C. GODFREY.

Surface-Condenser.

No. 162,470. Patented April 27, 1875.

Fig. 1.

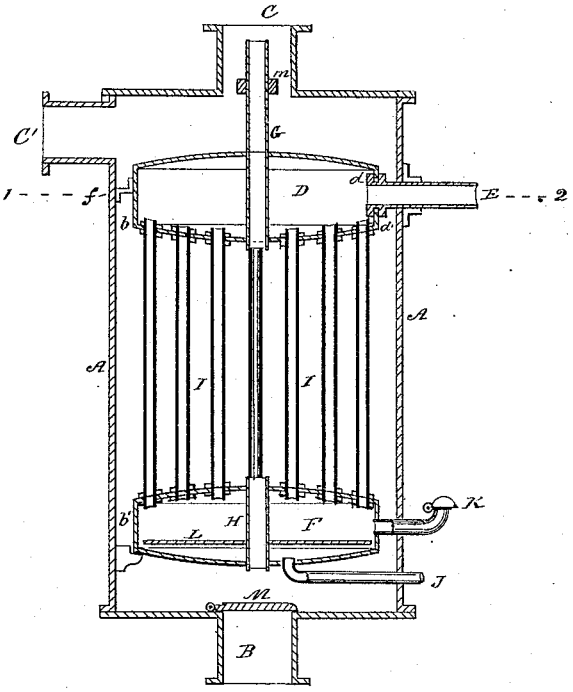


Fig. 2.

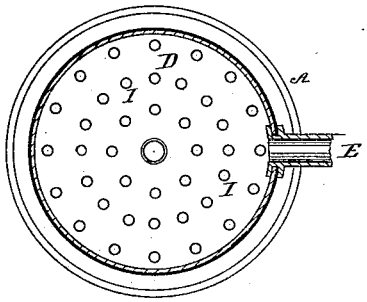
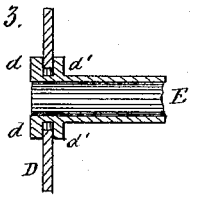


Fig. 3.



Witnesses:

Wm. S. Thornton

A. P. Smith

Inventor:

Cornelius Godfrey

UNITED STATES PATENT OFFICE.

CORNELIUS GODFREY, OF HUNTINGTON, NEW YORK.

IMPROVEMENT IN SURFACE-CONDENSERS.

Specification forming part of Letters Patent No. **162,470**, dated April 27, 1875; application filed September 21, 1874.

To all whom it may concern:

Be it known that I, CORNELIUS GODFREY, of Huntington, Suffolk county, and State of New York, have invented certain new and useful Improvements in Surface-Condensers; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification.

The object of this invention is to construct a condenser in such a manner that the expensive packing of the steam-condensing tubes, heretofore generally used, may be dispensed with, thereby greatly simplifying the structure, and reducing its cost and at the same time to make ample provision for the expansion of the said tubes when subjected to the heat of the exhaust steam; also, to secure a thorough condensation, and to maintain a gradual upward flow within the condenser of the water which effects condensation.

These improvements consist, first, in the means employed for providing for the expansion of the tubes, whereby the expensive packing of the tubes, generally found necessary, may be dispensed with, and so that the tubes and steam and vacuum-chambers may have a bodily upward movement, when expansion takes place, thereby admitting of the tubes being rigidly secured to the chambers, without expansion-joints; secondly, in an improved arrangement of the said chambers and tubes in relation to each other and to the inlet and outlet of the water which effects condensation, for the purpose of securing thorough condensation of the steam and a more perfect vacuum in the vacuum-chamber; and, thirdly, in improved means for maintaining a gradual and even upward flow within the body of the condenser of the water which effects condensation.

In order that my said improvements may be fully understood, I will proceed to particularly describe the same, referring to the accompanying drawing, in which—

Figure 1 represents a vertical section of a condenser, constructed according to my invention; Fig. 2, a horizontal section through the steam-chamber, on the line 1 2; and Fig. 3, a detailed view, hereinafter referred to and described.

Similar letters of reference indicate the same parts in each of the figures.

A represents the shell of the condenser, which may be of sheet metal, or it may be of wood, as no part thereof is exposed either to the heat or the pressure of the steam. B is the inlet for the water, which effects condensation, and C and C′ the outlets for the same, which latter may be used interchangeably, according to the position of the condenser in relation to the water-supply, as hereinafter set forth. D is the steam-chamber, which receives the exhaust steam from the engine, through a suitable pipe, E, and which is of such form and dimensions that a suitable space, *b*, may be formed between its sides and the shell A to allow the water to flow upward toward the outlet C or C′. A tube, G, passes up and through the center of this chamber D, to facilitate this upward flow of the water. F is the vacuum-chamber, of similar form and dimensions as the steam-chamber D, which is located in the lower part of the body of the condenser, a short distance above the inlet B, and rests upon suitable brackets or supports *a*. A tube, H, passes up and through the center of this chamber, similar to that in the chamber D, and for a similar purpose. *b′* represents the water-passages between this chamber and the shell A. I represents a series (consisting of any suitable number) of steam-tubes, whose upper ends enter the chamber D, and their lower ends enter the vacuum-chamber F, both ends being rigidly secured by means of screw-nuts or similar means, the former to the lower sheet of the chamber D, and the latter to the upper sheet of the chamber F.

When the exhaust steam enters this chamber D there is sufficient room therein for it to spread or expand, thus preventing any shock or concussion being caused by its entrance, and as it descends through the tubes I it is subjected to the action of water of gradually-decreasing temperature, until it reaches the discharge-pipe J, which is located in the lower part of the body of the condenser where the water is coldest. By these means thorough condensation of the steam is effected, and a more perfect vacuum in the vacuum-chamber F is attained.

The pipe E is rigidly secured within the shell A, and is connected with the chamber D by means of a sliding or expansion joint, formed by an elongated slot in the side of the said chamber, which slot is covered by flanges *d d'* provided on the end of the pipe E, which said flanges fit closely to the inner and outer surfaces, respectively, of the side of the said chamber, and form a steam-tight joint. This is shown on an enlarged scale in Fig. 3, which represents a vertical section of the joint. As an equivalent means, or what I conceive to be such, of providing for expansion, the slot may be formed in the shell A, and covered by similar flanges to those described, while the end of the pipe E is rigidly secured within the side of the said chamber D.

The tube G may pass upward through a cross-bar, *m*, in the neck of the outlet C, for the purpose of preventing lateral movement of the tubes and chambers, as shown in Fig. 1, or such lateral movement may be prevented by means of suitable guides *f* placed between the chamber D and shell A.

K is an air-valve, of any suitable form, connected with the vacuum-chamber F, to allow the escape of the air contained in the chambers and tubes when the steam is admitted. L is a plate placed within the vacuum-chamber, and of slightly-smaller diameter than the said chamber, to allow the water of condensation to descend into the reservoir formed thereby at the bottom of the said chamber. M is a valve, which may be of any suitable construction, placed over the inlet B, which said valve is used only when the position of the condenser is such that the water which effects condensation has to be forced into the same.

When the position of the condenser is such in relation to the water-supply, that the water will flow through the outlet C', the outlet C is closed; but when this is not the case, a pump is connected with the outlet C for drawing off the warm water, and in such case the outlet C' is closed.

From the foregoing description it will be seen that all the tubes are subjected to the same temperature, and consequently there will be equal expansion throughout; also, that the steam is subjected to the action of water of gradually-decreasing temperature, from the time it enters the condenser until it is discharged in the form of water; and, further, that there is an even and gradual upward flow of cold water in the body of the condenser as the warm water is drawn off.

Having thus described my improvements, what I claim as my invention is—

1. A surface-condenser, in which the steam-tubes are rigidly secured to the steam-chamber and vacuum-chamber, and wherein provision is made for the expansion of the tubes by means of a sliding or expansion joint between the steam-inlet pipe and the steam-chamber, substantially as specified.

2. In a surface-condenser, the combination and arrangement herein shown and described, of the steam-chamber D, vacuum-chamber F, upright tubes I, connecting said chambers, water-inlet B, water-outlet C', pipe J, and shell A, for the purposes set forth.

3. The tube H, passing upward through the chamber F, in combination with the water-passages *b b'*, inlet B, and outlet C', as and for the purpose set forth.

CORNELIUS GODFREY.

Witnesses:
JOHN S. THORNTON,
A. P. SMITH.