(No Model.)

J. P. SERVE.

BOILER TUBE.

No. 349,060. Patented Sept. 14, 1886.

Fig. 1

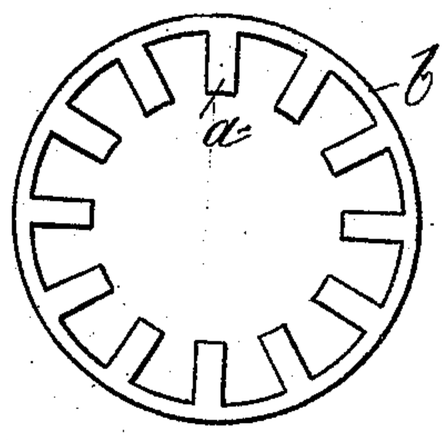


Fig. 2

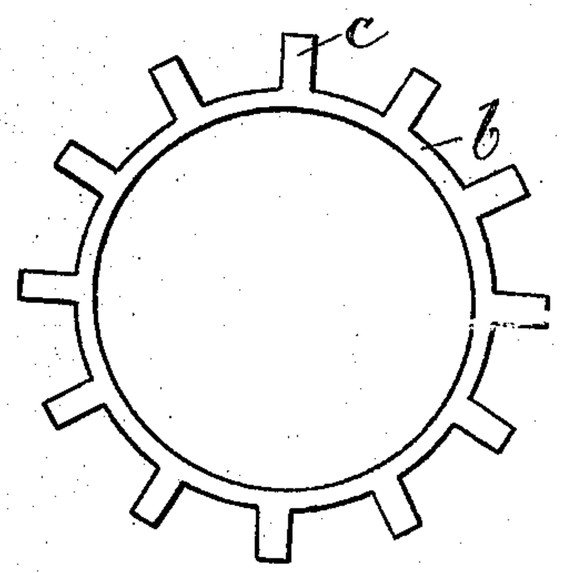


Fig. 3

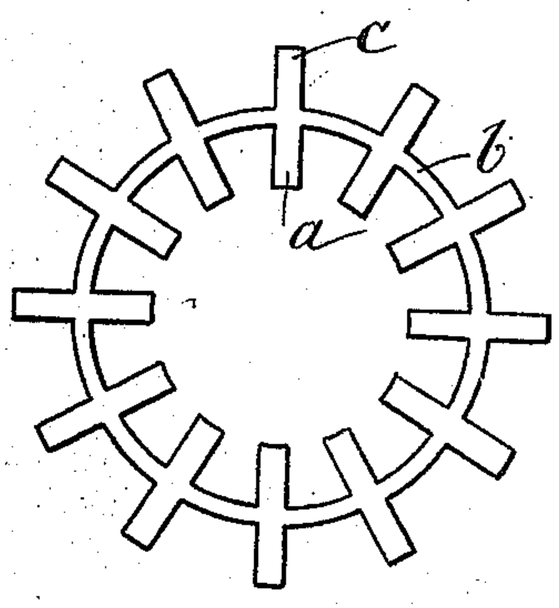


Fig. 4

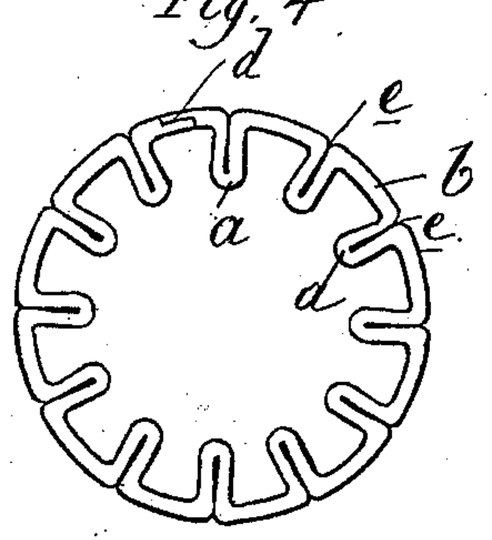


Fig. 5

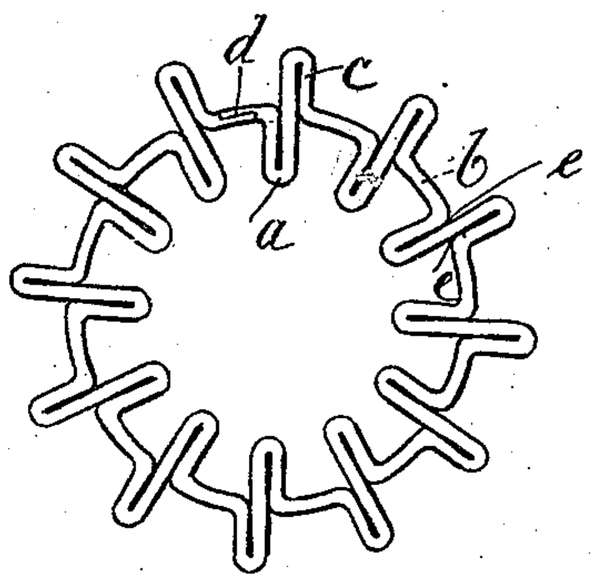
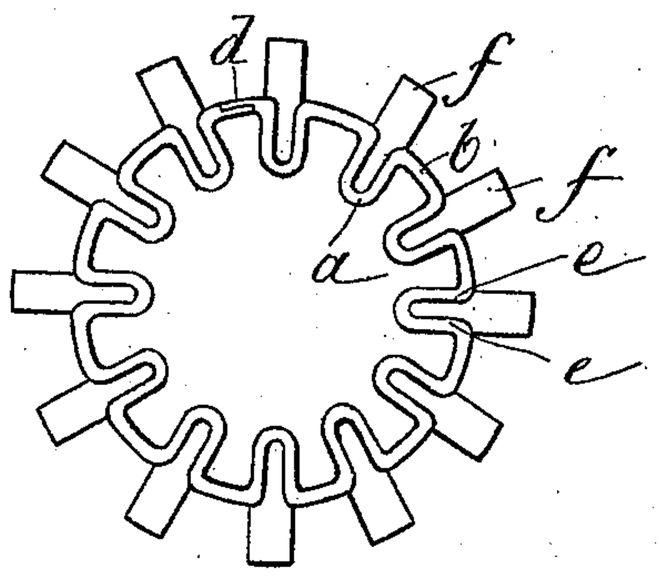


Fig. 6



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Fred'k Hoffmann

Inventor:
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by his attorneys
Brown & Hall

UNITED STATES PATENT OFFICE.

JEAN PIERRE SERVE, OF GIVORS, FRANCE.

BOILER-TUBE.

SPECIFICATION forming part of Letters Patent No. 349,060, dated September 14, 1886.

Application filed February 6, 1886. Serial No. 190,994. (No model.) Patented in France September 20, 1884, No. 164,412.

To all whom it may concern:

Be it known that I, JEAN PIERRE SERVE, a citizen of the Republic of France, residing at Givors, in the said Republic, have invented a new and useful Improvement in Metallic Tubes for Steam Boilers and Condensers, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to increase the capability of transmission of heat, and also to increase the rigidity of the tubes without proportionately reducing the area of the tubes in their transverse section. I obtain this result by constructing or providing the tubes with longitudinal solid and massive wings or fins, either internal or external to the tubes. Tubes with such wings or fins employed in surface-condensers present to the water of condensation the greatest heating-surface possible and to steam the greatest cooling-surface possible, and in a boiler they present the greatest surface to the water and to the gases of combustion. The same result is obtained by them in other apparatus for transmitting heat or cold. These wings or fins may have a rectilinear form—that is to say, may be arranged along the tube; or they may be arranged spirally around the tube. The dimensions, the form, the position, and the number of the said fins or wings are variable, and they may be applied or provided on the tubes, whatever be the construction of the latter, by any known means of manufacture—that is to say, in certain cases the fins or wings may be obtained directly by the rolling of a sheet of metal which is to be afterward rolled up to form the tube. In other cases the wings may be obtained by folding the sheet. In other cases they may be applied after the completion of the tube; and in other cases yet they may be obtained directly in the operation of drawing the tube when that mode of manufacture is employed. The wings are, however, always solid and massive, as distinguished from concavo-convex flutes or corrugations.

My invention has for its principal advantages, first, the augmentation, in a very great proportion, of the transmission of heat by reason of the increase of the heating-surface, and consequently the diminution in a considerable degree of the expense of fuel; second, the increased rigidity of the tubes, which permits the employment for their manufacture of certain metals which could not otherwise be used.

Figure 1 of the drawings represents a transverse section of a seamless tube with internal fins. Fig. 2 represents a transverse section of a seamless tube with external fins. Fig. 3 represents a transverse section of a seamless tube with internal and external fins. Fig. 4 is a transverse section of a seamed tube with internal fins. Fig. 5 is a transverse section of a seamed tube with internal and external fins; and Fig. 6 is a transverse section of a seamed tube with specially constructed internal and external fins.

Similar letters of reference designate corresponding parts in all the figures.

As may be seen by reference to the drawings in the examples represented by Figs. 1, 2, and 3, the seamless drawn tube and the fins are obtained directly by the drawing operation. They may be only, as at *a*, in the interior of the tube *b*, Fig. 1, or they may be only on the exterior, as at *c*, Fig. 2, or both, as at *a* and *c*, in the interior and on the exterior, Fig. 3.

In the examples represented in Figs. 4, 5, and 6 the tube is seamed—that is to say, formed of a sheet or strip of metal, *b*, rolled and soldered in the joint *d*. In Fig. 4 the fins are simply constituted by folds *a*, all formed on same side of the sheet *b*, and of which the two thicknesses are soldered one to the other at *e*, as in the joint *d* of the tube. These folds are obtained by any mechanical means, and may be arranged either on the exterior or in the interior of the tube.

In the example shown in Fig. 5 the fins are formed of folds, as has been described, and placed in the interior and on the exterior of the tube. Instead of being juxtaposited, as seen in the last-mentioned figure, the interior and exterior folds may be separated a certain distance.

In Fig. 6 I have represented an example in which the fins are both internal and external and formed of folds *a*, arranged in the interior of the tube, as before described, but wider, and into this I introduce bands *f*, formed to enter the said folds and to project therefrom to form the external fins, the said bands being

soldered at *e* to the sides of the fold. The fins may also be constituted by bands simply applied and soldered or riveted upon the wall of the tube, the tube itself being in such case either seamless or seamed.

The fins may have any forms and dimensions whatever. They may be arranged on the tube in any manner whatever, and obtained on the sheets of metal either before or after the formation of the tube, or directly by the drawing of the tube, whether the tubes are seamless or seamed.

I am aware that tubes have been made with a corrugated or undulating profile in their transverse section, thereby securing a comparatively slight increase in their radiating-surface, and with almost a corresponding reduction in the area of their transverse section, and I do not include such a tube in my invention. My tube is distinguished from those which have been before made in having solid and massive wings which, when on the interior surfaces, project to a considerable distance into the tube and receive heat from the hottest gases which pass through the tube, and, whether upon the interior or exterior surface, such wings very greatly increase the heating-surface of the tube and reduce but very little the transverse area of the tube-passage. By the solid and massive wings the interior or exterior heating-surface, or both, may be doubled or trebled without any proportionate reduction of the area in transverse section, although, of course, the area will be slightly reduced by the interior wings.

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

1. The tube herein described for boilers and condensers, having solid and massive wings upon its surface or surfaces, as distinguished from a tube having a wavy, corrugated or undulating profile in transverse section, substantially as herein set forth.

2. The tube herein described for boilers and condensers, having its metal folded closely upon itself to form solid and massive wings upon its surface or surfaces, substantially as herein set forth.

3. The tube herein described for boilers and condensers, having its metal folded upon itself to form wings upon one surface, and having strips or pieces *f* inserted within such folds and projecting beyond the other surface, whereby are produced solid and massive wings projecting from both surfaces of the tube, substantially as herein described.

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

JEAN PIERRE SEIVE.

Witnesses:
F. J. RAYMOND,
N. HALL, Jr.