(No Model.)

E. J. MOORE.

VERTICAL BOILER.

No. 426,839. Patented Apr. 29, 1890.

FIG. 1.

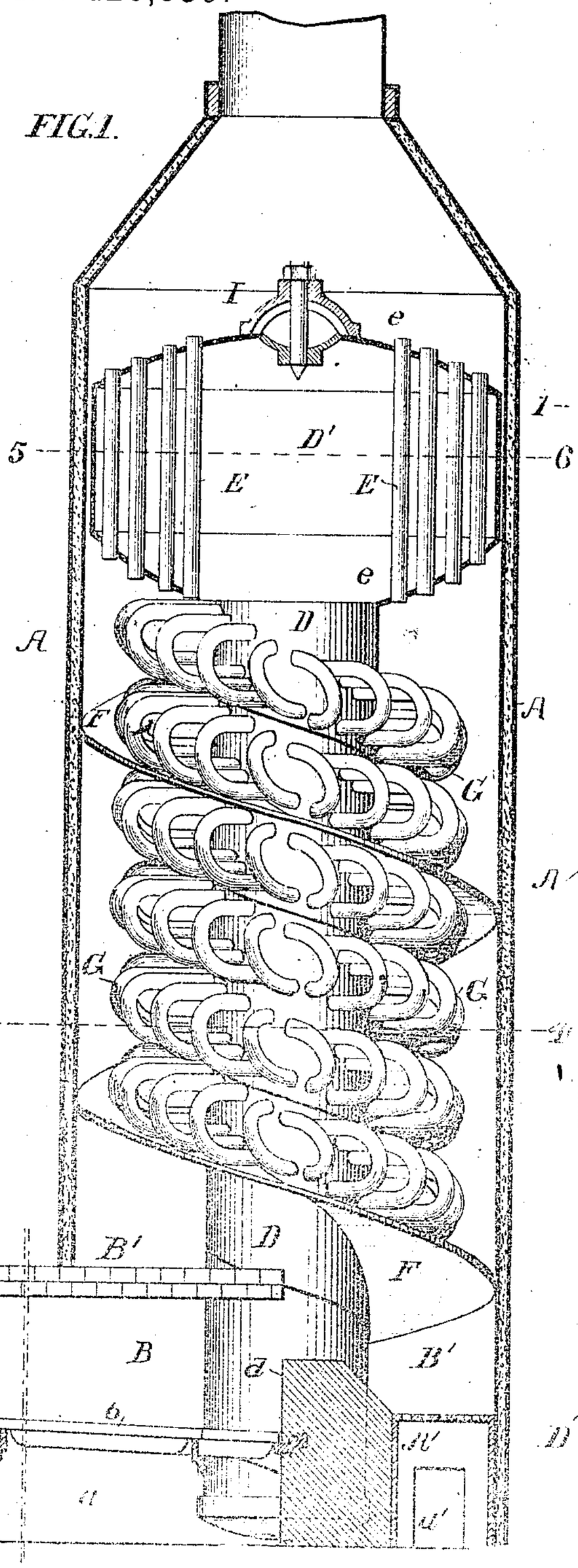


FIG. 3.

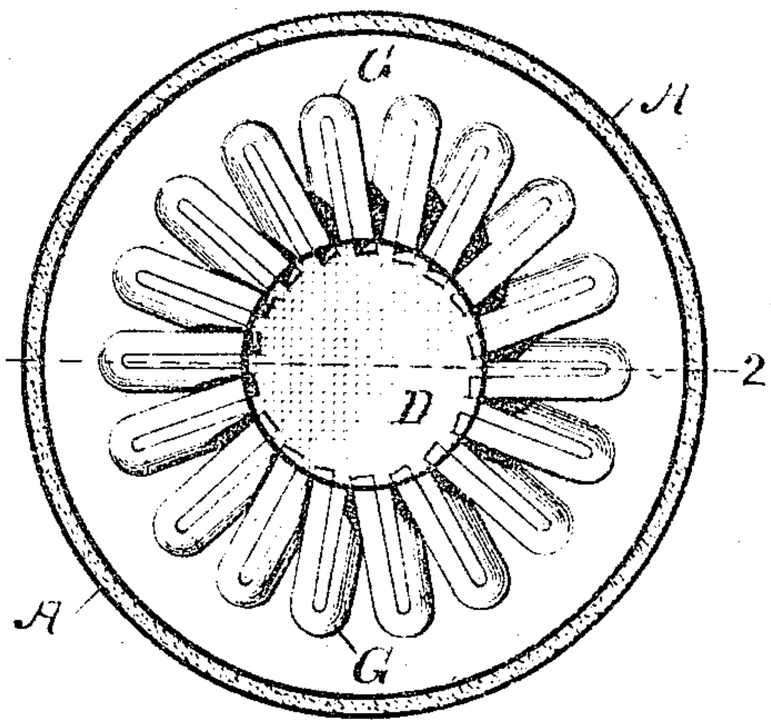


FIG. 2.

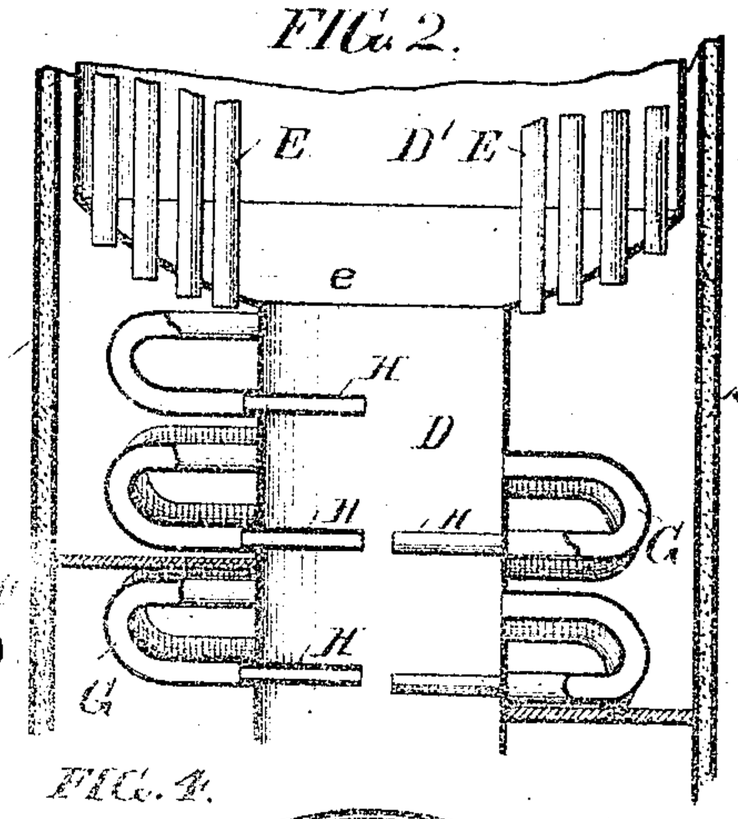
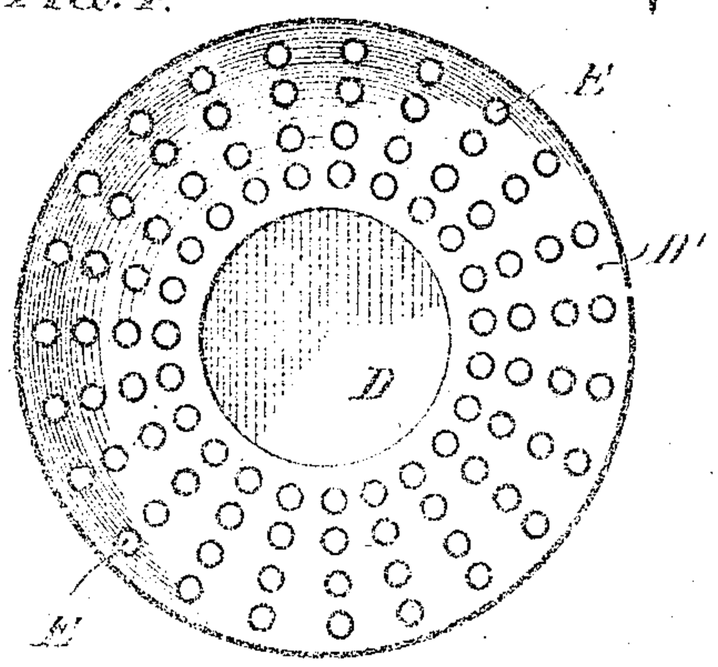


FIG. 4.



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UNITED STATES PATENT OFFICE.

EDWARD J. MOORE, OF PHILADELPHIA, PENNSYLVANIA.

VERTICAL BOILER.

SPECIFICATION forming part of Letters Patent No. 426,839, dated April 29, 1890.

Application filed May 9, 1889. Serial No. 310,103. (No model.)

To all whom it may concern:

Be it known that I, EDWARD J. MOORE, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Vertical Boilers, of which the following is a specification.

The object of my invention is to construct a vertical tubular boiler of what is known as the "porcupine" type, by which an increased steam-generating space is obtained and by which steam at high pressure can be readily generated. These objects I attain in the following manner, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation of my improved steam-boiler with the tubular portion partly in section and partly in elevation. Fig. 2 is a vertical section on the line 1 2, Fig. 3. Fig. 3 is a sectional plan view on the line 3 4, Fig. 1; and Fig. 4 is a sectional plan on the line 5 6, Fig. 1.

A is the casing of the boiler, made in the form of a tube and mounted on a suitable foundation.

B is the combustion-chamber, *b* the grate-bars, and *a* the ash-pit, the combustion-chamber being of the usual form.

Centrally situated in the vertical casing A is the boiler proper D, extending through the combustion-chamber into the ash-pit. On each side of this boiler D is a bridge-wall *d*, and back of the bridge-wall is a second combustion-chamber B′, communicating with which is an air-chamber A′, having an inlet *a′* for the air which mingles with the products of combustion. The inlet of air to this chamber can be regulated by a suitable door or valve, as circumstances require. The upper portion of the boiler D is enlarged, forming a steam-dome D′, having concave top and bottom plates *e e*. Passing through and expanded in these plates are vertical tubes E, through which the products of combustion pass.

The roof B′ of the combustion-chamber extends partially around the boiler D, as shown, so that the products of combustion will pass first into the second combustion-chamber B′, being then deflected in a spiral course around the boiler by means of the spiral deflecting-plate F until they reach the tubes E, through which they pass to the stack. Thus all portions of the boiler are heated uniformly, and the products of combustion cannot pass directly from the furnace to the stack.

Projecting in a spiral line from the body of the boiler D are a series of tubes G, bent as shown and expanded into the body of the boiler, these tubes being contained in the spiral passage formed by the plate F, so that the products of combustion in their spiral course through this passage must pass in contact with the tubes G.

Inserted in the lower end of each bent tube G is an extension-pipe H, (shown in Fig. 2,) so that circulation of the water is insured, as the tubes extend to nearly the center of the boiler D, and consequently take water at a lower temperature than if taken at the side, and by making the tubes H detachable they can be removed when it is wished to examine or repair the interior of the boiler.

I is a man-hole, through which access can be had to all portions of the interior of the boiler.

The seams of the shell of the boiler are spiral, as shown in Fig. 1, thus adding to the strength of the boiler.

I claim as my invention—

1. The combination, in a steam-boiler, of the central vertical chamber with a series of looped tubes projecting from said chamber in one or more spiral lines, substantially as specified.

2. The combination of the vertical chamber having loops radiating therefrom with a spiral deflecting-plate encircling said chamber, substantially as described.

3. The combination of a tubular boiler, the seams of which are in a spiral line with tubes radiating from said boiler, and also arranged in a spiral line, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD J. MOORE.

Witnesses:

HENRY HOWSON,

HARRY SMITH.