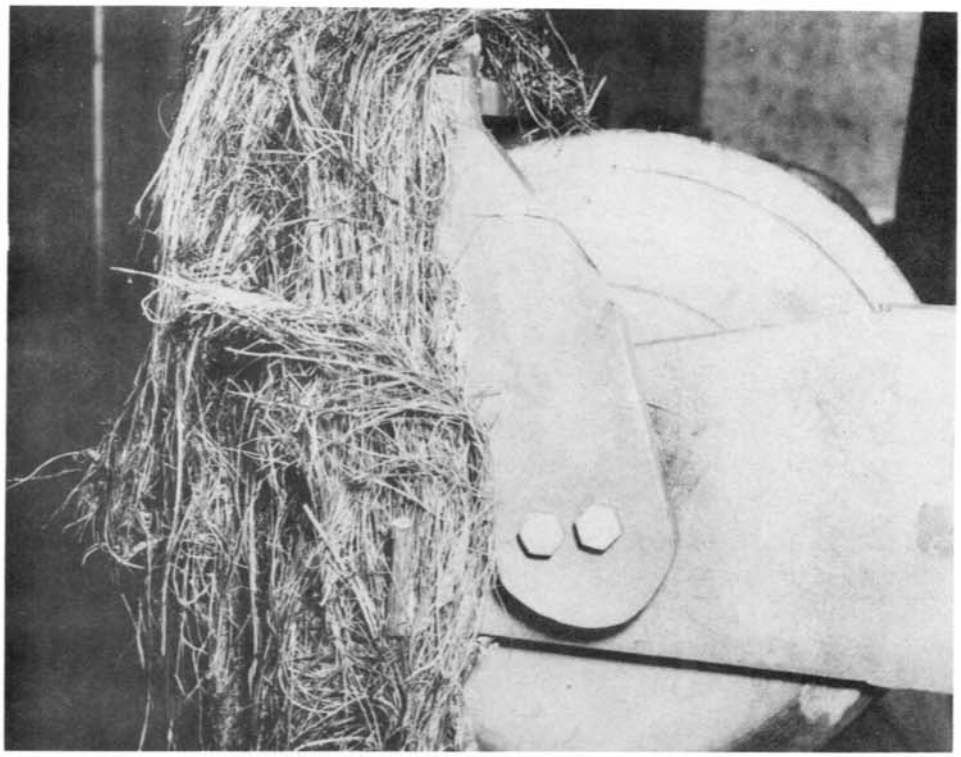
Department of the Interior

Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 6

September-October 1953



CONTENTS

INTRODUCTION

With this release, No. 6 of the Operation and Maintenance Equipment and Procedure Bulletin, we have now been publishing bi-monthly for a year, the information you have submitted. Many of the suggestions included in the Bulletin appear to have been helpful to operating projects, and we have received comments from many of you. Your comments are appreciated, and if you have further comment on the ideas heretofore publicized, they will be welcome.

We are in need of additional material for the Bulletin. So don't feel backward about letting us have your ideas.

At this time of year, operating projects are beginning to think about winter protection for the irrigation facilities. The memorandum included in this release, "Methods for Keeping Motor Windings Dry" prepared by the Chief, Power Utilization Field Division may be of interest in this respect. Should you have any further questions concerning the protection of motors, you may contact the author, or the O&M Liaison Representative, Denver Federal Center, Denver, Colorado.

The Operation and Maintenance Equipment and Procedure Bulletin is circulated for the benefit of irrigation project operators. Reference to a trade name does not constitute an endorsement of a particular product and omission of any commercially available item does not imply discrimination against any manufacturer.

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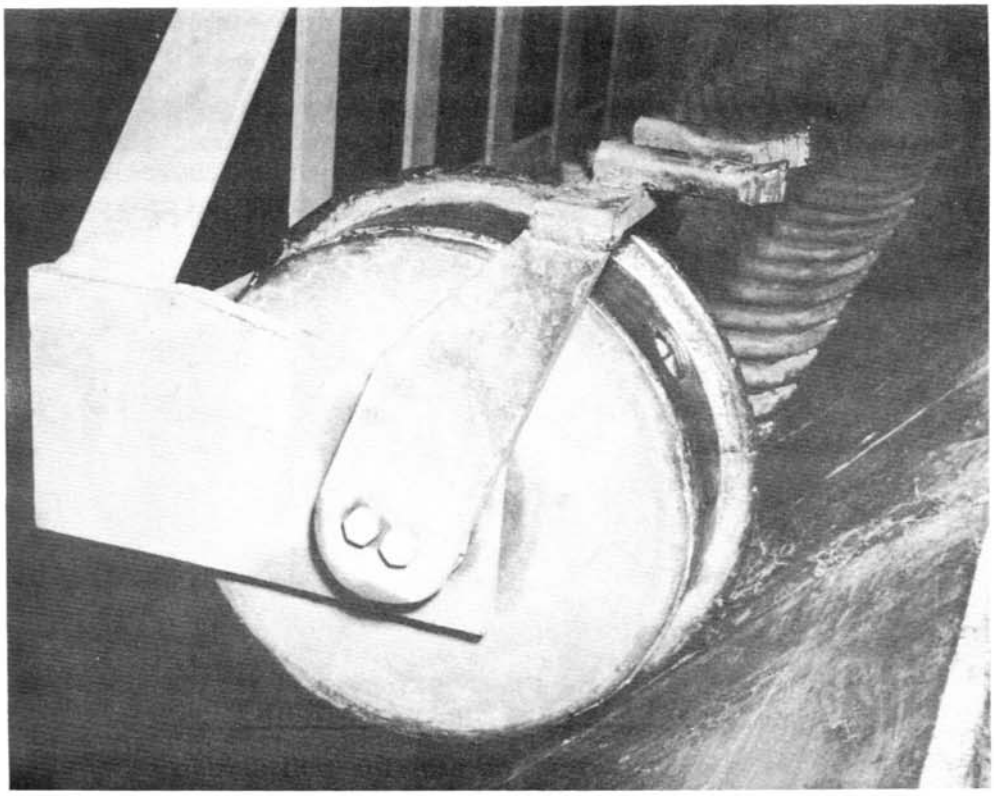
TRASHRACK RAKE MODIFICATION

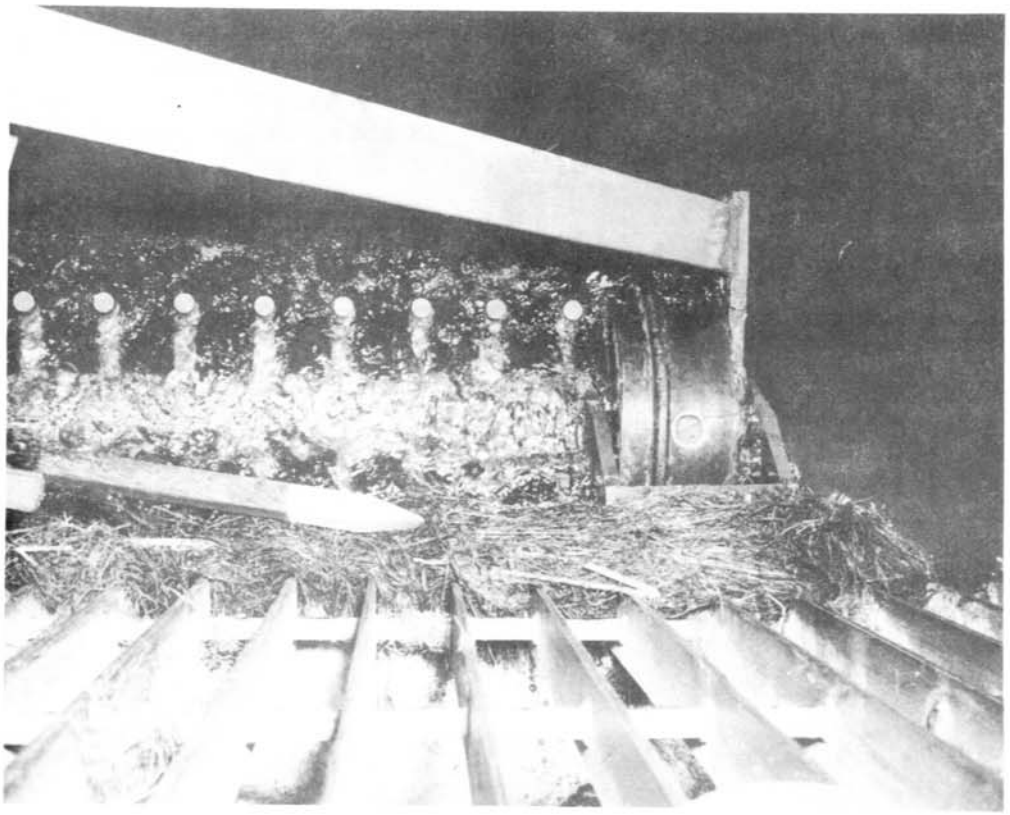
The debris that collects on the trashrack of the Wellton-Mohawk Pumping Plant No. 1 of the Gila Project, Arizona, consists largely of pondweed, as shown on the cover page. A mechanical rake was provided for clearing the debris from the trashrack; however, in operation, difficulty was encountered in using the rake, due to the type of debris. It collected on the trashrack and interwove into a homogeneous compact mass, forcing the wheels of the rake to ride over it. This in turn lifted the rake away from the trash bars.

In the photograph below, the modifications devised by the project forces are shown. A set of rake teeth or plows have been 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.



Several rakes of the type installed on the Gila Project have been installed on other Bureau constructed projects. The type of debris appears to have a bearing upon the success of the rake in clearing trashracks. As now modified the Gila Project is well

satisfied with the rake in handling the debris, principally pondweed and moss encountered in the canal system. A view of the rake in operation is shown in the photograph below.



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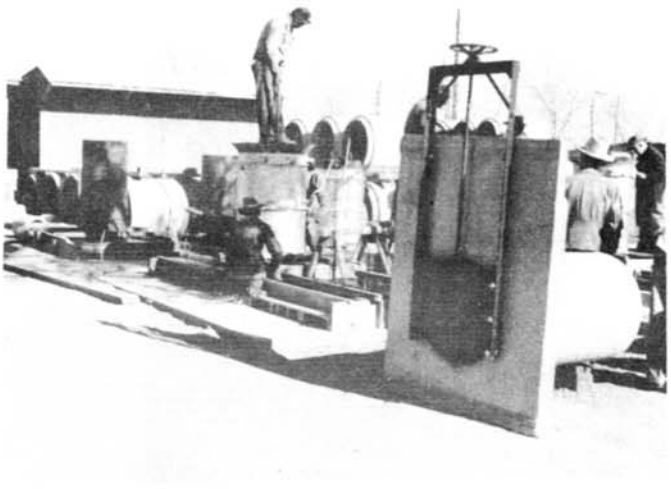
PRECAST IRRIGATION STRUCTURES

A good many years ago the Bureau of Reclamation prepared designs for precasting small structures, but they were not utilized to any great extent for various reasons. Probably one of the principal reasons the precast structure did not prove popular at that time was that equipment for convenient handling, transporting and setting of the structures was not available. With the availability of present day equipment for such work, one of the major objections to precast structures is removed.

It has been observed that many operating projects now are using precast concrete structures of various kinds in performing rehabilitation and betterment work. During construction on some of our

new projects, the contractors also have elected to precast some of the smaller structures, reporting an appreciable saving compared with casting them in place.



On the Rio Grande Project, New Mexico and Texas, the fabrication of a precast concrete turnout is shown in the photographs on this page.

In this turnout, the outlet pipe is placed monolithically with the headwall. At the extreme left of the upper photograph a form is being assembled. The inner pipe form and reinforcing steel have been placed. Concrete is being placed in the form in the center of the photograph, and a completed precast turnout is shown on the right. The completed structure has been cured and is ready for transportation to the site of installation. One of the advantages of this method of precasting is that the pipe reinforcement extends into the headwall.

The forming and reinforcement are shown in more detail in the photographs at left.

If wing walls are desired for a turnout structure of this type, they are provided by jetting precast reinforced concrete sheet piling into place after the turnout structure has been set. The sheet piling is also precast in the project yard, which in this instance is Ysleta, New Mexico.

Other types of prefabricated structures are used on the Rio Grande Project and fabricated by operation and maintenance personnel in their own yards. In the photograph at the top of the following page, there is shown a prefabricated turnout of different design. The turnout in this instance was incorporated in a

combination check, drop, and farm turnout structure. In the fabrication of this type of turnout, the turnout pipe was first manufactured and later incorporated into the headwall, as the headwall and wing walls were being placed monolithically. In the installation shown, a smooth transition will be formed from the side slab of the check to the turnout wing walls by hand troweling.

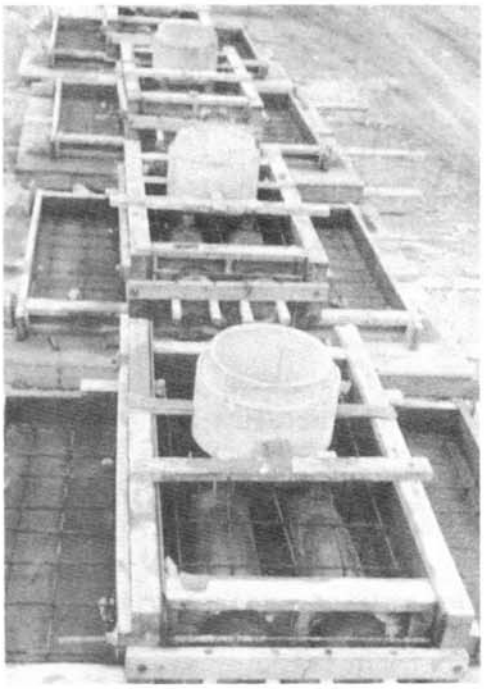
The prefabricated structures are handled and set in place by a winch truck equipped with an A-frame boom. Headquarters for the Rio Grande Project are located in El Paso, Texas. Additional information and plans of the structures can be obtained by contacting the Project Manager at El Paso, or by writing the Director, Region 5, Bureau of Reclamation, Amarillo, Texas.

The Riverton Project, Wyoming, also utilizes precast structures in rehabilitation. In the photograph below, project forces are precasting farm delivery weirs in the project yards at Pavillion.

Something over two completed structures can be fabricated daily by a crew of five men. Project people estimate that the precast weirs can be fabricated and installed for about half the cost of casting the structures in place.

In construction of the Superior Canal Laterals on the Bostwick Division of the Missouri Basin Project, Nebraska, the contractor elected to precast headwalls and outlets of metergate turnout structures, Parshall flumes, and the headwalls for road crossings. Several views of the structures are shown on the following pages.

The forms used in fabrication of the turnout headwalls and outlet structures are shown in the photographs immediately below. The lower photograph on this page shows the method used in placement of concrete in the forms.



The method employed by the contractor in setting one of the precast headwalls is illustrated in the photographs at the top of the next page. After fine grading, the precast structure is set in a bed of fresh mortar about an inch thick to correct for slight variations in the prepared subgrade.

In the lower photographs on the following page, several completed structures to be placed in the lateral system are stored in the contractors fabrication yard. These include Parshall flumes and turnout headwalls and outlet structures. The method of handling the structures is also shown. The limiting capacity of available handling equipment will control the economical use of prefabricated structures, but in most instances a savings in costs can be made on the smaller structures where

uniform types of structure can be mass produced. From an observation of some of the structures in place, they appear satisfactory in every way.

* * * * *

HEAVY COMPACTED EARTH LINING - COURTLAND CANAL

The Courtland Canal on the Bostwick Division of the Missouri River Basin Project in Nebraska, is constructed principally through loess. The canal has an average bottom width of 25 feet, a water depth of 8.5 feet and $1\frac{1}{2}$:1 side slopes. Lining the canal economically to provide for control of seepage and to stabilize the side slopes has been of much concern to the designers.

Various types of linings have been considered. Recently bids for construction of a heavy compacted earth lining on 3.7 miles of the canal resulted in a low bid price of about $0.60 per square yard. The lining will be 2 feet thick in the bottom of the canal and 3.25 feet thick on the side slopes, normal to the slope.

Construction will consist of overexcavating the bottom and side slopes of the canal to accommodate the lining. In the bottom, 18 inches of material will be removed. The subgrade will then be scarified to an additional depth of 6 inches and the scarified material will be compacted. Where suitable, the excavated material will be utilized, spreading and compacting it in three 6-inch lifts. If the subgrade material is not suitable in some reaches for construction of a heavy compacted earth lining, it will be replaced by more suitable material from borrow pits.

The horizontal width of the lining on the side slopes will be about 6 feet, and this also will be placed in horizontal 6-inch lifts. The subgrade material, where it is suitable, will be utilized also in the lining on the side slopes.

Lining is to be done in accordance with Bureau Specifications DC-3997, and copies can be obtained by writing the Regional Director, Region 7, of the Chief Engineer, both of whom have offices at the Denver Federal Center, Denver, Colorado.

* * * * *

SKIMMING WEIR AT FARM TURNOUT

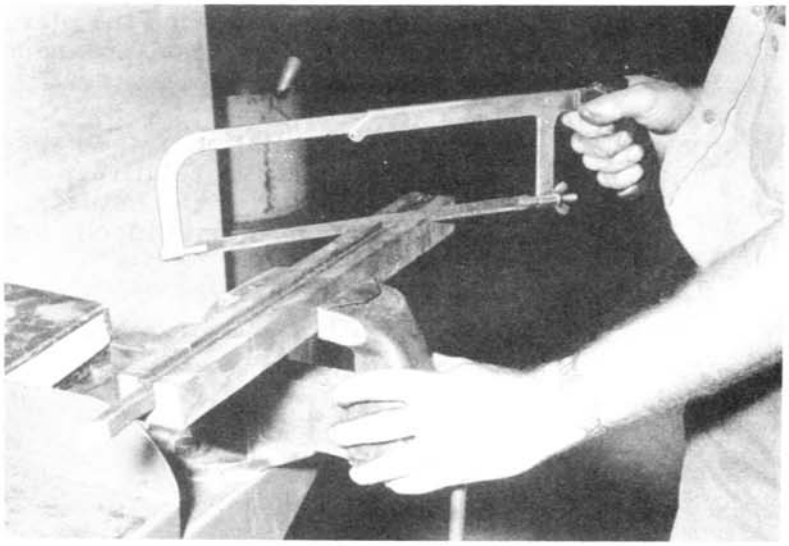
An innovation of the Rio Grande Project, New Mexico and Texas, is the skimming weir placed at a farm turnout as shown in the photograph at left. The weir is located on the West Main Canal.

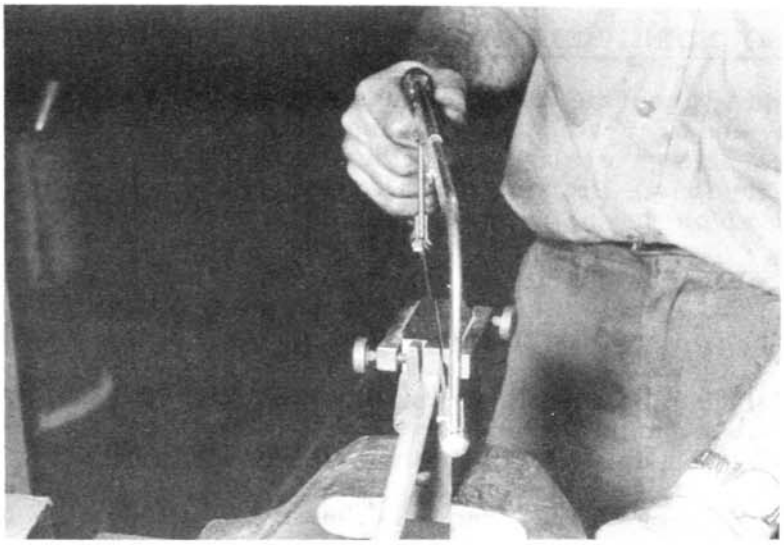
The inlet to the turnout is provided with check plank grooves about a foot upstream from the turnout gate. Planks in the grooves reduce the amount of silt and sand that enters the lateral and consequently, the farmers' fields.

* * * * *

JIGS FOR CUTTING GASKET MATERIAL

The metal jigs shown in the photographs below were devised by the Shasta Division of the Central Valley Project, California, for making a long and accurate 45-degree bevel to permit fabrication of a strong cemented joint in both round and square gasket material. Providing the 45-degree end cut is facilitated by use of the jigs and a hacksaw blade which has been ground to a knife edge. The sharp blade results in a smoother and more uniform cut. For further information contact the Supervising Engineer, California Projects, Sacramento, California.





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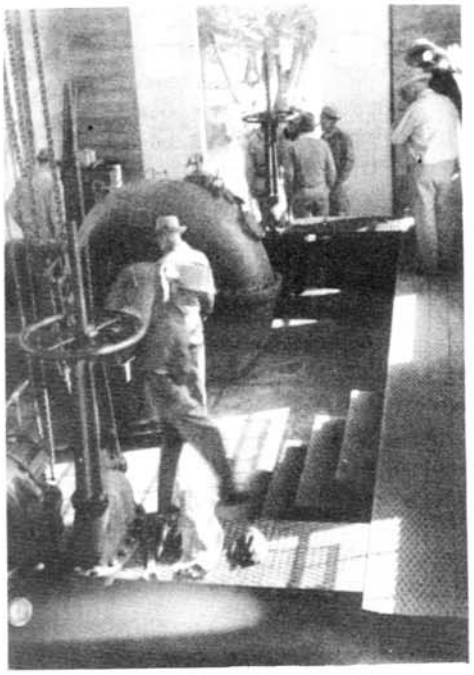
EXPANDED METAL PLATE PREVENTS SLIPPING



Expanded metal plate has been fastened to plank walkways within the Whipple Pumping Plant on the Kittitas Division of the Yakima Project, Washington. The inexpensive wooden platforms covered with the metal plate provide access to controls and valves, with good footing being assured even when the platforms are wet. A very neat appearance also results.

Installation of the expanded metal plate is relatively simple and such material can be used to good advantage in both indoor and outdoor locations.

* * * * *

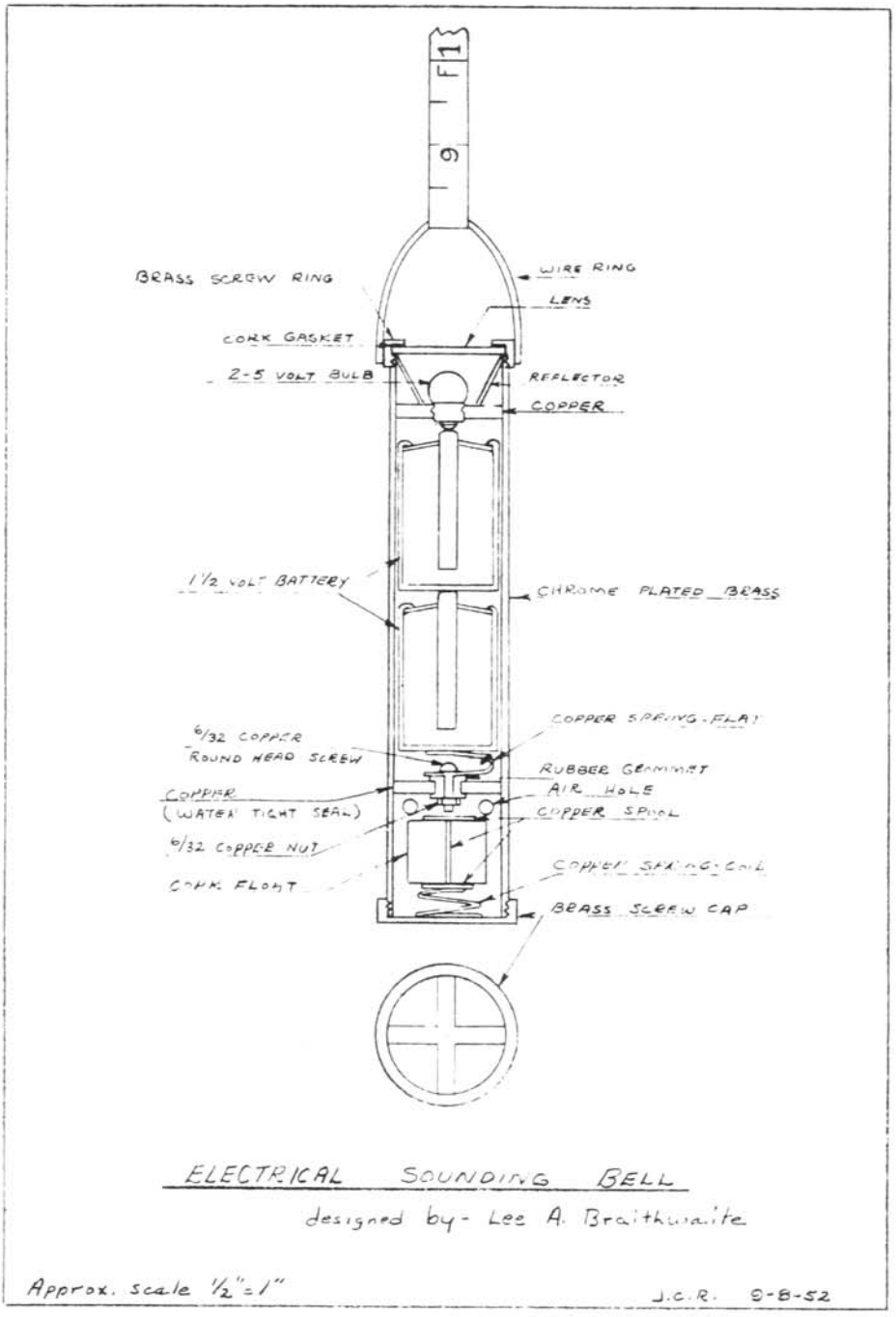
ELECTRICAL SOUNDING BELL FOR WATER SURFACE MEASUREMENT

Obtaining accurate water surface elevations in wells or pipes can be more easily and accurately done by use of an electrical sounding bell. Many devices of this general type have been developed. The one developed and in use by the Shasta Division of the Central Valley Project, the design of which is shown on the facing page, is presented because of its simplicity.

The bell can be fabricated from materials available in most project shops, and no cumbersome wire is needed to supply a source of power to the device. The two small batteries within the body of the unit are adequate.

The bell can be used in any pipe or well that is 2 inches in diameter or larger, where it can be lowered to the water surface. As the electrical sounding bell, attached to a metallic tape, is lowered into a pipe or well, the cork float is buoyed up on contact with the water. This closes the electrical circuit and turns on the light. As the bell is lifted out of the water,

the cork float drops until the contact is broken and the light goes off. In operation, readings are taken as the light goes off.



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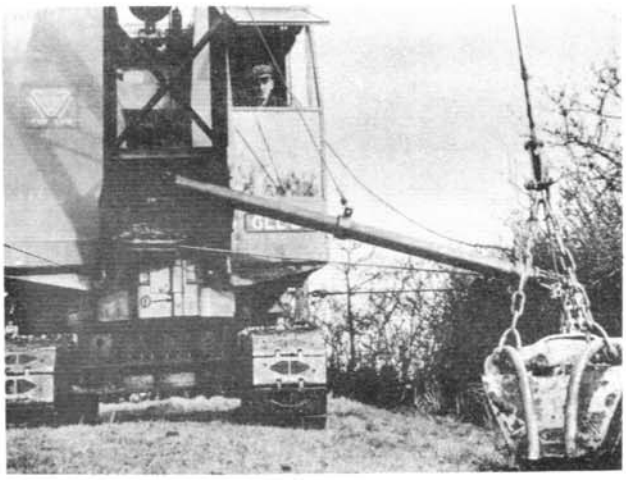
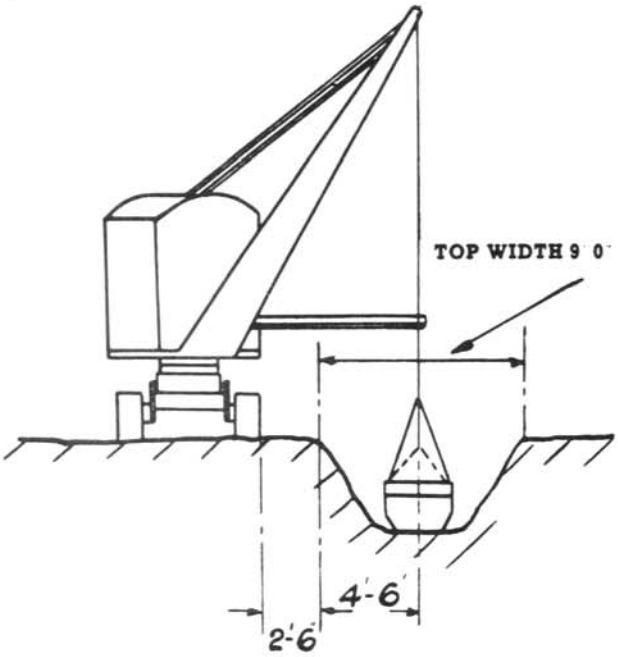
"SIDE-ARM" ATTACHMENT FOR DRAINAGE WORK

The photograph and sketch below illustrate the use of a "side arm" attachment placed on a dragline, which may be of value in drainage maintenance.





Working Range as Constructed

Submitted by Region 6, Bureau of Reclamation, Billings, Montana, it is pointed out that this machine permits the cleaning of the bottom of the drain by dragline without disturbing the sides. This is highly advantageous in unstable soils.

The machine illustrated is one manufactured by an English concern and is used for maintenance of drains and ditches. It appears from the photographs and literature that accompanied the photographs that such an attachment would be simple to make and one that could be placed on any dragline. One important consideration would be that of installing a latch on the swing gear to prevent excessive use of the brakes, which otherwise would be required, since the pull is in an off-center position and would tend to swing the machine.

For further information, contact the O&M Supervisor, Region 6, Bureau of Reclamation, Billings, Montana, or the O&M Liaison Representative, Chief Engineer's Office, Building 53, DFC, Denver, Colorado.

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CONTROLLING ALGAE GROWTH IN CONCRETE FLUMES

The growth of algae and naiad cocoons in open concrete structures, flumes particularly, can be a very troublesome problem because of the serious reduction of water carrying capacity that results. Some years ago this problem became very acute on the concrete bench flumes of the Black Canyon Canal, Payette Division, Boise Project, Idaho.

In searching for a coating that might be applied to the interior of the structures to inhibit the growths, two materials were tried. One material was CTP-3 paint, a coal-tar cut back with naptha, and the other was a catalytically blown asphalt. The CTP-3 paint proved to be effective in preventing the growth of the naiad cocoons and algae and for the most part the coating was still in good condition after three years of service. There was some cracking and curling of the CTP-3 paint where it had been applied over wet concrete, otherwise the paint was intact. The catalytically blown asphalt failed to adhere to the concrete and after three years was practically gone.

Rosin-Amine D Acetate was added to the CTP-3 paint in amounts varying from 0 to 10 percent to determine if this material would assist in preventing the growth of the algae and cocoons when used in this manner. From observations made last fall, the Rosin-Amine D Acetate did not appear to have contributed to the prevention of the growths.

In applying the paint to the concrete surfaces, all loose scale and other loose material should be removed first. Three coats of CTP-3 should then be applied by spraying, each coat being applied at the rate of one gallon per 300 square feet of surface. It is believed that better penetration into the voids of the concrete can be obtained by spraying rather than by brush application of the paint.

CTP-3 paint may be obtained from The American Tar Co., Seattle 3, Washington; The Bituminous Paint Co., 345 Vermont St., San Francisco, California; and The Crown Tar and Chemical Works, Denver, Colorado.

* * * * *

CA-50 PAINT PROTECTS FLUME SHEETS FROM SCOUR

After trying other types of paint, the Orland Project in California reports that CA-50 paint has been the most successful in protecting the invert of metal flume sheets from the abrasive action of sand carried by the water. The paint was applied to the invert of a twin barrel metal flume, following the procedure recommended in the Bureau Paint Manual for applying this type of paint. (See O&M Equipment and Procedure Bulletin, Release No. 2, page 6.)

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MALEIC HYDRAZIDE - A PLANT GROWTH RETARDER

The chemical maleic hydrazide, or MH as it is commonly designated, is being field tested as a plant growth retarder by the Connecticut State Highway Department with a view to reducing maintenance costs, by eliminating some of the mowing that is necessary. The chemical and its use are described in an article appearing in the August 20, 1953, issue of Engineering News-Record. From the article it would appear the chemical could also be used in the economical control of grasses grown along our canal banks.

Engineering News-Record describes MH as "a white, crystalline material slightly soluble in water. When applied to grasses, the chemical reacts unfavorably on certain plant growth hormones and thereby hinders plant growth. The degree of stunting is proportionate to the dosage applied and therefore, can be used to reduce the number of mowings required".

The Connecticut State Highway Department cites examples of the growth control. One area treated with MH has not been mowed in two years. Another, treated last October, has not required mowing since being treated. In other areas, seventeen mowings have been eliminated. The results of the tests have shown that although MH has been only 60 percent successful to date, the chemical shows promise for the purpose intended.

The chemical being used by the Connecticut State Highway Department in field tests was MH-40, a 40 percent mixture of the chemical, supplied by the Naugatuck Chemical Division of the U. S. Rubber Company, Naugatuck, Connecticut. The chemical is sprayed on the roadside grasses, using a single-nozzle fan spray. The spray is operated at 50 to 100 psi and the chemical applied at the rate of 10 to 15 pounds of MH-40 per acre, mixed in 50 gallons of water.

Care should be employed in using the chemical on a ditch bank to prevent damage to adjacent crops by drifting of the spray. Excessive dosages of the MH can produce browning of the grass or even be herbicidal. The article also states that MH should not be used on grass that is in poor condition or less than two years old.

Apparently MH can be used at any time of year, but since it is absorbed into the plant systems through the leaves, it is desirable to spray the areas when the foliage is dense, rather than immediately after cutting.

Before using the maleic hydrazide, it would be well to contact the manufacturer for instruction regarding the particular type of grass to be treated and your particular problem.

* * * * *

KEEPING MOTOR WINDINGS DRY

In a memorandum to power and irrigation O&M personnel of the Bureau of Reclamation, Engineer E. P. Schurch, points out some precautions to be taken in protecting electric motors during their operation in damp atmospheres or when subject to condensation when the motors are out of service for long periods. Mr. Schurch has given permission for this memorandum to be published in this issue of the Bulletin.

Mr. Schurch is Chief, Power Utilization Field Division, Bureau of Reclamation, with headquarters at the Denver Federal Center, Denver, Colorado. After reading his memorandum if you have further questions on the subject, he will be glad to answer them.

The memorandum follows.

IN REPLY REFER TO:
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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
DENVER FEDERAL CENTER
DENVER, COLORADO

August 4, 1953

Memorandum

To: Regional Director, Region 1, 3, 4 5, 6 7
Supervising Engineer, California Projects, Sacramento, Calif.
Attention: Power & Irrigation O&M

From: Chief, Power Utilization Field Division

Subject: Methods for keeping motor windings dry

Special provision should be made to protect motor windings which operate in a damp atmosphere or are subject to condensation of moisture when out of service for long periods. Motors located in galleries of dams are frequently subject to continual moisture, either by dripping on the equipment or condensing on the cold metal parts. Motors in irrigation pumping plants of either the indoor or outdoor type are generally shut down during the winter months and are subject to condensation of moisture, in localities where the atmospheric conditions are severe.

The organic insulating materials used on motor windings tend to soak up any moisture coming in contact with it and require the application of heat over a long period of time to drive it out. Damp insulation has very low insulating value and the winding may fail the next time the machine is started. Moisture may also cause corrosion of exposed metal parts.

Motors subject to excessive moisture can be properly protected by keeping them warm enough during shut-down periods so that condensation does not form, or by providing a suitable permanent cover to protect against dripping water or a temporary cover for use during shut-down periods. Which of the above solutions is best will depend on local conditions.

Keeping motors warm during the time they are not in service can be accomplished by the use of electric heaters, or special reactors across the motor starting contactor to circulate a small

current through the motor winding. The best and most widely used method is by electric heaters, which are inexpensive and easily applied. The method using reactors connected across the motor starter contacts has the advantage that the heat is produced by circulation of current through the motor coils where it is most needed and is automatically controlled by the starting and stopping of the motor. Special reactors designed to give the correct amount of current in the motor winding are required and the cost is considerably more than for strip heaters. Only a few of these installations are in use by the Bureau.

If electric strip heaters are used they should be mounted in contact with the iron frame near the underside of the motor. The flat strip type heaters are preferable as they can be mounted flat against the metal frame and give better transmittal of heat to the iron than the round cartridge type. The heaters should not be mounted close enough to the motor winding end turns so that the heat can damage the insulation either by direct radiation or by flames from any inflammable material which might be set on fire by the heaters. It is important that heaters be selected which run at a low surface temperature so that bearing oil or other inflammable material which might come in contact with it will not be ignited. To accomplish this, the heaters should be operated at one-half their rated voltage. That is, use a 220-volt element or two 110-volt elements in series on a 110-volt circuit. This will also insure long life for the heaters. The heat dissipated by strip heaters operating at one-half rated voltage will be one-fourth the rated watt value. Electric heaters should be connected through an auxiliary switch on the motor starter so that they will be "on" when the motor is "off," and vice versa. In using this method it is necessary to apply only enough heat to maintain the motor frame at 10 to 15° above room temperature to prevent condensation. Actually the "dew point" temperature at which condensation starts is below room temperature but some margin must be provided so that on rapidly rising room temperature following a cold period, the motor temperature will not lag too far behind the room temperature. There is a general tendency to apply too much heat rather than not enough. Table I shows examples of the approximate size heaters required. Several small heater units are preferable to one large one. The relationship of air temperature dew point and humidity is shown in Figure 1.

At such installations as irrigation pumping plants which are shut down all winter, the cost of maintaining electric service to the plant may make electrical heating too expensive.

Where electric power is not available to keep motors warm during shut-down periods, the most practical solution is providing moisture proof covers of plastic or waterproofed fabric. These covers should be bound tightly around the shaft and motor base so as to be as air tight as possible. This method will not entirely exclude moisture under severe atmospheric conditions. It is therefore necessary that motors so protected be dried out by the application of heat before they are returned to service after long shut-down periods, if megger readings taken on the windings show the insulation value is too low. Reduced life of the motor windings can be expected where they are subjected to repeated cycles of wetting and drying and the above method of protection is recommended only in cases where the motors cannot be kept warm during shut-down periods. See Power O&M Bulletins No. 3 and 9 for information on dry out methods and insulation resistance measurements and standards. Power O&M Bulletin No. 9 on "Keeping Motor Windings Dry" will be revised in the near future to cover this subject.

E. Schurch

Enclosures

Copy to: Director of Power Utilization, Washington, D. C.,
Attention 640 (in triplicate)

Table I

SIZE OF ELECTRIC HEATERS REQUIRED TO KEEP MOTORS WARM

Motor			Approximate watts to maintain motor frame 10° F above ambient temperature in still air
Hp	Rpm	Wt. lbs.	
5	1800	150	65
5	1200	170	70
10	1800	225	95
10	1200	250	110
25	1800	400	170
25	1200	600	250
25	600	900	380
50	1800	600	250
50	1200	900	380
50	600	2000	850
100	1200	2500	1050
100	600	2800	1180
200	1200	2500	1050
200	600	3800	1600

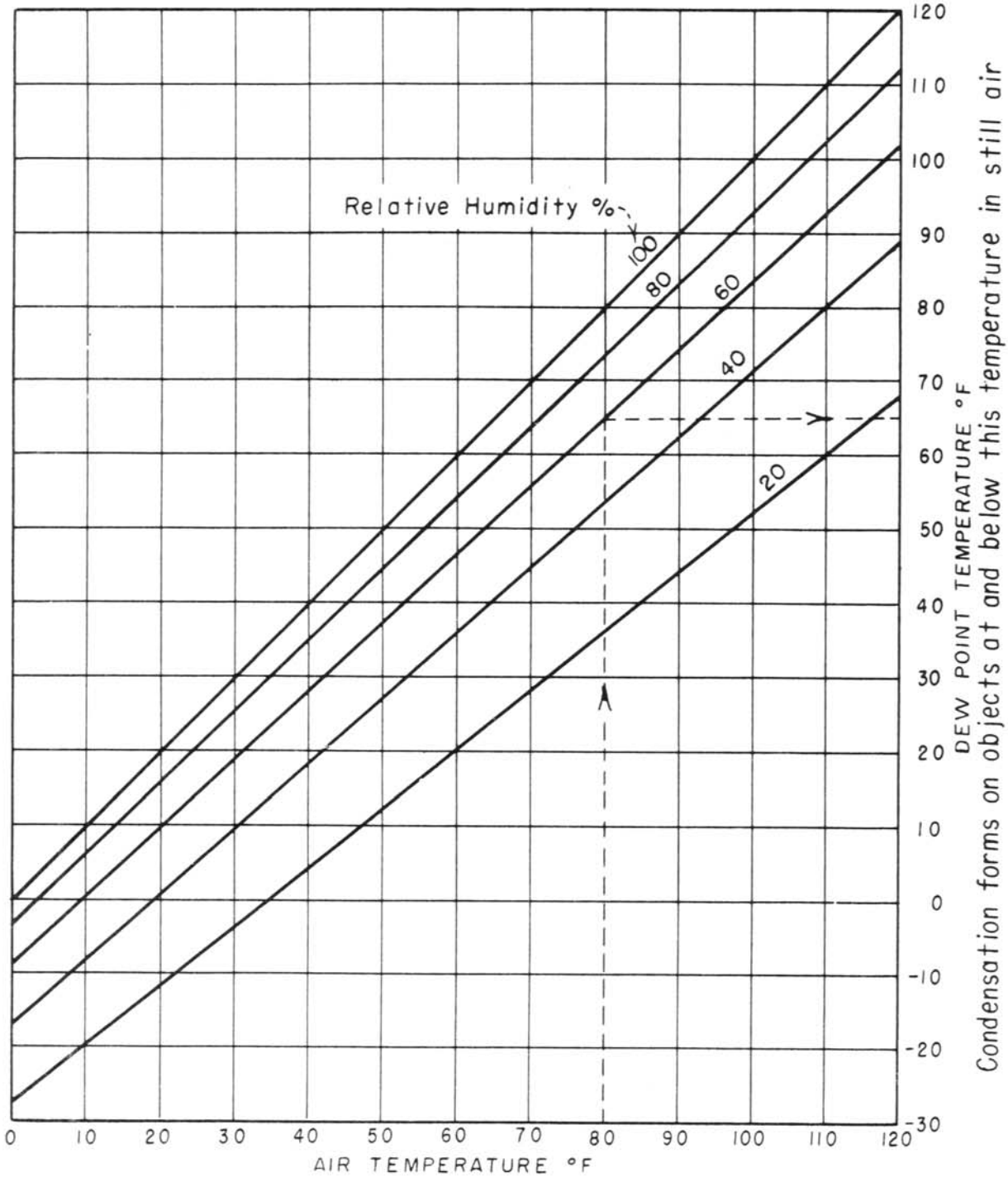

FIGURE 1

RELATIONSHIP OF AIR TEMPERATURE, DEW POINT AND HUMIDITY. APPROXIMATELY CORRECT FOR ELEVATIONS OF 0 TO 5000 FT.

GPO 842741