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 weight "23" is carried in a transverse hole in the thrust bearing extension shaft, 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 "24" and the retaining nut "26". 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 "23", due to the increased centrifugal force, overcomes the compression of the spring "24" and moves outward. In this outer position the weight strikes the trigger "20" and rotates it so as to disengage the latch between the lower end of the trigger and the sleeve "30". Disengagement of this latch releases the load imposed by the spring "13" on the valve "7", 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 "35", which, by suitable linkage, depresses the oil valve until the latch between the trigger "20" and the sleeve "30" is again engaged. The valve "7" is then held firmly on its seat by the compression spring "13". This, of course, cannot be done until the turbine speed has decreased sufficiently to allow the weight "23" 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 inward or striking the hand trip lever "11". As shown in Fig. 1, this lever is fulcrumed so that it, in turn, strikes the trigger "20", thus disengaging the latch and allowing the oil valve "7" to open in the same manner as described above.

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 "20" and the shaft.

2. With the mechanism in its tripped position, there should be at least 3/8 inch clearance between the trigger "20" and the shaft.

3. With the trigger cam adjusted as above, there should be 1/16 inch lap of the latch between the trigger "20" and the sleeve "30".

A turbine should be overspeeded occasionally to check the speed at which the weight "23" 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 percent 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 "23" 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 "24" is compressed too much thus preventing the weight "23" from flying out at the correct speed.

In order to correct the adjustment, the lock screw "25" should be removed and the retaining nut "26" should be backed out part of a turn to decrease the compression of the spring "24". The lock screw should then be replaced to fit into one of the notches in the retaining nut. Turning the retaining nut one notch will change the turbine speed approximately 40 rpm.

Should the unit trip out at less than 11 percent overspeed, the spring retaining nut "26" should be screwed in part of a turn and again locked in place.

After making a change on the compression spring "24" 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 "35" is held to prevent opening of the oil valve "7", 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 inside of the trip weight "23" and noting the oil pressure required to move the weight outward. This arrangement is shown in Figure 2. Suitable cored and drilled passages, in the thrust bearing pedestal cover and extension shaft, connect a high pressure oil supply to the trip weight. The oil flow is shown by arrows. The valve "5" is supplied to permit removal of the test gauge, and should be in the open position with the gauge installed. The valve "8" (shown in Section A-A), therefore, controls the oil pressure inside the trip weight. The pressure gauge "7" 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 overspeed 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.

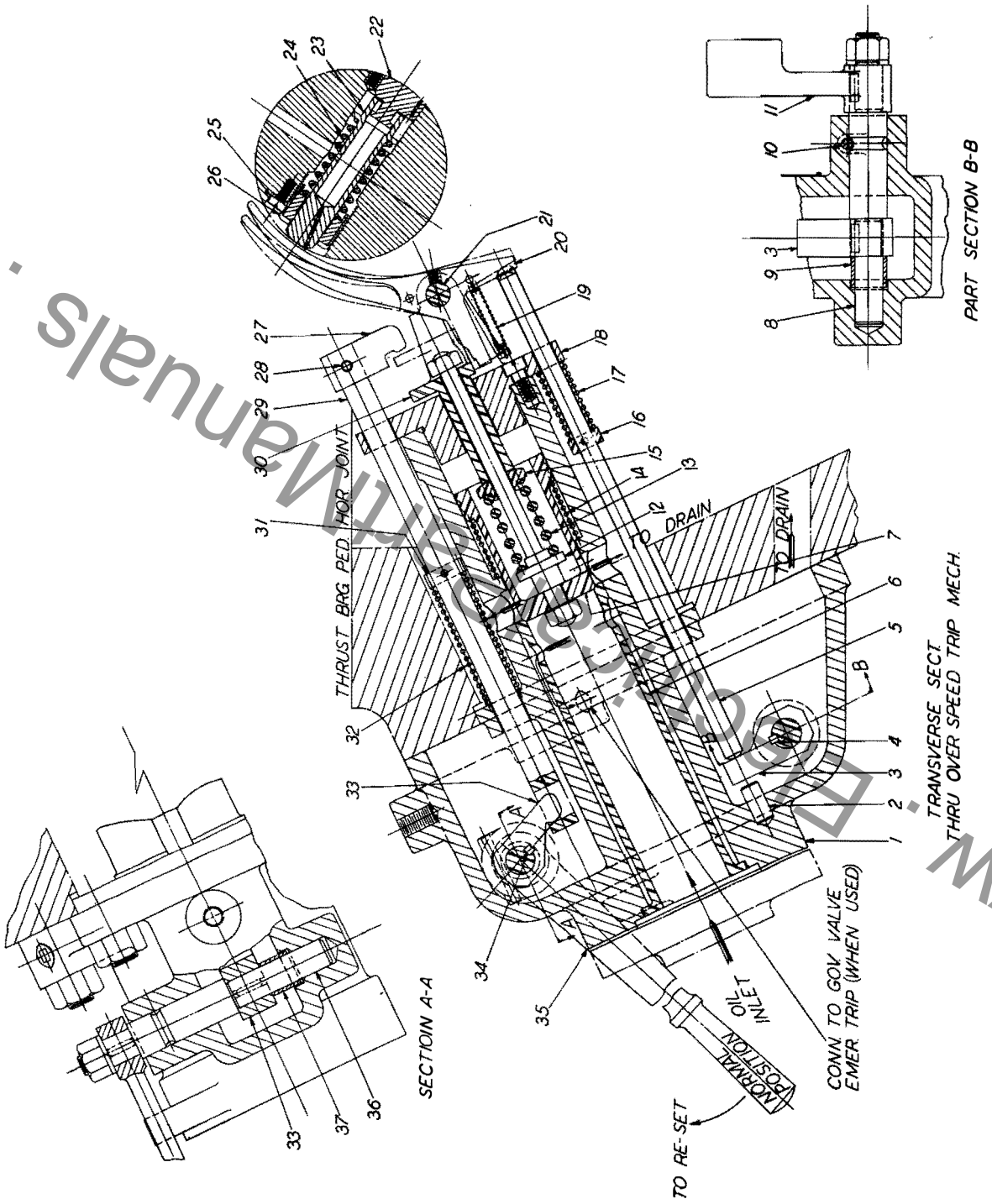
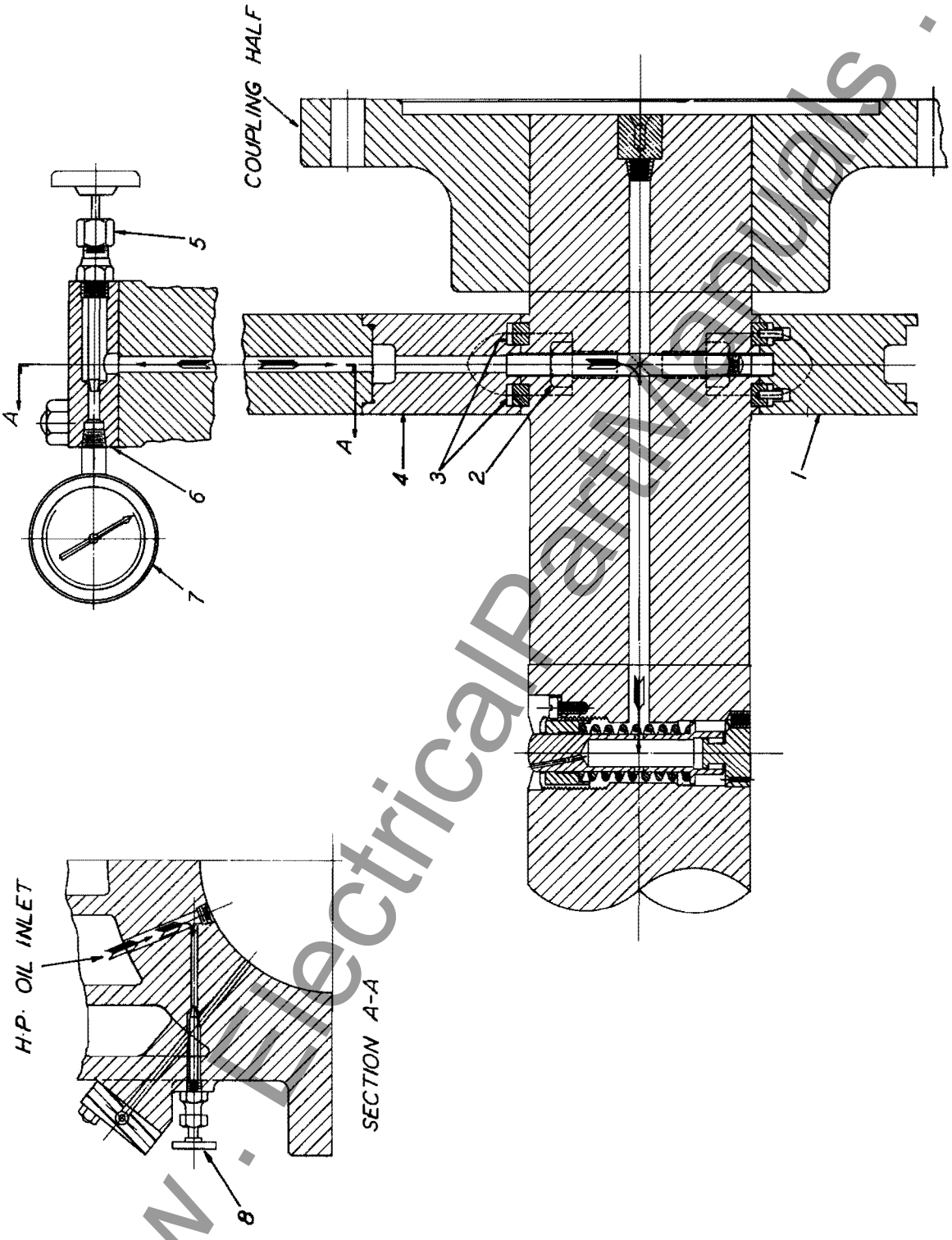


Fig. 1



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
	Figure 1
1	Valve Body
2	Hand Trip Lever Cam Stop
3	Hand Trip Lever Cam
4	Hand Trip Lever Cam Key
5	Hand Trip Rod
6	Valve Seat
7	Valve
8	Hand Trip Lever Shaft
9	Hand Trip Lever Shaft Bushing
10	Hand Trip Lever Shaft Lock Pin
11	Hand Trip Lever
12	Valve Stem
13	Valve Stem Spring
14	Valve Spring
15	Valve Stem Spring Seat
16	Hand Trip Rod Collar
17	Hand Trip Rod Spring
18	Valve Body Cover
19	Trigger Spring
20	Trigger
21	Trigger Falcrum Pin
22	Balancing Block
23	Weight
24	Weight Spring
25	Weight Spring Retainer Lock Screw
26	Weight Spring Retainer
27	Resetting Rod Head
28	Resetting Rod Head Taper Pin
29	Resetting Rod
30	Valve Stem Sleeve
31	Resetting Rod Collar
32	Resetting Rod Spring
33	Resetting Lever Cam
34	Resetting Lever Cam Key
35	Resetting Lever
36	Resetting Lever Shaft
37	Resetting Lever Shaft Bushing
	Figure 2
1	Oil Trip Housing Half (lower)
2	Oil Trip Housing Bolt (fitted)
3	Oil Trip Housing Spal Ring (complete)
4	Oil Trip Housing Half (upper)
5	Valve
6	Flange
7	Test Gauge
8	Test Valve