GLANDS
(Carbon)

Figure 1 shows the type of gland used to prevent leakage at the points where the rotor shaft passes through the cylinder. When the pressure inside the gland is below atmospheric, the gland must, of course, seal against leakage of air inward, while when the pressure within the cylinder is above atmospheric, the glands must seal against the leakage of steam outward into the atmosphere.

These glands are of the conventional carbon ring type, and are used either with or without auxiliary labyrinth seals. The case is split in the horizontal plane to facilitate dismantling and assembling. The carbon rings are made in three segments to insure a good fit around the shaft. It is essential that the joints at the ends of these segments be perfectly square and radial in order to prevent leakage of steam at these points. Each complete ring fits in a separate groove in the gland case and is held around the shaft by two garter springs and saddle arrangement which also serves to keep the joints at the ends of the segments tight. The pins "11" in the spring clip saddles "9" and "14" which are located on the horizontal centerline of the ring, fit in slots in the lower half of the case. Each ring segment contains two spring backed buttons "15" which hold the assembled ring against the side of the groove. The groove side and the carbon ring face should be smooth to insure good sealing. The axial clearance between the ring and the groove should be approximately .032 inches. After squaring and fitting the ends of the segments, the complete ring should be bored to give the required clearance. This clearance is shown on the Title Page of the Instruction Book. No oil should be used in fitting these rings.

If the gland is dismantled, it is important to reassemble each segment in the same position as found originally. Each groove in the gland case is numbered on the horizontal joint of the lower half of the casing and each segment of the corresponding carbon ring is marked on the side with the same number and the joints of the ring are marked with dots so that the ring may be easily reassembled in the way it was originally. In assembling the ring, the spring clip saddle "9" should be assembled so that the letter "T" stamped on it is above the centerline of the turbine.

For condensing operation the rings in the No. 2 gland should be assembled as shown in part section, i.e., the sealing face of the center ring should be against the outer side of the groove.

When the pressure difference across the gland is large, a labyrinth seal is used in addition to the carbon seal and a leak-off connection is provided from the chamber between the labyrinth seal and the carbon seal. This labyrinth baffles the flow of steam toward the gland, thus taking a portion of the pressure drop and reducing the pressure difference against which the carbon rings must seal. The labyrinth seal-off should be connected to a zone of lower pressure, not greater than 100 lb. in^2g. When the labyrinth is used in the #1 gland only, this leak-off is usually connected to the exhaust.

The labyrinth seal consists of a number of very thin, steel strips, held edgewise in a grooved retaining ring by means of locking strips which are rolled into the grooves. The retaining rings are split on the horizontal plane and are inserted in grooves provided in the cylinder base and cover. The rings are held in place by garter springs and are prevented from rotating by locking pins. After assembly, a very small running clearance normally exists between the sealing strips and the shaft, although any rubbing that might occur is negligible.

The illustration shows a labyrinth seal at the #1 gland only. It should be borne in mind that the use of these inner labyrinth seals depends

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entirely on the operating steam conditions. In some cases they are omitted altogether and in cases of high exhaust pressure, they are used at both ends. Likewise, the number of carbon rings used in each gland may vary to suit the operating conditions. The exact arrangement of carbon rings and labyrinth seals for each particular turbine is given on the Title Page of its Instruction Book.

As shown in the illustration, there are two openings for pipe connections in each gland case. These should be connected as follows:

1 - The opening at the bottom of the gland case serves as a steam leak-off and drain. It should be connected either to an ejector or to some point at atmospheric pressure where a slight amount of escaping steam is not objectionable.

2 - The opening at the top of the gland case serves as a sealing steam inlet and is used only for condensing operation. When used, it should be connected to a supply of low pressure steam which serves as the sealing medium.

For non-condensing operation, this opening should be plugged.

On the majority of the turbines which use this type of gland, the leak-off from the lower opening will be connected to a gland ejector. This ejector is merely a small jet condenser, built on the ejector principle, so that the jet of water condenses the steam and also creates a slight vacuum in the gland leak-off chamber, thus eliminating any leakage to atmosphere.

The water supply to the ejector should be maintained at a pressure not less than 10 lb/sq.in. gauge. It is desirable to use clean water, free of all impurities, because any dirt or scale which may clog the ejector nozzle will interfere with its operation and necessitate frequent cleaning. Obviously, if pure water is used, the discharge from the ejector can be saved and used for other purposes.

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	Gland Case, Upper Half, Coupling End
2	Gland Case, Lower Half, Coupling End
3	Gland Case, Lower Half, Thrust End
4	Gland Case, Upper Half, Thrust End
5	Retaining Ring (In Halves)
6	Labyrinth Seal Retainer Complete
7	Labyrinth Seal Retainer Springs
8	Carbon Seal Ring Spring (In Pairs)
9	Spring Clip Saddle
10	Pins (Two Per Spring Clip Saddle)
11	Pins (One Per Spring Clip Saddle)
12	Carbon Seal Ring Complete
13	Carbon Seal Ring Spring Saddle
14	Spring Clip
15	Spring Backed Button

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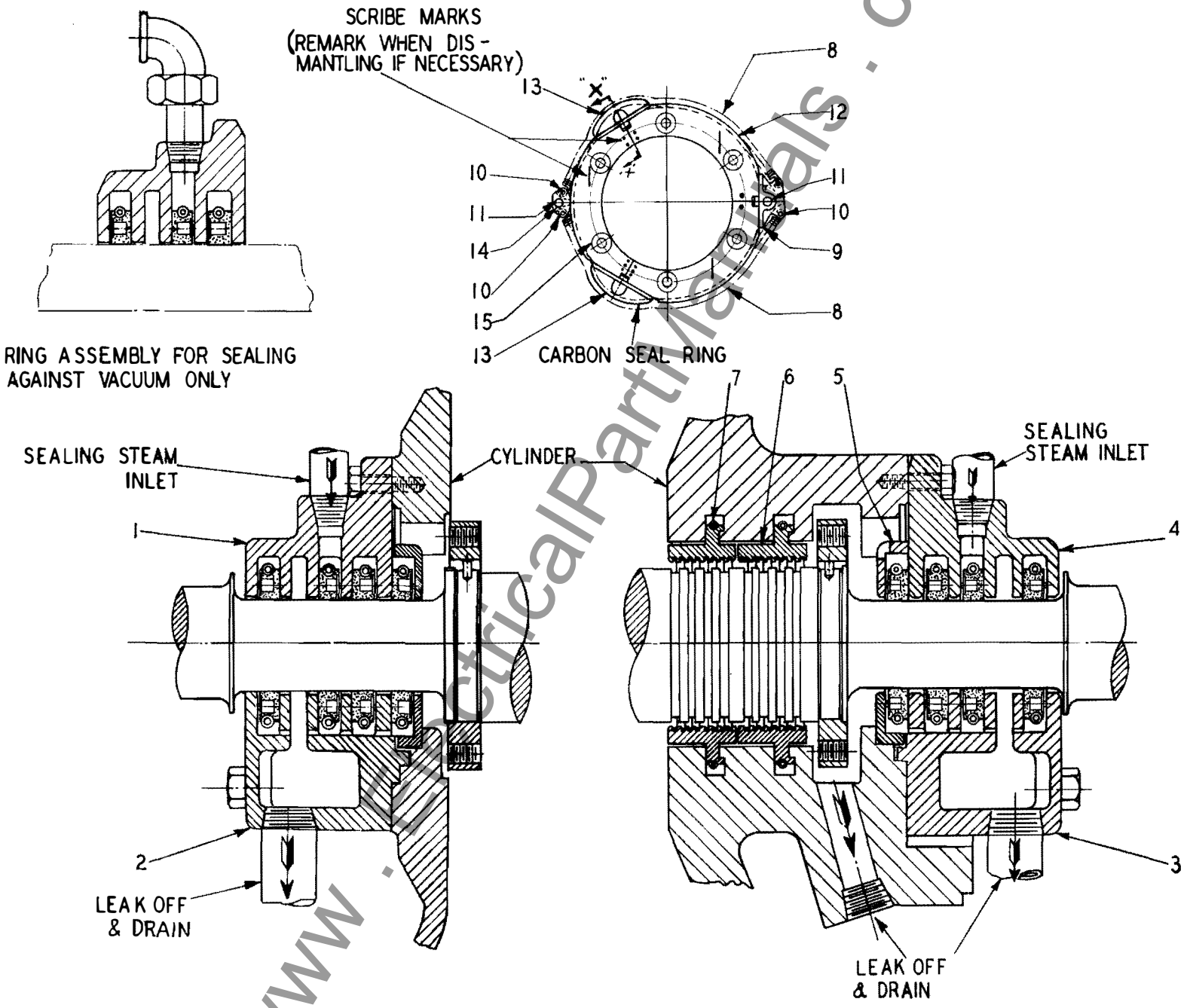

Figure 1

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