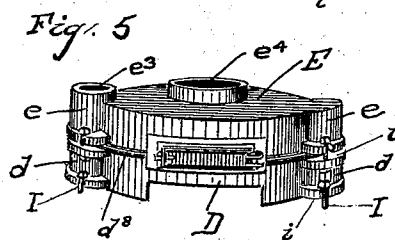
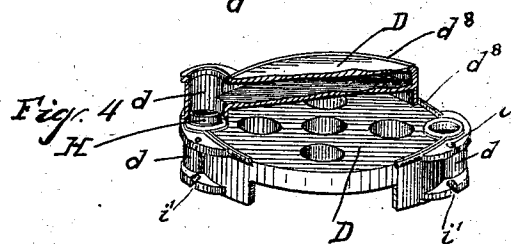
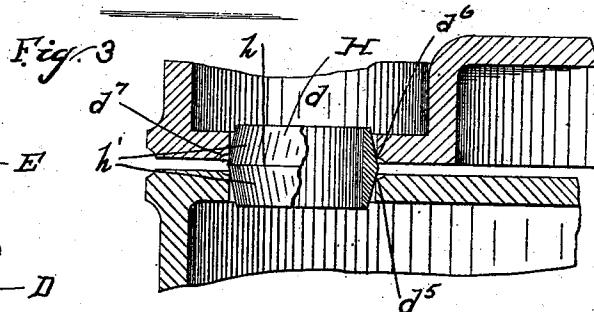
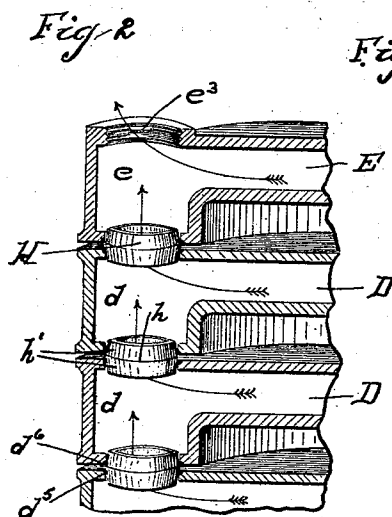
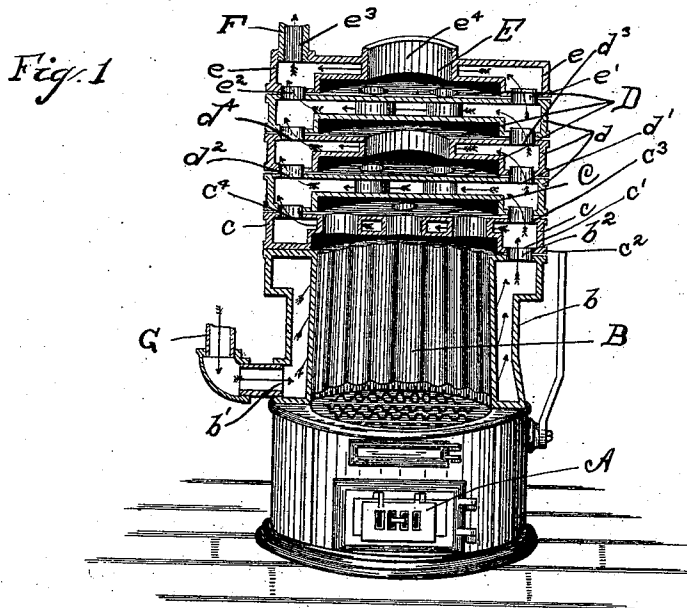


(No Model.)

H. S. DOWNE.
SECTIONAL BOILER.

No. 551,949.

Patented Dec. 24, 1895.



Witnesses:
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UNITED STATES PATENT OFFICE.

HENRY S. DOWNE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE IDEAL
BOILER COMPANY, OF SAME PLACE.

SECTIONAL BOILER.

SPECIFICATION forming part of Letters Patent No. 551,949, dated December 24, 1895.

Application filed November 27, 1894. Serial No. 530,131. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. DOWNE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Sectional Boilers, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

10 Figure 1 represents a vertical section of a boiler embodying my improvements, except the base or ash-pit, which is in elevation; Fig. 2, a detail section taken on the same line as Fig. 1, but showing only a part thereof; Fig. 15 3, a similar view, but showing only parts of two sections of the boiler at their juncture; Fig. 4, a perspective view of one of the boiler-sections and a portion of another detached, and Fig. 5 a front elevation of two sections 20 of the boiler detached. In these drawings Figs. 1, 4, and 5 are upon one and the same scale, Fig. 2 upon a scale by itself, enlarged from the former, and Fig. 3 upon a separate scale, still more enlarged.

25 My invention relates to what are known generally as "upright sectional boilers," and especially such as are designed for housewarming by heating water and circulating it through the edifice.

30 The invention consists in a special construction of the joints between the sections of the boiler, and also in the construction and arrangement of the circulation-passages through the boiler from section to section.

35 The construction and operation of a sectional boiler embodying my invention are shown and will be described so far as necessary to an understanding of my improvements, and the special improvements which 40 I believe to be new and wish to secure by Letters Patent will be definitely pointed out in claims following the said description.

In all general features the boiler may be of any ordinary construction in this type, and 45 therefore need not be described in all its details. General reference only will be made to the main features. As intimated above, these boilers are generally upright, and they are sectional in construction.

50 In the drawings, A represents the base or ash-pit, and B the fire-pot surrounding the

base. This fire-pot is surrounded by an outer casing *b*, of larger size than the fire-pot, so as to provide a free space between it and the fire-pot, and running entirely around the latter, closed at the top and bottom, the two 55 parts being constructed in one piece. On one side of this section and at the bottom there is an opening *b'* through the outer wall, thereby providing for admission to the annular 60 space at the left hand of the structure, as seen in Fig. 1 of the drawings. At the opposite side of this section there is an opening *b''* in the annular top, which covers the free space mentioned above, so furnishing an- 65 other connection with the annular space around the fire-pot. It will be noticed from this description and Fig. 1 of the drawings that these apertures or openings are on opposite sides of the furnace, one being at the 70 bottom of this section B and the other at the top thereof, and on sides opposite to each other. The sections of the boiler are built up one upon the other on this fire-pot section B. So far as the circulation of the hot products 75 of combustion up through these sections is concerned their construction is ordinary. They may be of any known construction and need not be described here, as provisions for such circulation are well known. For the cir- 80 culation of the water, however, the construction is different from anything heretofore known by me and will now be explained. These sections are all provided with side enlargements arranged opposite to each other, in 85 which are arranged the connecting apertures between the sections. The first or lower section C of the boiler proper is constructed with enlargements *c* on each side thereof, opposite to each other, and formed to provide the usual 90 annular space running around the central portion of the section, including the enlargements or side projections just mentioned. In the projections are openings or apertures, one, *c'*, in the bottom *c''* of the annular space 95 and two others in the top of said space, one, *c''*, immediately over the opening in the bottom just mentioned, and the other, *c'*, in the top of the enlargement at the opposite side 100 of the section.

The sections D of the boiler between the bottom section C and the top section are sub-

stantially alike. They are provided with side enlargements d corresponding to the side enlargements of the said lower section; but they are constructed with two apertures d' d^2 in the bottom corresponding with the openings in the top of the section below, and with two similar apertures or openings d^3 d^4 corresponding to the top openings in the bottom section C already described. The number of these body-sections D may be varied as desired, and they are surmounted by a top section E, which is also constructed with the side enlargements e like those in the sections below. In the bottom of these are apertures e' e^2 corresponding with the openings in the top of the sections below. On one side of this upper section there is also an opening e^3 immediately over the bottom opening e^2 , these being on the same side of the boiler as the lower or inlet aperture b' at the lower end of the fire-pot section described above. An outlet-pipe F is set in this top opening of the upper section, through which the hot water passes out for circulation in the usual way. There is also in this same section a large central opening e^4 , which is for the reception of the smoke-pipe to provide for the escape of the gases produced by combustion. The return-pipe G is connected with the annular space or chamber in the fire-pot section by insertion in the lower opening b' .

An important feature of my invention is the mode of connecting the boiler-sections together. Ordinarily these sections rest directly one upon the other, and the joints between the two at the connecting openings are packed. In this construction expansion and contraction, occasioned by heat and changes in the degree thereof, produce results which are very injurious. As the metal plates are in direct contact with each other and the joints are packed, the expansion and contraction of the metal by changes in temperature very often destroy the efficiency of the joints by injuring the packing, thus requiring frequent repairs which are not easily made and are often very annoying because of the necessary suspension of the operation of the boiler. It is the purpose of my improvement in this part of the boiler to obviate all these objections. For this purpose I provide what may be called "push-nipples" H of a special construction. This device is a ring adapted to fit the respective openings in two adjoining sections which have been described above; but this ring, instead of being made of a diameter exactly the same as the said openings in the sections, is constructed on a double taper or inclination running from the central circumferential line to each end. Obviously this construction produces a circumferential edge h , from which extends an inclination or tapering surface h' to each end or edge of the nipple. The diameter of the nipple at the central edge thereof is somewhat larger than the diameter of the connecting openings in adjoining sections, and the diameter at the

respective ends of the nipple is somewhat less than that of the said openings. These push-nipples make the joint between adjacent sections without any additional appliance. In setting up the boiler the push-nipples are set into the apertures in the top of the section in place.

From the statement as to relative size made above, it is evident that the nipple will not set down to the central or circumferential line, and also that when seated, by setting into the opening, as suggested, there will be a slightly-flaring space all the way from the line of contact between the two parts and the inner face of the section-top. It is practically impossible to show this construction clearly in a figure on a small scale like Fig. 1; but it is indicated in Fig. 2 of the drawings, and still more clearly in Fig. 3 thereof, in which figures the bearing-edge around the connecting apertures in the lower section is indicated by the letter d^5 . The next section above is set in place, the upper ends of the push-nipples being received in the connecting apertures in the bottom thereof, as seen in Figs. 2 and 3. Obviously the result in this instance is practically the same as in the seat of the nipple in the section below, described above—that is, the openings in the bottom of this upper section will strike the upper incline surface of the nipple before the central line is reached, finding there an edge bearing d^6 , the same as the bearing d^5 in the section below. This edge bearing is obtained by the tapering of the surface of the nipple from the central circumference outward toward each end, and the flaring space between the bearing or joint lines and the inner edges of the apertures in the sections are clearly seen in Fig. 3. Obviously this construction of the connecting devices with a difference in diameter between the central portion of the push-nipple and the connecting apertures in the boiler-sections will prevent actual contact between the adjacent boiler-sections. They must necessarily be separated by a slight free space, as seen in the drawings, which is an important result, for it tends to prevent the injurious effect of expansion and contraction.

The connecting openings in the boiler-sections and the surfaces of the nipples are both carefully milled so that the edge bearing described will be perfectly accurate, and the open space between two adjacent sections will permit a slight variation in the size of the nipples without disturbing the completeness of the joint-bearing. This connecting device may be used with the apertures in the sections cut straight through, but a slightly different construction is preferred. This change consists in slightly cutting away the outer edges of the connecting apertures in the respective sections, thereby producing a slight incline d^7 around these edges, as clearly shown in Fig. 3. These cuts may be on straight lines or slightly concave, the latter being the contour indicated in Fig. 3 of

the drawings. The cut is carefully made and milled, so as to secure a very accurate circular edge around the inside of the openings, which assists in making the joints perfectly tight. This is the form preferred, though I do not wish to be understood as limiting the improvement to this particular feature. It is preferable that the metal of the push-nipples shall be the same as that of the sections, as a more reliable joint connection is thus obtained, the expansion and contraction of both parts being then in the same degree under changes of temperature.

The outer edges of the boiler-sections are connected in the usual way by means of a narrow upright flange d^8 , rising from the edge of the top of each section and running around from one of the side enlargements to the other. The lower edge of the side of each section between the said enlargements fits within this flange when the sections are applied to build up the boiler, as described above and as shown in Fig. 4, and the joint thus made is packed in any known way so as to make an air-tight connection between these sections, the exterior appearance of the joint being shown in Fig. 5. The boiler-sections are also secured together by means of bolts i and slight horizontal flanges i on the respective sections of the boiler at one side of the water-columns or side enlargements thereof and at both the upper and lower edge, as seen in Figs. 4 and 5. The bolts are ordinary fastening-bolts, threaded and provided with a head, and the sections are secured together, after being set in place, by passing a bolt through apertures i^1 i^2 in the lower flange of the upper section and the upper flange of the lower section, respectively, a nut being turned on the projecting lower end of each bolt, by means of which this fastening device may be very tightly drawn and the respective sections set very firmly and closely upon the nipples.

The apertures for the bolts may be ordinary through-openings; but, if preferred, one of these apertures may be a recess in from the edge, this being the construction shown for the apertures in the respective lower flanges, as seen in Figs. 4 and 5. This is convenient for connection, for the head end of the bolt is readily slipped into the recess, and as the bolt will probably be longer than the space between the flanges of adjacent sections it would be almost impossible to insert it through plain apertures. It is very important that the boiler-sections be held very firmly and forcibly in contact with the nipples at the edge joints, which have been explained above. These fastening-bolts are of importance for this purpose, for obviously the sections can be drawn toward each other upon the respective inclines of the nipples with all the force required to make the joint contact perfectly firm.

It is evident that it makes no particular difference whether the recess-aperture is in the upper or lower flange of the respective sec-

tions, though preferably it is made in the lower flange, as seen in the drawings.

The operation and effect of the push-nipple joint between the sections have been set forth in connection with the description above. The circulation of water through the boiler has not been distinctly pointed out. The inlet is at the bottom of the fire-pot section, and the circulation of the water must be from this point around the fire-pot to the opposite side of the boiler, for there is no outlet from this annular space or chamber except on that side opposite to the inlet. Thence the flow is up through the upper opening in the top of the fire-pot section, into the annular water-space in the section above, from which there is an outlet on each side of the boiler, so that the water will pass partly through the opening directly above this aperture and partly circulate around the central heating-chamber, and thence out at the nipple connection on the other side of the boiler, and so on through the several sections until the upper one is reached, when the outlet is at the opening in the top of this section and on the same side as the main inlet below, and thence there is the circulation as usual through a room or rooms of the building and back to the chamber of the fire-pot section, as specified above. This circulation is indicated by arrows in the drawings and secures a very complete and satisfactory utilization of the heat produced by combustion in the fire-pot. Obviously the construction herein described and shown also provides for a very easy and ready detachment of a section or sections of the boiler. In fact, scarcely anything is required except simply to lift one section right off from the other, when the push-nipples are removed by simply lifting them from their seats, any repairs required effected, or new nipples or boiler-sections substituted, and the several parts are quickly replaced and the whole structure is again complete and ready for operation. The walls around the connecting apertures in the sections may be vertical, as contemplated in the description above, or, if desired, they may be inclined slightly in either direction—that is, slightly outward from the push-nipple, or a little inward toward the latter—but in all cases there must be a space between these two parts from the joint-lines and extending inward therefrom.

In regard to the circulation of water provided for by the construction of the several sections described and shown, it will be noticed that the water enters at one side of the boiler and at a point only a little above the grate at the bottom of the fire-pot; that the water then passes around the fire-pot to the opposite side thereof where it has an outlet to the sections above, and that thence it may pass into the next section at each side, and so on through the succeeding sections to the extreme upper one, whence there is an outlet on one side only. The side enlargements of the sections form a kind of water-column on

opposite sides of the structure, and it will be noted that the water has access from each section above the fire-pot to the next section in either or both of these water-columns. In
 5 circulating through these sections obviously the water may pass from one to the other at each side of the boiler—that is, in each water-column—but through whichever passage it escapes it passes through a section but once,
 10 and if it moves from one side to the other of the section it passes over the hot surfaces of the heating-column but once. It will be seen also that the water may be passed up through one column alone. Hence if the fire is low
 15 and the lower or bottom section only is heated this heated water may pass up directly through one of the columns and out to the radiators without mingling to any great extent with the water in the sections above, which will
 20 probably be colder and heavier, so that even with a low fire hot water may be sent directly to the radiators.

I do not wish to be understood as limiting my invention to the precise construction and
 25 arrangement of all the devices as herein shown and described, for obviously some mechanical modifications may be made without losing the main features of the invention, and such changes are considered within the province of
 30 the invention and are contemplated in the practical application thereof under different circumstances.

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

1. In a sectional boiler, the boiler sections provided with openings for the circulation of water, in combination with push nipples constructed with a central circumferential edge
 40 of greater diameter than that of the said openings and tapering in both directions from said central edge so that each end will enter part-way the opening in one of the boiler sections, these two parts being formed and milled to
 45 provide a sharp edge bearing between each taper of the nipple and the openings in the adjacent sections to which it is applied a short distance from the enlarged central edge of the nipple, substantially as described.

50 2. In a sectional boiler, the boiler sections provided with openings for the circulation of water, in combination with push nipples of

larger central diameter than said openings and tapering thence at each end to enter part-way the said openings in adjacent sections,
 55 the nipples and said openings being constructed to provide a sharp edge bearing at the contact lines and a slight open space inward from said bearing between the nipple and the face or wall of the opening, substantially as
 60 described.

3. In a sectional boiler, the boiler sections provided with openings in the top and bottom for the circulation of water and cut away slightly at the outer edge thereof, in combination with push nipples of larger central
 65 diameter than said openings, tapering toward each end from the central circumference thereof and making a sharp edge bearing with the openings in the boiler sections inside of the enlarged outer edges of the latter, which
 70 are not in contact with the nipples, substantially as described.

4. In a sectional boiler, the fire-pot section constructed with an annular space entirely
 75 surrounding the fire-pot and provided with an inlet opening at one side at the bottom thereof and a single outlet opening in the top of the fire-pot section and on the side opposite to that of the inlet opening, in combination
 80 with body sections arranged successively above the former section and with the first connecting at one side directly with the top opening in the fire-pot section, substantially
 85 as described.

5. In a sectional boiler, the fire-pot section having a free annular space around the fire-pot with an inlet opening at one side of the section and a top outlet opening at the opposite side thereof, in combination with a body
 90 section C, immediately above the fire-pot section and provided with a single opening in the bottom at one side, corresponding to the top opening in the section immediately below, and two openings in the top arranged on opposite sides thereof, and body sections arranged
 95 successively over the said lower section and provided with top and bottom openings on each side thereof, substantially as described.

HENRY S. DOWNE.

Witnesses:

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