(No Model.) 2 Sheets—Sheet 1.

G. H. TAYLOR.

FURNACE.

No. 414,604. Patented Nov. 5, 1889.

FIG. 1.

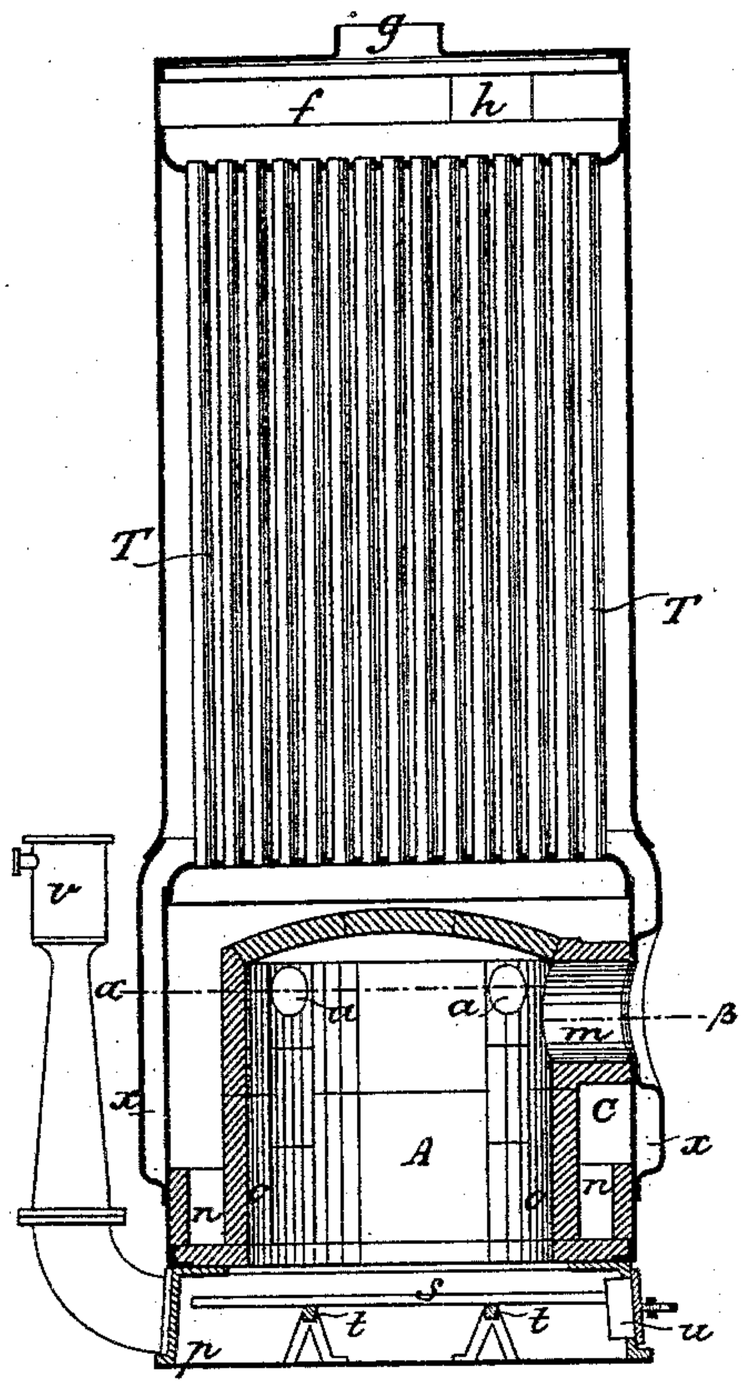


FIG. 2.

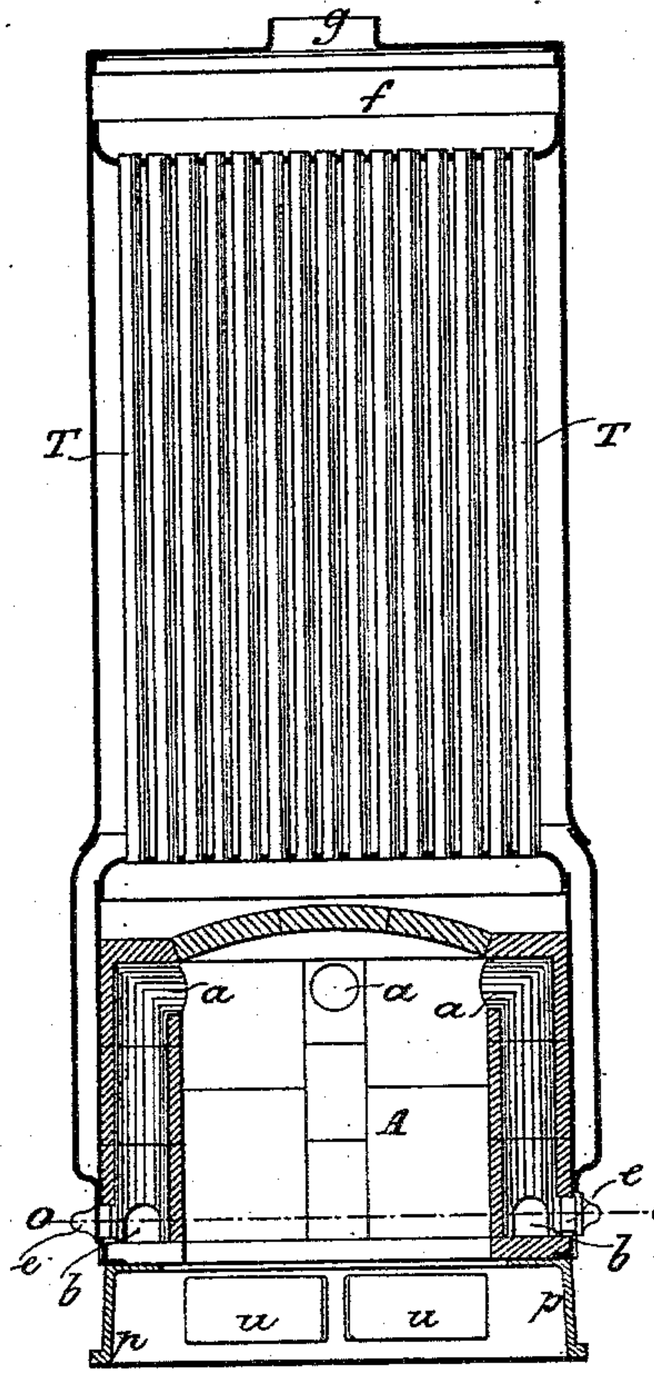


FIG. 3.

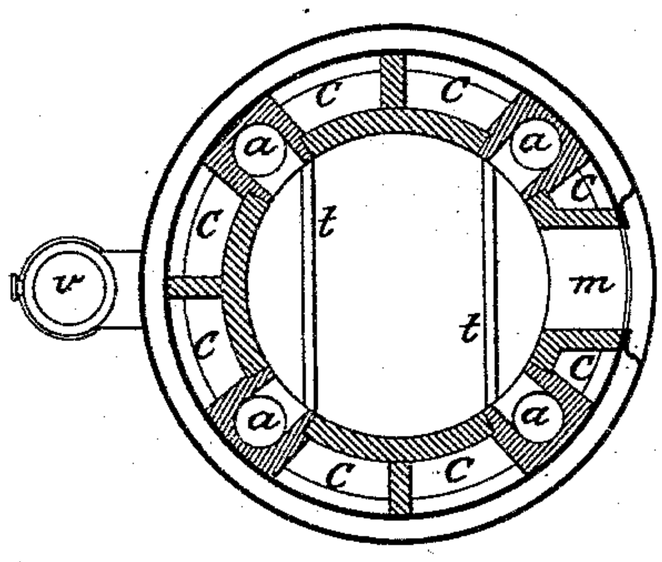
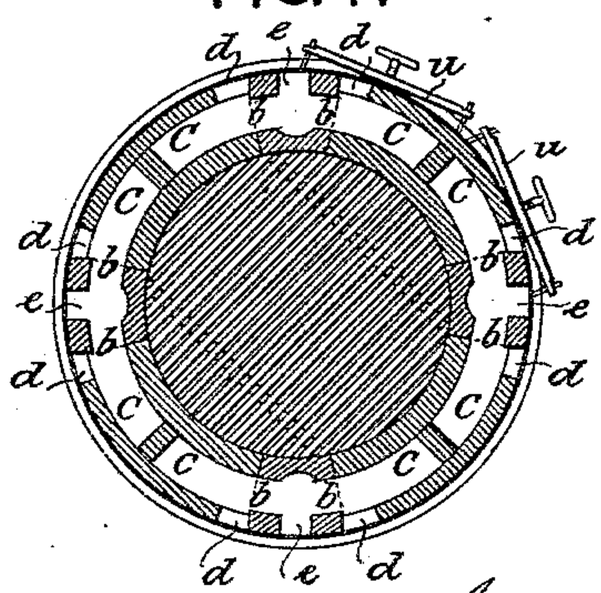


FIG. 4.



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(No Model.) 2 Sheets—Sheet 2.

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FURNACE.

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FIG. 5.

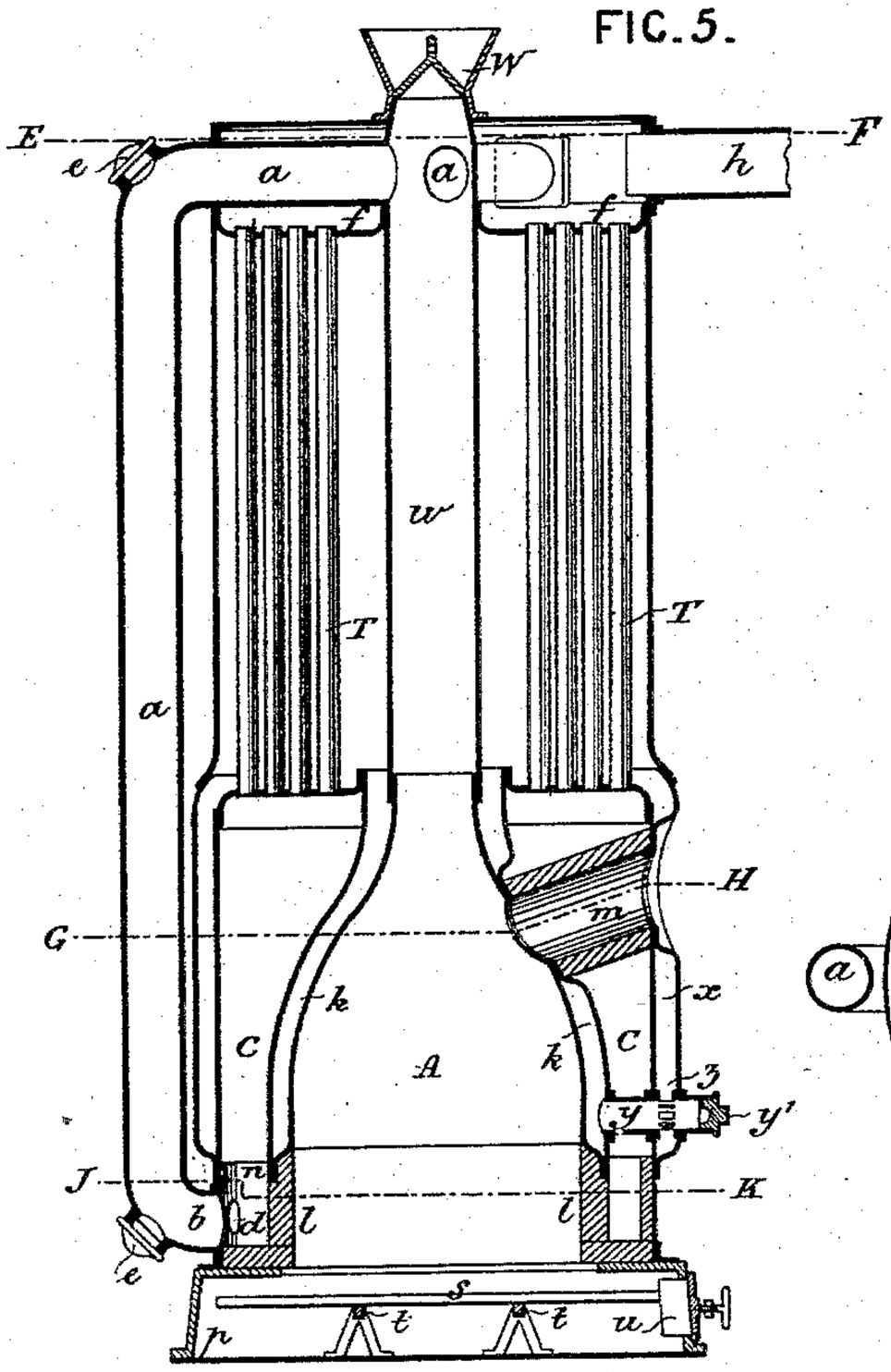


FIG. 8.

FIG. 7.

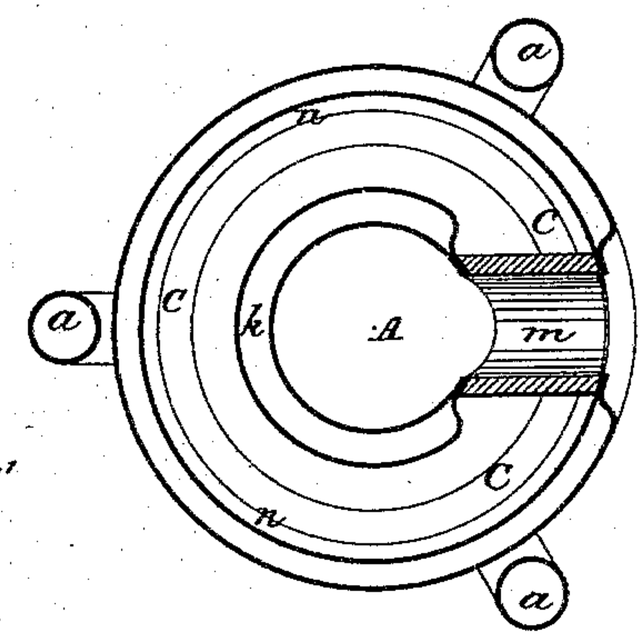
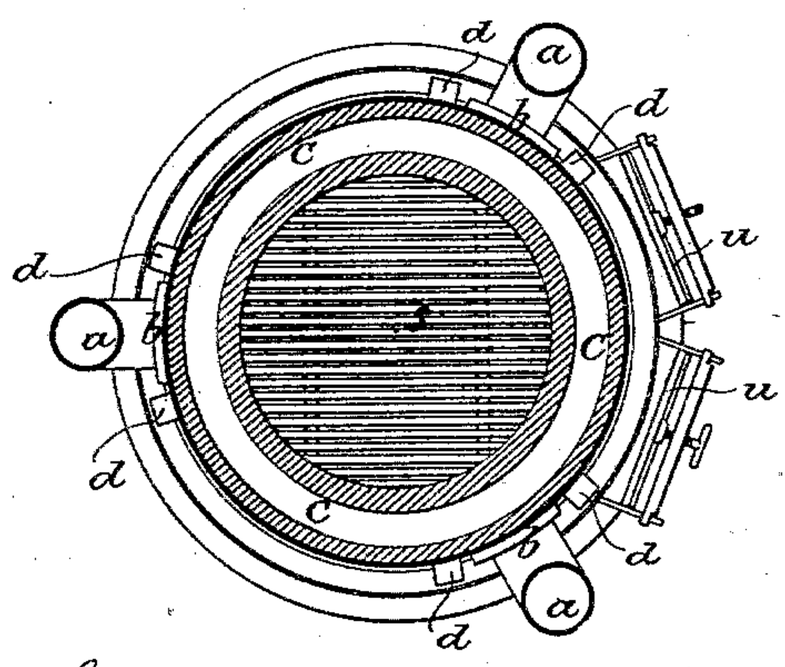
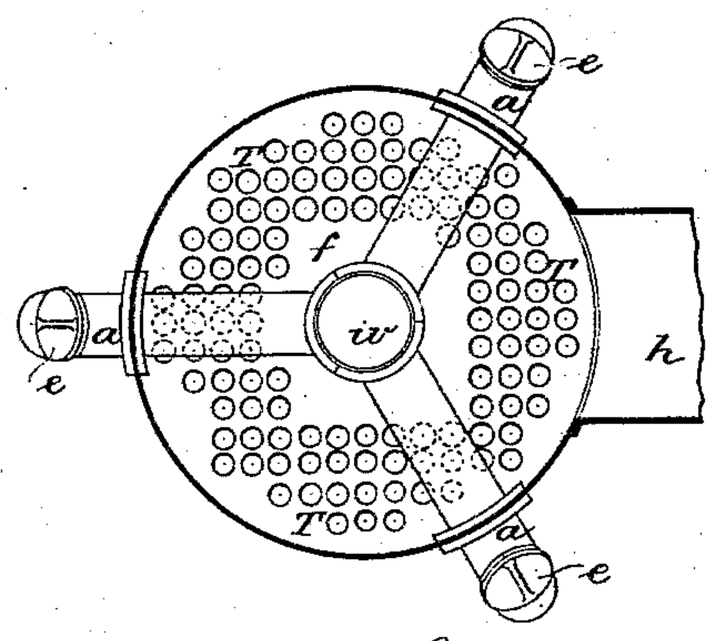


FIG. 6.





Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE HENRY TAYLOR, OF LIVERPOOL, COUNTY OF LANCASTER, ENGLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 414,604, dated November 5, 1889.

Application filed June 26, 1889. Serial No. 315,577. (No model.) Patented in England October 17, 1884, No. 13,733.

To all whom it may concern:

Be it known that I, GEORGE HENRY TAYLOR, a subject of the Queen of Great Britain and Ireland, residing in Liverpool, in the county of Lancaster, England, have invented new and useful Improvements in Furnaces, (for which I have obtained a patent in Great Britain, No. 13,733, dated October 17, 1884,) of which the following is a specification.

My invention relates to a novel construction of furnace for heating a steam-generator, by means of which the fuel is converted into gas in the central part of the fire-box or furnace and combustion takes place in a chamber formed between the inner furnace or gas-producer and outer casing of the same, as hereinafter fully described.

In commencing operations, a fire is lighted on the fire-grate in the ordinary way, and is increased as quickly as practicable to a thick layer of incandescent fuel. The gas which is then produced passes through conduits to the lower part of the combustion-chamber which surrounds the gas-producer. According to one arrangement the gas passes into conduits formed in the fire-brick lining of the producer and is thence conducted to the lower part of the combustion-chamber, where each conduit supplies two jets of gas. In this arrangement the whole of the interior or producer portion of the fire-box is made of fire-brick or other fire-resisting material built up in sectional parts and domed over, or the gas may be led off from the gas-producer or inner furnace by a central uptake to the outer or combustion chamber, the lower part of said central uptake being secured to an annular water-casing and the remaining length thereof being in the water-space above the bottom tube-plate. From the upper end of said uptake the gas is conveyed by branch pipes, preferably, to the outside of the steam-generator shell, and thence by other pipes down to the combustion-chamber. The gas is ignited at the various ports or jets in the lower part of the combustion-chamber, the air, heated or otherwise, necessary to support combustion being admitted close to each gas-inlet. The products of combustion rise and pass through tubes in the upper portion of the steam-generator, the heated gases being led off to a chimney.

The gas-producer may be worked under pressure by any suitable steam-jet blower. The admission of air to the combustion-chamber is regulated by valves and may be assisted by the blast from the steam-jet blower taken from under the fire-grate. Openings are formed in the casing of the fire-box for firing-doors, and in the fire-box foundation plating for clinkering-doors, which doors require to be well fitted, so as to be air-tight when closed.

Dust-boxes are formed at the top of the steam-generator, and doors are provided for cleaning out the dust. The chimney is provided with the necessary damper arrangement. The gas-conduits on the outside of the steam-generator are coated with a suitable composition to prevent radiation of heat, and suitable cleaning-doors are provided at the elbows or bends. The supply of gas is regulated by the steam-blower and chimney-draft, a thick bed of fuel being always maintained in the producer.

In order that my invention may be readily understood, I will now describe it, with reference to the drawings.

Figure 1 is a vertical section taken through the firing-door of the brick-lined producer, and Fig. 2 is a vertical section taken through two of the gas-conduits. Fig. 3 is a plan on the line $\alpha\ \beta$ of Fig. 1, and Fig. 4 is a plan on the line *o o* of Fig. 2. Fig. 5 is a vertical section taken through the firing-door of the water-cased producer. Fig. 6 is a plan on line E F of Fig. 5; Fig. 7, a plan on line G H of same figure; and Fig. 8, a plan on line J K, also of same figure.

In apparatus constructed according to my invention gas is produced in the central retort A, and is conveyed by conduits *a* to the inlets *b* in the lower part of the combustion-chamber C, and air enters close to the gas-inlets at *d*, suitable cleaning-doors *e* being provided in the gas-conduits. The products of combustion pass upward and through the tubes T into the dust-box *f*. Thence the heat may be led into a chimney *g*, or by branch *h* into an ordinary chimney.

The water-space *k*, Fig. 5, may have a fire-brick lining *l* set below it, and a fire-brick mouth-piece *m* for stoking through; or the water-space may be carried down to the lower

part of the ash-pit and there provided with suitable doors to facilitate cleaning. The lower part of the combustion-chamber is lined with fire-bricks *n*. The central or inner lining *o* and gas-conduits of producer indicated on Sheet 1 are entirely of fire-resisting material.

The fire-box may stand upon a cast-iron bed-plate *p*, which forms the hearth of the gas-producer, and is provided with a plate or plates at the bottom; or the outer casing of the fire-box may be continued down to the bottom or floor-level.

s are the fire-bars, which are supported by bearers *t*. The clinker-doors *u* have suitable cross-bars and fixing-screws. The steam-jet blower *v* may be fixed where shown or in any other convenient place.

A close-fitting firing-door is provided in the casing at the front end of the mouth-piece *m*. The hopper and valve W (shown at Fig. 5) may be used as an alternate method for feeding the fuel through the uptake *w*, but still retaining the mouth-piece *m*. Water from the fire-box casing *x* to the producer-casing *k* circulates through a number of tubes *y*, which are fitted with caps *y'*. The said tubes *y* may have perforations, as at *z*, through which the sediment in the water-casings is washed out.

The water-casing *k* of the gas-producer A (shown at Fig. 5) may be made a few inches less in depth, and the brick lining *l* below said casing may be increased in depth, so as to coincide with the depth of fuel, leaving a space of a few inches between the lower edge of the water-casing and the upper edge of brick lining, and thereby forming an annular outlet for the gas to escape into the surrounding combustion-chamber, where jets of air are admitted to support combustion, as previously described.

The outer casing of the fire-box is of greater diameter in circular or greater width in rectangular forms than the casing of the steam-generator above or beyond the fire-box, whereby I provide for a large and sufficient grate-surface, and so insure an abundant supply of gas, whether for vertical or for horizontal generators, and whether for circular or for rectangular forms of producers and fire-boxes.

The drawings herein given illustrative of my invention have reference to vertical generators; but it is obvious that boilers of this type may be constructed in horizontal form, and that the gas-producer and combustion-chamber may be also made of rectangular form when applied to existing horizontal tubulous boilers. The stoking-hole *m* and clinker-doors *n* may be placed at any convenient angle from center line of generators to suit position of coal-bunkers.

In starting the producer, the smoke may be allowed to pass through the uptake *w*, the valve W being opened, or through the gas-conduits *a* until the fire is ready for making gas. The upper plate of dust-box *f* has holes through which a flue-brush may be passed to clean the tubes T.

In working these generators at high pressure, where superheating of the steam is undesirable, the upper heat-box of the generators may be lowered, so as to be covered with water, the upper end of the outer casing being domed for steam-space above said heat-box. In the arrangement just named the heated gases may be passed into a chimney in the center of the dome, the details of which are well understood by boiler-makers.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

A steam-generating furnace-structure, consisting of a central gas-producing fire-box, an annular combustion-chamber encircling and entirely surrounding the fire-box and in communication with the external atmosphere, and gas-conducting passages extending from the top portion of the gas-producing fire-box and descending or leading downward and opening laterally into the combustion-chamber, whereby the produced gases are ignited in the combustion-chamber and ascend therefrom into the steam-generator, substantially as shown and described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

GEORGE HENRY TAYLOR.

Witnesses:

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T. CREIGHTON,

Clerks with Messrs. Whikey & Co., Solrs., 2 Cook Street, Liverpool.