

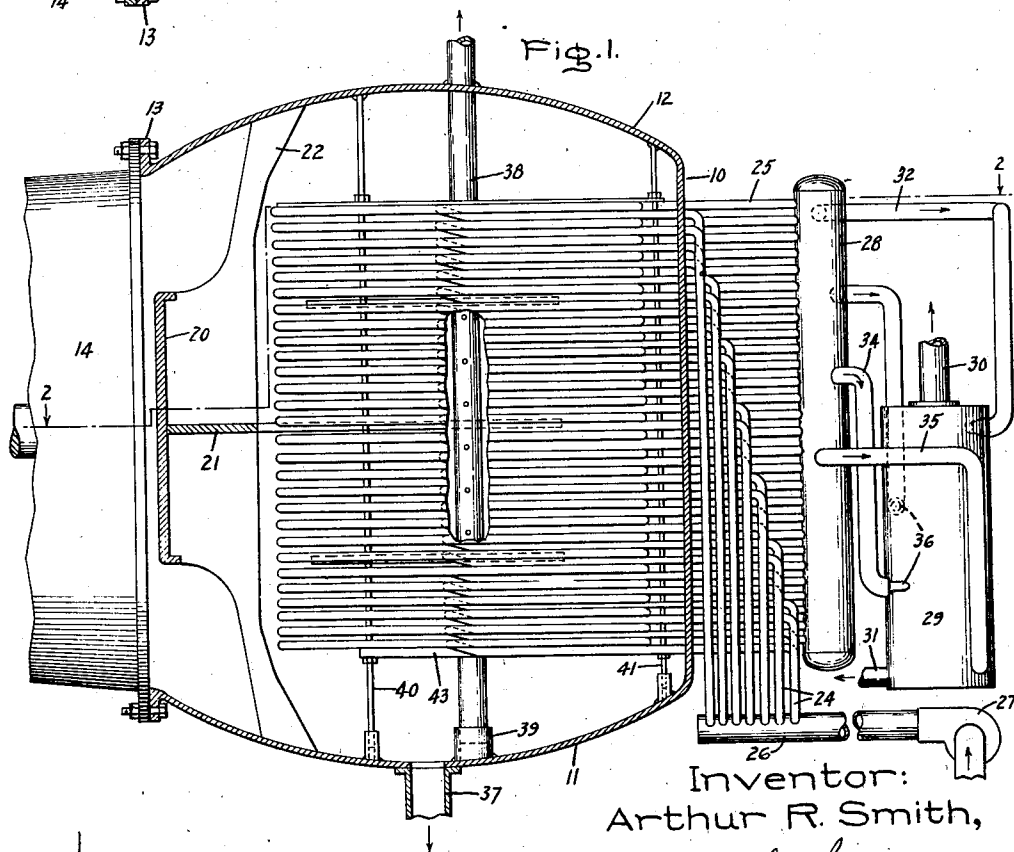
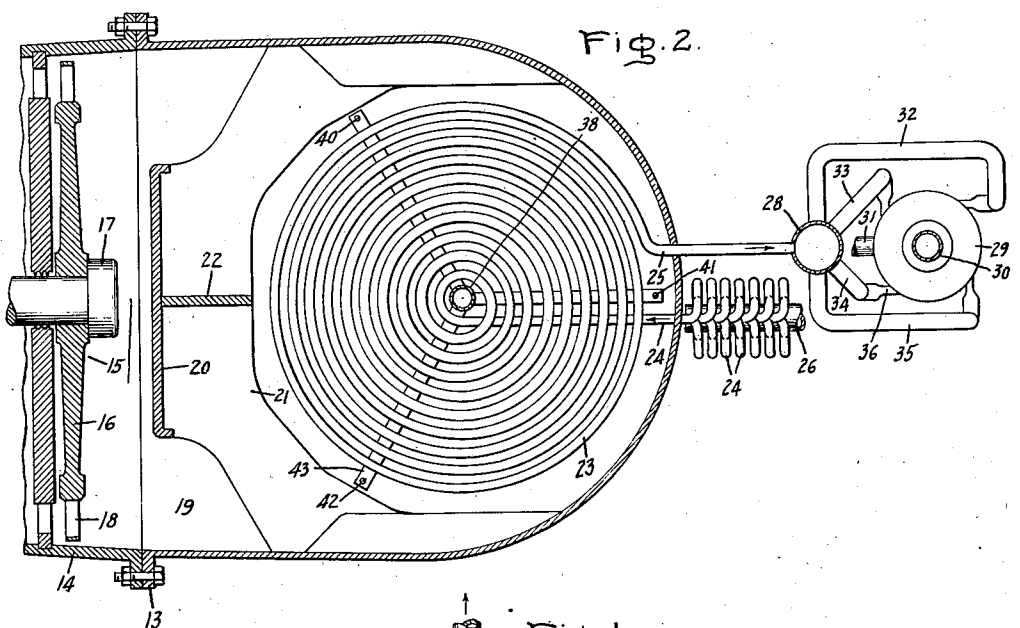
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A. R. SMITH

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SURFACE TYPE HEAT EXCHANGER

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Inventor:
Arthur R. Smith,
by *Harry E. Dunham*
His Attorney.

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SURFACE TYPE HEAT EXCHANGER

Arthur R. Smith, Schenectady, N. Y., assignor to
General Electric Company, a corporation of
New York

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2 Claims. (Cl. 257—28)

The present invention relates to surface type heat exchangers such as condenser boilers used, for example, in mercury power plants to condense mercury vapor exhausted from a turbine by transferring heat from the mercury vapor to a liquid such as water to be evaporated.

The object of my invention is to provide an improved construction and arrangement of condenser boilers and like heat exchangers of the type above specified which are simple and compact in construction and efficient in operation.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing Fig. 1 illustrates a surface type heat exchanger embodying my invention; and Fig. 2 is a section along lines 2—2 of Fig. 1.

The surface type heat exchanger illustrated in the drawing is particularly adapted as a condenser boiler for mercury power plants. The arrangement comprises a vertically disposed cylindrical shell 10 with a bottom 11 and a top 12. The shell 10 has an opening on one side fastened to a turbine casing 14 forming part of a mercury turbine which includes a rotor 15 having a bucket wheel 16 secured to an overhung shaft 17 with a row of buckets 18 adjacent an opening or inlet 19. This opening is formed between the inner surface of the shell and a disk 20 adjacent the disk of the bucket wheel 16 and supported on the shell 10 by a horizontal web or partition 21 and a vertical web 22 fused to the disk 20 and to the inner surfaces of the shell 10. The webs 21 and 22 while acting to support the disk 20 and to reinforce the shell structure also serve as guides for elastic fluid passing into the condenser and aiding uniformly to distribute the fluid therein. In addition the disk 20 acts as a baffle to prevent condensed mercury flowing along the tubes from being sucked towards the center of the bucket wheel and then thrown out tangentially, thus cutting the last stage buckets on the turbine.

The cooling arrangement or, from another viewpoint, the boiler means associated with the shell 10 comprises a plurality of vertically spaced spiral tubes 23 each having an inlet near the center of the spiral connected to a tube 24 and an outlet at the outer end of the spiral connected to a tube 25. The tubes 24 and 25 project through and are sealed to openings in the shell 10. The inlet tubes 24 have vertical por-

tions outside the shell connected to an inlet header 26 which in turn is connected by means of a pump 27 to a source of water or like operating medium, not shown. The outlet tubes 25 are connected to vertically spaced portions of a vertically disposed outlet header 28. Thus, all of the spiral tubes are connected in parallel between the inlet header 26 and the outlet header 28. During operation, water or like cooling medium is forced through the tubes and partly evaporated therein, the mixture being discharged into the outlet header 28. This outlet header is connected to a liquid vapor separating device comprising a vertically disposed drum 29 having a discharge conduit 30 for vapor or steam and another discharge conduit 31 for liquid or water.

The drum 29 is connected to the header 28 by means of a plurality of conduits. In the present instance I have indicated four conduits 32, 33, 34 and 35 each having an inlet connected to the header 28 and an outlet forming a nozzle 36 connected to the drum 29 and arranged to discharge the mixture of liquid and vapor tangentially towards the inner wall surface of the drum 29. The nozzles 36 of the four conduits 32 to 35 are connected to vertically spaced portions of the drum 28. During operation the liquid content of the mixture discharged into the drum 29 flows along the inner wall surface of the drum and is discharged through the liquid outlet conduit 31 whereas the vapor or steam flows towards the center of the drum space and is discharged therefrom through the vapor or steam outlet 30.

The heating of the cooling medium in the spiral tubes is effected by heat transfer from the mercury vapor discharged from the turbine to the condenser boiler. The mercury thereby condenses, the mercury liquid collecting on the bottom 11 of the drum to be discharged therefrom through a conduit 37.

The condenser boiler includes means for removing non-condensables such as air from the condenser. This means in the present example is in the form of a perforated tube 38 located in the center of the spirals and having a lower end portion held on a support 39 fused to the bottom 11 while the upper end of the tube 38 projects through and is sealed to an opening at the top 12. Said upper end may be connected to any suitable known pumping means (not shown) for removing non-condensables from the condenser.

The support of the vertically spaced spiral

tubes 23 comprises a plurality, in the present instance 3 circumferentially equally spaced rods 40, 41 and 42 secured at their lower and upper ends to the bottom 11 and the top 12 respectively of the condenser and connected by arms 43 to the non-condensable removal tube 38. Thus, the tube 38 also constitutes a means for supporting the spiral tubes 23. The inlet tube 24 for each spiral tube 23 is located below the spiral tube 23 and acts as a means for vertically spacing and supporting the vertically spaced spiral tubes.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. Surface type heat exchanger comprising a shell having an opening for receiving fluid to be cooled, a plurality of vertically spaced spiral tubes located within the shell, means including an inlet header located outside the shell and connected to the inner ends of the spiral tubes, other means including an outlet header disposed external the shell and connected to the outer ends of the spiral tubes, and means for removing

non-condensables from the condenser including a perforated tube near the center of said spiral tubes.

2. Surface type heat exchanger comprising a shell having an opening for receiving fluid to be cooled, a plurality of vertically spaced spiral tubes located within the shell, means including an inlet header located outside the shell and connected to the inner ends of the spiral tubes, other means including an outlet header disposed external the shell and connected to the outer ends of the spiral tubes, means for removing non-condensables from the condenser including a perforated tube projecting through the center of said spiral tubes and being supported on the bottom of the shell, and means for supporting the spiral tubes within the shell comprising a plurality of circumferentially spaced vertical supporting members held on the shell and horizontal radially disposed arms secured to the supporting members and the perforated tube.

ARTHUR R. SMITH.