

Department of the Interior
Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 33

July, August and September 1960



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COVER PAGE

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OPERATION AND MAINTENANCE

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INTRODUCTION

The cleaning of clogged foundation drains is a problem on many projects where access to the drains is difficult. A method of attacking the problem used on Hungry Horse Dam in removing accretions of calcium carbonate from piping and diamond-drill holes 50 to 100-feet deep is described on Page 12. An article on Page 15 describing the use of prestressed concrete bridge members probably has some application on our projects. The use of the prestressed members has provided for economical and rapid construction. Something a little different in the way of mowers is now being used on the Tucumcari Project, Page 18. This piece of equipment includes a sickle cutter bar and a rotary mower mounted on a single tractor.

This bulletin, published quarterly, is circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. It is hoped that the labor-saving devices or less costly equipment developed by the resourceful water users will be a step toward commercial development of equipment for use on irrigation projects in a continued effort to reduce costs and increase operating efficiency.

To assure proper recognition of those individuals whose suggestions are published in this and subsequent bulletins, the suggestion number as well as the person's name is given. All Bureau offices are reminded to notify their Suggestions Awards Committee when a suggestion is adopted.

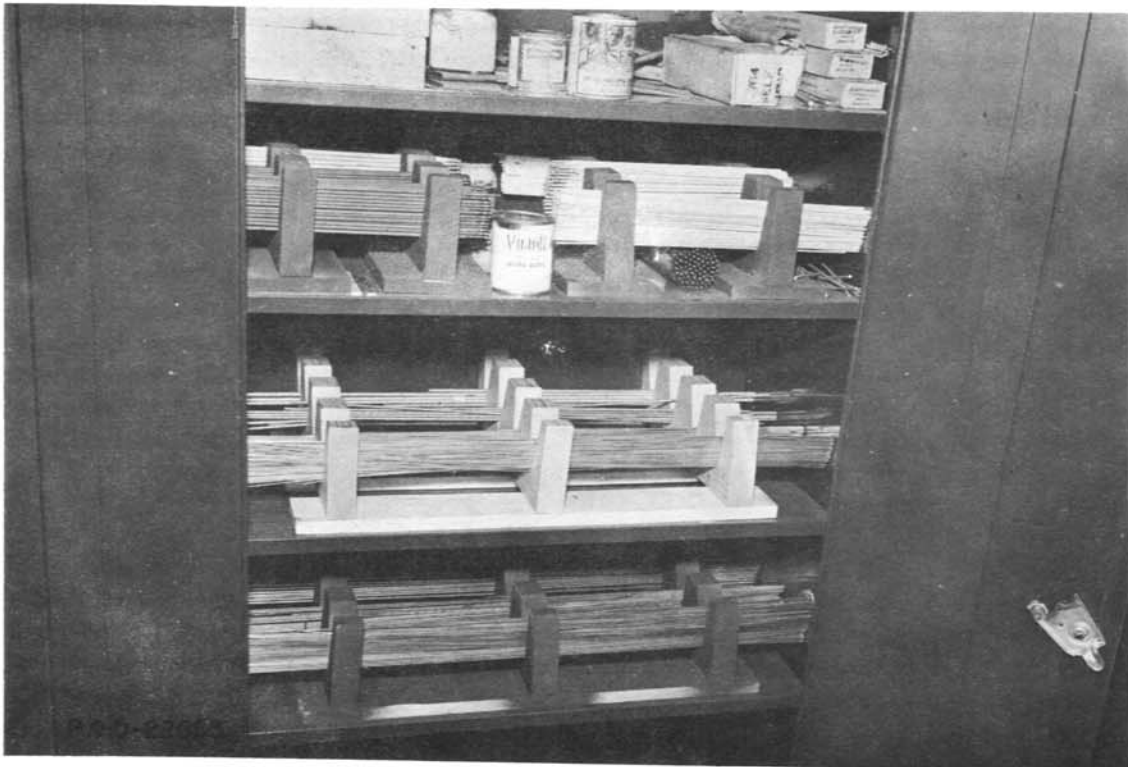
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Division of Irrigation Operations
Commissioner's Office
Denver, Colorado

WELDING ROD STORAGE (Suggestion R2-60-68)

Eugene H. Lee, Plant Mechanic, Folsom Operations, Field Branch, suggested, designed and installed the rack shown in the photograph below for welding rods in the welding shop locker. The racks are made of redwood with notches to hold rods of different lengths and sizes. The cost of construction of the racks in labor and material was approximately \$15.

The racks save time in locating the correct rod and keep the flux from being chipped off the arc welding rod.



* * * * *

EXTENDING THE LIFE OF WOOD POSTS (Suggestion No. R8-60-50)

The Government and the operators of irrigation projects are extensive users of wood posts for guard posts, guardrail posts, and fences. Quite often treated posts are not conveniently available, are not desirable because of painting requirements above ground, and are too expensive. L. E. Thompson, Canals Branch, Division of Design, Bureau of Reclamation, Denver, Colorado, suggests that a simple on-the-job method for providing

long post life can be accomplished by treating the soil used for backfill about the post with a wood preservative or soil disinfectant.

Post ends should be dipped in the preservative or sterilant prior to embedment. The disinfectant may be mixed with the soil prior to backfilling or poured onto the soil as the backfill is placed. The use of an oil preservative is advisable for shedding the water away from backfill mounded about the post. Backfill should be a mixture of clay, sand, and gravel to prevent heaving due to frost action, and to provide for a dense backfill free from shrinkage cracks. Following the post erection, the upper part may be coated as required.

The above measures have been used for more than 10 years without any deterioration to the embedded post ends. The cost per post (using pentachlorophenol with waste oil in the recommended proportions) is from 1/3 to 1/2 the cost of treating posts.

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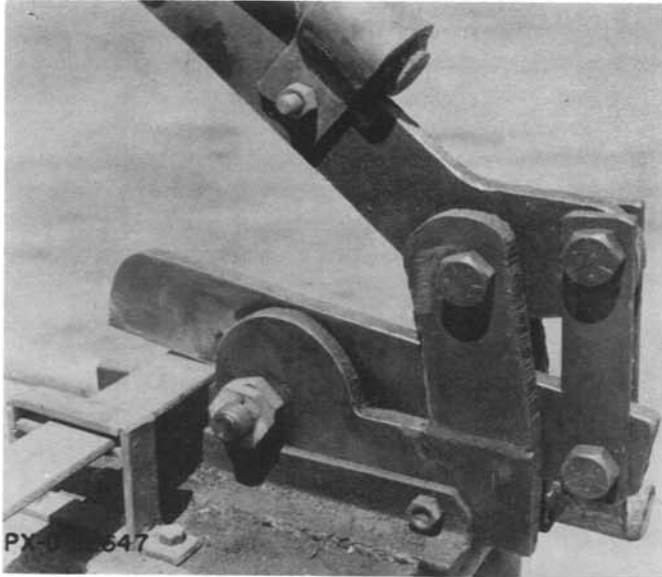
STEEL CUTTING SHEAR (Suggestion No. R2-60-40)

A requirement for approximately 500 quick-closing gate fasteners for installation on gates along the Friant-Kern and Madera Canals gave Frank W. Athos, Pipefitter, at the Fresno Operations Field Branch, Friant Unit, Central Valley Project, California, the idea to construct a steel cutting shear.



Each gate fastener required six cuts in 1/4" x 1" strap steel. Although the cutting could have been done by burning with a torch, it would require slagging and grinding each piece which was time consuming. Therefore, Mr. Athos fabricated the hand-operated shear at left capable of cutting up to 5/16" x 3" steel.

The jaws and frame of the shear proper were flame-cut from 5/8" steel plate. The cutting edge was hard-faced with a hardening type electrode which is resistant to abrasion and impact. A handle from an old canthook was attached and gives ample leverage to easily cut the strap steel.



The cutter, fastened to a stand 12" wide, 18" high and 5' long, was fabricated from 1½" scrap pipe.

The present shear shown in detail at left has made several thousand cuts and shows no wear. Using this shear, an operator can cut 5/16" x 3" straps at least five times faster than with an acetylene torch and the shear makes smoother and more accurate cuts.

* * * * *

LIFTING AND HAULING DEVICE (Suggestion No. R3N-60-3)

The shop-made lifting and hauling framework mounted on a flat bed truck shown in the photograph below replaces one truck and driver previously used in hauling supplies and heavy equipment parts, on the



P423-D-22658

Colorado River Front Work and Levee System in the general vicinity of Needles, California. The device was suggested by Foreman Ralph H. McVey.

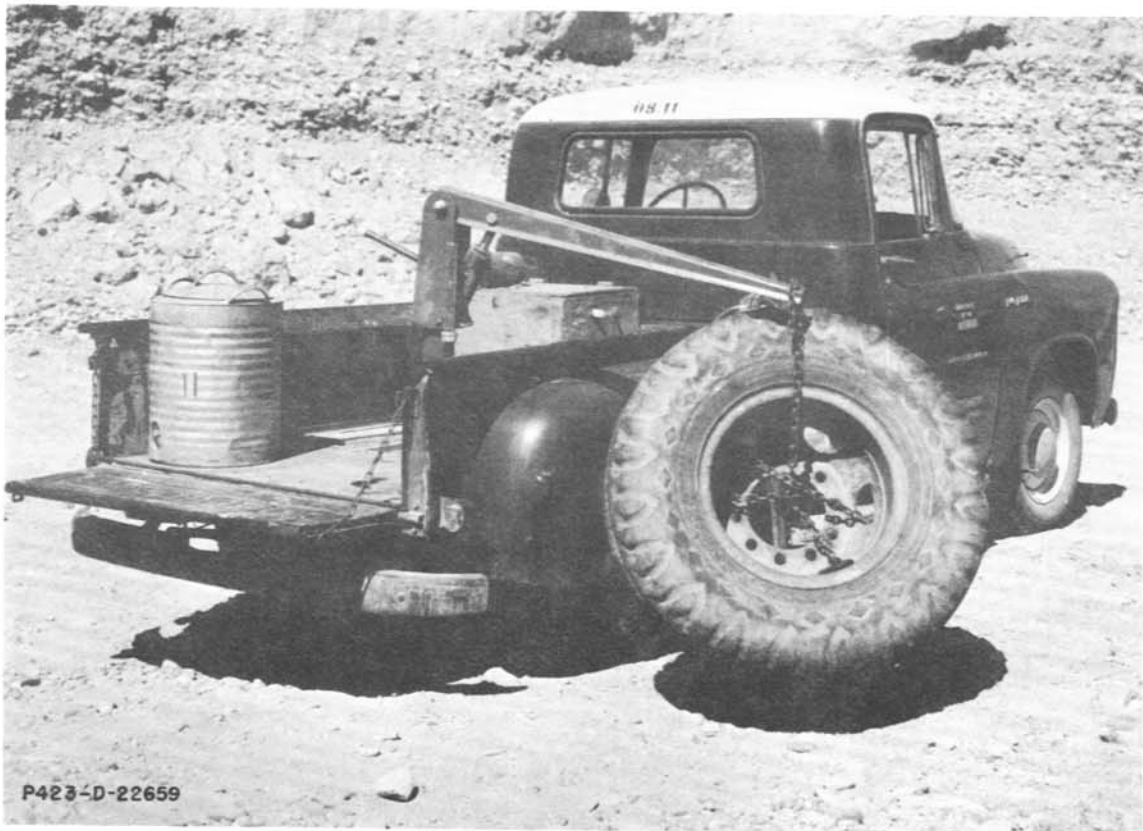
The chain fall is used to pick up the material, then by means of the monorail the load can be pulled onto and positioned on the truck bed by hand or by the power winch, if required. The present chainfall is rated at one ton but will be replaced with a heavier unit in the near future.

The horizontal and vertical members are of 8-inch standard channel and the monorail is a 12-inch WF I-beam; however, other material could be used if available. The framework is bolted to the steel flat bed and can be removed if lifting unit is not required for an extended period of time. A drawing of the lifting unit and hauling device for mounting on a 1946, 2½ ton truck is shown on the following page.

* * * * *

PICK-UP MOUNTED HYDRAULIC CRANE (Suggestion R3N-60-4)

The pick-up mounted hydraulic crane shown below and also used in the Colorado River Front Work and Levee System in the vicinity of



Needles, California is a commercially available crane, rated at 1000 pounds. The crane is used in loading and unloading tires, heavy equipment parts, barrels of gasoline, lubricant, etc. The use of this crane enables one man to handle loads previously requiring two or three persons and increases the safety in loading and unloading. The crane was purchased and installed at the suggestion of Harold E. Hansen, Crane Operator. Cost of this crane was about \$85.00 f.o.b. a factory in California. This crane is complete and ready to bolt or weld on vehicles and includes a 6-foot chain with hook. The barrel chains are \$5.00 each and will pick up a barrel from an upright position or lying down.

* * * * *

RAILROAD CAR BEAM BRIDGES

The Owyhee South Board of Control, operators of the South Division of the Owyhee Project in Idaho and Oregon, have utilized railroad car beams as operating walkways in the rehabilitation of structures on the irrigation system. Improvements made to a gaging station, as



shown in the upper photograph at left included the installation of a railroad car beam as a walkway and work platform during current meter measurements.

The installation presents a neat appearance and the beam installed over the canal having a 20-foot bottom width, looks like it was designed for the purpose.



As shown in the lower photograph at left, similar beams have also been used to advantage by the project operators in providing an operating deck and walkway over the rehabilitated Succor Creek Diversion Dam. Here, again, the installation provides a neat appearance and is adequate in all respects for removal and placement of stop planks in the structure as required.

FUEL MIXER-CONTAINER

(Reprinted from the March-April 1960 issue of *Grist*, a publication by the National Conference on State Parks, Washington, D. C.)

Many areas use two-cycle gasoline engines--mowers, outboard motors, chain saws, etc.--which means that the lubricating oil must be mixed with the fuel. Unless the correct amount of oil is properly mixed with the gasoline, engine malfunction results. Shop Foreman Barton P. Boothroyd and Mechanic Roger R. Low of Rocky Mountain National Park have designed a foolproof mixer-container for two-cycle engine fuel which permits a large quantity of properly prepared fuel to be mixed in advance.



The photo at left shows the A-frame to which a 55-gallon drum is mounted by means of a wide strap iron band around the center of the drum. Two $3/4$ "- by $1\frac{1}{2}$ " bolts are welded by their heads to this side of the drum, and these serve as hubs when inserted in $3/4$ -inch pipe nipples welded to the top of the A-frame. The triangle-shaped frame is made by welding together pieces of angle iron or pipe of proper size and length.

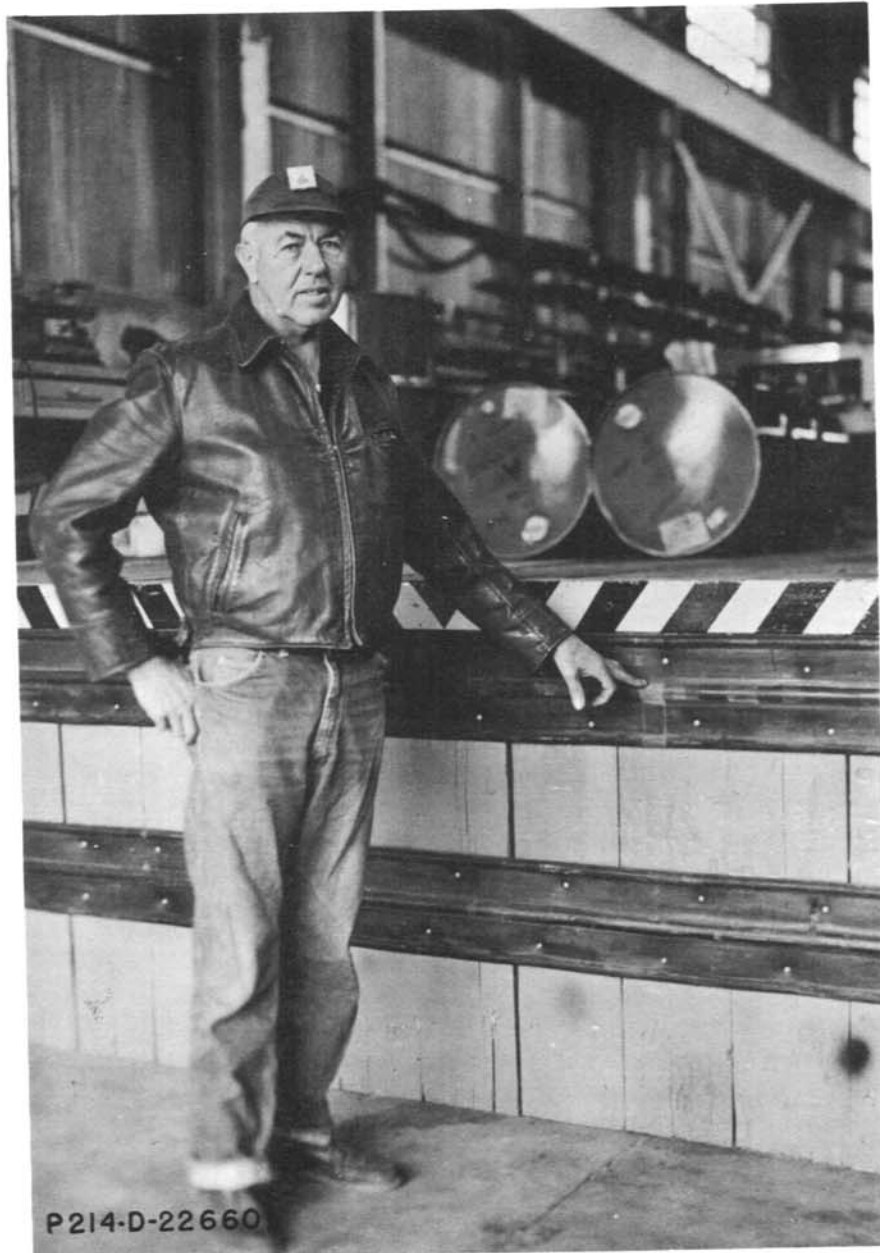


A steel bar, to which has been fastened a strip of wood to serve as a bumper, is welded between the two front uprights. This prevents the drum from tipping over backwards or from tipping forward more than is necessary to draw fuel. Rocking the drum mixes fuel and oil.

Note the funnel handily chained to the spigot. A piece of chamois skin in the funnel filters the fuel as it is drawn for use.

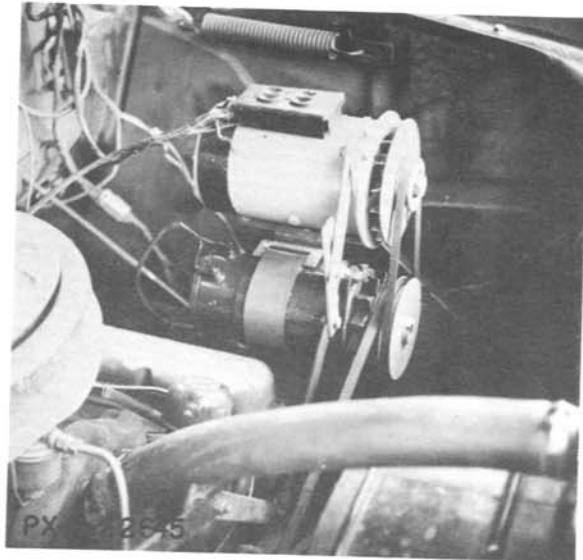
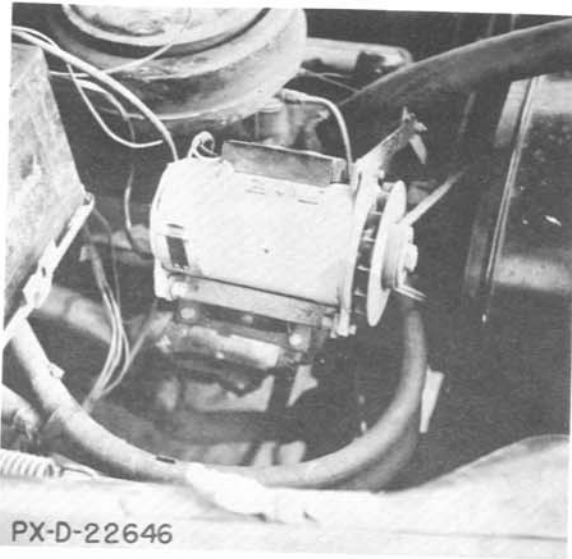
TWO LEVEL PROTECTION
(Suggestion R2-60-73)

Edward J. Deleski, Tracy, California, points out the two level rubber bumper strips installed on wood loading dock at Tracy in accordance with his suggestion. One strip protects against pick-up, and the other big truck and trailer damage.



VEHICLE OPERATED GENERATOR (Suggestion R8-60-124)

It has been suggested by Francis G. Kellogg of the Canals Branch, Division of Design, Commissioner's Office, Denver, that operation and maintenance vehicles can be equipped with 110-volt generators which are powered by the vehicle's motor, and that so equipped, power to operate tools and equipment in the field is conveniently available. One manufacturer can furnish 1,500 and 2,500 watt capacity units, costing about \$80 and \$150 respectively, for mounting under the hood of the vehicle, as shown in the photographs below.



The power units can be mounted easily on the motor with brackets furnished with the unit and are driven from the D.C. generator or water pump pulleys. Controls for the generator can be located under the hood or on the dash panel. The cost of the units quoted above include controls, mounting equipment, belts and pulleys, which are packed as a complete kit.

Mr. Kellogg believes the easily available power could be used to operate compressors, grinders, gate hoists, spray guns, drills, saws, winches, ventilating fans, flood lights, augers, and small heating units as the field conditions warrant.

The use of an auger is illustrated in the photograph on the cover page. One principal advantage of such a generator would be the fact that instant power is available without transporting, unloading and servicing a separate power unit. Such a unit would be very valuable in emergencies.

O&M SAFETY

The subject of safety has been discussed in several past releases of the bulletin pointing out that the accident rates of irrigation operation and maintenance personnel is usually about the highest of all Bureau of Reclamation forces.

For the 1959 calendar year, "Safety Record", published in the Commissioner's Office, Bureau of Reclamation, Denver, Colorado, again reports as shown in the following tabulation that the Bureau irrigation O&M people have had the highest frequency rate and next to the highest severity rate during 1959, being "outscored" only by the Power O&M people in the severity of accidents.

<u>Type of Work</u>	<u>Man-Hour Exposure</u>	<u>Lost-Time Injuries</u>	<u>Days Lost</u>	<u>Frequency Rate</u>	<u>Severity Rate</u>
Administration	4,803,668	20	265	4.2	55
Construction	5,133,807	41	635	8.0	124
Design	1,516,392	5	98	3.3	65
Investigation	1,633,031	13	109	8.0	67
O&M					
Irrigation	2,591,634	55	906	21.2	350
Power	<u>3,793,854</u>	<u>44</u>	<u>7,023</u>	<u>11.6</u>	<u>1,851</u>
Totals and Averages	19,472,386	178	9,036	9.1	464

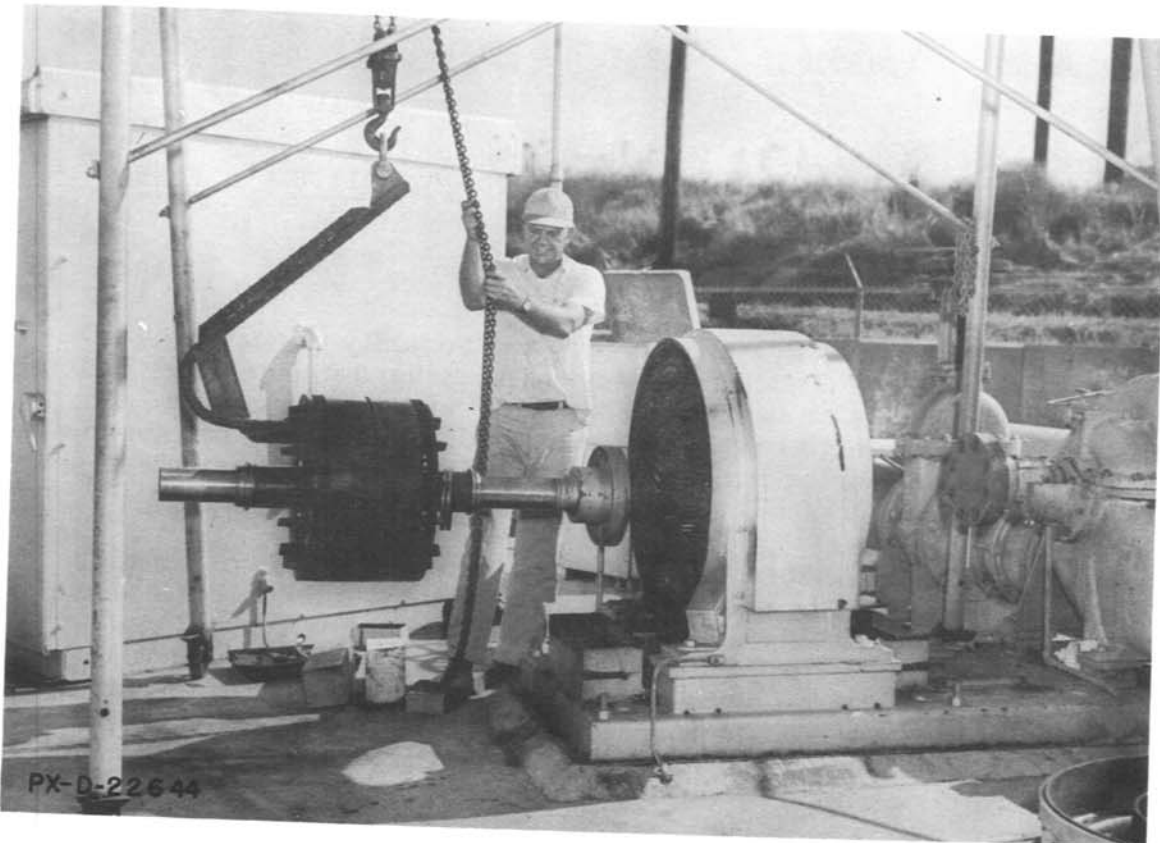
Outscoring other people in the frequency and severity of accidents is hardly a way to make a good record and a very hard way to make a living. It is hoped that the water users who operate and maintain many of the facilities on our projects have a better record. If not, why not spend a little time considering the problems and conditions that contribute to the accidents.

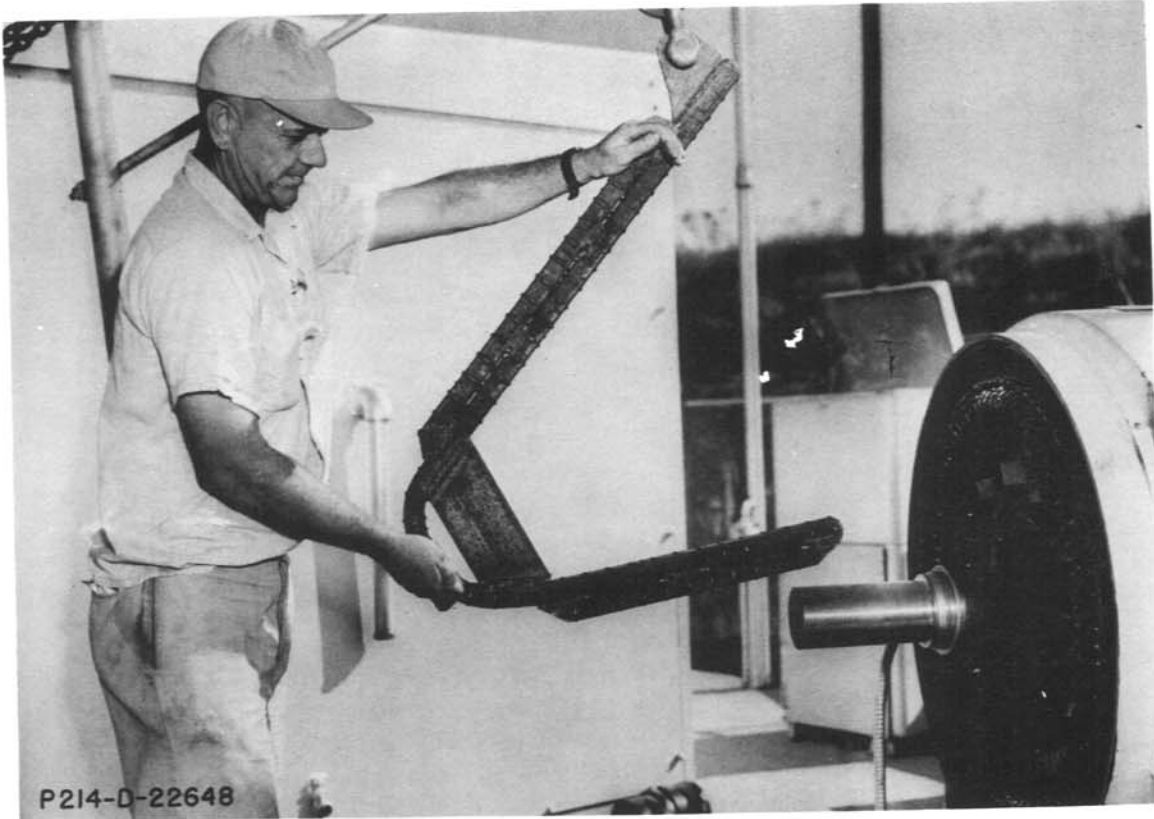
The "Safety Record" quoted above believes that "In order that safety will be accepted by all levels of supervision, the approach should be one of integrating safety and the safety program as a part of the supervisor's function--not just trying to sell it on the basis that it is another function that the supervisor must perform. Safety, to be productive, must be a fundamental part of any organization, and the supervisor, to be productive, must include in his work habits and job program a preponderance of safety."

HANDLING HORIZONTAL MOTOR ROTORS (Suggestion R2-60-81)

The handling of large rotors for horizontal electrical motors has been simplified by the use of a device suggested by John Escher, Electrician, Electrical Operation and Maintenance Unit, of the Tracy Operations Field Branch, Central Valley Project, California. Use of the device as shown in the photograph below and the photograph at the top of the next page has resulted in a saving in time when handling the motor rotors and prevents damage to the rotor and stator windings through use of a better means of lifting and handling. Less equipment is required to perform the operation, and it can be accomplished in a much safer manner than other methods previously used. The project estimates that about \$100 can be saved each time a rotor must be handled.

The hook-shaped device shown was constructed of a piece of steel reinforcement bar with an added support provided at the bend. Similar steel bars about 1-1/4- to 1-1/2-inches in diameter would suffice for similar handling problems.



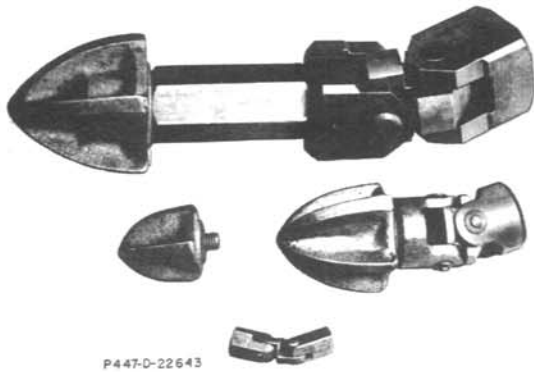


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CLEANING CLOGGED FOUNDATION DRAINS

In connection with the examination of Hungry Horse Dam, Power-plant, and appurtenant works recommendation was made that the project inspect foundation drains and open those found to be obstructed. The drains, clogged by accretions of calcium carbonate, were effectively opened with tube cleaning tools similar to those shown in the photographs





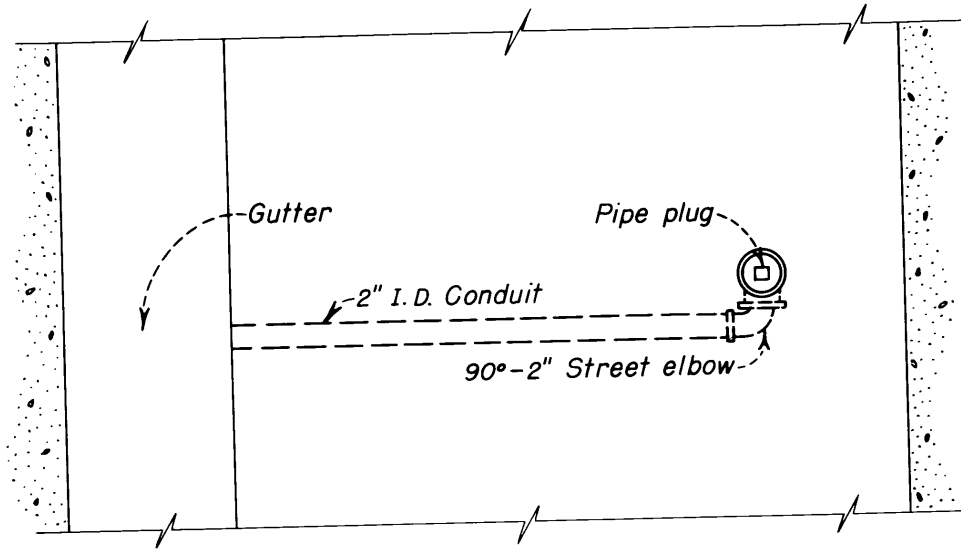
at the bottom of the preceding page and the photograph at left. Since this method of cleaning drains appears to have been successfully used for the first time on the Hungry Horse Project, Montana, the Regional Director's staff at Boise, Idaho, thought application of the devices might be made elsewhere.

As shown in the sketch on the following page, it was necessary that: (1) the cleaning tool enter a 2-inch conduit embedded in the concrete a minimum of 3 inches below a gallery floor and opening into a 12-inch

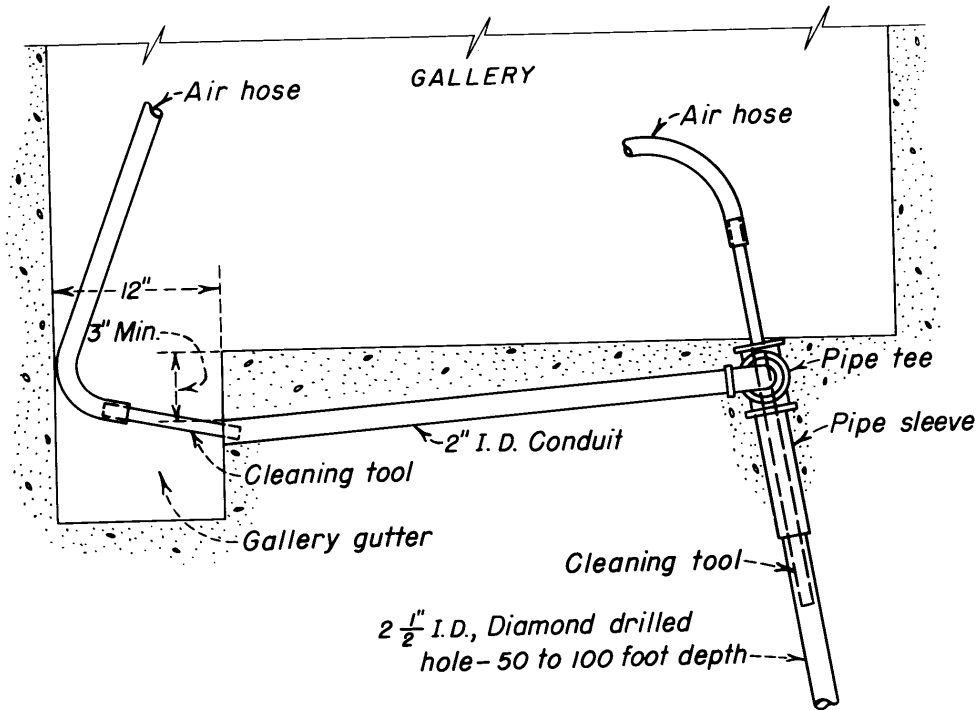
wide drainage gutter along the gallery wall, and (2) clean to 50- to 100-foot depths, the 2-1/4-inch inside diameter diamond drilled holes in the foundation rock. Since it was possible to gain entry to the almost vertical holes drilled into foundation rock by removal of a plug from a pipe tee set at floor level in the gallery on top of a short length of pipe, selection of one cleaner suitable for both cleaning operations was based on the availability of equipment that could be operated within the limits of the 12-inch gutter width in gaining access to the more or less horizontal 2-inch diameter conduit in the gallery floor. By so doing, the conduit could first be cleaned to the junction of the 2-inch conduit and vertical drilled hole followed by a cleaning of the hole.

Commercial air-powered and water-powered machines are available for such work in various sizes and tools for special problems are available, accordingly each problem should be considered separately. The air-powered machines are reportedly more powerful and operate at somewhat higher speeds. However, for convenience with existing facilities and for simultaneous flushing of the pipe and drilled holes, the device selected for the Hungry Horse work was water-powered and had sufficient power for the job involved. The same motor was used for both devices and had an outside diameter of 1-9/16-inches. It easily negotiated the confines of the 2-inch conduit and according to the manufacturer can be successfully used where the radius of a bend is not less than 9-inches.

The operation was accomplished in two steps. First the harder calcium carbonate deposits were drilled out and this was followed by final cleaning with the cutter. The total cost of the tools was about \$230.00, which included one water-driven motor, the necessary universal couplings, a drilling head, a cutting head with the necessary cone and star cutters, and 3/4-inch, 4-ply, armored hose.



PLAN



SECTION

CLEANING FOUNDATION DRAINS

PRESTRESSED CONCRETE BRIDGES

A refining company needed a 105-foot long bridge built in a hurry to span a river in western Colorado so that a large rotary drilling rig could be moved in to meet a drilling obligation deadline. The company superintendent obtained some general information on bridges from the Colorado State Highway Department and elected to construct the bridge of prestressed concrete. The bridge, as shown in the photo-

graph at the left was completed in ten days after the first inquiry of the contractor was made.



The same day the contractor was called, he in turn called a prestressed concrete fabricator in the Denver, Colorado, area for design information of a bridge to withstand the loading requirements. Plans for a prestressed concrete bridge were approved, a contract was executed, and after only five days actual construction time, the bridge was completed and turned over to the refining company. The company states that construction of the prestressed concrete bridge saved both time and money,

some \$7,000, compared to the cost of another type of bridge that would meet the loading requirements. The company also believes that there will be a further saving of cost in maintenance.

The 105-foot long, 13-foot wide bridge was constructed to the same load specifications as those used on major highways, except that it has no obstructions above the deck and provides for unrestricted load width for moving heavy and bulky equipment. Steel "H" beams were used for bridge pilings, and were delivered at the site an hour ahead of the pile driver which further illustrates the timing of the construction on the job. The concrete deck slabs were fabricated at a Denver plant. Each of the nine prestressed deck slabs measured 35 feet in length and weighed 6-1/2 tons. The concrete caps, abutments, and deck slabs were precast and hauled by three trucks a distance of 238 miles from Denver to the construction site near Meeker, Colorado.

At the site four sets of steel pilings were driven to bedrock and then capped. A large crane, as shown in the photographs at the top of the next page, was used in placing the deck slabs to form the sturdy 3-span bridge. During this operation the bridge safely carried simultaneously, the crane weighing 84,000 pounds and another 80,000 pound load consisting of a truck loaded with the remaining deck members.

in place was reported to be \$2,715 or \$3.02 per square foot.

It has been reported by the Bureau's Austin, Texas, office that bids taken March 1960 by the Corps of Engineers for a bridge across Lake Waco on Highway 6 in McLennan County, reveal the economy of prestressed concrete. The structure will use 31,093 linear feet of 54-inch deep prestressed girders.

Although many of the earlier Bureau of Reclamation projects were built with turnouts, checks, drops and other structures made of timber, very few projects today are making such installations and those who have such structures might well investigate the use of precast and prestressed concrete. There are numerous fabricators of precast and prestressed concrete members for bridges and other structures throughout the United States. Some may not be presently equipped to fabricate bridge members, but in many cases the additional equipment required would be relatively small. From a list recently supplied, there are fabricators in the 17 Western States as follows:

Arizona	Phoenix and Tucson
California	Colton, Florin, Long Beach, Los Angeles, Napa, San Diego, San Francisco, San Pedro, Santa Fe Springs, and Sun Valley
Colorado	Denver and Pueblo
Idaho	Idaho Falls and Nampa
Kansas	Newton and Wichita
Montana	Billings, Great Falls, Missoula, and Silver Bow
Nebraska	Lincoln and Omaha
New Mexico	Albuquerque
North Dakota	Bismarck and Fargo
Oklahoma	Ada, Oklahoma City, and Tulsa
Oregon	Harrisburg and Portland
South Dakota	Sioux Falls
Texas	Amarillo, Austin, Corpus Christi, Dallas, Houston, Lubbock, Pasadena, and Victoria
Utah	Salt Lake City

Washington

Auburn, Everett, Redmond, Spokane, and
Tacoma

The Prestressed Concrete Institute, 425 N. E. Fifth Street, Boca Raton, Florida, is forming a committee to develop standards and specifications for short span bridges and, in addition to the addresses of local fabricators, can be contacted for information.

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TUCUMCARI COMBINATION MOWER

An unusually wet month of July caused a very heavy growth of weeds on the canal and lateral rights-of-way of the Tucumcari Project in New Mexico, as well as in the water prisms, since the ditches were empty much of the month. In order to use his mower tractors and operators in the most efficient manner, Project Manager, Sanford Caudill, put a 7-foot sickle cutter bar on the side of one tractor equipped already with a three-rotor, 8-foot cut, rotary mower mounted on the rear. This made it possible for the one machine to cut a 15-foot swath, clearing the operating road and one bank of a lateral in a single operation, as shown in the photograph below and the one at the top of the next page.

The side-mounted sickle cutter bar is driven by a hydraulic motor while the rotary mower is driven from the tractor power take-off.





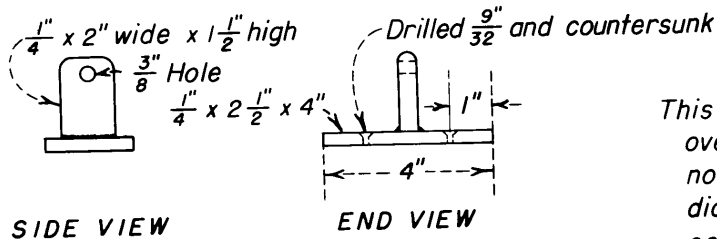
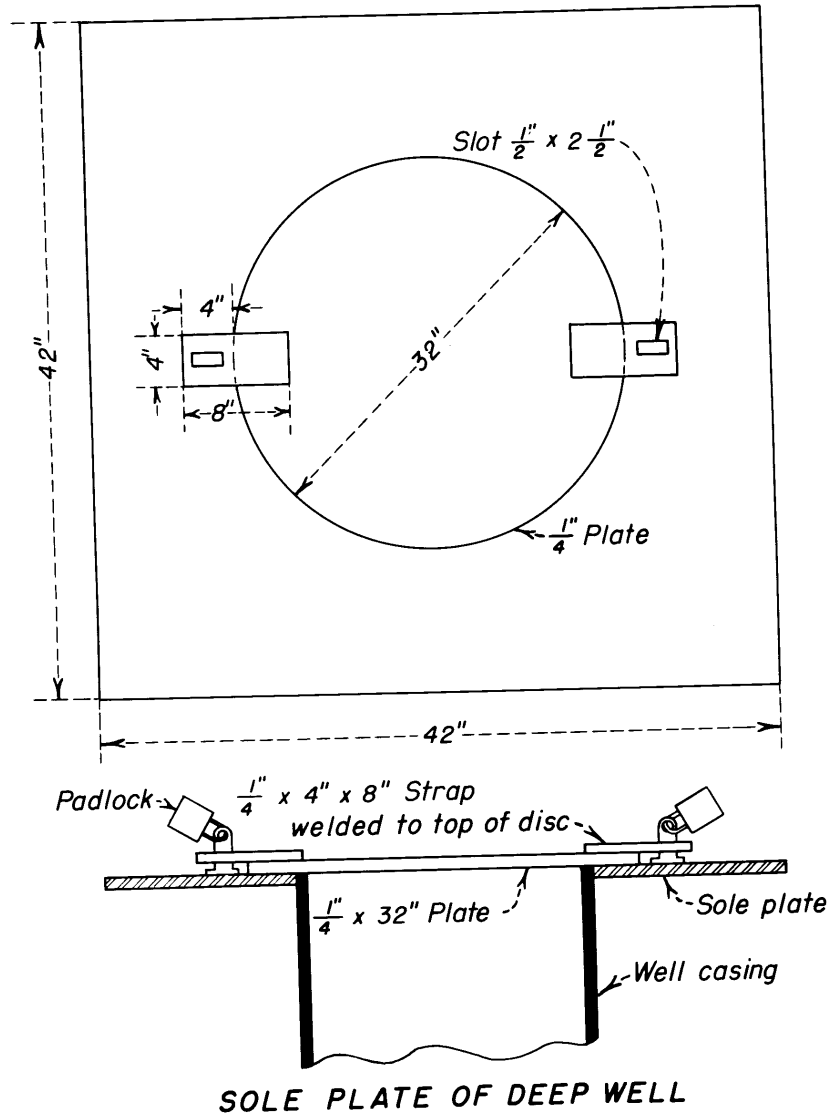
The machine operates very smoothly and covers a lot of ditch bank in a short time. Mr. Caudill is so well pleased with the operation of this machine that he has purchased a second one. Both the rotary mower and the hydraulically-driven sickle mower are available commercially. The price of the hydraulic mower is about \$900. Anyone interested in obtaining equipment of this type may obtain the name of the supplier from Mr. Sanford Caudill, Manager, Arch Hurley Conservancy District, Tucumcari, New Mexico.

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WELL HOLE COVER PLATE (Suggestion R1-59-203)

The drawing on the following page of a safety cover plate for drilled wells is a safety feature that Donald W. Newcomb of the Electrical-Mechanical, Design Branch of the Minidoka Projects Office, Idaho, believes vitally essential on installations on the North Side Irrigation Field Division where 170 deep wells have now been drilled and more will be drilled before the project is completed. The suggestion was prompted primarily because of the numerous small children residing on the project, some in close proximity of the wells and the necessity to pull pumps from the wells, and leaving the holes protected with only temporary covers which can be easily removed. With the drilled holes and casings being of such large size, a youngster could easily fall in.

The cover plate has been designed so that it could be adapted to any of the steel well sole plates over the well casings. Only a few of the covers would have to be on hand to provide for the number of pumps pulled at one time, such as in the winter when they are being serviced and rehabilitated. Similar cover plates may be used over any well casing that is not more than 30-inches in diameter and has a 42-inch steel soleplate by drilling and tapping the soleplate for bolts. The padlock brackets also can be removed from the soleplate when the cover is not in use, and bolts screwed into the tapped holes to protect them from damage.



PADLOCK BRACKET

The padlock bracket to be removed when not in use, and 4- $\frac{1}{4} \times \frac{1}{2}$ " N.C. round head bolts screwed in threads.

This cover plate may be used over any well hole that is not more than 30" in diameter and has a 42" sole plate by drilling 4- $\frac{3}{16}$ " holes and tapping for $\frac{1}{4}$ " N.C. bolts. The mounting bolts should be $\frac{1}{4} \times \frac{3}{4}$ " N.C. flat head.