(No Model.)

D. M. HARTEAU & M. GAFFING.

STEAM BOILER FURNACE.

No. 432,668. Patented July 22, 1890.

Fig. 1.

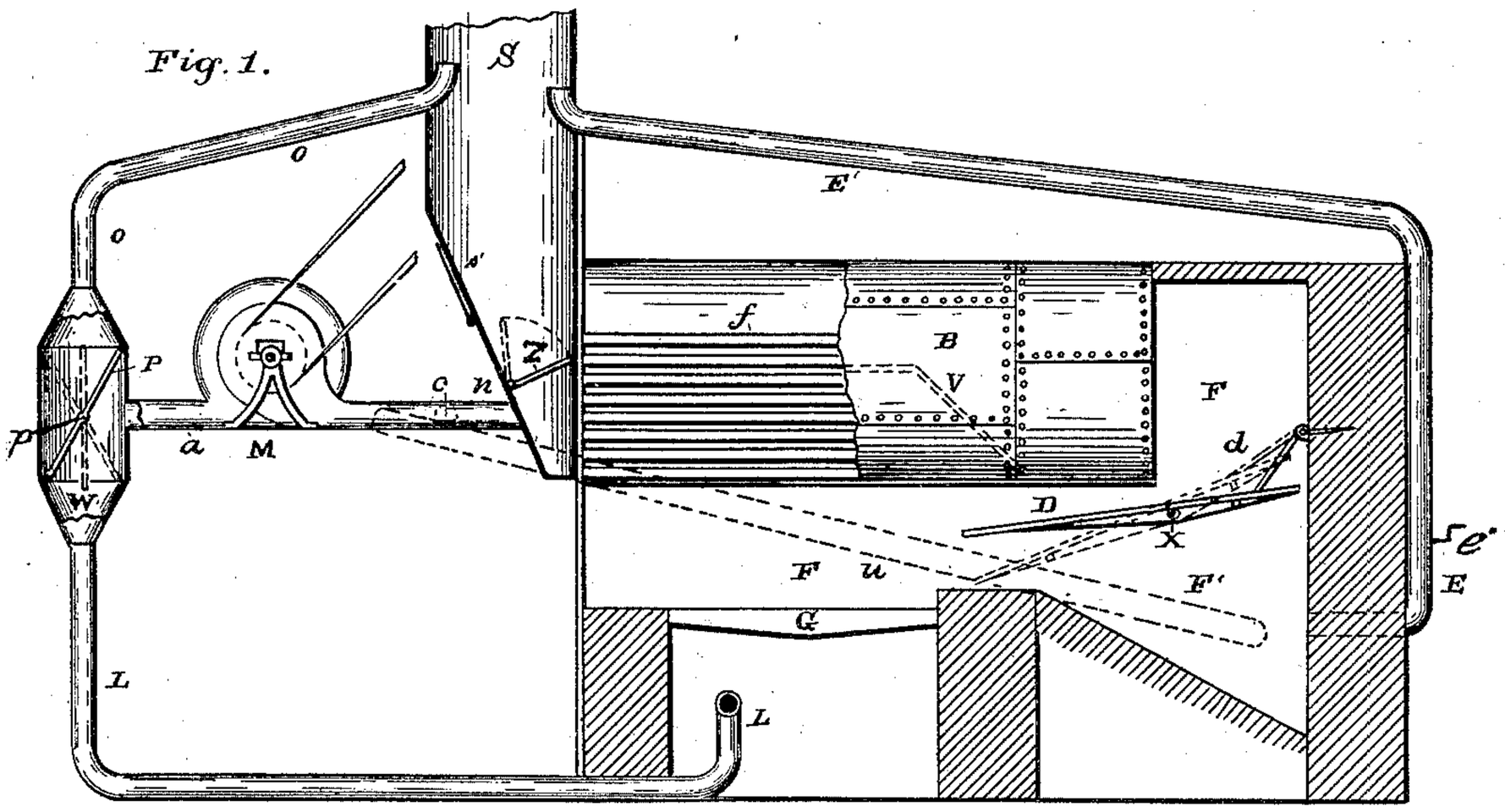


Fig. 2.

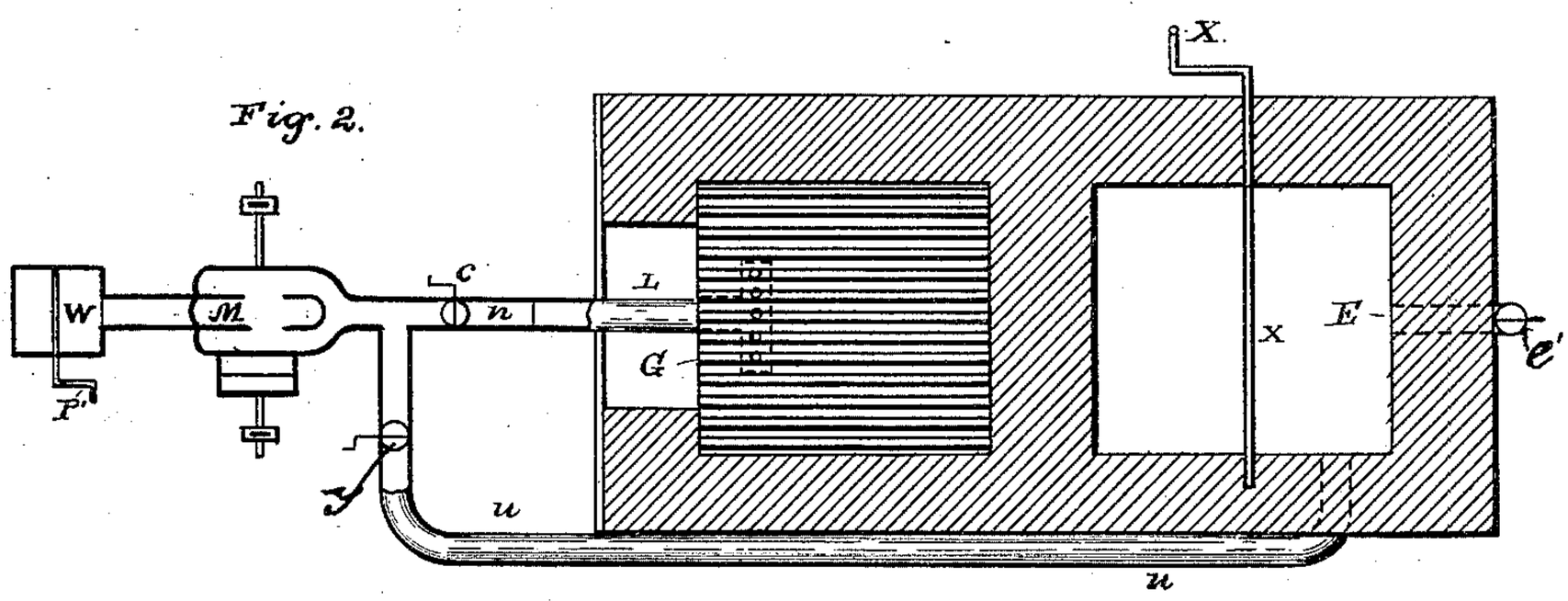
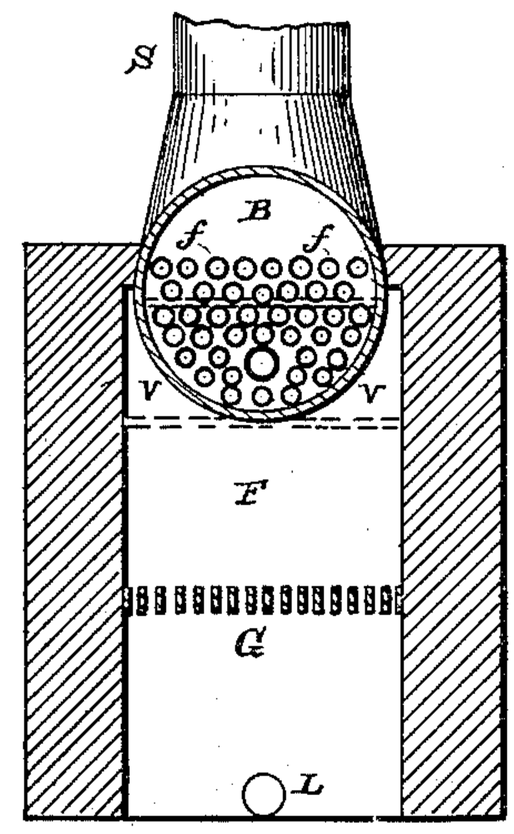


Fig. 3.



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DAVID MICHAEL HARTEAU AND MICHAEL GAFFING, OF GREEN BAY, WISCONSIN.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 432,668, dated July 22, 1890.

Application filed November 25, 1889. Serial No. 331,451. (No model.)

To all whom it may concern:

Be it known that we, DAVID MICHAEL HARTEAU and MICHAEL GAFFING, citizens of the United States, residing at Green Bay, in the county of Brown and State of Wisconsin, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and we do hereby 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.

Our invention relates to furnaces, more particularly to steam-boiler furnaces.

The object of our invention is to obtain by a novel arrangement of dampers, chambers, and draft-passages the separation of the hot air before it leaves the furnace from the cold or semi-heated air and heavy smoke and gases, and to convey the latter by a separate channel to the chimney or smoke-stack, while the hot air takes the usual channel to the boiler-flues.

It is also our object to devise means for intercepting the hot air, gases, and smoke after they pass through the lower boiler-flues and conduct them by forced draft under the grate, and thereby promote combustion and increase the draft.

It is also our object to increase the generation of steam in boilers by quickening the velocity of the draft through the lower boiler-flues, and thereby heat the same equally with the upper flues.

It is also our object to devise means for increasing and regulating the draft and generation of steam and promoting combustion by conducting the air from either the furnace direct or from the bottom of the smoke-stack and lower boiler-flues and forcing the same under the grate or directly to the smoke-stack above the breecher or to force it in both directions simultaneously.

It is also our object to devise means for rapidly cooling the furnace when desired.

In the accompanying drawings, forming part of this specification, and in which like letters of reference denote like parts, Figure 1 is a longitudinal vertical section of our steam-boiler furnace. Fig. 2 is a horizontal section, and Fig. 3 is a transverse vertical section, of the same.

B denotes the boiler; *f f*, the boiler-flues; G, the grate; F, the furnace; S, the smoke-stack.

D is a dividing-damper, which extends across the back of the furnace from side wall to side wall, reaching nearly to the back wall of the furnace, as shown in Fig. 1.

X is a shaft upon which said damper is swung, and X′ a crank to operate the same.

d is a small damper having the full width of damper D. It serves to inclose the space between the back wall of the furnace and the said damper D. It is hinged to said back wall, its free end resting upon said damper D and riding upon the same when motion is imparted by the crank X′.

F′ is a cold-air chamber covered by the damper D *d*.

M is a fan having a hollow arbor *m* and geared by a belt and pulley with the machinery or auxiliary engine. Said fan may be placed either in front or to one side of the boiler.

n is a pipe opening at one end into the lower part of the smoke-stack or breecher and at the other into the fan M. Said pipe is provided with a valve *c*.

Z is a damper hinged to the inner wall of the smoke-stack or breecher and operated by a suitable crank. Said damper is shown in Fig. 1 as closed. When open it drops back against the breecher-wall. To close it, it is swung down against the boiler-front, as shown, thereby separating the number of lower boiler-flues desired.

A is a short pipe leading from the fan M to a receiver W. Said receiver is provided with a damper P, operated by a crank-shaft *p*.

o is a pipe connecting said receiver with smoke-stack above the breecher, and L is a pipe connecting said receiver with the draft-chamber under the grate.

u is a pipe opening into the cold-air chamber F′ and into the pipe *n* at a point about midway between the valve *c* and fan M, as shown in Fig. 2. Said pipe is provided with a damper *y*. E is a pipe connecting said chamber F with the smoke-stack and provided with a damper *e′*.

V V are aprons placed under the boiler to receive the dividing-damper D when closed.

The fan M acts as either a suction exhaust or blower to supply forced draft, or acts in both capacities simultaneously.

The dividing-damper D serves to divide the cold and semi-heated air and heavy smoke and gases from the hot air and deflect the former to the cold-air chamber F′, while the hot air ascends to the boiler. So much of the cold and semi-heated air or smoke and gases as escape this division naturally take the lower flues of the boiler, and the purpose of the damper Z is to cut off the communication of said flues from the smoke-stack or chimney, and by means of the pipe *n* and fan M, which for this purpose acts as a suction-exhaust, to conduct said air, smoke, and gases from said flues and simultaneously force the same through the pipe *a* into the receiver W, whence, by operating the damper P, they may be forced through the pipe L under the grate or through the pipe *o* to the smoke-stack, or forced through both pipes simultaneously. The advantage of this construction is that the air, smoke, and gases in passing through said lower boiler-flues are given a greatly-increased velocity, thereby heating said flues equally with the upper flues of the boiler, which upper flues naturally form the channels of the hottest air. Another advantage of this construction is that said semi-heated air, smoke, and gases may be again forced through the furnace, thereby promoting combustion and draft. Another advantage is that by operating the dampers P and Z a more exact and immediate regulation of the heat in the boiler may be obtained. The pipe E serves as an outlet from the chamber F′ to the smoke-stack, communication being regulated by a damper *e*. The pipe *u* serves as both an inlet and an outlet pipe to said chamber F′, communication being regulated by the damper *y*.

When damper Z is open and the fan M is in motion, valve *c* in pipe *n* may be closed, thereby causing the boiler-flues to work, as usual in other boilers. Then if valve *y* in pipe *u* be opened the cold air from chamber F′ is exhausted through said pipe to the fan and forced through pipe *a* to the receiver W, whence, by operating the damper P, it can be either forced through the pipe *o* to the smoke-stack or through the pipe L under the grate, or through both pipes *o* and L, simultaneously, in each case increasing the draft. In exhausting said cold air through the pipe *u* the damper in pipe E may be closed. To reduce the heat in the boiler suddenly, the dividing-damper D should be closed up against the apron V V, the damper Z closed, and the breecher-door *s′* opened. Then the fan will draw the cold air from the outside through the upper boiler-flues around into and through the lower boiler-flues, through the pipe *n*, and force it through pipe *a* into the receiver and to the smoke-stack, in which case the heated air escapes through the pipe E to the chimney.

The fan M may exhaust from both the cold-air chamber F′ and lower boiler-flues at the same time and the air and products of combustion be carried under the grate or up the chimney or forced in both directions simultaneously. This is done by separating the lower boiler-flues by damper Z and opening the damper *c* in pipe *n* and the damper *y* in pipe *u*, thereby operating the damper P in the receiver W. The draft may be all thrown to the chimney or to the grate or divided and thrown in both directions. The air and heavy products of combustion in chamber F′ may be carried to the chimney by forced draft through the pipe E by closing the damper *c* in pipe *n* and opening the damper *y*.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a steam-boiler furnace, of a partition adapted for separating the hot air and lighter products of combustion from the semi-heated air and smoke or heavy products of combustion prior to its passage through the flues of a steam-boiler and conveying the same by separate escape-channels to the chimney, substantially as described.

2. The combination, with a steam-boiler furnace, of a partition adapted to separate the products of combustion into heavier and lighter grades before said products reach the boiler-flues and conveying the said graded products by separate and independent outlets to the outer air, substantially as described.

3. The combination, in a steam-boiler furnace having separate and independent outlets for the escape of the hot air and the cold or semi-heated air, gases, and smoke, of the adjustable partition adapted to separate said heavier and lighter products before said products reach the boiler-flues, substantially as described.

4. The combination, in a steam-boiler furnace, of the partition adapted for separating the heavier and lighter products of combustion before said products reach the boiler-flues, an outlet for the lighter products, and an outlet for the heavier products, located at a point below the plane of the outlet for the lighter products, substantially as described.

5. The combination, in a steam-boiler furnace, of the upper outlet, the lower outlet, and the partition located intermediate said outlets for dividing or separating the products of combustion according to gravity before said products reach the boiler-flues, substantially as described.

6. The combination, with a steam-boiler furnace having partition for separating the heated or hot air from the cold or semi-heated air, smoke, and gases before said products of combustion reach the boiler-flues, of a chamber for receiving the latter, provided with suitable outlets or pipes, substantially as described.

7. The combination, with a steam-boiler furnace having partition adapted for separating

the heated or hot air from the semi-heated air, smoke, and gases before said products reach the boiler-flues, of a chamber for receiving the heavier products, provided with inlet and outlet pipes, and means for forcing said air, smoke, and gases to the chimney, substantially as shown and described.

8. The combination, in a steam-boiler furnace, of a damper or cut-off for separating or dividing the outlets of the upper from the outlets of the lower boiler-flues, fan for increasing the draft through the lower boiler-flues, and means for conducting said draft under the grate and to the chimney simultaneously, substantially as described.

9. The combination, in a steam-boiler furnace, of a damper or cut-off for dividing the air-currents, and means for exhausting the air-currents from the lower boiler-flues and conveying the same under the furnace-grate, the currents through the upper flues passing to the chimney, substantially as described.

10. The combination, in a steam-boiler furnace, of a damper or cut-off for dividing the air-currents, and means for exhausting the air-currents from the lower boiler-flues and conveying the same to the chimney, substantially as described.

11. The combination, in a steam-boiler furnace having partition adapted for separating the hot air from the semi-heated air, smoke, and gases before they reach the boiler-flues, of fan for exhausting the air from the lower boiler-flues and conveying the same simultaneously to the chimney and under the grate, while the currents through the upper flues are allowed to pass up the chimney, substantially as described.

12. The combination, in a steam-boiler furnace, of a cut-off for separating the air-currents after they have passed through the flues, and a suction-fan for increasing the draft through the lower flues, substantially as shown and described.

13. The combination, in a steam-boiler furnace, of a chamber for the reception of the heavier products of combustion before they reach the boiler-flues, and means for conveying the same to the chimney direct or to both the chimney and grate simultaneously, substantially as described.

14. The combination, in a steam-boiler furnace, of a chamber for the reception of the heavier products of combustion before they reach the boiler-flues, and means for conveying the same to the grate, substantially as and for the purposes described.

15. The combination, in a steam-boiler furnace in which the heavier and lighter products of comubustion are divided, of a chamber for the reception of the heavier products of combustion and means for conveying the same to the chimney and grate simultaneously, substantially as and for the purposes described.

16. The combination, with a tubular boiler having means for secluding the products of combustion from the tubes and conducting the same directly to the outer air, of a stack or chimney having an opening near its lower end or breecher, a device arranged below said opening adapted to divide the lower portion of the chimney or breecher, and means for drawing the cold or outer air through said opening and into the upper series of flues and through the lower series of flues, substantially as described.

17. The combination, with a tubular boiler having a forced draft, of means for conducting the products of combustion to the stack without first passing through the flues, and means for drawing cold air through said tubes, substantially as described.

18. A steam-boiler furnace having the adjustable dividing-damper D *d*, aprons V V, the chamber F′, having the pipes E and *u*, provided with suitable dampers, the damper Z, arranged at the lower part of the chimney or breecher, the pipe N, having the valve *c*, the fan M, the pipe A, receiver W, having the damper P, the pipe *o*, leading from said receiver to the chimney, and the pipe L, leading from said receiver to the grate, substantially as and for the purposes shown and described.

19. The fan M, having the passage-way *a*′ formed on the side shell-boxing, substantially as and for the purposes shown and described.

In testimony whereof we have affixed our signatures in presence of two witnesses.

DAVID MICHAEL HARTEAU.
MICHAEL GAFFING.

Witnesses:
VAN BUREN BROMLEY,
JAMES F. LYON.