(No Model.)

J. GAMGEE.

STEAM BOILER.

No. 459,225. Patented Sept. 8, 1891.

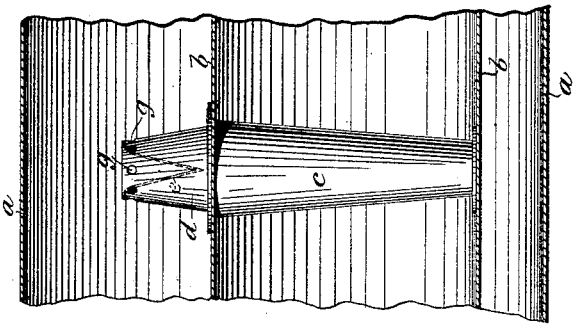

Fig. 3.

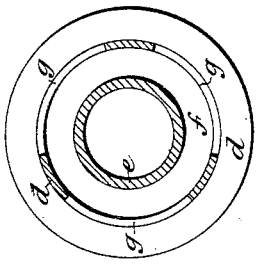

Fig. 2.

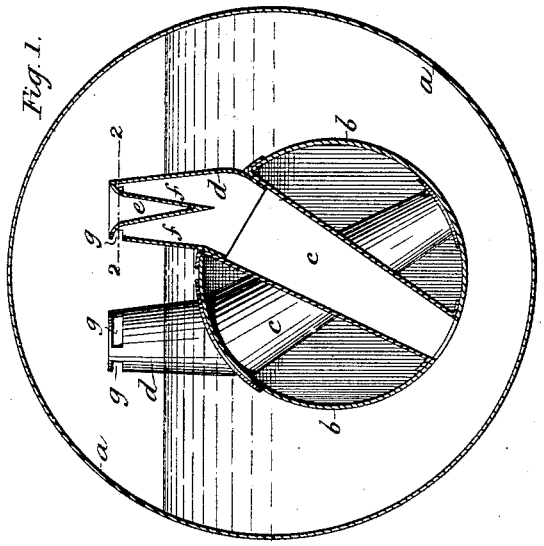

Fig. 1.

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UNITED STATES PATENT OFFICE.

JOHN GAMGEE, OF LONDON, ENGLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 459,225, dated September 8, 1891.

Application filed June 30, 1890. Serial No. 357,185. (No model.) Patented in Belgium December 2, 1889, No. 88,699.

To all whom it may concern:

Be it known that I, JOHN GAMGEE, of London, England, have invented certain new and useful Improvements in Steam-Boilers, (for which I have obtained a patent in Belgium, No. 88,699, bearing date December 2, 1889,) of which the following is a specification.

My invention has reference to steam-boilers of the kind in which flue-tubes of the Galloway type are employed, and its objects are the better circulation of water, the more rapid production of steam, and the prevention of incrustation. When a conical tube of the Galloway type is inserted as a stay and for the extension of breaking-surface in the internal flue of a boiler, such as a Cornish or a Lancashire boiler, the "fluid-currents" are from one side to the other of the tube, and therefore are entirely confined to the tube, forming, in fact, intra-tubular convection currents. According to my invention I so form the tubes that the motionless water is forced from below the flue, which is the coldest part of the boiler, through the tubes to above the normal water-level, where it is discharged in horizontal or approximately horizontal streams or jets, which fall upon the surface of the water at some distance from the tubes. Each tube is thus converted into a sort of automatic pump, a more equable temperature throughout the boiler being thereby maintained. The active circulation induced under all pressures naturally results in the rapid generation of steam and prevents any deposit or formation of scale.

In carrying out my invention I continue the flue or Galloway tube above the internal flue of the boiler to a height above the normal water-level in the boiler. The continuation is so formed as to present a gradually-contracting space for the passage of the water, the said space or passage terminating in one or more openings or outlets adapted to deliver the water in as many horizontal or approximately horizontal streams. Above the flue the upper part of the tube continuation contains an inverted cone fixed concentrically therein. The space between this cone and the tube continuation thus presents an annular passage for the water, which passage gradually contracts up to the outlet or outlets at the upper part. The conical tubes will be secured to the boiler-flue in any suitable manner—such as by being welded or by flanges and rivets at the lower and upper ends. The continuation above the flue may also be secured by flanges and rivets or otherwise. With my construction of boiler-tubes the fluid-currents before mentioned are by means of the peculiar formation of the continuations concentrated into jets at high velocity, compelling motion in one direction from the comparatively still water below the flue into the steam-space, into which the jets are discharged horizontally, or approximately so.

In the accompanying drawings, Figure 1 is a vertical section of an internal flue-boiler fitted with flue-tubes which are provided with my continuations. The section is on a line through the center of one of these tubes and its continuation. Fig. 2 is a horizontal section on a larger scale on line 2 2 of Fig. 1. Fig. 3 is an elevation of a tube and continuation similar to that shown in Figs. 1 and 2, except that the outlets are of different form.

Referring first to Figs. 1 and 2, *a* is the boiler-shell; *b*, the internal flue, and *c c* the flue-tubes. *d d* are my continuations, which are somewhat conical externally and have each a concentric internal inverted cone *e*, the combination of the outer cone *d* and the inner cone *e* forming an annular water-passage *f*, which gradually contracts up to the outlets at top. *g g g* are the outlets, which are shown as being in the form of rectangular openings or slots, three in number; but their number and form may be varied. Owing to the position of these openings and to the configuration of the upper part of the cone *e*, the water which rushes up the tube *c* and becomes concentrated into a stream of high velocity in the gradually-contracting passage *f* is discharged horizontally through the outlets *g* into the steam-space of the boiler.

Fig. 3 represents a flue-tube *c*, having a continuation *d*, which differs from that shown in Figs. 1 and 2 only in the form and number of the openings *g*.

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

In a steam-boiler, the internal flue *b* and the upwardly-extending water-tube *c*, fitted within said flue, in combination with the upward continuation *d* to said water-tube, said

continuation extending upwardly above the water-level in the boiler and contracting gradually in diameter, so that it is smallest at the top, and an inverted cone *e*, located within said continuation *d*, whereby there is formed between said continuation and cone a gradually-decreasing passage for the water, said cone flaring out above the mouth of said continuation, so as to form an outlet for discharging the water in a horizontal direction, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN GAMGEE.

Witnesses:
JOHN C. NEWBURN,
GEORGE C. BACON.