Reda Pumps—Their Care And Operation

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Power to operate the unit is generally taken from the lines of public utility companies who furnish 3-phase, 60 cycle power at various standard voltages. Where utility power is not available, an engine generator unit is used at the well.

The motor, which is a squirrel cage, induction type, turns the pump at approximately 3450 R.P.M. Maximum motor horsepower ratings are controlled by casing size.

Maximum Motor Rating

5 - 1/2" casing — 59 - 1/2 H. P.
7" casing — 150 H. P.
8 - 5/8" casing — 240 H. P.

The characteristics of a centrifugal pump are quite different from those of a reciprocating or positive displacement pump. Its capacity varies with the amount of work head. (Feet of lift or pounds per square inch of pressure.) As the head decreases, the capacity of the pump increases. This is illustrated by the Head Capacity Curve in Figures 3 and 4. (100 Stage D-33 and E-59).

It is to be noted that the curves in these two figures are for 100 stage pumps of two different types. (These are 2 out of 15 pump designs covering capacities from 500 B.P.D. to 16,000 B.P.D.)

From these charts, it is possible to calculate the head value of one stage at a given producing rate. If the head or lift in feet is known, it is then possible to figure the number of stages required to produce the desired volume.

Installation

The installation of a Reda Pump is usually made by a factory-trained serviceman.

While this leaves little for the pumper or farm boss to do, there are two or three things in connection with unloading the equipment on location that warrant their attention.

Both pump and motor are long and flexible. Even though they are in steel shipping boxes, they are subject to damage from improper handling. Most truck drivers who are experienced in loading and unloading Reda equipment are very careful. One who is not experienced may slide the boxes off the end of the truck until one end rest on the ground and then pull his truck out from the other end, allowing it to fall to the ground. This should be prevented, if possible. When it does occur, it should be reported to the company.

The shipping boxes are painted red on one end, indicating the head end of the pump or motor contained in the box. The heads should be unloaded next to the derrick floor in such a way that the elevator can easily be attached to each of them and clearance allowed for moving them to the well head.

The cable reel should be mounted on the reel supports in a location where the cable can be threaded over a wheel and fork assembly, hanging on the mast or in the derrick, and carried to the well head without interfering with the pulling unit lines or the pulling crew.

Operation

The majority of Reda installations are on a steady 24 - hour pumping schedule.

The routine of this operation takes very little of the pumper's time or attention.

Changing the ammeter charts once a day is usually all that is required.

Frequently a light is installed at the well to visually inform the pumper that the unit is operating, thus saving pumper travel and unit downtime.

From time to time the pumping unit may be down due to power interruptions, or if the unit is shut down for any reason, certain precautions should be observed before immediately restarting the unit. In almost all cases a check valve is installed immediately above the pumping unit in the tubing unit, and will save down-time. Occasionally a check valve will fail to hold if foreign material is present, and in other cases a check valve may not have been installed. While the tubing is draining, the pump will turn in reverse rotation, and any attempt to start it during this time may cause a broken shaft, or at least would cause the overload trips to kick out.

When switchboards are equipped with automatic control panels, the time clock can be set for a predetermined time interval that will permit the tubing to completely drain back, and thus provide the desired safety margin. When a hand-operated, non-automatic switchboard is used, the tubing should be checked before attempting to start the unit after a very short time interval. This can be done by opening the tubing bleeder and checking for suction to indicate if the tubing is still draining. In any event, it is best not to restart a unit after a very short down-time interval of about one or two minutes. In general, a down-time of two minutes per thousand feet of pump setting should be satisfactory.

In some applications, as in water supply wells for water floods, the daily pump capacity may be in excess of the daily water requirements, and this may be controlled by one of two methods.

The pumping units may be operated intermittently, using a float switch in a storage pond or tank, or by using a time clock control.

As an alternate, in many cases the use of a high-pressure valve and pressure gauge may be employed to impose back-pressure on the tubing.

Flow is decreased or increased by varying the amount of back-pressure on the tubing. In general, this method is less efficient from the standpoint of power consumed for work done, than is intermittent operation.

In operating in this manner, the pumping unit should not be restricted to less than about 50 percent of its nominal rated capacity. Reduction of flow to much less than one-half of normal will cause increased wear in the pump due to downthrust and thus it becomes more desirable to install a pump of more nearly the correct size for the application.

Some wells, either oil or water wells, may evolve sufficient quantities of gas at the pump screen to interfere with the pump capacity, or even to cause a gas-lock. When these conditions are known in advance, a gas separator is provided with the

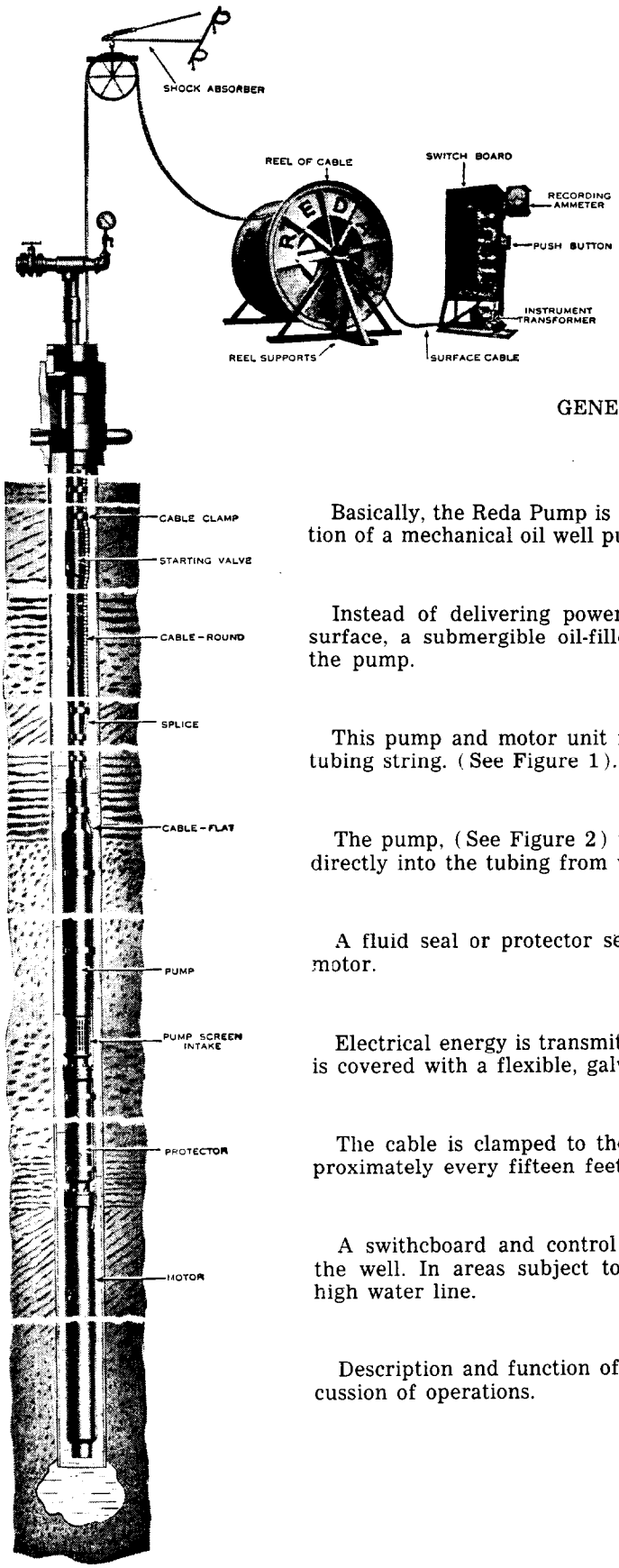

Fig. 1

GENERAL DESCRIPTION

Basically, the Reda Pump is a radical departure from the general conception of a mechanical oil well pumping unit.

Instead of delivering power from an engine or electric motor on the surface, a submergible oil-filled motor is coupled with a direct drive to the pump.

This pump and motor unit is lowered down the hole on the end of the tubing string. (See Figure 1).

The pump, (See Figure 2) which is a multistage centrifugal, discharges directly into the tubing from which it is suspended.

A fluid seal or protector section is located between the pump and the motor.

Electrical energy is transmitted by a jacketed, three-conductor cable that is covered with a flexible, galvanized steel or monel armor.

The cable is clamped to the tubing with steel strap clamps, spaced approximately every fifteen feet.

A swithcboard and control panel is conveniently located, usually near the well. In areas subject to flooding, it should be mounted above the high water line.

Description and function of the control panel will be covered in the discussion of operations.

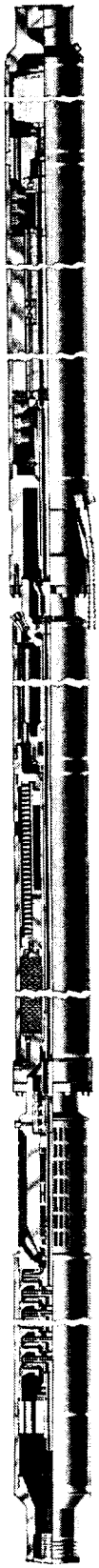

Fig. 2

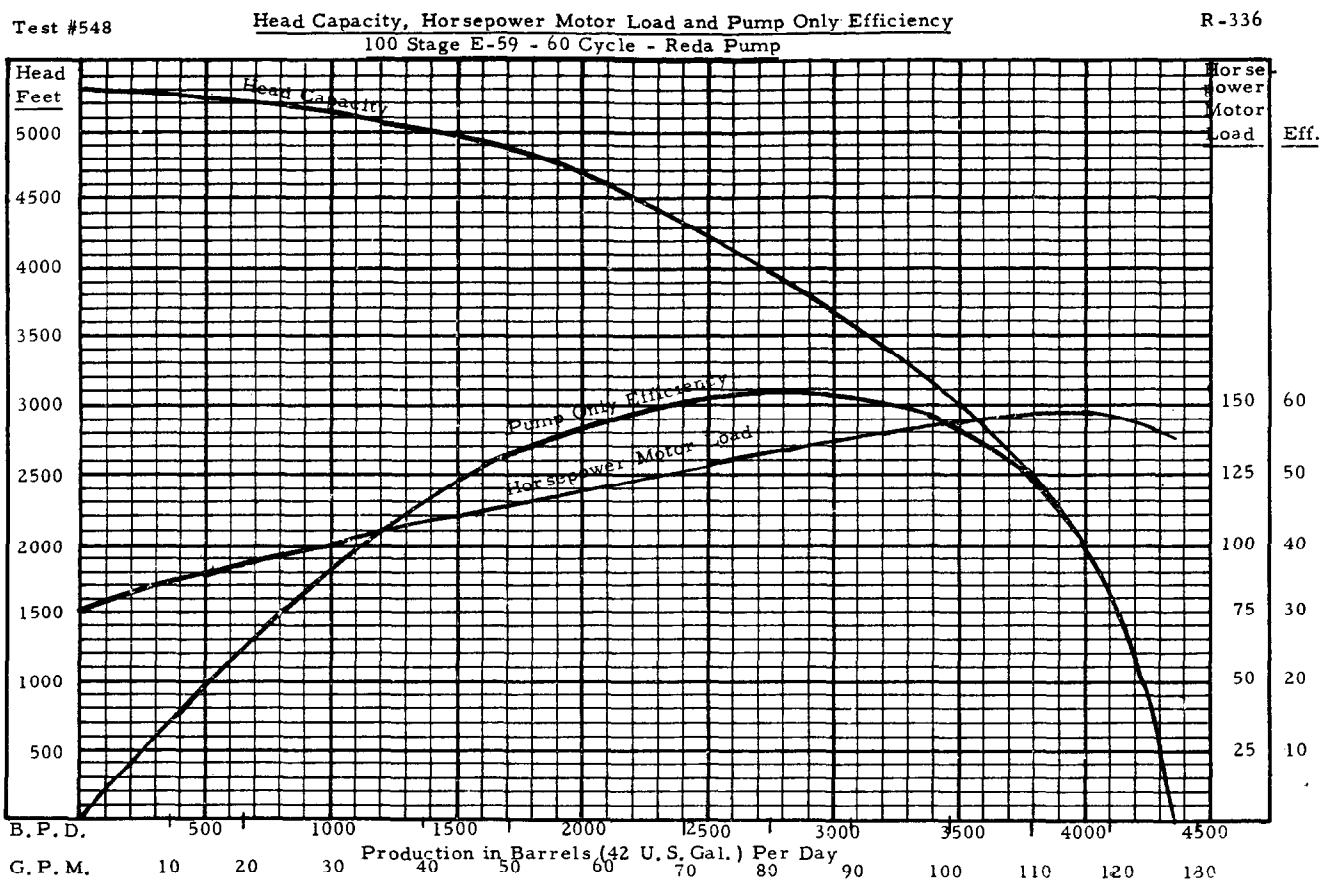

FIGURE 3

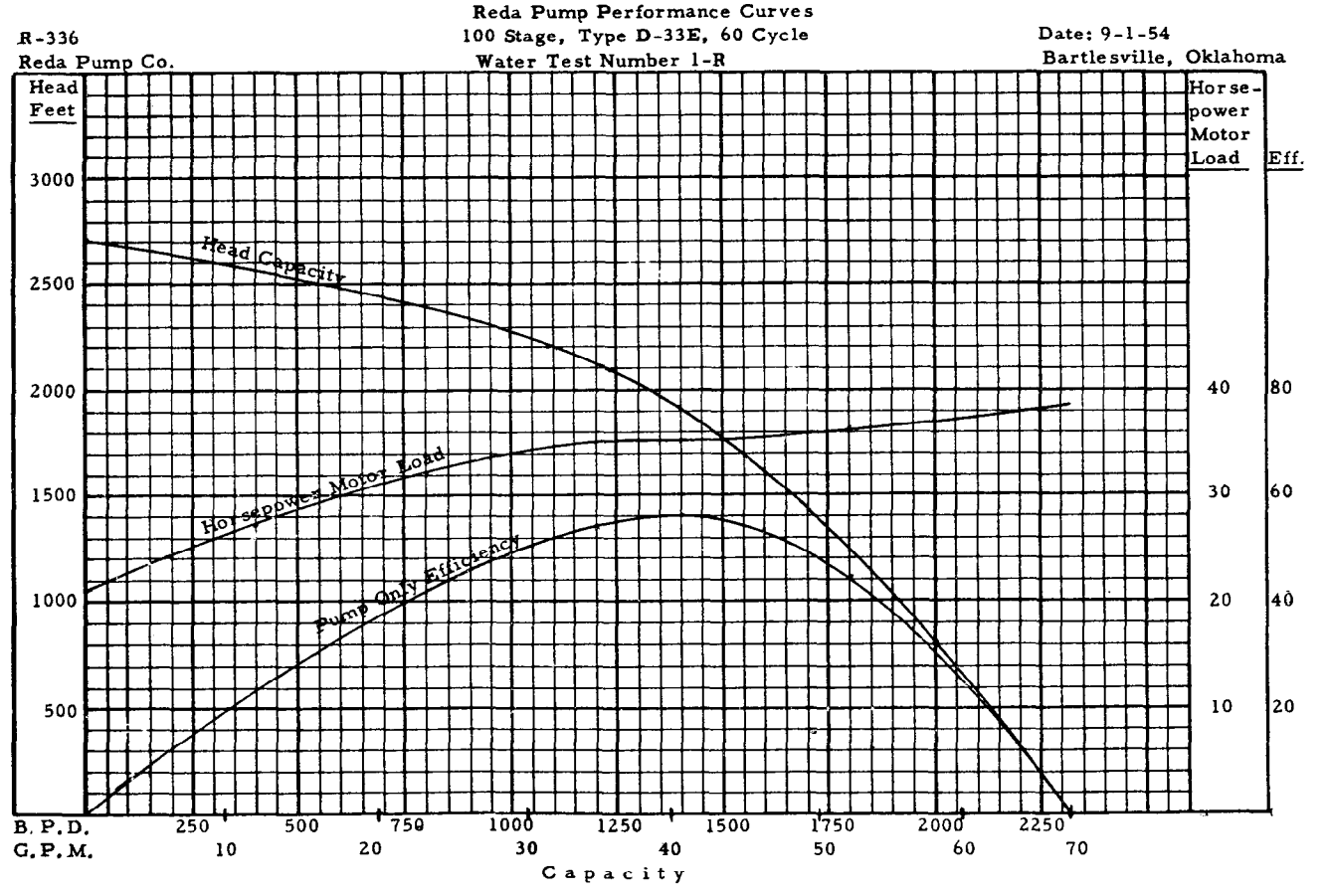

FIGURE 4

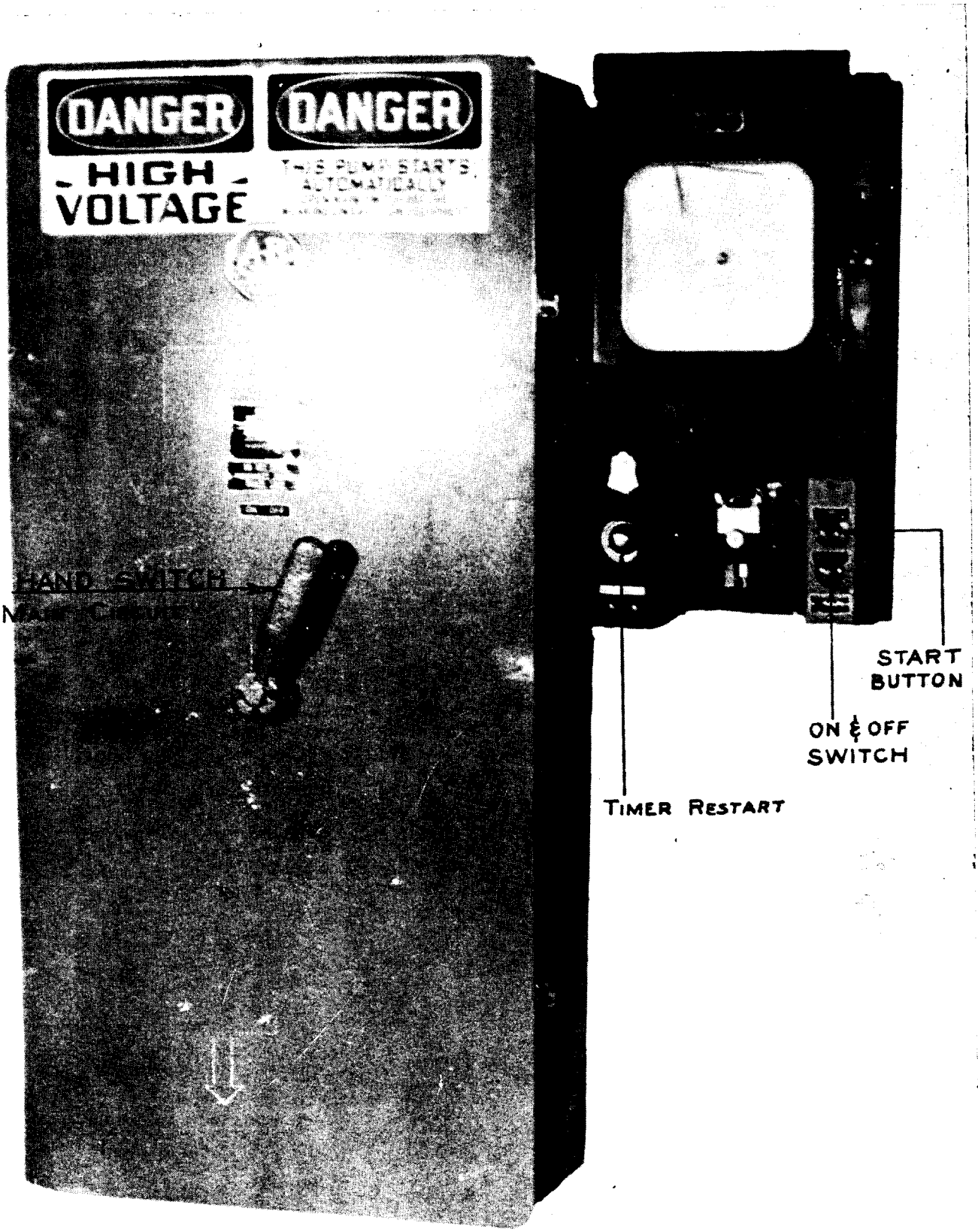
DANGER
DANGER
HIGH VOLTAGE
HAND SWITCH
START BUTTON
ON & OFF SWITCH
TIMER RESTART

FIGURE 5

pumping unit, the separator being able to effectively separate large amounts of gas from the liquid, thus enabling the pump to produce at or near its volumetric rating.

Most switchboards are equipped with an underload shut-down device which will stop the pumping unit when a gas-lock takes place, and the time clock setting can provide for a sufficient down time interval to let more liquid accumulate in the well and to permit the gas to bleed off.

In some cases where the pump capacity is only slightly larger than the well capacity, a small amount of back-pressure on the tubing will usually stabilize the rate of flow.

At this point we will take up the description and function of the switchboard and control panel.

With most installations of 50 H. P. or larger, use the 100 ampere automatic board that is equipped with overload and underload relays, recording ammeter and restart panel.

There are four external switch controls.

The lever hand switch on the door face (Fig. 5) opens and closes the main service circuit. It also acts as a safety switch since it will not allow the door to open while the switch is closed.

At the right of the control panel is an off and on switch that energizes the control system. Directly above this is a push-button starter. The push-button is for hand starting and energizes the magnetic relays (M1, M2, M3—Fig. 6) on the motor starter.

The timer restart shown on Fig. 5 and 6 can be set to restart the unit at any interval from five minutes to five hours after the unit is shut down.

An underload cutout relay shown at the base of the control panel (Fig. 6) is set to cut out the motor starter when the electric load drops below a certain point. This occurs when a well pumps off; or when gas-locking occurs.

In each case the restarter begins to function immediately after the shut-down occurs, restarting the unit on the time interval for which it is set.

If a delayed start is not desired at that time, the push-button starter may be used and the timer restart relay will be cut out of the circuit.

Overload relays A & B (Fig. 7) are designed to open the motor starter as protection against several causes

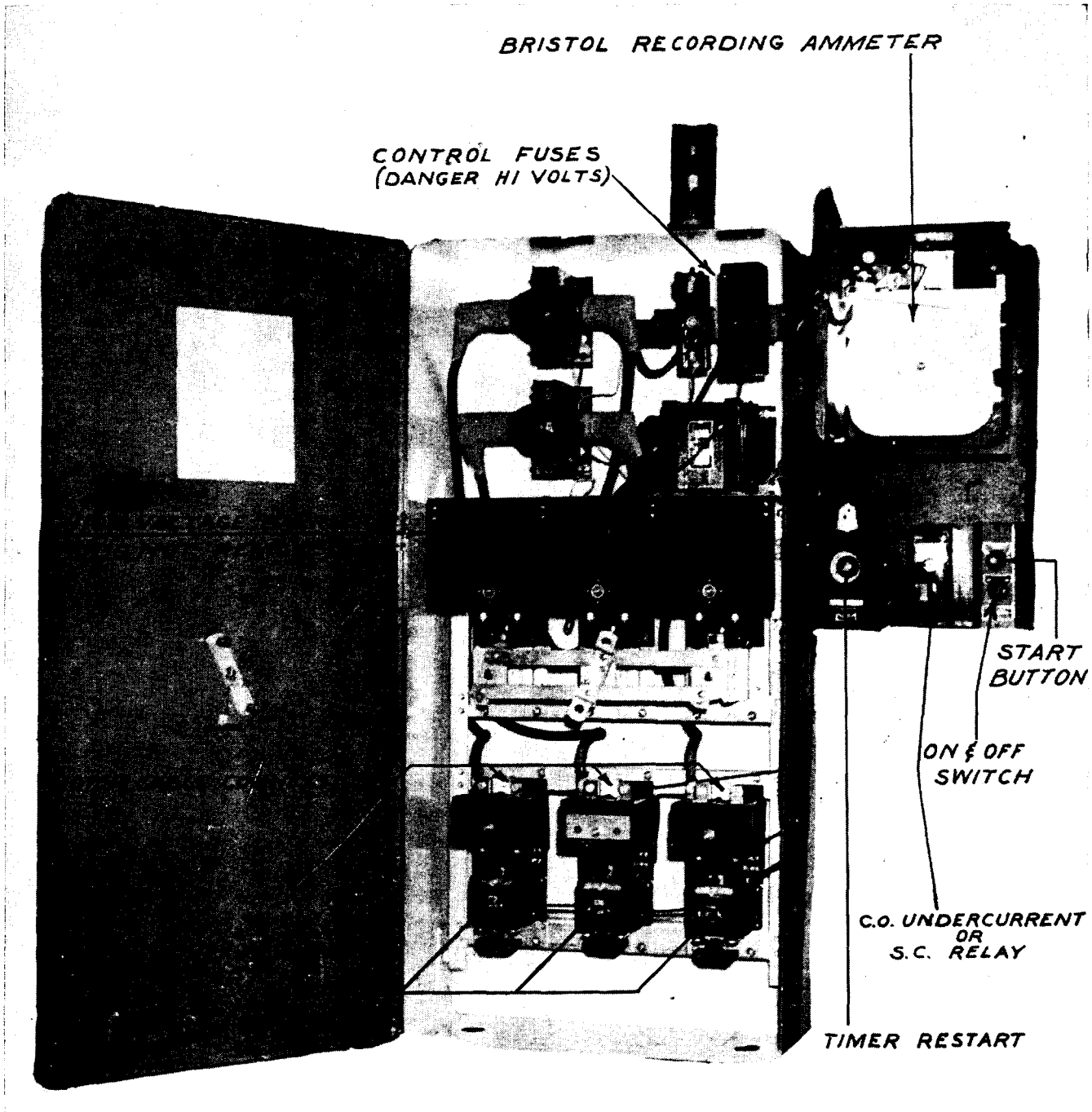

FIGURE 6

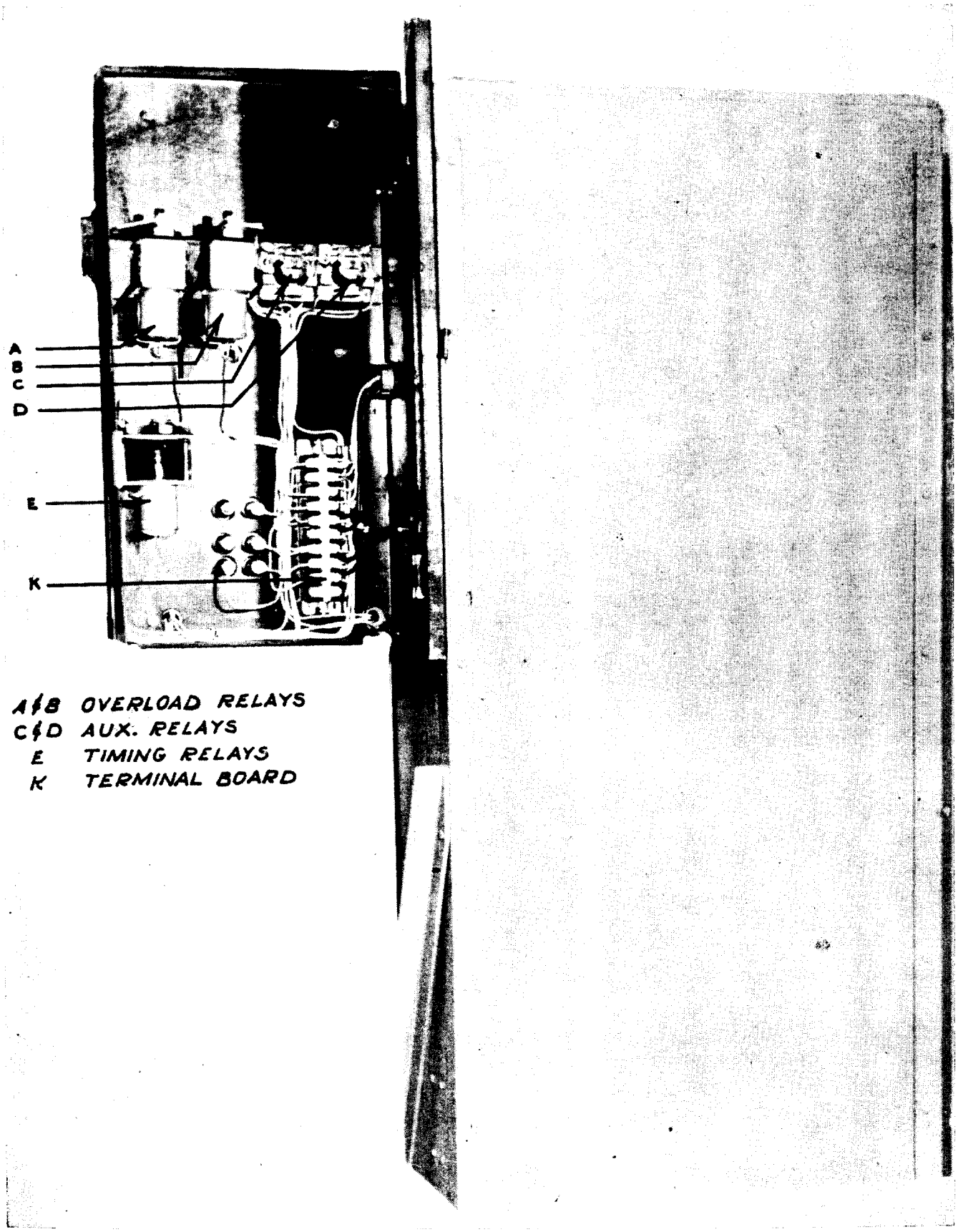
A
B
C
D
E
K
A & B OVERLOAD RELAYS
C & D AUX. RELAYS
E TIMING RELAYS
K TERMINAL BOARD

FIGURE 7

of power overload, some of which are listed below:

1. Pump drag due to sand damage or worn out bearings.
2. Short circuit or burned cable.
3. Burned motor.
4. Single phase on power supply due to single power transformer or fuse burning out.

A power wire broken or down will cause the same trouble.

The restarter system on the illustrated boards will make one attempt to start the motor. If this fails, it locks itself out, since repeated attempts would cause aggravated short-circuiting, usually resulting in excessive damage to the motor and cable.

Where a manual switchboard is used, a set of fuses protects against overload, in addition to the usual overload relays. If these are burned they should not be replaced until the source of trouble is located.

In case of trouble with either the automatic or manual control, the pumper should not attempt to start the unit by push-button more than once. If it does not start on first try, a serviceman should be called.

Two sources of trouble, which are quite uncommon, can be recognized with little study. One is a tubing leak; the other is a casing leak from a water zone above the pump.

When a tubing leak occurs, the volume of flow at the surface decreases and the amperage on the recording ammeter generally increases.

When a casing leak occurs, the volume and percentage of water produced increases and an increase in amperage will be observed.

In either case, remedial measures should be taken to correct the trouble, as both contribute to loss of production and high operating costs.

Summary

In summation, it can be said that the Reda pumping unit has operating characteristics basically similar to surface types of electric motor-driven centrifugal pumps. The amount of attention ordinarily required by personnel is kept to a minimum. Since no regular attention, such as adjusting of the various controls, oiling, greasing, etc., is required, very little operating attention is required.