

1,015,833.

D. POPA.
WATER HEATER.
APPLICATION FILED JUNE 10, 1911.

Patented Jan. 30, 1912.

2 SHEETS—SHEET 1.

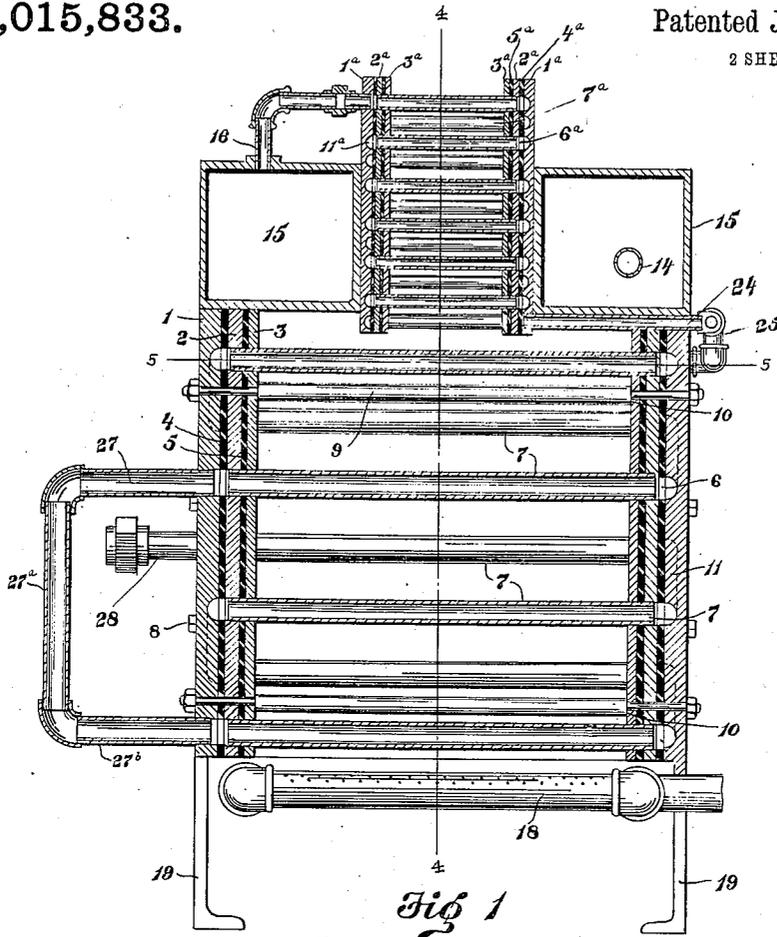


Fig 1

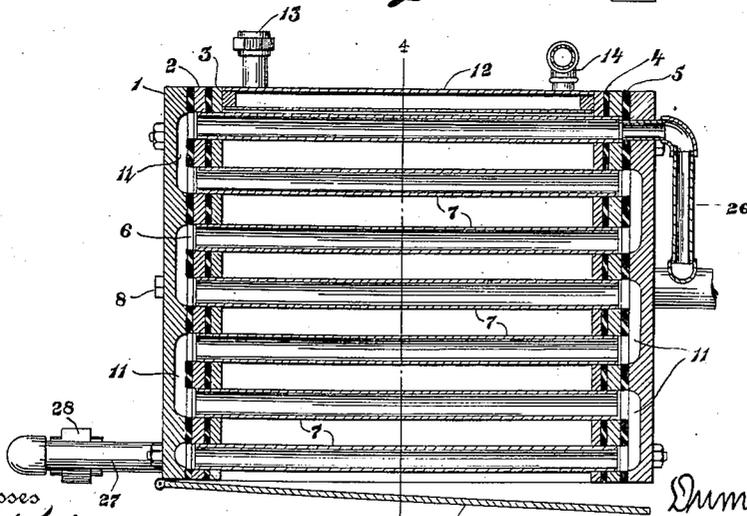


Fig 2

Witnesses
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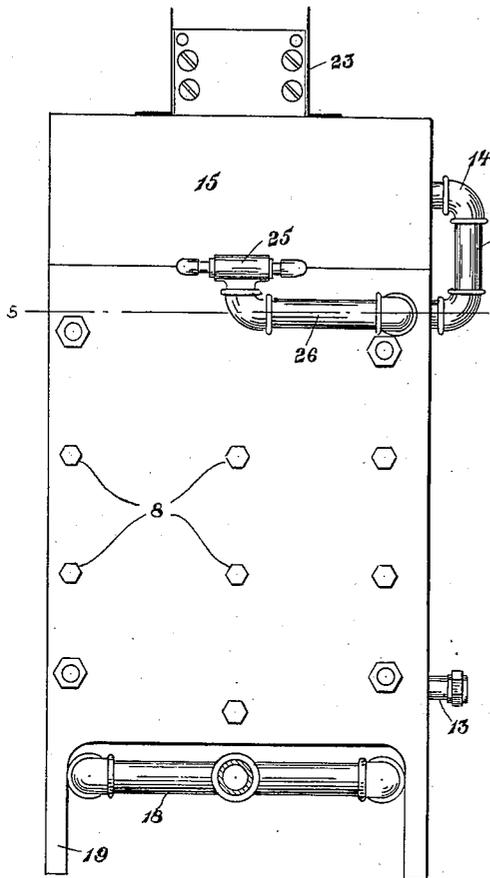


Fig 3

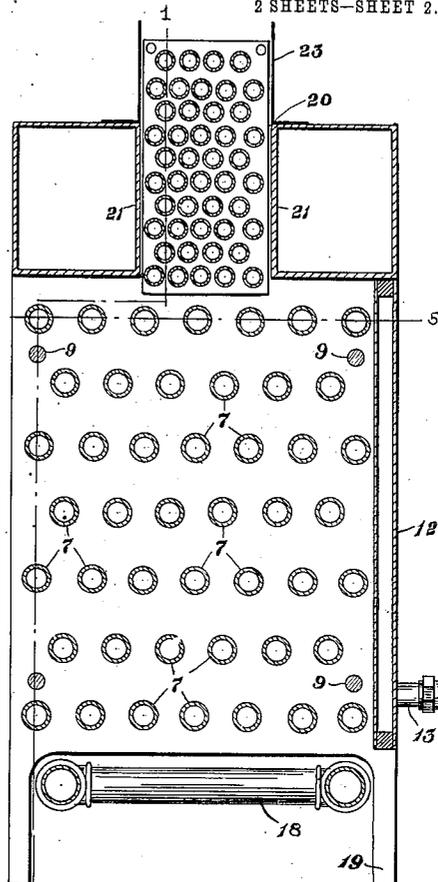


Fig 4

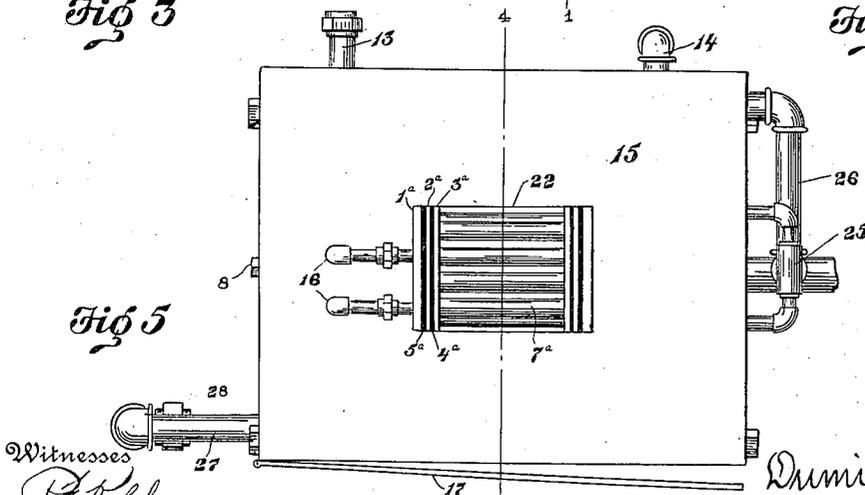


Fig 5

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4 334

UNITED STATES PATENT OFFICE.

DUMITRU POPA, OF CANTON, OHIO.

WATER-HEATER.

1,015,833.

Specification of Letters Patent.

Patented Jan. 30, 1912.

Application filed June 10, 1911. Serial No. 632,334.

To all whom it may concern:

Be it known that I, DUMITRU POPA, a subject of the King of Hungary, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Water-Heaters, of which the following is a specification.

The invention relates to a water heater of the type in which the water is heated while flowing through a coil or plurality of tubes, and the object of the invention is to construct and arrange the parts of the apparatus in such manner that they may be readily assembled and separated, that the tubes may extend and contract under varying temperatures, and that a maximum amount of the heat is utilized.

The objects of the invention, thus set forth in general terms, are attained by a preferred embodiment thereof illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a side elevation section of the apparatus on line 1—1, Fig. 4; Fig. 2, a cross section of the apparatus on line 5—5, Figs. 1, 3 and 4; Fig. 3, an end view of the apparatus; Fig. 4, a section of the apparatus on line 4—4, Figs. 1, 2 and 5; and Fig. 5, a plan view of the apparatus.

Similar numerals refer to similar parts throughout the drawings.

The end walls of the apparatus are each composed of the three metal plates 1, 2 and 3 with the two rubber sheets intervening between the respective plates, the two inner metal plates 2 and 3 and the rubber sheets 4 and 5 being provided with registering apertures together forming the sockets 6 adapted to receive the ends of the tubes 7; and the plates and sheets of each end being clamped together as by the bolts 8 while the two walls are secured in relative position by the through bolts 9 provided with annular shoulders 10 abutting against the inner sides of the walls to properly space the same apart.

The tubes 7 are made of thin copper or other like heat conductive metal and are cut in such lengths that the ends will be normally located just within the outer face of the intermediate metal plate 2 so that the tube can expand endwise to the inner face of the outer metal plate 1 and may contract or be shifted endwise without withdrawing

either end from the inner rubber sheet; thus insuring a water-tight joint between the tubes and the walls.

The transverse and upright grooves 11 are provided in the inner sides of the outer metal plates 1, which grooves are arranged so that their end portions will register with adjacent tube sockets; and, the inner side of the grooves being closed by the adjoining rubber sheet, ducts are thus formed between the ends of the respective tubes to carry the circulation from one to the other in such manner as may be desired.

One side wall 12 of the apparatus is preferably made hollow with suitable apertures for the inlet and communicating pipe connections 13 and 14; and the cover 15 of the apparatus is also preferably made hollow and is likewise provided with apertures for the communicating pipe connections 14 and 16; while the other side may be closed by the door 17 to give access to the interior parts of the case thus formed. The lower end of the case is preferably open, and heat is applied to the tubes as by the perforated tubular gas burners 18, and the apparatus may be supported on the legs 19 which are preferably formed in extension of the outer end wall plates 1.

The upright opening 20 is provided in the middle portion of the hollow cover 15, which opening is provided with the walls 21 to separate the same from the cavity of the hollow cover. This opening forms a flue extending upward from the main tube chamber 22 of the apparatus, which flue may be further extended upward by the stack 23. Within the flue chamber thus formed is located a supplemental heater composed of end walls including three metal plates 1^a, 2^a and 3^a with intervening rubber sheets 4^a and 5^a and tube sockets 6^a; together with the tubes 7^a having their ends entered in the sockets, all substantially like the structure of the main heater, there being grooves 11^a in the outer metal plates 1^a forming ducts communicating with the ends of adjacent tube sockets, as in the main heater.

The tubes in the main heater and also the supplemental heater are arranged in transverse rows, and the tubes of one row are preferably staggered with reference to the tubes of an adjacent row, as shown in the drawings, so that the flame or the heated

gases of combustion arising therefrom will directly impinge each tube after passing between two tubes next below.

In practice, the flame from the gas burners rises about half way in the case of the main heater, whence the heated gases of combustion rise through the upper half of the main chamber and find their way among the tubes of the supplemental heater in the flue and thence upward through the stack, and it is evident that the heat from the flames and gases of combustion will serve to heat to a lesser extent the hollow side wall of the case and to a greater extent the hollow cover of the same.

The water to be heated enters the cavity of the hollow side wall 12 through the inlet pipe 13, in which cavity the water is slightly heated; thence it flows through the communicating pipe 14 into the cavity of the cover, wherein it is further heated; thence it flows through the communicating pipes 16 which are preferably of about half the diameter of the communicating pipe 14 and lead through the end wall plate 1^a to a communication with one of the tubes 7^a in opposite sides of the supplemental heater.

Each of the tubes in the supplemental heater is about half the diameter of the tubes 7 in the main heater and accordingly is made with correspondingly thinner walls; and the wall plate groove-ducts 11^a in the supplemental heater are arranged to circulate water in succession through all the tubes in the respective lateral halves of the heater and to discharge it from one of the lower tubes in each side thereof into a similar communicating pipe 24 which preferably extends outward immediately under the cover of the case and emerges into a T-fitting 25, the stem of which is of substantially the same diameter as the main tubes, which T-stem is connected with the communicating pipe 26 which in turn is connected in the outer metal plate 1 of one end wall of the main heater and communicates with one of the upper row of tube sockets therein.

The groove-ducts 11 in the outer plates of the end walls of the main heater are so arranged that the water flows consecutively through all the tubes of the upper row, thence through all the pipes of the successive rows downward to one of the middle rows; and thence by the pipes 27, 27^a and 27^b to one of the pipes in the lower row thereof, and thence consecutively through all the pipes of the lower row, thence through all the pipes of the successive rows upward to an outlet pipe 28 which carries the water to the point of use.

By this construction and arrangement, it is evident that the water enters the apparatus in the least heated portion thereof and thence proceeds successively and progressively through the cavities of the side and

the cover, and thence through the tubes of the supplemental and the main heater, in such a manner as to progress at all times from a lesser to a greater heated portion of the apparatus and is finally discharged from the hottest portion thereof, namely, the tubes which are located at the tips of the flame.

I claim:

1. A water heater including end walls composed of three metal plates with intervening rubber sheets, there being registering apertures forming sockets in the two inner metal plates and the rubber sheets and grooves forming ducts in the outer plates communicating with adjacent sockets, and tubes having their ends jointed in the sockets.

2. A water heater including an end wall composed of three metal plates with intervening rubber sheets, there being registering apertures forming sockets in the two inner metal plates and the rubber sheets and grooves forming ducts in the outer plate communicating with adjacent sockets, and tubes having ends jointed in the sockets.

3. A water heater including a case forming a main chamber, a plurality of tubes in the main chamber communicating in series, the case having a side wall and a hollow cover with a flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes in each lateral half of the flue chamber communicating in series, a pipe leading into the cavity of the side wall, a communicating pipe between the cavities of the side wall and the cover, communicating pipes between the cavity of the cover and each lateral series of flue tubes, and communicating pipes leading from the flue tubes to the series of main tubes, the main tubes being substantially twice the diameter of the flue tubes.

4. A water heater including a case forming a main chamber, a plurality of tubes in the main chamber communicating in series, the case having a side wall and a hollow cover with the flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes in each lateral half of the flue chamber communicating in series, a pipe leading into the cavity of the side wall, a communicating pipe between the cavities of the side wall and the cover, communicating pipes between the cavity of the cover and each lateral series of flue tubes, and communicating pipes leading from the flue tubes to the series of main tubes.

5. A water heater including a case forming a main chamber, a plurality of tubes in the main chamber communicating in series, the case having a hollow cover with a flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes

in each lateral half of the flue chamber communicating in series, a pipe leading into the cavity of the cover, communicating pipes between the cavity of the cover and each lateral series of flue tubes, and communicating pipes leading from the flue tubes to the series of main tubes, the main tubes being substantially twice the diameter of the flue tubes.

10 6. A water heater including a case forming a main chamber, a plurality of tubes in the main chamber communicating in series, the case having a hollow cover with a flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes in each lateral half of the flue chamber communicating in series, a pipe leading into the cavity of the cover, communicating pipes between the cavity of the cover and each lateral series of flue tubes, and communicating pipes leading from the flue tubes to the series of main tubes.

20 7. A water heater including a case forming a main chamber, a plurality of tubes in

the main chamber communicating in series, 25 the case having a flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes in each lateral half of the flue chamber communicating in series, and communicating pipes leading 30 from the flue tubes to the series of main tubes, the main tubes being substantially twice the diameter of the flue tubes.

8. A water heater including a case forming a main chamber, a plurality of tubes in 35 the main chamber communicating in series, the case having a flue chamber extending through the cover, a plurality of tubes in the flue chamber, the tubes in each lateral half of the flue chamber communicating in 40 series, and communicating pipes leading from the flue tubes to the series of main tubes.

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Witnesses:

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