Department of the Interior

Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO 7

January - February - March 1954

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INTRODUCTION

With this issue, Release No. 7, of the Operation and Maintenance Equipment and Procedures Bulletin, a new schedule of publication is being initiated. The Bulletin has been issued on a bi-monthly basis in the past. From now on it will be issued quarterly.

As in the past, the Bulletin will continue to be circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose will continue to be the medium for exchange of operating and maintenance information. As such we need your ideas.

Reference in the Bulletin to a trade name does not constitute an endorsement of a particular product and ommission of any commercially available item does not imply discrimination against any manufacture. It is hoped that labor saving 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.

Regions 5 and 7 are sold on the seeding of ditch banks. The equipment used in preparation of canal and lateral banks for the seeding is described in an article on page 2. An article describing the seeding, as submitted by Region 7, is included starting on page 11. Experience on the Mirage Flats Project in Nebraska and on projects in Kansas shows that savings can be made in operation and maintenance costs in the control of weeds and bank stabilization. The grass covered banks offer a very pleasant appearance and provide an excellent pasture, if grazing is controlled. Overgrazing, of course, must be avoided to prevent weeds from getting a new start.

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CORRECTION

Controlling Algae Growth in Concrete Flumes

Release No. 6 of the Bulletin for September-October 1953 presented on page 13, an article on the control of the growth of algae and naiad cocoons in open concrete structures, especially concrete flumes on the Black Canyon Canal, of the Payette Division of the Boise Project. The article stated that Rosin-Amine D Acetate gave the best results in the control of the algae and naiad cocoons. This statement is an error.

The material actually used was Rosin-Amine D, instead of Rosin-Amine D Acetate. The Rosin-Amine D is stable upon exposure to water, being only soluble in oil, while the acetate is water soluble.

Sorry.

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CANAL BANK RESHAPER AND GRASS SEEDER

A good cover of low growing grasses along irrigation canal banks and rights-of-way was effective in reducing the annual operation and maintenance charge by reducing weed growth and canal bank erosion on the Tucumcari Project, New Mexico. Prior to seeding the low growing grasses on established canal banks, it is generally necessary to reshape the ditch banks by filling in erosion cuts, and removing most of the weed vegetation. In order to accomplish this phase of the operation a crawler-type tractor was equipped with a special blade as shown on the cover photograph and in the photograph below.

The bank shaper pictured on the cover page has been very efficient and was developed and constructed by maintenance personnel of the Tucumcari Project. A similar device is being manufactured commercially. The first shaper developed by project forces and shown above was controlled entirely by the tractor operator by means of cables. However, to prevent the blade from "riding" in areas where a large amount of cut is necessary the hydraulic actuating arm installed on the device shown on the cover page has definite advantages for raising and lowering the blade in lieu of the cable control. Another improvement in the shaper blade consisted of placing an extension on the blade at a 45-degree angle to clean the bottom of laterals as well as the slopes. Both adaptations are very usefull for the reshaping and cleaning of both small and large canals.

Upon completion of bank reshaping, the blade is removed from the tractor, and a grass drill attached as shown in the photograph at the top of the following page. The grass drill used in Region 5 is adapted to

seeding all varieties of grass, either individually or in mixtures. Regulators are installed on the disc to govern the depth of seeding.

The grass drill may be removed from the rig and attached to a conventional wheel type tractor for use in seeding adjacent rights-of-way and reservoir areas.

The unit cost for seeding canals and rights-of-way will average about $10.00 per acre, exclusive of canal bank reshaping and cleaning.

The framework on the tractor and the bank reshaper were shop constructed and the grass drill was purchased commercially. Additional information regarding the work done in this area may be obtained from the Project Manager, Tucumcari Project, Tucumcari, New Mexico, or the Regional Director, Region 5, Amarillo, Texas.

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FLUID PIPE LINES MARKED WITH COLORED TAPE

The use of colored gummed masking tape to identify the type of fluid and the direction of flow within a pipe line was adopted 3 years ago on the Rio Grande Project in New Mexico and Texas. The original labels are still in excellent condition.

The tape, obtainable in various colors, is used in banding the pipes for identification. Arrows of contrasting color are also cut from the tape and applied to the pipe to indicate direction of flow. Use of this tape results in a neat appearance and is much less time consuming than hand painting.

The Bureau of Reclamation follows A. S. A. Code A-13, 1947 in identification of piping systems. This system is discussed in Chapter 3, Volume X of the Reclamation Manual Design Supplement and Figure 26a of Chapter 7 of the same volume gives the color schedules, color classification, and method of banding. Copies may be obtained by writing the Chief Engineer, U. S. Bureau of Reclamation, Denver Federal Center, Denver, Colo.

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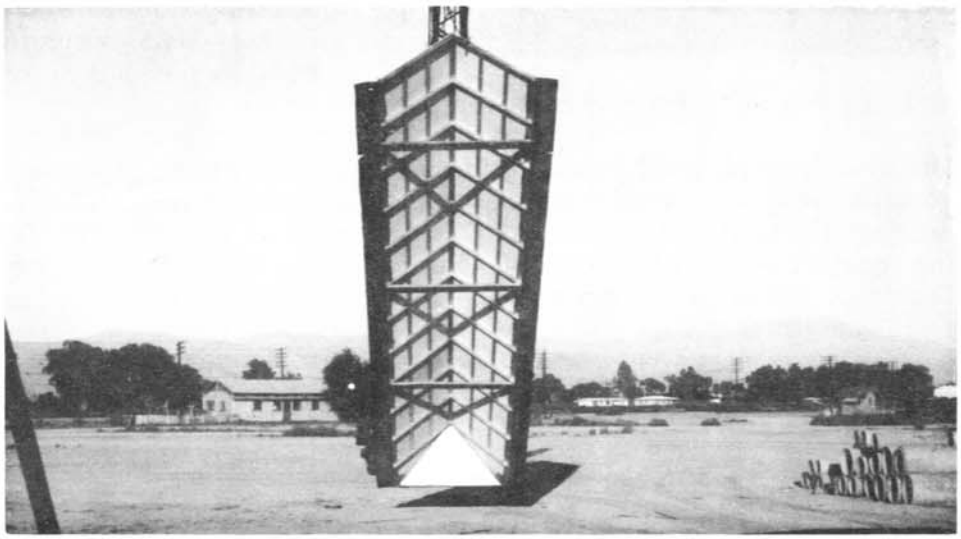
UNDERWATER REPAIR OF TURNOUTS ON CONCRETE LINED CANAL

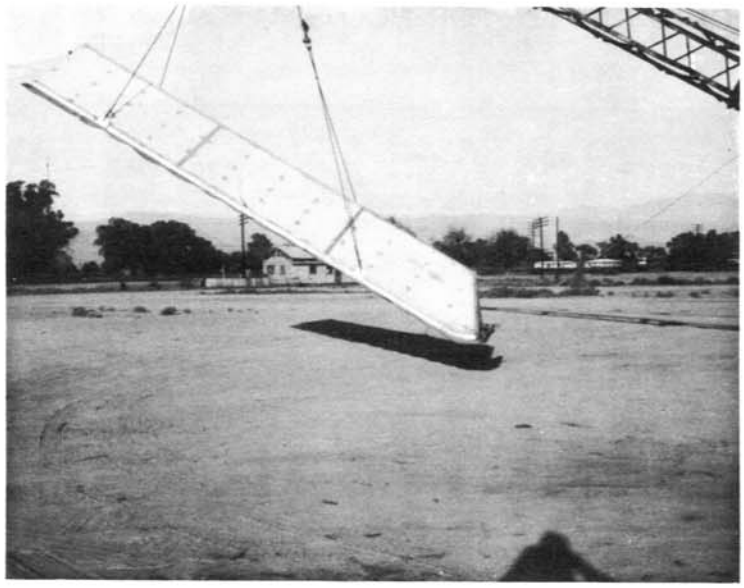
Repairs on many canals in the Southwest are made difficult because of the year-around demand for irrigation water. The canals can not be dewatered for repair and maintenance, except at infrequent intervals. Therefore, much of the repair work must be accomplished under water. The device shown in the photographs below and on the following page, was developed by the Coachella Valley County Water District primarily for underwater repair and maintenance of turnout structures on the concrete lined Coachella Main Canal. The caisson can be constructed for about $500. The caisson is light in weight and can easily be lifted in and out of the canal by a truck mounted crane. The device is reported to have worked perfectly for the purpose intended.

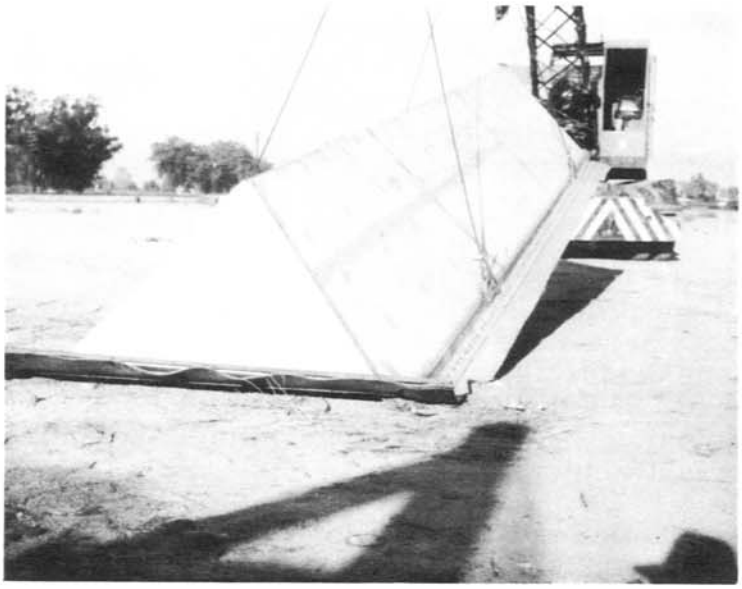


The caisson is constructed in an inverted "V" shape to fit longitudinally over turnouts having widths of from 3 feet to 5 feet. It is constructed of angle iron framework, 3/4-inch plywood covering, and 5/16-inch belting bolted to the bottom to act as the water seal. Holes drilled in the three ribs across the bottom of the caisson, permit moving of steel guides to fit the "U" frames of two standard turnout dimensions.

Some of the turnout structures extend to the invert of the canal. Because of this the caisson had to be curved at the lower closed end to fit the canal profile as shown in the photograph at top of the following page. The cable by which the device is handled is permanently attached to the caisson framework as shown.

The belting used for the water stop or seal should not be too heavy. The first belting used on the Coachella Caisson was too heavy and would not





conform to the surface of the lining. However, the 5/16-inch belting, 9 inches in width, has sufficient flexibility and forms a good water tight seal with the concrete lining.

Two previous attempts to construct a suitable device were unsuccessful. The first consisted of a rectangular plywood box and the second a half-section of corrugated metal pipe. A manufacturer contacted regarding construction of a suitable caisson agreed to build one for the project at a cost of $5000. The project constructed device can be built for $500, and has been safely used. It is recommended for use where it is necessary to meet similar turnout maintenance and repair problems.

Additional information regarding the construction or use of the device can be obtained from the General Manager of the Coachella Valley County Water District, P. O. Box 158, Coachella, California, or by writing the Regional Director, Region 3, Boulder City, Nevada.

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Do you have an idea for the bulletin? One that has lowered your operation and maintenance costs? One that has improved the safety of your operations? One that has improved the efficiency of your equipment or procedures? If you have, lets pass it along.

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DAYLIGHT MOVIE PROJECTOR BOOTH

Visual education aids are increasing in popularity and can be used advantageously to attract spectators to display booths at fairs, conventions, and general meetings where a continuous showing of movies on subjects related to the exhibit is desirable. Rather than seating spectators and controlling the lights, the use of a daylight movie projector booth is practical. Action attracts spectators, and they will remain for the entire showing if the display is sufficiently interesting.

Projectors of a type suitable for daylight projection are obtainable from many manufacturers or can be rented. However, the movie projector booth shown above and described below was designed and constructed at low cost by personnel of the Kansas River District, McCook, Nebraska. Additional information concerning the projector booth may be obtained by writing the McCook, Nebraska, office or the Regional Director, Region 7, Denver Federal Center, Denver, Colorado.

Construction Details

The projection booth as designed works very well in ordinary room light. However, to obtain a clear picture, the screen should not be exposed to direct sunlight. Basically the unit consists of the projector which focuses the image upon a mirror, which in turn reflects the picture through a screen to the audience. Any size box and screen can be used

provided care is taken to determine the angles of reflection from the projection lens to the mirror and back to the screen. Information on image size for different focal-length lenses and projection distances is obtainable from camera manufacturers.

The use of a projection box in a lighted room takes advantage of the greater light intensity of an image projected through a translucent screen as compared with light reflected from a conventional screen. To reverse the image it is necessary to reflect it from a mirror before passing it through the screen. This has the advantage of increasing the projection distance without materially increasing the size of the box. When using a projection lens with a 1-inch focal length rather than the 2-inch standard focal-length lens, the overall length of the projection path is reduced. The size of the image on the screen varies as the square of the projection distance.

The screen may be a heavy grade acetate film base or daylight-type dark-color projection screen. The material should be mounted on a window shade roller for convenience in keeping the screen taut and for packing or storing. If the acetate film base used for the screen is too light in weight, the sheet will wrinkle and also be so transparent that too much light is reflected, resulting in faded pictures. If a heavy acetate film base is not obtainable a lighter material can be taped upon window glass. The dull side of the acetate sheet should be placed to the outside.

Special front-surfaced mirrors, although expensive, are recommended. If a standard mirror is used, the light passing through the glass is refracted resulting in a loss of image sharpness. The mirror is mounted to a wooden fin that is fastened upon a post suspended from the top of the projection box. A bolt passes through a slot in the fin into the bottom of the post. This slot permits vertical and lateral adjustment of the reflected image on the screen by shifting or by rotating the mirror. A slide opening is provided in one side of the box so that the operator can make the mirror adjustments. The interior of the projection box should be painted a dull black.

The projector is mounted on a platform on one side of the box and a light-metal funnel is provided to enclose the light beam between the lens and the box. The funnel is hinge-mounted to swing out so the operator can rewind the film conveniently. The wooden frame-work for the projection box is built in 5-panel sections for easy disassembly and transportation. The legs and braces also are demountable so the unit will occupy a minimum space for transporting or storing. Paper can be used to cover the frame, or the booth can be incorporated into the exhibit as a support for photograph or poster display panels.

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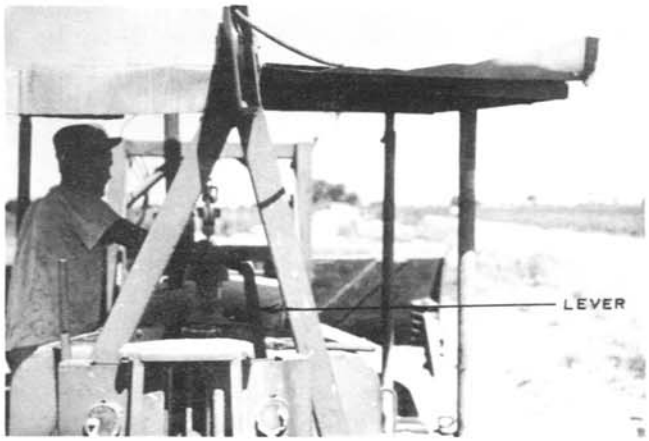
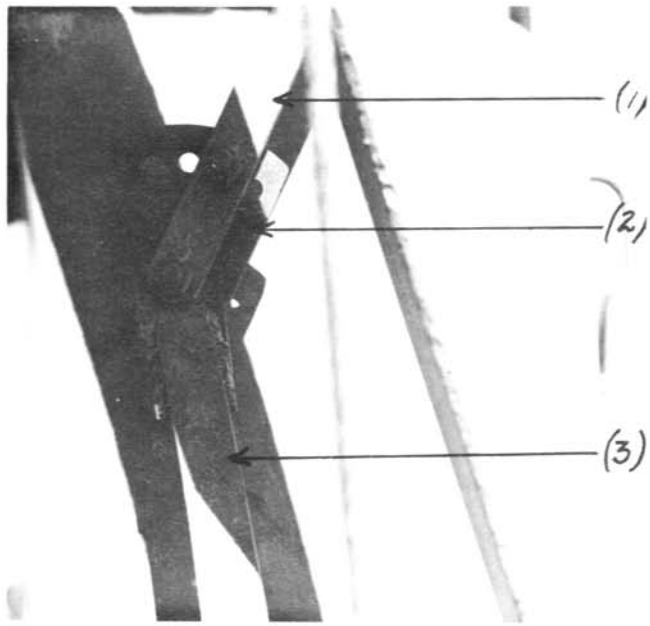
MODIFICATION OF TRACTOR CLUTCH CONTROL LEVER

The original position of the clutch control lever on tractors which used double drums for operating turnapulls and other towed equipment required that the operator keep his right arm bent upward at the elbow in a very awkward and tiring position. This position cannot be maintained for very long periods at a time. To remedy this situation the operator usually sits to the left and upon the arm of the seat, as shown in the photograph below. From this position he can operate the lever with his arm extended. While this position is satisfactory when towing a dirt scraper, it is not satisfactory when operating a bull-dozer blade. When sitting on the left arm, sideways, the operator can not see the right edge of his blade, and considerable damage has been done in the past to turnouts, checks and bridge planking because of obscured vision.



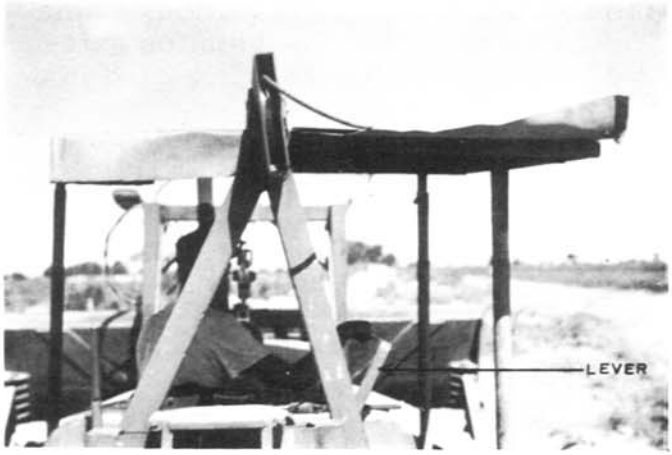
Obviously the operator has better control of the machine when he can sit directly in the center of the tractor seat where he has better access to the hand levers and foot pedals in front of him. Modifications made to the lever on the equipment of this type used on the Ysleta Field Branch of the Rio Grand Project, Texas, are shown below.



The straight shaft was cut in two. Two holes were drilled in the top part (1). A bracket (2) was welded to the bottom part (3) and the top part was bolted to this bracket. The bracket shown in the photograph has been provided with four holes, allowing for the top part of the lever to be set at four different angles with reference to the bottom half of the lever for adjustment, depending upon the length of the operator's arm.

It is estimated that the operator's efficiency has been increased 20 percent and the

better vision provided now results in few structures being damaged in tractor operation on the project.



A view of the operator in the center of the tractor seat is given in the photograph at left. When this equipment is place in the shops for repairs the holes in the bracket will be slotted to speed adjustment in the field. Now the bolt must be removed each time the angle between the top and bottom parts of the lever is changed. Slots will permit changing the angle quickly by loosing the top nut.

For additional information on the modification write the Project Manager, Rio Grande Project, U. S. Bureau of Reclamation, El Paso, Texas, or the Regional Director, Region 5, U. S. Bureau of Reclamation, Amarillo, Texas.

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PLASTIC CANAL LININGS AND PIPE

Two of the major manufacturers of plastics have contacted the Bureau of Reclamation relative to the possible use of their products for canal linings, and for fabrication of larger diameter pipe for closed conduit type irrigation systems. A representative of one of the manufacturer's recently visited the Chief Engineer's office to obtain information on the requirements of a good canal lining.

The poly-ethelene type plastics, investigated by the engineering laboratories to date weathered rapidly upon exposure to sun light and also had low resistance to puncture. The high cost of the material and the difficulty in maintaining a protective cover of earth or gravel on the slick surface were other factors that had slowed development of plastics as a canal lining material.

The newer poly-ester plastic is claimed to have overcome some of the deficiencies and can be produced at a cost that may make it competitive with other types of lining materials. The possibility of using thin sheets of this material as a buried membrane or thicker sheets as an exposed membrane was discussed. If pilot plants now under construction are completed in time, some trial installations using the sheets may be made during the next irrigation season.

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CAUTION - LOWER ANTENNA

A safety precaution that appears worth passing along to projects or irrigation districts that use mobile radios for communication, is the system of warning signs installed in the center of each substation gateway on the Rio Grande Project in New Mexico and Texas. Installed in a socket in the center of the gateway, the sign:-

"CAUTION - LOWER ANTENNA"

is easily visible and an excellent reminder.

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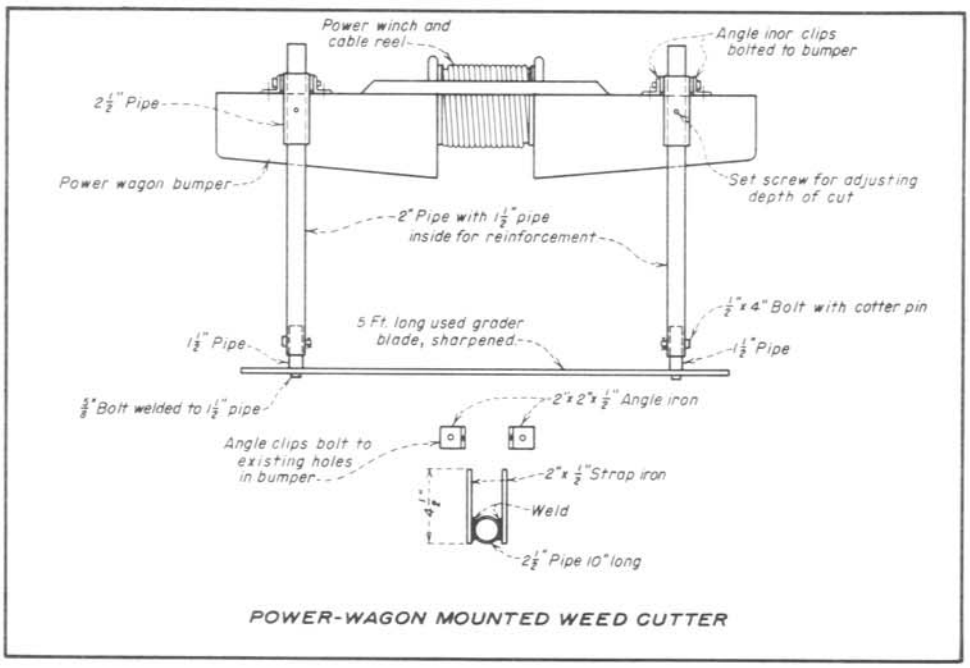
POWER WAGON MOUNTED WEED CUTTER

A simple weed cutter which works very effectively in substation yards as a means of reducing maintenance costs has been constructed by the Power O&M crews of the South Platte River District, Region 7. The device was constructed for attachment to the front bumper of the truck as shown in the photograph and drawing below.

The cutter is reported to work very effectively in gravelled substation yards where the cutter bar is set to cut two or three inches below the surface. In moving forward the blade slides through the gravel cutting the weeds below. the surface and bulking and freshening the packed gravel. In backing, the blade drags, pulling out the weeds and leveling the gravel.

The cutter was built at a cost of $22.95, all of which was labor. Materials for construction of the device were obtained from the shop scrap pile. It is estimated that work previously accomplished by two men in 40 hours, is now done with the cutter in about 5 hours.

The success of the first cutter led to construction of a second which is now in use. For further details regarding the weed cutter, contact the Regional Director, Region 7, Denver Federal Center, Denver, Colorado, or Superintendent of Transmission Lines and Substations, U. S. Bureau of Reclamation, Loveland, Colorado.



POWER-WAGON MOUNTED WEED CUTTER

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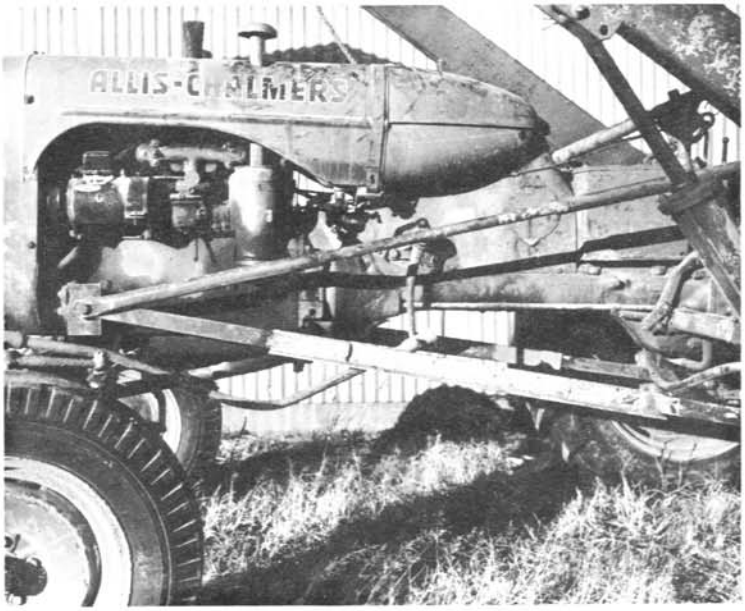
IMPROVED MOUNTING FOR FRONT END LOADER

The Maintenance personnel of the Tucumcari Project, New Mexico, have improved the mounting of the front end loader attachment for their farm tractor. The modification, as shown below, has reduced repair costs for the tractor.

The mounting originally furnished rested on the rear axle of

the tractor with braces to the flywheel housing. The housing in turn is fastened to the engine block. Both housing and block are made of cast iron. In lifting the loader, the braces caused a downward stress on the housing which was critical and could result in the housing block being broken.



In eliminating the undesirable condition, the project forces have lengthened the braces and attached them to the front motor support, see photograph at left. This transmits the stress directly to the front axle. A short piece of angle iron is bolted to the motor support plate for connection of the braces.

For further information, write the Regional Director, U. S. Bureau of Reclamation, Amarillo, Texas, or the Project Manager, P. O. Box 518, Tucumcari, New Mexico.

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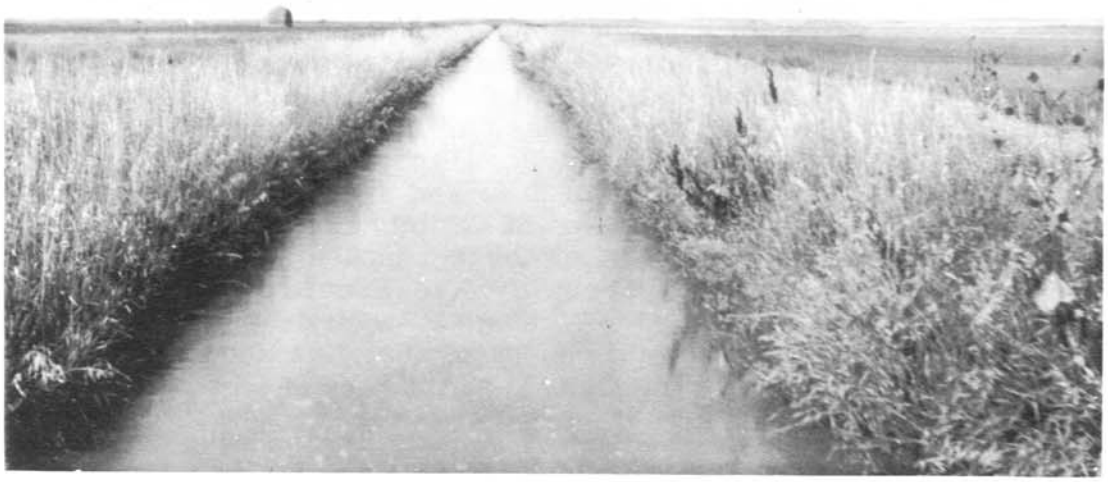
DITCH BANK SEEDING

The best method of controlling weeds on irrigation systems is to plant desirable adapted grasses. Experience under the climatic conditions in Region 7 shows that four to five years after planting the grasses, weed control expenditures hit rock bottom. During the four to five year period that the grasses are becoming established, they must compete with weeds for nutrients, water and light. Spraying with 2-4D during that time eliminates most of the weeds and encourages more rapid development of the grasses. Studies of grass stands previously established have shown that for every one dollar invested in seeding grasses, about $2.50 is saved in O&M costs.

What does it cost to establish a new stand of grass on a ditch bank? In 1952, cost records were kept in planting work done on the Frenchman-Cambridge and Bostwick Divisions, Missouri River Basin Project. The costs ran from $6.60 to $13.76 per acre, depending upon conditions encountered and method of seeding used. In the same Divisions, weeds were sprayed with 2-4D using ground rigs, at costs ranging from $3.23 to $4.95 per acre. Mowing costs averaged about $2.45 per acre. However, mowing had to be accomplished two or three times

during the season to give results comparable to those obtained with one 2-4D spraying. Isn't the comparatively high initial investment in seeding worth the chips . . . even if for no other reason than eliminating the recurrent need for annual spraying and mowing?



A good stand of grass on the banks of a canal on the Mirage Flats Project, Nebraska, is shown in the above photograph. Much of the ditch bank seeding in Region 7 has been done under contract. To indicate how the work is done, an excerpt from a typical seeding specification is presented:

"Spreading fertilizer and sowing grass seed. (a) General. -- Areas of excavation surfaces, embankments, spoil banks, and drains, as shown on Drawing No. 271-701-1392, or as designated by the contracting officer, shall be prepared for seeding and fertilized and seeded. All seeding operations shall be in accordance with the provisions of this paragraph.

"(b) Seedbed preparation. --The contractor shall compact or loosen the surfaces of laterals, drain ditches, embankments, and spoil banks as directed prior to seeding, in order to obtain a firm well-packed seedbed. Compaction for seeding may require 2 passes, but not more than 2 passes, with a packer and mulcher similar but not restricted to the 'Western Sprocket Packer and Mulcher' manufactured by the Western Land Roller Company of Hastings, Nebraska. No separate payment will be made for compacting or loosening areas to be seeded and all costs of seedbed preparation shall be included in the unit price per acre bid in the schedule for furnishing and spreading commercial fertilizer and furnishing and sowing grass seed.

"(c) Commercial fertilizer. --The contractor shall furnish a standard commercial fertilizer of 16(nitrogen), 20(phosphorus), 0(potassium) formula, and shall uniformly broadcast or drill the specified fertilizer at the rate of 100 pounds per acre into the surfaces of the areas to be seeded unless otherwise directed. Fertilizer shall be applied to the prepared seedbed previous to seeding operations, or at the time of seeding if a grass drill with a fertilizer attachment is used.

"(d) Seeding. --The contractor shall furnish and sow a mixture of brome grass and wheatgrass on all the areas to be seeded, except that portion of Ayres Creek Channel Change from Station 34+00 to End Station 44+50. This mixture shall consist of brome grass (Bromus inermis), Lincoln or Achenback strain, at the rate of 14 pounds of pure live seed per acre and western wheatgrass (Agropyron smithii) at the rate of 4 pounds of pure live seed per acre. For that portion of Ayres Creek Channel Change from Station 34+00 to End Station 44+50, the mixture of grasses to be sown and the rates of seeding are as follows: (1) Brome grass (Bromus inermis), Lincoln or Achenback strain at the rate of 10 pounds of pure live seed per acre; (2) Rye (Secale cereale), at the rate of 20 pounds of pure live seed per acre; (3) western wheatgrass (Agropyron smithii), at the rate of 4 pounds of pure live seed per acre; (4) Sand lovegrass (Eragiostis trichodes), at the rate of 1 pound of pure live seed per acre.

$$\frac{\text{Pure live seed - percent of purity x percent of germination}}{100}$$

"The germination of brome grass and rye shall not be less than 85%, the germination of western wheatgrass shall not be less than 65%, and that of sand lovegrass not less than 75%. Seed shall contain no noxious weed seed or quackgrass (Agropyron repens) and shall contain not more than 4 percent of other weed seed. All grass seed shall comply with the seed laws of the State of Nebraska. The age of seed of the brome grass and rye shall not exceed two years. The sand lovegrass and brome grass seed shall have been produced in Nebraska, Kansas, or Colorado.

"The seed of brome grass, western wheatgrass, rye, and sand lovegrass shall be separately packaged and labeled so they can be uniformly and thoroughly mixed after they are received on the job. The mixture of grasses specified herein shall be uniformly distributed on the designated areas to be seeded by means of a hand seeder or grass drill. When seed is sown by means of a hand seeder, immediately after broadcasting the seed shall be properly covered with soil to a depth not to exceed 1/2 inch by means of a spike tooth harrow, a treader (rotary hoe run backwards), or any similar implement acceptable to the contracting officer. If seed is sown with a grass drill, the drill shall be regulated so that the seed will be properly covered with soil to a depth not to exceed 1/2 inch. Seeding shall be done from February 1 to April 15 unless weather conditions, unfavorable soil moisture, or seedbed conditions are prohibitive to seeding, as determined by the contracting officer: Provided,

that when moisture and seedbed conditions are favorable, the contracting officer may order the contractor to continue operations in a period other than that stated above.

"(e) Measurement and payment.--Measurement for payment for furnishing and spreading fertilizer and furnishing and sowing grass seed will be made of the areas actually prepared, fertilized and seeded. The areas will be computed to the nearest 1/2 of an acre. Payment for furnishing and spreading fertilizer and furnishing and sowing grass seed will be made at the unit price per acre bid therefor in the schedule. The quantities as stated in the schedule for furnishing and spreading fertilizer and furnishing and sowing grass seed are estimates for the purpose of comparing bids and the contractor shall be entitled to no additional compensation above the unit price bid in the schedule by reason of any amount or none of this work being required."

Examination of the specifications will show that they meet several essential requirements needed to get the grass seeding done properly. First, the specification is written to enable Reclamation to make field changes in the seeding methods. For instance, it may be necessary to require the contractor to compact or loosen the ditch banks prior to seeding. Secondly, the specifications enable Reclamation to direct the contractor to seed miscellaneous spoil areas that are created during construction. In other words, if it is determined during construction that an additional bank will be constructed which is not anticipated in the original specifications for the canal or lateral, provisions are made in the contract that require the contractor to seed this additional area. Flexibility in the contract is also obtained by requiring the seeding of different species of grasses on different areas that are seeded. By going over such areas prior to preparing a specification, it can be determined what grasses are best adapted to the different soil types and drainage conditions encountered.

A special grass seeder has been developed by the Kansas River Projects staff working in cooperation with the Soil Conservation Service. The seeder, photograph below, prepares the seedbed and plants the seed in one operation. Excellent results have been obtained with its use. It consists of a native grass seeder and has a tillage width of 8 feet, and weighs 1,050 pounds.

A drawing, No. 271-701-1988, showing the modifications made to a commercial seeder to adapt it for ditch bank work, and any further information relative to the seeding operation can be obtained by writing to the Projects Manager, Kansas River Projects, Bureau of Reclamation, P. O. Box 737, McCook, Nebraska, or the Director, Region 7, Denver Federal Center, Denver, Colorado.

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