"Axial Clearance" Labyrinth Seal

Figure 1 shows an "axial clearance" type of labyrinth seal in which the close running clearance is in an axial direction instead of radial. This construction permits closer running clearances and thereby decreases the tip leakage which is of great importance in turbines using high pressure steam. Furthermore, by using our thrust bearing equipped with the adjusting mechanism which allows axial movement of the rotor, these running clearances can be increased temporarily during the starting and stopping periods, thus greatly decreasing the possibility of rubs due to unequal temperature changes of the rotating and stationary parts. Consequently, this type of seal is used when justified by the steam conditions.

The arrangement shown in the illustration is commonly called the double strip type, in that two strips are secured in the same groove by a single locking strip. The seal strips are secured in the seal strip rings, and the rings, in turn, are secured in the turbine cylinder. The illustration shows two rings, each containing four complete seal strips which are effective with the rotor in the normal running position, and two seal strips effective in the start and stop position. However, the number of rings used can be varried according to the number of seal strips required. By this arrangement, it is possible to get a greater number of seals in a given length and thus shorten the turbine. These seal strips are rolled angles (or L Sections). They are bent to the proper radius and held in the grooves by the soft steel locking strips which are rolled into the grooves. The seal strip rings are inserted in grooves and secured by shoulder type caulking pieces driven into place.. This construction is shown clearly in the Figure. The seal strips, locking strips and seal strip rings are made in half-rings. The shoulder type caulking pieces are made in short segments.

In order that this "axial clearance" principle can be most effective, it is necessary that the clearance between the strips and adjacent rotor lands be made the same throughout the entire seal, so that the strips in one ring will not make contact while those in another ring are still separated by an undetermined clearance. This equalization of clearances throughout the turbine is obtained by grinding the seal strips, by actual rubbing contact, with the machine in operation. After this grinding is completed, the desired running clearance can be obtained by means of the thrust bearing adjustment.

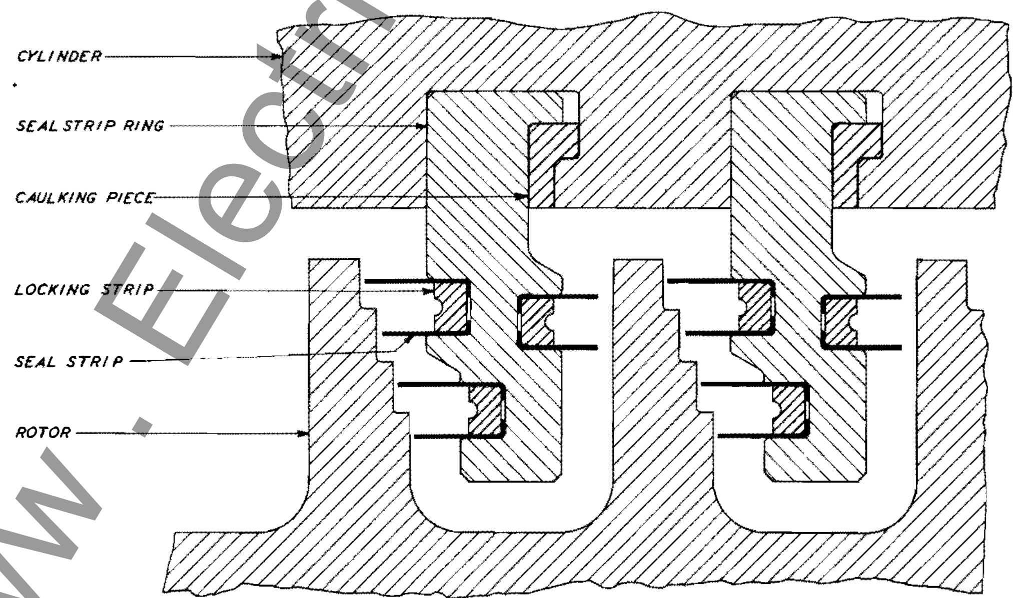

Fig. 1

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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 unit:

Item No.	Name
1	Pump Discharge Pipe
2	Pump Body Wearing Rings
3	Gasket
4	Pump Body Screen
5	Pump Body Cover
6	Pump Body
7	Pump Impeller
8	Gasket
9	Thrust Bearing Set Screw
10	Thrust Bearing
11	Shaft
12	Pump Body Support
13	Oilite Bushing
14	Bearing Sleeve
15	Blower Body Taper Dowel
16	Gasket
17	Flexible Coupling
18	Motor Support
19	Shaft Sleeve
20	Blower Gland Flange
21	Blower Gland Packing
22	Blower Impeller
23	Blower Body
24	Gasket
25	Gasket

Oil Pump (Motor Driven)

Figure 1 shows the motor-driven, vertical shaft, centrifugal type pump used to supply oil to the generator hydrogen seals.

The unit, as shown in the illustration, is designed for mounting on the auxiliary reservoir, which is integral with the main reservoir, so that the pump impeller is always below the minimum oil level. This arrangement insures a positive suction head and eliminates the necessity of priming the pump.

The pump impeller "7" is threaded on the shaft "11" with a left hand thread and secured by a set screw. Leakage from the discharge side back to the suction is limited to a minimum by the small clearance between the wearing rings "2" and the impeller hubs. The sheet metal screen "4" is used to protect the impeller against debris.

A centrifugal type blower, consisting of items "22" and "23" is mounted above the pump and driven by the shaft "11". This blower, in conjunction with special baffles between the main and auxiliary reservoirs, is used to thoroughly deaerate the oil and thus maintain a supply for the generator seals, free of entrained air or hydrogen gas. The blower impeller "22" is threaded on the shaft with a left hand thread and locked by the shaft sleeve "19". Leakage from the discharge side is prevented by a conventional type, adjustable gland, using soft, graphite impregnated packing. Care should be taken to see that the gland flange "20" is not pulled down too tightly. The blower discharge should be led to a point at atmospheric pressure outside of the building.

The shaft "11" is supported by two sleeve type bearings. The upper bearing consists of a sleeve "14" and an oilite bushing "13" and requires no lubrication. The lower bearing "10" is babbitt lined and in addition to carrying the radial load, serves also as the thrust bearing. It is lubricated by oil supplied through suitable passages from the oil pump discharge.

The body support "12" is bolted to the top of the oil reservoir. When dismantling for inspection, the entire unit should be lifted out of the reservoir. Dismantling of the various parts is then obvious.

The shaft "11" is connected to the driving motor by the flexible coupling "17". The motor is of standard design with two ball bearings, one of which serves as the motor thrust bearing. These bearings are lubricated by grease which is injected through external pipe connections provided for that purpose. Grease should be added periodically, depending on the total time the motor operates, so as to keep the bearings well lubricated. The kind of grease used should be in accordance with the instructions attached to the motor when it is received from the factory.

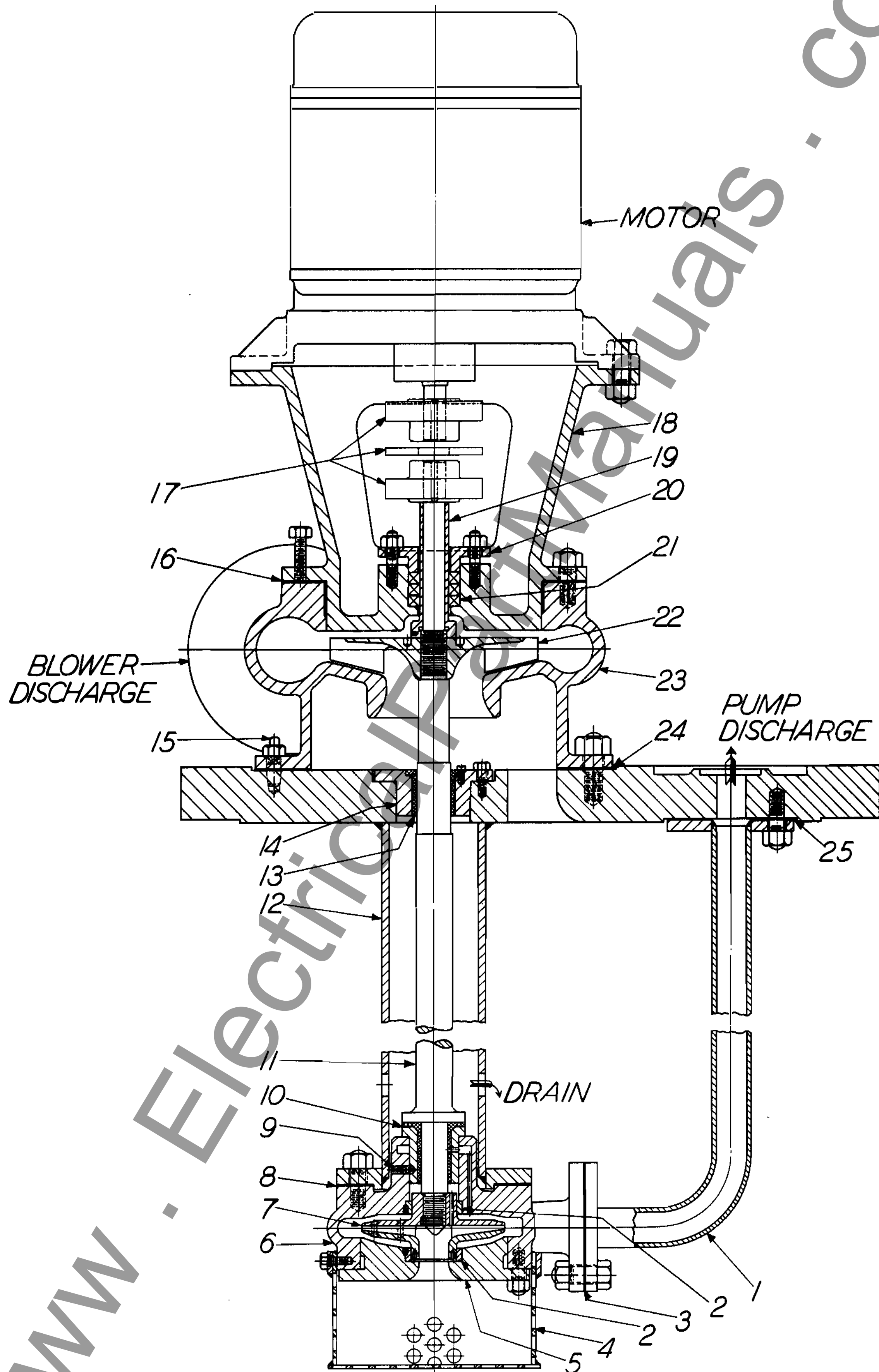

Fig. 1- Assembly