WESTINGHOUSE EVAPORATORS - I.B. 6259

Description

Evaporators in steam power plants are used to produce distilled make-up water for the boilers. Since this practice is well known to power plant engineers, the application of evaporators will not be discussed in this leaflet.

Figure 1 shows an evaporator designed for installation in a horizontal position. The evaporator is of the restrained tube type, the heating steam being in the tubes. The tube bundle is arranged for one pass of steam and the steam entrance is at the end opposite the shell cover. Condensate outlet and vent connections for the steam path are shown in Figure 1.

The steam is introduced through the steam inlet nozzle and pipes "5" and "6" through openings "7" into chamber "8". It is evident that in order to remove the tube bundle a joint in the steam piping must be broken. To facilitate this, the steam pipes form a "U" and with the shell cover "2" removed, easy access to the joint between pipe "5" and "6" is provided. This "U" shaped pipe also provides some heating surface for the evaporated steam and thus some drying of the steam is produced.

The tube bundle consists essentially of the tubes, tube plates, tube supports, and chambers. The tubes are given an initial bow and both ends of the tubes are expanded in the tube plates. Webs "X", located on the shell end and shell cover, restrain the tube ends. It is evident that a variation in the temperature will lengthen or shorten the tubes, thus changing the curvature and thereby producing cracks in the scale deposit. This is done periodically by emptying the shell of water, then turning on the heating steam, and then rapidly refilling the shell with water. In this manner the water fills up the cracks in the scale and when operation is resumed the evaporation of this water breaks off the scale from the tubes. The frequency of this cycle cannot be definitely given as it depends on the quality of the water used. The broken off scale may be removed by blowing down the shell.

Angles "15" and "16" support the tube bundle which is of the removable type. To remove the tube bundle the following procedure must be followed:

1. Remove shell cover "2".
2. Break joint in steam line between pipes "5" and "6".
3. Break joint between condensate outlet pipe and shell.
4. Break joint (union) in vent line "18".

Condensate from the steam path is usually drained by means of a trap into a heater or into an evaporator condenser. Such a trap is designed for the pressure of the heating steam.

To obtain satisfactory operation, the steam path must at all times be vented to a vessel in which the pressure is below that prevailing in chamber "10". Vent line "18" with suitable connection on the shell is provided for this purpose.

The water level in the shell should be approximately at the horizontal centerline and it should be maintained constant by means of a float which controls a valve in the water supply line.

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As indicated in Figure 1, connection for blow down, shell vent, relief valve connection, handholes, or manholes are provided.

At the top of the shell below the vapor outlet, a moisture separator is provided. This is illustrated in Figure 2, and it operates on the centrifugal principle. The outgoing vapors enter tangentially through the four ports "Y" just above the cone. This produces a whirling effect, separating the water particles from the outgoing vapors. After this separation is accomplished, the water at the four corners drains down into the lower compartment to which drain pipe "19" is connected. This separator increases the purity of the outgoing vapors since any water entrained in the vapor contains impurities.

The outgoing vapors from the evaporator are usually condensed in an evaporator condenser, however, these may be introduced into heaters, steam headers, etc. In other words, such arrangements are made to suit the prevailing conditions at a given plant.

The shell diameter is of ample proportion to give proper liberating surface which feature is essential to a well designed evaporator. An evaporator is judged by the amount of solids carried over with the outgoing vapors. To obtain the minimum of solids, ample liberating surface is necessary, plus of course, an effective moisture separator described heretofore.

List of parts

The following list, covering major parts, has been compiled to facilitate ordering repair parts by item number and name when the serial number of the evaporator is given:

ITEM NO.	
1	Shell
2	Shell Cover
3	Handhole Covers
4	Separator
5	Steam Inlet Pipe
6	Steam Inlet Pipe
7	Steam Inlet Chamber Nozzles
8	Steam Chamber (Inlet End)
9	Tube Plate (Inlet End)
10	Steam Chamber (Outlet End)
11	Tube Plate (Outlet End)
12	Tubes
13	Tube Plate Rods
14	Tube Support
15	Tube Bundle Supports
16	Tube Bundle Supports
17	Steam Pipe Straps
18	Vent Pipe (Steam Path)
19	Separator Drain Pipe
20	Tube Bundle Supports

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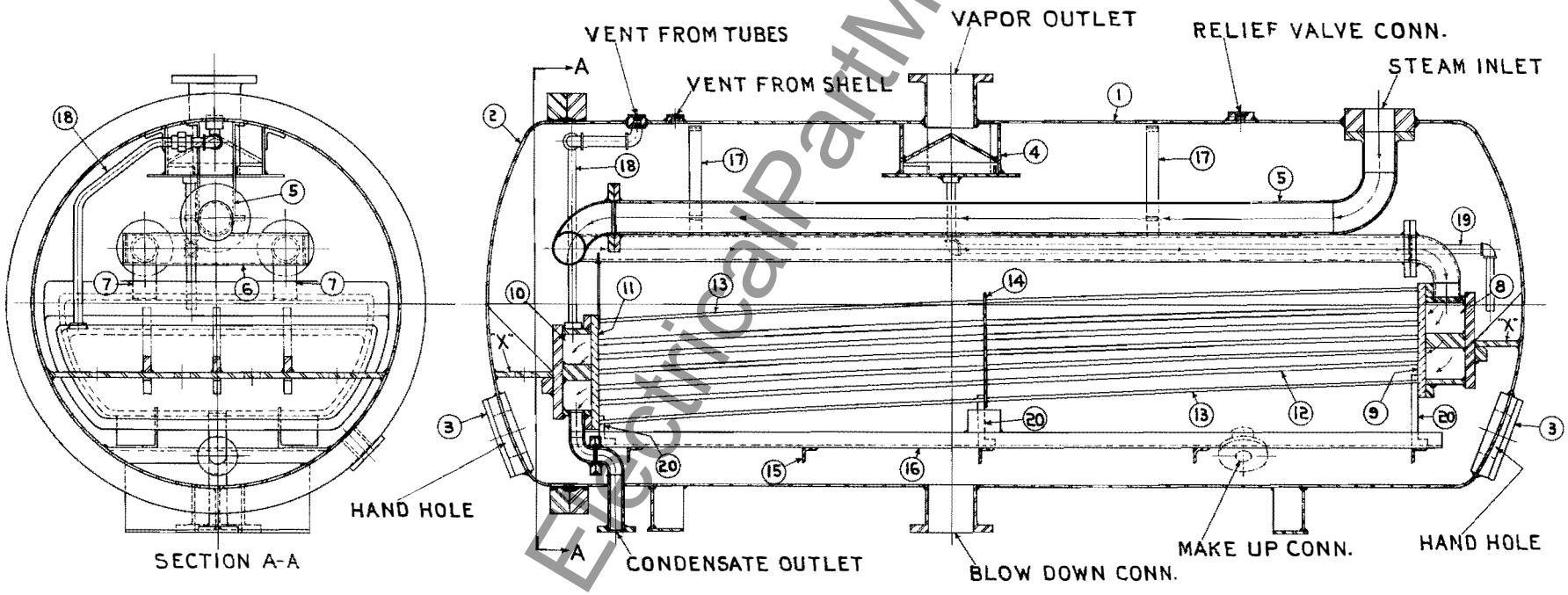

FIG. 1

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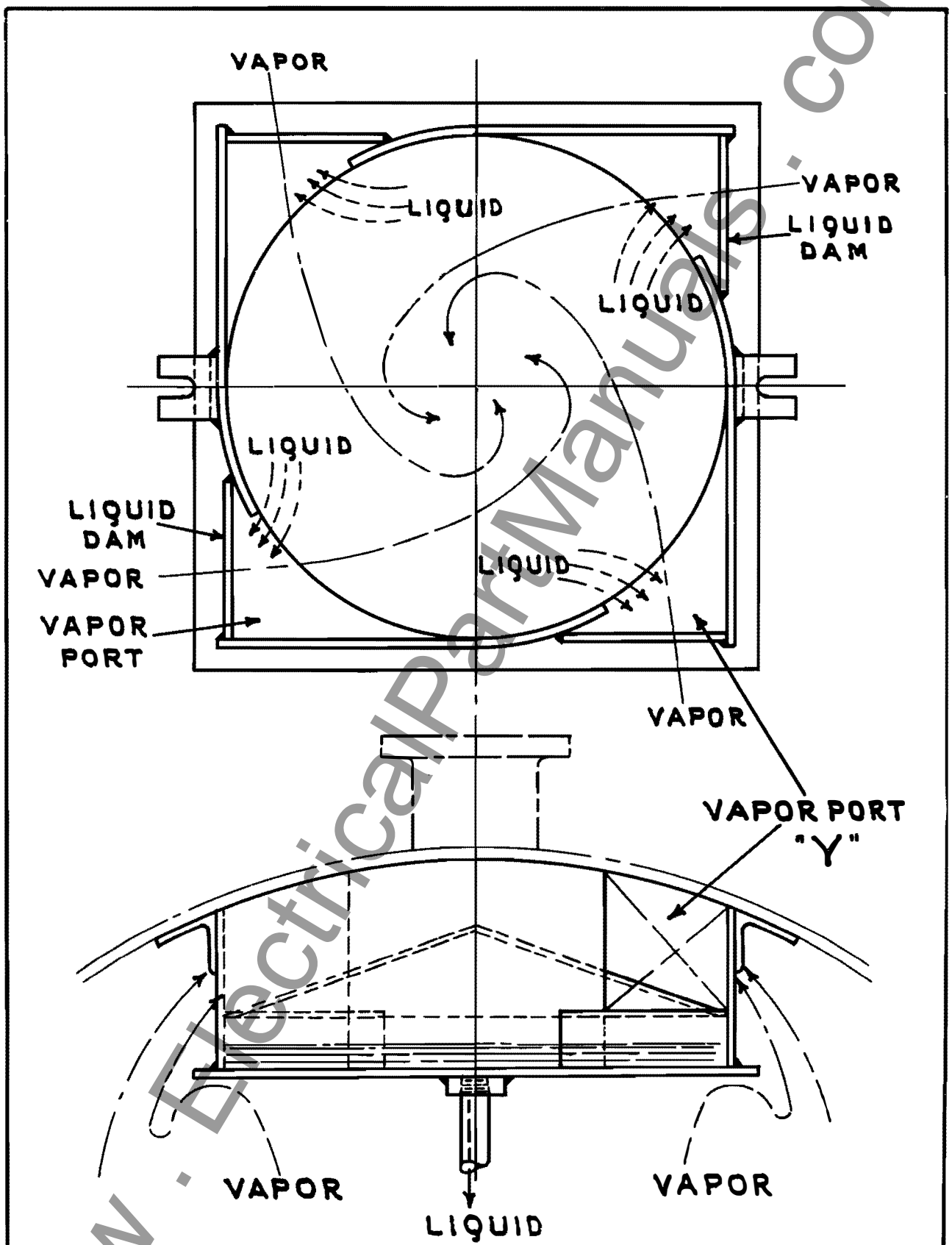

FIG. 2

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