No. 860,062. PATENTED JULY 16, 1907.

W. F. RUST.

CHIMNEY VALVE FOR HOT BLAST STOVES.

APPLICATION FILED FEB. 25, 1907.

3 SHEETS—SHEET 1.

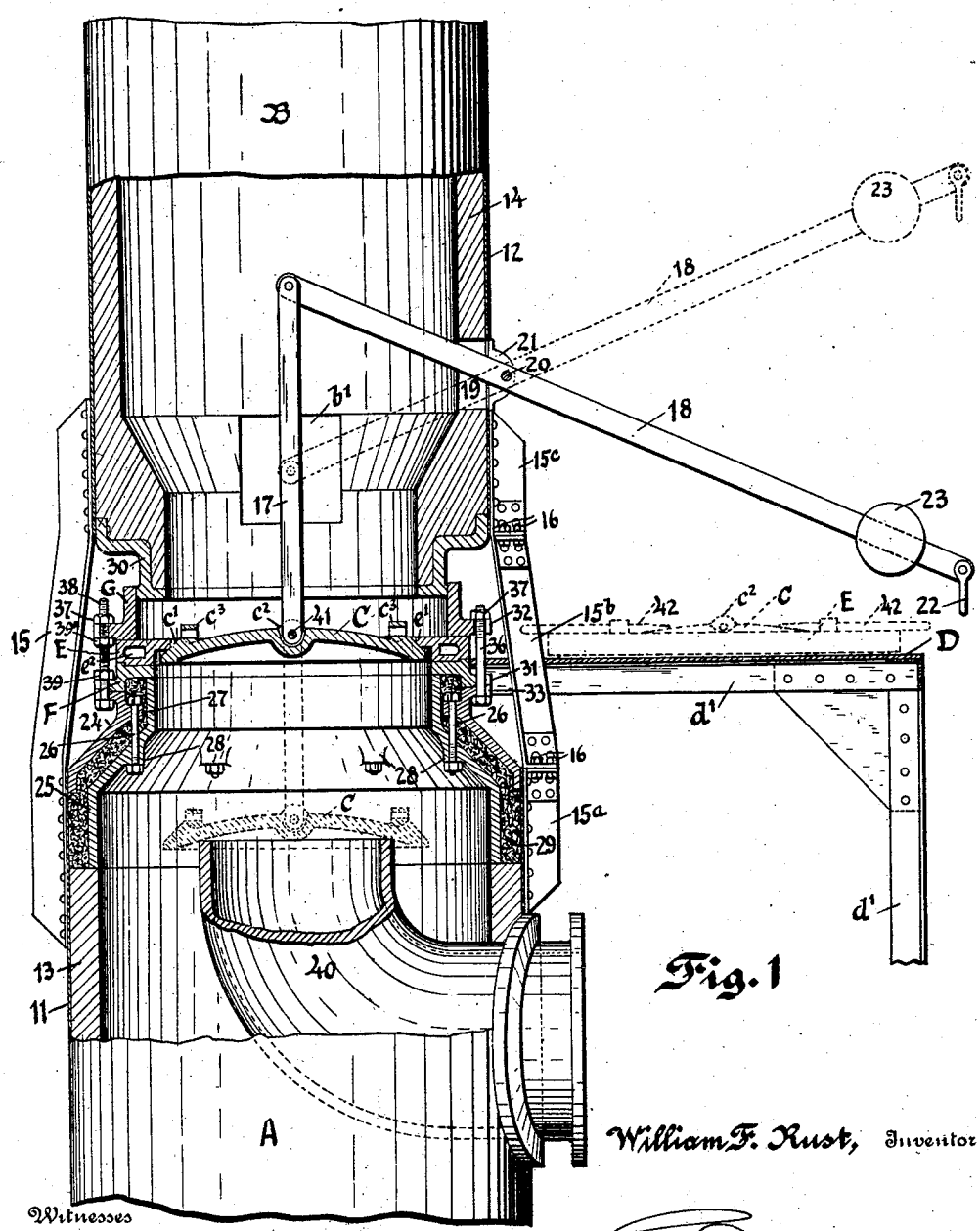


Fig. 1

Witnesses

E. H. Hoty

J. M. Gruber

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3 SHEETS—SHEET 2.

Fig. 2

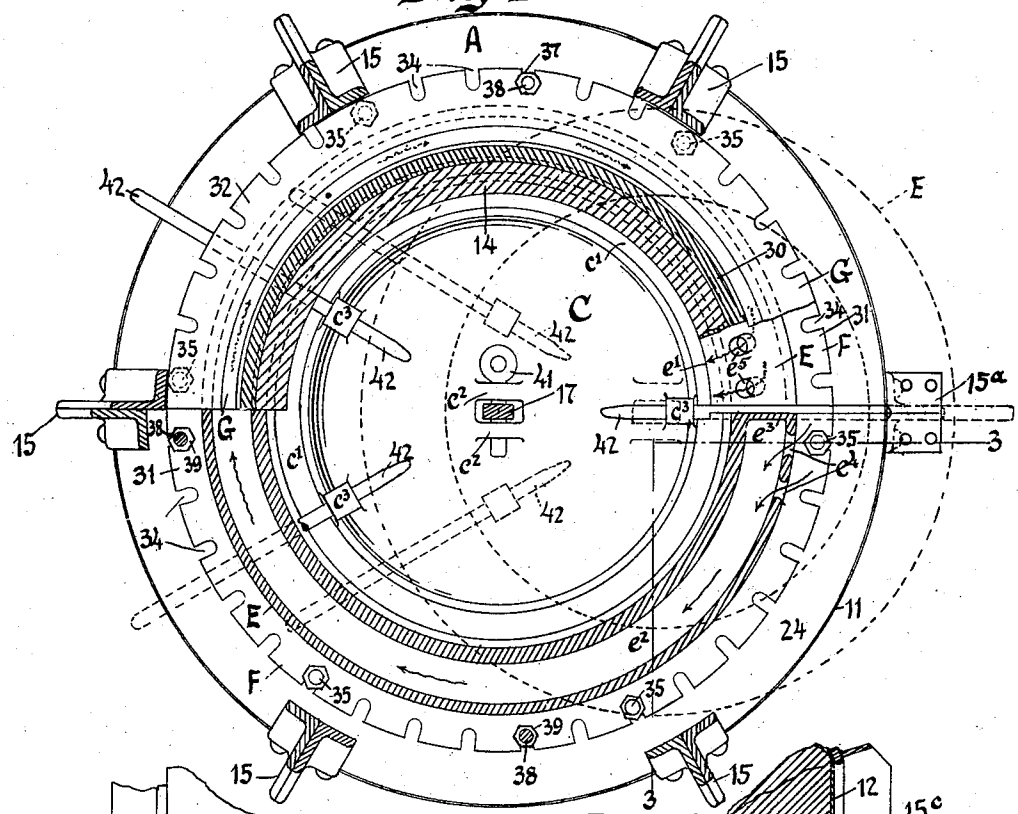


Fig. 3

Witnesses:
E. M. Holt
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3 SHEETS—SHEET 3.

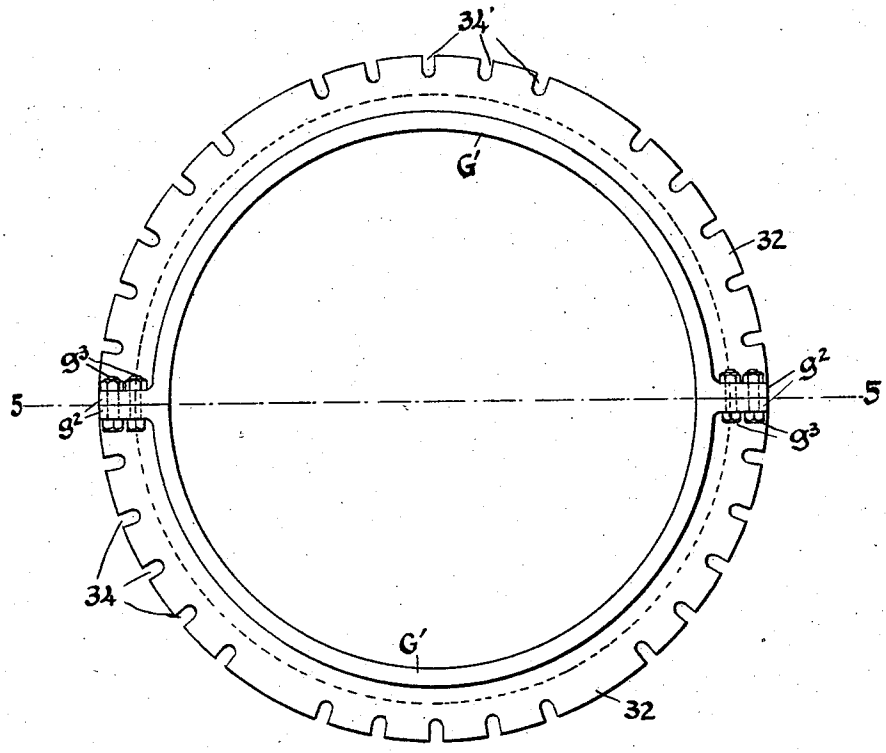


Fig. 4

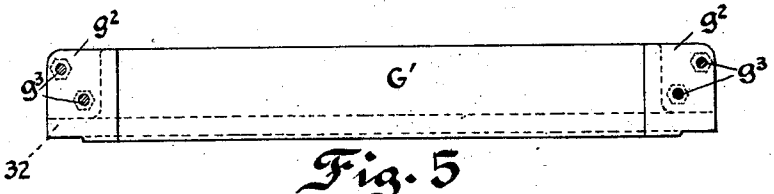


Fig. 5

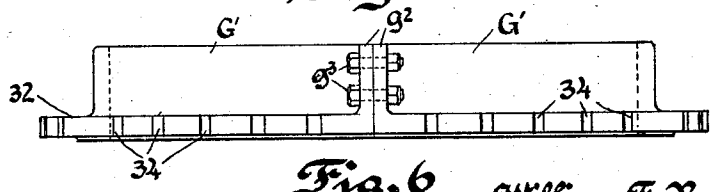


Fig. 6

William F. Rust, Inventor

Witnesses

E. M. Hoy

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UNITED STATES PATENT OFFICE.

WILLIAM F. RUST, OF JOLIET, ILLINOIS.

CHIMNEY-VALVE FOR HOT-BLAST STOVES.

No. 860,062. Specification of Letters Patent. Patented July 16, 1907.

Application filed February 25, 1907. Serial No. 359,277.

To all whom it may concern:

Be it known that I, WILLIAM F. RUST, residing in Joliet, Illinois, have invented a Chimney-Valve for Hot-Blast Stoves, of which the following is a specification.

This invention has relation to the air-heating or so-called hot-blast stoves used in blast-furnace practice. As is well understood this class of stoves is provided with a large area of internal heating surface over which the hot waste gases from the furnace are passed after being burned, said heating-surface taking up the heat in the gases and storing it temporarily, after which operation a current of air is passed through the stoves in the opposite direction and is heated by taking up the heat formerly stored therein, whereby said air is raised to the proper temperature for delivery to the twyers.

My present invention consists of a chimney-valve for such a stove, namely a valve more particularly adapted to use on the cold side of the stove, though it might also be used with some passable alterations as a hot-blast valve, that is, upon the hot side of the stove.

My valve is moreover more particularly adapted to use upon stoves of the three-pass type, in which type the hot gases enter at the lower end of the stove and pass to top thence downwardly to the bottom and thence upwardly to the top again and out on the cold side; and conversely, the air is caused to enter the top on the cold side pass down, up, and down again and out through the hot-blast valve.

In the design of chimney valves considerable difficulty has been found owing to the necessity of maintaining at all times a perfectly tight joint between the valve and seat, and between the seat and sub-seat and other parts on the inner side of the valve, while at the same time making it possible for the valve and seat to be readily and quickly removed, and for this operation to be performed when desirable without waiting a long time for the parts to cool off, during which the stove is idle and out of service. Valves as formerly designed made it necessary to enter the chimney at one side above the valve in order to detach the valve from the link by which it is operated, which detachment was necessary in order that the seat might be removed. Moreover, in the old style of valves, it has been necessary to remove the valve and seat through a special opening in the side or through the top of the chimney, which was a very laborious undertaking owing to the great weight of the parts and the difficulty of access.

In my present invention I aim to provide a combined valve and seat so designed in connection with the chimney that a wide annular opening around the chimney can be made, the valve firmly secured to the seat, and, after detachment from the operating link, both can be simultaneously removed through the annular opening aforesaid. I also aim to provide means for securing the seat in place that shall give an absolutely tight joint at all times and prevent any possible air-leakage between the seat and sub-seat. I further aim to provide means for automatically and continuously cooling the valve seat by the circulation of a current of air therethrough.

The construction of my invention is best understood by a consideration of the following description thereof, reference being had to the accompanying drawings, wherein

Figure 1 is a longitudinal section through the chimney of a three-pass stove having my chimney valve placed therein. Fig. 2 is a transverse or plan section through the chimney partly on the plane 2^a and partly on the plane 2^b of Fig. 3, further a part on the right being shown as broken away. Fig. 3 is in part a side elevation and in part a section on the plane 3 of Fig. 2 through the essential parts of the valve, and on a larger scale than Fig. 1. In Figs. 2 and 3 the clamping-ring is shown as raised and the valve is secured to the seat and ready to slide out. Fig. 3 shows the valve-seat as already in part slid out. Fig. 4 is a plan of a sectional form of clamping ring. Fig. 5 is a section therethrough on the plane 5. Fig. 6 is an elevation thereof in a plane at right-angles to that of Fig. 5.

In these drawings every reference letter and numeral refers always to the same part.

The chimney of the stove is divided into two parts A and B by the chimney-valve C and its fittings. The parts A and B each comprise a cylindrical metal casing 11, 12, inclosing a fire-brick lining 13, 14; and the part B is supported upon the part A by a series of angle-bar columns 15, same being herein shown at six in number, and one of them, that on the right of the drawing, is in three sections 15^a, 15^b, and 15^c, of which the intermediate part 15^b is removable and is secured to the parts 15^a and 15^c end to end by bolts 16. The purpose of having this column with a removable section is to enable the valve and seat to be slid out upon a platform D arranged at the side of the chimney and supported by a steel frame-work d^1 and other suitable means.

The valve C is of disk shape as usual, and is supported by an operating link 17 suspended from the end of a lever 18 which passes out through a hole 19 in the side of the chimney above the valve and is pivoted upon a pin 20 which is mounted in ears 21 on the side of the member B. A clevis 22 is shown upon the free end of the lever providing means to attach a chain by which the lever 18 is operated to raise and lower the valve C. The weight of the valve may also be partly counterbalanced by a weight 23 as usual.

Acting in conjunction with the valve C is the seat E of annular form and provided with an inwardly projecting seating-flange e^1 which is ground at its lower edge obliquely to fit the oblique edge c^1 of the valve C, and the latter is pressed upwardly thereagainst by the action of the counterweight 23 and the air-pressure beneath the valve. The seat E is hollow interiorly, that is, it is provided with an annular air-passage way e^2 which as more clearly shown in Figs. 2 and 3 is divided at one point by a partition e^3, and at one side of said partition are apertures e^4 communicating with the exterior, and at the opposite side of said partition other apertures e^5 communicating with the interior above the valve C. The heating of the valve-seat E causes a circulation current to be established by the air entering at e^4, passing around the air-channel e^2, and passing out through the apertures e^5 in the chimney. This air current serves to cool the valve-seat E at all times and to prevent it from becoming overheated, thus not only considerably increasing its life, but also avoiding the necessity of waiting a long while for it to cool off when it is desired to remove it from the chimney.

The section A of the chimney is terminated by two annular frame-castings 24 and 25, which at the end replace casing 11 and lining 13, these being secured together by a plurality of bolts 26 joining suitable lugs 27, 28, on the respective castings. The interior space between the castings 24, 25, is filled by insulating material, such as asbestos, mineral wool, quick-lime, fire clay or the like, designated 29.

The upper end of the chimney-section A is capped by an annular member F, upon which the seat E is directly secured and which is herein termed the sub-seat. This member is permanently secured to the frame-casting 24, as will be hereinafter described, and close-fitting lock-joints are provided between this and the casting 24 and the seat E, it being essential that these joints should be air-tight to prevent leakage. The lower end of the upper chimney-section B is terminated by an annular frame-casting 30, which is so shaped as to support the lining 14 as shown. This casting is located some distance above the seat E in order to enable the latter to be freely moved in and out as before described, and connection is made to the seat E by means of a sliding-ring piece G which I shall herein term the clamping-ring from its function of clamping the seat E in position.

The members F and G and the frame member 24 are each provided with an annular flange 31, 32 and 33, for the purpose of securing them together, each of these flanges having corresponding radial notches 34 in which bolts are set. These bolts are of three kinds, to-wit; first, a series of short bolts 35 which join only the two lower flanges 31 and 33, and whose function is to permanently secure the sub-seat to the frame-casting 24, whence they may be termed sub-seat bolts; secondly, a series of longer bolts 36 (one of which is shown on the right of Fig. 1) extending between the flange 32 and the flange 33, and having nuts 37 on their upper ends only, for the purpose of securing or clamping the ring G in place upon the seat E, whence they may be termed the clamping-bolts; and thirdly, a set of still longer bolts 38 (shown on the left of Fig. 1, and in Fig. 3) threaded for nearly their entire length and provided, in addition to nuts 37 on their upper end, with two further nuts 39, 39^a, the former securing the bolts in place on the flanges 31, 33, and the latter serving when turned to push upwardly upon the clamping-ring and jack it up into raised position, whence they may be termed jack-bolts. The first set of bolts 35 are herein six in number evenly spaced circumferentially and are desirable apart from the other bolts to enable these latter to be manipulated or removed as desired without breaking the joint between the sub-seat and frame-member 24. The jack-bolts 38 are only three in number, as seen from Fig. 2 and 3, and so disposed as to leave a free opening, on the right-hand side in the drawing, through which the valve and seat are moved. The clamping-bolts 36 fill all the remaining notches 34, not filled by the sub-seat bolts or jack-bolts.

Immediately below the valve C in the chimney-section A is the air-inlet pipe 40 having its open end disposed centrally and facing up against the valve C and in position for the latter to rest thereon when in open position, that is, when the chimney is being used for the passage of blast-furnace gases. The valve C is provided at the center with ears c^2 perforated transversely to receive a pin 41 which is connected with the link 17 as shown. A lateral door or opening b^1 may be provided in the side of the member B whereby access may be had to the interior, although this is not essential in the case of my invention, because the pin 41 can be withdrawn or replaced through the aperture above the clamping-ring when the latter is raised.

The valve C is provided on its upper side with a set of perforated lugs c^3, with which coöperate a number of bars or rods 42, these latter being pushed through the perforations of the lugs c^3 in a radial position as shown, when the clamping-ring G is raised, and serving to secure the valve firmly to the seat while being removed. Only two of the lugs c^3 (as shown in Fig. 1) are necessary to secure the valve to its seat, but I prefer to provide three, disposed as shown in Fig. 2, for greater convenience in manipulation, the ends of the rods serving also as handles whereby one or more men on each side can raise, lift, and push out the valve and seat together in a manner clearly shown in Fig. 3. The rods 42 might in ordinary practice be made considerably longer than shown in the drawings for greater ease in manipulation.

In general it will be found preferable to make the clamping-ring G in sectional form as is shown in Figs 4 and 5, to enable the ring to be replaced or removed after the construction of the chimney. This would not be possible with the one-piece clamping-ring shown in Fig. 2, except by a modification which would enable the ring to be slid out laterally, as by inserting a second sectional column 15^b. The simple one-piece form is, however, shown in Figs. 2 and 3 to avoid too much complexity in the illustration. In the sectional form the ring is divided radially into two or more parts G′ which are provided on their ends with abutting flanges g^2 perforated to receive bolts g^3. The flanges g^2 and bolts g^3 need not interfere with the clamping-bolts in the notches 34, since the flanges can be located in the blank spaces over the sub-seat bolts 35.

From the foregoing description the mode of operation of the valve will be clearly obvious.

When it is desired to remove the valve and seat, the bolts 36 are removed, the nuts 37 on the jack-bolts 38

loosened, and the nuts 39[a] are then screwed up until the clamping-ring G has been raised a suitable distance. The member 15[b] of the sectional column on the left is also removed. The valve C being in closed position, the rods 42 are inserted and jammed into place, after which the pin 41 can be removed to disconnect the link 17. The valve and seat are then slid out upon the platform D together, and if desired they can be readily raised by attaching a tackle to the ears c^2 and lowered to the ground and a new set raised and set in place, the clamping-ring being then lowered and the bolts 36 replaced. The whole operation can be performed in less time and with greater ease than it takes to remove the seat alone in former designs, and it is moreover extremely desirable to remove both together in order that the valve and seat may be accurately ground to fit together.

Another great advantage offered by my design of valve is in having the seat clamped to the sub-seat by external bolts. These bolts being on the outside can not become overheated, and therefore can be readily manipulated at all times, and moreover are not subject to expansion and contraction which would tend to slacken the pressure upon the seat-joint and thus give opportunity for leakage.

It is to be remembered also that in practice the valve C is often swung up against the seat with great violence (as for instance if the cold-blast should be suddenly turned on before the valve is closed) and this exerts a shock upon the joint between the seat and sub-seat and tends to break said joint and cause a leakage of air. For this reason some of the former designs have proved defective in that they failed to provide means for securing the seat to the sub-seat with sufficient force and positiveness. The defect is entirely eliminated in my valve. The arrangement of the terminal members 24, 25 and 30 of the chimney section is moreover an improvement over previous designs in that this arrangement leaves no room for the accumulation of dust on the working parts and provides against the dislodgment of fire-bricks from the lining caused by shocks of the valve in closing.

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

1. In a hot-blast stove, in combination with a chimney in two sections separated from each other by an annular opening, an annular valve-seat mounted on one section and adapted to be removed through said annular opening, and a valve coöperating with said seat on the inner or blast side thereof, and means passing through said seat for manipulating said valve.

2. In a hot-blast stove, in combination with a chimney in two sections separated from each other by an annular opening, an annular valve-seat mounted on one section and adapted to be removed through said annular opening, and a valve coöperating with the said seat and having a reciprocating movement toward and from said valve-seat and also removable through said annular opening.

3. In a hot-blast stove, in combination with a chimney in two sections separated from each other by an annular opening, an annular valve-seat mounted on one section and adapted to be removed through said annular opening, and a valve coöperating with said seat, said valve fitting inside said seat and adapted to be removed with it through said annular opening.

4. In a hot-blast stove, in combination with a chimney in two sections separated from each other by an annular opening, an annular valve-seat mounted on one section and adapted to be removed through said annular opening, a valve coöperating with said seat, said valve fitting inside said seat and adapted to be removed with it through said annular opening, and means for securing said valve in place within said seat.

5. In a hot-blast stove, in combination with a flue in two sections separated from each other by an annular opening, an annular valve-seat fitting over one of said flue-sections, a movable clamping-ring over said valve-seat, and means for pressing said clamping-ring upon said valve-seat to maintain the joint between it and the end of said flue-section.

6. In a hot-blast stove, an air or gas-flue in two sections separated from each other by an annular opening, an annular sub-seat mounted on the end of one of said sections, an annular valve-seat adapted to be mounted on said sub-seat, a clamping-ring over said valve-seat and movable with respect to said flue-section, and means for securing said clamping-ring to said sub-seat.

7. In a hot-blast stove, an air or gas-flue in two sections separated from each other by an annular opening, an annular sub-seat, a valve-seat and a clamping-ring thereover; together with a series of circumferential clamping bolts by which said clamping-ring is pressed upon said valve-seat; said valve-seat being insertible and removable through said annular opening; and said clamping-ring being movable with respect to said flue-sections.

8. In a valve for hot-blast stoves, an annular valve-seat having an internal circular passage-way adapted for the circulation of air; said passage-way being intercepted at one point by a transverse partition, and being connected by openings with the external side of said valve-seat on one side of said transverse partition, and by other openings with the inner side of said valve-seat on the opposite side of said partition.

9. In a valve for hot-blast stoves, the combination of a sub-seat having an external annular flange, an annular valve-seat fitting on said sub-seat, a valve coöperating with said valve-seat, a clamping-ring pressing on said valve-seat and having also an external flange, and a series of bolts connecting the respective flanges whereby to press said clamping-ring upon said valve-seat.

10. In a valve for hot-blast stoves, in combination with a removable annular valve-seat, an annular terminal member on the flue-section immediately outside of said valve-seat, said terminal member being separated from said valve-seat by an annular space, and a clamping-ring having a vertical limb forming a sliding-joint with said terminal member, and a horizontal limb forming a bolting-flange whereby said ring is clamped upon said valve-seat.

11. In a hot-blast stove, in combination with an air or gas-flue in two sections separated from each other by an annular opening, a metal terminal member on the inner or blast-section, said member having an external circumferential flange, an annular sub-seat having also an external annular flange, bolts securing said two flanges together, an annular valve-seat mounted on said sub-seat, and a plurality of bolts adapted to secure said valve-seat to said sub-seat and disposed circumferentially around the exterior of said valve-seat.

12. In a hot-blast stove, in combination with an air or gas-flue in two sections separated from each other by an annular opening, an inner and an outer terminal member secured together and forming the ends of one of said sections, insulating material filling the annular space between said inner and outer member, and means for securing a valve-seat over said terminal members.

13. In a hot-blast stove, in combination with an air or gas-flue in two sections separated from each other by an annular space, a terminal member on one of said flue-sections having an exterior circumferential bolting-flange, an annular sub-seat mounted on said terminal member and having also an external circumferential bolting-flange, an annular valve-seat mounted on said sub-seat, a clamping-ring over said valve-seat having a sliding connection with the opposite flue-section, said clamping-ring having further an external circumferential bolting-flange corresponding to the aforenamed flanges, a plurality of bolts securing said first two named flanges together, and a second set of bolts securing said first-named flange to said last-named flange whereby to clamp said clamping-ring over said valve-seat.

14. In a hot-blast stove, in combination with an air or

gas-flue in two sections separated from each other by an annular space, a terminal member on one of said flue-sections having an exterior circumferential bolting-flange, an annular sub-seat mounted on said terminal member and having also an external circumferential bolting-flange, an annular valve-seat mounted on said sub-seat, a clamping-ring over said valve-seat having a sliding connection with the opposite flue-section, said clamping-ring having further an external circumferential bolting-flange corresponding to the aforenamed flanges, a plurality of bolts securing said first two named flanges together, a second set of bolts securing said first-named flange to said last-named flange whereby to clamp said clamping-ring over said valve-seat, and and a third set of bolts having nuts clamping said first two flanges together and other nuts adapted to press said clamping-ring upon said valve-seat, and a third set of nuts on said last-named bolts adapted to press on the lower side of said clamping-ring to raise the same.

15. In a hot-blast stove, in combination with a gas or air-flue in two sections separated from each other by an annular interval, an annular valve-seat mounted in said interval and removable laterally therethrough, a valve coöperating with said valve-seat and having a plurality of perforated lugs thereon, and a plurality of bars adapted to be inserted through said lugs and to jam said valve-seat against the valve and resting on the outer side of said valve-seat whereby to secure said valve to said valve-seat so that both may be removed together through said annular opening.

16. In a hot-blast stove, in combination with a vertical chimney in two sections one of which is supported above the other, a plurality of vertical lateral columns acting to support the upper section in place with respect to the lower, one or more of said columns having a removable section opposite the annular interval between said sections, a platform opposite said removable section and substantially on a level with said annular interval, an annular valve-seat fitting over the upper end of the lower section and removable through said annular opening when said removable section of the column has been removed, and a member having a sliding connection with the lower end of the upper section of said flue and closing the interval between the lower end of said upper section and the valve-seat.

17. In a hot-blast stove, a chimney in two sections one of which is above the other and separated therefrom by an annular interval, an inner and an outer terminal member mounted on the upper end of said lower section and each having the section of an inverted funnel and separated from each other by an intervening space, insulating material filling said intervening space, means for securing together said inner and outer terminal member, said outer terminal member having an annular circumferential flange, an annular member capping said terminal member and having also a circumferential bolting-flange corresponding with said first-named flange, bolts securing said two flanges together, valve-mechanism mounted on said capping-member, said valve-mechanism being laterally removable through said annular opening between the flue-sections, and an annular clamping-ring having a sliding connection with the upper flue-section and adapted to be secured over said valve-mechanism to hold it in place upon said capping-member.

18. In a valve for hot-blast stoves, in combination with a chimney or flue in two sections separated from each other by an annular opening, valve-mechanism removably mounted in said annular opening and laterally removable therethrough, and an annular member in two or more sections having a sliding connection with the lower end of said upper flue-member and connecting it with said valve-mechanism to close the interval between the lower end of said upper section and the valve-seat.

In testimony whereof, I have hereunto set my hand this 20th day of February, 1907.

WILLIAM F. RUST.

In presence of—
A. F. DREES,
G. C. POWELL.