(No Model.)

J. GIBBONS.

GAS STOVE.

No. 410,792. Patented Sept. 10, 1889.

Fig. 1.

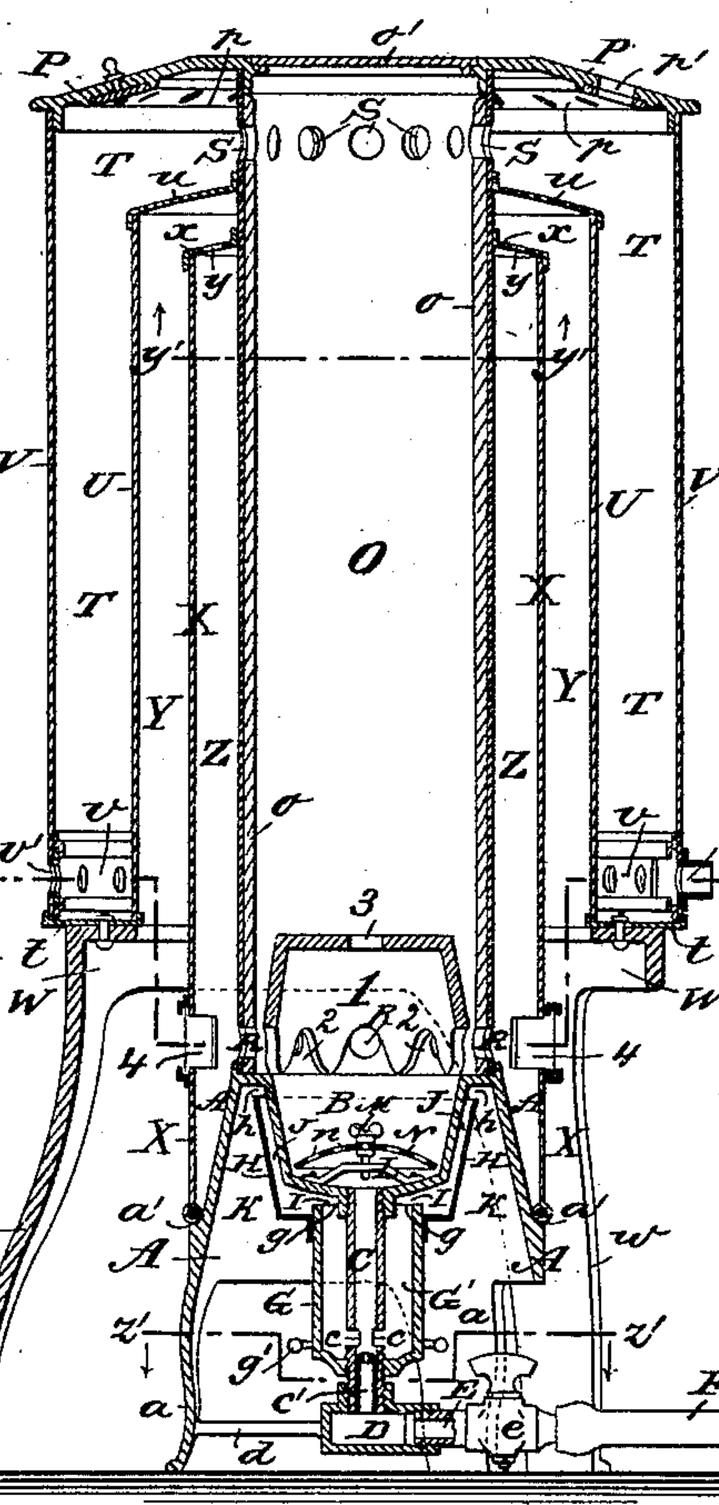


Fig. 4.

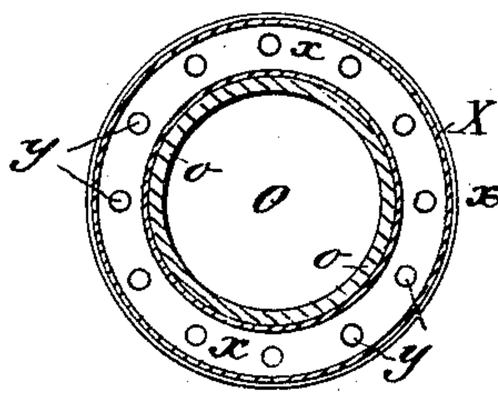


Fig. 5.

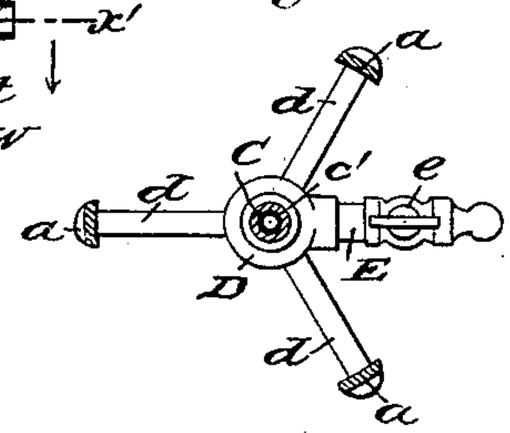


Fig. 2.

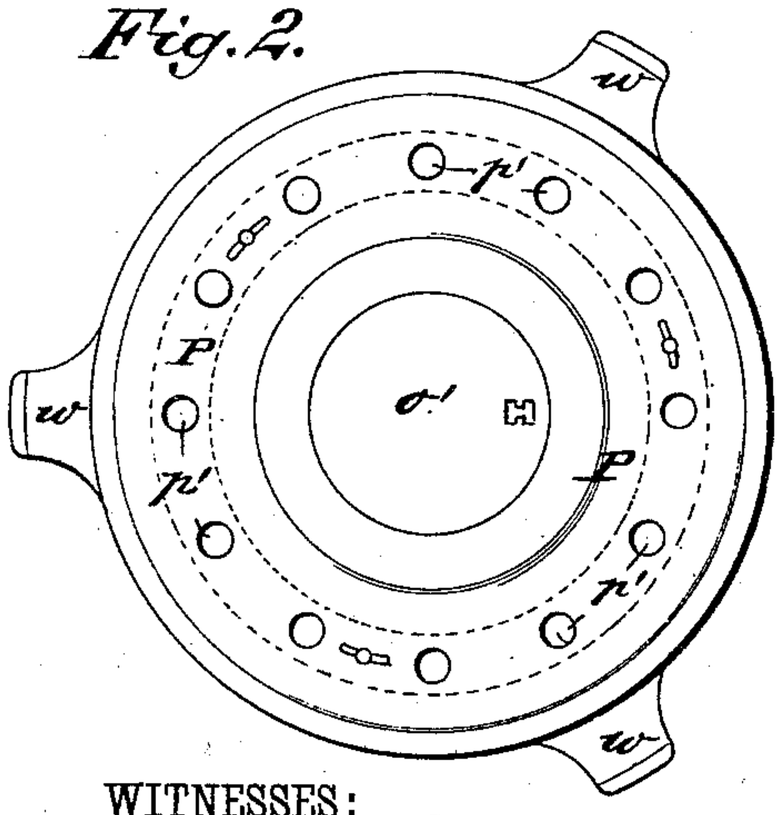
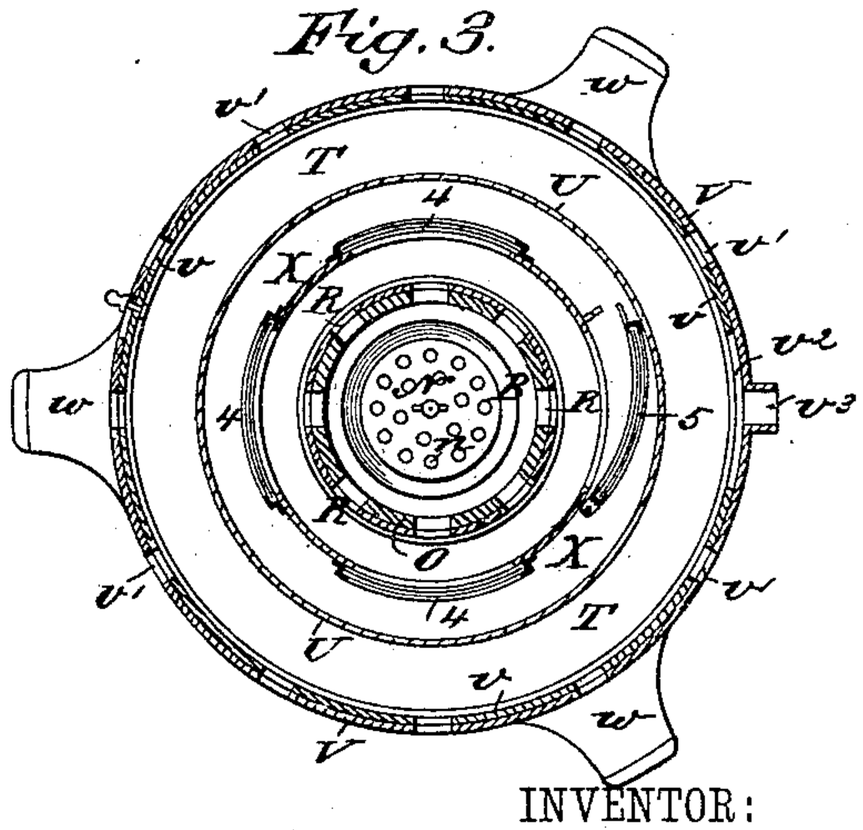


Fig. 3.



WITNESSES:

Herbert Beyer

C. Sedgwick

INVENTOR:

J. Gibbons

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JAMES GIBBONS, OF JERSEY CITY, NEW JERSEY.

GAS-STOVE.

SPECIFICATION forming part of Letters Patent No. 410,792, dated September 10, 1889.

Application filed March 30, 1887. Serial No. 233,018. (No model.)

To all whom it may concern:

Be it known that I, JAMES GIBBONS, of Jersey City, in the county of Hudson and State of New Jersey, have invented certain useful Improvements in Gas-Stoves, of which the following is a full, clear, and exact description.

My invention relates to stoves using fluid fuel—such as coal or water gases—and has for its object to provide a simple inexpensive stove of this class which will have very powerful heating effect, and one in which the combustion of the fluid fuel will be so nearly perfect as not to vitiate the air of a room in which the stove may be placed.

The invention consists in certain novel features of construction and combinations of parts of the stove, all as hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a central vertical sectional elevation of my improved stove. Fig. 2 is a plan view thereof. Fig. 3 is a sectional plan view of the stove, taken on the irregular line x' x' in Fig. 1. Fig. 4 is a transverse section taken on the line y' y' of Fig. 1, and Fig. 5 is a sectional plan view taken on the irregular line z' z' of Fig. 1.

I will first describe the inner base and burner of the stove and then its fire pot or chamber and surrounding drums for superheating of air passing to the burner to support combustion and for escape of hot air to the room in which the stove is placed.

In the preferred form of the stove its inner base consists of a metal burner-shell A, supported at suitable height on legs *a*, preferably three in number. The shell is shown as having an upwardly-tapering form, and it is provided with an inner depressed side wall and bottom, forming a flame-cup B, to an aperture of which a gas or fluid-fuel supply pipe C is fitted, preferably by screwing it into the flame-cup. One end of the pipe C is held, preferably by a screw-thread connection, to a coupling D, to which is attached a pipe E, having a cock *e* to govern the supply of gas passing from a rubber or metal feed-pipe F, connected thereto. The coupling D is stayed to the legs *a* of the burner-shell A by brace-rods *d*, thereby giving substantial support to the coupling and the gas-pipe C, and to the body G of the burner and its cup or wall H, when the latter is used.

The burner-body G is a metal casing, preferably made cylindrical and open at the end next the flame-cup, and at its other end the body is held to the fuel-supply pipe C, so as to be adjustable thereon, and preferably by fitting the body to the pipe by a screw-thread connection, as shown. The burner-body G is larger in diameter than the pipe C to provide an air passage or chamber G′ between them, and apertures *c* are provided in the pipe at or near its point of connection with the body G to admit superheated air from the chamber G′ to the interior of the fuel-supply pipe at or near a point where gas from the coupling D issues through a suitable plug or tip *c′* placed in the pipe. The burner-body preferably has projecting side studs *g′* for convenience in turning it upon the gas-pipe to carry its open end *g* farther from or nearer to the bottom of the flame-cup B, this adjustability permitting an enlargement or contraction of an opening or passage I between the burner-body and the flame-cup to regulate to a nicety the volume of air passing through I, G′, and *c* to the interior of the fluid-fuel-supply pipe C for admixture with gaseous fuel in said pipe and passage therewith through the pipe to the point of ignition at the flame-cup.

In the preferred form of the burner the outer cup or wall H is used, and this cup may be made separate from the burner-body G, and may be attached thereto in any approved way, or it may be cast in one piece with the body, or it may be held to the flame-cup in any suitable manner. The sides of the cup H preferably have the same general form as the sides of the flame-cup and surround them; but the cup H is larger in diameter than the cup B, to provide between the two cups an air-passage J, and the space between the cup H and the sides of the burner-shell A forms another air-passage K, which communicates with the one J by a passage *h* at the top of the cup H. When the commingled air and gas are ignited at the top of the pipe C or in the flame-cup B, a current of air will be in-

duced through the passage K, thence over the top of the cup H at *h*, then down the passage J to the opening I, thence through the burner-body chamber G′, and through the apertures *c* of pipe C to the interior of said pipe, where the air, now superheated, will commingle with the gas entering the pipe C, and will pass with said gas through the pipe C to the point of ignition. Were the outer wall H of the flame-cup dispensed with, the heat of the flame-cup B and burner-body G would raise the temperature of the air passing through the opening I to assure superheating of the air on its way to mingle with the fluid fuel in the pipe C to pass therewith to the point of ignition; but by providing the outer wall H, or, in other words, a double-walled flame-cup B H, the heat radiated from the entire side walls of the cup B is utilized to heat the air in the passage J in the flame-cup walls, and the air will be superheated to a very high temperature on its way to the point of ignition, and the flame will be intensely hot in the flame-cup and in the superposed fire-chamber or fire-pot of the stove above the flame-cup; hence the use of the outer wall or cup H is preferred in practice.

The entrance of air to the burner-body chamber G′ may be controlled at the opening *h* between the cup H and the shell A instead of at the opening I, or it may be at the air-inlets *c* also by adjusting the burner-body G on the fuel-supply pipe C, and the supply of air to the burner-body chamber G′ may in like manner be entirely cut off when for any purpose it is desired to burn gas alone or gas unmixed with superheated air in the flame-cup of the burner.

A bridge piece or plate L is fixed to the bottom of the flame-cup B, and a screw M, threaded into the bridge-piece, has swiveled or fixed to it a plate N, which may be imperforate, but is preferably provided with a series of perforations *n* to allow some of the flame of the burner to escape directly into the body of the flame-cup; but the chief function of the plate N, which is a little smaller in diameter than the inside of the flame-cup B, is to deflect the flame and cause it to impinge against the sides of the flame-cup all around, and thereby heat the cup intensely to assure the best superheating effect on the air flowing through the passage J between the double walls B H of the cup to the burner-body and fuel-supply pipe.

I have filed an application for another patent claiming the construction of the burner in detail; but I make claims herein for the burner in special combinations with the body of the stove, which in and of itself has important novel features, next described.

The fire pot or chamber O of the stove is shown made of sheet metal in the form of a cylinder, and is provided with a fire-clay or other suitable refractory lining *o*, which may extend but part way up the shell, but is shown extending to its top. The fire-chamber is shown resting on top of the burner-shell A and within a flange at the outer edge of the shell, whereby the weight of the fire-chamber is supported by the outer wall or shell of the burner or its legs *a*, and the interior parts of the burner or its flame-cup body or casing and fuel-supply pipe are relieved of the weight of the fire-chamber and other parts of the body of the stove. The fire-chamber O supports a top plate P, preferably made of cast metal, and to which is loosely fitted a central cover *o*′, which forms a lid to the fire-chamber and may be removed at any time for access to the chamber. The plate P also covers the hot-air chamber, preferably formed between two outer drums of the stove, and is provided with a damper regulating the escape of heat, as hereinafter more fully explained.

At or near the lower end of the fire-chamber O, or at its part next the burner, the chamber is provided with perforations R for passage of superheated air to support combustion at the burner, and at its upper part the fire-chamber has a series of perforations S for exit of hot air to the room in which the stove is placed, but preferably to an outer hot-air-distributing chamber T, which is formed mainly between the walls of an outer drum V and a next inner drum U, which latter drum preferably has a head-flange *u* fitted closely to the fire-chamber shell below its perforations S. The bottom of the hot-air-distributing chamber T is shown as closed by fitting a ring-plate *t* tightly to both the drums U V and bolting the plate *t* to the head-plate or ring W of the outer base, which has legs *w* and supports the outer drums U V at suitable height from the floor or table on which the burner-shell A rests; but, if desired, the ring-plate *t* may be dispensed with and the outer drums U V may rest directly on top of a somewhat broader face-plate W, and within or attached to flanges rising from said plate.

The fire-chamber cap-plate P projects sufficiently from the chamber to meet the drum V when this drum is used to form the chamber T, and to the under side of the plate P is fitted a ring damper-plate *p*, having a series of holes which, when the damper is turned, may be brought into line with a series of holes *p*′ in the plate P for controlling escape of heated air from the upper part of the chamber T, and at or near its lower end the drum V is fitted with a ring damper-plate *v*, having a series of holes which, when this damper is turned, may be carried opposite a series of holes *v*′ in the drum to allow escape of heat from the lower part of the drum. One of these damper-holes v^2 is opposite a collar v^3, set around one of the drum-holes, and said hole v^2 is a slot of sufficient size to always leave the collar—or the drum-hole *v*′, at which the collar is fitted—open to the hot-air-distributing chamber T of the stove, as will be understood most clearly from Fig. 3 of the drawings. With this arrangement of outlets

v' v^2 in the drum and the damper an opening will always be provided for escape of products of combustion, however the damper v may be adjusted.

Between the fire-chamber O and the drum U there is placed an inner drum X, which preferably rests on a shoulder a', formed on the burner-shell A, and a head-plate or ring x, fixed to the top of the drum and closely fitting the fire-chamber O, divides the space between the drum U and the greater part of the fire-chamber into two air passages or chambers Y Z, the outer one Y opening at the bottom to the air of a room and the inner one Z opening at the bottom to the fire-chamber through the perforations R. Holes y in the head-plate x give passage of air from the chamber Y to the one Z. The drum U, like the outer drum V, is not essential to the effective working of the stove, as the air intended for circulation next to the fire-chamber O in the passage Z, for the purpose of superheating the air by the fire-chamber prior to the entrance of said air through the fire-chamber holes R to the interior of the fire-chamber at or near the burner, may enter at the upper holes y of the inner drum X should the drums U V be dispensed with. The construction with these drums U V is, however, at present preferred, as the drum U itself becomes hot; hence a volume of air ascending the passage Y between the drums X U would be heated considerably in this passage before it enters the passage Z next the upper part of the fire-chamber, and the drum V by providing an outer chamber T assures a more equable distribution of heat from the stove into a room than the upper holes S of the fire-chamber would alone attain.

It is obvious that the drums X U may have a form tapering upward from their lower ends to the fire-chamber, and their separate head-plates x u would then be dispensed with and the holes y would be provided at or near the top of the tapering drum X.

The above-described feature or principle of construction allowing introduction of superheated air to the base of the fire-chamber to support active combustion of the fluid fuel at the burner, in connection with the commingling of superheated air with the fluid fuel in advance of the point of ignition of the burner to produce a very hot flame at the burner, gives heating-power and effects heretofore unattainable in stoves of this class.

Continued experiments have fully demonstrated that the peculiar or special burner shown with the peculiarly-formed stove-body herein described produces a complete stove which has far better effect than the burner would have with a stove-body of common drum or other ordinary form, and that the stove-body is much more efficient when this burner is used than it would be with an ordinary burner; hence there is a legitimate combination of the herein-described burner and stove-body, as they combined give a more perfect combustion and greater heating effect and leave a purer warm atmosphere than has ever come to my notice in the use of a complete stove of the class in an extended experience in the manufacture and use of stoves of this general character.

Inside of the fire-chamber O is placed a body capable, when subjected to the hot flame of the burner, of becoming luminant or incandescent. This body preferably has the form of an inverted cup made of clay and supported on the burner-shell A. This incandescent body or cup is formed or supported to provide an opening or openings at its lower part or edge mainly for inlet to the flame-cup or point of ignition of the burner of superheated air entering the fire-chamber holes R from the stove-body passage Z, and incidentally to provide also for passage from the burner of some of the products of combustion of the fluid fuel which rise into the cup and are deflected downward through and to the opening or openings below the cup, and pass thence to the upper part of the fire-chamber; but in the preferred form of the incandescent cup it is provided with an upper hole 3, or may have an equivalent series of holes in its upper part to allow direct escape of the products of combustion from the burner into the fire-chamber O, and thus not interfere with the freest inlet of fresh air at the openings R and beneath the cup to support combustion. I show the cup made with a scalloped lower edge, providing openings 2 for inlet of air to the flame-cup, as aforesaid; but the cup may have holes or perforations near its lower edge for the purpose, or the cup may be supported on a few legs or lugs to provide the opening or air-passage beneath it.

The openings 2 at or below the lower edge of the cup 1 are shown directly opposite the holes R in the fire-chamber, and the incandescence of the cup will be clearly visible through mica plates 4, which are fitted in the drum X, one of said plates 4 being preferably in a hinged frame or door 5, (see Fig. 3,) to allow said door to be opened for conveniently lighting the gas at the flame-cup B, although the gas may be lighted at the top of the fire-chamber, if desired. I prefer to arrange the burner and flame-cup a little lower with relation to the holes R than is shown, to bring the body of the cup 1 directly opposite the holes for illumination directly from the white-hot incandescent sides of the cup rather than from the opening between the cup and the burner.

I am aware that it is not new to give illumination through mica plates from the fire-pot and grate at the lower part of a stove-body. I remark, however, that my luminant or incandescent cup 1 is clearly distinguishable in structure and functions from the fire-pot of an ordinary stove, and chiefly in that the cup is closed or nearly closed at its upper part and is placed above the point of ignition

of the fluid fuel, instead of being open at the top to receive fuel falling into it, as in the fire-pot stove, and the cup, receiving the flame directly from the burner below it, becomes very much hotter and more incandescent than the fire-pot of an ordinary stove or the coals it contains; hence the illumination from the cup is very much more bright and cheerful.

The operation of the stove shown in the drawings is as follows: When the gas is lighted at the flame-cup B, considerable heat will be thrown off from the burner-shell A, its body G, and the outer wall H of the flame-cup into the room in which the stove is placed; but the main volume of heated air and products of combustion rise into the chamber O and pass freely through its holes S to the hot-air chamber T between the drums U V, and the heat at the burner and in the fire-chamber will induce a strong upward current of fresh air through the chamber or passage Y between the drums U X, thence through the holes *y* at the top of the drum X into the passage Z between the drum X and the fire-chamber O, to and through the holes R to the interior of the fire-chamber, wherein this air, having been highly heated by flowing through the passages Y Z, will pass upward, commingled with the excessively-hot products of combustion of the commingled superheated air and gas from the burner, and the hot products escape at the holes S into the heat-distributing chamber T. Ordinarily the upper and lower dampers *p v* of the chamber T will be closed to confine the heated air and allow escape of heat to the room by radiation from the outer drum V and its cover P, the openings at v^2 v^3, however, being always open to give vent for products of combustion into the room or through a pipe connected to the collar v^3 and leading to a suitable draft-flue or outlet to the atmosphere; but experiments have proved that the combustion of the fluid fuel in the stove is so far perfect that the air of the room is not vitiated to a dangerous degree by the escape of products of combustion directly into the room. By opening the upper damper *p* more or less the heat will escape directly to the room more freely at or from the top of the chamber T, and the radiation from the drum V will be correspondingly lessened, and by opening the lower damper *v* more or less the heat will escape directly to the room more freely at the bottom of the drum, and by opening either or both of the dampers *v p* the inflow of air through the passages Y *y* Z R to the burner and fire-chamber will be accelerated, the heat from the burner then inducing a very rapid circulation of air through the stove to the room, the larger volume of hot air having a proportionately decreased but very effective heating temperature.

The operation of the stove, should the outer drum V or the two outer drums V U be dispensed with, will be understood from the reference hereinbefore made to these constructions, the hot air then escaping directly from the holes S of the fire-chamber into the room, and, in fact, these holes may be dispensed with and the entire top of the fire-chamber may be left uncovered or open for free escape of heated products from the fire-chamber.

It will be noticed that the fire-chamber O and the drums X U V may, with their base W *w*, be lifted from the burner to allow the latter to be used for direct heating of any device or vessel placed on or over the shell A of the burner.

I am not limited to the precise construction shown and above described, as various modifications may be made without departing from the principles or spirit of my invention. For instance, the fire-chamber O and drum X, providing a passage in which air is superheated directly from the wall of the fire-chamber on its way to the point of ignition of the stove-burner, may be made in one piece of any material—fire-clay, for instance—having passages the equivalent of the one Z formed through or along its walls and opening at the top to an air-supply and at the bottom to the interior of the fire-chamber at or near the point of ignition of the burner, as will be readily understood.

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

1. The combination, in a stove, of a burner made with a gas and air mixing tube C, apertured at *c* at its inner part, and a casing G, having an open outer end admitting air and fitted at its closed inner end to the mixing-tube beyond or outside of its apertures *c*, and a fire-chamber receiving products of combustion from the burner and provided at its walls with an air-passage which opens at one end to an air-supply and ranges along or next the fire-chamber, into which it opens at or near the point of ignition of the burner, substantially as shown and described, whereby products of combustion from fluid fuel and superheated air commingled in advance of the point of ignition of the burner and flaming at the burner will be met thereat by a volume of air superheated in the passage at the fire-chamber walls to maintain combustion at a very high temperature in the stove, as herein set forth.

2. The combination, in a stove, of a burner made with a gas and air mixing tube C, apertured at *c* at its inner part, a flame-cup held to the outer end or part of the mixing-tube, a casing, as G H, surrounding the tube and cup and providing air-superheating passage J and chamber G′, said casing fitted at its closed inner part to the mixing-tube beyond or outside of its apertures *c*, and a fire-chamber receiving the products of combustion from the burner and provided at its walls with an air-passage which opens at one end to an air-supply and ranges along or next the fire-chamber, into which it opens at or near the point of ignition of the burner, substantially as described, for the purposes set forth.

3. The combination, in a stove, of a burner made with a gas and air mixing tube C, apertured at *c* at its inner part, and a casing, as G, having an air-inlet at its outer part and fitted at its closed inner part to the mixing-tube beyond or outside of its apertures *c*, a fire-chamber receiving the products of combustion from the burner and provided at its walls with a passage which opens at one end to an air-supply and ranges along or next the fire-chamber and opens at the other end to the fire-chamber at or near the point of ignition of the burner to maintain combustion of commingled fluid fuel and superheated air at the burner by a supply of air superheated by the fire-chamber of the stove, and a drum or wall providing an air-passage outside of and communicating with the inlet of the air-passage at the fire-chamber walls and opening to the outer air nearer the burner of the stove to cause the air which maintains combustion at the burner to traverse the fire-chamber twice in its passage to the burner for highly superheating said air, all arranged and combined for operation substantially as herein set forth.

4. The combination, in a stove, of a burner made with a gas and air mixing tube C, apertured at *c* at its inner part, and a casing, as G, having an air-inlet at its outer part and fitted at its closed inner part to the mixing-tube beyond or outside of its apertures *c*, a fire-chamber receiving the products of combustion from the burner and provided at its walls with a passage which opens at one end to an air-supply and ranges along or next the fire-chamber and opens at the other end to the interior of the fire-chamber at or near the point of ignition of the burner to maintain combustion of commingled fluid fuel and superheated air at the burner by a supply of air superheated by the fire-chamber of the stove, and said fire-chamber provided with outlets for delivery of hot products, a drum or wall providing an air-passage outside of and communicating with the inlet of the air-passage at the fire-chamber wall and opening to the outer air nearer to the burner of the stove to cause the air which maintains combustion at the burner to traverse the fire-chamber twice in its passage to the burner for highly superheating said air, and an outside drum forming an outer chamber receiving the hot products from the outlets of the fire-chamber and serving to radiate or distribute the heat of the stove, all arranged and combined for operation substantially as herein set forth.

5. The combination, in a stove, of a fire-chamber, a burner delivering hot products thereto, and said chamber provided with a passage at its walls which opens at one end to an air-supply and ranges along or next the fire-chamber and opens at its other end to the interior of the fire-chamber at or near the point of ignition of the burner to maintain combustion at the burner by a supply of air superheated by the fire-chamber of the stove, a drum or wall providing an air-passage outside of and communicating with the inlet of the air-passage at the fire-chamber walls and opening to the air nearer the burner of the stove to cause the air-supply maintaining combustion at the burner to traverse the fire-chamber twice in its passage to the burner in a superheated condition, said fire-chamber provided with outlets delivering hot products, and an outer drum, forming an outer chamber, receiving the hot products from the outlets of the fire-chamber and serving to radiate or distribute the heat of the stove, all substantially as described, for the purposes set forth.

6. A stove constructed with a body having a main fire-chamber and three drums forming three passages for air and products of combustion outside the fire-chamber, the center of the three passages opening at the bottom or inner part of the air, which has an updraft or outdraft through it, the inner of the three passages communicating with the outer part of the center passage and the inner part of the fire-chamber, and the outer passage or flue communicating with the outer part of the fire-chamber and serving as a heat receiving and distributing chamber, substantially as herein set forth.

7. In a stove, the combination, with a burner or fire-pot, of a fire-chamber provided with lower or inner air-inlet, and outer passages, as at S, for hot products, a drum X, fitted at its outer part to the fire-chamber and having air-inlet at *y*, and drums U V, supported outside of the drum X, said drum U fitting the fire-chamber inside of its passages S, and a cover fitted to the fire-chamber and outer drum V, substantially as shown and described, whereby passages Y Z T are formed for circulation and heating of air in the stove-body, as and for the purposes set forth.

8. In a stove, the combination, with a burner or fire-pot, of a fire-chamber provided with lower or inner air-inlet, and outer passages, as S, for hot products, a drum X, fitted at its outer part to the fire-chamber and provided with air-inlet at *y*, and drums U V, supported outside of the drum X, said drum U fitting the fire-chamber inside of its passages S, and a cover fitted to the fire-chamber and outer drum V, whereby passages Y Z T are formed in the stove-body for circulation and heating of air, said stove-body having passages at its outer wall for exit of hot products, and one or more dampers fitted to these hot-product exits, substantially as herein set forth.

9. A stove constructed with a body having a main fire-chamber and three drums forming three passages Y T Z for air and products of combustion outside the fire-chamber, and said fire-chamber fitted with a removable cover or plate at its outer end, substantially as herein set forth.

10. A stove constructed with a body having a main fire-chamber and three drums forming three passages Y Z T for air and products of

combustion outside the fire-chamber, said body having a top or outer end provided with openings p', and a damper p, controlling said openings, substantially as herein set forth.

11. A stove constructed with a body having a main fire-chamber and three drums forming three passages Y Z T for air and products of combustion outside the fire-chamber, said body having a top or outer end formed with a removable cover for the fire-chamber, and with openings p' from the outer passage T, and a damper p, controlling said openings, substantially as herein set forth.

12. In a stove, the combination, with a burner or fire-pot, a fire-chamber having inner air-inlet and outer passages for hot products, and drums relatively arranged to provide passages Y T Z for establishing circulation of air and hot products through the stove-body, of a damper fitted over hot-product passages in the outer drum, and one of said hot-product passages and the damper relatively arranged to always leave an opening for escape of hot products from the stove-body, substantially as herein set forth.

13. A stove made with a burner or fire-pot, a fire-chamber having air-inlet R and hot-product outlet S, a drum X, fitted to the fire-chamber and resting on the burner or fire-pot shell, and drums U V, connected at the top with the fire-chamber and resting on a base or support, as W w, substantially as shown and described, whereby passages Y Z T are provided in the stove-body for air-circulation and the entire body may be removed from the burner or fire-pot, as and for the purposes set forth.

14. In a stove, the combination, with a burner, a fire-chamber, and a drum fitted around the fire-chamber and burner and provided with mica or translucent plates 4, of a body capable of incandescence and made in the form of an inverted cup, placed in the fire-chamber, and providing an air and light passage at its rim, substantially as herein set forth.

15. In a stove, the combination, with a burner, a fire-chamber, and a drum fitted around the fire-chamber and burner and provided with mica or translucent plates 4, of a body capable of incandescence and made in the form of an inverted cup, placed in the fire-chamber, and provided with a passage 3 at its top or outer part and providing an air and light passage at its rim, substantially as herein set forth.

JAMES GIBBONS.

Witnesses:
HENRY L. GOODWIN,
C. SEDGWICK.