STEAM CHEST

A typical arrangement of the multiple valve steam chest is shown in Figure 1. The main body and nozzle chambers are cast integrally with the cylinder cover, thus eliminating joints between these parts. The valves are arranged in parallel within the chest; that is, all valves are surrounded with steam at approximately throttle pressure.

These valves are of the single seated plug type. The valve seats are pressed into the steam chest body and are secured either by keys which fit in slots cut in the valve seats and which are welded to the steam chest body, or by being welded directly to the body at several points. The method used is determined by design conditions. The governor servo-motor raises and lowers the valve bar "49", keeping it perfectly horizontal at all times. The bar in turn lifts the valves by engaging the adjusting nuts "34". As shown in the illustration, the adjusting nuts are threaded on the valves and hence the point at which each valve opens and the amount of opening can be varied by means of these adjusting nuts. Of course, there is an unbalanced steam force tending to close the valves, but in addition, a positive closing force is obtained by the lower edge of the valve bar "49" engaging the shoulder on each valve.

The valve bar lifting rod packing consists of three closely fitting bushings "8", "12" and "13" inserted in a bushing retainer "9" provided with suitable leakoff openings. On valves built for the higher pressures, two leakoffs are provided as shown in the Figure, while those built for the lower pressures are supplied with only one leakoff, the other being omitted or plugged.

When two leakoffs are used the upper one is led to a point at atmospheric pressure where a small amount of escaping steam is not objectionable. The lower one is led to a zone of intermediate pressure in the turbine. When only one leakoff is used, it is led to a point at atmospheric pressure at all times.

The operating lever "19" which is connected to the valve bar lifting rod crossheads "17" through links "30" at one end and to the governor linkage at the other end, is fulcrumed so that downward movement of the governor servo-motor piston opens the valves and upward movement of the piston closes them.

This construction gives ample flexibility to allow the valve bar lifting rod crossheads "17" to maintain correct alignment of the valve bar lifting rods, "32", throughout the entire stroke of the mechanism. Each crosshead slides between two guide plates "15" which are secured to the valve bar lifting rod bushing retainer "9", at the bottom and to a spacer "18" at the top.

An additional positive closing force is exerted by the valve bar balance pistons "3" which are attached to the valve bar lifting rods "32" by the connecting rods "4" and pins "2" and "5". The top of each balance piston is subjected to full steam pressure while the chambers at the bottom are connected to atmosphere through the leakoffs as shown. Therefore, the unbalanced forces on these pistons exert at all times a downward force tending to close the valves in case they have any tendency to stick.

As stated above, the illustration shows a typical arrangement. However, the number of valves and the position of each in the chest may vary to suit different steam and load conditions. For each particular turbine there is a "Governing Valve Setting Diagram" which shows the correct valve locations and the dimensions for setting the valve adjusting nuts to obtain the proper sequence of opening. <u>A print of this diagram will be found</u> in the instruction book for each unit.

The valve lifts as given on this diagram should give satisfactory operation. However, in some cases it may be desirable to adjust the nuts to bring certain valves in earlier or later in order to obtain the correct pressure drop across each. This pressure drop is usually about 4% but may be 2 or 3% on some noncondensing machines.

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

Item No.	Name
1	Valve Bar Balance Piston Bushing
2	Valve Bar Lifting Rod Connecting Rod Pin (Lower)
3	Valve Bar Balance Piston
4	Valve Bar Lifting Rod Connecting Rod
5	Valve Bar Lifting Rod Connecting Rod Pin (Upper)
6	Valve Bar Thrust Disc (Lower)
7	Valve Bar Thrust Disc (Upper)
8	Valve Bar Lifting Rod Bushing (Lower)
9	Valve Bar Lifting Rod Bushing Retainer
10	Steam Chest Cover Gasket
11	Steam Chest Cover
12	Valve Bar Lifting Rod Bushing (Center)
13	Valve Bar Lifting Rod Bushing (Upper)
14	Valve Bar Lifting Rod Crosshead Guide Liners
15	Valve Bar Lifting Rod Crosshead Guide (In Pairs)
16	Valve Bar Lifting Rod Connecting Link Pin
17	Valve Bar Lifting Rod Crosshead
18	Valve Bar Lifting Rod Crosshead Guide Spacer
19	Valve Bar Lifting Rod Operating Lever
20	Valve Bar Lifting Rod Operating Lever Trunnion
21	Operating Lever Bracket Bushing
22	Operating Lever Bracket
23	Governor Connecting Link (In Pairs)
24	Operating Lever Bushing
25	Governor Connecting Link Pin
26	Set Screw
27	Set Screw Cover
28	Set Screw Locknut
29	Set Screw Locknut Gasket
30	Valve Bar Lifting Rod Connecting Links
31	Operating Lever Bushing
32	Valve Bar Lifting Rod
33	Valve Adjusting Nut Locknut
34	Valve Adjusting Nut
35	Valve
36	Valve Seat
37	Valve
38	Valve Seat
39	Valve
40	Valve Seat
41	Valve
42	Valve Seat
43	Valve
44	Valve Seat
45	Valve
46	Valve Seat
47	Valve
48	Valve Seat
49	Valve Bar

IMPULSE BLADES

Figure 1 shows the arrangement of an impulse element consisting of two rows of rotating blades attached to the rotor, and one row of stationary blades attached to the cylinder. The rotating blades are secured to the rotor by the "Straddle Root" type of fastening. This consists of a T-root with lugs machined on the blade shank which straddle and hold in the sides of the rotor groove, thus resisting the tendency of the blade pull to spread the sides of the groove. The blades are held against the top of the groove by half round steel sections caulked in place at the bottom.

The stationary blades are secured in a straight sided groove by a series of short keys which fit in auxiliary grooves cut in the blade shank and in the side of the main groove.

These blades are shaped so as to form their own shroud, thus forming a closed passage for the steam flow. The shanks are machined accurately to fit closely to one another and to give the correct spacing for the steam passage area. On the longer rotating blades of this type (when the port height is greater than the blade width) a shroud strip is used to lash them together in groups in order to minimize the vibrational stresses. This strip is installed by machining a groove in the end of the blades and welding the strip in place. The lengths of the shroud strip sections are made so as to form groups of six to eight blades each. On the shorter blades (that is when the port height is less than the blade with) this shroud strip is not used because the short blades are so solid that their vibration is negligible, and no further strengthening is necessary.

When it is desired to decrease to a minimum the leakage of steam around the blades, seal strips are used as shown in the illustration. These seals consist of thin flat strips and are held in place by soft steel caulking strips which are caulked into the grooves. The seal strips and caulking strips must be fitted after the blades are installed. Since the strips are very thin, slight rubs between them and adjacent parts are neglibible. Hence they can be set with a small running clearance.

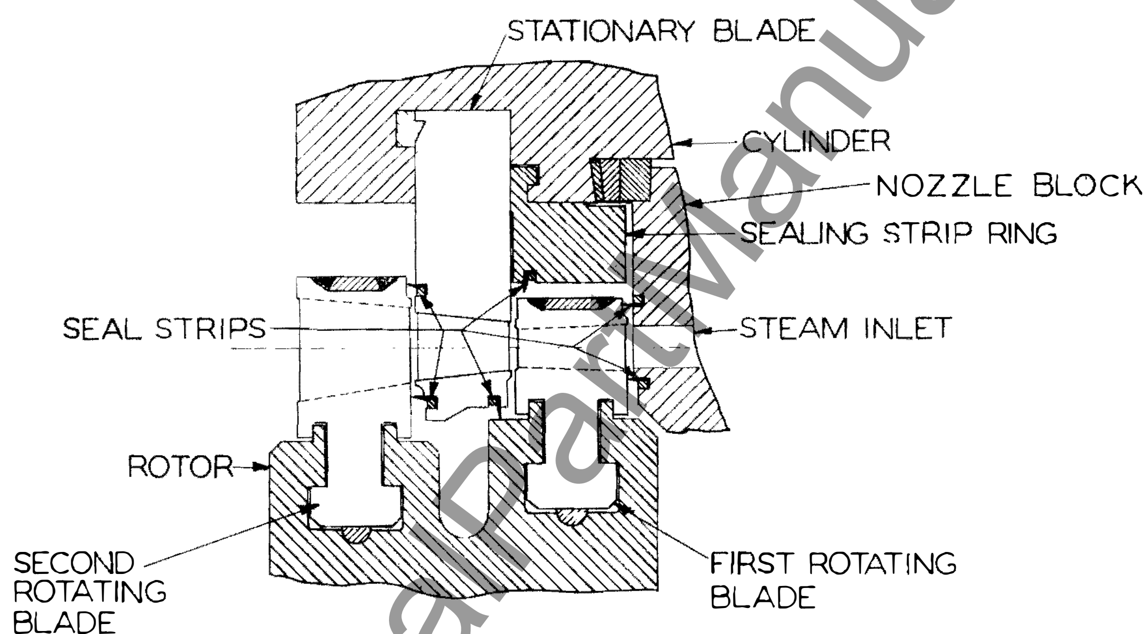

Figure 1

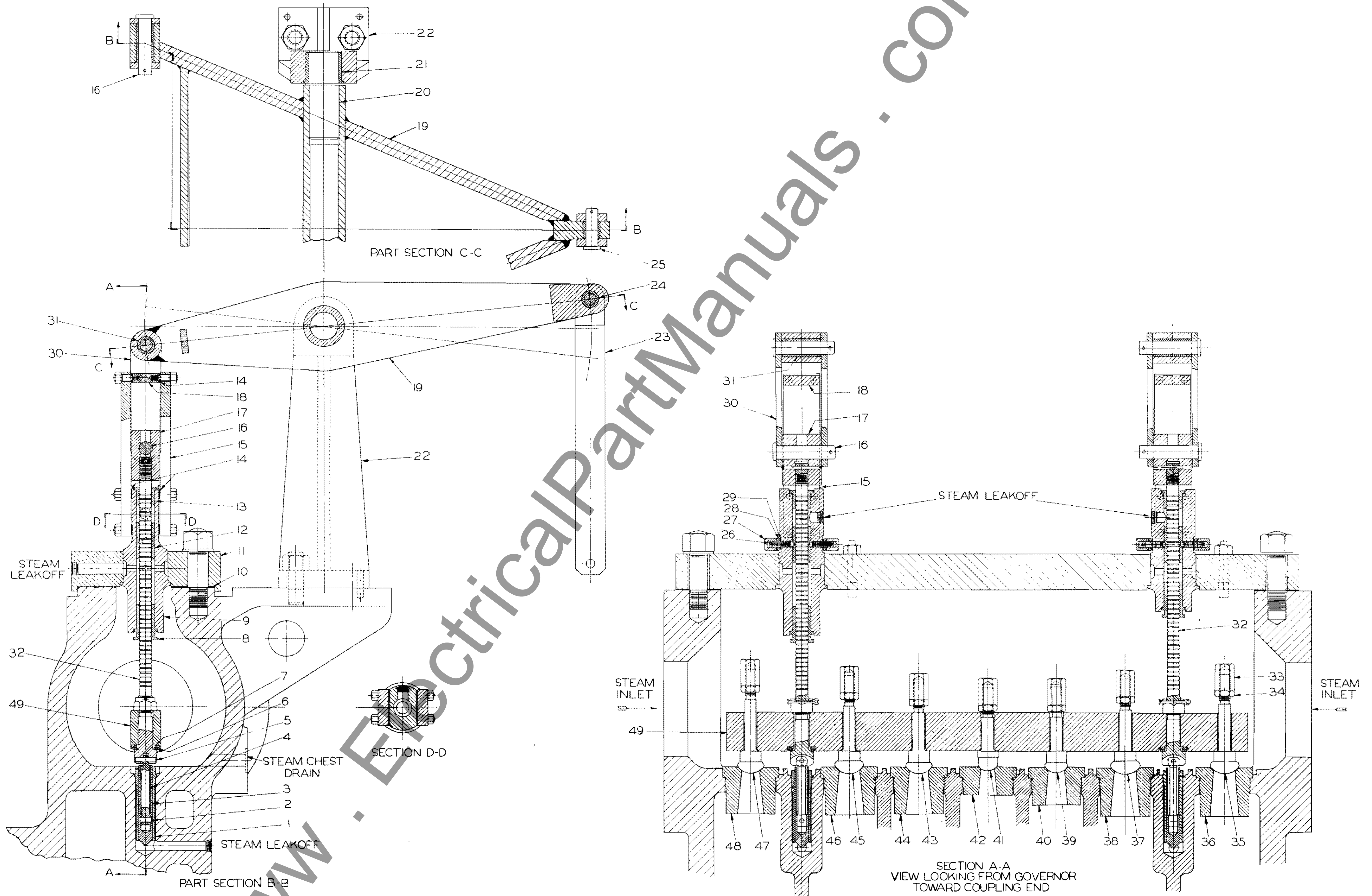
PART SECTION C-C
PART SECTION B-B
SECTION D-D
STEAM LEAKOFF
STEAM CHEST DRAIN
STEAM INLET
SECTION A-A
VIEW LOOKING FROM GOVERNOR
TOWARD COUPLING END
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Figure 1