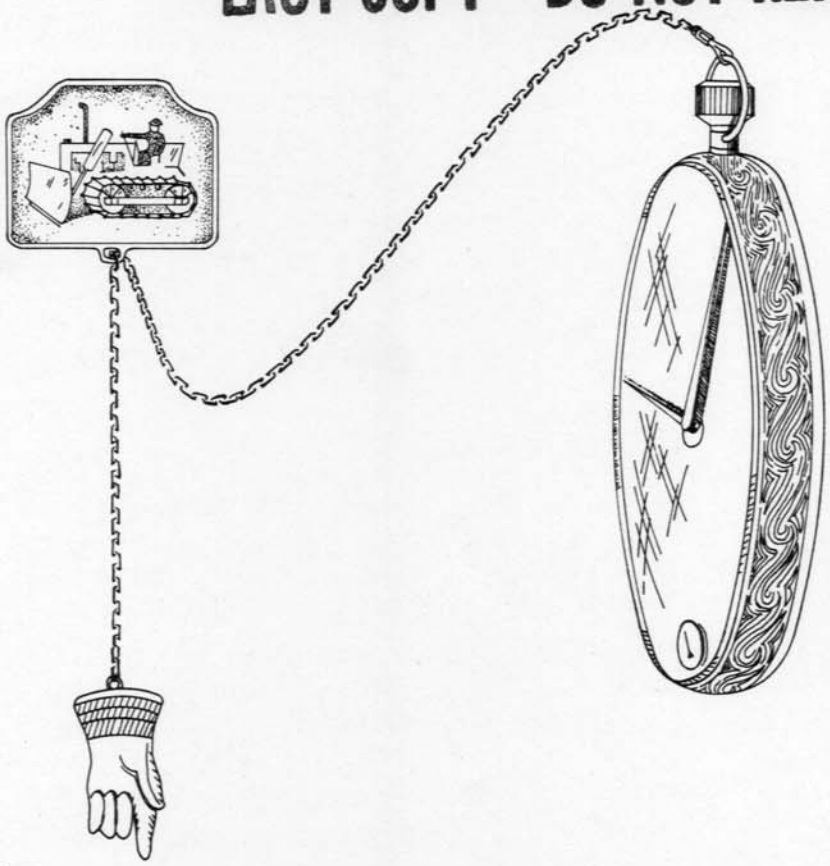
Department of the Interior, Bureau of Reclamation

IRRIGATION OPERATION AND MAINTENANCE

BULLETIN NO. 61

July, August, September 1967

LAST COPY - DO NOT REMOVE



LAST COPY - DO NOT REMOVE

LAST COPY - DO NOT REMOVE

In This Issue:

A STITCH IN TIME can Prevent Diesel Engine Failure
Treating Soil with Herbicides for Total Vegetation Control
Safety Tips
The Important Function of Hydraulic Hoist Oil and It's Characteristics
The Art of Getting Along
Far Out--Research on Equipment Maintenance
ABC's of Safety
Boat Modification for Weed Spraying
Installing Wooden Walk Planks on Irrigation Structures

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:
As pointed out in the beginning article, this drawing is to illustrate that a STITCH IN TIME can prevent engine failure.

IRRIGATION OPERATION AND MAINTENANCE
BULLETIN No. 61

July, August, September 1967

INTRODUCTION

The old saying "A Stitch in Time Saves Nine," is just as true today as when the phrase was coined. This article starting on page 1, on how to prevent diesel engine failure calls for change in maintenance routine, and how timely attention can prevent such failure. The article also includes a chart for trouble-shooting diesel engines.

The Bureau's Division of Research in Denver, Colorado, presents a soil sterilant program, beginning on page 7, that offers better vegetation control, with the proper use and application of several new herbicides. A table showing relative cost comparisons of a variety of suggested new materials for this purpose is also given.

Safety tips on page 9, include a list of the recently published, revised, or new National Safety Council technical data sheets. These data sheets may be obtained by writing to the Safety Council. Also on the same page is a warning to be on the safe side and read the label, followed by the "High Cost of Accidents."

Hydraulic hoist oils perform a very important service on many kinds of equipment. An article starting on page 10, discusses it's important characteristics.

On page 12, Lt. E. C. Esterbrooke, of the United States Naval Reserve, gives a basic formula on getting along with people, and what can be learned from others.

Research on equipment maintenance goes far out in an article beginning on page 13. This diagnostic technique is expected to pin down troubles before they start and take the guess work out of motor vehicle repairing.

An alphabetical approach to safety is given on page 14.

The last two articles in the Bulletin were suggested by Bureau Project personnel. Starting on page 16, is a suggestion for the modification of a boat for weed spraying. This should prove to be a safe, useful, and time saving suggestion, if a need for this kind of spraying is found necessary. The last suggestion on page 19, proposes a new type installation for wooden walk planks on irrigation structures.

A STITCH IN TIME CAN PREVENT 1/ DIESEL ENGINE FAILURE

New techniques and improvements in earthmoving machinery have practically eliminated deadlining units during the winter months. This practice has also eliminated many of the needed inspections and repairs formerly performed while the equipment was inactive.

It is doubly important, therefore, to carefully service machinery prior to spring activities. To obtain maximum equipment availability during the approaching heavy work season, it is advisable to inspect and, if necessary, repair certain components; components that may not show a malfunction in cold weather.

Cooling system deficiencies, for instance, are not as apparent during winter operations as when the equipment is operated during warmer weather. This system should be first on the checkout list before starting the spring operations.

Cooling System

Drain and flush the cooling system thoroughly. See Figure No. 1, for the location of the petcocks, they are all similarly located on any engine. Fill the system with clean, soft water or rainwater whenever possible. Add a commercial rust inhibitor if the unit is to run without antifreeze, following the manufacturer's directions. (CAUTION: Do not add rust inhibitor to a cooling system containing antifreeze.)

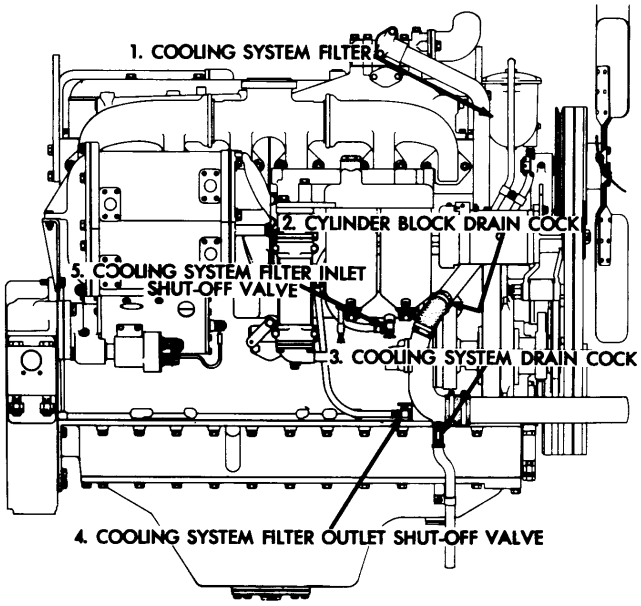


Figure 1

On systems equipped with coolant filters use of soft water or rust inhibitors is not necessary as the element will soften the water and inhibit rust. Replace the filtering element and clean or replace the lower magnesium alloy plate.

Open the vent cocks when filling the system and raise coolant level to approximately 1-in. below bottom of radiator filler pipe.

1/Reprinted by permission of the author and editor, from an article appearing in the December 1966 issue of World Construction.

Clean all debris from the radiator to permit passage of air through the radiator.

Oily dust or mud caked on the engine sides insulate and prevent cooling of the engine by radiation. This is something that might not affect engine operation until warm weather. Scrape or steam clean the outside of the engine to obtain proper cooling.

Fan Belts

Check the fan belts for proper tension and condition, the principle parts involved for this operation are shown in Figure 2 below.

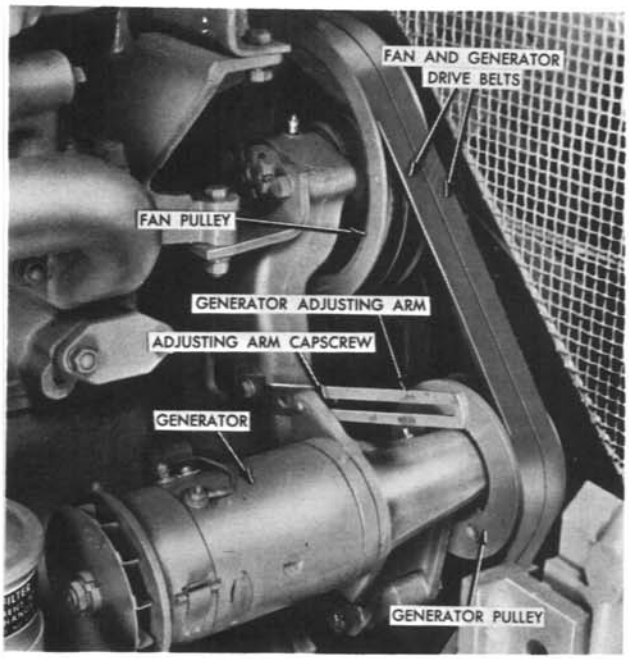


Figure 2

Worn or damaged belts should be replaced at this time. Where multiple fan drive belts are used, always replace the complete set even if only one shows damage.

To help lower the operating temperatures of the transmission, steering clutches and final drives, remove all accumulated mud. Check for loose or missing capscrews, leaking gaskets, seals and cracks, etc. --repair or replace as necessary.

Service the air pre-cleaner and air cleaner as outlined in the operator's manual, being sure to clean all connecting tubes and hoses thoroughly. Inspect hoses and clamps for damage.

Turbochargers

On turbocharged units, remove the air cleaner to turbocharger hose as shown in Figure 3, on the following page and inspect compressor impeller vanes for caked dirt or damaged vanes. Clean or correct as necessary. Do not use any sharp metallic object to remove dirt deposit from the vanes.

Fuel Tank

Open drain cock at bottom of fuel tank and remove water and sediment.

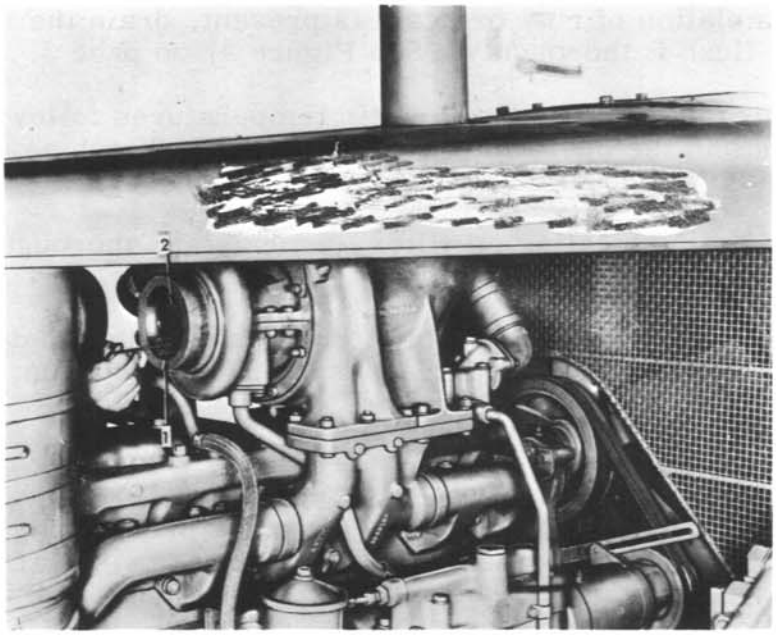


Figure 3

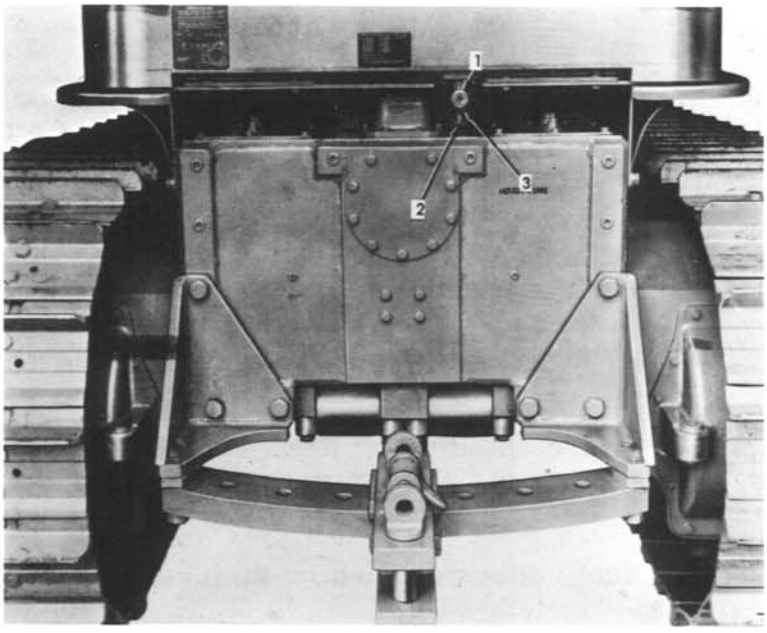


Figure 4

If a large accumulation of rust or scale is present, drain the tank completely and flush it thoroughly. See Figure 4, on page 3.

Change all lubricants affected by climatic temperatures following the recommendations in the operator's manual. Grease machine with correct lubricant as outlined in the manual.

Change all fuel and lubricating oil filter elements and thoroughly clean filter assemblies.

Check entire unit for leaks, loose bolts or wires missing or damaged parts and excessive wear. Take necessary corrective action.

Track Maintenance

Carefully inspect the undercarriage. Measure shoe, grouser, roller, idler, sprocket, sidebar and rail wear with guage provided by the manufacturer. Replace any component that shows excessive wear and remedy the cause. Tighten all shoe bolts to correct torque. Adjust track tension hydraulically, or mechanically if so equipped.

While these procedures apply generally to a crawler tractor, they can be applied to motor scrapers, motor graders, tractor shovels and rubber-tired loaders and dozers. Taking the time to perform these services during the slack work periods, will save time and money.

Trouble Shooting

Using five of your six senses as indicated below, will provide you with readily available tools when checking out diesel engines. Common sense, as well as touch, hearing, sight and smell is also recommended to locate a source of malfunction, analyze it and repair it.

LOOK--for fuel leaks, exhaust smoke color, bent or crimped fuel lines or restricted air intake system.

LISTEN--for engine loping, misfiring, metallic rubbing or knocking noises.

TOUCH--for temperature, binding or linkages, abnormal vibration, loose fittings, condition or air system hoses, crimped lines not readily visible.

SNIFF--for leaking fuel, odors of burning materials, unusual exhaust smoke aroma.

Once the source of malfunction has been identified, it is a matter of obtaining the proper instrument and tools to correct it. On pages 5 and 6, you will find a trouble shooting chart showing the symptom of the trouble and the possible cause

DIESEL ENGINE TROUBLE SHOOTING CHART	Low Power	Poor Performance, Surge, Erratic Action	Rougle Idle-Engine Vibrating	Excessive Engine Smoke Black	Excessive Engine Smoke, White-Blue	High Fuel Consumption	Engine Overspeeds	Hard starting	Engine will not start
CAUSE	**SYMPTOM**								
1. Throttle linkage adjustment	x	x	x			x	x		x
2. Throttle linkage sticking-binding	x	x	x				x		x
3. Incorrect governor setting (Ext.)	x	x	x			x			
4. Incorrect governor setting (Int.)	x	x	x	x		x	x		
5. Air cleaner restriction	x		x	x				x	x
6. Excessive lube oil in air cleaner					x				
7. Fuel delivery incorrect	x	x	x	x		x		x	
8. Fuel supply pressure low	x	x	x					x	x
9. Overflow valve leaking or stuck open	x	x	x					x	x
10. Fuel filter clogged-restricted	x	x	x					x	x
11. Air leaks in fuel supply system	x	x	x					x	
12. Incorrect bleeding-fuel tank	x		x					x	
13. Fuel return line restricted		x	x					x	
14. High pressure tubings—restricted	x	x	x					x	
15. Injection pump to engine timing	x	x	x	x	x	x		x	
16. Engine valve timing	x	x	x	x		x		x	
17. Fuel control rack sticking-injection pump	x	x	x				x	x	x
18. Nozzles defective-Leaking—Worn	x	x	x	x		x		x	
19. Incorrect nozzle opening pressure		x	x	x		x		x	
20. Nozzle incorrectly torqued	x	x				x			
21. Nozzle valve sticking	x	x	x	x		x		x	
22. Delivery valve sticking or leaking	x	x	x	x		x		x	
23. Fuel transfer pump inoperative									x

DIESEL ENGINE TROUBLE SHOOTING CHART	Low Power	Poor Performance, Surge, Erratic Action	Rougle Idle-Engine Vibrating	Excessive Engine Smoke Black	Excessive Engine Smoke, White-Blue	High Fuel Consumption	Engine Overspeeds	Hard starting	Engine will not start
CAUSES	**SYMPTOM**								
24. Exhaust pipe or muffler clogged or pinched	x	x		x		x			
25. Engine-pump drive worn	x	x				x			
26. Incorrect timing advance—retard	x	x	x	x	x	x		x	
27. Incorrect fuel oil, water, contamination, wrong grade or type	x	x	x	x		x		x	
28. Lube oil pump dirty or clogged	x	x							
29. Lube oil system restricted		x			x				
30. Lube oil level too high (APE)		x			x		x		
31. Lube oil level too low (APE)		x	x						
32. Lube oil too heavy—contaminated	x	x				x		x	
33. Engine mount deflection		x	x						
34. Engine running cold					x	x		x	
35. Engine overheating	x	x	x	x		x			
36. Poor compression	x	x	x	x	x	x		x	
37. Engine Head Gasket leaking	x	x	x	x	x	x		x	
38. Excessive carbon deposits in combustion chamber	x	x							
39. Engine valve guides worn or gummed		x			x	x		x	
40. Pistons or rings stuck, worn or broken	x	x		x	x	x		x	
41. Plunger sticking	x	x	x				x	x	
42. Injection pump plungers worn	x	x	x					x	
43. Injection pump rollers or cams worn				x					x
44. Fuel tank vent plugged									x
45. Fuel tank valve closed Fuel tank empty									x
46. Fuel lines or filters plugged	x	x	x					x	x
47. Incorrect nozzle popping pressure		x	x					x	x
48. Pump drive broken									x

* * * * *

TREATING SOIL WITH HERBICIDES FOR TOTAL VEGETATION CONTROL

The Study

During the past 4 years the Office of Chief Engineer, Division of Research, at the Denver Federal Center, Denver, Colorado, has been conducting evaluation tests of soil sterilant herbicides. The primary purpose of this long-term field study was to provide reliable comparative data for use in selecting the more promising materials to update the Bureau of Reclamation program on treating soil with herbicides and preparing recommendations for Operation and Maintenance personnel.

Sufficiently reliable information to warrant these suggested changes in the presently used soil sterilant program has now been obtained. Although some materials widely used in the past were effective, it appears that better and longer term vegetation control can be accomplished with the newer materials at much lower cost.

The following table shows the relative cost comparisons of three newer materials that are now suggested. These herbicides are recommended for use in substations, switchyards and other areas where total vegetation control is required.

Herbicides	Application rate, per acre	Relative cost on a per acre basis	Expected longevity, based on study results	Relative cost per year to provide effective plant control
atrazine	15 lb*	$ 31.95	3 years at a 15 lb/acre rate	$10.65
prometone (liquid)	15 gal* (2 lb/gal) or 30 lb/acre, active ingredient	$105.00	4 years at a 15 gal/acre rate	$26.25
isocil	20 lb	$103.00	4 years at a 20 lb/acre rate	$25.75

*To insure complete control of deep rooted perennial weeds, a somewhat higher rate than that shown above should be used.

A 4-year study has shown that adequate vegetation control can be achieved with these herbicides when used in semiarid areas similar to the test site.

The soil sterilant programs listed on the following page are offered for your guidance.

Materials and Their Application

Atrazine--The soil sterilant commonly known as atrazine, shall be composed of a finely divided wettable powder containing a minimum of 80 percent 2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine and related compounds. Commercial mixtures meeting these requirements may be used. This sterilant shall be mixed with water and applied uniformly so that the equivalent of 0.046 pound of dry product is used per 100 square feet (about 20 pounds per acre, total formulation). A minimum of 2 gallons of water shall be applied with each pound of dry product. Material must be kept in suspension at all times during application by continuous agitation.

Isocil--The soil sterilant commonly known as isocil, shall be composed of a finely divided wettable powder containing a minimum of 80 percent 5-bromo-3-isopropyl-6-methyluracil. Commercial mixtures meeting these requirements may be used. The soil sterilant shall be mixed with water and applied uniformly so that the equivalent of 0.046 pound of dry product is used per 100 square feet (about 20 pounds per acre total formulation). A minimum of 2 gallons of water shall be applied with each pound of dry product. Material must be kept in suspension at all times during application by continuous agitation.

Prometone--The soil sterilant commonly known as prometone, shall consist of liquid emulsifiable solution containing a minimum of 25 percent 2-methoxy-4, 6-bis (isopropylamino)-s-triazine. Commercial mixtures meeting these requirements may be used. This sterilant shall be mixed with water and applied uniformly so that the equivalent of 0.0344 gallon (130 cc) is used per 100 square feet (15 gallons per acre, total formulation). A minimum of 4 gallons of water shall be applied with each gallon of herbicide.

Summary

All of the described materials are noncorrosive and have a low order of mammalian toxicity when used under recommended procedures.

The rates and methods of application used in the suggested specifications were established for areas of low rainfall (15 inches annual or less), with all vegetation removed and on reasonably light nonorganic soils. These conditions would probably be characteristic of most of the Bureau's areas of activity.

Any specifications requirement for soil sterilants in areas of high rainfall or excessively heavy or highly organic soils would require other methods of application and possibly other more suitable herbicides. We have included in these suggestions the minimum amount of water to be applied with each material unless adequate rainfall is expected following application. This is very critical to the success of the treatments in most western areas of the United States where rainfall is low.

* * * * *

NATIONAL SAFETY COUNCIL DATA SHEETS

The National Safety Council has recently published revised or new technical data sheets on the subjects listed below. Copies of these data sheets (by numbers shown in parentheses) may be obtained from the National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.

Electric Cords and Fittings (385)

Portable Grinders (583)

Metal Saws (Cold Working) (584)

Management Policies on Occupational Safety (585)

Tractor Operation and Anti-Roll Bars (587)

* * * * *

WARNING READ THE LABEL

Be A Label Reader--your life may depend on it. Warnings are printed on cans of flammable lacquers, finishes, paint removers, thinners, mastics, cleaners and similar materials that contain a flammable solvent. When you use these materials, remember:

a. Work in a well-ventilated area, preferably outside.

b. Shut off pilot lights, stoves and other flame or spark producing sources in the area.

c. Don't smoke.

Industrial Bulletin, 2/67

* * * * *

HIGH COST OF ACCIDENTS

Two persons are killed and 200 injured by accidents in the United States every 10 minutes, according to the National Safety Council. Cost of the accidents occurring in a 10 minute period amount to approximately $340,000.00.

* * * * *

THE IMPORTANT FUNCTION OF HYDRAULIC HOIST OIL AND IT'S CHARACTERISTICS 1/

Machines employ hydraulic system lubricants quite extensively. For instance, these lubricants are required for hydraulic cylinders on dump trucks, loaders graders, etc.; hydraulic power steering units on heavy-duty trucks; and hydraulic lifts for cars and trucks in shops and hydraulic gate systems.

To avoid confusion with hydraulic brake fluids, hydraulic transmission fluids and automatic transmission fluids, this lubricant is called "hydraulic hoist oil" in State service. It is not a satisfactory substitute for these other fluids.

Several characteristics are required of hydraulic hoist oils. First of all they should provide flowability and pumpability at all temperatures within operating range. Their ability to flow is determined by their viscosity and pour point, or the temperature at which the oil congeals. The operating range is established by the viscosity of SUS deg. F. and the viscosity index of the oil.

Lubrication is also a required characteristic of hydraulic hoist oils, for they are the only lubricants for hydraulic pumps, valves, motors, cylinders, etc. They must prevent excessive wear of moving parts in the entire system, especially between the vane and pump body in vane-type pumps, where local pressures and rubbing speeds are high.

Hydraulic hoist oils must also provide rust protection. They must have a high metal-wetting ability, or the ability to form a protective film over metal surfaces. This characteristic, which is a natural ability, can be improved by the use of chemical additives that have metal-wetting ability: petroleum sulphonic acids, amine salts and phosphates, are sometimes used. Rust protection can also be enhanced by the ability of the lubricant to produce a skin of water repellent, or hydrophobic, material on the metal surface. Some protection is also obtained by neutralizing corrosive acids.

Very fine water droplets surrounded by oil during violent agitation will ordinarily remain suspended in oil in the form of an emulsion. This is the basis of emulsion sludge formed in the engine's crankcase. For this reason, the hydraulic hoist oil must be able to resist formation of a stable emulsion with water. Detergent-dispersent additives tend to assist in collecting water from the oil by forming a stable suspension in the crankcase which helps the oil filter to remove the water. This action is not wanted in hydraulic oil.

1/Reprinted by permission of the editor, from the December 1966 issue of Western Construction, as taken from Lubrication and Preventive Maintenance, a manual of the California Division of Highways Equipment Department.

It is desirable that hydraulic oil have the ability to permit any free water or emulsified oil to settle out quickly. The ability of the oil to separate from water in an emulsion is called demulsibility. Good hydraulic oils should have high emulsibility.

Oil with this quality loses its water content in the tank and can be returned to the system in comparatively water-free condition. Of course, the settled-out water should be removed from the bottom of the tank at regular servicing.

Since hydraulic hoist oils perform such a critical function, it is necessary to delineate all of the required characteristics- and there are many, all of which do an important job.

In addition to the characteristics mentioned they must also have a defoaming ability. Because of the churning action of the pump and other units, and because of turbulence of flow, the oil tends to mix with the air that is present in the system. This promotes oxidation of the oil and also results in the formation of foam. This foam compresses and expands with the operation of hydraulic units and destroys the incompressability of oil, thereby providing no lubricating ability and increasing wear. However, if a foam inhibitor is added to the oil (usually silicone polymers), a reduction in interfacial tension around the small air bubbles is caused so they combine to make large bubbles that rise to the surface more rapidly and break, thus reducing the entrained air in the tank.

Hydraulic hoist oils must also be able to resist oxidation and be chemically stable. Oxidation products of the oil cause corrosion and formation of varnish, gums and residue. These interfere with the operation of the hydraulic valves, pump, motors, cylinders, etc., and reduce the interval between overhaul and repairs.

Although hydraulic oil is exposed to local high temperatures that increase oxidation and decomposition effects where local heating occurs in the pump due to agitation and applying high pressure to the oil system, an oxidation inhibitor added to the oil can decrease the amount of oxygen taken up by the oil and form inactive soluble compounds with the oil. It may also be oxidized in preference to the oil, and it may reduce the formation of acids. This additive is usually an organic compound containing sulphur, phosphorus or nitrogen, such as organic amines, sulphides, hydroxy sulphides or phenols.

Last but not least, hydraulic oils must provide corrosion protection. Some corrosive materials accumulate in hydraulic oil from oxidation and chemical changes. A corrosion inhibitor added to the oil in the form of an organic phosphite, or metal salt of thiophosphoric acid, forms a protective film on metal surfaces. This film decreases catalytic oxidation of the oil, which is a result of chemical activity promoted by the metal but not entered into by the metal, and protects the metal against corrosion of acids.

* * * * *

THE ART OF GETTING ALONG

by

Lt. E. C. Estabrooke, USNR 1/

Sooner or later, a man, if he is wise, discovers that life is a mixture of good days, and bad, victory and defeat, give and take. He learns that it doesn't pay to be a sensitive soul; that he should let things go over his head like water off a duck's back.

He learns that he who loses his temper usually loses out. He learns that all men have burnt toast for breakfast now and then, and that he shouldn't take the other fellow's grouch too seriously. He learns that carrying a chip on his shoulder is the easiest way to get into trouble. He learns that the quickest way to become unpopular is to carry tales and gossip about others.

He learns that buck-passing always turns out to be a boomerang, and that it never pays. He comes to realize that the business could run along perfectly well without him. He learns also, that it doesn't matter so much who gets the credit so long as the job is done.

He learns that all people are human and that it doesn't do any harm to smile and say "good morning", even if it is raining. He learns that most of the other fellows are as ambitious as he is, that they have brains that are as good or better, and that hard work and not cleverness is the secret of success. He learns to sympathize with the youngster coming into the business because he remembers how bewildered he was when he first started out.

He learns not to worry when he has a failure because experience has shown him that if he always gives his best, his average will break pretty even. He learns that no man ever got to first base alone, and that it is only through cooperative effort that we move on to better things. He learns that bosses are not monsters, trying to get the last ounce of work out of him for the least amount of pay, but that they are usually fine men who have succeeded through hard work.

He learns that folks are not any harder to get along with in one place than another, and that the "getting along" depends about ninety-eight per cent on his own behavior.

* * * * *

1/Officer-in-Charge, Teacher's Training, Navy Pier, Chicago, Illinois, from a U.S. Navy Official publication.

FAR OUT--RESEARCH ON EQUIPMENT MAINTENANCE 1/

The cartoon image of a mechanic in white coat applying a stethoscope to the hood of a truck may not be so far-fetched after all.

A sophisticated version of the stethoscope is being studied by a leading automobile manufacturing company and one of it's subsidiaries as one of several "blue-sky" research projects under way in the company's new service research center. This diagnostic technique is expected to help pinpoint vehicle troubles without taking things apart.

Theoretically, the technique would compare the "heart beat" of a faulty engine, transmission or other component with the vibration patterns of a "healthy" component. The pattern-recognition device automatically would pinpoint the exact defect.

This technique of translating acoustical and vibration patterns visually onto a television screen was demonstrated recently by the subsidiary of this automobile manufacturing company. Eventually it is expected that diagnostic information might be translated into punched tape or printed cards.

Use of the technique in a service shop is a long way off, according to the manager of the new service research center. Nevertheless, converting ideas such as this into usable devices and techniques is a prime objective of this new $2,000,000 center.

The center also is working on use of ultrasonic sensing apparatus for detecting minute leaks in exhaust systems. Progress to date on the project has suggested the possibility that the "voice" of the tailpipe may help the mechanic detect many types of problems.

The research center is already tied into the companies technical computer center. Repair and parts malfunction data on 1,500 company-owned vehicles serviced at the center are being recorded and fed into the computer's memory bank. Eventually, diagnostic results on all cars (including those not requiring repair) will be computerized.

Another example of futuristic service equipment being used at the center is an electronic wheel-balance checker. It tells a technician how much weight is needed and where to put it. Sensors attached to the front suspension transmit vibrations to the display console. Another is a prototype vibrometer which might be used to locate car squeaks and rattles by inducing wheel vibrations.

1/Reprinted from an article appearing in the May 1967 issue of Western Construction, by special permission of the editor.

A prototype print-out system records diagnostic findings, compares the results with known standards, and tells the technician whether the findings are good or bad.

The dealership diagnostic service center of tomorrow may contain several test stations. As soon as a vehicle is connected to the testing equipment, the diagnostic data are fed into a computer. The "brain" then tells the technician what parts must be repaired or replaced and the cost of the parts plus local labor costs. The exact "prescription" for repairing all defects of a vehicle might take less than 5 minutes.

* * * * *

ABC'S OF SAFETY 1/

by
Michael Flag

A- is for Accidents, which can be tabooed.
The very first step is the right ATTITUDE.

B- is for BOONS safety brings in variety
To workers, their family, home, and society.

C- injury COSTS, seldom fully revealed;
Like icebergs, the far greater part is concealed.

D- is for DATA, essential to bare
Just what are the problems, and where.

E- EDUCATION, which has no divorcement
From sound ENGINEERING and wholesome ENFORCEMENT.

F- is for FOLLOW-UP. Surveys are vain
Without further check whether hazards remain.

G- is for GUARDING, and it's a disgrace
When guards are not used, or not kept in place.

H- for HOUSEKEEPING, a pretty good guage
Of whether a firm, safety-wise, is of age.

I- is for INJURIES--(outcome of flaws).
They never just happen; there's always a cause.

J- for JARGON. However sincere,
The message is lost if the meaning's not clear.

1/Reprinted from GRIST, May/June 1967 issue, a publication by the National Conference on State Parks, Washington, D.C., and written by the editor of California Safety News.

K- is for KNOWLEDGE. But it isn't enough
To know what to do; we must still do our stuff.

L- is for LIFE and the fruits of our labor.
Work safely, for your good and that of your neighbor.

M- is for MAINTENANCE, powerful pal
To men, to machinery, and to morale.

N- is for NOW. Let us faithfully vow
To deal with all hazards, and deal with them now!

O- for OBSERVANCE of all safety rules--
Obeyed by the wise, disregarded by fools.

P- for PREVENTION (far better than cure)
That PLANNING and PROGRAMS will help to insure.

Q- for the QUALIFIED. They understand
Production and safety should go hand in hand.

R- for REPORTING and RECORDS. Both needed
For trends to be quickly discovered and heeded.

S- SUPERVISION. And experts agree,
In safety the competent foreman is key.

T- is for TRAINING, designed to instill
The desire to work safely, as well as the skill.

U- for the UNSAFE WORK PRACTICES that
Employers, employees, alike should combat.

V- is for VISION in hazard detection,
And also for VIGOR in hazard correction.

W- WASTE (and how it can hurt)
That safety and safety alone can avert.

X- is for Xmas, with family cheer
For those who work safely the rest of the year.

Y- is for YOU for whom safety is planned.
It can't be complete unless YOU lend a hand.

Z- for the ZEALOUS--each one a hero
Who strives to bring injuries closer to zero.

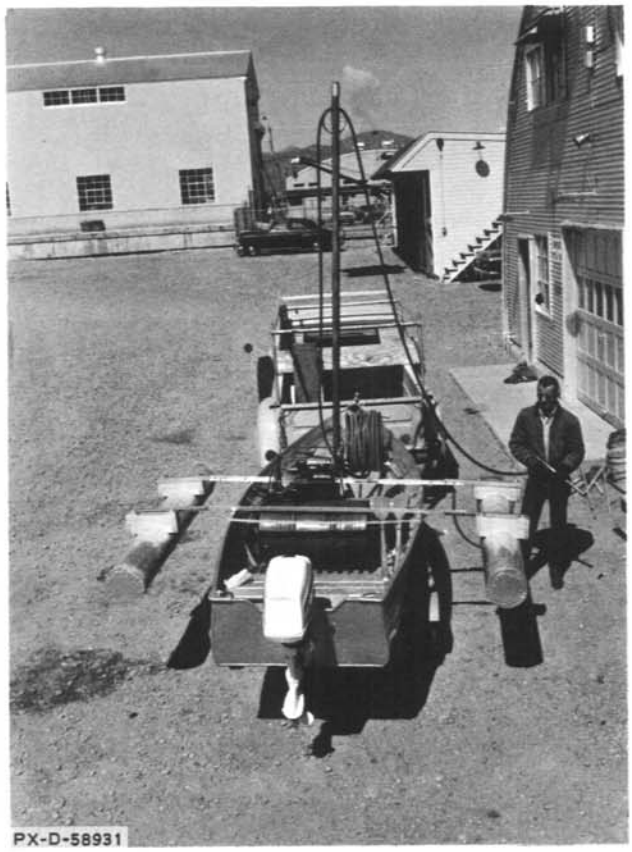
* * * * *

BOAT MODIFICATION FOR WEED SPRAYING
(Suggestion R7-67S45)

This suggestion on the modification of a boat for weed spraying was submitted by Mr. David D. Clark and Mr. Herman Krening, of the Irrigation and General Maintenance Division, South Platte River Projects, Loveland, Colorado. The utilization of this equipment should prove very useful and time saving where there is a need for the type of spraying described.

Modification of Boat

The boat modification consists of the installation of two pontoons, one along each side of the boat and fabricated from 10-inch I. D. aluminum pipe, about 18 gage, (.0478) 7 feet 9 inches in length. The leading end of each pontoon is beveled to help reduce resistance in moving through the water. The trailing, or squared ends, were capped and made water tight after the interior was filled with polyurethane plastic foam. The pontoons are attached to a frame built of 1/4-inch by 1-1/4-inch by 1-1/4-inch angle-iron. This frame is fastened to the boat, across the beam, at about the center of the boat (52-inch beam by 14-foot length). Photograph No. 1, at left shows the pontoons extended and other equipment assembled as it would be used for spraying at the reservoir site.



Photograph No. 1

The pontoons extend 24 inches from the sides of the boat while in the water and are folded back over the sides of the boat when traveling on the highway. Photograph No. 2, on page 17 shows the equipment disassembled and ready for transporting.

Other material needed to modify and equip the boat for spraying include:

1. A 30-gallon solution tank

2. A pump and motor.

3. Continuous flow hose reel and hand spray gun

4. A wood mast 2-1/4-inch in diameter by 8 feet 6 inches in length, with a pulley wheel and swivel mounted at the top.

One difficulty experienced in the past in spraying from a boat was moving the hose along the slope being sprayed. With the addition of the pontoons to stabilize the boat and the pulley wheel on the mast, it is now possible for the operator to unreel the amount of hose needed (Maximum 125 feet). This will clear rock and other ground obstructions, as the boat moves along.

Photograph No. 2

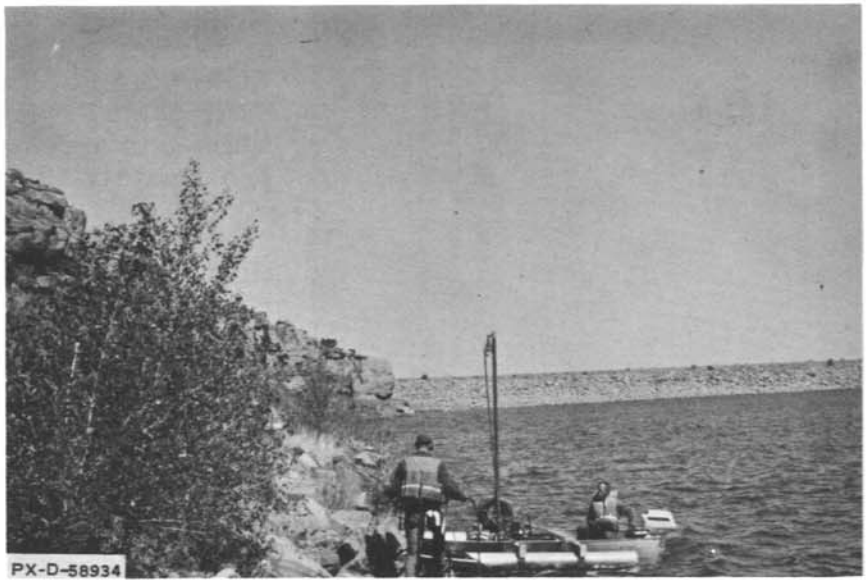
Photographs No. 3 and 4, on the following page are views of the equipment in operation at the Bureau's Horsetooth Reservoir, Colorado-Big Thompson Project, Colorado, which has a shoreline of approximately 18 miles.

The spray rig had to be fairly light and compact due to the launching restrictions and transporting to and from several reservoirs.

Safety Factor

When this boat is being used on a large reservoir or any substantial body of water, it has been found much safer to operate. The addition of the pontoons has made this possible, especially when the wind rises and the occupants are trying to get back to the launch area through rough water.

Photograph No. 3



Photograph No. 4

* * * * *

INSTALLING WOODEN WALK PLANKS ON IRRIGATION STRUCTURES (Suggestion R7-67S-40)

A suggestion by Mr. Alfred A. Fritz, Jr., of the Almena Construction Field Division, Kansas River Project, McCook, Nebraska, concerns a new method of installing wooden walk planks on irrigation structures. Although we do not use wooden walk planks in our newer designs, this could be of use to irrigation districts when they are rebuilding existing structures and retaining the wooden planks. The suggestion, as illustrated in the sketches on the following page and also on page 21, requires the fabrication of a special galvanized strap anchor and double pointed galvanized nail.

The suggested method of installing walk planks produces an extremely neat appearance and this type of installation has an immeasurable safety factor built in because these are no obstructions (such as a mismeasured anchor bolt sticking up above the walk), and no countersunk holes to catch the toe of a shoe or boot. The suggestion should also result in lower labor and material costs.

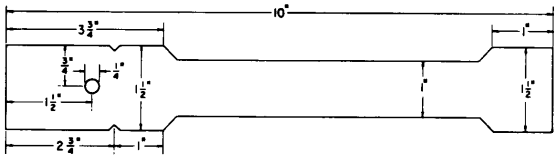
When using bolts the contractor has to drill the bolt hole by hand or furnish a power plant to run a drill and two sizes of bits, one for the bolt hole and one to countersink. The plank has to be marked for each hole to be sure the bolt holes are drilled in the right place. After installing the planks the washers and bolts have to be put on with a wrench.

In a typical installation where three walk planks for a structure are required, two 12-5/8" x 10" galvanized bolts with washers and nuts must be provided for each end of each plank. Using the anchor strap only 8 anchors plus regular nails and two double pointed nails are needed. This eliminates the need for measuring the depth to place the anchor in the concrete, as the anchors are already premeasured by their design. An added saving can be realized because using the strap anchor all planks can be precut ready for installing. Materials and tools required for plank installation are the planks, double pointed nails, regular nails, and hammer.

Anchor Detail

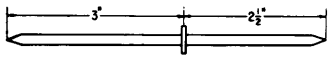
The measurement of 2-3/4" or 3-3/4" of the Galvanized Anchor Detail, as shown in Sketch A, on the next page, is the distance the concrete finisher leaves the anchor above the finished concrete surface for a 3" or 4" thick walk plank that is to be installed. A ruler or tape measure is not necessary. The spacing between anchors is 12-1/2" to 12-3/4" so therefore the top end of one of these anchors to the notch plus the total length can be used to set the space between anchors instead of using a measuring tape or ruler. This spacing allows room to insert each

successive walk plank. The anchor can be twisted just under the 3-3/4" measurement to a 90° offset. This gives added clearance adjacent to the top bars of the concrete reinforcement.



GALVANIZED ANCHOR DETAIL
3/16" THICK

Sketch-A



GALVANIZED NAIL

Sketch-B

Installation

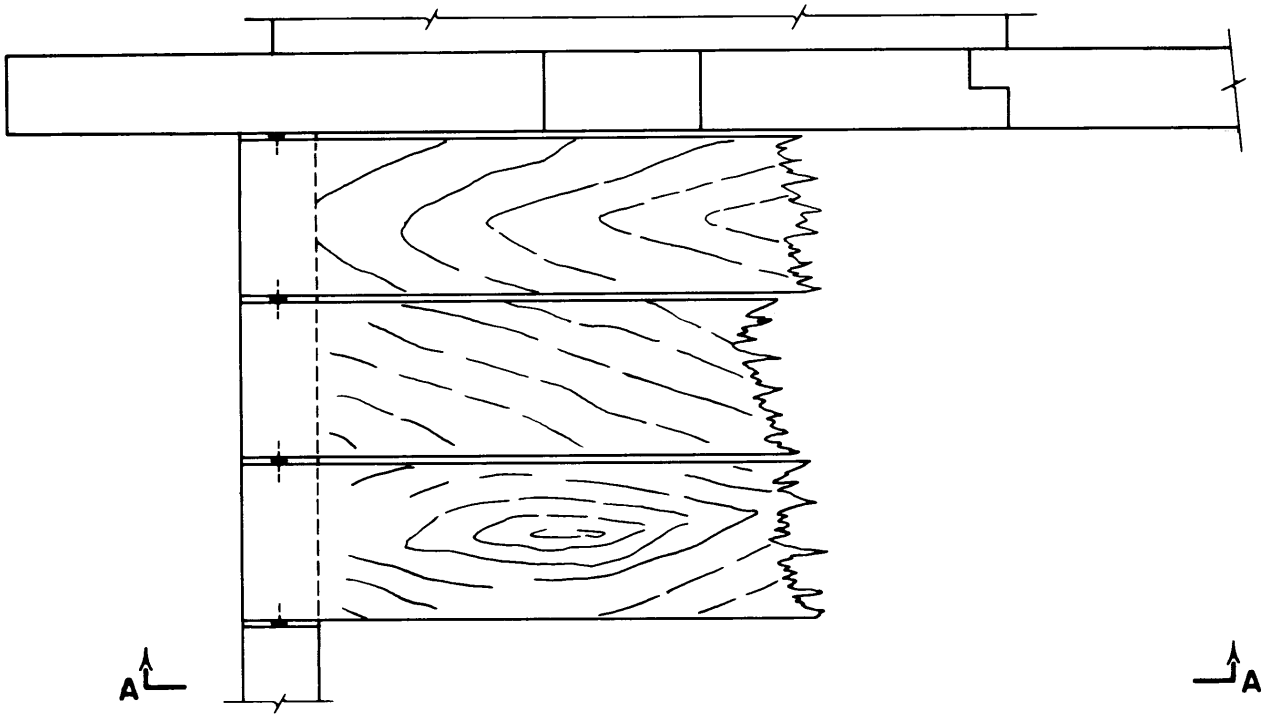
When installing the planks the first walk plank is placed between the outside and the next inside anchor. A regular 16 or 20 penny nail is used through the anchor holes of the outside anchor, then the double pointed nail as shown in Sketch B, above, is used on the inside anchor and the longer end of the nail is driven into the walk plank through the hole in the anchor. This can be achieved by driving directly on the point of the nail with a hammer or by using 3/8" inside diameter pipe approximately 4" long to be used as a driving tool. The next plank is laid in place against the points of the double pointed nails and driven against them till the plank drops in place. Succeeding planks are placed the same way with outsides fastened with regular nails. The drawings on page 21, graphically illustrate an installation.

Two sample installations of walk planks using this suggested method were made on the Almena Project with anchors and nails supplied by the contractor. According to information provided by him the comparable cost of bolts or anchors is approximately the same although his cost for the anchors was for a very small number, made up as a special order. Possibly in large lots the cost could be reduced.

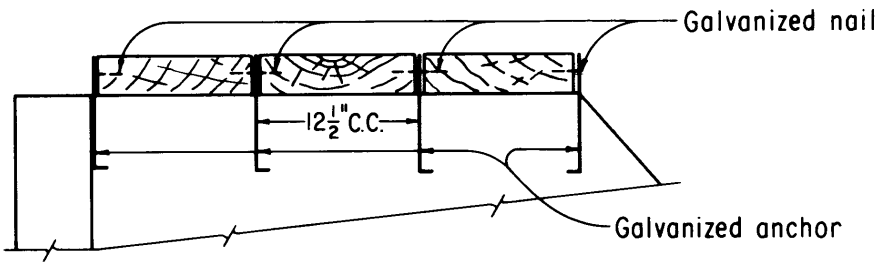
Maintenance

If it is necessary in maintenance to remove walk planks it is a very simple matter to pull the outside nails and remove the planks with a nail bar.

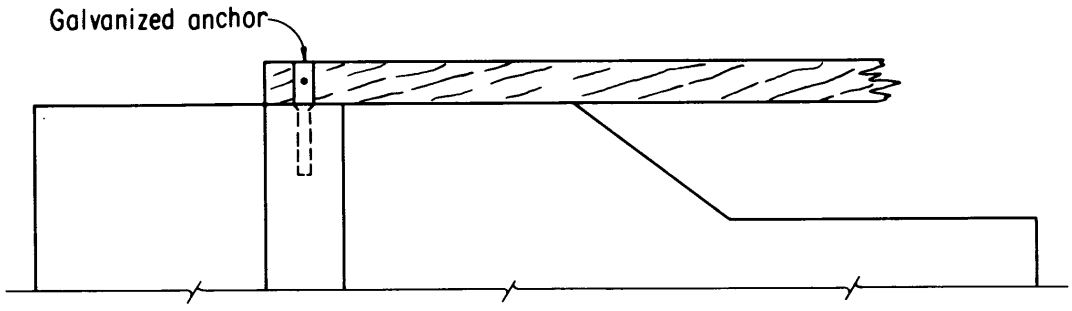
If further information is desired regarding this installation, please write to the Project Manager, Kansas River Projects Office, McCook, Nebraska.



PLAN VIEW



END VIEW



SECTION A-A

GPO 838-795