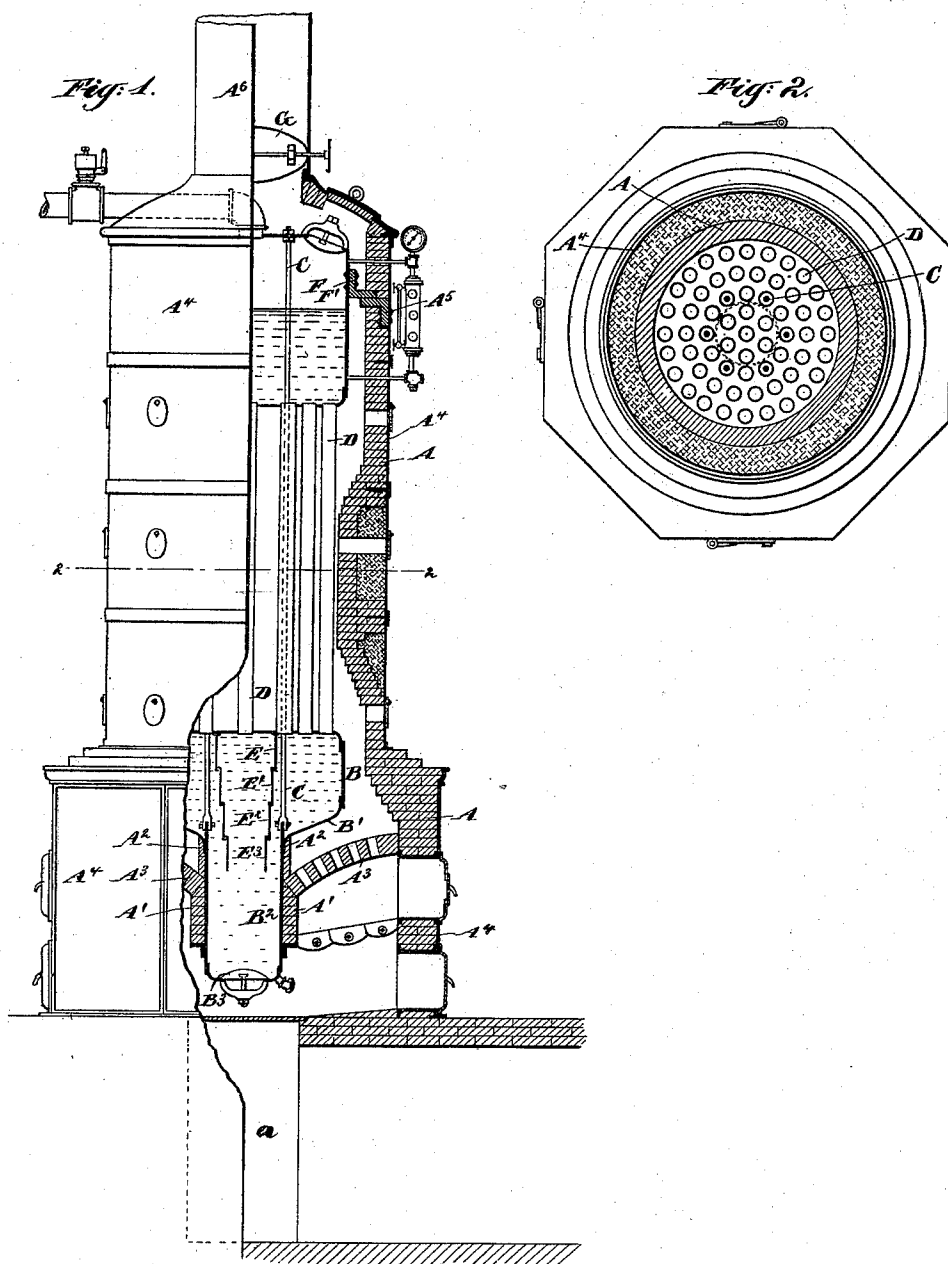


(No Model.)

M. R. MOORE.
STEAM BOILER.

No. 535,115.

Patented Mar. 5, 1895.



Witnesses:

Charles R. Seale,
H. J. Johnston.

Inventor:

Matthew R. Moore
by his attorney
Thomas S. Sisson

UNITED STATES PATENT OFFICE.

MATTHEW ROBERT MOORE, OF INDIANAPOLIS, INDIANA.

STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 535,115, dated March 5, 1895.

Application filed July 29, 1893. Renewed January 31, 1895. Serial No. 536,888. (No model.)

To all whom it may concern.

Be it known that I, MATTHEW ROBERT MOORE, a citizen of the United States, residing at Indianapolis, in the county of Marion, in the State of Indiana, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a specification.

My improvements pertain to that class in which a boiler of the general cylindrical section is mounted in an upright position within an inclosing casing of masonry. The lower part is a peculiarly shaped drum of an inverted bottle form, a central portion of less diameter extending down below the grate, while the main portion is held at a considerable height above the fire. The contracted portion of the lower drum is incased by fire-brick. The mid-height of the boiler is a set of vertical tubes. The upper part is a drum in which a liberal surface is presented for the disengagement of the steam from the water. I promote the descent of the water through the tubes near the center by means of a petticoat rim, made in horizontal sections, allowing the petticoat to be contracted telescopewise whenever necessary for repairs or cleaning. When extended downward so as to be fully efficient, it protects the central set of tubes from being affected by the large volume of steam generated in the exterior portion of the lower drum. The steam generated there rises through the series of tubes above, and insures an active upward current of steam and water through those tubes, and further steam is generated in these tubes by the circulation of the gaseous products of combustion through the spaces between them. The steam and water thus rising separate in the upper drum and the steam is conveyed away for use. The water descends through the central tubes of the series, which tubes are over the central portion of the bottom. The small quantity of steam generated in these central tubes is carried down by the descending current, and moving outward in the lower portion rises and contributes to the vigor of the strong rising columns in the tubes near the periphery of the series. The non-conducting protection between the central portion of the boiler and the annular furnace, which sur-

rounds it protects the fire from being too much cooled along the inner edge and allows all portions of the grate surface to be about equally efficient. The fire-brick also preserves that portion of the boiler from being over-heated in any exigency. The annular grate is slightly inclined inward. I prefer a shaking grate, and have indicated such, but this is not material. The annular furnace is fed, cleaned, &c., through doors in the outer casing. A perforated protection of fire-brick is extended over the fire at a proper height. At the mid-height of the tubes the masonry wall is extended inward so that it comes nearly or quite in contact with the outermost tubes. The hot gaseous products of combustion deflected inward thereby are caused to circulate among the tubes. They are afterward led outward and upward around the exterior of the upper drum and finally collected and conveyed away through a central stack at the top.

The accompanying drawings form a part of this specification and represent what I consider the best means of carrying out the invention.

Figure 1 is a central vertical section partly in elevation. Fig 2 is a horizontal section on the line 2—2 in Fig. 1.

Similar letters of reference indicate corresponding parts in both the figures where they appear.

A is the inclosing masonry, the portions most exposed to the heat being fire-brick. A' is an inner protection of fire-brick; A², a thinner upward extension therefrom, and A³ a funnel-shaped shield of fire-brick, liberally perforated, extending from the outer fire-brick A to the inner fire-bricks A', A². The fire on the annular grate is supplied with fuel through four doors, as shown.

B is the main body of the lower drum; B', a contraction in the form of a smoothly curved shoulder; B², an extension of the drum downward of smaller diameter, and B³ a bottom, which is made removable for convenience of manufacture, cleaning and repair. The smaller cylindrical part B² is extended upward above the base of the shoulder B' and forms a reliable fastening for stays, to be more fully described farther on.

D, D, &c., are vertical tubes connecting the horizontal tube sheet which forms the upper surface of the lower drum B with the corresponding horizontal tube sheet which forms the lower surface of the upper drum F. The tubes are expanded or otherwise firmly and tightly set in their respective tube sheets, and form a medium for the active circulation of the contents of the boiler, the steam and water rising through the outermost tubes of the series and the water descending through the innermost.

E is a hanging ring, screwed or otherwise permanently secured to the under face of the tube sheet which forms the upper surface of the lower drum. Its lower edge is flanged slightly inward and engages with a slight outward flange formed on the upper edge of a sufficiently smaller ring E'. The lower edge of this is flanged inward and similarly engages with a still smaller ring E², which in turn engages with a terminal ring E³. I term this part the "petticoat."

The rings E', E², E³, can all be lifted so as to cause them to telescope into each other and into the fixed ring E whenever it is necessary to obtain a clear space in the interior of the drum B for cleaning or repairs.

The stay-rods C extend upward from their junctions with the upper edge of the cylindrical part B² through the proper tubes D, and are strongly fastened to corresponding points in the upper sheet or top of the upper drum F.

It will be understood that the boiler is provided with the ordinary provisions for blowing off, feeding with water, taking away the steam, determining the height of the water-level, &c. The exterior of the masonry A is cased with iron A⁴. Internal brackets A⁵ riveted on this iron receive corresponding brackets F' riveted on the upper drum and cause the parts to mutually support each other. Hand-holes and covers are provided at proper intervals. The base of the stack A⁶ is equipped with a damper G and with means for adjusting and holding it.

The foundation below the boiler may be made of masonry or any other suitable material. I esteem it important to provide a pit *a* below the center to facilitate the removal of the bottom plate B³ in cleaning or repairing. When a number of my boilers are set together, the pits *a* may be left open and communicate with a tunnel through which the ashes can be conveniently removed without

the annoyance of hauling them out through the fire-room.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. I have shown the annular protection A² as considerably thinner than the corresponding protection A'. The part A' is exposed directly to the full heat of the fire, and it is important to defend the boiler efficiently against such heat. I esteem it of advantage also to partially defend the fire at that point against the cooling influence of the boiler. The non-conducting defense at the higher level above the funnel or partial arch A³ is of less importance, and may safely be thinner. The portion A² may be made still thinner or may be omitted altogether, if preferred.

I can vary the form of the petticoat E. Instead of making it in four sections, it can be successfully worked in three or five. It can extend down to a greater or less distance.

I have shown the fire-brick arch or shield A³ as laid in checker-work, but this may be varied. It is important to employ a material which will endure a high temperature for a long period, serving as a shield to defend the parts B, B', against being over-heated. I have shown the furnace part of the setting as polygonal, a cast iron casing made in sections, four of which contain the necessary fire and ash doors, but this may be varied. The upper portion of the masonry A and inclosing casing is preferably in short cylindrical sections, each in halves, so that they can be removed to give access to the boiler for repairs. I have shown the casing as provided with stoppered holes for the insertion of a steam flue cleaner to blow out the soot from the tubes, but this is not essential.

I claim as my invention—

In a steam boiler of the class described, the casing A, bottom drum B, tubes D and top drum F, in combination with a telescopic casing, as the petticoat E, E', E², extending downward from the central tubes, adapted to promote circulation of the water when in position for use and to be easily removed when required, all substantially as herein specified.

In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

MATTHEW ROBERT MOORE.

Witnesses:

ROLLIN DEFREES,
R. M. COFFIN.