

(No Model.)

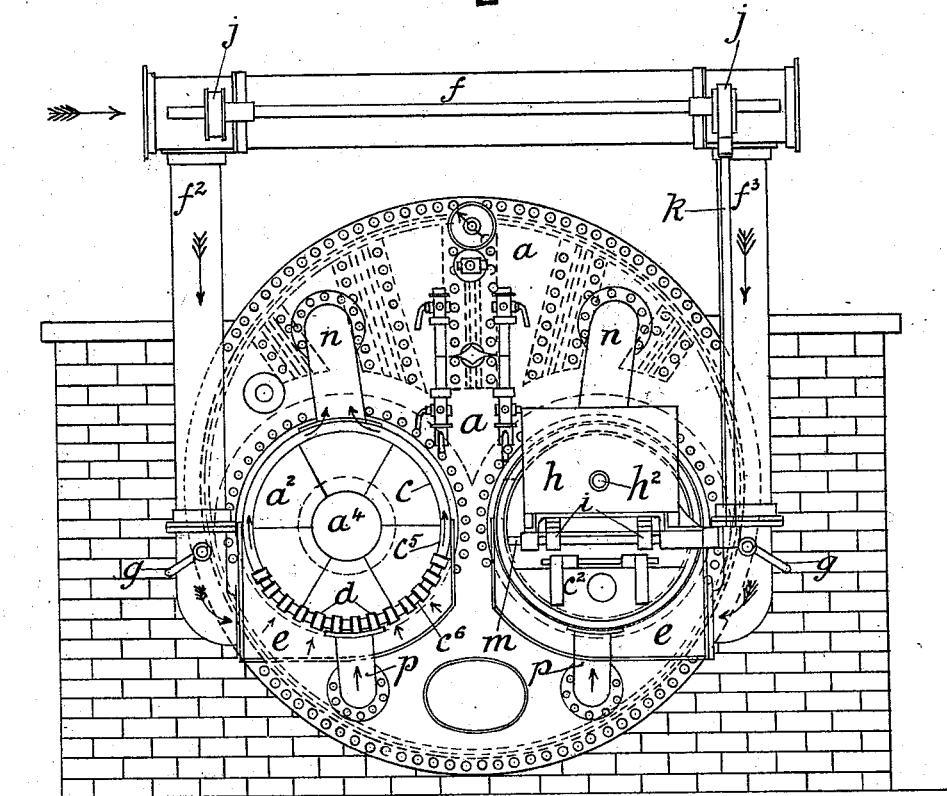
2 Sheets—Sheet 1.

W. FREAKLEY.
FURNACE.

No. 522,340.

Patented July 3, 1894.

Fig. 1



Witnesses:—

John Newton
John Henry Bopstark

Inventor.

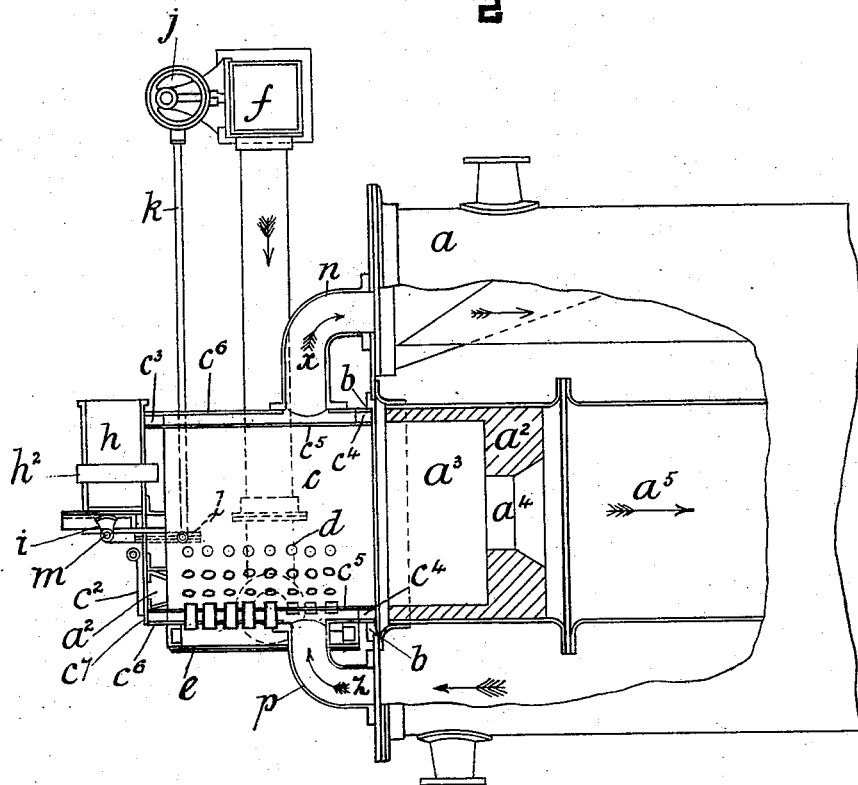
William Freakley

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Fig 2.



Witnesses;
John Newton
John Henry Coopers

Inventor;
William Freakley

UNITED STATES PATENT OFFICE.

WILLIAM FREAKLEY, OF STOKE-UPON-TRENT, ENGLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 522,340, dated July 3, 1894.

Application filed March 13, 1894. Serial No. 503,475. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM FREAKLEY, a subject of the Queen of Great Britain and Ireland, residing at Woodhouse Terrace, Stoke-upon-Trent, county of Stafford, England, have invented certain new and useful Improvements in Furnaces and in the Steam-Boilers in Connection Therewith, of which the following is a specification.

10 The objects of my invention are to effect greater economy in the consumption of fuel, to increase the efficiency, power and safety of the boilers to which such improved furnaces are applied, to permit much higher furnace
15 temperatures, to permit greater rates of combustion and to enable inferior fuels and refuse to be used with advantage in the generation of steam, the boilers to which such improved furnaces are applied being kept at
20 a practically uniform temperature in all their parts by reason of the rapid and enforced circulation of water across the heating surfaces of such furnaces, thus avoiding the injurious results of unequal expansion and contrac-
25 tion, the furnaces being free to expand and contract while in use without unduly straining any part of the boilers to which such improved furnaces are attached, the said furnaces being readily applied to existing boil-
30 ers of various types.

In carrying my invention into practice I dispense with fire-bars and similar gratings for supporting burning fuel, by carrying such fuel directly upon the water-backed plates of
35 such furnaces, thus enabling high temperatures to be produced, there being no dead plates, bars or other similar arrangement to melt or give way, the adherence of clinkers to the furnace plates is prevented thus en-
40 abling such clinkers to be readily removed, the combustion of fuel is rendered practically complete and the formation of black smoke is diminished. With such furnaces I am able to use forced draft of high pressure so as to
45 consume refuse coke or coal dust and inferior fuels to advantage, and greatly increase the evaporative power of the boilers to which such improved furnaces are attached. Such furnaces I construct by any suitable means in
50 the form of a horizontal water-jacketed cylinder consisting of an inner and an outer shell, which steel, iron, or other suitable metallic

plates or shells are connected by any suitable means, so as to form an annular space or water jacket between such inner and outer
55 shells, the water jacket entirely surrounding or only partially surrounding the inner shell or fire-box, concentrically or nearly so.

Referring to the drawings which form a part of this specification, Figure 1 is a front
60 elevation of a two-flued or Lancashire boiler or steam generator, to each flue of which boiler I have shown attached a horizontal barless furnace made according to my invention, one
65 of the said furnaces being shown in transverse section. Fig. 2 is a side sectional elevation of the fore part of the boiler shown at Fig. 1, and of one of the furnaces attached thereto.

Similar letters refer to similar parts throughout the several views.

70 On reference to the drawings *a* represents the front part or portion of a two flued, or Lancashire boiler, to the front end of each flue of which boiler I have shown attached by means of a metallic ring *b* a horizontal
75 barless furnace *c* provided with a door *c*², and a suitable number of air inlets or tuyeres *d*.

Annular wrought iron or other suitable metallic rings *c*³ and *c*⁴ being riveted, or otherwise suitably fitted or fixed between the inner and outer plates *e*⁵ and *e*⁶ at or near to
80 each end of such furnaces, for the purpose of rendering the ends of such jackets or spaces water tight, a lining of fire-brick or other refractory material *a*² being fitted or placed
85 against the inside of the front plate *c*¹ of such furnaces at their front ends, a metallic casing *e* is fitted or fixed to the exterior part of such furnaces by angle iron, rivets or other suitable means for the purpose of conducting
90 forced blast, air or steam under pressure, or air and steam under pressure through the several tuyeres *d* into the furnaces *c*, the said blast being conveyed by the pipes *f*, *f*² and
95 *f*³ into the said casing *e*, the supply of the blast to the interior of the said casing *e* being regulated by suitable valves or dampers *g* fitted to the lower interior part of the blast conducting pipes *f*², *f*³, fuel being fed from
100 the lower part of the hoppers *h* attached to the front end of the furnaces *c* to the interior of such furnaces by means of toothed quadrants and sliding plates *i*, reciprocating motion being transmitted to the said plates by

eccentrics *j*, rods *k*, levers *l* and shafting *m* driven by steam or other motive power, a sight-hole *h*² being fitted to each hopper to facilitate inspection of the interior of furnace.

5 While fuel in the interior of such furnaces is becoming incandescent, the water in the space between the inner and outer plates *c*⁵ and *c*⁶ is rapidly heated, and flows from such water-jacketed furnaces through pipes
10 *n* in the direction shown by the arrows *x* into the interior of the boiler *a* and circulates therein, the coolest water, or the water at the lowest part of such boilers flowing therefrom through pipes *p* as indicated by arrows *z*
15 into the lower portion of the water space of the said furnaces *c*, the water being kept in a state of circulation until steam is generated therefrom. Heat and smoke from the fires of such furnaces pass into chambers *a*³
20 formed of or from fire-brick or other suitable refractory material *a*² fitted or fixed in the front portion of each flue of the boiler *a*, and pass therefrom in the direction indicated by arrow *a*⁵ through the opening *a*⁴, into and
25 through the several flues of the boiler setting into the chimney stack, from whence it escapes into the atmosphere.

It will be understood that the refractory material or materials *a*² of which the combustion chambers *a*³ are made when rendered sufficiently incandescent by the heat from the fires, destroys the noxious constituents of the flame and smoke. The lower portions of such horizontal water-jacketed furnaces are fitted with numerous small air-pipes or tuyeres *d* conical or parallel in longitudinal section, and made of iron, steel, copper, brass or other suitable material, which tuyeres extend radially from the outside of
30 the outer shell *c*⁶ across the water space between the inner and outer plates *c*⁵, *c*⁶ through the said inner plate to the interior of the fire-box *c*, the said tuyeres being fixed, expanded, screwed or secured in other suitable manner
35 into holes formed through the said inner and outer plates so as to be steam and water-tight, and form efficient stays. When it is desirable to strengthen that portion of the fire-box without air tubes or tuyeres, screwed stays or
40 other suitable means are used for that purpose. In some cases I use corrugated or similar fire-boxes, in which cases as a rule screwed stays are dispensed with, the air-tubes or tuyeres being fixed in corrugated furnaces in
45 a similar manner to those in plain furnaces. The lower part of such water-jacketed furnaces I fit with one or more inlet branches or

pipes *p*, and the upper part of such furnaces with one or more outlet branches or pipes *n* which I attach at one end to the front plate
60 of the boiler, and the other end of such inlet and outlet pipes to the outer shell *c*⁶ of the annular water space. The air casings *e* I fit or provide with a suitable door or opening for permitting ashes or dust to be readily re-
65 moved or cleaned out from such casings.

I wish it to be understood that such water-jacketed barless furnaces may be used in connection with various types of boilers without refractory material *a*², without air-casings
70 *e*, and without fuel hoppers as shown on the drawings.

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

1. In a boiler, the combination of the flue or
75 flues, the refractory material in the front end thereof forming a combustion chamber, the horizontal barless furnace at the front end of the flues or tube, the water jacket about the
80 same, the pipes leading therefrom to the interior of the boiler, the air casing connected through suitable openings with the interior of the furnace and the fuel supply opening
85 for the furnace, substantially as described.

2. A furnace for attachment to a horizontal boiler having a fuel chamber and adapted to fit against the front end of the boiler and of proper size to fit over the horizontal tube of the boiler to form a forward prolongation
90 thereof, beyond the boiler, the water jacket surrounding the fire chamber and the pipes extending from said water jacket rearwardly and connecting with the interior of the boiler, substantially as described.

3. A furnace for attachment to a horizontal boiler having a fuel chamber and adapted to fit against the front end of the boiler over the horizontal tube to form a forward prolongation thereof beyond the boiler, the water
100 jacket surrounding the fire chamber, the pipes extending from said water jacket rearwardly and connecting with the interior of the boiler, the air forcing chamber beneath the water jacket and the connections there-
105 from extending to the fire box, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

WILLIAM FREAKLEY.

Witnesses:

JOHN NEWTON,
JOHN HENRY COPESTAKE.