(No Model.)

P. F. DICKINSON.

HOT AIR FURNACE.

No. 505,510. Patented Sept. 26, 1893.

FIG. 1.

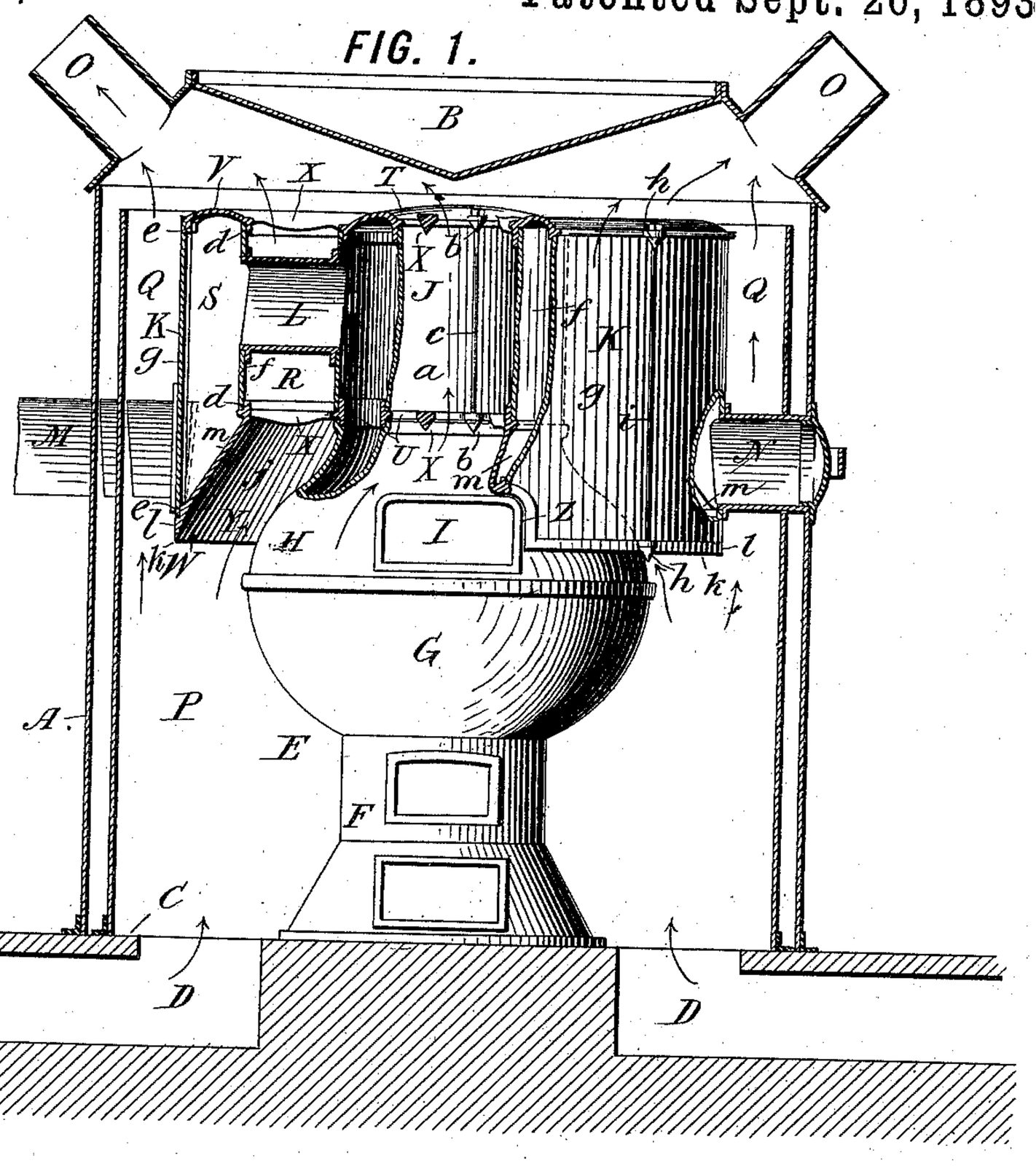
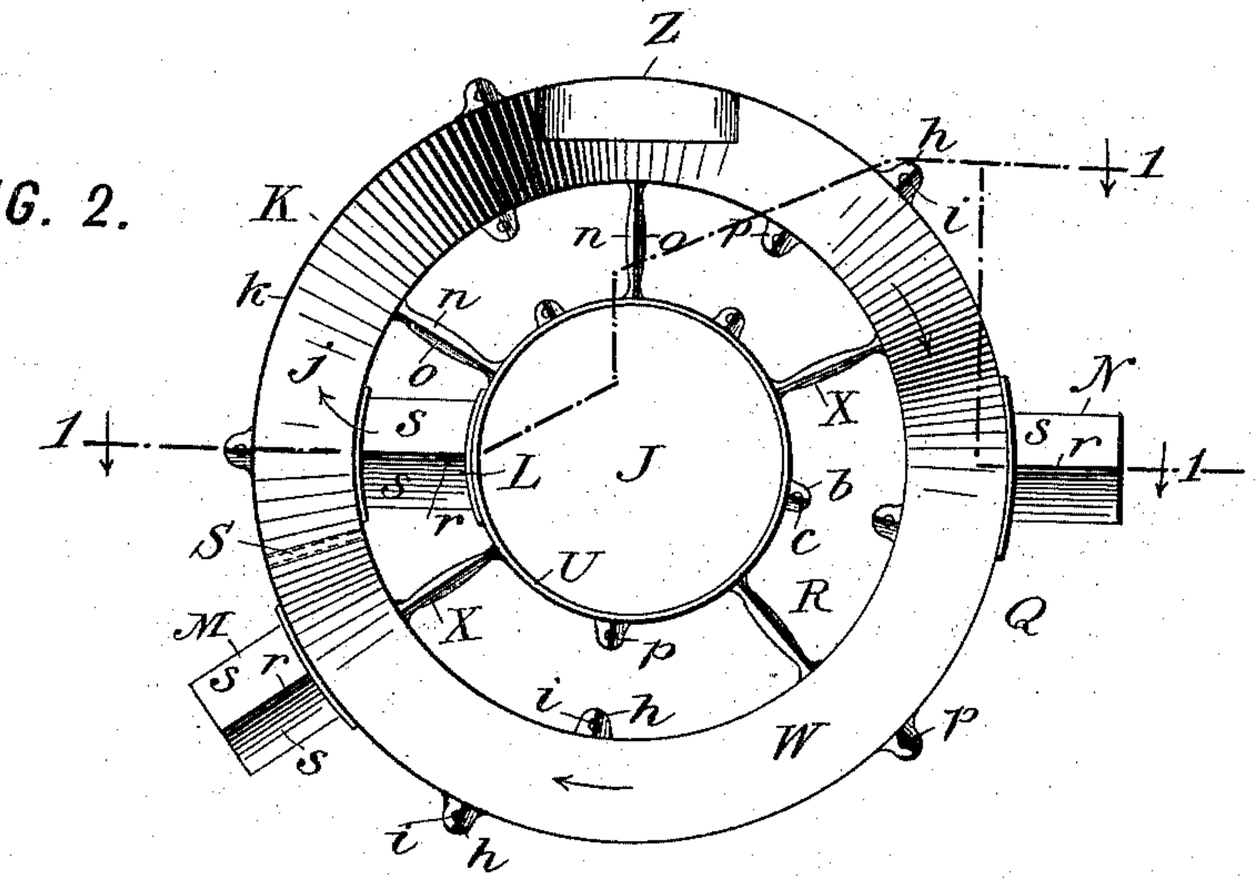


FIG. 2.



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UNITED STATES PATENT OFFICE.

PATRICK F. DICKINSON, OF NEW YORK, N. Y.

HOT-AIR FURNACE.

SPECIFICATION forming part of Letters Patent No. 505,510, dated September 26, 1893.

Application filed April 8, 1893. Serial No. 469,631. (No model.)

To all whom it may concern:

Be it known that I, PATRICK F. DICKINSON, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Hot-Air Furnaces, of which the following is a specification.

This invention relates to furnaces for heating air for warming purposes, such as are generally used for house heating, the heated air from the furnace being distributed through hot air pipes to the various rooms of the house.

My invention aims to provide certain improvements in such furnaces.

Heretofore hot air furnaces have been constructed with an inclosing casing, resting on the floor, over air ducts for supplying cold air to the furnace to be heated, and within this casing the apparatus has consisted of a furnace consisting of an ash-pot, a fire-pot thereover, a fire body, having a feed-lip resting over said fire-pot, and contracted at top, a dome above said body, into which the smoke and products of combustion rose from the fire, and a radiator of annular form surrounding the dome and connected therewith by a smoke-neck, and in connection with the smoke-pipe leading to any suitable flue or chimney. In such apparatus the hot smoke and gases rising from the fire have passed from the dome and its neck to the radiator, traversed the circuit of the latter, and passed off to the chimney through the smoke-pipe. The cool air rising from beneath has passed up around the sides of the casing, and around the fire-pot, body and dome, rising between the latter and the radiator, as well as around the exterior of the radiator, and flowing at top of this into hot air pipes, through which it is taken to the place of use. In such apparatus difficulty has been experienced in securing sufficient force and rapidity of the flow of hot air through the furnace to meet the requirements of use, and therefore the resulting heat effect has not been in satisfactory proportion to the consumption of fuel. My invention aims to avoid this defect, and to provide an improved hot air furnace which shall be simple, cheap and convenient of construction, and in which the flow of the hot air will be sufficiently strong to give the best results from the furnace for the fuel consumed. To this end in carrying out the preferred form of my invention, I provide certain improvements in the features of construction of the furnace which will be hereinafter fully set forth.

In the accompanying drawings, which illustrate the preferred adaptation of my invention, Figure 1 is a vertical mid-section of a furnace, the radiator and dome being in partial section on the line 1—1 of Fig. 2; and Fig. 2 is an under side plan view of the radiator and dome.

Referring to the drawings, let A indicate the usual double sheet metal outer wall of a hot air furnace, B the top thereof, C the floor on which the casing rests, D D the air flues for supplying cold air within the casing, E the furnace proper, F the ash-pit thereof, G the fire-pot thereof resting over the ash-pit, H the body thereof resting on the top of the fire-pot, I the feed-lip or hole through which fuel is supplied, J the dome over the body, K the radiator, L the smoke-neck leading from the dome to the radiator, M the smoke-pipe leading from the radiator, N the clean hole for cleaning out the radiator, O the hot air pipes leading from the casing, P the hot air space below the radiator, Q the like space around the radiator, R the similar space between the radiator and dome, and S the usual partition within the radiator between the smoke-neck L and the smoke-pipe M for insuring that the smoke shall circle the radiator before escaping through the smoke-pipe.

The casing A, and furnace proper E, may be of any known or suitable construction.

The dome J is usually a cylindrical sheet metal body, closed at top by a cap T of cast iron, and having at bottom a body ring U also of cast iron, these parts having annular flanges fitting within a cylindrical sheet metal shell *a* constituting the side wall of the dome. The body ring U fits upon the body H, and communication exists through this ring from the interior of the body to the interior of the dome. As usual the cap T and ring U are constructed with outwardly projecting lugs *b b*, which are engaged by a stay-bolt *c* drawing the cap and ring together, and thereby confining the intermediate shell *a* in position.

The radiator K as usual consists of a top

annular cap V of cast metal, and bottom ring W of cast metal, this cap and ring having opposing flanges *d* on their inner edges, and *e* on their outer edges, which flanges fit within cylindrical sheet metal walls or shells *f* and *g* respectively. The radiator thus consists of the annular cap at top, and ring at bottom, and the intermediate sheet metal walls, whereby an annular space is inclosed within the radiator.

The smoke-neck L as usual consists of a sheet metal pipe or neck, fitting into apertures in the opposing walls or shells of the dome and radiator, and serving to conduct the smoke from the former to the latter. The partition S is usually a sheet metal plate traversing the interior of the radiator from top to bottom, disposed close to one side of the neck L, and between it and the smoke-pipe M, whereby the products of combustion must completely circle the radiator before reaching the smoke-pipe.

As usual the radiator is supported by arms X maintained by the dome and extending to the top cap and the bottom ring of the radiator. These arms are generally formed as part of an integral casting comprising the top cap of the drum, the top cap of the radiator, and the intermediate arms, and lugs *b*, for the upper part of the furnace, and, for the lower part of the radiator, of another integral casting comprising the lower radiator ring, the body ring U, the intermediate arms X, and the lugs *b*.

The cap V and ring W are constructed as usual with lugs *h h* on their outer and inner edges, which lugs are engaged by vertical stay-bolts *i* which draw the cap and ring together, thus firmly securing the walls *f* and *g* in position.

According to my invention I construct preferably all of the surfaces which are in the path of the heated air as it rises through the furnace, with inclined or beveled faces at their sides opposed to the approaching air. In the construction shown this is their under sides. I also continue the lower side of the radiator downwardly beyond the top of the feed-lip or hole I, and construct it with inwardly tapering walls coming to a point at its lowest extremity, and I dispose the clean-out hole N, and the smoke-pipe M, at the lowest extremity of its interior.

In the construction shown in the drawings the inner wall *f* of the radiator is of substantially the same height as, and ends at substantially the same point with, the shell *a* of the drum. This is the point at which radiators as now constructed are usually terminated with an abrupt bend or flat bottom. According to my invention I construct the bottom ring W of the radiator with an elongated annular wall *j* having the form of a truncated cone, which at its upper edge terminates at the flange *d* substantially flush with the inner wall *f* of the radiator, and at its lower end flares outwardly around the body H, extends down almost to the fire-pot G, and terminates in a sharp edge or angle *k*. The wall *j* is of very thin cast metal and affords an excellent heating surface, while it gives a contracting annular air passage Y upwardly around the body H through which the rising air is gradually and gently drawn into the passage R. The edge *k* of the ring W is coincident with the outer periphery of the radiator, and the ring from this point rises in a vertical straight wall *l* until the lower edge of the outer wall *g* of the radiator is met, where the outer side of the ring is inset to form the flange *e*, above which flange the ring continues in an outer wall *m*, parallel with its inner wall *j*, which rises to its flange *d*. The openings to the clean-out N and the smoke-pipe M are substantially coincident with the lower edge of the wall *m* of the ring W, where it joins with the flange *e* and meets the outer wall *g* of the radiator. Thus the air in rising from the space P is divided by the narrow edge *k* of the ring W, and gradually spread part outside of the radiator and part inside thereof, without being impeded or retarded by the lower edge of the radiator, whereby the force of the current is not thereby in anywise destroyed.

According to another feature of my invention I construct the cross-arms X with beveled under faces *n*, preferably forming them with a sharp central edge *o*, from which they taper off to their top faces, whereby the air striking them is easily divided and its progress therefore is not impeded. I preferably also construct the lugs on the respective rings and caps with like beveled under faces *p*, bringing them to a sharp edge or point at their centers, and tapering them off at each side till their top edges are met. The lower lugs *b* of the ring U, and *h* of the ring W, preferably have screw-threaded holes tapped into them, in which the screw-threaded ends of the stay-bolts *c* and *i* respectively are screwed. To further avoid retardation of the air, I prefer also to taper in like manner the smoke-neck L between the radiator and drum, and the clean-out N, and smoke-pipe M, as best seen in Fig. 2, where it will be seen that each of these is constructed with a sharp or narrow edge *r* at bottom from which the walls gradually diverge in tapering sides *s*.

In order to secure the maximum of heating surface, the radiator depends below the feed-hole I and around the body. To accomplish this it is necessary to construct the ring W with an off-set Z fitting over the neck.

In operation the heated air rising through the furnace will pass with great facility from the air space P up straight through the space Q, and at a slight and gradual deflection up through the space Y to the space R, and through the latter to the top of the casing, where it will pass out through the hot air pipes O with a speed and force of current which has not been retarded, but has rather been accelerated by its passage of the heat-

ing surfaces of the radiator and drum, and the intermediate pipes, arms, lugs and necks. It will receive a long heating surface along the exterior of the radiator, and a longer one on the interior wall thereof, while a great bulk of the air will be held in close proximity in its upward passage to the body H, and the rising current will be directed against the side walls of the shell *a* of the dome. The smoke and heated products of combustion in rising and passing through the dome, neck and radiator, to the smoke-pipe, will traverse a slightly circuitous path from the entrance of the neck to the radiator, through the latter to the smoke-pipe. This is occasioned by reason of the neck L being in communication with the radiator near the top thereof, from which the tendency of the smoke to spread throughout the interior of the radiator will be developed before it meets the contracted portion thereof at the offset Z, where it will be caused to rise upwardly, and will then after passing the offset react and have a tendency to reverberate while traversing the remainder of the radiator to the pipe M, where it will be withdrawn from the bottom of the radiator and discharged. Thus it will be seen that an advantageous disposition of the parts for securing the greatest effective amount of heated air at the desired current force for the quantity of fuel employed in the furnace is obtained.

It will be seen that my invention provides an improved hot air furnace which will be variously, conveniently and effectively availed of, and that it is not limited in its application to the exact details of construction and arrangement shown and described as its preferred form, as these may be modified in many respects without departing from the essential features of the invention; such modifications will be within the province of any person skilled in the art, and will depend upon the circumstances or the particular construction of furnace in connection with which the invention is utilized.

What I claim is, in hot-air furnaces, the following-defined novel features and combinations, substantially as hereinbefore set forth, namely:

1. In a hot air furnace, a fire-pot H, dome J, radiator S, neck L between said dome and radiator, and smoke-pipe M leading from the latter, in combination with an annular tapering ring W having the form of a truncated cone, constituting the bottom of said radiator, said ring having a sharp lower edge surrounding said body H, and an inwardly inclined wall *j* rising around the latter, and said radiator having a narrow inner vertical wall meeting and rising from the upper extremity of said wall *j*, and a wide outer vertical wall meeting and rising from the lower extremity of said wall *j*, whereby the current of air to be heated is divided by the lower edge of said ring, and part thereof rises exteriorly of said radiator, and the remainder thereof is gradually deflected toward said body and between said radiator and drum, and the flow of the current is not impeded, substantially as and for the purpose set forth.

2. In a hot air furnace, the cylindrical casing A, the body H, having a feed-hole I, the dome J on said body, and the neck L leading from said dome, in combination with the radiator S surrounding said dome communicating with said neck and with a smoke-pipe, and depending below said drum surrounding said body and depending below the upper portion of said feed-hole, said radiator having a narrow cylindrical vertical inner wall *f* opposite said dome, an outwardly flaring wall *j* extending downwardly from said wall *f* and surrounding said body, and a wide cylindrical vertical outer wall *g* extending upwardly from said wall *j*, and parallel with but at a distance from said casing, substantially as and for the purpose set forth.

3. In a hot air furnace, the body H, dome J, and neck L leading from the upper part of said dome, in combination with the radiator S communicating at its upper part with said neck, having the offset Z at its lower edge beyond its point of communication with said neck, and the smoke-pipe M communicating with said radiator beyond said offset, substantially as and for the purpose set forth.

4. In a hot air furnace, the cap T for the dome of the furnace, radial arms X leading therefrom, annular cap V for the radiator of the furnace, and lugs *b* and *h*, said lugs and arms having beveled under faces, and said parts constructed all in one integral piece or casting.

5. In a hot air furnace, the body ring U for the dome of the furnace, the arms X radially of said ring, and the annular tapering ring W surrounding said ring U, said parts all constructed as one integral casting, substantially as and for the purpose set forth.

6. In a hot air furnace, a radiator consisting of an annular cap V having flanges *d* and *e*, an annular ring W having flange *d* at top, tapering internal wall *j*, lower edge *k*, front face *l*, flange *e* and outer face *m*, in combination with narrow sheet metal wall *f* between said cap and rings and engaging said flanges *d* thereof, and long sheet metal wall *g* between said rings, and engaging said flanges *e* thereof, substantially as and for the purpose set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

PATRICK F. DICKINSON.

Witnesses:

GEORGE H. FRASER,

THOMAS F. WALLACE.