

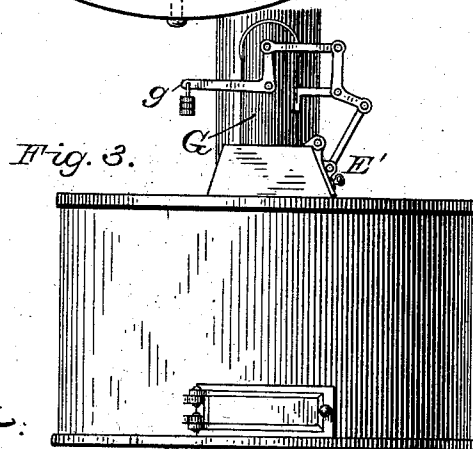
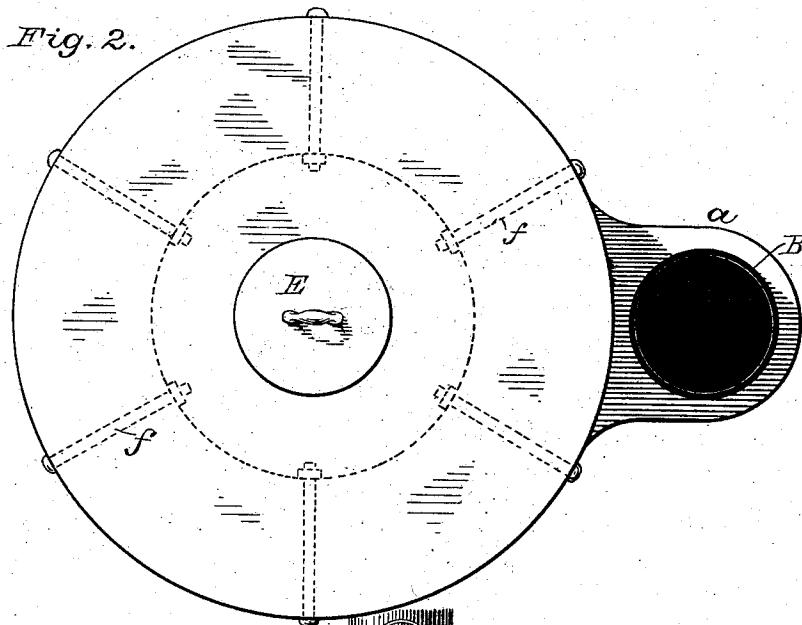
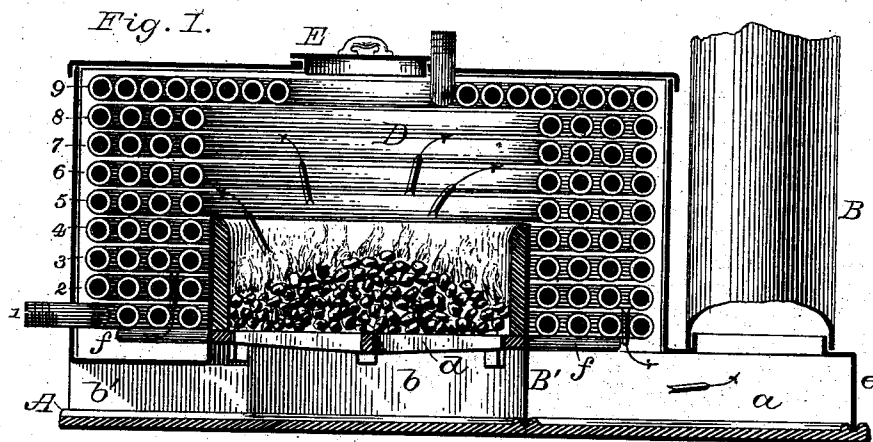
(No Model.)

G. B. BRAYTON.

STEAM BOILER.

No. 292,154.

Patented Jan. 22, 1884.



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UNITED STATES PATENT OFFICE.

GEORGE B. BRAYTON, OF BOSTON, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 292,154, dated January 22, 1884.

Application filed December 29, 1882. (No model.)

To all whom it may concern:

Be it known that I, GEORGE B. BRAYTON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare that the following specification, taken in connection with the drawings furnished and forming a part of the same, is a clear, true, and complete description of my invention.

My said improvements relate to that class of steam-boilers which involve the use of coiled tubes which contain water and steam, and are externally exposed to the heated products of combustion.

Although boilers embodying my present invention are of practical utility in any of the general connections wherein steam is desired, whether for operating engines or for heating and other purposes, they have been specially devised by me for use on steam yachts, launches, &c.

The objects of my said improvements are to obtain an extensive area of fire-surface, a corresponding capacity for developing steam, and the occupation of as little space as possible; also, to obviate undue vertical dimensions, thus avoiding the "top hamper," well known to be objectionable in steam-launches and small yachts; also, to economize in fuel; and to these ends a boiler embodying my invention has an inclosing-shell, a central cylindrical fire-pot, a series of flat or helical water and steam coils surrounding said fire-pot, a tumbling or falling flue containing the base of the coil, and an annular flue below the fire-pot, which is in communication with the falling-flue, and a smoke-stack. In its best form my boiler has directly above the fire-bed a flat horizontal coil, and the furnace-door is located centrally therein. In some cases I employ a small auxiliary uptake containing a damper, for connecting the shell adjacent to the furnace-door with the main uptake while stoking. In my boilers the feed-water is supplied to the base of the coil on a level with the fire-pot grate, and the steam is taken from the upper portion of the coil, which overlies the fire-bed. The heated products of combustion, rising from the fire, pass into direct contact with the upper portion of the coil, and then, turning downward, they are filtered through the several

layers of said coil until they reach the annular flue and pass to the smoke-stack, thus graduating the heat to correspondingly-heated portions of the coil, the latter being coolest at its base, and each succeeding upper coil thereof being more highly heated than the next lower coil throughout the several coils or series of coils or convolutions.

After a full description of the boiler illustrated in the drawings and certain modifications thereof, the features deemed novel will be specified in the several clauses of claims hereunto annexed.

Referring to the drawings, Figure 1 is a vertical diametrical section of one of my boilers and the lower portion of the smoke-stack. Fig. 2 is a top view of the same. Fig. 3 illustrates a similar boiler provided with a branch connection with the smoke-stack and a damper in said branch controlled by the movements of the furnace-door.

As a rule, I provide as a foundation for my boilers a bed-plate, A, annular in form, with a projecting wing, as at a, at one side for affording a lateral flue-extension, which is in direct communication with the smoke-stack B. In the center of the bed-plate there is a vertical annular wall, B', which extends from the upper surface of said plate to such a height as will afford the desired height of ash-pit b and depth of cylindrical fire-pot c, the circular grate d constituting the bottom of the fire-pot, the usual fire-brick lining, e', being applied to the inner surface of the annular wall B' above the grate. A radial opening, as at b', extends outwardly from the ash-pit for the admission of atmospheric oxygen to the fire and for the withdrawal of ashes, and other similar but smaller openings may be provided without departure from my invention.

The casing C of the boiler is cylindrical, with a flat top, made of suitable sheet-iron, and preferably coated internally with asbestos or other desirable non-conductor of heat, and the vertical wall may be also inclosed in wood, if desired. The bottom of the casing rests upon the bed-plate, and adjacent to the base of the smoke-stack there is an annular cap-plate for receiving the stack, and between said cap-plate and the extension a of the bed-plate is a vertical wall, e, within which is a lateral flue-extension. The interior annular wall, B', and

the outer casing, C, are firmly united by the series of radial bolts or stays *f*, upon which the coils rest.

As thus far described, it will be readily seen that the products of combustion, rising from the fire-pot or furnace, will pass upward, and thence downward at all sides into the annular falling flue between the wall B' and the casing, and thence to the smoke-stack, it being understood that the air-opening *b'* has an upper wall which cuts off all communication with said annular flue except by way of the fire-pot. In some cases, for more fully equalizing the draft on both sides of the fire-pot, a horizontal diaphragm or plate can be placed on a level with the grate, at the side adjacent to the smoke-stack, and extending, for instance, between the two stay-bolts nearest the stack, thus preventing a too direct passage from the fire-pot to the smoke-stack.

The boiler-coil D, as here shown, is composed of eight substantially similar flat or helical coils, placed one above the other, and numbered from the base upward from 1 to 8, inclusive, and also a larger cap-coil, (marked 9.) All of these coils are connected to form a continuous coil, the feed-water entering preferably at the outer convolution of the lower coil, 1, and the steam being taken from the inner convolution of the cap-coil 9, and said coils are connected alternately at their inner and outer convolutions. The pipe is closely coiled in the cap-coil 9, and separated by, say, one-half inch throughout each of the other coils, and said coils are also separated by a similar vertical space, thus affording ample passage between and around them for the heated products of combustion. The pipe used is preferably of the lap-weld variety, coiled while cold, and the lengths of pipe are joined by strong screw-couplings. In some cases slender arms or brackets may be extended inwardly from the casing to serve as supports for alternating coils. The lower coil, 1, is located on a line with the fire-grate, and it will be seen that several of said coils, and generally the greater number, are located below the top of the fire-pot wall. At the center of the casing at the top, and at the center of the cap-coil 1, is an opening through which fuel is supplied to the fire-pot. As shown in Fig. 1, the furnace-door E at said central opening is a simple cover, which is lifted on and off; but other arrangements thereof may be employed.

The operation of my boiler is as follows: The boiler-coil having its convolutions filled with water, and supplied therewith continuously or at frequent intervals at the lower outer convolution, and the fire-pot properly charged with ignited fuel, it will be seen that the heated products of combustion rise from the fire-bed in direct contact with the upper portion of the inner convolutions of the coils 5 to 8, inclusive, and with the overlying convolutions of the upper or cap coil, 9, and that said heated products are deflected outwardly from the top, causing the contents of the up-

per portions of the entire coil to be highly heated, and that said heated products then descend with a gradually-reduced temperature until the annular flue is reached below the coil, thus economically utilizing the heat developed from the combustion of the fuel. It will be seen that the helical coils 1, 2, 3, and 4, in fact, occupy an annular tumbling or falling flue, which is formed by the outer casing and the vertical annular wall of the fire-pot, and that it is in this portion of the boiler-coil that its contents are lowest in temperature, and that said portion of the boiler-coil is also exposed to the products of combustion only after their temperature has been reduced by raising the temperature of the contents of the upper portions of the coil, and I have worked one of my boilers up to a desirable steaming capacity with a temperature at the base of the smoke-stack of about 200° Fahrenheit.

In certain Letters Patent of the United States, issued to me October 11, 1864, I disclosed certain improvements made by me in this general class of boilers, which involved the combination, with a coil for water and steam, of an auxiliary boiler or chamber connected with the opposite ends of said coil, so as to provide for the proper circulation or supply of water to said coil, and said chamber served both as a steam-drum and as a feed-water heater, and it is to be understood that I employ with my present coil-boiler an auxiliary boiler, substantially as heretofore patented by me.

I am aware that falling or tumbling flues have been heretofore occupied by coils for heating-feed-water to be used in supplying a boiler coil, within which the water so heated is sprayed; but it is obvious that such boilers not only materially differ from mine in their construction, but also in their manner of working.

I am also aware that single spiral coils have been employed within a falling flue, and that flat helical coils connected alternately at their inner and outer convolutions have heretofore been organized so as to overlie the entire grate-surface of a furnace or fire-pot; but so far as I know I am the first to organize said connected flat helical coils so as to surround a central fire-pot.

By the use of the flat helical coils surrounding the fire-pot, as stated, the temperature of the contents of each is practically uniform, and the evils of expansion at the various unions or joints reduced to a minimum.

The series of connected flat or helical coils I deem of great practical value, when arranged and organized as shown, surrounding a central fire-pot, because of the complete utilization of space incident to their use and the great heating-surface afforded; and it will be seen that in each helical coil containing water I have a considerable quantity thereof at substantially the same temperature. Being alternately connected at the outer and inner

convolutions, they are coupled in pairs next adjacent to the fire, and also next adjacent to the casing, thus providing against any radical differences in temperature between the contents of any two adjacent coils. The top coil overhanging the fire-pot, in combination with the lower coils, I also deem of value, regardless of the particular character of the lower coils, because said top coil is thereby fully exposed to the highest temperatures favorable for the development of dry steam. It will be seen that I also obtain an extensive heating-surface with a minimum of vertical dimensions; and that I am thereby enabled to locate the weight of my boiler closely adjacent to the keel of a yacht or launch. My smoke-stack having its base below the boiler, and near the keel, need be extended but a few feet above the top of the boiler, thus preventing it from becoming objectionable as top hamper, which is a matter of great consequence in steam-launches, &c., which usually are required with as little breadth of beam as is consistent with the requisite floating capacity.

In Fig. 3 I have shown a boiler having a branch-flue or uptake, which connects the top of the boiler above the fire-pot with the smoke-stack for use only when stoking. As here shown, the branch G has a damper, which is connected by outside links and levers with the hinged door E', as clearly shown, in such a manner that when the door is opened the damper is also opened, thus causing such cold air as may enter to proceed directly to the smoke-stack without contact with the coil, and also preventing any outward discharge of heat and smoke into the face of the stoker. The

damper is provided with a weighted arm, *g*, which should fairly balance the door when raised, but be incapable of preventing the door from maintaining its closed position when once forced downward.

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

1. The combination, within a suitable casing, of a central fire-pot, an annular falling flue, and a boiler-coil overlying the fire-pot surrounding the same, and having its base located in said falling flue, substantially as described.

2. The combination, within a suitable casing, of a central fire-pot and a boiler-coil surrounding said fire-pot, and composed of a series of connected flat or helical coils connected alternately at their inner and outer convolutions, substantially as described.

3. The combination, within a suitable casing, of a central fire-pot, an annular falling flue, and a boiler-coil composed of a series of connected flat or helical coils surrounding said fire-pot, and a flat coil above said series of coils and overhanging the fire-pot, substantially as described.

4. The combination, with the coil-boiler, of the central fire-pot or furnace, a falling flue, a main stack communicating with said flue, a branch flue connecting the furnace at its top with the main stack, and a damper in said branch flue, substantially as described.

GEORGE B. BRAYTON.

Witnesses:

FREDERICK W. COBB,
G. W. RING.