

WESTERN CONSTRUCTION

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Steel bearing piles—
Western application record

Problems of repairing an
eroding spillway channel

Rental-purchase agreements—
Are you renting or buying?

Exhaust gas conditioner for
diesel engines in tunnels

APRIL 1953

WESTERN

CONSTRUCTION

Volume 28

APRIL 1953

Number 4

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FRONT COVER

A PORTION of over 5,000 tons of H-piling goes into place for Seattle's Alaskan Way Viaduct. In about 25 years, this type of foundation support has advanced from the driving of a single test pile to this and other major Western projects. For the story of this development, and some outstanding examples of the use of steel bearing piles, see pp. 76-78 of this issue.

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Executive Editor
Ralph Whitaker, Jr.

Managing Editor
John J. Timmer

Assistant Editor
Howard M. Smith

News Editor
June A. Siringier

Editorial Assistant
M. A. Carroll



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JAMES I. BALLARD	Editorial Director
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Time is an element of design

Because time does actually represent money, there can never be complete reconciliation between technical design and the broader considerations for engineering projects. The higher the value placed on the time saved, the greater may be the justifiable sacrifice in matters of pure design. Does this imply that the resulting engineering is bad? Not if the final objective for overall engineering achievement is to accomplish the purpose desired by the owner at the least total cost. Such a conclusion is not intended to extend to the "crash" type of military construction with its philosophy of save-time-at-complete-disregard-for-cost.

To outline an example of the time consideration in engineering design, suppose a power utility is in need of an addition to its generating system. Without any special demand on time, the following steps might be considered normal in pre-construction planning: (1) preparation of plans by the staff engineers of the company, with all the usual care taken to reduce materials to a minimum, (2) review by an independent engineering board or group with recommended changes and suggestions to be incorporated in the final plans, (3) reconciling of all these engineering ideas by the company staff with preparation of specifications, and finally (4) selection of the contractor and authorization to proceed with the work. This sequence would undoubtedly represent engineering science applied at its best in the solution of the problem. However, this procedure might not represent the best solution from the point of view of economics or company management. Revenue from power, or the products of an industrial plant, can be measured accurately and permit a careful comparison between weeks of time and tons of steel.

An outside organization combining engineering talent and construction facilities might be able to cut possibly a year from the time just outlined. This telescoping of various functions would admittedly entail some design concessions in the interest of speed, and might conceivably increase some of the quantities of materials. After all, it is not possible to start bulldozers clearing a site at the same time design work begins without making some allowance for added cost. But, assume this added cost represents only a fraction of the savings produced for the owner by the time cut from the schedule for design and construction. The value that management assigns to time must be considered in the broadest application of engineering thinking and planning.

Publicity for civil engineers

A perennial complaint among civil engineers is the general lack of publicity they receive, as compared to other professions. This relates particularly to mention in the daily press. The reasons are numerous and well understood by engineers who have struggled with the problem while serving on the customary local "Publicity Committee." Tangible results cannot be expected without relentless continuity of effort combined with real ingenuity. Newspaper editors are old hands at detecting publicity for self-promotion, and only recognizable public interest in the stories or announcements will keep them out of the "round file."

Although the basic idea is not new, a successful publicity plan was worked out and proved effective in connection with the recent ASCE convention in San Francisco. Local engineers selected the "Seven Engineering Wonders" in the area. The selections, with appropriate descriptions, were released to the press during the convention. Results were most gratifying, at least compared to those obtained through usual efforts to secure newspaper space intended to credit the accomplishments of civil engineers.

Recognition of the profession by the public will only be secured by earnest study of all means available for legitimate publicity, the development of newsworthy material, and a regard for proper timing. As a concluding thought, such a campaign sponsored by a local group of civil engineers should be placed in the hands of young members who have not previously been frustrated into an "it can't be done" attitude.

Equipment in a fog of legality

A piece of construction equipment involved in a rental-purchase agreement goes about its daily work enveloped in an atmosphere of legal uncertainty. Under the broad definition of a conditional sale the actual status of ownership becomes a subject for lawyers, certified public accountants and even the Bureau of Internal Revenue. In fact, for those looking in on construction from the outside, the machine may even appear to be an enormous pea in a giant shell game.

However, the rental-purchase idea has come to fill an important place in equipping construction jobs. No longer should it be shrouded in double talk. Contractors should understand the factors involved and the legal decisions already reached. To aid in this understanding, an article in this issue (p. 63) outlines the extent to which rental-purchase agreements between distributors and contractors have been explored and evaluated by legal authorities.



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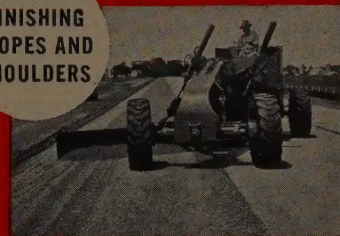
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Repairing eroded spillway channel

Overflow from Alder Dam was destroying its stilling pool and gouging out a fault zone — The problem and the method of correction are described

WHAT TO DO with a spillway which was destroying its stilling pool and eroding the rock in a fault zone leading back to its base was a problem which has confronted the engineers of Tacoma City Light for several years. Many engineers, both foreign and domestic visiting Alder Dam on the Nisqually River about 40 mi. from Tacoma have viewed the effects of the falling water on the rocky hillside in front of this jump-type spillway and have pondered over a possible solution.

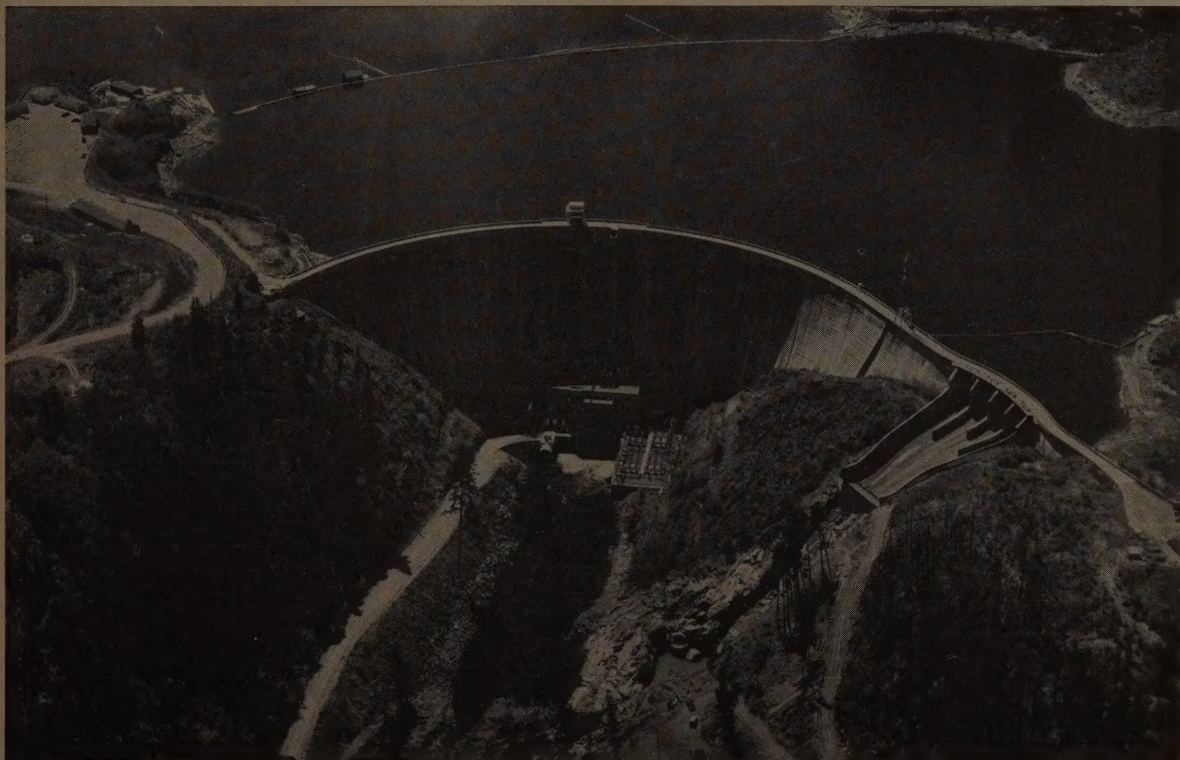
By HENRY A. COLE

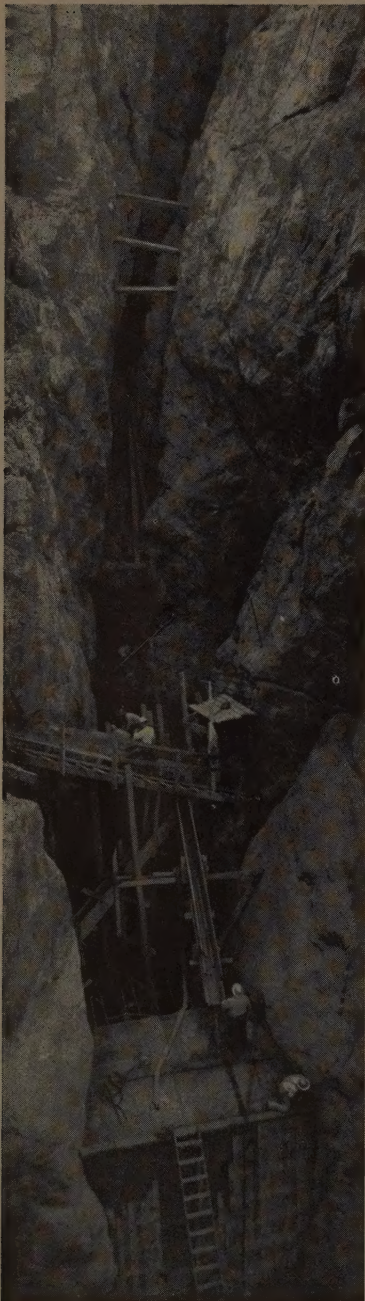
Project Office Engineer
Tacoma City Light
Tacoma, Wash.

This spillway was placed in service in 1945 and because of war conditions, materials, manpower and cost, it was decided at that time that the removal of the overburden and construction of protective cover on the rocky hillside should be delayed until such time

as the eroding effects of the spillway discharge could be more accurately determined.

It was realized that if the area below the spillway was left untouched the overburden would have to be removed from the tailrace, and it was also anticipated that the falling water would cut a hole until a balanced position was reached with respect to the energy absorbed in turbulence and the depth of the hole. The presence of a fault in the rock slope was known through preliminary exploration and

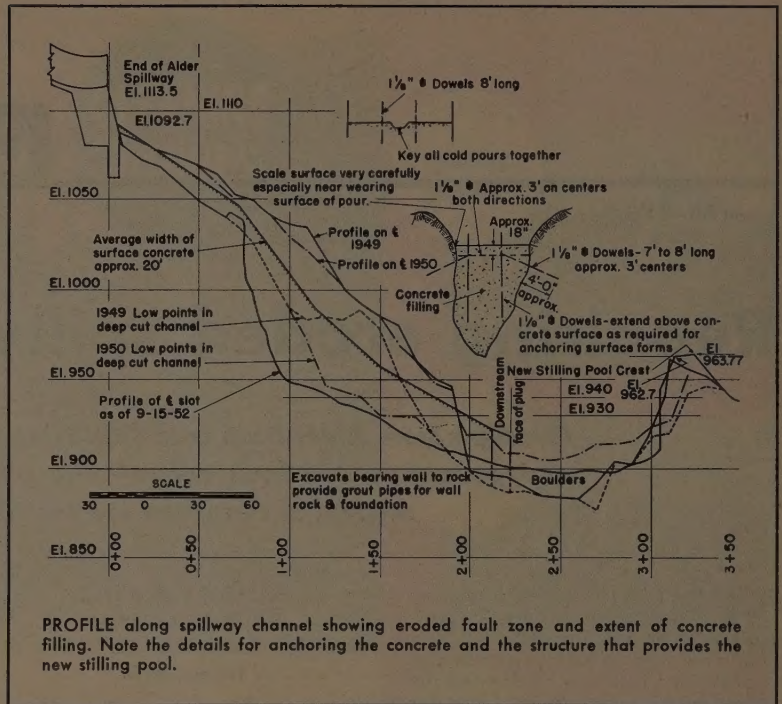




DETAIL of the fault zone showing depth of erosion and the cleaning operation in progress prior to backfilling with concrete.

geologists reports, but it was felt that any serious retrogressive erosion could be stopped.

It was not expected that the spillway would be used to any great extent as it was to be operated in conjunction with the City's Cushman reservoir and the system operation provided for very little spilling at either place. However, the War Production Board held up the authorization for Alder power house and so when the



reservoir was full in early 1945 excessive spilling was necessary with consequent excessive erosion over a period of several months. The reservoir subsequently has been operated as a part of the Northwest Power Pool and this operation at times has resulted in more spilling than probably would occur under strictly system operation.

Design of the spillway

Alder spillway is of the open overflow jump type. The curved overflow section at the crest is 164 ft. long, composed of four 41-ft. chords at a radius of 300 ft. to the dam axis. The spillway section is curved in plan to permit convergence of the side training walls. The horizontal length from the crest to the end of the bucket is 210 ft. Crest of the spillway is at elev. 1177 and the lip of the discharge bucket is at 1113.5. The spillway bucket is 80 ft. wide at the discharge end and is curved upward slightly. This throws the water in a clear jump and causes it to impinge on the rocky slope approximately 250 ft. horizontally from the end of the spillway bucket.

Flow over the spillway is controlled by four radial gates 30 ft. high by 32 ft. long. These radial gates are operated by individual motor-driven geared hoists placed on a deck across the spillway piers. The spillway was designed to discharge a maximum flood of 80,000 cfs. Maximum flood of record is about 27,000 cfs. and to date the maximum release has been about 20,000 cfs.

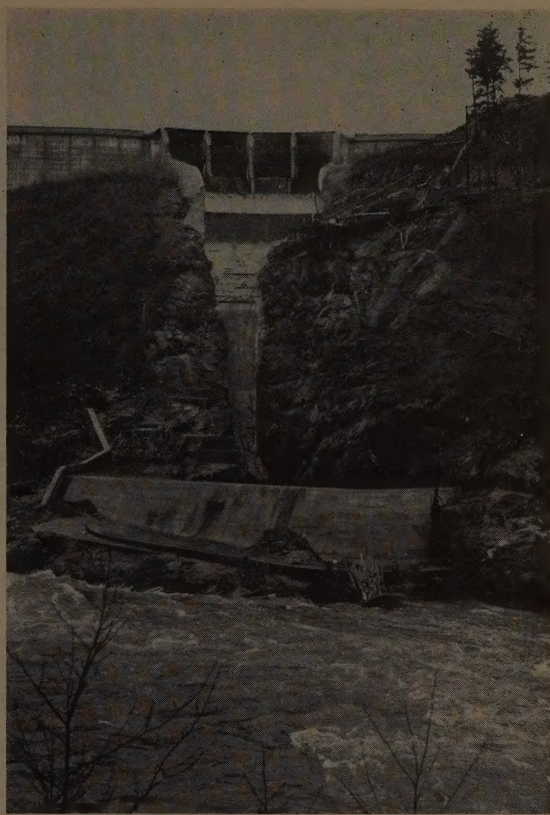
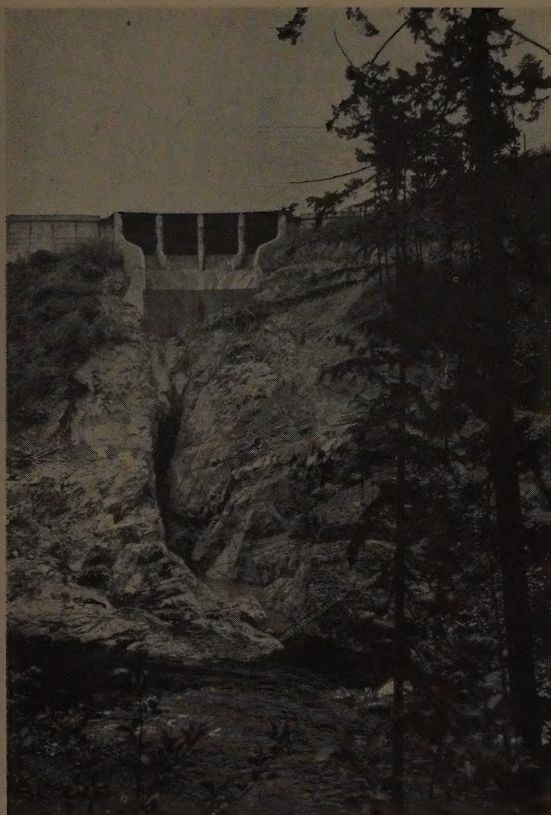
Extensive use of the spillway dur-

ing the past seven years has resulted in the creation of a stilling pool, roughly 100x150 ft. in area by 80 ft. deep at the base of the hill adjacent to the tailrace. It also resulted in deterioration of the rim on the river or tailrace side and caused the cutting back of a narrow fault zone in the rock slope uphill toward the base of the spillway bucket. This erosion combined with general erosion of the hillside resulted in the deposition of large quantities of waste in the river and an unnecessarily high backwater and loss of head at Alder power house.

The occurrence of the fault zone with its rapid cutting made the repair of this portion of the work obvious, but what to do with the stilling basin was a problem. Erosion of a cross fault at approximately right angles to the basin and cutting through of the rim along the main fault was not only depositing large quantities of material in the tailrace, but the efficiency of the stilling basin was being impaired and it was ceasing to function as in the early days of its existence.

Suggested plans varied

Suggestions by visiting engineers for repairing the spillway varied greatly. The minimum plan proposed was to clean out the fault zone, fill it with 5 or 6 ft. of concrete, perform "dental" work on certain spots on the rocky hillside and around the stilling basin, and then continue to clean out any waste deposited in the tailrace. The maximum plan mentioned was to concrete the fault slot, refill the stilling pool by sluicing and then cover



BEFORE . . . and . . . AFTER the spillway repair: Erosion in the deep fault zone (left) shown in June 1952 when repair work was undertaken. The new dam providing the stilling pool (right) is shown at the bank of the river, and above it the concrete filling in the fault, extending all the way up to end of the original spillway structure.

the entire area affected by falling water with a thick reinforced concrete mat thus eliminating the stilling pool.

Decision

The preliminary plan finally decided upon was to diamond drill and grout the river side rim of the stilling pool, restore the rim of the pool to elev. 944 by means of a small concrete dam across the eroded slot in the rim, unwater the pool and mouth of the fault and then concrete the fault zone to the end of the spillway bucket. It should be mentioned here that all plans for deenergizing the spill took into consideration possible damage to an access road on the opposite side of the river.

Depth measurements taken during the previous years had shown the bottom of the pool to be at approximate elev. 877, but upon unwatering the pool was found to be filled with small rocks and boulders to about elev. 900. The bottom of the fault slot also was found filled with eroded material and deeply cut for some distance back from the pool. Character of the rock walls and fault slot are shown in the accompanying illustrations.

Thirteen non-core 1 $\frac{3}{4}$ -in. holes were drilled from 50 to 70 ft. deep and 191 sacks of cement were used in

grouting the exposed rock area between the stilling pool and the river. This work was necessary not only to consolidate the rock and retard erosion, but also to make it possible to pump out the stilling pool. Considerable difficulty was encountered in placing the forms and concrete for the small dam across the eroded outlet slot loading from the pool to the river due to fluctuating water conditions and the narrowness of the eroded fissure extending downward in the bottom of this slot.

The rock and the fault

The country rock in the spillway area is blocky andesite. Joints are filled mainly with either calcite or one of the zeolite minerals or both. There are a few joints which failed to be filled with secondary minerals, or through a process of percolation the minerals originally deposited have been removed by solution and mud has filled the resulting void. Cutting action along these weak joints has in some cases resulted in the movement of large masses of rock which otherwise might have remained in place for a long period of erosion.

Completion of the small dam across the eroded outlet and unwatering of the pool opened the project for full

inspection of the damage for the first time since spilling began in 1945. The problem was not as simple as previously supposed since the bottom of the fault slot was found to be filled with broken material for 125 ft. back from the pool edge and huge blocks of rock were being carved out by erosion along the weak joint lines. Inspection of the rim showed that the entire barrier would be practically destroyed and sluiced into the spillway channel along with much loose rock back of the pool unless extensive remedial work was undertaken without delay. The rim on the river side was also being undermined by a zone of altered weak rock lying roughly parallel to the cross fault.

Correction program

It was decided that the inside wall of the rim should be faced with concrete and the height of the basin be restored to approximately its original elevation and the efficiency of the pool restored by means of a concrete dam imposed on and encasing the rimrock. Length of the crest of this dam was made 178 ft., the width 12 ft., and crest set at elev. 964. A hard massive ledge of rock was found in place across the rim just above the bottom of the pool and this was made use of as the foun-



CONSTRUCTION of dam to provide stilling pool: (left) outer face of dam showing reinforcing of the discharge apron; (right) back side of dam showing depth of stilling pool.

dation for inside pool lining. A discharge apron extending from the toe of the dam about 25 ft. in width sloping downstream and with a slight bucket effect at the upstream end was also decided upon as a protective cover for the altered rock zone lying between the rim and the river's edge.

Pool lining

Construction of the inside pool lining is shown in one of the illustrations. Foundation anchor bars were $1\frac{1}{8}$ -in., 8 ft. long spaced at 3 ft. on centers and rock face anchors the same size 4 ft. on centers. Concrete reinforcement was $1\frac{1}{8}$ in. in diameter, 18 in. on centers both ways. Overflow apron construction included foundation anchors which were $1\frac{1}{8}$ in. in diameter, 6 to 8 ft. long and spaced 4 ft. on centers for the slab and 18 to 36 in. on centers along the outer edge. Slab reinforcement was $1\frac{1}{8}$ in. lengthwise and $\frac{5}{8}$ to $1\frac{1}{8}$ in. crosswise, depending upon the location, spaced 18 in. on centers. The rim encasement section and apron required approximately 4,000 cu. yd. of concrete.

Treatment of the fault slot as planned prior to unwatering was to construct a bulkhead or retaining wall at its entrance into the pool, extend this to bedrock and then drive a drift horizontally under the fault for about 25 or 30 ft., fill it with concrete and then drill and grout foundation and side wall holes, so as to seal off the fault zone and prevent undercutting and retrogressive erosion. The balance of the fault slot then could be cleaned out to bedrock, filled with about 5 ft. of protective concrete cover and with some isolated dental work at weak spots and along joints the job could be considered complete for the present and awaiting possible repair work from time to time due to erosion from future spilling.

Inspection of the fault slot after unwatering changed practically all of the original plans since retrogressive erosion had taken place to such an extent that cleaning out to bedrock was economically out of the

question. Extensive scaling of the side walls was found necessary for safety reasons, and danger from a large hanging mass or "horse" at the upper end of the steep fault slope had to be eliminated by fissure grouting.

The bulkhead at the lower end of the fault slot was constructed with its crest at elev. 915.6 and the foundation and sidewalls drilled and grouted. Since it was economically out of the question to run the surface of the fault zone concrete on a uniform grade from the end wall of spillway downhill to the top of the bulkhead, it was decided to change the grade at four convenient points in such a manner as to provide sufficient cover over the "horse" and then a concave grade line to the bulkhead.

Concreting the fault slot

Concrete was placed progressively up the slope of the slot in approximately 5-ft. steps with each step edge set about 18 in. below the finished surface line. The step pours provided a working level for side wall drilling, placing anchor bars, form anchors and top surface cover form and eliminated the use of scaffolding. The 18-in. space between the edge of the step and surface finish line facilitated the placing of the surface reinforcing steel and the placing and vibrating of the surface concrete.

Surface concrete reinforcement consisted of $1\frac{1}{8}$ -in. bars spaced 3 ft. on centers both ways. Side wall anchor bars were $1\frac{1}{8}$ -in., 8 ft. long, spaced 3 ft. on centers and set 18 in. below the surface finish line. Where more than one step pour was required to reach the necessary elevation to within 18 in. of the surface one horizontal row of anchors on each side wall was used per lift. Approximately 3,200 cu. yd. of concrete was placed in the fault zone slot. Several hundred cubic yards of concrete were also used in constructing training walls, filling open fissures and consolidating rock

masses throughout the fault area.

Concrete placing, as shown in the photographs, was almost entirely done by means of gravity chutes, and only a very small amount was placed by buggies or bucket. Two 16-S gasoline-powered concrete mixers were used, one being located at the top of the hill adjacent to spillway end wall and the other on the hillside above the stilling pool dam structure. A stiff leg derrick with 76-ft. boom and 50-hp. motor driven double drum hoist and slewing gear located at the top edge of the fault slot was used for lowering materials. A five-sack mix was used with bank run aggregate. Bids taken on washed sand and gravel aggregate including a 40-mi. haul by truck were considered too high and it was decided to use selected bank run from a pit located about 3 mi. from the work. This unwashed aggregate had been used satisfactorily for general construction purposes in this vicinity for many years and with careful pit supervision the test cylinders showed good strength.

All engineering and construction work was performed by city forces and was completed just in time to receive a good test of its erosion resisting qualities for a spill of up to 5,500 cfs. over a period of three days. Observation of water action in and out of the new stilling pool under conditions produced by this amount of spill were completely satisfactory and inspection failed to show any destructive effects on the concrete from de-energizing and disposing of the falling water.

Personnel

C. A. Erdahl is Commissioner of the Department of Public Utilities and J. Frank Ward is Superintendent of the Light Division. Resident engineer on the Alder work is Floyd E. Rogers; his assistants are Robert L. Hanson, William A. Lieske and Kenneth D. Fewins. John Paulinski is labor foreman; Ed Burnett, carpenter foreman; Leonard Kaufman, rigger foreman and Ed Leach, master mechanic.

MANY CONTRACTORS enter into agreements with distributors to rent equipment with the option to purchase, the rentals paid being applied to the price if the option to purchase is exercised. Whether the periodic payments are rentals (and therefore a deductible expense in determining income subject to tax), or whether they are installment payments on the purchase of a capital asset, frequently makes a substantial difference in the amount of income tax payable.

When attempting to discuss the federal income tax aspects of rental-purchase agreements, we open a very important and yet a very controversial field of taxation. Therefore, let us consider the fundamentals which are contained in the Internal Revenue Code, in the regulations of the Commissioner of Internal Revenue, and in writings on the subject by recognized legal authorities. Having obtained the fundamentals, let us then see how they were applied by the judges in various court decisions. Finally we will consider some practical applications of these laws, regulations and decisions to the type of rental-purchase agreement in which construction contractors and equipment distributors are interested.

WHAT ARE THE LAWS?

The fundamentals are contained in tax and sales laws, difficult to understand. Writings on the subject clear it up some.

First is the Internal Revenue Code, which is the federal law containing the income tax law. The Internal Revenue Code (Sec. 23 (a) (1) (A)) provides that in computing net income there shall be allowed as a deduction, under the heading of trade or business expenses, "rentals or other payments required to be made as a condition to the continued use or possession, for pur-

poses of the trade or business, of property to which the taxpayer has not taken or is not taking title or in which he has no equity."

The Commissioner's regulations explaining his understanding of this section have remained unchanged since 1939. They discuss only leaseholds for business purposes and apparently do not refer specifically to transactions whereby pieces of equipment are acquired on a monthly payment plan of one kind or another. So we get very little light on this subject from the regulations.

Next let us take a look at the Uniform Conditional Sales Act. Under this act:

A lease is substantially equivalent to a conditional sale when the buyer is bound to pay rent substantially equal to the value of the goods and has the option of becoming or is to become the owner of the goods after all of the rent is paid. In such a contract "rent" means the purchase price and possession as "lessee" means the possession of the buyer under an executory contract of sale. That the buyer, in some cases, has [only] the option of becoming the owner and thus a sale is not sure to take place, is of but small importance, for, as a practical matter, the buyer will always be willing to accept ownership when he has paid the value.

In discussing these agreements, *Williston on Sales* (Second Edition, p. 78, Sec. 336) says:

"The distinction between an ordinary lease and a conditional sale is obvious. A lease contemplates only the use of the property for a limited time and the return of it to the lessor at the expiration of that time whereas, a conditional sale contemplates the ultimate ownership of the property by the buyer, together with the use of it in the meantime. Sometimes, however, leases contain options giving the lessee a right to buy the leased property, and again the amount of rent may be so fixed as to reimburse

RENTAL-PURCHASE AGREEMENTS

Are you renting or buying equipment?

By E. F. CONNER

THE SUBJECT of rental-purchase agreements is one of common interest to distributors and contractors throughout the entire West. Up to the present time the distributors have been more aware of the problem and its complex angles relating to both legal and tax matters.

One of the most comprehensive explanations of this subject has recently appeared in the publication of the Associated Equipment Distributors, and its value to contractors has been called to our attention by Frank Skidmore of Albuquerque, New Mexico, newly elected executive vice president of AED. Mr. Skidmore says concerning the article:

"The subject of rental-purchases has been misunderstood by both distributors and contractors. The appearance of the original article was most enlightening to many distributors and, in my opinion, it is an article that should be of great interest to contractors. It should be read carefully by both distributor and contractor as it answers many questions now causing confusion. A clear understanding of this subject by both parties would certainly improve the relations between the distributor and his customer, the contractor."

In the interest of serving the contractors of the West, Western Construction is presenting the information contained in this article.—Editor.

the lessor not only for the use of the property and its possible deterioration, but also in large part, or wholly, for the total value of the property.

"Sellers desirous of making conditional sales of their goods, but who do not wish openly to make a bargain in that form, for one reason or another, have frequently resorted to the device of making contracts in the form of leases, either with options to the buyer to purchase for a small consideration at the end of the term, provided the so-called rent has been duly paid, or with stipulations that if the rent throughout the term is paid, title shall thereupon vest in the lessee. It is obvious that such transactions are leases only in name. The so-called rent must necessarily be regarded as payment of the price in installments since the due payment of the agreed amount results, by the terms of the bargain, in the transfer of title to the lessee. This has been clearly recognized and many of the statutes relating to conditional sales in express terms include leases within their scope. Apart from statutes, courts have disregarded the form of the transaction and have held that where payment of so-called rent nearly or quite pays the price of the goods, the bargain is conditional sale and subject to the rules governing that kind of transaction.

"It is, however, essential in order to make a conditional sale, in the sense in which that term is used ordinarily in statutes or elsewhere, that the buyer should be bound to take title to the goods, or at least to pay the price for them. Therefore, a lease which provides for a certain rent in installments is not a conditional sale if the lessee can terminate the transaction at any time by returning the property, even though the lease also provides that if the rent is paid for a certain period the lessee shall thereupon become the owner of the property. And, though the rent is applied at the buyer's option toward the payment of the price, the transaction is not a conditional sale if the price largely exceeds the rent and lessee is bound to pay."

WHAT THE LAWS MEAN

Court decisions on specific cases throw some light on the fundamentals. It all boils down to "intentions" rather than "form."

We now come to the interpretation of these fundamentals as applied to various specific cases by the courts. First we are interested in the thinking of the Supreme Court of the United States. The approach of the Supreme Court to the construction of these agreements is set out in *Heryford v. Davis* (102 U. S. 235, 244, 26 L. Ed. 160), where the court said: "It is not to be

found in any name which parties may have given to the instrument, and not alone in any particular provision it contains, disconnected from all others, but in the ruling intention of the parties, gathered from all the language they have used. It is the legal effect of the whole which is sought for. The form of the instrument is of little account."

Let us consider a decision of a Maryland federal court. In this case *Rainey* (31 Fed. 2d 197) leased used machinery valued at \$812 for three months, paying \$325 as security for fulfilling the agreement and the remainder of \$487 in two monthly payments of \$243.50 each. *Rainey* agreed to return the machinery at the expiration of the term and to be refunded his \$325 deposit, but he had the option of then purchasing the machinery for \$325.

In its opinion the court said:

"In order to determine the true character of the agreement, it is necessary to look through form to

substance. In the present case the rental of machinery for three months, the full term of the lease, amounted to 60% of its entire value. A charge so disproportionate to the term of the user in relation to the value of the articles, all of which were second-hand, in and of itself certainly suggests a sale. Furthermore, the so-called rental payments, plus the original deposit, equal the total value of the machinery.

"The distinction between an ordinary lease and a conditional sale is obvious. A lease contemplates only the use of the property for a limited time and the return of it to the lessor at the expiration of that time; whereas, a conditional sale contemplates the ultimate ownership of the property by the buyer, together with the use of it in the meantime."

The United States Board of Tax Appeals and later the Tax Court of the United States have had this problem presented in many cases, a number of which arose during the second World War.

In equipment rental agreements which were made by the War Department, the government agreed to make monthly payments based on one 8-hr. shift with a 50% increase in the rate for each additional shift per day, until the amount of the rentals paid equalled the value of the equipment, plus 1% per month for interest, plus freight if any was necessary to the site of the project. Under these clauses title to an item passed to the government automatically when the monthly payments equalled its value plus an additional amount computed on a basis of 1% of the value per month; or if the contract was completed before title passed, a final payment could be made by the government in order to acquire title.

In attempting to formulate an equitable rule to apply to these rental-purchase agreements, the Tax Court of the United States in the *Chicago Stoker Corp.* case (14 TC 441) developed what it deemed to be an objective economic test. In that case the *Whiting Corp.* has a stoker division which was unprofitable. It disposed of this division under an agreement to accept a royalty on every stoker sold until it had received \$70,000 in royalties. The \$70,000 represented the original cost of its tools and dies. If the royalty payments had been made according to the agreement it would have been about 15 years before they would have amounted to \$70,000.

In the above case the Tax Court of the United States pointed out that:

"Payments . . . [that] have dual potentialities, that is, they may turn out to be payments of purchase price or rent for the use of property, have always been difficult to catalog for income tax purposes. A fixed rule for guidance of taxpayers and the Commissioner is highly desirable and it is also desirable that the rule, whatever it is, be as fair as possible, both to the taxpayer and the tax collector.

"If payments are large enough to exceed the depreciation and the value of the property and thus give the payer an equity in the property, it is less of a distortion of income to regard the payments as purchase price and allow depreciation on the property than to offset the entire payment against the income of one year. The payee, meanwhile, is not reporting the payments, since they are purchase price rather than rent, and his gain or loss can be determined at the time of the final outcome of the transaction."

This rule has been consistently followed by the Tax Court in numerous cases, one of which was *H. T. Benton*. Mr. Benton could not see eye to eye with the Tax Court and appealed its decision to the Court of Appeals. The facts in this case were that he operated a taxicab business in Amarillo, Texas. He entered into an agreement with *Yellow Cab* whereby both put their tangible and intangible assets into one bundle and Benton agreed to operate the combined companies and to pay *Yellow a*

rent of \$5,000 a month for ten months. If he fulfilled the terms of the agreement he had the option to purchase Yellow at the end of ten months for \$35,000. The assets to be acquired were admitted to be at all times worth much more than \$35,000.

The Court of Appeals held the monthly payments to be rent. In its opinion the court said:

"In undertaking to apply a purely objective economic test the Tax Court has fallen into error. Whether what is in form a lease is in effect a conditional sales contract depends on the intention of the parties. The economic relation of the value of the property to the option price was only one factor to be considered in determining intent. Further, that factor must be considered not as of the time for exercise of the option, but rather in the light of the facts and circumstances as they existed at the time the parties entered into the contract.

"If the parties in good faith actually intended to enter into a lease contract, then the taxpayer, up until the time he exercised his option to purchase, acquired no title or equity in the property."

The Commissioner did not appeal to the Supreme Court of the United States from this decision, and this is understandable in view of the decision of that Court quoted above from the *Heryford v. Davis* case.

PRACTICAL APPLICATIONS

Here's what we're really interested in—the applications of all this to the everyday affairs of contractors and distributors.

The foregoing has set forth fundamentals and their legal and judicial interpretation in factual situations. Exact quotations have been necessary to obtain a correct understanding of the thinking of the writers. Now let us consider the application of all this to the everyday affairs of contractors and distributors.

In view of the wording of the allowance for rental deductions contained in the income tax law, it was not too long before enterprising distributors of equipment devised numerous contracts whereby agreements were made which required lease payments or rentals on a monthly basis, but which in fact over a period of time, paid for the piece of equipment under lease so that title could be acquired by the lessor by the payment to the lessee of a nominal amount.

These agreements were carefully drawn to indicate that the periodic payments were to be rent and that after rental payments had been made for a specified number of periods, the lessee had the option of acquiring title to the property.

Small businesses lacking funds for development and expansion, and needing a safeguard against uncertain financial futures, will frequently seek ways and means of obtaining the equivalent of a reduction of the purchase price without the financial risk of outright purchase. One such way is found in a lease with an option to purchase. However, this device has its attendant risks of not succeeding. We must concede the decreasing effectiveness of tax saving schemes and be warned of skating on rather thin ice. To obtain a rental deduction, the lessee must establish that the property involved is one to which the taxpayer has not taken or is not taking title or in which he has no equity.

Moreover, a grave danger exists in these arrangements in that the Bureau of Internal Revenue is not required to treat the transactions consistently for both lessor and lessee, nor do the courts so interpret statutory provisions. This is true because the contractor's tax deduction is controlled by the language of the deduction section, and there is no necessary reciprocal relationship between this section and the ones governing the tax treatment of the

manufacturer or dealer in regard to the periodic payments received by him.

An analysis of all the decisions presents a somewhat confused problem involving varying results. It does seem clear, though, that the weaker cases for the purchaser in the deductibility of payments as rent are those in which only a nominal amount or no amount is to be paid for the passage of title. Conversely, the stronger cases are those in which a substantial sum bearing a relationship to the value of the property is to be paid when the option is exercised. Obviously, the latter sum is not to be paid as rent.

ADVANTAGES . . . AND METHODS

There are good reasons why a contractor should favor rental-purchase. But he's got to handle it right to avoid income tax troubles.

There are numerous valid reasons why a contractor could favor rental-purchase agreements, entirely aside from their possible effect on taxable income. Some of the reasons that readily occur as examples are:

1—The contractor may use the equipment to determine whether or not it fits his need or fulfills the promises of the manufacturer, without being obligated to buy

if it is not entirely satisfactory.

2—He can avoid the necessity of showing a big liability for notes payable, thereby improving his financial condition. This is particularly true in the case of a contractor doing work for a state highway department, where the net current position often has an important bearing on the amount of work that may be awarded.

3—He may make temporary use of a piece of specialized equipment even though he lacks certainty that its purchase is warranted for his organization.

Where a contractor considers claiming income tax deductions for rentals paid on equipment that ultimately is acquired, he must retain in his files a full statement of the reasons why the equipment was rented, rather than purchased. Some of the methods used in rental-purchase agreements to clarify their intentions are:

1—Separate rental agreements and purchase option agreements.

2—A rental agreement for a relatively short period, followed by the substitution for it of a sales contract, applying the rentals already paid to the total price.

3—A rental agreement for a period of months and the return of the equipment. Later, the purchase of a piece of used equipment of the same model for approximately the difference between the price new and the rent paid earlier.

4—The establishment of an equipment owning subsidiary corporation which buys the equipment and leases it to the parent operating company or to any other user.

In conclusion of this discussion of rental-purchase agreements, it is best to turn once again to the sound advice contained in the words of *Williston on Sales*:

"It is, however, essential in order to make a conditional sale, in the sense in which that term is used ordinarily in statutes or elsewhere, that the buyer should be bound to take title to the goods, or at least to pay the price for them. Therefore, a lease which provides for a certain rent in installments is not a conditional sale if the lessee can terminate the transaction at any time by returning the property, even though the lease also provides that if the rent is paid for a certain period the lessee shall thereupon become the owner of the property. And, though the rent is applied at the buyer's option toward the payment of the price, the transaction is not a conditional sale if the price largely exceeds the rent the lessee is bound to pay."

Plant capacity of 500 tons per hr. makes —

McNary aggregate production

Occasional surplus of large rock sizes is crushed to maintain efficient balance in plant production — Extensive crushing and rescreen machinery make a “plant within a plant” — Blend sand supply increased by settling pan fines from sand sizer overflow

A SINGLE ITEM of importance throughout almost all the years of construction on a big dam job is the aggregate plant. At McNary Dam on the Columbia River, as at nearly every damsite, special and peculiar conditions of the natural aggregate supply have called for development of a special plant to produce concrete aggregates in suitable quantity and quality. This article describes the facilities in use by McNary Dam Contractors (Guy F. Atkinson Co., Ostrander Construction Co., and J. A. Jones Construction Co.) for producing aggregates used in 1,850,000 cu. yd. of concrete.

Principal aggregate sources are a number of alluvial gravel bars located on the right and left banks of the river downstream from the dam. The particular one presently being processed is designated Mission Beach. It is about a mile below the aggregate plant, on the left bank.



By
J. M. WELLS
Chief,
Foundation and
Materials Branch
Seattle District
Corps of
Engineers

In composition, the coarse aggregate is dark, rounded natural gravel, composed mainly of fine-grained volcanic rock, with some quartzite, chert, quartz, granite, and gabbro. The sand is composed of fragments of similar rock, and of the minerals derived from them. The most abundant rock-type is basalt. Almost all the gravel is dense, tough, and essentially unweathered.

While petrographic analyses of the

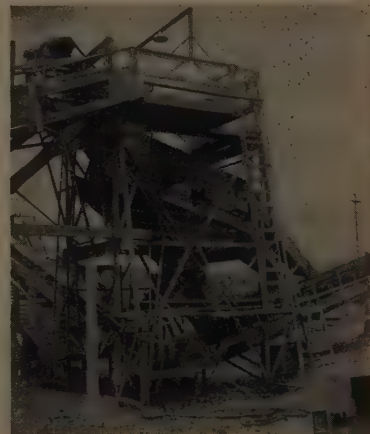
aggregate and study of existing concrete structures within a 50-mi. radius indicated little likelihood of alkali reactivity in the hardened concrete, a further precautionary measure of specifying low-alkali cement was included in job specifications.

Gap grading

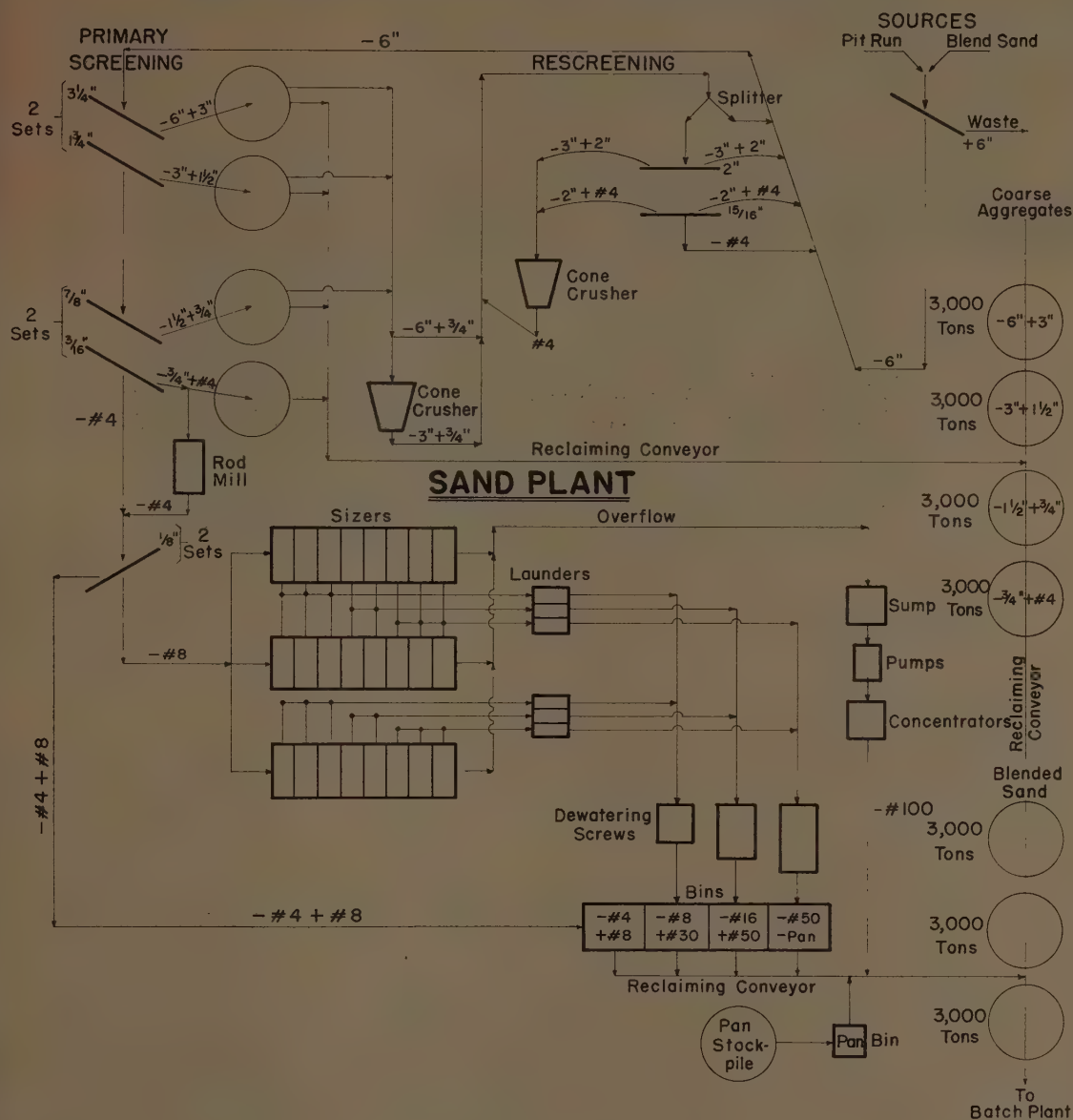
During aggradation of the material in geologic ages past, something went wrong in nature's process of grinding and sorting, with the result that a mild amount of gap grading on the #16 and #30 sieves exists in the fine aggregate. Two possible reasons for this phenomenon have been suggested. The first is based on characteristics of the cleavage planes in the structure of the rock, which lends itself to fractures common to the pit-run gradation. The second is based on the illogical supposition that the two defi-

STOCKPILE CAPACITY totals 21,000 tons. Timber dividers separate sizes during filling and draw-down of piles. Blend sand is drawn from only one of three piles at a time, assuring free drainage of newly processed sand for 72 hr.

RESCREENING of all finished product is carried out in this two-deck unit. It gives additional blending to fines. When coarse aggregates ($-6 + 1\frac{1}{2}$ -in.) are passed through, it removes degraded waste.



FLOW DIAGRAM FROM PIT-RUN TO FINISHED PRODUCT



cient fraction sizes were somehow separated from the coarser and finer grains and carried to terrace deposits at a higher stream level. As a matter of fact, large deposits of #16 and #30 material have been found on the higher terraces and are being used as a blend sand to supplement the deficiencies.

Production sequence

An accompanying table shows the gradation of both the pit-run fines and the terrace blend used in concrete for McNary Dam. Other columns in the table present the specifications for fine aggregate grading, and the grading that results from crushing and

milling operations performed at two points in the plant circuit.

Excavation of the raw material at Mission Beach is accomplished by a 5-yd. electric dragline that loads out a fleet of 14-yd. dump trucks. These travel a macadam haul road to the raw storage at the aggregate plant. This raw storage is generally maintained at a capacity of 100,000 tons, including both pit-run from Mission Beach and the coarse blend sand from the terraces.

The processing plant has a maximum production rate of 350 tons per hr. of coarse aggregate, and 148 tons per hr. of fine aggregate. Plant operation requires 2,200 gpm. of water. Of

this amount, 1,000 gpm. is used in operation of three sand sizers, 500 gpm. in the rod mill, 500 gpm. for washing sprays on the vibrating screens, and 200 gpm. for miscellaneous uses.

The processing of aggregate from raw storage to finished stockpiles can best be described in connection with the flow chart reproduced on these pages. Pit-run is reclaimed from storage through a 4x7-ft. feeder, and blend sand by a vibrating feeder. The pit-run is passed over a 3 1/2 x 5-ft. vibrating grizzly which scalps all over 6-in.

The raw product is then raised 67 ft. in a slope distance of 322 ft. by



SUPERVISING THE JOB for McNary Dam Contractors are (from left): Vern Glascock, superintendent of concrete and aggregate production; John Morton, project manager; Andy Duray, plant superintendent, and H. W. Parker, chief engineer.

conveyor, feeding two banks of 2-deck 4x12-ft. vibrating screens. This first process removes all $-6 + 3$ -in. and $-3 + 1\frac{1}{2}$ -in. to temporary storage bins. Passing material is further discharged on another pair of 2-deck 4x12-ft. vibrating screens which sizes the material as $-1\frac{1}{2} + \frac{3}{4}$ -in. and $-\frac{3}{4} + \#4$. In both processes the aggregates are washed by sprays as they are classified.

Balancing production

The four temporary bins are tapped by a conveyor which transports the sized aggregates to the storage area. A shuttle conveyor there receives each size in turn for deposit by rock ladder into four 3,000-ton stockpiles.

There is an occasional surplus of the top sizes of the coarse aggregate. This is due sometimes to a demand for small-aggregate concrete in the construction operation. At other times it results from an increase in the quantity of one or more of the coarser sizes in the borrow pit. When such a surplus occurs, the material is withdrawn from temporary bin storage and routed over an optional conveyor system through the rescreening circuit. A variety of treatments are available in this circuit, depending on the particular surplus size (or sizes) being handled and on the degree of reduction required for it.

If the material being rescreened includes $-6 + 3$ -in. rock, it is passed first through a cone crusher which reduces it to a maximum size of 3-in. It then proceeds to a splitter and, if no further treatment is desired, the material is bypassed entirely back to

the raw product conveyor for transport through the primary screening operation again.

Rescreen flexibility

All or a portion of this same material, however, may be routed instead over a 2-deck, 3 x 8-ft. screen having 2-in. and 5/16-in. square openings. Through an arrangement of gates in the chutes after this rescreen, it is possible to bypass any one of the three resulting sizes of material to a short head cone crusher, where the product is reduced to $-\frac{3}{8}$ -in. This material then circulates again through the rescreen, where $-\#4$ is removed and returned to the raw product conveyor of the main plant. Remaining rejects from the bottom deck of the rescreen go again through the short head cone crusher for further reduction to sand sizes. The overall purpose of this operation is to increase the sand production of the plant by crushing excess coarse aggregate.

Supplementing sand

The unclassified sand ($-\frac{3}{16}$ -in.) passing the primary screening operation proceeds to the sand plant. This sand includes pit-run material and also the result of any rescreening and crushing performed in the operation described immediately above. It is further supplemented by a coarsely ground product produced in an 8x12-ft. rod mill. The mill is supplied with $-\frac{3}{4} + \#4$ material taken from the last deck of the primary screening operation, though most of this same size proceeds to coarse aggregate stockpiles.

Equipment List

- 1—4-ft. Symons standard cone crusher
- 1—3-ft. Symons short head cone crusher
- 1—8x12-ft. Marcy rod mill
- 1—3 $\frac{1}{2}$ x5-ft. Symons vibrating grizzly
- 4—4x12-ft. 2-deck Symons screens
- 2—4x8-ft. Symons screens
- 1—3x8-ft. 2-deck Cedarapids rescreen
- 1—5x12-ft. 2-deck Tyrock rescreen
- 1—4x7-ft. Telsmith feeder
- 1— $\frac{1}{4}$ Jeffrey Traylor vibrating feeder
- 3—M.C. Jeffrey Traylor vibrating feeders
- 3—8-pocket Dorco sand sizers
- 2—sand launders (chutes)
- 3—Wemco screw classifiers (4x23-ft., 4x19-ft., 3x14-ft.)
- 2—6-in. Wemco sand pumps
- 2—25-in. Cottrell Whirlcone concentrators
- 4—500,000-B.T.U. Behlen heat blowers
- 4,228 ft. 36-in. conveyor belting
- 816 ft. 30-in. conveyor belting

The last separation of the fine aggregate before it enters a hydraulic sizing process is performed by a pair of 4x8-ft. scalping screens having $\frac{1}{8}$ -in. openings. The $-\#4 + \#8$ material is scalped off and deposited in a bin for blending with the finished sand product. Material smaller than $\#8$ is diverted through chutes to three 8-pocket sand sizers for classification.

Sizer operation

The sand sizers operate basically on the principle of flotation. Sand is held in suspension within the pockets by a constant head of water introduced at the bottom of each pocket. The progressively finer sizes are carried over a succession of adjustable weirs, being deposited in the various pockets by weight. The first three pockets retain $-\#8 + \#30$ material. The next two pockets retain $-\#16 + \#50$ material, and the last three pockets retain $-\#50$ -pan material. Note the overlap in grading from one series of pockets to the next. The grading by this hydraulic method cannot be absolutely precise.

The products of these separations are drawn off automatically through spigots at the bottom of each pocket, and they pass through a pair of sand launders to three dewatering screws, where the three general sizes are dewatered and deposited in bins for final blending.

Inasmuch as the separated sizes of sand in the sizer pockets do not always conform to the required proportions, it is sometimes necessary to waste some of the excess fractions in order to maintain uniform grading of the eventual blend. Wasting is accomplished by diverting any quantity of a sand fraction through a manually operated spigot in the sizer pocket.

It was found that considerable pan ($-\#100$) was being carried in the

Concluded on page 144

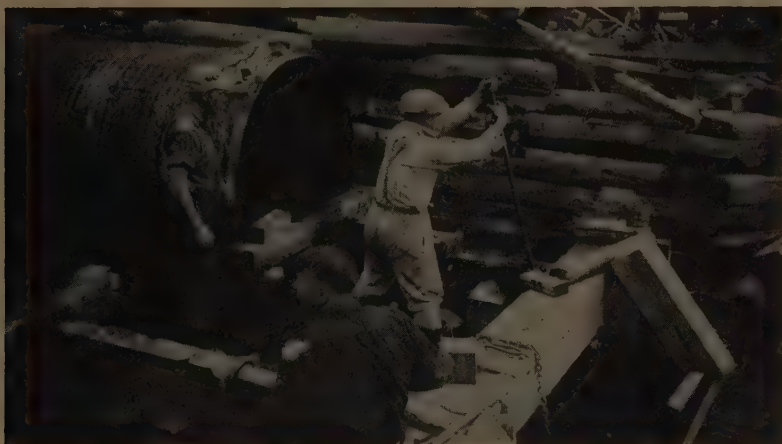
Fine Aggregate Grading at McNary Dam

(% retained on each sieve)

Sieve	Mission Beach	Terrace blend	Rod mill	Cone crusher	Finished blend	Specifications
4	2	2	1	2	2	0-5
8	10	8	13	37	11	5-15
16	8	13	19	27	13	10-20
30	14	31	17	16	23	20-30
50	37	26	14	7	29	20-30
100	24	15	11	4	15	10-20
pan	5	5	25	7	7	6-10
F.M.	2.34	2.64	2.37	3.71	2.60	

Methods and field details for . . .

Jacking culverts through fills



To eliminate traffic problems and maintenance of backfilled trenches more highway departments and railroads are demanding that pipes and conduits be installed by this method — The do's and don'ts of the operations are given

JACKING or tunneling methods for placing conduits, culverts or utility lines under roadways, are being demanded by highway departments and railroads, both to avoid traffic congestion that would result from employing open cut methods of installation, and because of the future maintenance costs that these open cut operations usually produce. Some thirty years' experience with both jacking and tunneling have served to develop both their respective advantages and limitations, and to work out a pattern of recommended procedure. Success in the use of both methods comes from the application of good "horse sense" and careful and accurate attention to details, rather than from use of any trick stunts or short cuts.

Almost any soil that will "hold a face" when excavated, and is not water logged, will permit jacking. Heavy clays, loams, or adobes are best, but gravels that have sufficient binder to prevent "running," or even damp sands can be jacked for short distances. Jacking should not be attempted in dry sand; gravelly soil that is known to contain large boulders; through fills where logs or stumps are known to exist; or where it is impractical or not economical to control the water table to a point below the jacking level.

It is neither a costly nor time-consuming operation to test the fill by boring or sampling before jacking is

By C. M. COLVIN

Civil Engineer

Armco Drainage & Metal Products, Inc.
Berkeley, Calif.

decided upon, and this should be followed in all questionable soil conditions. Such testing efforts occasionally fail to disclose obstacles to jacking, particularly under the center of old railway fills, but these instances are comparatively rare. Conditions do develop where extreme traffic congestion, etc., definitely require placement of the conduit without opening up the roadbed, and yet where jacking is physically impractical. In such instances some type of tunneling can be used, at slightly higher installation costs.

Naturally, in actual jacking operations all variations of soils and water conditions are encountered. To ensure jacking success the following recommendations are outlined. When working in good soil conditions, and with short lines to be jacked, these recommendations need not be followed to the letter, but under poor soil conditions and with longer lines they should be respected.

Size

Conduits from 24 to 96 in. in diameter have been jacked. Labor costs are higher in pipe conduits 36 in. in diameter and less because of restricted working conditions. Unless working

under high fills or under very substantial pavements, sizes larger than 60 or 66 in. should not be jacked, because of the long unsupported span at the head end of the conduit when it is under the load centers of the roadway.

Length

In many instances traffic conditions require jacking regardless of length to be jacked. Maximum lengths that can be jacked depend chiefly upon the nature of the soil being penetrated, and upon the type of conduit being jacked. Through the best of soils, and using corrugated metal or steel casings, lengths up to 200 ft. have been installed. The more usual length, however, is between 40 and 80 ft. The heavier type conduits are naturally more restricted in this respect, because soil conditions encountered are seldom at the optimum.

Cover

There should be at least 4 ft. of cover over the top of the conduit under railways and under highways with anything less than the heaviest of pavement surfaces. More cover is necessary in loose soils to prevent "freezing" due to raveling. Extreme fill heights naturally require culvert lengths that might be beyond the realm of jacking, particularly in loose soils.

Some degree of water table control is frequently necessary when jacking.

This varies from a simple sump, conveniently located below the level of jacking operations and pumped out automatically by a small gasoline or electrically operated pump, to a series of well points. It is only on the most vital jacking jobs that well pointing can be justified. A loose gravelly soil with a high water table usually means an undesirable jacking job; tunneling will probably be in order.

Jacking preparations

A. BACKSTOPS—These must be substantial, and adequate for the job. A 60- to 80-ft. jacking job in reasonably good soil often develops 150 to 300 tons of jacking resistance. A backstop incapable of supporting that

amount of thrust means a "stuck" pipe. Here again the type of soil, and the length, size, and kind of conduit being jacked controls the strength of backstop required. Usually, however, a substantial backstop pays dividends in the success of the jacking undertaking.

B. LINE AND GRADE—The timbers or guides that support the conduit as it enters the bore must be accurately placed on the required line and grade, as that is the last control of the direction the pipe will take other than the care exercised by the man excavating at the end of the pipe. Both line and grade should be checked at least once per shift as the work progresses. Engineers' stakes

should be required and followed in this control.

C. WORKING PIT—When pipe is to be jacked through fills higher than the diameter of the pipe, plus the required minimum cover, no working pit is necessary. Even so, it is desirable to excavate an approach trench into the fill far enough to provide a jacking face of 3 ft. or more above the pipe. However, some highway departments and railways limit the distance that this open face can be excavated towards the roadway. This open face should be shored securely to prevent slipping or raveling of the embankment. When jacking under low fills or through native soil, a working pit is necessary, the dimensions of which should allow free working room for men and equipment. The working pit should be securely shored or sloped at angles that make caving or sloughing of the embankment impossible. Certain state construction regulations control very definitely the degree of shoring required. Provision for a sump should be made, preferably in one corner of the pit, where pumping will be required.

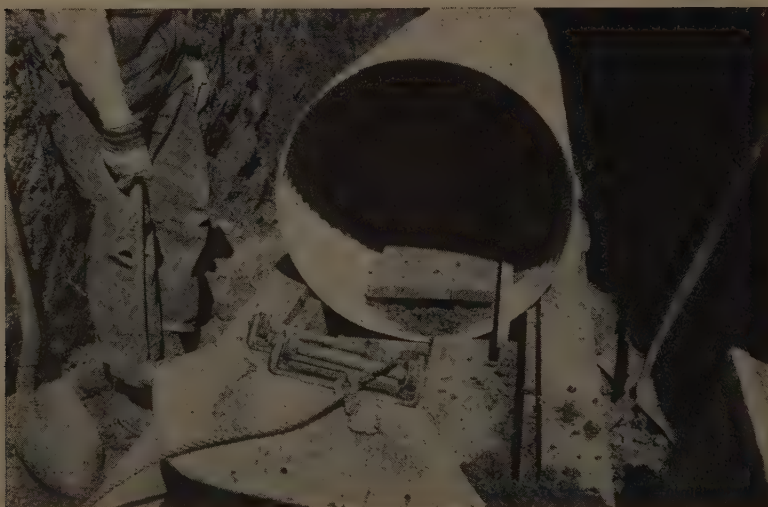
D. PIPE TO BE JACKED—For jacking corrugated pipe, the sections making up the barrel are especially prepared for that purpose at the factory. In jacking, the field joints are made by field riveting or bolting. These section ends are match-punched and marked at the factory, to eliminate field drilling. They must be placed in the same order, and with the identifying marks properly matched up, when making the field connections; otherwise the holes will not match. Corrugated pipe is fabricated, unless otherwise directed, to be jacked from the outlet end of the barrel. Use of a "jacking band," to reinforce the end of the pipe receiving the thrust, particularly when jacking longer lines or the larger diameters, is recommended.

E. PRECAUTIONS IN FIELD RIVETING OR BOLTING—The first section to be jacked is full riveted at the factory. The open end of the 2nd section to go on (and later the 3rd, 4th, etc.) should be first expanded by the spreader lugs; then threaded over the end of the section already in place, and then tightly cinched in place, being sure that the match marks for sections 1 and 2 are together. Field riveting then proceeds in consecutive order—not hit-or-miss—to be sure that the rivet holes will match. The rivet should be securely driven but not so forcefully as entirely to flatten the head itself, as that would destroy its holding strength. If the pipe has been asphalt coated, the facing ends must be scraped. The holes will not otherwise match, as the factory matching and punching was before coating.

After jacking has progressed through the fill, the end sections can



REMOVAL of the excavated material will depend on the size of the culvert being jacked. For pipe that is 48 in. in diameter or larger, a wheelbarrow can be used. For the smaller size pipe, a skip or some type of dolly-mounted dirt box is arranged and handled by rope from the face to the jacking pit. In either case, the loading at the head end is done by one crew member, while another does the actual digging.



usually be placed with less cost and time by using bands, the jacking band previously mentioned being used as one band for this purpose. When jacking invert-paved pipe, the pavement must be restored at the invert of each section, after the pipe is in place.

Equipment

An electric power plant for lights, pump (if water is probable), excavating tools, muck handling equipment, and jacks are the necessary tools for jacking. Air spades and breakers will justify the use of a compressor, except possibly on the smallest and shortest jobs. Conduits of 48-in. diameter and larger will permit the removal of muck directly with a wheelbarrow, and this tool usually proves more economical than many other more complicated devices occasionally designed for this chore, unless the conduit is both long and large. For diameters of 42-in. and smaller, it is necessary to employ some type of skip or dolly-mounted dirt box, which is pulled to and from the head end by means of ropes attached to each end of the skip.

Any of several types of jacks can be used. These should have a capacity of at least 35 tons, and should be worked in pairs. Air-operated jacks do a good job, particularly if a compressor is also required for operation of the air spades, etc. Jacks of a type that can be operated on their sides, such as car jacks, should be selected. The travel of the jacks should be at least 13 in. to accommodate 12 x 12-in. jacking timbers.

Pipe pushers operating in pairs on notched "T" rails, are very good for jacking purposes. It speeds up the job at the beginning to have available two 15- or 20-ton track jacks, or similar, because of their comparative speed at light pressures.

Working crews

A crew of 4 men and a sub-foreman, or "pusher," per shift provides all the manpower necessary. During the excavation of the working pit and placing of the lining timbers, shoring and backstops, more men can be employed, such as combining two shifts. Once the jacking operation is started, more than 4 men is needless. On short jobs of smaller conduits the crew can be safely cut to three men and the sub-foreman.

One man digs the material at the head end of the pipe. He is the most important man on the crew, as the over-all speed of operation depends on his ability to excavate the material. He is also responsible for keeping the pipe on proper line and grade. Working immediately behind him is the second man, whose duty it is to remove the excavated material behind the head-end man, and to load it into the dirt buggy or wheelbarrow, as the case may be. Two men on the outside withdraw the loaded dirt conveyor, remove this material to the spoil



JACKS should have a minimum capacity of 35 tons. Those operated by compressed air have proved effective if a compressor is available on the job. The travel of the jack should be at least 13 in. to allow the use of 12 x 12-in. jacking timbers. At the start of any job the use of lighter and faster jacks may speed the work until resistance builds up.



dump, and jack the pipe—when this is called for by the men in the pipe. All hands join in when lowering a new section of pipe into the trench, and making the field connection.

All jacking jobs should be set up to operate on a shift basis, and unless soil conditions are really bad, two shifts, with one or two hours spacing between, have proven to be an economical force distribution.

The jacking operation

As indicated previously, material is excavated beyond the head end of the pipe and the pipe is then jacked in to follow this excavation. Just how far the excavation can be safely carried depends on the nature of the soil, amount of cover, and the tools used in the work, but rarely should it exceed 12 to 18 in. Some soils, while "jackable," are so loose that the pipe has to be kept jacked up to within 3 or 4 in. of the face of the material. The pipe should always be jacked up to the face when ending a shift, or when operating under heavy traffic loads with minimum cover over the pipe.

Excavation should be about 1 in. more than the outside diameter of the pipe at the top, and taper off towards the invert. A pipe tends to dip in light or loose soils, and to raise slightly in heavy soils. The heavier conduit types always tend to dip, due to a combination of their weight and unconnected joints.

It becomes more important, as the required stress to move the pipe increases, to operate the jacks in conformity and at the same speed in order that the thrust to the pipe does not waver or lag from side to side. Otherwise the pipe will tend to weave in its advance, and so increase friction. This point has more significance,

naturally, with the heavier-walled pipe, but should be observed in all except the smallest and shortest jacking jobs.

Removing the muck

When the jacking is within a working pit some means of elevating the muck to the surface must be worked out. Unless the pit is too deep, a series of inclined runways over which wheelbarrows can operate, is usually planned. A dragline is occasionally used, and is very convenient for the purpose, but its use is difficult to justify from a cost standpoint, as the total amount of muck to be handled in the typical jacking job is not large. The same can be said of various types of conveyor systems that have been employed with jacking.

The "tough jobs"

Some jacking jobs are handled easily and the observance of the above recommendations seems unnecessary. For the longer or larger diameter jacking jobs, however, or when working in loose or wet soils, the following precautions will prove worth their effort:

1. Construct solid, firm and dependable backstop and jacking collars.
2. Plan the work on a "shift" basis.
3. Jack at frequent intervals.
4. Jack from the outlet, particularly during or when approaching the rainy season, or where rains can be expected at any time.

The method shown for transmitting the thrust from the jacks to the collar, also the type of lining timbers often varies, particularly with some

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The problems of PERMAFROST

Ignorance and wide differences of opinion on treatment of permafrost plague engineers — Corps of Engineers research and construction activity in Alaska provides precedent for future practice

PERMAFROST underlies one-fifth of the earth's surface, according to various authorities. Included are 80% of the land area of Alaska, 50% of Canada, and practically all of Siberia. These three alone add up to 5,500,000 sq. mi.—a tremendous area, relatively undeveloped, and much of it showing wonderful possibilities in its mineral wealth.

The Corps of Engineers, when assigned to design and construct Alaska defenses, was faced with a new and strange engineering field. Practically all research information known at the time had been developed by Russia, so the first step was to translate Russian publications into English, edit them, and publish a text that could serve as a general guide to the engineer.

Although considerable information was compiled by these translations, it soon became apparent that the usable data from them were rather meager for engineering purposes. So the Corps of Engineers initiated an extensive research program of its own. The idea was to develop the available data as necessary to design and construct the various facilities required by this country in the permafrost regions of Alaska. To date, in spite of the research already performed, the field of permafrost engineering still has a long way to go to give the engineer the tools he needs to perform his tasks with certainty and economy.

Careful location saves trouble

In permafrost regions, it is the foundation treatment that counts. With good site selection it is often possible to build a considerable per-



By

EDWARD J.
GLENNE

Structural Engineer
Alaska District,
Corps of Engineers

centage of the necessary facilities on nonfrost-susceptible materials. This is a tremendous economic advantage, mainly because of the saving in construction time. It should be remembered that in Alaska defense work the number of individual facilities may be great, as when an entire base is being built at what is here termed a single "site." Where buildings are located on nonfrost-susceptible material, no more care is generally necessary than would be given buildings constructed in any of the northern United States on similar soil.

Variable settlement

Even if the soil is nonfrost-susceptible, varying degrees of settlement will occur when heat from the building or heat from the sun thaws underlying material. It all depends on the density of the material. However, if an ice lense or a pocket of frost-susceptible material—silt or clay—is present under the building (either all or part of it), considerable damage may ensue from its thawing and settling or compressing. If the pocket happened to be directly below a column footing or at only one end of the

Definitions

Frost heaving—Many definitions have been suggested for this phenomenon. In 1765, F. O. Runeberg expressed the concept that frost heaving was due to volume change of the contained water changing to ice. This concept is still popular today. However, a unit volume of water changed to ice will represent an increase in volume of roughly 9%, hardly explaining the conditions, for example, for some of our roads each spring.

In 1916, studies by Tabor led to a more logical concept: that ice crystals are formed as soil moisture freezes and, as the freezing progresses, the ice crystals develop into ice lenses. This action continues as free water moves into the freezing zone, thereby increasing the lense size and producing the frost heave.

Permafrost—The layer of ground which has remained perennially frozen over a great period of time.

Annual freeze-thaw zone—The top layer of ground subject to annual freezing and thawing. This is also known as the "active layer."

Frost-susceptible material—Soil that contains more than a critical percent by weight of materials finer than 0.02 mm. in diameter.

Nonfrost-susceptible material—Granular, well-drained, cohesionless material.

Adfreezing strength—Bond strength per unit of area of frozen ground or ice on a pile, foundation wall, or other surface.



STEAM THAWING at this Fairbanks job was followed by excavation of poor material and backfill with compacted granular material. Method is mostly precautionary where frozen ground is of nonfrost-susceptible type.

CAREFUL LOCATION of buildings on a military site can avoid permafrost to some extent. But network of utilities, such as this steam line installed by Birch, Lytle & Green at Elmendorf Air Force Base, requires care in location, insulation to prevent unwanted thawing in trench vicinity.



building, it is easy to visualize the differential settlement that would occur and the expense involved in an attempt to realign the structure.

Justifying exploration

From the above may be seen the importance of determining accurately and completely the characteristics of underlying soils. The depth of exploration will vary with the size and importance of the building. For a small frame structure, one test hole in the vicinity may suffice. For a large hospital or hangar, the entire site will be explored in grid fashion to a depth of from 15 to 40 ft., and one or more test holes will be dug to a depth often exceeding 40 ft. If strata of deleterious material are encountered, additional holes are bored to determine the exact depth and extent of such strata. Careful studies are then made to determine whether or not such a compressible pocket needs to be removed.

At the present, sufficient data are lacking that would definitely indicate whether or not a detrimental settlement would occur if a large structure were erected immediately over permafrost consisting of nonfrost-susceptible material—say, a coarse, well graded gravel and sand. Samples have been tested and very little or no volume reduction observed during the change from frozen to thawed state. Still, whether or not to thaw is a difficult question when no precedent is at hand, and when a multi-million dollar building is at stake. At present some sites on this type of material are being thawed and others left unthawed; so the experience of these buildings over a period of years should provide a precedent.

Tests inconclusive

When the area under a building is thawed, it is assumed that the initial volume reduction is then made and, therefore, that any additional settlement is unlikely. This procedure is commensurate with the economies realized and with the very small risk assumed.

A few years ago, extensive tests by Karl Terzaghi resulted in recommendations to thaw by means of steam points and to compact by blasting the permafrost underlying a power plant site in Alaska. Although the results

of this procedure were inconclusive, steam thawing and consolidation by driving piling were used on several later jobs of importance. Here again, it was not possible, from observed results, to determine conclusively that the consolidation of underlying soils that took place was of sufficient degree to prevent subsequent settlement damage.

Questions remain

Continuing studies have been made of methods for compacting soil, and the question has always remained in the minds of engineers as to whether compaction is necessary in dense, granular permafrost. There has also been prevalent the question of whether thawing is necessary in this same type of permafrost. Every effort is being made to resolve these two points. It is always the hope of the engineers that the next site will require no preparation of its underlying soil. This attitude is commendable, especially when it is realized that several percent of the cost of the structure may be spent on soil preparation. Such preparation is all too often a very necessary contract item.

Cheap basements

Where the overlying soil is not suitable as foundation material, it is usually removed. The depth to good firm soil is often about 5 to 15 ft. Under such circumstances it is advisable to design the structure with a full basement. Where funds permit, the basement may be finished; where funds are limited, the basement may be left unfinished and completed later. Either of these methods will prove as cheap as or cheaper than excavation of the hole and then backfilling it with gravel compacted to densities of 90 to 95% of optimum.

Pile foundations are often resorted to where the facility is sited over a thick layer of frost-susceptible material. The bearing value of the piles may be governed by skin friction, point bearing, or the adfreeze strength of the permafrost. Where either of the first two methods is used, the design is conventional; where adfreezing is depended upon, the temperature of the permafrost must be favorable. Generally speaking, if the thermal regime is higher

than 28 deg. F., adfreezing of the pile is marginal and often doubtful; temperatures of 25 to 28 deg. F. will adfreeze but may require several months to do so and may not be practical to apply without resort to artificial back freezing. Where permafrost temperatures are lower than 25 deg. F., no trouble is encountered in developing full adfreeze strength.

Some of our most northern projects have found it necessary to keep poles and piling plumb and in line at all times because of the quick back freezing experienced. The rule, extracted from the Russian publication, for piling depending on adfreeze strength is to place the pile into permafrost at least twice the thickness of the annual frost zone anticipated when the new thermal regime has been established under the building.

Drilled-in piles

It is not possible to drive piling into permafrost, so holes are drilled first and the piling placed therein. If drilling is not practicable, the pile locations are steam thawed and the piles placed in the thawed area. It is imperative not to thaw any more ground than is absolutely necessary to place the pile to its designed depth, since the rate of adfreezing would be seriously retarded by such methods.

Another method being investigated is maintaining the permafrost under the building by mechanical refrigeration. The general principle underlying this system is that of circulating, during the winter months, enough subzero air to effectively keep the permafrost frozen throughout the summer months. This method holds considerable promise but is still in the experimental stage.

Conclusions

The present knowledge of methods of design and construction in permafrost regions remains sorely limited. However, research performed in the recent past, and the increased scope of research anticipated for the near future, holds promise that more exact means, and therefore more economical means, will be offered the designer to cope with his problems. In the meantime, the designer must be cautious, though the cost of being so is often very discouraging.

Prefab canal linings rated by seepage tests

Continued study by Idaho Experiment Station and USBR shows effect of various types of protective cover on action of low-cost canal lining materials — Compacted-earth shows up well in tests

FOLLOWING up a program started in June, 1950, the Engineering Experiment Station, University of Idaho, and Region 1, Bureau of Reclamation, have continued to investigate jointly the problem of lower-cost canal lining. Two additional years of work have been completed since activity under the program was summarized in the November 1951 issue of *Western Construction*. This article reports the latest progress and results of the cooperative investigation.

During the summer of 1951 a special lateral was constructed to isolate experimental lining operations and seepage testing from interference by normal operation of the canal system. Several types of linings have been placed in this experimental lateral, known as the Savage test lateral. A preliminary soil classification was made of the area, field permeability tests were made, and after construction of the unlined lateral, extensive tests were made of seepage loss before lining. Both seepage meters and the ponding method were used to measure seepage loss.

Three types of lining

Three different types of lining were installed in the Savage test lateral during 1951. The first type of lining was a buried prefabricated asphaltic membrane. The membrane consisted of a Fiberglas mat coated with filled

By **C. C. WARNICK**
Engineering Experiment Station
University of Idaho
Moscow, Idaho
and
R. J. ABBEY
Region 1
U. S. Bureau of Reclamation
Boise, Idaho

asphalt cement containing diatomaceous earth, slate flour, and asbestos fibers, and varied in thickness from $\frac{1}{8}$ to $\frac{3}{16}$ in. The material was furnished in rolls 36 in. wide and 36 ft. long weighing approximately 90 lb. To form a membrane, strips of the material were laid normal to the center line in an overexcavated section of the lateral. The strips were lapped 2 to 3 in., the overlap being cemented with an RC-1 asphalt cutback. One



SPECIAL CEMENTS for joining strips of prefabricated membrane (above) give better joint than cutback asphalt previously used. Cements were recommended by cooperating manufacturers of membrane.



BACKFILLING (left) required care to avoid displacement or rupture of lining. Fine grading of this bulldozed material gave 1 ft. of protective cover.

foot of earth was placed over the membrane as a protective cover.

The second type of lining used the same prefabricated liner but had a thin asphalt macadam as a protective cover for the membrane. Construction of this section consisted of excavating, installing the membrane, applying a tack coat of asphalt emulsion over the membrane, placing a thin layer of gravel (about 2 in.) over the tack coat, and penetrating the gravel with sufficient asphalt emulsion to tie the gravel particles into a stable mass.

Uncompacted earth

The third type of lining was an uncompacted earth lining. A 240-ft. section of the lateral was over-excavated 12 in. below the design grade during original construction to allow for placement of the uncompacted earth lining. The soil for lining, predominantly silt, was hauled in trucks and dumped into the over-excavated section. Then the section was reshaped with a dragline. All the sections had a design bottom width of 3 ft., water depth of 1.5 ft., and a profile gradient of 0.0007.

After installation, each type of lining was checked for seepage. The ponding method of measuring seepage loss was used in all lined sections. A comparison of seepage losses is shown in Table 1.

The figures indicate that the loss from the macadam-covered prefabricated section was twice that from the earth-covered, prefabricated section. The greater loss is probably due to the macadam cover not being heavy enough to press the prefabricated sheets together and thus insure a good seal at the joints. The thin macadam covering is not water tight and cannot be considered to aid in preventing seepage. However, it appears to be very stable and should require less maintenance than the earth-covered section.

New products

Various companies interested in manufacturing prefabricated canal liners furnished linings for testing during 1952. The products of four different companies were placed in adjacent sections of the Savage test lateral to compare the relative merits of each and to establish the best methods of installation. The first material was an asbestos-reinforced liner furnished by the Johns-Manville Sales Corp. of Pittsburgh, California. The second material was a new glass-fiber reinforced material proposed for use by Glass Fibers, Inc., a firm with headquarters in Toledo, Ohio. A third material was 45-lb. smooth-roll roofing, having an ordinary rag-felt base and furnished by Certain-Teed Products Corp. of Richmond, California. The fourth material was a "crawl space cover and concrete slab waterproofing" furnished by Ruberoid Co. of New York.

SUMMARY OF SEEPAGE LOSSES

Table 1. Comparison of seepage losses in Savage test lateral

Section description	Average seepage loss cu. ft. per sq. ft. per 24 hr.	
	Before Lining	After Lining
Earth-covered prefabricated lining.....	4.45	0.17
Thin macadam-covered prefabricated lining.....	4.45	0.35
Uncompacted earth lining.....	2.19	0.73

Table 2. Comparison of seepage losses in Montgomery lateral

No. of tests	Condition of lateral	Average seepage loss cu. ft. per sq. ft. per 24 hr.
6	Natural silt	1.16
8	Silt removed	4.77
3	Prefabricated lining.....	0.022

Table 3. Comparison of seepage losses in test sections of the "D" Line Canal

No. of tests	Section description	Average seepage loss cu. ft. per sq. ft. per 24 hr.
4	Unlined	0.15
4	Concrete-block lining	0.08
5	Compacted-earth lining	0.017

Special cements were used to cement the overlapping joints together as recommended by the companies, and in all cases these were found to work very satisfactorily. The cements performed better than the RC-1 cut-back asphalt used in earlier installations. They were much more cohesive and kept the joints more tightly bonded as the sheets were being placed and covered. A small brush with a long handle was used to apply the cement. All four types of lining were laid in strips normal to the lateral centerline and covered with 1-ft. of earth. A small berm at the top of the lining was used to anchor the strips during laying and cover-placing operations. Earth shoveled by hand onto the top ends of the membrane served to hold the sheets until the earth cover was placed. The earth cover was placed with a dragline immediately following installation of the membrane.

Seepage loss measurements made in these four lined sections revealed an average loss under unit head of 0.057 cu. ft. per sq. ft. per day. The comparative loss before lining averaged 2.99 cu. ft. per sq. ft. per day. Losses from each of the four sections were approximately equal. These sections will be retested and records will be kept of lining condition over a number of years.

Another test section

An additional test section established during 1952 was a 300-ft. section of a farm lateral located in sandy soil just south of the Savage test lateral. This lateral, referred to here as the Montgomery lateral, had been in operation three or four years. During that time a good layer of silt had been

deposited over the perimeter of the lateral. To determine the value of this silting in reducing seepage loss, a series of ponding tests were made before the silt was disturbed with the lateral in normal operating condition. After the seepage tests the layer of silt was removed by hand shoveling, and another series of ponding tests were made to evaluate the seepage loss. The section was then lined with Johns-Manville's prefabricated asbestos canal lining. The usual method of installing and covering the lining with 1 ft. of earth was used, except a small bulldozer was used to place some of the protective earth cover. To prevent disturbing the prefabricated sheet, the bulldozer blade was lifted as the earth was pushed into and down the side slopes of the lateral. Seepage tests were also conducted on the section after lining. The average seepage loss for each condition under unit head is indicated in Table 2.

Other seepage tests

A further series of tests conducted in the "D" Line Canal of the Payette Division, Boise Project, has also revealed interesting data on seepage loss. This canal has a design bottom width of 10 ft. and a water depth of 4.5 ft. Three sections 400 ft. in length were used in this series of experiments. An unlined reach of the canal, an experimental concrete-block lining and a compacted-earth lining were tested for seepage using the ponding method. The earth lining placed in 1947 has a minimum compacted-earth thickness of 18 in. and is covered with 6 in. of pit-run gravel. The average losses measured in these three sections are shown in Table 3. Losses in

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Development and outstanding examples of

Steel bearing piles in the West

In a period of about 25 years this type of foundation support has advanced from the driving of a single test pile to a major project calling for 24,700 tons of 89-lb. H-piles

By **MILO S. FARWELL**

Sales Engineer
Bethlehem Pacific Coast Steel Corporation



FIRST USE of metal bearing piles in the United States dates back to about 1899. At that time they were used in the midwestern states of Iowa and Nebraska for highway bridges. Engineers took note of the fact that fast-moving ice floes, as well as the erosive action of moving water, caused serious damage to other types of piles and undermined foundation material beneath concrete piers. They overcame this problem by using steel H-piling. Beyond this early application, however, no important increase in the use of steel H-piling occurred in the United States for the next 30 years.

First use in West

In the West steel H-piles were first introduced in 1929, when forward-looking engineers conducted a load-bearing test on a steel H-pile near the waterfront in Oakland, Calif. The pile selected was an 8-in. by 32-lb. section and was coated with hot coal tar paint. It was driven with a 2800-lb. drop hammer, and readings for the total penetration of the last six blows recorded $2\frac{1}{2}$ in. No soil data were available at the time. A bearing test was made on this pile by means of a

FROM THE TIME he directed the first Western load test on a steel bearing pile in 1929, Milo Farwell has been a recognized authority on this type of foundation design and construction. As evidence of his knowledge of the subject he was assigned to supervise the preparation of the first handbook in 1937 which appeared under the title "Bethlehem Steel H-Piling."

As the 25-year period ends it is proper to review the development of H-pile foundations through some historic applications, and the author is well qualified to present this outline to engineers and contractors of the West.—Editor.

steel bridle secured to two anchor piles, and pressure was applied with a hydraulic jack. When a pressure of 164 tons was reached, the pile wrinkled at the top. In spite of this, the load bearing test was considered to have provided excellent results, and marked the beginning of the use of steel H-piles in the West.

Results

The pile in this first test remained in its original driven position until 1940, when it was removed. It was found to

have had a 28-ft. penetration into sandy clay soil where the high tide line was 6 ft. below the ground surface. Compacted soil, of a granular nature, was found between the flanges. The tar coating was in good condition.

A local testing laboratory reported the test as follows: "The coating showed the original brush marks and was found to be in good condition. The pile, after removal from the ground, was in excellent condition, particularly considering the type of soil into which it had penetrated, and also considering the influence of salt water which had permeated the soil from the adjacent estuary."

When any doubt arose as to the bearing value of the soil on a particular job, load bearing and pulling tests have been conducted since that time.

Specification and soil conditions

The early application of H-piles was generally confined to 8-in. by 32-lb. sections. Since engineers experienced some web buckling with this type of section, however, a new series of 8-10-12-14 in. wide flange sections, with web and flange of equal thickness, was developed. This change in section overcame the tendency of the webs to buckle as they were being driven. The type of steel specified for pile sections is usually ASTM A-7. As for safe capacity for H-piles, standard design practice has been to use 9,000 psi.

The steel H-pile lends itself to easy splicing when long lengths are required, as steel plates can readily be welded on the outside of the pile flanges. Spliced lengths have been used to 350-ft. Steel piles have been used quite successfully when driven into both cohesive and granular types

AN EARLY installation of historic importance was the steel pile foundation for the San Diego Civic Center Building. The site was in a tidewater area, as shown. Piles were of 10- and 12-in. sections designed for 24- and 35-ton loads.

of soils. In this connection it is interesting to note that the adhesion of clay to the pile section is greater than the shear value of soil-to-soil. As evidence of this, a pulled pile will show the line of cleavage as a square around the edges of the flange for the length of the pile. An illustration shows that condition clearly with the clay core pried loose with a crowbar and up-lifted for several feet.

Probably the most satisfactory H-pile installation is the end bearing type. With this type of installation the point of the pile is embedded in the rock stratum.

Off-shore oil wells

In 1929 and 1930 off-shore oil well drilling operations in Southern California required service piers extending some 1,800 ft. from the shore line. Foundation material under 30 ft. of seawater was shale rock. The pile bents consisted of 8-in. by 32-lb., H-pile sections driven from 4 to 6 ft. into this material. This installation was of interest because it proved that steel H-piles could be driven to necessary penetration into soft rock. Of additional interest is the fact that after having been exposed to seawater for some 20 years the piles were found to be in usable condition. Approximately 20,000 tons of the light web section piles were used for these projects.

The service pier H-piling projects marked the beginning of large-scale use of steel H-piling in the West in many types of construction such as bridge and building foundations,



grading dock foundations, overhead highway crossings, wharf construction, retaining wall installations, false work bents, fender dolphins and even fish trap supports.

SOME TYPICAL WESTERN H-PILE INSTALLATIONS

1—A California state highway bridge over the Santa Clara River in Ventura County built in 1934 was one of the first highway projects using steel H-piles. Approximately 400 tons of 8-in by 32-lb. sections, driven into sand and gravel to carry superimposed concrete piers, went into this project. The bridge is approximately 1,100 ft. long and is still in use today.

2—Foundation for the San Diego

Civic Center Building, a Southern California landmark, required about 1,200 tons of 10 and 12-in. sections, driven to full depth for 24 and 35 tons bearing capacity and carrying concrete footings. Although the location was in a tide water area, the project was entirely satisfactory from an engineering standpoint.

3—A warehouse foundation for the AT&SF Ry. Co. was another project of significance. Ten-inch by 42-lb. H-piles, first of the new series, were driven on the San Francisco waterfront about 1936 through filled material of wood, metal, trash, etc. A load bearing test indicated the piles were ample for 40-ton design capacity. This project, which required about 200 tons of steel H-piles, marked an important step in the development of this type of piling.

4—In 1940 a large graving dock requiring 1,200 tons of H-piles was constructed near Honolulu. H-piling was used principally to resist uplift

FIRST JOB involving use of new series 10-in. by 42-lb. H-piles was the Santa Fe Railroad warehouse built on the San Francisco waterfront in 1936. The steel piles are shown as driven among wooden stubs and through metal, trash and fill. Test showed the piles adequate for a 40-ton design load.



caused by hydro-static pressure. A series of pulling tests to determine resistance of coral to uplift showed that the steel piling was satisfactory.

5—In 1943 the U. S. Bureau of Public Roads designed two steel H-piling projects of interest to the engineering field: One was the Colorado River Bridge at Parker, Ariz., having a trestle-type foundation constructed of 12-in. by 57-lb. piles. A load bearing test indicated the piles were satisfactory for 40 tons per pile as required for the H-15 loading. The other was the Blue Creek Bay Bridge in northern Idaho. This was supported by four leg-braced towers of 10-in. by 57-lb. H-piles set in 18-in. diameter steel casings which in turn rested on rock. The piles were set in place, the casings cleaned and then filled with concrete. Some of the piles were spliced to make 350-ft. lengths.

6—Approximately 600 10-in. and 12-in. H-piles were used for wharf foundation repairs to the Long Beach, Calif., plant of the Ford Motor Co. The problem here was to drill holes through a thick concrete deck before the piles could be inserted in position for driving.

7—A somewhat different H-pile application was in highway embankment protection for two sections of roadway near Guerneville, Calif., constructed in 1942. The embankment was secured by the use of driven H-piles with wood lagging to retain the earth and tie rods secured to H-piles as anchors.

8—An important H-pile installation was the falsework supports for erection of the 500-ft. truss spans of the San Francisco-Oakland Bay Bridge. Twelve-inch by 65-lb. H-piles were arranged in a structural cage

framework. Upon completion of the erection program, the piles were subjected to a number of driving and pulling tests. Test data indicated frictional value on the perimeter of the piles, which were driven into clayey and silty sand under 40 ft. of water, was 6-lb. per sq. in. of contact pile surface. This was considered a satisfactory value for this purpose.

9—The City of Seattle specified 96 battered 10-in. by 42-lb. piles to take the thrust of a 160-ft. arch span which carries H-20 highway loading and 40-ton electric railway cars. This installation, which was completed in 1934, was the first in which H-piles were used to take the thrust of a concrete arch.

10—In addition to the Western States and the Hawaiian Islands, steel H-piles also have been used in Alaska. In 1934 a post office building was constructed at Ketchikan on 8-in. by 36-lb. piles designed to carry 30 tons per pile. A particularly interesting Alaska application of H-piles is a fish trap at Alitak. The flexibility of steel piles, which were driven in a rectangular pattern, made for easy aligning of the trap.

11—Newest Western construction project calling for steel H-piling is the Richmond-San Rafael Bridge. Here the design calls for 24,700 tons of 14-in. by 89-lb. H-piles, some of which are to be spliced to make 180-ft. estimated lengths. The piles for the main piers are to be driven in a concentric pattern. Some groups will contain over 75 piles, of which some are to be battered. The driven pile tops finish under water. This will be the largest H-pile installation in the West to date.

This review of a few outstanding



EVIDENCE of the way a steel pile pierces a stratum of clay is shown by this core which was bent out from between the flanges after the pile had been pulled.

projects indicates the increasing usage to which H-piles have been put in Western construction projects and their increasing acceptance on the part of engineers during the last 22 years. From a single-pile test back in 1929 to a project calling for 24,700 tons, the use of steel H-piling in the West has come a long way and I predict their application will become more widespread in the future.

FOR bridge foundations H-piles can be used for direct bearing or for taking horizontal forces as shown by these batter piles being driven for a structure in the Los Angeles River channel.



New American Standard for cast-iron fittings

A NEW American Standard for short-body cast-iron fittings for water distribution has been published and may be obtained from the American Water Works Assn., 521 Fifth Ave., New York 17, N. Y., upon advance remittance of 35¢. Known as ASA A21.10-1952, the specification was jointly sponsored by the American Gas Assn., American Society for Testing Materials, New England Water Works Assn., and American Water Works Assn., and has received the official approval of the American Standards Assn.

The fittings are designed for 250-psi. water pressure plus water hammer, and represent a radical change in design from the previous standard, which was established by two of the sponsoring agencies in 1908. The new short-body fittings are lighter, cheaper, and more compact than the earlier bell-and-spigot fittings, and are better adapted for distribution work in city streets congested with utility and other structures.

Exhaust gas conditioner permits . . .

Diesel engine use in tunnels

On a tunnel project in Colorado the power of a diesel locomotive was used to speed driving progress on 2.18% up-grade—Scrubber neutralizes exhaust fumes—Design and operation of conditioner described

SUITABLE motive power for equipment working underground is a constant problem. Whether the operation is tunnel driving or mining, or merely work in a rather restricted excavation, an adequate supply of suitable air is essential. Seldom will natural draft alone do the job. Compressor installations are always expensive, and one way that ventilating cost has been held down in the past has been to rule out internal combustion engines for underground use. Compressed air has always been the power used in nearly every operation except haulage, and that has generally been given over to electric storage-battery powered locomotives.

Development and increasingly widespread use of diesel engines did much to change the thinking of tunnel engineers and contractors, but only on jobs of large diameter. The exhaust gas of diesel equipment has a fouling effect on the air, and it is toxic in large enough quantities. But it lacks the deadly quantities of carbon monoxide found in gasoline engine exhaust.

In 1944 the Commissioner of Mines of the State of Colorado approved the use of an exhaust scrubber for diesel equipment used underground. Since that date, a large number of mining and construction operations have been carried out with diesel motive power equipped with this type of exhaust gas conditioner. The equipment was developed and is manufactured by The Ruth Company of Denver, Colorado.

Used at Carter Lake tunnel

Recently this type of conditioner was used by K. S. Mittry Construc-

tion Co. during the driving of the Carter Lake tunnel for the Bureau of Reclamation. A description of this tunnel project and some of the driving and lining problems was presented by Max Gelwix, Bureau of Reclamation engineer, in an article which appeared in *Western Construction*, September 1952, p. 65. The importance of this development to other tunnel contractors throughout the West has resulted in this supplemental article which describes in more detail the contractor's use of the diesel gas scrubber and the features of the unit.

A statement has been secured from James H. Stewart, chief engineer, K. S. Mittry Construction Co., who served as project engineer on the Carter Lake tunnel. The statement from Mr. Stewart covering their operations follows:

On June 27, 1950 our company submitted the low bid to the Bureau of Reclamation for construction of the Carter Lake Pressure Tunnel located near Loveland, Colo. This tunnel forms an integral part of Estes Park-Foothills Power aqueduct on the Bureau of Reclamation's Colorado-Big Thompson project. Purpose of the tunnel is to convey water from the

Flatiron power and pumping plant into the Carter Lake Reservoir.

Total length of tunnel driven was 5,792 ft., and it has an inside finish diameter of 8 ft. after lining. Perhaps one of the most difficult features of the job from a construction standpoint was that it was driven up a 2.18% grade. Also, the grade to the dump was, of necessity, carried at 3½% up from the portal. The types of ground encountered were sandstone and shale, with approximately 70% of the distance in sandstone. Of the total distance of 5,792 ft., 4,558 ft. required structural steel tunnel supports with wood lagging. The remaining 1,234 ft. was carried through unsupported.

When driving operations were started, two 9-ton electric storage battery locomotives were used for main haulage in the tunnel and a 6-ton locomotive with gasoline engine was used to assist them in hauling the loaded mine cars from the portal up the 3½% grade to the dump. The two battery locomotives were each driven by two 15-hp. DC mine motors which gave a horsepower-to-ton ratio of 3.33. The acceleration of these locomotives up the 2.18% grade was very



EQUIPPED with exhaust gas scrubber this is one of the diesel powered locomotives as remodeled for use in the Carter Lake tunnel. Increased power and less weight than the original battery locomotive enabled this hauling unit to handle more cars of muck and definitely increase the daily advance of the heading. Bureau of Reclamation engineers conducted frequent tests to confirm the proper quality of the air in the tunnel. They found that the diesel engines had to be maintained in first class condition to keep the toxic gases reduced to a minimum.

poor and they were limited to pushing only 5 loaded 88-cu. ft. cars up the grade. Since a car passer was used in the mucking operation the above two facts seriously slowed down the mucking cycle.

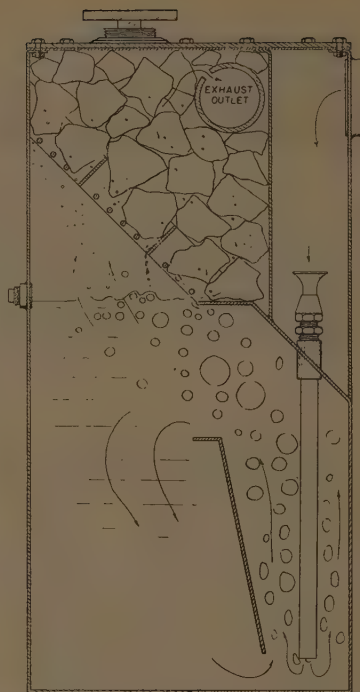
Another factor which greatly added to the maintenance cost of the storage battery locomotives was the fact that the motormen would "plug" or reverse the controller when hauling loaded cars down the grade to supplement the brakes. This resulted in an excessive amount of controller fingers, segments, and contacts being burned. Here the problem of replacement was not only the cost, but the fact that due to the shortage of electrical material, it was extremely difficult to keep sufficient replacement parts on hand. The above equipment was used as described for the period from Sept. 25 to Dec. 27, 1950. During this period there were 75 working days and the heading was advanced 1,854 ft. for an average daily advance of only 24.7 ft. per working day.

Hauling had to be speeded

It became apparent that something would have to be done to increase the speed of operations and since one of the biggest bottlenecks was haulage and the slowness in shuttling cars to the mucking machine it was decided to try a lighter locomotive with a higher horsepower engine. Arrangements were made with the Ruth Co. of Denver to try one of its 5-ton diesel locomotives equipped with a Hercules model DJX diesel engine and a Ruth exhaust gas conditioner. The addition of this one unit to the operation increased the average daily advance during the next two months from 24.7 to 32.2 ft. per day. This unit proved so satisfactory that it was decided to convert the 6-ton gasoline locomotive which had been used outside the portal to diesel power. This was done by replacing the gas engine with a model 190 DLC Waukesha diesel engine and adding a Ruth exhaust gas conditioner. After installing the second diesel unit the average daily footage was again increased, this time to 38.7 ft. per working day.

The reasons for this increase in footage can be attributed to one main reason: namely, a higher ratio of horsepower to gross weight of the locomotive. Where the battery locomotives had a horsepower to weight ratio of 3.33, the diesel locomotives with a horsepower of approximately 80 and a weight of 5 tons had a ratio of 16. This meant the diesel locomotives would accelerate much faster and would haul a much heavier load. They could push seven loaded 88-cu. ft. capacity cars up the $3\frac{1}{2}\%$ grade to the dump where before a battery locomotive had to be assisted by the gasoline locomotive to get the muck from the portal to the dump.

Other factors contributing to make diesel operation more economical are: (1) easier to maintain; (2) parts are



HOW IT WORKS: Exhaust gas from the engine enters at upper right and bubbles up violently through the water in the tank. This circulating water tends to shear off the incoming gas into tiny bubbles, which is an important factor. Gases lose their toxic oxides in the solution and then rise carrying spray into the lime rock where the acid is neutralized. Water drips back into tank and gas continues through the outlet.

more readily available and cheaper, and (3) no expensive auxiliary equipment such as battery charging sets are required.

Maintenance of the scrubber

Maintenance required for the exhaust gas conditioner is simple but important if the scrubber is to perform satisfactorily. First the water in the conditioner should be changed at least once every 8 hr. of operation to prevent building up the salts of calcium formed by the limerock, because these salts would decrease the absorbing capacity of the water. Second, the injection tubes should be rodged out with a wire brush every 50 hr. A piece of wood the shape of the flared top of the injection tubes is used to clean off the carbon soot which accumulates at this point. Third, the top of the conditioner should be removed at least once every 30 days and the limerock replenished with 2-in. mesh and minus 3-in. mesh limerock to replace that which has been consumed by the acid diesel exhaust gases. This maintenance is simple, and if followed regularly will allow the scrubber to clean up the exhaust gases and make for safe operation of diesel engines underground.

In closing we would like to state we are convinced that diesel power

properly used is the most economical and efficient locomotive power available for tunnel haulage. Our project was the first one which satisfactorily used it in this area and we proved its advantages so decisively that several other tunnels in this area have converted to its use. At the time of this writing our company is preparing to start driving another 8-ft. diameter tunnel and we plan to continue our use of diesel power.

This concludes the statement by James Stewart. A description of the scrubber follows:

Exhaust gas from a diesel engine contains aldehydes, carbon monoxide and oxides of nitrogen. In usual amounts these impurities are not toxic, but are irritating to eyes, nose, throat and lungs. However, they are soluble in water and when they are violently agitated in a column of water they tend to go into solution and may then be neutralized by an alkaline substance such as lime.

In principle, the exhaust gas must pass through a body of water in the form of tiny bubbles. The conditioner design not only requires that these bubbles be tiny in size, but that also the amount of water be kept to a minimum so that the unit will not be too bulky for use on portable pieces of equipment.

How it works

General features of design are illustrated in the cross-section drawing. By separating the water into two columns and introducing the gas into the first a rapid circulation is effected due to the difference in density. The circulating effect tends to shear off the bubbles at the point of discharge into the water, making them of small size. By means of this circulating effect about eight times more gas can be introduced into a given volume of water than would be possible if it were non-circulating. During the discharge through the water the toxic oxides of nitrogen go into solution.

Violent action in the water column tends to spray this acid water into the lime rock in the upper chamber of the scrubber where gas and liquid separate. The acid water is neutralized on the surface of the limestone and runs back into the conditioner in the form of calcium nitrate. The exhaust gas is further neutralized in its contact with the wet lime rock.

The conditioner has the further function of reducing the temperature of the exhaust gas from about 1,200 deg. F. as it comes from the combustion chamber of the engine to about 180 deg. F. as it leaves the conditioner.

The final feature of the conditioner is a venturi which dilutes the gas from the scrubber with five parts of air.

A partial list of the present users of this type of diesel exhaust gas conditioner includes some of the largest Western mining companies as well as several important contractors.

On Colorado canal— Control is automatic

**Newly-constructed head-
gates sensitive to varia-
tions of only .02 feet in
water level**

By KYLE F. BRYNING

Superintendent
Rio Grande Canal Water Users
Association

WATER REGULATION in the Rio Grande Canal at Monte Vista, Colo., occupied the constant attention of the headgate keeper for years, especially during the months of May and June when the Rio Grande is above flood stage and the daily fluctuation can amount to 1,000 cfs. During the 3-yr. period from late 1949 to 1952, the Rio Grande Canal Water Users Association replaced the old timber diversion dam, trash rack, and headgates with reinforced concrete structures. This article describes the construction, a special feature of which is the system of automatic headgate controls.

Work started on the headgate structure in October 1949 and was finished, including building rock walls in the canal, before March 1, 1950.

Since the average elevation of irrigated land in the San Luis Valley is 7,600 ft., the winters are long and severe. Temperatures below 20 deg. F. can be expected at any time during January or February. Therefore, special precautions taken against the



THIS GENERAL VIEW shows the diversion dam, drift guard, sluice gates, and canal headgates of the Rio Grande Canal water regulation system.

winter weather included heating the concrete aggregates and water before mixing, covering the forms with canvas and heating them for 12 hr. before a pour, and keeping them warm for 96 hr. after the concrete was in place. Danger from both fire and flood complicated the work, since ice jams in the river would divert water into the construction area, and on one occasion the oil-burning salamanders ignited the canvas, destroying both the cover and the forms.

Headgate structure

The headgate structure has five electrically-controlled, breastwall-type, radial gates. The center gate is 10 ft. wide and 7 ft. high. The other four, 14 ft. wide and 7 ft. high, are paired so that each pair can be operated by one geared electric motor and an electric hoist. The gates, whose arms are steel channels, have $\frac{1}{4}$ -in. steel face plates reinforced with steel

beams. The top and side seals are cloth-inserted rubber belting, and the bottom seal is a 4 x 6-in. timber.

The headgate job took 175 cu. yd. of concrete at a cost of \$25,300.

During the winter months of 1950-1951, the drift guard, sluice gates, and upper and lower river walls were built, the concrete pour amounting to 310 cu. yd. The cost of construction, including gates and lifts, was \$29,100.

The drift guard discharges water into the forebay through seven submerged openings 12 ft. wide and 6 ft. high. The elevation of the lower surface of the cantilever slab is the same as the crest of the diversion dam. During periods of low flow, the floating debris slides along the outer edge of the slab and is discharged over the dam. When the river is at flood stage, floating material is washed along the breastwall and is held out of the forebay by the 4-ft. cantilever slab.

Sluice gates

The sluice gates, two electrically-operated, breastwall-type radial gates, 10 ft. wide and 6 ft. high, are similar in design to the canal headgates. The cut-off walls for the headgates, drift guard, and sluice gates were excavated 6 ft. below the grade of the river. The upper wing wall of the headgate structure and the upper river wall were founded on solid rock. The other structures were built on a coarse gravel foundation.

A steel trash rack is now being installed in front of the drift guard to eliminate the saturated logs and stumps which have been taken into the canal and which have damaged the canal banks and lateral headgates.

Ogee-type dam

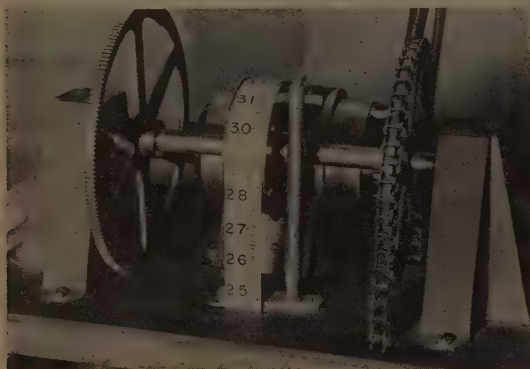
It was decided to make the diversion dam an ogee type after model tests were made at the Bellvue Lab-

FIVE RADIAL GATES, operated by three geared electric motors, control the water flow through a chain drive to the drum shaft.





ONE PAIR of gates is operated by this electric hoist. The vertical levers engage the jaw clutches and the hand wheels operate the brakes.



THE SENDING UNIT, located in the gauge house at the canal gauging station, transmits the armature movements of its selsyn motor, turned by the movement of a large float in the well below the gauge house, to . . .



THE RECEIVING UNIT, located in the electrical cabinet on the lower wing wall of the headgate structure, shown here below the control panel.

oratory of Colorado A & M by Ralph Parshall, and Arthur W. Kidder of the U. S. Bureau of Reclamation was consulted.

Since the San Luis Valley was very dry in 1951, preliminary work on the diversion dam started a month earlier than had been anticipated. The foundation slab and the cut-off walls are of reinforced concrete, supporting a core of cyclopean masonry enclosed by a 12-in. reinforced concrete shell.

The inverted filter and drains were carefully placed and were very effective. Water was flowing from every drain when the last section of the foundation slab was placed. Heavy rock riprap was laid for 50 ft. below the toe of the dam, where recent investigations show a gravel deposit in the area with no signs of erosion.

Construction of the diversion dam and the wing walls took 520 cu. yd. of reinforced concrete, 320 cu. yd. of cyclopean masonry, and 15 tons of reinforcing steel. The cost of this structure and the riprap below the dam was \$42,500.

Automatic operation

Automatic operation of the headgates is accomplished by means of a 1,000-ft. underground cable of five wires, laid from the canal-gauging station to the control panel at the headgates. These wires synchronize two selsyn motors, in the sending and receiving units, which are a part of the automatic controls.

The sending unit's selsyn motor is turned by the movement of a float in the well below the gauge house. It

has a graduated tape, showing the canal-gauge height, which is accurate to within .005 ft. Any movement of the armature of the selsyn motor in the sending unit causes a similar movement in the corresponding armature of the receiving unit's selsyn motor.

The canal-gauge height may be read on the cylinder in the center of the receiving unit, which has three cams, supported by vertical bars, turned by the armature of the selsyn motor. The first cam will make contact when there is a variation of .02 ft. in the canal-gauge height. This cam controls the center radial gates. The second cam controls the pair of radial gates near the sluice gates and will make contact when the variation is .04 ft. With the first and second cams in contact, three headgates are operated to correct the error. When the fluctuation is .06 ft., the third cam makes contact and all five gates are open. Jaw clutches and hand brakes make it possible for one motor to operate either one or both gates, the hand brake holding a gate in any position even though it is disconnected from the drum shaft.

Manual operation, too

Manual operation, when desired, is simple. The headgate keeper, when he is ordered to change the amount of water in the canal, releases a small clutch which disconnects the cams from the selsyn motor and adjusts the headgates with three hand switches. When the desired gauge height is shown on the cylinder, he holds all three cams in a neutral position and tightens the clutch which connects the cam shaft to the selsyn motor. As long as the canal's water depth is constant, all cams are in a neutral position and no contact can be made.

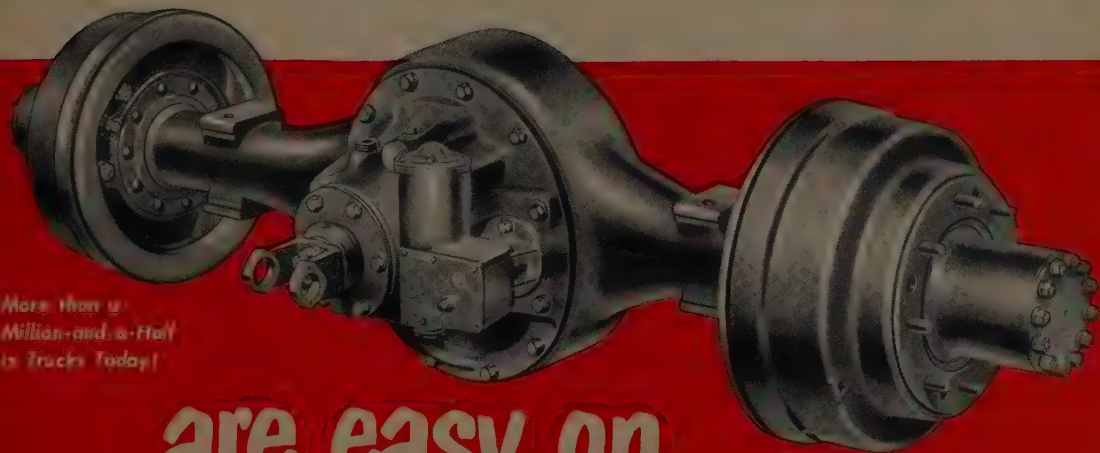
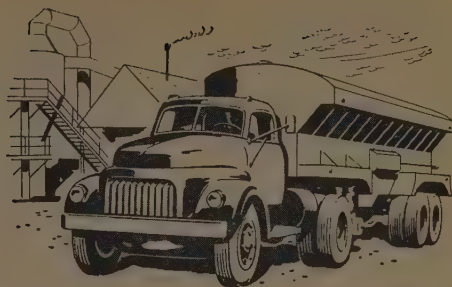
The cams are connected to the motors through an electric clock which rotates once in 15 min. and makes contact once in each revolution. The length of time the motors are energized is adjustable and is usually set between 1 and 2 sec. In this way the canal is checked every 15 min. This mechanism, which has been in use for three irrigation seasons, has proved very sensitive and highly efficient.

Project cost \$96,900

Total cost of the project, which covered a 3-yr. period from late 1949 through 1952, came to \$96,900. This sum was raised by assessing the owners of the 125,000 acres irrigated by the canal an average of less than 60 cents an acre.

Ralph Parshall designed and built the automatic controls described in this article. The Thompson Pipe & Steel Co. of Denver designed and furnished the radial gates, electrical hoists, and electrical controls. The author developed the designs and supervised the construction of all structures.

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HOW IT WAS DONE...

Mechanical detective tracks down flaws in metal



"HOIST AWAY," signals the rigger, and the portable industrial X-ray unit sets out to make a landing on a submarine at the San Francisco Naval Shipyard, where it will be used to inspect a welded hull patch.

TRACKING DOWN flaws in castings, welded sections, or other hard-to-inspect metal objects has been made easier than ever by use of a new industrial X-ray unit developed by the General Electric Co., according to E. W. Milburn, industrial specialist for GE's X-ray department in San Francisco.

The miniature mechanical detective, with an X-ray head weighing less than 150 lb., as compared with 1,150 lb.

GETTING SET to X-ray the welding on the outer hull of a submarine is J. J. Inman, radiographer at the San Francisco Naval Shipyard. The newly-developed portable unit is capable of getting into much tighter squeezes than was possible with the more ponderous conventional X-ray machines.



for conventional units, does a job in 3½ min. that took 4 hr. with heavier X-ray equipment or radium pills, says J. R. Jones, head radiographer at the San Francisco Naval Shipyard, which has the only unit in the West.

While the first unit is being used in a shipyard, Milburn says, it can also be used on such construction projects as bridges and pipelines, in welding shops, and in many other jobs where X-ray inspections are needed to control quality and safety. It is capable of X-raying up to 3½ in. of steel, operating in the range of 75,000 to 250,000 volts.

Mounted on a small trailer for portability all over the shipyard, the unit is hoisted inside ships by traveling dockside cranes. Its small size makes taking "inside out" pictures possible, since the unit's head can be placed inside the structure to be examined.

W. H. Hammond, shipyard laboratory director, says the unit is also used to inspect valve and high-pressure-piping castings. In setting up the unit for inspection of a welded joint connecting two sections of pipe, the technician can bring the unit inside the ship's hull and change its position for each exposure area without disturbing the pipe. He can also use it inside large castings and other areas difficult to reach, or insert the snout of the machine inside a smaller casting.

Plastic gas piping proves utility in Denver service installations

THE STEEL PIPE shortage in 1951 led to the experimental use of plastic gas pipe by the Public Service Company of Colorado, according to John Fugazzi, company maintenance engineer.

Some 750 service installations of the plastic pipe, leading from street main to house, have been found trouble-free by the company. Now if a steel service pipe springs a leak, plastic tubing is being inserted, on an experimental basis, instead of having the maintenance force dig up and replace the old pipe, a more costly and time-consuming operation.

Experiments showed that the plastic's gas-carrying capacity and expansion properties are satisfactory for underground use. It is not used for indoor piping, however.

In new installations, Fugazzi says, the semirigid sections of plastic tubing, (made of cotton linters processed to form "tenite-2") are joined with external plastic slip couplings fused together with butyl acetate solvent. Where the tubing joins the metal main and where it connects with steel pipe, steel sleeves are fitted into the tubing and a compression-type pipe coupling is used.

The semirigid, self-supporting tubing, superior to metal pipe in some cases, according to Fugazzi, is not used in abrasive soils. It is laid on well-compacted, level earth, wrapped at the steel-to-plastic joints, and air tested.

In acid and alkali soils that corrode steel, and particularly where electrolysis may attack metal, the plastic remains trouble-free.

The inside wall of the tubing is smoother than metal pipe, allowing gas to flow more freely through it. This lower-friction quality makes it possible to insert a flexible plastic tube into a steel pipe without cutting down the amount of gas delivered through it.



60 tons an hour on a 2-mile haul

This Caterpillar DW10 Tractor and No. 15 Scraper are loading river gravel mixed with sand — a “dead” material, difficult to handle. Although haul distance is two miles, this husky yellow team moves 60 tons of gravel in 60 minutes. Owned by K. C. Dack of Milton, Ore., they are under hourly contract to repair a secondary road in Morrow County.

Mr. Dack has two DW10s with No. 15s hauling gravel on this job, push-loaded by a Cat* D8 Tractor. “They load faster, with bigger and better loads than any other scraper,” he reports. The No. 15 Scraper is designed to be a real producer on long hauls. With its pumping action, it can get heaped loads of even “dead” material quickly and smoothly. And, with its low center of gravity, the No. 15 remains stable where the going is rough.

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HOW IT WAS DONE

Heavy equipment fleet wins race against winter rains at Lexington Dam project

A RACE against winter rains that could have washed away the construction efforts of seven months on the Lexington Dam project was won last December by the Guy F. Atkinson Co. So important was the time factor that Atkinson marshalled an equipment fleet representing an initial investment of more than the \$1,487,000 cost of the dam. As events have proved, the assemblage of this force (including 17 TD-24 crawler tractors, 10 rubber-tired scrapers, 4 pneumatic rollers, a power shovel and auxiliary equipment) was a smart move. With this equipment pool, Atkinson was able to finish the project in time enough to avoid the heavy rains which later washed out a 115-ft. cofferdam at Folsom Dam, a few miles from Lexington.

Located 45 mi. south of San Francisco, the dam was built on Los Gatos Creek for the Santa Clara Water Conservation District. It provides a capacity of 25,000 acre-feet and will store additional water for irrigation and domestic purposes.

An earthfill and rock structure in four zones, 195 ft. high from bedrock to crest, the dam was designed for a steep, narrow canyon where the foundation bedrock was principally blue shale.

The outlet structure, which will pass the normal flow of Los Gatos Creek, consists of a 60-in. steel pipe encased in concrete. The spillway structure contains about 2,500 cu. yd. of concrete and consists of a simple-throated, partially lined channel, which necks down to 40-ft. width. The spillway passes through a natural location along the left side of the stream, through a channel excavated by power equipment. Hydraulic energy dissipation has been achieved through a straight drop into a small stilling pool.

Operations started in May 1952 with the excavation of 430,000 cu. yd. of material from the foundation. This was a combination job of tractor-scraper-ripper work, shovel-truck work, drilling, blasting, and pioneer dozing. Considerable pioneer work was especially necessary on the right abutment to strip the material away, to expose bed-



INSTRUMENTAL in winning the battle against a tight time schedule at Lexington Dam were (from left) Lee Reid, field dirt foreman; E. M. Daly, day superintendent; and Hank Guade, project engineer.

rock, and to create a bench or berm for the relocation of a concrete irrigation pipe which passes down the canyon at this point.

While stripping operations were under way, crews working in the canyon were installing the outlet pipeline, setting it in the deepest part of the stream bottom. Although the stream had been diverted temporarily through a corrugated metal pipe leading through the lower part of the dam foundation, extensive pumping had to be maintained in the construction region of the canyon to keep the area dry enough to permit men and machines to work.

When the outlet pipeline was finished, an earth cofferdam was put in upstream and the normal flow was bypassed through the permanent pipe. The temporary corrugated metal pipe was filled with concrete and it remained in place in the dam.

A severe jolt to the all-important time schedule on the project occurred shortly after the left abutment had been stripped, inspected and accepted, and a haul road had been built up to the spillway. During the switch from day to night shifts, 150,000 cu. yd. of dirt had slid 26 ft. downhill.

Fortunately, the slide was up high enough so that work could start on the bottom part of the dam fill, and the entire slide was cleaned up while tractors and scrapers

Concluded on page 90

UNITS OF THE HUGE FLEET of heavy equipment rounded up by the Guy F. Atkinson Co. to speed progress at Lexington Dam line up for servicing. The fill was delivered in 14-cu. yd. scraper loads, then compacted solidly with sheepfoot rollers.



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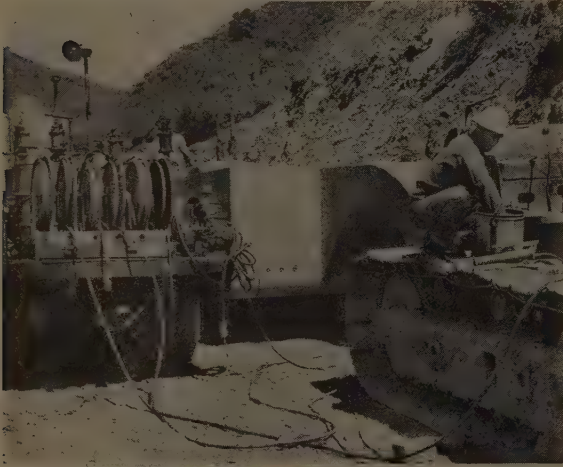
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HOW IT WAS DONE...

Continued from page 88

hauled from the spillway cut to the fill. Much of the material in the slide could be used in the rock zone portion of the dam, so it was not wasted.

Possibly one of the most interesting parts of the dirt work, from a mucker's standpoint, was the tractor-scraper spread first used between the spillway cut and the fill. Since the spillway cut began on top of the hill and the fill started simultaneously in the deepest part of the canyon floor, there was a problem resulting from grade and elevation differentials.



ONCE EACH SHIFT this mobile grease and fuel unit thoroughly serviced each piece of equipment on the job. A TD-24 crawler gets the business here.

The first haul road rose about 210 ft. in elevation in a distance of about 800 ft. Using 10 TD-24's and scrapers, the crawlers traveled uphill empty, came down with big loads. As the borrow pits deepened and the fill rose, the elevation differential became less.

Walter Hunt, in his capacity as chief engineer, directed the work for the Santa Clara Water Conservation District. Robert Roll was his assistant, and Pat Creegan was resident engineer.

Atkinson personnel on the project included: Grant P. Gordon, project manager; Hank Quade, project engineer; Frank Anderson, superintendent, and E. M. Daly, day shift superintendent. Wayne Wooton and Ernest Gressot headed the swing and graveyard shifts. Keeping the big equipment force in operation was the job of Master Mechanic Otis Rolling.

Sewage plants save time, manpower with high-pressure steam cleaning equipment

CUTTING GREASE and cleaning sedimentation basins and digester tanks was quite a problem, using high-pressure cold water and hand scrapers, in the East Bay Municipal Utility District Sewage Disposal Plant at Oakland and the North Point Sewage Treatment Plant at San Francisco, Calif. Portable and stationary steam cleaners have now alleviated a lot of the cleaning headaches at both plants.

At the San Francisco plant, five high pressure stationary cleaners, gas-fired and electric-driven, are used to clean floors and walls once a week with high-pressure hot water (up to 600 gal. per hr. at 180 deg. F. and 400 psi.).



CLEANING dirt, grease, and scum from the sedimentation basins, digester tanks, and building walls at the EBMUD sewage disposal plant is no trick at all with this Malsbury high-pressure movable steam cleaner.



They are also used to clean dirt and scum from bar screens and grit channels when needed, steam-clean sedimentation tanks about once a month or whenever one is shut down, remove sludge and scum from the walls of two big sump tanks by use of high-pressure steam, and steam-clean equipment before repair or overhauling work commences.

Chief Operating Engineer W. J. Angenent says that the Malsbury steam cleaning and high pressure hot water cut grease and knock scum loose in about half the time required by the cold-water method.

The portable type, a Malsbury trailer-mounted, gasoline-engine-driven, oil-fired, high pressure cleaner, is used in the Oakland plant. All parts of the plant are accessible, and the cleaner is towed wherever it is needed.

Dirt, grease, and scum are cleaned from the sedimentation basins once a week with a high-pressure hot solution (up to 600 gal. per hr. at 160 deg. F. and 400 psi.). Digester tanks are cleaned in the same manner whenever shut down for maintenance. Hot solution is also used to wash grease from plant walls.

A low pressure wet steam solution (equivalent to 15 boiler hp.) is used about every three months to melt sludge that accumulates inside pipes connecting sedimentation basins and digester tanks.

All equipment being overhauled is first cleaned with a high-pressure steam solution (up to 200 gal. per hr. at 325 deg. F. and 150-200 psi.).

Superintendent Elmer E. Ross believes one man and the Malsbury portable cleaner easily accomplish as much work as three men with scrapers and cold water.

Crews attack EBMUD San Pablo Tunnel job from three different angles

CREWS WORKING at three different locations are being used by the Guy F. Atkinson Co. to complete a \$1,214,000 contract for the rehabilitation and enlargement of the East Bay Municipal Utility District's San Pablo Water Transmission Tunnel at Oakland, Calif.

Explorations had shown the tunnel, first built in 1918, to be in need of repairs to provide better service and safer operation. The job is scheduled for completion on April 15.

At the 2½-mi.-long tunnel's west portal, crews have been working three shifts a day installing new 60-in.

Concluded on page 94

2 to 1,"

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HOW IT WAS DONE...

Continued from page 90

diameter welded steel pipe to replace the old 36-in. pipe. An 18-in.-gauge track of 20-lb. rail, supported on concrete blocks, is being used to skid the pipe into position in the $6\frac{1}{2} \times 5\frac{1}{2}$ -ft. horseshoe section of the tunnel.



PULLING CABLE through a section of the 60-in. diameter welded steel pipe being installed in the San Pablo Tunnel's West Portal are workmen of the Guy F. Atkinson Co.

Pipe sections to be installed are placed on the rail by crane, and hauled into position by means of a $\frac{1}{2}$ -in. cable attached to a 6 x 8-in. deadman. New deadmen are constructed by welding hangers on the inside shell of the pipe as the job progresses. Four pandor rings are placed inside the pipe at 4-ft. intervals to help retain its shape while being pulled into position and while the concrete is being placed. Four track guides are welded to the pipe's bottom to hold it in line.

The top of the pipe has two holes at 30 deg. from the vertical at 4-ft. centers with nuts welded over the holes on the outside shell to be used with adjusting bolts to prevent the pipe from floating.

After two lengths of pipe (which come in 30- and 24-ft., 10-in. sections) are in position, concrete is forced behind and around them to strengthen the tunnel and hold the new line firmly in place.

At the tunnel's eastern end, a 120-ft.-deep circular access shaft was sunk to enable crews to pour a new concrete floor in the old tunnel. This work is being performed under the handicap of restricted space and requires constant ventilation.

At the third working location, Wildcat Canyon in Tilden Regional Park, a 6 $\frac{1}{2}$ -ft.-diameter, concrete-lined shaft was sunk more than 300 ft. deep. Crews are working in both directions removing the old, unsafe tunnel floor and walls and pouring new concrete reinforced with steel. A special elevator carries the workmen up and down the shaft.

Empty spaces which appear behind the concrete lining will be filled with concrete pumped in under pressure. Approximately 45,000 cu. yd. of special mix is expected to be used by the time the job ends. Altogether, some 8,000 lin. ft. of the tunnel is being strengthened and renewed.

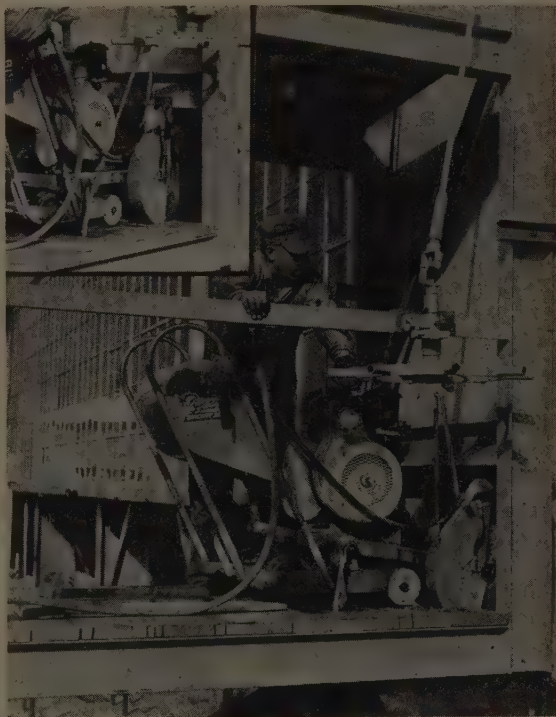
Ed Raimier is project manager, James E. Geddes is Atkinson district manager, and Carl F. Stahl, EBMUD senior construction inspector, is in charge of the inspections and quantities for the project.

Contractor rigs saw on winch-operated platform to accomplish vertical wall cut

CONFRONTED with the task of tying new construction into an existing building wall, Anderson Brothers Contractors solved the problem very neatly by rigging a Model C-130 Clipper Concrete Saw on a winch-operated platform and raising both saw and operator as the cut progressed.

The sawed line, cut to approximately $\frac{1}{4}$ the wall depth, left a smooth, neat existing corner post to which to anchor the new construction. The saw's blade guard was mounted at such a position that the front edge of the blade, rather than the lower portion, was exposed. The saw operator elevated the platform at whatever speed he desired by means of the winch.

Anderson Brothers has also used the saw to cut trenches for the laying of pipe lines. This eliminated radial fracturing beyond sawed lines and permitted faster, heavier breakout methods. Since a minimum of material was removed and replaced, a smoother finished job resulted.



ALTHOUGH NOT QUITE into the wild blue yonder, this Clipper concrete saw is quite a bit above its usual operating altitude. It was rigged on a winch-operated platform to accomplish a vertical wall cut needed to tie new construction into an existing building wall. A closeup of the saw is in the upper lefthand corner of the picture.

Other frequent uses of the concrete saws are: (1) Sawing transverse and longitudinal contraction joints in concrete highways, airport landing strips, and building floors. (2) Sawing openings in concrete or asphalt before breaking out for repair patches in worn or broken areas. (3) Sawing trenches in concrete or asphalt for installation or repair of utility or sewer lines or conduit. (4) Sawing bases for installation of new machinery. (5) Correcting architectural or construction errors in concrete work. (6) Sawing large stone, refractories, or cement products such as lintels and copings which are too large for a masonry saw. (7) Sawing precast roofing slabs.

No-bind suspension, positive screw feed, adjustable depth lock, streamlined bearing housing, spray control, and pressure equalizer are features of the 13 $\frac{1}{2}$ -hp., gas-line engine-powered saw.

Columbia-Geneva STEEL AT WORK IN THE WEST—"Super Inch", P. G. and E.'s 502-mile gas pipeline



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It took 184,000 tons of steel plate to produce "Super Inch", the world's largest-diameter natural gas pipeline, which delivers 400 million cubic feet of gas every day to Northern California homes and industries. Columbia-Geneva Steel has the only Western mill capable of producing a single plate wide enough to be fabricated into the 34-inch pipe needed for the job.

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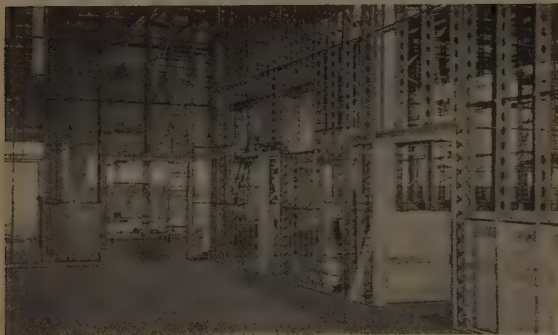


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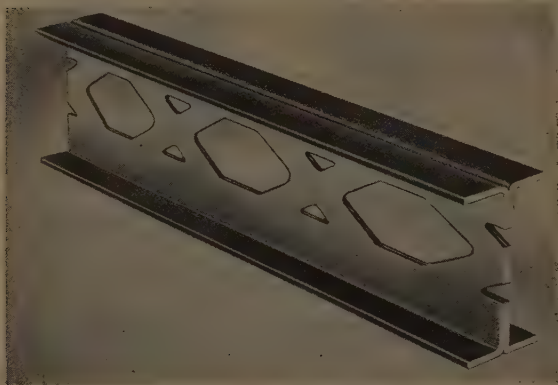
HOW IT WAS DONE

New structural steel sections are useful for light building field

A NEW LINE of steel structural sections, produced by the Penn Metal Company, has made it possible to use steel framework in the light building field for the first time, according to G. A. Sagendorph, the company's president.



INDUSTRIAL APPLICATION of Lightsteel framework in a high bay at the U. S. Naval Air Missile Test Center, Point Mugu, California.



CLOSEUP of a short length of 3/4-in. Lightsteel double stud.

Identified by the trade name "Lightsteel," these sections were designed for use in single and multiple residences, schools, and industrial and commercial structures.

These sections, fabricated from strip steel by cold rolling, include studs, joists, and accessories, and are distinguished by a carefully proportioned, double-trussed, open web design. It is this open web design which gives the advantages of light weight without sacrificing strength, Sagendorph says.

The new structural sections, intended for custom design and construction, are easier to handle and erect than wood studs or masonry blocks, it is claimed. Using "Lightsteel" sections as studs, rafters, joists, plates, sills, and the like, contractors can erect a frame of steel for any smaller building. The cold rolling process makes it unnecessary to work and rework each section under multiple-pass rolls, hence production costs are lessened. The open web simplifies the passage of wiring and piping through the erected studs and joists.

Studs and joists are available in single and double form. The single stud or joist is a channel, while the double unit

which resembles an I-beam in cross-section, is manufactured by welding two singles back-to-back.

Also in production are supplementary structural track and bridging, similar in appearance and other characteristics to the studs and joists. However, the track sections are slightly oversize to fit around the standard sections, and the bridging is slightly undersize to fit within the flange of the standard sections.

These sections contribute greatly to the overall flexibility of the system. A stud capable of carrying an enormous load may be erected by slipping a length of bridging within the flanges on each side of a double stud. Then the combination is boxed in by placing two lengths of track around the stud. The result is a column having the compressive strength of three double studs, yet occupying the space of only one.

Giant salt-shaker defrosts California mountain highway

A GIANT SALT-SHAKER is being used by the California Division of Highways to help defrost U. S. Highway 50 between Placerville and Lake Tahoe quicker and more efficiently.

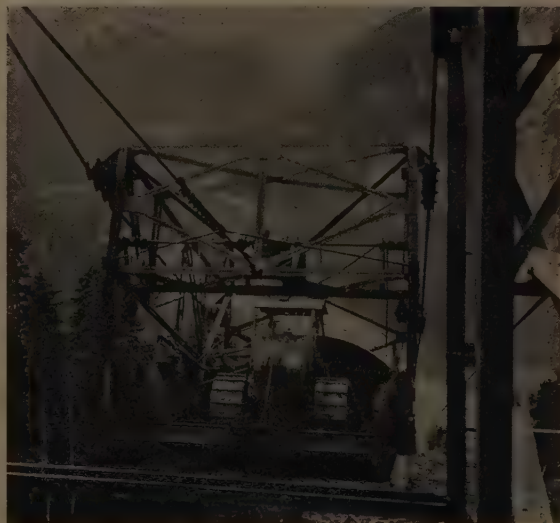
If the new equipment, a portable hopper-blower device which spreads rock salt crystals in a 16- to 36-ft. wide fan from the back of a truck or pickup, proves successful, it will probably be added to the winter-fighting tools used by the state on mountain roads, according to press reports.

The big shaker, known as the "Scotchman Salt Spreader," was first tested in January when a 16-mi. stretch of the test area was sprinkled with a ton of salt by a two-man crew in 90 min.

Ed Willis, maintenance station foreman, said that previously salt mixed with sand had been distributed by hand. He expects the new system to start a surface melting of ice by transferring some of the road ice heat calories in much the same fashion that salt and ice packed around a home ice cream freezer pulls heat out of the freezer. He theorizes that the action will also cause brine to remain in the pores of the road surface, thus lowering the freezing point of the road moisture.

The more often the roads are salted behind the snowplows, he feels, the easier successive plowings will become, since the snow and ice will start melting sooner and the ice forming over banks of snow will remain softer.

HIGH RIDE to the roof of the world is undertaken by Alcan men at Kemano, B. C. A giant aerial tramway carries a 9-ton car attached to two cables and can lift 60 men or 20 tons of machinery half-a-mile above the valley floor to reach the tunnel heading under construction. First load was an International TD-24 crawler tractor.



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APRIL 1953

Richmond-San Rafael Bridge job begins despite legal barrage

CONTRACTS have been awarded and ground has been broken for the \$62,000,000 Richmond-San Rafael bridge crossing of San Francisco Bay. The ground-breaking ceremony on March 2 was an unheralded, informal event—but not so the legal controversy that raged on until past the actual minute that the contracts were awarded.

Bids for the project were opened last December 19. Low bidder for the substructure, at \$14,234,550, was a joint-venture firm composed of Ben C. Gerwick, Inc., and Peter Kiewit Sons' Co. Low bidder for the superstructure, at \$21,099,319, was another joint venture made up of Peter Kiewit Sons' Co., A Soda & Son, and Judson Pacific-Murphy Corp.

But award of the contracts was headed toward legal obstacles, chiefly from groups favoring a solid barrier

at the site that would serve the double purpose of providing fresh water storage and eight or more traffic lanes across the Bay. Two injunction suits were filed by these opponents of the bridge attempting to prevent the Toll Bridge Authority from delivering bonds that had already been sold to finance the project. The Authority was successful in both trial court cases, but appeals followed both actions.

On the last day that the bonds could be delivered to the purchaser in accordance with the terms of the bid (February 27), the California Supreme Court consolidated and accelerated the appeals, and after hearings, rendered a final judgment sustaining the decision of the trial courts. On the same day, the U. S. District Court in San Francisco dismissed as abortive another action to prevent the Toll

Bridge Authority from proceeding. On the following morning, the bond transaction was completed and the contracts were awarded immediately.

Even after the contracts were awarded, an attempt was made in the State Assembly to halt beginning of the project. The Assembly passed a resolution to this effect, but all action was already beyond this jurisdiction.

In view of all the shenanigans, Norman C. Raab, engineer for the State Department of Public Works, summed up in appropriate manner the feelings of all contractors and engineers associated with the project, when he observed at the ground-breaking, "We didn't want the ground-breaking to be a formal affair. We didn't feel there was any need. We just wanted the people of Richmond to know we were on our way."

Plans call for a 6-lane structure with two cantilever spans and a total length of about 4 mi., with a high level crossing over two navigational lanes. At first, however, the bridge will have two traffic lanes, one for travel in each direction. Later, a second deck will be added, the two lanes on the top deck would be converted to three, and another three lanes would be provided on the second deck. Travel on each deck then would be one way.

In addition to the original contracts for substructure and superstructure, an estimated \$15,000,000 will be necessary for construction of a toll plaza, administration building, etc.

THE MONSTER below is the 275-ton gantry crane designed and built by Bedford Foundry & Machine Co. for the February installation of the third of four generators at Washington Water Power Co.'s 200,000-kw. Cabinet Gorge hydro-electric station near Clark Fork, Idaho. The crane is intended for all-weather general service work over the turbine area and has safe overload capacity to handle the massive rotors weighing up to 330 tons each (pictured). The generator was installed by Ebasco Services, Inc. Access and construction difficulties on this plant were considered the toughest on the continent.



Washington passes toll-road legislation

FIRST TOLL-ROAD legislation ever to pass both houses of the Washington State Legislature has cleared the way for a "super" limited access highway from Tacoma to Everett, with freeway through Seattle.

The measure directs the Washington Toll Bridge Authority to make a survey of the project, to be financed by a \$500,000 appropriation from the motor vehicle fund, and, if found feasible, to proceed with financing and construction.

The lower house also passed a bill authorizing the planning of a second bridge across Lake Washington and approved the highway appropriation bill, which includes \$44,000,000 worth of bond issues for new construction.

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Heavy grading is no job for balky, fragile equipment. That's why you see a Caterpillar No. 12 Motor Grader on the job in the picture, and almost everywhere heavy grading is required.

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The No. 12 above is being used by Kiely Construction Co., Butte, Mont., on a 4-mile relocation job of U. S. 26 near the Palisades Dam, Irwin, Idaho. Besides grading in the rocky cut, the No. 12 also is compacting fill along an 84" culvert. Teamed with the grader on the job are nine D8s with scrapers, and two Diesel D13000 Engines.

Rugged construction backed up by quality materials gives the No. 12 the muscle to endure rough going. It has a circle built of box section that weighs 35 pounds per foot — the strongest circle used on any grader!

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Concrete pouring resumed at Chief Joseph

CONCRETE OPERATIONS at the Chief Joseph Dam on the Columbia River in Central Washington, suspended since November 20, have been resumed, according to the Seattle District, Corps of Engineers.

First day's production amounted to placing 1,284 cu. yd. of concrete on Block No. 6, the north-end monolith of the 922-ft.-long spillway.

During the three months when the concrete operation was suspended, the left-side cofferdam was removed, filling and cleanup work was done, and cut-off gates and caisson were assembled and installed between Blocks 5 and 7 preparatory to the concrete buildup of Block 6.

Total concrete placed to March 1 in the main dam was approximately 647,000 cu. yd. More than 125,000 cu. yd. were placed in the powerhouse site. Plans call for an ultimate 981,000 cu. yd. in the main dam and 800,000 cu. yd. in the intake and powerhouse installations.

The generators will ultimately turn out 1,728,000 kw. (*Western Construction*—March 1953, p. 110). Present construction schedules of the Corps of Engineers call for the dam to be completed by the summer of 1955 and the first power generating unit to be in operation by September 1955.

Power control disputed in Northwest

THE PROPOSED federal-state corporation, intended to build dams in the Pacific Northwest through bond issues, is still in the talking stage.

Senator Guy Cordon of Oregon, original sponsor of the plan, is still seeking ideas and methods of making a practical switchover from the present federal agency system of construction.

Fundamentally, he wants to see development of the region's water resources transferred to and exercised by people of the basin to whom the resources should be delegated.

The idea has been endorsed in principle by Bonneville Administrator Paul J. Raver and Secretary of the Interior Douglas McKay also. Cordon, when interviewed in Washington, D. C., discussed the difficulty of arriving at the best plan.

"It could be a federal entity, the extreme left position—perpetuity of federal power, electric and political," he said.

Other plans look to congressional creation of an entity, to be staffed by a directorate appointed by and responsible to the several states; an overall compact among the states; and some are studying the possibility of transferring power to the affected states on their guarantees of payment.

"Still others are thinking of operation and construction by distributing entities, either public or private, or a combination of both. I lean toward a full examination of all of them to reach a conclusion," Cordon ended.

Homer D. Angell, senior congressman from Oregon and newly appointed chairman of the Public Works Committee's subcommittee on rivers and harbors, which controls authorizations for hydroelectric projects, said, when discussing the corporation proposal:

"It takes so long to get the machinery set up, it might stall the whole thing, whereas we've got it going now.

"The general proposition is good—if private enterprise can carry on, it should be done by private enterprise. But that is difficult where it involves several states."

Congressman Russell Mack, Washington, chairman of the Public Works Committee subcommittee on flood control, said that the Northwest has 50% of the nation's hydroelectric potential but that only about 10% is developed. He fears delay in construction while corporation details are being worked out.

"With all of the dams under construction, we will just about catch up with our present needs, but our needs are increasing 10% per year," he concluded.

Meanwhile, another group vitally interested in the problem, the Columbia Basin Interstate Compact Commission, met at Spokane to discuss the situation.

Jack V. Rogers, Commission chairman, visualized the organization of a local control agency to build, manage, and maintain multipurpose dam projects in the Northwest states, and to control the allocation of both water and power after they become available.

The Commission, appointed by the six Northwest states now participating, plans to hold public hearings on various plans before drawing up the proposed compact, he said. After it is drafted, it must be ratified by the legislatures of the participating states and by Congress before it can become effective, he added.

Rogers said he was greatly encouraged by a statement made recently by Secretary of the Interior McKay on giving private firms a better break in the power program of the Northwest. "But we must protect the public power agencies also," he concluded.

In Oregon, members of the House of Representatives Judiciary Committee were told that an interstate compact should be formed with California to decide how the Klamath River waters should be used.

"We are afraid of Bureau of Reclamation plans [see p. 70, March issue] to divert the waters of the Klamath River to the central valleys and other California points," said Frank Jenkins, Klamath Falls publisher.

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Plans materializing for second Lake Wash. bridge

A SECOND BRIDGE across Lake Washington at Seattle is a step nearer becoming a reality. A financial program providing for construction of the bridge without placing tolls on the present bridge has been submitted to the Washington Toll Bridge Authority, and a bill has been introduced in the Washington Senate providing for an early start of construction.

The financial study, prepared by the investment firms of A. C. Allyn Co. and Blyth & Co., is not available for public study. However, according to press reports, it is said that the report is based on a route which would extend from a point near the south end of the Montlake Bridge easterly across Lake Washington to a landing on Evergreen Point between Bellevue and Kirkland. This route has been favored by Toll Bridge Authority engineers. The report also apparently indicates financial feasibility of the project with no tolls being imposed on the present bridge.

The bill introduced in the state's Senate calls for a loan of \$200,000 from the State Motor Vehicle Fund to the Toll Bridge Authority to be used for preliminary engineering work for the \$16,000,000 structure.

At Kemano, Alcan comes up with another "biggest"

THE WORLD'S LARGEST multi-nozzle impulse turbine is being built at the plant of the Vancouver Engineering Works, Ltd., Vancouver, B. C., for installation at the Kemano powerhouse of the Aluminum Co. of Canada, Ltd. It is a four-nozzle impulse type rated at 140,000 hp. at 327 rpm. It is predicted that this guaran-

teed output could be increased to 150,000 hp. This rating makes it also the world's largest from a standpoint of horsepower output, exceeding the units at Grand Coulee.

The Kemano power plant when completed will have installed 16 such impulse turbines. Space requirements for the complete development in the underground power plant necessitates a chamber 1,000 ft. long, 80 ft. wide and 135 ft. high.

Pelton waterwheels will each drive a direct-connected, vertical, three-phase, 60-cycle, 13,800-volt power generator. Each group of two generators will feed into a bank of three single phase transformers rated at 300 kv. Access to the powerhouse will be through a 1,400-ft. tunnel 22 ft. wide and 14 ft. high. The terminal switching facilities at Kemano will be located in an outdoor switching station.

A small village will be necessary at the power plant to accommodate maintenance and personnel.

When completed Kemano will be the largest underground power development in the world, having a firm capacity over three times the ultimate installed capacity for Sweden's Har-spranget development and about 1.7 times Brazil's combined Foracava plants. It will have an installed capacity substantially in excess of Hoover Dam and exceeded only by the now-completed Grand Coulee development of 2,250,000 kw.

Transmission 50 mi. to the Kitimat reduction works will be made through narrow valleys and across a narrow mountain pass with a maximum altitude of 5,300 ft. From the power plant the first 9 mi. of the transmission system will comprise two double-circuit tower lines, climbing to El. 100 where they will feed into a switching station with motor-operated selector disconnect switches. The outgoing lines will consist of two single-circuit

transmission lines, running up to 5,300 ft. in a distance of 10.6 mi. Here another switching station will be located at El. 500, from which two double-circuit tower lines will run the remaining distance to the terminal station at Kitimat, where Alcan will have the world's largest aluminum smelter.

Alaska Public Works schedules 1953 projects

SOME \$13,500,000 worth of new construction has been scheduled under the 1953 program of Alaska Public Works, an agency of the Department of the Interior, according to John D. Argetsinger, acting district engineer. This sum covers 16 projects, including schools, street and sewer improvements, water supply systems, and a warehouse.

Already finished are 14 projects costing \$3,389,000. Twenty-eight others, totaling \$12,908,500 are under construction, with completion scheduled for this year.

New projects, and their estimated costs, are:

Schools—Addition to the Chugiak School near Anchorage, \$125,300; high school for Fairbanks Independent School District, \$2,385,600; high school for the Ketchikan Independent School District, \$2,686,000; general purpose room addition to school now under construction for the Kodiak Independent School District, \$346,000; and a high school for Palmer, near Anchorage, \$1,114,700.

Health centers—Wrangell, Naknek, Haines, and Klawock, \$135,000.

Water line and sewer improvements—Suburbs of Anchorage, \$1,426,800; Mountain View, \$656,300; and Kodiak, \$901,200.

Warehouse—Anchorage, \$352,600.

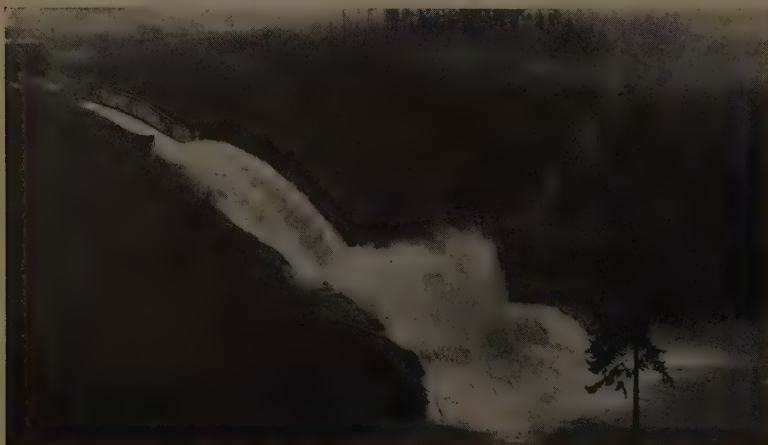
Street and sidewalk improvements—Fairbanks, \$397,600.

Waterfront arterial—Ketchikan, \$1,922,300.

Contractor wins one suit, finds another on his hands

A COLORADO general contractor who built two municipal pumping plants at Englewood, Colo., in 1951, has been awarded \$10,458 damages against that city. The contractor, Gerard F. Murphy of Pueblo, Colo., claimed he was entitled to extra compensation from the city because he encountered rock and water conditions not indicated by the city's plans and specifications. In turn, Murphy is now being sued by his excavating subcontractor on these jobs, who claims he performed services not specified in his subcontract. Murphy assertedly abandoned the contracting business after sustaining the losses on the Englewood jobs.

THE CASCADE below is Alder Dam's spillway in action following completion of the repair program in January. Its discharge is 4,200 cfs. Note the action of the water flowing over the rim of the stilling basin into the river. Full coverage of the job is reported on pages 59 to 61 of this issue.



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BY THE NUMBERS, the artist gives his conception of how the proposed 430-ft.-high Trinity Dam will look. (1) Main earth-fill dam with 3,300-ft.-long crest. (2) Overflow spillway. (3) 75,000-kw.-capacity power plant. (4) 1,800,000-acre foot reservoir. (5) Access road. (6) Trinity River. (7) Stuart's Fork.

Good news for veteran engineers

ENGINEERS who have reached a mature age can see a new horizon of opportunity in Federal service as a result of the recent liberalizing of maximum age limits for U. S. Civil Service examinations.

Harry T. Kranz, Director of the Twelfth U. S. Civil Service Region (Arizona, Nevada, California and Territory of Hawaii), says the opportunity is created by the U. S. Civil Service Commission's recent action in removing the maximum age limits for the majority of positions in the competitive Civil Service.

The new regulations, continues Kranz, have the effect of removing the former maximum age limit of 62 from all positions except where a maximum below 62 is specified because of the peculiar nature of the position. Typical exceptions are for "rugged" positions such as junior engineer.

The special maximum limits are waived for persons having veterans' preference.

The maximum age limit for applicants for engineers in the "junior" grade (Engineer, Grade GS-5, \$3,410 a year) has been set at 35, because engineer positions in that grade usually involve arduous field work; however, the 35-year limit is waived for persons entitled to veterans' preference. The Department of Interior has an age limit of 62 for applicants for non-office engineering positions.

A person who is 70 or older on the day he enters duty will have a temporary appointment for one year. The agency employing him may renew the temporary appointment. Such an appointment does not confer competitive civil service status.

The Twelfth U. S. Civil Service Region, 630 Sansome St., San Francisco 11, Calif., will provide more details on request about positions now open in Federal agencies in Arizona, California and Nevada.

Booklet on West's future power problems

WITH AN EYE toward the acceleration of Western development within the next few decades, the USBR has published "A Study of Future Power Transmission for the West." This 30-page booklet predicts that by 1975 the West may require the staggering total of 550,000,000,000 kw. hr. per year compared to last year's 106,000,000,000 kw. hr. The answer, the booklet proposes, may be found in a future tremendous electric power transmission system to link all major public and power systems in 22 Western states. The grid would operate at 500,000 volts and its purpose would be to aid these power short areas, thus guaranteeing Western states enough power to fully develop their resources.

Furthermore, with such growth predicted, the Bureau estimates that even if all potential hydraulic sites

are developed by the tentative deadline, the West would be able to generate only 38% of its power from those hydroelectric origins; after that the other available sources of energy would be 54% coal and 8% oil. (At present 51% of Western power is derived from falling water.) The cheapest way to utilize the coal deposits would be to convert its energy to electricity at the very source—in the Rocky Mountain area of eastern Utah, Wyoming, Colorado and New Mexico; also from coal in western Iowa, Missouri and Oklahoma; from lignite in North Dakota, eastern Montana and South Dakota.

It is pointed out in a foreword that the Bureau is not proposing such action but pointing out the advantages of such a unified system.

Colo. River corporation under study

A SOLUTION to the mystery of where a million acre-feet of Colorado River water a year is disappearing may not be known until October, when an 18-month research project on evaporation at Lake Mead will be completed, according to C. P. Vetter, chief of river control of the lower Colorado.

Vetter's explanation is that the Colorado River, with its flow controlled by the Hoover-Parker-Davis Dam series, has had its channel choked by various growth which have slowed the river's flow and caused greater evaporation. Previously, flood torrents had cut deep channels and had washed out any vegetation which had taken root between floods.

He explained the differences between daily stream flow as recorded at the three dams as due to time drag—the difference between outlet at an upper and downstream dam on the same day.

Meanwhile, Salton Sea in California's Imperial Valley has been rising, landowners report.

Evan Hewes, president of the Imperial Valley Irrigation District, says the rise in water level comes from unused supplies from the All American Canal. He predicts that at the present rate of rise, many Salton Sea property owners soon will be flooded out.

Looking for a job?

ABOUT 1,000 MEN will be hired, probably sometime in June, for construction of the Harvey Machine Company's \$65,000,000 aluminum plant near The Dalles, Oregon. Actual site for the plant, expected to produce 54,000 tons of aluminum annually, has not yet been chosen, although property has been optioned on both sides of the Columbia River, according to press reports.



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WASHO operations outlined for the year

THE SCHEDULE for operation of tests at the WASHO Test Road near Malad, Idaho, for the coming year has been established by the Highway Research Board.

Testing this year will be in two principal phases. The first phase, which will start shortly after the first of April, will consist of studies of deflections in the pavement under various axle loads and axle load combinations. These deflection studies will be repeated on about May first, and again later in May. At the conclusion of the third series of deflection tests, regular two-shift operations with the full test loads will be resumed.

The regular test traffic, which consists of 18,000 and 22,400-lb. single axle loads on one test loop and 32,000 and 40,000-lb. tandem axle loads on another, will operate about 18 hours per day, 6 days per week through the summer and on into the fall, until such time as the pavement structure is frozen. Although no definite action was taken at the recent meeting, it is planned to operate the test traffic through the critical spring period in 1954.

The project, located about half-way between Ogden, Utah, and Pocatello, Idaho, was constructed last summer and the test sections were subjected to about 17,000 heavy axle loads last

fall. During the winter, light traffic has been operated over the loops, and many special studies concerning the temperature and moisture contents in the pavement and subgrades have been conducted.

Airport program in Alaska . . .

A \$1,058,500 AIRPORT construction program in Alaska has been set for 1953, according to Tony Schwamm, territorial director of aviation. Largest project involves runway extension and a seaplane harbor at the Juneau airport, scheduled to begin this spring and estimated to cost \$300,000. Another \$250,000 has been allocated for a gravel-topped airport at Sand Point on Kodiack Island. A total of \$50,000 will be devoted to a 4,000-ft. air field near Bethel.

Colorado toll tunnel?

IN COLORADO they're again talking about a toll tunnel under the Continental Divide at Loveland Pass. The state's House of Representatives has indicated approval of a resolution that the State Highway Department submit complete plans to the legislature by next January for the tunnel. The tunnel, to cost more than \$1,000,000 if constructed, would be about a mile long. It would enable motorists

to bypass about 4½ mi. of winding road over the pass, which is subject to snow slides.

The Loveland Pass tunnel route was approved in 1942 by the late Charles Vail, former state highway engineer, and the Bureau of Public Roads. It was supported again in 1952 by the Governor's long-range highway planning committee. Action at the site to date includes a test bore to determine geologic conditions.

Phoenix engineering division reorganized

THE CITY engineering division of the Phoenix public works department has been reorganized as the result of increased engineering services due to the growth of the Phoenix area, according to Kenneth King, director of public works. More efficient operation and better flow of work are expected.

The engineering division, under City Engineer R. Gail Baker, is now set up in three major and four minor sections. The major sections are field engineering, office engineering, design. The minor sections are inspections, improvement districts, right-of-way, accounting and stenography. The work of draftsmen, formerly divided among various sections, is now centralized under the office engineering section.

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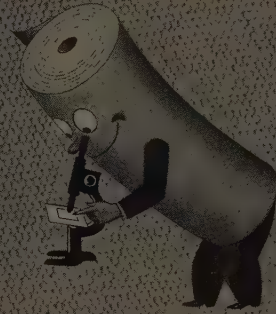
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Second bidder gets job— Low bid due to error

SHASTA COUNTY, Calif., supervisors awarded a contract to build 7.88 mi. of road along the west shore of Lake Shasta to the second-low bidder, J. H. Trisdale, for \$659,580, last month.

This action was taken at the request of S. L. Wixson, a member of the firm of Wixson & Crowe, who reported that his firm's low bid of \$573,990 was due to a clerical error which failed to list an item of \$175,000 for labor.

District Attorney Laurence J. Kennedy, Jr., and Road Commissioner Ernest D. Breuning conferred with Robert Calland, acting regional director of the Bureau of Reclamation, at Sacramento before the action was taken.

The road, to be paid for by the Bureau of Reclamation, will be built to provide access to mining properties cut off when the water of Shasta Lake covered roads leading to the mines.

Denver seeks water from Blue River

A BILL appropriating \$100,000 for a water survey to determine whether Denver's plan to divert 177,000 acre feet of Blue River water would be detrimental to Western Slope development was passed by the Colorado House of Representatives and sent to the Senate last month.

The survey, expected to take between four and six months, will consist chiefly of compilation of data already available. If the findings justify Denver's request, which includes building a trans-mountain tunnel to tap the Blue River near Dillon, the city will ask Congress for \$100,000,000 in interest-free funds to build the 23-mi. tunnel, considered necessary for the metropolitan area's future growth by supporters of the bill.

"By defaulting in the development of our water resources, we will lose the water to the lower basin states," said Representative Frank A. Meaker (Rep.) of Montrose, sponsor of the bill.

Underground flood halts work on Spokane sewers

A MAJOR SETBACK to construction progress on Spokane's Trent Ave. intercepting sewer system occurred last month when water gushed into about 4,500 ft. of one leg of the tunnel system. The mishap took place as the result of exploratory drilling operations. Drilling crews, intending to drill 30 or 40 ft. into rock ahead of completed tunnel section, had penetrated only a few inches when the face began to crumble and water began pouring in. The contractor's men

managed to haul dynamite and equipment to the surface before the tunnel filled.

At last reports, the entire tunnel area was submerged, with the water about on a level with the nearby Spokane River.

This portion of the project is under contract to Power & Cheff Construction Co.

Portland Electric asks to build two reservoirs

PERMISSION to construct two reservoirs at an approximate cost of \$4,800,000 to step up power production is being sought by Portland General Electric Co., which has filed an application with the Federal Power Commission in Washington, D. C.

Both reservoirs would be built in the upper Clackamas River watershed, above the company's present Oak Grove project. The larger, which would require an earth-and-rock-fill, 100-ft.-high dam some 11 mi. above the Oak Grove project intake, would impound 60,000 acre feet and would provide a lake of 1,340 ac.

The smaller, 2 mi. above the Oak Grove powerhouse, would provide a 400-acre-foot pond behind an earth-fill dike. This would increase the generating capacity of the plant from 34,000 to 50,000 kw., and would provide greater operating flexibility.

UP railroad to spend \$20,950,000 in 1953

UNION PACIFIC Railroad plans to spend \$20,950,000 in 1953 for track relaying and ballasting in 9 Western states and Nebraska and Kansas. This will include relaying of rail over 624 mi. of track and crushed rock ballast for about 430 mi. of track.

P. G. & E. beginning another steam plant

PLANS FOR ANOTHER addition to the Pacific Gas and Electric Company's power system, a \$44,000,000 steam-electric generating plant at Morro Bay in San Luis Obispo County, Calif., are announced. First unit of the 300,000-kw. addition will be operating by 1955. Much of the special equipment already has been ordered from manufacturers. The plant will have two generators, each of 150,000-kw. capacity. Their combined output could supply a city the size of San Francisco.

The contract was recently awarded to Bechtel Corporation.

Construction will begin next summer. Morro Bay will be the 13th major addition to the PG&E power system since the end of World War II, and will be the sixth postwar steam-electric plant.

Situated at the north end of Morro

Bay, a dozen miles northwest of San Luis Obispo, the plant will be built on a 140-acre site. At peak capacity, the boilers which activate the generators will consume 12,000 bbl. of fuel oil daily. They will require 283,500,000 gal. of sea water each day to pass through the cooling system.

The company has doubled its electrical output since 1945, and expects nearly to treble it by the end of 1955. At war's end, the total power capacity of PG&E plants was 1,658,300 kw. Since then it has added 1,687,600 kw. New hydro and steam-electric plants now under construction or on the active schedule will add 1,272,800 kw. This, with the retirement of old plants with an aggregate capacity of 37,600 kw., will bring the total power capacity of the system to 4,581,000 by the end of 1955.

Low flow forecast for Columbia River

LOWEST MAINSTEM FLOW in the last seven years was forecast for the Columbia River last month by the United States Weather Bureau and Soil Conservation Service.

The forecast, based on the monthly snow report, blames a number of factors for the low-water-year prospects. Among them are the unusually high snow line, the light cover on the lower courses, the warm weather which has melted snow on the south slopes earlier than usual, and the dry subsoil, caused by an unusually dry fall, which is expected to absorb some of the moisture when melting begins.

Late snowfall and spring rainfall will determine whether we have a low or near-normal flow, the report added.

Court rules against state engineer board

THE STATE BOARD of engineer examiners cannot limit its members to practicing in one engineering field, according to a ruling of the Colorado Supreme Court, which last month upheld a declaration of District Judge Joseph J. Walsh of Denver.

Judge Walsh had previously declared a session law of 1951, which specifically allowed the board to classify its engineers and to issue restricted registration cards, unconstitutional.

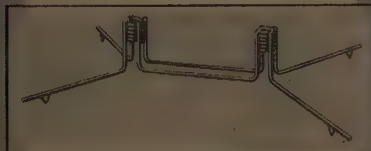
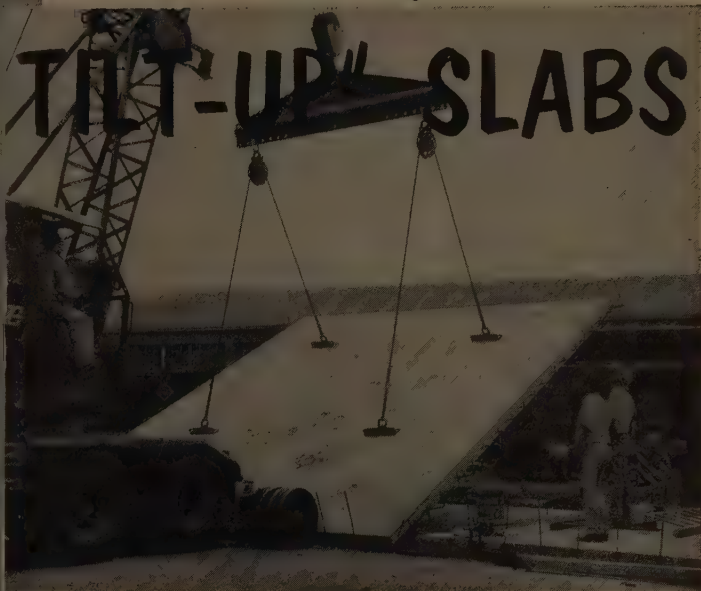
The decision was the result of a test suit filed by a Denver civil engineer, who claimed that at one time he held a registration card permitting him a general engineering practice but the state board, in recent years, limited his work by classifying him only as a civil engineer.

The Supreme Court found that the complainant had been deprived of a constitutional right by the limitation of his practice. The court found also that the board's classification system was too narrow.

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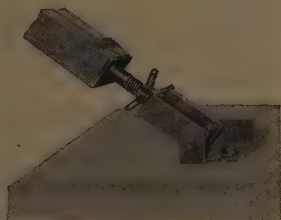
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Northwest road confab features informal technical sessions

TWO DAYS of programmed technical sessions provided about half the benefit gained by those in attendance at the Northwest Conference on Roadbuilding, held at the Oregon State College campus in Corvallis on February 26 and 27. As at nearly every engineering conference, the visitors gained a lot of insight and information on their various problems through conversation and exchange with each other. A deliberately informal atmosphere created by the engineering faculty of OSC and its ASCE student chapter, sponsors of the conference, encouraged discussion both in the conference rooms and in the corridors.

The Northwest Conference represents a sort of consolidation of two former annual conferences sponsored separately by the University of Washington and Oregon State College. Henceforth the conference sponsorship and meeting place will alternate from year to year, with activities coordinated by both engineering schools to avoid repetition and to gain a larger audience. Although the meeting this year was most heavily attended by highway engineers from the state and county departments of Oregon, many Washington personnel were present and stood to profit equally from the material presented.

Gleeson keynotes conference

The two-day conference was keynoted by Dean George Gleeson of the OSC engineering department. Topping off the list of appalling statistical facts that describe the Western—and the national—highway deficiency was Gleeson's revelation that various automobile insurance premiums represent a greater annual figure than do highway expenditures.

In the light of this fact, subsequent papers were of interest not so much for their pure engineering content as for the possible engineering economies they suggested. During the first session, this became apparent in the paper presented by Lewis Scott, geologist for the Oregon State Highway Department. Scott summarized briefly the geology of Oregon as it relates to deposits of material suitable for roadbuilding aggregates, and he sketched in the techniques of locating these deposits. His own contributions to both these main subjects can aid in achieving economies in roadbuilding. First, Scott adds certain sandstones to the list of acceptable mineral aggregates, but with some reservations, of course. Sandstone is recognized as being adversely affected by water; therefore, when contemplated for roadbuilding use it must be tested

thoroughly to determine the deterioration or alteration it has undergone. If structurally sound, it may be used to good advantage, except as a wearing surface. Its use may avoid expensive importation of more "conventional" aggregate, and it will conserve sources of other aggregates where they are in short supply.

The techniques of locating aggregate sources are only partly known to most engineers, Scott asserted. The services of a geologist can be used to good advantage in locating suitable aggregates, because the geologist is better trained to interpret topography as indicative of the geologic processes that have formed an area and established the character of its underlying rocks. In roadbuilding, the geologist and the engineer can complement each other to good advantage, Scott noted, if neither tries to usurp the other's field of work. The result is economical construction of good quality.

Reports on model study

A general statement on the use of models in solving hydraulic engineering problems was made by L. A. Clayton, assistant professor of civil engineering at Oregon State; and a report on a specific model study was given by R. H. Shoemaker, instructor. In conjunction with a later demonstration of the model itself, Shoemaker's presentation traced the development of an inlet design for box culverts that improves culvert capacity by 100%. This represents a potential construction economy worthy of consideration anywhere! Essence of the development is extension of the sidewalls and roof slab of a culvert on a taper, until the upstream opening area is twice that of the culvert section. Such design eliminates the vortex action characteristic of presently installed culverts and allows the culvert to flow full at all times when the inlet is submerged.

Cites money savings

Construction techniques and tests were considered the second day of the conference, particularly in a paper presented by C. M. Wimberly of the American Bitumuls & Asphalt Co. A base treatment with emulsified asphalt was described and recommended as a substitute for the more usual RC-3 prime coats. Wimberly cited money savings that can accrue, since the cost of his method ranges between \$0.08 and \$0.15 per sq. yd., as against \$0.12 to \$0.14 for cutback treatments.

One of the savings is found in equipment needs. The emulsified as-

phalt treatment is a simple one, and a cold one. It utilizes a tank truck equipped with a spray bar, in which are mixed one part of asphalt and between one and two parts of water. Application is at the rate of about 0.5 gal. per sq. yd., with just the top 1½ or 2 in. of the base course being treated. Blading and finishing are as usual.

Concerning tests of paving materials, two papers represented the results of thorough, logical approach. Vaughn Smith of California Research Corp. compared stability test methods used for asphalt paving mixtures. Graphical representation of compression vs. asphalt content of various mixtures gave no correlation when several test methods were compared. However, use of a kneading-type compactor for the tests brought comparable test results into line. The only test that avoids such inconclusive results caused by this single variable is the tri-axial type of test.

Tri-axial test

Furthermore, Smith noted, the tri-axial test best conforms to several criteria of a "good" test: it is applicable to all elements of the roadway (subgrade, subbase, and asphaltic surfacing material), it is susceptible of mathematical analysis, and it is simple and fast to perform.

Francis Hveem, materials and research engineer for California's Division of Highways, described a sand equivalent test that he has developed. The need for such a test was emphasized by Hveem with the observation that asphalt is generally measured as a percentage of the weight of aggregates, whereas the action of the asphalt is entirely unrelated to the weight. Rather, since the asphalt coats the aggregate surfaces, the volume of aggregate is more important—it bears a closer relation to the surface area.

Hveem's presentation of these preliminary facts was aided by his sense of the dramatic: he showed slides of graduate cylinders filled with different materials—equal weights and weight percentages in every case, but volumes varying as much as 100%. In an offhand manner, and with his discussion helpfully and pertinently punctuated by humorous asides, Hveem described the new test. Using only an inexpensive liquid mixture and a sample of a given earthen material, the sample is soaked for a few minutes. It is then shaken vigorously—"I don't know how it is up here in Oregon, but we find in California that our boys having some experience with cocktail shakers are pretty good at this!"

After the sample has settled for a time, it is flushed with more of the solution. Injected at the bottom of the "shaker," the solution carries the clay and lighter materials upward. The strata of materials of different

gradation are then apparent, and the sand volume may be determined as a percentage of the total volume of the sample. On the basis of many tests in California, criteria have been established as to the acceptable uses of materials having various values of sand equivalent. Values cited by Hveem range from 10 to 80, the lower values being unsuitable except in the lower portions of highway fills, while the highest ones may be used in concrete.

A final point in the promotion of good highways, on the local level as well as the national, goes beyond the present need for doing more with the money we have (or less). Oren L. King, city manager of Eugene, Oregon, titled his talk "What are good public relations?" King is himself a trained and experienced engineer, though for many years he has been in the management field. He described the public relations program of Eugene, in part by showing a movie of that city's municipal government activities. Pointing out that the movie is meant for consumption by the lay public of the community, King emphasized the educational function it has. And education on a subject such as highway needs could well result in better public acceptance, if not outright enthusiasm, for bearing the costs that must be incurred in building adequate roads. Thus, it could be that engineers would be in the happy position of having to do more . . . with more.

The roadbuilding conference was sponsored by the engineering department of Oregon State College and its student chapter of the American Society of Civil Engineers. Faculty representatives most active in the planning and conduct of the two-day meeting were Martin P. Coopey, professor of highway engineering, and James L. Gray, instructor of general engineering. The student chapter administered and actually carried out all management details, directed by President Robert Wendlandt.

First precast pumice bridge built in Idaho

THE FIRST precast, lightweight, all-pumice concrete bridge in the United States was completed recently over the Wood River at Stanton Crossing, Idaho, according to William Wood, who designed and built the span for the Blaine County Commission.

The bridge was completely precast, including the stringers and flooring, and is made up of three 40-ft. clear spans which can be separated into sections and moved to other parts of the river for 16-ft. spans, he reported.

The pour, which took place in sub-zero weather, was "made possible because of the insulation value of the material," Wood said.

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SAFETY

Safety conference advises construction job guards

SPECIFIC suggestions of practices to be followed by members of the construction industry were recommended at the Annual California Industrial Safety Conference.

1. That only inspected Douglas Fir not less than No. 1 Common be used in the construction of runways for concrete buggymobiles, that lumber used for joists on runways shall not be less than 3 x 4-in. material and not less than 5 ft. in width between wheel curbs, that wheel curbs of not less than 3 x 4-in. lumber be provided along the edge of runways, and that management control the speed of equipment operators so that such equipment will be under safe control at all times.

2. That manufacturers of electric power hand saws incorporate such additional safety features in their products as retractable-type guards, shorter guards, non-kick-back clutches, and lifts on guards.

3. That all portable electrical hand tools be equipped with three-wire cords and caps and that all plugs and receptacles be standardized.

4. That added protection be given mobile crane operators working near high voltage lines by the installation of insulated boom guards.

5. That consideration be given to the merits of a newly-patented load position indicator which enables the operator to handle his load in a safe manner when he is not able to see it and is dependent on a signalman.

6. That signs warning against starting equipment that is being repaired in the field be posted.

7. That effective safety programs be undertaken by all firms in the construction industry.

Job accidents take their toll

THESE were the accidents that resulted in deaths on the West's construction jobs during the last reported month:

John Kearns, 39, was apparently killed instantly by the intermeshing blades of a large soil-cement mixing plant on March 6 near San Diego, Calif. Kearns, who had been cleaning the machine preparatory to ending work for the day, evidently fell into the mixing box of the machine while the gears were engaged, according to the coroner.

A cloud of smoke from a burning weedpatch was blamed for the death of Charles Blevins, 64, a Walla Walla

(Wash.) County Highway Department employee, who was killed March 9 near Walla Walla as he stepped from the smoke directly into the path of a passing auto, according to state patrol officers. A county truck with a fire harrow attached was moving slowly along the burning patch. Blevins was apparently following close behind to see that the fire didn't spread.

Paul Thomson, 45, was killed February 19 at Laguna Beach, Calif., when the bulldozer he was operating overturned in the steep hills of a housing tract he was leveling. His body was pinned under the machine for several hours.

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

Frank G. McClure, 62, stope engineer for the Miami (Ariz.) Copper Co., was buried March 2 under hundreds of tons of loose ore and dirt when he entered a tunnel to find out why an underground blast had failed to detonate. He was found dead.

Electric shock killed Harry Howard Keeler, 53, near Bend, Ore., on March 12 when a crane touched a power line at the Cascade Pumice Plant where he was employed. Keeler was walking beside a truck, apparently touching it, which was moving the crane when the crane touched the power line.

Wesley Dobias, 22, was killed instantly after being caught in the revolving teeth of an automatic ditcher and dragged 10 ft. on March 11 on the Casa Grande Highway near Tucson, Ariz. Dobias, on leave from the U. S. Navy, was standing astride a ditch in front of the moving machine when apparently one side of the ditch crumbled and he fell in. The ditcher caught him before he could scramble to safety, crushing his chest. He was working for the Sundt Construction Co., where his father is a foreman.

Pantaleon Baca, 52, an employee of Miller & Smith Construction Co., was killed March 11 at Albuquerque, N. M., when a section of sewer trench wall collapsed and buried him under tons of dirt. Investigating police said that heavy machinery working in the area may have caused vibrations that loosened the trench wall.

It was doubtful for 2½ hours, but at the time of going to press Harry Miller, 55, is still alive after being pinned for that length of time beneath a 19-ton bulldozer in the icy waters of Cedar Creek, near Murray, Idaho, on March 6. Miller, a Shoshone County employee, received a broken collarbone and severe bruises and was reported suffering from exposure after the tractor crashed off a bridge and toppled 7 ft. into the shallow creek.

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ASCE begins second century at 1953 national convention in San Francisco

THE SECOND CENTURY of the American Society of Civil Engineers got off to a fast start last month with the holding of a national convention, the society's annual spring meeting, in San Francisco. With sponsorship by Western sections of the society—San Francisco, Sacramento, and Hawaii—the convention was dominated by consideration of Western engineering achievements.

Huber keynotes meeting

Keynoting the meeting was Walter Huber, the society's national president and a San Franciscan, who traced civil engineering as it has been practiced on a monumental scale in California for 100 years—the entire life of the state, and of the society. With water resources always involved—first their wanton exploitation, and now their thoughtful conservation—hydraulic engineering has been the particular field of activity that has dominated California engineering. It began in the mining days, when a system of canals, ditches and flumes were built for hydraulicking. Huber noted that by 1867 this conveyance system totaled over 6,000 mi.

From this it was a simple step, hydraulically speaking, to the construction of hydroelectric power plants. The canals and ditches were continued in use, and the habit of breaking precedent in working with high heads was continued by the civil engineers working for power projects. The names of many of the early engineers of California constitute a "Who's Who in Engineering," said Huber, and the practices of many of them remain standard to this day, where they haven't been the sole basis of further advances.

Seven engineering wonders

The popular appeal of this convention of over 600 engineers was heightened with selection by the "home" San Francisco Section of the seven civil engineering wonders of the San Francisco area. Topping the list, inevitably, are the two bridges for which San Francisco is famous. Actually, it has been pointed out that there are four—and a tunnel—involved, since the second choice, the Bay Bridge, is actually composed of two suspension bridges (the West Bay), a tunnel through Yerba Buena island, and a cantilever bridge (the East Bay).

The Golden Gate Bridge would doubtless rank as a world-wide engineering wonder, as it has the longest single span ever built—4,200 ft. This is 700 ft. longer than its nearest present rival, the George Washington

Bridge in New York, though only 400 ft. longer than the Mackinac Straits bridge to be constructed in Michigan. The Golden Gate Bridge also has another "greatest" dimension, its navigation clearance of 220 ft. minimum.

Following the Bay Bridge is the third San Francisco wonder, its underground vehicle garage in Union Square. This garage was the first of its type—where a park is removed, a garage excavated and built, and the park replaced—though the general scheme has been followed since, notably in Pershing Square, Los Angeles. Occupying a city block, 275 x 412 ft., the garage is 48 ft. deep, accommodating 1,700 cars on 4 levels.

Big crane picked

The fitting-out crane at Hunters Point Naval Shipyard captured fourth place honors. Actually it is a pair of twin bridge cranes, having a rated capacity of 504 standard tons. Tested to 625 tons, it has been used to best advantage in handling the big guns of our largest naval vessels.

Fifth place went to the collection of 15 wind tunnels operated by the National Advisory Committee for Aeronautics at its Moffett Field laboratory. Sixth engineering wonder is Treasure Island, the San Francisco Exposition site of 1939 and 1940, created by placement of 20,000,000 cu. yd. of fill over a 14-ft. deep shoal to give a 400-acre island. The seventh wonder is the Posey Tube, a vehicular connection between Oakland and Alameda, and passing under the Alameda Estuary, a total length of 3,545 ft. between portals. It was the largest submarine tunnel anywhere at the time it was built, and was further notable for the fact that some two-thirds of its length was constructed in drydock, a series of 12 segments that were later floated into position and sunk into a previously excavated trench.

PG&E program

Another wonder, the various phases of which were well presented in convention technical sessions, could well be the current engineering construction program of Pacific Gas & Electric Co. The company initiated a 10-year plan in 1945 that has a price tag of well over \$1,000,000,000. Walter Dreyer, vice president and chief engineer of P. G. & E., described the major features of the company's power program, noting that expenditures for it have already passed the \$750,000,000 mark. The major units involved are 8 hydro plants and 8 steam plants, representing among

them 2,956,000 kw. of new capacity. The program has been extended on P. G. & E. drawing boards, with another 1,000,000 kw. of hydroelectric capacity in the planning stage. This generating capacity, matched by an equal amount from projected steam plants, should be completed by 1960.

Design discussed

Details of the P. G. & E. program occupied the attention of convention visitors at technical sessions of the Construction, Power, Hydraulics, and Waterways divisions of ASCE. Design features of the P. G. & E. hydro development were presented by J. Barry Cooke, senior civil engineer of the company. Civil engineering design features, as opposed to those involving other engineering branches, for the Contra Costa and Pittsburg steam plants of P. G. & E. were discussed by Walter Dickey, chief civil engineer of the power division of Bechtel Corp., which has engineered and is building the plants. Construction features of the same plants were noted in a paper given by Edgar Garbarini, general superintendent of construction for Bechtel.

Underwater foundations for the towers of a transmission line crossing San Francisco Bay were the subject of Ben C. Gerwick, Jr., vice president of Ben C. Gerwick, Inc. The San Francisco marine contractor had recently completed such work for P. G. & E., performing the job without cofferdams by the extensive use of precast concrete units.

Surge chambers also

Surge chambers for hydroelectric plants were discussed by J. D. Worthington, senior engineer for P. G. & E., from his experience with company designs and installations. And the fish rescue project undertaken at P. G. & E.'s Contra Costa steam plant was described by James E. Kerr, senior engineer for Bechtel Corp., the contractor.

A final convention feature whereby visiting engineers became acquainted with P. G. & E. engineering was an all-day excursion taking in the two steam plants built by the company on the upper reaches of San Francisco Bay. The Contra Costa plant, undergoing expansion at this time, and the Pittsburg plant, just being built, provided an opportunity to view construction at two widely separated stages. (The 5-ft. thick mat foundation for the Pittsburg plant was reviewed in *Western Construction*, August 1952, p. 74.)

Many papers were concerned with engineering problems involving water



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—how to cross it, how to dam it, how to use it, how to treat it, how to get rid of it. Technical aspects of highway bridge design occupied one entire session, when papers on long-span live loading, wind load model tests, and stress measurements were discussed, respectively by Norman Raab, Division of San Francisco Bay Toll Crossings; George Vincent, bridge engineer, Bureau of Public Roads, Seattle; and R. W. Clough and C. F. Scheffey, assistant professors of civil engineering, University of California.

Norman Raab also joined with Ralph Tudor, consulting engineer of San Francisco and new Under Secretary of the Interior, in preparing a paper treating of economic studies in the location and design of the new Richmond-San Rafael Bridge over upper San Francisco Bay. The controversial project, contract award for which was long held up by legal maneuvering of earth barrier proponents, has been under way since the latter part of February. (Unit bid prices appeared in *Western Construction*, February 1953, p. 119.)

Excellent papers dealing with problems in earth- and rock-fill dam construction were presented. For rock-fill dams, design and construction problems were surveyed by Donald Bleifuss and J. P. Hawke of International Engineering Co. Foundation

treatment for earth dams on rock was the subject of Thomas F. Thompson, chief of the geologic section, South Pacific Division of the Corps of Engineers.

Use of Colorado River water

The use of Colorado River water in California was covered by Raymond Mathew, chief engineer of the Colorado River Board of California. Mathew accounted for present net diversions of 4,210,000 acre feet annually, and he asserted that agencies of and within the state of California have appropriate and contractual rights to an ultimate total of about 5,400,000 acre feet per year. Actual expenditures and commitments connected with the use of this water total about \$550,000,000, he said, emphasizing that the use of Colorado River water in California is vital to its present and future economy.

Sessions of the ASCE Sanitary Engineering Division were split between discussions of water treatment and sewage disposal. Robert Kennedy, chief engineer of the East Bay Municipal Utility District, described the \$23,500,000 disposal project undertaken by six cities along the eastern shore of San Francisco Bay. The construction program features three interceptors totaling 22 mi., and a treatment plant adjacent to the eastern approach of the Bay Bridge.

Historic powerhouse to be retired from service soon

ONE OF THE EARLIEST hydroelectric powerhouses still operating in California, Murphys Powerhouse on Angels Creek in Calaveras County, will be retired from service by the end of this year, according to the Pacific Gas and Electric Co.

The 53-year-old facility, placed in service in 1899 by the Utica Gold Mining Co. to furnish power for mining operations, will be replaced by a new \$1,000,000 plant, the second PG&E unit to have a generator driven by a high-speed waterwheel using more than one jet of water. The first is the new Bear River unit in the Mokelumne River development (*Western Construction*—February 1953, pp. 70 to 72).

A contract to build dams and the generator foundation has been awarded jointly to Claude C. Wood of Lodi, Calif., and the firm of Rothschild, Raffin and Weirick of San Francisco. The contractors will build two earthfill dams, 52 ft. high and 310 ft. long and 30 ft. high and 400 ft. long to create a 53-acre-foot forebay reservoir on the Utica Ditch. A third dam, 32 ft. high and 250 ft. long, will be built downstream to create a 40-acre-foot regulating afterbay reservoir on Angels Creek.

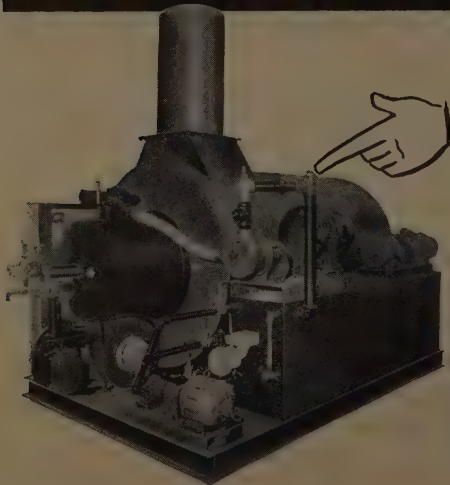
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Two natural gas lines proposed for Northwest

CONSTRUCTION of two natural gas pipe lines at an estimated cost of more than \$43,000,000 is being planned by the Colorado Interstate Gas Co., which filed applications for the projects with the Federal Power Commission last month.

One plan calls for a 365-mi., \$23,-300,000 line to Denver from a proposed intersection near Green River, Wyo., with a proposed pipe line of the Pacific Northwest Pipeline Corp. The Pacific Northwest project, now pending before the Power Commission, would bring gas from the San Juan Basin in New Mexico and Colorado to the Pacific Northwest. Colorado Interstate would buy some 100,-000,000 cu. ft. a day from this line.

The second Colorado Interstate application covers a proposal to build 49 mi. of new pipeline through Colorado, Oklahoma, Texas, and Kansas at an estimated cost of \$19,855,000.

Building site chosen for Colorado Highway Dept.

THE COLORADO State Highway Department has finally located a site for its long-planned \$2,500,000 office building. Site of the new building has been subject to a controversy in Denver for several years, chiefly as the result of protests from property owners near to proposed sites.

So now, safe from such protests, the department plans to go ahead with the building on a hilltop 20-acre site in Arapahoe County on the east side of Colorado Blvd., across the boulevard from the Convent of the Good Shepherd. (The low-lying buildings will not obstruct the mountain view from nearby homes.) Date for beginning of construction has not yet been announced at this writing.

The department's new home, for about 450 employees, will include an office building and a materials laboratory in a separate structure. Off-street parking space for employees and visitors will be provided. Highway equipment will not be housed or maintained at the location.

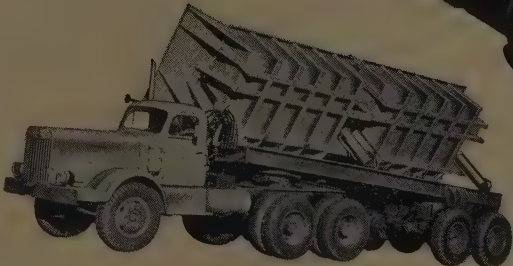
Toll road bill introduced in California legislature

AUTHORITY TO SELL up to \$3,-000,000,000 worth of toll road construction bonds was sought in a bill introduced in the California State Legislature by Senator Jack B. Tenney of Los Angeles.

Under this bill, the California State Toll Road Authority would have the power to built toll roads which would not duplicate existing state highways. A maximum toll of one cent a mile for passenger cars would be set.

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NEW BOOKS

BUILDING CONSTRUCTION COST DATA—1953—Means

A new edition of the invaluable handbook which provides average spot prices on a varied selection of building construction items for use in making up engineering estimates. Prices quoted usually are average and are accumulated from actual job material costs in 1952, and have been combined with January 1953 labor rates. Prices quoted include unit, lab, mat and total. Clearly presented and

thumb-indexed. Convenient spiral note-book form printed in engineering lettering. Published by the author, Robert Snow Means, Duxbury, Mass. 7½ x 10. Priced at \$2.75.

* * *

STATISTICALLY INDETERMINATE STRUCTURES—Wang

A text for use of senior and graduate engineering students, this is a thorough treatment of existing methods and should also prove to be a valuable reference for the practicing engineer. It covers methods of finding deflections of statistically indeterminate beams, rigid frames and trusses, the analysis of statistically indeterminate structures by the meth-

od of consistent deformation, by the three-moment equation, by the slope deflection and moment distribution methods. For textual use, illustrative problems and exercises are included. The author is a member of the civil engineering staff of the University of Colorado. Published by McGraw-Hill Book Co., New York. 414 pages, 6¼ x 9¼. Price \$7.50.

* * *

INDUSTRIAL SAFETY (2nd ed.) —Blake, ed.

First printed during World War II when there was urgent need for organized methods to insure personal safety, this handbook is one which will aid management and safety engineers to achieve—and to keep—good safety records. Though designed with an eye in mind chiefly to avert industrial plant casualties, contractors should find many chapters helpful, particularly those on handling tools, low voltage electrical hazards, prevention of falls, and personal protective equipment, to mention a few examples. The chapters are written by the editor, Roland P. Blake, who is senior safety engineer, Div. of Labor Standards, U. S. Dept. of Labor, and six other experts. Contains brief bibliography and index. Added material to the present edition includes a chapter analyzing accident distribution. Published by Prentice-Hall, Inc., New York, 458 pages, 6 x 8½. Priced at \$7.90.



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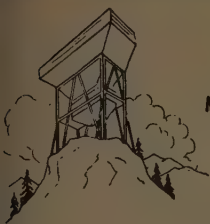
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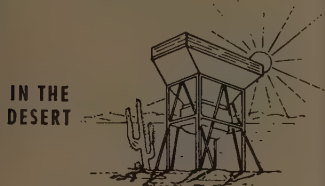
PLASTERING SKILL AND PRACTICE—Van Den Branden and Knowles

A helpful guide written to promote better craftsmanship in an ancient and widely-practiced trade. Its contents, however, have been restrained to the confines of present-day plastering methods with all of the practical modern advantages. Its aim is to present a general knowledge of plastering procedures by showing the simplest and most practical methods which are the result of tested procedures. This book is well organized and amply illustrated, and the authors are instructors in Building Trades Apprentice School, Detroit, Mich. Published by American Technical Society, Chicago. 289 pages, 5½ x 8½. Priced at \$4.90.

NOBLE BATCHING PLANTS ARE ON THE JOB



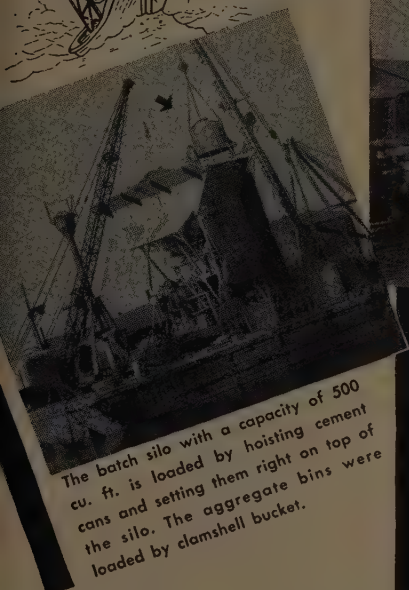
IN THE MOUNTAINS



IN THE DESERT



ON THE WATER



The batch silo with a capacity of 500 cu. ft. is loaded by hoisting cement cans and setting them right on top of the silo. The aggregate bins were loaded by clamshell bucket.

Noble Multiple Beam Scales weighed every batch correctly on this job regardless of the continuous 'roll' of the barge during pouring operations.

Noble Standard Multiple Beam Scales with 'full-vision' over-under indicator assures accurate manual control of aggregate batching. Accurate cement batching is assured with the NOBLE exclusive photo-relay control.

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BUILDING DAMS—TUNNELS—CANALS—HIGHWAYS, ETC.
IN EVERY CONTINENT ON THE GLOBE...



Operations were carried on from a base established near the toll plaza on the San Francisco peninsula end of the San Mateo Bridge.

BEN C. GERWICK INC. OF SAN FRANCISCO, CALIF. WERE AWARDED A CONTRACT BY THE PACIFIC GAS & ELECTRIC CO. TO BUILD NINETEEN TOWER FOUNDATIONS FOR THEIR NEW MORAGA-SAN MATEO TRANSMISSION LINE ACROSS SAN FRANCISCO BAY.

The tower foundations are of pre-cast concrete beam design "welded" together with concrete to form a solid concrete structure.

Two of the nineteen foundations contain approximately 800 cu. yds. each and the others about 200 cu. yds. each. 60 per cent of the concrete in each structure had to be poured under water.

TO BATCH CONCRETE FOR THIS JOB BEN C. GERWICK COMPANY OUTFITTED A BARGE WITH A NOBLE 100 TON 4 COMPARTMENT SEMI-AUTOMATIC CEMENT AND AGGREGATE BATCHING PLANT.

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Strategically located Factory Branches and Parts Stations maintain a constant \$3½ million parts and replacement unit inventory.

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JACKING CULVERTS

... Continued from page 71

types of jacks. If the pipe becomes "stuck" while jacking, it is usually possible, and not too difficult, to jack from the other end to meet the stuck pipe. When this becomes necessary good engineering work in transferring the correct line and grade to the opposite side of the fill is required, also very careful measurements in setting up in order to effect a "good meet." It is very seldom possible to withdraw a "stuck" pipe, especially if any appreciable footage has been made in the first effort.

As stated previously, conditions do arise where it becomes highly undesirable to open-cut a location for a conduit or culvert, and yet where soil or water conditions do not permit use of the jacking method. A solution can usually be found in tunneling, where the advantages of not disturbing traffic, etc., can be maintained, and still the required conduit can be placed. Tunneling methods using metal forms have been completely developed for that purpose, and while that is a considerable subject in itself, the point is made that where conditions are too bad for jacking they can be overcome by tunneling, but at higher costs. A type of metal liner plate has been developed that offers greater strength against heavy soils than does timber, occupies considerably less room (and hence requires less tunnel excavation), carries no fire hazard, and is usually cheaper to install than timber tunneling.

A discussion of jacking methods would not be complete without mention of the more recent development of "boring," which has made great strides recently.

It is now usual to bore conduits up to 42 in. in diameter into place, and in lengths up to 50 or 60 ft. Soil conditions must be better than are required for jacking since in boring the operation is "going blind." To encounter large rocks, soil too loose to hold a face, hidden piling, logs, stumps, or similar objects usually means a wasted effort. But where boring is possible—and here again this can usually be determined by proper testing—it is both faster and more economical than jacking, which is in turn more economical than tunneling. For placing small conduits, below the lower jacking limits, and for lengths less than 60 to 80 ft., boring should always be explored before opening up an existing fill or other spots through which a conduit is to be placed.

In general, then, consideration should be given to boring, jacking, and tunneling, when the problem of placing a conduit under a roadway is presented. Usually, one of these methods will eliminate the costs, delays, and headaches that associate themselves with open trench installations, particularly in present-day traffic.

Engineering seniors fight off personnel men

FIGHTING OFF personnel men until they can graduate seems to be the toughest problem confronting current university seniors in technical fields, according to Harlow H. Campbell, head of the student placement at the University of Idaho.

The heaviest-beaten path has been to the College of Engineering, said Dean Allen S. Janssen, who reported that representatives of 145 different industrial concerns had checked in since last fall looking for seniors. "For a while they were coming three and four a day," he added.

Dean Janssen tells the story of one party of eight which went on a tour of colleges to hire engineers. Only six returned to the home plant, two having been hired away while on the tour. One company is reported to have offered to take the entire graduating class of a certain college of engineering sight unseen; the only stipulation being to keep them alive until after graduation.

Dean A. W. Fahrenwald of the university's School of Mines says that every mines graduate has had his choice of four or five different jobs. Many graduates in technical fields are given opportunities to pursue their training under attractive fellowship arrangements, he added.

Portland files plans for longest sewer

THE LONGEST trunk sewer ever designed as a single unit in Portland came closer to reality when almost 6 lb. of plans and specifications were filed last month by City Commissioner William A. Bowes.

The 18-mi.-long sewer line, estimated to cost \$811,390, will include four pumping stations to boost the sewage along until it can flow by gravity into the existing sewage disposal system. Pipe will range from 6-in. cast iron to 48-in. reinforced concrete in size and material. Nearly 100 concrete manholes will be built, more than 30,000 cu. yd. of pit run gravel will be used, and more than 100,000 cu. yd. of earth will be moved, engineers estimated.

Some 425 working days will be required to finish the project, according to the city engineer. The new sewer system is also expected to provide storm drainage.

Improvement job to start

A \$4,000,000 COLUMBIA River Highway improvement program from Clatskanie to Delena will start next month, according to R. H. Baldock, Oregon state highway engineer. The construction will cost about \$100,000 a mile, Baldock estimates.



Engineer answers vital questions about the strongest wire rope made—Flattened Strand

Why does Hercules® Flattened Strand wire rope continue to outperform round strand rope by 2 to 1 or more? Can you use it? Here, Walter C. Richards, chief engineer, A. Leschen & Sons Rope Co., tells you.

More and more wire rope users are continually experiencing or hearing about spectacular performances of Hercules Flattened Strand wire rope. The explanation is clear.

First, Hercules Flattened Strand is a Super-rope because it packs 10% more steel than any round strand rope of the same size. It's 10% stronger...10% safer.

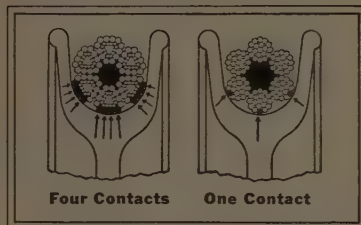
Second, Hercules Flattened Strand wears longer and more evenly. That's because there are four wires per strand contacting sheave grooves instead of one.

Third, Hercules Flattened Strand resists crushing and internal strand-cutting, because strands rest snugly against each other, keystone fashion, with less internal pressure or friction.

Fourth, Hercules Flattened Strand prolongs its own life and the life of equipment, because the relatively smooth surface of the rope prevents corrugating and wear on sheave grooves.

Can you use it?

It's a known, proved fact that no other wire rope made can equal Flattened Strand on applications such as hot ladle cranes, skip hoists, and dredge ropes. It is also best on a variety of other equipment both large and small. For many uses, it is truly a Super-rope.



With Flattened Strand, notice how four wires per strand contact sheave grooves—reducing rope and equipment wear.

But, the question is, can you use it to advantage? That can be answered only by a qualified wire rope engineer who is thoroughly acquainted with the characteristics and proper uses of Flattened Strand rope.

Check with the authority

That means, check with Leschen. It's wise to do so because Leschen pioneered and perfected Flattened Strand wire rope. Leschen developed special machines to make it. Leschen conducts continuing research on correct uses. Leschen is the authority.

If you discover you can use this Super-rope—Hercules Flattened Strand—you'll soon begin saving time, labor and money. Why not investigate now?

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ENGINEERS ON THE MOVE

Roy R. Clark, special assistant to Col. Thomas H. Lipscomb, Portland district engineer, has been appointed a member of the U. S. Committee on Large Dams, according to C. P. Vetter of Boulder City, Nev., Committee chairman. The U. S. Committee is part of the International Commission on Large Dams of the World Power Conference with headquarters in Paris. Committee membership is considered to be one of the highest honors which can be bestowed on a civil engineer. When the Columbia River Highway scenic route was being built, Clark was employed as a bridge designer by the State of Oregon. The next 15 years were spent completing 200 engineering projects in private practice, among them the Bridge of the Gods and the Astoria grain elevators. He joined the Corps of Engineers in 1933, working on the Bonneville, Dorena, Fern Ridge, Cottage Grove, Detroit, Big Cliff, Lookout Point, McNary, and The Dalles dams.

William J. Gough, who helped organize the Equipment Department of the California Division of Highways in 1919, retired after 34 years' service with the department.

Wilfred L. Karrer, Bureau of Reclamation construction engineer on the Kennewick Division, Yakima project in Washington, has gone to Israel to serve as irrigation adviser to the U. S. technical cooperation director there in the development of the national irrigation water supply. Karrer is an expert on the development of irrigation systems through pipelines rather than open canals. The high value of water in Israel makes pipeline transmission important in the development of its water resources.

Two San Francisco Bay Area employees of the Bureau of Public Roads were honored by the U. S. Department of Commerce at the Fifth Annual Honor Awards Program held in Washington, D. C., in February. Charles C. Morris, division engineer of Division 7, San Francisco, received the Gold Medal Award for Exceptional Service for major contributions to the development of the U. S. highway program, especially in the states of Arizona, Nevada, and California and the Territory of Hawaii. Geoffrey W. Mayo of Berkeley, assistant chief of the Bureau's Western headquarters, was given the Silver Medal

Award for Meritorious Service for his major contribution to the highway development of the Western states, particularly for the excellence of the design and construction of highways and bridges in the national forests and parks of the region.

Ivan C. Crawford of Boulder, a retired civil engineer with long experience on water projects, has been appointed Director of the Colorado Water Conservation Board, succeeding the late Clifford H. Stone. Crawford, a native of Leadville, has been dean of engineering at the state universities of Idaho, Kansas, and Michigan. While at the University of Idaho in 1933, he was a special consultant to the federal government on water conservation problems.

Meritorious service awards have been made by the Department of Commerce to two U. S. Bureau of Public Road officials in Denver. They are Jesse E. Williams, district engineer, and Clyde E. Learned, who has worked for the Bureau for 34 years. Williams was honored for his work in planning and starting construction of a national highway system in Turkey during his four-year stint as director of the Bureau of Public Roads there from 1947 to 1951. Learned was cited for valuable service on the Alaska Highway and for outstanding contributions to forest and park highways in the Rocky Mountain Empire. Learned, who pioneered in the job of keeping mountain passes open during the winter, was the first to introduce

the steam shovel and rotary snow plow in highway operations in the Rocky Mountains, said Secretary of Commerce Sinclair Weeks, in presenting the award.

The American Concrete Institute Construction Practice Award was given to F. Thomas Collins, consulting engineer of San Gabriel, Calif. Collins was honored for the excellence of his paper, "Tilt-up Construction in Western United States," which was published in the October 1951 ACI Journal. The award was established in 1944 to recognize the man on the job for his resourcefulness in translating design into the completed structure.

Danielson & Sowa is a newly-created general contracting firm in Bremerton, Wash., with headquarters at 610 Fourth St. The partnership was formed by Chester S. Sowa and Bert Danielson, who have been active as independent contractors in the area.

Seven California civil engineering and surveying groups have organized a state-wide association known as the California Council of Civil Engineers and Land Surveyors. The seven charter members of the Council include: San Diego Council of Registered Civil Engineers and Licensed Land Surveyors; Civil Engineers and Land Surveyors Association of California (Los Angeles); Civil Engineers and Land Surveyors of Santa Clara County; Western Association of Engineers, Architects and Surveyors (Sacramento), and the East Bay Chapter, Peninsula Chapter and San Francisco Chapter of the Bay Counties Civil Engineers and Land Surveyors Association, Inc.

Final arrangements were completed for the new organization at a San Diego conference on January 16 and 17. Its first officers are: Wayne

RECEIVING THE PRESIDENTIAL gavel from his father, Capt. A. K. Fogg (center), San Diego city engineer and retiring president of the San Diego Chapter, American Society of Civil Engineers, is Robert K. Fogg, practicing civil engineer, the new president. Other new officers are (from left) George R. Saunders, construction engineer for the San Diego Unified School District, secretary; William J. Bobisch, director of design, 11th Naval District, vice president; and Harlow Hyde, Jr., civil engineer in the 11th Naval District Public Works Office, treasurer. The term of office runs from January 1953 to June 1954.



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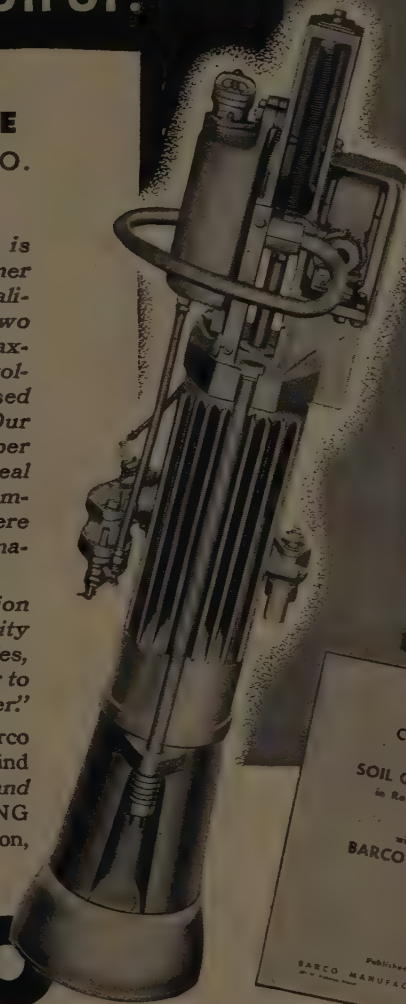
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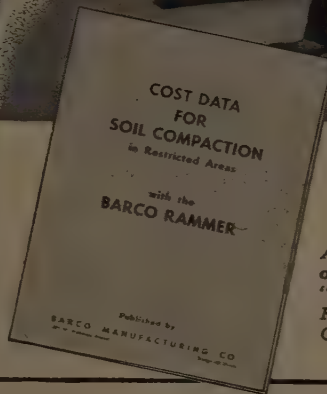
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April, 1953 — WESTERN CONSTRUCTION



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W. Smith, president; James E. Waite and J. R. Newville, vice presidents, and Albert W. Daniels, secretary-treasurer.

On March 11 the Junior Forum of the Los Angeles Section, American Society of Civil Engineers will celebrate its twenty-third birthday. Originated under the guidance of Harry W. Dennis and Raymond A. Hill, the group is said to be the Society's oldest Junior Forum.

Clyde V. Kane, district engineer of California Division of Highways District One at Eureka, has been transferred to the position of district engineer at San Bernardino to fill the vacancy created by the recent death of Spencer W. Lowden. Kane's old spot will be filled by Alan S. Hart, district engineer of District Nine at Bishop, which position, in turn will be taken by Milton Harris, service and supply engineer in the Sacramento headquarters office.

After 22 years of serving the Metropolitan Water District of Southern California, Ezra B. Rider, senior engineer, has retired. He played an important role in the District's development from before the time it was organized.

Edward T. Telford, a traffic engineer in the Sacramento office of the California Division of Highways, will be in charge of planning, location, and advance design of new freeways in Los Angeles, according to George T. McCoy, state highway engineer. He will fill the vacancy caused by the retirement of Mark E. Cessna.

Fred C. Quinell, Jr., of Butte, a district construction engineer for the Montana State Highway Department since 1942, has been appointed administrative engineer. Henry C. Helland of Helena, now control engineer, was upped to the post of planning survey engineer.

Otis S. Waters, mayor of Richey, Mont., has been appointed to fill a vacancy in the Montana Highway Commission caused by the resignation of Nils Bach, Sidney. Other members of the five-man group are Frank G. Connelly, Billings, the chairman; T. J. Landry, Kalispell; Lester Swanson, Livingston, and Harry L. Burns, Chinook.

G. L. McLane, Bureau of Public Roads district engineer at Phoenix since 1929, retired on January 31. His first engineering experience was with Santa Fe railway location and construction in New Mexico, Texas, Oklahoma, and Kansas. Then he served as a city and county engineer at several places in Kansas until



SMILING FOR THE CAMERAMAN at a recent meeting of the Southern California Chapter, Associated General Contractors, are (from left) J. A. Thompson, Donald E. Reed, Fred J. Early, Jr., Adolph Teichert, John McLeod, Spencer Webb, the new president, and R. A. Smith, the new treasurer. Other new officers, not pictured here, are Vice Presidents William E. Irish, R. A. Myers, and Harry L. James.

World War I, when he served in France as commanding officer of the 546th Engineers. He joined the Bureau of Public Roads in 1919 at Omaha, being transferred to Phoenix in 1922. McLane was president of the Arizona Section, American Society of Civil Engineers, in 1948.

Byron W. Matteson, Bureau of Public Roads division engineer for Colorado, New Mexico, Utah, and Wyoming with headquarters in Denver since January 1938, retired March 1.

The climax of his more than 33 years of service came last year when he received the Department of Commerce Gold Medal Award for outstanding work in national highway development from Secretary Charles Sawyer. The citation lauded him for efficient administration of the Bureau's work, maintenance of excellent working relationships with state officials, promotion of the Denver Valley Highway, development of highway planning in the Western states, and the effective adaption of planning data to highway improvement programs.

Matteson's engineering record started in 1903, when he worked with a paving contractor in New York City, the Tidewater Railway in Virginia, and the Union Pacific Railroad in Omaha.

He acted as assistant engineer for the City of Los Angeles, doing public works construction, from 1908 to 1919, when he entered the federal service with the Bureau of Public Roads at Ogden, Utah. From 1930 to 1938, when he went to Denver, he was in charge of all federal-aid highway work in the 11 Western states and Hawaii, working out of the Bureau's Regional Office in San Francisco.

In 1903, Matteson received his engineering degree at Dartmouth College, where he was elected to Phi Beta

Kappa. He is a member of the American Association of State Highway Officials, the American Society of Civil Engineers, the Colorado Society of Civil Engineers, and an ex-member of the Engineers' and Architects' Association of California. Last year he was chosen to head the Bureau of Public Roads National Personnel Board.

Gordon Zander, California assistant state engineer, retired in December after 39 years of state service.

James J. Breen, salesman for Layrite Concrete Products Co., has been elected 1953 president of the Spokane Construction Council. Breen succeeds Leonard Parr at the helm.

The Bureau of Reclamation's Kennewick, Wash., division construction superintendent, W. L. Karrer, will be in Israel for six months as an engineer-advisor for reclamation work. During his absence Edward Keeler, office engineer at Kennewick, will serve as acting engineer.

Two engineers assigned to the Walla Walla, Wash., district of the Corps of Engineers have been transferred to Korea where they will attend to air-field construction projects. They are Lt. Col. Robert N. Anderson, executive officer of the Walla Walla district, and Lt. Col. C. A. Rust, special assistant to the district engineer.

New appointments and transfers have been made necessary within the California Division of Highways because of the death of Spencer W. Lowden, district engineer of District 8, and the retirement of Mark E. Cessna, district engineer in charge of planning for District 7. Edward T.

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Telford, traffic engineer, Sacramento office, will now serve in District 7, with headquarters in Los Angeles. **C. V. Kane**, district engineer of District 1, has been transferred to District 8, with headquarters in San Bernardino. He is replaced in his former position by **Alan S. Hart**, district engineer of District 9. **Milton Harris**, service and supply engineer at Sacramento, is promoted to district engineer replacing Hart, with headquarters at Bishop. **H. H. Deardorff** has been assigned acting assistant traffic engineer at the headquarters office.

Lt. Col. John A. Graf relieved **Lt. Col. James W. Sloat** as executive officer of the Portland District, Corps of Engineers, in February. **Lt. Col. Sloat**, who held the position since 1950, left for his new assignment at Bremerhaven, Germany, last month. **Lt. Col. Graf**, a 1940 graduate of West Point, had been stationed most recently at Fort Huachuca, near Bisbee, Ariz., with the 419th Engineer Aviation Brigade and the Engineer Aviation Training Center. Before that he served with the Pusan Engineer Depot in Korea, taught engineering and history at West Point, and earned his master's degree at California Institute of Technology in 1947. **Lt. Col. Sloat**, a native of Portland, received his master's degree in civil engineering at the University of California in 1939.



Graf



McMillan

Fred O. McMillan, head of the Department of Electrical Engineering at Oregon State College, was named Oregon's Engineer of the Year, an award given at the annual banquet of the Professional Engineers of Oregon on January 31. The award, which was in the form of a certificate of merit, cited Professor McMillan for his contributions to the profession, fine teaching and for his national presidency of the American Institute of Electrical Engineers for the year ending August 1952. He has been a member of the Oregon State College staff since 1920, and carries on extensive research and consulting work in addition to his academic duties.

The organization's new officers for 1953 are: **Robert C. Shoemaker**, president; **H. Loren Thompson**, vice president; **Elliott B. Higgins**, secretary; **Paul D. Christenson**, treasurer, and **D. Ford McCormick**, **Elsworth G. Ricketts**, **W. A. Gish**, **F. James**

McCanna, and **James G. Kirwan**, trustees. Shoemaker is supervising engineer in charge of construction machinery design and patents for Hyster Co.

Charles P. Garman, assistant general manager and chief engineer of the Los Angeles Department of Water and Power, retired after more than 32 years of public service. A resolution presented by the Board of Water and Power Commissioners said that Garman's engineering knowledge and leadership played an important part in enabling the department "to maintain a high level of service at the minimum cost to the consumer."

Col. William H. Mills, Walla Walla district engineer for the Corps of Engineers, is expected to be transferred to France sometime this month. **Col. Mills** has supervised two years of the peak construction at McNary Dam on the Columbia River, as well as numerous military projects in Washington, Idaho, Oregon, and Montana. **Lt. Col. Robert Anderson**, executive officer, and **Lt. Col. C. A. Rust**, special assistant, have been ordered to Korea. **Col. Alex Miller** has already arrived to replace Anderson.

Col. James G. Truitt, assistant district engineer at the Seattle District, Corps of Engineers, has retired after 36 years in the service of the federal government, in both civilian and military capacities.

After 38 years of clearing snow and other maintenance work on the Big Thompson Highway between Estes Park and Loveland, Colo., **Lloyd Long** has retired. During that time the road was closed to traffic only one afternoon and evening, and only then because the equipment broke down and couldn't be repaired quickly.

Harry Linnecke, Reno electrical contractor, has succeeded **E. J. Maupin, Jr.**, as president of the Nevada State Contractors Board. Other new officers are **Harrison Stocks**, Las Vegas, vice president, and **Paul Manuel**, Reno, treasurer.

William F. Johnson has been named Asotin County, Wash., county engineer. His former experience includes service as Clarkston city engineer and a period as manager for the engineering firm of Swain-Storm & Associates.

Special adviser on water resource development for the government of Afghanistan is **Edward N. Torbert**, the Bureau of Reclamation regional planning engineer at Boise, Idaho. Torbert recently left for a year's tour of duty in the remote Asiatic country.

His assignment was made at the request of the Afghanistan government and the Department of State under the Point Four Program. Afghanistan is at present constructing, under private contract, a multiple-purpose project which will include two dams and reservoirs and canals furnishing water for approximately 500,000 acres of land. The project will also provide hydroelectric generating facilities for the economic advancement of the region.

Officers and directors for 1953 of the Colorado Contractors Association, Inc., are **C. L. Hubner**, C. L. Hubner Co., president; **Walter Schmidt**, first vice president; **Jack Harrison**, second vice president; **Edwin W. Vandervort**, secretary-treasurer; and the following directors: **Dan G. Bell**, **Clarence Brown**, **Carl V. Hill**, **Stanley L. Larson**, **R. J. Lawrence**, **Hoyle Lowdermilk**, and **J. H. Monaghan**.



Hubner



Tobin

Robert E. Tobin, district engineer in the Spokane office of the Portland Cement Association, has been elected president of the Associated Engineers of Spokane for 1953. Other new officers are **Harold Kirkemo**, first vice president; **R. E. Blasen**, second vice president; **Albert Gruber**, third vice president; **Harold Halstead, Sr.**, fourth vice president; **Carl Johnson**, fifth vice president; **Lee Patchen**, sixth vice president, and **W. L. King**, secretary-treasurer.

Members of the executive committee, and the groups they represent, are: **Johnson** and **Fred A. Long**, American Institute of Architects; **Patchen** and **Ivan A. Shirk**, American Society of Mechanical Engineers; **Tobin** and **T. H. Judd**, American Society of Civil Engineers; **Kirkemo** and **P. E. Oscarson**, American Institute of Mining Engineers; **Blasen** and **G. M. Brunzell**, American Institute of Electrical Engineers; **Gruber** and **Kenneth P. Norrie**, National Society of Professional Engineers; **George Shields** and **Halstead**, Society of Automotive Engineers; **R. David Brown** and **Ralph Nelson, Jr.**, representatives of associate members, and **Charles J. Melrose**, member at large.

More than 800 delegates attended the American Road Builders' Association 1953 convention held at Boston

in February. Robert M. Reindollar, a Baltimore consulting engineer, was elected president. Westerners elected to office in the Association included Harmer E. Davis, director of the Institute of Transportation and Traffic Engineering, University of California at Berkeley, Western District regional vice president.

The County and Local Roads Division found H. O. Walberg, Skagit County, Wash., road engineer, elected vice president of the Western District, and Wally M. Hector, Douglas County, Ore., engineer, named to the board of directors. Frank W. Wiley, director of the Montana Aeronautics Commission, was elected Western District vice president of the Municipal and Airport Division.

The Construction Industry Manufacturers Association, listed as the Manufacturers Division, elected the following officers for 1953: President, Harold T. Reishus, International Harvester Co.; first vice president, R. McLean, Jaeger Machine Co.; second vice president, L. G. Schraub, Union Wire Rope Corp.; secretary-treasurer, Roy E. McCluskey, R. G. LeTourneau, Inc. Harold F. Hess continues as executive vice president.

New directors for the term ending in 1956 are E. Bentley, General Motors Corp.; P. H. Birkhead, Bucyrus-Erie Co.; A. A. Levison, Blaw-Knox Co.; Robert Myers, United States Steel Corp.; Melvin Obestrud, Pioneer Engineering Works; Luke E. Smith, Quickway Truck Shovel Co.; W. White, Sr., White Manufacturing Co., and McLean.

The Northwestern Society of Highway Engineers elected A. G. Skelton, Oregon Highway Department district engineer, president for 1953 at its annual meeting in Portland last month. Others named to office include Ramon Schleger, Paul J. McKay, and F. B. Crandall, vice presidents; and R. L. Porter, D. D. Forgey, Fred J. Dixon, Forest Cooper, and W. A. Bugge, directors.

D. L. Cheney, vice president of S. Birch & Sons Construction Co., has been reelected president of the Alaska Chapter, Associated General Contractors, for the third consecutive year. Other chapter officers chosen include A. M. Strandberg, vice president; P. D. Koon, secretary-treasurer, and M. P. Munter, G. E. Lefler, Paul Fredrickson, and William Huf-eisen, directors. Larry Moore was re-appointed manager of the chapter.

New president of the New Mexico Chapter, National Society of Professional Engineers, is Otto H. Walter Blume, manager of Albuquerque's water department. Other new officers are Walter K. Wagner, national director; H. A. Person, first vice president; A. S. Walter, second vice presi-

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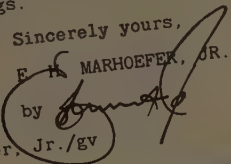
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dent; **T. T. Castonguay**, secretary-treasurer; and **William V. Gilpin**, **S. E. Reynolds** and **Frank Bromilow**, state directors.

In Portland, **Harvey S. Daley** has been elected president of the Builders Exchange Cooperative. **Jack F. Shearer** is vice president; **Robert J. Fester** is treasurer, and **Bill Mannan** is secretary. Members of the board of directors are: **H. A. Andersen**, **Frank Chown**, **Donald G. Drake**, **W. R. Grasle, Sr.**, **J. H. Hargreaves**, **Montie Smallen** and **Alfred S. Teller**.

The Seattle Construction Council has elected **E. B. Scriven** president for 1953. Other officers are: **R. M. Black**, first vice president; **Elmer Coats**, second vice president; **E. W. Waldal**, secretary, and **James Dodge**, treasurer. The organization is affiliated with the Seattle Chapter, Associated General Contractors.

Judge S. Waldrep, former city construction engineer of Oklahoma City, became chief of the San Diego County Building Division last month in place of **Charlie H. Salyers**, who resigned.

James J. Breen of the Layrite Concrete Co. has succeeded **Leonard Parr** as president of the Spokane Construc-

tion Council. Others chosen were **Les Stewart**, vice president; **Jack Powers**, treasurer; **Richard Saldin**, recording secretary, and **Mrs. Elizabeth Stone**, re-elected as secretary.

Pounding the gavel at 1953 meetings of the Tacoma Engineers Club will be **Conant Dodge**, who succeeded **Walter S. Gordon** as president. Other new officers include **William D. Smith**, first vice president; **Harold A. Hagestad**, second vice president, and **John T. Roberts**, secretary-treasurer.

W. E. Naumann of Tucson, vice president of the M. M. Sundt Construction Co., has been chosen president of the Arizona Chapter, Associated General Contractors. Other new officers are **W. J. Henson**, Prescott, vice president, and **Maurice Tanner**, Phoenix, member of the board of directors. **Joseph P. Condrey** was re-elected executive secretary.

At the annual meeting of the Idaho Branch, Associated General Contractors, **William Gramkof, Jr.**, Boise, was elected president. Other new officers are **N. L. Terteling**, vice president, and **L. D. Robbins**, secretary-treasurer. **Howard Reynolds** and **Woodrow Arrington** were elected to the board of directors. **Riley McCorkle** continues to be manager.

DEATHS

J. W. Miller, 73, retired professor of civil engineering at the University of Washington and first chief engineer for the Boeing Airplane Co., died recently in Seattle.

Stephen M. Miera, 45, a surveyor and engineer, died February 28 in Albuquerque, N. Mex., after a long illness. He had worked as a liaison engineer for the Calship Co.

J. Ross Roberson, 70, Olympia's commissioner of public works, died recently in Olympia, Wash. At the time of his retirement in 1949, he was Southern Division superintendent, Puget Sound Light & Power Co.

Thomas A. Bedford, 83, former assistant engineer in the Department of Surveys and Plans, California State Division of Highways, died last month at Redding, Calif. During his career with the state, which began in 1911, he supervised construction of the first road from Redding to Duns-muir, and construction of all the highways along the Feather and Klamath rivers. He was transferred to the

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Planning Office at Sacramento in 1928, where he laid out most of the modern highway routes through the state until his retirement in 1939.

Charles Coe Breyfogle, 73, retired building contractor, died February 25 in Los Angeles.

William W. Tincher, 67, a Los Angeles County Flood Control staff engineer for 35 years, died February 25 in San Bernardino, Calif.

Leonard Johnson, 47, an employee of the Isbell Construction Co., died February 14 in Reno.

Carl G. Olsen, 44, an administrative engineer for the California Department of Highways, died at the end of January in Arcadia, Calif.

Arthur Beauchemen, 58, contractor and builder, died February 16 in Los Angeles.

Forrest Q. Stanton, 67, retired contractor, died February 27 in Banning, Calif. A star athlete at the University of California at Berkeley and the University of Virginia, he went to Los Angeles in 1912 to form the Stanton-Reed Co., general contracting firm.

Vaughn E. Hayes, 53, formerly a civil engineer with the City of Monrovia, Calif., died last month in Monrovia.

Robert Thomas Lawrence, a resident of Spokane, Wash., for 53 years, died March 4 at his home in Spokane. He was a retired contractor.

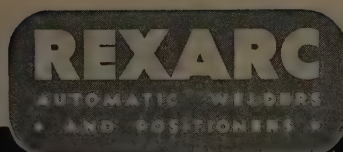
Milton R. Parrish, 37, an engineer with the Bureau of Reclamation, died March 12 at the U. S. Naval Hospital, Bethesda, Md. Parrish, whose home was at Lakewood, Colo., had been assigned to a Point Four engineering mission at Beyrouth, Lebanon, until he became ill and was flown back to the United States.

John Lee Berry, 68, former engineer for Kitsap County and the City of Bremerton, died February 20 in Bremerton, Wash., of a heart ailment.

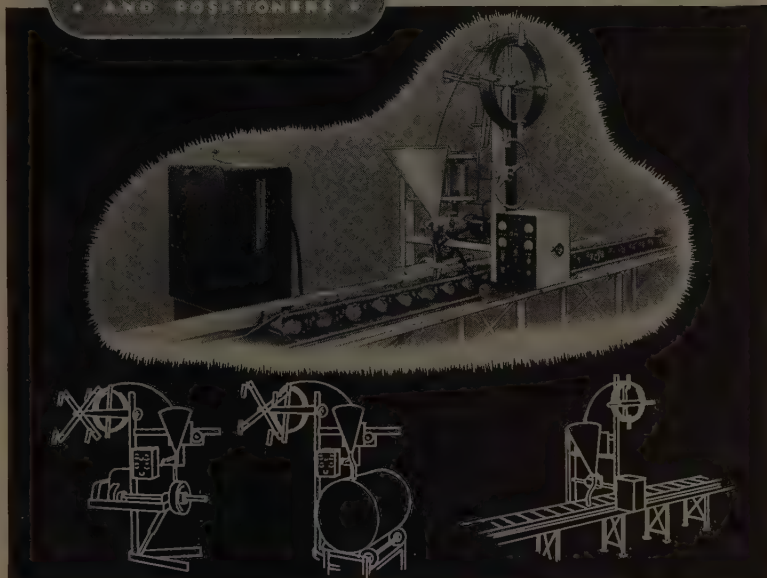
Mark A. Robin, 65, president of the Seaboard Engineering Corp., died February 11 in Los Angeles.

Charles Beattie Schoonmaker, 74, retired civil engineer for the Pacific Telephone & Telegraph Co., died February 16 in Los Angeles.

Charles F. Marvin, 75, a retired building contractor, died March 9 in San Diego.



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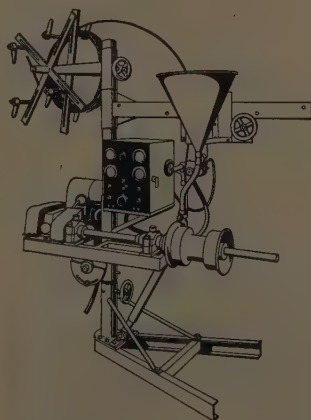
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SUPERVISING THE JOBS

Morrison-Knudsen Co., Inc., has **J. E. Ricker** supervising for its \$1,318,474 contract for earthwork, concrete lining and structures on Arizona's Wellton Canal.

Jack Stuckman is supervisor for Miller & Smith's contract for laying storm sewer pipe in North Albuquerque, New Mex.

Henry Thygesen & Co. has two road jobs going on in New Mexico. **Cliff Earsley** is superintending a \$442,545 award for 9 mi. on U. S. 85 in Mora County, and **Earl Shannon** is office manager. **Paul Cross** is superintendent for the other job, 4.14 mi. on State 180 in Sierra County, a \$214,217 award.

Contractor **W. F. Maxwell** is putting up 8 bridges on the Ramona Freeway in Southern California. Job superintendent is **M. N. Latham**, and job engineer is **H. B. Raun**. **Jack Stephens**, **Truman Hart** and **Roy Tribbey** are carpentry foremen, and **Martin O. LaRue** is concrete foreman.

George P. Nelson is in charge of clearing the reservoir area for Albeni Falls Dam at Clark Fork, Idaho, for **J. H. Trisdale, Inc.**

Widening 2½ mi. of U. S. Highway 40 in Washoe County, Nev., for the **Isbell Construction Co., Inc.**, are **Henry B. Isbell**, job superintendent; **Ed Dempsey**, assistant superintendent, and **Ben Mott**, office manager.

Various structures are under construction on the many campuses of the University of California. In Los Angeles, Unit 2 of the Life Sciences Building is being built by **Baruch Corp.** Key personnel are: **Frank L. Parker**, job superintendent; **Eddie Hondahl**, assistant superintendent; **Frank O'Lea** carpentry foreman; **Tony Lopez**, labor foreman, and **A. E. Fahs**, office manager. This is a big 5-story job, including a 30,000-gal. pipe system which will supply sea water for scores of aquariums.

Social Sciences and Humanities buildings on the Riverside campus are going up under contract to **Charles A. Jensen**, who has **Ralph V. Eno** superintending. Masonry foremen are **Roland Thatcher**, **Tony Varela** and **Leonard Rogers**.

On the campus at Santa Barbara, **Williams & Burrows, Inc.**, and **Carl N. Swenson Co., Inc.**, are constructing two lightweight structures, one a library, the other a science building. **Webster Mello** is general superintendent; **Howard Wilson** and **C. A. (Bud) Jaensen** are carpentry foremen, and **Osborne Daniels** is office manager. The structural engineer for the buildings is **Donald F. Shugart**, and the architect on the library is **Chester Carjola**, and **Soule & Murphy** is architect on the science building.

A short stretch of the Oregon Coast Highway in Curry County is being put in by a \$648,680 joint venture of **Fred H. Slate Co., Oregon, Ltd.**, and **E. C. Hall Co.** **Howard Nelson** is superintending, aided by **James Leinbach**, timekeeper and assistant superintendent.

An industrial paper mill is being built in Tracy, Calif., for the **American Reinforced Paper Co.** by **B & R Construction Co.** **Norman R. Pordmor** is on the job in the capacity of project manager, and he is assisted by **Byron M. Greene**, superintendent, and **Hugh Peverhill**, assistant superintendent. **Allen H. McKay** is representative for the paper company.

Jess Williams is supervising at a commercial rock and asphalt plant under way by **M. J. Ruddy & Son** for **Santa Fe Rock & Sand** at Waterford, Calif. **Dan Griffith** is crusher foreman and **Joe Robles** is foreman at the asphalt plant. The master mechanic is **Russell Haskins**.

ON LOCATION in the Northwest is **W. J. (Bill) Morcom**, who is superintending construction of the **McNary** switchyard control house. **Thompson and Georgeson** has the \$126,480 contract.



Jim Reed, assisted by **Ben Hardesty**, is supervising construction of an irrigation system at Manteca, Calif., for **Jay Tanner**, contractor.

Jack Westervelt, general superintendent, and **Wallace S. Nelson**, project manager for **Standard Rock Co.**, are heading operations at a gravel pit near Oakdale, Calif., for supplying concrete aggregates. Construction superintendent is **Wayne Jenziskey**.

Building a 390-ft. steel and concrete bridge for **McLaughlin Construction Co.** in Park County, Mont., are **J. A. Webb**, job superintendent; **Sig Mahlam**, carpenter foreman, and **Clarence Anderson**, labor foreman.

Near Las Cruces, New Mexico, **F. A. Campbell**, project manager, and **O. M. Brown**, superintendent, are heading a million dollar job to construct range instrumentation sites. **Campbell & Kay** holds the contract.

Ben C. Gerwick, Inc., has **Kenneth D. Sylvester**, superintendent, and **Fletcher Steele**, project engineer, heading repair work at **Jeheemy Ramp** at the **Naval Amphibious Base**, Coronado, Calif.

Virgil Morgan is heading the job for **Lewis A. Hopkins Co.**'s contract for installing roads, levees and pumping plants at **Pasco, Wash.**

Howard Shelp is superintending 4 miles of construction on the **West Indian School Road** in **Maricopa County, Ariz.**, for **Larsen Contracting Co.**

Bob Nutt, superintendent, and **Bill Schmidt** and **M. B. Smith**, foremen, are heading the job for **J. B. Stringfellow Co.**'s award for reconstructing portions of embankment slopes between **Point Mugu** and **Little Sycamore Creek** in **Ventura County, Calif.**

Fred Nygren, superintendent, and **Jess Woodward** are heading construction of steel truss bridges over the **Nisqually River** at **Elbe** in **Lewis and Pierce counties, Wash.** **David Nygren** holds this \$154,156 contract.

Weather conditions being what they are, starting time on buildings at **Great Falls Air Force Base, Mont.**, is rather indefinite, but **Lee E. Woods** will superintend for this \$1,665,700 **Lease & Leigland** contract.

A \$207,710 sewage disposal plant is under construction by **A. T. Fox**, contractor, at **Coos Bay, Ore.** **Harry A. Wechter** does the supervising.

The usefulness of the plate slab, in present day construction, seems limitless. By designing this fashionable apartment building with 7½" slab floors, the architects were able to: (1) encase all plumbing and utilities, (2) cantilever balconies 6' 4" beyond the building line, (3) soundproof all rooms, (4) eliminate ceiling beams, (5) dispense with plaster on ceilings, (6) save height in each story, (7) save costly formwork.

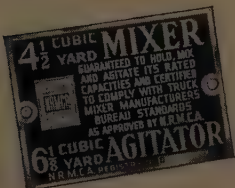
The builders needed only one set of forms to go up the 12 stories, pouring about one-third of a floor area at a time, straight through the winter.

Pouring schedules and strength specifications (3000 psi, increased to 3600 in cold weather) were most satisfactorily met with ready-mixed concrete, processed in truck mixers *certified* to have the correct design, capacity, mixing speed, mixing action and water control to insure a homogeneous material of uniform predetermined strength.

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Pittsburgh, Pa.

Chain Belt Company
Milwaukee, Wis.

Concrete Transport Mixer Co.
St. Louis, Mo.

Construction Machinery Co.
Waterloo, Iowa

The Jaeger Machine Co.
Columbus, Ohio

The T. L. Smith Co.
Milwaukee, Wis.

Worthington Corporation
Plainfield, N. J.

D. C. (Bob) Roberts is superintending a \$1,214,090 contract for building wards at the state tuberculosis hospital at Phoenix, Ariz., for Daum-Donaldson Construction Co. **George Beuchel** is purchasing agent and **Kenneth Coen** is timekeeper.

George Powers is in charge of building additions to the Yuma, Ariz., Water Treatment Plant for the Fisher Contracting Co.

Fisher Contracting Co. is building taxiways and electrical installations at Sky Harbor Airport, Phoenix, Arizona, under the direction of **J. R. Kaiserman**.

L. J. (Larry) Dolan is keeping busy these days as field engineer supervising the construction of concrete runways, taxiways, and aprons at Smokey Hill and Forbes Air Force bases at Salina and Topeka, Kans.

J. A. Terteling and Sons, Inc., is building 13 timber bridges, plus pipe and box culverts over 7.6 mi. of the Chandler Power Canal near Yakima, Wash., under the supervision of **Alfred Perry**. **Robert Wheeler** is job engineer.

Jim Ward, superintendent, and **Mike Rothwell**, engineer, are supervising construction of twin bridges across Cowlitz River near Toledo, Wash., for Peter Kiewit Sons' Co.

Earth and pipeline work on the Potholes East Canal Laterals of the Columbia Basin project in Washington is progressing under **LeRoy Basto**, superintendent, and **Allan F. Osberg**, project manager, for the Osberg Construction Co.

A \$1,903,290 addition to the Harborview County Hospital, King County, Wash., is being supervised by **Clement A. Smith** for the J. C. Boespflug Construction Co. **O. L. Roscoe** is engineer.

In Roosevelt County, N. Mex., 10.9 mi. of construction and blacktopping is going on under the supervision of **W. J. Loomis**. Contractor is **Floyd Haake**.

Grading, paving and building two overpasses on the Santa Ana Freeway are **Paul Fredrickson**, superintendent; **Allan Roth**, carpenter foreman, and **Frank Liston**, grade superintendent. **Webb & White** is contractor.

Anacapa Junior High School in Ventura, Calif., is being built by **Barringer & Botke**, who has **Sam Witty** and **Vern Weaver** superintending.

Carpentry foremen are **Rea Armstrong**, **Clarence Baker** and **Meredith Reid**, and **Lloyd Dunga** is office manager. Also at the site are **L. R. Armstrong**, who is inspector for the Ventura High School District, and **Lucian Barger**, who represents California Testing Laboratories.

On the job for guniting a warehouse at the Tracy (Calif.) Army Supply Depot are: **A. V. Roemisch**, project manager; **J. A. Davis**, general superintendent; **Coy Sanders**, equipment superintendent, and **Joe Wallis** and **Bill Evans**, operators working with Sanders. Sanders, incidentally, returned to the Stockton area in October from Casablanca, French Morocco, where he had been on job location.

Bob Gray, superintendent, heads work on a frame school building in Banta, Calif., for **Nomellini Construction Co.**, contractor.

Bridges and overpasses in the Tracy, Calif., vicinity are being put up by **C. K. Moseman**. **Dick Moseman** superintends the bridge work, and **Roy Gassman** is foreman. The resident engineer on the structures is **Eric Nordlin**.

S. A. Wattson heads the R. A. Wattson Co.'s \$1,411,770 job for Unit 3 of the Eagle Rock-Hollywood Conduit, for the Los Angeles Department of Water and Power. Project Engineer is **L. N. Collins**, and also on the job are: **Al Payton**, excavation superintendent; **M. Nieto**, pipe laying foreman, and **A. Massa**, master mechanic.

Robert Taylor does the supervising for **Arrington Construction Co.**'s contract for a hot cell and hot cell building at the National Reactor Testing Station at Idaho Falls, Idaho. **Tom Beall** is office manager and **Max Wheeler** is foreman.

Putting up the McNary and McNary-Big Eddy transmission lines for the Bonneville Power Administration in Oregon occupies key men for **Bay Construction, Inc.**, and **Don L. Cooney Co.** **Paul L. Ogren** is project manager, and **C. D. (Bud) Prater** looks after the roads; **Leo Johnson**, footings; **Jim Peace**, steel, and **Del Edlefson**, wire.

Wilhelm E. Sonju superintends at the site of construction of reinforced concrete structures at various intersections on Portland's T. H. Banfield Expressway. **William W. Wilson** is foreman on this contract for **Parker-Johnson Co.**

Thomas Scalzo has **R. J. Scalzo** superintending road work in Snoho-

mish County, Wash. **P. Raghianti** is grade foreman; **J. Carpine** is clearing and culverts foreman, and **R. Curtin** is master mechanic.

Project Manager **Bob Diehl** heads a big road construction contract near Tracy, Calif., for **McCammon-Wunderlich Co.** **Tony Hewitson**, assisted by **Jack O'Leary**, is the superintendent; **Mac McAlexander** is equipment superintendent; **Casey Jones** is master mechanic; **Pete Smith** and **George Henderson** are grade foremen, and **Max Staggs** is pipe foreman.

John P. Peters is supervising work on sanitary sewers and a sewage disposal plant at Angels Camp, Calif. Contractor is **Beerman & Jones**.

An \$814,000 contract for sanitary sewer extension, improvements and an outfall sewer for Murray, Utah, is held by **Statewide Plumbing & Heating Co., Inc.** **Ken Balis** supervises the job, and **Bill McDermott**, **Elmer Miller** and **Don Judy** are foremen.

Grading 8 mi. of gravel surfacing in Gallatin County, Mont., on a combined contract of **Bob Gibson** and **Blacktop Construction Co.**, are **Job Superintendents George Grice** and **Joe Puetz**, and **Crusher Foreman Art Kurner**.

Building central and test chambers for the supersonic wind tunnel at Moffett Field, Calif., are: **Jack Robertson**, superintendent; **Frank Davis** and **Jack Bennett**, foremen; **Bud Pond**, engineer, and **Del O'Neal**, timekeeper. The \$1,643,500 contract was awarded to **Carl N. Swenson Co., Inc.**

A. Madonna, general superintendent; **Don Eichner**, project engineer; **Bob Osborne**, superintendent; **Bernice Swader**, office manager and purchasing agent; **Don Borradorri**, master mechanic, and **Bob Pate**, field mechanic, are building 2.3 mi. of highway near San Luis Obispo, Calif., for the **Madonna Construction Co.**

A \$2,500,000 contract to build a pipe and conduit manufacturing plant at Newark, Calif., was awarded **Austin Co.** On the job are: **A. B. Gonzalves**, superintendent; **Bob McDannold**, clerk; **Harold Morten**, carpenter foreman; **Jess Jenkins**, ironworker foreman; **Roy Dunhom**, labor foreman, and **Charlie Black**, field engineer.

Working on improving **Pacoima Wash** in Southern California, an Army Engineers job, are **Robert T. Skinner**, general superintendent for Southern California; **H. L. Morissette**, job superintendent; **Adolph Bauer**, assistant superintendent; **Ben Acqui-**

stipace, master mechanic; Harold Gavin, job engineer; Gil Vannoy, bridge foreman; C. J. Homan and E. O. Kelley, excavation foremen; K. C. Owens, carpenter foreman; T. H. Dennis, equipment foreman; G. H. Bonville, utility foreman; Robert J. (Bob) Smith, office manager, and R. H. McCoy, timekeeper. Contractor on the \$1,805,415 job is A. Teichert & Sons, Inc.

Earl V. Mecham is supervising the grading and asphalt concrete paving of .8 mi. of Los Angeles County road for M. S. Mecham and Sons.

W. A. Brady, superintendent; Ralph A. Brady, carpenter foreman, and Bill Baird, labor foreman, are widening a bridge on U. S. Highway 101 at Del Mar, Calif., for W. F. Maxwell.

Bressi and Bevanda is executing a \$2,238,650 contract to build 4.4 mi. of road and 10 bridges near Carlsbad, Calif. Working on the job are: Dominic J. Bressi, project manager; Joseph Muscolo, superintendent; Jake W. Hill, office manager; M. B. Azrikan, engineer; Sam Hughes, carpenter superintendent; O. F. Siler, master mechanic, and Walt Hurst, grade foreman.

A \$1,700,000 contract to grade and pave 3.85 mi. of San Diego Freeway near Oceanside is being handled by Ronald McGarvie and Charles Milburn, superintendents; Frank Cronin, grade foreman; Morris Kennedy, master mechanic; Ann Earhart, office manager, and M. D. (Steve) Stephens, carpenter foreman, for Payton and Bent, contractors.

The Raymond Concrete Pile Co. subcontracted a job to install foundation piling on the Metropolitan Life Insurance Co. Park LaBrea Shopping Center in Los Angeles. J. T. (Jimmy) Barry was superintendent. Others on the job were: J. L. Helton, assistant superintendent; Floyd Williamson and Vincent Van Zant, pile driver foremen, and Bill Benson, concrete foreman.

Building a \$1,130,000 Law Library for Los Angeles County is occupying the time of K. K. Anderson, general superintendent; Vic Apted, assistant superintendent; Bud Anderson and Ed Del Pozo, carpenter foremen; Vincent Del Pozo, cement finisher foreman, and J. B. Allen, office manager. James I. Barnes Construction Co. is the contractor.

At Mojave, Calif., Lonnie Lawler is superintending the strengthening of taxiways and parking areas at the Naval Air Station for Peter Kiewit Sons' Co. Assisting are: Jack Ran-

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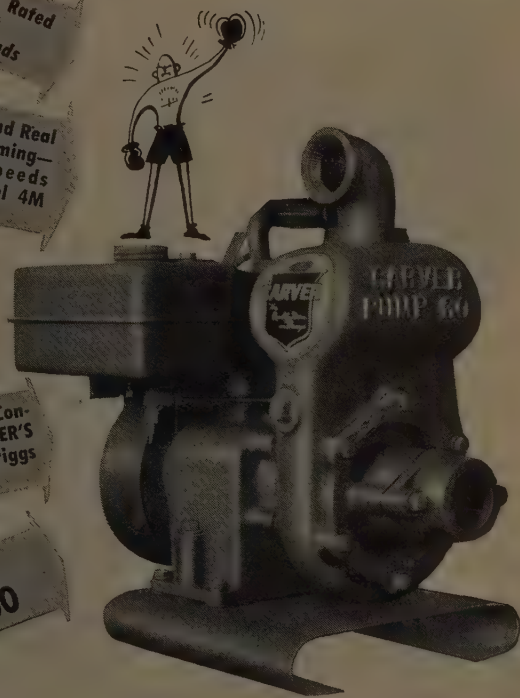
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dall, office manager; Don Fix, project engineer; Bill Miller, PCC superintendent; Tom Kelley, aggregate superintendent; Al Aleridge, crushing superintendent; R. J. Maxwell, general concrete foreman; H. A. Franklin, hot plant foreman; Buck White, grading foreman, and Thad Martin, mechanical foreman.

At the site of work on the Los Angeles River Freeway, Jack Yount is representing Ukropina-Polich-Kral as project manager, and "Mac" McAfee is general superintendent. H. F. Meinke is resident engineer, Ralph Bitter is grade foreman, and Olin Saine is master mechanic.

A \$6,142,550 joint contract by Ford J. Twaits Co. and Morrison-Knudsen Co., Inc., to erect an eight-story police facilities building for the City of Los Angeles is supervised by Jack Ogden, superintendent; Robert H. Kirkman, project engineer, and Everett W. Weatherman, office manager.

In Los Angeles construction of Park La Brea Shopping Center is under way by Jackson Bros. personnel. J. E. Wilson superintends, assisted by Dean Hansen and Harold Cross, steel foremen, and Roy Lautenslager, Guy Scofield, Abe Slater and Dennis Slusser, carpentry foremen.

Fredericksen & Kasler and Lowe & Watson are putting in 19 miles of roads and streets and reinforced concrete storm drains at Edwards Air Force Base. On the job are: C. E. Kasler, project manager; Frank O. Muren and Raleigh Watson, job superintendents; F. H. McBee, office manager; "Slim" Ransdell, equipment superintendent; George Shaffer, chief engineer; Bill Loy, grade superintendent; Carl Whetaire and Jesse Saylor, concrete foremen; George Bell, hot plant superintendent, and Shirley Horner, timekeeper. George Davis is resident engineer.

Another job at Edwards Air Force Base is one held by Engineers Ltd. Pipeline Co. for installing sewers and a gas and water system. Pete Price superintends, assisted by Ted Nielson. Foremen are Warren (Doc) Price, Ernie Cryder and Bob Fishel, and Harvey Montague is office manager.

John Lee, superintendent, heads construction of the Los Angeles Police Department's rehabilitation center at Saugus, Calif., for Ford J. Twaits Co., contractor. Al Katz is job engineer; Jim Griswold, field engineer; C. W. Byard and Jack Reinhart, foremen for carpentry and labor, respectively, and C. D. Head, office manager.

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CONTRACTS

Summary of bids and awards for major Western projects

Alaska

\$1,159,682—**S. Birch & Son and Lytle & Green**, Central Bldg., Seattle—Low bid for laundry and dry cleaning plant, Ladd Air Force Base; by C. of E.

\$2,196,720—**S. Birch & Son and Lytle & Green**, Central Bldg., Seattle—Low bid for 49 mi. of grading, surf. and bitum. surf., Alaska Hwy.; by Alaska Rd. Comm.

\$678,000—**Carson Construction Co.**, 1236 E. 6th Ave., Helena, Mont.—Low bid for utilities extension, Kodiak Naval Base; by U. S. Navy.

\$2,089,000—**Morrison-Knudsen Co., Inc.**, Box 450, Boise—Low bid for grading and draining about 45 mi. of Richardson Highway, Sect. G; by Alaska Rd. Comm.

\$228,875—**Rushlight Automatic Sprinkler Co.**, 55 N.E. Faragut St., Portland—Low bid for utilities, Ladd Air Force Base; by C. of E.

\$387,820—**Selid Construction Co.**, Fairbanks—Low bid for street grading, surf., and sidewalks, curbs and street lighting, Fairbanks; by City.

Arizona

\$313,670—**Arizona Sand & Rock Co.**, Box 596, Phoenix—Low bid for paving and sewer installation, Phoenix; by City.

\$479,935—**Arizona Sand & Rock Co.**, Box 596, Phoenix—Low bid for about 4.7 mi. of grading, draining, and bitum. surf., Globe-Show Low Hwy., 60 mi. northeast of Globe; by St. Hwy. Dept.

\$453,765—**Harry J. Hagen**, Globe—Low bid for about 4.7 mi. of grading, draining and bitum. surf., Globe-Show Low Hwy.; by St. Hwy. Dept.

\$195,721—**W. J. Henson**, Box 471, Prescott—Award for 5¼ mi. of grading and draining over a new alignment, Wickenburg-Kingman hwy.; by St. Hwy. Dept.

\$238,835—**Pioneer Constructors**, Box 2768, Tucson—Low bid for 10 mi. of widening and resurf. existing surf., Tucson-Nogales hwy.; by St. Hwy. Dept.

\$173,989—**Lyle Price**, Box 548, Flagstaff—Low bid for approx. 8 mi. of grading and draining over a new alignment, McNary-Eagar hwy., Apache County; by St. Hwy. Dept.

\$151,114—**Tiffany Construction Co.**, Box 6346, Phoenix—Low bid for 3½ mi. of grading, draining, and bitum. plant mix surf., Mesa-Superior hwy., Maricopa County; by St. Hwy. Dept.

\$564,680—**Wallace and Wallace**, Box 470, Phoenix—Low bid for grading and draining 7.7 mi. about 70 mi. north of Phoenix; by St. Hwy. Dept.

\$351,530—**Wallace and Wallace**, Box 470, Phoenix—Award for 4 mi. of reconstruction along a stretch of new alignment, Tucson-Benson hwy.; by St. Hwy. Dept.

California

\$825,530—**American Pipe & Construction Co.**, Box 3428, Terminal Annex, Los Angeles—Award for furnishing pipe (on two schedules) for Sutherland Dam-San Vicente conduit and dam outlet works; by San Diego City Council.

\$1,055,875—**Guy F. Atkinson Co.**, Box 593, South San Francisco—Award for paving 7.9 mi. of U. S. 99 betw. Tulare Airport and Tagus; by Div. of Hwys.

\$168,202—**Baker & Pollock**, Ventura—Award for 3.9 mi. of surf. and seal coating, US 101 betw. Winchester Creek and Las Varas Creek, Santa Barbara County; by Div. of Hwys.

\$1,441,647—**J. C. Boespflug Construction Co.**, 1912 4th Ave. So., Seattle, Wash.—Award for general work for construction of permanent facilities at Long Beach State College; by State.

\$514,393—**Dan Caputo and Edward Keeble**, San Jose—Low bid for two reinf. conc. bridges and approaches in Salinas; by Div. of Hwys.

\$305,485—**Coast Pipeline Contractors**, 580 Bragato Rd., Belmont—Low bid for Schedule 1, earthwork, pipelines and structures, Contra Costa Canal Distribution System, Central Valley Project; by USBR.

\$151,990—**Charles J. Dorfman**, 124 N. La Brea St., Los Angeles—Low bid for installing sewers in Old San Diego, San Diego; by City.

\$335,605—**Eaton & Smith**, 1215 Michigan St., San Francisco—Award for about 1.6 mi. of grading and plant-mixed surf. near Forest Mountain Summit, Siskiyou County; by Div. of Hwys.

\$309,917—**G. W. Ellis Construction Co.**, 8240 Lankershim Ave., North Hollywood—Low bid for widening, seal coating and resurfacing portions along 38.8 mi. of Halloran Springs to Nevada stateline highway in San Bernardino County; by Div. of Hwys.

\$187,756—**Engineering Constructors, Inc.**, Box 3428, Terminal Annex, Los Angeles—Award for installing pipe between Sutherland Dam and tunnel; by San Diego City Council.

\$237,860—**Harry L. Foster**—Award for installation of pipe for Sutherland Dam-San Vicente conduit and dam outlet works; by San Diego City Council.

\$1,085,489—**Fredrickson & Watson Construction Co.**, 873 81st Ave., Oakland—Low bid for 3.6 mi. of grading and surf. roadways, ramps and frontage rds. and reinf. conc. bridges, U. S. 101 betw. 1 mi. east of Carpinteria and 0.5 mi. east of Arroyo Parida and betw. Ortega Hill and Sheffield Dr., Santa Barbara County; by Div. of Hwys.

\$2,488,885—**Fredrickson & Watson Construction Co. and M. & K. Corp.**, 873 81st Ave., Oakland—Low bid for main units of Sly Park Project, including earthfill dam, adjacent saddle dam, conc. outlet works, conc. spillway and a conduit system; by USBR.

\$196,987—**Gallagher & Burk, Inc.**, 344 High St., Oakland—Award for surf. 3.6 mi. on State 106 betw. Muir Station and State 75, Contra Costa County; by Div. of Hwys.

\$291,482—**Gallagher & Burk, Inc.**, 344 High St., Oakland—Low bid for widening existing roadbeds and constructing new roadbeds and surf. over new cement-treated base and existing pavement on State Sign Rts. 21 and 24, betw. Danville and Concord (portions), Contra Costa County; by Div. of Hwys.

\$153,287—**Granite Construction Co.**, Box 900, Watsonville—Award for grading and surf. 2.4 mi. of U. S. 101 betw. San Lucas and 2.5 mi. north, Monterey County; by Div. of Hwys.

\$1,170,026—**Griffith Co.**, 1060 S. Broadway, Los Angeles—Award for 5.7 mi. of grading, plant-mixed surf. on cement-treated base, and 3 reinf. conc. bridges betw. Calleguas Rd. and 0.4 mi. west of Central Ave., Ventura County; by Div. of Hwys.

\$477,200—**Chas. L. Harney, Inc.**, 575 Berry St., San Francisco—Low bid for track removal on Precita Ave., Army, Folsom and 26th St., San Francisco; by City.

\$2,645,000—**Harvey & Rose**, Box 736, Arcadia—Low bid for Aliso Village housing extension; by City of Los Angeles.

\$179,210—**Lee J. Immel**, 3030 San Pablo Ave., San Pablo—Low bid for various street improvements, El Cerrito; by City.

\$275,000—**E. A. Irish**, 2944 Gleneden St., Los Angeles—Low bid for extension of a 12-kv. electrical distribution system, Edwards Air Force Base; by C. of E.

\$467,258—**R. V. Lloyd & Co.**, Box 391, Coachella—Low bid for earthwork, pipe lines and structures, Part I of Unit 8, Coachella Valley Distribution System, All-American Canal System, Boulder Canyon Project; by USBR.

\$329,000—**Martinelli Construction Co., Inc.**, 1580 Folsom St., San Francisco—Low bid for site improvements at West Sunset Community Center, San Francisco; by Recreation & Park Commission.

\$2,368,480—**Morrison-Knudsen Co., Inc.**, and **R. A. Westbrook**, Box 450, Boise, Idaho—Award for operational apron at Davis-Monthan Air Force Base; by C. of E.



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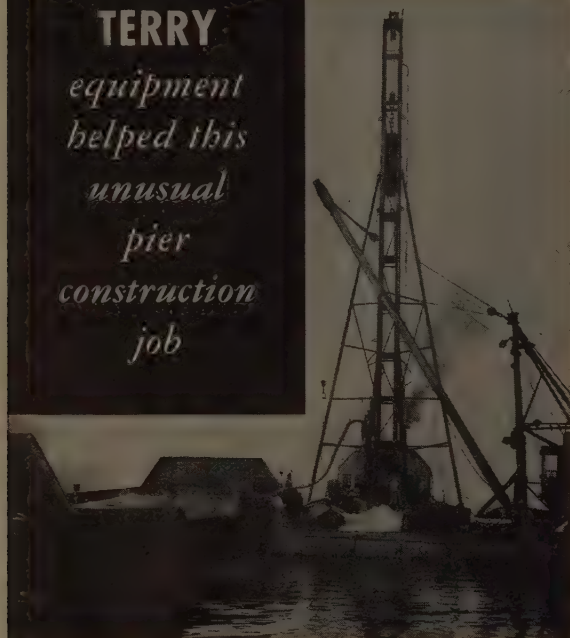
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\$292,285—Parish Bros., P. O. Box 1019, Benicia—Low bid for paving, storm drainage, Travis Air Force Base; by C. of E.

\$385,147—Robert E. L. Parker Co., Claremont—Low bid for grading and plant-mix surf. of 4.8 mi. at March Air Force Base in Riverside County; by Div. of Hwys.

\$2,308,178—J. A. Payton, George Herz & Co., and Clyde W. Woods & Sons, Inc., Riverside—Low bid for grading and paving with PCC about 7.2 mi., Los Angeles County line to Archibald Ave. in San Bernardino County; by Div. of Hwys.

\$112,490—J. R. Reeves & Co., Box 1072, Sacramento—Award for widening 7,200 ft. of Marconi Ave., Sacramento; by City.

\$1,179,600—Shepherd & Green, 309 American Trust Bldg., Stockton—Low bid for transit shed No. 9, Stockton; by Port Commission of Stockton.

\$507,340—Edward R. Siple Co., 2545 San Fernando Rd., Los Angeles—Low bid for unconventional fuel storage facilities, Edwards Air Force Base; by C. of E.

\$128,169—Arthur B. Siri, Inc., 1357 Cleveland Ave., Santa Rosa—Low bid for grading and surf. State 104 betw. 1.1 mi. west of Gossage Creek and same, Sonoma County; by Div. of Hwys.

\$457,950—Standard Dredging Corp., 800 Central Bldg., Los Angeles—Award for dredging 1,290,000 cu. yd. from vicinity of Berth 199, Los Angeles Harbor; by L. A. Harbor Comm.

\$131,970—Sully-Miller Construction Co., 1500 W. 7th St., Long Beach—Low bid for improvements on Orange Ave., Long Beach; by City.

\$1,246,000—Carl N. Swenson Co., Inc., 1095 Stockton Ave., San Jose—Award for concourses, San Francisco Airport; by City.

\$131,998—J. A. Thompson & Son, Box 518, Inglewood—Award for 1.2 mi. of widening and plant-mixed surf. on cement-treated base, Redondo Beach Blvd. betw. Redondo Beach and Manhattan Beach, Los Angeles County; by Div. of Hwys.

\$145,547—Transocean Engineering Corp., 15890 Hesperian Blvd., San Lorenzo—Low bid for a reinf. conc. bridge over North Fork of the Navarro River, 17 mi. northwest of Boonville on Sign Rt. 28, Mendocino County; by Div. of Hwys.

\$2,608,000—Trepte Construction Co. and Guy F. Atkinson Construction Co., Box 593, South San Francisco—Award for Donald N. Sharp Memorial Community Hospital at San Diego; by San Diego Hospital Assn.

\$1,218,245—Ford J. Twaits, Morrison-Knudsen Co., Inc., & Macco Corp., 449 S. Beaudry St., Los Angeles—Award for six 1-story precast-conc. barracks, at Twenty-nine Palms; by U. S. Navy.

\$396,436—Ukropina-Polich-Kral, 201 E. Las Tunas Dr., San Gabriel—Award for 3.4 mi. of grading and surf., U. S. 99 betw. Livingston Underpass and so. of Delhi to provide a 4-lane divided hwy., Merced County; by Div. of Hwys.

\$3,806,000—P. J. Walker Co., 3900 Whiteside Ave., Los Angeles—Award for research hangar and laboratory at Edwards Air Force Base; by Natl. Advisory Committee for Aeronautics.

\$1,000,000—Claude C. Woods, Lodi, and Rothschild, Raffin & Weirick, 274 Brannan St., San Francisco—Award for two earthfill dams and generator foundation for new Murphys Powerhouse, Angels Creek, Calaveras County; by Pacific Gas & Electric Co.

Colorado

\$256,605—James B. Kenney, 3233 Osage St., Denver—Low bid for 2 bridges and approaches, south Denver; by St. Hwy. Dept.

\$1,227,706—C. F. Lytle Co. and Green Construction Co., 321 Locust St., Des Moines, Iowa—Award for strengthening of runways at Lowry Air Force Base, Denver; by C. of E.

\$222,725—Northwestern Engineering Co., Box 567, Denver—Low bid for bridge crossing Market St., Denver; by St. Hwy. Dept.

\$871,615—Western Paving & Contracting Co., 5105 Washington St., Denver—Low bid for strengthening runways at Lowry Air Force Base; by C. of E.

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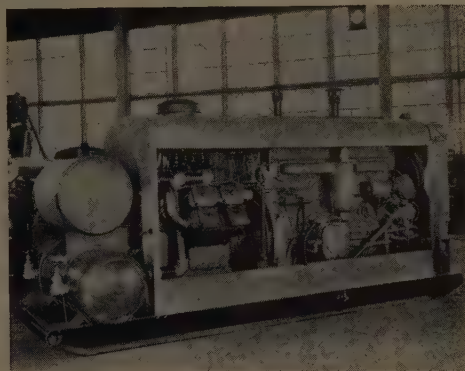
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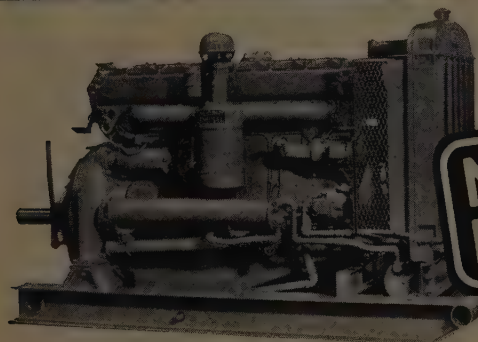
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Los Angeles, California

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Idaho

\$1,098,600—**American Pipe & Construction Co.**, 518 N.E. Columbia Blvd., Portland—Award for steel penstock manifold and outlet manifold for Palisades Dam and power plant; by USBR.

\$400,075—**Hoops Construction Co.**, Box 431, Twin Falls—Award for rd.-mixed bitum. surf. and 2 conc. bridges on 10.127 mi. of the Buhl-Castleford hwy., Twin Falls County; by St. Dept. of Hwys.

\$362,900—**Intermountain Plumbing Co.**, 1322 Grove St., Boise—Low bid for utilities, Mountain Home Air Force Base, Elmore County; by C. of E.

\$4,583,030—**Utah Construction Co.**, 142 East 3rd South St., Salt Lake City, Utah—Low bid for various bldgs., pump-house, utilities, etc., National Reactor Testing Station, Arco; by AEC.

\$107,200—**Western Construction Co.**, Box 628, Pocatello—Award for furnishing crushed gravel and cover coat materials in stockpiles at various locations in Power, Bingham and Bannock counties; by St. Dept. of Hwys.

\$100,563—**Karl Woodall**, Boise—Award for roadway and crushed gravel base on 11.7 mi. near Grandview in Owyhee County; by St. Dept. of Hwys.

Montana

\$116,935—**Kiely Construction Co.**, Drawer 246, Butte—Award for 0.7 mi. of asph. conc. paving in Deer Lodge, Powell County; by St. Hwy. Comm.

\$159,104—**McLaughlin, Inc.**, 331 Ford Bldg., Great Falls—Award for 8.3 mi. of road-mix surf. of Choteau-Dutton road in Teton County; by St. Hwy. Comm.

\$642,000—**Pacific Oerlikon Co.**, 3001 N. Starr St., Tacoma, Wash.—Low bid for furnishing and installing generators at Little Porcupine power plant, Missouri Basin Project; by USBR.

Nevada

\$1,268,295—**Dodge Construction Co. and Silver State Construction Co.**, Fallon—Award for highway construction near Wells in Elko County; by St. Hwy. Dept.

\$9,676,000—**Robert E. McKee**, Box 350, Glendale, Calif.—Low bid for ammunition storage depot at Nellis Air Force Base near Las Vegas; by C. of E.

New Mexico

\$151,545—**Allison and Haney**, Box 1507, Albuquerque—Low bid for 14 mi. of highway betw. Willard and Corona; by St. Hwy. Dept.

\$366,375—**Basanda Construction Co.**, Box 7008, Oklahoma City, Okla.—Low bid for approx. 114 mi. of rural distribution and transmission lines and substation, Artesia; by Central Valley Electric Cooperative.

\$563,990—**Brown Contracting Co.**, Box 1479, Albuquerque—Low bid for 17 mi. of construction on U. S. 54 near Corona; by St. Hwy. Dept.

\$850,210—**Colorado Constructors, Inc.**, 725 W. 39th Ave., Denver, Colo.—Award for 3 earthfill dams and a dike, Vermejo Project nr. Maxwell, Colfax County; by USBR.

\$135,149—**Daniels & Gleason**, Albuquerque—Low bid for 8.9 mi. of highway betw. Pena Blanca and Domingo; by St. Hwy. Dept.

\$308,954—**Dominic Leone**, Trinidad, Colo.—Low bid for 3,000 ft. of levee to surround pueblo near Jemez reservoir; by C. of E.

\$1,257,300—**Robert E. McKee, General Contractor, Inc.**, Box 562, El Paso, Tex.—Low bid for a wing steel frame engineering test bldg., conc. pier and beam footings, White Sands Proving Ground, Las Cruces; by C. of E.

\$141,915—**Ponsford Bros.**, El Paso, Tex.—Low bid for fuel test facilities at White Sands Proving Ground; by C. of E.

\$402,850—**Skousen-Hise Contracting Co.**, 201 Springer Bldg., Albuquerque—Award for a conc. bridge and 1.85 mi. approaches, La Bajada Hill-South, Santa Fe and Sandoval counties; by St. Hwy. Dept.

\$209,935—**Henry Thygesen & Co.**, Box 876, Albuquerque—Low bid for about 1 mi. of blacktop, a bridge and underpass on U. S. 85 near Raton; by St. Hwy. Dept.

\$776,771—**Western Contracting Co.**, 400 Benson Bldg., Sioux City, Iowa—Low bid for extending parking aprons and outside utilities, Kirtland Air Force Base; by C. of E.

Oregon

\$243,975—**J. C. Compton Co.**, Box 86, McMinnville—Award for 7.01 mi. of paving and rock or gravel shoulders, plus furnishing 13,000 cu. yd. of crushed material in stockpiles, Fremont Junction-Rosa Creek Section of Warner Hwy.; also 1.33 mi. of grading and paving in Lakeview, Lake County; by St. Hwy. Comm.

\$188,225—**Donald M. Drake Co.**, 904 Lewis Bldg., Portland—Award for removing 415 ft. of conc. viaduct and constructing 511 ft. of conc. viaduct for the N.E. 102nd Ave. overcrossing of Banfield Expressway, Multnomah County; by St. Hwy. Comm.

\$480,106—**Funderburk Construction Co.**, Sutherlin, Oregon—Award for grading and oil mat surf. 1.6 mi. of Pacific Highway near Roseburg; by St. Hwy. Comm.

\$303,925—**Funderburk Construction Co.**, Sutherlin, Oregon—Award for 5.5 mi., Steamboat Creek Rd., Umpqua Natl. Forest; by BPR.

\$219,570—**Henry Dan Herder**, P. O. Box 307, Lebanon—Low bid for a 1,900,000-gal. capacity sewage treatment plant, Lebanon; by City.

\$313,315—**Murray Construction Co.**, Bend, Ore.—Low bid for clearing right-of-way and constructing access roads for Carson-Ross section of McNary-Ross 345-kv. transmission line; by BPA.

\$385,675—**C. R. O'Neil**, Box 116, Creswell, Ore.—Award for relocation of 2 mi. of highway near Dexter Dam; by C. of E.

\$114,200—**Rogers Construction Co., Inc.**, 11760 N.E. Glisan, Portland—Award for furnishing 12,800 cu. yd. of crushed rock in stockpiles on Mt. Hood and Hood River hws. near Parkdale, Hood River County; by St. Hwy. Comm.

\$216,616—**Warren Northwest, Inc.**, Box 5072, Portland—Award for grading and asph. conc. paving, 7.83 mi., Noble Slough-Foster section of Santiam Hwy., Linn County; by St. Hwy. Comm.

Utah

\$516,146—**W. W. Clyde & Co.**, Springville—Low bid for road-mix and plant-mix surf. about 6.7 mi. betw. Lagoon and Layton in Davis County; by St. Rd. Comm.

\$251,747—**L. T. Johnson Construction Co.**, 709 Wall Ave., Ogden—Award for 11.574 mi. of 2-in. rd.-mixed bitum. surf. and one conc. bridge over a 20-ft. span, Blanding-Devil's Canyon rd., San Juan County; by St. Rd. Comm.

\$759,190—**Morrison-Knudsen Co., Inc.**, Box 450, Boise—Low bid for 5.8 mi. of plant-mix surf. in Wasatch and Summit counties; by St. Rd. Comm.

\$117,916—**Reynolds Construction Co.**, Springville—Low bid for 3.9 mi. of gravel surf. road near Orton in Iron County; by St. Rd. Comm.

\$169,291—**Young & Smith Construction Co.**, 306 Beason Bldg., Salt Lake City—Award for 4.624 mi. of 2-in. rd.-mixed bitum. surf., nr. Benjamin, Utah County; by St. Rd. Comm.

Washington

\$2,844,400—**Bethlehem Pacific Coast Steel Corp.**, South San Francisco—Award for furnishing steel for 132-mi. power line from Chief Joseph Dam to Puget Sound area; by BPA.

\$155,880—**Blaisdell & Son Construction Co.**, 8325 S.E. Cornwell St., Portland—Award for clearing, draining, grading and asph. conc. paving, 0.49 mi. on State No. 1, Ebey Slough to Tulalip Rd., Snohomish County; by St. Hwy. Comm.

\$123,226—**D-H Paving Co.**, 6808 Highway 99, Vancouver—Low bid for streets, parking areas and sidewalks, Camp Hanford; by C. of E.

\$331,670—**D-H Paving Co.**, 6808 Highway 99, Vancouver—Award for 6.4 mi. of asph. conc. surf. and illumination, State No. 2 in Wenatchee, Chelan County; by St. Hwy. Comm.

\$418,615—**Florito Bros.**, 1100 Leary Way, Seattle—Award for 5.09 mi. of clearing, grading and draining on State No. 1, Lewis County; by St. Hwy. Comm.

\$2,740,400—**Hall-Atwater Co.**, 605 13th Ave., Seattle—Low bid (on two schedules) for magazines and storage buildings at Bangor; by U. S. Navy.

\$174,600—Lambert Construction Co.—Award for water treatment plant, Bellevue; by Water District No. 68.

\$1,051,475—Manson Construction and Engineering Co., 821 Alaskan Way, Seattle—Award for Fox Island toll bridge across Puget Sound; by St. Hwy. Comm.

\$210,567—Pelton Water Wheel Co., 2929 19th St., San Francisco—Low bid for two 3,500-hp. station-service hydraulic turbines and governors, Chief Joseph Dam; by C. of E.

\$642,375—Pieler Construction Co., 705 Shafer Bldg., Seattle—Award for paving and storm sewer construction, Port Angeles, Clallam County; by City.

\$121,493—P. L. Saddler, Box 898, Wenatchee—Award for feeder roads in Adams County; by St. Hwy. Comm.

\$208,610—Smith & White, Seattle—Low bid for McNary-Big Eddy power transmission line; by BPA.

\$171,137—J. P. Surace Construction Co., 3238 Seaview Ave., Seattle—Award for clearing, grubbing, excavation, draining, and a timber bridge, 0.8 mi. of Secondary St. Hwy. No. 9-C, Pacific Beach vicinity, Grays Harbor County; by St. Hwy. Comm.

\$2,904,235—J. A. Terteling & Sons, Box 1428, Boise, Idaho—Low bid for 30 mi. of East Low Canal and 5 mi. of the Scootney Canal and wasteway near Warden, Grant County; by USBR.

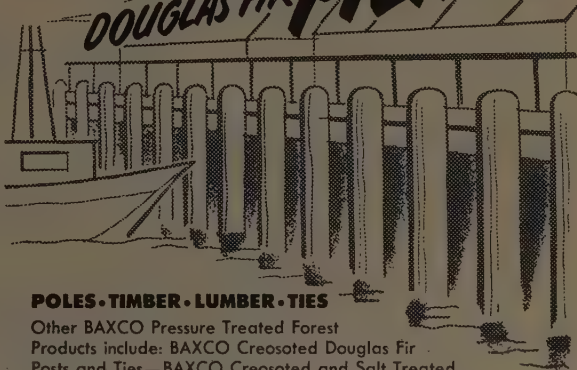
Wyoming

\$332,301—England & Roth Construction Co., Rapid City, So. Dak.—Award for 7 mi. of grading, draining, base course surf, base course stabilization and misc. work, Buffalo-Kaycee rd., Johnson County; by St. Hwy. Dept.

\$176,640—Peter Kiewit Sons' Co., Box 875, Sheridan—Award for grading, draining and misc. work on 5 mi. of the Hulett-Aladdin rd., Crook County; by St. Hwy. Dept.

\$189,375—Taggart Construction Co., Box 560, Cody—Award for metal cribbing and misc. work on 0.678 mi., Shoshoni-Riverton rd., Fremont County; by St. Hwy. Dept.

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FEENAUGHTY MACHINERY COMPANY.....	Portland 3, Oregon
HALL-PERRY MACHINERY COMPANY.....	Seattle 4, Wash., Spokane 2, Wash., Boise, Idaho
LUND MACHINERY COMPANY.....	Butte, Montana
	Salt Lake City, Utah

CANAL SEEPAGE

... Continued from page 75

the unlined section were relatively low, and it is quite evident that the concrete-block lining did not significantly reduce the losses. However, the compacted-earth lining was very effective in reducing the losses. This would indicate that compacted-earth linings can do an effective job in preventing seepage over a period of years.

A reported cost of \$0.37 per sq. yd. for placing the compacted-earth lining, including the 6-in. gravel cover, would indicate that engineers should consider more earth linings in construction of new canals and the rehabilitation of existing canals.

Prefabricated asphaltic membrane linings afford a lining which is low in cost and effective in preventing seepage loss. This type of lining can be constructed with relatively inexperienced labor and a minimum of supervision and inspection, and without specialized equipment. A reasonably smooth subgrade free of clods, rocks, and other projections, must be provided for the membrane. Sandy soils, where losses are high, make an excellent base for the prefab lining. Covering with earth appears to be the cheapest and most effective protection for the membrane lining. At least 1 ft. of earth cover should be provided to protect the membrane from weathering, displacement, and injury. In ordinary soil, the lateral side slopes should be 1 3/4 to 1. In irrigation laterals where the velocity might cause erosion of earth side slopes, a macadam protective cover or a gravel blanket over the earth cover may be necessary. This type of lining is recommended for small installations where a sprayed-on asphalt membrane becomes impractical. For repairing washouts in canal banks, prefabricated linings should certainly have a very practical application.

Much improvement in the quality of prefabricated asphalt linings has been noticed as the various companies strive to produce an inexpensive, yet effective, prefabricated membrane. All companies cooperating in the 1952 tests indicate that the material can be marketed at a cost of less than \$0.35 per sq. yd. delivered. Total cost of installing such a lining, including materials, should be less than \$1.00 per sq. yd.

Extended studies of the permanency of these linings are needed, and additional data should be collected on the maintenance problem of these earth-covered, prefabricated asphaltic linings. Plans are being prepared for continuing this work, and an invitation is extended to other groups, companies, and colleges to join in a search for better methods of lining canals and more accurate means of measuring seepage loss.

UNIT BID PRICES

Selected abstracts for Western projects

Bridge and Grade Separation

5-span steel girder bridge in Arizona

Arizona—Mohave County—State. H. J. Hagen, Globe, submitted a low bid of \$226,257 before the Arizona Highway Department for construction of a 5-span steel girder bridge crossing Burro Creek on the Wickenburg-Kingman highway. Unit bids submitted were as follows:

(1) H. J. Hagen	\$226,257	(3) Arizona Sand & Rock Co.	\$265,927		
(2) Vinson Construction Co.	257,808	(4) W. J. Henson, Contractor	274,670		
		(1)	(2)	(3)	(4)
3,240 cu. yd. structural excavation		10.00	22.00	23.00	26.00
81,404 lb. structural steel (new) (CIP)		.324	.33	.31	.24
316,400 lb. structural steel (used—furnished by state) (CIP)		.117	.10	.114	.10
971 lin. ft. structural steel handrail (CIP)		7.00	7.00	7.00	11.00
967 cu. yd. Class A concrete (including cement)		66.00	58.00	60.50	65.00
490 cu. yd. Class B concrete (including cement)		40.00	50.00	47.00	50.00
277 cu. yd. Class D concrete (including cement)		66.00	58.00	62.00	60.00
175,700 lb. reinforcing steel (bars) (CIP)		.125	.14	.14	.14

Reinforced concrete structures on Portland's T. H. Banfield Expressway

Oregon—Multnomah County—State. Parker-Johnson Co., Portland, submitted a low bid of \$364,607 before the Oregon Highway Commission for 0.67 miles of grading and paving and construction of 7 reinf. conc. structures at various intersections of the T. H. Banfield Expressway in Portland. Unit bids submitted were as follows:

(1) Parker-Johnson Co.	\$364,607	(5) Lindstrom Bros.	\$437,032
(2) Birkemeier & Saremal	411,776	(6) Carl M. Halvorson	437,972
(3) C. J. Montag & Son	417,539	— General Construction Co.	514,128
(4) Donald M. Drake Co.	423,102	— Guy F. Atkinson Co.	519,022

	(1)	(2)	(3)	(4)	(5)	(6)
260 cu. yd. structural excav., unclass.	3.00	3.00	5.00	3.50	3.00	2.50
125,000 cu. yd. general excav., uncl.	.47	.42	.70	.65	.65	.70
723,000 yd. sta. short overhaul	.015	.015	.015	.015	.03	.01
50,000 cu. yd. sta. long overhaul	.40	.40	.50	.43	.55	.40
0.67 mi. finish roadbed and slopes	\$1,000	\$1,000	\$1,000	800.00	\$1,000	\$1,000
24 lin. ft. 18-in. extra str. corr. metal pipe	4.00	4.00	5.00	4.25	5.50	4.50
400 lin. ft. 12-in. sewer pipe	2.50	2.50	2.00	2.75	2.50	2.00
370 lin. ft. 18-in. sewer pipe	4.00	4.00	3.50	4.25	4.00	3.00
1 only concrete manhole	300.00	300.00	220.00	275.00	350.00	250.00
3 only special conc. catch basins	80.00	80.00	100.00	60.00	100.00	150.00
4 only concrete catch basins	80.00	80.00	75.00	60.00	85.00	100.00
240 cu. yd. concrete curbs	45.00	50.00	45.00	40.00	46.00	40.00
2,700 cu. yd. selected roadbed topping	.85	.85	.85	.90	1.50	.85
3,100 yd. mt. hauling roadbed topping	.15	.15	.15	.20	.20	.15
870 cu. yd. 34-in. - 0 matl. in leveling course and shoulders	3.00	3.00	3.00	3.00	4.00	3.00
74 M. gal. sprinkling	2.50	2.50	2.50	2.75	3.00	2.50
110 cu. yd. 34-in. - 0 matl. in binder course	5.00	5.00	5.00	5.50	4.50	5.00
16 ton RC-3 asph. in binder course	40.00	40.00	40.00	45.00	50.00	40.00
2,300 ton Class "B" asph. conc.	6.00	6.00	6.00	6.15	7.50	6.00
10 ton RS-1 emuls. asph. in seal coat	38.00	38.00	38.00	40.00	65.00	38.00
60 cu. yd. aggregate in seal coat	4.50	4.50	4.50	5.00	6.00	4.50

148th Ave. R. R. Undercrossing, Br. No. 7087:

550 cu. yd. excav. for struct.	6.00	6.00	4.00	5.00	3.50	3.00
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
490 cu. yd. Class "A" concrete	36.00	50.00	44.00	40.00	47.00	40.00
64,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
70 sq. yd. membrane waterproofing with protection course	4.50	6.00	5.00	5.50	7.50	6.00
30 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	5.00	4.00

Rockwood Rd. R. R. Undercrossing, Br. No. 7090:

520 cu. yd. excav. for struct.	6.00	6.00	4.00	5.00	3.50	3.00
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
490 cu. yd. Class "A" concrete	36.00	50.00	44.00	40.00	47.00	40.00
64,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
70 sq. yd. membrane waterproofing with protection course	4.50	6.00	5.00	5.50	7.50	6.00
30 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	5.00	4.00

Birdsdales Ave. R. R. Undercrossing, Br. No. 7093:

520 cu. yd. excav. for struct.	6.00	6.00	4.00	8.00	3.50	3.00
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
490 cu. yd. Class "A" concrete	36.00	50.00	44.00	40.00	47.00	40.00
64,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
70 sq. yd. membrane waterproofing with protection course	4.50	6.00	5.00	5.50	7.50	6.00
30 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	5.00	4.00

148th Ave. Overcrossing, Br. No. 7044:

610 cu. yd. excav. for struct.	6.00	6.00	4.00	5.00	3.50	3.00
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
545 cu. yd. Class "A" concrete	38.50	50.00	44.00	52.00	47.00	61.00
108,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
105 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	4.00	4.00

(Continued on page 144)

"WHEN REBUILDING THE ROOSEVELT TRAIL WE GOT



more gravel for less money with our
AUSTIN-WESTERN
'201' Portable Crushing and Screening Plant"

... says contractor Frank Rossi of Gardiner, Maine

"Thanks to our Austin-Western '201' crusher we made our own surfacing material for this new highway . . . cutting time and costs by crushing and screening gravel right on the job." The Austin-Western '201' portable crushing and screening plant excels in high production and low operating cost, because of these advantages:

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ing capacity. Shaft and V-belt drives for all principal units. Anti-friction bearings. Large, oversize conveyors. Simplified design and fewer moving parts for low cost maintenance.

There are Austin-Western crushing plants for any requirement you might have . . . small portable units with single crusher and screen, multiple portable units, or stationary crushing and washing plants. We have just the plant to fit your requirements.

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Austin-Western

CRUSHING, SCREENING
and WASHING EQUIPMENT



BALDWIN-LIMA-HAMILTON CORPORATION
Construction Equipment Division
LIMA, OHIO, U.S.A.

Construction Equipment Division

McNARY AGGREGATES

... Continued from page 68

overflow from the sizers and consequently lost in the waste water. In order to recapture a portion of this pan material for use in the blend, all waste water now is discharged into a sump, where a portion of the solids settle. This slurry is picked up by a pair of sand pumps and passed through two 25-in. concentrators, after which it rejoins other sand sizes for blending. The pan material salvaged in this operation amounts to about 5% of that required to make up the specified 8% of #100 in the final blend.

Actual blending is accomplished by feeding predetermined quantities of the sized material from the bins on to a conveyor for transport to storage. The #4 + #8 material is fed by gravity to this conveyor; the other sizes are fed by vibrating feeders. Additional pan material is added in a dry state through a vibrating feeder that taps a separate bin. This material is locally excavated river-deposited silt.

A single reclaiming conveyor taps all stockpiles—both coarse and fine aggregate—for transporting the material to the batch plant. A vented duct is also located along the centerline of the stockpiles and directly above the reclaiming tunnel. During the winter four 500,000 B.T.U. heat blowers (two at each extreme end of the stockpile area) supply heat to the aggregates through this duct. Temperature readings taken before and after heating indicated a heat rise of about 6 deg. F. when the ambient temperature was between 20 and 32 deg. F.

A final rescreening is provided at the batch plant, where everything is passed over a 2-deck 5x12-ft. screen having 3-in. openings on top and 1½-in. opening at the bottom. This operation removes undersize (degraded) material from the two top sizes of coarse aggregate, and it provides additional blending for the sand as it passes through.

McNary Dam is being built under the jurisdiction of Col. W. H. Mills, Walla Walla District Engineer. Resident engineer for the Corps is Sam G. Neff. J. R. Thatcher is chief of the engineering branch, and A. G. Davis is chief of the supervision and inspection branch. C. L. Morgan is in charge of concrete construction operations, and F. M. Lee was in charge of excavation and earth construction. The author was formerly in charge of the materials control section.

Heading the work for McNary Dam Contractors is J. J. Morton, project manager. H. W. Parker is chief engineer. Vern A. Glascock is superintendent of concrete and aggregate production, and Andrew Duray is superintendent of the aggregate plant.

UNIT BID PRICES CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
162nd Ave. Overcrossing, Br. No. 7088:						
820 cu. yd. excav. for struct.	6.00	6.00	4.00	5.00	3.50	2.50
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
650 cu. yd. Class "A" conc.	38.50	50.00	44.00	52.00	47.00	61.00
120,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
115 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	4.00	4.00
Rockwood Rd. Overcrossing, Br. No. 7089:						
800 cu. yd. excav. for struct.	6.00	6.00	4.00	5.00	3.50	2.50
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
670 cu. yd. Class "A" concrete	38.50	50.00	44.00	52.00	47.00	61.00
140,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
120 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	4.00	4.00
Birdsdales Ave. Overcrossing, Br. No. 7092:						
550 cu. yd. excav. for struct.	6.00	6.00	4.00	8.00	3.50	3.00
20 cu. yd. excav. bel. elev. shown	10.00	10.00	4.00	15.00	5.00	10.00
524 cu. yd. Class "A" concrete	38.50	50.00	44.00	52.00	47.00	61.00
104,000 lb. metal reinforcement	.095	.10	.10	.09	.0925	.10
100 sq. yd. membrane waterproofing	3.00	4.00	3.60	3.50	4.00	4.00

Two reinforced concrete bridges and approaches in California

California—El Dorado County—State. Fredrickson & Watson Construction Co., Oakland, was low with a bid of \$294,999 submitted before the California Division of Highways for construction of two reinforced concrete bridges and approaches and city streets to be graded in Placerville. Unit bids submitted were as follows:

(1) Fredrickson & Watson Construction Co.	\$294,999	(6) Bishop, Younger, Bradley Co.	\$350,934
(2) Tumblin Co.	303,804	— Young & Smith Construction Co.	351,988
(3) James P. Morton	304,730	— Eaton & Smith	353,709
(4) Thomas Construction Co.	336,632	— Lord & Bishop	355,782
(5) Dan Caputo	337,630	— Charles MacClosky Co.	356,413
		— Granite Construction Co.	361,453

	(1)	(2)	(3)	(4)	(5)	(6)
110 cu. yd. removing concrete	4.60	6.00	6.05	7.00	10.00	10.00
Lump sum, clearing and grubbing	\$1,600	\$14,775	500.00	\$15,950	500.00	\$5,000
12,700 cu. yd. roadway excav.	1.15	1.00	1.90	2.25	3.00	2.70
1,300 cu. yd. struct. excav.	3.50	2.00	3.85	5.00	4.00	3.50
2,760 cu. yd. struct. excav. (bridges)	2.30	3.25	3.00	3.25	4.00	4.25
2,740 cu. yd. struct. backfill (bridges)	3.50	2.50	3.00	2.25	3.50	4.50
1,900 cu. yd. ditch and channel excav.	1.35	1.50	3.00	2.00	3.00	3.00
Lump sum, dev. wat. sup. & furn. wat. equip.	\$1,950	500.00	450.00	500.00	500.00	\$1,500
290 M. gal. applying water	2.50	3.00	2.00	2.00	3.00	3.00
155 ton U.R.B.	5.15	6.00	5.50	6.60	6.00	6.00
2 ton liquid asph., SC-2 (pen. tr.)	70.00	50.00	46.00	100.00	50.00	50.00
6 ton sand (pen. tr.)	11.50	10.00	10.00	10.00	10.00	10.00
3,800 cu. yd. Cl. "A" P.C.C. (structs.)	48.50	47.00	48.00	50.00	50.00	52.00
255 lin. ft. conc. railing	8.70	6.00	14.10	9.00	8.00	9.50
360 lin. ft. rubber waterstops	2.85	2.00	3.90	2.50	3.00	3.20
93 sq. yd. membrane waterproofing	2.85	3.00	2.28	3.00	10.00	4.50
60 cu. yd. sacked conc. riprap	37.30	35.00	31.79	35.00	40.00	45.00
35 cu. yd. conc. facing	85.00	54.00	88.00	110.00	60.00	75.00
65 lin. ft. 18-in. C.M.P. (16 ga.)	3.70	4.00	3.63	5.00	4.00	4.00
80 lin. ft. 24-in. C.M.P. (14 ga.)	5.40	6.00	4.84	6.20	5.00	5.00
90 lin. ft. 36-in. C.M.P. (12 ga.)	10.00	13.00	8.69	12.00	9.00	10.00
520 lin. ft. 4-in. vitr. clay sewer pipe (std. str.)	1.85	2.75	3.80	2.50	1.75	1.50
720 lin. ft. 4-in. cast iron soil pipe	2.00	4.00	3.05	2.80	2.00	2.40
240 lin. ft. 2-in. galv. steel pipe (std. wt.)	.90	2.00	2.71	1.50	1.00	1.20
568,000 lb. bar reinf. steel	.09	.10	.084	.095	.10	.10
280 sq. yd. mesh reinf.	1.00	1.00	.85	.60	.50	.75
1 ea. cast steel frame and cover for drop inlet	100.00	100.00	90.00	100.00	150.00	250.00
80 lin. ft. railroad rails	3.50	8.00	5.36	7.00	3.00	3.00
Lump sum, lighting equip.	\$2,700	\$2,300	\$2,900	\$3,750	\$4,000	\$4,000

Airport

Apron paving and warm-up pad at air base in Washington

Washington—Grant County—Corps of Engineers. Low bidder for constructing apron paving and warm-up pad at Larson Air Force Base, Moses Lake, was Cheri Bros. Construction Co., Sandkay Contractors, Inc., and J. A. Jones Construction Co., who offered a joint bid of \$2,471,686. Unit bids submitted were as follows:

(1) Cheri Bros. Construction Co., Sandkay Contractors, Inc., and J. A. Jones Construction Co.	\$2,471,686	— Fredrickson & Watson Construction Co. and M & K Corp.	\$2,787,534
(2) Morrison-Knudsen Co., Inc.	2,646,303	— Sather-Power-Hewett Cos.	2,840,654
(3) S. Birch & Sons Construction Co., McLaughlin, Inc., and C. F. Lytle Co.	2,730,827	— Guy F. Atkinson Co.	2,884,828
(4) Peter Kiewit Sons' Co.	2,733,445	— J. A. Terteling & Sons, Inc.	2,961,287
— Ukropina-Polich-Kral	2,743,466	— Goetz & Brennan	3,051,089
		— Donald M. Drake Co.	3,149,362
		— Northwestern Engineering Co.	3,217,246
		— Roy L. Bair & Co.	3,407,190
		(5) Government estimate	2,926,569

	(1)	(2)	(3)	(4)	(5)
14,000 cu. yd. structural excav.	2.60	2.60	.80	3.20	3.40
23 ea. drain inlet	450.00	540.00	630.00	330.00	240.00
3 ea. heavy duty manhole	870.00	\$2,150	\$1,450	675.00	820.00
3 ea. standard manhole	805.00	\$1,400	\$1,000	665.00	650.00
760 lin. ft. 12-in. R.C.P. drain	2.70	4.30	4.35	2.75	2.85
1,200 lin. ft. 15-in. R.C.P. drain	3.25	5.00	5.00	3.25	3.85
1,600 lin. ft. 18-in. R.C.P. drain	3.80	5.90	5.60	3.70	4.50
2,200 lin. ft. 21-in. R.C.P. drain	4.90	7.30	6.70	4.90	6.50
750 lin. ft. 24-in. R.C.P. drain	5.80	8.60	8.50	5.70	7.00

(Continued on page 146)

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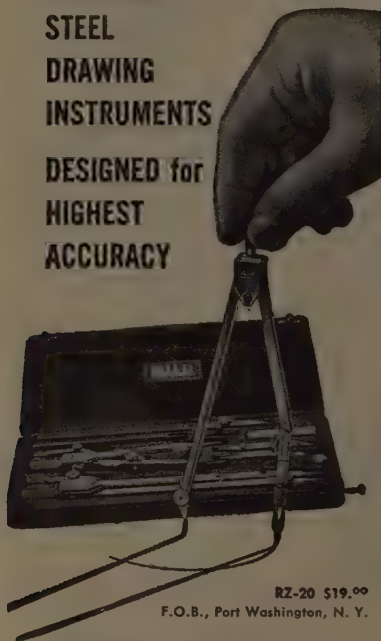
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UNIT BID PRICES CONTINUED

	(1)	(2)	(3)	(4)	(5)
1,130 lin. ft. 30-in. R.C.P. drain	7.35	11.00	10.00	7.20	9.70
820 lin. ft. 36-in. R.C.P. drain	9.70	14.00	12.50	10.70	13.00
1,000 lin. ft. 42-in. R.C.P. drain	11.75	17.00	16.00	12.00	16.00
510 lin. ft. tunnel	46.40	48.00	65.00	36.00	31.50
5 ea. remove existing manhole	145.00	330.00	130.00	55.00	83.00
Lump sum, remove existing storm drain	\$8,625	\$2,800	\$2,250	570.00	\$2,350
Lump sum, lower bottom of electrical manhole	\$1,100	740.00	400.00	640.00	560.00
1 ea. standard electrical manhole	\$1,100	960.00	700.00	830.00	510.00
2 ea. high-strength electrical manhole	885.00	\$1,140	900.00	\$1,000	675.00
1 ea. double cavity electrical manhole	\$1,940	\$1,700	\$1,100	\$1,500	800.00
620 lin. ft. 4-in. double duct encased in concrete	9.35	4.90	7.50	4.20	5.40
1,530 lin. ft. 4-in. quadruple duct encased in concrete	11.70	7.40	10.00	6.40	8.00
950 lin. ft. 4-in. sextuple duct encased in concrete	12.10	9.60	12.00	8.30	10.65
1,460 lin. ft. 4-in. octuple duct encased in concrete	19.50	12.50	15.00	10.75	14.50
1,700 lin. ft. trenching for direct burial cable	.55	.30	.30	.20	.65
15,000 lin. ft. cable, 1/2-in. No. 8 Awg., 5,600 volts	.31	.40	.25	.35	.35
5,000 lin. ft. relocate existing cables through new ducts	.12	.20	.17	.20	.07
365 lin. ft. 1 1/2-in. conduit and 2-in. drain encased in conc.	6.00	2.70	7.50	2.20	3.25
420 lin. ft. No. 6 Awg. bare copper wire	.08	.20	.35	.20	.06
970 lin. ft. 10-in. C.M.P. sleeve	5.40	6.10	6.00	5.50	6.05
88 lin. ft. 12-in. C.M.P. sleeve	5.00	6.60	6.50	6.50	6.60
690 lin. ft. 15-in. C.M.P. sleeve	6.80	27.50	10.00	7.20	8.50
270 lin. ft. 18-in. C.M.P. sleeve	5.80	8.70	8.00	7.50	8.90
420 lin. ft. 10-in. coated and wrapped steel pipe	8.20	8.40	9.00	8.60	7.15
11 ea. hydrant, 6-in. valve, valve box, complete	600.00	800.00	630.00	655.00	530.00
Lump sum, relocate existing hydrant	285.00	460.00	200.00	610.00	185.00
630 lin. ft. 6-in. water pipe	5.65	5.00	4.50	5.80	6.00
1 ea. connection to 10-in. water main	6.10	6.10	5.75	6.70	7.70
1 ea. connection to 8-in. water main	49.00	220.00	300.00	55.00	85.00
4 ea. 8-in. gate valve and valve box	150.00	200.00	200.00	155.00	140.00
16 ea. tee fitting	85.00	100.00	90.00	65.00	47.00
4 ea. elbow fitting	50.00	60.00	75.00	50.00	75.00
260 cu. yd. excav., unclassified	.42	.68	.55	.67	.91
144,000 cu. yd. embankment	.22	.15	.30	.26	.68
100 hr. additional rolling	16.00	25.00	12.00	17.50	14.00
380,000 sq. yd. preparation of subgrade	.28	.12	.20	.26	.10
349,600 sq. yd. concrete pavement	2.79	2.76	3.10	3.20	3.28
210,000 bbl. portland cement	4.25	5.00	4.94	4.65	5.00
2,500 ea. tie down anchor	3.75	3.50	3.25	6.90	6.35
3,800 cu. yd. base course	2.30	2.90	2.50	2.65	2.65
40 ton asphalt prime coat	57.00	60.00	55.00	53.00	52.50
200 ton asphaltic cement, 100-120 penetration	46.00	50.00	45.00	42.00	42.00
3,900 ton asphaltic concrete pavement	9.20	9.70	9.00	8.50	8.40

Dam

Three small earthfill dams and a dike

New Mexico—Vermejo Project—USBR. Colorado Constructors, Inc., Denver, Colo., submitted the low bid of \$850,212 before the Bureau of Reclamation for construction of three earthfill dams and one dike for the enlargement of three existing reservoirs on the Vermejo Project. Work will be located in Colfax County, about 5 miles northwest of Maxwell. Unit bids submitted were as follows:

(1) Colorado Constructors, Inc.	\$	850,212	— J. H.-N. M. Monaghan & Associ-		
(2) D. D. Skousen & Son		865,745	ated Cos.	\$1,189,913	
(3) Clark-Farrell Construction Co.		933,368	— Lowdermilk Bros.	1,344,036	
(4) Cook Construction Co.		983,155	— Allison & Haney	1,386,921	
(5) Domenic Leone Construction Co.,			— Morrison-Knudsen Co., Inc.	1,420,976	
Inc.		985,074	— Hinman Bros. Construction Co.	1,473,950	
— Armstrong & Armstrong		1,005,649	— Dragline Rentals Co.	1,484,858	
— Condon-Cunningham Co.		1,062,694	(6) Engineer's estimate	1,160,385	
33,500 cu. yd. excav. for foundation of dam and	(1)	(2)	(3)	(4)	(5)
dike embankments, first 93,500 cu. yd.	.35	.27	.25	.50	.55
33,500 cu. yd. excav. for foundation of dam and					
dike embankments, over 93,500 cu. yd.	.20	.20	.25	.25	.45
9,200 cu. yd. excavation for struts	1.50	1.50	1.00	1.00	1.50
6,200 cu. yd. excav., stripping borrow pits for Dam					
No. 2	.18	.20	.25	.30	.40
40,000 cu. yd. excav. stripping borrow pits for					
stubblefield dam and dike	.18	.20	.25	.30	.35
8,200 cu. yd. excav. stripping borrow pits for Dam					
No. 13	.18	.20	.25	.30	.40
62,000 cu. yd. excav. in borrow pit for Dam No. 2					
and transportation to embank., first					
62,000 cu. yd.	.20	.22	.28	.43	.42
62,000 cu. yd. excav. in borrow pit for Dam No. 2					
and transportation to embank., over					
62,000 cu. yd.	.18	.20	.20	.23	.35
397,500 cu. yd. excav. in borrow pits for Stubblefield					
Dam and Dike and transportation to					
embank., first 397,500 cu. yd.	.21	.24	.28	.43	.37
397,500 cu. yd. excav. in borrow pits for Stubblefield					
Dam and Dike and transportation to					
embank., over 397,500 cu. yd.	.19	.20	.20	.23	.28
82,500 cu. yd. excav. in borrow pits for Dam No.					
13 and transportation to embankment,					
first 82,500 cu. yd.	.23	.22	.26	.43	.42
82,500 cu. yd. excav. in borrow pits for Dam No.					
13 and transportation to embankment,					
over 82,500 cu. yd.	.21	.20	.20	.25	.35
850 cu. yd. backfill	1.00	2.00	2.00	2.00	.50
929,000 cu. yd. earth fill in embankment, Zone 1	.14	.12	.12	.07	.16
2,800 cu. yd. special compaction of earth fill	4.00	4.00	2.00	1.50	5.00
223,000 cu. yd. misc. dumped fill in embank., Zone 2	.08	.07	.04	.03	.10
2,400 cu. yd. sand and grav. fill in embank., Zone 3	1.35	2.00	2.50	2.00	1.50

(Continued on page 148)

10'' Jaeger lifts creek over 30' bank



Replacing 3 ordinary 6'' pumps previously operated 24 hours a day, one 10'' Jaeger "Sure Prime" handled the entire impounded flow of this creek in only 14 hours a day.

The job was performed in a 30' cut in a stream bed being stripped of coal by Ben Construction Co. of Pittsburgh, Pa.

This diesel-powered Jaeger operated for 8 months completely trouble-free, in all kinds of weather, which involved handling storm water as well as normal creek flow.



Note volume of discharge at a point 100' from intake and 30' higher.

Jaeger Pumps pull stronger and pump longer because they are built oversize with larger shells and impellers, have two priming actions, and are generously powered with engines of the highest horse-

power applicable. Prime without vapor lock, sustain efficiency on non-stop pumping, and give thousands of hours more service from pumps and engines.

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NELSON EQUIPMENT CO.....	Portland 14
WESTERN MACHINERY CO....	Salt Lake City, Denver 2, Spokane 11
SHRIVER MACHINERY CO.....	Phoenix
J. D. COGGINS & CO.....	Albuquerque

SMITH BOOTH USHER CO.....	Los Angeles 54
A. H. COX & CO.....	Seattle 4 and Wenatchee
THE SAWTOOTH CO.....	Boise and Twin Falls, Idaho
TRACTOR & EQUIPMENT CO.....	Sidney, Miles City, Glasgow
CENTRAL MACHINERY CO.....	Great Falls and Havre
WORTHAM MACHINERY CO.....	Cheyenne, Wyo.

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UNIT BID PRICES CONTINUED

	(1)	(2)	(3)	(4)	(5)	(6)
12,000 cu. yd. topsoil for seeding	.35	.50	.30	.50	.50	.60
70 thousand sq. yd. seeding	50.00	40.00	40.00	30.00	40.00	50.00
1,570 thousand gal. water for seeded area	2.00	2.00	2.00	3.00	2.00	4.00
29,000 cu. yd. gravel blankets under riprap	1.40	1.50	2.50	2.20	2.50	3.50
59,000 cu. yd. riprap	4.75	4.65	5.60	5.00	5.20	5.00
490 lin. ft. furn. 6-in. diam. sewer pipe and constr. embank. to dr. with uncem jts.	3.00	4.00	2.00	3.00	6.00	2.50
740 bbl. furn. and handling cement	6.00	6.00	5.00	6.00	7.00	6.00
58,000 lb. furn. and placing reinf. bars	.14	.15	.135	.15	.125	.18
500 cu. yd. concrete in struts.	75.00	90.00	70.00	67.50	61.00	70.00
310 lin. ft. placing rubber water stops	1.50	1.00	1.00	1.00	2.45	1.50
9,300 lb. furn. and installing gates and gate hoists	.60	1.00	.56	.50	.56	.70
1,100 lb. furn. and installing misc. metalwork.	1.00	2.00	1.00	.60	.70	.60
Lump sum, removal of outlet struct. at Dam No. 2	500.00	\$3,500	\$1,000	\$4,000	\$1,400	\$1,500
Lump sum, removal of waterw'y struct. at Dam No. 2	500.00	\$3,500	\$1,000	\$4,000	500.00	\$1,000
Lump sum, removal of outlet struct. at Stubblefield Dam	500.00	\$3,500	\$1,000	\$6,000	\$1,200	\$2,800
Lump sum, removal of outlet struct. at Dam No. 13	500.00	\$3,500	\$1,000	\$6,000	\$1,500	\$1,500
5,200 cu. yd. grading right bank of Vermejo Canal	.15	.20	.20	.25	.13	.25

Sewerage

Small by-pass sewer in Washington

Washington—Franklin County—Corps of Engineers. In response to a bid invitation issued for construction of a sanitary and storm by-pass sewer at Pasco, Utility Construction Co., Ontario, Ore., submitted a low bid of \$30,330 before the Corps of Engineers. A wide range of unit bids submitted were as follows:

(1) Utility Construction Co.	\$30,330	(6) Don Akina, Inc.	\$50,408
(2) Schimmels & Schnell	45,996	— Lewis A. Hopkins & Co.	54,253
(3) Willard P. Stoneburner	48,189	— Packard Pipe & Pump Co.	55,095
(4) C. J. Painter Co.	49,812	— Empire Construction Co.	71,302
(5) Otis Williams & Co.	49,890		

	(1)	(2)	(3)	(4)	(5)	(6)
3,500 cu. yd. structural excav.	1.50	2.60	3.40	5.40	3.50	4.00
260 lin. ft. 24-in. diam. vitrified clay pipe	8.50	8.90	10.65	10.25	11.00	9.75
1,140 lin. ft. 30-in. diam. vitrified clay pipe	13.00	13.32	15.50	15.60	17.00	15.70
60 lin. ft. 30-in. diam. welded steel pipe	35.00	50.00	55.00	48.10	100.00	50.00
4 ea. manhole	350.00	1,900	950.00	880.00	\$1,000	\$1,050
Lump sum, lift station	\$2,200	\$5,298	\$6,800	\$3,697	\$5,200	\$6,900
1 ea. connection to existing manhole	250.00	500.00	150.00	180.00	100.00	200.00
Lump sum, cut and plug existing sewer lines	\$2,100	\$3,000	\$1,800	180.00	100.00	\$1,675

Waterway

Dredging and filling at Long Beach Outer Harbor

California—Long Beach—City. A low bid of \$1,475,650 was submitted by Pacific Dredging Co., Paramount, before the Long Beach Board of Harbor for dredging and filling Pier E at Long Beach Outer Harbor. The approximate quantity was estimated at 5,500,000 cu. yd. Unit bids submitted were as follows:

(1) Pacific Dredging Co.	\$1,475,650	(3) Franks Dredging Co.	\$1,611,500
(2) San Francisco Bridge Co.	1,580,700	(4) Standard Dredging Corp.	1,646,700

	(1)	(2)	(3)	(4)
5,500,000 cu. yd. dredge and fill	0.2683	0.2874	0.293	0.2994

Levees, pumping plant and roads along the Columbia River

Washington—Franklin County—Corps of Engineers. Lewis A. Hopkins & Co., Yakima, was low with a bid of \$271,613 submitted before the Corps of Engineers for construction of levees, pumping plant and roads on the left bank of the Columbia River in the vicinity of Pasco. Unit bids submitted were as follows:

(1) Lewis A. Hopkins & Co.	\$271,613	— Roy L. Bair & Co.	\$322,149
(2) J. A. Terteling & Sons, Inc.	277,400	— Peter Kiewit Sons' Co.	322,474
(3) Otis William & Co.	280,387	— Steelman-Duff, Inc.	329,285
(4) George W. Lewis	303,451	— Clifton & Applegate	381,279
— Butler Construction & Engineering Co.	318,039	(5) Government estimate	268,299

	(1)	(2)	(3)	(4)	(5)
Lump sum, clearing grubbing	\$5,650	450.00	\$3,500	\$10,000	\$1,650
69,000 cu. yd. excav., unclassified	.37	.255	.30	.40	.37
9,000 cu. yd. excav., structural	2.52	3.00	2.50	2.00	4.20
70,000 cu. yd. embankment	.44	.36	.60	.30	.46
2,600 cu. yd. dumped riprap	3.68	2.75	3.75	5.00	6.85
600 sq. yd. asphalt membrane	1.00	1.65	5.00	4.00	2.60
Lump sum, 12-in. diam. corr. metal pipe assembly, complete	\$1,300	\$1,050	\$1,300	\$1,025	\$1,355
34 lin. ft. 24-in. diam. corr. metal pipe	8.19	8.90	8.00	10.80	8.50
50 lin. ft. 30-in. diam. corr. metal pipe	13.34	11.20	13.00	11.21	10.00
56 lin. ft. 36-in. diam. corr. metal pipe	17.60	17.00	17.50	15.74	14.50
2,000 lin. ft. 24-in. diam. perf. corr. metal pipe	8.70	8.90	9.00	10.16	8.15
2,120 lin. ft. 30-in. diam. perf. corr. metal pipe	10.70	10.80	10.50	11.40	9.85
740 lin. ft. 48-in. diam. perf. corr. metal pipe	23.38	25.50	23.50	24.40	22.65
12 ea. manhole	600.00	620.00	435.00	450.00	285.00
Lump sum, fencing	\$1,600	\$1,315	700.00	700.00	875.00

(Continued on next page)

	(1)	(2)	(3)	(4)	(5)
Lump sum, pumping plant—bldg. and appurtenances, intake and outfall struct.	\$40,222	\$31,500	\$32,000	\$31,076	\$26,750
Lump sum, pumps, motors, elect. controls and appurt.	\$19,111	\$29,000	\$20,000	\$21,000	\$17,765
Lump sum, discharge pipe and appurt.	\$8,106	\$12,000	\$14,000	\$14,300	\$8,155
Lump sum, gasoline engines, geared heads, and appurt.	\$25,804	\$28,000	\$25,000	\$25,140	\$8,870
Lump sum, fuel system	\$1,752	\$1,600	\$1,650	\$1,650	870.00
Lump sum, remove and replace grade crossing and track struct.	525.00	580.00	\$2,000	\$4,000	340.00
2,100 cu. yd. base course	1.73	1.75	2.00	4.75	2.45
2,200 ton crushed stone surfacing top course	2.00	3.80	2.00	6.96	4.50
1,150 ton mineral aggregate	2.10	5.00	2.10	8.40	5.95
75 ton asphalt cement	10.00	75.00	80.00	94.80	73.50
Lump sum, relocate perimeter lighting	651.00	\$1,740	500.00	750.00	405.00

Water Supply

Reconstructing water system on Vancouver Freeway

Washington—Clark County—State. Packard Pipe & Pump Co. of Vancouver was awarded a contract by the Washington State Highway Commission on the basis of a low bid of \$54,781 for Unit 2 of the water system reconstruction on the Vancouver Freeway. Unit bids submitted were as follows:

(1) Packard Pipe & Pump Co.	\$54,781	(3) Carl M. Halvorson, Inc.	\$85,190
(2) Harold E. Olds	71,737	(4) Empire Construction Co.	92,979

	(1)	(2)	(3)	(4)
3,810 cu. yd. structure excavation	3.75	5.60	9.50	10.75
80 days mechanical tamper	40.00	51.80	50.00	50.00
120 M. gal. water	.10	5.60	5.00	6.00
50 cu. yd. furn. and placing cr. stone surf. top course	3.00	11.00	5.50	7.00
130 cu. yd. furn. and placing cr. stone surf. base course	6.00	11.00	5.50	6.00

TYPE I-1 ASPHALTIC CONCRETE PAVEMENT

19 ton Class C wearing course	16.00	50.00	20.00	20.00
27 ton Class L leveling course	20.00	70.00	20.00	20.00

OTHER ITEMS

87 lin. ft. std. reinf. conc. culv. pipe 36-in. diam.	20.00	14.00	18.00	16.00
189 lin. ft. std. reinf. conc. culv. pipe 42-in. diam.	20.00	20.00	22.00	18.00
136 lin. ft. std. reinf. conc. culv. pipe 48-in. diam.	21.00	24.00	24.00	19.00
193 lin. ft. mechanical joint cast iron water pipe 6-in. diam.	3.25	4.63	6.00	11.00
188 lin. ft. mechanical joint cast iron water pipe 10-in. diam.	5.52	8.15	8.00	16.00
199 lin. ft. mechanical joint cast iron water pipe 12-in. diam.	6.50	10.46	10.00	17.00
601 lin. ft. mechanical joint cast iron water pipe 20-in. diam.	14.50	20.00	19.00	18.00
3,224 lin. ft. cast iron water pipe 6-in. diam.	3.50	3.60	4.00	4.25
150 lin. ft. placing conc. or V.C. sewer pipe 8-in. diam.	2.50	1.26	4.00	3.00
1 only special concrete manhole	400.00	350.00	350.00	300.00
15 only valves 6-in. diam.	190.00	120.00	100.00	125.00
2 only valves 10-in. diam.	190.00	264.95	200.00	210.00
2 only valves 12-in. diam.	275.00	348.32	250.00	275.00
19 only valve boxes	20.00	18.00	20.00	20.00
1 only removing and resetting fire hydrant and fittings	150.00	140.00	200.00	135.00
2 only conc. barricades 36-in. diam.	70.00	37.10	75.00	80.00
4 only conc. barricades 42-in. diam.	75.00	39.90	75.00	90.00
2 only conc. barricades 48-in. diam.	75.00	44.10	75.00	105.00

Streets and Highways

Asphaltic concrete paving on Columbia River Highway

Oregon—Wasco County—State. Vernie Jarl, Gresham, was low with a bid of \$1,229,045 submitted before the Oregon Highway Department for 5.7 mi. of grading and asphaltic concrete paving on the Rowena-Chenoweth Creek Unit, Mosier-The Dalles Section of the Columbia River Highway. Unit bids submitted were as follows:

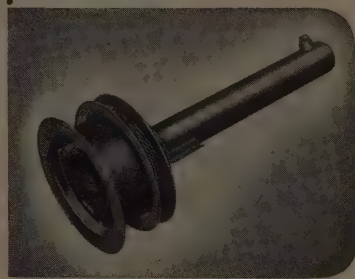
(1) Vernie Jarl	\$1,229,045	— Parker-Schram Co.	\$1,438,767
(2) Carl M. Halvorson, Inc.	1,229,550	— Matt McDougall Co.	1,454,029
(3) Rogers Construction Co.	1,232,400	— White Bros. Co.	1,471,376
(4) Gibbons & Reed Co.	1,351,845	— Kuckenberg Construction Co.	1,476,366
(5) Peter Kiewit Sons' Co.	1,410,944	— Fred H. Slate and E. C. Hall Co.	1,545,277
— Guy F. Atkinson Co.	1,414,333	— McNutt Bros.	1,593,860
— J. N. Conley & R. A. Heintz	1,431,197	— S. A. Healy Co.	1,689,301

	(1)	(2)	(3)	(4)	(5)
All specified clearing and grubbing	\$30,000	\$120,000	\$30,000	\$45,000	\$15,000
3,000 cu. yd. structural excav., unclassified	3.00	3.00	5.00	2.40	4.00
965,600 cu. yd. general excav., unclassified	.80	.70	.80	.89	.94
3,382,000 yd. sta. short overhaul	.01	.01	.01	.02	.02
45,000 cu. yd. sta. long overhaul	.40	.50	.40	.40	.50
12,000 cu. yd. excav. and placing topsoil	.80	.60	.75	1.25	.87
22,000 yd. mi. truck haul on topsoil	.20	.20	.15	.40	.15
5.70 mi. finishing roadbed and slopes	700.00	\$1,000	600.00	\$1,200	\$1,000
9,000 lin. ft. rounding cutbanks	.10	.20	.20	.12	.20
140 lin. ft. 12-in. corr. metal pipe	2.50	3.50	2.25	3.25	2.70
450 lin. ft. 18-in. corr. metal pipe	3.50	4.50	4.00	4.20	4.00
70 lin. ft. 18-in. corr. metal pipe, extra strength	4.00	5.00	4.50	5.00	5.00
170 lin. ft. 48-in. corr. metal pipe, extra strength	20.00	26.00	21.00	24.00	23.00
40 lin. ft. extra for installing pipe under railroad	12.00	200.00	10.00	23.00	50.00
1,100 lin. ft. 6-in. perf. metal drain pipe, coated	2.00	2.00	1.50	2.35	1.75
4,000 lin. ft. 8-in. perf. metal drain pipe, coated	2.50	2.50	2.20	2.75	2.35
130 lin. ft. 12-in. concrete pipe	2.50	2.50	2.00	2.30	2.00
30 lin. ft. 15-in. concrete pipe	3.00	3.50	2.50	3.00	3.00
810 lin. ft. 18-in. concrete pipe	3.50	4.00	3.50	4.00	3.75
340 lin. ft. 18-in. concrete pipe, extra strength	4.00	4.50	4.00	4.25	4.00
140 lin. ft. 24-in. concrete pipe, extra strength	5.50	5.50	4.50	6.00	5.50
280 lin. ft. 36-in. concrete pipe, extra strength	10.00	9.00	8.00	9.50	9.50
20 lin. ft. 8-in. sewer pipe	2.00	2.00	1.00	2.50	2.00
20 lin. ft. salvaging culvert pipe	3.00	3.00	2.00	2.00	3.00
1,000 cu. yd. 36-in. - 0 backfill in drains	5.00	6.00	3.00	7.50	7.00
130 cu. yd. Class "A" concrete	61.00	70.00	70.00	70.00	65.00

(Continued on page 150)



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UNIT BID PRICES CONTINUED

	(1)	(2)	(3)	(4)	(5)
22,500 lb. metal reinforcement	.12	.15	.12	.16	.11
3 ea. concrete catch basins	100.00	100.00	75.00	250.00	120.00
1 ea. special concrete catch inlets	100.00	150.00	150.00	200.00	150.00
80 ea. concrete sight posts	15.00	12.00	10.00	12.00	10.50
550 lin. ft. metal guard rail	3.00	3.50	3.50	4.35	3.00
75,000 cu. yd. 2-in. - 0 rock in base	1.50	1.50	1.70	1.55	1.70
19,500 cu. yd. ¾-in. - 0 rock in base and shoulders.....	2.20	1.65	1.70	2.25	2.05
2,400 M. gal. sprinkling	2.50	2.20	1.50	2.00	2.00
1,100 cu. yd. ¾-in. - 0 rock in binder course	3.00	3.00	3.00	3.10	3.75
180 ton RC-3 asphalt in binder course	38.00	40.00	40.00	39.00	42.00
22,500 ton Class "B" asphaltic concrete	5.50	5.50	5.40	5.65	5.50
100 ton RS-1 emulsified asphalt in seal coat	33.00	40.00	40.00	34.00	38.00
600 cu. yd. aggregate in seal coat	4.00	4.50	4.50	4.25	6.50
420 lin. ft. asphaltic concrete traffic markers	1.00	1.00	1.00	1.25	1.25

Heavy rock excavation in Idaho

Idaho—Bingham County—State. An award was given to Brennan Construction Co., Pocatello, on the basis of a low bid of \$270,690 submitted before the Idaho Department of Highways for constructing the roadway on 8.189 miles of the Lost River Highway from Reverse to the Peoples Canal. Work includes 63,000 cu. yd. of solid rock excavation. Unit bids submitted were as follows:

(1) Brennan Construction Co.	\$270,690	(4) Hoops Construction Co.	\$304,697
(2) Peter Kiewit Sons' Co.	284,000	(5) Morrison-Knudsen Co., Inc.	329,125
(3) Glenn Geery, Inc.	289,870	(6) LeGrand Johnson	329,290

	(1)	(2)	(3)	(4)	(5)	(6)
63,000 cu. yd. solid rock excav.	2.30	2.40	2.45	2.75	2.75	2.90
81,000 cu. yd. common excav.	.35	.29	.35	.30	.50	.35
580 cu. yd. excav. for structs.	3.00	3.00	3.00	3.00	5.00	4.00
85,000 cu. yd. borrow	.30	.35	.31	.30	.30	.32
51,000 yd. mi. haul	.20	.25	.25	.30	.25	.25
7,100 M. gal. watering embankments	2.00	2.00	1.90	2.00	3.00	3.30
296 day rolling tamping roller	50.00	50.00	50.00	45.00	50.00	55.00
1,700 cu. yd. mechanical tamping	2.00	1.50	3.50	3.00	3.00	3.00
30 sta. furrow ditches	10.00	15.00	20.00	8.00	15.00	10.00
7.0 cu. yd. concrete, Class "A"	110.00	90.00	90.00	100.00	100.00	100.00
100 lb. metal reinforcement	.25	.20	.25	.25	.30	.20
350 lin. ft. 12-in. pipe culverts	2.00	3.00	2.75	2.75	2.50	2.50
1,150 lin. ft. 18-in. pipe culverts	3.00	5.00	3.75	4.50	4.00	3.50
1,900 lin. ft. 24-in. pipe culverts	4.25	6.00	6.00	5.50	5.50	5.00
460 lin. ft. 30-in. pipe culverts	5.50	8.00	7.50	6.00	7.00	6.50
200 lin. ft. 36-in. pipe culverts	9.00	12.00	13.00	8.50	10.00	10.00
250 lin. ft. 24-in. bit. coated CMP siphon	8.00	10.00	7.00	7.50	8.00	7.00
300 cu. yd. loose riprap	3.50	5.00	7.00	5.00	7.00	5.00
12,000 lin. ft. wire fence (Type 2)	.40	.20	.18	.40	.30	.45

Grading, draining, select material, aggregate base and plant-mix surfacing

Arizona—Santa Cruz County—State. Western Constructors, Inc., Phoenix, submitted a low bid of \$281,725 before the Arizona Highway Department for 4 miles of grading, draining, select material, aggregate base and bituminous plant-mix surface on the Tucson-Nogales Highway. The work begins about 25 miles north of Nogales and extends northerly to the Pima-Santa Cruz County line. Unit bids submitted were as follows:

(1) Western Constructors, Inc.	\$281,725	(4) Pioneer Constructors	\$303,105
(2) San Xavier Rock & Sand Co.	295,084	(5) Lyle Price, Contractor	303,989
(3) Dale F. Payne, Contractor	295,424	— L. M. White Contracting Co.	305,485

	(1)	(2)	(3)	(4)	(5)
48,300 cu. yd. roadway excav.	.52	.50	.55	.48	.61
205 cu. yd. drainage excav.	.60	.60	1.00	.50	.50
3,350 lin. ft. crown ditches	.30	.15	.20	.20	.15
3,125 cu. yd. structural excav.	2.40	2.00	3.00	2.50	3.00
37,000 cu. yd. borrow (CIP)	.50	.40	.50	.52	.51
Lump sum, provide water supply	\$6,250	\$2,500	\$6,000	500.00	\$3,000
4,700 M. gal. apply water	.75	1.75	1.75	2.00	2.00
1,250 hr. rolling	5.00	8.50	7.00	7.50	7.00
37,550 ton select material (CIP)	.60	.55	.50	.60	.52
15,000 ton aggregate base (CIP)	1.10	1.15	1.25	1.15	1.10
1,150 ton cover matl. for seal coat (Type B) (CIP)	5.50	5.25	6.00	5.50	5.00
10,250 ton bitum. mix (Cl. II—plant-mix) (CIP except cost of liquid asphalt)	2.90	2.75	3.00	3.10	3.50
190 ton liquid asph. for prime coat (Grade MC-1 or MC-2) (CIP)	39.00	41.00	42.00	39.00	40.15
460 ton liquid asph. for bitum. plant-mix (Grade SC-6) (CIP)	33.25	36.00	36.00	33.00	35.20
115 ton emuls. asph. for seal coat (Grade A) (CIP)	40.00	40.50	40.00	39.00	39.60
1,920 lb. structural steel (state furn.) (CIP)	.33	.20	.10	.30	.10
1,855 lb. structural steel (CIP) (New)	.60	.50	.40	.40	.40
1,198 cu. yd. Class A conc. (incl. cement)	50.00	62.00	55.00	63.00	58.00
95,490 lb. reinf. steel (bars) (CIP)	.12	.13	.12	.13	.125
364 lin. ft. 24-in. corr. metal pipe (CIP except excav.)	5.75	6.00	7.00	5.50	5.90
210 lin. ft. 30-in. corr. metal pipe (CIP except excav.)	7.00	7.00	8.00	7.00	7.25
570 lin. ft. 36-in. corr. metal pipe (CIP except excav.)	11.25	11.00	11.00	11.00	11.30
96 lin. ft. 42-in. corr. metal pipe (CIP except excav.)	13.25	13.00	13.00	13.00	14.00
95 cu. yd. removal of struct. conc.	20.00	27.00	16.00	25.00	25.00
450 ea. place dowels	2.25	2.50	3.00	1.50	3.00
759 lin. ft. removal of corr. metal pipe (various sizes) and headwalls	1.50	2.00	2.50	4.00	3.00
150 cu. yd. plain riprap (Std. C-23) (Type E) (CIP)	13.00	10.00	10.00	8.50	10.00
4 ea. cattle guard (2 unit) (Std. C-14) (CIP except excav. and concrete)	665.00	625.00	600.00	750.00	605.00
2 ea. reconstr. cattle guard (Std. C-14) (Lt. Sta. 1402+ and Lt. Sta. 1524±) (CIP except excav. and concrete)	470.00	140.00	250.00	400.00	200.00
560 lin. ft. road guard (special) (CIP)	4.75	5.00	4.00	4.00	4.00
280 lin. ft. road guard (Std. C-7) (CIP)	3.60	3.75	3.00	3.50	3.50
48 ea. guide posts (Std. C-8) (Type A, B, C or D) (CIP)	7.00	7.00	6.00	6.50	5.00

(Continued on page 152)



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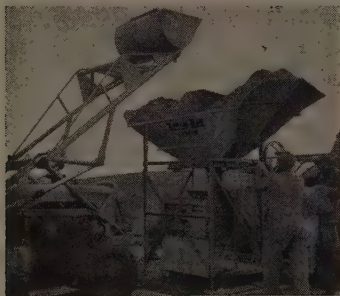
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Models AW — BW are permanently mounted upon a rubber tired trailer. You may obtain the trailer if you want to convert your models A-B to mobile units.



Twin Bin Model A is shown being loaded. The low height allows the use of small low-priced loaders or cranes. The operator is moving the positive shut-off valve to weigh accurately the first time.



Twin Bin Model BW is shown in the forward dumping position. The operator releases the weighed aggregate at the right spot in the mixer. The Stock Bin moves on greased packed, lam protected bearings. Its movement allows it to be used with some bituminous plants. Note the screw-jack leveler below left.



Twin Bin Model BW is shown working and being loaded on its permanent trailer mounting. It is easy to set up for work, operate and pull. The tongue is in the fold-up position. This model stores and weighs larger batches. Note the Stock Bin with its divided wall and the beams and working parts of the built-in 1000 lb. scales. Three men are doing this job.

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UNIT BID PRICES (CONTINUED)

	(1)	(2)	(3)	(4)	(5)
28 ea. right-of-way markers (Std. C-1) (Type A, B or C) (CIP)	8.00	11.00	8.50	8.00	7.00
35,326 lin. ft. line fence (Std. C-15 or C-16) (CIP)	.21	.25	.20	.26	.24
5,406 lin. ft. line fence (spec.) (C-15 or C-16 mod.) (CIP)	.25	.30	.25	.28	.26
11 ea. steel fence gate (Std. C-15 or C-16) (No. 1) (CIP)	65.00	60.00	50.00	55.00	60.00
4 ea. wire fence gate (Std. C-15 or C-16) (No. 2) (14-ft. and 17-ft.) (CIP)	20.00	25.00	25.00	20.00	30.00
300 lin. ft. bank protection (Std. C-23) (Type B) (CIP)	9.25	10.00	8.00	8.50	7.00
130 lin. ft. reconstr. bank protec. (Lt. Sta. 1563+) (Std. C-23) (CIP)	15.00	8.50	10.00	9.00	5.00
Lump sum, construct 16-ft. grader road	\$1,000	300.00	250.00	150.00	300.00

Forest road in New Mexico

New Mexico—Catron County—BPR. O. D. Cowart, Albuquerque, submitted a low bid of \$273,228 before the Bureau of Public Roads for construction of 4.166 miles of a 28-ft. wide forest roadway through Apache National Forest. Work includes clearing and draining, and bituminous surfacing. Unit bids submitted were as follows:

(1) O. D. Cowart	\$273,228	(4) Lowdermilk Bros.	\$339,761
(2) Skousen Construction Co.	326,051	(5) Henry Thygesen & Co.	344,994
(3) Allison & Haney	333,334		

	(1)	(2)	(3)	(4)	(5)
Lump sum, clearing and grubbing	\$3,000	\$15,000	\$5,000	\$24,000	\$3,500
178,000 cu. yd. unclassified excav.	.63	.75	.89	.73	.97
1,500 cu. yd. uncl. excav. for structs.	2.00	4.00	3.00	5.00	4.00
30,000 cu. yd. uncl. excav. for borrow, Case 1	.63	.44	.55	.90	.60
300,000 sta. yd. overhaul (1,000-ft. free haul)	.02	.03	.015	.02	.02
12,000 cu. yd.-mi. spec. overhaul of borrow (1,000-ft. free haul)	.20	.50	.15	.40	.20
Contingent sum, obliteration of old roadways to be paid for as earned	500.00	500.00	500.00	500.00	500.00
3,670 M. gal. watering of embankment	1.50	1.00	1.65	1.00	2.00
380 M. gal. watering of base course	1.50	3.00	1.65	1.00	2.00
Lump sum, providing and maint. water plant or plants	\$1,012	\$4,000	750.00	\$2,500	500.00
920 hr. rolling of embankment	10.00	9.00	9.50	10.00	9.00
110 hr. rolling of base course	8.00	8.00	7.50	8.00	7.00
13,000 ton cr. grav. or cr. stone base crse. Class 2, Grading D-1	1.40	1.75	1.55	1.50	1.30
65,000 sq. yd. processing bituminized base	.10	.08	.05	.07	.07
91,000 gal. MC cutback asph. Gr. 2 or 3	.165	.18	.21	.18	.19
500 cu. yd. conc., Cl. A (air-entrained conc., low-alkali cement)	60.00	68.00	73.00	80.00	70.00
47,900 lb. reinforcing steel	.14	.15	.16	.14	.17
1,300 lb. structural steel—furn., fabr. and erected	.40	.40	.40	1.00	.35
32 cu. yd. cement rubble masonry	50.00	70.00	105.00	100.00	90.00
108 lin. ft. 18-in. CGSM culvert pipe	5.00	6.00	5.50	4.75	5.00
1,902 lin. ft. 24-in. CGSM culvert pipe	7.00	8.00	8.00	5.75	7.25
296 lin. ft. 30-in. CGSM culvert pipe	8.50	12.00	10.50	8.50	10.25
70 lin. ft. 36-in. CGSM culvert pipe	13.00	15.00	14.25	12.50	14.50
52 lin. ft. 42-in. CGSM culvert pipe	15.00	20.00	21.00	17.50	24.00
20 cu. yd. hand-laid rock embankment	25.00	20.00	30.00	12.50	25.00
22 ea. concrete maintenance marker posts	15.00	30.00	25.00	15.00	20.00
2 ea. cattle guards (26-ft.)	\$2,600	\$2,500	\$2,600	\$2,750	\$3,000
16,000 lin. ft. barbed wire fence, Type 3	.24	.30	.25	.40	.21
6 ea. gates (12-ft.)	40.00	100.00	35.00	50.00	30.00
230 ea. timber guide posts with warning reflectors (treated)	7.00	8.00	6.50	7.50	7.00
300 lin. ft. chain link wire fence (6-ft.)	6.00	6.00	5.00	5.00	4.50

Miscellaneous city street improvements

California—Los Angeles County—County. J. E. Haddock, Ltd. & Haddock-Engineers, Ltd., Montebello, submitted a low bid of \$636,405 before the County of Los Angeles for construction of curbs, gutters, walks, pavement, drainage structures and water systems on Ocean Gate Avenue in Hawthorne. Unit bids submitted were as follows:

(1) J. E. Haddock, Ltd. & Haddock-Engineers, Ltd.	\$636,405	(4) Griffith Co.	\$693,868
(2) Oswald Bros. Co.	639,523	(5) J. A. Thompson	696,788
(3) Boddum Construction Co.	647,139	— Engineer's estimate	620,085

	(1)	(2)	(3)	(4)	(5)
7,905 lin. ft. 10-in. cast iron "Enameline" pipe	5.28	5.05	5.40	5.50	6.27
8,480 lin. ft. 6-in. cast iron "Enameline" pipe	3.34	3.20	3.45	3.25	4.06
12,350 lin. ft. 4-in. cast iron "Enameline" pipe	2.48	2.40	2.65	2.50	2.93
7 lin. ft. 10-in. asbestos-cement pipe	12.21	11.75	10.00	13.00	11.94
40 lin. ft. 6-in. asbestos-cement pipe	7.45	7.00	6.00	7.50	9.55
40 lin. ft. 4-in. asbestos-cement pipe	5.42	5.15	5.00	6.00	8.95
24 lin. ft. 14-in. pipe sleeve—standard steel pipe	14.05	13.50	20.00	15.00	29.85
18 lin. ft. 8-in. pipe sleeve—standard steel pipe	12.31	11.75	15.00	13.00	17.90
28 lin. ft. 10-in. coated—std. steel pipe for inserting in pipe sleeves	11.55	11.00	8.00	12.00	8.35
20 lin. ft. 4-in. coated—std. steel pipe for inserting in pipe sleeves	5.37	5.00	5.00	5.50	3.58
14 complete 10-in. water main line valves and valve boxes	.19	.26	.20	.29	.215
24 complete 6-in. water main line valves and valve boxes	216.00	200.00	151.00	225.00	179.00
62 complete 4-in. water main line valves and valve boxes	103.95	100.00	70.00	100.00	89.50
34 complete fire hydrants, new	65.83	63.00	48.00	70.00	65.70
14 complete relocating existing fire hydrants	106.00	200.00	195.00	160.00	215.00
60 3/4-in. customer service connections—new	98.00	93.50	90.00	105.00	71.65
388 3/4-in. metered customer service connections—new	34.65	33.00	42.00	36.00	41.80
1 1-in. metered customer service connection—new	75.10	71.50	67.00	80.00	71.65
2,134 lin. ft. 3/4-in. replacement of iron or steel customer service connections with copper	112.00	107.00	150.00	150.00	179.00
5,400 lin. ft. 1-in. replacement of iron or steel customer service connections with copper	2.19	2.40	1.50	2.50	1.55
1,843 lin. ft. 3/4-in. extension of existing copper customer service connections	1.90	1.80	1.80	2.00	2.03
	1.81	1.75	1.50	1.90	2.39

	(1)	(2)	(3)	(4)	(5)
72 lin. ft. 1-in. extension of existing copper customer service connections	2.02	1.95	2.00	2.10	2.70
598 services, 3/4-in. shortening existing copper customer service connections	9.81	10.00	5.00	11.00	5.37
10 services, 1-in. shortening existing copper customer service connections	11.55	11.00	10.00	12.00	7.15
1,241 relocation of water meters and meter boxes.....	5.20	5.00	5.50	5.50	6.00
1,629 customer yard piping connections	11.55	11.00	7.50	12.00	7.15
1,200 sq. ft. 2-in. thick resurfacing trench.....	.11	.25	1.00	.40	.36
825 sq. ft. 5-in. thick resurfacing trench	.21	.50	1.25	.60	.72
15 boxes, replacement of defective valve boxes.....	14.43	15.00	10.00	15.00	9.00
75 boxes, replacement of defective meter boxes and installing meter boxes where none exist north-erly of Tract No. 2542.....	8.08	7.70	6.00	8.50	11.95
10 closures, abandonment of obsolete water mains and service connections	8.10	7.70	20.00	8.50	11.95
313 lin. ft. removal and salvage of 4-in. pipe	1.44	1.40	1.00	1.50	1.45
41,280 cu. yd. excav., incl. clearing, grading, removal of trees and preparation of subgrade	1.49	1.32	1.65	1.50	1.35
95,973 lin. ft. mono. cem. curb and 2-ft. gutter—8-in. curb face	1.73	1.65	1.65	1.90	1.80
436 cu. yd. cem. conc. cross gutter, incl. curb	26.25	25.00	25.00	27.00	27.50
392,504 sq. ft. cem. conc. walk 3-in. thick	.22	.25	.25	.28	.28
1,932 ton No. 4 crushed rock	6.84	4.74	10.00	5.50	8.15
68,840 sq. ft. aggre. base Type "A"—6 in. thick	.095	.11	.09	.10	.10
1,219,100 sq. ft. aggre. base, Type "A"—4 in. thick	.063	.072	.065	.068	.077
483 cu. yd. Type "A" aggre. base under cem. con. cross gutters	5.25	5.50	6.00	5.30	5.30
53,664 gal. asphaltic oil, Type BC-6	.105	.11	.11	.10	.11
Lump sum, drainage structs. per plan No. 1, Sheet No. 17, complete	\$1,523	\$1,616	\$1,200	\$2,500	\$1,700

Miscellaneous

Gravel and cover material stockpiles in Utah

Utah—Millard County—State. Marion J. Hess of Malad, Idaho, submitted the low bid of \$27,200 before the State Road Commission of Utah for furnishing gravel and cover material stockpiles west of Holden. Unit bids submitted were as follows:

(1) Marion J. Hess	\$27,200	— Strong Co.	\$34,300
(2) Reynolds Construction Co.....	28,400	— L. T. Johnson Construction Co.....	36,600
(3) W. W. Clyde & Co.	28,800	— J. N. Samsion & Sons	39,900
(4) Parson & Fife Construction Co.....	30,200	— Thora Construction Co., Inc.....	41,400
(5) Olof Nelson Construction Co.....	30,400	— England Bros.	45,000
— Young & Smith Construction Co.....	33,500	(6) Engineer's estimate	36,300
— Whiting & Haymond Contractors.....	33,900		

	(1)	(2)	(3)	(4)	(5)	(6)
30,000 ton gravel surf., Type "A" stockpiled	.46	.50	.58	.55	.54	.70
2,000 ton gravel surf. (1/2-in. max.) stockpiled.....	.70	1.00	.95	.85	1.10	.90
6,000 ton cover matl., Type "A" in stockpile.....	2.00	1.90	1.75	2.00	2.00	2.25

Reconstruction of embankment slopes and placing riprap

California—Ventura County—State. J. B. Stringfellow Co. of Riverside submitted the low of two bids before the California Division of Highways with \$233,350 for reconstructing portions of embankment slopes between Point Mugu and Little Sycamore Creek, and placing heavy, medium-extra-heavy and extra-heavy stone riprap thereupon. Unit bids submitted were as follows:

(1) J. B. Stringfellow Co.....	\$233,350	(2) Guy F. Atkinson Co.....	\$288,525
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	(1)	(2)
18,000 ton imported borrow	2.10	2.70
13,000 ton heavy stone riprap	4.10	4.10
3,750 ton medium extra heavy stone riprap	5.00	6.70
19,000 ton extra heavy stone riprap	6.50	8.50

100-ton overhead electric traveling crane

Oregon—Lookout Point—C. of E. Cyclops Iron Works of San Francisco submitted a low bid of \$88,512 before the Corps of Engineers for supplying one 100-ton, double-trolley, electric motor-operated overhead traveling crane. Unit bids submitted were as follows:

(1) Cyclops Iron Works.....	\$ 88,512	(5) Harnischfeger Corp.	\$113,910
(2) Judson Pacific-Murphy Corp.....	99,748	(6) Pacific Coast Engineering Co.....	115,030
(3) Moffett Engineering Co.....	100,475	— Milwaukee Crane & Service Co.....	125,800
(4) Ederer Engineering Co.....	100,782	— Whiting Corp.	157,980

	(1)	(2)	(3)	(4)	(5)	(6)
1 ea. 100-ton, double trolley, electric motor-operated overhead traveling crane	\$152,780	\$96,225	\$121,250	\$110,180	\$93,971	\$111,050
1 ea. lifting beam for use with the crane.....	\$4,000	\$2,750	\$2,750	\$1,930	\$4,277	\$2,480
30 man day services of a supervising erector during erection and testing of the crane	40.00	50.00	60.00	60.00	50.00	50.00

Planting roadside areas

California—Orange County—State. Justice-Dunn Co. of Oakland submitted the low bid of \$7,641 before the California Division of Highways for preparing and planting roadside areas about 6.3 mi. in length between Peralta School and the Riverside County line. Unit bids submitted were as follows:

(1) Justice-Dunn Co.....	\$ 7,641	(5) Castro & Fisher	\$11,170
(2) Jannoch Nurseries	8,400	(6) Henry C. Soto Corp.	14,548
(3) Stephen L. Vistica	9,375	— F. A. Tetley & Son	28,440
(4) Dana R. Tyson Co.....	10,987		

	(1)	(2)	(3)	(4)	(5)	(6)
21,500 sq. yd. removing weeds	.015	.03	.05	.05	.055	.125
41,700 sq. yd. scarifying and cultivating	.026	.055	.05	.06	.0475	.09
231,000 ea. mesembryanthemum edule cuttings.....	.025	.022	.025	.03	.0325	.0325
4 ton commercial fertilizer	115.00	95.00	110.00	120.00	125.00	150.00



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NEW LITERATURE

401

Picture story tells how to splice wire rope

How to splice wire rope is shown graphically in a 30-page booklet published by the Bethlehem Steel Co. A splicing expert from the company set up his vise in front of a camera, and the resulting picture story gives the step-by-step details from beginning to end. Included are dimensional drawings of the required splicing tools. Fill in the coupon to send for your free copy.

402

"What you should know about diesel engines"

"What you should know about diesel engines," is a two-color, 28-page, pocket-sized booklet published by the P&H Division, Harnischfeger Corp. It explains, by means of non-technical language, cartoons, and illustrations, how the diesel engine was developed, how it differs from the gasoline engine, and how 2- and 4-cycle diesels operate. A two-page end piece shows P&H diesels being used in various kinds of equipment.

403

Four catalogs on earth-moving equipment published

Four new individualized catalogs, covering complete replacement and installation data on friction parts for earth-moving equipment, have been published by the S. K. Wellman Co. They give make and model information, parts specifications, ordering instructions, and installation data on Velvetouch parts for Allis-Chalmers, Caterpillar, International-Harvester, and LeTourneau equipment.

404

Batching plants described

An 18-page illustrated booklet describes the operation, dimensions, and specifications of Noble Co. cement and aggregate batching plants. Line drawings, elevation drawings, and photographs, outlined in color, present concrete examples of the complete plants and parts described. Tells about Noble series CA 100, CA 150, and CA 240. Free copies available. Just fill in the coupon.

405

Gear drive bulletin in color

An 8-page, full-color bulletin describes in detail a new Holloshaft Gear Drive to operate vertical turbine pumps where electricity is not

available. Cut-open views show many features. Published by U. S. Electrical Motors, Inc.

406

Tells about trencher

Photographs and text of a 4-page bulletin show the Model 320 trencher in action under all types of weather and job conditions. The folder, published by the Cleveland Trencher Co., outlines this model's advantages and special design features. It also contains complete dimensions and specifications, including a table of optional cutting widths.

407

Versatile power shovel described

Available as a standard shovel, long-range shovel, or dragline, the Marion 111-M diesel shovel with 4-cu. yd. dipper is described in a 12-page, 2-color booklet, illustrated with photos of the model in practically every material handling operation. A new type rigid gantry is also featured. Published by the Marion Power Shovel Co.

408

Four-wheel-drive tractor

"All the speed and manageability of a wheel tractor, all the power and traction of a crawler," says a 4-page bulletin put out by the Harris Manufacturing Co. The bulletin points out in color the plus advantages of this tractor. Also included are general specifications, transmission speeds, and dimensions.

409

Tips on doubling hose life

A new sand blast hose, 15% lighter and 100% more flexible, is described in a catalog issued by the B. F. Goodrich Co. It lists tips for doubling hose life, describes materials and methods used in the manufacture, and lists specifications.

410

Wire rope sling handbook comes in handy reference size

A new 64-page handbook on A. Leschen & Sons Rope Co. slings and fittings, printed in a handy 4 3/4 x 6 1/2-in. size for convenient reference on the job or in the plant, is now available. Just fill in the coupon for your free copy. It contains more than 100 illustrations showing standard wire rope slings, grommet slings, and multiple part slings, including flat-laced, hand-braided slings. Charts and

tables show correct calculations for determining the size of slings required and correct sling angles in relation to loads. The new line of Red-Strand, 8-part braided slings, along with Pin-Lock Thimbles, are featured.

411

All about graders

The advantages of using Caterpillar motor graders are listed in an 8-page booklet put out by the Caterpillar Tractor Co. It contains illustrations of the equipment in action and detailed cutaways of such parts as the transmission and control mechanism. It also shows the variety of possible attachments, such as scarifier, bulldozer, elevating grader, road widener, and snow plow.

412

Two leaflets on pipe

Two illustrated leaflets, which answer the 22 most frequently asked questions on Carlon plastic and rigid pipe, cover price comparisons, recommended applications, installation instructions, diameters, calculated burst pressures, weights, and shipping lengths, have been published by the Carlon Products Corp.

413

"Coupling or Converter?"

A 32-page special color magazine titled "Coupling or Converter?" has been issued by the Twin Disc Clutch Co. to explain where and why couplings or torque converters should be used. Both illustrations and text in layman's language are used to acquaint the reader with the meaning and characteristics of torque and the effect torque has on both driving and driven equipment. Early hydraulic drive installations are contrasted with those of today.

414

Motor truck scales described

Complete specifications and pit dimensions are included in the 8-page, 2-color folder, published by the Howe Scale Co., which illustrates and describes the complete line of heavy-duty Howe Four-Section Straight Lever Ball-Bearing Motor Truck Scales for weighing big truck and trailer loads. Installation photographs are included.

415

How to get a good concrete

The theory and practice of obtaining a good concrete is discussed in an 8-page booklet published by Sika Chemical Corp. Beginning with the gel mechanics of cement-water reaction, the booklet tells about the factors affecting cement hydration and basic quality of concrete, also how these factors can be controlled to reduce crackling and increase con-

crete hardness and impermeability. Illustrated with drawings, tables, and photographs of engineering projects built with Plastiment cement.

416

Spark-fired gas engines

Design, construction, and operating features of Nordberg FSE-9 and FSE-13 Spark-fired Gas Engines are described in a 4-page, 2-color bulletin published by the Nordberg Manufacturing Co. Included is information on their high thermal efficiency, with a heat balance diagram, their ignition systems, showing their ability to burn a wide range of gas fuels, and a table giving horsepower ratings of the various engines.

417

Snow plow-spreader information

Several types of snow plows and sand spreaders are discussed in two bulletins issued by the Anderson Engineering Co. They contain illustrations showing attachable models, as well as dimension and description tables. A side elevation reveals details of the spreader's operation.

418

More powerful bulldozer

A 4-page bulletin in color tells about Baker Manufacturing Co.'s new 15X bulldozer. Features it emphasizes include more power at the blade, an overall blade width of 96 in., allowing it to be transported over highways either day or night without a special permit, engineered balance permitting the tractor to do drawbar

work with the blade left on, better located center of gravity, and a design which allows easy servicing.

419

Jaw crushers in 11 sizes

Universal Series WRB Welded Steel Base Overhead Eccentric Jaw Crushers are now available in 11 sizes, according to a 4-page, color-illustrated bulletin of the Universal Engineering Corp. Ranging in capacity from 5 to 495 tons an hour, depending on crusher size and stage of reduction, the series incorporates the eccentric principle, which provides two distinct crushing blows with each revolution of the eccentric shaft.

420

Clay products catalog

A 98-page, cross-indexed clay products catalog has been published by American Vitrified Products Co. It includes data on sewer pipe and fittings, perforated pipe, channel pipe, wall coping, flue linings, chimney tops and pots, stove pipe, liner plates, fire brick, fire clay, septic tanks, drain tile, joint compound, and die cast sewer joints. Also listed are ASTM and federal specifications and installation and purchasing hints.

421

Euclid bulletin on scrapers, loaders, and dumps

Detailed information on all types of earthmoving equipment manufactured by the Euclid Road Machinery Co. is contained in a new 48-page booklet. Copiously illustrated with

views of rear-dumps, bottom-dumps, scrapers, and loaders, the booklet goes into detail about which piece of equipment to use on a particular type of job. It also describes how twin power—the use of two engines powering separate axles—is used in some models. Put key number on coupon for your free copy.

422

Ditcher folder issued

An 8-page, 2-color folder describes the Barber-Greene Co. Model 705-B Runabout Ditcher. Special features mentioned include a fluid coupling, hydraulic digging transmission, and curved-tooth bucket line. A "worms-eye" view of the machine gets to the bottom of some of the features. Also included are operating cost, digging range and speed, and ratio of pipe size to trench width data.

423

Water hose for construction projects

Water hose designed for specialized purposes such as long, heavy-duty hose for construction projects, road building, and other high pressure uses; large diameter hose for high pressure water and air service in pile driving, hydraulic bank grading, stripping and sluicing, and for heavy-duty service in mines and quarries; and a hose tube designed to withstand hot (200 deg. F.) water without swelling are described in a 4-page catalog published by the B. F. Goodrich Co. It also discusses hose for general water service.

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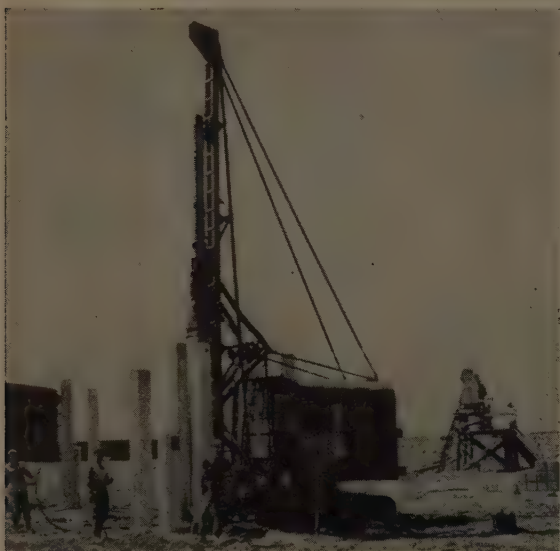
NEW EQUIPMENT

More information on any of the items in this section may be obtained by using coupon on page 155.

424

Diesel pile driving hammer cuts labor costs in half

A revolutionary self-contained diesel pile driving hammer said to save nearly 50% in labor costs is now on the market after years of development and improvements. Other advantages of this new hammer are the elimination of a steam or air generating unit, its high mobility, reduced setting-up time, fuel economy and low initial cost. Its shock-free characteristic permits the use of light-weight tubular leads which may be mounted on a tractor, crane or barge for quick transportation. This model is of medium capacity, delivering 7,500 ft.-lb. per stroke at the rate of 60 strokes per min. It is particularly suited to aver-



age and small jobs such as construction of boat landings, piers, docks, building foundations and railroad and highway maintenance work. The manufacturer claims that piles can be driven economically up to 2 tons in weight, and an average wood pile can be driven to a 150-ton load bearing capacity at a rate up to 2 ft. per min. Delivery can be made in 90 days. Manufactured by MTP Co. of America.

425

Portable crusher provides speedy service on small jobs

Designed for crushing operations where mobility counts is the new 100 Series of single-pass, portable crushing plants manufactured by Diamond Iron Works, Inc. The series includes three plants, No. 116, No. 120, and No. 124, ranging in capacity from 30 to 70 tons per hr. Their low hopper height, 10 ft. 4½-in., hinged delivery conveyor which makes it unnecessary to dismantle for towing, short wheel base, specially-positioned towing tongue, and full-view and easy-access operator's platform make these plants suitable for contractors with



small crushing jobs and for secondary and access road construction. Each plant has a 1½-deck oversize vibrating screen, roller bearing jaw crusher, choice of mechanical or air brakes, centrally located controls, light weight, low traveling height, and a clutch-operated feeder. Optional equipment includes a sand rejector conveyor, front and rear duals, and gasoline or diesel power unit.

426

Wilton Brush Saw slices way through toughest underbrush

Cutting your way through the toughest underbrush should be an easy matter if you're carrying a portable Wilton Brush Saw. The complete unit, which weighs approximately 30 lb., is slung from the shoulder on a broad web strap designed to distribute the weight and leave the operator's hands free to guide the high-speed circular saw. A heavy-duty V-belt direct drive, powered with a two-cycle, 1.2-hp. motor, turns the 8- or 10-in. blade up to 3,500 to 4,000 rpm., while cutting through vines, brush, saplings, and stems up to 4 in. in size. For lighter brush, the unit may be swung scythe-like. The Wilton, which permits a closer cut to the ground than a hand-scythe could approach, is operated by a simple centrifugal-type clutch after the motor is started by an automatically retractable pull cord. The entire unit, which fits in the trunk of a car, sells for \$295. Manufactured by Williams and Hussey Machine Corp.

427

New 6-wheel truck line by International Harvester

International RF-194 Loadstar model with concrete mixer body, pictured below, is one of a group of 6-wheel models introduced with International Harvester Co.'s new



R-line motor trucks for both highway and off-highway service. With the exception of the RF-195 Roadliner, the RF-190 Series (gross weight 30,000 to 38,000 lb.), are powered by the 154-hp. Super Red Diamond 406 engine. RF-170 Series models have gross weight from 22,000 to 26,000 lb., and the RF-210 Series have gross weight of 37,000 to 45,000 lb. All of these 6-wheel models are available with gasoline or LPG fuel systems. Models in the RF-190 Series are also available with diesel power.

426

Retractable lugs grip ground in adverse conditions

A new device enabling rubber-tired tractors to operate efficiently in mud, snow, ice, rock, sand, hills and on hard ground has recently been introduced. This device is a series of Vise-Grip Retractable Lugs, available for all



standard tractor tires, and requiring only 4 men and a wrench for extension or retraction. The manufacturer claims that a set of the lugs outlasts many tractors, can be installed in less than one hour, and by reducing power spinning, excessive fuel consumption and wear on motor and moving parts are reduced to a minimum. Manufacturer is Comco.

429

New 100-ton compaction roller features 4 unitized weight boxes

Four unitized weight boxes, each riding on its own tire and each free to rise and fall independently of the others, feature the new 100-ton compaction roller with advanced

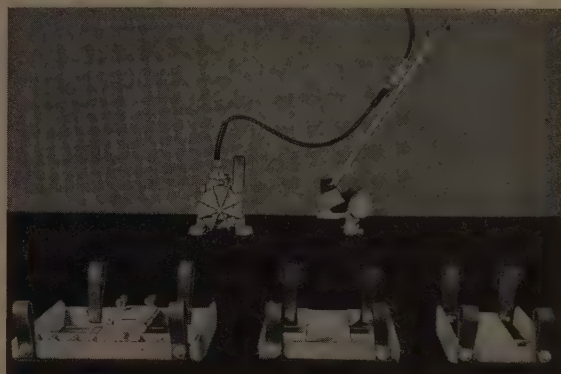


yoke design manufactured by Southwest Welding & Manufacturing Co. The steel tubing yoke is constructed in sections to permit the use of three to six weight boxes. Inside beams are full-circle welded to the yoke instead of being bolted into place to prevent torsional weaving and simplify re-arrangement of the weight boxes. The 44-ply, 2100 x 25 tires have a rated load per tire of 53,000 lb. Southwest also makes this oscillating compaction roller in 15-, 25-, and 50-ton sizes.

430

Interchangeable bases increase range of compactor flexibility

Quickly interchangeable bases for the Jackson Vibratory Compactor are now available in any width from 12 to 24 in. This means that the same self-propelled machine

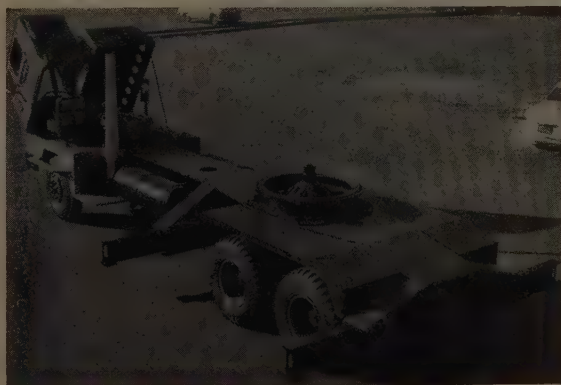


can be used in compacting granular soil in narrow trenches and fills, sub-bases for concrete floors, blacktop highway patching and widening, and paving walks, drives, railway platforms, and street crossings with only a few minutes delay for switching bases. It is claimed that maximum density of blacktop or granular soils at optimum moisture can be achieved with it at the rate of 2,400 sq. ft. an hour. Illustrations shows interchangeable bases and other component parts of the compactor. Manufactured by Jackson Vibrators, Inc.

431

Cook crane carrier hauls heavy equipment easier and faster

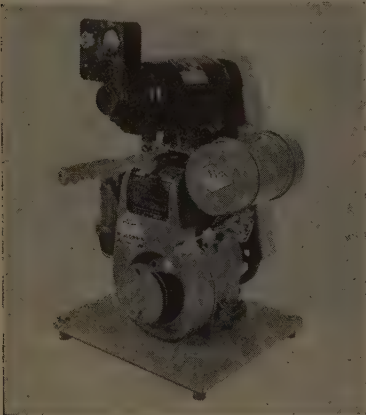
Hauling cranes, shovels, drag lines, and trench hoes to the job easier and faster is the special task of the Cook Crane Carrier. Available in all capacities from 5 to 20 tons, the carriers offer several special features of interest to operators and owners. These include hinged operator's cab and engine hood; choice of any make or type engine, either gasoline or diesel; pedestal-mounted instrument panel; spring-loaded folding door step; diamond-plated rigging and tackle box; heavy-duty bumper with tow hooks or draw bar type with pins; welded steel frame with plated top flanges and reinforced bottom flanges; optional outriggers, stationary with or without slide type extensions and demountable rear for hoe and shovel service, and adjustable Bostrom hydraulic suspended seats. Manufactured by Cook Bros. Equipment Co.



431

Small power unit features generator mounted above motor

Compactness, portability, and accessibility are featured in the new Lynnco Powerhouse, an engine generator which weighs 150 lb., has a maximum output of 3,000 watts and a continuous rating of 2,000 watts,



and occupies an overall floor area of 18 x 20 in. The unit, which has the generator mounted on vibration insulators above the engine cylinder head, is 29 in. high. Other features of the 115-v., single-phase, 60-cycle plant include built-in voltmeter and control box, manual governor control, automatic choke, and built-in carrying handles. A 6-hp. Wisconsin engine supplies power. Manufactured by Lynn Engineering & Supply Co.

432

Dig square holes with the Hydro-Clam

Developed for such wide digging applications as pilaster footings, septic tanks, and spot maintenance repair



on underground installations, the Hydro-Clam is available with a 36- or 24-in. clamshell type bucket. Each half of the clam bucket, which exerts 4½ tons pressure, can be operated independently or together. It permits square excavations up to 8 ft. long and 7 ft. deep, with a maximum digging depth of 8½ ft. The clam assem-

bly, which can be locked for operation as a backhoe, raises to dumping height clearance of 7½ ft. and can be removed from the tractor in less than 15 min. It has a 12-ft. reach behind the main frame with a 150-deg. operating arc. Manufactured by Shawnee Manufacturing Co.

434

Mobile press prints traffic and safety lines

Working much like ink rollers on a printing press, the improved all-metal, sled-type, roller spreader on the Universal Controlled-Flo Traffic-Line Paint-Striper prints rather than brushes or sprays traffic and safety lines. Since it is gravity-fed and has no power unit, maintenance is limited to immersing the machine in a can of kerosene or paint thinner when not in use. The paint feeds through the



gravity line to a distribution apron, feeds evenly to finger rollers, and results in a sharper, cleaner, and longer-lasting printed line. Noiseless in operation, the machine throws off no dust spray and may be used on any surface such as black top, macadam, concrete, asphalt, or wood. It allows the operator a clear view of the line at all times, thus eliminating the necessity of straddling the stripe. Manufactured by Universal Yonkers Corp.

435

Electrode designed for rebuilding parts

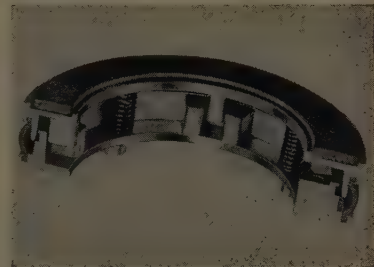
Stoody Build-Up is a new electrode developed to provide the exact properties necessary in a material used for rebuilding carbon steel and alloy steel parts—sound deposits, high tensile strength, toughness, and resistance to cold flowing. It is an extruded alloy-coated electrode designed to produce an alloy steel deposit of consistent

medium hardness of 29-31 Rockwell C under normal conditions. As an underbase it is generally recommended for such parts as drive sprockets, churn drills, shovel drive tumblers and house rolls, tractor rollers and idlers, tool joint shoulders, and clutch jaws. It has limited uses as a final overlay on equipment where impact is the principal wear factor—steel shafting, gears, and tractor rails. Deposits are machinable with high-speed tools. Manufactured by Stoody Co.

436

New grease seals won't leak or puncture

Grease seals for Caterpillar D-4, D-6, D-7, D-8, and International TD-24 tractors, which will not leak or puncture because of high-pressure

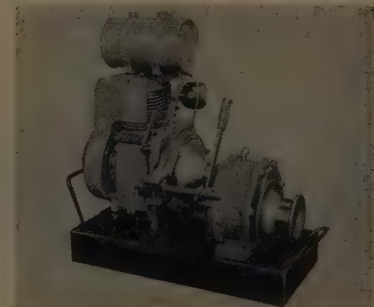


lubrication methods, have been developed by the Sure-Seal Equipment Co. Two neoprene rubber seals are used. Solid cast-metal sides with no holes or notches hold the lubricant in. Final Drive Bellows Seals for the D-7 and D-8 tractors, manufactured in the same general design, are also available.

437

Portable winch utilizes capstan-type drum

A lightweight, portable, gasoline-powered winch with a capstan-type drum for critical control of loads, called the Stampco Gypsiwinch, has



been announced by Stampco Products. The unit, designed as a multi-purpose hoist for fast, low-cost material handling on general construction sites, may be had with power engines ranging from ¾ to 7½ hp. Electrically-powered models are also available. In operation, the operator can

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skid the line by slacking off pressure while the capstan is rotating. Thus a heavy load may be taken up and stopped very slowly with no stress on rigging or equipment. Base dimensions range from 12 x 32 to 12 x 42 in.

431

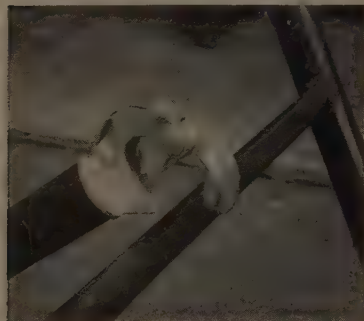
Here's a means for greater road safety

For greater highway construction safety, here is the Neo-Flasher Barricade Light Unit which will assure the contractor of dependable operation despite the worst weather conditions. It is a collapsible unit and conforms to meet all traffic control specifications. The light is mounted on the barricade and will operate up to 30 days before exhausting the battery. Outstanding features include elimination of fire hazard due to use of kerosene lamps, no replacement of bulbs and no maintenance. Claimed to pay for itself in 90 days of operation, the unit is manufactured by Light Products, Inc.

432

New scaffolding is mobile and easily erected

Quick and easy scaffold erection is made possible by use of Ladscaf, light-weight ladder type panels of welded steel construction. Ladscaf



clamps eliminate practically all bolting, lock horizontal panels and braces to upright members, and provide rigid scaffolding. Ladder rungs, spaced at 1-ft. intervals, place working platforms at efficient levels and permit installations on stairs and sloping floors. Assembled scaffolds, which can be mounted on adjustable bases or lockable casters, can be rolled to new locations. Stabilizers swivel back to permit passage through confined working spaces. Manufacturer is Universal Manufacturing Corp.

440

New water repellent protects masonry, water-based paints

Kemiko Aqua-tite, a new water repellent made of concentrated silicone material, reacts chemically with the water-soluble compounds in masonry to make them waterproof and protects against efflorescence and staining. Since it contains no wax, the

product can be oil-painted over and will protect the appearance and life of water-based paints if applied after they have been well set, the manufacturer says. Aqua-tite needs only one coat and is claimed to have a life expectancy up to 10 years. Manufactured by Rohloff & Co.

441

This drainer can be submerged without damaging motor

Completely sealed in by a stainless steel motor case, the Deming Co. Submersible Cellar Drainer, Fig. 4667, can be fully submerged without dam-



aging the $\frac{1}{3}$ -hp., 115-v., 60-cycle, 1,750-rpm., split-phase motor. The unit, which is 16 in. high and fits into an 11-in. diameter sump, ranges in capacity from 1,200 gal. per hr. against a 22-ft. head to 3,000 gal. per hr. against a 5-ft. head. The switch is fully automatic, starting the motor when the water level raises the motor case. Each unit, which can be used to drain boiler rooms, tunnels, elevator pits, and the like, has an 11-ft. cord and plug. Pipe connections are $\frac{1}{4}$ in.

442

Permanent size markings on Goodall's rubber boots

Contractors can keep their rubber boot sizes straight by using the Goodall Rubber Co. line, which features permanent size markings. This gets away from confusion and delay caused by fading of stamped-on figures after the boots are bulk cleaned or sterilized.

443

One-man air compressor weighs 1,280 lb.

A new 75-cfm., single-stage, gasoline powered portable air compressor, known as the Hornet "75," has been developed by the O. K. Clutch & Machinery Co. Weighing 1,280 lb., and

mounted on a three-wheel streamlined trailer with retractable pivot wheel, the compressor can be towed at high speed behind a passenger car. It uses a rebuilt 6-cylinder Chrysler engine which furnishes power from three cylinders and air compression from the other three. Tests have shown that the new model will handle a 45-lb. paving breaker, a 45-lb. rock drill, or any combination of two small tools such as backfill tampers, clay spades, or riveting guns. It is capable of being operated by one man.

444

Twin drums feature of new tamping roller

Twin drums with solid wedge-type feet feature the new Model 2D10-WS extra-heavy-duty tamping roller, announced by the Southwest Welding & Manufacturing Co. A tamping pres-

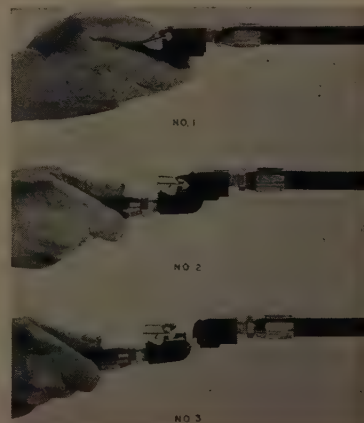


sure of 1,250 psi. is produced when the 5-ft.-diameter by 5-ft.-long drum is loaded with sand. Water ballast may be used for lighter pressures. The new model has an oscillating yoke which allows a full tamping effect on uneven ground.

445

Slide Seal Coupling permits full fluid flow

Instant connection and disconnection of fluid-carrying lines by means of a simple push-pull action have been made possible by development of the



Slide Seal Coupling, according to the manufacturer. The coupling consists of two 2-piece, die-cast aluminum assemblies with rubber "O" rings. A spring-actuated locking device holds each half of the coupling in a position which permits full flow of fluids. The

picture illustrates how lines may be disconnected: (1) Pressing the lock lever which separates the coupling halves by a fraction of an inch and automatically holds the lock open; (2) gripping the coupling halves or hose line, and (3) pulling lightly. Reconnection is easy and may be accomplished without actuating the lock lever. The couplings may be used with hydraulics, water, hot oil, crude and fuel oils, anti-freeze, gasoline, diesel fuels, air, or other fluids. They are applicable to engine test stands, drilling rigs, pneumatic gun charging systems, air tools, and others. Manufactured by Aeroquip Corp.

446

New ditcher features complete fluid coupling

A complete fluid coupling, a special curved-tooth bucket line, and a counterbalance valve are features of the new Runabout Ditcher, Model 705-B, announced by the Barber-Greene Co. The fluid coupling provides a hydraulic cushion to eliminate shock and permit full use of the engine horsepower to the digging job. If an obstruction presents too much resistance to the bucket line, the coupling slips and the line stops. The new curved-tooth bucket line remains sharp until worn to the point of discard and both ends are identical, so the tooth can be reversed when one

end is worn. This insures at least double the normal tooth life. The Runabout's digging range is 5½, 7½, and 10½ in. wide and extends to a maximum depth of 4 ft. The counterbalance valve maintains constant



crowding speed which stops "run-away" tendency when the machine is digging on a down-hill slope.

447

Portable generator develops power to operate electrical tools in the field

A new dual-voltage, 5-kw., portable generator, weighing 228 lb. complete with gasoline engine, has been developed by Homelite Corp. to provide power to operate such electrical equipment as saws, grinders, drills, routers, and tampers in the field. It can also be used to furnish lighting and power standby in case of emergencies. The generator, Model

32A115/230-1, will carry a continuous load of 5,000 watts at either 115 or 230 volts on 60-cycle alternating current. Driven by a Homelite Model 32 Gasoline Engine, with an adjustable jet-type pressure fuel system, the generator has moisture-resistant armature



and coils, pressure vapor oiling system, and all major castings are of aluminum alloy. Voltage regulation from no load to full load is approximately 4%. The armature is keyed directly to the one-piece, drop-forged engine crankshaft of the compact unit, which measures 29 in. long, 24½ in. wide, and 25½ in. high. It has adjustable handles for carrying by two or four men.

Continued on page 164



WELLMAN Williams Type

MORE YARDAGE PER DAY

● Elimination of excess materials and careful weight distribution permit rapid, rhythmic operation of Wellman Dragline Buckets. Operators can cover a wider digging radius with this streamlined bucket.

Built of special alloy steel, using strong welded design, Wellman buckets provide strength and stamina for long-term economy. Perforated designs also available. You'll do better with Wellman.

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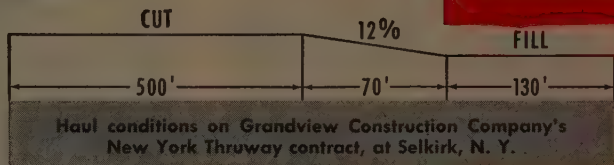
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Clyde Equipment Company, Seattle, Wash.

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LOAD—haul—spread—and return up a 12% grade—*51 times per hour!*

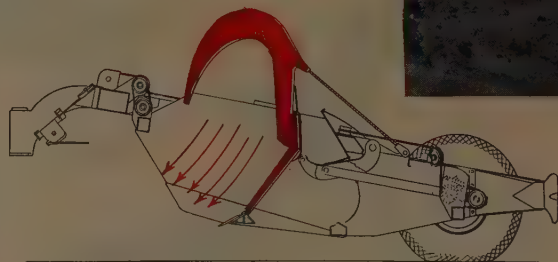
That's the record of the three Heiliners owned by Grandview Construction Company of Mt. Vernon, N. Y. Moving 1,400,000 cu. yds. of sand clay with a heavy water content, each Heiliner made 17 trips per hour—with an average cycle time of 2 min. 56 sec.

Here's the kind of fast-stepping Heiliner performance which makes earthmoving profitable. It's the kind of production that gives *you* the edge when bids are let.

Positive "TILTING FLOOR" EJECTION HELPS SLASH CYCLE TIME!

On Grandview's New York Thruway job, spread and turn time averaged 15.9 seconds . . . spreading heavy, sticky sand clay! It's proof positive that the Heiliner's positive "Tilting Floor" ejection helps cut cycle time to the bone.

Heil's exclusive "Tilting Floor" ejection is the simplest type of forced ejection known. The floor of bowl is



hinged back of the cutting blade. As the rear push-out ram is activated by the relatively low line pull, the floor simply tilts up to a maximum discharge angle of 75°. The load is forced out the wide front opening, while even the stickiest material is scoured from the sides and stationary back of the bowl. Material is dumped fast and clean . . . there's no extra yardage left in the bowl to cut down the size of your next load.



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power and speed of the rig. Heil's famous planetary drive, with full 4" gear faces on sun and planet gears, provides a low-torque drive for smoother, more positive power transmission to each wheel, and permits full utilization of engine horsepower.

Heiliners are designed from the ground up with many other features to keep up a profit-making pace on every job, shift after shift. Watch a Heiliner on the job, then ask your Heil distributor for complete details about every feature.

E-2

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Little Giant Shovel features smooth swing

With its main machinery deck rotating on 358 steel balls, the new Model S ½-yd. Little Giant Shovel



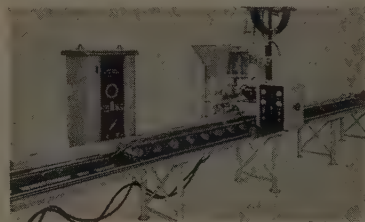
provides a fast, smooth, full 360-deg. swing. Other features include a twin dipper stick with powerful cable crowd; readily accessible cable crowd drum; quick-release, large internal band clutches; self-aligning, sealed cartridge-type bearings; cut steel drive gears, and all-welded steel car-

body, which eliminates excess weight. The Model S can be converted quickly to crane, pile driver, magnet, dragline, or trench hoe. Dumping radius is 21 ft., dumping height is 15 ft., 3 in., and digging depth below ground level is 3 ft., 6 in. Manufactured by Little Giant Crane & Shovel, Inc.

449

Automatic welder saves working time, material

Designed to replace by automatic procedure large numbers of welding operations previously done by hand is the new Rexarc Automatic Welder and Positioner, manufactured by the Sight Feed Generator Co. Outstanding features include provision for both high- and low-voltage welding,



a steady arc at all times, assured by high-frequency starting and stabilization, minimum stress and parent metal dilution by control over low arc voltage and amperage, and a remov-

able head which may be transferred from one positioner to another. Welding can be lineal or cross-bead on flat or circular shapes and either continuous or in sequence, as shown with the tractor tread in the picture. The rotating spindle is vertically adjustable to accommodate a large range of work sizes. Angular positioning is accomplished by a hydraulically-controlled elevating device. Supporting trunnions equipped with friction-bearing rolls are available for welding on long circular work.

450

Ejector extensions available for five Cat scraper models

Ejector extensions, designed to increase loading efficiency and decrease loading time, are now available for Caterpillar scrapers Nos. 15, 20, 21, 70, and 80. The extensions reduce spillage and lessen the chance of cable fouling. They should be particularly



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valuable when attached to scrapers working in moist, sticky soils that tend to peel up in slabs and break over the back of the ejector. The attached extensions will not hinder shovel or dragline loading. Manufactured by Caterpillar Tractor Co.

451
Jaw crusher weighs over 94,000 lb.
 An extra-large, 42 x 48-in. overhead eccentric jaw crusher has been added to the line of Pioneer Engineering Works, Inc. Weighing over 94,000 lb.,



it is equipped with SKF self-aligning roller bearings to conserve power and to reduce shaft strain. The crusher's manganese jaws, specially designed to reduce wedging resulting from cold flow and peening of metal, are of two-piece construction to facilitate handling. Adjustments permit an opening at the bottom of the jaws from 4 to 13 in. Other statistics are: crushing chamber exceeding 4 cu. yd.; 104-in. moving jaw; 90-in. stationary jaw; Pitman shaft length, 10 ft., 0 in., stroke 1¼ in., speed 250 rpm., and fly-wheel diameter 60 in., weight 4,060 lb.

452
Adjustable scaffolding prop designed for safety
 A completely encased adjusting screw and an inner steel tube free of any projections, designed to prevent possible injury to the operator, are features of the new adjustable scaffolding prop introduced by the Marvel Equipment Co. The new prop, available in four sizes with maximum adjustment to 15 ft., has a one-piece, straight crossbar for the adjusting bar and locking pin and is fastened with a chain and free-sliding ring to prevent loss. It also has an oversized base, head plates, and swivel action at the top to prevent binding.

453
Hydrojib drills blastholes, maintains own air supply
 The Hydrojib Pipeline Drilling Rig, a self-contained unit for drilling blastholes, carries two Joy 3½-in. rock drills on 6-ft., chain-type feeds mounted on 10-ft., hydraulically-actuated Joy Hydro Drill Jibs. Air receivers are built into the rig, which can be mounted on a used tractor. It maintains its own compressed air supply through a Joy WL-80 air com-

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THE GORMAN-RUPP COMPANY
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pressor, mounted on the rear of the tractor and driven through a power take-off. Manufactured by Joy Manufacturing Co.

#34

Single-wheel spreader cuts job costs

Maintenance costs are low on the new quick-action Model C material spreader made by Wausau Iron Works, since there are no gears,



nor more, or complicated mechanical parts to get out of order. The drive is by friction through an adjustable spring-loaded spinner disc against a pneumatic driving wheel. An adjustable cone in the hopper controls the material flow and the spinner disc rotation speed is controlled by adjusting the wheel position on the axle. The single-wheel construction is designed to prevent skidding or loss of spin-

ning power while rounding curves. The spreader, which weighs 212 lb., varies in width of spread from 8 to 24 ft. It can be attached to or removed from a truck by taking out one pin.

#55

Right-angle gear drive operates deep-well pumps

A new right-angle gear drive, universally adaptable to any pump, has been developed to operate deep-well pumps where electricity is not available or where gas, diesel, or gasoline engine power can be used more eco-



nomically. The drive, called the U. S. Holloshaft, will develop up to 70 hp., and larger sizes are to be added. It provides visual oil flow, easily-accessible thrust bearing, adjustable shaft, choice of two types of automatic, built-in backstops, and a large internal water cooling jacket. Tandem-mounted thrust bearings will give higher thrust ratings for extra deep pump settings. A reverse protection clutch prevents the pump shaft from becoming unscrewed in case of torque reversal. The picture shows a turbine pump operated by a U. S. Holloshaft gear drive and powered by a Chrysler engine with water pouring out at the rate of 1,050 gal. a min. Manufactured by U. S. Electrical Motors, Inc.

#66

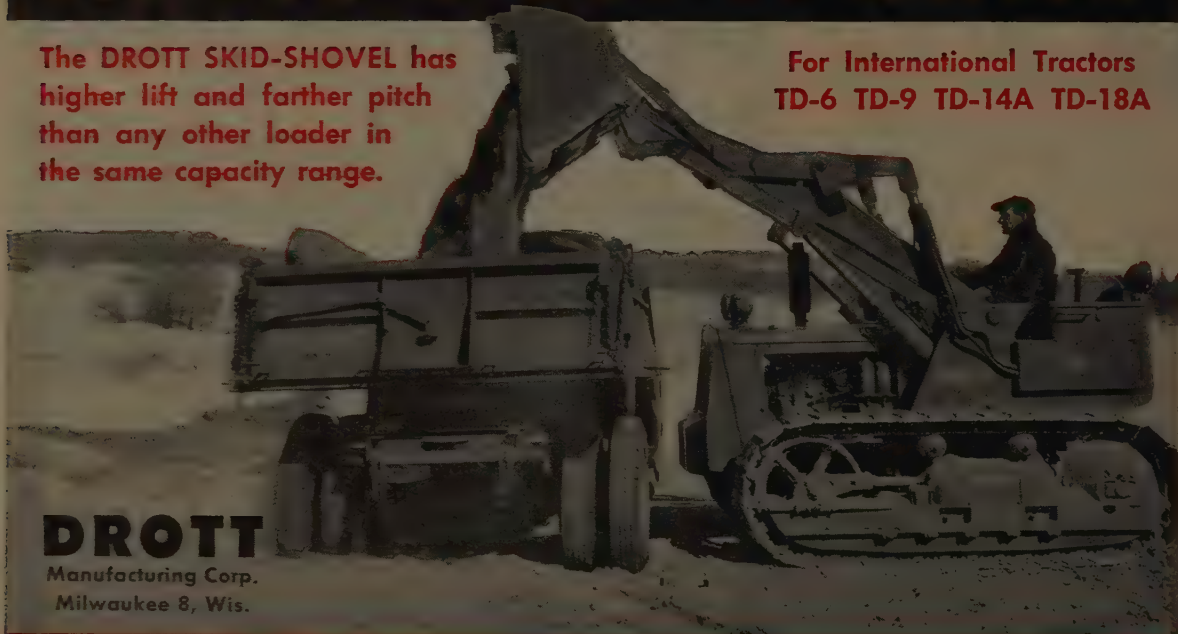
Lorain crane features larger crawler, new boom

An extra-long, extra-wide crawler and a two-piece, pin-connected boom are features of the new Lorain 45-ton Crawler Crane, 820-KS. The crawler is a two-speed, chain-drive type, 18 ft., 6 in. long and 14 ft., 2 in. wide with 48-in.-wide cast manganese steel tread shoes. Power from the diesel turntable is transmitted by a horizontal, independent travel shaft, which means that swing and travel operations may be used separately or together. A high-speed, double-threaded, worm-

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TD-6 TD-9 TD-14A TD-18A



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driven boom hoist with ratchet and pawl safety lock are incorporated in the crane. Also provided are a power-operated, tilting and folding type high gantry and a floating harness for reeving six-parts of boom hoist cable. Center sections in 10- and 20-ft. lengths are available to lengthen the boom to 100 ft. A feature of this new

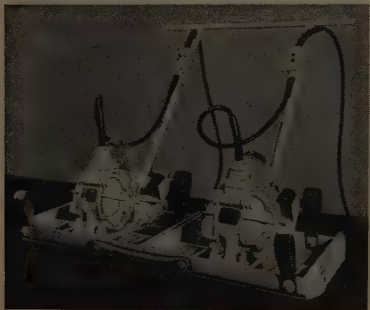


boom is the open-throat construction at the tip which allows hoist cables and hook block to clear the boom when operating at near vertical position. A three-sheave boom head for the main hoist lines and a whip-line sheave are provided. Manufactured by Thew Shovel Co.

457

Jackson compactors team up— one man does work of two

Manually-guided, self-propelling compactors are now available in teams of two-abreast and two-in-line, enabling one man to do the work of two on most jobs. The two-abreast



hookup is 4 ft. wide. In the two-in-line setup, the operator steers by pivoting the rear compactor. One pass of this double unit, the manufacturer says, should achieve specified densities. Contractors who already have two or more Jackson compactors may order attachments. Manufactured by Jackson Vibrators, Inc.

458

Non-corrosive plastic pipe now available

A complete line of plastic pipe based on high-impact styrene in sizes ranging from ½ to 6 in. o.d. with threaded fittings in sizes up to 2 in., is now available in 10- and 20-ft.

lengths. Known as Ampcolite, it has outstanding impact resistance and good resistance to a wide variety of corrosives, according to Atlas Mineral Products Co., the manufacturer.

459

Wisconsin Model VG4D engine develops 36 hp. peak rating

A peak rating of 36 hp. at 2,200 rpm. is developed by the new 4-cylinder, V-type, Model VG4D Wisconsin Heavy-Duty, Air-Cooled Engine. This engine, which has a 3½-in. bore, 4-in. stroke, and 154-cu. in. displacement, comes equipped with rotators of the positive type on the exhaust

values and a large fan cast in the fly-wheel, which forces a strong blast of air across and around the cylinders and heads, for efficient cooling. When specified, these engines may be equipped to operate on kerosene, fuel oil, or natural gas. Manufactured by Wisconsin Motor Corp.

460

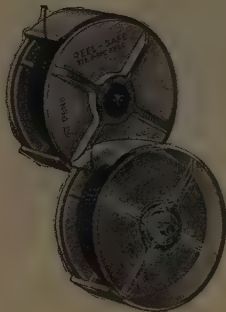
Lightweight masonry saw designed for portability

The Tak-A-Bout, an all-welded masonry saw built primarily of aircraft tubular steel, is offered in four new models, two with 14-in. and two with 12-in. blade capacity. One of

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THE COLORADO FUEL AND IRON CORPORATION, DENVER

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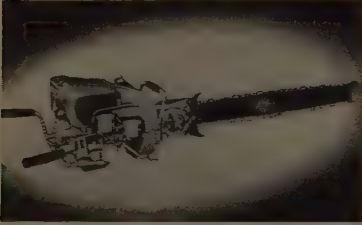
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each size is designed for wet and one for dry cutting. The larger blades are powered by a 1½-hp. motor, while the smaller run on a single-hp. plant. The lightweight (245 lb.) saws were designed for portability. Accessory wheels, permitting easy movement may be installed. Manufactured by Champion Manufacturing Co.

461

New power saw designed for all types of logging

Although basically designed for two-man use, the new Titan Series 100 power chain saw is adaptable for one-man operation. Powered by an



alternate-firing, twin-cylinder motor, the saw is designed for all types of logging. Special features include twin, counter-rotating, spur-gearred crankshafts to eliminate vibration and torque; a quick-detach transmission; automatic clutch; self-winding start-

er; completely shielded magneto; pressurized chain oiler; baffle-type mufflers; and turbo-type cooling fan. Cutting bars from 2 to 9 ft. long are available. A 360-deg. swivel permits the operator to cut from any angle. Manufactured by Titan Chain Saws, Inc.

462

All-aluminum conveyor reaches into inaccessible places

Built to reach into inaccessible places while carrying heavy loads of wet concrete, earth, sand, flue dust, cinders, and refuse, the Farnco SM



all-aluminum conveyor employs shock plates throughout its length. It has clean-outs at both head and tail ends, anti-friction roughing carriers, sealed-in bearings, and wheels at a balance point. The entire wheel assembly can be removed where it is necessary to extend the conveyor into small openings. Manufactured by Farnco Sales Co.

463

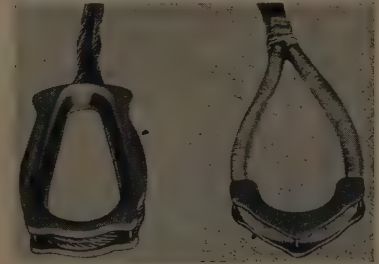
Volute design lowers cost of centrifugal pump care

Development of the Twin-Coaxial Volute for the Humdinger Centrifugal Pump has made maintenance easier and less expensive. By eliminating mechanical priming devices, the Humdinger is left with only two basic parts, the impeller and the seal, both easily accessible by removing the cover plate. The impeller, which is threaded on the shaft, may be locked in any desired position by the impeller adjustment screw. The Humdinger ranges in size from 1½ in., pumping 5,500 gal. per hr., to 10 in., pumping 250,000 gal. per hr. Choice of drives is offered from among gasoline, diesel, belt, and close- or long-coupled electric drives. Manufactured by Ralph B. Carter Co.

464

Reusable thimbles for wire rope slings

A new type of reusable thimble fitting, the Pin-Lock, is a special feature of the Red-Strand, a new 8-part braided sling introduced by A. Leschen & Sons Rope Co. Pin-Lock thimbles, reported to save sling users up to 20% or more, are attached by pins instead of conventional ham-



mered-down clamps, and are readily removable for reuse. On a sling made of ½-in. wire rope, 10 ft. long, it is claimed that reuse of two full thimbles produces a saving of 23.6%.

465

New undercarriage provides more Gradall maneuverability

A new undercarriage distributes the load in reference to the frame so that the entire unit is tip-proof without the need for outriggers on the



Warner & Swasey Co. Gradall, multi-purpose earthmover and construction machine. More maneuverability is provided by the 162-in. wheel base,

DAVEY

Super Chief

... the lightweight champion
with the heavy-duty work punch!



● Here, for the first time, is an economically-priced, light-weight compressor (1250 lbs.) that is designed for constant, heavy-duty service. ● Features include clutch between engine and compressor, full force feed lubrication, built-in unloader system, air receiver integral with frame . . . highest speed chassis and tow bar ever placed on a compressor. ● Like the famous bigger Daveys, the Super Chief has PERMANENT PEAK EFFICIENCY VALVES. These never carbon or foul. They guarantee the utmost in operating satisfaction, low cost operation and long compressor life. ● DAVEY COMPRESSOR CO. ● KENT, OHIO

DAVEY
Pioneers of Air-Cooled Air

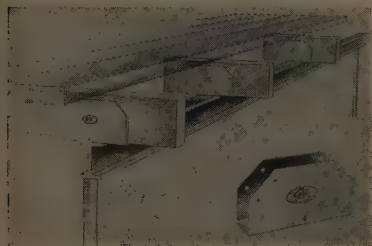
A-6598

10% shorter than previous models. The vehicle, which has a gross weight of 40,000 lb., has an extra-heavy frame made of 8- x 10-in. H-beam with a section modulus of 40 lb. A 427-cu. in. L-head engine develops 140 hp. at 2,800 rpm. Incorporated in the design are an oversize radiator, a 13-in. vibration-dampened clutch, Timken axles, and Bendix-Westinghouse air brakes.

466

Metal splicer speeds joist construction

A metal splicer and support for wood joists, made of heavy-gauge steel plate and formed and punched for use with 2 x 4-, 2 x 6-, 2 x 8-, 2 x 10-, and 2 x 12-in. joists, eliminates



need for specifying long joists at premium prices, eliminates lapping of short joists and speeds construction because joists can quickly and correctly be dropped from side to center and nailed after the splicers are placed on center beams. Manufactured by Gee Co.

467

Special socket for use on International trucks

A special socket has been designed to fit the propeller shaft pinion nut on International Truck Models L-110, L-120 and also some K-line models. This is a difficult job that cannot be done without a special thin-wall socket which will fit the inside diameter of the yoke. The new socket has a 1 1/4-in. 12-point opening and a 1/2-in. square drive to fit standard socket handles. Manufactured by Owatonna Tool Co.

468

Sealing compounds installation made easy

A new, easy-to-handle applicator for installing sealing compounds in joints and cracks in concrete and asphalt construction has been recently developed in answer to the need for satisfactory equipment for such construction and maintenance work, including airport runways and aprons and highways and streets. The device, designated Phillips No. 77 Joint Sealing Compound Applicator, has as its outstanding feature a conveniently located flow-control valve operating instantly and smoothly under all service pressures. A set of three Phillips nozzles is furnished with



For Record-Making Performance!

"INFERNO" Steam Hose

Pile driving at a record-making pace is an ordinary accomplishment with Goodall's "Inferno" Steam Hose . . . the Contractors' favorite for many years, for jobs involving *any* heavy duty steam work. Built to assure the utmost in reliability and safety, with high-temperature tube; multiple-braid steel wire carcass; and red wear- and weather-resistant synplastic cover. Sizes 1/2" to 3", inclusive, in maximum lengths of 50 feet.

Other Goodall products for Contractors include additional brands of steam hose; air, water, grout, jet and suction hose; conveyor, grader and muck-er belting; waterproof clothing and footwear.



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Est. 1870

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GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

Branches: Philadelphia • New York • Boston • Pittsburgh • Chicago • Detroit • St. Paul • Los Angeles • San Francisco • Seattle • Portland • Salt Lake City • Denver • Houston • Distributors in Other Principal Cities
Goodall Rubber Company of Canada, Ltd., Toronto.

each No. 77 Applicator, and others can be ordered. Manufacturer is Philips Products, Inc.

469

New power take-off has dual output capacity

Dual output capacity is the major advantage of a new Model K Brown-Lipe Power Take-off. The dual output capacity with two drive shafts permits operating separate units at different intervals, permitting the Model K to handle economically and with ease such simultaneous jobs as operating gasoline and fuel oil pumps, and winches and posthole diggers. By changing input gear only, the unit may be adapted to other transmissions. It is supplied for cable or lever control. Model K is for use with spur gear applications and its companion model KN is for helical gear use. Manufactured by Spicer Manufacturing Division of Dana Corp.

470

Continuous drilling possible with Hi-Twist

Hi-Twist is a new masonry drill which the manufacturer claims can be used for continuous drilling because of its ingenious dust-removing device. Dust removal is executed because of the construction of the drill's oval flutes, narrow lands and fast

spiral which carries dust up and away as fast as it forms. It can be used with any tool and is suitable for drilling not only masonry materials but copper, brass and other soft metals. It is constructed of a very tough alloy steel and has a carboloy tip which resists dulling. Sizes range from 11/64 to 1 in. for spiral-fluted drills and 1 1/8 to 1 1/2 in. for straight-fluted drills. Manufactured by Holub Industries, Inc.

471

Thew Shovel Co. addition—a 6-ton truck crane

Lorain TL-10 is a low-priced 6-ton truck crane which has recently been added to Thew Shovel Co.'s line of products. It is designed for light-duty crane work when mounted on a truck but it can also be mounted on piers, barges, trailers and elsewhere. The



TL-10 consists of a complete superstructure equipped as lifting crane which can also be used as a 3/8-yd. dragline or clamshell. It is a two-drum, gasoline-powered machine fully equipped with a 25-ft., 2-piece, butt-flange connected boom. Center sections can be had to extend the boom to 45 ft. Tagline for clamshell service, fairlead for dragline service, precision power boom lowering device and other extras are available also.

472

Non-toxic wood preservative on the market

Use of a non-toxic sealer now makes possible the preservation of dimensional control of raw lumber. The new product, Checkmate, is produced with a clear synthetic resin sealer and is particularly recommended to prevent shrinking and swelling of plywood, wood siding, and sash and doors. Manufactured by the Wilbur & Williams Co.

473

Electrode ovens available for welders

DryRod Electrode Ovens are now handled by General Electric Co.'s welding department. Available in 350- or 900-lb. capacities, use of these ovens is said to eliminate damaging

versatile
dependable

PREHY

construction equipment

PREHY CONCRETE GUN . . . safe, sturdy, compact . . . engineered for continuous operation . . . protected against clogging and damage from grit.



Superior construction, ease of operation, and adaptability to the pneumatic application of concrete and to sandblasting makes the Prehy Gun indispensable to all types of construction and maintenance . . . ideal for fireproofing, waterproofing, and the construction and repair of walls, bridges, tunnels, canals, culverts, and piles.

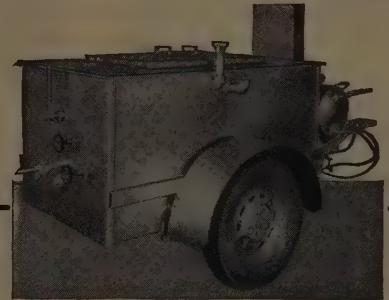


PREHY GROUTER . . . designed for Plastic, Fluid, and Inert grouting. Ideal for road stabilization, cast-in-place piles, correction foundations, solidification of fractured concrete and porous rock, and back anchorage of ledges to prevent rock slides.

Write today for further details about the Prehy Grouter and the Prehy Concrete Gun.

C. L. BALLARD

Successors to The Prehy Company, Inc.
420 Lexington Avenue, New York 17, N. Y.



White Oil Jacketed Kettles for Heating Elastic Joint Filler

Joint filling compounds containing rubber, for elasticity, must have indirect heat application. They melt at 375° and must not exceed 425°. White Model F-10 kettles maintain this temperature accurately by an oil jacket which transfers heat to the compound.

White kerosene burners are safe and dependable, easily controlled. Hand operated agitator. Insulated housing.

Other models for pavement maintenance have FIRE-PROOF tops. Hand or engine sprayers. Made in several sizes.

Write for Catalog

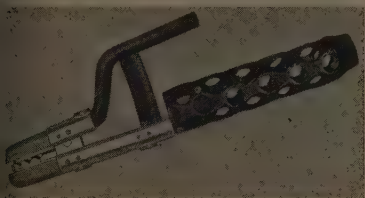
Elkhart 24 **White Mfg. Co.** Indiana

ffects of moisture pick-up by welding electrodes, assuring dry electrodes or better welds. Heat range is from 75 to 550 deg. Type 300 oven holds electrodes up to 18 in. long; type 900 can accommodate them up to 24 in. long. They are constructed of all-welded reinforced sheet metal to withstand rough shop use.

474

Insulated electrode holder wards off heat

Here's the Coolsong, a low-priced 40 amp. insulated electrode holder with several patented features designed to give longer service and cool



operation. It is claimed that in one field test, the holder remained cool enough to weld with bare hands when using 400-amp. current.

The jaws will handle electrodes from 1/8 to 5/16 in. in size and have a wide opening to permit fast release of stubs. Current carrying frame parts are made of pure copper for high conductivity and are reinforced with steel to increase rigidity and strength. The holder is said to be light, perfectly balanced, completely insulated and will not break when dropped or otherwise abused. Manufactured by Lincoln Electric Co.

475

Galion motor graders adopt G.M. diesel engines

Galion motor graders Models 104 and 118 are now available with General Motors 2-cycle diesel engines. The Model 104 grader will use a GM 3-71 engine, rated at 85 hp., and the Model 118 will use a 4-71 diesel, rated



at 104 hp. Advantages listed by using the new motors include more horsepower than was previously available and the possibility of interchanging moving parts, since most moving parts from 3-71 and 4-71 GM diesels are interchangeable with other 2-, 3-, 4-, or 6-cylinder Series 71 diesels, which have uniform bores and strokes. Manufactured by Galion Iron Works & Manufacturing Co.

ANOTHER *ESCO* MONEY SAVER!

The new UNIVERSAL SCARIFIER

FITS ALL GRADERS

Reduce your SCARIFIER Stock

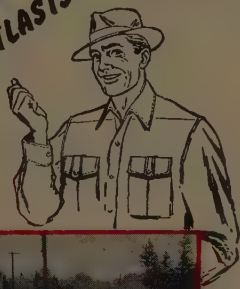
WITH ESCO'S NEW UNIVERSAL SCARIFIER

THE 24 DIFFERENT MODELS OF THE TWO MAJOR GRADERS NOW IN USE! YOU SAVE ON TRANSPORTATION AND INVENTORY BECAUSE YOU NEED ONLY ONE ESCO SCARIFIER TO FIT ALL YOUR GRADERS. WRITE FOR FULL INFORMATION.

The tougher the job gets, the tighter the scarifier point grips the shank in this specially designed groove. Point* and shank are long-wearing ESCO high-alloy steel.

*Pat. No. 2,222,071

IT OUTLASTS THEM ALL!



Fits 'em All



Digs Deeper...Lasts Longer

REPRESENTATIVES IN ALL MAJOR CITIES

ESCO

Offices and Warehouses: Honolulu, Hawaii; Houston, Texas; New York, New York; Los Angeles, San Francisco, California; Seattle, Spokane, Washington; Centralia, Pennsylvania; Eugene, Medford, Oregon; Salt Lake City, Utah. In Canada: Vancouver, B. C., and Toronto, Ontario.

ELECTRIC STEEL FOUNDRY CO.

2163 N. W. 25TH AVE., PORTLAND 10, ORE.

712 PORTER ST., DANVILLE, ILL.

DISTRIBUTORS AND FACTORY BRANCHES

GE forms Seattle credit district

Elmer G. Foster, manager of the General Electric Credit Corp. Seattle office, has been appointed manager of the newly-formed Seattle district. The new district, to cover the corporation's activities in the Pacific Northwest, including local offices in Seattle, Tacoma, Portland, and Salt Lake City, and with representatives in Spokane, Wash., Eugene, Ore., Butte, Mont., and Boise, Idaho, was formed to meet the rapid economic growth of the Pacific Northwest, according to L. E. Scott, vice president and Western regional manager. A Tacoma, Wash., office was established in March with Bruce Forslund, the corporation's Tacoma representative, as manager.

Empire changes told

C. L. (Swede) Cummings, manager of the Empire Machinery Co., Arlington, Ore., store, has been appointed industrial sales representative with headquarters at the Pendleton store. E. R. (Dutch) Strahm, formerly industrial sales representative at large, has replaced Cummings as manager of the Arlington store.

Koehring appoints new distributor

The Koehring Co. has delegated coverage of the Northern California territory, formerly handled by the Koehring Co. West Coast Sales Division at Stockton, to the Standard Machinery Co. of San Francisco. Standard also will handle the sale of Parsons products.

Tubesales appoints agent

William C. Tagmyer, formerly manager of tubular sales with Taylor & Spotswood Co., has been named sole Northern California agent for Tubesales. Tagmyer's organization, with offices in San Francisco, will



NEW TACOMA SHOP and office of the John W. Stang Corp., which specializes in the wellpoint dewatering method for construction jobs, is shown. Personnel of the new branch include **Ed Traum**, district manager, and **J. D. Switzer**, office manager from the Bell, Calif., office, and **Louis Landburg**, shop superintendent, **Jack Paugh** supervisor, and **Charles Hester**, yard foreman, all from the Omaha office. Traum will cover Washington, Idaho, Oregon, Montana, Alaska, Alberta, and B. C.

handle steel pipe and tubing in carbon, alloy, and stainless grades.

ESCO opens new branch

Electric Steel Foundry Co. of Portland has opened a new branch office in Salt Lake City with Garland T. Allen, an ESCO representative for 11 years, as manager of sales. The new office is designed for more "close-to-home" coverage of the Utah, Colorado, southeastern Idaho, and southwestern Wyoming intermountain territory.

Gearhart ends 43 years' service

Samuel G. Gearhart, manager of the Industrial Division, General Electric Co., San Francisco office, has retired after 43 years' service. He had been with the company's Northern California activities since 1912, receiving his most recent appointment in 1948. His future plans may include acting as a consultant in the electric field, he said.

GE names Pacific Northwest advertising manager

Marvin O. Christman, a General Electric Co. advertising and sales promotion executive at Schenectady and Boston, has been named manager of advertising and sales promotion for

GE's Pacific Northwest Apparatus District with headquarters in Seattle. His territory includes all of Washington and Alaska and parts of Oregon, Idaho, and Montana.

Western office for Wood Conversion Co.

The Wood Conversion Co., St. Paul, Minn., a Weyerhaeuser affiliate has opened a new sales office in San Francisco, with J. N. Godley, Sr., Western district manager, at the helm. This new office follows expansion of the company's Western sales in recent years. Wood Conversion Co. has manufactured soft insulation and board products, including Nu-Wood board, Balsam-Wool insulation, Tufflex Siding Underliner and Sill Sealer, for over 30 years.

Welding supply business opens

Robert and Norman Balaam have started a welding supply business featuring route delivery of supplies and consultation on welding problems in Emeryville, Calif. Their firm will be known as Balaam Brothers. Robert Balaam was formerly with the California Welding Supply Co. of Stockton and the Linde Air Products Co. in San Francisco, Los Angeles, and San Diego. Norman Balaam spent 11

SALE NUMBER ONE in Interstate Tractor and Equipment Co.'s new branch store (right) at Coquille, Ore., is made by Manager **Harry Sanford** (left) to **Brownie Coldiron**, who tries out the controls of his new Caterpillar D-8 Diesel Crawler. The new store provides complete parts and mechanical service for owners of Caterpillar diesel tractors, engines, and roadbuilding machinery, Skagit loading hoists, Trackson shovel loaders, Hyster tractor equipment, Young rigging, and U. S. Steel wire rope.



ars with the Kaiser Steel Corp. Before that he was with the U. S. Steel Corp. and the Standard Oil Company of California.

Independent Pneumatic Tool Co. appointment

Ralph (Buck) Beamer has been named industrial service engineer for the greater Seattle area by the Independent Pneumatic Tool Co.



Ralph (Buck) Beamer,
industrial service
engineer for
Seattle area,
Independent
Pneumatic Tool
Co.

endent Pneumatic Tool Co., according to E. L. Swart, manager of the Seattle branch.

Kyle to distribute Rippolite

Kyle and Co., which has warehouses in Fresno, Stockton, and Sacramento, has been designated Northern California distributor of Rippolite, a plastic, translucent, corrugated structural panel, by Alexander H. Kerr and Co., the manufacturer.

Hyster district manager

James Oliver has been appointed district manager in the Pacific Northwest for the Hyster Co. with headquarters at Portland.



James Oliver,
Hyster Co.
manager in
Pacific Northwest

quarters at Portland. His territory will include Washington, Oregon, Idaho, Alaska, Western Canada, and part of Northern California.

Cat promotion

Caterpillar Tractor Co. announces the promotion of Donald F. Coonan to the position of earthmoving engineer to work with distributors throughout the West. Coonan, formerly a district representative in Sacramento, succeeds W. G. Bloxham with headquarters at San Leandro, Calif.

Harnischfeger promotion

George A. Schmus, traffic manager since 1937 and a company employee for nearly 25 years, has been promoted to manager of the parts and service department of Harnischfeger Corp. His new duties will be to supervise and correlate activities of the two departments.

Cummins enlarges service area in Salt Lake City

A 75 x 80-ft. addition has been completed in the Cummins Intermountain Diesel Sales Co. service shop in Salt Lake City, making a total service area of more than 18,000 sq. ft. Eleven 14-ft.-high doors provide easy access to the shop, according to Manager Warren E. Pugh.

U. S. Spring and Bumper appoints Rauen

J. N. Rauen, manager of the United States Spring and Bumper Co. Brake Division at Santa Clara since 1951, has been appointed manager of the com-

pany's service division in Los Angeles. Rauen was chief of overseas traffic movement with the Air Force during World War II.

Knapp Industrial Service Co. announcement

Dan Baldwin, Jr., formerly with the Quincy Lumber Co., is now representing the Knapp Industrial Service Co. of Sacramento as a sales engineer in the Sacramento area. Other Knapp men in the territory are Walter Karr, working out of Oroville; George Thomas, Reno; and Hugo Tiemann, a salesman who recently became service manager. The firm has installed a

SPECIFY

*** DAREX AEA**

—the only catalyzed air entraining agent

IT DOES A BETTER JOB FOR LESS

specifically formulated for making air entrained concrete!

MASSIVE McNARY DAM OFFERS PROOF. The toughest job to pour and place is one like the great McNary Dam and power house on the Columbia River with its multiple, intricate forms, heavily reinforced. With low slump concrete, workability is a major problem. After months of comparative tests DAREX AEA was chosen for McNary Dam because of its low cost and outstanding uniformity not only at the mixer but at the point of placement where "controlled air" workability pays off.

DAREX AEA is the only catalyzed Air Entraining Agent specifically formulated to do your job . . . world's leading and most efficient Air Entraining Agent!

SEND TODAY for Information on DAREX AEA DISPENSERS and PRESS-UR-METER (FOR TESTING CONCRETE) Folder.

Specify

DAREX AEA

it does a better job for less!

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

CHARLES R. WATTS & CO.

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Darex AEA Distributors for Dewey & Almy Chemical Co. in 11 Western States, Alaska and Hawaiian Islands.
• T. M. Reg. U. S. Pat. Off.

complete on-the-job service for industrial lift trucks.

Sales rep. for Kellogg-American

L. D. Bax has been appointed sales representative for Montana, Idaho, Wyoming, Utah, Colorado, Arizona, New Mexico, and part of Nevada and Texas by the Kellogg Division of the American Brake Shoe Co., which manufactures air compressors and paint spray equipment. His headquarters will be at Denver.

Westinghouse names regional rep.

G. Burnett Mason was appointed Northern California supervisor for the Westinghouse agency and construction department last month. He will guide the sale of electrical apparatus through distributors and agents. Mason joined Westinghouse in 1946 and has been a panelboard application engineer since 1948.

U. S. Rubber personnel changes

Richard M. Payson, manager of farm market sales for the United States Rubber Co., has been appointed district manager of the company's San Francisco branch. He replaced John F. Arthur, who went to Rockefeller Center, N. Y., as manager of U. S. truck tire sales. At the same time, John W. Carpenter, formerly district manager of the Fisk-Gillette Division in New York, became district manager of the Denver branch.

New Southwest rep. for Riddell

Colorado and New Mexico will be among the southwestern states to be covered by Andrew Winters, newly-named factory representative of the W. A. Riddell Corp., Bucyrus, Ohio. Winters, formerly a dealer salesman of all types of construction machinery, will make his headquarters in Dallas, Tex.

Caterpillar names new sales representative

Wayne L. Krieger, who joined the Caterpillar Tractor Co. as a trainee in 1949, has been named sales represent-

W. L. Krieger,
new sales
representative
in the
Western Division,
Caterpillar
Tractor Co.



ative in the company's Western Division, according to B. L. Hagglund, Western sales manager. Krieger will work with California Caterpillar dealers in Napa, Eureka, Rio Vista, Marysville, Chico, Colusa, Petaluma, and Sacramento from his Sacramento headquarters.

Mullin to handle new territory

G. W. Mullin, a member of the Los Angeles Alemite distributorship Stewart-Warner Corp., for the last two years, has joined the factory sales organization as a national account representative. A veteran of 20 years in the automotive lubrication equipment field, Mullin will handle sales in a newly set up territory covering several south-western states.

New G. E. warehouse started in Portland

Construction has started on a new half-million-dollar service shop and warehouse for the General Electric Co. at Portland, according to J. F. Murphy, district apparatus manager, and J. F. Gogins, Portland manager of the company's Apparatus Division. The new facilities, to be complete around June 30, 1953, will cover more than 44,000 sq. ft.

Herron goes to South Africa

B. J. Herron, manager of the Los Angeles branch of the Independent Pneumatic Tool Co. for the last 2 years, has taken on a special sales development project in Johannesburg, South Africa. W. J. Laughlin, who had been in charge of the company's New Orleans operations, will replace Herron during his absence.

NEWS of MANUFACTURERS

Thor products and name now the same

After manufacturing Thor power tools for 60 years under the name of the Independent Pneumatic Tool Co., the stockholders voted to change the firm's name to the Thor Power Tool Co., effective March 17. Utilizing the trade name Thor, which has identified all of the firm's power tools since 1893, will eliminate confusion and make recognition of the company's products easier.

New sales mgr. for Master Vibrator Co.

Robert H. McCormick, new sales manager, will be responsible for all sales and will personally contact distributors to keep them posted with the latest developments in products manufactured by Master Vibrator Co., Dayton and Miamisburg, Ohio. The firm manufactures generators, concrete vibratory and finishing equipment, electric hammers, spades and tampers, and space heaters.

Barco moves to suburbs

Barco Manufacturing Co. is moving its manufacturing and business operations from Chicago to its new 103,000-sq. ft. plant at Barrington, Ill., according to F. N. Bard, president. Barco has recently broadened its line



Coffing Safety Pull Ratchet Lever Hoists. 10 roller chain models, $\frac{3}{4}$ to 15 tons. 2 coil chain models, $\frac{3}{4}$ and $1\frac{1}{2}$ tons



Quick-Lift Electric Hoists
Hoist-Alls • Mighty-Midget
Pullers • Spur-Geared
Hoists • Differential Chain
Hoists • Load Binders
I-Beam Trolleys

you play it
SAFE
with
Safety-Pulls

Just as important as the time and labor-saving advantages of Coffing Safety-Pull Ratchet Lever Hoists, is the way each one protects your men from injury, your equipment from damage.

Here's why:

Only the finest steel is selected for each part.

Hooks will not break or straighten out.

Dual ratchet and pawl will not slip — even if handle is accidentally released.

Handle will bend before any other part is overloaded beyond safe limits.

Every Safety-Pull is tested at 100 percent overload.

Write for Bulletin WC 4SP — and the name of your nearest distributor. Make use of his broad experience and complete service facilities.

COFFING HOIST COMPANY
Danville, Illinois

include portable gasoline soil tampers and gasoline-powered hammers.

Lincoln Engineering Co. changes

T. V. Picraux, Lincoln Engineering Co. of St. Louis Industrial Division sales manager, has been made production manager of both the company's plants. He was replaced by Albert J. Gruenewald, a sales engineer. The company manufactures lubricant application equipment.

Rosco new president

Rosco Manufacturing Co., Minneapolis, Minn., announces the election of J. A. (Jack) Miller as its president, replacing Thorman W. Rosholt, who recently retired. The firm manufactures bituminous road and street construction and maintenance equipment as well as street flushers.

Kallmeyer joins Standard Steel

Walter J. Kallmeyer, formerly works manager for Blaw-Knox Co., has been appointed chief engineer for the Standard Steel Corp. of Los Angeles.

Madsen promotion

Glenn F. Worthington has been appointed sales manager of Madsen Iron Works, Inc., Huntington Park, Calif., as part of an expanded sales program for Madsen Asphalt Paving

Plants. Worthington, who joined the sales staff in 1945, was formerly associated with the California Well Dehydrating Co., handling field problems and equipment installation.

Hough Co. promotes Tamblyn

G. A. Tamblyn, assistant sales manager of the Frank G. Hough Co. of Libertyville, Ill., since 1948, has been

G. A. Tamblyn,
new sales
manager,
Frank G. Hough
Co.



appointed sales manager. He will handle sales of the company's Payloader tractor-shovels and tractors.

Bollman assumes new post

Henry E. Bollman, director of the Rocky Mountain Region, Structural Clay Products Institute, has been named executive director of the organization, a national association of brick and tile manufacturers. Bollman will coordinate the activities of the Institute and its 17 regional affiliates throughout the country from his of-

fices in Washington, D. C. He will also work on programs of research, new product development, promotion, and engineering for the brick and tile industry. His position was created after a six-month survey of the industry by a management consultant firm had revealed the need for such a post.

Allis-Chalmers enlarges scraper line

Allis-Chalmers industrial tractor dealers now offer four-wheel scrapers in seven models, with struck capacities ranging from 2 to 18 cu. yd., the company said. They were made available by the integration of four former LaPlant-Choate (*Western Construction*—November 1952, p. 132) models with three made by Gar Wood.

Nelson appoints sales manager

R. E. Vadnais, manager of the Nelson Equipment Co. of Seattle, announces the appointment of Al Bruschke as sales manager. Bruschke has been with the firm for several years.

U. S. Steel promotes Mattos

John E. Mattos, resident technical field representative at Stockton since 1948, has been appointed manager of Heavy Products Sales by the Columbia-Geneva Steel Division, United States Steel Corp. Mattos, a native

drills **6** inches of concrete per minute

...gives lowest cost per foot of concrete drilled with a

tilden

ROTARY KONGRETE KORE DRILL

Patented core slot expels cuttings automatically

U. S. Pat. No. Re. 23532

Drill straight, clean, ready-to-use holes at speeds up to 6 inches per minute—even through steel reinforced concrete.

TILDEN Rotary Kongrete Kore Drills can be used with ordinary electric or air drill. Free factory sharpening and repair service still available in all Standard TILDEN Drills from 3/16" to 8 inch diameters. Interchangeable shanks for any depth hole.

TILDEN TOOL Manufacturing Company
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WRITE TODAY for free, illustrated catalog.

WORKING "ROUND THE CLOCK"

BARNES' BIG SELF-PRIMING CENTRIFUGALS AID DALLAS WATER SHORTAGE

Faced with the most critical water shortage in years, Dallas, Texas, last fall, reached for all available water in the area. One of the sources tapped for this critically needed water was Willow Lake, about fifteen miles from Dallas. Here, two Barnes 90M Self-Priming Centrifugal Pumps worked 24 hours a day — day in and day out — pumping the lake into the Trinity River where it then flowed to the Bachman filtration plant at Dallas. Even as Dallas was kept in water during this trying period, if it's water that is wanted or water that is not wanted, remember a Barnes Pump will move more of it — faster, steadier, and cheaper. Capacities from 480 to 120,000 G. P. H. Pressures up to 600 ft. or 260 P. S. I.

Distributors:

Central Equipment Co., Berkeley, Calif.
P. L. Cooks Co., Portland, Oregon
R. L. Harrison Co., Inc., Albuquerque, New Mexico
The C. H. Jones Equipment Co., Salt Lake City, Utah
Lee & Thatro Equipment Co., Los Angeles, Calif.
H. W. Moore Equipment Co., Denver, Colorado
The Rix Company, Inc., San Francisco, Calif.
Universal Equipment Company, Seattle, Wash.

BARNES MANUFACTURING CO., Mansfield, Ohio; Oakland 21, Calif.

Californian, will be responsible for planning the distribution and merchandising of the Division's heavy-rolled products throughout the 11 Western states.

Mack Truck promotion

K. L. Fitts has been promoted to manager of off-highway truck sales for the Mack Motor Truck Corp. to replace the recently retired P. J. Fleming. His headquarters will be in New York City.

Soulé Steel promotions

E. B. McClure, general sales manager of Soulé Steel Co., has been advanced to assistant to the president. His headquarters will remain in Los Angeles. McClure's old position will be filled by George L. Cobb, assistant



George L. Cobb,
general sales
manager,
Soulé Steel Co.

general sales manager since 1950, who will direct sales in Seattle, Portland, Los Angeles, and San Francisco from his San Francisco home office. His spot, in turn, will be filled by Craig C. Carpenter, transferred from the Washington, D. C., Eastern District Office.

Caterpillar reassignment

R. E. Mayo, supervisor of the Caterpillar Tractor Co. field research division, western section, San Leandro, Calif., has been appointed staff engineer of the research department at the company's Peoria, Ill., plant. Mayo, a Caterpillar man since 1930, has been a research assistant, a service engineer, and a service manager.

Charles T. Hvass dies

Charles T. Hvass, 63, vice president of E. D. Etnyre and Co., Oregon, Ill., died in January after a brief illness. He was an active participant in the American Road Builders' Association,

served on the Advisory Committee for the Construction Machinery Division of the War Production Board during World War II, and worked on road construction all over the world.

Ray Bauen killed in auto crash

Ray Bauen, 52, vice president and general manager of United States Spring & Bumper Co., was killed in an automobile accident February 6 in Los Angeles. He was employed by the Wooster Construction Co. of Los Angeles until 1930, when he joined his brother, John, president of U. S. Spring.

U. S. Steel promotes Male

Milton Male, director of housing research in the U. S. Steel Corp. Research and Technology Division since 1946, has been appointed manager of the Building and Construction Industries Section of the Commercial Department. His new assignment will include responsibility for coordinating and assisting the technical activities of the corporation's housing subsidiary, Gunnison Homes, Inc.

Chain Belt Co. announcement

Luther H. Bosnian, a Chain Belt Co. employee since 1919, has been appointed vice president in charge of manufacturing facilities, and Bernhard G. Schneider, manager of engineering services since 1951, was named to the newly-created post of assistant chief engineer in the company's Conveyor Equipment Section.

Steel co. names works engineer

T. F. Boyle, assistant to the district engineer at the Alameda Works of Bethlehem Pacific's Fabricated Steel Construction Division, has been appointed works engineer. Boyle has been handling all phases of estimating and structural engineering at the Alameda Works since 1933.

Baker-Lull lists new officers

Gilbert C. Strege has been appointed president of the Baker-Lull Corp., Minneapolis manufacturer of construction and materials handling equipment. Other new officers are Patrick Lamb and Harry Conklin, vice presidents, and LeGrand H. Lull,

G. B. Davis, John A. Matousek, C. M. Sumwalt, and A. C. Smith, director. Baker-Lull is a newly-acquired subsidiary of the Baker-Raulang Co. of Cleveland, which produces industrial lift trucks, cranes, and tractors.

Mack Mfg. Corp. names new vice president

W. Denis Kendall, executive vice president of Brunswick Ordnance Corp., became vice president of Mack Manufacturing Corp. in January. He is responsible for all manufacturing at all Mack plants.

Amsco promotes two

Gilfry Ward and Joseph L. Muller have been appointed president and first vice president respectively of the American Manganese Steel Division of the American Brake Shoe Co.

New Whiteman Mfg. Co. plant

Whiteman Manufacturing Co. of Los Angeles has completed a new plant, bringing its manufacturing area to 54,000 sq. ft. The company, which claims a 2,250% growth since its founding in 1941, makes power concrete finishing machines, concrete screening machines, and power buggies.

Kenworth promotion

R. D. O'Brien, Kenworth Motor Truck Corp., Seattle, sales manager, became vice president in charge of sales in January to replace Vernon A. Smith, who retired after 30 years service with the company. Smith will continue his services to the company on a consulting basis.

Sales manager for Wellman Engineering

Fred B. Shew, district manager of the New York Office for the Wellman Engineering Co., has been named sales manager of the Bucket Department.



Fred B. Shew,
Bucket
Department
sales manager,
Wellman
Engineering Co.

MARVEL

CONCRETE VIBRATORS

1 1/2 H.P. to 5 H.P.

The standard with contractors for many years.

GV-1, GV-2, & GV-3 MODELS NOW
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CENTRIFUGAL CLUTCH AS STANDARD
EQUIPMENT

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MARVEL EQUIPMENT CORPORATION
215-217 EAGLE STREET BROOKLYN 22, N. Y.



ment with headquarters at Cleveland. He will supervise the national distribution of the line of Williams clamshell and dragline buckets, log and stone grabs.

Four Wheel Drive Auto Co. promotion

G. F. DeCoursin has been moved up from field sales manager to general sales manager of the Four Wheel Drive Auto Co., Clintonville, Wis. He has been associated with the company since 1936 and was promoted to his former position in 1950.

troit Diesel appointments

Ernest F. Bentley has been appointed general sales manager of the Detroit Diesel Engine Division of General Motors to fill the gap caused by the death of V. C. Genn. Louis A. Steele has been named industrial sales manager.

Struve to head CISPI

J. W. Struve of Los Angeles, president of Rich Manufacturing Co., was elected 1953 president of the Cast Iron Pipe Institute. Other new officers are Frank Hamilton, vice president, James W. Hallman, treasurer, and Charles Hamilton and William C. Bird, executive committee members.

Concrete Assn. elects new chairman

Otis H. Manchester, Jr., secretary-treasurer of the Concrete Transport Mixer Co. of St. Louis, was elected chairman of the Truck Mixer Manufacturers' Bureau of the National Ready Mixed Concrete Association in 1953, succeeding K. W. Horsman.

Baldwin-Lima-Hamilton changes

W. M. Huston, formerly chief engineer of shovels and cranes, is now manager of engineering of LIMA shovels, cranes and crushers for the Lima Division of Baldwin-Lima-Hamilton Corp. He is succeeded by G. Halby in the shovel and crane engineering department.

Trailmobile announcement

Trailmobile, Inc., announces the appointment of Walter Hasenzahl, as general manager of manufacturing, following the resignation of E. Biggs, formerly vice president in charge of manufacturing.

1953 Solar Ephemeris now available

THE 1953 EDITION of "Solar Ephemeris and Polaris Tables," published by C. L. Berger & Sons, Inc., Boston, manufacturers of engineering and surveying instruments, is now available.

The 132-page booklet contains complete instructions, in English and Spanish, for determining azimuths from the sun and the altitude of Polaris, prepared by Herman J. Shea, associate professor of surveying, Massachusetts Institute of Technology.

Directions for making astronomical observations and computing results by direct solar observation and time from same observation; meridian by Polar attachment; meridian by Polaris elongation; azimuth by Polaris at any hour angle; latitude by sun at noon, and latitude by Polaris are included, as well as all requisite tables. A limited quantity of the Solar Ephemeris is available from Berger at 50 cents per copy to cover handling and mailing.

Handy labor calculator aids contractors

HERE'S an estimating system, in one handy book, especially prepared for men in the building business. Once the system is mastered, the book—"Building Labor Calculator"—makes it possible to estimate the cost of building apartment houses, stores, factories, schools, churches, residences, etc.

The system is based on material quantities and man-hours, not dollars and cents. The subject is treated in the every day language of the man on the job. Tables of material units and labor used in the text are arranged for speedy calculation, carrying correct allowance for waste in materials and giving the man-hours required to do the job based on average efficiency.

The book contains 200 pages and about an equal number of tables giving at a glance the necessary information and factors required to make estimating a simple matter of multiplication. For example, to figure the cost of excavating 100 cu. yd. of ordinary earth, an appropriate table tells us that it would require 1.75 man-hours per cubic yard. At a wage scale of \$2.00 per hour, the cost per cubic yard would be $1.75 \times \$2.00$ or \$3.50. Therefore 100 cu. yd. @ \$3.50 per yard will cost \$350.00. Every phase of building jobs is covered by the system—from excavation and foundations to furring, painting and marble work.

Author of the book and founder of the system, Gordon M. Tamblin, has 40 years of building experience, and has been developing and improving his system for many years.

For more information, write Tamblin System, P. O. Box 1465, Denver 1, Colorado.

Defense Department sets uniform standards

UNIFORM STANDARDS for the selection and payment of architectural and engineering firms for professional services to Army, Navy and Air Force construction agencies have been approved by the Munitions Board, the Department of Defense announces.

The standards, which apply to the Army Corps of Engineers, the Navy's Bureau of Yards and Docks, and the Director of Installations of the Air Force, were developed in collaboration with representatives of national architectural and engineering organizations.

Kinds of work, for which such professional services are required, include the preparation of plans and specifications for public works and similar technical matters such as master planning, engineering studies, and investigations.

Selection will be based on a review of qualified firms.

**IT GOES
WHERE THE
JOB GOES!**



*Mounts
Anywhere!*



McDonald KANISTER KIT

You couldn't ask for a more permanent, dependable first aid kit than this proved favorite! Weatherproof plastic roll-up is sturdy, lasts for years. But that doesn't mean it has to stay put—its simplified mounting bracket means quick installation in trucks, even on trees or posts for outdoor use! It's the easy way to keep first aid available—when-ever, wherever needed!

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AND PRICES**

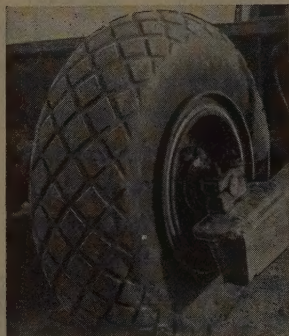


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heavy equipment

Airplane tires are made of real rubber, exceptionally strong for stress and impact; more serviceable because of flotation effectiveness, more rugged construction and LOWER INITIAL COST.

World's Largest Stock

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**TIRES, TUBES, WHEELS,
SPINDLES AND AXLES**

HELP WANTED

CHIEF ENGINEER

FOR COUNTY FLOOD CONTROL AND WATER
CONSERVATION DISTRICT

SALARY \$7800 PER YEAR

Minimum qualifications: either (1) graduation from a college with major in civil engineering and ten years experience, six years of which in flood control and water supply engineering work, or (2) some equivalent combination of education and experience.

Must have California civil engineer registration and be U. S. citizen, subject to physical examination and loyalty oath.

Write full details to:

CLERK OF THE BOARD OF SUPERVISORS,
COUNTY COURTHOUSE,
Riverside, California

ENGINEERS

Structural, mechanical, and electrical for work on hydro-electric power developments. Write giving full experience record and qualifications.

HARZA ENGINEERING COMPANY

400 West Madison Street
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FOR SALE STEEL SHEET PILING

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NEAR BREWSTER, WASHINGTON

Shipped New — Used Only One Job

CARNEGIE	MP-101	MP-102	TEES
Length	Pcs.	Pcs.	Pcs.
72-68 ft.	15	175	3
65-60 ft.	1493	—	39
55-50 ft.	1702	—	38
45-40 ft.	312	—	10

Also quantity 35 ft. and shorter—Quick Shipment. Regardless of job, location. Write, Wire or Phone

MISSISSIPPI VALLEY EQUIPMENT CO.

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CONCRETE FORM HARDWARE
CLAMPS — TIE RODS — COUPLINGS
AND PIGTAIL ANCHORS

Greater Safety — Less Weight to Handle

Investigate Williams Economy

WILLIAMS FORM ENGINEERING CORP.

1501 Madison Ave., Grand Rapids 7, Mich.
Phone 5-9209

Western Branch—Phone TW 6453,
2914 N. Lombard, Portland 17, Ore.

WANTED—

FLOOD CONTROL ENGINEER

To formulate, organize, and supervise flood control program in San Diego County. Salary \$749 monthly (40-hour week).

California registration as civil engineer required. Minimum five years recent responsible professional engineering experience, including two years in flood control and one year of administrative experience.

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Before April 21, 1953

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Models 24'—28'—35' Price \$2100. to \$3500. Birch finish, drafting table, 2 built-in desks with letter files & drawers, other conveniences. Can offer three year finance plan. Write for pictures and plans.

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Do YOU Want—

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- to get good help?
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Use WC Classified
Pages for ACTION!

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SUPERINTENDENT WANTED

California firm seeks experienced construction superintendent for industrial and refinery projects with specialization in industrial, process and power piping; millwrighting and machinery installation work.

Give full experience record, education, age, availability and salary expected.

Box 31, Western Construction
609 Mission St., San Francisco 5, Calif.

CONSTRUCTION SAFETY ENGINEERS

Must have 2 years experience safety engineering in construction work OR three years of construction work, 1 year of this in field engineering. College degree in engineering also required. Additional experience may be substituted for degree. Write: Dept. WC, STATE PERSONNEL BOARD, 1015 "L" Street, Sacramento 14, Calif.

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Practical, Down-to-Earth Welding Rods
Alloys as they are supposed to be

Corrosion Resistant—
Clean metal

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BACKFILL, uncompacted

Snake bites, one at a time

Snake bite kits for survey parties have come a long way from the days when a pint of Old XXX, a rusty penknife, and a dirty handkerchief were the whole story. The National Safety Council has done some high-type research into the business of first aid kits for about 25 craft occupations, especially the ones that are often performed by small, out-of-touch field groups. And they have come up with a data sheet listing the proper items—medicines and dressings—for keeping on hand.

The recommendations of the data sheet have another handy feature. They are tabulated in the form of "unit first aid kits." That is, they tell how much or how many of each item should go into a single-use package for a particular type of injury. This way, you don't have any half-empty bottles or half-used (and unsanitary) rolls of gauze left over.

The unit first aid kit has been a required feature in some industries. But the National Safety Council has broadened the base with its data sheet, and has figured the proper number of units that should be on hand for various sizes of working groups. Naturally, the recommended kit varies from craft to craft—poison ivy ointment is a big item in the kit for linemen.

The boys with the statistics have figured out what's going to happen to you, how often, and how bad. This data sheet is the result. You can get a jump ahead of the game by sending for one. Only \$0.17. Data sheet D-202. National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill.

All hands on deck

When you unroll a 12-ft. blueprint into the office next door and then start walking around on it to find the detail you're after, you sometimes think some silly things: how did the draftsman keep from making footprints, or what kind of a skyhook did he have for his drafting machine? Probably the last thing you wonder is why he made the drawing so darned big in the first place.

This was the first question that occurred to General Electric Co., when they set out to survey drafting performance. The result is that they have hit on a system that will save from 20% to 50% of the drafting time used up by their 5,000-man drafting crew.

The "new order" has sprung from a realization that draftsmen have been so busy with what they are drawing that they have neglected to be critical of how they draw it. The result has been that drafting practice has remained "horse and buggy." The sys-

tem now in use isn't defined in a hard and fast way, but the gist of it is to strip the frills from drawings, and to make them smaller whenever practical.

GE gives an example. There was one drawing that took 8 days of a man's time. It was a beauty, all 57 sq. ft. of it. It was duplicated in just 2 days on less than 4 sq. ft. of paper, and no clarity or accuracy was lost.

Beauty and the blueprints

We reported in January that President Eisenhower's inaugural platform would be a sturdy one of wood. The National Lumber Manufacturers Association had stated that nearly 1,000,000 board feet of lumber was to be used in building various bleachers and platforms for inaugural participants and spectators.

There's a sequel to the story. A Washington-dated news item of January 20, inauguration day, told of an otherwise unpublicized parade that day—the parade of spectators to a Red Cross first aid station for removal of splinters. Inauguration day was bright and clear, we recall, but cold as well. This, we presume, explains the Red Cross doctor's statement that most of the splinter injuries involved hands...

Furthermore, we're sure that Eisenhower's inaugural marked the last time that people in Washington will sit on their hands.

Building "Iron Curtain"

We ordinarily hate to let any other area claim the first, the biggest, the longest, or the deepest structure of any kind. But this time we're glad we haven't a topper.

According to the papers, the East Germans are busily building a barbed-wire fence 10 ft. high between East and West zones of the partitioned country. Some 30 mi. of this iron curtain have already been erected, and it is believed possible that the structure will eventually traverse the entire 600 mi. of the Russian satellite frontier. Such a fence would certainly rate dubious acclaim as the longest in the world.

We find it hard to believe that this fence could possibly be built on a contract basis. Somehow, we're sure it's a force account job...

Delivery by dog sled

One of the circulation salesmen for *Western Construction* must be sitting on top of the world these days. We have received word from him that a new subscriber to the magazine is Anton Dohl, manager of North Pole Motors, Inc., at North Pole, Alaska.

Twenty-five years ago in *Western Construction*

The Western Road and Equipment Exposition in Los Angeles was reported to have been a huge success. Running a full week between March 5 and 11, the exposition had attracted 185 exhibitors, 16,000 registered visitors, and good weather. The exposition was housed in three tents covering 152,600 sq. ft., and had an adjacent 20-acre demonstration field.

* * *

"J. W. Hamilton, district engineer for the Yakima district, Washington State Highway Department, has been appointed maintenance engineer with headquarters at Olympia."

* * *

"W. E. Emmett, for the past several years chief engineer of the structural steel department of the Moore Dry Dock Co., of Oakland, California, has been appointed district engineer for

the seven Pacific Coast states, for The American Institute of Steel Construction. Mr. Emmett will make his headquarters in the Russ Building, San Francisco."

* * *

The Cushman hydroelectric development was reviewed by B. E. Torpen, who had supervised design and construction of the first phase of the project, and was shortly to return for work on the second of three proposed eventual components of the development.

* * *

"Clyde C. Kennedy, San Francisco, civil engineer specializing in municipal work, has been retained by the city of Klamath Falls to prepare plans and specifications and supervise the construction of a modern sewage treatment plant, including new intercepting and outfall sewers. . . ."