

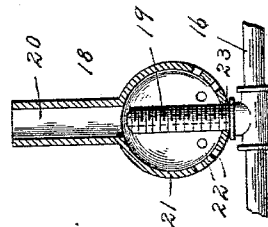
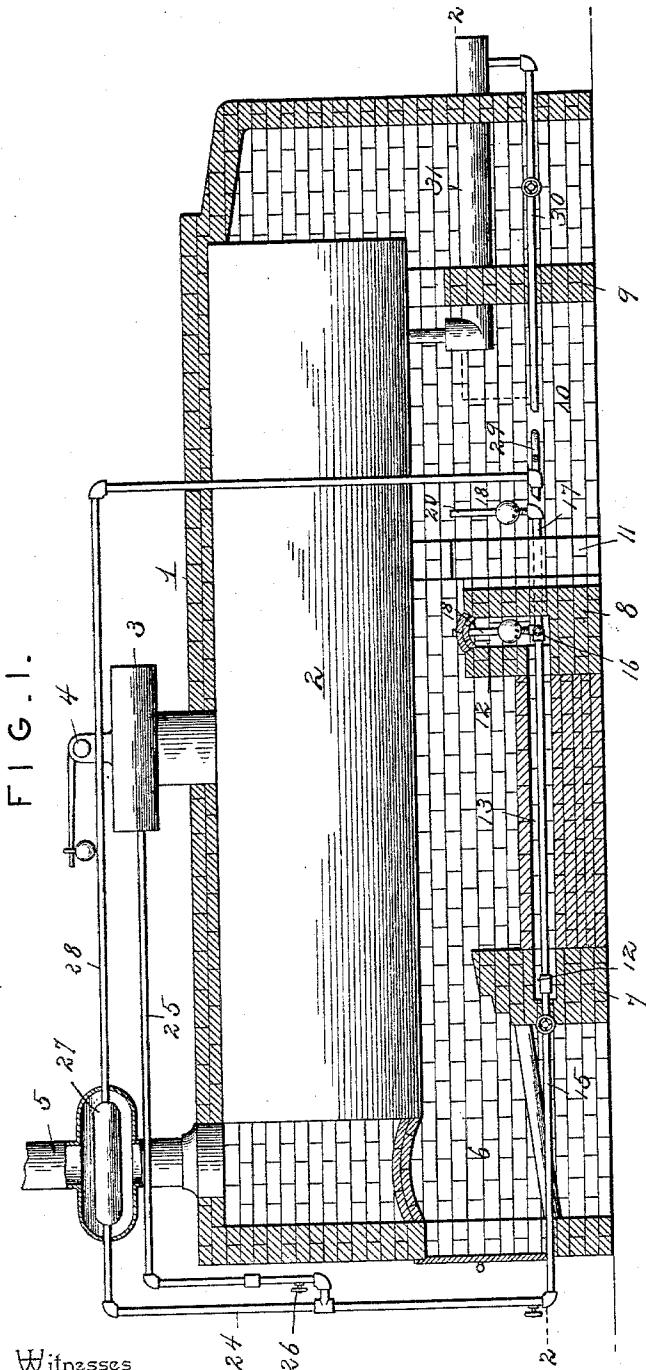
(No Model.)

2 Sheets—Sheet 1.

P. FLEMING & W. J. WALSH.
SMOKE CONSUMING FURNACE.

No. 566,674.

Patented Aug. 25, 1896.



Witnesses
Harry L. Amer,
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By their Attorneys.

Inventors
Peter Fleming and
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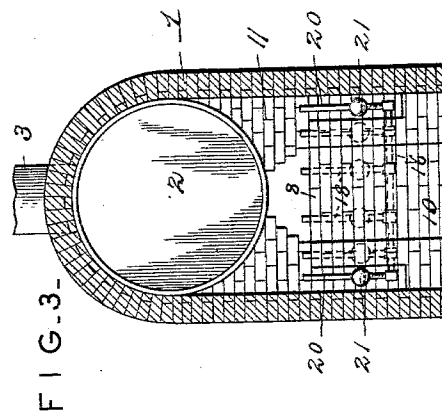
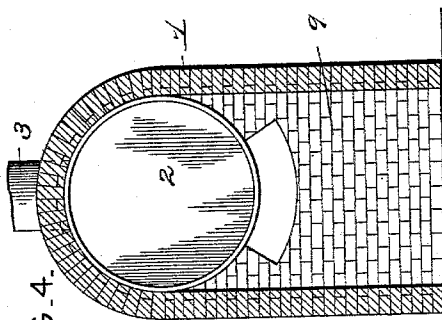
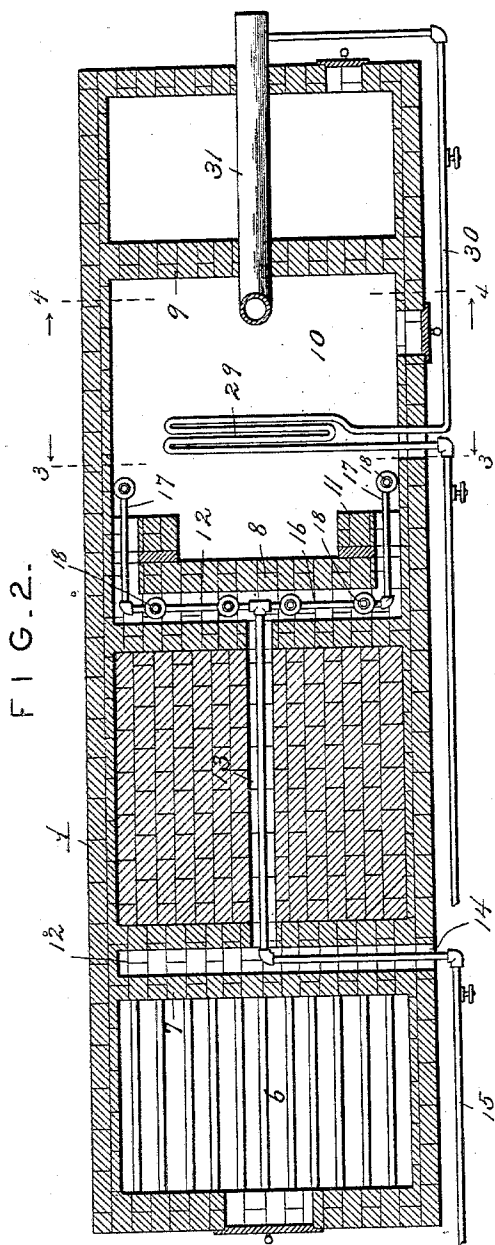
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UNITED STATES PATENT OFFICE.

PETER FLEMING AND WILLIAM J. WALSH, OF BUTTE, MONTANA.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 566,674, dated August 25, 1896.

Application filed January 25, 1896. Serial No. 576,884. (No model.)

To all whom it may concern:

Be it known that we, PETER FLEMING and WILLIAM J. WALSH, citizens of the United States, residing at Butte, in the county of Silverbow and State of Montana, have invented a new and useful Smoke-Consuming Furnace, of which the following is a specification.

This invention relates to smoke-consuming furnaces; and it has for its object to effect certain improvements in furnaces of this character whereby the smoke will be entirely consumed and the greatest amount of heat obtained from the fire with the use of but a minimum amount of fuel.

To this end the main and primary object of the invention is to provide a smoke-consuming furnace which shall provide for the thorough consumption of the smoke in such a manner that a great saving of fuel will be effected.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed:

In the drawings, Figure 1 is a vertical longitudinal sectional view of a steam-boiler furnace constructed in accordance with this invention, the pipes outside of the furnace-casing being shown in elevation. Fig. 2 is a horizontal sectional view on the line 2 2 of Fig. 1. Fig. 3 is a transverse sectional view on the line 3 3 of Fig. 2. Fig. 4 is a similar view on the line 4 4 of Fig. 2. Fig. 5 is an enlarged detail sectional view of one of the combined steam and hot-air distributing jets.

Referring to the accompanying drawings, the numeral 1 designates a furnace-casing, within which is mounted an ordinary boiler 2, provided with a steam-dome 3, projected above the top of the casing 1, and having an ordinary safety-valve 4. The boiler 2 is mounted within the furnace-casing in any suitable manner so as to provide for the circulation of the heat and other products of combustion under the boiler throughout its entire length and through the flues thereof to the front end of the furnace-casing, with which is connected an ordinary smoke-stack 5, which forms the main draft-flue of the furnace.

The furnace-casing 1 is provided at its front end, below the front end of the boiler 2, with the usual fire-box 6, inclosed at one side by the main front bridge-wall 7, arranged transversely within the furnace-casing and extending from side to side thereof. In rear of the front bridge-wall, below the boiler 2, are successively arranged an intermediate and rear bridge-wall 8 and 9, respectively, which are also disposed transversely within the casing and extend across the space between its side walls. The bridge wall 9 is disposed directly below the rear end of the boiler 2, near the rear end of the furnace-casing, while the intermediate bridge-wall 8 is located at a point between the front and rear walls 7 and 9, and incloses therebetween and the said wall 9 an enlarged rear combustion-chamber 10, which is located below the rear portion of the boiler 2, and is designed to provide for the complete combustion of the smoke therein before the heat and other products of combustion pass into the flues at the rear end of the boiler.

The products of combustion from the fire-box pass under the boiler and over both of the bridge-walls 7 and 8 before the same enter the combustion-chamber 10 under the rear portion of the boiler, and in order to provide for the proper deflection of the smoke and other products of combustion toward the center of the combustion-chamber 10 a pair of vertical baffle-walls 11 is employed. The vertical baffle-walls 11 are arranged adjacent to and in rear of the intermediate bridge-wall 8, and are built at opposite inner sides of the furnace-casing 1, so as to extend up from the floor thereof to the under side of the boiler 2, whereby the smoke and other products of combustion which pass over the wall 8 will necessarily be contracted and deflected toward the center of the chamber 10 in order to secure the desired result.

The front and intermediate bridge-walls 7 and 8 are provided longitudinally therein with hot-air passages 12, which are connected together by an intermediate hot-air flue 13, built longitudinally within the furnace-casing between the two walls 7 and 8, and said hot-air flue 13 communicates at one end with the passage 12 of the wall 7 at an intermediate point, and at its other end communicates with

the passage 12 of the wall 8 at an intermediate point, so that a direct and continuous communication is provided between the air-passages in the said bridge-walls 7 and 8.

5 The air-passage in the front bridge-wall 7 opens at one end outside of the furnace-casing, as at 14, to provide for taking in fresh cold air from outside of the furnace, which cold air becomes heated as it circulates
10 through the air-passages of the front and intermediate bridge-walls and in the hot-air flue connecting such air-passages.

A steam-supply pipe 15 leads from the outside of the furnace-casing into the air-passage
15 12 of the wall 7, and extending through the flue 13 connects with a jet-pipe 16, arranged longitudinally within the air-passage 12 of the wall 8, and is provided at its opposite ends with therearwardly-extending arms 17, which
20 project through the vertical baffle-walls 11 and into the combustion-chamber between the walls 8 and 9, as clearly illustrated in Fig. 2 of the drawings. The jet-pipe 16 and the extremities of the pipe-arms 17, within the
25 chamber 10, carry combined steam and hot-air jets 18, which provide for jetting a mixture of dry hot air and steam into the smoke and other products of combustion as the same pass over the wall 8 and into the chamber 10.
30 The jet-pipe 16 carries a series of the jets 18, which jets project out of the air-passage 12 of the wall 8 to a point above the top of the wall, so that the jet of steam and hot air will be distributed directly into the smoke to supply
35 the latter with sufficient oxygen in the best possible condition to insure the complete combustion of the smoke. The said combined steam and hot-air distributing jets 18 essentially consist of an exteriorly-threaded heavy
40 brass non-corroding steam-nipple 19, connected at its lower end to the pipe supplying steam thereto, and a discharge-tube 20 of a greater diameter than and arranged in line with and beyond the exteriorly-threaded nipple
45 19.

The discharge-tube 20 of each distributing-jet is provided at its lower end with an enlarged air-bulb 21, provided in the sides thereof with a series of hot-air-inlet openings 22,
50 and also provided in its lower end with a threaded opening 23, engaging the exterior threads of the steam-nipple 19.

In operation the steam is discharged out of the nipple 19 into the tube 20, and a suction
55 is necessarily produced in the bulb 21, which draws in hot air through the openings 22 from the passage 12, in which the jet is located, and as the operation continues the steam and hot air become thoroughly commingled, and in such condition are discharged out
60 of the tube 20. By adjusting the position of the bulb 21 on the exteriorly-threaded nipple 19 it will be readily understood that the suction of the jet may be increased or diminished, so as to accurately regulate the amount
65 of hot air and steam which is to be jetted into the smoke.

By reason of arranging the steam-supply pipe 15 in the hot-air passage 12 of the wall 7 and in the hot-air flue 13 the steam conducted through such pipe is necessarily superheated and thoroughly dried before it reaches the combined steam and hot-air distributing jets, and is therefore in the best possible condition for doing effective work in
75 connection with the hot air that is drawn into and discharged out of the jets. The said steam-supply pipe 15 has suitably connected therewith, outside of the furnace-casing, the branch steam-pipes 24 and 25, respectively,
80 the latter of which pipes, 25, is preferably connected with the steam-dome 3 of the boiler, and is provided with a suitable valve 26, so that communication with the pipe 15 may be controlled as desired. The other branch
85 steam-pipe 24 connects with the steam-drum 27, which is mounted inside the smoke-stack 5, near the base thereof, and said steam-drum is kept supplied with steam by the pipe 28, which connects at one end with a pipe-coil 29,
90 arranged at an intermediate point within the combustion-chamber 10, and is designed for the generation of steam to supply the same to the annular steam-drum 27. The steam-generating coil 29 is preferably supplied with
95 water by the feed-pipe 30, suitably connected at one end with said coil and at its other end with the mud-drum 31, which is connected with the rear end of the boiler and to the lower side thereof to subserve its usual function,
100 and at this point it will be noted that all of the pipe connections are provided with suitable valves so that the flow therethrough may be regulated or cut off at any time desired. By reason of having the separate steam-pipe
105 branch connections 24 and 25 with the pipe 15 such pipe 15 may be supplied with steam from either or both of said pipes 24 and 25, as the requirements of the furnace may demand, it being noted at this point that the
110 steam in the drum 27 is necessarily superheated and thoroughly dried, and at times it may be necessary to modify this condition of the steam by combining the same with the steam conducted directly from the steam-
115 space in the boiler by the pipe 25.

From the foregoing it is thought that the construction and operation of the herein-described smoke-consuming furnace will be readily apparent by those skilled in the art,
120 and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.
125

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a smoke-consuming furnace, the combination with the furnace-casing and the boiler therein; of an intermediate and rear bridge-wall respectively arranged within the furnace-casing below the boiler at an intermediate point and at its rear end, said inter-

mediate and rear bridge-walls confining there-
between an enlarged combustion-chamber,
and the intermediate bridge-wall being pro-
vided with a longitudinally-disposed hot-air
5 passage, a pair of vertical baffle-walls ar-
ranged at opposite inner sides of the furnace-
casing adjacent to and in rear of the bridge-
wall and extending from the floor of the cas-
ing to the under side of the boiler, a steam-
10 jet pipe arranged within said hot-air passage
and provided at its ends with rearwardly-ex-
tending arms projected through the baffle-
walls into said combustion-chamber, and a
series of combined steam and hot-air jets
15 fitted to said jet-pipe and to the rear ex-
tremities of the arms thereof, the jets fitted
to the jet-pipe being projected above the top
of the intermediate bridge-wall, substantially
as set forth.

20 2. In a smoke-consuming furnace, the com-
bination with the furnace-casing and the
boiler therein; of the separated front and in-
termediate bridge-walls provided longitudi-
nally therein with air-passages, the air-pas-
25 sage of the front bridge-wall opening at one
end outside of the furnace-casing, a hot-air
flue built between the two bridge-walls and
communicating at its ends with the air-pas-
sages therein, a steam-jet pipe arranged in
30 the air-passage of the intermediate wall and
provided with a series of combined steam and
hot-air jets projected above the top of the in-

termediate wall, and a steam-supply pipe
leading from a point of steam supply into the
air-passage of the front bridge-wall and ex-
tending through the hot-air flue to said steam-
jet pipe, substantially as set forth. 35

3. In a furnace of the class described, the
combination with the furnace-casing having
a smoke-stack, and the boiler arranged within
40 the furnace-casing; of an intermediate and
rear bridge-wall respectively arranged below
the boiler at an intermediate point and at its
rear end, said bridge-walls confining there-
between an enlarged combustion-chamber, a
45 suitably-arranged steam-jet pipe, a steam-
drum mounted inside the smoke-stack, a
steam-supply pipe connected with said steam-
jet pipe and having branch connections re-
spectively with said steam-drum and the
50 boiler, and a steam-generating-pipe coil ar-
ranged within said combustion-chamber and
having a feed-water-pipe connection and a
steam-pipe connection with said steam-drum,
substantially as set forth. 55

In testimony that we claim the foregoing
as our own we have hereto affixed our signa-
tures in the presence of two witnesses.

PETER FLEMING.
WILLIAM J. WALSH.

Witnesses:

JOHN LINDSAY,
JOHN KELSEY.