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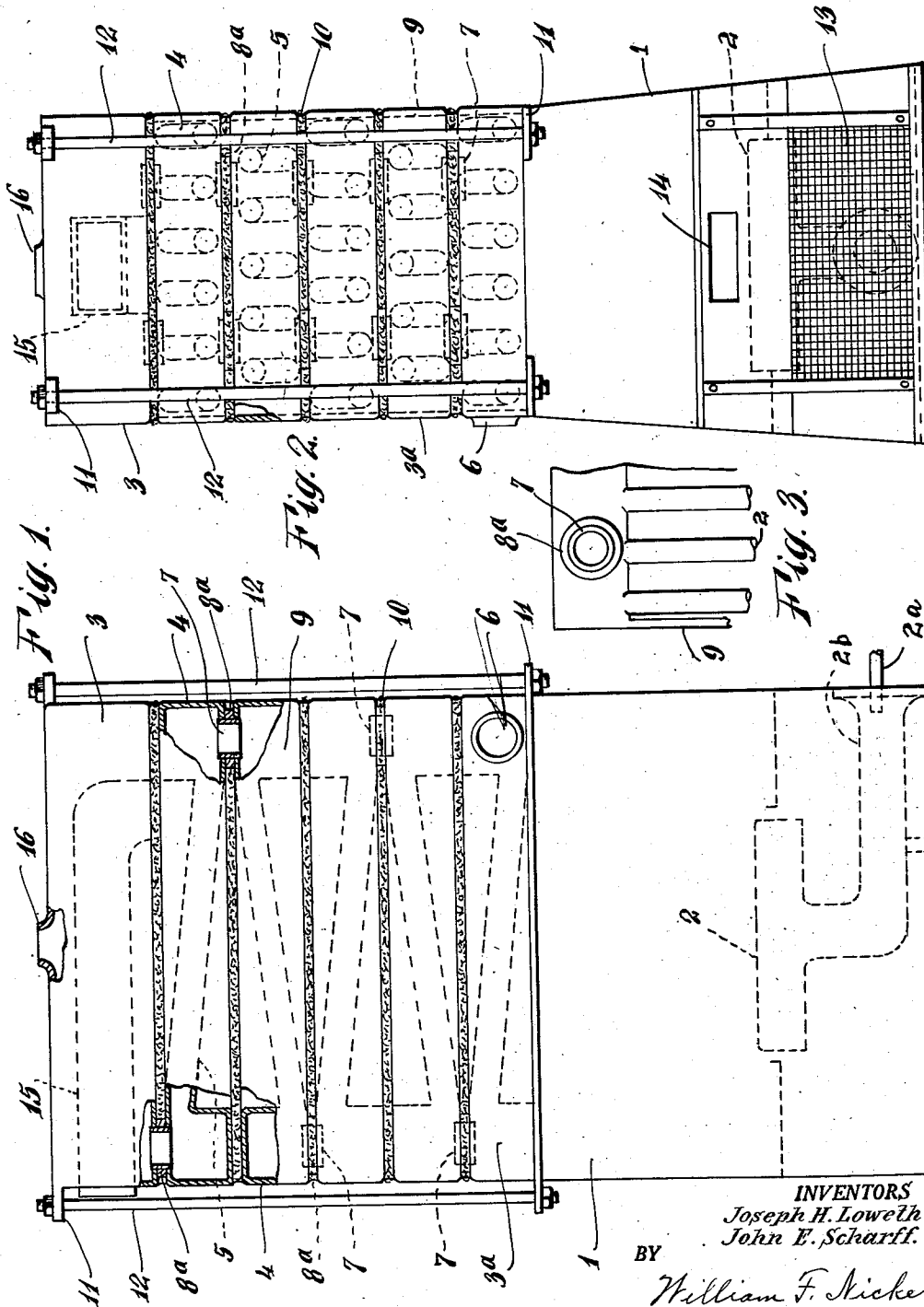
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2,580,033

HEATER

Filed Aug. 15, 1946

2 SHEETS—SHEET 1



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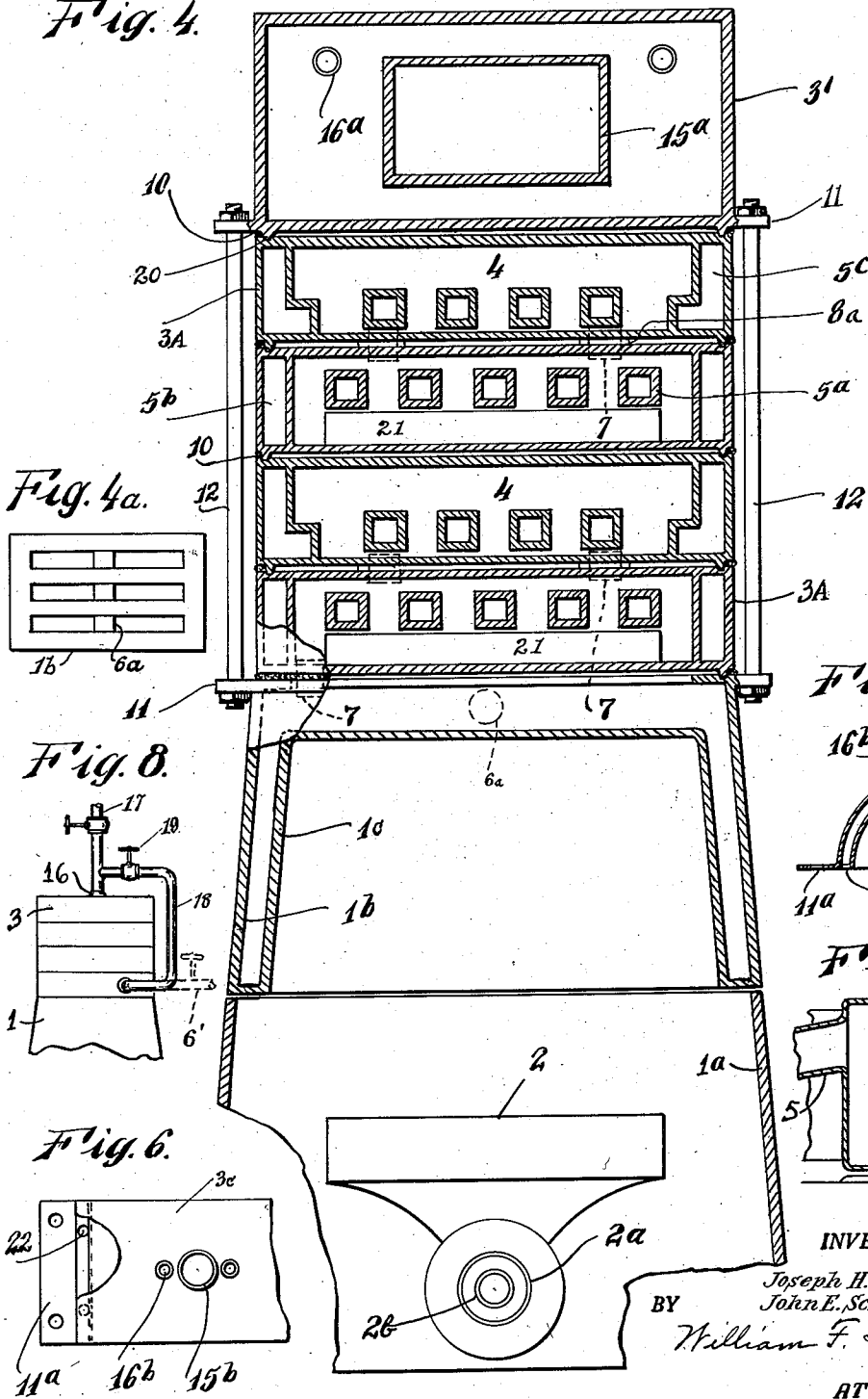
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HEATER

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2 SHEETS—SHEET 2

Fig. 4.



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HEATER

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2 Claims. (Cl. 122-214)

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This invention is an improvement in heaters; especially a heater in the form of a boiler containing water or some other suitable fluid in combination with a burner for transferring heat to the boiler and its contents.

An object of the invention is to provide a heater which can be inexpensively constructed and easily assembled; and operated with the highest possible efficiency in practice.

Another object of the invention is to provide a heater which, in its preferred form, is built of sections placed one upon another to constitute a complete unit; the sections wherein the water or the like heating medium is heated comprising headers connected by pipes which are inclined in reverse directions in the separate units. The pipes are fully exposed to the heat of the fuel and the contents of the units flow from bottom to top and in reverse substantially horizontal directions through each of the units in succession.

The invention is described in the following specification and is illustrated on the accompanying drawings which show the best forms of the invention known to me. In practice, however, the structural embodiments of the heater may be changed in various details without deviating from the essential design which characterizes the invention.

On the drawings

Fig. 1 is a side view of the heater according to this invention.

Fig. 2 is a front view thereof.

Fig. 3 is a top plan showing part of one of the units and the particular construction thereof.

Fig. 4 is a vertical transverse section taken not far from the front through a modified form of heater; and

Figure 4a is a top plan of the base with the upper sections containing the heater pipes and headers removed.

Figs. 5, 6 and 7 show details, while

Figure 8 is a diagram of the pipe connections for the heater.

On the drawings the numeral 1 indicates the base enclosing the fuel chamber of the heater which is hollow and the walls of which surround a suitable burner 2. Above the burner is sufficient space for combustion. This burner is supplied with fuel through an inlet pipe 2a and an air pipe 2b. On top of the base 1 are the sections in which the water is heated, said sections comprising a top or outlet section 3', below which and between the same and the base 1 are a number of similar sections 3a. Each of the sections 3a has headers 4 extending crosswise on the front and back; these

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headers being connected by inclined water pipes or tubes 5. At one end of the lowermost section 3a is an inlet opening 6 which is coupled to a water return pipe. The water entering the lowermost section 3a passes from the front header upward to the rear header and then in the next section it passes upward from the rear header towards the header in front. In the same manner the water flows or zigzags upward at a slight incline through the other sections into the section 3 from which it can be finally discharged from the heater, or returned to the lowermost section for recirculation.

As shown in Fig. 2, the pipes 5 connecting the headers 4 of each section are so arranged that the pipes or tubes of each section are in line with the spaces between the pipes of the sections above and below it. For example, the lowermost section 3a has six pipes placed side by side and the next section above this lowermost section has five pipes in staggered formation with respect to the pipes 5 of the section below and the section over it. The sections are open between the headers at front and rear and the hot gases produced by the burner 2 flow upward through the spaces between the pipes of the superimposed sections and give a powerful heating effect.

The rear header 4 of the lowermost section 3a is connected to the interior of the rear header of the section immediately above it by nipples 7. These nipples fit openings in the two headers snugly and are surrounded with packing elements 8a between the sections to make them leakproof. The other sections are put into communication with each other through one header in the same way. The ends of the front and rear headers of each section below the top section are connected by side walls 9, and the space between the adjacent upper and lower edges of the side walls of the different sections and between the headers at the front and rear are filled with boiler putty 10 so that the products of combustion at high temperature are confined in their upward movement from the base 1 to the spaces occupied by the pipes 5. The uppermost section 3 and the top of the base 1 below the lowermost section 3a have perforated projections 11 through which pass the ends of tie-rods 12 with nuts screwed upon the tie-rods to hold the sections tightly together. The uppermost section 3 has no tubes 5 and is hollow and closed at bottom, top and side.

The uppermost section 3 is connected through nipples 7 adjacent its rear end to the rear header 4 of the section 3a immediately be-

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low it, and in front of the furnace around the flue 2b has a screen or filter 13 to prevent dust from entering the burner. Above the screen is a sight opening 14 through which the flame may be watched. The hot gases enter an outlet flue 15 in the top section 3, which communicates with the space containing the pipes 5 at one end and is led out through the rear of the topmost section 3 at the other. In the upper part of section 3 is an outlet 16 for the water and this outlet may be coupled to a conduit 17 leading to radiators in a house or dwelling or some other point where the heating effect is needed. A branch conduit 18 may be added to return the heated water to the supply conduit 6' connected to the inlet opening 6, to be readmitted to the boiler and reheated if desired; and suitable valves 19 are installed to control the conduits. See Figure 8.

The action of this heater is very quick and efficient and water entering the inlet 6 is quickly warmed by exposure to hot gases from the burner 2 and is raised to a high temperature before it arrives at the top of the heater.

In Fig. 4 the heater is shown with a base made up of two sections 1a and 1b, the former being at the bottom of the heater and containing the burner 2. This section is open at the top and the other section 1b rests upon the upper edges of the walls thereof. The junction of the two is fully sealed in any approved fashion. On top of section 1b are the units 3A containing the heating pipes 5a and on top of the sections 3A is the uppermost section 3'. The section 1b is made up of double side walls and a double top wall forming a jacket 1c with an inlet 6a into which water is admitted for the sections 3A and 3'. The jacket 1c at the top of section 1b is not continuous but comprises one or more conduits with sufficient space between to permit the gases of combustion to pass up to the water pipes 4, said conduits at the top of section 1b communicating with each other across connections indicated at 6a.

Fig. 4 presents a transverse section shown as an observer sees it by looking from the front towards the back, that is, taking Fig. 1 for example, as if the plane of section were near the rear headers 4 at the left of Fig. 1 and the observer looked toward the left from a point at the right of Fig. 1. The burner 2, however, is shown in front elevation. The inlet 6 is at the front and the water fills the jacket 1c. At the top of the jacket it enters the front header 4 of the lowermost section 3A, this header being connected with the jacket 1c by nipples 7 in front of the heater, as shown at the left of Fig. 4, where a part of the front of the heater appears. From this front header the water passes upward through the inclined tubes 5a to the rear header 4 of the lowermost section 3A and thence through nipples 7 made leakproof by packing 8a to the rear header 4 of the next upper section 3A. From the rear header 4 of this section the water flows upward at an incline to the front header, and then through similar nipples to the front header of the next higher section; and so on until it reaches the top section 3'. The nipples 7 connecting the rear headers 4 of the first and second sections 3A, counting from the lowermost section upward, and the rear headers 4 of the third and fourth sections, are outlined in Fig. 4, but the other nipples 7, including those in the bottom of the top section 3', are not visible because they are forward of the plane of section represented by Fig. 4.

The construction of Fig. 4 is illustrated as comprising five sections instead of six as in Fig. 1;

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but obviously the number of sections can be increased or decreased at will.

The units 3A of the modification of Fig. 4 include five pipes 5a and four pipes in alternation, the four pipes of the sections having this number being arranged in line with the spaces between the groups of five pipes of the adjacent sections. Also the front and rear headers of the sections are not connected by solid side walls but by hollow side walls 5b and 5c, which are also in communication at both ends with the front and rear headers 4. The heat absorbed by the side walls of the sections is thus also conveyed to the water and the heating effect is thus enhanced. In the sections having four tubes, the side walls 5c are L-shaped in cross section so that the space between these side walls and the nearest or outside tubes 5a, is reduced.

The entire structure is assembled as before and the various parts are secured by tie rods 12 and nuts engaging projecting lugs 11 on the top section 3' and on the upper section 1b of the base. The top section 3' also has a flue 13a opening through the bottom of the section 3', to carry off the products of the combustion; and one or more outlets 16a for the heated water. Further, the sections beginning with the top section 3' have on their lower faces ribs 20 which fit into grooves in the top of the next section below and the base member 1b, these ribs and grooves extending around all four sides of the heater so as to prevent any of the gases of combustion from passing out through cracks in the sides when the heater is in operation. The spaces between the edges of the sections on the outside of the ribs 20 are also closed all around the heater with boiler putty and the seal between the various parts of the furnace is thus made perfect.

The headers 4 have cleaning openings, as illustrated in Figs. 4 and 5, with closures 21 that can easily be removed to give access to the headers and the tubes. These openings and closures are included in the construction of both Fig. 1 and Fig. 4. It will be seen that as shown in Figure 5 the openings with the closures 20 are in the lower part of each header so that in one header of each section the openings will be in line with the lower ends of the tubes 5.

The uppermost section of the form shown in Fig. 4 may be hollow and dome-shaped, as indicated at 3c in Figs. 6 and 7 with a central opening 15b for products of combustion and one or more outlet openings 16b for the water; the dome being open at the bottom over the inside space occupied by the tubes 5a. The entire dome may carry a water jacket to which water is admitted from the adjacent section 3A below through openings 22 adjacent the projections 11a which are apertures for the tie-rods 12. The openings 22 will communicate through suitable nipples with the headers or hollow side walls of the section immediately below it so that the heating of the water may be continued in the dome up to the point where the outlets 16b are situated. Also the dome-shaped section 3c may be solid, without a water jacket and the discharge of the water at the top of the heater may be otherwise arranged; but in either event, conduits will be coupled to recirculate the water through the heater as already described in connection with Fig. 8.

From the foregoing description it will be apparent that a heater of this type can be very easily made, because the sections can be formed by casting; and easily finished to the point at which they will be suitable for assembly. To

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construct and complete the furnace it is then only necessary to set up the sections and to seal up fully the spaces between them, and the furnace is then ready for operation.

The nipples 7 may be of the type known as push nipples, without packing; the push nipples having tapered ends which fit tight without packing rings 8a; and as many of the nipples 7 as are needed will be used between parts of the heater. The sections of the heater, too, may be made so as to fit tightly together without boiler putty shown at 10; and in some instances the tubes 5 may be horizontal instead of inclined.

Figure 8 simply indicates in diagram the usual connections for a water heater to the system; the water being returned to the heater from the radiators of a house and circulated through all the connections. Additional water is supplied when needed; and in Figure 4, the inlet 6 is preferably lower down than shown, to permit good drainage, through suitable valves connected to the pipes united to the heater.

Having described our invention, what we claim as new is:

1. A heater comprising a base enclosing a combustion chamber, a fuel burner in said chamber, and sections mounted in superposed relation upon said base, each of said sections comprising two straight headers at opposite ends, tubes connecting said headers, the tubes of each section being inclined and uniting the lower part of one header thereof to the upper part of the other header, side walls connecting the ends of the headers of each section to enclose the space in which said tubes are disposed, said walls being hollow and some being L-shaped in cross section, the tubes of each section being inclined in the opposite direction and staggered with respect to the tubes of an adjacent section, the header which has conduits joined to its upper part being directly below the header in the section next above it, the tubes of the last named section being joined to the lower part of the last-named header, said last-named two headers having nipples to put them directly into communication with each

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other, said headers having transverse openings in their outer face adjacent the bottom, one opening in each section being in line with the lower ends of the tubes.

2. A heater comprising a base enclosing a combustion chamber, a fuel burner in said chamber, and sections mounted in superposed relation upon said base, each of said sections comprising two straight headers at opposite ends, tubes connecting said headers, the tubes of each section being inclined and uniting the lower part of one header thereof to the upper part of the other header, side walls connecting the ends of the headers of each section to enclose the space in which said tubes are disposed, the tubes of each section being inclined in the opposite direction and staggered with respect to the tubes of an adjacent section, the header which has conduits joined to its upper part being directly below the header in the section next above it, the tubes of the last-named section being joined to the lower part of the last-named header, said last-named two headers having communication with each other, said headers having transverse openings in their outer face adjacent the bottom, one opening in each section being in line with the lower ends of the tubes.

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