Department of the Interior

Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 4

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INTRODUCTION

This is Release No. 4 of the Operation and Maintenance Equipment and Procedures Bulletin, being issued as a joint effort of the Divisions of Operation and Maintenance, and Design and Construction, of the Bureau of Reclamation. Since Release No. 1 and No. 2 were issued, some excellent material has been received from Regional and Project Offices and Water User Organizations. Many comments from the field indicate that the Bulletin is being received with wide interest among Operation and Maintenance forces. Let's pass along your good ideas and keep up the interest.

Our last issue, Release No. 3 devoted to Weed Control, should have been received as we prepare to duplicate this issue. We have received additional information items concerning weed control too late for inclusion in Release No. 3. This supplementary data will be passed along in future releases. If you have a particular weed problem, possibly some of the operating projects can help you.

It should be remembered that this Bulletin is being circulated for your benefit. In some instances a particular piece of equipment has served well on a project. In presenting the story we must disclaim any endorsement of a manufactured product or piece of equipment. Reference to a trade name does not constitute an endorsement of that product, and omission of any particular commercially available item does not imply discrimination against any manufacturer. We hope that improvements made in commercially available equipment by project people will be incorporated in the design of manufactured items in the future, and that some project designed equipment can be duplicated by the manufacturing industry and made available at reasonable cost for your use.

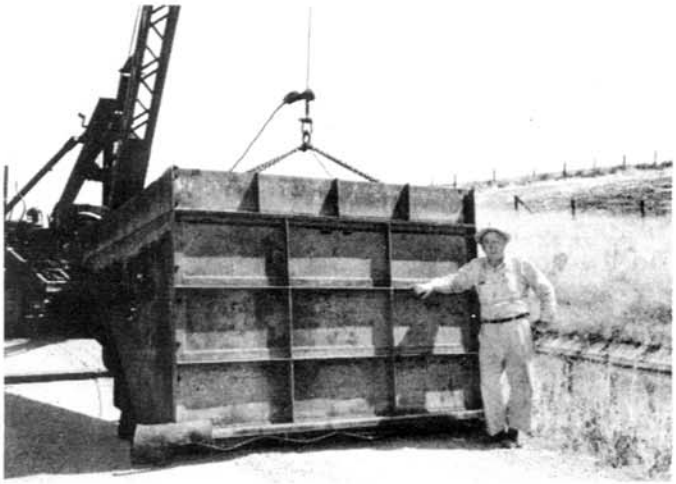
* * * * *

THE CONTRA COSTA PORTABLE COFFERDAM

In case some of you do not subscribe to the Reclamation Era, or missed the December 1952 issue, the portable cofferdam developed by Canal Maintenance Foreman Alexander G. McIntyre for use on the Contra Costa Canal maintenance work on the Central Valley Project will bear investigation on your part.

The article, "Contra Costa's Portable Cofferdam," prepared for the Reclamation Era, by W. G. Waggoner, Region 2, Bureau of Reclamation, Sacramento, California, very ably described and presented the construction details, and the simplicity and ease with which the device can be handled. Two photographs of the cofferdam are reproduced below.

As pointed out in the reference article, repair work that must be done without interruption of flow within the canal was the reason for development of the device by Mr. McIntyre. The device must of necessity be easily loaded, transported, and unloaded. It must be simple for handling, erection, and disassembly under difficult conditions. Most of all it must provide an effective barrier to the passage of water. The device incorporates all these features and has been used with much success.



If there are details about which you would like further information, you may inquire directly from the Regional Director, Bureau of Reclamation, Sacramento, California.

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NEOPRENE WATERPROOFING MATERIAL

Neoprene, a synthetic rubber, has been used experimentally on the upstream face of Gerber Dam, in an effort to decrease seepage known to be occurring through the construction joints. Placed in the fall of 1952, a recent report from Region 2 states that "with the reservoir elevation at its present high level, only a few signs of seepage are perceptible. . . . Only one small place where the neoprene application has peeled off has been reported and that is attributed to deteriorated concrete."

The application of the neoprene was made after sandblasting the surface and cleaning out and dry packing all crevices and holes with mortar. Several coats of the neoprene were then applied to all construction joints suspected of contributing to seepage, covering an area six inches on each side of the joints. The treatment was also given other spots, where there was evidence that seepage had occurred.

The project plans to mark the remaining seeps, reclean, repack, and repaint with neoprene as soon as the water level in the reservoir drops sufficiently. The apparent success of the neoprene on the face of the dam, where the hydrostatic head is high, may indicate possible use of the material for waterproofing other types of structures.

As the treatment was experimental, the material was furnished to the project by the manufacturer and applied by Government forces. The many coatings applied to the joints and seepage areas on the upstream face of the dam have apparently been sufficient to bridge existing cracks without rupture, when backed up with mortar. The present cost of the material and labor is estimated to be about $2.00 per square foot, however, more extensive use and experience in application would likely result in lower costs.

Use of the neoprene as a waterproofing compound is not being recommended for general use at this time, pending observation of the treatment at Gerber Dam. However, anyone interested in trial applications may contact the Chief Engineer's Paint Laboratory, Denver Federal Center, Denver, Colorado.

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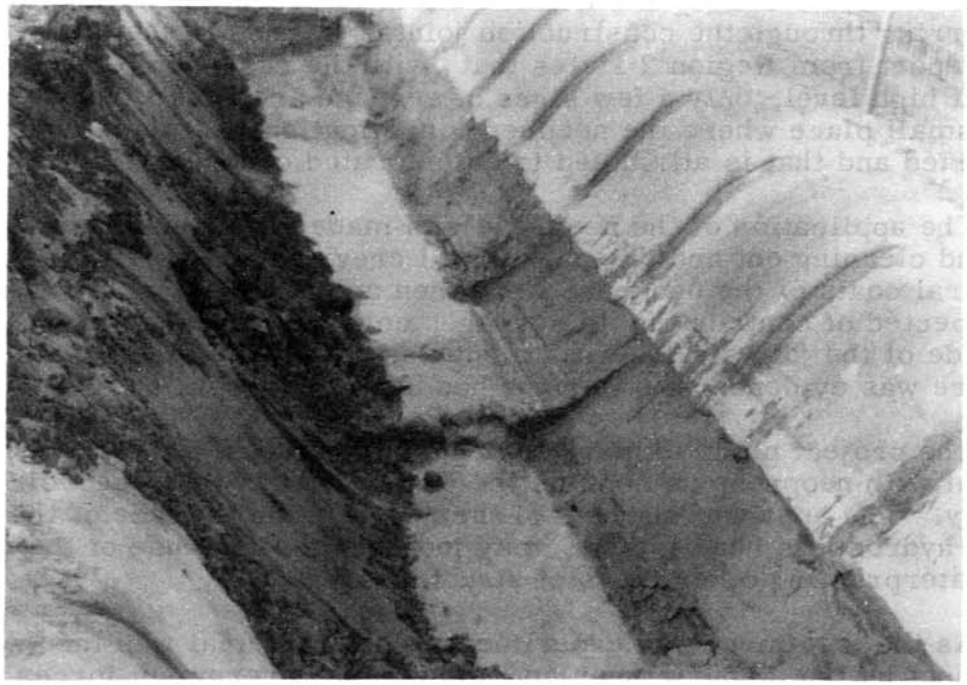
CLEANING EXPOSED TYPE MEMBRANE LINED LATERALS



It seems that often when an effort is made to improve one condition on a canal system another problem is created for the Operation and Maintenance people. Fortunately, they usually come up with a good solution. The problem of how to remove silt and debris from a small lateral without damaging the exposed type, heavy prefabricated asphaltic membrane lining is being solved by the Salt River Valley Water Users by use of a Gradall excavator. The completed operation is shown in the photograph above.

As shown on the facing page, an experienced operator can make good progress in removing silt from the lateral without damaging the membrane.

Incidentally, this is the first installation of the 1/2-inch thick prefabricated asphalt membrane lining on the Salt River Valley Project. The lining, designed to function without protective cover has been in service only 6 months, but is performing well so far in seepage and erosion control in the sandy subgrade material. The membrane was furnished by the Gulf States Asphalt Company of Houston, Texas, marketed under the trade name "Gulf Seal".

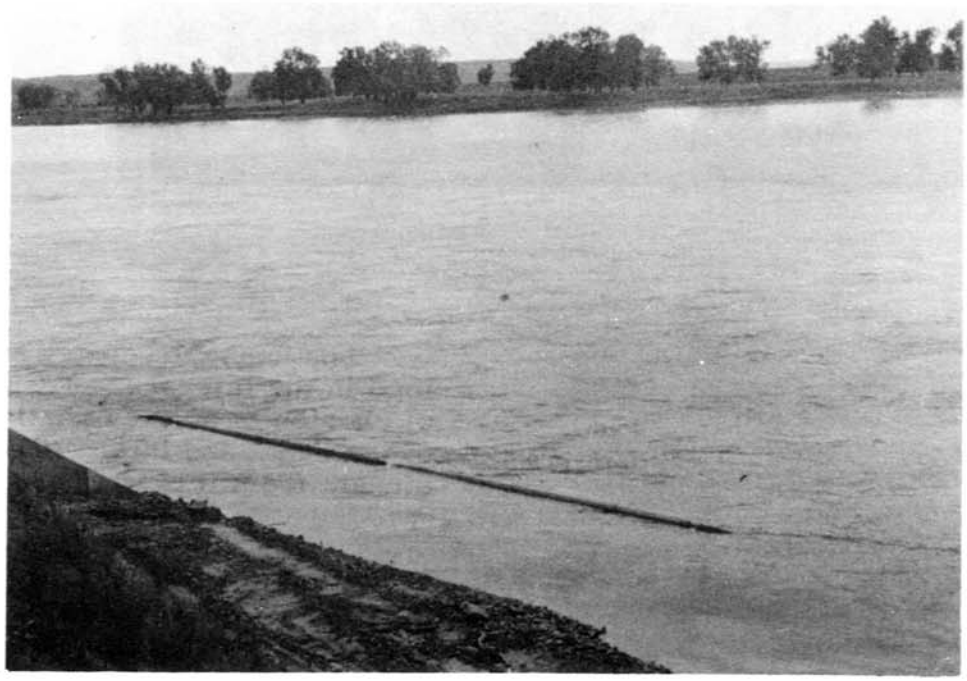
The unusually heavy silt load in the lateral is a result of erosion of unlined portions of the canal and lateral upstream from this point.

* * * * *

A VERY SIMPLE TRASH AND LOG BOOM

At a cost of only $25 to $30 a simple log boom has been installed by the Buffalo Rapids Farms Association to prevent trash from getting into the intake bays of their pumping plants during high water. The device will last indefinitely and makes it possible for one pump man to handle a plant even during the worst storms without having to call in additional structure or maintenance crew men to help in cleaning the bays. This in turn gives better service to the water users and reduces cost of operating.

The boom, as shown in the photograph below, consists of a series of logs or poles fastened end to end with chains or cables. The upstream end is anchored to the bank and a strut is arranged to hold the boom out from the bank.



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SHOTCRETE AS A TIMBER PRESERVATIVE

The Salt River Valley Water User's Association in Arizona report that canal bridge timbers are being successfully protected with shotcrete. Covering the timbers with shotcrete has increased their serviceable life by protecting them against rot and mildew.

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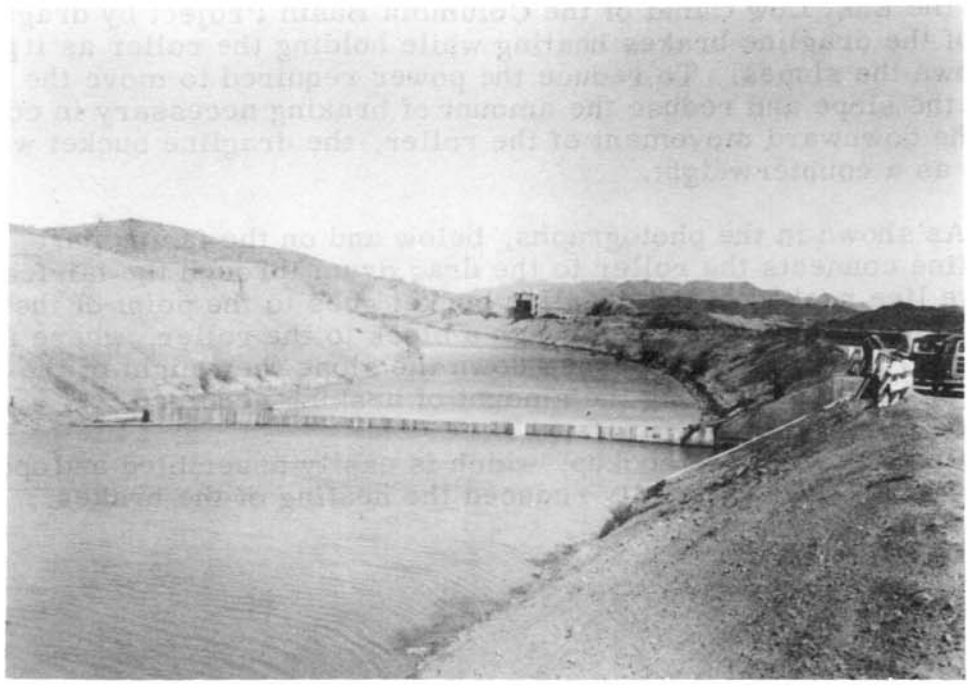
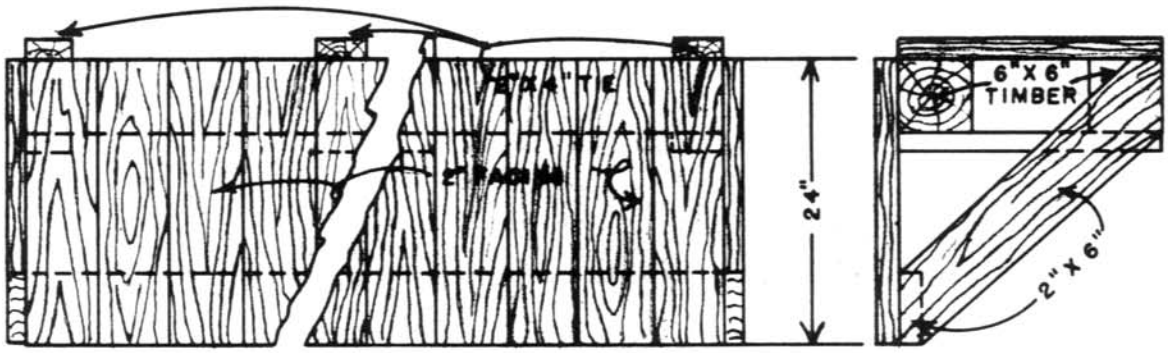
A BOOM IS USED TO DEFLECT WEEDS INTO A WASTEWAY



As shown in the above photograph, a simple floating boom has been installed across the Gila Canal at the wasteway immediately upstream from the Gila River Siphon to deflect weeds and debris into the wasteway during chaining operations. Short vertical boards on the upstream face of the boom, as shown in the sketch below, 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 decking.



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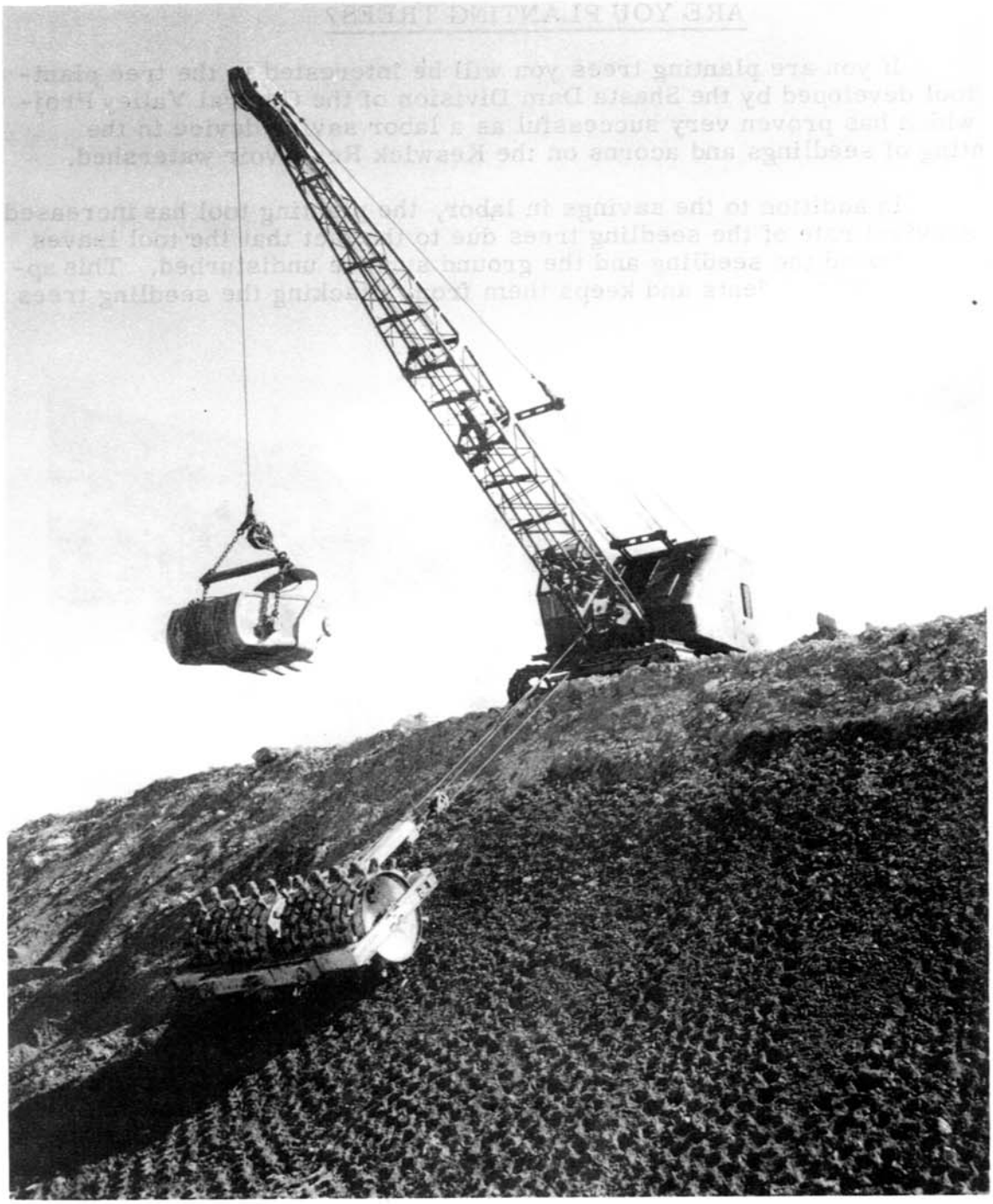
COMPACTION OF INNER CANAL SIDESLOPES

Considerable trouble was being encountered in rolling the inner slopes of the East Low Canal of the Columbia Basin Project by dragline, because of the dragline brakes heating while holding the roller as it proceeded down the slopes. To reduce the power required to move the roller up the slope and reduce the amount of braking necessary in controlling the downward movement of the roller, the dragline bucket was rigged up as a counterweight.

As shown in the photographs, below and on the facing page, a two part line connects the roller to the drag drum through the fairleads. A separate line hooked to the dragline bucket goes to the point of the boom, then down the boom and through a block to the roller, where it is clamped. As the roller progresses down the slope the weight of the bucket is picked up, reducing the amount of braking required.

Using this simple hookup, which is easily assembled and operated in the field, has materially reduced the heating of the brakes.



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ARE YOU PLANTING TREES?

If you are planting trees you will be interested in the tree planting tool developed by the Shasta Dam Division of the Central Valley Project which has proven very successful as a labor saving device in the planting of seedlings and acorns on the Keswick Reservoir watershed.

In addition to the savings in labor, the planting tool has increased the survival rate of the seedling trees due to the fact that the tool leaves the soil around the seedling and the ground surface undisturbed. This apparently baffles rodents and keeps them from attacking the seedling trees and acorns.

The planting tool is effective in all types of soil and is particularly useful in rocky areas. Some of the advantages in using the tree planting tool are:

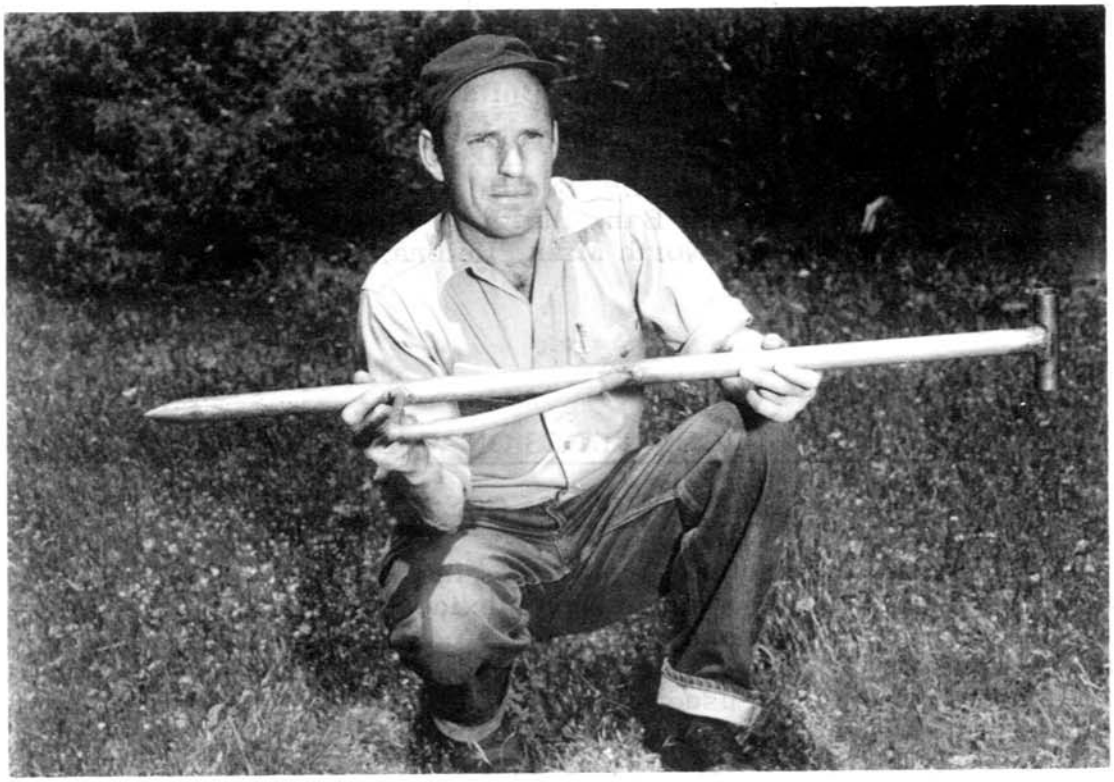
The number of trees planted in a given time has more than doubled.

Loss in planted seedling trees has been reduced by approximately 40 percent.

Ninety percent of the acorns planted with the tool survived.

It is difficult to evaluate the total savings made possible to the Government by use of the tool, considering the survival of seedlings and acorns. However, as a labor saving device approximately 6,000 man-hours were saved in planting 447,000 seedling trees during the year 1950 alone.

The tool, as shown in more detail in the photograph below, is made of 1-1/2-inch OD steel tubing with a tempered steel point. The handle is set at 90 degrees with the step or saddle for safety during tamping. Over-all dimension of the tree planting tool is 42 inches, with the step or saddle 12 inches from the point.



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HOW TO MAKE QUALITY CONCRETE

We were recently privileged to view a movie produced jointly by the Portland Cement Association and the American Concrete Institute which tells in a very effective way, as the title of the movie implies, "How to Make Quality Concrete". The film illustrates the importance of the water-cement ratio, quality and grading of aggregates, effect of entrained air and other factors which contribute to the strength, durability, and water-tightness of concrete produced.

Anyone interested in the production of good quality concrete would also be interested in, and benefited by, viewing the movie. It has been prepared for appeal to both technical and nontechnical audiences. It is believed it would be of particular interest to maintenance crews and others engaged in construction or concrete repair work.

The movie is a 16-mm, color and sound film with an excellent running commentary. Showing time for the movie is about 33 minutes. The film can be obtained for showing from your nearest Portland Cement Association office. In the irrigation states these offices are located at:

114 East 8th St., Austin, Texas
521 Boston Building, Denver, Colorado
816 West 5th St., Los Angeles 17, California
1308 First National Bank Building, Oklahoma City, Okla.
504 South 18th St., Omaha, Nebraska
David Kieth Building, Salt Lake City, Utah
903 Seaboard Building, Seattle 1, Washington
1309 Old National Bank Building, Spokane, Washington
Gold Block, 52 North Main, Helena, Montana.

* * * * *

PUNCTURE-PROOF TUBES ON WEED MOWERS

REDUCE O & M COSTS

By the use of puncture-proof tubes in the front tires of weed mowers, the Tucumcari Project in New Mexico, has made a direct saving of $800.00 in operation and maintenance costs during 1952. The pneumatic tires on the mowers are subjected to unusually severe operating conditions, as they are used to cut weeds on the steep wide slopes of the canals and borrow pit areas. Pneumatic tires on the weed mowers were continually being punctured by mesquite thorns, other thorny plants, debris, nails, and sharp rocks not encountered by other equipment which normally uses the operating roads exclusively.

The four tractor-mowers used by the project operated during the entire 1952 season without punctures. This is in contrast with the operation of these same machines during the 1951 season during which the machines averaged one puncture per week, at an approximate cost for repairs of $800.00 for the season's operation. The repair cost was entirely eliminated by the installation of the puncture-proof tubes, with a resulting increase in operational efficiency which can not readily be evaluated directly in money saved.

Puncture-proof tubes were not obtainable for the size tire originally supplied with the mowers. It was necessary, therefore, to change the wheels to a size which would permit use of standard automobile tires. This was accomplished by cutting the rims from the original tractor wheels and welding on rims from automobile wheels obtained from an auto wrecking yard at a cost of $1.00 each. It was discovered that 1942 Plymouth wheels would fit the Model B, Allis-Chalmers hubs without alterations. Total cost of the change over was approximately $60.00 and this included the preparation of two spare wheels.

* * * * *

VINYL RESIN IS BETTER PAINT FOR INTERIOR OF WATER STORAGE TANKS

Since the Bureau of Reclamation Paint Manual was issued in April 1951 (see O&M Equipment and Procedures Bulletin No. 2, page 6), there has been one significant change recommended in painting practice. This change applies to the painting of the interior of domestic water storage tanks.

CA-50 is recommended in the Paint Manual for this purpose. However, experience has shown that unless the CA-50 is allowed to dry very thoroughly there is a likelihood of imparting a taste to the water. Present practice is to apply 3 coats of vinyl resin paint. Specifications for this paint are available from the Chief Engineer's Paint Laboratory.

* * * * *

STORAGE BATTERY REJUVINATOR

The January 22, 1953 issue of Engineering-News Record reports very favorably on a new storage battery rejuvinator being marketed under the name of "Rejuvinator AD-X-2" by Pioneers Inc., 2411 Grove Street, Oakland 12, California. It is stated that the additive consists chiefly of sodium and magnesium sulfates, with some traces of other elements, and that sulfation of the lead plates, which eventually makes them hard and brittle so they will not take a charge, is prevented. The additive is added to the cells gradually by washing it in with the battery water and the battery is then placed on charge. One construction company reports savings of 70 percent in battery replacement costs through the use of this material.

* * * * *

DE-ICING BY COMPRESSED AIR

On many of the Bureau of Reclamation projects in the northern states, ice is prevented from interfering with the operation of gates and outlet works by the use of permanently installed compressed air ice-prevention systems. A recent report on the system installed at Angostura Dam in South Dakota has been received and is worthy of presentation as a subject of general interest and possible consideration of similar installations on other projects that have difficulty controlling the ice in and around gates and outlets during winter operation.

On December 30, 1952, the ice in contact with the faces of the radial gates of the Angostura Spillway was measured and found to be 6-1/8 inches in thickness. To operate the gates with the ice against them might have damaged the hoisting mechanism and possibly the gates themselves, if they could have been operated at all. At 7:15 AM, the ice-prevention air system was placed in operation, and by 12:15 PM, 5 hours later, the gate faces were free of ice.

The air outlets of the ice prevention system as shown on the drawing, page 15, were at a depth of about 36 feet below the water surface as it existed at the time. At 1:30 PM, a hole was chopped in the ice at a point about 60 feet upstream from the dam and the temperature of the water was found to be 32° F at the water surface and 36° F at a depth of 36 feet; the depth at about which the air system nozzles were located. The air temperature at the time was 37° F and the surface water temperature at the face of the dam where the air bubbles from the nozzles were emerging was about 35° F. The ice melted first at the face of the gates, later extending the ice-free open water area 8 to 10 feet upstream from the gates.

The compressed air ice-prevention system installed at Angostura Dam, is similar in design to installations incorporated into other Bureau structures. Like the Angostura system the others have aided materially in preventing ice from interfering with the operation of gates and outlet works. Some systems have been designed to operate more or less automatically, in that the compressors are started periodically by a time clock and operate for whatever length of time deemed necessary for freeing ice bound gates.

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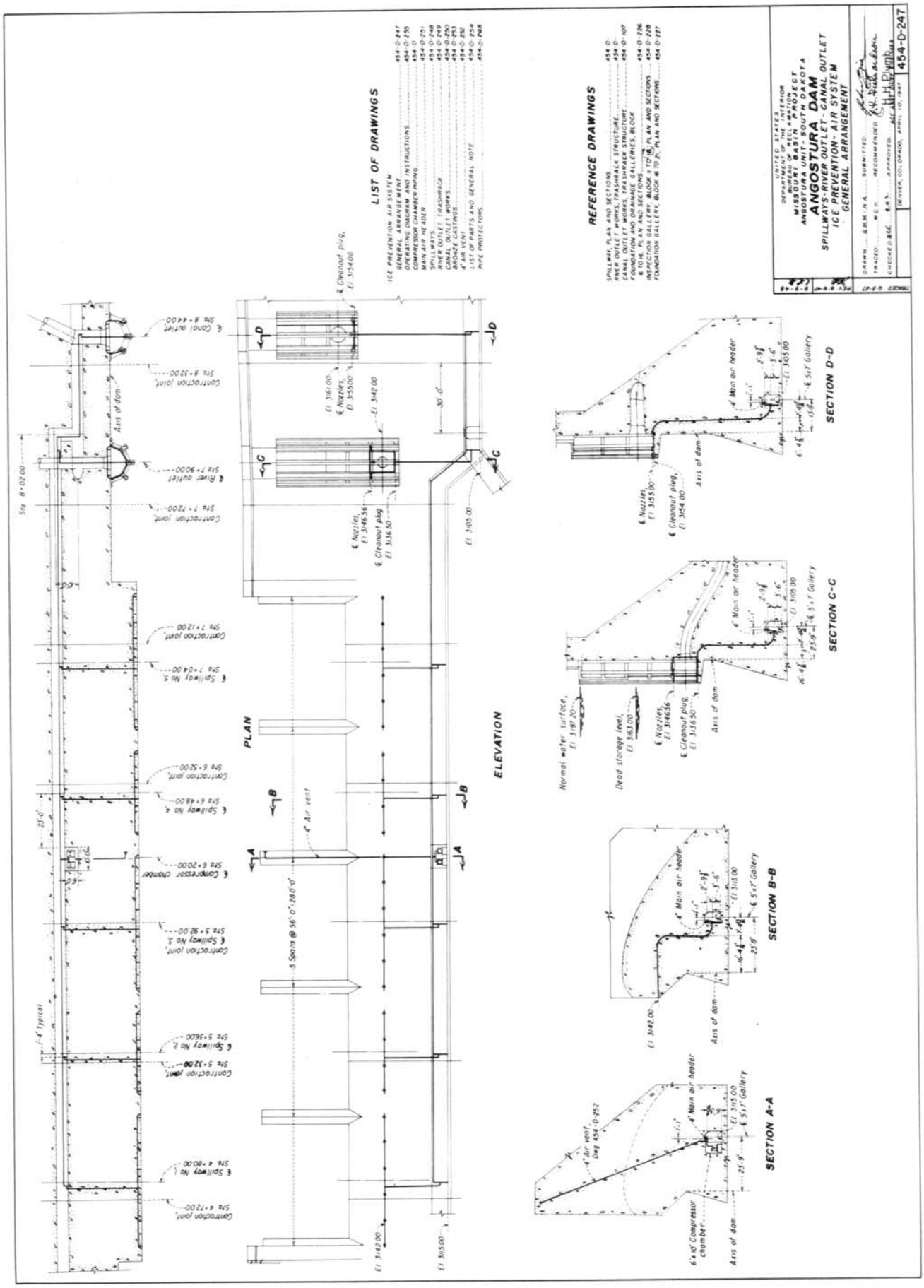
LIST OF DRAWINGS
ICE PREVENTION AIR SYSTEM
GENERAL ARRANGEMENT 454-D-247
OPERATING DIAGRAM AND INSTRUCTIONS 454-D-255
COMPRESSOR CHAMBER PIPING 454-D
MAIN AIR HEADER 454-D-251
SPILLWAYS 454-D-248
RIVER OUTLET TRASHRACK 454-D-249
CANAL OUTLET WORKS 454-D-250
BRONZE CASTINGS 454-D-253
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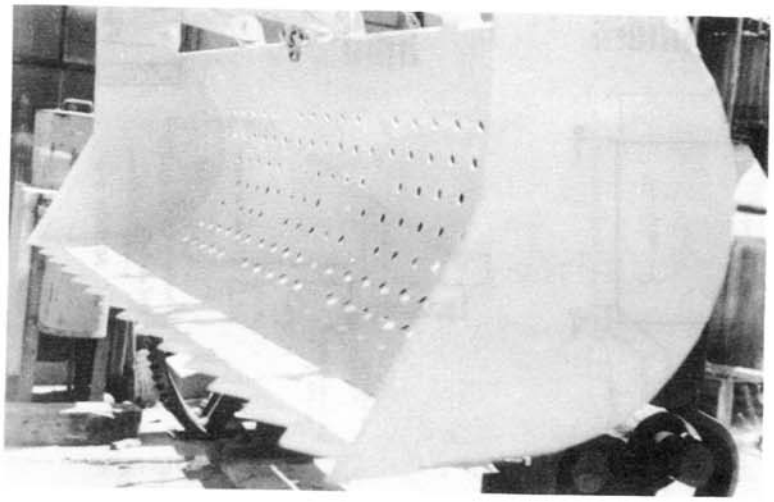
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MISSOURI BASIN PROJECT
ANGOSTURA UNIT - SOUTH DAKOTA
ANGOSTURA DAM
SPILLWAYS-RIVER OUTLET-CANAL OUTLET
ICE PREVENTION-AIR SYSTEM
GENERAL ARRANGEMENT
DENVER, COLORADO, APRIL 10, 1947
454-D-247
PLAN
ELEVATION
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
Axis of dam
Normal water surface, El 3187.20
Dead storage level, El 3163.00
4" Main air header
4" Air vent
5 Spans @ 56'-0" = 280'-0"
Contraction joint, Sta 4+72.00
Contraction joint, Sta 5+32.00
Contraction joint, Sta 5+36.00
Contraction joint, Sta 6+52.00
Contraction joint, Sta 7+12.00
Contraction joint, Sta 7+72.00
Contraction joint, Sta 8+32.00
Contraction joint, Sta 8+44.00
Sta 8+02.00
Sta 6+20.00
Sta 6+48.00
Sta 7+04.00
Sta 7+90.00
Sta 8+32.00
Sta 8+44.00
El 3142.00
El 3115.00
El 3105.00
El 3161.00
El 3155.00
El 3146.56
El 3136.50
El 3154.00
El 3105.00
30'-0"
25'-0"
1'-4" Typical

BUCKET ATTACHMENTS FOR A GRADALL SPEED PROJECT OPERATIONS

Two new buckets have been fabricated in the shops of the Salt River Valley Water User's Association in Phoenix, Arizona, for use with the Association's fleet of 5 Gradall excavators in expediting and facilitating operation and maintenance work.



The bucket to the left is used for demossing canals and laterals. It is shaped much like the 60-inch ditch cleaning bucket supplied by the manufacturer. However, the Salt River bucket is 72 inches wide, has a serrated cutting edge, and the bucket plate has been perforated, as it is normally used under water.

By use of the new bucket, demossing on the Project is done for approximately $68.00 per mile. This is about one-half the cost of the conventional chaining and discing operation previously used, which involved catching the moss on grates placed in the waterway and hand forking the moss from the grates.

The unit in operation, photograph above, removes a large amount of moss and silt with each pass of the bucket, demossing about one mile of ditch per day. Cleaning of the canal or lateral while demossing also

eliminates an additional pass through the ditch by hand crews at a later date.

A second bucket, also fabricated for connection to the standard Gradall unit and used for shaping ditches preparatory to gunite lining, has proven to be as successful as the demossing bucket. This second bucket varies from the manufactured bucket designed for the purpose in that the cutting edges are turned downward and outward slightly. By so doing, closer control and ease of operation has been accomplished. Several of these buckets have been constructed with variable bottom widths and wings on a 3/4:1 slope to conform to the desired ditch section. The buckets have a capacity of about 1/3-cubic yard.

In operation, as shown in the photograph to the left, the machine travels over the center line of a new ditch, digging and shaping as desired. If an old ditch is to be lined, it is first backfilled. The backfill is compacted and then re-excavated. Very little hand finishing remains to be done in preparing the ditch for lining and excavation of about 100 feet per hour is usual, according to information supplied by the project.

Compared with previous methods of excavation by dragline and necessary hand shaping, the use of the Gradall and project designed bucket has reduced costs to about 1/5 that of the older conventional method. Excavation, shaping and some small amount of hand finishing has been done for about $0.22 per cubic yard. For the ditch shown in the photograph, the cost was about $0.11 per linear foot, and the resulting ditches are free from the usual variations in alignment, are uniform in section, and ready for lining without delay.

On the Salt River Project, maintenance of the canal system is complicated by the proximity of many growing residential areas. Limited right-of-way, the presence of overhead power and telephone lines, and other residential problems make the Gradall ideally suited for the work that must be done.

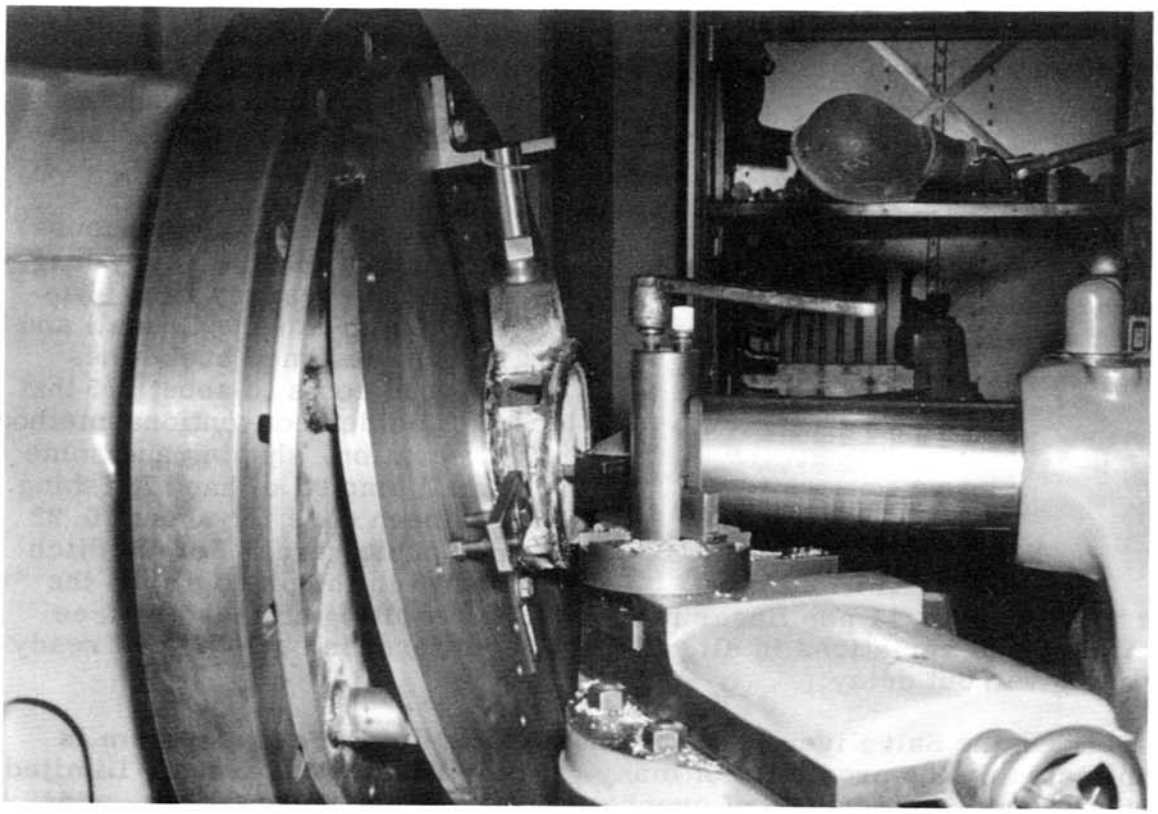
* * * * *

REFACING WEDGES AND SEATS OF GATE VALVES

By machining and refacing the wedges and seats, faulty valves previously replaced by new ones, are quickly and efficiently made serviceable by the Shasta Dam Division of the Central Valley Project. Approximately 20 valves are repaired annually, with the result that the purchase of new gate valves has been substantially reduced. An angle plate adapter that fits the lathe face plates is used in the machining and refacing.

The angle plate adapters shown in the accompanying photographs are used for machining and refacing wedges and seats of 2-inch to 8-inch valves. Another plate is available for use with larger valves up to 18 inches in size. However, valves larger than 12 inches in size must be machined elsewhere because the largest lathe in the Division shops does not have sufficient clearance for handling the larger sizes.

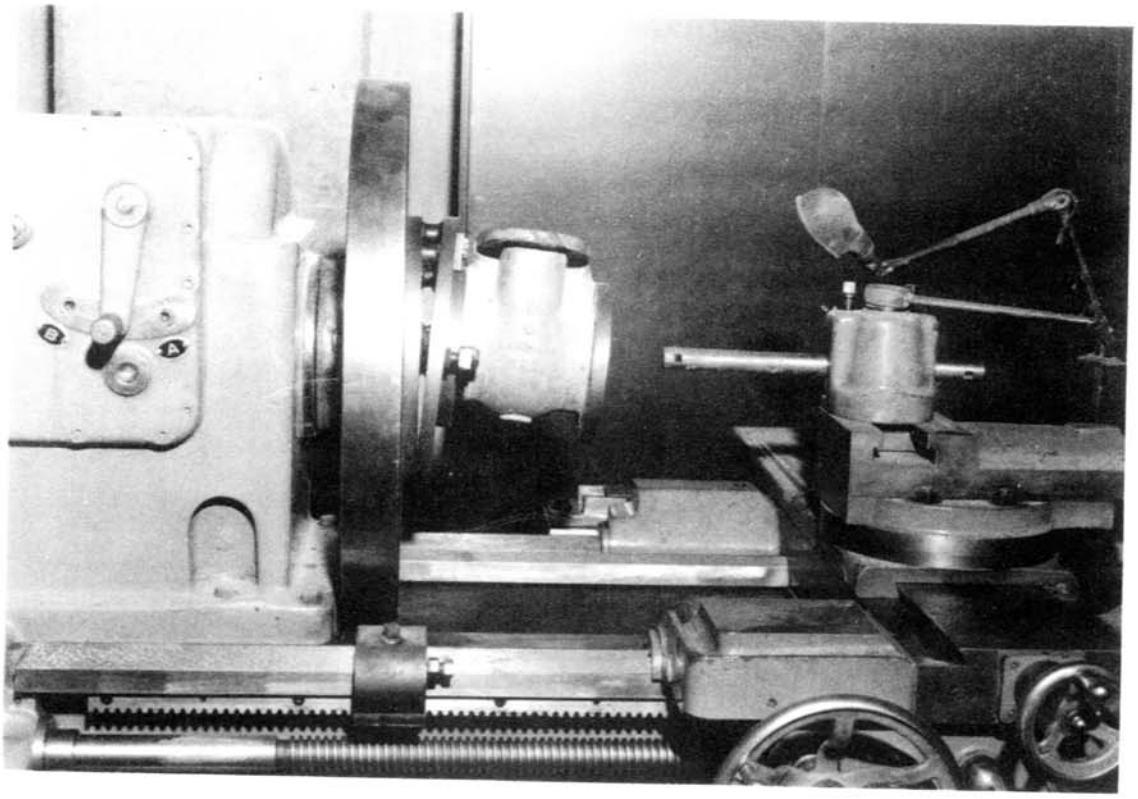
The device illustrated below for machining the valve wedges consists of two circular pieces of 1-inch steel plate 18 inches in diameter, joined at one edge of the circle to provide an angle of ten degrees between the angle plate and the vertical plate of the adapter. Attachment of necessary clamps, brackets and spacer plates is provided on the angle plate.



In operation the vertical face of the adapter is attached to the face plate of the lathe and the valve wedge bracketed to the angle plate of the adapter. The proper angle on the wedge facing is obtained by screwing a brass pusher or stem adapter into the threads of the valve

stem. This device rests firmly against a bracket mounted on the outside face of the angle plate and insures that the valve wedge is mounted on true plumb against the angle plate. By means of an angle plate, the gate valve wedge receives the correct facing to fit the valve seat.

Machining the gate valve seats is accomplished in similar manner, using a similar angle plate, but the angle plate is constructed with a five degree deviation from the vertical plate instead of ten degrees as used on the wedge described above.



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Interior - Reclamation - Denver, Colo.