

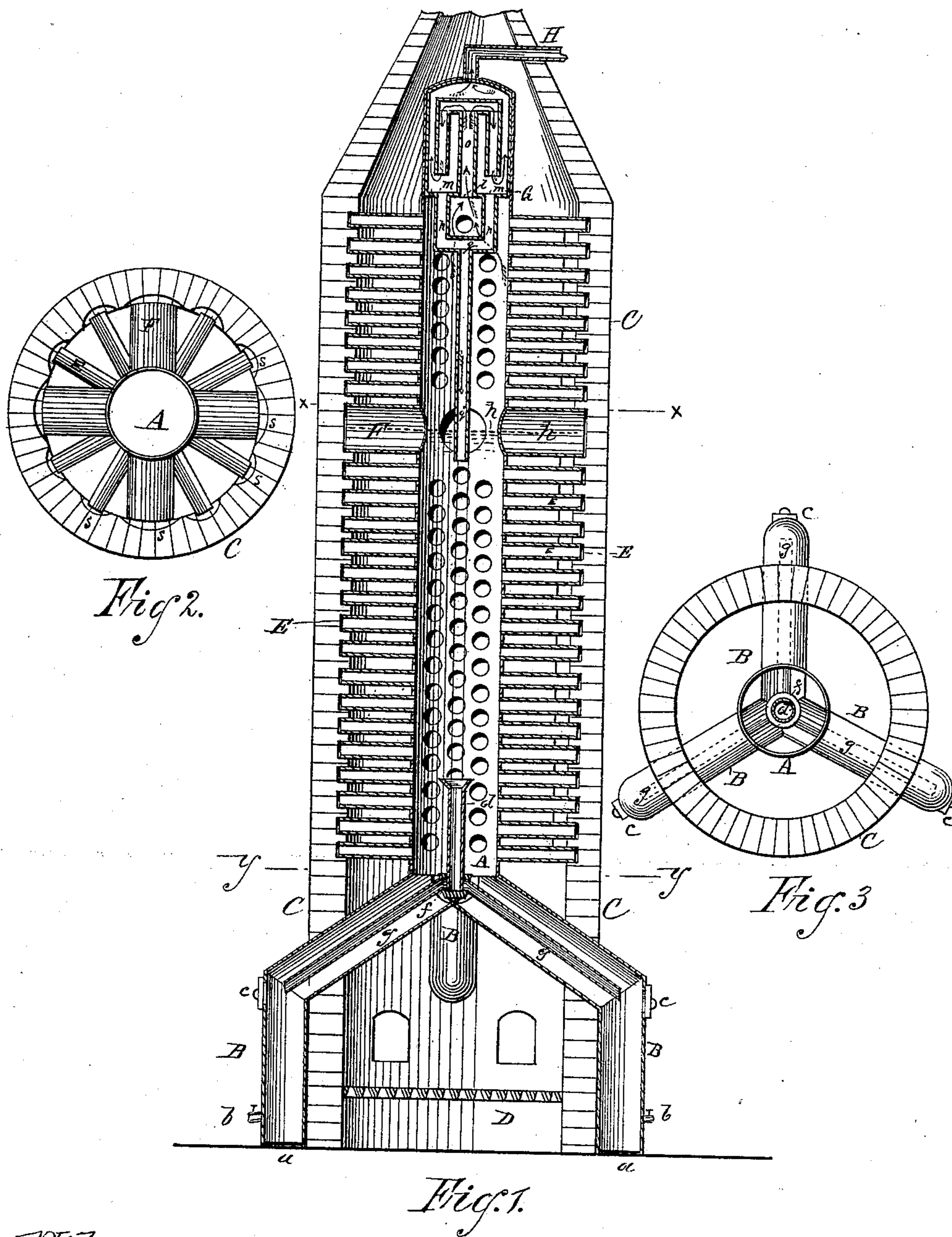
(No Model.)

H. C. GOULDING.

## STEAM BOILER.

No. 349,039.

Patented Sept. 14, 1886.



Witnesses  
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# UNITED STATES PATENT OFFICE.

HENRY C. GOULDING, OF NEW YORK, N. Y., ASSIGNOR TO MILTON W. HAZELTON, OF SAME PLACE.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 349,039, dated September 14, 1886.

Application filed April 10, 1886. Serial No. 198,437. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY C. GOULDING, a citizen of the United States of North America, and a resident of the city, county, and State of New York, have invented a new and useful Improvement in Steam-Boilers, of which the following is a specification.

The object of this invention is to construct an improved boiler of the "porcupine" type, with jacket therewith, a boiler with central upright cylinder provided with radial tubes, that is designed to be more economical of fuel, and more durable than other boilers of this type. The chief objections to boilers of this type are that the outer or free ends of the radial tubes are quickly injured or destroyed by the contact with them of the heated products of combustion, and where the central cylinder passes down through the grate unusual care and labor are required for proper firing all around the said cylinder.

My improvement is designed to obviate these objections.

My boiler consists of a central cylinder, supported by three or more divergent water-legs, and provided with radial tubes whose free ends are entered into pockets in the boiler-jacket. The water-legs resting on the floor extend upward and meet centrally in the fire-chamber above the grate, and there connect with the bottom of the central cylinder, which they support, so that there shall be free water communication between them all, and so that the grate-surface shall be unbroken and continuous.

The invention embraces other novel points of construction and arrangement, all of which will be hereinafter fully set forth.

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

Figure 1 represents a sectional elevation of my improved boiler and boiler-jacket. Fig. 2 is a plan of the same on line *x x*, Fig. 1. Fig. 3 is a plan of the same on line *y y*, Fig. 1.

In the drawings, A represents the vertical central cylinder of the boiler, supported on water-legs B B, which in this instance are three in number, though four or more may be

found advantageous in some instances. The water-legs B, closed at the bottom, as shown at *a*, rest on the floor, as shown in Fig. 1, and extend straight upward outside of the boiler-jacket C, and in contact therewith some distance above the level of the grate D, and then are inclined inward at angles of about forty-five degrees through said jacket to meet at a central point in the combustion-chamber, where they are connected, as shown, with and open into the bottom of the cylinder A, which extends upward in the vertical axis of the said jacket. The vertical portions of these water-legs being outside of the combustion-chamber are not exposed to the heat of the furnace, and consequently serve effectively as mud-drums for the deposit of sediment from the water, and they are provided with the usual blow-off cocks, *b*, and man-holes *c*, as shown in Fig. 1.

In order to insure a more perfect circulation of water in the lower part of the boiler a small pipe, *d*, with upper end flared, as shown in Fig. 1, is set in the vertical axis of the cylinder A, and coupled with this, by a three-way coupling, *f*, are three smaller pipes, *g*, each of which extends down in the inclined portion of a water-leg, B, and about centrally therein. This pipe-tripod *d f g* when in place, as shown in Fig. 1, improves the water circulation in the boiler by serving for the free downward movement of the cooler water, while the hotter water flows upward in contact with the sides of the boiler-cylinder. Up nearly to the water-line of the boiler (indicated at *h*) the radial tubes E are designed to be of equal size, and to be arranged in horizontal planes one above another, according to the usual method of construction of boilers of this type.

In my improved boiler I have two or more (in this instance four) large tubes, F, radiating from the cylinder A at the water-line, so that the boiler water-line, being about half-way up in these tubes F, shall present a more extended and continuous surface for the disengagement of steam, while the spaces in the said tubes above the water-line permit the easy escape of the steam, and thereby operate to prevent the excessive "priming" to which boilers of this type are subject.



The tubes E above the water-line are the steam-tubes, and may be multiplied to any desired extent required for steam-drying.

Within the cylinder A, near the top thereof, I fix a circular plate, G, having a central aperture, *l*, and a smaller aperture, *m*, at either side thereof, and in the central aperture, *l*, is secured an upright T-pipe, *o*, whose depending arms open directly above the apertures *m*, and in the apertures *m* are fixed pipes *p*, which, depending parallel with each other beneath the plate G, are united at their lower ends by a cross-pipe, *q*, from the center of which a communicating pipe, *q'*, extends down within the cylinder A, below the water-line thereof. The steam from the boiler passes up through the aperture *l* into the T-pipe *o*, and thence into the upper part of the cylinder A, whence it may be taken off through a pipe, H. Water carried by the steam into the pipe *o*, and condensing therein or arrested thereby, will drip from the arms of said pipe upon the plate G or into the apertures *m*, and will flow back into the boiler through pipes *p q q'*; hence it will be seen that the plate G and pipes *o p q q'* constitute a steam-drying device.

The boiler-jacket C is preferably constructed of brick, with pockets *s* formed on the inside thereof for the reception of the ends of the radiating-tubes E F, as shown. The free ends of the tubes E F, being extended into the pockets *s* for the distance—say of two inches, or thereabout—are thereby protected from the intense heat of the combustion-chamber, so that they shall not thereby be injured. These pockets *s* are not designed to be made close-fitting about the tube ends, but are to be made large enough to permit easy access to the tube ends for examination of the same, and they may be made to extend quite through the jacket and be closed on the outside with plugs, which, when removed, will enable the operator to remove and replace tubes.

In boilers of this type it is the usual practice to leave quite a space between the tube ends and boiler-jacket for the upward passage of the products of combustion, and, as the products of combustion moving upward seek the freest path, most of them pass up between the ends and jacket and out of the stack without making contact with the boiler cylinder or tubes, and hence great waste of fuel is incurred; but by this method of constructing the boiler-jacket, so as to cover the tube ends, the free upward passage for the products of combustion is eliminated, and the flame and hot air can escape up the stack only after having been in almost continuous contact with the central cyl-

inder and its radial tubes; hence it is evident that this form of construction assures great economy of fuel.

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

1. A steam-boiler constructed, substantially as herein shown and described, with a central vertical cylinder provided with radial tubes supported by diverging water-legs, and having a tubular tripod arranged within the water-legs and lower part of the said cylinder, as set forth.

2. A steam-boiler consisting of a vertical central cylinder, A, supported by communicating diverging water-legs B, and provided with series of radial tubes E F, arranged in horizontal planes, the tubes F radiating at the water-line of the boiler being of greater diameter than any of the other tubes, substantially as and for the purposes described.

3. A steam-boiler consisting of a vertical cylinder supported by communicating diverging water-legs, and provided with series of radial tubes, substantially as herein shown and described, the lower ends of the water-legs being arranged outside of the boiler-jacket and adapted to serve as mud-drums, as set forth.

4. The combination, with the vertical central cylinder, A, provided with radial tubes E F, and supported by water-legs B, of a steam-drying device consisting of perforated plate G and pipes *o p q q'*, all arranged and adapted to operate substantially as herein shown and described.

5. The combination, with a boiler constructed with a vertical cylinder provided with radiating tubes, substantially as herein shown and described, of a jacket surrounding said boiler and having pockets for the reception of the free ends of said tubes, as and for the purposes set forth.

6. The combination of a boiler constructed with a vertical cylinder provided with radiating tubes, and a boiler-jacket provided with tube-pockets, substantially as herein shown and described, said boiler and jacket being arranged relatively to each other so that the free ends of the radiating tubes shall be engaged in the jacket-pockets, as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 1st day of April, 1886.

HENRY C. GOULDING.

Witnesses:

JACOB J. STORER,

JULIUS M. FERGUSON.