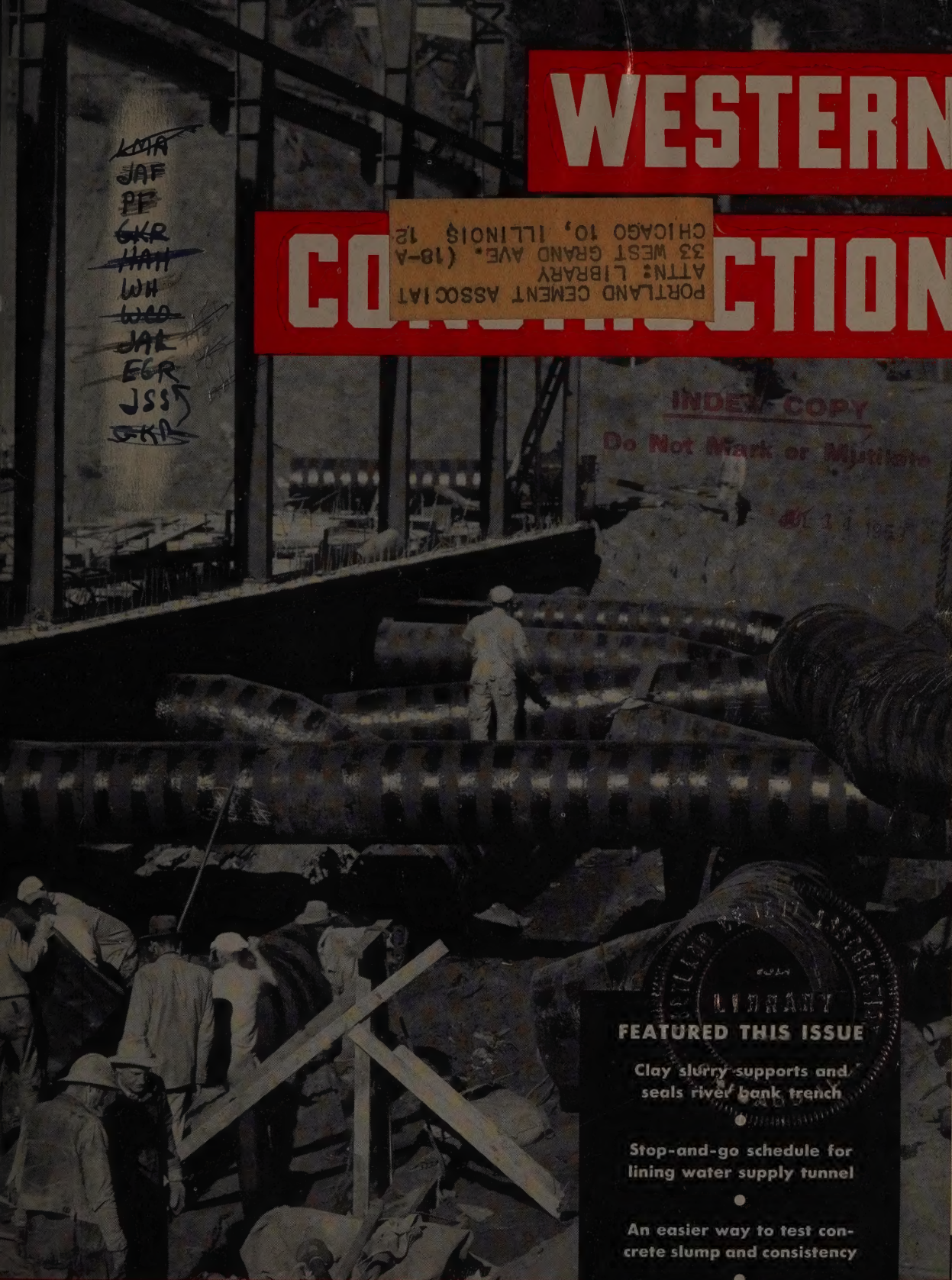
WESTERN CONSTRUCTION

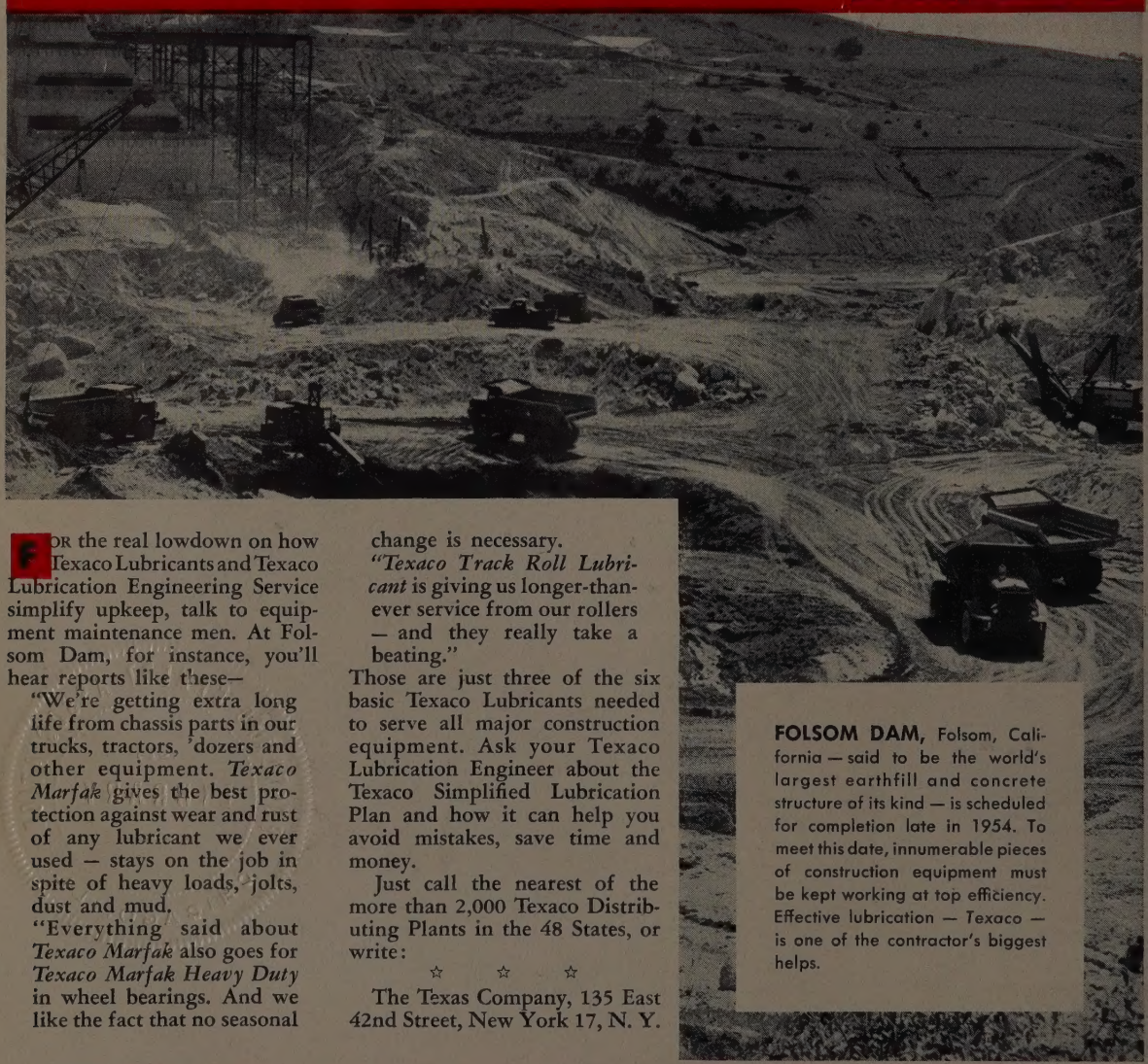


FEATURED THIS ISSUE

JULY 1953

TEXACO HELPS MAINTAIN BUILDING PACE AT FOLSOM DAM

Contractor: Merritt-Chapman & Scott Corporation and The Savin Construction Corporation



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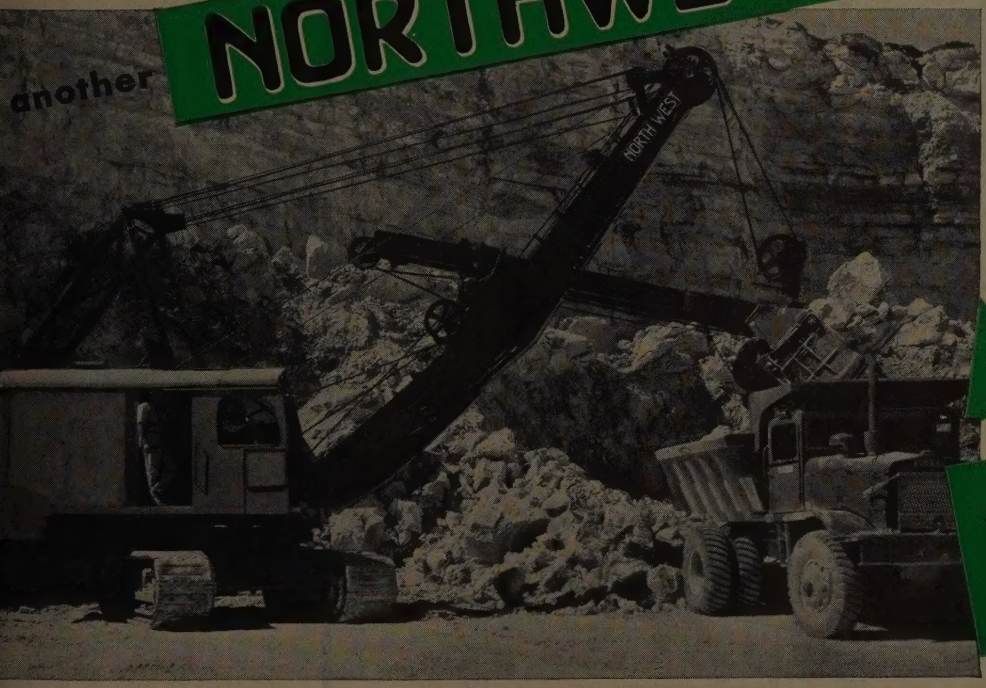

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WESTERN CONSTRUCTION

Volume 28 **JULY 1953** Number 7

ARTICLES

DEPARTMENTS

FRONT COVER

DOUBLE MANIFOLD suction and discharge piping is shown being prepared for connection to the new Lake Merced pumping station at the southern edge of San Francisco. The pipe, which is 48 in. in diameter, will carry water from the 60-in. Crystal Springs reservoir line by gravity to the new pumps. Then it will be pumped out again to the local Sunset and Sutro reservoirs.

The Construction and Civil Engineering Publication of the West

★

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WESTERN CONSTRUCTION

July 1953 Vol. 28, No. 7

Concrete questions . . . and some answers

This is a $4,000,000,000 construction year in the West. A program of that size includes a lot of concrete Field control of this basic material is vital to its successful utilization, and the men who place concrete have fundamental questions that need answers.

Efforts of civil engineers to probe design questions are not haphazard. Research activity by engineering firms and in university laboratories is constantly observed. By an interchange of technical literature, reinforced by footnotes and bibliography, a complete train of thought becomes available to the profession.

But highly technical literature seldom succeeds in providing practical help for the men who handle concrete in the field. In the interest of producing better concrete, ways are needed to expand the fund of useful knowledge at this final stage of concrete production. Means for a continuing interchange of ideas on best procedures are necessary.

One way to accomplish this interchange effectively is exemplified in this issue. On pp. 62-64, a designer and a contractor provide a pro and con discussion on certain features of concrete specifications. By publication of their thoughts, *Western Construction* adds to the practical fund of knowledge under discussion. Such editorial service to the construction industry helps to bridge the informational gap between the design laboratory and finishing trowel.

Another means is typified by a recent series of conferences. A "traveling circus," as it has become known, has convened periodically for "one-night stands" in major California cities. Short talks and then answers to questions from the floor are presented by panels of experts drawn from contractor groups, ready-mix suppliers, university engineering schools, public agencies and the Portland Cement Association, with the same groups acting as sponsors. Interest has been high, as reflected by attendance figures. The most recent gathering at San Francisco, for example, attracted 300. And the basic need for definitive answers to practical concrete questions has been indicated by the eagerness of the audience. With nothing more than microphones and water pitchers to shield them, the experts have met barrages of tough questions. They have had to tackle just about every "old wives' tale" known in concrete construction practice.

An effective combination of these two techniques and a continuation of efforts should help to provide more nearly adequate concrete answers for the men who need them most.

School begins at 25

Although not reported in last month's symposium on the shortage of engineers for highway work in the West, the most common plaint of adminstrators was "We're not getting as much effort from each man as we used to, especially among the younger engineers." In effect, this serves to intensify the problems of the manpower shortage. With colleges supplying only 40% of the needed number of graduate engineers, this discouraging percentage is attenuated even further because young engineers are not fulfilling expectations.

What's wrong? Are supervisory engineers failing to provide adequate training and inspiration? Has specialization robbed the younger engineer of his broad perspective, and thereby his incentive? Has the lure of higher salaries in other fields contributed to a lassitude among those working at moderate salaries early in job careers? Or is it true, throughout industry as well as engineering, that the diversions of modern day living result in less personal emphasis upon the job and more on outside interests?

Most Western highway departments have recently initiated effective in-service training programs that offer broad learning opportunities for the young engineer. The graduate who has chosen the highway field for his career would do well to appraise himself thoroughly in relation to his chosen profession, and the job at hand. Is his schooling over—or just begun—when the mortar board goes into mothballs?

No immunity to cost rises

To assail the policies of federal agencies engaged in engineering and construction has always been fashionable. Political and social policies—those whereby an agency's function is equated to public needs—are most often taken as the targets. Engineering policies are at times criticized for inconvenience caused to the contractor in the field. These criticisms are sometimes justified.

But a note of caution has recently been directed at those who ceaselessly seek to discredit administrative and economic policies of the Bureau of Reclamation. It is this. The cost experience of the Bureau cannot be thought much different from that of any individual or business: all have had to cope with rising costs. Thus, for a Bureau project to exceed original cost estimates when construction is finally complete some five or six years later is not unthinkable in itself. Insofar as the project has been held to its original scope, it is generally the case that final costs are in line with those of the engineer's estimate, plus only that added cost increment sustained by the economy as a whole.

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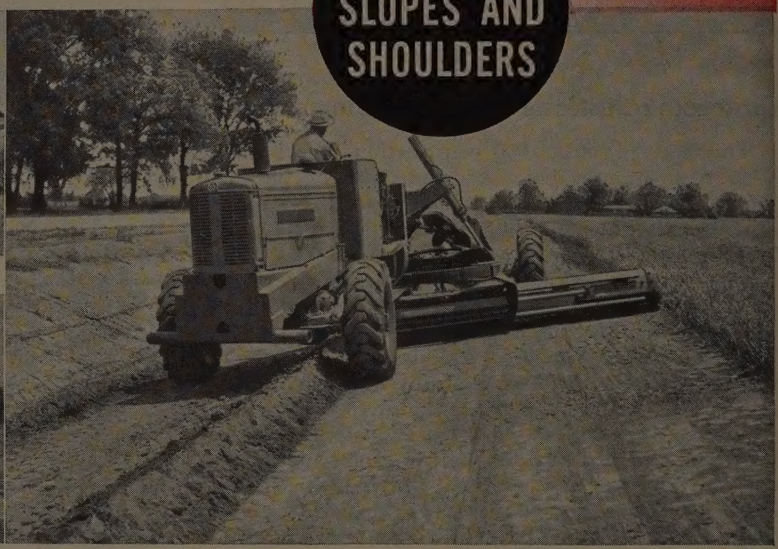

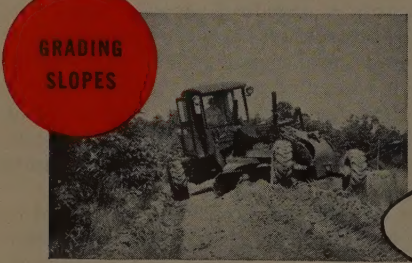

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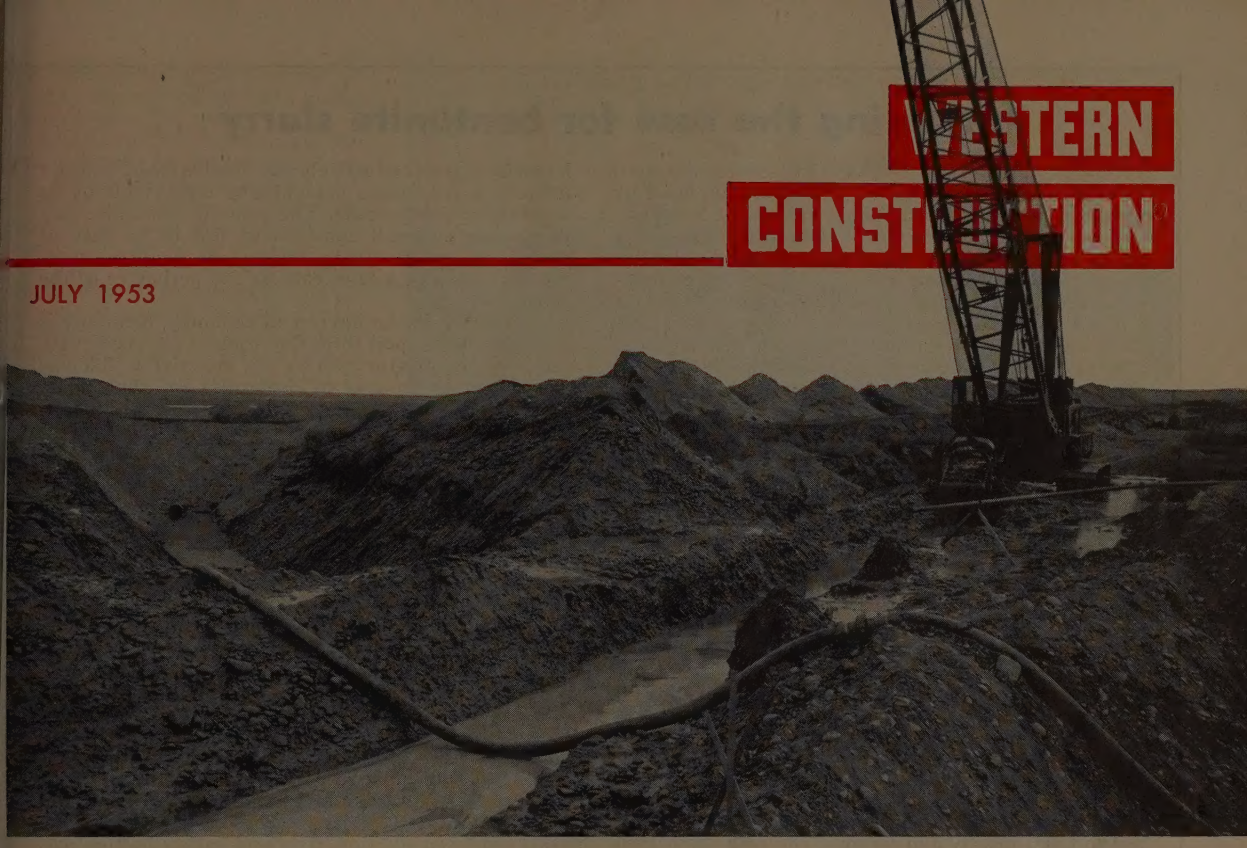
JULY 1953



Cutoff walls beneath Columbia River levees placed with—

Clay slurry for trench support

Drillers' mud has a new future—Bentonite slurry is heavier than water, is "self sealing"—Peculiar properties made it the only answer for trench excavation in wet, unconsolidated riverbank materials

CAVING BANKS and ground water inflow spell trouble on any excavation job. During the past year both these conditions became unmanageable along portions of an 8-mi. reach of the Columbia River, where a joint venture of D & H Construction Co. and M. H. Hasler Construction Co. has built levees on the west side of the Columbia to protect Kennewick from the now rising backwater of McNary Dam. Satisfactory results on about 13,800 lin. ft. of the contract were obtained only by resort to a fairly new civil engineering method, the use of a bentonite slurry.

In most cases what you see of a levee is all there is to it. But in the Pasco-Kennewick area natural soil materials are very pervious, and extensive underground construction has been necessary to render the levees watertight. Work on various contracts over the past two or three years has necessitated excavation to depths of as much as 50 ft. and the placement of impervious cutoffs up to ground level before construction of the levees proper could begin. Work performed by Peter Kiewit Sons' Company near Pasco, Washington, was described in *Western Construction* in June 1952.

Three alternates

For the recently completed work at Kennewick, specifications by the Army Engineers were similar. Three alternates for construction of the cutoffs were specified. The first two alternates called for trench widths, respectively, of 6 ft. and 3 ft. In each case backfill materials constituting the cutoff proper had to be select and well graded. Where ground conditions permitted, it was expected that the work area would be unwatered. Otherwise, natural inflowing water from the adjacent river might be allowed to stand in the trench to support its sides.

The third specified alternate also covered a 3-ft. minimum trench width. It also called for the use of a slurry to support the narrow trench at all times. Backfill materials would be similar, but due to the peculiar qualities of the bentonitic slurry to be employed, a much tighter cutoff would result.

Assuming that ground conditions would permit economical construc-

AT TOP OF THE PAGE

HERE is a startling example of what can be done with clay slurry. When cutoff alignment crossed drainage ditch, temporary random fill was thrown in to give dragline continued level footing. Slurry-filled trench did not leak.

Presenting the case for bentonite slurry . . .

PROPERTIES OF BENTONITE, commonly used as an oil-well drilling aid, are now being explored by civil engineers for their possible wide use in hydraulic structures. So far, bentonite has been used in slurry form both as an aid in construction and as an element in the formation of impervious seals for levee superstructures and the cutoff walls below them.

These applications have been developed by H. T. Wyatt and his firm, Cronese Products, Inc. Wyatt is a mechanical engineer whose experience in oil well drilling led him to seek further applications for "drilling mud." With him in the company is Charles H. Toll, a chemical engineer who has explored and studied bentonite's properties for the purpose of evaluating their applicability in civil engineering construction. First use of the Wyatt process was for construction of impervious seals in levee superstructures on Terminal Island, California, for the Union Pacific Railway Co. Since the method is reminiscent of hydraulic-fill dam construction, these impervious seals are sometimes known as puddled clay cutoff walls.

Reaction to water

Bentonite is a naturally occurring substance generally found in the company of certain clays. An emulsion of the pure bentonite and water may be known as a colloidal solution; that is, the particles are of molecular size and remain in suspension as a result of intermolecular forces. When a bentonite clay is mixed with water, the bentonite itself goes into colloidal solution, while the finely divided clay particles are held in suspension and merely add weight. The result is a low-viscosity medium having a specific gravity greater than water alone. Either a true colloidal solution of bentonite or a bentonitic clay suspension exhibits the peculiar characteristic of "setting up" when left undisturbed. The action of setting up observed in such an emulsion is but one half of a completely reversible action. Slow and careful handling does not disturb the gelled mass, but a sudden jar or shake converts it immediately into a liquid once again. The reason for this is that the undisturbed molecules of bentonite tend to align themselves all in one direction—like iron filings above a magnet. The resulting state is one of solidity which can, however, be disturbed. From this action bentonite is known as a thixothropic substance.

In civil engineering work, the original setting up of bentonite becomes most significant. Exposed area of the resulting slurry mass has nothing to do with its setting up, as might be thought from the fact that it will not percolate and cannot satisfactorily be injected or intruded through a soil formation. Naturally, when a bentonite slurry is introduced in an excavation, either as a supporting medium as excavation proceeds to greater depth, or as an impervious medium itself, the liquid slurry does commence to percolate. But its particles become "hung up" in the voids of the surrounding material. This is partly the result of the way bentonite molecules tend to line themselves up. But it is principally caused by the shape of the bentonite particles—revealed under microscope to be flat, plate-shaped. They pile up until at last a "keystone" particle blocks off a given void, completing a physical seal. Continued piling up, without any actual cementing of particles, creates such a winding path for water that the result is an impervious filter cake.

Impervious qualities

The value of bentonite slurry as a supporting medium is its specific gravity. Greater than that of water, the slurry nevertheless may be of comparable viscosity and therefore easily handled by pumps and pipes. Yet it displaces water effectively and, furthermore, impedes influent water from a surrounding water-table by its building of a filter cake. The value of bentonite as a permanent corewall constitutent lies in its ease of placement and positively impervious quality—again, the formation of a filter cake at the perimeter of the slurry mass.

Commonly, in the interest of economy, bentonite is combined with spoil from the original excavation (in the case of cutoffs) or with borrow material (which may be random, in the case of corewalls) and thoroughly mixed prior to placement. The filter cake action then takes place not only at the edges of the impervious section, but throughout its thickness.

Adaptability

Properties of bentonite slurry may be altered in accordance with construction conditions depending, for instance, upon the need for a particular degree of support in excavation through a given material. Slurry of one viscosity, determined by the percentage of bentonite, may be increased in specific gravity — without change in viscosity—by the addition of appropriate amounts of materials such as barium sulfate. The viscosity can be altered by the use of bentonite.

The particular value of this adaptability has been recognized by engineers seeking new and economical methods of submarine tunnel construction. An example of a "problem" area is New York harbor and the river reaches bordering Manhattan. Here the tidal action is aggravated by narrow confines and a naturally great range. In addition, river and harbor bottom materials are extremely silty and cannot easily be excavated to stable side slopes. Even when excavated, trenches become filled in very rapidly by tidal action. For this reason largely, tunnels in the New York area are still driven under pressure with the use of a shield, a laborious, hazardous, and expensive process.

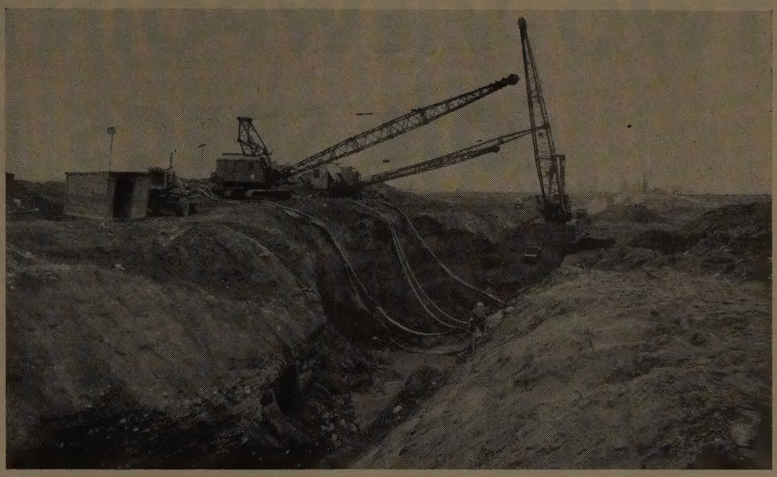
A solution may be at hand in the properties of bentonite slurry. Weighted to an otherwise unnecessary degree with barium sulfate so as not to be washed away by tidal action, bentonite slurry could be introduced by tremie into a submarine excavation, effectively displacing both silty excavated material and surrounding water, and thereby establishing and maintaining the desired dimension of trench. Upon completion of excavation, prefabricated tunnel sections could be weighted and sunk in the customary manner. They would displace the bentonite slurry, having no tendency to float on it as they would on silt that had washed into excavation unstabilized with slurry.

In dam construction, the use of bentonite slurry might do away with the present necessity for vast spreads of equipment used in classifying, crushing, and combining materials for proper grading. It would obviate precise control of moisture throughout large volumes of embankment, as well as tedious compaction.

A dam would be built almost entirely of random pervious materials, with mass and stability of outer slopes as almost the only criteria. Impervious qualities would be furnished in the form of a relatively thin corewall of bentonite slurry mixed with a correspondingly small volume of graded material. The mass of this portion of a dam—or a corewall or canal lining—would be determined only by economic comparison of materials with machinery capabilities and by dimensional requirements to meet seismic conditions.

Extensive use of bentonite slurry in hydraulic structures such as this will come about only after throughtful consideration both by the engineers who will design for it and by the contractors who will combine and schedule equipment to work with it.

ion under either of the first two alernates, the cost of the third makes : prohibitive. The slurry method, in roviding a tighter seal, does provide reater benefit to the project. Howver, the project also calls for instalation of considerable pumping caacity on the land side of the levees n order to dispose of return irrigaion water and excess precipitation unoff. Since these pumping facilities an also be used to dispose of river vater percolating through levees constructed under either of the first two lternates, economic advantages of an ven tighter seal are nullified.



SLOUGHING BANKS and water problems characterized work under normal scheme of open-cut excavation. Using bentonite slurry, trench width was barely more than that of dragline bucket.

Original plans

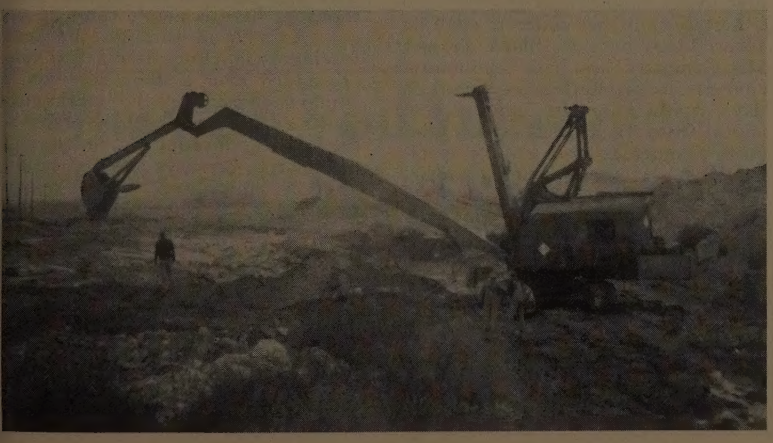
Construction by Kiewit near Pasco was carried out using the first alternate, that of a 6-ft. trench. Hasler and D & H decided upon the same course of action. Their $3,173,000 contract (later modified to over $5,766,000) covered construction of 46,788 lin. ft. of levees, with underground cutoff below 46,200 of the above total. As originally planned, the cutoff wall was required to be 6 ft. wide and composed of material of specified constitution according to grain size. This meant that much of the excavated earth could not be returned to the trench but had to be replaced by select borrow from pits at great distance. The cutoff wall was to extend to bedrock, which was found at depths varying from a few feet to 56 ft. below natural ground surface. This "bedrock" was identified as Ringold clay in most places, but in some places it was actually basalt.

Open-cut method failed

For the most part, the work was done by conventional open-cut method, using draglines for excavation and sump pumps to hold back the groundwater inflow. Despite the hauls involved, satisfactory backfill materials were available to construct a cutoff wall of the desired impermeability.

In practice, it was found that about 13,800 ft. of the levee alignment did not permit cutoff construction by the above method. It was necessary to resort to the Wyatt method and enabling modifications in the contract between the Corps of Engineers and the contractor were effected. The Wyatt method makes use of a bentonitic slurry similar to that often used in oil-well drilling operations. The slurry is formed basically of a mixture of water and a bentonitic clay. As explained in the box on these pages, the bentonite and water together form a colloidal solution while the clay particles—actually impurities—merely add weight. The resulting solution is heavier than water; it therefore supports the side of the trench excavation satisfactorily and displaces influent water. In construction practice, it is mixed with excavated spoil also, which is then used for backfill. Unclassified spoil is satisfactory for this purpose, but on the Kennewick work the original specifications for the quality of backfill material were retained. Returned once again to position in the cutoff trench, the mixture of natural materials and the colloidal solution sets up and exhibits remarkable impervious qualities.

BEDS OF BOULDERS called for backhoe, and this was the answer when the work went near maximum depth. Extra reach let the specially rigged Northwest dig to 38 ft.



Results

Use of the Wyatt method on the work at Kennewick has been very successful, and to the uninitiated, quite spectacular. Large flows of ground water had been encountered in several places, causing the banks of the trench to cave to widths of over 70 ft. by the time the depth of bedrock had been reached. In some places work had been suspended for a year without having reached the objective depth. In other places soft running sand with a very low angle of repose had given considerable trouble. To remedy the situation, the contractor simply filled in the holes and started over again using the colloidal slurry. In this manner he was able to cut a sharp trench through the unconsolidated backfill to the desired dimensions. The flow of water was completely cut off and no caving occurred.

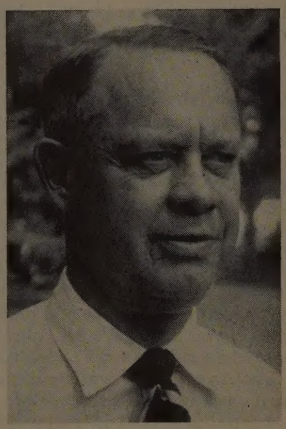
At another point the cutoff was started at a location where boring indicated a depth of 45 ft. to bedrock. Tremendous flows of water were encountered at about 20 ft. Pumping was attempted, but pumps with a total capacity of over 500,000 gal. per hr. failed to control the water. Pumping was abandoned and as a result, the trench, being excavated in water, sloughed and caved to widths up to 45 ft. It required 6 weeks to complete 75 lin. ft. of cutoff under these conditions, and the method was abandoned.

When construction operations in this area were resumed using the Wyatt method, 1,250 lin. ft. of cutoff were completed in 14 working days. The trench was no wider than the 5-cu. yd. bucket that was used.

Concluded on page 120

TWO VIEWPOINTS ON SPECS FOR BETTER CONCRETE

A building contractor's ideas



By
C. M. SCHREPFERMAN
Brown-Schrepferman & Co.
Denver, Colorado

SPECIFICATIONS should be written with one basic purpose in mind—to convey to contractors the requirements and functions the architect or engineer intends to accomplish through the use of concrete.

It is presumed that bidders on concrete building jobs are contractors of reasonable experience and integrity. Therefore, the successful bidder can be expected to produce and place concrete, as specified, in the most economical manner he can devise.

From the contractor's standpoint, it appears that many of the technical provisions of the concrete specifications could be eliminated without any serious effects on the finished product.

Simplifying product reference

Most all materials to be incorporated into a building are usually referred to by manufacturer names, or by reference to a standard specification. For example, brick and other masonry units are most always specified by manufacturer name and type. Who has ever seen a masonry unit specified in such detail as to state the type and amount of clay or shale, coal or other fuel, type of kiln and dryer to be used, and how long the heat shall be applied for the burning of the raw material!

In practically all specifications the bidder is supplied with a simple statement that the brick or tile shall be "Blank" style as manufactured by "Blank Company." This statement, along with portions of sand and cement or lime for the mortar to be used and a few remarks covering workmanship and specific job requirements, is sufficient for the masonry specification.

Transit-mix concrete companies are now producing and delivering a major share of the concrete used in metropolitan areas. These companies all have substantial investments in plant and equipment and have proven sources of aggregates. Furthermore, most of them have a considerable backlog of successful performance. Why then are they not qualified to deliver the concrete as specified just as the brick the architect is willing to buy is specified by a mere reference to the manufacturer's name?

A statement that concrete shall be as produced by the "Blank Transit Mix Company" and have a minimum compressive strength of — psi. in 28 days would eliminate quite a few pages from the specifications and mean as much as most lengthy specifications. In areas where transit-mix may not be available, or only one such company is operating, the specifications could state the test requirements and possibly the source and type of aggregates, and leave the producing or acquiring of concrete to the contractor. Design mixes and tests would accomplish and control the qualities of the concrete.

Note: Mr. Schrepferman's ideas pertain only to concrete for building operations, and therefore may not apply to concrete for highways, dams or other types of heavy construction.

Mixes to fit the job

Good quality concrete is fairly easy to obtain at the discharge chute of a mixer. Not so in placing, compacting and finishing in the proper location on the work. Failures in these operations are often caused by indifference of the workmen during placing and finishing. The architect or engineer can do much to eliminate personnel failures by analyzing his slump requirements and then **stating them to fit the job conditions.**

For example, a 2- or 3-in. slump is adequate for most foundations, heavy walls, and (if cement finishers will work the material) many flat slabs. However, for thin wall sections and heavily reinforced columns and beams it may be necessary to increase the slump to 5 or 6 in. and reduce the maximum size of the aggregate. This permits proper passage of concrete around and through the reinforcing steel, electricians' conduit, plumbing and heating pipes or other obstructions that necessarily are placed in the forms.

"Canned" specs dangers

Many times a contractor is faced with a job condition, where theoretically there is ample room to get a vibrator head through the reinforcing steel. But after a few bars are added over a door here and a window there, and the mechanical trades add their pipe where required, the proper vibrating or compacting of concrete becomes a $64 question.

To a contractor, this all means that the specifications writer must be familiar with the structural plans for the work. The apparent practice of too many architects and engineers of using "canned" specifications and transferring them from one job to another without due consideration for specific conditions for each part of the work certainly is not conducive of "better concrete."

Job inspection of concrete work is

matter that should be given much more attention than is now the practice on most work. It does not seem logical that most inspectors should be put on the work with only brief instructions to see that the contractor does this or that part of the work "according to the specifications." Seemingly, anyone who can read and be hired at a smaller wage than most any mechanic on the work is qualified for an inspector.

Inspector authority

Actually, the inspector is responsible for the proper execution of the work under his control. The architect or engineer must put forth a great deal of time and energy in producing the plans and specifications to convey his intentions as to the finished product. Surely then the inspector he places on the work should be experienced enough and have the confidence of the architect to the extent that he has authority to make decisions which require a minor modification of the specifications.

Modification of the slump specification is very often desirable on concrete work. Unless the inspector is sufficiently experienced and has authority to modify this requirement, the job and contractor are in for much needless trouble. The inspector and contractor should have a mutual interest in the work; namely, to give the owner a good job.

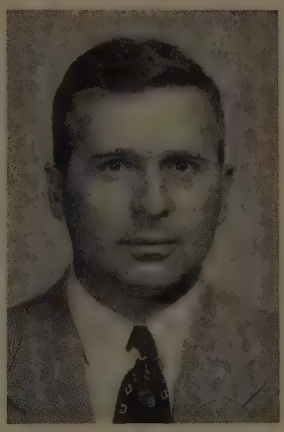
Adequate curing

Proper curing is one of the important operations in obtaining good concrete that often is neglected, particularly on smaller private jobs where a full-time inspector is not employed. Most specifications provide in some manner for the curing of concrete for several days, which all authorities seem to agree is necessary. However, because of the extra work required, contractors sometimes are prone to "get by" without proper attention. Considering the time and expense necessary to obtain and place concrete, it is not consistent that the small additional expense required for adequate curing should be saved by the contractor to the detriment of the job.

The requirements of form work for concrete vary greatly from one specification to another. In the opinion of most contractors, this would best be covered in a general manner. The contractor's forces may have their own ideas about the economical means of accomplishing form work. Again, if the intentions of the architect or engineer are conveyed to the bidders, the contractor should be permitted a reasonable leeway for exercising his ingenuity to offer an economical bid on the work. On architectural work, detail specifications are generally required, but surely the contractor should be offered the opportunity to substitute alternate ideas subject to approval.

The procuring of well-qualified workmen is becoming increasingly difficult for many contractors and is a subject of considerable concern. There are many theories about ways to correct conditions, but the designers of structures should also be aware of the problem. They should endeavor to provide plans and specifications that eliminate complicated operations either in placing the material or building forms to support the wet concrete. Many times a detail drawing looks good on the plans, but job conditions necessarily alter the picture to the detriment of the work. With proper analysis of conditions by the designer, much of this trouble could be avoided.

What good design requires



By
KENNETH R. WHITE
Structural Engineer
A. J. Ryan & Associates, Engineers
Denver, Colo.

THE PURPOSE of concrete specifications is twofold.

First—to portray the design and properties deemed necessary by the designer. The concrete design should result in a cost no greater than is necessary for the service that the concrete is required to perform.

Second—to prescribe the proportions, controls and limitations in such a manner as to be realistic. These requirements must be set forth in straightforward statements permitting an understanding by all concerned. Specifications must be written without vague, confusing or unnecessary legal terminology. Too often specification requirements are conflicting and there is uncertainty as to which provisions actually govern.

Methods

The first consideration in the use of any particular mixture should be its ability to withstand the forces imposed upon it in service. Of equal importance is the necessity that it have the properties of durability, water-tightness, and resistance to volume change as required for its particular usage.

Four methods of specifying concrete are in general use. The first, and most widely used, requires a minimum cement content. The second, preferable from a technical viewpoint, specifies a maximum wa-

WHAT DO YOU THINK?

CAN — AND SHOULD — many provisions of building concrete specifications be eliminated?

Should inspectors have the authority to approve on-the-job modification of specs—or should specifications be complete enough to provide nearly complete control?

What about the desirability of "canned" specs? — of detailed formwork requirements? — of drawings detailed profusely?

Designers and builders have the common goal of producing structures of the necessary strength and appearance within economic limitations. But their viewpoints on methods frequently differ, particularly in relation to specifications. Both have an interest in obtaining thoughtful answers to the questions outlined above.

To stimulate discussion, and action where possible, *Western Construction* invited two articulate spokesmen to present their thoughts on specifications. The discussions spotlight many facets of problem.

It is hoped that comments by other builders and engineers will be presented in *Western Construction* during coming months. Your comment is invited.—*Editor.*

ter content per bag of cement. This method is based on the concept that the strength of concrete is a function of the relative amounts of cement and water used in the mixture and is commonly known as the water-cement ratio.

The third method establishes the desired "strength" as a means of indicating the desired quality. This practice represents an economical method of procuring concrete, as it permits the producer to use his materials in the most effective manner to produce the specified strength of concrete. The desired consistency should be an accompanying provision for this specification. This type of specification should be recognized for what it is; namely, a requirement for a product to be obtained which presumes that any contractor undertaking to produce an end-product must be technically qualified to select and control properly the materials to accomplish the specified result.

The fourth method specifies both the method and end-result desired. This method is a combination of the other three and contains requirements for the minimum compressive strength, minimum number of sacks of cement and maximum amount of water. There is, however, considerable discussion as to the legality of this method. Therefore a modification of this method is desirable. This modification provides that the engineer assume the responsibility for the design and control of the concrete mix to obtain the quality and necessary properties of the concrete. This practice is being followed satisfactorily in a number of instances and is believed to be the most advantageous method.

The "why" of specifications

It is sometimes difficult for the contractor to understand why it is necessary to have such verbose specifications for concrete and why seemingly unimportant requirements are necessary. It appears to the contractor that the specifications could be simplified to a great extent and his job made easier. Certainly other products which are used in construction do not require the voluminous specification that concrete does.

Concrete is a man-made, job-controlled product and, contrary to the belief of many, compressive strength is not the only property required. It is true that compressive strength is an index to other properties, but workability, durability, water-tightness, and volume change are factors which must be considered or often the intent of the design is lost. Cement produced by modern methods if of such quality that excellent strength may be attained with less cement than is required for dense and durable concrete. It is, therefore, necessary to include in specifications such provisions as will assure the desired properties of the material.

The strength of concrete is dependent upon (1) richness of the mix, (2) the gradation and character of aggregate through their influence on the quantity of mixing water, and (3) curing conditions through their effect on hydration. Often a requirement for strength is specified without indicating the accompanying slump or other measure of consistency. Consistency is an important component of workability and is best measured by the slump test.

Workability control

The degree of workability required for proper placement and consolidation of the concrete is controlled by the spacing of reinforcement and by the size and shape of the structure. The most common failure in determining the water content of a mixture is the lack of knowledge of the moisture content of the aggregate. This results in a lack of uniformity of batches, a considerable amount of lost time on the project, and usually in inferior concrete. Workability is also affected by the gradation and shape of aggregate particles and the quantity of aggregate per unit volume of cement paste.

Durability is a function of strength and water-tightness. Obviously a porous concrete mass incurs a greater amount of disintegration due to the disruptive action of freezing and thawing and by expansion and contraction than a dense concrete mass. Hence the use of a low water-cement ratio and proper placement will result in a relatively water-tight and therefore more durable structure.

The purposeful entrainment of from 3 to 6% air materially improves the durability of concrete, as it provides spaces where destructive forces can be dissipated. The entrainment of air also provides a more workable mix and permits a reduction in mixing water. The amount of air must be controlled, however, as the durability will decrease above approximately 6% air, and air has an adverse effect on compressive strength.

Cracking preventitives

Volume change results in cracks due to shrinkage together with insufficient tensile strength and is the expansion and contraction of concrete resulting from wetting and drying or temperature variation. This cracking is unsightly, detracts from the durability of the concrete, and affects the ability of the concrete to withstand its design loads. The amount of volume change may be reduced by the use of as lean a mix as possible, since most of the shrinkage occurs in the cement paste, by the use of as coarse a gradation of aggregate as possible, as this permits a lean mix to be used satisfactorily, and by proper curing, since the cause of shrinkage is the loss of water from the cement paste.

Other factors which must be give careful consideration in prescribin the required concrete are the grad tion, shape, and character of aggr gate; the type of cement, and the mi ing water.

The specifications, based upon th aforementioned data, now set fort the design and physical features o the concrete as well as a mix whic will provide a product satisfactory fo the service intended at the most ec nomical cost. This, however, is by n means the limit of their scope.

Field control

After concrete materials have bee selected and the relative proportion determined their use should be con trolled to the best advantage in th field. This control governs the qual ity, uniformity, and ultimate econom of the concrete structure. Much o the value of first-class materials an optimum proportioning may be los through inefficient control in batch ing, mixing, handling, placing an curing.

The principal requirement with re gard to mixing is that it be thorough and uniform. To obtain this, th mixer must be properly designed an the process must be carried on for sufficient length of time. For mixing times up to one minute the increase in strength is large; for times in ex cess of two minutes there is insuffi cient gain in strength to justify the cost of longer mixing. Specifications usually require a minimum time o one minute.

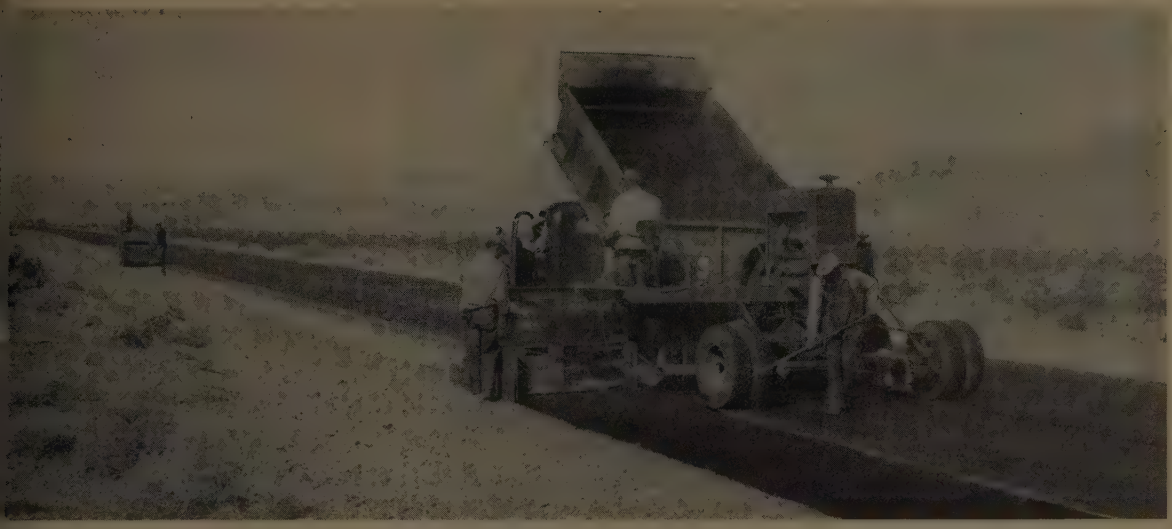
Handling transit-mix

Transit-mixed concrete should be placed within 45 min. after water is first added to the batch. Up to this time and somewhat more, the agita tion has no great effect on strength as long as the mix remains workable and provided no water other than the original mixing water is added. Careful handling and placing, whereby the concrete will be placed in its final position without loss of uniformity and quality, supplemented by suitable finishing and adequate curing complete the cycle of a satisfactory construction operation.

The segregation of concrete ingredients is directly or indirectly related to substantially all the imperfections, visible and invisible, including rock pockets, weak and porous layers, lack of bond at construction joints, surface scaling, crazing, pitting and sand streaks which are most frequently encountered in construction. It is, therefore, important that concrete be handled without segregation. This may be accomplished through the use of chutes and hoppers and by confining falling concrete to within a few feet of its place of deposit.

Consolidation of the plastic concrete in the forms is the next procedure. Thorough consolidation is necessary if maximum extent of the

Concluded on page 117



Work complete for longest single plant-mix job as . . .

Nevada resurfaces U. S. Highway 95

Atomic proving ground at Frenchman's Flat causes flood of heavy traffic to and from Las Vegas — 18-ft.-wide highway becomes definite hazard, making repair work imperative

By NORMAN E. JONES
Logan, Utah

THE LONGEST single plant-mix asphalt road construction job ever let in one contract, widening and resurfacing 57.73 mi. of U. S. Highway 95 between Las Vegas and Camp Desert Rock junction in Nevada, was nearing completion in June.

A few years ago, this 18-ft. wide highway with 2½-in. road-mixed surfacing was sufficiently adequate to handle the moderate amount of through traffic. With the development of the atomic proving ground at Frenchman's Flat, however, the tremendous increase in traffic volume and load shuttling to and from Las Vegas soon beat out the pavement edge and shoulder to the point that the narrow section became a definite hazard and entirely inadequate for the heavy trucks, convoys, and such that daily traveled the 58-mi. stretch.

Contract specifications

Aided with Federal funds, the State of Nevada Highway Department let the critical 57.73-mi. widening and resurfacing job in one contract late in September 1952. It was awarded to the Carl E. Nelson Co. of Logan, Utah, for $574,184.75. Principal components of the bid schedule, which called for completion of the job within 180 working days, comprised 8,510 tons of base gravel; 152,892 tons of plant mix, incorporating 6,333 tons of 120-150 penetration asphalt; 387 tons of mixing type emulsion prime; and 1,323 tons of emulsified asphalt seal with 9,068 tons of screenings.

Major phases of the work included (1) Widening the gravel base along the shoulders where necessary, particularly in the fill sections, with 1-in. maximum crushed gravel in preparation for surface widening. (2) Cutting a 3-in. trench from the old mat so that a plant-mix widening strip, varying from 3 ft., 6 in., to 4 ft., 6 in. in width, could be placed on each side. A mix of 3½% asphalt was specified for this portion of the paving. (3) Priming the existing surface with 0.10 gal. per sq. yd. of mixing type emulsion. (4) Placing a 26-ft. wide, 6-in. thick plant-mix mat over the old surface and newly-widened area. The mix here varies from 4.5% to 5.5% depending upon the nature of the aggregate from five separate gravel pits. (5) Sealing with 0.35 gal. per sq. yd. of penetration-type emulsion and ½-in. rock chips. (6) Finishing by dressing out the sideslopes and backslopes to a neat and uniform appearance.

Aggregate size requirements

Size sieve	% Passing Gravel base & plant mix	% Passing Rock chips
⅜ in.	—	80-100
½ in.	—	100
¾ in.	80-100	—
1 in.	100	—
No. 4	42-70	—
No. 10	27-50	0-8
No. 40	15-30	—
No. 200	5-12	0.2

Route

Specifications called for work to start on the north end at Camp Desert Rock and progress southeasterly into Las Vegas proper. This was to insure that construction would be well removed from the area before the spring series of atomic tests began and thereby avoid any possible interference. During the shorter days throughout the winter months only one daily shift would be feasible, but plans called for double shifting in the spring when longer daylight prevailed.

There were five designated sources for the plant-mix aggregate, located at approximately 10-mi. intervals along the job. This arrangement resulted in an average haul of the plant mix of 2.5 mi. from each set-up excepting the two end pits where a 5.0-mi. average haul existed when hauling toward the ends. Therefore, in spite of the extreme overall length of the job, the haul consideration was not as demanding as one might think from a cursory examination. More than offsetting this desirable part of the haul

ASSEMBLY-LINE type of operation shows the plant-mix material being dumped into the hopper of the widener and then out into the screed to be spread. Man in background stands ready to smooth out rough spots with a rake.

picture, however, was the asphalt and burner fuel oil which was hauled 360 mi., one way, from the Douglas Oil Refinery at Paramount, Calif.

With the pressing time limit and the five individual set-ups for the crushing and asphalt plants in mind, the contractor selected from his equipment a crusher and asphalt plant that had the principal units of each mounted in portable rubber tired assemblies, making them most suitable to the situation. Much of the equipment and personnel came directly from the construction of the much-publicized WASHO test road at Malad, Idaho, completed by the Carl E. Nelson Co. in the early fall of last year.

The job was done in the following manner:

Base Gravel—This was necessary only from the first, second, and fifth set-ups. It was planned so that it could be conveniently loaded and hauled by truck directly from the crusher at the same time that it was stockpiling the plant-mix aggregate in these three pits, since the specifications for the aggregate and base gravel were identical. The material was placed by an APSCO widener and compacted by rolling with a small trench roller.

Plant Mix Base—Widening with plant mix followed and was accomplished in the following manner.

A motor grader first cut a 3-in. trench from the old mat to a daylight section, windrowing the excess material into a berm off the shoulder. Directly behind, a tandem roller compacted the surface of the trench. Following the roller, the widener laid a 3-in. thick, 4-ft. wide strip of plant mix. Completing the widening operation was a larger roller which compacted the strip.

The entire operation was normally strung out no more than 400 ft. from blade to roller, with a flagman at each end for traffic control. This compact arrangement insured a minimum amount of hazard for both traffic and the contractor's personnel and equipment. Production ranged from 10,000 to 13,000 ft. of widening on one side per daily shift. Of the entire 153,000 tons of plant mix on the project, the widening consumed some 50,000 tons.

Emulsified Prime—With the widening on both sides, the surface was broomed and primed with 0.10 gal. per sq. yd. of a mixing type emulsion that was cut back 40% with water in a 1,000-gal. distributor just before application. This emulsion made an excellent prime and permitted traffic to proceed immediately through the primed area, at controlled speeds, without excessive pick-up or any detrimental effects to either car or roadway surface. Even after being open to traffic for several days ahead of the paving, the surface remained characteristically tacky, insuring a good bond between the old and new pavement.

HOT MIX pours out of the widener into the screed, which controls the depth of mat placed with a strike-off lever. Operator keeps close tabs on the operation. Windrowed material is piled at left.

Surfacing methods

Plant Mix Surface—The surfacing called for a 26-ft.-wide mat of 2-in. plant mix. This was laid in two 13-ft. strips by a Barber-Greene paver with the material hauled from the plant in International trucks carrying from 10 to 15 tons each. The daily operation consisted of laying one strip during the first half of the shift, walking the paver back to the start of that morning's run during the lunch hour, and then working the adjacent strip during the afternoon.

This arrangement afforded several advantages: first, both sides were even at the end of the day's run and the paving machine and rollers were in position to take off for the next day. Also, the exposed center seam of the new mat was closed at the end of the day, eliminating a possible hazard to evening traffic and sloughing off along the exposed edge from the overnight travel.

The abrupt 2-in. differential between the old and new pavement, present at the end of each day's run, presented a condition that required a simple yet effective method of easing the jolt to the oncoming traffic by temporarily tapering the joint. This was accomplished by squaring the joint, laying a 48-in. piece of Sisal-Kraft building paper across the width of the lane, and then taking a small excess of plant mix and hand raking a ramp over the paper. Before starting work the next day, the ramp could be easily and quickly pried loose and removed, since the SisalKraft prevented the material from adhering to the old mat and left a clean vertical joint to take off from. This method also avoided flattening out of the mat at the edge of the joint by the roller, which otherwise frequently results in a slight depression or bump at each joint.

A 3-axle tandem roller made the initial breakdown behind the paver and the lighter 4-ton roller followed, finishing the surface. During the 9-hr. daily shift, from 3,000 to 3,400 ft. of full road width was normally laid. Very positive traffic control was maintained for this phase of the work, consisting of a flagman at each end of the operation and a Jeep pilot-car which directed one-way traffic

hrough the active construction zone.

Seal Coat—The sealing began early n May. Following a 0.35 gal. per sq. d. application of a penetration type emulsion, the chips were applied with he company's own designed and constructed chip spreader. Mounted on he rear of a half-track is a hopper, similar to those on conventional paving machines, in which the chips are lumped and then carried up a conveyor and forward where they are dispersed by a diverging chute into a spread hopper protruding ahead.

An 18-in.-wide screen of ½-in. mesh extending across the end of the spread hopper allows the coarser chips to roll off ahead and be applied to the oil first, while the fines fall through the screen onto the already placed larger particles. In this way the clean chips are insured of being held in the oil before the fine particles can get on and absorb most of it. Based on past performances, it was expected that about 6 mi. per day would be chipped with the spreader.

Finishing—The finish work required pulling back to the pavement edge the berm of shoulder material windrowed during the widening and neatly leveling and shaping the embankment slopes to a uniform cross section. Finishing will also include resetting of culvert markers and guide posts, plus incidental cleaning up.

Plant production presented several interesting problems, which were met as follows:

Crushing Plant—The 160,000 tons of 1-in. max. gravel and 9,000 tons of ½-in. chips were produced with a Cedar Rapids Master Tandem crusher and fed by a D8 Cat with Udozer. The last aggregate stockpile was completed in mid-April and a review of the overall production for the five set-ups showed that better than 200 tons per hr. average was maintained, in spite of the necessity of wasting fines to obtain a product within specifications. This remarkable output, coupled with its mobility (average time to tear down, move 10 mi. and set up—1 day!), proved the plant to be ideal for this job.

Asphalt Plant—The asphalt plant, also a Cedar Rapids product, had a 3,000-lb. batch with dryer and conventional boiler-steam generation. Because of the intense nature and variable direction of the desert wind, a Cyclone dust collector was added. This aided plant production by maintaining a positive draft through the dryer, reduced the loss of fines from the aggregate, and aided in control of the ever-present dust nuisance. Production during a single 9-hr. shift ranged from 1,000 to 1,100 tons throughout the winter months. A double shift was initiated in mid-April, however, and the daily output was increased to about 1,800 tons, promising completion of the job within the 180-working-day time limit.

Asphalt Haul—Haul of the asphalt and hot plant fuel oil from the Douglas Oil Refinery was very capably handled by Peterson & Vance of Logan, Utah, whose 4 Mack trucks were leased for the job. An around-the-clock haul was necessary with two drivers for each unit. One driver hauled from Paramount to Barstow, where the other driver would take over and haul into Las Vegas, unload, and return to Barstow. In spite of the 720-mi. round trip, haul, and tight delivery schedule, the job was never halted for lack of asphalt or fuel oil.

Personnel

The work was done by contract with the Nevada State Department of Highways. H. D. Mills is state highway engineer, Otis Wright is District One engineer and G. D. Brockway is assistant engineer of District One, headquarters at Las Vegas. Ed Marraige was resident engineer and Angus Hicks and Guy S. Harbin were job inspectors.

Carl E. Nelson Co. personnel included Norman E. Parson, general superintendent; Samuel Gillette, project superintendent; James Stanger, asphalt plant superintendent, and Reed Spackman, crushing plant superintendent.

EQUIPMENT

- 1 Model 85 APSCO widener
- 1 No. 12 Caterpillar Motor Grader
- 1 Model KT-7, 4-ton Buffalo-Springfield tandem roller
- 1 Model KX-16, 3-axle Buffalo-Springfield tandem roller
- 1 1,000-gal. Austin-Western distributor
- 1 Barber-Greene paver
- 1 Home-made chip spreader
- 1 Cedarapids Master Tandem crusher with 10 x 36 jaws and 20 x 40 rolls, powered by a D17000 Caterpillar diesel engine
- 1 D8 Caterpillar tractor with Udozer blade
- 1 3,000-lb. batch Cedarapids asphalt plant with 5 x 24-ft. dryer, driven by a D13000 Caterpillar diesel engine
- 1 Cyclone dust collector with D318 Caterpillar power unit
- 2 6,700-gal. hot mix capacity truck trailers with Mack tractors
- 2 6,000-gal. hot mix capacity truck semis with Mack tractors
- Several L-180 and K-8 International trucks

PREPARING the trench to receive the asphalt mat which will add needed width to the road is a 4-ton roller (left). It can get right next to the road's edge and compact every bit of the trench. At right, Caterpillar No. 12 Motor Patrol cuts a 3-in. trench from old mat and windrows excess material into a berm.

San Francisco increases water supply with . . .

New municipal pumping station

Eight electric pumps added to water system — New units will have pumping capacity of 50,000,000 gal. daily — Tremie seal used to aid excavation of wet well and keep out sand

By O. G. GOLDMAN
Superintendent
City Distribution
San Francisco Water
Department

SAN FRANCISCO'S water supply should be adequate to take care of the needs of both present and future residents for some time to come after the new pumping station, now being built on the east bank of Lake Merced, goes into operation some time before the first of next year. The job is being done by a joint venture contract of $1,161,486 by Rothschild, Raffin & Weirick and Pacific Bridge Company.

Lake Merced, which is actually two lakes connected by a narrow strip of water, was discovered by Don Bruno de Heceta, an early Spanish explorer, in 1755. It lies just within the southern boundary line of the City of San Francisco.

In 1877 the Spring Valley Water Company, a private corporation, began to purchase the land encircling and tributary to the lakes, eventually acquiring some 2,800 ac. These lakes are fed by springs in the bottom and around the shores.

During the latter part of the seventies, a steam-driven pumping plant was erected on the north shore of the north lake. This plant was operated for many years until it was abandoned due to a boiler explosion.

In 1891 the second pumping plant was erected on the shores of Lake Merced, this time on the east shore of the south lake. It consisted of two steam-driven pumping units, each being of the Corliss cross-compound, direct-connected type. This plant had a pumping capacity of about 7,000,000 gal. per day.

An elaborate protection system was installed by means of which the surface waters from the entire watershed are diverted and carried into the Pacific Ocean by way of intercepting dams, flumes, canals, and tunnels. A dam was constructed on the outlet of the north lake, the overflow being on the west side of the south lake and leading into the waste tunnel. Maximum storage capacity of the two lakes is over 2,000,000,000 gal., with a maximum depth of more than 29 ft.

This pumping station was in continuous operation until January 4, 1934, when it was shut down. It was finally razed in the latter part of 1952 to make room for the new station now under construction.

Normally this station will act as a booster, taking the water from a 60-in. pipe line adjacent to the station in which will flow, by gravity, the water from the catchment reservoir known as Crystal Springs, some 16 mi to the south, el. 280 ft., pumping the same into either or both of two distribution reservoirs in San Francisco namely, Sunset, el. 385 ft., and Sutro el. 500 ft.

In case of an emergency water shortage in San Francisco, the station can be operated so as to take water from Lake Merced.

Capacity

This new station, containing eight electric motor-driven pumping units will have a pumping capacity of about 50,000,000 gal. per day, which will increase San Francisco's water supply by some 30,000,000 gal. per day. Six of the pumps are of the horizontal type. Four of them are Byron-Jackson 11,500-gal. per min. pumps, three with 1,000-hp. and the other with 1,500-hp. motors. Another two are General Electric 17,250-gal. per min. pumps with 700-hp. motors. The remaining two pumps are vertical Fairbanks-Morse equipment with 200-hp. motors and a capacity of 17,250 gal. per min. each.

The vertical type pumps take their suction from the lake, discharging into the suction side of two of the horizontal type pumps. The discharge of these pumps is connected into the pipe line from Crystal Springs Reservoir. These two horizontal type pumps are also so arranged as to be able to take their suction from the lake. Three of the remaining horizontal type pumps have their suction on the Crystal Springs pipe line and

ischarge into Sunset Reservoir. The emaining pump has its suction on the ischarge main to Sunset Reservoir nd discharges into Sutro Reservoir.

The connection into Lake Merced onsists of three 72-in. (coal tar lined nd coated with a cement mortar acket) steel pipes terminating in a vet well, in which is placed the suc- ion of the pumps mentioned above.

Construction

Borings were made in the founda- ion area of the new station by means of 2-in. auger holes to an average depth of about 20 ft., although a few reached about 30 ft. down. These borings were taken before the design of the station started under supervision of Water Department engineers. From these test borings it was assumed that there was a good solid foundation for the depths required.

When excavating for the pipe lines going into the pump station it was disclosed that the ground water table was about 2 ft. higher than expected. The subsoil below the water table gave indication of being fluid. For this reason all header pipes were raised about 2 ft. by means of appropriate bends.

Since the new station was practically over the site of the old one, advantage was taken of the existing concrete foundations, upon which rested the Corliss engines. These old foundations are of mass concrete, and in most cases have a depth of 10 ft. The new pump foundations are above the top of the existing one, and therefore the old foundations were not removed. This situation saved considerable money in the cost of constructing the new station by eliminating much of the cost of concrete removal. It also gave the new pump and motors an exceptionally strong and secure foundation.

Since the designed bottom of the wet well was about 33½ ft. below the water level in the lake, a cofferdam type of construction was required. The cofferdam was made from ZP 38 sheet piles, 50 ft. in length. The inside dimensions of the cofferdam are 32x37 ft. In selecting 50-ft. piles, the contractor expected to have sufficient length for landing them into firm ground, thereby avoiding any difficulty in unwatering.

After driving the piles to what was supposed to be the required depth, attempts were made to unwater the structure, but without effect; the more pumping that was done the more the surrounding material sloughed in, boiling up through the bottom of the cofferdam structure. So extensive was the sloughing that the cofferdam structure finally became an island.

The question then arose as to the depth at which firm material would be found, that is, firm enough for the landing of the sheet piling. For this determination a well-boring outfit was brought in, and a well put down at the north side of the dam next to the lake. The result was surprising. This test well was put down to a depth of about 50 ft. below the bottom of the wet well, and the material encountered for its entire depth was free-flowing sand---no firm material. With this determination, it was immediately decided to place a tremie seal approximately 15 ft. in thickness below the bottom of the wet well.

In order to place the tremie seal, attempts were made to excavate the inside area of the cofferdam without the removal of the water. All but the bottom few feet could be thus removed, but owing to the fluidity of the sand no further progress was possible due to cave-in from the sides. This liquid condition of the sand and the caving in from the sides of the cofferdam was finally overcome by placing large pieces of concrete and bales of hay around the outside perimeter of the dam, thereby forming a seal. With the placing of the tremie seal no further difficulty was encountered.

However, with the knowledge that the foundation material under the wet well was fluid, it became obvious that this part of the structure could possibly act as a barge, that is, rise and fall with the change in the water level in the lake, should the soil friction on the sides be insufficient.

The lake level being now at its maximum height, possible danger may be encountered when pumping takes place and the water level in the lake is lowered. For this reason, the wet well was redesigned so as to separate it from the rest of the pump building by means of a specially designed construction joint at the present level.

For the purpose of laying the 72-in. inlet pipes to the wet well, a 35x72-ft. barge was fabricated from 60 Navy surplus 5x7x5-ft. pontoons. A 1½-yd. crane was lashed to the barge. A clamshell bucket was attached for the required excavating and then the equipment was converted back as a crane for placing the pipe. Excavation for these inlet pipes was extremely slow, again due to the fluidity of the sand, but perseverance won. Pipe sections were connected by a diver.

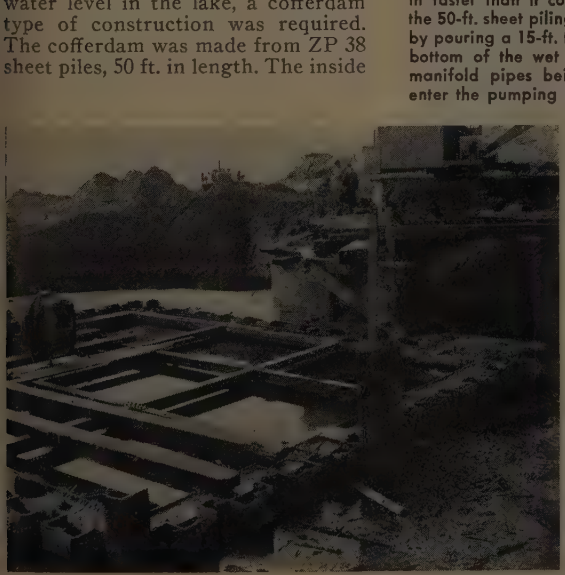
The station will be completed on or about July 1, 1953, except for the outdoor switch gear. This piece of equipment is expected about the first of October.

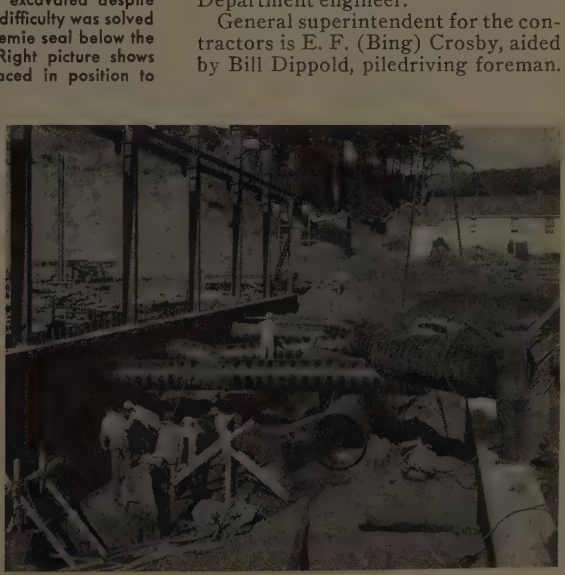
Personnel

All work in the San Francisco Water Department is under the general supervision of G. W. Pracy, General Manager and Chief Engineer; the design was by the engineering forces of the Water Department; general supervision of construction is under the direction of the writer; and actual construction in the field is under the direction of C. R. Galloway, a Water Department engineer.

General superintendent for the contractors is E. F. (Bing) Crosby, aided by Bill Dippold, piledriving foreman.

BOILING UP through the bottom of this cofferdam structure (left), sand and water came in faster than it could be excavated despite the 50-ft. sheet piling. The difficulty was solved by pouring a 15-ft. thick tremie seal below the bottom of the wet well. Right picture shows manifold pipes being placed in position to enter the pumping area.





Tunnel lining is a three-stage job

Everett, Washington, water supply will be "turned off" once more this year to permit completion of unique project—Lining work must stop when city surge storage drops—Schedule arranged to catch high flows of Sultan River to replenish reservoir

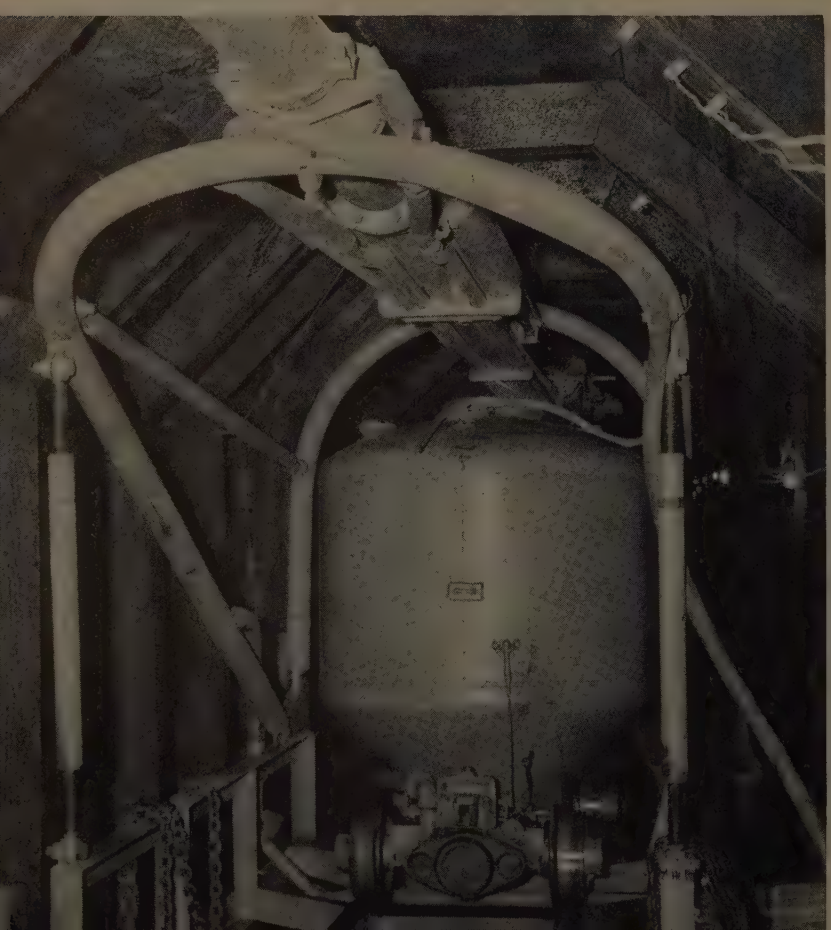
By F. S. ZEIDLHACK
Engineer
John W. Cunningham & Associates
Portland, Oregon

LINING a 1½-mi. water supply tunnel near Everett, Washington, without interruption of that city's water supply from the Sultan River has offered interesting problems of operation. Concrete placement through the 7,064-ft. bore is being done in three stages over a year's time. Water is being passed through the incomplete project during two intervening periods of several months each in order to replenish the 4,550,000,000-gal. capacity of Lake Chaplain, a reservoir in the line that provides surge storage to firm the city's annual supply.

Key factors in the project are the capacity of the tunnel itself and of Lake Chaplain. The tunnel must have capacity sufficiently in excess of 100 mgd. to fill the lake year after year during the wet season. (See box on these pages describing the development of Everett's water supply system since 1916.) Studies of the discharge of the Sultan River over a long period of years indicated this incremental capacity to be 25 mgd. The economic design of the original tunnel over 20 years ago was therefore based upon a capacity of 125 mgd.

The design contemplated installation of a concrete lining which, although it would reduce the cross-sectional area, would improve the hydraulic characteristics with resulting greater carrying capacity. Due to the cost, lining operations were deferred at the time of original construction and the unlined section, with a capacity believed to be only slightly more than 100 mgd., has been adequate to meet Everett's needs up to the present.

TIMBER-CRIBBED sections of the tunnel mark past trouble spots. Timbers will remain under a 4-in. concrete cover. Previously unlined portions—most of the tunnel—will receive 6-in. lining from this pneumatic placer.



Lining imperative

However, with demand approaching design capacity, lining of this tunnel was determined last year to be imperative. The present work will also eliminate the need of future annoying repairs and additional timbering, necessitated in the past by occasional cave-ins.

Attempting to line the tunnel now has brought with it some problems which could have been avoided had the work been done 10 years ago when demand on the entire system was considerably less. As things stand, while the tunnel is unwatered for work, the entire Everett supply is restricted to a 10-mgd. pipeline and to the storage in Lake Chaplain. At the present rate of draft, these sources—the lake is the critical one—are sufficient only for 40 to 45 days. After this, the reserve must be restored. Also, after the lake is exhausted there must be sufficient flow in the Sultan River, diverted through the tunnel being lined, not only to meet demand but to refill the lake as well. Consequently, lining operations have had to be planned for execution during two or more periods of 40-day duration.

Preliminaries

In May, 1952, the contract for lining the tunnel was let to Kemper Construction Co. and H. W. Hongola & Son of Los Angeles, Calif. The general plan was for the contractor to enter the tunnel in September 1952 for a 40-day period until the lake supply was depleted, after which the lake was to be refilled. A second period of operations would begin in March 1953 and the process repeated for a third and final time in September 1953. The time between letting of the contract in May and the first working period in September was devoted to extensive preparations for the work. Space for storage of aggregates had to be pro-

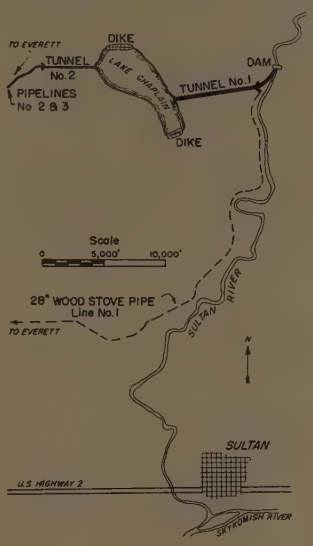
History of Everett's water supply system

THE PER CAPITA use of water by the city of Everett, Washington (population 35,000), exceeds that of any city in the United States. This is due to the large amounts required by two local pulp mills, one of which uses up to 58 mgd.; the other, 30 mgd. With additional requests by two other mills for 2 mgd. each, this adds up to a total industrial demand of 92 mgd. Domestic use varies with the seasons from 4 to 14 mgd. The amount delivered to the city may therefore reach a total of 106 mgd.

The source of supply is the Sultan River, 22 mi. east of Everett. This stream, rising in the Cascade Range, is subject to a wide range of flow, varying from a recorded minimum of 52 cfs. to a maximum in excess of 20,000 cfs. The early fall floods carry considerable silt which is settled out in a storage reservoir. The original Sultan River supply line No. 1 consists of a 28-in. wood and steel pipe line, following the river canyon for some distance and continuing over rolling timbered country to Everett, a total distance of 26½ mi. This line was built in 1916, has a capacity of 10 mgd., and is still in use, although replacements and maintenance have been extensive.

In 1929 the first pulp mill entered the city and contracted for 20 mgd. of water. Sultan River Project No. 2 was then initiated to supply 50 mgd. with conduits and structures not easily susceptible to future enlargement designed for 100 mgd. flow. With a minimum river flow of 52 cfs. (32 mgd.) and a transmission line capacity of 50 mgd., storage became necessary. Lake Chaplain, an uninhabited lake, offered the best opportunities, lending itself to enlargement for a continuous supply of 100 mgd.

In 1930, a new concrete diversion dam was built on the Sultan River about one-half mile above the original Project No. 1 dam.



A 54-in. diameter continuous wood stave pipe conducts the water to the portal of tunnel No. 1. This tunnel is 7,064 ft. long, in rock section 9 ft. wide and 9½ ft. high with semicircular arch roof. The upper 534 ft. and lower 108 ft. adjacent to the portals were concrete lined to a net section of 7½x8 ft. Portions were timbered and lagged to prevent caving. Tunnel No. 1 discharges into the Lake Chaplain storage reservoir. An earthfill dam was constructed at the outlet or south end of the lake to store 1,350,000,000 gal., sufficient to supplement the low summer flows in the Sultan for a continuous supply of 50 mgd.

Tunnel No. 2, located at the northwest end of the lake, serves as the outlet. It was driven in a compacted sand formation except for a short distance of rock at the inlet end. It is concrete lined throughout its 4,415 ft. The net horseshoe section is 6x6½ ft., has a fall of 1 ft. per 1,000 and a calculated capacity of 100 mgd. Water is conducted to the city in a compound pipeline primarily 48 in. and 52 in. in size and 22½ mi. in length. With the exception of 5¼ mi. of 52-in. creosoted wood stave pipe at the upper end, all pipe is arc welded steel.

In 1935 a second pulp mill located in Everett and the need of increasing the supply to 100 mgd. became necessary and advisable. This resulted in the construction of Project No. 3, involving additions and alterations. A 60-in. pipe was laid from the diversion dam to the inlet portal of tunnel No. 1 and a second supply pipe was installed from the outlet of tunnel No. 2 to the city. Between 1940 and 1942, to provide additional storage in Lake Chaplain, the earthfill dam was increased 26 ft. in height and a low dike constructed, to confine the water at the north or opposite end of the lake. The work was done by city forces with finances partially supplied by federal agencies. The total storage available is now 4,550,000,000 gal., which with the flow in the river is adequate for a continuous supply of 100 mgd. The long-range plan initiated in 1930 is therefore, with one important exception, completed. This exception is the lining of tunnel No. 1.

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vided, forms built, a batching plant constructed, cars for transporting concrete manufactured, compressors, track, pipe, lights and other paraphernalia secured in addition to providing an adequate water supply for the operations.

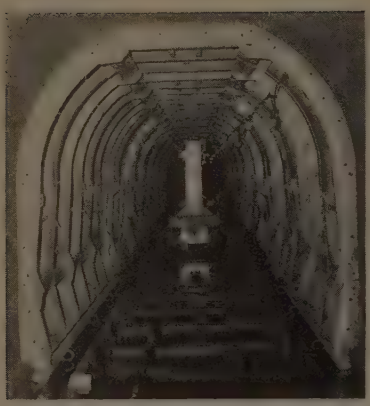
Arch forms

About 140 ft. of arch forms were manufactured by Chicago Bridge & Iron Co. These consisted of 10-ft. sections of ¼-in. skin plate, reinforced with plate stiffener ribs at 30-in. centers and with channel iron strut spacers. At the crown of the arch, the forms were dropped 3 in., forming a circular segment to permit space for the slick pipe. The forms were made collapsible with hinges 18 in. above the invert on each side and another at each end of the chord at the arch crown.

The placers or pots for transporting concrete to the forms are jug-like, air-tight containers of 1½ cu. yd. capacity each. The underpass, located at the forms, is a framework used to support the slick pipe and to receive the placers as they are successively emptied. The underpass and 8 placers were manufactured by the Flocrete Manufacturing Co. of Los Angeles. Passing track switches are automatic spring loaded, supplied by C. M. Lovestead of Seattle. Two 7½-ton monitor-type electric storage battery locomotives were secured from the Greensburg Machine Co. of Greensburg, Pa. All mechanical operations are powered by air, supplied by two 75-hp., 365-cfm. Gardner-Denver compressors. The batching plant has a capacity of 20 cu. yd., supplying a 1-yd. electric-driven stationary Ransome mixer which is set up over the center of the west portal to discharge directly into the placers. A ¾-yd. Northwest clamshell transfers the aggregates from stockpiles to the batching plant. With electric power available at the west portal, concreting operations are carried on from this end only.

First operations

The tunnel was dewatered for the first period of operations on September 14, 1952. The first week was devoted entirely to stringing lights and track from both ends of the tunnel, installing a 6-in. air line and a



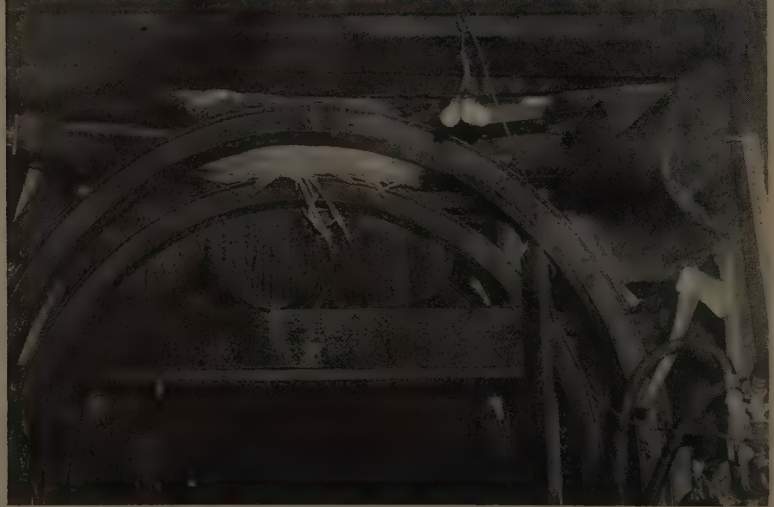
SPECIFICATION AND RESULTS are shown here. Drawing indicates lining for two types of tunnel. Reinforcing steel is placed only as directed—little has been used. Collapsible steel forms establish flat crown, leaving room above for slickline as concrete is placed.

2-in. water line. Surveys for grade and alignment were immediately made and all projecting points of rock painted for removal. Mucking out of caved-in material, accumulated silt and debris carried into the tunnel over a period of years followed. A rather serious cave-in 1,000 ft. from the west portal and extending over about 60 ft. of tunnel had previously been packed with 30-in. logs and I-beam supports, constricting the tunnel section considerably. These had to be removed, and this work took the entire second week of the first period. During the third week, concreting operations were started at this location and about 460 ft. of arch and sides had been poured when the city, apprehensive about the remaining supply, required the contractor to stop operations. The tunnel was reopened to water on October 12, after 26 days of work. Sufficient water still remained in the lake for several additional days of industrial supply; however, the Northwest was experiencing an unprecedented and lengthy dry spell, with no indication of immediate relief. To avoid complete shutting down of the mills for lack of water, it was decided to use the remaining storage in addition to what little was then flowing in the river. Luckily the rains came before complete depletion of the supply and the lake started filling again.

Second stage operations

After 146 days, required to fill the lake, water was shut off on March 8, and the second work period started the following day. With a well organized concreting crew, operations proceeded smoothly. Progress consisted of pouring 100 to 120 ft. of arch a day. The initial haul was 6,500 ft., decreasing as the work progressed.

WORST SPOT on the job was met during first work period. Log timbering throughout a 60-ft. caved section had to be replaced by steel sets to restore original dimensions and permit work to proceed.



Operations start by filling fo placers at the west portal. These a pushed to the underpass, adjacent the forms. The discharge nozzle the first placer couples into the sli pipe, coupling up the air line at t same time. Air enters the placer the bottom opposite the discharg nozzle, forcing the concrete into t slick pipe and up into the forms. A it is placed, the concrete is inspecte and vibrated at ports spaced eve 10 ft. both in the sides and top the forms. As operations progre the slick pipe is withdrawn by back ing up the entire train. After t first placer is emptied, the slick pi is uncoupled and raised and t empty placer pushed into the unde pass. The same operation is re peated with the second placer and s on until the four 1½-yd. containe are empty. The entire operation re quires from 8 to 12 min. On the wa out the train meets the incomin load at the by-pass. A signal i given at this point to start the mixe for the next load. The operation continue until the available form are filled.

The swing shift follows the plac ing of concrete. These men clea the placers and slick pipe, and pro ceed with preparation of the tunne for the next day's run by removing rock projections, mucking and gen eral clean-up. The graveyard shif resets the forms for the following day's concrete work. Forms are col lapsed at the knees and top and transported forward on a jumbo. The jumbo is powered by air jacks for breaking the forms loose, reset ting and jacking them into place.

Progress thus far

The second work period ended on April 22 after 45 days of continuous operation. A total of 4,280 ft. of arch and sides were poured, requiring 1,585 cu. yd. for the 6-in. lining and 3,388 cu. yd. for filling overbreak —a total of 4,973 cu. yd. The average length of travel each way was 4,390 ft.

Concrete is a 5-sack mix in approximate proportions of 1:2.4:3.8, with 32 gal. of water giving a 4- to 5-in. slump. Five ounces of Darex air entrainment agent are added per yard of concrete. To remove the chill and hasten setting, all mixing water is heated to 95 deg. F. in a coil heater, using propane gas.

Plans for third stage

Operations this spring were stopped when the storage was used up and the water in the lake stood 2 ft. above the crown of the outlet tunnel No. 2. The lake will again be filled by about July 24. Entrance into the tunnel at that time is not feasible, for after completing the 40-day working period the run-off in the river will normally be less than the industrial demand. The third

Concluded on page 80

pecial equipment eases traffic headaches on a . . .

Stop-and-go highway job

'PICAL working conditions under which orthern California's busiest intersection was ved in record time by the aid of a Seaman lf-Propelled Pulvi-Mixer. Traffic had to be opped completely only for one hour.

USIEST INTERSECTION in Northern California, the junction of Bayshore and Third street in an Mateo, was creating all sorts of eadaches for William G. Bell, the b superintendent.

The whole job is a $1,600,000 contract, awarded to the Piombo Construction Co. to excavate, drain, rade, and pave 2.1 mi. of U.S. Highway 101, including overpass construction, in preparation for converting the section to a divided freeway.

Normal heavy traffic, caused by orth and south travel along this main rtery between Los Angeles and San rancisco, is made even worse at this ntersection by east and west travel etween San Mateo and the San Mateo Bridge, which crosses San Francisco Bay at this point. That's why he intersection is considered to be ne of the most deadly traffic hazards n California.

Bell's toughest problem was to place an 8-in. thick slab of monolithic concrete over a 4-in.-thick soil cement base course, separated by an asphaltic emulsion seal coat, without holding up traffic any more than was absolutely necessary. Just to make things interesting, the specifications demanded that two out of the four lanes be kept open to traffic at all times.

Even tough at 2 a.m.

Nothing Bell tried was satisfactory. He paid double time so the men could work at 2 a.m., the time when traffic was the lightest, but he still received complaints because of the length of time it took his equipment train to cross the intersection.

Then he got in touch with Jack Lumley, West Coast representative of Seaman Motors, Inc., who furnished a Seaman Self-Propelled Pulvi-Mixer to enable him to get across the intersection in the record time of less than an hour without shutting down traffic completely. The Pulvi-Mixer, with its self-contained mixing operation, worked without the need of laying windrows, and the cement-treated base was soon placed.

Traffic was permitted to use all four lanes until the work had progressed right to the edge of the intersection. Then it was limited to the two north lanes while the Pulvi-Mixer and roller prepared and compacted the base to the middle of the intersection. As soon as this was finished, traffic was switched to the two south lanes while the north lanes were prepared by the same method.

This same procedure is in store for the concrete pour, which has been averaging 2,800 lin. ft. a day in 12-ft.-wide slabs. The slabs are poured in quantities of 3,500 cu. yd. to each one.

'ULVI-MIXER to the rescue. This self-propelled unit with its self-contained mixing peration places cement-treated base without the need of laying windrows, thus permitting traffic to cross the strip as soon as the base is laid.

ROLLER compacts the cement soil subbase while the bitumen truck (right) is prepared to place a seal coat of asphaltic emulsion on the 12-ft. strip.

Slides and movies, manuals and models—all prove effective as Colorado Highway Department makes full and vigorous use of . . .

Visual aids for training engineers

AMONG THE STATES which are using every available means of training their highway department personnel, Colorado is a leader. Training aids were considered necessary to help alleviate the current shortage of highway engineers (*Western Construction*—June 1953, pp. 74-82), so it was only natural to employ every possible kind.

By
J. F. DeVIVIER
Personnel Director
Colorado
Department of
Highways

Types of training aids

Training aids used by the Personnel Department include 35 mm. slides, both black and white and color; training manuals; motion pictures and film strips; training conferences (*Western Construction*—June 1951, p. 70) and study courses; and streamlining procedures so that much of the work can be done by non-engineers or sub-professional personnel.

Slides are used mostly at group training conferences, where they ar projected on a screen and discusse in detail. These slides, which includ photographs, charts, and drawing are usually prepared in subject group to illustrate step-by-step methods, procedure recommended by the De partment for work which is difficul and for which there is a clear need fo additional training. Such visual aid as slides are used because they im prove retention in the training proc ess and cut short the time needed fo training.

Slide groups used

Included among the slide group used are: "Bituminous Seal Coats,"

A checklist of movies on loan from AASHO

MOTION PICTURE library service is available from the American Association of State Highway Officials, 917 National Press Building, Washington 4, D.C., for those state highway departments which are interested.

Unfortunately, the supply is so limited that AASHO has had to limit distribution solely to highway departments and engineering schools, according to Hal H. Hale, executive secretary of the organization. Engineering schools must solicit and use the films through the faculty contact member representing AASHO in each of 135 institutions.

These rules govern the use of the library:

1. Requests for films will be honored in the order of their receipt.
2. Films will be shipped from this office to their destination by express, collect.
3. Films will be returned by the user by express, prepaid.
4. A simple report on the use of the film on an accompanying form is requested.

The following films are available:

"Oregon State Parks," 16 mm. color and sound, 22 min. Narrative report and scenery. Oregon State Highway Department.

"The New Oregon Trail," 16 mm. color and sound, 22 min. Oregon's highways, travel industry, and outstanding structures on the highway system. Oregon State Highway Department.

"You'll Remember Oregon," 22 min. One of the most scenic films available.

"Out of the Muddle," 16 mm. color and sound, 31 min. Overall problem of highway conditions, traffic congestion, and highway adequacy. General Motors.

"Safety in Highway Maintenance," 16 mm. color and sound, 26 min. Highway sequence from initial location through construction to maintenance.

"Thruway to Tomorrow," 16 mm. black and white and sound, 23 min. Advantages of the Thruway and relationship to the normal highway problem. New York State Thruway Authority.

"Four and Forty," 16 mm. color and sound, 12 min. The "facts of life" of the highway operation. Also a 9-min. film on the same reel, "Rivers to Cross." Kentucky State Highway Department.

"The Road Ahead," 16 mm. color and sound, 74 min. Three reels, the first on maintenance, the second on planning, and the third on construction. Missouri State Highway Department.

In addition there are three 16 mm. films made by the Pennsylvania State Highway Department in color and sound:

"Pennsylvania's Highway Story," 22 min. The story of highway usage and the problems of highway administration.

"Men Working," 39 min. All phases of highway maintenance.

"Construction Ahead," 23 min. The survey, design, and construction of a highway system.

Laying a Bituminous Plantmix Pavement," "How to Perform the Sand Equivalent Test" (*Western Construction*—June 1953, p. 107), "How to Perform the Liquid Limit Test," "How to Perform the Plastic Limit Test," and several groups on how to perform various fresh concrete tests. Other slides show how and why road failures occurred, pavement patching, equipment overhaul, and the like.

Manuals for field and office

Training manuals were put together with the aid of a mimeograph machine and issued to all persons concerned. The Field and Office Manual includes, among its more important divisions, chapters on survey procedures, design, soils, excavation and embankment, and structure backfill.

Survey Procedures show standard abbreviations, stake markings, and structure markings. Design standards are explained in text, charts, and maps, with a special section devoted to designing for thickness of surfacing and sub-base courses. The soils section includes information on soil surveys and sampling, methods of preparing disturbed soil samples for test, and standard methods of determining the liquid limit of soils. The soil sections are illustrated with both pictures and drawings. Excavation and embankment chapter handles grading, conservation of special materials, topsoil, drainage, material quality, borrow, drilling and blasting, cut slopes, embankments, foundations, subgrade, and ditches. The structure backfill chapter discusses settlement, consolidation, underdrains, and filter material.

The Manual on Uniform Traffic Control Devices for Streets and Highways takes up signs, markings, signals, and islands, and plates for signs, markings, and signals. It was prepared in loose-leaf form and assembled with detachable binders to facilitate insertion of supplements and revisions as they are issued.

Movies for supervisors

Most of the motion picture films and film strips used are obtained on loan from such agencies as: Portland Cement Association, Asphalt Institute, various construction equipment manufacturing companies, U.S. Bureau of Public Roads, American Association of State Highway Officials (see box), and other state highway departments.

The Department has purchased a stock of short (10 to 14 min.) 16 mm. motion pictures, mostly for supervisory training. They include such titles as "Supervisor as a Leader," "Instructing the Worker on the Job," "Improving the Job," "Planning and Laying Out Work," "Placing the Right Man on the Job," and "Working with Other Supervisors."

One training film, "Concrete Field Test Procedures," was produced by the Department. This color movie with sound track, which runs about 23 min., illustrates the step-by-step procedure for making the concrete slump test, the concrete air-entrained test, and shows how to mold concrete test cylinders in the field. A print of a U.S. Bureau of Roads film entitled "Highway Soils Engineering" has been purchased for use in the materials engineering training program. The most recent purchase was the Bureau of Public Roads' film on the Maryland Test Road.

Group training

A typical training study course was the Aerial Survey Training Course given in Denver from July 10 through 21, 1950, under the sponsorship of Colorado District, Bureau of Public Roads, Division Nine. Its purpose was to develop enough up-to-date know-how in the Highway Department so that more use could be made of aerial survey methods, which the Department has come to realize has definite advantages and economies over certain phases of ground-survey methods.

The instructor was William T. Pryor, location, design, and photogrammetric engineer for the U.S. Bureau of Public Roads in Washington, D.C., who is recognized as one of the top men in the nation in this field because of his long history of accomplishment in photogrammetry.

The course included 35 hr. of lecture and demonstration on the history, basic theory, and fundamentals of aerial photogrammetric methods (aerial survey) as applied to highway engineering. Some 40 more hours were spent receiving training under personal instruction on the actual application of aerial surveying to the location of highways, location of drainage structures, soils exploration, and evaluation of the influence of land use on highway location. Several sets of aerial pictures of proposed highway locations in Colorado were prepared into mosaics, during which time each man in attendance developed at least a portion of a completed mosaic by using the latest and best methods.

At the conclusion of the 2-week course, the Training Director, A. C. Skyrud, reported that each man who attended had gained enough knowledge and information to permit him to take a group of aerial photographs from a designated reconnaissance flight over an area through which a road construction project is proposed, prepare a true mosaic, and interpret the topographic features and land use features shown. He should also be able to pick out and trace feasible alternate routes on the photographs and calculate ground elevations at all needed points, as well as measure the shape and size of the topography to pick out the best possible route through the area. He should also be qualified to train other men in turn.

Cutting paper work

Streamlining of procedures includes cutting paper work so that one report takes the place of several by means of eliminating any information not really needed or used. One form, which was shortened 2 yr. ago, has proved its worth in getting the needed information completely and correctly. Actually some forms were so complicated and difficult to understand that the person filling them in couldn't figure out what information was desired.

Open season for the runoff races

THE GREAT ALASKA Sweepstakes, in which thousands of dollars go to the person who guesses the exact second at which the annual spring breakup of ice jams on the Tanana River will occur, has a new rival in the Southwest.

The upstart contest is the Annual Colorado River Water Derby, now in its sixth year. This year almost 200 individuals, mostly engineers, statisticians, and hydrographers, predicted the quantity of water that will flow down the Colorado during April, May, June, and July, when ¾ of the total yearly runoff occurs.

Last year's contest was won by Stuart A. Candiff, of the California Electric Power Co. His guess was 14,077,255 acre feet, as compared with the actual total of 14,064,000 acre feet. The runoff is recorded by two automatic water stage recorders located near Bright Angel Creek, some 260 mi. upstream from Hoover Dam. Mathematicians of the U. S. Geological Survey figure the flow. No mention was made in press reports of any prize for the winner, other than personal satisfaction in having his prediction proven most correct.

Panama Canal gets a major overhaul

FIRST MAJOR overhaul of the Panama Canal since it was built 40 yr. ago began with receipt of an order for new motor controls for the locks from Federal Electric Products Co.

First phase of the 10-year project is due for completion in 1956 at a cost of $1,500,000. Delivery of the 398 units, at the rate of about 30 a week, will continue all summer. The new controls, together with repairs to the lock culverts, will shorten the time needed to fill and empty the lock chambers, thus speeding up traffic through the heavily-traveled passage between the Atlantic and Pacific oceans.

Building a cut-and-cover subway

Actually, the cover comes first on Seattle's Battery Street subway—Excavation is completed with natural light streaming between precast concrete beams that "shore" the cut and support roadways for intersection traffic

By
H. WARD TYLER
Principal Engineer
Seattle Department of Engineering

and
CORWIN A. PILON
Assistant District Engineer
Washington Department of Highways

SEATTLE'S vehicular Battery Street subway is now about one-third completed. The design and construction of this underground project has presented many unusual and interesting construction problems. These involve subway construction under a portion of a two-story concrete building, support of sides of excavation against caving and subsidence under adjacent buildings, driving steel piling 30 ft. in hard, dry claylike ground, taking care of numerous underground utilities and the development of construction methods.

The subway is part of the Alaskan Way Viaduct project (*Western Construction*—August 1951) and extends the viaduct route under seven heavily traveled streets to emerge in Aurora Avenue, the principal artery approaching Seattle from the north. It is in the nature of a long underpass 2,134 ft. long, constructed by open-cut methods directly under the present surface street. In its completed form the ceiling of the subway becomes the roadway of the restored surface street.

Early design proposed a depressed roadway with only the cross streets and avenues being restored. It was estimated, however, that condemnation costs for loss of access to adjacent property would approximate the cost of restoring the surface street. Hence the present design. A better facility was gained by this decision, but additional safety equipment was required because of carbon monoxide accumulations, fire and accident hazards and artificial lighting.

Completed construction will provide two 25-ft. roadways separated by a solid dividing wall, each having a 3-ft. emergency sidewalk. Each roadway will carry two lanes of traffic at design speeds up to 45 mph.

All construction work is confined to the existing street width of 66 ft., which is lined on either side by one- and two-story buildings. Rather than underpin all of the buildings, the design provides that steel H-piles be driven along each side wall on 3-ft. 9-in. centers. These are capped with a longitudinal reinforced concrete waler beam which forms a seat for precast concrete deck beams. Deck beams spaced at 15-ft. centers strut between sidewalls and are supported at the center wall by an additional pair of steel H-piles. Initial excavation is made only deep enough to place the walers and deck beams. After these struts are in place, the excavation is completed and the roadway slab is poured.

As excavation is made, precast concrete liner plates are inserted behind and between the steel H-piles to prevent caving. Ground material is hard-packed glacial silt resembling hard clay. Experimental test piles indicated that it would be impossible to

ve steel piles through this mate-
. The answer was found in pre-
ing a 12-in. diameter hole with an
th boring auger, and the specifica-
ıs were written to provide for this
thod of boring and driving. This
proved to be an efficient and fast
thod of placing the piles except
.t experience proved a 16-in. auger
le to be preferable. The holes
nd up very well until piles are
ven to the required bearing and
netration. Minimum depth of 5 ft.
low subgrade is required to resist
eral thrust at the bottom of the
ewalls and 25 tons of bearing per
e is required to support the sub-
.y structure. The lower pavement
.b forms a final strut between side-
alls at the bottom.

bids received

All of the above noted factors cre-
ed need for considerable engineer-
g ingenuity and know-how.

Ten contracting firms submitted
ds for the contract ranging in
nounts from $2,384,061.00 to $3,749,-
1.00. Morrison-Knudsen Co., Inc.,
d Rumsey Co. submitted the low
d and were awarded the contract.
ompletion of the contract is sched-
ed for March 1954. The project was
signed by the City of Seattle Engi-
eering Department, is being con-
ructed under the supervision of the
ate Department of Highways, and
financed by both.

On October 6, 1952, the First Ave-
ıe intersection was closed to all
affic. Various utility company per-
nnel moved in and started clearing
isting power lines, gas and water
ains, etc., from the area to make
ay for construction of the subway.
he contractor secured a Highway
rth drill which he mounted on a
MC flatbed truck and started drill-
g 12-in. diameter holes for the
x 12-in. 53-lb. BP sections which
e driven as soldier beams for the
bway walls.

The requirements in plumbness for
e drilled holes are very rigid. The
oles are drilled to the subway grade
vel and are permitted to be not
ore than 1 in. out of plumb trans-
rsely and 3 in. longitudinally with
e subway centerline. The steel piles
e driven in the drilled holes and to
e same tolerances for plumbness.

Northwest Model 80-D crawler
ane, equipped with fixed leads to
ntrol a No. 1 Vulcan single acting
ammer, is used to drive the piles.
he leads are plumbed by an intricate
stem of hydraulic controls. A Lit-
eford steam generator is mounted
n back of the crane, making a com-
etely mobile pile-driving unit.

oulders delay drilling

Soil conditions encountered while
illing holes for the piles have not
ways proven to be hard-packed gla-
al silt. Several large boulders, con-
ete blocks and walls, old track ties,
c., have delayed the drilling. These

TOPSIDE of work shows shallow cut made initially to receive concrete beams, which are seated on H-piles at centerline of divided structure and on concrete poured at 15-ft. intervals between H-piles underpinning abutting property. Temporary timber roadway over these beams gives access for equipment on later pouring operations along center wall.

objects when encountered are being removed by excavation methods, or by spudding the object out of the way with a section of heavy railroad rail. The 12-in. H-pile in a 12-in. round hole developed so much friction that it proved difficult driving. To relieve this condition, the contractor was permitted to increase the diameter of the drilled holes to 16 in.

Following the pile-driving operations a power shovel and dump trucks remove a 4-ft. layer of the subway excavation. This clears the upper section of the piles for construction of beam seats, which are concrete blocks poured between two adjacent piles and supported on steel reinforcing bars and steel angles welded to the piles. The seats support the transverse precast concrete beams, which are 1 ft. 8 in. by 2 ft. 10 in. in section and 31 ft. 4 in. long. Waler beams encasing the tops of the steel piles and the outer ends of the precast beams are constructed along the outer walls, and the precast beams then become struts bracing the tops of the piles, which in turn support the vertical sides of the subway during excavating operations.

To excavate beneath the precast beams, the contractor chose a ¾-yd. Koehring dipper-type shovel. He shortened the boom and dipper arm to clear the beams and permit the loading of trucks within the subway. This method of operation has proven quite efficient, as powerful equipment is required to excavate the compact, fine clay-like glacial silt material. Following closely behind the excavation operations, the precast liner plates are placed. Pea gravel is used to fill all voids which occur behind the liner plates. The plates become the outer form for the cast-in-place concrete outer subway walls, and prevent caving of the sides of the excavation. During the excavation operations, it is necessary to remove existing sewer lines, to install a new sewer and drain-

SOUTH PORTAL is a skewed structure, its alignment showing how subway cuts under corner of Film Exchange Building (right). Approaches to subway are part of the contract, and total 2,000 ft. in addition to the 2,134-ft. subway.

age system beneath the subway floor, and to make new connections of the existing to the newly constructed system. Existing underground fire alarm, telephone and power cables are also encountered and must be relocated to accommodate the construction. This work has created numerous problems, as the systems must be kept in operation.

The precast beams are cast with openings for the sprinkler system pipes, and for conduits for electric wires, etc. Also, 2-in. inserts at 2-ft. intervals are placed in each side of each beam. The inserts support steel angles upon which forms are built for constructing the concrete roadway over the subway. The inserts will later be used for supporting maintenance platforms and scaffolding. Reinforcing bars are left protruding from the top of the beams to interlock with the reinforcing bars placed for the upper roadway slab.

The upper roadway at each street intersection is constructed over the precast beams as soon as formwork, etc., is completed. This operation reduces closure of the intersection to a minimum and permits the closure of the adjoining intersection, thereby permitting expansion of operations. At this time the First and Second Avenue intersections have been restored to traffic and the Third and Fourth Avenue intersections are closed. The roadway at Third Avenue is nearing completion and should be reopened to traffic early in August.

The outer subway walls are 16 in. thick—4 in. of concrete covering the inner face of the 12-in. steel piles. The center wall is 18 in. thick, with 3 in. of concrete covering the outer faces of the 12-in. steel piles. Concrete for the walls is placed over a network of steel reinforcing bars welded to the faces of the piles. The outer walls are constructed in sections averaging about 19 ft. in length. Rubber waterstops seal the vertical construction joints between wall units, and 8-in. diameter vertical holes cast through the waler beams permit the concrete to be placed tightly against the bottom of the waler beam.

FIRST CHORE is installation of H-piles along subway route. 16-in. auger rig (left) bores hos to receive piles driven from leads on Northwest crane at right. Note corbel removed from bui ing to give clearance for pile driving.

Concreting center wall

Concrete for the center wall is placed from the upper roadway level by pouring through the open top between the wall forms. The concrete for this wall is placed in sections of variable length, with vertical construction joints at the edge of a steel pile. The wall is built up to the elevation of the bottom of the precast beams. Troughs, which form part of the ventilating system, fit into the opening remaining between the top of this wall and the roadway slab.

Concrete for the walls and waler beams is delivered to the point of placement in agitator-type trucks traveling on a timber roadway d signed especially for the purpose a supported on the placed precast co crete beams.

There is only one building which seriously affected by the subway co struction. This building, known the Film Exchange Building, is l cated at the southeast corner of Fir Avenue and Battery Street. The cur ing approach to the subway passe under a corner of the building, mak ing it necessary to provide temporar supports for the building during co struction of the section of subway be neath it. Steel H-piles were drive along the outer perimeter of th building, and with a system of heav steel girders and beams welded to th piles and extending into the buildin through the first floor windows, th contractor was able to support th upper story while a Koehring hoe type shovel excavated the materia from beneath the building and th new foundation was constructed

COMPLETE SUPPORT of abutting ground is gained from precast concrete line plates slid down behind H-piles before structure excavation begins. Seats defined by re-bars between every fourth and fifth pile will receive transverse precast beams.

Personnel

Design and preparation of plans were done by the City of Seattle Engineering Department under direc tion of R. W. Finke, who was city engineer until December 1952, when he resigned and the position was filled by W. E. Parker. H. W. Tyler was principal design engineer, with R. M Murray as consultant.

Construction is being performed under the supervision of the Washington State Department of Highways, with W. A. Bugge as director D. D. Forgey as district engineer C. A. Pilon as assistant district construction engineer, and P. C. Leonard, resident engineer in immediate charge of construction.

For the contractor, M-K-Rumsey John Rumsey, Jr., is project manager, with John Rumsey, Sr., serving as adviser.

oundation work is kept dry as . . .

Wellpoints unwater screen well pit

Water from California's Suisun Bay flows out of excavation area through wellpoint headers at two levels—Pit to be site of intake structure for Pacific Gas & Electric Co. steam plant

FOUNDATION conditions continue to be one of the major civil engineering problems at Pittsburg, California, where Bechtel Corporation is building a 600,000-kw. steam electric generating plant for Pacific Gas & Electric Co. Last year saw the pouring of a concrete mat 5 ft. thick to support the structural steel and machinery now being placed in the main power building structure. The work was reviewed in *Western Construction* in August 1952. Late this spring the site of the screen well structure has been the focal point for wellpoint experts and excavation equipment.

The screen well structure is situated on the south shore of Suisun Bay directly north of the power plant structure itself. To be equipped with eight circulating pumps, the structure will suck 900 cfs. from the bay for use in the power plant. The general scheme for setting foundations for the screen well structure included excavation to el. –17½ over an area having a bottom dimension of 73 x 126 ft., leaving a narrow strip of the original shoreline on one long side to act as a cofferdam. For holding out the water, wellpoints were set at two levels along the cofferdam and around the other three sides of the excavation as well. In addition, the bay side of the cofferdam was blanketed to make it relatively impervious.

Natural ground surface adjacent to the bay is about el. 2. Although not strictly to be considered a tidal flat, the area is subject to occasional flooding by extreme tides. For this reason the ground surface has been built up during the course of construction to about el. 4. Prior to excavation for the screen well structure, the strip of shoreline to serve as a cofferdam was built up to el. 8. A select clay available on the power plant site was used for the cofferdam blanket and it was deposited on a 2:1 slope. This gave a normal thickness of about 5½ ft. for the clay blanket when the top width of the cofferdam had been built up to 12 ft. Riprap was then dumped in to hold the clay blanket against tidal action. With a high-level and fairly stable ground surface established in the most doubtful portion of the screen well structure area, it was then possible for Bechtel engineers to proceed with installation of the wellpoint system and subsequent excavation.

ROY STATER, project superintendent for Bechtel Corp., is supervising construction of the $83,000,000 steam plant going up for P. G. & E.

Area covered

A gross area some 100 x 160 ft. was laid out on the ground surface as location of the first wellpoint installation. Figuring ½:1 side slopes and an intermediate berm 4 ft. wide for installation of additional wellpoints at el. –8, this area left the desired area at the bottom of the excavation of 73 x 126 ft. The structure itself will measure 60 x 120 ft. A 3-ft. clearance on three sides of the structure is enough to permit form work, and a 10-ft. space on the bay side leaves extra room for machinery installation on that side of the building. Extra room was needed on this side of the hole also in order that steel sheet piling could be driven along the north wall of the screen well structure. This cutoff wall will be driven below the final bottom elevation as a precautionary measure against river water percolation under the structure, and the top 3 in. of the sheet piles will be imbedded in the foundation slab.

General procedure for installation of the wellpoints at el. 4 began with the use of a 16-in. auger through upper clay strata until sand was encountered. An 8-in. churn drill carried the wellpoint hole down to bottom at el. –20. The lower portion of

this hole was cased until the wellpoint had been installed and sand packed around it. Removal of the casing completed the wellpoint installation. Wellpoints are 4 in. x 3 ft., attached to 1½-in. x 21-ft. risers.

Spacing doubled

The original installation of wellpoints in the upper system called for 6-ft. spacing. Observation of the water level at a test hole driven at the center of the construction area after this first wellpoint system was in operation, however, showed that this was unnecessarily conservative. Accordingly, every other wellpoint along the inshore header was later removed, leaving a 12-ft. spacing along this side of the installation.

Suction provided by one 8-in. electric pump on this first system unwatered the area sufficiently for excavation to proceed. About 2 ft. of overburden was removed by scrapers, after which a stubborn clay was encountered. A backhoe was brought in to dig out the clay, which averaged about 8 ft. thickness over the entire area. In places the clay extended to an elevation of –8 ft., and below this level the remaining excavation was easily handled by dragline.

Second installation

The second set of wellpoints are drilled in below a header located on the berm at el. –8. The installation is similar to the previous one, except that wellpoints on the bay side of the excavation were spaced at 3-ft. centers, and those opposite, at 10-ft. centers. Along both ends of the excavation the spacing was graduated from 3 to 10 ft. Suction for this system is provided by two 8-in. electric pumps having a total capacity of 3,000 gpm. An 8-in. gas-driven pump is provided as a standby for both wellpoint systems at this time.

Operational technique for a wellpoint system calls for a gradual increase in suction up to the desired maximum. For instance, at Pittsburg, control valves on each wellpoint were initially opened only one-quarter of the way. This meant that during the first 24 hr. the suction was slow and the inflowing water to the wellpoints established a pattern of many radial channels through the sand being unwatered. After this period of time the valves were opened to provide maximum suction, and later adjustment at individual wellpoints eventually achieved a balanced performance for the entire system. If the wellpoints were to be opened to their full capacity immediately, the terrific suction would be of a turbulent nature in the sand stratum and sand itself would be drawn into the wellpoints, clogging the system.

As of May 5, the entire system had been in operation for 14 days. Already it had been determined that the lower wellpoint installation alone was enough to combat the inflowing water, and the two electric pumps on this system together were pulling a total of 1,500 gpm. Test well observations at this time indicated that the water level in the excavated area was down to el. –21 and was still dropping. The intention of Bechtel engineers was to continue suction until the water had reached an elevation of –24 ft., at which time one pump would be shut down, with the single remaining one expected to be able to handle the water thereafter.

Amount of excavation

Total excavation required for the screen well structure approximated 10,000 cu. yd. Elevation of the final grade at the deepest point is –17½ ft., although a considerable portion of the structure is founded at el. –15½. Initial construction operation on the structure itself was the pouring of a foundation slab uniformly 2 ft. thick and totaling about 575 cu. yd. of concrete.

Water entering the completed structure will pass into seven screen chambers fitted with seven traveling screens. With a tidal range of 8½ ft. at the power plant site, suction will be possible at all times, since the screen chambers and the circulating pumps behind them will admit water any place between el. 0 and el. –15½. Center line elevation of the eight pump intakes is at el. –15½, from which the intake water is boosted to el. 4.42, centerline of the pump discharge.

Pipelines from the screen well structure include eight reinforced concrete intake pipes, each 54 in. in diameter and connected directly to the pump discharges. A pair of 30-in. service water lines, also of reinforced concrete pipe, leave the screen we structure at el. –7.5, carrying water t the power plant for auxiliary uses.

Capacity of the system, noted ear lier, is 900 cfs. Velocity of the in coming water through the ⅜-in. mesh traveling screens, at low tide, is esti mated to be 2 fps. Water will be con veyed through the 54-in. intake pipes at 7.1 fps., through the condensers a 7 fps., and through four 78-in. outle pipes at 6.8 fps. The 78-in. pipes en in a concrete transition to a box cul vert structure partitioned into thre separate conduits. Only one of these conduits will be used to handle dis charge water from the initial plant installation. The 900 cfs. will pass through this conduit at a velocity of between 5.3 and 7.4 fps. The foregoing figures represent design velocities. Estimated cycle time for the water is 4 min.

Personnel

Overall supervision of steam plant construction by Bechtel Corporation is provided by E. J. Garbarini. His work includes steam plants for P. G. & E. at Pittsburg, at Antioch, and at coastal locations such as Moss Landing and Morro Bay as well. Project superintendent at Pittsburg for Bechtel is Ray Stater. D. K. Bruner is job superintendent, and Roy W. Stalwick is job engineer. Stalwick supervised the excavation and wellpoint installation for the screen well structure in conjunction with representatives of the John W. Stang Corp. of Bell, California. Also intimately concerned with this phase of the work at Pittsburg was Rex Mayfield, assistant superintendent of excavation and wellpoints. Harvey Hendricks is grade foreman.

Lining water tunnel at Everett, Washington

. . . Continued from page 72

period will start about September 15, when a balance of 1,790 ft. of arch and 6,422 ft. of invert will be placed. It is anticipated that 500 ft. of invert can be poured and finished per day. The same equipment will be used for the invert except that the slick pipe will discharge into a spreader car ahead of the underpass. The spreader car travels on a 6-in. curb at the sides which is part of the invert but is poured with the arch. Finishers ride on a platform, spanning the invert.

The contract was let on a unit-price basis at the following prices: For removal and disposal of loose material, $20.00 per cu. yd. For removal of rock projections, $2.00 per sq. ft. For additional tunnel sets and other protective work, removal of interfering timber, etc., the lump sum of $141,447.00. For 6-in. concrete lining (0.5 cu. yd. per ft.), $47.85 per cu. yd. Additional concrete for filling overbreak, $25.00 per cu. yd. Reinforcing steel, $0.10 per lb. Little if any reinforcing steel will be required. Applied to the estimated quantities, these unit prices bring the total cost of the work to about $554,000.

Personnel

The contractor is represented by M. F. Kemper, manager and operations consultant; N. W. Hongola as project superintendent, and his son, Robert Hongola, as job engineer and purchasing agent. The city's interest and important responsibility for maintaining adequate service to the industries and the city rests with Granville G. Paine, water superintendent, and Sumner Paine, construction engineer for the city. Consulting engineers are John W. Cunningham & Associates of Portland, who planned the original project in 1930 and prepared plans and specifications for the lining job. Lindsey K. MacPherson is project engineer for the consulting firm.

s the slump cone on its way out?

"Yes," says an aggregate firm's testing engineer—Kelly Ball is used to speed testing and keeps mixes more uniform in consistency—This article should interest every engineer and contractor concerned with concrete pours

By
E. L. HOWARD, JR.
Testing Engineer
Pacific Coast
Aggregates, Inc.
San Francisco, Calif.

THIS ARTICLE is presented as a service to the readers of *Western Construction*, since the editors believe it tells about a valuable development in concrete testing.

Professor J. W. Kelly, of the University of California Engineering Department, who invented the Kelly Ball, has no financial interest in the apparatus and has applied for no patent. It is being manufactured by a number of commercial firms, and almost any machine shop could turn out an adequate unit.

The Materials and Research section of the California Division of Highways has adopted the Kelly Ball for regular field tests to determine the consistency of concrete in place of the old slump cone test. A number have been ordered and furnished to field jobs throughout the state. *Editor.*

J. W. KELLY
Professor
of engineering
University of
California
Berkeley, Calif.

MY MISSUS collects flower pots —the kind that hang from the rafters. Our back porch is dripping with greenery growing in pots of all kinds and shapes. She found a real use for my slump cone, since the Kelly Ball put it out of business, as far as I'm concerned. By putting a bottom on the small end and a bail on the big end, she has an unusual and attractive flower pot.

Four years ago, we set our organization to the task of gathering comparative data on the slump cone and the Kelly Ball as tools for concrete consistency control. We had hoped to amass a large number of test results comparing the ball penetration to the slump measurement. We have given up all hope of getting any more comparative data than those we will show in this report. Our technicians found the Kelly Ball so easy to handle and the results so satisfactory they just stopped using the slump cone.

Two improvemets in concrete inspection using this test became apparent immediately. First, the speed of the test permits faster adjustment of mixes. Second, the concrete is more uniform because the Kelly Ball is sensitive to changes in consistency not always detected by the slump test.

Professor J. W. Kelly, who loaned us the original Kelly Ball to make our first tests, describes the ball as follows: (As printed in the January 1950 ASTM Bulletin, p. 71.)

"The test eventually adopted consists in observing the penetration of a 30-lb. plunger having a 6-in. hemispherical tip into the leveled-off surface of the concrete. The penetration in inches is read on the graduated handle of the plunger, at the top of a sliding stirrup with two feet, each 1 in. square, the centers of which feet rest on the concrete at a distance of 5½ in. from the axis of the hemispherical tip. The penetration is read to tenths of an inch, usually as the average of three readings. The concrete may be in a container, in a wheelbarrow or cart, or in the forms,

PICTURED AT THE TOP OF THE PAGE:

E. A. Bremm (left), materials engineer for the City of San Francisco, and Johnny Di Genio, P. C. A. batch plant foreman, check the slump on concrete for the new terminal building at the San Francisco Airport.

CLOSE-UP of the Kelly Ball in action. If it sinks too deep, back goes the batch to the mixer for more material.

so long as the depth is at least 6 in. and the least horizontal dimension is 12 in.

"The original form of the device was a 6-in. cast-iron ball. A more economical form to manufacture was machined from a 6-in. steel cylinder, and the length of the cylindrical portion was made such that the plunger with handle weighs exactly 30 lb. Observations to date indicate no significant effect of the difference in shape (as between ball and cylinder) of the upper portion of the plunger, which comes into play only when the concrete is of wet consistency."

Other work on penetration tests has been done in this country and abroad. Experimentors have used rods, balls, and cones in static and impact tests. The Kelly Ball has proven most satisfactory of all. It has found use in nearly all types of concrete construction.

Concrete Control Test Data

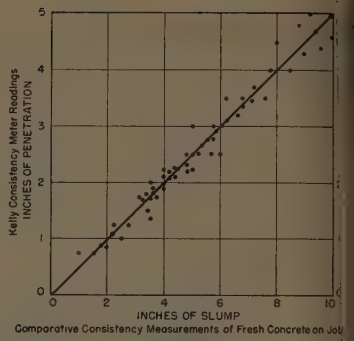
Average slump .....in.	4½
Aver. Kelly Ball penetration, in.	2.3
No. compressive strength tests	1,967
% tests less than 90% of aver.....	12.5
Co-efficient of variation	9.3

The Park Merced (San Francisco) housing units required concrete delivery at a rapid rate. Concrete was transit-mixed in 5-cu. yd. mixer trucks. The concrete was placed with a 3- to 5-in. slump. Slumps were tested during the first part of the job to find the relationship between the Kelly Ball reading and slump, but the ease of operation of the Ball soon caused the discard of the slump cone. The efficiency of this control is indicated by the test data in the table. The co-efficient of variation was an unbelievable 9.3%.

Mortar-aggregate separation

Since we first began to inspect concrete, we have noted the mortar-aggregate separation that occurs from mixer to forms. We have used several methods of test to measure this segregation. The Kelly Ball seems to be the best to find the troublesome spots where such segregation occurs. A load of concrete can be tested from mixer to final placement through all the phases of handling chutes, hoppers, buggies, and forms. The separation can quickly be detected by variations in consistency measurements.

New users of the Kelly Ball want their answers in terms of slump. We have discovered that 1 in. of Ball penetration is equal to about 2 in. of slump. Accompanying chart illustrates this relationship. These tes were made on structural concrete jo in the Bay Area.



Comparative Consistency Measurements of Fresh Concrete on Jo

CHART shows the relationship between in. slump and in. of penetration, which can read in one simple operation by using t Kelly steel ball test.

G. E. Leavitt made some studi with the Kelly Ball and slump con He tested concrete placed in airpo runways and parking aprons. H found the ratio of Ball penetratio to slumps to be slightly less than tw To take a slump required 10 mi about the time necessary for th screed to reach the spot where th sampled concrete had been dumpe by the paver. In contrast, only 10 se were required to make a Kelly Ba test, and each batch could have bee tested without delay to the job. S quick and simple was the test that th mixerman could be advised of any de sired change in water before a secon batch was dumped into the mixe giving, by this method, immediat control of the consistency of the con crete and mixing operations.

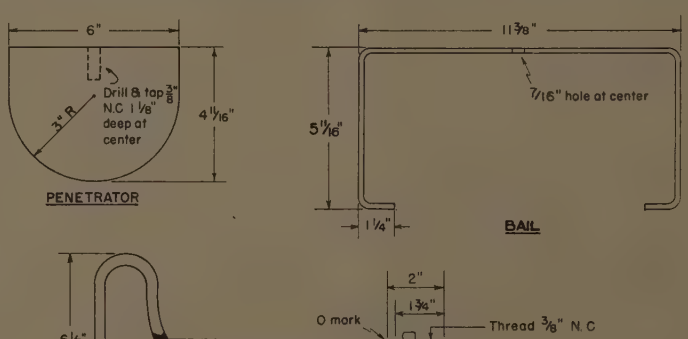
We are presently controlling con sistency of lightweight concrete wit the Kelly Ball. The mix has natura sand for fines and Haydite for coars aggregate. In this case the penetra tion inch is equal to about 1 in. o slump.

Take a bow, Prof. Kelly

One of our field men wrote th other day like this:

"Dear Boss: Thanks for the Kell Ball. Enforcing these specification for concrete consistency has cause the contractor inconvenience and los of time while we made slump tests The past two days we have made pen etration tests with the Kelly Ball. I a matter of seconds we have the an swer. The simplicity of operatio causes no delays. We made tests i buggies, forms, slabs, or any conven ient place. You should see these guy who usually cry for more water When the Ball sinks into the con crete, they are the first to want i drier. All in all, we have faster tes results, and thus a closer control o the concrete. Best of all, the job su perintendent likes it. (Signed) Joe."

YOU CAN BUILD your own Penetrator, which is what Prof. Kelly calls his steel ball. The most important thing to remember is that the penetrator and handle must be so machined that their combined weight equals 30 lb.



llette, Wyoming,
es . . .

Soil-cement base on ity streets

ATISFIED with the way last year's soil-cement paving has en holding up, Mayor Axel W. stlund and the City Council of Gil-te, Wyoming, have awarded a con-ict to the Wyoming Improvement . of Cheyenne for paving approxi-ately 60 more blocks of the city's eets.

This job, which will require about 000 sq. yd. of soil-cement street nstruction, was to start in Wyom-g's spring of 1953. Ed Johnson, eridan, Wyoming, consulting engi-er, prepared the plans and specifi-tions and was to furnish the super-ion for this street imrovement pro-am.

In 1952, Gillette, generally known the "Home of the Antelope Round-," used soil cement to pave Gillette enue, its main street. Gillette is cated on U.S. Highways 14 and 16 northeastern Wyoming. The town Gillette, population 2,196, which is e county seat of Campbell County, he only town in the county. Campbell County is 47 mi. wide and 104 mi. long, which is larger than some of our eastern states.

One of the largest herds of antelope on the North American Continent roam the ranges of Campbell County. In September of each year the Chamber of Commerce, local civic clubs, and businessmen of Gillette stage an Annual Antelope Hunt for big game hunters from all parts of the United States. This annual hunt has earned Gillette its nickname.

The soil-cement paving of Gillette Avenue consisted of surfacing six blocks, which took approximately 16,000 sq. yd. of 5-in. soil-cement base. A 1½-in hot plant-mix asphalt mat was used for the wearing surface. Preliminary engineering investigations showed that the six blocks to be paved required very little excavation or fill to meet the desired grade and crown for the finished street.

Samples of the existing soil in this six-block paving project were analyzed in a laboratory using the A.S.T.M. procedure of wet-dry and freeze-thaw tests. The final results of these tests showed that 10% cement by volume would be adequate to meet the A.S.T.M. specifications.

An economic comparison showed that using the existing soil with the 10% cement by volume was as economical or more economical than excavating and wasting 5 in. of the existing soil and then hauling in a borrow soil that would require a lesser percentage of cement to harden the borrow soil. The existing soil was a crushed scoria gravel, having a gradation from 1½ in. down to material passing the 100-mesh sieve.

Field work

In the preparation of the street for soil-cement operation, it was necessary to grade off and waste the old oil mat which had been built up over a period of years by distributor applications to hold the dust down. Therefore, it was necessary to add a small amount of borrow soil to bring the street back to crown and grade. The borrow soil used was scoria fines. These fines were obtained at a location 6 mi. east of Gillette where the Burlington Railroad had been obtaining scoria ballast for the railroad beds for many years. In the ballast operation all material below ¼ in. is rejected. Therefore, a large wastepile of scoria fines was available. This is the same material that was used by the Wyoming Highway Department in its 17-mi. soil-cement job constructed in 1952 (*Western Construction*—August 1952, p. 69; September 1952, p. 60) on U.S. Highways 14 and 16, starting at the city limits of Gillette, and extending east. That job was done by the Big Horn Construction Co. of Sheridan, Wyoming.

Mayor W. T. Fulkerson and the councilmen initiated the planning and awarded the contract for the construction. T. H. Baldwin, consulting engineer of Cheyenne, Wyoming, prepared the plans and specifications and supervised construction of the six-block street improvement. Before construction started the city administration changed, and the present Mayor, Axel W. Ostlund, and his councilmen were responsible for the construction.

IS is the main street of Gillette, Wyoming, looking north along Gillette Avenue at the intersection of Third Street. It was paved with a 5-in. soil cement base and a 1½-in. hot plant-mix halt surfacing in 1952.

HOW IT WAS DONE...

P. G. & E. strings power cable 7.2 mi. over water

STRINGING POWER transmission cable across any considerable body of water usually presents several ticklish problems to the design engineers, and the Pacific Gas and Electric Co. project to bring a new 220,000-v. power line from the East Bay to the San Francisco and Peninsula areas of California was no exception.

Some $3,287,000 was allotted for the job, of which $2,561,000 went to tower construction and the remaining $726,000 was devoted to line work. The entire line covers a distance of 32.9 mi., 7.2 mi. of it crossing the south arm of San Francisco Bay, near the San Mateo-Hayward Highway Bridge.

Of the 139 steel towers, which required 1,604 tons of steel to build, 21 are in the water—19 in shallow and 2 in deep water. The tower foundations were placed by Ben C. Gerwick, Inc., under contract, and the rest of the work was done by P. G. & E. forces. Each shallow water tower stands on four reinforced concrete precast footings about 12 ft. in diameter, set on concrete piles from 40 to 180 ft. long. The towers, which are 198 ft. high, except for the angle tower at the point where the line direction changes east of the main channel, stand 1,910 ft. apart. The angle tower is 184 ft. high.

Each of the two deepwater towers is supported on four hollow precast shells, each standing in turn on a cluster of 23 timber piles which were first driven and capped with steel rings. A tremie concrete pour served to seat each shell. Thus each tower, which is 298 ft. high and stands on foundations 74 ft. deep, is supported by 92 piles. These towers are 1,975 ft. apart.

Land tower height and construction varies according to location and terrain, but the height averages about 100 ft. Since their erection presented no particular problem, it will not be discussed.

After the towers were erected, the question of how to string the line arose. An old Navy LSM, whose flat bottom allowed it to float in shallow water, was converted to cable-laying operations. It was fitted with six spools cable carrying 4,100 ft. of conductor each, for a total 24,000 ft. of line. This is enough line for about half of o of the six cables which the towers will carry.

ACTUAL WORK of laying up was done by this tractor's winch. T conductors were first unreeled from tower to tower, secured to t concrete girders, and sagged to the bay bottom between towers. T hoist line from the tractor passed to the top cross-arm of the tow and down again, ending at a big single-sheave block over which t conductor passed on its way up.

The line was first unreeled between the deepwat towers by securing the conductors to the concrete girder Extra rigging from a barge to the top cross-arm of th tower and back again to a block on the hoist line enable crews to hold the block away from the tower base in fa of incoming tides. A 7-knot current pushed against th sunken conductor and delayed laying up the line for se eral hours until the tide slacked off. The hoist block wa kept at a constant distance from the tapering tower.

A tractor winch did the actual laying up work. It wa coordinated by short-wave radio communication betwee a barge, a station at the other tower, and winch crews o the west shore, where stress was maintained in the co ductor at the proper intensity.

LAYING UP the conductors between the two highest towers (298 ft. above sea level) flanking the highway bridge lift span was controlled from this barge moored to the western tower. Short-wave radio in the truck cab (left rear) provided communication with a station at the other tower and with winch crews on shore.

FOUR HOLLOW precast shells, each 62 ft. long, (right) support each deep-water tower of the new P. G. & E. 220-kv. Moraga-San Mateo line across South San Francisco Bay. Clusters of 23 timber piles were driven for each of the four tower legs and capped with steel rings. Tremie pours in the rings seated the shells. Precast concrete girders were placed in slots near the top of each shell to complete the 51-ft.-square pattern of each tower foundation.

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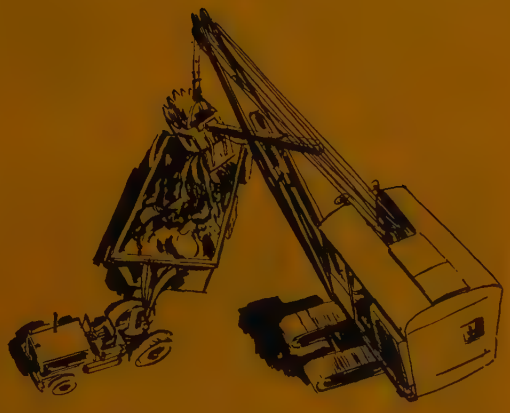

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DIESEL ENGINES AND ELECTRIC SETS

HOW IT WAS DONE...

Modified belt conveyor increases mixer production

MIXING SOIL CEMENT base on a section of the Hollywood Freeway in Los Angeles with a Barber-Greene 848 Travel Plant was complicated by five bridges with a roadway clearance of 15 ft., 8 in. from subgrade.

So Webb & White, the contractor, lowered the bucket loader and fitted it with a short belt conveyor to transfer the material from the loader to the apron feeder of the pugmill. This had the desired result of allowing uninterrupted mixing on the job.

An unexpected, but welcome, additional result was the increase in hourly capacity of the plant, improvement in

FEEDING INTO the shortened bucket loader on the specially adapted Barber-Greene 848 Travel Plant is some of the cement-treated base material shown being picked up from the windrow. The mixed material is shown (darker) being redeposited behind the unit. The water trucks alongside traveled with the plant at a speed of 18 lin. ft. per min. Not far behind is the Huber roller which provided the first compaction.

quality of the mixed material, and substantial savings in the amount of cement used.

The job itself was for paving a 0.7-mi., 8-lane divided section of the Freeway with PCC over a processed imported material base. The travel plant was used to mix some 14,000 tons of the cement-treated material used for erosion control. The material itself, which weighs 130 lb. per cu. ft., is a grade of decomposed granite selected to specific gradation requirements. After it was laid, it was compacted 95% to a depth of 16 in. of finished subgrade.

Then the top 4 in. was scarified and windrowed for mixing, cement was spread over the windrows both by hand labor and calibrated bulk cement feeder trucks. The material was then picked up by the bucket loader of the travel plant and transferred to the mixer where water was added. The mixed material was redeposited in a windrow, spread to a 6-in. depth, and rolled and compacted to a 4-in. depth. Then the surface was sprayed with a 60-70 oil emulsion for curing and topped with an 8-in. PCC slab.

The plant mixed approximately 5.3 mi. of 12-ft. width, cement-treated base on this job. Travel speed was 18 lin. ft. per min., and production averaged 248 tons per hr., based on a 55-min. operating hr. It also reduced the cement content from 2¾% to 2½% at quite a saving to the California State Highway Department, which had to pay the bills.

Used with the travel plant, in the same operation, was a 2,000-gal. water truck towed by a pneumatic-tired tractor and followed by a feeder water truck. A 12-ft.-wide rebuilt Johnson spreader spread the mixed material. A 12-ton Huber tandem roller followed the spreader for first compaction, and a Caterpillar motor grader with blade extensions equipped with rubber-tired dollies riding on the steel headers shaped the rolled material to finished sectio An 8-10-ton Buffalo-Springfield tandem roller followe for final compaction.

Advantages of using the modified travel plant we listed by Webb & White as follows:

Intimate and thorough mixing of soil, cement, a water resulted in higher compaction percentages a higher strengths of in-place material. The addition of t short belt conveyor on the bucket loader provided an add tional mixing action.

The spreader was towed by the travel plant, allowi the rollers and grader to follow right behind the pla and enabling the engineers to obtain top results with fres material. Total elapsed time was less than 30 min.

Spiral pickup action of the bucket loader leaves t grade always clean and to grade. Design of the picku bucket is such that any oversize rocks are kicked to o side.

Old ladle-lining pit salvaged at Kaiser steel plant

A SAVING of $8,000 on a $65,000,000 expansion progra sounds like pretty small potatoes, but doubtless Kais Steel Corp. didn't object when its bill was that amou less.

The big job was the addition of a ninth open hear furnace to the corporation's Fontana, Calif., steel plan The project called for extension of the open hearth buil ing, the abandonment of a huge concrete ladle lining p and the construction of a new pit at another location the building. The pit, which is 14 ft. deep, is used whe new refractory linings are placed in the giant ladles whic carry hot steel from the open hearths.

With a 250-ton overhead crane available, salvaging t old pit instead of building a new one became feasible. T old pit, which weighed 211 tons, contained 104 cu. yd. concrete and 3½ tons of steel reinforcing bars. A ne hole was dug, steel billets were set to grade, four hol

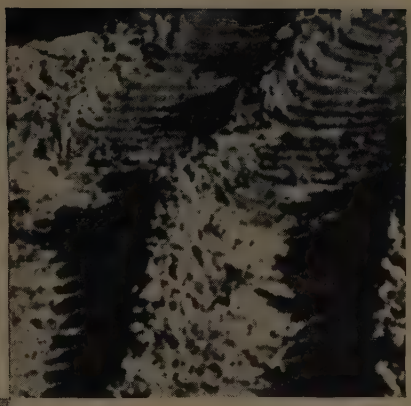
UP SHE GOES, and 211 tons of concrete and steel in the form a concrete ladle lining pit head for their new home in another pa of Kaiser Steel Corp.'s Fontana, Calif., plant.

were drilled in the sides of the old pit to admit liftin cables, and the pit was lifted out and moved to its ne location. The pit was shimmed until level, forms wer placed in the new pit, and a foundation was grouted in

There was one delay in the process. After pulling th pit from its old hole, the engineers had to wait for com pletion of the new craneway before moving the pit.

The work was supervised by A. L. Fischer, constructio manager for Kaiser Engineers.

THE TRACK OF A Mack TELLS A STORY OF Power



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HOW IT WAS DONE...

35,000 cu. yd. of dirt moved in less than 20 hr.

MOVING THE UNBELIEVABLE total of 35,000 cu. yd. of dirt in something less than 20 working hours was the record set late in March at the 16-ac. factory site of Minneapolis-Honeywell Regulator Co. in Gardena, Calif.

Earth-moving contractors can relax, however. It took more than one contractor to do the job. In fact, some 80

LOOKING DOWN from a hovering helicopter on the 16-acre cut and fill job, accomplished in less than 20 working hr. by the Los Angeles Excavating and Grading Contractors' Association.

excavating companies got together 125 pieces of heavy equipment, worth $3,000,000, and operated by 300 workers for the mammoth cutting and filling project.

It all came about when members of the Excavating and Grading Contractors' Association needed operating funds for their organization. So they got together with Minneapolis-Honeywell, which company was anxious to get its building operations under way, to arrange for the job. Some $12,000 was added to the Association's treasury as a result.

A festive air reigned over the project, featured by teams of catskinners competing against each other in eight flag-marked strips. Eight field superintendents directed the operation by means of 30 walkie-talkies. This earth-moving armada, units of which came from as far as 50 mi. away, is believed to be the largest ever assembled for a private project like this one.

In addition to the dirt moving, it was necessary to knock down a small house on the site and take care of a well, pump, and 1,000-gal. tank.

Bolts used to repair tires on earthmoving equipment

REPAIRING the large rubber tires used on earthmoving equipment by bolting them is the novel method used by A. D. Forbush of The Forbush Co. in Pueblo, Colo. Calling it the "Vulca Bolted" method, he holds the patent on the repair process which he guarantees will hold.

The operation consists of placing the bolts before the tread stock is applied in the section of the tire to be repaired. The bolts are completely covered with live rubber, both inside and out, thus creating a tighter bond which prevents the break from slipping and the section from r opening. The inner tubes are not harmed, since the fla headed bolts are surrounded by live rubber.

Forbush thinks so much of his process that he invit contractors to ship him tires in need of repair as jun He will pay the freight both ways (from any place We of the Mississippi River) and return the tires guarantee against failure, he says.

Pilings made of compacted sand support compressor building

A NEW USE for pile-driving equipment, driving pilin made of compacted sand, was made by Western Found tion Corp. at Blythe, Calif., at the site of a compress building for a section of a natural gas pipe line.

Site of the new building, owned jointly by the Souther California Gas Co. and the Southern Counties Gas Co., on loose, fine sand. It was feared that the vibration of th compressors would compact this sand and cause the build ing to settle. To prevent this, the building was erecte on a foundation of sand piling.

Some 954 piles, 16 in. in diameter and varying from 2 to 40 ft. in length, were driven in the 80 x 208-ft. site. wider area than the building foundation was compacted t provide that pile driving for future extensions will n affect the present structure. Although this system ha been used in Europe, it is believed to be the first applica tion of sand piling in the United States.

The procedure consisted of driving a 16-in. diamet steel casing with a concrete plug at the bottom into th ground with a No. 0 hammer. The casing contained core fitting snugly inside it with a closure plate at th lower end. Casing and core were driven to the require depth and resistance, the core was removed, and the ca ing was filled with sand. The core was then placed on to of the sand and the casing was extracted by a patente system of lines which forced the core down at a rate com pensating for the upward movement of the casing so tha sand was forced into the voided area as the casing wa withdrawn.

Plans for this method of compaction were develope by Stone & Webster Engineering Corp. Standard pil driving equipment of Western Foundation Corp. wa used to carry out the work. Necessary modifications pile-driving procedures, to insure that the sand was prop erly placed, were developed by Western.

FIRST USE in the United States of sand piling for a building found tion is shown being driven at Blythe, Calif., by this equipment own by Western Foundation Corp. Each of the 954 piles used was driv on a 4- by 5-ft. spacing.

REPORTS FROM THE COURTS

By
HOWARD S. BURNSIDE
Attorney at Law
Registered
Professional Engineer

Responsibility for defects in plans and specifications

Is the contractor responsible for a deficient structure which he builds in accordance with plans prepared by others? This is a problem which regularly occurs in construction practice and which is frequently litigated in one form or another. A recent case in the Supreme Court of New Mexico is instructive on this point.

In Staley v. New[1] an owner engaged a contractor to construct a building based on plans prepared and furnished by one who is referred to as the owner's agent. This agent also secured for the owner a radiant heating design from a specialist in this field. The plans for the building, as well as the heating system, were paid for by the contractor and added to the cost of the job. Installation of the heating system was performed by a subcontractor. The specifications provided that pea gravel or pumice might be used as filler and pumice was used.

The heating system did not function properly. Adjustments were attempted but failed. The owner sued the contractor, the subcontractor, and the specialist for breach of contract and warranty, contending that the wrong type of filler material was used; that pea gravel should have been used.

The court said: "The only duty devolving upon the general contractor and the subcontractor was that they perform in accordance with the plans and specifications given each for the purpose of submitting a bid.

"Manifestly it would be inequitable and unjust to hold that (they) cannot rely upon specifications given to them for the express purpose of submitting a bid. The rights of the parties are to be measured and determined by the particular . . . specifications upon which (they) submitted their bid.

"If . . . the plans were approved by the (owner's) agent, all that the contractors can be held to have warranted was that they would install the heating system in a workmanlike manner. . . .

"If there was an implied warranty of sufficiency, it was made by (the owner's) agent who approved the plans and specifications prepared at his request. . . . The responsibility rests upon the party who fathers the plans and specifications and presents them to another with the implied representation that they are adequate for the purpose to be accomplished."

It is the general rule that a construction contractor who follows plans furnished by the owner and architect which prove to be defective is not responsible for loss or damage which results from defective plans, after the work is completed, provided the contractor is not negligent and makes no express warranties as to the sufficiency of the plans. If "there is an express guaranty, or an absolute contract, without qualification or exception, the contractor must . . . perform . . . and he cannot recover . . . for extra work made necessary by a fault in the specifications."[2] Whether there is an express warranty or absolute contract depends upon the language employed in the agreement.

[1] *Staley v. New*, 250 P.2d 893.
[2] 9 Am. Jur., 20.

Agreements to solicit government contracts

Contractors who have done government work will recognize the standard contract provision which commences, "The contractor warrants that he has not employed any person to solicit or secure this contract upon any agreement for a commission, percentage, brokerage or contingent fee." If this provision is violated, damages will result as between the government and the contractor. But what of the agreement between the contractor and person employed to do the soliciting?

In York v. Gaasland Company[1] the plaintiff was an experienced expediter acquainted with government officials in Washington, D. C. He alleged that he was engaged by the defendant company to secure a government contract for construction of a road in Alaska, for which he was to receive a fee of $10,000.00 if he was successful. After the plaintiff made certain contacts, the defendant was awarded the job. The plaintiff then sued to recover his contingent fee. A judgment for the plaintiff was reversed on appeal to favor the defendant.

The court pointed out that the contract provision quoted above is based on the requirement of Executive Order No. 9001 which is a declaration of public policy. A contract entered into against this warranty is invalid as contrary to public policy; and the court will not permit enforcement.

Attention is directed to the fact that the warranty was part of the contract between defendant company and the government. Plaintiff was not a party to this contract. However, the declaration of public policy is broad enough to embrace within its scope an agreement which contemplates the securing of a government contract, although that contract has not yet come into existence and may never come into existence if some other company gets the particular job. Also, the defendant is permitted to invoke this principle as a defense to an agreement which he presumably entered with his eyes open.

This policy of the law is uniformly applied. Another case is cited in the opinion wherein the "solicitor" is denied a recovery even though the award of the government contract was based on subsequent competitive bids. That court stated the prohibition of contingent fee contracts "was intended to protect government agencies against corrupting influences." Competitive bidding did not completely safeguard this purpose. The fact that nothing sinister is contemplated or done is not controlling.[2]

[1] *York v. Gaasland Co.*, 250 P.2d 967.
[2] *Mitchell v. Flintkote Co.*, 185 F.2d 1008.

Liability based on negligent maintenance

In Hill v. King County, the court found that the drainage system of a county road was inadequate to carry ordinary surface drainage and for a considerable period of time the culverts had not been inspected and maintained. As a result, during a heavy rainfall natural drainage was prevented. The dirt fill under the road became saturated, collapsed, and cascaded down upon the plaintiff's property together with debris, stumps, logs and trees. All of this caused damage to the plaintiff's property and a judgment was rendered against the county, which was affirmed on appeal.

A concurrent cause was pressure of subterranean water from gravel strata under the base of the fill, accelerated by a period of excessively heavy rainfall; but the court believed the damage would not have been sustained except for the acts of the defendant county.[1]

[1] *Supr. Ct. of Wash.*, Dec. 4, 1952, 250 P.2d 960.

WESTERN CONSTRUCTION NEWS

JULY 1953

After 7 yr. of talk—another Bay bridge

AFTER SOME 7 years of passionate debate in the California legislature and newspapers, construction of another bridge from San Francisco to the East Bay area has been authorized.

The action came with dramatic suddenness after conflicting bills were introduced and it appeared that the legislature would adjourn (which it did on June 10) without taking any action on the problem. Both houses passed a bill for a bridge to extend from the vicinity of Army and Third streets in San Francisco to Bay Farm Island south of Oakland. Acting Governor Goodwin J. Knight signed the bill into law on June 6.

The bridge will cost an estimated $200,000,000, to be repaid by collection of tolls from those who use it.

Wyoming starts road study

WYOMING'S state highway department has started an 18-month study into the condition of the state's highway system, by which the engineers hope to be able to decide how much of the system will have to be reconstructed and how much of it can be salvaged. They will watch carefully for results of operations on the WASHO Test Road near Malad, Idaho.

Water for Albuquerque

MAXIMUM pumping capacity of the Albuquerque, N. Mex., water supply has been increased from 35,000,000 to 40,000,000 gal. daily with the cutting in of five new wells to the city's water system late in May. C & C Contractors handled the job.

Increase of another 20,000,000 gal. in pumping capacity was foreseen for the middle of July, by which time laying of a 14-mi. water line from Duranes to Albuquerque was scheduled for completion. The $1,500,000 contract is held by Allison & Haney.

Indians fight Montana dam

MONTANA SENATORS Mansfield and Murray are protesting congressional bills which would revoke authorization for construction of two dams, Libby, on the Kootenai River in northwestern Montana, and Yellowtail in southeastern Montana.

The Libby project has been withdrawn from the agenda of the International Joint Commission, which must give its approval before construction can commence, since Canadian territory would be affected.

The Yellowtail revocation was asked at the request of Chief Yellowtail of the Crow Indian tribe. Chief Yellowtail said the Indians feel the project would be detrimental to their interests.

Arizona seeks road aid

HIGHWAY construction in Arizona received a boost when the state legislature established a highway study committee to work out the beginning of an adequate road program. Last fall the voters approved a constitutional amendment which forbids diversion of highway revenues to non-highway uses.

A similar constitutional amendment has passed the Wyoming state legislature. It will be voted upon by the state's electorate at the next general election.

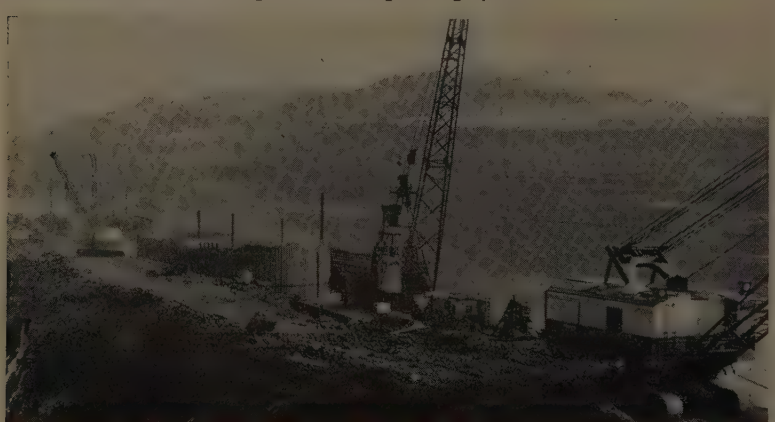
Dalles Dam excavation is well under way

EXCAVATION is well under way on The Dalles Dam and powerhouse located on the Columbia River between Bonneville and McNary dams (*Western Construction*—April 1952, p. 101, p. 106; January 1953, p. 58).

Meanwhile four members of the Yakima Indian Tribal Council went to the nation's capital to oppose construction of the project before the Senate Appropriations sub-committee, which has been debating fund appropriations for the next fiscal year. The Yakimas base their opposition on the fact that they would lose their fishing rights, guaranteed by a 90-yr.-old treaty. Two other tribes, the Warm Springs Confederation and the Umatillas, have accepted cash payments to make up for their lost fishing rights at Celilo Falls.

In Washington, D.C., Representative Don Magnuson of Washington claimed that slashing construction funds from The Dalles projects would result in a 2-yr. delay in production of power. Members of the committee had stated that only a year's delay would result from the proposed cut, which would allow $25,250,000 to be spent in place of previous higher proposals.

SITES ARE being readied here at The Dalles Dam (on the Columbia River between Bonneville and McNary dams) for 14 adjustable-blade propeller turbines to manufacture power. Each turbine is rated at 123,800 hp., at 85.7 rpm. and 81-ft. head, and will drive a 78,000-kw. generator. They are being built by Baldwin-Lima-Hamilton Corp. First power units are scheduled to be placed in service in November 1957, and all 14 are expected to be operating by 1960.



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NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

PREPARING the banks of the Borel Canal on the $5,873,731 Macco and Morrison-Knudsen joint venture at Isabella Dam on the Kern River in Southern California (*Western Construction*—March 1953, p. 68) is a Warner & Swasey Gradall. The canal will supply water to the Borel powerhouse of the Southern California Edison Co., a short distance west of the dam site. A 12-ft. berm will be built to prevent silting in the canal.

Work starts on dam for Denver reservoir

FIRST BUCKET of concrete to be poured this year on Denver's Reservoir 22 project in South Boulder Canyon was lowered April 28, starting operations on what will become the largest concrete dam in Colorado.

The $12,000,000 project, being constructed by Macco Corp. and Puget Sound Bridge & Dredging Co., will be 400 ft. high and form a 42,000-ac. ft. reservoir upon its completion in September 1954.

Pour into the steep canyon is by means of a 43,000-lb. bucket, holding 8 cu. yd. of concrete, which swings out from the top of the cliff along a 1,730-ft. cable which spans the rocky gulch. The bucket is talked down to the forms by a spotter equipped with telephone, since the cable operator can't see the canyon's floor.

The dam footings are being poured in sections 5 ft. deep, 246 ft. long, and 44 to 50 ft. wide. Each unit takes 2,200 cu. yd. of concrete. The contractors hope to have placed 300,000 cu. yd. by the time winter stops operations.

Sewage plant nears finish

A $250,000 sewage treatment plant being built for the city of Coos Bay, Oregon, should be in operation late this summer, according to Bob Kyle, the city manager.

Construction of an extensive system of sewers and pumping stations to intercept sewage now flowing into the bay and pump it to the new plant comes next. The work will be planned in six stages in order to avoid interference with downtown traffic as much as possible.

Salt Lake pipeline starts at City Creek

EXCAVATION work on the new City Creek pipeline near Salt Lake City's Pleasant Valley Reservoir began in May. The $114,785 job is being done by Ross Construction Co. H. F. Butcher, assistant city engineer, is in charge of construction of the new line, which will include both 18- and 22-in. pipe.

U. S. to collect $3,790 in "missing gravel" case

THE U. S. GOVERNMENT will be some $3,790 richer after it collects that much in damages from Construction Materials Co., an Arizona corporation, and Robert E. McKee, a Nevada general contractor.

This resulted from a ruling late in March by U. S. District Judge Carl A. Hatch, who tried the case in New Mexico. The government had charged that the two firms "unlawfully took and used gravel, sand and other materials from a pueblo that was under guardianship of the government." (*Western Construction*—October 1952, p. 108.)

Although the government's attorney sought $148,838 for value of the materials, restitution of interest charges, and recovery costs, Judge Hatch allowed only the sum that represented value of the materials in place on the pueblo lands before processing to be assessed. He fou that Construction Materials Co. w not a willful trespasser on pueb lands, since the company had soug legal advice and acted upon it.

Construction Materials claimed t entry was in accordance with an "e ployment" agreement with the pueb and that a sales agreement was i volved also in taking the sand a gravel. Judge Hatch ruled both these contracts invalid, however, b cause they had not been approved the Secretary of the Interior.

Some of the gravel taken from t pueblo was sold to McKee's firm. M Kee's defense asserted that he h bought $54,000 worth of material good faith and without notice of a defect in title to the materials.

Grand Coulee pumps sta

FOUR 65,000-hp. electric moto went into service at Grand Coul Dam on the Columbia River late May. Each is used to lift more th 1,000,000,000 gal. of water up 280 into the dried bed of the Grand Coul River.

Each motor weighs 325 tons, is 1 ft. in circumference, stands 25 ft. hig and has a diameter of 27 ft. Each rot weighs 172 tons, uses 46,000 kw., a revolves at a rate of 200 times p min. They were built by Westin house Electric Corp.

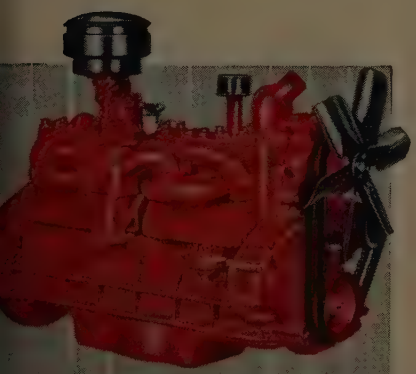
Pumping is to be done only in t summer and late spring when the is surplus water and power availab The reservoir, to be 27 mi. long, w furnish irrigation water for the sem arid region of southcentral Was ington.

CONSTRUCTION on the Palisades Da (*Western Construction* — Decemb 1952, p. 59, May 1952, p. 86, Janua 1952, p. 104) in eastern Idaho pro ressed this spring with clearing of t left abutment to bedrock, against whi the dam's impervious core will placed. Clearing operations includ blasting loose rock and dirt with hig pressure water so it could be push down the slope with a bulldozer.

EASIEST WAY OUT OF A RUT

Photo Courtesy Gar Wood Industries, Inc., Findlay Division, Findlay, Ohio

Pedigreed Horsepower digs ditch, carries dirt away, moves ditcher!



Without ever moving from his seat, this operator can dig a ditch eight feet deep and up to twenty-four inches wide. With an individually controlled clutch and brake for each crawler, he can dig straight as an arrow or curved as nicely as you please. With positive-pressure hydraulic controls holding the boom at the desired depth, he can easily undercut pipes or other obstructions, dig right up to foundations. Forward or reverse, the operator can select from a large number of digging speeds . . . going forward, he can dig up to nineteen feet per minute.

The plain fact is, this operator has it pretty good . . . the simplified controls of his Buckeye General Utility Ditcher and the Model 8 Chrysler Industrial Engine powering excavator, dirt conveyor and traction members were practically *made for each other*. For this manufacturer, like others, selects his Chrysler Engines equipped to meet his needs. Standard or gýrol Fluid Coupling, Torque Converter, standard or special dust-resistant air cleaner, gasoline, propane or natural-gas burning carburetors, fungus-treated or corrosion-resistant electrical systems, all of these were among the optional equipment available for his selection.

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CHRYSLER

Industrial Engines

HORSEPOWER WITH A PEDIGREE

Colorado starts 4-laning 14-mi. stretch of highway

FIRST STEP in Colorado's progres toward building a modern, four-lan highway system north of Denve came in April, when J. H. Monagha submitted a low bid of $370,190 fo construction of a 14-mi. section be tween Barr Lake and Hudson.

Plans call for a two-lane road t be built paralleling the present high way. After this job is finished, a 6-m stretch between Denver and Derb will be relocated so the road wi travel directly from the vicinity o Barr Lake to a junction with U. S Highway 85 north of Adams City.

About $3,500,000 in contracts wi be let to four-lane U. S. Highways and 85, linking Denver with Hudso and Brighton, before 1955, accordin to Charles Shumate, State Highwa Department administrative enginee

Reservoir dedication set

DEDICATION ceremonies for th new 10,000,000-gal. reservoir at Mes Arizona, were scheduled for July according to James A. Petrie, cit manager.

More than 96,000 sq. ft. of the bi concrete bowl's inside were gunite with a 3-in. thick concrete sealer. Thi required 312 sacks of cement a da for two weeks. Some 90,000 sq. ft. c sheet metal were used on the roof.

POWER BUILDING for P. G. & E. 600,000-kw. Pittsburg steam plant ris on shore of Suisun Bay, northeast o San Francisco. Boiler support steel being erected with aid of guy derrick h C. C. Moore, subcontractor to Bechte Corp. Flanking the steel at left an right are reinforced concrete turbin generator supports. Brickwork in righ background marks office facilities fo plant operating personnel.

ALASKA Newsletter

By CLIFFORD S. CERNICK, Anchorage

EMPLOYMENT ZOOMING: More and more jobs are opening up in Alaska's construction industry, but employment officials here report there is still a manpower pool in the territory sufficient to take care of all current needs. Employment upsurge in Alaska has given business in major cities a shot in the arm. Defense projects both in Anchorage area and "out on the tundra" now are operating full blast, with the bulk of the 1953 program under way.

LITTLE KNOWN is fact that many construction jobs in Alaska, especially those in the far north country and remote coastal points, are drawing on Eskimo villages for labor supply. Young Eskimo construction workers have made a good showing with Alaska construction bosses, being praised especially for work as catskinners and operators of heavy equipment. In construction of an airfield at Gambell on St. Lawrence Island off the Alaska coast, the entire labor force is composed of Eskimos. Much of the work in such settlements as Nome, Kotzebue and Point Barrow is predominately Eskimo.

AROUND THE CLOCK: Construction now is proceeding on a 24-hour-daylight basis in this "Land of the Midnight Sun." Because of the Far North position of Alaska, it's either daylight or twilight at all hours, a great boon for construction men with deadlines and tight schedules. Sun hasn't gone below horizon in Point Barrow area since early in May; it just circles the sky, being highest at noon and lowest in the north at midnight. Sun will not set in Barrow area until early in August.

AIRFIELDS, ROADS, UTILITIES, HOUSING figure prominently in current construction picture, when considering other than strictly defense construction.

AIRFIELDS: Director of Aviation for Alaska, Tony Schwamm, says work on territorial airports is in full swing at several widely-scattered points in Alaska. Sites for new airfields are being surveyed in six different Alaska locations. Included in work already begun on new airfields are fields at Bethel and Gambell.

UTILITIES: Municipalities in Alaska are pushing utility work to keep pace with rapidly expanding population. Typical is $5,000,000 long-range program for Fairbanks, to be financed with revenue bond issue. Anchorage, Alaska's largest city, is going ahead with expansion of water, phone and sewer service and a $500,000 road paving program.

HOUSING: Approximately 2,000 housing units now are under construction in Anchorage area, including 1,040 apartment units being constructed for military personnel at Elmendorf. This year's program will virtually eliminate critical family housing shortage in Anchorage, construction officials believe. In Fairbanks, at least 500 rental units will be available in the near future. New housing wrinkle rapidly coming into vogue is prefab and package cabins and garages. One Anchorage firm already is in production, and has Federal Housing Authority approval on units scheduled to sell for $10,500.

GRADUAL TAPERING OFF in housing construction is predicted, with some estimates running to around 3,000 new units a year until 1956, not including military housing needs.

COMMERCIAL CONSTRUCTION: Highlights in commercial building in Alaska are completion of a multi-million dollar Native Service hospital scheduled for opening September 1; a large apartment building under construction in Ketchikan, and a newspaper publishing plant in Fairbanks. Two Anchorage motels began operation in June, their total valuation being about $1,000,000. Trend toward construction of tourist facilities including motels, hotels, and highway resorts is more pronounced in 1953 with total construction in this category to exceed $5,000,000 this year.

AS DEFENSE BUILDING DWINDLES, work on such government projects as harbors and seaport facilities will tend to fill the gap. Delegate E. L. Bartlett, Alaska's congressional representative, is urging work on 12 harbor projects in Alaska, all of which have been approved by Congress. Work on only one of these projects has been started.

LABOR SITUATION in Alaska is good, with only sporadic union disputes on construction jobs, most of them jurisdictional. Outlook for a strike-free construction year in the territory appears excellent, with most of the crafts showing willingness t negotiate with construction contra tors.

BIGGEST WORRY is west coa shipping situation, which is bein closely watched and could thro monkey-wrench into constructio progress on scores of Alaska jobs de pendent on steady flow of supplie So far, no bottlenecks have deve oped in supplies, with heavy tonnag being carried to Alaska via steam ship, and by air cargo planes.

NEW HOUSING TREND: A signs point to wane in volume o housing construction in Alaska nex year because (1) most of the deman will be filled, (2) costs continue hig for such construction, while renta and income are experiencing dow ward trend. "For rent" columns i local daily newspapers still are fo midable indication of slackening i housing demand. Those seeking hou ing now are demanding better qua ters wherever available, and there steady migration away from sub standard housing and "shacks" whic were all that could be had a year o two ago.

OTHER HEADACHES confron ing Alaska builders include taxatio burden. In general, Alaskans mus pay higher taxes than any statesid residents, a situation widely be moaned as an inequality.

CRYSTAL-BALL GLIMPSE int the future of Alaskan constructio was taken recently by Stanley Tatom of Alaska Chamber of Com merce, Fairbanks. Tatom predicts er of Alaska's greatest construction ef fort lies ahead . . . better militar highways will be needed . . . add tional pipelines. He believes tech niques of Arctic construction pio neered by military will prove valuabl for industrial construction era "boun to follow" when Alaska is "give equal business opportunities" to g ahead on its own.

HERE AND THERE ON ALASK CONSTRUCTION SCENE: Ju neau has taken lead in city develop ment program, terming efforts "clean-up, clear-out and build-up pro gram." First big steps were razing ol city hall, clearing rubble at a mid town location for erection of moder municipal building and clearing awa 18 substandard housing units. . . Alaska has lost two vital lumber mil by fire since 1949—the recent $50,00 B. C. Canoles mill at Juneau and th Spruce corporation plant at Junea in August of '49. . . . "Oil fever" i Alaska dampened by Navy's abandon ment of Point Barrow fields, althoug several active explorations in Coo Inlet and coastal areas still are pro gressing.

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tons at a batch is average production e big Model E. All-electric operation utomatic time controls, signal lights and ntrols insure absolute accuracy of mix and table production. Another valuable feature s easy portability. A power raising it handles the heavy work of erecting and dismantling, and the separate, related units meet all legal limitations for highway travel.

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edar Rapids, Iowa, U. S. A.

NEW BOOKS

ESTIMATING CONSTRUCTION COSTS—Peurifoy

A practical volume for construction engineers, civil engineers, contractors, and architects, this book is a detailed guide to estimating construction costs of all kinds, and it describes the various methods of preparing such estimates. The author, a civil engineering professor at A and M College of Texas and director of the Texas Section, ASCE, breaks down the costs of a project into five parts: materials, labor, equipment, overhead, and profit. Then, with many examples, he explains how to arrive at costs of materials, equipment, and labor for a variety of projects: earthwork, foundations, highways, concrete, floor systems, masonry, timber structures, steel structures, utility systems, and others. Unit prices are included for materials, labor, and equipment in order to complete each estimate. The tables involving labor give the approximate man-hours required to perform a specified quantity of work. Up-to-date, covering all recent advances in the field, it should be an invaluable asset to the construction library. Published by McGraw-Hill Book Co., Inc., New York, 310 pages, 6¼ x 9¼. Priced at $7.50.

SPECIFICATIONS—Edwards

Since the development of new equipment, materials, and methods in building, and the establishment of standards, grading rules and tests have made specifications increasingly important, a new guide should be very helpful for those who wish to raise the standards of their writing, as well as for those uninitiated in the field. This book covers the general aspects of specification writing and the general conditions and specific trades as related to specification writing for non-fireproof types of construction. Clearly presented, the book is intended for the use of architects. Published by D. Van Nostrand Co., Inc., New York, 294 pages, 6¼ x 9¼. Priced at $5.00.

CARPENTRY FOR THE BUILDING TRADES (2nd ed.)—Lair

Clear and concise working instructions are presented for every phase of carpentry work on the small and medium-sized house. The author has based his text on the most efficient current practices so that the carpenter can be enabled to handle expertly all construction problems from blueprint and specification reading to framing, siding, and other details. Not only are the necessary trade procedures explained but much related information is included, especially on certain phases of structural design. Takes into consideration the new and different construction uses required by modern-type architecture and does not fail to include the estimating of materials. Contains more than 200 illustrations. Published by McGraw-Hill Book Co., Inc., New York, 297 pages, 6¼ x 9¼. Priced at $4.75.

SIMPLIFIED DESIGN OF ROOF TRUSSES FOR ARCHITECTS AND BUILDERS (2nd ed.)—Parker

The second edition of a book originally prepared for those who have had no preliminary training in the design of roof trusses brings the textual material up to date so that the reader can profit from the numerous changes in specification requirements relating to both timber and steel trusses. New tables, charts, and formulae are included. The book is divided into four parts: Part I, principles of graphic statics; Part II, stresses in roof trusses; Part III, design of roof trusses, and Part IV, timber connectors in roof trusses. Part IV is an entirely new addition to this volume in keeping with the accelerated use of timber connectors and toothed and split rings since its first publication in 1941. Published by John Wiley & Sons, Inc., New York, 272 pages, 5 x 8. Priced at $4.00.

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

WATER SUPPLY AND SEWERAGE (3rd ed.)—Steel

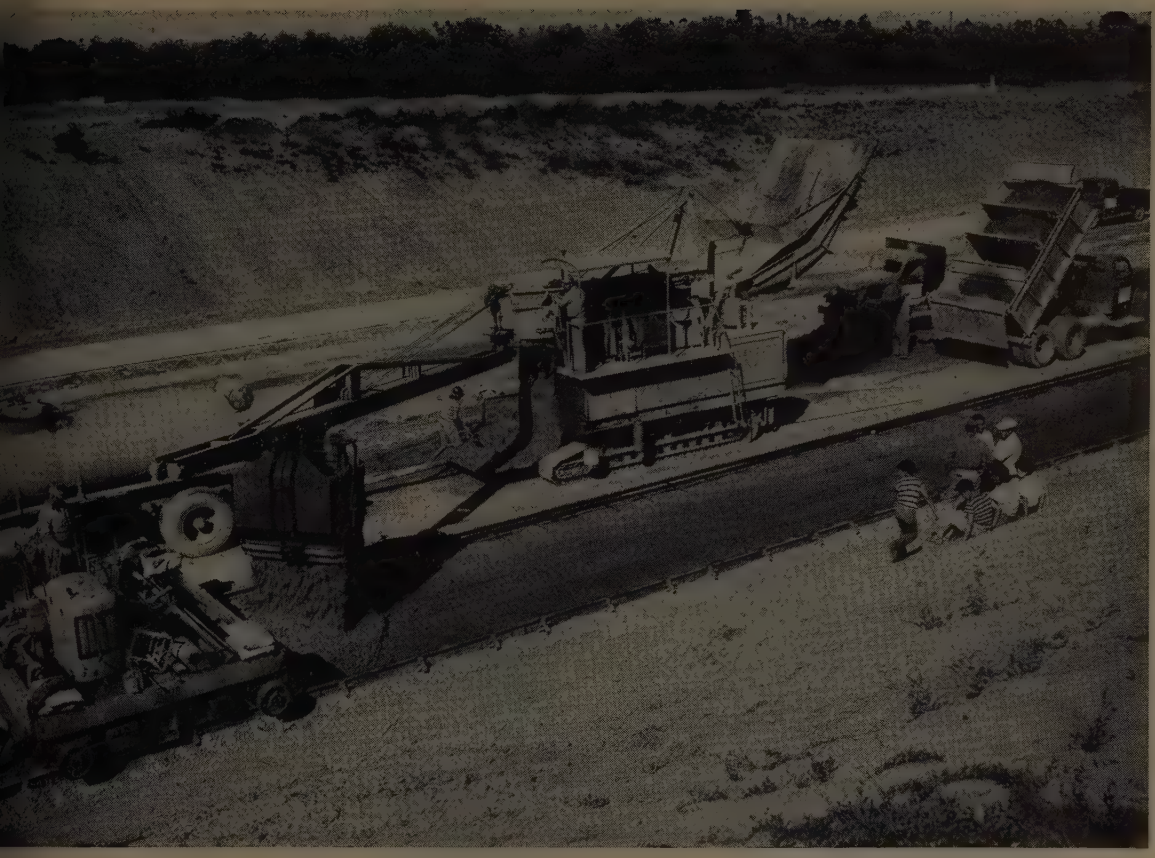
Designed to cover two related fields for achievement of conciseness and elimination of duplication, this revised text offers the fundamentals of both subjects in a well-balanced presentation of theory and application, relating to both design and operation of water and sewage works. The section on water supply covers consumption of water, development of surface and groundwater supplies, materials used in pipes and conduits, pumps and pumping, design, construction and maintenance of water distribution systems, and various methods of water treatment in g eral use. The sewage section co the amount of sanitary and st sewage to be expected, design, c struction, and maintenance of se systems, pumping of sewage, str pollution and recovery, and treatm methods to prepare sewage for posal. Emphasis in this edition been shifted to conform to pres practice; consequently more att tion has been given to stream po tion, trickling filters, and water rection. Published by McGraw-H Book Co., Inc., New York, 564 pa 6¼ x 9¼. Priced at $8.00.

ROUTE LOCATION AND SURV ING (3rd ed.)—Hickerson

This third edition was previou published under the names of "Hi way Curves and Earthwork" "Highway Surveying and Plannin It has been broadened to include s transportation systems as can pipelines, railways, airports, and ways. It is designed as a field man or a reference book in general en neering practice as well as a cla room text, and approximately thr quarters of the book, which is sn enough to be slipped into the poc of a field jacket, consists of valua formulae and tables which can ex dite the work of the field party. T introduction takes up various ty of transportation systems and ro surveys. Then the discussion g into curves, spirals, earthwork, miscellaneous problems. Most of tables are found in the appendix. P lished by McGraw-Hill Book C New York. 543 pages, 5 x 7¼. Pric at $6.00.

STATICALLY INDETERMINA STRUCTURES—Andersen

A text-book treatment of statica indeterminate structures usually limited to the theorems of analy but Author Paul Andersen, profes of structural engineering at the U versity of Minnesota, has include generous selection of illustrat problems in order to acquaint the s dent with the application of th methods to design. The majority the problems deal with steel str tures. Emphasis is placed on a th ough comprehension of deflecti and their importance in understan ing the behavior of a structure un load. First three chapters treat eva ations of displacements and angles rotation of strategic points and li in beams and trusses. Succeedi chapters deal with the slope-defl tion method, moment-distributi method, haunched and tapered bea etc. Appendix consists of 58 pages charts and tables reprinted by courtesy of the Portland Cement sociation. Published by The Ron Press Co., New York. 315 pages, x 9¼. Priced at $7.50.



Paving the new Santa Ana Freeway

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ENGINEERS ON THE MOVE

A reorganization of the Wyoming State Highway Department resulted in the appointment of five district engineers at the end of May. The announcement was made by **J. R. Bromley,** superintendent, who at that time assumed the position of chief engineer in addition to his other duties. **R. G. Stapp,** road design engineer for the Department, headed the reorganization in his new capacity as construction and maintenance engineer. The five new construction and maintenance districts have headquarters in Cheyenne, Casper, Sheridan, Rock Springs, and Basin. The five district engineers, who assumed their new duties on June 22, will be supervised by Stapp and two assistants, **Talcott Moore** and **W. E. Sutton.**

These five new district engineers are: **A. G. Gardner,** southeast district (Cheyenne); **George R. Anderson,** northeast district (Sheridan); **G. T. Shrum,** northwest district (Basin); **O. F. Baldwin,** southwest district (Rock Springs), and **J. A. Atkins,** central district (Casper).

Each district engineer was replaced in his former position by the following men: **H. J. Mitchell,** project engineer at Newcastle, went to Rock Springs, replacing Baldwin. **H. R. Baldwin** became project engineer at Newcastle, replacing Mitchell. Anderson was replaced at Sheridan by **G. H. Saffell,** formerly at Rock Springs. The Rock Springs post of district maintenance engineer was assumed by **C. R. Lord,** formerly at Evanston. Lord will work under O. F. Baldwin, district engineer.

Two other top appointees are **R. J. Templeton,** purchasing and equipment engineer, and **C. W. Beaver,** who was reappointed plans and office engineer. The entire reorganization is reported to involve about 450 employees of the State Highway Department.

Bromley emphasized that the new setup is not a shakeup, but an attempt to coordinate forces in construction and maintenance in the interests of better efficiency. Each engineer is expected to deal directly with such matters in his district. All other 48 states are said to have similar organizations.

* * *

California's State Engineer, **A. D. Edmonston,** recently announced the appointment of **Harvey O. Banks,** supervising hydraulic engineer, to the position of assistant state engineer in charge of water rights administration and water quality investigations. Banks succeeds **Gordon Zander,** retired. **Leslie C. Jopson,** who now has taken over the duties of **Harrison Smitherum,** retired, is also serving as principal hydraulic engineer in charge of water rights applications, watermaster service, and water rights adjudications, and occasionally will assist Edmonston on special projects. **Philip J. Coffey** will assist Banks in water quality investigations.

* * *

Arthur L. Williams has succeeded **James D. Laughlin** as head of the design and Construction Division of the Los Angeles Department of Water & Power. Williams, a Department employee since 1922, was assistant engineer of overhead design from 1926 to 1944, and supervisor of overhead design and system planning sections, 1944 to October, 1945, when he was appointed engineer of overhead design. Two years later he became engineer of distribution and transmission. He was assistant engineer of design and construction since October 1951. Laughlin was promoted to the position of assistant chief electrical engineer.

***Arthur L. Williams* of the Los Angeles Dept. of Water & Power.**

* * *

Leland B. True, formerly with the Bureau of Reclamation at Boysen Dam, Wyo., is now field engineer for Columbia River Constructors (sponsored by Morrison-Knudsen Co., Inc.) at Bridgeport, Wash. His new work involves the supervision of construction layout work on Chief Joseph powerhouse.

* * *

A 90-day assignment to Beirut, Lebanon, as advisor to the United Nations Relief and Works Agency, is being undertaken by **Charles S. Rippon,** construction engineer for the Bureau of Reclamation at the Alcova Dam and power plant, Casper, Wyo., since 1951. Rippon's assignment is the first to be made by the Bureau under the United Nations' relief program. During his stay in the Near East, he will serve as techn advisor in the construction of gation works for refugees in S and Egypt. One of the Egyptian p ects involves transfer of water f the Nile River under the Suez C to 60,000 ac. of land on the Sinai P insula. Another project contempl diversion of Euphrates River w for irrigating 300,000 ac. of lan Syria. **A. F. Wilber,** office egin is acting construction engineer at Alcova Project during Rippon's sence.

* * *

Maj. Gen. Samuel D. Sturgis, U. S. Army Chief of Engineers, vis Folsom Dam, Pine Flat Dam, Isab Dam, Riverbank Ordnance plant, Angeles County flood control p ects, and Los Angeles and L Beach harbors on a quick tour California during the week of M 11-16.

* * *

Leo M. Buhr, construction bra chief of the North Pacific Divis Corps of Engineers, has transfer to the Atomic Energy Commiss as chief of the engineering and c struction division at Portsmou Ohio.

* * *

Outstanding performance for w on the Middle Rio Grande Proj during 1951 and 1952, particularly the expedition of channelization w in the Bernardo (N. Mex.) area, v praise and salary promotions **Walter W. Hall,** field construct engineer, and **Charles H. Clark,** of and design engineer.

* * *

Col. Clarence C. Haug, of the S ramento District Office, Corps of gineers, has been transferred to Far East. He is being replaced by **William J. Ely** from the office of Chief of Engineers.

* * *

John M. Wells, formerly with Corps of Engineers' Seattle Distr as chief of the foundation and ma rials branch, is now with the en neering firm of Knappen-Tippet Abbett & McCarthy. He is chief c crete engineer for supervision of c struction of Peligre Dam in Hait project of the Artibonite Water velopment Authority.

* * *

L. V. (Pat) Campbell, an emplo of the California Division of Hi ways for 33 years, recently reti from his post as city and cooperat projects engineer in Sacramento position he had held since 1933. was replaced by **Clarence E. Bov** assistant district engineer in cha of administration for District 10 Stockton, San Joaquin County.

* * *

West Coast members of the sociated General Contractors nam to national committees for 1953

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The Booklet, "Put A Level On Your Roads", presents some new thinking on thickness and density control. If you have not seen it, ask for it.

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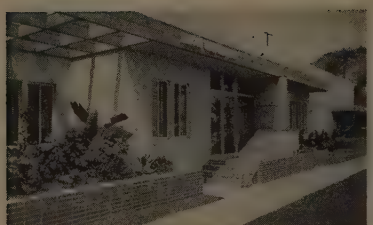

REMODELED and enlarged main offices of Macco Corp. are at 14409 Paramount, Blvd., Paramount, Calif. Ample room for engineering headquarters has been provided, with entire building floor space totaling 17,000 sq. ft.

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clude: **J. W. Cawdrey, John H. Sellen, Cliff Mortensen, W. D. Brown,** and **A. L. Atherton,** Seattle chapter; **Wayne Sutton, T. H. Youell,** and **D. L. Cheney,** Mountain Pacific chapter; and **R. A. Smith, Ben P. Griffith, Donald E. Reed, J. A. Thompson,** and **Robert V. Edwards,** Southern California chapter.

* * *

Newly appointed traffic engineer for the California Division of Highways is **George M. Webb,** who succeeds **Edward T. Telford.** Webb, with the State for 25 years, had been assistant planning engineer since March of last year. Telford was transferred to Los Angeles as district engineer.

* * *

Henry A. Alderton has been appointed district engineer at Seward, Alaska, by the Bureau of Public Roads. He has had nearly 30 years of experience with the Bureau, his most recent assignment being in Southern California where he supervised the extensive federal aid program in that area.

* * *

A residence of more than two years in one of the most remote and inaccessible areas of the world was ended in April when **Paul Jones** returned to the Sacramento area. Jones spent most of that time in Afghanistan as chief engineer on a large irrigation project sponsored by the Afghanistan government.

* * *

Two recent appointees to the California Division of San Francisco Bay Toll Crossings are **T. Fred Bagshaw** and **Austin W. Earl.** The former will be special assistant to the director and the latter will be special engineering consultant. Bagshaw, retired chairman of the Marin County Board of Supervisors, will fill a vacancy which existed since September 1951 when **Robert M. Shillito** resigned. Earl, well-known bridge engineer, succeeds **Ralph Tudor,** who was recently appointed Under Secretary of the Interior.

* * *

Trophies in the form of miniature steam rollers were awarded to **A. W. Carr,** Los Angeles resident engineer of the California Division of Highways, and **Adolph Bauer,** superintendent for A. Teichert & Son, Inc., at a dinner in Los Angeles. The awards were given as top honors in the annual highway contract competition based upon quality of grading, structures, subgrade, paving, curbs, gutters, finishing the roadway, and other such items. The project which won the pair the award was work on the Santa Ana Canyon road, in Southern California.

* * *

Leland K. Hill, hydrologist with the Bureau of Reclamation in Sacramento, Calif., is now in the Hashemite Kingdom of Jordan in the Near East to assist an investigation of the development of hydroelectric power generation and irrigation farming along the Yarmuk and Jordan rivers.

The Consulting Engineers Association of California, a statewide organization representing the interests of professional engineers in private practice, has opened offices at 461 Market Street in San Francisco. Pecos H. Callahan is executive secretary. The organization has been founded to serve the interests of civil, mechanical, electrical, chemical and other engineers having private offices.

John E. Davidson, formerly vice president, assistant and later general manager of the AEC's gaseous diffusion plant at Oak Ridge, Tenn., from 1943 to 1947, has been appointed executive vice president of Massman Construction Co., Kansas City, Mo. He also has been general manager of Guy F. Atkinson Co. and J. A. Jones Construction Co. on additions to the Hanford, Wash., atomic energy works.

* * *

Robert K. Ames is now vice president of Wunderlich Contracting Co., Omaha, Neb. He formerly was connected with Utah Construction Co. During past years he served as general superintendent and project manager on the construction of 12 dams, most recently Bear River Dam in central California (*Western Construction* —February 1953, pp. 70-72).

* * *

The city engineer of Rawlins, Wyo., **E. W. (Gene) Lewon,** recently resigned to begin private engineering practice in the same community.

* * *

Kenneth C. Laugenour and **Lou Meikle** have formed the civil engineering and land surveying partnership firm of Laugenour & Meikle. Offices are located at 350 College Street, Woodland, Calif. Both men are members of the American Society of Civil Engineers.

DEATHS

G. D. Macy, 60, former New Me state highway engineer and state ologist, died May 12 at Santa F Mex.

* * *

George B. Davis, 54, civil engi for Los Angeles County, died a May 20 at Los Angeles.

* * *

Fred James Freeman, 70, civil e neer, died May 4 at Portola, Calif

* * *

James Baird, 79, well-known engineer, died May 16 at Tuc Ariz. Baird supervised construc of Lincoln's Memorial and Tom the Unknown Soldier at Washing D. C., as well as the Flatiron B ing in lower Manhattan, the first s skyscraper in New York.

* * *

Harry Lewis Pray, 67, inspector the Bureau of Reclamation, died cently at Redding, Calif.

* * *

Stener Rosenberg, 28, junior e neer for Morrison-Kiewit-Macc Lookout Point Dam near Eug Ore., drowned April 30 when he from the dam's spillway into Willamette River.

* * *

Lander E. Bjork, 68, concrete c tractor and owner of Ballard C crete Products, died recently at attle.

* * *

William Edward West, 60, surve and engineer in Socorro County, N Mexico, died May 9 at Lemitar, Mex.

* * *

James I. Tucker, 76, professor civil engineering at the University Southern California, died May 12 Van Nuys, Calif.

* * *

George W. Mullins, Sr., 80, reti engineer, died recently at Los A geles.

* * *

Beal Owings Sellman, 77, reti building contractor, died recently Reno, Nev.

* * *

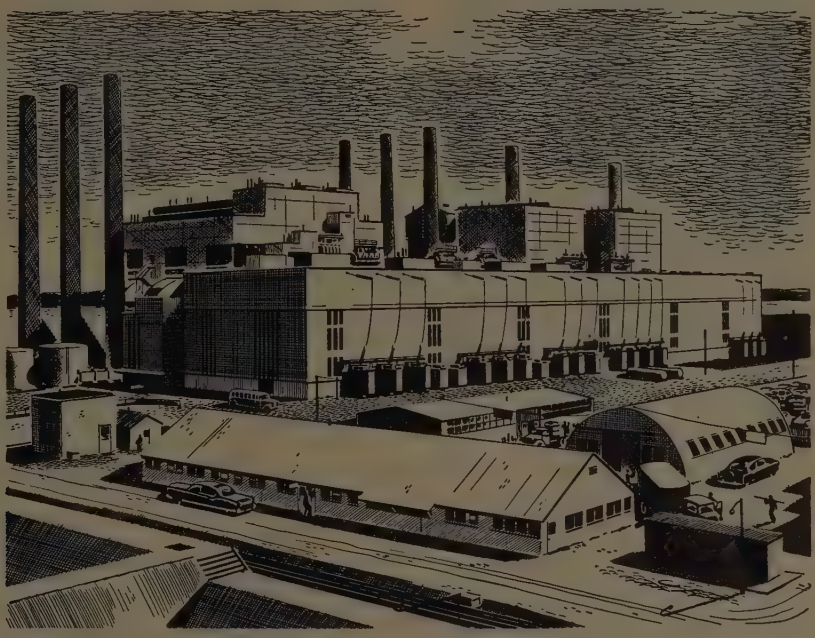
Thomas A. Bedford, 83, an engin with the California Division of Hig ways from 1911 until his retirement 1937, died March 14 in Redding, Ca He was Division Engineer of Distr II from 1911 to 1923; from 1923 1928 he was in charge of work District I.

* * *

Spencer Jones, a consulting en neer, died June 1 at Palo Alto, Ca

'HROUGHOUT THE WEST . . .

it's Permanente Cement



AT ANTIOCH, CALIF.—The $80,000,000 Contra Costa Steam Plant of Pacific Gas & Electric Company, on the San Joaquin River. Permanente Type I, Standard Portland cement was used in its construction.

On the job—On time

STANDARD PORTLAND
MODIFIED PORTLAND
HIGH EARLY STRENGTH
LOW HEAT
SULPHATE RESISTANT
PRONTO (Pipe Cement)
PORTLAND POZZOLAN
BRICK MIX
PLASTIC CEMENT
OIL WELL CEMENTS

For every type of concrete construction, there is a Permanente cement specially designed to meet all required specifications. As a result, Permanente is the cement of choice by the construction industry wherever good concrete is being placed.

PERMANENTE AVAILABILITY is maintained through the location of modern distribution plants in the centers of Western construction activity; so that Permanente dealers in practically every city and town in Northern California, Oregon, Washington, Western Nevada and the territories of Alaska and Hawaii, can take delivery within 24 hours from the time the order is accepted.

PERMANENTE SERVICE has become the accepted standard for customer delivery throughout the West; because Permanente's "On the Job, On Time" slogan is standard delivery policy.

PERMANENTE
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ERMANENTE, SANTA CLARA, YOSEMITE AND KAISER BRANDS OF PORTLAND CEMENT AND PERMANENTE LIME PRODUCTS

OAKLAND • PORTLAND • SEATTLE
ANCHORAGE • FAIRBANKS • HONOLULU

SUPERVISING THE JOBS

Superintendent *Hal Nourse* is heading passenger terminal construction at San Francisco Airport. Others on the $7,000,000 job held by Clinton Construction Co. are: *Larry Stevens*, general carpenter foreman; *Mike Collins*, labor foreman; *Johnny Perez*, cement foreman, and *"Duke" Martin*, *Warren Garde* and *Jack Martin*, carpentry foremen.

D. H. Blackmore is supervising 8.3 mi. of road construction in Teton County, Mont., for McLaughlin, Inc., contractor.

* * *

In Monterey County, Calif., **Edwin Spaith** is supervisor on a $165,622 job for Condick Co. Work involves constructing a reinforced concrete bridge crossing Little Sur River.

* * *

Eldon Osborn, a partner in the firm of Osborn Co., is heading 2 miles of surfacing on Foothill Blvd. in Los Angeles County, Calif.

* * *

A $400,000 award held by Henry Thygesen is headed by **Rufus McDonald**, project manager; **C. L. Earsley**, general superintendent, and **Paul Reynolds**, assistant superintendent. The job involves grading and black top surfacing in the vicinity of Watrous, N. Mex.

* * *

Don Weaver, project manager for Ben C. Gerwick, Inc., and Peter Kiewit Sons' Co., is head man on initial work—constructing approaches—on the sub-structure of the Richmond-San Rafael Bridge, crossing San Francisco Bay. **William (Bill) Goss**, general superintendent is assisted by **Harvey Larson, Jack Weiss** and **Robert Harvey. William Talbot** is chief engineer; **James McClees**, purchasing agent, and **John Hay**, office manager.

* * *

Roy Houck is heading a $494,000 award held by Roy L. Houck & Son for 6 mi. on the Salem By-pass Highway, Salem, Ore.

* * *

D. B. Winniford, superintendent; **Roy Lancaster**, carpentry foreman, and **Clarence Young**, grade foreman, are Thomas Construction Co. key men on the $141,037 job to construct five bridges and approaches in Santa Barbara County, Calif.

* * *

Louis E. Steelman project manager, and **Harold Maxwell**, general superintendent, head a long lineup of top personnel on the job at the site of Lookout Point Dam and powerhouse construction at Lowell, Ore., for the Corps of Engineers. Morrison-Knudsen Co., Inc., Peter Kiewit Sons' Co. and Macco Corp. hold the $21,764,000 award. The other key men are as follows: **John M. Erickson**, carpenter superintendent; **Leonard M. Kinyon**, master mechanic; **Harry D. Adkins**, powerhouse superintendent; **Allen Baskins**, concrete superintendent; **Edward S. Noon**, grade foreman; **Alfred L. Higgins, Howard L. Fosnot, Blaine B. Shaffer, Leonard M. Larsen, Fred Erickson Lesley L. Bean**, and **Lester O. Sparks**, carpenter foremen; **Julius A. Carney**, high line foreman; **Elmer J. Williams**, truck foreman; **John Murphy**, lubrication foreman; **Harold O. Dellen**, batch plant foreman; **Johnny R. Logan**, excavation superintendent; **Everett J. Woodhead**, electrical superintendent; **Jack S. Niemann**, screening plant foreman; **John P. Bellegante**, shift foreman; **Robert G. Knapp**, quarry superintendent; **Frank J. Miklovik**, concrete foreman; **Gordon L. Marquiss**, high line superintendent; **Steedley T. Brown**, concrete and aggregate superintendent; **Tommy A. Gregg**, high line foreman; **Daniel E. Flake**, general foreman; **Arthur F. Hartman**, screening plant foreman; **Troy H. Morton**, concrete foreman; **John E. Skene**, shift foreman; **Rex P. O'Brien**, assistant master mechanic; **Rubin M. Broom**, tunnel foreman; **Maxwell A. Graham**, concrete foreman; **Mike L. Stankovich**, powder superintendent; **Lauren Olson**, excavation foreman; **Charles N. Harrison**, batch plant foren
George S. Creacy, shift foren
Robert C. Bostwick, high line f
man; **J. E. Hensley**, pipefitter su
intendent; **James H. Poynter**, b
plant superintendent; **Frederick
Goddard**, concrete foreman; **Ha
Mott**, concrete superintendent;
R. Chenoweth, night walker; **J
H. Beecher**, shift foreman; **D.
Drugan**, office manager, and **D
Lutes**, project engineer. The pro
began in May 1950 and is expecte
be completed between June and
cember 1954.

* * *

Allison-Honer Co. has a numbe
building jobs currently under wa
the Los Angeles area. **Jack De**
superintends construction of a
sistence building at El Toro Ma
Corps Air Station near Santa
William R. Johnson is carpenter f
man and **Raymond Odum** is l
foreman. A control tower and op
tions building at the same plac
going up under the supervisio
M. C. Moore. Carpenter forema
"Red" Shane.

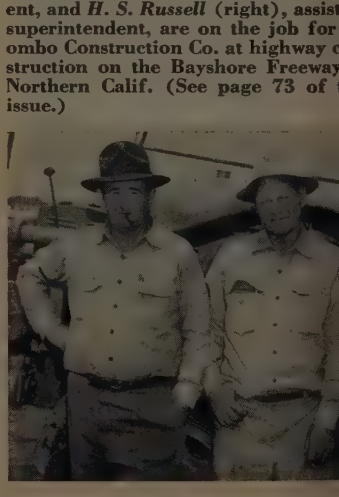
Jim Alderson, general foreman, **Hobie Brader**, labor foreman, heading Allison-Honer construct of a bank and store building for First National Bank of Santa Ana.

Jim Dykstra, superintendent; **Higginbotham**, general foreman, **M. L. Crane**, concrete foreman, heading the job for dental clin dispensaries, and postoffices at C Pendleton Marine barracks.

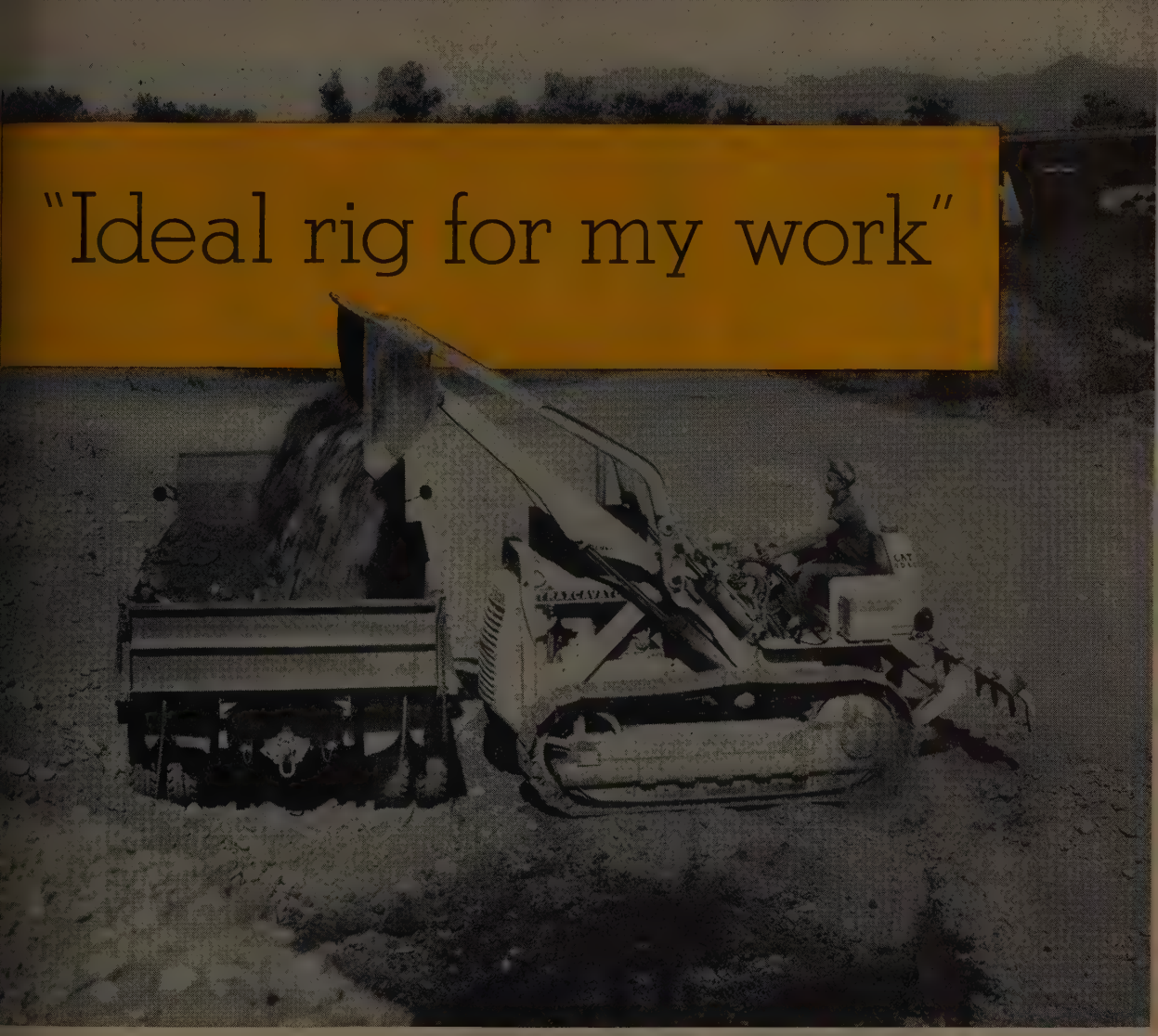
* * *

McCammon-Wunderlich has a
lion-dollar highway job going on
Tracy, Calif. Head men are: **R.
Kenning**, project manager; **Jim
son**, grade superintendent; **L. Coo
structures superintendent; C. J.
Alexander**, equipment superinte
ent; **Casey Jones**, master mecha
H. Gallagher, labor foreman; **Jim
sen**, drill foreman; **L. J. (Red) Bos**

***William S. Bell* (left), job superinte
ent, and *H. S. Russell* (right), assis
superintendent, are on the job for
ombo Construction Co. at highway
struction on the Bayshore Freeway
Northern Calif. (See page 73 of
issue.)**



"Ideal rig for my work"



"I wanted a loader for three or four years," says B. C. Foster, contractor, of Redding, Calif., "and I talked to everybody I knew with various rigs. The answer every time was, 'Buy a Caterpillar machine.' I've certainly had good going with my Cat* HT4 Shovel. Its versatility and easy handling make it an ideal rig for my work."

Mr. Foster's Caterpillar 1¼-yard HT4 Shovel handles materials, does precise grading and excavating, and general contracting work. In the photograph, taken at a gravel plant near Redding, note the scarifier, for ripping up pavement on street contracting jobs, mounted on the rear of this versatile machine.

The Caterpillar HT4 Shovel is engineered to take the stresses of a multitude of jobs. The girder-type frame is mounted low and close to the carrier rollers to keep the load off the transmission housing and track frames. A spacer bar between the lift arms keeps the bucket level, and prevents bending and twisting of the bucket control arms and bucket hinge pins.

Your Caterpillar Dealer—who gives fast, skilled service on the equipment he sells—will gladly demonstrate the Cat Shovel that fits your needs. Ask him to *prove* that a fast-operating, clean-dumping, soundly-engineered Cat Shovel is the "ideal rig" for you, too.

Caterpillar Tractor Co., San Leandro, Calif.; Peoria, Ill.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

**NAME THE DATE...
YOUR DEALER
WILL DEMONSTRATE**

Building a sewage treatment plant for Sacramento, California

Pictured above are some of the men who are building a $5,000,000 sewage treatment plant for the City of Sacramento, California. The award is a joint venture of Fred J. Early, Jr., Co., Inc., and Stolte, Inc.

TOP ROW: (left picture) ***Fred Copeland,*** **carpenter foreman; (center picture, l. to r.)** ***George Harper,*** **project engineer,** ***Carl Van Der Mead,*** **office engineer, and** ***William Yarnell, Jr.,*** **general superintendent; (right picture)** ***H. I. Madden,*** **cement finishing foreman.**

BOTTOM ROW: (left picture) ***A. M. Weathers,*** **carpentry foreman; (center picture, l. to r.)** ***C. M. Sumstead,*** **carpentry foreman, and** ***E. W. Tuttle,*** **assistant superintendent; (right picture, l. to r.)** ***C. R. Morris,*** **carpentry foreman, and** ***Ralph Turner,*** **general carpentry foreman.**

Other men on the job but not photographed are: ***W Shaw,*** **resident engineer;** ***George Doka, Jim Malcolm Harold Jeffrey,*** **assistant resident engineers;** ***Herbert C*** **concrete foreman;** ***John Balemex, G. L. Vowell,*** **and** ***Stewart,*** **carpentry foremen;** ***Russ Fox,*** **office manager;** ***liam Breede, Jr.,*** **labor foreman;** ***John Breckenridge,*** **fitter superintendent;** ***Jim Farley,*** **pipe fitter foreman;** ***Ratzell,*** **field purchasing agent;** ***L. B. Bagby,*** **assistant countant, and** ***George D. Sherman,*** **general electrical f man.**

and **Ken Omsberg,** grade foremen; **Sam Martinelli,** truck driver foreman; **Bill Stout,** mechanical foreman, and **Pete Smith,** structures foreman. **E. L. Craun** is resident engineer.

* * *

A highway and bridge contract held by Ukropina-Polich-Kral in North Sacramento, Calif., is headed by the following men: **P. D. Patterson,** project manager; **Paul L. Wilcox,** general superintendent; **R. M. Skamnes,** assistant superintendent; **H. L. Benedict** and **A. G. (Bill) Harrisberger,** carpentry foremen; **W. V. Rickman,** general foreman; **G. W. Yost** and **Wayne Alexander,** grade foremen, and **Paul Lukasko,** master mechanic.

* * *

The San Francisco Brewery Corp.'s stock house building which is being constructed by Cahill Construction Co., is under the supervision of J **Nelson.** Carpentry foreman is N **Nelson;** labor foreman, **T. Linda** and inspector, **Ray N. Moore.** F picture and more information ab this building (which is using up tons of structural steel), see *Wes Construction*—May, p. 101.

* * *

Bud Pollack, superintendent, **C. D. Shaw,** foreman, are coverin

in central Oregon on a re-oiling tract awarded to Babler Bros., tractor.

* * *

harles Prose, superintendent, is isted by Ed Pounds on a $782,110 tract held by Fisher Contracting for construction of a concrete king apron and appurtenances at ke Air Force Base, Phoenix, Ariz.

* * *

An award held by Morrison-Knudsen Co., Inc., is for preparation of out 25 mi. of roadbed for Atchison, peka & Santa Fe railroad line re-ation in Kern County, Calif. B. L. rkins is superintendent and W. C. rgeron is office manager.

* * *

Key men on a $2,368,478 job for the nstruction of an apron and taxiway Davis-Monthan Air Force Base in cson, Ariz., are: O. P. Pope, proj- manager; J. A. West, project en- neer; H. G. Mercer, superintendent, d R. N. Edwards, office manager. ne contract is held by Morrison-udsen Co., Inc., and R. A. West-ook.

* * *

Project Manager Henry O. Mong, assisted by William McNutt, is ading the job for the McNutt Bros. d C. J. Montag award for the $4,-5,530 Dexter Dam and powerhouse Lane County, Ore. Clyde C. Mong is construction superintendent id Theodore H. Schafer is assistant nstruction superintendent.

* * *

In Spokane County, Wash., Charles acek, superintendent; John C. Clayn, asphalt superintendent, and C. . Soderholm, office manager, are ith McLaughlin, Inc., on a $250,084 b for 26½ mi. of rolling and paving various locations.

* * *

Robert M. Turpen is superintendent Peter Kiewit Sons' Co. award for mi. of grading and surfacing in San iguel County, N. Mex.

* * *

Jack Youngstrom is supervising the b to put up 124 mi. of rural distribu-on lines in Grant and Umatilla coun-es, Ore., for Power Line Construc-on Co., contractor.

* * *

Project Manager C. E. Kasler and ill Loy, superintendent, are heading $827,145 road construction job at dwards Air Force Base, Calif., for redericksen & Kasler and Peter Kie-it Sons' Co. Other key personnel re: George Bell, plant superintend-nt, Slim Ramsdall, equipment super-tendent, and George Shaffer, chief ngineer.

* * *

Don Boots is supervising 5 miles of ad work for Peter Kiewit Sons' Co. Clark County, Wash.

CONTRACTS

Summary of bids and awards for major Western projects

Alaska

$2,287,547—**S. Birch & Sons** and **Lytle & Green,** Central Bldg., Seattle—Low bid for 16 two-story, 8-family quarters, Ladd Air Force Base; by C. of E.

$225,035—**S. Birch & Sons** and **Lytle & Green,** Central Bldg., Seattle—Sole bid for minor roads adjacent to Tongass Hwy.; by BPR.

$476,000—**Pacific Alaska Contractors, Inc.,** 2704 A St., Tacoma, Wash.—Low bid for water distr. and sewage collection system, Kodiak; by Alaska Public Works.

Arizona

$169,610—**Wallace & Wallace,** Box 470, Phoenix—Award for 1.59 mi. of grading, bitum. surf. and bridges, Globe-Holbrook rd., from Heber southwest, Sitgreaves Natl. Forest, Navajo County; by BPR.

$218,948—**Western Constructors, Inc.,** Box 1604, Phoenix—Award for 1.3 mi. of grading, bitum. rd. mix surf., seal coating, and a 5-span, 3-girder bridge, State 82 betw. Nogales and Patagonia, Santa Cruz County; by St. Hwy. Dept.

California

$583,700—**Vido Artukovich,** 11155 Rush St., El Monte—Award for Hemet Valley supply lines and booster plant, Hemet; by Eastern Municipal Water Distr.

$1,199,215—**Guy F. Atkinson Co.,** Box 259, Long Beach—Award for wharf at Pier C, Berths 24 to 26, Outer Harbor, Long Beach; by City.

$1,728,775—**Guy F. Atkinson Co.,** Box 259, Long Beach—Low bid for floor control and channel improvements, Tujunga Wash from Lopez Dam to Arleta Ave., Los Angeles; by C. of E.

$856,704—**Guy F. Atkinson Co.,** Box 593, South San Francisco—Award for grading 1 mi. of Bayshore Freeway nr. San Francisco County line, San Mateo County; by Div. of Hwys.

$856,970—**Ball & Simpson,** 685 Delaware St., Berkeley—Award for 4.2 mi. of grading and surf., Sonora Pass, Stanislaus Natl. Forest; by BPR.

$1,121,325—**Daley Corp.,** Box 4067, N. Park Sta., San Diego—Low bid for improvements on Wabash Blvd., Section B, San Diego; by City.

$1,176,448—**Fredrickson Bros.,** 1259 65th St., Emeryville—Award for 2.2 mi. of grading and paving, U.S. 50 betw. Crow Canyon Rd. and .1 mi. east of Foothill Blvd., and 4 reinf. conc. bridges and a pedestrian undercrossing, Alameda County; by Div. of Hwys.

$769,853—**Chas. L. Harney, Inc.,** 575 Berry St., San Francisco—Low bid for constructing sections of a structural steel viaduct and connecting ramps on 13th St. betw. Potrero Ave. and Bayshore Freeway, San Francisco; by Div. of Hwys.

$316,057—**Edward Keeble,** Rt. 4, Box 64, Tully Rd., San Jose—Award for 1.6 mi. of grading and surf. on Sign Rt. 1, and a reinf. conc. bridge over Laguna Creek, Santa Cruz County; by Div. of Hwys.

$964,845—**Peter Kiewit Sons' Co.,** 345 Kieways Ave., Arcadia—Low bid for flood control project, Los Angeles; by C. of E.

$2,000,000—**Lindgren & Swinerton, Inc.,** 605 W. Olympic Blvd., Los Angeles—Award for structural steel and masonry, factory and office bldg., Anaheim; by Delco-Remy Div., General Motors Corp.

$641,680—**M. & K. Corp.,** Financial Center Bldg., San Francisco—Award for 18th St. sewer, Sect. A, Shotwell to Church St., San Francisco; by City.

$1,518,245—**Macco Corp.,** 14409 S. Paramount Blvd., P mount—Low bid for two bridges, Ocean Blvd. and 9t Long Beach; by Long Beach Harbor Dept.

$985,452—**McCammon-Wunderlich Co.,** Box 1023, Palo —Low bid for grading and drainage facilities, U.S. 101, 4.1 mi. north of Forsythe Creek and Ridgewood Sur Mendocino County; by Div. of Hwys.

$539,393—**Mercer, Fraser Co.** and **Mercer, Fraser Gas Co.,** Second and Commercial Sts., Eureka—Low bid for 2.9 surf., U.S. 101 betw. Gannon Slough and .9 mi. north of Ave. in Arcata, Humboldt County; by Div. of Hwys.

$1,655,337—**Oberg Bros. Construction Co.,** Box 640, I wood—Low bid for about 1 mi. of grading, and paving, taining walls and 3 bridges, betw. Flower St. northbou ramp and Olympic Blvd., Los Angeles; by Div. of Hwys.

$350,152—**Lars Oberg,** 4982 Valley Ridge Ave., Los Ange Low bid for trunk sewer, Fostoria St. to Southern Ave., S Gate; by Los Angeles County Flood Control Distr.

$1,147,085—**Parish Bros.** and **Harms Bros.,** Box 6, Beni Low bid for strengthening runways, Travis Air Force by C. of E.

$561,065—**C. Norman Peterson,** 2832 Ninth St., Berkel Low bid for Schedule D, pump and tide gates, and dred for Seal Slough drainage, San Mateo; by City.

$447,860—**C. Norman Peterson,** 2832 Ninth St., Berkel Low bid for water treatment plant and reservoir, Fair by City.

$3,749,132—**Piombo Construction Co.,** 1571 Turk St., Francisco—Award for 5 mi. of grading and surf. Bays Freeway in San Mateo, Belmont, and San Carlos, to pr for a 6-lane divided hwy., and 7 overcrossings, San M County; by Div. of Hwys.

$887,675—**Peter Sorensen,** Box 790, Redwood City—Low for Schedule 2, Millbrae to Baden Section, Sunset Su Line; by Public Utilities Commission of San Francisco.

$1,837,865—**Standard Dredging Corp.,** 108 W. 6th St., Angeles—Low bid for shore protection dredging, Port H neme harbor, Point Mugu; by C. of E.

$1,140,221—**J. A. Thompson & Son,** Box 518, Inglewoo Low bid for structural steel and reinf. conc. overhead st ture and approaches, freeway betw. Leonis St. and Dun St. over tracks of Union Pacific Railroad, Los Ang County; by Div. of Hwys.

$1,277,501—**B. J. Ukropina, T. P. Polich, Steve Kral** and J **R. Ukropina,** 201 E. Las Tunas Drive, San Gabriel—Aw for 3.5 mi. of grading on U.S. 99E and U.S. 40 for a 4- divided hwy., and construction of 6 bridges, vicinity of R ville, Placer County; by Div. of Hwys.

$492,238—**Claude C. Wood Co.** and **Macal Improvement** Box 599, Lodi—Award for 3.5 mi. of grading a 10-mi. sec of St. 23 betw. 4 mi. southeast of Markleeville and M County line, and surf. the 10 mi., and for 7.6 mi. of surf St. 23 beginning at Alpine County line, Alpine and M counties; by Div. of Hwys.

Colorado

$136,170—**Martinson Construction Co.,** 5400 Colorado Bl Denver—Award for street paving, District 192, Denver; City & County of Denver.

$195,145—**Nielsen-Dougan Construction Co.,** 110 W. 1 Ave., Denver—Low bid for water system improveme Derby; by South Adams County Water & Sanitation Distr.

$207,299—**Spillane Construction Co.,** 1165 Pikeview, La wood—Low bid for roads and drainage, Lowry Air Fo Base, Denver; by C. of E.

$163,200—**Western Paving Construction Co.,** 5105 Washi ton St., Denver—Low bid for paving, curbs and sidewa West Mississippi Ave. from Broadway to Zuni St., Den by City.

$565,965—**Western Paving Construction Co.,** 5105 Washi ton St., Denver—Low bid for Schedules I to III, strength ing of parking apron No. 1, Lowry Air Force Base, Den by C. of E.

Idaho

$1,260,000—**Campbell Construction & Equipment,** 1150 som St., San Francisco—Low bid for 4-wing hangars apron pavement, Mountain Home Air Force Base; by C. o

$296,270—**LeBoeuf-Daugherty Contracting Co.** and **Erick**

Pierson, Foot of Third and Cutting Blvd., Richmond Calif. Low bid for superstructure, hwy. bridge crossing Snake ver, Palisades Project; by USBR.

58,145—**Eagle Construction Co.,** Box 246, Eagle—Award 4.423 mi. of bitum. surf. rd., U.S. 91 betw. Bassett and berts, Jefferson County; by St. Dept. of Hwys.

39,832—**Carl M. Halvorsen,** 218 Builders Exchange Bldg., rtland—Award for 1.3 mi. of roadbed and bitum. surf., S. 91 betw. Bassett & Roberts, Jefferson County; by St. pt. of Hwys.

39,810—**Marion J. Hess,** Box 247, Malad—Award for rd.- xed bitum. surf. and a 253-ft. conc. bridge on 1.9 mi. of eston-Red Rock hwy., Bear River to Preston, Franklin unty; by St. Dept. of Hwys.

82,708—**Peter Kiewit Sons' Co.,** Idaho Falls—Award for 8 mi. of bitum. surf., Gooding-Fairfield Hwy., Gooding- mas County line-North in Camas County; by St. Dept. of wys.

09,281—**McAtee & Heath,** Box 4083, Station B, Spokane, ash.—Award for 10.8 mi. of plant-mix bitum. surf., U.S. 95 cinity of Genesee, and .7 mi. of Genesee connection in Nez erce and Latah counties; by St. Dept. of Hwys.

ontana

55,445—**Nilson-Smith Contracting Co.,** Box 1147, Great alls—Award for 3.9 mi. of clearing, grubbing, grading, and aining, North Fork of Flathead River Rd., Flathead County; BPR.

05,055—**Tangmo Construction Co.,** Milltown—Low bid for chedule 2, Toston and Lombard canals, laterals and drain- ge system, Three Forks Div., Missouri River Basin Project; USBR.

94,302—**Otis Williams Co.,** Helena—Award for 8.27 mi. of ading and draining, Helena-Flesher Pass-Lincoln hwy., ewis & Clark County; by St. Hwy. Comm.

levada

140,771—**Gibbons & Reed Co.,** 259 W. 3rd South St., Salt ake City—Award for 7.4 mi. of surf. nr. Riverside, Clark ounty; by St. Dept. of Hwys.

186,193—**Silver State Construction Co., Inc.,** Fallon—Award or 16.3 mi. of st. hwy. system, Smith Ranch to junction of .S. 93 (nr. Warm Springs), Elko County; by St. Dept. of lwys.

),126,335—**Ford J. Twaits Co.** and **Morrison-Knudsen Co., nc.,** 449 S. Beaudry Ave., Los Angeles—Award for ordnance orage area, Nellis Air Force Base, nr. Las Vegas; by C. of E.

lew Mexico

242,128—**Armstrong & Armstrong,** Box 873, Roswell— ward for 9½ mi. of asph. surf., Lordsburg-Deming hwy., idalgo County; by St. Hwy. Dept.

2,921,180—**J. W. Bateson Co.,** Irwin-Keasler Bldg., Dallas, ex.—Award for hangar maintenance, Walker Air Force ase, Roswell; by C. of E.

158,751—**Floyd Haake,** 111 Lovato Lane, Santa Fe—Award or 10.6 mi. of grading and asph. surf., Tucumcari to Conchas am hwy., Quay and San Miguel counties; by St. Hwy. Dept.

168,287—**Floyd Haake,** 111 Lovato Lane, Santa Fe—Award or 4½ mi. of asph. surf., Cimarron to Philmont Ranch rt., olfax County; by St. Hwy. Dept.

Oregon

332,061—**J. M. Arenz,** 1601 N. E. Columbia Blvd., Portland —Award for 10.28 mi. of grading and paving, Fields Creek- Mt. Vernon unit, Dayville-Mt. Vernon section, John Day Hwy., 14 mi. east of Dayville, Grant County; by St. Hwy. Comm.

342,813—**J. M. Arenz,** 1601 N. E. Columbia Blvd., Portland —Award for 7.28 mi. of grading and 7.75 mi. of paving, Mt. Vernon-John Day section of John Day Hwy. betw. same, Grant County; by St. Hwy. Comm.

544,400—**Hallett Construction & Continental Co.,** Dayton, Ohio—Low bid for 73 mi., Maupin-Detroit 300-kv. line No. 2, Wasco and Marion counties; by BPA.

984,239—**Peter Kiewit Sons' Co.,** 8th & Douglas, Longview, Wash.—Award for 2.1 mi. of grading and 5 mi. of paving, Brush Creek-Frankport unit, Rocky Point-Gold Beach sec- tion, Oregon Coast Hwy., Curry County; by St. Hwy. Comm.

$755,270—Kuckenberg Construction Co., 11104 N. E. man St., Portland—Award for 7.12 mi. of grading a reinf. conc. bridge, Clatskanie-Delena section of Colu River Hwy. east from Clatskanie, Columbia County; b Hwy. Comm.

$983,850—**P. S. Lord, Mechanical Contractor,** 4507 S. E. waukie Ave., Portland—Low bid for west central unit i ceptor sewer, Portland; by City.

$1,874,700—**Ross B. Hammond Co.,** 1241 N. Williams Portland—Low bid for a 7-story conc. retirement home, 4 six-story wings, Milwaukie; by Willamette View M Assn.

$258,774—**Morrison & Lamping,** Walla Walla, Wash.—A for 5 mi. of grading and paving, Joseph-Sheep Creek Hill tion of Little Sheep secondary hwy. east from Joseph, lowa County; by St. Hwy. Comm.

$478,685—**Rogers Construction Co., Inc.,** 11760 N. E. Gl Portland—Award for 3.4 mi. of grading and paving, Ba Blvd.-Boones Ferry Rd. unit, Barbur Blvd.-White School tion, West Portland-Hubbard Hwy. about 3 mi. from land; by St. Hwy. Comm.

$29,820,997—**Winston Bros. Co., McLaughlin, Inc., F Contracting Co., Johnson, Drake & Piper Co., Inc., Dono Construction Co., C. F. Lytle Co., S. Birch & Sons Const tion Co., Foley Bros., Inc.,** and **Fegles Construction Co.,** 1725 Carroll Ave., St. Paul, Minn.—Low bid for comple of excavation for and construction of substructure for first 14 main unit bays and station service bay, fishway bine bay and complete assembly bay of powerhouse at Dalles Dam site, Columbia River; by C. of E.

Utah

$203,712—**W. W. Clyde & Co.,** Springville—Low bid for mi. of approaches to overpass nr. Beck's Hot Springs, 3-in. rd. mixed bitum. surf., Salt Lake County; by St. Comm.

$467,538—**Reynolds Construction Co.,** Springville—A for 9 mi. of 3-in. plant-mixed bitum. surf. and 2 conc. bri over a 20-ft. span, U. S. 40, Bridgeland to Myton, Duch County; by St. Rd. Comm.

Washington

$613,312—**Associated Sand & Gravel Co. and Western phalt Co.,** 2508 Colby, Everett—Award for grading and a conc. surface., 12.4 mi. of P.S.H. No. 1, Richmond Hgts Broadway cutoff, et al, King and Snohomish counties; by Hwy. Comm.

$1,963,085—**A. J. Cheff Construction Co.,** Seattle—Low Chandler powerhouse, penstocks and discharge lines; USBR.

$303,186—**D-H Paving Co.,** 6808 Highway 99, Vancouv Award for 0.234 mi. of grading and asph. conc. paving, one course cement conc., P.S.H. No. 1, Vancouver Freew Interstate Bridge to 5th St., Vancouver, Clark County; St. Hwy. Comm.

$399,250—**Fred J. Early, Jr., Co., Inc.,** 369 Pine St., San F cisco—Award for addition to sewage disposal plant, W Walla; by City.

$227,733—**Ellis Construction Co.,** Box 337, Ephrata—A

r 7.78 mi. of grading and light bitum. surf., P.S.H. No. 7, irke to Quincy, Grant County; by St. Hwy. Comm.

19,913—**N. Fiorito Co.,** 844 W. 48th St., Seattle—Award r 4.9 mi. of grading and paving, and 2 reinf. conc. slab idges, P.S.H. No. 2, middle crossing of Snoqualmie River Tanner, King County; by St. Hwy. Comm.

07,148—**Goetz & Brennan,** 914 Seaboard Bldg., Seattle—ward for 14.7 mi. of grading, light bitum. surf., and a reinf. nc. box girder bridge, P.S.H. No. 7, Grant County line to dessa, Lincoln County; by St. Hwy. Comm.

49,845—**R. A. Heintz Construction Co.,** 211 N.E. Columbia lvd., Portland—Award for 4.2 mi. of clearing, draining, ading and surf., P.S.H. No. 12, Palix River south, Pacific ounty; by St. Hwy. Comm.

00,229—**F. R. Hewett Co.,** Box 46, Parkwater—Award for .2 mi. of grading and light bitum. surf. on non-skid seal eatment, P.S.H. Nos. 7 and 10, Quincy vicinity to Naylor, rant County; by St. Hwy. Comm.

83,095—**Peter Kiewit Sons' Co.,** Box 491, Longview—ward for 6.39 mi. of grading, asph. conc. paving and one urse conc. paving, P.S.H. No. 2 over Snoqualmie Pass, lallie Creek to Hyak, King and Kittitas counties; by St. wy. Comm.

91,018—**McLaughlin, Inc.,** Box 1824, Great Falls, Mont.—ward for 12.64 mi. of light bitum. surf., seal coating, and ph. conc. paving, States 15, 15-C & 15-D, Gaynor to Mer-tt, Chelan County; by St. Hwy. Comm.

23,000—**Morrison-Knudsen Co., Inc.,** Box 450, Boise, Idaho -Award for excavation, clearing and grading, site of refinery Ferndale; by General Petroleum Corp.

58,375—**Murray & Stanford,** Bend, Ore.—Award for 9.9 i. of grading and an 85-ft. reinf. conc. bridge, Wind River d., Gifford Pinchot Natl. Forest; by BPR.

81,219—**C. E. Oneal,** Box 270, Ellensburg—Award for 7.05 i. of grading and light bitum. surf., P.S.H. No. 2, end of avement to Telford, Lincoln County; by St. Hwy. Comm.

17,025—**C. E. Oneal,** Box 270, Ellensburg—Award for rading, Blewett Pass on Sunset Hwy.; by BPR.

93,990—**Washington Asphalt Co.,** 309 W. 39th, Seattle—ow bid for Alternate B, crushed stone base and asph. paving n Magnolia Blvd., Seattle; by City.

$4,249,600—**Westinghouse Electric Corp.**—Award of furnishing four 67,368-kva. alternating current generators for Chief Joseph Dam; by C. of E.

$316,850—**Young & Smith Construction Co.,** 306 Beason Bldg., Salt Lake City—Award for outfall channel in Puget Sound, Fort Lewis; by C. of E.

Wyoming

$258,020 — **Black Hills Constructors,** Cheyenne — Award for grading, surf., oil treatment and seal coat, 8.1 mi. on Meeteetse-Thermopolis rd., Park County; by St. Hwy. Dept.

$398,245—**R. N. Campsey Construction Co.** and **O. F. Tucker,** Casper—Low bid for sewage disposal plant, Rock Springs; by City.

$260,099 — **Heald & Christler,** Cody — Award for grading, draining and misc. work, 5.2 mi. of Cody-Clarks Fork rd., Park County; by St. Hwy. Dept.

$172,217—**Jones, Hickley & Jones,** Powell—Award for grading, 2 conc. culverts, and treated lumber bridge over Beaver Creek, 4½ mi. on Hylett-Aladdin rd., Crook County; by St. Hwy. Dept.

$249,796—**Knisley-Moore Co.,** Box 77, Douglas—Award for plant-mix surf., seal coat, etc., 25.2 mi. on Lovell-Burgess Junction rd., Big Horn & Sheridan counties; by St. Hwy. Dept.

$460,176—**J. H. & N. M. Monaghan & Associates,** Rt. 1, Derby, Colo.—Award for grading, base course and plant-mixed surf., and 2 culverts, 2½ mi. on Cheyenne-Greeley rd., Laramie County; by St. Hwy Dept.

$4,500,000—**Morrison-Knudsen Co., Inc.,** 319 Broadway, Boise, Idaho—Award for construction of lodge and tourist cottages, Grand Teton Natl. Park; by Grand Teton Lodge & Transportation Co.

$243,872—**Platte Valley Construction Co.,** 900 S. Adams St., Grand Island, Neb.—Award for grading, draining and base course surf., 5.6 mi. on Herrick Lane rd., Albany County; by St. Hwy. Dept.

$492,003—**Taggart Construction Co.,** Box 560, Cody—Award for 5½ mi. of grading and surf., Hoback Canyon rt., Teton Natl. Forest; by BPR.

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Owner Ed Blood rebuilding teeth on 28" bucket auger with VICTORTUBE "Special" at Berkeley Bit Service, Berkeley, California. VICTORALLOY used on bucket wear pads (left).

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THIS HARDFACING ROD	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
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VICTORTUBE	Severe abrasion	Scarifier teeth, dredge c blades, posthole augers, oil tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel guides, cement chutes, s bearings, rolling mill guides
VICTORITE 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, guides, rocker arms
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimm dies; cams, hot punches, p shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick aug pug-mill knives, screw conve

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TTER CONCRETE SPECS

. . . Continued from page 64

ired properties, economy, and uni-
mity are to be attained. The use
vibration equipment has been a
at aid in the compaction of con-
te. Drier mixes can be placed by
use of vibration, and the use of
er mixes permits the attainment of
her strengths with the same ce-
nt content. The mix should not be
dry, however, that it cannot be
idled by mixing and conveying
ipment. Vibration is not, how-
r, the complete answer, and rod-
g and spading are still necessary at
nts where perfect handling is
uired.

Proper usage of vibrators is impor-
t and such practices as using them
transport concrete in the forms and
ving them too long in one place
ould be avoided. The vibrator
ould be inserted at intervals suffi-
nt to provide complete consolida-
n of all parts of the mass within
easonable distance from it. Care
ould be exercised not to over-vi-
ate the mixture. Ordinarily, ade-
ate vibration has been attained
en the mortar just begins to flush
the surface of the concrete adja-
nt to the vibrator. Vibration of
xes which are too wet, or over-
ration of those that are otherwise satisfactory, tends to cause segregation in the forms.

Proper formwork not only affects the appearance of the structure but also its quality. The surfaces of forms must be clean and sufficiently tight to prevent leakage of mortar and leakage of excessive amounts of water. Form surfaces should be suitably oiled. The use of good form materials and proper form construction and maintenance are important elements of field control.

Control is necessary with every operation involved in finishing surfaces. The methods and duration of floating and troweling must be strictly controlled in order that the quality of the surface is not impaired by overworking and by bringing excessive fines and water to the surface.

Proper hydration of cement particles to form hard and durable concrete requires that the concrete be properly cured. Within reasonable limits, most of the desirable properties of concrete are improved as the effectiveness and duration of the curing treatment are increased.

Considerable comment has been made regarding the workmanship now available for concrete work. It is true that since concrete is a man-made, job-controlled product, it is certainly influenced by the caliber of the workmen and the skill with which each of the operations for production, forming and placing is accomplished. Each operation must be accomplished well to provide a product pleasing in appearance and conforming to design.

The caliber of inspection has also been a matter of discussion. The inspection and control of the concrete must be accomplished by experienced personnel who can intelligently interpret the specifications and who have the authority to cope with on-the-job situations. The man in the field must have an understanding of the desired results and the methods for achieving them. This responsibility cannot be given the inexperienced.

Obviously unless the specifications are well written and unless they clearly set forth the characteristics of the concrete and the results desired in construction, it will not be possible for the inspector to exercise the proper control or for the contractor to produce the desired quality. A knowledge of the available materials and the ability to avoid ambiguous and confusing specifications is an absolute necessity. The use of "canned" specifications is one of the greatest failings of the specification writer. This practice may result in an entirely undesirable mix due to the difference in available materials and the characteristics of the structure.

The job of writing a specification for concrete is not an easy one, due to the very nature of concrete.

Columbia's flow cut to build McNary reservoir

HISTORIC landmarks and lowlands along the Columbia River disappeared under water late in April when stop-gates in the powerhouse penstocks were lowered to cut the river's flow to 60,000 cfs. (the minimum possible without interfering with power production at Bonneville Dam downstream) and build up the reservoir behind McNary Dam.

The giant structure, under construction since 1948 (*Western Construction*—April 1953, p. 66; January 1951, p. 100; October 1950, p. 75; May 1950, p. 90; September 1949, p. 65; August 1949, p. 95; April 1948, p. 104), entered its final phase with the formation of the reservoir pool, according to Col. F. S. Tandy, Corps of Engineers district engineer at Walla Walla.

The reservoir, which soon reached a height of 310 ft. above sea level, will be held at that height until behind-schedule work of clearing the basin and relocating highways and railroads is finished. The permanent level of 340 ft. will be reached in early August, Col. Tandy said. The lake will be 60 mi. long.

Pine Flat Dam to cost $9,000,000 less

ALTHOUGH proposed appropriations for Pine Flat Dam on the Kings River near Fresno, California, have been cut by more than half to the sum of $3,150,000, Charles L. Kaupke, Kings River watermaster, feels it will be adequate to complete the project.

Total cost for the finished project will be $42,000,000, about $9,000,000 less than previous estimates, he said.

Cascade highway progresses

POWDER BLASTS are holding up motorists these days at Snoqualmie Pass in the Cascade Mountains of Washington. The work is part of several separate contracts to four-lane 10 mi. of the cross-state Sunset Highway. K. L. Goulter Contractors holds an $827,780 award for the work from Olallie Creek to the summit. Farther west, Northwest Construction Co. is carving out a new two-lane highway for 3 mi. under a $739,250 contract.

UNIT BID PRICES

Selected abstracts for Western projects

Canal

35 miles of the East Low Canal

Washington—Columbia Basin Project—USBR. J. A. Terteling & Sons, Inc., Boise, Idaho, wa bidder with a total of $2,904,235 submitted before the Bureau of Reclamation for 35 mi. of the East Canal, earthwork and structures, and 5 mi. of the Scooteney Wasteway. The company submitted bid of $1,378,037 for Schedule 1 (East Low Canal, Station 2980+00 to Station 3492+19.84 and S 3479+81.90 to Station 4168+00), and $1,040,380 for Schedule 2 (East Low Canal, Station 3492+ to Station 3497+81.90 and Station 4168+00 to Station 4575+67). Morrison-Knudsen Co., Inc. low bidder for Schedule 3 (East Low Canal, Station 4575+67 to Station 4580+00 and Scoo Wasteway, Station 0+00 to Station 263+40). Unit bids were as follows:

	Schedule 1	Schedule 2	Schedule
(1) J. A. Terteling & Sons, Inc.	$1,378,325	$1,040,380	$485,52
(2) Morrison-Knudsen Co., Inc.	1,428,917	1,191,741	474,94
(3) Peter Kiewit Sons' Co.	1,525,515	1,356,439	602,09
(4) Mittry Constructors, Inc.	2,021,121	1,388,575	635,04
— Vinnell Co., Inc.	2,014,801	1,704,422	849,21
— Long Construction Co., Inc.	No bid	No bid	646,07
(5) Engineer's estimate	1,558,037	1,200,121	537,57

SCHEDULE 1	(1)	(2)	(3)	(4)	
2,496,600 cu. yd. excav., common, for canal	.14	.18	.145	.23	
20,000 cu. yd. excav., intermediate, for canal	.25	.18	1.03	.70	
419,000 cu. yd. excav., rock, for canal	1.05	1.17	1.03	1.25	
300,000 cu. yd. construction of core banks	.08	.06	.23	.30	
2,250 M. gal. water for core banks, first 2,250 M. gal.	4.60	3.00	6.00	12.00	
6,750 M. gal. water for core banks, over 2,250 M. gal.	3.80	2.50	4.85	10.00	
15,000 cu. yd. excav., common, for drainage channels and ditches	.16	.30	.60	.40	
43,300 cu. yd. construction of road embankments	.14	.06	.23	.40	
80,000 mi. cu. yd. overhaul	.48	.60	.60	.50	
91,200 cu. yd. compacting embankments	.37	.21	.75	.30	
18,630 cu. yd. excav., common, for structs.	.75	.40	.90	2.50	
50 cu yd. excav., rock, for structs.	2.65	3.00	5.00	15.00	
13,900 cu. yd. backfill about structs.	.45	.30	.70	.50	
6,900 cu. yd. compacting backfill about structs.	3.66	3.25	4.30	6.50	
2,275 cu. yd. one-course gravel road surfacing	2.20	7.00	5.50	6.50	
2,050 sq. yd. asphalt surfacing	2.09	1.50	1.25	1.10	
1,170 cu. yd. riprap	2.10	7.40	5.00	8.00	
460 cu. yd. gravel bedding for riprap	5.50	7.00	3.50	8.50	
2,060 cu. yd. concrete in structs.	45.00	47.00	65.00	80.00	
2,990 bbl. furnishing and handling cement	5.00	5.00	5.25	5.75	
196,000 lb. furn. and placing reinf. bars	.12	.11	.138	.14	
85 sq. ft. furn. and placing ½-in. elastic filler matl. in joints	2.25	2.00	2.00	2.00	
260 lin. ft. placing 9-in. rubber water stops in joints	1.00	1.00	2.00	3.00	
158 M.B.M. furn. and erecting untr. timber in structs.	290.00	260.00	300.00	225.00	2
116 M.B.M. furn. and erect. treated timber in structs.	280.00	270.00	310.00	350.00	3
130 lin. ft. furn. and laying 18-in. diam. corru.-met. pipe	5.10	5.00	5.00	7.00	
414 lin. ft. furn. and laying 24-in. diam. corru.-met. pipe	6.50	6.70	6.00	9.00	
778 lin. ft. furn. and laying 30-in. diam. corru.-met. pipe	8.25	8.50	7.50	12.00	
404 lin. ft. furn. and laying 36-in. diam. corru.-met. pipe	10.00	10.00	9.00	21.00	
144 lin. ft. furn. and laying 36-in. diam. extra-str. conc. culvert pipe	17.00	15.00	15.00	18.50	
164 lin. ft. furn. and laying 42-in. diam. extra-str. conc. culvert pipe	21.00	19.00	18.50	30.00	
613 lin. ft. furn. and laying 54-in. diam. extra-str. conc. culvert pipe	28.00	26.00	25.00	38.00	
106 lin. ft. furn. and laying 36-in. diam. extra-str. conc. culvert pipe with special reinf.	19.00	17.00	17.00	28.00	
42 lin. ft. furn. and laying 42-in. diam. extra-str. conc. culvert pipe with special reinf.	23.00	21.00	21.00	35.00	
218 lin. ft. furn. and laying 54-in. diam. extra-str. conc. culvert pipe with special reinf.	33.00	30.00	30.00	42.00	
130 sq. yd. membrane water-proofing of bridge abutments and wing walls	4.15	1.35	2.20	7.00	
120 sq. yd. exposed water-proofing of bridge piers and abutments	3.60	1.35	3.00	6.00	
450,000 lb. erecting struct'l steel for railroad bridges	.036	.05	.05	.06	
1,520 lin. ft. furnishing and driving timber piles	7.15	1.80	3.00	5.00	
450 lin. ft. furn. and installing wire-rope bridge railings	1.75	.50	.60	2.00	
Lump sum, furn. and installing radial gate and hoist for check at Station 3778+00	$15,900	$16,000	$14,600	$14,500	$1
2,500 lb. furn. and installing miscl. metalwork	.40	.30	.60	.55	

Continued on page 120

THE TRUE-LAY PAVING MACHINE

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TRUE-LAY 3-MEN 8-HOURS 40,000 SQ. FT.

CLAY SLURRY

. . . Continued from page 61

Three major pieces of equipment were used on the job for excavation of cutoff trench. One was a Manitowoc 4500 with a 120-ft. boom, and another was a Lima 1201 with a 90-ft. boom. Both these machines were used as draglines, with buckets of from 2½- to 5½-yd. capacity. The unique item was a Northwest 80 fitted with a specially constructed backhoe having a 40-ft. boom and 12-ft. bucket arm. This machine reached a depth of 38 ft. The use of draglines and a backhoe—particularly such a novel one—is worthy of exclamation.

This being one of the first projects of its kind, some new problems were encountered and were solved only by the cooperative efforts of the various principals. For example, previous cutoff trenches excavated by the Wyatt method were excavated with a ladder-type bucket-line machine. Here the presence of beds of boulders up to 4 ft. in diameter made dragline excavation more attractive. Experience on this job has suggested that the future selection of excavating tool will depend on many factors.

It was interesting to note at Kennewick that dragline followed the uneven surface of the bedrock satisfactorily, and in any event the slurry saturation on the bottom was thought to provide a safety factor of impermeability. The sedimentation of the banks of the Columbia is quite irregular and constant control was necessary to provide optimum combinations of constitution of slurry, depth of slurry in the cutoff trench, and working distance.

The dragline buckets were perforated to permit escape of excess slurry while hoisting. Whenever possible, the spoil was deposited in previously stockpiled select backfill material—to the extent that specified grain size classification would permit. This practice made maximum use of the slurry and added to the impervious quality of the backfill material. Additional quantities of colloidal solution were mixed with the backfill material before it was bulldozed into the completed cutoff trench.

Construction of the levees at Kennewick is being carried out under the jurisdiction of the Walla Walla District, Corps of Engineers, with George J. Schock as project engineer.

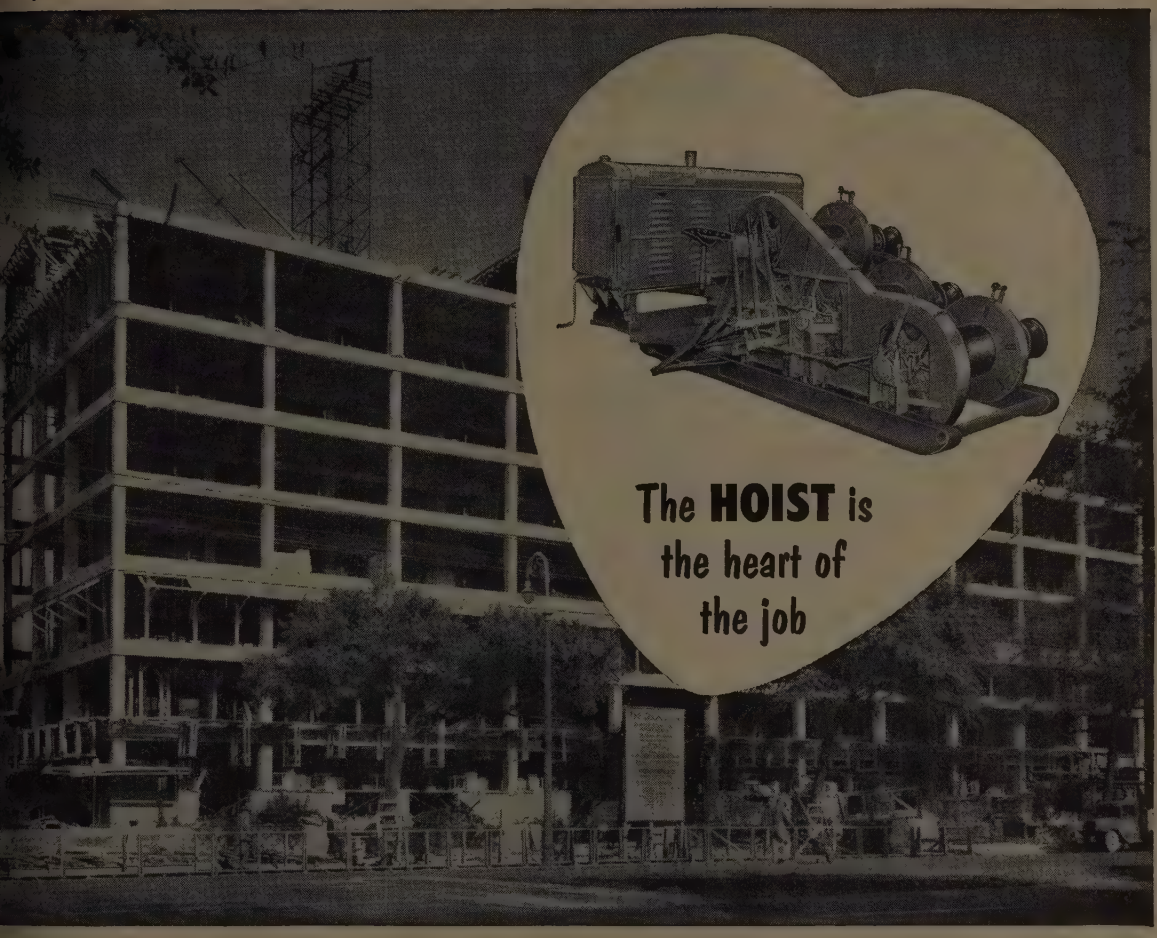
W. J. Darkenwald, vice president and general manager of D & H Construction Co., is the executive in charge for the joint venture. Thomas "Bud" Kelley is project manager, and George Renauld is superintendent. Arthur Gray is job engineer.

Slurry materials were furnished by Cronese Products, Inc., of Tarazana, Calif. Company representatives on the job were H. T. Wyatt, president of the firm, and Charles H. Toll, vice president.

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)
32	posts furn. and erecting conc. guard posts	17.00	12.00	13.00	25.00
220	lin. ft. furn. and installing elect. metal conduit ¾-in. and less in diam.	2.00	1.10	2.80	3.00
160	lin. ft. furn. and install. elect. metal conduit 1½ in. in diam.	2.10	3.00	2.80	4.00
30	lin. ft. furn. and install. elect. metal conduit, 2 and 2½ in. in diam.	4.50	21.00	5.60	6.00
300	lin. ft. furn. and applying plastic tape on buried conduit	.15	1.50	.20	2.00
110	lb. furn. and installing elect. conductors and grnd. wires	2.90	2.80	3.75	4.00
4	fixtures installing lighting fixtures	25.00	63.00	35.00	100.00
1	cabinet installing motor control cabinets	65.00	550.00	90.00	250.00
1,300	cu. yd. excav. cut-off trenches under embankments	.40	.30	.40	1.00
1,300	cu. yd. refilling and compacting cut-off trenches under embankments	1.00	.40	1.00	1.00
122,000	sq. yd. discing and rolling canal surface areas	.63	.06	.25	.75
	SCHEDULE 2				
823,700	cu. yd. excav., common, for canal	.14	.18	.125	.23
5,000	cu. yd. excav., intermediate, for canal	.25	.18	1.12	.70
15,000	cu. yd. excav., rock, for canal	1.05	1.17	1.12	2.00
26,000	cu. yd. construction of core banks	.08	.05	.23	.30
[illegible]00	M. gal. water for core banks, first 200 M. gal.	4.60	3.00	6.00	12.00
580	M. gal. water for core banks, over 200 M. gal.	3.80	2.50	4.85	10.00
15,000	cu. yd. excav., com., for drainage chan. and ditches	.16	.30	.60	.40
700	cu. yd. construction of road embankments	.14	.05	.23	.40
5,000	mi. cu. yd. overhaul	.48	.60	.60	.50
38,000	cu. yd. compacting embankments	.37	.20	.75	.30
84,900	cu. yd. excav., common, for structs.	.60	.40	.55	.60
32,500	cu. yd. excav., rock, for structs.	1.18	3.00	2.85	2.00
71,500	cu. yd. backfill about structs.	.34	.30	.70	.50
53,000	cu. yd. compacting backfill about structs.	2.20	3.25	2.20	2.00
85	cu. yd. one-course gravel road surfacing	2.20	7.00	5.50	6.50
235	cu. yd. riprap	2.10	7.40	5.00	8.00
100	cu. yd. gravel bedding for riprap	5.50	7.00	3.50	8.50
7,055	cu. yd. concrete in structs.	40.00	47.00	71.25	60.00
10,230	bbl. furnishing and handling cement	5.00	5.00	5.25	5.75
1,427,500	lb. furn. and placing reinf. bars	.12	.11	.124	.14
10	sq. ft. furn. and placing ½-in. elastic filler in joints	2.25	2.00	2.00	2.00
4,120	lin. ft. placing 9-in. rubber water stops in joints	1.00	1.00	1.50	3.00
47	M.B.M. furn. and erecting untr. timber in structs.	290.00	260.00	300.00	225.00
61	M.B.M. furn. and erecting tr. timber in structs.	280.00	270.00	310.00	250.00
262	lin. ft. furn. and laying 30-in. diam. corru.-metal pipe	8.25	8.50	7.50	12.00
216	lin. ft. furn. and laying 36-in. diam. corru.-metal pipe	10.00	10.00	9.00	21.00
178	lin. ft. furn. and laying 36-in. diam. extra-str. conc. culvert pipe	17.00	15.00	15.00	15.50
495	lin. ft. furn. and laying 42-in. diam. extra-str. conc. culvert pipe	21.00	19.00	18.50	30.00
42	lin. ft. furn. and laying 36-in. diam. extra-str. conc. culvert pipe with special reinf.	19.00	17.00	17.00	28.00
164	lin. ft. furn. and laying 42-in. diam. extra-str. conc. culvert pipe with special reinf.	23.00	21.00	21.00	35.00
Lump sum,	furn. and installing safety screens at Sta. 3493+19.84 Ah.	$1,100	600.00	700.00	$2,000
Lump sum,	furn. and installing safety screens at Sta. 4172+77.28	$1,100	560.00	650.00	$2,250
Lump sum,	furn. and installing safety screens at Sta. 4475+85.95	$1,070	525.00	625.00	$2,650
506	lin. ft. furn. and erecting chain-link fences	4.60	4.00	3.30	3.00
Lump sum,	furn. and installing radial gate and hoist for check at Sta. 3493+19.84	$11,700	$15,000	$11,500	$12,500
Lump sum,	furn. and installing radial gate and hoist for check at Sta. 4172+77.28	$11,700	$15,000	$11,500	$12,500
Lump sum,	furn. and installing radial gate and hoist for check at Sta. 4475+85.95	$11,700	$15,000	$11,500	$12,500
10,500	lb. furn. and installing miscl. metalwork	.36	.25	.60	.55
19,900	lb. furn. and installing blow-off valves and connections	1.25	.90	.80	1.00
400	lin. ft. furn. and installing elect. metal conduit ¾-in. and less in diam.	2.00	1.10	2.80	3.00
560	lin. ft. furn. and installing elect. metal conduit 1½ in. in diam.	2.10	3.00	2.80	4.00
130	lin. ft. furn. and installing elect. metal conduit 2 and 2½ in. in diam.	4.50	21.00	5.60	6.00
900	lin. ft. furn. and applying plastic tape on buried conduit	.15	1.50	.20	2.00
330	lb. furn. and installing elect. conductors and ground wires	2.90	2.80	3.75	4.00
9	fixtures installing lighting fixtures	25.00	60.00	35.00	100.00
3	cabinets installing motor control cabinets	65.00	550.00	90.00	250.00
8,700	cu. yd. excav. cut-off trenches under embankments	.40	.30	.40	1.00
8,700	cu. yd. refilling and compacting cut-off trenches under embankments	1.00	.40	1.00	1.00
8,000	sq. yd. discing and rolling canal surface areas	.63	.06	.25	1.50
	SCHEDULE 3				
450,900	cu. yd. excav., common, for canal and wasteway	.14	.18	.17	.23
200	cu. yd. excav., rock, for canal and wasteway	1.05	1.17	1.03	5.00
25,000	cu. yd. construction of core banks	.08	.05	.22	.30
190	M. gal. water for core banks, first 190 M. gal.	4.60	3.00	6.00	12.00
560	M. gal. water for core banks over 190 M. gal.	3.80	2.50	4.85	10.00
500	cu. yd. excav., common, for drainage channels and ditches	.16	.30	.55	.40
7,200	cu. yd. constr. of road embankments	.14	.05	.22	.40
4,000	mi. cu. yd. overhaul	.48	.60	.60	.50
500	cu. yd. compacting embankments	.37	.20	.70	1.00
84,000	cu. yd. excav., common, for structs.	.65	.40	.55	.80
50	cu. yd. excav., rock, for structs.	2.60	3.00	5.00	15.00
14,500	cu. yd. backfill about structs.	.50	.30	.81	.50
10,500	cu. yd. compacting backfill about structs.	2.20	3.25	3.85	4.50

Continued on page 122



our tower is a mighty important part of any uilding job . . . but how much is it worth until ie hoist puts some pull on the line, and materials egin to move?

Carpenters need a steady flow of lumber for rms. Concrete has to move as fast as it's called r. All along the line, you can save minutes iat are worth *big money* if you have speed, ccuracy and dependability in the hoist.

Well-organized jobs all over the world are kept on schedule by American Hoists. A typical example is the Georgian Apartments, shown above, where a 3-drum American Model 75 handled the loads with power and speed to spare.

Would you like that kind of safety at the heart of your job? Let your distributor help you select your new hoist from the broad and world-famous American line.

Colorado St. Bridge to be finished August 1

THE LARGEST contract ever let by the California Highway Department, the $6,000,000 Colorado St. Bridge in Pasadena, was scheduled for completion by August 1 by Guy F. Atkinson Co., the contractor (*Western Construction*—July 1952, p. 62).

Main deck of the bridge, which includes six traffic lanes and an 8-ft. center dividing strip, measures 152,000 sq. ft. It is 120 ft. high, 1,364 ft. long, and contains 35,000 cu. yd. of reinforced concrete. Some 2,700 tons of steel were used. There was no waste from the 420,000 cu. yd. of excavation. About 40% of the material was used at the bridge site and the remaining 60% was used as fill on the Figueroa dump, over which a freeway to the west will be built in the future.

Willow Creek Dam completed

WILLOW CREEK Dam and reservoir, one of the last structures on the $150,000,000 Colorado-Big Thompson reclamation project (*Western Construction*—November 1947, p. 75; September 1951, p. 61; October 1951, p. 142), was completed early in May.

The dam, an earth and rock-fill structure, is 140 ft. high and 1,000 ft. long. Its reservoir capacity is 9,000 ac. ft. Very little interference with stream flow was caused by the final closure, it was reported.

More money for Alaska?

INCREASE IN appropriations for Eklutna Hydroelectric project (*Western Construction*—June 1953, p. 47) from $20,000,000 to $35,000,000 and added money to rehabilitate the Portage-to-Seward section of the Alaska Railroad were sought from Congress by Ralph A. Tudor, Undersecretary of the Interior, upon his return from a recent trip to Alaska.

Keyhole Dam water is released

THE FIRST water to be released from Keyhole Dam on the Belle Fourche River in Wyoming rushed down the spillway at the rate of 200 cfs. on April 20 under the eyes of L. C. Bishop, state engineer, and Bureau of Reclamation officials.

Arizona housing job starts

FOUNDATION WORK has started on a 300-unit housing project in Phoenix, Ariz. The $1,664,000 contract is held by Farmer & Godfrey.

UNIT BID PRICES . . . CONTINUED

		(1)	(2)	(3)	(4)	(5
1,800	cu. yd. riprap	2.10	7.40	5.00	8.00	6.0
1,000	cu. yd. gravel bedding for riprap	5.50	7.00	3.50	8.50	5.0
340	sq. yd. 6-in. grouted paving	5.40	8.60	5.00	8.00	10.0
540	lin. ft. furn. and laying 6-in. diam. sewer or conc. pipe for drains	1.30	1.00	2.41	3.00	2.0
665	cu. yd. one-course gravel road surfacing	2.20	7.00	5.33	6.50	3.0
3,680	cu. yd. concrete in structs.	55.00	47.00	73.50	60.00	55.0
5,340	bbl. furnishing and handling cement	5.00	5.00	5.25	5.75	5.5
483,500	lb. furn. and placing reinf. bars	.12	.11	.132	.14	.
10	sq. ft. furn. and placing ½- and ¾-in. elastic filler matl. in joints	2.25	2.00	2.00	2.00	2.0
190	lin. ft. placing 9-in. rubber water stops in joints	1.00	.70	1.50	3.00	2.0
15	M.B.M. furn. and erecting untr. timber in structs.	290.00	260.00	300.00	225.00	275.0
13	M.B.M. furn. and erecting tr. timber in structs.	280.00	270.00	310.00	350.00	325.0
240	lin. ft. furn. and laying 30-in. diam. corrugated-metal pipe	8.25	8.50	7.50	12.00	9.5
1.3	mi. furn. and erecting type-B fences	$3,000	$2,600	$2,400	$1,850	$1,5
Lump sum,	furn. and install. 2 radial gates and hoists at Sta. 4576+10 for wasteway turnout	$12,000	$16,900	$14,650	$17,000	$12,5
1,000	lb. furn. and installing flap gates	.55	.55	.45	2.00	.
2,000	lb. furn. and install. miscl. metalwork	.48	.40	.60	.55	.
80	lin. ft. furn. and install. elect. metal conduit ¾-in. and less in diam.	2.00	1.10	2.80	3.00	1.0
80	lin. ft. furn. and install. elect. metal conduit 1½-in. in diam.	2.10	3.00	2.65	4.00	2.0
40	lin. ft. furn. and install. elect. metal conduit 2 and 2½ in. in diam.	4.50	21.00	5.40	6.00	2.
300	lin. ft. furn. and applying plastic tape on buried [illegible]	.15	1.50	.20	2.00	.
80	lb. furn. and install. elect. conductors and ground wires	2 90	2.80	3.85	4.00	2.0
3	fixtures installing lighting fixtures	25.00	60.00	35.00	100.00	20.0
1	cabinet installing motor control cabinet	65.00	550.00	90.00	250.00	200.0

Dam

Savage Rapids Dam rehabilitation

Oregon—Grants Pass Project—USBR. Young & Smith Construction Co., Salt Lake City, submitted a low bid of $243,854 before the Bureau of Reclamation for reconstruction and repairs at Savage Rapids Dam. Work is located near Grants Pass. Unit bids submitted were as follows:

(1)	Young & Smith Construction Co.	$243,854	
(2)	Inland Construction Co.	422,807	
(3)	C. J. Montag & Sons	425,615	
(4)	W. B. Willett and John C. Gist	486,140	
—	Le Boeuf-Dougherty Contracting Co., Erickson & Pierson, and F. S. Rolandi, Jr., Inc.	492,840	
—	Carl M. Halvorson, Inc.		$492,8
—	Dragline Rentals Co.		585,9
—	Hall-Atwater Co.		626,9
—	Scheumann & Johnson		775,7
(5)	Engineer's Estimate		315,2

		(1)	(2)	(3)	(4)	(5
Lump sum,	diversion and care of river during constr. and unwatering foundations	$50,000	$160,000	$95,000	$100,000	$80,0
0.2	acre clearing	$1,000	$2,000	$1,000	800.00	$1,0
600	cu. yd. excav., rock, for river channel and for river outlets foundation	10.00	17.00	20.00	70.00	8.
100	cu. yd. excav., common, for river channels and river outlets foundation	10.00	17.00	8.00	15.00	4.
90	cu. yd. excav., rock, for highway drain	10.00	17.00	20.00	48.00	7.
200	cu. yd. excav., common, for highway drain	10.00	5.00	8.00	8.00	2.
400	cu. yd. excav., all classes, for structs. and radial-gate control piping trench	5.00	5.00	15.00	14.00	5.
370	cu. yd. backfill	3.00	3.00	2.00	5.00	1.
320	cu. yd. compacting backfill	5.00	4.00	2.50	6.00	3.
40	cu. yd. furn. and placing sand or gravel bedding for highway drain pipe	5.00	5.00	10.00	15.00	5.
1,005	lin. ft. furn. and laying 15-in. diam. reinf.-conc. pipe for highway drain	4.00	4.00	4.00	8.00	6.
20	cu. yd. rock bedding	10.00	7.00	8.00	15.00	5.
310	cu. yd. concrete in dam	60.00	70.00	50.00	75.00	45.
500	cu. yd. concrete in river outlets	60.00	75.00	50.00	80.00	60.
190	cu. yd. conc. in overflow slabs and pier exten.	65.00	90.00	75.00	150.00	75.
500	cu. yd. conc. fill under spillway apron and tailrace wing wall	40.00	70.00	45.00	60.00	40.
320	cu. yd. conc. in miscl. structs.	65.00	75.00	50.00	100.00	65.
360	cu. yd. excav., mass conc.	20.00	17.00	25.00	92.00	30.
50	cu. yd. excav., reinf. conc.	30.00	25.00	35.00	175.00	50.
2,400	sq. ft. chipping and roughening conc. surfaces	.50	.40	.50	.50	.
45	holes drilling weep holes	10.00	2.00	3.00	4.00	6.
2,000	lin. ft. drilling holes for anchor bars and grouting bars in place	1.00	2.00	3.00	4.00	2.
100	lin. ft. drilling grout holes	5.00	2.00	2.00	4.00	3.
Lump sum,	drilling 6-in. diam. vent holes in piers	$1,500	350.00	300.00	500.00	250.
Lump sum,	removing exist. 16-in. diam. hwy. drain pipe	500.00	$1,000	$2,500	$1,500	$2,0
Lump sum,	removing exist. metalwork, gates, and facil.	$6,000	$10,000	$10,000	$15,000	$8,0
2,500	bbl. furn. and handling cement	6.00	6.00	5.00	6.00	5.
90,000	lb. furn. and placing reinf. bars and fabric	.14	.14	.15	.20	.
52,300	lb. installing radial gates	.10	.12	.15	.20	.
12,000	lb. installing radial-gate hoists	.10	.12	.15	.20	.
3,400	lb. installing control equip. for radia-gate hoists	.10	.40	.30	1.00	.
9,350	lb. installing miscl. pipe	.10	.50	.50	.60	.
169,300	lb. installing and storing stop logs, removable guides and struts	.03	.12	.10	.10	.
43,600	lb. installing fixed stop-log guides, hinge castings, and strut anchor plates	.10	.15	.15	.15	.
2,300	lb. installing miscl. metalwork	.10	.50	.50	.50	.
35,000	lb. installing cableway towers, anchorage and cableway	.10	.20	.20	.32	.
Lump sum,	constr. cableway-hoist house superstructure	$1,500	$2,500	$2,200	$2,500	$2,7
Lump sum,	installing elect. systems and furn. necessary matls. and equip. to complete same	$2,000	$1,000	$2,500	$2,500	$1,2

A TYPE OF SEAMAN MIXER FOR EVERY TYPE OF WORK

the SEAMAN SELF-PROPELLED TRAV-L-PLANT

The new Heavy Duty Self-Propelled TRAV-L-PLANT pumps 200 G.P.M. of bitumen or water. Tachometer indicates accurate travel in feet per minute; volumetric meter measures rate of flow and gallonage applied to meet changing application requirements in variable soils.

(Below) TRAV-L-PLANT applying 3.17 gal. per sq. yd. in one pass at 50 ft. per minute in sand-asphalt construction.

SEAMAN TRAV-L-PLANT mixing bituminous binder for expressway shoulder. All Seaman Mixers operate up to slab leaving no intervening unmixed material. Bitumen is mixed instantly and thoroughly because TRAV-L-PLANT spray bar applies binder directly into mixing chamber.

SEAMAN Self-Propelled MIXER follows asphalt distributor closely to prevent binder migration or surface run-off, important feature of all SEAMAN MIXERS is thorough blending of aggregates and fines to prevent aggregate segregation.

Send for Bulletin TPS completely illustrating SEAMAN TRAV-L-PLANT and SEAMAN Self-Propelled MIXER. Shows many field scenes. Gives complete specifications. Write today.

the SEAMAN SELF-PROPELLED PULVI-MIXER

The SEAMAN Self-Propelled PULVI-MIXER, like all SEAMAN MIXER models, leaves clean, sharp section-end in any type of stabilization. Turns around are quick because of short turning radius.

SEAMAN Deep Mix Motorized unit mixing for 18 inch (compacted) sand and rock dust base. Note high fluff behind the SEAMAN which indicates exceptional depth. In this case the SEAMAN mixed 30 inches of loose material. SEAMAN Deep Mix unit is recommended for sub-grade stabilization and fill processing. Mixes up to 800 cu. yds. per hour.

the SEAMAN DEEP-MIX PULVI-MIXER

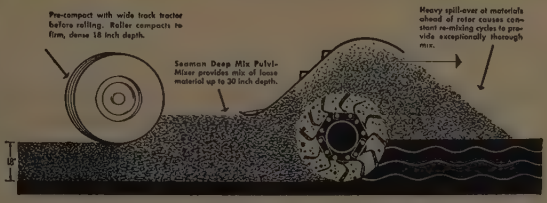


Diagram showing operating depths of SEAMAN Deep Mix unit and movement of materials in mixing chamber. Note heavy spillover ahead of rotor which produces constant re-mixing cycles as the SEAMAN moves ahead.

SEAMAN MOTORS Inc.

285 NO. 25TH STREET — MILWAUKEE 3, WISONSIN

Monterey Seabee reservists take "best" honors again

SEABEE RESERVISTS of Division 12-17 at Monterey, Calif., were picked as the best in the 12th Naval District for the second consecutive year. The men are all employed in some phase of construction work as civilians, and are Seabee veterans of World War II, with few exceptions. Comdr. Edward K. Neroda, a partner in Hugh Comstock Associates, architects and builders, is commanding officer.

From 12th Naval District Headquarters in San Francisco comes word that a drive is being held to recruit skilled civilians and Seabee veterans into the Seabee Reserve training program. Construction men in Northern California, Utah, and Nevada may be given rates up to and including chief petty officer, depending on the amount of construction experience they have. The type of training being given the Seabees these days was discussed in *Western Construction* for February 1953, p. 87.

Freak storm cuts power

PACIFIC GAS & Electric Co. crews worked all night near Fresno, Calif., to repair power lines and transformers that were knocked out by a freak lightning storm on May 31. A 50-ton transformer at the Pine Flat substation in the Sierra foothills blew out with a loud roar, and three smaller transformers at the Copper Mine substation north of Clovis burned out.

Several days previously, the company had announced that it was suspending cloud-seeding operations in the Sierra Nevada so summer vacationists would be bothered as little as possible by rain. There's probably a moral here some place if anyone wants to look for it.

Wyoming highway opens

U. S. HIGHWAY 14, which runs through the Big Horn Mountains near Sheridan, Wyo., was opened to traffic late in May after being blocked by snow all winter. Bill Ainsley, state highway department maintenance engineer, warned motorists to be careful, however, since snow continues to fall in the area.

New Colorado city planned

CONSTRUCTION of a new city with 20,000 residents is being planned for a site just north of Denver by the Victory Housing Corp. It will be complete with parks, schools, shopping centers, and 4,500 homes, and it represents a chance for city planners to avoid the congestion and poor layout found in the usual city of haphazard growth.

UNIT BID PRICES ... CONTINUED

Streets and Highways

Heavy grading and road-mixed surfacing on cement-treated base

California—Siskiyou County—State. A low bid of $335,605 was placed by Eaton & Smith, San Francisco, before the California Division of Highways for about 1.6 mi. of road construction in the vicinity of Forest Mountain Summit. Work includes grading and road-mixed surfacing on cement-treated base; 282,000 cu. yd. of excavation is involved. Unit bids submitted were as follows:

(1) Eaton & Smith $335,605
(2) Fredrickson & Watson Construction Co. 355,381
(3) Fredrickson Bros. 365,602
(4) Harms Bros. 377,342
(5) Paul E. McCollum $378,1
(6) Huntington Bros. 388,7
— M. W. Brown 392,3
— Natt McDougall Co. 436,8

		(1)	(2)	(3)	(4)	(5)	(6
26	acre clearing and grubbing	355.00	760.00	600.00	525.00	$1,000	$1,20
282,000	cu. yd. roadway excav.	.71	.714	.77	.82	.70	.7
1,150	cu. yd. structure excav.	6.00	5.00	4.50	4.25	3.50	3.0
450	cu. yd. ditch and channel excav.	4.00	3.00	3.00	3.65	3.00	3.0
3,580,000	sta. yd. overhaul	.004	.007	.01	.01	.01	.00
Lump	sum, dev. wat. sup. and furn. wat. equip.	$4,795	$3,000	$1,500	$2,000	$10,000	$4,00
550	M. gal. applying water	2.30	4.00	2.50	3.00	4.00	4.0
87	sta. finishing roadway	13.00	24.00	15.00	10.00	20.00	20.0
11,000	ton min. aggre. (C.T.B.)	1.85	2.60	2.00	2.00	2.50	3.0
1,400	bbl. portland cement (C.T.B.)	5.10	5.66	6.50	5.50	4.75	6.0
35,000	sq. yd. mix. and compact. (C.T.B.)	.18	.18	.16	.17	.22	.3
30	ton asph. emuls. (pt. bdr. and cur. sl.)	58.00	70.00	60.00	50.00	50.00	50.0
60	ton sand cover (cur. sl., pen. tr. and pr. ct.)	5.00	6.00	9.00	7.00	10.00	6.0
1,050	ton untr. rock surf.	3.25	3.00	3.50	3.00	2.90	3.0
7	ton liq. asph., SC-2 (pr. ct. and pen. tr.)	75.00	80.00	60.00	66.00	70.00	75.0
3,800	ton min. aggr. (R.M.S.)	4.25	2.75	2.30	2.90	3.50	3.0
228	ton liq. asph. MC-3 or MC-4 (R.M.S.)	39.00	40.00	40.00	35.00	37.00	35.0
34,000	sq. yd. mix. and compact. (R.M.S.)	.19	.12	.08	.12	.15	.1
200	sq. ft. placing R.M.S. (ditches and gutter lining)	.50	.20	.30	.85	2.00	.5
3,800	lin. ft. placing R.M.S. (dikes)	.25	.20	.22	.20	.50	.3
14	cu. yd. Class "A" P.C.C. (struct.)	105.00	130.00	100.00	110.00	100.00	100.0
39	ea. right-of-way mon.	8.00	7.00	10.00	8.00	20.00	15.0
14	ea. center line mon.	20.00	24.00	20.00	25.00	50.00	15.0
596	lin. ft. metal plate guard rail.	5.10	5.65	4.50	4.50	5.25	7.0
596	lin. ft. salv. exist. metal plate guard rail.	1.30	1.20	2.00	1.00	2.00	2.0
153	lin. ft. reconstr. salv. met. plate guard rail.	3.00	3.50	3.00	2.50	2.90	3.0
83	ea. culv. mkrs. and guide posts	7.00	7.00	8.00	9.00	7.50	8.0
30	lin. ft. 12-in. C.M.P. (16 ga.)	3.80	3.00	3.25	2.65	4.20	3.0
864	lin. ft. 18-in. C.M.P. (16 ga.)	4.10	4.00	4.30	3.85	4.70	5.0
640	lin. ft. 24-in. C.M.P. (14 ga.)	6.00	5.80	6.50	5.95	6.50	7.0
100	lin. ft. 24-in. C.M.P. (12 ga.)	9.00	7.40	8.00	8.25	7.00	7.0
286	lin. ft. 30-in. C.M.P. (12 ga.)	11.00	9.25	9.70	10.10	7.85	8.0
3	ea. 18-in. C.M.P. elbows (16 ga.)	20.00	23.00	30.00	37.25	50.00	20.0
1	ea. 18-in. x 12-in. C.M.P. taper (16 ga.)	50.00	35.00	30.00	40.70	50.00	20.0
606	lin. ft. 8-in. perforat. met. pipe underdrains (16 ga.)	2.80	2.00	2.60	1.75	2.75	2.5
90	cu. yd. filter material (underdrains)	26.00	8.88	6.00	8.50	6.00	7.0
5	ea. spillway assemb.	36.00	38.00	35.00	35.00	35.00	60.0
192	lin. ft. 8-in. C.M.P. down drains (16 ga.)	2.50	2.60	2.00	2.10	2.75	2.0
5	ea. 16-in. x 8-in. corru. met. tapered down drain inlets (16 ga.)	42.00	35.00	35.00	40.00	40.00	30.0
650	lb. bar reinf. steel	.23	.20	.25	.18	.25	.2

Grading, asphalt paving and oiling shoulders

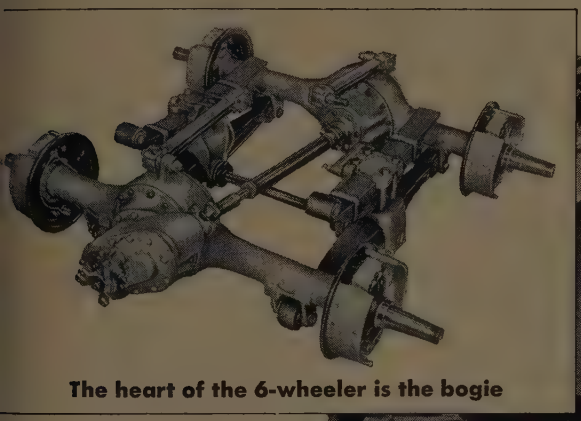
Oregon—Deschutes County—State. Rogers Construction Co., Portland, submitted a low bid of $756,471 before the Oregon State Highway Department for 12.09 mi. of grading, asphalt paving and oiling shoulders on the north unit, Bend-Lapine section of The Dalles-California highway. Unit bids submitted were as follows:

(1) Rogers Construction Co. $756,471
(2) J. N. Conley 774,228
(3) R. A. Heintz Construction Co. 776,618
(4) Babler Bros. 777,420
(5) J. W. Briggs 779,280
(6) C. R. O'Neil 833,375
— Porter W. Yett 847,283
— Fred H. Slate Co., Oregon Ltd. & E. C. Hall Co. 848,362
— Central Heating Co. and F. L. Somers $849,665
— Funderburk Construction Co., Harding Blasting Co. and Koppish Construction Co. 872,325
— Parker Schram Co. 887,716
— Peter Kiewit Sons' Co. 908,865
— McNutt Bros. 936,559
— Gibbons & Reed Co. 991,220

		(1)	(2)	(3)	(4)	(5)	(6)
Lump	sum, clearing and grubbing	$30,000	$49,000	$50,000	$40,000	$61,200	$78,000
120	cu. yd. structl. excav., unclassified	4.00	2.50	4.00	5.00	3.00	4.00
40	cu. yd. trench excav., unclassified	4.00	2.50	1.50	5.00	2.00	4.00
412,000	cu. yd. general excav., unclassified	.82	.85	.85	.78	.80	.83
1,240,000	yd. sta. short overhaul	.01	.01	.0125	.02	.01	.02
10,000	cu. yd. sta. long overhaul	.50	.40	.45	.50	.40	.70
12.09	mi. finishing roadbed and slopes	400.00	500.00	700.00	$1,000	$1,000	$1,200
37,000	lin. ft. rounding cutbanks	.15	.10	.15	.20	.15	.20
130	lin. ft. 12-in. conc. pipe	1.50	2.00	3.00	2.00	2.50	2.25
2,000	lin. ft. 18-in. conc. pipe	3.50	3.00	4.00	3.50	3.50	4.00
88,000	cu. yd. selected cinder topping	.30	.32	.35	.30	.50	.45
140,000	yd. mi. hauling cinder topping	.07	.085	.07	.10	.07	.12
21,800	cu. yd. 1-in. - 0 cinders in leveling course and shoulders	1.80	1.45	1.50	1.80	1.50	1.50
3,000	M. gal. sprinkling	2.50	2.00	2.50	3.00	2.50	3.00
1,800	cu. yd. 1-in. - 0 cinders in binder course	2.75	3.45	2.75	2.75	2.75	2.75
290	ton RC-3 asph. in binder course	42.00	44.00	40.00	42.00	40.00	40.00
25,000	ton asphaltic conc. mixture	4.40	4.15	4.00	4.40	4.00	4.00
3,400	ton 86-100 asphalt in mixture	32.00	32.00	31.00	32.00	31.00	31.00
1,300	cu. yd. aggre. in pavement seal coat	4.00	3.10	4.00	4.00	4.00	4.00
2,900	cu. yd. aggre. in Type 0-9 oil mat	3.00	3.45	3.25	3.00	3.25	3.25
190	ton furn. and placing 150-200 asph.	44.00	41.30	35.00	44.00	35.00	35.00
270	ton furn. and placing 200-300 asph.	44.00	41.30	35.00	44.00	35.00	35.00

Continued on page 126

INTERNATIONAL LEADS 6-WHEELER FIELD



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GVW ratings, 22,000 to 90,000 lbs. Engines from 130 to 356 horsepower. Choice of gasoline or LPG fuel systems. Diesel engines available for models with GVW ratings of 30,000 lbs. and over. Transmissions, axle ratios to meet any requirement. America's Most Complete Truck Line—168 basic models from ½-ton pickups to 90,000 lbs. GVW off-highway models.

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Better roads mean a better America

INTERNATIONAL TRUCKS

"Standard of the Highway"

Orange County builds new sewage system

LARGEST OF 10 work projects under construction for the Orange County, Calif., sanitation districts is a $2,047,809 job to lay 7,000 ft. of 78-in. reinforced concrete pipe in the Marine Section of the sewage system's Ocean Outfall. The job is being done by the Healy-Tibbitts Construction Co.

Plans for a $900,000 treatment plant, to handle some 20,000,000 gal. daily, were completed on June 1. It was expected that the contract would be awarded by July 1.

Truck highway opens

A NEW 3½-mi. highway, designed principally for the use of heavy gravel truck traffic, was opened for business in California's San Gabriel Valley early in May.

Called the River Grade Truck Highway, it is a four-lane, $420,000 stretch of road which is intended to take heavy truck traffic off the streets and highways of the heavily-populated Southern California area. It is expected to connect with the Ramona Freeway eventually.

Oregon dam fixed up

REPAIR of the cofferdam and replacement of a 50-ft. length of 42-in. pipe, which washed out at Savage Rapids Dam in southern Oregon, took place early in June.

Young and Smith Construction Co. holds the $245,915 contract (*Western Construction*—March 1953, p. 134).

N. Mex. gets road money

A BUDGET OF $32,165,000, probably the highest in the history of the New Mexico State Highway Commission, has been approved by the Commission for the next fiscal year. This includes $18,064,155 for new construction and $6,679,795 for maintenance, press reports said.

9 more mi. paved in Ariz.

NINE MORE miles of the Black Canyon Highway between Prescott and Phoenix, Ariz., were opened to traffic early in May after bituminous surfacing was applied to the road. About 22 mi. still remain to be paved.

Gals, bands open bridge

BATHING BEAUTIES, bands, and marching units made up the "Parade of Progress" which marked the opening of the new $1,836,000 Sunset Cliffs Blvd. Bridge at Ocean Beach, Calif., near San Diego on May 22.

UNIT BID PRICES . . . CONTINUED

2-inch road-mixed bituminous surfacing in Utah

Utah—San Juan County—State. L. T. Johnson Construction Co., Ogden, was low bidder wi $251,747 submitted before the State Road Commission of Utah for 11.574 mi. of a 2-in. road-mix bituminous surfaced road and one concrete bridge over a 20-ft. span. Work is located on the Blandin Devil's Canyon road. Unit bids submitted were as follows:

(1) L. T. Johnson Construction Co.....$251,747
(2) Young & Smith Construction Co..... 279,847
(3) W. W. Clyde & Co..... 303,023
(4) Reynolds Construction Co..... 313,479
(5) Thorn Construction Co., Inc.....$314,3.
— Strong Co..... 320,4
(6) Engineer's estimate..... 274,5

		(1)	(2)	(3)	(4)	(5)	(6
237,000	gal. bitum. matl., Type MC-3	.16	.16	.165	.155	.16	.
46,500	gal. bitum. matl., Type MC-1 or MC-2	.16	.16	.17	.16	.17	.
36,000	gal. bitum. matl., Type RC-4	.16	.18	.175	.16	.20	.
1,085	gal. bituminous additive	2.50	2.80	2.25	2.50	2.50	2.(
11.574	mi. scarifying and mixing	750.00	700.00	750.00	800.00	800.00	800.(
1,750	ton cover material, Type "A"	3.00	3.00	3.50	3.00	3.50	2.9
1,500	ton cover matl., Type "A" in stockpile	2.00	2.50	2.25	2.00	2.00	2.2
60,000	ton gravel surface, Type "B"	.72	.80	.96	1.00	.85	.7
12,000	ton gravel surface, Type "A" stockpiled	.55	.65	.65	1.00	.60	.7
1,500	ton gravel surface, ½-in. max., stockpiled	.75	.70	1.40	1.50	.90	.8
75,000	ton gravel base course	.60	.75	.91	.80	.80	.6
55,000	cu. yd. unclassified roadway excav.	.40	.55	.50	.72	.75	.7
50,000	sta. yd. Class "A" overhaul	.015	.02	.02	.02	.03	.0
2,000	yd. mi. Class "B" overhaul	.20	.20	.20	.15	.25	.2
2,170	1,000-gal. watering	1.75	2.00	1.25	2.00	1.50	1.5
300	hr. rolling, tamping roller	9.00	9.00	12.00	10.00	10.00	9.0
400	hr. rolling, pneumatic tire or power roller	6.00	9.00	7.00	10.00	8.00	6.0
184	lin. ft. 15-in. corrugated metal pipe	3.00	3.50	3.00	3.00	3.70	2.7
305	lin. ft. 18-in. corrugated metal pipe	4.00	3.80	3.75	3.50	4.40	3.2
754	lin. ft. 24-in. corrugated metal pipe	5.50	5.50	6.00	5.50	6.00	4.8
50	lin. ft. 30-in. corrugated metal pipe	7.50	7.00	7.00	7.00	8.00	6.1
108	lin. ft. 36-in. corrugated metal pipe	12.00	11.00	11.50	10.50	11.00	9.6
36	lin. ft. 60-in. corrugated metal pipe	25.00	25.00	27.00	27.00	28.00	22.0
132	lin. ft. corru. met. pipe-arches 29-in. x 18-in.	6.50	6.00	6.00	6.00	6.50	5.3
34	lin. ft. relaying 24-in. corru. metal pipe	2.50	2.00	2.00	2.00	3.00	1.0
7	cu. yd. concrete, Class "A"	75.00	150.00	80.00	75.00	90.00	100.0
675	lb. reinforcing steel	.15	.16	.16	.20	.16	.1
50	cu. yd. loose riprap	5.00	6.00	6.00	10.00	15.00	3.0
500	cu. yd. excav. for structs., unclass.	3.00	2.00	2.00	1.00	2.00	1.5
200	cu. yd. small ditch excavation	2.00	4.00	1.00	1.00	1.00	1.0
200	hr. mechanical tamping	5.00	6.00	6.00	5.00	5.00	4.0
7,550	lin. ft. right-of-way fence, Type "B"	.15	.37	.34	.25	.30	.3
4	ea. 10-ft. gates	25.00	35.00	35.00	25.00	30.00	30.0
4	ea. 14-ft. gates	35.00	40.00	40.00	35.00	35.00	35.0
156	ea. guide posts	6.50	6.00	7.00	8.00	7.00	6.0
114	right-of-way markers	6.00	7.00	7.00	7.00	7.00	5.5
2	ea. F.A.P. markers	25.00	10.00	40.00	25.00	25.00	25.0
Lump sum, furn. water equipment		$1,000	$1,000	$2,200	$1,000	$5,000	$1,50
Lump sum, furn. construction signs		$1,000	600.00	$1,000	$1,000	$1,000	$1,00
	34.5 ft. 0 to 0 (1) conc. bridge over 20-ft. span, Sta. 917+50						
30	cu. yd. excav. for structs. (unclassified)	5.00	4.00	4.00	6.00	10.00	10.0
349	cu. yd. concrete, Class "A"	75.00	62.00	70.00	75.00	85.00	75.0
58,200	lb. reinforcing steel	.135	.13	.15	.16	.15	.16
1	ea. removal of existing structures	500.00	$3,000	$1,000	$3,000	$5,000	$1,50

Heavy grading, draining and asphaltic concrete paving

Washington—Lewis County—State. On the basis of a low bid of $418,615 submitted by Fiorito Bros., Seattle, a contract was awarded by the Washington State Highway Commission for construction of 5.096 mi. on Primary State Highway No. 1. Work includes heavy grading, drainage structures and asphaltic concrete paving. Unit bids submitted were as follows:

(1) Fiorito Bros.....$418,615
(2) Peter Kiewit Sons' Co..... 452,175
(3) N. Fiorito Co..... 460,600
(4) C. J. Montag & Sons..... 470,653
(5) Goetz & Brennan..... 483,960
— J. N. Conley, F. C. Scott & R. A. Heintz Construction Co.....$490,596
— Erickson Paving Co..... 510,701
— Natt McDougall Co..... 543,292
— P. L. Saddler..... 558,424

		(1)	(2)	(3)	(4)	(5)
119.17	acres clearing	250.00	200.00	300.00	250.00	350.00
75.03	acres grubbing	250.00	365.00	285.00	540.00	350.00
561,190	cu. yd. common excav., incl. haul of 600 ft.	.28	.275	.29	.26	.32
9,690	cu. yd. common trench excav., incl. haul of 600 ft.	1.00	.85	1.00	1.75	.90
5,000	cu. yd. stripping, borrow and surfacing pit, incl. haul of 600 ft.	.01	.01	.30	.24	.001
369,850	cu. yd. stas. overhaul	.01	.015	.015	.01	.015
7,204.9	M. cu. yd. stas. overhaul	3.65	5.00	4.00	4.50	4.20
5,360	cu. yd. structure excav.	2.00	1.80	2.00	2.00	2.00
49	days smooth-wheeled power roller	35.00	50.00	50.00	50.00	56.00
151	days tamping roller	40.00	75.00	55.00	60.00	60.00
200	days pneumatic-tired roller	36.00	50.00	55.00	60.00	60.00
190	days mechanical tamper	40.00	50.00	20.00	40.00	40.00
31	days furn. and operating gangplow and tractor	35.00	80.00	55.00	55.00	66.00
30	days furn. and operating heavy duty power grader with scarifier	48.00	55.00	75.00	64.00	88.00
27	days furn. and operating heavy tandem disc and tractor	35.00	60.00	55.00	50.00	66.00
26	days furn. and operating pulverizer and tractor	48.00	60.00	75.00	60.00	70.00
29,000	lin. ft. slope treatment Class A	.14	.15	.15	.20	.15
6,980	lin. ft. slope treatment Class B	.14	.25	.15	.10	.15
379.3	stas. (100-ft.) finishing roadway	18.00	15.00	15.00	12.00	10.00
1,200	M. gal. water	2.50	2.00	2.00	2.00	2.40
1,280	cu. yd. gravel backfill for foundations	5.00	2.40	4.50	9.00	4.50
110	cu. yd. gravel backfill for drains	5.00	5.00	6.00	10.00	8.00
20,830	ton selected roadway borrow	.85	1.23	1.35	.90	1.00
5,840	ton cr. stone surf. top crse. in place from stockpile	.65	.45	.60	.75	.62
6,700	ton cr. stone surf. base crse. in place from stockpile	.65	.45	.60	.75	.62
	Type I-1 Asphaltic Concrete Pavement					
18	ton asphalt cement MC-3 prime coat	60.00	65.00	70.00	60.00	65.00
860	ton Class C wearing course	9.00	10.50	9.50	11.00	10.00
1,290	ton Class L leveling course	9.00	10.50	9.50	11.00	10.00

UNIT BID PRICES ... CONTINUED

Other Items					
167 cu. yd. concrete, Class A	52.00	63.00	55.00	65.00	65.00
17 cu. yd. concrete, Class C	85.00	85.00	80.00	90.00	75.00
23,400 lb. steel reinforcing bars	.12	.12	.12	.12	.13
471 lin. ft. pl. conc. or V.C. drain pipe 10-in. diam.	1.25	1.50	1.75	1.25	1.50
4,086 lin. ft. pl. conc. culv. pipe 12-in. diam.	1.75	1.75	1.90	1.75	1.50
78 lin. ft. pl. conc. culv. pipe 18-in. diam.	3.00	3.25	3.75	3.00	2.65
72 lin. ft. std. reinf. conc. culv. pipe 12-in. diam.	2.45	2.75	2.50	2.00	2.20
3,405 lin. ft. std. reinf. conc. culv. pipe 18-in. diam.	3.80	4.30	4.25	4.00	4.00
891 lin. ft. std. reinf. conc. culv. pipe 24-in. diam.	5.50	6.20	6.25	5.50	6.00
834 lin. ft. std. reinf. conc. culv. pipe 36-in. diam.	10.50	12.50	11.50	12.00	11.50
52 only catch basins	100.00	105.00	100.00	90.00	100.00
3,536 lin. ft. standard beam guard rail	3.00	3.00	3.50	3.00	3.30
100 lin. ft. temporary beam guard rail	2.00	3.00	3.00	3.00	3.30
122 only reinforced conc. right-of-way markers	6.00	6.00	7.00	5.00	5.50
40 only reinforced concrete spot posts	12.00	15.00	15.00	12.00	12.00
149 only removing cement conc. guard rail posts	1.00	2.00	1.50	1.50	1.00
4,100 sq. yd. removing cement conc. pavement	.50	.50	.65	1.00	.50

Bridge and Grade Separation

Reinforced concrete structures, grading and plant-mixed surfacing

California—Santa Barbara County—State. Fredrickson & Watson Construction Co., Oakland, submitted a low bid of $1,085,489 before the California Division of Highways for the construction of 7 reinforced concrete structures, plus the grading and surfacing with plant-mixed surfacing on U. R. B. of about 3.6 mi. of roadways, ramps and frontage roads. Work is located between 1 mi. east of Carpinteria and ½ mi. east of Arroyo Parida, and between Ortega Hill and Sheffield Drive. Unit bids submitted were as follows:

(1) Fredrickson & Watson Construction Co. $1,085,489
(2) Granite Construction Co. 1,109,095
(3) Clyde W. Wood & Sons, Inc. and Charles MacCloskey Co. 1,111,159
(4) J. A. Thompson & Son and W. F. Maxwell 1,114,645
(5) Gordon H. Ball & Son and Ramon Valley Land Co. 1,129,415

	(1)	(2)	(3)	(4)	(5)
62 cu. yd. removing concrete	6.00	5.00	15.00	10.00	10.00
188 sta. clearing and grubbing	250.00	80.00	133.00	220.00	300.00
340,000 cu. yd. roadway excav.	.44	.42	.48	.60	.516
12,300 cu. yd. struct. excav.	2.15	2.50	2.80	1.90	2.32
2,400 cu. yd. struct. excav. (bridges)	2.80	3.00	3.50	2.00	2.20
3,955 cu. yd. struct. backfill (bridges)	2.90	3.00	2.00	1.50	2.44
3,400 cu. yd. ditch and channel excav.	.75	1.00	1.50	1.70	1.20
15,000 sq. yd. compacting original ground	.04	.05	.05	.05	.14
23,000,000 sta. yd. overhaul	.004	.004	.004	.003	.004
6,800 ton imported subbase matl.	1.40	2.00	1.75	1.75	1 63
13,000 ton pervious subbase matl.	2.50	2.50	3.10	3.25	3.10
Lump sum, dev. wat. sup. and furn. wat. equip.	$17,600	$12,000	$20,000	$5,000	$5,000
20,000 M. gal applying water	1.10	1.35	1.00	1.50	1.46
188 sta. finishing roadway	48.75	25.00	20.00	20.00	14.00
7,300 ton U.R.B.	3.25	3.50	3.30	3.25	3.60
5 ton asph. emuls., high viscosity type (sl. ct.)	50.00	50.00	50.00	50.00	61.00
3 ton asph. emuls., mix. type (sl. ct.)	50.00	50.00	50.00	50.00	61.00
4 ton asph. emuls. (pt. bdr. & sl. ct.)	50.00	50.00	50.00	50.00	61.00
55 ton screenings (sl. ct.)	7.50	8.00	7.00	7.40	8.00
41 ton liquid asph., SC-2 (pr. ct.)	34.00	30.00	27.50	32.50	32.00
3,000 ton mineral aggre. (P.M.S.)	5.50	6.00	5.35	5.35	6.00
163 ton paving asph. (P.M.S.)	5.50	6.00	5.35	5.35	6.00
150 lin. ft. raised traffic bars	2.00	2.00	2.50	2.50	1.65
3,300 sq. ft. placing P.M.S. (ditches & slope drs.)	.21	.20	.20	.30	.22
700 lin. ft. placing P.M.S. (dikes)	.35	.30	.40	.33	.36
4,065 cu. yd. Class "A" P.C.C. (struct.)	55.25	60.00	54.00	50.00	53.37
2,570 lin. ft. conc. railing	7.00	8.00	7.00	8.00	7.32
255 lin. ft. rubber waterstops	2.40	2.00	2.50	2.00	3.00
20,320 lb. miscl. steel	.33	.35	.35	.30	.30
23,932 lin. ft. furnishing conc. piling	3.00	3.00	2.70	2.50	3.04
553 ea. driving piles	86.00	125.00	120.00	100.00	93.00
700 cu. yd. sacked conc. riprap	39.00	30.00	27.50	30.00	36.00
80 cu. yd. Class "A" P.C.C. (curbs, gutters & sidewalks)	44.00	40.00	50.00	45.00	49.00
180 ea. right-of-way monuments	5.00	6.00	8.00	7.00	9.00
760 lin. ft. metal plate guard rail	3.40	3.50	4.50	3.75	3.60
55 ea. guide posts and clearance makers	5.70	7.00	5.50	7.00	9.00
3 ea. horiz. reflect. units	8.00	6.00	15.00	8.50	12.00
1,500 lin. ft. 36-in. chain link fence	1.25	1.40	1.10	1.05	1.25
8,700 lin. ft. 48-in. chain link fence	1.40	1.60	1.35	1.25	1.46
0.6 mi. new property fence	$2,250	$2,500	$1,800	$2,400	$1,700
220 lin. ft. 12-in. R.C.P.	3.50	3.00	4.00	5.00	3.55
140 lin. ft. 15-in. R.C.P.	4.40	3.50	5.00	5.75	4.51
1,320 lin. ft. 18-in. R.C.P.	5.35	4.50	6.10	7.20	5.43
640 lin. ft. 21-in. R.C.P.	6.30	5.50	7.25	8.50	6.25
1,750 lin. ft. 24-in. R.C.P.	7.20	6.50	8.25	9.45	7.25
1,300 lin. ft. 27-in. R.C.P.	8.25	8.50	9.50	11.90	8.43
600 lin. ft. 30-in. R.C.P.	9.35	10.00	10.65	12.90	9.55
860 lin. ft. 36-in. R.C.P.	11.80	12.00	12.80	15.25	12.08
130 lin. ft. 42-in. R.C.P.	14.90	16.00	17.00	18.50	15.77
990 lin. ft. 48-in. R.C.P.	17.65	20.00	20.00	21.40	19.32
330 lin. ft. 8-in. C.M.P. (16 ga.)	2.00	2.00	2.00	2.05	1.98
850 lin. ft. 12-in. C.M.P. (16 ga.)	2.55	2.50	2.75	3.00	2.51
24 lin. ft. 18-in. C.M.P. (16 ga.)	3.40	4.00	3.60	4.00	3.91
90 lin. ft. 22-in. x 13-in. C.M.P. arch (16 ga.)	3.75	5.00	4.20	5.00	3.75
470 lin. ft. 29-in. x 18-in. C.M.P. arch (16 ga.)	5.65	6.50	5.65	6.90	5.70
440 lin. ft. 36-in. x 22-in. C.M.P. arch (14 ga.)	6.85	8.00	7.90	9.20	7.02
10,100 lin. ft. 8-in. perf. met. pipe underdrs. (16 ga.)	1.90	2.00	2.10	2.25	2.02
1,050 cu. yd. filter matl.	9.00	5.00	5.00	6.85	6.90
2 ea. spillway assemb.	32.00	35.00	30.00	35.00	35.63
42 lin. ft. 8-in. C.M.P. down drains (16 ga.)	2.90	2.50	2.00	2.55	2.57
654,000 lb. bar reinf. steel	.092	.10	.10	.098	.095
170 lin. ft. 4-in. welded steel pipe (16 ga.)	1.40	1.00	1.25	1.45	1.74

Continued on page 128

UNIT BID PRICES ... CONTINUED

	(1)	(2)	(3)	(4)	(5
275 lin. ft. 6-in. welded steel pipe (16 ga.)	1.75	2.00	1.80	1.75	2.
555 lin. ft. 8-in. welded steel pipe (16 ga.)	3.10	2.00	2.50	2.40	3.
720 lin. ft. 6-in. cast iron pipe	2.95	4.00	2.50	4.40	4.
100 lin. ft. 8-in. cast iron pipe	3.50	7.00	3.80	5.20	5.
570 lin. ft. 6-in. drain tile	1.00	1.00	.75	1.20	1.
13,000 ton sand cushion matl.	1.40	2.25	2.00	2.00	1.
Lump sum, rem. detour	850.00	700.00	500.00	$1,500	400.
Lump sum, lighting equip.	465.00	250.00	600.00	500.00	300.

Reconstructing a freeway overcrossing in Oregon

Oregon—Multnomah County—State. Low bidder on a project for reconstruction of the 102nd Av overcrossing on the T. H. Banfield Expressway in Portland was Donald M. Drake, who submitted a b of $188,223 before the Oregon State Highway Department. Unit bids submitted were as follows:

(1) Donald M. Drake $188,223
(2) C. J. Montag & Sons 197,529
(3) Schrader Construction Co. 198,649
(4) General Construction Co. 240,240
(5) Carl M. Halvorson, Inc. $246,87
(6) Lindstrom Bros. 254,2
— Guy F. Atkinson Co. 257,8

	(1)	(2)	(3)	(4)	(5)	(6
250 cu. yd. struct. excav., unclass.	4.00	3.00	3.00	4.00	3.50	3.0
10,000 cu. yd. gen. excav., unclass.	.75	.50	.90	.55	.75	.5
22 lin. ft. 8-in. sewer pipe	2.30	1.50	2.00	2.00	1.50	2.2
380 lin. ft. 12-in. sewer pipe	2.75	1.75	3.00	3.00	2.50	2.7
1 only Type "B" manhole	197.90	250.00	350.00	400.00	300.00	450.0
1 only conc. catch basin	88.75	75.00	125.00	100.00	125.00	100.0
Lump sum, removal of old bridge	$13,719	$29,732	$8,000	$30,000	$20,000	$46,00
1,800 cu. yd. excav. for structs.	3.00	2.50	6.00	7.00	3.50	6.0
20 cu. yd. excav. below elev. shown	20.00	5.00	10.00	20.00	15.00	15.0
1,700 cu. yd. Class "A" conc.	52.50	55.00	58.00	70.00	80.00	68.0
308,000 lb. metal reinf.	.095	.10	.105	.10	.11	.10
61,000 lb. structural carbon steel	.22	.1775	.21	.23	.23	.2
85,000 lb. structural low alloy steel	.22	.1775	.21	.23	.23	.2
408 lin. ft. pre-cast conc. rail	18.50	13.00	15.00	12.00	15.00	10.0
260 lin. ft. 6-in. metal drain pipe, coated	2.10	3.00	2.00	3.00	3.50	3.0

Miscellaneous

Three buildings and utilities at an Army air base

Washington—Larson Air Force Base—C. of E. Low bidder for construction of an officers' mess hal and two squadron operations buildings at Larson Air Force Base was L & S Construction Co., Inc. Moses Lake, who submitted a low bid of $232,454 before the Corps of Engineers. The work likewis was offered on two other schedules, and the same firm was low bidder on each. Also included are water sewer and steam lines, and an asphaltic concrete walk.

(1) L & S Construction Co., Inc. $232,454
(2) Gus J. Bouten Construction Co. 233,774
(3) Cisco Construction Co. $331,48

	(1)	(2)	(3)
2 ea. headquarters and operations bldg.	$79,349	$79,936	$115,28
1 ea. officers' mess building	$65,948	$66,674	$92,43
100 lin. ft. water line, 2-in.	5.00	5.00	3.16
100 lin. ft. water line, 2½-in.	6.62	6.00	3.5
500 lin. ft. sewer line, 6-in.	4.57	4.10	4.6
1 ea. manhole	308.00	270.00	513.00
70 lin. ft. steam line, incl. 2-in. steam line, 1-in. condensate return line and appurtenances	13.29	12.00	7.3
130 lin. ft. steam line, incl. 2½-in. steam line, 1¼-in. condensate return line and appurtenances	14.70	14.00	7.00
130 sq. yd. asphaltic conc. walk	2.85	2.60	10.00
1 ea. fire hydrant	452.00	460.00	$1,828
Lump sum, final connection and testing of heating system (all bldgs.)	390.00	350.00	347.00

Metal cribbing and miscellaneous road work in Wyoming

Wyoming—Fremont County—State. Taggart Construction Co., Cody, was awarded a contract by the Wyoming Highway Department on the basis of a low bid of $189,375 for construction of metal cribbing and miscellaneous work on 0.678 mi. of the Shoshoni-Riverton road. Unit bids submitted were as follows:

(1) Taggart Construction Co. $189,375
(2) Knisely-Moore Co. 193,685
(3) Charles M. Smith 198,275
(4) Big Horn Construction Co. 199,650
(5) Read Construction Co. 205,500
— Heald & Christler, Inc. 224,400
— Ready Construction Co. 229,060
— Yellowstone Construction Co. $233,966
— Boatright-Smith 234,690
— Woodward Construction Co. 245,750
— W. E. Barling, Inc. 247,250
— Platte Valley Construction Co. 258,500
(6) Engineer's estimate 172,100

	(1)	(2)	(3)	(4)	(5)	(6)
50 hr. bulldozer operation	13.50	16.50	17.50	15.00	14.00	20.00
8,000 cu. yd. structure excav.	1.50	.50	2.25	1.00	1.50	3.50
11,000 special backfill	1.50	1.00	1.10	1.00	1.40	2.00
42,000 sq. ft. metal cribbing	3.70	4.13	3.85	4.15	4.10	2.75
800 hr. mechanical tamping	6.00	5.50	7.00	7.00	6.50	7.00

Cleaning and painting a steel bridge

California—Mendocino County—State. Acme Maintenance Engineering Co., Montebello, has submitted a low bid of $72,865 before the California Division of Highways for cleaning and painting an existing steel bridge crossing Noyo River about 1 mile south of Fort Bragg. Unit bids submitted were as follows:

(1) Acme Maintenance Engineering Co. ... $72,865
(2) D. Zelinsky & Sons 78,626
(3) Klass Bros. 79,320
(4) R. W. Reade & Co. $84,205
(5) J. S. Morris Co. 91,880

	(1)	(2)	(3)	(4)	(5)
Cleaning steel bridge	$28,475	$33,000	$36,130	$46,497	$52,360
Painting steel bridge	$44,390	$45,626	$43,190	$37,708	$39,520

NEW LITERATURE

701

Adams TraveLoader catalog offered

A brilliantly-colored, 8-page catalog issued by **J. D. Adams Manufacturing Co.** describes its All-Purpose TraveLoader. Action pictures show the machine at work on various types of windrow and stockpile loading, including picking up surplus material on ditch-cleaning, road reclamation jobs, and snow loading. More photographs plus diagrams point out the TraveLoader's important features and show you how they operate. A full page presents complete specifications.

702

Covers Gar Wood dump truck hoists and bodies

The top features of its heavy-duty line of dump truck hoists and bodies are given a brief but thorough resume in a new 4-page catalog (No. HB 302) published by **Gar Wood Industries, Inc.** Illustrations and explanatory captions point out the salient features of the exclusive cam and roller hoist, which reduces damaging stress to both the truck chassis and the body by exerting a more vertical lifting force when dumping. Also shows Gar Wood hydraulic system, and heavy-duty bodies with full-width rear apron and rear corner posts welded into an integral unit.

703

Pipe and pipe fabrication

Here is a useful booklet made available to you by **L. B. Foster Co.**, pipe manufacturer. Beginning with descriptive data telling about the firm's line of pipe and pipe fabrication facilities for structural uses, including portable docks, sewer inlets, portable scaffolding, and hand railing, the bulletin devotes the balance of its pages to tables giving data and description, wall thickness, weight, etc., covering all schedule pipe from Schedule 20 through Schedule 160 standard, extra-strong, and double extra-heavy pipe, spiralweld pipe, large O.D. pipe, pipe in all wall thicknesses, line pipe, electric-weld tubing, welding fittings and flanges, oil well casing, and water well casing. Also lists specifications for American Petroleum Institute and American Society for Testing Materials.

704

Drum transfer pump handbook

"Do It with Fast-Flo" is a complete catalog of specifications and applications of this new air-operated drum transfer pump, which handles extra-heavy greases and pastes as well as less viscous substances. Colorful drawings illustrate its manifold uses. Also contains performance graph for reading output or delivery of Graco Fast-Flo pump for fluids or pastes of various viscosity. Readings can be taken in either No. 4 Ford cup seconds or Saybolt seconds universal. The 24-page catalog is offered by **Gray Co., Inc.**

705

On fuel filtration

Anyone who operates a machine using a gaseous fuel is aware of the importance of clean, fresh gas, and thus he should be interested in this illustrated bulletin offered by **Winslow Engineering Co.**, manufacturer of filters for crude and residual fuels, diesel, gasoline and other refined fuels, natural gas, sewage gas, and

ther gaseous fuels. Descriptive text ells exactly why filteration is impor- ant for efficient operation.

706

ynnco Powerhouse info.

"Lynnco Powerhouse" is a brief rochure describing the low-cost gas- line engine electric generator plant f the same name. Seven sound rea- ons are presented for the case of this ew product by **Lynn Engineering & upply Co.** Specifications are treated detail. Also presented is a resume f the many uses to which the plant an be applied.

707

The Surveyor's Notebook —Series Two is issued

Publication of "The Survey- or's Notebook" in 1952 was so successful that W. & L. E. Gur- ley, long-time manufacturer of engineering and scientific in- struments, has issued Series Two, another collection of short articles on unusual surveying problems and their solutions. What makes the "notebook" most interesting is the fact that the stories and surveying tips report actual experiences which are narrated by the surveyors themselves. Anecdotes are va- ried. For example, one covers experiences in surveying the Antarctic; another, methods for eliminating errors in precise alignments; a third discusses how to cut down weather prob- lems in the field; a fourth pre- sents recommendations on the use of the gradienter. And so on. Certain examples from the wealth of timely information are sure to be applicable to some problem on your job. Just fill in coupon for your free copy.

708

're-fab canal lining n 12 pages

This 12-page, 2-color brochure oesn't cover the mere physical fea- ures of asbestos pre-fab canal liner, ut **Johns-Manville,** publisher and anufacturer, includes on-the-spot hotographs which show you how to ne laterals and small ditches easily nd economically. Diagrams point ut the advantages of using this new roduct, which was developed in co- peration with irrigation engineers. llustrations and charts are clearly nd attractively presented.

709

All about Dorr clarifiers

Sanitary engineers shouldn't miss his handsome bulletin (No. 6192) ointing out the advantages of Dorr larifiers for water, sewage, and in- ustrial waste treatment. The 24-

page treatment covers the complete line of clarifier mechanisms for round or square tanks by means of descriptive text, detailed drawings, and photographs. Also includes data from numerous installations which provide an accurate picture of the performance and maintenance to be expected from the units. Sludge handling equipment is briefly described in the final section of the bulletin, which is offered by **The Dorr Company, Engineers.**

710

Catalog and price list

Everything you want to know about the products available from **Hensley Equipment Co.** is contained in this 15-page illustrated booklet (HC-52). Photographs and diagrams are provided in the section on mold board rippers for dozers and scrapers. Other sections treat the manufacturer's miscellaneous repair parts and end bits for tractors, dozers, and motor graders, and the D-8 heavy-duty center-thrust rollers and roller parts.

711

Specs for iron-body, bronze-mounted gate valves

An authoritative and detailed treatment of recommended specifications for iron-body, bronze-mounted gate valves should be of interest to engineers. Includes general specifications; detailed specifications of double disc, inside screw gate valves, solid wedge inside screw gate valves, and outside screw and yoke valves; manual, hydraulic, and electric operation of gate valves; operation from above the valve; recommendations, and material specifications. This helpful information is available from **Chapman Valve Manufacturing Co.**

712

Tournatractor bulletin

Bulletin TD-216, a 28-page booklet in color describing the Tournatractor, a high-speed, electric control, rubber-tired tractor available with 10 interchangeable attachments, has just been issued by **R. G. LeTourneau, Inc.** Action shots and cut-out photos of integral ports of the machine illustrate the bulletin. Also, photographs and diagrams show its fingertip electric control system, instant shift transmission and torque converter, and big tire features.

713

Angle measuring instrument described

A brief bulletin describing Stewart's Electric Level, a new type of electronic angle-measuring instrument for use on graders and other road machinery, has been published recently. Descriptive photographs illustrate the two component parts of the useful instrument, and a diagram shows how it can be easily installed. The information is published by **Electro-Level Corp.**

714

What's this?—a *salt* road!

There are more uses for salt than a place on the kitchen table, so says **Morton Salt Co.**, which recently published an interesting brochure on the subject of salt-stabilized roads. Briefly, the reader is informed that a salt-stabilized gravel road is one that is well held together, tough, and dependable. It is made by mixing salt (at the rate of about 4 tons per mi.) with the aggregate, wetting it, rolling it, and letting it dry. Salt stabilization, once an ancient practice, more or less passed out of existence until recent times. Morton Salt Co. will make you interested in trying this new-old kind of road.

715

Soil conditioners for erosion control

Two interesting new booklets are devoted to the subject of Bondite soil conditioners for erosion control. One, 5 pages long, completely describes the soil conditioner, covering methods of application, preparation of the solutions, and includes a table of recommended solution concentrations for the product. The other bulletin de-

scribes a mobile spray unit which has been developed by the manufacturer and used successfully to apply the soil conditioner. Both booklets are published by **Monsanto Chemical Co., Organics Chemicals Div.**

716

On concrete curing compounds

Servicised Products Corp. recently published a nicely-illustrated, 2-color brochure describing its line of membrane forming concrete curing compounds. Each of the four basic types is covered—pigmented, clear, separation, and black.

717

Bulletin on diesel engines

Printed in 2 colors, this is a 6-page bulletin covering horizontal and vertical models of both the 600 and 680 cu. in. Fageol-Leyland Diesel Engines. The publisher, **Twin Coach Co.**, has liberally illustrated Bulletin L-6841 with photographs, cutaway and section views, horsepower and torque curves, dimensional drawings, and condensed specifications.

718

Weed burners and flame throwers described

A small folder describes Ker-O-Kil weed burners, disinfecting torches, and flame throwers. Just a glance will answer your questions in regard to the many applications which are possible by using these machines. Also lists specifications for the No. 25 Special and the No. 44 All-Purpose models. Published by **Ker-O-Kil Manufacturing Co.**

Literature briefs . . .

719

SHOVELOADER—Two-color literature is offered about the construction and industrial uses of the Shoveloader by **Baker-Lull Manufacturing Co.** Includes illustrations of applications and attachments for the front end loader, lists specifications of the equipment, and describes performance characteristics.

720

HYDRAULIC END LOADER — Galion Allsteel Body Co. is offering this bulletin descriptive of its LOADevators, hydraulic end-loaders. Outstanding feature is brief specification chart which permits user to select exact model best suited to his needs.

721

DIESEL ENGINES—Diesel engines as the foundations of such construction equipment as shovels, ditchers, compressors, and crushers are discussed in the new **Caterpillar Tractor Co.** booklet, "Power for Construction." It has pictures of construction equipment powered by Cat diesel engines, there is a chart giving horsepower and kw. ratings of Cat engines and electric sets, and the back cover lists manufacturers whose products can be fitted with Cat engines.

722

SCAFFOLDING — A new folder showing how modern scaffolding is used to speed and simplify construction operations and increase safety has been published by **The Patent Scaffolding Co., Inc.** It describes the scaffolding and shows its use with photos which can provide cost-cutting ideas for contractors and subcontractors.

723

STEEL ELECTRODES—A 20-page color catalog describing the complete line of Arcaloy stainless steel electrodes is offered by **Alloy Rods Co.** Provides individual descriptions of the 23 regular and special analyses of electrodes, weld metal properties, welding procedures, electrode analysis and color charts, current ranges, and A.I.S.I. type numbers.

724

HARD HAT—Details about Shockgard are contained in a new bulletin, No. 0601-1, published by **Mine Safety Appliances Co.** It's a one-piece molded plastic shell which will protect the wearer against electrical shock and extreme temperature ranges.

725

TIMBER BRIDGES — An attractively illustrated 8-page catalog for everyone interested in timber bridge structures is available from **Timber Structures, Inc.** Gives pertinent engineering information, including diagrams, on standard types of modern timber bridges.

726

HYSTER IN THE OIL INDUSTRY—This is a 4-page brochure illustrating **Hyster Co.'s** materials-handling equipment operating in oil fields, bulk stations and refineries.

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NEW EQUIPMENT

More information on any o the items in this section ma be obtained by using coupo on page 133.

727

Manufacturer improves Triplex backfill tamper line

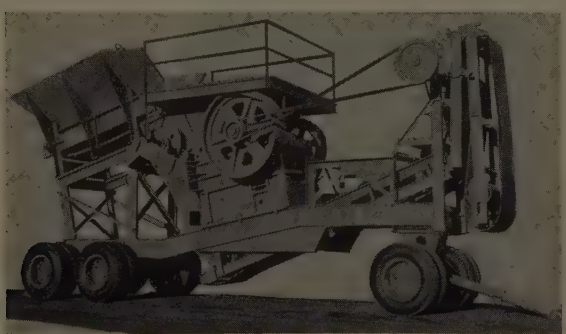
The Standard Triplex backfill tamper line manufactured by **Gunderson-Taylor Machinery Co.**, has been augmented by the new Super Triplex (Model GT-RV-4). The

firm lists a number of distinct improvements which make it superior to the standard model, particularly for tamping backfill under severe conditions. Among those improvements are: a 20 to 40% faster speed; 40% heavier impact and more vibration to soil being compacted, and 40% more power. The effective compaction area of the Super Triplex is 90 to 100 sq. in., compacting to the same density as the standard model, with substantially higher lifts. It is claimed to save 75% on contractors' backfilling costs. All of the advantages offered by the Super Triplex are listed at only a 12% price increase.

728

Cedarapids AAA-GR crusher redesigned

A vibrating grizzly which acts as a by-pass for materials under crushing size is the leading feature of Cedarapids Model AAA-GR portable primary crushing unit, made by **Iowa Manufacturing Co.** The machine's new design reduces the load on the crusher and insures larger crushing space, higher capacity, and lower maintenance, according to manufacturer. Equipped with positive circle-throw action, the vibrating grizzly is reported to eliminate dirt and fines from materials before they reach the crushing chamber. Material passing through the grizzly bars drops into the by-pass chute and discharges onto the under-crusher conveyor which carries it to the next crushing unit. As a result, the crusher is especially effective for obtaining peak production in gravel and quarry operations where a high percent of the raw material is



below the 2½ in. to 6 in. range of size, depending upon the finished product size desired. The vibrating grizzly also keeps wet or sticky material from passing to the crushing chamber. Model AAA-GR is equipped with a 22- x 36-in. Cedarapids roller bearing jaw crusher or a 25 x 40-in. jaw crusher. Also includes a heavy-duty apron feeder, with 7- x 4-ft. hopper, and a channel-type clutch-controlled, 30-in. x 28-ft. delivery conveyor with a 10-ft. discharge clearance, all mounted on a semi-trailer, pneumatic-tired truck with tandem rear axle.

729

Try to match the features of this two-drum sheepsfoot roller . . .

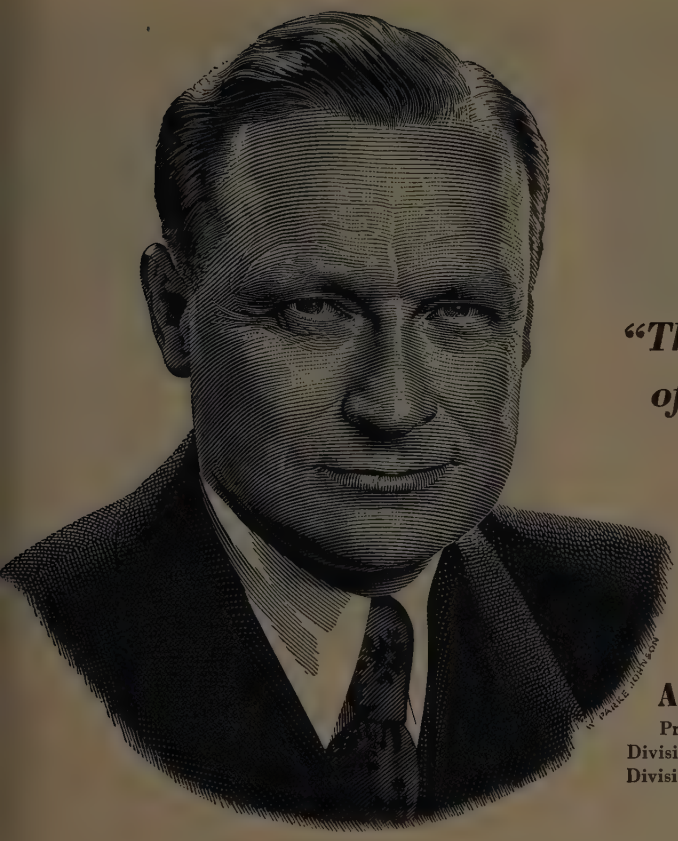
A 2-drum sheepsfoot roller now in production has good features which should be of interest to contractors. Transportation problems are alleviated because it can be easily

disassembled into its various parts. All feet are hardfaced on tips and down the face. Bearings on this 5-ft. diameter roller are double-roller, heavy-duty, dust and water proof, and the axles can be easily withdrawn. All structural members are boxed. When loaded with water, the roller exerts 558-lb. per sq. in. ground pressure. Manufacturer is **Utah Sprocket & Machinery Co., Inc.**

730

Mack introduces new line of trucks

Newly engineered from tail light to front bumper is Series B, a brand new line of Mack trucks. The line includes both trucks and tractors in 4- and 6-wheel types, covering a range from 17,000-lb. gvw. through 70,000 lb. gcw., with power supplied by either gasoline or diesel engines. The most modern operating requirements are taken care of by the engineering and design; for instance, highest payload capacity, both of volume and weight, has been achieved by a reduction in chassis weight through new and more compact design. The sturdy frames are made from lighter steel alloys than previously, and axle banjos, transmission cases, and wheels all embody similar weight-reducing construction. The operator benefits from the design features which make service and routine maintenance easier. There is more working space actually avail-



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- The Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C., will gladly help your company with suggestions, posters, envelope stuffers and other aids.

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able around the engine despite its compact design. The cab likewise features advanced design, stressing driver comfort, safety, and durability. These and other features highlight the new Series B, manufactured by **Mack Trucks, Inc.**

731

Offset boom attachment—added Gradall equipment

An offset boom attachment is now offered as a standard accessory for the Gradall, multi-purpose earthmover and construction machine. The attachment is designed to permit straight-line operations when trench centerlines are offset from the machine. Available in 3- or 4-ft. sizes, it is advantageous for work beside a roadway, as illustrated, or whenever the work line lies very close to trees or other obstacles which would prevent straddle digging. It is easily attached by clamping the shaft in the usual boom hinges and bolting the two top straps to the boom.

The main boom tool-actuating cylinder may be transferred to the offset, or an integrally-mounted cylinder may be obtained, with the accessory requiring only the transfer of hose connections. Tool mounting on the offset boom, the same as on the main boom, is quickly achieved. Manufacturer is **Warner & Swasey Co.**

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732

New all-purpose coating cuts rust and corrosion

The various corrosive agencies—salt air, alternate wet and dry exposure, and chemical fumes—are said to be effectively reduced by use of Exitrust, an all-purpose rust inhibitive and corrosion resistant coating. It can be applied easily over damp or dry surfaces which needn't first be cleaned. Useful for buildings and equipment which are subject to severe atmospheric conditions, Exitrust is available in various colors from **Casey & Case Coating Co.**

733

Special shear available for cutting steel rods

A special shear, consisting of a movable blade and fixed shearing die, has been developed as a fast, easy, and accurate means for cutting various kinds and sizes of steel rods. The blade is moved by a geared 48-in. lever. The tool, No. 400 Rod Cutter, will handle any type of mild steel rods from ⅛- to ¾-in diameter. Weighing 42 lb., it may be mounted on a bench or on the floor. Manufacturer is **Whitney Metal Tool Co.**

734

Little discs ideal for bonding plaster to concrete

Little rubber discs 2 in. in diameter and ⅜ in. thick are an ingenious device for bonding plaster to concrete. The picture shows two of the discs nailed to a sample wooden form with an ordinary roofing nail. Concrete was poured over the form and, when it hardened and was pulled off bringing the discs with it, two undercut

niches were left in the concrete face. Such niches become a multiple anchorage for binding plaster to concrete without the use of wood lath, metal lath, or roughening. Re-usable, they are manufactured by **Buffalo Products, Inc.**

735

Thermal circuit breaker new feature on Comet saws

New feature of Comet power saws is a thermal circuit breaker which replaces the old-style overload fuses. By thus eliminating the necessity of carrying spare fuses, the circuit breaker makes it impossible to damage the motor by over-fusing or

short-circuiting the fuse. Just throw the conveniently located switch for complete protection on either 110 or 220 volts. Manufacturer is **Consolidated Machinery & Supply Co., Ltd.**

736

Transvar 266 controls dusting concrete floors

Expressly designed to aid in the control of dusting concrete floors, Transvar 266, a product of **United Laboratories, Inc.,** is claimed to have shown remarkable results in binding together tiny dust particles, which are actually a part of the concrete surface. The new product, a thin liquid, may be applied by brush or mop to both newly-laid and old concrete surfaces as well as wooden floors.

737

Special ripper devised for Cat dozer blades

The Preco Dozer-Ripper is a new 650-lb. unit which clamps to the front of Caterpillar 8S and 7S bulldozers. According to the manufacturer, the new type ripper has proved quite effective for confined dozing under extremely tough conditions, for pioneering, for steep downhill dozing, for bank sloping, and for breaking black-top and light concrete. It can be adjusted to rip to depths of 22, 15, or 8 in., or it can be fully retracted

when not in use. Both replaceable tooth and shank are made of heat-treated chrome molybdenum steel. Either one or two of them can be used on the same blade. Manufacturer is **Preco Incorporated.**

738

Improved Uni-Form panel on the market

Wartime economy cut out the steel supply which would have placed the new improved Uni-Form panel on the market some years ago. Several innovations provide additional structural rigidity to the portion of the frame which acts as a plywood protector. They are a special rolled tee angle with an equal legged tee strut. The added protection to corners and edges of the plywood increases its life, assuring greater re-usage and lower maintenance costs. Milled tie slots assure tighter forming and minimize concrete seepage, and two-point contact of panel frames insures tight closure at wall face. The new product

is claimed to combine the strength of steel forms while retaining the desired nailing surfaces of wooden forms. Manufacturer is **Universal Form Clamp Co.**

739

Heavy-duty cabs mfgd. for Cat HT4 Traxcavator

The Crenlo Cab is an all-steel, arc-welded unit designed especially for installation on the Caterpillar HT4 Traxcavator tractor. Design allows for easy access to controls and maximum visibility. All normal types of allied equipment can be used without modification. The cab's dimensions are: height, 56 in.; width, 52½ in.; length, 44¾ in.; door opening, 25 in. wide by 48 in. high. Shipping weight is approximately 700 lb. Manufacturer is **Crenlo, Inc.**

740

New power take-off available

Model HUD, available in coupling sizes 21 in. and 27 in., is **Twin Disc Clutch Co.'s** answer for bringing more effective hydraulic linkage to heavy-duty applications requiring quick, positive disconnection of power source from driven equipment. The power take-off can handle 60 to 600 hp. engines of any type. It is hydraulically controlled by the new Disconnecting PTO, which is said to reduce impact shocks at least 70% through the energy-absorption ability of the fluid circuit.

741

Special outrigger available for Model B Hydra-Lift

Model B Hydra-Lift, a truck-mounted crane with loadline capacity of 6,400 lb. and power-swinging boom which telescopes from 12 to 22 ft., now can be made more easily maneuverable by using a hydraulically-operated outrigger available as optional equipment. The operator needs only to manipulate controls at his regular operating station in order to raise and lower the outrigger legs. Thus such jobs as stringing pipe, pulling paving forms, and unloading materials at various points on the job, are speeded up. Easy to operate, the manufacturer claims the hydraulic outriggers constitute an important safety feature because operators needn't try to get by on "border-line" loads without first putting outriggers down. Also, if the truck on which the Hydra-Lift is mounted is on uneven

ground, the operator can use the outrigger to level the truck before picking up a load. Arrow in picture points to hydraulic cylinder which raises and lowers outrigger leg of the truck-mounted crane. Manufacturer is **Pitman Manufacturing Co.**

742

Automatic steering unit has 1- to 2-ton load capacity

A new 1¾-in. square-beam front automotive steering unit with a load capacity of 2,000 to 4,000 lb. is now on

e market. The unit features ground
ng and center pins with increased
earing length on steering knuckle of
e king pins to provide better fit,
nger service, and maximum road-
ility at reduced costs. Known as
eries 1A1 of the Caravan axle line,
e units are recommended for such
plications as transporting genera-
rs, air compressors, welding equip-
ent, pumps, tar kettles, concrete
ixers, steam cleaners, utility poles,
ld service equipment, fire fighting
paratus, and horizontal or vertical
rilling equipment. Manufacturer is
nited Manufacturing Co.

743

pecial kit offered y drill manufacturer

All that's needed for drilling jobs is ontained in this Model 114 Shop Kit, anufactured by **Porter-Cable Ma-hine Co.** The rig consists of a steel arrying case containing Model 107 lectric drill, a set of 13 high-speed wist drills for wood or metal, a hori-ontal drill stand which converts the rill into a stationary bench grinder, 4-in. wire wheel brush for removing ust, crackled paint, and other matter, 3-in. buffing wheel with stick of ouge for polishing metals, and a 3-in. rinding wheel for contact grinding nd implement sharpening.

744

lew type road disc available

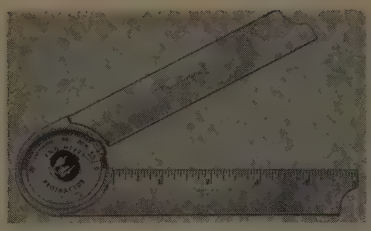
Shav-O-Disc is a new type road isc which can be mounted on the carifier controls of all makes and nodels of motor graders. Claimed to lo a complete job on black top roads, he 1,740-lb. disc is built in two op-osed sections which take out the side hrust. It operates under full weight

f motor grader, cutting out furrows o a width of 64 in. Individual hard-aced cleaners keep road oil from acking between the discs. All parts re replaceable from standard stocks. Manufacturer is **T & M Manufac-uring Co.**

745

Adjustable protractor dubbed 'miniature drafting machine"

A "miniature drafting machine" is what the manufacturer calls the Trac-ograph, a new adjustable engineer's rotractor. Simply by swinging the pper rule arm to the desired angle nd lock adjustment knob, any num-



ber of angles up to 180 deg. can be drawn instantly — without turning, sliding, or moving the protractor out of position. Made from clear plastic, it is 2 in. wide and 7 in. long when set at zero. Manufacturer is **Way-Mac Manufacturing Co.**

746

Plastic pipe developed for gas service lines

Two new types of plastic pipe for the installation of new gas service lines and the replacement of old corroded metallic ones recently have been developed. Both types are claimed to bring notable advantages to the gas industry. These include guaranteed corrosion resistance, greater carrying capacity, elimination of interior build-up, light weight (only ⅛th that of steel pipe), rapid and easy handling, faster connection, elimination of electrolysis, and strength and durability. Both types permit fast, low-cost installation. Type GR is furnished in 20-ft. sections which easily can be cut to desired lengths. Type GF is supplied in lengths up to 250 ft. and can be pulled through old corroded lines. Manufacturer is **Carlon Products Corp.**

747

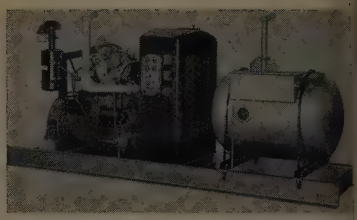
Improved radial arm machine is in production

Developed to replace the manufacturer's previous model, Model GA radial arm machine is now in production. Principal changes are a radial arm which is 1½ in. longer and a roller head carriage supporting the overhead cutting member. The carriage now rides on eight bearings as compared to only four in the earlier model (GR). An increased accuracy of cut is reported to result from the added surface contact of the four extra bearings. Manufacturer is **DeWalt Inc.**

748

Reo Motors, Inc., enters industrial engine field

The completion of design work on a series of spark ignition industrial engine models for use with gasoline, natural gas fuel, liquefied petroleum gas, or dual fuel carburetion marks the entry of **Reo Motors, Inc.**, into the industrial engine field. The line embraces 6-cylinder, 4-stroke cycle engines of 292- or 331-cu. in. displace-



ments, or twin 6-cylinder 331-cu. in units. Maximum basic engine output for these units at 2,500 rpm. is 10 120, and 240 hp., respectively. Optional and accessory equipment is available to tailor an engine to the particular requirements of a customer. Included are a variable speed mechanical governor; direct drive power take-off; instrument panel with warning light to indicate when oil filter is required, and heavy-duty and normal-duty air cleaners.

749

Standardized oil-applied clutch developed

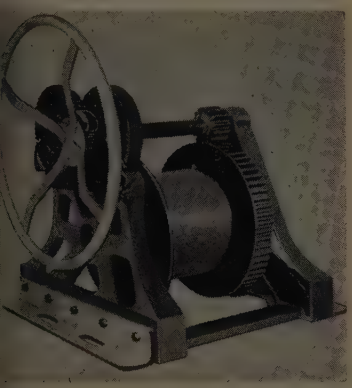
An oil-actuated multiple-plate clutch recently developed by **Twin Disc Clutch Co.** is reported to be the first standardized oil-applied clutch for general industrial use. According to the manufacturer, its most obvious advantage is that no adjustment is required to compensate for friction plate wear, because the floating or

ssure plate is the ram of the cylin-. As the plate stack wears, the n travel increases automatically. nother advantage of the no-adjust-nt feature is that with constant que capacity assured, it is often ssible to use a smaller clutch. Avail-le in Model MOS (single) and OD (duplex), the clutch is also aptable to remote control and has ng wear life.

750

versible hand winch is safety features

A 15-ton heavy-duty reversible hand nch was recently designed so that e operator always is able to stand the safest or most convenient side. wo optional drum diameters of 10 d 14 in. provide for varying cable quirements. Three speeds with pat-



ted instant gear change give speed power when needed. All gearing is ear the top of the winch, providing very low drum center which adds to e machine's strength, while at the me time giving ample clearance for ther hand wheel or crank. Claimed withstand a 100% overload, factory ipment is available in one week om manufacturer, Beebe Bros.

751

urex electrodes are ow packaged in cans

Whenever you buy Murex stainless eel electrodes, manufactured by letal & Thermit Corp., you'll be get-ng them in hermetically sealed tin ns. Most obvious advantage of this ousing is the immunization to at-ospheric moisture changes. The ns lend themselves easily to storage ecause they insure factory fresh ma-rial. Special construction furnishes xtra protection during shipping.

752

uller is introducing new lting concrete mixer

The new Muller 6-S tilting concrete ixer recently introduced by **Muller** achinery Co., Inc., has a capacity of cu. ft. of loose materials or 6 cu. ft. mixed concrete. The leak-proof and nbreakable drum is of welded steel construction. Timken bearings are installed on the spindle as well as in the countershaft bearings. The mixer is equipped with a quick-starting Briggs & Stratton air-cooled gasoline engine and pneumatic tires for quick towing and easy placement on the job.

753

Special valve controls air flow

Whenever it is necessary to control the flow of air or to provide split-second timing of piston movement by positive air-flow control, a recently-developed special speed control valve can be used. It can be mounted in any position between the operating valve and one or both ends of a cylinder to provide easily-adjustable control of air exhaust. It is small, light-weight, and durable. Available with ¼-, ⅜-, ½-, ¾-, 1-, and 1¼-in. IPT. Manufactured by **Ross Operating Valve Co.**

754

Glass fiber mat is tough, waterproof

A glass fiber mat coated with waterproofed asphalt is suitable for a variety of uses, including as covering and weather sealing for above-ground insulated pipes and exposed ducts, and as lining for irrigation ditches, laterals, canals, and small reservoirs. The reinforced glass fiber gives the material added strength and tear and punc-

ture resistance. Easily installed and easily cut, the material is available in two thicknesses. Manufacturer is **Glass Fibers, Inc.**

755

Special Globe-Seal hose lines

The new Aeroquip Globe-Seal hose lines have been made exclusively for connecting to the Ermeto and Feru-

lok type of flareless tube systems. The hose-fitting nipple mates directly with Ermeto or Ferulok tube connectors without need for ferrules or inserts. Simply designed, the unit consists only of the standard Aeroquip hose socket and the new nipple. Manufacturer is **Aeroquip Corp.**

756

Process for vulcanizing rubber to crawler pads

The problem of moving pavers over finished concrete is taken care of by a new process for vulcanizing rubber to steel plates which are bolted to crawler pads. Use of the rubber pads eliminates labor costs necessary to relay belting and it also speeds up paving operations. The B. F. Goodrich Vulcalock Bonding Process is used by the manufacturer, **Metalweld, Inc.**

757

New portable Porter-Cable generator available

Available in 2 models, a new lightweight gasoline-driven generator is now available to serve as an independent power supply for the manufacturer's line of 30 different portable electric tools wherever necessary at unwired building sites and remote construction projects. The generators also can be used as a mobile power source for flood lighting by public utility crews or as a standby emergency power plant. Model 119 is a 1,500-watt DC unit supplying 115 volts at 13 amp.; Model 118 is similar to 119 except that it provides AC. The former weighs 75 lb.; the latter 135 lb. Manufacturer is **Porter-Cable Machine Co.**

758

Match this wheel chock . . .

An alloy steel wheel chock, which retracts away from the wheel, regardless of how tightly the tire wedges against it, recently has been announced. Easily operated, the

chock makes backward movement retraction; thus it is claimed th no amount of wedging action can a fect its retraction in removal. A pos tive safety feature prevents prem ture retraction. Designated the Ca teel Retractable Wheel Chock, man facturer is **Calumet Steel Castin Corp.**

759

Portable angle iron cutter recently developed

A new guillotine angle iron cutt has recently been developed. Accor ing to the manufacturer, it cuts wit a straight, clean shear and causes n deformation of the angle iron en It does not need to be bolted dow or otherwise mounted for operatio

s available in electric models or in table models with hand-pump hydulic action for use in field erection rk. Adaptations of these units are o available for cutting special ipes such as channel or H-beam. nufacturer is Manco Manufactur- Co.

760

ppin excavator re-designed

Re-engineering of the Pippin excator has made it a heavier machine, th power of its bucket increased 0% through hydraulics and lever- e. The excavator is rigidly supted by its two hydraulic stabiliz- s, which relieve the tractor of work-

g stresses and assure digging of umb ditches on uneven ground or n slopes up to 15 deg. Greater hyaulic tank capacity provides better l cooling under extreme working nditions. Designated Deluxe Model F-104, it attaches to light tractors, cavates more than 10 ft. deep, and ill lift up to 12 ft. for truck loading. has a 16-ft. reach behind the tracr and a wider side swing of 12½ ft. om center. Manufacturer is Pippin nstruction Equipment, Inc.

761

ecial guards obtainable r Remington stud driver

A complete line of special-purpose ards are now obtainable for the wder-actuated Model 450 Reming- n stud driver. Conforming to the ape of the prefabricated sections, e guards are designed for instant choring of special sections or fixes to steel or concrete. Various ards are available for special secns but all of the special guards are d to be instantly interchangeable h the standard guard furnished h the stud driver. Manufacturer is mington Arms Co., Inc.

762

xiliary transmission useful heavy-duty trucks

new four-speed auxiliary transsion for heavy-duty truck operan recently has been announced. auxiliary, Model 6041, is reported e particularly useful because of combination of low-underdrive or eak-away-gear" (2.14 to 1) with three progressive ratios of 1.24 to

1 (medium), 1 to 1 (direct), and 186 to 1 (overdrive). The gearing facilitates on- and off-highway maneuvering of heavy-tonnage loads of all types and also the in- and out-maneuvering in ordinary highway traffic. Manufactured by **H. S. Watson Co.**

763

Hydraulic power tailgate is improved

There are several important engineering improvements in the Hydrogate, a hydraulic power tailgate for trucks manufactured by **Marion Metal Products Co.** One, a double locking device; another, the full coordination of locking and lifting controls so that the operator does not need to dismount in order to unlock the gate; the third, the sealing around the main lift cylinder head, piston rod, and closing cylinders has been improved. The hydraulically-operated Hydrogate is a complete unit ready for easy mounting on any truck. It acts as a freight elevator (capacity 2,000 lb.), and as a safe, locking tailgate.

764

Carbide-tipped drill makes boring an easy job

Because of a tip of tungsten carbide, the hardest of man-made metals, boring holes in concrete, brick, plaster and other materials is claimed to be a simple, quick operation with the use of a new self-cleaning drill. The newly-designed spiral flute automatically lifts dust out of the hole as it rotates, thus eliminating clogging and stalling. Available in a wide range of sizes from 3/16 in. up. Manufacturer is **Carboloy Dept., General Electric Co.**

765

Chrome-plated sawblade is semi-self-sharpening

All of the filing and sharpening that makes sawblades wear out is remedied by a special kind of factory filing and a unique application of very hard chrome plating which makes a new saw blade, the Sabre, a semi-

self-sharpening attachment for the Wright pneumatic saw. The Sabre tends to sharpen itself as the saw blade steel wears away under the chrome cutting edge. Moreover, the manufacturer claims, when refiling finally is necessary, no special saw-filing skill is required. The blade needn't be separated nor are the raker advance or bevel angles to watch; you simply file straight across the front face of the teeth. Other advantages listed are: light weight, faster cutting ability, and a design for ripping and angled cuts, as well as cross-cutting, enabling it to make circular cuts in a radius as small as 12 in. Designated Model AKSC, it will be standard with all Wright pneumatic saws. Manufacturer is **Wright Power Saw & Tool Corp.**

766

Powerful generator a boon to large-scale arc welding jobs

A new heavy-duty diesel engine generator, which provides for the simultaneous operation of a bank of seven welders, has been designed to improve the efficiency of large-scale arc welding operations. Claimed to maintain welding efficiency at far greater distances than gas-driven

welders do, it was built specifically for erectors of large-capacity storage tanks for fuels and liquids. However, the 100-kw. unit can be used for other steel work whenever multiple welders are required—such as for bridge building and salvaging operations. It can also power a 50-hp. electric air compressor and a drop-cord line for operation of power tools and emergency lighting. A further advantage stated is portability of the rectifier which eliminates the need for elevation of the power source. Designated Model RD24A12, the manufacturer is **Ready-Power Co.**

767

T-302 transmission improves torque converter performance

Model T-302 is a new oil-actuated two-speed transmission which is engineered to obtain improved performance in torque converter installations by providing a dual range of converter operation. It also is said to offer greater shifting ease because of its hydraulically-actuated multiple-disc clutches providing the selection of three operating positions. Compact and rugged, it is easily installed and simply maintained. Two ratio spreads are available: direct drive and 2.69:1 reduction, or direct drive and 3.07:1 reduction ratio. Manufacturer is **Twin Disc Clutch Co., Hydraulic Div.**

EWS of DISTRIBUTORS AND FACTORY BRANCHES

restressed concrete plugged

Truscon Steel Co., a division of Republic Steel Corp., has been marketing Stressteel concrete reinforcing ars and has joined in the promotion prestressed concrete as a major advance in the field of concrete construction, according to C. B. McGee, general manager of sales. Truscon will act as an agent for Steel Corp.

at man goes to Spokane

James E. Curfman, an earthmoving engineer for Caterpillar Tractor Co., has been transferred to Spokane, Wash., from Dallas, Tex. He will work with distributors in Washington, Oregon, Idaho, Western Montana, British Columbia, and Alaska.

ima names California rep.

McGaraghan Supply Co., of Eureka, Calif., has been appointed distributor of Lima power shovels, cranes, draglines, and pull shovels in Humboldt, Del Norte, Mendocino, and western Trinity counties in California.

New Hough rep.

Kenneth B. Larkin, formerly with the Nelson Equipment Co. in Oregon and Washington, has been named district representative in the territory covering Washington, Oregon, Idaho, Montana, British Columbia, Alberta, and Saskatchewan by the Frank G. Hough Co., manufacturers of Payloader tractors and tractor-shovels.

Wick is Seattle AED prexy

L. E. Wick, vice president and general sales manager of A. H. Cox & Co., was elected president of the Associated Equipment Distributors of Seattle, succeeding Elmer Schoen. Other new officers, elected at the May meeting, are Conrad Creim, vice president, and John P. Studebaker, secretary-treasurer.

Price to sell wire rope

Charles F. B. Price, Jr., wire rope engineer at the Pittsburg, Calif., plant of Columbia-Geneva Steel Division, United States Steel Corp., since 1947, has been appointed sales engineer for wire rope products of the division. He will be responsible for furnishing technical assistance to all district sales offices and customers.

Thermit Corp. expands

Two announcements by Edward E. Anderson, district manager of Metal & Thermit Corp.'s Western Division, marked expansion of the firm's activities in the West. Fred Joyce, Jr., has been named district sales engineer for the Pacific Coast territory. He will handle all welding division lines, operating out of the South San Francisco office. In the company's Southern California branch, new and larger offices were opened at 923 East Third St., Los Angeles. C. W. Humphreys, sales engineer of the welding division, is in charge. He will cover the Southern California-Arizona area.

MODERN MACHINERY CO., Inc.'s Seattle branch has moved to a remodeled shop and office building, 220 ft. long by 60 ft. wide, at 4975 Third Ave. S. Plenty of storage and parking area is provided on the 1-ac. site. The building features spacious display bays, lots of natural light, and a mezzanine area for conference rooms and storage space. The firm handles a complete line of heavy construction equipment. *S. T. Wyndham* is branch manager, *Bob Shulz* is office manager, *Bob Anderson* is parts manager, and *Lee Davidson* is in charge of the service department.

Foster opens West Coast office

L. B. Foster Co., one of the nation's largest suppliers of pipe, steel sheet piling, and tubing, has opened a new office at Suite 606, 3460 Wilshire Blvd., Los Angeles 5, Calif., to serve the West Coast. It will be headed by

***Henry E. Fleishman*, head of Los Angeles office, L. B. Foster Co.**

Henry E. Fleishman, vice president of the company and general manager of the Chicago office for almost 20 yr. States to be served include Arizona, Utah, Nevada, Oregon, Washington, Idaho, Montana, Wyoming, and California.

Air Reduction expands

Air Reduction Pacific Co. is adding about 5,000 sq. ft. to its present building in Seattle to make more room for order and storage space. Work was expected to be finished by July 1.

New Stockton distributor

Equipment Sales & Service Co. has opened an office and shop at 821 So. Wilson Way, Stockton, Calif. Allen McCasland is manager, Durward Spencer is in charge of diesel engine sales, Chet Bolay is in charge of the shop, and Ray Hanson heads the parts department. Lines represented include J. I. Case, Chrysler Engine Division, GMC diesel engines, and Kohler Co. The firm serves San Joaquin, Calaveras, Tuolumne, and Stanislaus counties.

Riddell rep. in Washington

Western Tractor & Equipment Co. has been named representative for the state of Washington by The W. A. Riddell Corp. Western has branch offices in Chehalis, Tacoma, Hoquiam, and Everett, with the main office at Seattle. Riddell manufactures Warco 4D-100 and 4D-85 road graders.

A-C pumps in Alaska

Yukon Equipment, Inc. has been appointed exclusive distributor for the pump division of Allis-Chalmers Manufacturing Co. in the Territory of Alaska, according to Stan Tatom, Yukon's president. Yukon now handles all of the A-C products—some 1,600 items.

Wickham Purchasing Service

The Donald Wickham Purchasing Service, Inc., has been organized in Portland, at 4135 N. W. St. Helens Rd., to facilitate customer buying of heavy construction and logging equipment. The service will coordinate skilled technical help, maintaining listings of trouble-shooters in various mechanical fields. Phone service will be available 24 hr. a day.

Barber-Greene names field engrs.

Barber-Greene Co. has established a new sales assistance group of field engineers to aid distributors and their customers. Each will be able to assist Barber-Greene equipment users in solving difficult or unusual material-handling problems, in the selection of appropriate machines, or with equipment operation.

Concrete Forms gets franchise

Concrete Forms, Inc., of Portland, Ore., has been given exclusive rights for the assembly, sale, and rental of the Symons system of concrete form construction in the Pacific Northwest. The system was originated by

Symons Clamp and Manufacturing Co. of Chicago.

Sea-Ro names distributor

Jefferson Supply Co. of Los Angeles has been named distributor for the Southern California area of Sea-Ro Packing Co., Inc., products for marine and industrial use.

Cook gets larger hq.

Cook Brothers Equipment Co. of Los Angeles, manufacturer of specialized trucks, crane carriers, trailers, and drive units for the construction industry, has expanded its headquarters to provide new and enlarged sales offices, better truck service and repair facilities, and a display area.

Hubbard personnel changes

Personnel changes announced by the Hubbard Co. include Vergil Koch, moved to San Francisco from Southern California to become manager in place of Bob Cook, resigned; George D. Kite appointed to take Koch's spot on the sales force, and J. C. Maccracken appointed to cover Arizona and New Mexico. The Hubbard Co. has also been named exclusive Southern California distributor by the Sherwin-Williams Co. for their concrete curing compounds and Kemwood Formsaver, and by the National Expansion Joint Co. for their fibre joints used in concrete construction.

NEWS of MANUFACTURERS

LeTourneau moves to Texas

In the wake of the news that R. G. LeTourneau, Inc., has sold its earthmoving business to Westinghouse Air Brake Co. (*Western Construction*—June 1953, p. 208) came an announcement that headquarters for the company's remaining business have been transferred from Peoria, Ill., to Longview, Tex.

Lessmann Co. sold

The Lessmann Manufacturing Co. has been purchased by the United Steel Barrel Co., which will continue to build the Lessmann Power Crowder-Arm Loader. New staff changes announced for the company, which will continue to operate under the Lessmann name, include Howard W. Dodson, vice president; Elmer J. Mrozek, sales promotion manager and Gerald T. Baker, production manager and engineer.

Kaiser Gypsum ups Costa

Robert A. Costa, administrative assistant to the general sales manager of Kaiser Gypsum Co., Inc., for the last 3 yr., has been appointed assistant general sales manager.

Berkson named Alsynite president

John S. Berkson, formerly executive vice president of the Alsynite Co. of America, has been named president of the firm in place of Louis L. Potomac, who became president of Reflite Co. (*Western Construction*—May 1953, p. 158).

Ryerson expands plant

Plant expansion facilities at the Spokane, Wash., plant of the former Inland Empire Steel Co., purchased in 1951 by Joseph T. Ryerson & Son, Inc., are now under way. The expansion will add 10,000 sq. ft. of working

A. P. Flagg, head of Spokane, Wash., plant of Joseph T. Ryerson & Son, Inc.

space for the purpose of adding reinforcing bar fabrication operations to the plant's facilities. This new section will be directed by A. P. Flagg, who has moved to Spokane from the company's Buffalo, N. Y., steel service plant.

New Soulé safety man

James Haig, previously American Can Co. personnel manager at San Jose, Calif., has been appointed plant

office personnel manager of Soulé
l Co.'s San Francisco operations.
will also supervise the safety pro-
n.

ree new veeps

Three new vice presidents were
ed to the Calaveras Cement Co.
of officers by the board of direc-
on April 30. They are E. M.
ker, manager of the company's
nt at San Andreas, Calif., Mel J.
ndon, general sales manager, and
nold M. Ross, assistant vice presi-
t. The board also announced the
ointment of Grant Metzger, me-
nical superintendent, as acting
nager of the plant.

F. & I. promotes Brill

William Brill, chief engineer for the
lorado Fuel and Iron Corp. plant at
eblo since 1950, was named di-
tor of engineering for the corpora-
n. His duties will consist of acting
an advisor and consultant to engi-
ring staffs located at various C. F.
I. properties throughout the coun-
. The recent acquisition of John A.
ebling's Sons Corp. added cold-
led wire and strip, electric wire and
ble, and bridge construction mate-
ls to C. F. & I.'s line of steel prod-
ts.

Brill

Hass

rmanente ups Hass

Peter S. Hass, formerly assistant
orks manager at Permanente Ce-
ent Co.'s plant at Permanente,
lif., was appointed executive assist-
t to Wallace A. Marsh, vice presi-
nt and general manager, on May 8.
is headquarters will be in Oakland.

mken personnel changes

A chain reaction of promotions at
e Timken Roller Bearing Co. came
out through the May 31 retirement
J. A. Riley, secretary-treasurer. H.
Markley, assistant secretary, was
ected secretary and G. L. Deal, as-
stant treasurer, was elected treas-
er. B. R. Powell, chief cost account-
t, became assistant secretary and
A. Gulling, systems supervisor, be-
me assistant treasurer.

ew Readymix head

R. Melvin Pottenger has been ap-
inted manager of the Readymix
ivision of Brighton Sand and Gravel
o. of Sacramento, Calif., according
Allan T. Olson, president of the
m.

Thor gets four veeps

The directors of Thor Power Tool Co. have elected four new vice presidents. They are J. A. Hill, now vice president and sales manager; John A. McGuire, vice president in charge of labor relations; B. H. Johns, vice president in charge of rock drill sales, and W. B. Hunn, vice president in charge of the company's Los Angeles Works.

Forster to head Hercules Powder

Albert E. Forster, vice president of Hercules Powder Co. since 1951, has been elected president of the company in place of Charles A. Higgins, who will continue in his position as chairman of the board.

Joy acquires research co.

Barnes and Reinecke, Inc., a Chicago engineering company specializing in mechanical research and development, has been acquired by Joy Manufacturing Co. The firm will continue to operate under its present name as a Joy subsidiary. Its physical plant includes a testing laboratory and a prototype assembly area.

Gardner-Denver promotions

Gardner-Denver Co. has made a number of personnel changes. A. G. Lindquist, secretary of the company since 1945, was elected a director. A. H. Jones, director of exports, has been elected vice president. Other promotions include: C. M. George, sales administrator; O. C. Knapheide, Jr., sales manager of the Oilfield & Industrial Division; C. H. Rieman, sales manager of the Mining & Contracting Division; J. R. Affre, sales supervisor of the Oilfield & Industrial Division; E. A. Linneman, sales supervisor of the Contracting Division, and J. A. Caverly, sales supervisor of the Mining Division.

Clark takes over Ross Carrier

Clark Equipment Co., manufacturer of industrial trucks and heavy automotive transmissions, has acquired all the capital stock of The Ross Carrier Co. Michigan Power Shovel Co., a Ross subsidiary, is included in the transfer.

Highway Equipment sales mgr.

William W. Kingman, Chicago branch manager for Illinois Contractors' Machinery, Inc., has been appointed general sales and advertising manager for Highway Equipment Co.

Air-O-Matic promotes three

Henry Schneider has been named board chairman by the Air-O-Matic Power Steer Corp. George Wichman became president in place of Schneider, and Wichman's executive vice president spot was filled by Homer Gray, former chief engineer of the company.

CONSTRUCTION EQUIPMENT—FOR SALE

SHOVELS AND CRANES

1—Model 10B, Bucyrus-Erie Shovel only, gas		$ 9,000
1—Model 22B, Bucyrus-Erie Shovel, Crane and Backhoe, diesel		20,000
1—Model 25, Northwest Shovel and Dragline, diesel		17,500
1—Model 6, Northwest Shovel and Dragline, diesel		25,000
1—Model 38B, Bucyrus-Erie Shovel, Dragline and Backhoe, diesel		30,000
3—Model 54B, Bucyrus-Erie Combination Shovels and Draglines, diesel	$46,000 to	57,000
1—Model 54B, Bucyrus-Erie Shovel only, diesel		44,000
1—Model 80D, Northwest Shovel, Dragline and Backhoe, diesel		40,000
1—Model 1201, Lima Dragline only, diesel		54,000
1—Model 88B, Bucyrus-Erie Combination Shovel and Dragline, diesel		112,500
1—Model 120B, Bucyrus-Erie Combination Shovel and Dragline, electric		118,000

TRUCK CRANE

1—Model 25, Northwest Truck Crane on Dart under carriage		$ 22,000

TRACTORS

5—D8 Caterpillar Tractors with Cat PCUS, Dozers and Johnson Bars	$10,500 to	$ 14,000
1—DW10 Caterpillar Unit with No. 21 PCU and A-Frame		8,500

CARRYALLS

4—Model FU LeTourneau Carryalls, 18 to 22 yds.	$4,000 to	$ 5,500

EXCAVATING EQUIPMENT

1—Southwest Double-Drum Sheepsfoot Tamper		$ 1,500
2—5' x 4½' Double-Drum Sheepsfoot Tampers, each		1,000
1—#22 Ferguson Double-Drum Sealing Roller (smooth)		800
1—#20 Ferguson Single-Drum Sealing Roller (smooth)		400
1—5-Shank Davenport Ripper		1,000
1—9-Wheel Pneumatic-Tired Roller with 1600 x 24 tires, 45,000 lbs.		2,000
1—Model 28 Caterpillar Ripper		2,750

PILE HAMMERS AND EXTRACTORS

2—Model 9B3 McKiernan-Terry Pile Hammers, each		$ 2,000
1—Model 10B3 McKiernan-Terry Pile Hammer		2,700
1—Model No. 1 Vulcan Pile Hammer		2,000
2—Model E4 McKiernan-Terry Pile Extractors	$2,750-	3,500

SPRINKLER TRUCKS

1—2,500-gal. International Sprinkler Truck, with pump		$ 2,000
2—3,000-gal. Sterling Sprinkler Trucks, with pumps, diesel, each		4,000
2—4,500-gal. Western Sprinkler Trucks, with pumps, diesel, each		5,000

AIR EQUIPMENT

5—105' 2-Stage Portable Air Compressors, various makes	$1,500 to	$ 1,750
3—500' I. R. Portable Compressors with Waukesha Hesselman engines, each		3,500
3—500' C. P. Portable Compressors with Cat. diesel engines, each		5,500
4—500' Gardner-Denver Portable Compressors with Cat. diesel engines, each		6,500
15—FM3-R and URM99 G. D. Wagon Drills, pneumatic-tired	each	750

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72-68 ft.	15	175	3
65-60 ft.	1493	—	39
55-50 ft.	1702	—	38
45-40 ft.	312	—	10

lso quantity 35 ft. and shorter—Quick Shipment. egardless of job, location. *Write, Wire or Phone*

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FOR SPEED ECONOMY EFFICIENCY FLOOD SAFETY LABOR REDUCTION

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Mdl. WD60 Diesel, w/General Motors 471 engines, 6-8 c.y. bodies, all current mdl. Good rubber. Cleaned, painted, and ready to go. $4,250, Boise, Idaho. Three available.

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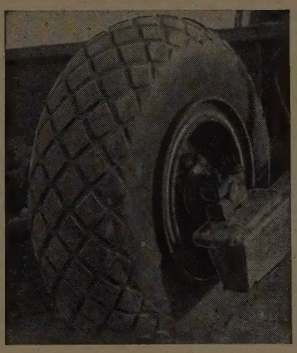

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Set 1, 2, 3 Columns, (specify which) by ..... inches (1-10).

NEWS of MANUFACTURERS

New Sprague & Henwood prexy

James A. Ross, president of Sprague & Henwood, Inc., drilling contractors and manufacturers for 30 yr., has been made chairman of the board. Adrian E. Ross, former assistant to the president and chief engineer has been elected president. William J. Schank, former vice president, has been made senior vice president and general manager.

Parker joins Kaiser Steel

Edward A. Parker, formerly affiliated with the Youngstown Sheet and Tube Co., has been named assistant superintendent of Kaiser Steel's plate and hot strip mills.

Gottshall to head Atlas Powder

Ralph K. Gottshall, executive vice president of the company since 1952, has been elected president of Atlas Powder Co. in place of Isaac Fogg, who becomes chairman of the board.

Galion ups Tiller

J. H. Tiller, district representative in the South-Central area, has been appointed assistant sales manager by the Galion Iron Works & Manufacturing Co.

Ramer to aid Renner

Ralph Ramer has been appointed assistant to L. J. Renner, Chicago district manager of the Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp.

Union Carbide gets new veep

Thomas D. Cartledge, president of Linde Air Products Co. since 1952, has been elected vice president of Union Carbide and Carbon Corp. Linde is a division of Union Carbide.

Plastaloy facilities enlarged

Production facilities for Plastaloy reinforced polyester fume exhaust systems have been enlarged by the Atlas Mineral Products Co.

Westinghouse promotes 15

Westinghouse Electric Corp. has announced recent personnel changes. Five new vice presidents were elected. They are: Bruce D. Henderson, William C. Rowland, Franklin L. Snyder, C. Swan Weber, and Robin S. Kersh. L. S. Houk, director of works engineering for the Headquarters Manufacturing Division, became manager of manufacturing for consumer products, a newly-created position. Houk's old job was taken by Walter W. Wendelken, chief electrical engineer of the Headquarters Works Engineering Department. John J. McCloy, former U. S. High Commissioner for Germany, has been elected to the board of directors in place of Winthrop W. Aldrich, now U. S. Ambassador to Great Brita Seven men have been named to p tions in the newly-formed Ato Equipment Department. They a Leo B. Dorsner, supervisor of ma facturing; Ralph M. Yearick, sup visor of production; James L. Ack man, administrative assistant to department manager; Benjamin C metti, manager of the pump engine ing section; Raymond L. Witz manager of the industrial ato power section; Stewart E. Lauer, purchasing agent, and Charles Willer, manager of accounting.

P & H promotes three

Harnischfeger Corp. has announc three recent appointments. Cur Meyer, a director and vice preside of Milwaukee Electric Tool Cor became sales manager of the Elect Hoist Division. Ralph Diehl, tool s perintendent, became works manag of the main plant in Milwaukee a repair division in West Allis. Dieh vacated spot was filled by Robe Over, formerly chief tool designer.

U. S. Pipe & Foundry gets veep

Fred Osborne, president of t Sloss-Sheffield Division, has be elected a vice president of Unit States Pipe and Foundry Co.

New Pioneer president

Oscar J. Ellertson, vice preside of Pioneer Engineering Works, In since 1951, has been elected preside in place of Melvin Ovestrud, who h retired but who will continue to a as an engineering consultant for t company.

Haynes to direct producers

John L. Haynes, director of th Building Materials Division of th National Production Authority, ha been appointed managing director the Producers' Council, National o ganization of building products ma uacturers. He succeeds Charles M Mortensen, who resigned to becom associate manager of the Trade Asso ciation Department, U. S. Chambe of Commerce.

Wilson joins Sanymetal

Allen Wilson, formerly of the Celo tex Corp. Acoustical Department, ha become manager of the Suspende Ceilings Division, Sanymetal Prod ucts Co., Inc. Burl O. Purdy has bee appointed assistant manager of th division. T. S. Price has been name Western regional promotional ma ager with headquarters at the ne plant, 6433 Canning St., East Los An geles, Calif.

New Sauerman sales mgr.

Martin Meyer has been named ge eral sales manager of Sauerman Bros Inc., to fill the vacancy caused by th death of Dwight D. Guilfoil (*Wester Construction* — June 1953, p. 209 Meyer was formerly assistant sal manager.

INDEX TO ADVERTISERS IN THIS ISSUE

BACKFILL, uncompacted

We won a prize (and you did too)

You may or may not have realized this as you were reading your copies of *Western Construction* during 1952, but you had in your hands a prize-winner. In the fifth annual Awards of Merit Contest of the Western Society of Business Publications, the magazine walked off with a special

***Harry Simonson*, left, president of the Society, presents award certificate to *Jack Timmer*, managing editor of *Western Construction*.**

award for "outstanding editorial accomplishment in behalf of its readers, advertisers and its industry." This was the first year the magazine was entered in the contest.

Needless to say, we're happy and proud to have received this special recognition from among 112 entries in the contest. However, we can't help recognizing that any business magazine is actually a part of its industry and exhibits many of the same characteristics of the other parts of its industry. *Western Construction's* editorial material attempts to reflect all the vigor and resourcefulness of Western engineering - construction men, and we think that's the chief reason the award came our way. So a good share of the award was for you —our readers and friends.

Engineering Aide

Here is an item for our "Engineers on the Move" column that rates special mention. It all started when we sent a routine postcard to Lee Irwin after he changed his address a while back. We thought Irwin's friends in the construction West might like to find out where he had gone after Utah Construction Co. finished up its Bear River work last fall.

Imagine our surprise when we got a letter from his wife saying that Irwin had left the country! A happy situation, though. Utah had sent him to South America for six months only, and he was due back in the States last month.

Remember, men, a word to the wives is sufficient.

Are we getting too abstruse?

We got a piece of constructive criticism from an old hand in the construction game the other day. The writer himself is retired now, but he hasn't forgotten that things are different for the beginner than they are for the experienced construction man. His reminder is a good one for us and it's nicely expressed:

"I do think many editors aim too high, and so miss a large class of readers who are mighty close to the beginning of their experience rather than near the end of it—as they woul have to be to read some technic magazines well. These fellows nee good 'down to earth' common sens and sometimes fail to find it in th magazines they pick up. There are lot of such men, and while this age moving fast, not all of us can b studying space rockets if the busines of usual living is to go on. Some mus learn how to do the regular work i pretty much the regular way—an who will teach them if not the me who have been down the road ahea of them?"

Twenty-five years ago in *Western Construction*

"**Utah Construction Co.** of Ogden, Utah, have practically completed all excavation in connection with their contract for construction of Gibson dam, to be 175 ft. high, concrete arched massive type, for the U.S. Bureau of Reclamation in Sun River canyon, 23 mi. northwest of Augusta, Montana. . . . Contract price, $1,566,240. . . . **Ralph Lowry** is engineer in charge of construction for the Bureau of Reclamation and **A. E. Paddock** is superintendent of construction for the Utah Construction Co."

* * *

"**Thomas H. Means,** consulting engineer of San Francisco who was employed by the Contra Costa County Industrial Water Users' Association, to report on the feasibility . . . of the contemplated salt water barrier across Carquinez strait . . . has submitted his report . . . He favors the construction of a dam at Army Point, nearly opposite Martinez, . . . as a combined salt water barrier, railroad bridge (in lieu of the proposed bridge by the Southern Pacific Co.) and highway bridge, at a cost of $40,000,000."

ASCE tips its hat

Sacramento Section of the Ameri can Society of Civil Engineers ha tipped its collective professional ha in recognition of Marvin C. Nichol as the new Commissioner of Recla mation. They did it by a resolutio which says "whereas" only twice, s here it is:

"Whereas civil engineers have lon looked with pride upon the monu mental and utilitarian projects con structed by the Bureau of Reclama tion . . . under the direction of civ engineers . . . and

"Whereas we have been informe of renewed recognition of the wis policy of engaging professional direc tion for technical agencies in the nom ination of an outstanding civil engi neer for appointment to this post, b it therefore

"Resolved, that Sacramento Sec tion . . . commends the Secretary o the Interior, the Honorable Dougla McKay, for his recommendation t the President that Mr. Marvin Curti Nichols be appointed Commissione of Reclamation . . ."

Inflated concrete

A telephone inquiry the other da set us hopping to look up comparativ bid prices on mass concrete. Th party wondered how much chang there had been since, say, 1939. Th change is startling. How often hav you realized?

Back in 1938, construction of Shast Dam began. There were 5,400,000 cu yd. of mass concrete involved, at unit price of $2.80. The next year bid were taken on Friant Dam. This time only 1,850,000 cu. yd., priced at $2.48

Now we jump up to 1950 and th bids on Pine Flat Dam. Here are 2, 150,000 cu. yd. at $7.71. Plus 1,600,00 bbl. of cement at $2.75 (separate iten on Corps projects). A year later cam Folsom Dam; 1,030,000 cu. yd. a $8.40, plus 900,000 bbl. of cement a $3.60.

By THE EDITORS