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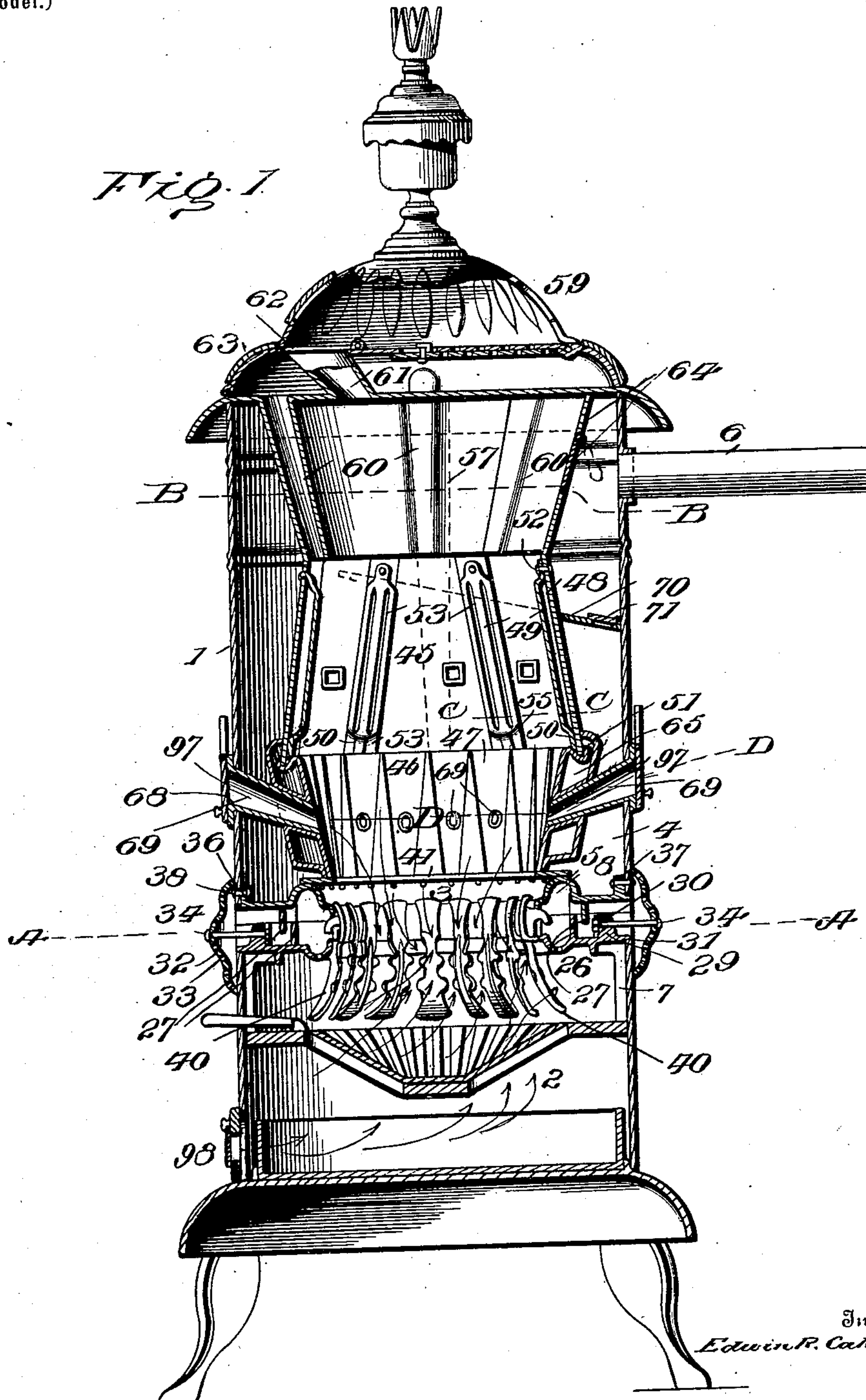
Patented Apr. 29, 1902.

E. R. CAHOONE.
HEATING STOVE.

(Application filed Jan. 28, 1902.)

4 Sheets—Sheet 1.

(No Model.)



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Witnesses

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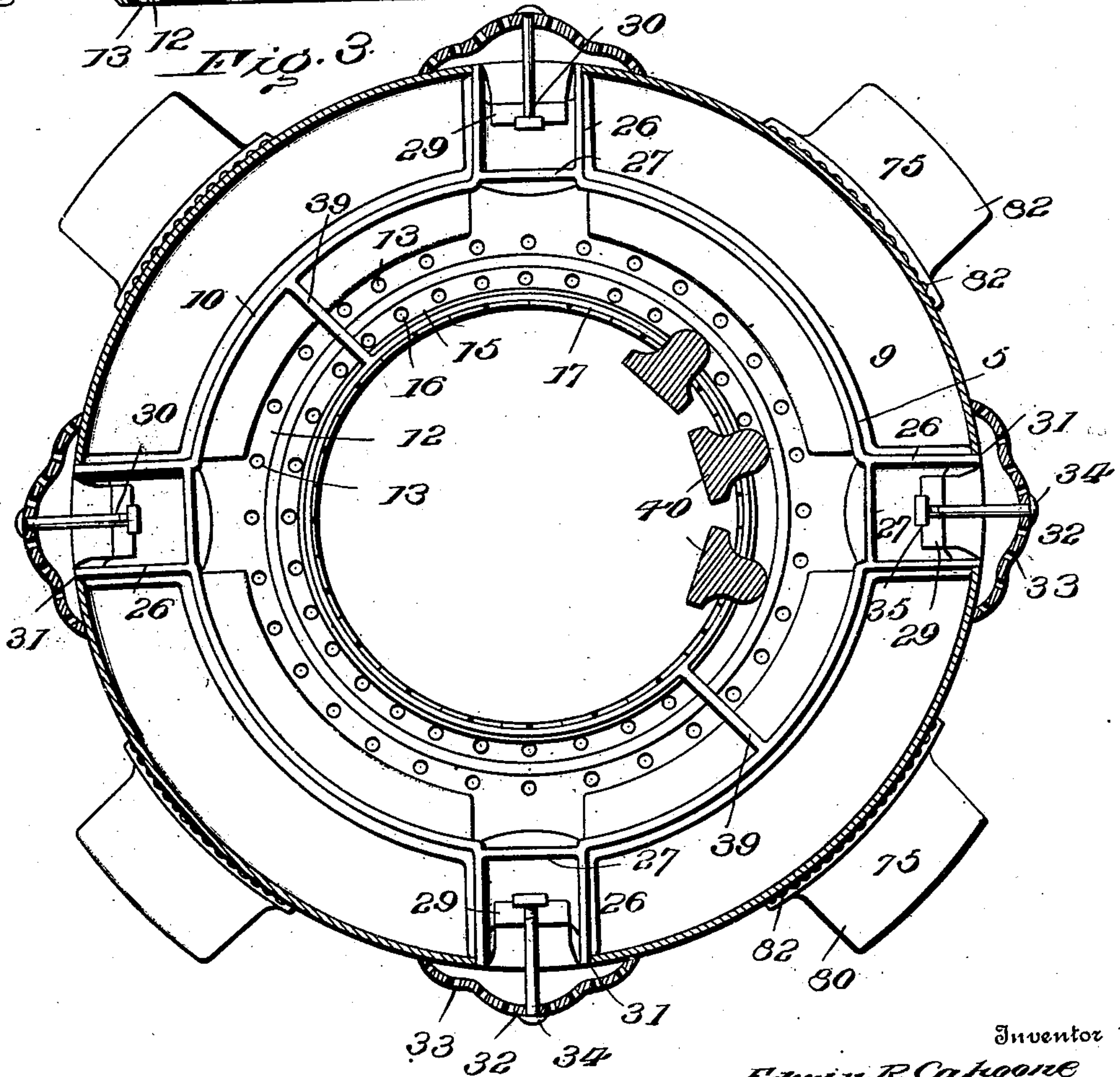
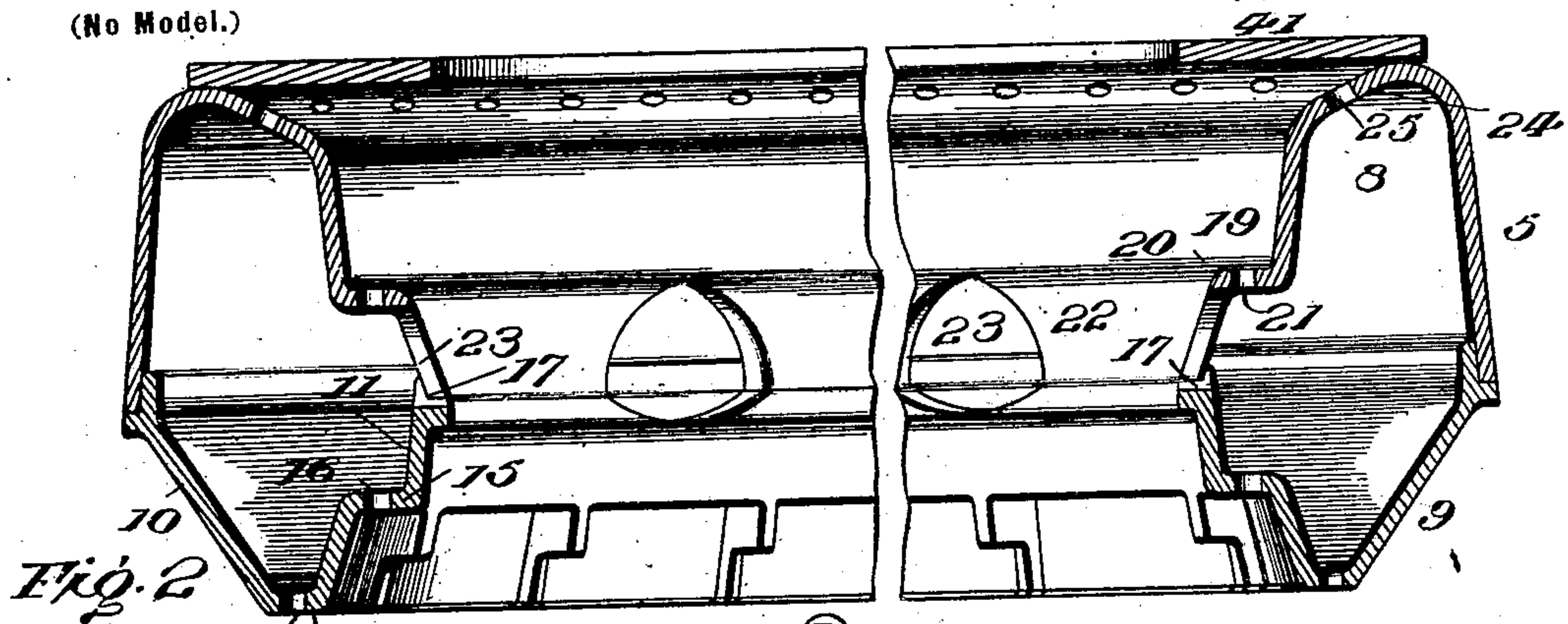
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4 Sheets—Sheet 2.

(No Model.)



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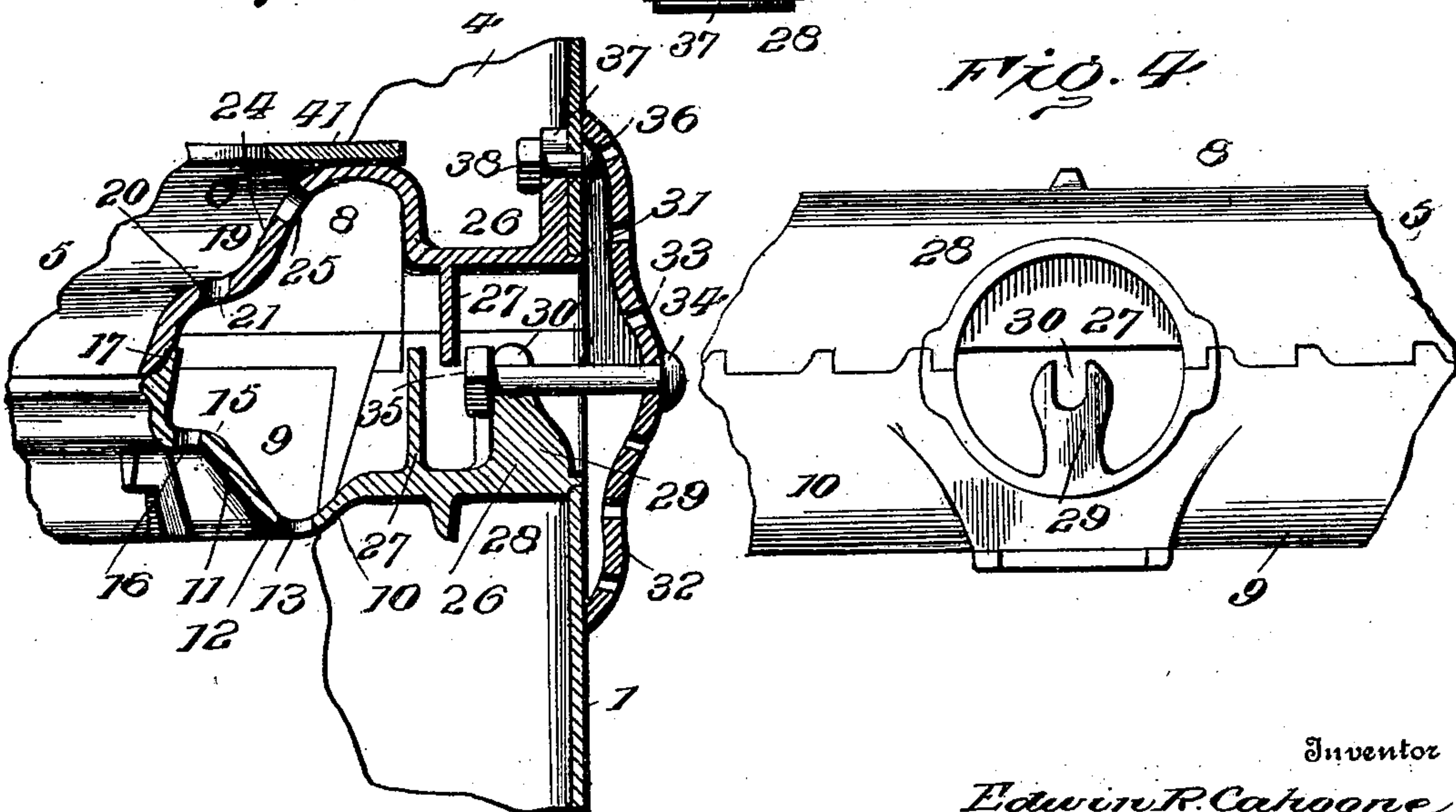
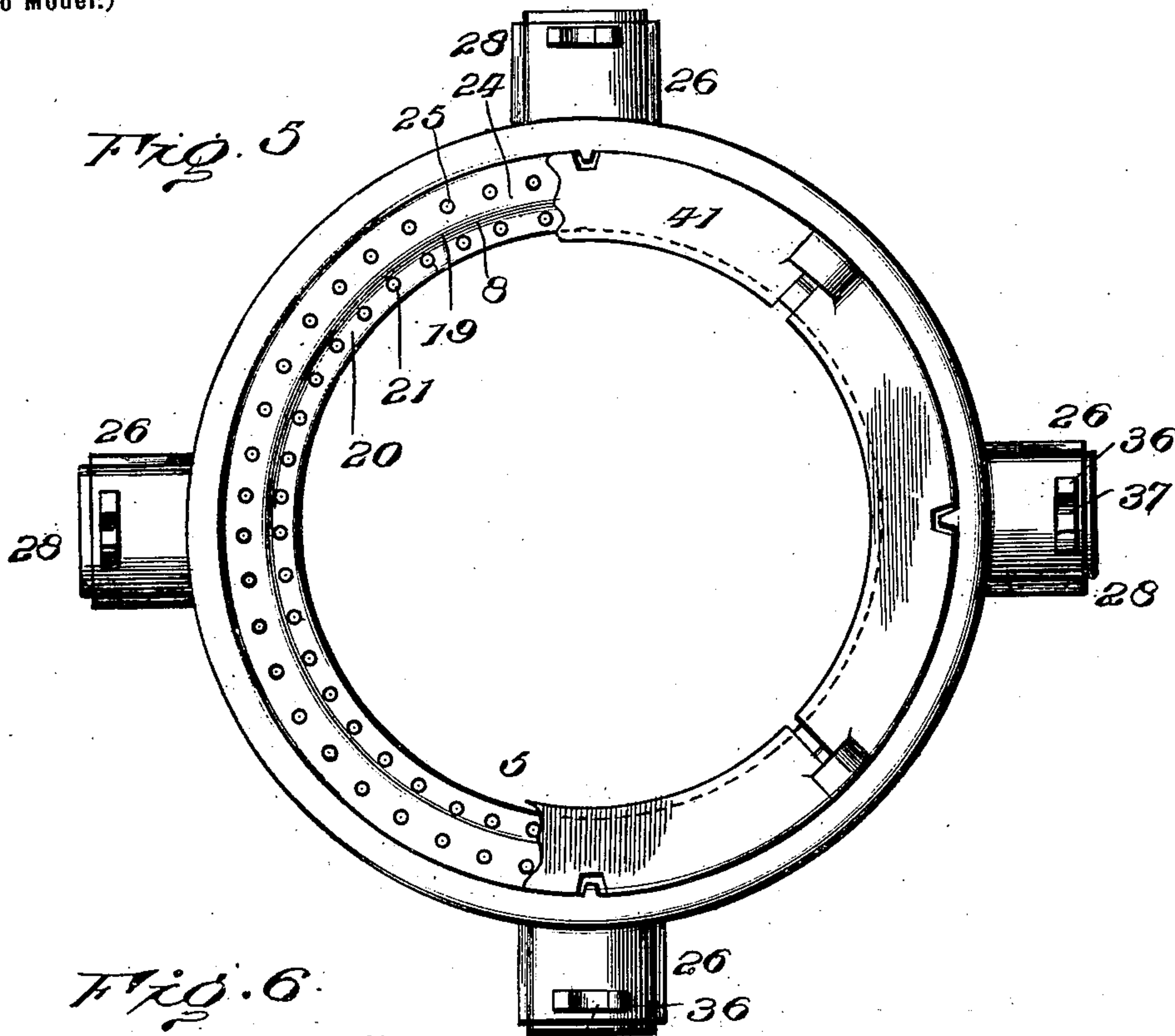
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.4 Sheets—Sheet 3.

(No Model.)



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No. 698,810.

Patented Apr. 29, 1902.

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HEATING STOVE.

(Application filed Jan. 28, 1902.)

(No Model.)

4 Sheets—Sheet 4.

FIG. 7.

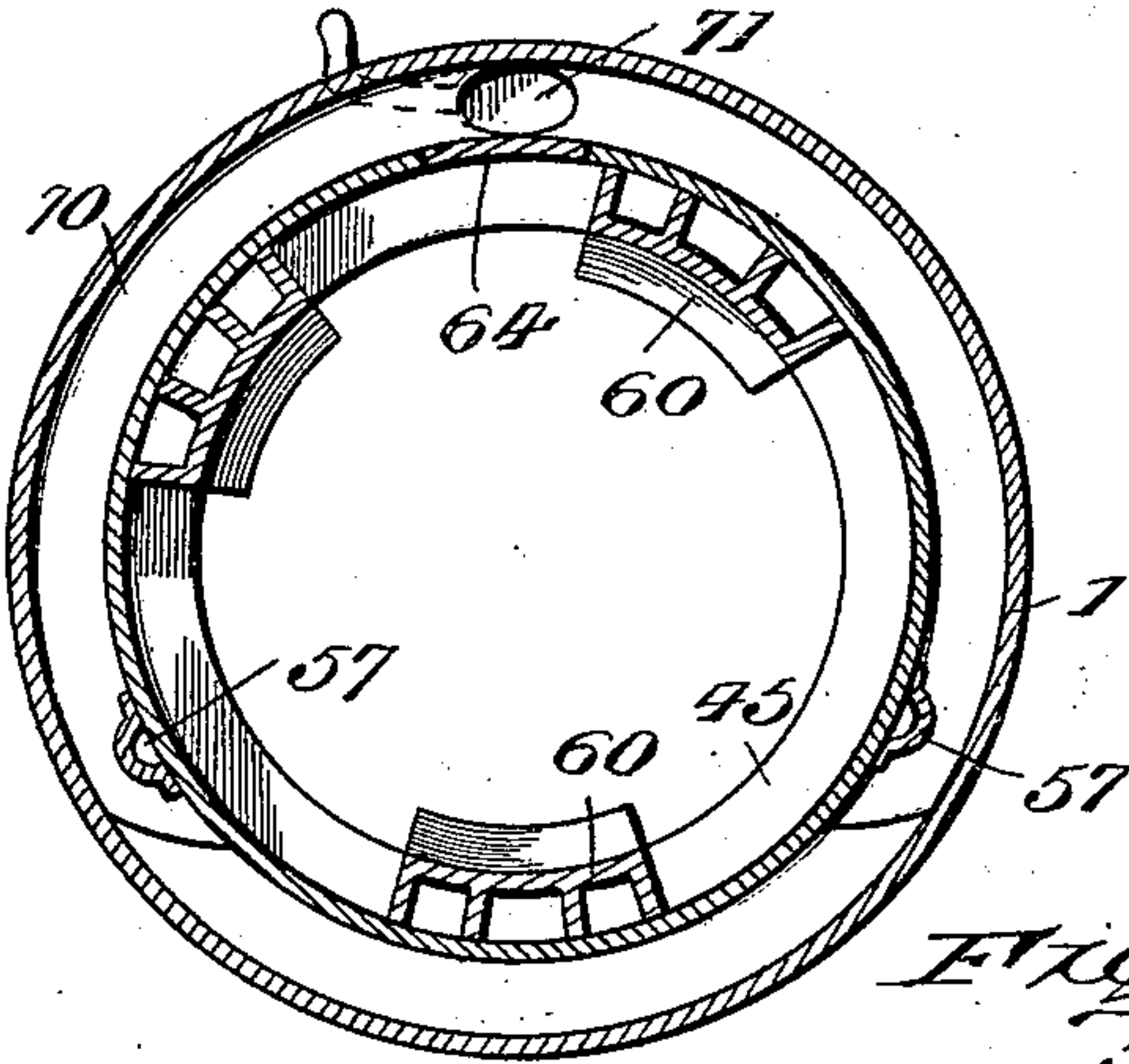


FIG. 9.

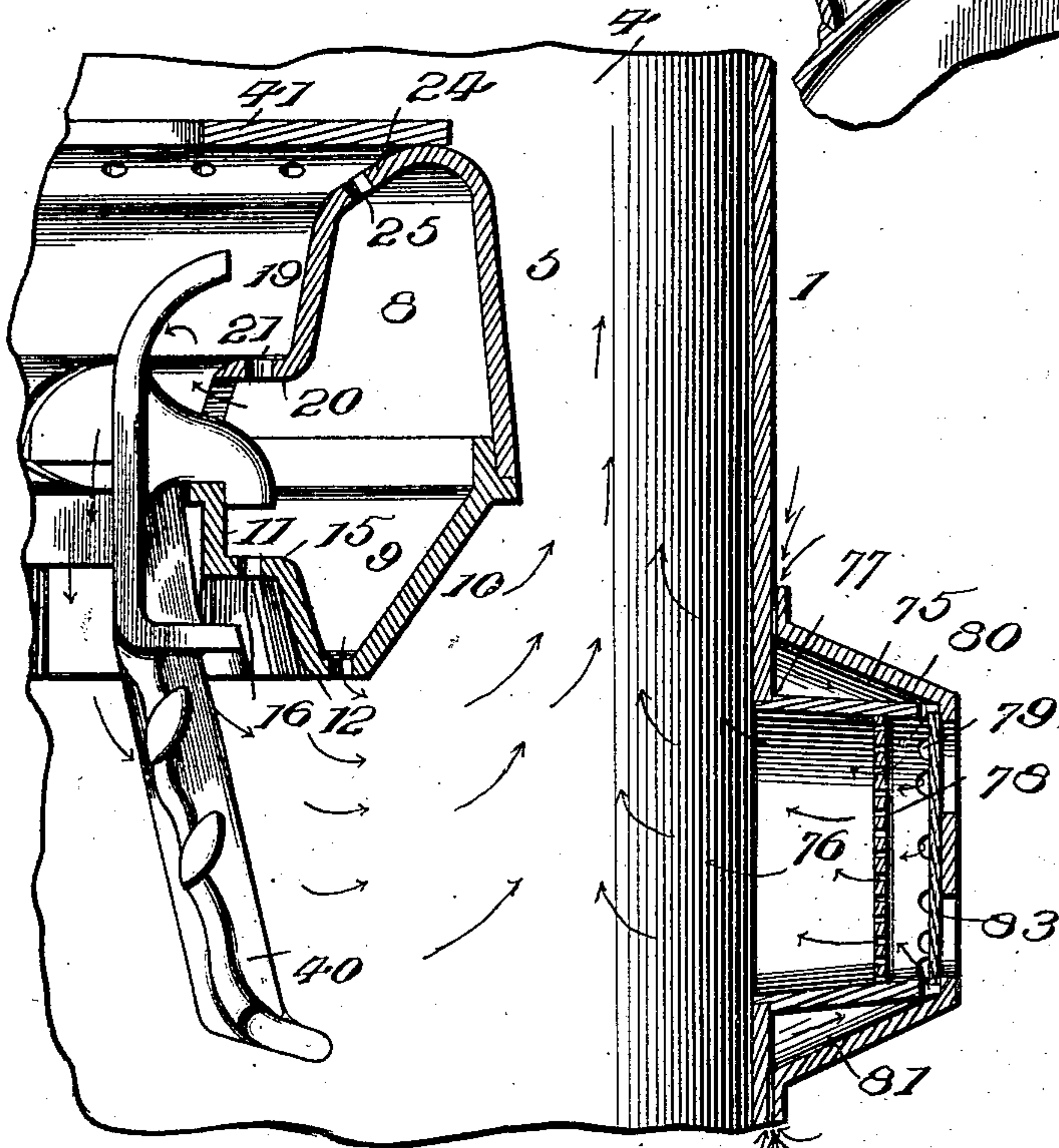


FIG. 8.

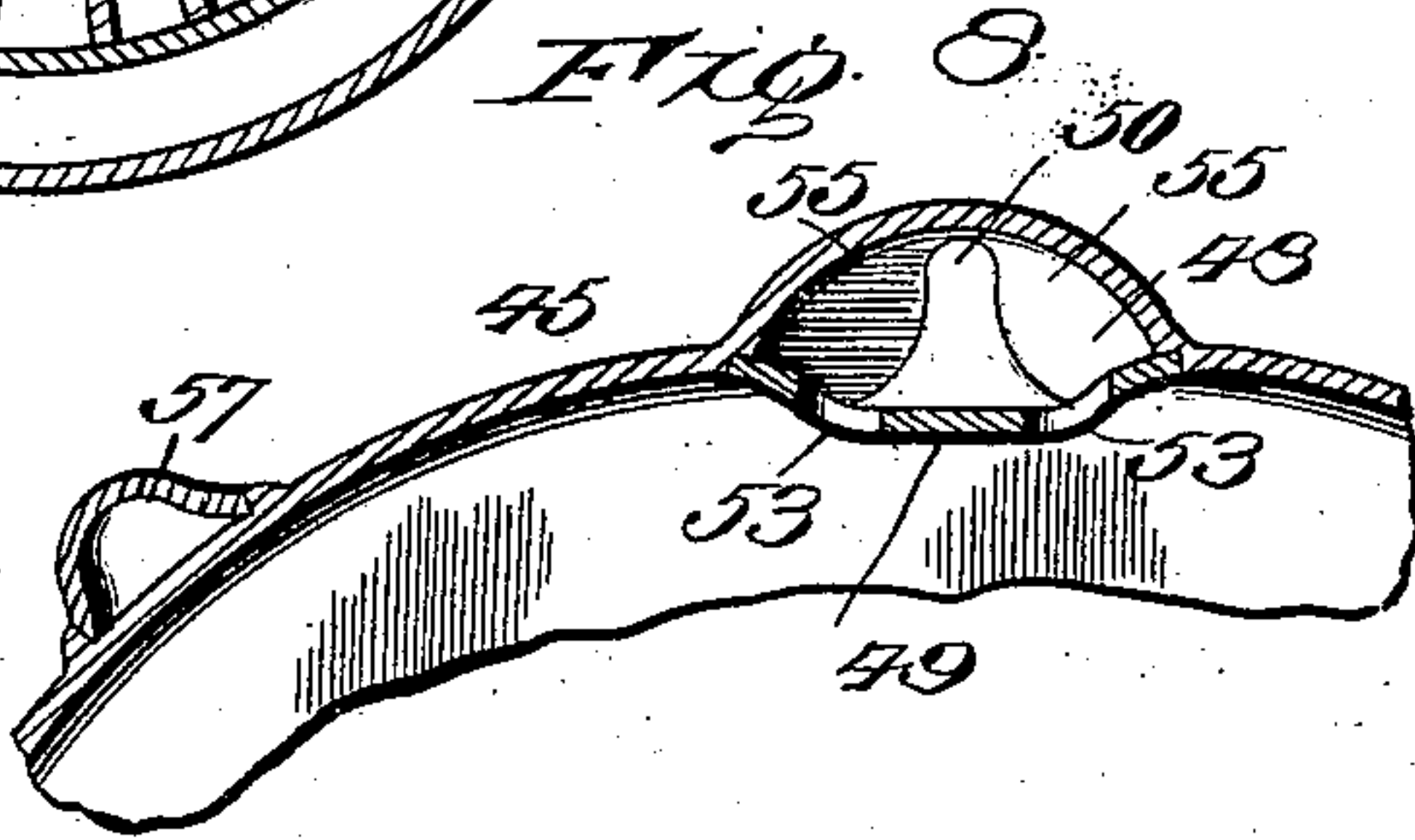
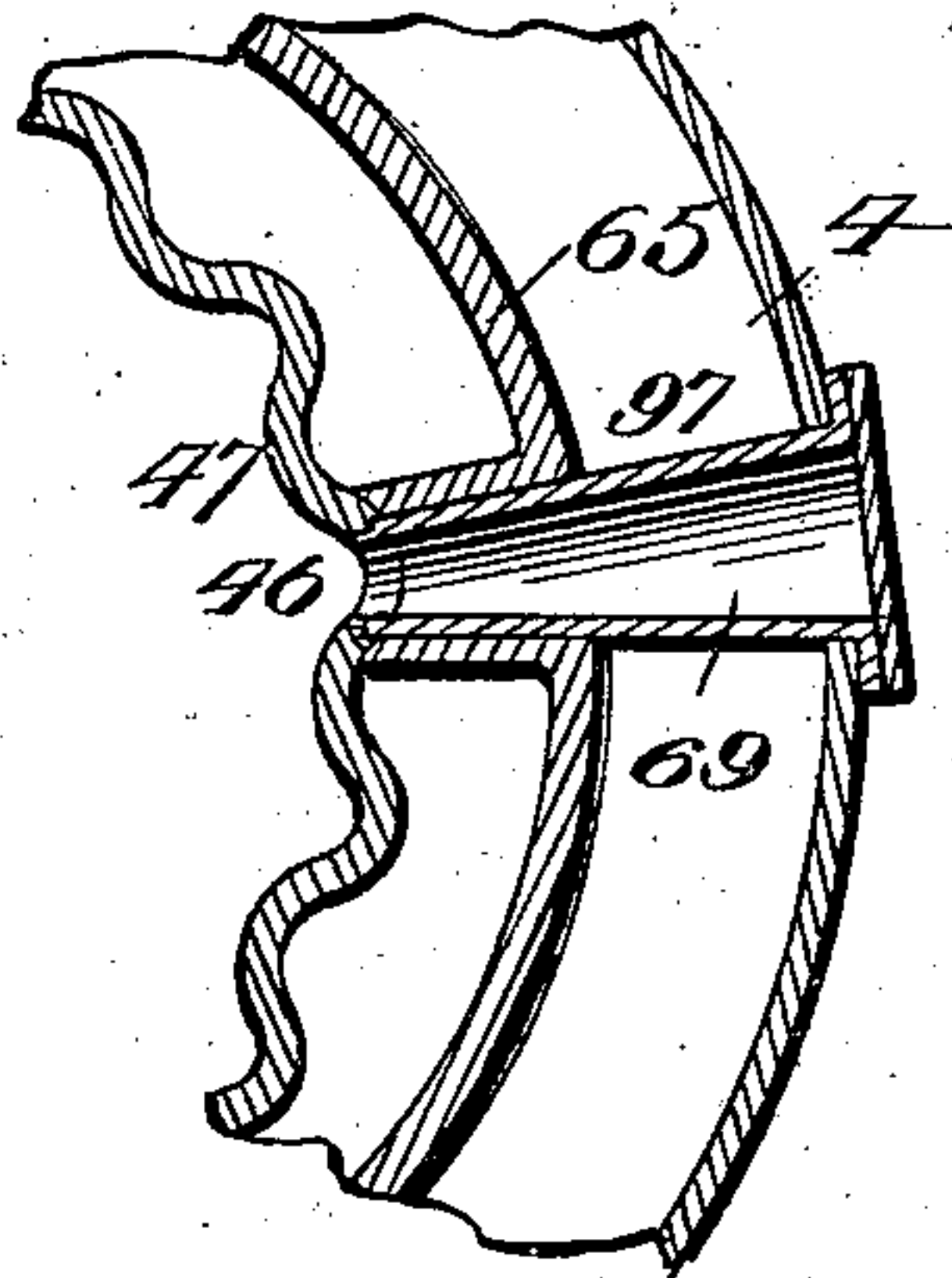


FIG. 10.



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FIG. 11.



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UNITED STATES PATENT OFFICE.

EDWIN R. CAHOONE, OF TROY, NEW YORK.

HEATING-STOVE.

SPECIFICATION forming part of Letters Patent No. 698,310, dated April 29, 1902.

Original application filed March 5, 1901, Serial No. 49,818. Divided and this application filed January 28, 1902. Serial No. 91,622. (No model.)

To all whom it may concern:

Be it known that I, EDWIN R. CAHOONE, a citizen of the United States, residing at Troy, county of Rensselaer, State of New York, have
5 invented certain new and useful Improvements in Heating-Stoves, of which the following is a specification.

This invention relates to improvements in downdraft heating-stoves and forms a division of my application filed March 5, 1901, Serial No. 49,818.

The prime object of the invention is to provide an air-heating chamber at a point where the fuel is usually incandescent and to mount
15 on said chamber a fire-pot and fire-pot extension, each having specific means for distributing air in conjunction with the air-heating chamber.

In downdraft-stoves it is important that the
20 heated air introduced for promoting combustion be uniformly distributed to the fuel and at the same time deliver the supply of air constantly.

It is therefore one of the purposes of this
25 invention to prevent the uneven introduction of air by providing coverings for those of the air-inlets which are likely to become clogged by the fuel, so that in the event of the lay of the fuel being such that at one point the air-
30 supply would be cut off at the face of any particular inlet the passage would still be uninterrupted and the ingress of air at other points would not be stopped.

It is also the purpose of this invention to
35 provide a downdraft-stove wherein heated air is introduced at various points and levels above the level of the bed of fuel and simultaneously therewith deliver air to the incandescent mass of fuel below the top thereof,
40 all of said heated-air currents being drawn through the fuel under the influence of the draft.

Many other objects and advantages will be hereinafter referred to and be particularly
45 pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of a stove constructed in accordance with my invention. Fig. 2 is an enlarged vertical section of the air-heating
50 chamber. Fig. 3 is a horizontal section of the stove, taken approximately on the line

A A of Fig. 1. Fig. 4 is a detail elevation of the air-heating chamber, illustrating the end of one of the air-inlet pipes. Fig. 5 is a top plan view of the air-heating chamber. Fig. 55 6 is an enlarged detail section of the means employed to fasten the air-heating chamber in position. Fig. 7 is a horizontal section on the line B B of Fig. 1. Fig. 8 is a detail horizontal section on the line C C, Fig. 1. Fig. 60 9 is a detail vertical section of the means employed for introducing air to the escaping products of combustion. Fig. 10 is a detail horizontal section on line D D, Fig. 1. Fig. 11 is a detail horizontal section of a modifica- 65 tion of air-pockets.

The numeral 1 represents the stove-casing; 2, the grate; 3, the fire-pot; 4, the exit-space intermediate the fire-pot and casing; 5, the air-heating chamber, and 6 the smoke-exit 70 flue.

The air-heating chamber 5 is mounted on supports 7 and is preferably composed of two sections 8 and 9, bolted or otherwise secured together. The section 9 is composed of an 75 outer and inner wall 10 and 11, which taper down toward their lower ends to the bottom 12, wherein is formed a series of air-exit openings 13. In the inner wall 11 is formed a step or shoulder 15, provided with a series of per- 80 forations 16. Extending from the upper edges of the lower section are vertical and horizontal flanges 17, the two forming a seat for the upper section 8. The section 8 is approximately U-shaped in cross-section, ex- 85 cept that its inner wall 19 has an inwardly-projecting flange 20 at its lower end, which is provided with a series of vertically-arranged air-exit openings 21, and on the inclined portion 22 of the section 8 are a num- 90 ber of larger openings 23. The upper inner edge 24 of the section 8 is slightly inclined toward the center and is provided with a series of air-exit openings 25.

Extending radially from the sections 8 and 95 9 are semicircular lugs 26, each having a baffle-plate 27, and when said sections are placed together they form air-inlet flues 28. In each lower lug 26 is a vertical boss 29, having in its upper end a notch 30. The flues 28 register with openings 31 in the stove-casing 1, and over the openings are placed ornamental 100

plates 32, perforated at 33 and having passed through the center a bolt 34, the inner end of which is seated in the notch 30 and is held therein by a nut 35, said nut fitting between
 5 flanges formed on the inner sides of the boss 29. By means of this construction the parts can be quickly assembled and bolted, and should access to the chamber be desired through a flue 28 the screw 34 is released, the
 10 plate 32 is slightly raised to disengage the nut and bolt from the notch, when it can be withdrawn. Lugs 36, having a crotch 37 in their upper ends, project from the upper section 8 and are designed to more effectually secure
 15 the chamber 5 in position. A bolt 38, passing through the crotch and a perforation in the casing, clamps the parts together.

To prevent uneven distribution of the heated air to the fire-pot, partitions 39 are arranged in the air-heating chamber, forming practically two separate compartments. This insures the air being directed evenly in each side of the chamber.

Hung in the openings 23 are bars 40, comprising the lower part of the fire-pot. The bars fit the openings loosely to permit air to pass to the fuel.

The numeral 41 represents a ring resting on the air-heating chamber 5 and is designed
 30 to perform a double function, to wit: The inner side, which extends toward the center, overlaps the annular chamber 5 and deflects the currents of heated air coming through the perforations 25 down into the bed of the fuel, and it further supports the upper portion of
 35 the fire-pot and its extension. The fire-pot may be, if desired, made in one piece. However, the most practical construction will be to make it in sections 45 and 46, the section
 40 46, together with the series of portable bars 40, constituting the fire-pot proper. In many instances the section 46 will have a series of vertical grooves 47, which taper from the top. However, in equally as many instances the
 45 grooves will be omitted. The tapering grooves permit the heated air to be more readily liberated and be forced in continuous currents around or down into the body of fuel and mixing with the newly-generated gases, such
 50 mixture causing the gases to be made more susceptible to ignition when the lowest part of the fire-pot is reached, where of course in stoves of this type the mass of fuel is the hottest. The upper end of the section 46 is beveled,
 55 so as to afford as little resistance to the fuel and incoming air-currents as possible. The fire-pot extension is, for the convenience of construction, preferably of double-truncated-cone formation, the lower cone being provided
 60 with a series of air pockets or depressions 48 (shown best in Fig. 8) and are covered on the inner side by slotted plates 49. Plates 49 are of such shape as to fit in depressions surrounding the pockets 48, and each plate has
 65 at its lower end a reduced angularly-bent portion 50, fitting in a socket 51 in the upper flanged end of the fire-pot section 46, and at

the upper end is formed an eye 52 for the passage of a screw, rivet, or hook to rigidly fasten the plates in position.

53 represents slots in the plate which form communication with the fire-pot and the pockets 48.

The lower portion of the plates 49 are open, as at 55, to permit free exit of the currents of
 75 air and gas, it being noted, however, that most of the air-currents find their way down the grooves 47.

On the outside of the upper section of the fire-pot extension and preferably intermediate the air-pockets 48 are a series of air-ducts 57, designed to introduce currents of heated air from the top of the stove above the bed of the fuel at a point approximately on a line with the exit-openings 55. The two
 85 separate sets of air-currents coming through the ducts 57 and openings 55 entering their respective ducts at different heights are of somewhat different temperatures and velocities, which creates a plurality of resistances
 90 to mix the air and gases—that is to say, the air fed to the fuel through the openings 55 being nearer the fire is necessarily of higher temperature than the air delivered from above, and by the lay of the fuel the air is
 95 broken. Hence the velocity and heat of the various currents are irregular.

The top 59 of the stove may be of any construction and is provided with a number of depending air-inlet tubes 60 and a fuel-inlet
 100 61, covered by a door 62. The tubes are preferably formed by a plate provided with ribs to bear against the wall of the fire-pot extension, thus completing the tubes or ducts. The tubes or ducts taper in cross-section and
 105 incline toward the center, directing a series of regular currents of heated air thereto, the admission of said air being regulated by a damper 63.

In the upper part of the extension of the
 110 fire-pot is a damper 64, the purpose and operation of which will be hereinafter referred to. Surrounding the lower part of the extension and the upper section 46 is a water-jacket 65, having the usual inlet and outlet
 115 pipes. (Not shown.) It is my purpose to preferably make this feature around the fire-pot proper; but this will be determined according to the various circumstances which arise in placing a stove of this character.

Between the outer wall of the casing 1 and the fire-pot is a space or exit-passage 4, through which the products of combustion pass on the way to the exit-flue 6. Extending from the outer wall 1 and across the passage 4 and
 125 through the section 46 is what I shall term a "combined air-introducer and sight-opening" 97. The device consists of an outer flange 68, bearing against the casing 1, an inclined bevel-chute 69, having its lower end reduced
 130 to form a flange to fit snugly in the section 46, a suitable damper being arranged at the mouth of the chute to regulate the supply of air to be admitted to the fuel.

In the exit-space 4 and below the flue 6 is a baffle-plate 70, extending approximately half-way around the structure, and it inclines upwardly toward the stove-front. In the baffle-plate and directly under the flue 6 is a damper 71, affording an additional means whereby the products of combustion may be controlled.

Approximately where the products of combustion leave the fire-pot and enter the space 4 I provide a series of air-introducers 75, each consisting of an open frame 76, which registers with an opening 77 in the casing 1, a perforated partition 78 being interposed in the frame 76 and a series of notches 79 being formed at the outer end of said frame. A jacket 80 surrounds the frame 76 and is somewhat larger than the latter, forming a passage 81, which communicates with the atmosphere through the openings 82, a sheet of transparent material 83 being interposed between the outer end of the frame 76 and the front of the jacket 80. The air surrounding the stove enters the passage through the openings 82 and thence passes through the notches 79 to the interior of the frame 76, where it encounters the perforated partition 78, which breaks the air into finely-divided particles. The introduction of these fine particles of heated air at this point mixes with the escaping products of combustion before the smoke-gases form, which tends to ignite the unconsumed molecules of gas and therefore produce a better grade of combustion. This structure is claimed in an application filed by me January 14, 1902, No. 89,740, and allowed March 26, 1902.

The operation is substantially as follows: Fuel is fed through the feed-opening 61 and falls into the fire-pot below. Suppose the fire to have been started and it is desired to open the feed-door 62. The damper 64 is opened and by so doing the smoke and gases which would ordinarily be drawn into the room rush through the opening uncovered by the movement of the damper to the exit-flue 6. When the door 62 is closed and the fuel is sufficiently ignited, the damper 64 is closed, whereupon the currents of heated air directed through the tubes or ducts enter the fire-pot, and if they cannot penetrate the body of fuel from this point they pass through slots in the pockets 48, distributing air-currents into the crevices formed between the fuel, or out of the bottom into the grooves 47, where the heated air is disseminated into the heat of the mass of fuel, after which the products of combustion escape from the fire-pot through the slots formed between the pendent bars and up through the passage 4 to the exit-flue. It is apparent that the escaping heat on its way to the exit-flue will be deflected toward the front of the stove by the baffle-plate 70, and as it contacts with this plate it is somewhat broken and forced forward and made to travel farther, and the consumed molecules of gas are brought into contact with the continued sup-

ply of highly-heated air and again made more liable to be ignited before passing out to the atmosphere. Should the products of combustion in passing through the passage 4 to the exit-flue be all directed by the baffle-plate toward the back of the stove and cause an uneven distribution of radiant heat to the room, the damper 71 will be closed, or almost so, and the desired equalization of the heat may be regulated. If the fire does not ignite as rapidly as the operator thinks it should and it is to be forced, the air-introducers 69 are opened and currents of heated air are directed into the body of the fuel, which after it mixes and ignites the unburned gases in the fire-pot passes into the space 4, thence to the exit-flue. This is equally so with the air introduced from the air-heating chamber 5, the various air-currents from the chamber 5 being so directed as to create a series of resistances between the air and the gas in the fire-pot. For instance, the currents of air coming from the perforations 25 strike the ring 41, which deflects the air toward the center of the fuel, and air-currents coming from the perforations 21 in a vertical direction meet the broken particles of gas caused by the mixing of the upper air-currents, again creating a mixing action. Further than this, air-currents are delivered horizontally through the openings 23, in which are seated the end of the portable bars. This action once more breaks up the gas and mixes it. As the products of combustion escape into the space 4 through the outlets formed between the portable bars they are once more subjected to the heated currents, which again break up and spread the particles of gas, making them more susceptible to ignition.

The parts forming this stove structure are constructed so as to permit almost any individual part thereof to be adjusted or replaced independent of the other, and, further, this utilization of the various parts to support and hold each other in position, as shown most clearly in the drawings, is, so far as I am aware, decidedly unique and practical in the art.

It is sometimes desirable to introduce air to and through the fuel from the bottom, either simultaneously with or independent of the air introduced from the top, and to adequately supply this air a damper 98 is provided in the ash-pit. When air is admitted at this point in combination with the air-supply from above, the two currents meet, which causes them to spread and disseminate into the fuel, releasing and igniting the gases, such meeting of the air-currents being indicated by arrows in Fig. 1.

Having thus fully described my invention, what I claim as new is—

1. A downdraft-stove comprising a casing, a fire-pot provided with a series of air-pockets, detachable covers for said pockets having slots whereby fuel is prevented falling into the pockets and the free ingress and egress of

the air to the fuel is not retarded, and means for securing the covers in position, substantially as described.

2. A downdraft-stove comprising a casing, a fire-pot provided with a series of air-pockets, detachable covers for said pockets which are open at the lower ends, whereby the ingress and egress of air to the fuel is permitted; and means for securing the covers in position, substantially as described.

3. A downdraft-stove comprising a casing, a fire-pot having a series of pockets, covers for said pockets which are reduced at their lower ends, seats for the reduced ends, and means for locking the covers in position, whereby the admission of air to the fuel is not retarded, substantially as described.

4. A downdraft-stove comprising a casing, a fire-pot, means for introducing currents of preheated air downwardly to the fuel in the fire-pot, said air being drawn through the fuel under the influence of the draft, a plurality of air-pockets in the fire-pot, a space being formed intermediate the fire-pot and casing which communicates with the lower end of the fire-pot, an exit-flue communicating with the space at or near the top of the latter and a damper in the upper part of the fire-pot at or near the exit-flue, substantially as described.

5. In a downdraft-stove, the combination with a casing, a fire-pot which is provided with a plurality of air-pockets, slotted covers for said air-pockets, a series of air-introducers in the fire-pot below said pockets and at a point where the fuel is incandescent, substantially as described.

6. In a downdraft-stove, the combination with a casing, a fire-pot which is provided with one or more air-pockets, air-introducers located above the bed of the fuel, and a series of air-introducers in the fire-pot at a point below the top of the bed of the fuel where the latter is incandescent, substantially as described.

7. In a downdraft-stove, the combination with a casing, a fire-pot which is provided with a series of air-pockets, a damper at or near the top of the fire-pot, slotted covers for the pockets, pendent portable bars having exit-spaces therebetween forming the bottom of the fire-pot, a space being formed intermediate the fire-pot and casing which communicates with the fire-pot through the spaces between the pendent portable bars and an exit-flue communicating with the space at or near the top, substantially as described.

8. In a downdraft-stove, the combination with a casing, a fire-pot made in sections, the lower section being constructed of pendent portable bars, means for independently supporting said bars, an air-heating chamber having a series of air-exits surrounding the portable bars, a plate or flange adapted to deflect the air-currents coming from the air-heating chamber toward the bed of fuel, means for supplying air to the air-heating chamber, the

upper section of the fire-pot resting on the plate or flange and being provided with a series of air-pockets, and means at or near the top of the stove for introducing currents of heated air, substantially as described.

9. A downdraft-stove comprising a casing, a fire-pot made in sections, the lower section being made up of pendent portable bars, a space being formed between the casing and fire-pot, an air-heating chamber surrounding the portable bars, a plate or flange which supports the upper section of the fire-pot, pockets being formed in said upper section, a damper above the air-pockets, means for introducing currents of heated air above the bed of the fuel, and an exit-flue communicating with the space at or near the top, substantially as described.

10. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at its lower end, a space being formed intermediate the fire-pot and casing, a damper at or near the top of the fire-pot, an exit-flue communicating with the space at or near the top, means for introducing individual currents of heated air downwardly to the fuel, and means for introducing currents of air into the incandescent mass of fuel from the sides, said air being drawn through the fuel under the influence of the draft, substantially as described.

11. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at its lower end which communicate with an exit-space formed intermediate the fire-pot and casing, a perforated air-heating chamber forming a part of the fire-pot structure, a water-jacket surrounding the outside of the fire-pot, said water-jacket being above and in close relation to the air-chamber, an exit-flue communicating with the space at or near the top thereof, and means for introducing currents of heated air to the top of the fuel, said air-currents being drawn through the fuel under the influence of the draft.

12. In a downdraft-stove, the combination with a casing, a fire-pot, having a series of slots at the bottom which communicate with a space intermediate the fire-pot and casing, an air-heating chamber having air-exits surrounding the fire-pot, flues for introducing air to said chamber, means for deflecting selected currents of air coming from the chamber toward the center of the fuel, and means for introducing currents of heated air above the fuel, all of said air-currents being drawn through the fuel under the influence of the draft, substantially as described.

13. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at its lower end which communicate with a space intermediate the casing and fire-pot, an air-heating chamber in the space, said chamber having a series of air-exits to introduce heated air to the fuel, flues for introducing air to the air-heating chamber, and

means for introducing currents of heated air above the fuel, all of said air-currents being drawn through the fuel under the influence of the draft.

- 5 14. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at the bottom which communicate with a space intermediate the casing and fire-pot, an exit-flue communicating with said space, an air-heating chamber having air-exits surrounding the fire-pot, means for supporting the air-heating chamber in the space, the inner wall of said chamber forming a portion of the fire-pot, means for introducing air to the air-heating chamber, and means for introducing currents of heated air above the fuel, the air-currents being drawn through the fuel under the influence of the draft, substantially as described.
- 15 15. In a downdraft-stove, the combination with a casing, a fire-pot, an exit-flue, an air-heating chamber surrounding the fire-pot which has a series of air-exits, means for introducing air to said chamber, means for introducing air in individual currents to the body of the fuel, and means for delivering individual currents of heated air at different levels to the top of the bed of the fuel, all of said air-currents being drawn through the fuel under the influence of the draft, substantially as described.
- 30 16. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at its lower end which communicate with a space formed intermediate the casing and fire-pot, an exit-flue, an air-heating chamber mounted in said space, means for supplying air to the chamber, and a series of exit-openings being formed in the chamber at different angles and of different sizes to deliver air-currents at various points to the fuel at varying angles and proportions, said air-currents being drawn through the fuel under the influence of the draft, substantially as described.
- 45 17. In a downdraft-stove, the combination with a casing, a fire-pot, an exit-flue, an air-heating chamber having air-exits surrounding the fire-pot, an air-heating chamber, ducts connecting with said air-heating chamber to deliver heated air above the fuel, and means permitting the passage of the heated air should the mass of fuel become packed, substantially as described.
- 50 18. In a downdraft-stove, the combination with a casing, a fire-pot, an exit-flue, means for introducing individual currents of air to the top of the fuel, means for introducing individual currents of air to the fuel below the top thereof, a passage or passages being formed on the interior of the fire-pot to permit the air to pass on the outside of the fuel, openings being formed for the escape of the air from the passage or passages to the fuel, said air together with the individual currents being drawn down through the fuel under the

influence of the draft, substantially as described.

19. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at the lower end which communicate with a space formed intermediate the casing and fire-pot, a flue communicating with said space, an air-heating chamber surrounding the fire-pot, a series of air-exits being formed therein to introduce air to the fuel, means for introducing air to the fuel from the top, and means for introducing finely-divided air-currents to the products of combustion where the latter leave the fire-pot to enter the space, all of the air-currents being drawn through the fuel under the influence of the draft, substantially as described.

20. In a downdraft-stove, the combination with a fire-pot, means for introducing currents of heated air to the top of the fuel, means for introducing heated air to the sides of the fuel, means for introducing heated air intermediate the two aforesaid means, and a series of air-pockets, in the fire-pot, substantially as described.

21. In a downdraft-stove, the combination with a casing, a fire-pot, made in sections, the lower section being constructed of pendant portable bars, means for independently supporting said bars, an air-heating chamber having a series of air-exits surrounding the portable bars, means for deflecting part of the air-currents coming from the air-heating chamber toward the bed of fuel, means for supplying air to the air-heating chamber, the upper section of the fire-pot resting on the means for deflecting a part of the air, air-pockets, and means at or near the top of the stove for introducing currents of heated air, substantially as described.

22. In a downdraft-stove, the combination with a casing, a fire-pot having a series of openings at the lower end which communicate with a space formed intermediate the casing and fire-pot, an air-heating chamber in the fire-pot, having a series of air-openings to introduce heated air to the fuel, means for introducing individual currents of heated air to the top of the fuel, means for introducing currents of heated air intermediate the means for delivering air to the top of the fuel and the series of openings at the lower end of the fire-pot, the air-currents being drawn through the fuel under the influence of the draft, and means for introducing finely-divided air-currents to the products of combustion after the latter leave the fire-pot.

23. In a downdraft-stove, the combination with a casing, a fire-pot, which is provided with one or more air-pockets, air-introducers located above the air-pockets and the bed of fuel and adjacent the walls of the fire-pot, and a series of air-introducers in the fire-pot at a point below the top of the bed of the fuel where the latter is incandescent.

24. In a downdraft-stove, the combination

with a casing, a fire-pot, having a series of openings which communicate with an exit-space formed intermediate the fire-pot and casing, a perforated air-heating chamber 5 forming a part of the fire-pot structure, a water-jacket located in said exit-space and above the air-heating chamber, an exit-flue communicating with the space above the water-jacket, and means for introducing currents 10 of air toward the fuel, said air-currents being drawn through the fuel under the influence of the draft.

25. In a downdraft-stove, the combination with a casing, a fire-pot, having a series of 15 openings at the bottom which communicate with a space intermediate the fire-pot and casing, an air-heating chamber having air-exits in the fire-pot, said chamber being adjacent the fire-pot, means for introducing air 20 to said chamber, means for introducing individual currents of heated air above the fuel, all of said currents being drawn through the fuel under the influence of the draft, substantially as described.

25 26. In a downdraft-stove, the combination with a casing, a fire-pot, an exit-flue, an air-heating chamber adjacent the fire-pot, said chamber having a series of air-exits, means 30 for introducing air to said chamber, means for introducing air in individual currents to the body of the fuel, means for delivering heated air-currents to the fuel at different levels, all of the air-currents being drawn

through the fuel under the influence of the draft, and a plurality of air-pockets in the 35 fire-pot, substantially as described.

27. In a downdraft-stove, the combination with a fire-pot having openings at its lower end which communicate with a space formed 40 intermediate the casing and fire-pot, an exit-flue, an air-heating chamber adjacent the fire-pot, means for supplying air to the chamber, a series of exit-openings being formed in the chamber at different angles and of different 45 sizes to deliver air-currents at varying angles and proportions, said air-currents being drawn through the fuel under the influence of the draft, substantially as described.

28. In a downdraft-stove, the combination with a casing, of a fire-pot having grooves 50 therein, and being provided with openings which communicate with a space formed intermediate the casing and fire-pot, a plurality of air-pockets above the grooves which co- 55 operate therewith, an exit-flue and means for introducing air above the fuel, said air being drawn through the fuel under the influence of the draft, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing wit- 60 nesses.

EDWIN R. CAHOONE.

Witnesses:

FRANK SHRANDER,
WILLIAM S. HOPKINS.