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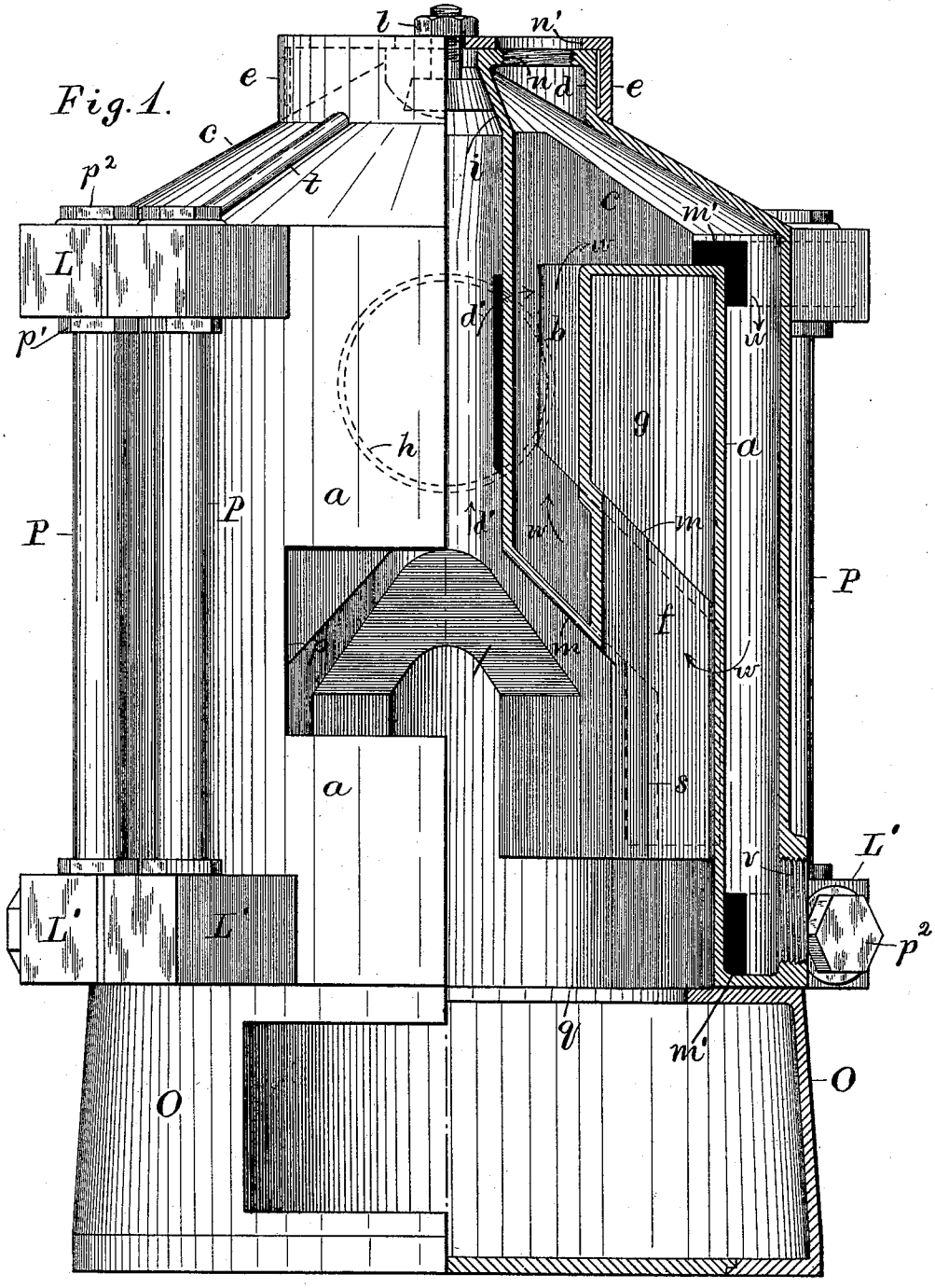
J. J. HOGAN.

BOILER IN VERTICAL SECTIONS.

No. 520,885. Patented June 5, 1894.

Fig. 1.



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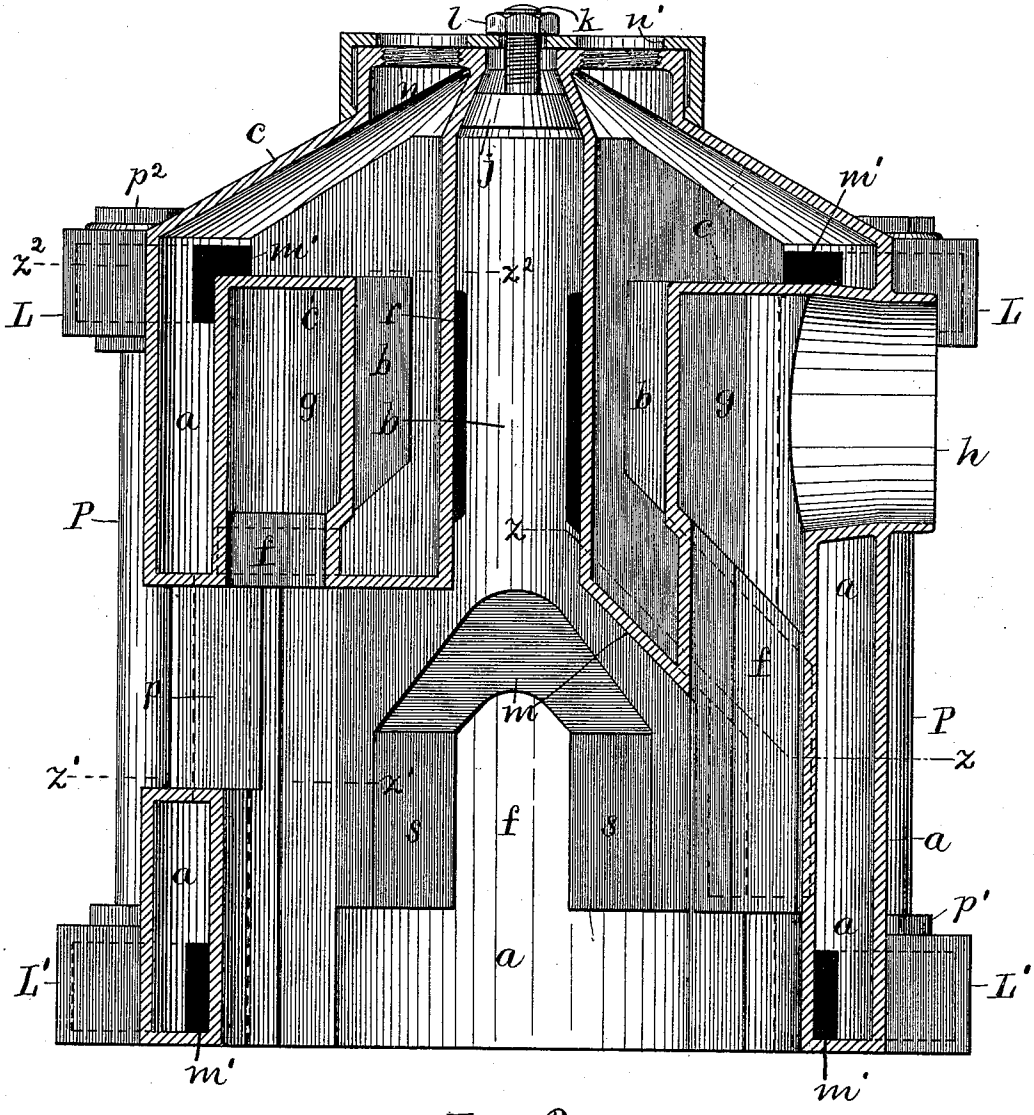

Fig. 2.

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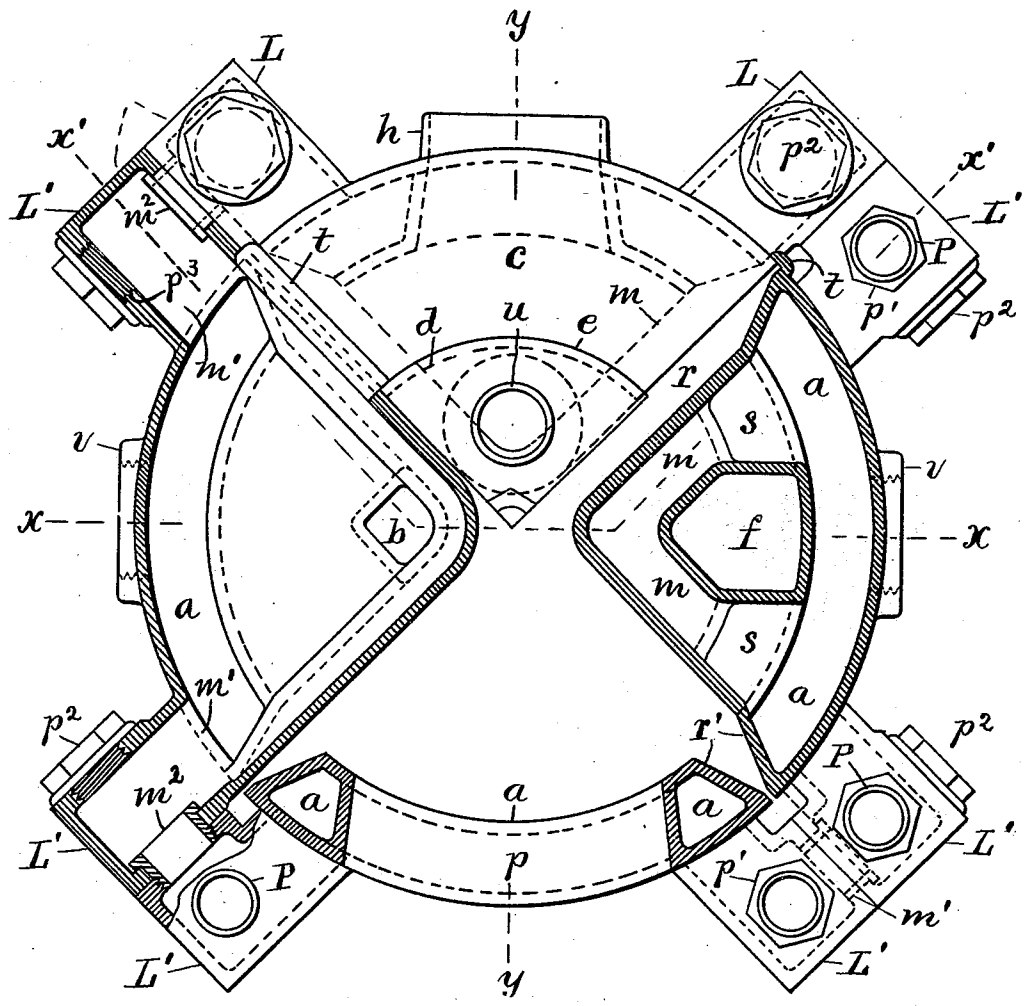

Fig. 3.

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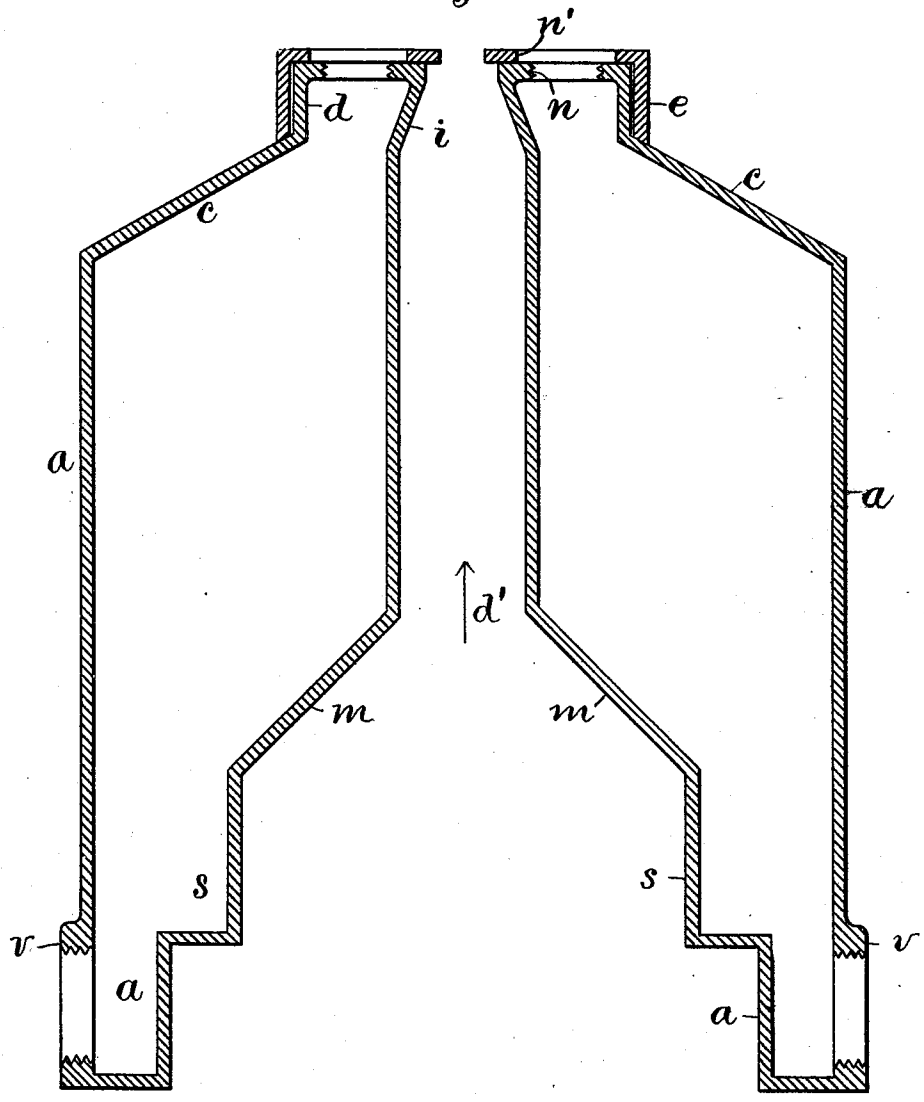
BOILER IN VERTICAL SECTIONS.

No. 520,885. Patented June 5, 1894.

Fig. 4.



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J. J. HOGAN.

BOILER IN VERTICAL SECTIONS.

No. 520,885. Patented June 5, 1894.

Fig. 5.

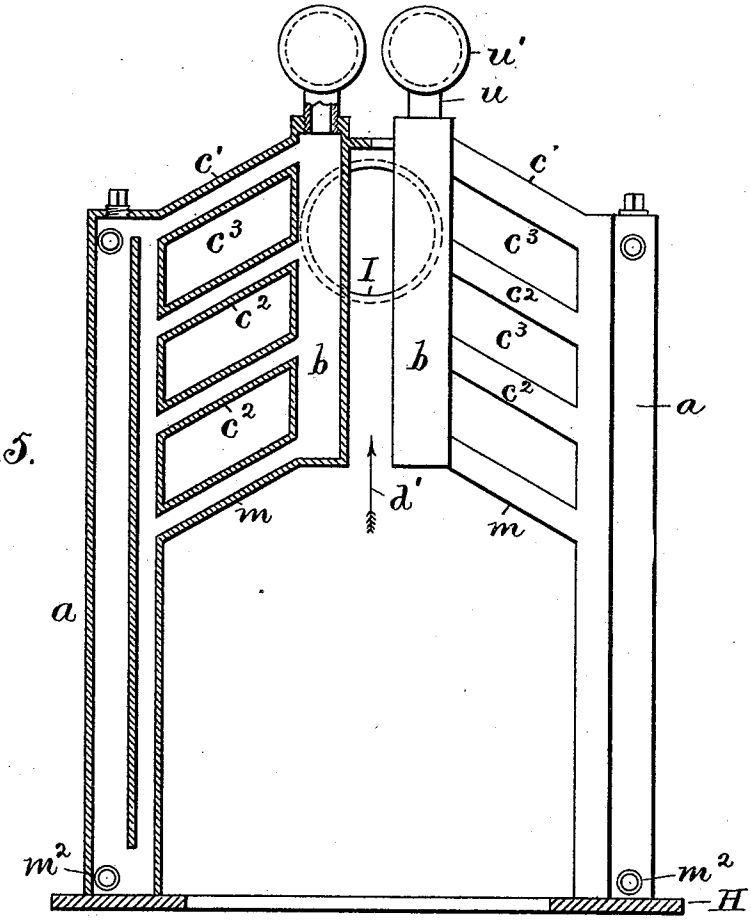
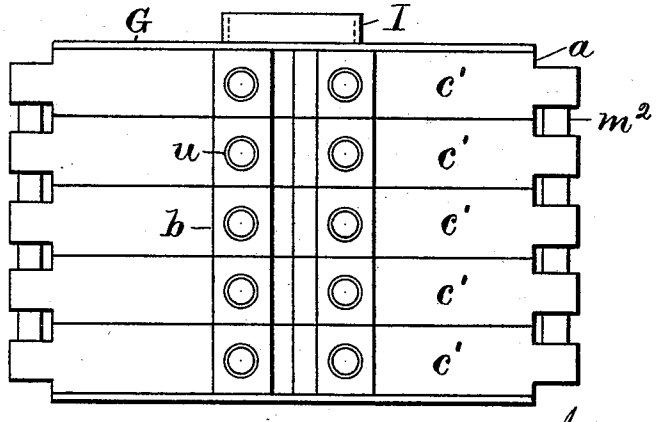


Fig. 6.



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J. J. HOGAN.

BOILER IN VERTICAL SECTIONS.

No. 520,885. Patented June 5, 1894.

Fig. 7.

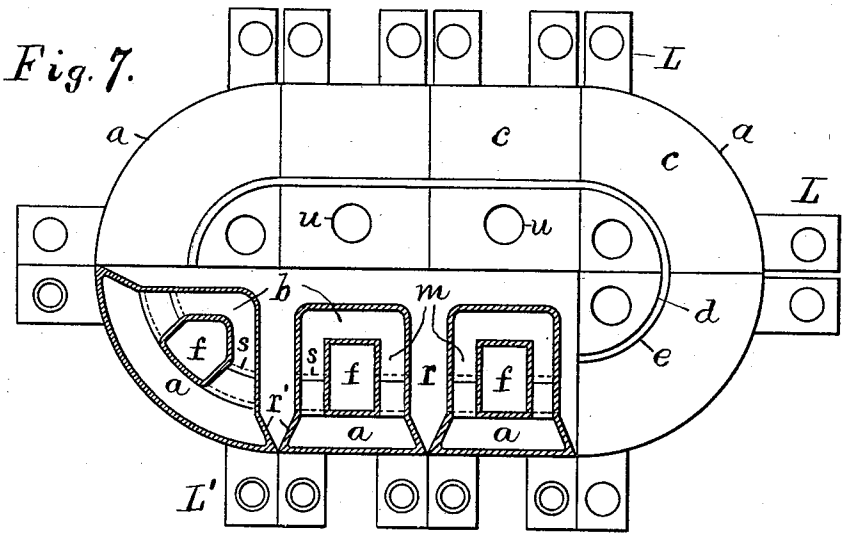
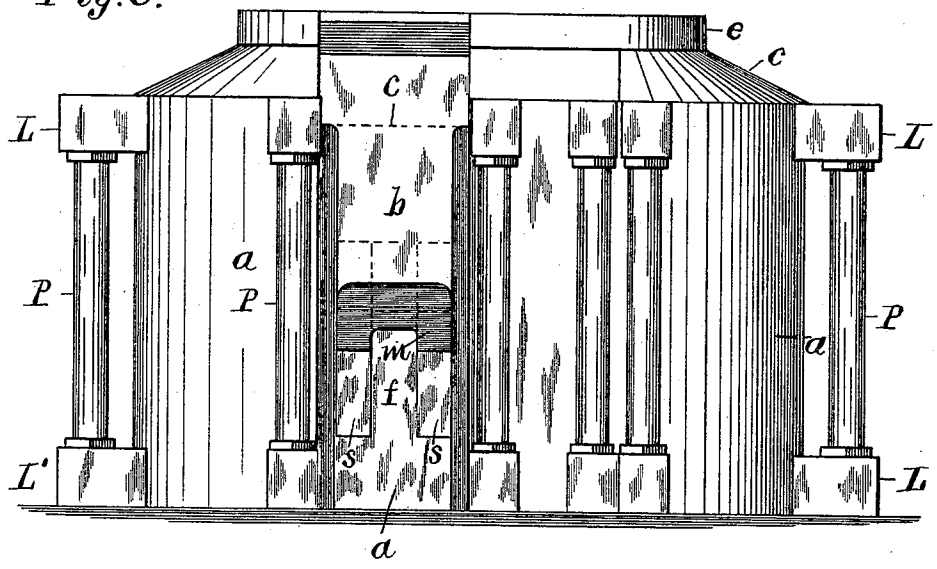


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN J. HOGAN, OF BROOKLYN, NEW YORK.

BOILER IN VERTICAL SECTIONS.

SPECIFICATION forming part of Letters Patent No. 520,885, dated June 5, 1894.

Application filed May 13, 1892. Renewed November 4, 1893. Serial No. 490,010. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. HOGAN, a citizen of the United States, residing at Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Boilers in Vertical Sections, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The object of this invention is to furnish a cheap construction for a heating boiler formed of separate cast iron sections, such a boiler being adapted to stand the pressure commonly required in furnishing either steam or water to heating radiators.

The construction is especially adapted to promote the circulation within the separate boiler sections to prevent the overheating of the parts nearest to the fire, and to thus secure the utmost efficiency and economy in practice. Each section of the boiler consists in a single casting provided with a water column at its inner side and a water column at its outer side, the inner column being arranged over the middle of the fire box, and the outer column forming the wall of the fire box, and the two columns being connected above the fire by water tubes having their top sides sloped upwardly from the outer to the inner column. The most efficient boiler for such a construction is in circular form with segmental sections, but the boiler may also be made in flat sections adapted for connection together laterally to form a rectangular fire box which may be extended at any time by the addition of more sections to increase the capacity of the boiler. Both constructions are shown in the annexed drawings, in which—

Figure 1 is an elevation partly in section on line x, x, in Fig. 3. Fig. 2 is an elevation in section on line y, y, in Fig. 3. Fig. 3 shows the boiler divided in four sections, with the upper section carrying the smoke nozzle shown in plan, the section at the right side of the figure being divided obliquely upon line z, z in Fig. 1, the section at the lower side through the door being divided on line z', z', in Fig. 2, and the section at the left being divided at line z^2, z^3, Fig. 2. Fig. 4 is an elevation on line x' x', in Fig. 3. Fig. 5 shows at the right side an elevation of one of the flat boiler sections, while the left side shows a similar section divided vertically. Two such sections form an arch over the fire box, as shown in Fig. 5, a bed plate being shown beneath the legs of the two sections, upon which plate a grate would be sustained in practice. Fig. 6 shows five such double sections in plan connected together laterally by thimbles; but a considerable number of such sections would be connected together in practice to form a fire box of the desired length. Fig. 7 is a plan of an extensible boiler partly in section where hatched, upon the same plane as the right side of Fig. 3. Fig. 8 is an elevation with one square section removed.

In Figs. 1 to 3, showing a circular boiler made in four sections, the outer water column of each section is formed as a segment of a cylindrical water jacket a, and the inner water column b, being located adjacent to the center of the boiler over the fire, is reduced to a vertical water tube. The outer and inner columns open at the top into a sector c of a dome, the under side of which is flat and the upper side of which is sloping, and provided with a sector of a collar d at the middle, over which a cap e is secured; to hold the boiler sections together. The water jacket extends to the bottom of the boiler and forms the wall of the fire box, and is connected at a suitable distance above the bottom with the inner column b by a sloping crown piece m which is perforated vertically with flue f to conduct the gases into the space g between the columns a and b. The inner columns are separated by a central space in which arrows d' are applied in Fig. 1; showing the passage of the smoke or gases upward to the bottom of the dome sectors c. Spaces lettered r in Fig. 3 are also formed between the several crown pieces and inner columns, by which the smoke rises to the bottom of the dome, and a smoke nozzle h is formed through the outer column near the top of one section to conduct the smoke and gases from all of the internal spaces to a suitable flue. The sections are shaped, within the collar d at the top, to form a conical or square seat i in which a bolt head j may be clamped and the bolt k extended outwardly, with a nut l to hold the cap e in place. The spaces r are closed at the periphery of the boiler by beveling the edges of the outer columns as shown in Fig. 3 at r', and

the joints between the sections upon the sides and top of the boiler are closed by overlapping tongues t, as shown in Figs. 1 and 3. The top of each section is provided with a threaded hole n to receive an outlet pipe u, shown in Fig. 3, thus providing four pipes to discharge the fluid from the entire boiler. The cap is provided with openings n' over such holes, to insert the pipes, and pipe nozzles v are provided upon opposite sides of the boiler at the bottom; to admit the feed water or return fluid from the radiators. One of the sections is provided with a door opening p opposite the smoke nozzle h, and such opening would be closed with a suitable door. An external view of the sections is shown at the left side of Fig. 1, and an internal view at the right side, the inner and outer water columns being divided by the section plane so as to clearly show their relation to the dome and the passages connecting the bottom of the columns. The sections are shown sustained upon a base O adapted to serve as an ash box. The fire box of the boiler is embraced between the several crown pieces m and the outer columns a, and may evidently be fired with fuel of any kind. A ring or flange q is projected from the top of the ash box inside of the sections sufficiently to sustain a grate, gas-burner, or other heating device. Whatever kind of fuel be used, the flames would impinge upon all the surfaces adjacent to the fire box and would penetrate the flues f, the spaces g above the crown pieces, and the spaces r between the several sections. The projections s may be extended downward to the bottom of the columns a, or they may be dispensed with and the crown piece extended into direct connection with the outer column.

To prevent any portion of the sections from being overheated, an internal circulation is provided throughout all the sections, by means of hollow lugs L, L', projected outwardly from the upper and lower ends of the water columns a at their junction, and thimbles m' connecting such lugs laterally. The lugs communicate, as is indicated by the black passages m' in Figs. 1 and 2, with the interior of the outer column, and through the same with the dome, the crown piece m, and the inner columns b. When the outlet pipes u are connected with radiators, the fluid would circulate from the dome of the boiler through such radiators and into the bottom of the outer columns through the inlets v. The fluid entering such inlets would be drawn into the hollow projections s adjacent to the fire box, and into the crown piece m and inner column b, by reason of the higher temperature of such parts of the boiler, and the greater levity of the water therein. When the water, elevated by its temperature and its levity in the columns b, exceeds the volume of water drawn from the pipes u, the excess of water would circulate, as indicated by the arrows w in Fig. 1, downward in the outer column a and continuously in a circuit through the crown piece and dome, as shown by the arrows. The upper side of the crown piece and the upper side of the dome are sloping, to facilitate the movement of the hottest fluid toward the outlet opening n from which the water is driven to the radiators, and the sloping surface upon the top of the dome thus prevents the hotter fluid from passing into the outer column a; while the flat under side of the dome operates more effectively as a heating surface by its disposition perpendicular to the flame or heated gases rising in the spaces g. It will also be observed that the flues f in the crown pieces are directly beneath the flat surface of the dome, so that the flames rising from the fire box may strike the same without any obstruction. The inner and outer columns, connected near the top and bottom by the crown piece and dome, thus furnish a complete and independent circuit for the water in each section, and prevent any of the sections from being overheated in any part; if the water is drawn from the same in a less degree than from one of the others. The lugs are connected vertically by pipes P held in place by lock nuts p'. When the exterior circulation is cut off by disusing the radiators, as sometimes occurs when the fire is in the boiler, the pipes P furnish a downward circulation for the contents of the boiler, in addition to that in the column a. The pipes P, being located upon the exterior of the water jacket of the boiler, are wholly removed from the influence of the fire, and are thus much colder than any other parts of the boiler. When a hot fire exists and the external circulation is cut off, such pipes furnish a means of cooling the contents of the sections, as the gravity of their contents operates to force the same into the lower part of each section and thence upward through the crown piece and inner column, which are most highly heated.

The operation of the boiler shown in Figs. 5 and 6 is substantially the same, as to the inner and outer columns and sloping water connections; as the construction shown in the previous figures. The outer columns form a water jacket and rest upon a bed plate H. They are connected laterally at the top and bottom like those shown in the other figures by thimbles m^2, and the top of each inner column is provided with an outlet pipe u, which pipes may be connected with a header u', as shown in Fig. 5 if desired. The crown piece m and tubes c^2 are made narrower than the columns, thus forming intermediate spaces which are closed by the contact of the sloping tubes c' which connect the top of the sections. Intermediate tubes c^2 connect the inner and outer columns; with intervening smoke spaces c^3, into which the smoke and gases rise in the same manner as is indicated by arrows d as in Fig. 1. The series of sections would be provided at the opposite ends with plates G to form the ends of the fire box, the front plate being provided with a door to supply the fuel, and the

rear plate being provided with a smoke outlet I from which the smoke would be discharged. By the provision of the columns *a* and *b*, a complete circuit for the water is provided within each section, while the lateral connection of the sections by the thimbles m^2 permits the fluid to circulate throughout the entire boiler, to supply the portion upon which the draft may be the greatest. It will be noticed that the entire construction for the boiler is very cheap, as the castings, even when the boiler is made in cylindrical form, require no finishing except the formation of a few screw threads to insert the plugs p^2, the thimbles *m'*; and in the holes *n*, to receive the outlet pipes *u*. The thimbles are shown in Fig. 3 provided with collars which could not be passed through the plugged apertures, but the thimbles may be inserted within the columns *a* through the inlet nozzles *v*, and thence into the lugs L', where they are tightened by a wrench, through the apertures p^3. It will be perceived that the sloping crown piece and the dome sectors *c* form water tubes or connections joining the outer column *a* and the inner column *b*, and that the sloping of such water tubes upon their upper sides facilitates the movement of the water from the outer and colder column to the inner and hotter column. The object in forming the water pillars *s* upon the inner face of the water leg *a* is to subdivide the water in contact with the hottest part of the fire, and thus increase the heating surface where such surface is most efficient.

The cap *e* embraces the sections of the collar *d*, upon their periphery, to hold the boiler sections together, and a loose band would obviously perform the same function. The plate forming the top of the cap is provided simply to secure the band at the periphery of the cap firmly in place.

All the improvements described herein may be embodied in an extensible boiler, by separating the sections shown in Fig. 3 upon a diametral line, and inserting rectangular or square sections of similar character between them to any desired number. Such a boiler of eight sections, four of which are square and four of which are segmental, is shown in Figs. 7 and 8, the flue *f* being made square in the intermediate square sections, and the inner water column *b* corresponding nearly in width to the outer water column *a*. The sections would be secured together in the same manner as the sections shown in Fig. 3, by lateral thimbles *l* at the bottom, and a simple band *e* is shown in Fig. 7 applied to the collar *d* upon all the sections. The inner face of one of the square sections is exposed by the removal of the opposite square section in Fig. 8, showing the sloping crown piece *m* which would project inwardly over the furnace, as shown in Figs. 1 and 2. The door to the furnace is not shown in Fig. 8, but would be formed in practice through the side of one or more of the sections, or at opposite ends of the entire boiler; as may be required to inspect the furnace or supply the same with fuel if coal be used. The capacity of the boiler is more than doubled by the insertion of the square sections shown in Fig. 7, but a greater or less number of square sections may be interposed between the segmental sections at the ends to form a boiler of any desired power.

An advantage of this construction lies in the great facility by which the power of a boiler may be changed at slight expense after it has been put in use.

The segmental sections upon one end of such boiler may obviously be removed and other square sections added to the construction without any expense except for the additional square sections.

Such a boiler is thus very desirable for use where it may require future enlargement.

Having thus set forth the nature of my invention, what I claim herein is—

1. A vertical sectional boiler having separate sections upon opposite sides, formed each in a single casting provided with a water column upon its inner side and a water column constituting a water jacket upon its outer side, and sloping water passages connecting the water jacket with the upper and lower ends of the inner column, as and for the purpose set forth.

2. A vertical sectional boiler having separate sections upon several sides formed each in a single casting provided with a water column upon its inner side and a water column constituting a water jacket upon its outer side, a water tube or connection between the tops of the columns, a sloping crown piece between the water jacket and the bottom of the inner column, and an aperture through such crown piece in the rear of the inner column for the circulation of gases between the columns, substantially as herein set forth.

3. A circular boiler having separate sections upon several sides formed each in a single casting provided with a water column upon its inner side and a water column constituting a cylindrical jacket upon its outer side, the tops of the columns in each section being connected by a sector of a dome having a flat bottom and a top sloped upwardly toward the center of the boiler, and the bottom of the inner column being connected with the water jacket by a sloping crown piece perforated to permit the passage of the gases upward into contact with the flat side of the steam dome, as and for the purpose set forth.

4. A circular boiler having separate sections upon several sides formed each in a single casting provided with a water column upon its inner side and a water column constituting a cylindrical jacket upon its outer side, such jacket being extended below the inner column to form a fire-box casing, the

tops of the columns in each section being connected by a sector of a dome, and the bottom of the inner column being connected by a sloping crown piece with water pillars formed upon the inner side of the jacket, and a smoke passage being provided between the water pillars and through the crown piece to permit the access of the gases upward into contact with the under side of the steam dome, as and for the purpose set forth.

5. A circular boiler consisting in four sections formed each in a single casting provided with a water column upon its inner side and a water column constituting a cylindrical jacket upon its outer side, a sector of a dome connecting the tops of the columns, a sloping crown piece connecting the bottom of the inner column with the water jacket and perforated for the passage of the gases, hollow lugs connecting with the exterior of the jacket upon the upper and lower corners of each section, and thimbles connecting the same laterally, as and for the purpose set forth.

6. A circular boiler consisting in four sections formed each in a single casting provided with a water column upon its inner side and a water column constituting a cylindrical jacket upon its outer side, a sector of a dome connecting the tops of the columns, a sloping crown piece connecting the bottom of the inner column with the water jacket and perforated for the passage of the gases, hollow lugs connecting with the exterior of the jacket upon the upper and lower corners of each section, thimbles connecting the same laterally, and pipes connecting the lugs vertically, as and for the purpose set forth.

7. A circular boiler having separate sections upon several sides formed each in a single casting provided with a water column upon its inner side and a water column constituting a cylindrical jacket upon its outer side, a sector of a dome connecting the jacket with the inner column at their upper ends, and a sloping crown piece connecting the bottom of the inner column with the water jacket and perforated for the passage of the gases, a sector of a collar upon the top of the steam dome, a cap or band applied to such collar to hold the sections together at the top, an outlet from the top of each section, and water connections between the several sections at the top and bottom, as and for the purpose set forth.

8. A vertical sectional boiler having segmental sections at the ends, with square sections secured between the same substantially as described, and each section being provided with a dome and with the outer column *a* and inner column *b* connected therewith, and a sloping water connection between the lower ends of such columns for circulation through the same, substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

JOHN J. HOGAN.

Witnesses:
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T. S. CRANE.