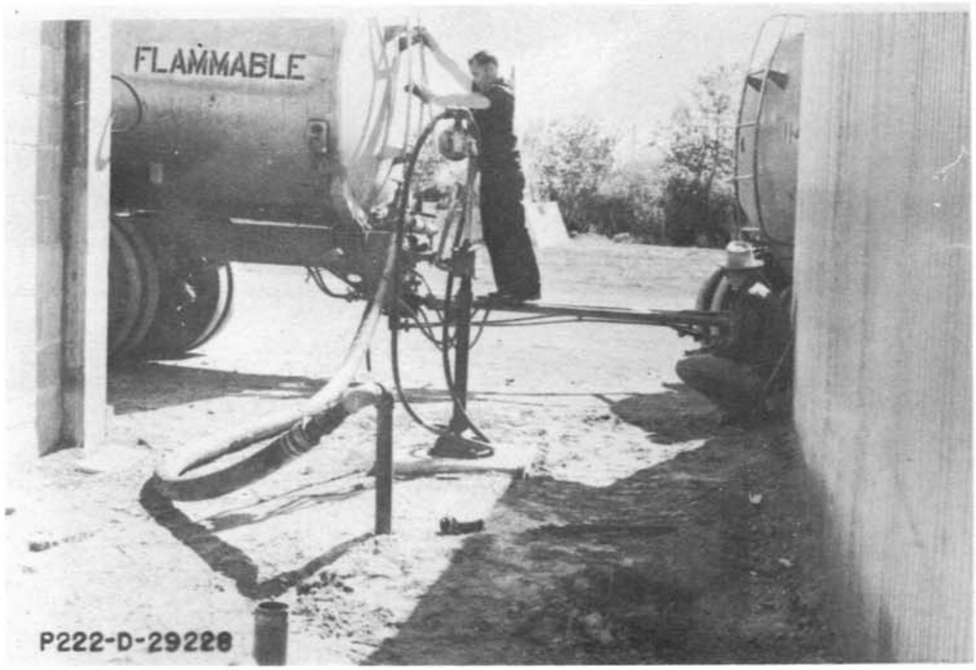


Fig. 151

Mechanical Methods for Control of Aquatic Weeds

Numerous devices from hand tools to very elaborate cleaning devices, have been used for the cleaning of aquatic weeds from canals. The few illustrations given in this section of the bulletin are typical of many devices and convey the general idea that disposal is the important problem as discussed in a later section.

Chaining and Drags

Removal and disposal of submersed aquatic weeds in large canals is a problem which has thus far been solved only by mechanical methods. Chaining, Figure 152, is one of the most used mechanical methods and consists of the passage of a very heavy linked drag, Figure 153, over the bottom of the canal.

Usually, at least three passes of the chain drag are required, however, treatments are repeated as often as necessary to relieve the aquatic weed problem. Two or three chainings a season would be a minimum. On other projects the treatments may need to be repeated every 10 days.

On projects containing many pumps, farm sprinkler systems, siphons or spiles, project management would chain only as a last resort. In these instances special diversion structures might be constructed to keep the water relatively free of weed debris which clog pumps

Fig. 152

Fig. 153

and farm sprinklers. The problem is illustrated in Figure 154 on the Boise Project, Idaho, where weeds loosened from the bottom of the canal by chaining have been deposited on a trashrack provided for collection of the weeds and debris. Expensive hand removal of the debris is necessary where other facilities are not available.

A study of the relative merits of pondweed control by chaining and by treatment by aromatic solvents on projects in Region 1 was reported in "Pondweed Control: Chaining vs. Aromatic Solvents," copies of which may be obtained by addressing the Regional Director, U. S. Bureau of Reclamation, Boise, Idaho.

A side-arm boom has proved satisfactory for towing demossing equipment through irrigation ditches where only one ditchbank operating road has been provided. The boom shown in Figures 155 and 156 was designed by personnel of the Patterson Water Company, Patterson, California.

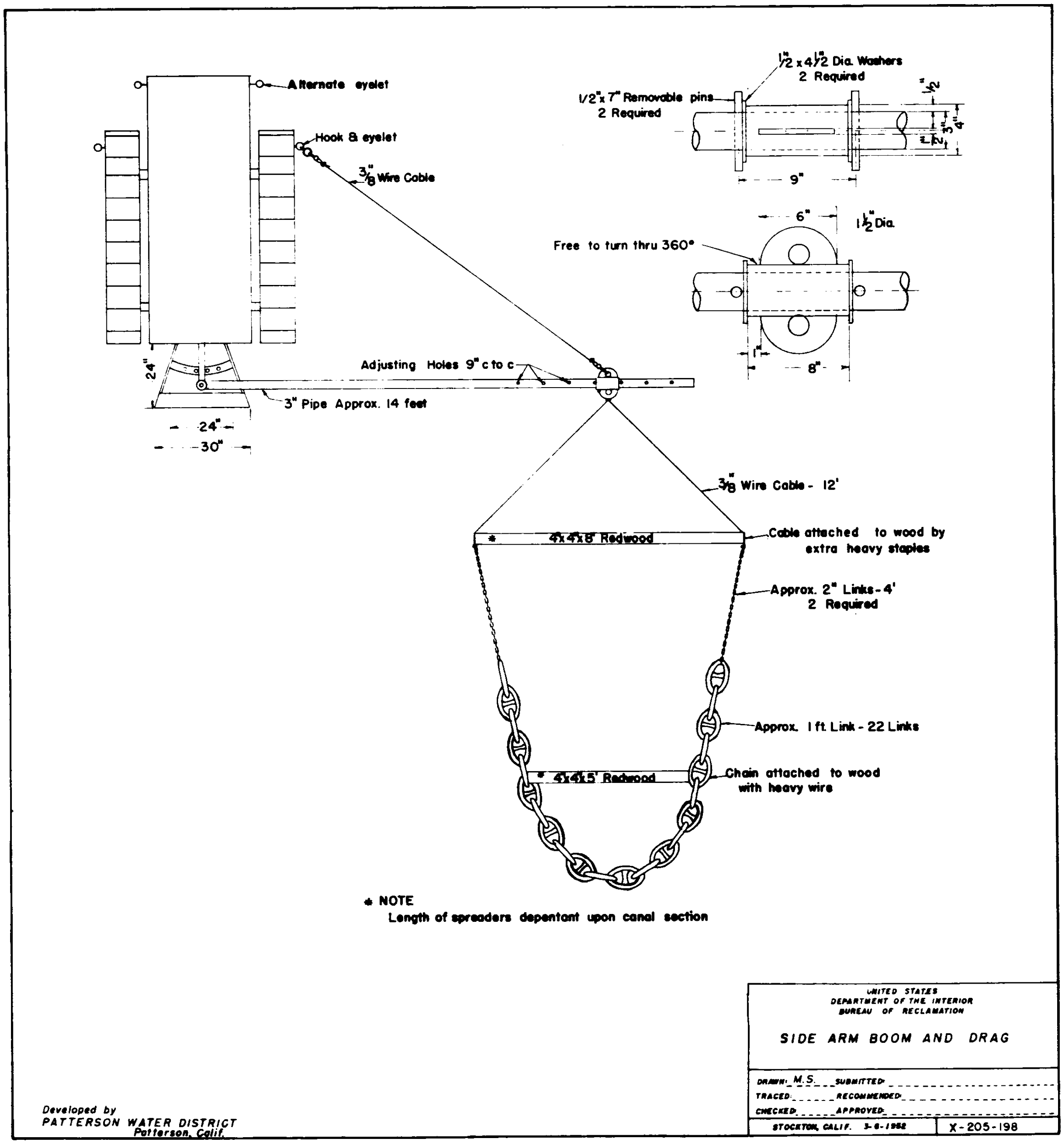
Fig. 154

A special platform was constructed on the tractor hitch as a support for the boom. The boom was made from 3-inch pipe to which the free-swinging butterfly is fitted and held in the desired position by two collar clamps. Being able to move the butterfly back and forth on the boom permits the operator to center the drag in ditches of different widths and also allows adjustment for the distance from the ditch where the tractor must operate.

Fig. 155

When it is desired to make a return trip, the hitch end of the boom is unpinned and refastened to the opposite side of the platform. The butterfly is turned over and the anchor cable is hooked into an eye welded to the track-bar shield on the opposite side of the tractor.

The plank spreaders are necessary to keep the heavy chain at proper width to attain full coverage of the ditch. Sufficient length of cable and chain should be used so the entire loop lies flat upon the canal bottom and the pull is as vertical as possible. A drag that is too short results in an upward pull and the chain passes over the weeds without breaking or tearing them loose.



Alternate eyelet
Hook & eyelet
3/8 Wire Cable
1/2" x 7" Removable pins
2 Required
1/2 x 4 1/2 Dia. Washers
2 Required
9"
6"
1 1/2 Dia.
Free to turn thru 360°
1"
8"
Adjusting Holes 9" c to c
3" Pipe Approx. 14 feet
24"
24"
30"
3/8 Wire Cable - 12'
4x4x8' Redwood
Cable attached to wood by extra heavy staples
Approx. 2" Links - 4'
2 Required
Approx. 1 ft. Link - 22 Links
4x4x5' Redwood
Chain attached to wood with heavy wire
* NOTE
Length of spreaders depentant upon canal section
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
SIDE ARM BOOM AND DRAG
DRAWN: M.S. SUBMITTED
TRACED RECOMMENDED
CHECKED APPROVED
STOCKTON, CALIF.
X-205-198
Developed by
PATTERSON WATER DISTRICT
Patterson, Calif.

Fig. 156

A somewhat similar chaining device to that previously shown is that shown in Figure 157 and used by the Twin Falls Canal Company, Idaho. This boom and chain are used in the removal of pondweeds from smaller canals and laterals.

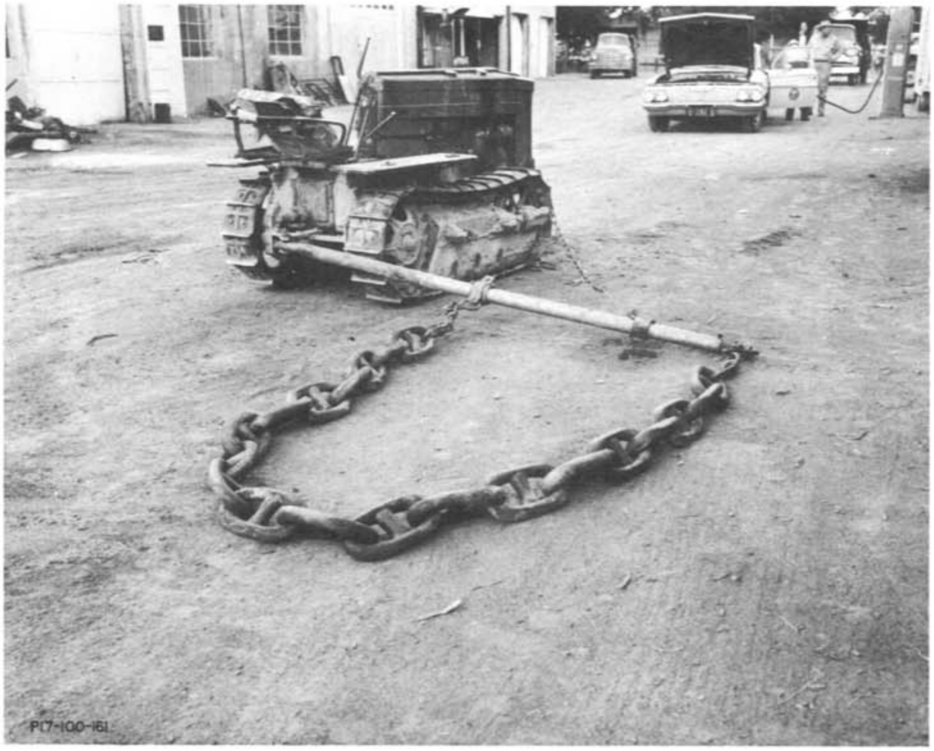


Fig. 157

Fig. 158

A cylinder for demossing laterals and drain ditches and for loosening silt deposits is shown in Figures 158 and 159. This device, known as "Ganow's Pondweed Cutter," was developed by the Gem Irrigation District in its shops at Homedale, Idaho.

The rotary action of the device as it is pulled forward cuts the pondweeds and sandbars from the bottom of the laterals.

The cylinder is 54 inches in diameter,

8 feet long from rear to nose and the nose cone is 24 inches in length. A drawing of the device can be made available by writing the Regional Director, U. S. Bureau of Reclamation, Boise, Idaho.

Fig. 159

Cutters

Periodic draining and drying of the channels are the most economical and practical methods of controlling submersed waterweeds. Where the method can be used, the sun and wind rapidly dry the exposed weeds and within a few days the tops are dead. Even though water must be carried in the laterals the year round, the Imperial Irrigation District operation and maintenance forces practice drying entire lateral systems for 3 days every 3 weeks, effectively reducing the weed problem.

Periodically, it is necessary to groove or channel the bottom of the ditches to connect the low areas and permit rapid and complete draining so all weeds will dry quickly. This can be done by the unit shown in operation in Figure 160 being towed by a wheeled tractor. The device shown in more detail in Figures 161 and 162 was designed and constructed by personnel of the Imperial Irrigation District, Imperial, California. Several sizes of the channel groover, sometimes referred to as the "moss plow" have been constructed but each is designed to slice a groove about 12 inches wide and 8 inches deep.

Fig. 160

Fig. 161

The groover is constructed of heavy metal and planking. The plowshares are discarded grader blades or steel plates with lugs welded on one side for bolting into the platform. The unit weighs about 400 pounds.

The forward lever is attached to a rolling coulter which the operator manipulates to keep the sled near the center of the ditch. A movable arm on the hitch can be pinned in several positions to produce a more direct pull. The vertical staff at rear of the platform serves only as a handhold for the second rider who adds weight and also helps balance the sled.

Fig. 162

Every year small, sluggish sublaterals on the Tieton Division of the Yakima Project, Washington, become infested with aquatic growths. The weed growths, together with the silt deposits which accumulate among them, rapidly increase the elevation of the water surface to a point where corrective action is required. Often the weeds in small ditches are removed by rakes or by dragging chains behind teams of horses or small tractors. However, hand-operated devices are useful in very small laterals where the infestation is not heavy or is in isolated patches.

A hand-type "moss cleaner" developed by project personnel to cut the aquatic plants on the bottom of the ditch is shown in the drawing, Figure 163. The implement is pushed by the operator wading up the ditch. Cut weeds float downstream to be removed with a weedhook at a screen or a structure.

The implement is a diamond-shaped blade of saw steel which is attached to a fork handle. Both edges of the blade are kept very sharp so the weeds are cut rather than being pulled. The hardwood handle is fastened to the blade at an angle of 30°.

Trouble has been experienced at the pumping plants on the Yakima Project, Washington, from weeds and debris collecting on plant trashracks and weed screens in such a way as to be very difficult to remove. A knife for cutting, and thereby loosening the weeds and debris from the trashracks and screens has greatly reduced the weed removal problem.

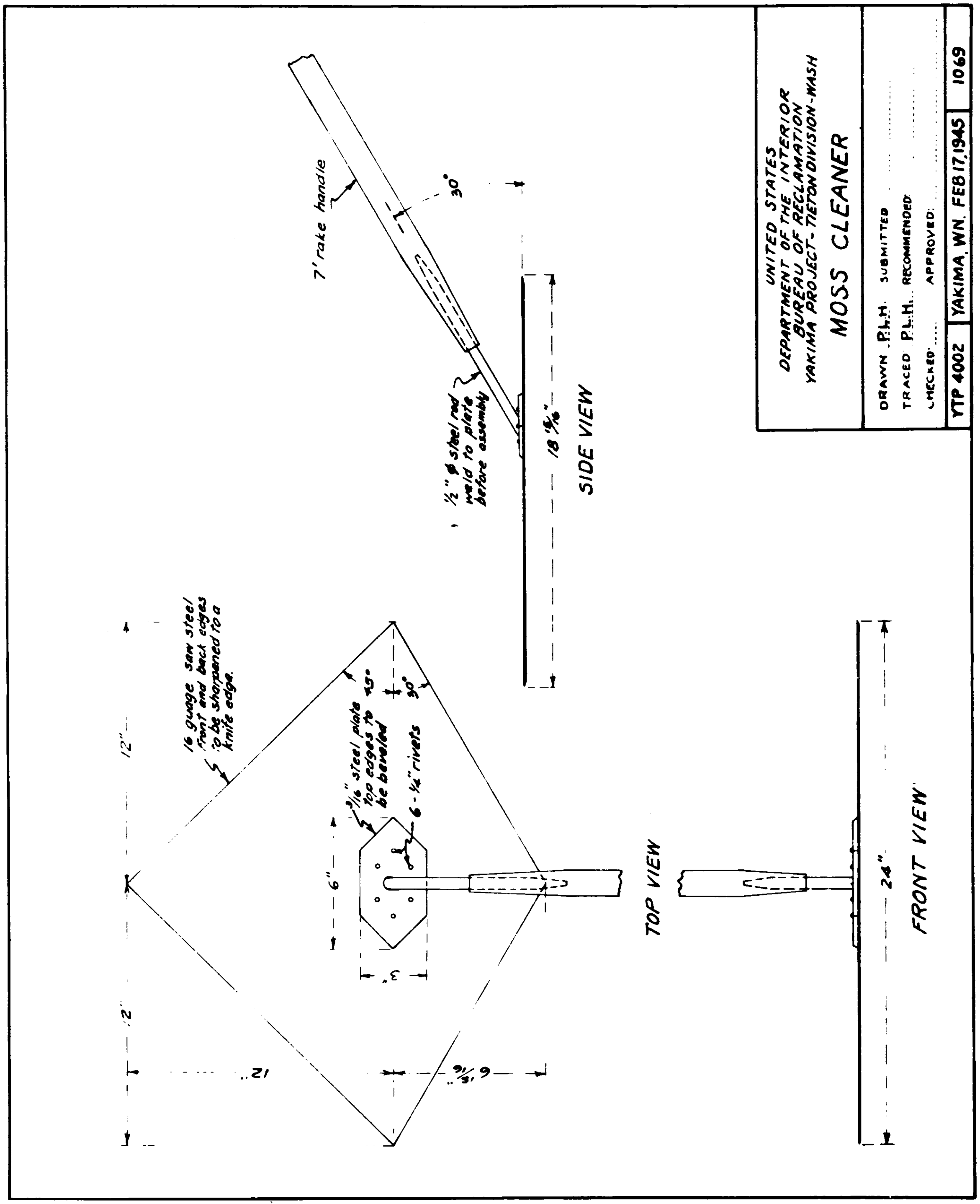

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
YAKIMA PROJECT- TIETON DIVISION-WASH
MOSS CLEANER
DRAWN P.L.H. SUBMITTED
TRACED P.L.H. RECOMMENDED
CHECKED APPROVED
YTP 4002
YAKIMA, WN. FEB 17, 1945
1069
7' rake handle
30°
½" ϕ steel rod weld to plate before assembly
18 13/16"
SIDE VIEW
16 guage saw steel front and back edges to be sharpened to a knife edge.
3/16" steel plate top edges to be beveled
6 - ¼" rivets
45°
30°
12"
6"
3"
6 15/16"
TOP VIEW
24"
FRONT VIEW

Fig. 163

The knife, Figure 164, can be made quite quickly and easily from a part of an old automobile spring, welded to a 1/2-inch pipe coupling, cut, pointed, and sharpened as required. The pipe coupling can then be screwed onto the required length of ordinary 1/2-inch water pipe, to be used as a handle for the knife.

Since material for the knife is readily available from used material, the main cost is in cutting, welding, and sharpening the blade. Maximum cost is about $7.00.

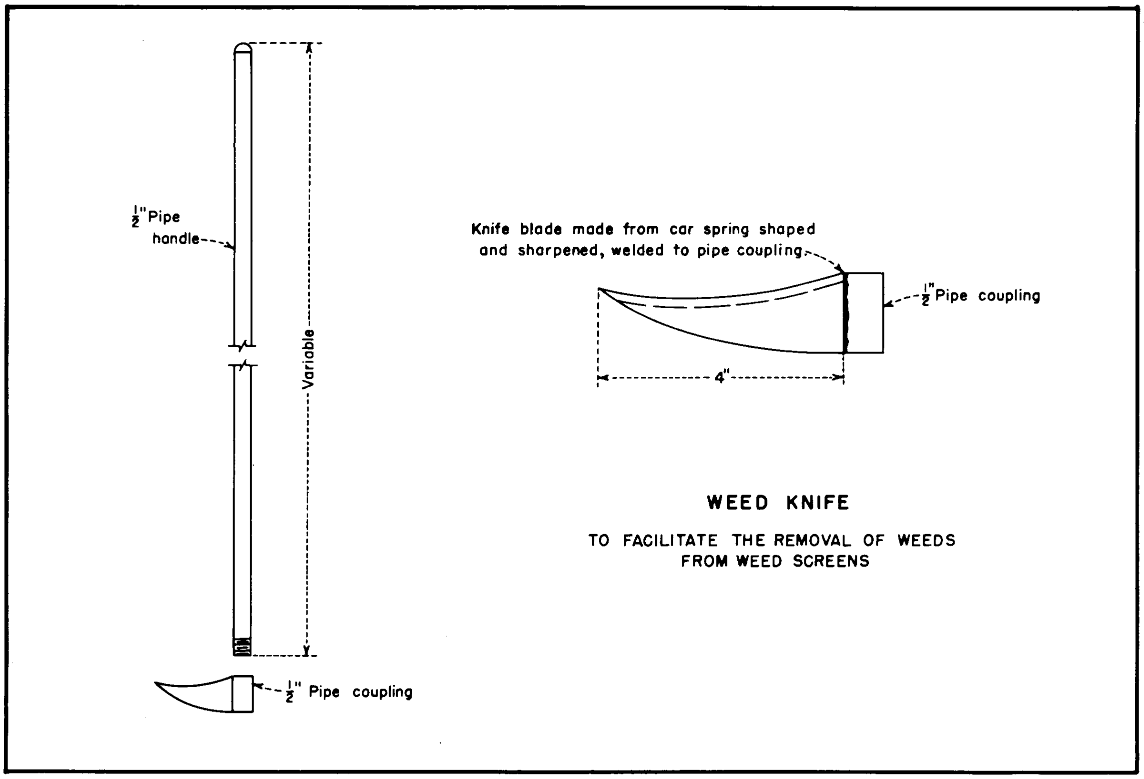


Fig. 164

The Problem

Weeds which enter a waterway or which become detached after growing in a waterway must be removed or diverted from the irrigation system to prevent their collecting at structures, causing overflows and the breaking of banks. They also interfere with water deliveries. The delivery of clean water also is becoming more important as sprinkler irrigation and the delivery of municipal and industrial water increases.

A problem with tumbleweeds is illustrated in Figures 165 and 166. The removal and disposal of dead weeds from this channel is necessary before water can be delivered. They may be rapidly burned with motorized burners; however, the fine charred debris that remains may clog pumps of certain types, and may initiate sediment bars which favor growth of pondweeds. Such channels are usually flushed thoroughly with water before deliveries are begun.

Fig. 165

Fig. 166

Equipment for disposal of dead or detached weeds may be incorporated in the same equipment used for mechanical control. Devices, machines, and structures described in this section include buckets for heavy motorized cleaning equipment, trashracks, diverters, and weed traps. Some of the devices described in the preceding sections of this bulletin also may play a part in weed disposal.

The diversion of weeds into larger channels and wasteways is often practical. Where there are pumps in the system, however, the vegetative debris must generally be removed from the trashracks; and often this must be done by hand. Unattended or semiunattended pumping stations must of necessity become attended stations unless: the weeds can be prevented from occurring; they can be divided into such small pieces that they are no longer a problem; or the disposal of the weeds is made semiautomatic.

Self-cleaning trashracks are only semiautomatic. Weeds are removed from the rack, but they must be destroyed or hauled from the site.

Disposal of Dry Weeds by Burning

Butane dry weed burning is a disposal process which can be accomplished in an unlined channel, as in the case of windblown tumbleweeds, or on the banks where weeds still in place have not been prevented or controlled.

Hazards of burning include the escape of the fire to dry range grasses and damage to flammable structures. The burning of dry weeds is a once-over job, but strong wind can create a new job overnight, by loosening tumbleweeds and carrying them into the channels.

Burning of loosened weeds in channels is aided by air movement. Burning of dry weeds rooted in place may be aided, but is as likely to be hindered by air movements.

The total amount of heat necessary to ignite dry weeds varies with the moisture content of the weeds. But it is much less than that required for green weed burning.

Much of the dry weed burning is intermittent. Oil or L. P. gas burners described previously under Weed Control are effective, especially if igniter devices permit the main burners to be turned off when not needed, and turned on when they are needed. A pilot light or other form of remote igniter is useful also for the ignition of burners on long booms.

Long booms and vehicles capable of moving rapidly are essential. The long booms permit ignition at the bottom of long slopes or across channels. A vehicle capable of moving at least 10 or 15 miles per hour is a safety feature. Updrafts, flash fires, and fast changes in wind direction may cause accidents if the men and equipment cannot be moved rapidly away.

Butane Burners

Motorized large L. P. gas burners have been in use for some time. Burning units have been fabricated by the irrigation project operators or purchased from commercial firms. Recently, also, lightweight, hand burners have been developed which use the L. P. gas. Both types of burners are illustrated in Figures 167, 168, and 169.

Fig. 167

Fig. 168

An L. P. gas, propane burner with a 33-foot boom in operation on the Columbia Basin Project is shown in Figures 167 and 168. The

Fig. 169

boom consists of a 25-foot section of 6-inch-diameter irrigation tubing plus 8 feet of 3/4-inch electrical conduit.

Figure 167 illustrates the burning of weeds which were blown into the channel by the wind. In Figure 168, inplace dry weeds are being burned.

Figure 169 shows a hand propane burner in use on the Columbia Basin Project. The burner is being used to burn scattered groups of weeds on a small lateral.

Weed Traps

Wire Weed Traps

An inexpensive and simple weed trap to collect weeds and debris in an irrigation canal can be constructed of smooth wires placed at an angle to the waterflow which diverts floating material into a pocket or trap along the banks as shown in Figures 170 and 171. This weed trap was designed and constructed by personnel on the Tucumcari Project, Tucumcari, New Mexico.

The weeds are guided into the trap by smooth No. 9 galvanized wires which are strung 4 inches apart across the ditch at an angle of not greater than 20° to the embankment. The wires are placed parallel in a vertical plane from a few inches above the water level to about half the depth of the canal. Bracing with guy lines is suggested to prevent bending of the 2-inch pipe uprights and to keep the wires tight.

The trap or pocket, constructed of woven wire, may be of any width and may be extended for some distance parallel to the ditchbank. Debris is removed from the trap by using a weed fork mounted upon a mobile crane. In this manner the accumulated weeds are removed quickly at a fraction of the expense of hand labor.

Fig. 170

Fig. 171

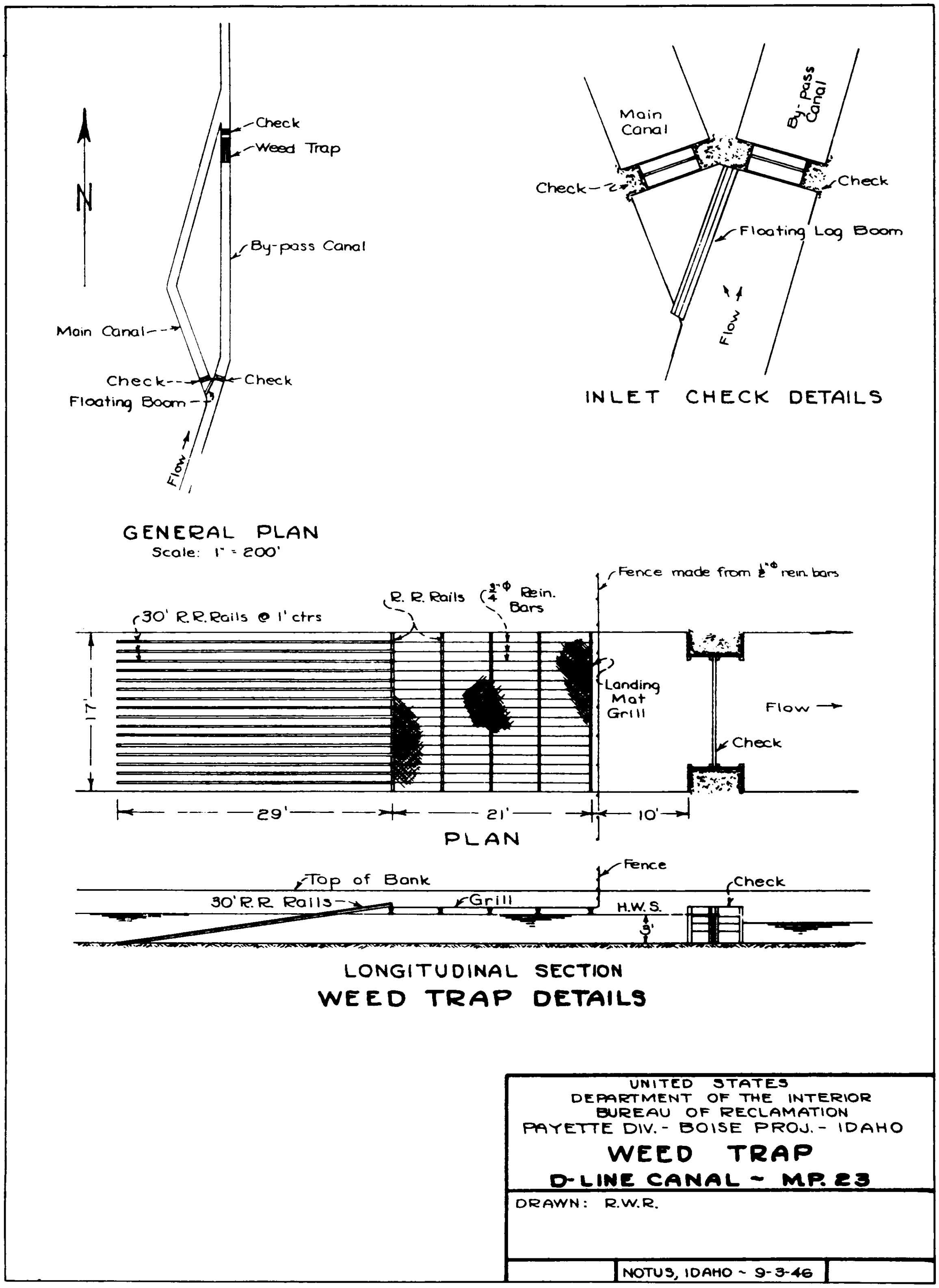
The cost in 1950 of installing a weed trap similar to that shown in Figures 170 and 171 was $175 for a 24-foot-wide canal. Traps for 10-foot-wide laterals were installed for about $50.

Diversion Channel Traps

An effective and economical way of collecting floating material in the irrigation system may be accomplished by a weed trap similar to that shown in Figure 172, designed and constructed on the Payette Division, Boise Project, Boise, Idaho. 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 inclined grating by the current where they subsequently are burned.

The rack is constructed of railroad rails 30 feet long and placed with flat side up and held in place by spacers which are far enough below the canal grade to keep floating weeds from collecting against the ends of the rails. A crossmember holds the upper end of the sloping rails about 1 foot above high waterline. A grill supported by an iron frame levels off from the sloping rails and covers the entire width of the ditch. The grill itself is made from sheets of steel airplane runway mats placed over 3/4-inch reinforcing rod that is welded to the support frame. A railing or fence surrounds the grill to keep weeds confined until they are dry and can be burned. Details of the construction of the channel and trap are shown in the drawing, Figure 173.

Fig. 172



Check
Weed Trap
N
By-pass Canal
Main Canal
Check
Check
Floating Boom
Flow
GENERAL PLAN
Scale: 1" = 200'
Main Canal
By-Pass Canal
Check
Check
Floating Log Boom
Flow
INLET CHECK DETAILS
Fence made from ½"Φ rein. bars
R. R. Rails
¾"Φ Rein. Bars
30' R.R. Rails @ 1' ctrs
17'
Landing Mat Grill
Flow
Check
29'
21'
10'
PLAN
Fence
Top of Bank
Check
30' R.R. Rails
Grill
H.W.S.
3'
LONGITUDINAL SECTION
WEED TRAP DETAILS
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
PAYETTE DIV. - BOISE PROJ. - IDAHO
WEED TRAP
D-LINE CANAL ~ M.P. 23
DRAWN: R.W.R.
NOTUS, IDAHO ~ 9-3-46

Fig. 173

Fig. 174

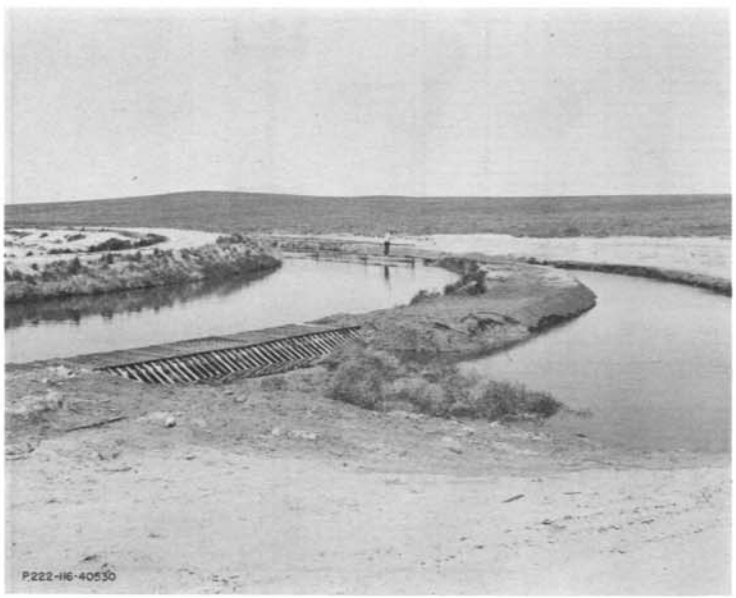


Fig. 175

Similar in many respects to the diversion-type weed trap previously described is that shown in Figures 174 and 175. The essential difference is that a channel has been excavated at the far end of the trap into which the weeds are diverted and from which they can then be removed without seriously interferring with the flow of water in the canal.

The diversion structure and bypass channel on the West Canal of the Columbia Basin Project is shown in Figure 174.

Figure 175 shows the rack which holds the weeds but permits water from the bypass channel to re-enter the canal.

A method of tightening the wires on the diversion structure is shown in Figure 176.

Following the adaptation and successful use of a weed fork, described subsequently, it became evident to operators of the Tule Lake Division of the Klamath Project, California-Oregon, that a better method of ponding moss in a canal would be needed, rather than let it pile up at structures.

Floating booms, mesh fencing, trashracks patterned after pumping plant racks, and many other methods and devices were tried. The

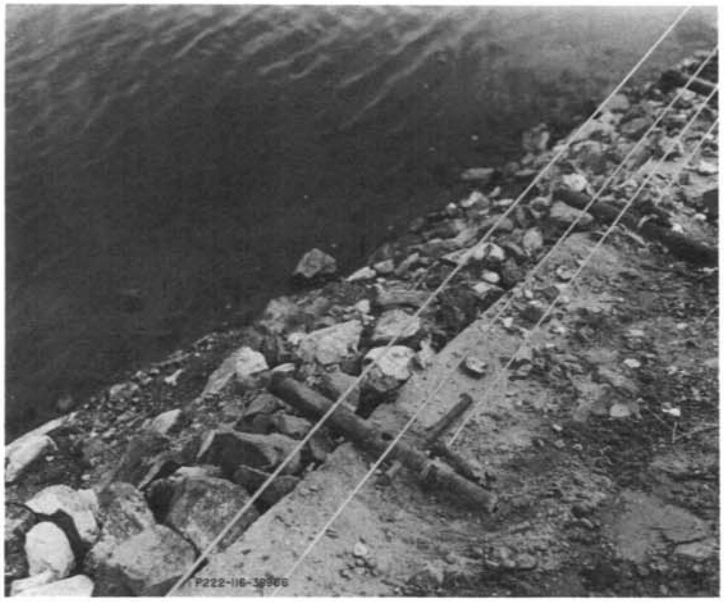


Fig. 176

Fig. 177

most successful method, termed a "moss trap," Figure 177, consists of two 30-foot poles or large timbers placed parallel to each other and three 4- by 12-inch timbers bolted crosswise, one at each end and a third in the middle, thus two stilling ponds were formed. The length of the 4- by 12-inch cross timbers depends on the width of the canal or lateral.

The traps are placed in the canal or lateral at points readily accessible to a truck crane and are held in place by cables. As the moss and weeds are torn loose by chaining and float downstream, they lodge against the upstream cross timber of the trap. Some of the floating material is forced under and lodges against the middle cross timber. Very little moss is found in the second stilling pond of the trap. The blanket of moss lodged against the trap has been 1/4 of a mile long at times without seriously impeding the flow of water. When sufficient moss has been ponded, a truck crane removes it with a fork. The traps are left in place throughout the year.

Trash Booms

A simple floating boom has been installed across the Gila Canal on the Gila Project, Arizona, at a wasteway immediately upstream from a siphon to deflect weeds and debris into the wasteway during chaining operations, as shown in Figure 178.

Fig. 178

Short vertical boards on the upstream face of the boom, Figure 179, extend below the water surface a nominal distance to prevent floating material from being drawn under the boom. Logs may be substituted for the horizontal members of the boom and the length of the boom varied to fit the given canal or lateral. Although not designed as a platform from which to operate, the boom could be made so by providing a decking.

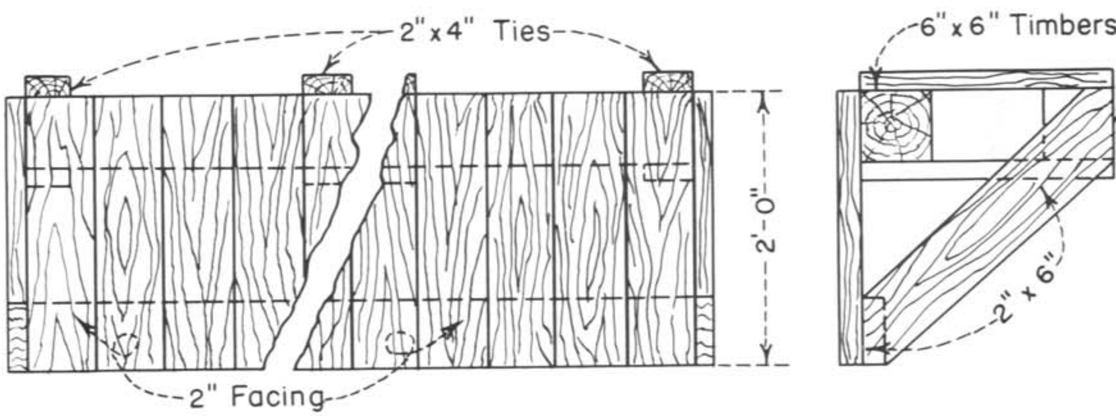


Fig. 179

Trashracks

Trashrack for Canals and Larger Laterals

The trashrack shown in Figure 180 is of the type presently in use on laterals in the West Canal area of the Columbia Basin Project, Washington. 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 was 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 span. The rack shown was constructed of 1-1/4-inch pipe with the longest pipe length being about 20 feet.

The pipe is spaced 8-inch center to center and placed on a slope no steeper than 4:1. 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.

Fig. 180

Small Trashrack Installations

Fine debris collected on the trashrack on two low-lift centrifugal pumps is the problem illustrated in Figures 181 and 182 on the Columbia Basin Project, Washington.

Fig. 181

Fig. 182

Typical of materials which can reduce the output of pumps is that shown in Figure 182. Some of this debris may pass through a trashrack, if the rack is not cleaned frequently during the period in which such debris is a problem.

Weed racks are placed at the ends of siphon structures to prevent the entrance of trash, tumbleweeds, and animals during the nonoperating season on the Cambridge Canal of the Frenchman-Cambridge Unit of the Missouri River Basin Project in Nebraska. The lightweight racks similar to the ones shown in Figure 183, are placed in the fall after the irrigation season and removed the following spring before water is again placed in the canal system.

The lightweight racks consist of pipe, steel rail, or wooden frames, to which a wire mesh is attached. The racks have been very effective and are believed to have reduced O&M costs materially.

Fig. 183

Self-cleaning Weed Rack

The Kennewick Division of the Yakima Project, Washington, has about the same floating debris problems experienced elsewhere. Devices in use include, among others, the weed traps and sloping-pipe weed racks. However, the most troublesome spot on the 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 1:1 slope, with 1-inch openings. With this rack absolutely clean, the average velocity through the 1-inch slots approached 5 feet per second. Algae, tumbleweeds, and other debris floating in the canal increase operation and maintenance problems at this structure. To reduce the problems, the automatic weed rack shown in Figure 184 was installed.

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

The trashrack shown in detail on the drawing, Figure 185, was installed during original construction of the canal and plant facilities. The rack was installed on a 1:1 slope and had 1-inch clear openings between longitudinal bars which were supported by cross-members at 4-inch centers. It was difficult and time consuming to prevent obstruction of the trashrack by weeds, moss, and debris.

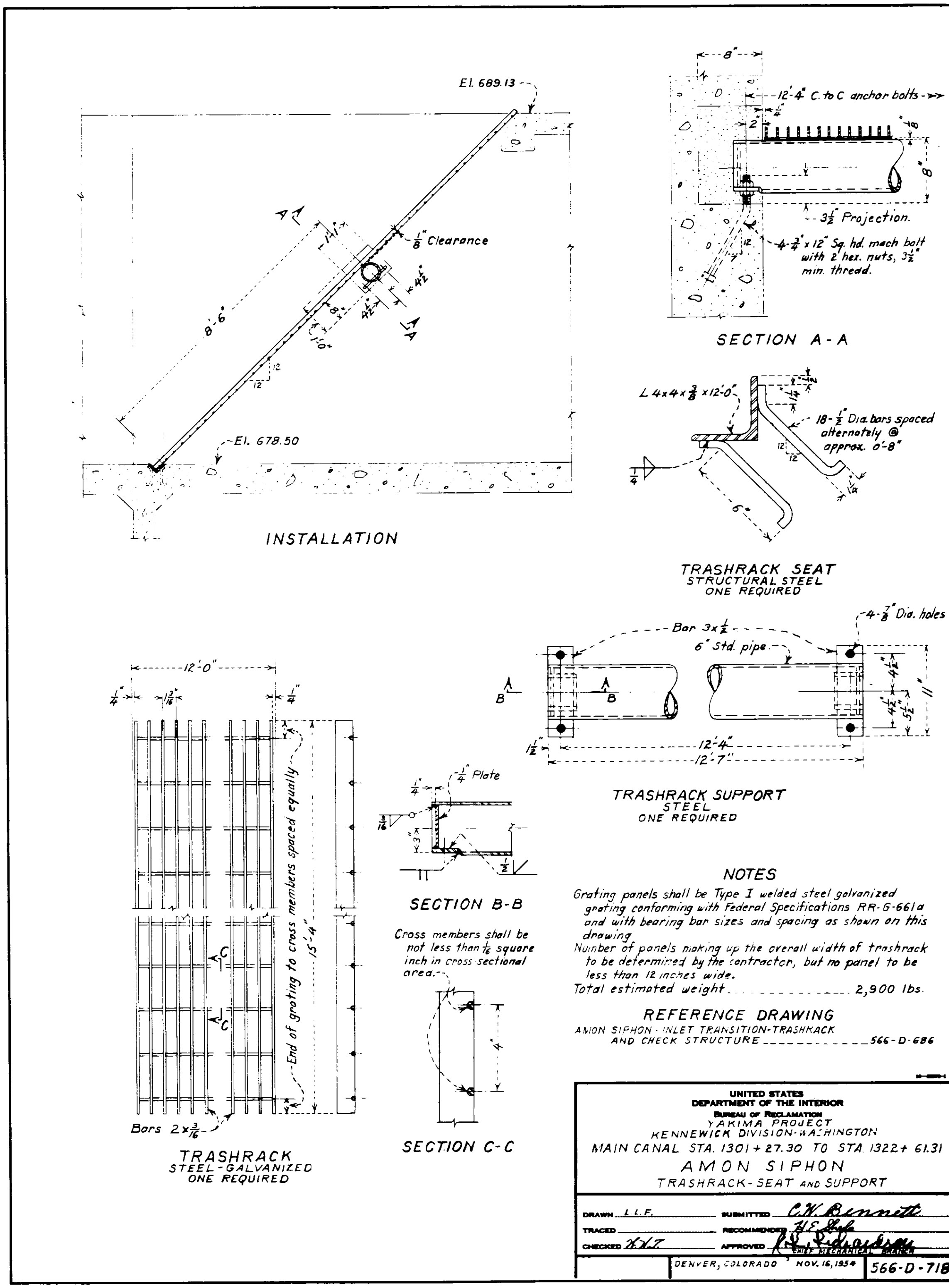
Fig. 184

The close spacing of the longitudinal bars of the rack probably contributed to the problem, though the rack is necessary if the trash, etc., are to be kept from the pumps.

To overcome the problem, the irrigation district installed electrically powered angle-iron drags, attached to endless link chains. These were operated from sprocket-driven pulleys on both sides of the rack. To date, the device has proved very satisfactory in removing weeds and debris from the rack and with additional modification proposed will be even more efficient in operation.

Many of the ideas incorporated in the Amon siphon rack cleaning device were taken from a similar installation made to protect and clean another trashrack at the Grandview Irrigation District Pumping Plant on the Yakima Project. The Amon installation, as shown in the drawing, Figure 186, consists of a rigid steel frame supporting a lengthened standard Bureau trashrack, which is cleaned by 3-1/2- by 3-1/2-inch angles connected on each end to moving chains. The cleaning angles move about 5 feet per minute. Prior to the installation of the device, the trashrack was remodeled so that the rack and cleaning device frame now rests on a 1-1/2:1 slope.

As shown in Figure 187, a 1/4-horsepower motor provides the power through a stoker gearbox and a 1-3/4-inch steel shaft at the top of the rack. The upper bearings are connected to the frame in such a manner that they are adjustable to allow taking slack out of



El. 689.13
1/8" Clearance
El. 678.50
INSTALLATION
SECTION A-A
12'-4" C. to C anchor bolts
3½" Projection.
4-¾" x 12" Sq. hd. mach bolt with 2 hex. nuts, 3½" min. thread.
L 4x4x⅜ x12'-0"
18-½" Dia. bars spaced alternately @ approx. 0'-8"
TRASHRACK SEAT
STRUCTURAL STEEL
ONE REQUIRED
Bar 3x½
6" Std. pipe
4-⅞" Dia. holes
TRASHRACK SUPPORT
STEEL
ONE REQUIRED
¼" Plate
SECTION B-B
Cross members shall be not less than 1/16 square inch in cross sectional area.
SECTION C-C
End of grating to cross members spaced equally
Bars 2x3/16
TRASHRACK
STEEL-GALVANIZED
ONE REQUIRED
NOTES
Grating panels shall be Type I welded steel galvanized grating conforming with Federal Specifications RR-G-661a and with bearing bar sizes and spacing as shown on this drawing.
Number of panels making up the overall width of trashrack to be determined by the contractor, but no panel to be less than 12 inches wide.
Total estimated weight .... 2,900 lbs.
REFERENCE DRAWING
AMON SIPHON - INLET TRANSITION-TRASHRACK AND CHECK STRUCTURE 566-D-686
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
YAKIMA PROJECT
KENNEWICK DIVISION-WASHINGTON
MAIN CANAL STA. 1301+27.30 TO STA. 1322+61.31
AMON SIPHON
TRASHRACK-SEAT AND SUPPORT
DRAWN L.L.F.
SUBMITTED C.W. Bennett
TRACED
RECOMMENDED
CHECKED
APPROVED
DENVER, COLORADO NOV. 16, 1954
566-D-718

Fig. 185

BILL OF MATERIAL

Single Phase electric motor ½HP			4" x 4" ∠	12'- 0"	five
Gear box			Weed rack	12' x 5'	one
1¾" shaft	12'- 6"	one	Weed rack	12' x 2'	one
1¾" shaft	12"	two	10" Sprocket for 1¾" shaft		four
6" x 6" ∠	24'- 0"	two	1¾" bronze bearings		two
6" x 6" ∠	12'- 0"	six	link chain		94'
2" x 2" ∠	12'- 0"	one			

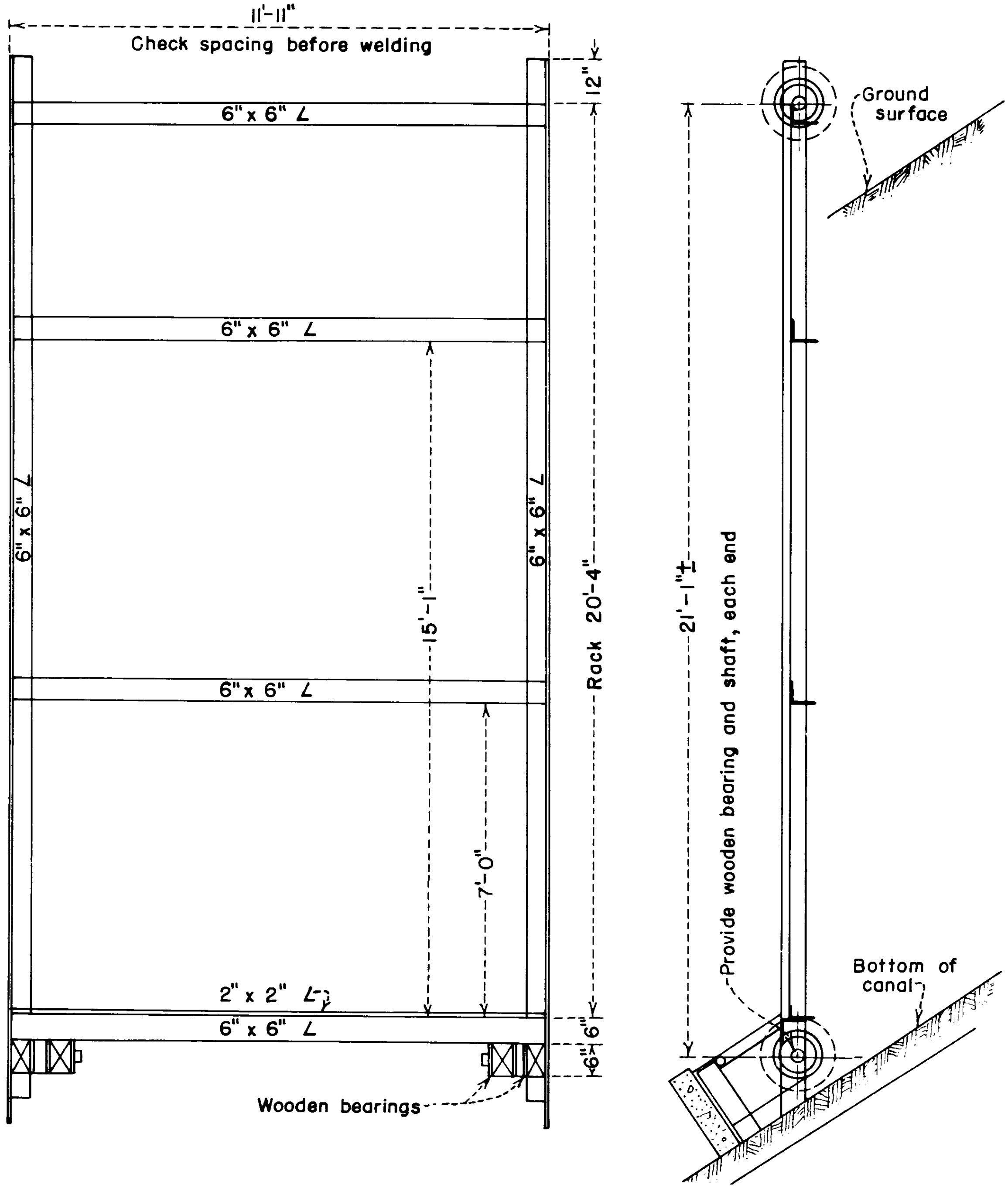


Fig. 186

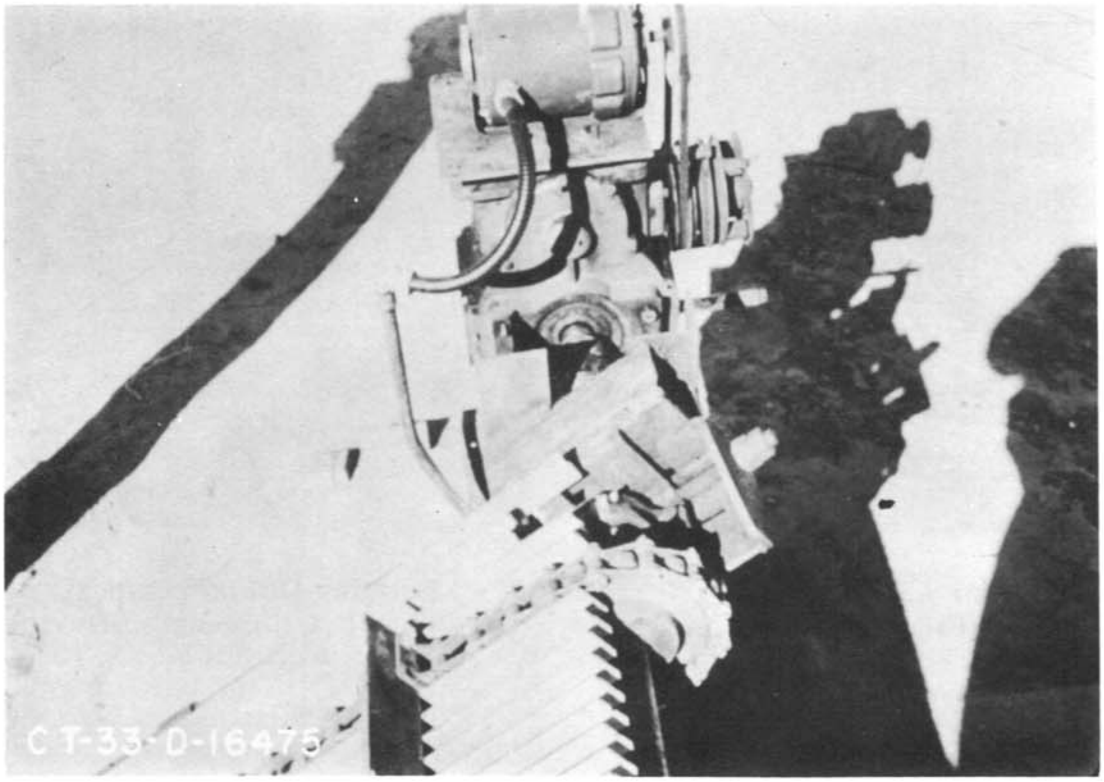


Fig. 187

the chain. The lower sprockets are attached to the frame through hardwood bearings. These are highly recommended.

Those responsible for operation and maintenance of the trashracks believe the automatic cleaning device can be improved by extending the trashrack 3 to 6 feet above the operating deck. Sometimes, the flap gate which permits passage of the cleaning angles at the bottom of the canal becomes too heavy to be lifted when the screen is partially plugged with debris. This can occur particularly when the device has not been in operation for a period of time. Shortening the flap gate would improve this condition. It is also believed the spacing between the cleaning angles should not be more than 5 feet.

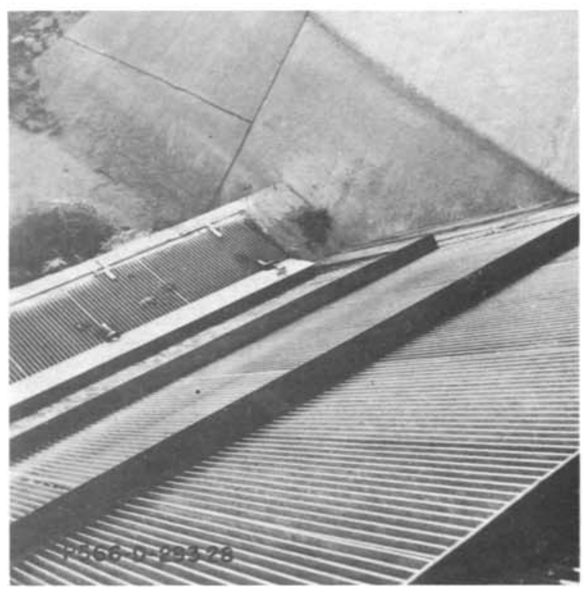
Cost of remodeling the structure and installation of the device was $2,100.

Several other views of the device with appropriate captions are shown in Figure 188. The 2-foot flap gate, at the canal bottom, allows for passage of the cleaning angles.

Motor and Gearbox
Fig. 188A

Looking Downstream at
Trashrack and Cleaning Device
Fig. 188B

Flap Gate at Bottom of Canal
Fig. 188C



Flap Gate and Lower
Portion of Rack
Fig. 188D