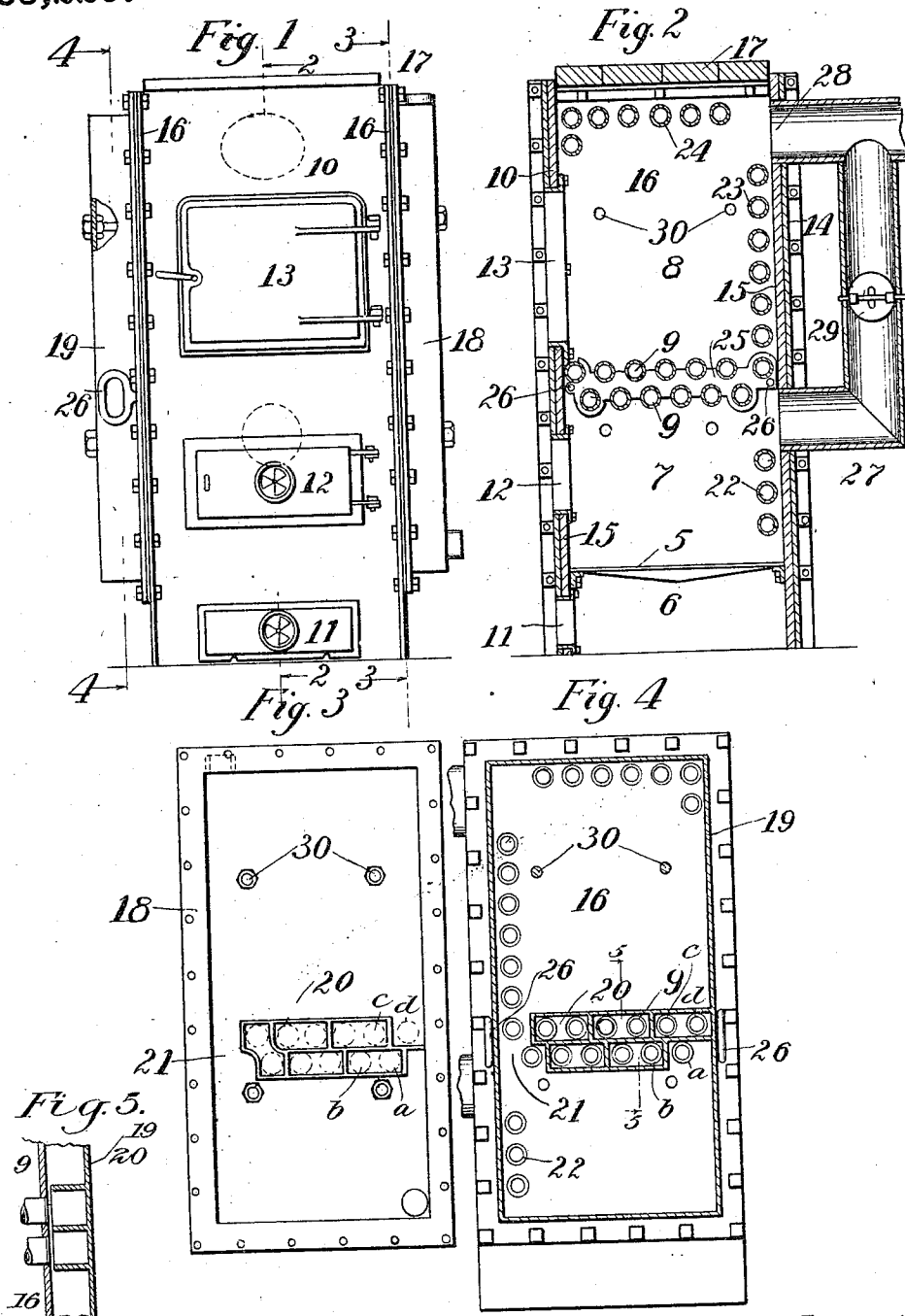


W. G. ROSS.
GARBAGE BURNER AND WATER HEATER.
APPLICATION FILED SEPT. 8, 1908.

Patented July 26, 1910.

965,229.



Witnesses:

Edwin Phelps
Mary M. Hillman

Inventor:
William G. Ross

By *Sumner & Sumner*
Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM G. ROSS, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO FRANK SUTHERLAND, OF CHICAGO, ILLINOIS.

GARBAGE-BURNER AND WATER-HEATER.

965,229.

Specification of Letters Patent.

Patented July 26, 1910.

Application filed September 8, 1908. Serial No. 452,082.

To all whom it may concern:

Be it known that I, WILLIAM G. ROSS, a citizen of the United States of America, and a resident of Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Garbage-Burners and Water-Heaters, of which the following is a specification.

The main objects of this invention are to provide an improved form of combined garbage burner and water heater which is inexpensive in construction and efficient in operation; and to provide an improved construction for devices of this class wherein moist material, such as garbage, may be rapidly dried, then dropped upon a bed of fuel, the heat of the fuel and garbage being utilized for heating water; and to provide an improved construction for the headers of tubular water heaters which will at all times insure an ample supply of water at the delivery outlet, while at the same time having the advantages of the rapid heating which is accomplished where the water flows successively through a series of tubes. These objects are accomplished by the device shown in the accompanying drawings, in which—

Figure 1 is a front elevation of a combined garbage burner and hot water heater constructed according to this invention. Fig. 2 is a transverse section thereof on the line 2—2 of Fig. 1. Fig. 3 is an elevation of one of the headers or water casings viewed from the plane of the line 3—3 of Fig. 1. Fig. 4 is a section on the line 4—4 of Fig. 1. Fig. 5 is a fragmentary section on the line 5—5 of Fig. 4.

In the construction shown in the drawings, the apparatus comprises a substantially rectangular shell having four side walls roofed over by a fire brick arch. The grate bars 5, which may be of any usual construction, separate the ash-pit 6 from the heating chamber, which is again subdivided into upper and lower compartments 7 and 8 by a grating formed of water tubes 9. Each of the compartments 6, 7 and 8 has a door opening into it through the front wall 10 of the heater, the doors being designated 11, 12 and 13 respectively in the drawing. The front wall 10 and rear wall 14 are preferably constructed of metal covered with a lining of refractory material 15. The remaining side walls 16 are formed of unco-

ered sheet metal and serve as tube sheets through which the tubes 9 are connected, said tubes being expanded into the sheets and beaded in the usual manner so as to form a water tight joint therewith.

Casings or headers 18 and 19 are bolted against the outer face of the respective tube sheets 16. The casings 18 and 19 are preferably of cast iron and are of sufficient size to cover the tube sheets 16 throughout the entire extent of the compartments 7 and 8. Each of the casings 18 and 19 has a system of intersecting partitions therein, which partitions are so arranged as to form a plurality of closed pockets each of which connects an adjacent pair of tubes 9 and the pockets 20 in the casing 18 are staggered with respect to those in the casing 19 in such manner that water entering the system of tubes 9 will be compelled to follow a tortuous path throughout the system. The partitions in each of the casings 18 and 19 are so arranged as to leave a passage 21 through which water may flow directly from the lower to the upper part of the casing without passing through the system of tubes 9. The edges of the pockets do not form steam tight joints with the tube sheets (see Fig. 5), but are sufficiently close to cause the water to flow along the series of tubes from one to the other while allowing the steam, which may be formed in the tubes, to escape from the pockets. The tube sheets 16 are also connected by other tubes which, however, are not connected with individual pockets in the headers 18 and 19 like those of the tubes 9. Of these the tubes 22 connect the casings 18 and 19 adjacent to the fire box 7 and the tubes 23 and 24 are arranged around the top and rear of the garbage drying compartment 8.

The scraper 25 is provided for removing accumulations from the outside of the tubes 9. This scraper consists of a plate disposed at right angles of the tubes 9 and having its edges shaped to partly fit around the tubes. The scraper 25 is rigidly secured to the operating rods 26 which extend outwardly through the flanges of the casing 19 and terminate in handles on the outside of the furnace.

Smoke outlets 27 and 28 are located in the rear wall at the upper parts of the compartments 7 and 8 respectively and are con-

nected together and then to a smoke stack, the smoke opening 27 being controlled by a damper 29.

The operation of the device shown is as follows: A fire is first started on the grate bars 5 with suitable fuel and after the water is heated to a high temperature the compartment 8 is filled with garbage or other moist material which is to be dried and burned, this being supported by the tubes 9 of the heating coil. The two sets of tubes 9, being staggered with respect to each other, support the moist mass until it has been sufficiently dried to partly disintegrate and fall between the tubes 9. The heat of the fuel on the grates rapidly heats the water in the tubes and in the header casings 18 and 19, and the hot water circulating through the tubes serves to evaporate the moisture from the contents of compartment 8. During the early part of the operation the material in compartment 8 will prevent the smoke from reaching the main smoke outlet 28, so that before or immediately after charging the compartment 9 with garbage it is necessary to open the damper 29. As soon as the garbage has become sufficiently dry to allow the heated gases which result from the combustion to pass upwardly through them, the damper 29 is closed. The garbage continues to dry and finally parts of it crumble to pieces and fall through the crevices between the tubes 9 into the fire, where it adds its heat value to that of the fuel for continuing the heating of the water in the coils and casings. Some of the garbage is consumed in compartment 8 without falling through the coil. If the material clogs the spaces between the tubes 9, or if said tubes become coated with accumulations, so that the heating efficiency of the coils is reduced, the accumulations may be removed by sliding the plate 25 backward and forward along the tubes 9 by means of the rods 26. These rods are so placed as to extend through the wall at joints beyond the sides of the water spaces so as to avoid the necessity of using stuffing boxes.

The heating of the water in coil 9 is very rapid since the same water is caused to flow through all of said tubes, in the following manner. The water in the casing 19 flows through the tube *a* toward the casing 18 where the tubes *a* and *b* are inclosed within the same pocket. (See Fig. 3.) The water then returns through the tube *b* to the casing 19 where the tube *b* and an adjacent tube are inclosed within a pocket; the water then flows back through said adjacent tube to the casing 18 and so on through the series of tubes 9. The tubes *c* and *d* are inclosed within the same pocket in casing 19 but in the casing 18 the tube *c* is inclosed within a pocket with the next preceding tube and the

tube *d* opens into the interior of the casing 18. The formation of steam in these tubes does not choke the flow of water as might be expected, since the steam, or a large part of it, may escape through the spaces between the sides of said pockets and the tube sheets. The water is also heated by the other tubes and the tube sheets.

The flanges of the casings 18 and 19 are bolted to the shell of heater with gaskets interposed to make the joint water tight. There are however no gaskets between the edges of the pockets 20 and the tube sheets, as it is preferred to have a certain amount of leakage at that point. The tube sheets are stayed by stay bolts 30 where needed and these are provided with nuts or shoulders to abut against the wall of the casings and with other nuts outside of the casing.

What I claim as my invention and desire to secure by Letters Patent is:

1. A combined garbage burner and water heater comprising a heating chamber, a fuel door in one side of said chamber, a garbage door in said chamber above said fuel door, a row of horizontally disposed tubes extending across said chamber between said fuel and garbage doors and extending through the opposite walls of the chamber and having water tight engagement therewith, a pair of casings respectively secured against the walls of said chamber through which said tubes extend, each of said casings having therein a plurality of partitions arranged to form a plurality of pockets and each pocket connecting an adjacent pair of tubes and the pockets in the two casings being in staggered relation to each other so as to cause water to follow a tortuous path backward and forward and upwardly through said system of tubes, said chamber having smoke outlets both above and below said horizontal row of tubes.

2. A combined garbage burner and water heater comprising a chamber, a plurality of rows of horizontally disposed tubes extending across said chamber between and through opposite walls thereof, the tubes of one row being staggered with respect to those of the other, and said tubes being arranged to subdivide the said chamber into two compartments one above each other, doors in the walls of the chamber communicating with the respective compartments, a pair of casings respectively secured against the opposite walls of said chamber so as to inclose and connect the ends of said tubes, said chamber having smoke outlets both above and below said horizontal row of tubes.

3. A device of the class described, comprising a heating chamber having vertically disposed tube sheets at opposite sides thereof, a plurality of tubes extending transversely between said sheets, a casing fitting

against the outside of one of said tube sheets and having therein a plurality of horizontal partitions extending toward the tube sheet, a plurality of vertically disposed partitions 5 connecting the adjacent horizontal partitions, said partitions being arranged to form a plurality of pockets each connecting a plurality of adjacent tubes, a second casing abutting against the other tube sheet and 10 having a corresponding system of pockets arranged in staggered relation to those in the first casing so as to cause water to follow a tortuous path upwardly through the system of tubes communicating with said 15 pockets, there being a contracted clearance space between the edges of said partitions and said tube sheets to permit the escape of steam from said pockets.

4. A combined garbage burner and water 20 heater comprising a chamber, a plurality of rows of horizontally disposed tubes extending across said chamber between and

through opposite walls thereof, and forming a grate for the support of garbage, said tubes being arranged with a fire box under- 25 neath, doors in the walls of the chamber communicating respectively with the garbage compartment and the fire box, a second set of tubes along the back of the garbage compartment and effective to drive 30 moisture from the garbage before burning, a pair of casings secured respectively against the opposite walls of said chamber, so as to inclose and connect the ends of said tubes, a smoke outlet from said fire box be- 35 low the grate tubes, and a second smoke outlet leading from the top of the garbage compartment.

Signed at Chicago this 5th day of September, 1908.

WILLIAM G. ROSS.

Witnesses:

EUGENE A. RUMMLER,
MARY M. DILLMAN.