(No Model.) 3 Sheets—Sheet 1.

J. J. HOGAN.

STEAM SEPARATOR FOR BOILER TUBES.

No. 520,884. Patented June 5, 1894.

Fig. 1.

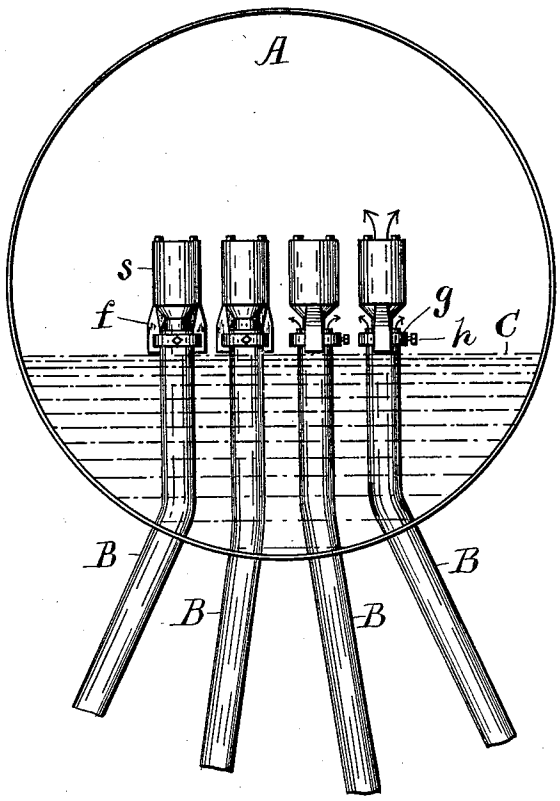

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Fig. 2.

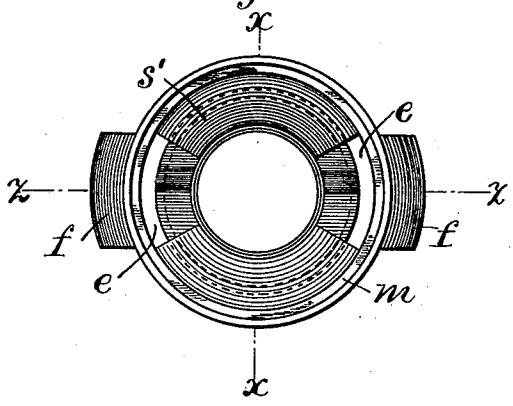


Fig. 4.

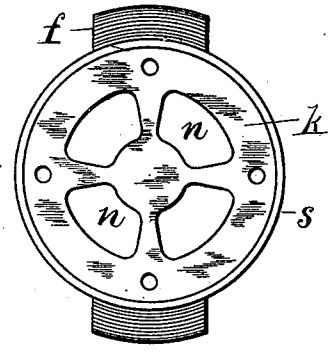


Fig. 3.

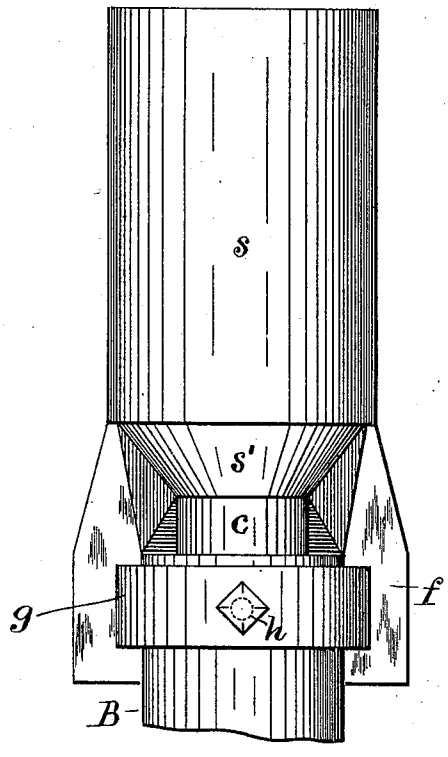
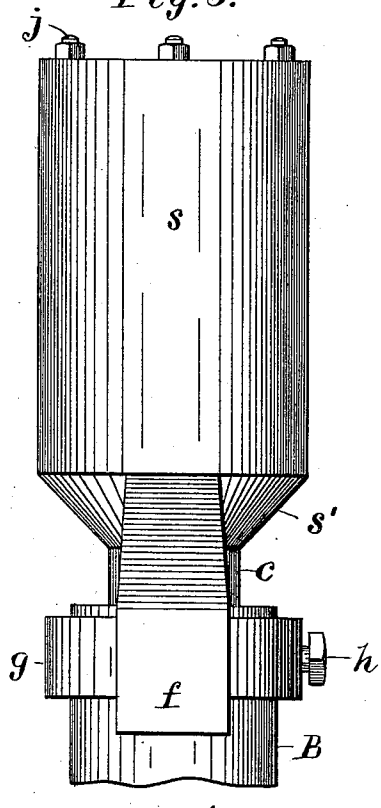


Fig. 5.



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J. J. HOGAN.

STEAM SEPARATOR FOR BOILER TUBES.

No. 520,884. Patented June 5, 1894.

Fig. 6.

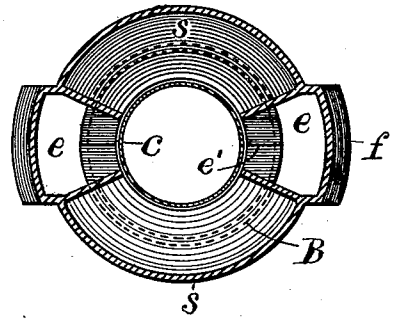


Fig. 7.

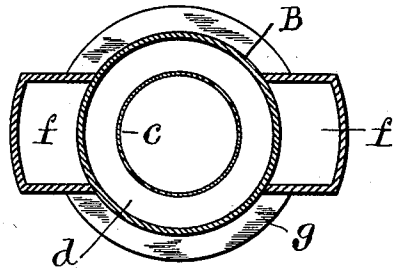


Fig. 8.

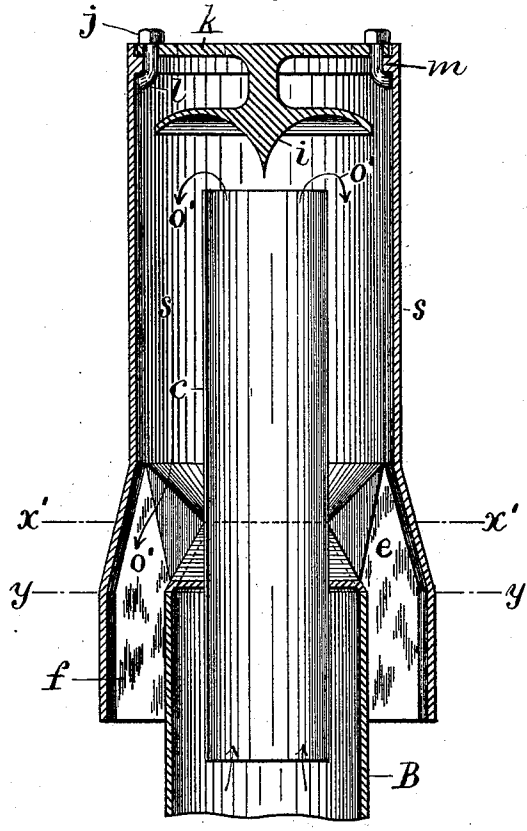
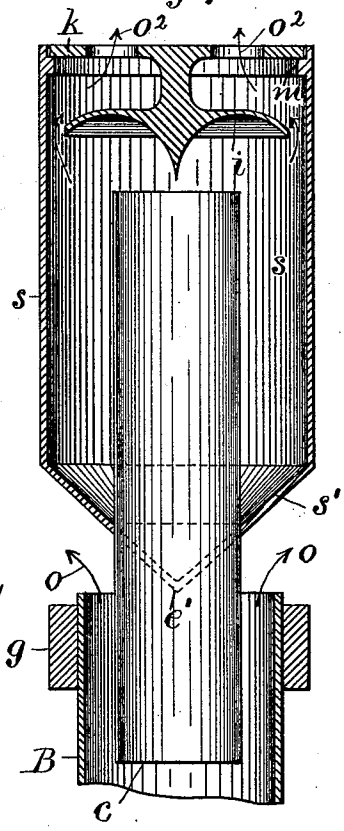


Fig. 9.



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UNITED STATES PATENT OFFICE.

JOHN J. HOGAN, OF BROOKLYN, NEW YORK.

STEAM-SEPARATOR FOR BOILER-TUBES.

SPECIFICATION forming part of Letters Patent No. 520,884, dated June 5, 1894.

Application filed March 26, 1892. Renewed November 4, 1893. Serial No. 490,009. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. HOGAN, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Steam-Separators for Boiler-Tubes, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a convenient attachment for the mouths of upright boiler tubes to separate the steam from the water which rises therewith into the steam space of the boiler. This attachment is intended to be applied separately to each tube from which a mixture of steam and water would be discharged into the steam space, and thus facilitates the delivery of dry steam from the boiler, and obviates the use of detached or external separators to accomplish such object.

This invention is based upon the assumption that the contents of a boiler tube are coldest at the center because farthest from the heated metal, and that the fluid next to the heated metal is that which furnishes the greater portion of the steam. I have therefore devised a means of separating the core of water from the envelope of steam and water, and permitting the escape of steam into the steam space separately.

The invention consists in a pipe inserted in the mouth of the boiler tube and provided at its upper end with a chamber having water outlets directed downwardly and a steam outlet directed upwardly. The pipe thus forms an annular mouth upon each boiler tube, and thus separates the core of water in the center from the shell of steam and water outside of the same, permitting the steam to escape from the top of the boiler tube below the bottom of the chamber, while the central core of water rises into the chamber and is discharged from the bottom of the same downward by passages so formed as not to obstruct the steam escaping from the annular mouth of the tube. A baffle-plate is preferably inserted in the top of the chamber and the water is thus arrested and turned downward while any steam separated from the same is discharged from the top of the chamber to mingle with the steam which is discharged into the steam space, from the annular mouths of the boiler tubes. The contents of the various tubes discharging into the steam space of the boiler are thus prevented from interfering with one another, and the water especially, which is discharged from the center portion of each tube, is prevented from obstructing the upward flow of the steam rising from the same or the adjacent tubes. The construction may be varied to suit the dimensions of the tubes; their arrangement in the wall of the steam space and the degree of heat to which they are subjected varying materially the proportions of steam and water rising from the mouth of the tube.

A construction illustrating the invention is shown in the annexed drawings, in which—

Figure 1 is an end view, in section, of a steam drum having a series of water tubes introduced into its lower side, as claimed in my patent application Serial No. 490,010. Fig. 2 is a plan of the attachment with the top removed. Fig. 3 is a side elevation; Fig. 4 a plan, and Fig. 5 an edge view of the entire attachment. Figs. 6 and 7 are transverse sections on lines x', x', and y, y, respectively, in Fig. 8, which latter is a vertical section on line z, z, in Fig. 2. Fig. 9 is a vertical section on line x, x, in Fig. 2.

A represents a horizontal steam drum, B a number of boiler tubes entering the same from the lower side and extending upward a little above the water line C.

c designates a pipe of suitable diameter inserted in the mouth of the water tube to leave an annular space *d* between the pipe and the tube, from which the larger volume of the steam would escape. The mouth of the pipe is surrounded by a chamber *s* having sloping bottom *s'* provided upon opposite sides with outlets *e* discharging downward into vertical water passages *f* which are preferably terminated below the top of the water tube B, and thus discharge at the water line. The chamber is shown cast in one piece with the water passages and with a band or collar *g* extended between the water passages to embrace the top of the water tube, and provided with a set screw *h* to clamp it thereon. The bottoms of the outlets *e* are shown wedge-shaped at *e'* where they cross the annular mouth of the water tube B, and thus offer but trifling ob-

struction to the escape of steam therefrom. A baffle-plate *i* is shown formed in one piece with a cover *k*, secured upon a flange *m* in the top of the chamber *s*, by bolts *j* having hooked heads *l* fitted beneath the flange. The movement of the steam from the annular mouth *d* is indicated by the arrows *o*, and the movement of the central core of water upward from the water tube through the pipe *c* and downward through the passages *e* is indicated by the arrows *o'*. The cover is formed with vent holes *n* for the escape of any steam which is discharged from the pipe *c*, the arrows o^2 indicating the movement of the steam from the chamber through such holes. The relative diameter of the pipe *c* and the bore of the water tube B is determined by experiment for different classes of boilers; according to the temperature of the water tubes, which discharge a greater or less volume of steam from their mouths according to the rapidity of the firing.

It is obvious that the necessity for separating the steam and water is much the greatest with rapid firing, and the area of the annular mouth *d* is therefore proportioned to discharge the steam at such time. The effect of such proportions when the boiler is not so hot is of little consequence.

The separator can be constructed by casting and used without any finishing, and be made in sizes adapted to fit the various boiler tubes in use; and as the separator is attached to the boiler tube by the mere clamping of the set screw *h*, it is obvious that the preparation and attachment of the separators involves a very trifling cost.

As the separator is made and sold apart from the boiler tubes, I have claimed it herein as a new article of manufacture.

The pipe *c* is shown in the drawings extended downward into the water tube a distance equal to the inner diameter of such tube, but the attachment of the pipe to the mouth of the tube may be varied to suit the requirements of each case. It is therefore immaterial how the separator is sustained upon the boiler tube, except that it must be provided with means for holding the lower end of the pipe *c* in proximity to the mouth of the tube.

Having thus set forth the nature of my invention, what I claim herein is—

1. The steam separator, consisting in the pipe *c* having its mouth surrounded by the chamber *s* provided at the top with steam outlet and at the bottom with water outlets, and the device being provided with means for sustaining the lower end of the pipe in proximity to the mouth of a boiler tube.

2. The steam separator, consisting in the pipe *c* having its mouth surrounded by the chamber *s* provided at the top with steam outlet *n*, and baffle-plate *i* between the mouth of the pipe and such outlet, and having at the bottom one or more outlets with downward passages *f*, and the collar *g* for securing the device upon the end of a boiler tube, substantially as set forth.

3. The combination, with the mouth of a boiler tube, of a pipe *c* fixed in the bore of the tube to form an annular mouth, a chamber surrounding the mouth of the pipe *c* and provided at the bottom with water outlets and at the top with steam outlet *n* and baffle-plate *i* below the same, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN J. HOGAN.

Witnesses:
JOSEPH M. STOUGHTON,
THOMAS S. CRANE.