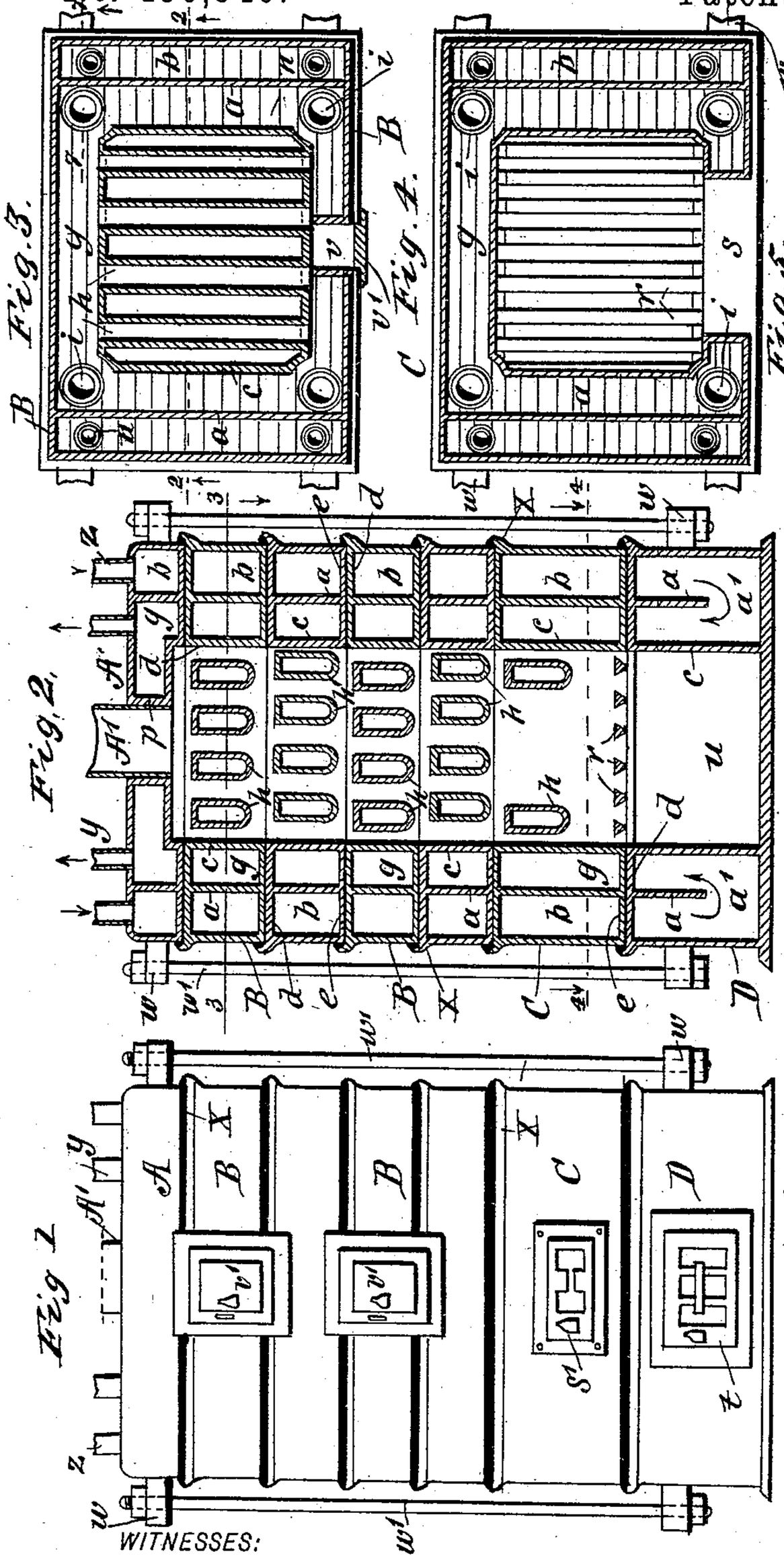
(No Model.)

T. C. ANDREWS.

STEAM BOILER AND WATER HEATER.

No. 490,940. Patented Jan. 31, 1893.



UNITED STATES PATENT OFFICE.

THOMAS C. ANDREWS, OF NEW YORK, N. Y.

STEAM-BOILER AND WATER-HEATER.

SPECIFICATION forming part of Letters Patent No. 490,940, dated January 31, 1893.

Application filed October 24, 1892. Serial No. 449,827. (No model.)

To all whom it may concern:

Be it known that I, THOMAS C. ANDREWS, of New York city, in the county and State of New York, have invented a new and useful Steam-Boiler and Water-Heater, of which the following is a full, clear, and exact description.

This invention relates to an improvement in boilers for the evolution of steam, or the heating of water, and circulation of the latter for house warming and similar uses; and consists in the peculiar construction of parts, and their combination, as is hereinafter described and claimed.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a front perspective view of the improved boiler; Fig. 2 is a view in vertical section, on the line 2—2 in Fig. 3; Fig. 3 is a plan view in section on the line 3—3 in Fig. 2, with parts broken away; Fig. 4 is a plan view in section on the line 4—4 in Fig. 2, also with parts broken away; Fig. 5 is a sectional plan view of the lower portion of the boiler, showing a modified form of construction; Fig. 6 is a similar view of the modified form of boiler, showing parts near the top of the same; and Fig. 7 is an enlarged broken vertical sectional view of part of the preferred form of boiler, taken on the line 7—7 in Fig. 3.

The boiler is preferably formed of cast metal in several sections A, B, C, and D, which are rectangular in form externally, and are assembled in a tier when the boiler is completed for service. The similar sections B, are parallel on their top and bottom sides, and have transverse vertical walls *a*, introduced at a proper distance from each side, thereby producing an oblong chamber *b*, between the outer side walls and the partitions *a*.

In each boiler section B, a rectangular ring wall *c*, is held, with its sides parallel to the external walls of the section, by the junction of its top and bottom edges with the top wall *d*, and bottom wall *e*, of said section.

The ring wall *c*, of each boiler section B is made of such proportionate dimensions diametrically considered, that a suitable water space *g* is afforded between the ring-wall and partition walls *a*, and front and rear walls of the section, as indicated in Fig. 3.

Across the rectangular opening encompassed by the ring-wall *c* of each boiler section B, a series of spaced and parallel tubes *h*, are formed and integrally connected at their ends to the opposite sides of said wall, that is apertured in alignment with the passage through each tube, thereby permitting fluid in the space *g*, of each section to freely circulate through all the tubes therein.

To establish a free communication between the boiler sections B, there are aligning circular apertures *i*, formed in the top walls *d*, and bottom walls *e*, of the same, and concentric with these circular holes an annular groove is produced in each wall face oppositely, so that a gum or other suitable joint ring *m* may be embedded in the surrounding groove or recess of each aperture and afford means to seal the joints between the water spaces *g*, when the several chambers B, are assembled. It is essential that the spaces or oblong chambers *b*, should be rendered communicating; to effect which apertures *n*, are formed in the top and bottom walls of each section B, oppositely, as represented in Fig. 7, and sealing joints are therefor provided consisting of embedded rings *o*, similar to the rings *m*.

The boiler section A, is made rectangular in contour and of similar dimensions laterally to the sections B, so that it will be adapted to rest upon the top face of the uppermost section B, when the boiler is complete. There are transverse partition walls *a*, formed in the section A, that are in the same vertical planes with the similar partition walls of the sections B.

The top and bottom walls of the section A, are parallel, and extend throughout the area of the section except where centrally apertured to receive a smoke stack A′, that is shown broken in Fig. 2, the aperture mentioned being produced vertically in the boiler section A, by the formation of an integral collar wall *p* which joins at its ends with the top and bottom walls of the section A.

Apertures (not shown) are produced in the lower wall of the boiler section A, in vertical alignment with the apertures *i*, *n*, of the sections B, thus affording a free passage for water between the outer chambers *a* of the sections A, B, and also of the water spaces *g*, therein, and joint rings are furnished for

these holes to prevent leakage between the sections.

The boiler section C, is of greater height than the sections B, above it, and constitutes the fire box of the boiler, having the division walls *a*, and ring wall *c;* which latter forms the sides of the fire chamber, and is apertured at the front above the grate bars *r*, that are horizontally supported at their ends and are of any preferred form.

There are two transverse water circulating tubes *h*, formed or secured in the boiler section C, near the sides of ring wall *c*, and at the front this section is apertured to afford a stoke-hole *s*, see Fig. 4, that is furnished with a door *s'*, of ordinary form. (See Fig. 1.)

Below the boiler section C, a base section D, is located, wherein an ash-pit *u*, is produced directly beneath the grate bars *r*, by a ring wall *c*, that is in vertical alignment with the similar walls *c*, of the upper boiler sections C, and B, and a door *t*, is furnished for the removal of ashes from the base section, (see Fig. 1.)

The top and bottom walls of the boiler sections C, D, are apertured to afford water passages which align with the similar apertures *i*, *n*, in the upper sections, and these should be in like manner protected with sealing joint rings.

Transverse partition walls *a*, are formed in the base section D, which depend a proper depth from the top wall of the section, as shown in Fig. 2, the spaces *a'*, allowed below the free lower edges of these partitions affording communication between the outer spaces or chambers *b*, and the annular water spaces *g*.

Hand hole apertures *v*, are formed in the boiler sections B, at the front by preference, to allow the introduction of a proper implement for the removal of soot accumulation, which hand holes are normally closed by cap plates *v'*, secured removably in place by any suitable means.

There are vertically aligning and perforated lugs *w*, formed exteriorly on the sides of the boiler sections A, and D, for the reception of clamping bolts *w'*, that are furnished with screw ends and nuts on said ends, whereby the assembled boiler sections A, B, C and D may be drawn into close connection and so maintained.

From the sides of the boiler sections on the top edge of each section where they engage each other, a projection or ledge X, is formed, which is adapted to receive and retain fireproof joint putty or cement that will seal the joints between the sections and render them intact, so that there will be no crevices between to vitiate draft or permit the escape of sparks.

The transverse water circulating tubes *h*, may be made of various forms in cross section, that preferred and shown consists in providing each tube with parallel sides, flattened top, and rounded bottom faces, see Fig. 2, which will avoid improper draft impediment and permit tubes of proper capacity to be employed. As shown, the tubes *h*, are staggered, or so located in the respective sections B, and C, that those of one section will not vertically align their sides with the tubes of an adjacent section; the object of which arrangement is to cause an intimate contact of heat evolved in the fire-box, with the exteriors of the tubes as it passes upwardly to the stack A'.

The top wall of the section A, is perforated above the water chambers *g*, *b*, and water circulating pipes *y*, *z*, are connected with said perforations, the pipes *y*, being adapted to receive water from the water spaces *g*, and the pipes *z*, return water to the boiler which has been projected from the water spaces *g*.

In service, the boiler being properly erected in a lower story, or cellar of a building that is to be heated, and the water pipes *y*, *z*, extended and connected with suitable heat radiating devices in the rooms of the building above the boiler, it will be seen that the evolution of heat in the fire-box by combustion of fuel in it, will speedily raise the temperature of the water that has been introduced in the water spaces of the boiler by any proper means (not shown). As the water is expanded, it will be forced upwardly through the pipe *y*, and heat radiators connected therewith, the cooled water flowing back by gravity down the pipe *z*, into the connected oblong water chambers *b*, and from the latter upwardly at the base of the boiler, into the annular water spaces *g*, to be again expanded by heat.

In Figs. 5 and 6, there is a single return water chamber *b*, provided for each boiler section B' D', which chambers are preferably located at the rear side of the boiler, or opposite the fire-door and other doors in the same, the arrangement for water circulation being similar to that shown in the preferred construction before explained.

The modified construction is to be used only when a small water heater is desired, and a large quantity of water is not to be circulated.

It will be evident that if the tubes *h*, are made of material that will be sufficiently strong, and the water feed is restricted, steam of low pressure may be produced and circulated for heating purposes, the pipes *y*, conveying the steam to radiators, and the pipes *z*, returning the condensed water in an obvious manner.

It is claimed that the particular arrangement of parts is of great advantage in the production of cheap and economical steam and hot water boilers; the provision of the return water chambers *b*, serving a useful purpose in that the cooled water as it is returned from circulation in the house, receives some heat from the partition walls *a*, and serves as a water jacket for said walls, so as to avoid loss of heat on the sides of the boiler. Furthermore, the large spaces afforded for water circulation in the boiler sections, pre-

vent impediment of circulation occurring in it while in service, and as there is no machine fitting needed in the construction, of any amount, the device can be produced at a lower initial cost.

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

1. A boiler, comprising a plurality of sections superposed and secured together, a central heat compartment in the several sections, a hot water chamber around the heat compartment in each section and all made to communicate, and communicating water return chambers exterior of the hot water chambers and equal in width therewith, substantially as described.

2. A boiler, comprising a plurality of sections superposed and secured together, a central heat compartment in each section, a surrounding integrally formed hot water chamber next to the heat compartment of each section, a return water chamber at each side of the hot water chamber of section, and integral therewith connections between the hot water chambers, connections between the return water chambers, a series of transverse spaced tubes in the central heat compartments, a fire box section below said tubes, and an ash-pit section below the fire-box section, substantially as described.

3. In a boiler, comprising a plurality of sections superposed and secured together, a stack in the cap section, an ash-pit in the base section, a fire-box in the section above the ash-pit section, a series of transverse tubes in the boiler sections intermediate of the cap section and fire-box section, doors for the tubed sections and for the fire-box and ash-pit sections, hot water chambers around the central heat compartment in the boiler sections, return water chambers exterior of the hot water chambers, all the chambers communicating, and circulating pipes for the water chambers, substantially as described.

4. A composite boiler made up of a series of superposed rectangular sections held together by bolts, a central heat compartment in each section, a draft stack on the top section, an ash-pit in the base section, a fire-box in the section above the ash-pit, grate bars in the fire-box section, doors for the two lower sections, transverse tubes in the boiler sections intermediate of the cap and fire-box sections, a hot water chamber around the heat compartment of each section, which chambers are in communication, return water chambers on the sides of the boiler sections exterior of the hot water chambers, and communicating with each other and also with the hot water chambers in the base section of the boiler, substantially as described.

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Witnesses:
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