W. C. WOLFE.
Steam-Boilers.

No. 206,408. Patented July 30, 1878.

Fig. 1.

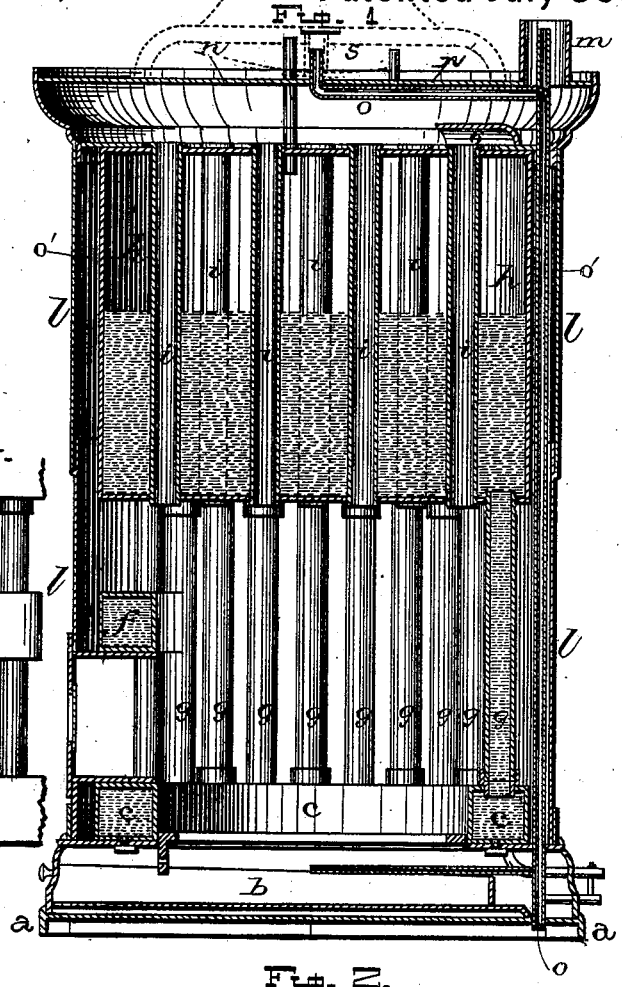


Fig. 4.

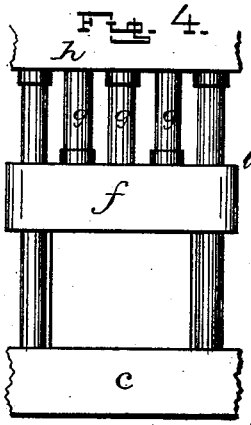


Fig. 3.

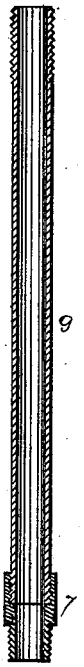
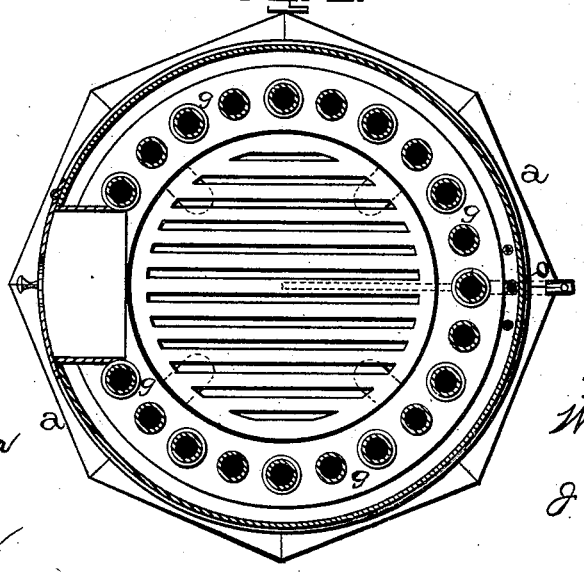


Fig. 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

WILLIAM C. WOLFE, OF JOHNSTOWN, PENNSYLVANIA.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **206,408**, dated July 30, 1878; application filed May 18, 1878.

To all whom it may concern:

Be it known that I, WM. C. WOLFE, of Johnstown, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to an improvement in steam-boilers; and it consists in the construction and arrangement of parts whereby the greatest amount of heating-surface is obtained within the smallest amount of space, a saving made in fuel, steam more rapidly generated, and power increased in the boiler, all of which will be more fully described hereinafter.

The accompanying drawings represent my invention.

a represents the base of my boiler, which may be of any construction or form desired, and which has an opening through one side for the introduction of an ash-drawer, *b*; but larger boilers are provided with doors having draft-registers attached. The lower portion of the boiler proper consists of a horizontal water-pipe, *c*, surrounding the grate, rectangular in cross-section, and provided with stud-bolts on its under side, by which it is secured to the base *a*. The base has several projections extending horizontally inward beyond the edges of the pipe *c*, upon which the grate rests.

By this arrangement a crevice is left all round the grate, which increases its surface, and permits it to be shaken or the fire stirred by means of a poker inserted in the aperture in the downward-projecting lug on the under side of the grate; or, if desired, the grate and fire may be instantly removed through the ash-chamber.

Upon the top of the water-pipe *c*, to which is connected the water-supply pipe and discharge-cock, are secured a number of vertical water-pipes, *g*, placed all around the fire-chamber and inclosing or forming it. A small space is left between the pipes to permit a free circulation of heat around them and allow access of hot air to the burning fuel. At the door for the introduction of the fuel to the grate there are none of these pipes; but just above the level of the door in large boilers, and just below it in small ones, there is a short horizontal water-pipe, *f*, of the same shape as the one *c*, and extending upward from this pipe *f* are shorter pipes *g*.

By this construction it will be seen that, with the exception of the small space taken up by the door, there is no heating-surface lost, and that the pipes are connected uninterruptedly together, so that the circulation of water is perfect and complete.

The upper ends of these water-pipes *g* are connected with the body *h* of the boiler, up through which the flues *i* pass. The lower ends of these flues are pressed through the upper head and screwed into the lower head, their upper ends being expanded, so as to form a tight joint with the upper head.

As the draft will be much greater through the flues nearest to the stack, if allowed to pass uninterruptedly upward, the cap or hood 6 is placed over the tops of those flues that are nearest to the stack. As this hood prevents the products of combustion from escaping so freely through them, the heat is forced to escape equally through all the flues, and thus the water is heated uniformly throughout.

The water-tubes *g* may be secured in position by means of the extension socket and nozzle 7, having an internal screw-socket to receive the end of the pipe and an external screw-thread to screw into the crown-sheet or annular chamber *c*, which arrangement permits their separate removal and insertion after repairing or cleaning. The tubes are short enough to pass between the boiler-heads, and have a long thread cut on one end, which can be screwed far enough through one head to admit the insertion of the socket and nozzle at its opposite end, when the tube may be locked and screwed into it. Should the threads not meet properly the socket may be turned, which, having a different pitch of thread from the nozzle, will correct the difference of the tubes. This socket is alternately placed at top and bottom of the tubes to permit a closer arrangement. These tubes may also be placed in the molds and cast in the iron permanently.

The body *h* or steam-chamber is so construct-

ed as to admit the insertion into its side of a gage, gage-cocks, or other attachments, and a fusible plug in its lower head, together with a steam-gage, safety-valve, or other fittings in its upper head.

Around the tubes or pipes *g* and steam-chamber is placed a sheet-iron casing, *l*, which is made in two sections and connected together at the lower end of the steam-chamber. By removing the lower section ready access is given to the tubes *g* for cleaning or repairing them.

The upper head of the boiler is surmounted by a plate, *n*, which forms a covering for the boiler and base-plate for the engine, which is to be placed thereon, and is provided with a smoke-nozzle, *m*, into which the exhaust-steam from the engine is discharged if desired to increase the draft.

A hot-air space or chamber, *p*, is formed all around the steam-chamber inside the casing, and extends to the bottom of casing and pipe *c*. This hot-air space prevents radiation of heat from the steam-chamber and interior of the boiler, and protects the outside casing from any injurious effects of heat, and also permits the feed-water and steam-pipe to pass through it, preserving a neater appearance and preventing condensation of steam.

The top of the boiler or plate *n* forms a base for the engine when placed thereon, as shown in dotted lines, and the bottom of a heater or chamber, *s*, formed in the base of the engine, through which the feed water is forced or drawn by means of a pump attached to the engine. The water, while passing through this chamber, is heated while resting on the plate, which is kept hot by the heat against its under side before escaping up the pipe. The water-supply pipe leads from the base of the boiler up through the hot-air chamber, then through a pump into the heater, and is provided with the necessary check-valves. The delivery-pipe leads from the surface of the water, where it is hottest, to the bottom of the casing, and discharges into the pipe entering the pipe *c* on its lower surface, and it carries also the discharge-cock, which permits the sediment being blown out at its lowest point. A horizontal check-valve is placed at the junction of the delivery-pipe and the discharge-pipe.

An exhaust-pipe, *o*, leads from the engine to the smoke-nozzle, where it intersects a vertical exhaust-pipe, *o'*, inside the casing, into which it discharges, and may be directed up into the smoke-stack to increase the draft, or down through the base by means of a suitable half-round valve placed at the point of intersection of the two pipes. To the lower end of this exhaust-pipe *o'* is attached a horizontal branch, *t*, extending under the grate, by which a vapory blast may be delivered on the fire, if desired. Any condensed steam or drainage from the exhaust may be also carried off through this vertical pipe, which would otherwise be injuriously discharged into the smoke-stack. A short steam feed-pipe passes up from the boiler to the induction part of the engine.

The boiler is also provided with a draft-damper in the smoke-stack and a mica door. A register will be placed at the bottom of the chamber *o* on the base inside the case to permit the escape of ashes working into this space from between tubes or from the fire-chamber, and to afford a greater supply of air to the fuel, if necessary.

In the larger boilers I propose to use doors fitted with draft-registers in the ash-pit instead of the ash-drawer described.

Having thus described my invention, I claim—

1. A vertical tubular steam-boiler consisting of the combination of the upper portion, *h*, through which the flues *i* pass, a single row of vertical pipes, *g*, inclosing the fire-chamber, the horizontal annular chamber *c* surrounding the grate, and an outer inclosing-case, *l*, having its lower portion made removable, substantially as shown.

2. The combination of the tubes *g*, extension-sockets 7, chamber *c*, and crown-sheet, the sockets having an internal screw to receive the end of the pipe and an external screw-thread to screw into the annular chamber *c* or crown-sheet, whereby each tube may be independently removed and replaced, substantially as described.

3. In combination with the boiler, substantially as herein described, the exhaust-pipe running from the engine through the boiler, and provided at its upper end with a nozzle for increasing the draft in the uptake and at its lower end with a horizontal perforated projection, whereby a jet of steam is supplied and mingled with the air under the grate for the better combustion of the fuel, said pipe being provided with suitable cocks, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 30th day of April, 1878.

WILLIAM C. WOLFE.

Witnesses:
JOHN HENDERSON,
JOHN WIDMANN.