# F. B. Stevens,

## Steam-Boiler Condenser.

No. 36,809. Patented Oct. 28, 1862.

Fig: 1.

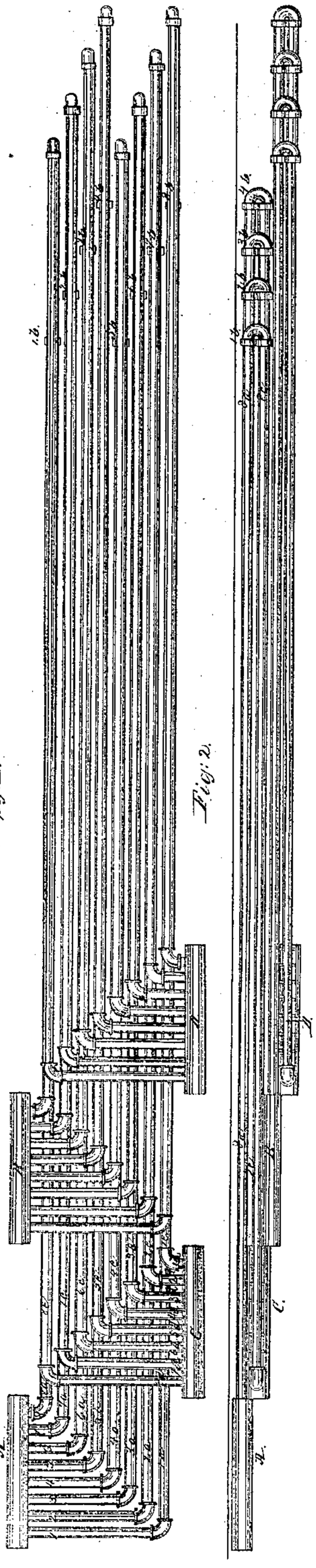


Fig: 2.



Fig: 4.

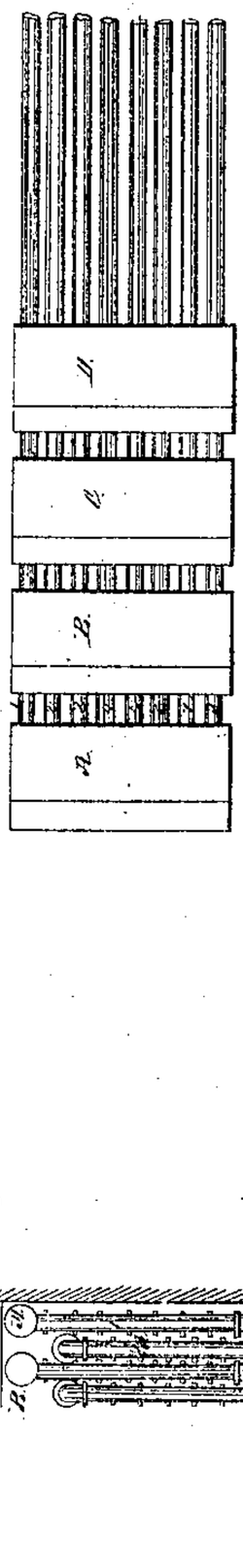


Fig: 5.

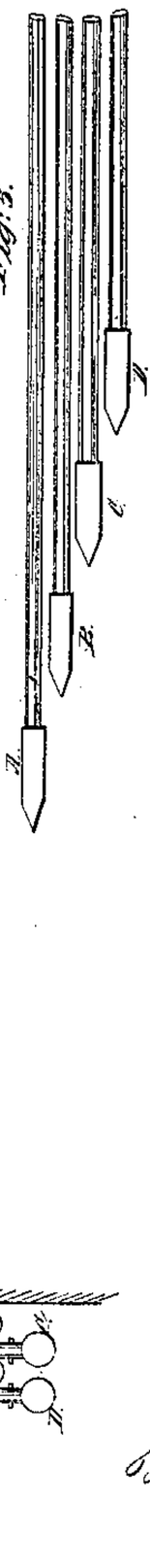
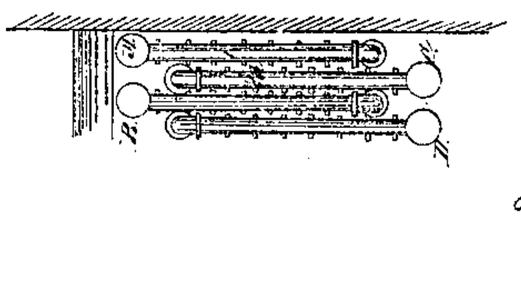


Fig: 6.



Fig: 3.



Witnesses:

Albert S. Easton
Wm. Sadler

Inventor:

Francis B. Stevens

# UNITED STATES PATENT OFFICE.

FRANCIS B. STEVENS, OF NEW YORK, N. Y.

## IMPROVEMENT IN SURFACE-CONDENSERS.

Specification forming part of Letters Patent No. **36,809,** dated October 28, 1862.

*To all whom it may concern:*

Be it known that I, FRANCIS B. STEVENS, of the city, county, and State of New York, have invented a new and Improved Surface-Condenser or Cooler for Steamers; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

It has often been proposed to place a surface-condenser for condensing the steam or a cooler for cooling the injection-water outside of a steamer, so that the surfaces to be cooled may be surrounded by the water in which the steamer floats.

The object of my invention is to improve a condenser or cooler so placed.

I form my surface-condenser or cooler by placing on the outside of the submerged surface of a steamer a system of tubes with headers, elbows, and return-bends, arranged one behind the other, so as to cause little obstruction to the passage of the steamer through the water, and at the same time to allow sufficient water to flow around the tubes to condense the steam or cool the injection-water. I propose to use this system of tubes placed on the submerged surface of a steamer either as a surface-condenser for condensing the steam that leaves the cylinder or as a cooler for cooling the injection-water on its passage between the air-pump and condenser.

Figure I is an elevation of the system of tubes applied to the side of a steamer. Fig. II is a horizontal view of the same. Fig. III is an end view of the same. A and B show two upper headers, each receiving the steam to be condensed or the water to be cooled. C and D show the lower headers, each leading off the condensed steam or cooled water. 1 2 3 4 5 6 7 8 show each a short tube, and form the series of short tubes leading from the header A. $1^a$ $2^a$ $3^a$, &c., show each a horizontal tube, $1^a$ being connected to the short tube 1, and $2^a$ being connected to the short tube 2, and so on. $1^b$ $2^b$ $3^b$, &c., show return-bends placed at the ends of the horizontal tubes $1^a$ $2^a$ $3^a$, &c. $1^c$ $2^c$ $3^c$, &c., show horizontal tubes leading back from the return-bends $1^b$ $2^b$ $3^b$, &c. $1^d$ $2^d$ $3^d$, &c., show the short tubes connected to the horizontal tubes $1^c$ $2^c$ $3^c$, &c., and leading to the lower header C. The tubes leading from the upper header B to the lower header D being arranged in the same manner as those leading from the headers A and C. The headers, their elbows, and return-bends are all placed the one behind the other. Thus C is placed behind A, B behind C, and D behind B, so that the water may have access to the horizontal tubes. The return-bends are also placed one behind the other, so that the water, after passing by one return-bend, may have access to the horizontal tubes before coming to the next return-bend. The horizontal tubes, instead of making one return, may make two or more, where desirable. The headers A and C and their tubes could be used separately from the headers B and D and their tubes, if less surface were required, or if more surface were required additional headers could be used, or more tubes could be connected to each header. The header A is shown close to the side of the vessel. The header B could be placed directly behind the header A by bending the short tubes, or by adding elbows to them. The short tubes 1 2 3, &c., are shown in Fig. III parallel to the side of the steamer; but they may, if required, be set at any angle to it.

When used for a surface-condenser, the cross-sections of the upper headers or of the tubes connecting with them should be equal or nearly equal in area to the opening of the eduction-pipe, and when used for a cooler their area must be sufficiently great to pass the injection-water from the hot-well back again to the condenser. The tubes should, of course, be arranged in systems symmetrically on both sides of the steamer.

Fig. IV shows a longitudinal elevation of another application of my invention. Fig. V shows a horizontal view of the same. Fig. VI shows an end view of the same. The short tubes are here dispensed with, the horizontal tubes 1 2 3, &c., being connected directly to the headers A B C D, which are here shown by flat tubes sharpened at the ends. These headers can be placed parallel with the sides of the steamer and connected to it, or they can be placed at right angles to it and con-

nected by their ends. The return-bends are not shown. They must be placed in the same manner as in Figs. I, II, and III—that is, one behind the other.

What I claim as my invention is—

Forming a surface-condenser or cooler by a system of headers, elbows, and horizontal tubes placed on the submerged surface of a steamer, as herein set forth and described.

New York, September 20, 1862.

FRANCIS B. STEVENS.

Witnesses:

ALBERT S. EASUM,

A. L. TELFER.