

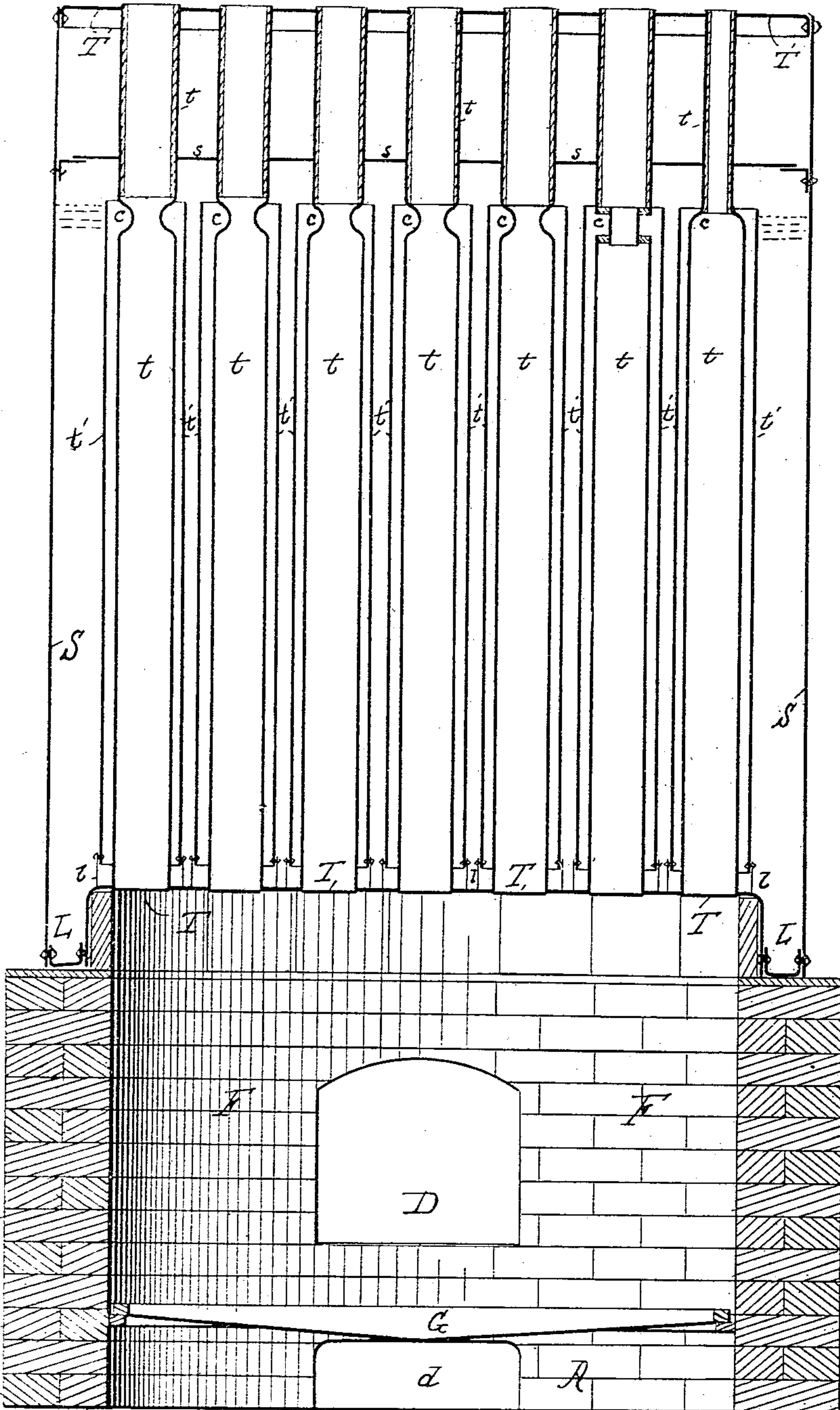
(No Model.)

E. F. EDGAR.

BOILER.

No. 555,236.

Patented Feb. 25, 1896.



WITNESSES:

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ELLIS F. EDGAR, OF WOODBRIDGE, NEW JERSEY.

BOILER.

SPECIFICATION forming part of Letters Patent No. 555,236, dated February 25, 1896.

Application filed September 17, 1895. Serial No. 562,757. (No model.)

To all whom it may concern:

Be it known that I, ELLIS F. EDGAR, a citizen of the United States of America, and a resident of Woodbridge, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Boilers, of which the following is a specification, reference being had to the accompanying drawing, forming part of the same, in which
10 the figure represents a central vertical section of a boiler embodying my invention, the smoke-box and draft-pipe being omitted.

My invention relates to boilers for generating steam; and it consists essentially in contracting the fire-tubes at or about the water-line of the boiler.

I have discovered that for very many reasons it is advantageous to use large fire-tubes, as they are more durable, requiring less repairs, and they do not choke the fires and impair combustion to the degree that smaller tubes do; but I have also found that to employ large tubes as ordinarily constructed entails a great waste of fuel, and accordingly
25 large expense in running, which I am enabled to avoid by means of the invention about to be described, which, as stated, consists essentially in contracting said tubes at or about the water-line of the boiler. I am thereby enabled to cause a large body of flame, highly-heated air and gases to enter the tubes and thereby greatly heat them and the surrounding water; but as this heat is rapidly absorbed by the water surrounding the tubes, and the
35 absorption of such heat reduces the volume of the air and gas that has entered the tube, I do not need so large an exit or so large a draft-space from the point where there is no water to absorb the heat. Consequently I may at that point reduce said space by contracting the tube, and thus prevent the driving through into the smoke-box and the draft-exit of large quantities of heat and unconsumed heat-producing material before it has
45 had an opportunity to do the work desired, which would occur were the tubes left of one size and uninterrupted throughout, and yet, because of the reduction of volume noted, such contraction will not choke or sweat the fires, so that I utilize the advantages of large tubes without being damaged by the ordinary disadvantages.

In the drawing I have shown a vertical shell boiler with a brickwork furnace F, having ash-pit A, ash-door opening *d*, grate-bars G, fire-door opening D, outer shell S, tube-sheets T and T', tubes *t* and *t'*, water-leg L, and separator or spray plate *s*. 55

The novelty is in the fire-tubes, which, it will be noticed, are contracted at or about the water-line, most of them by merely drawing in the tubes themselves near that point, as at *c*; but I may vary this arrangement and provide for the contraction by using a small section of smaller tubing at that point and joining two sections of larger tubing to it, as seen at the second tube from the right-hand side of the drawing. So too, after drawing in the tube, I may maintain the smaller diameter from about the water-line to the succeeding tube-sheet, as shown in the extreme right-hand tube. 65

To avoid priming, which is likely to take place in boilers that are so arranged as to heat the fire-tubes very rapidly, I surround them by what I term "circulator-tubes" *t'*, reaching from near the lower ends of the fire-tubes to about the water-line or a trifle above it, as shown, and to insure these tubes shall hold their places, and to provide an entrance-way for the water at the bottom, I usually support them a little above the level of the lower tube-sheet by legs *l*. 75

The parts of the tubes *t* above the water-line would naturally be very highly heated, and though the contraction mentioned does insure that the greater part of the heat shall be absorbed and utilized below the water-line, and thereby decrease the danger of burning the tubes out above that line, I still prefer to line them from the contraction upward with fire-clay *f* or some substantially equivalent substance, thereby practically insuring the life of that end of the tube shall equal that of the other end. 85

Steam arising from the heated water will move laterally to and around the edge of spray-plate *s* into the steam-space above it, and any part of the water thrown up by ebullition will be stopped by the plate and fall back into the main body, leaving the steam in the steam-space dry. 90

What I claim as my invention, and desire to secure by Letters Patent, is— 100

The combination in a vertical tubular boiler
of fire-tubes whose walls are contracted sub-
stantially at the water-line and circulator-
tubes, open at the bottom, surrounding said
5 fire-tubes and extending to about the level of
said water-line, all substantially as set forth.

In testimony that I claim the foregoing as

my invention I have signed my name, in pres-
ence of two witnesses, this 13th day of Sep-
tember, 1895.

E. F. EDGAR.

Witnesses:

M. SLOUGH,

A. G. N. VERMILYA.