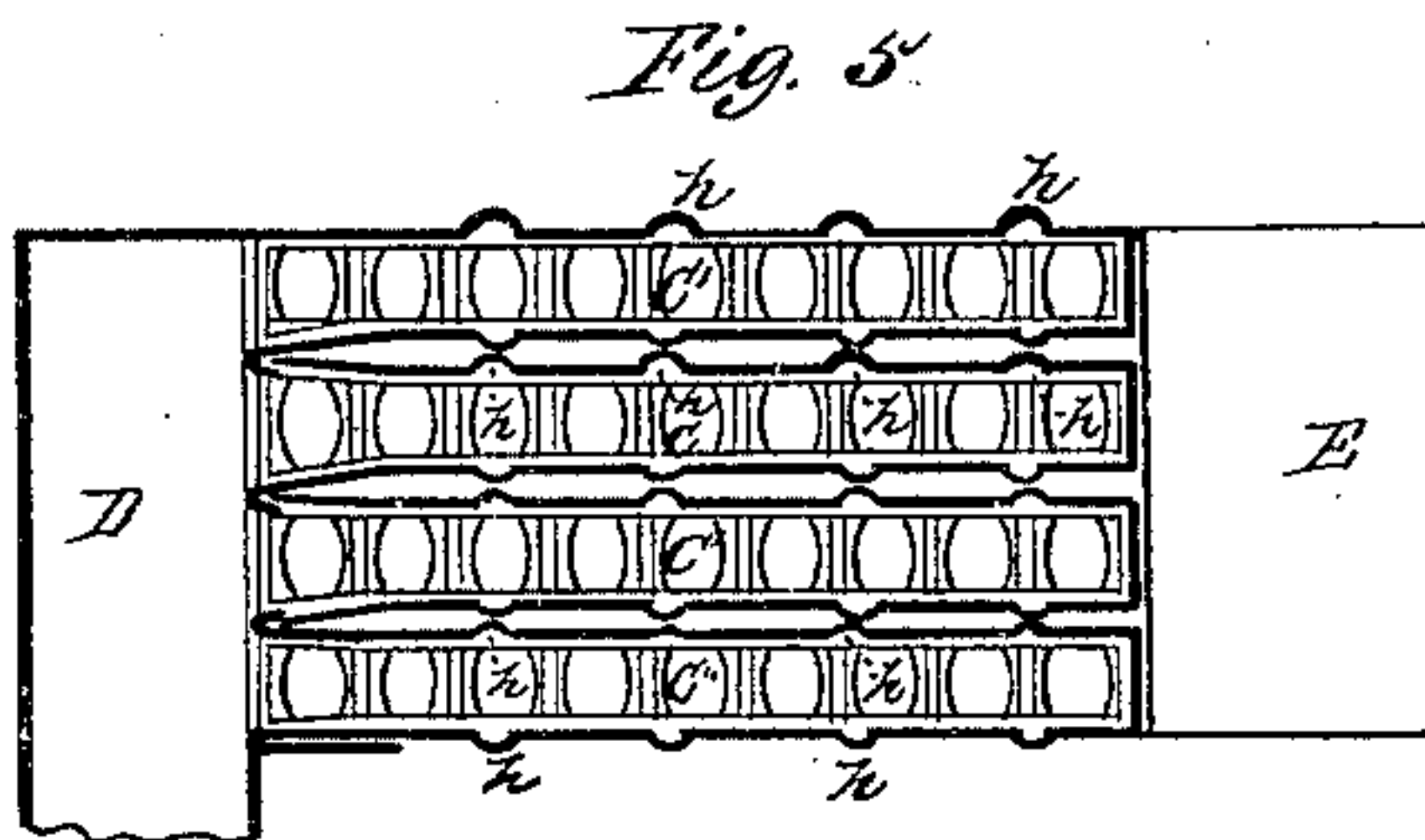
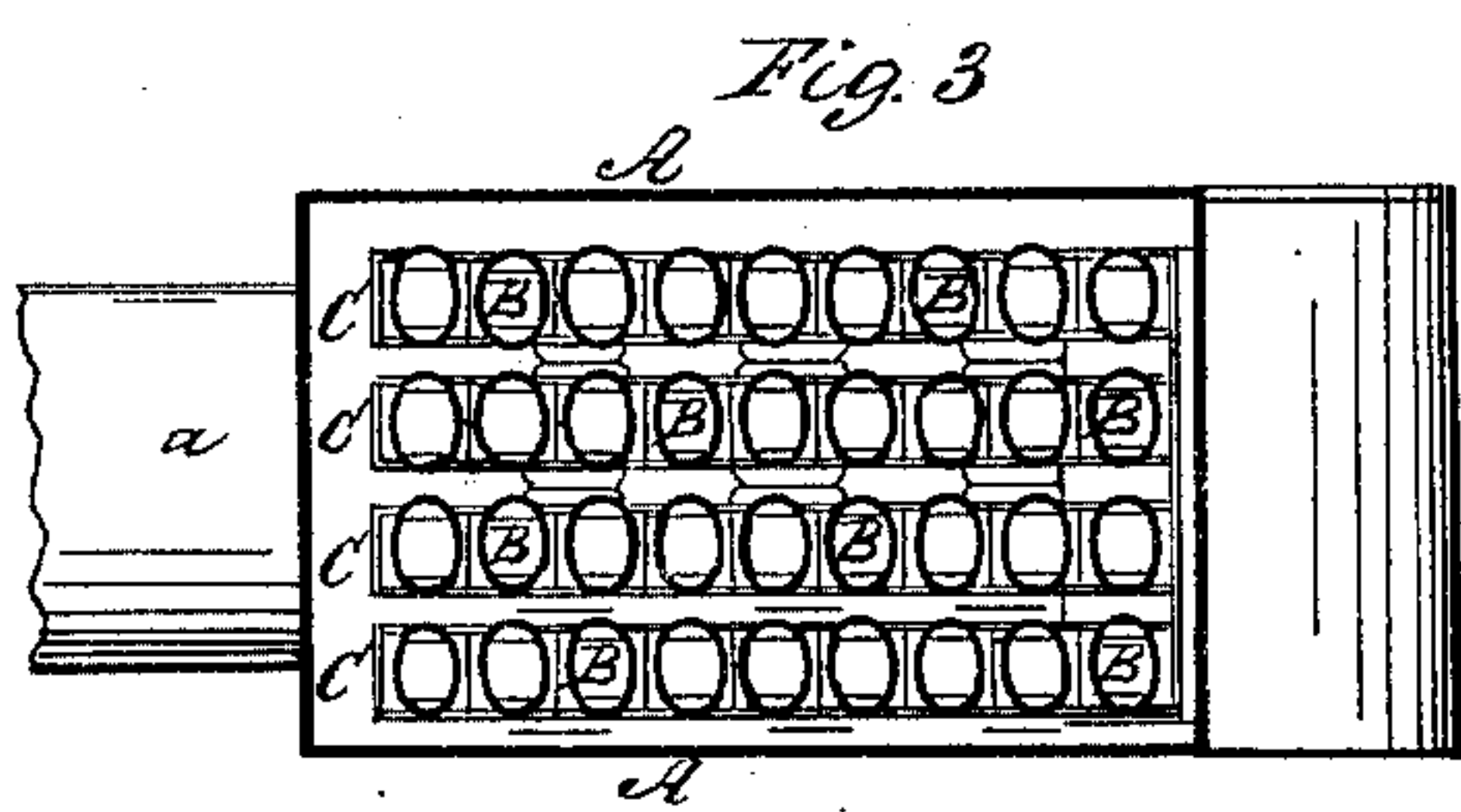
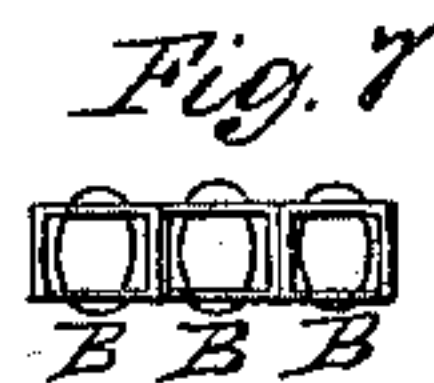
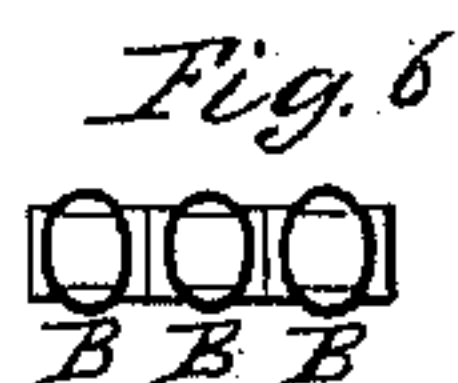
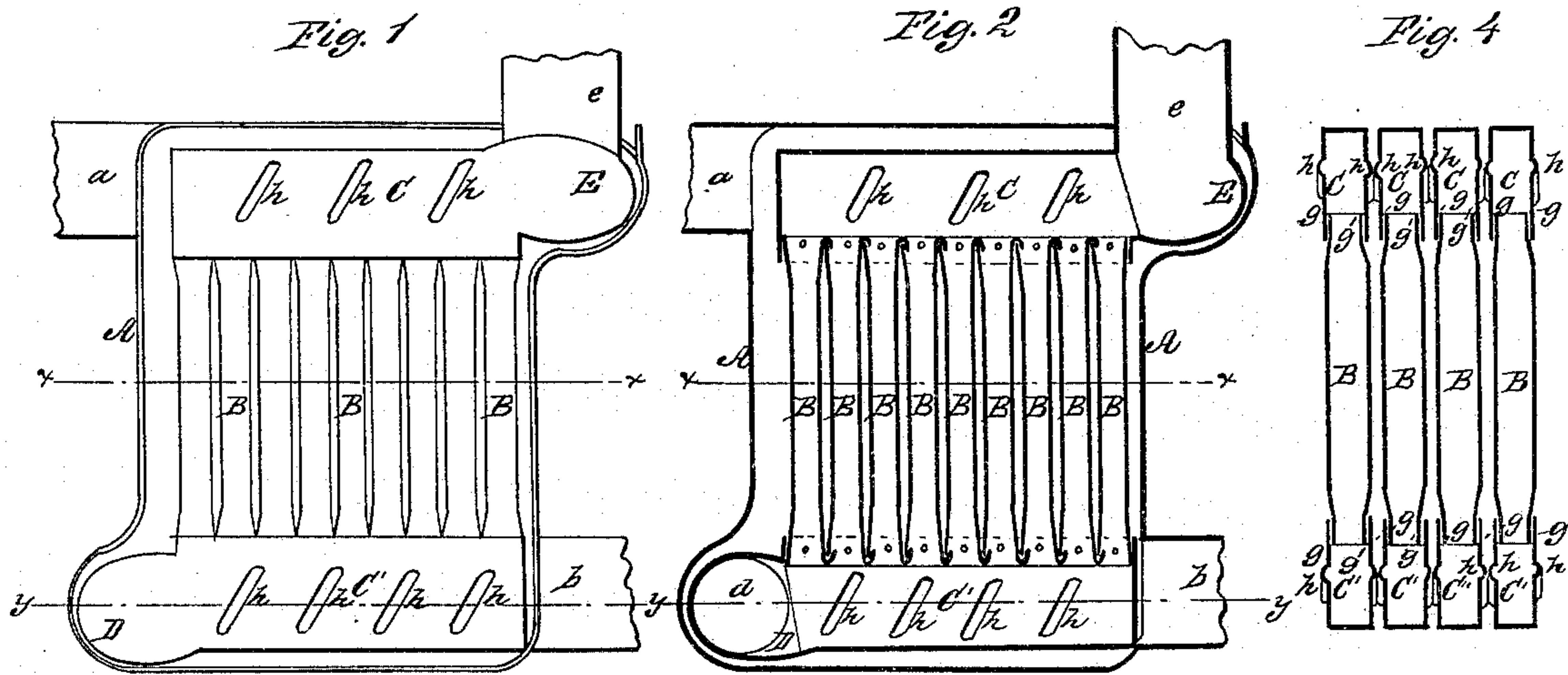


West & Mills,
Steam-Boiler Condenser.
N^o 16,130. Patented Nov. 25, 1856.



UNITED STATES PATENT OFFICE.

UEL WEST AND ABNER MILLS, OF NEW YORK, N. Y.

IMPROVEMENT IN THE CONSTRUCTION OF TUBULAR CONDENSERS AND HEATERS.

Specification forming part of Letters Patent No. **16,130**, dated November 25, 1856.

To all whom it may concern:

Be it known that we, UEL WEST and ABNER MILLS, of the city, county, and State of New York, have invented a new and useful Improvement in the Construction of Tubular Condensers and Heaters; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side view of a condenser with one side of the shell taken away to show the internal arrangement of tubes. Fig. 2 is a vertical section in a plane parallel with Fig. 1, passing through the centers of a row of tubes. Fig. 3 is a horizontal section of the same in the line *xx* of Figs. 1 and 2, looking upward. Fig. 4 is a vertical section of the tubes and conductors at right angles to Figs. 1 and 2. Fig. 5 is a horizontal section of the tubes and conductors in the line *yy* of Figs. 1 and 2, looking upward. Fig. 6 is a transverse section of three adjacent tubes. Fig. 7 is an end view of the same.

This invention consists, chiefly, in a certain mode of effecting the connection of the ends of the tubes of a tubular condenser or heater with the passages or conductors which convey the steam or water to or from the several rows of tubes, whereby the employment of tube-sheets is dispensed with and the difficulty of preserving tight joints around the ends of the tubes is obviated.

A is the outer shell of the condenser, and *a* is the inlet-pipe and *b* the outlet-pipe belonging thereto.

B B are the tubes, arranged in rows.

C C' are the conductors, with which the ends of the tubes connect.

E D are the trunks connecting the conductors *C C'* with the inlet and outlet pipes *e d*.

In this condenser the steam is supposed to be received in the jacket *A* outside of the tubes and the cold water to circulate through the tubes; but the action may be just the reverse. The connection of the tubes *B B* with the conductors *C C'* without tube-sheets, which constitutes the main feature of this invention, is made in the following manner: The tubes are first squared at their ends for some distance by the insertion of a mandrel or by other means, so that when placed side by side the adjacent sides *ee* of the squared ends will form a joint with each other of the whole

width of the tube, and the other sides *ff* will all range in two parallel straight lines, as shown at *o*, Fig. 7, so that by making the conductors *C C'* entirely open on the side which is to receive the tubes and of a proper width the squared ends of the whole row of tubes may be received between the sides *gg* thereof, as is shown in Fig. 4.

In constructing the condenser the sides *ee* of both ends of a whole row of tubes are first secured together and then the whole row secured to the two conductors *C C'*. The tubes may be secured together by lap-joints by riveting or in any other suitable manner, and they may be secured in the conductors by riveting, and after being finished the whole joint may be tinned or brazed. In employing this mode of connecting the tubes and conductors it is very advantageous to have the tubes of elliptical form in the parts not squared, as this by arranging the major axis of the ellipse transversely to the conductors provides for a proper circulation between the tubes without making the ends larger than the other parts, for the squared ends may be made widest in the direction of the minor axes of the elliptical portions. Cylindrical tubes would require the ends to be enlarged by the addition of mouth-pieces, which would entail considerable expense, but by having the tubing drawn of elliptical form and then cut into proper lengths the ends can be squared in a proper manner simply by employing a mandrel to change the form without drawing or stretching the metal.

The conductors *C C* and those *C' C'* are severally connected together so as to leave a space between them by simply giving them a flaring form in a lateral direction at one end, which is left open to connect with the trunk *D E*, as is shown in Fig. 5, and uniting the adjacent sides of the said open ends by riveting or by lap-joints or other suitable means, and a sufficient distance is maintained between the several conductors for proper circulation by making a few corrugations *h h* on the sides *gg* of the conductors, the convex surfaces of the corrugations being on the outside of the conductors and resting against each other, as shown in Fig. 4. This mode of connecting the conductors is simple, dispensing entirely with flanges.

What we claim as our invention, and desire to secure by Letters Patent, is—

The connection of the ends of the tubes B B with the conductors C C' by squaring the ends of the tubes, fitting the squared ends of the tubes of each row close together and making tight joints between them, and inserting the whole united row directly between the two parallel sides or portions *g g* of the conductor and securing each tube closely to the said sides

or portions *g g*, substantially as herein described.

UEL WEST.
ABNER MILLS.

Witnesses:
HUGH CORCORAN,
O. P. ROLLINS.