

No. 737,104.

PATENTED AUG. 25, 1903.

R. H. HORN BROOK.
STEAM CONDENSER.

APPLICATION FILED JULY 24, 1902.

NO MODEL.

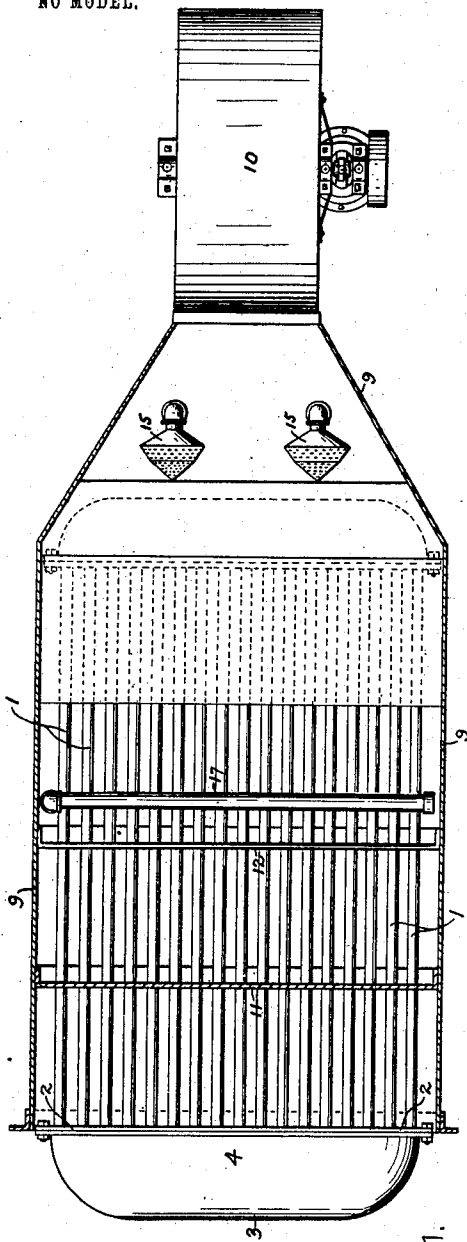


Fig. 1.

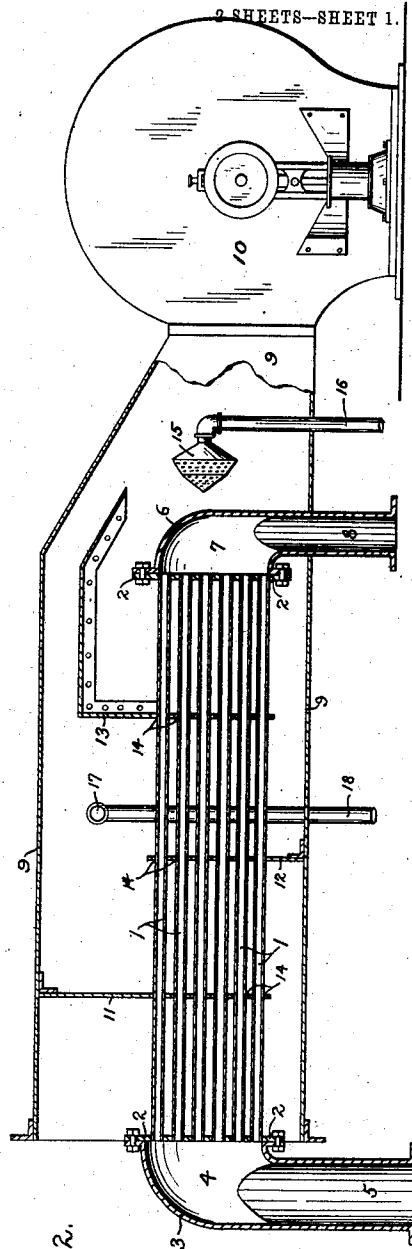


Fig. 2.

Witnesses:

Edward Nelson
Joseph Freese.

Inventor;

Raymond H. Hornbrook,
By *Harry Freese* - Attorney

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2 SHEETS—SHEET 2.

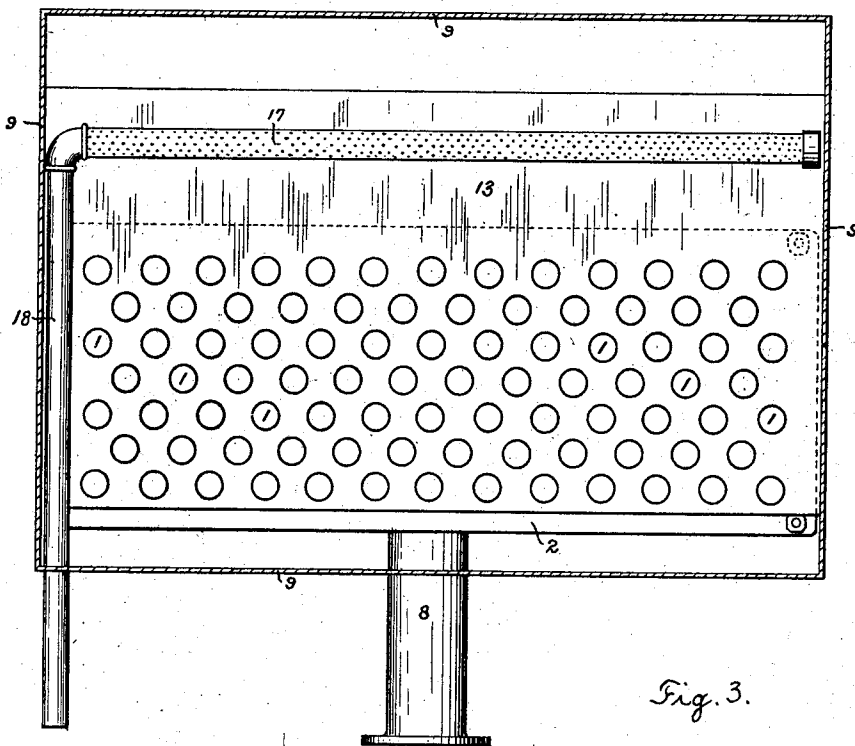


Fig. 3.

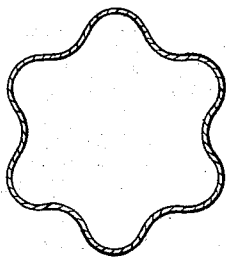


Fig. 4.

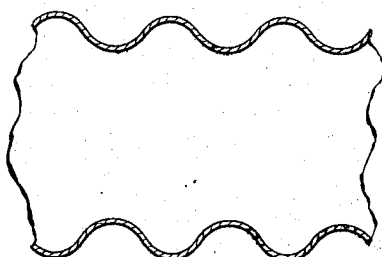


Fig. 5.

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UNITED STATES PATENT OFFICE.

RAYMOND H. HORN BROOK, OF CANTON, OHIO.

STEAM-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 737,104, dated August 25, 1903.

Application filed July 24, 1902. Serial No. 116,762. (No model.)

To all whom it may concern:

Be it known that I, RAYMOND H. HORN BROOK, a subject of the King of Great Britain, residing at Canton, county of Stark, and State of Ohio, have invented a new and useful Steam-Condenser, of which the following is a specification.

My invention relates to an apparatus for condensing steam by passing it through relatively small tubes and cooling the same by currents of air, either dry or moistened, which process is made the subject of another application for patent; and the object of this invention is to accomplish the condensation by a forced draft around and among the tubes. I attain this object by the apparatus and mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of the condenser with the top of the case removed; Fig. 2, a vertical longitudinal section on the median line of the same; Fig. 3, a cross-section of an apparatus in which the tubes are staggered in reference to each other; Fig. 4, a cross-section of a corrugated tube, and Fig. 5 a longitudinal section of a crimped tube.

The tubes 1 are preferably made quite thin and of a metal which conducts heat readily, and at either end of the tubes are the plates 2, into which the tubes are securely fastened, so there is no leakage of any sort. To the tube-plate at one end is securely joined by bolts or otherwise the head 3, forming the steam-chamber 4, to which is connected the steam-pipe 5, and to the tube-plate at the other end is similarly joined the head 6, forming the receiving-chamber 7, to which is connected the drain-pipe 8. Steam-exhaust from an engine, a feed-water heater, or other source passes into the steam-chamber through the steam-pipe, from which chamber it is distributed through the respective tubes, wherein it is condensed, whence the water or vapor accumulates in the receiving-chamber and passes off through the drain-pipe to an air-pump, a vacuum-pump, or other receptacle. To increase the surface of the tubes they can be longitudinally corrugated, as shown in Fig. 4, or crimped, as shown in Fig. 5. The case 9 entirely surrounds the tubes, and at least one of the chambers, preferably the receiving-chamber, and one end of the case,

preferably corresponding to the receiving-chamber, is connected with the blower 10. The other end of the case is left open. Depending from the top of the case, near the open end, is the deflector or baffle-plate 11, which preferably extends downward to include the lower tubes, but not to the bottom of the case, and projecting from the bottom, near the middle, is the deflector 12, which preferably extends upward to include the upper tubes, but not to the top of the case. Across the case, between the bottom deflector and the receiving-chamber, is the dividing-deflector 13, which preferably includes all the tubes and below the top of the case is bent back toward the blower, so as to divide the current of air. Suitable apertures 14 are provided in the several deflectors for the respective tubes, and the various deflectors are preferably located equal distances apart along the tubes, and thereby serve as suitable supports for the tubes at intervals along the case. Spray-heads 15 are located in the blower end of the case, through which heads small jets of water can be distributed from the water-pipes 16, and a spray-pipe 17 is conveniently located in and across the case, preferably near its middle, through which pipe small jets of water can be distributed from the water-pipe 18.

To operate the condenser, the blower is set in motion, and a strong current of air is thus forced into the case. This current is split by the dividing-deflector, and the lower part is blown, as indicated by arrows in Fig. 2, first against the receiving-chamber, thence over the same and diagonally downward around and among and impinging the respective tubes and under the dividing-deflector, and thence diagonally upward around and among and impinging the respective tubes and over the bottom deflector. The upper part of the air-current is blown, as is also indicated by arrows in Fig. 2, over the dividing-deflector and joins and cools the other part over the bottom deflector. Thence the united current of air is blown diagonally downward around and among and impinging the respective tubes and under the top deflector and thence diagonally upward around and among and impinging the respective tubes against the steam-chamber and over the same and

out of the open end of the case. By thus dividing the current of air and carrying a part of the same to a contact with the tubes at or beyond the middle the tubes are kept quite cool even to the steam ends. To further cool the air by evaporation, it is moistened by small jets of water from the spray-heads and the spray-pipe, respectively.

While I have illustrated and described the top and bottom deflectors in the form of vertical partitions across the case, any other form of deflectors can be used which will guide an air-current through the case to and fro around and among and impinging the respective tubes without affecting the nature of my invention, and additional top and bottom deflectors and dividing-deflectors can be used if it is desired to elongate the condenser, and instead of locating the respective tubes in rows opposite each other, as shown in Figs. 1 and 2, the tubes can be so disposed that each tube in one row is opposite the space between tubes in the adjacent row, as shown in Fig. 3, thus exposing each individual tube more fully to the cooling medium.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a steam-chamber connected with a steam-pipe, a receiving-chamber connected with a drain-pipe, and relatively small tubes connecting said chambers; a case surrounding said tubes, and the chamber at one end, which end of said case is connected with a blower, and the other end being open; and deflectors alternately depending from the top and projecting from the bottom of said case, said deflectors having apertures for said tubes to support the same.

2. The combination of a steam-chamber connected with a steam-pipe, a receiving-

chamber connected with a drain-pipe, and relatively small tubes connecting said chambers; a case surrounding said tubes, and the chamber at one end, which end of said case is connected with a blower, and the other end being open; and deflectors arranged to guide the air-current from said blower to and fro around and among said tubes to impinge the same.

3. The combination of a steam-chamber connected with a steam-pipe, a receiving-chamber connected with a drain-pipe, and relatively small tubes connecting said chambers; a case surrounding said tubes, and the chamber at one end, which end of said case is connected with a blower, and the other end being open; and a deflector arranged to divide the air-current from said blower, and to carry part of it forward around and among said tubes near the forward ends thereof.

4. The combination of a steam-chamber connected with a steam-pipe, a receiving-chamber connected with a drain-pipe, and relatively small tubes connecting said chambers; a case surrounding said tubes, and the chamber at one end, which end of said case is connected with a blower, and the other end being open deflectors are arranged to guide the air-currents from said blower, to and fro, around and among said tubes to impinge the same; and means for spraying water in said case.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RAYMOND H. HORN BROOK.

Witnesses:

HARRY FREASE,
JOSEPH FREASE.