

E. P. CLAPP.
STEAM BOILER.

No. 474,039.

Patented May 3, 1892.

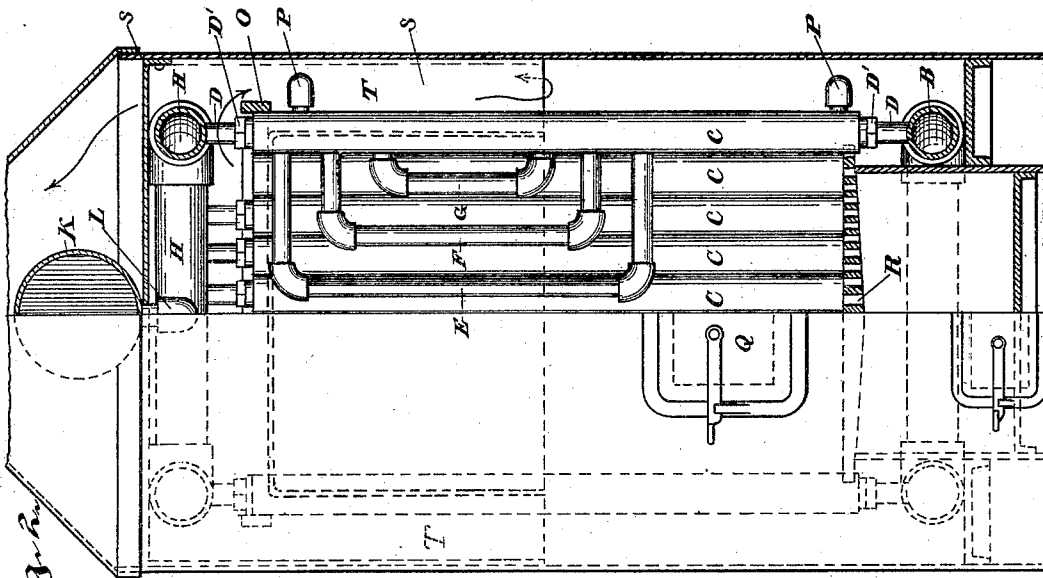


Fig. 2.

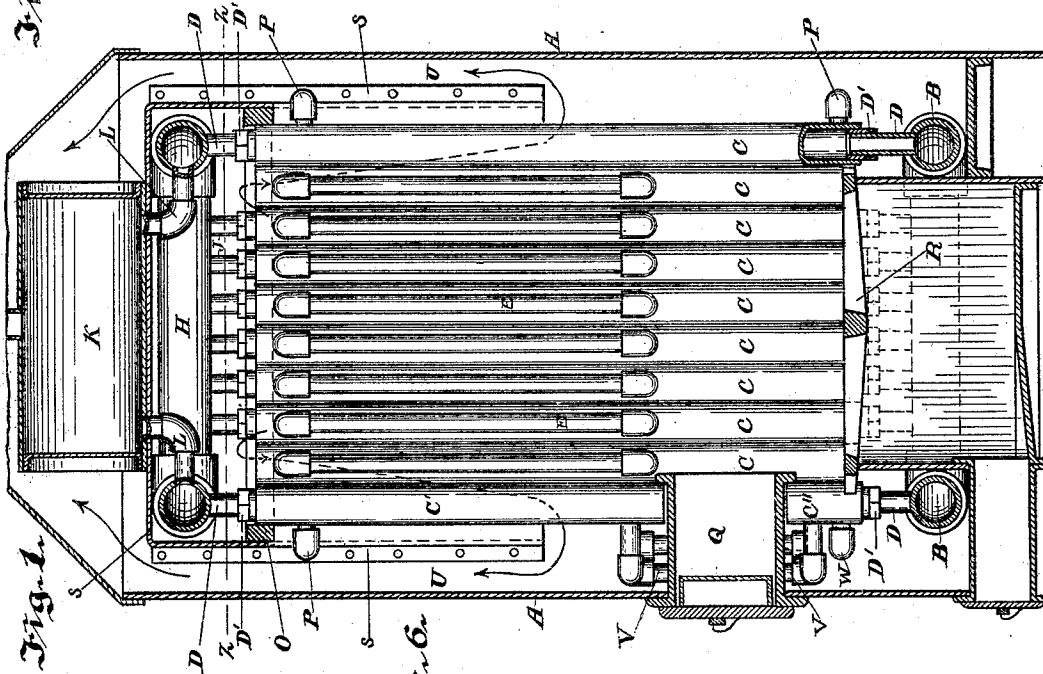
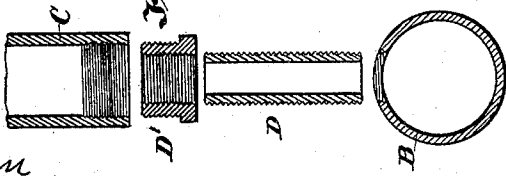


Fig. 1.

Fig. 6.

Witnesses
J. H. Adams
James Sullivan

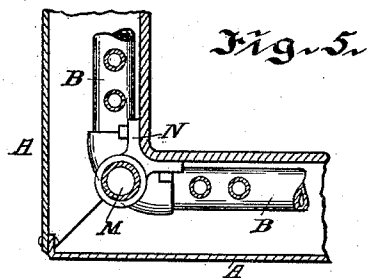
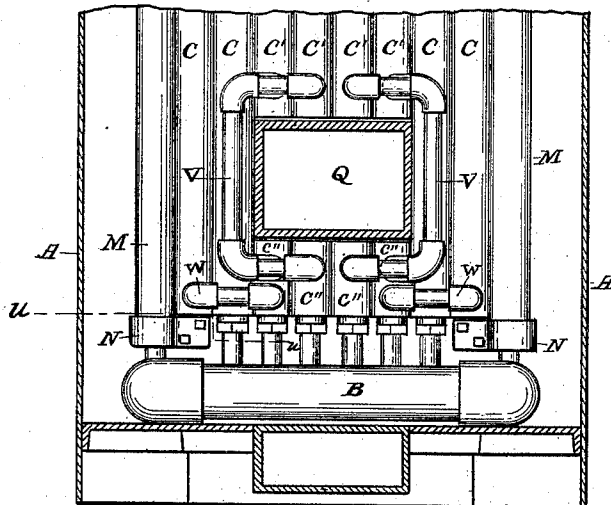
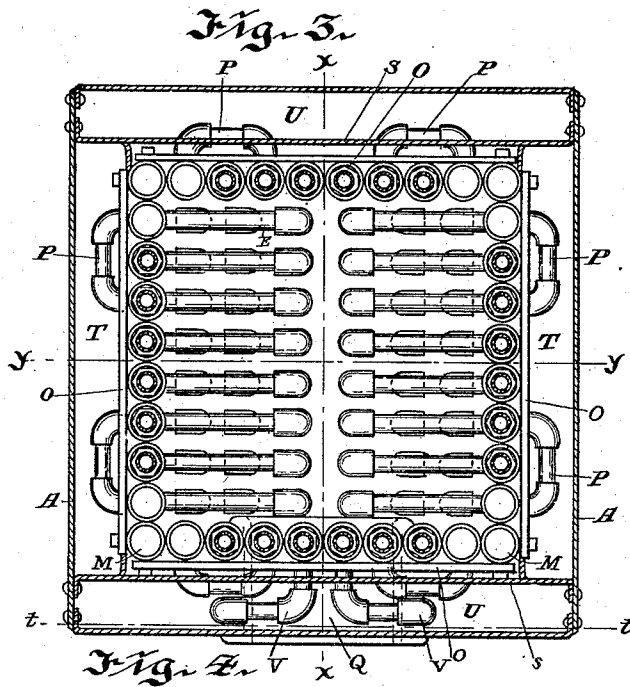


Inventor
Edwin P. Clapp
by Howard L. Coryell
his atty

E. P. CLAPP.
STEAM BOILER.

No. 474,039.

Patented May 3, 1892.



Witnesses
J. Chas. Sims
James B. Winn

Inventor
Edwin P. Clapp
by Howard L. Osborn
his atty

UNITED STATES PATENT OFFICE.

° EDWIN P. CLAPP, OF RUSH, NEW YORK.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 474,039, dated May 3, 1892.

Application filed April 9, 1890. Serial No. 347,261. (No model.)

To all whom it may concern:

Be it known that I, EDWIN P. CLAPP, a citizen of the United States, residing in the town of Rush, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a specification, reference being had to the accompanying drawings, in which—

10 Figure .1 is a vertical transverse section from front to back of my steam-boiler on the line *x x*, Fig. 3. Fig. 2 is partly a front elevation and partly a transverse vertical section from the center to one side on the line *y y*, Fig. 3. Fig. 3 is a horizontal transverse section through the upper part of the boiler on the line *z z*, Fig. 1. Fig. 4 is a partial front elevation, the door and front plate being removed, on the line *t t*, Fig. 3. Fig. 5 is a partial horizontal section on the line *u u*, Fig. 4, showing the construction and connections of the pipes at one of the corners. Fig. 6 is a detail view showing a method of connecting the water-drum B or the steam-drum H with the vertical and corner pipes C and M.

25 My invention relates to the improvements in steam-boilers hereinafter specifically described and claimed; and the object of my invention is to produce a quick-steaming compact boiler for small as well as large powers which shall be economical in fuel.

Throughout the drawings similar letters indicate similar parts.

35 A is the outside shell or jacket of the boiler.

B is the water-drum.

C C are vertical tubes, which are placed closely adjacent to each other and connect the water-drum B with the steam-drum H.

40 D D are small tubes connecting the vertical steam-pipes C C with the water-drum B and the steam-drum H.

45 D' D' are sleeves threaded internally and externally and provided with suitable bearing-surfaces, so as to be operated by a wrench.

E E F F G G are internal tubes connected to the vertical pipes C C, as shown, and each having two bends and forming three sides of a parallelogram. The pipes E are of suitable length, so that the pipes F may be connected with the vertical pipes C within the plane

of the pipes E, and the pipes G are connected with the pipes C within the plane of the pipes F.

H is the steam-drum, to which the vertical pipes C are connected by means of the smaller tubes D.

K is the dry-steam dome, which is connected with the upper circulation-pipe H by means of pipes L.

60 L L are pipes connecting the steam-drum with the dry-steam dome.

M M are the corner pipes in my boiler when the same is made in a square form.

N is a ring and yoke for holding the corner pipes M M in place.

O O are straps for holding the vertical tubes C C in place.

P P and W W are double-bent pipes for making connections between certain of the vertical tubes C C.

Q is the door of the boiler.

R is the grate.

S is a diaphragm for directing the course of the products of combustion.

75 T T are spaces at the sides of the boiler between the vertical tubes C C and the jacket A.

U U are spaces at the front and back of the boiler between the vertical pipes C C and the jacket A.

80 V V are bent pipes for making connections around the door and between certain of the vertical tubes.

The form of my boiler shown in the drawings is square; but obviously it may be made circular, oval, or of other suitable section. In the square form shown in the drawings the corner pipes M are dead-pipes—that is, are simply used as standards and supports for the structure and not used for the circulation of water or the production of steam. These, as shown in Figs. 4 and 5, are fastened to the frame-work of the boiler—as, for instance, to the corners of the walls of the ash-pit—by means of the ring and yoke N, (shown in Figs. 4 and 5,) and are connected to the water-drum B and the steam-drum H by short pipes in a similar manner to that by which the vertical pipes C are fastened to them. The water-drum B, I prefer to made of sections of large wrought-iron pipe connected together in the form of a parallelogram by elbows, and

the steam-drum H is made in a similar manner. When my boiler is made circular or oval in cross-section, these dead-pipes may be omitted.

5 The vertical tubes C, I prefer to make of sections of wrought-iron pipe, and the same are connected to the water-drum B and the steam-drum H by means of connecting-pipes D D, which are of smaller diameter than the diameter of the tubes C. A suitable method of making these connections is shown in detail in Fig. 6. An internal thread is made in each end of the vertical tube. A series of threaded holes at suitable distances apart are made in the water-drum B and in the steam-drum H. The smaller connecting-pipes D are suitably threaded to screw into the holes in the water or steam drum and into a threaded sleeve D', which is also externally threaded to fit the internal threads in the ends of the vertical tubes C. This sleeve is provided with suitable bearing-surfaces, so as to be operated by a wrench. All these threads may be right hand. The pipes D are screwed into the water-drum B and the steam-drum H. The sleeves D' are then screwed down upon the pipes D. Each vertical tube C, already provided where proper with its internal bent tubes E E F F G G, is placed upon and under its corresponding pipe D and sleeve D'. Then the sleeves D' are screwed off from their positions on the pipes D and into the ends of the vertical tubes C. It will be immediately seen that tight and strong connections may thus be easily made and that the vertical positions of the tubes C may thus be adjusted to a nicety.

The internal bent tubes E, F, and G are also preferably constructed of wrought-iron pipe of suitable diameter and are connected in the form of three sides of a parallelogram by suitable elbows. Two of the three sections of the smallest G of these bent tubes are first fastened together and are screwed into the vertical pipe C. Then the other section is by means of right and left screw-threads fastened into the vertical pipe C and into the corresponding elbow, as shown. Then in the same manner the next bent tube F is fitted together, fastened to the vertical pipe C, and then the third bent tube E is fastened and fitted in the same way. A series of these pipes C, having the bent tubes E, F, and G connected with them, are set up to form two sides of the boiler proper, as shown in Fig. 3. The other two sides—viz., the front and back—as shown in Fig. 3, have only the vertical pipes C, without the internal tubes E, F, and G. Suitable straps or bands O are used to hold the pipes in place.

On account of the elbows at the corners of the water-drum B and the steam-drum H, I prefer not to connect the vertical pipes next to the corner pipes directly to the water-drum B and the steam-drum H; but in order to ob-

tain a good circulation of steam and water in these pipes I connect them at the top and bottom with the next vertical pipe or the next but one by means of the double right-angle bends P P.

In order to provide space for the door of the boiler Q, I cut out a proper length from a suitable number of the vertical pipes (see c' c' c'' c'', Figs. 4 and 5) and plug up their ends above and below the door-space. I then by means of the double-bent pipes V and W, as shown in Figs. 1, 3, and 4, connect the separate parts of these pipes so cut off around the space thus left for the door.

R is the grate, which fits closely against and fills the space within the vertical pipes C close to their lower ends. On this the fire is built, and the fire-pot is thus formed of the grate R and the vertical pipes C, there being no separate fire-pot in my form of boiler. The burning fuel is therefore brought in close contact with the vertical tubes C. The flame and heated gases rising from it act against the portions of these vertical tubes above the fuel, act against the internal pipes E, F, and G, act against the steam-drum H, and there meet a diaphragm S. (Shown in Figs. 1, 2, and 3.) This diaphragm extends wholly over the steam-drum H from one side of the jacket A to the other (see Fig. 2) and is perforated to permit the pipes L L to pass through it. (See Figs. 1 and 2.) It then is bent down at each corner close outside of the vertical tubes C C, so as to reach downward and close for a suitable distance the spaces between the corner pipes M M and the jacket A, (see Fig. 3;) but the portion from one corner pipe to the other is left open, as shown by the double dotted lines in Fig. 2, so as to expose those sides of the vertical tubes C C which are toward the jacket A.

The flame and heated gases pass out from the inner space over the grate through the spaces between the upper connecting-pipes D D, as shown by the arrows. They then pass downward through the spaces T T, Fig. 3, at the sides of the boiler between the vertical tubes C C and the jacket A, then turn toward the front and back of the boiler around the lower edges of the diaphragm, as shown by the arrows in Fig. 2, and rise through the spaces U U, Figs. 1 and 3, between the exposed vertical tubes and the jacket, then pass upward and out of the smoke-stack, meeting in their way the dry-steam dome K.

When my boiler is made of other form than square, this form of diaphragm may be modified so as to produce the same division and direction of the products of combustion.

In the water-drum B, I may place a transverse diaphragm at some suitable point which shall completely stop internal circulation and on one side of this diaphragm put a suitable connection for an inlet water-pipe and on the other side of this diaphragm put an outlet

water-pipe, in order that by flushing the same it may be cleansed of such sediment as may have settled in it.

5 This form of boiler is especially adapted for quick-steaming purposes and for the economical use of fuel on account of the direct contact of the fuel burning in the fire-pot with the steam-pipes C and on account of the internal steam-pipes E, F, and G breaking up
10 and filling the space above the fire and their being eminently suited to catch and absorb the heat from the fuel. The flame and heat also at every point of their passage meet either a pipe containing water for the production of steam or a pipe containing steam
15 until they reach the smoke-stack itself. All the pipes of this boiler excepting the water-drum are surrounded by flame and form part of the heating-surface. On account of the
20 use of pipes throughout this boiler a larger amount of heating-surface is obtained for the production of steam than in other boilers, where parts of the heating-surface consist of pipes and parts consist of plates. The strength
25 of this boiler is very great on account of the use of wrought-iron tubes throughout except for the elbows, which may easily be made of

sufficient thickness and weight to withstand any internal strain to which they may be subjected.

What I claim is—

30 In a vertical steam-boiler, the combination of a continuous tubular water-drum and a continuous tubular steam-drum with a series of contiguous independently-removable vertical water-tubes connected to the water-drum
35 and to the steam-drum by adjustable coupling-pipes smaller than said tubes, a grate set at the level of the lower ends of said tubes, the vertical tubes surrounding the grate and
40 adapted with it to form the water-pot, together with a series of double-bent pipes connected at each end with one of the vertical tubes and extending inward over the central
45 grate, and a diaphragm extending over the steam-drum and downward on two sides of the vertical tubes, and a steam-dome placed above the diaphragm and connected with the steam-drum, all arranged and operating as set forth.

EDWIN P. CLAPP.

Witnesses:

H. L. OSGOOD,
FRED. W. SMITH.