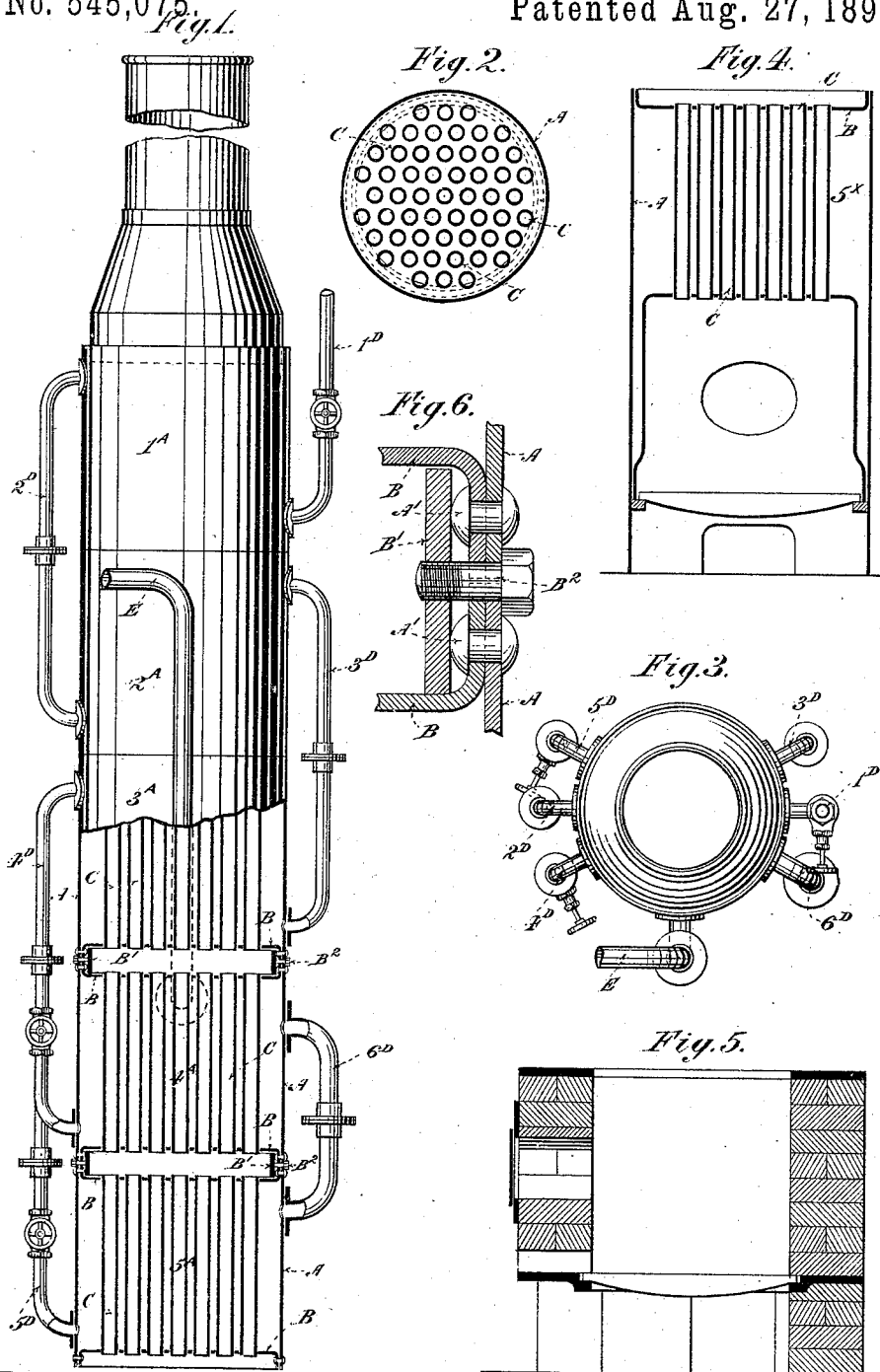


(No Model.)

T. HENDERSON.
STEAM BOILER.

No. 545,075.

Patented Aug. 27, 1895.



Witnesses.
Benj. S. Ober.
Henry M. H. S.

Inventor
Thomas Henderson
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UNITED STATES PATENT OFFICE.

THOMAS HENDERSON, OF WAVERLEY, NEW SOUTH WALES.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 545,075, dated August 27, 1895.

Application filed August 17, 1894. Serial No. 520,573. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HENDERSON, iron-ship builder, a subject of the Queen of Great Britain, residing at Mill Hill Road, Waverley, near Sydney, in the British Colony of New South Wales, have invented a new and useful Steam-Boiler, entitled an Improved Tubular Sectional Steam-Boiler, of which the following is a specification.

10 This invention relates to an improved tubular sectional steam-boiler in which the whole, or nearly the whole, of the gases of combustion will be utilized in converting the feed-water into steam or dry steam, and in which
15 practically no or very little waste heat escapes into the atmosphere.

This improved tubular sectional steam-boiler consists of a number of tubular sections connected rigidly end on to one another and having pipe connections from the end
20 farther from the combustion-chamber of one section to the end nearer the combustion-chamber of the section nearer to said combustion-chamber. When placed vertically one upon the other, as is preferred, the lower
25 tubular section has an ordinary fire-box made therein, or it may sit upon a brick or other fire-box or furnace, and when placed horizontally one against the other one end section is
30 constructed similar to a locomotive or semi-portable steam-boiler. In connecting the tubular sections, one to the other a novel construction of holding-joint is used having an internal ring, into which take stud-bolts from
35 the outside, so as to clamp or hold both abutting sections in position; and my said invention consists, essentially, in the construction of said holding-joint; but in order that this invention may be clearly understood reference
40 will now be made to the drawings herewith, in which—

Figure 1 is an elevation, partly in section, of an improved steam-boiler constructed according thereto, the combustion-chamber or
45 fire-box being omitted. Fig. 2 is a section of the boiler taken just above or below a tube-plate. Fig. 3 is a plan of same. Fig. 4 is a sectional elevation of a lower tubular section containing a combustion-chamber or fire-box;
50 and Fig. 5 is a section of a brickwork or masonry furnace on which a construction, such as that shown in Fig. 1, might rest. Fig. 6 is

a detail of joint between two abutting tubular sections.

Though five tubular sections 1^A 2^A 3^A 4^A 5^A 55 are shown, there is no restriction to the number so long as there is any heat in the escaping gases of combustion which will pass through the tubes. Each section is constructed with its cylindrical shell A riveted
60 to flanged tube-plates B, between which tube-plates are the tubes C. On the top of the highest section suitably supported by it is a funnel or an escape-pipe to a chimney-stack. The joint between abutting sections is made
65 by means of internal cylindrical ring B' taking against the heads A' of the rivets of the sections and acting as a clamp or holding-piece screwed up tightly by means of stud-bolt B², whose head takes half upon each abut-
70 ting edge of the tubular sections. Pipe 1^D supplies feed-water from a pump or high-level reservoir into top section 1^A at its lower end. Pipe 2^D joins top of section 1^A to bottom of
75 section 2^A. Pipe 3^D connects top of section 2^A to bottom of section 3^A. Pipe 4^D connects top of section 3^A to bottom of section 4^A. Pipe 5^D connects top of section 4^A with bottom of section 5^A. Said section 5^A is supposed to rest
80 upon a combustion-chamber, as shown in Fig. 5, or to be replaced by combustion-section 5^X, as shown in Fig. 4, in which latter event pipe 5^D would connect with the lower part of the water-space of said combustion-section 5^X.
85 Pipe 6^D connects the top of section 4^A to the top of section 5^A or to the top of the combustion-chamber 5^X. Pipe E is steam-supply or service pipe to where required.

The feed-water is supplied by pipe 1^D to the section 1^A, and, as it extracts the heat of the
90 gases of combustion passing upward through the tubes C of said section 1^A, it moves upwardly to the pipe 2^D, where the hotter part flows to section 2^A, thence farther heated to section 3^A, and thence into either of the lower
95 sections 4^A or 5^A, or, both, as may be desired to according to regulation of cocks or valves provided for the purpose. The two lower sections 4^A and 5^A or as substitute for the latter the combustion-section 5^X shown in Fig. 4
100 may be termed "evaporators," while the other sections may be called "water-heaters," and the evaporators are connected by pipe 6^D, so as to provide increased steam-space. It will be

seen that according to the number of sections used so more or less of the heat of the gases of combustion passing through the tubes will be extracted by the water constantly traveling in the opposite direction toward the combustion-section or fire-box or furnace.

5 With a horizontal construction of this improved tubular sectional steam-boiler the gases of combustion would travel through
10 similarly-connected tubular sections in one direction and the water travel from the top of the water space of one section to the bottom of water-space of the next in the opposite direction toward the combustion section or
15 furnace.

Having now particularly described and ex-

plained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

In a sectional tubular boiler, the combination with the shells A of abutting sections, and the tube plates or flue sheets B, having converging flanges to which said shells are riveted, of the internal ring B' taking against the heads of the shell rivets and the stud bolts B² clamping said ring to the rivet heads, substantially as and for the purpose set forth.

THOS. HENDERSON.

Witnesses:

FRED WALSH,
THOMAS JAMES WARD.