passes the baffle on the post and will return to slide along the wire to the next post or into the storage area or bypass channel, as shown. The information gained from tests helped determine the proper angle (40°) at which to install the baffle plates and their size.

Log boom deflector. - Figure 143 shows the placement of a log across the Inlet Canal, Owl Creek Unit, Wyo., to deflect floating weeds and debris into a wasteway. This is an example of a simple and inexpensive method of diverting floating debris from a canal.

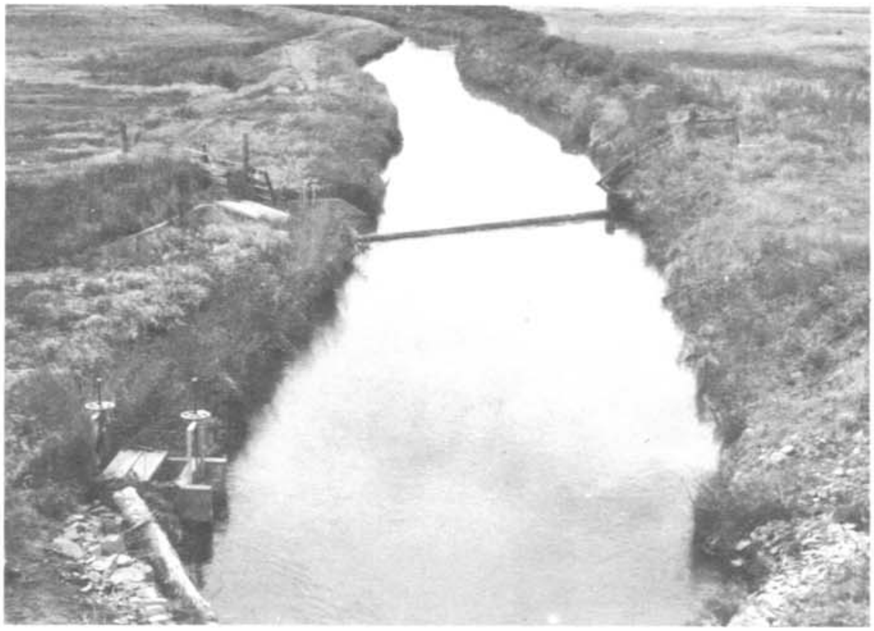


Figure 143

Diversion channel traps. - An effective and economical way of collecting floating material in an irrigation system may be accomplished by a weed trap similar to that shown in figures 144 and 145, designed and constructed on the Columbia Basin project. Regardless of quantity of plants collected or the resulting damming effect, the water will not overflow the banks, as the weed trap is located in a bypass channel into which the floating material is directed by a log boom. Weeds floating in the system are forced upon an inclined grating by the current, where they are subsequently burned.

Figure 145 also shows the rack which holds the weeds but permits water from the bypass channel to reenter the canal.

A method of tightening the wires on the diversion structure is shown in figure 146.

Figure 144

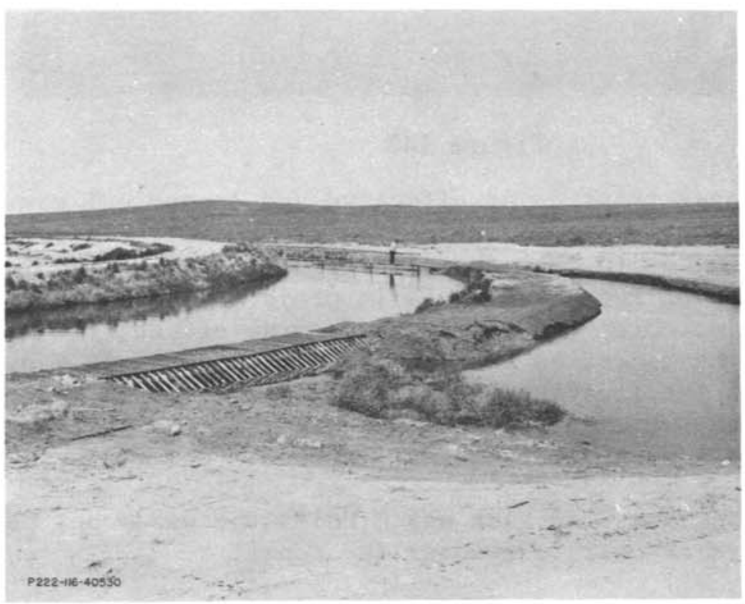


Figure 145

Trashracks

Trashracks for canals and larger laterals. - The trashrack shown in figure 147 is of the type presently in use in many laterals on the Columbia Basin project. The flat slope of the rack aids in the removal of weeds, and the landing mat deck provides good footing for removal of the accumulated debris. The trashrack shown is installed in a lateral having a capacity of 400 cubic feet per second.

Surplus rails are used for the supporting crossmembers of the trash-rack, and heavy-duty pipe for the rack varies from 3/4 to 1-1/4 inches, depending on the length of the span. The rack shown was constructed of 1-1/4-inch-diameter pipe, with the longest pipe length being about 20 feet.

The pipe is spaced 8 inches center to center and is placed on a slope no steeper than 4 to 1. Upper ends of the pipes are loosely attached to the rail by large spikes which pass through holes in the ends of the pipes and through the web of the rail. The foundation for the rail crossmember can be of concrete or serviceable timber. The platform required in large laterals, as shown, has a deck constructed from surplus landing mat supported by a pipe framework.

In many cases, the complete unit is fabricated in the project shop and is rigidly constructed, using pipe or heavy strap around the outside perimeter of the rack. A fence enclosure is constructed adjacent to large installations for deposition and burning of weeds collected.

The trashrack shown in figure 148, designed and constructed by personnel of the Yuma Projects Office, Yuma, Ariz., is reportedly easy to install and very easy to clean.

Materials required for construction of this trashrack consist of:

a. 3- by 3- by 1/4-inch angle iron

b. 1-inch diameter galvanized pipe

c. Flat bar 3- by 1/4-inch

The pipe is welded to flat bars at 8-inch centers, and other dimensions would vary with the size of the canal or lateral. Installation of the pipe on a flat slope causes most of the trash to collect near the top of the rack. This permits the easier cleaning previously mentioned and also eliminates the need for cross bracing between the pipes in most installations. Larger pipe can be used where flow velocity causes vibration damage to the pipe.

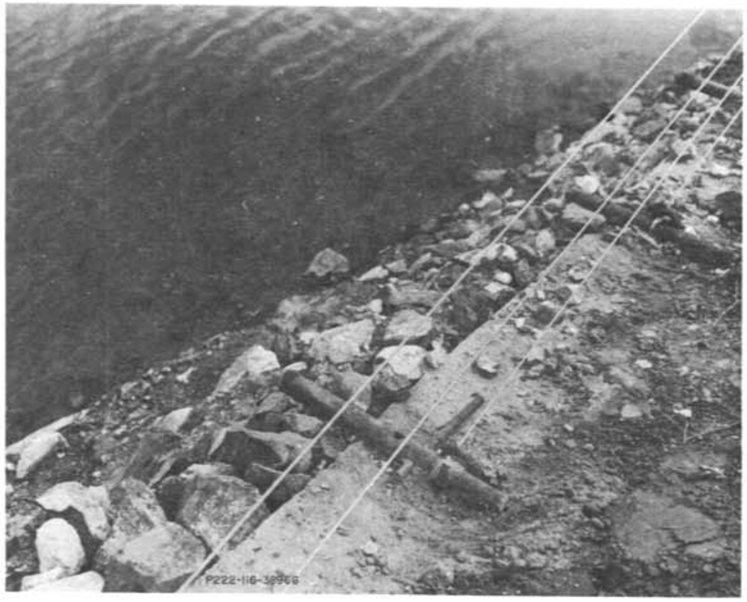


Figure 146

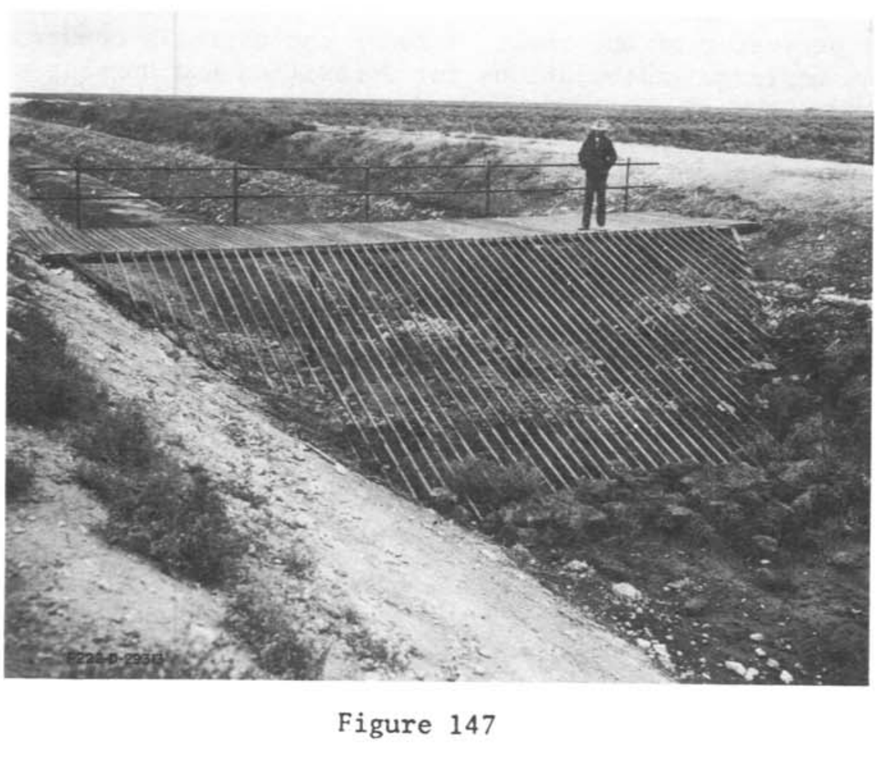


Figure 147

Figure 148

Self-cleaning weedrack. - A better type of weedrack, developed on the Columbia Basin project, is simple to construct, requires less material to build, and by using existing chutes or inclined drops is particularly well suited to combing out large weeds such as Russian thistle and mustard, which are common to the project area. Several views of typical racks are shown in figures 149, 150, and 151.

Constructed of 1- to 1-1/2-inch-diameter pipe or square tubing, the rack has a flat metal plate at the upstream end and an operating platform at the downstream end, where weeds are collected and burned. The operating platform is fabricated using grating material supported by laterally positioned pipes. The upstream plate has a dual purpose: to smooth the flow of water through the rack and to prevent the water from splashing over the structure walls. The plate also prevents weeds from hanging on the upstream end of the pipes forming the rack. Whenever possible, the plate and rack are positioned to take advantage of any changes in the slope of the structure, to minimize the obstruction to the flow of water.

The real value of this weedrack lies in its self-cleaning action. The rack does not require constant attention to keep weeds from impeding the waterflow, as the weeds are easily removed from or burned on the platform when dry, and time and labor are saved by not having to pick heavy clumps of weeds from the teeth of the rack. Also, there is less chance of this type of weedrack becoming choked with weeds and flooding the lateral or washing out the structure.

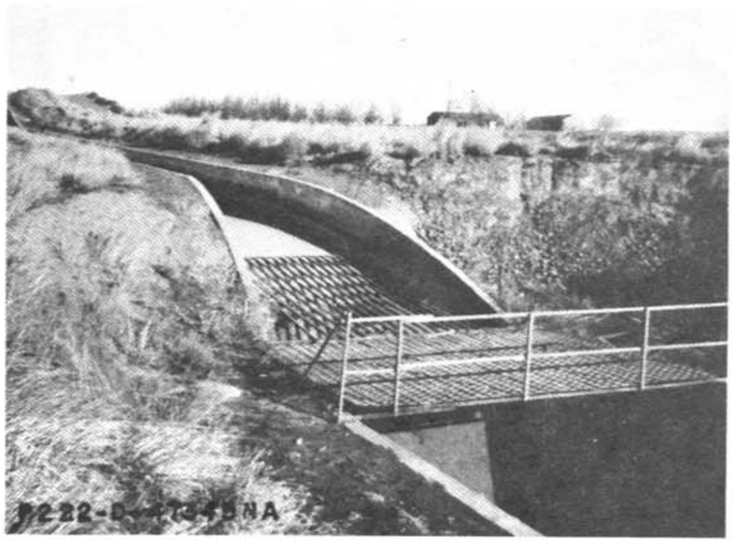


Figure 149

Figure 150

Figure 151

Pumping plant trashrack. - A heavy concentration of debris on the trashrack at the Burbank No. 3 Pumping Plant, Columbia Basin project, was continually interfering with the flow of water to the pump, causing frequent shutdowns at the plant.

To eliminate this problem, another trashrack, as shown in figure 152, was constructed approximately 6 feet in front of the original rack.

Figure 153 shows the original trashrack that was built with a 1-7/8-inch spacing on a 1 to 3 slope. The supplemental trashrack with a trash bar spacing of 3 inches, from 2-1/2- by 1/2-inch steel bars, restricts the larger material to the forebay, where it can be removed easily.

The new rack has a much flatter slope, which makes it possible to clean both racks at less frequent intervals. This has been made possible because of the heavier driftwood and other large debris being caught by the auxiliary trashrack.

Project field personnel fabricated the new rack, and a platform was made from surplus landing mats on which the debris can be piled for removal.

The Kennewick Division of the Yakima project, Wash., has similar floating debris problems experienced elsewhere. However, the most troublesome spot on their canal is a siphon entrance which is also the entrance to a direct-connected turbine pump.

The Amon siphon and pump entrance at Mile 25 on the main canal (243 cubic feet per second) was originally equipped with a trashrack set on a 1 to 1 slope, with 1-inch openings. With this rack completely clean, the average velocity through the 1-inch slots approached 5 feet per second. Algae, tumbleweeds, and other debris floating in the canal increased operation and maintenance problems at this structure. To reduce the problems, the *automatic weed rack* shown in figure 154 was installed.

Angle iron bars, moving upward by sprocket-driven, endless chains, carry weeds to a conveyor which in turn carries the weeds to a pit which is provided to trap and burn the weeds.

A similar self-cleaning trashrack in use on the Middle Rio Grande project, N. Mex., is shown in figures 155 and 156.

Mechanical trashrack. - The mechanical trashrack used on the Northport Canal, North Platte project, Neb., is a product of 4 years of experimentation and improvement. Most of the construction and

Figure 152

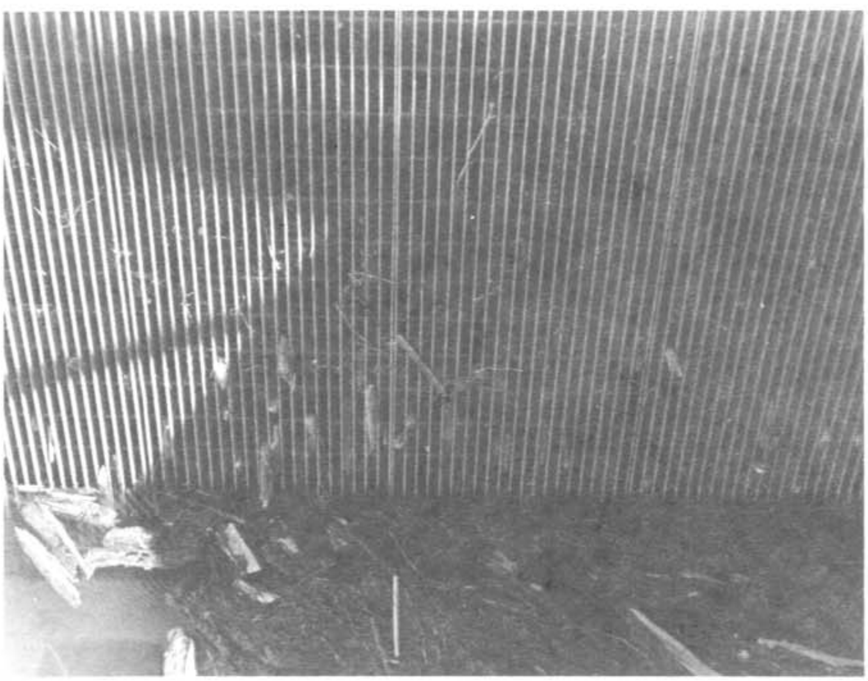


Figure 153

Figure 154

alterations that were necessary for the efficient operation of this device were done by personnel of the Northport Irrigation District.

It is basically a very simple mechanical device that reportedly operates very efficiently. Figure 157 is a view of the trashrack looking up at it from the lower section. The trash moves up the rack, falls onto the conveyor belt, which moves the trash to a depression on the right side of the 60-ft^3/s canal, where it has been installed at a drop structure.

Trashrack Construction

The device is made of 2-inch steel shaft that has eccentrics or cams keyed to the shaft. These raise and lower alternate steel bars or walkers approximately 2 inches with each stroke. The walkers are made of 3/8-inch steel, 4 inches wide. Each walker is notched at intervals of about 8 inches and has several weld spots to further roughen the top surface and aid in the upward movement of the trash, as shown in figure 158. The walkers are spaced 1-3/4 inches apart.

A piece of 3/8-inch steel is used on each side of the walker to eliminate lateral movement and also to give a closer fit as the walkers slide in the groove on the eccentric. It was found that better

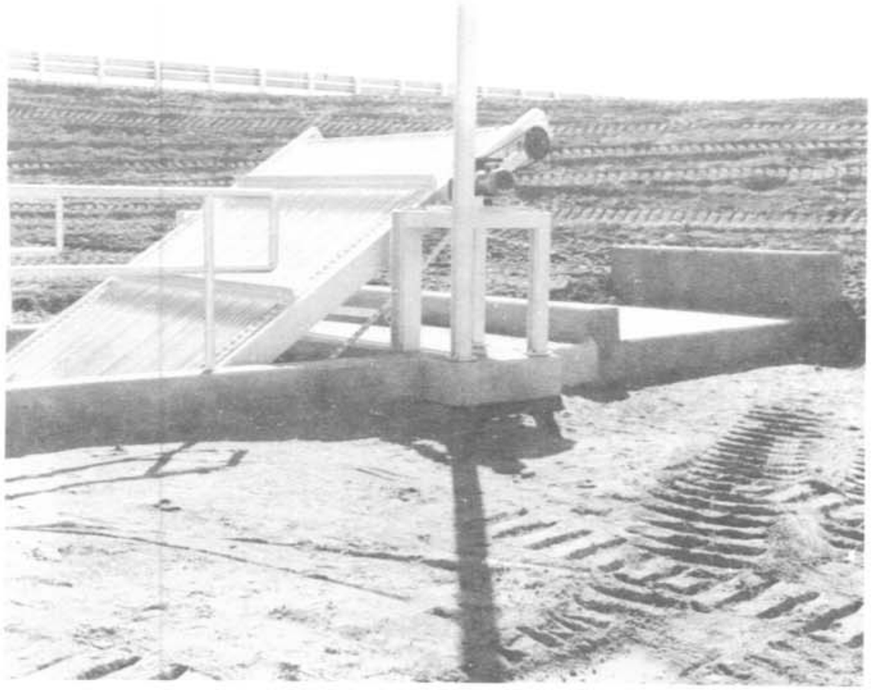


Figure 155

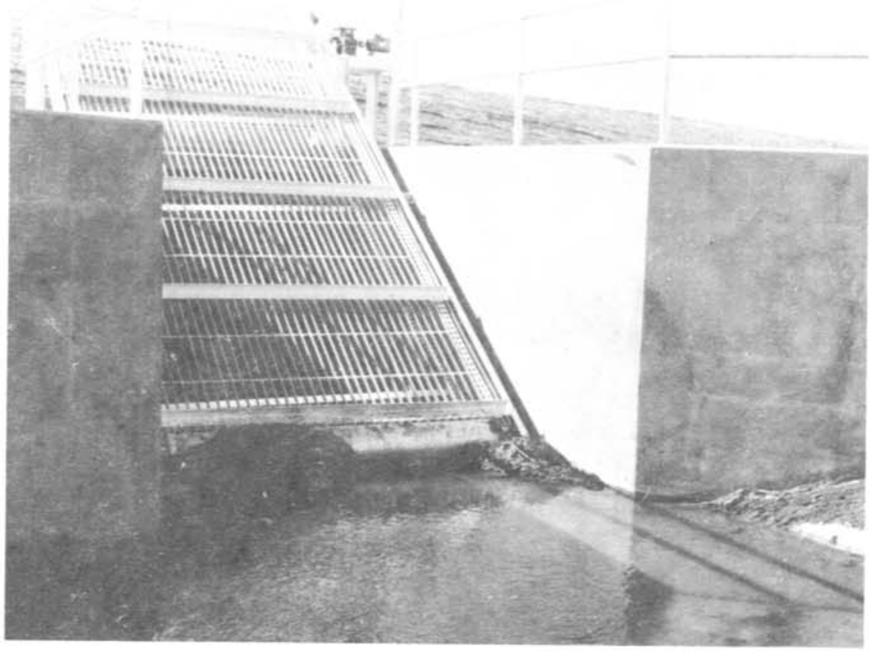


Figure 156

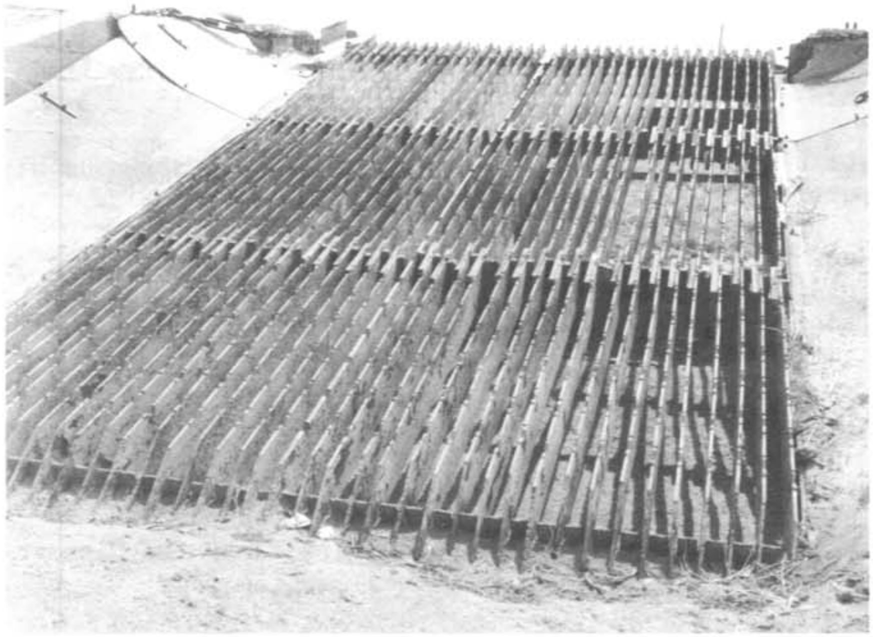


Figure 157

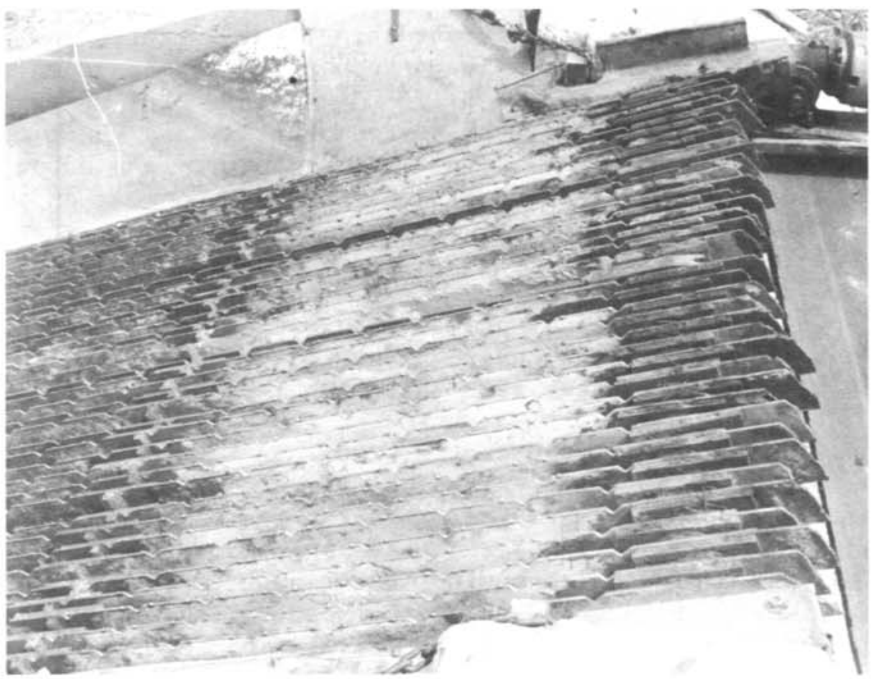


Figure 158

results were obtained when the bearing surface was bronzed at the bottom of the walker where it makes contact with the eccentric. The shaft makes 42 revolutions per minute and is powered electrically with a 1-1/2-hp motor, The walker-eccentric contact surface is greased once a day; wheel bearing grease was found to be best.

Conveyor belt. - A view of the conveyor belt is shown in figure 159. This particular conveyor belt is 60 feet long and 2 feet wide and is also powered electrically by a 3/4-hp motor. The smooth-type belt does not move the lighter weight weeds as well as it should. Therefore, a rough-surfaced belt, 3 feet wide, is recommended. It is believed that the added width is needed to handle longer logs and large objects.

Revolving weed screen. - A shop-built, revolving aquatic weed (includes algae and other water weeds) screen is being used by the Ivanhoe Irrigation District, Visalia, Calif., to prevent weeds and trash from entering two turnouts in the distribution system. The weed screen device was designed by the District Manager and was fabricated by a local machine shop.

The weed screen as shown in figure 160 is placed deep enough in the rectangular canal section upstream of the turnout to pick up all the weeds and trash. Basically, it is a large, 10-foot-diameter, cylindrical drum covered with a heavy 3/8-inch wire mesh. Note the switch in the lower right corner, which turns on the pump and screen drive motors when the turnout gate is opened.

The drum for the revolving weed screen rotates on a shaft powered by a 1-hp, 230-volt, 1,725-r/min electric motor. The output speed of the motor shaft is reduced by a 40:1 reduction gear on the motor and a 6:1 ratio on the drive pulleys. The shaft is supported by two large pillow block bearings. The drum has eight pickup screens, which are equally spaced on the circumference, to pick up the weeds. As the pickup screens pass through the weed collector box, they are rotated so that the weeds can be washed off by the six water jets. Figure 161 shows the water jets that wash the weeds from the screens.

A 75-pound pressure is produced for the water jets by a 3-hp, 230-volt centrifugal pump. After the pickup screens pass through the collector box, they return to their original pickup position by means of a spring. The weeds that are removed by the water jets are flushed from the collector box back into the canal downstream of the turnout. Figure 162 shows the weed collector box that returns the weeds to the canal, and figure 163 shows the high-pressure pump that operates the water jets. A sketch of the weed screen is shown in figure 164.

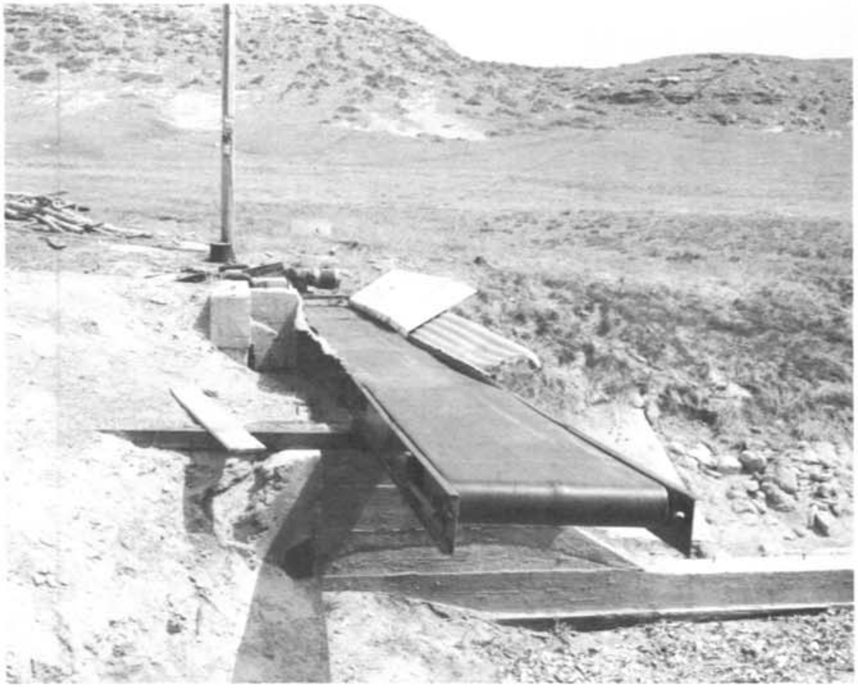


Figure 159

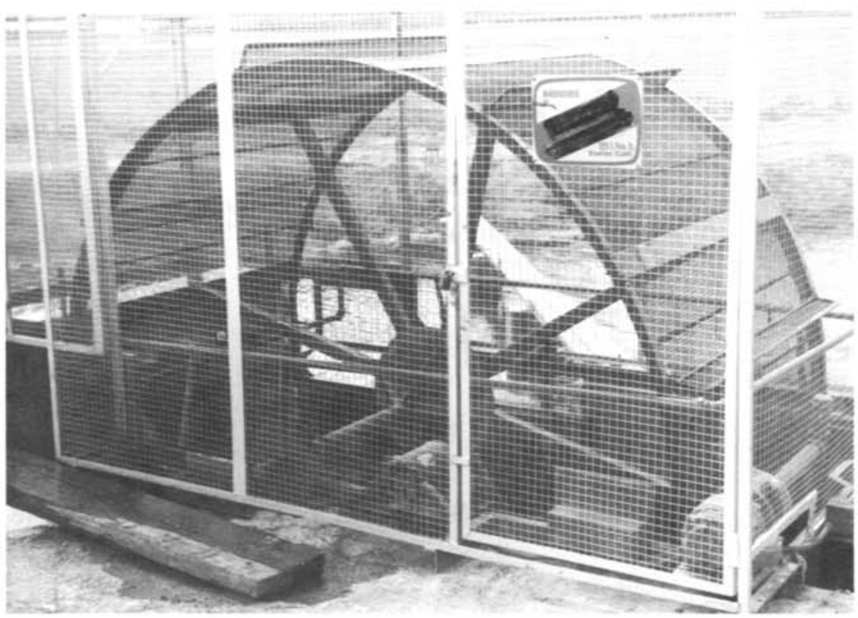


Figure 160

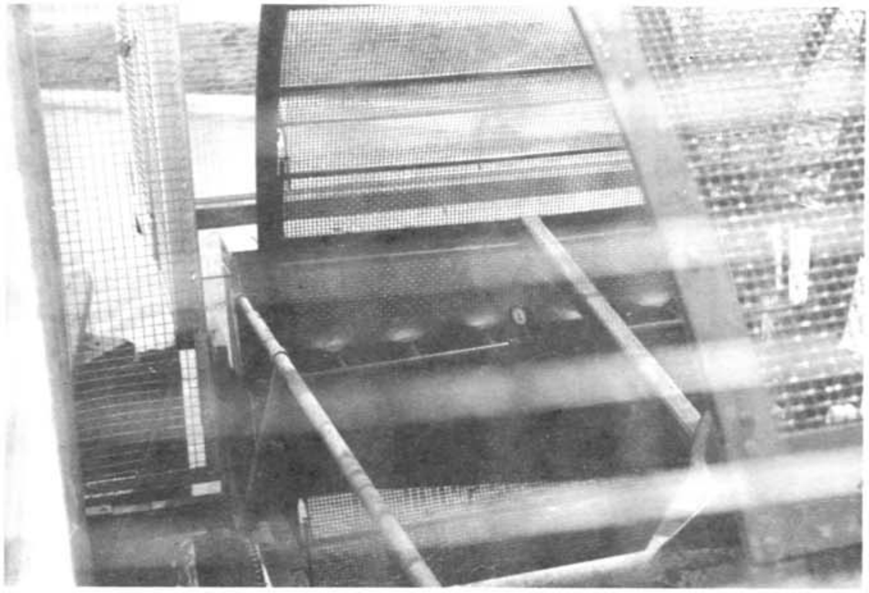


Figure 161

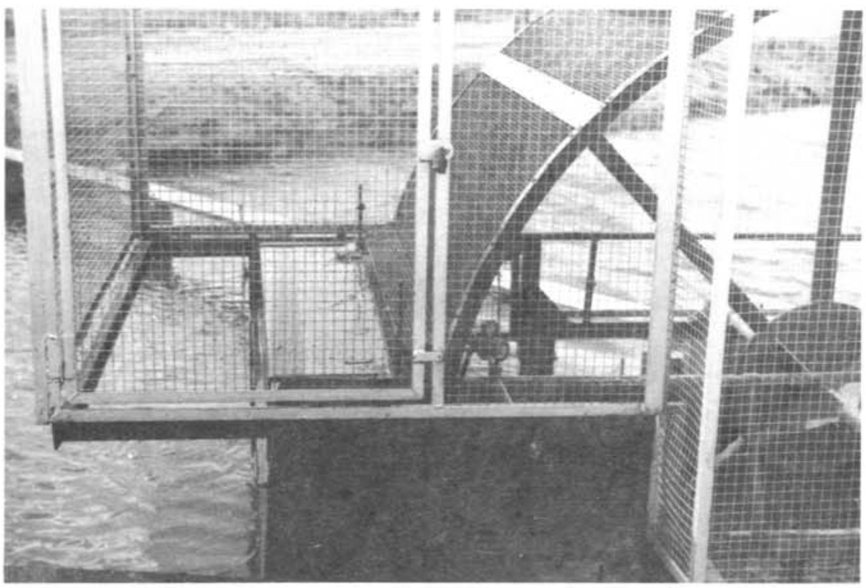


Figure 162

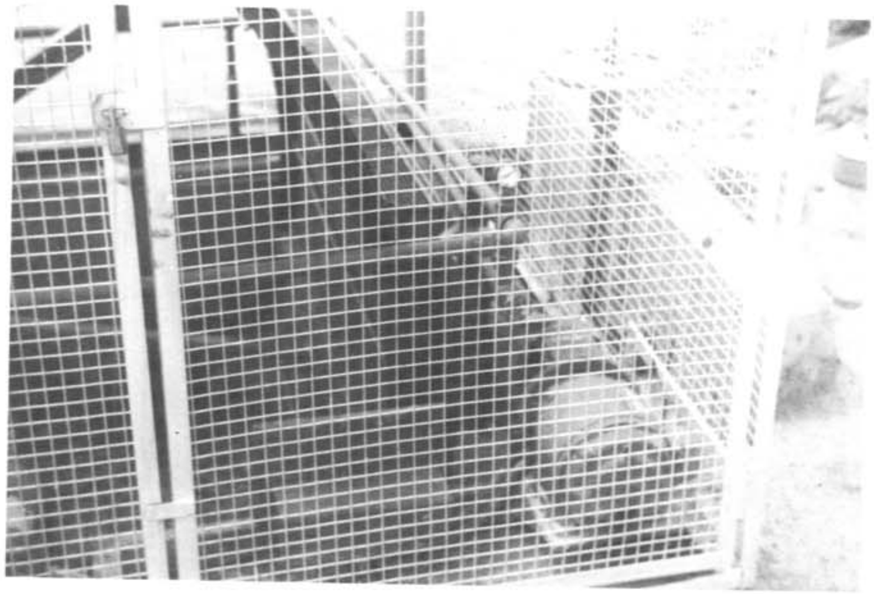


Figure 163

The weed screen device was thoroughly cleaned and painted with a good rust-inhibiting primer and paint. A safety enclosure has been neatly installed around the device, which also deters vandals. Periodic lubrication of the shaft pillow blocks and drive chain is required; otherwise, the device is relatively maintenance free, and is reported to be working very effectively.

Vacuum cleaner for trashrack. - A vacuum cleaner that removes floating weed and debris from trashracks has been developed by the California Department of Water Resources. A macerating-type pump is mounted on a dolly, as shown in figure 165, and placed on the trashrack by a truck boom. The powerful suction of the pump draws the weeds up into the blades and the finely cut discharge particles fall back into the aqueduct without danger of future clogging. Figure 166 shows the pump in action.

Trashrack rake. - The debris that collects on the trashrack of the Wellton-Mohawk Pumping Plant No. 1 of the Gila project, Ariz., consists largely of pondweed. A mechanical rake similar to that installed on other project facilities was provided for clearing the debris from the trashrack. In operation, however, difficulty was encountered in using the rake due to the type of debris. It collected on the trashrack and interwove into a homogenous, compact mass, forcing the wheels of the rake to ride over it. This in turn lifted the rake away from the trash bars. Modifications to improve operations were made as discussed below.

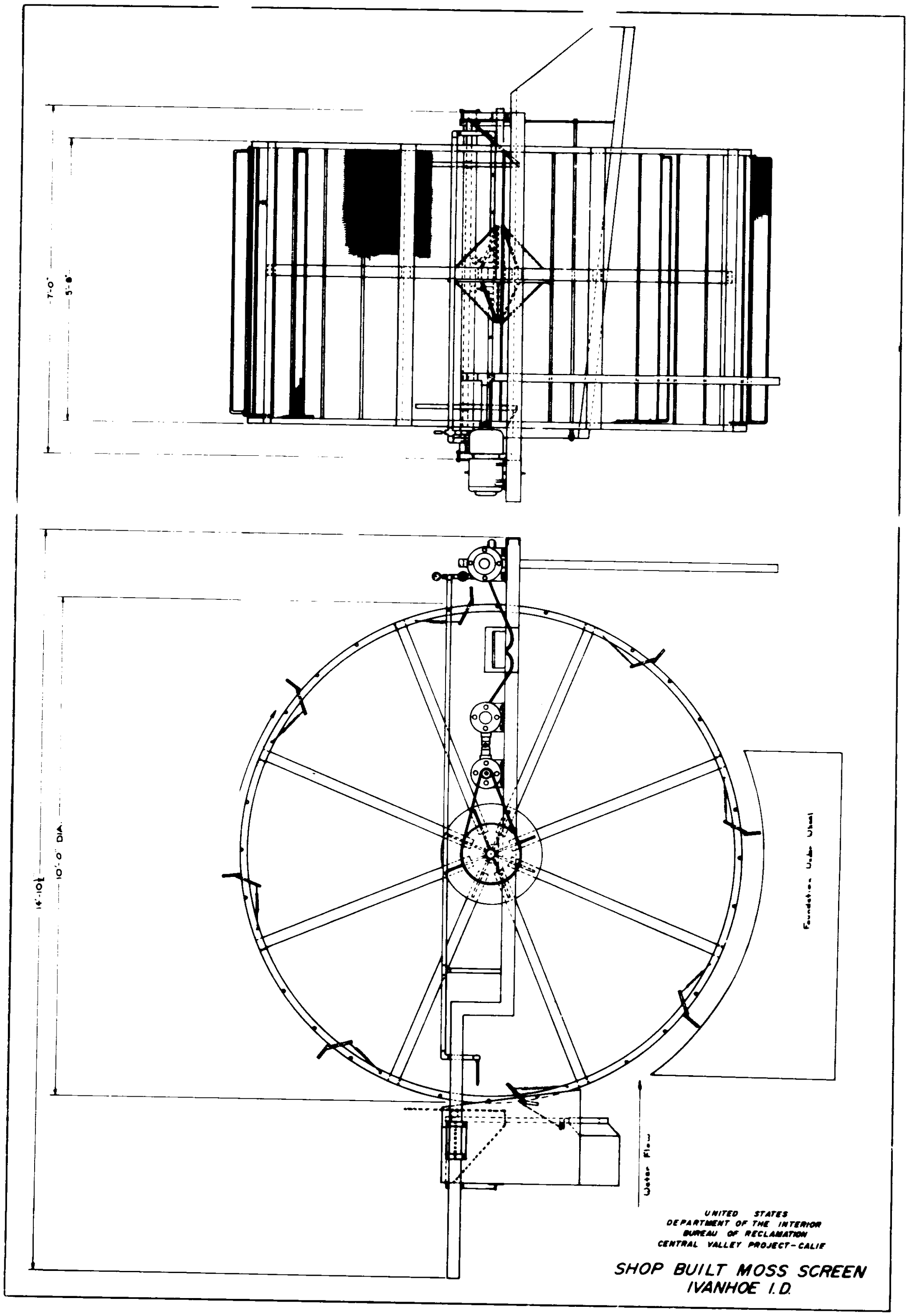

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT-CALIF
SHOP BUILT MOSS SCREEN
IVANHOE I.D.

Figure 164

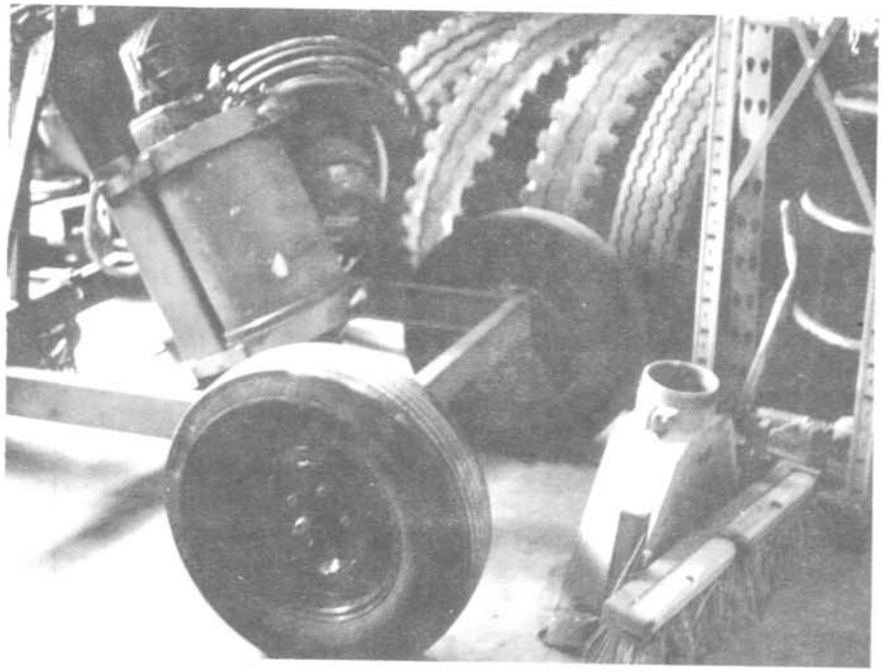


Figure 165

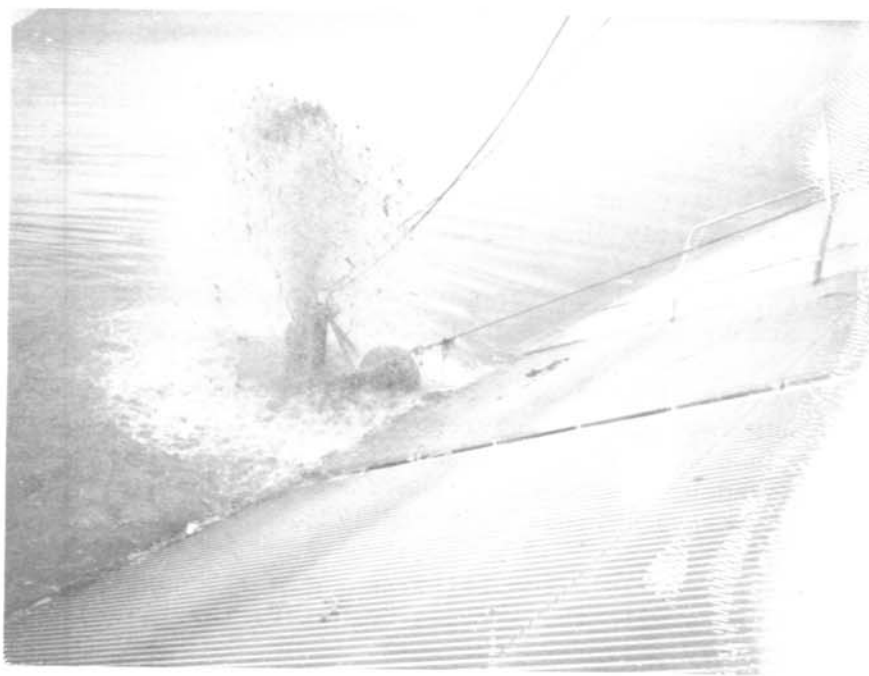


Figure 166

A drawing of the original trashrack rake is presented in figure 167. The modification of the rake devised by project forces is illustrated in figure 168 and consists of a set of rake teeth or plows mounted just ahead of the wheels. The teeth clear a path through the debris so that the wheels are permitted to roll on the surface of the rack as designed, successfully removing the entwined mass.

The type of debris appears to have a bearing on the success of the rake in clearing trashracks. As now modified, Gila project personnel are well satisfied with the rake in handling the debris, principally pondweed and algae encountered in the canal system. A view of the rake in operation is shown in figure 169.

Weed Forks

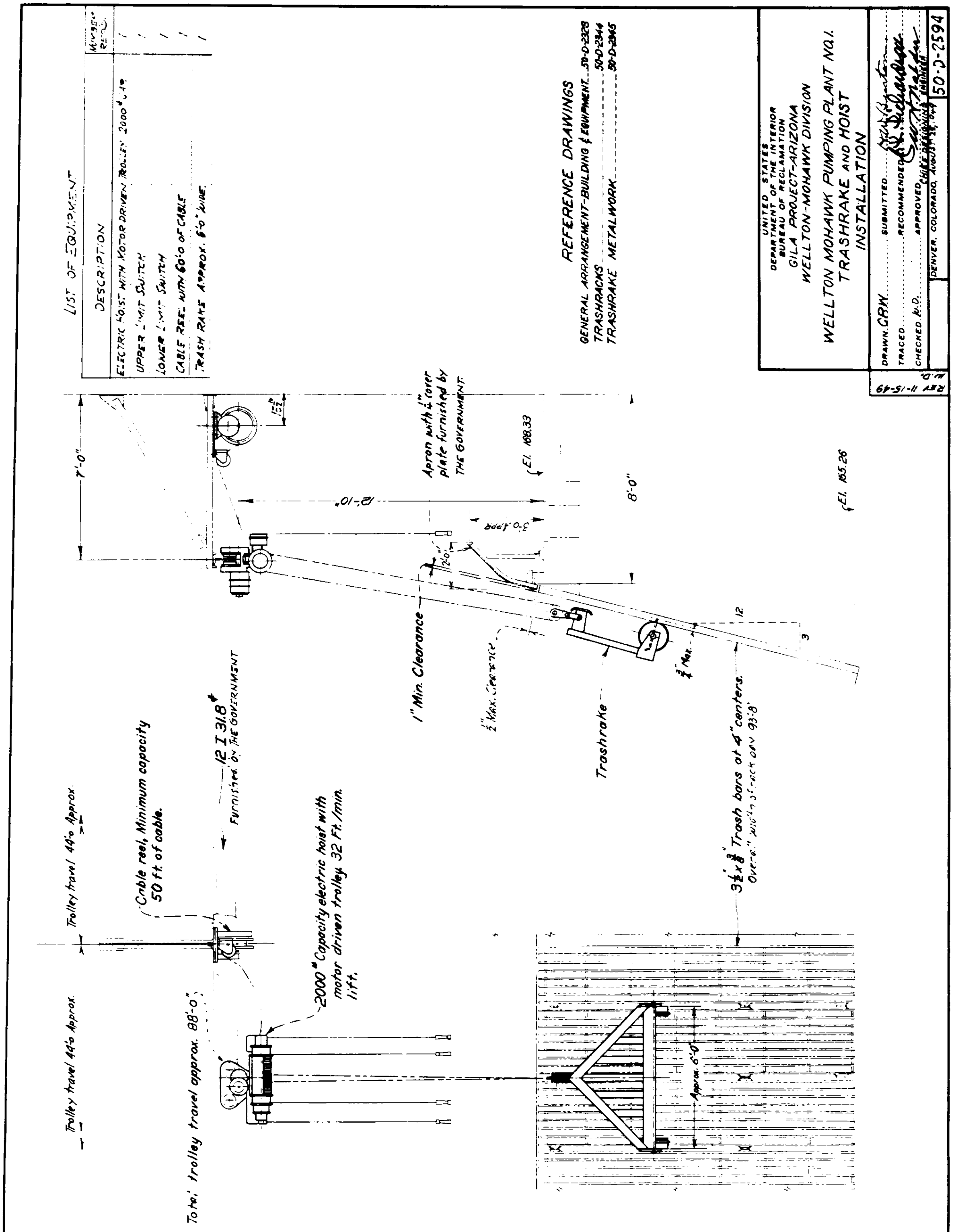
In an attempt to reduce the manpower used in the removal of dislodged algae and weeds that have floated downstream to pumps, culverts, and siphons, the Tulelake Division of the Klamath project, Calif.-Oreg., purchased a crane-operated *sugarcane* grapple or *fork*. This fork, shown in figure 170, was modified by adding two prongs and a heavy weight to each jaw. The weights were needed to give faster and more positive action in opening and closing. This fork is operated by a truck crane, giving it the required mobility to move around to various ditches as required.

The weed fork shown in figure 171 was designed and constructed for use on the W.C. Austin project, Okla., to remove weed growth which has been broken loose by chaining operations or to grab floating material. The *mechanical weed fork* was found to be more effective than a dragline bucket, as a larger payload can be carried and the water drains away freely when the debris is raised.

Sugarcane forks, to which one or more tines can be added for this type of use, are available commercially.

A fork-type attachment used on a commercially available, truck-mounted unit has facilitated the removal of floating weeds or other debris that accumulates in canals and drains on the Yuma project, Ariz. The attachment developed by the Yuma County Water Users' Association is shown in figures 172 and 173.

When the dislodged debris accumulates to where it cannot be floated through the turnouts with the irrigation water, the fork-type attachment has efficiently performed the work.



LIST OF EQUIPMENT
DESCRIPTION
Electric hoist with motor driven trolley 2000# cap.
Upper limit switch
Lower limit switch
Cable reel with 60'0 of cable
Trash rake approx. 6'0" wide.
REFERENCE DRAWINGS
GENERAL ARRANGEMENT-BUILDING & EQUIPMENT 50-D-2328
TRASHRACKS 50-D-2344
TRASHRAKE METALWORK 50-D-2345
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
GILA PROJECT-ARIZONA
WELLTON-MOHAWK DIVISION
WELLTON MOHAWK PUMPING PLANT NO.1
TRASHRAKE AND HOIST
INSTALLATION
DRAWN CRW
TRACED
CHECKED R.O.
SUBMITTED
RECOMMENDED
APPROVED
DENVER, COLORADO
50-D-2594
Trolley travel 44'0 Approx.
Total trolley travel approx. 88'-0"
Cable reel, Minimum capacity 50 ft. of cable.
12 I 31.8#
Furnished by the Government
2000# Capacity electric hoist with motor driven trolley. 32 Ft./min. lift.
1" Min. Clearance
Trashrake
Trash bars at 4" centers.
Apron with 1/4" cover plate furnished by the Government
El. 188.33
El. 155.26
7'-0"
12'-10"
8'-0"
Approx. 6'-0"

Figure 167

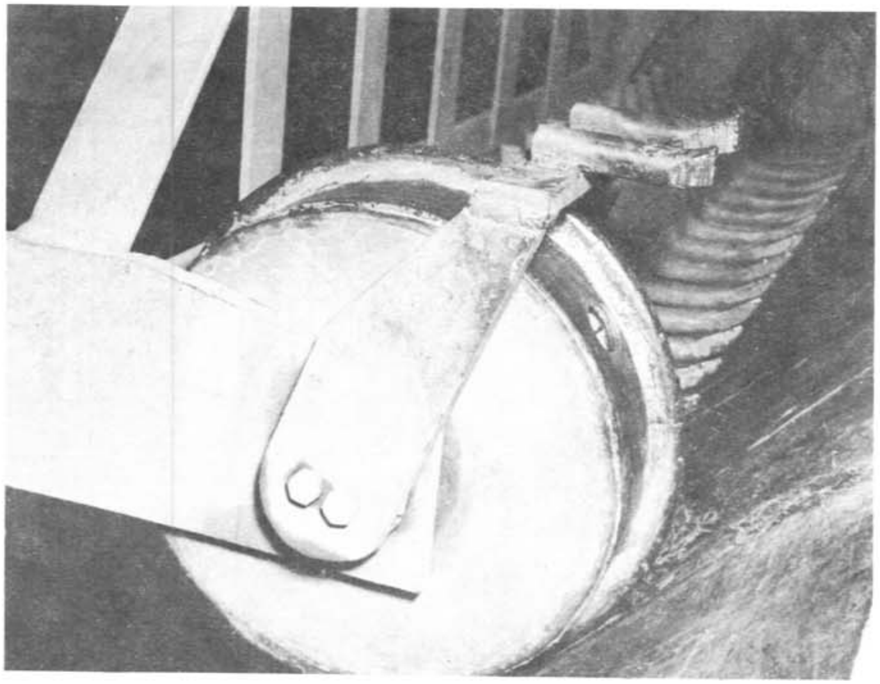


Figure 168

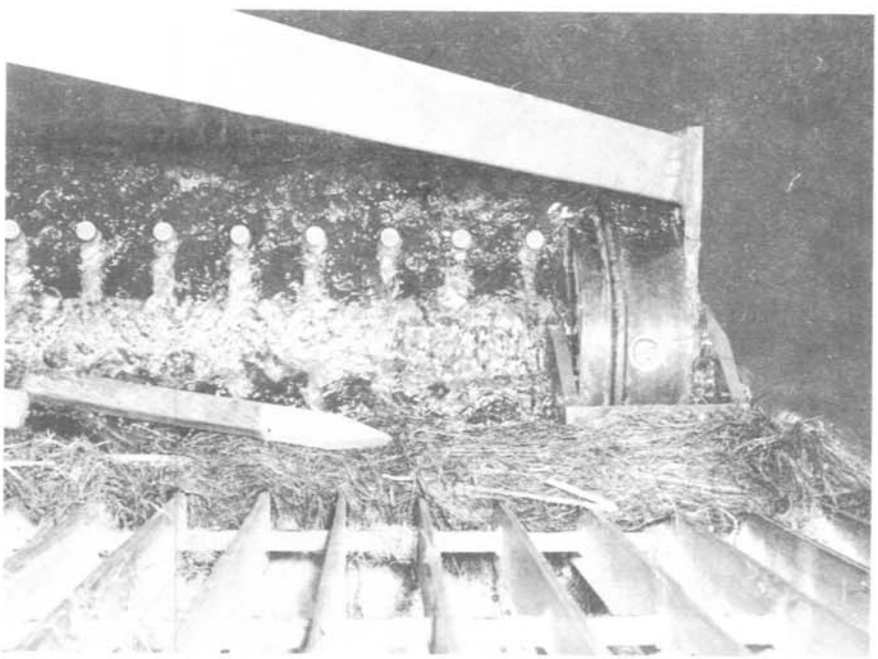


Figure 169

Figure 170

Figure 171

Figure 172

Figure 173

Insley Weed Rake

Many types of weed rakes have been designed and constructed in project shops, to mechanically remove weeds from laterals, canals, and drain ditches.

Using these as a guide, Insley Manufacturing Corporation of Indianapolis, Ind., constructed a "basket rake," shown in figures 174 and 175, that does an excellent job of removing floating weeds from canals and laterals and heavy weed growth from drain ditches.

The rake can be easily handled by a standard 1/2-cubic-yard dragline or crane. Installation is similar to a dragline bucket. There are two models, each having a cleaning width of 9 feet. One model is designed for flat-bottom ditches and the other for narrow, "V"-shaped ditches. Both models have 10 permanent teeth at 1-foot intervals with provisions for 9 intermediate removal teeth, providing 6-inch tooth spacing. When used to remove floating weeds, one project welded 9-inch extensions to one set of removable teeth to provide extra basket capacity. When cleaning drains, they installed another set of removable teeth without the extensions.

Where problems with weeds blowing into and plugging canals and laterals exist, the weed basket on a truck-mounted dragline can replace several weed removal crews. When used to clean drains, the teeth at 6-inch spacing are close enough together to adequately remove heavy weed growth. Its 9-foot cleaning width enables a dragline operator to clean two to three times more drain in the same time period as when using a standard dragline bucket.

The time saved rapidly repays the cost of the basket rake on any project where there is considerable need to mechanically remove weeds from project waterways.

Wide Dragline Bucket

The 10-foot-wide dragline bucket shown in figure 176 was designed for more efficient cleaning of aquatic weed growth from canal and drain channels. It also increases the efficiency on light dredging for silt removal from the channels. The capacity and weight of the bucket were designed for use on the Imperial Irrigation District's 20- and 30-ton transit cranes. A transit crane equipped with the 10-foot-wide bucket, as shown in figures 177 and 178, cleans 1 to 1-1/2 miles of channel per 8-hour day.

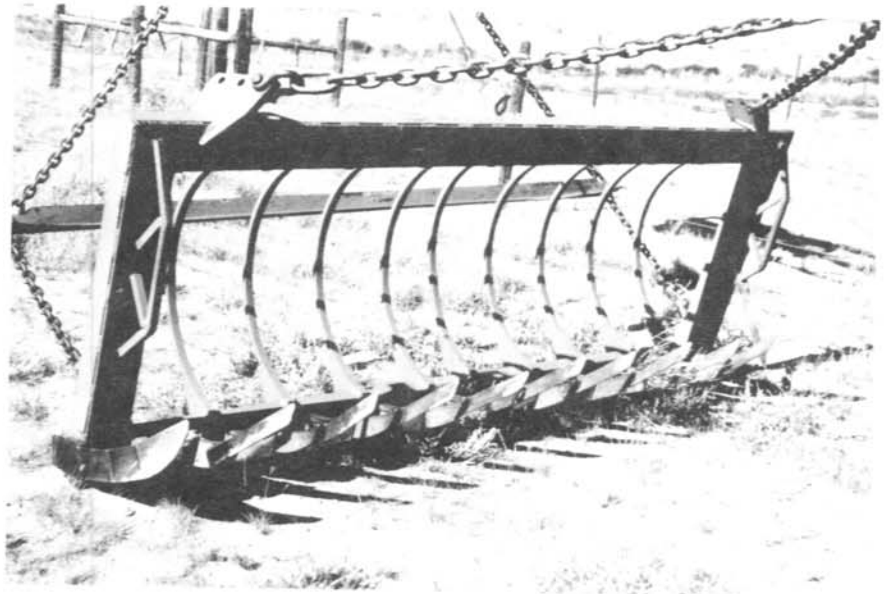


Figure 174

Figure 175

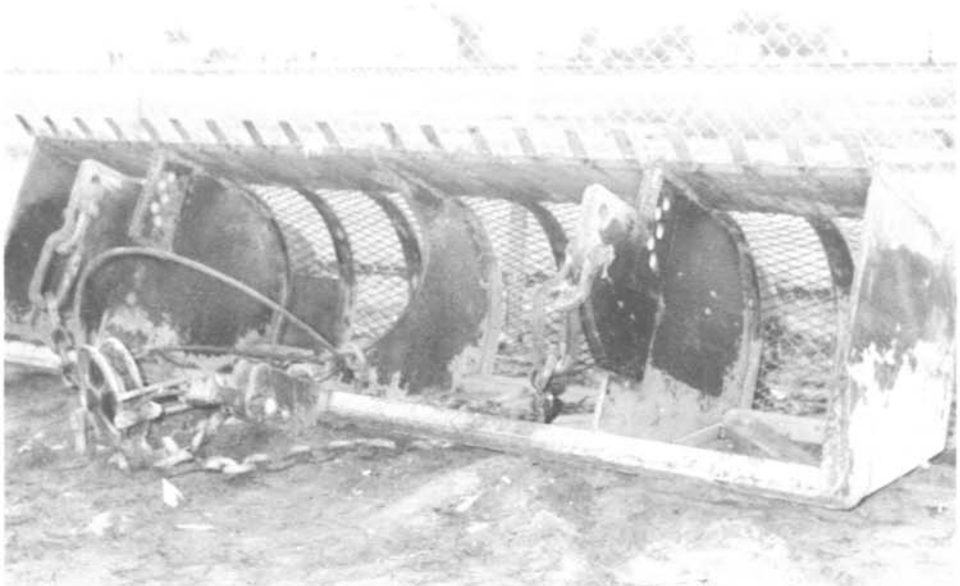


Figure 176

Figure 177

Figure 178