Glands

Figure 1 shows the type of gland used to prevent leakage at the points where the rotor shaft passes through the cylinder. The gland consists essentially of a small impeller pump and suitable labyrinth seals. The principal parts are:- the runner "9"; the outer case "4" and "17", the support ring "3" and "18", and the inner case "14" and "19". Both sections of the case and the support ring are split horizontally to facilitate dismantling and assembling.

Each runner consists of four segments which are secured to the rotating sleeve "11" by interlocking shoulders and the restraining rings "8". These restraining rings are installed with a light drive fit and further secured by peening the edge of the runner over the edge of the ring. The sleeve "11" is held against a shoulder on the rotor shaft by the screws "12". It is centered by a spigot fit adjacent to the bolting face and is clear of the shaft at all other points. The surface of this shoulder is scraped to eliminate leakage between the sleeve and the shaft.

This type of gland is designed to have a continuous circulation of water through the runner cavity. As shown in the Figure, the gland case liner "6" separates the runner cavity from the annular chambers "X" and "Y". The water passes through this liner by means of a series of small holes. This construction distributes the water supply around the entire periphery of the runner and eliminates any undesirable turbulent effect which may tend to break the seal. To further eliminate turbulence in the water, the holes for water passage which would be directly in line with the inlet and outlet pipes are omitted. The inlet water first enters the annular chamber "X" and passes through the small holes into the runner cavity. Then it passes through another series of small holes into the annular chamber "Y" from which it is discharged. With the water thus supplied at its periphery, the pumping action of the runner maintains in the runner cavity a solid annulus of water which effectively seals the gland against leakage.

The liner "6" protects the main gland case against any erosive or corrosive action of the water in the runner cavity. It is made in halves and fits in grooves as shown. In addition, the upper half is secured by two cap screws at the horizontal joint. Hence if the liner should become eroded or corroded, it can be renewed without difficulty, thus restoring the gland case to its original condition.

Labyrinth seal strips (items "7" and "10") are provided on both sides of the runner to reduce water leakage to a minimum. An auxiliary drain is provided just inside the outer two strips which eliminates all leakage outward along the shaft. Part of the labyrinth seal strips are carried in the rotating sleeve "11" and part in the gland case, as shown in the Figure; they are all of the same type, consisting of very thin flat strips and are held in place by soft steel caulking strips, which are rolled into the grooves. All of these labyrinth seals should have a close running clearance, as shown on the "Rotor Clearance Drawing".

As shown in the illustration, one seal strip is located between the outer case and the support ring which forms a water catcher. This strip serves as a thrower which effectively removes any water which may leak inward along the shaft and throws it into the chamber between the outer and inner cases. The

water which collects in this chamber is led through the internal drain into the turbine exhaust chamber.

Condensate should be used as the sealing medium so that the leakage can be returned to the system and also to eliminate scale deposits in the gland which would impair the seal. The supply should be maintained at the proper pressure by either an overhead tank or a relief valve.

This gland is designed to seal against a vacuum. It is used only on low pressure turbines or at the exhaust end of a condensing turbine. The water supply pressure should be maintained at approximately 5 pounds gauge at the turbine centerline.

A special arrangement is provided by means of which the gland can be sealed with the turbine at rest, for testing the system with air or water. This consists of a seal ring "16" (in halves) which is bolted to the gland case and clamps a rubber packing ring between the gland case and the shaft.

Dismantling and Assembling

It should be noted that in addition to the vertical joint bolting shown in the illustration, each section of the case is split in the horizontal center plane and the upper and lower halves are bolted together. A sufficient number of dowel bolts are used in each section to maintain the correct alignment of the two halves.

The method of dismantling the outer case and support ring is obvious, all bolts being visible. In order to remove the inner case, it is necessary to remove both halves of the outer case and support ring first. Then, after removing the inner case screws "15", the complete inner case can be moved outward until the horizontal joint dowel bolts are accessible.

When reassembling, the inner case halves should be bolted together around the shaft. Then set the complete ring concentrically with the seal strips and secure it to the cylinder by the screws "15". The support ring likewise should be set concentrically with the seal strips and secured by bolts "2". The outer case is then centered on the support ring by a spigot fit between the two.

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

Item No.	Name
1	Gasket
2	Gland Case Support Ring Tap Bolt
3	" " " Ring (upper half)
4	" " (outer)(upper half)
5	" " Tap Bolt
6	" " Liner (in halves)
7	" " Seal Strip
8	" Runner Restraining Ring
9	" Runner

Item No.	Name
10	Gland Sleeve Seal Strips (outer)
11	" Sleeve
12	" " Screw
13	" " Seal Strips (inner)
14	Inner Gland Case (upper half)
15	" " " Screw
16	Gland Case Seal Ring (for testing)
17	" " (outer)(lower half)
18	" " Support Ring (lower half)
19	Inner Gland Case (lower half)

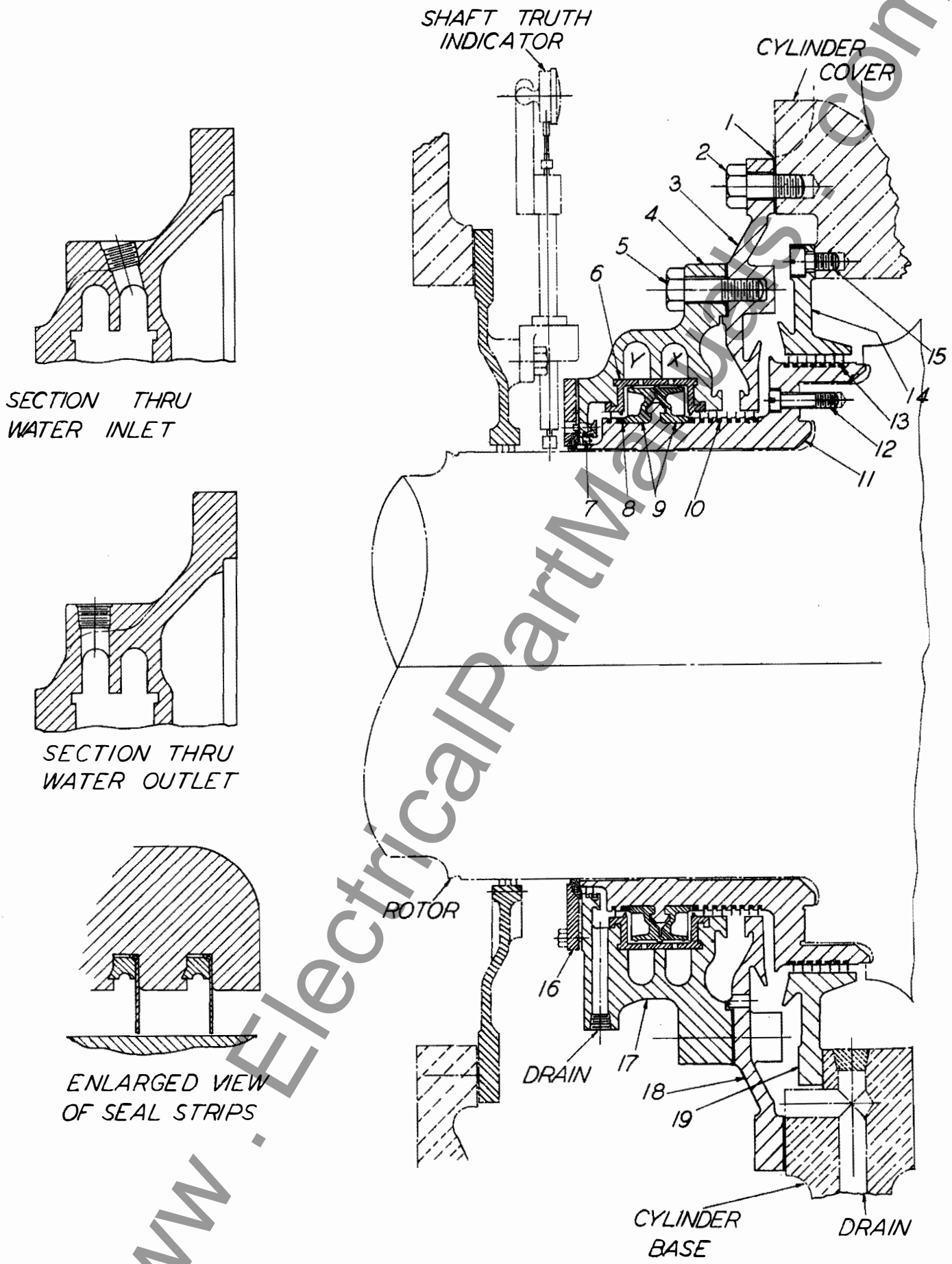

FIGURE 1.