(No Model.) 2 Sheets—Sheet 1.

F. WILD.

AUTOMATIC FURNACE.

No. 492,175. Patented Feb. 21, 1893.

Fig. 1.

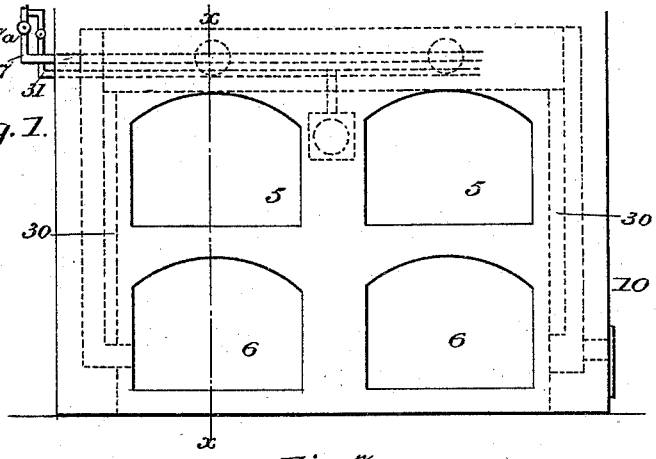


Fig. 5.

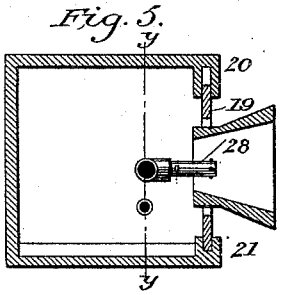


Fig. 7.

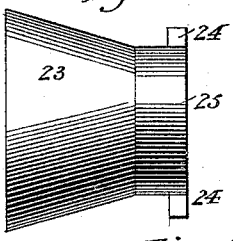


Fig. 8.

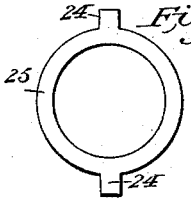


Fig. 4.

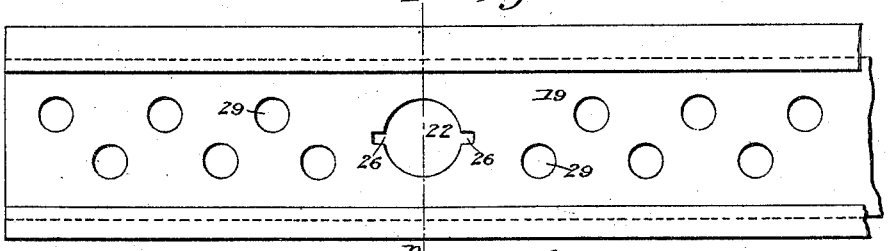
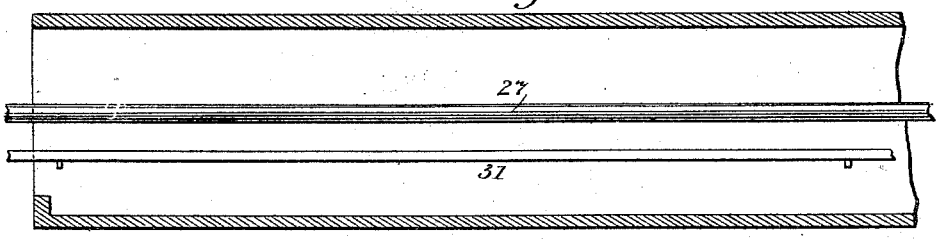


Fig. 6.



Witnesses.
C. J. Dellandit.
Wm McConnell

Inventor.
Fred Wild
By A. J. O'Brien
Atty

(No Model.) 2 Sheets—Sheet 2.

F. WILD.

AUTOMATIC FURNACE.

No. 492,175. Patented Feb. 21, 1893.

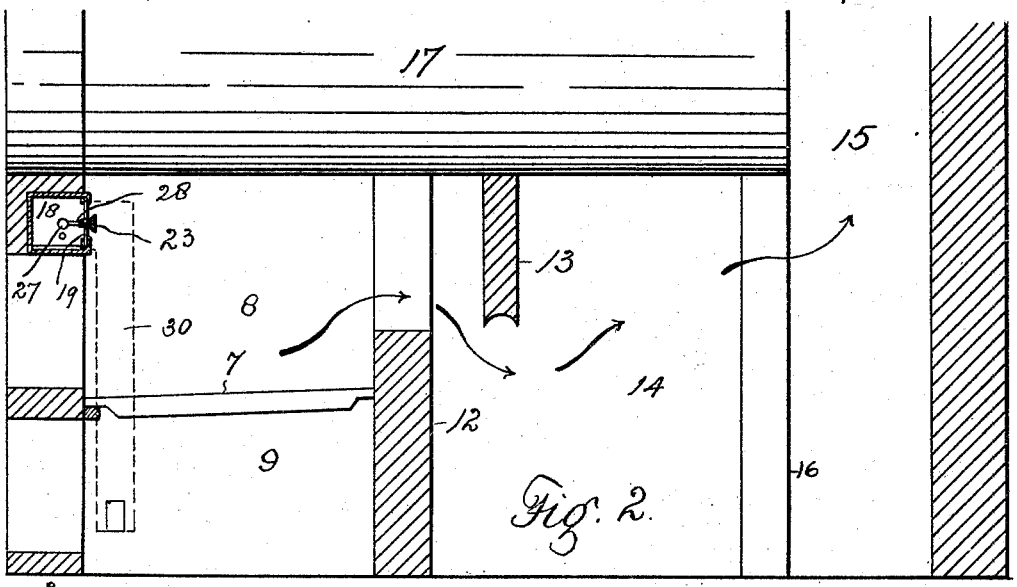


Fig. 2.

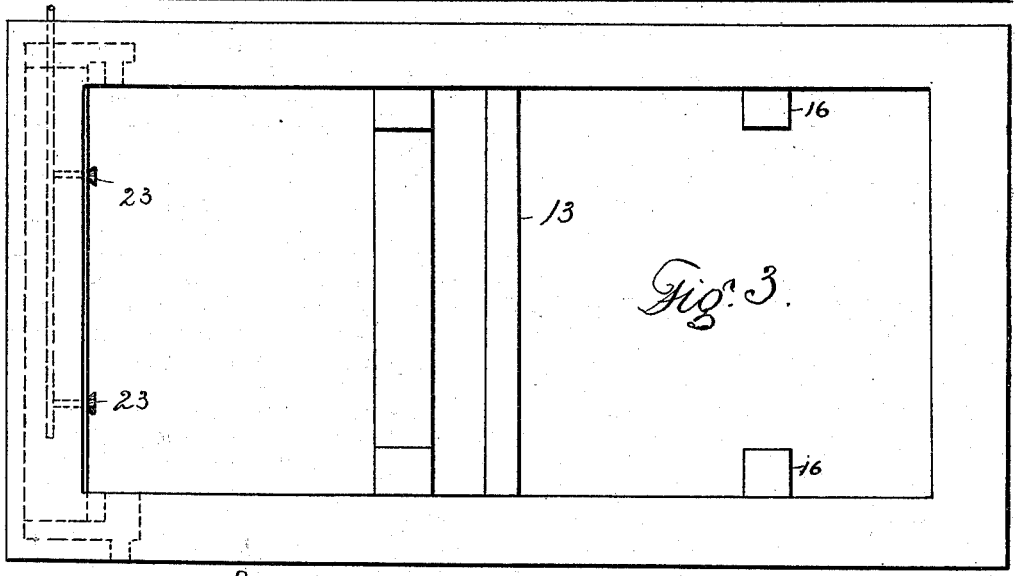
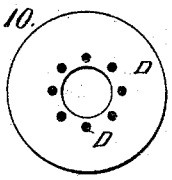


Fig. 3.

Fig. 10.



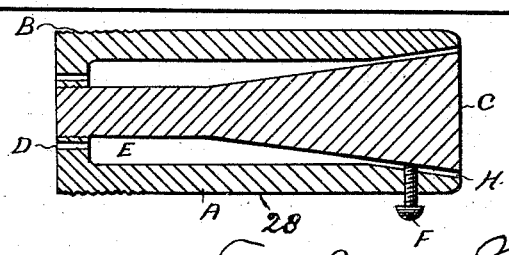


Fig. 9.

Fig. 11

WITNESSES:

G. J. Rollauer.

Wm. McConnell

INVENTOR

Fred Wild

BY A. J. O'Brien

ATTORNEY.

UNITED STATES PATENT OFFICE.

FRED WILD, OF DENVER, COLORADO.

AUTOMATIC FURNACE.

SPECIFICATION forming part of Letters Patent No. 492,175, dated February 21, 1893.

Application filed December 1, 1891. Serial No. 413,667. (No model.)

To all whom it may concern:

Be it known that I, FRED WILD, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Automatic Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in boiler furnaces and the object of the improvement is the same as set forth in my former applications Serial No. 371,804, filed November 18, 1890, and Serial No. 375,758, filed December 24, 1890; namely to provide an automatic smokeless furnace in which the chemical equivalents never vary. In this furnace I obtain perfect combustion under all circumstances since it adapts itself to any coal and works perfectly regardless of atmospheric changes and varying climatic conditions. The air supply is regulated to correspond with the different stages of combustion, being greater when the carbonaceous material or hydrocarbons are present in large quantities and less when this element of the fuel is diminished. In other words the supply of oxygen to the furnace is automatically regulated and commensurate at all times with the demands of combustion.

My improved smokeless furnace as well as the principle on which it operates, and by which it is governed, will it is believed be fully understood by reference to the accompanying drawings in connection with the description hereinafter given. From these drawings and description it will be observed that my improved furnace is of simple and economical construction, reliable and durable as well as automatic in operation and efficient in use.

Figure 1 of the drawings is a front elevation of my improved furnace. Fig. 2, a section taken on line *x*—*x*, Fig. 1. Fig. 3, a top view with the boiler removed. Fig. 4 is a fragmentary front view of the box whereby the supply of air to the furnace is automatically regulated. Fig. 5 is a transverse section of the same taken on the line P—P, Fig. 4. Fig. 6 is a longitudinal section taken on line *y*—*y*, Fig. 5. Fig. 7 is an enlarged view in detail of the detachable funnel-shaped mouth located in the apertures of the box through which the blowers protrude. Fig. 8 is a rear end view of the same. Fig. 9 is a longitudinal section taken through one of the blowers. Fig. 10 is a rear end view, and Fig. 11 a front view of the same.

Similar reference characters indicating corresponding parts or elements of the several views let the numeral 5 designate the body of the furnace, composed of suitable side, rear and front walls. The front portion of the space within these walls is divided by the grate 7 into the fire box 8 and ash pit 9. To the former lead the doors 5, 5 and to the latter the similar doors 6, 6. In the rear of the ash pit and extending somewhat above the same is the bridge wall 12. In the rear of the bridge wall is located the depending partition or arch 13 in the combustion chamber 14. On the line between the combustion chamber and the stack 15 and below the rear extremity of the boiler 17 may be placed the vertical side columns 16, 16, their object being to increase the draft of the stack and better distribute the heat to the boiler by narrowing the space between the stack and the combustion chamber.

Located in the upper portion of the front wall of the furnace and above the doors of the fire box, is the transverse removable box 18 preferably composed of cast iron, but which may be composed of any suitable non-combustible material possessing the requisite strength and durability. As shown in the drawings this box is provided with a removable face plate received by the grooves formed in the upper and lower flanges 20 and 21. The upper groove is of sufficient depth to permit the raising of the plate out of the lower groove when it is desired to remove the plate from the box. This face plate 19 is provided with one or more openings 22 adapted to receive the funnel shaped mouth piece 23 provided with lugs 24 secured to a cylindrical collar 25. In placing the mouth piece in the plate, lugs 24 are inserted in short counterpart slots continuous with openings 22. The

mouth piece is then turned partially around, thus locking it in position.

From the ash-pit or from any suitable point beneath the fire box or grate 7 on each side of the furnace lead the flues or ducts 30 communicating with box 18, and by means of which said box is supplied with air.

Communicating with the boiler and connected therewith at any suitable point is a pipe 27 extending into box 18. Connected with this pipe are the blowers 28, one for each opening 22 in face plate 19, and through which the requisite quantity of steam is forced into the fire box. The construction of these blowers is shown in Figs. 9, 10 and 11. Each blower is composed of a cylindrical shell A, exteriorly threaded at one extremity as shown at B and adapted to screw into the steam pipe. Within this cylinder is located a plug C which is largest at its outer extremity and tapers toward its opposite end. The inner extremity of the plug which is exteriorly threaded is screwed into a correspondingly threaded opening in the cylinder. In the inner extremity of the shell are formed apertures D surrounding the opening in which the smaller end of the plug is received. These openings are for the entrance of steam from the pipe to the chamber E of the shell. The larger end of plug C is cone-shaped and held in position within the cylinder by small adjusting screws F, whereby the space H surrounding the plug is maintained of uniform width. This space H is regulated according to the velocity with which it is desired to force the steam into the fire-box. If space H is small or contracted the steam rushes through with greater violence or rapidity under a given pressure, with a corresponding or increased vacuum-producing result or effect in box 18. While if the area of space H is increased and the pressure therefore less confined, the steam will pass out of the blower with less velocity or power to produce a vacuum in box 18. The outer portion of shell A is interiorly shaped or inclined to correspond with the conical shape of plug C. Hence the space H is regulated by screwing the plug in or out according as it is necessary to increase or diminish the size of the steam exit H.

Besides openings 22 the face plate 19 is provided with one or more openings or perforations 29 adapted to control the supply of air to the furnace from box 18.

Just above the regulating valve 27^a of pipe 27 there is connected with said pipe a smaller pipe 31 leading into box 18, its object being to conduct the water of condensation from the main pipe into the box which is adapted to retain a sufficient quantity.

When the fire is first made in the furnace and before the water is heated in the boiler this water in box 18 will become heated and sufficient steam will be generated therein and pass to the fire box for the purpose of combustion. In other words this water of condensation in box 18 is designed to supply the required amount of steam to the fire box before any steam has been generated in the boiler.

From the foregoing description it is thought the operation of my improved mechanism will be readily understood. When the fire is first made on the grate and while the air can pass readily therethrough from the ash-pit no air will pass through the ducts or flues 30 into box 18, and consequently no air will pass from box 18 into the fire box except the small quantity blown in with the steam passing from pipe 27 through the blowers. This result is based on the principle that the air will take the most direct route from the ash pit to the stack, which course is through the grate rather than the ducts or flues 30 leading to box 18 and thence from said box into the fire box. In this case the partial vacuum created in the box 18 by the action of the steam passing through openings 22 is filled by air from the fire box passing through openings 29 into box 18, on the principle that the partial vacuum in box 18 will be filled or destroyed by air from the nearest supply source, namely, the fire box, and will not pass from the ash-pit up through the ducts 30. When, however, the grate 7 is covered and the air can no longer pass through to the stack, the suction or draft through the stack will act above the grate, causing the air to rush through the ducts 30 and box 18 out of openings 29 to correspond with the requirements of combustion and the capacity of the stack. In this case the air supplied through box 18 exactly corresponds in amount with that previously supplied through the grate 7. Hence the area of openings 29 in face plate 19 is made to correspond with the grate surface of the air carrying capacity of the grate, the velocity or rate of travel of the air through the stack and the quality of the coal to be burned.

The object of the depending arch 13 is to partially confine the heat within the fire-box and cause it to act unequally on the boiler and thus keep up a circulation by reason of the displacement of the warm water in that portion of the boiler directly above the fire by that which is colder and farther away. This circulation of the water within the boiler prevents explosions by reason of the water being raised bodily from the bottom of the boiler, where this bottom is equally exposed, to the heat and the water in contact therewith equally heated. The hot air current from the box is also directed downward by the depending arch and thus kept longer in chamber 14. This arch also has another function, namely, preventing the solid particles of matter carried by the air current from the grate, from passing directly through the combustion chamber, and up into the flues of the boiler. These solid particles of matter first come in contact with arch 13 and are carried downward and deposited on the bottom of chamber 14, where they will do no damage and whence they are easily removed.

It will be observed that the face plate 19 of the box may be composed of brick and openings left corresponding with openings 22 and 29 in the face plate. Or this plate may be made in I-shaped sections which when put together between the top and bottom plates of the box will leave suitable openings 22 and 29. In this case any desired number of sections may be employed corresponding with the surface of the grate and the draft of the stack.

The back of box 18 may be of brick with the top plate supported thereon in front while in the rear it is supported by the I-shaped sections.

It must be understood that I do not wish to limit myself to any special construction for box 18 but claim broadly a receptacle properly located and supplied with air from below the grate, the receptacle being provided in front with suitable openings for the purposes heretofore explained. Hence I claim for my improved furnace perfect and complete combustion with any coal under any atmospheric conditions, at any altitude, and with any steam pressure; also rapid circulation of the water in the boiler and freedom from consequent dangers resulting from explosions; also great economy in fuel with no smoke as the result of complete combustion.

Having thus described my invention, what I claim is—

1. A furnace provided with a receptacle or chamber 18 formed across the front end thereof and having air flues or ducts 30 leading thereto from the ash pit or from beneath the grate and provided with two sets of openings communicating with the fire box whereby the furnace has an indirect supply of air from beneath the grate, that is to say, through flues 30 and chamber 18 as well as a direct supply through the grate, in combination with a steam pipe leading from the boiler and extending into receptacle 18, one or more blowers connected with the steam pipe and protruding through one set of openings, the other set of openings being regulated to correspond with the grate surface and the capacity of the stack, substantially as described.

2. In a furnace the combination with the box or receptacle placed or formed across the front end of the fire box, provided with air flues or ducts leading from beneath the grate and two sets of openings 22 and 29 communicating with the fire box, a steam pipe leading from the boiler into receptacle 18 and provided with one or more blowers located at openings 22 and corresponding in number with said openings, funnel shaped mouths surrounding said openings and extending into the fire box, the area of the openings 29 being regulated to correspond with the grate surface and the capacity or draft of the stack, substantially as and for the purposes set forth.

3. The combination in a furnace of a box, receptacle or chamber formed or located across the front end of the furnace and provided with air flues or ducts leading thereto from the ash-pit and one or more openings 22 and 29 communicating with the fire box, a steam pipe leading from the boiler into box 18 and provided with blowers corresponding in number with openings 22 and located at said openings, said blowers consisting of a cylindrical shell screwed into the pipe and provided with an adjustable plug located therein, the number or area of openings 29 being regulated according to the requirements of the furnace, substantially as described.

4. The combination in a furnace of a box or receptacle formed or located across the front end thereof and provided with air ducts or flues leading thereto from the ash-pit or from any suitable point beneath the grate and provided with openings 22 communicating with the fire box, a steam pipe 27 leading from the boiler and having blowers located at said openings, another pipe connected with pipe 27 and adapted to carry the water of condensation to box 18, substantially as and for the purpose set forth.

5. The combination in a furnace of a box or receptacle 18 located across the front end thereof and provided with air ducts or flues leading thereto from the ash pit or from any suitable point beneath the grate, said box being provided with two sets of openings communicating with the fire box, a steam pipe leading from the boiler and extending into receptacle 18, one or more blowers connected with the steam pipe and protruding through one set of openings, the other set of openings being regulated to correspond with the grate surface and the capacity of the stack, and a depending arch lying between the side walls of the furnace in the combustion chamber and in the rear of the space communicating with the fire box above the bridge wall, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

FRED WILD.

Witnesses:
WM. MCCONNELL,
G. J. ROLLANDET.