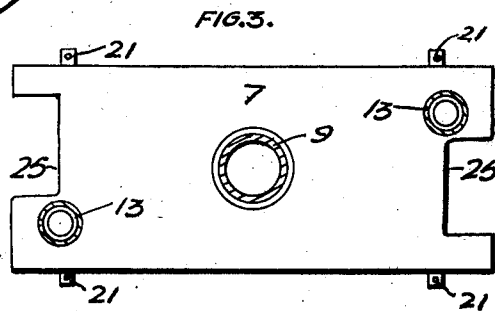
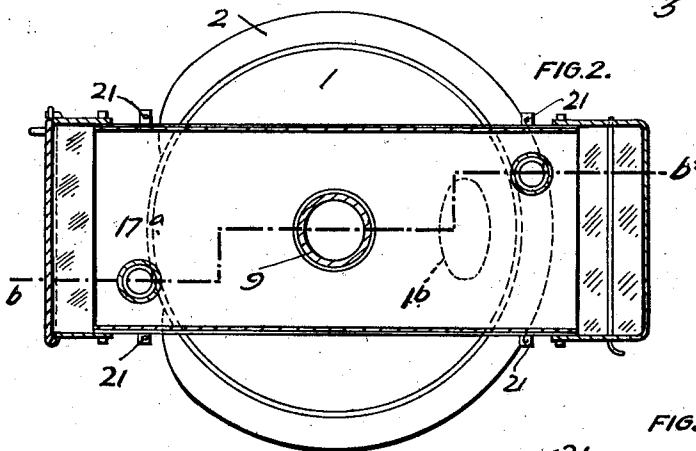
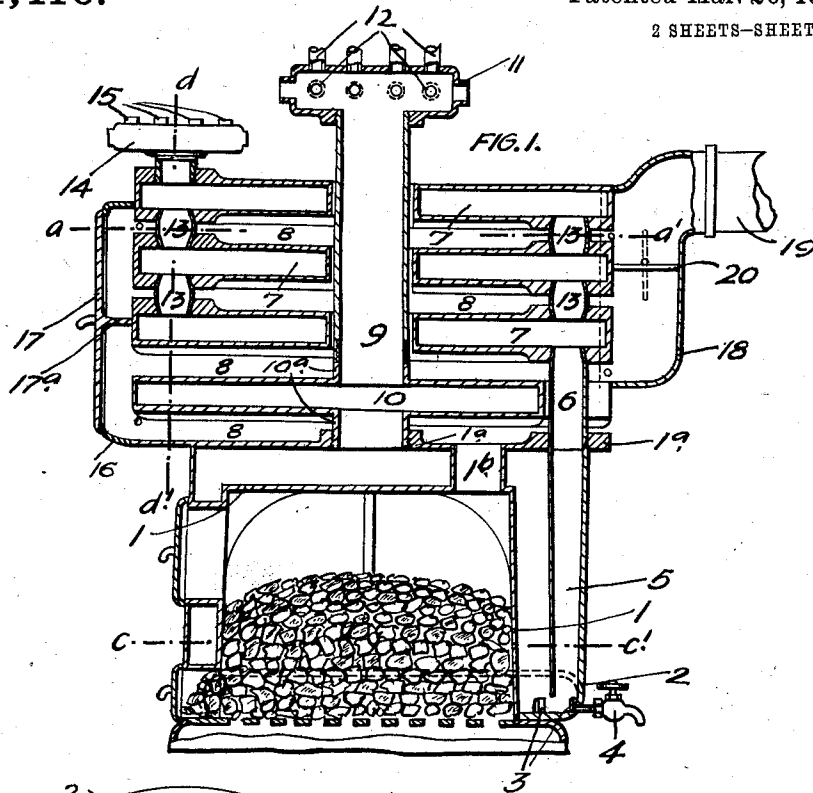


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HOT WATER HEATING BOILER.
APPLICATION FILED FEB. 21, 1911.

1,021,416.

Patented Mar. 26, 1912.

2 SHEETS—SHEET 1.



WITNESSES

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2 SHEETS-SHEET 2.

FIG. 4.

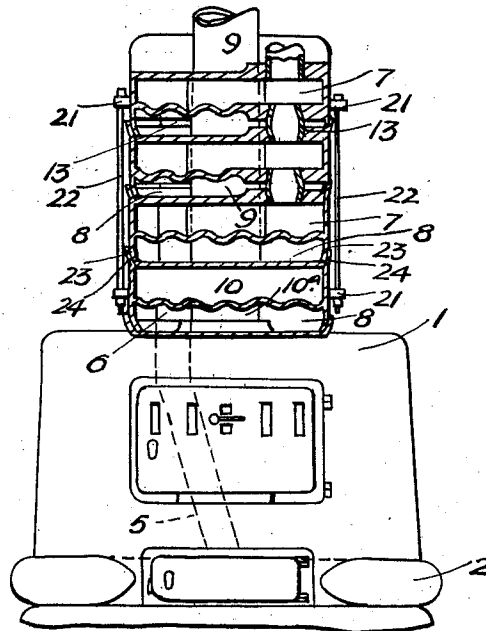
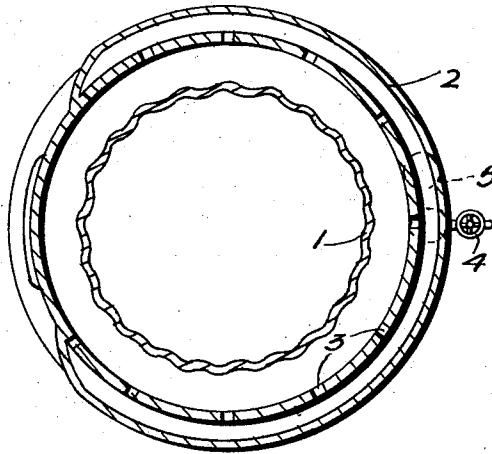


FIG. 5.



WITNESSES

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UNITED STATES PATENT OFFICE.

THOMAS DUNCAN MACGREGOR, OF DAVISVILLE, ONTARIO, CANADA.

HOT-WATER HEATING-BOILER.

1,021,416.

Specification of Letters Patent. Patented Mar. 26, 1912.

Application filed February 21, 1911. Serial No. 609,982.

To all whom it may concern:

Be it known that I, THOMAS DUNCAN MACGREGOR, of the village of Davisville, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Hot-Water Heating-Boilers, of which the following is the specification.

My invention relates to improvements in hot water heating boilers and the object of the invention is to construct a boiler wherein the length of travel of the heat and smoke before passing to the smoke-pipe is materially increased and the water thus more effectively heated.

A further object is to provide a boiler in which the heated water will be rapidly delivered to the radiators and in which the cool water from the radiators will be warmed before being finally returned to the fire pot to be heated again.

A still further object is to provide means whereby the length of travel of the heat and smoke may be varied before passing to the smoke-pipe.

My invention consists of a number of superimposed water sections having a suitable heat space between each pair of sections, said sections being constructed of preferably oblong form although they may be of elliptical, circular or other suitable form, push nipples connecting the sections together, a header at the top of the boiler for the delivery of the cool water to the said sections, one or more lower sections of similar form to the upper sections but independent thereof, said lower sections to be directly connected to the fire-pot of the boiler, a discharge pipe passing up from the fire pot and connected to the lower sections but independent of the upper sections and provided at its top above the boiler with a header for the delivery of the hot water to the respective radiators, a pipe connecting the upper sections with the bottom of the fire pot and a belt extending almost entirely around the fire pot and having a series of perforations on its inner wall for the even distribution of the water around the wall at the base of the fire-pot all as hereinafter more particularly described in the accompanying drawings in which—

Figure 1 represents a vertical section of the boiler through the line $b-b'$ (Fig. 2). Fig. 2, is a horizontal section of the same

through line $a-a'$ (Fig. 1). Fig. 3, is a plan view of a modified water section. Fig. 4, is a vertical section of the boiler through the line $d-d'$ (Fig. 1) taken at right angles to the section shown in Fig. 1. Fig. 5 is a horizontal section through the line $C-C'$ (Fig. 1).

Like letters of reference indicate corresponding parts in each figure.

1 is a fire pot and 2 is a belt cast or otherwise suitably formed thereon at the base of the fire pot.

3 are perforations at the bottom of the inner wall of the belt, said perforations extending around the same.

4 is a suitable drain-cock to take off waste water.

5 is a pipe cast on to the fire pot or otherwise suitably connected thereto.

6 is a push nipple seated at the bottom in the top portion 1^a of the fire pot, the pipe 5 being also seated in the said portion. The push nipple 6 is seated at the top in the lowest of the upper water sections 7.

1^b is a vent extending through the top of the fire pot and allowing the smoke and heat to pass from the fire into the smoke and heat spaces 8.

9 is an outlet pipe from the fire pot, connecting with the lower section 10, said outlet pipe being provided at its top with a header 11 having pipes 12 for distributing the heated water to the respective radiators. The lower water section 10 as above stated is connected directly to the pipe 9 and is independent of the upper sections 7 and the pipe 5, said lower section having a screw nipple 10^a formed thereon screwing at the bottom into the top portion 1^a of the fire-pot and at the top into the pipe 9.

13 are push nipples connecting the upper water sections together at each end thereof.

14 is a header at the top of the upper section 7 having return pipes 15 connected to the various radiators.

16 is an end smoke casing suitably secured to the sides of the ends of the upper sections 7, the lower section 10 and the top portion 1^a of the fire pot and provided with a door 17 having a cross web 17^a formed on its inner surface, said cross web abutting the end of the lowest upper water section 7.

18 is an end smoke casing situated at the opposite end to the aforesaid casing and attached in a similar manner to the sides of

the ends of the upper section 7 and the lower section 10 but not extending as far down as the top 1^a of the fire-pot. The said casing 18 is connected directly with the smoke pipe 19.

20 is a damper in the smoke casing 18 so situated as to abut the end of the center upper section 7 and designed to shorten the travel of the smoke through the smoke spaces by cutting out the upper smoke space 8.

21 are lugs formed on the sides of the upper and lower sections near the ends thereof and so designed as to receive securing bolts 22 for holding the sections firmly against each other.

23 are vertical flanges on each side of the bottom of the water sections designed to rest on the top of the adjacent section.

24 are outwardly curved flanges on the sides of the top of the water sections designed to extend outside of the aforesaid flanges 24. Suitable fire cement is inserted between these flanges in order to prevent the leakage of smoke and heat between the same.

25 (Fig. 3) are cut away portions in the sections 7 and 10 so formed as to permit the smoke and heat to pass through these cut-away portions into the smoke spaces 8 between the sections 7 and 10. This form is designed to do away with the end casings 17 and 18 if so desired.

The mode of operation is as follows: The water is primarily heated in the fire-pot 1 and the lower water section 10 and then directly discharged into the pipe 9 through the header 11 into pipes 12 and thence immediately to the radiators. Then after circulating through the radiators the water is returned through the pipes 15 to the header 14 and thence circulates down through the upper water sections 7 from the nipples 13 to the bottom push nipple 6 and thence down the pipe 5 and thence through the perforations in the belt to the fire-pot 1 again. It will be seen that the water being most effectively heated in the fire-pot 1 and in the section 10 will be very hot when reaching the radiators and the cooler water returning from the radiators will be warmed again by passing through the sections 7 before being deposited into the fire-pot 1 for its final heating before being circulated to the radiators again. Further the heat, smoke and flame passing through the vent 1^b will pass under the bottom and over the top of each section until it reaches the end of the top smoke space when it is discharged into the smoke pipe 19 as in the form shown in Fig. 1. The two lower smoke spaces 8 are connected together by the bottom portion of the casing 17 below the web 17^a and the two intermediate spaces 8 are connected together by the portion of the casing 18 below the

damper 20. The two upper smoke spaces 8 are connected by that portion of the casing 17 above the web 17^a; thus the smoke and heat circulates above and below the sections alternately from one end to the other until it is finally discharged through the smoke pipe 19. If the length of travel of the smoke and heat is found to give an insufficient draft in lighting up the furnace the damper 20 may be opened and the smoke and heat discharged into the casing 18 directly from the second smoke space 8 from the bottom and thus up through the end casing 18 into the smoke pipe 19 instead of passing through the two upper smoke spaces 8. This materially shortens the length of travel of the smoke and thus proportionately increases the draft. When the fire is burning well the damper is closed thus compelling the smoke and heat to travel through all the smoke spaces 8.

It will be seen from the above description what numerous advantages a boiler constructed according to my invention will possess. The smoke traveling from end to end of the smoke spaces strikes against the nipples 13, the screw nipple 10^a and the pipe 9 thus more effectively heating the water than is done in the ordinary form of boiler having circular sections. Also the length of travel is materially increased and thus the heat and smoke that would otherwise be sent directly up the chimney is utilized thus tending toward a greater economy of fuel consumption; further the water has not the tendency to get cool as occurs in the upper section of the ordinary hot water boiler but is discharged directly to the radiators and the return water is heated before being returned to the fire pot.

Many modifications may be made in my invention without departing from the spirit of the invention or scope of the claims and the form shown to be taken in an illustrative and not in a limiting sense. For instance, I might place the water sections below the fire-pot and cause the heat and smoke to be deflected down through the smoke spaces between the water sections.

What I claim as my invention is:

1. A hot water heating boiler comprising a water jacketed fire pot, a conduit connected to said jacket at one end and having radiator supply pipes connected to its opposite end, and a preheating section arranged to be heated by the products of combustion, said section being connected respectively with radiator return pipes and with the fire pot.

2. A hot water heater comprising a water jacketed fire pot, a water section adjacent thereto and connected with said jacket, a conduit connected to said section and having pipe connections for supplying radiators, a section in the path of the products of

combustion from the fire pot, radiator return pipe connections to said section, and a connection from said section to said jacket.

3. A hot water heating boiler comprising a water jacketed fire-pot around the fire, a plurality of water sections adjacent to the fire-pot connected to the water jacket, return conduits connecting the sections to the radiators and means for circulating the products of combustion around the sections whereby the return water from the radiators is warmed before being delivered to the fire-pot for its maximum heating prior to circulating to the radiators again as and for the purpose specified.

4. A hot water heating boiler comprising a water jacketed fire-pot around the fire, a heated water section of preferably oblong form and suitably connected to the fire-pot, a pipe for delivering the heated water to the radiators and suitably connected to the water section and superimposed return water sections independent of the aforesaid water section, the upper section of which being connected to the return pipes from the radiators and the lowest of the sections being suitably connected to the bottom of the fire-pot, smoke and heat spaces between the return water sections and above and below the heated water section and suitably connected together, and means whereby the return water is distributed around the bottom of the water jacket of the fire-pot, as and for the purpose specified.

5. A hot water heating boiler comprising a water jacketed fire-pot around the fire, a heated water section of preferably oblong form and suitably connected to the fire-pot, a pipe for delivering the heated water to the radiators and suitably connected to the water section and superimposed return water section independent of the aforesaid water sections, the upper section of which being connected to the return pipes from the radiators and the lowest of the sections being suitably connected to the bottom of the fire-pot, smoke and heat spaces between the return water sections and above and below the heated water sections and suitably connected together, and a belt extending around the bottom of the fire pot and having a series of perforations in the inner wall of the belt as and for the purpose specified.

6. A hot water heating boiler comprising a water jacketed fire-pot around the fire, a heated water section of preferably oblong form adjacent to the fire-pot, a discharge pipe, a screw nipple connecting the hot water section and the discharge pipe, a header for distributing the hot water to the various radiators, superimposed return water sections of preferably oblong form, push nipples connecting the return water sections together and located at the diagonal corners of the aforesaid sections, de-

pending flanges on the side edges of the bottoms of the heated and return water sections holding the sections apart, curved flanges on the side edges of the tops of the sections fitting outside the depending flanges, smoke and heat spaces between the sections, a vent through the top of the water jacket of the fire-pot connecting with the lowest smoke and heat space, and a belt extending around the bottom of the fire pot, a staggered pipe connected to the belt, a long push nipple for connecting the pipe with the lowest of the return water sections, and means for connecting the smoke and heat spaces together whereby the smoke and heat is compelled to travel alternately through the same from one end to the other as and for the purpose specified.

7. A hot water heating boiler comprising a water jacketed fire-pot around a fire, a heated water section of preferably oblong form adjacent to the fire-pot, a discharge pipe, a screw nipple connecting the hot water section and the discharge pipe, a header at the top of the discharge pipe, pipes connected to the header for distributing the hot water to the various radiators, superimposed return water sections of preferably oblong form, push nipples connecting the return water sections together and located at the diagonal corners of the aforesaid sections, depending flanges on the side edges of the bottoms of the heated and return water sections holding the sections apart, curved flanges on the side edges of the tops of the sections fitting outside the depending flanges, smoke and heat spaces between the sections, a vent through the top of the water jacket of the fire-pot connecting with the lowest smoke and heat space and a belt extending around the bottom of the fire-pot, a staggered pipe connected to the belt, a long push nipple for connecting the pipe with the lowest of the return water sections, a casing at the end of the return water sections, the hot water section and the top portion of the fire-pot for connecting the smoke spaces together, a door in the end of the casing, a web formed on the door and extending laterally across the casing, the web dividing the same into two portions and abutting the lowest of the return water sections, a second casing at the other end of the return water sections and the heated water section, said casing connecting with the smoke pipe, and a damper extending laterally across the casing and abutting the intermediate return water section and capable of being opened and closed as and for the purpose specified.

8. A water heating boiler comprising a jacketed fire pot, means for connecting the jacket to the radiators, water sections above the fire pot, connected to receive the return water from the radiators and also connected

to the water jacket, and means for passing the products of combustion from the fire pot around said sections in a direction reverse to the direction of flow of water there-
5 through

9. A hot water heating boiler comprising a jacketed fire pot, conduits for connecting the jacket directly with the radiators, water sections above the fire pot, and conduits for

circulating the products of combustion 10 around the sections the return water from the radiators circulating through the sections in a direction opposite to the circulation of the products of combustion.

THOMAS DUNCAN MACGREGOR.

Witnesses:

H. PRESTON,

B. BOYD.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
