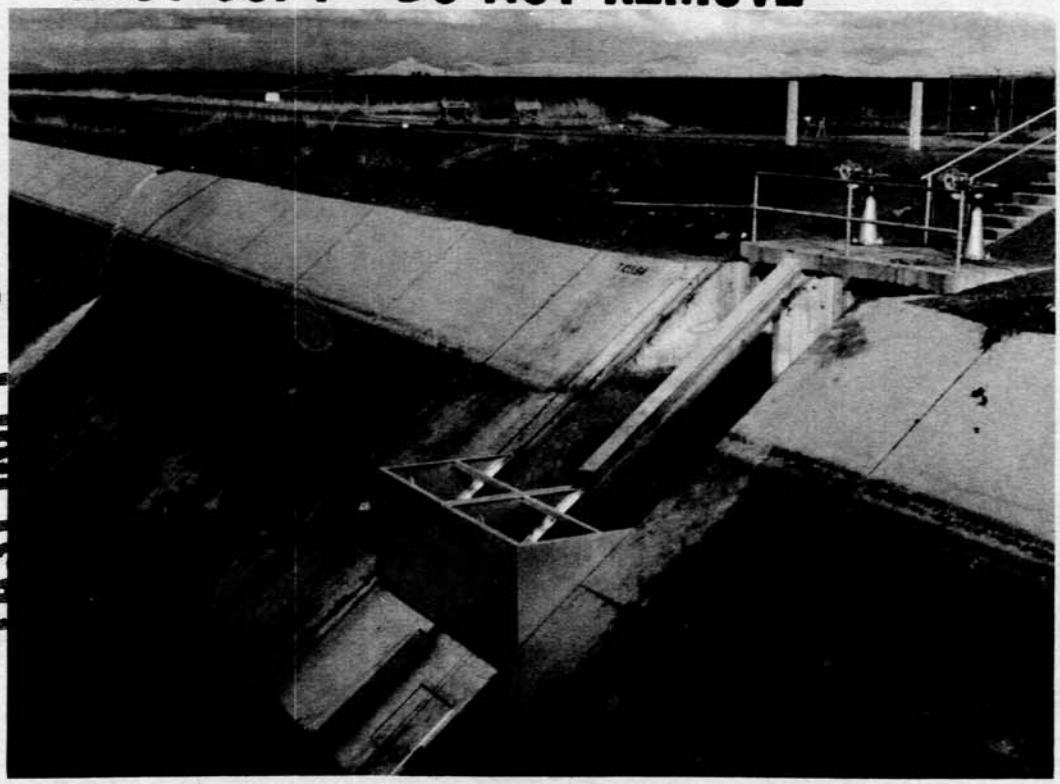
WATER OPERATION AND MAINTENANCE

BULLETIN NO. 77

SEPTEMBER 1971



IN THIS ISSUE

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF RECLAMATION

The Water Operation and Maintenance bulletin is published quarterly, for the benefit of those operating water supply systems. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. It is hoped that the reports herein concerning labor-saving devices and less costly equipment and procedures will result in improved efficiency and reduced costs of the systems for those operators adapting these ideas to their needs.

To assure proper recognition of those individuals whose suggestions are published in the bulletins, the suggestion number as well as the person's name is given. All Bureau offices are reminded to notify their Suggestions Award Committee when a suggestion is adopted.

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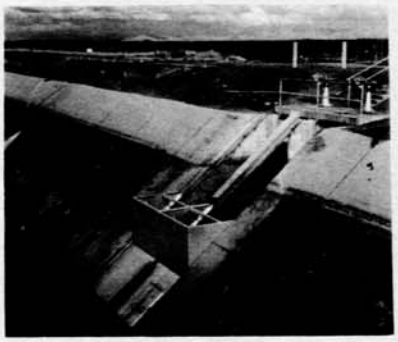
Division of Water Operation
and Maintenance
Engineering and Research Center
Denver, Colorado 80225



COVER PHOTOGRAPH:
Silt Excluder on the Friant-Kern Canal. This canal near Exeter, California, is 152 miles long and carries water from Millerton Lake behind Friant Dam to the fertile lands of the southern San Joaquin Valley terminals at the Kern River near the City of Bakersfield, California. Photo P214-D-69700.

UNITED STATES DEPARTMENT OF THE INTERIOR
Rogers C. B. Morton
Secretary

BUREAU OF RECLAMATION
Ellis L. Armstrong
Commissioner

WATER OPERATION AND MAINTENANCE
BULLETIN No. 77

September 1971

INTRODUCTION

Beginning on page 1, an article entitled "Silt and Sand Excluders," shows two devices designed to work in conjunction with each other to prevent silt and sand from entering the canal turnouts by diverting it on down the canal. The device was fabricated by shop personnel and is being used on the Friant-Kern Canal, Central Valley Project, California.

A publication recently issued for the specific use of Operation and Maintenance personnel entitled "Power System Safety Standards," First Edition, is now available. A brief description of its contents and how it may be obtained can be found in the article at the top of page 6. Also on page 6, is a short article entitled "Dry Ice Not Cool," which points out the potential dangers of this seemingly harmless product.

Maintenance personnel of the Cachuma Operation and Maintenance Board, Santa Barbara, California, made the two gate locking devices described on page 7. The devices are used to keep trespassers out of various restricted areas, and project officials report that they are working most effectively.

On page 10, some sound advice can be found on mixing concrete for small jobs, and if followed will result in a strong durable concrete.

Protective safety measures must be taken when applying shotcrete. A short article at the bottom of page 11 includes precautionary recommendations.

A plastic warning label used by the Solano Irrigation District, Vacaville, California, to discourage vandalism to meters and valves is shown on page 12.

On page 13, many uses for a new forklift attachment are suggested. The attachment was developed by an employee of the Boulder City Project Office.

A foolproof safety mouser (latch) has been designed for use on a cable hook and is shown on page 15. The idea was developed by Mr. T. B. Capps, Boulder Canyon Project, Boulder City, Nevada.

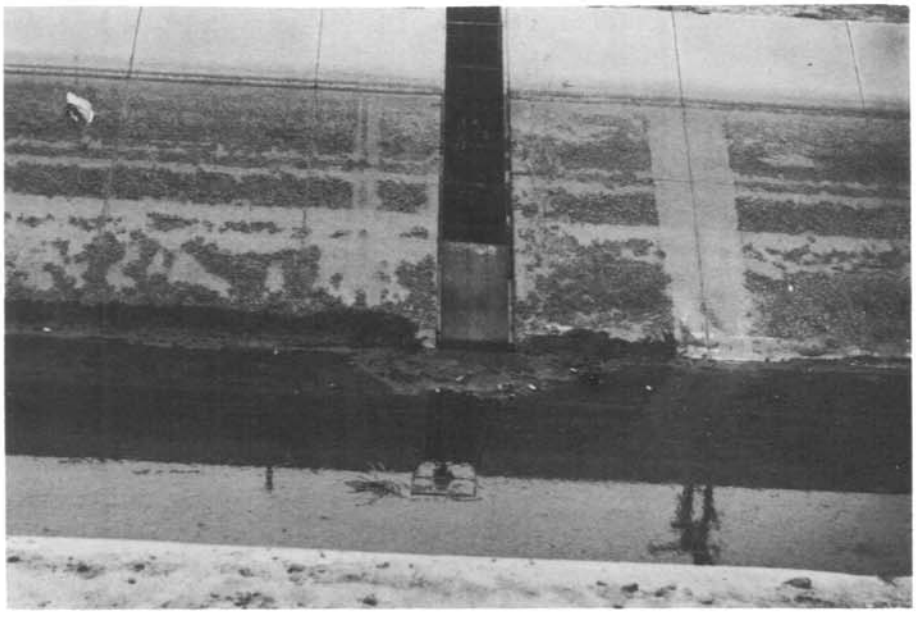
A revolving moss screen was designed and placed into operation by the Manager of the Ivanhoe Irrigation District, Visalia, California, to screen out moss and trash from entering their distribution systems. Material for the article found on page 17 was submitted by personnel of the Fresno Field Division, Fresno, California.

SILT AND SAND EXCLUDERS

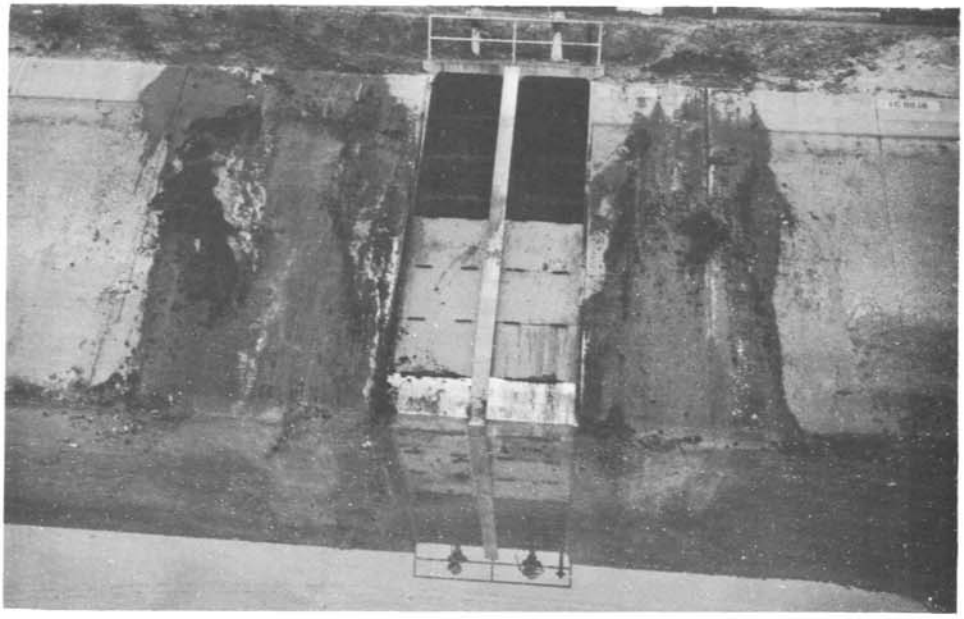
Two simply constructed devices are utilized to exclude silt and sand from lateral turnouts on the Bureau of Reclamation constructed Friant-Kern Canal on the Central Valley Project in California. The canal has a maximum capacity of 4,000 cfs, a maximum bottom width of 36 feet, a maximum depth of 15.54 feet and side slopes of 1-1/4:1.

The principal purpose of the silt and sand excluders is to skim the turnout flow requirement from the upper levels of the canal. The heavier silt in the bottom of the canal will flow on past the turnouts which are particularly susceptible to siltation. The use of such devices is limited to canals that can be kept relatively full or at least at a relatively constant level. Where this is possible the operators of the canal and lateral systems claim that the silt and sand deposits are greatly reduced in open laterals and pipe distribution systems.

One such device uses a single plate of steel that is inserted on the trash rack guides in the lower portion of the turnout, as shown in Photograph 1 below. This was reported to be very effective in eliminating silt from the pipelines. Photograph 2 on the next page, shows the silt excluders in position on a double turnout.

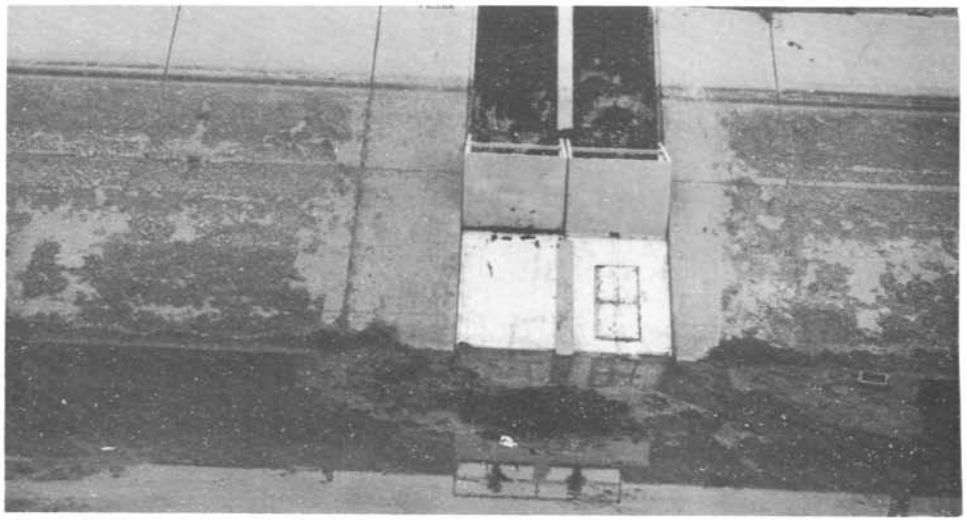


Photograph 1. Photo P214-D-69703



Photograph 2. Photo P214-D-69705

A second device works in conjunction with the first as can be seen in Photograph 3 below. This particular type of excluder has been installed on a number of turnouts in the canal. The excluder is dimensioned and set deep enough below the water surface to deliver the maximum rate required at the turnout. Rubber waterstop material is installed between the frame of the excluder and the trashrack frames and at the horizontal joint between the vertical and sloping sections.



Photograph 3. Photo P214-D-69704

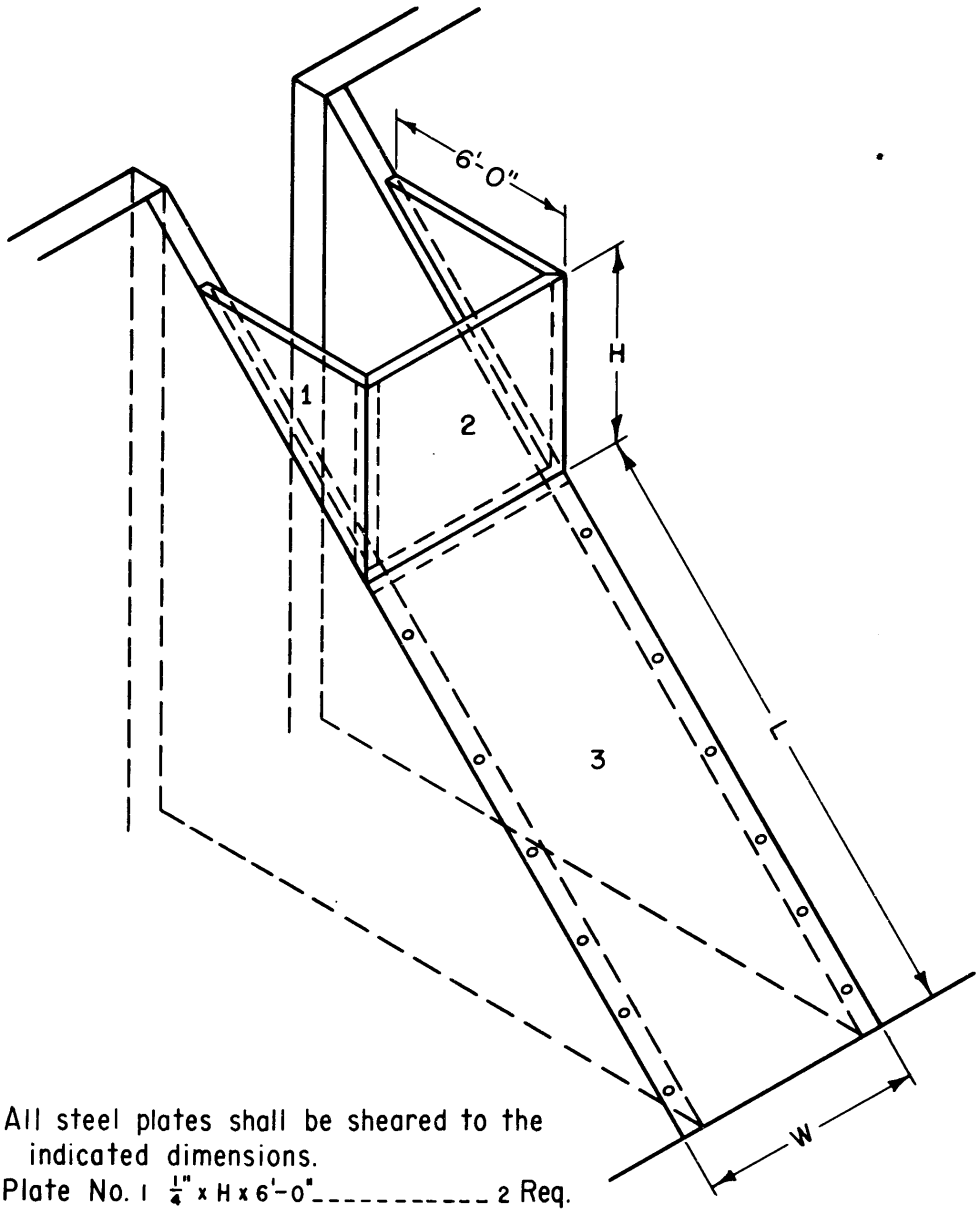
A sliding door near the bottom is shown through which water may be delivered while the canal is being dewatered, which usually requires from 15 to 30 days. A cable shown in Photograph 3 runs through a pulley fastened below the door and is secured in a grooved angle iron on the concrete pedestal floor. The door can be opened or closed by the cable being attached to the door and pulling one way or the other. Steel plate one-fourth inch in thickness and 2- by 2-inch angle iron are sufficient to withstand the hydraulic pressures. Before installation, the steel is sandblasted, primed with two coats of Type IV, red lead and covered with one coat of aluminum paint. Sketch 1 on page 4 shows a typical excluder. Sketch 2 on page 5 shows the dimensions for one such excluder that was fabricated and in use on the Friant-Kern Canal. A list of materials for this excluder is also shown below:

Sheared Plates (10-20 lbs per sq ft)
All steel plates shown in sketch 1, shall be sheared to the indicated dimensions

Item		Quantity	Unit	Unit price	Est. amount
Plate No. 1, ¼"x4'-9"x6'-1½"	2 Req	597.92	lbs	$12.75/C	$ 76.23
Plate No. 2, ¼"x6'1½"x9'-3"	2 Req	1,164.20	lbs	12.75/C	148.44
Plate No. 3, ¼"x4'-9"x6'-0"	4 Req	581.40	lbs	12.75/C	74.13
Angle, Steel Structural (3.71 lbs per ft)					
3/16"x3"x3"x14'-2"	5 Req	265.30	lbs	11.85/C	31.44
3/16"x3"x3"x6'-2"	11 Req	244.86	lbs	11.85/C	29.06
3/16"x3"x3"x4'-9"	4 Req	70.49	lbs	11.85/C	8.53
Rubber Waterstop					
Type 3" rubber waterstop shall be in accordance with Bureau requirements.		100	feet	1.40/ft	140.00
					$507.83

Material:
The rubber waterstop shall be fabricated from a high-grade tread-type compound. The basic polymer shall be natural or synthetic rubber.

These structures have all been shop built by maintenance forces over a period of 10 or 15 years, and have proven to be most satisfactory for the purpose.



All steel plates shall be sheared to the indicated dimensions.

* Plate No. 1 $\frac{1}{4}$" x H x 6'-0" ---------- 2 Req.
  Plate No. 2 $\frac{1}{4}$" x H x W ---------- 1 Req.
  Plate No. 3 $\frac{1}{4}$" x L x W ---------- 1 Req.
  Angle, Steel, Structural (3.71 lbs./foot)
  $\frac{3}{16}$" x 3" x 3" x 25'-0".

* The 6-foot dimension will depend on the size of the canal.

SILT AND SAND EXCLUDER FOR CANAL TURNOUT

NOT TO SCALE

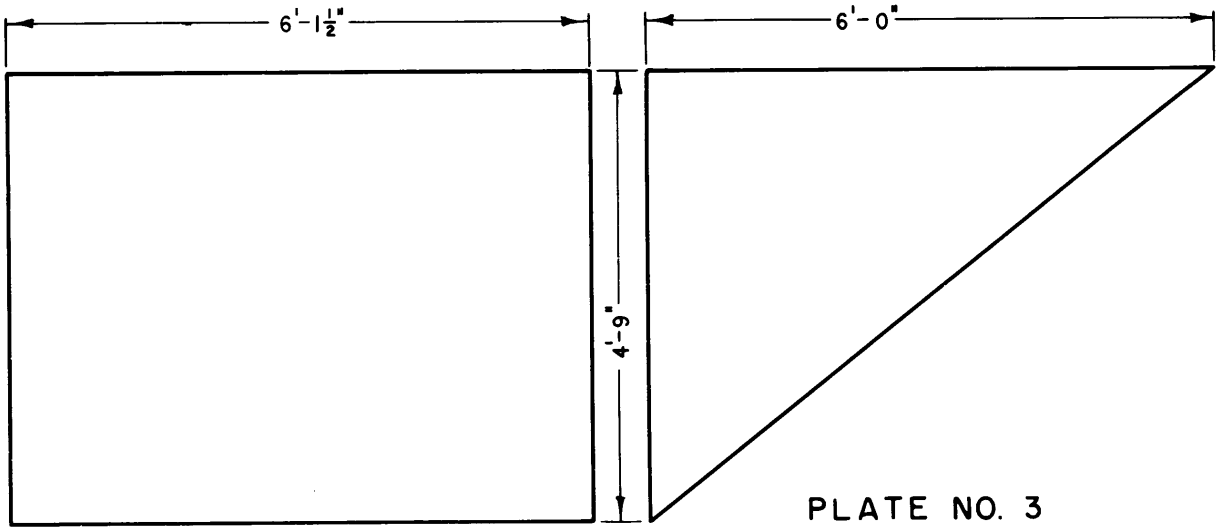


PLATE NO. 1

PLATE NO. 3

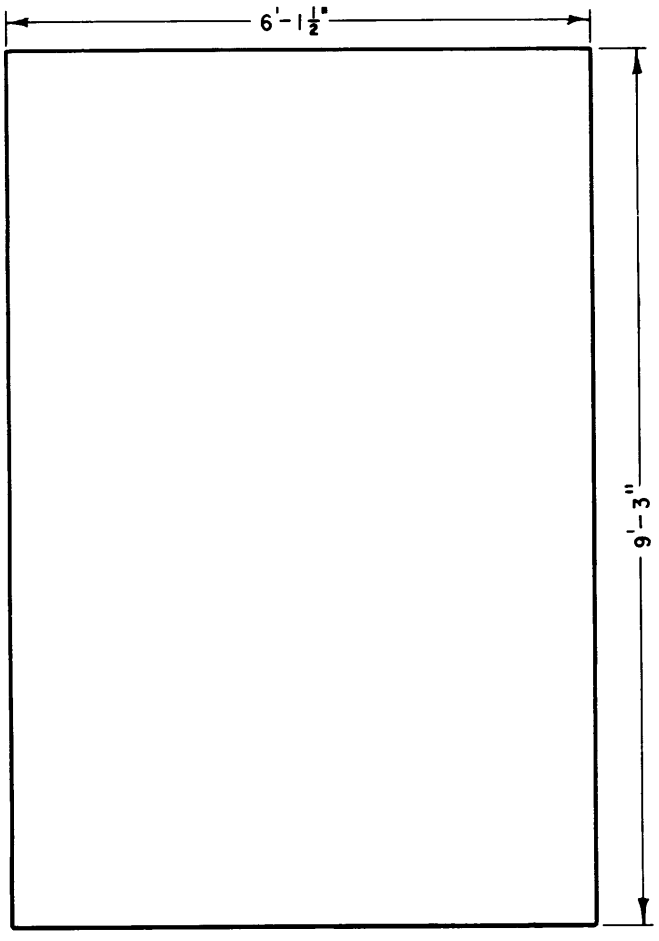


PLATE NO. 2

NOTES:

1. All steel plates shall be sheared to the indicated dimensions.
2. Plate No. 1, $\frac{1}{4}$" x 4'-9" x 6'-1$\frac{1}{4}$"
3. Plate No. 2, $\frac{1}{4}$" x 6'-1$\frac{1}{4}$" x 9'-3"
4. Plate No. 3, $\frac{1}{4}$" x 6'-0" x 4'-9
5. Drawing not to scale

POWER SYSTEM SAFETY STANDARDS

A manual entitled "Power System Safety Standards," First Edition, dated May 1, 1971, is now available. The manual establishes safety standards and safe work practices for all operations and activities performed by Bureau power operation and maintenance personnel. Applicable standards and safe work practices also apply to operations performed by Water O&M personnel responsible for the operation and maintenance of pumps, pumping plants, pumping-generating plants, and electrical facilities or apparatus of any nature. This manual supersedes the former "Power System Safety Handbook." Copies of the new safety standards can be purchased for $1.05 a copy. Requests should be forwarded to: Engineering and Research Center, Bureau of Reclamation, Attention: Code-920, Denver Federal Center, Denver, Colorado 80225. Bureau offices can obtain copies by requisition to the E&R Center at the above address.

Accident prevention is to continue to be considered a definite, aggressive, and continuing part of every Bureau operation and maintenance activity. The active support and participation of all power operation, maintenance, and irrigation personnel is required. Compliance with the safety standards and safe work practices set forth in the manual is to be fully enforced in all activities. It will take precedence over immediate job production - with SAFETY ALWAYS FIRST.

* * * * *

DRY ICE NOT COOL

There appears to be no end in sight to the ways youngsters discover to jeopardize their lives, limbs, and eyesight. Now the "craze" is putting dry ice into a glass bottle and then shaking it to allow the resulting carbon dioxide gas to build up pressure and explode. Three children in Illinois have each lost an eye as a result of this unsafe practice, and another suffered laceration of the arm, requiring 20 stitches.

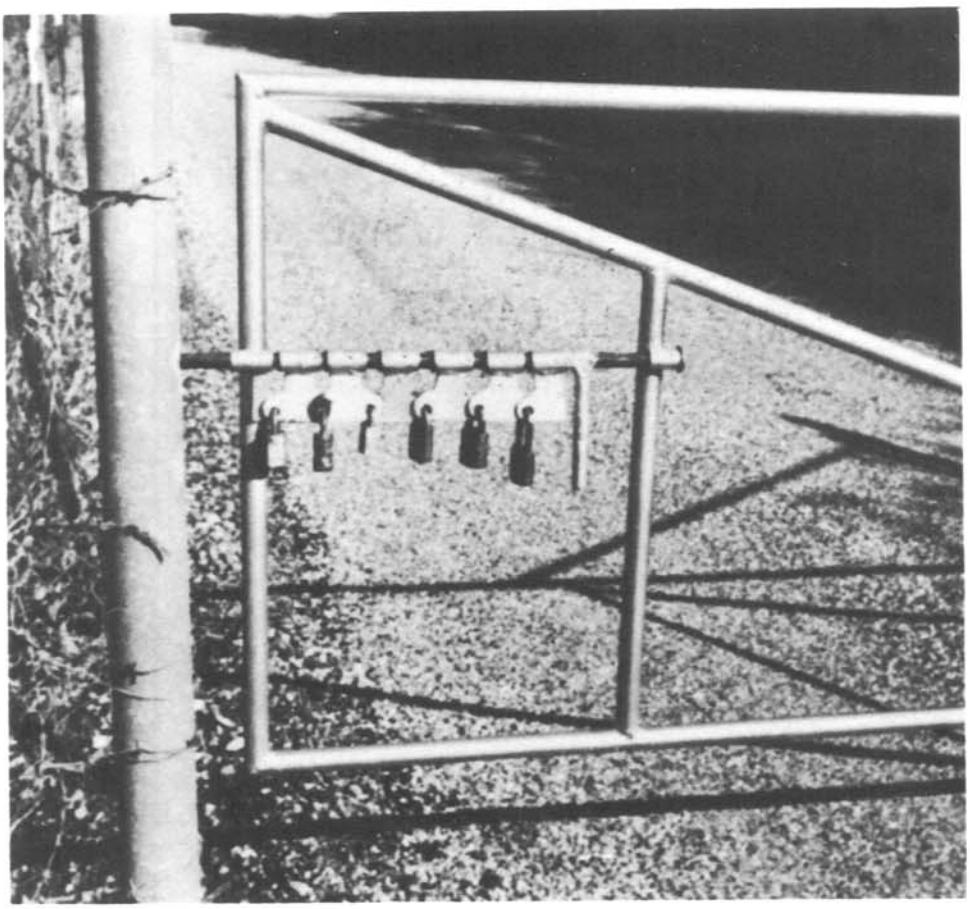
Unfortunately, this diversion is gaining in "popularity." All users of dry ice are being advised to dispose of this surplus refrigerant in open containers indoors where children won't have access to it. It is recommended that parents recognize this hazard and never leave dry ice accessible to their children.

--National Safety Council Textile Newsletter

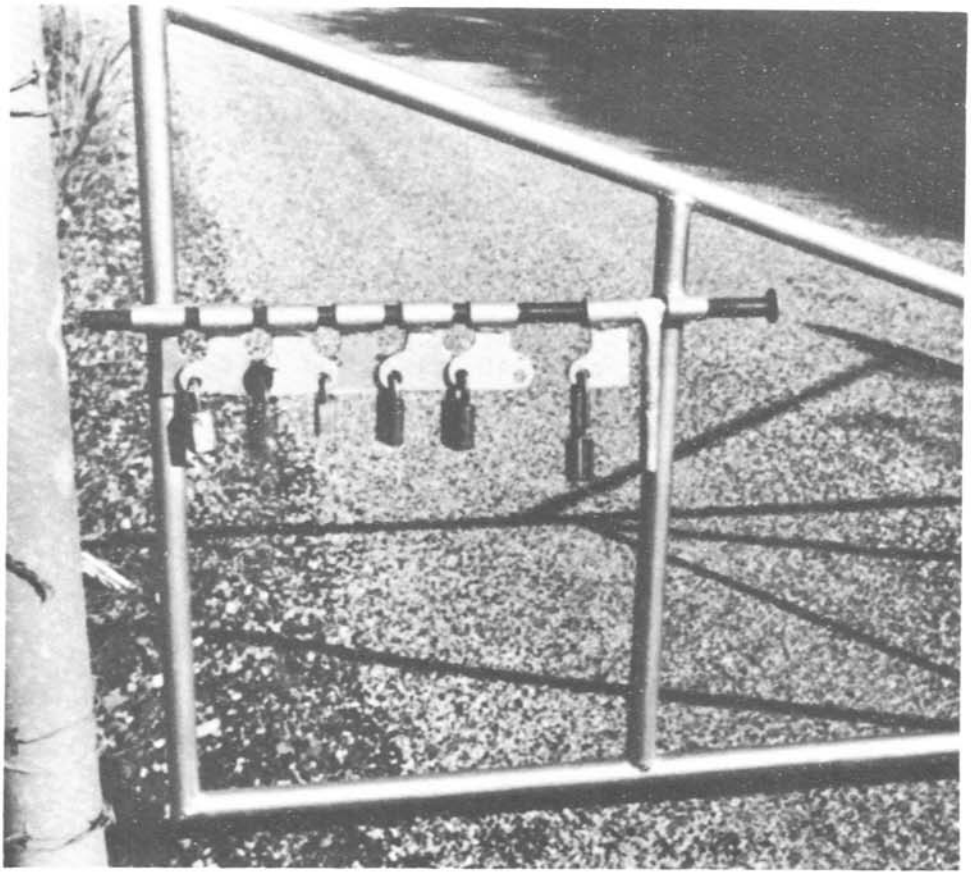
GATE LOCKING DEVICE

The gate locking device presented in this article was designed and fabricated by personnel of the Cachuma Operation and Maintenance Board, Santa Barbara, California. The pictures and sketch displayed shows a gate locking device which will permit any number of locks to be placed on a gate to keep out trespassers from restricted areas. Authorized personnel, however, have an appropriate key to gain entry.

Photograph 1 below, shows all the locks in place and bolt fastened and Photograph 2 on next page, shows the right end lock open and the bolt pulled back to permit entry.



Photograph 1. Photo P465-D-69701

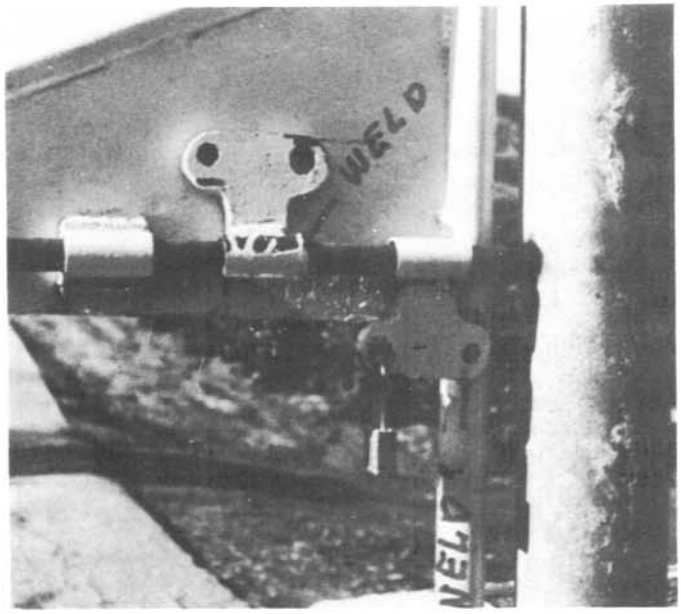


Photograph 2. Photo P465-D-69706

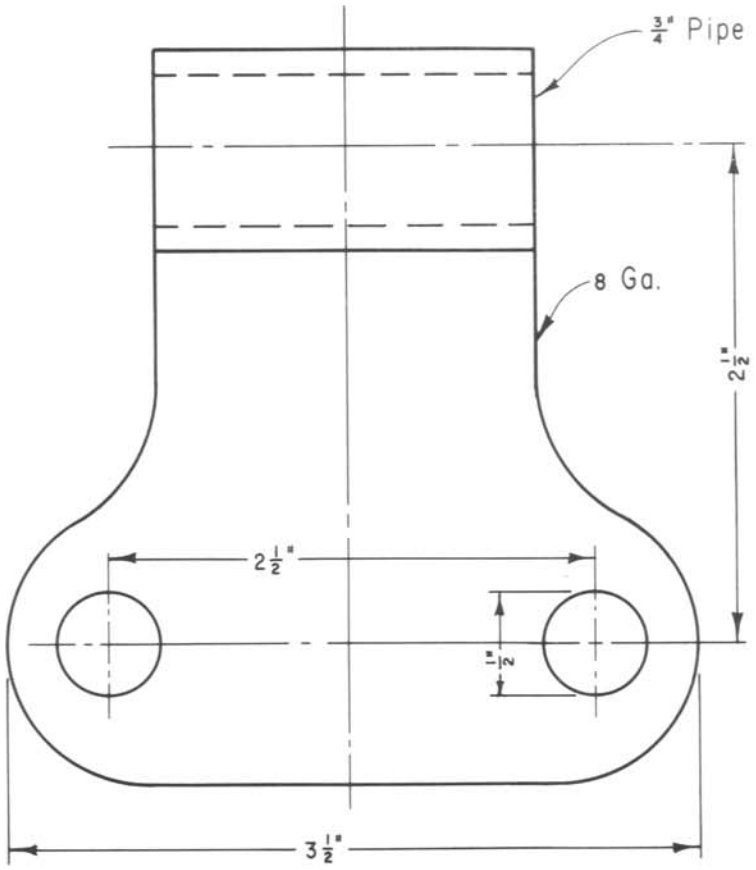
A second device shown in Photograph 3 on page 9, has a single lock which is used only as a blind to discourage trespassers. The gate appears to be locked but it is actually open. Its appearance is only a deterrent. It was reported that hundreds of people have turned back thinking the gate was locked. The picture was taken on the outside as viewed by the public.

A sketch of the second device is also shown on page 9. The end slide piece is welded to the bolt, and the left end slide piece is welded to the gate, as shown in Photograph 3. This piece is one-half the size of the slide pieces that are used with the locks that slide free on the bolt.

If further information is desired regarding these devices, please write to the Cachuma Operation and Maintenance Board, 3301 Laurel Canyon Road, Santa Barbara, California 93105.



Photograph 3. Photo P465-D-69707



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CONCRETE MIXES FOR SMALL JOBS 1/

For small jobs, where time and personnel are not available to determine the proportions in accordance with the recommended procedure, mixes in table 1 below, will provide concrete that is amply strong and durable if the amount of water added at the mixer is never large enough to make the concrete overwet.

Table 1--Concrete mixes for small jobs [1]

(May be used without adjustment)

Maximum size of aggregate, inches	Mix designation	Approximate bags cement per cubic yard of concrete	Pounds of aggregate per 1-bag batch		
			Sand [2]		Gravel or crushed stone
			Air-entrained concrete [3]	Concrete without air	
½	A	7.0	235	245	170
	B	6.9	225	235	190
	C	6.8	225	235	205
¾	A	6.6	225	235	225
	B	6.4	225	235	245
	C	6.3	215	225	265
1	A	6.4	225	235	245
	B	6.2	215	225	275
	C	6.1	205	215	290
1½	A	6.0	225	235	290
	B	5.8	215	225	320
	C	5.7	205	215	345
2	A	5.7	225	235	330
	B	5.6	215	225	360
	C	5.4	205	215	380

[1] Procedure: Select the proper maximum size of aggregate. Then, using mix B, add just enough water to produce a sufficiently workable consistency. If the concrete appears to be undersanded, use mix A; and if it appears to be oversanded, use mix C.

[2] Weights are for dry sand. If damp sand is used, increase the weight of sand 10 pounds for a 1-bag batch, and if very wet sand is used, add 20 pounds for a 1-bag batch.

[3] Air-entrained concrete is specified for all Bureau of Reclamation work. In general, air-entrained concrete should be used in all structures that will be exposed to alternate cycles of freezing and thawing.

These mixes have been predetermined in conformity with recommended procedures by assuming conditions applicable to the average small job, and for aggregate of average specific gravity. Three mixes are given for each maximum size of coarse aggregate. Table 2 on the next page, may be used as a guide in selecting an appropriate maximum size of aggregate. Mix B for each size of coarse aggregate is intended for use as a starting mix in table 1. If this mix is undersanded, change to mix A, or, if it is oversanded, change to mix C. Note that the mixes listed in the table apply where the sand is dry. If the sand is moist or very wet, make the corrections in batch weight prescribed in the note.

1/ This article was taken from the Concrete Manual, Seventh Edition, Chapter III. This is a Water Resources Technical Publication, printed for the Bureau of Reclamation by the Superintendent of Documents, Washington, D.C.

Table 2 —Maximum sizes of aggregate recommended for various types of construction

Minimum dimension of section, inches	Maximum size of aggregate,[1] in inches, for—		
	Reinforced walls, beams, and columns	Heavily reinforced slabs	Lightly reinforced or unreinforced slabs
5 or less	----------	¾ to 1½	¾ to 1½.
6 to 11	¾ to 1½	1½	1½ to 3.
12 to 29	1½ to 3	3	3 to 6.
30 or more	1½ to 3	3	6.

[1] Based on square screen openings.

The approximate cement content in bags per cubic yard of concrete listed in table 1, will be helpful in estimating cement requirements for the job. These requirements are based on concrete that has just enough water in it to permit ready working into the forms without objectionable separation. Concrete should slide, not run, off a shovel.

* * * * *

SHOTCRETING PRESENTS HEALTH HAZARD

Sodium, potassium hydroxide, and other chemicals contained in shotcrete accelerators and hardeners are moderately toxic and can cause skin and respiratory irritation unless adequate safety measures are undertaken. It is recommended that in applying shotcrete containing toxic accelerators or hardening admixtures the nozzlemen and helpers should wear sandblasting hoods supplied with filtered air free of toxic or objectionable material. In order to protect against dermatitis, they should also wear gloves and necessary protective clothing.

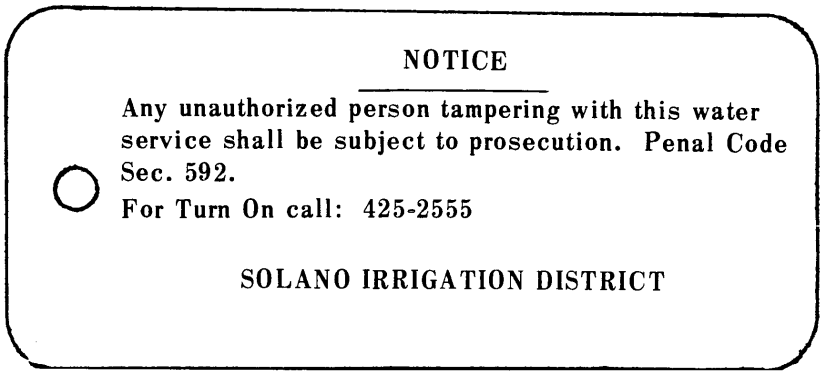
Shotcrete consisting of sand and cement without coarse aggregates does not usually contain chemical accelerators or hardening admixtures. In applying this type of shotcrete, face protection and dust respirators afford adequate protection.

* * * * *

PLASTIC LABEL FOR METERS AND VALVES

In an effort to overcome a rash of vandalism the Solano Irrigation District, Vacaville, California, has initiated a plastic label to be placed on meters and valves throughout the district and tied in such a manner that makes it easy for vandals to read. The label shown below, is printed in black on red paper and encased in plastic. Actual size of label is shown.

It was reported that vandalism has noticibly decreased since the idea was first introduced. If further information is desired regarding this idea, please write to: Manager, Solono Irrigation District, Post Office Box 536, Vacaville, California 95688.



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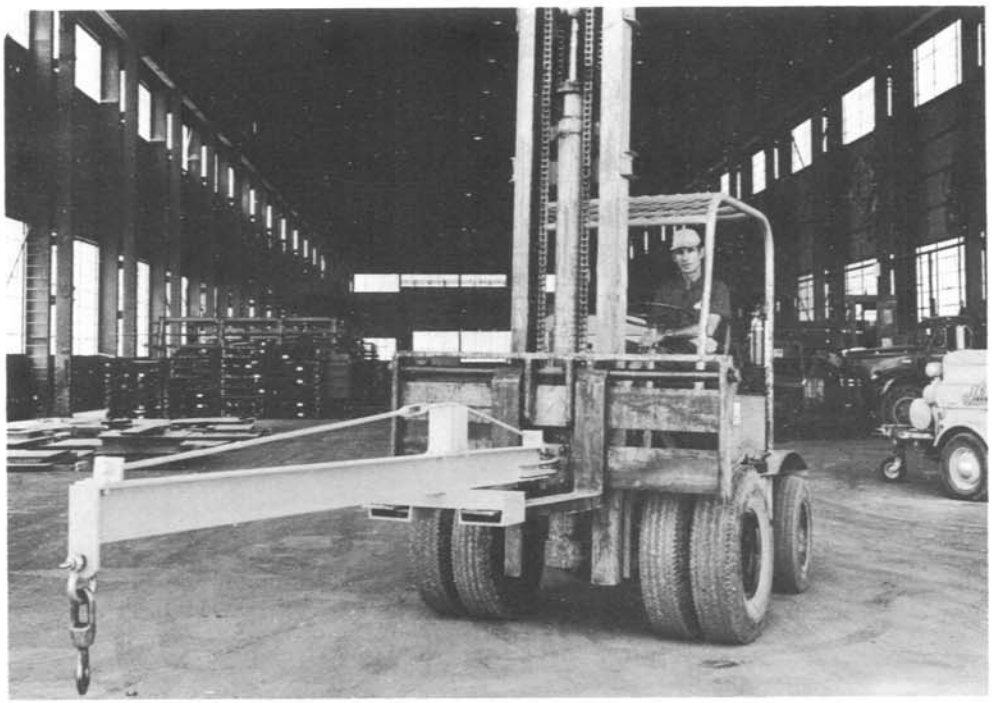
Man's basic drive is to seek a quality environment where he is in harmony with both his neighbors and with his natural surroundings. Man seeks a full way of life where he has ever-broadening opportunities for growth and development in an orderly and progressive society, and where the blessings of ample food are to be enjoyed along with clean air and water and the other bounties and beauties of nature.

Reclamation Era

FORKLIFT ATTACHMENT
(Suggestion R3BC-79S-16)

A suggestion by Mr. Joseph Kahl, Boulder City Project Office, Boulder City, Nevada, for a Forklift attachment was reported to be both convenient and timesaving for personnel handling heavy materials. The attachment was made from scrap steel and fabricated by shop personnel at a minimum of cost. See Photograph 1 below.



Photograph 1. Photo P45-D-69709

The boom attachment is used for lifting large pieces of steel from the storage rack and after cutting to the desired length, the operator is able to replace the remaining piece of steel back on the rack by himself. See Photograph 2 on next page. Previously this task was done with two people and the use of an overhead crane.

Mr. Kahl reports various other uses for this boom attachment, making it a very versatile tool. The unloading of closed van trucks that deliver heavy items to the warehouse is another one of its many uses. He reports the boom attachment has greatly facilitated the handling of these items and has cut down on the unloading time. It is also being used to unload 55-gallon drums of scrap steel sent to the Warehouse from the Machine Shop to be reclaimed. In the past, a truck driver

and a warehouseman were required to handle these heavy drums. The boom attachment will save many hours of time and in many cases will prevent personal injuries.

As can be seen in Photograph 1, the boom attachment can easily be attached or detached from the forklift freeing it for other uses.

Photograph 2. Photo P45-D-69710

If further information is desired regarding this attachment please write to: Project Manager, Boulder Canyon Project Office, Boulder City, Nevada 89005.

* * * * *

A Manager is one who is big enough to know that his understanding is so limited that he can ill afford to overlook the little wells of understanding around and about him.

FOOLPROOF SAFETY MOUSER
(Suggestion R3BC-70S-17)

A foolproof safety mouser (safety latch) has been developed by Mr. Ted B. Capps, Boulder Canyon Project, Boulder City, Nevada. The mouser can be fabricated locally by shop personnel and can be installed on a cable hook without welding or drilling holes through hook.

Present safety practice for crane operators is to always use safety latches on the cable hook when lifting heavy objects. The safety latches in use today are either spring loaded or a safety pin has to be set in place to lock the mouser when in use. One objection to the spring-loaded type is the possibility of the spring breaking and the operator not having it repaired, or sometimes carelessness on the part of the operator not setting the safety pin. These two things alone will defeat the purpose the present safety mouser is designed for.

The safety mouser as designed by Mr. Capps is considered foolproof. It has no springs to break or no pins to put in place, because it works on a counterbalance. If the suggested mouser is used on a cable hook there is no way an operator can use the hook without the safety mouser automatically falling into place. (See photograph below and the sketch on next page.)

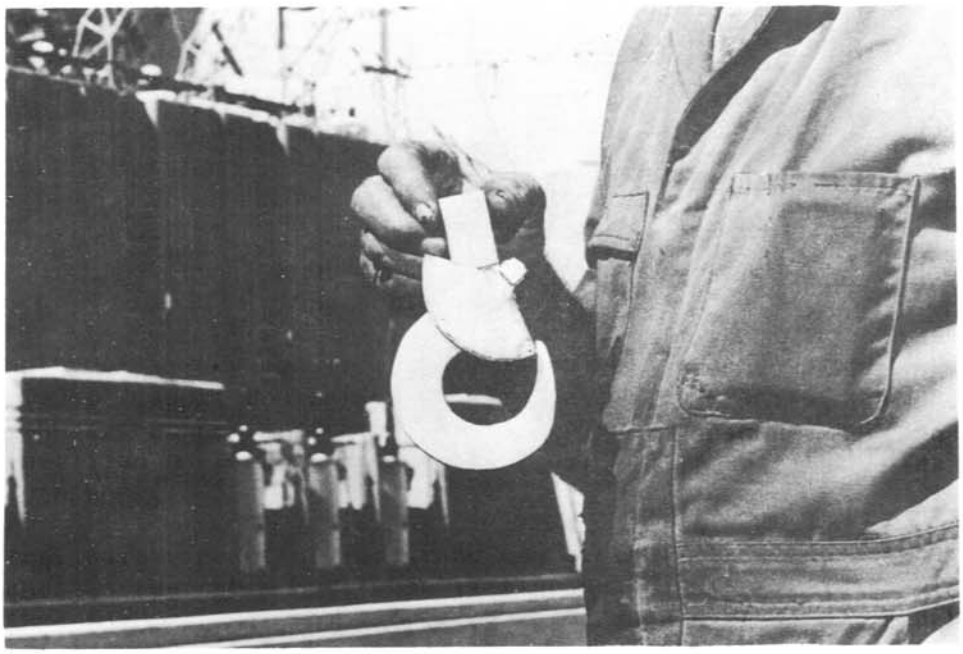
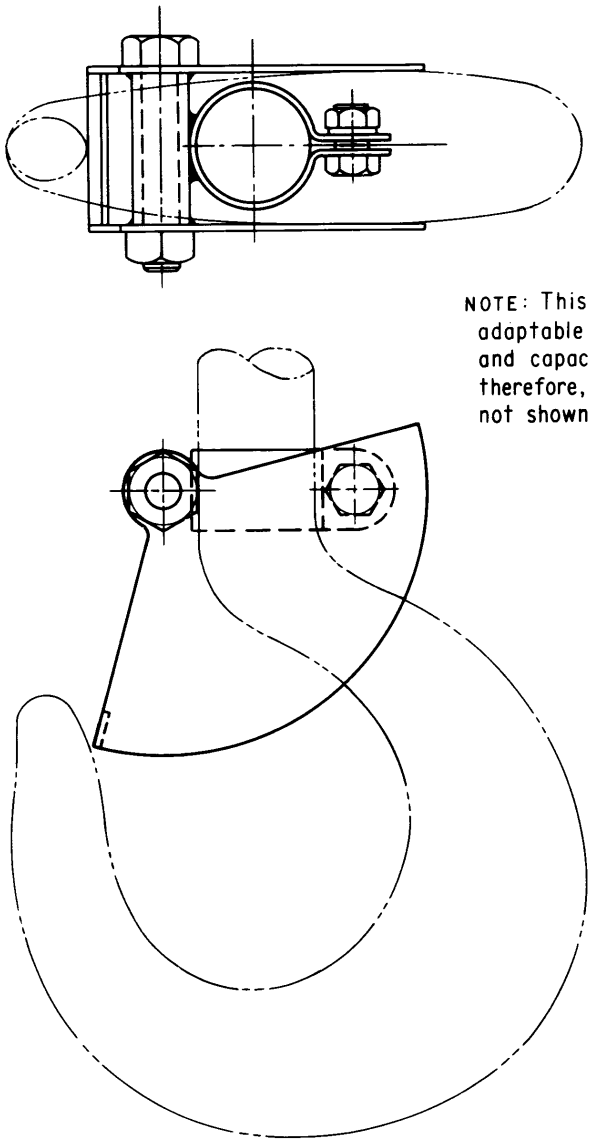


Photo P45-D-69711

A rigger will find the device very easy to use. When the cable is lifted onto the crane hook, the mouser moves back then falls back into place. Using the old type mouser has always been a two-man operation, requiring one man to keep the mouser open and another man to lift the cable onto the hook.

Additional information regarding this safety latch may be obtained from the Project Manager, Post Office Box 427, Boulder City, Nevada 89005.



NOTE: This safety latch is adaptable to various sizes and capacities of hooks; therefore, dimensions are not shown on this sketch.

SAFETY LATCH

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REVOLVING MOSS SCREEN

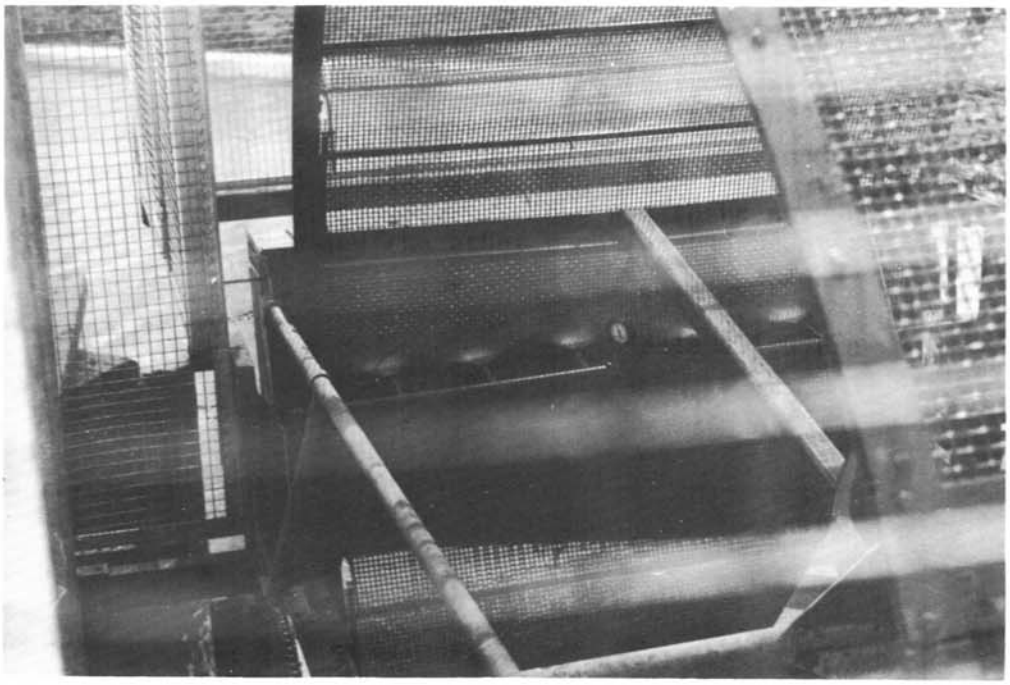
A shop-built revolving moss screen is being utilized by the Ivanhoe Irrigation District, Visalia, California, to prevent moss and trash from entering two turnouts in their distribution system. The moss screen device was designed by Mr. Howard Weekly, District Manager, and was fabricated by a local machine shop.

The moss screen as shown in Photograph 1 below, is placed deep enough in a rectangular canal section upstream of the turnout to pick up all of the moss and trash. Basically it is a large 10-foot-diameter cylindrical drum covered with a heavy 3/8-inch wire mesh. Note the switch in the lower right corner which turns on the pump and screen drive motors when the turnout gate is opened.

Photograph 1. Photo P465-D-69708

The drum for the revolving moss screen rotates on a shaft powered by a 1-horsepower 230-volt, 1,725-rpm electric motor. The output speed of the motor shaft is reduced by a 40:1 reduction gear on the motor and a 6:1 ratio on the drive pulleys. The shaft is supported by two large pillow block bearings. The drum has eight pickup screens which are equally spaced on the circumference to pick up the moss.

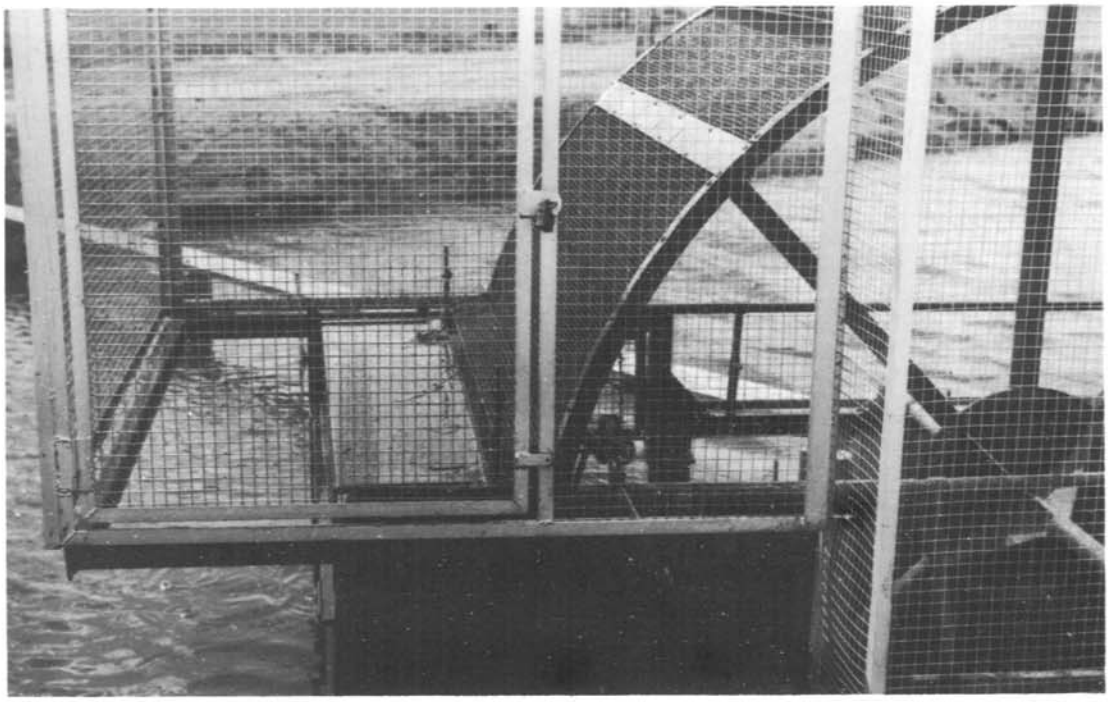
As the pickup screens pass through the moss collector box, they are rotated so that the moss can be washed off by the six water jets. Photograph 2 below, shows the water jets that wash the moss from the screens.



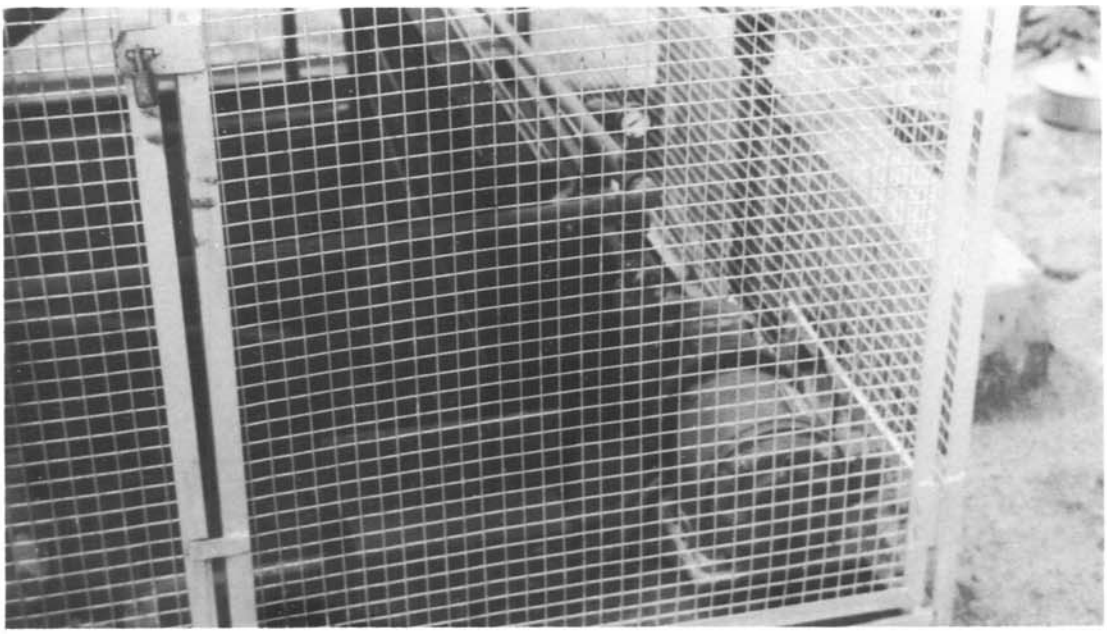
Photograph 2. Photo P214-D-69712

A 75-pound pressure is produced for the water jets by a 3-horsepower, 230-volt centrifugal pump. After the pickup screens pass through the collector box, they return to their original pickup position by means of a spring. The moss that is removed by the water jets is flushed from the collector box back into the canal downstream of the turnout. Photograph 3 on page 19, shows the moss collector box that returns the moss to the canal, and Photograph 4 shows the high-pressure pump that operates the water jets. A sketch of the moss screen can also be found on page 20.

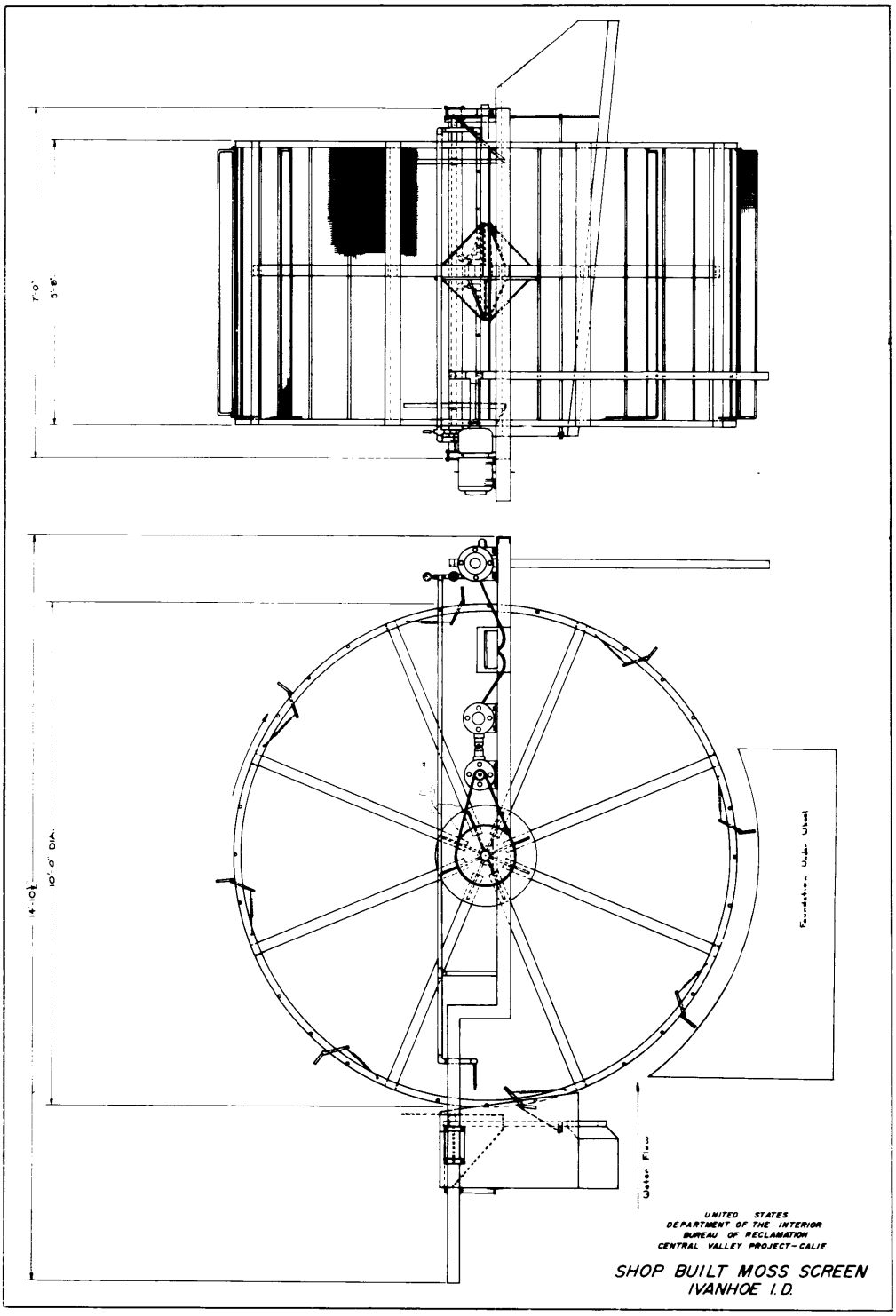
The moss screen device was thoroughly cleaned and painted with a good rust-inhibiting primer and paint. A safety enclosure has been neatly installed around the device, and the enclosure also deters vandals. Periodic lubrication of the shaft pillow blocks and drive chain are required, otherwise, the device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



Photograph 3. Photo P214-D-69714



Photograph 4. Photo P214-D-69713


7'-0"
5'-8"
14'-10½"
10'-0" DIA.
Foundation Under Steel
Water Flow
UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
CENTRAL VALLEY PROJECT - CALIF
SHOP BUILT MOSS SCREEN
IVANHOE I.D.

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