EXTRACTION VALVE SERVO-MOTOR

The extraction steam valve servo-motor (or operating mechanism) is shown in Figure 1. It consists essentially of a relay controlled, oil operated piston. The principal parts are: the relay "19", relay bellows "43" and "52", bellows spring "22" and operating piston "10".

High pressure oil, delivered by the main oil pump, is admitted to the relay, as shown, for operating the piston "10". Upward movement of the relay uncovers ports connecting the operating oil inlet to the space above the piston and connecting the space below to the outlet, thus moving the piston downward. Downward movement of the relay uncovers ports connecting the operating oil inlet to the space below the piston and connecting the space above to the outlet, thus moving the piston upward. The piston rod "15" is so connected to the extraction valves through an operating lever that upward movement of the piston opens the valves and downward movement of the piston closes them.

Movements of the relay "19" are controlled by the differential oil pressures acting on the bellows shown in Figure 2. High pressure oil is supplied through external orifices to chambers "F" and "E" and from these chambers the oil is led to the reservoir through the relief valve of the "Extraction Pressure Regulator" (described in a separate supplement). Consequently the pressures maintained in chambers "E" and "F" are controlled by the Extraction Pressure Regulators. In addition, the secondary governing pressure is connected to chamber "D".

From the above it will be seen that the position of the relay "19" is determined by five forces:

1. The extraction regulating pressure in the bellows chambers "E" and "F" acting downward, which is varied by the pressure regulators.

2. The secondary governing pressure below the bellows acting upward, which varies directly as the square of the turbine speed.

3. The tension of the spring "22" acting downward.

4. The force of the compression spring "16" which causes the relay to follow all movements of the bellows.

5. The force of the compression springs "26" shown in Section "B-B", acting upward. The purpose of the loading springs is to keep down the value of the secondary governing pressure by balancing out the governor control pressures.

In normal operation, the principle actuating forces are the governor control pressures acting in the bellows chambers "E" and "F" which are controlled by the extraction regulators. If a regulator moves to increase this oil pressure, the relay moves downward, thus admitting oil below the operating piston and opening the steam valve. If the regulator moves to decrease this oil pressure, the relay moves upward, admitting oil above the piston and closing the steam valve.

Due to the fact that the secondary governing pressure below the bellows varies as the square of the turbine speed, if other conditions remained constant, this mechanism would respond to changes in speed in the same manner as a standard governor. However, the spring "22" is adjusted so that the controlling force resulting from changes in speed (that is, the

secondary governing pressure below the bellows) is not effective until the speed increases or decreases a comparatively large amount. Therefore, the actual close speed regulation of the unit is maintained by the main governor.

From the above description, it will be noted that following any movement of the relay the operating piston moves in the opposite direction. The follow-up lever, item "34", which connects the operating piston rod and the bellows spring "22", is fulcrumed so that, following any relay movement, the resulting piston movement changes the tension in spring "22" so as to return the relay to its neutral position until another change in control pressure occurs.

As shown in Section "A-A" and "B-B", Figure 1, the chambers above the operating piston and above the relay are vented into a vertical drain passage in order to eliminate any accumulation of air. This same drain passage connects to the space between the oil seal rings "6" and carries away any oil leakage past the upper seal.

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 of Part (FIGURE 1)
1	Gasket (1/32 Thick)
2	Piston Rod Crosshead
3	Drip Pan
4	Piston Rod Stop
5	Piston Rod Oil Seal Retainer
6	Piston Rod Oil Seal
7	Piston Rod Oil Seal Ring
8	Piston Rod Bushing
9	Cylinder
10	Piston
11	Piston Ring
12	Gasket (1/32 Thick)
13	Cylinder Cover
14	Piston Rod Bushing
15	Piston Rod
16	Relay Spring
17	Relay Spring Seat (Upper)
18	Relay Spring Seat (Lower)
19	Relay
20	Relay Bushing
21	Relay Bellows Spring Nut (Upper)
22	Relay Bellows Spring
23	Relay Bellows Spring Nut (Lower)
24	Relay Bellows Spring Bolt (Lower)
25	Bellows Loading Spring Flange (Complete)
26	Bellows Loading Spring
27	Bellows Loading Spring Adjusting Stud
28	Bellows Loading Spring Seat (Lower)
29	Piston Position Indicator
30	Piston Position Indicator Plate
31	Follow-up Lever Link (In Pairs)
32	Round Head Shoulder Pin
33	Follow-up Lever Spacer Bolt
34	Follow-up Lever (In Pairs)
35	Follow-up Lever Crosshead
36	Follow-up Lever Crosshead Ball Bearing

Extraction Valve Servo-motor

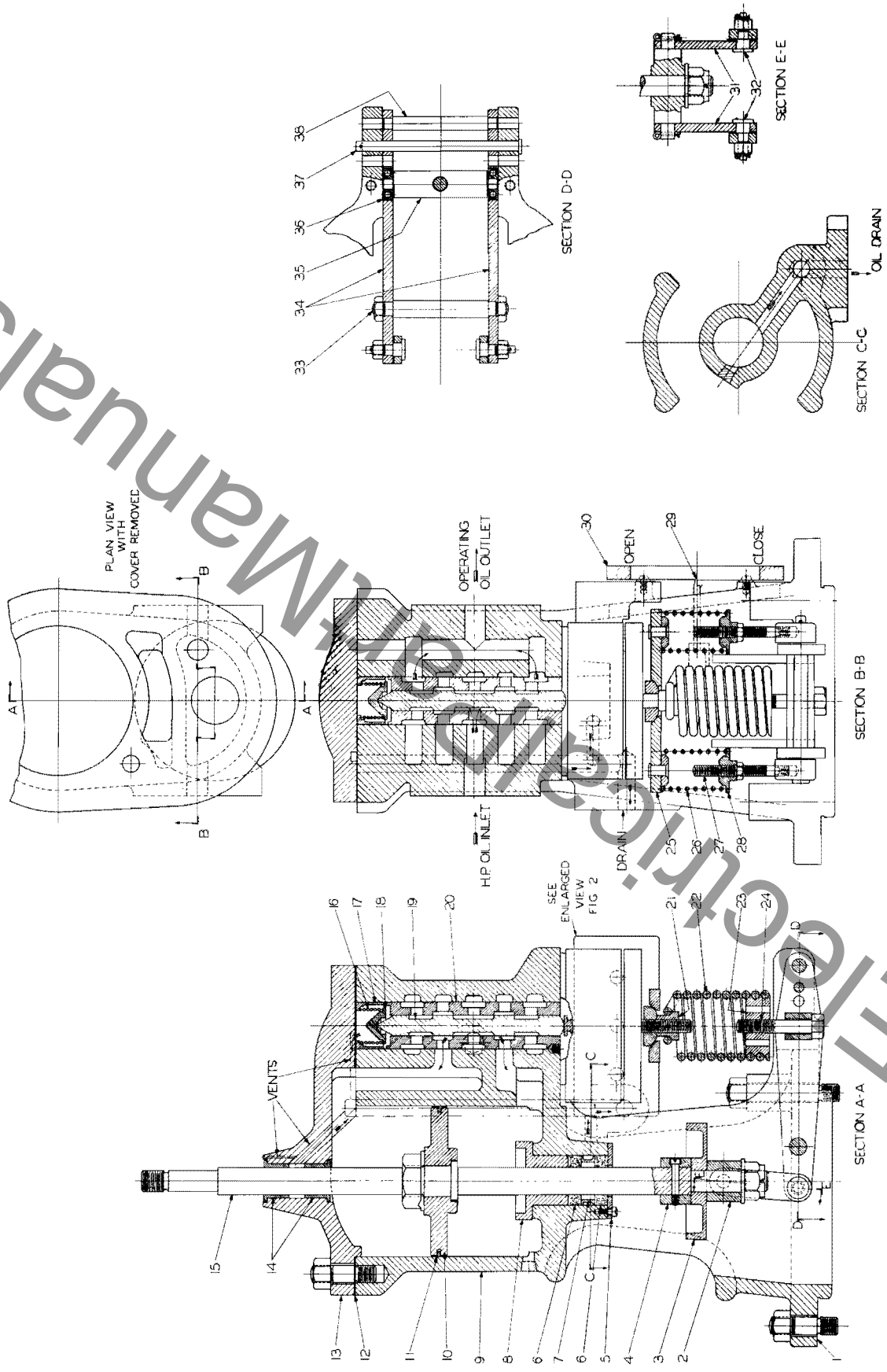

Figure 1

(FIGURE 2)

Item No.	Name of Part
* 37	Follow-up Lever Fulcrum Pin
* 38	Follow-up Lever Spacer
41	Relay Seat
42	Relay Seat Spacer
43	Servo-motor Bellows (Outer) (Complete)
44	Screw
45	Gasket (1/32 Thick)
46	Servo-motor Bellows Housing
47	Servo-motor Bellows Coupling
48	Lockwasher
49	Gasket (1/32 Thick)
50	Gasket (1/32 Thick)
51	Servo-motor Bellows Ring
52	Servo-motor Bellows (Inner) (Complete)
53	Servo-motor Bellows Nut
54	Gasket (1/32 Thick)

*Illustrated on Figure 1.

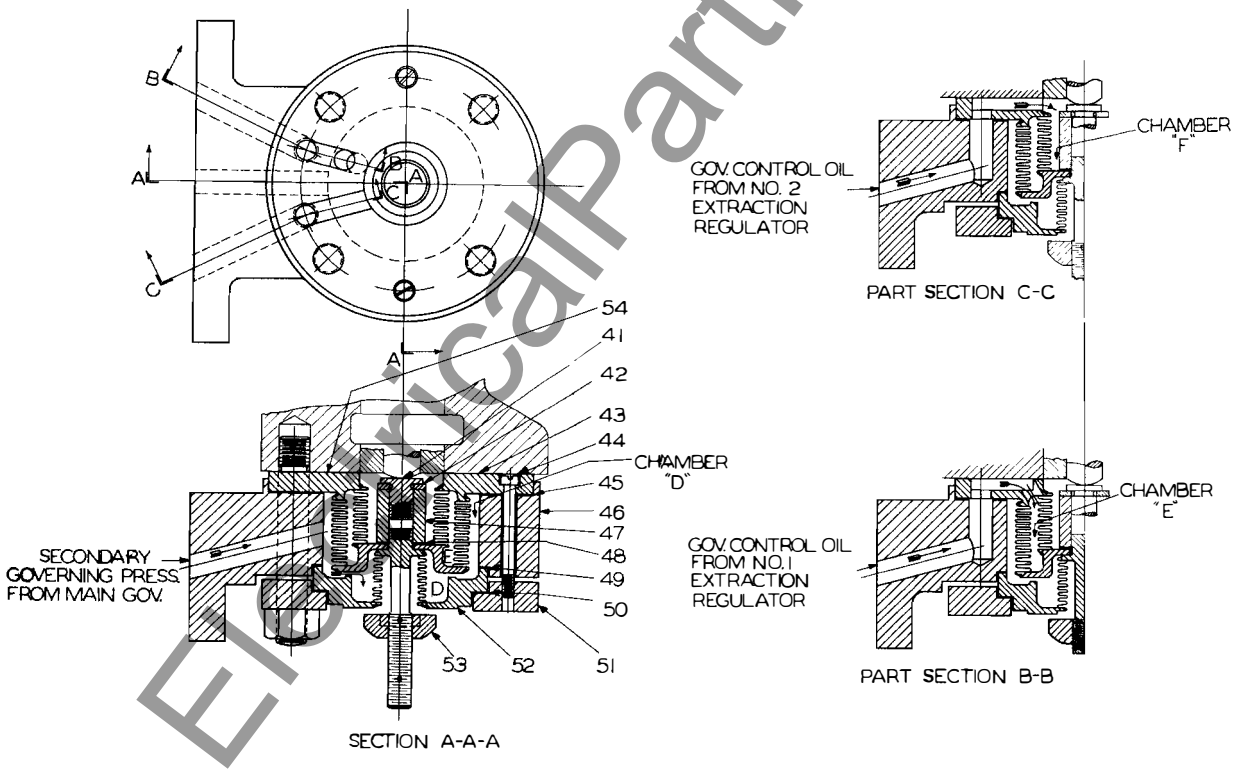

Figure 2

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