OVERSPEED TRIP MECHANISM

Figure 1 shows the overspeed trip which automatically closes the throttle valve, thereby shutting down the turbine, if the speed increases to approximately 11 per cent above normal. Oil is used as the operating medium.

The trip body (which is integral with the governing impeller) is threaded on the end of the turbine shaft with a thread opposite to the direction of rotation and is locked in place by a set screw. The trip weight "16" (shown in Section C-C) is carried in a transverse hole in the body, with its center of gravity offset from the axis of rotation so that centrifugal force tends to move it outward at all times. Normally, this weight is held in its inner position by the compression spring "14" and the retaining nut "15". If the speed of the turbine increases to the point for which the mechanism is set to operate (approximately 11 per cent above normal), the weight (16), due to the increased centrifugal force, overcomes the compression of the spring "14" and moves outward. In this outer position the weight strikes the trigger "11" and rotates it so as to disengage the latch between the lower end of the trigger and the sleeve "7". Disengagement of this latch releases the load imposed by spring "5" on the valve "2", and therefore, releases the oil pressure below the valve, which in turn, releases the oil pressure below the throttle valve operating piston. The throttle valve, therefore, closes, thereby, shutting down the unit.

After this mechanism has tripped, it must be reset by hand. This is done, by pulling upward on the resetting lever "24", which, by suitable linkage, depresses the oil valve until the latch between the trigger "11" and the sleeve "7" is again engaged. The valve "2" is then held firmly on its seat by the compression spring "5". This, of course cannot be done until the turbine speed has decreased sufficiently to allow the weight "16" to return to its normal position, which should occur at approximately 2 per cent above normal speed.

The mechanism can be tripped by hand by pushing downward or striking the hand trip lever "39". As shown in Fig. 1, this lever is fulcrumed so that it, in turn, strikes the trigger "11", thus disengaging the latch and allowing the oil valve "2" to open in the same manner as described above.

When desired, an electrical solenoid can be provided to trip the mechanism, In such cases, the solenoid (not shown in the illustration) is located on the end cover so that when energized, its plunger strikes the end of the trip lever "39" and thus disengages the trigger latch.

The following adjustments should be maintained in order to insure proper functioning of the trip mechanism.

1. With the mechanism latched in its normal position, there should be 1/16-inch clearance between the trigger "11" and the body.

2. With the mechanism in its tripped position, there should be at least 3/8-inch clearance between the trigger "11" and the body.

3. With the trigger cam adjusted as above, there should be 1/16-inch lap of the latch between the trigger "11" and the sleeve "7".

A turbine should be overspeeded occasionally to check the speed at which the weight "16" flies out and actuates the tripping mechanism. It is not sufficient to disengage the trigger latch by hand because this tests only the automatic throttle valve.

In order to check the overspeed of the turbine properly, the governing valves should be blocked open. The throttle valve should then be opened very slowly, due attention being given to the tachometer, and the speed slowly increased to the tripping point. During this test, it is advisable to have an operator stand by the overspeed trip, ready to trip it by hand instantly if it does not trip automatically at the 11 per cent overspeed.

If the governor on the turbine is equipped with an overspeed testing device, the unit should be tested for overspeed in accordance with the instructions given in the instruction book supplement covering the governor.

In case the weight "16" fails to fly out at the correct speed the unit should be shut down and the mechanism checked. Make sure that the weight is not sticking in its body. The overspeed test should again be run and if the same trouble results, it is evident that the spring "14" is compressed too much thus preventing the weight "16" from flying out at the correct speed.

In order to correct the adjustment, the lock spring "19" should be removed and the lock "17" pulled out. The retaining nut "15" should then be backed out part of a turn to decrease the compression of the spring "14". The lock "17" should be reassembled so that it fits into one of the notches in the retaining nut and is secured by the lock spring "19". Turning the retaining nut one notch will change the turbine speed approximately 12 rpm. on an 1800 rpm. machine and 50 rpm. on a 3600 rpm. machine.

Should the unit trip out at less than 11 per cent overspeed, the spring retaining nut "15" should be screwed in part of a turn and again locked in place.

After making a change on the compression spring "14" a final overspeed test should always be made before the turbine is again put in service.

An arrangement is provided by means of which the trip mechanism can be tested without actually overspeeding the turbine, and, if the resetting lever "24" is held to prevent opening of the oil valve "2", it can be tested without taking the turbine off the line or removing the load. This is accomplished by admitting oil, under pressure, to the bottom of the trip weight "16" and noting the oil pressure required to move the weight outward. As shown in section A-A-A-A, the test plunger "30" which is located at the center of the end cover "33", contains passages which connect with a high pressure oil supply and direct this oil into a corresponding passage in the end of the rotating overspeed trip body. This plunger is normally held away from the end of the body by the compression spring "29". When it is held inward against the rotating body and the oil test valve "31" is opened, oil pressure is established at the bottom of the weight "16". This pressure is regulated by the hand valve "31" and a pressure gauge is provided by means of which the pressure required to operate the weight at normal speed can be ascertained.

The readings obtained in this manner are, of course, only relative and must be compared with previous readings. With the spring adjustment made correctly by actually overspeeding the turbine, the speed changer should be adjusted to maintain exactly normal full speed and the over-

speed trip operated by oil pressure as described above. The pressure at which the trip operates should be recorded for future reference. Then at any future time, the mechanism can be tested by means of oil pressure alone. If the oil pressure required to operate the trip is the same as that originally recorded, it can be assumed that the mechanism is functioning properly. It is important to have the turbine operating at exactly normal full speed whenever the trip is operated by oil pressure, otherwise the readings will not be of any value.

In order that the axial location of the rotor in the cylinder may be checked at any time, provision is made for using a depth micrometer against the end of the overspeed trip body. The micrometer pin should be inserted in the hole drilled near the center of the end cover (shown in the end view) and adjusted until the pin just touches the rotating body. In order to insert the micrometer pin, the cover plate "41" should be rotated to clear the hole.

The following list has been compiled to facilitate ordering spare or renewal parts by item number and name, together with the serial number of the turbine.

Item No.	Name
1	Overspeed Trip Valve Seat
2	Overspeed Trip Valve
3	Overspeed Trip Valve Stem
4	Overspeed Trip Valve Spring
5	Overspeed Trip Valve Stem Spring
6	Overspeed Trip Valve Stem Spring Seat
7	Overspeed Trip Valve Stem Sleeve
7-A	Overspeed Trip Valve Body Cover Bushing
8	Overspeed Trip Valve Body
9	Overspeed Trip Valve Body Cover
10	Overspeed Trip Trigger Spring
11	Overspeed Trip Trigger
12	Overspeed Trip Trigger Fulcrum Pin
13	Overspeed Trip Body Balancing Block
14	Overspeed Trip Weight Spring
15	Overspeed Trip Weight Spring Retainer
16	Overspeed Trip Weight
17	Overspeed Trip Weight Spring Retainer Lock
18	Overspeed Trip Weight Wearing Ring
19	Overspeed Trip Weight Spring Retainer Lock Spring
20	Overspeed Trip Re-setting Cam Stop Pin
21	Overspeed Trip Re-setting Cam Shaft
22	Overspeed Trip Re-setting Cam
23	Overspeed Trip Re-setting Lever Stop Stud
23-A	Overspeed Trip Re-setting Lever Spring
24	Overspeed Trip Re-setting Lever
25	Overspeed Trip Re-setting Lever Nut
26	Overspeed Trip Re-setting Lever Indicator
27	Overspeed Trip Test Plunger
27-A	Overspeed Trip Test Plunger Packing Retainer Ring
28	Overspeed Trip Test Plunger Packing
29	Overspeed Trip Test Plunger Spring
30	Overspeed Trip Test Plunger Head
31	Overspeed Trip Test Valve
32	Overspeed Trip Test Gauge
33	Overspeed Trip End Cover
34	Gasket
35	Overspeed Trip Hand Trip Lever Cam Stop
36	Overspeed Trip Hand Trip Lever Cam
37	Overspeed Trip Hand Trip Lever Shaft
38	Overspeed Trip Hand Trip Lever Spring
39	Overspeed Trip Hand Trip Lever
40	Overspeed Trip Hand Trip Lever Nut
41	Micrometer Hole Cover Plate

Overspeed Trip Mechanism

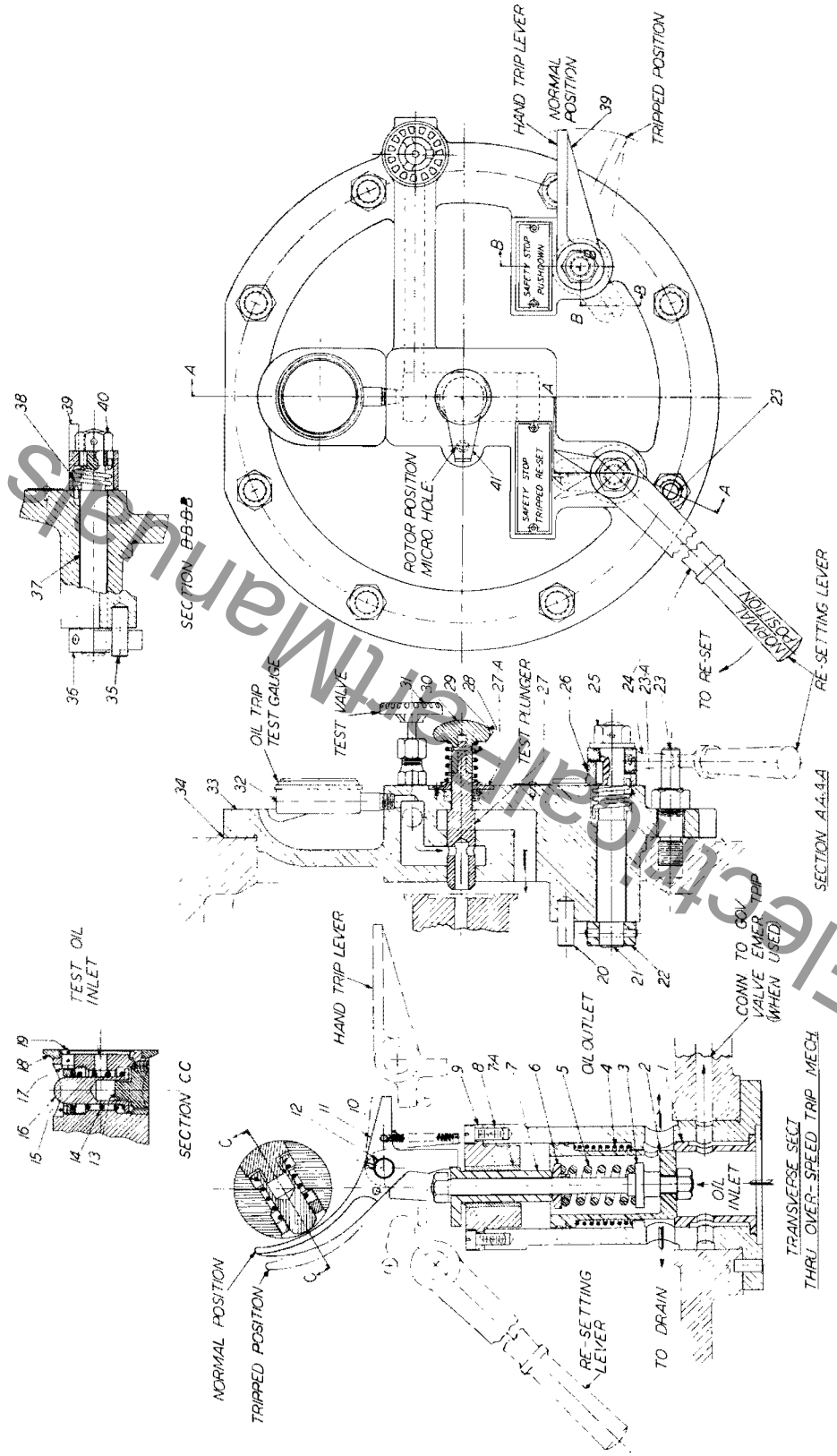

Figure 1

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