Exhaust Pressure Regulator

This mechanism automatically controls the main governor so as to maintain the pressure in the turbine exhaust line within the desired limits. It is in reality a pressure transformer which transforms steam pressure changes (in the turbine exhaust) into oil pressure changes which actuate the main governor.

The mechanism is shown in the accompanying Figure. Its principal parts are: The diaphragm "24" and its loading spring "31", the relay "18" and its loading spring "6", together with the necessary supplementary details. Steam from the exhaust is admitted as shown in Section A-A and exerts a downward force on the diaphragm "24". This force is opposed by the compression spring "31" acting through the seat "34" and stem "32". The relay "18" operates within a ported bushing "17". By means of a jet of high pressure oil directed against the spinner "15", the relay is kept revolving at all times so as to reduce the friction to a minimum and make the mechanism highly sensitive. The upper "land" on the relay, controls ports which admit high pressure oil while the lower "land" controls parts which open to drain. The chamber between the two "lands" is connected to the space above the relay, and also to the main governor, (as shown in Section C-C). This chamber contains the regulating (or transformed) pressure which varies with movements of the relay.

Upward movement of the relay closes the drain ports and opens the high pressure ports, thus increasing the Regulating oil pressure in the chamber between the two relay "Lands" and above the relay. Conversely, downward movement of the relay closes the high pressure oil ports and opens the drain ports, thus decreasing the Regulating oil pressure. In following the operation of this mechanism, it is important to bear in mind that whatever pressure exists in the chamber between the two relay "lands" also exists in the space above the relay and any change in this pressure results in a change in the force acting downward on the relay.

The relay is spring loaded in an upward direction by the compression spring "6". Therefore, with no steam pressure acting on the diaphragm "24", the spring "31", thru seat "34" and stem "32", holds the diaphragm "24" against its upper stop, clear of the relay, and the spring "6" moves the relay upward thus admitting high pressure oil to the Regulating oil chamber until its pressure, acting above the relay, becomes great enough to balance the force of the spring. The movement at the relay "18", is stabilized by the dashpot action of the bellows and cover assembly "9". Before starting up for the first time or if the unit has been out of service for a long period, the bellows "9" should be filled with oil. An external filling connection is provided for this purpose.

Assuming that the mechanism is in operation and in its neutral position, the following, outlines a complete cycle of its control:-

If the exhaust pressure becomes higher than that for which the regulator is set, the increased steam pressure acting on the diaphragm "24", and thence, through the yoke arrangement consisting of items "42", "43" and "45", stem "32" and spring seat "34", overcomes the spring "31" and moves the yoke downward, which in turn, through the fulcrum levers, moves the relay downward, Downward movement of the relay opens the drain ports, thus decreasing the regulating oil pressure. A decrease in this

pressure acts on the governor so as to close the steam valves.

If the exhaust pressure becomes lower than that for which the regulator is set, the steam pressure above the diaphragm "24" decreases and the spring "31", through the spring seat and stem, raises the yoke away from the fulcrum levers. Consequently, the relay is moved upward by the spring "6". Upward movement of the relay opens the high pressure ports, thus increasing the Regulating oil pressure above the relay and to the governor. An increase in this oil pressure acts on the governor so as to open the steam valves.

The exhaust pressure maintained by this regulator can be varied by changing the compression of the upper load spring "31". This can be done by means of the hand wheel "30". Before connecting the regulator to the steam line, the chamber around the diaphragm "24" and the connecting pipe should be filled with water. In order to take the regulator out of service (that is, to render it inoperative) close the valve in the steam line which connects it to the exhaust and open the valve in the adjacent branch line to atmosphere so as to put atmospheric pressure above the diaphragm "24".

The design of any pressure regulator is based on the fundamental governing principal that there must be a slight change in the pressure controlled in order to actuate the regulator. Therefore, in order to obtain stable operation, the pressure held when exhausting the maximum amount of steam must be somewhat lower than when exhausting smaller quantities of steam. When the process steam is supplied from several sources, the pressure variation, between maximum flow and no flow, is generally greater than when the supply is from a single source.

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	Relay Spring Adjusting Screw Cover
2	Relay Spring Adjusting Screw Lock Nut
3	Bracket
4	Relay Spring Adjusting Screw
5	Relay Spring Seat
6	Relay Spring
7	Gasket
8	Relay Seat Insert
9	Dashpot Bellows Assembly
10	Gasket
11	Body Flange (bottom)
12	Gasket
13	Dashpot Bellows Casing
14	Body
15	Relay Spinner
15-A	Relay Spinner Oil Nozzle
15-B	Relay Spinner Oil Nozzle Washer
16	Relay Bushing Cover
17	Relay Bushing
18	Relay
19	Relay Guide Bushing
20	Fulcrum Lever Spacer Plate

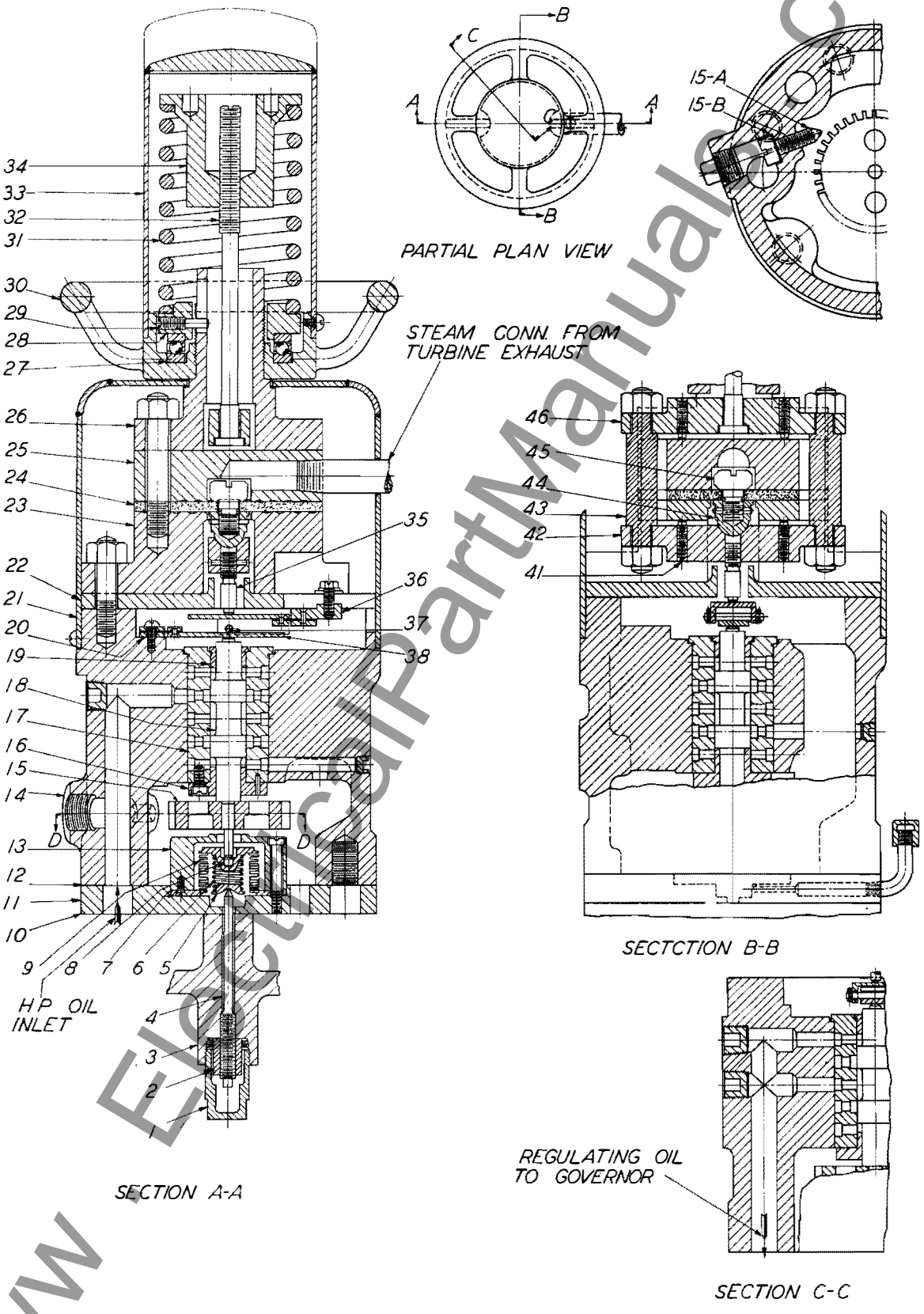

Fig. 1

Item No.	Name
21	Body Cover
22	Body Flange (Upper)
23	Diaphragm Body (Lower)
24	Diaphragm
25	Diaphragm Body (Upper)
26	Handwheel Sleeve
27	Diaphragm Spring Seat Ball Bearing
28	Diaphragm Spring Seat (Lower)
29	Diaphragm Spring Seat Lock Screw
30	Hand-wheel
31	Diaphragm Spring
32	Diaphragm Stem
33	Diaphragm Spring Cover
34	Diaphragm Spring Seat (Upper)
35	Diaphragm Stem Extension
36	Fulcrum Lever (Upper)
37	Fulcrum Lever Pin
38	Fulcrum Lever (Lower)
41	Diaphragm Yoke Flange Adjusting Screw
42	Diaphragm Yoke Flange (Lower)
43	Diaphragm Yoke Spacer Bolt
44	Diaphragm Lock Nut
45	Diaphragm Screw
46	Diaphragm Yoke Flange (Upper)

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