

J. COTTER.
COMBINED FURNACE AND BOILER.

No. 535,354.

Patented Mar. 12, 1895.

Fig. 1.

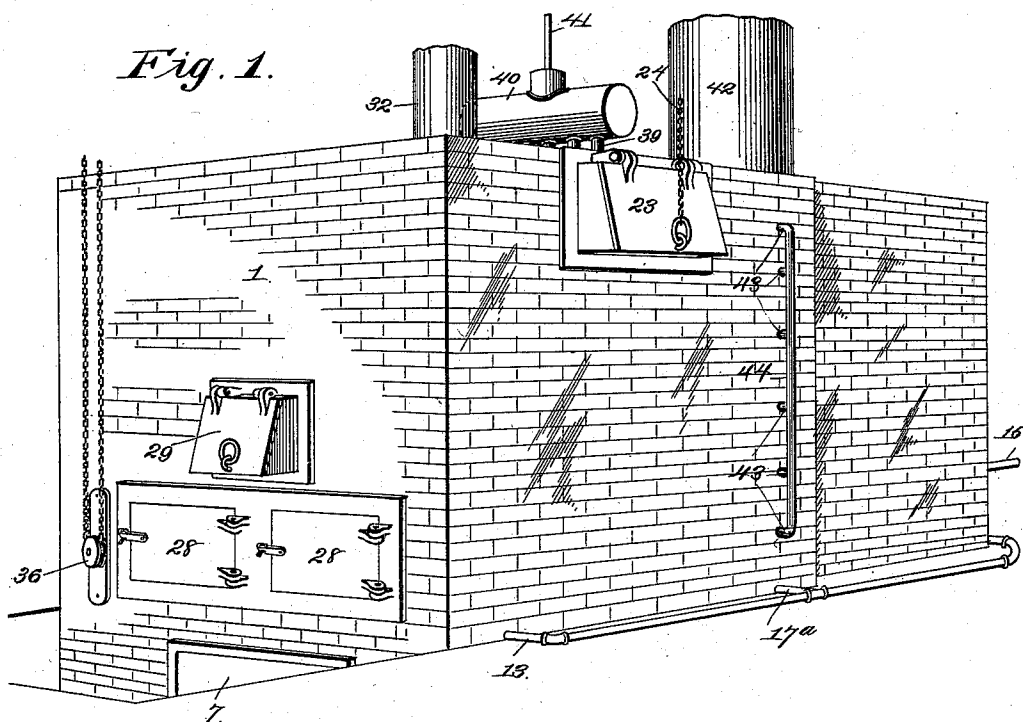
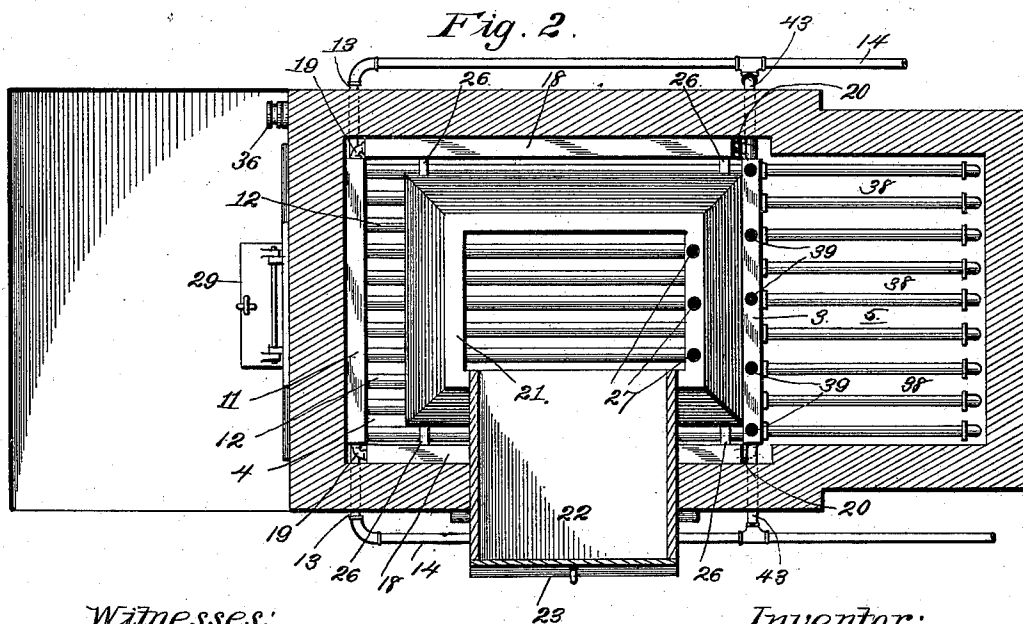


Fig. 2.



Witnesses:

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Inventor:

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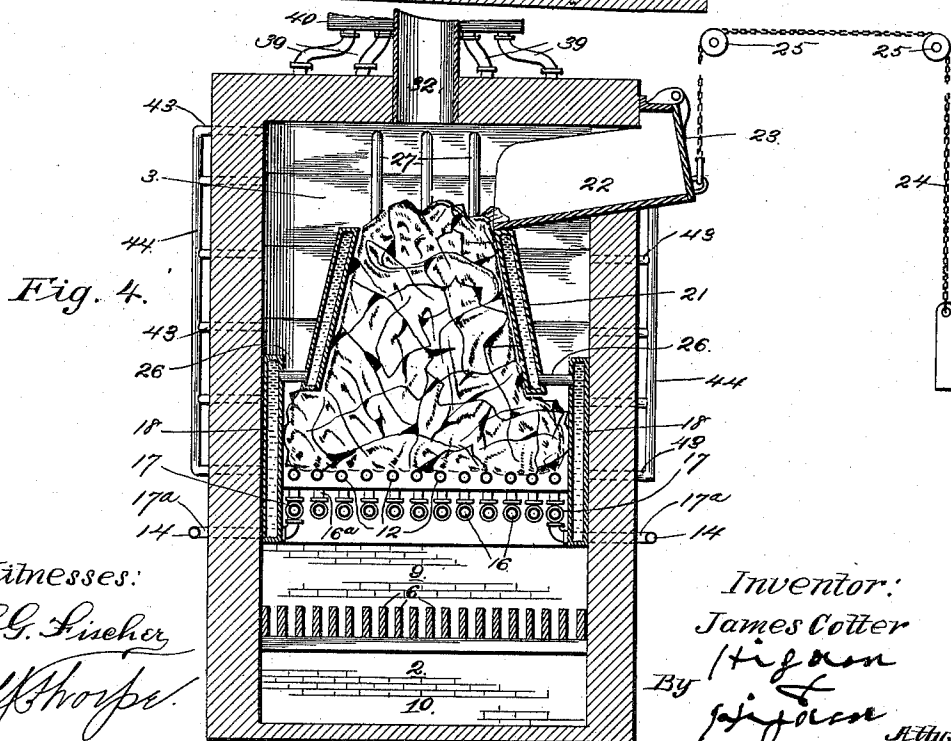
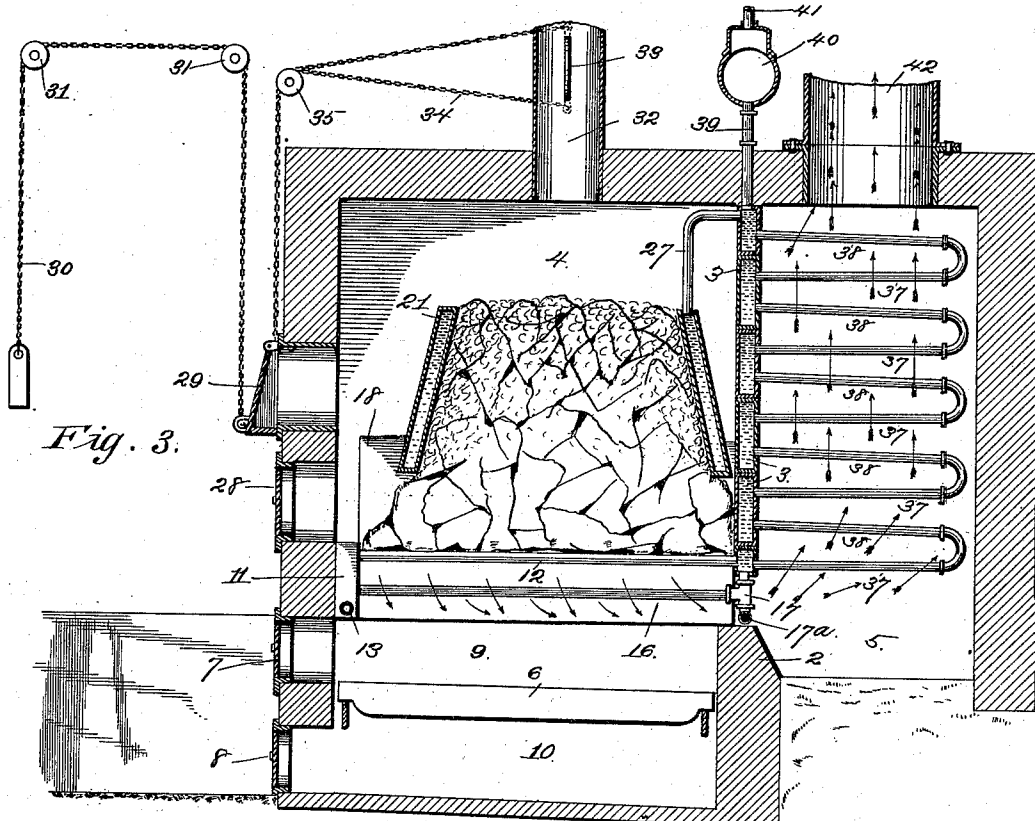
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

JAMES COTTER, OF KANSAS CITY, MISSOURI.

COMBINED FURNACE AND BOILER.

SPECIFICATION forming part of Letters Patent No. 535,354, dated March 12, 1895.

Application filed May 3, 1894. Serial No. 509,896. (No model.)

To all whom it may concern:

Be it known that I, JAMES COTTER, of Kansas City, Jackson county, Missouri, have invented certain new and useful Improvements in a Combined Furnace and Boiler, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to a combined furnace and boiler, and has for its primary object to produce an apparatus of this character having a reservoir or magazine in which sufficient fuel may be stored to last a considerable length of time, and which will insure the positive and automatic feed of said fuel to the fire.

A further object of the invention is to produce a construction wherein the water receptacles are arranged at all sides of the fire, so that the water may be heated in the shortest possible time, and thus economize in the consumption of fuel.

With these objects in view, and others, as hereinafter appear, the invention consists in certain peculiar and novel features of construction and combinations of parts, as hereinafter described and claimed.

In order that the invention may be fully understood, reference is to be had to the accompanying drawings, in which—

Figure 1. is a perspective view of a combined furnace and boiler constructed in accordance with my invention. Fig. 2. is a horizontal sectional view of the same. Fig. 3. is a central vertical longitudinal sectional view of the same, and Fig. 4. is a vertical transverse sectional view of the same.

In the said drawings, 1 designates a structure, which is divided by the vertical and transverse bridge-wall 2, and the series of superimposed water-boxes 3, into a front compartment 4, and a rear compartment 5. Extending longitudinally of the front compartment is a furnace-grate 6 of the ordinary construction, and access to the interior of the lower portion of the structure is controlled by the doors 7 and 8, which lead, respectively, to the fire-box 9, above and the ash-pit 10, below the grate 6. Supported at the inner side of the front wall, is the horizontal water-box 11, which extends transversely of the structure and above the fire-box 9, and extending longitudinally and arranged in hori-

zontal series are the tubes 12, forming the water-grate, and these tubes communicate at their front ends with the upper portion of the water-box 11, and at their rear ends with the water-box 3, immediately above and a slight distance from the bridge-wall 2; said water-box 3 being the lowest of said superimposed water-boxes.

Extending transversely through the side-walls of the furnace, are the pipes 13, which communicate with the opposite and lower ends of the water-box 11, and with the longitudinally extending pipes 14, which lead to and receive their water-supply from the main supply-pipe 15. Extending longitudinally, and arranged parallel with and below the tubes forming the water-grate 12, are the tubes 16, which form an auxiliary grate, and these tubes communicate at their front ends with the water-box 11, and with two exceptions, communicate at their rear ends through elbows 16^a, with the lowest water-box 3, through its bottom, and these exceptions, which are the two outermost tubes 16, are connected with the water-box 3, through its bottom, by the T-couplings 17, and also by said couplings with the transversely extending pipes 17^a, which project through the side-walls and are coupled to the longitudinally extending pipes 14.

Secured within the furnace chamber, against each side-wall, are the water-boxes 18, which preferably project considerably above the upper margin of the water-box 11, and these side-boxes 18 communicate near their lower ends through elbows 19, with the water-box 11, and communicate at their rear ends through elbows 20, preferably, with the lowest of the water-boxes 3.

An annular water-box 21, preferably of rectangular form, as shown, is supported horizontally and a suitable distance above the water-grate in any suitable manner, and this water-box, which forms a fuel magazine or reservoir, flares outwardly from its upper to its lower end, so that it will be impossible for the fuel to become wedged therein, and not automatically descend upon the fire, and communicating with the upper end of this fuel magazine, is the inclined chute 22, which extends transversely through a side-wall of the structure, and has its outer end normally closed by

a hinged door 23, and a weighted chain 24, guided over suitable pulleys 25, is connected to and adapted to hold said door open when required.

5 In order to supply the annular box forming the fuel magazine with water, it is connected by the pipes 26 with the upper ends of the side water-boxes 18, and in order to allow of the escape of the water as it rises under heat, 10 or for the escape of steam generated therein, the pipes 27 communicate with its upper end and with the uppermost of the super-imposed water-boxes 3. It is to be understood, however, that I do not confine myself to the pre- 15 cise construction herein shown, as the box may be circular in plan view, or of any other annular configuration, and may be simply a solid casting if desired.

Controlling access to the furnace above the 20 water-grate, are the hinged doors 28, and above said doors the hinged draft door 29; a weighted chain 30, guided over suitable pulleys 31, being connected to said door to hold it in its open position when required, and communi- 25 cating with the interior of the furnace and above the center of the fuel magazine, is the draft pipe 32, which is provided with a damper 33, of the ordinary or any preferred construction, and connected to opposite ends of 30 the arms of said damper, are the ends of the chain 34, which is guided over the pulleys 35, and engages the pulley 36, carried by a casting secured to the front wall of the furnace, and by manipulating this chain, the damper 35 may be opened or closed at will. Extending longitudinally, and arranged in the same vertical plane and converging rearwardly, are the boiler-tubes 37 and 38, which are coupled together at their rear ends, and communicate 40 at their front ends with the upper ends and lower ends of each adjacent pair of super-imposed water-boxes 3, so as to form a serpentine or tortuous water-way which leads from the lowest of said boxes, through each series 45 of vertically aligned tubes and interposed water-boxes to the uppermost of said boxes, and from said water-box the way continues through the tubes 39, to the steam dome 40, and from said steam dome 40, through the 50 pipe 41, to the heat-distributing system of pipes or registers in the building, and communicating with the chamber 5 through the upper wall and above the boiler-tubes 37 and 38, is the combustion-flue 42, leading to the 55 chimney.

The boiler construction just described allows for the forced circulation of hot-water or steam, and in order to provide for the natural circulation thereof, horizontal pipes 43 com- 60 municate at their opposite ends with the ends of the water-boxes 3, and with the vertical pipes 44.

The operation of the apparatus is as follows: The door 23 being raised, the fuel, preferably soft coal, is fed through the chute 22 65 and into the fuel magazine 21, and into the fire upon the water-grate 12, and the supply

of fuel is continued until the magazine is filled, which quantity, in practice, lasts a considerable length of time in moderate weather, 70 but in extremely cold weather it is necessary to fill the magazine oftener and the draft passing downward through the fuel, escapes rearwardly through the space between the bridge-wall 2 and the water-boxes 3, and passing up 75 through the boiler compartments 5, escapes through the combustion flue to the chimney, thus providing an effectual down-draft, which causes all of the heat to impinge upon the water-tubes and receptacles at practically all 80 points, and as the temperature of the water is increased, the hot water circulates from the water-box 11, through the water-grate tubes 12 and 16, the boiler-tubes 37 and 38, and the super-imposed water-boxes 3, and passes at 85 the required temperature through the pipe 41, to the distributing system of hot-water pipes in the building, or, if desired, the heat can be so intensified that the steam thus generated and following the course thus pre- 90 viously traced by the circulation of hot water, will pass from the pipe 30 and steam dome 31, to the radiators in the building.

In the construction illustrated, the water will circulate, also, through the water-boxes 95 18, magazine water-box 21 and pipes 27, to the uppermost of the water-boxes 3, and from said water-box follows the course explained; the water also circulating from the box 11, through the side-boxes 18, to the super-im- 100 posed water-boxes 3. If necessary at any time, especially in generating steam, an auxiliary fire may be maintained upon the grate 6 in the ordinary manner. If the draft through the pipe 32 be too powerful, the door 105 29 may be manipulated to supply the required quantity to support combustion.

From the above description, it will be apparent that I have produced a combined furnace and boiler for supplying hot water or 110 steam, which, having the water receptacles widely distributed, allows the water to be heated with the smallest consumption of fuel, and having the boiler constructed so that the water necessarily follows a serpentine or tortuous way, so that the water may be acted 115 upon again and again by the products of combustion passing up through the compartment 5.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a combined furnace and boiler, the combination with a bridge-wall, a series of super-imposed water-boxes which, in conjunction with said bridge-wall, divide the structure into a front and rear compartment, a front water-box, a water-grate connecting the front water-box and the lowest of the super-imposed water-boxes, and boiler-tubes connected together and to said super-imposed water-boxes, so as to form a serpentine or tortuous water-way, of an auxiliary water-grate arranged horizontally below the first-men- 125 130

tioned water-grate, and communicating at its front end with the front water-box, and at its rear end with the lowest of the super-imposed water-boxes, and water-supply pipes communicating with the front water-box and with the lowest of the super-imposed water-boxes, substantially as set forth.

2. In a combined furnace and boiler, the combination with a series of super-imposed water-boxes which extend from the top-wall of the furnace a suitable distance downward, and divide the interior into a furnace compartment and a boiler compartment, a series of boiler-tubes connected together and to said super-imposed water-boxes, a combustion-flue communicating with the upper end of the boiler compartment, a draft flue communicating with the furnace compartment, a water-box in the furnace compartment, a water-grate connecting said water-box with the lowest of the super-imposed water-boxes, side water-boxes communicating with the front water-box and the superimposed water-boxes, and an annular water-box forming a fuel magazine, pipes connecting the same to the upper end of the side water-boxes, and pipes connecting the upper end of the annular water-box to a water-box of the super-imposed series, substantially as set forth.

3. In a combined furnace and boiler, the

combination with a bridge-wall 2, a superimposed series of water-boxes 3 arranged above and in conjunction with the bridge-wall dividing the structure into furnace and boiler compartments 4 and 5, respectively, boiler-tubes 7 and 8, connected together and connecting said water-boxes, a steam-drum, and pipes connecting the top-most water-box 3, to the said steam-drum, of a water-box 11, water-grate pipes connecting the same with the lowest of the water-boxes 3, side water-boxes 18, and pipes connecting the same with the water-box 11, and with one of the water-boxes 3, a fuel magazine, comprising an annular water-box 21, which flares outwardly at its lower end to permit the free discharge of the fuel, pipes connecting the same to the water-box 11, to the water-boxes 18, and to the top-most of the water-boxes 3, and supply-pipes 13 and 14, communicating, respectively, with the water-box 11, and certain of the auxiliary water-grate pipes leading to the lowest water box 3, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES COTTER.

Witnesses:

M. R. REMLEY,
G. Y. THORPE.