

(No Model.)

2 Sheets—Sheet 1.

J. W. BAKER.
GAS HEATER OR FURNACE.

No. 552,504.

Patented Jan. 7, 1896.

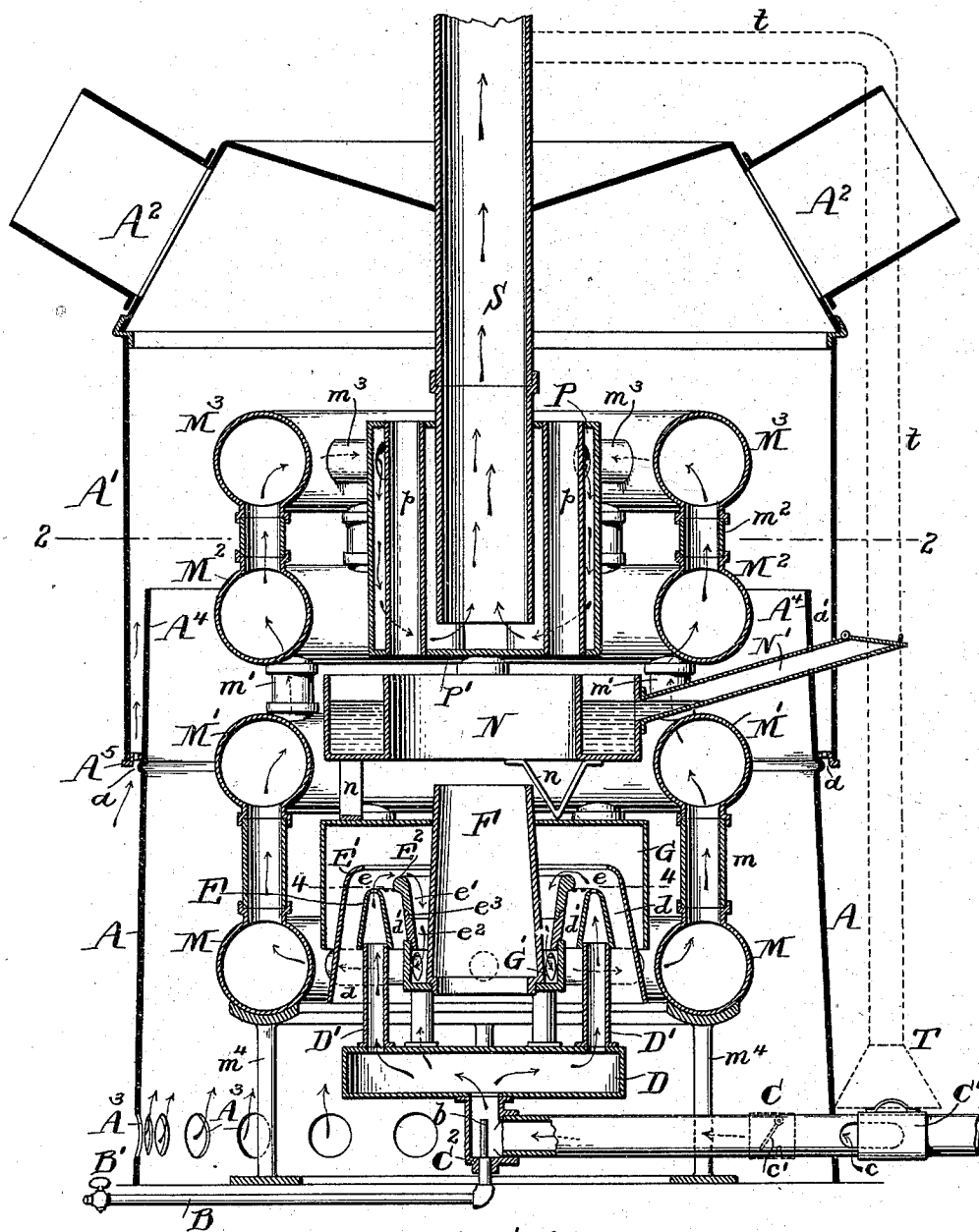


FIG. 1.

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(No Model.)

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FIG. 2.

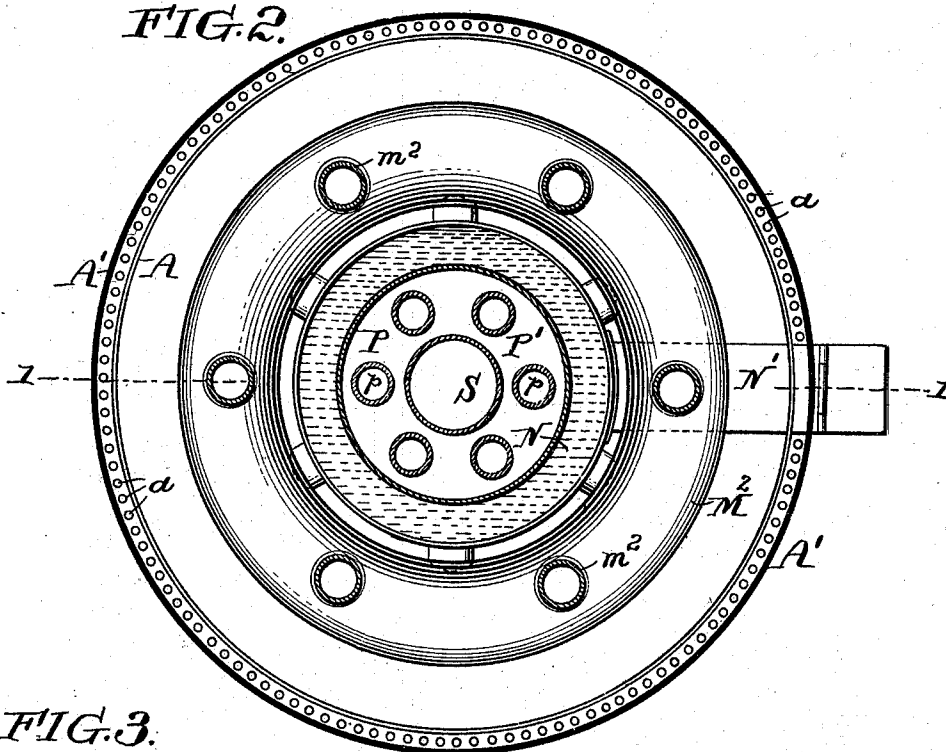


FIG. 3.

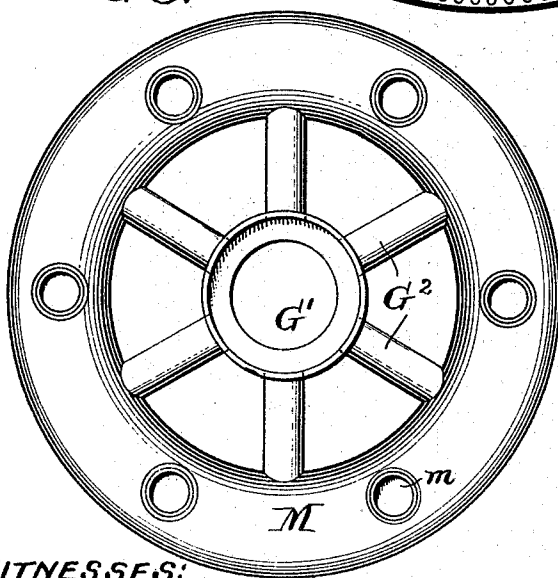
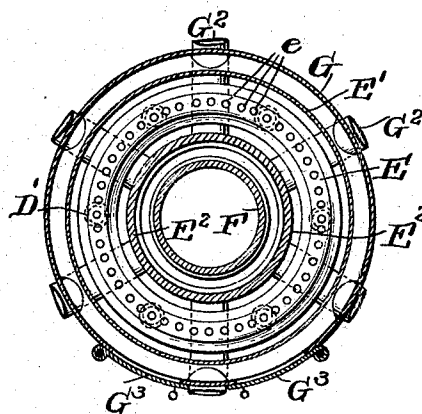


FIG. 4.



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UNITED STATES PATENT OFFICE.

JOHN W. BAKER, OF PHILADELPHIA, PENNSYLVANIA.

GAS HEATER OR FURNACE.

SPECIFICATION forming part of Letters Patent No. 552,504, dated January 7, 1896.

Application filed March 15, 1893. Serial No. 466,057. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. BAKER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in Gas Heaters or Furnaces, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to heaters or furnaces, especially to those in which gaseous fuel is employed, and has for its object the overcoming of several practical difficulties in the operation, and a general improvement in the construction of this class of furnaces, rendering them more efficacious and capable of burning equally well with all qualities of gas. One of the troubles heretofore found in this style of furnace has been that if the heated products of combustion are conducted through several radiators so as to obtain all the heat possible, then the cooled gases are so sluggish that a proper draft cannot be maintained, while if a proper draft be maintained much heat is lost by going up the chimney. Another trouble in the practical operation of these furnaces has been the variation in their heating capacity on account of the varying quality of the gas used in different places. These and other difficulties have been overcome by my invention, which is best described in connection with the drawings illustrating a furnace in which it is embodied, and in which—

Figure 1 is a sectional elevation of a heater or furnace embodying my invention, taken on the line 1 1 of Fig. 2. Fig. 2 is a plan on the section-line 2 2 of Fig. 1. Fig. 3 is a plan view of the lower heating-section M and its connections removed from the furnace, and Fig. 4 is a plan on the section-line 4 4 of Fig. 1.

A and A' represent the outer casings of the heater.

A² are flues adapted to conduct heated air uncontaminated with products of combustion to radiators or other places where it may be used for heating purposes.

S is an outlet-flue for the products of combustion and leads to a chimney in the usual way.

The casing A is provided, preferably, near or at its base with openings, as A³, for the admission of air, though in some cases air may, if preferred, be led to the furnace through a suitable pipe or conduit when it is not desired to take air from the chamber in which the furnace is situated. Supported within the casing in any convenient manner, as by uprights *m*⁴, is placed a heating-drum, as M. This, as shown, is made annular to conform to the cylindrical shape of the furnace, but it may of course be of any convenient shape. Arranged in the lower part of the casing, preferably and conveniently as shown within the lower drum M, is a burner E supported, as shown, on pipes D' leading from a mixing-box, as D, into which lead air and gas pipes, marked C and B, respectively. The air-pipe C is a comparatively large pipe having an opening *c* outside the casing for the admission of air. A valve, as C', is arranged so as to regulate the size of the opening *c* in the air-pipes whereby the supply of the air-supply to the burner is very important, since the quality of gas varies greatly in different localities, all the way from ten to sixty candle-power, and when no regulation is provided to govern the amount of air admitted to be mixed with the gas either too much air is admitted, making a weak flame, or too little, in which case the smoke is formed which fills up the radiators with soot, but by regulating the amount of air to the burner this trouble is entirely done away with and the proper amount of air can be admitted to suit any quality of gas.

The air-pipe is preferably provided with a light non-return valve *c'*, so as to prevent any gas being forced back outside of the heater. In case, however, that this return of the gas should happen, or the non-return valve be omitted, a bonnet T, as shown in dotted lines, may be arranged, preferably, over the opening *c* in the air-pipe and connects by means of a pipe *t* with the outlet-flue, so that any escaping gas will be drawn up the chimney. The gas-pipe B is shown provided with the gas-cock B', and enters the air-pipe C preferably at the joint C², and is provided with an extension *b* leading above the level of the pipe C, so that the gas in issuing from the

pipe *b* may create an inflowing current in the air-pipe and thus the tendency to a back-flow of gas may be diminished.

The burner *E* is preferably made annular, as shown, and is provided with holes *e* through which the mixed air and gas flow. These openings *e* in aggregate area should considerably exceed the area of the pipes *B* and *C*, as should also the area of the mixing-chamber *D* and the pipes *D'* leading from said chamber to the burner. In short, the conduit consisting of the mixing-chamber, the pipes *D'* and the burner should have such relative area throughout as will make it easier for the gases to flow through it than back through the air-flue *C*.

On each side of the annular burner *E* are passages *d d'*, as shown, which are larger than would be necessary for the passage of simply that amount of air to the burners which would be necessary to support combustion at the burner, thus permitting a relative excess of air from within the furnace-casing to unite with the products of combustion and to be conducted with them to the chimney, thus increasing the volume of heated gases which is passed through the heating-drums *M M'*, &c.

The burner *E* is covered by a hood or casing, as *G*, to prevent the products of combustion mixing with and contaminating the air in the casing, and doors, as *G³*, (see Fig. 4,) may conveniently be arranged to permit access to the burner within. Deflectors, as *E' E'*, are arranged on either side of the burner *E* at such distance as to make the passages *d d'* of approximately equal size. The outer deflector *E'* is preferably curved at the top, as shown, and may be made of cast metal; but the inner deflector is preferably made of a refractory substance, as fire-brick. The intensely-heated products of combustion following the direction of the arrows pass directly over this inner deflector *E²*, and as it is apt to burn out I preferably make it in two or more sections, as *e' e²*, preferably jointed, as at *e³*, so that one or more sections may be removed if so desired. The inner deflector *E²* is conveniently supported on an annular casting *G'*, which also affords a convenient support for the nozzle or air-conduit *F*. This conduit *F*, preferably formed slightly conical, as shown, is situated so that it will be exposed to the heated products of combustion as they leave the burner, and the air within is very highly heated, which serves to create an upward current of air which impinges against and heats the drum *P*, as will be explained later. From the casting *G'* lead pipes *G²* to the lower heating-drum *M*. Above this are other heating-drums, as *M' M² M³*, united by pipes *m m' m²*, preferably out of line with each other, as shown. From the last heating-drum *M³* the products of combustion are conducted by pipes, as *m³*, to a closed drum, as *P*, and from it to the outlet-flue *S*.

I provide heating-drums of such area and

number as to insure under ordinary conditions that the gases passing through them to the flue *S* will be cooled down, parting with their heat to the air in the furnace to a temperature little above that of said air, and as this temperature might not cause sufficient draft to insure proper combustion at the burner *I* reheat the gases by the action of the intensely-heated air issuing through the nozzle *F*, which as already described impinges on the drum *P* beneath the mouth of flue *S* and causes a direct draft in said flue.

A water-trough *N* conveniently supported by angle-irons *n* over the drum *G* may be arranged within the heater, and a spout *N'* is preferably connected thereto, as shown, so that it may be filled without the casing. Flues *p* are also preferably formed in the drum *P*. The outer casing of the furnace is preferably formed into two parts *A A'*, as shown, with a small space *a* between them, which construction serves to prevent the radiation of heated air into the room or cellar in which the heater is situated.

The inner casing *A* becomes heated, particularly at its upper part, marked *A¹*. A flange *A⁵* filled with holes *a* to permit the introduction of air is arranged considerably below this top *A⁴* of said casing *A*, and the second casing *A'* is arranged to project upward from the flange *A⁵* on which it is supported. Air entering the holes *a* and rising between the casing will be heated by the inner casing at *A⁴*, then rising around inside the outer casing *A* will be further heated by mingling with the heated air already in the casing.

The operation of the heater can be understood from the foregoing description. Gas is turned on and enters through the pipe *B* and nozzle *b*, creating a suction in the air-pipe *C*, thus drawing in air properly regulated by the valve *C'*. The gas being lit at the burner as it issues from the holes *e* heats the deflectors *E' E²*, which heat the air layers passing over their surfaces, and which air supports combustion at the burner, making the burner regenerative. The excess of heated air and the products of combustion first heat the nozzle *F* to a high degree and are then drawn through the drums *M M'*, &c., heating the same, and through them the air in the furnace. The highly-heated air rises through nozzle *F* and impinges against the bottom of the drum *P*, heating the gases therein in the manner already described, quickening the flow of gases up the outlet-flue *S*, which acts to draw the products of combustion through the heating-drums, and so stimulating the sluggish draft and insuring the proper action of the furnace.

The air in the casing is heated by the heating-drums *M M'*, &c., also by the heated surfaces of the nozzle or conduit *F* and the outside of the chamber *G* and rises through the flues *A²*, by which it is led to the places where it is to be used. The air which is used for heating purposes is, as seen, at all times kept separate from the products of combustion,

and so is not vitiated thereby and as it carries away with it vapor from the water in the pan N it affords a healthful heating medium.

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

1. In a furnace, the combination with a hot air chamber and air flues leading therefrom of a burner, a heating drum system leading from the burner through the hot air chamber and adapted to convey the products of combustion from the burner to an outtake flue, an air conduit arranged in the hot air chamber as described, to be externally heated by the products of combustion arising from the burner and to direct the heated current of air against the outside of a remote part of the drum system, said drum being also in the hot air chamber whereby the products of combustion somewhat cooled in their passage through the drum system may be reheated to insure a proper draft and the intensely heated air after so reheating the cooled products of combustion may mingle with the air in the hot air chamber.

2. In a hot air heater the combination in a hot air chamber having flues leading therefrom, of a burner, an air channel or nozzle open at top and bottom and so arranged that its walls form one side of the outlet flue for the highly heated products of combustion, a heating drum system leading from the burner through which the products of combustion are passed, an out take flue for products of combustion leading from the inside to the outside of the hot air chamber, and a drum connecting the drum system and the base of the out-take flue, said drum being arranged in the path of the highly heated air from the nozzle aforesaid, as and for the purpose specified.

3. In a hot air heater the combination in a hot air chamber having flues leading therefrom of an annular burner, an air channel or nozzle open at top and bottom and arranged within the burner so that its walls form one

side of the outlet flue for the highly heated products of combustion, a heating drum system leading from the burner through which the products of combustion are passed, an out-take flue for products of combustion leading from the inside to the outside of the hot air chamber, and a drum connecting the drum system and the base of the out-take flue arranged in the path of the highly heated air from the passage aforesaid and wherein the products of combustion are reheated to insure a proper draft in the out-take flue.

4. In a gas heater the combination of a burner, a heating drum system leading from the burner, and a removable sectional deflector for guiding the products of combustion from the burner to the aforesaid heating drum system as and for the purpose specified.

5. In a heater, a heating drum as M, a casting connected thereto, an air nozzle supported on said casting, a deflector as E² also supported on said casting and a burner so arranged that the flame and products of combustion therefrom will be drawn by the draft into the heating drum M substantially for the purpose specified.

6. In a heater the combination of a burner, a heating drum system leading from the burner, deflectors to direct the flame, products of combustion and air currents from the burner into the heating drum system, and a hood or casing so arranged that the products of combustion will not mingle with the main body of air in the heater.

7. The combination in a heater of a casing having an opening or openings for the admission of air, heating drums arranged within said casing, a burner, a water chamber also supported within the casing, an outlet or outlets for conveying heated air from said casing and an outlet flue for the products of combustion substantially as shown.

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Witnesses:

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