United States Department of the Interior, Bureau of Reclamation

IRRIGATION OPERATION AND MAINTENANCE

BULLETIN NO. 71

January, February, March 1970

In This Issue:

The Irrigation Operation and Maintenance Bulletin is published quarterly, for the benefit of irrigation project people. 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, developed by resourceful project people, 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 Irrigation Operations
Office of Chief Engineer
Denver, Colorado 80225

COVER PHOTOGRAPH:

Employee in the Bureau of Reclamation Engineering Laboratory, Denver, Colorado, using a modified power saw, wearing protective goggles and a breathing device while cutting through an 8-foot-diameter reinforced plastic mortar pipe. Photo PX-D-66148

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INTRODUCTION

Starting on page 1 is an article taken from Plant Engineering, which describes the need for an efficient eye protection program and gives seven basic points to be considered.

An idea for replacing open flow meters simply and economically with the use of a special tool called a "Mechanical Arm," can be found on page 5.

A self-adjusting marker buoy is described on page 8, it is used by the Wyoming Recreation Commission to mark waterways where there is considerable reservoir fluctuation. However, it can be adapted to any waterway where the need for such a buoy exists.

Although this article entitled "A Real Accident Prevention Effort Pays Big Dividends," starting on page 9, was written especially for the National Park Service, we feel it presents a message of general interest.

By using concrete cylinders as counterweights on their high-pressure gates, this article on page 12, shows how the Ainsworth Unit in Nebraska solved a problem in gate creep.

"Installation of Monuments During Construction," is the title of an article on page 13. This suggestion will make it less difficult to locate permanently submerged structures in the future.

The idea on page 14 to use belting to prevent paint damage on radial gates was contributed by Bureau of Reclamation forces on the Central Valley Project in California. It was noted in a recent regional report of a biennial examination made under the Review of Maintenance Program.

The spillway gate opening indicator illustrated in an article beginning on page 17, was designed and installed on the radial gate hoists at Enders Dam. With the pigtail extension on the controls observation of the gates during operation is possible.

The new differential float control device noted in this article on page 20, was installed by the Salt River Project, Phoenix, Arizona, to control demossing machinery. They advise that the device has proven so successful they have installed it in other areas on the project.

GUARDING EMPLOYEES' EYESIGHT 1/

by G. J. Wolnez

Except for an industrial fatality, nothing compares to the tragedy of losing the sight of both eyes. In spite of all that has been written on this subject, maintenance workers continue to lose eyes. Why? Too many employees simply refuse to wear safety glasses. This was understandable 20 years ago when safety glasses were heavy, unattractive and extremely uncomfortable. Modern safety spectacles, on the other hand, are stylish (similar to dress glasses) and offer a high degree of protection. In fact, the newer plastic lenses are superior to glass for impact resistance as well as optical quality. So what's the problem, and why do we still have trouble protecting the eyes of the maintenance working force?

Like most accidents, those that involve injury or loss of sight, are needless, generally caused by the same people-problems that kill over 100,000 Americans every year.

Most employees are exposed to known positive motivation techniques--films, posters, special literature, lectures, etc. Usually, though, a tough enforcement policy must be written to get employees to wear glasses, face shields, or eye hoods for maintenance. The number of eyes saved is directly proportional to the time and effort expended on an efficient eye protection program.

Remember that aside from humanitarian benefits, an eye protection program can save many dollars that would otherwise be spent on high compensation insurance rates, medical expenses, and litigation. When you fail to provide eye protection, you may be violating a state or federal safety code and the violation can cause more trouble than you realize.

Seven basic points should be considered in setting up an eye safety program to ensure its effectiveness. They are:

1. Management should establish a comprehensive policy which requires eye protection in every hazardous operation. The policy should contain a workable method of enforcement that is equally applied to salaried as well as shop employees.

2. Don't settle for weak enforcement programs that allow employees to remove their safety glasses in so called "safe areas." The effect here is that glasses will not be worn at all, because people will forget to put them on when they return to the hazardous area. Although requiring eye protection is ridiculous in some areas, it must be enforced to make your program effective.

1/Reprinted from Plant Engineering, issue date of November 28, 1968, by special permission of the Managing Editor.

Getting some people to wear safety glasses is often a simple matter of "laying down the law."

It will take people who don't ordinarily wear glasses, a few days to become accustomed to them. Once this hurdle is passed there is no reason why properly fitted glasses can't be worn all day.

3. If your company is involved with a bargaining unit, be sure that the requirements and enforcement policy are written in the company/union agreement. If the costs of prescription safety glasses are equally shared, the exact amount of the company's maximum contribution should be stipulated in the company/union contract.

4. Don't purchase a single pair of safety glasses unless they meet federal specifications and USASI Standards. These standards establish levels of impact resistance, optical quality, and specify flameproof frames. Be especially wary of the well-meaning purchasing agent who buys from the lowest bidder without checking the specifications.

5. Avoid making the mistake of trying to provide more protection than is needed for the job. Tight fitting frames which are held in place with elastic headbands offer 100 per cent protection. But, because they are also hot and often uncomfortable, they might wind up on top of the workman's head instead of over his eyes. Be sure to use them where heavy impact from all sides is inevitable. They are also effective against exposure to chemical splash and dust.

For most exposures, the regular safety spectacles will do the job. Even though they provide a limited amount of protection, they are effective. The lenses in front of the eye protect employees from direct impact and because of their light weight, they are generally more acceptable than the side shield spectacles or headband-type goggles.

6. Safety lenses should be inspected frequently for deep scratches and pitting caused by molten metal or sparks. Pits and scratches cause loss of the lens surface temper and may actually cause the lenses to lose their safety qualities. (It is very important for welders to wear clear plastic cover lenses on both sides of the tinted glass for this reason.)

One way to emphasize the need for changing pitted lenses is to have your safety equipment vendor demonstrate the effects of the weakened (pitted) lenses with a standard drop ball lens testing device.

7. Your eye protection program should include all office workers and plant visitors who walk through eye-hazard areas.

Inexpensive yet lightweight visitor's glasses are available for this purpose.

In order for any eye protection program to be enforced, management personnel must set the example. With this in mind, make sure everyone wears eye protection in hazardous areas, at all times.

It's important to remember that eye protection programs are humanitarian, good for morale, good for business, and are practical. It is beneficial for all when you: "do something about eye protection."

SELECTING THE PROPER EYE PROTECTION FOR THE JOB

THE JOB	THE HAZARD	TYPE OF PROTECTION
Electric arc welding and cutting - high intensity inert gas welding.	Radiant energy which is injurious to the eyes; also burns on face and neck.	Approved weldors' helmet or hand shield for observation. Tinted plastic or safety glass spectacles to be worn under hood.
Oxy-acetylene welding or cutting, tending furnaces or working near ultra-violet.	Radiant energy which is injurious to the eyes.	Cup goggles with tinted lenses. Soft frame plastic goggles with tinted lenses. Weldors' helmets with appropriate lenses.
Handling strong acids, caustics; working with plating or pickling tanks; steam cleaning with strong detergents; working with strong solvents.	Severe injury to the tissues of the eyes and face. Burns.	Full acetate faceshield that extends down to chin. Chemical hood that covers entire head and neck. Rubber or soft plastic chemical goggles.
Sandblasting.	Severe tissue damage.	Bureau of Mines approved face and breathing device.
Chipping metal or cement; operating high speed saws; using chisels, jack hammers, rock drills or heavy duty grinders.	Large flying particles that may become embedded in eyes and face.	Cup goggles, soft frame plastic goggles with heavy lens; large faceshield with 0.040 acetate fronts; special hoods with screen fronts.
Operating road building equipment, tractors, power shovels.	Dust, wind, heavy brush, rain, and snow.	Soft frame plastic goggles with fog free and dust free construction and tinted lenses for bright sun or reflective surfaces.
Soldering.	Metal splash.	Regular safety spectacles with glass or plastic lenses.
Light gas cutting and gas welding.	Injurious radiant energy.	Shade 5 Filter Lenses.
Gas cutting, medium; gas welding and arc welding up to 30 amperes.	Injurious radiant energy.	Shade 6 Filter Lenses.
Heavy gas welding and for arc cutting and welding exceeding 30, but not exceeding 75 amps.	Injurious radiant energy.	Shade 8 Filter Lenses.
Arc welding and cutting more than 75, but not exceeding 200 amperes.	Injurious radiant energy.	Shade 10 Filter Lenses.
Arc welding and cutting more than 200, but not exceeding 400 amperes.	Injurious radiant energy.	Shade 12 Filter Lenses.
Arc welding and cutting more than 400 amperes.	Injurious radiant energy.	Shade 14 Filter Lenses.

Handy guide that can be used to determine type of safety equipment needed to protect industrial workers. Included is a detailed description of the particular device to use to meet specific job hazards.

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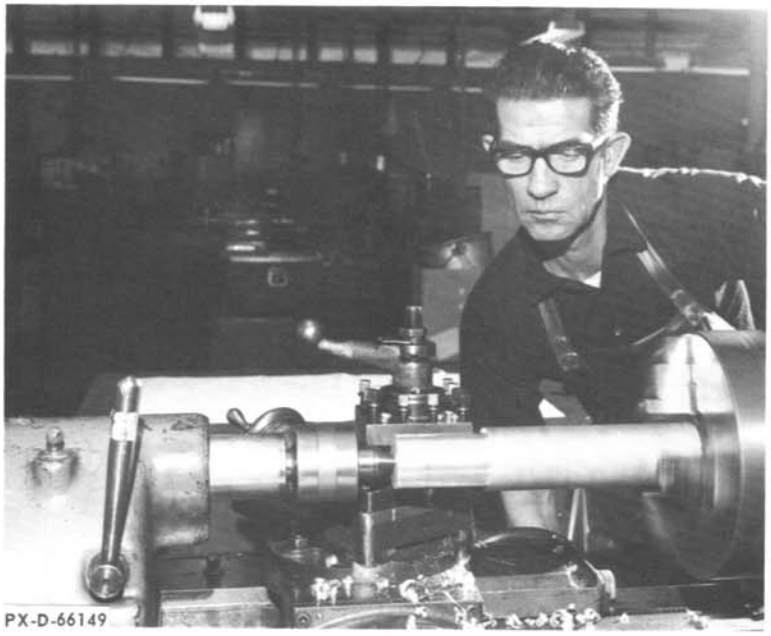
The illustrations below show two different types of work performance with workers wearing the modern safety spectacles. One shows a machinist running a high speed lathe. He is wearing modern safety spectacles with new plastic lenses for greater impact resistance. The other photo is of an employee wearing the modern safety glasses while using a high speed power saw.



PX-D-66149

PX-D-66150

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REPLACING OPEN FLOW METERS

The cleaning of open flow meters in the South Gila Valley Unit is a very difficult task under full flow conditions. The meter can be pulled out of the bracket quite easily for cleaning, but when replacing it the velocity of the water pushes it away from the lower bracket. At various times in the past, it has been necessary to shut off the delivery of water when a meter was being replaced, because of the water velocity.

The suggestion described here was submitted by Thomas L. Cramp, of the Yuma Projects Office, Yuma, Arizona. It was his idea to use a "Mechanical Arm" to replace a meter in the bracket under full flow conditions. This device fabricated by field personnel, exerts pressure on the lower drop pipe of the meter, thereby forcing the propeller on the meter into the flow of water, making it easy to increase or decrease the pressure as the meter is lowered and inserted in the brackets. A very difficult task can be made easy when using this device. It makes it unnecessary to interrupt water deliveries to clean and check the meters, thereby increasing the efficiency of the farm delivery and the measurement of the water.

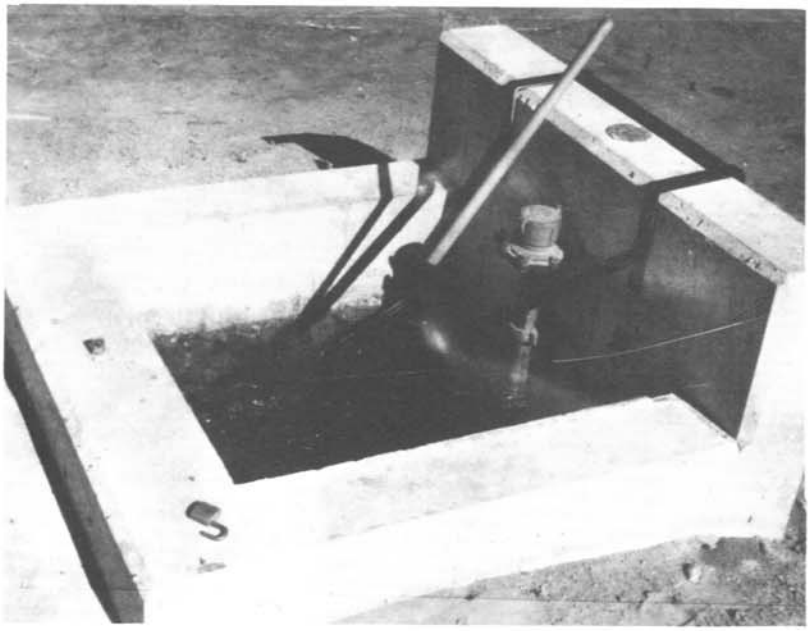
An added bonus is the ditchriders safety. When using this device the ditchrider does not have to strain his back or put himself in a position where he may fall into the meter box while accomplishing this cleaning operation.

Photograph 1 (PX-D-66151)

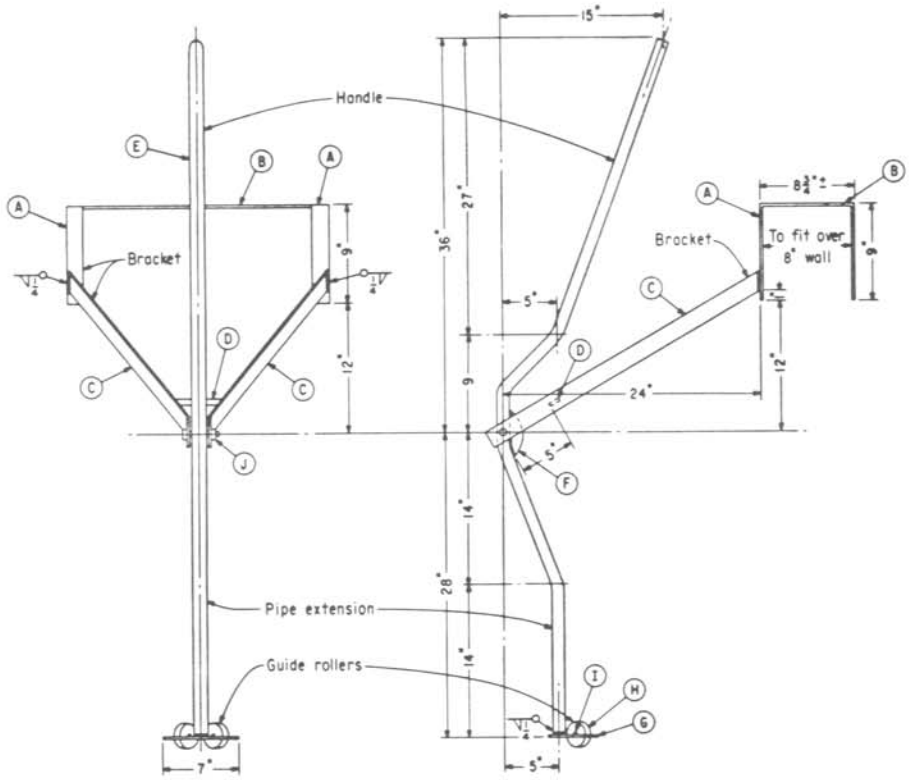
Photograph 1 at left shows a full view of the "Mechanical Arm" as described above. Photograph 2 on next page shows the "Mechanical Arm" being operated by the ditchrider during replacement of an open flow meter, and Photograph 3 shows a view after replacement. Weighing only 6 pounds, it is easy to handle during the cleaning operation. A sketch of the device is shown on page 7.

Further information may be obtained from the Project Manager, Yuma Projects Office, Bin 5569, Yuma, Arizona 85364.

Photograph 2 (PX-D-66152)



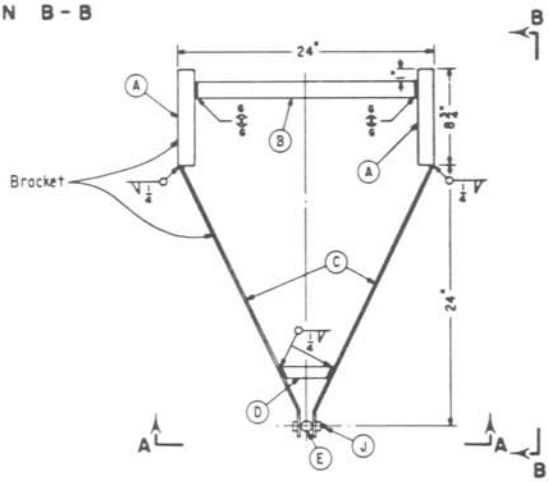
Photograph 3 (PX-D-66153)



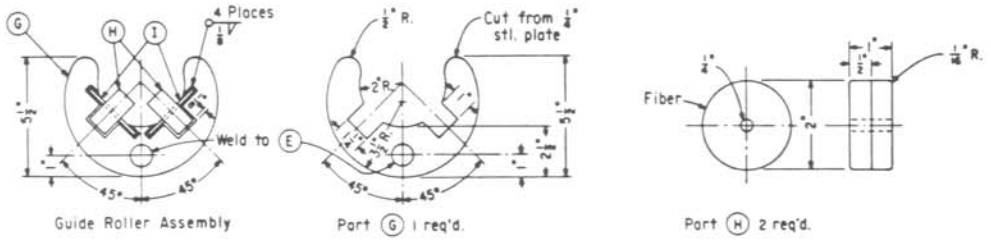
ELEVATION A-A

ELEVATION B-B

SCALE: $\frac{1}{8}$" = 1"



PLAN



Guide Roller Assembly

Part (G) 1 req'd.

Part (H) 2 req'd.

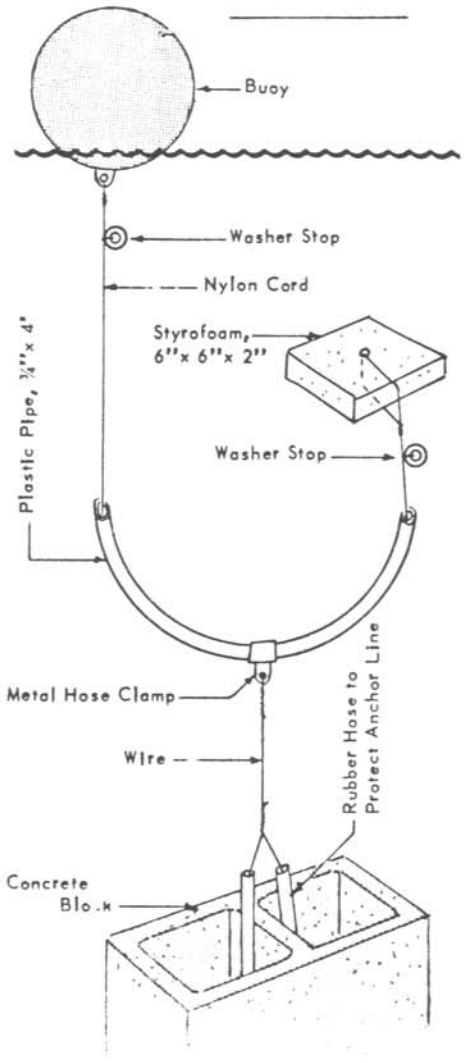
GUIDE ROLLERS

SCALE: $\frac{1}{4}$" = 1"

MECHANICAL ARM FOR INSTALLING OPEN-FLOW METERS

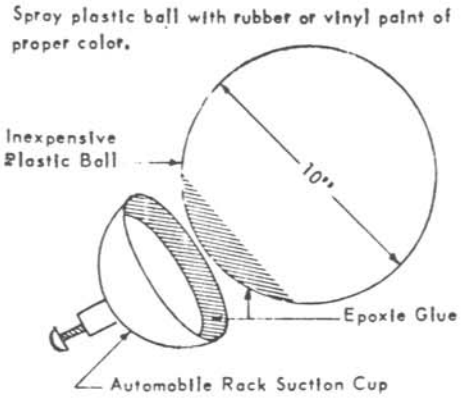
SELF-ADJUSTING MARKER BUOY

(Reprinted by permission of GRIST, November/December 1969 issue. This is a publication of the National Conference of State Parks, Washington, D.C.)



Peter J. McNiff recreation specialist, Wyoming Recreation Commission, designed the self-adjusting marker buoy and replacement shown in the sketch below and at left. It is used to mark waterways on bodies of water such as reservoirs which have a considerable amount of water fluctuation.

While the Wyoming Recreation Commission has used the device primarily to mark waterski slalom courses, the same principle could be used for buoys to mark channels, hazards, and the like.



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A REAL ACCIDENT PREVENTION EFFORT PAYS BIG DIVIDENDS by Nat Baker

(Reprinted by permission from a recent issue of GRIST, a publication of the National Conference of State Parks, Washington, D.C.)

Management often forgets or has never thought of the importance and many benefits that can be realized through a sincere team effort in searching for and initiating corrective action on potential accident situations--human acts, work procedures, and environmental conditions. While the usual "dollar savings" benefit always gets the attention, numerous other benefits occur and are never evaluated. Some of these intangible benefits do pay off too in dollars directly or indirectly.

When the "team spirit" in accident prevention has been established and a safety conscious attitude among our people has developed, both the Service and the employee will benefit. Often the safety effort can be a powerful management influence "in doing things better." Management often experiments with new or revised innovations, approaches and gimmicks for improving our way "of doing things." Yet, often the same accomplishments would have occurred if we had applied the safety management "tool."

To document all the benefits, especially the intangible ones, is difficult because often a new or forgotten benefit will result from an all-employee safety effort. Safety pays off in dollar value and in "goodwill." Specific benefits are cited to better understand that the safety effort can be one of our most effective and influential management and supervisory techniques.

Some specific benefits are cited here:

1. Elimination of accidents.
2. Elimination of other errors in supervisory or operational procedures. Accidents are excellent "indicators" of the existence of other deficiencies and errors.
3. Happy employees produce more and better "products."
4. Better park operations attract more people to facility, make more use of the citizens' tax, and increase the concessioner gross receipts.
5. Reduction in tort claim accident processing costs and payment of approved claims.
6. Reduction of employee medical and compensation which is paid out of our operational funds.
7. Reduction of number of family accident injury expenses.
8. Reduction of number of welfare cases where wage-earner is killed or permanently injured, mentally or physically.
9. Reduction of property and motor vehicle damages annually when no large fire losses occur.

10. Reduction of time lost in getting and training replacement personnel as craftsmen, specialists and professionals.
11. Reduction in personnel replacement costs where personnel turnover is unusually high.
12. Management time saved by the elimination of the need to reply to the criticism of next-of-kin, public inquiries or other-wise get involved.
13. And you can probably think of other dollar-loss items that would be spared.

Using injury cost figures and adding the indirect costs (4-1 ratio or indirect costs four times the direct cost) a total cost for all accidents can be estimated. In industry the competition has become so great that their "savings" through an aggressive safety effort has now become a substantial addition to their annual net profit dollar total.

Now some of the "good will" benefits which an all-employee safety effort can provide:

1. A cooperative and proud community and national citizenary image.
2. An enjoyable, healthy, and relaxing environment with safety for people.
3. Happy employees promote the good public relations image. Most problems for management originate from the "acts" of an unhappy employee.
4. For pleasurable existence for employee and visitor families.
5. Opportunity for supervisor to know each employee personally so he can be a better "counselor."
6. Opportunity for supervisor to set the example which is the one most effective method to establish safe attitudes among his employees.
7. Opportunity for supervisor to give each of his employees a chance to realize his ambitions and dreams. Phycologists say that only about 15 percent of our ability, talents, and skills are developed in a lifetime, for lack of an opportunity, personal laziness, or illness.
8. And you can probably think of other "good will" elements that can be realized by a sincerely accident preventive conscientious group of people.

The organization safety effort can win friends and influence people! What greater investment with as many dividends, can you think of, than an agency-wide employee cooperative safety effort?

Management and supervision in operations have to give daily "doses" of prodding to the employees. The employee hears about personnel

ceilings, budget cuts, manpower utilization, progress, failures, incentive awards, reorganizations, and on and on, yet too little about what an accident can do to him, his family, a visitor's family, or to the agency.

Safety-first is a misused term and not applicable. When you plan and do "something," consider the possible hazardous situations so that safety-applied is a more definitive term. This should be done in the planning stage, and followed up with your staff or crew in the execution of the project or work assignment. The job planning stage (regardless of type or size or project) is where the accident prevention effort must begin. After the job is started, the site equipment, materials and crew members might introduce additional hazardous situations. Therefore, the two most important stages for application of safety techniques are in planning and on the site at the beginning of the work. Even in some of the more simple one or two man work assignments, the supervisor should do pre-planning and check out the beginning of the work at the site. Occasionally, a crew member is qualified to do the planning and execution of the routine or small work assignments, but often he forgets about the potential hazards--so the supervisor has the responsibility to remind him when he delegates to a crew member.

Without support and participation, any organization can expect to get involved in embarrassing and critical situations which often bring on disturbing "outside" investigations, public denouncements in the news media, costly inefficiencies in operations, loss of operating funds to recover from large fire destruction and for payment of employee compensation and public claims, deterioration of employee morale, loss of valuable time in "battling" criticism and complaints, and other "accident prone" debits which could lead to a bankrupt operational image. Accidents will happen, but these critical situations can be resolved with much less embarrassment if a real preventive effort is evident.

The objective here is to highlight what a safety oriented and active group of people in an agency can produce. To make real this goal you, as a manager or supervisor, must accept your safety role responsibility and make accident prevention a part of your daily activities. Then the agency and its people will be proud and well rewarded for actively participating in the safety activity.

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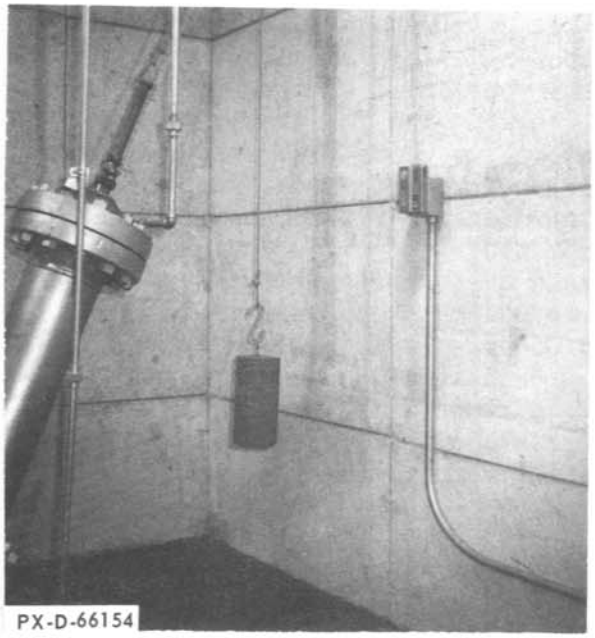
Slogans intended to promote safety may actually retard accident-prevention efforts. For example, "Safety First" can make employees distrustful of a safety program because safety is, in fact, essential to an organization's primary goal--making a profit or achieving some other objective. Safety is better served by realism.

--National Safety News

CONCRETE CYLINDER COUNTERWEIGHT FOR HIGH PRESSURE GATES

During the annual maintenance review of major structures at Merritt Dam, Ainsworth Unit, Nebraska--Missouri River Basin Project, it was reported by the Irrigation District personnel that they were experiencing some difficulty holding constant gate openings in the river outlet works. As the reservoir was lowered during the course of the irrigation season, the tendency for the gates to creep towards a closed position increased to the point where adjustment to maintain constant releases was required about every two hours.



PX-D-66154

To correct this condition the District has installed a 6- by 12-inch concrete cylinder counterweight on each of the river outlet works gates. See photographs at left.

PX-D-66155

This arrangement has proven very satisfactory according to reports from District personnel. In fact they were so pleased with the results achieved on the river outlet works gates that they are proceeding with the same type installation on the gates in the canal outlet works control house.

Additional information about this idea can be obtained by writing to the Regional Director, Regional Office, Region 7, Denver Federal Center, Denver, Colorado 80225.

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INSTALLATION OF MONUMENTS DURING CONSTRUCTION
(Suggestion R2-69S-73)

This suggestion is presented by James L. Andrews, of the Regional Design and Construction Office, Region 2, Sacramento, California. He suggests the installation of monuments during construction that will be used for locating structures which will eventually be permanently submerged under reservoir water.

During the past 3-1/2 to 4 years that the Region 2 underwater examination team has been in operation, there have been several occasions where the actual work of examining a structure was incidental and much less time consuming to locating the structure under water. This very real problem of locating continuously submerged isolated structures located in reservoirs, primarily outlet works intake structures, comes about usually because the only data available is a very small scale drawing which invariably has not been revised to show "as built" status.

After a survey of all regions, the subject suggestion has been adopted by the Bureau of Reclamation. It will be used for the first time in Specifications for Teton Dam that is to be constructed on the Teton River in Idaho. Monuments also will be included as a part of the final construction of all Bureau projects having this type of isolated continuously submerged structure.

A set of two monuments will be provided with appropriate bearings to locate by intersection the structure in question. The location of the monuments and bearings to submerged structures is to be included as a part of the designers operating criteria or other instructions as a matter of record.

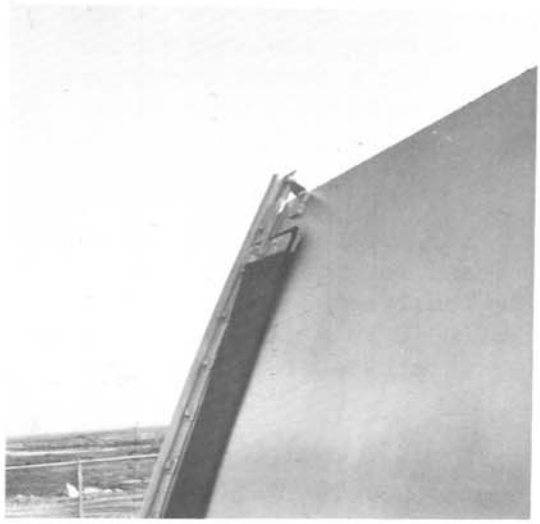
There are numerous permanently submerged structures in existence on many Bureau Projects that would be extremely difficult to locate if the need arose. It could be that the provision of monuments for locating these structures should be considered. The cost of their location and examination could be quickly repaid.

* * * * *

The All-American Canal System of the Boulder Canyon Project in California, has passed the $3 billion mark for crop production or 52 times the Federal investment, according to the Commissioner of Reclamation. The All-American Canal began delivering Colorado River water to the Imperial Irrigation District in 1941 and to the Coachella Valley County Water District in 1949.

MAINTAINING PAINT ON RADIAL GATES

Protecting the paint on the skin plates of radial gates has long been a problem to operation and maintenance personnel in those instances where cables are attached to the upstream face of the gate. As the gates are raised and lowered, the cables chafe and break the seal of the paint. Since the early 1950s on the Friant-Kern Canal, a number of ideas were tried to prevent the damaging of the paint on radial gates; but none of them proved to be very satisfactory. Then a program of repainting all of the radial gate structures with a VR-6 vinyl resin material was begun.



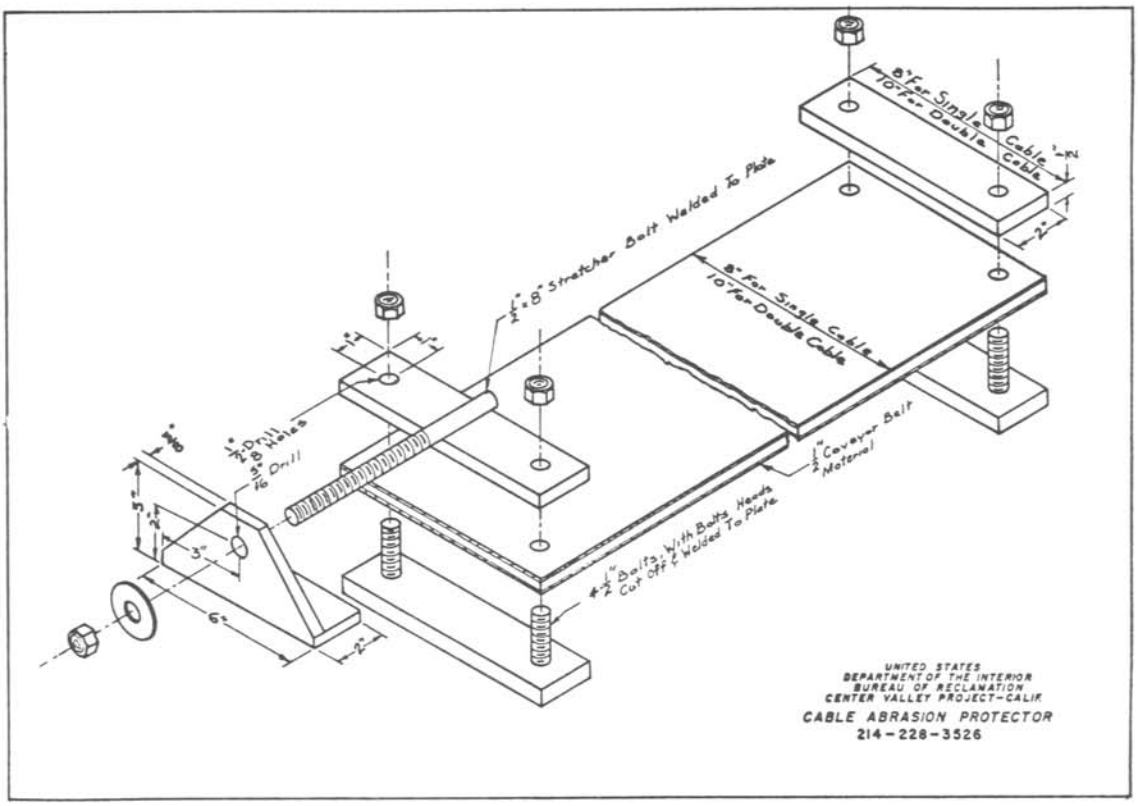
Photograph 1 (PX-D-66156)

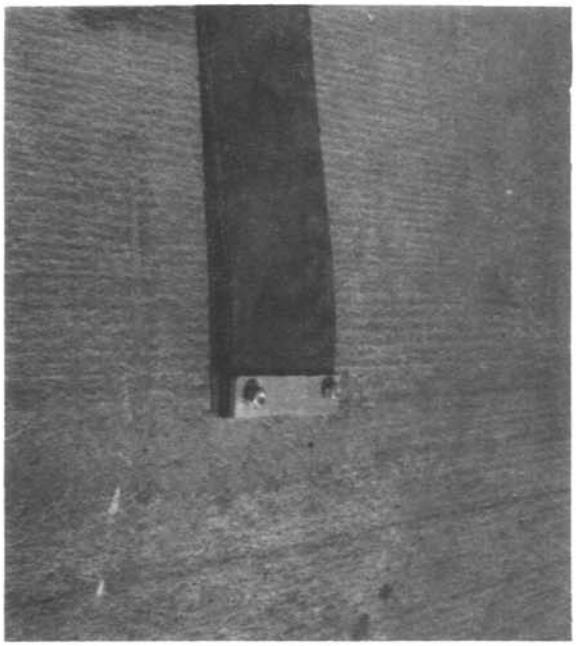
Photograph 2 (PX-D-66157)

Since a considerable expense was incurred in providing this type of paint on the gates, it was decided that new effort should be made to solve the problem of cable chafing and damage to the paint. An idea was suggested that a strip of conveyor belting which was on hand be placed between the cable and the newly painted surfaces. One of the problems was how to attach the belting in such a manner that it would be held rigidly in place without drilling the skin plate of the gate.

The strips of 1/2-inch belting are 8 inches wide for gates with single cables on each side and 10 inches wide for those with double cables. The strips are long enough to provide protection for the full length of cables along the gate face. Photograph 1 at upper left shows the top of a check gate and Photograph 2 shows the bottom section with the belting installed.

With reference to the sketch on the next page, a clamp for each end of the belt was fabricated by cutting out two pieces of 5/8-inch steel plate, 2 inches wide and 8 to 10 inches long, or enough to cover the width of the belt. Two 5/8- by 2-inch plow bolts were welded to one piece to serve as the inside portion





Photograph 3 (PX-D-66158)

of the clamp. Each end of the belt was cut out with two corresponding 5/8-inch holes to allow it to fit over the bolts protruding from the inside portion of the clamp. The piece to be used as the outside of the clamp was also drilled in a like manner and fit over the belting and tightened down by nuts. This provided an identical clamp for each end of the belt.

The clamp for the bottom of the gate was attached by welding the inside portion of the clamp to the face of the gate just above the cable anchor. This was done prior to the gate being painted. Photograph 3 at left, shows the bottom bracket of the gate and cable protector as it is installed on the belting.

Photograph 4 (PX-D-66159)

The clamp to be used at the top of the gate was further modified by welding to the outside piece of the clamp, a 5/8- by 6-inch bolt which extended up from the clamp toward the top of the gate. This assembly is shown in Photograph 4 at left. It shows the top clamp bolted in place on belting, with the 5/8-inch bolt in place through top anchor bracket.

A bracket made out of 5/8- by 2-inch angle was welded near the top of the gate face plate, again, prior to the gate painting, and drilled with one 5/8-inch hole to accept the 6-inch bolt extending up from the top clamp. When the top clamp is inserted into the bracket a nut tightened on the end of the 6-inch bolt serves as a stretcher to pull the belt tight against the face plate. The bracket at the top holds the top clamp out and away from the face plate.

All the loose pieces of the clamps were painted with the same VR-6 paint as was used on the gates.

The belting was installed on these gates in January 1967 and in January 1968, an inspection was made of the paint under the belting and also the belting itself. The paint was in very good condition and the belts showed no signs of scuffing or deterioration.

This method of attaching the belting to the gates appears to be far superior to others tried. There is no rust problem evident because once the gate is painted, the surface is not disturbed in any way.

If further information is desired regarding this idea, please write to the Regional Director, Region 2, Sacramento, California 95825.

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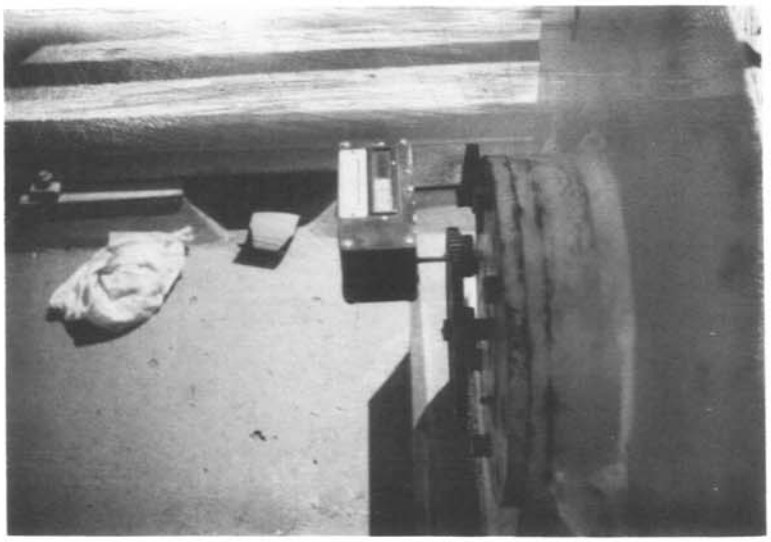
There is so much good in the worst of us, and so much bad in the best of us, that it hardly behooves any of us to talk about the rest of us.

RADIAL GATE POSITION INDICATOR

The Water Control Branch of the Irrigation Division, Kansas River Project Office, McCook, Nebraska, has designed and installed gate position indicators on the radial gate hoists at Enders Dam. The indicator is calibrated in feet and tenths of radial gate movement and provides a positive and convenient means of determining the gate opening. Photograph 1 below, shows the completed assembly and Photograph 2 is a view of the hoist deck. The drawing on page 19 shows in detail how the position indicator assembly was attached to the gate hoist.



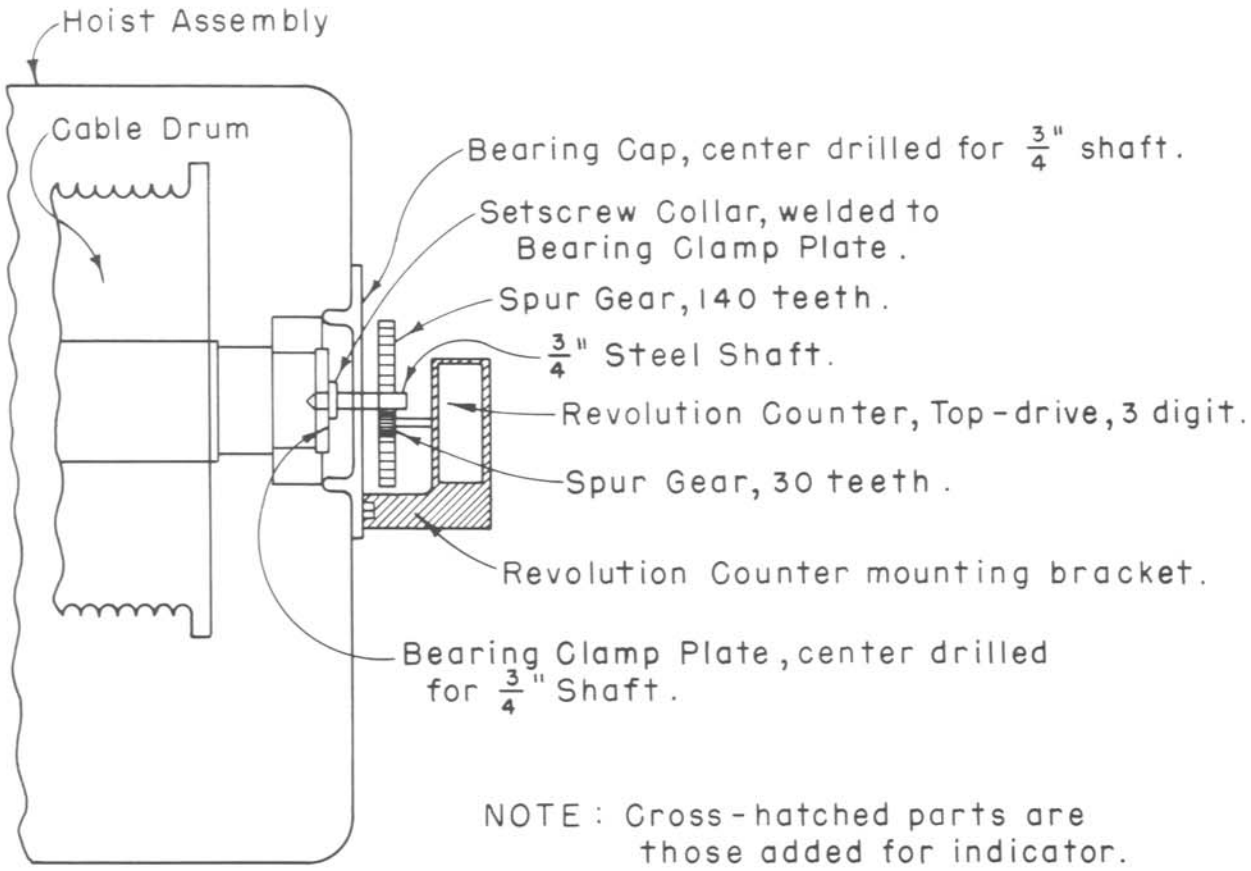
Photograph 1 (PX-D-66160)

Photograph 2 (PX-D-66161)

It also will be noted that the control stations for the electric motors powering the hoist units are located approximately 25 feet from the units; therefore, a pigtail extension is utilized to enable the operator to read the indicator and also view the operation of the gate as shown in Photograph 2 on the preceding page, and in Photograph 3 below. Photograph 4 shows the interior of a typical control station and the pigtail control head. This particular control is of the spring-loaded pushbutton type, so that the moment the pushbutton is released, the gate will automatically stop.

Photograph 3 (PX-D-66163)

Photograph 4 (PX-D-66162)



ENDERS DAM

SPILLWAY GATE OPENING INDICATORS

(Top View)

The material cost for each assembly was approximately $90.00. If further information is desired write to the Kansas River Projects Office, U.S. Bureau of Reclamation, P. O. Box 737, McCook, Nebraska 69001.

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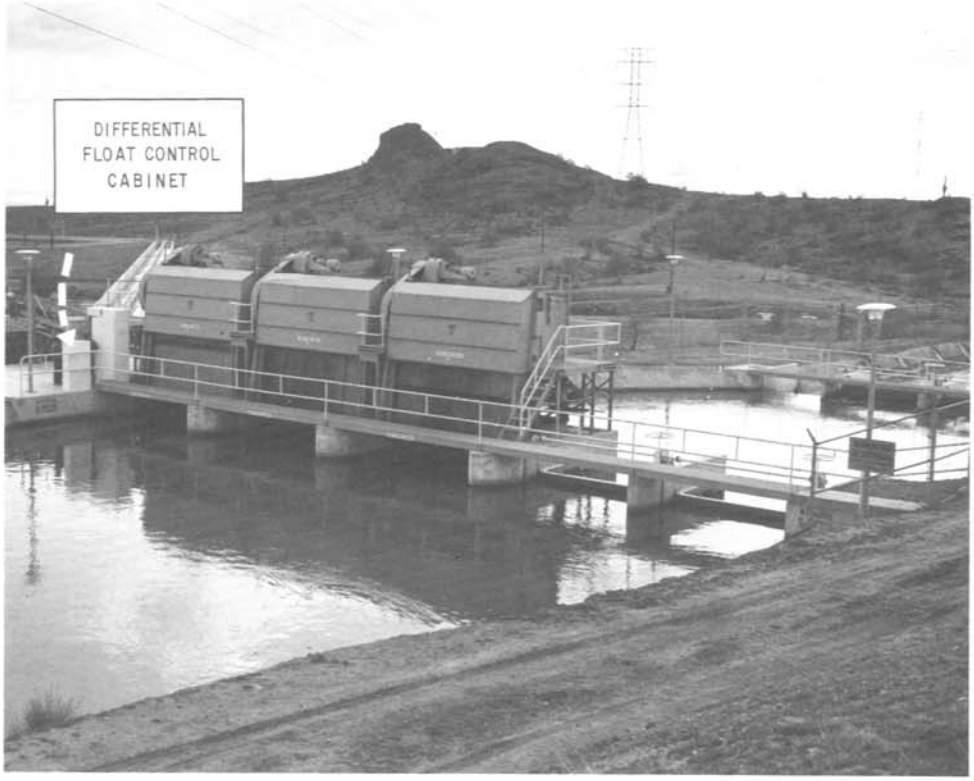
The more wisely a man thinks and the more information he acquires; the more he gains in his capacity for work and the enjoyment of life.

DIFFERENTIAL FLOAT CONTROL

by

Robert Earll and Ray Pristo 1/

With the planned installation of automatic supervisory control, it became obvious that a satisfactory differential float control had to be developed for operation on demossing screens and silt conveyors in our canal system, such as that shown in Photograph 1 below.



Photograph 1 (PX-D-66164)

The developed device shown in Photograph 2 on the next page, replaces the conventional manufacturer's bladder-type control which also operated by means of a head differential between the upstream and downstream side of the screens. However, maintaining the proper bladder pressure for accurate control of the screens was difficult and required a supply of bladder diaphragms to be kept on hand for frequent replacement. Also, the linkages and bellows components required close attention. After eleven years of operation and anticipating the installation of additional automatic trashracks in the canal system, it was

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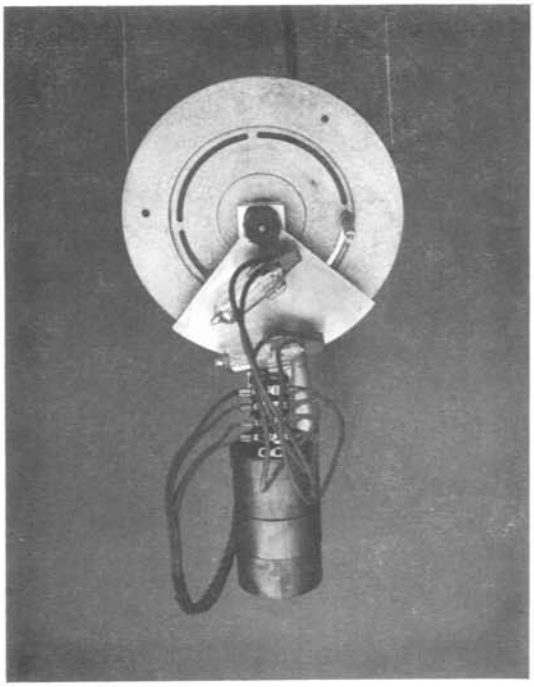


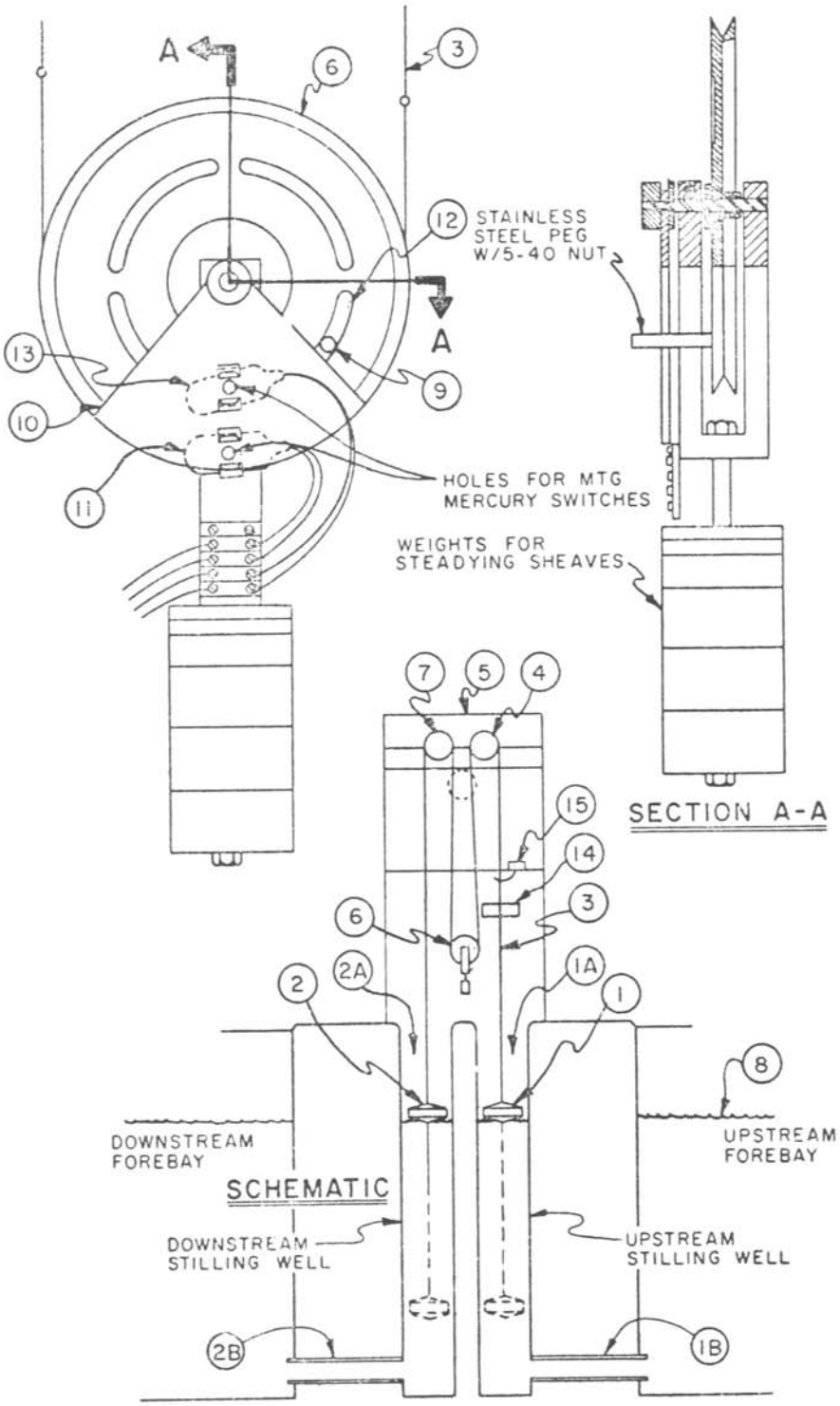
Photograph 2 (PX-D-66165)

felt that a more efficient and dependable control was needed.

The new device consists of a 120 volt electro-mechanical arrangement of brass, stainless steel and aluminum corrosion-resistant components. The pulleys, timing cable, cable clips and floats are items readily available from the manufacturer. The device is energized by an increase in the water elevation differential between the upstream and downstream side of the screens. It is not affected by the range of operating water surface elevations occurring from varying canal flows. It automatically starts the machinery when an accumulation of trash and moss creates the required differential. The machinery continues to run for a pre-determined length of time to remove the trash and to bring the differential back to a pre-set normal.

Photograph 3 (PX-D-66166)

Photograph 3 at left, is a view of the complete unit and as shown in the sketch on page 22, the device is housed in the steel cabinet (5) is operated by floats (1) and (2) which rest on the water surface in two stilling wells, (1A) and (2A) fed from their respective forebays through inlets (1B) and (2B). The floats rise and fall equally with the normal rise and fall of the water surface on each side of the unit. The timing pulley (6) raises or lowers an equal amount in the opposite direction but does not rotate. However, if the upstream water elevation raises with respect to the downstream water elevation, the beaded timing cable (3) (attached to the floats and backwrapped around the stationary pulleys (4) and (7) will



DIFFERENTIAL FLOAT CONTROL

rotate the timing pulley. The peg (9), adjustable in slot (12) on the pulley, will pivot cam (10), energizing the mercury switch (11) which starts the demossing machinery. The machinery then runs until the water levels return to normal.

Mercury switch (13) is adjusted to signal an alarm in the Dispatch Center in the event the differential should reach an unsafe condition, which could occur if excessive amounts of trash and moss gathered on the screens. Micro switch (15) is activated by the raising of disc (14) attached to the timing cable which signals an unsafe high water condition in the upstream forebay (8) of the structure.

One of the new devices has been in operation for five years. Four more have been installed to control other demossing machinery in the canals in the past four years. Only periodic light lubrication of the pulley bearing has been necessary and no breakages or worn out parts have been experienced to date.

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