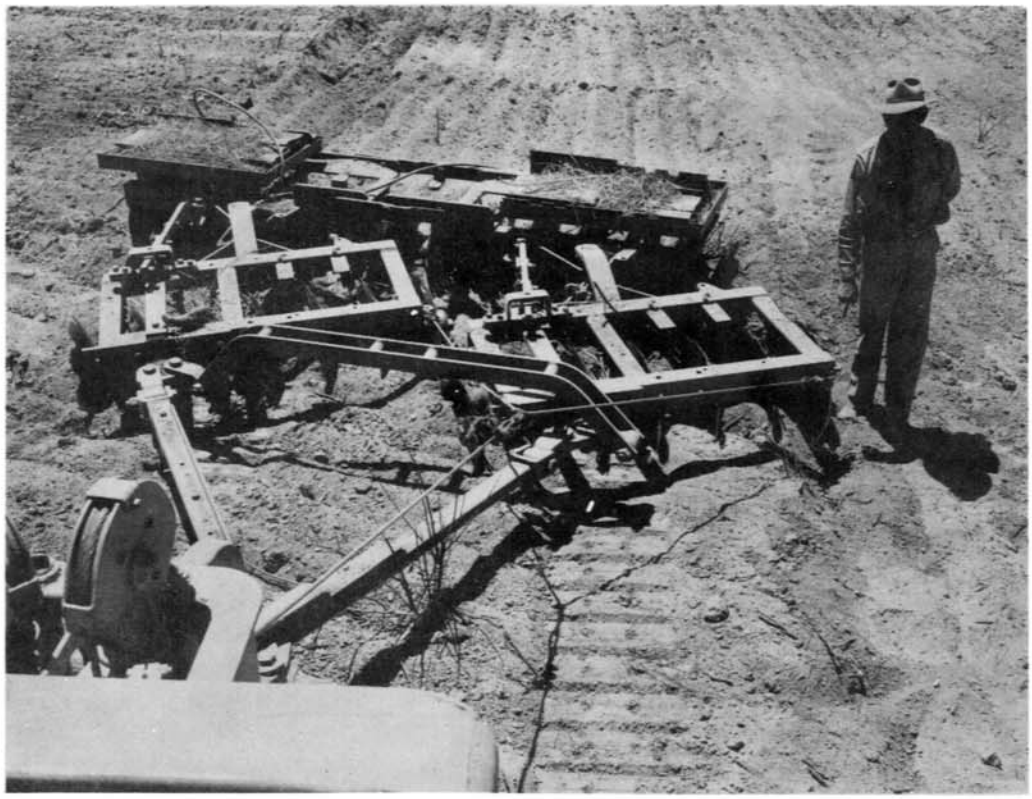
Department of the Interior

Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 17

July, August and September 1956



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OPERATION AND MAINTENANCE

EQUIPMENT AND PROCEDURES BULLETIN

RELEASE NO. 17

July-August-September 1956

Introduction

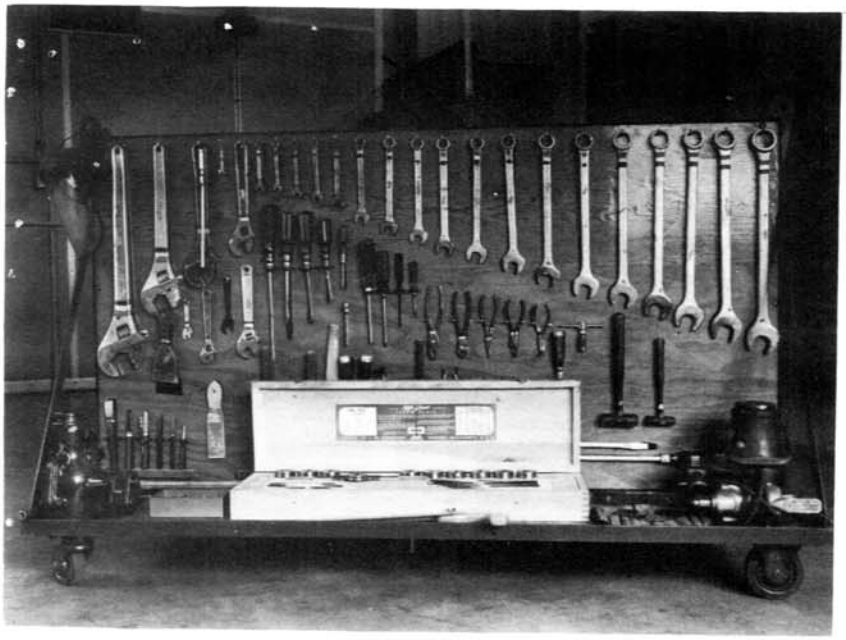
This Operation and Maintenance Equipment and Procedures Bulletin is published Quarterly. The articles in this Bulletin are assembled, for the most part, from suggestions by people engaged in the irrigation of our western lands. It is circulated for the benefit of irrigation operation and maintenance people with its principal purpose being to serve as a medium of exchange of operation and maintenance information. Reference to a trade name does not constitute an endorsement of a particular product, and omission of any commercially available item does not imply discrimination against any manufacturer. 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 continued effort to reduce costs and increase operating efficiency.

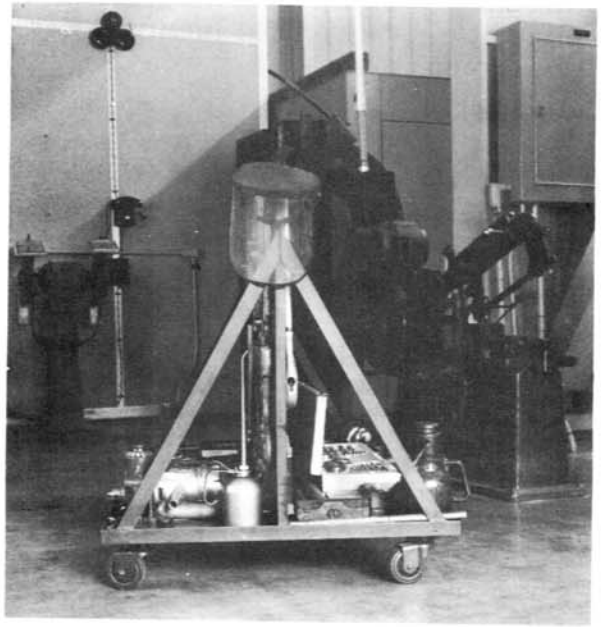
Division of Irrigation Operations

Commissioner's Office
Denver, Colorado

PORTABLE TOOL BOARD

Improvement in operations and maintenance has been accomplished in the power and pumping plants on the Colorado-Big Thompson Project of the Bureau of Reclamation in Colorado, by the use of the portable tool board shown below. Use of the board makes it possible to have the necessary tools for any job conveniently located at the site of the work and a minimum of time is required in locating any particular tool or device.



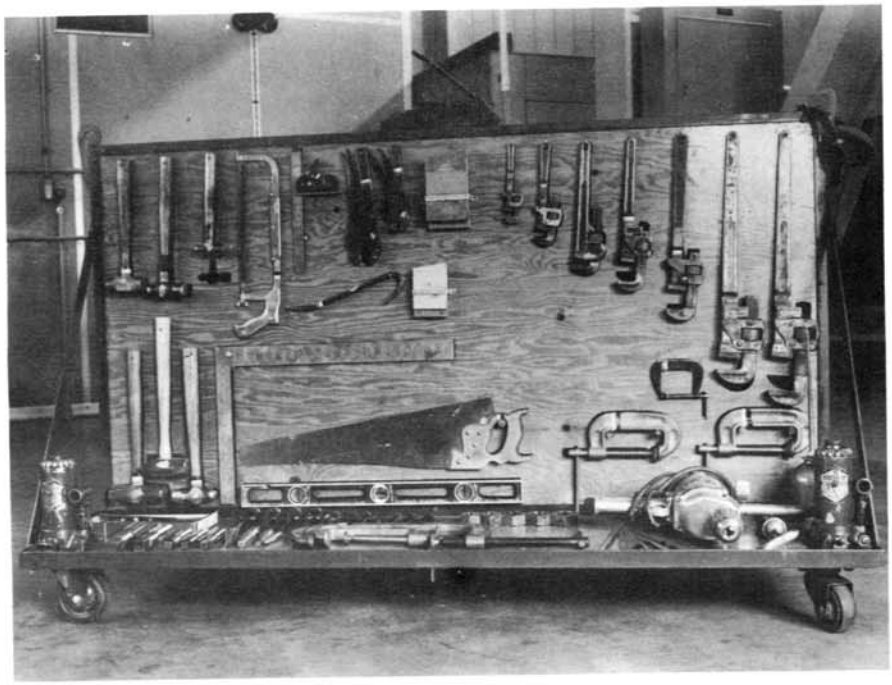


Being mounted on casters, the board can be easily wheeled to any desired work area on a particular floor. It also can be readily transferred from one floor level to another by means of a plant crane and a sling attached to the lifting eyes made a part of the framework.

Where wall space is at a premium, the board is a most convenient means of tool storage and obviates the necessity for carrying tools to and from the larger maintenance jobs. Inventory time is also saved as the tools missing can be noted at a glance.

The reverse side of the board shown above is shown on following page.

The device was suggested and constructed by George G. Adamson, Powerhouse Foreman and W. Louis Clark, Plant Superintendent, at the Pole Hill Powerplant and similar boards have been constructed for use in other power and pumping plants on the project.



Construction:

The cost of fabrication is small. Most of the materials were secured from salvage on the project. The center board is plywood and the deck may be of plywood or metal, whichever is preferred. The channel iron or angle iron frame, braced with stap iron, is mounted on rubber tired casters. The simple construction also makes the board easily kept clean.

* * * * *

FREEZING OF MOISTURE IN PADLOCKS

M. B. Montgomery, Powerplant Operator, Hungry Horse Project, Montana, reports that moisture in the padlocks on the fixed-wheel gate cubicle doors has been causing the operators some difficulty during cold weather. The locks must be thawed out to allow inspection of the cubicles. This has been done in the past with matches, solvent, paper, etc., which is rather awkward and somewhat unsafe.

Prestone, Zerex, or some other type permanent anti-freeze in a small squirt-type oilcan and left in a convenient place can be used to lubricate the locks and also make them freeze-proof for some time since water and ethylene-glycol type anti-freeze preparations go into a true solution and the locks cannot again freeze until the water content becomes

great enough to lower the specific gravity somewhat. When this happens and the lock again freezes, another squirt or two of the anti-freeze, warmed from storage in the heated entryway to the cubicles, thaws out the lock and again prevents freezing for some time.

Rust inhibitors in the anti-freeze should allow their use with no damage to the locks.

* * * * *

SELF-ESCAPE FROM CANALS

The continuing incidents of drownings in canals, despite the extensive system of escape devices, fencing, and warnings provided, points up the importance for adequate means of escape. The need for protecting the visitors and our operating people has prompted Mr. G. A. Greenwood of the Washington Office, Bureau of Reclamation, to suggest the device shown diagrammatically on the following page.

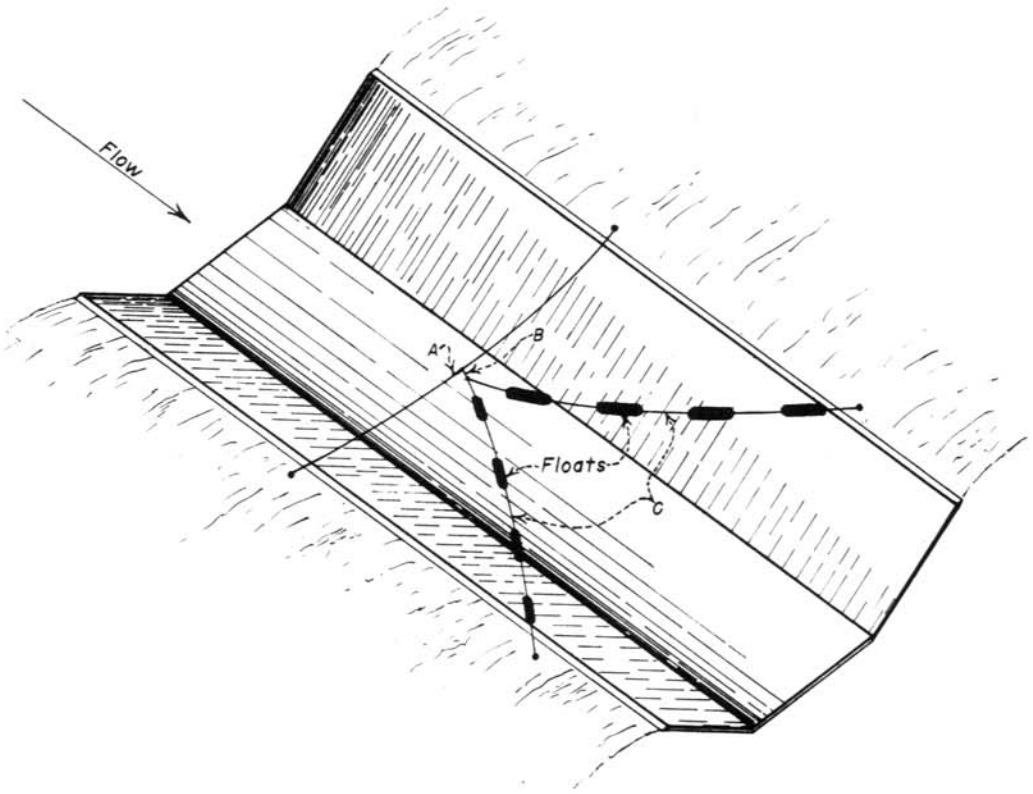
In the event an individual falls into a canal where this self-escape device is installed he will be carried downstream against the floating cable which can be grasped and thereby work toward a ladder or similar escape device which should be provided up the side slopes of the canal. Forming the device in the "V" shape will result in the water flowing within the canal assisting a person in reaching the canal bank.

Construction:

A small wire cable is drawn taut across the canal and anchored at the top of the concrete lining or unlined earth embankment. At the midpoint of this cable a short wire cable is suspended. To this short cable a third wire cable forms a "V" with its apex attached and its ends anchored to the canal embankment approximately 20 feet downstream from the transverse cable across the canal. Floats such as 4-inch by 4-inch by 3-foot timbers should be fastened to the "V" cable at intervals, the number varying with the width of the channel.

It is estimated that the self-escape device will cost less than $25.00 per unit even on our larger canals.

The "V" cable will be kept afloat on the water surface by the timber blocks, accordingly, the length of the short supporting cable at the midpoint of the transverse cable should be such as to permit the apex of the "V" cable to remain intact with the surface as the water is lowered, thus providing a continuous floating guard across the channel at all times.



SELF ESCAPE DEVICE

No doubt the safety device will collect some debris. However, it is believed that the quantity of debris would be small and could be removed without difficulty.

* * * * *

SOCKETING ALL WIRE ROPES

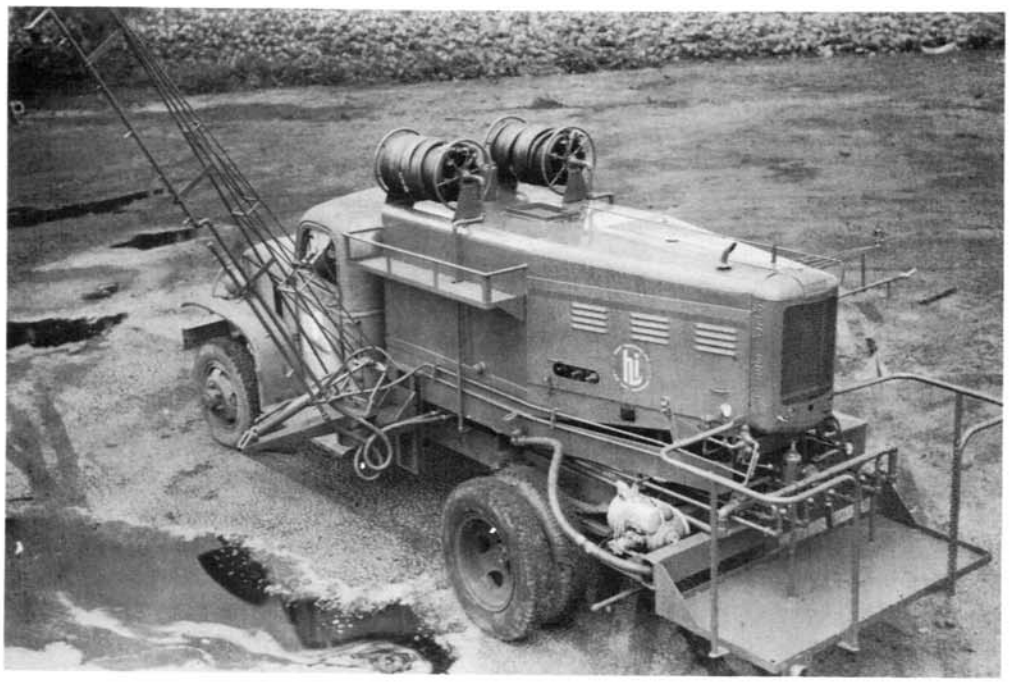
In socketing of all wire ropes or cables where the socket is made of steel or iron, use clean zinc where the socket is to be submerged in water. Any other metal is likely to result in a corrosive galvanic action being set up between two different kinds of metal. This will cause a rapid deterioration of the steel in the rope or cable.

Socketing with zinc has given greater life to the cables used on Bureau projects and reduced the amount of replacement necessary. Any good wire rope handbook will give the steps to be followed in the socketing operation.

* * * * *

THE WORK HORSE OF O & M

There has been much written about weed sprayers but little, if any, mention of other uses besides spraying weeds. In order to gain a better understanding of these uses it may be best to start with a description of the Hurst-Robin spray rig, shown below, which is the type currently in use by Bureau forces on the Friant-Kern, Madera, and Delta Mendota Canals, Central Valley Project, California.



Basically the Hurst-Robin spray rig consists of a "V" bottom, 500-gallon tank made of a material resistant to the chemicals used in spraying weeds. It may be mounted on any standard 2-1/2-ton truck frame with minor alterations. A mechanically driven agitator, driven from the Robin pump, insures adequate mixing of the various ingredients in the solution.

Pressure is supplied by a Robin, 40-gallon per minute, three-cylinder, reciprocating pump. It is in turn gear driven by a Continental engine.

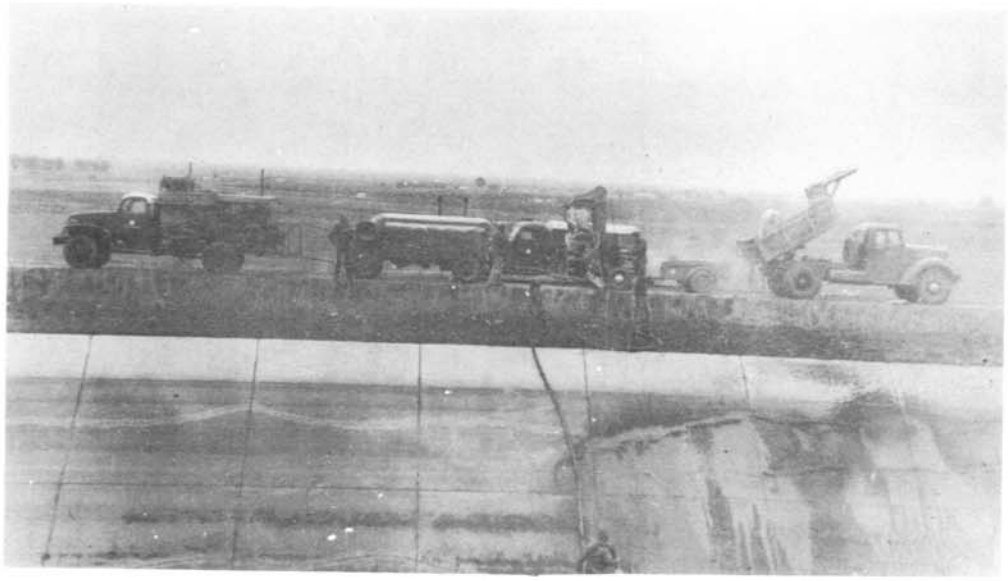
In order to fill the tank, a portable type 1-1/2-inch self-priming pump and two 15-foot lengths of neoprene lined 1-1/2-inch hose have been provided as shown in the picture.

The two hose reels shown on top of the tank each contain 100 feet of 3/4-inch neoprene lined and covered 2500 psi hose. These are used when it becomes necessary to hand spray or work in confined areas. When used in this manner, the hose is usually led down the side of the tank and out along the boom through the two sets of roller guides which are fastened to the upper side of the boom. High pressure orchard

spray guns or hand wands can be used with the hand line, depending on the nature and requirements of the respective operations. The two 10-foot booms, as shown in the photograph at left, are lowered and raised hydraulically by remote control from the rear platform, the hydraulic control pressure being supplied by a 2-gallon per minute Adel pump. The booms are capable of being lowered from 35 degrees below horizontal to a vertical position. This is an extremely desirable characteristic since it may be adjusted to the slope of the canal banks. We might add that this is a feature which was not generally available on most of the commercial weed sprayers, at the time of purchase. The side booms are held in a horizontal spraying position simply by friction and swing back along the sides for traveling. In addition to the two side booms there is a 90-inch center spray manifold mounted under the operating platform which is in two sections, but controlled by a single valve. It may be operated with or without the side booms, but is not movable. Mounted on the lower side of each boom are two 3/4-inch pipe manifolds, an inner and an outer, on which the spray nozzles are connected. The effective coverage of the booms is increased by the addition of off-center nozzles on the ends. The pressure to the spray nozzles is controlled by a 0-800 psi pressure regulator. There is also a pressure regulator for the hand lines which will allow the booms and hand lines to be operated simultaneously at different pressures. Through the manipulation of the valves at the operating platform, either the outer or inner spray manifold only may be used or both.

With the foregoing description in mind, the numerous uses of the Hurst-Robin spray rig may now be shown. To cite a particular, and one of the most important alternate uses, it was used in guniting operations, for repairing of broken or cracked concrete lining on the Friant-Kern Canal. When the "Bondactor" gunite machine first came it was necessary to maintain a continuous supply of compressed air and water under pressure. At first it was considered necessary to have a tank truck with water, a truck to pull the air compressor and also the "Bondactor." This required several men and pieces of equipment which was soon found to be unnecessary. An air-driven pump was furnished with the Bondactor to be used on a tank truck. However, this did not prove satisfactory as there was a shortage of air for this type of service. Then

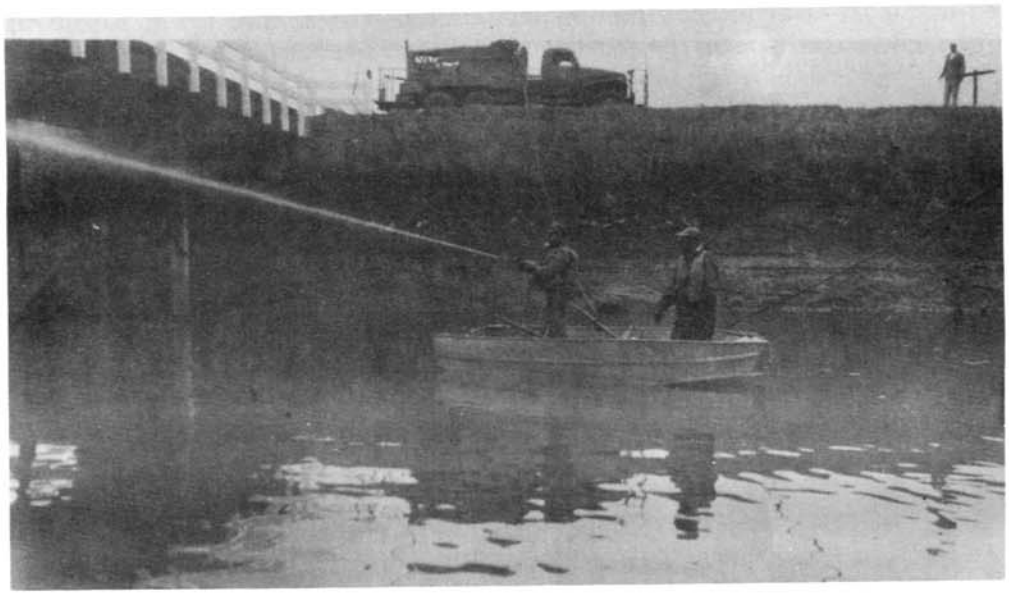
the use of the Hurst spray rig was proposed. Its use became two-fold in that it was a ready source for the continuous high pressure water supply required, and was also the prime mover for the air compressor, Bondactor, and sand trailer. The arrangement of equipment is shown in the photograph below which was taken during recent guniting operations. Of course, prior to guniting, the cracks must be thoroughly cleaned. In order to speed this process the Hurst spray rig was again put to use. A man with the hose is lowered down the slope by a line. The water pressure is adjusted to 400 pounds per square inch which has been found to be the right pressure to easily jet the silt from between the cracks.



During a recent maintenance period, a contract was let for providing a catalytically blown asphalt membrane to be applied over a 400-foot section at Mile 79.85 on the Friant-Kern Canal. Bureau of Reclamation personnel were to apply an asphalt primer prior to the application, and apply a coat of asphalt base aluminum paint after the asphalt membrane had been applied. It was necessary, of course, to have the lining clean before applying the primer. Here again the Hurst sprayer played an important role. Not only was it used to water wash the lining, but was also used for spraying the primer and aluminum paint on. This was done simply by filling the tank with the asphalt primer and applying by the use of a hand wand. The area was completely covered in slightly less than four hours by one man. This represented 34,400 square feet and a consumption of approximately 150 gallons of primer. Upon completion a few gallons of solvent were used to clean out the tank and hose. After the catalytically blown asphalt had been applied the asphalt base aluminum paint was sprayed on in the same manner in the same amount of time.

There are, of course, other lesser uses for the Hurst sprayer. For instance, the idea of using it as a small, auxiliary fire truck was suggested. From then on it became routine for the field offices to keep the truck filled with water over the weekends during the dry months, in the event a fire should occur.

During the 1954-1955 irrigation season, pondweed became a serious problem in the Friant-Kern Canal. In order to make the proper herbicidal applications, it was necessary to treat the surface area of the water. This required applications from a boat. The materials were thoroughly mixed with the agitator and then applied, as shown below. The boat was pulled by a pick-up, not shown, over a one-mile stretch of unlined canal.



Another utilization of the rig's high pressure was in cleaning out piezometer rings in Venturi meters. Hydrographers had previously used compressed air, but found that 125 to 150 psi water pressure was much more effective in the cleaning out the accumulated silt. It was also found invaluable in cleaning structures for painting and maintenance work. The high pressure water jet was very effective in removing mud and debris from checks, bridges, and siphons. Also it has been converted into a weed-burning rig and for storing or transferring fuels from tank to tank. Along this line it might also be used for transporting fuel to a location where several pieces of heavy equipment are working.

All in all, it can readily be seen the unlimited uses to which the Hurst-Robin sprayer may be put. At any rate, the initial cost of the Hurst-Robin sprayer becomes small in comparison to the savings made in the number of man hours that would ordinarily be spent for these many and varied tasks.

* * * * *

SHOTCRETE DISCOURAGES BURROWING ANIMALS

The Arch Hurley Irrigation District, which operates the Bureau constructed Tucumcari Project, Tucumcari, New Mexico, has encountered difficulty in preventing burrowing animals from undermining some canal structures. The animals in several instances have caused severe washing under and around structure headwalls and cut-off walls.

By placing shotcrete upstream from the structures, as shown at left, the animals have become discouraged sufficiently and many severe breaks under and around the canal structures have been eliminated.

* * * * *

FAIRLEAD MODIFICATION FOR HYSTER DRAGLINE

The Hyster dragline, mounted on a D-6 tractor, has many uses as described in Release No. 1 of the Bulletin, photograph below. The Rio Grande Project, Texas-New Mexico, has such equipment in use, but has had trouble with the drag cable slipping off the roller bushing assembly when the bucket is pulled in near the fairlead assembly on the boom. This results in the cable being mashed, ravelling and subsequently breaking.

To alleviate this condition, an auxiliary roller was installed in a horizontal position in the fairlead bracket, which holds the cable on the vertical roller, as shown on the drawing on the following page. This modification has been made on two draglines on the project.

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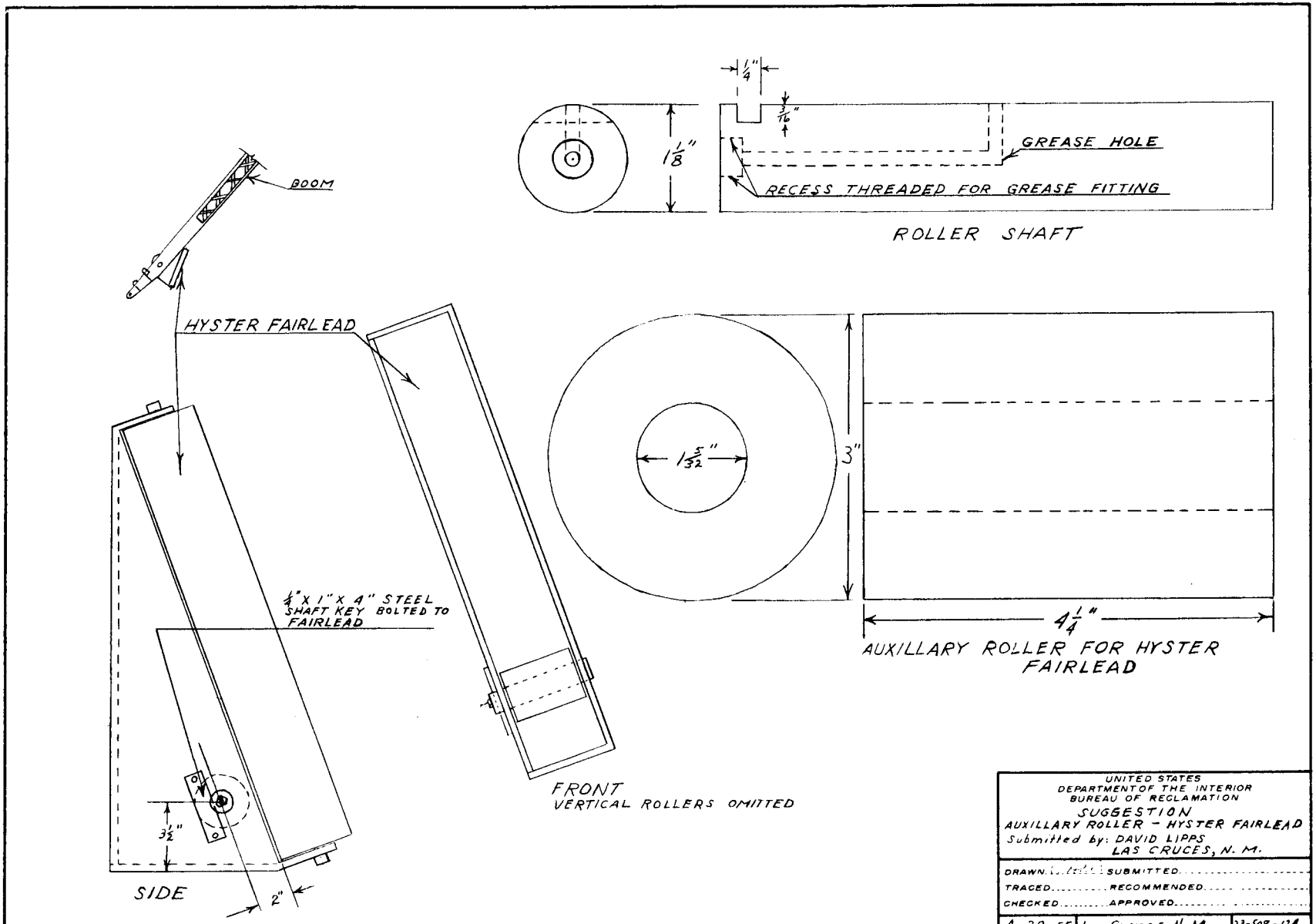
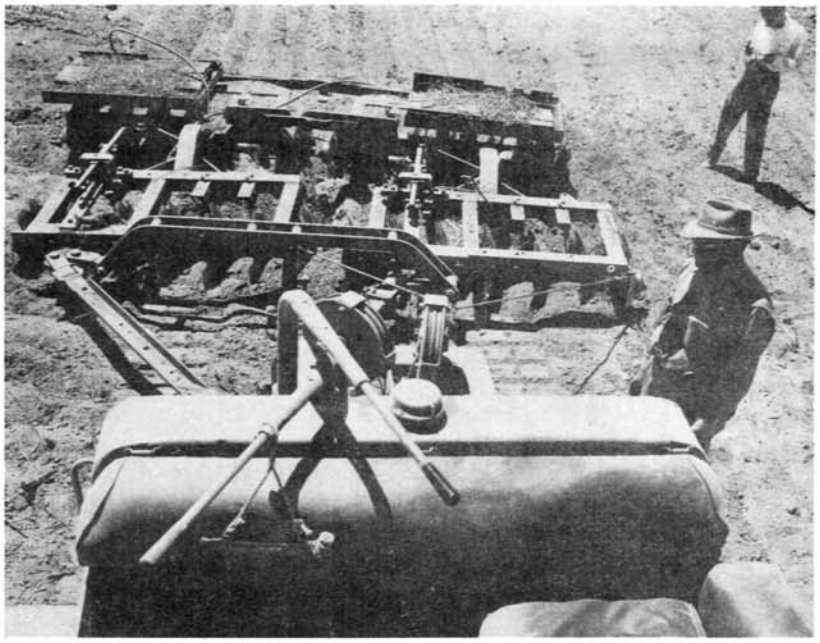

BOOM
HYSTER FAIRLEAD
1/4" X 1" X 4" STEEL SHAFT KEY BOLTED TO FAIRLEAD
3 1/2"
2"
SIDE
FRONT
VERTICAL ROLLERS OMITTED
1/4"
3/16"
1 1/8"
GREASE HOLE
RECESS THREADED FOR GREASE FITTING
ROLLER SHAFT
1 5/32"
3"
4 1/4"
AUXILLARY ROLLER FOR HYSTER FAIRLEAD
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SUGGESTION
AUXILLARY ROLLER - HYSTER FAIRLEAD
Submitted by: DAVID LIPPS
LAS CRUCES, N. M.
DRAWN
SUBMITTED
TRACED
RECOMMENDED
CHECKED
APPROVED
4-29-55
Las Cruces, N. M.
23-509-124

CABLE-CONTROLLED TANDEM DISC

A cable-controlled angle adjustment for a Towner tandem disc, shown on the cover of this bulletin was designed and put in operation by the Maintenance Superintendent on the San Marcial Division of the Middle Rio Grande Project. The Towner disc has been used in river bottom land and reservoir areas to disc the areas subject to regrowth of woody plants after the old growth has been cleared and burned.

Since the majority of the land disced was of very sandy nature, the disc continuously clogged, resulting in loose dirt piling up in front of it. Adjustment of the discs, as they come from the manufacturer, must be made by removing bolts to regulate the angle of the disc, thus regulating the depth of cut. To accomplish this, the tractor operator must dismount from the tractor, remove the pins from the disc, move the tractor foreward until the disc dumps the trash pile, and then reset the disc. To avoid this time consuming operation, a cable control angle adjustment was attached to the disc and is controlled by the cable drum on the tractor.



In the photograph at left, looking down from the top of the tractor, the disc has been pulled from a cutting position to a straight noncutting position by means of the cable control leading from the drum on the tractor.

In the photograph on the cover of this issue of the bulletin, note the cable control leading from the drum on the tractor to the disc which is used to regulate the angle of set of the disc, thus controlling the depth of cut. The cable attachment allows the tractor operator to straighten the disc angle without leaving his seat or stopping the tractor.

The simple device has resulted in material savings both in time and money. The cable adjustment in lieu of pins, has been installed on two 14-foot Towner tandem discs, and will be adapted to any additional discs purchased in Region 5. More detailed information may be obtained from the Middle Rio Grande Project, Albuquerque, New Mexico, or the Regional Director, Region 5, Amarillo, Texas.

* * * * *

PLASTIC IDENTIFYING PLATES

Something a little different has been used on the Wellton-Mohawk distribution system of the Bureau's Gila Project, for identifying farm unit turnouts. A plastic plate as shown in the photograph at left, is neat, and provides a permanently legible marking for the structure.

The built-up black and white plastic strip is purchased with the numbers cut into it as shown. The marker is attached to the gate frame with bolts.

The project reports the strips cost about 50 cents each. For further information contact the Manager, Wellton-Mohawk Irrigation and Drainage District, Wellton, Arizona, or the Regional Director, Bureau of Reclamation, Boulder City, Nevada.

* * * * *

TILT-UP TRAILER

Movement of tractors about the Belle Fourche Project, South Dakota, has been facilitated by the use of "tilt-up trailers" similar to that shown on the following page. The trailers have been constructed by the operation and maintenance forces of the Belle Fourche Irrigation District in project shops at Newell, South Dakota. Actually the project has constructed three such trailers, two larger than that shown, to handle various pieces of mobile equipment.

Construction:

The steel channel frame of the trailer shown accommodates a bed 11 feet 6 inches long and 5 feet 2 inches wide, and has been constructed from members of an old truck frame. The channels are 4 inches wide at the rear of the trailer and increase in width to 7 inches at the axle and are 7 inches wide from that point foreward.

The entire channel frame rests on a triangular shaped heavy duty pipe framework with the apex toward the front and the base forming

the supporting axle. The pipe forming the base and axle has been strengthened by the use of a 3-inch pipe inside a 4-inch pipe. Otherwise, the pipe framework is constructed of 3-inch pipe. To lower the bed and reduce the center of gravity of the trailer, the wheel axles have been offset 7 inches from the main trailer axle. This has been accomplished as shown in the photograph at left by welding to both the main pipe axle and the wheel axle to opposite ends of a piece of steel plate 3/4 inch thick, 5-1/2 inches wide and 10-1/2 inches long.

Two 1/4-inch steel channels welded together form a 3-inch by 3-inch tongue for the trailer. The tongue extends from the apex of the pipe framework to the base or axle and is welded to the pipe and channel framework. Hold-down eyes are welded to the channel frame and the wheels used on the trailer shown accommodate 32 x 6 truck tires, with the tread width between tires being 7 feet 3 inches center to center.

The trailer is well balanced on the axles. The weight of a man standing on the rear end of the trailer as shown, lowers the rear into a loading position.

* * * * *

BELLE FOURCHE DITCHER

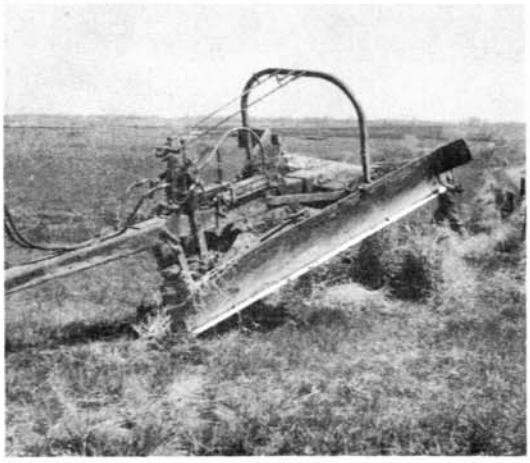
Purely for reference reasons, the ditcher shown below, and on the following page, has become known as the Belle Fourche Ditcher because it was fabricated in Newell, South Dakota, operating headquarters of the Belle Fourche Irrigation District. It was designed and constructed by Bud Sorenson, a resident of the area. Project personnel state that this ditcher and others of similar design have given very satisfactory service in the cleaning of ditches on the project. The ditcher is normally pulled by a D-2 tractor in light soils, but in heavier soils a D-4 or D-6 tractor is generally used. With the controls provided, the ditcher can be operated either from the rear of the machine or by the tractor operator.

Construction:

The center bar and tongue of the ditcher is constructed of two pieces of truck frame channel to provide a beam about 7 inches wide and 7 inches deep at the rear of the center bar and foreward to about the point where the hydraulic controls are located. From this point foreward, the beam narrows until it is about 4 inches wide and 4 inches deep at the front end. To the front, by means of heavy steel plate welded to the beam, a pulling hitch has been provided.

To support the "V" shaped blade an assembly at the rear of the center bar has been provided so that the blade can pivot at this point and be raised or lowered. The rear assembly consists of a light weight railroad rail welded to the bottom of the center bar; a "U" shaped frame extending upward from the rail to the opposite side of the machine, which supports also the remote control lever; and a pipe spacer welded to this assembly and the center bar. Horizontal support

is added to the assembly by welding a heavy strap to the blade side of the rear assembly and extending it diagonally to the center bar.



The hydraulic control valves are located on a raised platform slightly back of the apex of the blade on the center bar. The platform consists of two pieces of 1-inch pipe, across the top of which has been welded a piece of flat steel. The valves are connected to the two hydraulic pistons, one in front of and one in back of the raised control platform, mounted horizontally on the center bar. The pistons in turn are connected to cantilever arms which either raise and lower the apex end of the blade or a wheel set in between the blades near the apex. The hydraulic units used on the machine shown are Frasco units. Power to control the operation is supplied by heavy oil resistant hose, attached to the hydraulic pressure unit on the pulling tractor.

The 7-foot long blades of the ditcher are of welded construction. They were made from grader blades with the cutting bar forming almost a right angle with the blade proper. On the back side of the blade, in the angle formed with the cutting bar, a light steel rail has been placed and welded to both the blade and cutting bar to add strength.

The wheel provided for the unit shown is 18 inches in diameter and has a tread width of 6 inches. It was constructed of two 3-inch wide plow wheels welded together.

The remote control rod extending from the rear assembly "U" frame through a support on the control platform and on to the tractor through a front end support consisting of pipe, can be turned from side to side. By so doing a "U" shaped hasp slips over the control valve handle of either hydraulic valve to raise or lower the wheel or the front end of the blade. Adjustment of the wheel and blade makes it possible to adjust the blade to the width of ditch being cleaned.

For further detail concerning construction of the device or its operation, contact Manager, Belle Fourche Irrigation District, Newell, South Dakota, or the Regional Director, U. S. Bureau of Reclamation, Billings, Montana.

* * * * *

CRAYFISH CONTROL

The transactions of the International Commission on Irrigation and Drainage, reporting on the Second Congress on Irrigation and Drainage, 1954, carries the following statement regarding the control of crayfish:

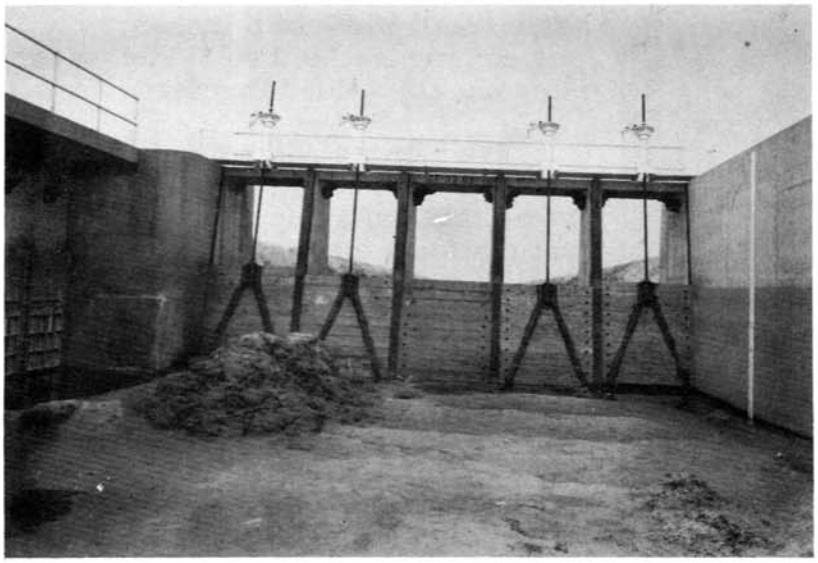
> ". . . . in Australia . . . . crayfish are successfully controlled by mixing sharp materials such as cinders, gravel, etc., with the soil in places of infestation. For self-preservation, the crayfish will not burrow in sharp materials as the slightest cut will cause it to bleed to death."

Have any of you tried this?

* * * * *

CHECK STRUCTURE IMPROVEMENT

With short flashboards and a high check structure, it is difficult to manipulate the structure without losing a great many of the boards, and to hold them in place without wedging or other means.



On the Madera Canal in California the flash boards are bolted together and fastened to screw stems, as shown, providing a positive mechanical means of control. Upstream water levels are easily regulated, and the idea was used throughout the 1955 irrigation season with outstanding success.

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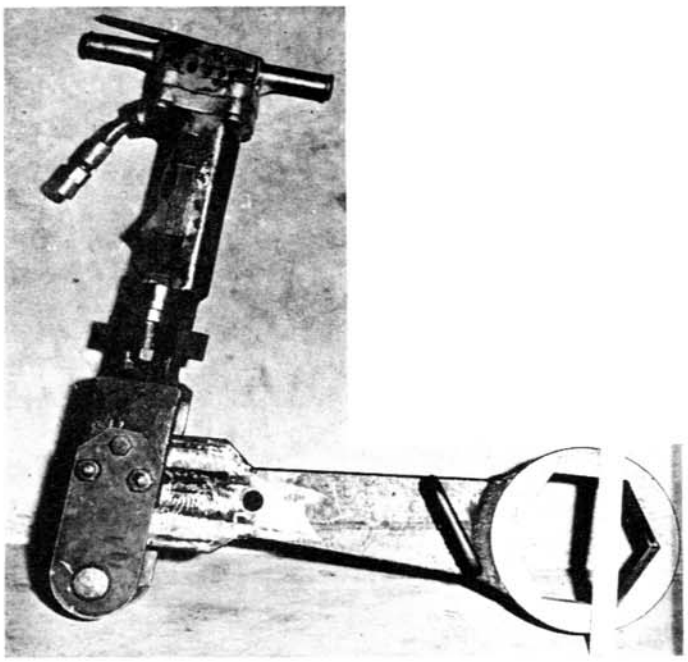
BOLTS LOOSENED WITH PAVING BREAKER



Ray O. Pickard of the Central Valley Project's Shasta Powerplant, devised and adapted the action of a Thor Pavement breaker to the loosening and tightening of the main shaft coupling bolts on the main generator shaft of units in the Shasta Powerplant.

This job is ordinarily done swinging a 20-pound sledge hammer. The Regional Office states that Ray's idea "took the sweat out of the operation," as well as saved considerable time.

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GPO 842397