the District Soil Engineer with whom he must work.

"As a basis for this training, I wish to present the Soil Classification Chart. In training personnel for field work, I have found that it is more satisfactory to train them to use word descriptions for soil-types rather than a letter or number classification. Also, I have found that it is important for the field men to have a general knowledge of the engineering properties and uses of the various soils as they are then able to judge more accurately where borings are necessary and where to pick samples. With this in mind I have recently compiled this chart and have found it very useful. This is not a new classification system, but rather a correlation of the existing Highway Research Board Classification System used by the highway departments and the Airfield Classification System used by the U. S. Army Engineers and other government agencies. To gain the advantage of its simplicity, I have used the basic chart outline developed by A. Casagrande of Harvard University with some modification to adapt it to the specific needs of road building.

"In compiling this chart, my prime concern was to simplify understanding of the HRB Classification System by establishing a breakdown of the soils into groups having similar engineering properties and uses that could be differentiated between in the field by simple visual means and manual manipulation. For example, the wide range of gravels included in the A-1-a group has been broken down to four basic types. As shown by the chart, each of these has a distinctly different range of strength properties and engineering uses. By applying simple field procedures a properly trained field man can differentiate between these soils without resorting to laboratory tests.

Confusion minimized

"The use of word descriptions in classifying these soils eliminates the confusion that often results from a letter or number classification, and enables the engineer who has not actually seen the soil to interpret the soil information accurately without referring to some publication explaining a given letter or number classification. Very few field engineers have studied any of the established classification systems sufficiently to understand letter or number groupings thoroughly without references. Application and use of this chart should result in a better understanding of the HRB Classification System.

MORE TEXT ON PAGE 66

CHARTS ON PAGES 64-65

SOIL CLASSIFICATION FOR HIGHWAYS & ROADS

BASED ON HIGHWAY RESEARCH BOARD CLASSIFICATION SYSTEM

1 MAJOR DIVISIONS		2 SOIL GROUPS & TYPICAL NAMES	3 GROUP	4 SUB-GROUP	5 % PASS NO. 200	6 SIEVE ANALYSIS NO. 10	NO. 40	NO. 200	7 CHARACTERISTICS OF FRACTION PASSING NO. 40 LIQUID LIMIT	PLASTIC INDEX	8 GROUP INDEX	9 GENERAL IDENTIFICATION (ON DISTURBED SAMPLES) DRY STRENGTH	OTHER EXAMS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	WELL-GRADED GRAVEL & GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	A-1	A-1-a	35% OR LESS	50% MAX.	30% MAX.	15% MAX.	30 MAX.	6 MAX.	0 ⑥	NONE	GRADATION
		POORLY-GRADED GRAVEL, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES										NONE	
		W. G. GRAVEL-SAND MIXES WITH EXCELLENT CLAY BINDER, CEMENTED GRAVEL										MEDIUM	
		POORLY-GRADED GRAVEL-SAND-CLAY MIXTURES, SILTY OR CLAYEY GRAVEL										VERY SLIGHT TO HIGH	
	SANDS AND SANDY SOILS	WELL-GRADED SANDS & GRAVEL-SANDS WITH ① EXCELLENT CLAY BINDER		A-1-b			50% MAX.	25% MAX.	30 MAX.	6 MAX.	0	MEDIUM TO HIGH	GRAIN SHAPE
		POORLY-GRADED SANDS WITH ① SILT & CLAY BINDER										VERY SLIGHT TO HIGH	
		WELL-GRADED SANDS & GRAVEL-SANDS WITH LITTLE OR NO FINES	A-3				51% MIN.	10% MAX.		(NON-PLASTIC)	0	NONE	EXAMINATION OF BINDER WET AND DRY
		POORLY-GRADED SANDS & GRAVEL-SANDS WITH LITTLE OR NO FINES										NONE	
		SILTY GRAVELS & SANDS WITH LOW TO MEDIUM SHRINKAGE & EXPANSION	A-2	A-2-4				35% MAX.	40 MAX.	10 MAX.	0	VERY SLIGHT TO MEDIUM	DURABILITY OF GRAINS
		SILTY (ELASTIC) GRAVELS & SANDS WITH HIGH SHRINKAGE & EXPANSION		A-2-5				35% MAX.	41 MIN.	10 MAX.	0	VERY SLIGHT TO MEDIUM	
		CLAYEY GRAVELS AND SANDS (LOW PLASTIC CLAY)		A-2-6				35% MAX.	40 MAX.	11 MIN.	4 MAX.	MEDIUM	
		CLAYEY GRAVELS AND SANDS (HIGH PLASTIC CLAY)		A-2-7				35% MAX.	41 MIN.	11 MIN.	4 MAX.	HIGH TO VERY HIGH	
FINE GRAINED SOILS CONTAINING LITTLE OR NO COARSE GRAINED MATERIAL	FINE GRAINED SOILS HAVING LOW TO MED. COMPRESSIBILITY	LOW PLASTIC SILTS, SANDY SILTS, ROCK FLOUR LOW ELASTICITY	A-4		36% OR MORE			36% MIN.	40 MAX.	10 MAX.	8 MAX.	VERY SLIGHT TO MEDIUM	SHAKING TEST & PLASTICITY
		ELASTIC SILTS, MICACEOUS & DIATOMACEOUS EARTH HIGH ELASTICITY ②	A-5					36% MIN.	41 MIN.	10 MAX.	12 MAX.	VERY SLIGHT TO MEDIUM	SHAKING TEST & PLASTICITY
		CLAYS (INORG.) OF LOW TO MED. PLASTICITY, SANDY, SILTY & LEAN CLAYS	A-6					36% MIN.	40 MAX.	11 MIN.	16 MAX.	MEDIUM TO HIGH	EXAMINATION IN PLASTIC RANGE
	FINE GRAINED SOILS HAVING HIGH COMPRESSIBILITY	CLAYS (INORG.) OF MED. TO HIGH PLASTICITY, FAT CLAYS	A-7	A-7-6				36% MIN.	41 MIN.	⑤ 11 MIN.	20 MAX.	HIGH TO VERY HIGH	EXAMINATION IN PLASTIC RANGE
		CLAYS (ORG) OF MED. TO HIGH PLASTICITY, VERY FAT CLAYS, KAOLIN TYPE		A-7-5				36% MIN.		④		MEDIUM TO HIGH	EXAMINATION IN PLASTIC RANGE
FIBROUS ORGANIC SOILS WITH VERY HIGH COMPRESSIBILITY -		PEAT & OTHER HIGHLY ORGANIC SWAMP SOILS	PEAT & MUCK									READILY IDENTIFIED	

① A-1-b SOILS HAVING NO CLAY BINDER HAVE PHYSICAL PROPERTIES SIMILAR TO A-1-a SOILS WITH LITTLE OR NO FINES (LOWER STRENGTH VALUES)

② A-5 SOILS HAVE HIGH COMPRESSIBILITY
③ P.I. OF A-7-5 SUBGROUP ≤ (LL-30)
④ P.I. OF A-7-5 " " > (LL-30)
⑤ REFER TO HRB GROUP INDEX FORMULA

NOTE: BASIC OUTLINE ADAPTED FROM A-C CLASSIFICATION CHARTS DEVELOPED BY A. CASAGRANDE

CHARTS TO FURNISH QUICK REFERENCES FOR ESTIMATING ENGINEERING PROPERTIES OF SOILS

Here's how the system works

AFTER a man has been trained to perform a few simple field tests to enable him to distinguish between soils in the various groups listed in Col. 2, the use of the chart is very simple. The field tests are not difficult to learn, and the general types used are indicated in Col. 9. The groups listed in Col. 2 are self-explanatory, and examination of these will show that there are distinct differences between the groups that normally are not difficult to determine.

Once the soil is classified properly, it is necessary then only to trace horizontally across the chart to determine the various qualities or properties as listed in the top column heads. Column 3 through Column 8 are to be used for correlation with the HRB Classification System. Columns 10 and 11 list the field tests and laboratory tests applicable to each type. For borderline cases these tests may be necessary to clarify the proper classification. The remainder of the columns are self-explanatory. They approximate the various engineering properties and uses for each type of soil, and should be used for preliminary planning and estimating.

Practical information

The values listed in Col. 20 cover the range required for those secondary roads subject to heavy traffic, as indicated by the sub-note. Where traffic is light, these values can be reduced. It is advisable to use this column for estimating only, and to base actual surfacing design on laboratory test data.

Empirical data collected in any given area may indicate that some of the factors listed are not applicable to that area. Intelligent observation and rational modification of those values is highly recommended.

Of considerable value to counties is the section under Column 13. Stage construction is widely applied by these agencies, and many miles of good gravel surfacing have been spoiled by using plastic soils for binder material. Although these binders work well on untreated roads, they often lead to failure when a bituminous surface is placed later. Use of the chart has led to exercising more care in selecting binder materials, and many engineers have been surprised to find that a properly selected sand will work better than clay.

4	10	11	12	13			14
SUB-GROUP	OBSERVATIONS & TESTS OF IN-PLACE MATERIAL	CLASSIFICATION TESTS (ON DISTURBED SAMPLES)	VALUE AS SUBGRADE (NO FROST ACTION)	VALUE AS WEARING SURFACE FOR STAGE OR EMERGENCY CONSTRUCTION NO TREATMENT	DUST PALLIATIVE	BIT. SURF. TREAT.	POTENTIAL FROST ACTION
A-1-a	DRY UNIT WEIGHT OR VOID RATIO	MECHANICAL ANALYSIS	EXCELLENT	FAIR TO POOR; TO IMPROVE USE SAND FILLER & WATER	FAIR TO POOR; TO IMPROVE USE SAND FILLER	EXCELLENT	NONE TO VERY SLIGHT
		MECHANICAL ANALYSIS	EXCELLENT	POOR; TO IMPROVE USE SAND FILLER & WATER	POOR; TO IMPROVE USE SAND FILLER	POOR TO FAIR	NONE TO VERY SLIGHT
	DEGREE OF COMPACTION	MECHANICAL ANALYSIS, LIQUID & PLASTIC LIMITS ON BINDER	EXCELLENT	GOOD TO EXCELLENT	EXCELLENT	EXCELLENT	MEDIUM
	CEMENTATION	MECHANICAL ANALYSIS, LIQUID & PLASTIC LIMITS ON BINDER	GOOD TO EXCELLENT	POOR TO GOOD; TO IMPROVE USE SAND FILLER & WATER	POOR TO GOOD; TO IMPROVE USE SAND FILLER	FAIR TO GOOD	SLIGHT TO MEDIUM
A-1-b		MECHANICAL ANALYSIS, LIQUID & PLASTIC LIMITS ON BINDER	EXCELLENT	GOOD TO EXCELLENT	EXCELLENT	EXCELLENT	MEDIUM
	STRATIFICATION & DRAINAGE CHARACTERISTICS	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS ON BINDER IF APPLICABLE	FAIR TO GOOD	POOR TO GOOD	POOR TO GOOD	POOR TO GOOD	SLIGHT TO HIGH
A-3		MECHANICAL ANALYSIS	EXCELLENT	POOR; TO IMPROVE USE CLAY BINDER & WATER	POOR	GOOD	NONE TO VERY SLIGHT
	GROUND WATER CONDITIONS	MECHANICAL ANALYSIS	GOOD	POOR; TO IMPROVE USE CLAY BINDER & WATER	POOR	POOR TO FAIR	NONE TO VERY SLIGHT
A-2-4	TRAFFIC TESTS	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS ON BINDER IF APPLICABLE	POOR TO FAIR	POOR	POOR TO FAIR	POOR TO GOOD	MEDIUM TO VERY HIGH
A-2-5	LARGE SCALE LOAD TESTS	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS ON BINDER IF APPLICABLE	POOR	POOR	POOR	POOR	MEDIUM TO VERY HIGH
A-2-6		MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS ON BINDER IF APPLICABLE	POOR TO FAIR	POOR	POOR TO FAIR	POOR TO FAIR	MEDIUM TO HIGH
A-2-7	CALIFORNIA BEARING RATIO TESTS	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS ON BINDER IF APPLICABLE	POOR	POOR	POOR	POOR	MEDIUM TO HIGH
A-4	DRY UNIT WEIGHT, WATER CONTENT & VOID RATIO	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS IF APPLICABLE	FAIR TO POOR	POOR			MEDIUM TO VERY HIGH
A-5	CONSISTENCY, UNDISTURBED & REMOLDED	MECHANICAL ANALYSIS LIQUID & PLASTIC LIMITS IF APPLICABLE	POOR TO VERY POOR	VERY POOR			MEDIUM TO VERY HIGH
A-6	STRATIFICATION, ROOT HOLES & FISSURES DRAINAGE & GROUND WATER CONDITIONS	LIQUID & PLASTIC LIMITS	FAIR TO POOR	POOR			MEDIUM TO HIGH
A-7-6	TRAFFIC TESTS LARGE SCALE LOAD TESTS	LIQUID & PLASTIC LIMITS	POOR TO VERY POOR	VERY POOR			MEDIUM
A-7-5	CALIFORNIA BEARING RATIO TESTS COMPRESSION TESTS	LIQUID & PLASTIC LIMITS FROM NATURAL CONDITION & AFTER OVEN DRYING	VERY POOR	USELESS			MEDIUM
PEAT & MUCK	CONSISTENCY, TEXTURE & NATURAL WATER CONTENT		EXTREMELY POOR	USELESS			SLIGHT

4	15	16	17	18	19	20	21
SUB-GROUP	COMPRESSIBILITY & EXPANSION	DRAINAGE CHARACTERISTICS	FIELD COMPACTION CHARACTERISTICS & EQUIPMENT	DRY DENSITY AT OMC & VOID RATIO	CBR FOR COMPACTED & SOAKED SPECIMEN	APPROX. REQ. SURF. DEPTH (CURVE "D")●	NORMAL SUITABILITY AS FOUNDATION UNDER FILL
A-1-a	ALMOST NONE	EXCELLENT	EXCELLENT; TRACTOR, RUBBER TIRED EQUIPMENT	>125 e<0.35	>50	3" TO 8"	EXCELLENT; SUBMERGED OR DRY & FOR BACKFILL IN SWAMP AREAS. NO SETTLEMENTS
	ALMOST NONE	EXCELLENT	GOOD TO EXCELLENT; TRACTOR, RUBBER TIRED EQUIPMENT	>115 e<0.45	25-60	7" TO 9"	
	VERY SLIGHT	PRACTICALLY IMPERVIOUS	EXCELLENT; TAMPING ROLLER, RUBBER TIRED EQUIPMENT	>130 e<0.30	>40	3" TO 8"	
	ALMOST NONE TO SLIGHT	FAIR TO PRACTICALLY IMPERVIOUS	GOOD TO EXCELLENT; TRACTOR RUBBER TIRED EQ. TAMP. ROLL	>120 e<0.40	>20	6" TO 10"	
A-1-b	VERY SLIGHT	PRACTICALLY IMPERVIOUS	EXCELLENT; TAMPING ROLLER, RUBBER TIRED EQUIPMENT	>125 e<0.35	20-60	7" TO 10"	GOOD IF UNDISTURBED WHERE SUBMERGED. NOT SUITABLE FOR BACKFILL UNDER WATER. RAPID MINOR SETTLEMENTS
	ALMOST NONE TO MEDIUM	FAIR TO PRACTICALLY IMPERVIOUS	GOOD TO EXCELLENT; TRACTOR, RUBBER TIRED EQ. TAMP. ROLL	>105 e<0.60	12-30	8" TO 11"	
A-3	ALMOST NONE	EXCELLENT	EXCELLENT; TRACTOR RUBBER TIRED EQUIPMENT, VIBRATOR	>120 e<0.40	20-60	7" TO 10"	EXCELLENT; SUBMERGED OR DRY. FINENESS OF GRADING DETERMINES SUITABILITY FOR BACKFILL UNDER WATER. RAPID MINOR SETTLEMENTS
	ALMOST NONE	EXCELLENT	GOOD TO EXCELLENT; TRACTOR, RUBBER TIRED EQUIPMENT	>100 e<0.70	10-30	8" TO 13"	
A-2-4	SLIGHT TO MEDIUM	FAIR TO POOR	POOR TO GOOD; CONTROL ESSENTIAL; RUBBER TIRED TAMP. ROLL.	>100 e<0.70	8-20	9" TO 15"	GOOD IF UNDISTURBED WHERE SUBMERGED. NG FOR BACKFILL. MINOR SETTLEMENTS DURING CONST.
A-2-5	MEDIUM TO HIGH	FAIR TO POOR	VERY POOR TO FAIR, CONTROL ESSENTIAL RUBBER TIRED EQUIP.	<100 e>0.70	5-15	11" TO 19"	GOOD IF UNDISTURBED WHERE SUBMERGED. NG FOR BACKFILL. MED. SETTLEMENTS DURING CONST.
A-2-6	SLIGHT TO MEDIUM	POOR TO PRACTICALLY IMPERVIOUS	FAIR TO GOOD, RUBBER TIRED EQUIPMENT, TRACTOR, TAMP. ROLL.	>100 e<0.70	7-20	10" TO 15"	GOOD IF UNDISTURBED WHERE SUBMERGED. NG FOR BACKFILL. SLIGHT SETTLEMENTS WITHIN 1ST YEAR
A-2-7	MEDIUM TO HIGH	POOR TO PRACTICALLY IMPERVIOUS	POOR TO FAIR; RUBBER TIRED EQUIPMENT TRACTOR, TAMP. ROLL	> 90 e< 0.70	4-15	12" TO 19"	GOOD IF UNDISTURBED WHERE SUBMERGED. NG FOR BACKFILL. SLIGHT SETTLEMENTS OVER SEVERAL YRS.
A-4	SLIGHT TO MEDIUM	FAIR TO POOR	GOOD TO POOR; CLOSE CONTROL ESSENTIAL; RUBBER TIRED ROLLER	> 90 e< 0.70	4-25	14" TO 17"	POOR. LIMITED FILL HEIGHT. MED. SETTLEMENTS COMPLETE WITHIN APPROX. 1 YEAR AFTER CONST.
A-5	HIGH	FAIR TO POOR	POOR TO VERY POOR	<100 e>0.70	<7	15" TO >30"	VERY POOR. VERY LIMITED FILL HEIGHT. HIGH SETTLEMENTS, OVER 1 TO 2 YEAR PERIOD
A-6	MEDIUM	PRACTICALLY IMPERVIOUS	FAIR TO GOOD; TAMPING ROLLER	> 95 e< 0.70	4-15	12" TO 19"	GOOD. LOW TO MEDIUM SETTLEMENTS OVER PERIOD OF SEVERAL YEARS
A-7-6	HIGH	PRACTICALLY IMPERVIOUS	FAIR TO POOR; TAMPING ROLLER	> 85 e< 0.90	<6	17" TO >30"	FAIR. MEDIUM TO HIGH SETTLEMENTS OCCUR SLOWLY OVER 10 TO 20 YEAR PERIOD
A-7-5	VERY HIGH	PRACTICALLY IMPERVIOUS	POOR TO VERY POOR	<100 e>0.70	<3	24" TO >30"	POOR. FILL HEIGHT LIMITED. MED. TO VERY HIGH SETTLEMENT OCCURS SLOWLY OVER SEVERAL YRS.
PEAT & MUCK	VERY HIGH	FAIR TO POOR	COMPACTION NOT PRACTICAL			NO LIMITED CRITERIA	VERY POOR. REMOVE & WASTE WHERE PRACTICAL. VERY HIGH SETTLEMENTS. FILL HEIGHT VERY CRITICAL

● FOR HEAVY TRAFFIC OVER 2,000,000 REPETITIONS OF 8,000 LBS EQUIVALENT WHEEL LOADS COMPUTED FOR 10 YEARS TRAFFIC IN 1 DIRECTION ONLY

Introducing award-winner Humphres

HERBERT W. HUMPHRES is a co-recipient of the 1952 Dr. L. I. Hewes Award, presented by the Western Association of State Highway Officials at its annual convention in Seattle during June. Sponsored by *Western Construction* to commemorate the career of Dr. Hewes and his service to highway development in the West, the award is presented annually for "an outstanding contribution to highway development in the West."

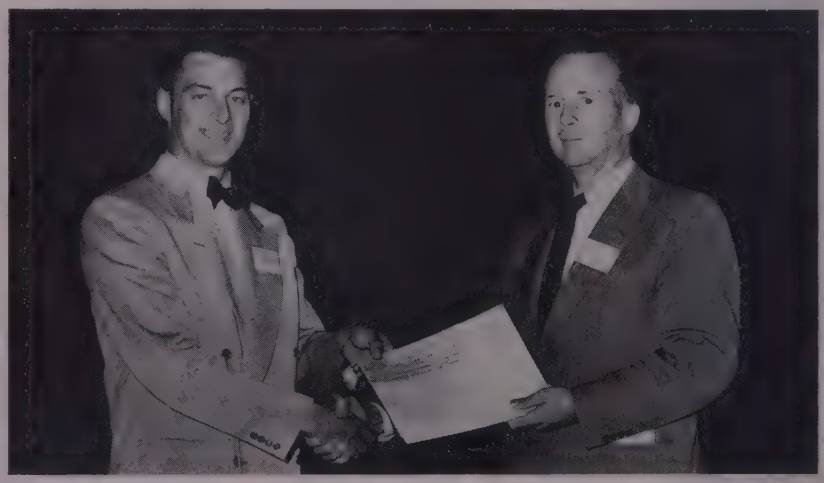
The award to Mr. Humphres was in recognition of "his outstanding work in soils mechanics and soils stabilization, with particular emphasis on meeting the needs of counties and cities."

Western Construction presents here a review of Humphres' plan whereby local municipalities may gain the advantages evolving from an adequate soil program in their own organizations. First proposed at the Northwest Conference on Road Building at the University of Washington in 1950, the plan created widespread interest among county and city engineers in Washington. Since then, several have adopted the plan to a large extent and find that it works well. Mr. Humphres now devotes a considerable amount of his time to aiding city and county organizations with their soil engineering problems. He has been very active in a state-wide educational movement designed to keep road engineers up-to-date in new developments. In addition to giving lectures and talks to various organizations, he periodically distributes "Information Bulletins" on specific soil topics, and these have been very favorably received by engineers throughout the area.

Mr. Humphres is 34 years old, a resident of Washington since 1920, married, and the father of three children. He attended the State College of Washington intermittently from 1936 until 1943, when he received a B.S. degree in General Engineering. Enlisting then in the Army, he was commissioned a second lieutenant in the Corps of Engineers. During the war years he received special training in soils at Harvard, and served with a Construction Battalion building roads, airfields and supply depots in the South Pacific, the Philippine Islands and Japan, and was promoted to the rank of captain. Discharged in 1946, he entered the Graduate School of Engineering of Harvard University and received an S.M. (Soil Mechanics) degree in 1947. Since then, he has been employed continuously as District Soils Engineer by the Washington Department of Highways.

The other co-recipient of the 1952 Dr. L. I. Hewes Award, James T. McWilliam, Assistant Highway Engineer with the California Division of Highways, received his award for the development of gyroscopic equipment for use in compiling a rapid inventory of unsurveyed roads, and particularly in the application of IBM methods to the assembling and coordinating of the survey data. In a later issue, *Western Construction* will also present a review of this development.—*Editor.*

HERBERT HUMPHRES (left) receives Dr. L. I. Hewes Award certificate from James I. Ballard, Editorial Director of *Western Construction*. Ceremony occurred at annual convention of Western Association of State Highway Officials in Seattle during June.



"As to the use of this chart I wish to emphasize that it is intended to be used as a guide and training aid, and not as a substitute for test data as a basis for design. This is a first draft and, as a result, some of the values used, particularly in Columns 18, 19 and 20, necessarily have been approximated. Further study may result in modification of some of these values. The principal advantage of the chart is that it enables a comparatively inexperienced person to summarize quickly the general engineering properties of a soil once it is properly identified.

Steps in the program

"With a man trained in classification work available in the counties and cities, the operation of the proposed soil program would consist of the following steps:

1. Initial reconnaissance made by the District Soil engineer to
   a. plan the necessary boring schedule,
   b. locate special problems and outline investigations required, and
   c. determine approximate sampling and testing required.

2. Boring and sampling schedule completed by county or city technician, and samples sent to the state testing laboratory for testing. In many instances it would be necessary to prepare a profile showing graphically the soils encountered in relation to the ground line and the proposed grade line. The soil profile is necessary to give engineers who have not had an opportunity to examine the ground thoroughly in the field a complete picture of the problems involved. The group needing such information would include the County Road Engineer, the State Aid Engineer, and the Bureau of Public Roads when Federal Aid is involved.

3. Final analysis made by the District Soil Engineer and recommendations made for design.

"This plan would serve satisfactorily as a basis for initiating a soil program in the counties and cities without a high initial cost. As the individual needs of the various areas become more clearly defined, modifications can be made.

"That some action in this direction should be taken soon is indicated by the fact that the Federal agencies now require that a soil survey be performed o all state Federal-aid Projects, and ar strongly considering placing the sam requirement on similar county and cit projects. I feel confident that, once soil program is established, results wi eliminate any existing objections to i inclusion in the secondary road an street program. A few counties and citie in this area have sought state help wit their soil problems already, or hav taken steps to organize soil departmen of their own. This paper will have serve its purpose if these and other countie and cities are encouraged to more tho oughly investigate the advantages to b gained from an adequate soil program

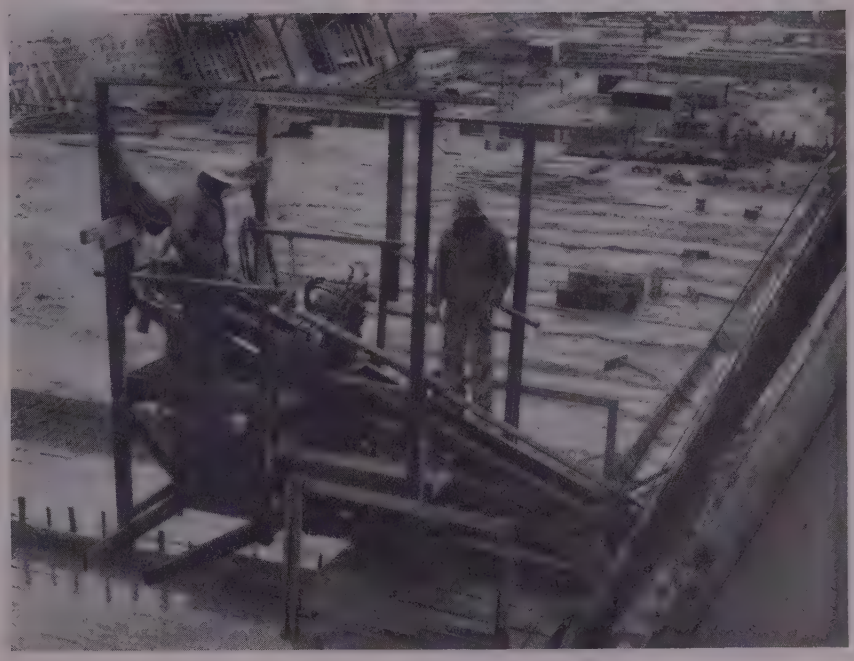
The results of experience

Immediate response to the abov paper was rather disappointing. With few exceptions, the sub-agencies adopte a "tongue-in-cheek" attitude and s back to see what would develop. The fir real encouragement came within a fe weeks, however, when the State Colleg of Washington polled all of the counti and cities to find out what road buildir

Concluded on page 132

JOB-BUILT DRILL IS AUTOMATIC

Pictured here at work on the wall of a Naval drydock, this hydraulically powered machine was designed by its owner with feed control mechanism that responds automatically to changes in drilling resistance — Harder material slows rate of feed to maintain constant feed pressure



DRILLING with equal facility in reinforced concrete, Franciscan sandstone, or clay, a job-built rig of J. N. Pitcher Co., Daly City, Calif., has recently completed a subcontract for 3,850 lin. ft. of 4- and 6-in. holes at San Francisco Naval Shipyard, Hunters Point. The lightweight machine turned up a peak daily production of 220 lin. ft. (in serpentine), involving at least four separate setups.

The work was performed for Swinerton & Walberg Co. and Ben C. Gerwick, Inc., of San Francisco, in connection with a prime contract of about $1,000,000 for patching and repairs of Drydock No. 3 at the Naval shipyard. At five points along the walls of the dock, deterioration of the original concrete called for installation of reinforced concrete patches 60 ft. high and 80 to 300 ft. wide. Under plans engineered for the Navy by B. L. Nishkian, a San Francisco consultant, each patch was to be held in place by 1½- and 2-in. reinforcing bars—a total of 70 in a typical patch—sunk 55 ft. into the existing wall and underlying material, then grouted in place and fabricated to vertical steel beams embedded in the concrete patch.

Designed for a difficult job

The holes were aligned in two rows, one 18 ft. above the drydock floor, and a second 22 ft. above that. Each row consisted of 35 holes at 20-ft. centers. The lower holes were 6 in. in diameter and the upper ones 4 in., to receive 2- and 1½-in. bars, respectively. All were drilled normal to the dock walls, at an angle of 22½ degrees below horizontal.

To meet conditions of the job—variable material, time allowed, and bid competition—Pitcher himself designed and had built a highly versatile drill rig. Providing power for its operation, a 39-hp. Buda gasoline engine drives two hydraulic pumps. One of these operates at 2,000 psi., pumping 12 gpm. and in turn operating a vane type fluid motor. The fluid motor is geared to a crosshead through which it drives the drill stem at rotary speeds up to 350 rpm. The second hydraulic pump operates at about 275 psi., pumping about 2½ gpm. Acting on a feed cylinder 4 in. in diameter, this pressure is equivalent to a total longitudinal thrust of 7 tons on the drilled hole. In operation, this thrust is controlled by drilling conditions encountered—here is the feature of the entire machine.

Built-in flexibility

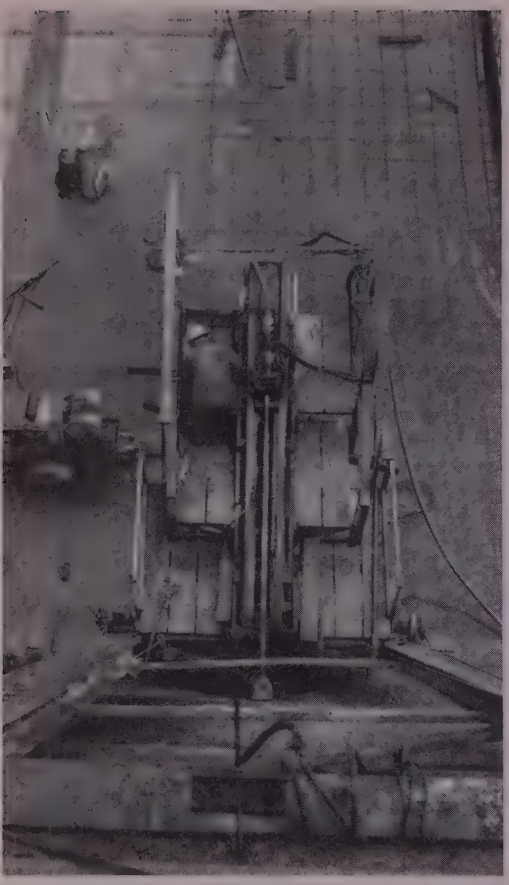
An arrangement of four hydraulic controls for rotary speed and feed gives the flexibility that sets this drilling rig apart. These are seen and noted in an accompanying photograph. One lever provides for rotation control: forward, reverse, neutral. A second lever gives accelerated motion in the feed mechanism; this control is used when it is desired to add or pull lengths of drill steel. A third lever cuts in a low pressure system for the feed mechanism; this system and its bypasses give a constant feed pressure despite the nature of material drilled. Increased resistance is immediately reflected in a lower rate of feed. Finally, a fourth lever provides for selection of an initial rate of feed.

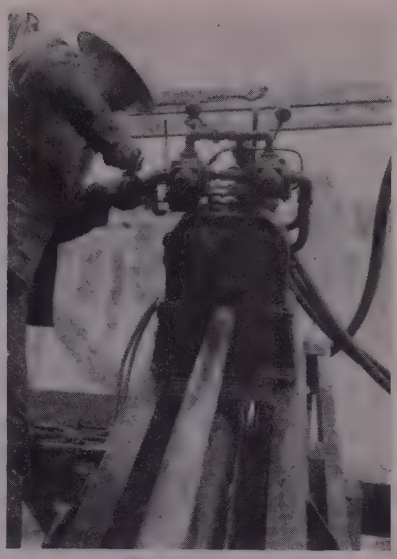
In designing the drill, Pitcher made use of several stock items—the Buda engine, the pumps and fluid motor. However, the necessary gearing, the crosshead, and the overall framework were all especially built at a local machine shop. To keep frame weight and dimensions down, and yet permit the use of 10-ft. lengths of drill rod, the feed control includes a crosshead that travels through only a 5-ft. stroke.

In operation, the drill uses standard rotary drill pipe, 2⅜ in. O.D., with acme thread flush joints. Tri-cone roller bits were used on the Navy yard job, having an average life there of 500 lin. ft. Compressed air from the Navy yard supply was fed into the hole to clear cuttings, which were produced generally as a very fine dust, with occasional chips. When the machine was in soft going, air was introduced generously, it being found that its drying effect caused an otherwise soft hole to "stand" uncased until the reinforcing steel could be inserted and grouted.

Works in any position

The drill rig, connected to its gasoline engine-powered pumps by hose only, can work in any position, though it was not universally mounted for the drydock job (see pictures). Its frame of steel channels, carrying motor, controls, crosshead and drill guides (total weight about 450 lb.) was fixed in a timber and steel framework which in turn rode a pair of I-beams resting vertically against the drydock wall. Movement up and down these "rails" between upper and lower rows of holes was by cable and





LEFT—Compact rig lies in framework and scaffolding built around it for drydock work. Gasoline engine and hydraulic pumps are seen at bottom of dock, connected to drill only by hose. Hand winches and cables were used to raise and lower drill between work locations. Framework was anchored against effects of drill thrust by bracket and stud in foreground.

ABOVE LEFT—Close-up of fluid motor shows all controls: Knobbed lever at left controls rotation; knobbed lever at right controls direction of feed; thin lever at extreme left cuts in automatic feed feature; plain lever at right (between knobs) controls initial setting of rate of feed.

ABOVE RIGHT—J. N. Pitcher (no hat), designer and owner of the drill, demonstrates a point of operation on the drydock work.

winch. For movement along the dock, the entire assembly of drill framework and rails was picked up and transferred by truck crane.

When not in operation, this entire assembly rested against the steep dock wall, in equilibrium by force of gravity alone. In operation, however, exerting longitudinal thrust through its feed mechanism, the drill tended to jack itself (and its I-beam rails) away from the wall. Eventually, under such a condition, it would topple backwards into the floor of the drydock. As a restraint against such action, the upper ends of the I-beams were secured to the dock walls. Specifically, a piece of angle iron bolted to a crosspiece connecting the I-beams was pierced and fitted over a stud embedded in the concrete dock wall. A nut run down on this stud held the framework. Though the rig could not then fall away, its thrust still acted to deflect the I-beams into a bow shape between points of restraint at top and bottom of the drydock.

Advantages

The Pitcher design is felt by its owner to improve upon various other choices of drilling equipment in several ways. First, it can tackle material usually calling for a diamond drill rig, but without the necessity for working in 5-ft. increments, stopping to remove drill cores (that are not otherwise needed). This machine works continuously except for addition of 10-ft. lengths of drill rod, and it employs a far less expensive cutting tool. Second, it is reliable for drilling a straight hole to any practical depth—Pitcher estimates up to 200 ft. This would not be so by, for example, pneumatic methods.

Feed control system

Other advantages are based in the remarkable feed control system. This rig responds automatically to changes in drilling resistance. In picking its own best rate of feed, even with constant rotary speed, it makes optimum use of drill bits and does not waste cutting life in heavy pressures against harder material. On the Hunters Point job, it sank 220 ft. of hole on the best day. On the slowest day, in Franciscan sandstone having white quartz seams, it cut 55 ft. Because of its selective feed control, the machine is suited to any kind of drilling. Initial penetration of the drydock walls at Hunters Point included as much as 10 ft. of reinforced concrete—at a point where walls of the present and a preceding drydock alignment coincided. On one occasion also, the machine took an old pipe pile filled with concrete in its drilling stride.

Throughout the Navy job, Pitcher kept a critical eye on his machine's performance. Altogether, he concluded, the drilling work at the shipyard was a successful test for the new machine. What is more, he states, it was a successful job.

One win, one loss in fight of citizens versus chuckholes

VENTURES by two U. S. citizens into the field of municipal street maintenance failed recently to provide precedent for the future benefit of those who might be similarly inclined. Faced with long-neglected chuckholes, the citizens repaired them. C. R. Hansen, an Austin, Minn., business man, made his patchwork stick in more ways than one. Peter Dukes of Chicago was not so lucky.

Hansen had watched trucks rumble through a chuckhole in front of his place of business for two years, and on one occasion the resulting vibration had shattered a $300 plate glass window. The solution cost him $2 and 14 minutes of time. In 7 min. he had cleaned out the offending chuckhole, and in another 7 min. he had poured and finished $1.70 worth of ready-mix concrete. A thirty-cent red flag perched on a barricade of old crates completed the job. And there have been no repercussions at the date of this writing.

In Chicago, however, a municipal judge called upon Peter Dukes "to put the holes back." Dukes is a junkman, and he also had tried in vain to have city forces repair holes in the street passing his junkyard. But his engineering wasn't so precise as that of the Minnesota businessman. Dukes, the city claimed, used inferior materials (unsaleable junk from his own yard) and filled the hole too full. The verdict: "Get that street back the way you found it," or a $25 fine!

Wyoming's first use of soil-cement for highways

Investigation shows soil-cement stabilized base economically feasible for project near Gillette—Long haul or use of inferior materials made unnecessary

By D. J. OLINGER
Materials Engineer
Wyoming State Highway Department

THE FIRST soil-cement highway construction project in Wyoming is under way this summer. The possibility of using soil-cement had been investigated by the Wyoming State Highway Department for several projects since 1948. Specifically, projects considered were those where there would be a long haul for proposed surfacing materials or where only available materials were of inferior quality. In 1951, it was decided that soil-cement would be economically feasible for a project near Gillette in Campbell County.

Aggregate sources

The only available satisfactory gravel deposits adjacent to the project were small, and it was necessary to keep them for future maintenance work. Some small dirt terrace deposits 1 to 3 ft. in depth under several feet of overburden were located 10 to 15 mi. south, and the haul road would have been through notorious gumbo country. Fifteen miles east of the project small terrace deposits were scattered along the Belle Fourche River, and 20 mi. south of Gillette was a sandy-gravel deposit on the Belle Fourche River, also important for maintenance. One possible way to obtain aggregate was to ship it in by rail from Sheridan, 120 mi. to the northwest, or to haul crushed limestone in from a pit at Newcastle, a distance of 7 mi., and thence by rail the remaining 70 mi.

For use in soil-cement construction, some sands were available at Gillette which extended east for 2 mi. Also, a huge dump of scoria rejects (minus #4 waste from Burlington R. R. crushed ballast operations) was available 6 mi. east of Gillette. On the average, this scoria has 95% passing the No. 4 sieve, 55% passing the No. 10 sieve, 31% passing the No. 40 sieve, and 18% passing the No. 200 sieve, a liquid limit of 32, and is non-plastic. The soil classification is A-1-b(O), and the modified C. B. R. is 105.8 with a cementing value of 77 psi. The average maximum dry weight is 95.0 lb. per cu. ft., with optimum moisture 23.0%.*

Design considerations

The scoria was selected as the material for soil-cement and various tests (moisture-density, compression, and freeze-thaw) were run by the Wyoming Highway Department, the California Division of Highways, the Colorado Highway Department, and the Portland Cement Association at Chicago.

Rough preliminary studies by the various agencies resulted in recommendations of from 1.5% to 11.0% of cement by volume. Further study narrowed this range down to from 3.0% to 9.0%. The final design selected called for a 6-in. thickness of base stabilization with 7.0% of cement by volume, or 93 lb. of scoria and 6.58 lb. of cement per cu. ft. This gave a loss of less than 14% on the 12-cycle freeze-thaw test and a 7-day compressive strength of approximately 650 psi. This will be protected with 0.2 gal. of RC-2 per square yard and 15 lb. of cover aggregate per square yard, if placed under traffic prior to placing of the 1½-in. plant mix A. C. 120-150 surface course. The surface course materials are being shipped in by rail 120 mi. from Sheridan, Wyoming.

The 6-in. soil-cement stabilized base was considered to be the equivalent in design to 8 in. of standard base. It has been estimated that had satisfactory aggregate been available with a 3-mi. average haul, the 6-in. cement-stabilized base would have been replaced with an 8-in. gravel base, for $0.40 per square yard or at a saving of $0.61 per square yard. If the gravel had been shipped in by rail, the 8-in. base estimated cost was $1.74 per square yard. In round figures normal base would have cost $6,600.00 per mile; soil-cement stabilized base is costing $16,600.00 per mile; shipped-in gravel base would have cost $28,600.00 per mile.

The contract for this project was awarded to the low bidder, Peter Kiewit Sons' Co. Contract prices for the project are given in the accompanying box. The entire project should be completed during the 1952 construction season.

[The foregoing is a condensation of Mr. Olinger's remarks before the recent highway engineering conference held at the University of Colorado.]

*Scoria, burned clay, reddish brown in color, has been used as road building aggregates in the past. It is generally considered by field engineers to be an inferior material. Laboratory investigations to date in Wyoming have failed to back up this general feeling. However, its high absorption, 13% to 19%, may have contributed to some maintenance problems.

Contract prices

	Quantity	Bid	$/sq. yd.
Scoria borrow for s/c	34,500 tons	$0.45M	0.095
Haul on above (includes 3¢/T royalty)	90,954 ton mi.	0.10	0.056
Cement, 7% C by vol.	51,500 sks.	1.40	0.442
Processing	163,100 sy.	0.39	0.39
Watering	1,400 M gal.	3.00	0.026
RC-2 bituminous cover 0.2 gal./sq. yd.	131 tons	35.00	0.028
Scoria cover aggregate 15 lb./sq. yd.	1,223 tons	2.50	0.019
Haul of cover aggregate	4,895 ton mi.	0.10	0.003
Plant mix surfacing course (gravel)	12,100 tons	8.10	0.60
AC 120-150	720 tons	26.00	0.115

P. G. & E. applies to build two Pit River hydro plants

IN APPLICATIONS still pending (since April) before the Federal Power Commission, the Pacific Gas & Electric Co. plans to extend its Pit River hydroelectric development in Shasta County, Calif., by construction of two new powerhouses, Pit 4 and Pit 6, at an estimated total cost of $45,000,000.

Pit 4 powerhouse will have an installed capacity of 84,000 kw., and will cost $25,000,000. The dam and reservoir for this project were built in 1927, and the company's present application to FPC is for an amendment to its existing license to construct. Design modifications from the original plan are contemplated in view of engineering advances over the 25-yr. period. Located about 4 mi. downstream from the dam, Pit 4 will require construction of a 21,427-ft. pressure tunnel. Bids have been called for this portion of the work, the contract award to depend on FPC approval of the P. G. & E. application. The tunnel will be variously of circular and horseshoe section, 19 ft. in diameter. Together with the powerhouse construction, work on Pit 4 is expected to continue for about 2½ yr.

Pit 6 powerhouse will have a capacity of 60,000 kw., and will cost about $20,000,000. Seven miles downstream from the existing Pit 5 powerhouse, Pit 6 will be built immediately below a concrete gravity dam that is also included in the 3-yr. construction program. The dam will be about 230 ft. high and have a crest length of 700 ft. Two penstocks, each 15 ft. in diameter, will extend 160 ft. through the dam to supply water to the powerhouse turbines.

Transmission line connections will be necessary to link both Pit 4 and Pit 6 to the P. G. & E. system. Pit 4 will require a seven-mile 220,000-volt line, and Pit 6 a three-mile 220,000-volt line.

JUMBOS ON THE WELLTON-MOHAWK

OFFICIAL CEREMONIES on May 1, 1952, marked delivery of the first Colorado River water to serve lands of the new Wellton-Mohawk Division of the Gila Project in Arizona. This canal system, with its pumping plants, has been under active construction since September 1949, and water has already been made available to some 10,000 acres in the Wellton and Roll areas.

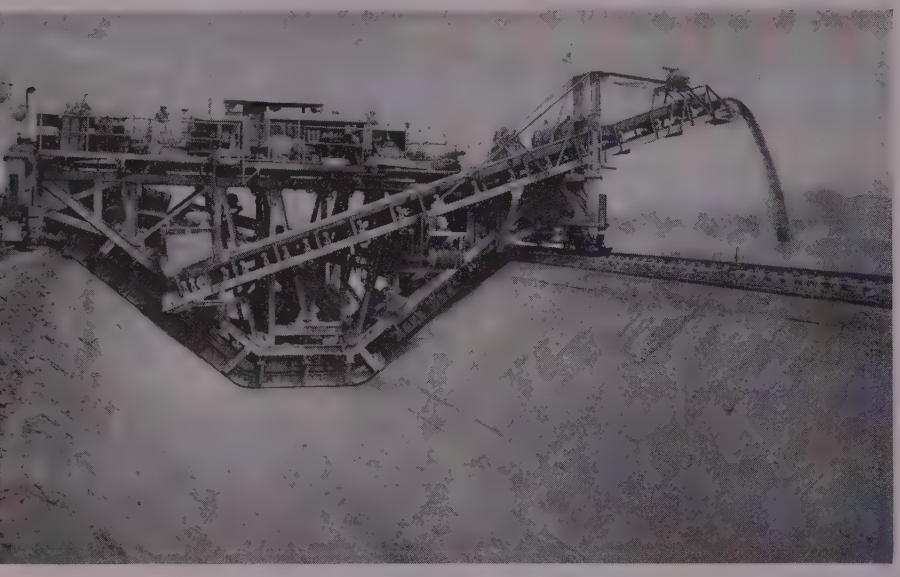
This division of the Gila Project—which diverts at Imperial Dam on the Colorado River above Yuma—was designed to bring a dependable supply of suitable water to an acreage that had gradually reverted to desert during low runoff years in the valley. Rapidly diminishing groundwater, unreplenished for lack of runoff, had become increasingly saline from well pumping for irrigation. Leaching of accumulating salts in the soil was impossible until delivery of fresh water became a reality.

The new water supply diverts from the Gila gravity main canal at Mi. 18½ through a gravity turnout just below the Gila River siphon crossing. With a capacity of 1,300 cfs., this canal extends 8½ mi. by a clay-lined section to the first pumping plant, where a lift of 31 ft. permits gravity flow for another 5 mi. along the concrete-lined main to the second pumping plant. An 84-ft. lift here and another concrete-lined 5-mi. reach lead to the third pumping plant, for a lift of 55 ft.

Some 2,900 acres are served directly from the Wellton-Mohawk main canal en route from its supply turnout to the terminus at the third pumping plant. The 220-cfs. Dome Canal and distribution system, branching off from the main at Mi. 10½, will ultimately serve 10,500 acres. The Wellton Canal, turning out from the Wellton-Mohawk at Mi. 18, has an initial capacity of 300 cfs. to serve 15,500 acres in the Wellton area. The 900-cfs. Mohawk Canal, supplied by the third pumping lift, is a 47-mi. main serving some 40,000 acres of distribution systems in the Tacna, Ralph's Mill, Roll and Texas Hill areas. A relift pump station, supplied by gravity from the Mohawk Canal turnout, will serve 6,100 acres in the Texas Hill unit located at the eastern end of the district. The main system totals more than 100 mi. of concrete-lined canals, while 300 mi. of concrete-lined laterals will carry water to individual farm turnouts throughout the 75,000-acre project.

Work is currently under way on the final Mohawk Canal contract, an 8½-mi. reach being built by Marshall, Haas & Royce of Belmont, Calif. Also, Macco Corporation of Paramount, Calif., is proceeding with a $1,099,000 contract for construction of 30 mi. of concrete-lined laterals and irrigation structures under Unit No. 1 of the Mohawk distribution system, which serves lands now under cultivation in the Roll area. Work is expected to be started early in the fall for the second and final reach of the Wellton Canal and the first unit of the distribution system served by that canal.

Reclamation engineers directing the development and construction of the Wellton-Mohawk Division of the Gila Project are: District Manager M. J. Miller, District Engineer Clyde E. Shields, Field Engineer Edward J. Heiser, Design Engineer R. D. Austin, and division engineers Burl Heileman, A. J. Rolle, and Lee D. Purdin.

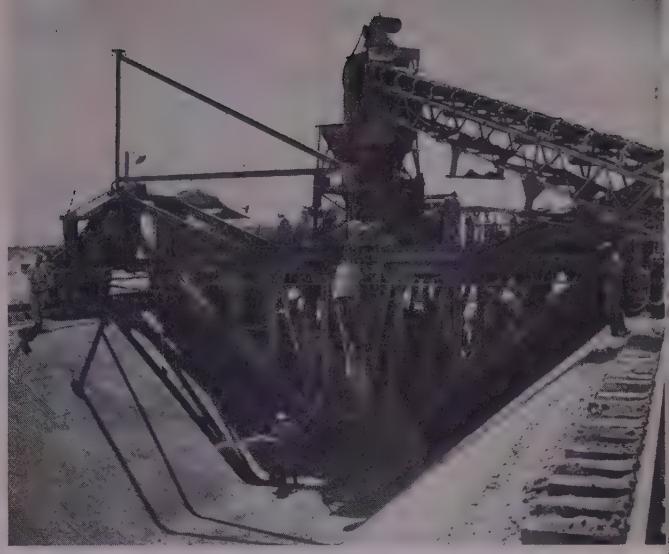


TRIMMING The large and the small of it are shown in these two views of canal trimmers used, respectively, by Western Contracting Corp. (above) and Marshall, Haas & Royce on portions of the Mohawk Canal. The work by Western Contracting, a 30-mi. reach (see tabulation of contracts), moved at a rate of 2½ mi. per week, with this trimmer leading the way. The small machine, in use this year on a MH&R contract, set a comparable pace, working on a three-shift basis. Two or three passes were necessary to give desired section, the night shift doing only rough work, and the day shifts catching up and moving ahead. Morrison-Knudsen Co., Inc., also used the small trimmer on its Wellton Canal work.

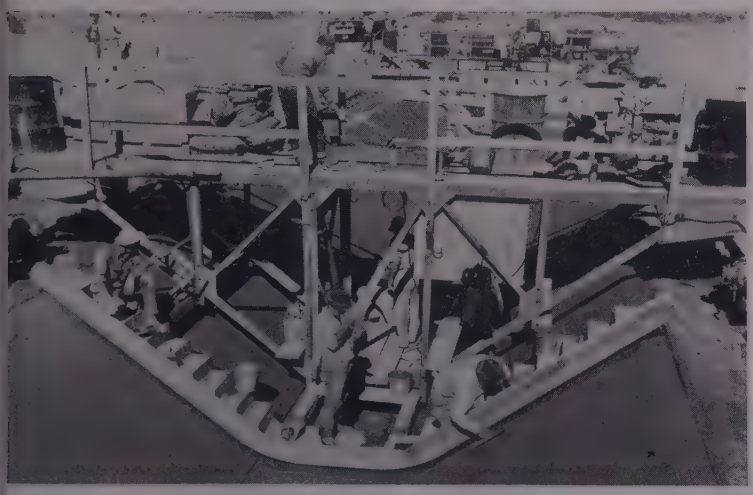
Construction contracts on the Wellton-Mohawk Division Gila Project, Arizona

At the half-way point of construction, the following work has been done. Completion is scheduled for 1958.

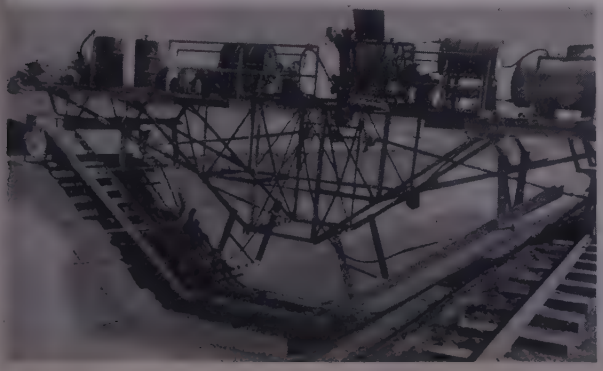
Contractor	Work	Cost
Fisher Contracting Corp., Phoenix	8½ mi., Wellton-Mohawk Canal	$1,527,000
Morrison-Knudsen Co., Inc., Boise	10 mi., Wellton-Mohawk Canal	1,766,000
Morrison-Knudsen Co., Inc., Boise	11 mi., Wellton Canal	1,141,000
United Concrete Pipe Corp., Baldwin Park, Calif.	3 pumping plants, Wellton-Mohawk Canal	1,618,800
Western Contracting Corp., Sioux City	30 mi., Mohawk Canal	2,493,500
Marshall, Haas & Royce, Belmont, Calif.	9½ mi., Mohawk Canal	1,616,600
Marshall, Haas & Royce, Belmont, Calif.	8½ mi., Mohawk Canal	766,000



.INING Concrete supply methods differed more than did the jumbos n the different contracts. Shown above is Morrison-Knudsen's boom-quipped paver loading a buggy for slipform distribution on the Wellton anal. Earlier work by Western Contracting on a bigger section (right) tilized a conveyor dumping into a central hopper, while MH&R this year below, left and right) swung the concrete bucket by crane from mixer o jumbo. The small slipform (above and below) was built by Guntert & Zimmerman of Stockton, Calif; the large one (right) by Pacific Coast Engineering Co. of Alameda, Calif. Lining record on the MH&R work was 3,028 ft. in one day, using about 900 cu. yd. of concrete.

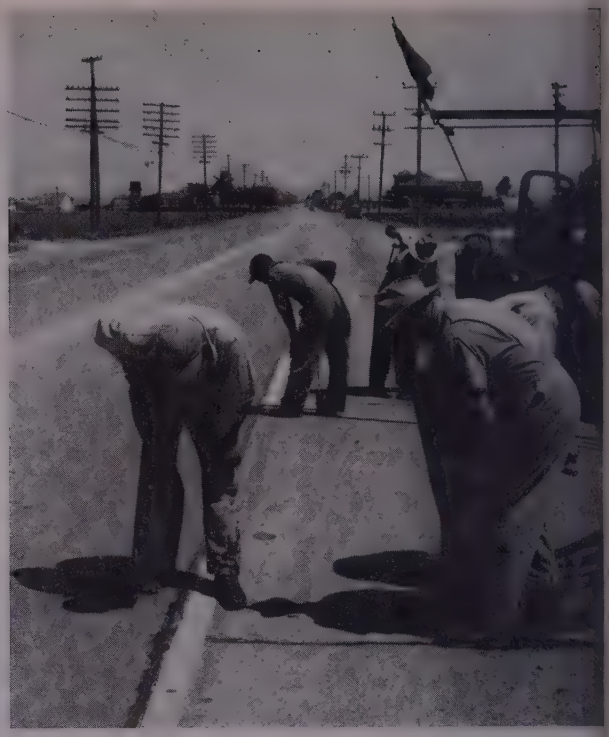


FINISHING Directly behind the slipform, or combined with it by Western Contracting for Mohawk Canal work (below), came a finishing platform. Crews here troweled the fresh concrete and marked joints. Lining is 3 in. thick on the smaller canal sections, had a 2½-in. slump. Morrison-Knudsen work on the Wellton Canal is at left. Mastic compound filled transverse joints at 12-ft. intervals. Curing compound was also applied from a jumbo. The one shown (lower left) was furnished by Techkote Co., suppliers of all air entraining agent, curing compounds and mastic to MH&R work on the Mohawk Canal this year.



A close look at California's maintenance technique for—

Pavement subseal



Injecting asphalt into subgrade voids beneath concrete pavement, these men are watching for upheaval of joint filler, proof that subsealing is thorough

SPECIAL APPARATUS and techniques developed by California's Division of Highways are being used by that state's maintenance forces to inject asphalt into the subgrades of concrete pavements where pumping action in the presence of moisture has washed out fines and weakened the pavement support. Twelve years of experience in this work have led to today's refined operations that see stabilization of subgrade beneath as much as 8,000 lin. ft. of traffic lane in one shift.

The symptoms—the treatment

Need for this form of maintenance becomes apparent through two symptoms, (1) staining of the shoulder adjacent to the affected pavement and/or (2), transverse cracking of the concrete, characteristically occurring first at the "near" third point of the slab as it is traversed by traffic. The stain is caused by washing out of fines from the subgrade; the cracking is caused by pavement pumping that may thereafter occur. The third-point location so often noticed in the pattern of cracking results from traffic action. A tendency for pavement to pump exists in areas of impact beyond inter-slab joints, where discontinuities in the surface exist, if not significant differentials in elevation. Given the displacement of fines which permits actual pumping, a fulcrum develops, and it tends to do so at the third point. The measure adopted in California to combat this form of deterioration is the injection of asphalt into the subgrade as a volumetric replacement of the eroded fines.

The first operation in the subsealing sequence is the drilling of holes. The work illustrated here, conducted south of Salinas, in District V of the state highway system, involved 1.5 mi. of 4-lane roadway composed of both bituminous and concrete surfacing. Subsealing had become necessary in the two outer lanes, made up of concrete slabs 11 ft. wide and 20 ft. long. Injection holes were drilled along the longitudinal centerline of the affected lanes, each hole located about 18 in. forward—in the direction of traffic—of the joint. Used in this phase of the work is a 2-ton truck mounting a compressor and hydraulic booming equipment fitted with a beefed-up jackhammer. Universal jointing of the boom assures that holes may be accurately located without the need for careful spotting of the truck. Each hole is 2 in. in diameter and 7 in. deep, drilled in from 30 to 55 sec.

Though drilling may precede subsequent work by an indefinite period, remaining operations must come in close succession. First of these is surface treatment of the pavement around each hole. Here, water is applied to act as a bond-breaking medium between the pavement surface and the inevitable slop-over of asphalt from the subsealing operation. One-man spray rigs are often used for this task, but at Salinas a bucket and swab sufficed. It is significant to note that various light oils have been tried for bond-breaking, but that none has been found satisfactory.

Asphalt injection

A heated tank truck carries the asphalt, a 10- to 25-penetration cement maintained at between 350 and 450 deg. F. Duplicate systems of hose and injection apparatus lead from this truck, their weight largely supported by booms. The injection pipe is simple (see picture), consisting of a T-shaped pipe frame for easy handling, a circular disk as a splash shield above the nozzle, dual hose connections and control valve. The nozzle itself is the interesting part of the assembly, as it incorporates a self-expanding feature to plug the hole in the pavement during injection. By this means pressure is maintained to force the asphalt into all voids in the treated area, and leakage at this time is prevented.

Essentially, this expanding feature is a rubber section above the nozzle tip. Pressure of the asphalt (about 70 psi.) swells this section to fill the drilled hole in the concrete and is relieved only when injection ceases. Due to the conical nozzle shape and the back pressure on it, however, this expansion is not enough to hold the equipment in place under all circumstances. For this reason, it is standard practice for the two operators employed on each nozzle to stand on the splash shield.

Control

Control of the operation is based entirely on visual inspection of nearby pavement joints. This is performed by one of the operators or by the crew foreman—or both (see picture)! Evidence of satisfactory spread of the asphalt below the surface comes first in disturbance and then in upheaval of dirt and other residue lodged in the joint. Actually, the joint filler itself is moving, but this is not so readily apparent. At any rate, detection of disturbance is the signal to stop pumping. Further perceptible motion is likely to be accompanied by significant jacking of the pavement slab itself.

In the operation illustrated here, close watch was kept on the longitudinal seam between the concrete slabs and the bituminous center lanes. The "critical" seam

TWO HOLES receive asphalt from dual circulating hose system on 1,650-gal. heated tank truck. Solid spud rammed into hole in foreground holds asphalt under pressure until it cools.

QUICK WORK is necessary to place spud with back surge of asphalt when injection nozzle is removed. Working ahead of crew, laborer swabs pavement around holes with water to break bond of spilled asphalt.

varies from job to job. At this location, the bituminous shoulders were tight—no telltale staining had taken place. Also, traffic tended to travel the inner side of the lane more heavily, and displacement of fines had occurred somewhat to the left of the center in the lane. In injecting the asphalt, therefore, it was expected that first evidence of asphalt spread would be seen at the seam nearest the voided area, rather than near the shoulder.

Easy does it

Removal of the nozzle is unhurried, as the still-liquid asphalt is held in place only by that means. In fact, where moisture beneath the pavement is excessive, steam is generated that significantly raises the back pressure and calls for added delay and great care. When the nozzle finally is raised, for economy of operation will not permit it to remain until the asphalt solidifies, it is replaced by another spud (see picture). Insertion of this spud must be rapid and accurate but, even so, a little asphalt always erupts and spreads in a small pool around the hole. These spuds remain in position for perhaps 5 min. Their removal after that time is without eruption of any sort.

Follow-up members of the crew scrape off the residual puddle of asphalt around each hole, and are in turn followed by personnel who grout the hole, completing the operation.

The equipment used has been developed by the headquarters shops of the Division of Highways in Sacramento. The actual injection apparatus is shop-built, and the rubber expanding ring is an innovation contrived by District X personnel in 1943. It replaces a rigid tip that had to be inserted in a separate conical spud previously driven into the pavement hole. This latter spud included a check valve to prevent back surge of the liquid asphalt. Its use added an operation and slowed things considerably, in addition to which it had a tendancy to get gummed up with cooling asphalt, requiring periodic cleaning and more delays. All in all, today's gear is a far cry from the hand pumps that pioneered the injection technique in 1940, when Districts VIII and XI first put it to work.

Also contributing to freedom from work stoppage in the modern equipment is the circulating system of hoses provided for conveyance of the asphalt from tank to nozzle tip. Avoiding the frequent necessity for hose cleanout (now necessary only at the end of a shift), the system pumps the asphalt continually through the hoses. Opening the nozzle control merely taps off asphalt from the loop flow. Those hoses are double-walled; specified as 800-psi., and operating at only 70 psi., they last a long time. Connections constitute the weak point of the system, and they must be rigidly inspected.

INJECTION apparatus features rubber nozzle section that expands under pressure to fill hole in pavement. Note dual hose connections.

Special tank

Temperature of the asphalt, 350-450 deg. F., also contributes to its easy flow and is maintained by a thermostatically controlled system of three fans which blow burner gases continually through fire tubes within the tank. Tank capacity is 1,650 gal., enough for about 1½ hr. of operation. Supply is had from a booster truck operating out of a central asphalt plant having tank facilities. At about 20 gal. of asphalt per hole, a good day's work of 400 holes consumes 8,000 gal. of asphalt.

Asphalts used in the various highway districts differ in their specified melting points. The range is from 160 to 200 deg. F., the higher values being specified for work in warmer climates.

The work is not done continually, throughout the year, but only during the summer months. For the most part, it precedes resurfacing of these older concrete pavements, generally with a dense-graded plant mix. However, since the pressures involved in subsealing are sufficient actually to raise the pavement, the

Concluded on page 114

CONCRETE MAT for power plant foundation

Ground conditions and 114,000-ton load dictate pouring of concrete mat 5 ft. thick for biggest P. G. & E. steam plant — Bechtel Corporation is engineering and building 600,000-kw. installation

WITH CLEAR WEATHER and improved ground conditions finally at hand in mid-April, Pittsburg, Calif. operations of Bechtel Corporation at the new P. G. & E. steam plant site went into high gear. The rush job, with some of its features still in the design stage, got under way last November as ground was broken for the first of 279,000-cu. yd. total project excavation. First power production is expected late in 1953, using four boiler-and-turbine units totaling 600,000 kw. of installed capacity, but plant layout on the 230-acre site is proceeding in anticipation of additional facilities that will more than double this figure.

The Pittsburg plant is the third such steam-powered installation built by Pacific Gas & Electric Co. in recent years. It has been preceded by plants at Moss Landing, Calif. (340,000 kw.), and at Antioch (340,000 kw.), the latter just a few miles east of Pittsburg on the south shore of Suisun Bay, which receives flows of Sacramento and San Joaquin rivers. Situated close to P. G. & E.'s load center, these plants are being built concurrently with demands for additional electric power born of California's postwar industrial growth. The plants at Moss Landing and Antioch (known as the Contra Costa plant) were planned for expansion, and they are having their facilities augmented at present, to individual capacities of 575,000 kw. The Pittsburg plant, though it may also be expanded, is in its original design the biggest such installation ever to be built in the West.

Major work to date has included extensive site grading for buildings, railroad spurs, and equipment and fuel storage areas, with actual permanent construction commenced only in the powerhouse structure area. This feature is notable for its foundation design, which is for a "100% spread footing"—that is, the entire building is underlain by a reinforced concrete mat 5 ft. thick. Pouring of the mat was completed in June.

Foundation conditions at Pittsburg are not ideal for support of large, interconnected systems of precision equipment such as are involved in steam plant construction. Yet, a design was needed that would adequately distribute the plant's great total weight to minimize settlement, both total and differential. In addition, there was the factor of vibration characteristic of the machinery installation. To investigate soil conditions at the Pittsburg site, P. G. & E. retained the firm of Dames & Moore, who in turn formulated an extensive boring program that was largely carried out by J. N. Pitcher Co. of Daly City. Borings were made both onshore (95) and in the river channel adjacent to the site (30).

Mat design

The findings of Dames & Moore, on which Bechtel engineers based their foundation designs for the various plant structures, noted an extensive surface or near-surface layer of peat. Depths of the peat at various points on the project site ranged to El. —65, though the powerhouse location shows peat only to El. —6. There are lenses at greater depth, however. (Ground surface elevation here is about 2 ft.) Principal other materials in the site are sand, clay, and silty loam. Tests were performed on these materials, showing a safe bearing capacity of 2,500 lb. per sq. ft.

Choices for foundation types considered by Bechtel, in light of the above findings, included piles, spread footings, and a deep or shallow mat. It was decided to use piles for the switchyard structures only, where the peat layer extends to a depth of 65 ft. Other buildings have been designed for spread footings, while the powerhouse design embodies the unusual "mat" foundation. Reasons for its use include, first, the fact that the plant's tremendous total weight (114,000 tons) must be distributed through a maximum of 2,500 lb. per sq. ft. design bearing. Also, a minimum of excavation was desired, insofar as site conditions would permit. The final design puts all operating units of the plant at their proper elevations, yet does so with foundation excavation necessary only to the top surface of good bearing material. The mat design gives the required structural qualities in a 5-ft. thickness, so no extra digging had to be done to "squeeze" the mat in under the plant.

The design is built around an anticipated total settlement of 2½ in., of which 80% will occur during the first 18 mo. of construction. The accompanying diagram shows schematically the time-settlement relationship. It is interesting to note the ups and downs caused by unwatering, excavating, and structural loading. The effect of removing unwatering equipment has also been considered in the design, since re-establishment of the natural water table around the structure will result in an uplift of about 700 lb. per sq. ft. In addition, the weight of overburden removed in foundation excavation may be considered as reducing the actual loading by as much as 900 lb. per sq. ft. Thus, the net effective loading of the completed powerhouse is expected to be about 900 lb. per sq. ft.

Unwatering

As suggested, groundwater at this plant site has been a problem. The Pittsburg work, only 500 ft. from the south shore of Suisun Bay, has required installation of a complete unwatering system precedent to excavation for the powerhouse. An attempt was made to lower the groundwater by means of one well sunk to El. —45 ft. This was a 24-in. gravel-packed shaft containing a 10-in. casing in which was installed a deep well turbine capable of pumping 500 gpm. The method was a failure, however, as the pump drew down and broke suction almost immediately, due to the poor permeability of the soil.

A wellpoint system was finally in-

stalled, with wellpoints on 10-ft. centers completely around the powerhouse site. The alignment for the system was first established by a dragline trench, in which a truck-mounted auger sank holes through the clay cap to El. —14. The wellpoints were then put down to El. —23, the 10-in. holes sand-packed, and the system hooked up to a pair of 500-gpm. electrically driven pumps. Average discharge has been 350 gpm. The wellpoints will remain in their present use until the powerhouse walls have been carried to El. 9, when they will be removed and re-installed at the waterfront site of the pump structure.

Excavation

Excavation for the powerhouse has totaled 64,000 cu. yd., all but the top 4,000 cu. yd. (sand) done by dragline. The excavation was carried through peat (at about El. —6) and then through clay and loam to El. —11. In places, lenses of peat or poor clay required that pockets be dug out as far down as El. —14. In either case, crushed rock of ¾-in. maximum size was deposited in the finished excavation to an average of El. —10 (giving a minimum thickness of 1 ft.) as subgrade for the concrete mat. A total of 13,000 tons was required for this work, being distributed in 6-in. lifts and compacted to 500 psi. by a crawler tractor with bulldozer.

Spoil from the powerhouse excavation has been used elsewhere on the project in conjunction with an extensive program of site grading. Until the weather cleared in mid-April, this excavation alone could proceed, the dirt being loaded out into Athey trailers and

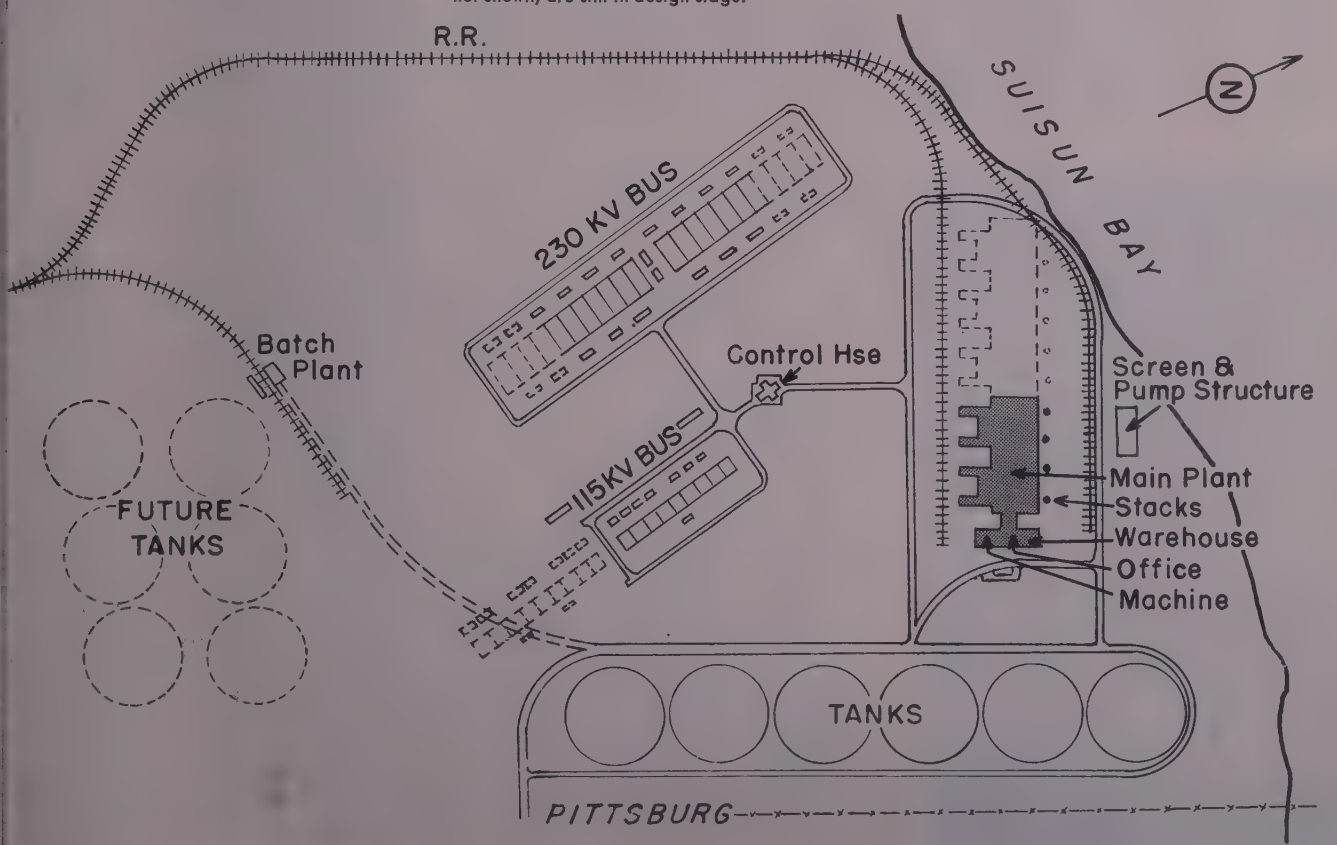
FED BY a 2½-yd. dragline, only these Athey trailers could navigate in waterfront mud until spring came to the project in mid-April.

hauled through the ever-present mud by crawler tractors. Other work that subsequently got under way has been done by nine tractor-scraper combinations, five bulldozers and a motor grader. The total project excavation, including that in the powerhouse area, comes to 279,000 cu. yd., of which 30,000 cu. yd. is as yet indefinitely programmed. Grading in the tank storage area alone (see map) totals 185,000 cu. yd. All this material is being transported from its original position on the east end of the site to the eventual bus yard and coal storage areas on the west, where it is utilized in embankment.

Concrete for the work is being supplied by Henry J. Kaiser Co. on subcontract and is being batched on the job. The plant is located on the south side of the project site and is served by a rail spur. (Sacramento Northern and A. T. & S. F. facilities—being built by Santa Fe—enter the property and will serve both an area reserved for possible future coal storage and the powerhouse itself, passing under an overhead crane rail at the latter structure and extending along the building on both north and south sides.)

Concrete

Powerhouse mat concrete is a 4½-sack mix, having aggregate of 1½-in. maximum size. It is designed to develop 2,500 psi. at 28 days, and is specified for a 3-4-in. slump. However, the mix gains in workability through admixture of 3-4% of air entraining agent (Protex). Trucked from plant to powerhouse pour site by transit mixers, the concrete was discharged into two chutes leading directly to the section of mat being poured, and also into the skips of two Towermobiles (see picture). These latter have articulated and counterweighted chutes enabling the concrete to be poured at greater distances from the top of the surrounding embankment. Careful control of their slopes prevented segregation and supplied concrete of unimpaired quality to the mat. On the pour, a crew of from 10 to 16 men was employed in spreading and vibrating the concrete, at a rate of 85 to 90 cu. yd. per hr. Four



FUTURE EXPANSION possibilities were foremost in minds of PG&E and Bechtel engineers in laying out Pittsburg site. Details of cooling water intake, not shown, are still in design stage.

SPREADING AND COMPACTING crushed rock base course, small Cat stayed ahead of concrete operations at east end of plant. Depression in subgrade (rodman) is for sump installation. Excavated avenues at left are for stack foundations.

vibrators were used in the work.

The dimensions of the mat are 174 ft. by 368½ ft., but it was divided into blocks for separate pours. The largest of these contained about 750 cu. yd., the smallest about 380 cu. yd. Included in the operation were foundation mats projecting out on the north side below the sites of four boiler stacks. Also, on the south, the rectangular mat shape was broken by projecting turbine blocks.

Construction joints between mat pours included a shear key 4 in. deep and 18 in. high formed in the edge of each section. Other variations in their section included only the provision of a 2½-in. height differential across the blocks to assure drainage into a collection system and sump buried in the mat. Vertical faces of the pours were water cured, while horizontal surfaces were treated with curing compound. Construction joints between completed sections were further treated with an iron oxide-base compound that expands to seal the joint.

Concreting operations began on February 21 in the powerhouse site, and the mat was completed in the latter part of June. Elevation of the completed mat surface is —5 ft., and total concrete amounts to about 15,000 cu. yd. Next structural concrete will be interior columns and exterior walls up to El. 6.5, and the concrete main deck, bringing the total work up to El. 9. To that point, 25,000 cu. yd. of concrete will be used, with 42,000 estimated for the whole project. The latter total includes floors at El. 22 and El. 35 (supported, however, by structural steel), an office building, machine shop, control house, fuel tank firewalls, and the cooling water intake screen and pump structures.

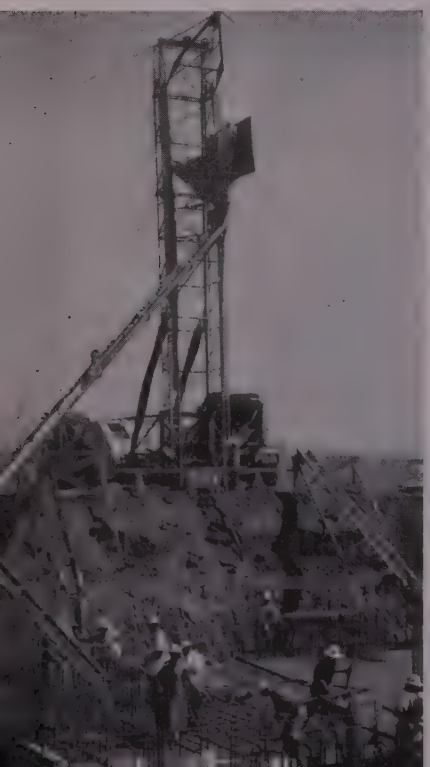
Powerhouse mat construction prior to concreting included placement of a drainage system, utilities, and some 1,800 tons of reinforcing steel. Largest utility item is a corrugated metal pipe that will be the intake for the station service pump (see picture). Reinforcing is almost all of No. 11 deformed bars. These are spaced variously 6 and 12 in. apart, and are laid transversely and longitudinally in the mat near both its top and bottom surfaces. Top and bottom steel has 3¾ in. of concrete cover. At the construction joints, dowel steel extends 4 ft. horizontally into each adjacent slab. Three "layers" of dowels were installed, two being continuations of top and bottom reinforcing assemblies, and a third projecting from the middle of the mat at the shear key locations.

Additional steel is provided at column locations and is bent up to join column reinforcing cages when they are fabricated. It is interesting to note that all reinforcing steel, except that in the turbine foundations, is being detailed and fabricated on the job site. Project total approximates 5,000 tons. For the concrete columns, which extend up to El. 9, vertical reinforcing includes No. 11 bars, with stirrups of No. 6 bars. These columns will be topped by base plates of 1- to 8-in. thickness, which will in turn receive the structural steel columns that will support the plant superstructure. The base plates will be secured in the concrete columns by means of anchor bolts, variously 1¼ and 4¾ in. in diameter and up to 8 ft. long.

Work peak next year

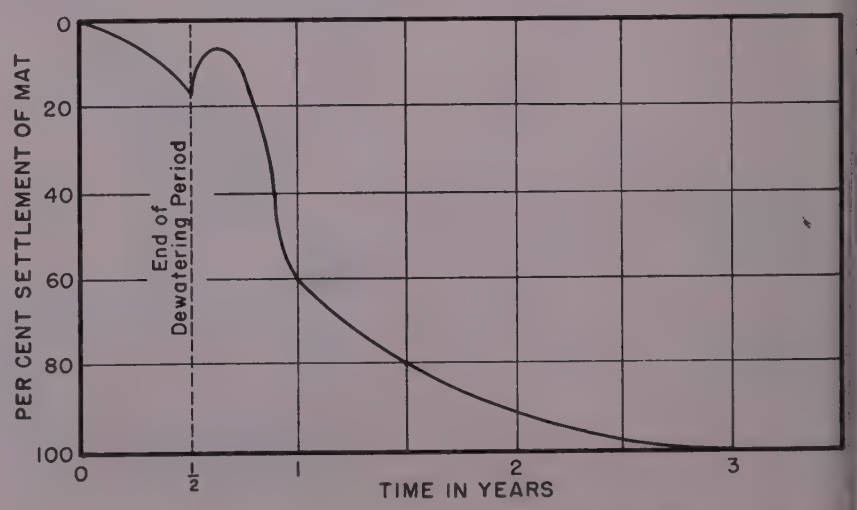
With construction facilities themselves not yet completed, Bechtel's work is not in full swing. Peak of work on the project is seen for next spring, when between 2,300 and 2,400 men will be on the job. At that time, excavation and grading will be continuing for other structures, while structural steel erection and installation of equipment will be under way in the powerhouse. Fuel tanks and auxiliary maintenance buildings will be under construction also.

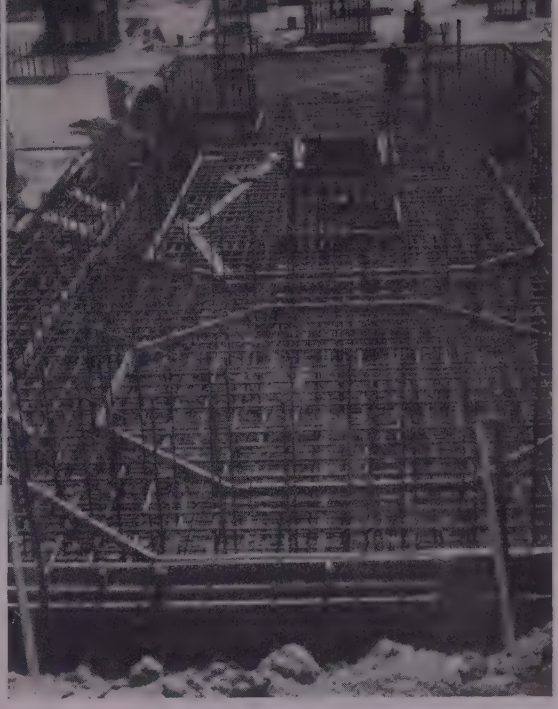
Among the major features of the powerhouse will be its four Babcock & Wilcox boilers, to be erected by C. C. Moore. The Moore work also includes structural steel in the boiler bay, so-called boiler support steel. The boiler



LEFT: Towermobile, augmented by two direct, low-level chutes, supplied concrete to foundation mat pours. Two of these machines were used at times on the larger pours.

BELOW: Settlement pattern is shown in graph prepared by Dames & Moore after soils investigation. Swell results from reduced unit loading caused by excavation and from later termination of unwatering operation.





ABOVE: Four vibrators and a 16-man crew worked the concrete into place in the maze of reinforcing that runs through the 5-ft. mat. Wellpoints (left) skirted close to the excavation, drawing the water table down 11 ft.

RIGHT: Template in foreground denoted location of stack. These 200-ft. structures will be built on foundations poured integrally with the rest of the mat.

stacks will be impressive structures furnished by Consolidated Western Steel. Built in place, they will be 200 ft. high and 18 ft. in diameter, of welded steel pipe construction reinforced and lined with gunite. Structural steel in the firing and turbine bays is also to be furnished and erected by Consolidated Western Steel. Turbines will be furnished and installed by General Electric Co.

The cooling water intake pump structure will contain eight pumps manufactured by Foster Wheeler Corp. Of 49,300-gpm. capacity, they will supply eight 54-in. pipelines carrying water to the condensers. Discharge will be through four 78-in. pipes, furnished by Consolidated Western Steel.

Bechtel's office engineering staff includes J. N. Landis, chief power engineer; C. K. Lewis, project engineer; W. L. Dickey, structural and civil engineer, and George Thon, job supervisor.

In addition to the office personnel, Bechtel men directly connected with the Pittsburg work in the field are: E. J. Garbarini, general superintendent of construction for P. G. & E. plants at both Antioch and Pittsburg; R. L. Stater, project superintendent at Pittsburg; D. K. Bruner, job superintendent of civil and structural work; Charles Copeland, job engineer; Basil Harris, assistant superintendent on steel work; W. C. McKinley, assistant superintendent on general structural work; and Elmer Elson, assistant superintendent of yard work and subcontracts.

Walter Dreyer is vice president and chief engineer of Pacific Gas & Electric Co. Principal company personnel responsible for the Pittsburg work are C. C. Whelchel, chief of the division of steam engineering, and H. V. Lutge, civil engineer. Other civil engineers include F. F. Mautz and C. W. Appleford. A. R. Campbell is concrete technician for P. G. & E. at the construction site.

Prefabrication simplifies setting of anchor bolts

STEAM PLANT construction for Pacific Gas & Electric Co. at Pittsburg, Calif., posed some handling and erection problems for W. C. McKinley, assistant superintendent on structural work for Bechtel Corporation, engineers and contractors on the work. Concrete interior columns rising from the powerhouse foundation are topped by base plates which will receive structural steel members upon which the remaining plant superstructure is to be built. Securing these base plates to the concrete are assemblies of anchor bolts, variously 1¼ and 4¾ in. in diameter, and up to 8 ft. long. Placement of such assemblies is characteristically a chore, as they are heavy, must commonly be lowered into a completed (and complex) cage of column reinforcing, and must be set precisely in elevation.

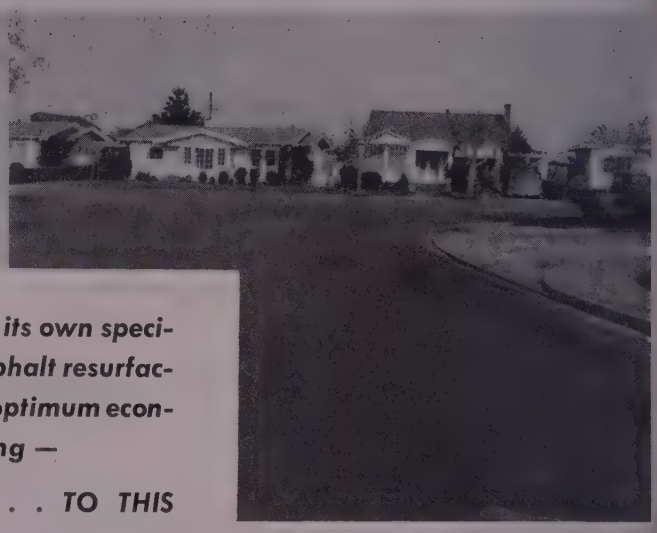
To beat the problem, McKinley built a jig at the steel yard and assembled the anchor bolt assemblies in advance of installation. Each assembly consists of four bolts in a rectangular pattern 13 in. wide and 20 in. long. Held in the job, the bolts were trussed together by tack welding short lengths of reinforcing steel "in all directions." The resulting unit is completely rigid, and can withstand a fall on one corner without rackng or displacement of any bolt.

As a further means of simplifying the anchor bolt installation, McKinley had a secondary interior cage of reinforcing built in each column location, but only so high as to support horizontal members welded in place at exact elevation to hold the bolt assemblies. Transported to the powerhouse by truck and handled there by a Clyde Handicrane, the anchor bolts are dropped into position and welded there. The cage of column reinforcing subsequently drops over the bolts and envelops them completely.

ANCHOR BOLT assembly, all trussed up, has been perched on special steel platform, will be encased by reinforcing cage for pouring of column.

ASPHALT SURFACES

City specs for city needs



San Mateo has its own specifications for asphalt resurfacing — Result is optimum economy in changing —

FROM THIS . . . TO THIS

A REDUCTION in the fines content of an open-graded plant mix marks the essential difference between San Mateo, Calif., specifications for asphalt resurfacing and the source specifications from which they were drawn. The San Francisco peninsula city has been resurfacing its streets with "Virginia mix" for five years now, and observations and inspection bear out its inherent suitability. Roughly, Virginia mix may be described by the single characteristic of containing only about 10% fines in its total weight of aggregate, rather than the more conventional 20% found in open-graded mixes of comparable application.

San Mateo sought something different for its resurfacing program because much of the work encompassed badly cracked concrete and asphalt pavements many years old. These cracks and joints signified points of maximum vertical displacement under traffic load, and it was desired not to have the new surface "reflect" the old fracture through failure itself. Rather, a mix was sought which would combine the maximum of flexibility with satisfactory service, retaining its own continuity above the irregularities of the old pavement. Since thin layers (about 1 in.) were to be applied, stability of the new paving could not be assured by virtue of its sheer thickness.

Control essential

Though its grading is the mark of Virginia mix, it has a further characteristic that suits it well to San Mateo's needs; this is the relatively thick asphalt coating of its aggregate. Properly manufactured, applied, and compacted, the mix is satisfactorily bound but sufficiently flexible for service over an old pavement subject to displacement. Control in manufacture must be exercised especially in regard to temperature, which should not exceed 250 deg. F. San Mateo has imposed a practical limit of 225 deg. and has gained its best success in a temperature range of from 175 to 200 deg.

Having satisfied the need for improved "inter-action" of new and old pavements, San Mateo engineers were attracted by other qualities of the mix. Traction is better, as the compacted surface retains a pebbly texture: this is the pavement that "hums." The pebbled effect gives a drier surface at all times, since precipitation runoff is channeled between the surface aggregate projections, which remain exposed. It is realized that the balance between satisfactory action in this regard and unsatisfactory action—marked by raveling—is very delicate; here is another point where control of the paving operation is all-important.

Economy

In comparison with other open-graded mixes, the Virginia mix gives greater area coverage and resulting economy of construction. The decrease of 10% in fines content (by weight) means an increase of about the same amount in finished mix. Instead of fines, the compacted pavement contains an equivalent volume of voids; coverage per cu. yd. remains about constant, while coverage per ton increases. With asphalt paving expense computed on a tonnage basis, it is apparent that San Mateo has here effected a 10% saving on materials, not inconsequential in furtherance of any municipal maintenance program.

AGGREGATE GRADING for the Virginia mix used in San Mateo's resurfacing program is as follows:

Sieve size	% passing
½-in.	100
⅜-in.	85-95
No. 4	35-50
No. 8	10-20
No. 16	5-20
	0-9

Contract construction

San Mateo's resurfacing program has been executed in large part by four local contractors, including L. C. Smith Co., holder of the only major contract let in 1951 for work of this type. Totaling $29,510, the contract was for 440,000 sq. ft. of plant-mix resurfacing applied to a roadway averaging 34 ft. in width. Typical in its conduct, the paving job was preceded by a cleaning operation in which the streets were blown by compressed air and rid of occasional weed growth by application of a weed killer. Following this work came a tack coat, and then the Virginia mix resurfacing.

A 50-deg. temperature drop is permissible between asphalt plant and job site, the minimum for spreading being 175 deg. F. Spread by a grader or mechanical spreader, the mix is shaped and rolled to give a thickness of 1½ in. at centerline and an abrupt feathering at the edges. In addition to the grader, equipment includes a 10-ton tandem roller, a compressor, a distributor truck for tack coats, and 5 asphalt trucks. Personnel include operators for all these rigs and also 5 laborers on the spreading operation.

Personnel

Arthur B. Sullivan is City Manager and City Engineer of San Mateo. J. A. Krabbe is Assistant City Engineer.

LISTENING IN ON A LEAK

A leaking water main is traced by an electronic finder—The leak is pinpointed by measurement of water noise intensity along the main — San Francisco conditions put detection equipment to test

WATER MAIN LEAK detection is more of a problem in San Francisco than perhaps anywhere else in the West. In its more level areas, San Francisco today stands largely on fill. Progressive settlement and compaction of these areas have put increasing stress on water mains, resulting in development of numerous leaks. Detection and remedy of these leaks is made doubly difficult by the fact that as many as three or four separate pavements, laid as settlement progressed, may overlie a given pipe. Elsewhere, in the city's characteristic hills, water from a leak may travel many blocks before showing up on the surface. This is especially so in streets where there are street car or cable car lines. On these streets, roadbeds are composed of imported crushed rock that is porous and forms an almost ideal conduit for leakage water. Hence, initial reconnaissance in locating leaks may cover many blocks.

One of the accepted methods of leak detection, and that used by the San Francisco Water Department, uses the sound generated by escaping water. Sound of the water may be detected by a sensitive crystal pickup. Passed through a high gain amplifier, the leak sound may then be observed on a visual meter and heard through earphones.

Reconnaissance

Using this instrument, standard procedure for the San Francisco Water Department in locating a reported water main leak is first to obtain readings, or measurements of water noise level, at all nearby surface outlets or other fittings. Fire plugs, meter boxes, and valves are all checked in this work, up one side of the street and down the other. In order to establish a common basis for these measurements, a value of, for example, 25 scale divisions on the visual meter is chosen for reference. The measured and recorded reading at each water system fitting, then, is the amount of gain necessary to produce a reference reading of 25 on the visual meter. Measurement of the loudest sound, therefore, will require the least additional recorded gain to give a meter reading of 25. By indicating additional noise, this initial reconnaissance generally defines the area in which it is most probable that the leak exists.

The position of the pipe is then accurately outlined along the pavement by

Case histories illustrate effects of unusual subsurface conditions

AN UNUSUAL interpretational problem was encountered by San Francisco's leak detection crews in a recent search for a large water main leak. Tracing the main showed that it crossed an abandoned subsurface cistern that was still partially full of water. The line entered and left through holes in the side of the cistern that had been carefully patched, maintaining the storage area in a watertight state. The cistern was about 25 ft. in diameter, and the line spanned this distance with no support other than that provided at the walls.

Leak detecting equipment revealed two apparent leaks, one on each side of the cistern a short distance out from the walls. Readings taken on the pipe within the cistern showed a very definite sound minimum. Since it was improbable that there were two leaks, it was decided to pump out the cistern and look at the pipe exposed within. This was done, and it was found that a pipe joint was located at the approximate center of the span across the cistern. Over the years this span had developed a sag and a sizeable leak at the joint. The water in the abandoned cistern actually was leak water. The marked decrease in leak sound intensity within the cistern was an impressive example of the damping effect of water saturation on leak noise, defying ordinary detection.

Another unusual detection problem involved a low pressure oil supply line located in the tidal mud flats. The low line pressure, coupled with the damping effect of mud and water saturation, resulted in a sound of such low magnitude that it was impossible to find the leak by normal operating methods. The problem was solved by closing the line at valves on both sides of the suspected leak area and introducing air and water into the isolated portion of the line at pressures of 40 to 50 psi. The greater line pressure increased the leak sound to such an extent that the leak was easily located.

SEARCHING with a 2-part electronic finder that reacts to electro-magnetic field of pipe, operators maintain a 30-ft. spacing.

TRACING exact alignment of pipe, the pavement is marked at intervals to establish sounding points for detector.

SOUNDING is taken by connecting detector to rod driven down on water main. Greatest noise level is found at leak source.

use of an M-scope pipe and cable finder. In using this electronic finder, a transmitter is first connected to the suspected leaking main at some nearby exposed fitting. The pipe is thereby directly energized and the resulting electro-magnetic field along the pipe may be traced with the finder. This direct connection, establishing the field by using principles of conductance rather than inductance, is especially practical when there are several closely spaced service lines in the vicinity. Both the leak detecting and pipe finding equipment used in San Francisco's work have been built by Fisher Research Laboratory, Inc., of Palo Alto, Calif.

Once the centerline of the pipe has been located, it should theoretically be possible for the operator to detect the leak by taking measurements along the pavement surface. In practice, however, this is all but impossible in San Francisco. The principal obstacle to surface detection is the subsidence problem mentioned, which has resulted in the presence of multiple intervening pavement layers between the pipe and the present street surface. Secondly, the job is impeded by a wide variety of usual or unusual city noises. A common source of noise is large power transformers located in rooms or manholes beneath the pavement. Often, water mains pass right through these rooms, picking up a lot of noise that appears as a background hum, masking or obscuring the leak noise itself. Refrigerators, pumps, printing presses, and all kinds of motors are capable of putting a large amount of noise into a pipe line. Frequently, as a result, it has been necessary to have the City leak detection crew work well into the early morning hours in search of a difficult leak, since traffic and background noises decrease markedly at night.

Detection

With the leak vicinity well reconnoitered and alignment of the suspected pipe traced accurately on the surface, the next step is to drill a series of holes down through the different pavement layers. For this work a standard mining rock bit is used in conjunction with a conventional jackhammer and air compressor setup. Once the bit is through the difficult material and into natural ground (or fill) below, the bit is removed and replaced by a section of ¾-in. pipe, which is in turn driven down into contact with the water main. A ½-in. hexagonal rod then replaces this pipe and is set down firmly on the water main. Leak detection equipment then comes into play again, with the microphone being firmly attached to this rod by a special brass hexagonal socket. Readings taken at this and other holes of the series drilled give a pattern of sound intensities that make it possible to pinpoint the leak, leaving its repair to regular Department maintenance crews.

SAN FRANCISCO crew operates from compressor truck, does its own drilling for taking soundings. Hand truck eases reconnaissance and detection problem on city's many hills.

Drill hole spacing

Since the drilling of holes just described constitutes the only instance of pavement damage during the progress of leak reconnaissance and detection, some further attention might be given to this phase of the work. Spacing of the drilled holes depends on the ability of the pipe and surrounding soil to transmit the leak sound. In ordinary dry dirt, a spacing of 100 ft. between observation points—if surface reconnaissance has not already narrowed the search below that figure — is generally satisfactory. On the other hand, at low waterfront elevations where the soil is saturated by tidal action, it may be necessary to obtain readings at intervals of 5 or 10 ft. This close spacing also holds for pipe laid in moist clay.

The reason for this wide difference in possible spacing of observation or sounding stations is two-fold. First, water escaping into otherwise dry soil causes a boiling of small particles in the immediate vicinity of the leak. These particles impinge against the pipe as they boil and swirl about, setting up additional noise to that generated by the water itself as it escapes from the pipe under pressure. It can be seen that if the soil is already, or characteristically, saturated, there will not be this marked erosional action and resulting noise. Or, if the surrounding material is clay, there are no particles of appreciable size to boil about the jet of escaping water.

Damping effects

A second factor contributing to the necessity for close spacing of soundings is that moist material damps whatever

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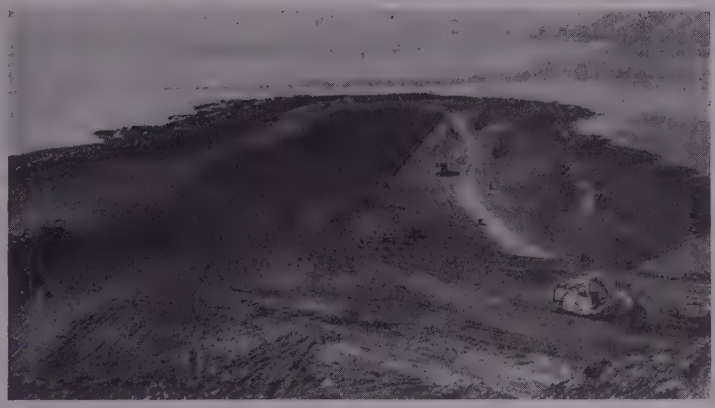
FILL CONSTRUCTION
is a test in method



Lateral displacement of unstable bay mud by fill operation replaces expensive pre-dredging — Virtual completion of lower fill settlement clears the way for surcharge of roadway embankment — Careful compaction and extensive boring program mark experimental project

CONSTRUCTION of a 500,000-cu. yd. experimental highway fill across tideland portion of San Francisco Bay is now in its later stages, and the method of placing embankment used on the project has already shown its feasibility for projected freeway construction in the vicinity. Location of the work is the future Bayshore Freeway alignment south of San Francisco city limits, where portion about 11,600 ft. long traverses tidal flats between Candlestick and Sierra points. A total of 3,000 ft. is covered by the present project, 575 ft. lying on the southerly slope of Candlestick Point (borrow area) and 2,425 ft. extending southward (fill area).

Water in the project area is very shallow, with an average mudline elevation of —5 ft. Below this lies a very unstable mud in thicknesses approaching 60 ft. The current work was undertaken to see if this undesirable, highly fluid mud (density 80-100 lb. per cu. ft., moisture content about 100%) could be displaced in the course of advancing a fill across it. Seen as a much less expensive alternate to the usual method of pre-dredging in such circumstances, the technique depends for success upon fairly complete volumetric replacement of the bay mud and satisfactory stabilization of what remains by the weight of fill above.

Dimensions of fill

The project was begun last February as a $136,260 contract awarded to Edward G. Keeble of San Jose, Calif. The project southerly limit was set at station 30+00, although it was not known whether available borrow quantities and settlement characteristics would combine to permit this length of construction. In fact, this maximum length has not been attained, construction to specified widths being possible only about to station 20+00 (exact terminus not known at this writing). The fill is composed of two separate embankment portions, as shown on the accompanying typical cross section. Maximum width, measured at the top of the lower embankment slope, is 400 ft. At stations 10+00 and 12+00 this dimension narrows, first to 300 ft., then to 250 ft. Throughout, however, the width of surcharged roadway embankment is constant at 132 ft. Time and observation will tell whether or not the greatest total width built (400 ft.) is necessary to stability of the roadway.

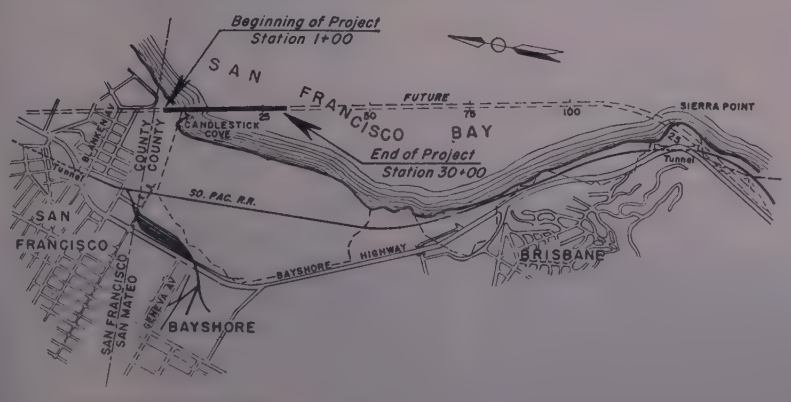
In this method of construction, the expected performance of the fill-displaced mud is its upheaval ahead and to either side of the advancing fill in the form of a "mud wave." In order that this wave shall not become so great in volume as to halt fill progress, a frontal approach cannot be used. Rather, the "nose" of fill narrows to a point, so that the mud is in large part displaced laterally. At any given station, the process of widening the fill to full section provides enough in forces of settlement to complete this lateral displacement. As a result, the volume of mud remaining directly ahead of current operations stays relatively small, being split by the new fill instead of rolled bodily back.

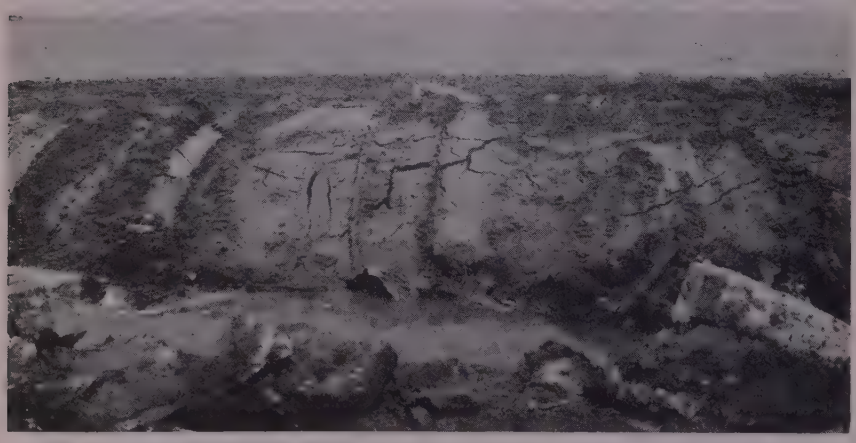
Spectacular settlement

The method is less expensive than that requiring pre-dredging. Time, however, is not saved proportionately. In a pre-dredged situation, fill may be placed at a maximum rate, limited only by the working area available for equipment operation. When the fill is expected to displace original material, however, and do so thoroughly, time must be allowed for the fill load to have its effect on the underlying mud. On the described project there has been at least one occasion when filling operations were conducted for five days, involving placement of over 25,000 cu. yd., without marked settlement. Then, within ½ hr., the last 100 ft. of the fill—the most recently placed—settled about 6 ft., establishing a well-defined scarp or shear failure clear across the fill. Coincident with similar spectacular settlement on another occasion was upheaval of a mud wave 11 ft. high within a 2-hr. period. This rate of rise was easily perceptible to observers. In fact, more modest progress of the rising mud may be detected without resort to reference marks of any kind.

Illustrative of the nature of motion of the mud wave was the history of a long stake driven into the wave just ahead of the fill when the nose was at about sta-

Project is extension of freeway from San Francisco





ABOVE: Sudden settlement at Sta. 16+00 occurred after nose of fill had advanced well ahead. Borrow area in left background.

LEFT: Sudden rise of mud wave reveals polished face of shear plane. Irregular, narrow arm of water separates wave from embankment. Note block of concrete (at water surface) carried up by wave.

tion 14+00. This stake was still in position some two weeks later, but it then stood well beyond station 16+00. This performance shows that an increment of mud stayed ahead of the fill, in line with its axis, and was not progressively split and shunted aside.

Specifications for the work have provided that the contractor shall be equipped to place 5,000 cu. yd. per day, although the work might be slowed or halted at the engineer's discretion in order to give time for settlement and mud displacement. Available on the project was about 400,000 cu. yd. of material, to be excavated between stations 1+00 and 5+75. The borrow area between these limits extends far on right side of the roadway centerline. In fact, the face of the borrow area is normal to the centerline, and the present work terminates on the north at the toe of a 138-ft. cut slope. Additional material needed on the project has come from a Fredrickson & Watson freeway job in San Francisco, from where a fleet of from 15 to 25 10-cu. yd. trucks has hauled between 1,000 and 2,000 cu. yd. daily (total to mid-June: 50,000 cu. yd.).

Compaction

Height of the lower portion of embankment was specified as that necessary to support continued equipment operation without settlement, but in no case less than El. 8 ft. In practice, El. 8 has represented sufficient volume of fill to sustain the work. Above this elevation the roadway embankment has been built in 8-in. layers. Specifications provided an exception to this provision in case 25% of fill material was of some greater size. For such a situation the additional thickness of layer was permissible, but only to a limiting thickness of 2 ft. Whereas the lower embankment has side slopes determined by the natural repose of the fill, and compaction only to the extent provided by equipment operation, the upper embankment has specified side slopes of 2:1, and compaction to 90%. Sheepsfoot rollers have been used in compaction of successive upper embankment layers.

Observations

Exact yardages involved in the work are not yet known. However, three lines of borings made along this and two adjacent alignments have shown good correlation in revealing the general contour of the stiff mud upon which the fill rests. Final determination of fill volume will utilize this information and also that gained from extensive borings along the fill centerline and at selected cross sections. A consolidation factor will be derived at that time also, from knowledge of borrow pit and imported yardages. In addition to borings for measurement purposes, undisturbed samples have been recovered for laboratory tests.

Also, settlement platforms have been established, not to determine settlement in a given layer or zone, but to determine overall settlement of the mass. An interesting point in the instrumentation story is the design of settlement platforms. Since earthmoving equipment had occasionally run over a platform and broken the slender rod projecting through the fill above, new platforms have been made incorporating a short length of wire rope as the lower portion of the rod. Welded to the platform, and with the usual rod welded in turn above, the rope section has provided the sought-after resiliency. It gives under loading, yet recovers completely, restoring the overall rod length to its original figure.

Further provision for observing effects of the fill construction includes placement of piezometers. These measure pore pressures developed in the originally soft bay mud remaining beneath the fill and thereby indicate the degree of consolidation of the mud mass under load. At least eight piezometers have been located, some on centerline, others at points on either side, permitting piezometer data to be gathered across a given section. Most of the instruments are of the Norton tube variety. Effects of the weight of fill and of the natural "water table" head on the tube locations have been sufficient to produce pressures of as much as 7-psi. gauge, equivalent to a head of 16 ft. above fill elevation. The foregoing figure applied in mid-June, when only the lower embankment (El. 8 ft.) had been placed.

A particular point of knowledge determined by members of the Division of Highways materials and research staff, and contributing to the initiation of this project, has had to do with the character of material underlying the fluid, low-density mud being displaced by fill. This lower material, known as a stiff mud or clay, has densities ranging (over the project length) between 120 and 140 lb. per cu. ft. Its moisture content is between 17 and 20%. Tests have shown that this material provides a satisfactory foundation for loads up to 10 tons per sq. ft. It is expected that the present fill will in no case exceed this unit loading and will, from this standpoint, be stable and satisfactory for roadway construction.

Results

Perhaps the principal point for speculation relates to the action to be expected from the relatively thin lenses or layers of low-density mud which remain beneath the completed fill. In the course of exploratory borings during the fill operation, some measure was made of the

Concluded on page 84

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FILL CONSTRUCTION

Continued from page 82

volume and areal extent of this residuum. As of mid-June a maximum thickness of 10 ft. of mud had been encountered at a few scattered points. Elsewhere, the thickness seldom exceeded 5 ft., and it ranged downward to zero.

All significant observations and all practical results of this method of fill construction are expected to be complete by the time the work is done. Thereafter, the rate of settlement will be comparable to that for any structure during the years after it is built. Finished grade of the present work will be, in cut, 2 ft. below proposed final roadway profile elevation and, in fill, 1 ft. above that elevation. In the latter case, a level profile, final roadway elevation is 16.76 ft. Methods of construction for the remaining fill in coming years, amounting to some 9,200 lin. ft. connecting with Sierra Point to the south, will depend on the outcome of this work. The date for such future construction has not been determined.

Personnel

The experimental fill has been constructed under the general direction of Division of Highways District IV, headed by B. W. Booker, assistant state highway engineer. R. P. Duffy, assistant district engineer, and William Travis, district construction engineer, have been in more direct charge of the work. Resident engineer is Herbert L. Moses, assisted by August Egli. Robert Chambers is grading inspector. Liaison between Sacramento headquarters and District IV personnel on soils testing has been furnished by William Weber, assistant physical testing engineer. Superintendent for Edward G. Keeble is Anthony Bruno. Blasting necessary in the Candlestick Point borrow pit was done by C. V. (Maggie) Magistretti of San Francisco.

List of major equipment

Edward G. Keeble earthmoving equipment involved in construction of California Division of Highways experimental fill south of San Francisco.

- 4 Caterpillar D-8 tractors with bulldozers
- 1 International TD-24 tractor with bulldozer
- 1 Caterpillar D-8 with K-30 ripper
- 1 Allis-Chalmers HD-19 with K-30 ripper
- 2 Caterpillar D-8 tractors with LeTourneau Model W scrapers
- 1 International TD-24 with LeTourneau Model W scraper
- 1 Caterpillar D-8 with LeTourneau Model FP scraper
- 5 LeTourneau Super-C Tournapulls with Model LP scrapers
- 1 Caterpillar Model 12 Motor Patrol
- 1 210-cfm. air compressor
- 1 500-cfm. air compressor
- 1 2,000-gal. water tank truck
- 1 300-amp. welder
- 3 pickup trucks
- 1 grease truck
- 1 boom truck

. . . "the rolls take a beating on this job!"

a report from

J. V. GLEASON

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on their "66"

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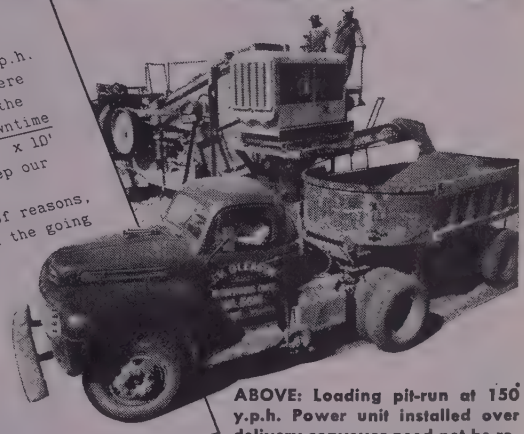
J. V. Gleason
J. V. Gleason, Owner



ABOVE: Loading pit-run at 150 y.p.h. Power unit installed over delivery conveyor need not be removed when on road.

BELOW: Dumping pit-run into Diamond shovel-loading hopper. A Diamond grizzly and single eccentric plate feeder keep a continuous, regulated feed.

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Clogged cooling system can seriously cut engine power

Deposits around the cylinders not only cut efficiency but also start a chain reaction of other problems — Boiling out is the best answer

By
C. W. LINDGREN
Commander, CEC, USNR
Field Superintendent
Construction Equipment Depot
Port Hueneme, Calif.

AS ENGINES get older there are three sources of lost power, other than in the improper fit of pistons in cylinders. These are: (1) timing, (2) valves and (3) clogging of the water cooling system. The first two can be detected easily and corrected, regardless of the engine's age. However, the third is more difficult to determine and correct.

The water area inside the block is of utmost importance in the production of power and any restriction can become a major source of power loss. The objectionable foreign matter may be silt (from dust), dirt (from dirty water) or scaly material usually found when water is used for cooling engine blocks.

The water area is designed to provide cooled water against the iron surrounding the cylinder, or the wet sleeve. In the engine block, which has various shapes of channels for passage of the water around the cylinders, the passages are not large in some areas. The largest openings are adjacent to the metal surrounding the cylinder. Therefore, it is the place where the circulating water has the slowest velocity. This slow moving water tends to drop sediment.

The cylinder is cooled from the outside by this water. The design of the metal and its thickness is such that water of a certain temperature will keep the metal at the best degree of heat for obtaining optimum tightness around the piston, which results in maximum power.

When the water temperature gauge shows 150, 160 or 180 deg., it is assumed that the water in the block against the outside of the cylinder is within at least 1 or 2 deg. of what the gauge reads. **This is not always so.**

If the areas surrounding the cylinder were painted with several coats of paint or tar, the cooling effect through the cylinder metal would be different than if not painted. There would be less cooling, the metal of the cylinders would be hotter, but the temperature gauge would remain about the same.

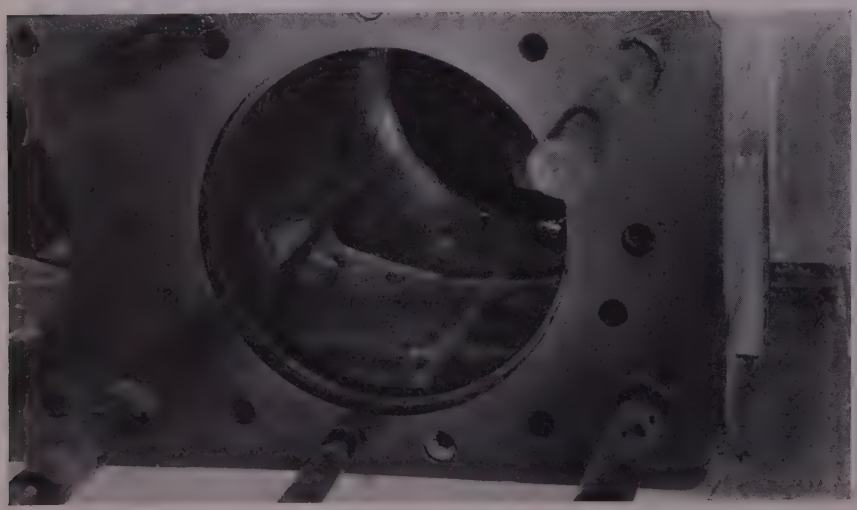
Sediment lodged against the outside areas of the cylinder will have an even greater effect on cooling than paint or tar. Water jacket scale is most resistant to the transmittal of heat. Cooling in the most important place is not obtained. The engine runs slightly hot all the time, the radiator steams on grades, uses more water, and maximum engine power is lacking. It's a pretty good engine, and causes no anxiety. But the machine it drives is not popular and usually referred to as "That old wreck."

When water jackets of engines remain dirty and the cooling effect of the water is not up to the original design, other undesirable factors affect the engine. They are as follows:

1. The cooling effect is irregular and in different degrees in different areas of the cylinder.
2. Hot spots develop which practically scorch the piston oil.
3. Hot oil has then been added to the original heating problem.
4. The hot oil (destroyed) drops into the crankcase and deteriorates the quality of the oil.
5. The net result is a much hotter engine.

Concluded on page 88

ABOVE: Pieces of sediment, compared with inch scale to show size, were removed from an engine cooling jacket by intensive boiling.



LEFT: After boiling out, water jacket area around the piston sleeve (removed) is clean, enabling cooling water to maintain proper cylinder temperature for maximum efficiency.

The opinions and assertions contained in this article are those of the writer, and are not to be construed as official or reflecting the views of the Navy Department or Naval Service at large.

Construction methods . . .

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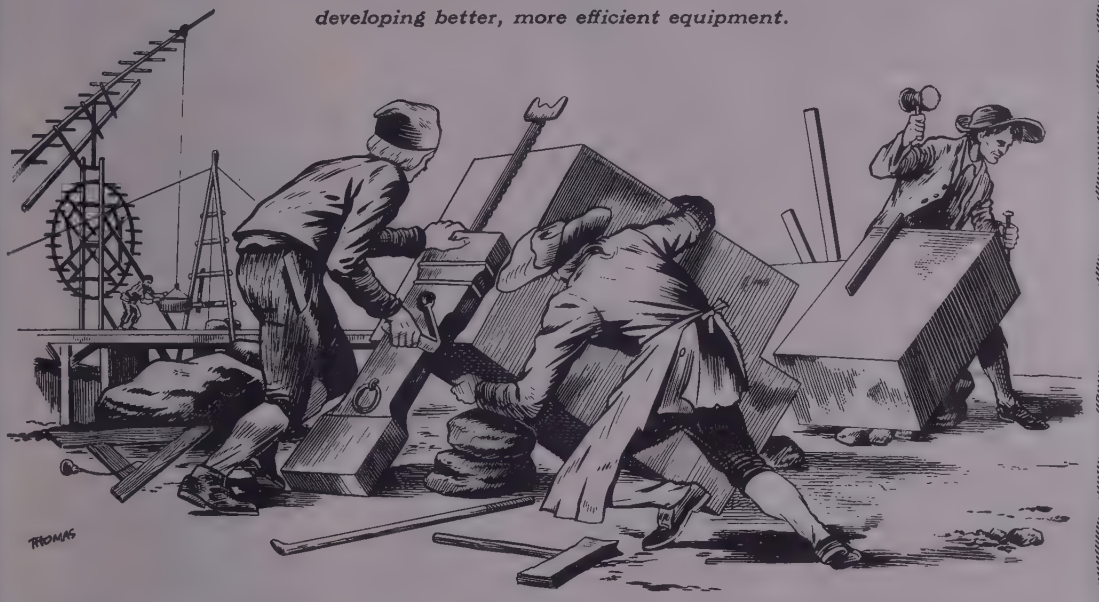

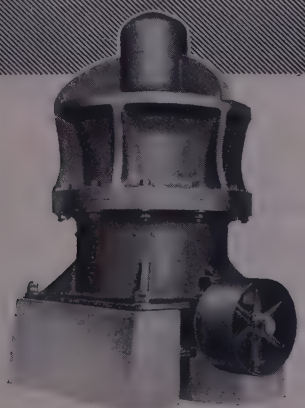

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COOLING SYSTEM

Continued from page 86

6. The hotter engine, especially in the case of diesel engines, heats the air under the hood, to the extent that it will be already partially expanded before drawn into the combustion chamber, reducing the power of the compressive explosion.

When shops are set up to overhaul or rebuild equipment by a contractor, government agency or distributor, it is suggested that the engines be boiled out with water additives designed for this purpose. The saving in labor, as compared to using gasoline, putty knives, and rags, will pay for a simple tank equipped to heat the engine bath mixture. Also, by boiling it is possible to thoroughly clean the entire water jacket area.

Dry sleeve engines, when overhauled and not boiled out, may retain in the water jacket area enough packed sediment to cut the cube area of the water jacket by 30 to 50%. It is not unusual when removing wet sleeve cylinder liners from engine blocks, to find layers of sediment up to 1 in. thick. Rust, which adds to objectionable deposits in engine water jackets, occurs more frequently in tropical and semitropical climates.

The contractor must rely on two men the superintendent of operations and the shop supervisor. The profitable use of equipment is in their hands. Regardless of how excellent the mechanic's work is engines in trucks and construction equipment need precise attention after leaving the overhaul shop. This responsibility falls on the superintendent. By exacting control of usage and speed, he and the drivers and operators can save power.

Maybe this ditching machine holds world's record

IS 17,200 FEET of 22 x 40-in. trench dug in 9 hr. on a single working day by a one-unit ditching machine the world's trench digging record? If not, what is?

George W. O'Connor, head of the O'Connor Construction Co. of Fromberg, Montana, claims the championship on the basis of his Cleveland trencher's performance on October 4, 1951 during the construction of a gas pipe line from the Two-Dot gas wells to Warren, Mont.

"As far as I know this is a world record for a one-unit ditcher," says O'Connor, "and most ditch men would call me a liar if I made this statement to them." Operator of the Cleveland trencher during its record-making performance was Fagin Rehm of Burley, Idaho. O'Connor reported his crew had the advantage of ideal soil for the trenching operation on the bench of Big Basin where the company was laying 6-in. pipe.

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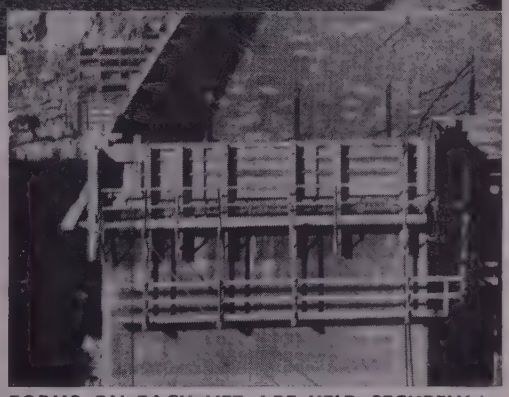

FORMS ON EACH LIFT ARE HELD SECURELY by Superior 4-Strut Coil Loops embedded in a lean concrete mix.

Joint venture contractors, known as the *Chief Joseph Builders,* include: *L. E. Dixon Co., Arundel Corp., Hunkin-Conkey Construction Co., and American Pipe and Construction Company.*

Located on the Columbia River near Bridgeport, Washington, the dam, sponsored by Corps of Engineers—U.S. Army, is scheduled for completion on August 1, 1955.

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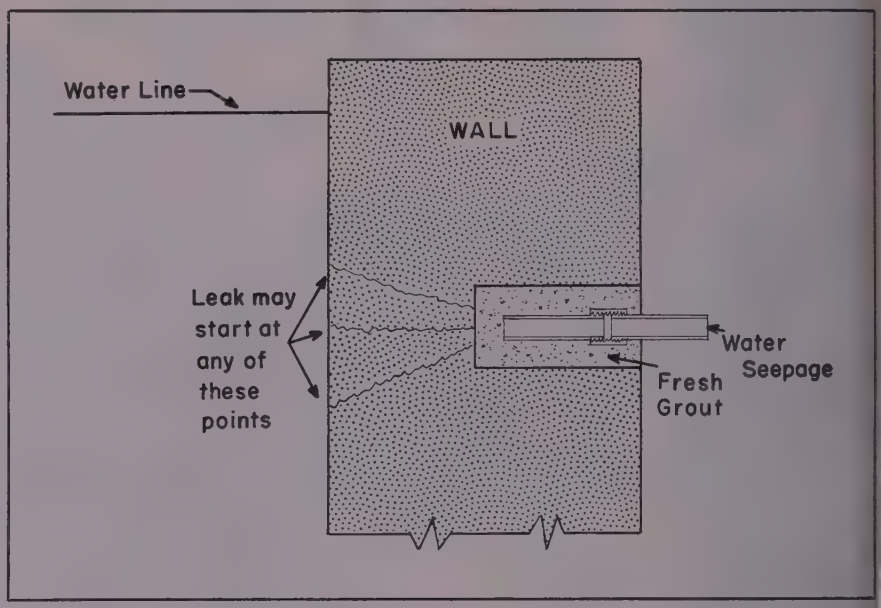
HOW IT WAS DONE . . .

Sure-fire technique for stopping a leak quickly

By H. B. McDERMID
Retired Construction Engineer



EMBARRASSING LEAKS sometimes show up on hydroelectric projects, especially when the reservoir behind a dam is being filled. I remember one instance on a job where the dam was about a mile long and the reservoir extended some 65 mi. up the river. When the reservoir filled, a leak showed up in a wall about 10 ft. below water line. The water was leaking into a room that had to be kept dry. The wall was about 10 ft. thick at this point, and it was impossible to tell where the leak originated.

It was a large leak, probably about 2 gpm. And it had to be plugged against the pressure of the 10-ft. head of water. But how?

While a gang of the regulars was standing by discussing possible ways to stop the leak, a hobo mechanic—you'll always find a few of his type around big construction projects—wandered by and took a look. After a short time, he commented, "I can fix that easily." So the boss said, "Go ahead. Let's see how you would do it."

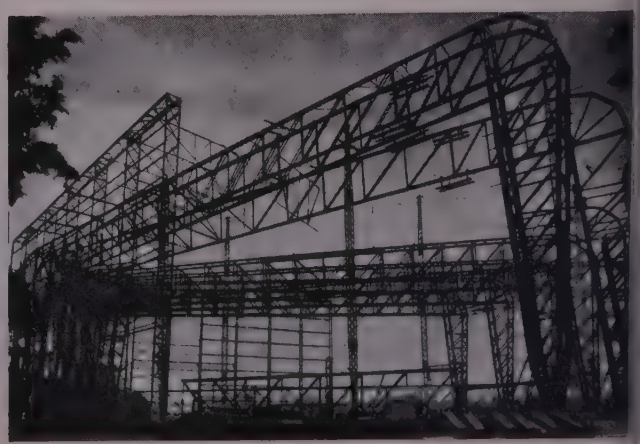
In a short time, the mechanic had procured two 3-in. pipe nipples, each about 4 in. long, with a coupling and plug to match. For tools, he had a hand hammer and a concrete drill of a size quite a bit larger than the O.D. of the pipe. He "made up" one of the nipples tightly into the coupling. Then, starting at the leak, he drilled a hole deeply enough into the wall so the entire nippled coupling would go into the hole an inch beyond the wall surface.

Next, he screwed the second nipple loosely into the near end of the coupling, and pushed the entire assembly into the hole until the second nipple projected only slightly. Then he took rich grout and packed it in the hole around the assembly (for better anchorage he had deformed the far end of the inner nipple and slightly enlarged the inner end of the hole in the concrete).

Now, the leaking water was running through the pipe assembly to relieve the pressure on the new plug of concrete. Returning on the following day, the mechanic screwed out the loose nipple, inserted the pipe plug, and then completed the job by plastering over the scar. Later, after the wall was painted, the location of the leak could not be found and the wall was dry as desired.

This trick has been used several times by the writer, and it always works. An important point to remember is that pipe should be chosen of large enough capacity so water from the leak may easily pass through it. A build-up of pressure is thus avoided and the green concrete is allowed to harden without disturbance.

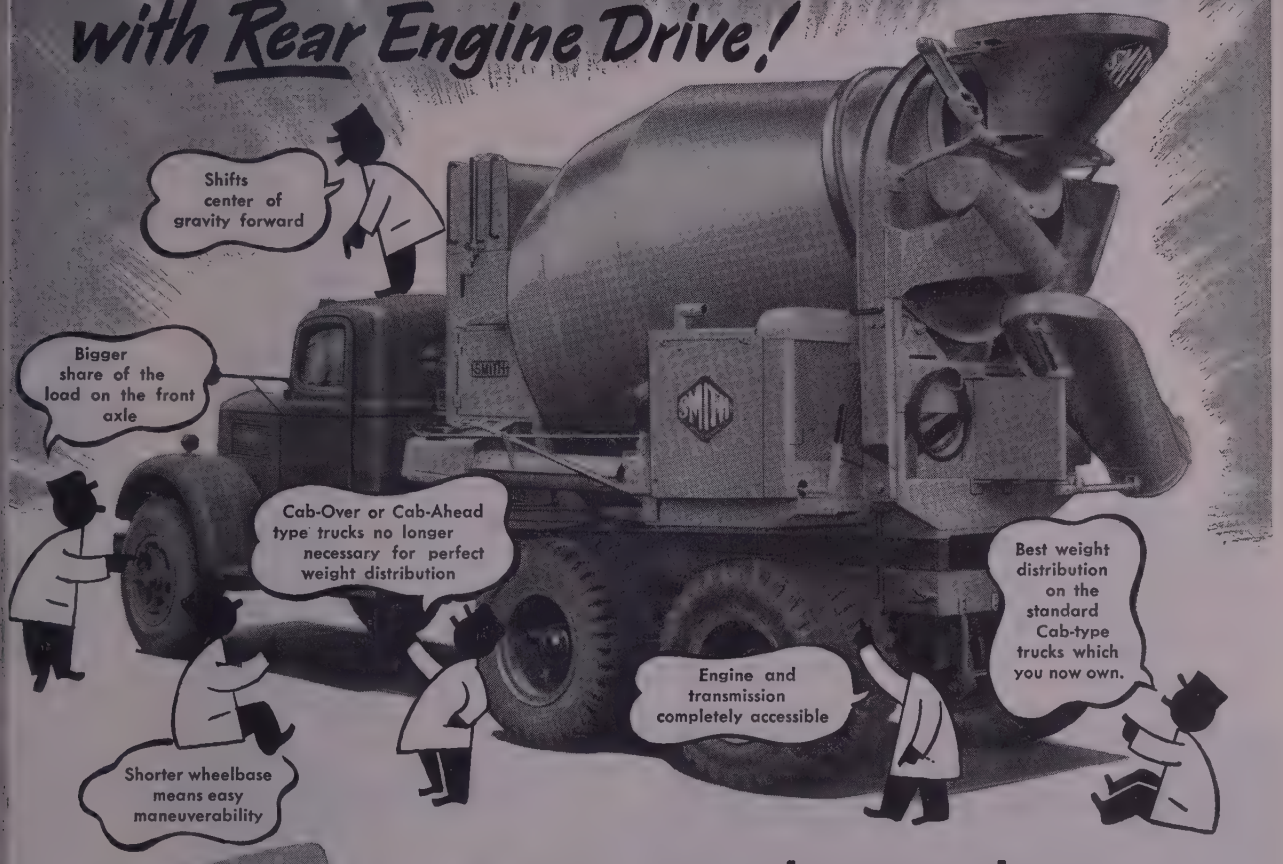
Mexico City claims to have world's largest welded rigid frame under way



THE DRAMATIC outline at right is claimed to be the world's largest welded rigid frame, a clear span of 328 ft. Mexico City's $4,500,000 municipal auditorium has eight similar frames arranged in a pie shape. The auditorium will seat 18,500 people when completed this summer. Fabricators and erectors, Macomber de Mexico, estimate that a 50% weight saving was achieved by welded construction, lightness being essential because of sandy subsoil condition. The 6,000 tons of structural steel were welded with Lincoln Fleetweld 5 and 7, A. W. S. class E-6010 and E-6012 electrodes.

SMITH-MOBILE

with Rear Engine Drive!



Note the space saved on the truck because of rear-engine drive. This is a 5½ yard mixer in place of a 4½ front drive which formerly used all the space on this truck.

Better Weight Distribution . . . Means Bigger Legal Payloads

Are you looking for a truck mixer that will give you maximum legal payloads? Then be sure to investigate the new Smith-Mobile with REAR-ENGINE DRIVE. The engine has been moved from the front to the rear of the mixer, thereby reducing over-all length by over a foot and a half. Now you can move the mixer forward on the truck and thus move the center of gravity forward to put the proper share of the load on the front axle and relieve the rear axle. This means better weight distribution, greater payloads and more take-home dollars for the owner. You can now get the best weight distribution without using Cab-Over or Cab-Ahead type of trucks. Or, you can use a shorter wheelbase truck and get greater maneuverability. Use your present standard cab type trucks and still get perfect weight distribution.

Rear Engine Drive Smith-Mobiles are built in three standard sizes: 4½, 5½ and 6½ cubic yards, all bearing Truck Mixer Bureau rating plates. All of these new models have been job-tested and are backed by a company which has built nothing but mixers for 52 years.

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

SMITH
THE T. L. SMITH CO. MILWAUKEE, U.S.A.

CONCRETE MIXERS

For BIGGER and BETTER Concrete Mixers and Truck Mixers . . . LOOK TO SMITH

A 7200-1P

Sluice gate operation speeded by high-pressure oil hydraulic system

USE of a high-pressure oil-hydraulic system to operate heavy sluice gates rapidly has proved successful at the main pumping station of the East Bay Sewage Treatment Plant, Special District No. 1, East Bay Municipal Utility District. The gates are 6 ft. wide x 5 ft. high; having rising stems; weigh 2,900 lb. each, and are designed for an unseating head of 20.75 ft. of water.

Four gates in operation

There are four such gates at the pumping station, three of which are located between the interceptors and the two sumps from which the pumps lift raw sewage into the treatment plant. These three gates normally open, must be closed fast in case of power failure, as otherwise raw sewage would flood the station. The fourth gate is between the sumps; is normally open; must be closed occasionally to permit servicing of the pumps and bar screens connected with either sump; but has no critical operating speed.

Designers of the pumping station considered various means of gate operation, and discarded the idea of using any but some sort of oil-hydraulic system. The choice of a high-pressure system as against a low-pressure system was made because the high-pressure system permitted the use of smaller pumps, piping, accumulators and cylinders; required less gallonage of oil and little if any more power; and promised to operate the gates more rapidly than a low-pressure system.

Low bidder on the high-pressure oil-hydraulic system was The Rucker Company, Oakland, California, specialists in the design, manufacture and installation of fluid power systems.

Under the contract, two power units were installed, one of them a standby. Each has a 20-hp. U. S. motor direct connected to a Dudco vane pump and operating at 1,200 rpm. Either unit can deliver 14.5 gpm. at 1,250 psi. from a 60-gal. reservoir.

Pressure is stored in 8 cross-connected Greer bag type accumulators, each of 10 gal. capacity. Oil flows from the accumulators through pressure switches, flow control valves and double solenoid directional control valves to the cylinders.

The three gates between interceptors and sumps are closed automatically when a float rises to a predetermined height in the sumps, energizing the solenoids of the directional control valves. These gates are opened by means of a manually operated control valve which energizes the solenoids to permit flow in the opposite direction. The gate between the sumps is closed and opened with an identical manually operated control valve and solenoid. Control valves are located on a control board adjacent to the main pump motor controls.

If power fails . . .

Since the gates must be operated after power has failed, 125-volt current for the solenoids is furnished from a battery of Exide cells, which also provides current for light in case of power failure, and operates the main circuit breaker.

With 80 gal. of oil at 1,250 psi. in the accumulators, and the storage battery kept constantly charged from a solenium rectifier, gate operation is entirely independent of outside power for emergency closing.

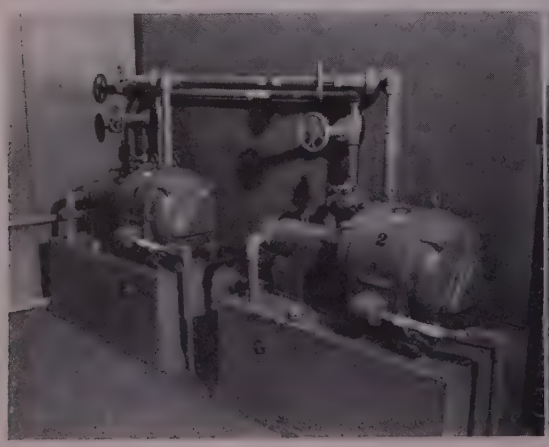
All gates are tested each month, and invariably close or open completely within 35 to 40 seconds, which is less than one-half the maximum time limit. Enough power is stored in the accumulators to enable all four gate cylinders to make two strokes, each, yet leave a pressure of 675 psi. in the system. Since only one stroke of three cylinders is needed for pumping station protection the margin of safety is ample.

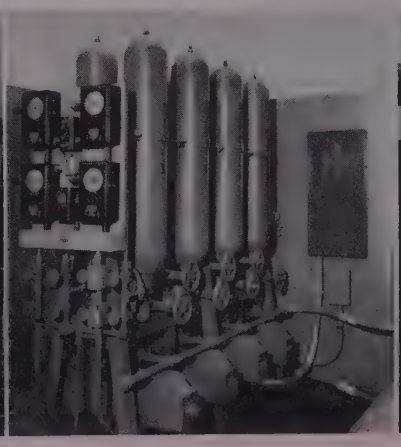
LEFT: Looking down at one of the sluice gates. It is 6 ft. wide, 5 ft. high, with a rising stem. Weight: 2,900 lb.

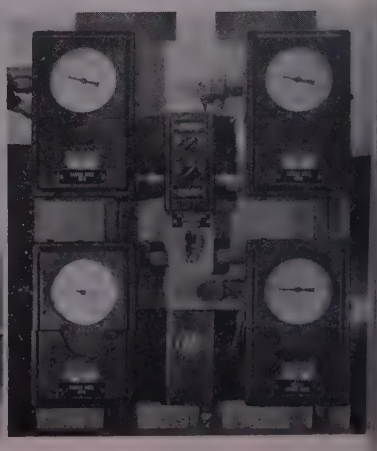
LEFT BELOW: View of power units which deliver 14.5 gpm. and 1,250 psi. each, to a battery of accumulators.

BELOW CENTER: Battery of 8 cross-connected Greer accumulators, bag separator type, are kept charged at 1,250 psi. and are able to operate all four gates' two strokes yet leave a pressure of 675 psi. in the system.

BELOW RIGHT: Control board showing arrangement of automatic and manual controls.







Transport service adds plumbing, offers on-the-job distribution of bulk materials

INCORPORATING specialized services to construction contractors with its regular business of bulk freight transport, Miles & Sons Trucking Service of Merced, Calif., has fitted nine insulated asphalt hauling units with on-the-job distribution equipment. Since the equipment makes transfer to a distributor truck at the job unnecessary, Miles completes its delivery to a highway contractor by spreading the asphalt on the desired section of roadway.

Metered distributor

The distributor bar is mounted with swiveled pipe connections that permit it to be hand winched up into "transport" position well clear of the roadway (see picture). Design of the bar includes full circulation of the asphalt and controls for giving either 8- or 12-ft. spread in application. Meeting California state specifications for such equipment, the device is fitted to regulate amounts of asphalt from 0.05 to 1.50 gal. per sq. yd., and pressures from 25 to 75 psi.

Further justifying Miles' use of the distributor bars, the transporting units themselves are especially suited to long hauls. Capacity of each unit, a 275-hp. Kenworth-powered truck-trailer combination, is 5,500 gal. of asphalt. Insulated with 3 in. of spun glass, the tankers lose only about ½ deg. of temperature per hr. They are thus able to travel as far as 600 mi. without reheating. Pumping equipment also carried provides for transfer of the trailer contents to the distributor truck in about 15 min.

Serving the needs of smaller highway contractors doing cement-treated base construction, Miles & Sons provides similar service in its bulk-cement hauling operations. The problem here was a feasible means of transferring cement from a 60-bbl. bottom-dump truck or trailer to a spreader truck of equal capacity. The answer was a drop-side hopper that would slide under the trailer. As pictured here, the hopper has been positioned but has not had its drop-side closed. In conjunction with this hopper Miles & Sons uses a "bazooka," a 20-ft. screw conveyor chain-driven by a 2-cylinder Fairbanks-Morse engine, to move the cement.

The spreader truck includes controls for metering the required cement quantity and a small plow that cuts a trough in the windrowed base material to receive the cement. It can be loaded by the bazooka in about 10 min., after which it distributes the cement smoothly and continuously, requiring no hand labor such as is involved in breaking, dumping, and burning the individual cement sacks that would otherwise be used.

Subcontract or rental

The cement spreading service is a new field for Miles & Sons, who recognized the inability of smaller contractors to purchase large items of equipment needed for cement-treated base construction. Being somewhat familiar with road construction problems through long experience in asphalt supply, Miles undertook the subcontracting of soil-cement work and, for that purpose, obtained graders and Wood mixers also. Now, the firm operates this latter equipment on either subcontract or rental basis.

LEFT: High-low distributor bar literally stays "out of the road" during transport of asphalt.

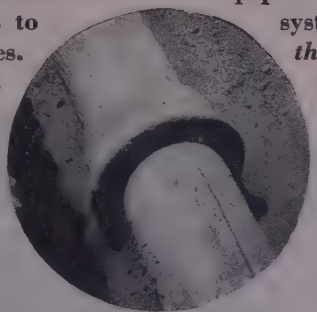
BELOW: Drop-side hopper fits under truck (left), taps contents into screw conveyor (right) that loads 60 bbl. of cement in 10 min. into spreader truck.

The pipe that's known as the *Taxpayers' Friend*

To a tax-burdened public the statement that cast iron pipe is the "taxpayers' friend" is more than a mere figure of speech. To most waterworks engineers it is a cold fact. They know that cast iron pipe in water distribution systems has saved, and continues to save, millions of dollars in local taxes.

More than 35 American cities have cast iron mains in service that were installed over 100 years ago. A survey sponsored by three water-works associations shows that 96% of all six-inch and larger cast iron pipe *ever laid* in 25 representative cities, is still in service.

Fortunately for taxpayers, over 95% of the pipe in America's water distribution systems is long-lived cast iron pipe—*the taxpayers' friend.* Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Illinois.



This cast iron water main installed in Richmond, Virginia, 120 years ago, is still in service. Over 35 other cities have century-old cast iron mains in service.

CAST IRON ®

CAST IRON PIPE

America's No. 1 Tax Saver

The big sweep— on California's highways

A ROADSIDE vacuum cleaner is now aiding California's State Division of Highways in a struggle to keep bottles, cans, and miscellaneous paper articles from cluttering scenic routes.

Officials had long despaired of the painful clearing of trash by hand methods from the beach, resort and park highways where picnickers discard it. With an average of 7 mi. per maintenance man, the job took too long and was too expensive. If only a machine could carry the load, it was felt that time and money could be saved and the end result would be more satisfactory.

A starting point

Good Roads Machinery Co., Minerva, O., manufactures a leaf and litter collecting unit, which formed the basis for departmental experiment. The unit had sufficient suction through a 10-in. intake hose to collect the bottles and cans as well as the papers, but the vacuum fan was not designed to withstand constant bombardment by heavy objects. Although it pulverized these objects, technicians felt that the damage would be severe after a few thousand bottles had been thrown against the blades. District VII shop offices were instructed to experiment with the machine.

To eliminate wear and tear on the fan mechanism, the suction hose was connected to the upper end of an old hot water tank attached above the fan and with a little box below it. The velocity of the heavy articles through the water tank carried them past the fan into the box, while the lighter materials went through the fan into a 14-cu. yd. box. This first attempt was not entirely satisfactory since the box full of heavy articles had to be emptied too often. Even with this disadvantage, the machine was a vast improvement over the previous hand method.

Next step consisted of constructing an air-tight compartment to trap the heavy objects and eliminate the frequent emptying. This compartment when tried seemed to cut down the vacuum in the hose intake to the extent that heavy articles could not be sucked in. However, with the addition of a larger fan and by making all pipe connections or curves to reduce friction, it was found that the machine could pick up anything that would go through the 10-in. intake hose.

LEFT: A close view of the operator in his suspended chair. Note the control he can exercise over the snout with the handle-bar arrangement. His left hand is on button which signals driver of truck.

BELOW: To the left is view of cluttered highway. At right, same stretch of highway immediately after treatment by the vacuum cleaner.

Adjustments necessary

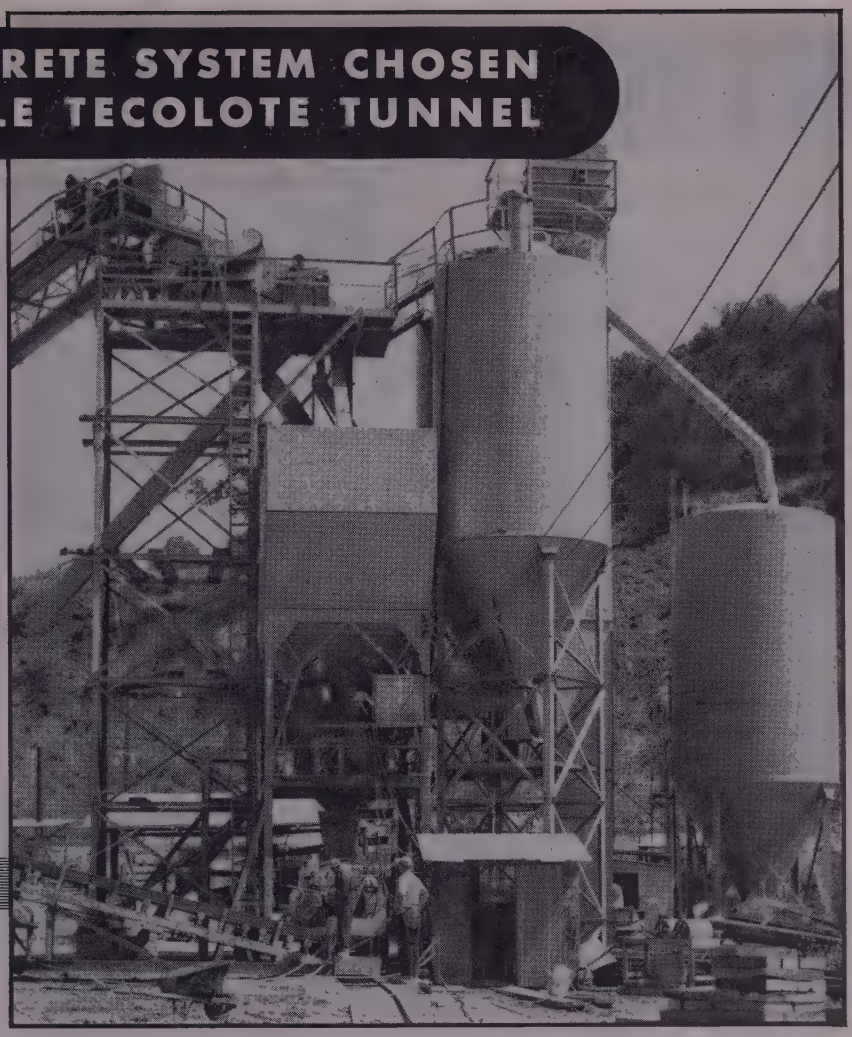
In practice, several external adjustments were necessary. When handle bars were attached to the snout and the operator walked alongside the machine swinging the snout from side to side, the job proved too tedious, and the operator did not have sufficient control over the hose. The final decision, which proved very successful, was the mounting of a seat and a footrest connected to a ball, near the end of the box. Handle bars, which swiveled in a socket on the ball, were then connected to the intake hose near the suction end. This provided the operator with a sweep of 5 ft. and the power to elevate the snout.

For the most successful results, a man walks in front of the machine raking debris off banks into a windrow in the ditch, and another man moves directly ahead of the intake hose to throw box and other outsize objects into the top. The design permits placing of the intake hose on either side of the box to permit sweeping of central dividing strips.

The District VII shop under the direction of George Siebert was responsible for the successful adaptation of this useful piece of equipment.

Man-hours invested in the perfection of this equipment are more than compensated for in the results obtained by the division on road cleaning operations.

NOBLE CONCRETE SYSTEM CHOSEN FOR 6.4-MILE TECOLOTE TUNNEL



At north portal Tecolote Tunnel —NOBLE CA154 semi-automatic plant with NOBLE-built 24" aggregate belt conveyor and three 2000 cu. ft. silos: one for cement batching, one for pozzolan batching, one for storage. NOBLE also furnished tunnel jumbos, concrete hopper cars, 100 feet of 7-ft. circular forms and 300 feet of horseshoe forms.

Tecolote Tunnel, to carry water through the Coast Range to the Santa Barbara-Goleta-Carpinteria area, calls for concreting a 6.4-mile-long, 7-ft. bore. Halvorson Contractors asked NOBLE to supply the entire concreting system from batching plant to telescoping forms. Here's why:

Accurate Batching, automatically controlled by NOBLE's exclusive photo relay, meets exacting specifications of Bureau of Reclamation, U. S. Engineers, State Highway Departments, even under difficult conditions.

Shop Fitting and Marking at factory, both of batching plants and tunnel forms, assures rapid, easy assembly on job. Plants are easily dismantled, moved and re-erected . . . forms quickly stripped and moved.

Bring Concreting Problems to NOBLE

Take a tip from Halvorson and other successful Western contractors; consult NOBLE. Our engineers are ready to help you at every step—estimating, designing, fabricating. We can build a system to fit your exact needs—often from standard units at stock model prices. Let us show you. Wire, write or phone NOW.

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DESIGNERS AND BUILDERS OF
CEMENT AND AGGREGATE BATCHING PLANTS . . . BULK CEMENT PLANTS . . . AGGREGATE BINS AND CEMENT SILOS . . . STEEL FORMS FOR CONCRETE CONSTRUCTION JOBS . . TUNNEL AND DRILL JUMBOS CONVEYORS AND ELEVATORS . . WEIGH METERING DEVICES

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NEWS OF WESTERN CONSTRUCTION AUGUST 1952

Frenchman Hills Tunnel holed through to set a new USBR safety record

HOLED THROUGH on June 27, the Frenchman Hills Tunnel on the Columbia Basin Project set a safety record for Bureau of Reclamation tunnel work, according to H. E. Wersen, district safety engineer. Started in July 1951, the work progressed for 11½ months, resulting in a 9,300-ft. bore 16 ft. in diameter, and only seven lost-time accidents, none of them fatal.

By comparison, the 10,000-ft. Bacon Tunnel, driven several years ago on the same project, involved 93 lost-time injuries and one death.

Frenchman Hills Tunnel has been driven under a contract held by United Concrete Pipe Corp. and Ralph A. Bell, a joint venture bidding from Baldwin Park, Calif. Superintendent on the job is C. C. Harris. Together with Harris, the Bureau of Reclamation safety engineer and resident engineer Fred McCune held conferences before operations started. Advance planning at these sessions contributed both to the successful prosecution of the work and to its safety record.

The horseshoe tunnel section penetrated far more difficult material than had been suspected, and required 700 tons of steel support, about twice the anticipated amount. Only about 1,670 ft. of the tunnel length stands unsupported.

Holing through found the two headings within 6 in. of line and ½ in. of grade. Lining operations commenced almost immediately and will produce a finished section 14 ft. in diameter. The contract allows 3 yr. for completion, terminal date being October 1953.

Albuquerque's highest bldg. gets under way this fall

ALBUQUERQUE'S tallest building is expected to be under construction this fall, according to a recent announcement by the owners, Albert and John Simms. The 12-story office building will represent the first major construction in downtown Albuquerque since the Twenties, and it will relegate the 10-story Hilton Hotel to second-highest status. Plans are being prepared by Flatow & Moore, Albuquerque architects.

The new Simms Building will stand at the corner of Fourth and Gold, replacing the existing 60-yr. old Simms Building, and will also utilize adjacent property now occupied by a service station and parking lot. Total property dimensions are 142 x 200 ft., the longer dimension being in an east-west direction.

Compared in some of its architectural features to the spectacular Lever House recently built in New York City, the new Simms Building will also use heat-absorbent glass extensively on its north and south exposures. Similarly also, its design has been developed to enhance an illusion that the upper portions "float" above the ground floor. Structural columns through first and second floors will be exposed, and the 10 upper stories will overhang the lower levels by 5 ft. on all sides. A patio, planting, and large glazed areas will contribute to the "open" effect at street level.

Cost of the new structure, construction of which depends only on obtaining government permission, is estimated at $1,500,000. The lower floors will be devoted to shops, while 3 elevators will provide access to the upper floors. Total floor space, excluding basement and roof, is 132,000 sq. ft. Structural features will permit the utmost flexibility in office design and placement of interior walls and partitions.

SPECIAL D8 TRACTOR IS PLENTY POWERFUL PACKAGE

From the shops of McCoy Company, Denver, Colo., statewide distributors for Caterpillar Tractor Co., comes news of this Caterpillar D8 tractor equipped with torque converter and supercharged D337 engine. The firm believes this to be the most powerful single engine crawler type tractor in the world. The same type engine is used in DW20 and 21 high speed rubber tired scraper units. It develops maximum horsepower at 2,000 rpm., but is reduced to 1,800 rpm. in this application. Combination of standard transmission and torque converter gives greater range of power output and greatly increases the efficiency of the torque converter unit. The tractor weighs approximately 46,000 lb.

Defense building means new Alaskan construction boom

RE-OPENING of large scale defense building operations throughout Alaska has been announced by the Alaska District Engineer. Funds now available for construction of a multi-million dollar power plant extension at Ladd Air Force Base make practical the early advertising of contracts for many other projects which have been held up pending authority to proceed.

In addition, the Corps of Engineers has invited contractors to bid on a multi-million dollar family housing project for Elmendorf Air Force Base. This contract will call for construction of 340 units of standard 8-family houses and will consist of 43 buildings. An alternate bid for 320 additional units is to be offered for a total of 83 buildings.

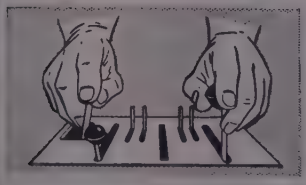
All contractors are invited to bid on an open competitive basis for construction of a power plant extension at Ladd Air Force Base. This project calls for reinforced concrete foundation, steel framing, insulated metal siding and metal decking roofing, 6 boilers approximately 202 ft. by 143 ft., and 4 generators 95 ft. high.

Operating 24 hours per day!

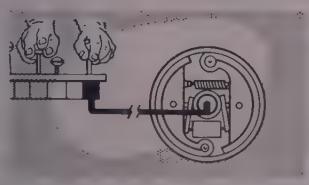
Rugged K-595 steps up output on tough stripping job

Working 24 hours a day, 6 days a week is a grueling pace for any rig. But on a tough stripping operation in Butler County, Pa., this Link-Belt Speeder K-595 with Speed-o-Matic controls and torque converter is doing an "outstanding job," averaging 3600 yds. per day handling a 2¾-yd. bucket with 75 ft. boom. It's remarkably maneuverable for a machine its size, and the operator finds the torque converter especially good in rock, also reports "the K-595 is very good on travelling."

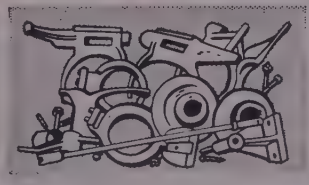
Here are Link-Belt Speeder PLUS FEATURES for extra yardage per shift



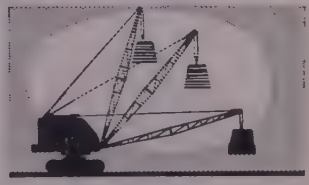
Speed-o-Matic Controls — fully hydraulic! You "feel" the load all the way. Simple, easy—fingers instead of muscles do work.



Speed-o-Matic Clutch, hydraulically actuated, simple, smoothly responsive. Runs cool. Eliminates need for frequent adjustments.



Eliminates up to 150 parts — cuts friction, no worn bushings, pins, links or clutch toggles to put you "down."



Independent Boom Hoist — controlled power down and up. Boom, hoist, swing simultaneously or independently. Optional.

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CORPORATION

Builders of the most complete line of shovels, cranes and draglines

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Riblet, Pacific Northwest C.E. pioneer, succumbs

JULY 5 marked the death in Spokane, Wash., of Byron C. Riblet, a pioneer civil engineer in the Pacific Northwest and designer of aerial tramways built all over the world. He was 87 years old.

Riblet came to the then Washington Territory in 1886, immediately after his graduation from the University of Minnesota. His career thenceforward was always associated with engineering projects in Washington, though his tramway company work subsequently caused him to travel widely. Riblet's earliest work was with the Northern Pacific Railway, for which he laid out many miles of line. A later notable association was with Washington Water Power Co., for which he engineered the company's first streetcar system.

In 1897 Riblet built a tramway in British Columbia. His success there and his improvements in the field of tramway engineering led to his formation of the Riblet Tramway Co. of Spokane. Over the ensuing 50 years, he built an estimated 300 mi. of tramways, both industrial and passenger carriers located in Peru, Bolivia, Chile, Alaska, Hawaii, and Yugoslavia. In recent years his designs have been adapted to resort use for ski lifts.

Accorded many national engineering honors and a member of many engineering organizations, Riblet belonged locally to the Northwest Mining Association. He is survived by his wife, two daughters, and two grandsons.

375-ft. water main section laid in one piece in L. A.

A SECTION of 16-in. water main 375 ft. long was assembled and laid in one piece last June by Smale & Robinson Co. on a $40,840 contract for the Los Angeles Department of Water and Power. Location of the work was Cerritos Channel, which separates Terminal Island from the mainland at the Los Angeles municipal harbor. Connecting sections of the main are suspended beneath a drawbridge across the channel, while the new length of pipe drops to channel bottom at either end of the 235-ft. lift span.

The pipe was assembled in its necessary U-shape, having a base 235 ft. long and arms of 70 ft. each. Barged to the site and handled there by two derricks, the 34-ton pipe was swung clear and lowered into position. A channel depth of 55 ft. meant that 15 ft. on each arm projected from the water for fitting to the connecting main. Divers assisted in guiding the pipe into a trench excavated beforehand in the channel bottom.

Joint connections are fully flexible to permit both horizontal and vertical movement of the submerged section since subsidence is a problem in the area. It was this fact that brought about the work, a previous cast-iron main having required frequent maintenance due to increasing strains caused by the subsidence. The new pipe is steel.

nterior Dept. grants award or Hungry Horse ideas

EVELOPMENT of a revolutionary rvey control method that is resulting improved accuracy and substantial vings in survey costs in construction Hungry Horse Dam in northwestern ontana has won Department of the nterior superior accomplishment wards for three Bureau of Reclamation nployees, C. H. Spencer, Construction ngineer at the Hungry Horse Project, id recently.

The one-step pay increase awards ere granted to E. J. Niemen, Field Enineer; A. A. Brownson, Chief of Genal Surveys, and C. I. Beck, Chief of am Surveys at the Hungry Horse Projt, upon approval by Harold T. Nelson, egional Director for the Bureau of eclamation at Boise, Idaho.

Basically, the new survey method, hich is the result of the joint efforts of he three Bureau engineers, involves doption of an optical plummet to proct vertical survey control lines upward s the huge concrete dam grows in eight. Block layout for location of penocks, elevator shafts and other features accomplished with much greater accucy, and at a considerable saving in me and labor by using the vertical conol lines obtained with the optical plumet as compared with previous survey ethods.

Use of the optical plummet survey ethod eliminates the need for one field arty, and Bureau of Reclamation engieers estimate that total savings at the ungry Horse Project over a 2-year eriod will be approximately $37,000.

luge construction program or Camp Beale planned

LANS have been completed for conruction exceeding $6,000,000 to rectivate Camp Beale, Calif., as an Air orce training center. Officials reported hat architects have completed drawings or airmen's housing, bachelor officers' uarters, dining and supply facilities, in ddition to administrative buildings, ase communications, a bakery, and a re station. Completed plans also include habilitation of railroad facilities serg the base, motor pool installations, ttendant shop buildings, and a new priary and secondary electric power disibution system.

Camp Beale, a World War II rmored Forces training center near arysville, is being reactivated as a aining base for aviation engineer force oops. Contracts have already been warded for more than $4,000,000 of the ork, and construction is to be cometed next March. Some of the conacts went to A. D. Schrader Co. of San rancisco for rehabilitation of the railad facilities; and to Stolte, Inc., and orrison-Knudsen (a joint venture) of akland for part of the airmen's dormiries, dining and administrative facilies.

Action gets under way on Sutherland Dam, San Diego

SUTHERLAND DAM in San Diego County, Calif., is the scene of new construction activity now, with work on a $2,896,485 contract getting under way after a lapse of 25 years. The San Diego city council awarded the work to a joint venture of Bent Construction Co. and the Daley Corporation on June 19. Bids had been opened on June 10.

Sutherland Dam construction on the San Dieguito River was stopped by financial and political difficulties when approximately 25% completed. The new work, undertaken with funds from a bond issue recently voted by the county citizens, is therefore termed a completion contract. The 164-ft. high dam is of the multiple arch type and will impound about 37,000 acre feet of water from a 53-sq. mi. watershed.

In connection with the dam completion, bids were also taken for the Black Canyon tunnel on the Sutherland-San Vicente conduit. These bids were still under study following the dam award, as the lowest, at $344,532, was nearly 40% above the engineer's estimate of about $250,000.

New highway district set-up in Colorado—its fourth

FORMATION of a new state highway engineering district in Colorado was marked in July by the opening of operating headquarters in Greeley. The partition of District 1 resulted in assignment of the following counties to the new District 4: Sedgwick, Phillips, Logan, Washington, Yuma, Morgan, Weld, Larimer and Boulder. District engineer is Lawrence C. Bower, formerly district construction engineer at Steamboat Springs.

Colorado's state highway operations are now conducted through four districts, the other three having headquarters at Denver, Pueblo, and Grand Junction.

Ore. spends record funds on '52 highway construction

A RECORD annual expenditure for highway construction purposes in Oregon will be realized at the close of the current fiscal year in September, according to press reports. A bond issue in 195 has been partially responsible for the state's ability to spend $60,000,000 on highways this year, as opposed to a pa normal volume of $20,000,000.

W. C. Williams, assistant state highway engineer, noted that the expanded work schedule had been met in spite of a shortage of engineering personnel in his department. Long hours by the engineers, coupled with capable contractors have helped the work. Also, competition for contracts has been high, adding to fast prosecution of the work.

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Loading, hauling and dumping material like this at a rate of 15 pay yards per trip is profitable earth-moving production. The material is composed of clay and stone, of glacial origin and is very abrasive.

ROCHEZ BROS., INC. are knocking off the top of a mountain . . . three million tough yards . . . for a Supply Depot in the Pocono Mountains at Tobyhanna, Pa. They're really giving their six LPC rigs a workout. But in their TS 300 Motor Scrapers they've got all the features it takes to lick the tough jobs . . . big capacity, 14-yds. struck and 18-yds. heaped (Rochez Bros. are getting 15 pay yards each trip) . . . speeds over 22 miles per hour for lower cycle time (one 2000-ft. cycle in approximately 3½ minutes for Rochez Bros.) . . . easy loading characteristics in the roughest conditions (a minute and 11 seconds average loading time on the Rochez Bros. job), plus positive forced ejection and the extra high apron lift that speeds dumping of heavy clay and large stones. In addition, LPC Motor Scrapers give you the power you need for severe conditions like this . . . your choice of either a 280 HP Buda or a 275 HP Cummins Diesel.

Whether your earthmoving job is tough or easy, you'll find these and the many other features of TS 300 Motor Scrapers will make money for you. Get job figures and facts from your LaPlant-Choate distributor today!

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Maricopa County, Ariz., asks highway budget increase

THE BUDGET REQUEST submitted by the highway department of Maricopa County, Arizona, for the new fiscal year shows a 10% increase over that of last year. Seeking $1,243,000, County Engineer Howard Shelp is still faced with what he has called a $20,000,000 deficiency in county road construction and maintenance (*Western Construction*—June 1952, p. 81). The new budget, submitted to Maricopa County supervisors in June, includes three general classifications of funds: salaries ($740,000), materials ($489,000), and social security ($14,000).

Still no action on master sewerage plan for Salt Lake

SUBMITTED to the municipal commissioners of Salt Lake City last March, the master sewerage plan for that city prepared by the engineering firm of Clyde C. Kennedy has not yet been adopted. Extra studies by the city to date have included an investigation of eastern bond markets and a survey of other financing methods used elsewhere.

Action should be taken in the near future, however, as various parties are pressing the Salt Lake City government for decision. The consulting firm would like to proceed with detailed plans for actual pumping plant and trunk sewer installations in the hope that adoption of the overall plan would permit construction next year. The city engineer has urged a decision in order that determination of affected property may be made. And, finally, real estate interests seek future sewerage information as they proceed with subdivision planning.

A brief description of the sewerage plan appeared in *Western Construction* for May 1952, p. 96.

Water resource progress told in Oregon report

INCREASING consciousness of the valuable role of water resources in the West is documented in a recent report submitted to Governor Douglas McKay of Oregon by Curtiss M. Everts, chief state sanitary engineer. Reflecting also a spectacular growth in one field of engineering construction, the report states that anti-pollution expenditures since 1946 along Oregon's Willamette River alone have totaled $17,500,000. New works during the 5-yr. period covered by the report include 280 sewage disposal plants.

Everts emphasized the cooperation of industry along the river in achieving the progress measured to date. Virtual completion of the program for cleaning up the Willamette will require construction of treatment plants by at least nine more municipalities. Construction funds being expended in the work this year amount to $3,117,500.

G.P. does *double duty* for "Flying Truckman"

Hauling materials to and from construction jobs all over California ahead of vital deadlines is one thing... but doing it at a profit is another

John Wagner, owner of the Fairfield Trucking Co., of Fairfield, Calif., claims that General Petroleum products and service provide his fleet with double-duty benefits—allowing him to make even the roughest hauls well within established schedules and keeping his maintenance costs down through proper use of multi-purpose lubricants.

Piloting his private Navion plane all over the State, the "Flying Truckman" supervises earth-moving and hauling jobs from Laguna Beach to Oakland... from El Toro to Salinas.

"In order to operate successfully our equipment has to be on the job—day or night. G. P.'s representatives have helped us keep 'em rolling for seven years... they really know our problems," Wagner declares.

Fairfield Trucking Co. owner John Wagner, right, confers with his Northern California superintendent John Wallace and G. P. representative Doug Tait, left, prior to boarding his private Navion plane.

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11-21

USBR plans to give back this river's course

BUREAU OF RECLAMATION officials are planning to develop "a way out" for Oregon's Lost River.

At the present time the river starts near the California-Oregon line, flows north for a short distance and then disburses itself in a fan-like pattern to be swallowed in a 6½-mi. long swamp.

Here is the point where the Bureau will come to the rescue. A channel will be dredged through the swamp to the beginning of the natural channel where the river picks up again, flows through Klamath County on its way to California's Tule Lake sump.

Construction job turns up a buried brick building

BUILDERS of state capitol facilities in Sacramento have uncovered some surprises for the citizens of California's capital city. Most recent is the discovery by B & B Construction Co. of an ancient brick building buried under Ninth St. in the path of new power and telephone conduits. Students of early Sacramento history are baffled by the discovery, and amateur archeologists are having a field day. Old timers believe the building was erected before Sacramento streets were surveyed about 1850.

In 1860, Sacramento downtown streets were filled in to second-story level of most buildings, with first stories becoming basements. This was a flood precaution measure. At that time, the city has a list of all existing brick buildings, but the building uncovered under Ninth St. is not listed.

Old hammered-out square nails indicate the building was erected in the early 1800's. Other than the brick walls, only heavy redwood timbers for a frame roof are clues to the building's identity.

With several construction jobs under way in and around the new capitol building, other interesting and unexpected discoveries have been made. During installation of a vault in the basement, workmen drilled into heavy brick structural arches designers had not known existed. Plumbing around the vault therefore had to be re-routed. Bulldozers at one time tore up some old brick fish ponds on the capitol grounds. These were converted into flower beds.

Another covered bridge gives way to progress

ONE OF THE FEW remaining covered timber bridges in the Northwest will soon disappear. It is the Fields Bridge across the Tualatin River near Willamette in Oregon. Elimination of the narrow bridge and several curves in the highway route which includes the bridge made a new structure desirable. Lindstrom Brothers Co. of Portland is carrying out the contract for the entire job.

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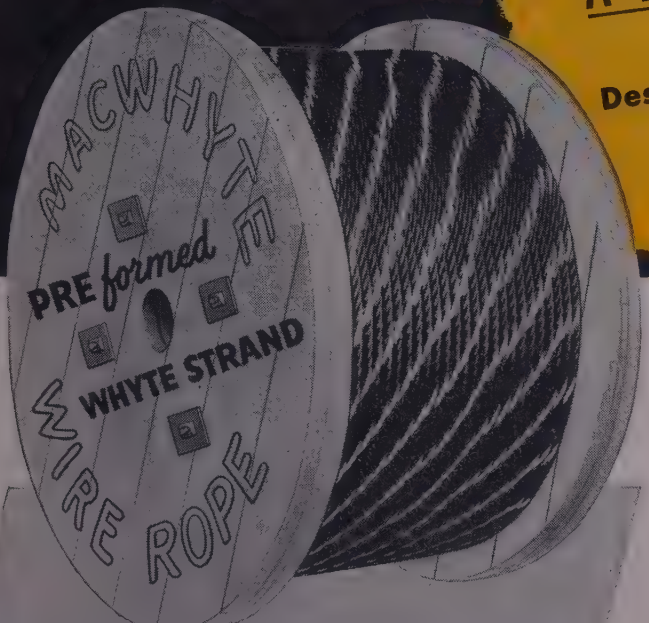

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ASCE holds summer meet in Denver, Colorado

WITH THE PROGRAM built around the engineering facilities and personnel of the Bureau of Reclamation, the American Society of Civil Engineers held its summer convention in Denver, Colo., during the week of June 16-20. With a registration of more than 1,000, those in attendance were able to attend the usual meetings of the technical divisions, spend a full day at the Bureau of Reclamation headquarters including an inspection of laboratory facilities and were otherwise entertained at social functions. The women were particularly well taken care of, including an all-day trip to the historic community of Central City.

General chairman for the convention was Alfred J. Ryan, with Robert F. Blanks vice-chairman, and R. N. Tracy chairman of the arrangements committee.

The presidential address by Carlton S. Proctor called for greater participation by American engineers in the planning of the country's future courses and policies. Speaking before assembled engineers, Mr. Proctor pointed out the increasing importance of engineering accomplishments in the nation's struggle to avoid a third World War.

Commenting on the responsibility of engineers toward guiding the nation's destinies, Mr. Proctor declared, "No longer may we remain indifferent to the social impacts, the economic implementations and the cultural repercussions of our work and inventions.

"No longer can we bury our heads in the sands of our chosen branch of engineering technology and escape the accusing eye of those who look to us for guidance and accurate road directions.

"No longer may we hide behind our slide rule and expect to be able to maintain the stewardship of our God-given privilege to utilize and direct the forces of nature for the benefit of mankind.

"And no longer may we shirk our responsibilities for direction of the educational training of the young men coming into our profession . . . "

Proctor, in an interview, also declared that ASCE is wholeheartedly in favor of supporting construction of self-supporting toll superhighways, such as the Denver-Boulder turnpike and the New Jersey turnpike. This type of road, he declared, does not impose a further strain on already overburdened taxpayers. Mr. Proctor also pointed out that surveys show motorists would gladly pay toll for the privilege of driving on well-built super roads.

Some of the outstanding papers given included one by Roderick L. Downing, professor of civil engineering at the University of Colorado, on the Boulder-Denver turnpike. Professor Downing was literally the "father" of the big project. Another provocative paper was that of Col. L. J. Lincoln, District Engineer for the Corps of Engineers in the Kansas City district. He pointed out that during the devastating Kansas floods last year, prompt action by health authorities completely averted a deadly typhoid epidemic. He added that modern sanitary know-how and prompt action can, in future, prevent epidemics in disaster areas.

Savings in time and money by surveying from helicopters in Alaska were described by Gerald FitzGerald, Chief Topographic Engineer of the U. S. Geological Survey, Washington, D. C. So successful has this been, he declares, that other public agencies are adopting this aerial survey method. At another technical session, Henry A. Barnes, Denver Traffic Engineer, declared that present Denver public transportation concepts—and, by implication, those elsewhere—will have to be drastically altered within a few years. He pointed out that money spent on improved, ultra-modern public transportation can enable transit to do the job of transporting city dwellers more effectively than street and highway projects costing many times more.

The first day of the convention was devoted to an open house at the Bureau of Reclamation engineering center, with papers covering the fifty years' history celebrated in 1952 by this organization. The principal paper was presented by Kenneth Markwell, assistant commissioner. Following luncheon at the center the group inspected the laboratory facilities of the Bureau.

The technical divisions holding sessions at the Denver convention included the construction division, engineering

Continued on page 116

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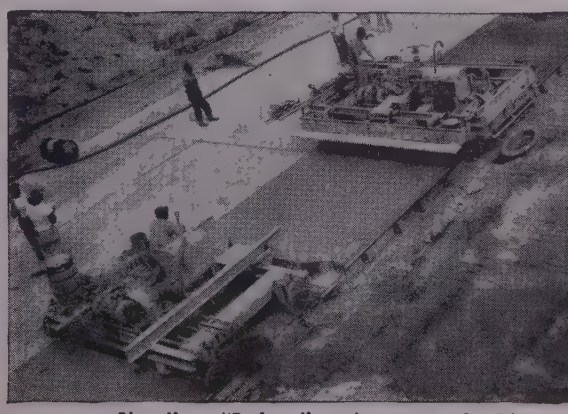
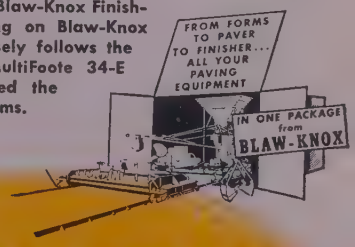


Blaw-Knox "Package" equipment on the Edens Expressway near Chicago. Blaw-Knox Batching Plants for aggregate and cement were used to insure accurate batching. The Blaw-Knox Spreader with vibratory pan attachment assured satisfactory and economical placement of the low-slump, air-entrained concrete. The Blaw-Knox Finishing Machine, also riding on Blaw-Knox Steel Paving Forms, closely follows the Spreader-Vibrator. A MultiFoote 34-E Dual Drum Paver placed the concrete between the forms.



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PAVEMENT SUBSEALING

Continued from page 73

work has been done by itself as a minor form of reconstruction. Due to its specialized nature and because the various jobs are scattered and of short length, subsealing is done only by state forces. The described job was 1.5 mi. long, while two other typical ones in the area were .75 and .2 mi., respectively.

Also because of the distribution and short duration of the jobs, subsealing equipment spreads and operating crews are not maintained in all highway districts. The work near Salinas was performed by sign and striping crews that have been trained in the technique. Equipment for the work—two crews involved—came from Districts IV and VII, San Francisco and Los Angeles. Personnel in each crew totaled 14: foreman, assistant foreman, 4 operators on the injection apparatus, 1 operator on the asphalt truck, 1 operator on the drill truck, 1 drill operator, 1 operator on the pick-up truck that transports personnel and accessory equipment, 1 laborer wetting down drilled holes, 1 acting as flagman and 2 engaged in cleaning and grouting the completed work.

District Engineer in charge of the described work is E. J. L. Peterson, with headquarters in San Luis Obispo, Calif. P. L. Dito is the District Maintenance Engineer.

LISTENING IN ON A LEAK

Continued from page 80

leak noise is present. An originally low noise level in saturated sediments is further lowered in transmission through moist overburden.

Considering that numerous drill holes are often necessary to spot a leak, it may be seen how important it is that the alignment of all other utility services in the immediate vicinity be accurately determined. On one occasion a drill bit nicked a high voltage conduit that had not been previously located. Fortunately, the current was such that the bit was fused off almost immediately, before the drill operators received more than a slight jolt. On another job, drillers went through a major telephone trunk line, cutting over 1,500 pairs. Since these incidents, the leak detection crew has been exceedingly careful, using the pipe and cable finder extensively to locate all possible services lying near Department mains.

Personnel

George W. Pracy is general manager and chief engineer of the San Francisco Water Department. Leak detection operations are under the general direction of Oscar G. Goldman, superintendent of city distribution. A. G. Zecher, general foreman of main pipes, supplied the information for this article. The present leak detection crew consists of Robert Nelder, inspector; Paul Cartwright, operator, and Pat Mullins, laborer.

Mont. looks ahead to big highway program year

A $12,000,000 highway construction program for Montana during the current fiscal year (1952-53) is anticipated by the state's highway commissioners on the basis of estimated revenues and the matching of Federal aid funds. Primary system roads, with $3,232,300 of state money, will thereby have a total budget of about $7,500,000. Secondary roads, financed with $1,994,000 of state funds, will receive a total of about $4,600,000.

Even this program falls short of using all Montana's share of Federal money, there being insufficient revenue in the state to match an outstanding Federal contribution of $1,500,000. Furthermore, unobligated Federal funds from previous years still stand available if the state could finance its share.

Seeking better utilization of the funds that the state is presently able to obtain from both local and Federal sources, the highway commission is considering new methods of allocating its highway construction budget. One proposal is to establish a state secondary system, to be under state control. The present so-called secondary system consists of county roads which receive Federal aid as county roads. A state-controlled system would permit new construction on well-traveled routes which lie outside both existing networks.

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ASCE meeting

Continued from page 110

mechanics, irrigation and drainage, soil mechanics, hydraulics, air transport, waterways and sanitary.

The construction division at its first session, which was presided over by A. H. Ayers, chairman of the executive committee, heard papers reviewing construction planned and in use for building Dam No. 22 for the Denver water supply system and a review of the construction problems and procedures at Hungry Horse Dam. The first paper was presented by George P. McIndoe, assistant project superintendent, Macco-Puget Sound Co., and the second paper was given by Clyde H. Spencer, construction engineer for the Bureau of Reclamation on the Hungry Horse Project. An important feature of Mr. Spencer's review described the program for carrying out joint discussions between engineers and contractors during the course of the construction program to reduce misunderstandings and the problems normally arising between the design planning and actual field work. This cooperation was particularly essential on the Hungry Horse Project since the climate required that the job be completely shut down and started again each year. Mr. Spencer indicated that the Bureau considered the plan for joint meetings most effective in its reduction of difficulties.

At another session of the construction division (held jointly with the structural division) a series of three papers reviewed the design and construction problem for the Granby pumping plant on the Colorado-Big Thompson Project.

Following the convention, plans had been made for several excursions to local engineering projects including a trip over the Colorado-Big Thompson work.

Wets vs. dries— in weathermaking

THE RAINMAKERS have met their nemesis. Jack Hubbard, a meteorologist of Olympia, Wash., says he has discovered chemicals powerful enough to "dry up a continent." Here is the significant paragraph in a report he made recently before a meeting at Corvallis.

"Through several years of intensive research, we have developed a method of cloud dispersal which has been tested under severe weather conditions. We believe that by enlarged and intensive operations it would be possible to dry up a nation or a continent for a considerable period of time. We believe that we are working with an ultimate weapon which has greater implications than the rain inducers have yet developed."

According to Hubbard, specially prepared chemicals act like sponges in drying up clouds and dispersing them. Only small amounts of the chemical are used because large amounts would dry up tremendous areas.

Contractors, who like to work in-the-dry, should be interested in Hubbard's method.

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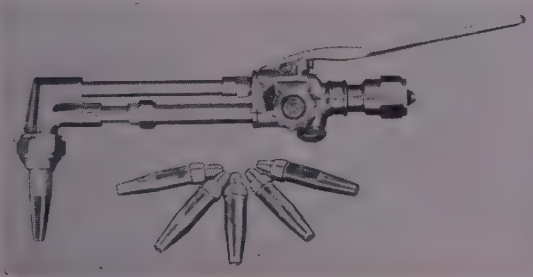

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NEW BOOKS

TOLL ROADS AND THE PROBLEM OF HIGHWAY MODERNIZATION—Owen and Dearing

Timeliness makes this book a standout, for it delves into the toll road, which once vanished from the American scene, yet is today a common occurrence once again. This book discusses the failures or mistakes in administration which have made the toll road a necessity once again, if American roads are to be modernized and maintained to keep up with the increase in vehicular traffic. The authors discuss the advantages and disadvantages of the toll road system, and they suggest remedies in the public policies, which have made the toll road stage a comeback. Wilfred Owen and Charles Dearing have an interesting subject, well-treated in this informative book. Published by The Brookings Institution, Washington, D. C. 204 pages. 5½ x 8½. Priced at $2.50.

RECLAMATION IN THE UNITED STATES—By Golzé

Here is a comprehensive study of this important subject written by Alfred R. Golzé, Director of programs and finance for the Bureau of Reclamation. It discusses irrigation and hydroelectric power components, showing the relationships and interdependence of the two. Golzé includes sections on the economics of reclamation, and indicates the importance of economics to the engineer who will engage in the water resources field. The author covers all recent advances in water resource development in the West, with the emphasis upon the growth of the multi-purpose project, the growth of the public and private power program, and the need for the modern reclamation project. This is a complete story of the reclamation field today, written by a man who really knows it. Published by McGraw-Hill Book Co., Inc., New York, N. Y. 451 pages. 6½ x 9½. Priced at $6.00.

ELEMENTARY STRUCTURAL DESIGN—Harris

A practical easy-to-read approach is used by Charles O. Harris, chairman of the Civil Engineering Department, Michigan State College, for this book. He writes about design and the principles of structural design with considerable attention given to strength of materials. This is a fundamental treatment, ideal for the student. The material is up-to-date and selected for its applicability in the field rather than as a basis for a theoretical discussion. Chapters include information on: equilibrium, centroid of an area, moment of inertia, beams, reinforced-concrete floor slabs, etc. Each chapter ends with a set of review questions, answered in the back of

the book, so that the reader may check himself on the information presented. Published by American Technical Society, Chicago, Ill., 163 pages, 8½x11½. Priced at $4.90.

SOIL ENGINEERING—Spangler

An introduction to soil engineering for those who must work with the soil in construction or engineering and yet have no specific background in the science. Civil engineers should find this text a more or less introductory volume to soil engineering. The author Merlin G. Spangler, C.E., Iowa State College, has a good comprehension of the construction field and the soil engineering knowledge required in the construction of dams, irrigation systems, underground conduits, foundations, highways, etc. Published by International Text Book Co., Scranton, Pa. 458 pages, 6 x 9½. Price $6.50.

CRANE AND HOIST ENGINEERING —Edited by G. A. Mitchell

The design, construction and application of cranes is covered in this well illustrated volume. It begins with a dictionary of crane types and how to select one to suit your purposes, and ends with a discussion of how to modernize older cranes. The book was compiled by the engineering staff of the Shaw Box Division of Manning, Maxwell & Moore, Inc., with engineers, schools and colleges in mind. All dimensions and construction details concern the Shaw Box line of cranes, with much for the construction field. Diagrams, photos, and mechanical features are thoroughly discussed. Published by Manning, Maxwell & Moore, Muskegon, Mich. 160 pages, 8¾ x 11¼. Priced at $3.50.

TECHNICAL REPORTING, by Joseph Ulman, Jr., MIT, should interest any man whose work includes the writing of material within the framework of his engineering, scientific or technical organization. With a copy of this book the author feels the reader will become better able to express himself in his reports, descriptions, memorandums, etc. Self-expression is sometimes the most important part of a job, and getting over one's ideas in written form is an easy matter, according to Ulman, if you once learn how to write clearly and swiftly about your field. Published by Henry Holt and Co., New York, N. Y. Priced at $4.75.

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ENGINEERS ON THE MOVE

Colonel Norman A. Matthias is now district engineer at Seattle, Wash., according to **Lt. Gen. Lewis A. Pick,** chief of engineers. Matthias comes West from a post as instructor at the Industrial College of the Armed Forces, Ft. Lesley J. McNair, Washington, D. C. Matthias replaces **Col. John P. Buehler,** district engineer in Seattle since 1950. Buehler moves to Washington, D. C., for assignment as assistant Chief of Engineers for Military Construction, Air Force.

W. T. Mulkey is now in charge of concrete work for the Bureau of Reclamation at Palisades Dam, tunnels, powerhouse and outlet works. Mulkey was formerly field engineer for the P1 lateral job at Otello, Wash. He also served as field engineer on the North and South Coulee Dams.

E. B. Skeels, Atkinson-Jones Construction Co. general manager at the joint venture's Hanford Works, is retiring after 45 years in the construction field. Skeels is a vice president in the Guy F. Atkinson Co., and he will be replaced as general manager by **Williams A. Kettlewell,** also one of the firm's vice presidents.

George E. Hatch, formerly civil engineer with the Corps of Engineers in the Honolulu area of the San Francisco district, is now concerned with paving and materials for the South Pacific Division with headquarters in San Francisco.

Howard Stites, former city engineer of Burbank, Calif., has resigned his post as city manager.

Clarence C. Davis, Lookout Point Dam resident engineer for the past nine months, has been recalled to active duty as a colonel in the army. Davis will be replaced as civilian engineer by **Tom G. Waring.**

Louis Jansen and **R. Melvin Pottenger,** Sacramento, Calif., have opened a concrete producing plant. Noble Company of Oakland, Calif., was the designer of the steel plant which is semi-automatic. Both men have been active in contracting and engineering circles in the Northern California city.

The American Institute of Steel Construction announced winners of ten $1,000 scholarships in civil engineering awarded in its third annual scholarship program. Westerners involved in receipt of the awards are: **Frank M. Newcomb,** Great Falls, Mont., who was sponsored by Gate City Steel Works, Omaha, Neb., and **George J. Strom,** Oakland, Calif., sponsored by Schrader Iron Works, San Francisco.

Several prominent members of the California Department of Public Works divisions have announced their retirements. **James M. Hodges,** supervising highway engineer on the District VII staff, has announced his retirement. Hodges has been a member of the highway division since 1914. **Stanley C. McCulloch,** associate materials and research engineer, has retired after 28 years of service. **J. B. Hodges,** office engineer in District III, is retiring after 31 years of service.

R. J. Allred, formerly engineer with Colorado Constructors, Inc., Denver, Colo., is now engineer on Jemez Dam construction for Hinman Bros., Denver. Layout of the dam, spillway and outlet works is under way.

Kenneth A. Dye, formerly with Guy F. Atkinson Co. on construction of Rock Island Dam, is now a construction supervisor for the California Department of Public Works' Division of Architecture. He is headquartered at Patton, Calif., where the state is building a reinforced concrete hospital building.

Samuel F. Turner, since 1939 the ground water division head for the U. S. Geological Survey, Ariz., is retiring. Turner announces that he will open an office as a consulting engineer, specializing in ground water problems.

R. W. Beck & Associates, Seattle, Wash., engineering firm, is organizing a department of hydraulic engineering. **John R. Wallace, Jr.,** will head the new department.

Elmer E. Soniville, formerly junior assistant engineer, Lewiston, Idaho, is now city engineer for Coeur d'Alene, Idaho. Soniville replaces **Joe H. Latimore,** who assumes new duties as city manager in Twin Falls.

Harold W. E. Larson, Bureau of Reclamation land classification and soil investigation expert, is en route to Iraq to cooperate with that government in outlining an investigation program to increase food production.

David S. Stoner, Sacramento, Calif. employee of the U. S. Bureau of Reclamation, is back from India where he served as a technical advisor to the country on irrigation development. In Sacramento, Stoner performs engineering duties in the Operations and Maintenance Branch.

Foreign assignment has been given two more Bureau of Reclamation men under the Point Four program. **Clement T. Douglass, Jr.** and **Fred H. Hartz,** engineers from Denver, Colo. and Sacramento, Calif., respectively, are presently en route to New Delhi, India. The Bureau staffers will serve as advisers to India's Central and Water Board on dam and powerplant design and construction problems.

Orin A. Chase, bridge engineer with the Oregon State Highway Department, retires after 32 years of service. Chase designed the Youngs Bay bridge near Astoria and assisted in designing many major crossings in the state.

William S. Chamness, assistant chief building inspector, San Diego, Calif., resigns his post to enter private contracting in the area.

Harold F. Schwartz, formerly chief inspector at the Wallula Project office, Ore., of the Corps of Engineers, is now assistant project engineer for the Corps on the Pasco-Kennewick Project at Kennewick, Wash.

F. D. Eason retires after 32 years of service to the Oregon State Highway Department.

Arnold F. Downer, owner of Downer & Co., one of the largest firms engaged in the New Zealand construction industry, recently visited the West Coast. The firm is now working with Morrison-Knudsen Co., Inc., on an Australian project.

Engineering offices of Penfield and Smith, Santa Barbara, Calif., are brand new, but very much in the tradition of the California coastal town. Partners, **Delbert D. Smith** and **Wallace C. Penfield** are well pleased with their new center of operation, which offers clients plenty of parking space.

CALENDAR OF MEETINGS

August 9 — Northwest Engineers Centennial, Multnomah Hotel, Portland, Ore.

August 24-27—58th Annual Congress of the American Public Works Association, Los Angeles, Calif.

August 27—General Meeting, Los Angeles Section, ASCE. Meeting of Junior Forum, also.

September 3-13—American Society of Civil Engineers, Centennial Celebration, Conrad Hilton Hotel, Chicago, Ill.

September 15-20—International Symposium on the Chemistry of Cement, London.

DEATHS

Oscar W. Odell, 86, retired contractor and builder, died June 1 in his Pasadena, Calif., home. Among the outstanding projects Odell helped to construct is March Field Air Force Base.

Theodore L. Witt, 59, contractor and builder, died June 1 in his Milwaukie, Ore., home.

Robert C. Peel, 29, former chief of party for Drake Puget Sound Co., died May 31 in Salt Lake City, Utah.

David G. Saville, 25, Halper Construction Co. executive, died May 11 in an automobile accident near Coronado, Calif.

Wade Hampton Wine, 72, president of the contracting firm bearing his name, died after a long illness in Reno, Nev., June 7.

Arthur E. Ferguson, 71, former resident highway engineer for Idaho, died May 12 in Salt Lake City.

T. A. Tucker, 58, employee of Cheyenne, Wyo.'s, city engineering department, died May 16 in Cheyenne.

Elling M. Halvorson, president of Halvorson Construction Co., died June 14 in St. Paul, Minn., while visiting. Halvorson's firm is building Tecolote Tunnel, near Santa Barbara, and working on the Seward-Anchorage Highway.

George W. Meranda, 48, foreman of the maintenance and construction division of Mountain States Telephone and Telegraph Co. for 20 years, died June 14 in Ogden, Utah.

R. C. Sheedy, building contractor, died June 20 in Placerville, Calif.

Willis T. Knowlton, 80, former consulting engineer for Los Angeles, Calif., died June 17 in his home.

Florian B. Jackman, 80, retired building contractor, died June 21 in his Los Angeles, Calif., home.

O. R. Squire, 49, contractor, died July 6 in Texarkana, Ark., from injuries sustained in an automobile accident. Squire was a contractor in Mesa, Arizona.

Horace McDowell, 79, owner of McDowell Construction Co., Lamar, Colo., died in Denver June 23. McDowell's firm constructed Twin Lakes Tunnel.

Clyde Fietkau, 34, construction maintenance worker, died June 21 in Missoula, Mont., of injuries received from a construction accident. Fietkau was repairing a crane boom when it fell upon him.

C. Don Field, 53, president of the City Board of Public Works, Los Angeles, died June 9 of a heart ailment.

Horace Shidler, 58, building contractor, died July 6 in Las Vegas, Nev., after a series of paralytic strokes. Shidler has developed many subdivisions in So. Calif. and other parts of the West.

Harvey M. Hickok, 78, retired civil engineer, died July 7 in his Sierra Madre, Calif., home.

Robert Leslie Wilson, 70, building contractor, died in Santa Ana, Calif. Wilson, who had lived in Santa Ana and Tustin for 30 years, was at one time president of the Orange County Contractors Association.

Albert Andreen, 65, superintendent, died June 29 in Lakewood, Colo. Andreen was masonry superintendent for F. J. Kirchhof Construction Co. for thirty-five years.

Jack Robert Stone, 37, construction worker, was electrocuted June 28 in Wenatchee, Wash., while at work for Washington Water Power Co. Stone was a native of Conrad, Mont.

SUPERVISING THE JOBS

Carl M. Halvorson holds a $1,152,953 contract for construction of a crushed rock surface on 4.8 mi. of the Boise-Stanley Highway (Lucky Peak Dam relocation), Boise County, Idaho. **R. E. Robertson** is the superintendent for the job.

D. G. (Arky) Wills is superintendent for Midland Constructors, Inc., on clearing, and construction of Madras-Redmond, 230-kv. transmission line, Jefferson-Deschutes counties, Ore. Midland Constructors, Inc., holds the $180,494 contract.

N. G. Thorn is job superintendent for Coates Construction Co. of Portland, on construction of Lane Towers Apartments, Eugene, Ore. The 11-story, reinforced concrete structure will cost $1,500,000. **Sam Boyes** is labor foreman, and **Ed Cox** is cement finisher foreman.

Construction of the 3-story, brick-faced School of Business Administration for the University of Oregon at Eugene is under the supervision of **F. W. Shininger. George Ketchum** is carpenter foreman and **Charles Dorr** is labor foreman for Bickford Construction Co., holder of the $400,000 contract.

M. M. Spier is general superintendent for Goldie Gentle on the construction of a 2,000,000-gal. water reservoir at Ephrata, Wash. **Willard Shuel** is carpenter foreman, and **Arnie Bayless** is labor foreman.

Howard C. Daniels is supervising a survey party for work in preparation for the Colville-Republic 115-kw. transmission line.

Fred Bernard is general superintendent for Fredrickson & Watson on highway construction 5 mi. east of Gilroy, Calif.

H. N. Allinder, formerly working at the Gaviota Tunnel, Santa Barbara, Calif., is now with Palmer Constructors of Anchorage, Alaska, on another tunnel job.

Burt Brewer is superintendent for Anderson Bridge Construction Co. on the Kalama River Bridge in Cowlitz County, Wash. **Axel Malstrom** is concrete and excavation foreman on the $262,900 project.

Highway construction near Folsom, Calif., is under the supervision of **Pop Goetz** for Brighton Sand & Gravel Co. **Emmett Allen** is ramrodding the dirt moving operations using **Joe Vicini's** equipment. **Gene Dougerty** is project manager and **W. J. Campion** is resident engineer.

J. H. Wright **is superintendent for R. A. Heintz Construction Co. on levee construction job near Richland, Wash.**

James A. Kenealy is superintendent and **Hugh Hartley** is his assistant on construction at State College, Sacramento, Calif. **Charles Dolce** is foreman. **W. Evans** is office manager on the Sacramento Construction Co.'s $126,000 project.

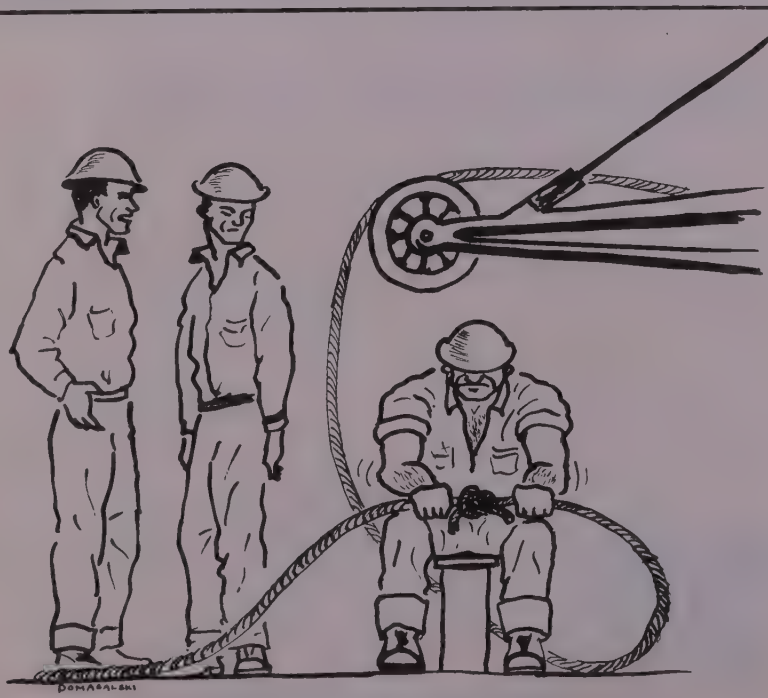
Grading, surfacing and oiling Beaver Tail Hill, 25 mi. east of Missoula, Mont., under $800,000 surfacing and $200,000 oiling contracts is under way by Kiely-Union. **Earl Wilcox** is grading superintendent and **C. R. Pilcher** is surfacing superintendent. **E. A. Taylor** is grading foreman; **John Haas,** structures foreman, and **Joe Howell** is master mechanic. **N. D. Robinson** is office manager and **Stanley Bonesteck** is resident engineer.

Construction of a modern-design music building at University of Montana, Missoula, is being supervised by **Paul Swallow. Bud Price** is carpenter foreman on the $500,000 Pew Construction Co. project.

Great Falls Air Force Base in Montana is the scene of several construction projects. **Johnnie Martin** is superintendent for Birch-McLaughlin-Lane on construction of a $748,460 refueling system. **Jim Eagen** is labor foreman; **Ernie Richardson,** pipefitter foreman, and **Roy Pope, Jr.,** is office manager. **J. A. McLean** is project manager and **Roy D. Wright** is project engineer. Leigland Co. holds the concrete subcontract with

Continued on page 124

Down-time . . . . . By Domagalski



"Sure he's a lousy cable splicer, but who's going to tell him?"

Western Construction

"Bearing failures have not occurred with UNOBA grease,"

says California construction superintendent

MacDonald, Young & Nelson, Inc., in San Francisco, uses multi-purpose UNOBA grease in all of its trucks and heavy equipment. E. L. King, superintendent of equipment, writes: "Due to UNOBA's high lubricating ability, bearing failures have not occurred, nor has the replacement of parts been necessary. Also, the all-purpose quality of UNOBA grease has eliminated the necessity of our keeping 4 or 5 containers of greases."

UNOBA—the industry's original multi-purpose *barium*-base grease—stays put in service and resists oxidation in storage... protects bearing metals against foreign matter... maintains its consistency under varying loads and working conditions... withstands high temperatures and extreme moisture.

***Prove* UNOBA'S versatility for yourself with these two simple tests:**

1. Place any amount of UNOBA on a plate heated to 300° F. You will quickly see that UNOBA continues to maintain its body or structure, while most conventional greases disintegrate or deteriorate rapidly.
2. Pack UNOBA in an anti-friction bearing on your earth-moving or road-building machinery. Subject the bearing to a continuous stream of water for one hour while the bearing rotates at 600 r.p.m. UNOBA can withstand punishment of this sort—*and more*—without disintegrating or washing away.

Developed by the manufacturers of T5X—the amazing purple heavy-duty motor oil.

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New Orleans, 917 National Bank of Commerce Building

UNION OIL COMPANY 76
OF CALIFORNIA

Harold Leigland as superintendent. Construction of the operations building and tower at the base is being supervised by **C. V. Beaulaurier** for J. E. Beaulaurier & Sons. **William Thomas** is steel foreman on this $252,000 job. **Don Rosbarsky** is carpenter foreman. A $2,322,339 runway and taxiway contract is held by Airbase Constructors, a joint venture of Nilson-Smith Construction Co., Kiely Construction Co., and Northwestern Engineering Co. **Bill Radovich** is paving superintendent; **Jim Jones,** rock superintendent, and **Norm Moe,** quarry superintendent. **Russell Egosque** is paving foreman, **Orville Busby** and **Ernie Harris,** plant foremen. **Paul Howard** is office manager and **A. C. Nesbitt** is project manager.

Construction of an industrial building for Byrne-Ferris Machinery Co., Spokane, Wash., is being supervised by **W. C. Onan** for H. Halvorson, Inc. **Orville Wright** is his assistant.

Paul Wilcox is superintendent and project manager for United Concrete Pipe Corp. on construction of a State Freeway in West Sacramento, Calif. **Pat Patterson** and **Ray Austin** are Wilcox' assistants. **George Yost** is borrow foreman and **Jack Donald** is pipe foreman. **Orville Banks** is master mechanic. **Bob Patterson** is dirt foreman.

John P. Becich is general superintendent for Bechtel Corp. on machinery installation at the Riverbank Ordnance Plant of Morris Thermador Corp., Riverbank, Calif. Foremen are: **John Culler,** carpenter; **Jerry De Spain,** ironworker; **V. W. Grove,** electrician; **T. J. Azevedo,** laborer. **John Brewer** is office manager and **E. D. Parker** is engineer on the $7,000,000 project.

***John Huggard,* supt., left, and *Don K. Kellogg,* equip. supt. for M. M. Sundt Construction Co. on runway construction at Davis-Monthan Air Force Base, near Tucson, Ariz.**

Seven miles of grading and surfacing on the Missoula-Arlee Highway, Mont., is being supervised by **Bud King** on gravel operations and **Ed Tangmo** on grading operations. **Casey Blake** is grading foreman, **Paul Truitt** is pipe foreman. L. A. Woodward Construction Co. and Ed Tangmo hold the $367,931 contract. **Ray Percy** is resident engineer.

At Fairchild Air Force Base where Gus J. Bouten, contractor, is building a 200 x 600-ft. warehouse, **Bill Perry** is supervising the job. **Russ Herman** is block foreman, **Carl Holine,** plumbing foreman, and **K. W. Irvine,** labor foreman.

Construction of a 6,250-ft. tunnel for Spokane, Wash.'s sewer project is under the supervision of **Elmer Cheff** with **Billy Allen** as his assistant. **Nick Flynn** is tunnel foreman and **John Bonderenko** is master mechanic for Cheff & Powers, contractor.

Construction of the $43,000,000 Hungry Horse Dam by General-Shea-Morrison, joint venture, is being supervised by **W. W. Simpson. Tom Moyer** is aggregate superintendent, **Stewart Hurdle** is spillway superintendent, and **George Gauert** is master mechanic. **Bill Guyot** is pipe superintendent. **Harry Mitchell** is carpenter superintendent, **J. F. (Scotty) Dow** is form yard superintendent, and **D. D. Elliot** is excavation superintendent. **Ernest Gross** is power house superintendent; **L. W. Nichols,** mix plant superintendent, and **D. C. Deckebach,** warehouse superintendent. **Al Royce** is chief electrician; **Jack Johnson,** rigger superintendent, and **Ray Wilkes** is day

concrete walker. **R. D. Moody** is swing shift concrete walker, and **Tobe Wight** is travelyard and concrete superintendent. **R. N. Savage** is paymaster; **D. H. Henderson,** office manager; **C. W. Wood,** project manager, and **M. R. Hord,** personnel manager. **Al Royce** is chief engineer.

Up in Alaska on the Eklutna Project, **Al M. Coker** is project manager for Palmer Constructors, joint venture, with **William Nixon** as his assistant. **Al Aitken** is general superintendent; **Ray Robbers,** project engineer, and **Ray Hamilton,** concrete superintendent. **Dan Daggs** is penstock superintendent. Construction engineer for the Bureau of Reclamation is **Bernard Felkner,** and **Sam Westgate** is field engineer.

Construction of a 9,500-kw. steam plant for Anchorage, Alaska, by Morrison-Knudsen Co., Inc., is being supervised by **L. V. Seibert. W. H. McClaskey** is project engineer and **F. M. Bragg** is resident engineer.

Construction of the San Luis Rey Bridge, Oceanside, Calif., is under the supervision of **William Laird.** Charles MacClosky Co. holds the contract. Union Steel Co. has the subcontract with **Jack Long** as superintendent.

J. L. Epps is general superintendent for Smith-Campbell Construction Co. on addition to Poly High School Auditorium and Natatorium building, Long Beach, Calif. **Kenny Brown** is carpenter foreman. **Kenney Epps** is labor foreman and **J. W. Linnell** is timekeeper.

Vernie R. Golden is superintendent for M. R. Smith, contractor, on the construction of a utility distribution system in Anchorage, Alaska. **H. W. Umbs** is expeditor and **E. J. Sisson** is foreman. The job cost is $624,825.

J. E. Swallow is general superintendent for McKinnon-Decker on construction of the Humanities and Science Building at University of Montana. The reinforced concrete L-shaped structure to be both four and five stories high will cost $488,000.

At El Toro Marine Base, Grimes, Hood & Irish has the electrical subcontract from Bressi & Bevanda and A. Teichert & Sons, prime contractors. Pictured above are, l. to r.: *Ray Dyer*, field supt.; *Harold Grimes*, partner in this joint venture; *Eleanor Harrison*, bookkeeper; *Matt Stanisch*, gen. supt.; *Shanghi Nelson*, Navy insp.; *C. Mower*, elect. eng.; *John Krieg*, off. mgr.; *Herb Isett*, cable foreman; *Frank Bilderback*, elect. duct foreman; *Chester Pawley*, elect. maint., and *Paul Banks*, elect. maint.

CONTRACTS

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

★★

Alaska

$1,097,310—**Birch, Lytle and Green** (joint venture) 208 Central Bldg., Seattle, Wash.—Award for construction of road and street paving at Ft. Richardson; by C. of E.

$4,249,470—**Grove, Shepherd, Wilson and Kruge, Inc.,** 247 Park Ave., New York, N. Y.—Award for construction of 3-story airmen's dormitory building, Elmendorf Air Force Base; by C. of E.

Arizona

$227,573—**Drummond, Hicks Construction Co.** and **Scott,** Los Angeles—Low bid for construction of a 2.8-mi. long, 30-ft. wide highway on Grand Canyon National Park south entrance road, Grand Canyon National Park, Coconino County; by BPR.

$595,376—**Fisher Contracting Co.,** P. O. Box 4035, Phoenix—Low bid for 4 mi. grading, draining, subgrade seal, select material, aggregate base and bituminous surface treatment, beginning about 68 mi. northeast of Globe and extending northeasterly, Globe-Showlow highway; by St. Hwy. Dept.

$315,430—**W. J. Henson, Contractor,** P. O. Box 471, Prescott—Low bid for work on the Flagstaff-Winslow highway consisting of resurfacing the existing bituminous pavement with plant-mix bituminous stabilized base and bituminous plant-mix, beginning about 42 mi. east of Flagstaff and extending easterly on U. S. Route 66 for 6.5 mi.; by St. Hwy. Dept.

$115,672—**Larsen Contracting Co.,** P. O. Box 1790, Phoenix—Low bid for work on the Page Spring Road consisting of grading, draining, select material, aggregate base and bituminous road-mix beginning at a point on U. S. Alternate 89 about 11 mi. southwest of Sedona or about 41 mi. southwest of Flagstaff and extending southeasterly to Oak Creek; by St. Hwy. Dept.

$224,227—**Dale F. Payne,** 2345 W. Thomas Rd., Phoenix—Low bid for work on the Indian Pine-White River highway consisting of subgrade seal, select material, aggregate base and bituminous plant-mix, beginning about 16 mi. southeast of Show Low and 63 mi. south of Holbrook and extending southerly on State Route 73 for approx. 9.5 mi.; by St. Hwy. Dept.

$341,838—**Lyle Price,** P. O. Box 548, Flagstaff—Low bid for construction 5.8 mi. on Pine-Winslow route to be 26 ft. wide; Coconino National Forest, Coconino County; by BPR.

$299,784—**Royden Construction Co.,** P. O. Box 3707, Phoenix—Low bid for work on Winslow streets, on the westbound line of U. S. Route 66 through the city; grading, draining, select material, bituminous stabilized base and bituminous plant-mix; by St. Hwy. Dept.

$461,414—**San Xavier Rock & Sand Co.,** P. O. Box 1031, Tucson—Low bid for work on the Phoenix-Yuma Highway, consisting of grading, draining, select material, aggregate base and bituminous plant-mix beginning about 1 mi. east of Sentinel and extending easterly along U. S. Route 80 for a distance of approx. 8.2 mi.; by St. Hwy. Dept.

$493,108—**Wallace & Wallace,** P. O. Box 470, Phoenix—Low bid for work on the Ashfork-Prescott highway (Drake Overpass and approach roadway), consisting of construction of a new O.P. structure and approach roadway, including grading, draining, subgrade seal, select material, aggregate base and bituminous plant mix beginning about 14 mi. south of Ashfork and extending southerly for a distance of approx. 2 mi. to a point about 37 mi. north of Prescott; by St. Hwy. Dept.

$340,339—**Jack Willson,** 7111 Rio Flora Place, Downey, Calif.—Low bid for completion of architectural finish and miscel. metalwork installations for Davis Dam and power plant, Arizona-Nevada; by USBR.

California

$248,802—**John Burman & Sons,** 2750 Harrison St., Eureka—Low bid for 1.4 mi. widening existing roadbeds and grading, road-mix surfacing applied on portions along the Smith River, bet. 14.1 mi. and 30.8 mi. northeast of Crescent City, Del Norte County; by St. Div. of Hwys.

$216,962—**Cox Bros. Construction Co.,** P. O. Box Drawer C, Stanton—Low bid for grading and surfacing with plant-mix surfacing on untreated rock base, bet. 3 mi. west of Route 77 and Route 77, at Miramar, 3.2 mi. long, San Diego County; by St. Div. of Hwys.

$217,987—**G. W. Ellis Construction Co.,** 8240 Lankershim, North Hollywood—Low bid for 26.7 mi. existing roadbed to be widened and plant-mix surfacing placed thereon, and plant-mix surfacing placed on a portion of existing surfacing, bet. Cronise Valley and 3 mi. west of Halloran Springs, San Bernardino County; by St. Div. of Hwys.

$426,249—**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland—Low bid for 6.7 mi. grading and surfacing with plant-mix surfacing on Crow Canyon Rd., bet. Rte. 5 in Castro Valley and Contra Costa County line, Alameda County; by St. Div. of Hwys.

$310,747—**Fredrickson & Watson Construction Co.,** 873 81st Ave., Oakland—Low bid for 5.6 mi. resurfacing existing roadbed with plant-mix surfacing on untreated rock base, bet. 5.6 mi. south of Merced and Merced, Merced County; by St. Div. of Hwys.

$340,704—**Griffith Company,** 1060 So. Broadway, Los Angeles—Low bid for 1.1 mi. to be graded and surfaced with plant-mix surfacing on cement treated base and reinforced concrete bridge to be constructed bet. 0.5 mi. south of Nestor and Palm Ave., in Palm City, San Diego County; by St. Div. of Hwys.

$4,558,000—**Haas & Haynie,** 275 Pine St., San Francisco—Award for construction of the School of Engineering building, U. S. Naval Postgraduate School, Monterey; by 12th Naval District.

$113,257—**J. Henry Harris,** 2657 9th St., Berkeley—Low bid for 1.2 mi. grading and surfacing with plant-mix surfacing on imported base material, Petaluma-Valley Ford highway, bet. 40 mi. and 5.4 mi. westerly of Petaluma, Sonoma County; by St. Div. of Hwys.

$101,921—**R. E. Hazard Contracting Co.,** P. O. Box 1951, San Diego—Low bid for 7.6 mi. to be surfaced with plant-mix surfacing, portions bet. Balboa Ave. in San Diego, and Las Flores, San Diego County; by St. Div. of Hwys.

$585,385—**R. E. Hazard Contracting Co.** and **W. F. Maxwell,** P. O. Box 1951, San Diego—Low bid for 5.2 mi. grading additional roadway widths, cement treated base and plant-mix surfacing to be placed and a bridge across San Dieguito River and San Elijo Lagoon to be widened, bet. Del Mar and Encinitas, San Diego County; by St. Div. of Hwys.

$149,837—**Hermreck & Easter Co.,** P. O. Box 147, Santa Maria—Low bid for 1.6 mi. of grading and surfacing with road-mix surfacing on cement treated base to provide a four-lane highway on portions bet. 4.4 mi. east of San Luis Obispo County line and 5. mi. west of Maricopa, Kern County; by St. Div. of Hwys.

$746,708—**Charles MacClosky,** 112 Market St., San Francisco—Low bid for construction of eight reinforced concrete bridges be the Los Angeles County line and Route 192, San Bernardin County; by St. Div. of Hwys.

$724,873—**W. F. Maxwell,** Los Angeles—Low bid for construction of 8 reinforced concrete bridges bet. Euclid Ave. and Archibald Ave., San Bernardino County; by St. Div. of Hwys.

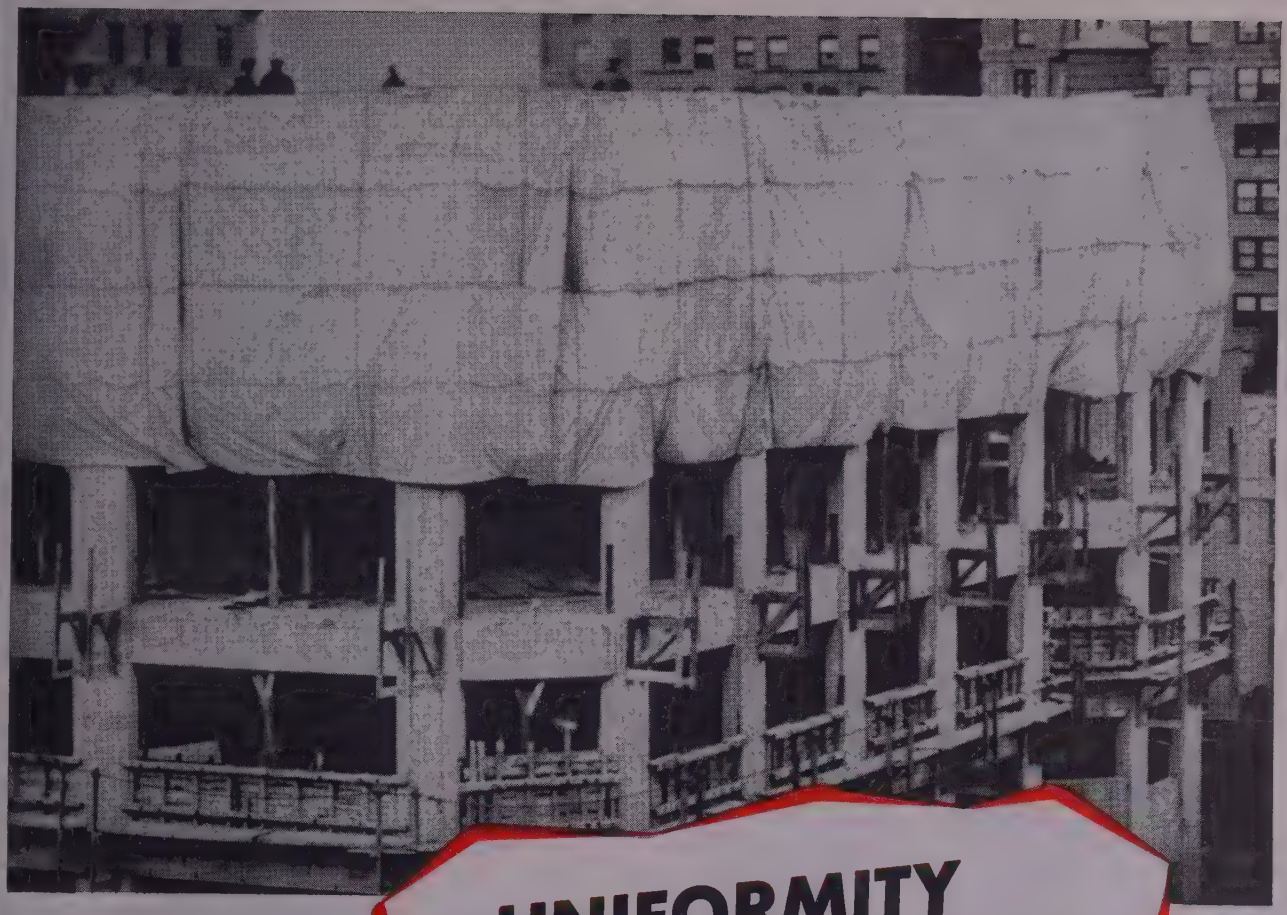
$360,727—**M. S. Mecham & Sons,** 11125 Garfield Ave., South Gat —Low bid for 2.4 mi. grading a roadbed, and surfacing wit asphalt concrete pavement on untreated rock base; portions the existing roadbed to be surfaced with asphalt concrete pav ment on existing pavement and seal coats applied, on Artesia S bet. Long Beach Blvd. and east city limits of Long Beach; b St. Div. of Hwys.

$352,246—**Oberg Bros. Construction Co.,** Box 640, Inglewood Low bid for construction of two reinforced concrete box gird bridges and city streets to be graded and paved on Harbor Fre way, 11th and 12th Sts., Los Angeles, Los Angeles County; b St. Div. of Hwys.

$2,096,200—**H. Earl Parker, Inc.,** 12th and F Sts., Marysville Low bid for earthwork and structures, east section, Unit No. Madera Distribution System, Central Valley Project; by USB

$241,716—**Pike & Hill, Carey Bros. & Bailey,** P. O. Box 569, S Rafael—Low bid for 2 mi., portions to be surfaced with plant-m surfacing on cement treated base and portions to be graded a surfaced with plant-mix surfacing on cement treated base, b the Northwestern Pacific Underpass and Eleven Oaks, Mend cino County; by St. Div. of Hwys.

$109,595—**M. J. Ruddy & Son,** 922 J St., Modesto—Low bid f 3.7 mi. of surfacing with plant-mix surfacing bet. Alameda Coun



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line and Janney Station, San Joaquin County; by St. Div. of Hwys.

$103,479—**L. C. Smith Co.,** 1st and Railroad, San Mateo—Low bid for 1.3 mi. surfacing with plant-mix surfacing, untreated rock base and cement treated base, portions bet. Three Oaks Way near Saratoga and Main St. in Los Gatos, Santa Clara County; by St. Div. of Hwys.

$1,058,500—**Stolte, Inc.,** and **Gallagher & Burk, Inc.,** 8451 San Leandro St., Oakland—Award for construction of water, sewer, gas lines and miscellaneous work, U. S. Naval Air Station, Alameda; by 12th Naval Dist.

$167,850—**Stolte, Inc.,** 8451 San Leandro St., Oakland—Low bid for earthwork, concrete pipe line and structures, Contra Costa County Water District, Contra Costa Canal Distribution System, Central Valley Project; by USBR.

$188,365—**B. J. Ukropina, T. P. Polich, Steve Kral,** 2115 Adair St., San Marino—Low bid for construction of 0.7 mi. of 4-lane divided roadbed and a drainage pumping plant to be installed on W. Sacramento Freeway, bet. 0.8 mi. and 0.1 mi. west of Tower Bridge, Yolo County; by St. Div. of Hwys.

$6,067,353—**Winston Bros. Co., Al Johnson Construction Co.,** 1532 So. California Ave., Monrovia—Low bid for Nimbus Dam power plant and appurtenant works, Folsom Unit, American River Division, Central Valley Project; by USBR.

$725,672—**E. L. Yeager,** P. O. Box 87, Riverside—Low bid for 4.7 mi. grading, and surfacing with plant-mix surfacing on cement treated base; construction of 2 reinforced concrete overcrossings and 9 reinforced concrete bridges; installation of highway lighting system, bet. Route 64 and Nuevo Road, Riverside County; by St. Div. of Hwys.

Colorado

$1,171,417—**Marye-Northwestern Co.,** 1300 Cherokee, Denver—Award for construction of hangar building, Lowry Air Force Base, Denver; by C. of E.

$1,160,268—**Swinerton & Walberg,** 225 Bush St., San Francisco, Calif.—Award for construction of three structures at Rocky Mountain Arsenal; by C. of E.

Idaho

$135,649—**Asphalt Paving & Construction Co.,** Boise—Award for construction of a plant-mix bituminous surface and seal coat on 8.5 mi. of the Payette Highway bet. Cove Junction and Donnelly, Valley County; by St. Hwy. Dept.

$404,999—**Clifton & Applegate,** Box 1473, Spokane, Wash.—Award for construction of a roadway and a roadmix bituminous surface on 1.3 mi. of Highway U. S. 10 bet. Argentine Gulch and Wallace in Shoshone County; by St. Dept. of Hwys.

$952,511—**Duffy Reed Construction Co.,** Box 1092, Twin Falls—Award for construction of a roadway and a plant-mix bituminous surface on 13.7 mi. of the Old Oregon Trail and Regina to Cleft in Ada and Elmore counties; by St. Dept. of Hwys.

$585,041—**Hansen & Park Construction Co.,** 1103 N. Calispel, Spokane, Wash.—Award for construction of a 410-ft. bridge over St. Joe River, a 112-ft. overhead across the tracks of G. N. & S. P. R. R. and approaches on U. S. 95 Alternate in St. Maries, Benewah County; by St. Dept. of Hwys.

$262,365—**Tony Marrazzo,** Box 876, Boise—Award for construction of a roadway and a 107-ft. concrete bridge on 2.7 mi. of the Lewis and Clark Highway, Lochsa Ranger Station section in Idaho County; by St. Dept. of Hwys.

$169,820—**Statewide Plumbing and Heating Co.,** Pocatello—Award for construction of 60,000 ft. of 6-in. to 15-in. sanitary sewers for L. I. D. No. 74, Coeur d'Alene; by City of Coeur d'Alene.

$246,304—**Willamette Iron and Steel Co.,** 2860 N.W. Front, Portland, Ore.—Low bid for emergency gates, bulkhead, guides and appurtenances for intake structure, Lucky Peak Dam, near Boise: by C. of E.

Montana

$397,208—**Inland Construction Co.,** 3867 Leavenworth, Omaha, Neb.—Award for 8.9 mi. grading, gravel surfacing, road-mix oiling and construction of small drainage structures bet. Glascow and Nashua, Valley County; by St. Hwy. Comm.

$231,996—**McKinnon-Decker Co.,** 1520 Hauser, Helena—Award for construction of a 450-ft. steel and concrete bridge on Shelby South highway, Toole County; by St. Hwy. Comm.

$155,847—**Nilson-Smith Construction Co.,** P. O. Box 1147, Great Falls—Award for 5.1 mi. grading, gravel surfacing, road-mix oiling and construction of small drainage structures on Fairfield West, Teton County; by St. Hwy. Comm.

New Mexico

$240,925—**Allison & Haney,** P. O. Box 1507, Albuquerque—Award for 12.7 mi. construction bet. Las Vegas and Trujillo, San Miguel County; by St. Hwy. Dept.

$165,237—**Armstrong & Armstrong,** Box 873, Roswell—Award for 88.6-mi. construction between Roswell-Tularosa, U. S. 70, Chaves, Lincoln and Otero counties; by St. Hwy. Dept.

$281,277—**Armstrong & Armstrong,** Box 873, Roswell—Award for 4.2 mi. construction bet. Roswell and Walker Air Force Base, Chaves County; by St. Hwy. Dept.

$399,099—**Brown Construction Co.,** P. O. Box 1479, Albuquerque—Award for 8.3 mi. construction bet. Santa Rosa and Newkirk, Guadalupe County; by St. Hwy. Dept.

$166,432—**Floyd Haake,** 1111 Lovato Lane, Santa Fe—Award for 35.9 mi. of work on Roy-Mosquero, Gladstone-Clayton Road, Harding, San Miguel and Union counties; by St. Hwy. Dept.

$255,466—**Lowdermilk Bros.,** P. O. Box 501, Los Alamos—Award for 6.0 mi. construction bet. U. S. 84 and Coyote, Rio Arriba County; by St. Hwy Dept.

$262,766—**G. I. Martin,** 520 S. Tulane, Albuquerque—Low bid for 9.8 mi. construction on Caprock-Maljamar road, Chaves and Lea counties; by St. Hwy. Dept.

$174,106—**D. D. Skousen,** 201 Springer Bldg., Albuquerque—Award for 7.3 mi. construction bet. Valdez and Taos, Taos County; by St. Hwy. Dept.

$142,831—**Henry Thygesen & Co.,** P. O. Box 876, Albuquerque—Award for 3.3 mi. construction on Bloomfield-Blanco road, San Juan County; by St. Hwy. Dept.

Oregon

$988,629—**Babler Bros., Inc.,** 4617 S.E. Milwaukie Ave., Portland—Award for 7.3 mi. of grading and 3.3 mi. of temporary surfacing, Anlauf-Elkhead Road unit, Divide Hill section of the Pacific Highway, southerly from the Anlauf Railroad Station to a point

about 3.5 mi. easterly from Yoncalla, Douglas County; by St. Hwy. Comm.

$153,925—**Birkemeier and Saremal,** 301 Lewis Bldg., Portland—Award for construction of four reinforced concrete viaducts over West Portland-Hubbard Highway bet. Tualatin and Wilsonville, Washington County; by St. Hwy. Comm.

$704,706—**The Central Heating Co. Oreg., Ltd.,** and **F. L. Somers,** P. O. Box 938, Eugene—Award for 5.1 mi. of grading and paving the Rock Point-Blackwell section of the Pacific Highway near Gold Hill, Jackson County; by St. Hwy. Comm.

$128,563—**K. C. Dack Construction Co.,** Milton-Freewater—Award for 6.1 mi. of grading and oil-mat surfacing the Pocahontas-Baker section of the Baker-Pine Creek-Wingville County road west from Baker, Baker County; by St. Hwy. Comm.

$7,763,750—**General Electric Co.,** 421 W. Clark St., Pasco, Wash.—Low bid for main unit generators 9 to 12 inclusive, McNary Dam; by C. of E.

$200,790—**Vernie Jarl,** Gresham—Award for 0.9 mi. of grading and 3.5 mi. of selected gravel course in the Hayesville-School-Turner Road unit, Salem by-pass section of the Pacific Highway east, east of Salem, Marion County; by St. Hwy. Comm.

$182,480—**Koppisch Construction Co.,** Astoria—Award for 2.7 mi. of rock base and paving on the Cannon Beach-Arcadia section of the Oregon Coast Highway about 1 mi. south of Elk Creek at Cannon Beach, Clatsop County; by St. Hwy. Comm.

$753,510—**Natt McDougall Co.,** 824 Pittock Block, Portland—Award for 2.5 mi. of grading and paving; also furnishing 750 cu. yd. crushed material in stockpile on the Low Pass section of the Siuslaw Highway, about 2 mi. east of Blachly; by St. Hwy. Comm.

$564,677—**Natt McDougall Co.,** 824 Pittock Block, Portland—Award for construction of a new reinforced concrete east approach, approx. 499 ft. long; construct new reinforced concrete west approach approx. 752 ft. long; alter and raise existing truss spans; and other miscel. work, Center St. bridge on Salem-The Dalles Highway, Salem, Marion and Polk counties; by St. Hwy. Comm.

$1,223,561—**Parker-Schram Co.,** 200 Builders Exchange Bldg., Portland—Low bid for 2.1 mi. of grading and 5.4 mi. of paving the Shogren-Rowena Unit, Mosier-The Dalles Section of the Columbia River Highway bet. Mosier and Rowena, Wasco County; by St. Hwy. Comm.

$175,088—**Parker-Johnson Co.,** 200 Builders Exch. Bldg., Portland—Award for construction of Salem heavy equipment shop, Marion County; by St. Hwy. Comm.

$311,220—**Fred H. Slate Co., Ore., Ltd.,** Portland—Award for 2.1 mi. of grading and oil-mat surfacing the Middle Unit, Reedsport-Dean Creek section of the Umpqua Highway, about 1 mi. east of Reedsport, Douglas County; by St. Hwy. Comm.

$515,864—**T. W. Thomas,** 10248 N.E. Halliday, Portland—Low bid for 5.3 mi. of grading and paving; also furnishing 2,000 cu. yd. crushed material in stockpile, Medford-County Farm section of the Pacific Highway south from Medford, Jackson County; by St. Hwy. Comm.

$254,485—**Valley Construction Co.,** 6100 N.E. Columbia Blvd., Portland—Award for construction of an 800-ft. reinforced concrete and steel bridge, Haynes Slough Bridge on the Oregon Coast Highway near Coos Bay, Coos County; by St. Hwy. Comm.

$173,531—**Porter W. Yett,** 6500 N.E. Ainsworth, Portland—Low bid for 6.5 mi. of grading and paving the Benton County line-Cheshire section of the Territorial Secondary Highway, about 2 mi. south of Monroe, Lane County; by St. Hwy. Comm.

Utah

$500,000—**Chicago Bridge & Iron Co.,** 550 W. 17th St. South, Salt Lake City—Award for construction of storage tanks for products terminal in North Salt Lake, Pioneer Pipe Line, Salt Lake City; by Sinclair Pipe Line Co. and Continental Oil Co.

$188,790—**L. T. Johnson Construction Co.,** 709 Wall St., Ogden—Award for construction bet. Blanding and Mexican Hat; by St. Rd. Comm.

$234,628—**L. A. Young Construction Co.,** Richfield—Award for construction of roadway bet. Fairview and Mt. Pleasant; by St. Rd. Comm.

Washington

$162,250—**J. Arlie Bryant,** 428 Hutton Bldg., Spokane—Award for stockpiling from Snoqualmie Pass to Ollalie Creek, King County; by St. Dept. of Hwys.

$553,312—**Carbon Bros. & Plath,** E. 3430 Cook St., Spokane—Low bid for construction engine build-up shop, Fairchild Air Force Base; by C. of E.

$1,031,574—**Cherf Brothers Construction Co.** and **Sandkay Contractors, Inc.,** P. O. Box 938, Ephrata—Low bid for earthwork, asphaltic membrane lining and structures, West Canal laterals, Columbia Basin Project; by USBR.

$213,744—**Donald M. Drake Co.,** 904 Lewis Bldg., Portland—Award for construction of the Oak Park Bridge over Washougal River at Camas, Clark County; by St. Dept. of Hwys.

$525,071—**Eichleay Corp.,** P. O. Box 336, Mt. View, Calif.—Low bid for pump installation units P5 and P6 Grand Coulee pumping plant and miscel. metalwork and electrical installations, Grand Coulee Dam pumping plant and power plant; by USBR.

$114,085—**Peter Kiewit Sons' Co.,** Box 491, Longview—Award for construction of the east approach to Cowlitz River Bridge in Kelso, Cowlitz County; by St. Dept. of Hwys.

$252,468—**Peter Kiewit Sons' Co.,** P. O. Box 491, Longview—Award for 4.4 mi. work on Stella to Longview Dyke, PSH No. 12, Cowlitz County; by St. Dept. of Hwys.

$152,888—**Lee J. Lavin,** Coulee City—Award for 15.2 mi. of work on a county road, Moses Lake to Stratford, Grant County; by St. Dept. of Hwys.

$995,845—**McLaughlin, Inc.,** P. O. Box 1491, Spokane—Low bid for apron paving and utilities, Fairchild Air Force Base; by C of E.

$161,156—**Murphy Bros.,** E. 3728 Broadway, Spokane—Award for 5.7 mi. of work from Omak to Riverside, PSH No. 10, Okanogan County; by St. Dept. of Hwys.

$283,786—**Pieler Construction Co.,** 705 Schafer Bldg., Seattle—Award for 8.7 mi. construction, Elwha River to Port Angeles Clallam County; by St. Dept. of Hwys.

$713,429—**Scheumann & Johnson,** Lloyd Bldg., Seattle—Low bid for construction of the Henderson St. relief trunk sewer, Seattle by City of Seattle.

$121,602—**United Paving Co.,** P. O. Box 1017, Edmonds—Award for 63.6 mi., Elwha River to East Beach Road, et al., State Highways No. 9, 14, 1-N, 9-A and Bucoda city streets, Mason, Clallam, Pierce and Thurston counties; by St. Dept. of Hwys.

Wyoming

$236,460—**Boatright-Smith,** P. O. Box 703, Rawlins—Low bid for construction of a roadway 2.2 mi. long and 30 ft. graded by 4-in. base in Targhee and Teton national forests, Teton County by BPR.

$445,642—**C-L Electric Co.,** 410 So. Main St., Pocatello—Low bid for Lovell-Yellowtail 115-kw. transmission line, Transmission Division-Wyoming, Montana; Missouri River Basin Project; by USBR.

$121,302—**Jones-Hinkley & Jones, Inc.,** Powell—Low bid for grading, draining and miscel. work on 4.6 mi. of the Douglas Cold Springs road in Converse County; by St. Hwy. Dept.

$145,925—**Knisely-Moore Co.,** Box 77, Douglas—Award for base course surfacing, plant-mix surface course and miscel. work on 8.1 mi. of the Casper-Glenrock road in Natrona and Converse counties; by St. Hwy. Dept.

$176,277—**Leach Bros.,** Box 152, Buffalo—Award for grading, draining, selected material surfacing, 2 treated timber bridges and miscel. work on 5.2 mi. of the Upton-Haycreek road in Weston County; by St. Hwy. Dept.

$264,844—**Read Construction Co.,** 706 W. 19th St., Cheyenne—Low bid for base course surfacing, plant-mix surface course and miscel. work on 7.1 mi. of the Cheyenne-Pine Bluffs road and 0 mi. near the intersection of Ninth St. and Dunn Ave. in Cheyenne, Laramie County; by St. Hwy. Dept.

$265,677—**Taggart Construction Co.,** P. O. Box 560, Cody—Award for grading, curb and gutter work, base course surfacing, plant-mix surface course and miscel. work on 2.1 mi. of the Cody streets and a 48-in. reinforced concrete siphon on the Cody-Greybull road in Park County; by St. Hwy. Dept.

$100,406—**Woodward Construction Co.,** Box 1046, Rock Springs—Award for bituminous shoulder treatment on 22.4 mi. of the Lyman-Granger Junction road in Sweetwater and Uinta counties; by St. Hwy. Dept.

$514,379—**Young and Smith Construction Co.,** 306 Beason Bldg., Salt Lake City, Utah—Low bid for earthwork and structures, Means Canal and Eden Canal and channel changes and waste way, Eden Project; by USBR.

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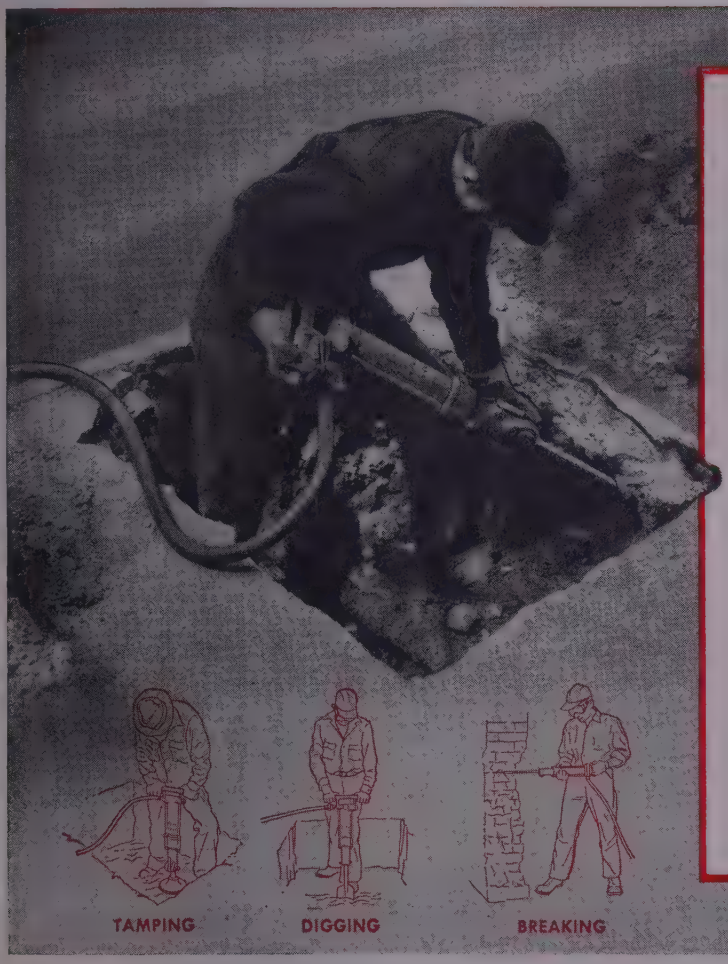

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SPECIFICATIONS:

Weight	41 pounds
Length	23⅜ inches
Bore	1⅝ inches
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Continued from page 66

subject they wanted as the main topic at the 1950 Road Builders Clinic sponsored by that institution. By the large majority the subject of "Soils" was chosen. This furnished further opportunity to promote action on the sub-agencies part to help themselves set up an active soil program. More detail as to how they should start, what tools and equipment they needed, and how to obtain help from the state was furnished. Probably more effective, the benefits and savings they might receive were outlined more completely. The "Clinic" seemed to furnish the final "push" required, as shortly thereafter requests for assistance began to multiply.

At first, most of the work requested by the sub-agencies was accomplished by state forces, with county or city personnel acting as observers for training. This was the period when the Chart served its real purpose. With only a short period of training using the chart in actual field work, these relatively inexperienced men were soon able to take over the field work and thereafter needed only moderate supervision. Several counties and some of the larger cities, such as Seattle and Everett, now have one or more men capable of doing field work and inspection work during construction. The principal drawback has been the relatively large turnover among the personnel assigned to these tasks, as the tendency at first was to give this work to younger, temporary employees. The fallacy of this was soon recognized, and now an effort is being made to train those men who indicate their intention to make a career of their work.

All of the counties and several of the cities within the operating area of the writer have taken advantage of this plan to date. The degree of acceptance has varied almost directly in proportion to the volume of work done by each. It is not unusual for the sub-agencies, now, to include such features as "controlled compaction" or special foundation treatment in their contracts. Skagit County, one of the first to actively adopt "soils," on one job alone, relocated one section of the proposed line, changed the slopes on another section, included "crosshaul" to take advantage of high bearing cut material, and controlled fill placement to solve a soft foundation problem. King County has included soil control specifications in several jobs, and the City of Seattle rarely designs a structure without complete soils investigations. Pierce County now has a full time Soil Engineer to handle its problems. Those mentioned are only a few of the many that are now making progress along these lines.

The wide and rapid acceptance of state assistance in soils work is indicative that the sub-agencies recognize the benefits they can gain, and that they are desirous of modernizing their methods of road building. The gain made in this area through the application of this plan during the past two years has formed a substantial basis for much wider expansion and progress.

UNIT BID PRICES

Selected bid abstracts for Western projects

Water Supply

Prestressed and modified concrete cylinder pipe for South Coast Conduit

California—Cachuma Project—USBR. Ventura Pipe Line Construction Co., Ventura, submitted the low bid of $232,208 on alternate schedules 1, 2 and 3, (modified prestressed concrete cylinder pipe and prestressed concrete cylinder pipe) on concrete pipe lines and structures, South Coast Conduit, Carpenteria Section, Cachuma Project. ABC Construction Co., Inc. and R. J. Daum Construction Co., joint venturers, were low on alternate schedules 4 and 5 with a bid of $1,471,950, and a total bid for alternate schedules of $1,713,948. Unit prices for Schedules II and III, providing a comparison of the two types, were as follows:

SCHEDULE II (MODIFIED PRESTRESSED CONCRETE CYLINDER PIPE)

(1) Ventura Pipe Line Construction Co...$232,208
(2) ABC Construction Co., Inc. and R. J. Daum Construction Co..... 241,998
(3) M. Miller Company 248,265
(4) Steve P. Rados, Inc. $309,915
(5) Engineers Limited Pipeline Co. and L. E. Webb Construction Co., Inc. 402,433
(6) Engineers' estimate 228,853

Schedule No. 2—Station 0+18.59 to Station 82+35.83

	(1)	(2)	(3)	(4)	(5)	(6)
1,500 cu. yd. excav., station 0+18.59 to 9+00	1.35	2.88	3.00	5.75	1.50	.80
7,000 cu. yd. excav., station 9+00 to 48+00	2.43	2.88	2.75	5.75	1.00	1.30
2,000 cu. yd. excav., station 48+00 to 59+00	3.50	2.88	2.50	5.75	3.00	1.40
4,000 cu. yd. excav., station 59+00 to 82+35.83	2.95	2.88	3.50	5.75	2.00	.95
5,200 cu. yd. backfill	.72	1.13	1.25	1.25	.50	.60
1,100 cu. yd. consolidated backfill	2.50	1.25	2.50	2.00	2.00	2.00
5,500 cu. yd. compacted backfill	2.10	2.00	2.75	3.00	4.50	2.50
6 tree removal of selected trees	150.00	50.00	25.00	500.00	150.00	80.00
5 acre scarifying right-of-way	45.00	75.00	50.00	125.00	75.00	50.00
5 acre seeding and fertilizing right-of-way	75.00	100.00	25.00	300.00	125.00	75.00
16 ton mulching right-of-way	60.00	60.00	20.00	100.00	60.00	60.00
50 sq. yd. dry-rock paving	14.00	10.00	5.00	10.00	10.00	7.00
1,200 sq. yd. replacing pavement for Highway No. 150	3.20	6.50	4.00	3.50	3.50	4.00
70 cu. yd. concrete in structures	100.00	50.00	75.00	50.00	70.00	75.00
4,200 lb. furn. and placing reinf. bars in structs.	.20	.16	.20	.20	.15	.18
30 lin. ft. manuf. and erect. conc. conduit pipe 48-in. in diam. for shafts of structs.	65.00	60.00	61.00	75.00	65.00	22.00
50 lin. ft. furn. and erect. std.-str. conc. culvert pipe 48 in. in diam. for shafts of structs.	50.00	50.00	48.00	60.00	50.00	20.00
7 cover furn. and placing precast-conc. covers 4 in. thick for 48-in. diam. pipe structs.	45.00	40.00	40.00	40.00	30 00	40.00
2 cover furn. and placing precast-conc. covers 6 in. diam. pipe structs.	70.00	60.00	50.00	50.00	35.00	50.00
9 nozzle with cover furn. and install. 20-in. manhole nozzles with covers	500.00	500.00	500.00	600.00	570.00	650.00
5 nozzle furn. and installing 6-in. nozzles	100.00	120.00	120.00	125.00	140.00	350.00
1,700 lb. furn. and installing miscl. metalwork	.50	.30	.60	.45	.50	.55
300 lb. furn. and install. steel pipe and fitgs. for blow-offs	.50	.70	.15	.60	.50	.60
6,000 lb. furn. and install. 4- to 12-in. cast-iron pipe and fittings	.50	.20	.08	.30	.25	.35
5 valve furn. and install. 6-in. 125-lb. std. iron-body gate valves	90.00	90.00	120.00	125.00	120.00	150.00
4 valve furn. and install. 4-in. 125-lb. std. iron-body gate valves	68.00	75.00	80.00	100.00	80.00	75.00
4 valve furn. and install. 4-in. std. air valves	155.00	200.00	220.00	250.00	200.00	375.00
3,750 lin. ft. conc. pipe, symbol 36MPC-250	15.80	16.80	16.90	18.00	38.50	17.10
770 lin. ft. conc. pipe, symbol 36MPC-300	16.85	18.00	17.40	20.00	34.40	19.10
3,750 lin. ft. conc. pipe, symbol 36MPC-350	18.25	19.00	19.65	21.00	38.50	21.30
30 lin. ft. special bends	66.00	80.00	80.00	100.00	82.50	50.00
900 bbl. furn. and handling type II cement	4.00	4.00	3.60	5.00	4.50	4.50

SCHEDULE III (PRESTRESSED CYLINDER PIPE)

(1) Ventura Line Construction Co.....$244,535
(2) Engineers Limited Pipeline Co and L. E. Webb Construction Co., Inc. 391,358
(3) Engineers' estimate $233,973

Schedule No. 2—Station 0+18.58 to Station 82+35.83

	(1)	(2)	(3)
1,600 cu. yd. excav., station 0+18.59 to 9+00	1.35	1.50	.80
7,500 cu. yd. excav., station 9+00 to 48+00	2.43	1.00	1.30
2,300 cu. yd. excav., station 48+00 to 59+00	3.50	3.00	1.40
4,600 cu. yd. excav., station 59+00 to 82+35.83	2.95	2.00	.95
6,000 cu. yd. backfill	.72	.50	.60
600 cu. yd. consolidated backfill	2.50	2.00	2.00
6,000 cu. yd. compacted backfill	1.80	4.50	2.50
6 tree removal of selected trees	150.00	150.00	80.00
5 acre scarifying right-of-way	45.00	75.00	50.00
5 acre seeding and fertilizing right-of-way	75.00	125.00	75.00
16 ton mulching right-of-way	60.00	60.00	60.00
50 sq. yd. dry-rock paving	14.00	10.00	7.00
1,200 sq. yd. replacing pavement for Highway No. 150	3.20	3.50	4.00
70 cu. yd. concrete in structs.	100.00	70.00	75.00
4,200 lb. furn. and placing reinf. bars in structs.	.20	.15	.15
30 lin. ft. manuf. and erect. conc. conduit pipe 48 in. in diam., for shafts of structs.	65.00	65.00	22.00
50 lin. ft. furn. and erect. std-str. conc. culv. pipe 48 in. in diam. for shafts of structs.	50.00	50.00	20.00
7 cover furn. and plac. precast-conc. covers 4 in. thick for 48-in. diam. pipe structs.	45.00	30.00	40.00
2 cover furn. and plac. precast-conc. covers 6 in. thick for 48-in. diam pipe structs.	70.00	25.00	50.00
9 nozzle with cover furn. and install. 20-in. manhole nozzles with covers	500.00	570 00	650.00
5 nozzle furn. and install. 6-in. nozzles	100.00	140.00	350.00
1,700 lb. furn. and install. miscl. metalwork	.50	.50	.5

(Continued on next page)

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SOLD AND SERVICED BY: Contractors Equipment Co., Portland, Ore.; Bow Lake Equipment Co., Seattle, Wash.; Modern Machinery Co., Inc., Spokane, Wash.; The Sawtooth Co., Boise & Idaho Falls, Idaho; Reed Hardware & Implement Co., Idaho Falls, Idaho; Missoula Mercantile Co., Missoula, Mont.; Central Machinery Co., Miles City, Mont.; Croskey Motors, Kalispell, Mont.; Tractor & Equipment Co., Miles City, Mont.; Taylor Machinery Co., Salt Lake City & Layton, Utah; Edward R. Bacon Co., San Francisco, Oakland, Stockton, Fresno, Sacramento, Calif.; Sierra Machinery Co., Reno, Nev.; Basin Truck & Implement Co., Durango, Colo.; Gunderson-Taylor Machinery Co., Denver, Colo.; Mutual Machinery Co., Pueblo, Colo.; Casey-Metcalf Machinery Co., Inc., Los Angeles, Calif.; Western Machinery Co., Phoenix.

UNIT BID PRICES . . . CONTINUED

	(1)	(2)	(3)
300 lb. furn. and install. steel pipe and fittings for blow-offs	.50	.50	.60
6,000 lb. furn. and install. 4- to 12-in. cast-iron pipe and fittings	.50	.25	.35
5 valves furn. and install. 6-in. 125-lb. standard iron-body gate valves	90.00	120.00	150.00
4 valve furn. and install. 4-in. 125-lb. standard iron-body gate valves	68.00	80.00	75.00
4 valve furn. and install. 4-in. standard air valves	155.00	200.00	375.00
3,500 lin. ft. conc. pipe, symbol 36PSC15	17.55	35.60	18.35
2,540 lin. ft. conc. pipe, symbol 36FSC17	17.90	35.90	19.10
2,230 lin. ft. conc. pipe, symbol 36PSC20	18.40	36.40	20.60
30 lin. ft. special bends	60.00	86.00	50.00
1,500 bbl. furn. and handling type II cement	4.00	4.50	4.50

Bridge and Grade Separation

Reinforced concrete bridge in Nevada

Nevada—Lincoln County—State. Young & Smith Construction Co., Salt Lake City, Utah, received a contract from the Department of Highways on its low bid of $37,173 for construction of a double 10-ft. x 8-ft. reinforced concrete bridge near the north city limits of Caliente. Unit prices were as follows:

(1) Young & Smith Construction Co. $37,173
(2) Wells Cargo, Inc. $40,607

	(1)	(2)
Lump sum, signs	$1,000	$1,200
Force account, special detour	$1,000	$1,000
198 cu. yd. selected detour surface	4.00	2.50
4,130 cu. yd. roadway excavation	.80	1.00
24 cu. yd. drainage excavation	2.00	1.00
943 cu. yd. structure excavation	3.00	1.50
438 cu. yd. backfill	2.00	2.50
30 M. gal. water	3.00	1.00
Lump sum, furnish water equipment	.....	.....
150 cu. yd. special Class A concrete	80.00	85.00
21,015 lb. reinforcing steel	.15	.15
1,582 sq. yd. mesh reinforcement	1.00	.25
212.5 lin. ft. beam type metal guard rail	4.00	5.00
183 cu. yd. slope paving	50.00	73.00

112.5-ft. concrete bridge in Idaho

Idaho—Latah County—State. Thurston Storey, Lewiston, received a contract from the Department of Highways for his low bid of $115,936 for construction of a 112.5 ft. concrete bridge over the Palouse River, and a roadway with a crushed rock surface on 0.5 mi. of the Grangeville-Harvard Highway, between Harvard and Dreary. Unit prices were as follows:

(1) Thurston Storey $115,936
(2) J. S. Anderson Co. 128,766
(3) Commercial Builders 132,626
(4) Colonial Construction Co. $133,149
(5) Roy L. Bair 150,271
(6) Engineers' estimate 115,963

	(1)	(2)	(3)	(4)	(5)	(6)
1 ea. removal of bridge	500.00	400.00	520.00	500.00	100.00	500.00
48,000 cu. yd. unclassified excav.	.48	.40	.62	.60	.79	.40
416 cu. yd. excav. for structs.	1.00	6.00	6.50	4.00	6.00	4.00
2,500 yd. mi. haul	.35	.30	.20	.20	.30	.20
1,200 M. gal. watering embankments	.05	2.00	2.00	2.00	1.50	1.50
190 M. gal. watering base and surface courses	2.50	2.00	2.00	2.00	2.00	1.50
7 days rolling power roller	80.00	56.00	90.00	45.00	60.00	60.00
60 days rolling tamping roller	40.00	56.00	45.00	45.00	30.00	50.00
300 cu. yd. mechanical tamping	2.00	2.50	2.50	2.00	5.00	2.50
5,300 ton cr. rock surf. crse. ¾-in. max.	2.80	3.50	3.35	4.00	4.00	2.75
7,500 ton cr. rock in stkpl. ¾-in. max. Site No. 1	2.10	2.35	2.20	1.70	2.55	1.45
7,500 ton cr. rock in stkpl. ¾-in. max. Site No. 2	1.70	2.00	1.85	1.60	2.00	1.30
332 cu. yd. conc., Class A	65.00	69.00	69.50	80.00	80.00	72.00
63,000 lb. metal reinf.	.14	.13	.14	.12	.13	.15
5,000 lb. structural steel	.32	.25	.35	.60	.50	.40
220 structural steel handlrail	8.50	8.00	8.90	10.00	10.00	8.00
450 lin. ft. 18-in. pipe culverts	3.50	4.50	4.00	4.00	5.00	4.00
80 lin. ft. 24-in pipe culverts	5.50	6.00	6.25	6.00	6.50	6.00
1,600 cu. yd. loose riprap	4.00	3.50	3.00	3.00	2.00	7.00
6,000 lin. ft. wire fence Type 2	.20	.20	.20	.45	.35	.30
2 ea. project markers	25.00	20.00	30.00	25.00	25.00	20.00
20 ea. right-of-way markers	6.00	7.00	8.00	7.00	8.00	10.00
1 ea. 30-ft. wire gates	15.00	30.00	35.00	50.00	50.00	10.00

Ebey Slough Bridge in Washington

Washington—Snohomish County—State. Guy F. Atkinson Co., Seattle, received a contract from the Department of Highways on its low bid of $1,192,822 for construction of the Ebey Slough Bridge on Primary State Highway No. 1. Unit prices were as follows:

(1) Guy F. Atkinson Co. $1,192,822
(2) Manson Construction & Engineering Co. 1,241,086
(3) General Construction Co. 1,265,777
(4) Peter Kiewit Sons' Co. 1,331,928
(5) M. P. Butler $1,338,09
(6) Morrison-Knudsen Co., Inc. 1,427,48
— Valle-Sommers Construction Co. 1,473,03
— MacRae Brothers 1,515,81
— N. Fiorito Co. 1,634,80

	(1)	(2)	(3)	(4)	(5)	(6)
42,700 cu. yd. com. borrow, incl. haul	.56	.70	.70	.75	.75	.8
29,200 cu. yd. excav. of unsuit. matl. incl. haul	.58	1.20	.90	.75	.75	.6
Lump sum, removing abandoned mill	550.00	$1,000	$2,000	$11,000	$5,000	$1,00
BRIDGE						
7,700 cu. yd. struct. excav.	3.40	8.00	4.00	1.50	2.50	4.0
Lump sum, shoring and cribs	$105,000	$60,000	$100,000	$173,000	$75,000	$110,00
16 days mechanical tamper	80.00	100.00	50.00	50.00	44.00	50.0
5,000 cu. yd. conc. Class "A"	62.00	61.00	70.00	70.00	50.00	78.0
4,150 cu. yd. conc., Class "F"	29.00	35.00	26.00	32.00	50.00	32.0
1,900 cu. yd. conc., Class "H"	26.00	25.00	24.00	25.00	50.00	22.0

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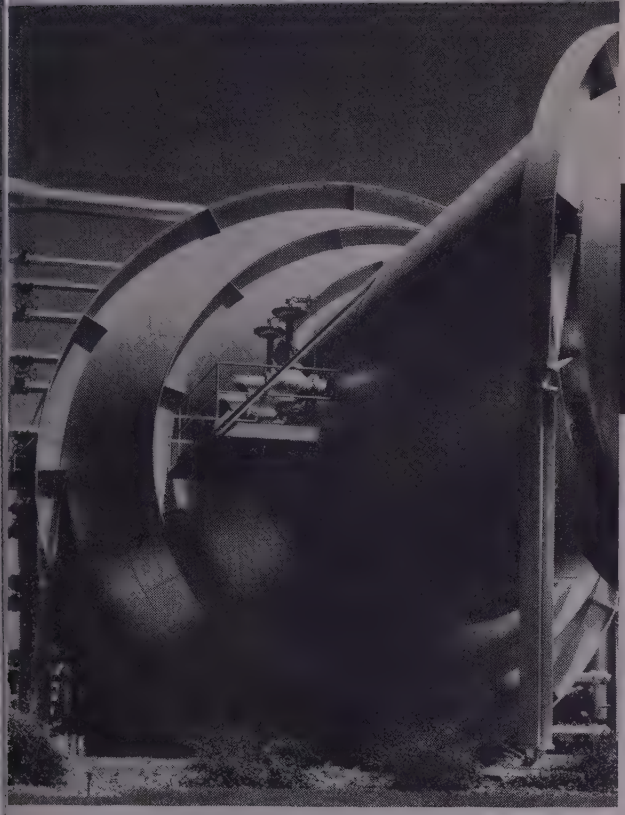

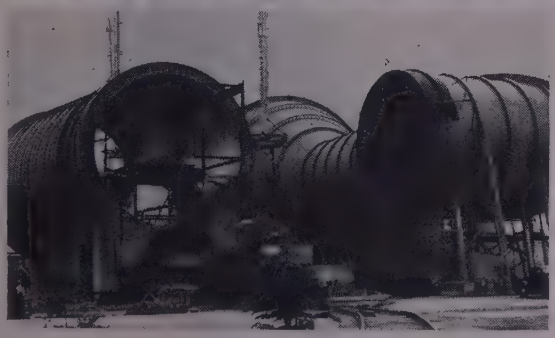

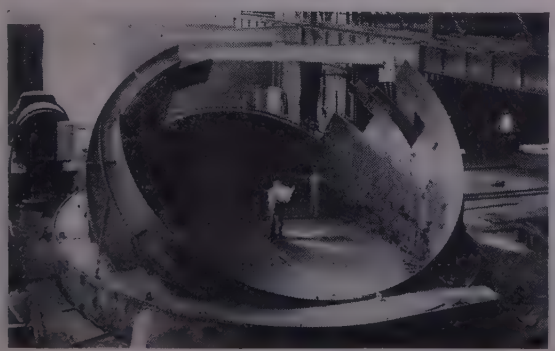

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UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)	(5)	(6)
2,310	lin. ft. reinf. conc. bridge railing	7.00	9.00	8.00	8.00	8.00	10.00
1,610,000	lb. steel reinf. bars	.10	.10	.105	.095	.115	.12
870,000	lb. structural carbon steel	.18	.20	.19	.19	.23	.22
19,500	lb. cast steel	.40	.40	.40	.50	.45	.50
78	only bridge drains	40.00	70.00	40.00	35.00	43.00	50.00
67,100	lin. ft. furn. timber piling, untreated	.60	.50	.75	.75	1.00	.95
713	only driving untreated timber piles	35.00	30.00	30.00	27.00	25.00	37.00
13,500	lin. ft. furn. precast conc. piling	3.50	4.00	4.50	3.65	4.10	4.30
300	only driving precast conc. piles	56.00	50.00	45.00	60.00	30.00	67.50
6,336	lin. ft. furn. precast conc. pile extensions	4.70	6.00	7.00	4.80	7.50	5.70
396	only driving composite piles	80.00	50.00	40.00	80.00	35.00	97.50
4	only furn. and driving untr. timber test piles	600.00	500.00	300.00	500.00	800.00	650.00
2	only furn. and driving precast conc. test piles	700.00	700.00	700.00	600.00	$1,000	750.00

Power

Eklutna Power Plant in Alaska

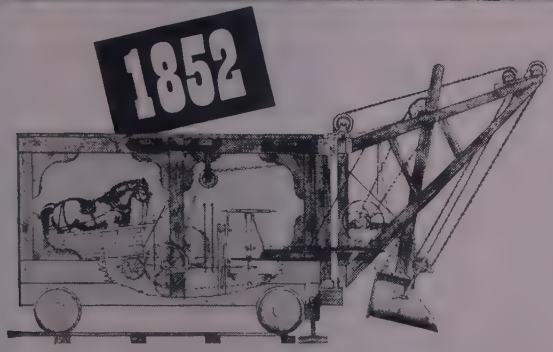
Alaska—Eklutna Project—USBR. Rue Contracting Co., Fargo, No. Dak., submitted the low bid of $2,579,607 to the Bureau of Reclamation for construction of the Eklutna Power Plant, Eklutna Project. The work to be performed for the power plant and appurtenant structures includes excavation for the structures; driving of piles, construction of the substructure of the power plant including the machine shop; construction of the penstock anchor block and the transformer structure; installation of electrical, mechanical, and hydraulic apparatus; installation of interior of ceilings and partitions, doors, piping; plumbing fixtures; metal stairs; handrailings; ladders; platforms; floor plates; hatch covers; and gratings; installation of transformer track rail; and erecting switchyard steel structures. For the purpose of these specifications the machine shop is considered as part of the power plant. Additional work includes relocation of highway, excavation and backfill on service area around the power plant and the excavation for and construction of the tailrace conduit and channel. Unit prices were as follows:

(1) Rue Contracting Co. $2,579,607
(2) J. H. Pomeroy and Co., Inc. 2,839,413
(3) Morrison-Knudsen Co., Inc. and Peter Kiewit Sons' Co. $3,126,550
(4) Engineer's estimate 3,032,204

		(1)	(2)	(3)	(4)
Lump sum, unwatering		$80,000	$46,000	$145,400	$100,000
31,000	cu. yd. excavation for structures	1.50	2.00	1.70	7
58,500	cu. yd. excavation for tailrace channel	2.00	.80	1.70	3
250	cu. yd. excavation for culverts and ditches	7.00	8.00	3.20	
40,000	cu. yd. backfill	1.50	2.00	3.20	1.5
24,700	cu. yd. compacting backfill	2.00	1.60	3.60	7.00
55	cu. yd. screened gravel fill	15.00	12.00	16.60	13.0
100	cu. yd. gravel surface	10.00	12.00	10.00	9.
1,000	cu. yd. riprap	10.00	6.50	4.50	10.00
34,000	cu. yd. roadway embankment	1.50	2.00	2.00	1.00
6,600	cu. yd. selected roadway subsurfacing	3.00	2.60	2.85	1.
150	M. gal. water for moistening embankment materials	10.00	8.00	7.90	6.00
220	roller hrs. rolling roadway embankments	20.00	22.00	23.30	18.00
1,750	cu. yd. crusher-run base	12.00	10.00	11.40	5.50
18	ton liquid-asphalt prime coat	200.00	170.00	42.00	40.00
665	cu. yd. mineral aggregate for bituminous surfacing	15.00	40.00	13.80	7.00
80	ton liquid asphalt for bitum. surfacing and seal coat	125 00	260.00	35.20	40.00
100	cu. yd. stone chips for seal coat	45.00	32.00	15.30	18.00
100	lin. ft. furn. and lay. 12-in. diam. 16-ga. corru. metal pipe	10.00	17.00	8.30	6.00
70	lin. ft. furn. and lay. 24-in. diam. 14-ga. corru. metal pipe	14.00	27.00	16.60	13.00
150	lin. ft. furn. and lay. 36-in. diam. 12-ga. corru. metal pipe	25.00	44.00	30.90	23.50
17,000	lin. ft. driving vertical H bearing piles	4.00	3.80	3.90	4.50
6,700	lin. ft. driving steel H bearing piles	4.50	3.80	5.10	5.30
100	splices splicing steel H bearing piles	70.00	120.00	95.00	50.00
390	caps capping steel H bearing piles	50.00	60.00	31.50	20.00
8,300	bbl. furnishing and handling cement	13.50	30.00	17.80	12.00
317,000	lb. furn. and placing reinf. bars ¾-in. diam. and smaller	.25	.36	.30	.32
588,000	lb. furn. and placing reinf. bars ⅞-in. diam and larger	.25	.32	.30	.30
2,915	cu. yd. first-stage in power-plant structure	90.00	88.00	133.00	85.00
900	cu. yd. first-stage concrete in power-plant superstructure	160.00	250.00	297.00	160.00
1,075	cu. yd. second-stage concrete in power-plant structure	75.00	76.00	105.00	75.00
435	cu. yd. concrete in penstock anchor	70.00	53.00	92.00	75.00
215	cu. yd. concrete in transformer and miscel. structs.	150.00	275.00	300.00	150.00
725	cu. yd. concrete in tailrace conduit	170.00	300.00	205.00	105.00
3	cu. yd. concrete in blockouts	900.00	250.00	385.00	235.00
425	lin. ft. constructing type "A" control joints	7.00	2.00	6.00	7.00
120	lin. ft. constructing type "B" control joints	9.00	2.00	6.00	6.00
2,500	sq. ft. furn. and placing 1-in. corkboard joint filler	4.00	.50	2.85	3.50
2,200	lin. ft. placing rubber water stops	5.00	3.00	4.00	4.50
6,565	sq. ft. furn. and placing roof insulation	2.00	1.25	1.40	1.30
4,600	sq. ft. furn. and placing coal-tar-saturated-felt roofing	2.50	.75	.85	.85
4,200	sq. ft. furn. and placing membrane waterproofing	2.00	4.00	.90	1.75
1,320	sq. yd. bonded-concrete finish on floors, stairs, and stair landings	14.50	10.00	24.00	21.40
50	lin. ft. bonded-concrete finish at base of walls	7.00	1.25	8.40	5.70
760	sq. ft. furn. and installing rubber tile	3.00	1.00	3.00	2.15
90	lin. ft. furn. and installing rubber cove base	2.00	1.00	2.80	1.40
14,000	sq. ft. furn. and install. 2-in. nominal thickness insulation on walls, ceiling, and cover plates	1.25	1.25	1.50	1.30
760	sq. ft. installing control-room ceiling	4.00	1.50	2.40	5.00
156	sq. ft. furn. and install. flush-type metal partitions	12.00	8.00	10.00	13.00
390	sq. ft. furn. and install. industrial-type metal partitions	5.00	7.00	8.30	11.00
110	sq. ft. furn. and install. industrial-type ceiling	5.00	8.00	6.40	5.50
8	lin. ft. furn. and install. metal toilet-stall partition and metal urinal partition	20.00	25.00	31.00	46.00
470	sq. ft. erecting drywall partitions and toilet-room ceiling	3.00	2.50	3.10	2.35
256,000	lb. furn. and erect. structural-steel building framing	.40	.50	.36	.50
4,000	lb. furn. and install. embedded metal frames and embedded metal tubing	1.50	1.00	.70	1.40
32,500	lb. furn. and install. hatch covers, cover plates, & gratings	.70	1.00	.55	.75
1,000	lb. furn. and install. track rails on concrete	.40	1.00	.64	.40
15	Mbm furn. and installing timber ties and guard timbers	500.00	600.00	510.00	560.00
19,000	lb. furn. and installing track rails on timber ties	.40	1.00	.50	.40
240	cu. yd. furn. and placing rock ballast	10.00	8.00	12.00	10.00

(Continued on next page)

100 years of progress in OSGOOD shovels



OSGOOD'S 2-horse power excavator

of 100 years ago was powered by a team of horses on a treadmill inside the machine. Although crude by today's standards, this excavator embodied the four principal functions of a modern power shovel; (1) Crowd (2) Hoist (3) Swing (4) Travel. Then, as now, the name OSGOOD stood for sound engineering.

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UNIT BID PRICES — CONTINUED

	(1)	(2)	(3)	(4)
64,000 lb. furn. and erecting switchyard steel structures	.59	.90	1.05	.85
84 sq. ft. furn. and install. flush-type hollow-steel exterior swinging doors	30.00	11.00	11.00	28.00
462 sq. ft. furn. and installing metal accordion doors	12.00	9.00	11.00	26.00
150 sq. ft. furn. and install. tin-clad fire doors	10.00	12.00	12.00	22.00
63 sq. ft. furn. and installing wood swinging doors	12.00	6.00	6.00	18.50
75 sq. ft. furn. and install. steel windows	10.00	13.00	7.60	9.00
6,300 lb. furn. anchor bolts	.60	.50	.35	.27
8,200 lb. installing anchor bolts	1.00	.70	.50	.90
4,200 lb. furn. and install. pipe railings	1.20	1.00	1.40	1.30
1,600 lb. furn. and install. pipe ladders	1.20	1.00	1.40	1.20
7,300 lb. furn. and install. metal stairs	1.00	.75	1.20	1.30
126 lin. ft. furn. and installing metal safety treads	6.00	2.00	5.00	5.50
2,700 lb. furn. and install. cable trays, cable tray supports, and cable ducts	1.07	1.00	1.30	1.00
800 sq. ft. furn. and install. asbestos-cement sheets for cable trays and cable ducts	3.29	2.50	2.85	1.90
1,200 lb. furn. and installing nonmagnetic conduit and cable supports	2.10	5.00	6.00	1.65
2,000 lb. furn. and install. rotor erection base	.75	.75	.70	1.00
15 lin. ft. furn. and install. metal enclosure	20.00	40.00	57.00	17.00
3,200 lb. furn. and install. stop-log liners	.75	.70	.50	1.00
3,900 lb. furn. and install. miscl. metalwork	1.00	.90	.85	1.30
110,000 lb. installing penstock	.30	.20	.35	.23
65,000 lb. installing turbine guard valves	.20	.10	.24	.38
4,000 lb. installing guides and seats for bulkhead gate	.30	.60	.31	.38
3,000 lb. installing draft-tube bulkhead gate	.20	.25	.14	.30
83,300 lb. installing cranes	.20	.05	.12	.18
13,200 lb. installing oil storage tanks	.20	.11	.26	.25
Lump sum, installing machine tools	$5,000	$1,800	$3,100	$3,750
Lump sum, installing two 25,000-hp. hydraulic turbines	$150,000	$100,000	$77,300	$75,000
Lump sum, installing 2 governors for hydraulic turbines	$20,000	$4,000	$8,900	$12,500
4,000 lb. installing motor-driven drainage and unwatering pumps	.75	.15	.15	.50
500 lb. installing motor-driven gear-type oil pump	1.00	.40	.31	.65
1,000 lb. install. motor-driven centrif.-type fire-protect. pump	.40	.20	.31	.65
1,000 lb. installing jet pumps	.40	.30	.31	.65
3,000 lb. install. 50 cu. ft. per min. motor-driven, mounted air compressors	.40	.33	.31	.50
500 lb. install. 8 cu. ft. per min. motor-driven portable air compressor	.50	.60	.31	.50
Lump sum, install. carbon-dioxide fire exting. systems for generators and for oil storage and oil purifier rooms	$5,000	750.00	$1,800	$5,000
Lump sum, install. portable fire extinguishers and hose-reel cart	$2,000	200.00	710.00	$1,500
Lump sum, install. water level indicating instrument	$1,500	230.00	770.00	900.00
30 instruments installing miscl. indicating instruments	50.00	50.00	60.00	75.00
Lump sum, install. portable oil purifier and filter-paper drying oven	$2,500	200.00	770.00	750.00
8 cabinets install. comb. fire hose and service cabinets	72.00	75.00	95.00	150.00
125 name plates installing name plates	15.00	2.50	7.00	15.00
2,000 lb. install. special valves and special fittings	.58	.60	.62	1.20
3,000 lb. install. flanged strainers in power plant	.40	.50	.45	1.20
11,500 lb. furn. and install. cast-iron soil pipe and fittings	.95	.65	1.00	1.00
20,000 lb. furn. and install. embedded cast-iron bell-and-spigot water pipe, fittings, and wall castings	1.14	.60	1.25	.90
4,000 lb. furn. and install. buried cast-iron bell-and-spigot water pipe, valves, and fittings	.85	.65	.90	.90
150 lb. furn. and install. embedded steel pipe and fittings 2 in. and smaller in nominal diam.	2.04	1.00	2.20	1.90
150 lb. furn. and install. buried steel pipe, valves, and fittings 2 in. and smaller in nominal diam.	1.36	1.00	1.45	1.65
24,400 lb. furn. and install. exposed steel pipe, valves, and fittings 2½ in. and larger in nominal diam.	1.31	1.00	1.40	1.50
25 lb. furn. and install. metal tubing, valves, and fittings	2.00	1.30	.80	2.60
2,000 lb. furn. and install. pipe hangers and supports	2.00	.75	1.10	4.00
2 fixtures furn. and install. water closets	200.00	130.00	260.00	275.00
1 fixture furn. and install. urinal	216.00	300.00	280.00	325.00
2 fixtures furn and install. lavatories	162.00	160.00	210.00	230.00
1 fixture furn. and install. service sink	276.00	160.00	360.00	370.00
1 fixture furn. and install. kitchen sink	216.00	160.00	280.00	230.00
1 heater, furn. and install. 30-gal. elect. storage water heater	384.00	160.00	475.00	370.00
1 heater furn. and install. 20-gal. elect. storage water heater	330.00	260.00	410.00	335.00
1 cooler install. electric water cooler	450.00	400.00	580.00	300.00
Lump sum, furn. and install. heating and ventilating system	$29,360	$32,000	$33,000	$25,000
5,000 lb. furn. and install. grounding system in power plant, transformer area, and switchyard	3.36	.70	3.00	3.75
25 lb. furn. and install. grounding system in gate control hse.	6.30	1.00	3.00	4.30
150 lin. ft. furn. and install. embed. elect. rigid metal conduit ½-in. in diam.	1.79	2.00	2.20	2.10
6,500 lin. ft. furn. and install. embed. elect. rigid metal conduit ¾-in. in diam.	1.95	2.00	2.20	2.35
2,000 lin. ft. furn. and install. embed. elect. rigid metal conduit 1-in. in diam.	2.14	2.00	2.50	2.90
50 lin. ft. furn. and install. embed. elect. rigid metal conduit 1¼-in. in diam.	2.65	3.00	4.00	3.75
1,300 lin. ft. furn. and install. embed. elect. rigid metal conduit 1½-in. in diam.	3.09	4.00	4.60	4.35
350 lin. ft. furn. and install. embed. elect. rigid metal conduit 2-in. in diam.	3.82	5.00	5.60	5.40
330 lin. ft. furn. and install. embed. elect. rigid metal conduit 2½-in. in diam.	4.27	8.00	9.60	7.50
50 lin. ft. furn. and install. embed. elect. rigid metal conduit 3 inches in diam.	7.35	16.00	19.20	9.40
40 lin. ft. furn. and install. embed. elect. rigid metal conduit 3½-in. in diam.	9.08	18.00	21.50	10.80
75 lin. ft. furn. and install. embed. elect. rigid metal conduit 4-in. in diam.	11.17	21.00	25.80	12.70
200 lin. ft. furn. and install. exposed elect. rigid metal conduit ½-in. in diam.	1.79	2.50	2.80	2.50
935 lin. ft. furn. and install. exposed elect. rigid metal conduit ¾-in. in diam.	1.95	2.50	3.00	2.70
200 lin. ft. furn. and install. exposed elect. rigid metal conduit 1-in. in diam.	2.14	3.00	3.40	3.40
150 lin. ft. furn. and install. exposed elect. rigid metal conduit 1½-in. in diam.	3.36	4.00	5.00	4.95
15 lin. ft. furn. and install. exposed elect. rigid metal conduit 2-in. in diam.	4.11	8.00	10.00	6.30
50 lin. ft. furn. and install. exposed elect. rigid metal conduit 3-in. in diam.	7.72	17.00	20.00	10.50

(Continued on next page)

Straight Down to Paydirt!

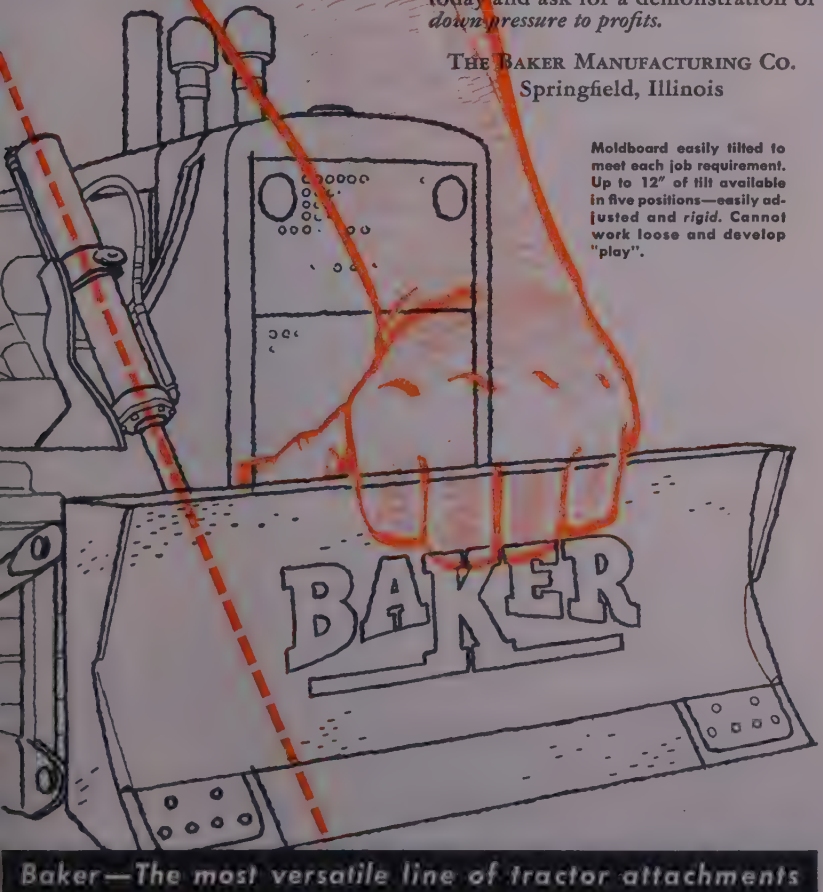
Designed for maximum down pressure through toughest conditions, Baker Hydraulic Blades *go down positively* and *stay down positively*—with the exact bite desired—fingertip-controlled by the operator.

Regardless of blade tilt or angle, Baker's superior design provides *straight-line force* through hydraulic cylinders to blade—permitting nearly entire weight of tractor to force blade *straight down to pay dirt!*

The versatile line of Baker Bulldozers, Grade-builders and Root Rippers—*all interchangeable*—is manufactured exclusively for Allis-Chalmers tractors. Three mountings are available: Engine-mounted hydraulic; frame-mounted hydraulic (the revolutionary 9-X "no-pushbeam" 'Dozer), and cable-controlled types.

Contact your Baker, A-C Dealer today and ask for a demonstration of *down pressure to profits.*

THE BAKER MANUFACTURING CO.
Springfield, Illinois



Moldboard easily tilted to meet each job requirement. Up to 12" of tilt available in five positions—easily adjusted and *rigid*. Cannot work loose and develop "play".

Baker—The most versatile line of tractor attachments

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Albuquerque, New Mexico

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Roswell, New Mexico

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The Dalles, Oregon

Farm & Industrial Equipment Co.
Eugene, Oregon

West-Hitchcock Corporation
Klamath Falls, Oregon

Oregon Tractor Company
LeGrande, Oregon

Tractor Sales & Service, Inc.
Medford, Oregon

Wood Tractor Company
Portland, Oregon

•

Cate Equipment Company, Inc.
Salt Lake City, Utah

•

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

Northern Harris
Walla Walla, Washington

Yukon Equipment, Inc.
Seattle, Washington
Fairbanks, Alaska
Anchorage, Alaska

American Machine Co.
Spokane, Washington

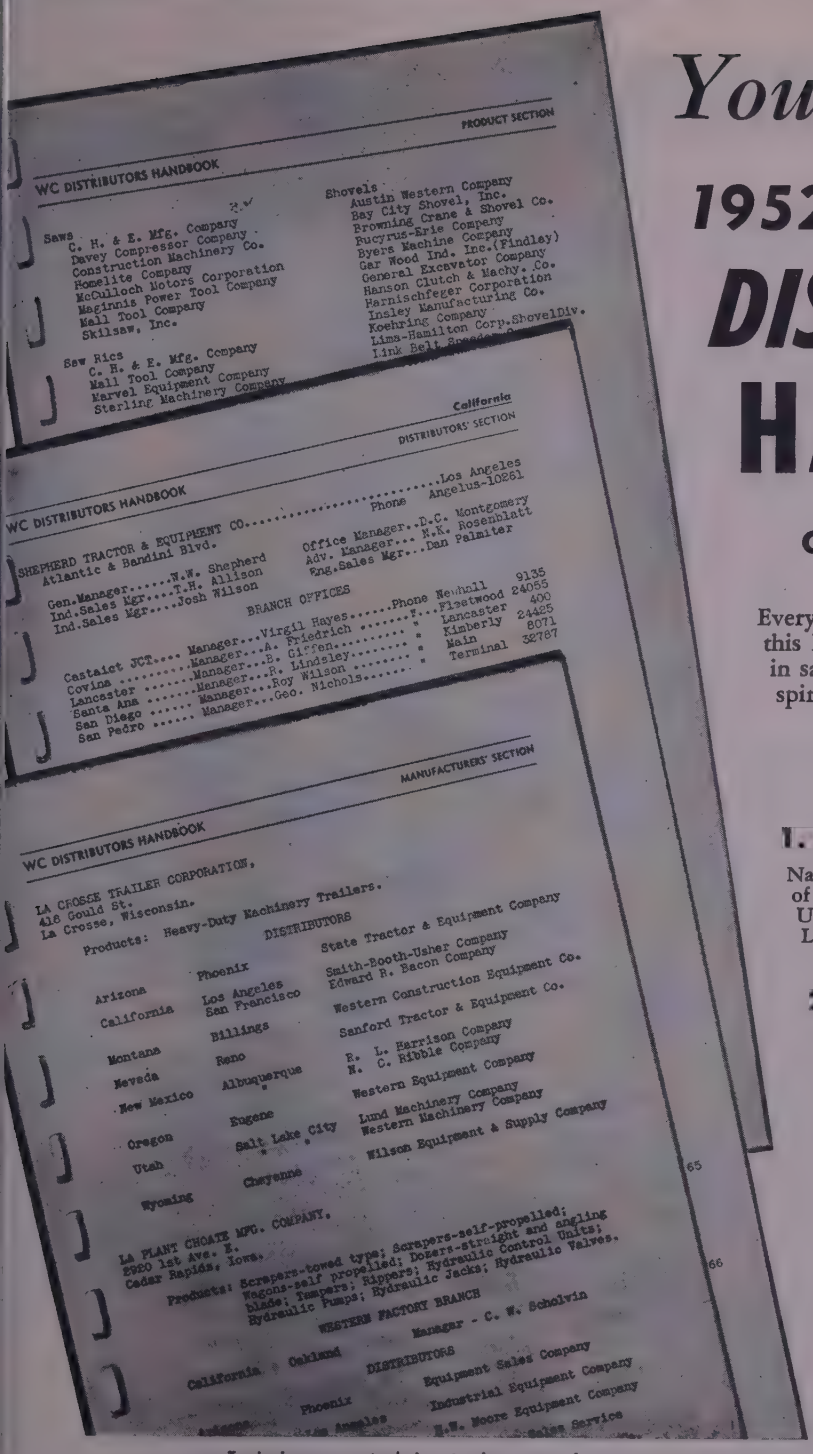
•

Studer Tractor & Equipment Co.
Casper, Wyoming

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)
45	lin. ft. furn. and install. exposed elect. rigid metal conduit 4-in. in diam.	11.76	28.00	33.00	13.50
100	lin. ft. furn. and install. exposed elect. flex. metal conduit ½-in. in diam.	1.58	1.75	2.10	1.90
100	lin. ft. furn. and install. exposed elect. flex. metal conduit ¾-in. in diam.	1.89	2.00	2.20	2.10
100	lin. ft. furn. and install. exposed elect. flex. metal conduit 1-in. in diam.	2.67	3.50	4.20	2.70
50	lin. ft. furn. and install exposed elect. flex. metal conduit 1½-in. in diam.	5.04	8.00	9.80	4.00
10	lin. ft. furn. and install. exposed elect. flex. metal conduit 2-in. in diam.	6.76	10.00	13.00	4.95
10	lin. ft. furn. and install exposed elect. flex. metal conduit 2½-in. in diam.	11.76	13.00	15.30	7.00
90	lin. ft. furn. and install embedded elect. nonmetallic conduit 2-in. in diam.	1.89	2.00	2.30	3.50
730	lin. ft. furn. and install. embedded elect. nonmetallic conduit 4-in. in diam.	2.42	2.00	2.50	7.00
1,400	lin. ft. furn. and install. exposed elect. nonmetallic conduit 4-in. in diam.	2.52	5.00	6.00	7.60
14,150	lin. ft. furn. and install. single-conductor, No. 12 AWG, 600-volt-insulated electrical wire	.15	.12	.14	.24
8,240	lin. ft. furn. and install. single-conductor, No. 10 AWG 600-volt-insulated electrical wire	.18	.14	.20	.28
3,200	lin. ft. furn. and install. single-conductor, No. 8 AWG, 600-volt-insulated electrical wire	.23	.16	.20	.47
2,300	lin. ft. furn. and install. single-conductor, No. 6 AWG, 600-volt-insulated electrical wire	.33	.25	.30	.70
350	lin. ft. furn. and install. single-conductor, No. 4 AWG, 600-volt-insulated electrical wire	.44	.35	.42	.95
500	lin. ft. furn. and install. single-conductor, No. 1 AWG, 600-volt-insulated electrical control cable	.77	.70	.85	1.40
3,000	lin. ft. furn. and install. 2-conductor, No. 19/22 AWG, 600-volt-insulated electrical control cable	.65	.60	.70	1.30
1,500	lin. ft. furn. and install. 3-conductor, No. 19/22 AWG, 600-volt-insulated electrical control cable	1.03	1.00	1.25	1.65
1,600	lin. ft. furn. and install. 5-conductor, No. 19/22 AWG, 600-volt-insulated control cable	1.47	1.50	1.80	2.35
2,200	lin. ft. furn. and install. 7-conductor, No. 19/22 AWG, 600-volt-insulated electrical control cable	1.68	2.00	2.25	3.00
600	lin. ft. furn. and install. 9-conductor, No. 19/22 AWG, 600-volt-insulated electrical control cable	2.37	2.70	3.20	3.50
400	lin. ft. furn. and install. 12-conductor, No. 19/22 AWG, 600-volt-insulated electrical control cable	3.53	4.00	4.75	4.50
50	lin. ft. furn. and install. 9-conductor, No. 16 AWG, 600-volt-insulated electrical control cable	2.94	3.00	3.90	3.50
300	lin. ft. furn. and install. 19-conductor, No. 16 AWG, 600-volt-insulated electrical control cable	5.15	5.00	5.80	5.90
500	lin. ft. furn. and install. single-conductor, 250,000-circular mil, 600-volt-insulated electrical power cable	1.84	2.00	2.30	3.50
500	lin. ft. furn. and install. single-conductor, No. 4 AWG, 15,000-volt-insulated electrical power cable	5.04	3.00	3.30	3.30
500	lin. ft. furn. and install. 2-conductor, No. 8 AWG, 600-volt-insulated electrical parkway cable	1.80	.75	.90	2.80
1,900	lin. ft. install. single-conductor 1,750,000-circular mil, 15,000-volt-insulated electrical main power cable	6 51	6.00	5.35	9.40
Lump sum,	installing generator voltage switchgear	$2,650	$3,000	$3,600	$25,000
Lump sum,	installing 2 sets of generator-neutral grounding equip.	945 00	$1,200	$1,570	$2,000
Lump sum,	installing 2 generator surge-protective equip. cubicles	$1,430	750.00	900.00	$4,000
600	lb. installing carrier-current transmitter-receiver sets	1.58	1.50	1.65	1.50
500	lb. installing capacitor potential-device adjustment units	.74	.90	1.05	.90
152,000	lb. instal. large power transformers without oil in transformer area	.05	.15	.18	.11
57,500	lb. handling, filtering, and purifying insulating oil for power transformers and placing insulating oil in power transformers	.04	.15	.02	.05
8,800	lb. installing small power transformer without oil in transformer area	.14	.25	.30	.45
2	breakers install. 115-kilovolt power circuit breakers	$3,780	$3,000	$3,500	$3,500
28,000	lb. handling, filtering, and purifying insulating oil for power circuit breakers and placing insulating oil in power circuit breakers	.035	.10	.11	.05
7	switches installing 115-kilovolt bus-disconnecting air switches in switchyard and transformer area	990.00	$1,300	$1,600	$2,000
3	arresters installing 115-kilovolt lightning arresters	515 00	550.00	650.00	750.00
483	insulators furn. and install. suspension-type insulators	10.50	11.00	13.00	11.00
3	insulators furn. and install. 115-kilovolt pedestal insulators	27.30	50.00	65.00	34.00
15	stacks furn. and install. 115-kilovolt pedestal insul. stacl s	247.00	335.00	400 00	370.00
950	lb. furn. and install. No. 4/0 AWG copper buses in switchyard and transformer area	2.84	1.65	2.00	4.70
360	lb. furn. and install. 1¼-in. iron-pipe-size copper tubing in switchyard and transformer area	5 57	2.20	2.60	9.40
2,050	lb. furn. and install 2½-in. iron-pipe-size copper tubing in transformer area	3.26	2.00	2.60	8.25
7	fixtures furn. and install. lighting fixtures in switchyard and transformer area	95.00	110.00	130.00	215.00
2	receptacles furn. and install. weather-proof, outdoor-type plug receptacles in switchyard and transformer area	28.40	25.00	30.00	85.00
9	attachments furn. and install. strain insulator spring attachments	21.00	30.00	34.00	35.00
4,000	lb. install. 115-kilovolt coupling capacitors and potential devices	.26	.70	.80	.85
1,200	lb. installing line traps	.53	.65	.80	.85
500	lb. install. carrier-current line tuning units and coaxial cables	.65	.70	.85	1.20
80	lb. install. elect. apparatus in gate control house	2.63	3.50	4.20	1.50
5	devices furn. and install. wiring devices in gate control house	30.00	7.00	9.00	40.00
11,000	lb. installing main control board	1.05	.25	.30	.8
5,000	lb. install. low-voltage alternating-current power distribution board	.63	.20	.25	1.1
1,000	lb. install. dry-type 50-kva distribtn. lighting transformers	.63	.40	.50	.7
600	lb. install. CO_2 control cabinets and assoc. equipment	1.05	.70	.80	1.8
2,500	lb. install. direct-current power distribution board	.84	.40	.45	1.1
1,500	lb. installing 2 battery chargers	.80	.15	.20	.6
20,000	lb. install. 300-kva station-service transformers including associated bus and disconnect switches	.10	.15	.16	.3
2,500	lb. install. miscl. power distribution cabinets	1.26	.55	.65	1.1

(Continued on next page)



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UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)
2,000	lb. installing recording board	1.05	.40	.50	1.10
12	receptacles furn. and install. 460-volt power receptacles complete with metal enclosures and matching plugs	86.10	70.00	81.00	225.00
2	receptacles furn. and install. 115-volt power receptacles complete with matching plugs	55.00	20.00	20.00	75.00
9,000	lb. install. station-storage battery and battery rack	.15	.25	.26	.28
800	lb. furn. and install. power contact conductors for 40-ton traveling crane	1.47	2.00	2.20	3.50
3	panelboards furn. and install. recessed lighting panelboards	325.00	600.00	700.00	830.00
150	devices furn. and install. lighting system wiring devices	6.62	8.00	10.00	35.00
1	contactor assemb. furn. and install recessed emergency lighting contactor	231.00	300.00	370.00	215.00
2	fixtures furn. and installing type "A" lighting fixtures	10.00	10.00	13.50	28.00
93	fixtures furn. and install. types "B", "C", "D", and "E" lighting fixtures	20.00	22.00	27.00	70.00
15	fixtures furn. and install. type "F" lighting fixtures	12.60	10.00	12.00	50.00
12	fixtures furn. and install. types "G" & "H" lighting fixts.	25.20	30.00	36.00	68.00
6	fixtures furn. and install. type "J" lighting fixtures	25.20	25.00	30.00	59.00
23	fixtures furn. and install. types "K", "L", and "M" lighting fixtures	46.20	50.00	65.00	90.00
12	fixtures furn. and install. type "N" lighting fixtures	94.50	90.00	110.00	220.00
2	fixtures furn. and install. type "P" lighting fixtures	16.80	20.00	21.00	90.00
12	fixtures furn. and install. type "Q" lighting fixtures	69.30	90.00	105.00	190.00
3	fixtures furn. and install. type "R" lighting fixtures	27.30	33.00	40.00	80.00
8	fixtures furn. and install. type "S" lighting fixtures	78.75	100.00	120.00	170.00
2	fixtures furn. and install. type "T" lighting fixtures	79.50	110.00	140.00	59.00
3	fixtures furn. and install. types "U" & "V" lighting fixts.	420.00	500.00	605.00	600.00
22	fixtures furn. and install. type "AA" fluorescent ltg. fixts.	50.00	125.00	150.00	210.00
1	set furn. complete set of incandescent lamps for spare stock for lamp replacement	147.00	100.00	23.00	68.00
24	lamps furn. F48T 12/ww slimline fluorescent lamp for spare stock for lamp replacement	3.15	2.00	2.25	2.70
5	ballasts furn. 2-lamp 430ma ballasts for 48T12 slimline fluorescent lamps for spare stock for ballast replacement	12.61	17.00	20.00	8.00
14	recesses finishing recesses for lighting panelboards, distribution panelboards, and other recessed elect. equip.	30.00	15.00	23.00	45.00
2	recesses finishing recesses for type "A" incandescent lighting fixtures	25.00	13.00	23.00	45.00
Lump sum, furn. and install. overhead power and control cable circuits from power plant to gate control house		$15,120	$15,000	$18,200	$17,000
1,600	sq. ft. painting exterior surfaces of generators except handrailings, stairs, and walkways	.80	2.50	.80	.90
2,400	sq. ft. painting interior surfaces of generator housings and exposed surfaces of handrailings, stairs, and walkways	1.00	.50	.80	.80
3,250	lb. install. pressure water filter, pressure tank, and chlorinating equipment	.73	1.25	.50	1.25

Streets and Highways

Heavy grading, asphaltic concrete paving and bridge work in Oregon

Oregon—Lincoln County—State. McNutt Bros., Eugene, submitted the low bid of $963,787 to the State Highway Commission for bridge construction and grading and paving the Newport-Tolego section of the Corvallis-Newport Highway. Unit prices were as follows:

(1) McNutt Bros. $963,787
(2) Babler Bros., Inc. 968,992
(3) Fred H. Slate Co. Oregon Ltd. & E. C. Hall Co. 991,430
(4) Kuckenberg Construction Co. ..... $ 993,787
(5) Goetz & Brennan, R. H. Sussex and L. E. Hoback 994,455
(6) Peter Kiewit Sons' Co. 1,043,859

		(1)	(2)	(3)	(4)	(5)	(6)
All specified clearing and grubbing		128,000	100,000	65,000	125,000	100,000	2,000
9,600	sq. yd. removal of pavement	1.00	1.00	.25	.25	.30	.65
4,500	cu. yd. structural excav., unclassified	6.00	3.00	4.00	5.00	3.50	4.00
360	cu. yd. trench excav., unclassified	4.00	3.00	2.50	5.00	3.00	6.00
7,000	cu. yd. special borrow excav., unclassified	.60	.60	.60	1.00	.40	1.25
994,000	cu. yd. general excav., unclassified	.32	.44	.48	.42	.45	.50
1,926,000	yd. stas. short overhaul	.02	.01	.015	.01	.015	.01
45,000	cu. yd. stas. long overhaul	.60	.50	.50	.50	.60	.50
5.21	mi. finishing roadbed and slopes	$1,000	$1,000	800.00	500.00	700.00	$1,000
20,000	lin. ft. rounding cutbanks	.20	.15	.20	.20	.12	.20
70	lin. ft. 84-in. corrugated metal pipe	52.95	50.00	50.00	42.00	60.00	50.00
310	lin. ft. 24-in. 10-gauge, corrugated metal pipe	10.05	8.00	10.00	10.00	10.00	10.40
4,300	lin. ft. 6-in. perf. metal drain pipe, coated	1.70	2.00	2.00	2.50	2.50	1.80
9,700	lin. ft. 8-in. perf. metal drain pipe, coated	2.30	2.00	2.50	3.00	3.00	2.40
120	lin. ft. 8-in. metal drain pipe, coated	2.20	2.00	2.50	3.00	3.00	2.30
250	lin. ft. 12-in. concrete pipe	1.96	2.00	2.00	4.00	1.50	2.10
1,190	lin. ft. 18-in. concrete pipe	3.54	4.00	4.00	4.00	3.20	3.80
230	lin. ft. 36-in. concrete pipe	9.60	10.00	10.00	9.00	9.00	10.00
250	lin. ft. 48-in. concrete pipe	14.40	15.00	15.00	14.00	15.00	16.00
1,600	lin. ft. 18-in. extra str. conc. pipe	3.92	4.00	4.50	4.00	3.50	4.20
810	lin. ft. 24-in. extra str. conc. pipe	5.57	6.00	6.00	6.00	5.50	5.20
240	lin. ft. 36-in. extra str. conc. pipe	10.75	10.00	11.00	10.00	10.00	12.00
1,300	cu. yd. ⅜-in. - 0 backfill in drains	6.00	5.00	7.00	5.00	5.00	6.00
25,200	cu. yd. 3-in. - 0 rock in base	3.45	3.00	3.00	3.10	3.00	3.10
7,600	cu. yd. ¾-in. - 0 rock in base and shoulders	3.50	3.00	3.00	3.40	3.00	3.50
1,200	M. gal. sprinkling	2.00	2.00	2.50	2.00	3.00	2.00
5.21	mi. preparation of base	300.00	200.00	200.00	200.00	200.00	300.00
760	cu. yd. ¾-in. - 0 rock in binder course	4.35	4.00	4.50	4.00	4.70	5.30
120	ton RC-3 asphalt in binder course	45.00	40.00	45.00	45.00	45.00	55.00
16,300	ton Class "B" asphaltic conc.	8.20	7.00	7.00	6.80	6.70	7.30
70	ton RS-1 emuls. asph. in seal coat	47.50	50.00	45.00	45.00	45.00	51.00
420	cu. yd. aggregate in seal coat	6.50	5.00	5.00	5.50	5.30	6.70
4,700	lin. ft. furn. treated piling	2.00	1.75	2.00	1.50	1.80	1.00
112	only drive piles	65.00	50.00	65.00	50.00	50.00	60.00
384	cu. yd. Class "A" concrete	72.00	70.00	70.00	70.00	75.00	70.00
104,000	lb. metal reinforcement	.12	.12	.105	.12	.12	.11
11	M.F.B.M. treated lumber in place	375.00	275.00	300.00	300.00	300.00	300.00
All specified remove bridge at Station 220 plus 30		$2,750	$1,000	500.00	$2,000	500.00	500.00
All specified remove bridge at Station 282 plus 10		$2,750	$1,000	500.00	$2,000	500.00	500.00

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spanning the South Channel Sweetwater River between National City and Chula Vista, California is this 332-foot long highway bridge supported by Raymond piles. It has a 28-foot wide roadway and is of reinforced concrete construction with concrete caps resting directly on the Raymond piles—another example of the important role Raymond is playing in the constant development of the highways of America.

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801

12-page booklet on compaction equipment

In the first section of this 12-page brochure on the history of pneumatic-tired compaction equipment, there is a condensed background of rubber-tired compaction developments in the construction of super-highways, heavy duty airfield runways and giant earth dams. The second section gives results of compaction tests conducted at the Oahe Dam project near Pierre, So. Dak. Also shown are charts describing performance of Bros 35 and 50 Roll-O-Pactors in various types of fills. Details and specifications on the machine are contained in the third section of this well-illustrated brochure. **Wm. Bros Boiler and Mfg. Co.** is offering the material.

802

Tractor tools and their uses in heavy equipment brochure

Here is a brochure which for the first time provides a guide to the use of tractor-mounted tools in all basic industries such as railroading, construction, logging, mining, etc. **Hyster Company** has published "A Story of Tractor Tools and Their Uses," in a colorful cartoon format which is easy to read as well as being well illustrated. Much in this brochure has never before been presented in such practical form. "A Story of Tractor Tools and Their Uses" should be of interest to contractors, operators and others interested in construction operations.

803

Elevated water tank storage

Just about everything you would want to know about water storage in elevated steel tanks has been condensed into this 20-page, beautifully-illustrated booklet from **Pittsburgh-Des Moines Steel Co.** A pattern is set for the book in order to best present the information. The various types of tanks are pictured, explained and outlined in specifications form. The booklet advances the idea that there is a tank for your specific needs.

804

Motor grader maintenance

Those who own or operate No. 12, No. 112 and No. 212 Caterpillar Motor Graders will want to have a copy of this maintenance guide just released by **Caterpillar Tractor Co.** This offers 24 pages in color of good sound information. The company has again chosen a cartoon format for the presentation of this information, and readers will find that not much if anything is omitted from this important guide. There is a convenient table of contents on the back page to make spot checking an easy matter.

805

Useful panel booklets

Universal Form Clamp Co. offers two booklets just released for the interest of those concerned with the Uni-Form panel system and its versatility in building sewage treatment plants (SA-75) faster, easier and more economically. The second booklet (SA-70) covers the general line of the firm's products, form ties, anchors and other accessories for reinforced concrete construction. Both booklets provide the reader with diagrams, illustrations and actual photographs of operations.

806

Mobile machine shop booklet

This well-illustrated literature tells you all about the advantages of **Cemco Industries, Inc.'s** mobile machine shop—a complete trailer unit which rides around with you to meet the trouble on the spot. The usefulness of such a unit is pointed out in this booklet. Downtime troubles and costly delays can be held back by having such a unit ready to go into action. The booklet gives photo-

graphs of the equipment contained in the unit as well as construction and performance details which you will want to know.

807

"Cat" scraper line

In this 16-page illustrated booklet specifications are given for the nine sizes of scrapers offered by **Caterpillar Tractor Co.** from the No. 40 for use with the D4 track-type tractor to the No. 90 with a heaped capacity of 27 cu. yd. for use with the D8. The more than 20 illustrations include photographs of actual working conditions and drawings showing the particular features of the scrapers. Bulletin No. 30375 gives you a lot of information about this important line.

808

Pumping anything

This materials pump catalog issued by **Lincoln Engineering Co.** tells about the firm's line of Air-Motor operated pumps and accessories for automatic dispensing and applications of heavy to light materials, such as sealers, adhesives, roofing, waterproofing, etc. Shown are eleven standard models for Spray Gun, Pole Gun and Flo-Gun applications, plus component units for assembling custom-designed systems. Catalog No. 40 has it all.

809

Emergency power advantage

D. W. Onan & Sons, Inc., is offering this 24-page booklet to point out the advantages of emergency power systems. The booklet contains several articles on various types of business which were saved during power failures by the foresighted installation of properly planned emergency power systems. The booklet makes interesting reading, since power failure in many businesses can cost thousands of dollars and perhaps a few lives.

Literature briefs . . .

810

GEAR HERE — **The Snow-Nabstedt Gear Corp.** has issued a 4-page folder which illustrates industrial, farm and construction machinery driven by engines equipped with S-N Industrial Reduction Gears.

811

TILT-UP DETAILS—Information on the 3 new accessories for more efficient handling of tilt-up slabs is available from **Superior Concrete Accessories, Inc.,** in bulletin T U-1.

812

MITI-MITE—Most of you are probably aware of the new addition to the construction equipment family—the Miti-Mite machine for truck service. If you want to really keep abreast of this development you might send for Bulletin TX-127, offered by **Harnischfeger Corporation** to get you acquainted with this versatile truck crane development.

813

TRENCHLINER — A colorful 4-page booklet has been released by **Parsons Co.,** Koehring subsidiary, on the outstanding features of the new Model 202 Trenchliner.

814

LOW ABSORPTION CONCRETE—Here is a bulletin which tells you all about an integral treatment for producing concrete with low absorption, of special advantage for concrete slabs on the ground not subjected to hydrostatic pressure. **The Master Builders Co.** is offering the piece.

815

THE BIG SHIFT—A graphic description of how to shift the new Fuller Road Ranger Transmission is given in this new folder, released by **Fuller Manufacturing Co.**

816

COMPRESSORS—A new 4-page bulletin (E-237) descriptive of all types of 105-cfm. Davey Compressors is offered by **Davey Compressor Co.**

817

IN THE MAIN — "Mains Without Maintenance" tells you all about **Keasbey & Mattison's** Century asbestos-cement pipe—specifications, reference material, etc.

818

SECRET AGENT—Darex AEA is the trade name of this catalyzed air entraining agent. Information on dispensers and meters for this agent are available in a folder from **Charles R. Watts & Co.**

819

STOP WATER — EASILY! — Labyrinth Waterstops from **Water Seals, Inc.** can solve your problems simply, quickly, economically. The only things you need to do a good job are a knife, a hammer, some Waterstop and this free folder which gives you all the information.

820

POWER MAGIC—Information covering all 4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models of **Ingersoll-Rand Co.** compressors is contained in the firm's "Power Magic" booklet.

MORE LITERATURE FOLLOWS

CLIP AND MAIL THIS COUPON

▶▶ *for your free copies of*

NEW LITERATURE

▶▶ *or for more information on*

NEW EQUIPMENT

described in the following pages.

WESTERN CONSTRUCTION

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Please list below key numbers of items in which you are interested

Name_____

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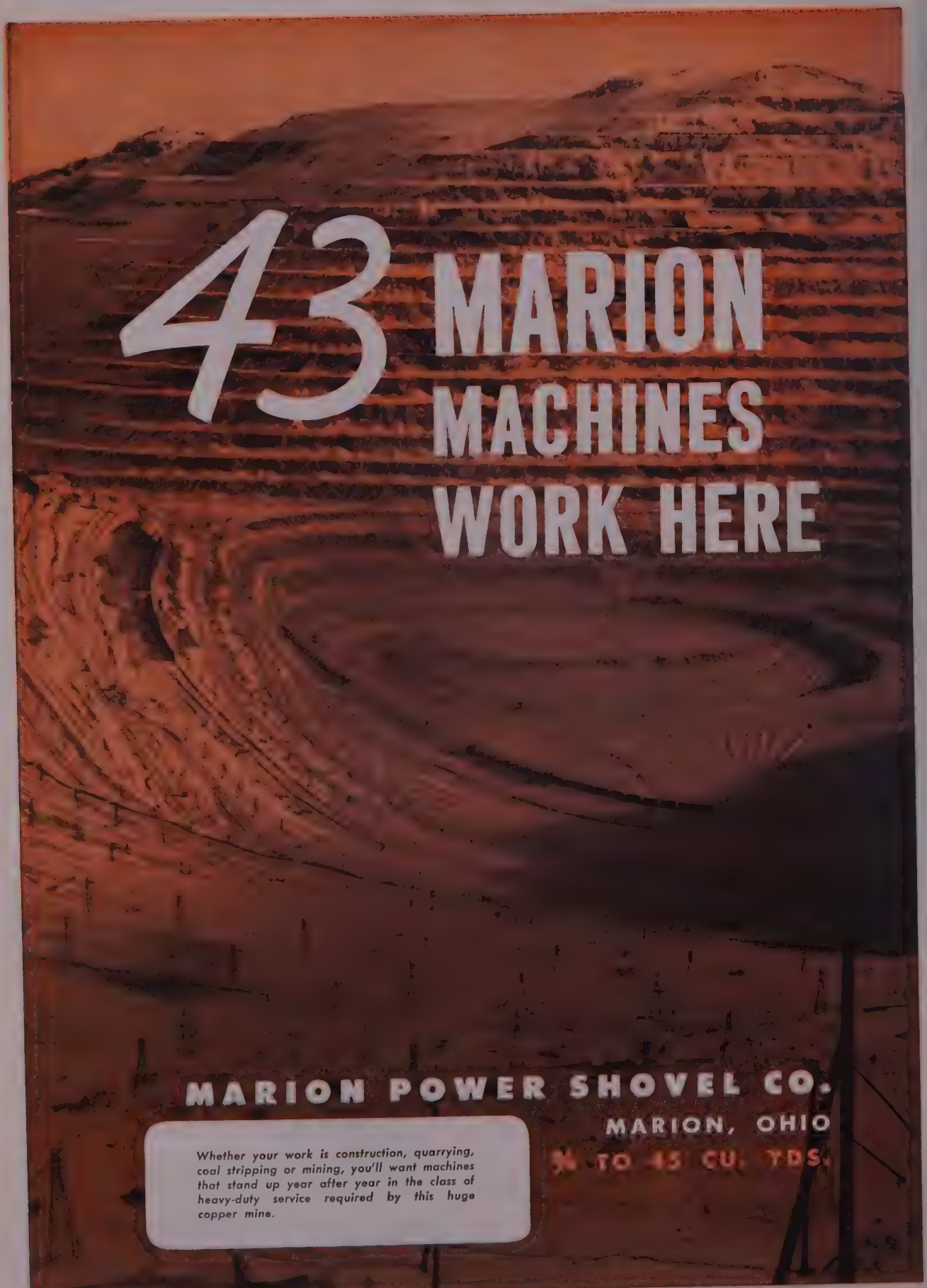


REPRESENTED BY Marion Power Shovel Company, 571 Howard Street, San Francisco 5, Calif.; Star Machinery Company, 1741 First Avenue, South, Seattle, Washington; M & F Equipment Company, 2521 Isleta Highway, Albuquerque, New Mexico; Marion Power Shovel Company, 2505 N.E. 33rd Avenue, Portland, Oregon; C. H. Grant Company, 1401 Eastshore Highway, Berkeley 10, Calif.; Star Machinery Company, E. 415 Sprague Avenue, Spokane 8, Washington; Marion Power Shovel Company, Title and Trust Bldg., 114 W. Adams Street, Phoenix, Arizona; Rasmussen Equipment & Supply Company, 1960 South Second West, Salt Lake City, Utah.

021

STUDLESS—Complete details and specifications for the construction of this 2-in. studless metal lath and plaster partition are now available free from the **Metal Lath Manufacturers Association.**

022

DRAFTING TABLE—A one-page bulletin (208) is available from **Stacor Equipment Co.,** describing this new steel drafting table with a shallow reference and a tool drawer.

023

"CAT" DOWN-TIME BEATER—Preventive maintenance of your equipment is the subject of this booklet issued by **Caterpillar Tractor Co.** This is an inside on Caterpillar dealer facilities to help you keep your equipment moving.

024

JACKS—Cable Reel Jacks for lifting and holding heavy reels are featured in a new 2-page bulletin (AD-26) published by **The Duff-Norton Manufacturing Co.**

025

FLOOR AND ROOF — Pictures tell "how to do it" in this newly revised Erection Procedure Folder for the Flexicore floor and roof system, released by **The Flexicore Co., Inc.**

026

MATERIAL MOVEMENT — Just by writing a note on your letterhead, you can obtain a copy of **Euclid Road Machinery Co.'s** booklet "Estimating Production and Costs of Material Movement with Euclids." Maybe you have seen this useful material helping others to solve estimating problems. How about sending in for one yourself?

Over the hump at Pine Flat Dam

PINE FLAT DAM on the Kings River near Fresno, Calif., was two-thirds completed on July 1 when workmen of Pine Flat Contractors placed the 1,500,000th cubic yard of concrete. April 23, 1953, is the target date for topping out the dam, according to the Corps of Engineers.

The lowest section of the dam is now about 220 ft. above stream bed, with ultimate height being about 440 ft. from bedrock to crest. About 550 men are working in three shifts at the site.

Cost survey under way on city crew use

ALBUQUERQUE has started a cost analysis survey to determine whether money is being lost by having pavements installed by city crews. According to press reports, the city charges about $1.80 per yard for paving as compared to $1.97 by most private contractors, while city patch paving costs about $4.00 per yard. The city's commissioners have been wondering whether it might be a good idea to "get out of the paving business."

NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 145.

827

Portability of finishing machine aids concrete paving

City street, expressway and airport concrete construction jobs are easy marks for the new Detroit Finishing Machine, pictured. The machine, manufactured by the **Flexible Road Joint Machine Co.**, is extremely portable. In a matter of

seconds the Flex-Plane finisher will lift itself off the paving forms onto its own built-in, pneumatic-tired "trailer." A hydraulic tongue lifter quickly spots the tongue for fast attachment to batch truck or other towing equipment. Two automobile-type pneumatic-tired wheels nest in the frame of the finishing machine as it is working on the forms. When it comes time to move the machine to another job, a flick of a switch lowers the wheels and the whole machine becomes a trailer. It comes in three basic sizes to finish widths from 10 ft. to 27 ft. Changes in paving width can be accomplished in one-quarter the time required by other known methods, according to the manufacturer.

828

This lube oil extends diesel and gasoline engine service life

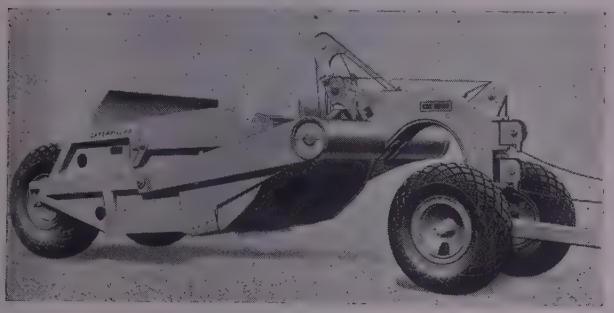
A combination of additives never before attempted on a commercial basis is featured in **Shell Oil Co.'s** Rimula Oil, according to the manufacturer. The oil is designed to sub-

stantially extend the serviceable life of automotive type diesel engines as well as certain gasoline engines operating in some industrial stop-and-go, low temperature service. Engine wear from corrosion and fouling is considerably reduced by this highly fortified oil, and it naturally follows that there is a reduction in oil consumption and frequency of overhauls.

029

Another "Cat" earthmover available—scraper for use with D6 tractor power

No. 60 Scraper, for use with D6 tractor power, has a flat-bottom bowl and stinger blade engineered for loading and finishing characteristics. The reversible blade cuts a 7 ft., 8



in. swith; the bottom is double with steel beam fillers. No. 60's capacity has been increased to 7 cu. yd. struck and 9 cu. yd. heaped. Maximum carrying capacity is 11.5 tons. Other design details include: an unobstructed bowl, tapered roller bearings at the axles, induction hardened sheaves and bulldozer-type ejection. Operation is by means of a Cat Cable Control available for attachment to the tractor. **Caterpillar Tractor Co.** is the manufacturer.

030

Truck crane designed exclusively for truck service

Here is the Miti-Mite! Take a look at this equipment, which is designed to mount on any truck of suitable capacity. Special engineering makes installation simple and fast. The

Miti-Mite is readily convertible for any front end service—shovel, trench hoe, dragline, clamshell, crane and magnet crane, etc. It has a ⅜ cu. yd. capacity as shovel and 7 ton capacity as crane. As shown in the photograph, the Miti-Mite is compact, easy to operate, and the answer to many on-the-spot construction problems. It has the necessary stability and ruggedness to really tackle the job, and is the product of over 5 years of development and field testing by **Harnischfeger Corporation.**

WIRE ROPE

This is the most economical rope we've ever made for construction equipment

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the best choice for efficiency and long life on excavating and construction equipment. This rope has *extra* resistance to crushing and abrasion . . . stands up under rough going. It saves you time and cuts costs.

There's a Roebling wire rope of the right specification for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, San Francisco-Los Angeles-Seattle.

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831

lailing attachment for driving - to 16-penny common nails

This new semi-automatic nailing tool will attach to any neumatic hammer with a number 2 Morse taper to drive - to 16-penny common nails. It is 6 in. long and weighs

nly 1 lb. It consists of 4 parts, two of which are moving. he nail is fed head first into the muzzle of the nailer and riven by rapid blows of an alloy steel plunger when the trig- er is pulled. On overhead nailing jobs (see cut) the tool re- uces nailing time and operator fatigue. **Fox Nailer Corp.** s the manufacturer.

832

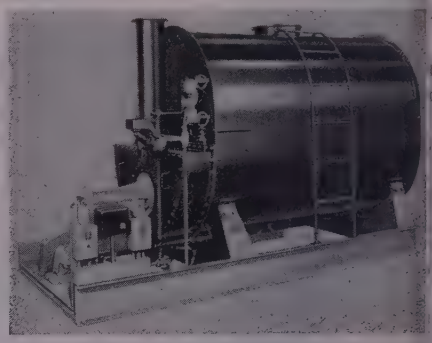
2-yd. tractor-drawn scraper ffers large capacities

Wooldridge Manufacturing Co. announces its TC-190, de- signed for use with today's largest tractors. This tractor- rawn scraper offers capacities of 19.0 cu. yd. struck and 2.0 heaped. Standard equipment calls for 21:00 x 24 tires ront, 24:00 x 25 rear.

833

High temperature oil booster joins heating line

This High Temperature Oil Booster, manufactured by **Cleaver-Brooks Co.**, is said to heat quicker, reduce maintenance, give quicker shutdown, positive heat circulation, etc. It is a self-contained fully automatic heating unit operating on the principle of a closed heating system, vented to atmosphere. It provides higher temperatures with lower fuel costs and less maintenance. The unit is always at atmospheric pressure. Available in two sizes of stationary electric driven units.



834

Highly advanced GMC truck engine is now available

High-compression GMC truck engine is now available with the best power-to-weight ratio ever achieved in the trucking industry. The 302-cu. in. engine has a compression ratio of 7.2 to 1—and generates 145 gross brake hp. at 3,600 rpm. It weighs 545 lb. (dry) and is as much as 500 lb. lighter than other engines of comparable power, a weight factor of considerable significance to truckers in the market for more pay load. The new engine is scheduled for placing in the popular GMC 450 and 470 (2½ ton and 3 ton) model series trucks and tractors. **General Motors Corp.** is the manufacturer.

835

Excavator and truck crane now ready for contractors

This new Gar Wood 75 standard and heavy duty ¾-yd. excavator and 20-ton truck crane, featuring power actuated drum clutches, direct right angle drive optional hydraulic coupling and the new Foundation Borer attachment, is now available. Operated by direct, extra-se

ive manual controls, the Gar Wood es the engine's power to engage the avy duty clutches. The 75 is complete- convertible in the field to shovel, ane, dragline, clamshell, trench hoe or e driver. The **Findlay Division of Gar ood Industries, Inc.** is the manufac- rer.

836

ew line of hydraulic dump uck body hoists, bodies

Among the improvements offered in is new line of hydraulic dump truck dy hoists and bodies is that the model ers up to 22% more payload than pre- ous models. Fourteen models of this w hoist are available in a selection of pacities from 6 to 25 tons. Advanced

ing point, new low operating oil pres- res, industry's lowest standard mount- g height, a new Universal subframe, ction-free roller bearing drive mech- ism, etc., are among the improve- nts. **St. Paul Hydraulic Hoist** is the nufacturer.

837

ood cutting blade in any diameters

Valsafe blade, manufactured by **Vic- Engineering Corp.**, is a combination nylon and abrasives for tremendous ength and good cutting qualities. It nes in many diameters and arbor es for use on most cutting equipment. cellent on hand electric saws.

838

w variety of plywood eathing announced

Valley Ply, a new plywood sheathing nes in 3/8-in., 1/2-in. and 5/8-in. thick- sses. Panel sizes 4-ft. x 8-ft. and 2-ft. 8-ft. are available immediately and er dimensions can be provided on cial order. **Valley Plywood Co.** is the nufacturer.

839

ndy hand tool

Metalmitre is a hand tool for on-the- precision work. It features high lev- ge, clean and accurate cuts by squeez- the handle. Various dies are avail-

able—all hardened and precision ground tool steel, capable of burr-free mitering, notching, slotting of non-hardened steel up to 1/32-in. and metals like copper and aluminum up to 1/16-in. **Lander & Abbott** is the manufacturer.

840

Color coatings to "pretty-up" bituminous pavements

Though the primary function of these two color coatings is the beautification of bituminous pavements, they can also serve as water proofing agents on cinder block, brick and masonry walls. Decora and Decoralatex are the trade names of these two coatings. The former is a colored asphalt emulsion with excellent hiding power. The latter has a base of latex for a brilliant durable surface. **Troyer Driveway Service** is the manufacturer.

841

Lull announces addition to Shoveloader line

Lull Manufacturing Co. announces the model 3-B Shoveloader built for use on the Minneapolis-Moline RTI tractor in conjunction with the M-M SMRI mower attachment. The new 3-B permits the installation of the M-M SMRI mower attachment without interfering with the operation of the Shoveloader or the mower. Both Shoveloader and mower operate independently of each other and neither needs to be removed from the tractor while operating the other. The bucket is controlled by a parallelogram mechanism which automatically keeps the bucket level while raising.

842

Power roller should please paving contractors

This easily transported roller is available in two models: a lawn roller with weight adjustable between 300 and 1,200 lb. and an all-purpose roller, with weight

adjustable between 375 and 1,400 lb. The latter model carries a sprinkler tank with a capacity of 15 gal. of water, used to wet the rollers to reduce sticking of paving materials. A pick-up truck or station wagon can take this model from job to job. Operation is unusually simple and features convenient grouping of controls on the handle bar, a tiller-type steering bar, and single lever for both forward and reverse. Substituting a caster-type roller for the sulky roller gives perfect maneuverability. Its economical 2½ hp. Briggs & Stratton engine provides ample power under all conditions. It is equipped with a manually set governor through which set speed is maintained up and down grades. **Consolidated Industries, Inc.** is the manufacturer.

843

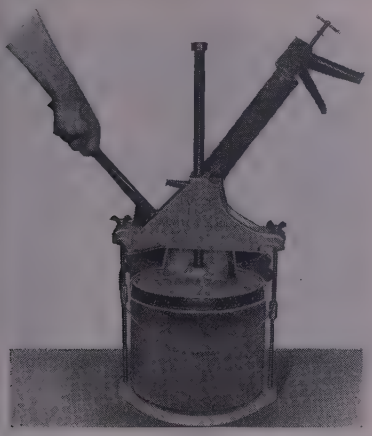
Tractor-mounted stone spreader handles 20 tons per minute

Known as the Jersey Spreader, this model 100 features an exclusive strike-off adjustment that permits varying depths of spread from a minimum of 1 in. up to 12 in. in 3-in. increments. This model is designed for use with the heavier crawler-type tractors and is mounted on the push beams of the dozer after the blade has been removed. The adaptation can be made without special attachments to most tractor-dozer combinations. No special accessories or attachments are required for feeding stone from any type dump truck directly into the hopper. Truck is backed up to the hopper and the body raised. The forward movement is controlled by the tractor operator as the truck, steered by the driver, is pushed along. The model handles stone of any size from ¾ in. up through the normal macadam range and certain subgrade materials. Overall width is 12 ft., height, 48 in., and weight (without tractor) 4,200 lb. **Tracto Spreader Co.** is the manufacturer.

844

New gun loader for caulking compounds

This new Force-Flo gun loader is comprised of a series of levers operated by a single handle to exert tremendous downward pressure on a piston that



readily forces caulking, glazing, pointing and sealing compounds, and other materials that do not seek their own level, into caulking guns for safe, efficient, clean and low cost loading without the formation of air pockets or contamination of material within the gun barrel. Caulking guns filled with material extruded from the Force-Flo unit permit smooth uninterrupted application of caulking materials. The result is better work and a saving in operation time, according to **Force Flo, Inc.**, the manufacturer.

845

New model concrete cutter gets power drive

This new model 252 Felker Di-Met Concrete cutting machine has a 13½-hp. Wisconsin air-cooled engine which not

only drives the diamond blade but also furnishes power to the rear wheels through a stepless variable-speed reducer and friction drive. Speed is adjustable from a mere crawl to a fast walk by rotating a crank. The diamond wheel is raised or lowered by a built-in double-acting hydraulic jack, which also expedites coupling the machine to a trailer hitch for towing; front wheels automatically retract as valve is released. Depth of cut is established by an adjustable stop. The machine can be steered, rear wheel position locking after establishing line of travel. Front and rear guides are provided. This is a **Felker Manufacturing Co.** product.

846

Rubber hose developed to transfer concrete

The transportation of concrete from batch mixer to trucks can now be done with this new hose, developed by **United States Rubber Co.** The hose is said to be superior to the canvas now commonly used for this purpose, since it has a life expectancy on the job of about 6 months and remains flexible throughout its lifetime. Cleaning is comparatively simple. The hose is made in various sizes ranging from 18 in. to 24 in. in diameter and from 18 in. to 36 in. in length.

847

Cement finisher's float now available

This Tempered Board Float, manufactured by **Harris, Inc.**, is said to offer better performance and give increased durability over the usual hand-made, wooden float. The float comes ready for action with no preliminary roughening of the working surface required. Sizes and suggested retail prices are: 4½ in. x 12 in., $1.85; 4½ in. x 15 in., $1.95; 3½ in. x 12 in., $1.85; 3½ in. x 15 in., $1.95; 3½ in. x 18 in., $2.10. Each Tempered Board Float is ½ in. thick.

848

Dirt-free brush clearing with standard dozer blade

Working from the idea that it would be practical to turn a standard dozer blade into a first class brush clearing blade, the **Hensley Equipment Co.** has

provided clearing units and brush rakes which can be attached and detached quickly. A unit consists of two shanks fastened together with the desired spacing and with all necessary parts.

849

Waterstop eases sealing between concrete pours

This waterstop has as one of its purposes the elimination of leakage between adjacent concrete pours. Labyrinth waterstop is nailed directly to the inside of the form—no special form work is necessary. It can be cut by a knife and sections can be joined by a hot knife or a torch. These plastic stops tend to eliminate the objections which rubber and metal stops brought forth. The Labyrinth waterstop is made of polyvinyl plastic which is easy to handle. It is ribbed, grooved and corrugated to form a bond with concrete that maintains its seal under the most severe contraction conditions. **Water Seals, Inc.,** is the manufacturer.

850

HOPTO digger gets independent engines

The HOPTO "Pick-up" model is a trailer mounted digger with independent power source. The power unit is a Wis-

consin VF4 air cooled motor with 2.: reduction, and the unit has a completely hydraulic principle. It weighs approxi mately 3,000 lb., has a 180-deg. swing and a 15 ft., 4 in. reach. Road position length is 8 ft., 10 in. overall. Width with single tires is 7 ft., 11 in., and with dua

tires 9 ft., 4 in. The unit has a 10-ft. standard digging depth and operating pressure of 1,000 psi. The prime mover is any pick-up truck, jeep or tractor. Capacities are: trenching 60 ft. hourly, 6 ft. deep in average soils; excavating, 45 yd. hourly with 24-in. bucket in average soils. **Badger Machine Co.** is the manufacturer.

851

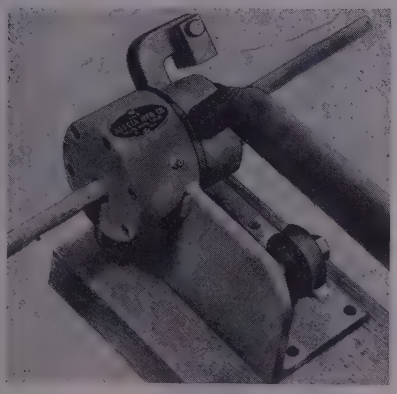
New rear-engine-drive truck mixer available

Two main things are accomplished by **T. L. Smith Co.'s** new rear engine drive truck mixer: (1) better load distribution, (2) shorter wheel-base that results in greater maneuverability. The engine from the front to the back of the mixer so that the mixer drum could go forward to give maximum gross vehicle loads. The result provides bigger payloads without exceeding highway weight limits.

852

Shearing and bending tool for reinforcing steel rod

The Bend-O-Shear, from **Lee Sales Co.**, will easily bend and shear ⅜-in., ½-in., and ⅝-in. reinforcing steel rod. The shears are constructed with Tor-



rington bearings, the cutting blades are of finest tool steel, the one blade cuts all size rods up to ⅝-in. The Bend-O-Shear mounts over the end of a bench or plank. It's portable—weighing only 24 lb.

853

"Hot radiography"—pictures pipes, valves

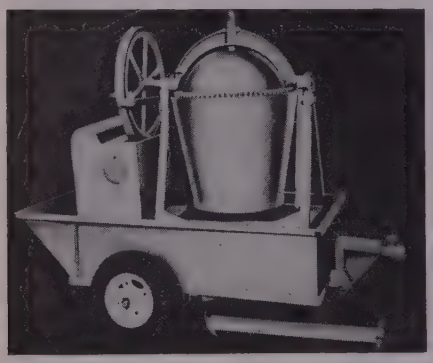
X-ray photographs of large pipes, valves, and similar units at temperatures as high as 1,200° F. are possible with this new technique called "hot radiography." It has already been applied with considerable success to the inspection of partially completed welds on hot sections of pipe to check for possible welding defects. With ordinary radiographic techniques, before the film can be placed on the weld, the pipe section must be cooled down to about 100° F. With certain types of alloys, this cooling must be preceded by post-heating the weld to relieve internal stresses. Because of the lengthy cooling period involved, the usual practice has been to complete the weld before inspecting it. Hot radiography, however, makes it practical to interrupt the welding operation to inspect the weld

root where most flaws occur. Time-saving features are obvious—no waiting for cooling, and less material to chip away if defects are found, since the weld is not complete. **Sam Tour & Co., Inc.**, holds exclusive licensing rights to this McElroy-McNutt hot radiography process.

B54

Portable concrete mixer good for large or small jobs

This new mixer weighs in at only 147 lb. and is capable of mixing better than a 3-cu. ft. batch of wet concrete in an average of two minutes. Foundation



pouring, floors, steps, sidewalks, walls, and many other construction operations are easy jobs for this unit. Unique feature of the new mixer is that bowl, pulley wheel, yoke and end bearing castings are all formed of extremely solid aluminum alloy rather than heavy cast iron. This eliminates the extreme heaviness and frequent cracking of some cast iron models. The drum, made of 16 gage steel, is machine rolled and flanged to the bowl in a continuous rivetless joint and turns on a true-centered cold rolled steel shaft. The entire unit is mounted on an electrically welded framework of rugged steel angle with reinforcing gusset plates. Holes punched in the frame accommodate the board on which an optional gas or electric motor may be mounted. Many other features are incorporated in the design of this **Wright Engineering and Supply Company** product.

B55

Complete line of pumps and accessories

Air-Motor operated pumps and accessories for automatic application of heavy to light materials, such as sealers, adhesives, roofing, waterproofing, insulating and caulking compounds, are now available from **Lincoln Engineering Co.** Eleven standard models provide complete systems for Spray Gun, Pole Gun and Flo-Gun applications. Models are available for use with original 400-lb. and 100-lb. drums, and with container for 5-gal. material package.

B56

Difficult cut types are a cinch for this new blade

Edge cuts, grooving cuts and grinding type cuts virtually impossible with standard type abrasive blades are now performed with ease by **Eveready Bricksaw Co.'s** new "Tuffie" reinforced masonry blades. Reinforced internally with layers of strong fabric and further protected by a "safety web" molded into the blade surface, "Tuffie" is practically indestructible. Since the blade withstands twisting strains and binds, it is well suited for use on any make hand power saw.

B57

Stud driver gives power plus yet weighs only 5 lb.

Thanks to a tiny quantity of propellent powder this stud driver generates enough controlled energy to drive a

steel stud into a structural steel plate ¾-in. thick, or so snugly imbed it into aged concrete that a pull in excess of 4,000 lb. is necessary to remove it. Of particular interest to the general con-

racting field is that this highly port-ble unit is easily operated by one man. A saving in labor costs as high as 75% over other methods is claimed for he stud driver. It can be comfort-bly operated at a sustained speed of ive or more stud settings a minute in oncrete, steel, wood and other struc-ural materials. The secret power of the driver comes from control of slightly over three grains of propellent powder. **Remington Arms Co., Inc.** is the manu-acturer.

858

Pipe polishing speeded by new-type wheel

Polishing pipe preparatory to joining is said to be faster, easier and safer with no possibility of undercutting or grind-

ng flats when this Nu-Matic Grinder is ut to use. The wheel, a unique air-in-lated type consists of a rubber drum of 6-in. diameter with a 3½-in. surface. Drum is mounted on a flange with either a ½ or ⅝ in. arbor. The operator slips an abrasive belt over the drum and then inflates the drum with from 3 to 10 lb. of air. Five to six lb. is said to be about right for polishing pipe ends. The wheel can be used with any kind of power tool for any type of polishing job. Changing belts is quick and easy. Big feature of the wheel is its resiliency which permits far greater abrasive contact area, elim-nates chatter and bounce and enables the wheel to polish contours more effi-ciently with 100% safety. **Nu-Matic Grinders, Inc.** is the manufacturer.

859

Kwik-Mix redesigns its plaster-mortar mixers

Both new 6-P Kwik-Mix tilting and non-tilting mixers now are side dis-charge models. The telescopic axle principle is used on the 6-P tilting mixer. Incorporating this feature on the tilting model makes it possible to reduce the mixers' overall width from 50 in. to 32½ in. This allows the machine to be moved through standard doorways for indoor operation. The power tilting arrange-ment is another prime feature on the side discharge model. The loaded drum is tilted for discharge by power from the paddle shaft drive action when the ratchet lever is released. The non-tilt model features an extra wide discharge door, operated by toggle lever, that simplifies discharging partial batches. Easier cleaning of the non-tilting drum is provided by the toggle lever arrange-ment which opens the drum drain plug. **Kwik-Mix Co.** is the manufacturer.

860

Troughing roll assembly for belt conveyors

This grease-type troughing roll as-sembly for belt conveyors features sim-plified greasing from one side, Timken bearings, and self-cleaning mounting brackets. The simplified greasing of all bearings from one side eliminates the necessity for a walkway on both sides of the conveyor. Greasing is accomplished through readily accessible fittings with flexible automotive type grease tubing carrying lubricant to middle and ex-treme end troughing roll bearings. The tubing is designed to take high grease gun pressures and withstand rough han-dling during shipment. Flexibility elim-inates breakage caused by vibration. The rolls are mounted on self-cleaning brackets inclined at a 2½-deg. angle toward the flow of material to keep the conveyor belt in alignment. Extreme end bearings are protected by all steel guard shields, preventing damage from mate-rial dropping off the belt and jamming between the troughing roll and the end bracket. **Universal Engineering Corp.** is the manufacturer.

NEWS of DISTRIBUTORS AND FACTORY BRANCHES

M. W. Kellogg Co. founder dies

Morris W. Kellogg, 79, founder and chairman of the board of The M. W. Kellogg Co., died at his home in New York City on February 22. He started the company as a small pipe fabricating shop in Jersey City and developed it into the pioneer in the field of penstock fabrication. The firm was also noted for its prominent position in design and construction of petroleum refineries and chemical plants.

U. S. Rubber names Frecker commodity sales manager

Harry M. Frecker is the newly appointed commodity sales manager of U. S. Rubber Co.'s mechanical goods division. He will have direct charge of all commodity sales departments.

Rigidized Metals names new Western distributor

Electric Steel Foundry is a newly appointed West Coast distributor for Rigidized Metals Corp., Buffalo, N. Y. The new distributor maintains offices in Portland and Eugene, Ore.; Seattle, Wash.; Vancouver, B. C., and San Francisco and Los Angeles, Calif.

Three hold new posts with Pettibone-Mulliken

Alex E. Ainlay is the new district manager of the Construction Equipment Division of Pettibone-Mulliken Corp. Ainlay's territory comprises the states of Colorado, Wyoming, Utah, eastern Idaho and a portion of New Mexico. C. W. Stewart transfers from the mid-western territory to cover the northern half of California, Nevada, Oregon and a portion of Idaho. Arnold C. Lee will be district manager of Washington, Montana, a portion of Idaho, Alaska and the Canadian provinces of British Columbia, Alberta and Saskatchewan.

Rocky Mountain Mach. Co. gets new line

The Rocky Mountain Machinery Co., Salt Lake City, Utah, is now a distributor in Utah and southeastern Idaho for the New York Belting and Packing Co., manufacturers of belting, hose, packing and other industrial rubber goods.

Cummins Diesel Sales Corp. v. p.

W. B. Lawrence, for the past year and a half general manager, Cummins Diesel Sales Corp., is now a vice president of the corporation. Lawrence will continue to serve as general manager of the eight Cummins dealerships operated by the corporation.

Bow Lake Equip. Co. opens new rental gimmick

Bow Lake Equipment Co., Seattle, Wash., comes up with a drive-in Tool Crib which will delight "jacks of all trades" in the Seattle area. Just about anything from a utility trailer to a cement trowel can be obtained at the Tool Crib without any trouble to the customer. The lot is arranged in a U-shape to permit through traffic and easy access. The tools are neatly housed in covered sheds.

Cox & Co. announces personnel changes

A. H. Cox & Co., Seattle, Wash., announces appointment of two representatives in the state and other personnel changes. Norm Viles, formerly Yakima representative, is promoted to the position of manager, Allis-Chalmers tractor department, Seattle branch. Scott Jamison will be representative in Centralia and Hugh Hanna in the new Port Angeles office. Viles will be replaced at Yakima by Fred Robinson, who is new to the firm.

Harnischfeger Corp. Seattle news

Carl H. Keller is the newly appointed welding engineer at the Seattle, Wash. branch of Harnischfeger Corp. Keller was formerly with G. S. Parsons Co., San Diego, Calif. George A. Glass, Seattle office manager for the firm, transfers to Spokane. He will have new duties as sales engineer covering all P & H products, except diesel engines and prefabricated houses. Glass' territory will cover

astern Washington, Idaho, Montana, orthern Wyoming, and Alberta and astern British Columbia in Canada.

Jews from Nelson Equip. Co.

The Nelson Equipment Co., Seattle, Vash., is now distributor for Oshkosh Motor Corp. Charlie McCabe, formerly onnected with Continental Motors Corp., recently joined Nelson's sales staff nd will work in the city on all lines distributed by the firm.

Pioneer Rubber Mills xpands in L. A. area

A modern one-story concrete and rick building has just been completed y Pioneer Rubber Mills to house its ctivities in the Los Angeles, Calif., area. The new building, located at 5001 Hampon St., Vernon, contains offices, conerence room, warehouse and truck loadng facilities with adjacent parking facilies.

Goodrich to consolidate eattle offices

In a consolidation and expansion move nvolving four divisions, the B. F. Goodich Co. will set up new Pacific Northvest headquarters later this year in a ew building to be constructed at 1 Hanord St., Seattle. The new building, comrising 35,000 sq. ft., will bring under one oof the firm's replacement tire, footvear, industrial products, automotive nd aviation and government sales divisions.

Ariz. Equip. Sales adds pace to house new line

A new building 62 by 65 ft. has been onstructed by Arizona Equipment ales, Inc., to house a complete parts epot for Harnischfeger Corp.'s electric hovels. The firm will serve all of Arizona, New Mexico, Utah, Nevada and outhern California.

nternational Harvester rganizational changes

George S. Stewart, assistant district anager of Oakland, Calif., motor truck istrict, International Harvester Co., ransfers to the Seattle, Wash., district s assistant manager. J. P. Feyen, formerly branch manager at Fresno, Calif., ucceeds Stewart in Oakland.

Firm organizes to make Waco scaffolding

Waco-May Scaffolding Co. is a new rm, organized in Los Angeles, Calif., by Marvin and Stanley May for the manufacture of "Waco" brand sectional steel caffolding on the West Coast. The firm vas granted exclusive licensee manufacuring and distribution rights by Wilson-Albrecht Co., Inc., Minneapolis, Minn.

Davey Compressor Co. ames Feenaughty

Feenaughty Machinery Co., Portland, Ore., announces its appointment as distributor for Davey Compressor Co. in Western Wash. Two men have joined the ales staff of the firm . . . Robert S. Sears, ormerly with Baer Steel Products Co., nd H. L. Hollingsworth, formerly with he Washington State Highway Department. Sears will specialize in contractor sales while Hollingsworth will concentrate on municipalities.

Knapp rep. in No. Calif.

Knapp Industrial Service of Sacramento, Calif., announces that the firm is now represented in northeastern California and northern Nevada by L. George Thomas. He headquarters in Reno, Nev. Knapp is distributor for Lincoln lubricating equipment, Rol-Pak filters and refiners, etc.

Iowa Mfg. Co. San Francisco post

O. E. (Bud) Whitney is now district representative for Iowa Manufacturing Co., Cedar Rapids, Iowa. Whitney will headquarter in San Francisco, Calif., and cover a territory which includes: Washington, Oregon, California, Idaho, Nevada, Utah and Arizona, and the provinces of British Columbia and Alberta in Canada.

D-A Lubricant Co. names Western representative

Robert Spratlin will handle the job of sales and service representative for D-A Lubricant Co., Inc., in most of Idaho and parts of Utah and Nevada.

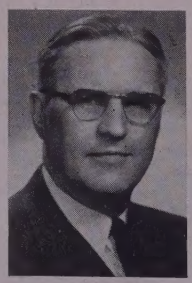
Indig appointed Baker Steel rep.

Victor A. Indig is the new San Francisco Bay Area representative for Baker Steel and Tube Co. He will maintain offices on Bryant St. to serve as direct factory representative.

NEWS of MANUFACTURERS

Marion elects officers

John P. Courtright is the newly elected president and general manager of Marion Power Shovel Co., succeeding Harvey T. Gracely. J. Malcolm Strelitz, Marion attorney and industrialist, becomes chairman of the board. Adrien F. Busick, Jr., is vice president in charge of engineering, and Maurice V. Cornell is vice president in charge of sales.



Courtright

Williamson

Williamson takes post at Wm. Bros Boiler

A. O. (Archie) Williamson is the newly appointed manager of the Road Machinery Division of Wm. Bros Boiler and Manufacturing Co. The announcement was made by Raymond J. Bros along with a statement of the firm's organization into three main divisions—road machinery, steam power and special fabrication. Williamson, as one of three managers, will direct all sales programs, advertising and new product development for the road machinery division.

Gar Wood promotions

D. R. Merchant is now sales engineer of the Richmond Division of Gar Wood Industries, Inc., Richmond, Calif. E. G. Hirtle will become chief engineer, the position Merchant formerly held. R. S. Jay is now sales manager of the Findlay Division of the firm. R. M. Steegman replaces Jay as assistant sales manager in charge of Buckeye equipment, and David J. Davis becomes sales manager in charge of tractor equipment. H. H. Hippler becomes an assistant director, sales and advertising. R. F. Whitworth, formerly sales manager, national accounts, has been named to succeed Hippler as manager of Gar Wood's branch division.

McHenry joins PCA

Douglas, formerly head of the concrete laboratory section of the U. S. Bureau of Reclamation in Denver, becomes administrative assistant to A. Allen Bates, vice president for research and development of Portland Cement Association. McHenry is the author of many articles on concrete technology.

Ideal Cement consultant

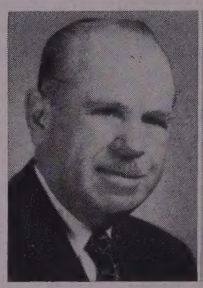
In addition to serving as vice president and general manager of Western Aggregates, Inc., subsidiary of Ideal Cement Co., Robert F. Blanks is now research consultant to the parent firm.

Cleveland Rock Drill Div. gets chief engineer

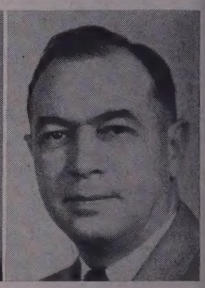
Jack Feucht is now chief engineer of the Cleveland Rock Drill Division of Le Roi Co., Cleveland, O.

Allis-Chalmers promotes two Western reps

Two Western representatives of the Tractor Division of Allis-Chalmers Manufacturing Co. receive promotions.



Dorn



Davis

A. E. Dorn, Pacific Coast territory manager since 1943, becomes industrial sales manager. L. W. Davis, branch manager at Oakland, takes over Dorn's previous position.

Two appointments announced by American Pipe

Elliot E. Brainard, formerly with the Lock Joint Pipe Co. of East Orange, N. J., is the newly appointed vice president in charge of sales for American Pipe and Construction Co., Los Angeles, Calif.

Robert V. Edwards, formerly vice-president in charge of sales for American, takes over new duties which will cover overall operations in the company including production, sales and general company management.

Linde Air names Cartledge as new president

Thomas D. Cartledge is the new president of Linde Air Products Co., a Division of Union Carbide and Carbon Corp. Cartledge has been senior vice president of this firm and a director and vice president of Dominion Oxygen Co., Ltd., Canadian subsidiary.

Kramer joins National Tank

Arthur Kramer, formerly of Timber Structures, Inc., joins National Tank and Pipe Co., M and M Woodworking subsidiary, as an operating engineer.

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

CLASSIFIED SECTION

Rates are $8.50 a column inch. Copy should be sent in by the 20th of preceding month if proofs are required by the 23rd if no proofs are required

WANT TO SAVE DOUGH?

Check here for used machines with lots of profitable working life:

1—Caterpillar D8 tractor, rebuilt 2U series.

9—Caterpillar DW10 tractors (1V series) and Caterpillar No. 10 scrapers with extensions for 11 yards struck, 14 heaped.

1—Caterpillar DW10 tractor (1V series) with LeTourneau LP scraper.

7—LaPlant-Choate TS300 tractor-scraper units, 14 yards struck, 17.5 heaped.

4—Caterpillar No. 12 motor graders (one 8T series, one 7T series, two 9K series).

1—Caterpillar D6 tractor (4R series) with T6 cable Traxcavator shovel.

3—Caterpillar D4 tractors with T6 Traxcavator shovels.

All are available for immediate delivery. Act NOW. Call Used Equipment Manager Joe Salvador and ask about our Rental-Purchase Plan.

PETERSON TRACTOR AND EQUIPMENT COMPANY

955 First Avenue, San Leandro, Calif., Phone SWeetwood 8-5600

EUCLID
Sales & Service Inc.

5231 Manchester Ave.
St. Louis 10, Missouri
Phone HIland 3417

Exclusive Euclid Dealer, offers the following, subject to prior sale:

Euclid 13-yd. 20 ton Diesel Engine Driven Bottom Dumps; 3 Model 29 FDT-58W; 3 Model 43 FDT-58W; 1 Model 70 FDT-89W (500 hours); 1—9 FDT-58W; 2 FDT-47W.

Euclid 15 Ton 9.7 cu. yd. Rear Dumps: 2 Model 27 FD. Euclid Twin Powered 18 cu. yd. Scapers: 2 GMC Engines, Model 51 FD-15SH (Less than 2000 hours).

Contact us for serials, conditions and prices. All Machines located St. Louis.

FOR SALE OR RENT

D7 Caterpillar dozer, double-drum hoist, 1951 model.

DP 121 Wooldridge scraper, 13-yards. 1951 model.

Huber tandem 10-ton roller, in top condition.

TD 24 International Harvester tractor and dozer. Late 1951 model.

TC 142 Wooldridge scraper, 16-yards.

Caterpillar rooter.

ALL IN GOOD SHAPE,
AT BARGAIN PRICES

Write, wire or phone

General Truck Sales

3190 Third Street at Army
San Francisco, Calif.
AT. 8-0606

STRUCTURAL STEEL FRAMING

AVAILABLE FROM STOCK

40 ft., 60 ft. and 100 ft. clear span widths. Two (2) 5 ton bridge crane buildings 80 ft. wide by 240 ft.

QUILTY ENGINEERING CO.

435 W. Spring, Naperville, Illinois, Phone 552

TOURNAPULL FLEET
For Sale

4—complete Tournapulls, Super C, 1942 models, good condition, with W-210 LeTourneau wagons, 11-17 yd. capacity.

1—Extra Super C tractor only, to complete fleet. Priced right.

Can be seen operating in Spokane area now. Available in approximately three weeks.

Intermountain Equipment Co.

E. 611 Sprague Ave., Spokane 10, Wash.
Main 3345

FOR SALE

5—D-8 Caterpillar tractor—all reconditioned—2 with dozers.

1—Northwest Model 25 shovel and dragline. Only 3,036 hours on it. Has shovel front and bucket.

1—¾ Cu. Yd. Hendrix dragline bucket.

1—1 Cu. Yd. Hendirx dragline perforated bucket.

40 foot boom.

1—Euclid loader, Serial No. 5BU-34. Ready to go to work.

1—Euclid bottom dump, Serial No. 9FDT2582. GMC Motor—Tires all good.

1—A-C Motor Patrol, Model AD3.

GOING OUT OF BUSINESS

Forgey Construction Company

No. 6 Townsend Building
Casper, Wyoming Telephone 4060

SOLD • RENTED • REPAIRED
Transits • Levels
Steel Tapes • Compasses
PORTLAND INSTRUMENT CO.
334 S.W. 5th nr. Stark,
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FOR SALE

2—LaPlant-Choate Motor Scrapers
Model TS-300
Less than 2500 Hours on each machine
$21,250.00 Each

Will throw in one Brand New 24:00 x 29 24 Ply Goodyear Sure Grip Tire

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Arnold Machinery Company, Inc.

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Phone 4-6401

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