

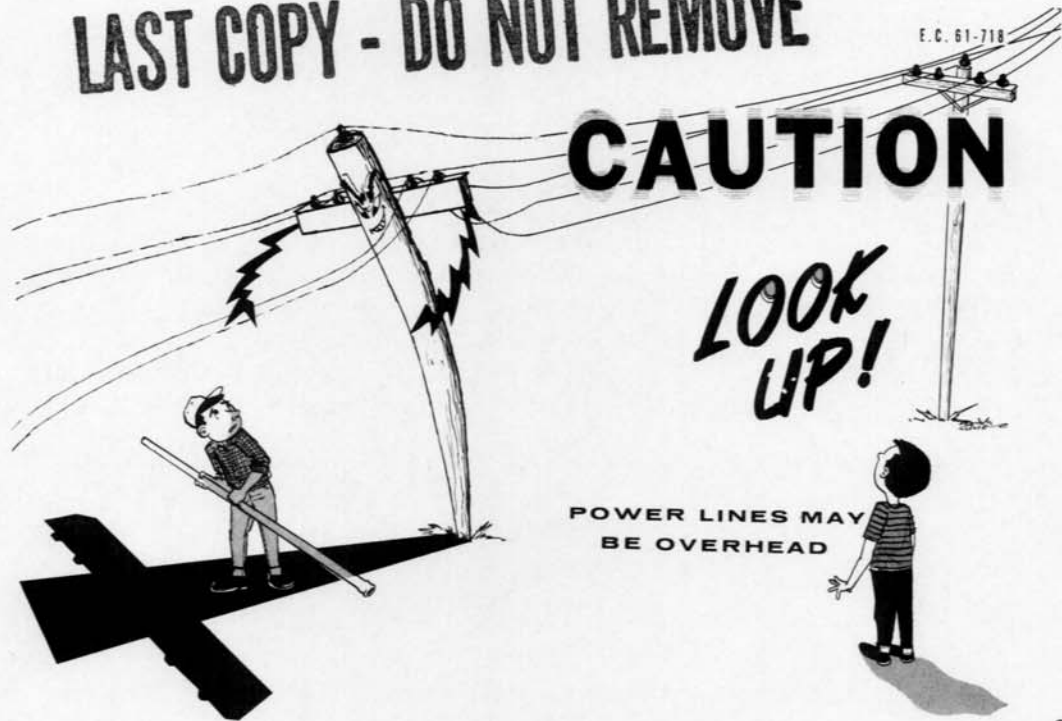
United States Department of the Interior, Bureau of Reclamation

IRRIGATION OPERATION AND MAINTENANCE

BULLETIN NO. 63

January, February, March 1968

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In This Issue:

- Operations and Maintenance Safety Program
- Lifting Device for Steel Cylinders
- What You Should Know About Motor Graders
- Hydraulic Pump Lubrication
- Preventing Equipment from Moving While it is Serviced
- Painting Inside Valve Boxes
- Dye for Weed Control Chemical
- Portable Compressors
- Some Ways to Prevent Engine Overheating
- Locating Blockage in Newly Laid Closed-Drain Systems
- Rules to Follow for Safe Lifting
- Corrosion Protection
- Care In Cleaning Paintbrush Pays Off
- Scraper and Sweeper for Cleaning Concrete Canal Linings
- Flow Meters

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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.

* * * * *

Division of Irrigation Operations
Office of Chief Engineer
Denver, Colorado 80225

ON THE COVER:

This drawing was made for the cover of a bulletin distributed to power subscribers in Nebraska, for the purpose of drawing peoples attention to overhead powerlines, and to the various types of accidents these lines have caused.



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INTRODUCTION

Beginning on page 1, an article that was presented to the Four States Irrigation Council, entitled "Operations and Maintenance Safety Program," gives some important reasons for a workable safety program and six points to consider when analyzing an accident.

An ingenious lifting device for steel cylinders can be found on page 5.

Keep them running is the aim of the article starting on page 6, written by a man who has been associated with the construction industry for the past 25 years. The article gives five important points to follow for keeping motor graders running in tip top condition.

When an hydraulic pump is headed for trouble, it usually gives some indication or warning. The article on page 8, may help you find the problem, if a pump does indicate such signs of distress.

The article on page 9, suggests various means to prevent accidents caused by operators of heavy equipment while it is being serviced.

A suggestion on page 10, for painting inside valve boxes, recommends a fluorescent paint to make equipment more easily seen. Another suggestion on the same page, recommends a dye to color the weed control mixture, so it will give a clear outline to an area being sprayed.

Proper cleaning and lubrication is essential to keep compressors working under tough field conditions, and of prime importance is an effective trouble shooting procedure. Starting on page 11, a program is outlined to accomplish such a purpose.

See page 13, for some practical ways to prevent engines from overheating.

The suggestion on page 14, shows a series of photographs of a systematic approach for locating pipe blockage in newly laid, closed-drain systems.

Some rules to follow for safe lifting is given on page 17, and starting on the same page a suggestion to prevent corrosion between the inlet and the measuring well on an irrigation structure.

Care in cleaning paintbrushes pays off, as this short article on page 18 points out.

Two suggestions for cleaning dead algae from concrete canal linings, starts on page 19.

A suggestion on page 23, to install two ceramic filters on each filter tank flowmeter, has proven to be a very worthwhile idea.

OPERATIONS AND MAINTENANCE SAFETY PROGRAM^{1/}

A worker gave this report of an accident that happened after a hurricane hit the British West Indies:

"When I got to the building, I found that the hurricane had knocked some bricks from the top of the building so I rigged up a beam with a pulley at the top and hoisted up a couple of barrels of bricks. After repairing the building there were a lot of bricks left over. I hoisted the barrel back up again and secured the line at the bottom, then went up and filled the barrel with the extra bricks. Then I went down to the bottom and cast off the line. Unfortunately, the barrel of bricks was heavier than I was and before I knew what was happening, the barrel started down, jerking me off the ground. I decided to hang on and halfway up I met the barrel coming down and received a severe blow on the shoulder. I then continued to the top, banging my head against the beam and having my fingers jammed in the pulley. When the barrel hit the ground, it burst its bottom, allowing the bricks to spill out. I was now heavier than the barrel so I started down again at a high speed. Half way down I met the barrel coming up and received severe injuries to my shin. When I hit the ground, I landed on the bricks, getting severe painful cuts from the sharp edges. At this point, I must have lost my presence of mind because I let go of the line. The barrel came down, giving me another heavy blow on the head and putting me in the hospital. I respectfully request sick leave."

This is funny, but it is something that does happen in our work. I hear a lot about incidents like this. Some of the things I point out today may be new to you and in some cases, it may be repetition.

To be of any value a safety program has to be backed by management. When we think of safety programs, there are two organizations that have the best safety programs in the world. One is the Space Program and the other is the Atomic Energy Program. These people get just one chance; if they goof off one time or goof up one time, they don't have a second chance. However, they have a good safety program and I wish we had the same type of program in agriculture.

Power Lines

Some associations conduct good programs for safety. One example is the Nebraska Intra-Industry Electric Council. They realized that people were being electrocuted as a result of coming in contact with overhead power lines. Five to eight people per year were being electrocuted as a result of coming in contact with overhead power lines while handling irrigation pipe. The Council contacted their electrician and myself to obtain any ideas we might have concerning this problem.

^{1/}Reprinted from the PROCEEDINGS. . . Four States Irrigation Council, 15th Annual Meeting, January 1966, as presented by Mr. Rollin D. Schnieder, Extension Specialist, Safety Cooperative Extension Service, University of Nebraska.

One of the proposals that we made was that the Council conduct a program of putting decals which read, "CAUTION, LOOK UP, POWER LINES MAY BE OVERHEAD" on electric irrigation wells. The Council placed 2,000 decals on irrigation pumps around the State of Nebraska and printed 20,000 copies of a bulletin with the same title, the cover of which is shown on the cover of this issue of our bulletin. Illustrations in the Council's bulletin show persons coming in contact with an overhead power line in many ways. These bulletins were sent to power subscribers, and the death rate from this cause went down dramatically. 1/

In 1961 there were no fatalities. In 1962 a 12 year old boy was killed at Minden, Nebraska. He raised an irrigation pipe to get a skunk out of the pipe and the pipe came in contact with an overhead power line. In 1964 a 15 year old boy was killed at North Platte, Nebraska.

In 1965, up until December 31, we had one fatality. It was a 27-year old man from Greeley, Nebraska, and on December 31, a 17 year old boy from Cozad, Nebraska came in contact with an overhead power line. We are still running one and two fatalities per year, but the good thing about it is that we dropped four to five per year since 1960.

It is interesting to note too, that all of these people that come in contact with an overhead power line are taking more electricity than the electric chair at the Nebraska State Penitentiary. The electric chair uses 2,100 volts to kill the person who is sentenced to die, while power lines carry from 2,300 to 7,200 volts.

When using cranes or other type of equipment where there is a possibility of coming in contact with power lines, remind operators using these machines, that if the crane does come in contact with a power line and they are going to get away from the machine they must jump free and jump far. If they are not injured and help is coming, they should stay with the machine because if they happen to touch the machine and the ground at the same time they will be electrocuted or badly burned.

Tractor Rollbars

You may have tractors to use for mowing on canal banks and along roads. Here again, be concerned about tractors tipping over. There is some thought about putting rollbars on tractors. If you don't have rollbars on your tractor, it would be wise to put them on at the first opportunity. There is no manufacturer of rollbars as yet, but there will be.

There were five people killed in Nebraska this year as a result of accidents involving "track" type tractors. One ran into a tree knocking a limb out of the tree and crushed the individual on the tractor.

1/Copies of this bulletin may be obtained by writing to:
Extension Service, University of Nebraska College of Agriculture,
Lincoln, Nebraska 68503 - Single copies will be furnished without cost. Quantity shipments are available at \$.05 per bulletin.

In three of the other cases, the tractor was actually upset and passed over the individual. If rollbars had been installed, they might have saved the individual's life.

Power Shafts

We put stories in the Nebraska Farmer, concerning this program and in these stories, we also included unprotected power shafts on irrigation pumps. Any time you have such a power shaft, you have the possibility of someone getting caught by the shaft. There are about 25,000 wells in the State of Nebraska. A lot of pump power shafts at these wells did not have shields on them. However, a couple of weeks after the story was written, I noted some of the power shafts had been shielded. Evidently, people read our story and were concerned. Some shafts were wire covered; some covers were made of wood; some were of hardware cloth; anything to get the shaft concealed; this was the important thing.

This story was repeated in the Nebraska Farmer, a year ago, and again we saw power shafts shielded--we hope as a result of our story. The FHA in Nebraska, in some of their loans on irrigation wells, requires that shields be placed on the pumps for the wells that are drilled.

I could present a number of cases in Nebraska where people have been caught in power takeoff shafts, especially where irrigation pumps were concerned. This is also true where we have stationary pump motors on irrigation wells. If an electric motor were the power source, a person could possibly be electrocuted, not only by the overhead power lines, but also by the wiring or motor.

Rotary Mowers

Rotary mowers are fairly safe unless one gets behind them. Mowers pick up rocks and other objects and can throw them as projectiles. We know of one case where a person was run over by a rotary mower and lived. He did come out chewed up as the mower passed over him while it was running.

Ditchbank Roads

When driving a car or tractor on canal banks there is the possibility of driving into the canal. One man drove a tractor into the canal, the tractor rolled over, the man was pinned under the water and he drowned. If a car goes into an irrigation ditch, tell your people to stay in the car until it hits bottom. This sounds like a foolish thing to do, but some research was conducted in Mississippi and Louisiana where cars were purposely sunk. People in the cars would try to get out when the car was floating. It was found there was too much pressure on the doors. If the people remained in the car and the car sank, pressure was equalized. They then could open the door and float to the water surface.

Color Coding

The Bureau of Reclamation is doing a real good job as far as safety is concerned. Those of you who walked through the laboratory probably did not realize the different colors were significant, but the whole laboratory is painted according to a color-dynamics code. They have orange, red, yellow, green, blue, and if they have any radioactive material, they surely would have purple.

You should notice that the electric boxes are painted orange and the water and air lines are painted green. The orange is for high-hazard equipment; the red is fire-fighting material, and the yellow makes hazardous equipment stand out so that you are not apt to run into it. If you have the time later on in the day, look at the different colors because they do follow a color-dynamics code.

Storing Materials

When you store materials that you use, keep in mind that a lot of them are very potent. Gasoline--1 gallon of gasoline--under ideal conditions is equal to 83 pounds of dynamite. If we had a gallon of gas in this room and it properly vaporized we could cause as much damage as would 83 pounds of dynamite exploding. Gasoline is a real potent material.

Analyze Accidents

There are six main points which I think are very important in analyzing an accident. An accident causes the following:

1. Immediate lost time while getting an injured employee to first-aid treatment and several other employees may have to leave their jobs temporarily to render assistance.
2. If the injury is serious, production drops sharply because everyone has the accident in mind and can't give full attention to the job, and a bad accident may affect the work program for several days.
3. Something has to be done about the injured employee's work. A temporary replacement may be required.
4. If the employee's accident is serious, he may not be able to do his full job when he returns to work and a light work program has to be arranged. This will affect production and efficiency.
5. If you have to substitute a less experienced worker for a regular employee, he may damage expensive equipment or machinery and he, too, might have an accident.

6. A serious injury lowers the morale of other workers and it may change the attitude of the injured employee and reduce his efficiency after he returns to the job.

Can you stand to have these six things happen? If not, then there are things that can be done. Set up a safety program for your organization.

* * * * *

LIFTING DEVICE FOR STEEL CYLINDERS (Suggestion No. R7-67S-12)



Figure 1 PX-D-58393



Figure 2 PX-D-58395

This is a suggestion by Mr. D. M. Wheatley, Granby Branch of the Colorado-Big Thompson Project, Bureau of Reclamation, Grand Lake, Colorado. His suggestion for a lifting device for handling CO-2 or oxygen (steel) cylinders as shown in Figure 1 at left, is both safe and practical. The device was very economical to build, and was fabricated in the Granby Pumping Plant shop, using materials on hand.

Anyone who has handled these cylinders knows that they are very difficult to handle, because of their size and shape. However, by the use of this device, as shown in Figure 2, two men can safely handle steel cylinders that weigh approximately 170 pounds.

If further information is desired concerning this suggestion, please write to: Regional Director, Bureau of Reclamation, Building 20, Denver Federal Center, Denver, Colorado 80225.

* * * * *

WHAT YOU SHOULD KNOW ABOUT MOTOR GRADERS^{1/} by John Herrick

A motor grader is like a carpenter's plane, its blade must have power behind it and it must be held steady or it cannot do the job it was designed to do. And it must also be carefully and properly maintained.

Here are the basic procedures which should be followed to get the most from your motor grader equipment.

First Things First

Before starting his machine, the operator should check the water level in the radiator and battery, and make sure that his engine oil is clean and at the proper level. These operations are familiar to the car owner, but they are even more important in working with construction machinery.

Have Air Cleaner Checked

The proper care of the air cleaner is frequently neglected. If the machine has a dry-type filter, the bottom should be removed and the dust knocked out. To do this, the pan is simply turned over and tapped with the hand. The pan should not be knocked against something solid. If the pan is bent, the filter will no longer be air-tight and the dirt will by-pass the filter and go right into the engine.

If the machine has an oil bath-type filter, the oil should be dumped out and the inside wiped with a clean cloth if there is dirt in the oil. Fuel oil can be used as a cleaning agent if the pan is excessively dirty, but the pan should be wiped dry before refilling it with oil. Otherwise, oil diluted with diesel fuel may be thin enough to be drawn down the air intake and the engine is likely to "run away" because it is getting both fuel and air through the air cleaner and the governor is by-passed.

The air cleaner should be serviced at least once a day under normal circumstances, and twice a day if the machine is working where there is a lot of dust.

Some air filters are equipped with an indicator which signals when the flow of air is restricted by a stopped-up cleaner. Lacking such an indicator, the operator should watch for a loss of engine power or excessive black smoke from the stack. These signs indicate that something is restricting the breathing of the engine.

Having dry fuel is just as important as having a clean air filter.

^{1/}Reprinted by permission of the editor from an article appearing in World Construction magazine of September 1967.

Water not only ruins fuel injectors, but it also rusts the inside of the tank. Rust particles are then free to circulate in the fuel system and the engine.

Keep Fuel Dry

On a diesel-powered machine, oil is being constantly pumped to the injectors. It flows around them and cools them and some of it is injected into the engine. The excess hot oil flows back to the tank and this stirs up any dirt or water present in the tank causing it to mix with the fuel.

It's a good idea to fill the tank to the top at the end of the work shift so moisture can not condense from the air in the tank as the fuel cools down.

Lubricate Daily

Once a day the grader should be lubricated. This can be done while the machine is being warmed up at the beginning of the shift or when it is idling down before being turned off. Detailed instructions are spelled out in operator or maintenance manuals.

While this is being done, the operator should be charged with the responsibility of looking over his machine for loose bolts, cracked welds and damaged tires. He should also check the cutting edges and scarifier teeth.

Maintaining proper tire pressure is particularly important in keeping the machine working at its best. All four tandem tires should be set at the same pressure to provide equal rolling radius of the wheels and prevent excessive tire wear.

The operator should also check the dipstick in the hydraulic reservoir. If the oil level is low each day, this indicates a leak somewhere in the system which should be reported to the maintenance department.

Where the circle or the wear plates on the drawbar are being worn excessively, it is good practice to flush them with a 50-50 mixture of clean fuel oil and engine oil. This will provide the needed lubrication and eliminate the possibility of dirt and sand getting into the grease where it can act as a grinding compound. Of course, any dirt that is stuck to the circle should be knocked off before it rides through the pinion and causes wear or jams the circle.

Look For Trouble

Whenever the machine is working, the operator should be watching and listening for signs of trouble.

He should be watching for excess oil on the arms of the hydraulic rams. If he finds it, he will know that a packing gland is wearing out and needs replacement.

If his blade or any other accessory does not stay put on a hydraulically-controlled machine, he should look for a leak. If the same sort of slippage occurs on a machine with mechanical controls, the mechanic should be called to check the thrust-bearing in the gearbox, or the tension on the anti-coast brake.

By following these suggestions and adhering to a regular program of lubrication and maintenance, the operator will have a machine that grades faster, smoother, with less effort.

* * * * *

HYDRAULIC PUMP LUBRICATION^{1/}

Pumps Can Starve, too

If a hydraulic pump is in distress, it usually gives some warning. When you hear an unusual noise or chattering, it is safe to assume the pump is starved for oil. It should be stopped immediately and the following steps taken at once:

1. Check the oil in the reservoir. A low level could provide insufficient head to keep the pump inlet filled with oil and could also allow air to enter.
2. Check the inlet screen to make sure it isn't clogged. Also check any filters in the system.
3. Check for air leaks in the pump seals and in the piping from the reservoir to the pump inlet. If you suspect that a seal or a joint is leaking, pour some oil over it. This will momentarily seal the leak and change the sound of the pump.
4. Check that the correct oil is being used. An oil that is too heavy will not flow fast enough into the pump inlet.

Engineers from a prominent oil corporation, advise against changing to a finer-mesh screen, installing a filter on the intake line, or changing to a fine filter cartridge without consulting the equipment manufacturer. Such attempts to get rid of dirt in hydraulic oil can prove to be damaging and result in oil starvation.

And if it is necessary to relocate the oil reservoir on a rig to accommodate a new accessory or attachment, be careful not to lower it. If the reservoir is being moved farther from the pump, you might consider increasing the inlet-pipe size.

* * * * *

^{1/}Reprinted by permission of the editor from an article appearing in Contractors and Engineers magazine of October 1966 issue.

PREVENTING EQUIPMENT FROM MOVING¹/
WHILE IT IS SERVICED

by
J. J. Veatch

When heavy earthmoving equipment is brought into a field service area or is stopped adjacent to the work site for servicing, the operators always dismount for a brief rest period. Over the years there have been many fatalities and serious injuries as the result of operators returning to their equipment and then starting and taking off before the service crew had completed its work.

Listed below are some of the devices used by contractors to prevent such accidents:

A heavy canvas cover, with "DO NOT OPERATE" painted on one side, was designed to slip over the steering wheels of rubber-tired equipment. For track-laying equipment, such as dozers, a wooden sign with the same wording is placed on the operator's seat. The steering wheel covers and signs are put in place by the foreman in charge of servicing and are removed by him when all servicing is completed.

In one contractor's maintenance shop, the foreman suspended a "DO NOT OPERATE" sign from an overhead roof truss, which could be raised and lowered with a sash cord. When a hauling unit was brought into the shop for servicing or repair, the sign was lowered into position directly in front of the operator. When all work was completed, the sign was raised.

On one large dirt job the contractor established a semi-permanent field service area. All equipment was brought to this area for servicing. The foreman in charge mounted a panel of lights in full view of operators. There was a light on this panel for each member of the service crew. When he started to service a piece of equipment, each crew member turned on his light. When he completed his assigned duties, he turned his light off. The operators were instructed never to move the equipment as long as there was a light burning on the panel.

Regardless of the method used to eliminate this hazard, it should provide positive assurance that all persons are in the clear before equipment is moved.

Reliance should never be placed on the safety consciousness of persons exposed to hazards, where it is feasible to provide protection against human error.

* * * * *

¹/Mr. J. J. Veatch, Chief, Safety Office Missouri River Division, Corps of Engineers, Omaha, Nebraska.

PAINTING INSIDE VALVE BOXES
(Suggestion No. R1CB-67S-3)

Mr. Emil Zourda, Power Field Division, Columbia Basin Project, Ephrata, Washington, suggests painting with a light reflecting fluorescent material the inside of underground valve boxes and also the pipe inside the boxes that protects valves and other equipment. He made the suggestion because it was so difficult to see to any reasonable depth in the usually unpainted box or where the box and pipe was protected with unreflecting or even light absorbing paint.

By shining a light into the fluorescent painted interior, it is reported that the reflected light makes it possible to easily see the position of valves and other equipment.

* * * * *

DYE FOR WEED CONTROL CHEMICAL
(Suggestion No. R2-67S-33)

In field operations work of a more urgent nature may take preference over the weed control operation. When this happens a spraying job may have to be postponed. Several days may elapse before operations are resumed. It is almost impossible to see where the operations were stopped. When this happens there is a good chance of overlapping or missing an area entirely.

Most chemicals, particularly those of the ground sterilent type, are colorless. These chemicals do not affect the weed foliage immediately because rain is needed to activate them. Mr. Edmon D. Pruett, Folsom Field Division, Central Valley Project, Folsom, California, suggested coloring the sterilent mixture, with a dye.

When a dye is used and the work is resumed, even after several days, a clear outline of the area already sprayed is easily apparent. Accordingly, no material is wasted, there is no lost motion, and the possibility of over activating an area is also eliminated.

Mr. Pruett's idea has been used for some time in weed control operations.

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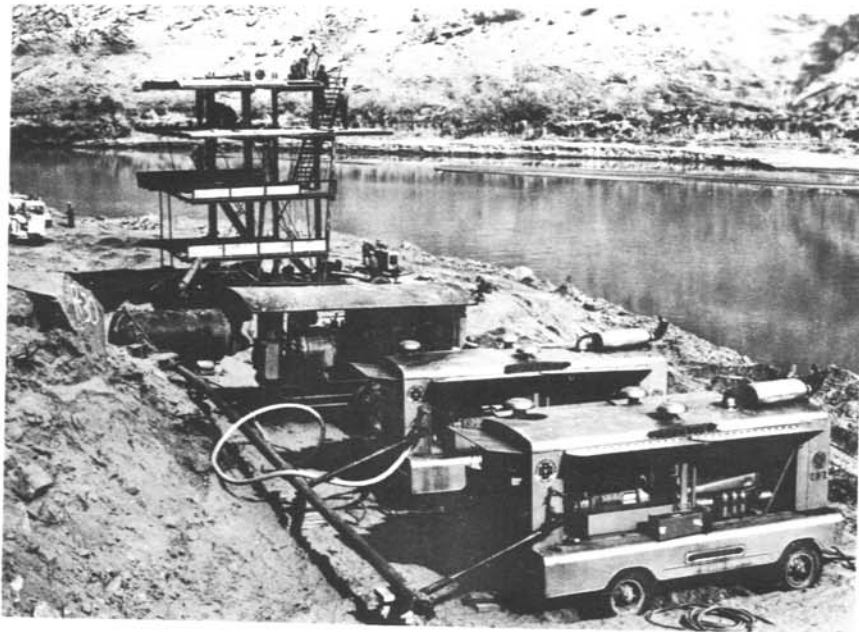
Things do not get better by being left alone. Unless they are adjusted, they explode with a shattering detonation.

Sir Winston Churchill

PORTABLE COMPRESSORS^{1/}

A maintenance program for portable compressors, whether piston, rotary or screw type, stands or falls on basic principles: proper cleaning, lubrication, and responsible record keeping. But maintenance is sometimes reduced or ignored under day-to-day pressures, and breakdowns will occur. The repairman must have a quick and efficient troubleshooting procedure if downtime is to be kept to a minimum, and keeping these air compressors running as shown in the photograph below is of major importance on any construction site.

The following program suggests what to look for when the compressor is overheating, when trouble shows up in the lubricating and cooling-oil system, or when lack of speed signals danger.



Photograph 1 P557-D-60394

Overheating

Overheating of the compressor and subsequent "tripping" can be caused by several factors, such as clogging of the oil filter or the oil cooler, or a block in the lubricating and cooling-oil system. The oil filter should be removed and the sumps and cartridges cleaned. Check the oil cooler for flow resistance, and flush and clean the lubricating and cooling system if it should appear to be necessary.

If the unit is automatically shutting down and the oil line to the cooler is hot while the return oil line is cool, check and clean the cooler and

^{1/}Reprinted by permission of the editor from an article appearing in Contractors and Engineers magazine of October 1966.

filter. The thermostatic bypass should be cleaned. Pay particular attention to the relief-valve parts.

Something as basic as the wrong type or grade of compressor lubricating and cooling oil is a common cause of overheating. Specification requirements must be followed.

Low discharge-air pressure caused by a faulty minimum-pressure valve can starve the compressor of lubricating and cooling oil by cutting off suction at the oil pump. (The unit should not be operated below 45 psig.) The resulting high operating temperatures will, under normal conditions, cause the discharge-air temperature switch to function. The remedy, of course, is to repair or replace the minimum-pressure valve.

The oil-pump discharge pressure should be checked. The bypass valve on the receiver-separator should be removed and inspected, it may be stuck open. It should be cleaned or replaced if it still does not work properly.

Failure to trip or shut down when the compressor is overheating signals trouble in the discharge-air temperature switch. Improper connections or defective wiring might be the cause of an open or short circuit in this switch, or the trouble might be in the switch itself.

After the wiring has been checked, remove the switch and test its operation by placing the bulb end in an oil bath heated to 225 degrees F. Tap the switch lightly and replace if it is defective. Do not operate any unit with a defective switch nor by shorting out the switch.

Lubricating and Cooling System

The receiver-separator may get clogged with debris and the oil cooler filled with sludge and lacquer deposits. Both cause a definite drag on the compressor's lubricating and cooling-oil system. When either occurs the system must be drained. If the trouble is in the receiver-separator, it should be cleaned and flushed and the secondary separator element replaced if that is excessively deteriorated. If the oil cooler is clogged, it must be removed, cleaned, and flushed.

Excessive consumption of lubricating and cooling oil can be caused by a clogged screen in the scavenger line at the receiver-separator cover, or by a plugged orifice in the scavenger line at the gear case. A deteriorated secondary separator element could cause excessive consumption. It should be removed and the media in the element fluffed out to create better contact with the shell. If advanced deterioration or compressive settling is indicated, the element must be replaced.

Engine Speed

Lack of speed is often simply the result of the poor operating condition of the engine. But the cause may lie elsewhere, such as the engine speed regulator being out of adjustment. Inspect the inlet unloader operating control diaphragm for possible plugging of orifice and air passage, clean and replace it if necessary.

The diaphragms, the engine speed regulator metering pin, and the regulator lever diaphragms must also be inspected for leakage. The regulator metering pin and the metering pin seat should be checked for improper seating, which might be caused by scaling or rust.

Improper seating of the metering pin might result in irregularities in the regulator, which should then be removed and disassembled and the metering pin and seat cleaned and replaced. Also inspect the regulator-level diaphragms for wear and deterioration.

Oil-Pressure Gage

If the oil-level gage isn't working, drain the lubricating and cooling oil and remove and inspect the gage float for clogged oil. If the float leaks or has collapsed, replace the gage.

Another cause of gage failure is clogging of the magnetic end of the float shaft by attracted particles. After removing the gage, clean the magnetic arms and make sure that the receiver-separator is thoroughly cleaned and flushed. Finally, refill the oil system with new oil.

* * * * *

SOME WAYS TO PREVENT ENGINE OVERHEATING

There are many reasons why an engine overheats. Often a plugged radiator is the cause. Blow it out with compressed air.

Lint and dust on the outside surface of an engine can contribute to overheating. Wipe off the outside of the engine.

Late timing or a lean fuel mix can cause heat. So can the wrong pressure cap. Check these items.

It is also suggested that you check the water pump, fan belt, coolant level and thermostat.

* * * * *

In order that people may be happy in their work, these three things are needed: They must be fit for it, must not do too much of it, must have a sense of success in it.

LOCATING BLOCKAGE IN NEWLY LAID
CLOSED-DRAIN SYSTEMS
(Suggestion No. R1CB-66S-73)

Here is a suggestion for locating blockage in newly laid, closed-drain systems by Mr. J. C. Cameron, of our Columbia Basin Project Office, Construction Field Branch, Ephrata, Washington.

After closed drains are installed the lines are inspected to assure that they are clear of obstruction and will carry the desired flow of water. The present method of inspection is to float a ball through the newly completed drain. This method is satisfactory providing there is sufficient water flowing through the line and the line is clear. If the ball is caught somewhere in the line, it sometimes becomes very expensive for both the contractor and the Bureau to excavate and break the line on a "trial and error" basis in an attempt to locate the obstruction.

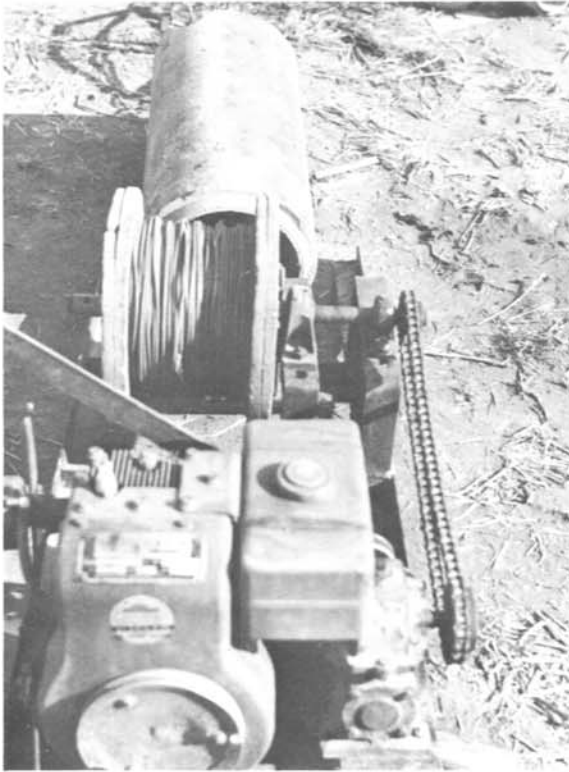


Figure 1 P222-D-60393

A more efficient method suggested by Mr. Cameron, is to pull a light-weight aeroplane control cable through the pipe, as illustrated in Figure 1 above, when laying the pipe.

This cable should be of sufficient length to reach through the entire pipe from manhole to manhole or from a manhole to the end of the drain. The cable is spooled off of a small spool carrier winch shown in Figure 2, on next page, and threaded through the pipe as it is laid.

When the backfill is completed and the pipeline is ready for testing, a specially designed torpedo-shaped "pig" shown in Figure 3,



is fastened to the outlet end of the cable. Another cable is fastened to the end of the "pig," and the assembly pulled through the pipeline.

Figures 4 and 5 on the following page show how the "pig" should enter, and be pulled through the pipe.

If an obstruction is encountered, the back cable is marked. The "pig" is then pulled back out of the pipeline, and the distance of the obstruction from the pipe outlet is then measured from the "pig" to the mark on the line.

Figure 2 P222-D-60395



Figure 3 P222-D-60396



Figure 4 P222-D-60397



Figure 5 P222-D-60398

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RULES TO FOLLOW FOR SAFE LIFTING

What have you lifted lately? Despite mechanical aids and improved methods of lifting and carrying, whether on or off the job, many materials still require handling by hand. Steer clear of two common dangers, hernia and back injury, in unsafe lifting by following these simple rules:

1. Examine the load carefully. Use mechanical aids or get help if you can't manage it easily.
2. When lifting a heavy object, get as close to it as possible, plant your feet firmly apart and crouch squarely in front of it.
3. Get a firm grip, keep your back straight (not arched), and push up slowly and evenly with your legs.
4. When turning with a heavy load, shift your feet. Don't twist your body.
5. Lower the object by keeping the back straight and bending the legs. If the back is kept straight and pushed from the top or bottom, it's extremely strong. Pull it out of line and it collapses.

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CORROSION PROTECTION (Suggestion No. R7-67S-52)

If there is a corrosion problem between the inlet and the measuring well of an irrigation structure, the problem could be solved with the following suggestion by Mr. Arthur L. Chester, Hydraulic Engineering technician, Kansas River Projects Irrigation Division, McCook, Nebraska.

Mr. Chester suggests the use of copper, cast iron or plastic pipe as a casing to protect any kind of pipe that was installed between the concrete of the inlet and the measuring structures. See Detail A, and B, in Figure 1, on the next page.

If copper, cast or plastic pipe were used on the measuring wells of these structures it would eliminate the need of replacing pipes that have deteriorated by chemical action.

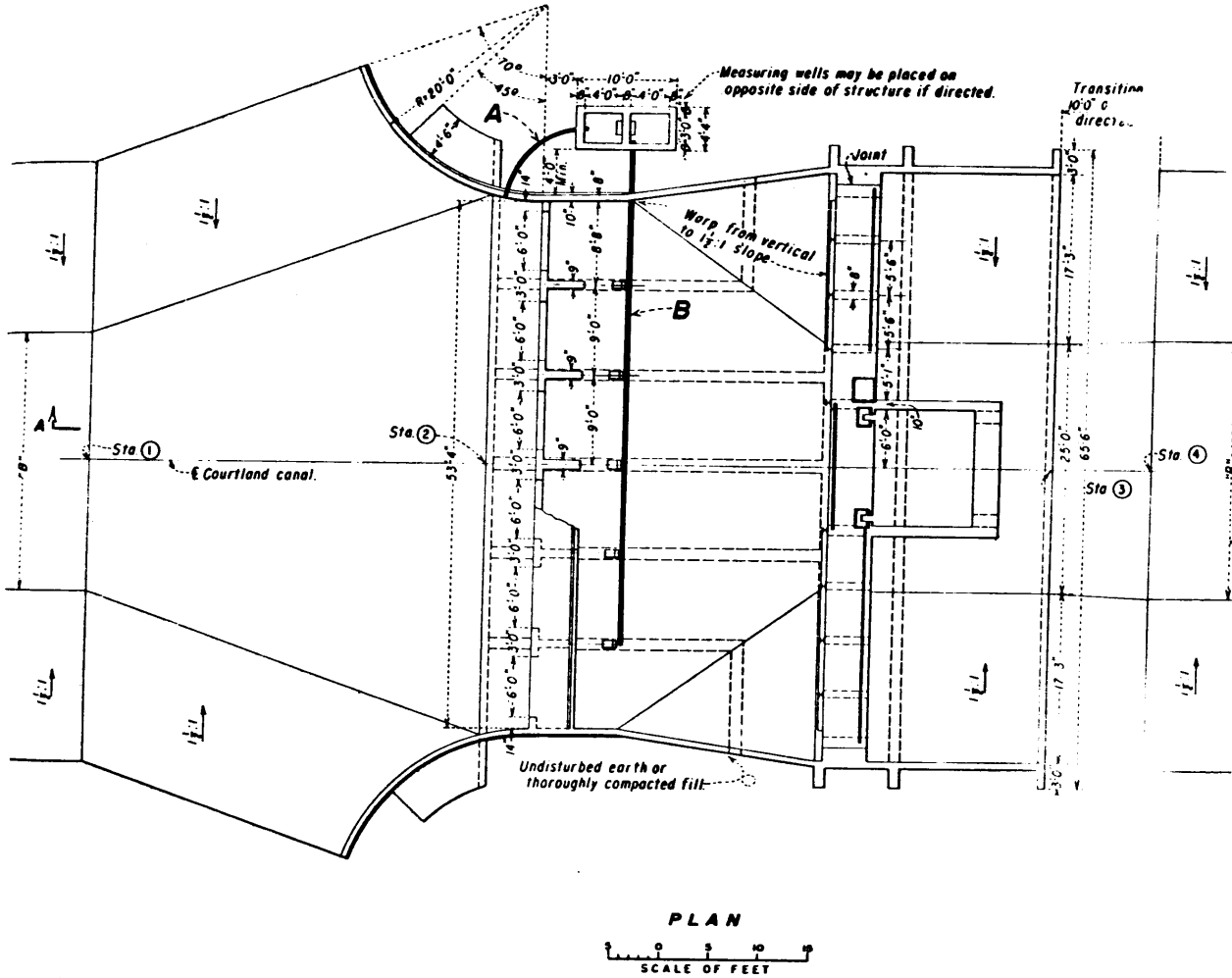


Figure 1

CARE IN CLEANING PAINTBRUSH PAYS OFF

When a fast-drying latex paint has been used, clean your brush immediately with mild soap and water, followed by a thorough rinsing.

A brush that has been used with an oil-base paint, enamel, or varnish can be properly cleaned with turpentine or mineral spirits if the paint has not dried in the brush.

When shellac has been used, alcohol is the best cleaning agent.

SCRAPER AND SWEEPER FOR CLEANING
CONCRETE CANAL LININGS
(Suggestion No's. R7-68S-15 and SPRP-67-10)

These two suggestions were submitted by Mr. Grant H. Burkard of the Irrigation and General Maintenance Division, Colorado-Big Thompson Project, Loveland, Colorado, for cleaning algae from concrete canal linings.

On certain features of this Project the water flowing through concrete lined canals contain microscopic plants or filamentous green algae. This algae will thrive year-around in a canal when the water flow and sunlight are sufficient to maintain growth. To impede the growth of this algae, copper sulphate solution is injected into the canal every 2 weeks.

Once each year, the Pole Hill Canal is drained and the accumulation of dead algae is cleaned from the lining slopes. Photograph No. 1 below, shows a view of the canal taken during cleaning operations. It shows a typical amount of dead algae that accumulates in the canal each year and it presented a serious cleaning problem prior to the fabrication of a scraper and sweeper.

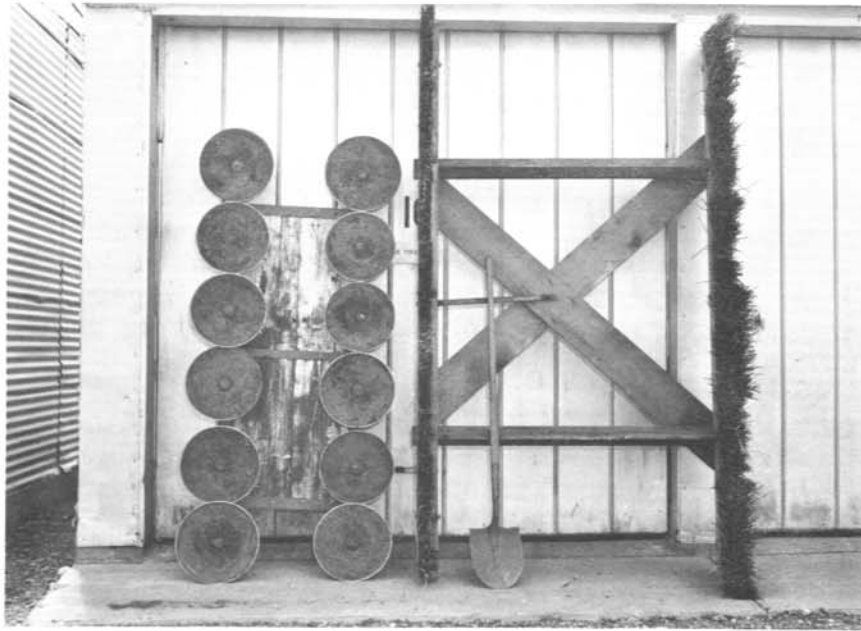


Photograph 1 P245-713-4040NA

Disk Scraper

The "Disk Scraper" consists of 12 blades, as shown in Photograph 2 on the following page. It shows two rows of six each, of the type used on farm disks and attached to a metal frame with a bolt and coil spring

arrangement to permit individual verticle blade movement, on uneven surfaces.



Photograph 2 P245-713-4045NA

Photograph 3 below, shows how the scraper is used on the surface of the canal. This scraper should be used as soon as possible after the canal is drained since the algae scrapes off easier when wet. The algae still adhering to the concrete will be brushed off when dry with the sweeper.



Photograph 3 P245-713-4041NA

Sweeper Assembly

The "Sweeper Assembly" as shown in Photograph 2 on the preceding page, consists of a row of 14 straight back 7-1/4" x 2-1/4", wire brushes, and a row of six fiber bristle stable brooms, 3-1/2" x 16", attached to a wooden frame.

Photograph 4 below, shows the sweeper being placed in operation in the canal, from which algae has been removed by scraping, after the algae has dried and has begun to curl. It usually takes about 24 hours for that portion of the algae, still adhering to the concrete, to dry sufficiently for brushing. Photograph 5, on the next page shows the concrete lining after it has been cleaned of algae by using both the scraping and sweeping processes.

Additional details of the scraper and sweeper assembly are shown in Photograph 6, on the next page. The Irrigation Operation and Maintenance personnel, of the South Platte River Project, Loveland, Colorado, were instrumental in putting this assembly together.



Photograph 4 P245-713-4042NA

If further details are required, they may be obtained by writing to:
Regional Director, Bureau of Reclamation, Building 20, Denver
Federal Center, Denver, Colorado 80225



Photograph 5 P245-713-4043NA



Photograph 6 P245-713-4044NA

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FLOWMETERS
(Suggestion No. R2-66S-95)

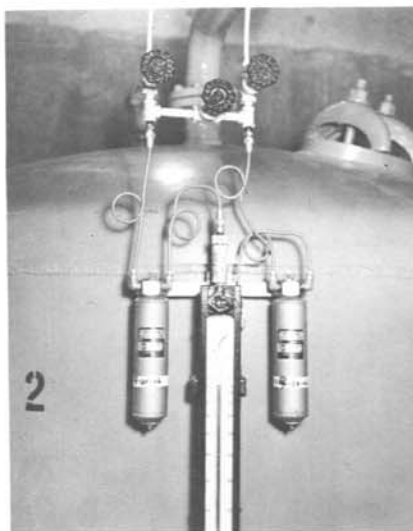
An idea by Mr. John M. Borejko, of the Central Valley Project, Tracy Field Division, Tracy, California, will save time in the cleaning of flowmeters on filter tanks. A typical flowmeter hook-up is shown in Photograph 1.



Photograph 1 P214-D-60399

As shown in Photograph 2, this suggestion calls for the installation of two ceramic filters on each filter tank, to stop the sediment from collecting in the reservoir in back of the flowmeter.

A trial installation of filters in the lines as shown in the photograph, has proven to be a practical means of preventing sediment from collecting in the flowmeters. Similar installations at the Tracy Pumping Plant are planned for the near future.



Photograph 2 P214-D-60400

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