

WESTERN CONSTRUCTION NEWS

WITH WHICH IS CONSOLIDATED
WESTERN HIGHWAYS BUILDER

PUBLISHED MONTHLY
VOLUME XXIV, No. 8

AUGUST 15 • 1949

35 CENTS A COPY
\$4.00 PER YEAR

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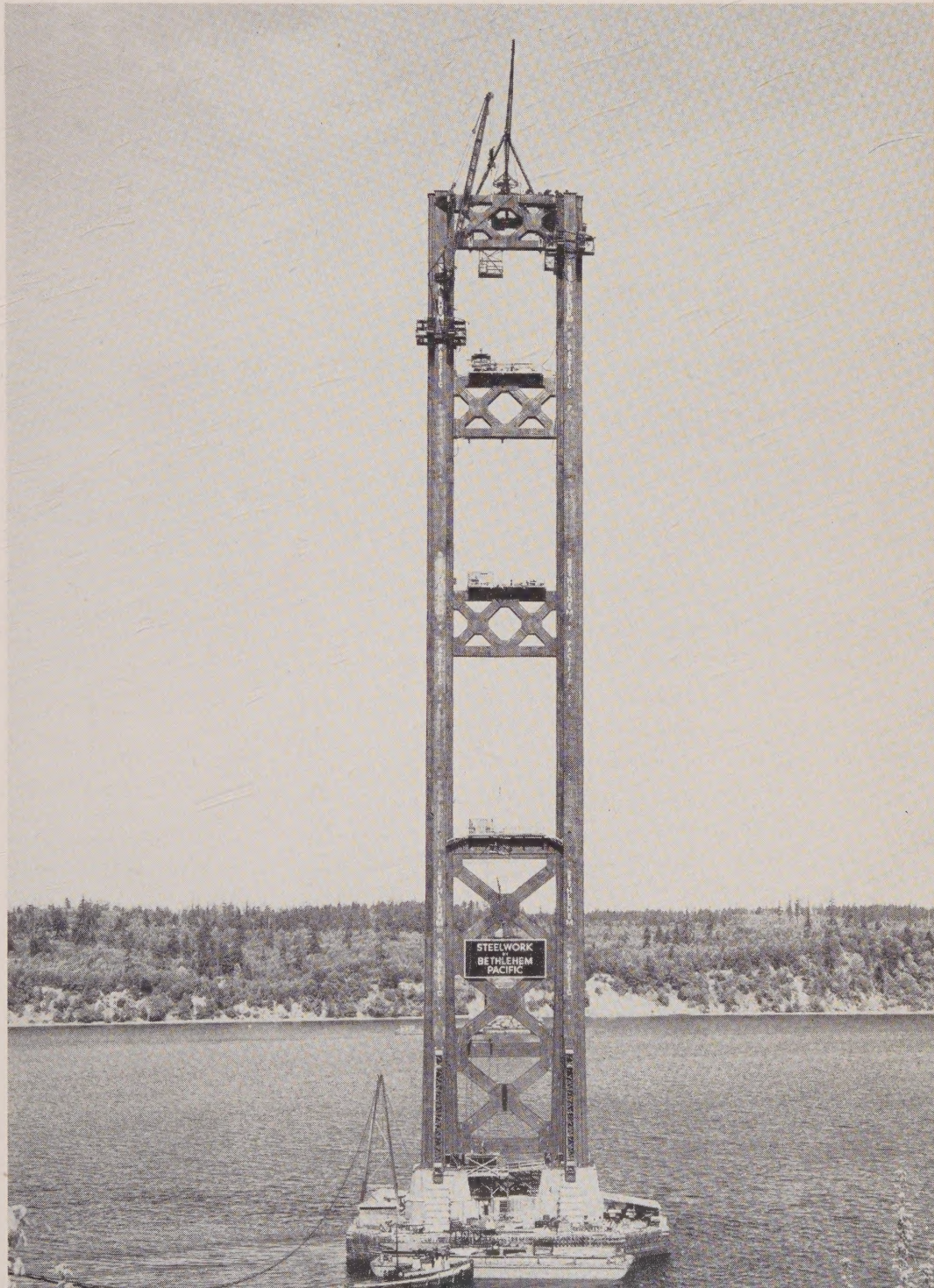
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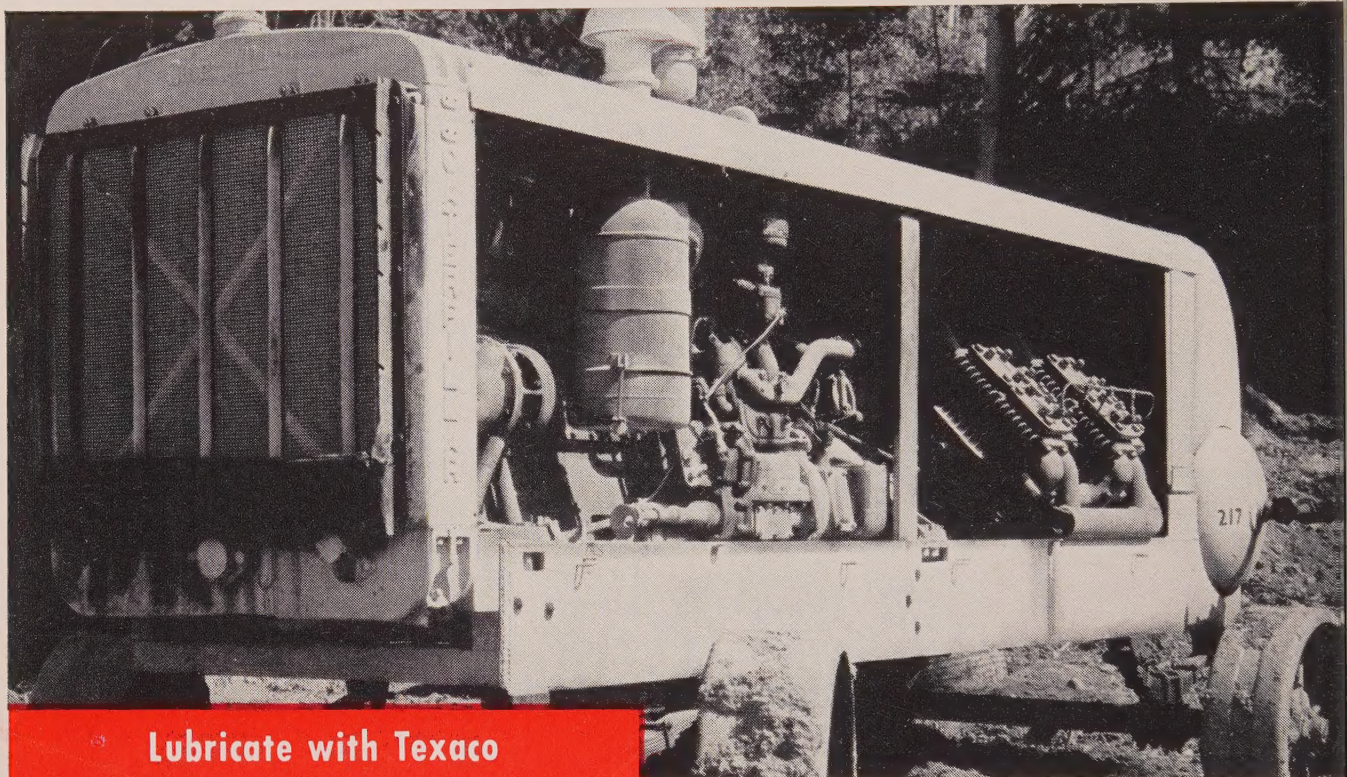
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Portrait of J. W. Cunningham

EAST TOWER of the Tacoma Narrows suspension span nearly completed and ready for cable spinning operations to begin. The seemingly ill-fated bridge is going up as a higher, wider and safer structure (See article on page 61).



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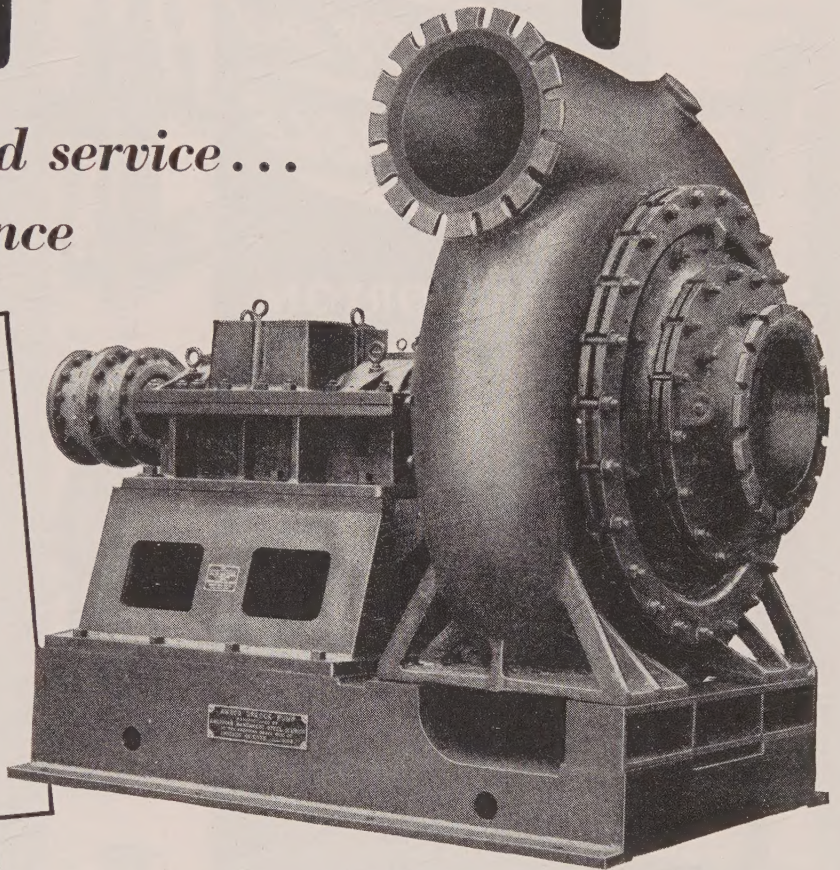
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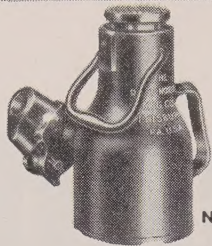
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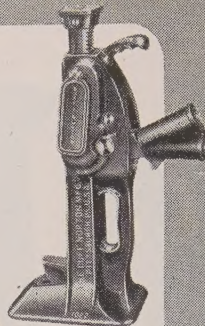
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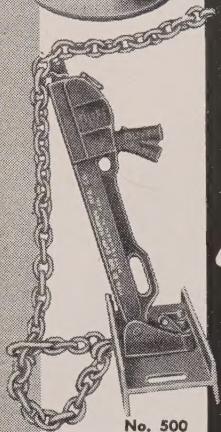
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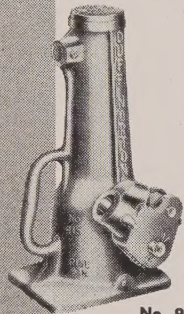
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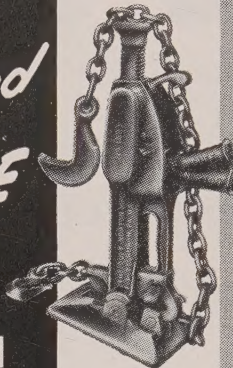
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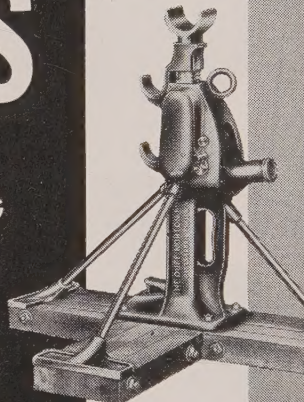
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**Of Importance—The Man Who
Actually Does the Building**

Editor, Western Construction News

We wish to thank you for the recent news item and photograph of our Sewage Treatment Plant at Castroville, Calif., published in the June 15th issue of *Western Construction News*.

Since publication of this story, we have received many comments and inquiries concerning the construction and operation of this plant.

We particularly appreciate the mention of Clyde K. Moseman, partner in our firm, who was directly responsible for the fine execution of this project. Highly commendable is the policy of your magazine to refer specifically to the man most important in the construction of any project—the man who actually builds it.

CHARLES C. MacCLOSKEY
Partner, Charles MacCloskey & Co.
Engineers—General Contractors

San Francisco, Calif.

1 1 1

**Never Too Old, But Some
Just Won't Believe It**

Editor, Western Construction News

I have a whale of a problem.

And this is part of it. I cannot help but read *Western Construction News* any more because some cuss of an insurance man or a personnel manager has set up regulations which compel most employers to rid themselves of men who reach sixty or so years of age.

I am a construction engineer, and have fifty years of first-hand, on-the-job experience in several fields of heavy construction work, as well as surveying, estimating and all the many chores that go with such work. That experience, together with seasoned judgment, is for sale—it is dependable, it is available all times, and the owner is loyal and industrious.

But just because there are fifty years of that experience, it and its owner are thrown into the discard, unused and unwanted.

Ability, capability, fitness and all the rest that go to make up a worthwhile construction man, count for nothing if your hair is gray or white—if you are old!

I am sorry, more than you can guess, that I am not able to renew my subscription to your admirable magazine; I am trying to go on, but I am going to miss its fine and timely articles and accounts of the "boys."

Good luck, and I hope that *Western Construction News* never becomes old.

CHARLES G. NASH

San Leandro, Calif.

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Cooperation Works Both Ways

COOPERATION is a wonderful thing, and a very necessary one. According to Webster, it means "collective action in the pursuit of common well-being." We take it that "collective" means **everyone** involved in a specific enterprise working together. It's not "cooperation" if only one party or a part of the total group acts.

Obviously, that introduction leads up to a "beef." Indeed we have one! We are aware of the fact that the private power companies, such as Utah Power Co., Montana Power Co., Southern California Edison Co., Portland General Electric Co., Idaho Power Co., Pacific Gas & Electric Co., California Oregon Power Co., Public Service Co. of Colorado, and scores of others throughout the West employ some of the most talented engineers in the country, plan and carry out some of the largest, most interesting, most complicated and unique hydro and steam electric generating systems in the world. They employ the most advanced technical knowledge which should, in all fairness, be made known to other engineers for the benefit of the profession and the public.

Furthermore, all of them are fighting a life-and-death struggle against encroachment by power-mad federal bureaucrats, who would put them out of business, if possible, and who would, as expressed by one of their chiefs, David Lillenthal, "control people through control of energy." Currently, the drive for Valley Authorities is one method being used to accomplish the bureaucratic end.

The enlargement of federal power in all phases of life has been a particular target for this editorial page for many years, and especially have we fought against expansion of publicly-operated power systems in such a manner as to place them in competition with private plants. We've written numerous pieces attacking the proposed Columbia Valley Authority and Missouri Valley Authority, for instance. In other words, because we believe whole-heartedly in the free enterprise system, where initiative and efficiency can bring benefits to their possessor, as well as to the whole community, we've fought as valiantly and as consistently as we know how in support of the well-operated private power industry.

For that reason, we feel terribly hurt when representatives, high-ranking officials at that, of power companies refuse to give us information for technical articles on their outstanding engineering and construction accomplishments. Within the past month, for instance, two companies have exhibited this attitude. One informed us that such publicity was only "secondary" to them, and they preferred to get their story into the daily papers. Another was actually insulting to our staff member, permitted him to drive over 200 miles on a horrible dirt road to a project, and then with complete discourtesy, refused to show him the operation or to allow him to write about it. This we'd scarcely call "cooperation," or even fair remuneration for fighting their battles.

This condition is, of course, not universal. Pacific Gas & Electric Co., the largest private system in the country, does not subscribe to any such creed. Portland General Electric has always been most pleasant to deal with, as has Utah Power Co. These are but three of many who understand the word "cooperation," and its definition, "the pursuit of common well-being." But there are others.

No Politics, Mr. Krug?

IT APPEARS as a news item on page 98 of this issue, but in order that nobody may miss it, we want to emphasize again, here, the attitude of Secretary of Interior "Cap" Krug, who once in this editor's presence described himself as a non-political administrator, (God save the mark!) regarding the proposed Columbia Valley Authority.

In testimony before the House Public Works Committee recently, Public Works Commissioner Erdahl of Tacoma deplored such an Authority, especially on the basis of the loss of local control over natural resources. Let no one think Mr. Erdahl is unduly alarmed, for "Cap," in speaking before the same committee, urged **removal** of the provision that would require two of the three directors of the Authority to be local residents, also that no vote on personnel or policies of the Authority be granted to the local residents, those who, that is, would be regulated by it. Neither would he permit any vote by local people on whether or not they want such an Authority, but would have the federal government impose it upon them, regardless of their need or desires.

This, he said, would "keep politics out of CVA!" Actually he meant, any opposition politics.

Hoover Progress

SOME PRELIMINARY steps are being taken toward implementation of the Hoover Commission report. First of any importance is the reorganization of the several parts of the Federal Works Agency, War Assets Administration, Bureau of Federal Supply, National Archives and a few other bodies, into the General Services Administration, which it is believed will effect considerable savings in inventory, purchasing, and office space.

We have been disappointed, as has everyone else, in the "unification" of the armed services, which has resulted in no apparent lessening of inter-service disputes, but has merely piled a super-bureau on top of the existing agencies. This new GSA reorganization and other subsequent ones could be definitely beneficial from the standpoints of efficiency and economy.

Naturally, the way it finally works out will depend on the efficiency and determination of the executives in charge of the reorganization, but it sounds like a desirable forward step. We support it heartily.

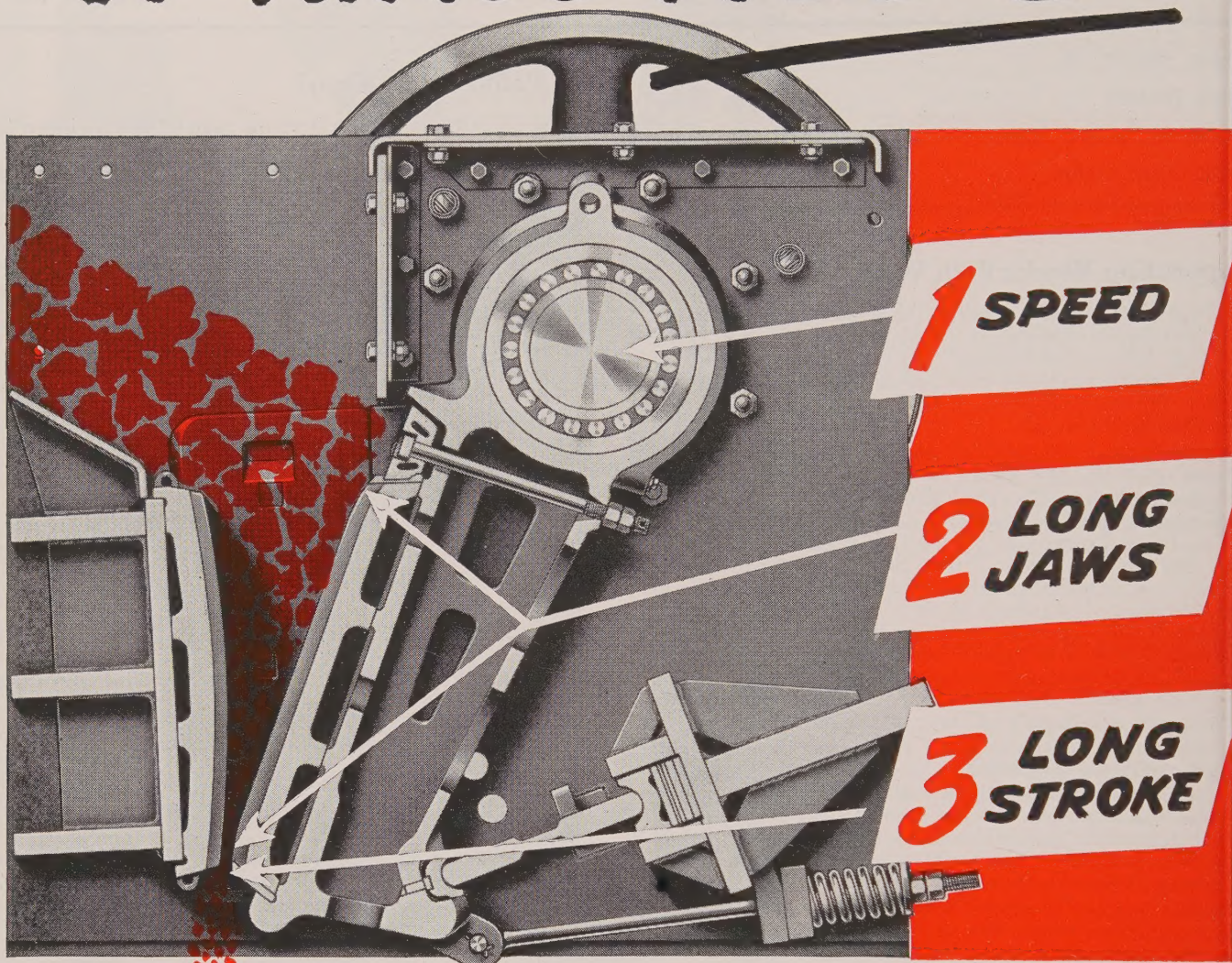
Those Fine County Engineers

WE NEVER CEASE to be impressed by the serious demeanor of the County Engineers and Road Commissioners as they face their huge task of maintaining county roads and other services, often with insufficient equipment, small personnel, and inadequate funds.

We've observed them in convention in the last few weeks at Hobergs, Calif., where the California group met, and at Oakland, where the national meeting was held. Their sense of responsibility, their serious approach, their obvious desire to learn the most modern and efficient methods for both their technical and their administrative duties, make us sure that our counties will receive the finest of service from their engineering departments.

This statement does not indicate any change in our conviction that there are too many counties in practically every state, and that there is a great deal of excessive taxation due to the presence of so many governmental bodies. But we do want to express our satisfaction with the splendid work of the county engineers, operating the very best they can under the set-up that exists.

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"Jinx" Bridge Going Up Again

Ill-fated Tacoma Narrows suspension span, destroyed in 1940 by uncalculated aerodynamic forces and damaged during current construction by earthquake and fire, going up on schedule as a higher, wider and safer structure

OVERCOMING a series of jinxes, the Washington State Toll Bridge Authority is progressing rapidly in the construction of an \$11,230,000 bridge across Tacoma Narrows, a three-quarter mile wide channel in Puget Sound, so that the important cities of Tacoma and Bremerton may have a direct highway tie.

The original suspension bridge was destroyed on Nov. 7, 1940, when vibrations set up by uncalculated aerodynamic forces destroyed the central suspended span, causing the approach spans to sag about 70 ft., and distorted the towers so that they had to be subsequently removed. At the time of its destruction, the bridge had been in service only four months and six days. As a corollary "jinx," it was discovered that insurance funds for the bridge had been misappropriated, and only after much negotiation was a portion of the damage compensated for, the recovery being \$4,000,000.

A long series of wind tunnel model tests were conducted under the direction of Prof. F. B. Farquharson at the University of Washington, covering several years (see *Western Construction News* for May, 1946) and on the results of these tests a new structure was designed.

Last year contracts were awarded to Bethlehem Pacific Coast Steel Corp. for tower, deck, and other steel fabrication and erection, and to John A. Roebling's Sons Co. for cable spinning. To date the new towers have been erected, and the Roebling's organization is getting equipment set up to start on the cables.

Disasters have some fortuitous angles

The "jinx," however, seems to have continued into the new construction, for just as the cable saddle atop the east tower had been placed, the earthquake of April hit, and the 22-ton casting was shaken into 140 ft. of water, striking and sinking a work barge at the base of the tower on its way down. The saddle was located by divers and salvaged. Being virtually undamaged, it was replaced on the tower.

Hardly had this been accomplished when a fire broke out in construction materials piled on the fender at the base of the west tower, causing damage estimated at \$200,000. For a time it was feared that the heat might have damaged

the tower steel, but a careful survey failed to discover any distortion or damage.

These events, however, have not materially slowed the progress of construction of the new bridge. A comparison of some of the principal dimensions of the original and new design is of interest.

The two channel piers have not been changed. The original sinking of these two piers in the swift current of the Narrows was such a difficult job that engineers regard the fact that they were undamaged in the collapse as one of the most fortuitous circumstances of the disaster.

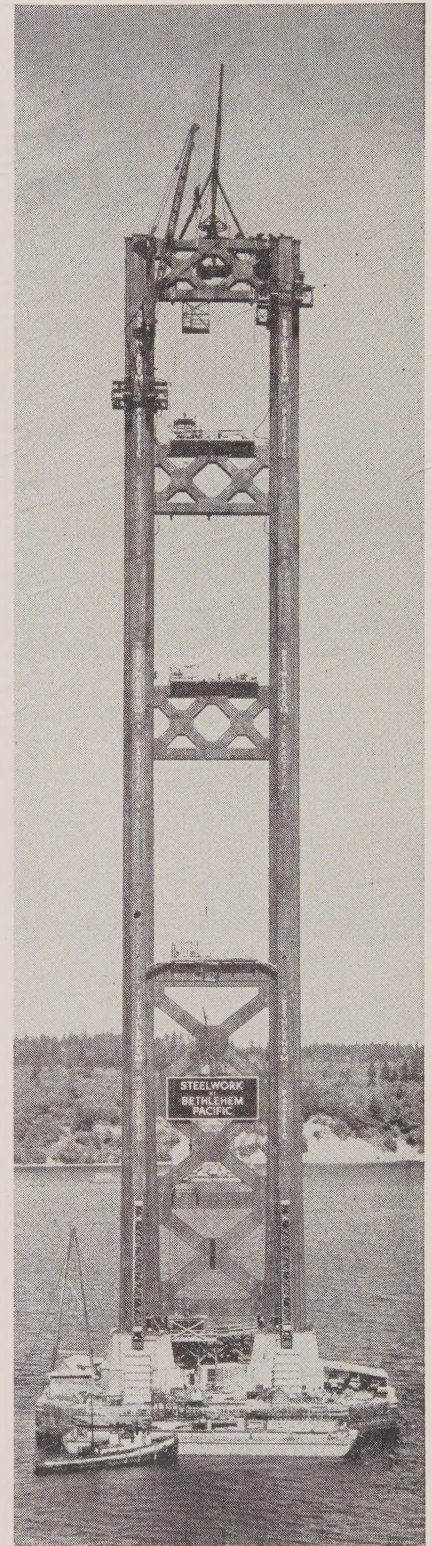
Span same; bridge higher and wider

The original towers were 50 ft. apart at the base, and were battered to 39 ft. at the top. The new design carries vertical tower legs, 60 ft. apart. The tower steel is 40 ft. longer in the new bridge, and in addition the feet of the towers are raised 18 ft. by the addition of a concrete footing above the original pier surface, so as to lessen the attack of salt spray on the steel. Thus the tops of the towers are 58 ft. higher than formerly. Each original tower contained 1,600 T. of steel, while each of the new towers contains 2,500 T. As temporary braces until cables and decks are installed, sloping structural members were welded to the bottom of the tower legs in the form of an A-frame. These are, however, only a temporary installation.

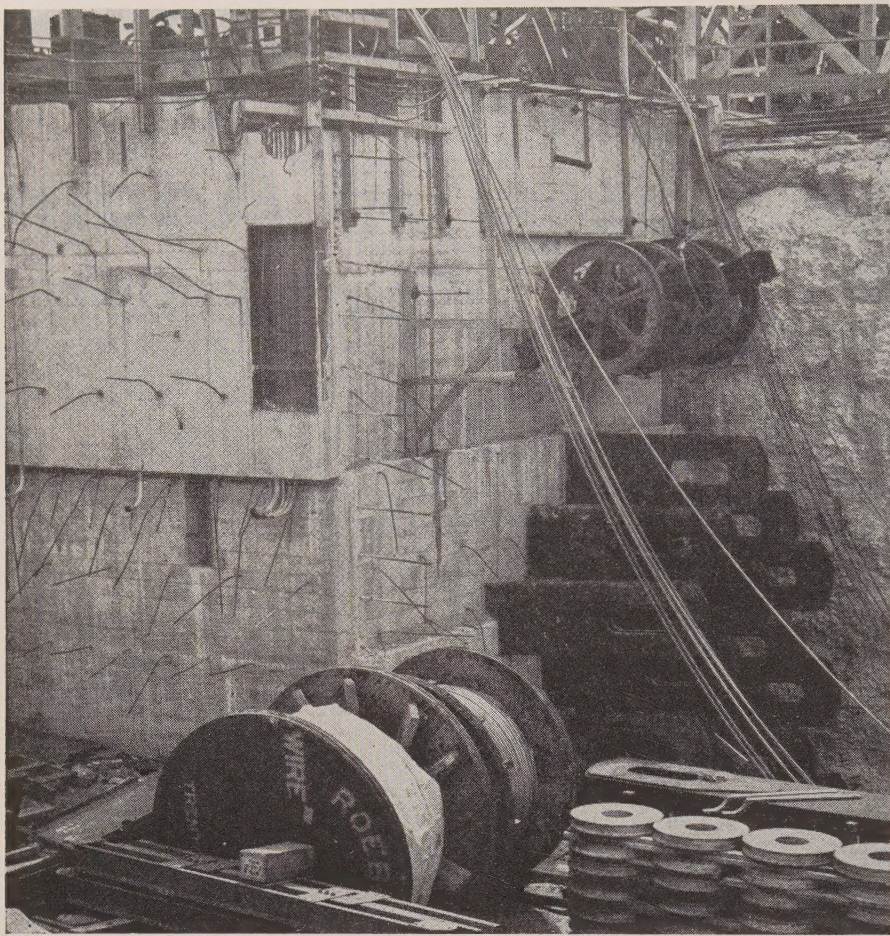
The span lengths are identical, 2,800 ft. for the suspended span and 1,100 for each approach. The old deck, however, was 26 ft. wide and carried two traffic lanes, while the new deck has a four-lane roadway 46 ft., 8½ in. wide, and a sidewalk 3 ft., 6 in. wide on each side. This, and other new design features bring about a weight of 8,678 lb. per ft. on the new bridge, as compared to 5,600 lb. per ft. on the old.

The new main cables will be 20 in. in diameter, as compared to 17 in. on the old bridge. Each main cable will be comprised of 8,702 strands of .192-in. bare wire, about 10,000 miles of wire being required in each cable. Suspender cables will be 1¾ in. in diameter, with four being carried on each hanger.

The original anchorages are being widened 8 ft. on each side, and lengthened 20 ft. The weight of the anchorage



EAST TOWER of bridge completely erected with a 22-ton cable saddle on each leg yet to be installed. A Roebling derrick can be seen on the top strut. The tower, erected by Bethlehem Pacific, is 58 ft. higher than the original.



NEW EYE-BARS in the anchor blocks, above, will be encased in concrete after cables are spun and attached. Original anchorages of 1940 span are being widened 8 ft. on each side; lengthened 20 ft.

blocks at each end will be 54,000 lb. New eye-bars are set into the anchor blocks, and will be encased in concrete after the cables are spun and attached. Concrete is poured in three states, first of which has been completed:

1. To point of setting eye-bars;
2. Encasement of eye-bars up to roadway level;
3. All else, toll houses, deck, etc.

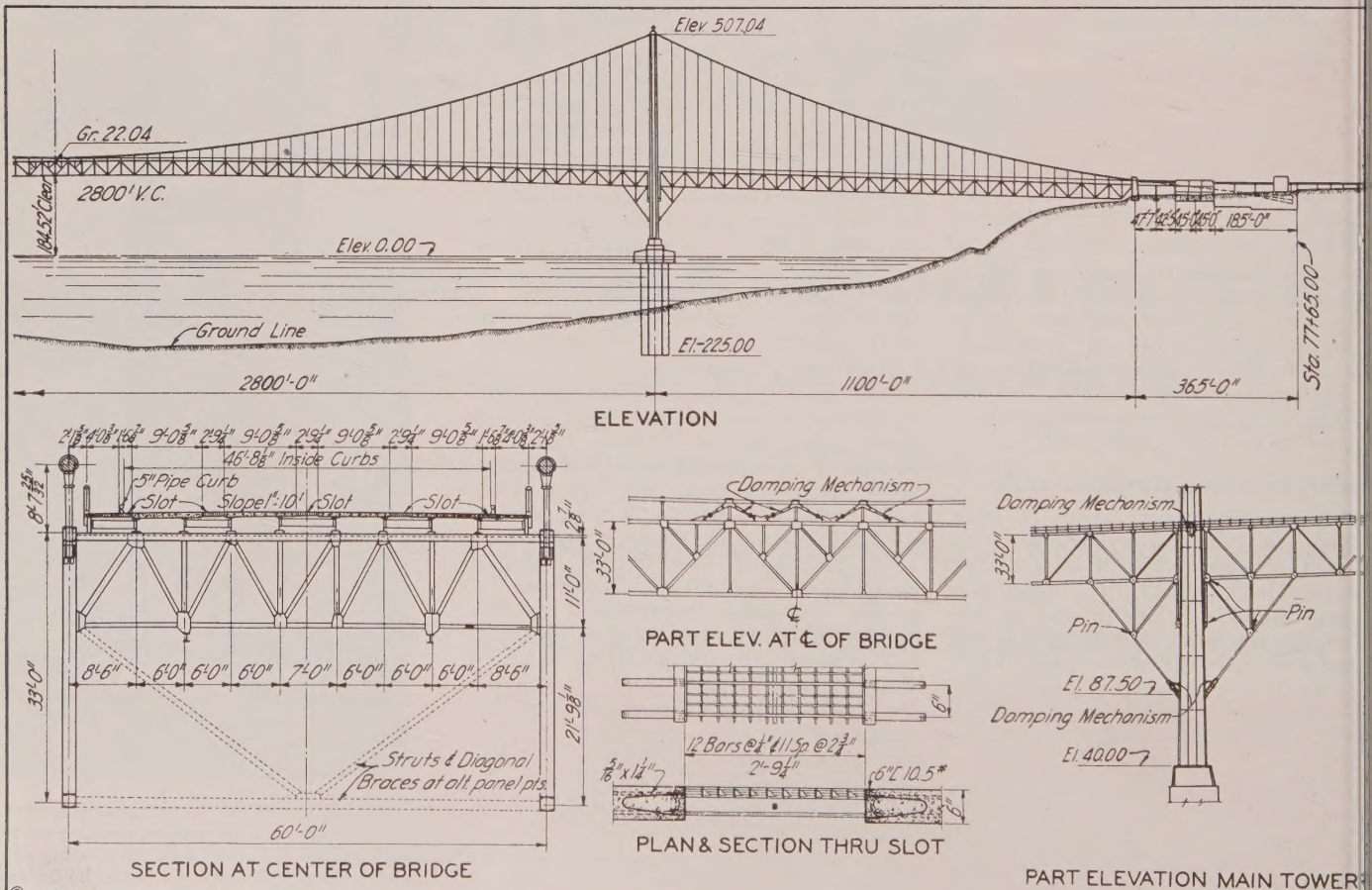
Wind tunnel dictates new design

The new deck will be constructed of light-weight concrete, using Haystack aggregate. Numerous features grown out of the wind tunnel investigations have been incorporated in the new design. Among these are continuous longitudinal slots between each of the floor roadway lanes, covered with steel grating to permit passage of air currents which may be inclined upward, similar to those which caused the damage in 1940.

Another design change is the substitution of open truss design throughout even for floor beams, rather than girders, as used in the original structure, and which apparently formed pockets upon which aerodynamic forces worked.

Also, "damping" or shock absorbing mechanisms will be located at each tower and at the center of the span where the cables come down to the deck.

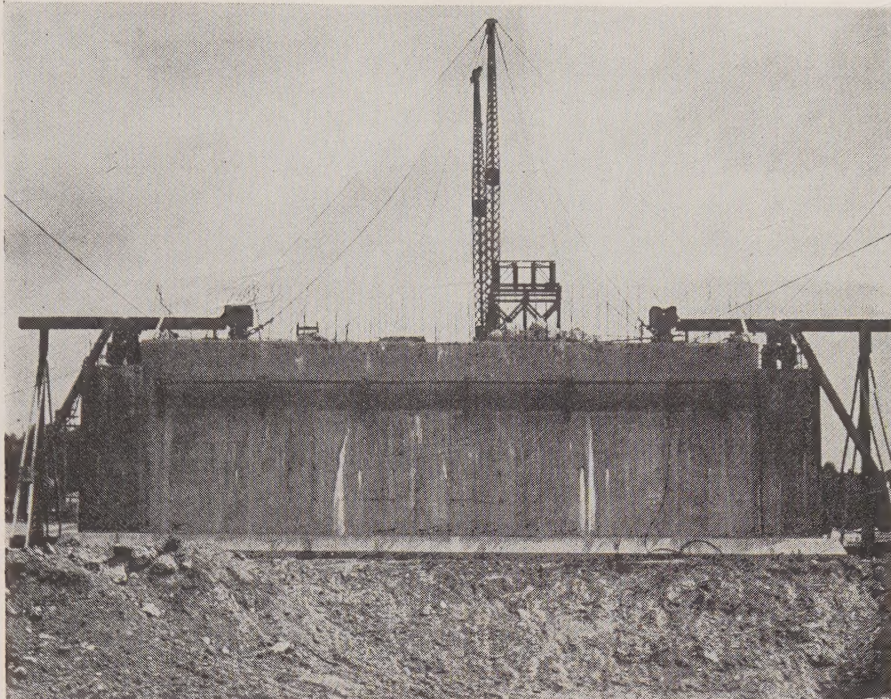
ENGINEER'S DRAWINGS of the redesigned span are shown below. Results of a long series of wind tunnel tests dictated the new design features, such as the open truss design throughout and the shock-absorbing system shown at lower right.



roadway. They consist of large hydraulic cylinders which will permit slow motions such as live load deflections, but will resist rapid motions such as those set up by air movements.

The steel towers were erected by Bethlehem Pacific with stiff leg crawler cranes mounted on the tower legs and advancing with the steel. The steel was

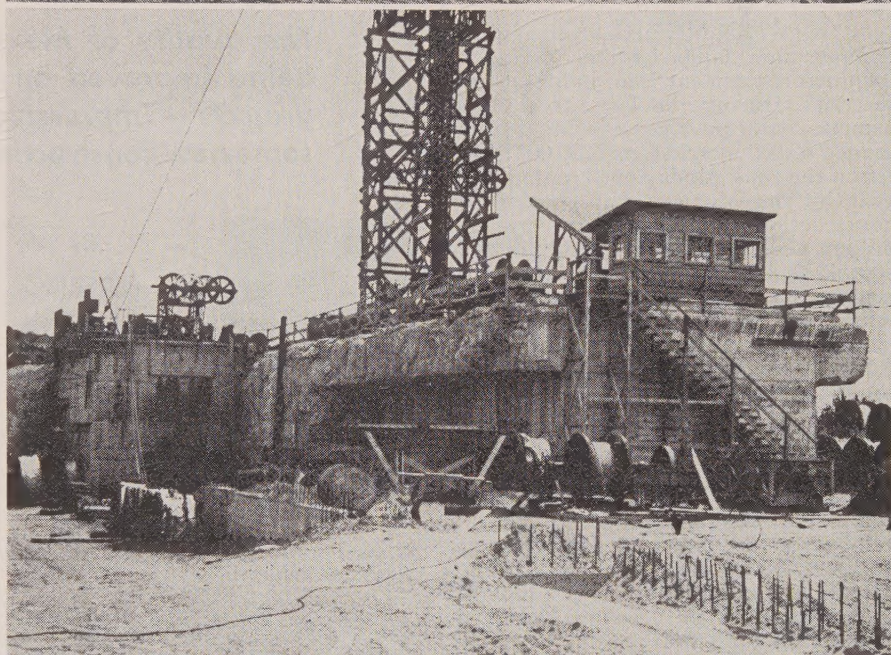
A LOOK AT the east footing block ➡ shows the amount of widening required in the transition from the old to the new. The old cable blocks, which are being cut off, show on top of the old block. The new cable supports can be seen on the concrete added at both sides. The excavation in the foreground will accommodate a 33-ft. deep stiffener truss which replaces an 8-ft. girder stiffener used on the old structure.



erected unpainted, that operation being carried out soon after completion of erection. A temporary elevator operates for the full height of each tower to provide access for workmen to any desired point.

Derricks replace barges

With the completion of cable spinning Bethlehem Pacific will return to install the deck, stiffeners, and other members. In contrast to the standard procedure of deck erection from barges, they plan to use derricks mounted on the bridge,

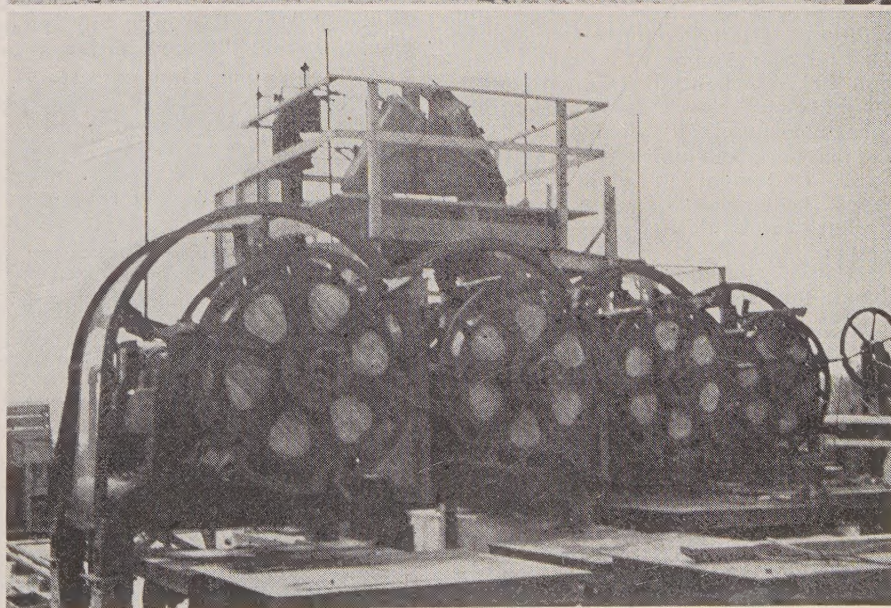


A VIEW OF the old roadway, right, ➡ and the new anchor block completed to the point of setting eye-bars, left. The widened and heaved anchor block will extend out all the way along the small wall in the left foreground after the cable has been spun and attached. Cable spinning equipment is being set up on top of the block.

one advancing each way from each of the towers until the task is completed.

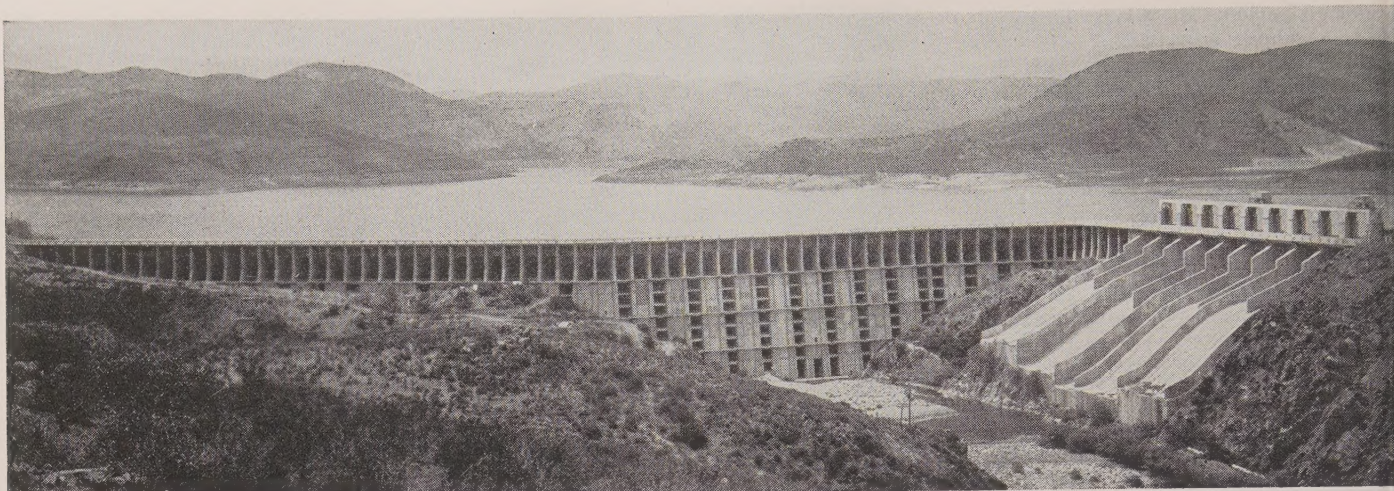
Cable spinning was scheduled to start about Aug. 15. A single wire was first carried across to two towers, followed by a cable, and later by a catwalk. Because of the inaccessibility of the various parts of the job, a Motorola radio communication set-up has been found an invaluable aid.

The bridge is the property of the Washington State Toll Bridge Authority. C. E. Andrew is principal engineer; Kenneth Arkin is chief inspector, and



CABLE SPINNING drums being set up ➡ by the Roebling forces to begin placement of the 8,702 individual strands in the 20-in. main cables. These same drums were used for spinning of the 17-in. cables on the original Tacoma Narrows span, and were previously used on construction of San Francisco's Golden Gate Bridge.

N. E. Olson is design engineer. For the contractors, Tom Martinsen is resident engineer for Bethlehem Pacific Coast Steel Co., and R. J. (Bob) Cole is superintendent for John A. Roebling's Sons Co.



Efficient and Economical Lean Mixes Developed as— Mexico Advances Cement Technology

IN MEXICO'S struggle to conquer new lands by reclaiming her own deserts, cement is an indispensable material. During the last three years, cement yearly purchased in Mexico averaged 60,000 metric tons (350,000 bbl.). From the total funds appropriated each year by the Mexican government for construction of irrigation projects—210 million pesos or approximately \$25,000,000—2.7% has gone for the purchase of cement. During the next three years when construction of major dams and irrigation projects will be proceeding at full rate, the cement used per year will be more than twice the present tonnage.

Efforts have been made during the existing 23 years of the Mexican federal reclamation agency* to secure better cement and use it more efficiently. The cement technology progressively developed by the agency's engineers has generally been based upon four criteria: (1) Massive concrete dams can be built economically with properly designed, very lean concrete mixes using entrained air to provide plasticity, (2) puzzolanic additions, properly controlled, can be used advantageously to correct expansion due to correct alkalies, (3) cement for reclamation work must present low tricalcium aluminate, alkalies, free lime and magnesia and high silicates and fineness, (4) cement efficiency and price should be appraised by the durability, strength and plasticity per unit of weight.

Recipe for better cement

Mexican cement plants have been responding to the 23-year effort to improve the quality of cements used for reclamation construction. Lessons learned during the construction of major structures (discussed later in this article) have resulted in the formulation of ten general rules for the production of efficient and

The quality of Mexican cements is constantly being improved on major dam and irrigation projects — Impressive savings in supplies and some new construction techniques are the results



By
FEDERICO BARONA de la O
Chief, Technical
Department of Materials
Ministry of Hydraulic Resources
Mexico, D. F.

yet economical cements at the Mexican plants. Briefly, these are as follows:

- (1) Add iron ore or iron slag to raw mix to reduce tricalcium aluminate in clinker to less than 8%, or better to less than 6%. More thorough burning will also be obtained by the addition.
- (2) If the silica/alumina ratio of the raw mix is less than 3.75, add some silicious material, quartz or sand to increase the silicates content. The sum of both silicates (di- and tri-calcium) shall not be less than 72%, preferably not less than 74%.
- (3) Burn thoroughly, keeping free lime below 1.5%.
- (4) Control the lime content of the raw mix according to whether the sections are large and concrete has a cement

content higher than 0.85 bbl. per cu. yd. and thus require a low-heat cement (tricalcium silicate not higher than 30%). Otherwise, for smaller sections of massive concrete with very lean mixes, secure an efficient cement by keeping tricalcium silicate from 40 to 55%.

(5) Keep alkalies at the lowest content possible (not higher than 6%), especially when the aggregates contain reactive minerals such as opal, chalcedony or volcanic glass.

(6) To correct alkali expansion, use puzzolana of proven activity, either interground with the clinker or added to the mixer in a finely ground condition. Sands from which the fines (particles under No. 50 mesh) have been removed have shown higher expansion than those with their fines included. Thus, when alkali expansion is suspected, a possibility of correction is to intergrind with the clinker an adequate proportion (10 to 20%) as determined by test, of the same suspected aggregate.

(7) When Portland puzzolana cement is to be made:

- (a) Use clinker of high tricalcium silicate, but not lower than 45% and preferably not lower than 50%.
- (b) Use puzzolana of proven activity. Silicious minerals and rocks undergo disintegration and partially hydrate to constitute active puzzolanas in some cases, but activity should be proved before by testing the compressive strength of their mixes with hydrated lime. Heat treatment (up to about 900 deg. C.) may in some cases increase the activity of puzzolanic materials. The most promising way to obtain puzzolana would be to develop a process for

PICTURED ABOVE—
RODRIGUEZ DAM in Lower California. Cement was used that hydrated fast and gave a rise in temperature of 54 deg. F. Cracks appeared in the buttresses with the subsequent cooling and the lesson gave impetus toward the use of low-heat cements.

*Formerly "Comision Nacional de Irrigacion," and since 1947 "Secretaria de Recursos Hidraulicos."

hydrating quartz and thus produce opal, which is very active.

(c) Do not add more than 20% puzolana to 80% clinker, except by especial approval based on previous tests.

(d) Grind finely. Finished cement shall have not less than 3400 sq. cm./g. by the Blaine air permeability method.

(8) Control gypsum content, taking into account that the finer the cement and the higher its tricalcium aluminate and alkalies, the higher the gypsum required. By the water extraction test, SO_3 should be higher than 0.2 g./liter at 18 hours, while at 24 hours it should not exceed that same value.

(9) Grind cement finely. During the last three years, the average specific surface (Wagner) of Mexican cements has increased from 1400 to 1650 sq. cm./g., and some plants are grinding finer (about 1800 sq. cm./g.). The use of grinding aids and the cooling of mills with water sprayed on the outside shell by a pipe parallel to the axis of the mill are recommended to secure higher specific surface.

(10) Provide silos with horizontal sampling pipes at each 3 meters (10 ft.) of height to secure a truly representative sampling of the cement stored.

Prior to 1926, when the Mexican reclamation program started, Mexican cement presented, in general, the following characteristics: High tricalcium aluminate (up to 13%), high free lime (3%), rather low tricalcium silicate (30%), and low fineness (85% passing No. 200 mesh). Fortunately, magnesia has always been low in Mexican cements (lower than 2% in most cases).*

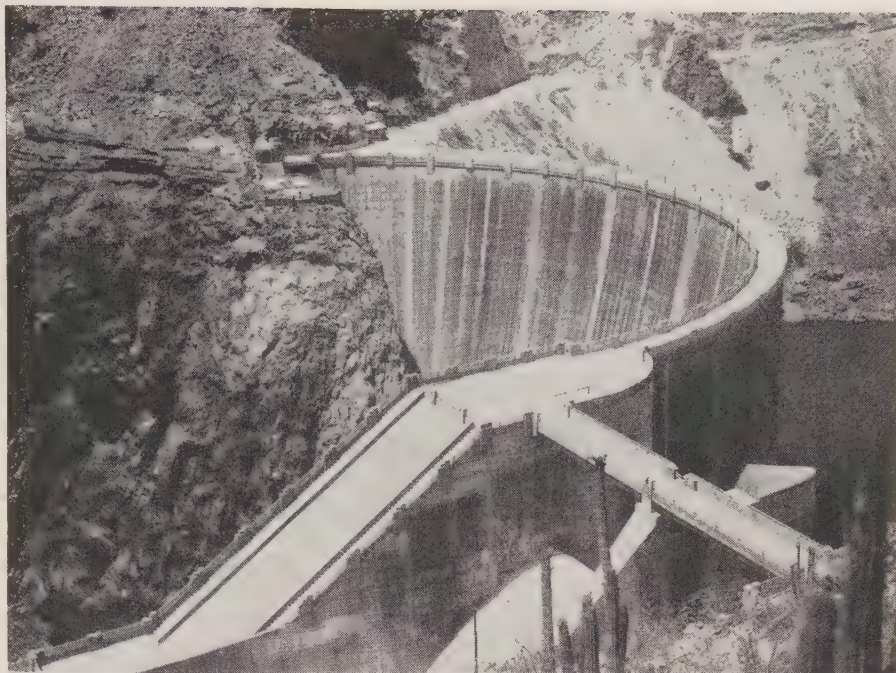
Cracked buttresses taught one lesson

The development of Mexico's cement technology is pointed up by a discussion of major projects where lessons were progressively learned.

The construction of the Ambursen-type Rodriguez Dam in Lower California was started in 1928 using United States-manufactured cement of high tricalcium silicate and aluminate and high fineness that hydrated fast and produced a rise in temperature of 30 deg. C. (54 deg. F.). Cracks appeared in the buttresses with the subsequent cooling. At the Don Martin Dam spillway, a round-head buttress structure built at the same time with Mexican cement of slow hydration rate with low tricalcium silicate and low fineness, cracking was much less. Tests made at Rodriguez Dam comparing temperature rise obtained with different cements showed that the rise was higher for those rich in tricalcium salts (silicate and aluminate). These results and the knowledge afforded by Hubert Woods' research at the Riverside cement plant decided the use of low-heat cement at Rodriguez.

In 1936, to construct Angostura Dam, a gravity arch structure in the State of

*At about the same time (1926), cement in the United States had in general a similar tricalcium aluminate (12%), but mills were providing higher early strength by finer grinding (about 94% passing No. 200 mesh) and higher tricalcium silicate (about 45%).



ON CONSTRUCTION of Angostura Dam, a gravity arch structure in the State of Sonora, low-heat cement was successfully used as low content of oxides prevented expansion troubles.

Sonora, low-heat cement was also specified with the additional requirement that sodium and potassium oxides were not to exceed 0.8%. Actually they were lower than 0.7%, and no trouble from expansion was experienced. The tricalcium silicate content of the cement made by wet process was kept during the winter months at 26 to 28%, and during hot weather at 20 to 24%. The cement had a high content of silicates (di- plus tri-calcium equaled 78%), and not only complied with the low-heat requirements but also presented a low tetra-calcium aluminum ferrite that would qualify it as sulphate resistant. To grout the vertical contraction joints at the lowest expected temperature, cool water was circulated through coils embedded in the concrete.

At the round-head buttress type Fran-

ADOLFO ORIVE ALBA, former Chief Engineer and now Executive Commissioner and Cabinet Secretary of Mexico's reclamation agency, has been leading the country's efforts to obtain new land by reclamation of its deserts.



cisco Madero Dam (formerly Las Virgenes Dam), the use of an efficient low-heat cement and an appropriate system of contraction joints made possible the saving of more than 2,000 tons of reinforcing steel.

Strength in lean mixes

Efficient cement of the modified type was used advantageously for construction of Lazaro Cardenas and Marte Gomez dams (1938-1946). At the latter, a natural clay-sand-gravel material (Reynosa formation) mixed with a low proportion of cement (0.58 bbl./cu. yd.) was used to fill the interior of the free-crest spillway. The lean concrete thus made attained at 28 days an average strength of 427 psi., which although satisfactory for the purpose, was low due to the clay content of the Reynosa material. The outside of the spillway was cast with regular concrete (f'_c at 3000 psi.). For the free-crest spillway of the Alvaro Obregon Dam, presently under construction on the Yaqui River, a similar procedure will be followed using, instead of clay, an efficient air-entraining agent to provide about 4% air with which the lean mixes will acquire plasticity and improve in strength.

Alkalies controlled in Morelos concrete

The cement technology is now being applied to many new Mexican reclamation structures. For instance, close control of aggregates, alkalinity, etc., is featuring construction of the big Morelos Dam on the Colorado River just south of the international border (see Feb. 15, 1949, issue of *Western Construction News*). At this dam, Portland puzolana cement is being used, and although its alkalies used to be high (1.1%), mortar bars kept in sealed containers at temperatures of 100 to 110 deg. F. have shown no expansion up to the age of 6 months.

Central Valley Project Goes Into Biggest Year

A STEPPED-UP construction program on California's Central Valley Project looking toward the first regular operation of the initial features by 1951, will make the work program of the new fiscal year the biggest in the project's history. Although action has not been completed by the Congress on the new Department of the Interior appropriation bill, the amounts in it for the Central Valley Project are larger than any previous year's appropriations.

Several Central Valley Project features have been in partial operation for some years, including Shasta Dam, the Shasta Power Plant, the Contra Costa Canal, Friant Dam, and the Madera Canal. Added to this list is the Friant-Kern Canal into which water was turned for the first time on July 9.

The stage of development for major C.V.P. features is as follows:

Friant-Kern Canal, about 57% finished. Of the 153-mi. canal, 75 mi. have been completed to the St. John's River and 42 mi. are under contract. Two contracts for the final 36 mi. to the Kern River will be let in the new fiscal year.

Delta-Mendota Canal, 120 mi. long, 27% finished. Of the first 68 mi. now under contract, 33 mi. are completed. The remaining 52 mi. to Mendota Pool will be advertised soon.

Tracy Pumping Plant. The principal contract for construction of the huge building, intake canal, and discharge lines is 60% complete. A contract for completion of all remaining work, including installation of the pumping equipment, is expected to be awarded in August for completion in June, 1951.

Shasta Dam, 99.5 per cent finished. Contracts recently completed include the drum gates, the river outlet valves, the highway from Summit City, a parking area at the dam, and removal of the construction headtower. A 300,000-gal. steel water tank is under contract. Reservoir clearing will continue on the Pit River.

Keswick Dam and Power Plant, 80% finished. A contract was awarded in February for completion of the dam and power plant, including the spillway gate house, installation of the turbines, and miscellaneous items, to be completed by July, 1950. The three 25,000-kw. generators are being installed with the first unit scheduled for completion late this year. A contract for relocating a section of the railroad branch line to Shasta Dam, which now passes through an open section of Keswick Dam, is scheduled for completion next April.

Tracy Switchyard. All major items of equipment have been ordered. Bids for grading, surfacing, foundations, and installation of equipment will be advertised this winter.

Delta Cross-Channel. Final investigations are being completed to determine the actual route of the channel. It is expected the first construction contract will be let this year.



AT FRANCISCO MADERO DAM, a round-head buttress-type structure, use of efficient low-heat cement and an appropriate system of contraction joints saved 2,000 tons of reinforcing steel.

However, in order to secure additional protection, instructions have been given to change the composition of the cement raw mix to reduce the alkalis. The proportion of limestone, disintegrated granite, silicious limestone and hematite were such that the Al_2O_3 and the alkalis ran in the clinker up to 5.5% and 1.2%, respectively. With both protections (puzzolana addition and reduced alkalis) no detrimental expansion is expected at Morelos Dam. However, the sealed container tests are being continued.

It has not been until recent years that a serious effort was made in Mexico to handle cement in bulk and save the paper bags. Railroad box cars are used for the Morelos Dam job, and will be employed for the Alvaro Obregon and Presidente Aleman dams. Similar procedures will be adopted for other jobs, and in the future, bulk cement will represent in Mexico as large a proportion (30 to 40%) as it does in the United States.

Workable mix allows tunnel concreting in one operation

Bulk cement (modified-type) is being transported by tank truck to the Lerma Tunnel, being constructed for the water supply of Mexico City. Feature of this construction is that the tunnel's complete section (360 deg.) is being concreted in a single operation instead of by the usual method of casting the invert first and then the sides and arch. The new procedure requires an especially good workability for the concrete that is being provided by the addition of an air-entraining agent in the proportion of 0.07% by weight of cement, which entrains 3% air. Cement content is about 1.5 bbl. per cu. yd.; W/C is 0.55, and slump is $4\frac{1}{2}$ in.

Placing is done by a one-cu. yd. Press-Weld air gun. The end of the 6-in. discharge pipe is kept at the center of the arch, buried 3 to 13 ft. into the concrete. Boards at the bottom of the section form a bulkhead to help thorough filling of the invert, and are moved every 5 ft. as the concreting proceeds. Internal vibrators are used at the top of the arch but not at the sides, where spading is done close to the form. External vibrators have been suggested to improve the finish of the invert.

Lean mix saves cement

On the Tonto River, affluent of the Papaloapan, the Presidente Aleman Dam (to be a gravity structure 246 ft. high and 2,560 ft. long) will require more than 1,000,000 cu. yd. of concrete. Considering that the spillway will be constructed in a different location and that in the mild Mexican climate lean concrete can stand outside exposure, it is contemplated to use a mix with only 0.67 bbl. of cement per cu. yd. of concrete.

Twenty-two years ago in Mexico, concrete for dams with a cement factor of about 1.25 bbl./cu. yd. was considered satisfactory if its strength went up to 2000 psi. The lean concrete intended for Presidente Aleman Dam represents 25% higher strength and 16% less cement in the concrete.

For Presidente Aleman Dam, it is suggested that cold water be used to cure concrete and to cool piled aggregate, that at least seven days should elapse before new concrete is placed on top or at the sides corresponding to transverse contraction joints, that gaps five feet wide parallel to the axis of the dam with serrated edges to follow the direction of the principal stresses not be filled until the adjoining blocks have attained the mean annual temperature, and that all concrete surfaces be sprinkled continuously with cold water. With the gap joints, no longitudinal grouting will be required. By the use of properly-designed concrete mixes, cement of the composition and fineness required and adequate contraction methods, it is estimated that 300,000 bbl. of cement can be saved at this dam.

GRAND COULEE DAM in Eastern Washington increased its lead last month as the foremost power producer in the world when its 11th big generator went into commercial service. As the new unit went into action, the installed rated capacity of the Bureau of Reclamation power plant reached the total of 1,208,000 kw. (1,618,000 hp.).

Work is progressing satisfactorily on R-3, the third East Powerhouse generator. It will be operated this fall to swell the dam's installed rated capacity to 1,316,000 kw. (1,763,000 hp.).

Job Time Saved by Radio-Telephone

Radio-telephone can keep field teams and job superintendents in close touch with one another and the home office by making the nearest telephone as close as your car

COMING off Wheeler Ridge on California's Highway 99 at 60 m.p.h., Earl Q. Shafer, Road Superintendent for Pacific Crane & Rigging, Inc., of Los Angeles, remembered he'd forgotten to tell the home office about a new job problem. He reached below the dashboard, picked up a telephone and dialed the operator. A few seconds later he was talking to the home office in Los Angeles—100 mi. away.

Pacific Crane & Rigging is one of the 165 Pacific Telephone and Telegraph customers who have installed radio-telephones in company cars. P. C. & R. has two supervisors' cars radio-telephone equipped, and finds that despite the high initial and per-call cost, the time saved is worth it.

Shafer and the company's construction superintendent, T. L. Sitton, say they wouldn't know what to do without the phones, and don't see how they got along all those years before 9 months ago when their first phone-equipped car took the road.

Radio-telephones are cutting construction time, keeping company superintendents and field teams in close touch with the home office and one another, and making the nearest telephone as close as your car. But for contractors considering radio-telephone installations, there are several drawbacks and some questions which need answering.

Three channels not enough

At present there are three radio-telephone channels; two are called "urban channels"; the other, "highway channel." "Urban channels" are for use around the city; the highway setup, for

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out of town communications. Today Pacific Telephone and Telegraph has 1,000 companies on the waiting list with prospects for only one or two more channels, each capable of handling 55 customers.

Urban service, on 152-162-megacycle high frequency band, is satisfactory within a 25-30 mi. radius of the central transmitter station. In Los Angeles, for instance, a 250-watt transmitter is located atop nearby Verdugo Hills, Burbank. Telephone numbers on these mobile urban channels are prefixed JL and WJ. Scattered within the radius-area of each 250-watt transmitter station are six remote receiver stations which pick up the weak 20-watt signal from the mobile transmitters and relay it to the central mobile operator.

The highway channel, prefixed ZM, has transmitting and receiving stations along main highway routes. California stations are San Diego, Los Angeles, Bakersfield, Fresno, Modesto, Stockton, Sacramento, Oakland, and Salinas. Transmitters are also located at Salem and Eugene in Oregon, and the plan is to extend this service to Sacramento so that a construction outfit's personnel

can cruise from San Diego to the Washington state line remaining in constant communication with the home office, or for that matter, with any land phone that knows his number and which of the various highway transmitters he's near. A mobile car, cruising within a 50-60 mi. radius of a main highway transmitter, can be picked up by operators at these stations which are approximately 100 mi. apart.

Mobile call tolls

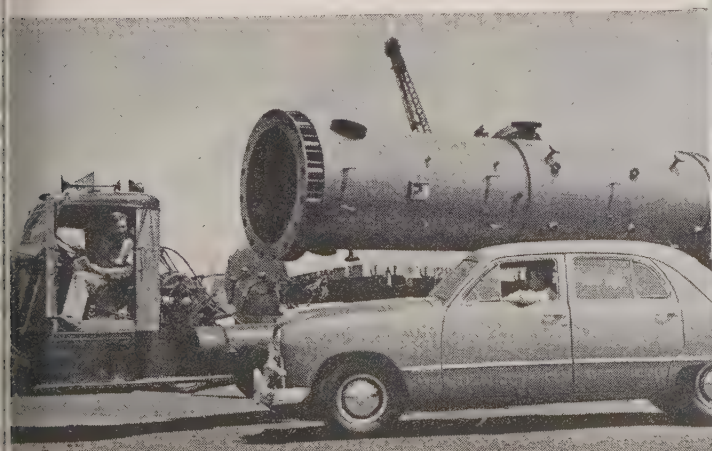
Initial installation cost is \$50.00, which includes the receiver and the mobile unit's 20-watt transmitter. Besides initial installation costs, there is a \$25.00 monthly rental fee for the equipment and a \$7.00 minimum usage charge. Thus, the base rate for a minimum number of calls (approximately twenty 10-cent zone calls) is \$32.00.

Mobile per-call tolls run considerably higher than for regular pay-phone calls. For calls made within the regular 10-cents toll area, the mobile unit is charged 30 cents per call; within the 15-cent toll area, the mobile unit pays 35 cents per call; within the 20-cent zone, 40 cents per call. These rates are for 3-minute conversations. For any call beyond the usual 20-cent zone, calls are figured whether day or night, on a person-to-person, daytime rate, with a 45-cent minimum.

Mobile party lines

Essentially, the mobile unit is a party line, with 55 subscribers per line. But calls from the mobile operator to a mobile unit are made directly, the operator ringing only the desired mobile unit. Each mobile receiver is equipped with an amber dash light which flashes when the operator calls; there is also a bell, just as with ordinary phone. All a driver need do is lift the receiver and talk. If a busy field-supervisor must be away from his field car, the phone can be attached to the horn; when the operator

A RADIO-TELEPHONE-equipped car pulls alongside a shipment of pipe bound for the oil fields, left. The superintendent driving the car will telephone ahead to tell field crews the truck is on its way. T. L. SITTON, right, construction superintendent for Pacific Crane & Rigging, illustrates how easily his phone can be used as he drives along.



calls, the car horn blows. The same can be done with lights; when the operator calls, his car lights go on.

Mobile phone customers now include general contractors, truckers, and pipeline contractors.

Field experience tells

Pacific Crane and Rigging's Construction Superintendent, T. L. Sitton, lists advantages to himself and his company through actual field experience:

1. Has cut out doubling back; the company in Los Angeles can put him on another job by merely calling his unit.
2. If a customer has a technical question in the Los Angeles office, Sitton often phones in the answer, although he may be several hundred miles away. This keeps technicians within phone reach.
3. Helps speed daily progress reports. Instead of driving miles to a phone, all Sitton has to do is lift his car phone (pro-

viding he's within transmitter distance), and make his report.

Some objections

There are some objections to the new system. The main limitation is range. Cars driving out in the desert find reception fair to poor; mountains may blot out reception altogether. Generally, reception is very clear and results are good.

Another objection is the party-line arrangement of channels. While the mobile-telephone has the advantage that you speak directly to your party, oftentimes the line is busy. With 55 customers per channel, it is possible for a long-winded conversation to hold up the channel while others must wait to phone. However, latest of the new developments by the phone company will be installation of a multi-channel device enabling users to switch channels when their channel is busy.

U. S. B. R. Chief Approves Idaho Reclamation Work

SECRETARY of the Interior J. A. Krug has approved a Bureau of Reclamation planning report calling for irrigation of 77,650 acres of new land in the North Side Pumping Division of the Minidoka project, near Rupert, Idaho, at a total cost to the Federal government of \$11,395,000. The water supply will come from the Snake River and from wells. The report is now being sent to the States and to the interested Federal agencies for comments.

Under the proposal, 13,650 ac. of the Division would be served with water from the existing American Falls Reservoir and the authorized Palisades Reservoir by pumping from the Snake River behind Milner Dam, and 64,000 ac. would be supplied from some 300 wells to be drilled to tap the great groundwater body underlying the area.

Hydroelectric power for pumping would be obtained initially from the Minidoka and Anderson Ranch power plants. The proposed Palisades power plant will, when completed, be an additional source of power, and the report suggests that the completion of the American Falls power plant should also be considered for this purpose. An electrical power distribution system to service the pumps required to bring water supply to the land is an integral part of the development plan.

The report is based on a settlement of the long-standing controversy between local groups over the final utilization of 433,593 ac.-ft. of reserve storage space in American Falls Reservoir. Recent negotiations with 22 irrigation organizations, which have leased the space annually since 1931, have resulted in a tentative agreement to sell to them 315,000 ac.-ft. of the reserve space and utilization of the remaining space (118,593 ac.-ft.) for new land development in the area.

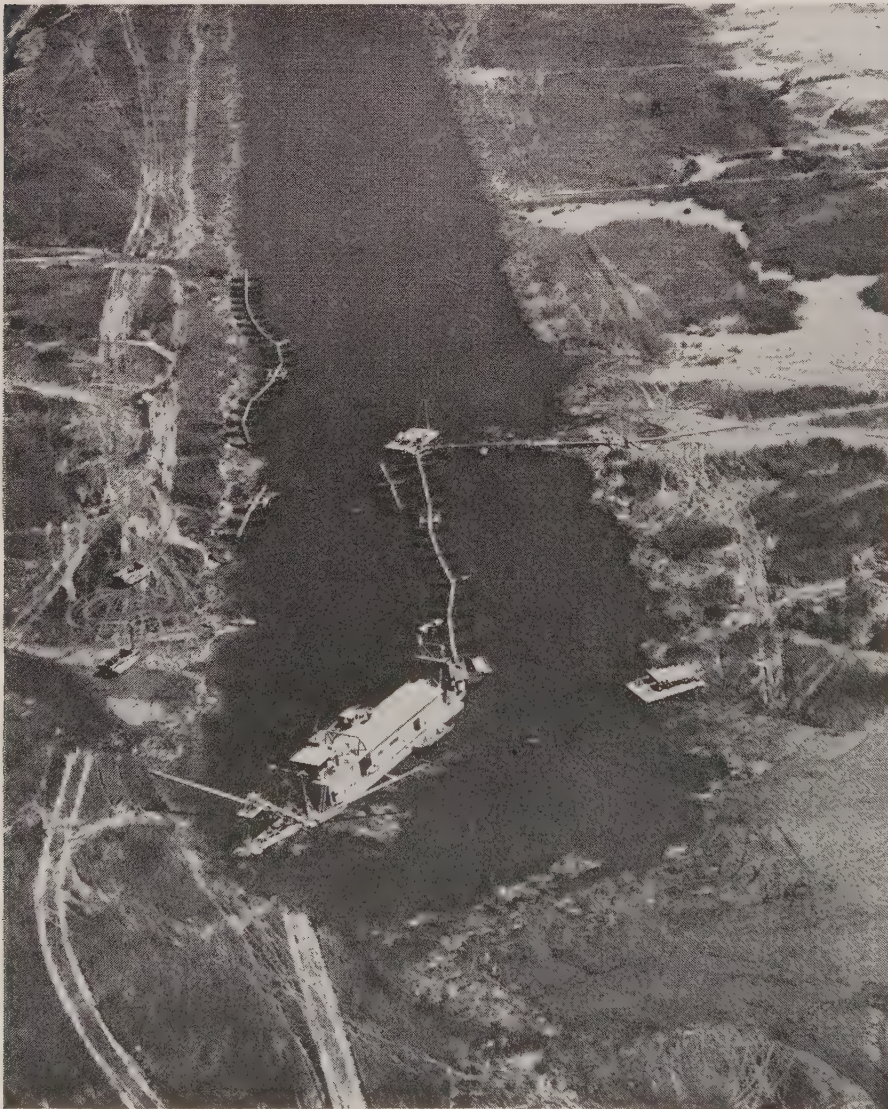
Record Expenditure for New Construction So Far in 1949

A RECORD TOTAL of nearly \$8.5 billion was spent for new construction during the first half of 1949, according to the U. S. Department of Commerce report. The figure was about \$300 million (4 per cent) higher than the previous record dollar value of new construction put in place during the first 6 months of 1948. Private expenditures totaled \$6.2 billion, 5 per cent less than last year, but public agencies spent over \$2.2 billion during the first half of this year, 37 per cent more than in the corresponding period of 1948.

Total value of new construction put in place during June was over \$1.7 billion, a better-than-seasonal increase of \$100 million from the revised estimate for May and \$5 million above the total for June 1948, according to the Department's Construction Division. Both private and public expenditures increased by 11 per cent in June over May.

SUCTION DREDGE RESTORES COLORADO RIVER TO A CONFINED BED

THE BUREAU of Reclamation's big hydraulic dredge (described in April 15 issue of *Western Construction News*) went into operation last January and already has progressed nearly 2 mi. on the alignment of a new channel to relieve the town of Needles, Calif., from flood danger. Nearly a million cubic yards of material have been dredged (note dredge material being discharged by pipeline alongside channel at right). The new channel is 300 ft. wide and approx. 17 ft. deep. A levee is being constructed from dredged material to keep water from escaping into swamp lands at right. The machine progresses by means of two 40-ft. spuds at the stern and swing anchors suspended by cables from the anchor booms. It was built by the Pacific Coast Engineering Co.



Tests Establish Strength of Single Diagonally Sheathed Roof Structure

First tests determine diaphragm action of the single diagonally sheathed wood structure and point toward its use on buildings to effectively resist lateral seismic and wind forces

SO FAR AS IS KNOWN tests have been made to establish the strength and stiffness of a single-diagonally sheathed wood roof structure used as a horizontal diaphragm to distribute lateral seismic and wind forces to the vertical bracing elements of a building. The usual design involves simply the provision of proper chord members at the margins of the diaphragm to resist direct bending stresses and the provision of sufficient marginal nailing to resist the shear forces. The stresses within the diaphragm itself have been given little attention.

Past findings, present investigations

In a previous series of tests, the authors investigated the lateral beam or diaphragm action of quarter-scale model floor panels having diagonal and longitudinal sheathing and with the loads and reactions acting in the plane of the panel. These tests were reported in Engineering News-Record for June 20, 1935. It was found that with this type of sheathing, the panel acts to resist lateral bending forces in a manner similar to a beam and that the deflection can be closely approximated by the use of empirical elastic constants in the usual flexure and shear formulas applicable to homogeneous beams. The tests described in this article were performed in the same manner on similar models, except that panels were provided with flange members to resist the direct bending stresses and were single diagonally sheathed to simulate a roof instead of a floor. It was desired to investigate the manner of action of such a structure from both a qualitative and a quantitative standpoint and to determine if this action could be analyzed by the same general methods as had previously been employed.

Resolving the stresses

In this type of structure it was expected that the sheathing would act somewhat in the manner of the web of a plate girder. If the direct bending stress is assumed to be resisted entirely by the flanges, the web is subjected to pure shear stress which may be resolved into two equal principal stresses, one of tension and one of compression, each acting at an angle of 45 deg. with the axis of the panel and at an angle of 90 deg. with each other.

If the diagonal boards are in the direction of the principal tension, the com-



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pression, which will be at right angles to the boards, tends to force them together. There are two conditions to be considered here. In one condition the boards are in contact with each other and the compression is efficiently resisted in direct bearing between the boards. In the other condition the boards are separated slightly, as would normally be the case due to shrinkage, and the compressive stress must be resisted by the nails connecting the boards to the joists or rafters. Condition two would be expected to give a diaphragm of somewhat less efficiency and stiffness than condition one.

If the diagonal boards are in the direction of the principal compression, the tension, which will be across the boards, will tend to cause their separation. This separation must be resisted by the nails which will be stressed the same as for condition two described above but in the reverse direction.

THE SUBJECT of this manuscript is of interest to all engineers who are concerned with the designing of buildings to resist lateral forces and is of particular interest to engineers on the Pacific Coast, who are seismic force conscious.

A committee has recently been appointed by the Structural Engineers Association of Southern California to study the design problem presented by the single diagonally sheathed wood diaphragm, with the object of advising local building officials concerning building code requirements relative to this type of structure.

Illustrated on the next page is a set-up of the test apparatus with a panel in position for testing. The load was applied by means of a screw jack at the center of a distributing beam, which in turn transmitted the load to two other beams through a spacer and calibrated spring so as to produce fifth point loads on the test panel. The deflection of the unloaded flange of the panel relative to the end supports was determined by means of Ames dials reading directly to 1/1000 of an inch.

For convenience, in referring to the panels, the members forming the margins of the panel are designated as follows:

Loaded Flange: The margin of the panel against which the load is applied.

Unloaded Flange: The margin opposite and parallel to the loaded flange.

End Posts: The margins of the panel at right angles to the flanges.

Each test panel comprises $\frac{1}{2} \times 1\frac{1}{8}$ -in. joists spaced 6 in. (simulating 2×8 -in. joists at 24-in. spacing) placed between and at right angles to two $1\frac{1}{2} \times 2\frac{1}{2}$ -in. flange members. The span of all panels was 10 ft. between end joists. Panel No. 1 was 6 ft. wide, Panels Nos. 2 and 3 were 5 ft. wide. Each end joist was nailed to a $2\frac{1}{2} \times 3\frac{1}{2}$ -in. end post (simulating a wall or bond beam) to take the reaction. Solid blocking was provided between the ends of the joists and at the third points of the joist span, with each joist end nailed to a block and the end blocking nailed to the flanges to resist horizontal shear. Since it was not the intention to simulate the connection of the end blocking to the wall or bond beam of an actual building, the nailing of the blocking to the flanges was made very secure (8 shingle nails in each block) so as to obviate slip at this point. The sheathing boards, which were $3/16 \times 1\frac{1}{8}$ in. (simulating 1×6 in.) were laid with the boards in contact with each other and at an angle of 45 deg. with the joists. Joints of adjacent boards were staggered or separated by two joist spaces. Three 20 gauge $\times \frac{5}{8}$ in. nails (simulating 8d common nails) were provided in each board at the end joists and end blocking at the margins of the panel and two nails were provided in each board at intermediate joists.

The board length that was employed (3 ft.) is equivalent to 12 ft. full size boards, which is as short as it is expected would be used in actual practice. Each board spanned four joist spaces except where shorter boards were required to fill in at the margins.

Panel No. 1 fails at 3,120 lb.

Panel No. 1 was 6 ft. wide between the centers of the flange members and had the sheathing boards laid all in one



GROUPED AROUND a set-up of the test apparatus with a panel in position for testing are, left to right: RALPH TAYLOR and CHARLES PETERSON of the California Division of Architecture; B. BENIOFF and GEORGE GRAY of Summerbell Roof Structures; RALPH THOMAS, Los Angeles Dept. of Building & Safety; HARRY BOLIN, Division of Architecture; R. J. FINDLETON of Summerbell; N. B. GREEN, co-author of this article; E. D. SEAYER of the Summerbell firm, and A. C. HORNER, co-author of this article (foreground).

direction. This panel failed under a load of 3,120 lb. The failure occurred in that portion of the panel where the boards were in the direction of the principal compression. The failure was due to the lateral separation and the accompanying outward thrust of the boards in this portion of the panel. This produced bending in the end posts and separation of the end posts from the unloaded flange at one end of the panel. Lateral separation of the boards in this portion of the panel was progressive as the load increased, whereas in the portion of the panel where the boards were in the direction of the principal tension, they remained tight and there was no evidence of distress even at the ultimate load.

Since it was expected that this panel would deflect unsymmetrically, deflection measurements were made at the center and quarter points of the span. Curve #1 in the left drawing of Figure 1 gives the deflection at the quarter point nearest the end that failed. Curve #2 gives the deflection at the center and curve #3 is for the other quarter point. These smooth curves average the slight irregularities of the recorded load deflection lines and correctly indicate the rate of deflection at any load.

The dotted lines of Figure 2A show the lateral deflections of the margins of the panel as they were measured after the panel had failed. No measurements were made of movement at the corners or of the unloaded flange.

Unfortunately no measurements were made of the marginal deformations of the end posts at the lower loads. Also, the flange members were not securely fastened to the end posts. These two factors render the results of this test somewhat inconclusive.

Panel No. 2 fails at 4,200 lb.

Panel No. 2, which was 5 ft. wide, was designed with the sheathing boards laid in the form of a V having their vertices along the center joist of the panel, so that the boards in each half of the panel

would be in the direction of the principal tension.

Panel No. 2 failed at a load of 4,200 lb. due to the sudden shear failure of all of the nails connecting the sheathing to the end joist at one of the end posts and a simultaneous pulling away of the sheathing from the loaded flange. The maximum deflection of this panel occurred at the center of the span. The load deflection curve is shown in Fig. 1. It will be noted that this panel not only attained a higher ultimate load than Panel No. 1 but was very much stiffer, even though it was a foot less in width. The deformation of this panel was more nearly symmetrical than Panel No. 1 and the secondary bending in the end posts was relatively small. There was no separation of the boards at any point in the panel.

Panel No. 3 did not fail

A roof diaphragm could be constructed as a single unit of the type of Panel No. 2, in which case, however, the boards might be in the direction of either the principal tension or the prin-

cipal compression depending upon direction of the lateral force. It decided therefore to test a panel similar to Panel No. 2, except the load would be reversed so that all of the boards would be in the direction of the principal compression instead of in the direction of the principal tension. A steel angle was provided at each corner of the panel having four $\frac{5}{16} \times 1\frac{1}{2}$ -in. lag screws into the flange member and a $\frac{1}{2}$ in. through the end post. Cross ties were provided between the loaded and unloaded flange at the center and quarter points of the span.

This panel was loaded to 4,400 lb. at which point it was continuing to load at a nearly constant rate and did not show any signs of approaching failure. The test was stopped at this point due to limitations of the testing apparatus. The load deflection curve shown in Fig. 1 shows that this panel was not as stiff as panel No. 2 at low loads but was stiffer at high loads and had a higher ultimate strength.

During the test of Panel No. 3, at each load increment, measurements were made of the center deflection of each end post and of the relative movement of flange and end post at each corner of the panel. It was found that at a load of 1,500 lb., there was a very slight deflection of the end posts (about .03 in.) but no movement at the corners. Beyond that load a movement developed at the corners and the deflection of the end posts and the movement at the corners progressively increased so that at a load of 4,040 lb., the deformation of the panel was as shown in Fig. 2.

The cross ties did not resist any lateral movement during the test; in other words, loaded and unloaded flanges remained parallel.

The test results . . .

The deflection of Panel No. 1 was symmetrical. That portion of the panel having the boards in the direction of the principal tension was considerably stiffer than the portion where the boards were in the direction of the principal compression. This result agrees with the results of the tests of Panels Nos. 2 and 3. However it is not clear why the n-

THE DRAWINGS—

FIGURE NO. 2-A

Deformation of the panel that failed.

FIGURE NO. 2

Deformation of the panel that didn't fail.

FIGURE NO. 3

Plan view of boards in a roof structure for greatest strength and stiffness.

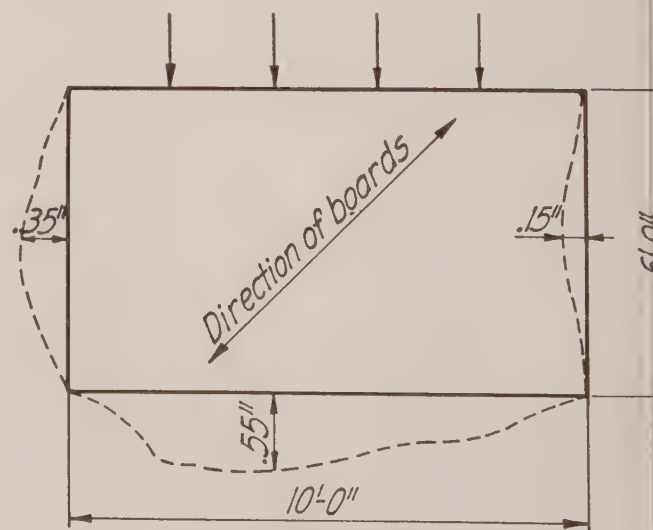


FIGURE NO. 2-A

imum deflection of Panel No. 1 was greater than that of either of the other two panels, in spite of its greater width.

It seems apparent that up to the ultimate load, Panel No. 2 acted predominantly as a plate or diaphragm. There was no board separation, no apparent tendency of the panel to separate at the corners and very slight secondary bending of the end posts.

It is believed that Panel No. 3 acted efficiently as a plate or diaphragm up to a load of about 1,500 lb. At this load, the outward bending of each end post was .03 in. This deflection would be produced by a uniformly distributed load on the end post of 98 lb. The outward load on the end posts is evidently somewhat greater near the unloaded chord, judging from the slip at the corner connections, but even if the load distribution is assumed to be triangular instead of uniform, the load calculated from the maximum deflection is practically the same.

This computation is based on a Modulus of Elasticity of 1,600,000; a span between corner connections of 63 in., and a moment of inertia based on the assumption that the end post and the end joist (which was nailed to the end post with two 1-in. shingle nails every two inches) acted as a unit in resisting bending.

Since the boards were at an angle of 45 deg., it may reasonably be assumed that the components of force normal to and parallel to the end posts are the same.

Truss and diaphragm action

In other words twice the load, or 196 lb., was transmitted to the reaction through the end posts by what may be termed truss action. This 196 lb. is only 13% of the applied load of 1,500 lb., and it is believed that for a full-sized roof structure the marginal forces associated with this percentage of truss action would probably not necessitate any specially designed marginal members.

This condition of load distribution, with respect to the relative proportion of load carried by truss action, is therefore used as the limit up to which diaphragm action may be assumed to govern; and the load at which it occurs is designated the maximum permissible load for diaphragm action.

Beyond the load of 1,500 lb., the dia-

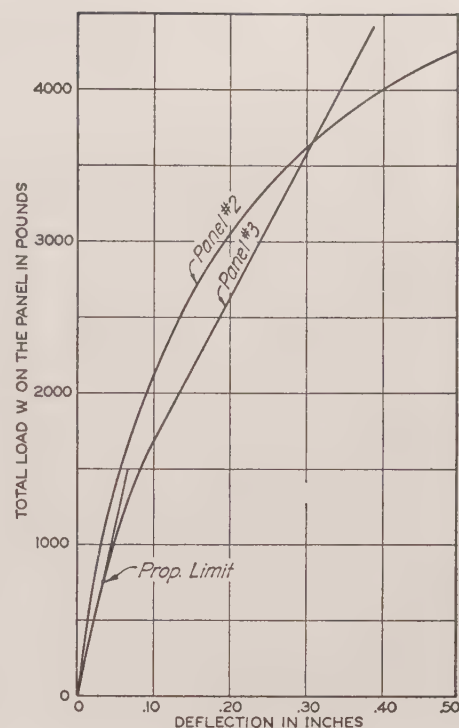
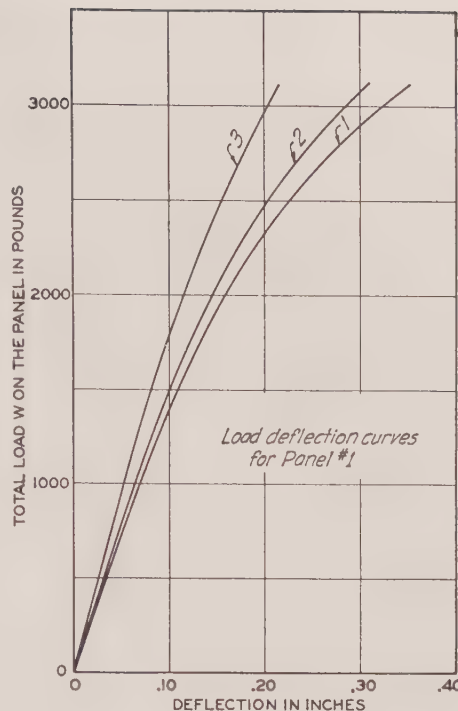


FIGURE NO. 1—Load Deflection Curves.

phragm action of Panel No. 3 was less efficient and truss action became more important. A greater and greater portion of the load was transmitted from the loaded chord in compression along the diagonal boards, thence directly into the end posts and the testing frame.

At the last load to which measurements were taken, 4,040 lb., the outward bending of each end post was .26 in., which on the above basis indicates truss action of 42% and diaphragm action of 58%.

Limitations in practice

The greater stiffness of Panel No. 2 is believed to be due to the fact that the boards were in contact so that the principal compression was efficiently resisted. In practice there might be a separation of the boards due to shrinkage, in which case an actual roof of the type of Panel No. 2 would have about the same stiffness as a roof of the type of Panel No. 3.

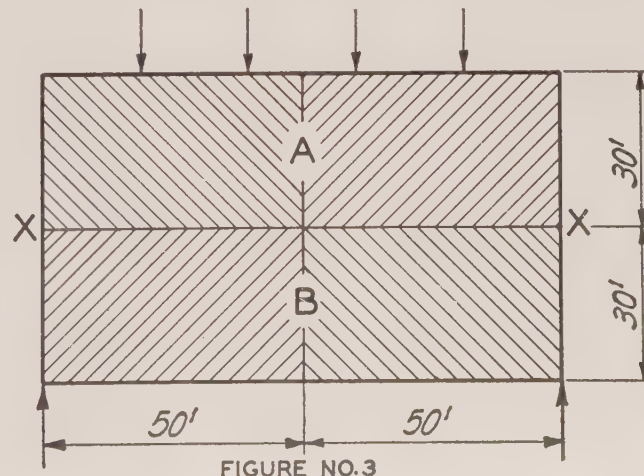
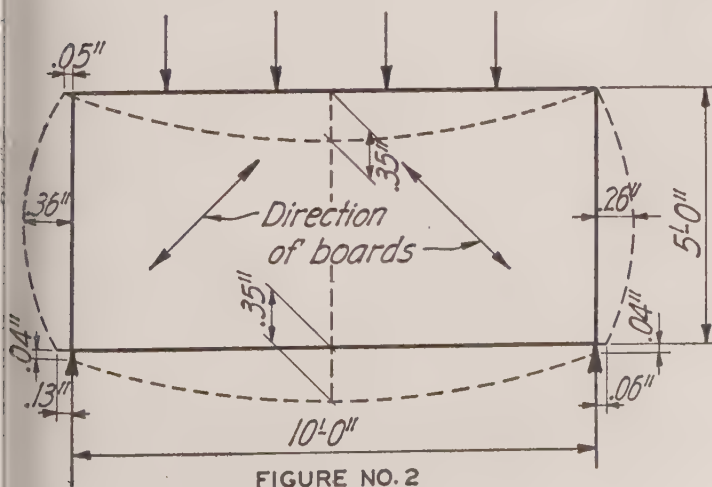
The subsequent analysis will be based

on the deflection of Panel No. 3, and it will be assumed that the analysis applies also when the direction of loading is reversed so that the boards are in the direction of the principal tension.

To take advantage of this truss action would involve the provision of strong and relatively stiff marginal or bond beams. It is believed therefore that unless specially designed marginal beams are provided, the lateral load on a roof structure of the type of Panel No. 3 should not greatly exceed the maximum permissible load for diaphragm action as herein developed.

Conclusions, applications, recommendations

1. A roof structure comprising wood joists, marginal flange members and single diagonal wood sheathing laid at an angle of 45 deg., will have the greatest strength and stiffness in resisting lateral bending forces if the boards are laid in one direction for half the structure and at an angle of 90 deg. for the other half,



so as to give a symmetrical board pattern. (See Fig. 3).

2. If the boards are laid with a reasonable stagger between joints of adjacent boards and adequately nailed to the joists and flange members, this structure will act partly as a truss and partly in the manner of a plate girder with joists and sheathing serving as a diaphragm to resist shear stresses. If the direction of loading is such that all boards are in the direction of the principal tension and in contact with each other (Panel No. 2), the diaphragm action will be predominant up to the ultimate resistance of the structure. For a loading in the reverse direction (Panel No. 3) the diaphragm action will be predominant up to the ultimate load but will be efficient only up to a certain limiting load which may be termed the maximum permissible load for diaphragm action. A criterion of efficiency has been arbitrarily selected such that only 13% of the load which the panel is carrying at any time is resisted by truss action. It is believed that when such condition of truss action exists, the outward thrust at the margins (end posts) could probably be resisted by any practical roof structure.

3. It is recommended that the maximum permissible load for diaphragm action for a full size panel constructed in the manner of the $\frac{1}{4}$ scale model test panels No. 2 and No. 3, be taken as that load which will produce a maximum shear stress in the diaphragm of 275 lb. per foot width. For loads on the structure within this limit, the lateral deflection of the structure can be approximated on the assumption that it acts in the manner of a homogeneous beam.

4. For a lateral load on the roof structure that exceeds the maximum permissible load for diaphragm action, an important portion of the load is transmitted to the supports by truss action. This action exerts a lateral thrust on the marginal members of the roof. Unless these members are specially designed to resist this thrust, the lateral load on the roof should not exceed the maximum permissible load for diaphragm action.

5. The load at the proportional limit and the stiffness of the diagonally sheathed roof structure will be directly proportional to the number of nails that connect each board of a given size to each joist or rafter, when sufficient nails are provided at the margins to resist shear.

6. The above conclusions should be considered as tentative, since it is obvious that the scope of the tests herein reported is inadequate to establish clearly the manner of action of single diagonally sheathed wood diaphragms, intended to resist loads applied in the plane of the diaphragm. Specifically, further tests are needed to evaluate the effect of the following factors: Width of diaphragm, separation of boards, board pattern, openings in the diaphragm and repetitive loading. It is hoped however that the data and analysis herein will provide a provisional method of design and may be helpful in furthering a more complete test program.

Analysis of the tests in accordance with beam theory

Up to the point of maximum permissible load for diaphragm action it is believed that the stresses within the panels are distributed essentially in the same manner as in a beam or plate girder, with the sheathing and joists acting as a web to resist shear stresses.

From Fig. 1, it will be seen that the deflection of Panel No. 3 was directly proportional to the load up to about 750 lb., which may be termed the proportional limit. It is proposed to employ the conventional beam theory and to determine an elastic constant or shear modulus for the diaphragm from the measured load and deflection at the proportional limit.

Nomenclature:

W = Total load on the panel applied at the fifth points of the span. (Unit of measurement, lb.)

r = Scale ratio of the panel (4 for the model, 1 for the prototype).

L = Span of the panel (unit, 12"/r).

b = Width of the panel, center to center of flanges (unit, 12"/r).

A = Sectional area of the flange members (unit, 12"/r).

I = Moment of inertia of a transverse section of the panel neglecting the web (unit, 12"/r).

E_1 = Modulus of the flange material (unit, (12"/r)³).

E = Modulus of the flange material (unit, inches³).

E_s = Equivalent shear stress modulus of the web (unit, (12"/r)³).

d_1 = Shear deflection of the panel (unit, 12"/r).

d_2 = Bending deflection of the panel (unit, 12"/r).

d_3 = Total deflection of the panel (unit, 12"/r).

d = Total deflection of the panel (unit, inches).

Employing the formulas for shear and bending deflection of a simple beam of homogeneous material under fifth point loads, there is obtained

$$d = d_1 + d_2 = \frac{3WL}{20 b E_s} + \frac{WL^3 r^2}{4580 E A b^2} \quad 1.$$

Equation 1 gives the deflection of the panel in terms of the unit 12"/r. To obtain the deflection in inches, multiply by 12/r whence

$$d = \frac{1.8 WL}{r b E_s} + \frac{WL^3 r}{382 E A b^2} \quad 2.$$

The value of E_s with the diagonal boards in the direction of the principal compression may be determined from Equation 2 by substituting therein the load and deflection at the proportional limit for Panel No. 3 and the other values relating to this panel.

The substitutions are as follows:

$W = 750$, $d = .034$, $r = 4$, $L = 40$, $b = 20$, $A = .416$ and $E = 1,600,000$.

Solution of the resulting equation gives $E_s = 21,000$.

Substituting $E_s = 21,000$, $E = 1,600,000$ and $r = 4$ in Equation 2, there is obtained

$$d = \frac{WL}{47000 b} + \frac{WL^3}{153,000,000 A b^2} \quad 3.$$

Equation 3 gives the deflection under fifth point loads within the proportional

limit, of a quarter scale model of the of Panel No. 3, in which the boards are in the direction of the principal compression. For loads acting in the opposite direction so that the boards are in tension the deflection is assumed to be the same or at least no greater.

Relationship of the shear stress modulus of the model panel to that of the prototype

From Equation 2 it is seen that the deflection of the panel consists of two parts, the bending deflection and the shear deflection. The former can be directly computed for either model or prototype, since the modulus E for the material of the flanges is known. It is desired to establish a relationship between the shear deflection of the model and that of the prototype from which a relationship between the shear stress moduli can be determined. This relationship is here determined under center loading, however the same method of analysis may be employed for any type of loading and the relationship will be the same.

Nomenclature:

W = Center load on the panel in pounds

S_x = Load on any one nail X in pounds

$C_x = W/S_x$ which is assumed to be constant for any given nail X .

e = Slip or deformation of nail X in inches under load S_x .

K = S_x/e for the nails of the panel which is the slope of the load deformation line expressed in pounds per inch deformation.

n = The total number of nails in the panel.

D = The center deflection of the panel in inches due to the deformation of the nailed diaphragm or web.

It is assumed that the deflection of the diaphragm or web is entirely due to deformation, i.e., that the boards are rigid. It is further assumed that K is constant. This implies a load on the diaphragm that does not exceed its proportional limit, within which none of the nails of the diaphragm will be stressed beyond their proportional limit.

Equating the external work to the internal work performed on the diaphragm

$$\frac{1}{2} WD = \text{Summation (1 to } n) \frac{1}{2} S_x e$$

from which

$$D = \text{Summation (1 to } n) \frac{1}{(C_x)^2}$$

It will be seen from Equation 5 that for geometrically similar panels (i.e., for model and prototype) acted upon by the same load W , since the summation is the same in each case, the deflection will be inversely proportional to the respective values of C_x . If therefore D and K refer to the full size panel and D' and K' refer to the model

$$\frac{D'}{D} = \frac{K}{K'}$$

Substituting the expression for the shear deflection from Equation 2 into Equation 5 and if r' and E_s' refer to the model panel and r and E_s refer to the prototype, there is obtained

$$E_s = E_s' \frac{K r'}{K' r}$$

which gives the desired relationship between the equivalent shear stress moduli.

Continued on page 132

Concrete Bins Go Up in Record Time

In the fastest such construction performed to date, Spokane contractors use continuous slip-form pouring to erect concrete grain storage bins — Screw jacks lift forms on steel rods that have a double use

FIFTY-TWO concrete grain storage bins composing an elevator 120 ft. high were completed last month by Henry George & Sons, Spokane contractors, by continuous slip-form pouring in ten days, the fastest such construction that has ever been performed.

The project is one of eleven grain elevators being built this summer by the George company in Washington, Oregon and Montana. It is owned by Centennial Flouring Mill Co., and is located about 2 mi. east of Spokane. The new elevator is in fact an addition to an existing elevator and mill.

Design standard; speed of erection meritorious

The floor plan of the structure shows it to be composed of 14 circular bins, each 15 ft. in diameter; 14 semi-circular fillers, which cause the outside of the structure to appear like a series of parallel tubes, and 24 center bins between the circular members, making a total of 52 separate containers. Altogether they will accommodate a total of 412,000 bushels of grain.

The bins are topped off with a head-house in which is located a continuous 24-in. belt system for feeding the various silos, and in the substructure beneath them is another belt system, of 18-in. width, for taking the discharge of grain and distributing it to the desired sections of the flouring mill. The design and operation of the elevator is rather stand-



THE ELEVATOR BINS, 52 in number and looking like a series of parallel tubes, are shown half completed. Transit-mixed concrete was being delivered at this stage at the bottom of the bins.

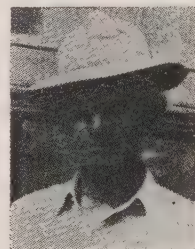
ard, but the method and speed of erection by the contractors merit comment.

Bins 8 in. taller each hour

No particular foundation treatment was required, as the underlying rock in the Spokane area is adequate to support any structure. The substructure is composed solely of heavy reinforced concrete walls set on a 30-in. floor slab. These walls carry a 12-in. slab upon which the heavy hopper bottoms for the bins were constructed of lean concrete and the slip forms for bin wall construction were erected.

These forms are of 1 x 4-in. lumber, vertical on the outside, and with a 3/8-in. batter on the inside to permit free up-

JACK DILLON, veteran with Henry George & Sons, contractors for the construction, was day-time superintendent on the job.



ward movement. The forms are 4 ft. high, and across the top surface all except the actual pour openings is floored to serve as a working area.

Mounted on this floor are 300 heavy timber yokes, through each of which projects a 3/4-in. steel rod, which serves simultaneously as the lifting support and the vertical steel in the bin walls. Operating around the rod and acting upon the yokes are screw jacks, each of which will lift the yoke and the attached form 5/16 in. with each full turn.

Ten jacks per operator

A crew of men is assigned solely to the operation of these screw jacks, ten of the devices being assigned to each operator. The jacking foreman, carefully observing the progress of concrete placing, blows a whistle at regular intervals, upon which signal each of the jack tenders turns his screw one-quarter turn, thus assuring an even and steady lifting movement of the forms. Progress on the Centennial job averaged about 8 in. per hr.

The tender is also responsible for adding a new length of rod (fastened to its predecessor only by a sleeve of 3/4-in. pipe, with a small crimp at the center to prevent it from sliding away from the joint) and for periodically repositioning the grappling jaws by which the

CREWS OF MEN were assigned solely to operating the 300 screw jacks that lifted the yokes supporting the forms through 8 in. each hour. Close-up of the jacks' grappling jaws, right.



screw jack exerts its force upon the rod.

Concrete was mixed at the site in a Mixermobile for the earlier stages of construction, but after the working deck had reached 35 ft. above ground, the maximum reach of the machine's boom, transit-mixed concrete was purchased from Central Pre-mix Co. of Spokane, which delivered it to the base of the bins, where it was discharged into concrete buggies. The loaded buggies were lifted to the working deck by stiff-leg cranes mounted on the side of the deck, with power furnished by two donkey engines on the ground. On the working deck, the buggies are wheeled to the desired point of placement and dumped. The thin walls (7 in. thick on the periphery and 6 in. in the central walls) are not vibrated, but voids in the concrete are eliminated by careful spading as the concrete is dumped. Concrete was specified to produce 3,000-lb. strength in 28 days.

Pre-bent reinforcing steel is also lifted

to the deck by means of the stiff-leg cranes and is placed by a steel crew at specified intervals as pouring progresses by threading through the legs of the yokes.

No finish is applied to the inside of the bins other than the natural troweling of the moving forms. On the outside, rubber float finishing is applied to improve appearance by a man on a scaffold mounted below the forms and moving with them.

The pour on the main bins started June 21 and ended July 1, continuing without interruption for 24 hr. every day throughout the entire period, so that no joints or breaks appear in the surface. At the maximum height, 120 ft., the floor of the working deck was used as the lower form for the bin roofs. The head house, also of concrete, was added later, by conventional methods.

Supervising construction for Henry George & Sons was Jack Dillon, a veteran with the company, in daytime, and Dimes Carlos at night.

FPC Okeh Asked on Pipeline In Montana and Dakotas

THE FEDERAL Power Commission has been asked to authorize construction of a proposed \$8,419,880 pipeline project which would make available an additional 35,000,000 cu. ft. of natural gas per day to customers of Montana-Dakota Utilities Co. in Montana and North and South Dakota.

A joint application filed with FPC by Montana-Dakota and Montana-Wyoming Gas Pipe Line Co. includes plans for a 340-mi., 12¾-in. pipeline extending from the Worland Field in Washakie County, Wyo., to Montana-Dakota's Cabin Creek compressor station in Fal-

lon County, Mont.; a combination gas compressor, dehydration and sulphur removal plant near the Wyoming origin of the line, and two branch lines, one connecting with the present gas distribution system at Miles City, Montana, and the other connecting with a distribution system to be built by Montana-Dakota in Forsyth, Montana.

The 340-mi. main pipeline and combination plant would be constructed and owned by Montana-Wyoming and operated under lease by Montana-Dakota. The branch lines would be constructed, owned, and operated by Montana-Dakota. Both Montana-Wyoming, a new corporation organized May 20, and Montana-Dakota have main offices in Minneapolis, Minnesota.

Collegians Win Awards For Arc Welding Papers

AWARDS and scholarships totaling \$6,750 have been presented by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, to engineering college and undergraduates closing the 1949 competition of the Annual Engineering Undergraduate Award and Scholarship Program. The program was designed to stimulate engineering undergraduates to investigate and aid in developing the science of arc welding and its application.

Included among the awardees were a number of Western collegians. The Westerners and the subjects of the papers included: Kenneth G. Parron, Montana School of Mines, "Design of Arc Welded Mast for Oil Well Drilling Machine"; Norman C. Hodge, University of Denver, "Design of a Portable Drafting Table"; Lewis F. Cheek, Texas Agricultural and Mechanical College, "Design of Arc Welded Fixtures for War Production"; Arthur G. Moore, Montana School of Mines, "Arc Welding Applied to Concrete Aggregate Plant"; B. M. Chronic, University of Idaho, "The Design of an Adjustable Mobile Mono-Rail Hoist"; Edwin Carlson, Utah State Agricultural College, "Arc Welded Design for Two-Wheel Trailer"; Theodore Pollard, University of Colorado, "A Flexible Resistor Achieved with Arc Welded Steel"; John S. Ransom, University of Colorado, "Design of Welded Bridge"; Gordon Daniels, New Mexico School of Mines, "Arc Welded Conveyor Belt Accessories"; Justin T. Morgan, Oregon State College, "Redesign of a Laboratory Sand Sifter"; and Frank C. Seiler, University of Colorado, "Aluminum Formwork for Concrete."

FOR CONSTRUCTION of Metropolitan Life Insurance Company's multi-million dollar Parkmerced apartment house project in San Francisco, Pacific Coast Aggregates is supplying the 200,000 cu. yd. of concrete required by Dinwiddie Construction Co., the general contractors. To supply the concrete, PCA assembled a Noble standard CA 154 semi-automatic batch plant, with

a 2,000-cu. ft. cement storage silo added to the plant. The plant is turning out as high as 500 cu. yd. in 4 hours. The conveyor on the right is used for stockpiling aggregates, which are loaded into the bin by a Bucyrus-Erie clamshell. The tall towers in the background mark the sites of four of the 13-story apartment buildings, and are used for hoisting construction material.



Lava Beds Blasted for County Road

One of the trickiest grading jobs in Northern California is requiring expert blasting techniques on unpredictable lava beds

HARDLY ANY HINT of job conditions is in the description, "Butte County, Calif., between two miles east of Chico and Paradise, District III, route 7, 9.2 mi. grading, and reinforced concrete bridge, etc.," but the Butte County Federal Aid Secondary job is getting a reputation as one of the trickiest grading jobs to be found in Northern California. Under a \$365,000 contract let to the Granite Construction Co., Watsonville, Calif., the Chico-Paradise cut-off is biting into the extensive lava beds about 50 mi. south of Mt. Lassen, with the result that 65,000 of the total of 108,000 cu. yd. of roadway excavation are in unpredictable, sluggish, and hard-handling lava.

Setting centered on the lava

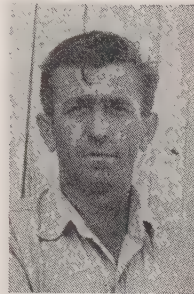
This lava is rough stuff to build a road on, and the placing and hauling of the boulders is what makes this grading a real contractor's challenge instead of merely a routine road job. Actually, lava drills easily and shoots easily, but when it blows it breaks into large chunks regardless of the different techniques used in blasting.

In an effort to find and crack the secret of handling the stratified lava beds, the contractor experimented with a wide range of methods. Because there was frequently underground water under the road that found its way into the holes, the Atlas Gelodyn was tried and found to be very satisfactory. After many tries, holes were spaced on 4-ft. to 5-ft. centers in an effort to crack, not pulverize, the lava. Regular operations with bulldozers and loaders did the job of pulverizing it. Before it was decided to use holes on roughly 5-ft. centers, the contractors ran tests by spacing holes from 6-ft. centers to 5-in. centers; however, regardless of the results, secondary shooting was always necessary in order to get the slopes and gutter lines formed.

Chunks the size of the resident engineer's sedan

All different types of lava formations were encountered. The formation type changes almost every 10 ft., so that no regular pattern of shooting could be employed with success. It didn't matter where the shooting was done because conditions always changed. In every case it was necessary to drill and shoot some 1 ft. below grade in order to root and loosen the lava to a very rough, and yet to a satisfactory, rough-grade. A pleasant experience on the job was the manner in which wagon drills handled the holes. After experimenting on different bits, Sullivan Throw-Away bits, at six for a dollar or so, were found to be best from the cost angle on this particular type of lava bed. The average life for

By
PAUL MATUS
Superintendent
Granite Construction Co.
Watsonville, Calif.



each bit on this job was better than 50 ft., with some reaching as high as 350 ft.

The big problem is getting rid of the boulders without shooting each one individually. A great portion of the stratified lava breaks up in slabs, countless numbers of which are roughly the size of the resident engineer's sedan. These big ones were not shot, but merely pushed over onto the bluffs next to the job. Local property owners gave their full permission to the contractor to fill in depressions in their land with the boulders, a great help in construction because it was not always possible to place the bulk of the rock in the fill.

Cover material for most of the road is very scarce, so the contractor bulldozed off all the fine top material before shooting, and placed it on the uphill side of the road cuts. Each cut was worked for all it was worth. After shooting and removal of the lava, the stockpiled cover material was bulldozed down onto rough grade. Fortunately there was no need

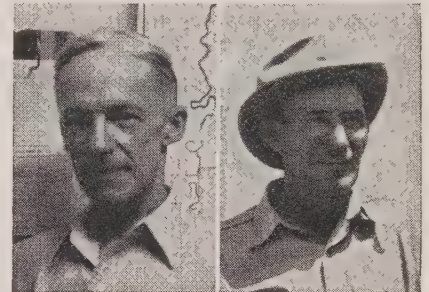
for the contractor to borrow material for the cover on this job; however, it sometimes took long hauls to get the right amounts of stockpiled material in the right place.

Both the superintendent and the foreman for the contractor are impressed with the loyalty of their heavy equipment operators, and want it understood that they have a "darn good crew, fighting boulders and rock—faithful where most men would give up."

Experimental bulldozer paced

Supplied by the Sierra Tractor and Equipment Co. in Chico, a few miles from the tough grading operations, an experimental model Caterpillar bulldozer was put through its paces on the lava beds. The heavy duty Cat was given a thorough test on the boulders and held up to job expectations. Special features of this unit are heavier, tougher steel plates, and heavier arm braces built integrally into the push beams. The tracks

Continued on page 130



BERT PAXTON, left, is Butte County Engineer. **ART OSTRUM**, right, job foreman for the contractors, is bossing the cats and cans over 9 mi. of the lava beds.

GALVANIZED METAL bin-type cribbing, left, confines fills where boulders are small and earth is plentiful. Lava boulders after shooting and a portion of rough grade, right.





New Design and Erection Methods Enable Glulam to Give— Strength and Beauty From the Wood

GLULAM, the laminated timber using glue to bond laminations together, has come a long way since it was first used on a structural job in 1935. Fabricators under the urge to improve their products have worked unceasingly to bring glued laminated timbers into commercial production. They have been assisted by FPL,* government bureaus, glue companies and lumber associations.

It seems that now design and laminating processes are well established and the industry should be considered a commercial standardized industry.

Dispelling doubts

To many engineers and constructors, glulam design and usage may appear complicated and difficult. This article should help to dispel this opinion. Presented in this, the second of two consecutive articles, are discussions on lumber and timber grades required for glulam, methods of laminating, test data and design methods, assembly and erection suggestions, etc.

A discussion of the necessities and methods for fabrication of glued laminated timbers should help familiarize the engineer with this new product.

Laminations are necessarily from lumber of a grade and species required by design criteria. The following item is illustrative of the lumber clause which may be used in specifications:

"All laminations shall be Douglas Fir,

* Abbreviations used in this article are as follows:

FPL—Forest Products Laboratory.

TSI—Timber Structures, Inc.

NDS—National Design Specifications.

Design and fabrication methods that make full use of the versatile glued laminated timber are no longer based on theory alone — In No. 2 of two articles, an expert tells of the latest techniques evolved from experience



By
VERNE KETCHUM
Chief Engineer
Timber Structures, Inc.
Portland, Ore.

Coast Region, old growth lumber graded in accordance with WCLA Grading Rules No. 14. Lumber for the inner 3/5 for depth zone laminations shall be to Paragraph 204—1450 PSI bending stress grade. Lumber for the outer 1/5 zones, top and bottom, laminations shall be to Paragraph 202—1900 PSI bending stress grade."

Many specifications have restricted lamination thickness to 2 in. nominal. To date, commercial laminating has been to this lamination thickness or less because of drying convenience and capacity of equipment. For some time, this thickness will not generally be exceeded by the industry. There may, however, be special jobs or later developments which will make use of thicker pieces.

Control is to drying pressure rather than to arbitrary restrictions. Laminations are required of such thickness that drying operations do not cause checking or splitting to produce loss of strength that may offset the increase of strength to dryness.

For exterior but not for interior timbers before assembling, lumber is sorted that the material in all laminations of an individual timber are either flat grain or edge grain. At the time gluing, the lumber is conditioned to moisture content of not less than 7 and more than 16 per cent. There is a spread of no more than 5 per cent in moisture content throughout any one timber.

Surfaces of laminations are kept free from oil, dust and other foreign matter. Laminations are machine finished, not sanded, to a smooth surface and to uniform thickness with a maximum allowable variation of 1/64 of an inch. Warp, twist or cup which will prevent properly intimate contact of adjacent glued faces when under clamping pressure is not permitted. Grading characteristics that interfere with bringing laminations into proper intimate contact to proper position straight or curved are not permitted.

PICTURED AT LEFT—

TIMBER BOWSTRING TRUSSES, with a 232-ft. span, were designed by the U. S. Navy for the Minneapolis Research Hangar. Top and bottom chords of the big truss were fabricated entirely of glulam timbers.

Glue is required of a quality which develops the full strength of the wood, and which provides adequate strength under conditions of service and for the expected service life of the structure. Glues are used that will not produce deleterious chemical actions.

For interior timbers, the glues should comply with the Army Air Force's specification entitled "Glue; Water and Mold Resistant Casein—No. 14122"—amended September 8, 1943 or later; or, with Bureau of Ships, U. S. Navy specification, ad interim entitled: "Glue; Resin (urea Formaldehyde) — No. 52G11," dated May 19, 1945 and as amended to date.

For exterior timbers, resinous waterproof glues or equal should be used. These glues comply with Army-Navy specification "Adhesives, Thermosetting-Resin. Room Temperature and Intermediate-Temperature setting, Waterproof (Phenolic, Resorcinol, and Melamine Base) No. JAN-A-397" dated September 20, 1946 and as amended to date.

Product right if control is right

Operations followed are favorable to the characteristics and limitations of the specific glue used and conform to manufacturers' recommendations as to control of temperature and moisture content of materials, mixing and spreading of glue, maintenance of adequate pressures, assembly time within life of glue, and compatibility of the glue with any wood treatments employed.

The glue, except where the shape of a piece prohibits, is applied by mechanical spreaders to a uniform thickness as recommended by the glue manufacturer.

Assembly clamping pressure is necessarily not less than 75 lb. per sq. in. Clamp spacing is such that the pressure is as uniform as practicable over the whole area. The nailing of laminations in lieu of clamping for pressure is not permitted.

The laminator, upon request, should furnish to the buyer without extra cost his certificate stating that the materials and workmanship are to job plans and specifications and to standard laminating shop practice. When so desired, laminating operations should be inspected by an approved agency who should grade mark material or furnish to the buyer a certificate stating that materials and workmanship are to job plans and specifications and to standard laminating shop practice. Cost of such inspection should be borne by the buyer.

In nearly all glulam timbers, laminations are in more than one piece lengthwise and have scarfed, stepped, butt, or dovetailed end joints. Butt or dovetailed end joints transfer no stress in either compression or tension with grain. Scarf joints do transfer up to 90 per cent of lamination strength. Stepped joints, ex-

cept at the step, transfer the same stress as the same slope area of scarfed joints.

Scarfs should not be steeper than the slope of grain permitted in the grade of lumber specified, but in no case should it be necessary to make the slope flatter than 1 to 12, except as may be necessary for curved portions, nor should the slope be steeper than 1 to 8. In exterior timbers, slope should not be steeper than 1 to 12.

Defective timber eliminated

The laminations should be so assembled as to disperse the end joints well. In those sections where bending moment is equal to or greater than eighty per cent of full section strength, the scarf slope should be 1 to 12 and no scarfed joint should be directly over another in an adjacent lamination nor with scarf sloping in the same direction closer together in adjacent laminations than the length of the scarf.

A lamination may consist of two or more pieces of lumber placed side by side to form the full width. All longitudinal joints thus formed should be staggered at least two inches in a lateral direction with joints, when such occur, in both upper and lower adjacent laminations.

Fabrication should be only to such requirements as will best serve the particular job. Sometimes complete fabrication will be best, and other times members should leave the shop as timbers and be fabricated at the jobsite. Ends may be left untrimmed if members are hidden by adjacent construction. Similarly, sides can be left rough.

Much good laminating information may be found in Laminating of Structural Wood Products by Gluing (FPL 103).

Lamination lumber is now purchased as planks and boards and grading rules do not closely conform to use requirements. Laminators must of necessity re-grade or be penalized heavily both in the appearance and in the strength of their product.

As the lumber passes through the processes of cutting and drying, many pieces that are warped, undersized or have other major defects must be eliminated as unsuitable for laminating operations. Shops are now required to set up laminating grades which have definite stress assignments. Mills may some day recognize these modified grades and furnish stock accordingly.

Graded for indoors and out

The industry is now trending toward grades in grading and inspection of completed glulam timbers as in sawn timbers. Such classification methods have developed slowly awaiting standardization of glulam construction.

Grading should take into account the factors of appearance, strength, treatment, and service specifications. Appearance should consider characteristics of lumber, planing, sanding, and beveling. Strength grades should consider species, grades, sizes, glues, and laminating operations. Treatment grades should define fire retardants, preservatives, termite protection, stains, paints, seals, and wrappings. Service grades should consider exterior, interior, or other special service conditions.

Glulam timbers, like plywood, are now graded to interior and exterior types. The interior grade is for service conditions where moisture content will not exceed fifteen per cent and water resistant glues may be used. The exterior grade is for service conditions where

ELLIPTICAL GLULAM ARCHES of the Radar Research Laboratory at Dayton, Ohio, have an 80-ft. span and an 80-ft. rise. Unobstructed space within is the desirable result.





TRUSSES AND PURLINS of glulam give a pleasing effect at St. Paulus Evangelical Lutheran Church, Oakland, Calif. The timbers enabled design of a steep pitched roof.

moisture content may exceed twenty per cent and waterproof glues must be used. Decay hazard exists in high moisture content, and for permanent construction lumber should be the heartwood of a durable species or preservative treatments should be applied.

Types of inspection less than complete could well be: (1) Laminators' guarantee, (2) Underwriters' label, and (3) some combination of such items as (a) lumber certificate, (b) glue certificate, (c) spot inspection, (d) spot tests, and (e) inspection of completed member.

The design of glulam members has, until recent months, been based on theory and incomplete research and designers have, of necessity, been conservative. Now the industry is presenting new test data and new methods of analysis that give us a firm foundation and permit full use of all strength qualities.

We now have Laminating Manual (103), test report (104), and in preliminary form to be adopted soon, Design Manual (105). Laboratory design theory is now known and the industry is now speeding its adoption into commercial practice.

Glulam, like sawn timbers, will with safety withstand greater short time

loads than those of long duration. Thus, working stresses may be higher for impact, earthquake, wind, and snow live combined with dead loads than for full maximum permanent loading conditions. Consult National Design Specification (102) and Structural Live Loads (107). Timber literature gives working stresses at normal load condition level, and values are about ten per cent higher than those permitted for permanent load condition level. The greater share of timber framing is subjected to normal duration loads.

National Design Specifications give working stresses for American commercial woods as sawn timbers.

Uniform Building Code, NDS and structural engineers have recognized and used the following working stress increases for glulam:

Stress Type	Percentage
A. Bending and Tension.....	20
B. Shear	15
C. Compression Across Grain.....	15
D. Compression With Grain.....	40
E. Modulus of Elasticity.....	13

FPL, in a new design manual, recommends the following increases in basic stresses for glulam over sawn timbers due to increased strength for dryness.

These values agree closely with strengths now being used although grades and stress assignments may varied from present accepted classification:

Stress Type	Percentage
A. Bending and Tension.....	25
B. Shear	14
C. Compression Across Grain.....	14
D. Compression With Grain.....	38
E. Modulus of Elasticity.....	13

Glulam timber design would best be based on strength ratio reductions working stresses from basic stresses clear wood according to reduction of the moment of inertia of timber by lumber characteristics such as knots. The major factors which affect strength of glulam members are knots, wane, slope of grain and joints of laminations, curvature, and moisture content. Strength depends on size, frequency and distribution of characteristics. That is, allowable working stress bears the same ratio to basic stress as net moment of inertia of cross section does to gross moment of inertia. Strength reducing characteristics which lie within one twelve inch section for length are considered. Working stresses must be reduced in curved members per standard formula given in NDS.

Increased glulam working stresses should be allowed for dry material, and where exterior timbers have a moisture content rise to 20 per cent or more the lower stresses as used for sawn timber should apply.

Variations for duration of loading apply in glulam as in sawn timbers. It is inclined to grain and combined stresses are computed for glulam as for sawn timbers. In general, load tables of fastenings and standard engineering formulas are used for glulam.

Erection skill determines costs

Assembly and erection at the jobsite are important operations in timber construction. Here often lies the final answer as to whether total job costs are in red or in black.

The erector works under many handicaps since he must bring workmen and heavy equipment to a new location, work around new construction, around wire excavations, and on soft ground. He must place heavy trusses in a matter of hours, then pay off his men and return his equipment to a central plant. Any lack of equipment or materials, faulty supports, labor trouble, traffic delays or any one of a number of things can happen to slow down planned fast schedules.

The erector can only function properly and economically when he is thoroughly familiar with the job site and sure when he takes out materials that supports are ready for erection. Sufficient lines, tackle, and lifting equipment and gear must be at hand. Those trips back to shop for missing equipment cost heavily in money and delays.

Safety in assembly and erection operations is the greatest attribute of a successful erector. Accidents to life and property are most costly. Consult Safety Code revised by State of Washington and Safety Requirements for Building Construction issued by War Department.

ment, Corps of Engineers, U. S. Army. Here are given safe cable loads and other pertinent information.

For truss assembly, yard space must be available at the jobsite. It is nearly always best to assemble trusses in a horizontal position and usually best to assemble several on top of each other. If trusses vary, the order of erection should be considered when making assembly. Piece marks and assembly drawings should be followed carefully. If connector rings do not enter grooves easily, cock them slightly. Other suggestions: Keep reaming and regrooving to a minimum; lay out work in systematic progressive order, and keep all work plumb and true to dimensions shown on plans.

More pushing and pulling allowed

Remember that timber frames like those of steel are in a most vulnerable condition after being erected and before sheathings and coverings have been added. Brace, tie and guy well against winds which may arise while workmen are absent. The easiest method for erection is to use a mobile truck crane for both delivery and erection.

Gin poles are adequate and economical for moderate size jobs. The floor must be able to withstand the concentrated load of the gin pole, and the pole must be guyed and moved as needed.

The erector must learn in advance from plans the weights of lifts and boom lengths needed. For long timber trusses, bridges and perhaps two or more cranes must be used. Timber trusses up to 130 ft. long have been erected with a single line.

Timber construction is more flexible than steel, and will withstand more pushing out of alignment and pulling back into position without injury.

The weight of wood trusses varies according to spacing and loading. The following table gives approximate weight in pounds of one timber bowstring truss for 1000 pounds per lineal foot total load.

Span	Weight
40	1,500
50	2,000
60	2,500
70	3,500
80	4,500
90	6,000
100	7,500
120	10,000
140	13,000
160	18,000
180	23,000
200	30,000

Glulam timbers, being seasoned when glued, need little or no maintenance operations during their service life. When only portions of construction are glulam and the balance is installed unseasoned, then maintenance becomes necessary. Keep bolts tightened and keep adjoining timber faces in close contact. Consult "Are Timber Checks and Splits Serious?" and "Timber Maintenance Methods" available from TSI at Portland, Ore.

The timber industry is now forming an American Institute of Timber Con-

THIS CONCLUDING ARTICLE by Mr. Ketchum, along with last month's article, furnishes a complete resumé of the latest information available on the manifold possibilities of glued laminated timber for construction. Readers who desire to delve further into the subject are urged to refer to the listing of literature along with last month's article and to supplement their knowledge by writing for the booklets listed there.

struction which will blanket all the interests of those who produce and use structural timbers and their fastenings and accessories. Authoritative information regarding sawn and glulam timbers, plywood, poles and piling, glues, treatments, fastenings, and hardware and ironwork will be assembled and distributed. Standard specifications and standard codes of practice will be established.

This institute will be a work horse for the coordination of modern timber production and use and will work unceasingly to secure recognition by owners, designers and governing code bodies of all that is best and latest of engineering in wood. Publicity throughout the industry of this organization will be given very shortly.

Many universities are using glulam to construct large field houses that permit important indoor training in team athletics during good weather and bad. The University of Minnesota has just completed a clear span field house 200 ft. wide, 400 ft. long, and 36 ft. clear height using timber wall framing and timber bowstring trusses. Columns, wall girts, and truss chords are all of glulam. Here, thanks to glulam framing that is long and deep and wide, practicing teams may run rampant and enormous crowds may watch games with unobstructed vision.

Effective, and pleasing to the eye

Exposed glulam timbers in schools as in churches give a pleasing effect that is in keeping with occupational uses. Ground area permitting, modern schools trend toward low one-story buildings that eliminate stairways and their attending hazards. Classrooms are generally arranged with widths of 22 to 28 ft. and adjoining corridors five feet or more in width.

Glulam timbers spaced at about eight foot centers and decked with 2-in. matched plank laid solid make a most excellent classroom roof. Decking on the top side should be covered with insulation and roofing and acoustical ceiling material placed on the under side. Glulam timbers should be left exposed in the classroom.

Glulam arches make fine roof supports for other school buildings such as chapels, and auditoriums, drill halls, and gymnasiums.

Timber arches are especially suitable for churches. Roofs are often steep pitched with slopes 12 to 12 or greater

and widths varying from 30 to 60 ft. and greater.

Tudor arches spaced 12 to 20 ft., three-hinged and using wood purlins make an excellent framework. Sometimes, ornamental wood trusses either sawn or glulam are used, and ornamental frames are added in the apex of the glulam arches. Arches, trusses, and purlins should be left exposed and decorated to suit the material and surroundings.

Outdoor theater screen towers are now using vertical glulam girders with back braces. The entire tower is assembled in horizontal position on the ground, including painting, roofing, and electrical or mechanical equipment. Cranes are brought to the site and the tower is swung up into vertical position in a matter of minutes.

New possibilities for bridges

Timber bridges are being built in many styles and with varied spans, with the material best suited for foot or highway bridges with up to 200-ft. spans. Old time timber highway bridges were covered over to place structural timbers in the dry where they lasted without deterioration for many decades. Present practice is to forego housing with its excessive cost and weight and to pressure treat timbers with preservatives. Treated bridges have a life expectancy of 30 to 50 years. Sawn and glulam bridge timbers treat well with either oil or water borne preservatives. Hand and guard rails should be treated with water borne treatments and painted a light color for better visibility.

Glulam treated arches, either two- or three-hinged, make fine bridge supports where the site provides high clearance and rocky banks. No structure can have a greater beauty than the rainbow arches which rise in one graceful sweep from shore to shore.

Large glulam treated girders make fine low clearance timber bridges for spans up to sixty feet. Assembly and erection costs of girder bridges are low.

Pony bridges using bowstring timber trusses with glulam top and bottom chords make fine structures. Curved glulam top chords take treatment well.

At Oswego, New York, a 90-ft. glulam creosote pressure treated pony bridge for heavy highway traffic was erected in 1945 by Timber Structures, Inc. It is believed that this bridge is the first of the type.

At Bohemia, Ore., there has in 1949 been installed a two-hinged low-rise arch glulam creosote pressure treated railroad bridge with 120 ft. span by Timber Structures, Inc.

Over Lake Creek in Oregon, a retort pressure treated two-hinged glulam arch bridge of 100-ft. span was constructed last year (see Sept., 1948, issue of *Western Construction News*). Five types of timber were used: (1) Glulam arches salt treated after laminating, (2) glulam posts salt treated before laminating, (3) creosote treated laminated deck, (4) painted handrails and (5) untreated and unpainted approaches.

Similar bridges are being built throughout the West. For many years we still will bridge the gap with timber.

Economical Pipe From "Unfit" Clay

BY MAKING USE of clays that were once considered unfit for ceramics-fabrication work, and by developing one of the most modern production setups now available in the ceramic industries, Pacific Clay Products' plant at Los Nietos, Calif., is now manufacturing ultra-quality sewer pipe at a cost which is proportionally lower than the prices generally paid for secondary pipe products.

Western clays adapted

Generally speaking, this unprecedented accomplishment can be attributed to an intensive engineering-research program currently supervised at the Los Nietos division by Meredith C. Brown, who summarizes the basic accomplishments of his group as follows: "We have devoted particular attention to the subject of raw materials, since it was both economically and physically desirable for our plant to make use of Western clay deposits. This presented a

Low-cost sewer pipe is being produced at a Southern California plant by expert blending of clays once considered unfit for ceramics



By
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number of problems—not only because clay beds in California and adjacent states are usually small, but because the clays vary in composition and often have only a few of the components deemed most desirable in raw materials

for the manufacture of ceramic pipes.

"Accordingly, we have endeavored to acquire the chemical and physical data needed to blend many different types of clay as raw materials in which the most desirable features of Western clays would be predominant. To date, we have completely tested more than 200 of the clays that appear to be most accessible and adaptable to our work; and, while only about 17 of these are now being blended for production work, we find that we have acquired an abundance of data which will facilitate our use of natural resources in future operations.

Experience guides design

As a rule, the material tests are carried out with small bars comprising samples of new clay deposits or new clay blends. The bars are prepared by molding with a small laboratory press, constant-temperature drying, and kiln firing at temperatures ranging upward from about 1000 deg. F. Then standard engineering tests are made to provide data with regard to texture, plasticity, pressure resistance, laminating qualities, water absorption, shrinkage, modulus of rupture, etc.

From the scientific viewpoint, the procedure is by no means unusual; but it is remarkable in that it represents one of the few attempts which have been made—since the first ceramics were developed, literally in the dawn of civilization—to compound clays without the use of empirical formulations.

More than 7,000 individually-devised bars have been used as test specimens, and, besides permitting the conservation of the best grades of natural clays, the resultant test data have enabled the Los Nietos plant to produce sewer pipe with previously "unobtainable" strength properties.

Careful blending

Production blending of clays is accomplished with a huge crane which is almost a quarter mile in length. Clays from currently-used deposits are conveyed to various areas of the crane way by means of trucks, so that required quantities of each can be picked up with an overhead crane and carried to a blending or mixing mill in a predetermined sequence.

Blended clays are compounded with water so that they will have the plasticity required for extrusion molding into pipe segments of different diameters.

Extrusion molding is accomplished with a battery of high-speed hydraulic presses which were made to order for the plant by a Pacific Clay subsidiary, Pearne and Lacy Machine Co. of Los Angeles. Besides including one of the world's largest hydro-presses (install-



THE HUGE CRANEWAY, almost 1/4 mi. long, that is used for production blending of the clays, is shown in the background above. Below, a stack of finished pipe ready for shipment, left, and a series of the periodic kilns in which the pipe products are fused, right.



n of which required a three-story factory building), these machines represent probably the first practical effort to take use of electrically-deaired production molds.

Electrically-deaired production molds use metal matrices to which high-voltage current can be applied during the extrusion process to facilitate the release of moist clay moldings, thus eliminating the need for conventional lubricants, speeding the rate of production, and minimizing the number of defects. As moist clay-pipe extrusions are ejected from the extrusion presses, employees manually load belt or platform conveyors so that the moldings will be conveyed to a suitable area for constant-temperature drying.

Tunnel kilns replace igloos

Dehydrated extrusions are carried by platform conveyors or lift trucks, as necessary, to "periodic" and tunnel kiln facilities for firing or high-temperature seasoning. Periodic kilns are oval-shaped brick structures which look something like igloos, and which have been used in many types of ceramics-firing work for years. Tunnel kilns are modern, electrically-heated ovens wherein firing can be accomplished with conveyor facilities and are generally used to fuse all but the larger types of extrusions.

Latest addition to the kilns in the Los Nietos plant is a 300-ft. tunnel kiln, constructed at a cost of \$250,000 and believed to be at least one of the largest units of its type in the world.

Glazing time shortened

As a rule, ceramic products are glazed after an initial firing or fusion interval. For example, sewer pipe is normally fired and cooled so that sodium chloride (or salt) can be thrown into a kiln preparatory to a second firing interval, during which the salt is vaporized with heat and allowed to settle as a fused glazing compound on the ceramic pipe surfaces. But in the Los Nietos plant, this time-consuming procedure has been greatly shortened in several instances through the development of liquid glaze coatings, which can be automatically applied by spray guns to "green" extrusions for fusion with clay materials during a single firing interval. In addition to saving time, the latter process is said to yield smoother pipe coatings and to minimize discrepancies due to extended firing intervals.

After firing, fused pipe products are allowed to cool slowly in still air to prevent damage due to thermal shock. When they are moved by lift trucks to storage areas, pending the time when they will be shipped to customers. At this writing, the Los Nietos plant is equipped for the production of more than 8,000 tons of clay-pipe products monthly, a world's record in terms of square feet of plant space. However, the level of production is by no means static.

It is being constantly increased; not only through the acquisition of new production equipment, but through the knowledge that is being obtained through an estimated expenditure of \$80,000 for annual research work.

Grants for Western Airport Projects Scheduled by C.A.A.

THE LIST of airport construction and development programs to be undertaken in the West under the Federal Aid Airport Program during fiscal year 1950 has been announced by D. W. Rentzel, Administrator of Civil Aeronautics. Projects in six Western states (the remaining five Western states had no programs submitted for fiscal year 1950) represent a cost to the Federal government of \$4,001,184 with local or state sponsors providing an additional \$4,633,104.

California is receiving the largest portion of Federal aid, \$2,288,622, and Arizona is next with \$752,000. Grants in the other four states are: Oregon, \$444,381; Colorado, \$416,507; Utah, \$376,607, and Washington, \$278,316.

A total of \$9,000,000 remains in a discretionary fund that may be used by the Administrator anywhere in the country regardless of state boundaries.

Approved appropriations for the Western states are detailed below.

Loc. and Name of Airport	Class			Funds		Proposed Work
	Pres.	Prop.	Sponsor	Federal	Total	
ARIZONA						
Flagstaff Mun.	3	3	\$17,000	\$26,400	\$43,000	Paving rwys., txwys, aprons, misc.
Phoenix Mun.	5	5	424,219	658,801	1,083,020	Bldgs., pvng., rwys., txwys., aprons, lighting, misc.
Prescott Mun.	4	5	17,701	27,399	45,100	Land, paving rwys., txwys., aprons, lighting
Safford Mun.	3	3	25,553	39,500	65,053	Land, misc.
CALIFORNIA						
Kern County	5	5	40,500	34,500	75,000	Land, prep. of site, lighting
Fresno Air Terminal.....	6	6	29,400	35,000	64,400	Paving rwys., txwys., aprons, lighting, misc.
Half Moon Bay Flight strip.....	4	4	10,200	12,000	22,200	Lighting, misc.
Hayward Mun.	4	4	4,225	5,000	9,225	Paving rwys., txwys., aprons
Los Angeles Mun.	5	5	800,300	945,500	1,745,800	Prep. of site, paving rwys., lighting, misc.
Madera Mun.	3	3	5,500	6,500	12,000	Bldgs.
Merced Mun.	3	3	13,600	16,000	29,600	Misc.
Modesto Mun.	3	3	43,425	23,300	66,725	Land, paving rwys., aprons
Siskiyou County	6	6	8,450	10,000	18,450	Bldgs.
Monterey Peninsula	4	4	16,900	20,000	36,900	Paving rwys., aprons, misc.
Needles Mun.	5	5	7,500	8,900	16,400	Prep. of site, misc.
Oakland Mun.	5	5	103,000	90,000	193,000	Land, paving rwys., aprons, lighting, misc.
Palmdale, Los Angeles County....	5	5	72,200	59,900	132,100	Land, paving rwys., aprons, misc.
Palm Springs Mun.....	6	6	63,900	50,000	113,900	Land, bldgs., paving rwys., misc.
San Bernardino Valley.....	2	4	125,000	100,000	225,000	Land, prep. of site, paving rwys., aprons
San Diego, Gibbs Mur.....	2	2	10,779	3,593	14,372	Land
San Francisco Mun.	7	7	813,043	850,000	1,663,043	Prep. of site, paving rwys., aprons, misc.
San Jose Mun.	3	3	74,400	50,000	124,400	Land, paving rwys., aprons, misc.
Orange County Arpt.....	4	4	16,700	10,000	26,700	Land, bldgs., paving rwys., aprons
Los Angeles Met.....	5	5	26,200	31,000	57,200	Bldgs., paving rwys., aprons, misc.
Watsonville Mun.	3	3	3,400	4,000	7,400	Bldgs.
COLORADO						
Denver, Stapleton Airfield.....	6	6	364,493	416,507	781,000	Bldgs., paving rwys., txwys., aprons, lighting, misc.
OREGON						
Portland	4	8	325,585	414,381	739,966	Paving rwys., txwys., aprons, lighting, misc.
Reedsport.....	0	8	4,814	5,000	9,814	Land, bldgs., misc.
Salem, McNary Field.....	4	4	19,543	25,000	44,543	Lighting
UTAH						
Cedar City Mun.....	3	3	40,042	65,000	105,042	Paving rwys., aprons, lighting, misc.
Carbon County	3	3	30,802	50,000	80,802	Bldgs., paving rwys., aprons
Provo Mun.	5	5	58,638	95,186	153,824	Bldgs., paving rwys., aprons, misc.
Salt Lake Mun. No. 1.....	4	5	85,727	131,421	217,148	Land, bldgs., paving rwys, aprons
Vernal Airport	3	3	21,561	35,000	56,561	Bldgs., lighting
WASHINGTON						
Hoquiam, Moon Island.....	4	4	9,981	10,719	20,700	Paving rwys., aprons, lighting, misc.
Anacortes	0	1	55,700	48,300	104,000	Land, prep. of site, misc.
Kitsap County	4	4	29,850	32,050	61,900	Bldgs., paving rwys., aprons
Cashmere Dryden	0	1	12,600	8,000	20,600	Land, prep. of site, misc.
Asotin County	2	2	9,360	10,040	19,400	Paving rwys., aprons
Everett, Paine Field.....	5	5	12,055	12,945	25,000	Paving rwys., aprons, misc.
Kennewick, Vista Field.....	2	2	9,000	9,700	18,700	Bldgs., paving rwys., aprons, misc.
Northport	0	1	6,430	6,370	12,800	Land, prep. of site, misc.
Omak	3	3	1,450	1,550	3,000	Misc.
Prosser	2	2	6,460	6,940	13,400	Lighting
Seattle, Boeing Field.....	7	7	62,686	67,314	130,000	Bldgs., paving rwys., aprons, lighting, misc.
Seki Emergency	0	1	19,700	20,000	39,700	Land, prep. of site, misc.
South Bend, Willapa Harbor.....	2	2	8,200	8,800	17,000	Paving rwys., aprons
Wenatchee, Pangborn Field.....	3	3	28,932	31,068	60,000	Bldgs., paving rwys., aprons
Wilson Creek	0	1	4,480	4,520	9,000	Land, prep. of site, misc.

County Engineers Share Their Ideas



ELECTED LEADERS of the California County Engineers are, left to right: **ROBERT L. RYAN**, Ventura County, President; **MARSHALL WALLACE**, Sonoma County, Vice-President, and **EARL A. BURT**, Chief Deputy Road Commissioner, Los Angeles County, Secretary-Treasurer.

PLENTY OF PROBLEMS were aired and a lot of information changed hands at the 30th Annual Meeting of the County Engineers Association of California, held in conjunction with the County Supervisors Association on June 29, 30, and July 1 at Hoberg's Resort, Lake County, Calif. Attending general sessions with the supervisors and holding their own business and technical sessions, members of the County Engineers Association not only discussed their specialized activities among themselves, but cooperated with the supervisors present to bring to light all sides of those matters vitally affecting California counties, and particularly their roads.

No eulogies or back-patting

With President Wallace Boggs, Alameda County, presiding, the opening general session of the county engineers got down to business fast with a symposium of county roads that featured current problems facing county engineers rather than past successes. Chairman Earl A. Burt, Chief Deputy Road Commissioner of Los Angeles County, introduced the panel of engineers that wasted no time in discussing present needs and practices in California.

SPEAKERS at the symposium on county roads, left to right: **MARSHALL WALLACE**, Sonoma County; **ED. R. HANNA**, San Benito County; Chairman **EARL A. BURT** of Los Angeles County; **JOSEPH BARKLEY**, Contra Costa County, and **A. C. KEITH**, Riverside County. A speaker but not shown

Importance of keeping adequate equipment records, methods to cut bothersome red tape and ways to make the most of available funds hashed out at California county officials convention

First speaker Lyle H. Walther, Road Commissioner of Siskiyou County, stressed the economic fallacy of keeping antique equipment running on the job at all costs. The exact costs can be found by having the job foreman keep a performance record on each piece of equipment, and to do this, Siskiyou County uses a duplicate of the form used by the State Highway Division. Walther urged county engineers to keep good records of equipment in order to determine adequate charges to make for depreciation, and pointed out the fact that contractors of necessity keep enough records so that they know at any time the performance and profits produced by any one rig. It is easy to do county road work in a big way, resembling the State Highway jobs, but in many counties it costs \$300 to \$400 every time the engineer moves equipment from one end of the county to the other, and this can lead to duplication of equipment in order to prevent extra-long hauls, according to Walther.

Actual equipment costs—?

Joseph W. Barkley, Contra Costa County Engineer, was the second speaker, and outlined the procedure used in his office for equipment cost accounts. Each piece is numbered and has a corresponding file, recorded by the job foreman. This complete record enables the county to find hourly rates to charge against each piece, from experience. The real problem is to keep enough records to know what equipment—always a big county item—actually costs, and then to arrange the books so that the cost of equipment maintenance and depreciation does not hit one job too hard.

A. C. Keith, Road Commissioner of Riverside County, stated that all the county's new construction is handled

from the central office in the court seat, but that maintenance is all done in the county road districts, leading to extra problems on maintenance appropriations. The county has some pieces of equipment, and a certain number of these are always in need of repair. This prevents the county from building up a large reserve fund, because money is needed and spent just about as fast as it comes in. Keith believed it was easiest to have one fixed rate for equipment for all work, that is, so much an hour for a piece of equipment regardless of the job, as anything else would be complicated.

Snipping the red tape

Ed. R. Hanna, Road Commissioner of San Benito County, pointed out that too easily the counties could find themselves buried in red tape and publish a book each year for the State Comptroller. Hanna reaffirmed the purpose of the meeting for getting uniformity in the counties for the annual report, which depreciation charges are the current problem. San Benito County does all its equipment maintenance and repair, and the hourly costs of equipment include all garage expenses and maintenance, except insurance, which is covered by the County Courts. Hanna doubted if it was worthwhile to keep a separate record on each individual piece of equipment, and brought up the question of whether a new tire should be charged against the job or the operating expense.

H. B. LaForge, Engineer, Federal Secondary Roads, Division of Highways, commented that in order to keep equipment rental rates computed, counties needed a concrete and workable form for the accounting systems.

was **LYLE WALTHER** of Siskiyou County. Discussions took place over the session too. At right after the meeting, l. to r.: **HOWARD WAY**, San Bernardino County; Past President **WALLACE BOGGS** of Alameda County; **LYLE WALTHER**, and elected President **ROBERT RYAN**, Ventura County.



ed engineers to get all costs of their ds into the annual report—this indes all equipment costs. The prevat opinion favors charging depreciatn to each job. Either this, or the altere of carrying depreciation in a separe account would be acceptable to the te Controller, just as long as there is formity in the counties. The chief ire is for uniformity, since some nties look like they are spending ge amounts and others look like they spending small amounts to do the ne job.

ads, funds and wrinkles

Wallace B. Boggs and Frank H. gle, Supervisor, San Bernardino unt, were co-chairmen for the joint eting on highway problems, and nt out the need for continued pervisor-engineer cooperation when the next legislative session comes in 2 ars. Perhaps a few wrinkles have apared so far during the 1½ years under e Collier-Burns Act, but in time they ll be well taken care of.

Speaker Judge C. W. Phillips, Chief, ight-of-Way Division, Federal Public ds Administration, stated that roads re located for the least maintenance in ny cases, and, under pressure, county ineers sometimes did not build roads original standards that could provide future maintenance. He said that not ineers, but communities control the st per mile of roads.

H. B. LaForge, the next speaker, ke on the "New FAS Matching Reirements Under SCR 62 (Hatfield et of the 1949 Legislature" as adopted the Senate May 23, 1949, and exined the use of the over \$4-million in nds available for the one year ending ne 30, 1950. LaForge outlined the nstruction completed or under way der the 1944 Federal Aid Program, nsisting of 104 road and 52 bridge jobs th a combined cost of nearly \$30-miln. There remains about 30 projects t to be put under way under this 1944 rogram. Under the 1948 Federal Aid ct, two projects are already advertised, as an additional four more during July.

hat the law permits

C. R. Montgomery, Chief Counsel, epartment of Public Works, delivered address on "California Laws Relating Public Construction Contracts," and ed cases, one even dating back to 1862, ablishing that "a contract made in disregard of a law requiring competitive dding is absolutely void." Montgomery inted out the right of a taxpayer to maintain an action against city and unt, officials to recover from their rsonal funds moneys spent under an egal contract, and cited a case as cent as one in 1942. One of the ticklish oblems in public works is that arising hen a job is split so that each part mes under the amount requiring comittive bidding. Splitting a job to avoid mpetitive bidding law is, of course, egal; however, Montgomery gave veral examples of cases tried where the blic officials involved split the jobs for her reasons, quite sound, and were ll brought to the courts.

He believed that, "In any case where a public official can show that there was a substantial reason for splitting a job, the courts will approve the exercise of the officer's discretion." Montgomery also cited a case involving construction contracts where, "There was no time fixed for completion, thereby opening the door to favoritism; there were contradictory specifications regarding the right of the engineer to change the plans; it was provided that bidders may submit their own plans and specifications for the whole or any portion of the contract; there were varied references in the specifications to work shown on the plans, whereas, in fact, the plans did not show any such items." Montgomery also stated: "The presumption that everyone knows the law is about as far removed from actual fact as any presumption made by the law. Numerous five-to-four decisions by the highest court in the land demonstrate that everyone does not know what the law is."

At the closing general session of the County Engineers Association, Julius B. Manthey, County Engineer of San Joaquin County and chairman of the Legislative Committee, admonished the county engineers to read and be cautioned about sections 4000 to 4007 of the Government Code, applying to jobs over \$5,000. Ralph A. Moyer, who also addressed the supervisors-engineers joint

meeting on "Engineering Problems in the Construction of 'Low Cost' County Roads," urged the counties to select and keep typical road sections, and keep typical costs for different types of road cross-sections. These costs should include accidents, gasoline mileage, tire mileage, and others, as well as construction costs. Moyer also maintained that each county should have its own soils laboratory.

The new leaders

Unanimously elected to serve for the coming year were Robert L. Ryan, Ventura County, President; Marshall Wallace, Sonoma County, Vice-President and Earl A. Burt, Los Angeles County, Secretary-Treasurer. Directors Howard L. Way, San Bernardino County, and Ernest Breuning, Shasta County, were reappointed for a new term of office. Howard F. Cozzens, Monterey County Engineer and chairman of the Resolutions Committee, introduced resolutions thanking Lake County Engineer, Frank B. Johnson, and other Lake County officials for their work as hosts to the Meeting, and directing that all current Federal Aid Secondary information be mailed directly to each of California's counties. Wallace Boggs then turned the president's gavel over to incoming President Robert Ryan, and the California County Engineers ended their 30th Annual Meeting.

National County Officials Discuss Roads and Taxes

AS OFTEN HAPPENS, any meeting of county officials boils down to sessions on roads and taxes without too much wasted time. This was the case at the 13th Annual Conference of the National Association of County Officials, held in Oakland, Calif., July 17-20. Upholding the engineering point of view at the road session were M. J. Norby, Rock Island County, Ill., County Engineer; Wallace B. Boggs, Alameda County, Calif., County Engineer; Neil R. McKay, State Aid Engineer, Wash.; and H. E. Hiltz, Deputy Commissioner, Public Roads Administration, Washington, D. C.

County responsibilities

County Engineer Norby, in his talk, "Federal Aid Highway Program; Counties' Responsibility," mentioned that on

NORBY



a national level there are now 377,000 mi. of FAS roads, with an ultimate goal of 500,000 mi., and that 92% of this mileage is on roads carrying less than 400 vehicles per day. Illinois, he said, distributes FAS funds as follows: 10% equally to all counties; the remaining 90% apportioned by total

area, rural population, and total road mileage of each county. Norby refuted complaints that Federal Aid Secondary standards are too high, and urged a speedup of work on the Federal Aid Highway Programs so that no backlog or uncompleted work would give the public the false impression of an excess of funds.

County limitations

County Engineer Boggs, speaking on the same subject, stated that the biggest limitation on the FAS 1944 Act was the



BOGGS

counties' capacity for construction and maintenance, and that the 1945 Act made \$12 million available to help the counties match funds. The Federal Aid Road Program in 1948, Boggs continued, is set up in an identical manner to the previous program, except that appropriations are smaller and state aid will be lacking. The California FAS program has worked well, especially under the counties' unified road departments as established under the 1947 Collier-Burns Act. The entire national program, Boggs said, is

a fine challenge to the counties to do a good job.

The states' responsibility

State Aid Engineer McKay, in discussing the federal aid secondary program subject, spoke on the "State Highway Departments' Responsibility to Counties; How the Program is Working in Washington State." He spoke on county roads from the state level, and explained the newly created equipment rental fund, guided by the Washington County Commissioners Association and slated to begin in January, 1950. McKay continued with an explanation of the new "10-year program" in Washington counties, and ended on the theme that the states are the go-betweens for the counties and the federal government, and help both agencies to comply with the spirit of the Federal Aid Highway Program.



McKAY

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Federal responsibility

Deputy Commissioner Hiltz, in speaking of the federal government's responsibility in the Federal Aid Highway Program, pointed out that action is hampered by a lack of sufficient engineering and administration personnel, as well as lack of the counties' matching funds. He said that the Public Roads Administration is also interested in roads below the FAS level, but lack of money alone



HILTZ

is not the cause for back roads out of repair, and that other causes are obsolete local highway laws and administrative practices, and isolated, uncoordinated maintenance divisions in the counties. Hiltz, the last speaker at the roads session, stated that less than one-third of the 3,052 counties in the United States have adequate engineering facilities and personnel, although many have consultant engineer advice.

Public Roads Administration Survey Important to All County Engineers

DURING AUGUST the Public Roads Administration is making a survey of all counties, either by mailed questionnaires or by personal interviews with the county engineers, in an effort to determine the types of county and local highway administration and road building resources. This survey is a great deal more than a mere road inventory or county engineer census; it is the first attempt in this country to find out how well the counties are equipped in physical plant, financial resources, engineering talent, and administrative set-up. It is being made for the exclusive purpose of helping and bettering the counties and their 2½ million miles of roads in the United States.

Guesses are no help

It is assumed that the factual data assembled will not only provide a basis for a comparative study of organization types, but will also provide basic information as to county and local road building resources, both factual and administrative, for a broad-scale highway planning on the national level. The framework for the assembly of the information is both tabular and descriptive, indicating on a comparable basis the present stage of development of local road systems, the extent to which this development may be utilized in further development, and the size of the job remaining to be done. The descriptive information will show on a comparable basis, the manner in which the job is being undertaken under the laws and regulations of the various states. At the present time, the state highway departments and the field organizations of the

PRA are cooperating with the Board of County Consultants to the PRA in order that this survey, proposed in February of this year, will be completed by October 1.

County engineers in committee

At the special request of PRA Commissioner Thomas H. MacDonald, the Board of County Consultants was formed in 1946 for the express purpose of aiding the PRA in finding out what the present county activities are. The PRA has its hands tied, so to speak, and is not in a strong position to give counties necessary and desired aid via the Federal Aid Secondary Act of 1944 unless it knows exactly how the counties stand. This mandatory information will be available where it will do the most good just as soon as the survey has been completed and analyzed. By far it is to the county engineers' best interest to give detailed thought to either the mailed questionnaire or to the questions asked during a personal interview. Accurate engineering information, instead of glowing chamber of commerce recommendations, is what is desired by the county engineer Board of Consultants, and is what will be of greatest benefit to the county road departments in the long run.

In a special effort of the PRA to keep this entire survey project on the county level, the bulk by far of county men on the Board of Consultants consists of county engineers whose jobs are appointive, but without pay. Western county engineers serving on the 10-man board include the following: Earl Coyne, Supt. of Highways, Brown County, S. Dak.;

L. W. Newcomer, County Engineer, LeFlore County, Kansas; Manton H. H. County Engineer, McLennan County, Tex.; Howard L. Way, County Engineer and Highway Commissioner, Bernardino County, Calif.; H. O. Walberg, County Engineer, Clallam County, Wash.; Van A. James, County Engineer, Colorado. Among the county engineers serving from the eastern part of the country are: R. B. Traver, Engineer, Onondaga County, New York; J. F. Ranney, Summit County Engineer, Ohio; B. T. Collier, County Engineer, Clarksdale, Miss.; Otto S. Hess, Engineer-Manager, County Road Commission, Kent County, Mich.

Problem neatly stated

Charles W. Upham, Engineer, American Road Builders' Association, stated the problem neatly in his testimony before the United States committee of the Committee on Public Works, May 6, 1949, Washington. He said, "Undoubtedly the most important factor in the highway program is the knowledge learned by experience and the know-how. Practical highway States have developed excellent programs that carry on the program with efficiency and economy. This knowledge is probably the most valuable asset the State program has. Many counties are also doing most excellent and economical work. However, it is estimated that the 3,000 counties only about 750 full-time highway engineers, although around 2,600 counties had engineering advice that enabled them to participate in the Federal secondary program.

"This leaves over 2,200 counties without full-time highway engineers, and at this level that most of the programs would be carried on.

"It is important that Federal money should be invested in the permanent features of the program. Probably the most important and at the same time permanent part of this program is the knowledge and experience in highway engineering. So, provision should be made that no Federal money should be allotted any local unit unless they have engineers. There should be no better investment of Federal money—that is, than toward the engineering department."

"Jerry Builders" in Arizona Warned by State Registrar

R. S. SPOON, newly-appointed Arizona State Registrar of Contractors, has issued a warning that contractors operating without licenses will be prosecuted by the state. The warning was prompted by numerous complaints from throughout the state concerning illegal contracting operation. The registrar declared that there is considerable "jerry building" (substandard and cheap construction) going on throughout the state, blamed unlicensed contractors for the practice. The penalty in Arizona for engaging in the contracting business without a license is 6 months in jail or up to \$500, or both.

Portrait of a Consulting Engineer

John W. Cunningham came West sight-seeing in 1909 and stayed to become a prominent Consulting Engineer in Portland—Monuments to his ability are all over the Northwest

BOY! He's a good engineer!" That seems to be the universal opinion of John W. Cunningham, prominent and well known Consulting Engineer of Portland, Ore., when one asks about him.

Cunningham is tall, well-proportioned (has kept his figure), is soft-spoken and kindly and always has a twinkle in his clear blue eyes.

As a boy in Wisconsin, he had a yen for electricity. When he entered the University of Wisconsin at Madison, he "switched" to civil engineering, and received a degree in 1908. He was born in Watertown, S. Dak., in 1887.

Go West, young man

In 1909 he was looking around for an engineering spot and read about the World's Fair in Seattle. Hearing that the West offered good opportunities for a young engineer, he bought a round-trip ticket and started off to see the fair, and the West.

The train finally pulled into Spokane, Wash. Cunningham liked the looks of the town and decided to spend a few days there before going on to Seattle to see the fair.

"How did you like the fair?" he was asked.

There was a twinkle in his eyes as he answered, "I don't know. I never got there. You see I had a fine engineering job offered me in Spokane so I went to work."

His first job was for the North Coast railroad. He was there four years and spent some time surveying bridges. Later he worked on designs for bridges in the office. One of the biggest was the bridge at Ayer Junction over the Snake River, which is $\frac{3}{4}$ -mi. long and at a height of 225 ft. above the river, as he recalls.

In 1913, Cunningham went to Ellensburg, Wash., and worked for the Kittitas Municipal Reclamation District. The next year, he moved to Portland and was with the Northwest Steel Co. He worked on the design and was in charge of the construction of this company's immense shop building where World War I equipment was built.

Into business with ambitions

In 1915 Cunningham went into business with J. O. Baar. Both men had a good fund of structural experience and their ambitions were to specialize in bridge design and construction. It seemed no one wanted bridges in the months that followed, so realizing that they were faced with "postponing a few meals," they decided they would go into general civil engineering practice.

By

ARTHUR J. LARSON

Portland, Ore.



This was a period when the Northwest was interested in far-flung irrigation projects, and the firm was identified with many of the larger ones in Oregon, Washington and Idaho, including the great Central Oregon Irrigation Project in the Bend country. In 1922, prices on farm produce hit the skids. Demand for alfalfa and kindred crops that needed irrigation suddenly stopped, and the firm was forced to turn to other fields to keep it going.

"We started building water works and delved into sewer construction, and sewage treatment," said Cunningham, "for various cities."

"What cities did you work for?" he was asked.

His eyes twinkled again, and he said softly, "Maybe you should say, 'What cities didn't we work for?'"

The Everett, Wash., water works project, done in 1931, is one of this firm's biggest ones. It cost \$2,000,000 and delivers 100,000,000 gal. per day, with the supply coming from the Sultan River by gravity.

JOHN W. CUNNINGHAM



In the early '30's, water supply projects for Port Townsend and Hoquiam, Wash., followed. The Port Townsend project cost \$850,000 and the Hoquiam about the same, the latter having a 20,000,000-gal. daily delivery.

In 1933, Baar left the firm and John W. Cunningham continued on alone, doing what he could during the depression years. In 1938, he designed the Bellingham, Wash., water works, which cost about \$1,000,000 and has a capacity of 100,000,000 gal. of water per day.

Busy on the home front

World War II found Cunningham a very busy engineer. In 1941, he was the architect engineer in charge of design and construction of Camp Adair, Oregon, a \$25,000,000 project that housed 35,000 soldiers when completed.

In 1942, Cunningham's firm became known as John W. Cunningham & Associates, with Felix S. Zeidlhack and Carl E. Green as his partners.

When the Camp Adair job was done, Cunningham was named the architect-engineer of the Tillamook (Ore.) Naval Air Station. This project cost \$14,000,000 and took care of a complement of 1,000 men when completed.

At this naval air station are two immense hangars — probably the biggest structures in the Northwest. They are each 300 ft. wide, 1,000 ft. long, and 158 ft. high. There is room in each one for three football fields, placed end to end.

Light (from pork chops)

When asked what his most colorful engineering experience was, you'd think he'd say the naval hangars or the Camp Adair job—but no!

"It was back in 1919. We were doing some irrigation stuff in eastern Oregon desert country. Roads then were only two ruts through the sagebrush. We were at Silver Lake and were going to drive 90 mi. to Bend.

"Our party was warmly dressed in sheeplined coats and we were following a couple of streaks that were supposed to be a road when a blizzard caught us. Our car broke down and we continued on foot and finally got a team of horses and a sled from a rancher. It took us 8 days to reach Bend.

"One of the nights we stayed in a tar paper shack. A couple of the boys tried to sleep on the one bunk but another man and I sat on the small table near the rusty stove and tried to keep warm. We'd lost our lantern so had no light, except pork chops."

"How's that again?" he was asked (it was nearly noon when he was being interviewed and the thought came that perhaps he was thinking of pork chops at home).

"We had no light—that is, except pork chops," he said. There was that twinkle in those eyes again, (and when engineers get ready to spring one, it's better to sit back and wait).

He continued: "You see, we had pork

Continued on page 128

Construction Design Chart

CX...Reinforced Concrete Slabs

THE ACCOMPANYING chart is the third one of a related series on the same subject, utilizing a unit stress in the one-way reinforcing steel of $f_s = 20,000$ p.s.i. The two previous charts have been for values of $f'_c = 2,000$ p.s.i., and $f'_c = 2,500$ p.s.i., respectively.

In order to illustrate the use of this chart, I have assumed the following conditions:

Given, Live-load = 200 p.s.f.

Continuous span, $L = 12$ ft.

Using a trial solution line (not shown), I note that I will probably have to use $\frac{5}{8}$ -in. round bars as reinforcement. A protection of 1 in. below the center of such reinforcing bars would be a little shy of

By
JAMES R. GRIFFITH
Dean of Engineering
University of Portland
Portland, Oregon



the $\frac{3}{4}$ in. minimum coverage required. As a consequence, I will assume a protection of 1.25 in. below the center of the steel. As will be noted from the tabular values at the bottom of the chart, it will then be neces-

sary to add 18.8 p.s.f. to the given load. We then have, for use on the chart, the value $200 + 18.8 = 218.8$ p.s.f.

I have drawn a solution line on the chart for the above conditions. The following values will be noted on the chart, taken the bar spacing horizontally opposite the intersection of the solution line with the A_s scale:

Effective depth, $d = 4.1$ in.

Reinforcing, $A_s = 0.665$ sq. in. per ft. of width

Bar spacing

$\frac{5}{8}$ -in. round bars 5½ in. on center

$\frac{3}{4}$ -in. round bars 8 in. on center.

As a check on the above results, we can do the following computations:

From any standard table of constants:

When $f'_c = 3,000$ p.s.i. and $f_s = 20,000$ p.s.i.,

Then $K = 236$, and $p = 0.0136$ for $f_s = 20,000$ p.s.i.

If $\frac{5}{8}$ -in. round bars are used.

Total slab thickness = $4.1 + \frac{5}{16} + \frac{3}{4} = 5.16$ in.

Dead-load = $\frac{5.16}{12} \times 150 = 64.5$ p.s.f.

Live-load = 200

Total Load = 264.5 p.s.f.

Bending moment for continuous span
 $M = \frac{w L^2}{10} = \frac{264.5 \times 12^2 \times 12}{10} = 458,000$ in. lb.

$M = K b d^2$

$d = \sqrt{\frac{M}{K b}} = \sqrt{\frac{458,000}{236 \times 12}} = 4.1$

$A_s = p b d = 0.0136 \times 12 \times 4.02 = 0.657$ sq. in.

$\frac{5}{8}$ -in. round bars 5½ in. on center,
 $A_s = 0.68$ sq. in.

$\frac{3}{4}$ -in. round bars 8 in. on center,
 $A_s = 0.66$ sq. in.

It will be noted in this same problem that the chart gives results slightly in excess of those required by formula. The difference is caused by taking the protection below the reinforcing steel as 1.25 in. instead of the actual $\frac{3}{4}$ in. + $\frac{5}{16}$ in.

While this difference is small and insignificant, it does have some effect on the end result.

I note that the 1947 printing of the A.C.I. Code,¹ and the 1946 Uniform Building Code,² both have a clause permitting relatively high tensile stresses in the reinforcement of one-way slabs. Quoting from Article 306 of the A.C.I. Code:

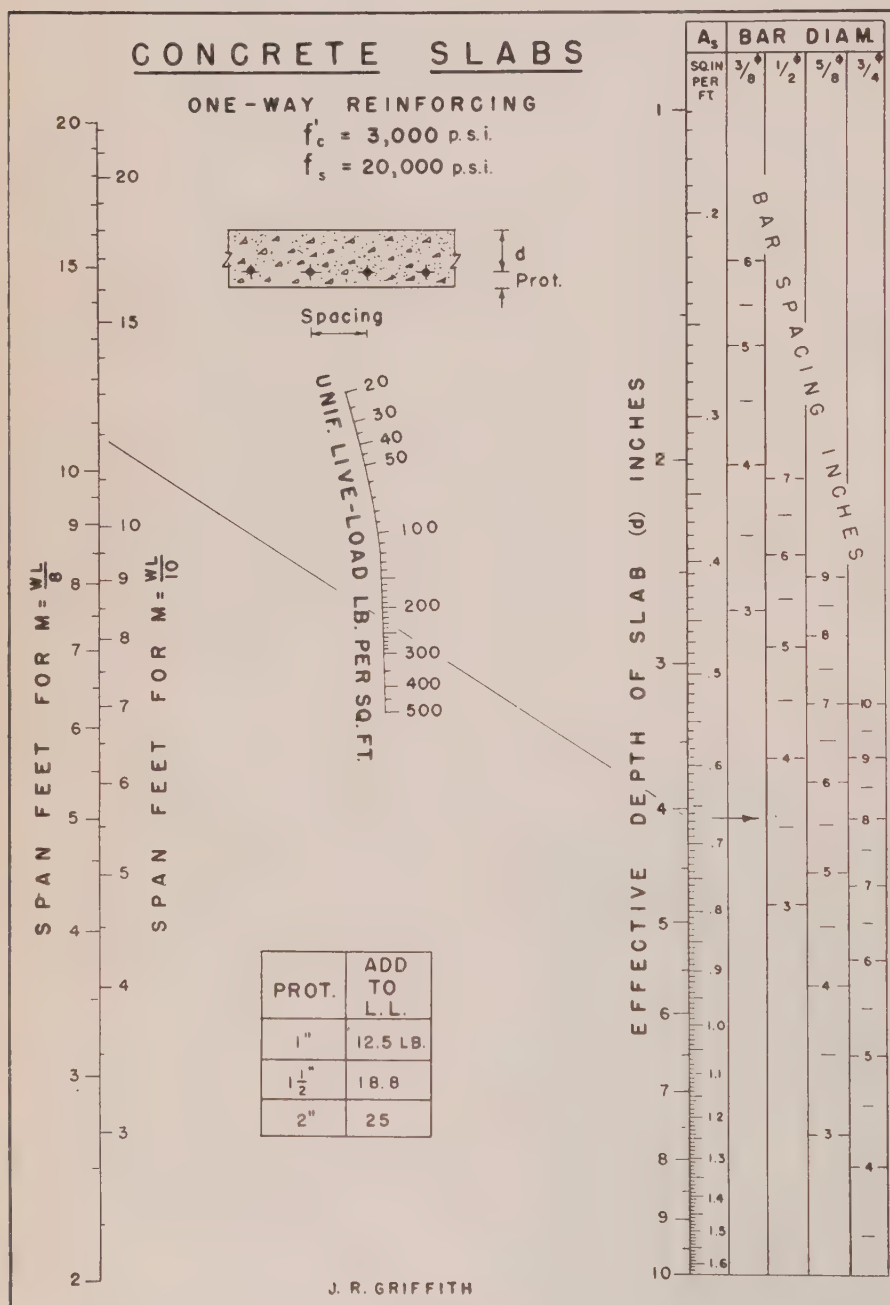
(b) Tension in One Way Slabs of More Than 12-ft. Span. (f_s = Tensile stress in main reinforcement).

For the main reinforcement, $\frac{3}{8}$ in. less in diameter, in one-way slabs, 50 per cent of the minimum yield point specification.

Continued on page 130

¹Building Regulations for Reinforced Concrete, American Concrete Institute.

²Pacific Coast Building Officials Conference.



Pipe Dreams in Concrete Come True

An Arizona contractor thought continuous concrete pipe could be poured in position, so he perfected a machine to do the job

CONTINUOUS concrete pipe lines poured in position are no longer just a pipe dream for John W. Colvin, Glendale, Ariz., contractor. Since 1946, when his two sons returned from war service to help him, he has laid down more than 20 mi. of 16-in. and 24-in. continuous, formed-in-the-trench irrigation lines on vegetable farms in the Glendale area. They are all giving excellent service as pressure systems with no major breaks yet reported.

Years of experimentation

Though it is only since 1946 that Colvin has concentrated on the work, it was 22 years ago that he poured his first continuous pipe. That was a 14-in. line on the O. D. Betts ranch, and it is still in use, virtually without trouble after all those years. Colvin continued to work on his machine through the years, pouring experimental pipes for local sewer and water systems and occasionally venturing the more difficult pressure irrigation systems.

Big farm operators knew the conservation value of underground systems, but it wasn't easy to convince them that a continuous concrete pipe could be poured in the trench where it was to stay. Eventually, though, one of them agreed to let the Colvins pour a $\frac{3}{4}$ -mi. section as an experiment. They have

JOHN W. COLVIN, inventor of the special machine, stands beside the concave which forms the bottom of the trench to fit the pipe.



By
**RICH
JOHNSON**
Phoenix, Ariz.



never since moved out of that area and they have been busy all the time.

Colvin's pipe has no joints and the top half is reinforced with wire lath. In a few instances, under extreme pressure, it has been crushed down at the top, but the reinforcing held the concrete in place and the leak in the line did not result in blocking the system with earth washed in.

A tube and a foot

The machine, patented by John Colvin, is quite simple. A steel tube of the desired diameter is the form around which the concrete—a four-to-one mix—is poured. Through the center of this tube is a rod, one end of which is attached to an elliptically-shaped piece of sheet iron having the same diameter as the tube, but open at the top. The other end of the rod is supported by a foot in the trench ahead of the machine. Thus the machine is held off the bottom of the concave trench at the desired height, which determines the thickness of the pipe wall. In the case of a 16-in. line this is two inches, and three inches for a 24-in. line.

The tube which forms the inside of the pipe is split at the top and a small gap left. A lever makes it possible to draw the tube together slightly for ease in moving the machine along in the pipe.

Nine men, 700 ft. a day

Atop the tube is a small hopper which receives the concrete. As the machine is pulled along for each new pouring, a previously fabricated semicircle of wire lath is laid on the top before the concrete is poured.

With a nine-man crew on the mixer, sand trucks and in the trench, the Colvins are able to pour 700 ft. of 16-in. diameter pipe, or 400 ft. of 24-inch, in an eight-hour day.

One man follows the machine to cut out holes in the top of the pipe for the stack valves. He also inserts reinforcing wires around the hole, so that when the stacks are poured they are tied directly into the pipe. This has successfully eliminated the explosion of valve stacks under the pressure developed in the system.

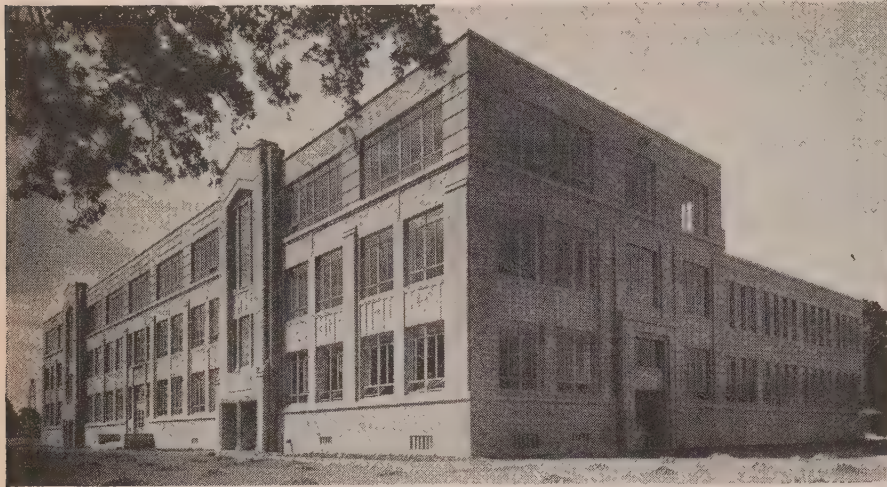
At a very active 74 years of age, John Colvin can honestly say that his pipe dream has come true. He hasn't decided exactly how he will proceed from here on with it, because he and his sons have been too busy just pouring mile after mile of the solid, reliable pipe.

Coincidentally with Colvin's development of the continuous pipe machine, he has also perfected a divided pressure stack which is a protection to well pumps. In the usual irrigation system where water is to be forced under pressure to higher land, the pump is expected to support the entire column of water in the system and build up the pressure. Colvin's divided stack eliminates a large part of the work required of the pump. The pump forces water into one side of the stack until the top of the partition is reached. The water then spills into the other half of the stack out of which the pipe leads away to the fields. It builds up there to give the necessary pressure in the system.

THE SYSTEM in operation, below. Wire reinforcement is in place atop the machine and ready for concrete to be poured. Note the center rod which supports the machine and determines the thickness of the pipe wall. Small hopper receives the concrete.



University of Portland Has A New Engineering Building



ROSS B. HAMMOND, contractor of Portland, Ore., has just completed an engineering building for the University of Portland, at a cost of \$450,000. The engineering school was set up in the University on a 4-year basis in 1948, and James R. Griffith, a monthly contributor to *Western Construction News*, was named Dean of the school.

The University of Portland is located in a scenic site on the top of the bluff just north of Swan Island, and a panoramic view of Portland may be observed from the campus. The University has at present a total enrollment of approximately 2,000 students and is operated by the Congregation of Holy Cross, an order which likewise operates a number of other schools including the University of Notre Dame.

Prognostication impossible

The new Engineering Building was dedicated on June 12, 1949. The building was designed and supervised by the architectural firm of Jacobberger, Stanton and Zeller of Portland. Since the engineering faculty was non-existent during the planning state there were many needs which could not be anticipated. The main building is three stories in height and measures 252 x 54 ft. The laboratory wing is two stories in height forming an "L" at one end 69 ft. long and 49 ft. wide. The ground floor of the laboratory wing was omitted until the machinery could be spotted. In order to provide maximum flexibility a service trench was designed, having a steel plate cover so that changes in machinery locations could be made with a minimum effort.

Classrooms and lecture rooms have a maximum capacity of 440 students. Since the future growth of the Engineering School was impossible to prognosticate, all classrooms have stubbed conduits, as well as gas, water, air and vacuum pipes so that any room can quickly be converted into a laboratory for either Physics or Engineering with little trouble.

The building is of reinforced concrete with pan-ribbed floors. The drop ceilings in the corridors provide space for a gravity ventilation system of all classrooms. The corridor walls are faced with salt-glazed tile and the ceilings are acoustically treated. The building is heated by steam from the University's central heating plant and finned pipe convectors. Aluminum-faced convector shields extend across the outside walls of all classrooms to the height of the window sill covering a space which is also used for pipes and conduits.

Many material delays

Like all present day construction projects, delays in material were not uncommon. Even Nature seemed to try to hold up construction. During the record May 1948 flood of the Willamette River, every ready-mixed concrete company in the city had either its plant or trucks immobilized by the flood. While Portland has the home plant of one of the country's largest door manufacturers, for some unexplained reason the interior doors for the Engineering Building were shipped from Wisconsin. The doors were en route during the heavy mid-west snowfall last winter when all railroad transportation came to a complete standstill. Lock sets were promised from Pittsburgh in January and did not arrive until the middle of May. During the laying of face brick in January and February, Nature saw fit to break a 50-year record for cold weather.

Due to crowded conditions in other buildings on the campus, the contractor hung temporary doors on five classrooms which were put to use in February.

No specialization in curriculum yet

During the past year, the first full one for the School of Engineering, there were approximately 200 students. About 90 freshmen enrolled in September and the remainder were inherited from the previous pre-engineering course.

Dean Griffith has organized the cur-

riculum of the School on the basis of general engineering education, rather than of specialization.

The first two years is fairly representative of any conventional engineering school. Therefore a student who decides that he prefers a conventional course in some specialized branch of Engineering may transfer without too much loss of credit. Those students who are possible they prefer specialization are advised to start, or transfer to a college where specialization is available, as quickly as possible. In the upper division years technological work is divided almost equally among the basic courses of electrical and mechanical engineering. Since economic conditions and changes frequently influence the employment of the young graduate, it is considered advisable to concentrate on basic training in all branches in contrast to specialization. Whether he starts in civil, electrical or mechanical fields, the graduate with such a general curriculum will at least have had the basic courses. Probably practicing engineers will agree that the real engineering education began at graduation.

In the School of Engineering this year Catholics comprised only 46% of the total enrollment. About the same division will be found among the faculty. The Catholic students must attend chapel and take eight semester hours of religious subjects. Non-Catholics are not required to do either, although they may if they so desire.

Fifteen Oregon Cities Plan Sewage Facilities

A TOTAL of fifteen Oregon localities now have final plans and specifications approved for sewage treatment systems according to Curtiss M. Everts, Jr., Oregon State Sanitary Engineer. The list now includes Coos Bay, Southwest Hills Sanitary District, Sutherlin, Cannon Point, John Day, Pendleton, Woodburn, North Bend, Fairview, Monmouth, a veterans' facility at Roseburg, Milwaukie, Beaverton, Canby and Oakland.

Three of the systems were approved last month. These were at Coos Bay, Southwest Hills Sanitary District and Sutherlin. At Southwest Hills, a project is contemplated to cost \$785,000, includes a sewerage system and a treatment plant on Tryon Creek. The treatment plant will be designed to serve a 10,000 population of this community adjacent to the southwest boundary of Portland.

At Coos Bay, where valuable oyster farm operations were halted recently because of polluted water, a project planned to cost in excess of \$600,000 includes interceptor sewers, pump stations and a sewage treatment plant. Coos Bay's sister city, North Bend, has similar plans approved less than three months ago, for a project to cost \$300,000.

At Sutherlin, a complete sewer system and treatment plant designed for 3,500 residents will cost about \$248,000.

HOW IT WAS DONE

JOB AND SHOP TIPS FROM THE FIELD

On-the-Job Batch Plant Designed by Contractors

MAXIMUM ADVANTAGES of gravity and terrain have been called into play in designing an on-the-job concrete plant for the 3,800,000-gal. reservoir now under construction in the hills over Glendale, Calif. Planned by MacIsaac and Menke Co. of Los Angeles, general contractors for the reservoir, the mixing arrangement handles up to 250 cu. yd. of material per day as a 4-man operation.

Situated on the face of a 35-ft. high 50-deg. slope convenient to the top level of the reservoir, the plant is fed from the top via a 600-ft. truck road built for the job. Aggregate is received by four wooden bunkers anchored into the steep



slope by one-inch rods sunk 6 ft. into the granite wall. The #3 rock and sand bunkers are the largest of the four; they occupy the center of the line and carry the heaviest loads. The smaller pea gravel and #2 rock bunkers are on the flanks.

Gravity delivers the aggregate directly from the bunkers to four Garlinghouse bins and a batch scale which discharges into two $\frac{1}{2}$ -cu. yd. mixers set in battery. One Jaeger-Wright mixer and one Koehring Dandy with a left hand delivery is an arrangement that can be handled by one operator.

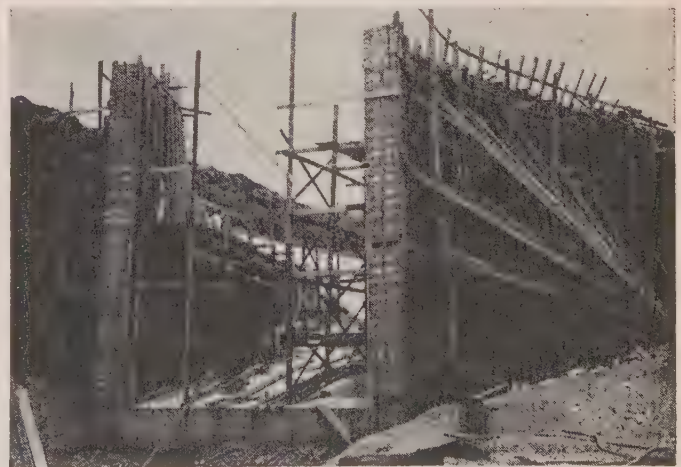
Sack cement is delivered at the top of the hill to a shed for storage. From there it is fed by gravity to the mixers via a metal lined chute on 27-deg. slope in front of and on the same working level with the grizzly placed over the receiving hopper of each mixer. A small knife blade protrudes upward from the center of each grizzly so that when the feeder pushes the sack over the grizzly the blade slits the sack and the cement is released. A lean cement slab floor carries the buggies from the discharge end of the plant to the reservoir site.



SIX ALLIS-CHALMERS HD-19 tractors teamed up recently to move this 400,000-lb. Bucyrus-Erie shovel into place on construction of river embankments at the Garrison Dam Project on the Missouri River in North Dakota. Contractors for this portion of the job, Peter Kiewit Sons' Co. and Morrison-Knudsen Co., Inc., have three of the big shovels on the job. The dam's embankment will be the world's largest rolled earthfill.



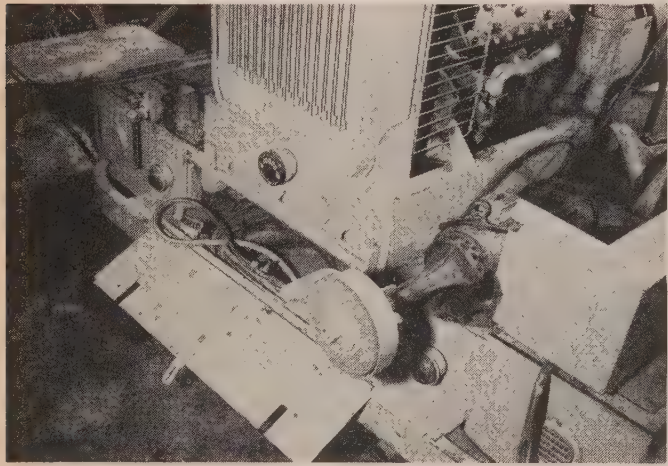
A HEAVY ROCK RAKE is being used by Western Contracting Corp. of Westley, Calif., to finish to rough grade canal banks on the Columbia Basin Project near Ephrata, Wash. A Bucyrus-Erie mobile crane casts the rake somewhat in the way a dragline bucket is handled. Spike teeth on upper bar of the triangle pull rocks and earth to where they can be loaded into trucks. The excavation is then ready for the trimmer jumbo which follows to excavate to fine grade preliminary to placement of the concrete lining.



IN BUILDING forms for the transition sections at the ends of siphons on the Columbia Basin canals, Western Contracting Corp. foots all form braces against one concrete block poured in the wall of the excavation. The system besides saving on the number of footing blocks required, is applicable here because of the curvature of the forms.

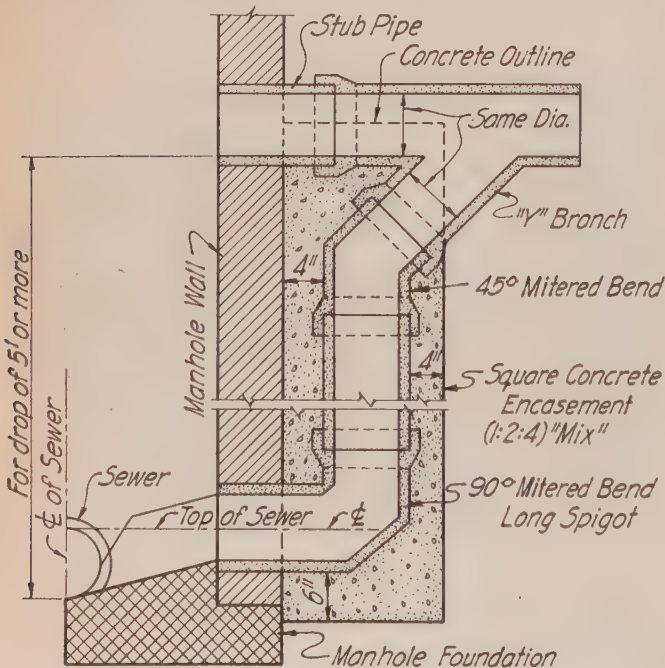


A SPECIAL SAND SPOUT attached to a truck is used for placing sand in the thin filter blanket along the slopes of rock fill on the north abutment at McNary Dam on the Columbia River near Plymouth, Wash., by McNary Dam Contractors. The spout enables crews to put the sand where it is needed in just the amount that is needed. Sand is guided into a hopper box by baffles on the dump body, and a chain from the edge of the body connected to the end of the spout positions the gadget.



—Lincoln Electric Company Photo.

H. E. NELSON, principal in Nelson Welding Service of Compton, Calif., has equipment neatly and compactly mounted in his truck. The grinder slides out from under a hinged cover ready for use. Air hose is stored in a compartment that can be seen under the radiator. The hose connects onto 3/8-in. copper tubing which runs under the frame to the air tank.

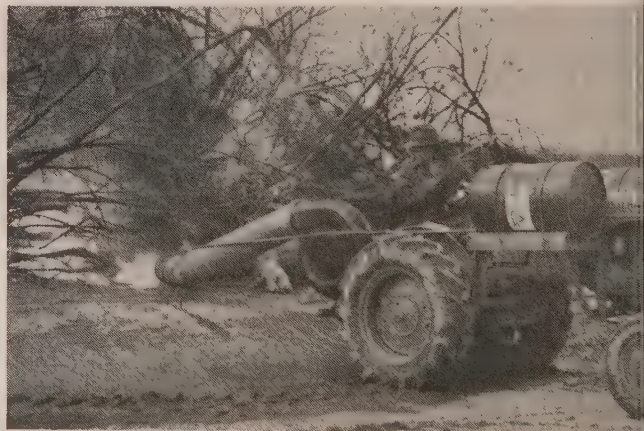
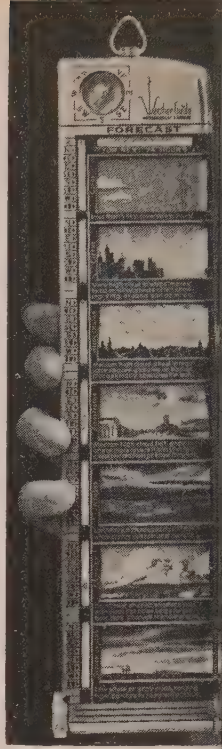


Weather Guide Provides Local Forecasts Quickly

A WEATHER guide that makes automatic local forecasts from wind and cloud conditions has been developed from war-born forecasting techniques and Northern Hemisphere daily weather charts for the past half century. For construction firms dependent on the right weather for successful operations, the weather can be predicted 12 to 24 hours in advance by a simple twist of an instrument dial.

Operation of the device requires no special skill, according to American Optical Co., and is small enough to fit into a pocket. Two steps are necessary to figure out weather conditions ahead of time. Direction of the wind is noted and local clouds matched with one of seven pictures of cloud formations on the face of the instrument. Then, by turning a dial to align a red arrow with wind direction, the correct weather prediction appears in a little window.

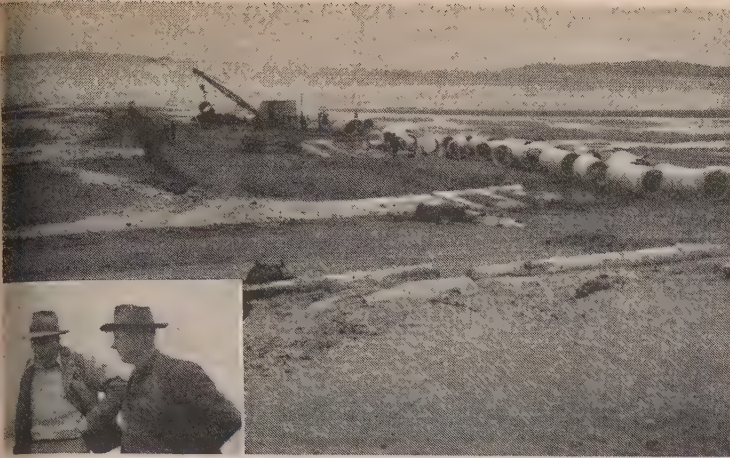
The guide was developed by Dr. Irving P. Krick, president of the American Institute of Aerological Research, states that predictions based on wind direction and cloud formations are much more accurate than those prepared from a barometer, which considers only air pressure. Weather is caused by certain moisture and temperature conditions in the atmosphere, and air pressure alone cannot reveal these complexities, he explains.



A PROBLEM that has plagued contractors for years has been the burning of timber from clearing operations, but one enterprising operator of Carmen & Kirchner Construction Co., Bristow, Okla., working at the Burn Dam project in Oklahoma, has devised a scheme that saves money as well as time. Two 30-gal. drums mounted on a small tractor are used with a cheap non-volatile distillate as a burning agent. A large centrifugal-type blower is mounted behind the driver's seat, being belt-driven by the tractor power take-off. A 10-in. diameter galvanized pipe is attached to the blower and to the fuel line extending over the end of the pile. A petcock-type valve provides a steady flow of the fuel which vaporizes when the blower is in operation. The mixture is blown into the center of the timber deck by force draft and an extremely hot fire is created. The timber which burns from the center to the outer edge. When the fire is well started in the center of the pile, the fuel supply is shut off by the petcock and the blower continues to feed air to the flames.

DETAIL OF a "Drop Sewer Connection" used by the City Engineering Department of Phoenix, Ariz., for locations where a collection sewer enters a main at 5 ft. or more higher elevation. The vertical sewer is extended to accommodate the amount of added drop.

—Contributed by Richard Bennett, Hydraulic Engineer for the City of Phoenix



WORKING ON A TIME BUDGET of four hours, Valley Construction Co. of Seattle laid concrete sewer pipe on a 400-ft. long outfall near Seattle's Alki Beach to get as many of the 8-ft. sections of pipe laid as possible during the low tide conditions. At left above, stockpiled pipe is rushed into place on timber supports set at grade exactly 20 minutes before extremely low tide conditions. At lower left, BOB WARTELLE, Office Engineer, and FRED VINTON, Resident Engineer from the Seattle City

Engineer's office, figure the chances of getting in 200 ft. of pipe before the tide stops the job. At right, N. COLUCCIO supervises guniting of one of the joints of the 42-in. pipe. Trenching in the beach sand was done with a Model 25 Northwest crane, rigged alternately with a dragline for excavation and a sling for lifting and placing each section of the pipe. This particular outfall is one of many improvements being built by the City of Seattle to increase its present system.

Portable Pipes and Pumps Water Fill at Borrow Pits

A NOVEL METHOD for adding water to fill material to provide the proper density required by government specifications has been worked out by Concho Constructors on construction of San Angelo Dam near San Angelo, Texas. Instead of laboriously trucking water from the nearest source to borrow pits on the excavation site, the San Angelo project employs a portable pumping system, which is essentially an adaptation of a portable overhead irrigation system.

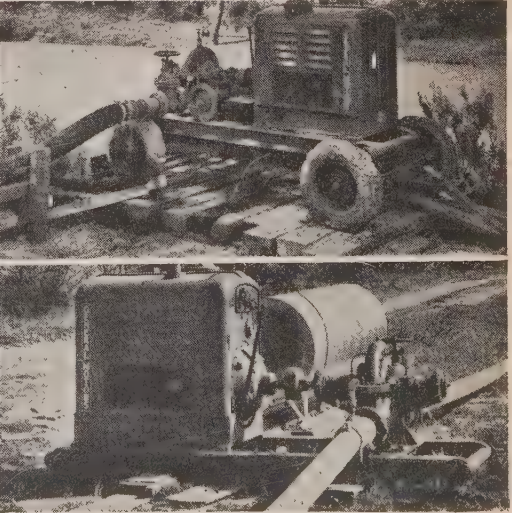
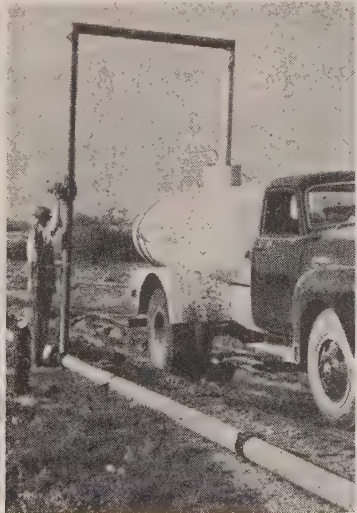
Construction of the dam on the North Concho River is divided into three stages, two of which have been completed at this writing. The third and final stage involves 11,000,000 cu. yd. of fill for the 37,000-ft. long embankment. Soil at the excavation site is so dry that 40 gal. of water must be added to each cubic yard to bring it to the density of 95% specified by the Corps of Engineers, the project's sponsors. Caliche, a porous but adhesive soil found in the area, is used principally for the impervious fill.

Stewart & Stevenson Services of Houston, in cooperation with Armstrong Tractor Co., Austin, Tex., installed the water pumping system. It consists of a portable pumping unit, two booster stations and 5-in. aluminum pipe to carry the water supply. The pumping unit, a 3-cylinder General

Motors Series 71 Diesel engine directly connected with a Gardner-Denver Model 5-D centrifugal pump and mounted on a trailer, takes water from the North Concho and sends it to the excavation point on the project. (This unit is illustrated at top right below. The two booster stations (one illustrated at bottom right below) are made up of identical pumping units mounted on skids and situated along the line to give the system its extreme range totalling 17,600 ft. Each of the three engines has its own 330-gal. fuel tank. The aluminum pipe is made up of 20-ft. sections, so that the line can be lengthened or shortened by the manipulation of one of the 20-ft sections.

Water is lifted an average of 9 ft. from the surface of the North Concho River, and maximum elevation in the line above the river level is 110 ft. Although the system was first required to deliver a flow of 650 gal. per min. through 17,600 ft. of line, the average length of line for the time of the project will be 11,600 ft. As the line is shortened, flow will be stepped up to 850 GPM, enough to keep the fill on a necessary 20,000 cu. yd. per day basis. Outlet of the line at the fill site is shown at left below.

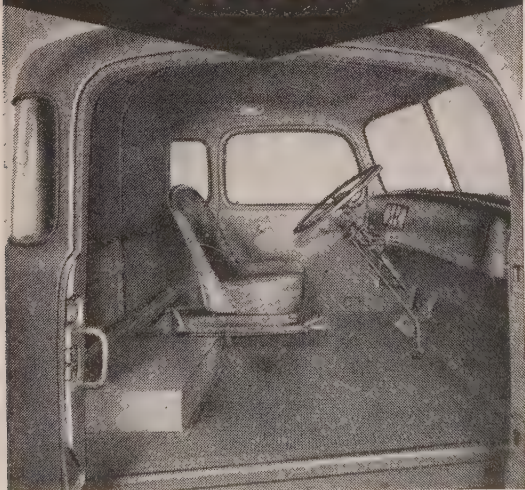
Another interesting and important part that the pipe line plays in the project is in the loading of watering trucks (illustrated in center below). At two points along the line, standpipes have been placed. Watering trucks can pull under these pipes and refill in a short time. Enough water flows through the standpipes to fill a 1500-gal. tank in 3 min.



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NEWS OF WESTERN CONSTRUCTION

AUGUST 15, 1949



Atkinson and Associates Low On New McNary Dam Section

SUBMITTING a joint bid of \$15,835,539.50, the Guy F. Atkinson Co., Ostrander Construction Co., and the J. A. Jones Construction Co. were low bidders for construction of the Oregon shore cofferdams and a portion of the powerhouse at McNary Dam on the Columbia River last month. The three contractors at present are engaged in the construction of the Washington shore installations, including the navigation lock, fishways and 13½ bays of the spillway dam under a \$21,751,456 contract. They are doing business as McNary Dam Contractors.

Only one other bid on the Oregon shore work, the second major contract to be advertised for the multi-purpose McNary project, was submitted. General Construction Co., The Shea Co., and the

Pacific Bridge Co., bidding jointly as General-Shea-Pacific of Portland, Ore., quoted \$18,648,000. The Atkinson-Ostrander-Jones bid was 23.5 per cent above the estimate of the government contracting officer, who figured the work at cost without profit to total \$12,784,132.

The work involved on the Oregon shore includes the construction of a junior cofferdam, the excavation for a portion of the powerhouse, the concrete substructure for two main power units, a station service bay and an assembly bay for the powerhouse, construction of the "second-step" cofferdam, and placing a portion of the Oregon shore abutment embankment. The contract will call for completion, ready for use, not later than May 1, 1951.

The "second-step" cofferdam will con-

nect the "junior" cofferdam on the Oregon shore with the cofferdam protecting the work now under construction on the Washington shore and will bring about the closure of the river. Construction of this "second-step" cofferdam will close off the remaining channel of the river and divert water over the spillway section now being built. Construction will get under way in August.

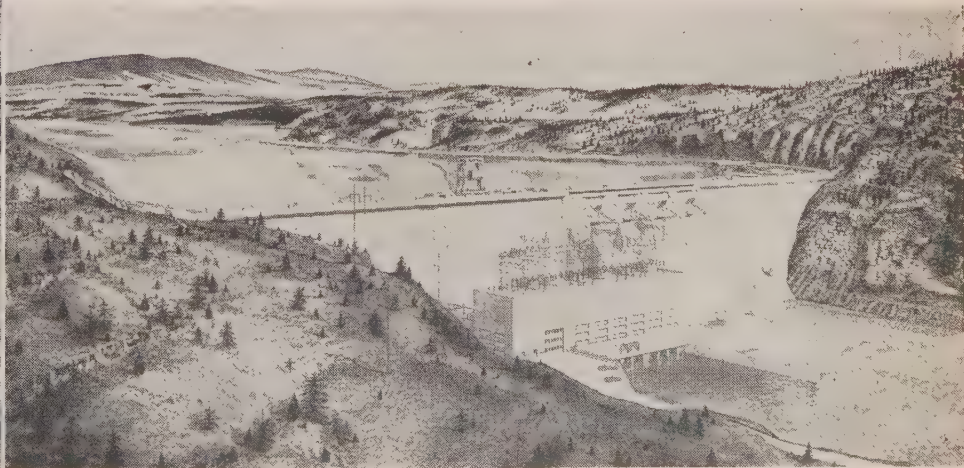
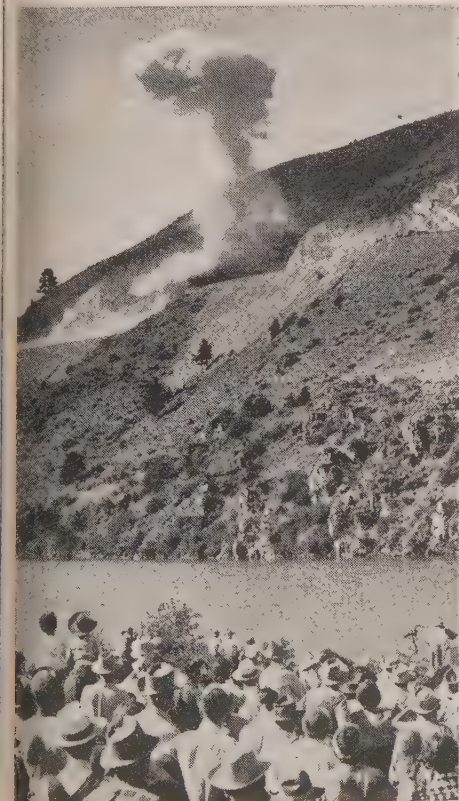
Cement Firms Charged With Sales Malpractice

THE FEDERAL Trade Commission has charged two Western cement companies with violating the anti-trust laws by giving lower rates to customers who take delivery of cement by rail than those who ship by truck. Named in the suit are the Monolith Portland Cement Co. of Laramie, Wyo., and Ideal Cement Co. with plants at Portland, Ore., and Boettcher, Colo.

The complaint charges that both firms

CONSTRUCTION STARTED ON CANYON FERRY DAM BY BIG POWDER CHARGE

A POWDER BLAST and plume of smoke formally marked the beginning of construction on Canyon Ferry Dam, \$36,000,000 concrete gravity structure on the Missouri River, 17 mi. east of Helena, Mont. The switch which detonated the initial blast was thrown by O. S. Warden, former president of the National Reclamation Association on July 22. The dam will be 220 ft. in height above streambed and approximately 1,000 ft. long at the crest. It is a unit in the coordinated Bureau of Reclamation-Corps of Engineers plan for the Missouri River. The first contract was awarded to Canyon Constructors, Inc. of Los Angeles, Calif., on their bid of \$11,896,425. Under the terms of the contract, the dam and powerhouse are to be completed by the summer of 1953. The power plant will produce 300,000,000 kw. hr. of electric energy and the water conserved in the reservoir will irrigate about 310,000 ac. of previously undeveloped land.



sell cement to customers who transport by rail at a price 20 cents per barrel lower than that charged for truck transport. It is alleged that this policy discriminates against the customers who ship by truck and so violates the Robinson-Patman Act prohibiting illegal price discrimination.

Seattle-Tacoma Airport Is Formally Dedicated

THE \$11,000,000 Seattle-Tacoma International Airport, operated by the Port of Seattle, was formally dedicated July 9. With its north-south runway 6,100 ft. long, its northeast-southwest runway 5,600 ft. long and its northwest-southeast runway 5,000 ft. long, the huge airport between the two Washington cities is ready to accommodate aircraft as large as the Boeing Stratocruiser. The airport is located 12 mi. south of Seattle and 19 mi. north of Tacoma on a 920-ac. site.

Featuring the airport in addition to its long runways is the new \$4,000,000 Administration Building constructed by Lease & Leightland of Seattle and exceeded in size in this country only by the Idlewild Airport Administration Building in New York. The four-story building covers approximately 90,000 sq. ft. of ground area.

Arizona to Make Highway 80 A High-Speed Traffic Artery

PROJECTED this year by the Arizona State Highway Department is a \$2,383,000 improvement program on the Phoenix-Tucson-Nogales sector of U. S. Highway 80. It marks the beginning of a program which will in three or four years make this route a high-speed, master highway serving a heavy volume of traffic. Also coming up soon is a \$480,000 job of widening U. S. Highway 89 north from the Nogales city limits. A total of \$1,400,000 is earmarked this year for a controlled access highway through Tucson. The route begins at the junction of U. S. Highway 80 south of Tucson and extends north.

COMPLETELY SURROUNDED by steel scaffolding, several of the 13-story buildings at Parklabrea expansion are shown under construction between 3rd and 6th Streets in Los Angeles. Starrett Bros. and Eken, Inc., are general contractors for the \$40,000,-

Awards Coming Up for Work at Chief Joseph Dam Site on Columbia River

THE INITIAL CONTRACT for construction of Chief Joseph Dam, Army Engineers' \$234,000,000 structure on the Columbia River near Bridgeport, Wash., is now planned for award in about April of 1950. Utilizing government funds recently made available, the Corps of Engineers, Seattle District, are prepared to award a number of major contracts this fall for preliminary work around the dam site.

First contract to be awarded will be for the Okanogan River Bridge to cross the Okanogan River 3 mi. east of Brewster, Wash., and connect the access highway to the dam with U. S. Highway 97 and accommodate trucking facilities from the rail head near Brewster. Award is also being awaited now on the drilling contract for the cut-off area on the right bank at the dam site, for the intake canal and powerhouse area on the left bank and for the dam foundation.

Bids on the 15-mi. access highway to the dam will be called during August. This contract will include construction of another bridge across the Columbia River near Bridgeport to connect the access highway with State Highway 10. Bids for the bridge will be opened during September.

Scheduled for early fall are the construction contracts for grading, water supply and distribution, sewage and electrical supply for the permanent village at the dam. Contracts for the initial housing construction will be awarded following completion of the utilities work.

In anticipation of appropriated funds, initial contract for construction of the dam itself is scheduled for April, 1950. The dam will be a straight gravity overflow type, 220 ft. long and 1,484 ft. long. The first contract will include 3,500,000 cu. yd. of excavation which will be disposed of before the construction of the cut-off and placing of the right-bank cofferdam are undertaken.

The Chief Joseph powerhouse will be

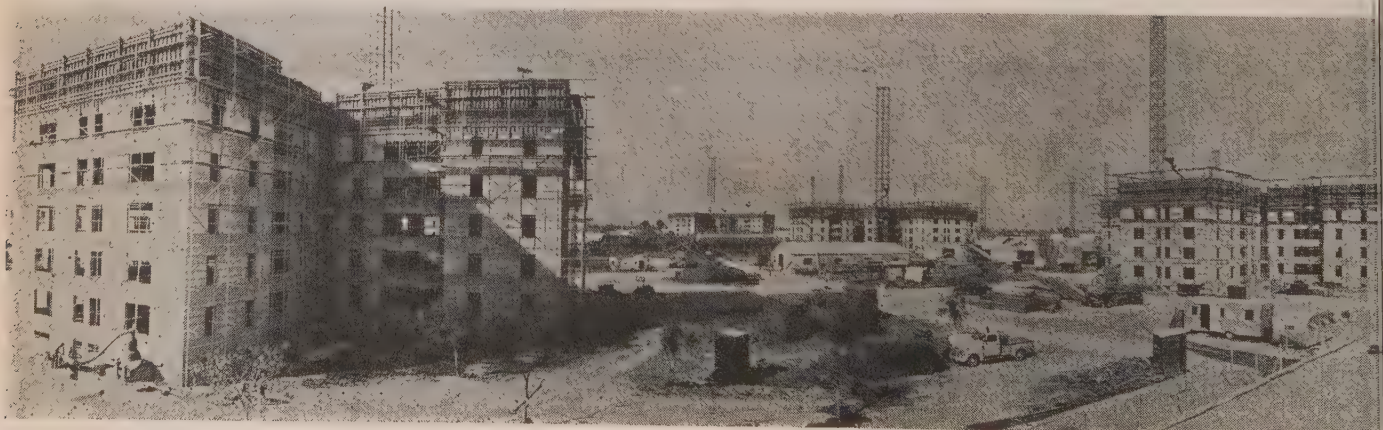
constructed on the left bank at an angle to the axis of the dam and initially contain 20 generators with vertical Francis-type turbines having a capacity of 100,000 hp. at the rated head of 100 ft. Generators will be three phase, cycle, 13,800 volts, tentatively rated at 64,000 kw. Construction details of original structure are being planned to accommodate seven additional generating units, making an ultimate total of 27 units. Peak construction employment for the huge project is forecast for the summer of 1953, with approximately 10,000 contractor employees on the job.

Oakland Firm Builds Biggest Plug Valve Yet for P. G. & E.

WEIGHING 15,900 lb., the largest fabricated plug valve ever constructed, has been completed in the Nordstrom Valve plant of Rockwell Manufacturing Co., Oakland, Calif. Twelve of these valves are being manufactured for the intake section of Pacific Gas & Electric Co.'s 34-in. gas pipe line from the Colorado River into the San Francisco area.

Ten of the valves will be 30 x 30 Figure 4649½ with elevated gearing; two of the same type will have electric motor control. The valves are designed with butt-welding ends. The valve cylinder operating unit is 81½ in. diameter and the end-to-end dimension is 59 in. Weight of the plug alone is 1,000 lb. The cylinder is designed to operate the valve under unbalanced pressure equal to maximum working pressure of the valve with not more than 75 lb. differential pressure across the cylinder. Maximum thickness of the body wall is three inches and that of the throat wall is 3½ in. This biggest of plug valves is an accomplishment that would have been impossible of attainment were it not for application of lubricant. More than 100 man-hours were invested to develop the first valve, including design and test-

000 Metropolitan Life Insurance Co. project. Visible are steel towers, 180 ft. high, used by the contractor for hoisting concrete and materials. Scaffolding and towers are being supplied by the Patent Scaffolding Co., Inc., Los Angeles.





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Around the West in a Hurry...

Politics and CVA...

OPPOSITION was expressed last month by Secretary of Interior J. A. Krug, to letting Columbia River Valley voters select the director who would administer a proposed Columbia Valley Administration. Before the House of Representatives Public Works Committee, Krug stated: "It is of paramount importance that the President and Congress retain control of a program involving such large federal expenditures."

The present bill now being considered would set up a CVA requiring appointment of residents of the area as two of three directors. Krug stated that he believes three directors would be enough but that the three best qualified men in the country should be chosen without regard to where they live.

Krug also stated that he opposed a referendum of the voters of the area on the proposed CVA, contending that it would be impractical and that the elected representatives of the area in Congress should speak for the people. Finally, and paradoxically, he stated that he "wanted to keep politics out of CVA."

No Jobs at Hungry Horse...

THE INFLUX of jobless construction men is still continuing at Hungry Horse Dam near Kalispell, Mont., despite wide publicity that there is already plenty of help available.

Sultan River Project...

PRELIMINARY engineering has begun on the proposed \$14,000,000 Sultan River multiple-purpose project approved by the Snohomish County Public Utility District in Washington. Harza Engineering Co. of Chicago is doing this work under a \$240,000 contract.

The project will consist of two major dams and powerhouse installations to add about 150,000 kw. hr. to Snohomish County power. Also, some 87 billion gallons of water storage will be added to the county's supply.

The two dams will both be about 310 ft. long and 150 ft. high. Dam No. 1 will

cost about \$4,000,000, and cost of power installations is estimated at \$3,600,000. Construction of conduits carrying water from the dams to the generators will top \$5,000,000.

Approved by the Federal Power Commission last March, first construction will begin on the project by June of 1950. The plan has been under discussion for the last 20 years.

Over Continental Divide...

"PLAN B" for improvement of the highway over Loveland Pass in Colorado has definitely been approved and will involve expenditure of \$500,000. The work will include widening of the present roadway to 30 ft., removal of dangerous switchbacks, surfacing and installation of guard rails. "Plan A" for a tunnel through the Continental Divide beneath the pass is still held as a possibility for the future. This plan would have involved expenditure of some \$1,800,000. A contract has been let to Colorado Constructors, Inc., of Denver for the highway improvement.

Other action in relation to Colorado road construction was a bill passed by the state's legislature for a \$4,000 contract for further traffic and engineering studies on the proposed Denver-Boulder toll road. The contract has been signed with the engineering firm of Howard, Needles, Tammen & Bergendoff of Kansas City, who made a previous survey. Construction of the toll road is involved in litigation, and no construction contracts will be approved while the litigation is pending awaiting completion of the fact-finding survey.

Indian Graves Watery...

THE GRAVES of Indians in burial grounds along the Columbia River in the area affected by McNary Dam will remain untouched and will be covered by a mantle of water when the reservoir is created behind the dam, according to Col. William Whipple, Walla Walla District Engineer upon his return from a pow-wow with the Indian tribes of the area. The general council of four tribes

adopted a resolution expressing the desire that the graves of their ancestors remain undisturbed, although water

Albuquerque Plans...

PLANNED under a \$1,410,000 revenue bond issue now up for sale by the City of Albuquerque, N. M., are construction of a new 5,000,000-gal. waterworks across the Rio Grande River from the city, several water mains and sanitary sewer trunklines, according to City Manager Charles E. Wells.

The waterworks unit would be located near the foothills near the Rio Grande and would include wells, chlorination and pumping stations and would be connected to the city's distribution system via a 10-in. main. About \$600,000 of the bond issue would be allocated to New Mexico City with the bulk of the money going for sewer projects.

Big Utah Pipeline...

THE FEDERAL Power Commission has authorized Mountain Fuel Supply Co. of Salt Lake City to build a \$1,000,000 pipeline to increase natural gas distribution in the Salt Lake valley. The new line will parallel the company's existing line from Coalsville, Utah, to Salt Lake City, and will consist of 32 miles of 20-in. pipe.

CVA Cost "Pegged"...

A COLUMBIA VALLEY Authority patterned after TVA and absorbing activities in the Columbia Basin of the Bureau of Reclamation, Army Corps of Engineers and Bonneville Power Administration, would cost about \$100,000,000 annually, according to testimony presented by Secretary of Interior, J. A. Krug, before the Senate Public Works Committee. Krug, pointing out that the aforementioned agencies have already received \$125,000,000 in appropriations for the current fiscal year, urged the Committee to approve President Truman's program for development of the Columbia River Basin in seven northwest states.

Reclamation Commissioner Michael W. Straus, also testifying before the Committee, described the coordinating program of the Bureau and the Engineers as presently existent the best devised for any river basin in the world but stated that there is no reason the proposed CVA cannot carry out the program. He was quoted as saying: "The prime difference between the comprehensive plan and the proposed CVA is that one is the physical plan and the other is a vehicle of administration."

Alaska Project Okeh...

APPROVED by the U. S. House of Representatives is a bill authorizing appropriation of \$21,000,000 for the Tutna Dam power project near Anchorage, Alaska. If the Senate follows through with approval, it will be the first power project in Alaska ever to receive Federal aid. The project would

REALIGNMENT ELIMINATES CURVES ON OREGON COUNTY ROAD

CURVES of 64 and 90 deg. are being eliminated on a stretch of Douglas County, Ore., road near Roseburg. Left view shows drainage preparations which, in this area, require substantial fill as guard against winter damage. Right, Douglas County Roadmaster, DUWARD OWENS, checks progress of newly-purchased Austin-Western grader.



sist of a low dam on Lake Eklutna, a 30,000-kw. power plant and transmission lines to Anchorage. This would be nearly as much power as is now generated in all Alaska. The bill also would authorize the Secretary of Interior to conduct investigations throughout Alaska to determine what other public works, primarily power, are needed for raising the territory to self-sufficiency.

Big Navy Jobs Due . . .

THE HOUSE of Representatives Armed Services Committee has approved a number of Navy projects totaling millions of dollars for construction in California, Alaska and the Pacific Basin. Included among the projects are the following: A jet overhaul building at the Naval Air Station, Alameda, Calif., \$950,000; an aerodynamics ballistic tract range, modification of guided missile and other ranges, etc., at the Naval Ordnance Test Station at Inyokern, Calif., \$10,992,000; auxiliary air station facilities at Miramar, Calif., \$2,230,000; laboratory buildings at Point Loma, Calif., \$3,450,000; family quarters and general construction for the base at Adak, Alaska, \$22,616,000, and extension of the runway and construction of family quarters for the Naval Base at Kodiak, Alaska, \$2,548,000.

Spokane's Budget Big . . .

NEXT YEAR'S BUDGET for Spokane, Wash., will include a \$3,000,000 item to provide for completion of the city's intercepting sewer system. According to City Engineer Charles Davis, \$700,000 has been used for units completed or already under construction, and award of new contracts will be staggered throughout the next year as an aid in preventing unemployment.

Oakland Builds Soon . . .

CONSTRUCTION of the \$2,700,000 Hall of Justice building, to be located in a \$15,000,000 new Civic Center at Oakland, Calif., will be started toward the end of this year, according to City Manager John F. Hassler. It will be the second building of the group, following current construction of a new public library.

Pipe Line Firm Grows . . .

THE SIGNAL Pipe Line Corp., a subsidiary of the Macco Corp., has recently effected an outright purchase of the Signal Pipe Line Construction Co., a company which has been actively engaged in the construction of utility and oil pipe lines in Southern California for the past twenty years.

B. M. Laulhere will head the new Signal Pipe Line Corp. as Vice-President and General Manager. Laulhere has been connected with the pipe line industry for many years.

Of the three partners operating the predecessor company, James Kitt, Jack Robertson and L. L. Bendinger, only the latter continues with the new manage-

ment in the capacity of Office Manager and Assistant Secretary.

Other officers are John MacLeod, President; F. E. Cornwall, Vice-President; Fred H. Brown, Vice-President and Treasurer; and W. B. von Klein Smid, Secretary. These officers hold similar offices in Macco Corp.

Gas Underground . . .

PACIFIC GAS & Electric Co. has announced plans to construct a \$1,300,000 underground pipe-type gas storage holder on a 20-ac. site in North Sacramento, Calif., to supply the Sacramento area with an increased gas reserve for cold weather demands. With a capacity of 6,000,000 cu. ft., the project will involve placing of 38,000 ft. of 34-in. high pressure steel pipe.

Columbia Will Be Diked . . .

THE HOUSE of Representatives Public Works Committee has approved all of the recommended Columbia River dike and bank protection projects de-

signed to prevent disastrous floods similar to last year. The bill calls for about \$36,000,000 for work on the Oregon and Washington banks of the river from Bonneville Dam all the way to the mouth of the river.

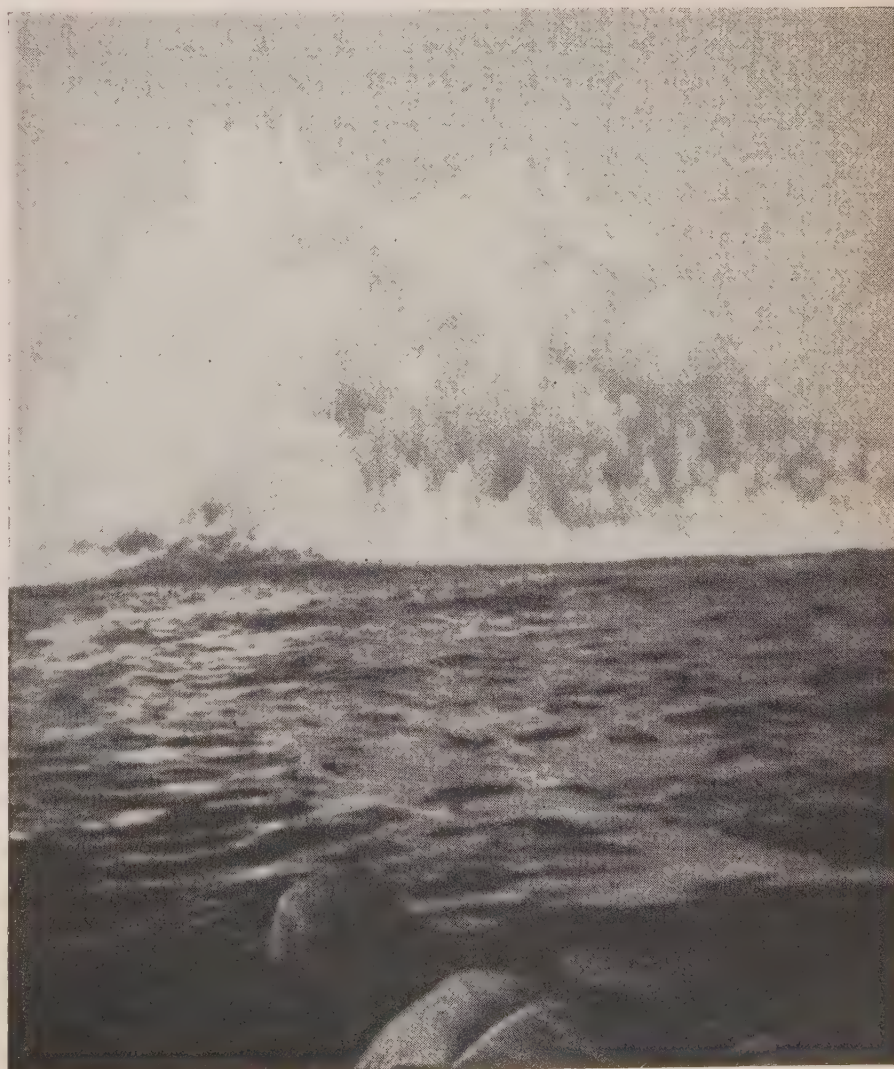
Utah Project Okeh . . .

A SUBCOMMITTEE of the House of Representative's Public Lands Committee, in a surprise move last month, approved the \$70,000,000 Weber Basin reclamation project in Utah. The entire project has been under discussion for the last ten years. Possibility was seen that a bill authorizing funds for the project would get through the House of Representatives this session.

First part of the project would be the enlargement of the Pine View Reservoir on the Ogden River, construction of the Perdue Reservoir on the Weber River and an aqueduct down Weber Canyon to carry culinary and irrigation water as far south as Bountiful. Municipalities in Davis, Weber, Morgan, Summit and Box Elder Counties would be benefited.

CHANNEL BOTTOM "BULLDOZED" ON OREGON DREDGING JOB

ON THE DREDGING of Coos Bay Channel by San Francisco Bridge Co. and Standard Dredging Corp. (the job was described in last month's *Western Construction News*), powder charges were laid in a grid on the channel bottom and then detonated at one time. This shot caught the blast at its peak. Dupont's "Hi Velocity" gelatin was used.



PERSONALLY SPEAKING

W. A. Bugge, newly-appointed Director of Highways for the State of Washington, has named **Ray Dinsmore** as his assistant and **Neal R. McKay** as Assistant Director for State Aid. Dinsmore has been Acting Director of the highway department since last January and was formerly Chief Construction Engineer. McKay has had considerable experience as State Aid Engineer. Also named is **E. C. Simpson**, veteran employee of the department, as the Department's engineer in charge of construction.

R. J. Newell, long-time Bureau of Reclamation builder and administrator who retired recently as regional director at Boise, Idaho, has been cited for distinguished service by Secretary of the Interior, J. A. Krug. The first line of the citation read, "As an engineer and administrator, Mr. Newell has served the Bureau of Reclamation with extraordinary distinction in the development of water resources in the West, and particularly in the Northwest." Newell is 69 years old and was with the Bureau continuously since 1923. His knowledge remains available to the Bureau as an official consultant. Succeeding him as Regional Director at Boise is **Harold T. Nelson**.

Leo F. Schuknecht of Helena, Mont., has been appointed manager of equipment and shops for the Montana State Highway Department, according to State Highway Engineer **C. E. Stahl**. Schuknecht replaces **W. B. Kiefner**.

Gustaf Adolph Swanson has been named Construction Engineer for the Bureau of Reclamation to supervise completion of the Anderson Ranch Dam of the Boise, Idaho, Project. Swanson has been office engineer on the project since 1944.

Earl Rawson has been named city engineer of Yerington, Nevada. For the last 2½ years, he has been assistant city engineer under **Frank Brooks**, who is retiring after 35 years at the post.

John A. Burnett of Seattle, Wash., has been named supervising engineer for the Washington State Department of Public Institutions. He will supervise engineering, maintenance and construction of the state's thirteen institutions.

William H. Popert, for the past three years representative in Northern California and Nevada for the American Institute of Steel Construction, Inc., national organization representing the structural steel fabricating industry, resigned from the position July 1. Popert is active in a number of professional groups, including the Structural Engi-

neers Association of Northern California, and The American Society of Civil Engineers. **Harry B. Corlett**, member of the American Society of Civil Engineers and formerly engineer with Ellison & King of San Francisco, has been appointed to replace Popert.

Promotion of **Frank M. Clinton**, currently Assistant Regional Planning Engineer, to Assistant Regional Director for the Bureau of Reclamation in Region 1, the Pacific Northwest, with headquarters at Boise, Idaho, has been announced by Regional Director **H. T. Nelson**. Clinton, a Civil Engineer, has been an employee of the Bureau since 1937, being best known for his engineering and economic study of the complicated Snake River water problem in connection with the proposed construction of Palisades Dam in southeastern Idaho and the negotiations with canal companies concerning the use of reserved space in American Falls Reservoir. The Bureau's other Assistant Regional Director for the region is **J. Lyle Cunningham**.

William Arthur Johnson of Balboa, Calif., internationally known contractor and construction engineer, has accepted an appointment to the Board of Trustees of Pomona College at Claremont, Calif. Johnson, President of American Pipe and Construction Co. of South Gate, Calif., since 1929, is best known as the man who built Shasta Dam while president of Pacific Constructors, Inc.

President Truman has selected **Harry W. Bashore**, former Commissioner of Reclamation from Mitchell, Neb., as United States Representative on the Upper Colorado River Commission. The

Commission, created by the Upper Colorado River Basin Compact, will include in addition to Bashore, members representing the states of Colorado, New Mexico, Utah and Wyoming. Bashore was United States representative in the 2½ years of negotiations which led to the successful negotiation of the Compact. He served in the Bureau of Reclamation from 1906 to 1945.

Completing 35 years of active service, **Sidney T. Harding**, Professor of Irrigation at the College of Engineering at the University of California, Berkeley, has announced his retirement. In addition to his scholastic work, Professor Harding has served as an expert consultant to numerous governmental agencies and irrigation districts.

The Sanford E. Thompson Award to recognize a paper of outstanding merit on concrete and concrete aggregates, has been given by the American Society for Testing Materials to **R. Mielenz** and **L. P. Witte**, Heads of the Petrographic Laboratory and Durability Unit Materials Laboratories, respectively, for the Bureau of Reclamation, Denver, Colo. Their paper presented at the ASTM convention and in the Society's Proceedings was entitled "Test Used by the Bureau of Reclamation for Identifying Reactive Concrete Aggregates."

R. S. Spoon, contractor and builder of Phoenix, Ariz., has been appointed Arizona State Registrar of Contractors. He succeeds **Morgan G. Pratt**, who held the office since 1943.

Clyde Heberling, County Engineer of Stevens County, Wash., has retired after 40 years of service. **John J. McInerney** of Richland, Wash., area engineer with General Electric Co. at the Hanford Atomic Plant, has been appointed to the position.

The Montana State Highway Department has approved the appointments of **Albert W. Jones** as Bridge Engineer to succeed **Howard W. Holmes**, and of **Albert W. Greiner** as Planning Engineer to succeed **M. J. Steere**. Jones has been with the Public Roads Administration, Montana, Greiner has been with the department for 10 years in the roles of plans, office engineer and construction sections.

Twelve prominent private citizens representing all phases of airport operation, have accepted the invitation of the Administrator of Civil Aeronautics, **W. Rentzel**, to serve on an "Airport Advisory Committee" to advise the CAB on its programs relating to the management, operation and maintenance of a



SHEERER

DAVIDSON

CAPTIONS under the cuts of these two men were reversed on page 63 of last month's *Western Construction News*. Correctly identified now are **HAROLD SHEERER**, left, Bureau of Reclamation's Resident Engineer on the first section of the East Low Canal, West Canal and Soap Lake Siphon of the Columbia Basin Project, and **ARTHUR W. DAVIDSON**, right, Chief of the Bureau's Engineering Section and Head of the Design Unit for the Irrigation Division.

ports. Included on the Committee are: **Clarence Young**, Director of Aviation, Los Angeles; **J. P. Doyle**, Manager of the Portland, Ore., Airport; **Merle Huston**, Manager of the Harlingen, Texas, Airport, and **Carl J. Amundson**, Manager of the Grand Forks, N. D., Municipal Airport. **Robert N. Cook**, Executive Officer for the Office of Airports of CAA, has been designated to serve as Executive Secretary.

Establishment of a resident engineer office at Richland, Wash., and appointment of **R. R. Garnett** as the resident engineer have been announced by **Col. William Whipple**, Walla Walla District Engineer, Corps of Engineers. Garnett will be in charge of all construction work in connection with the Richland levee and pumping plant projects necessitated by the building of McNary Dam. His offices will be in the McNeil Construction Co. building on Thayer Drive in Richland.

Harlan H. Edwards, Seattle civil engineer, has been appointed to a three-year term on the Seattle City Planning Commission. Edwards, now associated with Jones & Bindon, Seattle architects, was a consulting engineer in Southern California for 18 years and was at one time city engineer of Claremont, Calif.

Jack A. Earley, member of the Seattle Port Commission, has accepted a position as consulting engineer for the Inter-County (King and Pierce Counties, Wash.) River Improvement District.

Paul vonder Lippe, formerly engineer with the Bureau of Reclamation at the U. S. Customhouse in Denver, Colo., is now on loan from the Bureau as technical advisor to the Ministry of Agriculture and Land at Colombo, Ceylon.

Col. Henry Hutchings, Jr., head of the Southwestern Division of the Army Engineers at Albuquerque, N. M., has retired after 41 years of service. **Col. Louis W. Prentiss**, formerly Omaha District Engineer, has replaced Hutchings at Albuquerque.

William L. Eager, materials engineer for the U. S. Public Roads Administration, Philippine Division, has been transferred to the Denver office. Eager has been in Manila for 2½ years doing educational and direct aid work in road construction.

Forrest H. Coulter, Bureau of Reclamation engineer on the Humboldt Project in Nevada, has won special recognition and a cash award for suggestions that have proven to be money savers. Coulter used his spare time to devise a tool to drive piezometer pipes and designed a reduction nomograph to determine the percentage of salt in soils. For his efforts, he received a cash award of \$40 and a certificate of honorable men-

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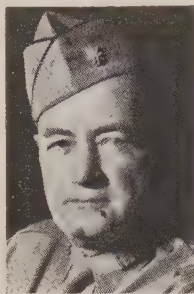


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tion signed by William E. Warne, Assistant Secretary of the Interior.

Changes in the offices of the Sacramento, Calif., District of the Army Engineers include the appointment of **H. E. McGee** as head of the operations division and the placement of **J. L. Newman** in charge of the construction branch.

William A. Stancer became the County Road Engineer of Pierce County, Wash., on June 15 following 20 years of experience in the Washington State Highway Department. During the war he served 5 years with the Corps of Engineers, and is a member of the Tacoma Section, American Society of Civil Engineers, and the Tacoma Engineers Club. **Ernest A. White** is Deputy County Road Engineer.



STANCER

Bijah G. Smith became City Engineer of Vancouver, Wash., on May 1, succeeding **George Brown**. Smith was the City Engineer of Camas for 14 years.

Elmer Biegel is now City Engineer of Ashland, Ore., replacing **F. H. Walker**, who retired after many years of service. Biegel has been Deputy City Engineer for 8 years prior to his recent appointment.

John B. Gearhart is City Engineer of Centralia, Wash., as of July 1. He was formerly City Engineer of Ontario, Ore., and succeeds **Charles C. Swartwood**.

T. Hugh Wilson is now locating engineer for the Alaska Road Commission at Nome, Alaska.

James O. Taylor, formerly with the Public Roads Administration at Lincoln, Neb., is now Highway Engineer for PRA on the Western Divide Forest Highway Project near Johnsondale, Calif.

Lamarr Oslin is now residing in Indiana, where he is field office manager for the Fluor Corporation, Ltd., on a Standard Oil Co. (Indiana) refinery job at Whiting. The work consists of miscellaneous piping and refining facilities.

Robert N. Olsen, former Instructor of Civil Engineering at Michigan State College, is now estimator with the Rognstad-Olsen Construction Co. at Casper, Wyo.

Philip N. Fletcher, formerly with Griffith Co. of Los Angeles, is now Senior Construction Engineer with the Power Division of Bechtel Corp. of Los

Angeles and San Francisco. He is working with the firm on construction of Pacific Gas & Electric Company's Contra Costa Steam Plant.

Evan E. Peterson, city manager at Coos Bay, Ore., for about a year, has been named city manager of Redondo Beach, Calif. He was employed for four years with the Denver office of the Corps of Engineers.

Paul E. McKeon, for many years with the Colorado State Highway Department at Denver, is now an engineer on inspection work for the City of San Bernardino, Calif.

Charles P. Seger, former Construction Engineer on the Narrows Dam, a unit of the Missouri Basin Project at Fort Morgan, Colo., has been appointed by the Bureau of Reclamation as District Engineer for the South Platte River District. He has been with the Bureau for 25 years.

Lt. Col. James U. Moorhead of Anchorage, Alaska, who for the past year has been Chief of the Engineer Section, Alaska General Depot, has been named head of the engineer section for the Army in Alaska.

Byrne C. Manson succeeds **Ben F. Wade**, deceased, as engineer in charge of research and utilization problems for the California Redwood Association, San Francisco. Until his appointment,

Manson was associated with the office of Herbert Fryer, consulting engineer on lumber production and use.

Stanley B. Roscoe became City Engineer of Eureka, Ore., on July 11. He had 15 years of experience with Humboldt (California) Division of Pacific Gas & Electric Co., was with Chicago Bridge & Iron Co. from 1942 to 1945, and in private practice from that time until his new appointment.

Norman Hill of Olympia, Wash., with thirty years of experience in the Washington Department of Highways, has been named Work Control Engineer of the Department. During the past few years, he has been in private practice as a consulting engineer on various projects throughout Washington.

Howard Greer, City Engineer of Las Vegas, Nev., for the past year, turned his resignation effective August 1. He will be associated with **J. M. Murphy**, who recently resigned as City Manager of Las Vegas, in a Los Angeles construction firm to be known as the Sparling Murphy Construction Co.

John W. Cunningham, head of an engineering firm of John W. Cunningham & Associates, Portland, was elected president of the Oregon State Board of Engineering Examiners at its recent meeting. Cunningham has served on the board since 1935 and has been vice-president since 1940.

OBITUARIES...

Colonel Robert Bradford Marshall, 82, retired Chief Geographer for the U. S. Geological Survey, died recently in San Francisco. He was noted as the "father" of California's \$440,000,000 Central Valley Project, since he spent 30 years touring the state making surveys, charting stream flows, etc., and formulating the plans that eventually took shape as the huge water project. Basic works of the project, including Shasta and Friant Dams, are virtually as Col. Marshall envisioned them. He was retired in 1919.

Peter Gronemen, 82, contractor of Provo, Utah, died July 15 of a heart ailment. Since 1928, he was in the contracting business with his two sons, La Var and Lynn, as junior partners.

Donald M. Drake, 54, contractor of Portland, Ore., shot himself to death recently.

Philbrook W. Holmes, 51, contractor of Roseburg, Wash., was killed July 13 when the body of a dump truck which he was repairing fell and crushed his head.

Herbert Pomfret, 62, former chief engineer for the Scofield Engineering Construction Co. of Los Angeles and for 25 years associated with major building projects in Southern California, died recently.

Dominic Coluccio, 53, who retired two years ago from active partnership with Joe Congiusta in the Superior Construction Co. of Seattle, Wash., died recently of a heart attack.

Oscar J. Caudill, 44, oiler and heavy equipment operator for General-Shaw Morrison, prime contractors for construction of the Hungry Horse Dam in Montana, was killed by a falling rock July 14. The loosened 1½-ton rock bounced over several guard barriers and struck him a glancing blow.

Robert H. Patton, 38, on the first day he was working on the Union Pacific Railroad's Aspen tunnel near Evanston, Wyo., was killed by a falling timber in the tunnel.

John A. Farmer, 61, construction engineer with the Bureau of Reclamation at Hungry Horse Dam in Montana, died June 29.

SUPERVISING THE JOBS

Walter Hurst is superintendent and R. P. Downs is project manager for Gordon-Bressi & Bevanda on their \$3,000,000 contract for construction of a concrete pipeline for a distance of 20 mi. south of Denver, Colo. Ralph Nelson is master mechanic. Foremen on the job are Bob Radich, Wes Dill, Chuck Loughrey and Ed Howe.

Victor Jackson is the general superintendent for Western Paving Co. on their \$2,500,000 contract from the Bureau of Reclamation for construction of the Horsetooth Feeder Canal, part of the Colorado-Big Thompson Project near Masonville, Colo. Dugal Young is the project manager. Foremen on the job include C. E. Price, C. G. White, A. L. Nelson, Russel Pohrbocker and U. W. Florer. Joe Dorough is the job engineer.

Fred L. Cherry is the superintendent for the Anderson Construction Co. on their new \$1,174,000 contract from the Montana State Highway Department for the bridge at Great Falls. R. Millen-sifer, vice-president of the firm, will act as project manager. At this writing, other key personnel had not yet been selected.

Work is getting under way with initial excavation beginning last month at the Canyon Ferry damsite near Helena, Mont., under the direction of E. W. Simpson as general superintendent for Canyon Constructors, Inc.

C. R. McCoy is the general superintendent for Pacific Dredging Co. of San Pedro, Calif., who have the contract for removing 7,600,000 cu. yd. of material from the Long Beach Harbor. Ralph Vea is captain of the dredge and George "Bill" Kich is chief engineer. C. W. Eddy is in charge of the job office, and William

ON COMPLETION of the current contract on San Francisco's Hetch Hetchy Aqueduct in the vicinity of Modesto by P. & J. Artukovich, Inc., Los Angeles, "MITCH" BENICH, left, is the superintendent, JOHN GRBAVAC is excavation foreman, and JOHN ARTUKOVICH, principal in the firm is project manager.



Boyden is master mechanic. Levee superintendent and foreman respectively are George Fernandez and Virgil Zugg.

R. G. MacGillivray is the general superintendent for Peter Seerie, Inc., on construction of seven structures for the Denver Valley Highway, part of a \$13,000,000 job. C. H. Nichols and Paul Weimer are carpenter foremen. I. Bidwell is steel foreman. Ben George is labor foreman. Bob Benning is cement finisher foreman.

H. L. Wheat is the superintendent and H. L. Royden is acting as project manager for H. L. Royden, contractor of Phoenix, Ariz., on the \$199,440 contract for construction of a grade separation at Sanders, Ariz. Woodrow B. Joslin is foreman on the job. The job involves a steel girder overpass, a steel girder bridge, overpass approaches and an approach roadway.

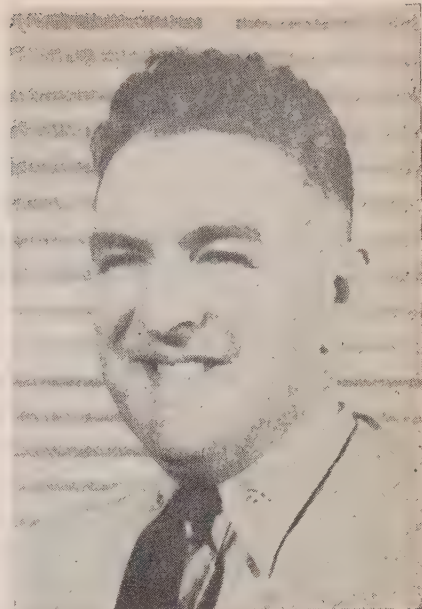
A. F. "Andy" Weesner is the superintendent for Clyde W. Wood, Inc. of North Hollywood on construction of the North Jetty of the Mission Bay Project near San Diego, Calif. The job is just getting started. Foreman on the job is Robert Butt. Foreman on quarry work is Harry Schultze. Foreman on the trucks is Don Bridwell, and foreman on the cranes is Frank Watson.

Eugene E. Sedille has severed his connection with the firm of Olympic Design & Builders of Seattle, Wash., and has announced the establishment of his own firm for general contracting practice at 4601 Sixth N.W., in Seattle.

J. N. McFee is the superintendent and J. R. Ashton, company vice-president, is acting as project manager for Del E. Webb Construction Co., of Phoenix, Ariz., on construction of the \$3,161,000 Veterans Administration Hospital in Phoenix. The job is just starting, and at this writing no other key personnel have been named.

Ed Raimier is the superintendent for Guy F. Atkinson Co. of South San Francisco and Bill Caldwell is the project manager on excavation of 950,000 cu. yd. for removal of the old Fort Moore Hill in Los Angeles to make way for the downtown freeway construction.

Bob Thomas is superintendent for L. J. Hesser of Greeley, Colo., on a bridge and grading job north of Greeley. Foremen on the job are Dean Schuman, Bill



R. G. MacGILLIVRAY

Johnson, Elmer Coursey and Pete Johnson. The job involves a reinforced concrete bridge across the Poudre River.

N. J. Kohler is the general superintendent for Colorado Constructors, Inc. of Denver on their \$1,000,000 contract for grading work on the Bureau of Reclamation's Horsetooth Canal near Masonville, Colo. I. N. Fox, Charley Eckman and Art Tyree are foremen on the job. Johnny Huba is job engineer.

Ed Furguson is superintendent for Beyer & Abrahamson of Los Angeles on construction of the Associated Telephone building at Laguna Beach, Calif. W. Thurman is assistant superintendent. I. Milligan is carpenter foreman. J. E. Randrup is labor foreman, and William Powell is the job engineer.

W. J. Weidler is superintendent for F. B. Anderson, Inc., on a \$200,000 con-

SUPERVISING structural steel work and machinery installation by Thomas Rigging Co. of Emeryville on the new \$21,000,000 plant for Fibreboard Products, Inc., at East Antioch, Calif., are, standing left to right: L. J. HOWARD, rigger foreman; JACK BERGMAN, millwright; FLAVIE BEACH, general superintendent, and BLACKIE GODFRIE, job superintendent. Kneeling is ROY PEARSON, rigger.





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tract for construction of an overpass structure at 37th and Fox in Denver, the Valley Highway. **Willard Bagley** the carpenter foreman, **Eddie Jones** steel foreman, and **Ed Allen** is his equipment operator.

Roy V. Alber is superintendent for **Frank M. Kenney**, contractor of Denver on construction of a twin overpass on the Valley Highway at 36th and Fox in Denver, Colo. **Al Dow** is carpenter foreman, **Gerald Norman** is steel foreman and **F. T. Bradley** is labor foreman.

W. E. Samways is superintendent for **Daley Brothers** of San Francisco on construction of a precast concrete warehouse in Great Falls, Mont. **Lee M. Smith** is the job foreman.

Gordon J. Patterson is general superintendent for **Askevold Construction Co., Inc.**, on a dormitory building being built in Warm Springs, Montana, under a \$441,665 contract by the State. **Elling Nelson** is foreman on the job. Work began this January and will probably end this December.

E. P. Holm is the general superintendent for **Holm Construction Co.** on construction of a \$90,000 concrete school building in Richey, Mont. **Harold D. Hansen** is project manager.

R. B. McAlpin is superintendent for **Ted Bendler** is foreman for **H. P. Adams Construction Co.** on erection of a school building at Yuma, Ariz.

Henry Linkert is superintendent for **John Bevanda** and **Nick Bulum** are in as project managers for **M.J.B. Construction Co.** of Stockton, Calif., on construction of the \$367,000 Army Engineers' Burns Alam Dam near Merced, Calif.

M. V. Allison, with twenty years of experience in construction, is superintendent for **John Sterhan Construction Co.** of Wolf Point, Mont.

Elmer T. Royse is the superintendent for **Central Valley Pipe Lines, Inc.** on construction of the sewer system for the town of Anderson, Calif. Engineer for the project is being done by **Clair Hill**, civil engineer of Redding, Calif. and **Bruce Finley** is the resident engineer.

E. T. McCabe is the general superintendent for **J. P. Brennan and D. J. Stutzman** on the \$150,000 construction of buildings for the Intermountain Division of Shasta County in California.

H. Bergendahl is the superintendent for **Dudley Construction Co.** of Great Falls, Mont., on their \$950,000 contract for construction of the big state of



C. C. DE ARMOND

building at Helena, Mont. Fred B. Dudley is acting as the project manager. Foremen on the job are Cecil Kenyon and Frank Bolin. Directing construction of a school at Great Falls for the firm are Gordon Gens and Elmer Ackerman.

F. P. Llewellyn is the superintendent for Lee Moor Construction Co. of El Paso, Texas, on their \$300,000 contract for construction of streets and sidewalks in Tucumcari, N. M. Foremen for the work are Jack Payne, H. Pruitt, Joe Lednick, and J. E. Butler.

Al Golden is the superintendent for M. H. Golden construction Co. of San Diego on completion of the sewerage plant at San Diego. Jack Golden, Mel Radford and W. H. "Bill" Dukes are carpenter foremen. Howard Drew is labor foreman. Robert Sloan is superintendent of the pipe work. Harry Parish is timekeeper.

R. W. Bailey is the superintendent for Robert E. McKee of West Los Angeles on construction of housing facilities at Point Mugu Navy Base near Oxnard, Calif. Carpenter foremen are Ray Bailey, Frank Marrell, William Robertson and Jimmy Gatewood. Labor foreman is F. Andreason. R. C. Smith is the job engineer, and Jack Dershimmer is his assistant. C. S. Douglas is electrical foreman, and J. R. De Young is steel foreman. George Fordham is the office manager.

C. L. Peck of Los Angeles is the contractor for construction of the big and attractive Calvary Auditorium for the Forest Lawn Memorial Park at Glendale, Calif. He has as his superintendent R. O. Youmans. Harold Youmans is carpenter foreman, Art Carpenter is

labor foreman, and timekeeper is J. A. Rice.

C. C. De Armond is now superintendent for R. J. Daum Construction Co. of Albuquerque, N. M., on their \$2,881,648 contract for construction of a structural steel building at the Sandia Base near Albuquerque. Leo W. Cook is assistant superintendent. W. H. Browne is the job engineer. Bill Thompson is general labor foreman and Bobby Frandsen is timekeeper.

M. R. Stover is the general superintendent and C. E. Kasler is the project manager for Fredericksen & Kasler of Sacramento, Calif., on their \$779,093

contract for construction of the City Creek Road below Running Springs in Southern California. Ray Austin is grading superintendent; Frank Muren is structures superintendent, and Slim Ransdell is master mechanic. Grading foremen are Bill Loy and Herb Gibson, and Hap Gray is in charge of clearing. Job accountant is Mike Whalen.

R. M. Rigney is the general superintendent for Claude Fisher Co., Ltd., and L. A. and R. S. Crow of El Monte, Calif., on their \$743,000 contract for construction of the third section of the City Creek road near Running Springs. H. B. Arnold is the grading foreman and S. C. McCormick is labor foreman. For the



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State of California, **M. E. Nelson** is resident engineer, **J. B. MacDonald** is grade inspector, and **P. H. Wittig** and **R. H. Ramey** are structures inspectors. The job is being completed in August.

S. A. Johnson is the superintendent for Baruch Corp. of Los Angeles on construction of a 500,000-sq. ft. reinforced concrete industrial plant in east Los Angeles for Union Hardware and Metal Co. **Clarke Cherry** is engineer on the job. **Bill Allen**, **A. "Scotty" Noble** and **Lee Wire** are carpenter foremen. **Fred Garcia** is labor foreman and **Mike Priseler** is office manager.

Ralph Bronson is superintendent and **Frank Hess** is project manager for Hess Construction Co. on their \$507,000 contract from the Public Roads Administration for road construction near Camp Angeles, Calif. **Norman Webb** is master mechanic. Foremen on the job are **David Myers** and **R. J. Lidikay**.

J. M. Davidson, contractor of Sturgis, S. D., is personally supervising a number of building construction jobs in that city. **Harold Davidson** is his project manager.

Al Dalin is the superintendent for Contracting Engineers Co. of Los Angeles on their \$500,000 contract for construction of the Roosevelt Junior High School in Glendale, Calif., and the \$125,000 Allesandro School in Pasadena. **J. R. Ray** is inspector of construction for the schools.

Floyd Boschert is the superintendent for construction of the Mayfair Market in Glendale for Jackson Bros. of Bell Gardens, Calif.

Al Simmons is job superintendent for Anthony C. Meehleis Co. of Los Angeles on their subcontract to Matich & Yaeger for reinforcing steel on the Los Angeles River channel improvements. **Al Meehleis** continues as field superintendent of all the firm's projects.

Verne T. Davis is the superintendent for Ribb, Remmen & Ribb on construction of the new Sears, Roebuck store at San Fernando, Calif. **Ed. T. Barrington** is carpenter foreman and **Harris Larson** is labor foreman. **Joseph Agostino** is doing the excavating.

R. W. "Dick" Keiser is superintendent for B & R Construction Co., San Francisco, on their \$400,000 contract for construction of an elementary school at Martinez, Calif. **Paul Niswander** is carpenter foreman and **E. McCutchan** is labor foreman. The project is nearing completion.

D. W. Arave is superintendent for R. M. Price Co. and O. B. Pierson on construction of a bridge over the San



S. A. JOHNSON

Gabriel River for the State of California. **Olen Ware** is steel foreman. Other key men are **Allen Rooth**, **Mac McOsker** and **Curley Wimberly**.

K. Murray is the superintendent and **Neil Saul** is project manager for J. E. Haddock, Ltd., of Pasadena, Calif., on their \$494,309 contract for grading and paving of Rosemead Blvd. in Los Angeles.

George Mason is the superintendent for Crocker & Ellett, Inc., of Denver, Colo., on construction of water mains for the City of Denver.

Carl Andrews is the superintendent for J & K Construction Co. on their \$100,000 contract for construction of school buildings in Denver. **John Lonergan** is project manager and **Keppel Brierly** is the job engineer.

Ed Roach is superintendent on grading and **Les Davis** is superintendent on graveling and oiling for Northwestern Engineering Co., Rapid City, S. D., on their \$360,000 contract for grading, graveling and application of asphalt on the state highway 9 mi. west of Lead, S. Dak. **Les Davis** is also acting as superintendent for the firm on their \$232,500 contract for construction of runways at the Rapid City Airport. **Tom Regan** is the firm's superintendent of paving and **E. T. Roach** is superintendent of grading on the firm's \$301,000 contract for paving of streets in Belle Fourche, S. D. **R. J. O'Meara** is the firm's superintendent on construction of a road in the South Dakota Forest Project near Pactola, S. D.

Max Berry is the superintendent for Colorado Constructors, Inc., Denver, on their \$350,000 contract for the grading

and oiling on 10 mi. of U. S. 40 Loveland Pass. Foremen on the job are **Lee Moxley**, **"Blackie" Noble** and **Guthrie**.

John Alger is superintendent. **Hank Eberhardt** is assistant superintendent for Brown Construction Co., Colorado Springs, Colo., on their contract for grading and oiling of 4 mi. of the road over Loveland Pass in Colorado. Foremen on the job are **T. Woodard**, **Dan Ratliff**, **Roy Ba**, **"Rosy" Holman** and **John Young**.

Arlie Bailey is superintendent for tractor **Henry Shore** on the \$250,000 contract for construction of a bridge overpass on U. S. Hwys. 85 and 87 in Larkspur, Colo. Foremen on the job are **Walter La Force** and **Nathan Shr**.

Tom Atwell is superintendent for tractor **Nick Pinello** on the excavation and riprap placement for Temple Gap Flood Control Project near Colorado Springs, Colo., sponsored by Army Engineers. Foremen include **Claude Ford**, **Harry, Tony, Ben**, **Tom Pinello**. **E. C. Althouse** is the engineer in charge of the project.

Jamie O'Hara is superintendent for contractor **J. E. Roberts** on the \$468,000 contract for construction of the Creek Road, a State of California project. **Ray Shearer** is the master mechanic. Foremen on the job are **Carl Nelson**, **Ted Little** and **O. A. Crean**.

R. A. Mathisen is now superintendent for Holmes Construction Co. of Casper, Wyo., on the construction of commercial buildings. Formerly he was with the E. S. McKittrick Co., of Huntington Park, Calif., as general foreman in building construction.

"Pete" Bassette is now superintendent of pile driving operations for Morris Knudsen Co., Inc., on construction of 13 railroad bridges for relocation of C. B. & Q. Railroad around the Hay County Dam near Alma, Neb.

E. L. Young, formerly assistant resident engineer for Army Engineers, Merced, Calif., is now general foreman for United Concrete, Ralph A. Bell, Westbrook & Pope on road construction near Auburn, Calif.

W. B. Greer is now shop manager for McKay, Inc., of Twin Falls, Ida. Formerly he was construction shop foreman for Arizona-Nevada Constructors, Dinuba, Calif.

Mr. Frank is superintendent for Swerton & Walberg Co. of San Francisco on their \$1,500,000 contract for construction of a distributing plant building at East 40th St. in Denver, Colo., for

Western Electric Co. of New York City. **Bradford M. Bowker** is the project manager. **J. H. Wilson** is carpenter foreman, **H. Donovan** is labor foreman, and **Al Peterson** is field engineer. **L. E. Carlson** is job clerk.

Everett Maus is the superintendent for **J. Kirchhof Construction Co.** on their \$400,000 contract for construction of additions to the administration building at the Stapleton Municipal Airport at Denver, Colo.

R. W. Jones is superintendent for **Hutcheson Construction Co.** of Denver, Colo., on their \$142,000 contract for construction of water mains in Denver. **Charles Slusher** and **Earl Hershey** are job foremen. **W. R. Allen** is the city inspector on the job.

Alec Pushee is superintendent for **P. Walker Co.**, Los Angeles, on construction of the Times-Mirror bindery plant in Los Angeles, a job nearing completion. **Chuck Sanford** is carpenter foreman, **Ed Ball** is labor foreman, **R. A. Smith, Jr.**, is in charge of materials, and **R. E. "Bob" Miller** is the job engineer. In the office are **R. T. Noel** and **R. S. Taylor**.

Glen P. Snyder is the superintendent for **J. A. Payton**, Riverside, Calif., on his \$428,000 contract for the LaCadena road job from Colton to Riverside. **O. G. Sansone** is in charge of the job office. For the subcontractor for structures work, **Thomas J. Pleman**, **James E. Hopkins** is the superintendent.

Pickard Construction Co., formerly located at 3355 Lime, Long Beach, Calif., have moved to larger quarters at 2190 W. Willows in the same city. **D. W. Pickard** is owner. **Cuvier Greene** is the firm's superintendent. The firm engages in heavy construction.

Ole Remmen is the superintendent for **V. O. Brunzell**, Gardena, Calif., on construction of the William Northrup Elementary School in Alhambra, Calif. **R. D. McDonald** and **George Baxter** are carpenter foremen, and **Lloyd Brunzell** is the job office manager. In charge of inspections for the Alhambra schools is **John P. Mitchell**, formerly superintendent of many building jobs in the area.

R. R. Richmond is superintendent of all jobs for **L. S. Whaley Construction Co.** of Long Beach, Calif., currently constructing the Los Lomas apartments adjacent to the Navy Hospital in Long Beach. **Charles J. Morrison** is the job superintendent. Carpenter foremen include **J. Patrick**, **M. R. Heise**, **Lee Colby**, **Art Emfield**, **Oren Browne** and **John Schuster**. Concrete foreman is **Earl Davis**. Labor foreman is **Harlan Westrope**. Timekeepers are **Thomas Ford** and **M. Boyer**.

Reclamation Construction Projects Advertised for Bid in Near Future

ACCORDING to an announcement from the Chief Engineer of the Bureau of Reclamation in Denver, invitations to bid on construction for the Bureau will be issued in the near future on the following projects:

On Aug. 15, for construction of three pumping plants and all auxiliary equipment on the Wellton-Mohawk canal, about 20 mi. east of Yuma, Ariz.,

On Aug. 18, for completion of the switchyard at Tracy, Calif., including installation of all electrical equipment; for installing equipment and erecting steel structures at the Estes and Marys Lake power plants near Estes Park, Colo.; for removing and replacing 70,600 sq. ft. of bituminous sidewalk with concrete at Boulder City, Nev.; and for construction of 26 mi. of 115-kv. wood pole transmission line between Wray and Yuma, Colo.

On Aug. 23, for relocation of 6 mi. of county road at Medicine Creek reservoir, near Cambridge, Neb., including two steel bridges; and for construction of four relief pumping plants and the Willow Creek pumping plant about 10 mi. north of Caldwell, Idaho.

On Aug. 25, for construction of the 7 ft. diameter Tecolote tunnel near Goleta, Calif., under two alternate plans, the first including 5,600 ft. at the inlet end of the tunnel and 5,600 ft. at the outlet end, along with an access road, and the 2nd including both of the above sections and the remaining 11,200 ft. of tunnel, plus concrete lining and structures for the entire 6.4 mi.; for erection of transmission lines between Perkins and Tracy and between Oroville and Elverta, Calif., 54 and 57 mi. in length, respectively; and for construction of 6.5 mi. of Cambridge Canal, 40 mi. north-east of McCook, Neb.

On Aug. 30, for installation of a substation at Lusk, Wyo., and for installation of air-conditioning in a building at Hoover Dam.

In addition, the Bureau contemplates asking for bids on a number of other construction projects in the following two months, but definite advertising dates have not yet been established. Among these projects are two earthfill dams, Moorhead Dam, 190 ft. high and 2,660 ft. long on the Powder River near Moorhead, Mont., and Keyhole Dam, 109 ft. high and 3,300 ft. long on the Belle Fourche River 18 mi. northeast of Moorcroft, Wyo.

A 26-mi. concrete pipe distribution system connecting to the Friant-Kern Canal near Delano, Calif., and the 3,800-ft. Superior siphon, a 4.5-diameter precast concrete structure near Superior, Neb., are also to be advertised soon.

Among canals to be constructed soon are 19.7 mi. of the West Canal of the Columbia Basin project near Quincy and Winchester, Wash.; the second section of the Fire Mountain Canal near Somerset, Colo.; 8.5 mi. of the Delta-Mendota Canal near Oro Loma, Calif.; 9.1 mi. of the Potholes East Canal of the Columbia Basin project, about 16 mi. west of Warden, Wash.; 5 mi. of the Poudre Supply Canal, near Fort Collins, Colo.; and 9.5 mi. of the Wellton-Mohawk Canal, about 12 mi. east of Yuma, Ariz.

Electrical work to be advertised includes, stringing of conductors for 238 mi. from Davis Dam to Mesa, Ariz.; erection of 73 mi. of wood pole transmission line between Brush and Limon, Colo.; 42 mi. of wood pole line between Kremmling and Oak Creek, Colo.; and 41 mi. of wood pole line near Bismarck, N. Dak.

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FOR CONSTRUCTION of an Idaho forest highway project along the scenic Payette River near Banks, Ida., **McNutt Bros.**, contractors of Eugene, Ore., use a 2-cu. yd. Lorain shovel to load 30-cu. yd. LeTourneau buggies. **JACK STEPHENS** is operator.





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HYDROLOGY—By C. O. Wisler, Professor of Hydraulic Engineering, University of Michigan, and E. F. Brater, Associate Professor of Civil Engineering, University of Michigan. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 420 pages, 6 x 9. Price \$6.00.

The book is a discussion of precipitation, floods, the hydrograph, infiltration capacity and other recent developments in hydrology. The book explains procedures for determining the minimum flow and long-term average yield of any drainage basin. Dependable methods for computing the ground water yield of a well or of any given area are presented. The book provides information which can be used in the determination of the maximum flood flow that may be expected every few years as in airport drainage and storm sewer design. For the design of a spillway for an important dam or any flood control work, the authors present methods for determining the maximum flow that will occur with rare frequency such as once in a thousand years.

TVA'S WATTS BAR STEAM PLANT—Technical Report Number 8 of the Tennessee Valley Authority, Knoxville, Tenn. 340 pages, many drawings and illustrations, 6 x 9. Price \$2.25, available from the TVA Treasurer's Office at Knoxville.

This technical report of the TVA's Watts Bar Steam Plant has entirely covered the planning, design, construction and initial operation of this modern installation. The report includes a comprehensive summary of the project costs, a statistical summary of physical features, a list of major purchases of material and equipment, mechanical and electrical installations, etc.

MODERN RAILROAD STRUCTURES—By Charles P. Disney and Robert F. Legget. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. 215 pages, 7 x 10. Price \$5.00.

An illustrated record of some of the recent advances in the design and construction of some of the more important types of structures required for railroads is contained in this book. A large number of illustrations are presented, picturing structures in the United States, Canada and Great Britain. Through the use of the illustrations, the authors present ideas for new structures for railroad use which can be adapted to local problems in the construction and maintenance of railroad lines. The importance of soil mechanics in railroad engineering is stressed, modern methods of treating railroad track are described, and recent improvements in the art of grouting and repairing concrete and masonry work are covered.

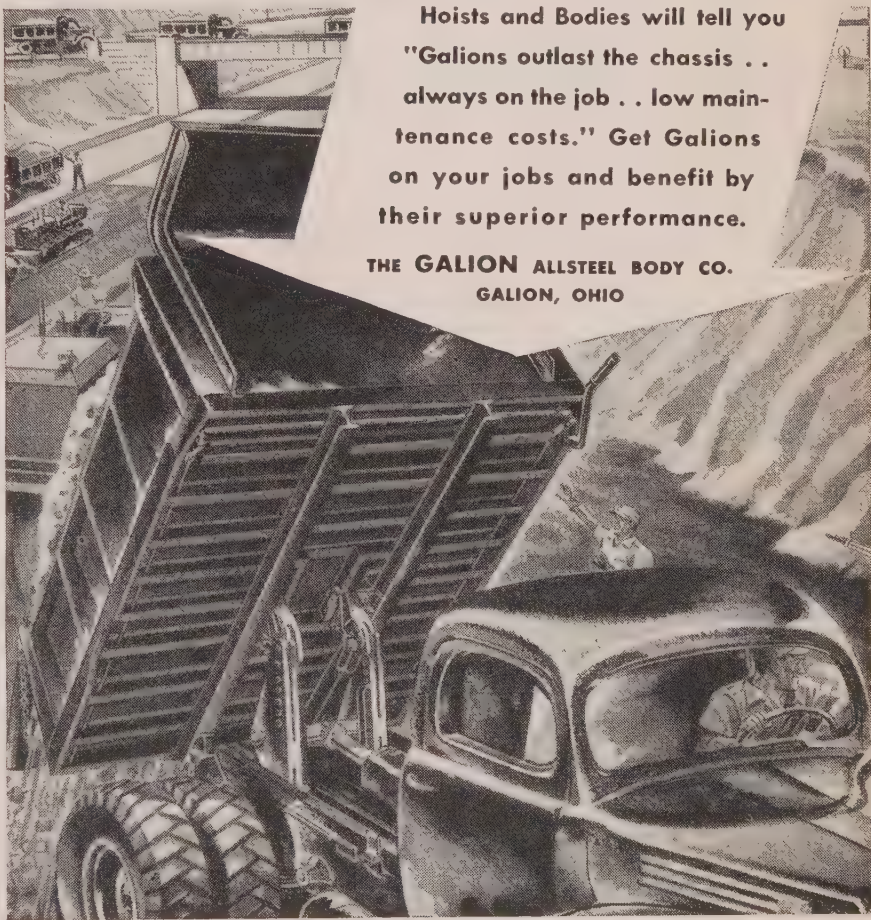
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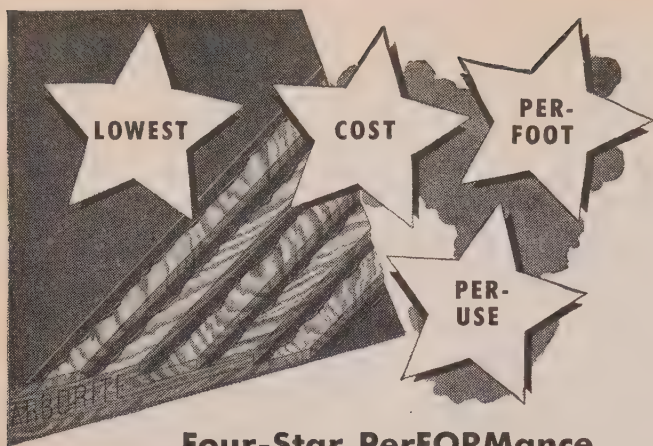
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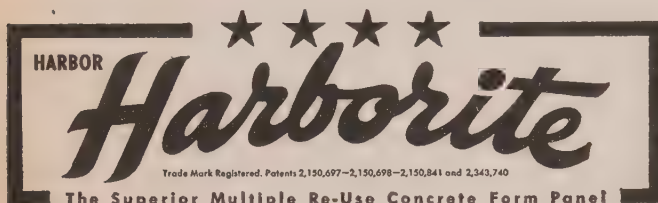
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Colorado	FRUEHAUF TRAILER CO.	4780 Vasquez Blvd., Denver 5
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Contracts . . .

Summary of Major Construction Contracts Awarded Last Month

McNary Dam Contractors (joint-venture firm comprised of **Guy F. Atkinson Co.**, **Ostrander Construction Co.**, and **J. Jones Construction Co.**, Box 593, San Francisco), with the 1 bid of \$15,835,539, were awarded the contract by the Walla Walla District, Corps of Engineers, for the Oregon Shore cofferdam and a portion of the powerhouse structure at McNary Dam on the Columbia River in Oregon (see news item about the dam and work involved on page 95, this issue).

With a joint bid of \$1,063,900, **Manson Construction Co.**, and **Osberg Construction Co.**, Seattle, Wash., were awarded contract for construction of a 3,350-ft. long rock seawall at Norton Sound at Nome, Alaska, by the Corps of Engineers.

Western Contracting Corp. and **Hubert Everist, Sr.**, Box 1 Westley, Calif., were awarded a \$4,165,764 contract by the Bureau of Reclamation for construction of earthwork, concrete lining and structures on the Delta-Mendota Canal from Station 21 plus 80 to Station 3024 plus 80 near Newman, Calif. A total of 700 days are allowed for completion.

The Chief of the Bureau of Yards and Docks has awarded \$998,700 contract for the construction of a runway, taxiway and plane parking areas at the U. S. Naval Air Missile Test Center, Point Mugu, Calif., to the **Griffith Co.**, 1060 S. Broadway, Los Angeles. Time for construction is 210 days.

Del E. Webb Construction Co., Box 4066, Phoenix, Ariz., was awarded a \$3,161,000 contract by the Los Angeles District, Corps of Engineers, for construction of the Veterans Administration Hospital at Phoenix. The 200-bed general medical hospital will be located on 180 ac. of land on the east side of the Indian School grounds at 7th St. and Indian School Road in Phoenix. About 20 months will be allowed for completion of the project.

The \$4,488,000 general contract for construction of the reinforced concrete Medium Security Prison building at Soledad, Calif., Monterey County was awarded by the California Division of Architecture to the joint-venture firm of **M & K Corp.**, 4 Montgomery St., San Francisco; **Fredrickson & Watson Construction Co.**, 873 81st Ave., Oakland, and **Piombo Construction Co.**, 1571 Turk St., San Francisco. The project includes a number of large buildings, a sewage disposal plant and water reservoirs, roads and utilities, etc.

N. M. Ball & Sons, 645 N. Willard Ave., San Gabriel, Calif., were awarded a \$938,108 contract by the California Division of Highways for the grading and surfacing with PCC on cement treated subgrade of 1.2 mi. of the Hollywood Parkway in Los Angeles between Glendale Blvd., and Grand Ave.

Electric Constructors and **C. M. Elliott**, 130 G St., Chula Vista, Calif., were awarded a \$986,000 contract by the Bureau of Reclamation for construction of 69-kv. transmission circuit from Estes Power Plant to Marys Lake Power Plant on the Colorado Big Thompson Project near Grand Lake and Estes Park, Colo. A total of 450 days are allowed for completion.

J. A. Terteling and Sons, Inc., Boise, Idaho, were awarded \$1,088,817 contract by the Bureau of Reclamation for construction of earthwork and structures from Station 1 plus 28 to Station 964 plus 00 on the Winchester Wasteway on the Columbia Basin Project. The work begins at the West Canal about 8 mi. east of Quincy, Wash. A total of 600 days are allowed for completion.

Waale-Camplan Co., 2100 S.W. Jefferson, Portland, Ore., were awarded a \$540,348 contract by the Seattle District, Corps of Engineers, for rehabilitation of the Portland Air Force Base damaged in the flood of 1948. The bid was audited down to the award figure from \$720,915.

M J B Construction Co., 322 Elks Bldg., Stockton, Calif., were awarded a \$367,089 contract for construction of the earthwork Burns Creek Dam about 18 mi. from Merced, Calif., by the Sacramento District, Corps of Engineers.

Dodge Construction Co., Inc., Fallon, Nevada, were awarded \$396,024 contract by the Nevada State Highway Department for construction of approx. 23 mi. of Route FAS 614 south of Denio in Humboldt County.

Walsh Construction Co., 785 Market St., San Francisco, were awarded a \$323,060 contract by the Sacramento District, Corps of Engineers.

of Engineers, for excavation of the main dam outlet works for the Isabella Project on the Kern River near Isabella in Kern County, Calif.

Fredericksen and Kasler, 212 13th St., Sacramento, Calif., were awarded a \$1,039,500 contract by the California Division of Highways for construction of about 4.9 mi. of the highway between Pismo Beach and Miles Station in San Luis Obispo County, Calif.

A \$429,899 contract was awarded by the Public Roads Administration for improvement of the Harmony Ridge Road in Tahoe National Forest in Nevada and Placer Counties, Calif., to the joint-venture firm of **Richter Brothers**, 2136 Spencer Ave., Oroville; **W. H. Darrough & Sons**, Box 292, Yuba City, and **M. J. Ruddy & Son**, 922 J St., Modesto, Calif.

Fiorito Bros., Seattle, Wash., were awarded a \$314,176 contract by the Washington State Highway Department for the clearing, grading, draining and surfacing of 3.1 mi. of PSH No. 14 in Pierce County.

Peter Kiewit Sons' Co., Sheridan, Wyo., were awarded a \$442,933 contract by the Wyoming State Highway Department for construction of grading, base course surfacing, and road-mix asphalt surfacing on 20 mi. of the Colony Road in Crook County.

Clinton Construction Co., 923 Folsom St., San Francisco, were awarded the \$1,735,900 general contract by the City of Richmond, Calif., for construction of a reinforced concrete auditorium and art center building at Richmond.

James I. Barnes Construction Co., 1119 Montana Ave., Santa Monica, Calif., were awarded the \$1,230,610 contract by the California Division of Architecture for construction of a reinforced concrete tuberculosis hospital, the Patton State Hospital, at Patton in San Bernardino County, Calif.

Rumsey & Co., 3821 Airport Way, Seattle, Wash., were awarded a \$547,668 contract by the Board of Regents at the University of Washington for construction of a 3,200-ft. utility tunnel on the campus at Seattle.

Robert E. McKee, 4700 San Fernando Road W., Los Angeles, were awarded a \$1,390,400 contract by the United States Atomic Energy Commission for construction of 132 buildings, water and

gas supply lines, sewage collection and disposal units, etc., at Los Alamos, N. M.

R. A. Wattson Co., 5528 Vineland Ave., North Hollywood, Calif., were awarded a \$473,754 contract by the Los Angeles Board of Public Works for the installation of sanitary sewers and appurtenant work in Relief Sewer District No. 2, Los Angeles.

Guy F. Atkinson Co., 223rd St. and Santa Fe Ave., Long Beach, Calif., were awarded a \$448,676 contract on Section B (bulkhead), and **Livingston Truck and Materials Co.**, 3366 Cherry Ave., Long Beach, were awarded a \$476,600 contract on Section C (furnishing rock) by the Long Beach Harbor Department for construction of circular steel sheet pile bulkheads and a rock dike to confine the second unit of Pier A at the Long Beach Outer Harbor.

Pacific Coast Builders, 2530 18th St., San Francisco, were awarded a \$792,635 contract by the Board of Regents of the University of California for construction of an office and shop building to house a bevatron on the University of California campus, Berkeley.

W. S. Ford, Box 928, Kingman, Ariz., was awarded a \$609,557 contract by the Board of Regents of the University and State College of Arizona for construction of a heating plant and power generator building on the campus of Arizona State College, Flagstaff.

Isbell Construction Co., South Virginia Road, Reno, Nev., were awarded a \$398,186 contract by the Nevada Department of Highways for constructing 2.5 mi. of Hash Lane south of the Reno city limits.

Guy F. Atkinson Co., Cascade Bldg., Portland, Ore., was awarded a \$647,748 contract by the Portland City Council for construction of Outfall Unit No. 1 of the Intercepting Sewer and Sewage Treatment Project, Portland. The project includes construction of an 8-ft. concrete sewer line approx. 2 mi. long and a concrete tunnel 117 ft. long under railroad tracks.

A. Teichert & Son, Inc., Box 1113, Sacramento, Calif., were awarded a \$598,859 contract by the California Division of Highways for the grading and surfacing with plant-mix surfacing on selected material base for about 6.5 mi. and construction of a small bridge in Riverside and San Bernardino Counties, Calif.

IMAGINE!

A SEALING COMPOUND usable at 70° F. that has

- Greater adhesiveness than soft asphalt
- The elasticity of rubber
- Great ductility at sub freezing temperatures, yet will not run in the hottest sun

THAT WILL STICK TO

- Concrete, wet or dry
- Vitrified clay
- Wood
- Steel

THAT MAY BE USED AS A

- Liquid to be poured
- Plastic to be trowelled
- Solid to be placed in slabs or strips

YOU'RE NOT IMAGINING

YOU'RE THINKING OF INDACO ELASTIC JOINT SEALER

THE MOST MODERN PROVEN SEALING COMPOUND FOR PAVEMENTS, RUNWAYS, SEWERS, RESERVOIRS, STRUCTURES.

Manufactured by

INDUSTRIAL ASPHALT CO.

1801 - 4th Street

Berkeley 10, California

Telephone THornwall 3-3273

20,350 feet per second!

That's how fast the explosive wave travels along the *Pentaerythritetranitrate* (PETN) core of Primacord-Bickford Detonating Fuse. Practically instantaneous, but the fraction of time delay between holes and between rows of holes allows relief of burden—so that a minimum of explosives obtains the maximum in results.

PRIMACORD-BICKFORD Detonating Fuse

1. Improves powder efficiency
2. One cap shoots unlimited charges
3. Practically instantaneous
4. Simple to hook-up—simple to check
5. Always safe to handle
6. No caps required in holes

Other COAST Products

CELAKAP
SPITTERCORD
COAST SAFETY FUSE
HOT WIRE FUSE LIGHTERS

Consult your powder company man or write for literature

COAST MANUFACTURING & SUPPLY CO.

Livermore, California



TRADE WINDS

News of Men Who Sell to the Construction West

Western Distributor News Round-up

The EDWARD R. BACON CO. of San Francisco have been appointed distributors for LA CROSSE TRAILER & EQUIPMENT CO., La Crosse, Wis., and TAMPO MFG. CO., San Antonio, Tex., according to **Gordon Harris**, sales manager of the Bacon company. La Crosse manufactures heavy duty trailers, while the Tampo company makes pneumatic tired sheep-foot rollers. Harris also announces that the Bacon company has been made distributors for the WILSHIRE POWER SWEEPER CO., Los Angeles, manufacturers of the Wilshire power sweeper.

☆☆☆

INDUSTRIAL EQUIPMENT CO. has opened a new branch building at Kalispell, Mont., giving them three strategically located branches to provide prompt, efficient sales, parts and repair service for the entire state of Montana. The main office of the company is at the headquarters branch at Billings, and the third branch building is located in Missoula. Industrial Equipment Co. are distributors for: J. D. Adams Mfg. Co., Bethlehem Steel Corp., Bucyrus-Erie Co., Cleveland Trencher Co., Construction Machinery Co., E. D. Etnyre & Co., Harnischfeger Corp., The Heil Co., Heltzel Steel Forms, Frank G. Hough Co., International Harvester Co., Isaacson Iron Works, C. R. Jahn Co., Le Roi Company, Quaker Rubber Co., Schield-Bantam Co., Inc., Seaman Motors, Simplicity Engineering Co., and Universal Engineering Corp.

☆☆☆

George M. Philpott, head of the GEO. M. PHILPOTT CO. of San Francisco,

recently made an extended trip through the Portland, Ore., area. Among the construction jobs he visited were McNary and Detroit dams.

☆☆☆

Announcement of the appointment of the WORK HOIST & BODY CORP. of Berkeley, Calif., as northern California distributor for the Coleman front wheel drive installations was recently made by THE AMERICAN-COLEMAN CO., Omaha, Neb. President of the Work company is **J. C. Work**, veteran truck equipment distributor in California.

☆☆☆

Paul Prestrud was recently made manager of Cummins Diesel Sales in Montana, with headquarters at Billings. He was formerly covering Colorado and Wyoming out of the Denver office. Prior to his association with CUMMINS ENGINE CO., INC., he served six and a half years in the Air Corps.

☆☆☆

L. R. McKinney, formerly parts manager of the Greybull, Wyo., store of WORTHAM MACHINERY CO., Cheyenne, Wyo., has been transferred to Bozeman, Mont. He will be under the direction of the Billings branch store. **Ray Moline**, who formerly was attached to the Bozeman store, has been transferred to Billings.

☆☆☆

J. M. Nesson, sales manager, SEITZ MACHINERY CO., INC., Billings, Mont., announces their appointment as distributor for THE OSGOOD CO., manufacturers

of power shovels, cranes, draglines, clamshells, backhoes, pile drivers, crawlers and Mobilcranes. His territory embraces Montana and a portion of northern Wyoming.

☆☆☆

The MCCOY COMPANY of Denver, Colo., distributors of heavy equipment lines including Caterpillar tractors, engines and electric sets; Lima and Bay C shovels; Gardner-Denver air tools, etc., announces the appointment of **E. H. Hennen**, well known construction man, to the presidency of the company to fill vacancy caused by the untimely death of **Floyd W. McCoy**. Other changes in personnel include the appointment of **J. T. Tibbetts** as assistant general manager; **M. Vincham**, sales manager, and **A. Snodgrass**, assistant sales manager. **P. Ausgen** is controller, **Lloyd Faris**, parts manager, and **G. E. Goodwin**, service manager.

☆☆☆

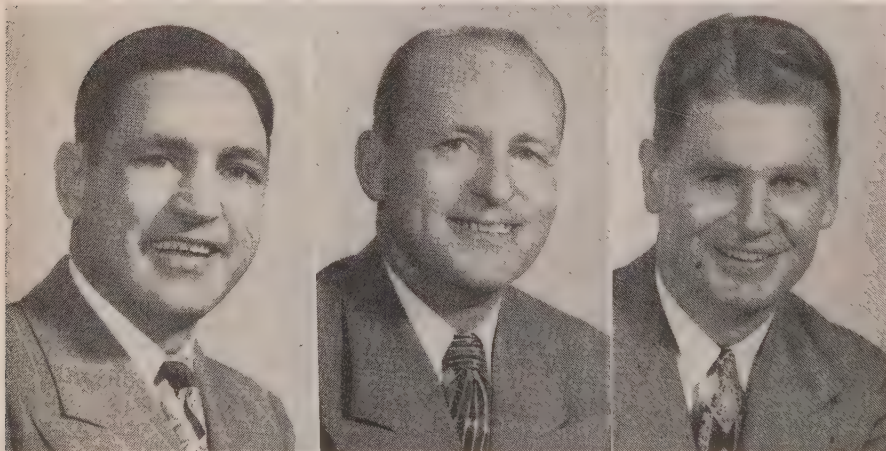
The MITCHELL-KENNEDY MACHINERY CO., INC., formerly of 110 Third Ave., Phoenix, Ariz., are now in the new location at 1915 W. Grant St. The new quarters gives them expanded parking space, as well as greater warehouse space and a large yard. While **T. W. Kennedy** no longer associated with the corporation, the corporate name remains the same. Construction equipment sales are handled personally by **D. K. Mitchell**, president of the company. **Tench G. Swartz** is in charge of mining sales. **H. Boyd Fletcher** has recently joined the organization as office manager.

☆☆☆

The MERRILL-BROSE CO. of San Francisco announces their appointment as distributors for the E. H. WACHS CO. of Chicago. This company manufactures the Wachs National Pipe Saw, capable of cutting cast iron or steel pipe from 12 to 60 in. in diameter.

☆☆☆

O. Glenn Stapley, 54, president of THE O. S. STAPLEY CO., Phoenix, Ariz., died July 11 in Salt Lake City, Utah. He was a member of a pioneer Arizona family.



WITH GALA OPENING CEREMONIES attended by most of the county, city, state and federal engineers and contractors of the region, CENTRAL MACHINERY CO. of Great Falls, Mont., opened the attractive new store at Havre, Mont. (pictured left below) and inaugurated improved facilities at their main store in Great Falls (pictured at right). Their new Havre building, 100 x 100 ft., contains parts department and office, a showroom, shop and offices. The firm serving 17 north central Montana counties, distributes and services construction equipment in the following lines: "Caterpillar," Athol Trackson, Hyster, Thew-Lorain, Jaeger, Pioneer Thor, Leschen, Page, Badger, Minneapolis-Moline, Gardner-Denver, and Martin Machine Co. Executives of the company, pictured left to right, **HENRY SHEFFELS**, President; **FRED LIVELY**, Vice President and General Manager, and **ED REED**, Secretary-Treasurer.



test son of **O. S. Stapley**, founder of the company, which has grown from a single hardware store to an enterprise of seven construction equipment, industrial equipment, and hardware depots serving Central Arizona, a separate motor truck division, and a wholesale house serving the entire state.

☆☆☆

Paul Shetter has been appointed office manager of the Spokane, Wash., Branch of **WESTERN MACHINERY CO.**, according to **H. A. Myers**, Manager. Shetter was formerly connected with the Sullivan Machinery Co., and Chicago Pneumatic Tool Co.

☆☆☆

FEENAUGHTY MACHINERY CO., Spokane, Wash., have been appointed distributors for the construction equipment line of **Wooldridge Manufacturing Co.**, Sunnyvale, Calif.

☆☆☆

Bob Andrews, President of **ANDREWS EQUIPMENT SERVICE OF WASHINGTON, INC.**, Spokane, announces the appointment of **E. T. Norton** as office manager. Norton was formerly with Andrews in the sales department, and was with the General Electric Co.

☆☆☆

CONSTRUCTION EQUIPMENT CO. of Spokane, Wash., were recently appointed distributors for **Gar Wood Industries Inc.**, Findlay Division. They will distribute that company's line of ditchers, rollers, spreaders and Hiway Wideners.

☆☆☆

TRI-STATE EQUIPMENT CO., Spokane, Wash., were recently appointed dis-



NORMONT EQUIPMENT CO. of Great Falls, Mont., distributors for 27 manufacturers of construction equipment in Northern Montana, held special dedication ceremonies July 30 when they moved into spacious new quarters at 420 Third St. South in Great Falls. The 100 x 115-ft. building contains show rooms and offices, a large shop and separate parts department, and a large display area is located at one end of the building. **J. B. BEATTY** is the firm's President and General Manager, and **W. C. HARDIE** is Vice-President.

tributors for **Willard Concrete Co., Ltd.**, Lynwood, Calif. The company's line features mixers and mobile concrete conveyors.

☆☆☆

E. L. Benson, Area Sales Manager, **BARBER-GREENE CO.**, Aurora, Ill., recently witnessed the installation of one of the company's new 848 bituminous plants at Mecca, Calif. The plant is to be used for mixing cement-treated base and black-top for a 24-mi. base and surfacing contract held by the **Hensler Construction Corp.**, Glendale, Calif.

☆☆☆

E. L. Benson, Area Sales Manager, **BARBER-GREENE CO.**, was a recent visitor to B-G distributors in Oregon and Idaho.

Arthur A. Levison, Vice-President in Charge of Construction Equipment for **BLAW-KNOX CO.**, was a recent visitor on the West Coast, according to **Charles Grant**, president of the **Charles H. Grant** firm, distributors for **Blaw-Knox** equipment. Levison spent several days in San Francisco and then proceeded to Los Angeles.

☆☆☆

The **STANDARD MACHINERY CO.**, San Francisco, have been appointed distributors for **SACOMO MANUFACTURING CO.** of San Francisco, makers of "Fireball Torch" road flares.

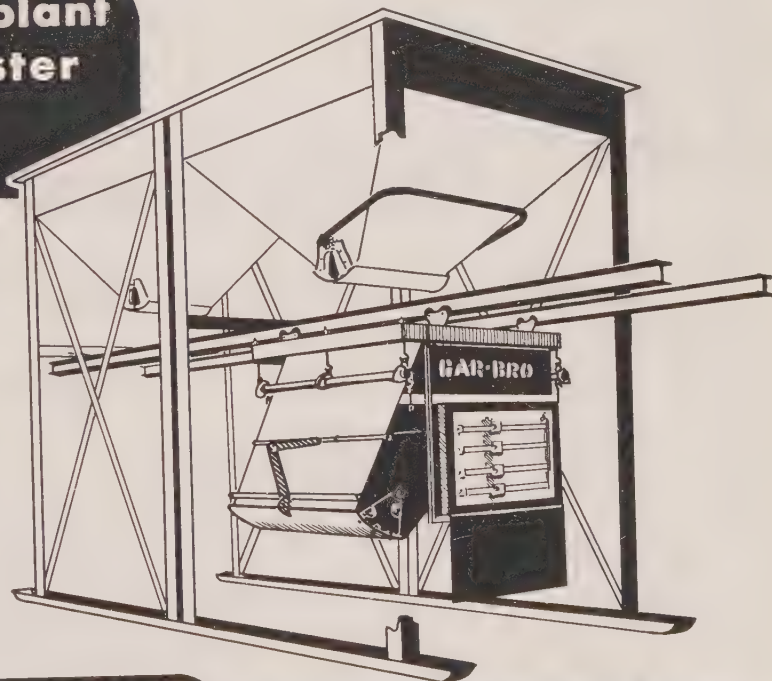
☆☆☆

Maynard Dudley has been appointed to the staff of the **SACRAMENTO VALLEY TRACTOR CO.** as district salesman,

GAR-BRO'S unit batch plant gives low cost faster batching...

Developed to meet the growing demand for small portable batching plants, Gar-Bro's new Unit Batch Plant consists of any number of hoppers assembled as a unit and equipped with a 3000-lb. capacity weighing batcher to charge a 1/2 yd. or 16-C mixer. Plant can be moved as a whole from job to job or knocked down and a single unit moved. Each hopper can be used as concrete hopper when not in use as batching plant. Accurate, efficient, built to last!

Each hopper: Water level capac., 81 cu. ft., heaped capac., 100 cu. ft. By adding 3-ft. sideboards capacity can be nearly doubled. Mounted on skids for easy portability on job.



DISTRIBUTORS

WASHINGTON—A. H. Cox & Co., 1757 First Ave., So., Seattle 4
Construction Equipment Co., 1118 Ide Ave., Spokane 1
ORE.—Loggers & Contractors Mchry. Co., 245 S. E. Clay, Portland 14
NO. CALIF.—Edward R. Bacon Co., 17th at Folsom St., San Francisco 10
SO. CALIFORNIA—Garlinghouse Bros., 2416 E. 16th St., Los Angeles 21
IDAHO—Intermountain Equipment Co., Broadway at Myrtle St., Boise
UTAH—Arnold Machinery Co., 427 W. 2nd So. St., Salt Lake City 1

GAR-BRO

industrial equipment. He was formerly associated with the contracting industry. The tractor company, headed by William Pahl, president, is located at 19th and Broadway in Sacramento, Calif.

☆☆☆

The West Coast Engine & Equipment Co. of Berkeley, Calif., have been appointed Northern California distributors for CROFTON INDUSTRIAL DIESEL ENGINES. Engines are made in both single and twin cylinder models. The headquarters of the Crofton Company is at San Diego, Calif.

☆☆☆

THE RIX CO. of San Francisco announces their appointment as Northern California distributors for ENGINEERING LABORATORIES, INC., of Tulsa, Okla., and Garland, Tex. M. L. Hewett, Rix general manager, says they will handle the complete line of ELI products, including drills and accessories. The Rix Co. are distributors also for products of the LE ROI CO.

☆☆☆

Leigh M. Jones is now branch manager for the Denver branch of the WESTERN MACHINERY CO. He was formerly attached to their Phoenix, Ariz., branch.

☆☆☆

The AUTOMATIC NUT CO., INC., Lebanon, Pa., has appointed the PAN-PACIFIC SCREW & BOLT CO. of Richmond, Calif., as their distributor and warehouse for "Structural Rib Bolts," which are used in the erection of steel and "Anco" lock nuts used in the manufacture of products and equipment where vibration is a factor. Besides this new distributorship in

TRADE WINDS

northern California, Automatic Nut Company is represented in the southern California territory by RAWLINS BROTHERS, INC., in Los Angeles.

☆☆☆

Appointment of the INDUSTRIAL SUPPLY CO., INC., Salt Lake City, Utah, as distributors for Nelson stud welding equipment in the states of Utah, Montana, and portions of Idaho, Wyoming and Nevada, has been announced by Leonard C. Barr, vice-president and general sales manager of the NELSON STUD WELDING DIVISION of MORTON GREGORY CORP. Rudolph Orlob, president and general manager of Industrial Supply, voiced

the hope that this arrangement brings the economies made possible in welding in the construction, manufacturing and railroad industries within the grasp of hundreds of contracting and producing firms in the mountain states.

☆☆☆

On July 1, J. H. Owen joined THAM MACHINERY CO., Cheyenne, Wyo., as sales manager. Prior to that he was manager of parts and service for E. A. MARTIN MACHINERY CO. of Lincoln and Springfield, Mo., from 1936 to 1944. At that time he joined OAKES STRUCTION CO. on their operation in Central America. Upon completion of a project in 1944, he became associate manager for JOHN FABICK TRACTOR CO. of St. Louis, Mo. Before joining Wortham he was store manager for MISSOURI LEY MACHINERY CO., Sioux City, Iowa.

News of the Western Manufacturers

Frank H. Powell, prominently known in the cement industry, died in Los Angeles on July 7. He was president of the SOUTHWESTERN PORTLAND CEMENT CO., and director of several companies, including the Blue Diamond Co., the Grand Canyon Lime & Cement Co., the Holly Development Co., and the Farmers & Merchants National Bank. He was born in San Francisco 65 years ago, but at an early age moved to Los Angeles, where he had since resided.

☆☆☆

STOODY COMPANY, Whittier, Calif., recently announced the addition of two new

distributors for the entire line of S. H. HARD-FACING ALLOYS: MORRIS, WHEAT & CO. of Philadelphia, and SIEGEL WELDING SUPPLY CO. of Boston.

☆☆☆

J. B. Steed, general manager of the eastern division of the four manufacturing divisions of GAR WOOD INDUSTRIES, which is located in Richmond, California, announces an expansion program for greater use of the 130,000 sq. ft. Richmond plant. Gar Wood is a comparative newcomer to this area. Richmond activities were started on May 1, 1948, and manufacturing operations turn out truck bodies



Quality is Economy



... an answer to the shrinking profit margin



Recently 1,167,000 cubic yards of earth were moved at a cost of only 1/4¢ per yard for all the grease lubricants used . . . D-A No. 00 Transmission Lubricants and D-A Gun Grease. There were no major equipment failures and none whatsoever due to faulty lubrication.

Low consumption such as this is normal when quality lubricants are used. D-A quality also gave maximum lubricating protection to this contractor's equipment, valued at \$750,000 . . . kept it out of the shop . . . moving dirt . . . making money.

All contractors can do these three things to improve their profit picture:

● Reduce lube consumption ● Reduce equipment downtime ● Reduce repair costs

The answer lies in the use of long-lived, quality D-A lubricants. D-A has specialized exclusively on manufacturing heavy-duty lubricants for a quarter of a century. Ask your local D-A representative to quote you prices and show you how other contractors have made money on D-A quality.

RALPH A. BARTLETT.....2201 Eye Street, Sacramento, California. Phone: 4-3061
M. W. CASSADY.....3913 Wallingford Avenue, Seattle 3, Washington. Phone: Melrose 6622
OSCAR FRENK.....528 Lewis Avenue, Billings, Montana. Phone: 6369

ALSO SERVICED BY LEADING EQUIPMENT DEALERS

D-A LUBRICANT COMPANY, INC.
INDIANAPOLIS 23 INDIANA

draulic hoists, road machinery, tractors and ditchers. For marketing purposes, diamond products are sold throughout the Western States, and in addition to manufacturing and marketing, the plant is service headquarters in this area, not only for products manufactured there, but for all Gorman-Rupp divisions.

☆☆☆

Consummation of the merger of the White River Lumber Co., located near Tumclaw, Wash., and the Willapa Harbor Lumber Mills, at Raymond, Wash., into the WEYERHAEUSER TIMBER CO., Tacoma, was recently announced. Weyerhaeuser Timber Co. has been a controlling shareholder from the beginnings of both these companies and no real change in management policies or sales policies will be effected, and the operating personnel in each case remains unchanged, according to P. Weyerhaeuser, Jr., president of the Weyerhaeuser company.

☆☆☆

The IRVING SUBWAY GRATING CO., Western Division, reputedly the largest manufacturer of open steel flooring, edge decking, and grills in the Western United States, soon will be completely moved from Emeryville, Calif. to its new and larger plant at 1819 Tenth St., Oakland, according to announcement by J. C. Gynn, president.

Established originally in the San Francisco Bay Area in 1942 as a branch plant of the Irving Subway Grating Co., Inc. of Long Island City, N. Y., for the manufacture of Irving airfield landing mats, the Irving Subway Grating Co., Western Division, was incorporated in 1945 for the manufacture and distribution of all IRVING products, to better serve the eleven Western States, Alaska, and countries bordering on the Pacific Ocean.

☆☆☆

On August 1 the California Wire Cloth Corp. officially opened its new warehouse in Seattle, Wash., for the better servicing of the entire Northwest and the territory of Alaska, according to announcement by George J. Skarich, district manager for the company, who has been with the firm for the past sixteen years. The warehouse is at 434 Second Ave. S.

☆☆☆

The appointment of James A. Bardsley as sales manager of the California Division of THE TRAILMOBILE COMPANY, has been announced by Joseph Kuttler, vice-president at Berkeley. For the past year Bardsley has been assistant sales manager at the main plant of the company in Cincinnati, O., and prior to that was manager of the plant in Indianapolis.

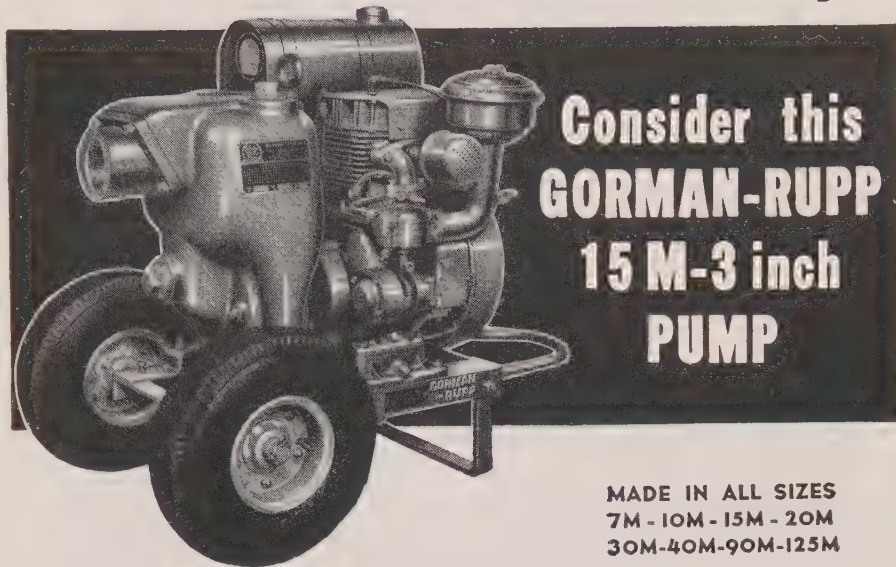
☆☆☆

THE PARAFFINE COMPANIES, INC. makes announcement of several changes in their personnel. E. C. Ashford has been transferred from the Southern California territory to the Seattle territory; V. H. Langhenry takes over the Kansas City territory, replacing H. H. Reardon, who has been promoted to acting regional manager of Pabco's Southeast Region. Langhenry was replaced in the Dallas territory by Jack Malmquist. Milton N. Clark took over the El Paso-New Mexico territory.

☆☆☆

James L. Boyle, district manager of the PACIFIC STATES CAST IRON PIPE CO., Portland, Ore., announces the establishment of offices at Seattle and Billings, Mont. John Gearhart, formerly with Stev-

WHAT DO YOU WANT IN A PUMP?



Consider this
GORMAN-RUPP
15 M-3 inch
PUMP

MADE IN ALL SIZES
7M - 10M - 15M - 20M
30M-40M-90M-125M

FAST PRIMING!



This Pump Primes at 25 foot Suction Lift in 61 seconds.

HIGH PRIMING!



Gorman-Rupp featured High Priming in demonstrating pumps at the Road Show.

HANDLE DIRTY WATER!



This Pump will handle whatever muck passes the suction strainer. There is nothing to clog.

DEPENDABILITY!



Always the most simple design -- always the most in dependability.

Gorman-Rupp Pumps meet A.G.C. standards in every respect. Every Pump fully guaranteed.

Write for the new Contractors' Bulletin 8-CP 11

DISTRIBUTED BY:

PACIFIC HOIST & DERRICK COMPANY.....	Seattle, Washington
THE SAWTOOTH COMPANY.....	Boise, Idaho
THE LANG COMPANY.....	Salt Lake City, Utah
HARRON, RICKARD & McCONE CO. OF SO. CALIF.....	Los Angeles, California
FRANCIS WAGNER COMPANY.....	El Paso, Texas
NEIL B. MCGINNIS COMPANY.....	Phoenix, Arizona
FRESNO EQUIPMENT SERVICE INC.....	Fresno, California
BAY CITIES EQUIPMENT INC.....	Oakland, California
NEVADA EQUIPMENT SERVICE INC.....	Reno, Nevada
MOORE EQUIPMENT COMPANY.....	Stockton, California
STUDER TRACTOR & EQUIPMENT COMPANY.....	Casper, Wyoming
WESTERN MACHINERY COMPANY.....	Spokane 11, Washington



GORMAN-RUPP COMPANY

MANSFIELD, OHIO

ens & Koon, Portland consulting engineers, will be in charge of the Montana territory, with headquarters at Billings. **Wick Hauser**, now serving in the Oregon and Washington territories, will head the Seattle office. The Pacific States company, at a cost of 3½ million dollars, recently completed plant additions at Provo, Utah, serving the entire eleven Western states.

☆☆☆

Appointment of **Verne W. Bender** as manager of distributor sales for the **NELSON STUD WELDING DIVISION** of **MORTON GREGORY CORP.**, Lorain, Ohio, has been announced by **Leonard C. Barr**, vice-president and general sales manager. Bender, since 1945 has served as special representative and field engineer for Nelson Stud Welding in the San Francisco Bay area, where he will have his headquarters at 844-54 Folsom St., San Fran-

TRADE WINDS

cisco. He will work directly with salesmen in distributor organizations, which include the **BIG THREE WELDING EQUIPMENT CO.** in the Southwest, **VICTOR EQUIPMENT CO.** on the Pacific Coast, **GENERAL WELDING SUPPLY CO.** of Denver, and **INDUSTRIAL SUPPLY CO.**, Salt Lake City.

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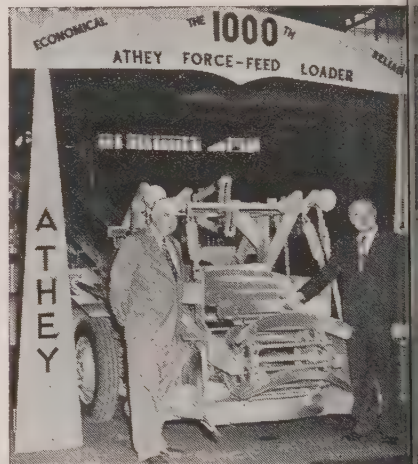
According to an announcement by **G. A. Wilson**, vice-president and general manager of **UNITED ENGINEERING CO.**, of San Francisco, the company has been reconverted and reorganized to use its plant and facilities for engineering work other than its usual ship repair. Already contracts

totaling a half million dollars have been awarded them. Five of the awards came from the Bureau of Reclamation, including work on the radial gates and hoists for the **Superior-Courtland Diversion Dam** on the **Missouri River Project**; radial gates for the **Tule River and Deer Creek stations** of the **Central Valley Project** in California; hoists for the spillway at **Boysen** in **Wyo.**, part of the **Missouri River Project**. The largest contracts came from the **U. S. Corps of Engineers**: gates, friction conduit liners, and dogging devices for the **Tenkiler Ferry Dam** on the **Illinois River** in **Oklahoma**, and for taintor valves, bulkheads, and trashracks for the **McDonald Dam** navigation locks in the State of **Vermont**.

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Manufacturing News From the East and Midwest Regions

On hand to witness the 1000th **Force-Feed Loader** as it left the assembly line of the **ATHEY PRODUCTS CO.** manufacturing concern of Chicago, President **B. F. Lease**, Vice-president **W. L. Kubik** and Assistant Plant Manager **A. T. Marc** were present. The first **Athey Force-Feed Loaders**



WITNESSING completion of the 1000th **Force-Feed Loader**, left to right, are President **B. F. LEASE**, **W. L. KUBIK**, and **A. T. MARC**

off the assembly line in 1942. Suspended during the war, but again introduced in 1945, production of the loader has been steady since then, to fill the large demand that has developed for these machines.

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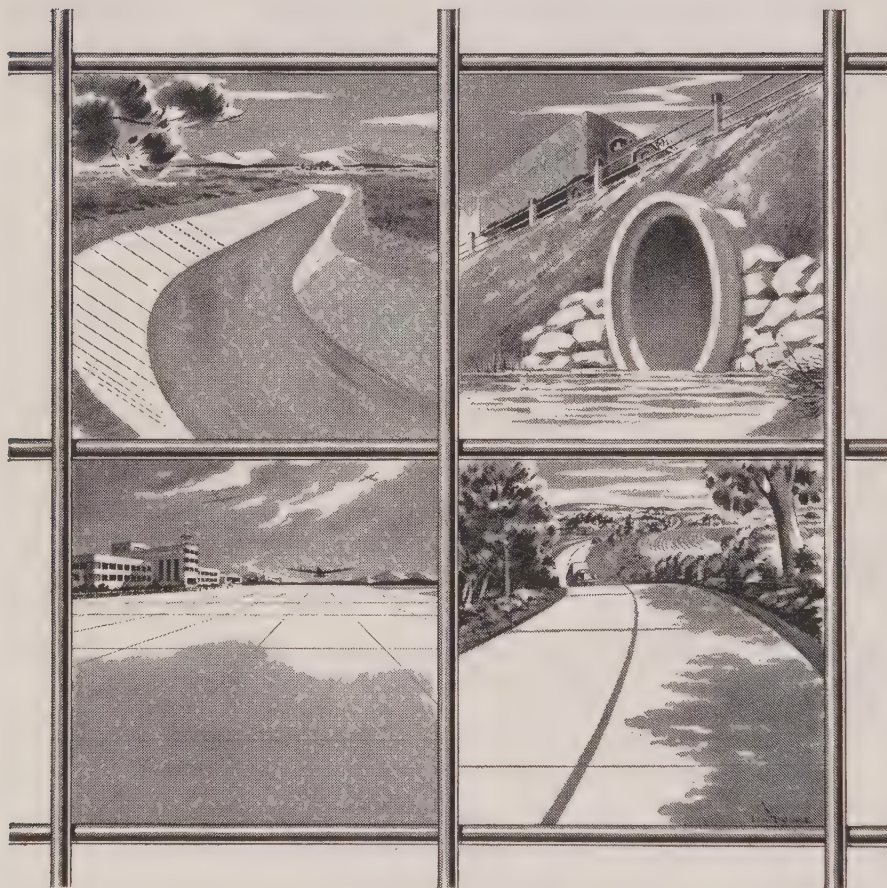
John J. Summersby has been elected vice-president in charge of sales by the Board of Directors of **WORTHINGTON PUMP & MACHINERY CORP.**, of **Waukegan, Ill.** **N. J. Thomas J. Kehane** was named assistant vice-president and general manager. Both men have long records of service with the **Worthington** company.

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CHAIN BELT COMPANY of **Waukegan, Ill.**, manufacturers of chain and transmission, conveying and process equipment, announces the appointment of **Charles S. Gray** as district sales engineer to the **Detroit** office.

☆☆☆

S. F. Beatty, Jr., formerly assistant sales manager of **THE WARNER & SWANSON CO.**, **Cleveland, O.**, has been named



Strength of Steel...

added to concrete with **CLINTON Welded Wire Fabric**

AMONG OTHER CF&I PRODUCTS: REALOCK FENCE, WICKWIRE ROPE, CUTTING EDGES FOR SCRAPERS, DOZERS, GRADERS AND SNOWPLOWS.



The Colorado Fuel and Iron Corporation

General Offices: Denver, Colorado

Pacific Coast Sales: The California Wire Cloth Corporation, Oakland, Calif.

manager of the Gradall Division it was announced by **Charles J. Stilwell**, president. The appointment reflects the growing importance of the division in overall Warner & Swasey operations. The Gradall machine, precision earthmover of unusual design, was introduced by the company three years ago, and since then more than 150 machines have gone into service.

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SCHOEN

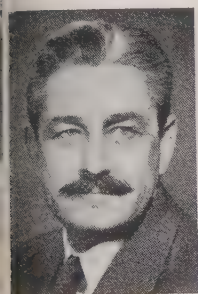
The appointment of **J. W. Schoen** to the position of sales manager was recently announced by **A. D. Dennis**, assistant to the president, **La PLANT-CHOATE MANUFACTURING CO., INC.**, Cedar Rapids, Ia. Schoen replaces **E. R. Galvin**, who has resigned. Schoen joined the La Plant-Choate organization in 1943.

Since then he has served the company progressively in the treasury and sales departments, and until his recent appointment was assistant to the general sales manager.

☆ ☆ ☆

Two promotions in **HERCULES POWDER CO.**'s explosives department have been announced by **L. Keane**, director of sales. **J. J. Kelleher** has been named assistant sales manager, a newly created post, and **L. C. LeBron** has been appointed to succeed Kelleher as manager of the contractors division. Kelleher had held that position for several years and is well acquainted with most of the nation's contractor organizations. LeBron joined Hercules twenty years ago and became Kelleher's assistant early in 1948.

☆ ☆ ☆



EAGERTON

The appointment of **B. T. Eagerton** to the position of vice-president in charge of the Export Division of **NORDBERG MANUFACTURING CO.** of Milwaukee, Wis., is announced by **R. E. Friend**, president. After several years of varied experience, including operation of his own automotive equipment distributing agency, Eagerton

joined the Cleveland Tractor Co. in 1928, and when it merged with the Oliver Corporation he became assistant manager of the export division of Oliver. He has been export manager of Nordberg since leaving the Oliver Corporation in 1946.

☆ ☆ ☆

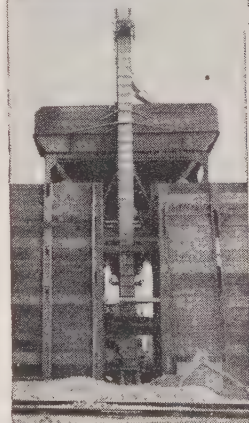
AMERICAN STRUCTURAL PRODUCTS CO., recently reorganized subsidiary of **OWENS-ILLINOIS GLASS CO.**, has announced the election of the following new officers: **C. R. Megowen**, chairman of the board; **S. J. McGiveran**, president; **E. B. Dennis, Jr.**, **K. M. Henry** and **S. A. Kenworthy**, vice-presidents; **J. H. McNercey**, secretary-treasurer; **J. S. Rinehart**, comptroller, assistant secretary and assistant treasurer; **E. F. Martin**, assistant secretary and assistant treasurer; **J. A. Serra**, assistant secretary and **A. H. Ahlers**, assistant treasurer. All of the officers as well as directors of the company are executives of Owens-Illinois Glass Co.

DESIGNED FOR EFFICIENCY

WITH

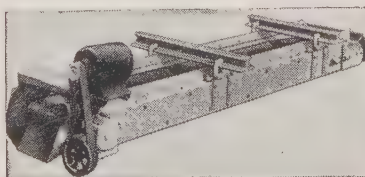
Baughman
HI-SPEED

Conveying Equipment

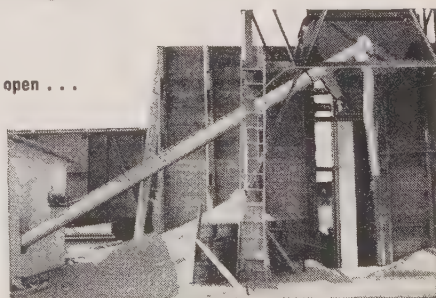


MODEL 175 Belt and Bucket Elevator with Centrifugal Discharge Head.

Some Distributor and Dealer territories still open . . .
Write for further information.



MODEL 190 Heavy-Duty Troughed Belt Unloader



MODEL "Q" HI-SPEED Screw Conveyor

This Ready-Mix Plant gets peak capacity with Baughman **HI-SPEED** Bulk Materials Handling Equipment. Three Baughman units — the **HI-SPEED** Belt and Bucket Elevator for the elevation of sand and gravel to hoppers . . . the Auger Type Conveyor carrying cement from the building to the truck under the hopper . . . the Heavy-Duty Undertrack Unloader charging the Belt and Bucket Elevator . . . All work as a team to make a very smooth, quiet and economical operation with **HI-SPEED** performance. Baughman standardized production methods cut your equipment costs. Quality materials and expert construction minimize your maintenance expenses.

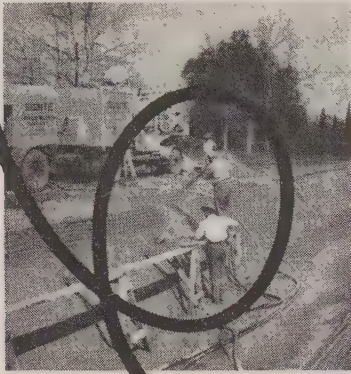
Write For Information About Our Special,
Built-to-Order Conveying Equipment . . .
There Is No Obligation.



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BAUGHMAN MANUFACTURING CO., Inc.

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by JOHNSON WESTERN

Gunite provides rapid construction of lining for irrigation and drainage ditches and for protection of earth banks against erosion. Ditch linings of Gunite, applied by Johnson Western, not only mean construction speed, but through sound engineering and proper handling give permanency and low maintenance cost.

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Johnson Western experience and attention to specifications means savings for you.

Write today, or phone, for further information on ditch lining and bank protection, as well as commercial and industrial, rehabilitation or construction.



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UNIT BID SUMMARY

Bridge and Grade Separation ...

Montana—Park County—State—Reinf. Conc.

McLaughlin Construction Co. of Livingston, Mont., with a bid of \$410,108 were low before the State Highway Commission of Montana for construction of a reinforced concrete underpass under the Northern Railway lines in the City of Livingston, Park County. The underpass will be 0.143 mi. long. Unit bids submitted by the following:

(1) McLaughlin Construction Co.	\$410,108	(3) Cahill-Mooney Construction Co.	\$410,108
(2) Riedesel Construction Co.	416,382	(4) Inland Construction Co.	431,000

	(1)	(2)	(3)
804.0 cu. yd. Class A concrete	55.00	45.00	70.00
1,209.1 cu. yd. Class AD conc. in str.	70.00	70.00	75.00
103.8 cu. yd. Class D conc. in str.	75.00	70.00	80.00
56.0 cu. yd. concrete backfill	30.00	30.00	60.00
341,060 lb. structural steel	.20	.20	.18
123,530 lb. reinforcing steel	.16	.18	.16
70,130 lb. ballast plate steel	.23	.20	.15
1,411 cu. yd. structure excavation	10.00	4.00	13.50
513.46 lin. ft. ornamental rail	15.00	15.00	18.00
555.30 lin. ft. pipe rail	9.00	2.50	10.00
3,193 sq. ft. asph. plank and waterproofing	1.00	1.00	2.50
Lump sum, rem. ex. str., falsework	\$43,500	\$42,000	\$15,000
Lump sum, furn. and inst. lighting sys.	\$3,250	\$3,000	\$5,000
Lump sum, rev. and const. of drain sys.	\$13,300	\$17,000	\$3,500
Lump sum, FA-Rev. rel. rec. of util.	\$15,000	\$15,000	\$15,000
136 cu. yd. gravel cush. material	10.00	8.00	3.00
1,030 cu. yd. select. bor. base course	1.50	2.00	3.00
3,143.0 sq. yd. Portland cement conc. pavement	5.00	10.00	7.50
19,198 cu. yd. uncl. exc. and backfill	1.60	2.00	2.00
58,107 cu. yd. Class AD conc. in sidewalk	45.00	40.00	70.00
228,019 cu. yd. Class AD conc. curbs and gutters	45.00	50.00	80.00
2 ea. conc. project markers	20.00	25.00	25.00
10 unit rolling	20.00	12.00	10.00
35 M. gal. watering	5.00	10.00	10.00

California—San Diego County—State—Conc. Girder

E. G. Perham, Los Angeles, with a bid of \$51,875, was low before the California Division of Highways for construction of a reinforced concrete girder bridge across Viejas Creek, about 3 mi. east of Alpine, in San Diego County. Unit bids for the first five of ten contractors bidding are presented below:

(1) E. G. Perham	\$51,875	(4) Johnson Western Gunite Co.	\$51,875
(2) Clifford C. Bong & Co.	56,424	(5) E. S. & N. S. Johnson	61,000
(3) Thomas Construction Co.	58,773		

	(1)	(2)	(3)	(4)
255 cu. yd. struct. excav. (bents)	5.00	6.50	10.00	4.68
92 cu. yd. struct. excav. (abutments)	3.00	5.00	3.40	5.85
70 cu. yd. Class "A" P.C.C. (footing blocks)	35.00	33.00	32.00	58.50
620 cu. yd. Class "A" P.C.C. (struct.)	54.00	54.00	62.00	60.50
2,780 lb. misc. steel	.30	.50	.36	.468
134,000 lb. bar reinf. steel	.085	.11	.09	.091
434 lin. ft. metal bridge railing	5.00	5.50	5.00	5.85

Oregon—Lane County—State—Steel

Tom Lillebo of Reedsport, Ore., with a bid of \$447,885, was low before the Oregon State Highway Department for construction of the structural steel Ferry Street Bridge in Eugene, Ore. Unit bids were submitted by the following:

(1) Tom Lillebo	\$447,885	— L. H. Hoffman	\$507,000
(2) E. C. Hall Co.	459,625	— General Construction Co.	511,000
(3) Lindstrom Bros., Inc.	471,625	— Guy F. Atkinson Co.	544,000
(4) Valley Construction Co.	480,880	— Macco Corp.	571,000
(5) Minnis & Shilling	481,989	— Lee Hoffman	571,000

	(1)	(2)	(3)	(4)
Lump sum, shoring, cribbing, etc.	\$24,000	\$50,000	\$44,000	\$35,000
600 cu. yd. structural excavation	8.00	10.00	6.00	7.50
20 cu. yd. structural excav. below elevations shown	20.00	25.00	10.00	20.00
1,875 lin. ft. furnish steel foundation piles	7.00	5.00	8.00	4.00
72 only drive piles	50.00	100.00	70.00	65.00
2,200 cu. yd. Class "A" concrete	53.00	55.00	58.00	65.00
400,000 lb. metal reinforcement	.104	.10	.10	.1125
300,000 lb. structural carbon steel	.166	.15	.15	.16
850,000 lb. structural low alloy steel	.182	.17	.17	.175
1,605 lin. ft. metal handrail	12.00	10.00	12.00	10.00
Lump sum, removal of old bridge	\$20,000	\$20,000	\$27,425	\$28,000

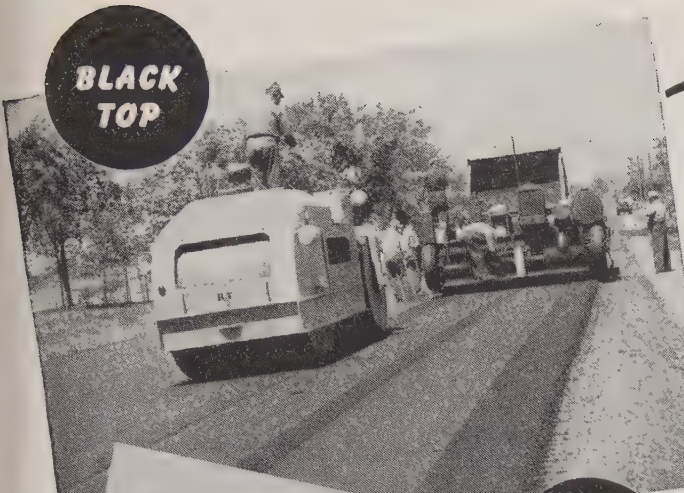
California—Mendocino County—State—Steel Truss

Judson-Pacific-Murphy Corp., Emeryville, Calif., with a bid of \$324,958, were low before the California Division of Highways for construction of a structural steel truss bridge on reinforced concrete towers, and abutments across Salon Creek near Albion, Calif., in Mendocino County. Unit bids were submitted by the following:

(1) Judson-Pacific-Murphy Corp.	\$324,958	— Erickson, Phillips & Weisberg	\$383,000
(2) Bates & Rogers Construction Corp.	352,182	— Metzger Co.	385,000
(3) Granite Construction Co.	376,148	— Fred J. Maurer & Son	386,000
(4) Lew Jones Construction Co.	376,164	— Charles MacClosky Co.	396,000
(5) Dan Caputo	378,614	— J. H. Pomeroy & Co., Inc.	398,000
— Guy F. Atkinson Co.	381,661	— Fredrickson Bros.	428,000

	(1)	(2)	(3)	(4)
Lump sum, clearing and grubbing	750.00	310.00	\$5,000	\$1,600
290 cu. yd. stripping	4.20	.95	1.00	12.00
1,300 cu. yd. struc. excav. (Type "A")	9.00	13.30	15.00	13.00
900 cu. yd. struc. excav. (Type "B")	4.20	2.00	5.00	12.00
426 cu. yd. Class "A" P.C.C. (footing block)	30.00	31.50	45.00	38.00

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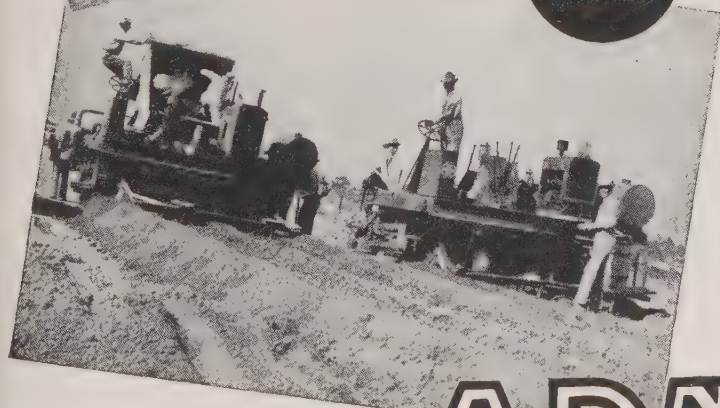
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NO other Black Top Paver offers you the combination of advantages found in the Adnun for versatility in laying materials and in job bidding!

Your Adnun puts you in a position to handle any type of asphalt job either hot or cold. It will lay slag, chips, stone (up to No. 1 stone) with an accuracy not possible with a blade. It has been successful on sand, cinders and soil cement.

Adjustments provide for narrow widths between car lines or tracks. Adjustments for feathering permit laying shoulders and widening without destroying or modifying old crown and End Gates and overlapping Cutter Bar give full control of materials beyond the width of the paver.

Years of service in the hands of many contractors have proved its ability to withstand the heavy loads imposed by this service. Owners agree that maintenance costs are lower and that you seldom have to rebuild an Adnun.

If you have an asphalt job, or an aggregate spreading job of any kind, ask about the Adnun. It brings you advantages found in no other asphalt paver.

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Subsidiary of Blaw-Knox Co.

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PROTECTION**
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McDONALD SAFETY BOOT

Short type, sizes 6 to 13. With safety insole and steel toe cap.

Write for information and prices.



1,680 cu. yd. Class "A" P.C.C. (structure)	64.00	76.90	70.00	65.00
822,000 lb. structural steel	135	134	14	16
8,500 lin. ft. furnishing timber piling	.85	.78	.80	.63
242 ea. driving timber piles	27.50	44.00	30.00	44.00
1,720 lin. ft. furnishing steel piling	2.70	3.10	3.00	2.70
85 ea. driving steel piles	30.00	50.00	80.00	100.00
10 ea. steel pile splices	20.00	28.70	15.00	24.00
1,454 lin. ft. steel bridge railing	6.50	7.25	8.50	7.75
321,000 lb. bar reinforcing steel	.0798	.079	.10	.086
Lump sum, cleaning and painting bridge	\$14,200	\$10,500	\$13,379	\$12,015
Lump sum, removing existing bridge	\$5,700	\$6,200	\$11,000	\$6,200

Edens & Lee of Bozeman, Mont., bidding at \$17,593, were low before the State Highway Commission for construction of three small timber bridges on the Helena-Wilborn highway in Lewis & Clark County. Unit bids were submitted as follows:

(1) Edens & Lee.....	\$17,593	(4) Walter Mackin & Son	\$14,222
(2) Kiely Construction Co.	18,493	(5) Flynn & Holland Co.	28,750
(3) Dotshcer Underseeth Eng. & Constr. Co.	18,573	(6) Schye & Sullivan	28,750

	(1)	(2)	(3)	(4)	(5)	
50.59 MBM treated timber	267.50	265.00	270.00	280.00	290.00	360.00
3.31 MBM untreated timber	267.50	250.00	270.00	250.00	290.00	360.00
52 ea. 25-ft. tr. tim. piles	50.00	35.00	60.00	60.00	70.00	80.00
10 ea. 30-ft. tr. tim. piles	55.00	65.00	70.00	65.00	75.00	80.00
Lump sum, rem. ex. st. and main. tr. (224/68)	25.00	750.00	200.00	500.00	100.00	250.00

Dan Caputo of San Jose, Calif., with a bid of \$88,676, was low before the California Division of Highways for construction of a reinforced concrete slab bridge across Camadero Creek about 1.8 mi. south of Gilroy, Santa Clara County. Unit bids are given below for the lowest five of the eleven contractors bidding the project.

(1) Dan Caputo	\$ 88,676	(4) Lew Jones Construction Co.	\$103
(2) Carl N. Swenson Co., Inc.	93,546	(5) Metzger Co.	102
(3) Granite Construction Co.	100,772		

	(1)	(2)	(3)	(4)
210 cu. yd. removing concrete	3.00	5.00	3.00	4.00
1,340 cu. yd. channel excav.	1.00	.85	.50	.80
1,900 cu. yd. structure excav.	2.50	1.00	1.50	2.00
1,160 cu. yd. structure backfill	1.00	2.00	1.30	2.00
416 lin. ft. timber bridge railing	3.50	1.75	3.50	3.50
1,120 cu. yd. Class "A" P.C.C. (struct.)	37.00	34.00	46.00	45.00
50 cu. yd. P.C.C. filler walls	80.00	125.00	98.50	120.00
1,530 lb. misc. steel	.35	.70	.40	.40
5,960 lin. ft. furn. concrete piling	2.50	2.40	2.40	2.60
149 ea. driving piles	42.00	75.00	45.00	47.00
246 cu. yd. broken concrete riprap	3.00	8.00	5.00	9.00
155,000 lb. bar reinf. steel	.072	.085	.09	.075
515 sq. yd. mesh reinf.	.60	.75	.80	.60

Irrigation . . .

Western Paving Construction Co., Denver, Colo., with a bid of \$1,383,439, were low before the Bureau Reclamation at Denver for construction of earthwork, concrete lining, tunnel and structures for the Hogtooth Supply Conduit, Station 0 to Station 53 plus 89, The Horsetooth Feeder Canal from Station 53 plus 1 to Station 67 plus 52, and an access road approx. 3 mi. long on the Colorado-Big Thompson Project at Fort Collins, Colo. Unit bids were submitted by the following:

(1) Western Paving Construction Co.	\$1,383
(2) Grafe-Callahan Construction Co., Gunther-Shirley Co.	1,409
	(1)
Lump sum, diversion and care of river and unwatering foundations	\$100,000
7,300 cu. yd. excavation for diversion structure	3.80
10,900 cu. yd. excavation for structures except diversion structure	5.00
16,500 cu. yd. excavation in tunnel	34.25
200 cu. yd. excavation for tunnel enlargement	65.00
10,000 cu. yd. backfill about structures	.95
4,000 cu. yd. compacting backfill	6.00
15,000 cu. yd. excavation for canal	2.25
1,000 cu. yd. excavation for ditches, channels, and dikes	5.00
10,000 cu. yd. borrow excavation	.50
1,550 cu. yd. excavation for access road	.55
2,000 sta. cu. yd. overhaul	.10
15,000 cu. yd. compacting embankments	.12
250 cu. yd. backfill at top of concrete canal lining	1.20
75 cu. yd. riprap and rock fill	10.00
455 cu. yd. one-course road surfacing	2.65
5,820 sq. yd. preparing foundations for concrete canal lining	2.00
204,500 lb. furnishing and installing permanent steel tunnel supports	.20
71 M.B.M. furnishing and erecting permanent timber tunnel supports	400.00
1,000 lin. ft. drilling feeler or pilot holes	1.00
500 lin. ft. drilling grout holes	3.00
500 lb. furnishing and placing grout pipe and connections	1.00
1,600 cu. ft. pressure grouting	3.00
2,235 cu. yd. concrete in structures	86.50
340 cu. yd. concrete in tunnel inlet structure, and outlet transition and portal	100.00
1,610 cu. yd. concrete in tunnel lining	39.90
580 cu. yd. concrete in unreinforced canal lining	30.00
65 cu. yd. concrete in reinforced canal lining	35.00
7,300 bbl. furnishing and handling cement	5.75
366,600 lb. furnishing and placing reinforcement bars	.155
105 sq. ft. furnishing and placing elastic filler in joints	1.00
50 lin. ft. placing rubber water stops in joints	2.00
50 lin. ft. furnishing and laying 6-in. diam. sewer pipe with cemented joints	2.00
1,500 lin. ft. furnishing and construction 6-in. diam. tunnel drain	3.00
50 lin. ft. furnishing and laying 6-in. diam. sewer pipe with cemented joints	2.00
550 lin. ft. furnishing and laying 24-in. diam. concrete pipe	30.00
34 lin. ft. furnishing and laying 18-in. diam. corrugated-metal pipe	5.00
40 lin. ft. furnishing and laying 36-in. diam. corrugated-metal pipe	12.00
1.8 mile furnishing and erecting barbed-wire right-of-way fence	\$1,800
2 gate furnishing and installing barbed-wire fence gates	10.50
1 gate furnishing and installing metal fence gate	100.00

(Continued on next page)



Sometimes it pays to see double

When you put two Bucyrus-Erie shovels on the job, for instance. It's a case of seeing smooth action, unequalled dependability, steady top-flight output — *multiplied by two*. That's duplication that puts money in your pocket.

These days it's easy to find two or more of these outstanding machines teaming up to whip tough jobs in record time. Experience with one Bucyrus-Erie quickly convinces owners that it pays to duplicate such efficiency. This is the secret of Bucyrus-Erie's high percentage of repeat orders — especially

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Check into this $\frac{3}{8}$ - to $2\frac{1}{2}$ -yard line of shovels, draglines, cranes and dragshovels. You'll find that for steady big output in rock and dirt, your best buy is Bucyrus. *Bucyrus-Erie Company, South Milwaukee, Wisconsin.*

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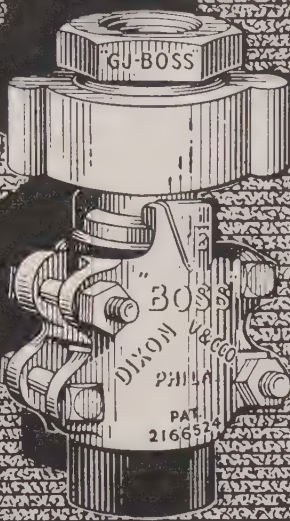
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Ground joint female coupling

Style X-34

The original washerless
hose coupling... product
of true perfection in
design and construction.
Provides unequalled
convenience, durability
and safety on all high or
low pressure lines. Cad-
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2 cattle guard furnishing materials and constructing cattle guards.....	750.00
3.7 M.B.M. furnishing and erecting timber in structures.....	350.00
1,930 lb. installing pipe lines for compressed air and to measuring section.....	1.00
29,500 lb. installing grizzly bars and supports and walkway supports.....	.05
28,200 lb. installing miscellaneous metalwork	.25
18,900 lb. installing gates and gate hoists	.20
270 lin. ft. furnishing and installing electrical conduits, 1½ in. or less in diam.....	2.00
100 lb. furnishing and installing electrical conductors and ground wire.....	1.00

Dam . . .

California—Merced County—Corps of Engineers—Earthfill

M J B Construction Co., Stockton, Calif., with a bid of \$359,111, were low before the Sacramento Dis-
Corps of Engineers, for construction of the earthfill Burns Creek Dam about 18 mi. northeast of Mc
Calif. Unit bids are presented below for the first four of the thirteen contractors bidding the job along
the government estimate.

(1) M J B Construction Co.	\$359,111	(4) Morrison-Knudsen Co., Inc.	\$39
(2) Foster & McHarg	373,409	(5) Government estimate	38
(3) A. Teichert & Son, Inc.	386,565		

	(1)	(2)	(3)	(4)
143,000 cu. yd. uncl. excav.	.30	.35	.46	.40
8,600 cu. yd. borrow excav. for test fill.....	.20	.60	.25	.23
399,000 cu. yd. borrow excav. for imp. fill and imp. backfill.....	.22	.29	.26	.26
3,800 cu. yd. pervious fill and pervious backfill.....	.20	.415	.20	.25
14,100 M. gal. water	2.00	2.00	2.50	2.75
400 hr. discing	8.00	10.00	9.00	10.00
1,050 hr. mix or scarifying with motor grader.....	9.00	8.10	8.50	10.00
1,820 hr. compaction rolling	13.00	19.00	11.00	10.00
1,450 hr. pneu. tamping	5.00	5.00	6.00	8.00
1,100 cu. yd. conc. for slabs and cut-offs in place.....	22.00	22.00	15.00	17.00
530 cu. yd. conc. for walls and baffle blocks in place.....	37.00	30.00	42.00	36.00
730 cu. yd. conc. for conduit in place	32.00	26.00	32.00	31.00
3,400 bbl. cement	4.50	4.25	4.50	5.00
325,000 lb. steel reinf. in place	.094	.09	.08	.095
550 lin. ft. rubber water stops.....	1.50	1.00	5.50	4.75
1,200 cu. yd. gravel.....	3.00	1.00	2.50	5.00
1,000 cu. yd. cobbles.....	3.50	2.00	4.00	5.00
1,070 cu. yd. one man stone in place	12.00	4.00	7.00	6.00
400 cu. yd. derrick stone in place	14.00	5.00	6.00	8.00
180 lin. ft. drain trench fill in place	1.80	2.00	2.00	1.50
20 lin. ft. 6-in. vit. clay pipe in place	1.50	1.00	2.50	1.25
430 lin. ft. 6-in. perf. vit. clay pipe in place.....	1.50	1.30	3.00	1.60
700 lin. ft. fence spillway and outlet struct. in place.....	.35	.81	.80	.75
500 lin. ft. const. fence in place.....	.30	.36	.25	.35
3 ea. double gates in place.....	120.00	100.00	140.00	150.00
3 ea. single gates in place.....	60.00	80.00	75.00	75.00
3 ea. cattle guards in place.....	\$2,000	\$1,400	\$1,600	\$1,450
Lump sum, gage well and reservoir staff gages.....	\$5,000	\$3,000	\$4,000	\$4,500
Lump sum, remove timber.....	200.00	250.00	350.00	800.00
Lump sum, payment of all insurance required.....	\$1,460	\$7,011	\$1,000	\$1,000

Highway and Street . . .

California—Los Angeles County—State—Grade and PPC Pave.

N. M. Ball Sons, Berkeley, Calif., with a bid of \$1,287,397, were low before the California Division
Highways for the grading and surfacing with Portland Cement concrete pavement on cement treated
grade of 1.6 mi. in length on the Hollywood Parkway in the City of Los Angeles between Virgil Ave.
Glendale Blvd. Unit bids were submitted by the following:

(1) N. M. Ball Sons	\$1,287,397	(5) J. E. Haddock, Ltd.	\$1,338
(2) Griffith Co.	1,301,794	— Peter Kiewit Sons' Co.	1,397
(3) Winston Bros. Co. and Yount Constructors, Inc.	1,323,334	— MacDonald & Kruse and Fred D. Chadwick	1,622
(4) United Concrete Pipe Corp. and Ralph A. Bell and Jesse S. Smith	1,325,470		

	(1)	(2)	(3)	(4)
2,700 cu. yd. removing concrete	3.50	3.75	1.90	3.50
Lump sum, clearing and grubbing	\$23,000	\$6,500	\$11,000	\$10,000
480,000 cu. yd. roadway excav.	.545	.65	.60	.61
32,600 cu. yd. struct. excav.	2.40	2.00	3.25	1.50
1,900,000 sta. yd. overhaul	.005	.006	.01	.005
6,600 sq. yd. compacting orig. ground	.05	.06	.05	.10
61,000 ton imp. subbase material	.62	.80	.65	.65
70,000 ton imp. base material	1.12	1.25	1.00	1.20
50,000 sq. yd. prep. slopes (erosion control)	.075	.10	.06	.10
15,000 sq. yd. cultivating (preparatory landscaping)	.055	.17	.06	.10
Lump sum, dev. wat. supply and furn. wat. equip.	\$3,500	\$1,700	\$2,500	\$22,000
6,800 M. gal. applying water	1.40	1.80	1.65	1.00
Lump sum, finishing rdwy.	500.00	\$1,700	\$3,500	\$2,000
77,000 sq. yd. mix. and compact. (cem. tr. subgrade)	.225	.22	.25	.20
27,200 sq. yd. mix. and compact. (cem. tr. base)	.30	.34	.31	.32
6,600 bbl. Portland cem. (cem. tr. subgrade and base)	3.60	3.50	3.50	4.00
20 ton liquid asph. SC-2 (prime coat)	26.00	26.00	25.00	30.00
2,500 ton plant-mix surf.	4.75	5.00	5.40	6.00
120 ton asphaltic emuls.	42.00	50.00	27.00	50.00
180 lin. ft. raised bars (plant-mix surf.)	.80	1.15	2.00	1.00
8,900 ton asph. concr.	4.70	4.60	5.40	5.00
18,100 cu. yd. Cl. "B" P.C.C. pavement	12.00	11.00	12.00	12.00
18,200 ea. pavement tie bolt assemblies	.50	.60	.60	.60
2,680 cu. yd. Cl. "A" P.C.C. (struct.)	44.00	45.00	46.00	50.00
350 cu. yd. Cl. "C" P.C.C. (pipe reinf.)	33.50	17.00	17.50	15.00
168,000 lb. bar reinf. steel	.10	.10	.085	.10
79,630 lb. misc. iron and steel	.30	.25	.26	.30
84 lin. ft. metal stair treads	3.50	2.00	2.00	4.00
45 lin. ft. ornamental iron handrail	7.00	6.50	6.00	8.00
140 lin. ft. rubber waterstops	3.30	2.50	2.00	3.00
350 lin. ft. furn. concr. piling	3.00	2.90	6.00	5.00
14 ea. driving piles	110.00	110.00	150.00	100.00
182 sq. yd. membrane waterproofing	3.30	2.50	3.00	3.00
3,100 cu. yd. P.C.C. (curbs, gutters and sidewalks)	33.50	30.00	29.00	32.00
200 cu. yd. Cl. "A" P.C.C. (surf. drains)	37.00	47.00	25.00	32.00

(Continued on next page)



**Du Pont Dynamite
starts the job on ...**

NEW \$100,000,000 HUNGRY HORSE PROJECT

With the first canyon wall blast in the Flathead River Valley, Montana, the huge task of clearing away thousands of cubic yards of earth and rock for the Hungry Horse Dam begins. Work started on this Bureau of Reclamation project with the prime contractor, General-Shea-Morrison Co., using Du Pont Special Gelatin 40%.

Hungry Horse Dam, to be completed in 1952, will be the world's fifth highest and fourth largest concrete dam. It will impound a 34-mile-long lake with a capacity of 3,500,000 acre-feet of water and will generate 300,000 kilowatts of hydroelectric power. To divert the Flathead River during the construc-

tion of the dam, the contractors built a 1,180-foot-long tunnel, 36 feet in diameter.

Du Pont Special Gelatin 40% is ideal for jobs of this kind. It is an economical, plastic dynamite with excellent water resistance... maintains its efficiency in water-filled holes. It detonates at a high velocity and is well-suited for hard rock work.

No matter what the size of your blasting operation... whether a large project or small excavation job... it pays to call in a Du Pont Explosives representative. He may be able to show you how to do the job more efficiently, safely and economically.

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This recent addition to the extensive line of Du Pont Caps is designed to eliminate risk of misfires due to arcing or "water hammer."



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250 lin. ft. laminated guard railing	3.50	4.00	2.50	3.00
15,000 lin. ft. chain link fence	1.32	1.45	1.35	1.40
23 ea. walk gates	60.00	33.00	32.00	35.00
1,600 lin. ft. remov. and reconstruct exist. ch. link. fence	.60	.65	.60	.60
7,300 lin. ft. 15-in. R.C.P. (standard strength)	3.35	2.90	3.50	3.00
1,280 lin. ft. 18-in. R.C.P. (standard strength)	4.11	3.30	4.40	3.50
650 lin. ft. 21-in. R.C.P. (standard strength)	4.79	4.00	5.00	4.25
120 lin. ft. 24-in. R.C.P. (1250-D)	5.43	4.75	6.00	5.00
190 lin. ft. 24-in. R.C.P. (1500-D)	5.50	4.80	6.00	5.00
390 lin. ft. 24-in. R.C.P. (2000-D)	7.05	5.60	7.00	6.00
26 lin. ft. 27-in. R.C.P. (1250-D)	6.36	6.00	7.00	6.00
500 lin. ft. 30-in. R.C.P. (1250-D)	7.12	6.15	7.50	6.50
260 lin. ft. 33-in. R.C.P. (1200-D)	9.29	7.60	9.00	7.00
150 lin. ft. 33-in. R.C.P. (2000-D)	9.95	9.00	10.50	9.00
80 lin. ft. 39-in. R.C.P. (1200-D)	11.35	13.00	12.00	10.00
76 lin. ft. 39-in. R.C.P. (2500-D)	13.53	14.50	13.00	12.00
26 lin. ft. 42-in. R.C.P. (1150-D)	11.57	10.00	12.00	11.00
84 lin. ft. 45-in. R.C.P. (1150-D)	13.16	15.50	13.00	12.00
290 lin. ft. 63-in. R.C.P. (1500-D)	21.74	20.00	22.00	20.00
30 lin. ft. 6-in. non-reinf. conc. pipe	.88	1.50	2.00	1.00
6 lin. ft. 8-in. non-reinf. conc. pipe	1.23	2.00	3.00	1.00
90 lin. ft. 12-in. non-reinf. conc. pipe	1.99	2.00	4.00	1.50
44 lin. ft. pipe shaft manholes	12.05	15.00	20.00	20.00
85 lin. ft. 6-in. cast iron pipe	3.30	5.00	2.00	5.00
7 ea. remodeling exist. manholes	22.66	60.00	36.00	100.00
10 ea. adj. manholes to grade	22.55	50.00	33.00	25.00
1,900 lin. ft. 1½-in. conduit	.72	.85	1.00	1.25
2,900 lin. ft. 2-in. conduit	.83	1.35	1.35	1.60
6 ea. moving and replanting magnolia trees	40.00	60.00	22.00	100.00
145 ea. control assemblies	14.85	15.00	15.00	16.00
330 ea. sprinkler connections	6.32	6.30	6.25	6.75
4,400 lin. ft. ¾-in. galv. pipe (anchor posts and risers)	.24	.25	.25	.25
3,100 lin. ft. 1-in. galv. pipe (supply lines)	.46	.45	.50	.50
6,300 lin. ft. 1¼-in. galv. pipe (supply lines)	.55	.60	.55	.60
6,300 lin. ft. 1½-in. galv. pipe (supply lines)	.61	.65	.60	.65
6,300 lin. ft. 2-in. galv. pipe (supply lines)	.88	.90	.90	1.00
4,700 lin. ft. 2½-in. galv. pipe (supply lines)	1.23	1.25	1.20	1.30
2,600 lin. ft. 4-in. galv. pipe (supply lines)	2.36	2.35	2.35	2.50
11,200 lin. ft. ¾-in. galv. pipe (nozzle lines)	.37	.35	.36	.40
13,200 lin. ft. 1-in. galv. pipe (nozzle lines)	.45	.45	.45	.50
470 lin. ft. 1¼-in. galv. pipe (nozzle lines)	.55	.60	.55	.60
Lump sum, washing equip.	400.00	100.00	500.00	300.00
380 lin. ft. 6-in. vitrified clay pipe (std. str.)	1.19	2.00	1.35	3.50
480 lin. ft. 8-in. vitrified clay pipe (std. str.)	1.45	1.65	1.50	3.50
2,050 lin. ft. 8-in. vitrified clay pipe (extra str.)	1.56	1.80	1.60	3.50
480 lin. ft. 15-in. vitrified clay pipe (extra str.)	4.30	6.00	4.50	6.00
27 ea. manholes (sanitary sewers)	277.00	265.00	330.00	300.00
1 ea. drop manholes (sanitary sewers)	369.00	450.00	525.00	400.00
3 ea. chimney pipe Type "D" (sanitary sewers)	42.24	60.00	75.00	75.00
50 ea. house connection caps	42.24	17.00	20.00	25.00
Lump sum, electrical equip.	\$2,000	\$1,500	\$1,600	\$1,500
Lump sum, drainage equip.	500.00	250.00	500.00	400.00
1,800 lin. ft. metal plate guard rail	3.30	3.50	2.75	3.00

Nevada—Washoe County—State—Grade and Surf.

Isbell Construction Co., Reno, Nevada, with a bid of \$398,186, were low before the Nevada Department of Highways for construction of a portion of the State Highway System in Washoe County from Hash Lake approx. 1.62 mi. south of the south city limits of Reno to Mt. Rose Street in Reno. The total length is 2.45 mi. is to be graded and surfaced with bituminous pavement. Unit bids were submitted by the following:

(1) Isbell Construction Co.	\$398,186	(3) Dodge Construction Co.	\$444,400
(2) Silver State Construction Co.	426,825		
		(1)	(2)
39 ea. remove trees (7-ft. to 12-ft.)		25.00	10.00
35 ea. remove trees (1-ft. - 1-in. to 1-ft. - 6-in.)		50.00	15.00
15 ea. remove trees (1-ft. - 7-in. to 2-ft. - 0-in.)		100.00	25.00
25 ea. remove trees (2-ft. - 1-in. to 3-ft. - 0-in.)		175.00	50.00
8 ea. remove trees (over 3-ft. - 0-in.)		275.00	100.00
95 ea. remove stumps		25.00	25.00
14,136 lin. ft. remove fence		.16	.10
37 cu. yd. remove concrete		15.00	20.00
400 sq. yd. remove concrete sidewalk		.50	1.00
945 lin. ft. remove concrete curb and gutter		.25	1.00
Lump sum, remove rock wall		75.00	\$1,000
4,160 lin. ft. remove culvert pipe		1.50	1.00
20 ea. remove headwalls		20.00	20.00
14 ea. remove timber structures		4.00	100.00
8,677 sq. yd. remove composite surface		1.50	1.00
27,640 cu. yd. roadway excavation		.85	.50
1,800 cu. yd. drainage excavation		1.50	1.00
53,242 yd. sta. overhaul		.02	.02
5,753 yd. mi. overhaul		.20	.20
3,680 cu. yd. structure excavation		2.50	2.00
2,690 cu. yd. backfill		2.00	1.50
2,072 M. gal. water		1.50	2.00
Lump sum, furnish water equipment		500.00	\$3,000
210 hr. power roller		6.00	8.00
790 ft. hr. tamping roller		.60	.50
26,340 ton Type 1 gravel base		1.40	1.50
16,920 ton Type 2 gravel base one inch		1.60	1.55
118 ton liquid asph., Type MC-1 (prime)		37.00	35.00
80 ton emulsified asphalt (seal)		37.50	50.00
608 ton screenings		5.50	5.00
740 ton liquid asph., Type SC-5 and SC-6 (plantmix)		30.00	30.00
12,335 ton Class F-2 plantmix surface		2.60	3.25
216 cu. yd. Class A concrete		60.00	70.00
40,170 lb. reinforcing steel		.11	.12
14 sq. yd. mesh reinforcement		1.00	1.00
148 lin. ft. 8-in. corrugated metal pipe		2.10	3.00
2,944 lin. ft. 18-in. reinforced concrete pipe		4.10	5.00
2,050 lin. ft. 24-in. reinforced concrete pipe		5.90	7.00
283 lin. ft. 30-in. reinforced concrete pipe		7.85	10.00
91 lin. ft. 36-in. reinforced concrete pipe		10.65	12.00
717 lin. ft. relay culvert pipe		1.00	1.00
3,615 cu. yd. Class A concrete curb and gutter		31.00	42.00
46 cu. yd. Class A concrete sidewalk		30.00	40.00
16,220 lb. structural steel		.40	.25
63 ea. guide posts		5.00	6.00
5,431 lin. ft. reconstruct fence		.30	.20
438 lin. ft. reconstruct ornamental wood fence		5.10	1.00
790 lin. ft. standard right of way fence, Type B4B		.20	.40
628 lin. ft. standard right of way fence, Type B5B		.25	.45

(Continued on next page)

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Consulting Engineer

... Continued from page 85

chops along to eat. We'd fry the pork chops and eat them, and use the grease from the chops as the base for a light. We contrived a wick from rags and lighted it. When the grease got low, we'd fry more pork chops! So we had a light all night."

His eyes twinkled and he said, "The roof of that shack had holes in it and the heat from the stove melted the snow on the roof. It ran through the holes, and icicles that looked like stalactites and stalagmites were formed in the shack. It was a very colorful experience!"

War boom work

In 1943, Cunningham's firm did all the utilities for Vanport which included the waterworks and sewage. This warboom town housed 40,000 people during its peak. This was the city that the Columbia River drowned when a dike broke May 30, 1948 and 18,500 people were left homeless.

In a joint venture now with Stevens & Koon, Consulting Engineers of Portland, Cunningham and his associates have designed the Portland Intercepting Sewer and Sewage Treatment project which will cost \$15,000,000 when completed. They have just let the bid for a 2½-mi. tunnel through the peninsula, the first step in the project. Also on the firm's drawing boards are sewage treatment plants for Salem, Ore., and Olympia, Wash., capitals of the two states.

Hobbies, activities—and ambitions

Cunningham's hobby is photography and he always carries two loaded cameras with him on his many trips. One is color and the other black and white.

He is married; has four lovely daughters and eleven grand-daughters. He lives on a Portland hillside and has a view of four snow-capped mountains from his window. He belongs to the University club, is vice-president of the national ASCE, a member of Professional Engineers of Oregon, American Water Works Association, Federation of Sewage Works Associations, member of Portland City Planning Commission, and president of the State Board of Engineer Examiners.

His ambition, as a member of the Planning Commission, is to study traffic and write a few rules to regulate traffic's flow. He feels there are too many stop and go signs in cities. There was a twinkle in his eyes as he concluded. He referred to an editorial in *Western Construction News* some months ago, protesting excessive lights in Berkeley, Calif., and added, "I feel like your editor does. He might tell you sometime."

He came to the door and added: "Another thrilling experience I had was in eastern Oregon where tumbleweed piles up in drifts. I was driving with a man who stopped to light a cigarette and threw his match out. The tumbleweed flamed and chased us down the road..." (he is a good engineer—mighty good to interview, wouldn't you think so?)

3,112 lin. ft. field fence, Type A	.58	.40
285 lin. ft. field fence, Type B	.66	.50
1,912 lin. ft. special timber fence	2.20	1.00
235 lin. ft. lawn fence	1.80	.60
4 ea. 14-ft. standard metal gates	75.00	50.00
1 ea. 16-ft. standard metal gates	85.00	50.00
9 ea. 12-ft. special timber gates	100.00	50.00
3 ea. 3.5-ft. lawn walk gates	25.00	20.00
97 lin. ft. pipe railing	8.00	1.00
Lump sum, remove and reconstruct rock wall	550.00	\$2,000

California—Riverside & San Bernardino Counties—State—Grade & Section

A. Teichert & Son, Inc., Sacramento, Calif., with a bid of \$598,859, were low before the California State Highway for the grading and surfacing with plant-mixed surfacing on selected material base sections totalling 6.5 mi. of the road between a point on Route 43 west of Corona and Pine Ave. and the end of Euclid Ave. near Ontario in Riverside and San Bernardino Counties, Calif. The job includes construction of a steel and concrete bridge. Unit bids were submitted by the following:

(1) A. Teichert & Son, Inc.	\$598,859	— Cox Brothers Construction Co.	\$2,000
(2) Vinnell Co., Inc.	615,918	— United Concrete Pipe Corp. and Jesse S. Smith	2,000
(3) Basich Bros. Construction Co. and Basich Bros.	646,243	— Peter Kiewit Sons' Co.	2,000
(4) Griffith Co.	661,144	— Dimmitt & Taylor and K. B. Nicholas	2,000
(5) Winston Bros. Co. and Yount Construction Co.	667,920	— R. P. Shea Construction Co.	2,000
— Match Bros. and L. A. & R. S. Crow	696,355	— Silva & Hill Construction Co.	2,000
— Claude Fisher Co., Ltd.	705,873	— Sharp & Fellows Contracting Co.	2,000

	(1)	(2)	(3)	(4)
1,200 cu. yd. remove conc.	3.00	3.00	3.00	4.75
350 cu. yd. remove bituminous surf.	2.00	.75	.80	4.00
Lump sum, clearing and grubbing	\$11,000	\$25,000	\$4,500	\$14,500
800,000 cu. yd. roadway excav.	.27	.29	.32	.325
5,400 cu. yd. struct. excav.	2.50	2.35	3.80	2.16
94 cu. yd. struct. excav. (bridge)	10.00	7.00	5.50	13.50
5,600 cu. yd. ditch and channel excav.	.70	.35	.60	.90
14,600,000 sta. yd. overhaul	.002	.003	.0025	.0025
11,000 sq. yd. compact. orig. ground	.05	.05	.05	.05
4,300 lb. seed (erosion control)	.20	.25	.30	.30
120 ton straw (erosion control)	40.00	50.00	125.00	58.00
Lump sum, dev. wat. supply and furn. wat. equip.	\$7,500	\$13,500	\$5,000	\$12,000
25,500 M. gal. applying water	1.00	1.20	1.20	1.45
Lump sum, finishing roadway	\$3,000	\$5,000	\$1,700	\$3,000
26,000 ton min. aggregate (P.M.S.)	3.00	2.65	2.75	2.80
1,300 ton paving asphalt (P.M.S.)	19.00	19.00	18.00	19.60
2 ton asphalt emuls. (paint binder)	40.00	55.00	45.00	110.00
170 ton liquid asphalt MC-2 (pr. ct.)	23.00	25.00	23.00	26.00
120 ton asphalt emuls. (sl. cts.)	30.00	30.00	37.50	28.00
870 ton screenings	5.00	3.00	4.00	3.20
730 lin. ft. raised bars	1.00	1.00	.80	1.20
20,000 lin. ft. placing P.M.S. (dikes)	.10	.20	.15	.23
500 sq. yd. paved spillways	1.00	1.00	1.50	2.80
202 lin. ft. timber bridge railing	3.00	3.20	3.80	3.50
580 cu. yd. Class "A" P.C.C. (struct.)	60.00	36.00	60.50	48.00
44 cu. yd. Class "A" P.C.C. (bridge footing blocks)	30.00	25.00	44.00	29.00
56,200 lb. struct. steel	.15	.13	.132	.135
1,040 lin. ft. furn. conc. piling	2.50	2.80	2.75	3.50
30 ea. driving piles	110.00	50.00	75.00	65.00
118 cu. yd. P.C.C. (slope paving)	35.00	22.00	33.00	45.00
650 cu. yd. P.C.C. (curbs and gutters)	35.00	24.00	28.00	29.00
175 ea. r/w monuments	5.00	6.00	7.00	6.00
235 ea. instal. culv. mkrs. and guide posts	4.00	3.00	2.00	3.60
13.4 mi. new property fence	800.00	750.00	895.00	900.00
14 ea. drive gates 10 ft. wide	40.00	30.00	32.00	50.00
10 ea. drive gates 14 ft. wide	50.00	40.00	40.00	60.00
2,900 lin. ft. 24-in. C.M.P. (14 ga.)	4.00	3.70	3.82	3.65
230 lin. ft. 24-in. C.M.P. (12 ga.)	5.00	4.90	4.25	4.70
380 lin. ft. 30-in. C.M.P. (14 ga.)	5.00	4.70	4.60	4.70
246 lin. ft. 30-in. C.M.P. (12 ga.)	6.00	6.00	4.85	6.00
506 lin. ft. 36-in. C.M.P. (12 ga.)	8.00	6.90	6.65	7.00
174 lin. ft. 36-in. C.M.P. (10 ga.)	10.00	8.50	7.75	8.00
148 lin. ft. 42-in. C.M.P. (12 ga.)	10.00	8.30	8.00	8.00
260 lin. ft. 42-in. C.M.P. (8 ga.)	14.00	12.10	10.75	11.50
216 lin. ft. 48-in. C.M.P. (12 ga.)	12.00	11.20	10.80	9.00
150 lin. ft. 54-in. C.M.P. (10 ga.)	16.00	15.30	14.30	14.00
468 lin. ft. 54-in. C.M.P. (8 ga.)	19.00	18.00	16.50	16.50
220 lin. ft. 72-in. field assemb. plate culv. (310-18)	35.00	36.50	35.00	32.00
824 lin. ft. 8-in. C.M.P. down drains (16 ga.)	1.50	1.50	2.00	1.50
11 ea. down drain slip joints	30.00	13.60	9.00	24.00
54 lin. ft. salv. exist. pipe culv.	1.00	2.30	1.00	1.00
130,000 lb. bar reinf. steel	.08	.08	.10	.10
770 sq. yd. mesh reinf.	.40	.40	.40	.40
17 ea. horiz. reflector units	6.00	4.00	9.00	8.00
Lump sum, remov. exist. bridge	500.00	\$2,000	500.00	\$1,200
300 lin. ft. met. pipe guard railing	3.00	2.30	4.00	3.20

Power . . .

Colorado—Various Counties—Bur. of Reclam.—Transmission Line

Reynolds Electrical and Engineering Co. of El Paso, Texas, with a bid of \$1,483,782, was low before Bureau of Reclamation at Denver, Colo., for Schedule No. 1 for construction of the 115-kv. transmission line from Granby Pumping Plant to Estes Power Plant and from the Marys Lake Power Plant to Estes Plant on the Colorado-Big Thompson Project in Colorado. Unit bids were submitted by the following:

(A) Reynolds Electrical Co., El Paso	\$1,483,782
(B) Abbott Electric Corp., San Francisco	1,822,000
(C) A. S. Schulman Electric Co., Chicago, and Northwestern Engineering Co., Denver	1,840,000
(D) Utilities Construction Co. and W. L. Hailey Co.	1,880,000
(E) Donovan-James	1,980,000

SCHEDULE NO. 1

PARTS 1A AND 1B

- (1) Lump sum, clearing land and right-of-way
- (2) 1 structure, constructing type-HS structure with 45-foot poles

- (3) 8 structure, constructing type-HS structure with 50-foot poles
- (4) 29 structure, constructing type-HS structure with 55-foot poles
- (5) 60 structure, constructing type-HS structure with 60-foot poles

(Continued on next page)

BIG MUNICIPAL MARKET



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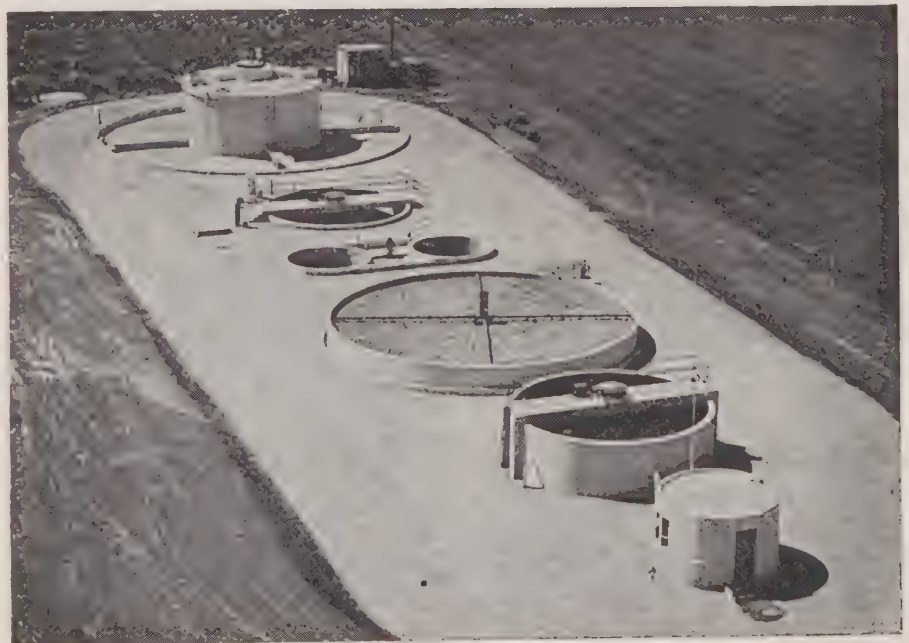
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County Road in Lava

... Continued from page 75

are standard, but the trunnions are moved back a small amount because of the additional length in the arms.

On several isolated spots of the road the contractor ran into beds of cemented gravel, but this was handled fairly well by merely shaking it up with several shots and then going ahead and biting into it with earth movers in the usual manner. Farther on up the line of the road, on the edge of Butte Creek Canyon, the two large fills on the job are supported by Armco galvanized metal bin-type cribbing.

Where the line crosses Butte Creek, a reinforced concrete girder bridge 187 ft. long, under the same contract, has been completed. It involved 570 cu. yd. of concrete and 85,600 lb. of reinforcing steel. Work on the \$365,000 contract for grading and concrete bridge work began Dec. 1, 1948, and completion is expected by the middle of this September. Paving on the Chico-Paradise cutoffs will be done under separate contract at a later date. A typical cross-section under the present grading contract shows two 11-ft. lanes of road with 4-ft. shoulders, and a layer of crushed gravel varying between .50 and .67 ft. in thickness.

EQUIPMENT ON THE JOB

- 1—1½-cu. yd. shovel—Marion.
- 8—bulldozers—Caterpillar.
- 4—15-cu. yd. carrier scrapers—Gar Wood, Wooldridge.
- 2—dumpsters—Koehring.
- 2—motor graders—Adams, Caterpillar.
- 2—10-ton, 3-wheel rollers.
- 1—500-cfm. and 2—105-cfm. compressors—LeRoi.
- 2—light weight wagon drills—Sullivan.

The entire Federal Aid Secondary route 757 is under the direction of Butte County Engineer Bert Paxton, and Mat Ryan is resident engineer on the job.

Design Chart

... Continued from page 86

in the Standard Specifications of the American Society for Testing Materials for the particular kind and grade of reinforcement used, but in no case to exceed 30,000 p.s.i.

The Uniform Building Code has practically the identical clause without the 12-ft. span limitation. This provision apparently applies to the cold drawn wire of reinforcing mesh. Then I recently noted an advertisement of Webrib Steel Corp. concerning their dumbbell shaped reinforcing bars. Having a cold spiral bend, or twist, the reinforcing bar is guaranteed to have a minimum yield point of not less than 60,000 p.s.i., permitting the use of a design stress of 30,000 p.s.i. While I have not seen a specific city code which permitted such unit stresses in the reinforcement, it is representative of the trend.

- (6) 58 structure, constructing type-HS structure with 65-foot poles
- (7) 34 structure, constructing type-HS structure with 70-foot poles
- (8) 9 structure, constructing type-HS structure with 75-foot poles
- (9) 1 structure, constructing type-HA structure with 55-foot poles
- (10) 2 structure, constructing type-HA structure with 60-foot poles
- (11) 4 structure, constructing type-HSB structure with 55-foot poles
- (12) 9 structure, constructing type-HSB structure with 60-foot poles
- (13) 17 structure, constructing type-HSB structure with 65-foot poles
- (14) 13 structure, constructing type-HSB structure with 70-foot poles
- (15) 5 structure, constructing type-HSB structure with 75-foot poles
- (16) 1 structure, constructing modified type-HSB special snow-slide structure with 70-foot vertical poles, complete in accordance with Drawing No. 40-D-4565
- (17) 1 structure, constructing modified type-HSB special snow-slide structure with 75-foot vertical poles, complete in accordance with Drawing No. 40-D-4565
- (18) 1 structure, constructing type-HTR structure with 65-foot poles
- (19) 3 structure, constructing type-HTR structure with 70-foot poles
- (20) 1 structure, constructing type-3A structure with 50-foot maximum pole length
- (21) 2 structure, constructing type-3A structure with 55-foot maximum pole length
- (22) 4 structure, constructing type-3A structure with 65-foot maximum pole length
- (23) 5 structure, constructing type-3A structure with 70-foot maximum pole length
- (24) 1 structure, constructing type-3AB structure with 55-foot maximum pole length
- (25) 5 structure, constructing type-3AB structure with 60-foot maximum pole length
- (26) 1 structure, constructing type-3AB structure with 65-foot maximum pole length
- (27) 1 structure, constructing type-3AB structure with 70-foot maximum pole length
- (28) 1 structure, constructing type-3AB structure with 75-foot maximum pole length
- (29) 1 structure, constructing type-3AT structure with 55-foot maximum pole length
- (30) 1 structure, constructing type-3AT structure with 60-foot maximum pole length
- (31) 1 structure, constructing type-3AT structure with 75-foot maximum pole length
- (32) 1 structure, constructing type-3T structure with 50-foot maximum pole length
- (33) 3 structure, constructing type-3T structure with 55-foot maximum pole length
- (34) 8 structure, constructing type-3T structure with 60-foot maximum pole length
- (35) 8 structure, constructing type-3T structure with 65-foot maximum pole length
- (36) 6 structure, constructing type-3T structure with 70-foot maximum pole length
- (37) 3 structure, constructing type-3T structure with 75-foot maximum pole length
- (38) 1 structure, constructing type-3T structure with 80-foot maximum pole length
- (39) 1 structure, constructing type-3T structure with 85-foot maximum pole length
- (40) 2 structure, constructing type-3T-1 structure with 55-foot maximum pole length
- (41) 1 structure, constructing type-3T-1 structure with 60-foot maximum pole length
- (42) 1 structure, constructing type-3T-1 structure with 65-foot maximum pole length
- (43) 1 structure, constructing type-3T-2 structure with 50-foot maximum pole length
- (44) 1 structure, constructing type-3T-2 structure with 60-foot maximum pole length
- (45) 2 structure, constructing type-3T-2 structure with 65-foot maximum pole length
- (46) 171 X-brace, assembling and attaching X-brace
- (47) 54 guy, constructing single guy
- (48) 246 guy, constructing double guy
- (49) 1 guy, constructing stub guy with 50-foot pole and one double guy
- (50) 1 guy, constructing stub guy with 55-foot pole and one double guy
- (51) 1 guy, constructing stub guy with 60-foot pole and one double guy
- (52) 1 guy, constructing stub guy with 65-foot pole and one double guy
- (53) 200 anchor, placing plate anchor
- (54) 100 anchor, placing grouted anchor
- (55) 100 protector, installing guy protector
- (56) 855 assembly, assembling and attaching suspension-insulator assembly with seven insulator units
- (57) 24 assembly, assembling and attaching suspension-insulator assembly with eight insulator units
- (58) 42 assembly, assembling and attaching suspension-insulator assembly with nine insulator units
- (59) 21 assembly, assembling and attaching double suspension-insulator assembly with nine insulator units per string and single yoke plate
- (60) 3 assembly, assembling and attaching tension-insulator assembly with nine insulator units

- (61) 252 assembly, assembling and attaching tension-insulator assembly with ten insulator units per string and double yoke
- (62) 31.9 3-phase, single-circuit mile of stringing 336,400-circular mil steel reinforced aluminum conductor
- (63) 444 damper, attaching vibration damper aluminum conductor
- (64) 7 weight, attaching 50-pound hold weight for suspension insulators
- (65) 15 weight, attaching 100-pound hold weight for suspension insulators
- (66) 28 weight, attaching 180-pound hold weight for suspension insulator
- (67) 31.9 mile of line, stringing two ¾-inch galvanized-steel overhead ground-wires
- (68) 50 post, placing fence ground post and grounding fences.

PART 1C

- (69) Lump sum, clearing land and right-of-way
- (70) 1 structure, constructing type HS structure with 55-foot poles
- (71) 8 structure, constructing type-HS structure with 60-foot poles
- (72) 2 structures, constructing type-HS structure with 65-foot poles
- (73) 1 structure, constructing type-HS structure with 70-foot poles
- (74) 2 structure, constructing type-HTR structure with 65-foot poles
- (75) 2 structure, constructing type-HTR structure with 70-foot poles
- (76) 1 structure, constructing type-3A structure with 60-foot maximum pole length
- (77) 3 structure, constructing type-3AT structure with 60-foot maximum pole length
- (78) 1 structure, constructing type-3T structure with 60-foot maximum pole length
- (79) 4 X-brace, assembling and attaching braces
- (80) 25 guy, constructing single guy
- (81) 36 guy, constructing double guy
- (82) 1 guy, constructing stub guy with pole and one double guy
- (83) 1 guy, constructing stub guy with pole and one double guy
- (84) 55 anchor, placing plate anchor
- (85) 8 anchor, placing grouted anchor
- (86) 20 protector, installing guy protector
- (87) 45 assembly, assembling and attaching pension-insulator assembly with seven insulator units
- (88) 6 assembly, assembling and attaching pension-insulator assembly with eight insulator units
- (89) 3 assembly, assembling and attaching pension-insulator assembly with nine insulator units
- (90) 3 assembly, assembling and attaching pension-insulator assembly with nine insulator units
- (91) 24 assembly, assembling and attaching tension-insulator assembly with nine insulator units per string and double strain
- (92) 2.3 3-phase single-circuit mile of line, stringing 336,400-circular mil steel-reinforced aluminum conductor
- (93) 72 damper, attaching vibration damper aluminum conductor
- (94) 3 weight, attaching 50-pound hold weight for suspension insulators
- (95) 3 weight, attaching 100-pound hold weight for suspension insulators
- (96) 3 weight, attaching 180-pound hold weight for suspension insulators
- (97) 2.3 mile of line, stringing two ¾-inch galvanized-steel overhead ground-wires
- (98) 10 post, placing fence ground posts and grounding fences

PART 2

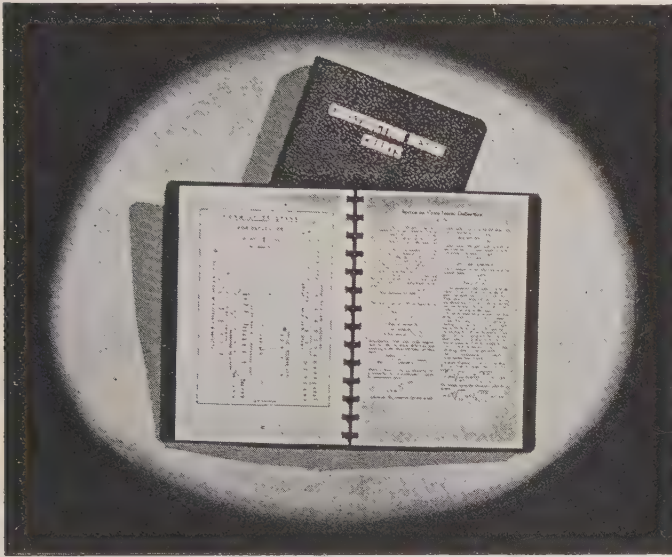
- (99) Lump sum, clearing land and right-of-way
- (100) 1,400 cu. yd. excavation, common, for footings
- (101) 250 cu. yd. excavation, rock, for towerings
- (102) 4,000 lin. ft. drilling holes for anchoring and grouting bars in place
- (103) 900 bbl. furnishing and handling cement
- (104) 80,000 lb. furnishing and placing reinforcement bars
- (105) 880 cu. yd. placing concrete in towerings
- (106) 228 stub, placing steel stubs in towerings
- (107) 967,000 lb. furnishing structural-steel to complete with leg extensions
- (108) 967,000 lb. erecting steel towers, complete with leg extensions
- (109) 132 assembly, assembling and attaching pension-insulator assembly with nine insulator units
- (110) 72 assembly, assembling and attaching tension insulator assembly with 10 insulator units per string and double strain
- (111) 5.6 3-phase single-circuit mile of line, stringing No. 4/0 AWG copper-equivalent cold-weld-copper conductor
- (112) 5.6 mile of line, stringing two ¾-inch galvanized-steel overhead ground-wire
- (113) 5.8 mile of counterpoise, constructing continuous counterpoise

(Continued on next page)

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Wood Diaphragm Tests

... Continued from page 72

for the model panel and that for the full size panel or prototype. These moduli are based on the initial rate of deflection of the diaphragm, which implies an elastic action of all nails. It will be seen that, if the number of nails in a given panel is varied, the deflection under a given load will vary inversely as the total number of nails in the panel. This will be true, however, only if the number of nails at each board connection at joists and at margins is varied in the same ratio as is the total number of nails. For example, if panel A has 2 nails in each board at each joist and 3 nails in each board at the margins and panel B has 4 nails and 6 nails respectively, then the deflection at a given load for panel A will be twice that of panel B under the same load.

This conclusion may be compared to results of shear tests that have been carried out on diagonally sheathed wood stud wall panels, which constitute nailed diaphragms. These tests are reported in a publication of the Forest Products Laboratory of Oct. 7, 1929 entitled "The Rigidity and Strength of Frame Walls," and a revision thereof dated Feb., 1947 (#R896). The average stiffness factor for three panels having two 8d nails in each board at each stud crossing was 3.8. A panel that was the same in all respects except that three 8d nails were used in each board at each stud crossing had a stiffness factor of 5.2 and a panel having four 8d nails per board at each stud crossing had a stiffness factor of 7.5. These stiffness factors are in the ratio 1.0 to 1.37 to 1.97. In the F.P.L. tests, the number of nails at the marginal connections was apparently kept constant for all three panels. Since the observed ratios of stiffness are closely proportional to the number of nails at the stud crossings, it seems apparent that the marginal nails did not have much effect on the stiffness of the panels. It may be concluded that if the marginal nailing in a diagonally sheathed roof panel is adequate to resist the shear stresses, the stiffness of the panel can be controlled by varying the number of nails in the boards at the joist or rafter crossings.

Determination of K and K' from tests of nailed joints

In order to determine the equivalent shear stress modulus of the prototype from Equation 7 it is necessary to establish values for K and K'. For this purpose a series of tests of nailed joints was completed as a part of this test program. Douglas fir nailed joints were employed using 8d common nails in one series and nails 1/4 of the diameter and length of 8d nails (20 gauge flat head wire nails 5/8 in. long) in another series.

For the 8d common nails each test specimen comprised a center piece 3 3/8 in. thick with a piece 3/4 in. thick fastened to it on each side with 4 nails. To prevent splitting of the side pieces, holes were drilled for the nails in these members, of a diameter of .108 in., which is approximately 80% of the diameter of the nails. The load was applied to the center piece and was resisted by 8 nails acting in single shear.

For 20 gauge x 5/8 in. flat-head nails, a similar test specimen was employed having a center piece 1 3/8 in. thick and side pieces 3/16 in. thick each side, so that the load was resisted by 12 nails in single shear. No holes were drilled for these nails.

In all of the tests the nails were driven perpendicular to the grain of the wood and

Concluded on page 133

PART 3

- (114) Lump sum, clearing land and right-of-way
- (115) 420 cu. yd. excavation, common, for tower footings
- (116) 100 cu. yd. excavation, rock, for tower footings
- (117) 400 lin. ft. drilling holes for anchor bars, and grouting bars in place
- (118) 210 bbl. furnishing and handling cement
- (119) 20,000 lb. furnishing and placing reinforcement bars
- (120) 170 cu. yd. placing concrete in tower footings
- (121) 40 stub, placing steel stubs in tower footings
- (122) 226,000 lb. furnishing structural-steel towers, complete with leg extensions
- (123) 226,000 lb. erecting steel towers, complete with leg extensions
- (124) 30 assembly, assembling and attaching suspension-insulator assembly with nine insulator units
- (125) 6 assembly, assembling and attaching tension-insulator assembly with 10 insulator units
- (126) 54 assembly, assembling and attaching double tension-insulator assembly with 10 insulator units per string and double strain yoke
- (127) 1.0 3-phase double-circuit mile of line, stringing 336,400-circular mil steel-reinforced aluminum conductor
- (128) 72 damper, attaching vibration dampers for aluminum conductor
- (129) 1.0 mile of line, stringing two 3/4-inch galvanized-steel overhead ground-wire
- (130) 40 rod, placing tower ground rod and connecting to tower leg
- (131) 8 post, placing fence ground posts and grounding fences
- (132) 2 unit counterpoise, constructing unit counterpoise

	(A)	(B)	(C)	(D)	(E)
(1)	177.509	88,000	246,292	332,000	256,000
(2)	319.15	653.00	676.25	630.00	973.00
(3)	351.31	675.00	714.10	670.00	1,155
(4)	379.04	707.00	748.50	700.00	1,176
(5)	408.34	738.00	783.05	740.00	1,193
(6)	447.13	786.00	835.30	780.00	1,275
(7)	480.05	832.00	873.00	810.00	1,300
(8)	523.99	892.00	896.00	850.00	1,373
(9)	414.58	743.00	768.00	710.00	1,193
(10)	443.87	779.00	803.00	750.00	1,212
(11)	429.71	895.00	797.00	775.00	1,303
(12)	459.00	905.00	833.00	815.00	1,322
(13)	497.81	925.00	874.00	850.00	1,404
(14)	530.73	975.00	909.00	885.00	1,428
(15)	574.66	1,037	952.00	925.00	1,514
(16)	1,129.9	1,634	1,972	2,470	2,260
(17)	1,345	1,734	2,048	2,650	2,380
(18)	510.35	940.00	878.00	850.00	1,380
(19)	543.28	983.00	917.00	890.00	1,410
(20)	590.82	725.00	852.00	945.00	1,457
(21)	434.71	750.00	896.00	990.00	1,490
(22)	533.87	843.00	980.00	1,100	1,628
(23)	583.80	893.00	1,038	1,155	1,665
(24)	646.15	800.00	908.00	1,000	1,531
(25)	509.35	832.00	954.00	1,060	1,558
(26)	565.28	887.00	992.00	1,115	1,670
(27)	478.08	796.00	1,035	1,020	1,604
(28)	678.11	997.00	1,076	1,220	1,822
(29)	478.08	798.00	1,035	1,020	1,604
(30)	521.27	336.00	956.00	1,080	1,632
(31)	690.04	1,000	1,193	1,240	1,921
(32)	559.70	987.00	1,044	1,020	1,671
(33)	603.59	1,029	1,111	1,070	1,699
(34)	646.79	1,081	1,177	1,130	1,726
(35)	702.74	1,132	1,208	1,180	1,853
(36)	752.66	1,187	1,259	1,230	1,890
(37)	815.56	1,200	1,304	1,290	2,017
(38)	867.63	1,300	1,431	1,350	2,053
(39)	939.26	1,500	1,571	1,425	2,209
(40)	603.90	761.00	935.00	1,070	1,702
(41)	647.10	897.00	1,177	1,130	1,730
(42)	703.05	940.00	1,229	1,180	1,856
(43)	562.44	739.00	1,103	1,020	1,690
(44)	649.53	917.00	1,178	1,130	1,748
(45)	705.48	960.00	1,231	1,180	1,875
(46)	45.39	45.00	80.20	67.00	65.00
(47)	28.29	82.00	28.70	37.00	50.00
(48)	40.97	153.00	44.80	45.00	65.00
(49)	203.15	237.00	291.00	300.00	361.00
(50)	214.34	245.00	301.00	320.00	372.00
(51)	250.53	267.00	323.00	335.00	381.00
(52)	251.49	279.00	329.00	350.00	412.00
(53)	21.79	37.00	52.00	63.00	94.00
(54)	28.72	64.00	23.20	63.00	32.00
(55)	6.42	7.00	11.30	7.00	9.00
(56)	39.60	35.00	37.00	25.00	33.00
(57)	43.74	37.00	40.00	28.10	38.00
(58)	47.87	40.00	44.00	31.20	43.00
(59)	99.71	98.00	93.00	66.70	113.00
(60)	46.83	43.00	92.00	33.50	88.00
(61)	102.15	101.00	96.50	71.00	137.00
(62)	\$3,241	\$4,900	\$5,508	\$3,830	\$4,257
(63)	9.24	15.00	18.00	10.50	9.50
(64)	19.03	35.00	28.00	9.00	52.00
(65)	33.14	56.00	42.00	15.00	66.00
(66)	55.73	71.00	79.00	23.00	85.00
(67)	\$1,016	\$2,407	\$2,150	\$1,320	\$1,487
(68)	6.97	18.00	18.60	10.00	10.00
(69)	\$5,372	\$6,600	\$6,197	\$5,000	\$10,416
(70)	336.63	507.00	748.50	510.00	730.00
(71)	365.20	538.00	783.05	550.00	788.00
(72)	401.78	586.00	835.30	585.00	868.00
(73)	434.02	632.00	873.00	620.00	893.00
(74)	458.80	740.00	878.00	630.00	970.00
(75)	491.05	783.00	917.00	665.00	913.00

PART 4

- (133) 400 cu. yd. excavation, common, for tower footings
- (134) 60 cu. yd. excavation, rock, for tower footings
- (135) 200 lin. ft. drilling holes for anchor bars, and grouting bars in place
- (136) 160 bbl. furnishing and handling cement
- (137) 14,000 lb. furnishing and placing reinforcement bars
- (138) 130 cu. yd. placing concrete in tower footings
- (139) 28 stub, placing steel stubs in tower footings
- (140) 143,800 lb. furnishing structural-steel towers, complete with leg extensions
- (141) 143,800 lb. erecting steel towers, complete with leg extensions
- (142) 30 assembly, assembling and attaching suspension-insulator assembly with nine insulator units
- (143) 6 assembly, assembling and attaching tension-insulator assembly with 10 insulator units
- (144) 18 assembly, assembling and attaching double tension-insulator assembly with 10 insulator units per string and double strain yoke
- (145) 1.0 3-phase double-circuit mile of line, stringing 397,500-circular mil steel-reinforced aluminum conductor
- (146) 24 damper, attaching vibration damper for aluminum conductor
- (147) 1.0 mile of line, stringing two 3/4-inch galvanized-steel overhead ground-wires
- (148) 28 rod, placing tower ground rod and connecting to tower leg
- (149) 8 post, placing fence ground post and grounding fences
- (150) 1 unit counterpoise, constructing unit counterpoise

	(A)	(B)	(C)	(D)	(E)
(76)	430.99	588.00	930.00	765.00	\$1,116
(77)	470.25	637.00	956.00	775.00	\$1,220
(78)	583.31	877.00	\$1,177	835.00	\$1,330
(79)	40.49	35.00	80.20	45.00	65
(80)	24.48	62.00	28.70	20.00	50
(81)	35.06	103.00	44.80	30.00	65
(82)	194.04	187.00	301.00	260.00	372
(83)	210.78	207.00	323.00	280.00	381
(84)	16.78	17.00	52.00	44.00	94
(85)	20.75	44.00	23.20	44.00	32
(86)	5.83	6.00	11.30	9.00	9
(87)	36.28	37.00	37.00	22.90	33
(88)	40.10	39.00	40.00	25.70	38
(89)	43.91	43.00	44.00	28.50	43
(90)	43.06	46.00	92.00	30.80	88
(91)	93.65	92.00	96.50	65.40	137
(92)	\$3,087	\$3,710	\$5,508	\$2,640	\$4,220
(93)	8.28	10.00	18.00	10.50	9
(94)	16.21	27.00	28.00	9.00	52
(95)	28.06	36.00	42.00	15.00	66
(96)	47.02	51.00	79.00	23.00	85
(97)	875.01	\$1,607	\$2,134	660.00	\$1,440
(98)	5.82	13.00	18.60	10.00	10
(99)	\$99,774	\$18,600	105,151	130,800	\$43,220
(100)	45.30	40.00	3.80	30.00	21
(101)	95.56	100.00	18.75	70.00	95
(102)	5.72	10.00	3.80	3.00	10
(103)	9.44	22.00	11.25	20.00	11
(104)	.23	.36	.22	.30	
(105)	133.48	175.00	68.50	150.00	125
(106)	40.00	50.00	33.50	10.00	86
(107)	.17	.20	.18	.16	
(108)	.13	.20	.21	.12	
(109)	47.80	86.00	44.50	41.00	43
(110)	121.11	202.00	103.00	89.00	151
(111)	\$5,964	\$5,710	\$8,843	\$6,940	\$6,220
(112)	\$1,149	\$2,500	\$2,125	\$1,920	\$1,440
(113)	\$9,263	\$12,575	\$2,096	\$16,000	\$5,300
(114)	\$2,578	\$3,300	\$3,090	\$10,000	\$2,170
(115)	15.87	15.00	3.80	15.00	13
(116)	40.23	51.00	18.75	50.00	61
(117)	3.50	5.00	2.50	2.00	6
(118)	7.50	9.00	9.40	10.00	11
(119)	.189	.18	.19	.20	
(120)	80.00	75.00	68.50	100.00	80
(121)	15.00	25.00	33.50	10.00	48
(122)	.167	.15	.18	.16	
(123)	.06	.08	.16	.06	
(124)	45.71	43.00	44.50	31.70	42
(125)	49.69	48.00	52.50	34.50	91
(126)	104.62	96.00	103.00	76.00	133
(127)	\$6,322	\$2,804	\$9,158	\$6,000	\$8,770
(128)	8.40	8.00	17.50	10.50	9
(129)	\$1,025	\$1,250	\$2,125	900.00	\$1,440
(130)	14.78	13.00	12.00	13.25	7
(131)	5.90	10.00	18.60	10.00	10
(132)	283.46	516.00	228.00	175.00	433
(133)	15.87	15.00	3.80	15.00	13
(134)	40.23	51.00	18.75	50.00	61
(136)	3.50	5.00	2.50	2.00	6
(136)	7.50	9.00	9.40	10.00	11
(137)	.189	.18	.19	.20	
(138)	80.00	75.00	68.50	100.00	80
(139)	15.00	25.00	12.50	10.00	48
(140)	.167	.15	.18	.16	
(141)	.06	.08	.16	.06	
(142)	45.71	43.00	44.50	31.70	42
(143)	49.69	48.00	52.50	34.50	91
(144)	104.62	96.00	103.00	76.00	133
(145)	\$6,656	\$3,710	\$9,033	\$6,100	\$9,500
(146)	8.40	8.00	17.50	10.50	9
(147)	762.71	\$1,250	\$2,873	705.00	\$1,440
(148)	14.78	43.00	12.00	13.25	7
(149)	5.90	10.00	18.60	10.00	10
(150)	283.46	516.00	228.00	175.00	433

Wood Diaphragm Tests

... Continued from page 132

the load was applied parallel to the grain of the wood. The material was well seasoned Douglas Fir and was selected so that the several test specimens each had wood of a different specific gravity.

The head of the testing machine was run down at a speed of .04 in. per minute. The recorded deformation of the joint was the average reading of two Ames dials, one of which was mounted on each side of the specimen.

From Fig. 4 showing the average deformation curve for 6 test specimens (48 nails), it will be seen that the value of K for 8d nails is 10,000. The average of 6 test specimens (72 nails) gives a value of K for 20 gauge x 5/8 in. flat head nails of 1220. The ratio of K/K' is therefore 8.2.

It is important to note that while tests indicate that there is quite a large variation in the value for K for individual nails and even for individual test specimens, we are concerned here with the value of K that represents the average action of the several thousand nails in a wood diaphragm. It seems fair to assume that under these circumstances K would be reasonably constant. However it is known that a nailed joint tested immediately after fabrication and a similar joint nailed together when the lumber is green and tested after it has seasoned several weeks, will show different load slip characteristics. The influence of this seasoning effect upon the ratio K/K' cannot be estimated from the meager information that is available. Whatever influence it may have can be minimized by the use of well seasoned lumber for building construction.

Deflection of a full size wood diaphragm

Substituting the ratio $K/K' = 8.2$ and the ratio $r'/r = 4$ in Equation 7, there is obtained $E_s = E_s' 32.8$. Since E_s' was found to be 21,000 the value of E_s is 690,000. Substituting the values $E_s = 690,000$ and $r = 1$ in Equation 2 there is obtained

$$d = \frac{WL}{b 380,000} + \frac{WL^3}{382 E A b^2} \quad 8.$$

Equation 8 gives the deflection within the proportional limit of a full size wood diaphragm similar in construction and loading to Panel No. 3. From Fig. 1, it will be seen that the deflection computed on the basis of the initial slope of the load deflection curve will not be seriously in error for a load as much as twice the proportional limit, i.e., 1,500 lb. This load has heretofore been suggested as the maximum permissible load for diaphragm action. It is therefore proposed to apply Equation 8 to the computation of deflections for loads on Panel No. 3 up to twice the proportional limit and to establish this load as the maximum permissible load on the diaphragm.

Load at the proportional limit for a full size wood diaphragm

In order to apply Equation 8 for design, it is necessary to establish a general method for determining the maximum permissible load of a full size diaphragm.

In the design of a diaphragm the flange members should be given sufficient sectional area so that they will not be overstressed when the panel as a whole reaches its proportional limit. For example at the assumed proportional limit of 750 lb. for Panel No. 3, the stress in the flanges is only 60 lb. per sq. in. The proportional limit is therefore determined by nail deformation. It will be assumed that when the load on a

nailed diaphragm reaches the proportional limit, the load on the most stressed nail or group of nails will also reach the proportional limit.

Let W' and Sx' be the load on the panel at the proportional limit and the corresponding load on the most stressed nail or nails respectively, for the model panel. Let W and Sx be the corresponding quantities for the prototype. Then

$$\frac{W}{W'} = \frac{Cx Sx}{Cx S'x} = \frac{Sx}{S'x} \quad 9.$$

Referring to Figure 4 it will be seen that the proportional limit for 8d nails is about 66 lb. and for the 20 gauge nails it may be taken as 9 lb. The ratio $Sx/S'x$ is therefore $66/9 = 7.3$.

Since the proportional limit for Panel No. 3 is about 750 lb. from Equation 9 the proportional limit of the prototype would be $750 \times 7.3 = 5,500$ lb. and the maximum permissible load on the 40 by 20-ft. diaphragm would be twice this or 11,000 lb. This total load represents a maximum shear of 5,500 lb. or a shear stress of $5500/20 = 275$ lb. per ft.-width of panel. If three nails per board at each joist were used instead of two (and, theoretically, $4\frac{1}{2}$ nails at each marginal connection, the relative effect of which has been shown to be small), it may be expected that the proportional limit will be reached at a shear stress of $3/2$ of 275 lb. or 410 lb. per ft., which will produce the same stress per nail.

Application to design of roof panels

The test results and analysis relating to test panels Nos. 2 and 3 may be applied directly to the design of a roof diaphragm that is constructed and loaded in the manner of these test panels.

Consider for example a one-story building 30 x 100 ft. in plan, acted upon by transverse loads as indicated by portion A of Fig. 3. The maximum permissible load

$$\text{on the diaphragm would be } \frac{30 \times 275 \times 2}{100}$$

$= 165$ lb. per linear foot, and the total load would be 16,500 lb. This would represent about the minimum width of a building of this length and of normal height, designed to resist wind pressure of 15 lb. per sq. ft. If the building is narrower or longer, more nails would have to be used in the roof diaphragm.

If it is assumed that the flange members or bond beams in this building are 12 x 12 in. concrete and that the value of E for concrete is 3,000,000, then the lateral deflection of the roof diaphragm under this loading, from Equation 8 would be

$$d = \frac{16,500 \times 100}{30 \times 380,000} + \frac{16,500 \times 100^3}{382 \times 3,000,000 \times 1 \times 30^2} \\ = .145" + .015" = .160"$$

Ordinarily it would be necessary to provide a roof diaphragm that will distribute lateral loads that are in the direction of either axis of the building. It is suggested that such a diaphragm be constructed in the manner of Fig. 3, in which case it may be assumed that the entire roof acts as a unit in resisting bending stresses, with a neutral axis on the line X—X. The deflection of the entire roof would then be computed from Equation 8 using a width of 60 ft.

Although the test results here reported relate only to diaphragms having the joists or rafters running in the direction of the applied load, it seems highly probable that they may be applied with reasonable

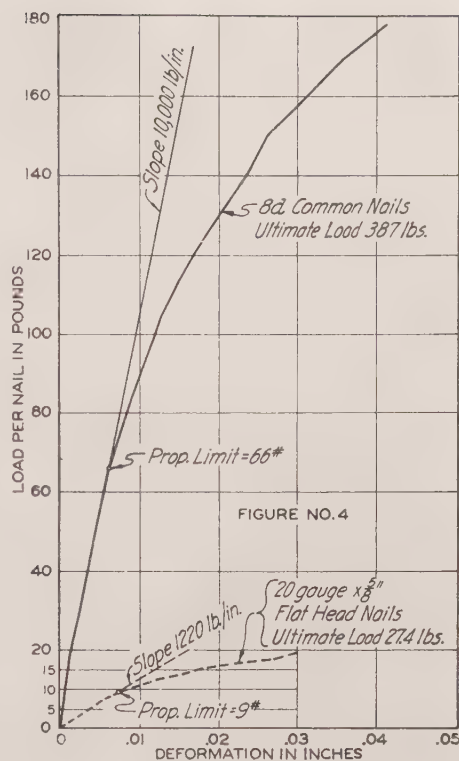


FIGURE 4

accuracy to diaphragms in which the joists are at right angles to the load. The joists act as stiffeners to prevent buckling and serve to transmit stress in a direction across the boards. It would appear that the direction of the joists will have little effect on either function. It is true that if the joists run at right angles to the applied load, they will also provide resistance to direct bending stresses. However, the above example indicates that in most cases the portion of the deflection of a single diagonally sheathed roof diaphragm that is due to bending will be relatively small and that the stiffening effect of the joists will have a correspondingly small influence on the total deflection.

Davis Power Contract

A CONTRACT between the Department of the Interior and the Arizona Power Authority for the delivery of 45,000 kw. of Davis Dam power to load centers in Arizona, has been approved by Acting Secretary of the Interior William E. Warne. The basic allocations, taking into consideration the fulfillment of commitments in contracts now in existence for Parker Dam power, will provide about 50 per cent of the 180,000-kw. Davis Dam capacity for use in Arizona, 25 per cent in California, and 25 per cent in Nevada. Applications for four times the Davis Powerplant's capacity have been received from power-short Arizona, California, and Nevada areas.

The Bureau has under construction a transmission system connecting the Hoover, Davis and Parker Powerplants and the load centers in Arizona to furnish energy under contracts between the Department of the Interior and the Arizona Power Authority. All of the transmission lines are either completed, under construction, or under contract.

NEW EQUIPMENT

MORE COMPLETE INFORMATION of any of the new products or equipment briefly described on the following pages may be had by sending your request to Equipment Service, Western Construction News, 503 Market Street, San Francisco 5, Calif. For quicker service, please designate the item by number.

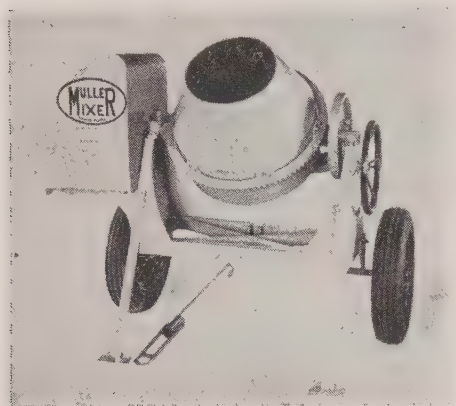
801

Tilting Concrete Mixer

Manufacturer: Muller Machinery Co., Metuchen, N. J.

Equipment: Mixer of the end discharge type with 3½-cu. ft. capacity.

Features claimed: The unit is designed for discharging directly into forms and for



easy spotting on the job. Powered by a Model 9R6 Briggs and Stratton Air Cooled Gasoline Engine with the latest easy starting features, it is driven by a heavy roller chain on tooth sprockets. The disc wheels are equipped with Timken bearings and 5:50 x 16 tires. Two supporting legs provide a stabilizing 4-point suspension which prevents twisting strains.

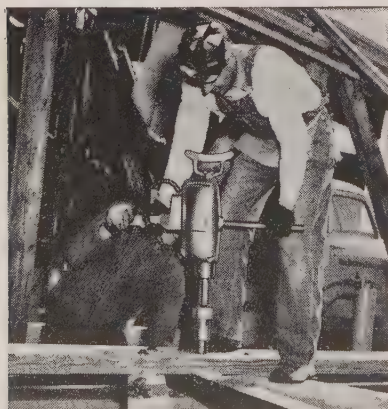
802

Four-Cylinder Compressor Unit

Manufacturer: Schramm, Inc., West Chester, Pa.

Equipment: Compressor unit with actual air delivery of 105 cu. ft.

Features claimed: The new unit has a 4-cylinder Schramm engine operating the



4-cylinder compressor. More than 90% of the engine parts are interchangeable with the compressor, reducing the necessity for carrying service parts to a minimum. The

unit is also equipped with the Schramm Pneumostat assuring variable speeds and the elimination of continuous loading and unloading. Simplified design has resulted in a rugged outfit capable of 4 hours of continuous service and the elimination of two staging and intercoolers.

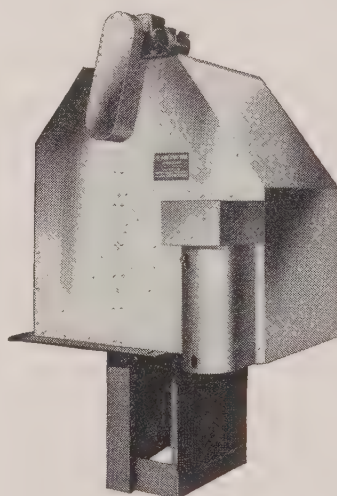
803

Mechanically Cleaned Bar Screen

Manufacturer: American Well Works, Aurora, Ill.

Equipment: Mechanically cleaned bar screen with grinder for sewage plants.

Features claimed: The Unit Screen is fully automatic, and is adaptable for minimum channel widths and settings or for parallel multiple installations for large



flows. The smooth steel frame is easily inserted into slots formed in concrete channel walls, with only 4 bolts to mount the screen on the operating floor. It is designed for channels from 2 ft. 6 in. wide to 5 ft. wide, with minimum depth setting at 2 ft. 6 in. A special feature of the unit is the pivoted rake which causes the teeth to enter the bottom of the screen bars horizontally. The rake immediately gets under and picks up all the screenings from the bottom of the screen; it does not push them away to pile up in front of the bars out of reach of the rake. As the rake rises at a point just above the tray slide, it automatically drops and withdraws 45 deg. radially.

804

Line of Heavy Duty Trucks

Manufacturer: General Motors Corp., Detroit, Mich.

Equipment: Complete line of truck models, including 61 basic gasoline and Diesel models with gross combination weights up to 90,000 lb. for vehicles used in off-the-highway operation.

Features claimed: Generally, the new models feature more powerful engines, stronger chassis and roomier cabs, and massive new functional design that makes

them "big brothers" in appearance. GMC's light and medium duty models number of new models have been added to the line to meet the requirement of certain specialized hauling operations. There are new high-speed tractors for fast freights: the "640" series with a 177-hp. engine and the "740" series with a 190-hp. engine of the 4-71 Diesel power plant. There are new gas and Diesel 6-wheelers with gross vehicle weight ratings ranging from 38,000 to 75,000 lb. for logging, concrete mix, oil field work and other extra heavy jobs. For operators in states with short-length limitations, GMC offers a new high-powered "900" series with distance from bumper to back of cab shortened approximately 1½ ft. Featuring the new line are five new gasoline engines, including a big new power plant of 707 cu. in. piston displacement, providing gasolene power for models heretofore exclusively Diesel. Prices of the new "H" models include needed items of equipment which in general practice now, are added to the base price.

805

New Type Buffer Drum

Manufacturer: American Diamond Saw Co., Portland, Ore.

Equipment: Split drum, cushioned with rubber, to accommodate standard wheel abrasives.

Features claimed: The halves of the split drum are locked into a solid drum by a cone type washer. The abrasives in roll form are wrapped around the drum and secured in place by pins that recede out of the drum when the cone washer is tightened down. During buffing, grinding, etc., the wheel never loses diameter and never needs dressing. Abrasive cloth in various grits can be quickly interchanged on the same drum to accommodate rough or fine work.

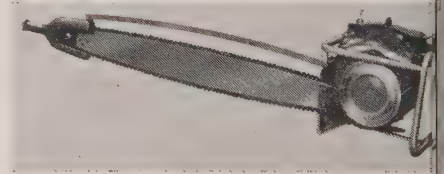
806

Gasoline-Driven Chain Saw

Manufacturer: Reed-Prentice Co., Worcester, Mass.

Equipment: Portable power saw especially designed for rapid cutting of heavy timber by contractors.

Features claimed: Powered by a 2-cylinder 4.2-hp. engine, the two-man Timberline



"36" features an anti-friction ball-bearing idler at the helper's end which provides greater use of the horsepower produced and insuring faster cutting. With parts of cast aluminum and complete with guide bar, chain, guard and helper's end, the saw weighs only 65 lb. A diaphragm-type carburetor enables the engine to operate in any position without stalling. The narrow guide bar eliminates binding.

807

Front End Loader

Manufacturer: Drott Mfg. Co., Milwaukee, Wis.

Equipment: Tractor mounted loader with many attachments.

Features claimed: Manufactured in two models (Model 35 for mounting on the

ernational T or TD-9 or the Allis-Chalmers HD-5, and the Model 60 for mounting on the International TD-14 or the Allis-Chalmers HD-7). The Drott Skidloader can be fitted with a log-loading rack, a general purpose bucket, a bulldozer blade, a reversible snow plow or a V-type plow. The load can be lifted through a 160-deg. radius up to 12½ ft. (for the Model 60). With the bucket attachment, the hydraulically-controlled bucket wiggles into the dirt with a 12,000-lb. break-out force, and a prying action is used to break the load out of the cut. The weight is on the loader shoes, not on the tractor.

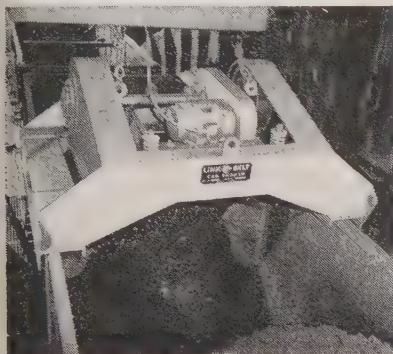
808

Vibrator for Unloading Freight Cars

Manufacturer: Link-Belt Co., Chicago, Ill.

Equipment: Car Shaker for the rapid unloading of materials from open-top, hopper-bottom gondola cars to conventional track hoppers serving bulk materials conveying equipment.

Features claimed: The vibrator unit eliminates the use of picks, augers, sledges or



air hammers to shake material loose from the car, and its low-frequency vibration imparts no greater stresses to cars than does their rolling along the road bed. Normally, one to 3 min. is all that is required to unload a car. Upon completion of unloading, the Shaker is hoisted out of the way and ready for another car. Weighing 9,500 lb., the Shaker is powered by a 20-hp. electric motor.

809

Split Ring Timber Connectors

Manufacturer: Marsh Co., Hastings, Neb.

Equipment: Timber connectors in 2½- and 4-in. diameter sizes.

Features claimed: These rings are true circles, precision-made from mild strip steel. The edges are rounded so installation in the grooves can be made smoothly and quickly. Previous to this time the entire supply had been allocated to government construction, but they are now available to the trade.

810

Primary Crusher

Manufacturer: New Holland Mfg. Co., New Holland, Pa.

Equipment: New model 3030 New Holland Double Impeller Breaker.

Features claimed: This is the second breaker now produced by New Holland for handling any stone passing a 30-in. opening. New design of the second model permits the feeding of longer slabs without bridging. Major change is the relocation of the adjustable breaker bar over one of the twin impellers in the breaking cham-

ber. The present model has the bar directly over each impeller and a vertical path. The new model has a relocated bar over the impeller opposite the feed chute. Adjustable upward and outward, the bar moves to permit feeding of much longer material.

811

Small Portable Batching Plant

Manufacturer: Gar-Bro. Mfg. Co., Division of Garlinghouse Bros., Los Angeles.

Equipment: Batch plant that will charge a ½-cu. yd. or 16-S mixer and can handle material requirements which vary from job to job.

Features claimed: Essentially the plant consists of a standard center discharge hopper mounted in a steel frame sufficiently high to carry a 24-cu. ft. or 3,000-lb. batcher underneath. From two to six of these units can be assembled to make up a portable batching plant of any number of compartments and of almost any capacity desired. To permit skidding the plant about as a single unit on a job, an 8-in. channel skid is provided to which the units can be bolted. The plant can be moved as a whole from one job to another, with any number of units bolted together. By removing a few bolts, it can be moved as separate, single-bin units.



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Wood Tractor Co., Portland, Oregon

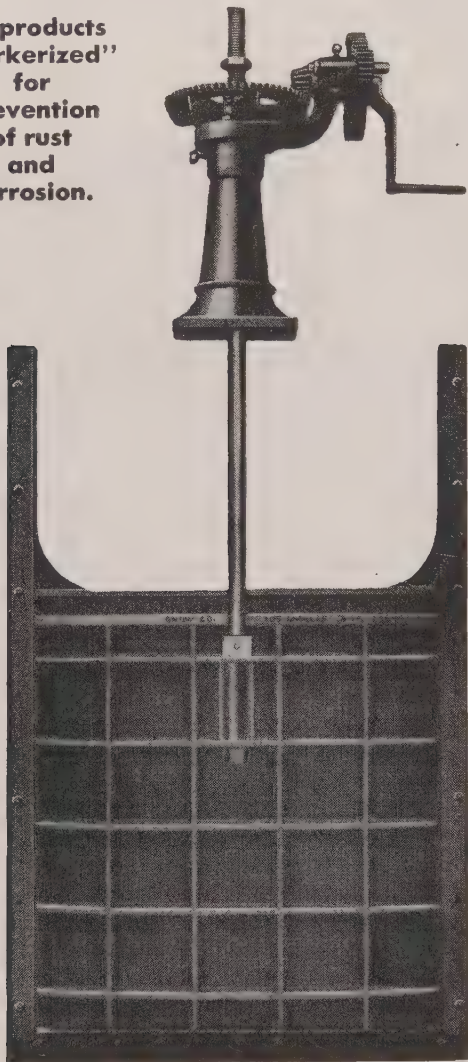
Electric Tool & Supply Co., Los Angeles, Calif.
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Seitz Machinery Co., Billings, Montana

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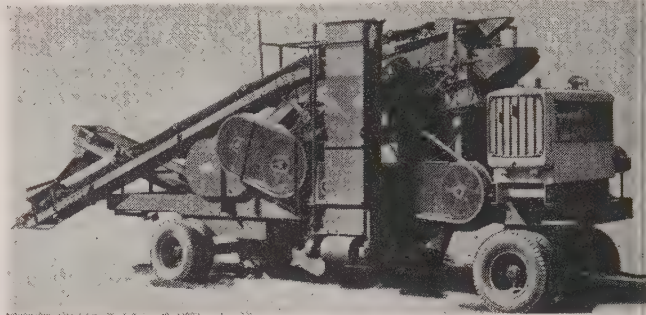
812

Small Crushing Plant

Manufacturer: Pioneer Engineering Works, Inc., Minneapolis

Equipment: Portable gravel crushing and screening plant.

Features claimed: Designated as the 17-V, this new small plant incorporates all features of Pioneer's larger "Bottom Deck Feeder"



plants. New features include a swivel-type feeder conveyor 6 ft. 6 in. overall height; all drives on the plant proper either V-belt or tumbler shaft and gear box, and delivery conveyor that feeds at the side. The jaw crusher is 10 x 16, and the roll crusher is 24 x 16. A 30-in. by 8-ft., 3½-deck vibrator screen provides 400 sq. ft. of effective screening area. The chassis is two-axle with 14.9:00 x 20 tires front and rear.

813

Crane Carriage

Manufacturer: Keystone Driller Co., Pittsburgh, Pa.

Equipment: Self-propelled mounting for all makes of cranes from 10 to 25-ton capacity.

Features claimed: Propulsion power for the Keystone Crane Carriage is obtained through the travel clutches and vertical transmission shaft of the crane. The carriage is equipped with 4-speed transmission with a speed range of 2 to 10 mph. in either direct or reverse. There is complete control of the entire machine from the operator's seat in the cab, regardless of its position on the carriage. Short turning radius for narrow roadway and air-operated brakes on all wheels are other features.

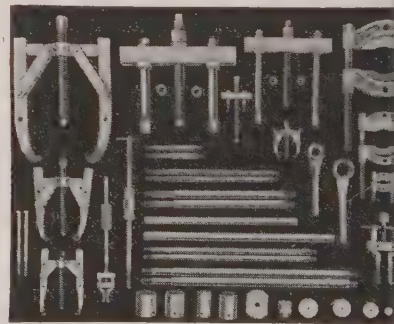
814

FWD Essential Service Set

Manufacturer: Owatonna Tool Co., Owatonna, Minn.

Equipment: Set of essential tools for servicing Four Wheel Drive truck models.

Features claimed: Developed in cooperation with Four Wheel Drive service engineers, the set contains tools for the following operations: Removal and installation of gears, bearings, wheels, skeins, shafts, collars, bearing outer races, etc. The tools will work equally well on other makes and models of trucks and will not become obsolete with each model change.



815

Closed Diaphragm Pump

Manufacturer: Chain Belt Co., Milwaukee, Wis.

Equipment: Four-inch pump with a capacity rated at 6000 g.p.m. per hour with a 10-ft. suction lift.

Features claimed: The pump, weighing only 440 lb., is of welded steel construction and has no castings. It has an enclosed gear case with hellicoid-type, cut gears mounted on ball bearings. The crank arm has needle bearings and a shear pin, which is a safety measure protecting the gears and power unit in case of abnormal overloads or severe clogging. Changing the diaphragm on the pump is quick and simple. The pump opens like a pair of scissors and four wedges knock out of place, involving no turning of lifting. Other features include a handy cleanout opening and 3¼-h.p. air-cooled motor.

Attachment to Lift Loads Into Trucks

Manufacturer: Stratton Equipment Co., Cleveland, Ohio.

Equipment: Loader platform operated by a hydraulic mechanism actuated from the power take-off of the truck transmission.

Features claimed: The Stratton Hydro-Loader lifts the load to the exact height desired, and carries the operator along with



the load. The operator raises and lowers the loader platform by finger-tip control to a height of 7 ft. When not in use, the attachment lies flat against the side of the truck, adding only a few inches to the width of the truck. Two models are available, with 50 and 1500-lb. capacities.

817

Perforated Dragline Buckets

Manufacturer: Pettibone-Mulliken Corp., Chicago, Ill.

Equipment: Buckets claimed to be more than 20% lighter than other makes.



Features claimed: The buckets are of welded construction with 14% manganese steel for the lip and socket point-type teeth, sheave, wire rope sockets and dump link chains. Design and construction features are claimed to give the buckets the widest set corner teeth and sharpest cutting edge, requiring only $\frac{2}{3}$ of the drawbar pull of the average bucket,

and only $\frac{2}{3}$ of the distance of the average bucket required for filling. They are available in sizes from $\frac{3}{8}$ to 2-cu. yd. capacities.

818

Magnetic Sweeper for Roadways

Manufacturer: International Diesel Electric Co., Inc., Long Island City, N. Y.

Equipment: Electro-magnet sweeper mounted on a 4-wheel trailer.

Features claimed: Briefly, the unit consists of a 4-cylinder gasoline engine driving a $7\frac{1}{2}$ -kw. D.C. generator which furnishes the electric power to energize the magnet pick-up. The magnet, covering an area of 26 x 96 in., is suspended by spring hangers which provide rigid support when the trailer is suddenly accelerated. The trailer assembly is of sturdy construction to support the equipment, and a steel angle drawbar for attaching to truck or tractor.

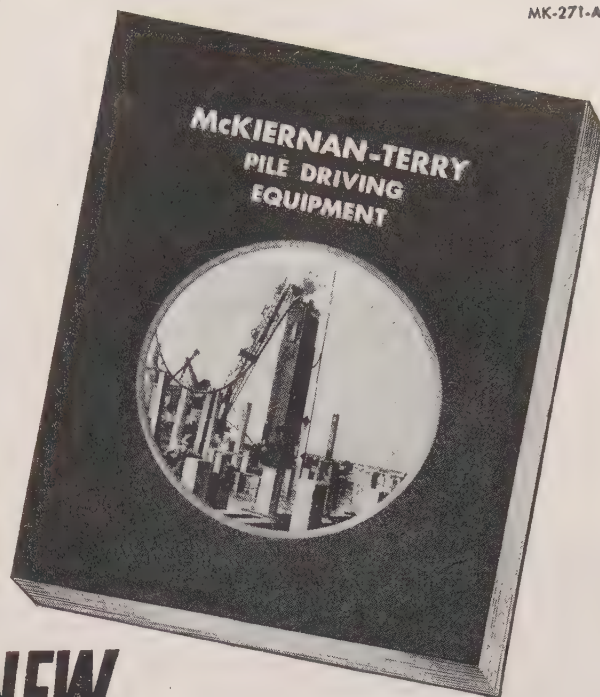
819

Hydraulic Floor Crane

Manufacturer: Stratton Equipment Co., Cleveland, Ohio.

Equipment: Portable crane that can double as a truck loading crane and a towing crane.

Features claimed: The active operating unit of the Stratton Hydro-Crane can be easily detached from the portable



NEW

Complete Manual On PILE-DRIVING EQUIPMENT

This 120-page catalog is the latest word on the selection, application, operation, and maintenance of pile driving equipment of all types.

In it you will find complete specifications and engineering data on McKiernan-Terry double-acting and single-acting pile hammers, double-acting pile extractors and pile-driving rigs, together with 140 photographs of pile driving equipment at work on all types of piles and all types of jobs.

The information in the manual will enable you to pick out the right pile driving equipment for each of your jobs, and will give you many ingenious, practical ideas for saving time and expense in your pile driving work, based on the successful experiences of other contractors and engineers.

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PILE HAMMERS AND EXTRACTORS

base on which it normally operates as a floor crane, and then it can be quickly mounted on the bed of a truck, into a heavy-duty sleeve, where it has a 360 deg. turning radius to load effectively on either side or back of the truck. With the addition of tow guide rods and a floating bar, the model operates as a towing crane adequate to meet the demands of most towing jobs. One- and two-ton capacity models are available.

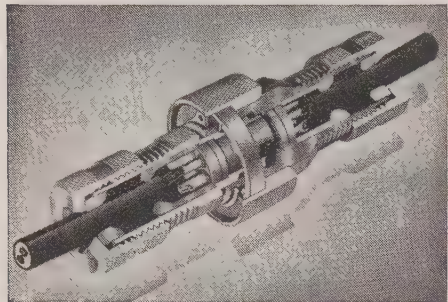
820

Waterproof Electrical Coupling

Manufacturer: Roylon Inc., Glendale, Calif.

Equipment: A quick-disconnect electrical coupling for all-weather and submarine applications.

Features claimed: Designed to meet requirements when an electrical connector is needed that is quick acting and impervious



to moisture and capable of withstanding long periods of complete immersion under high external pressure without leakage, this coupling has withstood many months of

submergence tests conducted on U. S. Navy equipment. The quick disconnect principle employed is the same positive acting, vibration-proof type of quick connection exclusive with Roylon Couplings. A quarter turn is all that is required to make or break the coupling and no tools are required. A wide selection of standard (Army-Navy type) electrical inserts are available.

821

Rock Pulverizer

Manufacturer: Lippman Engineering Works, Milwaukee, Wis.

Equipment: 32 x 36-in. pulverizer for production of road aggregate.

Features claimed: Engineering features of Lippman's new pulverizer includes non-choke steel angle feed chute, expanding crushing chamber, spider-type congestion relieving rotor, forged hammer arms, 4-edge wear abrasion resisting steel grate bars, one-piece 4-edge gear hammers, and manganese abrasion resisting steel armored wearing surfaces. In addition, a large feed opening permits the entrance of extremely large rocks for primary reduction purposes. The grate bars can be removed for production of road aggregate.

822

Self-Priming Centrifugal Pumps

Manufacturer: The Deming Co., Salem, Ohio.

Equipment: Six stationary models with capacities from 10 to 300 gal. per min. against heads up to 250 ft.

Features claimed: Priming is fast, automatic and reliable. A positive, non-siphon-

ing feature assures automatic repriming regardless of the amount of back-wash suction line surge encountered when pump stops. Semi-enclosed, non-clog type of impeller permits passage of up to size solids encountered in dewatering service. The impeller is adjustable for wear. Stationary models are equipped with electric motors of proper characteristics.

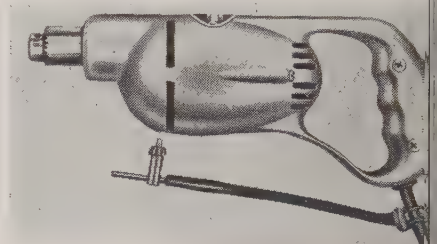
823

Utility Drill

Manufacturer: Cummins Portable Tool Co., Chicago, Ill.

Equipment: Streamlined ¼-in. drills, specially designed for use around the shaft.

Features claimed: The drills (three different models available) are of die-cast



minimum construction for compactness and light weight. The natural grip handle is positioned to fit the hand comfortably. Precision-cut gears have a steel pinion integral with the armature shaft and an extra-wide chuck gear of tough alloy metal. The switch is recessed in the top of the handle to prevent accidental starting of the tool while laying it down. Capacity is ¼-in. in metal and ½ in. drills for wood.

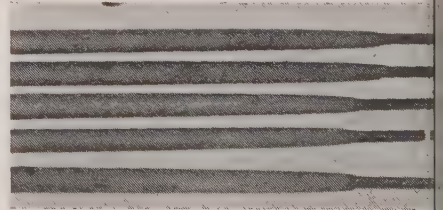
824

Hard Facing Rod

Manufacturer: Wall Colmonoy Co., Detroit, Mich.

Equipment: Hard facing electrode for extreme abrasion.

Features claimed: This hard facing is easy to apply on carbon or manganese



steel parts. It is available in 14-in. length and diameters of ⅛, ⅜ and ¾ in. Rockwell C. Hardness is 61 to 65, as deposited. It will not anneal under heat.

825

Clay Digger, Trench Digger, Breaker

Manufacturer: Worthington Pump & Machinery Corp., Harrison, N. J.

Equipment: Three newly-designed Breaker air tools.

Features claimed: The new tools feature refinements in design and manufacture and include a 4-bolt handle; built in lubricated replaceable bronze cylinder bushing; replaceable chuck bushing, and interchangeable handles. Two major advancements incorporated in the new design—a streamlined latch-type Retainer, enabling trimming and breaking in close quarters without damaging the retainer fulcrum pin—cause there are no side projections, and simple-metering-type valve which is unaffected by wear. The new design provides

arger bearing surfaces and shorter piston travel, lengthening the expected life of the tools.

826

Cylinder Liner Puller

Manufacturer: Owatonna Tool Co., Owatonna, Minn.

Equipment: Liner puller for both wet and dry sleeves.

Features claimed: The revised model of TC No. 970 Universal Sleeve Puller will



pull sleeves on more than 200 makes and models of trucks and tractors. The tool is adjustable to provide clearance regardless of the position of cylinder studs and to simplify centering of the tool over the bore. The long, fine threaded screw and a heavy thrust bearing eliminate friction and provide a steady pull.

827

9-Lb. Engine Developing 4 H.P.

Manufacturer: Homelite Corp., Port Chester, N. Y.

Equipment: Air-cooled 4-hp. engine weighing 19 lb. complete.

Features claimed: The new No. 20 Homelite Engine uses die-cast aluminum alloys for all major castings. Two-cycle design permits a minimum number of moving parts. There are no exhaust valves, and only one rotary intake valve which is self-heating and requires no adjustment. The engine speed is controlled by a built-in governor, which is part of the rotary intake valve. The engine can be used either horizontally or vertically, developing 4 hp. at 4000 rpm.

828

Hydraulic Straight Dozer

Manufacturer: Wm. Bros Boiler & Mfg. Co., Minneapolis, Minn.

Equipment: Dozer designed for the International TD-14 wide gauge tractors.

Features claimed: This new Bros dozer is completely tractor main-frame mounted, providing a standard gauge blade for a wide gauge tractor, making possible full utilization of tractor power without overload. The blade is held in any dozing position because of the holding force of the hydraulic rams which is applied directly to the blade. This direct application of hydraulic power eliminates the heavy beam type of structure required by remote direct-lifts. The hydraulic unit is the La Plant-Choate self-contained package. The dozer has been field tested and approved by International Harvester Co. engineers.

829

Measuring Tape on a Wheel

Manufacturer: Co-Jay Corp., Los Angeles, Calif.

Equipment: Wheel with fixed measuring tape for taking fast measurements over terrain.

Features claimed: When the Rolatape is used, the back edge of the wheel is placed at the starting point. Grasping a convenient telescoping handle, the user simply rolls the wheel along until its front edge reaches the destination. The figure indicated on the tape by a pointer is then added to the footage registered on a recorder at the side of the wheel to determine the total distance

measured. The Rolatape is equally efficient in making measurements of objects and structures.

830

Highway Mower

Manufacturer: Oliver Corp., Cleveland, Ohio.

Equipment: Hydraulically-operated mower for use with the Oliver industrial wheel-type tractors.

Features claimed: The hydraulic pump on the unit operates the power hydraulic curb and bar lift which gives the mower a curb lift minimum of 18 in. and a bar lift which makes it possible to operate the cutter bar in a position 50 deg. below horizon-

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tal to 95 deg. above horizontal. In addition, a hydraulic motor operates the cutter bar unit which has 3-in. underserrated sections and heavy-duty rock guards.

831

Device for Locating Leaks in Pipes

Manufacturer: American Pipe & Steel Corp., Alhambra, Calif.

Equipment: Tester operating on the vacuum principle.

Features claimed: For operating the tester, seams of the pipe are covered with soap suds. An inspection box, with clear glass top and soft rubber base, is laid over the seam. A powerful vacuum created within the inspection box draws air through any leaks causing soap bubbles to form. These are clearly visible through the glass top. The testers are available in a wide variety of sizes and shapes for inside corners, outside corners, circumferential seams and straight seams.

832

Twin Oxy-Acetylene Hose

Manufacturer: B. F. Goodrich Co., Akron, Ohio.

Equipment: Two lengths of hose, one red and the other green, joined by a thin strip of rubber.

Features claimed: Duo-Weld has smooth molded finish cover. Reinforcement consists of one braid of high tensile hawser cord cotton yarn which in the 3/4-in. size gives strength comparable to the standard two-braid single line construction. The rubber strip joining the two hose lengths allows the hose to be separated into single lengths, when that is desirable, without

tearing into the cover of either length. The hose is being made in lengths of 50, 25 and 12 1/2 ft.

833

Line of Chain Saws

Manufacturer: Mall Tool Co., Chicago, Ill.

Equipment: Six new models of the Mall Chain Saws and four improved models.

Features claimed: Illustrated is the new Mall one-man Model 12 gasoline engine chain saw, one of the "Big 10" line of Mall



sawing equipment. In the line now are types of chain saw designed specifically for almost any type of application. Pneumatic electric and gasoline engine power units make the saws available for use on any job. For further diversity, bow saw attachments are available for all except the smallest air and electric saws.

834

Diesel Engines

Manufacturer: Hercules Motors Corp., Canton, Ohio.

Equipment: Two new models, the DIX4B and DIX4D, both closed type power units.

Features claimed: To meet a demand for broader application of the "DIX4" Series

of 4-cylinder Diesel engines, Hercules presenting these two models. The DIX4B is 3 3/4-in. bore x 4-in. stroke a piston displacement of 133 cu. in. The DIX4D is 3 5/8-in. bore x 4-in. stroke has a piston displacement of 166 cu. Both models are the solid injection, compression ignition, 4-stroke cycle type. They are designed for high speed, heavy service. They have exceptional characteristics that are maintained at a high level over a wide range of speeds. They start quickly and easily on fuel with a conventional electric starter.

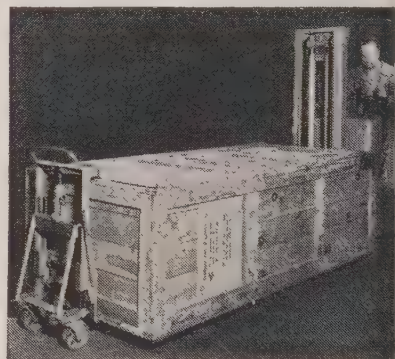
835

Lifting and Rolling Device

Manufacturer: Elwell-Parker Electric Co., Cleveland, Ohio.

Equipment: Hand-operated auxiliary power trucks to move extra heavy loads.

Features claimed: The Rol-a-Lift combines a lifting and rolling mechanism in unit as an auxiliary unit for use with company's fork trucks. The unit has a pair of handles, a pair of forks 5 in. long, 16 in. apart, and a pair of swivel wheels. A hydraulic jack is mounted on



steel frame. The operator pushes the unit under the forward end of the load and it by means of the jack to any needed height up to 9 1/2 in. after the power truck has engaged the opposite end of load. The unit is built in four models for loads up to 8000 lb.

836

Electric Drill

Manufacturer: Mall Tool Co., Chicago, Ill.

Equipment: The Model 540A 1 1/4-in. capacity electric Mall-Drill.

Features claimed: The new drill is specially designed and engineered for all types of heavy construction and maintenance work, and is a time saver for drilling in steel and wood, and driving lag screws, running nuts. Special construction features include a heavy-duty Universal motor, 115-volt AC-DC, also 230 volts; an interlocking reverse switch, detachable side handle, Timken roller bearings, a Morse taper, and a 150 rpm. triple speed reduction. Optional equipment for the drill includes a 5/8-in. Jacobs chuck, and a clutch that can be set for predetermined pressures.

837

Tractor-Drawn Scraper

Manufacturer: Wooldridge Mfg. Co., Sunnyvale, Calif.

Equipment: Model TC-142 scraper, 14.2 cu. yd. capacity truck and designed to withstand the heavier stresses imposed by today's more powerful tractors.

Here's the *Proof* of Preference for WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINES

✓ 4 Out of 10 Carburetor Type Engines made in 1947 in 2 to 30 H.P. Range were WISCONSINS!

According to an official bulletin issued on April, 22, 1949 by The Bureau of Census, Dept. of Commerce (Preliminary Industry Report, Series MC-31D, covering the production of Internal Combustion Engines for the year 1947) 40.2% of all carburetor type engines within a cu. in. displacement range from 11.0 to 175.9 were Wisconsin Air-Cooled Engines.

The summary includes data received by the Census Bureau from 134 engine manufacturers. The tabulation of the 9 groups within the above displacement range, representing 528,063 units, allocates 212,174 units to Wisconsin, or an average of 40.2% of the total production.

These figures speak for themselves . . . in terms of outstanding preference for Wisconsin Air-Cooled Engines among power users in all fields.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines
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Features claimed: Comparative tests of the TC-142 show faster loading characteristics than previous models as a result of new 3-piece cutting edge. A wider 65-in. front apron opening and newly-designed curved bowl ejector have been added to achieve faster complete discharge of load. High yoke and ground clearance have been achieved, together with low center of gravity, short wheel base and equalized weight distribution to permit increased stability and maneuverability over all types of ter-



min. Basic Wooldridge design features have been maintained, including pivot-tilt forced ejection, rear-draft fulcrum leverage, pivoting bowl loading and replaceable side cutter blades. Cable is easily accessible and reeved in simple straight lines over a minimum of sheaves located away from load for maximum cable life. Overall height with blade on ground, 10 ft., 9 in.; overall width, 11 ft., 6 in.; overall length with bumper, 35 ft., 2 in.; approximate weight, 8,400 lb.

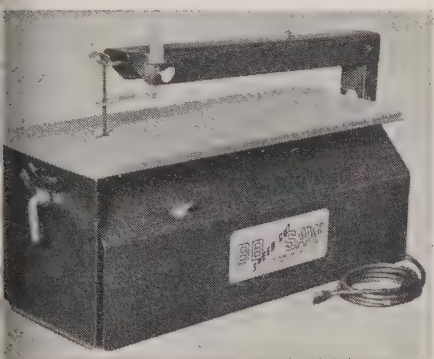
838

High Speed Jig Saw

Manufacturer: Beebe Bros., Seattle, Wash.

Equipment: BB Speed-Cut Saw.

Features claimed: The saw has an enclosed steel cabinet, patented full-length



cutting table with handy front-end lock and quadrant, wide-leaf upper and lower tension springs, patented incutting arc and a direct drive from the 3/4-hp. General Electric motor to the blade. Weighing less than 1 lb. complete with motor, the cutting capacity is up to 2 in. for wood. It will also cut soft metals, plastics, fiber, bakelite, etc. Two models, with 18- and 24-in. throats.

839

Painting Tool

Manufacturer: The Rubberset Co., Newark, N. J.

Equipment: New tool which rolls paint on flat surfaces in a fraction of the time needed for ordinary brush application.

Features claimed: The product has a 1-in. diameter tubular handle which holds more than a half pint of paint under pressure. A slight movement of an adjacent arm opens a valve permitting the material

to flow to the 4-in. roller. Holes in the center of the roller direct the paint into a seamless wool pile cover which envelopes the roller. The "Flo-matic" is made for use on walls, ceilings, floors, tanks and all flat surfaces, and can be used for either interior or exterior work on both rough and smooth surfaces.

840

Self-Priming Centrifugal Pump

Manufacturer: The Deming Co., Salem, Ohio.

Equipment: Pump equipped with a 1 1/2-hp. air-cooled gasoline engine.

Features claimed: The pump has iron casing, bronze impeller mounted directly on the engine shaft, and a mechanical type shaft seal which eliminates the need for stuffing the box and packing gland. Pipe connections are 1 1/2 in. suction and 1 1/2 in.

discharge. Dimensions are: length, 20 in.; width, 13 in.; height 19 in., and net weight, 83 lb. Performance ratings of this pump range from 10 g.p.m. with 80-ft. head to 90 g.p.m. with 15-ft. head.

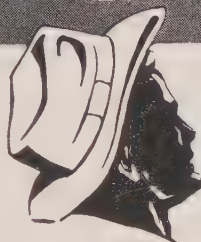
841

Half-Yard Shovel Crane

Manufacturer: Link-Belt Speeder Corp., Chicago, Ill.

Equipment: Shovel-crane convertible for operation as a shovel, trench hoe, lifting crane, dragline, clamshell or pipe driver.

Features claimed: The Model LS-51 is equipped with the well-known Speed-o-Matic full hydraulic controls. Changing from one attachment to another is quickly accomplished with only slight changes in the machinery. The front drum lagging used in dragline and other cable operations is interchangeable with a split sprocket



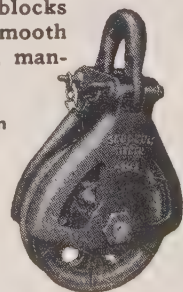
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- KIND OF BEARINGS

Choosing the right block will cut operating costs, time lost in breakdown, and in replacing blocks. The right block will make your whole operation last longer. Years of experience have given the Skookum Co. the know-how to make quality blocks. Today Skookum is the leader in the field. Skookum blocks feature: wide throat to reduce line wear, smooth lines that prevent fouling, Timken bearings, manganese sheaves, annealed cast steel sides.

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used in connection with the Independent Positive Chain Crowd on shovel operations. The Independent Rapid Boom Hoist provides hoisting and lowering of the boom under power of the engine. For balanced rotation without slippage or uneven wear, the LS-51 has hook-type conical rotating rollers, individually mounted and adjustable, travelling in a roller path 53 inches in diameter, providing unusual stability. Maintenance is materially simplified by interchangeability of such parts as front and rear drum clutches, the boom hoist clutch and the swing and travel clutches.

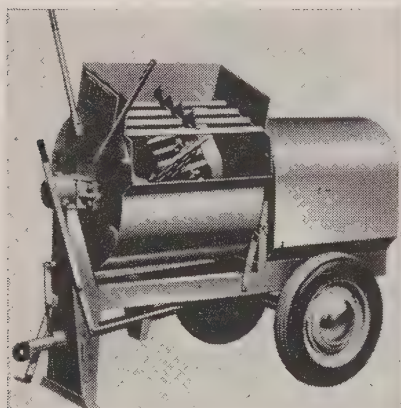
842

Plaster and Mortar Mixer

Manufacturer: The Jaeger Machine Co., Columbus, Ohio.

Equipment: Tilt-type mixer with mixing drum and power plant entirely separate.

Features claimed: This new Jaeger mixer is of 6-cu. ft. capacity and will handle up to 40 shovelfull of sand. Construction is rugged, for heavy-duty service, without ex-



cess weight, and the unit is readily maneuvered about on the job. Loading is made easier by a still lower loading height. Easy and exact control of discharge is assured by its balanced mixing drum which is mounted on Timken tapered roller bearings and has long, full-leverage control handles. In addition to exact handlever control of discharge at any point in the arc of the drum's tilt, two fixed discharge positions are offered: 24 in. for wheelbarrows, 17½ in. for mortar boxes. A safety grate over the mixing drum opening, which also serves as a sack holder and cutter, swings aside for complete and instant access to the mixer blades and drum interior. When cleaning,

all flush water and waste can be instantly discharged by a full tilt of the drum. There are four sets of mixing blades.

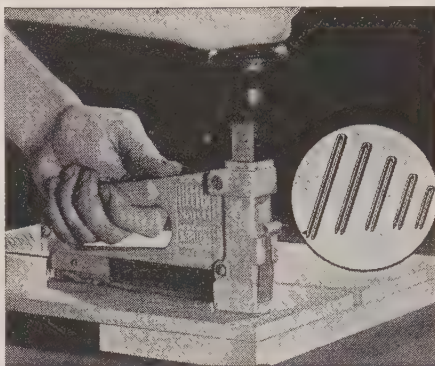
843

Portable Nailer

Manufacturer: The Heller Co., Cleveland, Ohio.

Equipment: Hand-operated nailer with an automatic feeder that is claimed as four times faster than ordinary nailing.

Features claimed: The Heller lock-nail drives and countersinks with one blow. Precision made with tool-steel mechanism, the machine will withstand constant pro-



duction line duty. Without skill or experience, the worker gains precision as well as speed with the nailer. It drives Heller lock-nails that have greater holding power than ordinary nails and will not split the wood. The machine holds over a hundred lock-nails at a time that come adhered in one long strip for fast loading. Lock-Nails come in several sizes from ⅞ in. to 1½ in. long.

844

Rubber Tired Attachment for Adnun

Manufacturer: The Foote Co., Inc., Nunda, N. Y.

Equipment: Attachment for the Adnun Black Top Paver.

Features claimed: This device is made up of rubber-tired wheels which will replace the rollers under the rear of the Adnun which are supplied for laying black top. The Rubber Tired Stone Attachment should be used when laying stone or chips and it makes possible the development of the full effectiveness of the 4-wheel drive design of the Adnun. The device can be placed on any Adnun now in the field using the large steel rollers.

LITERATURE FROM MANUFACTURERS..

Copies of the bulletins and catalogs described in this column may be had by addressing request to the Western Construction News, 503 Market Street, San Francisco 5, California.

845

THE McCLOSKEY STORY — Closkey Company of Pittsburgh, Pa., a new 8-page illustrated catalog describes the Rigidsteel design principle for economical building construction. How Rigidsteel design affords speedy construction without a network of trusses, with particular applications for industrial, public and commercial buildings, is fully discussed in the booklet. A list of some of the companies for which Rigidsteel buildings have been designed and erected is also given.

846

BAR SCREENS — American Works, Aurora, Ill., has published a Technical Supplement, MS 1-6, on mechanically cleaned bar screens. This is the first series of Technical Supplements which cover the entire line of pumping, water conditioning, sewage and industrial water treating equipment manufactured by American. The 6-page MS 1-6 supplement describes and illustrates the new AMERICAN mechanically cleaned screen grinder, the well-known heavy duty screen for larger installations, and construction foundation plans, exploded views, specifications.

847

POWER CONVEYORS — Lake Superior Engineering Co., Iron Mountain, Mich., announces the publication of an 8-page illustrated catalog No. 495, showing Tote lightweight, portable power conveyors for handling bulk materials and packaged goods. Included in this catalog are photographs, application and specifications covering Tote-All bulk conveyors, pack conveyors, combination bulk-and-pack conveyors and special machines.

848

GRID ROLLER — Hyster Company, Portland, Ore., has released an 8-page booklet in color covering the new Hyster grid roller, the latest addition to its varied line of auxiliary tractor tools. In addition to its use as an earth compactor for airports, dams, levees, fills, road build and other earth compacting projects, the Grid has another main purpose, that of salvaging and maintaining bituminous

L-O-N-G-E-R SERVICE LIFE IS SOLD WITH EVERY

Grit-proof bearings for Alemite lubricated center shaft minimize wear on hinge castings. Wide bearing surfaces also reduce wear and assure permanent shell alignment.

Owen hinge stop design holds bottom sheave block upright and broad counterweight is shaped to protect cables and sheaves from contact with abrasive materials. Yes, Longer Service Life is sold with Every Owen Bucket.

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A MOUTHFUL AT EVERY BITE



lacktop pavement. The book is well illustrated with pictures and diagrams as well as specification tables.

849

SNOW PLOWS — Baker Mfg. Co., Springfield, Ill. Bulletin 1002, the new 24-page Baker truck snow plow catalog, is off the press. It is complete with dimensions and specifications, is profusely illustrated with large views showing the design and construction of the complete Baker truck plows. This is an excellent book for the file of anybody interested in snow removal.

850

ENGINEERED EQUIPMENT—The Jaeger Machine Co., Columbus, Ohio, has available a new book covering their complete line of equipment. This 36-page catalog, known as GC-9, describes in text, by photographs and in tables each of the units manufactured by the company, and for ready use and simplification is divided under the headings of: "Sure-Prime" Pumps, "New Standard" Compressors, "Speedline" Building Mixers, "Hydro-Hoist" Hoists, Truck Mixers, and Jaeger Paving Machinery.

851

CATERPILLAR DIESELS IN INDUSTRY—Caterpillar Tractor Co., Peoria, Ill., has released a 12-page booklet presenting an informal question-answer format on the various problems confronting industrial power usage in the equipment field. Such questions as: "Higher personnel efficiency?" "Increased power output?" and "Improved material handling practices?" give the reader an opportunity to view the many applications of Caterpillar Diesel engines and earthmoving units as

they are used by various industrial firms throughout the country.

852

LUBRICATION—Farval Corp., Cleveland, Ohio, has available an eight-page booklet describing the Farval centralized systems of lubrication. The booklet features color drawings of the equipment in industrial use, and describes each installation.

853

VELOCITY-POWER DRIVER — Mine Safety Appliance Co., Pittsburgh, Pa., describes in their new bulletin how steel studs can be driven instantaneously into steel, masonry or concrete with the M.S.A. Velocity-Power Driver. In this 4-page bulletin No. TA-17, the manufacturer points to cost reductions up to 60% over conventional stud-placing methods by use of the M.S.A. Driver. Several illustrations show typical applications of the uses for which the M.S.A. Driver is employed.

854

SECTIONAL CONVEYORS—George Haiss Mfg. Co., Inc., New York, N. Y., announces publication of a new catalog illustrating and describing the new Haiss Sectional Conveyor, Model 487. This conveyor can be used with flat belt or trough belt on any type of portable or stationary mounting, elevating or horizontal. In addition to a general description, the new publication lists and describes the accessories, and also contains dimensions and specification tables.

855

SILICONE NOTES — Dow Corning Corp., Midland, Mich., has issued two publications. Silicone Notes No. D-5 on "Dow

Corning Silicone Greases" gives the properties, performance and uses of these heat stable and oxidation resistant silicone lubricants. High temperature stability is effectively demonstrated in a table of bleed and evaporation values for the silicone greases and various high temperature petroleum greases. Silicone Notes No. D-6 contains information on "How to Use DC 44 Silicone Grease in the Bearings of Electric Motors." It includes instructions for lubricating open and single shielded ball bearings, and relubrication schedules based on experience gained in developing DC 44 Silicone Grease.

856

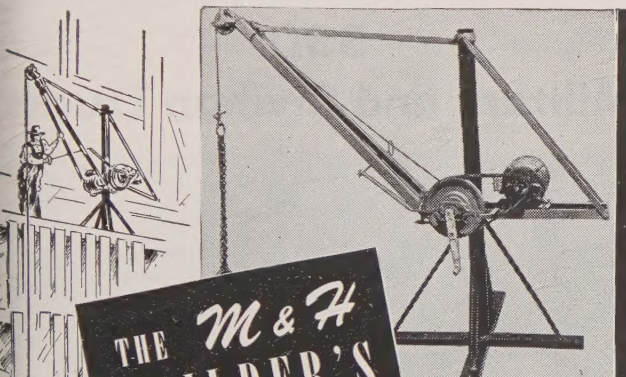
BANTAM PUMP — The Jaeger Machine Co., Columbus, Ohio, in their newly published Bulletin LP9 graphically describe their automatic-priming small pump. Coming in two models, No. 1½ AP is complete with 1½-hp., 4-cycle air-cooled, ball bearing engine, weighing 60 lb., aluminum, 90 lb., semisteel. Model 2 PAF is a 9,000-gal. aluminum pump weighing 105 lb. complete. This folder is well illustrated and should be of especial interest to all those contractors who need a small, compact and easy portable pump.

857

TRUCK SCALES—L. R. Murphy Co., Sacramento, Calif., designers and manufacturers of Murphy all steel motor truck scales has released a 4-page bulletin graphically describing the many features of this equipment. Also shown and described are the full capacity beam and type registering beam.

858

SPOT WELDER — Greyhound A. C. Arc Welder Corp., Brooklyn, N. Y., has



THE M & H BUILDER'S HOIST

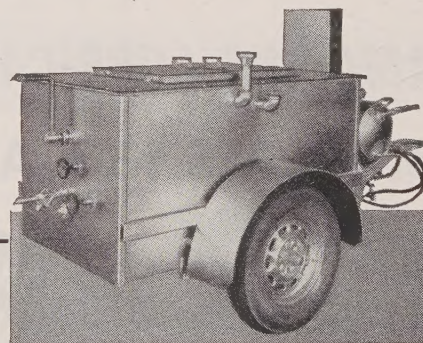
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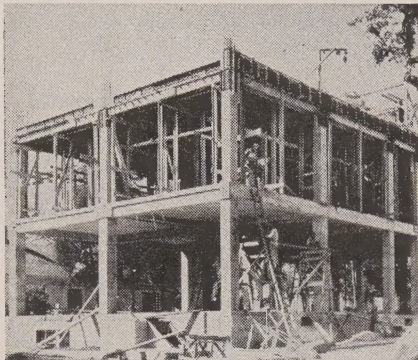
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Home Office • Des Moines, Iowa
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Denver, Colo.; Los Angeles, Cal.;
Decatur, Ga.; Dallas, Texas;

released a catalog sheet containing pictures and a description of their newest development in a completely portable and self-operating spot welder. Featuring several patented improvements over the company's 1948 portable model, the versatile new welding tool is described as the most efficient self-contained portable spot-welder. The unit is only about 23 lb., and is called the "Greyhound Portable Spot-Welder."

859

CATERPILLAR — Caterpillar Tractor Co., San Leandro, Calif., highlights in a 12-page, 2-color booklet recently released the workings of the world-wide organization of Caterpillar distributors and dealers. Titled "Let's Take a Look at Your Caterpillar Dealer," the booklet gives the reader an insight into the parts and service facilities afforded him by the distributor. Parts handling and service facilities of various distributor organizations is pictorially displayed.

860

TRANSITE PRESSURE PIPE — Johns-Manville, New York, N. Y. "Engineering Facts about Transite Pressure Pipe" is a new 12-page booklet recently issued by this company. It presents informative data about Transite asbestos-cement pipe covering such things as high carrying capacity, tight, flexible joints, its long life expectancy, and similar subjects of particular interest to engineers and others in the waterworks fields. Weights and dimensions are given in the back of the booklet.

861

SAVING TAX DOLLARS WITH CATERPILLAR — Caterpillar Tractor Co., San Leandro, Calif., have recently issued a 16-page booklet devoted to the

users of Caterpillar equipment concerned with public works. Governmental users, state, county, city and town, working roads, water supply, drainage, electric power or sewage disposal are limelighted in the publication. The booklet contains specifications on Caterpillar equipment for consideration of governmental officials.

862

ALLOY STEELS — American Brake Shoe Co., New York, N. Y. A new bulletin "Alloy Steels for Ball Mill Liners and Grates" has been released by the American Manganese Steel Division of this company. The 12-page booklet recommends the alloy steel or iron best suited to meet different impact and abrasion combinations which exist in grinding mill installations in ball industries, metal mining, non-metallic miners, and Portland cement production. Alloys covered in the bulletin include AMSCO standard austenitic manganese steel, AMSCO chromium-manganese steel, AMSCO chromium-molybdenum steel and ABK metal.

863

TRUCK NEWS — General Motors Corporation, Pontiac, Mich., has for distribution a fine multi-colored folder announcing an all-new line of 520-650 Series of GM heavy duty truck models. A table of specifications for each series appears, and many job applications are also depicted.

864

CONCRETE VIBRATORS — Chicago Pneumatic Tool Co., New York, N. Y., has published a 12-page illustrated booklet presenting authoritative information on subject of vibration of concrete. The booklet describes in detail the proper vibrator selection, the development of CP design

AN AMAZING LUBRICANT LUBRIPLATE 130-AA



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the advantages in its construction and care of the equipment. It is replete with many cuts of the equipment, both pneumatic and electric, and shows on the job applications.

865

SLOPE STAKE TO FINAL GRADE
—Caterpillar Tractor Co., San Leandro, Calif., has a new 16-page book entitled "Slope Stake to Final Grade with Caterpillar Equipment," presenting to the reader a detailed method of pioneering the land through application of machines engineered and designed for low cost clearing, short-haul work and initial cut performance. Highlighted in the book are cut-and-fill operations with tractor-scraper teams involving speedy long cycles and dividend performance of the ripper-scraper combination. Additional presentations of Caterpillar powered units adapted for draglines and shovels, compressors, rollers, force feed loaders and crushers, including final grading and finishing of road surfaces by Caterpillar Diesel motor graders, are included.

866

CONTRACTING WITH "CAT" — Caterpillar Tractor Co., San Leandro, Calif., features in the company's new 8-page booklet their forty years of experience in grader design. Under the title "Contracting with Cat Motor Graders," this new publication tells of various job applications tailored to this maintainer unit and offers the reader detailed and cutaway illustrations of Caterpillar transmission and Diesel engine power plant.

867

NEW FILM—Timber Engineering Co., Washington, D. C., has announced the availability, for free use by architectural and building groups, of a 16-mm. motion picture covering the mass manufacture and assembly of 3,500 timber connector equipped trussed rafters. The new film depicts in detail the quantity production methods used to fabricate, assemble and erect the new low-cost trussed rafter which has been used in over 17,000 housing units in the last three years. The picture is a single reel, black and white silent film, requiring 18 min. for projection.

FOR SALE

- 1—Buckeye Model RB Finegrader
- 1—Madsen Model 50 Oil Plant, 3,000 lb.
- 4—No. 11 Caterpillar Diesel Patrols
- 1—No. 12 Caterpillar Diesel Patrol
- 1—La Plant-Choate Model C86 Scraper
- 3—Half-Yard Badger Shovels
- 1—1½ yard Osgood Shovel
- 1—Jaeger Model CS20 Concrete Spreader
- 3—Terra-Cobras, Wooldridge 15-yard
- 1—Jaeger Model BP2A Bituminous Paver
- 1—Cedar Rapids Traveling Roadmix Machine powered with Caterpillar D-13000 motor
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