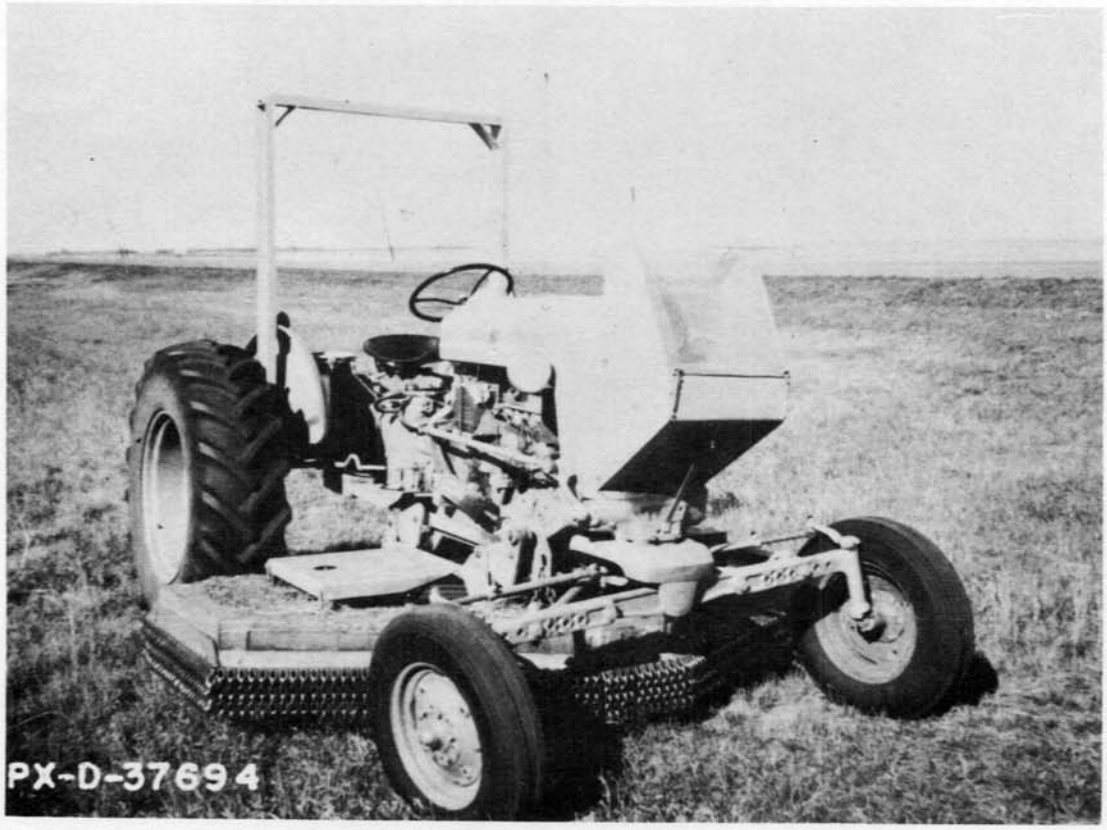
Department of the Interior
Bureau of Reclamation

OPERATION AND MAINTENANCE EQUIPMENT AND PROCEDURES

RELEASE NO. 43

January, February, and March 1963



CONTENTS

Cover sheet. The North Dakota Highway Department decided something should be done to stem the rise in accident rates due to its motor graders tipping over while mowing weeds on highway rights-of-way. As a result, the Department installed "anti-roll bars" on all of its field mowers. See article on page 21.
PX-D-37694.

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INTRODUCTION

The Operation and Maintenance Equipment and Procedures bulletin, published quarterly, is circulated for the benefit of irrigation project operation and maintenance people. Its principal purpose is to serve as a medium of exchanging operation and maintenance information. It is hoped that the laborsaving devices or less costly equipment developed by the resourceful water users will be a step toward commercial development of equipment for use on irrigation projects in a continued effort to reduce costs and increase operating efficiency.

This issue, Release No. 43, includes an article on liquid petroleum fuel for trucks, page 1; and an article on a maintenance inspection vehicle used on the Columbia Basin Project, page 8. Also of some interest although unusual in the Western United States, is an article "Using Airboats for Spraying" describing operations in backwater areas of Florida, page 11.

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 Awards Committee when a suggestion is adopted.

Mr. C. R. Brandenburg, who with J. W. Hamm, both then of the North Platte Projects area of the Bureau of Reclamation, calls attention to an omission in the write-up of their joint suggestion for construction of a 32-volt lighting system, page 5 of Release No. 42. Mr. Brandenburg states that the 32-volt side of the transformer also is grounded at the neutral point making use of the lower voltage system even more safe.

* * * * *

Division of Irrigation Operations
Office of Chief Engineer
Denver, Colorado

LP FUEL FOR TRUCKS

by Sanford Caudill, Manager,
Arch Hurley Conservancy District
Tucumcari, New Mexico

Substantial savings have been made by the use of liquid petroleum (LP) fuel on the Tucumcari Project in New Mexico, operated by the Arch Hurley Conservancy District. The District has used LP fuel for two seasons in 1/2-ton ditchrider trucks, 1 year in 8-yard trucks, and in other vehicles and equipment, including a maintenance and service pickup, a Gradall truck and power unit, and a truck equipped with a 4-cylinder power unit and 500-gallon tank for weed burning. A part of the fleet of trucks equipped for the use of the LP fuel is shown in Photograph No. 1.

Photo No. 1

It has been estimated that the investment involved in converting the equipment to LP fuel operation will be recovered in less than 3 years in the saving of fuel alone. Other apparent savings include a saving of oil in the larger trucks and longer motor life.

Fuel Cost

The cost of LP fuel for summer use, May through October was 5-1/2 cents per gallon in 1961 and 5 cents in 1962. Winter fuel costs were

higher, 6-1/2 cents per gallon in 1961 and 6-1/4 cents in 1962. By way of comparison, the cost of gasoline for 1961 and 1962, respectively was 13.38 cents and 13.3 cents per gallon, respectively. A tax of 6 cents per gallon must be added, since such a tax is paid on both gasoline and LP fuel.

Bids for fuel purchases are called for twice each year; and since most of the fuel is used during the summer months, there is a distinct advantage in purchasing as much fuel as possible at that time. Storage facilities, of course, must be provided and those should be of adequate capacity to take advantage of lower summer fuel cost. There is also an advantage costwise by buying fuel in larger quantities. Bulk purchase has saved 2.9 cents per gallon compared with the purchase in 400-gallon lots.

One-half Ton Trucks

The mileage per gallon of fuel--11 miles per gallon--has been found to be practically the same for both gasoline and LP fuel in the operation of the half-ton trucks. However, the vapor remaining in the 83-gallon LP fuel tanks makes exact mileage computations difficult. For instance, it has been found that after the fuel gage registers empty, half-ton trucks have been driven as much as 56 miles, apparently from the vapor remaining in the fuel tank. When tanks are refilled, this vapor is pumped back into the storage tank.

Available records for 1959 for six half-ton ditchrider trucks, show a gasoline fuel cost of $1,868.64, or $311.44 per unit. The LP fuel equipped units used in the same water distribution districts were operated for $862.86, or $143.81 per unit in 1962. Part of this saving resulted from the need for fewer refueling trips. The six gasoline-powered units averaged 158 trips to the gasoline pump. The mileage driven to the shop for fuel--about 30 miles for a single unit--was reduced from a daily basis in the case of gasoline-powered units to about a twice a week basis for LP fuel-powered units, depending upon how much LP fuel was used for weed burning.

An LP fuel-powered ditchrider unit, equipped for weed burning as well as other duties, is shown in Photograph No. 2. There is a distinct advantage of having the ditchrider attend to weed burning in troublesome spots, such as weir pools, etc. This is conveniently possible with an adequate supply of fuel provided from the 83-gallon tank mounted in the truck bed. Accounting for the LP fuel used in weed burning can be a cost factor that needs to be considered in some States. In New Mexico, there is a State tax on fuel for our vehicles. There is none, of course, on fuel used in weed burning. Separating the costs with fuel supplied from a single tank on a unit complicates the tax and fuel cost records. Presumably, this problem can be solved to the satisfaction of all concerned.

Photo No. 2

Pickups do not have quite as much power for "jack rabbit" starts. The District ditchrider trucks are equipped with 16-inch wheels and heavy duty tires, accordingly, less spinning of power wheels occurs. Drivers soon learn this difference in driving the units and often a lower gear must be used. However, the additional weight of the LP fuel truck and fuel has not been a problem. Often the additional weight has contributed to needed truck traction. Wet weather travel also is helped by the weight. The ditchrider trucks also can be operated with gasoline as the fuel, if necessary, and a single switch enables the driver to change to gasoline.

It has cost the Arch Hurley Conservancy District $232.48 to convert each of the half-ton trucks to LP fuel operation, not including the 83-gallon fuel tank. The tanks have cost an additional $22 per unit. Equipment needed for conversion of the half-ton trucks to LP fuel operation include the following:

1 - 83-gallon tank 24-48-inch diameter
1 - 3-way switch
2 - Solenoid switches, one for gas, one for propane, 12-volt
1 - Adapter for cab

1 - Heat exchange
1 - Fuel strainer
1 - 12-foot length high pressure hose and 3/8-inch copper tubing
1 - 6-foot length water hose, 5/8 inch
8 - Clamps
15 feet C12E wire
2 - 3/8-inch tee pipes
8 - 3/8-inch nipples
1 - 3/8-inch tee, 3/8 by 3/8 by 3/8 flare type
6 - 3/8-inch flare nuts
2 feet fuel hose, 7/8 or 5/8 inch to carburetor
2 - 1/4-inch bolts, 2-1/2 inches long
1 - 1/8-inch pipe nipple

Eight-ton Trucks

The 8-yard trucks, Photograph No. 3, have averaged 5-1/4 miles per gallon. These trucks are powered with 345-horsepower "V"-type,

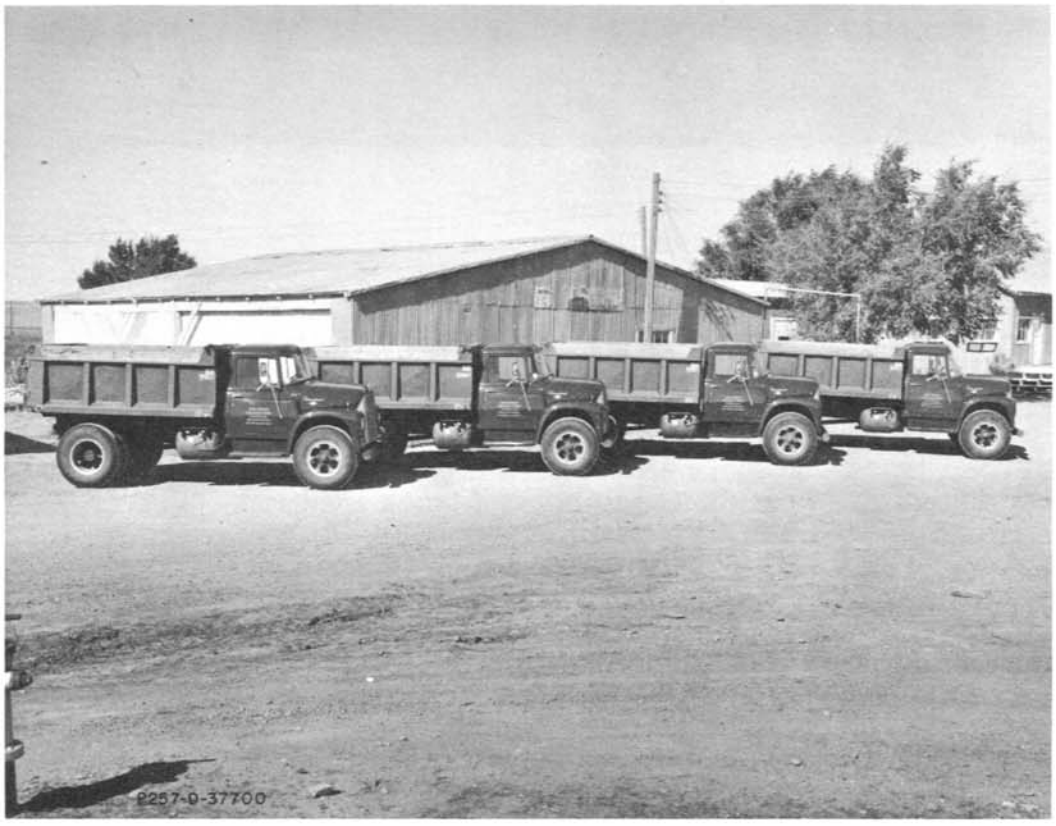


Photo No. 3

engines and arrive on the project factory-equipped for operation with LP fuel and develop approximately the same horsepower as gasoline engines. Records for the first year of operation of the 8-yard trucks

show that 3,070 gallons of LP fuel were used per truck. At a saving of 8 cents per gallon for fuel per truck or $245.60, the yearly saving in fuel alone for the four trucks amounts to $982.40. There also has been an apparent saving of oil of $44 per year. This total saving, then, is $1,026.40 on the four trucks.

The factory equipped LP fuel burning 8-yard trucks were supplied at an additional cost of $87 each, above the cost of conventional gasoline burning equipment of the same capacity. Accordingly, the total additional cost for the four trucks was $348.

Other Equipment

The Gradall and weed burning truck and the auxiliary equipment on these units were furnished by the manufacturers equipped for operation with LP fuel. Other equipment purchased for the storage and handling of the fuel, which was purchased in 5,400-gallon lots, includes:

1 - 6,000-gallon LP gas 250-pound stress-relieved storage tank with hemispherical heads, 66 inches O.D. by 39 feet 6 inches O.A. or equivalent.

A set of LPG fittings, including a float gage and safety valves for withdrawal.

2 - 18-inch-high metal saddles.
1 - 5-horsepower explosionproof 60/220 manual starter.
1 - 2- by 2-inch explosionproof flange LPG pump for loading or unloading.
1 - Explosionproof electric 60/220 5-horsepower motor.
1 - 20-foot length - 3/4-inch LPG vapor hose
1 - 20-foot length - 1-inch LPG liquid hose
1 - 12-foot length - 2-inch LPG liquid hose
Clamp-type couplings for hose:
2 - 3/4-inch couplings
2 - 1-inch couplings
2 - 2-inch couplings
Valves:
1 - 3/4-inch valve
1 - 1-inch valve
1 - 2-inch valve

Initial Costs

The total cost involved in the preparation for the LP fuel operation is as follows:

6,000-gallon tank plus motor, pumps, valves, hose, electrical connections, etc.	$4,243.30
Pump and tank installation	312.00

9 conversion units and tanks	4 in 1961	$ 929.93
	4 in 1962	932.45
	1 in 1961	259.00
500-gallon supply trailer and butane vapor pump.		417.00
Extra for factory LP engines for 8-yard trucks ($87 per unit).....		348.00
Saddle tanks, two per truck (8 tanks).....		814.56
Tank installation on 8-yard truck ($34)		136.00
	Total	$8,392.24

Comments

The estimated savings in fuel costs can be summarized as follows:

Total Savings:

4 - 8-yard trucks	$1,026.40
9 - 1/2-ton trucks.....	1,508.67
Gradall and power unit.....	307.00
Weed burner truck and power unit.....	139.00
Savings of 2.9 cents per gallon LP fuel for weed control, by buying in bulk in place of 400-gallon lots	734.80
Total fuel saving in 1 year	$3,715.87

In addition to the savings in fuel costs, there are other apparent advantages to the use of LP fuel. Properly equipped LP fuel-burning motors actually present fewer starting problems. An accumulation of moisture appears to be a problem that does not exist and dirty fuel problems are practically eliminated. The unaccountable loss of LP fuel has been much less than gasoline.

It is believed that motor life will be extended at least 25 percent by the use of the LP fuel. The savings involved by extending the useful life of motors has not been evaluated, but this is a definite savings in operation costs and can be more properly evaluated as service records become available.

Vehicles can be fueled at the project bulk fuel storage facilities, Photograph No. 4 in the next page. In addition, a 500-gallon trailer equipped with a vapor pump, Photograph No. 5, is generally kept in the vicinity of truck operations. This cuts down truck travel at fueling time. The 500-gallon tank trailer also is used with the weed burner truck during the summer.

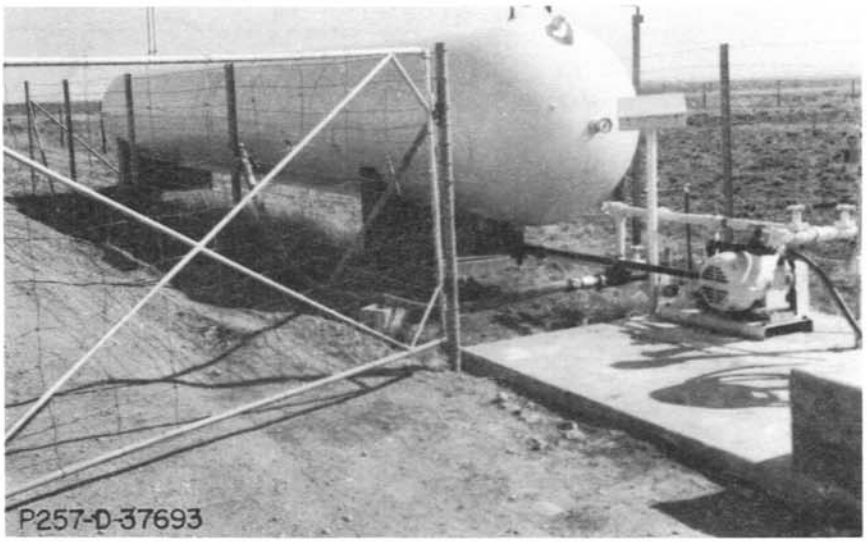


Photo No. 4

Photo No. 5

There is one word of caution--Safety needs to be stressed in the handling of LP fuel. Those handling the fuel should be trained in its use.

If additional information is desired on the LP fuel operation on the Arch Hurley Conservancy District, write Mr. Sanford Caudill, Manager, Arch Hurley Conservancy District, Tucumcari, New Mexico.

EDITOR'S NOTE: The use of LP fuel on other irrigation projects was discussed in the Irrigation Operators' Workshop held in the Office of Chief Engineer, Bureau of Reclamation, Denver, Colorado, December 3-7, 1962. W. D. Parish, Manager, Hidalgo and Cameron Counties Water Control and Improvement District No. 9, Mercedes, Texas, has stated that similar economies have resulted from the use of LP fuel in operation and maintenance of the irrigation system on the Mercedes Division of the Lower Rio Grande Rehabilitation Project. Additional information can be obtained by writing Mr. Parish.

* * * * *

MAINTENANCE INSPECTION VEHICLE

Each fall the major facilities on the Columbia Basin Project are inspected by various supervisory personnel. The inspection group varies in number from 7 to 10 people, which necessitates 2 sedans for transportation. In addition to the inspections made at the various stops, it is very desirable to be able to view the channels, structures, etc., en route between stopping points. Visibility from a sedan as one travels along is poor at best, especially for the people sitting in the middle or on the offside. Getting in and out of the modern sedan is time-consuming and awkward, especially when heavy coats, overshoes, etc., are being worn. Conversation between stops also is limited to those riding in a particular car.

In order to overcome some of the above problems, it was suggested that the inspections be made with the inspection group standing in the back of a pickup.

Photo No. 1

The photograph at left and those on the following page show how a pickup was remodeled to provide a wind shelter as well as a handrail for support while traveling.

The framework for the wind shelter is of 1-inch reinforcing steel bars welded together. Attached to the framework is 1/2-inch plyboard. The frame is

Photo No. 2

Photo No. 3

easily installed or removed from the pickup and provides safe side racks to permit personnel to ride standing on the pickup bed. The solid panels of plywood and the heavy clear plastic windshield provide shelter from the wind. Metal wind and dust deflectors are attached on either side of the windshield and on either side at the back of the box.

The important factor is that while driving along a canal practically the entire wetted perimeter of the channel can be visually inspected. Stops are made where closer examinations are desired.

The inspection vehicle also can be used to advantage in checking and developing annual maintenance programs; making an examination of distribution systems; and taking tours over projects with the Board of Directors.

* * * * *

INSULATING BLOWOFF AND AIR VALVE STRUCTURES

Polystyrene insulation is being used to protect equipment in blowoff, and air valve structures of the Foss Aqueduct, Washita Basin Project, Oklahoma, from freezing. Typical is the installation made in the blowoff structure shown in Photographs No. 1 and 2 on the following page where the 2-inch-thick material is installed on the walls and entrance hatchway of the structure.

Photo No. 1

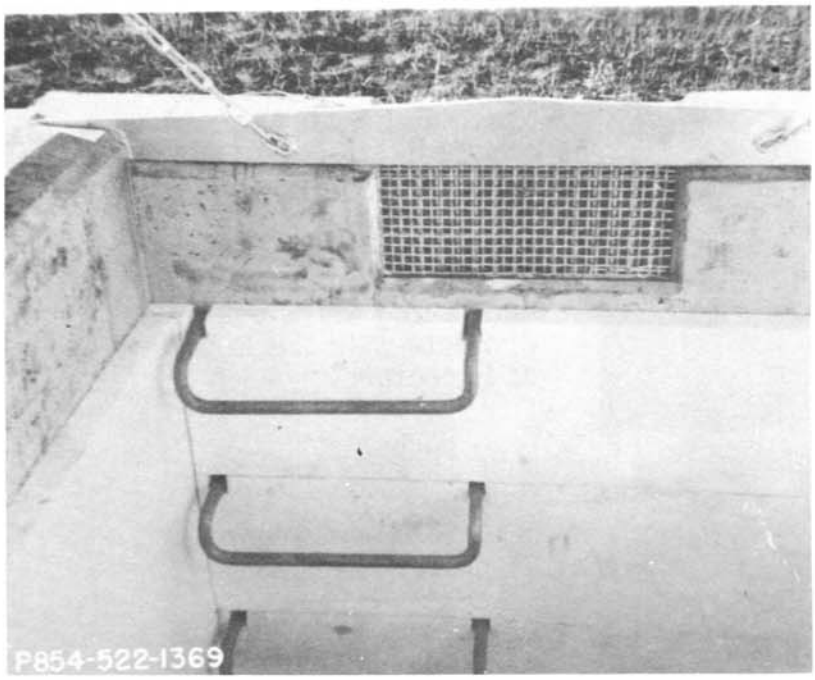


Photo No. 2

More detail of the cover or lid is shown in Photograph No. 2.

Note that the edges of the cover sections have been rabbeted and that plywood reinforcement on the underside of the lid has been provided for the rope-lifting loop to prevent damage to the insulating material.

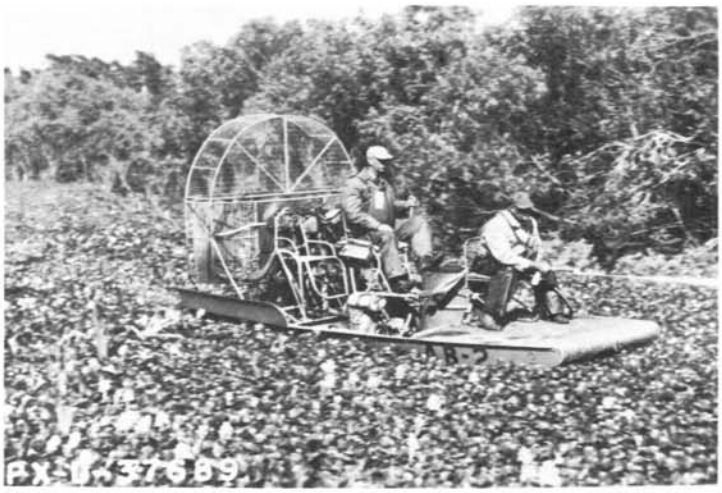
The polystyrene is easily cut to size and can be readily cut to fit around embedded metalwork, such as the embedded ladder rungs in the hatchway walls.

The insulation work was performed by contract.

* * * * *

USING AIRBOATS FOR SPRAYING

The Corps of Engineers, in Jacksonville, Florida, is now using airboats for the transportation of men and equipment to spray hyacinths in isolated backwater areas inaccessible by other equipment, according to A. L. McKnight, Chief, Operations Division.



This laborsaving technique and unusual type of equipment is used in aquatic plant control.

Airboats are able to operate in extremely shallow water, slide over logs, and proceed through heavy growths of aquatic plants. Overall, the airboat is proving to be the most economical and effective piece of floating equipment used to destroy hyacinths.

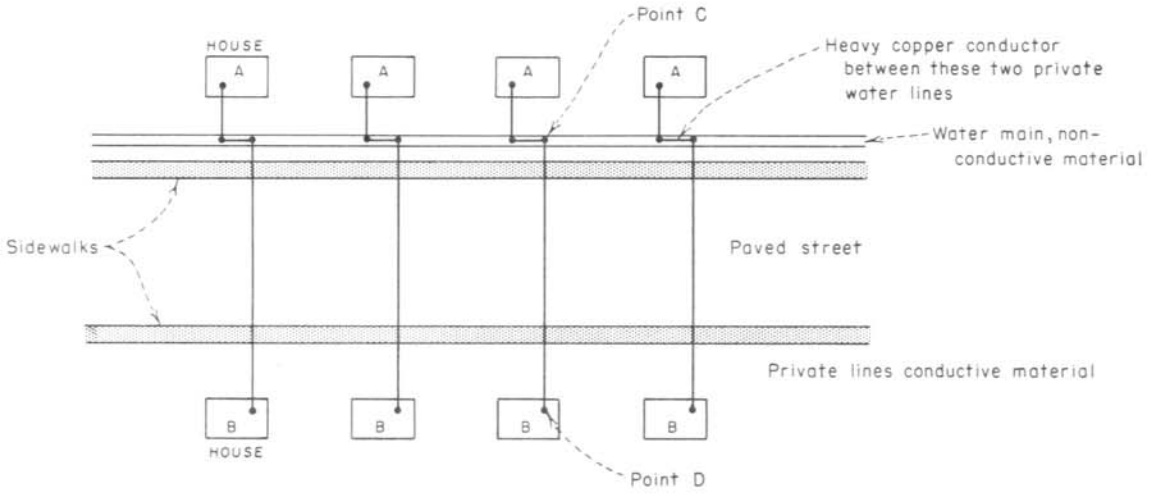
The photographs at left show the equipment in operation on Eph Creek in the Jacksonville area.

For more information concerning the pumps and spray equipment, write to J. W. Rodner, Regional Supervisor of Irrigation, Bureau of Reclamation, Boulder City, Nevada, or to the Chief Engineer, Bureau of Reclamation, Code D-400, Denver Federal Center, Denver 25, Colorado.

* * * * *

THAWING FROZEN WATERLINES
(Suggestion R4-62-14)

A suggestion by John C. Pickell, maintenance man, on the Seedskadee Project, Wyoming, was used to good advantage in thawing frozen



waterlines for three residences the past winter, where a nonconductive water main is used to supply water to a Government camp. This operation was accomplished by clamping a heavy copper conductor between House A's and House B's outlets on the main waterline, as shown in the sketch on the following page. It saves digging down through frozen ground to get an electric connection at Point C to complete the circuit to Point D with an arc welder. By putting in the heavy copper conductor, House A's faucet can be hooked up with House B's faucet. Subsequent freeze-ups were then taken care of without any additional labor.

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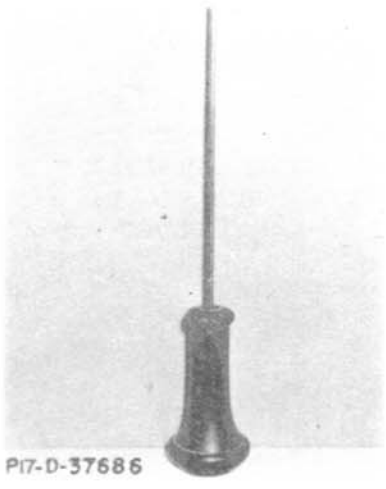
BEARING NOISE DETECTOR DEVICE
(Suggestion R1-62-14)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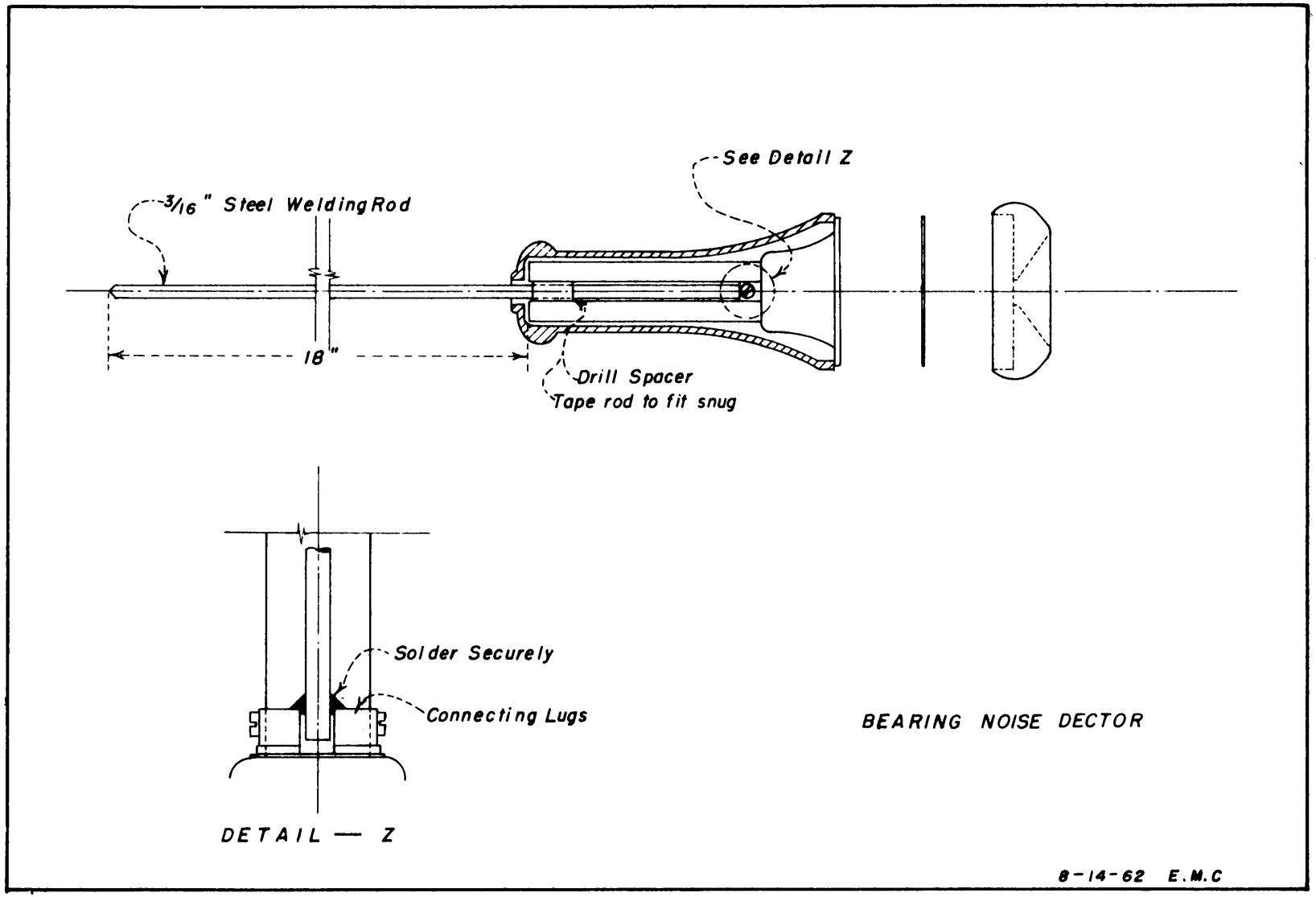
This suggestion for detecting bearing noises was made by Archie Ball, Turbine Pump Mechanic, North Side Irrigation Field Division, Minidoka Project, Rupert, Idaho.

The main purpose of the device is to determine whether noise is in the top thrust bearing or the bottom guide bearing or in the pump itself. It is very effective on deepwell pumps and hollow shaft motors. The device is made of a 1/4-inch welding rod and an old telephone receiver. See photograph at left and the sketch on the following page.


See Detail Z
3/16" Steel Welding Rod
18"
Drill Spacer
Tape rod to fit snug
Solder Securely
Connecting Lugs
DETAIL — Z
BEARING NOISE DECTOR
8-14-62 E.M.C

"BUBBLER" GAGE IMPROVEMENT

Release No. 35 of the Operation and Maintenance Equipment and Procedures bulletin for January, February, and March 1961 contained an article, starting on page 8, on the use of "bubbler" type pressure gages to measure water surface elevation in rivers, creeks and reservoirs. Release No. 42, on page 1, describes a telemeter unit installed in conjunction with a bubbler gage at the outflow station at Hugh Butler Lake with the control unit installed at Red Willow Dam, which eliminates an 11-mile drive by the Superintendent to obtain outflow data from the dam. The Geological Survey has been using the gages rather extensively in the State of Kansas and continues to make improvements in gage design.

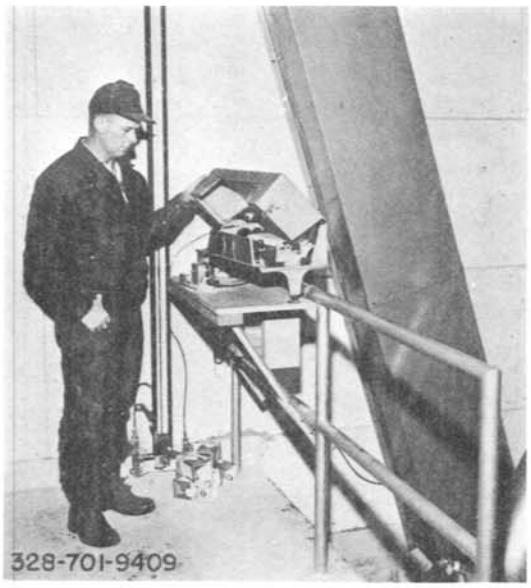


Photo No. 1

The Survey now has designed an insulated case with thermostatic controlled heat lamps to eliminate the expansion and contraction of the mercury within the modified "bubbler" gages used to record the water surface elevations of reservoirs. The thermostat is usually set for 120° F within the case.

The photographs at left were taken of the new installation made at Red Willow Dam and were supplied by R. E. Aldrich, Chief, Water Control Branch, Kansas River Projects Office, Bureau of Reclamation, Post Office Box 737, McCook, Nebraska.

The cases are trim and neat in appearance.

In Photograph No. 1, the case at Red Willow Dam in the closed position is shown attached to the concrete wall in the background. The water stage recorder mounted on the handrailing, also, is shown.

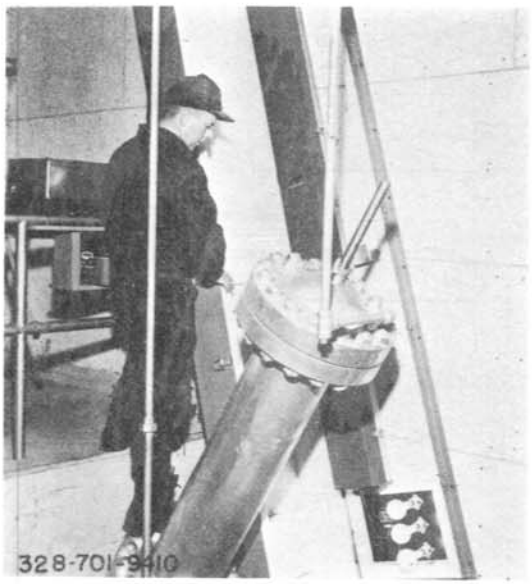


Photo No. 2

Photograph No. 2, shows the case in an open position with the heat lamps mounted on a panel within the case.

* * * * *

BRUSH CUTTER

The photograph below is of a brush cutter used by the U. S. Army Engineer District, Corps of Engineers, Savannah, Georgia, in the control of woody coppice regrowth in the drawdown zone of the Corps' Clark Hill and Hartwell Reservoirs in the southern area. James B. Edgerton, Acting Chief of the Engineering Division states that the wheeled tractor and brush cutting unit have been modified to meet their specific needs and that the exact modification will vary with the make of the tractor, but in general needed protection of the operator and equipment weaknesses are a common problem.

The cutting unit shown in Photograph No. 1, has been strengthened by the addition of two 4- by 1-1/2-inch channels welded to the upper side, parallel to the direction of travel. The tractor operator's back is protected by a 1/4-inch steel plate. The underside of the tractor is protected by a 1/4-inch steel plate welded to 2- and 3-inch steel pipes which project out in front of the machine to carry railroad iron which serves as a bumper to knock down heavy brush and saplings. The radiator and hydraulic system are also protected by 1/4-inch steel plate welded to pipe as shown in Photograph No. 2.

Photo No. 1

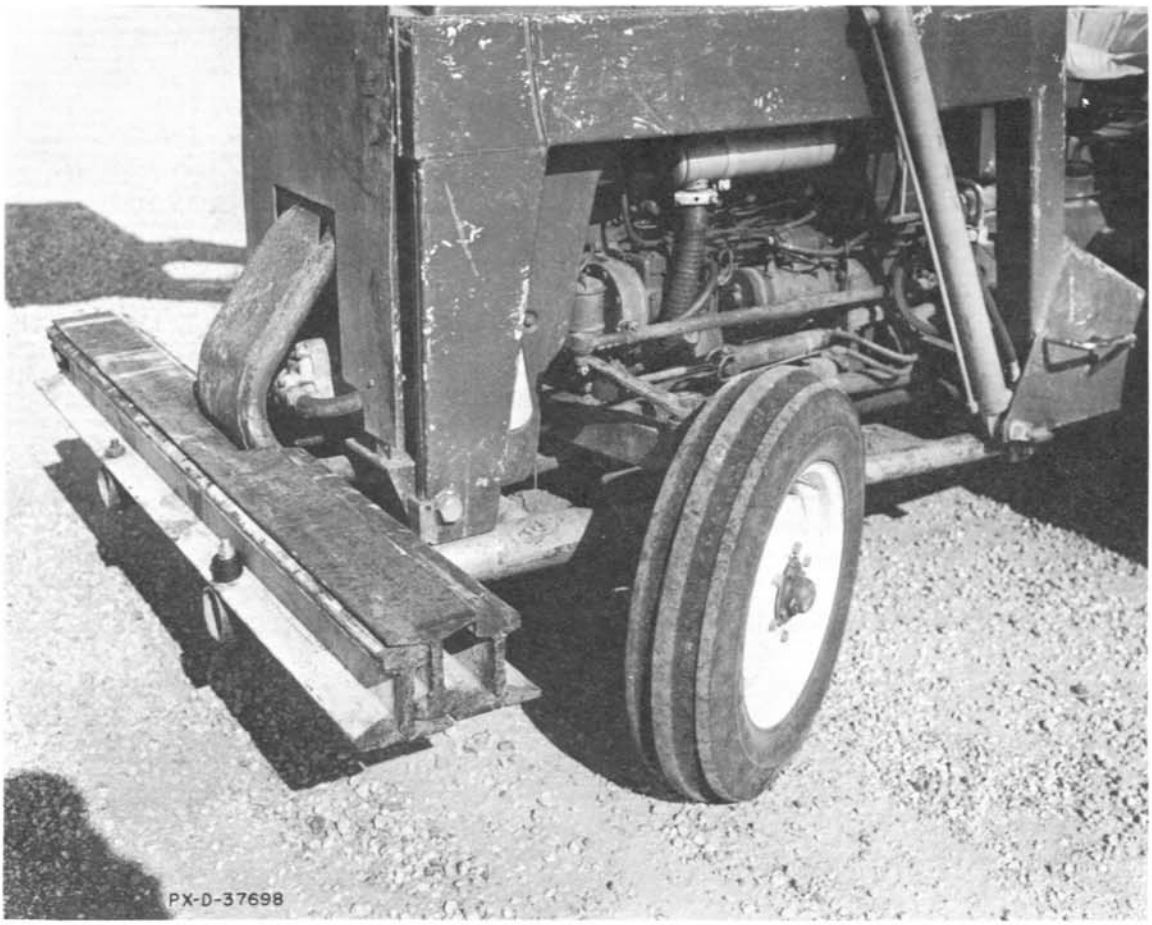


Photo No. 2

For further information, write to Regional Director, Attention: Code 3-420, Bureau of Reclamation, Boulder City, Nevada; or the Chief Engineer, Attention: Code 400, Bureau of Reclamation, Denver Federal Center, Denver 25, Colorado.

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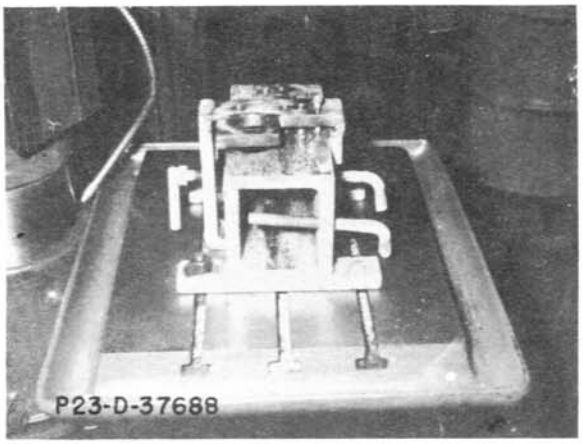
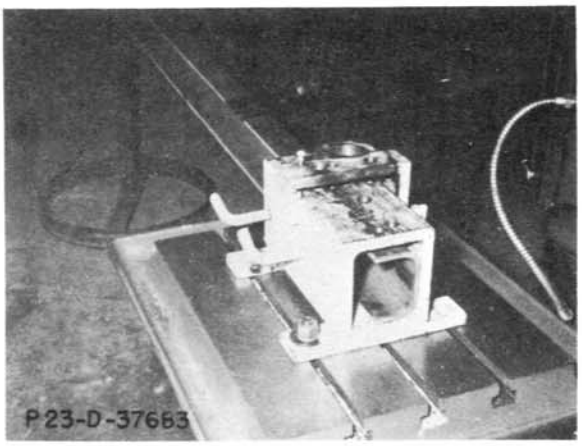
JIG FOR DRILLING HOLES IN CHECK GUIDES AND HEADERS
(Suggestion R5RG-61-6)

In constructing check guides and headers, it is necessary to have all of the holes drilled in the channels, angles and strap iron to very close dimensional tolerances. Mr. Robert P. Marin, Machinist, on the Rio Grande Project designed and made a jig which reduces error, tedious measurements, saves time, and which simplifies and eliminates the



Jig attached to drill press.



Jig with cold-rolled check guide in place ready to be drilled.

necessity of laying out the holes. This jig is shown in the photographs above. Other projects may be interested in making a similar jig.

Additional information is available by writing to the Project Manager, Rio Grande Project, 211 U.S. Court House, El Paso, Texas, or to the Chief Engineer, Attention: Code D-400, Bureau of Reclamation, Denver Federal Center, Denver 25, Colorado.

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AUTOMATIC GATE CONTROL ON BOISE PROJECT

On the Payette Division, Boise Project, an automatic gate control, Photograph No. 1, was installed at the end of the Black Canyon Canal to reduce fluctuations in the water surface elevation. At this section of the main canal, there is a wasteway and the headings of two canals serving about 25,000 acres. Before installation of the automatic controls, extra flows in the canal were wasted through siphons to the wasteway which is 27.55 miles from the Black Canyon canal heading. The operation of the siphons caused the canal surface to fluctuate several inches as they abruptly operated and then cut off, consequently, a higher than normal

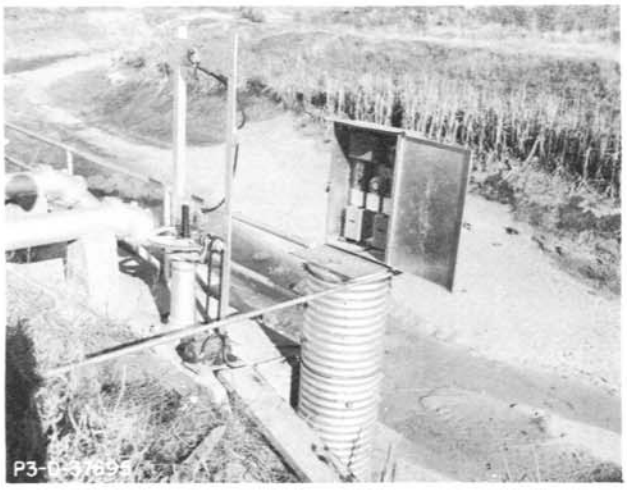


Photo No. 1

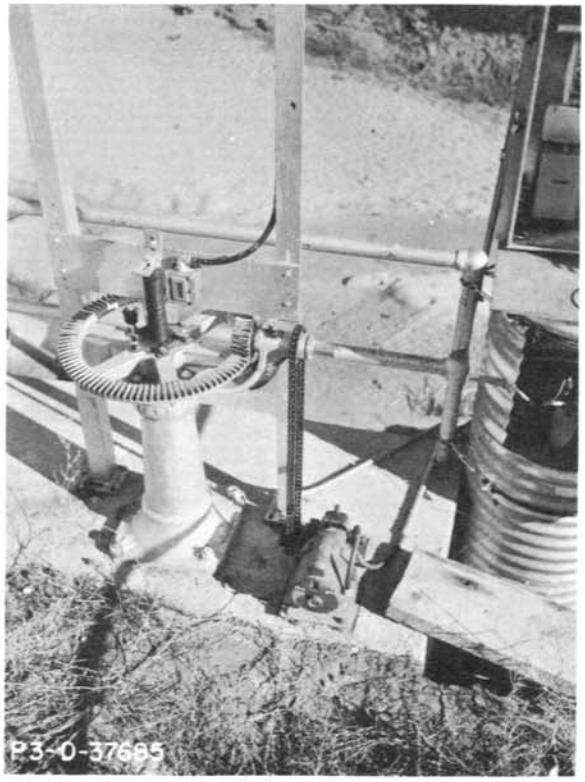


Photo No. 2

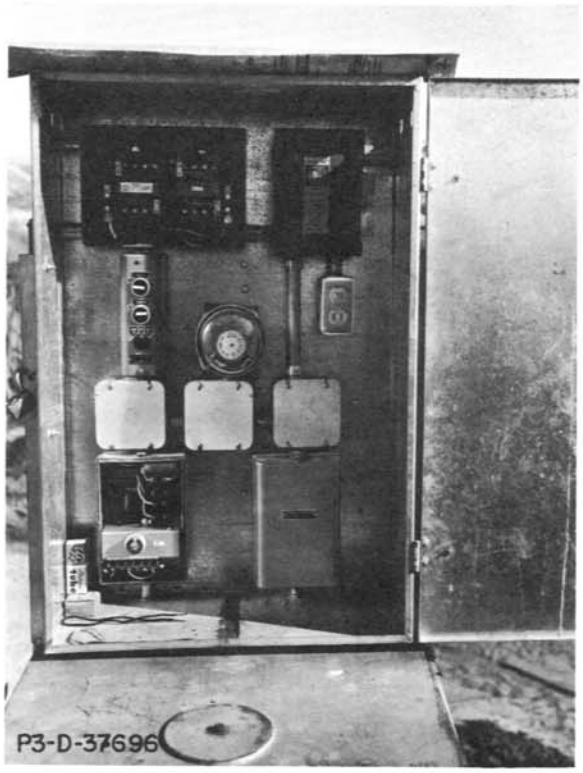


Photo No. 3

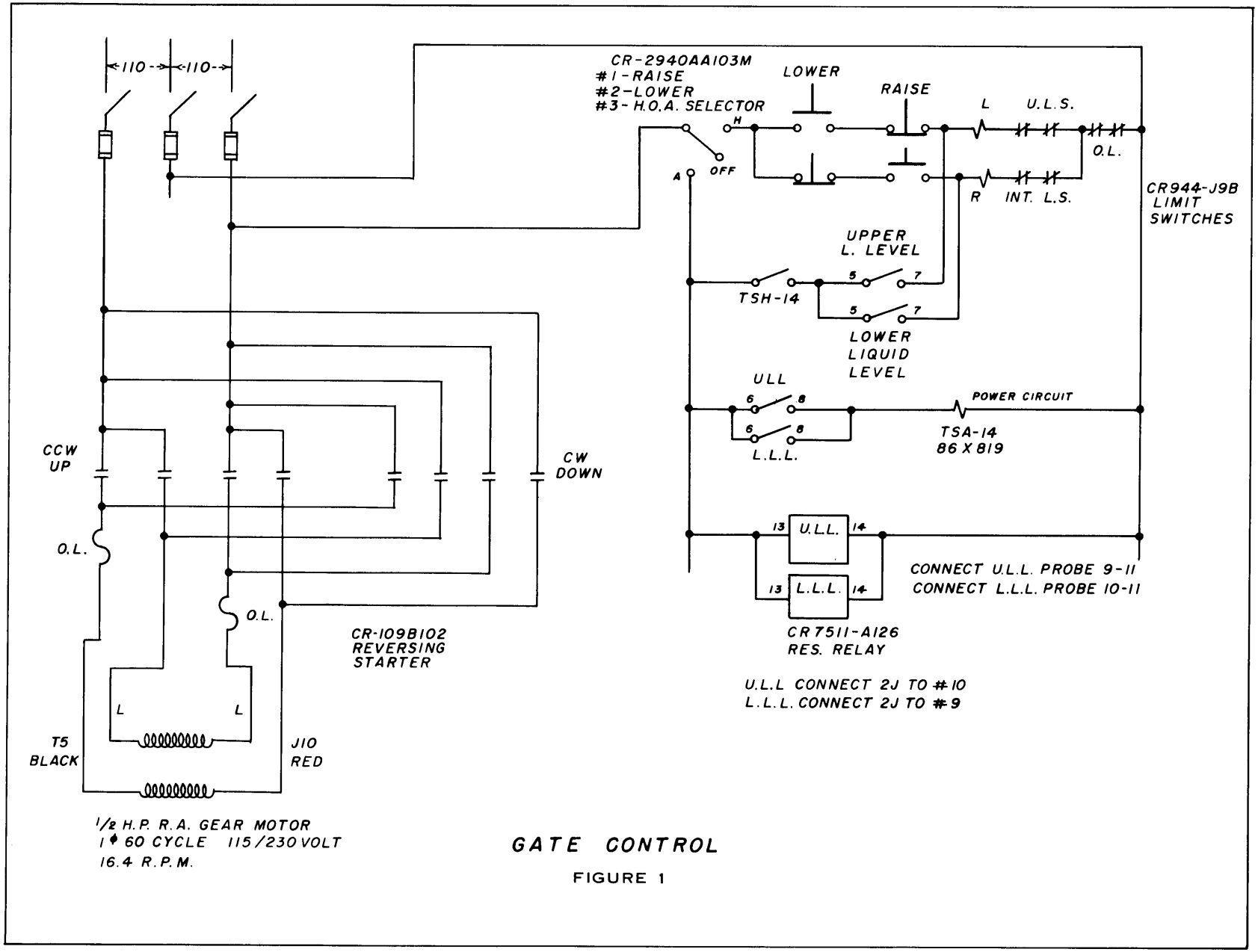
water surface was maintained in this reach of the canal to offset the effect of the fluctuations on downstream canal gates. In addition, the extreme on-off flows from the siphons made calculation of the amount of water being wasted very difficult.

With the installation of an electric motor to power the 4- by 5-foot gate, Photograph No. 2, and automatic controls, Photograph No. 3, the fluctuation on the canal was reduced to about 0.03 foot, and it was possible to lower the operating level of the water in the canal about one-half foot.

The controls selected utilized the electrodes or probes described in Operation and Maintenance Equipment and Procedures Release No. 32. Note Photograph No. 4, there is room behind the 4-inch probes for a recorder in the 24-inch stilling wall. These were used in place of the float arrangement as described in Release No. 20 and used on the Columbia Basin Project.

The controls have been for all practical purposes 100 percent reliable with the only trouble being a sticky microswitch. By removing the motor-driven chain, the gate can be operated as usual by a handcrank. Limit switches also are provided to stop the gate travel in the fully opened or closed position.

Assistance with the wiring diagram, Figure 1, was provided



GATE CONTROL

FIGURE 1

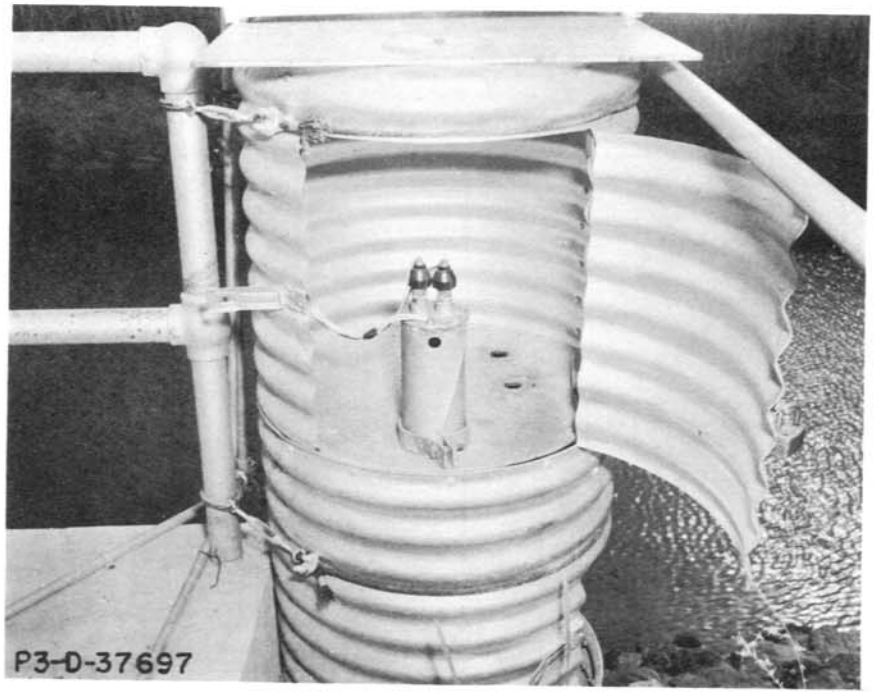


Photo No. 4

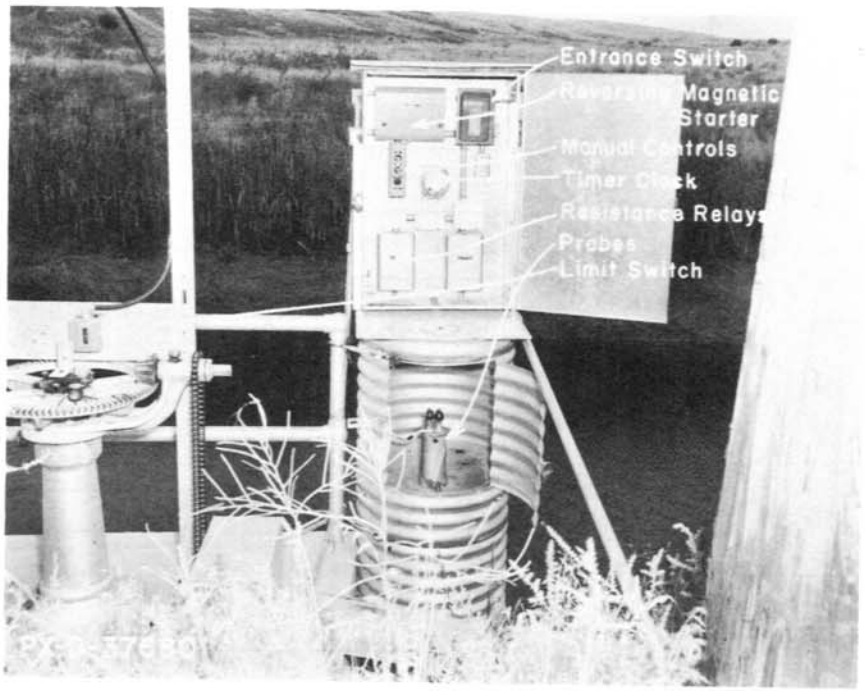


Photo No. 5

by a manufacturer's service engineer. Mr. Larry Douglas, of the project forces, wired the equipment and made the installation. Photograph No. 5 is a labeled view of the individual electrical components.

List of Equipment

No.	Item	Approximate cost
1	Entrance switch	$ 10
1	110-volt reversing magnetic starter (GE, CR109)	70
2	Electronic resistance sensitive relay (GE, CR7511-A126) each at $85	170
1	Pushbutton station (GE, CR2940)	20
2	Liquid level probe (GE, LP100A1) each at $15	30
5	Probe rods each at $3	15
	Time clock - Time cycle 1 minute percentage on-off (GE, TSA-14)	25
1	1/2-horsepower right angle gear reduction motor - 16.4 rpm (GE, 045822)	145
2	Limit switches (GE, CR9440-J4B) each at $27.50	55
1	Box for instruments	50
	Drive chain and sprockets	15
	Miscellaneous wire, conduit, and fittings, est.	50
	Stilling well and platform, etc., est.	75
	Limit switch racks, etc. not listed	-
	Total	$730

Cost of transmission line to box not included in above.

* * * * *

"ANTI-ROLL BARS" ON TRACTORS SAVE LIVES

Agriculture leads all major industry groups in the number of accidental deaths and ranks fourth in the number of disabling injuries.

Prominent among the causes are accidents involving farm tractors. The North Dakota Highway Department recently decided something should be done to stem the rise in the accident rate. As a result, the Department installed "anti-roll bars" on all of its field mowers. See Photograph No. 1 on the following page.

An "anti-roll bar" is a device constructed of 3-inch pipe welded in a frame and mounted on a tractor, over the driver's seat as shown in Photograph No. 2. Its purpose is to protect the driver in cases where the tractor either tips sideways or backward. The welded-bar frame is bolted to the frame of the tractor, Photograph No. 3.

Photo No. 1

Photo No. 2

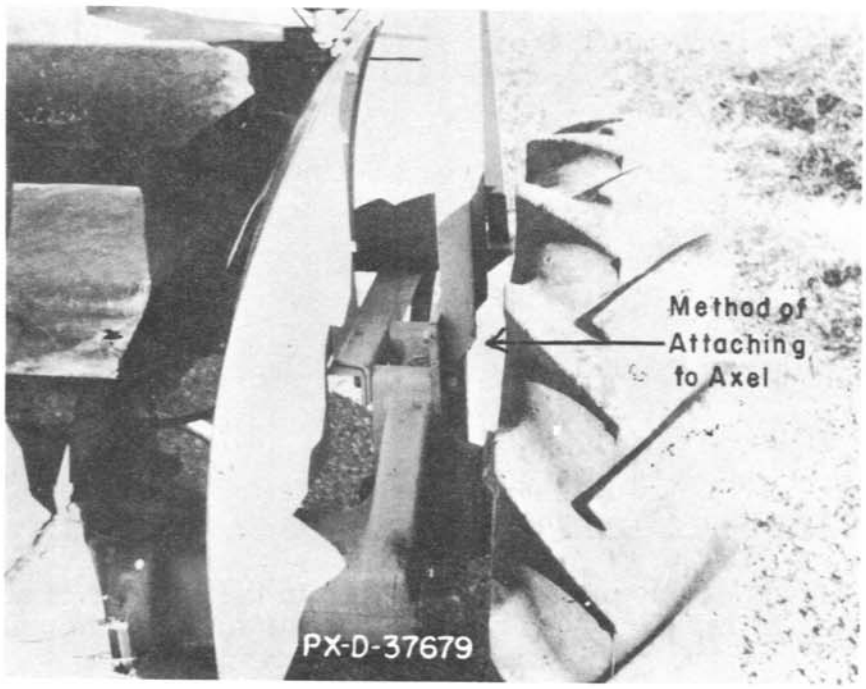


Photo No. 3

During the period since installation of the "anti-roll bars" on its field mowers and tractors, the Department reports that five such units were tipped over. These involved two cases of minor injury and a minimum of damage to the units. In view of these reports, the North Dakota Highway Department is convinced that the "anti-roll bar" can be of great assistance in preventing serious injury and death in tractor accidents.

--Journal of the American Society of Safety Engineers--May, 1962.

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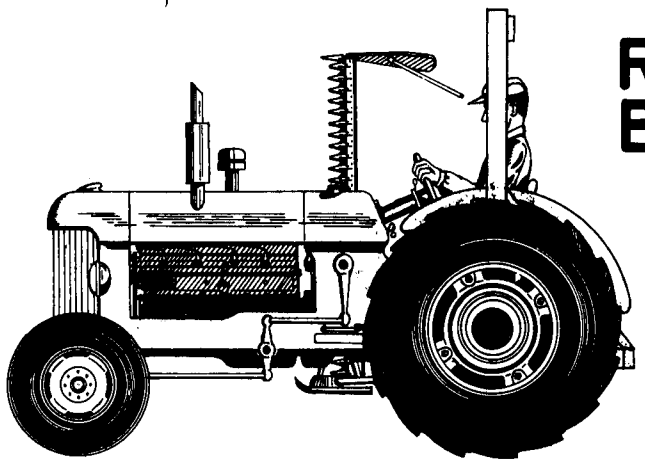
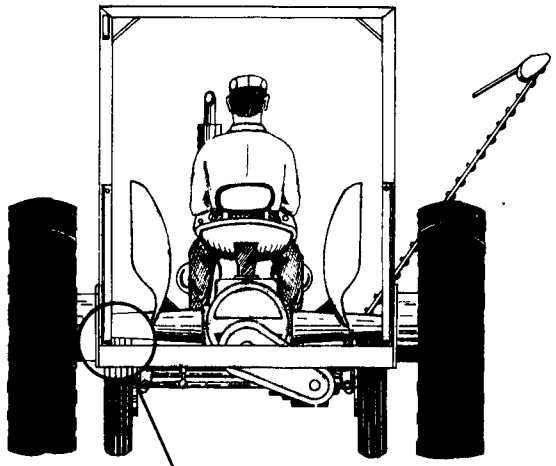
ROLL BARS

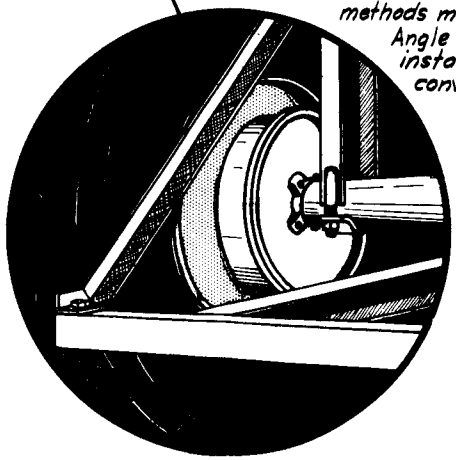


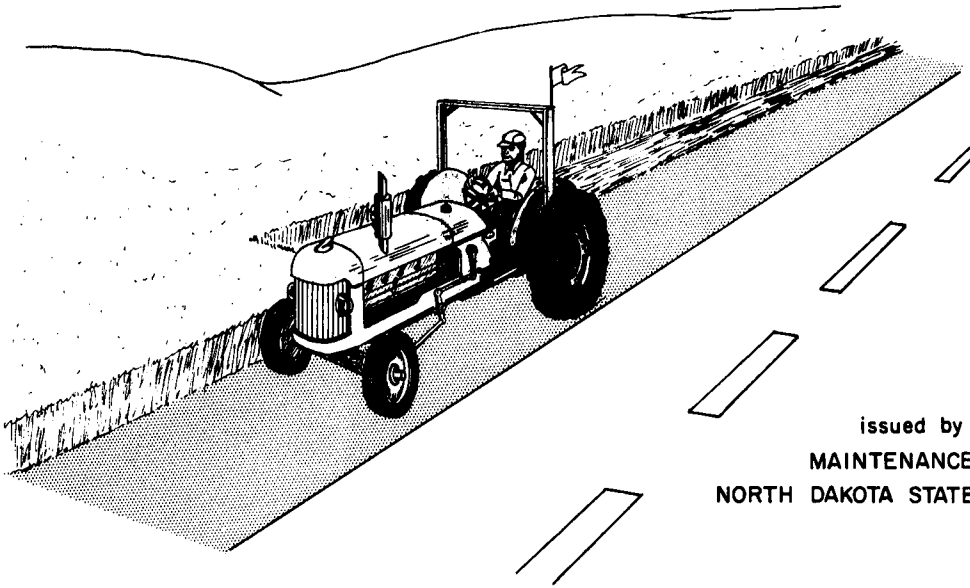


Note:

This installation applies only where tractor axle is of this type.

In other cases, different methods must be improvised. Angle braces may be installed in the most convenient manner.





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